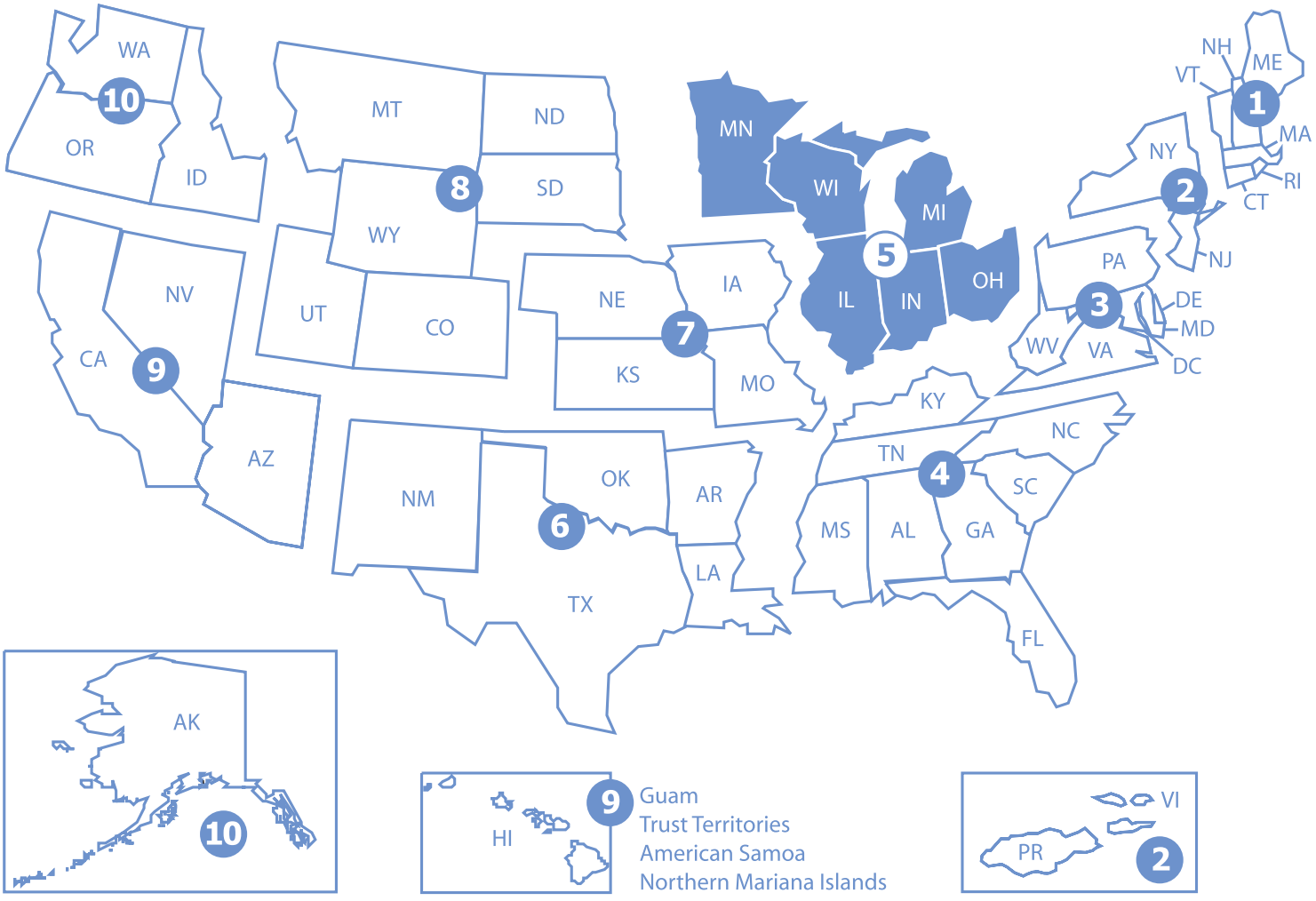
United States
Environmental Protection
Agency

1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

March 2026

Office of Land and Emergency Management

Support Document for the Revised National Priorities List Final Rule – Gelman Sciences Inc.



Support Document for the Revised National Priorities List Final Rule

Gelman Sciences Inc.

March 2026

Assessment and Cleanup Division
Office of Superfund and Emergency Management
Office of Land and Emergency Management
U.S. Environmental Protection Agency
Washington, DC 20460

Table of Contents

Executive Summary ..... **iii**

Introduction ..... **iv**

Organization of this Document iv

Background of the NPL iv

Development of the NPL v

Hazard Ranking System v

Glossary vi

1. List of Commenters and Correspondence **1**

2. Site Description **8**

3. Summary of Comments **11**

3.1 Support for Listing and Other Non-opposition Comments 13
3.1.1 General Support 13
3.1.2 Support with Requests for Further Action 15

3.2 Adequacy of Record 17

3.3 Purpose/Need for Listing 20

3.4 Delay 23

3.5 Narrative Summary Clarifications 23

3.6 Extent of Site/Site Boundaries 24

3.7 Pathways Not Scored/Score More 26

3.8 Consistency with Guidance and Policy 27

3.9 Community Involvement 30

3.10 Alternatives to Listing 32

3.11 Consideration of Response and Remedial Actions 33

3.12 Risk to Human Health or the Environment 36

3.13 Economic Impacts/Stigma 39

3.14 Funding and Resources 39

3.15 Permitted Releases/Concentrations Below Regulatory Levels....40

3.16 Site Inspection Report Data....41

3.17 Source Characterization....43
3.17.1 Sample Collection Techniques....44
3.17.2 Soil Sample Results....52

3.18 Aquifer Delineation....54

3.19 Observed Release....59
3.19.1 Eligible Releases....72
3.19.2 Background Samples....74
3.19.3 Attribution....83

3.20 Targets....85
3.20.1 Use of Qualified Data in Establishing Level I Concentrations....99
3.20.2 Municipal Well (Montgomery Well)....104
3.20.3 Actual Contamination in Residential Wells....105

4. Conclusion....107

Attachment A: State Request to Reinitiate Assessment of the Gelman Site for the NPL Process
Attachment B: NPDES Permit No. MI0048453 Discharge Data – Gelman Site, Ann Arbor, MI
Attachment C: Final Site Assessment Technical Support Sampling and Analysis Plan, Gelman Sciences, Inc. (June 2022)
Attachment D: Additional Background Well Data
Attachment E: MI LUST U000266410 - Montgomery Pumping Station
Attachment F: Summary of Unsewered Neighborhoods with Non-Detect of 1,4-Dioxane
Attachment G: Gelman-Related Municipal Water Connections Due to 1,4-Dioxane Contamination

Executive Summary

Section 105(a)(8)(B) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), requires that the EPA prepare a list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States. An original National Priorities List (NPL) was promulgated on September 8, 1983 (48 FR 40658). CERCLA requires that EPA update the list at least annually.

This document provides responses to public comments received, primarily those comments in opposition to placing the Gelman Sciences Inc. site, proposed on March 7, 2024 (89 FR 16498), on the NPL. This site is being placed onto the NPL through a final rule action published in the Federal Register dated March 2026.

The Gelman Sciences Inc. site (the Site), is located in Ann Arbor, Michigan. The Site is in Washtenaw County and includes portions of the city of Ann Arbor and Scio Township, Michigan. The EPA received 148 comment submissions that either expressed support or did not express opposition to the proposed NPL designation of the Site, and one comment submission that was unrelated to the proposal to add the Site to the NPL. The EPA also received two comment submissions that opposed the proposed NPL designation of the Site. Commenters supporting the addition of the Site to the NPL cited multiple concerns, including health impacts from both past and current exposures to 1,4-dioxane, threats to the ecosystem and wildlife, and insufficient remediation efforts that result in a continued threat to Ann Arbor's drinking water supply. Commenters in opposition to the addition of the Site to the NPL include one private citizen and one comment submission on behalf of Gelman Sciences. Comments opposing the proposal to add the Site to the NPL expressed multiple concerns, including the adequacy of the data used to support the Hazard Ranking System (HRS) documentation record at proposal, the need and rationale for listing, the consistency of the proposal with EPA guidance and policy, the consideration of ongoing remediation and alternatives to NPL placement, the risk posed by the Site-related contamination, and the stigma associated with an NPL designation. Commenters opposing the proposal to add the Site to the NPL also provided comments questioning the technical evaluation of the Site, including the characterization of the sources scored in the HRS documentation record at proposal, the assessment of background conditions, the attribution of contamination in the residential wells to the releases at the Site, and the inclusion of a well closed due to Site-related contamination in the evaluation of targets at the Site.

In section 3, Summary of Comments, and its subsections, of this support document, the EPA responds to public comments received and primarily to those comments in opposition of placing this Site on the NPL. These comments were submitted on the March 2024 proposed listing of the Gelman Sciences Inc. site, located in Ann Arbor, Michigan. After consideration of these items, the EPA has revised the HRS documentation record at promulgation to remove one of the sources scored (Source 3) and instead identified this area (the Spray Irrigation Field) as a possible source. The ground water migration pathway score and the overall HRS site score remain unchanged at promulgation, as explained in detail in the responses to public comments in this support document, and the EPA is appropriately placing the site on the NPL.

Introduction

This document explains the rationale for placing the Gelman Sciences Inc. site in Ann Arbor, Michigan onto the list of sites of national priority among known or threatened releases of hazardous substances, pollutants or contaminants throughout the United States and provides responses to public comments received on the proposed rule to place this site on the NPL. The EPA proposed this site to the NPL on March 7, 2024 (89 FR 16498). This site is being added to the NPL based on the results of an evaluation under the Hazard Ranking System (HRS) through a final rule published in the *Federal Register* dated March 2026.

Organization of this Document

The following sections discuss the NPL and the HRS followed by a glossary and site-specific discussion containing EPA responses to site-specific public comments received on the proposal of the Gelman Sciences Inc. site to the NPL on March 7, 2024 (89 FR 16498). The site discussion begins with a list of commenters (section 1), followed by a site description (section 2), a summary of comments, and the EPA responses to each comment (section 3). A concluding statement indicates the effect of the comments on the HRS score for the site.

Background of the NPL

CERCLA, 42 U.S.C. Sections 9601 *et seq*. (December 11, 1980), was passed to address the dangers of uncontrolled hazardous waste sites to public health and the environment. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP), which was comprehensively revised on March 8, 1990 (55 FR 8666), provides the implementing regulations. Those regulations include the HRS, which provides the scoring system for evaluating priority sites. NPL sites are eligible for remedial funds from the "Trust Fund" established by Congress under CERCLA. The placement of a site on the NPL must meet one of the three criteria: a site score under the HRS of 28.50 or greater, a State or Territory designation of one hazardous waste facility of highest priority (40 CFR 300.425(c)(2)), or the issuance of a health advisory by the Agency for Toxic Substances and Disease Registry (ATSDR), assuming other requirements are met, recommending the public be dissociated from the release (40 CFR 300.425(c)(3)).

EPA promulgated the HRS as Appendix A of the NCP (47 FR 31219, July 16, 1982). On December 14, 1990 (55 FR 51532), EPA promulgated revisions to the HRS in response to SARA and established the effective date for the HRS revisions as March 14, 1991. On January 9, 2017 (82 FR 2760), EPA promulgated a further revision to the HRS that added a component for evaluating the threats posed by the intrusion of subsurface contamination into regularly occupied structures, most commonly involving the assessment of "vapor intrusion." These changes to the HRS are consistent with, and comply with, the statutory requirements of SARA.

Section 105(a)(8)(B) of CERCLA, as amended, requires that the statutory criteria provided by the HRS be used to prepare a list of national priorities among the known releases or threatened releases of hazardous substances, pollutants or contaminants throughout the United States. The list, which is Appendix B of the NCP, is the NPL.

On September 8, 1983 (48 FR 40658), an original NPL of 406 sites was established as directed by CERCLA. An HRS score of 28.50 was determined to be the cutoff for listing because it resulted in at least 400 sites, as suggested by CERCLA. The NPL has since been updated, most recently on July 3, 2025 (90 FR 29491) and the current list consists of 1,343 sites. The EPA also has published a number of proposed rulemakings to add sites to and delete sites from the NPL. The most recent proposal to place a site on the NPL was on September 5, 2024 (89 FR 72356).

Development of the NPL

The primary purpose of the NPL is stated in the legislative history of CERCLA (Report of the Committee on Environment and Public Works, Senate Report No. 96-848, 96th Cong., 2d Sess. 60 [1980]):

> The priority list serves primarily informational purposes, identifying for the States and the public those facilities and sites or other releases which appear to warrant remedial actions. Inclusion of a facility or site on the list does not in itself reflect a judgment of the activities of its owner or operator, it does not require those persons to undertake any action, nor does it assign liability to any person. Subsequent government actions will be necessary in order to do so, and these actions will be attended by all appropriate procedural safeguards.

The identification of a site qualifying for placement on the NPL is intended primarily to guide EPA in determining which sites warrant further investigation to assess the nature and extent of the human health and environmental risks associated with the site and to determine what CERCLA-financed remedial action(s), if any, may be appropriate. The NPL also serves to notify the public of sites EPA believes warrant further investigation. Finally, placing a site on the NPL may, should there be potentially responsible parties identified at the time of listing, serve as a notice to such parties that the EPA has identified the site to be one of national interest. EPA has the discretion not to use CERCLA to respond to a release should another authority be more appropriate to address the contamination. EPA also has discretion to not place a site on the NPL, even where the site qualifies for placement.

Hazard Ranking System

The HRS is the principal mechanism EPA uses to place known or threatened releases of hazardous substances, pollutants or contaminants on the NPL. It is a numerically based screening system that uses information from initial, limited investigations -- the preliminary assessment and site inspection -- to assess the potential of a release to pose a threat to human health or the environment. EPA allocates the resources needed to assess the relative risk under the HRS, producing an HRS site score, before investing more into fully characterizing the risk present at a site. HRS scores, however, do not determine the sequence in which EPA funds cleanup response actions and the EPA does not address sites on the NPL in a ranked order based on HRS scores. EPA does not rely on HRS scores to drive cleanup actions. The HRS site score does not reflect the site-specific risk between one site and another. The NCP provides for more detailed studies to evaluate whether and which actions may be appropriate for a specific site.

The HRS uses a structured value analysis approach to scoring sites by assigning numerical values to factors that relate to or indicate risk, based on the current (or recent) conditions at the site. The factors are grouped into three categories. Some categories have a maximum value, and each category contributes to the overall HRS score. The categories are:

- likelihood that a site has released or has the potential to release hazardous substances into the environment (or for the soil exposure and subsurface intrusion pathway, the likelihood that a site has resulted in exposure of targets to contamination);
- characteristics of the waste (e.g., toxicity and waste quantity); and
- targets (e.g., people or sensitive environments) affected by the release.

Under the HRS, four pathways can be scored for one or more components and threats as identified below:

- Ground Water Migration (S_{gw})
  - Population

- Surface Water Migration (S_{sw})
  The following threats are evaluated for two separate migration components, overland/flood migration and ground water to surface water.
  - drinking water
  - human food chain
  - sensitive environments

- Soil Exposure and Subsurface Intrusion (S_{sessi})
  - Soil Exposure Component:
    - resident population threat
    - nearby population threat
  - Subsurface Intrusion Component
    - population

- Air Migration (S_a)
  - Population

After scores are calculated for one or more pathways according to prescribed guidelines in the HRS, they are combined using the following root-mean-square equation to determine the overall site score (S), which ranges from 0 to 100**:**

$$S = \sqrt{\frac{S_{gw}^2 + S_{sw}^2 + S_{sessi}^2 + S_a^2}{4}}$$

At sites where multiple pathways can be evaluated, not all pathways need to be scored to obtain an HRS score at or above 28.50, and EPA need not score all four pathways. In its discretion, EPA can choose to score only one pathway.

Glossary

The following acronyms and abbreviations are used throughout the text:

ACWG	Allen's Creek Watershed Group
Agency	U.S. Environmental Protection Agency
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
CARD	Coalition for Action on Remediation of Dioxane
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. Sections 9601 *et seq*., also known as Superfund
CFR	Code of Federal Regulations
CIP	Community Involvement Plan
CLP	EPA Contract Laboratory Program
CRQL	Contract-required quantitation limit
DL	Detection Limit

EGLE	Michigan Department of Environment, Great Lakes, and Energy
EPA	U.S. Environmental Protection Agency
ESI	Expanded Site Inspection
FID/PID	Flame/photo ionization detector
FR	Federal Register
FS	Feasibility Study
GEA	Global Environment Alliance
HRS	Hazard Ranking System, Appendix A of the NCP
HRS score	Overall site score calculated using the Hazard Ranking System; ranges from 0 to 100
MCL	Maximum contaminant level
MCLG	Maximum Contaminant Level Goal
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MDPH	Michigan Department of Public Health
MNRC	Michigan Natural Resources Commission
MWRC	Michigan Water Resources Commission
MRL	Minimum reporting limit
MW	Monitoring Well
µg/L	Microgram per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300
NFRAP	No Further Remedial Action Planned
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OLEM	EPA Office of Land and Emergency Management
PA	Preliminary Assessment
PAH	Polycyclic aromatic hydrocarbons
PPM	Parts Per Million
PRP	Potentially responsible party
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RI	Remedial investigation
RI/FS	Remedial investigation/feasibility study
ROD	Record of Decision
RPMs	Remedial Project Managers
SAP	Sampling and Analysis Plan

SARA	Superfund Amendments and Reauthorization Act
SEMS	Superfund Enterprise Management System
SI	Site Inspection
SLA	Sister Lakes Association
SOP	Standard Operating Procedures
SQL	Sample quantitation limit
SRSW	Scio Residents for Safe Water
TDL	Target Distance Limit
USGS	United States Geological Survey
VOC	Volatile organic compound
WCHD	Washtenaw County Health Department

1. List of Commenters and Correspondence

EPA-HQ-OLEM-2024-0067-0004	Correspondence, dated December 11, 2023, submitted by Gretchen Whitmer, Governor of Michigan, Office of the Governor.
EPA-HQ-OLEM-2024-0067-0005	Comment with attachment, dated March 10, 2024, submitted by Phyllis Blumberg.
EPA-HQ-OLEM-2024-0067-0006	Comment, dated March 7, 2024, submitted by Edward Korczynski.
EPA-HQ-OLEM-2024-0067-0007	Comment, dated March 7, 2024, submitted by Tim Durham.
EPA-HQ-OLEM-2024-0067-0008	Comment, dated March 7, 2024, submitted by Daniel McCarter.
EPA-HQ-OLEM-2024-0067-0009	Comment, dated March 7, 2024 submitted by Atticus Wolf.
EPA-HQ-OLEM-2024-0067-0010	Comment, dated March 7, 2024, submitted by Judith Erb.
EPA-HQ-OLEM-2024-0067-0011	Comment, dated March 7, 2024 submitted by James Downward.
EPA-HQ-OLEM-2024-0067-0012	Comment, dated March 7, 2024, submitted by Kathryn Leibert.
EPA-HQ-OLEM-2024-0067-0013	Comment, dated March 7, 2024 submitted by Stephen Bottke.
EPA-HQ-OLEM-2024-0067-0014	Comment, dated March 7, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0015	Comment, dated March 9, 2024, submitted by Carolyn Stark.
EPA-HQ-OLEM-2024-0067-0016	Comment, dated March 9, 2024, submitted by Sarah Elmiger.
EPA-HQ-OLEM-2024-0067-0017	Comment, dated March 11, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0018	Comment, dated March 11, 2024, submitted by Kitty Kahn.
EPA-HQ-OLEM-2024-0067-0019	Comment, dated March 11, 2024, submitted by Lewis Okun.
EPA-HQ-OLEM-2024-0067-0020	Comment, dated March 12, 2024, submitted by Robert Ferguson.
EPA-HQ-OLEM-2024-0067-0021	Comment, dated March 12, 2024, submitted by Jennifer Buehrer.
EPA-HQ-OLEM-2024-0067-0022	Comment, dated March 12, 2024, submitted by Susan Baughn.
EPA-HQ-OLEM-2024-0067-0023	Comment, dated March 12, 2024, submitted by Dwight Cendrowski.
EPA-HQ-OLEM-2024-0067-0024	Comment with attachment, dated March 7, 2024, submitted by Mary Florida.

EPA-HQ-OLEM-2024-0067-0025	Comment, dated March 14, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0026	Comment, dated March 17, 2024, submitted by Tom Demmon.
EPA-HQ-OLEM-2024-0067-0027	Comment, dated April 2, 2024, submitted by Stephen C. Brown.
EPA-HQ-OLEM-2024-0067-0028	Comment, dated April 3, 2024, submitted by Anya Dale.
EPA-HQ-OLEM-2024-0067-0029	Comment, dated April 3, 2024, submitted by Mitch Holdwick.
EPA-HQ-OLEM-2024-0067-0030	Comment, dated April 3, 2024, submitted by Elizabeth Stone.
EPA-HQ-OLEM-2024-0067-0031	Comment, dated April 3, 2024, submitted by Robert Bailey.
EPA-HQ-OLEM-2024-0067-0032	Comment, dated April 4, 2024, submitted by Matthew Weston.
EPA-HQ-OLEM-2024-0067-0033	Comment, dated April 5, 2024, submitted by Evan LeRoy.
EPA-HQ-OLEM-2024-0067-0034	Comment, dated April 7, 2024, submitted by Rob Pattinson.
EPA-HQ-OLEM-2024-0067-0035	Comment, dated April 7, 2024, submitted by Jo Pattison.
EPA-HQ-OLEM-2024-0067-0036	Comment, dated April 8, 2024, submitted by Ryan Yaple.
EPA-HQ-OLEM-2024-0067-0037	Comment, dated April 8, 2024, submitted by Andrea Strieter.
EPA-HQ-OLEM-2024-0067-0038	Comment, dated April 8, 2024, submitted by Harley Schwadron.
EPA-HQ-OLEM-2024-0067-0039	Comment, dated April 8, 2024, submitted by Mary Jarzebowski.
EPA-HQ-OLEM-2024-0067-0040	Comment, dated April 11, 2024, submitted by Carol E. Fletcher.
EPA-HQ-OLEM-2024-0067-0041	Comment, dated April 11, 2024, submitted by Kanda Fletcher.
EPA-HQ-OLEM-2024-0067-0042	Comment, dated April 11, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0043	Comment, dated April 12, 2024, submitted by Beth Lawless.
EPA-HQ-OLEM-2024-0067-0044	Comment, dated April 12, 2024, submitted by Sierra Club Huron Valley Group.
EPA-HQ-OLEM-2024-0067-0045	Comment, dated April 12, 2024, submitted by David Spicer.
EPA-HQ-OLEM-2024-0067-0046	Comment, dated April 16, 2024, submitted by Peter Schork.
EPA-HQ-OLEM-2024-0067-0047	Comment, dated April 17, 2024, submitted by an anonymous commenter.

EPA-HQ-OLEM-2024-0067-0048	Comment, dated April 19, 2024, submitted by Allen's Creek Watershed Group (ACWG) and Coalition for Action on Remediation of Dioxane (CARD).
EPA-HQ-OLEM-2024-0067-0049	Comment, dated April 19, 2024, submitted by Lynn Borset.
EPA-HQ-OLEM-2024-0067-0050	Comment, dated April 21, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0051	Comment, dated April 22, 2024, submitted by Suzanne Perkins.
EPA-HQ-OLEM-2024-0067-0052	Comment, dated April 22, 2024, submitted by Liz Brauer.
EPA-HQ-OLEM-2024-0067-0053	Comment, dated April 23, 2024, submitted by J. Moenck.
EPA-HQ-OLEM-2024-0067-0054	Comment, dated April 25, 2024, submitted by Vincent Caruso.
EPA-HQ-OLEM-2024-0067-0055	Comment, dated April 25, 2024, submitted by Colin Clark.
EPA-HQ-OLEM-2024-0067-0056	Comment, dated April 25, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0057	Comment, dated April 25, 2024, submitted by Terri Merte.
EPA-HQ-OLEM-2024-0067-0058	Comment, dated April 25, 2024, submitted by Jared Ledvina.
EPA-HQ-OLEM-2024-0067-0059	Comment, dated April 25, 2024, submitted by Carlos García.
EPA-HQ-OLEM-2024-0067-0060	Comment, dated April 25, 2024, submitted by Anna Sampson.
EPA-HQ-OLEM-2024-0067-0061	Comment with attachment, dated April 26, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0062	Comment, dated April 26, 2024, submitted by D. White.
EPA-HQ-OLEM-2024-0067-0063	Comment, dated April 26, 2024, submitted by Brooks Curtis.
EPA-HQ-OLEM-2024-0067-0064	Comment, dated April 26, 2024, submitted by Michael Glinke.
EPA-HQ-OLEM-2024-0067-0065	Comment, dated April 26, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0066	Comment, dated April 26, 2024, submitted by Laura Slider.
EPA-HQ-OLEM-2024-0067-0067	Comment, dated April 26, 2024, submitted by Kyla McCarthy.
EPA-HQ-OLEM-2024-0067-0068	Comment, dated April 26, 2024, submitted by Joe Meunier.
EPA-HQ-OLEM-2024-0067-0069	Comment, dated April 28, 2024, submitted by Rita Mitchell.

EPA-HQ-OLEM-2024-0067-0070	Comment, dated April 28, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0071	Comment, dated April 28, 2024, submitted by Eric Russell.
EPA-HQ-OLEM-2024-0067-0072	Comment, dated April 29, 2024, submitted by Sonia Schmerl.
EPA-HQ-OLEM-2024-0067-0073	Comment, dated April 29, 2024, submitted by Kathleen Brant.
EPA-HQ-OLEM-2024-0067-0074	Comment, dated April 29, 2024, submitted by Holli Bertram.
EPA-HQ-OLEM-2024-0067-0075	Comment, dated April 29, 2024, submitted by Brian Knowles.
EPA-HQ-OLEM-2024-0067-0076	Comment with attachments, dated April 29, 2024, submitted by Evan Pratt, Water Resources Commissioner, Washtenaw County.
EPA-HQ-OLEM-2024-0067-0077	Comment, dated April 30, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0078	Comment, dated May 1, 2024, submitted by Joe Cialdella.
EPA-HQ-OLEM-2024-0067-0079	Comment, dated May 1, 2024, submitted by Priscilla Parker.
EPA-HQ-OLEM-2024-0067-0080	Comment, dated May 1, 2024, submitted by Elizabeth Collins.
EPA-HQ-OLEM-2024-0067-0081	Comment, dated May 1, 2024, submitted by Kirby Evans.
EPA-HQ-OLEM-2024-0067-0082	Comment, dated May 1, 2024, submitted by Ivan Zhu.
EPA-HQ-OLEM-2024-0067-0083	Comment, dated May 2, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0084	Comment, dated May 2, 2024, submitted by Nancy Burbano.
EPA-HQ-OLEM-2024-0067-0085	Comment, dated May 2, 2024 submitted by Pat Ulanowicz.
EPA-HQ-OLEM-2024-0067-0086	Comment, dated May 2, 2024, submitted by Willie Northway.
EPA-HQ-OLEM-2024-0067-0087	Comment, dated May 3, 2024, submitted by Daniel McCarter.
EPA-HQ-OLEM-2024-0067-0088	Comment, dated May 3, 2024, submitted by Veronique Liem.
EPA-HQ-OLEM-2024-0067-0089	Comment with attachment, dated May 3, 2024, submitted by Sister Lakes Association.
EPA-HQ-OLEM-2024-0067-0090	Comment, dated May 3, 2024, submitted by Kenneth Winter.
EPA-HQ-OLEM-2024-0067-0091	Comment, dated May 3, 2024, submitted by Edith Lewis.
EPA-HQ-OLEM-2024-0067-0092	Comment, dated May 3, 2024, submitted by J. M. Mink.

EPA-HQ-OLEM-2024-0067-0093	Comment, dated May 3, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0094	Comment, dated May 3, 2024, submitted by Julie Wheaton.
EPA-HQ-OLEM-2024-0067-0095	Comment, dated May 3, 2024, submitted by Anniemae Fisher.
EPA-HQ-OLEM-2024-0067-0096	Comment, dated May 3, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0097	Comment, dated May 4, 2024, submitted by Karen Hart.
EPA-HQ-OLEM-2024-0067-0098	Comment, dated May 4, 2024, submitted by Tara Cohen.
EPA-HQ-OLEM-2024-0067-0099	Comment, dated May 4, 2024, submitted by Deborah Webster.
EPA-HQ-OLEM-2024-0067-0100	Comment, dated May 4, 2024, submitted by Frode Maaseidvaag.
EPA-HQ-OLEM-2024-0067-0101	Comment, dated May 4, 2024, submitted by Susan Kaufmann.
EPA-HQ-OLEM-2024-0067-0102	Comment, dated May 5, 2024, submitted by Garrett Schwinghamer.
EPA-HQ-OLEM-2024-0067-0103	Comment, dated May 5, 2024, submitted by Charles Todd.
EPA-HQ-OLEM-2024-0067-0104	Comment, dated May 5, 2024, submitted by Cathy Antonakos.
EPA-HQ-OLEM-2024-0067-0105	Comment, dated May 5, 2024, submitted by Linda Berauer.
EPA-HQ-OLEM-2024-0067-0106	Comment, dated May 5, 2024, submitted by Charles Compton.
EPA-HQ-OLEM-2024-0067-0107	Comment, dated May 5, 2024, submitted by Marion Oey.
EPA-HQ-OLEM-2024-0067-0108	Comment, dated May 5, 2024, submitted by Ed Steinman.
EPA-HQ-OLEM-2024-0067-0109	Comment, dated May 5, 2024, submitted by Vivienne Armentrout.
EPA-HQ-OLEM-2024-0067-0110	Comment, dated May 5, 2024, submitted by John Vincent.
EPA-HQ-OLEM-2024-0067-0111	Comment, dated May 5, 2024, submitted by Ellen Ramsburgh.
EPA-HQ-OLEM-2024-0067-0112	Comment, dated May 5, 2024, submitted by Ira Maine.
EPA-HQ-OLEM-2024-0067-0112	Comment, dated May 5, 2024, submitted by Rae Ann Weymouth.
EPA-HQ-OLEM-2024-0067-0113	Comment, dated May 5, 2024, submitted by an anonymous commenter.

EPA-HQ-OLEM-2024-0067-0114	Comment, dated May 5, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0115	Comment, dated May 5, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0116	Comment, dated May 7, 2024, submitted by Martha Ratliff.
EPA-HQ-OLEM-2024-0067-0117	Comment with attachments, dated May 2, 2024, submitted by Will Hathaway, Supervisor, and Kathleen Knol, Trustee, Scio Township.
EPA-HQ-OLEM-2024-0067-0118	Correspondence with attachments, dated May 2, 2024, submitted by Rita Loch-Caruso.
EPA-HQ-OLEM-2024-0067-0119	Comment, dated May 3, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0120	Comment, dated May 4, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0121	Correspondence with attachment, dated May 5, 2024, submitted by Roger Rayle, CARD Chair.
EPA-HQ-OLEM-2024-0067-0122	Comment, dated May 5, 2024, submitted by Allison L.
EPA-HQ-OLEM-2024-0067-0123	Comment, dated May 5, 2024, submitted by C.L.
EPA-HQ-OLEM-2024-0067-0124	Comment, dated May 6, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0125	Comment, dated May 6, 2024, submitted by Wendy Lombard.
EPA-HQ-OLEM-2024-0067-0126	Comment, dated May 6, 2024, submitted by Gail Einhaus.
EPA-HQ-OLEM-2024-0067-0127	Comment, dated May 6, 2024, submitted by Ann Agler.
EPA-HQ-OLEM-2024-0067-0128	Comment, dated May 6, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0129	Comment, dated May 6, 2024, submitted by Denis Marshall.
EPA-HQ-OLEM-2024-0067-0130	Correspondence with attachments, dated May 6, 2024, submitted by Washtenaw County Commissioners, Districts 1, 3, 5, 6, 7, 8 and 9.
EPA-HQ-OLEM-2024-0067-0131	Comment, dated May 6, 2024, submitted by Janet Ankney.
EPA-HQ-OLEM-2024-0067-0132	Comment, dated May 6, 2024, submitted by Gloria Zimet.
EPA-HQ-OLEM-2024-0067-0133	Comment, dated May 6, 2024, submitted by Marta Manildi.

EPA-HQ-OLEM-2024-0067-0134	Comment, dated May 6, 2024, submitted by Glenn Hendrix.
EPA-HQ-OLEM-2024-0067-0135	Comment, dated May 6, 2024, submitted by Elizabeth Noren.
EPA-HQ-OLEM-2024-0067-0136	Comment, dated May 6, 2024, submitted by John Einhaus.
EPA-HQ-OLEM-2024-0067-0137	Comment, dated May 6, 2024, submitted by an anonymous commenter.
EPA-HQ-OLEM-2024-0067-0138	Comment, dated May 6, 2024, submitted by Catherine Daligga.
EPA-HQ-OLEM-2024-0067-0139	Comment, dated May 6, 2024, submitted by Jennifer Russell.
EPA-HQ-OLEM-2024-0067-0140	Comment, dated May 6, 2024, submitted by Shana Milkie.
EPA-HQ-OLEM-2024-0067-0141	Comment, dated May 6, 2024, submitted by Patricia Bova.
EPA-HQ-OLEM-2024-0067-0142	Comment, dated May 6, 2024, submitted by Katherine Griswold.
EPA-HQ-OLEM-2024-0067-0143	Comment, dated May 6, 2024, submitted by Carol Tucker.
EPA-HQ-OLEM-2024-0067-0144	Comment, dated May 6, 2024, submitted by Linda Mendelson.
EPA-HQ-OLEM-2024-0067-0145	Comment, dated May 6, 2024, submitted by Lynda Asher.
EPA-HQ-OLEM-2024-0067-0146	Comment with attachment, dated May 4, 2024, submitted by Jillian Kerry.
EPA-HQ-OLEM-2024-0067-0147	Correspondence with attachments, dated May 6, 2024, submitted by Raymond B. Ludwiszewski, Gelman Sciences LLC.
EPA-HQ-OLEM-2024-0067-0148	Comment with attachments, dated May 6, 2024, submitted by Gelman Sciences LLC.
EPA-HQ-OLEM-2024-0067-0149	Comment with attachments, dated May 6, 2024, submitted by Gelman Sciences LLC.
EPA-HQ-OLEM-2024-0067-0150	Correspondence with attachments, dated May 6, 2024, submitted by Molly Maciejewski, Water Treatment Services Unit Manager, City of Ann Arbor.
EPA-HQ-OLEM-2024-0067-0151	Correspondence with attachment, dated May 6, 2024, submitted by Jimena Loveluck, Health Officer, and Kristen Schweighoefer, Environmental Health Director, Washtenaw County Health Department.
EPA-HQ-OLEM-2024-0067-0152	Comment with attachments, dated May 6, 2024, submitted by James D'Amour.
EPA-HQ-OLEM-2024-0067-0153	Comment, dated May 6, 2024, submitted by Margaret.

EPA-HQ-OLEM-2024-0067-0154	Comment with attachments, dated May 5, 2024, submitted by Daniel J. Bicknell, President, Global Environment Alliance, LLC.
EPA-HQ-OLEM-2024-0067-0155	Comment with attachments, dated May 9, 2024, submitted by Daniel J. Bicknell, President, Global Environment Alliance, LLC.
EPA-HQ-OLEM-2024-0067-0156	Comment with attachments, dated May 6, 2024, submitted by Roger Rayle, Chair, Scio Residents for Safe Water (SRSW).
EPA-HQ-OLEM-2024-0067-0157	Comment with attachments, dated May 5, 2024, submitted by Daniel J. Bicknell, President, Global Environment Alliance, LLC.

2. Site Description

The Gelman Sciences Inc. site (the Site), is located in Washtenaw County and includes portions of the city of Ann Arbor and Scio Township, Michigan. At proposal, the Site consisted of three sources containing hazardous substances (1,4-dioxane and acetone) at the Gelman facility and the groundwater contaminated with Site-attributable 1,4-dioxane as a result of releases from Site sources. Gelman manufactured membrane filtration material and related products for the medical, biomedical, and laboratory industries; these manufacturing operations included the use of leaching tanks and coating lines to apply and wash various solvents onto filters. Between 1966 and May 1986, 1,4-dioxane was used for cellulose triacetate filter production and cleaning process lines; during this time, process wastewater effluent was sampled and documented to contain 1,4-dioxane at a concentration of 1,600 parts per million (ppm). This process wastewater was managed at the facility in ponds (i.e., surface impoundments) throughout Gelman's operational history, by spray irrigation beginning in 1976, and, beginning in 1981, by deep underground well injection. In 1969, the estimated volume of process wastewater discharged to the unlined Former Ponds 1 and 2 was 50,000 gallons per day. Effluent from the ponds was historically designed to percolate into the ground and, on multiple occasions, was documented to overflow and discharge directly to the surrounding environment. In October 1992, Gelman and the State of Michigan entered into a Consent Judgment pursuant to which Gelman agreed to take specified response actions to address the 1,4-dioxane at the Gelman facility and in the groundwater plume. The Consent Judgment has since been amended multiple times, and most recently on May 17, 2023 (referred to as the Fourth Amended Consent Judgment; this Consent Judgment is primarily focused on managing the contamination within the footprint of a drinking water prohibition zone through groundwater pump and treat, plume natural attenuation, and eventual discharge to the Huron River, rather than remediation). Gelman has been addressing the 1,4-dioxane plume through a pump and treat regime and as of July, 2024, has removed approximately 99,937 pounds of 1,4-dioxane from the aquifer. However, contamination remains in the aquifer, and the State has requested the EPA to place the Site on the NPL.

Sources scored in the HRS evaluation of the Site at proposal include a surface impoundment, a set of buried/backfilled surface impoundments, and a spray irrigation field/land treatment area. The spray irrigation field/land treatment area (Source 3) and acetone were removed from HRS scoring of the Site at promulgation because decontamination procedures for the Source 3 samples were not sufficiently documented (See section 3.17.1, Sample Collection Techniques, of this support document). Removing the Source 3 hazardous substance (i.e., acetone) and hazardous waste quantity from scoring does not impact the ground water migration pathway score or the resulting overall Site HRS score. A release to groundwater of a hazardous substance (1,4-dioxane) attributable to operations at the Gelman facility is documented by chemical analysis and direct observation based on past waste disposal practices and sampling and analysis by the U.S. Environmental Protection Agency (EPA) in 2022 and 2023 and by Michigan Department of Environment, Great Lakes, and Energy (EGLE) and

Washtenaw County Health Department in 2023. Groundwater results document concentrations of 1,4-dioxane related to releases from the Gelman facility at concentrations significantly above background in nearby monitoring wells. Thirty-one residential wells and a public supply well have been evaluated and documented to contain Site-related contamination at observed release concentrations. A public water-supply well (i.e., Montgomery Well) was closed in 2001 due to contamination with Site-attributable 1,4-dioxane. The Montgomery Well served an apportioned population of 3,712.8750 people at the time of closure. 1,4-dioxane contamination is also documented in multiple residential wells; based on analytical results collected in 2023 and used in scoring of this Site, 23 residential wells contain Site-related contamination at Level I concentrations (54.97 people), and 8 residential wells contain Site-related contamination at Level II concentrations (19.12 people). The Site vicinity is shown below in Figure 1 of this support document (which was originally Figure 5 of the HRS documentation record at proposal and remained Figure 5 at promulgation).

Separate from the Site as described for HRS purposes, among other requirements in the Fourth Amended Consent Judgment, Gelman agreed to implement "Groundwater Remediation" at areas located east of Wagner Road, including the areas encompassed by the Prohibition Zone ("the Eastern Area"), and at areas located west of Wagner Road ("Western Area"), as well as response actions at the former facility ("Gelman Property Response Activities"). The Groundwater Remediation objectives in the Consent Judgment for the Eastern Area include preventing the contaminated groundwater from migrating beyond the boundaries of a designated prohibition zone or the use of groundwater (the "Prohibition Zone Containment Objective") and preventing 1,4-dioxane from venting into surface waters at concentrations above the Generic GSI (groundwater surface water interface) Cleanup Criterion, except in compliance with Part 201[1], including MCL 324.20120e ("Groundwater-Surface Water Interface Objective" for the Eastern Area). The Groundwater Remediation objectives in the Consent Judgment for the Western Area include preventing the horizontal extent of the groundwater contamination from expanding (the "Western Area Non-Expansion Cleanup Objective") and preventing 1,4-dioxane from venting into surface waters at concentrations above the Generic GSI Cleanup Criterion, except in compliance with Part 201, including MCL 324.20120e ("Groundwater-Surface Water Interface Objective" for the Western Area). The Gelman Property Response Activities objective in the Consent Judgment is to prevent the migration of 1,4-dioxane from contaminated soils on the Gelman Property into any aquifer at concentrations or locations that cause non-compliance with the Western Area objectives set forth in the Fourth Amended Consent Judgment.

On April 12, 2021, EGLE, with the support of the city of Ann Arbor, Washtenaw County, and Scio Township, requested that the EPA reinitiate assessment of the Site for inclusion on the National Priorities List (NPL) under Section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended. Consistent with CERCLA and the National Contingency Plan at 40 C.F.R. Part 300, a Remedial Investigation and Feasibility Study ("RI/FS") is conducted at sites listed on the NPL prior to EPA selecting a final remedy in a Record of Decision ("ROD"), if determined necessary. As part of the RI/FS process EPA considers an array of remedial alternatives. An RI/FS conducted for the Site would consider the ongoing remedial and response activities under the Fourth Amended Consent Judgment as well as additional remedial alternatives consistent with CERCLA and the NCP prior to selecting a final remedy for the Site in a ROD, if deemed necessary.

With the publication of the final rule to place the Site onto the NPL, the EPA has changed the site name from "Gelman Sciences Inc" to "Gelman Sciences Inc." in accordance with the EPA stylebook.

[1] As defined in the Fourth Amended and Restated Consent Judgment as referring to Part 201 of the Natural Resources and Environmental Protection Act, MCL 324.20101 (https://www.legislature.mi.gov/Laws/MCL?objectName=mcl-324-20101).

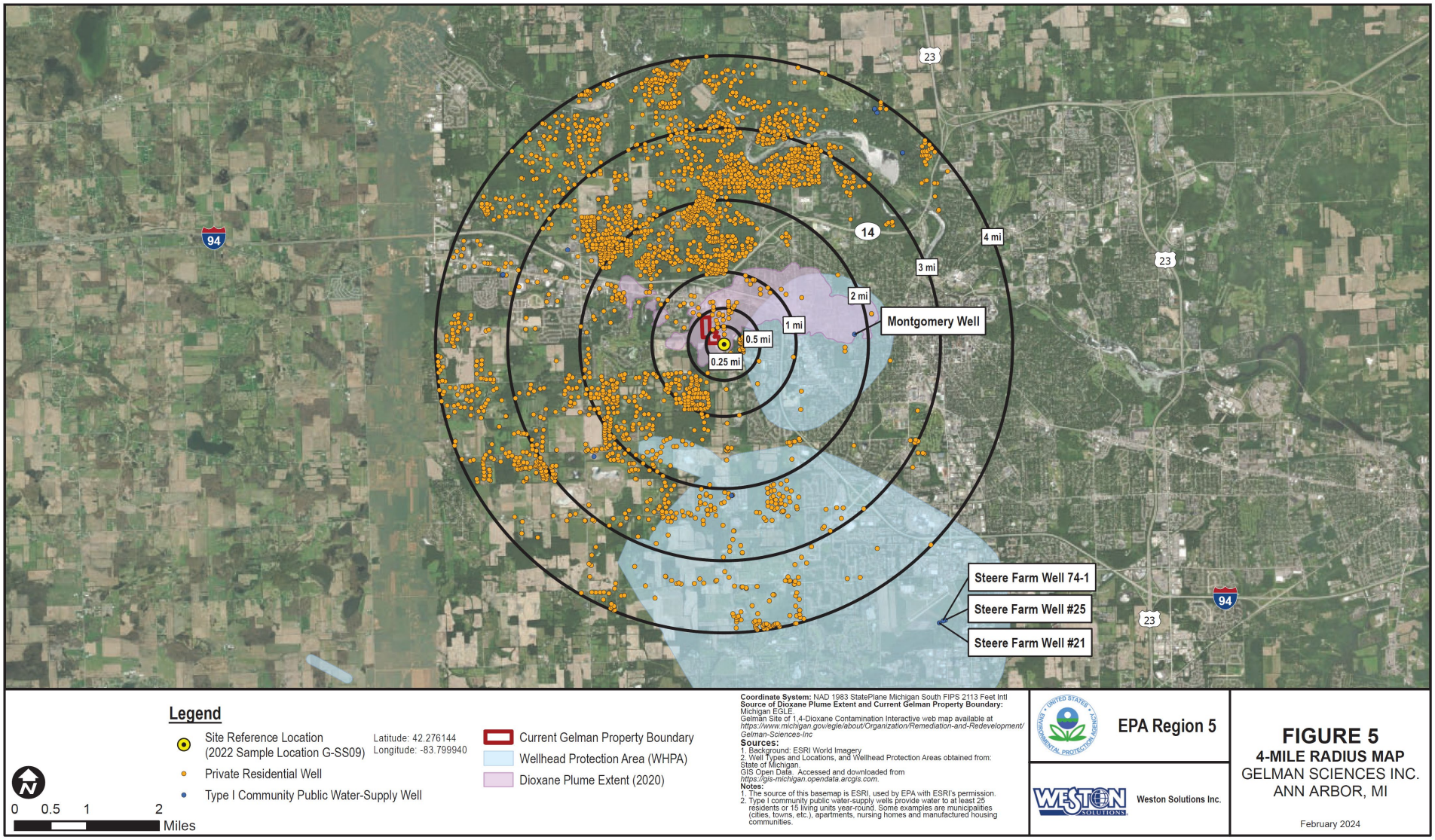


Figure 1: HRS documentation record Figure 5; a 4-mile radius map showing the Gelman property, the approximate extent of the dioxane plume (in 2020), and both residential and public supply wells.

3. Summary of Comments

The City of Ann Arbor, Scio Township, Washtenaw County Board of Commissioners, Washtenaw County Water Resources Commissioner, Washtenaw County Health Department, Coalition for Action on Remediation of Dioxane (CARD), Allen's Creek Watershed Group (ACWG), Sierra Club Huron Valley Group, Global Environment Alliance, LLC (GEA), and numerous citizens expressed support for, or did not oppose, the proposed listing of the Site on the NPL. Commenters opposing the listing included Mr. Joe Meunier (a citizen) and Gelman (Raymond Ludwieścki of Gibson Dunn commented on behalf of Gelman Sciences LLC [hereinafter referred to as Gelman]).

Many supporters, or commenters that are not opposed to the listing, provided comments in support of placing the Gelman Sciences Inc. site on the NPL. Citizens and the Sierra Club Huron Valley Group expressed concern for health impacts from both past and current exposures to 1,4-dioxane and expressed concern about the threat to the ecosystem and wildlife. Many supporters requested the need for swift action. Mr. Vincent Caruso in association with ACWG and CARD and Dr. Rita Loch-Caruso support placing the Site on the NPL but stated that the HRS evaluation does not include vapor intrusion which may be a concern at the Site.

Multiple local officials supported the listing. Scio Township commented that the EPA should improve the current delineation of the plume boundary and requested that the EPA expand the perimeter of sentinel well networks, lower the trigger/cleanup level for 1,4-dioxane, and adopt EPA Method 522 for drinking water analyses. The City of Ann Arbor supported NPL listing and commented that 1,4-dioxane from Gelman contaminated the City's Northwest Supply Well (i.e., the Montgomery Well), which the City used as a public drinking water source. The City stated that it took the Northwest Supply Well offline because of the presence of 1,4-dioxane. Washtenaw County Board of Commissioners stated that the 1,4-dioxane plume continues to expand due to ineffective off-site hydraulic controls. Washtenaw County Water Resources Commissioner and the Washtenaw County Health Department commented that they supported the listing because of the extent to which the Site has expanded over the years.

GEA supported the listing but requested changes to the Site Inspection (SI) Report; GEA requested that the SI report include additional recent data on impacted residential wells indicating that the 1,4-dioxane groundwater pollution has migrated north, and background levels that are reflective of "true background" conditions outside of the influence of the Site (i.e., non-detect). Mr. Ulanowicz, a citizen, did not oppose the listing but commented that Gelman has been below all federal, state, and local standards on treatment and discharge of 1,4-dioxane and that he hopes the community and Gelman can work together.

Gelman submitted numerous comments opposing the listing. It commented that the Site is not an uncontrolled waste site and that Superfund resources should be reserved for orphan uncontrolled waste sites where federal intervention is more appropriate. Gelman claimed that the HRS evaluation is flawed and added that the listing should be withdrawn.

Gelman stated that because the EPA failed to consider the "importance and impact of the Fourth Amended Consent Judgment," the EPA's proposed listing is arbitrary and capricious. It claimed that community dissatisfaction and local community concern about the existence of the 1,4-dioxane plume "do not provide a basis under the HRS or EPA policy to place the Gelman Site on the NPL" considering the "robust remedy" it is implementing. It stated that it was the collapse of the negotiations with the City, County, and Township who sought a "'better' clean-up through litigation" that led them to petition the State and the EPA to be involved at the Site. Gelman commented that the State has consistently determined that the Site remedy is protective of public health and the environment, and that under current remedies no member of the public is exposed to contamination above the State accepted 1,4-dioxane drinking water level of 7.2 parts per billion. It added that despite past and current litigation, no court has found the Site to be unprotective of public health and the environment. Gelman commented that intervention of local government in its negotiations with the State of Michigan has caused more than "a six-year delay before an amended consent judgment applying the [new] 7.2 ppb [drinking water] standard could be entered," and so Gelman requested that the EPA not place the Site on the NPL so that it can continue to

carry out the remedy agreed upon with the State. Gelman also commented that statements in the Site narrative summary regarding the expansion of the plume are inaccurate and not supported by the HRS documentation record.

In comments on pathways not scored, Gelman stated that the groundwater/surface water interface might be relevant in only two marshy areas near the Site. Gelman also commented that the EPA failed to evaluate the existing State-led remedial strategy as a cleanup alternative and is being inconsistent with Agency procedures. It added that, twice before, the EPA evaluated the Site for the NPL but did not proceed with a listing decision due to the remedy being in place under State supervision. Gelman also commented that alternatives to place the Site on the NPL have not been evaluated.

Regarding community involvement in the listing decision, Gelman commented that it would welcome community support and cooperation with a State-led remedy but contested federal involvement at the Site. Gelman stated that local community concerns about the existence of the 1,4-dioxane plume is not a basis under the HRS or EPA policy to place the Site on the NPL. A citizen expressed hope that the community and Gelman Life Sciences could work together.

Gelman commented that it has been a responsible site owner that has been successfully remediating the 1,4-dioxane plume through pump-and-treat for decades and institutional controls are in compliance with the Consent Judgment with the State of Michigan. Gelman stated that it is also performing enhanced remedial actions as set forth in the latest Consent Judgment that are not accounted for in the HRS documentation record at proposal and asserted that the EPA's failure to account for these remedial actions makes the listing proposal arbitrary and capricious. Mr. Joe Meunier, a citizen, opposed the listing and stated that the cleanup efforts will be reduced if taken over by the EPA. He added that wells that contain the plume would be shut down, maintenance would suffer, and new technology would not be explored.

Gelman stated that placing the Site on the NPL is not appropriate when there is no meaningful threat to human health and the environment. It commented that it has reduced contaminant concentrations to levels that are safe for human health and the environment. It added that the HRS score relies upon low-level detections in residential wells, overstating the human health risk posed by the Site. Gelman asserted that both the eastern and western areas of the plume specified in the Consent Judgment are subject to cleanup objectives that protect public health and the environment.

Gelman commented that the community does not understand the stigma that can be attached to the Site being labeled a Superfund site. A citizen also commented that the community may have concerns about the stigma associated with Superfund sites but noted that there are potential benefits to continue the Superfund process in Ann Arbor.

Gelman commented that expending federal oversight and resources at this Site would waste limited federal resources and run counter to the intent and core purpose of the NPL. Gelman commented that its wastewater discharges were legal and authorized, but at the time it did not know that 1,4-dioxane had a "resistance to biodegradation" and would result in unintended releases of 1,4-dioxane into the groundwater. Gelman added that it now has a National Pollutant Discharge Elimination System (NPDES) permit for treated water discharges. A citizen also commented that the treated discharges from the Site have been well below all federal, state, and local standards for many years.

Commenting on the SI report, Gelman stated that the report included data that were potentially cross-contaminated and otherwise unusable in an HRS evaluation, resulting in a flawed HRS score. Gelman commented that improper soil sampling procedures were followed during sample collection via borings into the Spray Irrigation Field (Source 3). It stated that sample collection from areas of high contamination to low contamination resulted in flawed source characterization. Gelman also commented that the SI report did not discuss decontamination and noted that equipment, such as brushes, were observed at the Site which would not eliminate

cross-contamination. Gelman stated that 1,4-dioxane was not detected in any soil or sediment samples collected by the EPA in 2022 and the spray irrigation area had a no further action determination since 1996.

Gelman commented that the City's Steere Farm Well, used as a background well, is not screened (or completed) in the same aquifer as the Montgomery Well. Gelman commented that the two wells are four miles apart from each other, are located "in different geological settings," and are in different sub-basins of the Huron River. Gelman commented that these aquifer differences render the background sample inappropriate and the HRS evaluation erroneous.

Gelman commented on the establishment of an observed release in the HRS documentation record at proposal. It stated that the HRS documentation record at proposal incorrectly determined background conditions and did not properly attribute contamination in the residential wells to the releases at the Gelman Sciences Inc. site. Gelman stated that the EPA relied on historical "unauthorized" releases of wastewater contaminated with 1,4-dioxane, and the groundwater contamination detected in the 2022 SI report is consistent with the historical data. It stated that the authorized releases should not be considered in the HRS evaluation. Gelman also commented that there are septic systems and sanitary lines in the area and the EPA failed to collect background samples to determine if the trace levels of 1,4-dioxane in the residential wells could be from a non-Gelman source. Gelman commented that many common household products often contain 1,4-dioxane. Gelman also commented that exfiltration from leakage of wastewater out of the sanitary sewer system via cracks, joints, and corrosion are another source of 1,4-dioxane.

Gelman commented that the targets scored at the Site were inappropriately included in the HRS evaluation. Gelman stated that qualified data were inappropriately relied on to score targets at the Site. Gelman asserted that the permanently closed municipal well (the Montgomery Well) should not be scored as a target well, and the EPA failed to sample the Montgomery Well (and instead sampled a nearby observation well). Gelman commented that the detections in the residential drinking water wells are below the applicable State drinking water standards and including the population served by residential wells is inappropriate and flawed.

3.1 Support for Listing and Other Non-opposition Comments

The EPA received 148 comments that either expressed support or did not express opposition for the proposed NPL designation of the Site, and one comment that was unrelated to the proposal to add the Site to the NPL. Commenters in support of listing or not opposed to listing the Site include the Sierra Club Huron Valley Group, Allen's Creek Watershed Group (ACWG), Coalition for Action on Remediation of Dioxane (CARD), the Washtenaw County Water Resources Commissioner, the Sister Lakes Association, the City of Ann Arbor, Scio Township, the Washtenaw County Board of Commissioners, the Washtenaw County Health Department, the Scio Residents for Safe Water (SRSW), Global Environment Alliance (GEA) and a number of citizens.

3.1.1 General Support

Comment: CARD concurred with the EPA's conclusion that adding the Site to the NPL is a necessary step for effectively addressing the consequences and risks of the contamination to the community. CARD noted that, "State efforts for cleanup of the contamination have been restricted by an on-going court case with a consent judgment that has been amended four times since its establishment in 1992." Similarly, the Washtenaw County Board of Commissioners and other commenters stated that Gelman has fought cleanup efforts through the court system. Additionally, CARD and multiple other commenters in support of NPL placement cited various specific reasons for their support including those summarized below:

- CARD, the City of Ann Arbor, Roger Rayle from the SRSW, and multiple citizens commented that, "[i]nclusion of the site on the NPL would bring additional resources that are urgently needed to halt further spread of the contamination, protect precious drinking water sources, and protect our community from unnecessary and harmful 1,4-dioxane exposure." In related comments, the Washtenaw County Board of Commissioners, the Sierra Club Huron Valley Group, GEA, and multiple commenters discussed

that "Federal oversight over this Potentially Responsible Party clean-up is necessary to correct the serious and on-going concerns with threats to the public health." One commenter stated that properly cleaning up the Ann Arbor water supply is expensive but so is war which the government funds every year. This commenter added that when it comes to public health, it has to be debated to be resolved.

- CARD, the Sierra Club Huron Valley Group, Washtenaw County Board of Commissioners, and numerous citizens stated that the dioxane plume continues to expand, due to the lack of remediation controls, thereby, contaminating groundwater underlying large portions of the City of Ann Arbor and surrounding areas and degrading a pristine natural resource, drinking water resources, surface waters, and the health of ecosystems.
- Multiple commenters, including the Washtenaw County Water Resources Commissioner, indicated that the spread of the dioxane groundwater contamination has been going on for too long (for decades) and that an effective cleanup of the Site is long overdue since little or no progress has been made over the years. In a related comment, a citizen offered to volunteer to assist in the cleanup of this Site.
- The City of Ann Arbor, GEA and multiple commenters stated that the state of Michigan and local governments have failed for over 40 years to clean up the dioxane groundwater contamination properly and to hold the responsible party accountable. They also discussed that the EPA is their last hope and best suited to address this issue of safeguarding public health and the environment because "there is no other non-federal cleanup alternative which will address the dioxane pollution."
- Multiple commenters expressed concern regarding the dioxane contamination polluting wells and aquifers for miles around and about the spread of the contamination increasingly reaching the Huron River, which is the source of almost all of Ann Arbor's drinking water.
- GEA and several citizens commented that they are concerned for their health from both past and current exposures to dioxane contaminated groundwater used for residential and municipal drinking water, and for the health of children and the community in general. Commenters also expressed concern for contaminated groundwater threatening the ecosystem, wildlife, and park grounds where children play and wildlife live. Commenters agreed that the migration of the contaminated groundwater presents an imminent endangerment to the public health and environment, and therefore, groundwater should be protected and restored.
- The City of Ann Arbor, Washtenaw County Health Department, Scio Township, and various citizens commented that available maps depict the migration of the 1,4-dioxane groundwater plume contamination to be much larger and expanding outside of the court-established Prohibition Zone, impacting more individuals as new risks and exposure pathways are identified.
- Several commenters, including the Washtenaw County Health Department provided comments regarding the vapor intrusion associated with the 1,4-dioxane contaminated groundwater and the associated vapor intrusion into homes and basements impacting air quality that could affect human health.
- One commenter expressed concern regarding the effectiveness of the methods used to remove the 1,4-dioxane (and co-contaminants of 1,4-dioxane) from groundwater, and/or drinking water, and inquired whether multiple contaminants would be removed.
- Multiple commenters expressed frustration stating that remediation efforts have been inadequate or not rightfully implemented to ensure that the spread of the plume is reduced and not threatening the drinking water supply for Ann Arbor. In a related comment, one commenter indicated that years have passed, and thorough cleanup procedures and ongoing monitoring are needed due to the "pollution's intricacy and enduring presence in the environment."
- Various citizens noted that the contamination caused by the Site not only affects public health and the environment, but also the quality of the economy and property values. The Washtenaw County Water Resources Commissioner stated that as the contamination spreads, wells are sampled at the public's expense and the impacted residents have incurred expenses such as additional taxes and the cost of city water after the "free" hook up to city water. Other citizens also commented on the annexation and higher

taxes once connected to City of Ann Arbor water system. A commenter also stated that it should be a priority to connect all families affected to city water.

- One commenter indicated that the Superfund's community program would enable direct engagement with residents to address their concerns and ensure transparent remediation efforts.
- The Sister's Lakes Association (along with the support of its surrounding neighbors and neighborhoods), and one citizen submitted comments related to a resolution opposing any NPDES and/or wetland permits from the Parklake extraction well and the well's discharge of partially treated water into the first or second sister lakes.
- A commenter noted that it is "ironic that Pall Gelman is recognized for manufacturing filtration, separations, and purification products, given their crucial role in the cleanup of the 1979 Three Mile Island nuclear accident. Leveraging these skills is essential now."

Response: The EPA has added the Site to the NPL. Listing makes a site eligible for remedial action funding under CERCLA, and the EPA will examine the Site to determine what response, if any, is appropriate. Actual funding may not necessarily be undertaken in the precise order of HRS scores, however, and upon more detailed investigation may not be necessary at all in some cases. The EPA will determine the need for using Superfund funding for remedial activities on a site-by-site basis, taking into account the NPL ranking, State priorities, further site investigation, other response alternatives, and other factors as appropriate.

Economic factors such as those raised by the commenter are generally not considered in the assessment of whether a site belongs on the NPL. Inclusion of a site or facility on the NPL does not in itself reflect a judgment on the activities of the owner(s) or operator(s), but rather reflects the EPA's assessment that a significant release or threat of release has occurred and that the site is a priority for further investigation under CERCLA. The EPA notes that there are both costs and benefits that can be associated with listing a site. Among the benefits are increased health and environmental protection as a result of increased public awareness of potential hazards. In addition to the potential for Federally financed remedial actions, the addition of a site to the NPL could accelerate privately financed, voluntary cleanup efforts. Listing sites as national priority targets also can give States increased support for funding responses at particular sites. As a result of the additional CERCLA remedies, there will be lower human exposure to high-risk chemicals, and access to higher quality surface water, ground water, soil, and air. Therefore, it is possible that any perceived or actual negative fluctuations in property values or development opportunities that may result from contamination may also be countered by positive fluctuations when a CERCLA investigation and any necessary cleanup are completed. For further information, see information in the September 2000 EPA fact sheet, *Superfund Today, How Can a Superfund Site Affect My Property?* (EPA 540-F-98-001, available at https://semspub.epa.gov/src/document/05/927384.pdf).

3.1.2 Support with Requests for Further Action

Comment: Some of the commenters in support of NPL listing also provided comments related to the EPA's future actions for the Site.

- The City of Ann Arbor and several citizens requested that the EPA take swift action to ensure that cleanup of the dioxane plume is effective and prioritized for the sake of the environment and the community and to ensure access to safe and uncontaminated drinking water before it is too late. Several commenters indicated that cleanup will probably take many years which is why it must begin as soon as possible. In a related comment, a citizen stated that "access to water is a fundamental human right and supersedes concerns over money."
- Multiple citizens concluded that Gelman has allowed the contamination to spread and continue to poison and/or harm the community and requested that the responsible party (Gelman/Danaher) be held fully accountable for the cleanup and remediation. One commenter stated that "[t]his disaster has cost our community millions of dollars. Please make Gelman pay for the cleanup." Several commenters also asserted that those responsible for allowing the contamination to spread and continue to harm the

community by polluting the groundwater, local and residential wells, municipal drinking water supplies, and the environment cannot go "unpunished."

- One commenter expressed frustration regarding the delineation of the extent of the pollution noting that there is little information on the movement of the 1,4-dioxane in shallow groundwater. This commenter requested the EPA require a "more robust monitoring program to define the boundaries of 1,4-dioxane pollution along with additional remediation to prevent expansion and eventually clean up the 1,4-dioxane." CARD also stated that Gelman's descriptions of the 1,4-dioxane contamination "have been woefully inadequate, repeatedly underestimated the extent of the contamination in the aquifers." It also stated that limited data are collected in west Ann Arbor and requested test wells drilled to the bedrock. One citizen asserted that Gelman has groundwater and soil data that have not been provided to regulatory agencies.
- Multiple citizens raised concerns regarding public health consequences related to the 1,4-dioxane contamination of local drinking water such as neurological illnesses, elevated cancer risk, respiratory problems, etc. Two commenters requested that a study of the population in the area be included to see whether cancer had a higher percentage of occurrence than normal.
- Scio Township and several commenters requested the EPA to lower the monitoring well compliance trigger level and cleanup level for the Site to at least 3.5 parts per billion (ppb), preferably to 0.35 ppb, and to routinely test residential wells in the vicinity of the 1,4-dioxane plume using the EPA Method 522. Another commenter requested updating remediation methods for the contaminated plume before it becomes a national emergency requiring more expensive techniques and remediation methods.
- A commenter stated that 1,4-dioxane has infiltrated the Allen Creek Drain stormwater conveyance and Gelman was issued a notice of violation but it is unclear if action has been taken to remediate the situation. The Washtenaw County Water Resources Commissioner also expressed concern about infiltration of 1,4-dioxane in stormwater pipes with no approved work plan for addressing the issue.
- The Washtenaw County Water Resources Commissioner requested that the EPA consult a professor at Central Michigan University regarding the mass balance of 1,4-dioxane, i.e., "**more 'missing 1,4-dioxane' than 'captured and treated 1,4-dioxane.**'" [emphasis in original]

Response: Regarding comments in support of NPL listing that expressed concern for health studies of the population, delineation of contamination, more robust monitoring, and effective remediation, the listing process encourages and relies on the participation of the public at several steps in the Superfund process, and the Superfund program offers numerous opportunities for public participation at NPL sites.

Pursuant to 40 CFR 300.430, the EPA Regional Office develops a Community Involvement Plan (CIP) before remedial investigation/feasibility study (RI/FS) field work begins. The CIP is the "work plan" for community relations activities that the EPA will conduct during the entire cleanup process. In developing a CIP, Regional staff interview state and local officials and interested citizens to learn about citizen concerns, site conditions, and local history. This information is used to formulate a schedule of activities designed to keep citizens apprised and to keep the EPA aware of community concerns. Typical community relations activities include:

- Public meetings at which the EPA presents a summary of technical information regarding the site and citizens can ask questions or comment.
- Small, informal public sessions at which EPA representatives are available to citizens.
- Development and distribution of fact sheets to keep citizens up-to-date on site activities.

For each site, an "information repository" is established, usually in a library or town hall, containing reports, studies, fact sheets, and other documents containing information about the site. The EPA Regional Office continually updates the repository and must ensure that the facility housing the repository has copying capabilities.

After the RI/FS is completed and the EPA has recommended a preferred cleanup alternative, the EPA Regional Office sends to all interested parties a Proposed Plan outlining the cleanup alternatives studied and explaining the process for selection of the preferred alternative. At this time, the EPA also begins a public comment period during which citizens are encouraged to submit comments regarding all alternatives. Once the public comment period ends, the EPA develops a Responsiveness Summary, which contains EPA responses to public comments. The Responsiveness Summary becomes part of the Record of Decision (ROD), which provides official documentation of the remedy chosen for the site. Further, if private parties commit to conduct remedial action under a consent decree between the EPA and the parties, the consent decree is also subject to public comment.

In addition to meeting these specific Federal requirements, community relations is a continuing activity and the EPA makes every attempt to ensure that it is designed to meet the specific needs of the community. Anyone wanting information on a specific site should contact the Community Relations staff in the appropriate EPA Regional Office. The EPA believes that the above process offers the public sufficient opportunity to present facts and opinions germane to its decision-making.

Regarding comments imploring the EPA to "punish" those responsible for damage by requiring industry to pay for the Site's cleanup rather than the taxpayers, the NPL listing process is separate from a determination of liability, and liability is not considered in evaluating a site under the HRS. The NPL serves primarily as an informational tool for use by the EPA in identifying those sites that appear to present a significant risk to public health or the environment. Listing a site on the NPL does not reflect a judgment on the activities of the owner(s) or operator(s) of a site. It does not require those persons to undertake any action, nor does it assign any liability to any person. This position, stated in the legislative history of CERCLA, has been explained more fully in the *Federal Register* (48 FR 40674, September 8, 1983, and 53 FR 23988, June 24, 1988). *See Kent County v. EPA*, 963 F.2d 391 (D.C. Cir. 1992).

3.2 Adequacy of Record

Comment: Gelman commented that the [Site] score is based on "improper assumptions and ignores important data and information." Gelman commented further that the EPA failed to "acknowledge the existence" of and consider the Fourth Amended Consent Judgment and the impact of the resulting remedies that Gelman indicated they intend to implement as a result of this judgment. Gelman opined that because the EPA failed to consider the "importance and impact of the Fourth Amended Consent Judgment," the EPA's proposed listing is arbitrary and capricious.

Separately, Gelman commented about perceived absent information in the 2017 preliminary assessment (PA). Gelman asserted that while the EPA concluded that the Site was potentially eligible for addition to the NPL based on the 1986 PA and 1987 SI; the EPA, however, declined to make the draft HRS scoring package "and the 1993 no further action remedial action planned (NFRAP) decision documents part of the administrative record despite EGLE's [Department of Environment, Great Lakes, and Energy] request to do so." Gelman referred to Attachment 9 of their comment document in support of the statement that EGLE requested specific information be added to the 2017 PA report, which is included as Reference 6 of the HRS documentation record at proposal.

Response: The data relied upon in the HRS documentation record at proposal are of sufficient quantity and type for the purposes of scoring the Site and Site placement on the NPL. All of the data that were necessary and relied upon for the purposes of NPL listing were included in the HRS documentation record references at proposal, and the HRS docket for the Site at the time of proposal was appropriate and sufficient for the public to review the HRS evaluation of the Site and the proposed NPL listing. As shown in other sections of this support document, the scoring of the ground water migration pathway was supported in the HRS documentation record at proposal and comments submitted have not identified "improper assumptions" or errors in the HRS factor values that would result in the Site score falling below the listing threshold of 28.50.

The EPA used appropriate levels of data and investigation in determining the HRS score for the Site consistent with HRS regulation. As explained in the preamble in the *Federal Register* notice promulgating the 1990 HRS

(55 FR 51532, December 14, 1990), Congress, in discussing the substantive standards against which HRS revisions could be assessed, states:

> This standard is to be applied within the context of the purpose for the National Priorities List; i.e., identifying for the States and the public those facilities and sites which appear to warrant remedial actions. * * * This standard does not, however, require the Hazard Ranking System to be equivalent to detailed risk assessments, quantitative or qualitative, such as might be performed as part of remedial actions. The standard requires the Hazard Ranking System to rank sites as accurately as the Agency believes is feasible using information from preliminary assessments and site inspections. * * * Meeting this standard does not require long-term monitoring or an accurate determination of the full nature and extent of contamination at sites or the projected level of exposure such as might be done during remedial investigations and feasibility studies. This provision is intended to ensure that the Hazard Ranking System performs with a degree of accuracy appropriate to its role in expeditiously identifying candidates for response actions [H.R. Rep. No. 962, 99th Cong. 2nd Sess. at 199-200 [1986]].

Courts have supported this position in stating that the NPL is intended to be a "rough list" of prioritized hazardous sites; a "first step in a process-nothing more, nothing less." *Eagle Picher Indus. v. EPA*, 759 F.2d 922, 932 (D.C. Cir. 1985) (Eagle Picher II). EPA would like to investigate each possible site completely and thoroughly prior to evaluating them for proposal for NPL, but it must reconcile the need for certainty before action with the need for inexpensive, expeditious procedures to identify potentially hazardous sites. Courts have found EPA's approach to solving this conundrum to be "reasonable and fully in accord with Congressional intent." *Eagle Picher Industries, Inc. v. EPA*, (759 F.2d 905 (D.C. Cir. 1985) Eagle Picher I).

As shown throughout this support document, the comments submitted have not identified "improper assumptions" or errors in the HRS factor values that would result in the Site score falling below the listing threshold of 28.50, nor as explained below, would inclusion and consideration of the Fourth Amended Consent Judgment change the HRS factor values assigned in the HRS documentation record at proposal. The Site qualifies for addition to the NPL because it has achieved an HRS score greater than 28.50, as is demonstrated in the HRS documentation record at proposal and this support document. This score is based on the facts presented in the HRS documentation record at proposal and this support document. Achieving a site score of 28.50 or greater indicates that the Site is eligible for inclusion on the NPL and therefore warrants further investigation. Placing a site on the NPL allows the EPA to more effectively prioritize sites and manage possible future site investigations; it also notifies the public that the release at a site is of concern to the Agency. The addition of the Site to the NPL is an appropriate next step in this instance. This determination was made consistent with the purpose of the NPL and is supported by the HRS evaluation. Comments discussing specific "improper assumptions" and scoring errors are discussed in detail throughout this support document in relevant technical sections including but not limited to sections 3.11, Consideration of Response Actions; 3.16, Site Inspection Report Data; 3.17, Source Characterization; 3.17.1, Sample Collection Techniques; 3.19, Observed Release; 3.19.2, Background Samples; 3.19.3, Attribution; 3.20, Targets; and 3.20.2, Municipal Well (Montgomery Well).

Regarding comments asserting that the EPA's proposed listing is arbitrary and capricious because, as Gelman claims, the importance and impact of the Fourth Amended Consent Judgment and the remedy therein was not considered by the EPA, this claim is unfounded. This Consent Judgment is between Gelman and EGLE, not with the EPA. EGLE supports the proposal of this Site to the NPL (EPA-HQ-OLEM-2024-0067-0004). Furthermore, while the Fourth Amended Consent Judgment was not included in the HRS package at proposal, the details of this order do not negate the HRS scoring of the Site. The Fourth Amended Consent Judgment, which is now part of the administrative record as Attachment 3 of the Gelman public comments (EPA-HQ-OLEM-2024-0067-0147), details objectives that are primarily focused on preventing 1,4-dioxane contaminated groundwater above state designated cleanup levels from migrating beyond certain predefined boundaries with expected eventual discharge to the Huron River within the boundaries of the Prohibition Zone. The following is a summary of the Fourth Amended Consent Judgment objectives (in part):

- General Objective/Definition of Groundwater Contamination states:

  > [T]he Parties enter this Consent Judgment to reflect EGLE's revision of the generic state-wide residential and non-residential generic drinking water cleanup criteria for 1,4-dioxane in groundwater to 7.2 micrograms per liter ("ug/L") and 350 ug/L, respectively, and of the generic groundwater-surface water interface cleanup criterion for 1,4-dioxane in groundwater to 280 ug/L.…Groundwater Contamination' shall mean the 1,4-dioxane in the groundwater at a concentration in excess of 7.2 ug/L, as determined by the analytical method(s) described in Attachment B to this Consent Judgment, subject to review and approval by EGLE.

- Eastern Area/Prohibition Zone Containment Objective states:

  > Defendant shall prevent Groundwater Contamination, regardless of the aquifer designation or the depth of the groundwater or Groundwater Contamination, from migrating beyond the boundaries of the Prohibition Zone while the Groundwater Contamination migrates toward the Huron River as described and in compliance with the Groundwater-Surface Water Interface Objective.

- Eastern Area/Groundwater-Surface Water Interface Objective states:

  > Defendant shall prevent 1,4-dioxane, including 1,4-dioxane in groundwater that enters a sewer, including an MS4 Sewer (e.g., Allen Drain), from venting or discharging into surface waters in the Eastern Area at concentrations above the Generic GSI Cleanup Criterion, except in compliance with Part 201, including MCL 324.20120e ("Groundwater-Surface Water Interface Objective" for the Eastern Area). The migration and eventual discharge of the Eastern Area 1,4-dioxane plume to the Huron River or other surface waters within the boundaries of the Prohibition Zone in compliance with the Groundwater-Surface Water Interface Objective is intended by this Consent Judgment.

- Western Area Non-Expansion Cleanup Objective states: "The Defendant shall prevent the horizontal extent of the Groundwater Contamination in the Western Area, regardless of the depth (as established under Section V.B.3.b and c), from expanding."
- Western Area Groundwater-Surface Water Interface Objective states: "Defendant shall prevent 1,4-dioxane from venting into surface waters in the Western Area at concentrations above the Generic GSI Cleanup Criterion, except in compliance with Part 201, including MCL 324.20120e ("Groundwater-Surface Water Interface Objective" for the Western Area)."
- Gelman Property Objectives states: "The objectives for the Gelman Property shall be to prevent the migration of 1,4-dioxane from contaminated soils on the Gelman Property into any aquifer at concentrations or locations that cause non-compliance with the Western Area objectives set forth in Sections V.B.1 and V.B.2."

As explained in section 3.15, Permitted Releases/Concentrations Below Regulatory Levels, of this support document, contaminant concentrations below drinking water standards do not eliminate associated releases from consideration when evaluating a site using the HRS. Further, as explained in section 3.4, Delay, of this support document, future planned remedial actions are not a factor in evaluating whether a site qualifies for the NPL, and in fact, the listing process need not inhibit efforts to determine response actions or carry out currently planned response actions. No information is presented in the Fourth Amended Consent Judgment that negates the presence of a release as documented throughout the HRS documentation record at proposal and supported by the Site achieving an NPL-qualifying HRS site score of 50.00. As explained in the HRS documentation record at proposal and in section 3.19, Observed Release, of this support document and its relevant subsections, an observed release was documented at the Site and established to, at least in part, be attributable to the Site. Additionally, as

explained in section 3.6, Extent of Site/Site Boundaries, of this support document, the focus of scoring for HRS purposes is on the release of contamination and where the contaminants have come to be located, which have been documented at this Site.

Regarding comments that the EPA failed to provide certain information in the administrative record (specifically an early draft HRS scoring package and the 1993 NFRAP decision document as discussed in a Michigan DEQ comment on the 2017 PA report), this comment and these two documents do not impact the HRS site score as provided in the HRS documentation record at proposal. The EPA emphasizes that the state already had knowledge of these documents, based on their 2017 comments. As discussed above, all of the data that were necessary and relied upon for the purposes of NPL listing were included in the HRS documentation record references at proposal, and the HRS docket for the Site at the time of proposal was appropriate and sufficient for the public to review the HRS evaluation of the Site and the proposed NPL listing.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.3 Purpose/Need for Listing

Comment: Gelman commented that political pressure likely exists for the EPA to place the Site on the NPL, but the EPA should resist these pressures because "the process for listing sites on the NPL should have no room for political considerations." Gelman suggested that community dissatisfaction and local community concern about the existence of the 1,4-dioxane plume, "do not provide a basis under the HRS or EPA policy to place the Gelman Site on the NPL" considering the "robust remedy" they are implementing at the Site. Gelman added that the remedy in place is appropriate and is the most technically feasible remedy.

Gelman commented that the EPA's intervention and placing the Site on the NPL is unnecessary, inconsistent with the goals of the Superfund program, a waste of federal resources, and would risk disturbing a well-established and protective remedy. Gelman commented that the primary criteria to include a site on the NPL is the degree of risk to health and the environment based on "releases of uncontrolled hazardous substances." Gelman asserts, however, that there is no potential risk to health or the environment because they are effectively managing the plume (i.e., the Site is not uncontrolled) under the oversite of the State and has over 30 years of extensive investigation and delineation; thus, there is no need to include the Site on the NPL. Gelman elaborated that the Site has an effective and robust pump-and-treat remediation program that has resulted in significant 1,4-dioxane mass reductions and institutional controls to protect the community from exposure.

Further, Gelman stated that the EPA's listing proposal does not and cannot account for the significant progress of years of remediating the groundwater plume because "the HRS calculation may be similar for a supervised and well-controlled site and for a newly discovered and uncontrolled site with no responsible site owner"; therefore, an HRS evaluation is not a sound basis for determining whether there should be Superfund program involvement at the Gelman Site. Gelman added that HRS scoring is a "screening device to evaluate the potential for releases of uncontrolled hazardous substances" and that because the Site is under control "the application of the HRS to the Gelman Site is inappropriate as a policy and practical matter."

Gelman went on to comment that they have finalized the Fourth Amended Consent Judgment with EGLE and asserted that the remedial actions outlined in the agreement adequately resolve the environmental issues and protect the public interest; thus, placement on the NPL is unwarranted. Gelman stated:

> Gelman is and has been a proactive and responsible site-owner with an unwavering record of managing the Site in compliance with the Consent Judgement with the State of Michigan—compliance which has included engaging in a collaborative process for amending the Consent Judgment when technology, Site findings, or regulatory requirements have changed over time. Gelman has done exactly what has been required within the bounds of the law. Against this backdrop, other than shifting oversight burdens and costs from the State to EPA, it is difficult to see what purpose would be served by listing the Gelman Site on the NPL.

Gelman commented that the State has consistently determined that the Site remedy is protective of public health and the environment, and that under current remedies no member of the public is exposed to contamination above the State accepted drinking water level of 7.2 ppb. Gelman also stated that in 1996, the State concluded that Gelman had addressed the "spray irrigation field" and approved a "no further action" determination.

Gelman remarked that the EPA has twice previously evaluated the Site for the NPL; the EPA previously elected not to proceed with a listing decision due to the remedy being in place under State supervision, and the public risk to 1,4-dioxane exposure has not changed since those attempts. Gelman commented that after years of negotiations with the City, County, and the Township, the current remedy remained the same. Gelman stated that placing the Site on the NPL would not result in a meaningful public health benefit, it would only confirm the appropriateness of the current control program.

Response: Placing the Site on the NPL is an appropriate step in the Superfund process for this Site. The Site received an HRS site score of 50.00; an HRS site score above 28.50 represents the EPA's determination that based on existing information the Site poses a significant relative risk compared to other sites evaluated under the HRS and warrants further investigation. The EPA's actions to evaluate the Site using the HRS and list the Site are consistent with the requirements of CERCLA and SARA, and the statutory purpose of the NPL, which is to inform the public of possible threats and identify those sites that appear to warrant further investigation and/or remediation. At this Site, 1,4-dioxane has been released from sources at the Gelman facility and observed releases of 1,4-dioxane have been documented in the groundwater over a large area and include multiple residential wells and one public supply well (see page 44, Figures 2-5, and Tables 10, 12, 14, 16, 18 and 20 of the HRS documentation record at proposal; and page 40, Figures 2-5, and Tables 10, 12, 14, 18, and 20 of the HRS documentation record at promulgation) which resulted in an HRS site score of 50.00 (see page 2 of the HRS documentation record at proposal and at promulgation).

EPA disagrees with Gelman's comments that the EPA is proposing the Site to the NPL based on political pressure from the local community instead of following its procedure. While the EPA welcomes input from the community and other stakeholders during the site assessment process and beyond (see section 3.9, Community Involvement, of this support document), any assertion that the Agency did not follow its process for proposing sites to the NPL because of outside undue influence is unfounded. Consistent with CERCLA, the EPA has in place a procedure for identifying sites where releases of substances addressed under CERCLA have occurred or may occur, placing such sites on the NPL, evaluating the nature and extent of the threats at such sites, responding to those threats, and deleting sites from the NPL. The purpose of the initial two steps is to identify and evaluate sites for inclusion on the NPL, which identifies for the States and the public those sites that appear to warrant remedial action (56 FR 35842, July 29, 1991). The EPA's actions to evaluate the Site using the HRS and list the Site are consistent with the statutory purpose of the NPL and the requirements of CERCLA and the SARA. Specifically, the EPA's listing authority in 40 C.F.R. § 300.425(c)(1), and the HRS itself, are part of the "NCP" (located in 40 C.F.R. Part 300 and appendix A) and were promulgated pursuant to CERCLA § 105(a)(8)(A), 42 U.S.C. § 9605(a)(8). CERCLA Section 105(8)(A)[now Section 105(a)(8)(A)] as revised by SARA required the EPA to establish:

> [C]riteria for determining priorities among releases or threatened releases throughout the United States for the purpose of taking remedial action and, to the extent practicable taking into account the potential urgency of such action, for the purpose of taking removal action. Criteria and priorities under this paragraph shall be based upon relative risk or danger to public health or welfare or the environment, in the judgment of the President, taking into account to the extent possible the population at risk, the hazard potential of the hazardous substances at such facilities, the potential for contamination of drinking water supplies, the potential for direct human contact, the potential for destruction of sensitive ecosystems, the damage to natural resources which may affect the human food chain and which is associated with any release or threatened release, the contamination or potential contamination of the ambient air which is associated with the release or threatened release, State preparedness to assume State costs and responsibilities, and other appropriate factors.

See 42 U.S.C. § 9605(a)(8)(A). The HRS (last revised on January 9, 2017, 82 FR 2760) codifies or implements such criteria and is the Agency's tool for deriving a site score based on the factors identified in CERCLA Section 105(a)(8)(A). As documented in the HRS documentation record at proposal and as previously stated, the Site has met the CERCLA and NCP listing criteria for placement on the NPL by receiving an HRS score of greater than 28.50. It was for this reason, with concurrence from the state of Michigan (see Docket ID number EPA-HQ-OLEM-2024-0067-0004), that the EPA is proposing the Site for placement on the NPL.

Regarding Gelman's assertion that placing the Site on the NPL would risk disturbing a well-established and protective remedy, as explained in section 3.4, Delay, of this support document, future planned remedial actions are not a factor in evaluating whether a site qualifies for the NPL, and in fact, the listing process need not inhibit efforts to determine response actions or carry out currently planned response actions. All site investigation work, as well as any remediation undertaken by Gelman performed to date and that which is currently proceeding will be considered in other steps of the Superfund remediation process. Relatedly, regarding the commenter's assertion that there is no potential risk to health or the environment as determined by the State because of Gelman's past and ongoing remediation work and that the HRS does not account for the 30 years of work done at the Site, as discussed in section 3.12 Risk to Human Health or the Environment, of this support document, the Site poses a sufficient relative risk to human health or the environment to warrant inclusion on the NPL based on the Site achieving an HRS site score above 28.50 based on current conditions (see the HRS documentation record at proposal). CERCLA Section 105(a)(8)(a) requires the EPA to determine NPL priorities based on the "relative risk or danger to public health or welfare, or the environment," and the criteria the EPA applies to determine this relative risk or danger is codified in the HRS. As such, consistent with CERCLA and the Superfund program, the HRS evaluation assesses the relative risk of a site compared to other sites; it is not a site-specific risk assessment. The actual risks posed to humans and the environment by the Site is not determined until site characterization including risk assessment is completed, which is done under a separate stage of the Superfund process and not under the Site Assessment stage of the process. As part of these stages, various risk management options will be considered in selecting any appropriate remedy to clean up the contaminated groundwater and control for future contamination. Information collected in prior Gelman investigations over the last 30 years will be considered at these later stages in the Superfund process, when an up-to-date risk assessment is performed and a risk management decision is made. See also section 3.11, Consideration of Response and Remedial Actions, of this support document.

Regarding Gelman's comment that the application of the HRS is inappropriate because the Site is not "uncontrolled," this assertion is misleading. While Gelman has been involved in addressing contamination released from its facility in Ann Arbor, Michigan, since at least 1992 when Gelman and the State entered into a consent judgment requiring Gelman to conduct groundwater remediation and to conduct a soil investigation and subsequent remediation (see page 23 of the HRS documentation record at proposal), the work detailed in the most recent version of this judgment (i.e., the Fourth Amended Consent Judgment; see Attachment 3 of the Gelman public comments) (EPA-HQ-OLEM-2024-0067-0147), is not yet complete and efforts to contain the groundwater contamination are ongoing. In fact, as addressed in section 3.4, Delay, of this support document, Gelman admitted as much when it requested that the EPA not list the Site, so it can continue to carry out the "remedy agreed upon with the responsible State regulator." Further, as shown on Figures 3 and 4 and discussed in section 3.1.1, Observed Release, of the HRS documentation record at proposal, 1,4-dioxane groundwater contamination was detected in areas beyond the Prohibition Zone at observed release levels documenting groundwater contamination movement. The EPA notes that though Gelman pointed out in their comments that these detections beyond the Prohibition Zone are not above State cleanup levels, contaminant concentrations below drinking water standards do not eliminate the associated releases from consideration when evaluating a site using the HRS (see section 3.15, Permitted Releases/Concentrations Below Regulatory Levels, of this support document).

Regarding the commenter's statements that the EPA deferred to the State authority twice instead of the NPL and that listing the Site on the NPL now would only confirm the appropriateness of the current control program rather than result in a meaningful public health benefit, the EPA highlights that it reinitiated assessment of the Site

explicitly at the request of the State (see Attachment A of this support document). As previously discussed in this section, determination of whether the current (or some other) remedy is the most appropriate for this site will be assessed and decided later during remedy selection and remedial design phases of the Superfund process, if deemed necessary, at which time Gelman would have additional opportunities to affect remedy selection. In the meantime, adding a site to the NPL does not prevent Gelman from undertaking response actions if it desires to expedite cleanup efforts. See also section 3.4, Delay, and section 3.11, Consideration of Response and Remedial Actions, of this support document.

Regarding Gelman's comment that placing the Site on the NPL is a waste of federal resources, funding is not a factor considered in the determination of whether the NPL placement of a particular site is warranted. Please see section 3.14, Funding and Resources, of this support document for additional discussion.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.4 Delay

Comment: Gelman commented that the intervention of local units of government in their negotiations with the state of Michigan have caused more than "a six-year delay before an amended consent judgment applying the [new] 7.2 ppb [drinking water] standard could be entered," and so Gelman requested that the EPA not place the Site on the NPL and cease any further consideration for listing the Site, so they can continue to carry out the "protective and robust remedy agreed upon with the responsible State regulator." Similarly, a citizen expressed concern that an NPL designation would mean that there would be a "lengthy cleanup process and bureaucratic complexities might lead to delays in remediation."

Response: The commenters' concerns that listing would delay cleanup are unfounded. Future remedial actions are not a factor in evaluating whether a site qualifies for the NPL, and placement of the Site on the NPL does not necessarily lead to delay of planned response actions or associated negotiations. Placement of a site on the NPL does not delay any response actions. All site investigation work, as well as any remediation undertaken by Gelman performed to date and that which is currently proceeding will be considered in other steps of the Superfund remediation process, such as when performing a Superfund risk assessment for the Site. Then, based on the findings of the risk assessment, a determination of what further remedial actions, if any, are necessary will be made.

Furthermore, adding a site to the NPL does not prevent potentially responsible parties (PRPs) from undertaking response actions if a PRP desires to expedite cleanup efforts. The EPA makes decisions during all stages of the procedure to add sites to the NPL. PRPs can affect remedy selection, as can any other member of the public, through the public comment process that occurs prior to determining if remedial actions are needed and if so, what those actions may be for a site. PRPs may also undertake RI/FS and/or remedial design/remedial action stages under EPA supervision and pursuant to appropriate agreements with governmental authorities (under enforcement authorities of CERCLA or those of other statutes). The listing process does not encumber or preclude PRPs from entering into these agreements. See section 3.3, Purpose/Need for Listing, section 3.11, Consideration of Response and Remedial Actions, and section 3.12, Risk to Human Health or the Environment, of this support document for additional discussion regarding this topic.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.5 Narrative Summary Clarifications

Comment: Gelman commented that there are two statements in the NPL Site Narrative Summary document that are either incorrect or unsupported by the HRS documentation record at proposal. They asserted that the statement saying that the Gelman plume continues to expand beyond the Prohibition Zone boundary is incorrect. Gelman stated that "[c]oncentrations above the applicable state-wide standard have not expanded beyond the Prohibition Zone boundary." Gelman continued to explain that if this had happened, they would be required to carry out

response actions. Gelman also commented that the "HRS [Documentation] Record" does not support the statement made by the EPA in the NPL Site Narrative Summary saying that other state and federal cleanup programs were evaluated but are not viable at this time.

Response: The EPA has reviewed the commenter's assertions and the recommended revisions to the NPL Narrative Summary, and none of these comments and suggested revisions result in changes affecting the HRS scoring of the Site. The commenters' assertions are included as part of the docket for the Site listing as the comments were submitted to the docket. Regarding the Site Narrative Summary document, the content of this document has been modified as described below. The NPL Narrative Summary is a one-page, high level summary about the Site and is considered to reasonably reflect the Site as scored. As explained in the HRS documentation record at proposal and throughout this support document, adequate information has been provided to establish that the Site presents sufficient risk to warrant further investigation.

Specifically regarding Gelman's complaint that the NPL Site Narrative Summary document incorrectly states that the groundwater plume extends beyond the Prohibition Zone boundary, this statement is correct for HRS purposes. Gelman appears to be applying the definition of groundwater contamination from the Fourth Amended Consent Judgment, which states, "'Groundwater Contamination' shall mean the 1,4-dioxane in the groundwater at a concentration in excess of 7.2 ug/L, as determined by the analytical method(s) described in Attachment B to this Consent Judgment, subject to review and approval by EGLE" [see Attachment 3 of the Gelman public comments (EPA-HQ-OLEM-2024-0067-0147)]. However, as explained in section 3.15, Permitted Releases/Concentrations Below Regulatory Levels, of this support document, contaminant concentrations below drinking water standards do not eliminate the associated releases from consideration when evaluating a site using the HRS, and as shown on Figures 3 and 4 and discussed in section 3.1.1, Observed Release, of the HRS documentation record at proposal, groundwater contamination was detected in areas beyond the Prohibition Zone. Therefore, the statement in the Narrative Summary is a true statement for HRS purposes. However, to avoid confusing the public with varying definitions of groundwater contamination, the EPA has modified the NPL Site Narrative Summary at promulgation to state, "[t]he state of Michigan referred the site to the EPA for NPL listing because it cannot compel Gelman to do more under their cleanup authorities as the plume continues to expand."

Regarding Gelman's comment that the HRS documentation record at proposal does not support the statement in the narrative summary that other state and federal cleanup programs were evaluated but not viable at this time, EPA does not view changes to this statement to be necessary. The purpose of the HRS documentation record is to present the rationale for listing in the form of assigned HRS factor values and resulting pathway and site scores along with the supporting information for those assignments. Second, as discussed in sections 3.8 and 3.10 of this support document, Consistency with Guidance and Policy and Alternatives to Listing, respectively, the EPA has long deferred to other cleanup programs as an alternative to placing this Site on the NPL. EPA emphasizes that other cleanup authorities initially lead cleanup activities and continued to do so until such time as that authority (the state of Michigan) requested the EPA's involvement (see Attachment A of this support document). As documented in the HRS documentation record at proposal, the Site has met the criteria for placement on the NPL by receiving an HRS score of greater than 28.50; therefore, consistent with CERCLA and with support of the state of Michigan, placing the Site on the NPL is an appropriate approach to address the releases at the Site.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.6 Extent of Site/Site Boundaries

Comment: Scio Township commented that the EPA should improve the current delineation of the plume boundary. Scio Township requested that the EPA expand the "perimeter sentinel well network to the north and northeast" to detect contamination that the township claims has escaped detection. Scio Township also commented that "[a]dditional iterative testing to the north, east and west is necessary to fully delineate the extent of the 1,4-dioxane plume." They stated:

> From July 2021 to August 2022, Scio Township conducted an extensive testing program for 1,4-dioxane in residential drinking water wells. The results of the testing indicate that numerous residences located between the assumed northern boundary of the contaminant plume (as defined by Gelman) and the Huron River (located approximately one mile further north) have contaminated drinking water. In some cases, wells located more than 4,000 feet north of the assumed plume boundary have wells contaminated with more than 1 ppb of 1,4-dioxane.

Response: At proposal, the Site was appropriately defined for HRS purposes as consisting of three sources of hazardous substances (1,4-dioxane and acetone) at the Gelman facility as well as groundwater contaminated with site-attributable 1,4-dioxane as a result of releases from site sources. As described in more detail in section 3.17.1, Sample Collection Techniques, of this support document, the EPA has revised the HRS documentation record at promulgation and removed Source 3, Spray Irrigation Field, from scoring and instead listed the Spray Irrigation Field as a possible source at the Site in the "Areas of Concern" section of the HRS documentation record at promulgation. Removing the Source 3 hazardous substance (i.e., acetone) and hazardous waste quantity from scoring does not impact the ground water migration pathway score or the resulting overall Site HRS score. The extent of the groundwater contamination has been adequately documented in the HRS documentation record at proposal and at promulgation, and the Site meets the HRS requirements for scoring. A more complete evaluation of the extent of the contamination and associated contaminants at the Site will occur at a later stage in the Superfund process, including a review of sampling conducted by the township in this additional area. Placing a site on the NPL is based on an evaluation, in accordance with the HRS, of a release or threatened release of hazardous substances and pollutants or contaminants. However, the fact that the EPA initially identifies and lists the release based on a review of contamination at a certain parcel of property does not necessarily mean that the site boundaries are limited to that parcel.

CERCLA Section 105(a)(8)(A) requires the EPA to list national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. Further, CERCLA Section 101(b) defines a "facility" as the "site" where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." The "come to be located" language gives the EPA broad authority to clean up contamination when it has spread from the original source. On March 31, 1989 (54 FR 13298), the EPA stated:

> HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, the EPA contemplates that the preliminary description of facility boundaries at the time of scoring will need to be refined and improved as more information is developed as to where the contamination has come to be located; this refining step generally comes during the RI/FS stage.

The HRS (55 FR 51587, December 14, 1990) elaborates on the "come to be located" language, defining "site" as:

> area(s) where a hazardous substance has been deposited, stored, disposed, or placed, or has otherwise come to be located. Such areas may include multiple sources, and may include the area between the sources.

Until the site investigation process has been completed and a remedial action (if any) selected, the EPA can neither estimate the extent of contamination at the Site, nor describe the ultimate dimensions of the NPL site. Even during a remedial action, such as removing contaminated soils or sediments, the EPA may find that the contamination has spread further than previously estimated, or is not as extensive as estimated and the site extent may be correspondingly changed.

In describing the Site and the extent of contamination, page 21 of the HRS documentation record at proposal states:

> The Gelman Sciences Inc (Gelman) site as scored for HRS purposes consists of three sources of hazardous substances (1,4-dioxane and acetone) at the Gelman facility in Ann Arbor, Washtenaw County, Michigan, as well as groundwater contaminated with site-attributable 1,4-dioxane as a result of releases from site sources. Sources include a surface impoundment, a set of buried/backfilled surface impoundments and a land treatment area. … Thirty-one residential wells and a public supply well have been evaluated at observed release concentrations. … A release to groundwater of a hazardous substance attributable to operations at the Gelman facility is documented by chemical analysis and direct observation based on past waste disposal practices and sampling and analysis by the U.S. Environmental Protection Agency (EPA) in 2022 and 2023 and by Michigan Department of Environment, Great Lakes, and Energy (EGLE) and Washtenaw County Health Department in 2023. … Groundwater results show concentrations of 1,4-dioxane related to releases from the Gelman facility at concentrations significantly above background in nearby monitoring wells.

The HRS documentation record at proposal preliminarily defined the Site for HRS scoring purposes based on observed releases in residential, monitoring, and municipal wells that established where contamination had come to be located. Although boundaries of the groundwater contamination were described, as explained above, these were preliminary boundaries of the contamination, and the Site is not restricted to these preliminary boundaries delineating the groundwater contamination if further investigation shows a different extent of contamination.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.7 Pathways Not Scored/Score More

Comment: Three commenters discussed other possible pathways of concern that were not scored as part of this HRS evaluation. Gelman commented that based on their investigations, the groundwater/surface water interface (GSI) pathway might be relevant in two locations. Gelman explained that these two areas are the marshy area next to the Gelman property where 1,4-dioxane remains bound to "peat-rich" wetland soils and the "Western Wetland Area" next to Third Sister Lake. Gelman commented that they would be required under the Fourth Amended Consent Judgment to address venting above the GSI criterion of 280 ppb.

Vincent Caruso commented on behalf of Allen's Creek Watershed Group (ACWG) and as a personal statement as a Coalition for Action on Remediation of Dioxane (CARD) member that the EPA's scoring does not include consideration for exposure to 1,4-dioxane via groundwater intrusion into basements and subsequent evaporation. Mr. Caruso explained that this potential for vapor phase exposure means that the "hazard score" should be greater. Rita Loch-Caruso, PhD, expressed her concern with the "incomplete discussion of 1,4-dioxane in shallow groundwater in the city of Ann Arbor."

Dr. Loch-Caruso commented that although it is clear why the ground water migration pathway was the focus of scoring, the discussion of the non-scored pathways on the HRS documentation record at proposal coversheet is incomplete for the soil exposure and subsurface intrusion pathway. As further explanation, Dr. Loch-Caruso objected to the current discussion of shallow groundwater in the HRS documentation record at proposal being limited to a 2016 study conducted by Gelman. She indicated that this is a limited study from eight years ago where 1,4-dioxane in two out of 16 temporary wells was detected at concentrations ranging from 1.9 to 3.3 µg/L. Dr. Loch-Caruso went on to describe three more recent studies/scientific papers that characterize shallow groundwater contamination, including: a 2021 study conducted for the Washtenaw County Water Resources Commissioner, storm drain and surface water (pond) sampling conducted by EGLE between 2020 and 2023, and her own scientific paper titled "Atmosphere of wet basements as a novel route for potential residential exposure to 1,4-dioxane vapor" published in 2022. She indicated that this paper describes a previously unrecognized exposure route involving contaminated groundwater intrusion into basements with evaporation of 1,4-dioxane into the indoor air. Dr. Loch-Caruso also surmised that the existence of 1,4-dioxane contamination in the shallow groundwater is unsurprising considering the regional geology. She stated that "[b]ecause of decreasing topographic elevation along the eastward migration path of the largest 1,4-dioxane plume, the land elevation is

declining to meet the plume and this is happening in central Ann Arbor. However, this important aspect of geology is not considered in the HRS Documentation Record." Dr. Loch-Caruso suggested that the "potential threat [from the shallow groundwater] deserves elaboration in the HRS Documentation Record."

Response: While the Site may also pose a threat to human health via releases from the Site to other pathways and components, the evaluation of the ground water migration pathway was sufficient to qualify the Site for the NPL. That other pathways, such as the ground water to surface water component of surface water migration pathway or the subsurface intrusion component of the soil exposure and subsurface intrusion pathway, were not evaluated. However, these pathways may be evaluated further in the future as the site continues to be investigated through the Superfund remedial process.

The HRS does not require scoring pathways if scoring those pathways does not change the listing decision. For some sites, data for scoring a pathway are unavailable, and obtaining these data would be time-consuming or costly for a pre-remedial/screening evaluation. In other cases, data for scoring some pathways are available, but will only have a minimal effect on the site score. In still other cases, data on other pathways could substantially add to a site score but would not affect the listing decision. The HRS is a screening model that uses limited resources to determine whether a site should be placed on the NPL for possible Superfund response. As a matter of policy, the EPA does not delay listing a site to incorporate new data or score new pathways if the listing decision is not affected.

During the Superfund remedial site assessment process, the EPA would like to investigate each possible site completely and thoroughly prior to evaluating sites for proposal on the NPL, but it must reconcile the need for certainty before action with the need for inexpensive, expeditious procedures to identify potentially hazardous sites. For this reason, the EPA generally will not score additional pathways upon receiving new data as long as the site still meets the HRS cutoff score. Because the HRS is intended to be a "rough list" of prioritized hazardous sites; a "first step in a process--nothing more, nothing less." *Eagle Picher Indus. v. EPA*, 759 F.2d 922, 932 (D.C. Cir. 1985) (Eagle Picher II). The D.C. Circuit Court of Appeals has found the EPA's approach to solving this conundrum to be "reasonable and fully in accord with Congressional intent." *Eagle Picher Industries, Inc. v. EPA*, (759 F.2d 905 (D.C. Cir. 1985) Eagle Picher I). A subsequent stage of the Superfund process, the RI, characterizes conditions and hazards at the site more comprehensively. However, any additional data the Agency gathers to characterize site conditions could provide useful information during the RI.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.8 Consistency with Guidance and Policy

Comment: Gelman commented that in proposing the Site to the NPL, the EPA is acting inconsistently with Agency procedures and guidance by failing to evaluate the existing State-led remedial strategy as a cleanup alternative. Gelman mentioned the EPA Superfund Remedial Site Assessment Process webpage[2] as one example of Agency procedures that they contend were inconsistently followed. Gelman pointed specifically to Superfund Remedial Site Assessment Process diagram on this page that shows the EPA considers if there are other cleanup alternatives before deciding to pursue placement on the NPL, and Gelman commented that this page states that "where such alternatives are available, EPA shall '[p]ursue Non-NPL cleanup alternatives' and '[p]rovide information to states and other regulatory programs.'" Gelman also argued that the EPA has failed to adhere to what it describes as a Region 5 guidance document titled *Procedures for Addressing Potential 1,4-Dioxane Contamination at Region 5 Superfund Remedial Sites.*[3]. Gelman stated that this guidance "does not recommend

[2]Please note that Gelman's footnote 58 citation regarding the EPA Superfund Remedial Site Assessment Process webpage in this comment is incorrect. This citation refers the reader to Attachment 25 of the Gelman comment document; however, it appears that the EPA Superfund Remedial Site Assessment Process webpage was actually provided as Attachment 7 to the Gelman comment document. Attachment 25 of the Gelman comment document is a US EPA Fiscal Year 2025 Justification of Appropriation Estimates for the Committee on Appropriations (March 2024).

[3] Included as Attachment 6 of Gelman's comment document.

additional response actions at managed 1,4-dioxane sites without a finding that the 1,4-dioxane contamination 'yields an unacceptable risk not addressed by the implemented remedial action.'"

Further, Gelman remarked that the EPA twice previously evaluated the Site for possible inclusion on the NPL and declined to do so (i.e., in 1993 when the state of Michigan accepted responsibility for overseeing and managing the release and after a review in 2017 where Gelman asserts that the EPA concluded that because Gelman was addressing the release under the Michigan cleanup program federal intervention was unnecessary). Gelman commented that these decisions were consistent with EPA policy in their opinion because the Site was being addressed under the State cleanup program. Gelman opined that "there have been no changes in relevant facts or data that would justify the EPA's unsupported change in position on listing the Gelman site." Gelman asserts further that the only thing that has changed since the 2017 "determination by EPA that federal intervention was not warranted" is that Gelman's remedy had increased protectiveness. Gelman claimed that if federal intervention was not justified previously, it certainly would not be justified now; therefore, the Agency's "unsupported" change in position is arbitrary and capricious. Gelman concluded by acknowledging that the community's concern about the existence of the 1,4-dioxane plume continues but declared that these concerns "do not provide a basis under the HRS or EPA policy to place the Gelman Site on the NPL" considering Gelman's "robust remedy being implemented at the site."

Response: The HRS evaluation of the Site is consistent with the HRS regulation and the Administrative Procedure Act (APA); the EPA's decision to add the Site to the NPL based on the HRS evaluation is therefore neither arbitrary nor capricious. The HRS documentation record at proposal and this support document clearly document that the EPA has complied with the HRS regulation; this support document addresses all comments on the proposed listing of this Site and shows that HRS requirements have been met in every aspect of the evaluation of this Site.

Furthermore, unlike the HRS regulation itself, EPA guidance is not a regulation and imposes no mandatory requirements on the Agency. Regardless, all relevant EPA Superfund site assessment guidance and policy was also applied appropriately in the HRS evaluation based on the facts and circumstances known to be present for this Site at proposal; any variation in applying guidance was carried out to reflect site-specific conditions. In evaluating whether a site merits NPL listing, the EPA complies with the HRS and uses guidance as just that—guidance to determine how best to perform the HRS evaluation based on the facts or circumstances presented at each site.

Specific to Gelman's comment that the Superfund remedial site assessment process as outlined on the EPA Superfund Site Assessment Process Web page (https://www.epa.gov/superfund/superfund-site-assessment-process) was not followed, this assertion is incorrect. The flow chart referred to at this website is as follows:

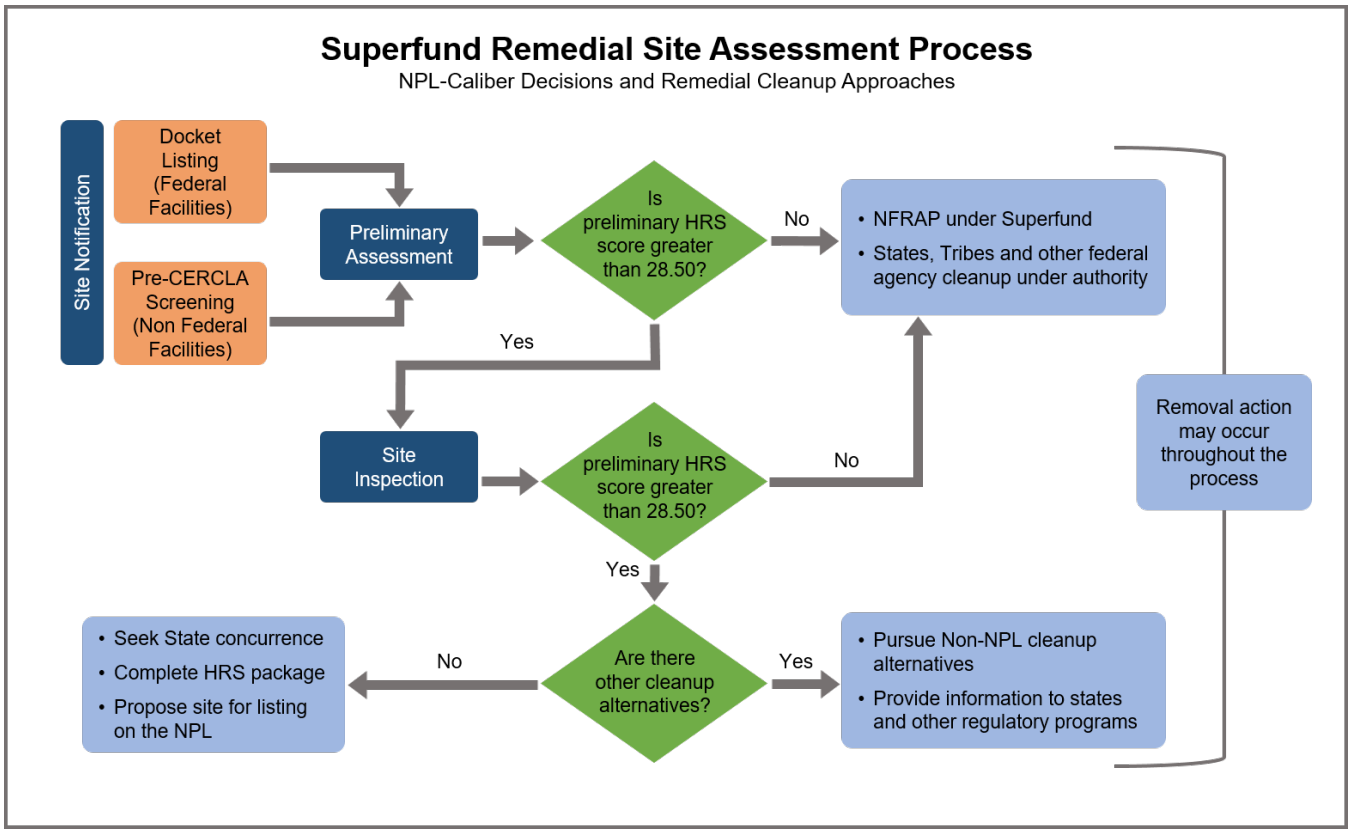


Figure 2: Superfund Remedial Site Assessment Process (https://www.epa.gov/superfund/superfund-site-assessment-process).

Also featured on the website that Gelman comments about is the following additional flowchart showing the major components of the Superfund site assessment process:

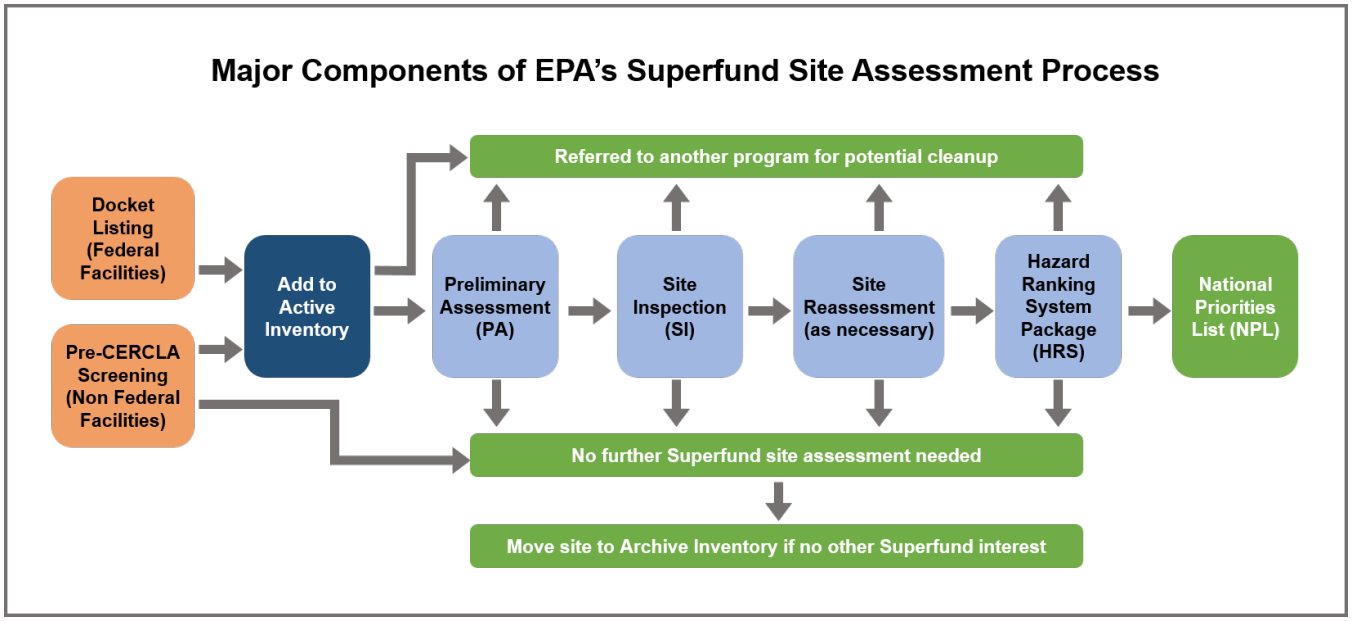


Figure 3: Major Components of EPA's Superfund Site Assessment Process (https://www.epa.gov/superfund/superfund-site-assessment-process); please note that these processes can start, restart, or be reassessed throughout the process.

Per requirements outlined in SARA and the NCP and as shown on the above flowcharts, the EPA performs a preliminary assessment (PA) for all sites added to the active inventory (i.e., SEMS – Superfund Enterprise Management System database). *See* 42 U.S.C. § 9605(d); *see also* 40 CFR § 300.420; https://www.epa.gov/enviro/sems-overview. The NCP and the above flowcharts also discuss performing an SI if additional information is needed. *See* 40 CFR § 300.420). A PA and SI were both performed for the Site (see References 6 and 119 of the HRS documentation record at proposal). Following along further, the above Superfund Remedial Site Assessment Process flowchart discusses several paths that a site can take based on the information collected during the PA and SI. One of these options is to pursue non-NPL cleanup alternatives, which as Gelman pointed out, is the option that the EPA followed when it deferred cleanup authority to the State in 1992 when the state entered into a Consent Judgment with Gelman (see page 23 of the HRS documentation record at proposal; Table 2-2, Site Timeline Summary, of Reference 119 of the HRS package at proposal; and Reference 74 of the HRS package at proposal). This, however, is not always the end of a site's cleanup journey. As shown in the Major Components of EPA's Superfund Site Assessment Process flowchart, a site may be reassessed as deemed necessary. In the case of the Site, reassessment was deemed necessary because the State (the acting cleanup authority at the time) requested specifically in its letter dated April 12, 2021, that the EPA reinitiate its assessment of the Site (see Attachment A of this support document). Further, the state of Michigan indicated its support for the placement of the Site on the NPL in its concurrence letter dated December 11, 2023 (see docket document number EPA-HQ-OLEM-2024-0067-0004). Therefore, the steps of the Superfund remedial site assessment process were followed as intended, and the listing of the Site on NPL is neither arbitrary nor capricious.

Regarding Gelman's comment that the EPA is acting inconsistently with the EPA Region 5 document titled, *Procedures for Addressing Potential 1,4-Dioxane Contamination at Region 5 Superfund Remedial Sites*, this memorandum is not applicable to the HRS evaluation or to the Superfund site assessment process in general. The Region 5 memorandum described in these comments is remedial guidance that is only meant to be applied after a site is added to the NPL. Specifically, the section cited by Gelman, which discusses no additional response actions unless there is unacceptable risk, is part of the "Post-ROD [record of decision]" recommendations for the Remedial Project Managers (RPMs) to consider after a comprehensive investigation and risk assessment have been completed under CERCLA when a risk determination can be made. As discussed in section 3.11, Consideration of Response and Remedial Actions, of this support document, a risk assessment evaluation at the Site and decisions regarding remedy selection for the Site occurs at a different stage of the remedial process (i.e., the RI/FS and/or remedial design/remedial action stages rather than the site assessment stage).

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.9 Community Involvement

Comment: Gelman commented that requests from local community interests are the reason that the EPA reinitiated the NPL process for the Site and conducted its 2022 SI, and Gelman suggested that the resulting report did not identify any new data that would support any changes from the EPA's prior conclusion not to list the Site. Gelman stated that community members who support an EPA takeover of the Site perhaps do not understand "the limited options for managing a plume of this size and type, or the stigma that can attach to localities with Superfund sites." Gelman suggested that local community concerns about the existence of the 1,4-dioxane plume, "do not provide a basis under the HRS or EPA policy to place the Gelman Site on the NPL" considering the "robust remedy" they are implementing at the Site. Gelman suggested that they "would welcome community support and cooperation with a State-led remedy, instead of unnecessary federal involvement." A citizen also expressed hope that the community and Gelman Life Sciences can "work together to move forward instead of bemoaning and dwelling on the past."

Response: The EPA has determined that adding the Site to the NPL is an appropriate next step in the Superfund process to address the 1,4-dioxane contamination in groundwater scored in the HRS evaluation of the Site. As presented in the HRS documentation record at proposal, the Site achieved an HRS site score above the listing threshold of 28.50, which represents the EPA's assessment that the Site warrants further investigation under the

Superfund program and placement on the NPL. The EPA has also received support from the state of Michigan for listing, so deferring to a State-led remedy is not appropriate at this time.

Regarding Gelman's assertions that the decision to proceed with listing is primarily due to community concerns and input, the EPA makes decisions during all stages of the Superfund Site Assessment process and has determined that placing the Site on the NPL is the next appropriate step in the multi-step Superfund process. In evaluating sites, the EPA has in place a procedure, consistent with CERCLA, for identifying sites where releases of substances addressed under CERCLA have occurred or may occur, placing such sites on the NPL, evaluating the nature and extent of the threats at such sites, responding to those threats, and deleting sites from the NPL. The purpose of the initial two steps is to develop the NPL, which identifies for the States and the public those sites that appear to warrant remedial action (56 FR 35842, July 29, 1991). The evaluation or RI/FS phase involves on-site testing to assess the nature and extent of the public health and environmental risks associated with the site and to determine what alternatives for remedial action, if any, may be appropriate. After a period of public comment, following issuance of the RI/FS and the identification of a preferred alternative, the EPA responds to the identified threats by issuing a Record of Decision which selects the most appropriate alternative. The selected remedy is implemented during the remedial design/remedial action phase. Finally, the site may be deleted from the NPL when the EPA determines that no further response is appropriate.

In this case, the Site has met the criteria for placement on the NPL by receiving an HRS score of greater than 28.50 and meeting the CERCLA and NCP listing criteria. Public concerns about the 1,4-dioxane plume are not a factor contributing to the HRS Site score. The Site achieved an NPL eligible HRS site score based on the scoring of an observed release to groundwater of 1,4-dioxane that has been documented at the Site as discussed on pages 44 to 57 of the HRS documentation record at proposal. (Please see section 3.2, the Adequacy of Record, of this support document for a discussion of comments on the quality of the supporting information.) The state of Michigan[4] concurred with the proposal to add the Site to the NPL. For these reasons (i.e., an NPL eligible HRS site score along with the state of Michigan's concurrence with the listing), the EPA is adding the Site to the NPL.

The Superfund process encourages and relies on the participation of the public, including potentially responsible parties. The public can comment during the comment period (typically 60 days) after a site is proposed for listing. Comments from those opposed and in support of the listing are considered before finalizing a site's placement on the NPL as exemplified by this support document. After placement on the NPL, the EPA evaluates and selects a remedy. The EPA may also hold a public hearing during the latter decision-making period. If private parties conduct remedial action under a consent decree between the EPA and the parties, the decree is also subject to public comment. The EPA believes that the above process offers the public sufficient opportunity to present facts and opinions germane to its decision-making.

Furthermore, regarding the citizen's comments on possible cooperation between members of the public and PRPs (or other stakeholders), the EPA makes every attempt to ensure that community relations is a continuing activity designed to meet the specific needs of the community. As part of community involvement efforts, the Superfund program offers numerous opportunities for public participation at NPL sites. The EPA Regional Office develops a Community Involvement Plan (CIP) before RI/FS field work begins. The CIP is the "work plan" for community relations activities that the EPA will conduct during the entire cleanup process. In developing a CIP, Regional staff interview State and local officials and interested citizens to learn about citizen concerns, site conditions, and local history. This information is used to formulate a schedule of activities designed to keep citizens apprised and to keep the EPA aware of community concerns. After the RI/FS is completed and the EPA has recommended a preferred cleanup alternative, the EPA Regional Office sends to all interested parties a Proposed Plan outlining the cleanup alternatives studied and explaining the process for selection of the preferred alternative. At this time, the EPA also begins a public comment period during which citizens are encouraged to submit comments regarding all alternatives. Once the public comment period ends, the EPA develops a Responsiveness Summary,

[4] Gretchen Whitmer, Governor of Michigan provided the EPA with a letter expressing support for placing the Site on the NPL on December 11, 2023. The letter is available on the EPA's website at the following location: https://semspub.epa.gov/src/document/11/404416.

which contains EPA responses to public comments. The Responsiveness Summary becomes part of the ROD, which provides official documentation of the remedy chosen for the site.

Regarding comments suggesting that alternatives to listing, including deferral to the State, should be considered, please see section 3.10, Alternatives to Listing, of this support document.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.10 Alternatives to Listing

Comment: Gelman commented that alternatives to placing the Site on the NPL have not been evaluated and stated that they have been implementing response activities for decades under State oversight to clean up contamination. Gelman commented that they recently reached an agreement with the State on enhancements to the Consent Judgment (fourth amended) and stated that these enhancements to their decades of response activities have reduced groundwater contamination and properly protect the public interest; these actions remain well-managed under State oversight and should remain in place as an alternative to placement on the NPL and the NPL listing should be withdrawn.

Gelman commented that the EPA has not evaluated the existing State-led remedial cleanup alternative to NPL listing that is underway at the Site and stated that this is a viable cleanup alternative. Further, Gelman commented that the EPA's assertion in the Site Narrative Summary that "other state and federal cleanup programs were evaluated but are not viable at this time" is unsupported.

Finally, Gelman commented that while some members of the community support an EPA takeover of cleanup actions at the Site, and while they welcome community support, there are limited options for addressing the contamination outside of the remedial actions already taking place and federal involvement is unnecessary.

Response: Adding the Site to the NPL is an appropriate next step in the Superfund process because the Site has achieved an HRS site score above the listing threshold of 28.50 and has support from the state of Michigan for listing. The HRS site score of above 28.50 represents the EPA's assessment that the relative risk posed by the Site warrants further investigation under the Superfund program and placement on the NPL.

Regarding an alternative cleanup deferral to Gelman, the EPA does not have regulations that require the Agency to defer placing a site on the NPL if the PRP has entered into a CERCLA enforcement agreement. EPA does not believe that deferral to Gelman Sciences Inc. is appropriate as the NCP (55 FR 8667, March 8, 1990) states that the Agency will not implement any part of an expanded deferral approach until the significant public and Congressional concerns have been fully reviewed, and a final decision made on expanding the deferral policy. Significant public comments have been fully reviewed as summarized in this document, and the EPA will not consider deferring the Gelman Sciences Inc. site at this time.

Regarding comments that suggest an alternative cleanup deferral to the state, the state of Michigan has requested that the Site be placed on the NPL (see Attachment A of this support document). In a letter dated December 11, 2023, (docket ID: EPA-HQ-OLEM-2024-0067-0004), prior to the placement of the Site on the NPL, the Governor of Michigan, Gretchen Whitmer, stated (in part):

> The State of Michigan concurs with the proposal and supports the inclusion of the Site in the next proposed NPL update.
>
> Environmental assessments and investigation activities have indicated that the Site is contaminated with 1,4-dioxane and the associated groundwater plume has migrated beneath an estimated 3+ square mile area of the city of Ann Arbor and Scio Township. The Site is eligible for NPL listing based on the recently completed Final Site Inspection Report. Placing the Site on the NPL is the most viable alternative for addressing the issues with the source contamination

> remaining on-site and the contaminated groundwater on and emanating from the Site. Additionally, this option is supported by United States Representative Debbie Dingell, several local units of government, and community groups.
>
> Thank you for your consideration. Please continue to coordinate the USEPA's activities with EGLE.

On May 3, 1995, the EPA issued its "*Guidance on Deferral of NPL Listing Determinations While States Oversee Response Actions.*" The EPA developed the guidance in an effort to enhance the State role in addressing sites. The deferral program is an administrative tool to enable States and Tribes, under their own laws, to respond at sites that the EPA would otherwise not soon address. Because of the great differences in State and Tribal capabilities; however, the EPA implements the guidance in a flexible manner.

In the case of the Site, the EPA has decided that deferral to the state of Michigan is not appropriate because the state of Michigan requested that the Site be placed on the NPL.

Regarding Gelman's comments that there may be limited options for addressing the contamination differently from its remedy agreed upon with the State in the Fourth Amended Consent Judgment, decisions on which, or even if, remedial actions will be taken at the Site are not considered at the listing stage of the Superfund process. All site investigation work, as well as any remediation undertaken by Gelman performed to date and that which is currently proceeding will be considered in other steps of the Superfund remediation process, such as when performing a Superfund risk assessment for the Site. Then, based on the findings of the risk assessment, a determination of what further remedial actions, if any, are necessary will be made. Please also see section, 3.4, Delay, and section 3.11, Consideration of Response and Remedial Actions, of this support document for more information.

Regarding Gelman's objection to statements in the Site Narrative Summary document regarding evaluation of alternatives to NPL listing, please see section 3.5, Narrative Summary Clarifications, of this support document.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.11 Consideration of Response and Remedial Actions

Comment: Gelman commented that the proposed listing does not account for what they describe as progress of over thirty years of remediation at the Site, and they stated that the EPA did not account for the Site having a robust remedial program with institutional controls. Gelman commented that they are, and have been, a responsible Site owner that has been successfully remediating the 1,4-dioxane plume through pump-and-treat for decades and institutional controls in compliance with the Consent Judgment with the state of Michigan. Gelman commented that the 1,4-dioxane plume has already been extensively investigated and delineated, and the existing remedy is effective and protective of human health and the environment. Gelman asserted that it pumps and treats more water than the majority of remedial systems in the state. Gelman commented that in the unlikely event the plume were to expand with the current remedial action in place, they would be required to provide municipal water to potentially impacted properties and apply additional actions to pull the plume back within the Prohibition Zone boundary.

Further, Gelman commented that the current remediation efforts have significantly reduced the mass of contamination in all but discrete areas of the Site. Gelman explained that they have been, and still are, running an effective pump-and-treat remediation program for over thirty years that has removed approximately 111,443 pounds of 1,4-dioxane and treated over 9.87 billion gallons of water resulting in substantial mass reductions in contaminant concentrations and protecting the communities near the Site from unacceptable exposures. Gelman commented that these actions and contaminant reductions that reduce the risk to human health and the environment are not considered in the formulas of an HRS score. Gelman also commented that they voluntarily connect properties to municipal water supplies when contamination is above state-wide drinking water standards.

Further, Gelman commented that failure to consider the actions results in scoring errors and stated that it is not appropriate to place the Site on the NPL.

Gelman commented that they have already completed certain aspects of the remediation at the Site and noted that the remediation plan at the Site is consistent with the EPA's approved remedy at other 1,4-dioxane Superfund sites in the State. Gelman commented that this included amending the current Site remedy to reflect the State accepted drinking water cleanup criteria of 7.2 ppb. Further, in noting that the current remediation goals are sufficient, Gelman commented that the County has evaluated other Superfund sites in the State and noted that no other site in the State has a 1,4-dioxane "complete cleanup" goal.

Gelman commented that they continue to, proactively and voluntarily, investigate and track the plume migration as well as evaluate and address possible source areas as part of the remediation to prevent unacceptable risk of exposure to hazardous substances. Gelman stated that they continue to remediate the aquifer west of Wagner Road by pump-and-treat from a series of extraction wells. Additionally, Gelman commented that their remediation in place includes phytoremediation tree wells to remediate clay-rich soils where pump-and-treat is impractical.

Gelman commented that they have engaged in negotiations with the City, County, and the Township regarding remediation at the Site and noted that the resulting agreement largely retained the same fundamental elements of the current remedy. Gelman noted that community dissatisfaction aside, it is unlikely that there is a "better" or more technically feasible remedy than the remedy that has been and continues to be implemented at this Site.

Gelman commented that they are also performing enhanced remedial actions to meet the agreements set forth in the latest Consent Judgment that are not accounted for in the HRS documentation record at proposal; the EPA's failure to account for these remedial actions makes the listing proposal arbitrary and capricious.

Scio Township commented that the "trigger/cleanup" levels, of 7.2 ppb for 1,4-dioxane at this Site, adopted by the State is too high and recommends that the EPA lower monitoring well compliance and cleanup levels of 1,4-dioxane from 7.2 ppb to at least 3.5 ppb, but preferably to 0.35 ppb.

Joe Meunier, stated his concern that the EPA's remediation efforts would be to lower standards in comparison with what Gelman does today. Mr. Meunier expressed concern that maintenance on wells may suffer and new technologies may not be implemented, resulting in the plume expanding.

Response: The Site has been appropriately evaluated with respect to the remedial and response actions that have occurred (or are occurring), and placing the Site on the NPL is the next appropriate step in the Superfund process. While removal actions and remediation (under the State Consent Judgment) at the Site have been considered, the current conditions at the Site warrant placement on the NPL as evidenced by the Site achieving an HRS site score above 28.50. Decisions regarding whether future remedial actions will occur and which approach to remediation should be employed are not addressed at the listing stage of the Superfund process but occur as part of the separate remedial investigation/feasibility study (RI/FS) stage of the Superfund process. Consistent with CERCLA, the EPA has in place a procedure for identifying sites where releases of substances addressed under CERCLA have occurred or may occur, placing such sites on the NPL, evaluating the nature and extent of the threats at such sites, responding to those threats, and deleting sites from the NPL. The purpose of the initial two steps is to develop the NPL, which identifies for the States and the public those sites that appear to warrant remedial action (56 FR 35842, July 29, 1991). The evaluation or RI/FS phase involves on-site testing to define the nature and extent of the threat posed by the contamination and to identify alternatives for remedial action, if needed. After a period of public comment, the EPA responds to those threats by issuing a ROD which selects the most appropriate alternative. The selected remedy is implemented during the remedial design/remedial action phase. The EPA may take removal actions at NPL sites at any time during the RI/FS phase when the need for an interim action arises. Finally, the site may be deleted from the NPL when the EPA determines that no further response is appropriate. Ongoing remediation does not negate the need for listing the Site on the NPL, and listing

the Site is consistent with the purpose of the NPL. Any site investigation or response work performed to date would be considered in separate, later stages of the Superfund process, not during NPL listing.

Ongoing remediation and other completed response actions are generally considered during the scoring process when the EPA has documentation that clearly demonstrates there is no remaining release or potential for a release that could cause adverse environmental or human health impacts. At this Site, the ongoing remediation of hazardous substances from releases at the Gelman facility has not eliminated the existence of contaminated groundwater nor has it prevented contaminated groundwater from reaching nearby residential wells. As presented in the HRS documentation record at proposal and in sections 3.17, Source Characterization, and 3.19, Observed Release, below in this support document, recent sampling in 2022 and 2023 shows that extensive contamination in groundwater monitoring wells around the Gelman facility and in nearby residential wells remains present at the Site and continues to pose a risk to human health and the environment. While Gelman's response actions have removed some 1,4-dioxane from the groundwater, and while these actions have been considered in the scoring of the waste quantity, these actions have not eliminated the contamination in the groundwater beneath the Site and have not eliminated the risk posed to human health or the environment. Therefore, as the relative risk posed by the release of those hazardous substances to the ground water pathway has not been eliminated, the remediation and response actions have been considered and the current conditions at the Site warrant placement on the NPL.

Regarding comments about remedial actions continuing into the future at the Site, future actions, if any, are not a factor in evaluating whether a site qualifies for the NPL. The EPA makes decisions during all stages of the procedure to add sites to the NPL; however, PRPs may undertake the RI/FS and/or remedial design/remedial action stages under EPA supervision and pursuant to appropriate agreements with governmental authorities (under enforcement authorities of CERCLA or those of other statutes). The HRS evaluation and NPL listing process is a part of the initial phase of Superfund site evaluation. Listing a site simply reflects the EPA's decision to inform the public of the possible threat posed by the site and that further investigation is needed. As part of the standard Superfund process, after listing a site on the NPL, the investigations performed to date to characterize the site will be evaluated for completeness, and further information will be collected, if deemed necessary, to adequately characterize the risks posed by the site. Based on this information, a risk assessment decision will be made determining what, if any, remedial action is necessary to protect human health and the environment.

Regarding Scio Township's comments to lower the remediation "trigger/cleanup" levels of 1,4-dioxane from 7.2 ppb to either 3.5 ppb or 0.35 ppb, these levels do not impact the HRS evaluation and do not impact the decision to place the Site on the NPL. As noted in section 3.15, Permitted Releases/Concentrations Below Regulatory Levels, of this support document, an observed release of hazardous substance is required to be documented and established consistent with the HRS; this does not require the use of any specific benchmark or "trigger/cleanup" level, nor does it eliminate permitted releases from HRS evaluations. As such, the "trigger" (e.g., the well exceedance or well noncompliance) levels discussed in the Fourth Amended Consent Judgment have no bearing on the HRS evaluation at this Site. At a later stage in the Superfund process, the RI/FS stage, additional on-site investigation and testing will determine the nature and extent of the threat posed by the contamination and this will determine what remedial actions, if any, are needed at the Site.

Regarding commenters' concerns that future remediation efforts may be to lesser standards or use older technologies than what is currently being utilized, as noted above, future remedial actions, if any, are not a factor in evaluating if a site qualifies for the NPL. However, also noted above, PRP's may continue ongoing remediation actions at the Site and these actions will be considered in future stages of the Superfund process. The EPA will consider all information available at the Site in later stages of the Superfund process, including ongoing remediation efforts, to determine what total remedial actions, if any, are needed at the Site, and the appropriate screening values.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.12 Risk to Human Health or the Environment

Comment: Gelman commented that the Site has undergone over thirty years of remedial actions and remains under a current robust remedial program, with effective oversight from the state of Michigan, and stated that there is no present or potential risk to human health and the environment. Gelman commented that they have been, and still are, running an effective pump-and-treat remediation program that has substantially reduced contaminant concentration risk to levels that are safe for human health and the environment. Gelman states that placing the Site on the NPL is not appropriate when there is no meaningful threat to human health and the environment.

Gelman commented that soil samples, sediment samples, and "on-site and off-site" groundwater well samples collected in the 2022 site investigation do not support any change to the risk profile of the Site from any of the previous EPA investigations at the Site; thus, there is no unacceptable risk to human health or the environment at the Site.

Gelman commented that the State has consistently determined that the remedy in place is protective of human health and that no member of the public is exposed to 1,4-dioxane in drinking water above the "stringent state-wide drinking water standard of 7.2 [ppb]." Gelman commented that no domestic water supply wells have been found to have unsafe concentrations of 1,4-dioxane since 1986 when Gelman connected area residents and commercial properties to municipal water. Gelman stated that the HRS score relies upon low-level detections (below the state-wide drinking water standard) in residential drinking water wells that should be considered safe for drinking water; and inclusion of these wells in the HRS scoring is inappropriate and overstates the human health risk posed by the Site.

Gelman commented that the remedial actions agreed to in the Fourth Amended Consent Judgment provides an effective and protective remedy that prevents unacceptable exposures to the residual contaminant plume. Gelman asserted that both the Eastern and Western areas of the plume specified in the Consent Judgment are subject to cleanup objectives that protect public health and the environment and ensure the public is not exposed to 1,4-dioxane.

Gelman commented that the Eastern Area remedy uses pump-and-treat remediation and a "Prohibition Zone" to prevent human exposure and protect the environment. Gelman commented that the "Prohibition Zone" in the Eastern Area "encompasses the entire residual Eastern Area plume and prevents the public from exposure to water contaminated with 1,4-dioxane at unsafe levels." Gelman added that the Prohibition Zone includes a "buffer" between "the delineated boundaries of the plume and edge of the Prohibition Zone itself" to safeguard against exposures above the state-wide drinking water standard. Gelman commented that data from wells confirm that the plume is contained within the Prohibition Zone and the plume is not expanding beyond the zone at levels above 7.2 ppb. Gelman stated that in the unlikely event that the plume were to expand beyond the Prohibition Zone at concentrations above 7.2 ppb, the Consent Judgment would require Gelman to provide municipal water to properties and "pull the plume back within the Prohibition Zone." Gelman asserts that these measures prevent unacceptable risks to human health and the environment.

Gelman commented that the Western Area remedy uses active pump-and-treat to prevent expansion of the Western Area plume and prevent human exposure and protect the environment. Gelman commented that the Western Area plume has been stable for decades due to remediation efforts and further stated that since Gelman has connected residents to municipal water, there is no risk to any drinking water receptors.

Finally, Gelman commented that in 2013 the Agency for Toxic Substances and Disease Registry (ATSDR) of the U.S. Public Health Service declined to perform a Public Health Assessment of the Gelman Site. Gelman commented that ATSDR stated that "most of the soil contamination at the site has been removed," and "available information indicates community members are not exposed to harmful levels of 1,4-dioxane from the site."

Response: The Site poses a sufficient relative risk to human health or the environment as compared to other candidate sites evaluated using the HRS to warrant inclusion on the NPL. This determination is based on the Site

achieving an HRS site score above the listing threshold of 28.50. Consistent with CERCLA and the NCP, the Site is being placed on the NPL based on an HRS evaluation of the relative risk posed by uncontained hazardous substances in Site sources, a release of 1,4-dioxane to groundwater, and the threat that this release poses to drinking water in the area.

The EPA used appropriate levels of data and investigation in determining the HRS score for the Site. As explained in the preamble in the Federal Register notice promulgating the HRS (55 FR 51533, December 14, 1990), Congress, in discussing the substantive standards against which HRS revisions could be assessed, stated in its Conference report on SARA:

> This standard is to be applied within the context of the purpose for the National Priorities List; i.e., identifying for the States and the public those facilities and sites which appear to warrant remedial actions. . .. This standard does not require the Hazard Ranking System to be equivalent to detailed risk assessments, quantitative or qualitative, such as might be performed as part of remedial actions.

The HRS is not a site-specific risk assessment, and the specific level of risk posed by the Site is not determined at the listing stage of the Superfund process. A site-specific risk assessment quantifies the risk to receptors actually posed by releases at a site. The HRS is a numerically based screening tool that the EPA uses to assess the relative degree of risk to human health and the environment posed by a site compared to other sites subject to review based on a screening-level knowledge of site conditions. The HRS score is used to determine whether a site is eligible for placement on the NPL. The NPL is intended primarily to guide EPA in determining which sites warrant further investigation to assess the nature and extent of public health and environmental risks associated with a release of hazardous substances, pollutants, or contaminants. *See* 83 FR 22918 (Proposed Rule, PROTECO site, May 17, 2018); *see also* 55 FR 51532 (Final Rule, Hazard Ranking System, December 14, 1990). CERCLA Section 105(a)(8)(a) requires EPA to determine NPL priorities based on the "relative risk or danger to public health or welfare, or the environment." The criteria the EPA applies to determine this relative risk or danger is codified in the HRS, and it is the EPA's primary tool for deriving a site score based on the factors identified in CERCLA. The HRS evaluation and score at or above 28.50 represents EPA's determination that the Site may pose a relative risk or danger to human health and the environment and warrants further investigation under CERCLA. Determination of site-specific risk posed to human health or the environment is made at a later stage of the Superfund process following listing. During this later stage, sufficient information will be collected to completely evaluate the site-specific risk associated with the Site. Based on this information, the EPA will determine if further response actions are warranted at the Site.

Regarding the impact of ongoing remedial work in the Site vicinity, any ongoing remedial actions to address the groundwater contamination, including pump-and-treat remedial work and the presence of a "Prohibition Zone" to address possible migration of the groundwater contamination, do not negate that the conditions at the Site are eligible for NPL placement and pose sufficient relative risk to warrant further investigation. An HRS evaluation of a site is based on an assessment of current conditions, which includes consideration of completed response actions. Future remedial actions are generally not considered during the HRS evaluation of a site because the current conditions at the Site do not include these actions. This Site achieved an NPL eligible HRS site score above 28.50 based on the HRS scoring of the current conditions. As noted above, the HRS site score above the listing threshold of 28.50 indicates that the relative risk posed by the Site is sufficient to warrant placing it on the NPL. As these comments related to the consideration of remedial work and remediation at the Site, please see sections 3.11, Consideration of Response and Remedial Actions, of this support document.

Furthermore, any agreements in place with a PRP to address Site conditions do not preclude the need for listing, affect the current presence of 1,4-dioxane contamination in groundwater documented in the HRS documentation record at proposal, or eliminate any potential risk that the Site may pose to human health or the environment. Placing the Site on the NPL is the next appropriate step in the Superfund process, and the current conditions at the Site achieved an NPL eligible HRS site score warranting placement on the NPL. As explained in section 3.11, Consideration of Response and Remedial Actions, of this support document, listing need not affect ongoing

planning and implementation of cleanup measures by the PRP or prevent the undertaking of remedial investigations, feasibility studies, and actual remediation in a process other than the traditional Superfund process. PRPs may undertake the RI/FS and/or remedial design/remedial action stages under EPA supervision and pursuant to appropriate agreements with governmental authorities, and the NPL listing process does not encumber or preclude PRPs from entering into these agreements. And, all site investigation work, as well as any remediation performed to date and that which is currently proceeding will be considered in other steps of the Superfund remediation process. Regarding comments discussing specific ongoing or completed remedial actions and agreements in place to complete remediation, these comments are discussed in detail in sections 3.10, Alternatives to Listing, and 3.11, Consideration of Response and Remedial Actions, of this support document.

Regarding comments on groundwater concentrations below the Michigan drinking water standard of 7.2 ppb used to establish an observed release to groundwater, releases below state drinking water standards or other screening levels do not establish the absence of a risk posed by the Site or eliminate the associated releases from consideration when evaluating a site using the HRS. As explained in detail in section 3.15, Permitted Releases/Concentrations Below Regulatory Levels, of this support document, permitted releases as well as concentration of hazardous substances below a screening level, regulatory limit, or state drinking water standard are still eligible for consideration in an HRS evaluation of a site. As these comments relate to whether an observed release was properly established, please see section 3.19, Observed Release, and associated subsections in the HRS documentation record at proposal for the discussion of the observed release established.

Regarding comments asserting that ATSDR declined to complete a public health assessment of the Site due to the removal of most of the soil contamination, a public health assessment or health advisory by ATSDR is not required for NPL placement, and a health advisory issued by ATSDR is associated with a listing mechanism other than an assessment of the Site via an HRS evaluation. As explained in the *Federal Register* notice proposing the Site to the NPL (89 FR 16498-16504):

> There are three mechanisms for placing sites on the NPL for possible remedial action (see 40 CFR 300.425(c) of the NCP): (1) A site may be included on the NPL if it scores sufficiently high on the HRS…. As a matter of agency policy, those sites that score 28.50 or greater on the HRS are eligible for the NPL. (2) Pursuant to 42 U.S.C. 9605(a)(8)(B), each State may designate a single site as its top priority to be listed on the NPL, without any HRS score. …(3) The third mechanism for listing, included in the NCP at 40 CFR 300.425(c)(3), allows certain sites to be listed without any HRS score, if all of the following conditions are met:
>
> • The Agency for Toxic Substances and Disease Registry (ATSDR) of the U.S. Public Health Service has issued a health advisory that recommends dissociation of individuals from the release.
> • The EPA determines that the release poses a significant threat to public health.
> • The EPA anticipates that it will be more cost-effective to use its remedial authority than to use its removal authority to respond to the release.

Thus, an ATSDR Public Health Assessment is not required for placing a site on the NPL. A Public Health Assessment by the ATSDR is part of only one of the three mechanisms to place a site on the NPL, and each mechanism is independent of each other.

As discussed above, this Site is being placed on the NPL because it achieved an NPL eligible HRS site score based on the scoring of the ground water migration pathway. An NPL eligible HRS site score indicates that there is a sufficient relative risk posed by the contamination associated with the Site to warrant additional investigation, and the site-specific risk posed to human health or the environment by the Site will be determined at a separate stage of the Superfund process following listing.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.13 Economic Impacts/Stigma

Comment: Gelman commented that while the community may support an EPA takeover at the Site, the community might not understand the stigma that can be attached to being labeled as a Superfund site. Another public commenter, Kirby Evans, commented that some of the community may have concerns about the stigma associated with Superfund sites, which could impact property values and local communities; however, Ms. Evans also noted that the potential benefits are a compelling case to continue the Superfund process in Ann Arbor.

Response: Economic factors and stigma such as those raised by the commenters are generally not considered in the assessment of whether a site belongs on the NPL. Inclusion of a site or facility on the NPL does not in itself reflect a judgment on the activities of the owner(s) or operator(s), but rather reflects the EPA's assessment that a significant release or threat of release has occurred and that the site is a priority for further investigation under CERCLA. The EPA notes that there are both costs and benefits that can be associated with listing a site. Among the benefits are increased health and environmental protection as a result of increased public awareness of potential hazards. In addition to the potential for Federally financed remedial actions, the addition of a site to the NPL could accelerate privately financed, voluntary cleanup efforts. Listing sites as national priority targets also can give States increased support for funding responses at particular sites. As a result of the additional CERCLA remedies, there will be lower human exposure to high-risk chemicals, and access to higher quality surface water, groundwater, soil, and air. Therefore, it is possible that any perceived or actual negative fluctuations in property values or development opportunities that may result from contamination may also be countered by positive fluctuations when a CERCLA investigation and any necessary cleanup are completed. For further information, see information in the September 2000 EPA fact sheet, *Superfund Today, How Can a Superfund Site Affect My Property?* (EPA 540-F-98-001, available at https://semspub.epa.gov/src/document/05/927384.pdf).

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.14 Funding and Resources

Comment: Gelman commented that expending limited federal oversight and resources at this Site, for which Gelman asserts has robust remedial measures in place that are protective human health, would waste limited federal resources and run counter to the intent and core purpose of the NPL.

Response: Concerns regarding sources of funding for future remedial activities are not factors considered in the determination of whether the NPL placement of a particular site is warranted, and both costs and resources are not determined as part of the assessment of whether placing a site on the NPL is appropriate.

Funding for site cleanup is not a consideration in determining the eligibility of a site for the NPL. CERCLA Section 105(a)(8)(A), as amended, discusses the criteria for determining priorities for responding to releases of hazardous substances and funding is not among the criteria that are considered. Additionally, the identification of a site for the NPL serves the purpose of notifying the public that the EPA believes the Site warrants further investigation and future funding is not relevant to this step in the process. Listing, however, makes a site eligible for remedial action funding under CERCLA, and the EPA will determine the need for using Superfund monies for remedial activities on a site-by-site basis.

Regarding concerns about the impact of the Site listing on remedial activities, including whether adequate funding can be secured, the *Federal Register* Notice (89 FR 16498-16504, March 7, 2024*)* states that:

> Listing a site on the NPL does not itself impose any costs.… Nor does listing require any action by a private party, state, local or tribal governments or determine liability for response costs. Costs that arise out of site responses result from future site-specific decisions regarding what actions to take, not directly from the act of placing a site on the NPL.

Therefore, costs, sources of funding for these expenditures, and resource allocation are associated with events that generally follow listing the site, not with the listing itself.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.15 Permitted Releases/Concentrations Below Regulatory Levels

Comment: Gelman commented that releases of wastewater from their facility to the environment were authorized and conducted pursuant to a series of wastewater discharge permits issued by the State that were improperly relied on in the HRS scoring. Gelman commented that the wastewater discharges were legal and authorized, but at the time they did not know that 1,4-dioxane had a "resistance to biodegradation" and would result in unintended releases of 1,4-dioxane into the groundwater. Gelman stated that local courts have found that, except for overflows from treatment ponds, Gelman's discharges were permitted releases consistent with State law and with CERCLA, and the EPA should not rely upon alleged "unauthorized" historical releases in the HRS scoring. Gelman commented that they now have and maintain a NPDES permit for treated water discharge. A public commenter, Pat Ulanowicz, stated that the treatment discharges from the Site have been well below all Federal, State and Local standards for many years.

The Sister Lakes Association (SLA) commented that they oppose any NPDES and/or wetlands permit to allow partially treated 1,4-dioxane and bromate discharges into the First and Second Sister Lakes and the Dolph Nature Area.

Gelman also commented that the Site score relies on low-level detections in residential wells that are below applicable State drinking water standards.

Response: Releases and/or discharges that are either permitted or unintended are eligible for consideration under CERCLA and inclusion in HRS scoring. The fact that the release may have been Federally permitted[5] does not preclude listing. CERCLA Section 105(a)(8)(B) directs the EPA to list on the NPL "releases" of hazardous substances, pollutants, and contaminants according to specific criteria set out in CERCLA Section 105(a)(8)(A). The definition of "release" in CERCLA Section 101(22) exempts certain releases from its scope, but it does not exempt "Federally permitted releases"; thus, even if discharges occur within the regulatory limits set by those Federal laws enumerated in CERCLA Section 101(10), so as to constitute "Federally permitted releases," the discharges may be considered releases under CERCLA and, if appropriate under the HRS, placed on the NPL. CERCLA exempts "Federally permitted releases" only from the notification and cost-recovery sections of the statute, sections 103(a) and 107(j), respectively; such releases remain subject to the other sections of the statute. Further, any current or future discharge permits at a site are not considered in the determination for placement on the NPL.

Regarding comments on releases being below applicable standards or the reliance on detections below State drinking water standards, the HRS does not require that a hazardous substance, pollutant, and/or contaminant meet or exceed a regulatory limit or screening level; rather the HRS requires that observed releases of those substances are established. Concentrations of a hazardous substance and/or pollutant or contaminant may be eligible for consideration in an HRS evaluation even if they are below a regulatory limit or screening level. As discussed in detail in section 3.19, Observed Release, and subsections of this support document, the concentrations of 1,4-dioxane were documented in the HRS documentation record at proposal to meet observed release criteria.

On July 16, 1982, when responding to public comments on the proposed (original) HRS (47 FR 31188), and again on September 8, 1983 (48 FR 40665), the EPA rejected the idea that releases within regulatory limits should not be considered "observed releases" under the HRS. As the EPA noted in 1982:

[5] The EPA notes that both State issued wastewater discharge permits covered by 33 U.S.C. 1342 and NPDES permits are included in the CERCLA Section 101(10) definitions as a "federally permitted release."

> [E]mission or effluent limits do not necessarily represent levels which cause no harm to public health or the environment. These limitations are frequently established on the basis of economic impacts or achievability.

By contrast, an observed release represents a 100 percent likelihood that substances can migrate from the site (47 FR 31188, July 16, 1982).

Section 2.3 of the revised HRS (55 FR 51589, December 14, 1990) states that an observed release can be established either by direct observation or by chemical analysis. An observed release by chemical analysis has occurred when a contaminant is measured significantly above background level if some portion of the release is attributable to the site. Although contaminant levels may be lower than regulatory limits, an observed release has nevertheless occurred if the measured levels are significantly higher than background levels. The HRS does, however, consider whether releases are above regulatory limits in evaluating target populations, increasing by a factor of 10 the weight assigned populations exposed to contaminants above regulatory limits.

Of course, the observed release factor alone is not intended to reflect the hazard presented by the particular release. Instead, the hazard of the site is approximated by the total HRS score, which incorporates the observed release factors with other factors such as waste characteristics (including waste quantity, toxicity, and mobility) and targets. This total HRS score reflects the hazard of the site relative only to the other sites that have been scored. The actual degree of contamination and its effects are more fully determined during the remedial investigation that typically follows listing.

Regarding Gelman's discharge permits, the HRS documentation record at proposal provided information on some of the permit violations. For example, in 1977, Gelman violated its discharge permit by allowing surface runoff from the spray irrigation field to discharge at the west property boundary. It was later determined that the discharge contained 1,4-dioxane. On July 13, 1986, Gelman discharged an estimated 18,000 gallons of process water from a surface impoundment onto the ground near the north property line. The Michigan Department of Natural Resources (MDNR) indicated that this discharge was a violation of Gelman's groundwater discharge permit (Permit No. M00337). In October 1996, effluent containing 1,4-dioxane at concentrations of 4 and 2 ppb was injected into the aquifer in violation of the groundwater permit. (See pages 22, 23, 34, 55, and 57 of the HRS documentation record at proposal.) Additional permit violations are discussed in Attachment B of this support document. While these permit violations are not a factor relied on in the HRS scoring of this Site, they do show that Gelman has violated its various discharge permits on multiple occasions.

Regarding the SLA comment that opposes new NPDES permits and/or wetland permits to release into the First and Second Sister Lakes and the Dolph Nature Area, future permits to release in a watershed is not a factor that is considered in the determination to place a site on the NPL. However, as noted in section 3.9, Community Involvement, of this support document, the public will have an opportunity to comment on the selected Superfund remedies. That is, after the RI/FS is completed and the EPA has recommended a preferred cleanup alternative, the EPA Regional Office sends to all interested parties a Proposed Plan outlining the cleanup alternatives studied and explaining the process for selection of the preferred alternative. At this time, the EPA begins a public comment period during which citizens are encouraged to submit comments regarding all alternatives.

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.16 Site Inspection Report Data

Comment: Gelman commented that the SI[6] report included data that were potentially cross-contaminated and otherwise unusable in an HRS evaluation that resulted in a flawed HRS score. Gelman specifically commented

[6] EPA notes that Gelman refers to the "Site Inspection investigation" or "Site Investigation" report instead of the Site Inspection report. The EPA notes that a Site Inspection report was completed and relied upon in the HRS documentation

that the EPA used qualified data in the SI report as well as data from potentially cross-contaminated soil borings, resulting in an HRS score that is not based on valid evidence.

GEA commented that the SI report should include some additional recent data about the large quantity of impacted residential wells and potential impacts to the public water supply by 1,4-dioxane from the Site. GEA commented that the SI should include that the 1,4-dioxane groundwater pollution has migrated north and contaminated approximately 43 residential drinking water wells in Scio Township, and the 1,4-dioxane plume continues to expand towards more residential drinking water wells. GEA noted that the SI should also state that the 1,4-dioxane plume is approximately 0.12 miles from the Huron River where it flows to Barton Pond, which is the main source of drinking water for the City of Ann Arbor and that the 1,4-dioxane pollution has contaminated the City of Ann Arbor - Montgomery water supply well, which was closed due to the 1,4-dioxane impact.

Additionally, GEA, commented that none of the background monitoring wells designated in the SI report are reflective of true background conditions outside of the influence of the Site. GEA commented that the SI report has designated a number of monitoring wells as "background;" however, none of the SI "background" monitoring wells are reflective of background conditions currently or in the future; the SI should be revised to only include the Steere Farm Well as the representative background well.

Response: The EPA has properly used the HRS screening tool to identify the Site as one that poses sufficient relative risk to warrant further investigation, and the EPA used adequate data to support its evaluation. The sample results and information gathered from the 2022 sampling event for the SI report, and results from other investigations presented in the HRS documentation record at proposal, resulted in the collection of data sufficient to evaluate the Site for HRS scoring purposes. The work performed as part of the sampling event in 2022 for the SI, is based on a limited investigation, and the SI report alone does not represent the Agency's final determination and rationale of whether the Site warrants inclusion on the NPL. The total information used to perform the HRS site evaluation is sufficient to support the HRS scoring of the Site and its proposal to the NPL.

The HRS is a screening tool for identifying sites that pose sufficient actual or potential risk to warrant further investigation under Superfund, and further assessment will be performed as part of the Superfund process that occurs at a separate stage from NPL listing. The EPA used appropriate levels of data and investigation in determining the HRS score for the Site and is in the spirit of the HRS regulation. As explained in the preamble in the Federal Register notice promulgating the present HRS (55 FR 51533, December 14, 1990), Congress, in discussing the substantive standards against which HRS revisions could be assessed, stated in its Conference report on SARA:

> This standard is to be applied within the context of the purpose for the National Priorities List; i.e., identifying for the States and the public those facilities and sites which appear to warrant remedial actions.... This standard does not require the Hazard Ranking System to be equivalent to detailed risk assessments, quantitative or qualitative, such as might be performed as part of remedial actions. This standard requires the Hazard Ranking System to rank sites as accurately as the Agency believes is feasible using information from preliminary assessments and site inspections.... Meeting this standard does not require long-term monitoring or an accurate determination of the full nature and extent of contamination at sites or the projected level of exposure such as might be done during remedial investigations and feasibility studies. This provision is intended to ensure that the Hazard Ranking System performs with a degree of accuracy appropriate to its role in expeditiously identifying candidates for response actions.

H.R. Rep. No. 962, 99th Cong. 2nd Sess. at 199-200 [1986]. The implications of each of Gelman's and GEA's comments above as they apply to the HRS scoring of the Site are discussed in other sections of

record at proposal; where applicable, the EPA assumes Gelman's comments on the Site Investigation report is referring to the Site Inspection report.

this support document; and in each case, the level of information used to generate an HRS score is shown to be sufficient and consistent with the HRS:

- The SI report included data that was potentially cross-contaminated is addressed in section 3.17.1, Sample Collection Techniques, of this support document.
- The request that the SI report include additional recent data, including that the 1,4-dioxane groundwater pollution has migrated north and contaminated approximately 43 residential wells, is addressed in section 3.20.3, Actual Contamination in Residential Wells, of this support document.
- The statements regarding the SI "background" monitoring wells not being reflective of current or future background conditions and that only the Steere Farm Well is a true background are addressed in section 3.19.2, Background Samples, of this support document.
- Regarding the use of qualified analytical data in the SI report, no qualified results from the SI report were used to associate hazardous substance with a source scored in the HRS documentation record at proposal. All qualified analytical results used to evaluate an observed release in the HRS documentation record at proposal were biased low or had no bias, and all qualified analytical results used in the HRS documentation record at proposal were used consistent with EPA guidance (see pages 26-27, 29-31, 34-36, 44-54 of the HRS documentation record at proposal for source characterization and observed release data; see section 3.20.1, Use of Qualified Data in Establishing Level I Concentrations, of this support document, for discussion of the use of qualified analytical results in the observed release and targets evaluations).

Regarding GEA's comment that the SI report should be amended to state that the plume has contaminated the Montgomery Well, the SI report conclusions were based on samples collected in September and October 2022. The SI report contains adequate information on the historical 1,4-dioxane contamination in the Montgomery Well.

Regarding GEA's comment that the SI report should be amended to state that the 1,4-dioxane plume is approximately 0.12 miles from the Huron River, as stated in section 3.6, Extent of Site/Site Boundaries, of this support document, the HRS documentation record at proposal adequately determined the extent of the groundwater contamination and met the HRS requirements for scoring. A more complete evaluation of the extent of the contamination and associated contaminants at the Site will occur at a later stage in the Superfund process.

These comments result in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.17 Source Characterization

Comment: Gelman commented that improper soil sampling procedures were followed. It also commented that 1,4-dioxane was not detected in any soil or sediment samples collected by the EPA in 2022 and the spray irrigation area (Source 3 at proposal) had a no further action determination since 1996.

Response: The three sources evaluated in the scoring were adequately characterized consistent with HRS Section 2.2, *Characterize sources*, and its subsections. As described in more detail in section 3.17.1, Sample Collection Techniques, of this support document, EPA has removed spray irrigation field/land treatment area (Source 3 at proposal) and acetone from HRS scoring of the Site at promulgation because decontamination procedures for the Source 3 samples were not sufficiently documented. Removing the Source 3 hazardous substance (i.e., acetone) and hazardous waste quantity from scoring does not impact the ground water migration pathway score or the resulting overall Site HRS score. In other words, even following removal of Source 3, Spray Irrigation Field, from scoring, the Site score remains the same as proposed and thus these comments result in no change to the HRS score and no change in the decision to place the Site on the NPL.

Specific comments related to the source characterization are discussed in the following subsections:

- 3.17.1 Sample Collection Techniques
- 3.17.2 Soil Sample Results

3.17.1 Sample Collection Techniques

Comment: Gelman commented that the subsurface soil samples used to characterize Source 3, Spray Irrigation Field, were collected using improper methodology, as samples were collected from areas of high contamination to low contamination resulting in a flawed source characterization. Gelman commented that this methodology is against industry practice of how sampling investigations are ideally sequenced to minimize cross-contamination. Gelman also commented that there is no discussion of decontamination procedures in the Site Inspection report, and there was no indication that the equipment was decontaminated before arriving at the Site (Gelman noted that only decontamination equipment such as brushes were observed at the Site which would not eliminate cross-contamination). Gelman commented that there do not appear to be any equipment rinse QA/QC samples. Finally, Gelman stated that the soils on the Gelman property are clay-rich and cause soil to adhere to the drilling equipment, which would be difficult to remove without power washing, thus asserting that the HRS score is flawed and unreliable.

Response: The EPA has revised the HRS documentation record at promulgation and removed Source 3, Spray Irrigation Field, from scoring and instead listed the Spray Irrigation Field as a possible source at the Site in the "Areas of Concern" section of the HRS documentation record at promulgation. The EPA determined that sampling and decontamination procedures for the Source 3 samples were not fully documented in the record at proposal; therefore, Source 3 was removed as a scored source. Removing the Source 3 hazardous substance (i.e., acetone) and hazardous waste quantity from scoring does not impact the ground water migration pathway score or the resulting overall Site HRS score. While the field sample collection procedures were adequately conducted for Source 3, and the data collected do not show a pattern that would indicate that cross contamination between samples affected the results, the sampling documentation is not sufficiently clear and Source 3 was removed from scoring at promulgation.

Regarding field procedures, the sampling equipment and procedures followed were consistent with the standard operating procedures (SOPs) pertinent to the SI. A rotosonic drill was used and the coring materials of the rotosonic drills were decontaminated prior to reuse. When necessary, appropriate dedicated equipment was used for collection of the samples. Additionally, the contaminant concentrations do not suggest meaningful carryover between locations such that a location characterized as containing acetone is a result solely of carryover from a previous sample or boring. Regarding sampling areas from high to low concentrations, when there is no prior screening to determine the level of contamination in a specific area below ground surface, there is no industry practice that samples should be collected from low to high concentration as this information would not yet be known.

Data collected do not show a pattern that would indicate contaminant carryover between samples affected results. Of the samples scored, the first sample collected in the series of samples used to score Source 3—G-SS05-3031—exhibited acetone contamination, and subsequent Source 3 samples collected exhibited similar levels. Some soil samples collected between samples used to score Source 3, but not used in scoring, exhibited non-detect levels of acetone. For instance, the next sample collected after sample G-SS06-1011 (i.e., G-SS06-1415), the four samples collected between Source 3 samples G-SS08-0506 and G-SS09-1213 (i.e., G-SS08-1920, G-SS08-3233 and its duplicate G-SS98-3233, and G-SS09-0708), and the next sample collected after Source 3 sample G-SS09-1213 (i.e., G-SS09-1819) all exhibited non-detect levels of acetone, indicating that contamination in the Source 3 samples is not the result of contaminant carryover from earlier samples or borings (pages 189 and 192 of Reference 119 of the HRS documentation record at proposal). Also, the source background samples were taken after the collection of the source samples and exhibited non-detect levels of contamination, indicating that there is no contaminant carryover from prior Source 3 sampling.

The HRS evaluation of sources is generally centered on three points: association of a hazardous substance(s) with a source, a measure of the hazardous waste quantity associated with the sources, and whether source hazardous substances are contained from the pathway being evaluated.

- Regarding the association of a hazardous substance with the source, documents prepared by Gelman indicate that between 1983 and 1984, approximately 2.6 million gallons of wastewater containing acetone was applied to the Spray Irrigation area (page 51 of Reference 60 of the HRS documentation record at proposal and page 1 of Reference 20 of the HRS documentation record at proposal). These documents make it clear that acetone is associated with Source 3 regardless of alleged sample collection/decontamination concerns. Additionally, the first sample collected in the series of samples used to score Source 3—G-SS05-3031—exhibited acetone contamination and subsequent Source 3 samples collected exhibited similar levels. Further, even if just one sample exhibits contamination, that is sufficient for associating acetone with this source.
- Regarding the hazardous waste quantity, this is also unaffected by alleged sample collection/decontamination concerns. The Source 3 hazardous waste quantity is based on the hazardous wastestream quantity (Tier B), which was calculated from the estimate of the mass of hazardous substance-bearing process water disposed of at Source 3 by spray irrigation (not contested by commenters); i.e., the delineation of the source area via soil sampling boring points does not impact the source hazardous waste quantity.
- Finally, the lack of Source 3 containment to prevent migration to groundwater is not contested by commenters. Therefore, the HRS evaluation of Source 3 is consistent with the HRS regardless of any alleged shortcomings in the collection procedures.

Any alleged shortcomings in collection procedures for Source 3 therefore would not affect the HRS score; further, Source 3 has been removed from scoring at promulgation. Removing Source 3 from scoring at the Site results in no impact to the Site score or the decision to place the Site on the NPL.

Sampling and the Association of Acetone with Source 3 at Proposal

While Source 3 is no longer included as a scored source at the Site, hazardous substances were properly associated with the source, consistent with the HRS, and it remains an unscored possible source at the Site.

HRS Section 2.2.2, *Identify hazardous substances associated with a source*, provides the directions for associating a hazardous substance with a source:

> For each of the three migration pathways, consider those hazardous substances documented in a source (for example, by sampling, labels, manifests, oral or written statements) to be associated with that source when evaluating each pathway. In some instances, a hazardous substance can be documented as being present at a site (for example, by labels, manifests, oral or written statements), but the specific source(s) containing that hazardous substance cannot be documented.

Page 34 of the HRS documentation record at proposal provided general information on the sampling methodology, analysis, and data validation of the samples used to characterize Source 3. It states:

> These borings were advanced **using Rotosonic drilling method** to a maximum depth of 40 feet bgs [Ref. 27, pp. 9–20]. A total of 20 soil samples (including two environmental duplicate samples) were collected at 1-foot intervals from depths ranging from 0 to 33 feet bgs [Ref. 17, pp. 26, 27]. The samples were submitted to a CLP laboratory for analysis of volatile organic compounds (VOC) under EPA CLP Statement of Work (SOW) SFAM01.1, and the data were validated according to EPA Region 5 data validation guidelines [see **Table 5** of this HRS documentation record]. [emphasis added]

Page 36 of the HRS documentation record at proposal provided Tables 4 and 5, which present sample information and sample results, respectively, for the soil samples used to associate a hazardous substance with Source 3:

TABLE 4. SOURCE 3 SAMPLE INFORMATION

Field Sample ID	CLP Sample ID	Laboratory Sample ID	Sample Date	Sample Time	Depth (feet)	References
Background Samples						
G-SS13-0506	EYBE0	0003282-16	9/29/2022	17:20	5–6	**Figure 2**; 17, p. 28; 35, p. 2; 36, p. 5; 119, p. 191
G-SS13-1011	EYBE1	0003282-17	9/29/2022	17:25	10–11	**Figure 2**; 17, p. 28; 35, p. 2; 36, p. 5; 119, p. 191
Source Samples						
G-SS05-3031	EYBA3	22I0469-02	9/27/2022	11:50	30–31	**Figure 2**; 17, p. 26; 40, p. 2; 41, p. 2; 119, p. 188
G-SS06-1011	EYBA6	22I0469-05	9/27/2022	15:50	10–11	**Figure 2**; 17, p. 26, 40, p. 2; 41, p. 2; 119, p. 188
G-SS07-3031	EYBB0	22I0469-09	9/27/2022	18:50	30–31	**Figure 2**; 17, p. 26; 40, p. 2; 41, p. 3; 119, p. 188
G-SS08-0506	EYBC0	0003282-07	9/28/2022	11:00	5–6*	**Figure 2**; 17, p. 27; 35, p. 2; 36, p. 3; 119, p. 191
G-SS09-1213	EYBB7	0003282-04	9/28/2022	14:20	12–13	**Figure 2**; 17, p. 27; 35, p. 2; 36, p. 3; 119, p. 191

* Incorrectly labeled as 5-5 feet on Ref. 119, p. 191.

TABLE 5. SOURCE 3 SAMPLE RESULTS

Field Sample ID	Hazardous Substance	Date Sampled	Result (µg/kg)	Sample Adjusted CRQL (µg/kg)	Reference(s)
Background Samples					
G-SS13-0506	Acetone	9/29/2022	8.7 U	8.7	35, pp. 1–9, 44, 63; 36, pp. 5, 68
G-SS13-1011	Acetone	9/29/2022	9.4 U	9.4	35, pp. 1–9, 46, 64; 36, pp. 5, 71
Source Samples					
G-SS05-3031	Acetone	9/27/2022	19	11	40, pp. 1–8, 11, 50; 41, pp. 2, 477
G-SS06-1011	Acetone	9/27/2022	17	9.5	40, pp. 1–8, 21, 52; 41, pp. 2, 489
G-SS07-3031	Acetone	9/27/2022	19	8.8	40, pp. 1–8, 29, 54; 41, pp. 3, 501
G-SS08-0506	Acetone	9/28/2022	8.7	8.1	35, pp. 1–9, 26, 65; 36, pp. 3, 41
G-SS09-1213	Acetone	9/28/2022	15	8.7	35, pp. 1–9, 16, 65; 36, pp. 3, 32

Concentrations reported in micrograms per liter (µg/kg).
U = The analyte was analyzed for but was not detected above the reported sample quantitation limit [Ref. 35, p. 9].
The sample adjusted CRQL for each CLP result is the CRQL adjusted for sample and method [Ref. 18, pp. 2, 63, 104, 333, 369]. Since the samples were analyzed through the CLP, the adjusted CRQLs presented above are HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3].

Page 21 of the SI report, provided as Reference 119 of the HRS documentation record at proposal, provides a general description of the soil sampling procedures:

> 3.1.2 Soil Sampling
>
> Subsurface soil sampling occurred in order from the most contaminated to the least contaminated area, except for samples from borings G-SS10, G-SS11, G-SS12, and G-SS13 on the east side of the Gelman Property, due to asphalt laying activities. A total of 37 biased grab surface and subsurface soil samples were collected at various depths from a total of 13 soil borings in the former spray irrigation fields (6 borings), the grass strip west of the former drum storage area (2 borings), and near Ponds 1 through 3 (5 borings). **Borings were advanced via Terrasonic CC150 rotosonic drill rig equipped with a continuous 4.25-inch diameter core** to maximum depths of 33 feet bgs. Due to compacted and filled areas throughout the Site, surface soils were only collected from 0-2 feet bgs at locations G-SS07 and G-SS05. Subsurface samples were generally collected within the vadose zone, at least two feet above the groundwater table.
>
> In accordance with the SAP (WESTON, 2022), collected soil was removed from the core and thoroughly mixed in dedicated plastic bags. Field screening utilizing a flame/photo ionization detector (FID/PID) for VOCs was completed. **VOCs were sampled directly from the core prior to removal of soil using 5-gram EnCore samplers**. [emphasis added]

The *Final Site Assessment Technical Support Sampling and Analysis Plan, Gelman Sciences, Inc.* (June 2022) provides site-specific sampling collection procedures for the surface and subsurface soil samples to be collected. It is included as Attachment C of this support document. It states on page 23 to 26:

> **Surface Soil Sampling** ...
>
> The samples will be collected in a non-dedicated core barrel with a dedicated acetate sampling sleeve and internal core catcher. Collected soil will be cut out of the core barrel and then homogenized in dedicated plastic bags for screening and sample collection. Samples for VOC analysis will be collected directly from the sampling sleeve using 5-gram En Core® samplers (or equivalent).
>
> Decontamination of sampling equipment must be conducted consistently to assure the quality of samples collected. All non-dedicated equipment that comes into contact with potentially contaminated soil or water will be decontaminated. Decontamination will occur prior to and after each use of a piece of non-dedicated equipment. The following steps are to be carried out sequentially, as the recommended procedure for the decontamination of sampling equipment: nonphosphate detergent and tap-water wash, using a brush, if necessary, tap-water rinse, then deionized/distilled water rinse (twice). Equipment will be decontaminated in a predesignated area on pallets or plastic sheeting, and clean bulky equipment will be stored on plastic sheeting in uncontaminated areas....
>
> **Subsurface Soil Sampling**...
>
> The borings will be advanced to approximately 25-50 ft bgs (if possible) and two subsurface soil samples will be collected from each boring. Soil cores obtained below 2 ft. bgs and above the bottom 2-foot sample interval will undergo field screening with a TVA [toxic vapor analyzer] for VOCs and SVOCs. The results of the field screening will be used to inform the selection of the subsurface soil interval in which the sample will be collected from for laboratory analysis. The subsurface soil interval selected for sample collection will be based on the highest response from any or all instruments and/or field observations (visual or olfactory). TVA screening will be

> conducted using the heated headspace procedure. Approximately 250 grams of soil will be placed into a sealable plastic bag and sealed. Sufficient air will be left in the bag so that the instrument can withdraw an adequate headspace sample. The sample will be agitated for 15 seconds and warmed within an approximately 70° degrees Fahrenheit (F) vehicle or building for a minimum of 10 minutes, but no more than 1 hour, for soil hydrocarbons to reach equilibrium with the headspace. The TVA will be used to measure the sample's headspace concentration by first re-agitating the plastic bag, and then inserting the probe of the TVA through the bag opening to half of the headspace depth and resealing the bag tightly around the probe. The highest reading that remains steady for 1 to 2 seconds will be recorded in the field logbook or data collection device. The samples will be collected in a non-dedicated core barrel with an acetate sampling sleeve and internal core catcher. Collected soil will be cut out of the core barrel to be homogenized in dedicated plastic bags for screening. Samples for VOC analysis will be collected directly from the sampling sleeve using 5-gram En Core® samplers (or equivalent). If no elevated TVA readings or visual signs of contamination are observed, one sample will be collected from approximately midway in the boring and an additional sample will be collected from the deepest 2 ft of the boring. In all cases, assuming a relatively low-permeability (i.e., silt and/or clay) interval is encountered at the boring's termination depth, the deepest sample would be collected from soils immediately above this interval. Subsurface soil samples will be submitted for laboratory analysis for TAL metals plus cyanide, PCBs, VOCs, and SVOCs (including PAHs).
>
> Decontamination of sampling equipment must be conducted consistently to assure the quality of samples collected. All non-dedicated equipment that comes into contact with potentially contaminated soil or water will be decontaminated. Decontamination will occur prior to and after each use of a piece of non-dedicated equipment. The following steps are to be carried out sequentially, as the recommended procedure for the decontamination of sampling equipment: nonphosphate detergent and tap-water wash, using a brush, if necessary, tap-water rinse, then deionized/distilled water rinse (twice). Equipment will be decontaminated in a predesignated area on pallets or plastic sheeting, and clean bulky equipment will be stored on plastic sheeting in uncontaminated areas.

Instructions in the *Superfund Technical Assessment and Response Team Standard Operating Procedure SOP 301 Decontamination Procedures (Revised October 2019)* were followed for the collection of the soil samples. These are standard protocols for Superfund site assessment work and are included as attachments in the *Final Site Assessment Technical Support Sampling and Analysis Plan, Gelman Sciences, Inc* (See Attachment C of this support document*)*. As stated above and quoted from the HRS documentation record at proposal, a rotosonic drilling method was used to collect samples to a depth of 40 feet below ground surface. Sections 2.1, 3.0, 3.1, and 3.3 of the *Superfund Technical Assessment and Response Team Standard Operating Procedure* state the following regarding decontamination of equipment used to retrieve the samples:

> 2.1 Introduction
>
> The objective of decontamination procedures is to provide clean equipment for the retrieval of representative environmental samples. **Decontamination procedures differ depending on the nature of the equipment used**. The three categories of decontamination procedures are discussed below:
>
> - **Intrusive equipment used to install sample points including drilling (tools, augers, rods, etc.) and excavation equipment (backhoes, excavators, etc.).**
> - Equipment used to measure the characteristics of the media to be sampled including water level, pH, specific conductivity, and temperature probes. This category also includes pumps to purge water.
> - **Equipment that has contact with the sample** to be submitted for laboratory analysis **including bailer, split-spoons, hand auger, stainless steel bowls and scoops**.

Because items from the first two categories do not contact the sample media that is sent to a laboratory for analysis, the decontamination procedures are less stringent. Dedicated and disposable equipment will be used whenever feasible to limit decontamination and the possibility of cross-contamination. This includes rope, tubing, filterware and, in some cases, soil scoops, pans, and bailers.

3.0 PROCEDURES

3.1 Intrusive Equipment

Drilling tools, including augers, rods, drill bits, hand tools, etc. will be steam cleaned prior to use and after each location. Split spoons will also be steam cleaned if not used for sample collection. Backhoe buckets and arms will also be steam cleaned prior to use and between each sample location…

3.3 Sampling Equipment

Equipment used for sample collection include but are not limited to:

- Teflon bailers
- Stainless steel scoops and bowls
- Hand augers
- Split spoons

This equipment will be cleaned using the following procedures:

- Liquinox®, or other appropriate non-phosphate cleaning solution and potable water scrub.
- Thorough potable water rinse.
- Deionized water rinse.
- Specialized decontamination fluid rinse, if necessary for the type of sampling and level of
- analyses.
- Deionized water rinse, if a specialized decontamination fluid rinse is used.
- Total air dry (only if sample is to be analyzed for organics). [emphasis added]

Instructions in the *Superfund Technical Assessment and Response Team Standard Operating Procedure, SOP 302 Surface Soil Sampling (Revised October 2019)* were also followed for the collection of the soil samples. These are standard protocols for Superfund site assessment work and are included as an attachment in the *Final Site Assessment Technical Support Sampling and Analysis Plan, Gelman Sciences, Inc.* (See Attachment C of this support document.) It states:

5.0 SAMPLING DEVICES

Four common sampling devices used by START personnel include the **sample scoop, the auger, the EnCore® sampler, and the thin-walled sampler/corer**. **The sample scoop includes both dedicated disposable plastic scoops and stainless steel scoops**. Augers include bucket augers and hand augers. EnCore® samplers (or equivalent) include a 5-gram or 25-gram Teflon sampling container and a "T" handle and is used for volatile organic compound analyses only. The thin-walled sampler/corer is the least used device of the three....

5.3 EnCore® (or Equivalent) Sampler...

NOTES:
1. The EnCore® Sampler is a Single Use device. It cannot be cleaned and/or reused.
2. The EnCore® Sampler is designed for soil only. Do not use the EnCore Sampler for solvent or free product.
3. The EnCore® Sampler must be used with EnCore® T-Handle and/or EnCore® Extrusion Tool exclusively. [emphasis added]

Pages 74 to 91 of the SI report, Reference 119 of the HRS documentation record at proposal, provide photographic records of soil boring samples collected and decontamination of the rotosonic drill. The field logbooks are also included on pages 119 to 157 of Reference 119 of the HRS documentation record at proposal. The sampling equipment and procedures followed were consistent with the SOPs pertinent to the Site Inspection. A rotosonic drill was used and the cores of the rotosonic drills were decontaminated prior to reuse. As shown in the photographs included in Reference 119 of the HRS documentation record at proposal, numerous drilling cores were brought on-site and decontamination of the cores occurred when cores needed to be reused (e.g., see pages 74, 75, 90, 91 of Reference 119 of the HRS documentation record at proposal). Samples from the cores were placed in disposable/dedicated plastic sleeves as shown in the photographic logs (e.g., see pages 74-76, 82-83, 89 of Reference 119 of the HRS documentation record at proposal). The portion of the sample collected from this sleeve was collected using additional dedicated equipment. For instance, the use of dedicated spoons to retrieve a portion of the sample ensures equipment is not reused and minimizes cross contamination. In some instances, the top few feet of a sample location was hand augured to clear the location as was the case with boring location G-SS06. However, as stated in the SI Report, surface soil samples were collected only at G-SS05 and G-SS07, and sampling did not use hand augers at either location. Even though they were not used directly for collection of soil samples, routine practice would include decontamination of the hand augers between locations.

Regarding the collection of samples from the most contaminated to least contaminated, it is not always feasible to field screen sample locations to determine concentration gradients prior to sampling events; hence, only after the samples are analyzed would the contaminant concentration gradients be determined based on the sample analytical results.

Nonetheless, the EPA has conceded Source 3 in scoring of the site at promulgation and has provided the *Final Site Assessment Technical Support Sampling and Analysis Plan, Gelman Sciences, Inc*. (June 2022) as Attachment C of this support document.

Impact of Source 3 on Pathway Hazardous Waste Quantity and Waste Characteristics

Although Source 3 has been removed from scoring in the HRS documentation record at promulgation, the same pathway hazardous waste quantity factor value and waste characteristics factor value assigned at proposal were also assigned at promulgation. HRS Table 2-6, quoted below, specifies a pathway hazardous waste quantity factor value of 10,000 when the sum of the source assigned hazardous waste quantity values is a value of greater than 10,000 and up to 1,000,000.

HRS Table 2-6 Hazardous Waste Quantity Factor Values

Hazardous waste quantity value	Assigned value
0	0
1[a] to 100	[b]1
Greater than 100 to 10,000	100
Greater than 10,000 to 1,000,000	10,000
Greater than 1,000,000	1,000.000

[a]If the hazardous waste quantity value is greater than 0, but less than 1, round it to 1 as specified in text.
[b]For the pathway, if hazardous constituent quantity is not adequately determined, assign a value as specified in the text; do not assign the value of 1.

For the calculation of the toxicity/mobility factor value in evaluating the waste characteristics component of the ground water migration pathway, HRS Section 3.2.1.3, *Calculation of toxicity/mobility factor value*, states the following:

> Assign each hazardous substance a toxicity/mobility factor value from table 3-9, based on the values assigned to the hazardous substance for the toxicity and mobility factors. **Use the hazardous substance with the highest toxicity/mobility factor value for the aquifer being evaluated to assign the value to the toxicity/mobility factor for that aquifer**. [emphasis added].

The HRS documentation record at promulgation has been revised to exclude Source 3 from scoring. The removal of Source 3 hazardous waste quantity and associated hazardous substance do not impact the pathway hazardous waste quantity or the toxicity/mobility component of the waste characteristics assigned as the same values are assigned at proposal and at promulgation. The HRS documentation record at promulgation states on page 54 at promulgation:

3.2 WASTE CHARACTERISTICS

3.2.1 Toxicity/Mobility

TABLE 21. TOXICITY/MOBILITY					
Hazardous Substance	**Source Number**	**Toxicity Factor Value**	**Mobility Factor Value**	**Toxicity/ Mobility**	**Reference(s)**
1,4-Dioxane	1, 2, OR	100	1	100	2, p. 3

OR = Observed Release

3.2.2 Hazardous Waste Quantity

Table 22. HAZARDOUS WASTE QUANTITY – GROUND WATER PATHWAY		
Source Number	**Source Hazardous Waste Quantity (HWQ) Value (Section 2.4.2.1.5)**	**Is source hazardous constituent quantity data complete? (yes/no)**
1	5,941.2	No
2	18,600	No
Sum of Values:	24,541.2	

The sum corresponds to a hazardous waste quantity factor value of 10,000 in Table 2-6 of the HRS [Ref. 1, Section 2.4.2.2]. Therefore, a hazardous waste quantity factor value of 10,000 is assigned for the ground water pathway.

Hazardous Waste Quantity Factor Value: 10,000

3.2.3 Waste Characteristics Factor Category Value

1,4-Dioxane corresponds to the toxicity/mobility factor value of 100, as shown previously (see **Section 3.2.1** of this HRS documentation record).

Toxicity/Mobility Factor Value (100) x Hazardous Waste Quantity Factor Value (10,000): 1×10^6

The product (1×10^6) corresponds to a Waste Characteristics Factor Category Value of 32 in Table 2-7 of the HRS [Ref. 1, Section 2.4.3.1].

==========

Waste Characteristics Factor Category Value: 32

While the hazardous waste quantity for Source 3 was evaluated in the HRS documentation record at proposal and assigned a source hazardous waste quantity value of 5,200 based on Tier B, hazardous wastestream quantity, this source wastestream quantity was not included in the HRS evaluation at promulgation. Also, because acetone was only associated with Source 3 at proposal, the association of acetone was not included in scoring the site at promulgation.

The EPA has revised the HRS documentation record at promulgation and removed Source 3 from scoring and instead lists it as a possible source at the site. However, removing Source 3 from scoring does not impact the Site score. The Source 1 and Source 2 assigned hazardous waste quantity values (5,941.2 + 18,600 = 24,541.2) are sufficient to support the ground water migration pathway hazardous waste quantity factor value of 10,000 assigned at proposal. That is, the sum of the Source 1 and Source 2 assigned hazardous waste quantity values would be 24,541.2 which is sufficient to assign a ground water pathway hazardous waste quantity of 10,000 using HRS Table 2-6; the same value assigned at proposal (see HRS Table 2-6 cited above). Additionally, the removal of Source 3 from scoring removed the association of acetone with the waste characteristics components of the site score; however, the removal of acetone has no impact on the waste characteristics assigned factor value because 1,4-dioxane achieved a greater toxicity/mobility factor value at proposal than acetone, and the toxicity/mobility component of the waste characteristics evaluation remains the same at promulgation. All other factors used in scoring also remain unchanged and the resulting site score remains unchanged. (See pages 1, 3, and 58 of the HRS documentation record at proposal and pages 1, 3, 35 and 54 of the HRS documentation record at promulgation.)

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.17.2 Soil Sample Results

Comment: Gelman commented that no new data were documented in the 2022 Site Inspection. It stated that 1,4-dioxane was not detected in any soil or sediment samples collected by the EPA in 2022. Gelman also stated that in 1996, the State concluded that it had addressed the "spray irrigation field" and approved a "no further action" determination.

Response: Sufficient source data and observed release to groundwater data were provided in the HRS documentation record at proposal to associate 1,4-dixane with sources and observed releases at the Site. Based on the limited soil sampling performed in 2022, 1,4-dioxane was not documented in the 2022 soil samples collected. However, 1,4-dioxane is associated with Sources 1 and 2 at the Site via historical sampling information and historical manufacturing processes. Sediment samples were not evaluated in the HRS scoring although the surface water pathway is a concern at the Site.

A summary of the hazardous substances associated with site scoring was shown on page 58 in section 3.2.1 of the HRS documentation record at proposal, which listed 1,4-dioxane as associated with Sources 1 and 2 and observed release at this Site:

3.2 WASTE CHARACTERISTICS

3.2.1 Toxicity/Mobility

TABLE 21. TOXICITY/MOBILITY					
Hazardous Substance	**Source Number**	**Toxicity Factor Value**	**Mobility Factor Value**	**Toxicity/ Mobility**	**Reference(s)**
Acetone[7]	3	1	1	1	2, p. 2
1,4-Dioxane	1, 2, OR	100	1	100	2, p. 3

OR = Observed Release

Information associating 1,4-dioxane with sources at the Site, specifically Source 1 (Historical Pond 3) and Source 2 (Former Ponds 1 and 2), were provided on pages 26 to 33 of the HRS documentation record at proposal, a fact not challenged by Gelman.

For Source 1 (Historical Pond 3), the HRS documentation record at proposal stated on page 27:

> **2.4.1 Hazardous Substances**
>
> As discussed above, analytical data cited by MDOH in 1981 indicated that a wastewater sample collected from Pond 3 in May 1981 showed the presence of 1,4-dioxane (0.09 mg/L), tetrahydrofuran (0.01 mg/L), and acetone (0.05 µg/L) [Ref. 93, pp. 1–3]. A sample from Pond 3 collected by Gelman in 1984 indicated the presence of 1,4-dioxane at a concentration of 21 mg/L [Ref. 59, pp. 3, 6]. The data for the historical samples discussed above are being considered for source documentation. These samples are waste samples; therefore, a comparison to background is not applicable.

For Source 2 (Former Ponds 1 and 2), the HRS documentation record at proposal stated on page 31:

> **2.4.1 Hazardous Substances**
>
> As discussed above, the process wastewater discharged to Ponds 1 and 2 and allowed to seep into the ground contained 1,4-dioxane beginning in 1968 [Ref. 94, pp. 2, 36]. In February 1986, Gelman reported that water covering the bottom of Pond 2 ("the old unlined lagoon") below the water table showed 1,4-dioxane levels of about 5 ppm [Ref. 94, pp. 2, 23, 34–36]. In May 1986, EPA and Gelman collected and split sludge samples from Pond 2 ("the unlined lagoon"), and concentrations of 1,4-dioxane in the Pond 2 sludge were 390 ppb (sample number: L3S, depth: 3 to 10 inches bss) and 270 ppb (sample number: L1D, depth: 18 inches bss) [Refs. 45, pp. 7, 26–27; 94, pp. 24, 26–27]. In 1988, MDEQ conducted soil boring and sampling activities in facility source areas; 1,4-Dioxane was detected at depths up to 16 feet bgs and at concentrations up to 7,500 µg/kg in the backfilled Former Pond 1, and at depths up to 1.5 feet below the pond sediment surface and at concentrations up to 2,300 µg/kg in Former Pond 2, which was approximately 15 feet deep (Pond 2 was no longer in use at the time, but it had not yet been backfilled at the time of sampling) [Refs. 6, p. 13; 32, pp. 5, 7, 14, 15; 43, p. 41].
>
> During the 1988 MDEQ investigation, soil boring DNR 88-8 was completed in the center of Former Pond 1 and showed 1,4-dioxane concentrations of 34 µg/kg (sample ID: DNR 88-8A, depth: 9.5-11 ft bgs) and 7,500 µg/kg (sample ID: DNR 88-8B, depth: 14.5-16 ft bgs), and soil boring DNR 88-9 was completed within the boundary of Former Pond 1 and about 25 feet east of DNR 88-8, and showed 1,4-dioxane concentrations of 26 µg/kg (sample ID: DNR 88-9A, depth: 9-10.5 ft bgs), 520 µg/kg (sample ID: DNR 88-9B, depth: 11-12 ft bgs), and 5,300 µg/kg (sample ID: DNR 88-9C, depth: 14-15.5 ft bgs) [Ref. 32, pp. 5, 14]. Soil boring DNR 88-12 was a hand boring in Pond

[7] The EPA has conceded Source 3 in scoring the Site at promulgation. Hence, the waste characteristics associated with Source 3, which includes Source 3 hazardous waste quantity and hazardous substance (i.e., acetone), were removed from scoring the Site at promulgation. The HRS documentation record was revised at promulgation to reflect these changes. See section 3.17.1, Sample Collection Techniques, of this support document for additional discussion.

> 2 about 2 or 3 feet from the water and showed 1,4-dioxane concentrations of 2,300 µg/kg (sample ID: DNR 88-12A, depth: 0.5-1 ft bgs) and 1,500 µg/kg (sample ID: DNR 88-12B, depth: 1-1.5 ft bgs) [Ref. 32, pp. 7, 15].

Further, the attribution section on pages 55 to 57 of the HRS documentation record at proposal discussed the significant increase in 1,4-dioxane documented in groundwater attributable to Gelman and provided sufficient documentation to associate 1,4-dioxane with the Site. It states in relevant part:

> Between 1966 and May 1986, 1,4-dioxane was used for cellulose triacetate filter production and cleaning process lines [Ref. 28, p. 1]….
>
> …
> A 1984 process wastewater effluent sample contained 1,4-dioxane at a concentration of 1,600 parts per million (ppm) [Ref. 59, p. 3]….
>
> …
>
> Wastewater containing 1,4-dioxane was disposed of in Sources 1 (Pond 3) and 2 (Ponds 1 and 2) [Refs. 6, pp. 6, 7; 20, pp. 1, 6; 30, p. 1; 59, pp. 3, 9; 93, pp. 1–3; 94, pp. 2, 36]. The liner for Source 1 was incomplete or damaged during portions of its operating period; Source 2 was unlined and designed to allow wastewater to seep into the ground, and the ponds were periodically dredged to promote this percolation [Refs. 6, p. 6, 7; 19, p. 1; 67, p. 2; 94, pp. 2, 36; **see Section 2.2** for Sources 1 and 2 of this HRS documentation record]. Unauthorized discharge of process water from site surface impoundments HRS Documentation Record 57 Gelman Sciences Inc MID005341813 to adjacent wetlands was documented by MWRC [Ref. 61, p. 1]. This discharge was noted as being in violation of an existing Order of Determination against Gelman forbidding discharge to waters of the state [Ref. 61, p. 1]. In October1996, it was noted that effluent from the Evergreen Treatment System containing 1,4-dioxane at 4 and 2 parts per billion had been injected into the aquifer on August 9 and 12, 1996, in violation of the groundwater exemption permit [Ref. 71, p. 1].
>
> In 2022 and 2023, EPA collected groundwater samples from study area monitoring wells as part of the SI and supplemental sampling performed in the vicinity of Gelman. Validated analytical data for groundwater samples collected in 2022 and 2023 document an observed release of 1,4-dioxane to the glacial aquifer system [see **Tables 11-14** of this HRS documentation record]. The 2023 sampling also shows observed release concentrations of 1,4-dioxane in four residential wells along Elizabeth Avenue and the Montgomery Well [see **Tables 15–18** of this HRS documentation record]. Additionally, 2023 sampling collected by EGLE and Washtenaw County shows observed release concentration of 1,4-dioxane in 27 residential wells [see **Tables 19 and 20** of this HRS documentation record].

Hence, even if the 2022 SI sampling did not document 1,4-dioxane in soils at Source 3 at the Site, 1,4-dioxane is associated with sources at the Site based on historical source information and current observed releases to groundwater at the Site as recent as 2022 and 2023.

These comments result in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.18 Aquifer Delineation

Comment: Gelman commented that the EPA used an inappropriate well for the background well in the HRS evaluation for the Montgomery Well and implied that the aquifers units between these wells were not one hydrologic unit. Gelman commented that the City's Steere Farm Well, used as a background well, is not screened (or completed) in the same aquifer as the Montgomery Well. Gelman commented that the two wells are four miles apart from each other, are located "in different geological settings," and are in different sub-basins of the Huron

River. Gelman commented that these aquifer differences render the background sample and the HRS evaluation erroneous.

Response: The hydrogeological conditions at the Site were appropriately evaluated in the HRS documentation record at proposal, and the aquifers underlying the Site were properly determined to be one interconnected hydrological unit for HRS purposes. Aquifer interconnections were appropriately evaluated at the Site; well logs show clay lenses to be discontinuous within 2 miles of the sources, and contaminant migration from the surface down to at least Unit E (the deepest aquifer being evaluated) was documented in the HRS documentation record at proposal. Aquifer discontinuities were also appropriately evaluated at the Site and no HRS-qualifying aquifer discontinuities, or physical barriers to groundwater flow, within the glacial aquifer system being evaluated were identified at the Site. Therefore, the aquifers underlying the Site were properly determined to be one interconnected hydrological unit for HRS purposes.

The HRS provides the general considerations to include when evaluating the ground water migration pathway. HRS Section 3.0.1.1, *Ground water target distance limit*, first directs that a target distance limit (TDL) be defined. It states:

> The target distance limit defines the maximum distance from the sources at the site over which targets are evaluated. Use a target distance limit of 4 miles for the ground water migration pathway, except when aquifer discontinuities apply (see section 3.0.1.2.2). Furthermore, consider any well with an observed release from a source at the site (see section 3.1.1) to lie within the target distance limit of the site, regardless of the well's distance from the sources at the site.

HRS Section 3.0.1.2, *Aquifer boundaries*, directs to "[c]ombine multiple aquifers into a single hydrologic unit for scoring purposes if aquifer interconnections can be established for these aquifers. In contrast, restrict aquifer boundaries if aquifer discontinuities can be established."

HRS Section 3.0.1.2.1, *Aquifer interconnections*, directs how aquifers should be evaluated for interconnections. It states:

> Evaluate whether aquifer interconnections occur within 2 miles of the sources at the site. If they occur within this 2-mile distance, combine the aquifers having interconnections in scoring the site. In addition, if observed ground water contamination attributable to the sources at the site extends beyond 2 miles from the sources, use any locations within the limits of this observed ground water contamination in evaluating aquifer interconnections. If data are not adequate to establish aquifer interconnections, evaluate the aquifers as separate aquifers.

HRS Section 3.0.1.2.2, *Aquifer discontinuities*, directs how to evaluate potential discontinuities at the Site being evaluated. It states:

> Evaluate whether aquifer discontinuities occur within the 4-mile target distance limit. An aquifer discontinuity occurs for scoring purposes only when a geologic, topographic, or other structure or feature entirely transects an aquifer within the 4-mile target distance limit, thereby creating a continuous boundary to ground water flow within this limit. If two or more aquifers can be combined into a single hydrologic unit for scoring purposes, an aquifer discontinuity occurs only when the structure or feature entirely transects the boundaries of this single hydrologic unit.
>
> When an aquifer discontinuity is established within the 4-mile target distance limit, exclude that portion of the aquifer beyond the discontinuity in evaluating the ground water migration pathway. However, if hazardous substances have migrated across an apparent discontinuity within the 4-mile target distance limit, do not consider this to be a discontinuity in scoring the site.

In addition to these directions, the preamble to the 1990 HRS in the Federal Register[8] provides the following examples of information that can be used to identify aquifer interconnections for the purposes of scoring a site; page 51553 states:

> In practice, EPA has found that studies in the field to determine whether aquifers are interconnected in the vicinity of a site will generally require resources more consistent with remedial investigations than SIs, especially where installation of deep wells is necessary to conduct aquifer testing. Thus, EPA has in the past relied largely on existing information to make such determinations and the Agency finds it necessary to continue that approach. Examples of the types of information useful in identifying aquifer interconnections were given in the proposed rule. This information includes literature or well logs indicating that no lower relative hydraulic conductivity layer or confining layer separates the aquifers being assessed (e.g., presence of a layer with a hydraulic conductivity lower by two or more orders of magnitude); **literature or well logs indicating that a lower relative hydraulic conductivity layer or confining layer separating the aquifers is not continuous through the two-mile radius (i.e., hydrogeologic interconnections between the aquifers are identified)**; evidence that withdrawals of water from one aquifer (e.g., pumping tests, aquifer tests, well tests) affect water levels in another aquifer; **and observed migration of any constituents from one aquifer to another within two miles. For this last type of information, the mechanism of vertical migration does not have to be defined, and the constituents do not have to be attributable to the site being evaluated.** Other mechanisms that can cause interconnection (e.g., boreholes, mining activities, faults, etc.) will also be considered. [emphasis added]

Pages 40 to 43 of the HRS documentation record at proposal provided the general description of the ground water migration pathway and the regional geological setting, and they outlined the Site-specific interconnected geological units. It states on page 40:

> Regional Geology/Aquifer Description:
>
> Washtenaw County is underlain by glacial deposits (lakebeds, outwash, deltas, and moraines) that range in total thickness from about 50 feet to about 450 feet [Ref. 125, pp. 2, 4]. Moraines (clay, silt, sand, and gravel mixtures) and outwash (principally sand and gravel) predominate in most of the county, including Ann Arbor and Scio Township [Refs. 84, p. 6; 125, p. 4; 126, p. 21]. Within the 4-mile target distance limit (TDL) for the Gelman site, **the glacial deposits range in total thickness from approximately 175 feet (Montgomery Well) to more than 300 feet** (wells MW-76D, S36-01, and EMU-1, **all located 1.5 to 2 miles from the site**), and consist of **discontinuous layers and lenses of gravel, sand, silty or clayey sand, silt, and clay** [**Figure 5** of this HRS documentation record; Refs. 84, pp. 8–12; 127, pp. 24, 44]. Underlying the glacial deposits are sedimentary rocks (i.e., shale and sandstone) of Mississippian and Devonian age [Refs. 84, pp. 8–11; 125, p. 2, 4]....
>
> Site Geology/Aquifer Description:
>
> Site-specific investigations and characterization confirm that **the aquifer of concern for the Gelman site comprises the glacial deposits**. Beginning in 1986, Keck Consulting Services, Inc. was retained to conduct an in-depth, multi-phase hydrogeologic investigation on and in the vicinity of the Gelman facility [Ref. 45, pp. 5, 6]. The findings of the initial 1986 Interim Report were refined, updated, and reported in 1987 Phase II and 1988 Phase III reports of the investigation [Refs. 43, pp. 1, 5, 6; 44, pp. 2, 7]. The glacial sequence underlying the study area was characterized using several methods of investigation, including installation of monitoring wells and hydrogeologic test holes; water level data acquisition; natural gamma logging; water sampling;

[8] 55 FR 51553. Accessed at https://semspub.epa.gov/src/document/HQ/174028.pdf

slug/aquifer performance tests; and in-situ permeability testing [Refs. 43, pp. 6–10, 40–138; 44, pp. 6, 8, 9, 61, 64–71, 75–248;45, pp. 6–8].

As shown below in the descriptions of the various strata, a **series of glacial depositional units (Units B, C, D, and E) have been identified** at and in the vicinity of the Gelman facility. A separate Unit A overlying Unit B was identified during the 1986 interim hydrogeologic investigation; however, based on additional data obtained during the Phase II investigation, the unit was eliminated as a stratigraphic unit and combined with other units [Refs. 43, pp. 36, 138; 44, p. 61]. Units C and D were further divided into subunits, including C_1, C_2, C_3, D_0, D_1, D_2, and D_3 [Ref. 44, p. 61]. Based on the findings of Phase II and Phase III, Unit C_1, C_3, Unit D_0, Unit D_2, and Unit E were considered aquifer units, while Units B, C_2, D_1, and D_3 were evaluated as aquitards (i.e., leaky confining beds) [Refs. 43, pp. 15–17, 20, 22, 23, 138; 44, pp. 12, 15, 19, 20, 21, 22, 25, 26, 42]. I**nterconnection between all glacial deposits has been established based on the potential downward migration of groundwater though the various units characterized as aquitards and the presence of 1,4-dioxane throughout the glacial sequence; therefore, all depositional units identified as aquifers are evaluated as one hydrologic unit (i.e., the glacial aquifer system) for HRS scoring purposes** [Ref. 43, pp. 16, 20, 23]. [emphasis added]

Following the regional and site-specific descriptions of the geological strata underlying the Site, the HRS documentation record at proposal discussed specific aquifer interconnections at the Site between the aquifer strata. It states on pages 42 and 43:

Aquifer Interconnection

The hydrogeologic investigation conducted on behalf of Gelman documents interconnection throughout the glacial sequence at and in the vicinity of the site based on geophysical and chemical analytical data [Refs. 43, pp, 26-28, 37; 45, pp. 17-18]. Hydraulic head elevations observed during the initial phase of the investigation indicated that hydraulic head elevation in Unit C was greater than that for Unit E, demonstrating the potential for groundwater flow under natural conditions from Unit C to Unit E [Ref. 45, pp. 14, 15]. Groundwater head elevation data observed in study area monitoring wells during Phase II indicates all intervening units characterized as aquitards (also referred to as aquicludes in Phase III) (i.e., Units B, C_2, D_1, and D_3) between the water-bearing units allow downward movement of groundwater in addition to the horizontal components, including downward migration from Units C_1 to C_3 through Unit C_2, through Unit D_1 to Unit D_2, and through Unit D_3 to Unit E; Unit D_0 also allows hydraulic communication between Unit C_3 and Unit D_2 [Ref. 43, pp. 16–20, 22, 23, 95–101; 44, pp. 19, 20, 23–26, 61, 65, 67, 70]. **Available well logs and geologic cross-sections show that the clay layers are discontinuous within 2 miles of site sources** [Refs. 44, pp. 10–26, 65, 67, 70; 84, pp. 8–10].

During Phase III, monitoring wells and test borings were evaluated to further understand the hydraulic characteristics and interactions of the units [Ref. 44, p. 20]. The data indicated that although Units C_1 and B_2 appear to be separated by the Unit B_3 aquitard, hydraulic head elevation values of the two units are comparable [Ref. 44, p. 20]. Based on these findings, Keck reported that hydraulic communication between the units may be occurring [Ref. 44, p. 20]. Due to the sandy nature of the lower intermediate and lower members of Unit C_2 at some locations, Unit C_1 may be hydraulically communicating with Unit C_3 [Ref. 44, p. 20]. Drilling data indicated this may occur in the northern portion of the Gelman property including the bog and pond (i.e., source) areas [Ref. 44, p. 21]. Aquifer Unit D_0 allows hydraulic communication between Unit C_3 and other aquifer units [Ref. 44, p. 23]. Because the potentiometric surface of Unit C_3 and Unit D_2 are similar in this area, communication between these two units exists [Ref. 44, pp. 23, 24]. Pump tests conducted during the Phase III indicate Unit D_2 and D_3 are in communication [Ref. 44, pp. 32-42].

> **Keck noted that previous sampling of study area monitoring wells by various agencies have detected 1,4-dioxane in all water-bearing units extending from Unit C_1 to Unit E [Ref. 43, pp. 26–28]. Contamination extending all the way down to Unit E is also documented in the Consent Judgement. Further, recent groundwater monitoring data collected by Gelman within 2-miles of the sources also document 1,4-dioxane in Unit E** [Refs. 78, pp. 3-4; 84, pp. 8, 9; 107, pp. 5, 6; 123, pp. 4-6]. **Based on the geophysical and chemical data presented above, aquifer interconnection occurs within 2 miles of sources at the site, and the entire glacial sequence is evaluated as a single hydrologic unit for HRS scoring purposes (i.e., the glacial aquifer system)** [Refs. 1, Section 3.0.1.2.1; 43, p. 157; 44, p. 65, 67, 68, 70, 71; **Figure 5** of the HRS documentation record].
>
> Aquifer Discontinuities
>
> No aquifer discontinuities or physical barriers to groundwater flow within the glacial aquifer system between site sources and target wells were identified in the hydrogeologic study or in other available well logs and geologic cross-sections, which confirm an absence of continuous confining layers between the water-bearing glacial units within the 4-mile TDL [Refs. 44, pp. 10–26, 65, 67, 70; 84, pp. 8–10]. The Huron River is located between 2 to 3 miles north-northeast of site sources; however, the vertical extent of the glacial aquifer system exceeds 200 feet, and the Huron River is not an aquifer discontinuity because it does not completely transect the aquifer of concern within the 4-mile TDL [Refs. 1, Section 3.0.1.2.2; 43, p. 40; 84, pp. 8–11]. In addition, both site sources and target wells lie to the south-southwest of Huron River; therefore, even if the Huron River formed an aquifer discontinuity, it would not disrupt the flow of groundwater and hazardous substances from sources to target wells [see **Figures 3 and 4** of this HRS documentation record]. [emphasis added]

Geologic cross sections on pages 9 to 11 of Reference 84 show well data for the wells used to depict the extent of the glacial drift aquifer; these wells are screened at varying depths and elevations in poorly sorted sand (SP), well graded sands (SW), poorly sorted gravel (GP), and silty sand (SM) in this aquifer. Specifically, regarding Montgomery Well and Steere Farm Well, they are both screened in poorly sorted sand (SP) at similar elevations (720-735 feet above mean sea level for the Steere Farm Well and 685-725 above mean sea level for the Montgomery Well (Reference 84, pages 8 and 11)). Page 44 of the HRS documentation record at proposal, in comparing the Montgomery Well with the Steere Farm Well, stated the following: "The Steere Farm Well is evaluated as representing background conditions as both are screened at similar elevations within poorly sorted sand [Ref. 84, p. 11]."

The HRS documentation record at proposal sufficiently documented that the geological units beneath the Site are interconnected for HRS purposes via both the absence of a continuous confining unit and by documentation of site-related contamination that has migrated into the deepest interconnected geological unit (Unit E). The HRS documentation record at proposal also sufficiently documented that aquifer discontinuities were investigated and found that no HRS-qualifying discontinuities are present at the Site. The EPA notes that Gelman does not challenge that aquifer interconnections are present or that glacial aquifer units B through E are interconnected for HRS purposes as one hydraulic unit.

However, regarding Gelman's assertion that the Montgomery Well and the Steere Farm Well are in different geological settings and in different sub-basins of the Huron River, the wells are located in the same geological setting, and the sub-basins of the Huron River being referred to by Gelman do not act as an HRS-qualifying aquifer discontinuity and do not impact the subsurface evaluation. Gelman does not state how being located in two sub-basins would impact the aquifer evaluation completed at this Site. If a sub-basin were a geologic, topographic, or other structure or feature that entirely transected the aquifer being evaluated at this Site, then the sub-basin would qualify as an HRS discontinuity impacting the aquifer evaluation. However, sub-basins refer to topographical (surficial) divides that impact the direction of surface water flow; at this Site these features do not qualify as HRS discontinuities and do not impact the aquifer evaluation. Further, according to the Huron River

Watershed Council,[9] these sub-basins are also referred to as "creeksheds" and there are at least seven creeksheds present within the TDL; none of the other creeksheds at the Site qualify as HRS discontinuities and none of the other creeksheds are challenged by Gelman on a similar standard of acting as a discontinuity or not containing representative conditions to a neighboring creekshed. In addition, the wellhead protection area for the Steere Farm Well extends across sub-basin boundaries. As shown in Figure 4 of the HRS documentation record at proposal, the wellhead protection area extends into the TDL and to within about 1.6 miles of both the Gelman facility and the Montgomery Well. As shown on pages 1 and 2 of Reference 120 and page 1 of Reference 121 of the HRS documentation record at proposal, the federal Safe Drinking Water Act defines wellhead protection area as "... the surface and subsurface area surrounding a water well or well field, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or well field." Michigan's established wellhead protection program summarized the wellhead protection area definition as "… that area which contributes ground water to a PWSS [public water supply system] well" and required a hydrogeological study to identify this contributing area. Therefore, the Huron River sub-basins in the vicinity of the Site do not constitute an HRS discontinuity, do not indicate any difference in the geological setting, and do not impact the aquifer evaluation at the Site.

Regarding Gelman's assertion that the Montgomery Well and the Steere Farm Well are not screened in the same aquifer, these two wells are both screened in the combined glacial aquifer (i.e., hydrologic unit) evaluated under the HRS. As quoted above, the combined glacial aquifer is documented, for HRS purposes, to be interconnected from the surface (Unit B) to the deepest unit of the glacial aquifer (Unit E). Also as quoted above in the HRS documentation record at proposal, beneath the combined glacial aquifer are sedimentary rocks of shale and/or sandstone. As confirmed by the well borehole data for each well and the geological cross-sections, pages 8, 11, and 12 of Reference 84 of the HRS documentation record at proposal show that the Montgomery Well and the Steere Farm Well are both located and screened in the same combined glacial aquifer hydrologic unit (and at similar depths above mean sea level), and neither of these wells are screened in the sedimentary rocks beneath the glacial aquifer.

Regarding Gelman's assertion that the Montgomery Well and the Steere Farm Well are 4 miles apart and not in the same hydrologic unit, these wells are indeed approximately 4 miles apart, but they are located in the same hydrologic unit and there is no discontinuity between these wells that would prevent groundwater flow. As discussed above, sub-basins (or creeksheds) do not constitute HRS discontinuities in the subsurface, and both wells are located and screened in the same combined aquifer (i.e., hydrologic unit). While the Montgomery Well and the Steere Farm Well are located approximately 4 miles apart, pages 11 and 12 of Reference 84 of the HRS documentation record at proposal confirm that the Montgomery Well and the Steere Farm Well are both located/screened in the same hydrologic unit and that there is no apparent HRS discontinuity that would exclude this portion of the aquifer. Thus, the Montgomery Well and the Steere Farm Well are located in the same combined hydrologic unit. In addition and as discussed above, the established area which contributes groundwater to the Steere Farm Well (i.e., the wellhead protection area) extends into the TDL and to within 1.6 miles of both the Gelman facility and the Montgomery Well.

Regarding comments relating to the Steere Farm Well being an appropriate background sample for the Montgomery Well, see section 3.19.2, Background Samples, below in this support document.

These comments result in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.19 Observed Release

Comment: Gelman commented that the HRS documentation record at proposal incorrectly determined background conditions and did not properly attribute contamination in the residential wells to the releases at the Gelman site; Gelman asserted both errors result in an inappropriate determination that an observed release has occurred at the Site at either the Montgomery Well or at the scored residential wells. Gelman also commented that

[9] Accessed at https://www.hrwc.org/our-watershed

the EPA relied on historical "unauthorized" releases of wastewater contaminated with 1,4-dioxane, and the groundwater contamination is consistent with the historical data.

Response: The observed release by chemical analysis was established consistent with the HRS for the interconnected aquifer at the Site including at the Montgomery Well and at the scored residential wells.

In establishing an observed release for the ground water migration pathway, HRS Section 3.1.1, *Observed release,* provides:

> Establish an observed release to an aquifer by demonstrating that the site has released a hazardous substance to the aquifer. Base this demonstration on either:
>
> • Direct observation—a material that contains one or more hazardous substances has been deposited into or has been observed entering the aquifer.
>
> • Chemical analysis—an analysis of ground water samples from the aquifer indicates that the concentration of hazardous substance(s) has increased significantly above the background concentration for the site (see section 2.3). Some portion of the significant increase must be attributable to the site to establish the observed release, except: when the source itself consists of a ground water plume with no identified source, no separate attribution is required.

HRS Section 3.1.1 quoted above refers to HRS Section 2.3, *Likelihood of release,* which directs:

> Establish an observed release either by direct observation of the release of a hazardous substance into the media being evaluated (for example, surface water) or by chemical analysis of samples appropriate to the pathway being evaluated (see sections 3, 4, and 6). The minimum standard to establish an observed release by chemical analysis is analytical evidence of a hazardous substance in the media significantly above the background level. Further, some portion of the release must be attributable to the site. Use the criteria in Table 2–3 as the standard for determining analytical significance.

The observed release criteria are explained in HRS Section 2.3, *Likelihood of release*, and HRS Table 2-3. HRS Table 2-3 explains:

TABLE 2-3–OBSERVED RELEASE CRITERIA FOR CHEMICAL ANALYSIS

Sample Measurement < Sample Quantitation Limit[a] No observed release is established. **Sample Measurement ≥ Sample Quantitation Limit[a]** An observed release is established as follows: • If the background concentration is not detected (or is less than the detection limit), an observed release is established when the sample measurement equals or exceeds the sample quantitation limit.[a] • If the background concentration equals or exceeds the detection limit, an observed release is established when the sample measurement is 3 times or more above the background concentration.
[a]If the sample quantitation limit (SQL) cannot be established, determine if there is an observed release as follows: - If the sample analysis was performed under the EPA Contract Laboratory Program, use the EPA contract-required quantitation limit (CRQL) in place of the SQL. - If the sample analysis is not performed under the EPA Contract Laboratory Program, use the detection limit (DL) in place of the SQL.

Not contended in this listing is the observed release *by direct observation* to the interconnected glacial aquifer system. Page 44 of the HRS documentation record at proposal first identified an observed release by direct observation:

> **Direct Observation**
>
> Former Ponds 1 and 2 were unlined surface impoundments designed to allow wastewater to seep into the ground, and the ponds were periodically dredged to promote this percolation [Refs. 6, pp. 6, 27; 94, pp. 2, 36]. In 1986, Gelman identified the former unlined ponds as a possible source of groundwater contamination [Ref. 94, pp. 34–36]. According to Gelman's reporting in 1987, Pond 2 was excavated through stratigraphic Units B and C_1 and the bottom of the ponds coincided with the top of Unit C_2 [Ref. 43, p. 41]. In February 1986, Gelman reported that water below the water table and covering the bottom of Pond 2 ("the old unlined lagoon") showed 1,4-dioxane levels of about 5 ppm [Ref. 94, pp. 2, 23, 34–36], indicating that contamination from Source 2 was in direct contact with the glacial aquifer system. Although not known to be used as a supply unit in the study area, Unit C_1 is characterized as a water- producing zone composed primarily of sandy deposits. The entire glacial sequence, which includes Unit C_1, is evaluated as a single hydrologic unit (i.e., the glacial aquifer system) for HRS scoring purposes [Refs. 43, p. 15; 44, p. 19].

This unchallenged release of contaminated water containing a hazardous substance (1,4-dioxane) observed to have been released directly into the aquifer is sufficient to establish an observed release by direct observation at the Site. However, in addition to the observed release by direct observation, multiple observed releases by chemical analysis were also properly documented in a public supply well (i.e., Montgomery Well), in monitoring wells located on and around the facility property (additionally not challenged by Gelman), and in residential wells; each well individually qualifies and establishes an observed release by chemical analysis at the Site. To document this for each well being scored with an observed release by chemical analysis, the HRS documentation record at proposal presented information to show a hazardous substance release concentration to be significantly above a respectively appropriate background concentration (i.e., each observed release well was compared to a background well with similar construction, similar depth, similar use, etc.) and to contain contamination that is attributable, at least in part, to releases at the Gelman Site.

Public Supply Well

Page 44 of the HRS documentation record at proposal presented information to document the observed release by chemical analysis of a hazardous substance significantly above background concentrations for the Montgomery Well. It stated in relevant part:

> 2001 Montogomery Well Sampling
> On March 7, 2001, a sample collected from the Montgomery Well indicated a concentration of 1,4-dioxane of 2 µg/L [Ref. 86, p. 3]. On April 2, 2001, the City of Ann Arbor announced that use of the Montgomery Well was discontinued pending further investigation [Ref. 86, pp. 1–3]. Subsequent samples collected from the Montgomery Well in April 2001 and December 2001 indicated concentrations of 1,4-dioxane at a concentration of 2 µg/L [Ref. 86, p. 3]. Results for the March sampling of the background well (i.e., Steere Farm Well # 25W) indicated no detectable concentration of 1,4-dioxane above the 1 µg/L detection limit [Ref. 86, p. 3]. The Steere Farm Well is evaluated as representing background conditions as both wells are screened at similar elevations within poorly sorted sand [Ref. 84, p. 11].

Monitoring Wells

Pages 44 to 50 of the HRS documentation record at proposal presented information to document the observed release by chemical analysis of a hazardous substance significantly above background concentrations for the monitoring wells at the Gelman site. In relevant parts, it stated:

> EPA 2022 SI Sampling
>
> Sampling and analysis by EPA in 2022 document an observed release of 1,4-dioxane to the aquifer of concern (i.e., glacial aquifer system), specifically 1,4-dioxane at observed release concentrations in eight study area monitoring wells [see **Figure 3**; **Tables 7–10** of this HRS documentation record]. Groundwater samples used to evaluate background conditions were collected from Monitoring Wells MW-127s and MW-28, which are screened in Unit C_3 aquifer; and MW-120d, which is screened in Unit E aquifer [see **Table 7** of this HRS documentation record]. MW-127s and MW-28 lie west-southwest of the mapped 2020 contaminant boundary, and MW-120d is located north of the mapped contaminant boundary [see **Figure 3** of this HRS documentation record]. Samples intended to be evaluated as background were also collected from Unit D_2 (MW-120s and MW-124s), as well as a second background sample from Unit E (MW-124d); however, the 1,4-dioxane results were rejected during data validation due to exceedances of sample technical holding times (non-detects were qualified as unusable) [Ref. 47, pp. 1–12, 22, 25, 28]. Although background samples were not evaluated from every water-bearing unit, as described above the entire glacial sequence is evaluated as one hydrologic unit for HRS scoring purposes [see **Section 3.0.1** of this HRS documentation record].
>
> Analysis of background groundwater sample G-GWBK-MW-127s showed an estimated concentration (1 J- µg/L) of 1,4-dioxane below the sample-specific reporting limit (2.0 µg/L) [see **Table 8** of this HRS documentation record]. Monitoring well MW-127s was designated as a background well; however, there is a westward component to groundwater flow in the C_3 aquifer, and 1,4-dioxane may now be encroaching on the well [Ref. 44, pp. 23, 23, 67]. There are no other known sources of 1,4-dioxane in the area [Refs. 9, pp. 2-672; 15, pp. 1-42; 88, p. 2]. The 1 J- µg/L (10 µg/L adjusted) 1,4-dioxane detection is designated as the background level for observed release comparison [see **Table 8** of this HRS documentation record].
>
> As shown in **Tables 9 and 10** below, observed release concentrations of 1,4-dioxane were detected in groundwater samples from eight monitoring wells screened in the C_3 (shallow), D_2 (middle), and E (deep) aquifer units at concentrations ranging from 53 to 1,100 J- µg/L; the maximum concentration was detected in duplicate samples collected from the MW-100, which is screened in Unit E. The background and release samples were all collected during the same sampling event, using the same methodologies as outlined in the EPA Region 5 sampling SOP [Refs. 7, pp. 5, 10, 12, 13, 22–27; 17, pp. 3–5, 11–13, 19, 22, 32]. The samples were all collected from monitoring wells screened within the glacial aquifer system [see **Tables 7 and 9** of this HRS documentation record]. In addition, most of the background and release monitoring wells are screened at similar elevations within their respective aquifer units and screened in predominantly sand and gravel deposits [see **Tables 7 and 9** of this HRS documentation record]. The groundwater samples were all analyzed for TAL SVOCs by CLP laboratories under CLP SOW SFAM01.1 and the results validated according to EPA Region 5 data validation guidelines [**Tables 8 and 10**; Refs. 47, p. 3; 48, p. 1; 49, p. 2; 50, p. 1, 51, p. 3; 52, p. 2; 55, p. 2]. Although release samples were not collected from Unit D_0, as described above the entire glacial aquifer system is evaluated as one hydrologic unit for HRS scoring purposes [see **Section 3.0.1** of this HRS documentation record].
>
> The hazardous substance 1,4-dioxane is man-made and attributable to historical facility operations [Refs. 28, pp. 1, 2; 57, p. 1]. Gelman utilized 1,4-dioxane from 1966 to 1986 as a solvent for cellulose triacetate filters and cleaning process lines [Ref. 28, p. 1].

Background Monitoring Well Samples

On September 26 and 27, and October 4, 2022, EPA collected groundwater samples G-GWBK-MW-127s, G-GWBK-MW-28, and G-GWBK-MW-120d from Gelman study area monitoring wells. Analysis reported a maximum 1,4-dioxane background concentration of 1 J- µ/L. The adjusted result (10 µg/L) is compared to the 1,4-dioxane results reported for release monitoring wells [see **Tables 8 and 10** of this HRS documentation record].

…

TABLE 8. BACKGROUND SAMPLE RESULTS

Field Sample ID	CLP Sample ID	Laboratory Sample ID	Hazardous Substance	Result (µg/L)	Sample Adjusted CRQL (µg/L)	Reference(s)
G-GWBK-MW-127s	EYB60	22J0010-01	1,4-Dioxane	**1 J- (10)**	2.0	47, pp. 1–13, 81; 48, pp. 2, 75
G-GWBK-MW-28	EYB77	200-65201-5	1,4-Dioxane	1.9 U	1.9	51, pp. 1–14, 34, 99; 52, pp. 10, 99
G-GWBK-MW-120d	EYB62	0003237-01	1,4-Dioxane	2.0 U	2.0	49, pp. 1–7, 8, 30; 50, pp. 3, 13

µg/L = micrograms per liter.
J- = The result is an estimated quantity due to the analyte result being greater than or equal to the detection limit (MDL) and below the quantitation limit (CRQL) [Ref. 47, pp. 8, 12]. The result may be biased low due to sample extraction being performed outside the extraction holding time, or the extract is analyzed outside the analysis technical holding time [Ref. 47, pp. 4, 12].
U = The analyte was analyzed for but was not detected above the reported sample quantitation limit [Ref. 49, p. 7; 51, p. 14].
The Sample Adjusted CRQL for each CLP result is the CRQL adjusted for sample and method [Ref. 18, pp. 2, 131, 188, 333, 366; 47, p. 81; 49, p. 30; 51, p. 99]. Since the samples were analyzed through the CLP, the adjusted CRQLs presented above are HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3].
Result in parentheses is adjusted based on EPA's Fact Sheet, *Using Qualified Data to Document and Observed Release and Observed Contamination* (November 2022). [Ref. 101, pp. 3, 5, 8, 9].
Bold = evaluated as maximum background concentration.

Contaminated Monitoring Well Samples

From September 27 through 29, and October 2 through 4, 2022, EPA collected 11 groundwater samples (including three environmental duplicate samples) from eight release monitoring wells. Analysis reported 1,4-dioxane concentrations ranging from 53 to 1,100 J- µg/L. These results are compared to the maximum adjusted background 1,4-dioxane result reported for G-GWBK-MW-127s (10 µg/L) [see **Tables 8, 9 and 10** of this HRS documentation record].

…

TABLE 10. RELEASE SAMPLE RESULTS						
Field Sample ID	**CLP Sample ID**	**Laboratory Sample ID**	**Hazardous Substance**	**Result (µg/L)**	**Sample Adjusted CRQL (µg/L)**	**Reference(s)**
G-GWRS-MW-1R	EYBA1	22J0010-14	1,4-Dioxane	930	80	47, pp. 1–12, 61, 86; 48, pp. 12, 151
G-GWRS-MW-91R	EYB61	22J0010-02	1,4-Dioxane	670	80	47, pp. 1–12, 16, 82; 48, pp. 9, 83
G-GWRS-MW-105s	EYB64	0003237-02	1,4-Dioxane	53	9.8	49, pp. 1–7, 17, 31; 50, pp. 3, 21
G-GWRS-NMW2d	EYB98	22J0010-12	1,4-Dioxane	680	80	47, pp. 1–12, 55, 85; 48, pp. 8, 135
G-GWRS-MW-77	EYBA0	22J0010-13	1,4-Dioxane	550	40	47, pp. 1–12, 58, 85; 48, pp. 5, 143
G-GWRS-MW-977	EYB82	22J0010-09	1,4-Dioxane	540 J-	40	47, pp. 1–12, 43, 83; 48, pp. 5, 119
G-GWRS-MW-4d	EYB63	22J0010-03	1,4-Dioxane	220 J-	40	47, pp. 1–12, 19, 83; 48, pp. 6, 91
G-GWRS-MW-100	EYB80	200-65226-1	1,4-Dioxane	1,100 J-	100	54, pp. 1–8, 13, 38; 55, pp. 3, 52
G-GWRS-MW-190	EYBE7	200-65226-2	1,4-Dioxane	1,100 J-	100	54, pp. 1–8, 16, 38; 55, pp. 3, 60
G-GWRS-MW-108d	EYB81	200-65201-7	1,4-Dioxane	310	20	51, pp. 1–14, 37, 100; 52, pp. 11, 107
G-GWRS-MW-85	EYB83	200-65201-12	1,4-Dioxane	370 J-	39	51, pp. 1–14, 40, 100; 52, pp. 14, 119

µg/L = micrograms per liter.
J- = The result is an estimated quantity, but the results may be biased low due to sample extraction being performed outside the extraction technical holding time, or the extract is analyzed outside the analysis technical holding time [Ref. 47, pp. 4, 12; 51, pp. 4, 14; 54, pp. 3, 8].
The RL for each CLP result is the CRQL adjusted for sample and method [Ref. 18, pp. 2, 131, 188, 333, 366; 47, pp. 82, 83, 85, 86; 49, p. 31; 51, pp. 100; 54, p. 38]. Since the samples were analyzed through the CLP, the adjusted CRQLs presented above are HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3].

EPA 2023 Supplemental Sampling

Supplemental sampling and analysis by EPA in 2023 confirm the observed release of 1,4-dioxane to the aquifer of concern (i.e., glacial aquifer system), specifically 1,4-dioxane at observed release concentrations in six study area monitoring wells, four residential water-supply wells, and the

Montgomery Well [see **Figure 4**; **Tables 11–18** of this HRS documentation record].[10] The maximum background concentration (0.0572 µg/L) was detected in MW-120s [see **Table 12** of this HRS documentation record] .

As shown in **Tables 11 through 14** below, observed release concentrations of 1,4-dioxane were detected in groundwater samples from six monitoring wells screened in the C_3 (shallow), D_0 and D_2 (middle), and E (deep) aquifers units at concentrations ranging from 9.15 to 1,720 µg/L; as with the 2022 results, the maximum concentration was detected in MW-100 [see **Tables 14** of this HRS documentation record]. The background and release samples were all collected during the same sampling event, using the same methodologies as outlined in the EPA Region 5 sampling SOP [Refs. 7, pp. 5, 10, 12, 13, 22–27; 105, pp. 7, 8, 12, 13, 17–19]. The samples were all collected from monitoring wells screened within the glacial aquifer system [see **Tables 11 and 13** of this HRS documentation record]. In addition, most of the background and release monitoring wells are screened at similar elevations within their respective aquifer units and screened in predominantly sand and gravel deposits [see **Tables 11 and 13** of this HRS documentation record]. The groundwater samples were all analyzed for 1,4-dioxane by a private, subcontracted laboratory using EPA Method 522, and the results were validated according to EPA Region 5 data validation guidelines [**Tables 12 and 14**; Refs. 108, p. 2; 109, pp. 2, 3; 110, pp. 2, 3; 111, p. 2; 112, p. 1; 113, p. 1; 114, p. 1; 115, p. 1].

Background Monitoring Well Samples

On September 11, 13, and 15, 2023, EPA collected groundwater samples G-GW01, G-GW02, G-GW03, G-GW04, G-GW05, G-GW06, and G-GW07 from Gelman study area monitoring wells [Ref. 105, pp. 7, 8, 12, 17, 18; **Figure 4** of this HRS documentation record]. Analysis reported a maximum 1,4-dioxane background concentration in G-GW02 (MW-120s). The result (0.0572 µg/L) is compared to the 1,4-dioxane results reported for release monitoring wells [see **Tables 12 and 14** of this HRS documentation record].

…

TABLE 12. BACKGROUND SAMPLE RESULTS

Field Sample ID	Laboratory Sample ID	Hazardous Substance	Result (µg/L)	MRL (µg/L)	Reference(s)
G-GW06	R2308509-002	1,4-Dioxane	0.0400 U	0.0400	108, pp. 8, 9, 46; 113, pp. 1–7
G-GW01	R2308527-011	1,4-Dioxane	0.0400 U	0.0400	109, pp. 8, 10, 64; 114, pp. 1–8
G-GW07	R2308527-012	1,4-Dioxane	0.0343 J	0.0400	109, pp. 8,1 0, 65; 114, pp. 1–8
G-GW04	R2308527-001	1,4-Dioxane	0.0400 U	0.0400	109, pp. 8, 9, 54; 114, pp. 1–8
G-GW02	R2308463-001	1,4-Dioxane	**0.0572**	0.0400	110, pp. 8, 9, 49; 112, pp. 1–7
G-GW03	R2308463-002	1,4-Dioxane	0.0400 U	0.0400	110, pp. 8, 9, 50; 112, pp. 1–7
G-GW05	R2308527-002	1,4-Dioxane	0.0400 U	0.0400	109, pp. 8, 9, 55; 114, pp. 1–8

[10] The Montgomery Well, a public supply well, was not sampled in September 2023. Rather, an observation well near the Montgomery Well was sampled. The EPA has revised the HRS documentation record at promulgation to remove observed release sample G-GW27 from scoring as a sample associated with the Montgomery Well. Sample G-GW27 is instead from an observation well near the Montgomery Well. (See section 3.20.2, Municipal Well (Montgomery Well), of this support document. Hence, Tables 15 and 16 have been removed from the HRS documentation record at promulgation.

µg/L = micrograms per liter.
J (no bias) = The result is estimated due to the reported concentration falling between the MRL and MDL [Refs. 109, pp. 5, 13; Ref. 114, p. 5].
U = Analyte was analyzed for but not detected. [Refs. 108, p. 12; 109, p. 13; 110, p. 15].
MRL = method reporting limit, a.k.a. Limit of Quantitation (LOQ); defined as the lowest concentration at which the analyte may be reliably quantified under the method conditions (i.e., a sample- and matrix-dependent quantitation limit equivalent to sample quantitation limit as defined in the HRS Rule) [Refs. 1, Sections 1.1 and 2.3; 109, p. 13].
Bold = evaluated as maximum background concentration.

Contaminated Monitoring Well Samples

On September 11, 13, and 17, 2023, EPA collected eight groundwater samples (including two environmental duplicate samples) from six release monitoring wells [Ref. 105, pp. 7, 12, 13, 19]. Analysis reported 1,4-dioxane concentrations ranging from 9.15 to 1,720 µg/L. These results are compared to the maximum background 1,4-dioxane result reported G-GW02 (0.0572 µg/L) [see **Tables 12 and 14** of this HRS documentation record].

…

TABLE 14. RELEASE SAMPLE RESULTS

Field Sample ID	Laboratory Sample ID	Hazardous Substance	Result (µg/L)	MRL (µg/L)	Reference(s)
G-GW12	R2308463-007	1,4-Dioxane	292	0.400	110, pp. 8, 9, 55; 112, pp. 1–7
G-GW16	R2308463-003	1,4-Dioxane	290	0.400	110, pp. 8, 9, 51; 112, pp. 1–7
G-GW13	R2308617-001	1,4-Dioxane	897	0.400	111, pp. 7, 8, 36; 115, pp. 1–6
G-GW14	R2308617-002	1,4-Dioxane	9.15	0.0400	111, pp. 7, 8, 37; 115, pp. 1–6
G-GW08	R2308509-005	1,4-Dioxane	539	0.400	108, pp. 8, 9, 49; 113, pp. 1–7
G-GW09	R2308463-004	1,4-Dioxane	1,720	0.800	110, pp. 8, 9, 52; 112, pp. 1–7
G-GW11	R2308509-003	1,4-Dioxane	377	0.400	108, pp. 8, 9, 47; 113, pp. 1–7
G-GW15	R2308509-004	1,4-Dioxane	360	0.400	108, pp. 8, 9, 48; 113, pp. 1–7

µg/L = micrograms per liter.
MRL = reporting limit, a.k.a. LOQ; defined as the lowest concentration at which the analyte may be reliably quantified under the method conditions (i.e., a sample- and matrix-dependent quantitation limit equivalent to sample quantitation limit as defined in the HRS Rule) [Refs. 1, Sections 1.1 and 2.3; 108, p. 12; 110, p. 15; 111, p. 11].

Residential Wells

Pages 51 to 54 of the HRS documentation record at proposal presented information to document the release of a hazardous substance significantly above background concentrations for the residential wells at the Site. In relevant parts, it stated:

On September 11, 13, 14, and 17, 2023, EPA collected seven groundwater samples (including one environmental duplicate sample) from six residential water-supply wells along Lakeview Avenue and Elizabeth Road [Ref. 105, pp. 8, 13, 14, 15, 16, 19, 20]. The two residential wells sampled on Lakeview Avenue are evaluated as representing background. Analysis reported 1,4-dioxane concentrations in the four residential wells along Elizabeth Road at concentrations ranging from 0.247 to 1.9 µg/L. These results are compared to the maximum background 1,4-dioxane result reported G-GW18 (0.0337 µg/L). The samples were all collected from residential wells screened within the glacial aquifer system [see **Table 17** of this HRS documentation record]. The residential samples were all analyzed for 1,4-dioxane by a private, subcontracted laboratory using EPA Method 522 and the results validated according to EPA Region 5 data validation guidelines [see **Table 18** of this HRS documentation record].

…

TABLE 18. RESIDENTIAL WATER-SUPPLY WELL SAMPLE RESULTS (EPA)					
Field Sample ID	**Laboratory Sample ID**	**Hazardous Substance**	**Result (µg/L)**	**MRL (µg/L)**	**Reference(s)**
Background Residential Water Supply Wells					
G-GW18	R2308463-006	1,4-Dioxane	**0.0337 J**	0.0400	110, pp. 8, 9, 54; 112, pp. 1–7
G-GW17	R2308509-006	1,4-Dioxane	0.0262 J	0.0400	108, pp. 8, 9, 50; 113, pp. 1–7
Observed Release Residential Water Supply Wells					
G-GW19	R2308527-007	1,4-Dioxane	1.42	0.0400	109, pp. 8, 9, 60; 114, pp. 1–8
G-GW20	R2308617-003	1,4-Dioxane	1.7	0.0400	111, pp. 7, 8, 38; 115, pp. 1–6
G-GW21	R2308527-008	1,4-Dioxane	1.9	0.0400	109, pp. 8, 9, 61; 114, pp. 1–8
G-GW22	R2308527-009	1,4-Dioxane	0.247	0.0400	109, pp. 8, 10, 62; 114, pp. 1–8
G-GW29	R2308527-010	1,4-Dioxane	0.249	0.0400	109, pp. 8, 10, 63; 114, pp. 1–8

µg/L = micrograms per liter.
J (no bias) = The result is estimated due to the reported concentration falling between the MRL and MDL [Refs. 112, pp. 4–6; 113, p. 4-6].
MRL = Method reporting limit, a.k.a. LOQ; defined as the lowest concentration at which the analyte may be reliably quantified under the method conditions (i.e., a sample- and matrix-dependent quantitation limit equivalent to sample quantitation limit as defined in the HRS Rule) [Ref. 1, Sections 1.1 and 2.3; 108, p. 12; 109, p. 13; 110, p. 15; 111, p. 11].
Bold = evaluated as maximum background concentration.

Contaminated Residential Water-Supply Wells - Michigan EGLE 2023 Supplemental Sampling

In June 2023, Michigan Department of Environment, Great Lakes, and Energy (EGLE) and Washtenaw County Health Department collected groundwater samples from residential water-supply wells in Scio Township including wells along Breezewood Drive, Cottontail Court, Craig Road, Elizabeth Road, Miller Road, North Wagner Road, Robinwood Drive, Wagner Woods Court, Dexter Ann Arbor Road, Waterman Drive, Westview Way, Cole Drive, West Delhi, South Wagner Road, Coventry Square, Bradford Square, W. Liberty, Myrtle Avenue, Pratt Road, Saginaw Court, Burton, Southwood Court, Rose Drive, Thornapple Drive, Wagner Woods Court, Woodlea Drive, Calvin Street, Parkridge Drive, Bay Ridge Drive, Woodrow Street, Leroy Boulevard, Mable Drive, Cottontail Lane, Woodrow Street, etc. (Ref. 8, pp. 1, 4, 5, 10, 22, 23, 25, 31, 38, 48, 52, 72, 75, 77, 78, 79, 80, 90, 91, 122, 123, 124, 125, 132, 141, 157, 160, 161, 162, 164, 168, 169, 189). Samples were analyzed by Michigan EGLE Drinking Water Laboratory using EPA Method 8260 and validated according to guidance presented in EPA National Functional Guidelines for Organic Superfund Methods Data Review OLEM 9240.0-51 EPA 540-R-20-005, November 2020. (Ref. 8,

pp. 1, 13, 19, 20). Samples collected from several residences along N. Wagner, Miller, Elizabeth, Breezewood, Wagner Woods, Craig, Myrtle Avenue, Burton Avenue, Cottontail Ct, Robinwood, W. Liberty and other residences indicated non-detect values for 1,4-dioxane at a reporting limit of 0.5 ug/L (Ref. 8, pp. 22, 26, 28, 30, 32, 37, 50, 78, 91, 95, 128, 129, 142, 143, 315, 485, 486, 589, 590, 1060-1068). All samples were all collected from residential wells screened within the unconsolidated glacial aquifer system [see **Table 19** and **Section 3.0.1** of this HRS documentation record]. Three samples listed below (LK70609, LK70622, LK70626) are used to establish a 1,4-dioxane background level of non-detect at a reporting limit of 0.5 µg/L which is used to evaluate an observed release in this Michigan EGLE/Washtenaw County Health Department sampling. Results reported as not-detected are results that were not detected at or above the reporting limit (Ref. 8, p. 19, 22, 78, 91, 95). Observed release concentrations range from 0.5 µg/L to 1.9 µg/L. Samples meeting observed release are in **Table 20** of this HRS documentation record.

…

TABLE 20. RESIDENTIAL WATER-SUPPLY WELL SAMPLE RESULTS (EGLE)

Street Name	Sample ID	1,4-Dioxane (µg/L)	Reporting Limit (µg/L)	Sample Date	Reference(s)
Background Residential Water Supply Wells					
Myrtle Avenue	LK70609	0.5 U	0.5	6.6.23	8, pp. 1, 12-21, 78, 1061
Burton Avenue	LK70622	0.5 U	0.5	6.6.23	8, pp. 1, 12-21, 91, 1060
W. Liberty	LK70626	0.5 U	0.5	6.6.23	8, pp. 1, 12-21, 95, 315
Observed Release Residential Water Supply Wells					
Breezewood Drive	LK70573	1.4	0.5	6.6.2023	8, pp. 12, 15–21, 43, 1049
Cottontail Court	LK71405	0.8 J-	0.5	6.7.2023	8, pp. 12, 15–21, 826, 924
Cottontail Court	LK71257	0.7	0.5	6.7.2023	8, pp. 12, 15–21, 504, 594
Cottontail Court	LK71423	0.8 J-	0.5	6.7.2023	8, pp. 12, 15–21, 844, 942
Craig Road	LK71276	1.3 J-	0.5	6.7.2023	8,pp. 12, 15–21, 613, 707
Craig Road	LK71428	0.8 J-	0.5	6.7.2023	8, pp. 12, 15–21, 947, 1038
Craig Road	LK71418	1.0 J-	0.5	6.7.2023	8, pp. 12, 15–21, 839, 1058
Craig Road	LK71427	0.8 J-	0.5	6.7.2023	8, pp. 12, 15–21, 946, 1037
Craig Road	LK71243	0.6	0.5	6.7.2023	8, pp. 12, 15–21, 353, 1056
Craig Road	LK71419	0.9 J-	0.5	6.7.2023	8, pp. 12, 15–21, 840, 1059
Craig Road	LK71246	0.8	0.5	6.7.2023	8, pp. 12, 15–21, 493, 583
Elizabeth Road	LK70590	0.8	0.5	6.6.2023	8, pp. 12, 15–21, 60, 1051
Elizabeth Road	LK70569	1.9	0.5	6.6.2023	8, pp. 12, 15–21, 39, 1048
Miller Road	LK70639	0.9	0.5	6.6.2023	8, pp. 12, 15–21, 238, 1055

TABLE 20. RESIDENTIAL WATER-SUPPLY WELL SAMPLE RESULTS (EGLE)					
Street Name	**Sample ID**	**1,4-Dioxane (µg/L)**	**Reporting Limit (µg/L)**	**Sample Date**	**Reference(s)**
Miller Road	LK70556	1.2	0.5	6.6.2023	8, pp. 12, 15–21, 25, 1044
Miller Road	LK70578	1.2	0.5	6.6.2023	8, pp. 12, 15–21, 48, 1050
Miller Road	LK70566	1.1	0.5	6.6.2023	8, pp. 12, 15–21, 35, 1046
Miller Road	LK70638	1.2	0.5	6.6.2023	8, pp. 12, 15–21, 237 327
Miller Road	LK70560	1.0	0.5	6.6.2023	8, pp. 12, 15–21, 29, 1045
Miller Road	LK70567	0.7	0.5	6.6.2023	8, pp. 12, 15–21, 36, 1047
N. Wagner Road	LK70647	1.0	0.5	6.6.2023	8, pp. 12, 15–21, 336, 473
N. Wagner Road	LK70612	0.6	0.5	6.6.2023	8, pp. 12, 15–21, 81, 1052
N. Wagner Road	LK70618	0.7	0.5	6.6.2023	8, pp. 12, 15–21, 87, 1053
N. Wagner Road	LK70619	0.9	0.5	6.6.2023	8, pp. 12, 15–21, 88, 1054
N. Wagner Road	LK71411	0.6 J-	0.5	6.7.2023	8, pp. 12, 15–21, 832, 930
Robinwood Drive	LK71382	0.8 J-	0.5	6.7.2023	8, pp. 12, 15–21, 620, 1057
Wagner Woods Court	LK71387	0.5 J-	0.5	6.7.2023	8, pp. 12, 15–21, 719, 809

J- = The result is an estimated quantity, but the results may be biased low. Samples were analyzed beyond the 7-day holding time (Ref. 8, pp. 19, 20). No adjustment is need for bias low observed release concentrations according to the EPA factsheet, *Using Qualified Data to Document and Observed Release and Observed Contamination* (Ref. 101, pp. 5, 8).
RL – Reporting Limit (Ref. 8, p. 22).
U = The analyte was analyzed for but was not detected at or above the reported sample quantitation limit/reporting limit (Ref. 8, pp. 19, 22).

Pages 55 to 57 of the HRS documentation record at proposal provided discission of Gelman's operations at the facility as well as the EPA's search for other possible sources of 1,4-dioxane in the area; the EPA did not find any other known historical or current sources or releases of 1,4-dioxane in the Site vicinity that would meaningfully contribute to the significant increase of 1,4-dioxane in the aquifer. It stated:

> Based on the decades-long period of operation (1963 to 2013) and the documented poor waste handling practices, the release of 1,4-dioxane is attributable to the Gelman facility [Refs. 28, p. 1; 58, p. 5]. Historical Gelman manufacturing operations included the use of leaching tanks and coating lines to apply and wash various solvents onto filters [Refs. 28, p. 1; 58, p. 6]. Solvents used at the facility included 1,4-dioxane [Ref. 28, p. 1]. In 1981, Gelman submitted a Notification of Hazardous Waste Site to EPA identifying organic and solvent waste managed in drums, as well as a drum storage area located in the northwest corner of the former Gelman building located at 600 S. Wagner Road [Refs. 6, p. 35; 63, pp. 1, 2]. The notification to EPA specifically listed 1,4-dioxane (RCRA Waste Code: U-108) as a specific waste type generated at the facility [Refs. 5, p. 4; 63, p.

1, 2]. The facility was determined to be an SQG and assigned RCRA Handler ID MID005341813 [Ref. 64, p. 2].

Between 1966 and May 1986, 1,4-dioxane was used for cellulose triacetate filter production and cleaning process lines [Ref. 28, p. 1]. Tetrahydrofuran and acetone were used after May 1986 [Ref. 28, p. 2]. Process wastewater containing 1,4-dioxane was managed at the facility in ponds, by spray irrigation, and in a deep underground injection well [Ref. 28, p. 1]. The injection zone of this deep well is 5,460 to 5,794 feet below ground surface (bgs) in sandstone bedrock [Refs. 68, p. 24; 69, p. 1] This discharge depth is significantly below the depth of the unconsolidated glacial strata aquifer scored as part of HRS evaluation; the maximum thickness of the glacial deposits in the site area is more than 300 feet [Refs. 82, p. 8, 9; 84, pp. 8–12].

The process wastewater discharged to Source 2 and allowed to seep into the ground contained 1,4-dioxane, a CERCLA hazardous substance, beginning at an unspecified date in 1968; according to Gelman, the disposal of wastewater to Source 2 ended as the main source of disposal at an unspecified date in 1973, when Gelman built an additional 3 million gallon lagoon (Pond 3) and began using it for wastewater disposal [Refs. 6, p. 6-7; 21, p. 26; 94, pp. 2, 36]. In 1969, the estimated volume of process wastewater discharged to Former Ponds 1 and 2 (i.e., Source 2) was 50,000 gallons per day [Refs. 6, p. 6; 30, p. 1]. Between October 1983 and October 1984, about 2.6 million gallons were disposed of by spray irrigation (i.e., Source 3) [Ref. 60, p. 51]. A 1984 process wastewater effluent sample contained 1,4-dioxane at 1,600 ppm [Ref. 59, p. 3]. According to Gelman, this result represented the average concentration flowing into Pond 3 (i.e., Source 1) [Ref. 59, p. 3].

On July 13, 1986, Gelman discharged an estimated 18,000 gallons of process water from an unspecified surface impoundment onto the ground near the north property line [Ref. 66, p. 1]. MDNR indicated that this discharge was a violation of Gelman's groundwater discharge permit (Permit No. M00337) [Ref. 66, p. 1]. The wetlands that received the unpermitted discharges are contiguous with the Honey Creek tributary [Refs. 4, p. 1; 82, p. 9; 83, p. 1]. According to USGS, small, upstream reaches of the Honey Creek tributary may be losing reaches at times and act as areas of recharge for the underlying aquifer [Ref. 82, pp. 7, 9, 11, 19].

…

Additional process wastes, including membrane filters, cellulose acetate solutions, miscellaneous research solutions, and waste solvent, were managed in an on-site burn pit [Refs. 23, p. 1; 24, p. 1; 25, p. 1]. Former Gelman burn pit operations were documented during several historic regulatory inspections. In 1968, MDPH observed an open fire in a depression on the ground and a black smoke plume over 500 feet high at the site resulting from open burning of four barrels of solvents and pigments [Ref. 22, pp. 1–3]. At the time, it was noted that four barrels of solvents were burned each week [Ref. 22, p. 2]. On November 14, 1979, MDNR visited the Gelman facility to investigate a complaint regarding open dumping of cellulose acetate membrane filters, solvents, and other fluids in an unlined pit [Ref. 23, pp. 1, 2]. Gelman was advised that the pit was an illegal means of waste disposal [Ref. 23, p. 1]. On November 27, 1979, Gelman responded by indicating that the practice of open dumping has ceased, and the contents of the pit would be removed [Ref. 24, p. 1].

On May 27, 1977, Gelman received a discharge permit from the MWRC to discharge up to 44,000 gallons per day of process wastewater and non-contact cooling water to the ground and groundwater by spray irrigation, under Permit No. M00337 [Ref. 37, pp. 1–4]. In 1977, Gelman violated the terms of its discharge permit by allowing surface runoff from the spray irrigation field to discharge at the west property boundary [Ref. 38, p. 1]. On August 16, 1984, Michigan Department of Environmental Quality (MDEQ) was notified that 1,4-dioxane was a component of the spray irrigation discharge [Ref. 68, p. 33]. MDEQ determined that the discharge of dioxane

violated Gelman's existing permit and could not reissue the permit until Gelman was in compliance with the existing permit. [Ref. 68, p. 33]. A 1984 study by the University of Michigan determined that runoff from the Gelman's spray irrigation field had impacted Third Sister Lake to the west of the facility via detections of 1,4-dioxane [Ref. 13, pp. 1–10].

In November 1985, sampling conducted by WCHD revealed the presence of 1,4-dioxane in certain private drinking water wells in the vicinity of the Gelman property [Ref. 72, pp. 1, 2]. On January 24, 1986, WCHD informed MDOH that 1,4-dioxane was detected in drinking water wells at Gelman in the 100 ppm range, as well as in wells located at Redskin Industries and A.D.P along Jackson Plaza adjacent to the north facility boundary [Ref. 73, p. 1]. Gelman also provided bottled water to a number of area residents and businesses where wells had become contaminated and paid for the extension of municipal water supplies for these areas [Ref. 72, p. 2].

In 1992, Gelman, MNRC, MWRC, and MDNR entered into a consent judgement requiring Gelman to conduct groundwater remediation, including design, installation, operation, and maintenance of groundwater pump and treat systems, and to conduct a soil investigation and subsequent remediation [Ref. 74, pp. 1–63]….

…

The consent judgement also required Gelman to address soil contamination at the facility by: a) preventing the migration of 1,4-dioxane from contaminated soils into any aquifer unit at concentrations that cause groundwater contamination; b) preventing discharge of groundwater into Honey Creek Tributary; and c) preventing discharge of groundwater contamination to Third Sister Lake [Ref. 74, p. 24]. The consent judgment divided the site into three separate systems: a) the Marshy Area System to address the wetlands north of Former Ponds 1 and 2; b) the Spray Irrigation Field System to prevent discharge into Third Sister Lake; and c) the Soil System for remediation of additional identified source areas (burn pit, Former Ponds 1 and 2, Pond 3, and former Lift Station area) [Refs. 70, pp. 8, 9; 74, pp. 24, 26, 29]. Subsequent amendments to the consent judgement and court opinions revised state benchmarks for 1,4-dioxane contamination of groundwater and soil, and required installation and operation of additional extraction wells and monitoring wells (1996 and 2000); changes to treatment infrastructure and methods (1999 and 2000); remediation of aquifer Unit E (2004); establishment of the Prohibition Zone, identification of drinking water wells within the zone, providing access to municipal water supply, and abandonment and replacement of existing drinking water wells (2005); and modifications to remedial objectives (2011) [Refs. 75, pp. 1–11; 76, pp. 1–4; 77, pp. 4, 5; 78, pp. 7–14; 79, pp. 1–6; 80, pp. 4–28; 81, p. 4]. In a 2006 Release of Claims and Settlement Agreement entered into between Gelman and the City of Ann Arbor, Gelman acknowledged that they were not aware of any other source of 1,4-dioxane in aquifer Unit E within the Prohibition Zone or in the vicinity of the Northwest Supply Well (i.e., Montgomery Well) [Ref. 88, p. 2]. There are likely multiple diffuse sources of 1,4-dioxane in the vicinity of Gelman and the Montgomery Well, such as the disposal of domestic wastewater (i.e., septic systems) and as a component of various commercial applications [Ref. 122, pp. 2, 3; 130, pp. 1–3]. **However, a search and review of Federal and State databases in December 2023 indicates that there are no other known significant historical or current sources or releases of 1,4-dioxane within 3 miles of the Gelman facility and the Montgomery Well** [Refs. 9, pp. 2–672; 15, pp. 1-42].

…

In 2022 and 2023, EPA collected groundwater samples from study area monitoring wells as part of the SI and supplemental sampling performed in the vicinity of Gelman. Validated analytical data for groundwater samples collected in 2022 and 2023 document an observed release of 1,4-dioxane to the glacial aquifer system [see **Tables 11-14** of this HRS documentation record]. The 2023

> sampling also shows observed release concentrations of 1,4-dioxane in four residential wells along Elizabeth Avenue and the Montgomery Well [see **Tables 15–18** of this HRS documentation record].[11] Additionally, 2023 sampling collected by EGLE and Washtenaw County shows observed release concentration of 1,4-dioxane in 27 residential wells [see **Tables 19 and 20** of this HRS documentation record]. [emphasis added]

This information documents significant increases of contamination in each of the respective wells (public supply, monitoring, and residential) above background levels. That is, an observed release by chemical analysis is established by showing that the hazardous substance in release samples is significantly greater than the background level (as established using the background samples) and that the release is due, at least in part, to operations at the Gelman facility. The significant increase can be documented in one of two ways for HRS purposes: if the background concentration is not detected (or is less than the detection limit), an observed release is established when the sample measurement equals or exceeds the appropriate quantitation or detection limit; if the background sample concentration equals or exceeds the quantitation or detection limit, an observed release is established when the sample measurement is three times or more above the background concentration and above the appropriate quantitation or detection limit.

In addition to demonstrating a significant increase, the HRS documentation record at proposal also documented that these significant increases are due, at least in part, to releases at the Gelman Site. Pages 55 to 57 of the HRS documentation record at proposal documented the extensive use and releases of 1,4-dioxane at the Gelman Site over time[12] and includes documentation that the EPA evaluated other possible sources of 1,4-dioxane in the area. This search for other possible sources did not find any other known historical or current sources or releases of 1,4-dioxane within 3 miles of the Gelman facility causing the significant increase of 1,4-dioxane in the aquifer; thus, the significant increases of hazardous substances (i.e., 1,4-dioxane) identified in the public supply well, the monitoring wells, and the residential wells is due, at least in part, to the release at the Gelman Site.

Therefore, observed releases by chemical analysis were appropriately established in the HRS documentation record at proposal for the public well, the monitoring wells, and the residential wells, consistent with the HRS criteria.

Additional specific comments on observed releases at the Site are discussed in the following subsections:

- 3.19.1 Eligible Releases
- 3.19.2 Background Samples
- 3.19.3 Attribution

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.19.1 Eligible Releases

Comment: Gelman commented that the EPA relied on historical "unauthorized" releases of wastewater contaminated with 1,4-dioxane to score the Site, but contends most of the scored releases were authorized and should not be considered in the HRS evaluation. Gelman commented that, in a July 1991 Opinion, a Washtenaw County Court Judge confirmed that Gelman's wastewater disposal methods were all authorized, except for those releases that occurred from overflows of the treatment pond. Gelman commented that the EPA's scoring relies on

[11] The Montgomery Well, a public supply well, was not sampled in September 2023. Rather, an observation well near the Montgomery Well was sampled. The EPA has revised the HRS documentation record at promulgation to remove observed release sample G-GW27 from scoring as a sample associated with the Montgomery Well. Sample G-GW27 is instead from an observation well near the Montgomery Well. (See section 3.20.2, Municipal Well (Montgomery Well), of this support document.) Hence, Tables 15 and 16 have been removed from the HRS documentation record at promulgation.

[12] The EPA notes that Gelman does not dispute the use or the release of 1,4-dioxane at its facility as a result of manufacturing microporous filters; rather, Gelman states that 1,4-dioxane was part of its historical wastewater discharge that, unbeknownst to them at the time, had a resistance to biodegradation.

authorized releases of permitted wastewater disposal practices and asserts that the authorized historical releases should not be relied upon in the HRS scoring. Gelman commented that the unauthorized releases via overflows from the treatment pond are insignificant and should also not be considered in an HRS evaluation.

Gelman also added that in the 2022 SI, no new soil or sediment sample data for 1,4-dioxane were documented above "EGLE surface water quality values" and that the 1,4-dioxane detected in on-site and off-site groundwater is consistent with the historical data.

Response: The releases of hazardous substances at the Site were appropriately considered in the HRS evaluation and were appropriately included in the HRS documentation record at proposal to identify observed releases of 1,4-dioxane by both chemical analysis and direct observation. The HRS evaluation relied on all HRS eligible releases from sources at the Site regardless of whether they were unauthorized or authorized/permitted releases. As explained above in section 3.15, Permitted Releases/Concentrations Below Regulatory Levels, of this support document, releases of wastewater, regardless of whether they were authorized/permitted/unintended, are eligible for consideration under CERCLA and for inclusion in HRS scoring. Therefore, the releases of hazardous substances at the Site were appropriately considered as eligible releases and included in the HRS evaluation.

Regarding Gelman's statement that a court opinion agreed that historical wastewater disposal methods have been authorized, except for overflows of treatment ponds that were not authorized, as noted above both authorized and unauthorized releases of wastewater are eligible for consideration under CERCLA. Assuming Gelman's statement to be true and Gelman's historical wastewater disposal methods were all authorized, this has no impact on the eligibility of the releases in an HRS evaluation and all releases were appropriately considered and included.

Regarding Gelman's comment that 2022 Site Inspection data did not present new soil or sediment data above "EGLE surface water quality values" and that groundwater data have remained consistent with historical data, the HRS does not require that a hazardous substance, pollutant, and/or contaminant meet or exceed a regulatory limit or screening level or show increasing concentration trends over time; rather, the HRS requires that observed releases of those substances are established to score that a release has occurred. Concentrations of a hazardous substance and/or pollutant or contaminant may be eligible for consideration in an HRS evaluation even if they are below a regulatory limit or screening level. As documented above in section 3.19, Observed Release, of this support document, observed releases of 1,4-dioxane by both direct observation and chemical analysis were properly established at this Site and constitute HRS eligible releases.

Finally, regarding Gelman's statement that historical unauthorized releases from overflows at the treatment ponds are insignificant and should not be considered, first, the EPA disagrees with Gelman's summary that unauthorized releases were found to be "insignificant" in a court opinion; and second, the EPA notes that both authorized and unauthorized releases are eligible for consideration under CERCLA, as noted above in this response. In stating that unauthorized releases from the treatment ponds were insignificant, Gelman cited a July 1991 Washtenaw Circuit Court opinion (included as Attachment 1 to Gelman's public comments). In this 1991 opinion, it is noted that a lawn mower cut a hose used to transport wastewater to a groundwater injection well, a crack in the lift station facilitated seepage into the groundwater, and a burn pit containing contaminated soils were three unauthorized releases into the groundwater. These three releases, the opinion states, resulted in up to "a few pounds" of 1,4-dioxane being released to the environment. The opinion notes that "a few pounds" compared to 3,800 pounds extracted by Gelman is insignificant; thus, in the court opinion these three releases are the only releases considered "insignificant." However, additional unauthorized releases are discussed in the same court opinion and include unauthorized releases between 5-10 gallons per minute[13] of wastewater during a two-year period from treatment Pond #2 that are not considered insignificant. This quantity of wastewater could be greater than the Source 2 hazardous wastestream quantity scored in the HRS documentation record at proposal.

[13] Page 6 of the July 1991 Washtenaw Circuit Court opinion (Attachment #1 to Gelman's comments) states that when Pond #2 would overflow, it would overflow with a rate between 5-10 gallons per minute. This was known to occur for approximately two years. Using this overflow rate, this quantity could be as low as 7,200 gallons (5 gallons per minute for one day) or as high as 10.52 million gallons (10 gallons per minute for two years).

Therefore, while three specific unauthorized releases may be considered insignificant in a 1991 court opinion, other documented unauthorized releases are not considered insignificant. Further, both authorized and unauthorized releases are appropriately considered as eligible releases and included in the HRS evaluation.

These comments result in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.19.2 Background Samples

Comment: Gelman commented that the HRS documentation record at proposal incorrectly determined background conditions at the Site and this failure results in inappropriately established observed releases.

Gelman commented that the EPA used an inappropriate background well for the Montgomery Well observed release in the HRS evaluation. Gelman commented that the City's Steere Farm Well, used as a background well, is not screened (or completed) in the same aquifer as the Montgomery Well and asserts that it is an inappropriate sample to represent background conditions at the Site. Gelman commented that the two wells are four miles apart from each other, are located "in different geological settings," and are in different sub-basins of the Huron River. Gelman commented that these differences render the background sample for the Montgomery Well inappropriate for comparison to the Montgomery Well at the Site.

Gelman also commented that there is a prevalence of septic systems and sanitary lines in the area around the Site and the EPA has failed to collect background samples to determine if the trace levels of 1,4-dioxane in the residential wells used in its scoring could be from a non-Gelman source.

GEA commented that none of the background monitoring wells are reflective of true background conditions outside of the influence of the Site. GEA commented that the SI report has designated a number of monitoring wells as "background;" however, none of the SI "background" monitoring wells are reflective of background conditions currently or in the future and the SI should be revised to remedy this issue. GEA stated that the SI finding of dioxane in background monitoring wells MW-28, MW-127s, and MW-129d confirms migration from the dioxane plume and confirms they are not reflective of background conditions. GEA commented that the only well representing a true background water quality is the Steere Farm Well which did not detect dioxane.

Response: The identification of an observed release by chemical analysis of 1,4-dioxane to the aquifer based on groundwater samples is consistent with HRS requirements and HRS observed release criteria. The site-specific background conditions were appropriately considered for all data used to establish an observed release at the Site and all background levels were properly established in the HRS documentation record at proposal. The background samples used to establish background levels were collected from similar portions of the aquifer and from wells with sufficiently similar well characteristics to document that the significant increase in contamination is due to a release from the Site and not from differences in sample characteristics.

The HRS does not identify requirements for establishing background levels. The observed release by chemical analysis requirements in the HRS present the discussion of background concentrations only in the context of identifying an observed release.

HRS Section 3.1.1, *Observed release*, explains how to establish an observed release to an aquifer:

> Establish an observed release to an aquifer by demonstrating that the site has released a hazardous substance to the aquifer. Base this demonstration on either:
>
> …
>
> - Chemical analysis-**an analysis of ground water samples from the aquifer** indicates that the concentration of hazardous substance(s) **has increased significantly above the background concentration** for the site (see section 2.3). Some portion of the significant increase must be

> attributable to the site to establish the observed release, except: when the source itself consists of a ground water plume with no identified source, no separate attribution is required. [emphasis added]

HRS Section 3.1.1 refers a scorer to HRS Section 2.3. HRS Section 2.3, *Likelihood of release*, quoted above in full, states in relevant part:

> The minimum standard to establish an observed release by chemical analysis is analytical **evidence of a hazardous substance in the media significantly above the background level**. Further, some portion of the release must be attributable to the site. Use the criteria in Table 2-3 as the standard for determining analytical significance. [emphasis added]

The HRS documentation record at proposal presented background and release sample similarity for each data set used to evaluate an observed release by chemical analysis. Sample similarity between background and release samples includes: similar sampling dates, similar well types, similar screened intervals/depths, similar sampling techniques, and similar analytical methods. The HRS documentation record at proposal included sample similarity information as presented in the following paragraphs.

For the 2001 municipal wells sampling, information establishing sample similarity is on page 44 on the HRS documentation record at proposal, which stated:

> On **March 7**, 2001, a sample collected from the Montgomery Well indicated a concentration of 1,4-dioxane of 2 µg/L [Ref. 86, p. 3]. On April 2, 2001, the City of Ann Arbor announced that use of the Montgomery Well was discontinued pending further investigation [Ref. 86, pp. 1–3]. Subsequent samples collected from the Montgomery Well in April 2001 and December 2001 indicated concentrations of 1,4-dioxane at a concentration of 2 µg/L [Ref. 86, p. 3]. Results for the **March** sampling of the background well (i.e., Steere Farm Well # 25W) indicated no detectable concentration of 1,4-dioxane above the 1 µg/L detection limit [Ref. 86, p. 3]. The Steere Farm Well is evaluated as representing background conditions as **both wells are screened at similar elevations within poorly sorted sand** [Ref. 84, p. 11]. [emphasis added]

For the EPA 2022 SI sampling, monitoring well data were presented and information establishing sample similarity are on pages 44 to 47 of the HRS documentation record at proposal, which stated:

> Sampling and analysis by EPA in 2022 document an observed release of 1,4-dioxane to the aquifer of concern (i.e., glacial aquifer system), specifically 1,4-dioxane at observed release concentrations in eight study area monitoring wells [see **Figure 3; Tables 7–10** of this HRS documentation record]. …
>
> … The background and release samples were all collected during the same sampling event, using the same methodologies as outlined in the EPA Region 5 sampling SOP [Refs. 7, pp. 5, 10, 12, 13, 22–27; 17, pp. 3–5, 11–13, 19, 22, 32]. The samples were all collected from monitoring wells screened within the glacial aquifer system [see **Tables 7 and 9** of this HRS documentation record]. In addition, most of the background and release monitoring wells are screened at similar elevations within their respective aquifer units and screened in predominantly sand and gravel deposits [see **Tables 7 and 9** of this HRS documentation record]. The groundwater samples were all analyzed for TAL SVOCs by CLP laboratories under CLP SOW SFAM01.1 and the results validated according to EPA Region 5 data validation guidelines [**Tables 8 and 10**; Refs. 47, p. 3; 48, p. 1; 49, p. 2; 50, p. 1, 51, p. 3; 52, p. 2; 55, p. 2]. Although release samples were not collected from Unit D0, as described above the entire glacial aquifer system is evaluated as one hydrologic unit for HRS scoring purposes [see **Section 3.0.1** of this HRS documentation record].…

Background Monitoring Well Samples

On September 26 and 27, and October 4, 2022, EPA collected groundwater samples G-GWBK-MW-127s, G-GWBK-MW-28, and G-GWBK-MW-120d from Gelman study area monitoring wells. Analysis reported a maximum 1,4-dioxane background concentration of 1 J- µg/L. The adjusted result (10 µg/L) is compared to the 1,4-dioxane results reported for release monitoring wells [see **Tables 8 and 10** of this HRS documentation record].

TABLE 7. BACKGROUND SAMPLE INFORMATION

Well Location	Top of Casing Elev. (ft MSL)	Screened Interval (ft MSL)*	Aquifer	Sample ID	Date Sampled	Reference(s)
MW-127s	911.02	876.5–871.5 fine to medium sand	C_3	G-GWBK-MW-127s	9/26/2022	11, p. 4; 17, p. 3; 46, p. 2
MW-28	917.4	867.9–864.9 fine to coarse sand and some gravel	C_3	G-GWBK-MW-28	10/4/2022	11, p. 4; 17, pp. 22, 34; 46, p. 3
MW-120d	930.03	708.5–703.5 fine to coarse gravel, cobbles	E	G-GWBK-MW-120d	9/27/2022	17, pp. 4, 5; 46, pp. 5–8; 53, p. 5

ft MSL = feet above mean sea level.
* measured from ground elevation.

…

Contaminated Monitoring Well Samples

From September 27 through 29, and October 2 through 4, 2022, EPA collected 11 groundwater samples (including three environmental duplicate samples) from eight release monitoring wells. Analysis reported 1,4-dioxane concentrations ranging from 53 to 1,100 J- µg/L. These results are compared to the maximum adjusted background 1,4-dioxane result reported for G-GWBK-MW-127s (10 µg/L) [see **Tables 8, 9 and 10** of this HRS documentation record].

TABLE 9. RELEASE SAMPLE INFORMATION

Well Location	Top of Casing Elev. (ft MSL)	Screened Interval (ft MSL)*	Aquifer	Sample ID	Date Sampled	Reference(s)
MW-1 Replacement	919.64	861.79–856.79 fine to coarse sand	C_3	G-GWRS-MW-1R/G-GWRS-MW-91R (Duplicate)	9/29/2022	**Figure 3**; 12, p. 4, 5; 29, pp. 1, 2; 46 p. 9
MW-105s	911.97	872.43–867.43 fine to medium sand	C_3	G-GWRS-MW-105s	9/27/2022	**Figure 3**; 11, p. 4; 17, p. 5; 46, p. 10; 119, p. 197
NMW-2d	906.2	892.9–889.9 unknown	C_3	G-GWRS-NMW2d	9/29/2022	**Figure 3**; 12, p. 4, 5; 17, p. 32; 46, pp. 1, 27
MW-77	932.01	772.5–762.5 medium to coarse sand	D_2	G-GWRS-MW-77/G-GWRS-MW-	9/28/2022	**Figure 3**; 11, p. 5; 17, p. 19; 46, pp. 11, 12

TABLE 9. RELEASE SAMPLE INFORMATION						
Well Location	**Top of Casing Elev. (ft MSL)**	**Screened Interval (ft MSL)***	**Aquifer**	**Sample ID**	**Date Sampled**	**Reference(s)**
				977 (Duplicate)		
MW-4d	911.58	848.08–838.08 Clean, coarse sand	D_2	G-GWRS-MW-4d	9/28/2022	**Figure 3**; 11, p. 5; 17, p. 19; 46, p. 13
MW-100	940.89	723–718 Fine to coarse sand, with coarse gravel	E	G-GWRS-MW-100/G-GWRS-MW-190 (Duplicate)	10/2/2022	**Figure 3**; 11, p. 5; 17, p. 11; 46, pp. 15–18
MW-108d	910.64	733.46–728.46 gravel and cobbles	E	G-GWRS-MW-108d	10/3/2022	**Figure 3**; 53, p. 5; 17, p. 12; 46, pp. 1, 19–22
MW-85	917.64	760–755 fine to coarse sand	E	G-GWRS-MW-85	10/4/2022	**Figure 3**; 17, p. 13; 46, pp. 23–26; 131, p. 4, 6

ft MSL = feet above mean sea level.
* Measured from ground elevation.

For the EPA 2023 Supplemental Sampling, monitoring well and residential well data[14] were presented and information establishing sample similarity are on pages 47 to 53 of the HRS documentation record at proposal, which stated:

> Supplemental sampling and analysis by EPA in 2023 confirm the observed release of 1,4-dioxane to the aquifer of concern (i.e., glacial aquifer system), specifically 1,4-dioxane at observed release concentrations in six study area monitoring wells, four residential water-supply wells, and the Montgomery Well [see **Figure 4**; **Tables 11–18** of this HRS documentation record].… [15]
>
> The background and release samples were all collected during the same sampling event, using the same methodologies as outlined in the EPA Region 5 sampling SOP [Refs. 7, pp. 5, 10, 12, 13, 22–27; 105, pp. 7, 8, 12, 13, 17–19]. The samples were all collected from monitoring wells screened within the glacial aquifer system [see **Tables 11 and 13** of this HRS documentation record]. In addition, most of the background and release monitoring wells are screened at similar elevations within their respective aquifer units and screened in predominantly sand and gravel deposits [see **Tables 11 and 13** of this HRS documentation record]. The groundwater samples were all analyzed for 1,4-dioxane by a private, subcontracted laboratory using EPA Method 522, and the results were validated according to EPA Region 5 data validation guidelines [**Tables 12 and 14**; Refs. 108, p. 2; 109, pp. 2, 3; 110, pp. 2, 3; 111, p. 2; 112, p. 1; 113, p. 1; 114, p. 1; 115, p. 1]

[14] The EPA notes that 2023 municipal well data were presented in the HRS documentation record at proposal; but as discussed in section 3.20, Municipal Well (Montgomery Well), of this support document, the Montgomery Well was not sampled, but rather an observation well near the Montgomery Well was sampled. The observation well is not discussed in section 3.19.2, Background Samples, of this support document.
[15] The Montgomery Well, a public supply well, was not sampled in September 2023. Rather, an observation well near the Montgomery Well was sampled. The EPA has revised the HRS documentation record at promulgation to remove observed release sample G-GW27 from scoring as a sample associated with the Montgomery Well. Sample G-GW27 is instead from an observation well near the Montgomery Well. (See section 3.20.2, Municipal Well (Montgomery Well), of this support document.) Hence, Tables 15 and 16 have been removed from the HRS documentation record at promulgation.

Background Monitoring Well Samples

On September 11, 13, and 15, 2023, EPA collected groundwater samples G-GW01, G-GW02, G-GW03, G-GW04, G-GW05, G-GW06, and G-GW07 from Gelman study area monitoring wells [Ref. 105, pp. 7, 8, 12, 17, 18; **Figure 4** of this HRS documentation record]. Analysis reported a maximum 1,4-dioxane background concentration in G-GW02 (MW-120s). The result (0.0572 µg/L) is compared to the 1,4-dioxane results reported for release monitoring wells [see **Tables 12 and 14** of this HRS documentation record].

TABLE 11. BACKGROUND SAMPLE INFORMATION

Well Location	Top of Casing Elev. (ft MSL)	Screened Interval (ft MSL)*	Aquifer	Sample ID	Date Sampled	Reference(s)
MW-127s	911.02	876.5–871.5 fine to medium sand	C_3	G-GW06	9/13/2023	11, p. 4; 46, p. 2; 105, p. 12
MW-28	917.4	867.9–864.9 fine to coarse sand	C_3	G-GW01	9/15/2023	11, p. 4; 46, p. 3; 105, p. 18
MW-51	898.24	874.04–865.04 ** Silty clay to fine to very coarse grained sand	D_0	G-GW07	9/15/2023	46, p. 37-40; 107, p. 4; 105, p. 18
MW-124s	854.28	740.5–735.5 fine to medium sand, silt	D_2	G-GW04	9/15/2023	46, pp. 28–30; 105, p. 17; 106, p. 4
MW-120s	930.07	830.5–825.5 fine to medium sand	D_2	G-GW02	9/11/2023	46, pp. 31, 32; 105, pp. 7, 8; 106, p. 4
MW-120d	930.03	708.5–703.5 fine to coarse gravel, cobbles	E	G-GW03	9/11/2023	46, pp. 5–8; 53, p. 5; 105, pp. 7, 8
MW-124d	853.88	679–674 fine to coarse sand	E	G-GW05	9/15/2023	46, pp. 33–36; 105, p. 17; 106, p. 5

ft MSL = feet above mean sea level.
* measured from ground elevation.
** estimated based on well depth.

…

Contaminated Monitoring Well Samples

On September 11, 13, and 17, 2023, EPA collected eight groundwater samples (including two environmental duplicate samples) from six release monitoring wells [Ref. 105, pp. 7, 12, 13, 19]. Analysis reported 1,4-dioxane concentrations ranging from 9.15 to 1,720 µg/L. These results are compared to the maximum background 1,4-dioxane result reported G-GW02 (0.0572 µg/L) [see **Tables 12 and 14** of this HRS documentation record].

TABLE 13. RELEASE SAMPLE INFORMATION						
Well Location	**Top of Casing Elev. (ft MSL)**	**Screened Interval (ft MSL)***	**Aquifer**	**Sample ID**	**Date Sampled**	**Reference(s)**
MW-105s	911.97	872.43–867.43 fine to medium sand, trace silt	C_3	G-GW12/G-GW16 (Duplicate)	9/11/2023	**Figure 4**; 11, p. 4; 46, p. 10; 105, p. 7
175 Jackson Plaza	930.02	837.43–826.43 unknown	D_2	G-GW13	9/17/2023	**Figure 4**; 12, p. 5; 46, p. 43; 105, p. 19
MW-53i	926.56	826.82–816.82 sand and gravel	D_0	G-GW14	9/17/2023	**Figure 4;** 46, p. 41-42; 106, p. 4; 105, p. 19
MW-77	932.01	772.5–762.5 medium to coarse sand	D_2	G-GW08	9/13/2023	**Figure 4**; 11, p. 5; 46, pp. 11, 12; 105, p. 13
MW-100	940.89	723–718 Fine to coarse sand, with some coarse gravel	E	G-GW09	9/13/2023	**Figure 4**; 11, p. 5; 46, pp. 15–18; 105, pp. 12, 13
MW-108d	902	725–720 gravel and cobbles	E	G-GW11/G-GW15 (Duplicate)	9/13/2023	**Figure 4**; 53, p. 5; 46, pp. 19–22; 105, p. 13

ft MSL = feet above mean sea level.
* Measured from ground elevation.

…

Contaminated Residential Water-Supply Wells – September 2023 EPA Sampling

On September 11, 13, 14, and 17, 2023, EPA collected seven groundwater samples (including one environmental duplicate sample) from six residential water-supply wells along Lakeview Avenue and Elizabeth Road…. The two residential wells sampled on Lakeview Avenue are evaluated as representing background. Analysis reported 1,4-dioxane concentrations in the four residential wells along Elizabeth Road at concentrations ranging from 0.247 to 1.9 µg/L. These results are compared to the maximum background 1,4-dioxane result reported G-GW18 (0.0337 µg/L). The samples were all collected from residential wells screened within the glacial aquifer system [see **Table 17** of this HRS documentation record]. The residential samples were all analyzed for 1,4-dioxane by a private, subcontracted laboratory using EPA Method 522 and the results validated according to EPA Region 5 data validation guidelines [see **Table 18** of this HRS documentation record].

TABLE 17. RESIDENTIAL WATER-SUPPLY WELL SAMPLE INFORMATION (EPA)				
Well Location	**Screened Interval (ft MSL)***	**Sample ID**	**Date Sampled**	**Reference(s)**
Background Residential Water Supply Wells				
Lakeview Avenue	855.8–851.8 sand	G-GW18	9/11/2023	105, p. 8; 116, pp. 2, 3
Lakeview Avenue	861.9–857.9 sand	G-GW17	9/13/2023	105, pp. 13, 14; 116, pp. 4, 5
Observed Release Residential Water Supply Wells				
Elizabeth Road	792.3–788.3	G-GW19	9/14/2023	105, p. 15, 16; 116, p. 6, 7

TABLE 17. RESIDENTIAL WATER-SUPPLY WELL SAMPLE INFORMATION (EPA)				
Well Location	**Screened Interval (ft MSL)***	**Sample ID**	**Date Sampled**	**Reference(s)**
	gray sand			
Elizabeth Road	Unknown**	G-GW20	9/17/2023	105, pp. 19, 20; 116, p. 8
Elizabeth Road	791.0–786.0 sand and gravel	G-GW21	9/14/2023	105, p. 16; 116, p. 9, 10
Elizabeth Road	791.3–787.3	G-GW22/GW29 (Duplicate)	9/14/2023	105, p. 16; 116, p. 11

ft MSL = feet above mean sea level.
* Measured from ground elevation.
** Assumed to be at a similar interval as the other Elizabeth Road wells
…

Contaminated Residential Water-Supply Wells - Michigan EGLE 2023 Supplemental Sampling

In June 2023, Michigan Department of Environment, Great Lakes, and Energy (EGLE) and Washtenaw County Health Department collected groundwater samples from residential water-supply wells in Scio Township…. Samples were analyzed by Michigan EGLE Drinking Water Laboratory using EPA Method 8260 and validated according to guidance presented in EPA National Functional Guidelines for Organic Superfund Methods Data Review OLEM 9240.0-51 EPA 540-R-20-005, November 2020. (Ref. 8, pp. 1, 13, 19, 20). Samples collected from several residences along N. Wagner, Miller, Elizabeth, Breezewood, Wagner Woods, Craig, Myrtle Avenue, Burton Avenue, Cottontail Ct, Robinwood, W. Liberty and other residences indicated non-detect values for 1,4-dioxane at a reporting limit of 0.5 ug/L…. All samples were all collected from residential wells screened within the unconsolidated glacial aquifer system [see **Table 19** and **Section 3.0.1** of this HRS documentation record]. Three samples listed below (LK70609, LK70622, LK70626) are used to establish a 1,4-dioxane background level of non-detect at a reporting limit of 0.5 µg/L which is used to evaluate an observed release in this Michigan EGLE/Washtenaw County Health Department sampling. Results reported as not-detected are results that were not detected at or above the reporting limit (Ref. 8, p. 19, 22, 78, 91, 95). Observed release concentrations range from 0.5 µg/L to 1.9 µg/L. Samples meeting observed release are in **Table 20** of this HRS documentation record.

TABLE 19. RESIDENTIAL WATER-SUPPLY WELL SAMPLE INFORMATION (EGLE)					
Well Location	**Sample ID**	**Elevation (ft msl)**	**Well Depth (ft bgs)**	**Screened Interval***	**Reference(s)**
Background					
Myrtle Avenue	LK70609	882	65	817-821 ft msl	8, pp. 78, 1061; 100, pp. 1, 22
Burton Avenue	LK70622	--	57	53-57 ft bgs	8, pp. 91, 1060; 100, pp. 1, 21
W. Liberty	LK70626	936.31	160	776.31-786.31 ft msl	8, pp. 95, 315; 100, pp. 1, 23
Release					
Breezewood Drive	LK70573	868	51	821-825 ft msl	8, pp. 43, 1049; 100 pp. 1, 2
Cottontail Court	LK71405	--	170	162-170 ft bgs	8, pp. 826, 924; 100, pp. 1, 3
Cottontail Court	LK71257	--	140	132-140 ft bgs	8, pp. 504, 594; 100, pp. 1, 4

TABLE 19. RESIDENTIAL WATER-SUPPLY WELL SAMPLE INFORMATION (EGLE)					
Well Location	**Sample ID**	**Elevation (ft msl)**	**Well Depth (ft bgs)**	**Screened Interval***	**Reference(s)**
Cottontail Court	LK71423	--	164	151-164 ft bgs	8, pp., 844, 942; 100, pp. 1, 5
Craig Road	LK71276	--	154	150-154 ft bgs	8, pp. 613, 707; 100, pp. 1, 6
Craig Road	LK71428	--	166	162-166 ft bgs	8, pp. 947, 1038; 100, pp. 1, 7
Craig Road	LK71418	--	--	--	8, pp. 839, 1058
Craig Road	LK71427	--	--	--	8, pp. 946, 1037
Craig Road	LK71243	--	175	168-175 ft bgs	8, pp. 353, 1056; 100, pp. 1, 8
Craig Road	LK71419	--	190	184–190 ft bgs	8, pp. 840, 1059; 100, pp. 1, 9
Craig Road	LK71246	--	--	--	8, pp. 493, 583
Elizabeth Road	LK70590	--	196	186-196 ft bgs	8, pp. 60, 1051; 100, pp. 1, 10
Elizabeth Road	LK70569	956.47	--	--	8, pp. 39, 1048; 100, pp. 1, 18
Miller Road	LK70639	915	160	755-763 ft msl	8, pp. 238, 1055; 100, pp. 1, 11
Miller Road	LK70556	--	161	157-161 ft bgs	8, pp. 25, 1044; 100, pp. 1, 12
Miller Road	LK70578	--	--	--	8, pp. 48, 1050
Miller Road	LK70566	--	171	166-171 ft bgs	8, pp. 35, 1046; 100, pp. 1, 13
Miller Road	LK70638	--	--	--	8, pp. 237, 327
Miller Road	LK70560	--	--	--	8, pp. 29, 1045
Miller Road	LK70567	--		--	8, pp. 36, 1047
N. Wagner Road	LK70647	--	152	144-152 ft bgs	8, pp. 336, 473; 100, pp. 1, 14
N. Wagner Road	LK70612	--	152 or 182**	154-182 ft bgs**	8, pp. 81, 1052; 100, pp. 1, 15
N. Wagner Road	LK70618	--	--	--	8, pp. 87, 1053
N. Wagner Road	LK70619	--	190	186-190 ft bgs	8, pp. 88, 1054; 100, pp. 1, 19
N. Wagner Road	LK71411	--	--	--	8, pp. 832, 930
Robinwood Drive	LK71382	--	144	134-144 ft bgs	8, pp. 620, 1057; 100, pp. 1, 16
Wagner Woods Court	LK71387	--	153	145-158 ft bgs	8, pp. 719, 809; 100, pp. 1, 17

* The well screen interval is presented in feet below ground surface when the elevation at the well location is not in the Wellogic record. The well screen interval is converted to feet above mean sea level when the elevation at the well location and the depth of the well screen interval in feet below ground surface are provided in the Wellogic record. For example, a well located at an elevation of 882 ft msl, with a screen interval located 61-65 feet below ground surface, would have a well screen interval of 817-821 feet above mean sea level (Ref. 100, pp. 1-23).
**Accuracy of well depth and screened interval could be determined from Wellogic record (Ref. 100, pp. 1, 15).
ft msl = feet above mean sea level.
ft bgs = feet below ground surface.

The HRS documentation record at proposal (quoted above and in section 3.19, Observed Release, of this support document) identified all of the background samples used in the HRS evaluation to document observed releases by chemical analysis. It includes establishing a separate background level (via background samples) for each of the sampling events and discusses why the background samples included are appropriate to compare to release samples at the Site, and it includes the documentation of sample similarity to the release samples (i.e., similar sampling dates, similar well types, the same aquifer, similar screened intervals/depths, similar sampling techniques and analytical methods, etc.). The relevant background sample discussions establish that the background conditions were evaluated for each set of samples collected, and sufficient information was provided to document that observed releases by chemical analysis were properly established at the Gelman site.

Regarding Gelman's comments that the background well for the Montgomery Well observed release is inappropriate to be used as a background well in the HRS evaluation, the Steere Farm Well is located up/side-gradient from a groundwater flow respective to releases at the Gelman facility, is similarly constructed, located in the same aquifer (Unit E), screened at similar elevations, screened in the same subsurface material of "poorly sorted sand," and was sampled in the same timeframe as the Montgomery Well in 2001. Thus, the Steere Farm Well is a sufficiently similar and appropriate well to be used as a background well for the Montgomery Well. In addition, regarding comments on the geological setting and the geological conditions of these two wells (e.g., the aquifer evaluation, screened intervals), please see section 3.18, Aquifer Delineation, above in this support document for a full explanation of the appropriateness, similarity, and the geological conditions of these well locations. The Steere Farm Well is documented to be sufficiently similar to the Montgomery Well, is located in the same geological setting (i.e., same hydrologic unit), and is a reasonable background sample location for the Montgomery Well. However, even if the Steere Farm Well was not sufficient on its own as an applicable background sample location, at least three other wells located closer to the Montgomery Well that are upgradient of both the public supply well and the Gelman facility contamination, screened in aquifer Unit E, and contain non-detect values for 1,4-dioxane, confirm that a background level of non-detect is appropriate for aquifer Unit E. Attachment D of this support document contains well logs, locations, and analytical data of three additional wells: Cole Drive, Southwood Court, and Miller Road wells, that are all screened in aquifer Unit E upgradient of the Montgomery Well (the analytical data are from the 2023 Supplemental Sampling event that is also included in Reference 8 to the HRS documentation record at proposal). These data are not intended to replace the Steere Farm Well appropriate background sample data; rather, as 1,4-dioxane is a non-naturally occurring substance, data from these additional nearby wells with non-detected values for 1,4-dioxane provide further evidence to confirm that the background level of non-detect established at the Steere Farm Well for the Montgomery Well is appropriate at this Site.

Regarding Gelman's comment that background samples were not collected on each property between the home's septic tank and the residential well, appropriate residential background samples were collected from similar residences to those with releases of 1,4-dioxane in their residential wells which would account for typical trace amounts of contamination that may be present on a residential property. The residential wells included in the HRS documentation record at proposal were sampled on two separate events and include a total of five background sample locations from residential wells that are similar to the residential wells with documented releases of 1,4-dioxane. In the September 2023 EPA sampling event, two background samples were collected and contained a maximum background concentration of 0.0337 J µg/L of 1,4-dioxane (the J-flag is due to the reported concentration falling between the MRL and MDL; thus, the sample result is not biased, and the result was not adjusted). In the 2023 Supplemental Sampling event, three background samples were collected and all three background samples contained non-detected values for 1,4-dioxane. Therefore, if septic systems and sanitary lines regularly impacted and contaminated residential wells with trace amounts of 1,4-dioxane, the background samples from similar residential wells would be impacted and trace amounts of 1,4-dioxane are accounted for in establishing an observed release at the Site.

In addition to the residential well background samples included in the HRS documentation record at proposal, the EPA notes that the 2023 Supplemental Sampling event sampled approximately 200 residential wells for 1,4-dioxane. Of those approximately 200 residential wells, 27 residential wells contained releases of 1,4-dioxane. If 1,4-dioxane regularly leached from septic systems and sanitary lines and contaminated the on-property residential

wells, then the total number of residential wells impacted in this study should be much higher. However, these data confirm that appropriate and similar background samples were collected in each sampling event to document background conditions at the residential properties at the time of the sampling events.

Regarding GEA's comments that the background samples for the monitoring well samples were not taken from locations that are outside of the influence of contamination from the Gelman facility and therefore are not appropriate background samples, the background samples for the monitoring well samples in the HRS documentation record at proposal are appropriate to establish background levels and to establish an observed release in downgradient monitoring wells. Even though background sample locations may not be completely removed from Site contamination, release samples still exhibited significant increases above levels and established an observed release for HRS purposes. Further, there is no requirement that background levels be zero or non-detect as the HRS allows for considerations of detected levels in background samples (see HRS Table 3-2 cited above). HRS Table 3-2 directs that if the hazardous substance is detected in the background sample, the concentration of that hazardous substance becomes the background level (and the criterion used to establish significance above background becomes three times that level). GEA's comments do not challenge the identification of any observed release in a monitoring well at the Site; rather, GEA asserts that the background samples for monitoring wells should use a lower background level which can only result in more samples meeting observed release criteria.

The HRS documentation record at proposal identified that the background monitoring wells are similarly constructed, located in the same interconnected aquifer unit, sampled in the same timeframe, and the samples were analyzed using the same methods as the release monitoring well samples and are therefore appropriate background sample locations. While these background monitoring well sample locations are located near the Gelman facility and may be impacted by releases of contamination at the Gelman facility, there is no requirement that background samples be non-detect; rather, the background sample locations are used to establish a background level above which release samples must show a significant increase (using HRS Table 2-3 quoted in section 3.19, Observed Release, above) to establish an observed release. The monitoring well release sample concentrations range from 9.15-1,720 µg/L of 1,4-dioxane and all show HRS qualifying significant increases above their respective monitoring well background levels and would not be impacted by a lower background level. Therefore, the background samples used for the monitoring well samples are appropriate for HRS purposes and GEA's comments suggesting the use of a background sample with a lower background level would not impact the identification of any observed release scored or any factor in the HRS evaluation.

These comments result in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.19.3 Attribution

Comment: Gelman commented that the HRS scoring failed to consider alternative sources for 1,4-dioxane detections in residential wells and at the Site. Gelman commented that it is particularly important to consider alternative sources with respect to the low-level detections in a few residential wells used in the HRS scoring. Gelman commented that 1,4-dioxane is a common byproduct in the manufacturing of ethoxylated surfactants included in personal care and cleaning products. Gelman commented that many common household products like shampoos, laundry detergents, dish washing soaps, etc., often contain 1,4-dioxane at concentrations in units of parts per million. Gelman commented that residential properties also typically contain septic tanks and leach fields that receive waste from the use of these household products and are known to contribute 1,4-dioxane to the environment.

Additionally, Gelman commented that sanitary sewers are another possible contributing source of 1,4-dioxane to the environment due to sewer exfiltration from leakage of wastewater out of the sanitary sewer system via cracks, joints, and corrosion.

Gelman stated that septic systems and sanitary lines are prevalent at the Site and the EPA failed to consider alternative sources or collect the types of data necessary to determine if the trace levels of 1,4-dioxane in the

residential wells are attributable to the Site. Gelman stated that the detections of dioxane in the residential wells that the EPA and the HRS score attributed to the Site is unfounded and is not based on substantial evidence.

Response: The identification of an observed release by chemical analysis of 1,4-dioxane to the aquifer based on groundwater samples is consistent with HRS requirements and HRS observed release criteria. The significant increase in 1,4-dioxane contamination identified in the residential wells was appropriately attributed, at least in part, to the extensive releases of 1,4-dioxane at the Gelman facility. The EPA did not fail to consider alternative sources of 1,4-dioxane in the area; rather, the EPA performed both state and federal database searches for other facilities and found no indication of historical or current sources of 1,4-dioxane releases within three miles of the Gelman facility and the Montgomery Well. Further, residential well background samples confirm that diffuse local sources of contamination are not responsible for the significant increase in contamination identified in the residential well release samples. Therefore, the attribution of 1,4-dioxane contamination in the residential wells is appropriately attributed, at least in part, to releases at the Gelman facility.

As quoted in section 3.19, Observed Release, above in this support document, the extensive releases of 1,4-dioxane from activities at the Gelman facility to the glacial aquifer system are documented. Among these releases are documentation that in 1977 Gelman was permitted to release 44,000 gallons of process wastewater per day; this process wastewater effluent, in 1984, was documented to contain 1,600 ppm of 1,4-dioxane. These extensive releases of 1,4-dioxane occurred for many years at the Gelman facility (cellulose triacetate filter production, which used 1,4-dioxane, occurred at the facility from 1966 and 1986), and Gelman does not challenge the release of 1,4-dioxane to the aquifer system. Following a release from the Gelman facility into the subsurface, the groundwater flow in the glacial aquifer system is documented to be complex with northerly, easterly, and westerly components capable of transporting this contamination to all of the release wells.

Regarding Gelman's assertion that the EPA did not consider alternative sources for 1,4-dioxane, as quoted above in section 3.19, Observed Release, in this support document, the HRS documentation record at proposal, on page 56, first acknowledged that multiple diffuse sources may be present, such as disposal of domestic wastewater, and second documented that a search and review of federal and state databases in December 2023 and found "no other known significant historical or current sources or releases of 1,4-dioxane within 3 miles of the Gelman facility and the Montgomery Well [Refs. 9, pp. 2–672; 15, pp. 1-42]." As Gelman's comments relate specifically to alternative diffuse sources at the residential wells (i.e., residential septic systems and sanitary sewers that may contribute contamination to those wells), the EPA considered these possible diffuse local sources, such as domestic wastewater, and collected representative and appropriate residential well background samples to consider and account for such contamination. As noted above in section 3.19.2, Background Samples, in this support document, appropriate residential well background samples were collected from representative residential wells at the Site to account for local sources of contamination; these residential well background samples further indicate that the releases identified in the residential wells are due, at least in part, to the extensive releases of 1,4-dioxane at the Gelman facility and the significant increases in contamination are not from local diffuse residential sources.

Further evidence that local diffuse residential sources, such as domestic wastewater leaking from septic systems or sanitary lines, are not typical contributors of 1,4-dioxane to residential wells can be determined from the results of the 2023 Supplemental Sampling event (Reference 8 to the HRS documentation record at proposal). The 2023 Supplemental Sampling event sampled approximately 200 residential wells for 1,4-dioxane near the Gelman facility. Of the approximately 200 residential wells, only 27 wells contained releases of 1,4-dioxane above background levels (non-detect). If diffuse residential sources of contamination were typical, a higher percentage of the total number of residential wells sampled would be expected to contain 1,4-dioxane contamination. As most residential wells in the study do not show any 1,4-dioxane impact from local diffuse sources, it is not determined that diffuse sources would regularly and meaningfully contribute to contamination identified in the residential wells, and, thus, using appropriate background samples, it is determined that the significant increases are due to the extensive releases at the Gelman facility.

As additional verification to support the source of 1,4-dioxane is at least partially attributable to Gelman and not the use of domestic products, the EPA has reviewed available data for two neighborhoods in the vicinity of the Gelman site that are on septic systems (see Attachment F of this support document). One neighborhood is located to the northwest of the Gelman site and the other is located south of the Gelman site (see pages 1 and 94 of Attachment F of this support document). The neighborhood northwest of the Gelman site consists of homes along Adrienne Lane, Dexter Road, Christine Drive, Florence Street, Sciomeadow Drive, Ridgemont Lane, Halcyon Court (pages 3 to 51 of Attachment F of this support document) and a monitoring well cluster (wells 136d, 136i, and 136s) (pages 53 to 57 of Appendix G of this support document). The neighborhood to the south of the Gelman site consists of homes along Westview Way, Southwood Court, West Liberty Road, Saginaw Court, and a monitoring well at Saginaw Forest Cabin #4 (pages 64 to 90 of Attachment F of this support document). Analytical results for the wells in both neighborhoods document that 1,4-dioxane is non-detect in those wells. The reporting limit for the analytical results were 0.5 or 1.0 µg/L for the years sampled (2003 to 2022) with one result having a detection limit of 2.0 µg/L (in 2012). (See pages 58 to 62 and 91 to 93 of Attachment F of this support document). This information further supports that household products are not the significant source of 1,4-dioxane to the aquifer at the Gelman site. If household products were the source of 1,4-dioxane at the Site, the release of 1,4-dioxane would be more prevalent[16].

Therefore, 1,4-dioxane, a man-made substance, has extensive documented releases from the Gelman facility. The EPA appropriately considered alternative sources of 1,4-dioxane contamination in the area and determined that there are no other known sources or significant releases of contamination that would significantly contribute to releases at the Site. Therefore, the 1,4-dioxane contamination in the residential wells is appropriately attributed, at least in part, to releases at the Gelman facility.

These comments result in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.20 Targets

Comment: Gelman commented that the targets scored at the Site were inappropriately included in the HRS evaluation. Gelman commented that qualified data were inappropriately relied on to score targets at the Site. Gelman commented that the permanently closed municipal well (the Montgomery Well) should not be scored as a target well. Gelman commented that the EPA failed to sample the (closed) Montgomery Well itself (and instead sampled a nearby observation well) and failed to account for the lack of any unacceptable human exposures in closed target wells. Gelman also commented that detections in residential drinking water wells are below the applicable State drinking water standards and including the population of residential wells is inappropriate and flawed.

Response: The targets scored were appropriately evaluated and included in the HRS documentation record at proposal. Where qualified analytical results were presented in the HRS documentation record at proposal, the data are of sufficient quality, all data qualifiers were appropriately defined, and the associated qualified analytical results were appropriately adjusted, if necessary, consistent with EPA guidance and fact sheets. The Montgomery Well was appropriately evaluated in the HRS documentation record at proposal as a well closed due to site-related contamination, 1-4-dioxane, and is therefore eligible for scoring. Gelman did not challenge that the well was closed due to site-related contamination. Even if the Montgomery Well was not sampled in 2022, the observed release documented in 2001 and the targets associated with the Montgomery Well in 2001, at the time of its closure, are eligible for scoring. Contamination in the residential wells is also appropriately evaluated with observed releases of site-related contamination above an applicable HRS benchmark; therefore, the contamination in the residential wells was appropriately established with actual contamination at Level I concentrations.

[16] The information contained in Attachment F of this support document were obtained from: maps from EGLE's Gelman Site of 1,4-Dioxane Contamination; well/data tables from the database associated with EGLE's website, which was obtained from Chris Svoboda of EGLE; and Washtenaw County Sewer Area map confirming that these neighborhoods are not sewered, from MapWashtenaw (https://gisappsecure.ewashtenaw.org/Geocortex/WebViewer/?app=f0327644649f4fab96af11ca00b7e3b4&)

Regarding use of qualified data, the U.S. Court of Appeals for the D.C. Circuit has specifically ruled on the use of analytical data in the scoring of a site using the HRS when there were possible weaknesses in the laboratory analysis. In *Board of Regents of the University of Washington v. EPA*, 86 F.3d 1214 (DC Cir. 1996), the Court, in response to the petitioner's challenge regarding the quality of the data being fed into the complex HRS model—specifically, when there were issues dealing with the analysis—stated that "EPA does not face a standard of absolute perfection. ... Rather, it is statutorily required to 'assure to the maximum extent *feasible*,' that it 'accurately assesses the relative degree of risk,'" [emphasis in original] and that "[i]t would hardly make sense for the courts to respond to the resulting evidence by treating a lab's findings as fatally defective whenever it comes up short in any way." The Court also said that "[i]f there are 'minor contractual deficiencies,' the appropriate response is to review the deficiencies on a 'case–by-case' basis to determine their impact on the 'usability of the data.'" Also in this decision, the Court repeated a statement in an earlier NPL HRS case (*Eagle–Picher Indus., Inc. v. EPA,* 759 F.2d. 905, 921, D.C. Cir. 1985) that explained the Agency has met its obligations when "[t]he EPA has thus 'examined [the] relevant data and ... articulated a rational explanation for its action.'" [addition of "the" in original] Therefore, analytical data used in HRS scoring need not be from absolutely perfect analyses as long as a reasoned explanation can be provided supporting the use of the data for the specific intended purpose.

Consistent with the HRS, the targets associated with Montgomery Well at the time of its closure (due to a site-related hazardous substance, 1,4-dioxane) can be considered in scoring the Site. Section Q, *Consideration of Removal Actions (Current Versus Initial Conditions*), of the preamble to the 1990 HRS in the Federal Register (55 FR 515567-51569) provides the following discussion of removal actions, including closed drinking water wells, for the purposes of scoring a site; page 51568 states:

> HRS scoring will not consider the effects of responses that do not reduce waste quantities such as providing alternate drinking water supplies to populations with drinking water supplies contaminated by the site. In such cases, **EPA believes that the initial targets factor should be used to reflect the adverse impacts caused by contamination of drinking water supplies; otherwise, a contaminated aquifer could be artificially shielded from further remediation**. **This decision is consistent with SARA section 118(a), which requires that EPA give high priority to sites where contamination from the site results in closed drinking water wells**. Similarly, if residents are relocated or if a school is closed because of contamination due to the site, EPA will consider the initial targets in scoring the site. [emphasis added]

The HRS documentation record at proposal used the correct health-based benchmarks to establish populations subject to Level I concentrations, as required by the HRS. HRS Section 2.5, *Targets*, and its subsections provide instructions for determining whether targets are subject to actual contamination at Level I and Level II concentrations. The HRS benchmarks applicable for establishing Level I concentrations in the ground water migration pathway are specified in with HRS Section 2.5, *Targets*, HRS Section 2.5.2, *Comparison to benchmark*s, HRS Section 3.3.2.1, *Level of contamination*, and HRS Table 3-10, *Health-Based Benchmarks for Hazardous Substances in Drinking Water*. Relevant sections are excerpted below.

HRS Section 2.5, *Targets,* provides the instructions for determining whether targets are subject to actual contamination at Level I and Level II concentrations. It states:

> -Level I:
> - Media-specific concentrations for the target meet the criteria for an observed release (or observed contamination or observed exposure) for the pathway and are at or above media-specific benchmark values. **These benchmark values** (see section 2.5.2) **include both screening concentrations and concentrations specified in regulatory limits (such as Maximum Contaminant Level (MCL) values),** or… [emphasis added]
>
> …

-Level II:

- Media-specific concentrations for the target meet the criteria for an observed release (or observed contamination) for the pathway, but are less than media-specific benchmarks.

HRS Section 2.5.1, *Determination of level of actual contamination at a sampling location*, provides instructions for determining whether Level I or Level II concentrations apply at a sampling location and associated targets for the sampling location. It states:

> Determine whether Level I concentrations or Level II concentrations apply at a sampling location (**and thus to the associated targets**) as follows:
>
> - Select the benchmarks applicable to the pathway (component or threat) being evaluated.
> - Compare the concentrations of hazardous substances in the sample (or comparable samples) to their benchmark concentrations for the pathway (component or threat), as specified in section 2.5.2.
> - Determine which level applies based on this comparison.
> - If none of the hazardous substances eligible to be evaluated for the sampling location has an applicable benchmark, assign Level II to the actual contamination at that sampling location for the pathway (component or threat). [emphasis added]
>
> In making the comparison, **consider only those samples, and only those hazardous substances in the sample, that meet the criteria for an observed release** (or observed contamination) for the pathway,… [emphasis added]

HRS Section 2.5.2, *Comparison to benchmarks*, provides the media-specific benchmark to consider:

> Use the following media-specific benchmarks for making the comparisons for the indicated pathway (or threat):
>
> - Maximum Contaminant Level Goals (MCLGs)−ground water migration pathway and drinking water threat in surface water migration pathway. Use only MCLG values greater than 0.
> - Maximum Contaminant Levels (MCLs)−ground water migration pathway and drinking water threat in surface water migration pathway....
> - **Screening concentration for cancer** corresponding to that concentration that corresponds to the 10^{-6} individual cancer risk for inhalation exposures (air migration pathway or subsurface intrusion component of the soil exposure and subsurface intrusion pathway) or for oral exposures (ground water migration pathway; drinking water and human food chain threats in surface water migration pathway; and soil exposure and subsurface intrusion pathway).
> - Screening concentration for noncancer toxicological responses corresponding to the RfC for inhalation exposures (air migration pathway or subsurface intrusion component of the soil exposure and subsurface intrusion pathway) or RfD for oral exposures (ground water migration pathway; drinking water and human food chain threats in surface water migration pathway; and soil exposure and subsurface intrusion pathway). [emphasis added]
>
> Select the benchmark(s) applicable to the pathway (component or threat) being evaluated as specified in sections 3 through 6. Compare the concentration of each hazardous substance from the sampling location to its benchmark concentration(s) for that pathway (component or threat). Use only those samples and only those hazardous substances in the sample that meet the criteria for an observed release (or observed contamination or observed exposure) for the pathway . . . If the concentration of any applicable hazardous substance from any sample equals or exceeds its benchmark concentration, consider the sampling location to be subject to Level I concentrations for that pathway (or threat). If more than one benchmark applies to the hazardous substance, assign Level I if the concentration of the hazardous substance equals or exceeds the lowest applicable benchmark concentration.

HRS Section 3.3.2.1, *Level of contamination*, of the ground water migration pathway provides direction on evaluating populations subject to actual contamination, and HRS Section 3.3.2.2, *Level I concentrations*, provides directions on how to sum the number of people subject to Level I concentrations.

HRS Section 3.3.2.1, *Level of contamination*, states:

> Evaluate the population served by water from a point of withdrawal based on the level of contamination for that point of withdrawal. Use the applicable factor: Level I concentrations, Level II concentrations, or potential contamination.
>
> If no samples meet the criteria for an observed release for a point of withdrawal and there is no observed release by direct observation for that point of withdrawal, evaluate that point of withdrawal using the potential contamination factor in section 3.3.2.4. If there is an observed release by direct observation, use Level II concentrations for that point of withdrawal. However, **if one or more samples meet the criteria for an observed release for the point of withdrawal, determine which factor (Level I or Level II concentrations) applies to that point of withdrawal as specified in sections 2.5.1 and 2.5.2. Use the health-based benchmarks from table 3-10 in determining the level of contamination**. Evaluate the point of withdrawal using the Level I concentrations factor in section 3.3.2.2 or the Level II concentrations factor in section 3.3.2.3, as appropriate. [emphasis added]

HRS Section 3.3.2.2, *Level I concentrations*, states:

> **Sum the number of people served by drinking water from points of withdrawal subject to Level I concentrations. Multiply this sum by 10**. Assign this product as the value for this factor. Enter this value in table 3-1. [emphasis added]

Table 3-10 of the HRS lists the screening concentration for cancer as one of the appropriate drinking water health-based benchmarks for evaluating Level I concentrations of drinking water. It states as follows:

> **TABLE 3-10–HEALTH-BASED BENCHMARKS FOR HAZARDOUS SUBSTANCES IN DRINKING WATER**
>
> - Concentration corresponding to Maximum Contaminant Level (MCL).
> - Concentration corresponding to a nonzero Maximum Contaminant Level Goal (MCLG).
> - **Screening concentration for cancer** corresponding to that concentration that corresponds to the 10^{-6} individual cancer risk for oral exposures.
> - Screening concentration for noncancer toxicological responses corresponding to the Reference Dose (RfD) for oral exposures. [emphasis added]

The qualified analytical data used in this HRS evaluation were properly reviewed according to documented data validation, QA/QC procedures, and the EPA fact sheet, *Using Qualified Data to Document an Observed Release and Observed Contamination* (November 2022), included as Reference 101 of this HRS documentation record at proposal. Each instance where a background or observed release concentration was qualified with a data qualifier, the data qualifier was defined at the bottom of the table, an explanation of why the analytical result was qualified was included, and if there is a bias associated with the analytical result, the analytical result was adjusted, if necessary, based on the guidance provided in the EPA fact sheet.

According to the EPA fact sheet, *Using Qualified Data to Document an Observed Release and Observed Contamination* (November 2022), the qualified analytical results with or without adjustment can be used to establish an observed release and the adjustment factors provided in the fact sheet serve to "adjust," or take into account, the analytical uncertainty in the data indicated by the qualifier, thereby making qualified data usable for

an HRS evaluation. Page 8 of the EPA fact sheet, *Using Qualified Data to Document an Observed Release and Observed Contamination*, states:

> Adjustment factors do not correct the biased sample concentration to its true value because such "correction" is not possible. The quality control data used to derive adjustment factors do not differentiate and quantify individual sources of variation. Instead, the ratio of the upper and lower bounds of anticipated performance for each analyte used to develop adjustment factors represent a "worst-case" scenario. **Adjustment factors either inflate background values to the high end of the range to generate an estimated maximum value or deflate release data to the low end to generate an estimated minimum value**. [emphasis added]

Pages 5 and 6 of the EPA fact sheet, *Using Qualified Data to Document an Observed Release and Observed Contamination*, also state:

> "J" qualified data are generally considered biased, but **provide definitive analyte identification**. However, note **that data qualified "J" solely due to detection at or above the detection limit but below the quantitation limit** (not associated with other "J"-qualifying QC issues) **are not considered to be biased**. [emphasis added]

Exhibits 2 and 3 of the EPA fact sheet define the J, J-, and J+ qualifiers and provide direction of how to address J, J-, and J+ qualifiers, respectively. An excerpt of Exhibit 2 on page 5 of the EPA fact sheet, *Using Qualified Data to Document an Observed Release and Observed Contamination*, states:

EXHIBIT 2 EPA NFG DATA QUALIFIERS AND THER USABILITY FOR DOCUMENTING AN OBSERVED RELEASE
USABLE*
"U" The analyte was analyzed for, but was not detected above the level of the adjusted detection limit or quantitation limit, as appropriate.
"J" The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
"J+" The result is an estimated quantity, but the result may be biased high.
"J-" The result is an estimated quantity, but the result may be biased low.
…

*Usable under certain circumstances as explained in this fact sheet.

Exhibit 3 on page 8 of the EPA fact sheet, *Using Qualified Data to Document an Observed Release and Observed Contamination*, states:

EXHIBIT 3 USE OF ADJUSTMENT FACTORS FOR "J" QUALIFIED DATA		
TYPE OF SAMPLE	**TYPE OF BIAS**	**ACTION REQUIRED**
Background Sample	No Bias	None: Use concentration without factor
	Low Bias	Multiply concentration by factor
	High Bias	None: Use concentration without factor
	Unknown Bias	Multiply concentration by factor
Release Sample	No Bias	None: Use concentration without factor
	Low Bias	None: Use concentration without factor
	High Bias	Divide concentration by factor
	Unknown Bias	Divide concentration by factor

Page 9 of the EPA fact sheet, *Using Qualified Data to Document an Observed Release and Observed Contamination*, explains the use of the adjustment factors but also directs to use a default factor of 10 when analyte-specific adjustment factors are not in the EPA fact sheet, which is the case for 1,4-dioxane. It states:

> **Application of Factors**
>
> Exhibit 3 shows how to apply the factors to "J" qualified data. **Multiply low biased or unknown biased background sample results by the analyte-specific adjustment factor or the default factor 10** when an analyte-specific adjustment factor is not available. (This **default of 10** may be applied for any analyte, method, or matrix that does not have a specific adjustment factor listed in the attachments to this fact sheet.) **The resulting new background value effectively becomes a high biased value**— an estimated maximum value that may be used to determine an observed release. **Divide high biased release sample data by the analyte-specific adjustment factor or the default factor of 10** when an analyte-specific adjustment factor is not available. **The resulting new release sample value effectively becomes a low biased value**—an estimated minimum value that may be used to determine an observed release.
>
> **Note: High biased background data, low biased release data, and unbiased data may be used at their reported concentrations**.
>
> Note: **Adjusted release and background values must still meet HRS criteria** (e.g., release concentration must be at least three times above background level) to determine an observed release. [emphasis added]

Section 3.19, Observed Release, of this support document, contains the discussion on samples meeting observed release criteria. It explains that the analytical data used for evaluating an observed release meet the observed release criteria specified in the HRS.

The HRS documentation record at proposal presented qualified data in Tables 8, 10, 12, 16, 18, 20, 25, and 26. The qualified data were used to establish background concentrations or observed release concentrations. In instances where an observed release is associated with a target well, that observed release was also presented to document Level I or Level II concentrations and evaluate Level I or Level II target populations, respectively. Text from the analytical data tables and relevant sections of the HRS documentation record published at the time of proposal are quoted below.

Table 8 on page 46 of the HRS documentation record at proposal contained monitoring well background concentrations collected as part of the SI in 2022, some of which are qualified with a low bias (J- data qualifier):

TABLE 8. BACKGROUND SAMPLE RESULTS

Field Sample ID	CLP Sample ID	Laboratory Sample ID	Hazardous Substance	Result (µg/L)	Sample Adjusted CRQL (µg/L)	Reference(s)
G-GWBK-MW-127s	EYB60	22J0010-01	1,4-Dioxane	**1 J- (10)**	2.0	47, pp. 1–13, 81; 48, pp. 2, 75
G-GWBK-MW-28	EYB77	200-65201-5	1,4-Dioxane	1.9 U	1.9	51, pp. 1–14, 34, 99; 52, pp. 10, 99
G-GWBK-MW-120d	EYB62	0003237-01	1,4-Dioxane	2.0 U	2.0	49, pp. 1–7, 8, 30; 50, pp. 3, 13

µg/L = micrograms per liter.
J- = The result is an estimated quantity due to the analyte result being greater than or equal to the detection limit (MDL) and below the quantitation limit (CRQL) [Ref. 47, pp. 8, 12]. The result may be biased low due

to sample extraction being performed outside the extraction holding time, or the extract is analyzed outside the analysis technical holding time [Ref. 47, pp. 4, 12].
U = The analyte was analyzed for but was not detected above the reported sample quantitation limit [Ref. 49, p. 7; 51, p. 14].
The Sample Adjusted CRQL for each CLP result is the CRQL adjusted for sample and method [Ref. 18, pp. 2, 131, 188, 333, 366; 47, p. 81; 49, p. 30; 51, p. 99]. Since the samples were analyzed through the CLP, the adjusted CRQLs presented above are HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3].
Result in parentheses is adjusted based on EPA's Fact Sheet, *Using Qualified Data to Document and Observed Release and Observed Contamination* (November 2022). [Ref. 101, pp. 3, 5, 8, 9].
Bold = evaluated as maximum background concentration.

Table 10 on page 47 of the HRS documentation record at proposal contained monitoring well observed release concentrations collected as part of the SI in 2022, some of which are qualified with a low bias (J- data qualifier):

TABLE 10. RELEASE SAMPLE RESULTS

Field Sample ID	CLP Sample ID	Laboratory Sample ID	Hazardous Substance	Result (µg/L)	Sample Adjusted CRQL (µg/L)	Reference(s)
G-GWRS-MW-1R	EYBA1	22J0010-14	1,4-Dioxane	930	80	47, pp. 1–12, 61, 86; 48, pp. 12, 151
G-GWRS-MW-91R	EYB61	22J0010-02	1,4-Dioxane	670	80	47, pp. 1–12, 16, 82; 48, pp. 9, 83
G-GWRS-MW-105s	EYB64	0003237-02	1,4-Dioxane	53	9.8	49, pp. 1–7, 17, 31; 50, pp. 3, 21
G-GWRS-NMW2d	EYB98	22J0010-12	1,4-Dioxane	680	80	47, pp. 1–12, 55, 85; 48, pp. 8, 135
G-GWRS-MW-77	EYBA0	22J0010-13	1,4-Dioxane	550	40	47, pp. 1–12, 58, 85; 48, pp. 5, 143
G-GWRS-MW-977	EYB82	22J0010-09	1,4-Dioxane	540 J-	40	47, pp. 1–12, 43, 83; 48, pp. 5, 119
G-GWRS-MW-4d	EYB63	22J0010-03	1,4-Dioxane	220 J-	40	47, pp. 1–12, 19, 83; 48, pp. 6, 91
G-GWRS-MW-100	EYB80	200-65226-1	1,4-Dioxane	1,100 J-	100	54, pp. 1–8, 13, 38; 55, pp. 3, 52
G-GWRS-MW-190	EYBE7	200-65226-2	1,4-Dioxane	1,100 J-	100	54, pp. 1–8, 16, 38; 55, pp. 3, 60
G-GWRS-MW-108d	EYB81	200-65201-7	1,4-Dioxane	310	20	51, pp. 1–14, 37, 100; 52, pp. 11, 107
G-GWRS-MW-85	EYB83	200-65201-12	1,4-Dioxane	370 J-	39	51, pp. 1–14, 40, 100; 52, pp. 14, 119

µg/L = micrograms per liter.
J- = The result is an estimated quantity, but the results may be biased low due to sample extraction being performed outside the extraction technical holding time, or the extract is analyzed outside the analysis technical holding time [Ref. 47, pp. 4, 12; 51, pp. 4, 14; 54, pp. 3, 8].
The RL for each CLP result is the CRQL adjusted for sample and method [Ref. 18, pp. 2, 131, 188, 333, 366; 47, pp. 82, 83, 85, 86; 49, p. 31; 51, pp. 100; 54, p. 38]. Since the samples were analyzed through the CLP, the adjusted CRQLs presented above are HRS-defined SQLs [Ref. 1, Sections 1.1 and 2.3].

Table 12 on page 49 of the HRS documentation record at proposal contained monitoring well background results collected in 2023, some of which are qualified as estimated with no bias (J data qualifier) or as a non-detected value (U data qualifier):

TABLE 12. BACKGROUND SAMPLE RESULTS					
Field Sample ID	**Laboratory Sample ID**	**Hazardous Substance**	**Result (µg/L)**	**MRL (µg/L)**	**Reference(s)**
G-GW06	R2308509-002	1,4-Dioxane	0.0400 U	0.0400	108, pp. 8, 9, 46; 113, pp. 1–7
G-GW01	R2308527-011	1,4-Dioxane	0.0400 U	0.0400	109, pp. 8, 10, 64; 114, pp. 1–8
G-GW07	R2308527-012	1,4-Dioxane	0.0343 J	0.0400	109, pp. 8,1 0, 65; 114, pp. 1–8
G-GW04	R2308527-001	1,4-Dioxane	0.0400 U	0.0400	109, pp. 8, 9, 54; 114, pp. 1–8
G-GW02	R2308463-001	1,4-Dioxane	**0.0572**	0.0400	110, pp. 8, 9, 49; 112, pp. 1–7
G-GW03	R2308463-002	1,4-Dioxane	0.0400 U	0.0400	110, pp. 8, 9, 50; 112, pp. 1–7
G-GW05	R2308527-002	1,4-Dioxane	0.0400 U	0.0400	109, pp. 8, 9, 55; 114, pp. 1–8

µg/L = micrograms per liter.
J (no bias) = The result is estimated due to the reported concentration falling between the MRL and MDL [Refs. 109, pp. 5, 13; Ref. 114, p. 5].
U = Analyte was analyzed for but not detected. [Refs. 108, p. 12; 109, p. 13; 110, p. 15].
MRL = method reporting limit, a.k.a. Limit of Quantitation (LOQ); defined as the lowest concentration at which the analyte may be reliably quantified under the method conditions (i.e., a sample- and matrix-dependent quantitation limit equivalent to sample quantitation limit as defined in the HRS Rule) [Refs. 1, Sections 1.1 and 2.3; 109, p. 13].
Bold = evaluated as maximum background concentration.

Table 16 on page 51 of the HRS documentation record at proposal contained public well background results collected in 2023 by the EPA, one of which is qualified as estimated with no bias (J data qualifier):

TABLE 16. PUBLIC WATER-SUPPLY WELL SAMPLE RESULTS					
Field Sample ID	**Laboratory Sample ID**	**Hazardous Substance**	**Result (µg/L)**	**MRL (µg/L)**	**Reference(s)**
Background Public Water Supply Well					
G-GW28	R2308463-009	1,4-Dioxane	0.0375 J	0.0400	110, pp. 8, 9, 57; 112, pp. 1–7
Observed Release Public Water Supply Well					
G-GW27	R2308463-008	1,4-Dioxane	2.8	0.0400	110, pp. 8, 9, 56; 112, pp. 1–7

µg/L = micrograms per liter.
J (no bias) = The result is estimated due to the reported concentration falling between the MRL and MDL [Ref. 112, pp. 5, 6].
MRL = reporting limit, a.k.a. LOQ; defined as the lowest concentration at which the analyte may be reliably quantified under the method conditions (i.e., a sample- and matrix-dependent quantitation limit equivalent to sample quantitation limit as defined in the HRS Rule) [Refs. 1, Sections 1.1 and 2.3; 110, p. 15].

The EPA has revised the HRS documentation record at promulgation to remove sample G-GW27 from scoring as an observed release sample associated with the closed Montgomery Well, a public supply well. Sample G-GW27 is instead from an observation well near the closed Montgomery Well. Hence, Table 16 is not included in the HRS documentation record at promulgation as the closed Montgomery Well was not sampled in 2023. (See section 3.20.2, Municipal Well (Montgomery Well), of this support document.)

Table 18 on page 52 of the HRS documentation record at proposal contained residential well background results collected in 2023 by the EPA, some of which are qualified as estimated with no bias (J data qualifier):

TABLE 18. RESIDENTIAL WATER-SUPPLY WELL SAMPLE RESULTS (EPA)					
Field Sample ID	**Laboratory Sample ID**	**Hazardous Substance**	**Result (µg/L)**	**MRL (µg/L)**	**Reference(s)**
Background Residential Water Supply Wells					
G-GW18	R2308463-006	1,4-Dioxane	**0.0337 J**	0.0400	110, pp. 8, 9, 54; 112, pp. 1–7
G-GW17	R2308509-006	1,4-Dioxane	0.0262 J	0.0400	108, pp. 8, 9, 50; 113, pp. 1–7
Observed Release Residential Water Supply Wells					
G-GW19	R2308527-007	1,4-Dioxane	1.42	0.0400	109, pp. 8, 9, 60; 114, pp. 1–8
G-GW20	R2308617-003	1,4-Dioxane	1.7	0.0400	111, pp. 7, 8, 38; 115, pp. 1–6
G-GW21	R2308527-008	1,4-Dioxane	1.9	0.0400	109, pp. 8, 9, 61; 114, pp. 1–8
G-GW22	R2308527-009	1,4-Dioxane	0.247	0.0400	109, pp. 8, 10, 62; 114, pp. 1–8
G-GW29	R2308527-010	1,4-Dioxane	0.249	0.0400	109, pp. 8, 10, 63; 114, pp. 1–8

µg/L = micrograms per liter.
J (no bias) = The result is estimated due to the reported concentration falling between the MRL and MDL [Refs. 112, pp. 4–6; 113, p. 4-6].
MRL = Method reporting limit, a.k.a. LOQ; defined as the lowest concentration at which the analyte may be reliably quantified under the method conditions (i.e., a sample- and matrix-dependent quantitation limit equivalent to sample quantitation limit as defined in the HRS Rule) [Ref. 1, Sections 1.1 and 2.3; 108, p. 12; 109, p. 13; 110, p. 15; 111, p. 11].
Bold = evaluated as maximum background concentration.

Table 20 on page 54 of the HRS documentation record at proposal contained residential well background and observed release results collected in 2023 by EGLE, ten of which are qualified with a low bias (J- data qualifier) and others as a non-detected value (U data qualifier):

TABLE 20. RESIDENTIAL WATER-SUPPLY WELL SAMPLE RESULTS (EGLE)					
Street Name	**Sample ID**	**1,4-Dioxane (µg/L)**	**Reporting Limit (µg/L)**	**Sample Date**	**Reference(s)**
Background Residential Water Supply Wells					
Myrtle Avenue	LK70609	0.5 U	0.5	6.6.23	8, pp. 1, 12-21, 78, 1061
Burton Avenue	LK70622	0.5 U	0.5	6.6.23	8, pp. 1, 12-21, 91, 1060
W. Liberty	LK70626	0.5 U	0.5	6.6.23	8, pp. 1, 12-21, 95, 315
Observed Release Residential Water Supply Wells					
Breezewood Drive	LK70573	1.4	0.5	6.6.2023	8, pp. 12, 15–21, 43, 1049
Cottontail Court	LK71405	0.8 J-	0.5	6.7.2023	8, pp. 12, 15–21, 826, 924
Cottontail Court	LK71257	0.7	0.5	6.7.2023	8, pp. 12, 15–21, 504, 594
Cottontail Court	LK71423	0.8 J-	0.5	6.7.2023	8, pp. 12, 15–21, 844, 942
Craig Road	LK71276	1.3 J-	0.5	6.7.2023	8,pp. 12, 15–21, 613, 707

TABLE 20. RESIDENTIAL WATER-SUPPLY WELL SAMPLE RESULTS (EGLE)					
Street Name	**Sample ID**	**1,4-Dioxane (µg/L)**	**Reporting Limit (µg/L)**	**Sample Date**	**Reference(s)**
Craig Road	LK71428	0.8 J-	0.5	6.7.2023	8, pp. 12, 15–21, 947, 1038
Craig Road	LK71418	1.0 J-	0.5	6.7.2023	8, pp. 12, 15–21, 839, 1058
Craig Road	LK71427	0.8 J-	0.5	6.7.2023	8, pp. 12, 15–21, 946, 1037
Craig Road	LK71243	0.6	0.5	6.7.2023	8, pp. 12, 15–21, 353, 1056
Craig Road	LK71419	0.9 J-	0.5	6.7.2023	8, pp. 12, 15–21, 840, 1059
Craig Road	LK71246	0.8	0.5	6.7.2023	8, pp. 12, 15–21, 493, 583
Elizabeth Road	LK70590	0.8	0.5	6.6.2023	8, pp. 12, 15–21, 60, 1051
Elizabeth Road	LK70569	1.9	0.5	6.6.2023	8, pp. 12, 15–21, 39, 1048
Miller Road	LK70639	0.9	0.5	6.6.2023	8, pp. 12, 15–21, 238, 1055
Miller Road	LK70556	1.2	0.5	6.6.2023	8, pp. 12, 15–21, 25, 1044
Miller Road	LK70578	1.2	0.5	6.6.2023	8, pp. 12, 15–21, 48, 1050
Miller Road	LK70566	1.1	0.5	6.6.2023	8, pp. 12, 15–21, 35, 1046
Miller Road	LK70638	1.2	0.5	6.6.2023	8, pp. 12, 15–21, 237 327
Miller Road	LK70560	1.0	0.5	6.6.2023	8, pp. 12, 15–21, 29, 1045
Miller Road	LK70567	0.7	0.5	6.6.2023	8, pp. 12, 15–21, 36, 1047
N. Wagner Road	LK70647	1.0	0.5	6.6.2023	8, pp. 12, 15–21, 336, 473
N. Wagner Road	LK70612	0.6	0.5	6.6.2023	8, pp. 12, 15–21, 81, 1052
N. Wagner Road	LK70618	0.7	0.5	6.6.2023	8, pp. 12, 15–21, 87, 1053
N. Wagner Road	LK70619	0.9	0.5	6.6.2023	8, pp. 12, 15–21, 88, 1054
N. Wagner Road	LK71411	0.6 J-	0.5	6.7.2023	8, pp. 12, 15–21, 832, 930
Robinwood Drive	LK71382	0.8 J-	0.5	6.7.2023	8, pp. 12, 15–21, 620, 1057
Wagner Woods Court	LK71387	0.5 J-	0.5	6.7.2023	8, pp. 12, 15–21, 719, 809

J- = The result is an estimated quantity, but the results may be biased low. Samples were analyzed beyond the 7-day holding time (Ref. 8, pp. 19, 20). No adjustment is need for bias low observed release concentrations according to the EPA factsheet, *Using Qualified Data to Document an Observed Release and Observed Contamination* (Ref. 101, pp. 5, 8).
RL – Reporting Limit (Ref. 8, p. 22).

U = The analyte was analyzed for but was not detected at or above the reported sample quantitation limit/reporting limit (Ref. 8, pp. 19, 22).

Page 61 of the HRS documentation record at proposal presented the eligible HRS benchmarks for evaluating whether 1,4-dioxane levels met Level I concentrations. It stated:

Applicable HRS screening concentration benchmarks for the hazardous substance detected in the observed release are as follows:

TABLE 24. HRS BENCHMARKS – GROUND WATER PATHWAY				
Substance	**MCL**	**Cancer Risk**	**Non-Cancer Risk**	**Reference(s)**
1,4-Dioxane	NA	0.779	602	2, p. 3

Concentrations presented in µg/L for consistency with reported analytical data.
NA=Not Available

Table 25 on pages 61 and 62 of the HRS documentation record at proposal contained Level I observed release results, eight of which are qualified with a low bias (J- data qualifier):

TABLE 25. LEVEL I CONCENTRATIONS						
Well	**Sample**	**Substance**	**Conc. (µg/L)**	**RL/MRL (µg/L)**	**HRS Benchmark Cancer Risk (µg/L)**	**Reference(s)**
Montgomery Well	Unknown	1,4-Dioxane	2*	1	0.779	2, p. 3; 86, p. 3
Montgomery Well	G-GW27	1,4-Dioxane	2.8	0.04	0.779	2, p. 3; 110, pp. 9, 56; 112, pp. 1–7
Elizabeth Road Residential	G-GW19	1,4-Dioxane	1.42	0.04	0.779	2, p. 3; 109, pp. 9, 60; 114, pp. 1–8
Elizabeth Road Residential	G-GW20	1,4-Dioxane	1.9	0.04	0.779	2, p. 3; 111, pp. 8, 38; 115, pp. 1–6
Elizabeth Road Residential	G-GW21	1,4-Dioxane	1.7	0.04	0.779	2, p. 3; 109, pp. 9, 61; 114, pp. 1–8
Breezewood Residential	LK70573	1,4-Dioxane	1.4	0.5	0.779	2, p. 3. 3; 8, pp. 12, 15–21, 43, 1049
Cottontail Residential	LK71405	1,4-Dioxane	0.8 J-	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 826, 924
Cottontail Residential	LK71423	1,4-Dioxane	0.8 J-	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 844, 942
Craig Residential	LK71276	1,4-Dioxane	1.3 J-	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 613, 707
Craig Residential	LK71428	1,4-Dioxane	0.8 J-	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 947, 1038
Craig Residential	LK71418	1,4-Dioxane	1.0 J-	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 839, 1058

TABLE 25. LEVEL I CONCENTRATIONS						
Well	**Sample**	**Substance**	**Conc. (µg/L)**	**RL/MRL (µg/L)**	**HRS Benchmark Cancer Risk (µg/L)**	**Reference(s)**
Craig Residential	LK71427	1,4-Dioxane	0.8 J-	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 946, 1037
Craig Residential	LK71419	1,4-Dioxane	0.9 J-	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 840, 1059
Craig Residential	LK71246	1,4-Dioxane	0.8	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 493, 583
Elizabeth Residential	LK70590	1,4-Dioxane	0.8	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 60, 1051
Elizabeth Residential	LK70569	1,4-Dioxane	1.9	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 39, 1048
Miller Residential	LK70639	1,4-Dioxane	0.9	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 238, 1055
Miller Residential	LK70556	1,4-Dioxane	1.2	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 25, 1044
Miller Residential	LK70578	1,4-Dioxane	1.2	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 48, 1050
Miller Residential	LK70566	1,4-Dioxane	1.1	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 35, 1046
Miller Residential	LK70638	1,4-Dioxane	1.2	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 237 327
Miller Residential	LK70560	1,4-Dioxane	1.0	0.5	0.779	82, p. 3; 8, pp. 12, 15–21, 29, 1045
N. Wagner Residential	LK70647	1,4-Dioxane	1.0	0.5	0.779	2, p. 3; 8, pp. 12, 15-12, 336, 473
N. Wagner Residential	LK70619	1,4-Dioxane	0.9	0.5	0.779	2, p. 3; 8, pp. 12, 14–20, 88, 1054
Robinwood Residential	LK71382	1,4-Dioxane	0.8 J-	0.5	0.779	2, p. 3; 8, pp. 12, 14–20, 620, 1057

*The result was reported in 2001, and the 2004 Court Order regarding remediation of aquifer Unit E confirms that Gelman reported the result of 2 µg/L for the Montgomery Well [Ref. 78, p. 10; 86, pp. 1–3].

The EPA has revised the HRS documentation record at proposal to remove sample G-GW27 from scoring as an observed release sample associated with the Montgomery Well, a public supply well. Sample G-GW27 is instead from an observation well near the Montgomery Well. Hence, sample G-GW27 is not included as a Level I sample in Table 25 of the HRS documentation record at promulgation because the Montgomery Well was not sampled in 2023. (See section 3.20.2, Municipal Well (Montgomery Well), of this support document.)

Table 26 on pages 62 and 63 of the HRS documentation record at proposal contained Level II observed release results, two of which are qualified with a low bias (J- data qualifier):

TABLE 26. LEVEL II CONCENTRATIONS						
Well	**Sample**	**Substance**	**Conc. (µg/L)**	**RL (µg/L)**	**HRS Benchmark Cancer Risk (µg/L)**	**Reference(s)**
Elizabeth Road Residential	G-GW22	1,4-Dioxane	0.247	0.04	0.779	2, p. 3; 109, pp. 10, 62; 114, pp. 1–8
	G-GW29 (Duplicate)	1,4-Dioxane	0.249	0.04	0.779	2, p. 3; 109, pp. 10, 63; 114, pp. 1–8
Cottontail Road Residential	LK71257	1,4-Dioxane	0.7	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 504, 594
Craig Road Residential	LK71243	1,4-Dioxane	0.6	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 353, 1056
Miller Road Residential	LK70567	1,4-Dioxane	0.7	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 36, 1047
N. Wagner Road Residential	LK70612	1,4-Dioxane	0.6	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 81, 1052
N. Wagner Road Residential	LK70618	1,4-Dioxane	0.7	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 87, 1053
N. Wagner Road Residential	LK71411	1,4-Dioxane	0.6 J-	0.5	0.779	2, p. 3; 8, pp. 12, 15–21, 832, 930
Wagner Woods Court Residential	LK71387	1,4-Dioxane	0.5 J-	0.5	0.779	82, p. 3, pp. 12, 15–21, 719, 809

The HRS documentation record at proposal established an observed release of 1,4-dioxane in the Montgomery Well based on contamination identified in 2001. The Montgomery Well was subsequently closed and the target population associated with this well at the time of its closure was evaluated in the HRS scoring as directed by the HRS. Page 44 of the HRS documentation record at proposal provided the observed release documentation in the Montgomery Well identified in 2001; it stated:

Chemical Analysis

2001 Montogomery Well Sampling

On March 7, 2001, a sample collected from the Montgomery Well indicated a concentration of 1,4-dioxane of 2 µg/L [Ref. 86, p. 3]. On April 2, 2001, the City of Ann Arbor announced that use of the Montgomery Well was discontinued pending further investigation [Ref. 86, pp. 1–3]. Subsequent samples collected from the Montgomery Well in April 2001 and December 2001 indicated concentrations of 1,4-dioxane at a concentration of 2 µg/L [Ref. 86, p. 3]. Results for the March sampling of the background well (i.e., Steere Farm Well # 25W) indicated no detectable concentration of 1,4-dioxane above the 1 µg/L detection limit [Ref. 86, p. 3]. The Steere Farm Well is evaluated as representing background conditions as both wells are screened at similar elevations within poorly sorted sand [Ref. 84, p. 11].

Section 3.3, Targets, of the HRS documentation record at proposal, discussed the contamination in the Montgomery Well and the associated target population at the time of this well's closure; it stated on page 59:

> On April 2, 2001, the City of Ann Arbor announced that use of the Montgomery Well was discontinued pending further investigation [Ref. 86, pp. 1–3]. Subsequent samples collected from the Montgomery Well in April 2001 and December 2001 also indicated concentrations of 1,4-dioxane at a concentration of 2 µg/L [Ref. 86, p. 3]. The background well (i.e., SF # 25W) did not have detectable concentrations of 1,4-dioxane above the 1 µg/L detection limit [Ref. 86, p. 3]. According to the City of Ann Arbor, the Montgomery Well was closed because of the 1,4-dioxane contamination from the Gelman facility [Ref. 78, p. 10; 84, p. 5; 123, pp. 1–20]. **Montgomery Well is permanently closed** [Ref. 84, p. 5]. In a 2006 Release of Claims and Settlement Agreement entered into between Gelman and the City of Ann Arbor, Gelman acknowledged that they were not aware of any other source of 1,4-dioxane in aquifer Unit E within the Prohibition Zone or in the vicinity of the Northwest Supply Well (i.e., Montgomery Well), including concentrations below the 85 µg/L benchmark in effect at the time [Ref. 88, p. 2]. **As historical analytical data from March, April and December 2001 show concentrations of 1,4-dioxane in the Montgomery Well significantly above background, and the well was closed because of site-related contamination, the Montgomery Well is scored based on actual contamination** [Refs. 78, p. 10; 84, p. 5; 86, p. 3; 123, pp. 1–20]. **Based on data provided by the Ann Arbor Water Department regarding population served and the relative contributions of system inputs in 2001, the apportioned population for the Montgomery Well at the time of closure is 3,712.8750 people** [Ref. 89, pp. 1–3]. **Level I contamination is established for the Montgomery Well, which was closed in 2001 due to 1,4-dioxane contamination; 1,4-dioxane was detected at a concentration of 2 µg/L, which is above the HRS Level I benchmark of 0.779 µg/**L [Refs. 1, Section 3.3.2.1, Table 3-10; 2, p. 3; 86, pp. 1–3]. [emphasis added]

The Level I concentration factor was shown in section 3.3.2, Population, and its subsections on pages 63 and 64 of the HRS documentation record at proposal. This factor included the target population associated with the Montgomery Well at the time of its closure (3,712.8750 residents), as well as the target population associated with the residential wells (54.97 residents) with Level I concentrations. Pages 63 and 64 of the HRS documentation record at proposal stated:

> **3.3.2 Population**
>
> **3.3.2.2 Level I Concentrations**
>
> As identified in **Section 3.3** of this HRS documentation record, the closed drinking water supply well (i.e., Montgomery Well for the City of Ann Arbor) and 23 residential wells are subject to Level I concentrations. The populations assigned to these wells are presented below and in **Section 3.3** of this HRS documentation record [see **Tables 25 and 27** of this HRS documentation record].

TABLE 27. LEVEL I POPULATIONS

Level I Well*	Population	Reference(s)
Mongomery Well	3,712.8750	89, p. 1
Elizabeth Road Residential	2.39	117, p. 1
Elizabeth Road Residential	2.39	117, p. 1
Elizabeth Road Residential	2.39	117, p. 1
Breezewood Residential	2.39	117, p. 1
Cottontail Residential	2.39	117, p. 1
Cottontail Residential	2.39	117, p. 1
Craig Residential	2.39	117, p. 1
Craig Residential	2.39	117, p. 1

TABLE 27. LEVEL I POPULATIONS		
Level I Well*	**Population**	**Reference(s)**
Craig Residential	2.39	117, p. 1
Craig Residential	2.39	117, p. 1
Craig Residential	2.39	117, p. 1
Craig Residential	2.39	117, p. 1
Elizabeth Residential	2.39	117, p. 1
Elizabeth Residential	2.39	117, p. 1
Miller Residential	2.39	117, p. 1
Miller Residential	2.39	117, p. 1
Miller Residential	2.39	117, p. 1
Miller Residential	2.39	117, p. 1
Miller Residential	2.39	117, p. 1
Miller Residential	2.39	117, p. 1
N. Wagner Residential	2.39	117, p. 1
N. Wagner Residential	2.39	117, p. 1
Robinwood Residential	2.39	117, p. 1

*See **Tables 23 and 25** of this HRS documentation record for sample information.

==========

Sum of Population Served by Level I Wells: 3,767.845
Sum of Population Served by Level I Wells x 10 = 37,678.45
[Ref. 1, Section 3.3.2.2]

Level I Concentrations Factor Value: 37,678.45
[Ref. 1, Section 3.3.2.2]

Additional specific comments on targets evaluated at the Site are discussed in the following subsections:

- 3.20.1 Use of Qualified Data in Establishing Level I Concentrations
- 3.20.2 Municipal Well (Montgomery Well)
- 3.20.3 Residential Wells

This comment results in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.20.1 Use of Qualified Data in Establishing Level I Concentrations

Comment: Gelman commented that the groundwater data collected in the 2022 "Site Investigation" was designated as unusable due to laboratory hold time exceedances and other quality control issues that designated the results as qualified. Gelman commented that several detections in the EPA investigation report, specifically the low level detections in residential wells, were reported with J qualifiers and specifically noted qualifiers on eight wells in Table 25 of the HRS documentation record at proposal have "estimated values (J-Flagged) above the Level I concentration." Gelman stated that the J qualifier indicates an estimated concentration because it was detected below the laboratory reporting limit but above the method detection limit. Gelman asserts that any detection that is estimated cannot be compared to an actual standard or benchmark, thus asserting that qualified data cannot be used to establish Level I concentrations. Gelman further commented that several monitoring wells' results also contain J flag detections at elevated (1 ppb or higher) concentrations, "which is not typical for higher concentration data."

Response: The data used to evaluate 1,4-dioxane observed release were of sufficient quality for HRS purposes. The analytical results of groundwater samples collected from monitoring, residential, and municipal wells at the Site were appropriate to use to document contamination in the aquifer at observed release concentrations and

establish Level I concentrations in the residential and municipal wells used in scoring the Site in the HRS documentation record at proposal. Where qualified analytical results were presented in the HRS documentation record at proposal, all data were of sufficient analytical quality, data qualifiers were appropriately defined, and the associated qualified analytical results were subsequently adjusted, if necessary, consistent with EPA guidance. In the specific drinking water wells where analytical results were qualified due to laboratory hold times exceedances, the associated analytical results were biased low and the true value is higher. Where analytical results were adjusted according to EPA guidance, the adjustment factors increased background data or decreased release data which made the observed release criteria more stringent and in turn, made scoring the Site more difficult. As qualified data were appropriately documented and adjusted, if necessary, the reported respective concentrations were appropriately used in establishing an observed release and, where appropriate, were compared to appropriate HRS benchmarks to document Level I concentrations. The HRS documentation record at proposal used the correct health-based benchmark to establish populations subject to Level I concentrations as required by the HRS; the 1,4-dioxane drinking water cancer risk was used in establishing Level I concentrations, consistent with the HRS.

Following the recommendations in the EPA fact sheet, *Using Qualified Data to Document an Observed Release and Observed Contamination*, the qualified data listed in Tables 8, 10, 12, 16, 18, 20, 25, and 26 of the HRS documentation record at proposal were addressed as follows:

- In Table 8 on page 46 of the HRS documentation record at proposal, the "1 J-" µg/L background concentration in background monitoring well sample G-GWBK-MW127s is biased low and the footnote at the bottom of the table explained that the results are biased low due to sample extraction being performed outside the extraction technical holding time, or the extract is analyzed outside the analysis technical holding times, and a citation was provided to Reference 47 (pages 4 and 12), as quoted above. Because this background concentration is biased low, the analytical result was multiplied by a factor of 10, resulting in an adjusted value of 10 µg/L. This adjusted value was shown in parentheses next to the unadjusted qualified result. This 10 µg/L value then represented the highest background concentration and served as the background level for the accompanying observed release data set (Table 10) of the HRS documentation record at proposal. All observed release data in Table 10 of the HRS documentation record at proposal were 3 times or more the background level of 10 µg/L. See section 3.19, Observed Release, of this support document for a detailed discussion of the observed release criteria.
- In Table 10 on page 47 of the HRS documentation record at proposal, all the J- observed release concentrations were low biased and were not adjusted. This is consistent with Exhibit 3 in the EPA fact sheet cited above. The footnote at the bottom of Table 10 of the HRS documentation record at proposal explained that the J- analytical results are biased low due to sample extraction being performed outside the extraction technical holding time, or the extract is analyzed outside the analysis technical holding times and citations were provided in Table 10 of the HRS documentation record at proposal to References 48 (pages 4 and 12), Reference 51 (pages 4 and 14), and Reference 54 (pages 3 and 8). Because the observed release concentrations were biased low, the analytical results were not adjusted.
- In Table 12 on page 49 of the HRS documentation record at proposal, the "0.0343 J" µg/L background concentration in background monitoring well sample G-GW07 did not indicate that it has a bias or that the bias is unknown. The footnote at the bottom of Table 12 explained there is no bias associated with this result because the estimated value is due to the reported concentration falling between the method reporting limit (limit of quantitation) and the method detection limit and cited Reference 109 (pages 5 and 13) and Reference 114 (page 5). Because no bias is associated with this estimated result, no adjustment is necessary, consistent with the EPA fact sheet cited above. Further explanation is provided in References 109 and 114, which contain the data validation for sample G-GW07.
    - Reference 114 page 5 states: "The concentration in sample G-GW07 is above the method detection limit but below the reporting limit. In accordance with the Final Site Assessment Technical Support Sampling and Analysis Plan for Gelman Sciences, Inc., these results are qualified 'Q'."

- Reference 114 page 7 states: "Q Detected concentration is below the method reporting limit/Contract Required Quantitation Limit but is above the method quantitation limit."
- Reference 109 page 65 (as cited in Table 12 to support the analytical result) provides the analytical result from the laboratory as 0.0343 J and lists the method reporting limit (i.e. quantitation limit) as 0.0400, the method detection limit as 0.0200, and a Q qualifier. However, most pertinent, is that no other data qualifiers were associated with the result. Thus, absent any other QA/QC issues, background results that are above the method detection limit but below the quantitation limit can still be used to establish background levels. These types of results document that the substance is present but that the quantitation is estimated; the estimated value can be used to establish background rather than considering the substance not present/not detected. In the case of an observed release concentration, an estimated result that is above the method detection limit but below the quantitation limit cannot be used to document an observed release because it would not meet the criteria established in HRS Table 2-3. See section 3.19, Observed Release, of this support document for a detailed discussion of the observed release criteria.
- Further, the estimated 0.0343 J µg/L (no bias) background concentration in background monitoring well sample G-GW07 is one of seven background concentrations considered in establishing the background level for the monitoring wells sampled in September 2023. The estimated 0.0343 J µg/L concentration in sample G-GW07 is not the background level. Rather, the result in sample G-GW-02 (0.0572 µg/L) was selected to represent the background level for the monitoring wells sampled in September 2023 because it was the highest among the representative values. Hence, even if the 0.0343 J µg/L estimated background concentration in background monitoring well sample G-GW07 were not considered, this would have no impact on the HRS evaluation.

- Similar to the J qualified data in Table 12 of the HRS documentation record at proposal, in Table 16 on page 51 of the HRS documentation record at proposal, the 0.0375 J µg/L background concentration in background public water supply well sample G-GW28 did not indicate that it has a bias or that the bias is unknown. The footnote at the bottom of Table 16 explained there is no bias associated with this result because the estimated value is due to the reported concentration falling between the method reporting limit (limit of quantitation) and the method detection limit and cited Reference 112 (pages 5 and 6). Because no bias is associated with this estimated result, no adjustment is necessary, consistent with the EPA fact sheet cited above. Further explanation is provided in Reference 112, which contains the data validation for sample G-GW28, and Reference 110, which contains the laboratory analytical results.
  - Reference 112 page 5 states: "The concentrations in samples G-GW18 and G-GW28 are above the method detection limit but below the reporting limit. In accordance with the Final Site Assessment Technical Support Sampling and Analysis Plan for Gelman Sciences, Inc., these results are qualified 'Q'."
  - Reference 110 page 57 (as cited in Table 16 of the HRS documentation record at proposal to support the analytical result) provides the analytical result from the laboratory as 0.0375 J and lists the method reporting limit as 0.0400, the method detection limit as 0.0200, and a Q qualifier. However, most pertinent is that no other data qualifiers were associated with the result. Similar to the data in Table 12 and as discussed above, absent any other QA/QC issues, background results that are above the method detection limit but below the quantitation limit can still be used to establish background levels. These results document that the substance is present but the quantitation is estimated; the estimated value can be used to establish the background level rather than considering the substance not present/not detected.

  Further, the EPA has revised the HRS documentation record at promulgation to remove sample G-GW27 from scoring as an observed release sample associated with the Montgomery Well, a public supply well. Sample G-GW27 is instead from an observation well near the Montgomery Well. (See section 3.20.2, Municipal Well (Montgomery Well), of this support document.) Hence, the associated background

sample G-GW28 in Tables 15 and 16 (with Table 16 containing the 0.0375 J µg/L background concentration) is no longer applicable as part of the observed release documentation at promulgation. Tables 15 and 16 have been removed from the HRS documentation record at promulgation.

- Similar to the J qualified data in Table 12 of the HRS documentation record at proposal, in Table 18 on page 52 of the HRS documentation record at proposal the 0.0337 J µg/L background concentration in background residential water supply well sample G-GW18 did not indicate that it has a bias or that the bias is unknown. The footnote at the bottom of Table 18 explained there is no bias associated with this result because the estimated value is due to the reported concentration falling between the method reporting limit (limit of quantitation) and the method detection limit and cited Reference 112 (pages 4 through 6). Because no bias is associated with this estimated result, no adjustment is necessary, consistent with the EPA fact sheet cited above. Further explanation is provided in Reference 112, which contains the data validation for sample G-GW18, and Reference 110, which contains the laboratory analytical results.
    - Reference 112 page 5 states: "The concentrations in samples G-GW18 and G-GW28 are above the method detection limit but below the reporting limit. In accordance with the Final Site Assessment Technical Support Sampling and Analysis Plan for Gelman Sciences, Inc., these results are qualified 'Q'."
    - Reference 110 page 54 (as cited in Table 18 of the HRS documentation record at proposal to support the analytical result) provides the analytical result from the laboratory as 0.0337 J µg/L and lists the method reporting limit as 0.0400 µg/L, the method detection limit as 0.0200, and a Q qualifier. However, most pertinent is that no other data qualifiers were associated with the result. Similar to the data in Tables 12 and 16 of the HRS documentation record at proposal and as discussed above, absent any other QA/QC issues, background results that are above the method detection limit but below the quantitation limit can still be used to establish background levels. These results document that the substance is present, but the quantitation is estimated; the estimated value can be used to establish the background level rather than considering the substance not present/not detected.
- Table 20 on page 54 of the HRS documentation record at proposal contained residential well observed release results collected in 2023 by EGLE, some of which are qualified. In Table 20, all the J- observed release residential well concentrations were low biased and were not adjusted. This is consistent with Exhibit 3 in the EPA fact sheet cited above. The footnote at the bottom of Table 20 of the HRS documentation record explained that the J- analytical data are biased low due to the sample being analyzed beyond the 7-day holding time and stated that no adjustment is needed for biased low observed release samples; citations were provided to Reference 8 (pages 19 and 20) and Reference 101 (pages 5 and 8) of the HRS documentation record at proposal. Because the observed release concentrations were biased low, the analytical results were not adjusted, consistent with the EPA fact sheet cited above. Further explanation is provided in Reference 8, which contains the laboratory results and the data validation report for the 2023 residential well samples presented in Table 20 of the HRS documentation record at proposal.
    - Reference 8 page 19 states: "J- The result is an estimated quantity, but the results may be biased low."
    - Reference 8 page 20 states "Samples ... were analyzed beyond the 7-day holding time for unpreserved water samples. These samples were qualified as estimated detects (J-) for detected results and unusable (R) for non-detects." The EPA notes that no rejected results were listed in Table 20 of the HRS documentation record at proposal and the ten biased low residential well samples listed in Table 20 of the HRS documentation record at proposal [LK71405, LK71423, LK71276, LK71428, LK71418, LK71427, LK71419, LK71411, LK71382, LK71387] were identified in the list of samples presented on page 20 of Reference 8 of the HRS documentation record at proposal.

- Table 25 on pages 61 and 62 of the HRS documentation record at proposal contained Level I observed release results. Amongst other samples presented, it contained eight Level I residential well samples with biased low results. The concentrations associated with these samples met observed release criteria and were also above the lowest eligible HRS benchmark, the cancer risk screening concentration (0.779 µg/L), for 1,4-dioxane in drinking water. Table 25 of the HRS documentation record at proposal provided the sample concentrations and the eligible HRS benchmark used to establish that the sample concentrations either met or exceeded. Consistent with HRS Section 2.5, *Comparison to benchmark*s; HRS Section 3.3.2.1, *Level of contamination*; and HRS Table 3-10, *Health-Based Benchmarks for Hazardous Substances in Drinking Water*, the sample concentrations in Table 25 met Level I concentration; thus, the associated target populations at those sample locations are eligible for scoring as Level I targets. That is, for the following low bias sample results, the 1,4-dioxane concentrations met observed release criteria (see section 3.19, Observed Release, of this support document) and were also above the HRS cancer risk screening concentration for 1,4-dioxane:

Sample	**1,4-dioxane**	**HRS Benchmark Type**	**HRS Benchmark Value**	**Level I**
LK71405	0.8 J- µg/L	Cancer risk	0.779 µg/L	Yes
LK71423	0.8 J- µg/L	Cancer risk	0.779 µg/L	Yes
LK71276	1.3 J- µg/L	Cancer risk	0.779 µg/L	Yes
LK71428	0.8 J- µg/L	Cancer risk	0.779 µg/L	Yes
LK71418	0.8 J- µg/L	Cancer risk	0.779 µg/L	Yes
LK71427	0.8 J- µg/L	Cancer risk	0.779 µg/L	Yes
LK71419	0.9 J- µg/L	Cancer risk	0.779 µg/L	Yes
LK71382	0.8 J- µg/L	Cancer risk	0.779 µg/L	Yes

- Table 26 on pages 62 and 63 of the HRS documentation record at proposal contained Level II observed release results. Two of the residential well results are qualified with a low bias that met observed release criteria but did not exceed the eligible HRS benchmark and therefore did not meet Level I concentration requirements. The two low biased sample results listed below were therefore among the Level II sample results in Table 26 of the HRS documentation record at proposal. They are as follows:

Sample	**1,4-dioxane**	**HRS Benchmark Type**	**HRS benchmark Value**	**Level I**	**Level II**
LK71411	0.6 J- µg/L	Cancer risk	0.779 µg/L	No	Yes
LK71387	0.5 J- µg/L	Cancer risk	0.779 µg/L	No	Yes

In summary, while adjustment factors do not correct the biased sample concentration to its true value (because such "correction" is not possible), the use of adjustment factors to account for uncertainty in J qualified data is a conservative approach to enable a quantitative comparison of the data for use in documenting an observed release. That is, the adjustment factors either inflate background values to the high end of the range to generate an estimated maximum value or deflate release data to the low end to generate an estimated minimum value which makes it more difficult for sites to generate an HRS score above 28.50. Adjustment factors compensate for analytical variability when comparing a high biased value to a low biased value and, thus, qualified data are of sufficient quality to document an observed release and the targets associated with drinking water wells that meet observed release criteria are appropriate for scoring. The cancer risk screening concentration is an appropriate HRS benchmark for evaluating Level I concentration in drinking water. The Level I target population was associated with the closed Montgomery Well and 23 residential wells that had concentrations of 1,4-dioxane at or above the 1,4-dioxane cancer risk screening concentration and were appropriately included in scoring. See sections 3.20.2, Municipal Well (Montgomery Well), and 3.20.3, Actual Contamination in Residential Wells, for additional discussion on contamination in these wells.

These comments result in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.20.2 Municipal Well (Montgomery Well)

Comment: Gelman commented that the HRS score includes the population from a permanently closed municipal well (the Montgomery Well) that cannot be safely returned to service and should not be scored as a target well. Gelman stated that the closed Montgomery Well has no bearing on the remediation plan for the aquifer, it does not have an "affected population," and including the well artificially inflates the score. Further, Gelman commented that the EPA failed to collect samples from the Montgomery Well itself, instead collecting samples from a nearby observation well, and asserted that the Montgomery Well should not be scored as a Level I target.

Gelman commented that the Montgomery Well was permanently closed 23 years ago and asserted that there should be no eligible population associated with the closed well. Gelman stated that including the Montgomery Well artificially, and improperly, inflates the HRS score; the EPA should not list a site using a population served by a permanently closed municipal well that has not been properly maintained, has not been used for over 20 years, and that cannot be legally returned to service. Gelman provided the following comments regarding the status of the Montgomery Well and its inclusion in the HRS score:

- The Site should be scored on current circumstances. Gelman asserts that current conditions/data do not indicate an observed release in the well; therefore, the Montgomery Well should not be subject to actual contamination or included as a target in the scoring.
- The Montgomery Well was taken out of service in 2001, has been out of service for more than 12 months and is considered abandoned and should be plugged, and does not (and will not) serve any population.
- If the Montgomery Well was maintained on a regular basis, only then could it be included as a standby well. Further, Gelman noted that standby wells should be included only if they are used for a drinking water supply at least once per year.
- Even if safely returned to service, the Montgomery Well cannot be legally operated as it is located within the "Prohibition Zone" where consumption and use of groundwater is prohibited. Further, Gelman commented that if returned to service, the Montgomery Well would have to be operated to meet the City's municipal water legal standards; due to "unsafe concentrations" in the Montgomery Well, it can never be returned to service and should not be an eligible target.
- The Montgomery Well does not meet current required isolation distances from nearby sources of 1,4-dioxane; operation of the Well would likely expand the 1,4-dioxane plume, change the Site conditions and increase the response activity needed at the Site.
- The Montgomery Well does not meet the 200-foot setback requirement from property lines required by Michigan's Safe Drinking Water Act, and cannot be brought back to service.
- The Montgomery Well site itself is a closed Leaking Underground Storage Tank (LUST) site.

Gelman commented that the EPA failed to sample the Montgomery Well itself, and instead collected samples from an observation well located approximately 75 feet to the northwest of the Montgomery Well. Gelman commented that, to its knowledge, no 1,4-dioxane data have been gathered from the Montgomery Well since 2002. Gelman stated that results from an "observation well" located near the Montgomery Well are not an appropriate surrogate for samples from the Montgomery Well itself; and based on this incorrect sampling, the assessment of a population impact from the Montgomery Well is incorrect and not based on substantial evidence. Gelman summarized that "any assertion of a community impact from 1,4-dioxane at the long-closed Montgomery Well is disconnected from the facts and does not support a need for current federal Superfund involvement."

The city of Ann Arbor (the City) commented that Gelman's 1,4-dioxane contaminated the City's Northwest Supply Well (i.e., the Montgomery Well) which the City used as a public drinking water source; specifically, the City noted that it took the Northwest Supply Well offline because of the presence of 1,4-dioxane. GEA similarly commented that the dioxane pollution contaminated the Montgomery Well, which served an approximate population of 3,750 people prior to closing due to the dioxane impact.

Response: The Montgomery Well was appropriately evaluated in the HRS documentation record at proposal as a closed well due to site-related contamination; therefore, consistent with the HRS, the well was appropriately considered an eligible well and the target population associated with the Montgomery Well prior to closing in 2001 was also appropriate to include in the HRS scoring. While the Montgomery Well is permanently closed, the EPA concedes that the Montgomery Well was not sampled on September 12, 2023, and sample G-GW27 included in the HRS documentation record at proposal is representative of an observation well in the vicinity of the closed Montgomery Well. While sample G-GW27 documents an observed release of 1,4-dioxane (2.8 µg/L) in the aquifer in the vicinity of the closed Montgomery Well, it was not collected from the closed Montgomery Well. The HRS documentation record was revised at promulgation to remove sample G-GW27 as an observed release sample from the closed Montgomery Well and instead this sample was placed in the discussion of monitoring wells (the well log for the observation well was added as Reference 132 of the revised HRS documentation record at promulgation). This does not change the HRS target population associated with the Montgomery Well or the Site score because the scoring is based on the target population associated with the Montgomery Well at the time of its closure in 2001.

As explained above, wells closed due to site-related contamination are not exempt from scoring. Consistent with the HRS, the target population associated with Montgomery Well and residential wells, subject to Level I concentrations, was multiplied by 10 to obtain the Level I concentrations factor value of 37,678.45 used in scoring the Site. See section 3.19, Observed Release, of this support document for a discussion of the observed release evaluated at this Site and section 3.20.1*,* Use of Qualified Data in Establishing Level I Concentrations, for a discussion on the qualified analytical data. While Gelman objects to the use of the target population associated with the closed well and to the prospect of the well ever being returned to service, Gelman did not dispute that the well was closed due to site-related contamination. Whether the Montgomery Well can or cannot be brought on-line in the future has no bearing on the contamination evaluated in scoring this Site.

Regarding the Montgomery Well as a closed LUST site, an underground storage tank (UST) was associated with the Montgomery Well location. The UST was removed in 1991 and the substance associated with this UST was diesel. 1,4-dioxane was not reported as being associated with this UST. See pages 27, 77, 90, 111, and 422 of Reference 9[17] of the HRS documentation record at proposal and Attachment E of this support document. Attachment E of this support document can also be accessed by clicking the link contained on page 422 of Reference 9 of the HRS documentation record at proposal.

Regarding remediation and current conditions at this Site, 1,4-dioxane contamination remains in the aquifer. See sections, 3.11, Consideration of Response and Remedial Actions, and 3.12, Risk to Human Health or the Environment, of this support document for additional discussion.

These comments result in no change to the HRS score and no change in the decision to place the Site on the NPL.

3.20.3 Actual Contamination in Residential Wells

Comment: Gelman commented that low-level detections in residential drinking water wells pose no risk to human health and are substantially below the applicable State drinking water standards. Gelman commented that no residential wells are threatened with concentrations approaching or above the State drinking water criterion of 7.2 ppb for 1,4-dioxane. Gelman commented that including the population of residential wells below the State drinking water criteria is inappropriate and flawed.

Gelman commented that the residential wells scored at the Site are not based on substantial evidence and their inclusion in the HRS scoring for the Site is therefore unfounded. Gelman commented that failing to properly attribute contamination in residential wells to releases at the Gelman site, or to properly exclude other potential

[17] Environmental Data Resources (EDR). The EDR Radius Map™ Report with GeoCheck, Gelman Sciences Inc, 600 S Wagner Road, Ann Arbor, MI 48103, Inquiry Number: 7509620.1s. December 04, 2023. [981 pages]

contributing sources, such as septic systems or sanitary sewer lines, to contamination in the residential wells, renders the EPA's scoring as flawed.

GEA commented that the dioxane groundwater pollution has migrated north and contaminated approximately 43 residential drinking water wells in Scio Township, which currently have no alternate drinking water supply, implying that additional residential wells should be included in the HRS evaluation.

Response: The residential wells were appropriately evaluated with observed releases of site-related contamination, 1-4-dioxane, and where 1,4-dioxane was documented above an applicable HRS drinking water benchmark, the contamination in the residential wells was appropriately established as actual contamination at Level I concentrations. According to the HRS, an observed release has occurred if the measured levels are significantly higher than background levels. As discussed in section 3.15, Permitted Releases/Concentrations Below Regulatory Levels, of this support document, contaminant levels lower than regulatory limits can be considered in HRS evaluations and were appropriately included. The HRS also considers, in evaluating target populations, whether releases are at or above an HRS benchmark; target populations exposed to contaminants at or above HRS specific benchmarks are increased by a factor of 10 (benchmarks include certain regulatory limits [such as drinking water maximum contaminant level (MCL)] and cancer risk and noncancer risk screening concentrations). At this Site, the 1,4-dioxane cancer risk screening concentration for drinking water was used as an appropriate HRS benchmark to evaluate if 1,4-dioxane was at Level I concentrations in drinking water wells. While the HRS may consider other regulatory benchmarks, such as the MCL, as an appropriate HRS benchmark, the State drinking water criteria is not an eligible HRS benchmark and is not considered in establishing Level I concentration in drinking water. Additionally, a drinking water concentration documenting Level I concentrations does not have to be at or above all the appropriate HRS benchmarks; it only needs to be at or above at least one appropriate HRS benchmark. HRS-specific benchmarks for drinking water are listed in HRS Sections 2.5, *Targets*, 2.5.2, *Comparison to benchmarks*, and 3.3.2.1, *Level of contamination*, and HRS Table 3-10, *Health-Based Benchmarks for Hazardous Substances in Drinking Water*, as cited above in section 3.20.1*,* Use of Qualified Data in Establishing Level I Concentrations, of this support document. See sections 3.15, Permitted Releases/Concentrations Below Regulatory Levels, 3.19, Observed Release, and 3.20.1, Use of Qualified Data in Establishing Level I Concentrations, of this support document for additional information on the appropriate use of data in the HRS documentation record at proposal.

Regarding Gelman's comment that contamination in residential wells excluded other possible contributing sources such as septic systems or sanitary sewers, the background wells were sufficiently similar to observed release wells and would have been similarly impacted by these other possible sources. Further, the HRS only requires that some portion of the significant increase be attributable to the site. See sections 3.19.2, Background Samples, and 3.19.3, Attribution, of this support document for further discussion.

Additionally, the evaluation of residential wells specifically contaminated by the release of 1,4-dioxane to the aquifer at this Site, has been ongoing since the initial identification of the release at the Site; connection of residential homes to municipal water supplies due to Site related 1,4-dioxane contamination has been occurring since 1986-1987. Beginning in September 1985, testing of private drinking water wells in the immediate vicinity of the Gelman facility showed 1,4-dioxane contamination, which had been released into the groundwater from the former Gelman manufacturing facility. In February 1986, Gelman agreed to pay for a water-line extension to seven wells on Wagner Road and Jackson Plaza, in the immediate vicinity of the Gelman facility. In April 1986, contamination was discovered in the Westover Hills subdivision and Gelman agreed to pay for water-line extensions to all businesses and homes with contaminated wells. The Westover Hills subdivision is just east of Wagner Road to the northeast of the former Gelman manufacturing facility. In October 1991, the Ann Arbor City Council reported that Gelman had paid water main improvement charges for a property in the Evergreens subdivision due to 1,4-dioxane contamination in the owner's well. In March 2011, MDNR entered into a consent agreement with Pall Life Sciences (current owner of the Gelman Facility) to expand the well prohibition zone north of its current boundary into the Evergreen Subdivision, in response to groundwater contamination from the former Gelman facility located on Wagner Road. In August 2011, six property owners within the expanded well prohibition zone petitioned Ann Arbor requesting annexation from Scio Township; all connection and

improvement charges for water and sanitary sewer service, as well as petition filing fees, were paid by Pall Corporation.

Additionally, in 2023, Gelman agreed by signature to the Fourth Amended and Restated Consent Judgment, which defined Municipal Water Connection Contingency Plan (MWCCP) as "a contingency plan to identify the steps necessary to connect properties that rely on a private drinking water well to municipal water in the event those wells are threatened by 1,4-dioxane concentrations in excess of the applicable drinking water cleanup criterion and the estimated time necessary to implement each step of the water connection process." Among the institutional controls and response activities regarding private drinking water wells stipulated in the Consent Judgment, Gelman shall plug and replace any private drinking water wells identified in any areas newly included in the Prohibition Zone by connecting those properties to the municipal water supply. (See Attachment G of this support document which contains a brief summary of municipal line hookups associated with release of 1,4-dioxane at the Gelman site.) Hence, the association of contaminated residential wells with the release of 1,4-dioxane from Gelman is not new and is an ongoing facet of the site evaluation. As discussed in section 3.19, Observed Release, and its subsections, in this support document, the observed release of contamination at the Site has been adequately documented and attributed, at least in part, to the releases at the Gelman facility.

Regarding the GEA comment that additional residential wells may be contaminated by site-related contamination, the EPA will continue to investigate the contamination in the aquifer in later stages of the Superfund process. Additional contaminated wells could only increase the targets population assigned value but would not impact the HRS site score.

These comments result in no change to the HRS score and no change in the decision to place the Site on the NPL.

4. Conclusion

The original HRS score for the Gelman Sciences Inc. site was 50.00. Based on the above responses to public comments, the score remains unchanged. The final scores for the Gelman Sciences Inc. site are:

Ground Water:	100.00
Surface Water:	NS
Soil Exposure and Subsurface Intrusion:	NS
Air Pathway:	NS
HRS Score:	50.00

Attachment A

Department of Environment, Great Lakes, and Energy. State Request to Reinitiate Assessment of the Gelman Site for the NPL Process

April 12, 2021

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY
LANSING

April 12, 2021

VIA E-MAIL

Ms. Cheryl L. Newton, Acting Regional Administrator
United States Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604-3507

Dear Ms. Newton:

SUBJECT: Gelman Sciences, Inc. (Gelman), Site; Washtenaw County, Michigan;
USEPA ID No. MID005341813

Enclosed are letters received from, and resolutions by, the city of Ann Arbor, Washtenaw County, and Scio Township seeking listing by the United States Environmental Protection Agency (USEPA) of the Gelman site of contamination in Washtenaw County, Michigan, on the National Priorities List (NPL). As requested by the communities, please reinitiate assessment of the site for the NPL listing process.

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) will work closely with the USEPA and will also ensure that the current remedy continues to protect human health and remains in compliance with Michigan law during the NPL listing process.

If you need further information or assistance, please contact Mr. Mike Neller, Director, Remediation and Redevelopment Division, at 517-512-5859; NellerM@Michigan.gov; or EGLE, P.O. Box 30426, Lansing, Michigan 48909-7926; or you may contact me.

Sincerely,

Liesl Eichler Clark
Director
517-284-6700

Enclosures
cc/enc: Mr. Doug E. Ballotti, USEPA, Region 5
Mr. Matt Ohl, USEPA, Region 5
Ms. Patricia Readinger, Governor's Washington, DC, Office
Mr. Aaron B. Keatley, Chief Deputy Director, EGLE
Mr. Mike Neller, EGLE
Mr. Josh Mosher, EGLE
Mr. David Kline, EGLE
Mr. Dan Hamel, EGLE
Ms. Cyndi Mollenhour, EGLE

City of Ann Arbor
City Administrator's Office
301 E. Huron Street, PO Box 8647
Ann Arbor, MI 48107-8647
734-794-6110 x41101

Governor Gretchen Whitmer
P.O. Box 30013
Lansing, MI 48909

Re: City of Ann Arbor Resolution Requesting Referral of Gelman Life Sciences. Inc. Site to the United States Environmental Protection Agency

Dear Governor Whitmer:

Enclosed please find Resolution #R-20-425 approved by the Ann Arbor City Council on November 5, 2020.

As directed by the Resolution, this letter requests you send a Concurrence Letter to the United States Environmental Protection Agency in support of listing and proceeding with the Gelman Life Sciences, Inc., site (currently a Michigan Part 201 site) as a Superfund site on the National Priorities List, as set out more specifically in the Resolution. The City also is continuing as a participant in the Washtenaw County Circuit Court litigation (*Attorney General v. Gelman Sciences, Inc., Case No. 88-34734-CE*).

Sincerely,

Tom Crawford
City Administrator

Enclosure

cc: Ann Arbor Mayor and City Council

City of Ann Arbor

301 E. Huron St.
Ann Arbor, MI 48104
http://a2gov.legistar.com
/Calendar.aspx

Certified Copy

Resolution: R-20-425

File Number: 19-1887 **Enactment Number: R-20-425**

Resolution Supporting the Environmental Protection Agency's Active Involvement with the Gelman Site and Encouraging its Listing of the same as a "Superfund" Site

Whereas, The City and its residents have worked for decades to require Gelman to delineate, and clean up City ground water contaminated by 1,4-dioxane ("Dioxane") that originated at the Gelman Sciences ("Gelman") Wagner Road facility (the "Contamination"), and to protect City ground water from further spreading of the Contamination;

Whereas, As part of that work, The City sued Gelman in state and federal court more than 10 years ago, and ultimately agreed to settle that lawsuit;

Whereas, The State of Michigan ("State") has for decades separately litigated against, and otherwise regulated, Gelman to enforce State environmental laws that apply to the Contamination;

Whereas, Following the State's recent tightening of its standards for Dioxane groundwater pollution, as part of the City's continuing efforts, it, along with others, intervened in the State's ongoing lawsuit against Gelman pending in Washtenaw County Trial Court;

Whereas, Since its intervention was allowed in 2017, the City has engaged in settlement negotiations over a potential new consent judgment;

Whereas, Negotiations aside, the City is not satisfied with the progress of the delineation, containment and remediation of the Contamination;

Whereas, City Council directs the City Administrator to continue the fourth consent judgment negotiation process; and

Whereas, The City believes that delineation, containment and remediation of the Contamination will be bolstered by the United States Environmental Protection Agency's ("EPA") active involvement and enforcement of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), the "Superfund" Act, as it applies to the Contamination;

RESOLVED, That the City Council supports EPA's active involvement, as the lead agency, and enforcement of CERCLA, the "Superfund" Act, as it applies to the Contamination;

RESOLVED, That the City Council encourages the EPA to list the site of the Contamination a "Superfund" site on the National Priorities List under CERCLA;

RESOLVED, That the City Council direct the City Administrator to write to the Governor enclosing this resolution and soliciting a Concurrence Letter to USEPA in support of making the Gelman Site into a National Priorities List site;

RESOLVED, That the City Council direct the City Administrator to send this resolution and any such State concurrence to the Washtenaw County delegation to the Michigan Legislature, the Director of the Michigan Department of Environment, Great Lakes, and Energy, and Congresswoman Debbie Dingell; and

RESOLVED, That the City Council authorize the City Administrator to take such further actions that are consistent with the purposes of this resolution.

Sponsored by: Councilmembers Griswold, Hayner, Bannister, Eaton and Ramlawi

As Amended and Approved by Ann Arbor City Council on November 5, 2020

I, Jacqueline Beaudry, Clerk of the City of Ann Arbor, Michigan, certify that this is a true copy of Resolution R-20-425, passed by the Ann Arbor City Council on 11/5/2020.

Attest: Steve Gerhart

Steve Gerhart

December 04, 2020

Date Certified

COUNTY ADMINISTRATOR

220 North Main Street, PO Box 8645 • Ann Arbor, Michigan • 48107-8645

December 11, 2020

To: Gretchen Whitmer
Governor of the State of Michigan

From: Gregory Dill
County Administrator, Washtenaw County, Michigan

Re: Adding the Gelman Sciences, Inc., 1, 4 Dioxane contamination site to the EPA's National Priorities List

Dear Governor Whitmer,

As the County Administrator for Washtenaw County, I write on behalf of the Board of Commissioners to request your support and concurrence in nominating and taking all other steps necessary to add the Gelman Sciences, Inc., 1, 4 Dioxane contamination site ("Gelman Site") located in Washtenaw County to the EPA's National Priorities List ("NPL"). As you know, the NPL is a list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants in the United States. This NPL process is authorized by the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA") which is more commonly referenced to as Superfund.

Washtenaw County is asking you to nominate and support the Gelman Site as a candidate for the NPL process through a letter of concurrence to the EPA. This will allow the public notice / Federal Register process to start, with the ultimate goal being to compel Gelman Sciences, Inc. to engage in a more robust remedial action cleanup process of the Site as allowed by CERCLA. The County believes the Gelman Site already technically qualifies for the NPL based on a prior score under the Hazardous Ranking System. The County also believes the Gelman Site poses a significant threat to human health and the environment and otherwise constitutes an imminent and substantial endangerment to the public health and welfare and the environment due to the release of pollutant(s) into the groundwater at the Gelman Site.

At this time, and notwithstanding considerable efforts by the County and other communities/members of the impacted public over many years, the County asserts that the US EPA is best positioned to address the Gelman Site and to ensure that the contamination at the Gelman Site is fully delineated, contained and remediated in accordance with the various provisions and regulations under CERCLA. Your concurrence in this matter would be of

immense value to the residents of Washtenaw County. The County's resolution authorizing this measure is attached for your review. Please advise if your Office requires further information.

Thank you for your consideration.

Sincerely,

Greg Dill

Gregory Dill
County Administrator
Washtenaw County, Michigan

WASHTENAW COUNTY BOARD OF COMMISSIONERS RESOLUTION SUPPORTING THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA) DESIGNATION OF THE GELMAN SCEINCES, INC. SITE AS A USEPA SUPERFUND SITE & GOVERNOR CONCURRENCE LETTER TO USEPA FOR A GELMAN SCIENCES, INC. SUPERFUND SITE

WASHTENAW COUNTY BOARD OF COMMISSIONERS

December 2, 2020

Sponsored by: Commissioner Morgan

WHEREAS, the County and its residents have worked for decades to require Gelman to delineate, and clean up City ground water contaminated by 1,4-dioxane ("Dioxane") that originated at the Gelman Sciences ("Gelman") Wagner Road facility (the "Contamination"), and to protect City ground water from further spreading of the Contamination; and

WHEREAS, as part of that work, the City of Ann Arbor sued Gelman in state and federal court more than 10 years ago, and ultimately agreed to settle that lawsuit; and

WHEREAS, the State of Michigan ("State") has for decades separately litigated against, and otherwise regulated, Gelman to enforce State environmental laws that apply to the Contamination; and

WHEREAS, following the State's tightening of its standards for Dioxane groundwater pollution, as part of the County's continuing efforts, it, along with the City of Ann Arbor, Scio Township, the Huron River Watershed Council, intervened in the State's ongoing lawsuit against Gelman pending in Washtenaw County Trial Court; and

WHEREAS, since its intervention, the County has engaged in settlement negotiations over a potential new consent judgment; and

WHEREAS, negotiations aside, the County is not satisfied with the progress of the delineation, containment and remediation of the Contamination; and

WHEREAS, the County recognizes that the Contamination poses a long-term threat to public health and the security of the City of Ann Arbor municipal water system; and

WHEREAS, in 2017 the United States Environmental Protection Agency (USEPA) completed the Preliminary Assessment and indicated that the Gelman Site was eligible for the National Priorities List (NPL) but a State Concurrence Letter was required to continue the NPL designation process; and

WHEREAS, Washtenaw County believes that delineation, containment and remediation of the Contamination will be bolstered by the USEPA active involvement and

enforcement of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the "Superfund" Act, as it applies to the Contamination.

NOW THEREFORE BE IT RESOLVED that the Washtenaw County Board of Commissioners supports USEPA active involvement, as the lead agency, and enforcement of CERCLA, the "Superfund" Act, as it applies to the Contamination;

BE IT FURTHER RESOLVED that the Washtenaw County Board of Commissioners ask the USEPA to list the Gelman Site a "Superfund" Site on the National Priorities List under CERCLA;

BE IT FURTHER RESOLVED that the Washtenaw County Board of Commissioners directs the County Administrator to write to the Governor enclosing this resolution and soliciting a Concurrence Letter to USEPA in support of making the Gelman Site into a National Priorities List site;

BE IT FURTHER RESOLVED that the Washtenaw County Board of Commissioners direct the County Administrator to send this resolution and any such State Concurrence to the Washtenaw County delegation to the Michigan Legislature, the Director of the Michigan Department of Environment, Great Lakes, and Energy; and Congresswoman Debbie Dingell; and

BE IT FURTHER RESOLVED that the Washtenaw County Board of Commissioners authorize the County Administrator to take such further actions that are consistent with the purposes of this resolution.

COMMISSIONER	Y	N	A	COMMISSIONER	Y	N	A	COMMISSIONER	Y	N	A
Beeman	X			LaBarre	X			Shink	X		
Brabec	X			Maciejewski	X						
Jamnick	X			Morgan	X						
Jefferson	X			Scott	X						

CLERK/REGISTER'S CERTIFICATE - CERTIFIED COPY ROLL CALL VOTE: 9 0 0

STATE OF MICHIGAN)

COUNTY OF WASHTENAW)SS.

I, Lawrence Kestenbaum, Clerk/Register of said County of Washtenaw and Clerk of Circuit Court for said County, do hereby certify that the foregoing is a true and accurate copy of a resolution adopted by the Washtenaw County Board of Commissioners at a session held at the County Administration Building in the City of Ann Arbor, Michigan, on December 2, 2020, as it appears of record in my office.

In Testimony Whereof, I have hereunto set my hand and affixed the seal of said Court at Ann Arbor, this 3rd day of December, 2020.

LAWRENCE KESTENBAUM, Clerk/Register

BY: _____
Deputy Clerk

Res. No. 20-205

Will Hathaway, Supervisor
Jessica Flintoft, Clerk
Donna E. Palmer, Treasurer

Township of Scio

Trustees: Jacqueline Courteau
Alec Jerome
Kathleen Knol
Jane Vogel

December 9, 2020

Dear Governor Whitmer,

I am writing on behalf of Scio Township to request your support for the designation of the Gelman Sciences, Inc. site located in Scio Township, Michigan (Gelman Site) as a United States Environmental Protection Agency (USEPA) National Priorities List Site, commonly called a USEPA Superfund Site.

Based upon the USEPA 2017 Preliminary Assessment conducted on the Gelman Site, the Gelman Site qualifies as a USEPA National Priorities List (NPL) Site. We request that you provide a Concurrence Letter to USEPA supporting the continuance of the designation process for inclusion of the Gelman Site as a NPL Site.

Previous investigative work has established that the Gelman Site has already contaminated an approximately four-mile by one-mile area of the local aquifer with 1,4-dioxane (dioxane). The dioxane contamination is a threat to a public potable water supply; private residential water wells; residential buildings from vapor intrusion; and the natural resources. This dioxane pollution presents an imminent and substantial endangerment to public health and the environment.

The communities have worked with the Michigan Department of Environment, Great Lakes and Energy and Gelman through a 1992 Consent Judgment to obtain a protective remedy for this site. However, Gelman has refused to perform work that will protect the public health and the environment from the release and migration of dioxane, which USEPA has categorized as a probable human carcinogen. The proposed August 2020 Fourth Amended Consent Judgment has been rejected by Scio Township and other local communities as not sufficient to protect the lives, homes and environment, see attached Resolution. **The County of Washtenaw, City of Ann Arbor, Ann Arbor Charter Township and Scio Township are now in agreement that placing the Gelman Site on the NPL is the most viable mechanism to address the environmental risks posed to the community by the Gelman contamination.**

Thank you.

Sincerely,

William Hathaway
Supervisor – Scio Township

Enclosure

827 N. Zeeb Road · Ann Arbor, MI 48103
734/369-9400 · 734/665-0825 Fax
www.ScioTownship.org

Scio Township Board Of Trustees
Resolution Rejecting The 4th Amended Consent Judgment And
Renewing The Petition For the Gelman Sciences, Inc. Site
To Be Designated As A USEPA Superfund Site

Whereas, From 1966 and continuing into the 1980s, Gelman Sciences, Inc. (Gelman), generated many tons of 1,4-dioxane as a waste material of its production process at its plant located in Scio Township and, through various means, dumped this hazardous chemical into the natural environment where it contaminated the surface and groundwaters of the State; and

Whereas, Members of the public and environmental advocates have worked for decades to document the problem and seek State of Michigan action to require Gelman to clean up its toxic pollution, but Gelman has evaded responsibility by repeatedly concealing the extent of the contamination, opting for less-effective clean-up methods, and using legal strategies to delay and thereby allow the plume of 1,4-dioxane pollution to spread through the groundwater, contaminating wells and potentially intruding into residential basements; and

Whereas, The State of Michigan has for decades litigated against and attempted to regulate Gelman to enforce the State of Michigan environmental laws, but the dioxane plume continues to spread in multiple directions and toward the Huron River; and

Whereas, Scio Township, Ann Arbor Charter Township, and the Sierra Club joined together in 2016 to petition for action by the United States Environmental Protection Agency (USEPA) to designate the Gelman site a Superfund site; and

Whereas, The Scio Township official position supporting the designation of Gelman site as a USEPA Superfund site was approved by a unanimous vote of the board of trustees on June 14, 2016, and remains in effect; and

Whereas, Scio Township intervened, together with others, in the State's ongoing lawsuit against Gelman pending in Washtenaw County Circuit Court; and

Whereas, Settlement negotiations have occurred since 2017, with Scio Township's participation, toward a new consent judgment that would result in better cleanup of the contamination; and

Whereas, Scio Township is dissatisfied with progress on the delineation, containment and remediation of the contamination under the current third or proposed fourth consent judgment; and

Whereas, The USEPA completed the Preliminary Assessment in 2017 and indicated that the Gelman Site was eligible for the National Priorities List (NPL) but a State Concurrence Letter was required to continue the NPL designation process; and

Whereas, The delineation, containment and remediation of the contamination will be bolstered by USEPA's active involvement and enforcement of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the "Superfund" Act, as it applies to the contamination.

Whereas, This renewal of Scio Township's 2016 petition for involvement by USEPA does not preclude simultaneous efforts to obtain a thorough clean-up either through negotiations or a court-ordered ruling from the Washtenaw County Circuit Court;

Resolved, That the Scio Township Board of Trustees rejects the fourth amended consent judgment based on the following specific areas of concern raised by members of the public and asks that the Washtenaw County Circuit Court consider these items as it formulates a new plan for remediation of the Gelman site:

1. Revise the 500 ppb standard for termination of extraction wells to a lower standard of continuing to pump and treat as long mass removal is still occurring.

2. Make explicit the right of the Intervenors to participate in the NPDES permitting process, including the process for any required wetland permits.

3. Do NOT allow the discharge of treated wastewater to First Sister Lake, instead require alternative discharge sites for any water pumped and treated from the Parklake well, either by piping back to the Gelman site or piping to a site east of the Ann Arbor water intakes unless treated to non-detect and in quantities not to exceed 500 gallons a day.

4. Prohibit the expansion of the Prohibition Zone beyond the boundaries established in the third amended consent judgement.

5. Re-establish the Maple Road Containment Objective with the new generic GSI of 280 ppb

6. Re-establish the Little Lake Area System Non-expansion Objective and operation of the Ann Arbor Cleaning Supply Well.

7. Require that Gelman and EGLE perform Method 522 dioxane analytical analysis on all drinking water wells, Sentinel Wells and Compliance Wells samples.

8. Lower the trigger levels for all the delineation/sentinel wells in the Western Area and along the northern boundary of the Prohibition Zone from 7.2 ppb to a level half of the whatever the current State drinking water standard is, to ensure that remedial action takes effect before the measured level exceeds the allowable amount.

9. Require Gelman to conduct quarterly surface water sampling of all the Allen Creek storm water drains east of Maple Road, Honey Creek, First Sister Lake, etc.

10. Establish metrics/standards for the phytoremediation in the source area. For example, specify what action would be triggered if plant detritus is found to contain dioxane rather than to have dispersed it. State how long the phytoremediation will last, how it will be maintained, and under what conditions it will be discontinued.

11. Mandate additional monitoring wells for delineation, particularly toward Barton Pond so that expansion of the contamination plume will be detected well before it reaches Barton Pond, whatever direction it is traveling.

12. Make the three optional extraction wells in the source area mandatory for a total of 6 extraction wells.

13. Perform a Remedial Design Investigation across the plume area to to determine how many extraction wells are required and at what pumping rate to control and capture the dioxane groundwater plume.

14. Locate enough additional Sentinel and Compliance Wells along the northern boundary of the Prohibition Zone, east of Maple Road and across M-14 in the northwestern area near the Wagner Road and Dexter/Ann Arbor Road intersection to ensure that expansion of the contamination plume won't escape detection.

15. Require that the Municipal Water Connection Contingency Plan provide a private land owner with a municipal water supply when the dioxane concentration reaches one-half of the drinking water criterion.

16. Do not permit Gelman to apply a Mixing Zone-Based GSI to attain compliance with the GSI Objective.

17. Change the definition of GSI to the new 280 ug/L dioxane from the old 2,800 ug/L dioxane without placing any preconditions such as the omission of the Maple Road Containment Objective.

18. Require that Gelman provide public, Quarterly Reports including: analytical trends; compliance with CJ objectives and criteria; compliance with Verification Plans, Monitoring Plans, and Down-gradient Investigations; discussion of quarterly analytical results and protocols; extraction system requirement compliance; plume migration compliance; and recommendations for follow-up actions.

19. Protect the ongoing rights of local government to intervene in court processes related to the Gelman contamination so that they can effectively advocate on behalf of the health and safety of their residents.

Resolved, That the Scio Township Board of Trustees supports USEPA active involvement, as the lead agency, and enforcement of CERCLA, the "Superfund" Act, as it applies to the contamination;

Resolved, That the Scio Township Board of Trustees reaffirms its request the USEPA to list the Gelman Site a "Superfund" Site on the National Priorities List under CERCLA;

Resolved, That the Scio Township Board of Trustees authorizes the Township Supervisor to write to the Governor enclosing this resolution and soliciting a Concurrence Letter to USEPA in support of making the Gelman Site into a National Priorities List site;

Resolved, That the Scio Township Board of Trustees authorizes the Township Clerk to send this resolution and any such State Concurrence to the Washtenaw County delegation to the Michigan Legislature, the Director of the Michigan Department of Environment, Great Lakes, and Energy; and Congresswoman Debbie Dingell; and

Resolved, That the Scio Township Board of Trustees authorizes the Supervisor to take such further actions that are consistent with the purposes of this resolution.

The foregoing preamble and resolution were offered by Trustee Kathleen Knol, and supported by Trustee Jacqueline Courteau at the Regular Meeting of the Board of Trustees, Township of Scio, County of Washtenaw, State of Michigan, at the Regular Meeting held remotely at 7:00 p.m. on Tuesday, December 8, 2020.

ROLL CALL VOTE:
Ayes: Supervisor William Hathaway, Treasurer Donna E. Palmer, Trustee Jacqueline Courteau, Trustee Alec Jerome, Trustee Kathleen Knol, Trustee Jane Vogel.
Nays: Clerk Jessica M. Flintoft.

RESOLUTION DECLARED ADOPTED.

Jessica M. Flintoft
Clerk, Township of Scio

CERTIFICATE

I hereby certify that the foregoing is a true and complete copy of a resolution adopted by the Board of Trustees, of the Township of Scio, County of Washtenaw, State of Michigan, at the Regular Meeting held remotely at 7:00 p.m. on Tuesday, December 8, 2020, and that said meeting was conducted and public notice of said meeting was given pursuant to and in full compliance with the Open Meetings Act No. 267, Public Acts of Michigan, 1976, as amended, and that the minutes of said meeting were kept and will be or have been made available as required by said Act.

Dated: December 9, 2020

Jessica M. Flintoft
Clerk, Township of Scio

Attachment B

NPDES Permit No. MI0048453 Discharge Data – Gelman Site, Ann Arbor, MI

November 8, 2024

PROJECT NOTE	WESTON SOLUTIONS,
To: Gelman Sciences Inc Site File	**Date:** November 8, 2024
Task Order No.: 68HE0723F0077	
From: G. Gilliland, Weston Solutions, Inc.	
Subject: NPDES Permit No. MI0048453 Discharge Data – Gelman Site, Ann Arbor, MI	

Background information

The Michigan Department of Environment, Great Lakes, and Energy (EGLE), formerly Michigan Department of Environmental Quality (MDEQ), issued National Pollutant Discharge Elimination System (NPDES) Permit No. MI0048453 on May 9, 1997. The permit authorized Gelman/Pall to discharge 800 gallons per minute (gpm) of treated groundwater to an unnamed tributary of Honey Creek, which eventually feeds into the Huron River, with effluent limitations of 60 parts per billion (ppb; equivalent to micrograms per liter [µg/L]) for the daily maximum and 10 ppb for the monthly average. Pall began discharging treated groundwater pursuant to the Permit shortly after it was issued [see Attachment A, pp. 8–9]. The 2010 and 2016 permit renewals changed the limits to 1.872 million gallons per day (MGD) (i.e., 1,300 gpm) with effluent limitations of 7 µg/L for the daily maximum and 22 µg/L for the monthly average (see Attachment B, p. 3, and Attachment C, p. 3).

Discharge Monitoring Data

EGLE has provided EPA with two spreadsheets of discharge monitoring data for Permit No. MI0048453, one spanning the years 1997 to 2010 and the other spanning the period October 2010 to May 2024; excerpts from these spreadsheets are included as Attachments D and E, respectively). The data, as reported by Gelman on discharge monitoring reports (DMR) submitted to EGLE, show that the treated effluent that was discharged to the unnamed tributary of Honey Creek under the permit contained 1,4-dioxane at monthly average concentrations ranging from 0.1 µg/L to 19.6 µg/L and daily maximum concentrations ranging from 1 µg/L to 350 µg/L. The data indicate numeric violations of the 1,4-dioxane effluent limitations as follows:

- August 1999: Daily maximum of 105 µg/L
- November 1999: Monthly average of 13.7 µg/L; Daily maximum of 112 µg/L
- January 2000: Daily maximum of 79.5 µg/L
- October 2000: Monthly average of 19.6 µg/L; Daily maximum of 350 µg/L
- July 2003: Daily maximum of 83 µg/L
- August 2021: Monthly average of 7.6 µg/L

PROJECT NOTE	WESTON SOLUTIONS,

In addition to the numeric violations under Permit No. MI0048453, Gelman/Pall received violations for unreported or overdue 1,4-dioxane effluent concentrations for January 2005, September 2005, February 2011, July 2011, August 2011, June 2012, October 2012, November 2012, January 2013, June 2013, and March 2014.

As documented in the HRS Documentation Record at listing, Gelman also committed discharge violations prior to issuance of Permit No. MI0048453. These violations occurred under the 1965 Order of Determination that allowed Gelman to discharge 9,000 gallons of process wastewater containing 1,4-dioxane into the ground [HRS Refs. 61, p. 1; 94, p. 2]; under groundwater discharge permit No. M00337, issued in May 1977 and modified in June 1978 [HRS Refs. 37, pp. 1–8; 38, p. 1; 39, p. 1; 66, p. 1; 68, p. 33]; and under Gelman's groundwater exemption permit [HRS Ref. 71, p. 1].

Gerald V. Gilliland, P.G.
Principal Project Scientist

Attachments A through E

ATTACHMENT A - EGLE (MDEQ) 2002

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF ADMINISTRATIVE HEARINGS

Constitution Hall
525 West Allegan Street
P.O. Box 30473
Lansing, MI 48909-7258

IN RE: GELMAN SCIENCES INC.

Part 31, Point Source Pollution Control (NPDES) Water Resources Protection of the Natural Resources And Environmental Protection (NREPA), 1994 P.A. 451, As Amended.

Petitions on Modified Permit issued to Pall Life Sciences, Inc.

NPDES No. MI 0048453

FINK, ZAUSMER & KAUFMAN, P.C.
MICHAEL L. CALDWELL (P40554)
Co-Counsel for Pall Life Sciences, Inc.
(f/k/a Gelman Sciences Inc.)
31700 Middlebelt Road, Ste. 150
Farmington Hills, MI 48334
(248) 851-4111

BODMAN, LONGLEY & DAHLING, L.L.P.
FREDERICK J. DINDOFFER (P31398)
KURT M. BRAUER (P54061)
Attorneys for the City of Ann Arbor
34th Floor, Renaissance Center
Detroit, MI 48243

WILLIAMS ACOSTA, PLC
ALAN D. WASSERMAN
Co-Counsel for Pall Life Sciences, Inc.
(f/k/a Gelman Sciences Inc.)
2430 First National Bldg
Detroit, MI 48226
(313) 963-3873

CHRISTOPHER CONN
Michigan Department of Environmental Quality
Surface Water Quality Division
525 W. Allegan Street
P.O. Box 30273
Lansing, Michigan 489090-7773

ROBERT P. REICHEL (31878)
Dept. of Attorney General
Attorney for Michigan Department of
Environmental Quality ("MDEQ")
Natural Resources Division
300 South Washington Square
Lansing, MI 48933
(517) 373-1410

MOTION FOR ORDER ALLOWING CONTINUED OPERATION UNDER MODIFIED PERMIT

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

Respondent and Permittee, Pall Life Sciences, Inc. ("Pall"), through its attorneys, Fink, Zausmer & Kaufman, P.C. and Williams Acosta, PLC, and states as follows:

1. Pall is responsible for addressing the groundwater contamination associated with the former Gelman Sciences Inc. ("Gelman") facility located in Scio Township. Pall purchased Gelman in February 1997 and assumed Gelman's obligations under the Consent Judgment entered in Granholm v Gelman Sciences Inc, Washtenaw County Court Case No., 88-34734 ("the Consent Judgment").

2. On July 17, 2000, the Hon. Donald E. Shelton, the Washtenaw County Circuit Court Judge overseeing implementation of the Consent Judgment, issued his Opinion and Remediation Enforcement Order ("the REO"). (Exhibit 1). After a hearing regarding Pall's cleanup program, Judge Shelton concluded that:

> The defendant [Pall], particularly since the change in ownership, has acted in good faith to meet its obligations to identify and clean up the polluted water supplies. It is also clear, however, that the purging of dioxane has not occurred fast enough to provide the public, or the Court, with assurance that the plume of dioxane was contained as early as it should have been or that there is an ongoing approved plan that will lead to the removal of unlawful levels of this pollutant from the area's water supplies. (REO, p. 2).

Judge Shelton went on to instruct Pall to develop a plan to complete the groundwater remediation within five years. Pall developed the required plan and it was adopted as an Order of the Court on January 10, 2001 ("the 5-Year Plan").

3. Both the Consent Judgment and the 5-Year Plan contemplate an extensive groundwater purge and treat system and that Pall would discharge the treated groundwater to an unnamed tributary of Honey Creek. This discharge is authorized by NPDES Permit No. MI0048453, issued on June 16, 2000 (the "Permit"). Until recently, the Permit authorized Pall to discharge up to 1,152,000 gallons per day ("gpd") or 800 gallons per minute ("gpm") of treated groundwater.

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

4. In November, 2001, Pall asked the Michigan Department of Environmental Quality ("MDEQ") to increase the discharge volume limit of the Permit from 1,152,000 gpd to 1,872,000 gpd (1300 gpm). Pall asked for this additional capacity so that it could increase the amount of contaminated groundwater being purged from the aquifers. Pall needed the additional capacity in order to meet the five year cleanup goal set forth in Pall's 5-Year Plan and to address recently discovered groundwater contamination in the "Unit E aquifer."

5. After public notice, the required comment period, and a public hearing, the MDEQ approved the requested permit modification and issued the modified permit on April 26, 2002 ("Modified Permit"). By its terms, the Modified Permit was immediately effective. (Exhibit 2).

6. As authorized by the Modified Permit, Pall quickly increased the rate of groundwater cleanup and began discharging over 1,700,000 gpd of treated groundwater.

7. The additional volume included over 200 gpm of groundwater purged from the Unit E aquifer. This recently discovered contamination has been given a high priority for remediation by Pall, the MDEQ Environmental Response Division, the Office of the Attorney General, and Judge Shelton.

8. On June 24, 2002, the City of Ann Arbor and a citizens group called the Scio Residents for Safe Water ("SRSW") filed petitions challenging the Modified Permit.

9. The Modified Permit contains the following provision regarding the effect of challenges to the permit modification:

> This modified permit takes effect on the date of issuance. Any person who is aggrieved by this permit modification may file a sworn petition with the Office of Administrative Hearings of the Michigan Department of Environmental Quality, setting forth the conditions of the permit modification which are being challenged and specifying the grounds for the challenge. The Department may reject any petition filed more than 60 days after issuance as being untimely. If any condition of this permit modification is administratively challenged, the

> entire permit modification is stayed and the current permit will remain in effect until the Department takes final action after the Administrative Hearing.

Modified Permit, p. 1.

This provision could be interpreted as allowing the third party petitions filed by the City and the SRSW to automatically stay the entire permit modification, including the increase the amount of treated groundwater Pall can discharge.

10. For the reasons set forth in Pall's supporting Brief, such an interpretation would violate Pall's statutory rights under Michigan's Administrative Procedures Act, MCL 24.201, et seq.

11. Such an interpretation would also be contrary to the public's interest in achieving a timely groundwater cleanup. Unless this Court issues an order allowing Pall to continue to discharge under the Modified Permit's higher discharge limits, Pall would be prevented from purging at the higher rate approved by the MDEQ until this contested case is resolved, which could be many months from now.

12. Based on the advice of the Attorney General's office, Pall decreased its purge rate to the prior volume limit (800 gpm) until this Court could review the effect and scope of the stay provision. This restriction on Pall's groundwater remediation has jeopardized Pall's ability to meet the five year cleanup goal.

13. If the Modified Permit is stayed pending resolution of a contested case, Pall and the public will be irreparably harmed because: (a) Pall may be unable to meet its five year cleanup goal; (b) Pall will be forced to reduce or eliminate purging from the Unit E aquifer; and (c) any reduction in the purging from the Unit E aquifer will make it immeasurably more difficult to remediate the contamination in this deep aquifer. The public and the environment will be

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

4

irreparably harmed by the slow down in Pall's groundwater cleanup program that would result from staying the Modified Permit. In addition, Pall faces potential sanction from the Court and/or MDEQ Environmental Response Division if it is unable to meet its obligations under the 5-Year Plan.

14. As set forth in the supporting Brief, and as the MDEQ has already concluded, the increased volume discharge allowed in the Modified Permit does not pose a threat to human health or the environment. Therefore, allowing Pall to continue to operate under the Modified Permit while this contested case is resolved will be in the public interest.

WHEREFORE, Pall respectfully requests that this Court issue an order allowing Pall operate under the terms of the Modified Permit and to discharge up to 1,872,000 gpd in accordance with the Modified Permit's volumetric limits until the Department takes final action and all appeals have been exhausted, or until further order of this Court.

Respectfully submitted,

FINK, ZAUSMER & KAUFMAN, P.C.



MICHAEL L. CALDWELL (P40554)
Co-Counsel for Pall Life Sciences, Inc.
(f/k/a Gelman Sciences Inc.)
31700 Middlebelt Road, Ste. 150
Farmington Hills, MI 48334
(248) 851-4111

WILLIAMS ACOSTA, PLC
ALAN D. WASSERMAN
Co-Counsel for Pall Life Sciences, Inc.
(f/k/a Gelman Sciences Inc.)
2430 First National Bldg
Detroit, MI 48226
(313) 963-3873

Dated: July 16, 2002

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

ATTACHMENT A - EGLE (MDEQ) 2002

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF ADMINISTRATIVE HEARINGS

Constitution Hall
525 West Allegan Street
P.O. Box 30473
Lansing, MI 48909-7258

IN RE: GELMAN SCIENCES INC.

Part 31, Point Source Pollution Control (NPDES) Water Resources Protection of the Natural Resources And Environmental Protection (NREPA), 1994 P.A. 45d, As Amended.

Petitions on Modified Permit issued to Pall Life Sciences, Inc.

NPDES No. MI 0048453

FINK, ZAUSMER & KAUFMAN, P.C.
MICHAEL L. CALDWELL (P40554)
Co-Counsel for Pall Life Sciences, Inc.
(f/k/a Gelman Sciences Inc.)
31700 Middlebelt Road, Ste. 150
Farmington Hills, MI 48334
(248) 851-4111

BODMAN, LONGLEY & DAHLING, L.L.P.
FREDERICK J. DINDOFFER (P31398)
KURT M. BRAUER (P54061)
Attorneys for the City of Ann Arbor
34th Floor, Renaissance Center
Detroit, MI 48243

WILLIAMS ACOSTA, PLC
ALAN D. WASSERMAN
Co-Counsel for Pall Life Sciences, Inc.
(f/k/a Gelman Sciences Inc.)
2430 First National Bldg
Detroit, MI 48226
(313) 963-3873

CHRISTOPHER CONN
Michigan Department of Environmental Quality
Surface Water Quality Division
525 W. Allegan Street
P.O. Box 30273
Lansing, Michigan, 48909-7773

ROBERT P. REICHEL (31878)
Dept. of Attorney General
Attorney for Michigan Department of
Environmental Quality ("MDEQ")
Natural Resources Division
300 South Washington Square
Lansing, MI, 48933
(517) 373-1410

BRIEF IN SUPPORT OF MOTION FOR ENTRY OF ORDER ALLOWING CONTINUED OPERATION UNDER MODIFIED PERMIT

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

INTRODUCTION

Pall Life Sciences, Inc. ("Pall") is the permittee under NPDES permit No. MI 0048453 ("the Permit"). In October 2001 Pall asked the Surface Water Quality Division ("SWQD") of the Michigan Department of Environmental Quality ("MDEQ") to modify the Permit to allow Pall to discharge more treated groundwater to the Honey Creek Tributary. Pall asked for this modification so that it could increase the pace of its groundwater cleanup program of the 1,4-dioxane contamination that is present in the vicinity of its Scio Township facility. The MDEQ approved the requested modification and issued a modified permit, effective immediately, on April 26, 2002 ("the Modified Permit"). Subsequently, the City of Ann Arbor ("the City") and the Scio Residents for Safe Water ("SRSW") filed petitions challenging the Modified Permit. The Modified Permit contains a boilerplate provision that, on its face, purports to stay the entire permit modification upon the filing of a petition until the MDEQ takes final action after the contested case.

Pall's motion asks this Court issue an order allowing Pall to operate under the terms of the Modified Permit because the so-called stay provision cannot be enforced in the context of a modification sought by the permittee. Staying the permit modification sought by Pall, based on the third-party petitions at issue here, would violate Pall's statutory rights under Michigan's Administrative Procedures Act. Issuance of the requested order is also supported by the same equitable considerations that would justify an injunction allowing Pall's discharge to continue. None of the issues raised in the petitions justify staying the Modified Permit or the harm to the public and the environment that slowing down Pall's cleanup program would cause.

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

FACTUAL BACKGROUND

A. Pall's Permit

In October 1992 Gelman Sciences Inc. ("Gelman") entered into a Consent Judgment with the Michigan Department of Environmental Quality ("MDEQ") and agreed to remediate the 1,4-dioxane groundwater contamination in the vicinity of its Scio Township facility. In February of 1997, Pall Corporation (n/k/a Pall Life Sciences, Inc. ("Pall")) purchased Gelman and assumed Gelman's cleanup obligations under the Consent Judgment.

The Consent Judgment calls for an extensive groundwater purge and treat program utilizing a UV/Hydrogen Peroxide treatment system. Following treatment, the water is to be discharged to an unnamed tributary of Honey Creek, which eventually feeds into the Huron River. This surface water discharge was authorized by NPDES permit no. MI0048453 ("the Permit"), which the MDEQ issued on May 9, 1997. Pall began discharging treated groundwater pursuant to the Permit shortly after it was issued.

As this Court will recall, perhaps painfully, several petitions were filed in November and December of 1997 challenging a number of the conditions in the Permit. These petitions culminated in a lengthy contested case hearing and this Court's Proposal For Decision dated April 5, 2000 (the "PFD").[1] Director Harding subsequently modified the PFD and adopted effluent limitations recommended by the MDEQ.[2] In all other respects, Director Harding adopted this Court's findings as the MDEQ's Final Decision, including the finding that the proposed 800 gpm discharge volume

---

[1]This Court's PFD is attached as Exhibit 1.

[2]Director Harding's June 16, 2000 Final Order ("the Final Order") is attached as Exhibit 2.

would not cause injury to the groundwater, flooding or erosion. No appeal from the Final Order was taken.

Pursuant to the Final Order, the Permit authorizes Pall to discharge 800 gpm of treated groundwater with effluent limitations of 60 parts per billion (ppb) for the daily maximum and 10 ppb for the monthly average. The Permit expires on October 1, 2004.

B. Pall's 5-Year Plan

In July 2000 the Washtenaw County Circuit Court Judge overseeing implementation of the Consent Judgment (Hon. Donald E. Shelton) instructed Pall to develop a plan designed to remediate the drinking water supplies affected by the 1,4-dioxane to acceptable levels within five years ("the Plan"). The Plan developed by Pall describes how Pall intends to achieve this ambitious goal and sets forth monthly benchmarks for measuring the cleanup progress.[3] The benchmarks are based on the mass of 1,4-dioxane that Pall and the MDEQ estimate is present in the aquifers. Each monthly benchmark specifies the amount of 1,4-dioxane that needs to be removed on a cumulative basis such that, at the end of the 5-year time frame, sufficient mass has been removed to achieve the cleanup criteria. After the MDEQ reviewed and approved the Plan, it was adopted as an order of the Court.[4]

Pall has made significant progress toward the five year cleanup goal. Since the Plan was adopted, Pall has installed 10 new purge wells (in addition to the four existing purge wells) and begun operating a previously installed state-of-the art horizontal well. Overall, Pall increased its total purge rate from just over 300 gpm before the 5-Year Plan was approved to almost 800 gpm, the maximum volume authorized by the Permit.

---

[3]Pall's December 20, 2000 5-Year Plan is attached as Exhibit 3.

[4]Judge Shelton's January 10, 2001 Order Adopting 5-Year Plan is attached as Exhibit 4.

FINK, ZAUSMER & KAUFMAN, P.C., 31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

This increase in purge rates has lead to a dramatic increase in the rate of groundwater cleanup. Over the 42 months of cleanup prior to the Plan, Pall purged and treated approximately 555,387,753 gallons of contaminated groundwater and removed about 22,835 pounds of 1,4-dioxane. These totals translate to monthly averages of 13,223,517 gallons and 543 pounds, respectively. During the first 18 ½ months Pall has operated under the Plan, Pall treated approximately 566,884,533 gallons of groundwater and removed about 17,400 of 1,4-dioxane. The monthly averages for this period are 30,642,407 gallons and 941 pounds, respectively.[5] As measured by its benchmarks, Pall has removed about 17,400 pounds of the 26,000 pounds originally estimated to be present in the aquifer. Pall has achieved this progress without sacrificing treatment efficiency. Pall has continued to treat its discharge to levels within its permit limits.[6]

C. Pall's Permit Modification Request.

Last summer, Pall discovered 1,4-dioxane in the "Unit E" aquifer, the deepest aquifer in the area. This aquifer was previously believed to be uncontaminated. By December, Pall had installed two purge wells into this newly discovered contamination zone.

In order to accommodate the additional purge volume from the Unit E wells and to ensure that Pall remained on schedule with regard to the previously known areas of contamination, Pall asked the MDEQ to modify its Permit to allow it to discharge up to 1300 gpm. Pall submitted its modification request in October 2001. A public hearing on Pall's proposed permit modification was held earlier this year, after the requisite notice and comment period. The MDEQ received extensive

---

[5]Exhibit 5.

[6]A spreadsheet identifying average concentration of residual 1,4-dioxane present in Pall's discharge is attached as Exhibit 6.

public comment"– including comments from both the City and the SRSW.[7] After reviewing the comments, the MDEQ approved Pall's Modified Permit, effective immediately, on April 26, 2002.[8] The MDEQ also provided written responses to the comments submitted by the public, including those provided by the petitioners.[9]

D. Pall's Progress Halted by Petitions.

The additional cleanup capacity provided by the Modified Permit allowed Pall to dramatically increase its rate of cleanup. From May 9, 2002, until July 1, 2002, Pall purged and treated approximately 1240 gpm of contaminated groundwater, 200 gpm from the Unit E wells. Pall was able to increase its removal rate from 682 pounds in April, to 898 in May, even though Pall was only purging at the higher rate for part of May. In June, Pall's first full month of purging at the higher rate, Pall removed 998 pounds of 1,4-dioxane from the groundwater. Pall was also able to begin purging over 200 gpm from the Unit E wells in an effort to halt or reduce off-site migration of that plume.

The Modified Permit, however, contains the following standard boilerplate language that allows an aggrieved party to appeal the modification within 60 days of issuance:

> Any person who is aggrieved by this permit modification may file a sworn petition with the Office of Administrative Hearings of the Michigan Department of Environmental Quality, setting forth the conditions of the permit which are being challenged and specifying the grounds for the challenge. The Department may reject any petition filed more than 60 days after issuance as being untimely. If any condition of this permit modification is administratively challenged, the entire permit

[7]The City's comments are attached as Exhibit 7. The SRSW did not send any comments as an organization that Pall is aware of. Numerous citizens, one or more of whom may be members of the SRSW, submitted written comments.

[8]The April 26, 2002 Modified Permit is attached as Exhibit 8.

[9]The MDEQ's Responsiveness Summary is attached as Exhibit 9.

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

> modification is staved and the current permit will remain in effect until the Department takes final action after the Administrative Hearing. (Emphasis added).

The emphasized language purports to stay the modified provisions of the permit upon the filing of a petition.

The City and the SRSW filed petitions opposing the Modified Permit, apparently on June 24, 2002.[10] After consulting with the Attorney General's office, Pall reduced its discharge rate – and the rate of groundwater cleanupa- to the previous limit of 800 gpm, in order to avoid any possible permit violation. This reduction in capacity has forced Pall to essentially abandon purging from the Unit E aquifer and to reduce the pace of its cleanup efforts overall. It has also reduced the likelihood that Pall will be able to meet its monthly benchmarks and achieve the five-year cleanup goal.

The petitions filed by the City and the SRSW identify a number of issues that this Court previously rejected during the earlier contested case or address portions of the Permit that were not modified. The only new challenge that is arguably related to the modified discharge limitation is the City's concern that detectable levels of 1,4-dioxane could conceivably be present down stream, at the point in the Huron River where the City's intake for its municipal water system is located.

LEGAL ARGUMENT

I. The Automatic Stay Provision, If Enforced With Respect to Petitions Brought By Third Parties, Violates Section 92 of the Michigan Administrative Procedures Act

The language staying the permit modification is standard language recently added to all NPDES permits at the suggestion of the Attorney General's office in an attempt to ensure that NPDES permits comply with the Michigan Administrative Procedures Act, MCL 24.201, et seq. (MAPA). This language is intended to allow a permittee to continue to operate under the conditions

[10]The petitions filed by the City and the SRSW are attached collectively as Exhibit 10.

of an existing permit while it exercises its due process right to challenge more restrictive modifications imposed on it by the MDEQ. This interpretation of the stay provision comports with the statutory rights granted by Section 91(2) of MAPA.[11] Section 91(2) allows a permittee to continue to operate under the terms of the previous permit while appealing a permit denial or the issuance of a more restrictive modified permit. While the automatic stay is appropriate – and required by Section 91(2)'– where the MDEQ attempts to restrict the permittee's rights through a permit denial or modification, the automatic stay is unnecessary where the permittee has requested the modification. Rather than effectuating a statutory right, applying the stay provision in that situation violates the permittee's right to due process under MAPA.

A state cannot suspend the operation of an NPDES permit without following appropriate procedures.[12] Thus, a state environmental protection agency could not suspend a construction schedule in an NPDES permit by authorizing the suspension administr tively through letters.[13] Under MAPA, the MDEQ cannot suspend any portion of an NPDES permit except as authorized by Sec. 92 of MAPA and Rule 2159(1).

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

---

[11] Sec. 91(2) provides: "When a licensee makes timely and sufficient application for renewal of a license or a new license with reference to activity of a continuing nature, the existing license does not expire until a decision on the application is finally made by the agency, and if the application is denied or the terms of the new license are limited, until the last day for applying for judicial review of the agency order or a later date fixed by order of the reviewing court. This subsection does not affect valid agency action then in effect summarily suspending such license under section 92."

[12]United States v Citv of Toledo, 867 F Supp 603 (ND Ohio, 1994) (state could not suspend conditions in Toledo's NPDES permit without following procedures for modification, suspension, or revocation under 40 CFR 124.5).

[13] United States v Ohio Edison Co, 725 F Supp 928 (ND Ohio, 1989).

Absent a request from the permittee, an existing permit can only be amended, suspended or revoked as provided in Section 92 of MAPA, MCL 24.292. This section describes the procedure that must be followed before an existing permit can be modified:

> (1) Before the commencement of proceedings for suspension, revocation, annulment, withdrawal, recall, cancellation or amendment of a license, an agency shall give notice, personally or by mail, to the licensee of facts or conduct which warrant the intended action. Except as otherwise provided in the support and parenting time enforcement act, Act No. 295 of the Public Acts of 1982, being sections 552.601 to 552.650 of the Michigan Compiled Laws, or the regulated occupations support enforcement act, the licensee shall be given an opportunity to show compliance with all lawful requirements for retention of the license.
>
> (2) If the agency finds that the public health, safety or welfare requires emergency action and incorporates this finding in its order, summary suspension of a license may be ordered effective on the date specified in the order or on service of a certified copy of the order on the licensee, whichever is later, and effective during the proceedings. The proceedings shall be promptly commenced and determined. (Emphasis added).

The procedure outlined in Section 92 is mandatory. Where a license or permit has issued (as here) it cannot be suspended, revoked, annulled, withdrawn, recalled, cancelled or amended except in compliance with Sec. 92.[14] This prohibition cannot be circumvented by anticipatory language inserted into the permit itself. Moreover, the circumstances under which a NPDES permit can be stayed, modified, or revoked are defined by administrative rule. These circumstances do not include suspension of permit conditions during a contested case proceeding.[15]

---

[14] Rogers v Michigan State Bd Of Cosmetology, 68 Mich App 751 (1976).

[15] Mich Adm Code Rule 2159(1) governs modifications of NPDES permits. It provides:

R 323.2159. State and national permits; modification or revocation by the commission. Rule 2159. (1) The commission may modify any term or condition, including a schedule of compliance, of a permit or may revoke a permit upon its finding of any of the following:

(a) There is a change in any condition that requires a temporary or permanent reduction or elimination of a permitted discharge or constituent thereof.

(b) The administrator of EPA issues a regulation prescribing a restriction or prohibition of a waste or wastewater constituent which is not covered by the terms and conditions of a permit or the regulation is more stringent than any

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

The facts presented here are clear. Once the MDEQ issued the Modified Permit and declared it immediately effective on April 26, 2002, Pall was authorized to discharge 1300 gpm of treated groundwater. Thus, the permit in existence as of the date the City and the SRSW filed their petitions authorized Pall to discharge 1300 gpm. That authorization is effective until October 1, 2004, whena the Modified Permit expires, unless the MDEQ undertakes the process described in Section 92 of MAPA.

Pursuant to Sections 91(2) and 92 of MAPA, Pall is entitled to continue to operate under the conditions of its existing Modified Permit including the 1300 gpm limit, while Petitioners' challenges are resolved. If the stay provision of the Modified Permit is interpreted to allow a third-party petition to suspend the entire permit modification, it would violate Pall's statutory rights under MAPA. Such a stay would, in effect, amend or suspend the issued permit to the detriment of the permittee in a manner inconsistent with the standards of Section 92 and would prevent Pall from

---

limitation imposed on a wastewater constituent in a permit.

(c) A modification of the terms and conditions of a permit or a time schedule thereon is necessary because of an act of God or other conditions beyond the control of the permittee.

(d) In the case of discharges from publicly owned treatment works, federal treatment works grant funds are not available or are not sufficient to allow construction of the treatment works in a time schedule set forth in the permit.

(e) There is a violation of any term or condition of the permit.

(f) The permittee has obtained a permit by misrepresentation or has failed to disclose all relevant facts to the commission.

(g) A toxic effluent standard or prohibition, including any schedule of compliance specified therein, is established pursuant to section 307(a) of the federal act for a toxic waste or wastewater constituent which is present in the permittee's discharge and the standard or prohibition is more stringent than any limitation upon the waste or wastewater constituent in the permit.

(h) The POTW receives wastewater from a nondomestic source and the development of a pretreatment program is necessary to control the introduction of regulated pollutants.

(i) When a request for removal credits is approved in accordance with R 323.2162(3).

9

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

continuing to operate under its existing permit contrary to the permittee's rights under Section 91(2). The permit language also conflicts with Rule 2159(1) of the Michigan Administrative Code, which does not identify a permit challenge as a circumstance justifying suspension of a duly issued NPDES permit. Accordingly, any construction of the Modified Permit language requiring a stay of the modified provisions in the circumstances presented here cannot be enforced.

Based on the above, Pall asks this Court to issue an order allowing Pall to operate under the terms of the Modified Permit while this contested case is litigated.

II. Allowing Pall To Continue To Operate Under The Modified Permit Is In The Public's Interest.

An order allowing Pall to maintain the increased rate of cleanup pursuant to the Modified Permit while this matter is litigated would benefit the public and the environment. If reviewed under the familiar four-factor analysis applied by Michigan courts in the context of a request for injunctive relief, it is clear that the relief Pall seeks is equitable and in the public interest. The factors to be considered are: (1) the likelihood that the moving party will prevail on the merits; (2) the irreparable harm to the moving party if the relief is not granted; (3) the relative harm to the non-moving party; and (4) the harm to the public interest if the relief is not granted.[16] These considerations fully support the relief Pall seeks in its motion.

A. This Court Is Likely To Uphold The Modified Permit.

The Petitions do not raise any challenges that are likely to be upheld. This Court previously rejected most of the issues raised during the last contested case. Indeed, many of the grounds

---

[16] Alliance for the Mentally Ill of Michigan v Department of Community Health, 231 Mich App 647, 660-61 (1998); Michigan State Employees Association v Department of Mental Health, 421 Mich 142, 157-58 (1984).

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

identified in the Petitions are unrelated to the change in discharge volume, and instead focus on the Permit's effluent limitations, which were not changed. Consequently, there is no legal basis for raising these unrelated issues as a challenge to the Modified Permit. Finally, this Court will likely conclude – as the MDEQ already has – that the concern expressed by the City in connection with its water intake does not justify denying the Modified Permit. The possibility that the extreme conditions identified by the City will ever exist in the first place is beyond remote. Moreover, the 500 gpm increase in discharge volume does not materially increase the likelihood that 1,4-dioxane will ever endanger the City's water intake. No one disputes that the highest levels of 1,4-dioxane that might ever be observed are far below any applicable guidelines.

1. The Previous Contested Case Has Already Addressed, And Resolved The Majority Of The Bases Identified In The Petitions.

The Final Order issued by Director Harding adopting and amending this Court's Proposal for Decision resolved nearly all of the issues that Petitioners have stubbornly raised again in the current Petitions. The potential for harm to groundwater (City Petition, ¶ 2, also raised in the SRSW's Petition), erosion, and flooding (City Petition, ¶¶ 6 and 7, also raised in the SRSW's Petition), were all addressed and rejected by this Court during the previous contested case.[17] As this Court noted, the 800 gpm discharge at issue at that time would only raise the hydraulic head of the

[17]Pall refers the Court to the following portions of its Proposal for Decision:

Issue	Proposal for Decision
Harm to Groundwater	Findings of Fact, Nos 10, 11 and 12, p. 48 Findings of Law, Nos. 1-4, p. 50-51
Erosion/Flooding	Findings of Fact, No. 6, p. 47.

11

receiving stream about one inch.[18] This Court also observed that erosion problems were unlikely to occur since the Honey Creek was a mature meandering stream with low energy.[19] The 500 gpm increase at issue here will not materially change the situation.

This Court already examined in excruciating detail the allegation that the discharge of treated groundwater could affect downstream groundwater. James Janiczek, who testified during the previous contested case hearing analyzed the effect of the proposed discharge volume under "worst-case" scenarios and concluded that no harm to the groundwater in violation of Part 31 would occur.[20] Mr. Janiczek determined that the small amount of 1,4-dioxane that could possibly reach the groundwater (<5 ppb) was similar to what he and this Court found would not injure the groundwater when this issue was resolved in the prior contested case.[21] The conclusions Mr. Janiczek reached in the prior contested case were based on the concentration of 1,4-dioxane in the Honey Creek and were not dependant on the volume of the discharge. Hence, his conclusions remain unchanged by the proposed increase in volume.

The MDEQ also responded to concerns regarding flooding with a detailed analysis that is set forth in its Responsiveness Summary.[22] The MDEQ concluded that Pall's total flow rate under the Modified Permit (not just the portion attributable to the 500 gpm increase) would account for only

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

---

[18]Proposal for Decision, p. 47.

[19]Id.

[20]MDEQ Responsiveness Summary, Comment 2, pp. 2-3. See also the attached December 27, 2001 memo from Mr. Janiczek to Jim Sygo attached to the Responsiveness Summary.

[21]Janiczek Memo.

[22]Responsiveness Summary, Comment 4.

0.6% of the total flow in Honey Creek and 2.2% of the total flow in the tributary during flood events. The effect of Pall's discharge on any flooding is, therefore, negligible. The MDEQ conducted a similarly detailed analysis, including field observations, with regard to the erosion issue.[23] The MDEQ concluded that Pall's discharge would not "contribute to or cause bank erosion on Honey Creek and the unnamed tributary."[24]

The issue of whether the permit effluent limits reflect the "Best Available Technology" or "BAT" was also addressed in detail in the previous contested case. Director Harding's Final Order and Decision resolved this issue in favor of the MDEQ's proposed effluent limits, at least until October 1, 2004, when the current permit expires.[25] Since the Modified Permit does not change the effluent limitations previously determined to be BAT, there is no legal basis for challenging these limits now.[26]

In sum, this Court is not likely to overturn the Modified Permit based on concerns which have already been raised, litigated, and resolved. The Modified Permit does not materially alter the reasoning that supported the disposition of these issues in the last contested case. These previously resolved issues certainly provide no reason to prevent Pall from discharging at the higher rate while this matter is resolved, thereby allowing Pall's accelerated groundwater cleanup to continue.

---

[23]Responsiveness Summary, comment 5, pp. 4-5.

[24]Id. at p. 5.

[25]Responsiveness Summary, Comment 3, p. 3.

[26]See 40 CFR 124.5(c)(2) (only those conditions to be modified shall be reopened when a modification of an existing permit is proposed).

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

2. The Modified Permit Will Not Cause 1,4-Dioxane To Be Detected In The City Water Intake Under Any Realistic Scenario.

a. The Likelihood That The City's Worst Case Scenario Will Ever Occur Is Insignificant

The only new issue raised by Petitioners is the City's concern that detectable levels of 1,4-dioxane may be present in the Huron River at the point where the City's water intake is located. Interestingly, the City does *not* assert that even its unrealistic hypothetical scenario would cause 1,4-dioxane to be present in the City of Ann Arbor water supply itself – after the river water is treated, but prior to distribution. Nor does the City claim that its calculated levels of 1,4-dioxane exceed any applicable water quality or drinking water quality standard.[27]

The substance of the City's position regarding the water intake issue is, presumably, set forth in the written comments submitted by its Utilities Department.[28] The worst-case scenario described in the City's petition assumes the improbable convergence of two random events -- a prolonged drought of historic proportions and a discharge at the maximum daily concentration allowed under the permit. Even assuming that a basis exists for the numbers provided by the City, the probability of these two events occurring at the same time is insignificant. The City assumes a low flow condition in the river that could occur only during a severe and prolonged drought. According to

[27]The current standard for 1,4-dioxane in groundwater safe for drinking is 85 ppb. Based on Rule 57 of the Part 4 Rules, MDEQ reports that the WQBL for 1,4-dioxane at the point of intake for a surface water drinking water intake is 34 ppb. There is no dispute that even the most conservative predicted river concentrations do not even approach these numbers.

[28]March 22, 2002 correspondence from Sumedh Bahl, the Water Treatment Plant Superintendent, to Alec Malvetis, Exhibit 7.

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

the water flow data collected by the USGS, the water flow in the Huron River has exceeded the level identified by Petitioners on 99.5% of the days since 1914.[29]

It is also interesting to note that to service its customers this year the City is currently pumping more water out of the Huron River than the entire "low" flow used in its hypothetical. Obviously, if the Huron River's flow ever got as low as the City assumes for purposes of its petition, a few parts per billion of 1,4-dioxane would be the least of its concerns. Similarly, Pall's discharge has only contained 60 ppb or more a handful of times (during upset conditions) since it started discharging in 1997. Pall calculates that the odds of these two unrelated events occurring simultaneously to be approximately 1 in 50,000.[30]

Moreover, the scenario also assumes that during a time of historic drought, Pall would, and could, continue to extract, treat, and discharge 1300 gpm from the aquifers. Pall has already experienced difficulties in maintaining the purge rates of certain wells under its 800 gpm purge program. It is extremely unlikely that Pall would be able to continue to purge at a 1300 gpm rate during a time of prolonged drought because of the lower water table levels that would be associated with those weather conditions.

b. The MDEQ Has Reviewed The Potential Impact on the Water Intake and Has Concluded That The Modified Permit Does Not Threaten The Intake

In response to the City's comments, MDEQ did its own analysis of the issue using the flow data and methodology it uses to evaluate all such permits and concluded that the modified permit did not threaten the drinking water intake. MDEQ used "very conservative flows" and a "very

[29]Affidavit of James Brode, ¶ 6, Exhibit 11.

[30]Brode Affidavit, ¶ 9.

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

conservative" flow and discharge rate for the outfall. For example, MDEQ used the most restrictive of the 12 monthly 95% exceedence flows. This is the flow equal to or exceeded 95% of the time for the lowest flow month (i.e., the MDEQ based its calculations on a flow that was exceeded 95% of the time during the months of August, not the entire year). MDEQ also used the permitted maximum daily discharge of 60 ppb at the maximum discharge volume even though over the last three years the average daily discharge of 1.4-dioxane from the Pall outfall was 5.2 ppb.[31] Finally, as MDEQ noted, its calculations did not take into account degradation that occurs in the receiving stream through natural processes and the attenuation of the maximum daily concentration due to mixing in the receiving stream and time of travel to the location of the water intake. Even under these highly conservative assumptions, the MDEQ determined that proposed increased use "is not a threat to the safety of Ann Arbor's drinking water.[32] MDEQ's analysis demonstrates that the Modified Permit does not threaten the City of Ann Arbor water intake.

c. The Modified Permit Does Not Increase The Chance That 1,4-Dioxane Will Be Detected At The City's Water Intake.

The City cannot show that the increased use granted by the Modified Permit has a materially different effect than the currently permitted volume. The basis for its petition on this point is that the increased use may cause levels of 1,4-dioxane in the river at the water intake above the detection limit of 1.0 ppb. Prior to the recent modification, Pall's permit authorized a discharge into the Honey Creek at the volume of 800 gpm. The City predicts the difference between the two discharge volumes (with 60 ppb at the hypothetical "low flow" condition) is the difference between 1.2 ppb

[31]Responsiveness Summary, Comment 6, p. 6.

[32]Responsiveness Summary, p. 2.

and 3.9 ppb. This difference is immaterial considering that the detection limit is 1.0 ppb and the health-based drinking water criterion for 1,4-dioxane is 85 ppb. Thus, even under the City's own calculations, the Modified Permit will not have a material effect on the likelihood that 1,4-dioxane would ever impair the City's water intake.

B. The Environment, and Pall, would be irreparably harmed if Pall is forced to reduce its discharge to 800 gpm.

Unless the automatic stay provision is suspended, the petitions filed by City and the SRSW will force Pall to downsize its cleanup program and will in all likelihood prevent Pall from achieving its five-year cleanup goal. The Michigan Legislature and Michigan Courts have long recognized that a threat to the State's groundwater constitutes irreparable harm.[33] From the environmental perspective, it is absurd to put a halt to the progress Pall has made in addressing the groundwater contamination in order to avoid an almost non-existent possibility that detectable levels of 1,4-dioxane –well below any health-based criteria – may be present downstream. If the history of this site tells us anything, it is that the longer the 1,4-dioxane stays in the groundwater, the more likely it is to end up someplace it's not supposed to be. While Pall's purge system is sufficient at 800 gpm to contain the leading edges of the plume in the shallower aquifers, there is no commensurate environmental benefit to be gained by slowing down the cleanup.

The irreparable harm that would be caused by the capacity reduction is particularly acute with regard to the recently discovered Unit E aquifer contamination. Pall has installed two purge wells on its property into the Unit E plume. These purge wells are intended to reduce or eliminate the flow

[33]See e.g., Part 17 of NREPA, MCL 324.1701, et seq.; Attorney General v Thomas Solvent, 146 Mich App 55, 65 (1985) (injunctive order to halt migration of contaminated groundwater justified to prevent further contamination).

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

of contamination off Pall's property. Without the additional capacity provided by the Modified Permit, Pall will be unable to adequately address this newly discovered problem. It will be immeasurably more difficult to remediate the contamination in this deep aquifer once the additional mass of 1,4-dioxane migrates off-site. This plume flows in the direction of a heavily congested residential area. Due to the surrounding area, issues regarding the availability of sufficient space to erect a treatment system, safety, access, and to manage the groundwater once it has been purged and treated become almost insurmountable.[34] Pall is currently wrestling with these issues with regard to the portion of the plume that has already escaped the property boundaries. The MDEQ and the Washtenaw County Circuit Court Judge overseeing this cleanup have stressed that the source control these two wells would provide must be implemented as soon as possible. Preventing Pall from doing so because of the City's unrealistic concerns would irreparably harm the environment and Pall's ability to remediate this aquifer.[35]

C. The Balance of Equities and the Public Interest Strongly Favors Continuation of the Modified Permit

The balance of equities lies overwhelming in favor of the relief Pall seeks. Simply put, the public interest in maintaining an accelerated groundwater remediation system far outweighs the benefit the public would realize in avoiding the remote and strictly hypothetical risk postulated by the City. This is particularly true where the City's own calculations show that the increase in volume itself has almost no effect on the amount of 1,4-dioxane that could possibly be detected downstream.

---

[34]Affidavit of Farsad Fotouhi ¶ 12, Exhibit 12.

[35]See Affidavit of Farsad Fotouhi, ¶¶ 13, 14.

CONCLUSION

Based on the above, Pall asks this Court to issue an order allowing Pall to continue to operate under the terms of the Modified Permit during the pendency of this contested case. Applying the stay provision to the instant situation would violate the very statutory rights granted to Pall by MAPA that the language was intended to effectuate and would be contrary to the public interest.

FINK, ZAUSMER & KAUFMAN, P.C.



MICHAEL L. CALDWELL (P40554)
Co-Counsel for Pall Life Sciences, Inc.
(f/k/a Gelman Sciences Inc.)
31700 Middlebelt Road, Ste. 150
Farmington Hills, MI 48334
(248) 851-4111

WILLIAMS ACOSTA, PLC
ALAN D. WASSERMAN
Co-Counsel for Pall Life Sciences, Inc.
(f/k/a Gelman Sciences Inc.)
2430 First National Bldg
Detroit, MI 48226
(313) 963-3873

Dated: July 16, 2002

FINK, ZAUSMER & KAUFMAN, P.C.,
31700 MIDDLEBELT ROAD, SUITE 150, FARMINGTON HILLS, MI 48334-2374 • 721 N. CAPITOL, SUITE 2, LANSING, MI 48906-5163

ATTACHMENT B - 2010 Permit Renewal

PERMIT NO. MI0048453

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENT

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 *et seq*.) (the "Federal Act"), Michigan Act 451, Public Acts of 1994, as amended (the "Michigan Act"), Parts 31 and 41, and Michigan Executive Order 2009-45,

Pall Corporation
600 South Wagner Road
Ann Arbor, Michigan 48103

is authorized to discharge from the groundwater remediation treatment facility located at

600 South Wagner Road
Ann Arbor, Michigan 48103

designated as **Pall Life Sciences Inc**

to the receiving water named the unnamed tributary of Honey Creek in accordance with effluent limitations, monitoring requirements, and other conditions set forth in this permit.

This permit is based on a complete application submitted on March 24, 2009.

This permit takes effect on October 1, 2010. The provisions of this permit are severable. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term in accordance with applicable laws and rules. On its effective date this permit shall supersede NPDES Permit No. MI0048453, expiring October 1, 2009.

This permit and the authorization to discharge shall expire at midnight, **October 1, 2014**. In order to receive authorization to discharge beyond the date of expiration, the permittee shall submit an application which contains such information, forms, and fees as are required by the Michigan Department of Natural Resources and Environment (Department) by **April 4, 2014**.

Issued May 11, 2010.

Original Permit Signed by Daniel Dell
Daniel Dell, Chief
Permits Section
Water Bureau

PERMIT FEE REQUIREMENTS

In accordance with Section 324.3120 of the Michigan Act, the permittee shall make payment of an annual permit fee to the Department for each October 1 the permit is in effect regardless of occurrence of discharge. The permittee shall submit the fee in response to the Department's annual notice. The fee shall be postmarked by January 15 for notices mailed by December 1. The fee is due no later than 45 days after receiving the notice for notices mailed after December 1.

Annual Permit Fee Classification: Industrial-Commercial Minor, high-flow (Individual Permit)

CONTACT INFORMATION

Unless specified otherwise, all contact with the Department required by this permit shall be made to the Jackson District Supervisor of the Water Bureau. The Jackson District Office is located at 301 East Louis Glick Highway, Jackson, Michigan 49201-1556, Telephone: 517-780-7690, Fax: 517-780-7855.

CONTESTED CASE INFORMATION

Any person who is aggrieved by this permit may file a sworn petition with the State Office of Administrative Hearings and Rules of the Michigan Department of Energy, Labor, and Economic Growth, setting forth the conditions of the permit which are being challenged and specifying the grounds for the challenge. The Department of Energy, Labor, and Economic Growth may reject any petition filed more than 60 days after issuance as being untimely.

PART I

Section A. Effluent Limitations And Monitoring Requirements

1. Final Effluent Limitations, Monitoring Point 001A

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge a maximum of 1.872 MGD of treated groundwater from Monitoring Point 001A through Outfall 001. Outfall 001 discharges to an unnamed tributary of Honey Creek. Such discharge shall be limited and monitored by the permittee as specified below.

Parameter	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration			Monitoring Frequency	Sample Type
	Monthly	Daily	Units	Monthly	Daily	Units		
INFLUENT MONITORING AND REPORTING								
1,4-Dioxane	---	---	---	---	(report)	mg/l	Weekly	Grab
DISCHARGE LIMITATIONS, MONITORING AND REPORTING								
Flow	(report)	(report)	MGD	---	---	---	Daily	Report Total Daily Flow
1,4-Dioxane, see Part I.A.1.d.	---	---	---	7	22	ug/l	5X Weekly	24-Hr Composite
Bromate	---	---	---	10	(report)	ug/l	5X Weekly	24-Hr Composite
Hydrogen Peroxide	---	---	---	---	180	ug/l	5X Weekly	Grab
Sodium Bisulfite Dose Rate	---	---	---	---	(report)	mg/l	2X Weekly	Calculation
Equipment Inspection	(report)	---	---	---	---	---	2X Weekly	Visual
Outfall Observation	(report)	---	---	---	---	---	Weekly	Visual
				Minimum Daily	Maximum Daily			
pH	---	---	---	6.5	9.0	S.U.	Monthly	Grab

a. BAT Treatment
This permit is based on the permittee providing ozone/hydrogen peroxide treatment. If treatment other than ozone/hydrogen peroxide is proposed, the permittee shall amend the application received on March 24, 2009. The permit may then be modified to include additional effluent limitations to protect water quality in accordance with applicable rules and regulations.

b. Narrative Standard
The receiving water shall contain no turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, or deposits as a result of this discharge in unnatural quantities which are or may become injurious to any designated use.

c. Monitoring Locations
Samples, measurements, and observations taken in compliance with the monitoring requirements above shall be taken prior to treatment for all influent monitoring, and after treatment but prior to mixing with any other waste stream for all effluent monitoring.

PART I

Section A. Effluent Limitations And Monitoring Requirements

d. Compliance Monitoring and Sampling for 1,4-Dioxane
Following collection of the composite samples, the samples shall immediately be refrigerated at 4°C or less, while not allowing the sample to freeze. Refrigeration is not required, if the sample will be immediately analyzed upon collection. In addition, the analytical results of any grab samples taken of the effluent for 1,4-dioxane shall be reported to the Department.

e. Outfall Observation
Any unusual characteristics of the discharge (i.e., unnatural turbidity, color, oil film, floating solids, foams, settleable solids, suspended solids, or deposits) shall be reported within 24 hours to the Department followed with a written report within five (5) days detailing the findings of the investigation and the steps taken to correct the condition.

f. Quantification Level for Bromate
The quantification level for bromate shall be 5 ug/l unless a higher level is appropriate due to sample matrix interference. Justification for higher quantification levels shall be submitted to the Department within 30 days of such determination.

g. Limits below the Quantification Level for Hydrogen Peroxide
The water quality-based effluent limitation for hydrogen peroxide is less than the quantification level using the analytical method specified below. Any discharge of hydrogen peroxide at or above the quantification level is a specific violation of this permit. If an effluent sample is less than the quantification level, the Department will consider the permittee to be in compliance with the final effluent limitation for this pollutant for the period that the sample represents, provided that the permittee is also in full compliance with the operation of the treatment system in accordance with the Operations and Maintenance Manual specified in Part I.A.3. of this permit. This paragraph does not authorize the discharge of hydrogen peroxide at levels which are injurious to the designated uses of the waters of the state or which constitute a threat to the public health or welfare.

The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for hydrogen peroxide shall be in accordance with the colorimetric method as approved by the Department. The quantification level shall not exceed 200 ug/l unless higher levels are appropriate because of sample matrix interference. Other analytical methods may be used upon approval of the Department.

h. Water Treatment Additives
This permit does not authorize the discharge of water additives without approval from the Department. Approval of water additives is authorized under separate correspondence. Water additives include any material that is added to water used at the facility or to a wastewater generated by the facility to condition or treat the water. In the event a permittee proposes to discharge water additives, including an increased discharge concentration of a previously approved water additive, the permittee shall submit a request to the Department for approval. See Part I.A.2. for information on requesting water treatment additive use.

PART I

Section A. Effluent Limitations And Monitoring Requirements

2. Request for Discharge of Water Treatment Additives

In the event a permittee proposes to discharge water additives, the permittee shall submit a request to discharge water additives to the Department for approval. Such requests shall be sent to the Surface Water Assessment Section, Water Bureau, Department of Natural Resources and Environment, P.O. Box 30273, Lansing, Michigan 48909, with a copy to the Department contact listed on the cover page of this permit. Instructions to submit a request electronically may be obtained via the Internet (http://www.michigan.gov/deq and on the left side of the screen click on Water, Water Quality Monitoring, and Assessment of Michigan Waters; then click on the Water Treatment Additive List which is under the Information banner). Written approval from the Department to discharge such additives at specified levels shall be obtained prior to discharge by the permittee. Additional monitoring and reporting may be required as a condition for the approval to discharge the additive.

A request to discharge water additives shall include all of the following water additive usage and discharge information:

a. Material Safety Data Sheet;

b. the proposed water additive discharge concentration;

c. the discharge frequency (i.e., number of hours per day and number of days per year);

d. the monitoring point from which the product is to be discharged;

e. the type of removal treatment, if any, that the water additive receives prior to discharge;

f. product function (i.e. microbiocide, flocculant, etc.);

g. a 48-hour LC_{50} or EC_{50} for a North American freshwater planktonic crustacean (either *Ceriodaphnia sp., Daphnia sp., or Simocephalus sp*.); and

h. the results of a toxicity test for one other North American freshwater aquatic species (other than a planktonic crustacean) that meets a minimum requirement of Rule 323.1057(2) of the Water Quality Standards.

Prior to submitting the request, the permittee may contact the Surface Water Assessment Section by telephone at 517-335-1180 or via the Internet at the address given above to determine if the Department has the product toxicity data required by items g. and h. above. If the Department has the data, the permittee will not need to submit product toxicity data.

3. Operations and Maintenance Manual

The permittee shall provide the Department a copy of the Operations and Maintenance Manual for the treatment system to be used in achieving compliance with this permit's effluent limitations and monitoring requirements. Changes in the operation or maintenance of the treatment system shall be submitted to the Department as amendments to the Operations and Maintenance Manual prior to implementation of the changes. The Department reserves the authority to provide comment and require modification to the Operations and Maintenance Manual and any subsequent amendments submitted by the permittee.

PART I

Section A. Effluent Limitations And Monitoring Requirements

4. Treatment System Operation

The treatment system must be operated in such a manner that the mineralization of 1,4-dioxane is maximized. Treatment parameters, including chemical feed rates, equipment maintenance, etc., all must be optimized to maximize the mineralization of 1,4-dioxane. However, maximized operation does not require that flow rates be reduced nor that treated water be recirculated through the treatment system. The Department may determine what shall be included in maximized operation and may request the submittal of operational data in order to review the parameters affecting treatment optimization.

5. Facility Contact

The "Facility Contact" was specified in the application. The permittee may replace the facility contact at any time, and shall notify the Department in writing within 10 days after replacement (including the name, address and telephone number of the new facility contact).

a. The facility contact shall be (or a duly authorized representative of this person):
- for a corporation, a principal executive officer of at least the level of vice president, or a designated representative, if the representative is responsible for the overall operation of the facility from which the discharge described in the permit application or other NPDES form originates,
- for a partnership, a general partner,
- for a sole proprietorship, the proprietor, or
- for a municipal, state, or other public facility, either a principal executive officer, the mayor, village president, city or village manager or other duly authorized employee.

b. A person is a duly authorized representative only if:
- the authorization is made in writing to the Department by a person described in paragraph a. of this section; and
- the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the facility (a duly authorized representative may thus be either a named individual or any individual occupying a named position).

Nothing in this section obviates the permittee from properly submitting reports and forms as required by law.

6. Discharge to the Groundwaters

This site is a known source of groundwater pollution. The reissuance of this permit does not authorize any discharge to the groundwaters or venting of contaminated groundwaters to the surface waters, nor does it constitute a release of liability for any groundwater contamination at or around the site. The state reserves its rights to seek remedies to abate any groundwater contamination.

PART II

Section A. Definitions

This list of definitions may include terms not applicable to this permit.

Acute toxic unit (TU_A) means $100/LC_{50}$ where the LC_{50} is determined from a whole effluent toxicity (WET) test which produces a result that is statistically or graphically estimated to be lethal to 50% of the test organisms.

Bioaccumulative chemical of concern (BCC) means a chemical which, upon entering the surface waters, by itself or as its toxic transformation product, accumulates in aquatic organisms by a human health bioaccumulation factor of more than 1000 after considering metabolism and other physiochemical properties that might enhance or inhibit bioaccumulation. The human health bioaccumulation factor shall be derived according to R 323.1057(5). Chemicals with half-lives of less than 8 weeks in the water column, sediment, and biota are not BCCs. The minimum bioaccumulation concentration factor (BAF) information needed to define an organic chemical as a BCC is either a field-measured BAF or a BAF derived using the biota-sediment accumulation factor (BSAF) methodology. The minimum BAF information needed to define an inorganic chemical as a BCC, including an organometal, is either a field-measured BAF or a laboratory-measured bioconcentration factor (BCF). The BCCs to which these rules apply are identified in Table 5 of R 323.1057 of the Water Quality Standards.

Biosolids are the solid, semisolid, or liquid residues generated during the treatment of sanitary sewage or domestic sewage in a treatment works. This includes, but is not limited to, scum or solids removed in primary, secondary, or advanced wastewater treatment processes and a derivative of the removed scum or solids.

Bulk biosolids means biosolids that are not sold or given away in a bag or other container for application to a lawn or home garden.

Chronic toxic unit (TU_C) means $100/MATC$ or $100/IC_{25}$, where the maximum acceptable toxicant concentration (MATC) and IC_{25} are expressed as a percent effluent in the test medium.

Class B Biosolids refers to material that has met the Class B pathogen reduction requirements or equivalent treatment by a Process to Significantly Reduce Pathogens (PSRP) in accordance with the Part 24 Rules. Processes include aerobic digestion, composting, anaerobic digestion, lime stabilization and air drying.

Daily concentration is the sum of the concentrations of the individual samples of a parameter divided by the number of samples taken during any calendar day. If the parameter concentration in any sample is less than the quantification limit, regard that value as zero when calculating the daily concentration. The daily concentration will be used to determine compliance with any maximum and minimum daily concentration limitations (except for pH and dissolved oxygen). When required by the permit, report the maximum calculated daily concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the Discharge Monitoring Reports (DMRs).

For pH, report the maximum value of any individual sample taken during the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs and the minimum value of any individual sample taken during the month in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. For dissolved oxygen, report the minimum concentration of any individual sample in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

Daily loading is the total discharge by weight of a parameter discharged during any calendar day. This value is calculated by multiplying the daily concentration by the total daily flow and by the appropriate conversion factor. The daily loading will be used to determine compliance with any maximum daily loading limitations. When required by the permit, report the maximum calculated daily loading for the month in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMRs.

Department means the Michigan Department of Natural Resources and Environment**.**

Detection Level means the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability.

PART II

Section A. Definitions

EC_{50} means a statistically or graphically estimated concentration that is expected to cause 1 or more specified effects in 50% of a group of organisms under specified conditions.

Fecal coliform bacteria monthly is the geometric mean of the samples collected in a calendar month (or 30 consecutive days). The calculated monthly value will be used to determine compliance with the maximum monthly fecal coliform bacteria limitations. When required by the permit, report the calculated monthly value in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMRs.

Fecal coliform bacteria 7-day is the geometric mean of the samples collected in any 7-day period. The calculated 7-day value will be used to determine compliance with the maximum 7-day fecal coliform bacteria limitations. When required by the permit, report the maximum calculated 7-day concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

Flow Proportioned sample is a composite sample with the sample volume proportional to the effluent flow.

Grab sample is a single sample taken at neither a set time nor flow.

IC_{25} means the toxicant concentration that would cause a 25% reduction in a nonquantal biological measurement for the test population.

Interference is a discharge which, alone or in conjunction with a discharge or discharges from other sources, both: 1) inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and 2) therefore, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or, of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent state or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including state regulations contained in any state sludge management plan prepared pursuant to Subtitle D of the SWDA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act. [This definition does not apply to sample matrix interference.]

Land Application means spraying or spreading biosolids or a biosolids derivative onto the land surface, injecting below the land surface, or incorporating into the soil so that the biosolids or biosolids derivative can either condition the soil or fertilize crops or vegetation grown in the soil.

LC_{50} means a statistically or graphically estimated concentration that is expected to be lethal to 50% of a group of organisms under specified conditions.

Maximum acceptable toxicant concentration (MATC) means the concentration obtained by calculating the geometric mean of the lower and upper chronic limits from a chronic test. A lower chronic limit is the highest tested concentration that did not cause the occurrence of a specific adverse effect. An upper chronic limit is the lowest tested concentration which did cause the occurrence of a specific adverse effect and above which all tested concentrations caused such an occurrence.

MGD means million gallons per day.

Monthly monitoring frequency refers to a calendar month. When required by this permit, an analytical result, reading, value or observation must be reported for that period if a discharge occurs during that period.

Monthly concentration is the sum of the daily concentrations determined during a reporting month (or 30 consecutive days) divided by the number of daily concentrations determined. The calculated monthly concentration will be used to determine compliance with any maximum monthly concentration limitations. When required by the permit, report the calculated monthly concentration in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMRs.

PART II

Section A. Definitions

For minimum percent removal requirements, the monthly influent concentration and the monthly effluent concentration shall be determined. The calculated monthly percent removal, which is equal to 100 times the quantity [1 minus the quantity (monthly effluent concentration divided by the monthly influent concentration)], shall be reported in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

Monthly loading is the sum of the daily loadings of a parameter divided by the number of daily loadings determined in the reporting month (or 30 consecutive days). The calculated monthly loading will be used to determine compliance with any maximum monthly loading limitations. When required by the permit, report the calculated monthly loading in the “AVERAGE” column under “QUANTITY OR LOADING” on the DMRs.

National Pretreatment Standards are the regulations promulgated by or to be promulgated by the Federal Environmental Protection Agency pursuant to Section 307(b) and (c) of the Federal Act. The standards establish nationwide limits for specific industrial categories for discharge to a POTW.

No observed adverse effect level (NOAEL) means the highest tested dose or concentration of a substance which results in no observed adverse effect in exposed test organisms where higher doses or concentrations result in an adverse effect.

Noncontact Cooling Water is water used for cooling which does not come into direct contact with any raw material, intermediate product, by-product, waste product or finished product.

Nondomestic user is any discharger to a POTW that discharges wastes other than or in addition to water-carried wastes from toilet, kitchen, laundry, bathing or other facilities used for household purposes.

Partially treated sewage is any sewage, sewage and storm water, or sewage and wastewater, from domestic or industrial sources that is treated to a level less than that required by the permittee's National Pollutant Discharge Elimination System permit, or that is not treated to national secondary treatment standards for wastewater, including discharges to surface waters from retention treatment facilities.

Pretreatment is reducing the amount of pollutants, eliminating pollutants, or altering the nature of pollutant properties to a less harmful state prior to discharge into a public sewer. The reduction or alteration can be by physical, chemical, or biological processes, process changes, or by other means. Dilution is not considered pretreatment unless expressly authorized by an applicable National Pretreatment Standard for a particular industrial category.

POTW is a publicly owned treatment works.

Quantification level means the measurement of the concentration of a contaminant obtained by using a specified laboratory procedure calculated at a specified concentration above the detection level. It is considered the lowest concentration at which a particular contaminant can be quantitatively measured using a specified laboratory procedure for monitoring of the contaminant.

Quarterly monitoring frequency refers to a three month period, defined as January through March, April through June, July through September, and October through December. When required by this permit, an analytical result, reading, value or observation must be reported for that period if a discharge occurs during that period.

Regional Administrator is the Region 5 Administrator, U.S. EPA, located at R-19J, 77 W. Jackson Blvd., Chicago, Illinois 60604.

Significant industrial user is a nondomestic user that: 1) is subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N; or 2) discharges an average of 25,000 gallons per day or more of process wastewater to a POTW (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process wastestream which makes up five (5) percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the permittee as defined in 40 CFR 403.12(a) on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's treatment plant operation or violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

PART II

Section A. Definitions

Significant Materials Significant Materials means any material which could degrade or impair water quality, including but not limited to: raw materials; fuels; solvents, detergents, and plastic pellets; finished materials such as metallic products; hazardous substances designated under Section 101(14) of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (see 40 CFR 372.65); any chemical the facility is required to report pursuant to Section 313 of Emergency Planning and Community Right-to-Know Act (EPCRA); polluting materials as identified under the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code); Hazardous Wastes as defined in Part 111 of the Michigan Act; fertilizers; pesticides; and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

Tier I value means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier I toxicity database.

Tier II value means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier II toxicity database.

Total Maximum Daily Loads (TMDLs) are required by the Federal Act for waterbodies that do not meet Water Quality Standards. TMDLs represent the maximum daily load of a pollutant that a waterbody can assimilate and meet Water Quality Standards and an allocation of that load among point sources, nonpoint sources, and a margin of safety.

Toxicity Reduction Evaluation (TRE) means a site-specific study conducted in a stepwise process designed to identify the causative agents of effluent toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in effluent toxicity.

Water Quality Standards means the Part 4 Water Quality Standards promulgated pursuant to Part 31 of Act No. 451 of the Public Acts of 1994, as amended, being Rules 323.1041 through 323.1117 of the Michigan Administrative Code.

Weekly monitoring frequency refers to a calendar week which begins on Sunday and ends on Saturday. When required by this permit, an analytical result, reading, value or observation must be reported for that period if a discharge occurs during that period.

Yearly monitoring frequency refers to a calendar year beginning on January 1 and ending on December 31. When required by this permit, an analytical result, reading, value or observation must be reported for that period if a discharge occurs during that period.

24-Hour Composite sample is a flow proportioned composite sample consisting of hourly or more frequent portions that are taken over a 24-hour period.

3-Portion Composite sample is a sample consisting of three equal volume grab samples collected at equal intervals over an 8-hour period.

7-day concentration is the sum of the daily concentrations determined during any 7 consecutive days in a reporting month divided by the number of daily concentrations determined. The calculated 7-day concentration will be used to determine compliance with any maximum 7-day concentration limitations. When required by the permit, report the maximum calculated 7-day concentration for the month in the “MAXIMUM” column under “QUALITY OR CONCENTRATION” on the DMRs.

7-day loading is the sum of the daily loadings of a parameter divided by the number of daily loadings determined during any 7 consecutive days in a reporting month. The calculated 7-day loading will be used to determine compliance with any maximum 7-day loading limitations. When required by the permit, report the maximum calculated 7-day loading for the month in the “MAXIMUM” column under “QUANTITY OR LOADING” on the DMRs.

PART II

Section B. Monitoring Procedures

1. Representative Samples

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations promulgated pursuant to Section 304(h) of the Federal Act (40 CFR Part 136 - Guidelines Establishing Test Procedures for the Analysis of Pollutants), unless specified otherwise in this permit. Requests to use test procedures not promulgated under 40 CFR Part 136 for pollutant monitoring required by this permit shall be made in accordance with the Alternate Test Procedures regulations specified in 40 CFR 136.4. These requests shall be submitted to the Chief of the Permits Section, Water Bureau, Michigan Department of Natural Resources and Environment, P.O. Box 30273, Lansing, Michigan, 48909-7773. The permittee may use such procedures upon approval.

The permittee shall periodically calibrate and perform maintenance procedures on all analytical instrumentation at intervals to ensure accuracy of measurements. The calibration and maintenance shall be performed as part of the permittee's laboratory Quality Control/Quality Assurance program.

3. Instrumentation

The permittee shall periodically calibrate and perform maintenance procedures on all monitoring instrumentation at intervals to ensure accuracy of measurements.

4. Recording Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information: 1) the exact place, date, and time of measurement or sampling; 2) the person(s) who performed the measurement or sample collection; 3) the dates the analyses were performed; 4) the person(s) who performed the analyses; 5) the analytical techniques or methods used; 6) the date of and person responsible for equipment calibration; and 7) the results of all required analyses.

5. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the Department.

PART II

Section C. Reporting Requirements

1. Start-up Notification

If the permittee will not discharge during the first 60 days following the effective date of this permit, the permittee shall notify the Department within 14 days following the effective date of this permit, and then 60 days prior to the commencement of the discharge.

2. Submittal Requirements for Self-Monitoring Data

Part 31 of Act 451 of 1994, as amended, specifically Section 324.3110(3) and Rule 323.2155(2) of Part 21 allows the department to specify the forms to be utilized for reporting the required self-monitoring data. Unless instructed on the effluent limitations page to conduct "Retained Self Monitoring" the permittee shall submit self-monitoring data via the Michigan DNRE Electronic Environmental Discharge Monitoring Reporting (e2-DMR) system.

The permittee shall utilize the information provided on the e2-Reporting website @ **https://secure1.state.mi.us/e2rs/** to access and submit the electronic forms. Both monthly summary and daily data shall be submitted to the department no later than the **20th day of the month** following each month of the authorized discharge period(s).

3. Retained Self-Monitoring Requirements

If instructed on the effluent limits page to conduct retained self-monitoring, the permittee shall maintain a year-to-date log of retained self-monitoring results and, upon request, provide such log for inspection to the staff of the Water Bureau, Michigan Department of Natural Resources and Environment. Retained self-monitoring results are public information and shall be promptly provided to the public upon request.

The permittee shall certify, in writing, to the Department, on or before January 10th of each year, that: 1) all retained self-monitoring requirements have been complied with and a year-to-date log has been maintained; and 2) the application on which this permit is based still accurately describes the discharge. With this annual certification, the permittee shall submit a summary of the previous years monitoring data. The summary shall include maximum values for samples to be reported as daily maximums and/or monthly maximums and minimum values for any daily minimum samples.

4. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

Monitoring required pursuant to Part 41 of the Michigan Act or Rule 35 of the Mobile Home Park Commission Act (Act 96 of the Public Acts of 1987) for assurance of proper facility operation shall be submitted as required by the Department.

5. Compliance Dates Notification

Within 14 days of every compliance date specified in this permit, the permittee shall submit a written notification to the Department indicating whether or not the particular requirement was accomplished. If the requirement was not accomplished, the notification shall include an explanation of the failure to accomplish the requirement, actions taken or planned by the permittee to correct the situation, and an estimate of when the requirement will be accomplished. If a written report is required to be submitted by a specified date and the permittee accomplishes this, a separate written notification is not required.

PART II

Section C. Reporting Requirements

6. Noncompliance Notification

Compliance with all applicable requirements set forth in the Federal Act, Parts 31 and 41 of the Michigan Act, and related regulations and rules is required. All instances of noncompliance shall be reported as follows:

a. 24-hour reporting - Any noncompliance which may endanger health or the environment (including maximum daily concentration discharge limitation exceedances) shall be reported, verbally, within 24 hours from the time the permittee becomes aware of the noncompliance. A written submission shall also be provided within five (5) days.

b. other reporting - The permittee shall report, in writing, all other instances of noncompliance not described in a. above at the time monitoring reports are submitted; or, in the case of retained self-monitoring, within five (5) days from the time the permittee becomes aware of the noncompliance.

Written reporting shall include: 1) a description of the discharge and cause of noncompliance; and 2) the period of noncompliance, including exact dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and the steps taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

7. Spill Notification

The permittee shall immediately report any release of any polluting material which occurs to the surface waters or groundwaters of the state, unless the permittee has determined that the release is not in excess of the threshold reporting quantities specified in the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code), by calling the Department at the number indicated on the second page of this permit, or if the notice is provided after regular working hours call the Department's 24-hour Pollution Emergency Alerting System telephone number, 1-800-292-4706 (calls from out-of-state dial 1-517-373-7660).

Within ten (10) days of the release, the permittee shall submit to the Department a full written explanation as to the cause of the release, the discovery of the release, response (clean-up and/or recovery) measures taken, and preventative measures taken or a schedule for completion of measures to be taken to prevent reoccurrence of similar releases.

8. Upset Noncompliance Notification

If a process "upset" (defined as an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee) has occurred, the permittee who wishes to establish the affirmative defense of upset, shall notify the Department by telephone within 24-hours of becoming aware of such conditions; and within five (5) days, provide in writing, the following information:

a. that an upset occurred and that the permittee can identify the specific cause(s) of the upset;

b. that the permitted wastewater treatment facility was, at the time, being properly operated; and

c. that the permittee has specified and taken action on all responsible steps to minimize or correct any adverse impact in the environment resulting from noncompliance with this permit.

In any enforcement proceedings, the permittee, seeking to establish the occurrence of an upset, has the burden of proof.

PART II

Section C. Reporting Requirements

9. Bypass Prohibition and Notification

a. Bypass Prohibition - Bypass is prohibited unless:

1) bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

2) there were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass; and

3) the permittee submitted notices as required under 9.b. or 9.c. below.

b. Notice of Anticipated Bypass - If the permittee knows in advance of the need for a bypass, it shall submit prior notice to the Department, if possible at least ten (10) days before the date of the bypass, and provide information about the anticipated bypass as required by the Department. The Department may approve an anticipated bypass, after considering its adverse effects, if it will meet the three (3) conditions listed in 9.a. above.

c. Notice of Unanticipated Bypass - The permittee shall submit notice to the Department of an unanticipated bypass by calling the Department at the number indicated on the first page of this permit (if the notice is provided after regular working hours, use the following number: 1-800-292-4706) as soon as possible, but no later than 24 hours from the time the permittee becomes aware of the circumstances.

d. Written Report of Bypass - A written submission shall be provided within five (5) working days of commencing any bypass to the Department, and at additional times as directed by the Department. The written submission shall contain a description of the bypass and its cause; the period of bypass, including exact dates and times, and if the bypass has not been corrected, the anticipated time it is expected to continue; steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass; and other information as required by the Department.

e. Bypass Not Exceeding Limitations - The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of 9.a., 9.b., 9.c., and 9.d., above. This provision does not relieve the permittee of any notification responsibilities under Part II.C.10. of this permit.

f. Definitions

1) Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

2) Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

PART II

Section C. Reporting Requirements

10. Notification of Changes in Discharge

The permittee shall notify the Department, in writing, within 10 days of knowing, or having reason to believe, that any activity or change has occurred or will occur which would result in the discharge of: 1) detectable levels of chemicals on the current Michigan Critical Materials Register, priority pollutants or hazardous substances set forth in 40 CFR 122.21, Appendix D, or the Pollutants of Initial Focus in the Great Lakes Water Quality Initiative specified in 40 CFR 132.6, Table 6, which were not acknowledged in the application or listed in the application at less than detectable levels; 2) detectable levels of any other chemical not listed in the application or listed at less than detection, for which the application specifically requested information; or 3) any chemical at levels greater than five times the average level reported in the complete application (see the first page of this permit for the date(s) the complete application was submitted). Any other monitoring results obtained as a requirement of this permit shall be reported in accordance with the compliance schedules.

11. Changes in Facility Operations

Any anticipated action or activity, including but not limited to facility expansion, production increases, or process modification, which will result in new or increased loadings of pollutants to the receiving waters must be reported to the Department by a) submission of an increased use request (application) and all information required under Rule 323.1098 (Antidegradation) of the Water Quality Standards or b) by notice if the following conditions are met: 1) the action or activity will not result in a change in the types of wastewater discharged or result in a greater quantity of wastewater than currently authorized by this permit; 2) the action or activity will not result in violations of the effluent limitations specified in this permit; 3) the action or activity is not prohibited by the requirements of Part II.C.12.; and 4) the action or activity will not require notification pursuant to Part II.C.10. Following such notice, the permit may be modified according to applicable laws and rules to specify and limit any pollutant not previously limited.

12. Bioaccumulative Chemicals of Concern (BCC)

Consistent with the requirements of Rules 323.1098 and 323.1215 of the Michigan Administrative Code, the permittee is prohibited from undertaking any action that would result in a lowering of water quality from an increased loading of a BCC unless an increased use request and antidegradation demonstration have been submitted and approved by the Department.

13. Transfer of Ownership or Control

In the event of any change in control or ownership of facilities from which the authorized discharge emanates, the permittee shall submit to the Department 30 days prior to the actual transfer of ownership or control a written agreement between the current permittee and the new permittee containing: 1) the legal name and address of the new owner; 2) a specific date for the effective transfer of permit responsibility, coverage and liability; and 3) a certification of the continuity of or any changes in operations, wastewater discharge, or wastewater treatment.

If the new permittee is proposing changes in operations, wastewater discharge, or wastewater treatment, the Department may propose modification of this permit in accordance with applicable laws and rules.

PART II

Section D. Management Responsibilities

1. Duty to Comply

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit.

It is the duty of the permittee to comply with all the terms and conditions of this permit. Any noncompliance with the Effluent Limitations, Special Conditions, or terms of this permit constitutes a violation of the Michigan Act and/or the Federal Act and constitutes grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of an application for permit renewal.

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

2. Operator Certification

The permittee shall have the waste treatment facilities under direct supervision of an operator certified at the appropriate level for the facility certification by the Department, as required by Sections 3110 and 4104 of the Michigan Act. Permittees authorized to discharge storm water shall have the storm water treatment and/or control measures under direct supervision of a storm water operator certified by the Department, as required by Section 3110 of the Michigan Act.

3. Facilities Operation

The permittee shall, at all times, properly operate and maintain all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance includes adequate laboratory controls and appropriate quality assurance procedures.

4. Power Failures

In order to maintain compliance with the effluent limitations of this permit and prevent unauthorized discharges, the permittee shall either:

a. provide an alternative power source sufficient to operate facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit; or

b. upon the reduction, loss, or failure of one or more of the primary sources of power to facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit, the permittee shall halt, reduce or otherwise control production and/or all discharge in order to maintain compliance with the effluent limitations and conditions of this permit.

5. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to the surface waters or groundwaters of the state resulting from noncompliance with any effluent limitation specified in this permit including, but not limited to, such accelerated or additional monitoring as necessary to determine the nature and impact of the discharge in noncompliance.

PART II

Section D. Management Responsibilities

6. Containment Facilities

The permittee shall provide facilities for containment of any accidental losses of polluting materials in accordance with the requirements of the Part 5 Rules (Rules 324.2001 through 324.2009 of the Michigan Administrative Code). For a Publicly Owned Treatment Work (POTW), these facilities shall be approved under Part 41 of the Michigan Act.

7. Waste Treatment Residues

Residuals (i.e. solids, sludges, biosolids, filter backwash, scrubber water, ash, grit, or other pollutants or wastes) removed from or resulting from treatment or control of wastewaters, including those that are generated during treatment or left over after treatment or control has ceased, shall be disposed of in an environmentally compatible manner and according to applicable laws and rules. These laws may include, but are not limited to, the Michigan Act, Part 31 for protection of water resources, Part 55 for air pollution control, Part 111 for hazardous waste management, Part 115 for solid waste management, Part 121 for liquid industrial wastes, Part 301 for protection of inland lakes and streams, and Part 303 for wetlands protection. Such disposal shall not result in any unlawful pollution of the air, surface waters or groundwaters of the state.

8. Right of Entry

The permittee shall allow the Department, any agent appointed by the Department or the Regional Administrator, upon the presentation of credentials:

a. to enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit; and

b. at reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect process facilities, treatment works, monitoring methods and equipment regulated or required under this permit; and to sample any discharge of pollutants.

9. Availability of Reports

Except for data determined to be confidential under Section 308 of the Federal Act and Rule 2128 (Rule 323.2128 of the Michigan Administrative Code), all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department and the Regional Administrator. As required by the Federal Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Act and Sections 3112, 3115, 4106 and 4110 of the Michigan Act.

PART II

Section E. Activities Not Authorized by This Permit

1. Discharge to the Groundwaters

This permit does not authorize any discharge to the groundwaters. Such discharge may be authorized by a groundwater discharge permit issued pursuant to the Michigan Act.

2. POTW Construction

This permit does not authorize or approve the construction or modification of any physical structures or facilities at a POTW. Approval for the construction or modification of any physical structures or facilities at a POTW must be by permit issued under Part 41 of the Michigan Act.

3. Civil and Criminal Liability

Except as provided in permit conditions on "Bypass" (Part II.C.9. pursuant to 40 CFR 122.41(m)), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance, whether or not such noncompliance is due to factors beyond the permittee's control, such as accidents, equipment breakdowns, or labor disputes.

4. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee may be subject under Section 311 of the Federal Act except as are exempted by federal regulations.

5. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Federal Act.

6. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other Department of Natural Resources and Environment permits, or approvals from other units of government as may be required by law.

PERMIT NO. MI0048453

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act (33 U.S.C. 1251 *et seq*., as amended; the "Federal Act"); Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA); Part 41, Sewerage Systems, of the NREPA; and Michigan Executive Order 2011-1,

Gelman Sciences, Incorporated, dba Pall Life Sciences
642 South Wagner Road
Ann Arbor, Michigan 48103

is authorized to discharge from **Pall Life Sciences**, located at

642 South Wagner Road
Ann Arbor, Michigan 48103

designated as **Pall Life Sciences Inc**

to an unnamed tributary of Honey Creek (receiving water) in accordance with effluent limitations, monitoring requirements, and other conditions set forth in this permit.

This permit is based on a complete application submitted on March 11, 2014 as amended through October 17, 2014.

This permit takes effect on February 1, 2016. The provisions of this permit are severable. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term in accordance with applicable laws and rules. On its effective date this permit shall supersede NPDES Permit No. MI0048453, expiring October 1, 2014.

This permit and the authorization to discharge shall expire at midnight, **October 1, 2019**. In order to receive authorization to discharge beyond the date of expiration, the permittee shall submit an application which contains such information, forms, and fees as are required by the Department of Environmental Quality (Department) by **April 4, 2019**.

Issued: January 26, 2016

Original signed by Philip Argiroff
Philip Argiroff, Chief
Permits Section
Water Resources Division

PERMIT FEE REQUIREMENTS

In accordance with Section 324.3120 of the NREPA, the permittee shall make payment of an annual permit fee to the Department for each October 1 the permit is in effect regardless of occurrence of discharge. The permittee shall submit the fee in response to the Department's annual notice. The fee shall be postmarked by January 15 for notices mailed by December 1. The fee is due no later than 45 days after receiving the notice for notices mailed after December 1.

Annual Permit Fee Classification: Industrial-Commercial Minor, high-flow (Individual Permit)

CONTACT INFORMATION

Unless specified otherwise, all contact with the Department required by this permit shall be made to the Jackson District Supervisor of the Water Resources Division. The Jackson District Office is located at 301 East Louis Glick Highway, Jackson, Michigan 49201-1556, Telephone: 517-780-7690, Fax: 517-780-7855.

CONTESTED CASE INFORMATION

Any person who is aggrieved by this permit may file a sworn petition with the Michigan Administrative Hearing System within the Michigan Department of Licensing and Regulatory Affairs, c/o the Michigan Department of Environmental Quality, setting forth the conditions of the permit which are being challenged and specifying the grounds for the challenge. The Department of Licensing and Regulatory Affairs may reject any petition filed more than 60 days after issuance as being untimely.

PART I

Section A. Effluent Limitations And Monitoring Requirements

1. Final Effluent Limitations, Monitoring Point 001A

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittee is authorized to discharge a maximum of 1.872 MGD of treated groundwater from Monitoring Point 001A through Outfall 001. Outfall 001 discharges to an unnamed tributary of Honey Creek. Such discharge shall be limited and monitored by the permittee as specified below.

	Maximum Limits for Quantity or Loading			Maximum Limits for Quality or Concentration			Monitoring	Sample
Parameter	Monthly	Daily	Units	Monthly	Daily	Units	Frequency	Type
INFLUENT MONITORING AND REPORTING								
1,4-Dioxane	---	---	---	---	(report)	mg/l	Weekly	Grab
DISCHARGE LIMITATIONS, MONITORING AND REPORTING								
Flow	(report)	(report)	MGD	---	---	---	Daily	Report Total Daily Flow
1,4-Dioxane	---	---	---	7	22	µg/l	5X Weekly	24-Hr Composite
Bromate	---	---	---	10	(report)	µg/l	5X Weekly	24-Hr Composite
Barium	6.8	---	lbs/day	440	---	µg/l	Quarterly	24-Hr Composite
Hydrogen Peroxide								
Through January 2018	---	---	---	---	180	µg/l	5X Weekly	Grab
Beginning February 2018	0.16	---	lbs/day	10	---	µg/l	5X Weekly	Grab
Sodium Bisulfite Dose Rate	---	---	---	---	(report)	mg/l	2X Weekly	Calculation
Equipment Inspection	(report)	---	---	---	---	---	2X Weekly	Visual
Outfall Observation	(report)	---	---	---	---	---	Weekly	Visual
				Minimum Daily				
pH	---	---	---	6.5	9.0	S.U.	Weekly	Grab

a. BAT Treatment
This permit is based on the permittee providing ozone/hydrogen peroxide treatment. If treatment other than ozone/hydrogen peroxide is proposed, the permittee shall amend the application received on March 11, 2014. The permit may then be modified to include additional effluent limitations to protect water quality in accordance with applicable rules and regulations.

b. Narrative Standard
The receiving water shall contain no turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, or deposits as a result of this discharge in unnatural quantities which are or may become injurious to any designated use.

PART I

Section A. Effluent Limitations And Monitoring Requirements

c. Monitoring Locations
Samples, measurements, and observations taken in compliance with the monitoring requirements above shall be taken prior to treatment for all influent monitoring, and after treatment but prior to mixing with any other waste stream for all effluent monitoring.

d. Compliance Monitoring and Sampling for 1,4-Dioxane
Following collection of the composite samples, the samples shall immediately be refrigerated at 4°C or less, while not allowing the sample to freeze. Refrigeration is not required, if the sample will be immediately analyzed upon collection. In addition, the analytical results of any grab samples taken of the effluent for 1,4-dioxane shall be reported to the Department.

e. Quantification Level for Bromate
The quantification level for bromate shall be 5 ug/l unless a higher level is appropriate due to sample matrix interference. Justification for higher quantification levels shall be submitted to the Department within 30 days of such determination.

f. Limits below the Quantification Level for Hydrogen Peroxide
The water quality-based effluent limitation for hydrogen peroxide is less than the quantification level using the analytical method specified below. Any discharge of hydrogen peroxide at or above the quantification level is a specific violation of this permit. If an effluent sample is less than the quantification level, the Department will consider the permittee to be in compliance with the final effluent limitation for this pollutant for the period that the sample represents, provided that the permittee is also in full compliance with the operation of the treatment system in accordance with the Operations and Maintenance Manual specified in Part I.A.3. of this permit. This paragraph does not authorize the discharge of hydrogen peroxide at levels which are injurious to the designated uses of the waters of the state or which constitute a threat to the public health or welfare.

The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for hydrogen peroxide shall use Chemetrics, Hydrogen Peroxide Chemets Kit K-5510 (Ferric Thiocyanate Method). The quantification level shall be 50 µg/l unless higher levels are appropriate because of sample matrix interference. Other analytical methods may be used upon approval of the Department.

g. Equipment Inspection
Equipment inspection shall be reported as “yes” or “no.” The permittee shall report “yes” if this requirement was completed and “no” if this requirement was not completed. The permittee shall inspect the treatment systems used to achieve compliance with the terms of the permit. The permittee shall immediately implement any corrective action for the treatment system that is noted during the inspection.

h. Outfall Observation
Outfall observation shall be reported as “yes” or “no.” The permittee shall report “yes” if this requirement was completed and “no” if this requirement was not completed. Any unusual characteristics of the discharge (i.e., unnatural turbidity, color, oil film, floating solids, foams, settleable solids, suspended solids, or deposits) shall be reported within 24 hours to the Department followed with a written report within five (5) days detailing the findings of the investigation and the steps taken to correct the condition.

i. Quarterly Monitoring
Quarterly samples shall be taken during the months of January, April, July, and October. If the facility does not discharge during these months, the permittee shall sample the next discharge occurring during that quarter. If the facility does not discharge during a quarter, a sample is not required for that quarter. For any month in which a sample is not taken, the permittee shall enter “*G” on the Discharge Monitoring Report.

PART I

Section A. Effluent Limitations And Monitoring Requirements

j. Monitoring Frequency Reduction for Barium
After the submittal of 24 months of data, the permittee may request, in writing, Department approval of a reduction in monitoring frequency for barium. This request shall contain an explanation as to why the reduced monitoring is appropriate. Upon receipt of written approval and consistent with such approval, the permittee may reduce the monitoring frequency indicated in Part I.A.1 of this permit. The monitoring frequency for barium shall not be reduced to less than annually. The Department may revoke the approval for reduced monitoring at any time upon notification to the permittee.

k. Water Treatment Additives
This permit does not authorize the discharge of water additives without approval from the Department. Approval of water additives is authorized under separate correspondence. Water additives include any material that is added to water used at the facility or to a wastewater generated by the facility to condition or treat the water. In the event a permittee proposes to discharge water additives, including an increased discharge concentration of a previously approved water additive, the permittee shall submit a request to the Department for approval. See Part I.A.2. for information on requesting water treatment additive use.

2. Request for Discharge of Water Treatment Additives

Prior to discharge of any water treatment additive, written approval shall be obtained by the permittee. Requests for such approval shall be submitted via the Department's MiWaters system. Instructions for submitting such a request may be obtained via the Internet (http://www.michigan.gov/deqnpdes; then near the bottom of the page, click on one or both of the links located under the Water Treatment Additives banner). Additional monitoring and reporting may be required as a condition for the approval to discharge the additive.

A request to discharge water treatment additives shall include all of the following usage and discharge information for each water treatment additive proposed to be discharged:

a. Safety Data Sheet (formerly known as Material Safety Data Sheet);

b. the proposed water treatment additive discharge concentration with supporting calculations;

c. the discharge frequency (i.e., number of hours per day and number of days per year);

d. the monitoring point from which the product is to be discharged;

e. the type of removal treatment, if any, that the water treatment additive receives prior to discharge;

f. product function (i.e. microbiocide, flocculant, etc.);

g. a 48-hour LC_{50} or EC_{50} for a North American freshwater planktonic crustacean (either *Ceriodaphnia sp., Daphnia sp., or Simocephalus sp*.); and

h. the results of a toxicity test for one (1) other North American freshwater aquatic species (other than a planktonic crustacean) that meets a minimum requirement of R 323.1057(2) of the Water Quality Standards.

Prior to submitting the request, the permittee may contact the Permits Section by telephone at 517-284-5568 or via the Internet at the address given above to determine if the Permits Section has the product toxicity data required by items g. and h. above. If the Permits Section has the data, the permittee will not need to submit product toxicity data.

PART I

Section A. Effluent Limitations And Monitoring Requirements

3. Operations and Maintenance Manual

On or before August 1, 2018 the permittee shall provide the Department a revised copy of the Operations and Maintenance Manual (Manual) for the treatment system to be used in achieving compliance with this permit's effluent limitations and monitoring requirements in Part I.A.1. The revised Manual shall additionally include:

a. procedures for determining and adjusting the feed rate of Hydrogen Peroxide required to treat the 1,4-dioxane to meet the effluent limitations in Part I.A.1. recognizing the operation condition in Part I.A.4.; and

b. procedures for determining and adjusting the feed rate of Sodium Bisulfate needed to minimize the discharge of Hydrogen Peroxide to meet the effluent limitations in Part 1.A.1., beginning December 2017.

Changes in the operation or maintenance of the treatment system shall be submitted to the Department as amendments to the Manual prior to implementation of the changes. The Department reserves the authority to provide comment and require modification to the Manual and any subsequent amendments submitted by the permittee.

4. Treatment System Operation

The treatment system must be operated in such a manner that the mineralization of 1,4-dioxane is maximized. Treatment parameters, including chemical feed rates, equipment maintenance, etc., all must be optimized to maximize the mineralization of 1,4-dioxane. However, maximized operation does not require that flow rates be reduced nor that treated water be recirculated through the treatment system. The Department may determine what shall be included in maximized operation and may request the submittal of operational data in order to review the parameters affecting treatment optimization.

PART I

Section A. Effluent Limitations And Monitoring Requirements

5. Pollutant Minimization Program for Hydrogen Peroxide

This requirement establishes the program necessary to comply with the final effluent limitations for hydrogen peroxide. The goal of the Pollutant Minimization Program is to maintain the effluent concentration of hydrogen peroxide at or below the water quality-based effluent limitation set forth in Part I.A.1. The permittee shall develop and implement a Pollutant Minimization Program in accordance with the following schedule:

On or before August 1, 2018, the permittee shall submit to the Department an approvable Pollutant Minimization Program for hydrogen peroxide designed to proceed toward the goal. The Pollutant Minimization Program shall include the following:

a. an annual review and semi-annual monitoring of potential sources of hydrogen peroxide entering the wastewater collection system;

b. a program for quarterly monitoring of influent; and

c. implementation of reasonable cost-effective control measures when sources of hydrogen peroxide are discovered. Factors to be considered include significance of sources, economic considerations, and technical and treatability considerations.

The Pollutant Minimization Program shall be implemented upon approval by the Department.

On or before February 1 of each year following approval of the Pollutant Minimization Program, the permittee shall submit a status report to the Department that includes 1) the monitoring results for the previous year, 2) an updated list of potential sources, and 3) a summary of all actions taken to reduce or eliminate identified sources of hydrogen peroxide.

Any information generated as a result of the Pollutant Minimization Program set forth in this permit may be used to support a request to modify the approved program or may demonstrate that the Pollutant Minimization Program requirement has been completed satisfactorily.

A request for modification of the approved program and supporting documentation shall be submitted in writing to the Department for review and approval. The Department may approve modifications to the approved program (approval of a program modification does not require a permit modification).

The permittee may choose to demonstrate that the program is complete and request removal of the program from the permit. Such request and supporting documentation demonstrating that the water quality-based effluent limits are being achieved shall be submitted in writing to the Department. If the Department determines that the request is approvable, this permit may be modified in accordance with applicable laws and rules to remove this requirement.

This permit may be modified in accordance with applicable laws and rules to include additional conditions and/or limitations as necessary.

6. Option to Provide Additional Toxicity Data

The effluent limits for hydrogen peroxide and barium are based upon Tier II water quality values. On or before February 1, 2018, the permittee may submit additional mammalian or aquatic toxicity data to reduce the uncertainty factor used in the development of Tier II values or to allow for calculation of Tier I values. Prior to conducting any additional toxicity testing, the permittee should contact the Department to determine the appropriate test organism(s). Following submittal and review of this data, this permit may be modified in accordance with applicable laws and rules.

PART I

Section A. Effluent Limitations And Monitoring Requirements

7. Facility Contact

The "Facility Contact" was specified in the application. The permittee may replace the facility contact at any time, and shall notify the Department in writing within 10 days after replacement (including the name, address and telephone number of the new facility contact).

a. The facility contact shall be (or a duly authorized representative of this person):
- for a corporation, a principal executive officer of at least the level of vice president; or a designated representative if the representative is responsible for the overall operation of the facility from which the discharge originates, as described in the permit application or other NPDES form,
- for a partnership, a general partner,
- for a sole proprietorship, the proprietor, or
- for a municipal, state, or other public facility, either a principal executive officer, the mayor, village president, city or village manager or other duly authorized employee.

b. A person is a duly authorized representative only if:
- the authorization is made in writing to the Department by a person described in paragraph a. of this section; and
- the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the facility (a duly authorized representative may thus be either a named individual or any individual occupying a named position).

Nothing in this section obviates the permittee from properly submitting reports and forms as required by law.

8. Discharge to the Groundwaters

This site is a known source of groundwater pollution. The reissuance of this permit does not authorize any discharge to the groundwaters or venting of contaminated groundwaters to the surface waters, nor does it constitute a release of liability for any groundwater contamination at or around the site. The state reserves its rights to seek remedies to abate any groundwater contamination.

PART II

Part II may include terms and /or conditions not applicable to discharges covered under this permit.

Section A. Definitions

Acute toxic unit (TU_A) means $100/LC_{50}$ where the LC_{50} is determined from a whole effluent toxicity (WET) test which produces a result that is statistically or graphically estimated to be lethal to 50% of the test organisms.

Annual monitoring frequency refers to a calendar year beginning on January 1 and ending on December 31. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Authorized public agency means a state, local, or county agency that is designated pursuant to the provisions of section 9110 of Part 91 of the NREPA to implement soil erosion and sedimentation control requirements with regard to construction activities undertaken by that agency.

Best management practices (BMPs) means structural devices or nonstructural practices that are designed to prevent pollutants from entering into storm water, to direct the flow of storm water, or to treat polluted storm water.

Bioaccumulative chemical of concern (BCC) means a chemical which, upon entering the surface waters, by itself or as its toxic transformation product, accumulates in aquatic organisms by a human health bioaccumulation factor of more than 1000 after considering metabolism and other physiochemical properties that might enhance or inhibit bioaccumulation. The human health bioaccumulation factor shall be derived according to R 323.1057(5). Chemicals with half-lives of less than 8 weeks in the water column, sediment, and biota are not BCCs. The minimum bioaccumulation concentration factor (BAF) information needed to define an organic chemical as a BCC is either a field-measured BAF or a BAF derived using the biota-sediment accumulation factor (BSAF) methodology. The minimum BAF information needed to define an inorganic chemical as a BCC, including an organometal, is either a field-measured BAF or a laboratory-measured bioconcentration factor (BCF). The BCCs to which these rules apply are identified in Table 5 of R 323.1057 of the Water Quality Standards.

Biosolids are the solid, semisolid, or liquid residues generated during the treatment of sanitary sewage or domestic sewage in a treatment works. This includes, but is not limited to, scum or solids removed in primary, secondary, or advanced wastewater treatment processes and a derivative of the removed scum or solids.

Bulk biosolids means biosolids that are not sold or given away in a bag or other container for application to a lawn or home garden.

Certificate of Coverage (COC) is a document, issued by the Department, which authorizes a discharge under a general permit.

Chronic toxic unit (TU_C) means 100/MATC or $100/IC_{25}$, where the maximum acceptable toxicant concentration (MATC) and IC_{25} are expressed as a percent effluent in the test medium.

Class B biosolids refers to material that has met the Class B pathogen reduction requirements or equivalent treatment by a Process to Significantly Reduce Pathogens (PSRP) in accordance with the Part 24 Rules. Processes include aerobic digestion, composting, anaerobic digestion, lime stabilization and air drying.

Combined sewer system is a sewer system in which storm water runoff is combined with sanitary wastes.

PART II

Section A. Definitions

Daily concentration is the sum of the concentrations of the individual samples of a parameter divided by the number of samples taken during any calendar day. If the parameter concentration in any sample is less than the quantification limit, regard that value as zero when calculating the daily concentration. The daily concentration will be used to determine compliance with any maximum and minimum daily concentration limitations (except for pH and dissolved oxygen). When required by the permit, report the maximum calculated daily concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the Discharge Monitoring Reports (DMRs).

For pH, report the maximum value of any *individual* sample taken during the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs and the minimum value of any *individual* sample taken during the month in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. For dissolved oxygen, report the minimum concentration of any *individual* sample in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

Daily loading is the total discharge by weight of a parameter discharged during any calendar day. This value is calculated by multiplying the daily concentration by the total daily flow and by the appropriate conversion factor. The daily loading will be used to determine compliance with any maximum daily loading limitations. When required by the permit, report the maximum calculated daily loading for the month in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMRs.

Daily monitoring frequency refers to a 24-hour day. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Department means the Michigan Department of Environmental Quality.

Detection level means the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability.

Discharge means the addition of any waste, waste effluent, wastewater, pollutant, or any combination thereof to any surface water of the state.

EC_{50} means a statistically or graphically estimated concentration that is expected to cause 1 or more specified effects in 50% of a group of organisms under specified conditions.

Fecal coliform bacteria monthly
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – Fecal coliform bacteria monthly is the geometric mean of all daily concentrations determined during a discharge event. Days on which no daily concentration is determined shall not be used to determine the calculated monthly value. The calculated monthly value will be used to determine compliance with the maximum monthly fecal coliform bacteria limitations. When required by the permit, report the calculated monthly value in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMR. If the period in which the discharge event occurred was partially in each of two months, the calculated monthly value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – Fecal coliform bacteria monthly is the geometric mean of all daily concentrations determined during a reporting month. Days on which no daily concentration is determined shall not be used to determine the calculated monthly value. The calculated monthly value will be used to determine compliance with the maximum monthly fecal coliform bacteria limitations. When required by the permit, report the calculated monthly value in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMR.

PART II

Section A. Definitions

Fecal coliform bacteria 7-day
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – Fecal coliform bacteria 7-day is the geometric mean of the daily concentrations determined during any 7 consecutive days of discharge during a discharge event. If the number of daily concentrations determined during the discharge event is less than 7 days, the number of actual daily concentrations determined shall be used for the calculation. Days on which no daily concentration is determined shall not be used to determine the value. The calculated 7-day value will be used to determine compliance with the maximum 7-day fecal coliform bacteria limitations. When required by the permit, report the maximum calculated 7-day geometric mean value for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. If the 7-day period was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – Fecal coliform bacteria 7-day is the geometric mean of the daily concentrations determined during any 7 consecutive days in a reporting month. If the number of daily concentrations determined is less than 7, the actual number of daily concentrations determined shall be used for the calculation. Days on which no daily concentration is determined shall not be used to determine the value. The calculated 7-day value will be used to determine compliance with the maximum 7-day fecal coliform bacteria limitations. When required by the permit, report the maximum calculated 7-day geometric mean for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. The first calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

Flow-proportioned sample is a composite sample with the sample volume proportional to the effluent flow.

General permit means a National Pollutant Discharge Elimination System permit issued authorizing a category of similar discharges.

Geometric mean is the average of the logarithmic values of a base 10 data set, converted back to a base 10 number.

Grab sample is a single sample taken at neither a set time nor flow.

IC_{25} means the toxicant concentration that would cause a 25% reduction in a nonquantal biological measurement for the test population.

Illicit connection means a physical connection to a municipal separate storm sewer system that primarily conveys non-storm water discharges other than uncontaminated groundwater into the storm sewer; or a physical connection not authorized or permitted by the local authority, where a local authority requires authorization or a permit for physical connections.

Illicit discharge means any discharge to, or seepage into, a municipal separate storm sewer system that is not composed entirely of storm water or uncontaminated groundwater. Illicit discharges include non-storm water discharges through pipes or other physical connections; dumping of motor vehicle fluids, household hazardous wastes, domestic animal wastes, or litter; collection and intentional dumping of grass clippings or leaf litter; or unauthorized discharges of sewage, industrial waste, restaurant wastes, or any other non-storm water waste directly into a separate storm sewer.

Individual permit means a site-specific NPDES permit.

Inlet means a catch basin, roof drain, conduit, drain tile, retention pond riser pipe, sump pump, or other point where storm water or wastewater enters into a closed conveyance system prior to discharge off site or into waters of the state.

PART II

Section A. Definitions

Interference is a discharge which, alone or in conjunction with a discharge or discharges from other sources, both: 1) inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and 2) therefore, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or, of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent state or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including state regulations contained in any state sludge management plan prepared pursuant to Subtitle D of the SWDA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act. [This definition does not apply to sample matrix interference].

Land application means spraying or spreading biosolids or a biosolids derivative onto the land surface, injecting below the land surface, or incorporating into the soil so that the biosolids or biosolids derivative can either condition the soil or fertilize crops or vegetation grown in the soil.

LC_{50} means a statistically or graphically estimated concentration that is expected to be lethal to 50% of a group of organisms under specified conditions.

Maximum acceptable toxicant concentration (MATC) means the concentration obtained by calculating the geometric mean of the lower and upper chronic limits from a chronic test. A lower chronic limit is the highest tested concentration that did not cause the occurrence of a specific adverse effect. An upper chronic limit is the lowest tested concentration which did cause the occurrence of a specific adverse effect and above which all tested concentrations caused such an occurrence.

Maximum extent practicable means implementation of best management practices by a public body to comply with an approved storm water management program as required by a national permit for a municipal separate storm sewer system, in a manner that is environmentally beneficial, technically feasible, and within the public body's legal authority.

MGD means million gallons per day.

Monthly concentration is the sum of the daily concentrations determined during a reporting period divided by the number of daily concentrations determined. The calculated monthly concentration will be used to determine compliance with any maximum monthly concentration limitations. Days with no discharge shall not be used to determine the value. When required by the permit, report the calculated monthly concentration in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMR.

For minimum percent removal requirements, the monthly influent concentration and the monthly effluent concentration shall be determined. The calculated monthly percent removal, which is equal to 100 times the quantity [1 minus the quantity (monthly effluent concentration divided by the monthly influent concentration)], shall be reported in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

Monthly loading is the sum of the daily loadings of a parameter divided by the number of daily loadings determined during a reporting period. The calculated monthly loading will be used to determine compliance with any maximum monthly loading limitations. Days with no discharge shall not be used to determine the value. When required by the permit, report the calculated monthly loading in the "AVERAGE" column under "QUANTITY OR LOADING" on the DMR.

Monthly monitoring frequency refers to a calendar month. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Municipal separate storm sewer means a conveyance or system of conveyances designed or used for collecting or conveying storm water which is not a combined sewer and which is not part of a publicly-owned treatment works as defined in the Code of Federal Regulations at 40 CFR 122.2.

PART II

Section A. Definitions

Municipal separate storm sewer system (MS4) means all separate storm sewers that are owned or operated by the United States, a state, city, village, township, county, district, association, or other public body created by or pursuant to state law, having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under state law, such as a sewer district, flood control district, or drainage district, or similar entity, or a designated or approved management agency under Section 208 of the Federal Act that discharges to the waters of the state. This term includes systems similar to separate storm sewer systems in municipalities, such as systems at military bases, large hospital or prison complexes, and highways and other thoroughfares. The term does not include separate storm sewers in very discrete areas, such as individual buildings.

National Pretreatment Standards are the regulations promulgated by or to be promulgated by the Federal Environmental Protection Agency pursuant to Section 307(b) and (c) of the Federal Act. The standards establish nationwide limits for specific industrial categories for discharge to a POTW.

No observed adverse effect level (NOAEL) means the highest tested dose or concentration of a substance which results in no observed adverse effect in exposed test organisms where higher doses or concentrations result in an adverse effect.

Noncontact cooling water is water used for cooling which does not come into direct contact with any raw material, intermediate product, by-product, waste product or finished product.

Nondomestic user is any discharger to a POTW that discharges wastes other than or in addition to water-carried wastes from toilet, kitchen, laundry, bathing or other facilities used for household purposes.

Outfall is the location at which a point source discharge enters the surface waters of the state.

Part 91 agency means an agency that is designated by a county board of commissioners pursuant to the provisions of section 9105 of Part 91 of the NREPA; an agency that is designated by a city, village, or township in accordance with the provisions of section 9106 of Part 91 of the NREPA; or the Department for soil erosion and sedimentation activities under Part 615, Part 631, or Part 632 pursuant to the provisions of section 9115 of Part 91 of the NREPA.

Part 91 permit means a soil erosion and sedimentation control permit issued by a Part 91 agency pursuant to the provisions of Part 91 of the NREPA.

Partially treated sewage is any sewage, sewage and storm water, or sewage and wastewater, from domestic or industrial sources that is treated to a level less than that required by the permittee's National Pollutant Discharge Elimination System permit, or that is not treated to national secondary treatment standards for wastewater, including discharges to surface waters from retention treatment facilities.

Point of discharge is the location of a point source discharge where storm water is discharged directly into a separate storm sewer system.

Point source discharge means a discharge from any discernible, confined, discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, or rolling stock. Changing the surface of land or establishing grading patterns on land will result in a point source discharge where the runoff from the site is ultimately discharged to waters of the state.

Polluting material means any material, in solid or liquid form, identified as a polluting material under the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code).

POTW is a publicly owned treatment work.

Pretreatment is reducing the amount of pollutants, eliminating pollutants, or altering the nature of pollutant properties to a less harmful state prior to discharge into a public sewer. The reduction or alteration can be by physical, chemical, or biological processes, process changes, or by other means. Dilution is not considered pretreatment unless expressly authorized by an applicable National Pretreatment Standard for a particular industrial category.

PART II

Section A. Definitions

Public (as used in the MS4 individual permit) means all persons who potentially could affect the authorized storm water discharges, including, but not limited to, residents, visitors to the area, public employees, businesses, industries, and construction contractors and developers.

Public body means the United States; the state of Michigan; a city, village, township, county, school district, public college or university, or single-purpose governmental agency; or any other body which is created by federal or state statute or law.

Qualified Personnel means an individual who meets qualifications acceptable to the Department and who is authorized by an Industrial Storm Water Certified Operator to collect the storm water sample.

Qualifying storm event means a storm event causing greater than 0.1 inch of rainfall and occurring at least 72 hours after the previous measurable storm event that also caused greater than 0.1 inch of rainfall, unless an alternate definition is approved by the Department.

Quantification level means the measurement of the concentration of a contaminant obtained by using a specified laboratory procedure calculated at a specified concentration above the detection level. It is considered the lowest concentration at which a particular contaminant can be quantitatively measured using a specified laboratory procedure for monitoring of the contaminant.

Quarterly monitoring frequency refers to a three month period, defined as January through March, April through June, July through September, and October through December. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

Regional Administrator is the Region 5 Administrator, U.S. EPA, located at R-19J, 77 W. Jackson Blvd., Chicago, Illinois 60604.

Regulated area means the permittee's urbanized area, where urbanized area is defined as a place and its adjacent densely-populated territory that together have a minimum population of 50,000 people as defined by the United States Bureau of the Census and as determined by the latest available decennial census.

Secondary containment structure means a unit, other than the primary container, in which significant materials are packaged or held, which is required by State or Federal law to prevent the escape of significant materials by gravity into sewers, drains, or otherwise directly or indirectly into any sewer system or to the surface or ground waters of this state.

Separate storm sewer system means a system of drainage, including, but not limited to, roads, catch basins, curbs, gutters, parking lots, ditches, conduits, pumping devices, or man-made channels, which is not a combined sewer where storm water mixes with sanitary wastes, and is not part of a POTW.

Significant industrial user is a nondomestic user that: 1) is subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N; or 2) discharges an average of 25,000 gallons per day or more of process wastewater to a POTW (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process waste stream which makes up five (5) percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the permittee as defined in 40 CFR 403.12(a) on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's treatment plant operation or violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

PART II

Section A. Definitions

Significant materials Significant Materials means any material which could degrade or impair water quality, including but not limited to: raw materials; fuels; solvents, detergents, and plastic pellets; finished materials such as metallic products; hazardous substances designated under Section 101(14) of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (see 40 CFR 372.65); any chemical the facility is required to report pursuant to Section 313 of Emergency Planning and Community Right-to-Know Act (EPCRA); polluting materials as identified under the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code); Hazardous Wastes as defined in Part 111 of the NREPA; fertilizers; pesticides; and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

Significant spills and significant leaks means any release of a polluting material reportable under the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code).
Special-use area means secondary containment structures required by state or federal law; lands on Michigan's List of Sites of Environmental Contamination pursuant to Part 201, Environmental Remediation, of the NREPA; and/or areas with other activities that may contribute pollutants to the storm water for which the Department determines monitoring is needed.

Stoichiometric means the quantity of a reagent calculated to be necessary and sufficient for a given chemical reaction.

Storm water means storm water runoff, snow melt runoff, surface runoff and drainage, and non-storm water included under the conditions of this permit.

Storm water discharge point is the location where the point source discharge of storm water is directed to surface waters of the state or to a separate storm sewer. It includes the location of all point source discharges where storm water exits the facility, including *outfalls* which discharge directly to surface waters of the state, and *points of discharge* which discharge directly into separate storm sewer systems.

SWPPP means the Storm Water Pollution Prevention Plan prepared in accordance with this permit.

Tier I value means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier I toxicity database.

Tier II value means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier II toxicity database.

Total maximum daily loads (TMDLs) are required by the Federal Act for waterbodies that do not meet water quality standards. TMDLs represent the maximum daily load of a pollutant that a waterbody can assimilate and meet water quality standards, and an allocation of that load among point sources, nonpoint sources, and a margin of safety.

Toxicity reduction evaluation (TRE) means a site-specific study conducted in a stepwise process designed to identify the causative agents of effluent toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in effluent toxicity.

Water Quality Standards means the Part 4 Water Quality Standards promulgated pursuant to Part 31 of the NREPA, being R 323.1041 through R 323.1117 of the Michigan Administrative Code.

Weekly monitoring frequency refers to a calendar week which begins on Sunday and ends on Saturday. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

WWSL is a wastewater stabilization lagoon.

WWSL discharge event is a discrete occurrence during which effluent is discharged to the surface water up to 10 days of a consecutive 14 day period.

PART II

Section A. Definitions

3-portion composite sample is a sample consisting of three equal-volume grab samples collected at equal intervals over an 8-hour period.

7-day concentration
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – The 7-day concentration is the sum of the daily concentrations determined during any 7 consecutive days of discharge during a WWSL discharge event divided by the number of daily concentrations determined. If the number of daily concentrations determined during the WWSL discharge event is less than 7 days, the number of actual daily concentrations determined shall be used for the calculation. The calculated 7-day concentration will be used to determine compliance with any maximum 7-day concentration limitations. When required by the permit, report the maximum calculated 7-day concentration for the WWSL discharge event in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMR. If the WWSL discharge event was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – The 7-day concentration is the sum of the daily concentrations determined during any 7 consecutive days in a reporting month divided by the number of daily concentrations determined. If the number of daily concentrations determined is less than 7, the actual number of daily concentrations determined shall be used for the calculation. The calculated 7-day concentration will be used to determine compliance with any maximum 7-day concentration limitations in the reporting month. When required by the permit, report the maximum calculated 7-day concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMR. The first 7-day calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

7-day loading
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – The 7-day loading is the sum of the daily loadings determined during any 7 consecutive days of discharge during a WWSL discharge event divided by the number of daily loadings determined. If the number of daily loadings determined during the WWSL discharge event is less than 7 days, the number of actual daily loadings determined shall be used for the calculation. The calculated 7-day loading will be used to determine compliance with any maximum 7-day loading limitations. When required by the permit, report the maximum calculated 7-day loading for the WWSL discharge event in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMR. If the WWSL discharge event was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred

FOR ALL OTHER DISCHARGES – The 7-day loading is the sum of the daily loadings determined during any 7 consecutive days in a reporting month divided by the number of daily loadings determined. If the number of daily loadings determined is less than 7, the actual number of daily loadings determined shall be used for the calculation. The calculated 7-day loading will be used to determine compliance with any maximum 7-day loading limitations in the reporting month. When required by the permit, report the maximum calculated 7-day loading for the month in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMR. The first 7-day calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

24-hour composite sample is a flow-proportioned composite sample consisting of hourly or more frequent portions that are taken over a 24-hour period. A time-proportioned composite sample may be used upon approval of the Department if the permittee demonstrates it is representative of the discharge.

PART II

Section B. Monitoring Procedures

1. Representative Samples

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations promulgated pursuant to Section 304(h) of the Federal Act (40 CFR Part 136 – Guidelines Establishing Test Procedures for the Analysis of Pollutants), unless specified otherwise in this permit. **Test procedures used shall be sufficiently sensitive to determine compliance with applicable effluent limitations**. Requests to use test procedures not promulgated under 40 CFR Part 136 for pollutant monitoring required by this permit shall be made in accordance with the Alternate Test Procedures regulations specified in 40 CFR 136.4. These requests shall be submitted to the Chief of the Permits Section, Water Resources Division, Michigan Department of Environmental Quality, P.O. Box 30458, Lansing, Michigan, 48909-7958. The permittee may use such procedures upon approval.

The permittee shall periodically calibrate and perform maintenance procedures on all analytical instrumentation at intervals to ensure accuracy of measurements. The calibration and maintenance shall be performed as part of the permittee's laboratory Quality Control/Quality Assurance program.

3. Instrumentation

The permittee shall periodically calibrate and perform maintenance procedures on all monitoring instrumentation at intervals to ensure accuracy of measurements.

4. Recording Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information: 1) the exact place, date, and time of measurement or sampling; 2) the person(s) who performed the measurement or sample collection; 3) the dates the analyses were performed; 4) the person(s) who performed the analyses; 5) the analytical techniques or methods used; 6) the date of and person responsible for equipment calibration; and 7) the results of all required analyses.

5. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the Department.

PART II

Section C. Reporting Requirements

1. Start-up Notification

If the permittee will not discharge during the first 60 days following the effective date of this permit, the permittee shall notify the Department within 14 days following the effective date of this permit, and then 60 days prior to the commencement of the discharge.

2. Submittal Requirements for Self-Monitoring Data

Part 31 of the NREPA (specifically Section 324.3110(7)); and R 323.2155(2) of Part 21, Wastewater Discharge Permits, promulgated under Part 31 of the NREPA, allow the Department to specify the forms to be utilized for reporting the required self-monitoring data. Unless instructed on the effluent limitations page to conduct "Retained Self-Monitoring" the permittee shall submit self-monitoring data via the Department's MiWaters system.

The permittee shall utilize the information provided on the MiWaters website at https://miwaters.deq.state.mi.us to access and submit the electronic forms. Both monthly summary and daily data shall be submitted to the Department no later than the 20th day of the month following each month of the authorized discharge period(s). The permittee may be allowed to submit the electronic forms after this date if the Department has granted an extension to the submittal date.

3. Retained Self-Monitoring Requirements

If instructed on the effluent limits page (or otherwise authorized by the Department in accordance with the provisions of this permit) to conduct retained self-monitoring, the permittee shall maintain a year-to-date log of retained self-monitoring results and, upon request, provide such log for inspection to the staff of the Department. Retained self-monitoring results are public information and shall be promptly provided to the public upon request.

The permittee shall certify, in writing, to the Department, on or before January 10th (April 1st for animal feeding operation facilities) of each year, that: 1) all retained self-monitoring requirements have been complied with and a year-to-date log has been maintained; and 2) the application on which this permit is based still accurately describes the discharge. With this annual certification, the permittee shall submit a summary of the previous year's monitoring data. The summary shall include maximum values for samples to be reported as daily maximums and/or monthly maximums and minimum values for any daily minimum samples.

Retained self-monitoring may be denied to a permittee by notification in writing from the Department. In such cases, the permittee shall submit self-monitoring data in accordance with Part II.C.2., above. Such a denial may be rescinded by the Department upon written notification to the permittee. Reissuance or modification of this permit or reissuance or modification of an individual permittee's authorization to discharge shall not affect previous approval or denial for retained self-monitoring unless the Department provides notification in writing to the permittee.

4. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

Monitoring required pursuant to Part 41 of the NREPA or Rule 35 of the Mobile Home Park Commission Act (Act 96 of the Public Acts of 1987) for assurance of proper facility operation shall be submitted as required by the Department.

PART II

Section C. Reporting Requirements

5. Compliance Dates Notification

Within 14 days of every compliance date specified in this permit, the permittee shall submit a *written* notification to the Department indicating whether or not the particular requirement was accomplished. If the requirement was not accomplished, the notification shall include an explanation of the failure to accomplish the requirement, actions taken or planned by the permittee to correct the situation, and an estimate of when the requirement will be accomplished. If a written report is required to be submitted by a specified date and the permittee accomplishes this, a separate written notification is not required.

6. Noncompliance Notification

Compliance with all applicable requirements set forth in the Federal Act, Parts 31 and 41 of the NREPA, and related regulations and rules is required. All instances of noncompliance shall be reported as follows:

a. 24-Hour Reporting
Any noncompliance which may endanger health or the environment (including maximum and/or minimum daily concentration discharge limitation exceedances) shall be reported, verbally, within 24 hours from the time the permittee becomes aware of the noncompliance. A written submission shall also be provided within five (5) days.

b. Other Reporting
The permittee shall report, in writing, all other instances of noncompliance not described in a. above at the time monitoring reports are submitted; or, in the case of retained self-monitoring, within five (5) days from the time the permittee becomes aware of the noncompliance.

Written reporting shall include: 1) a description of the discharge and cause of noncompliance; and 2) the period of noncompliance, including exact dates and times, or, if not yet corrected, the anticipated time the noncompliance is expected to continue, and the steps taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

7. Spill Notification

The permittee shall immediately report any release of any polluting material which occurs to the surface waters or groundwaters of the state, unless the permittee has determined that the release is not in excess of the threshold reporting quantities specified in the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code), by calling the Department at the number indicated on the second page of this permit (or, if this is a general permit, on the COC); or, if the notice is provided after regular working hours, call the Department's 24-hour Pollution Emergency Alerting System telephone number, 1-800-292-4706 (calls from **out-of-state** dial 1-517-373-7660).

Within ten (10) days of the release, the permittee shall submit to the Department a full written explanation as to the cause of the release, the discovery of the release, response (clean-up and/or recovery) measures taken, and preventative measures taken or a schedule for completion of measures to be taken to prevent reoccurrence of similar releases.

PART II

Section C. Reporting Requirements

8. Upset Noncompliance Notification

If a process "upset" (defined as an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee) has occurred, the permittee who wishes to establish the affirmative defense of upset, shall notify the Department by telephone within 24 hours of becoming aware of such conditions; and within five (5) days, provide in writing, the following information:

a. that an upset occurred and that the permittee can identify the specific cause(s) of the upset;

b. that the permitted wastewater treatment facility was, at the time, being properly operated and maintained (note that an upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation); and

c. that the permittee has specified and taken action on all responsible steps to minimize or correct any adverse impact in the environment resulting from noncompliance with this permit.

No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

In any enforcement proceedings, the permittee, seeking to establish the occurrence of an upset, has the burden of proof.

9. Bypass Prohibition and Notification

a. Bypass Prohibition
Bypass is prohibited, and the Department may take an enforcement action, unless:

1) bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

2) there were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass; and

3) the permittee submitted notices as required under 9.b. or 9.c. below.

b. Notice of Anticipated Bypass
If the permittee knows in advance of the need for a bypass, it shall submit prior notice to the Department, if possible at least ten (10) days before the date of the bypass, and provide information about the anticipated bypass as required by the Department. The Department may approve an anticipated bypass, after considering its adverse effects, if it will meet the three (3) conditions listed in 9.a. above.

c. Notice of Unanticipated Bypass
The permittee shall submit notice to the Department of an unanticipated bypass by calling the Department at the number indicated on the second page of this permit (if the notice is provided after regular working hours, use the following number: 1-800-292-4706) as soon as possible, but no later than 24 hours from the time the permittee becomes aware of the circumstances.

PART II

Section C. Reporting Requirements

d. Written Report of Bypass
A written submission shall be provided within five (5) working days of commencing any bypass to the Department, and at additional times as directed by the Department. The written submission shall contain a description of the bypass and its cause; the period of bypass, including exact dates and times, and if the bypass has not been corrected, the anticipated time it is expected to continue; steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass; and other information as required by the Department.

e. Bypass Not Exceeding Limitations
The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to ensure efficient operation. These bypasses are not subject to the provisions of 9.a., 9.b., 9.c., and 9.d., above. This provision does not relieve the permittee of any notification responsibilities under Part II.C.11. of this permit.

f. Definitions

1) Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

2) Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

10. Bioaccumulative Chemicals of Concern (BCC)

Consistent with the requirements of R 323.1098 and R 323.1215 of the Michigan Administrative Code, the permittee is prohibited from undertaking any action that would result in a lowering of water quality from an increased loading of a BCC unless an increased use request and antidegradation demonstration have been submitted and approved by the Department.

11. Notification of Changes in Discharge

The permittee shall notify the Department, in writing, as soon as possible but no later than 10 days of knowing, or having reason to believe, that any activity or change has occurred or will occur which would result in the discharge of: 1) detectable levels of chemicals on the current Michigan Critical Materials Register, priority pollutants or hazardous substances set forth in 40 CFR 122.21, Appendix D, or the Pollutants of Initial Focus in the Great Lakes Water Quality Initiative specified in 40 CFR 132.6, Table 6, which were not acknowledged in the application or listed in the application at less than detectable levels; 2) detectable levels of any other chemical not listed in the application or listed at less than detection, for which the application specifically requested information; or 3) any chemical at levels greater than five times the average level reported in the complete application (see the first page of this permit, for the date(s) the complete application was submitted). Any other monitoring results obtained as a requirement of this permit shall be reported in accordance with the compliance schedules.

PART II

Section C. Reporting Requirements

12. Changes in Facility Operations

Any anticipated action or activity, including but not limited to facility expansion, production increases, or process modification, which will result in new or increased loadings of pollutants to the receiving waters must be reported to the Department by a) submission of an increased use request (application) and all information required under R 323.1098 (Antidegradation) of the Water Quality Standards or b) by notice if the following conditions are met: 1) the action or activity will not result in a change in the types of wastewater discharged or result in a greater quantity of wastewater than currently authorized by this permit; 2) the action or activity will not result in violations of the effluent limitations specified in this permit; 3) the action or activity is not prohibited by the requirements of Part II.C.10.; and 4) the action or activity will not require notification pursuant to Part II.C.11. Following such notice, the permit or, if applicable, the facility's COC may be modified according to applicable laws and rules to specify and limit any pollutant not previously limited.

13. Transfer of Ownership or Control

In the event of any change in control or ownership of facilities from which the authorized discharge emanates, the permittee shall submit to the Department 30 days prior to the actual transfer of ownership or control a written agreement between the current permittee and the new permittee containing: 1) the legal name and address of the new owner; 2) a specific date for the effective transfer of permit responsibility, coverage and liability; and 3) a certification of the continuity of or any changes in operations, wastewater discharge, or wastewater treatment.

If the new permittee is proposing changes in operations, wastewater discharge, or wastewater treatment, the Department may propose modification of this permit in accordance with applicable laws and rules.

14. Operations and Maintenance Manual

For wastewater treatment facilities that serve the public (and are thus subject to Part 41 of the NREPA), Section 4104 of Part 41 and associated Rule 2957 of the Michigan Administrative Code allow the Department to require an Operations and Maintenance (O&M) Manual from the facility. An up-to-date copy of the O&M Manual shall be kept at the facility and shall be provided to the Department upon request. The Department may review the O&M Manual in whole or in part at its discretion and require modifications to it if portions are determined to be inadequate.

At a minimum, the O&M Manual shall include the following information: permit standards; descriptions and operation information for all equipment; staffing information; laboratory requirements; record keeping requirements; a maintenance plan for equipment; an emergency operating plan; safety program information; and copies of all pertinent forms, as-built plans, and manufacturer's manuals.

Certification of the existence and accuracy of the O&M Manual shall be submitted to the Department at least sixty days prior to start-up of a new wastewater treatment facility. Recertification shall be submitted sixty days prior to start-up of any substantial improvements or modifications made to an existing wastewater treatment facility.

PART II

Section C. Reporting Requirements

15. Signatory Requirements

All applications, reports, or information submitted to the Department in accordance with the conditions of this permit and that require a signature shall be signed and certified as described in the Federal Act and the NREPA.

The Federal Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance, shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

The NREPA (Section 3115(2)) provides that a person who at the time of the violation knew or should have known that he or she discharged a substance contrary to this part, or contrary to a permit, COC, or order issued or rule promulgated under this part, or who intentionally makes a false statement, representation, or certification in an application for or form pertaining to a permit or COC or in a notice or report required by the terms and conditions of an issued permit or COC, or who intentionally renders inaccurate a monitoring device or record required to be maintained by the Department, is guilty of a felony and shall be fined not less than $2,500.00 or more than $25,000.00 for each violation. The court may impose an additional fine of not more than $25,000.00 for each day during which the unlawful discharge occurred. If the conviction is for a violation committed after a first conviction of the person under this subsection, the court shall impose a fine of not less than $25,000.00 per day and not more than $50,000.00 per day of violation. Upon conviction, in addition to a fine, the court in its discretion may sentence the defendant to imprisonment for not more than 2 years or impose probation upon a person for a violation of this part. With the exception of the issuance of criminal complaints, issuance of warrants, and the holding of an arraignment, the circuit court for the county in which the violation occurred has exclusive jurisdiction. However, the person shall not be subject to the penalties of this subsection if the discharge of the effluent is in conformance with and obedient to a rule, order, permit, or COC of the Department. In addition to a fine, the attorney general may file a civil suit in a court of competent jurisdiction to recover the full value of the injuries done to the natural resources of the state and the costs of surveillance and enforcement by the state resulting from the violation.

16. Electronic Reporting

Upon notice by the Department that electronic reporting tools are available for specific reports or notifications, the permittee shall submit electronically all such reports or notifications as required by this permit.

PART II

Section D. Management Responsibilities

1. Duty to Comply

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit, more frequently than, or at a level in excess of, that authorized, shall constitute a violation of the permit.

It is the duty of the permittee to comply with all the terms and conditions of this permit. Any noncompliance with the Effluent Limitations, Special Conditions, or terms of this permit constitutes a violation of the NREPA and/or the Federal Act and constitutes grounds for enforcement action; for permit or Certificate of Coverage (COC) termination, revocation and reissuance, or modification; or denial of an application for permit or COC renewal.

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

2. Operator Certification

The permittee shall have the waste treatment facilities under direct supervision of an operator certified at the appropriate level for the facility certification by the Department, as required by Sections 3110 and 4104 of the NREPA. Permittees authorized to discharge storm water shall have the storm water treatment and/or control measures under direct supervision of a storm water operator certified by the Department, as required by Section 3110 of the NREPA.

3. Facilities Operation

The permittee shall, at all times, properly operate and maintain all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance includes adequate laboratory controls and appropriate quality assurance procedures.

4. Power Failures

In order to maintain compliance with the effluent limitations of this permit and prevent unauthorized discharges, the permittee shall either:

a. provide an alternative power source sufficient to operate facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit; or

b. upon the reduction, loss, or failure of one or more of the primary sources of power to facilities utilized by the permittee to maintain compliance with the effluent limitations and conditions of this permit, the permittee shall halt, reduce or otherwise control production and/or all discharge in order to maintain compliance with the effluent limitations and conditions of this permit.

5. Adverse Impact

The permittee shall take all reasonable steps to minimize or prevent any adverse impact to the surface waters or groundwaters of the state resulting from noncompliance with any effluent limitation specified in this permit including, but not limited to, such accelerated or additional monitoring as necessary to determine the nature and impact of the discharge in noncompliance.

PART II

Section D. Management Responsibilities

6. Containment Facilities

The permittee shall provide facilities for containment of any accidental losses of polluting materials in accordance with the requirements of the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code). For a Publicly Owned Treatment Work (POTW), these facilities shall be approved under Part 41 of the NREPA.

7. Waste Treatment Residues

Residuals (i.e. solids, sludges, biosolids, filter backwash, scrubber water, ash, grit, or other pollutants or wastes) removed from or resulting from treatment or control of wastewaters, including those that are generated during treatment or left over after treatment or control has ceased, shall be disposed of in an environmentally compatible manner and according to applicable laws and rules. These laws may include, but are not limited to, the NREPA, Part 31 for protection of water resources, Part 55 for air pollution control, Part 111 for hazardous waste management, Part 115 for solid waste management, Part 121 for liquid industrial wastes, Part 301 for protection of inland lakes and streams, and Part 303 for wetlands protection. Such disposal shall not result in any unlawful pollution of the air, surface waters or groundwaters of the state.

8. Right of Entry

The permittee shall allow the Department, any agent appointed by the Department, or the Regional Administrator, upon the presentation of credentials and, for animal feeding operation facilities, following appropriate biosecurity protocols:

a. to enter upon the permittee's premises where an effluent source is located or any place in which records are required to be kept under the terms and conditions of this permit; and

b. at reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect process facilities, treatment works, monitoring methods and equipment regulated or required under this permit; and to sample any discharge of pollutants.

9. Availability of Reports

Except for data determined to be confidential under Section 308 of the Federal Act and Rule 2128 (R 323.2128 of the Michigan Administrative Code), all reports prepared in accordance with the terms of this permit, shall be available for public inspection at the offices of the Department and the Regional Administrator. As required by the Federal Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Act and Sections 3112, 3115, 4106 and 4110 of the NREPA.

10. Duty to Provide Information

The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or the facility's COC, or to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information.

PART II

Section E. Activities Not Authorized by This Permit

1. Discharge to the Groundwaters

This permit does not authorize any discharge to the groundwaters. Such discharge may be authorized by a groundwater discharge permit issued pursuant to the NREPA.

2. POTW Construction

This permit does not authorize or approve the construction or modification of any physical structures or facilities at a POTW. Approval for the construction or modification of any physical structures or facilities at a POTW shall be by permit issued under Part 41 of the NREPA.

3. Civil and Criminal Liability

Except as provided in permit conditions on "Bypass" (Part II.C.9. pursuant to 40 CFR 122.41(m)), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance, whether or not such noncompliance is due to factors beyond the permittee's control, such as accidents, equipment breakdowns, or labor disputes.

4. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee may be subject under Section 311 of the Federal Act except as are exempted by federal regulations.

5. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Federal Act.

6. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other Department of Environmental Quality permits, or approvals from other units of government as may be required by law.

Permit Facility.Permit Num (NPID)	Facility Name Part 1 (NAM1)	Orig Issue Dt (ORID)	Permit Issuance Date (PERD)	Permit Effective Date (PEFD)	Permit Expiration Date (PERE)	Discharge Number (VDSC)	Parameter Cd Desc (VPRMD)	Monitoring Location (VMLO)	Monitoring Location Desc (VMLOD)	Seasonal (VSEA)	Modification Num (VMOD)
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0

Permit Facility.Permit Num (NPID)	Facility Name Part 1 (NAM1)	Orig Issue Dt (ORID)	Permit Issuance Date (PERD)	Permit Effective Date (PEFD)	Permit Expiration Date (PERE)	Discharge Number (VDSC)	Parameter Cd Desc (VPRMD)	Monitoring Location (VMLO)	Monitoring Location Desc (VMLOD)	Seasonal (VSEA)	Modification Num (VMOD)
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1

Permit Facility.Permit Num (NPID)	Facility Name Part 1 (NAM1)	Orig Issue Dt (ORID)	Permit Issuance Date (PERD)	Permit Effective Date (PEFD)	Permit Expiration Date (PERE)	Discharge Number (VDSC)	Parameter Cd Desc (VPRMD)	Monitoring Location (VMLO)	Monitoring Location Desc (VMLOD)	Seasonal (VSEA)	Modification Num (VMOD)
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	1	Effluent Gross Value	0	1
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	002	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	002	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	002	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	002	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	002	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	002	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0

Permit Facility.Permit Num (NPID)	Facility Name Part 1 (NAM1)	Orig Issue Dt (ORID)	Permit Issuance Date (PERD)	Permit Effective Date (PEFD)	Permit Expiration Date (PERE)	Discharge Number (VDSC)	Parameter Cd Desc (VPRMD)	Monitoring Location (VMLO)	Monitoring Location Desc (VMLOD)	Seasonal (VSEA)	Modification Num (VMOD)
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0

Permit Facility.Permit Num (NPID)	Facility Name Part 1 (NAM1)	Orig Issue Dt (ORID)	Permit Issuance Date (PERD)	Permit Effective Date (PEFD)	Permit Expiration Date (PERE)	Discharge Number (VDSC)	Parameter Cd Desc (VPRMD)	Monitoring Location (VMLO)	Monitoring Location Desc (VMLOD)	Seasonal (VSEA)	Modification Num (VMOD)
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	G	Raw Sew/Influent	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	002	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	002	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	002	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	002	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	002	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	001	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	002	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0
MI0048453	PALL LIFE SCIENCES INC	19911219	20100511	20101001	20141001	003	1,4-Dioxane	P	See Comments Below	0	0

Monitoring Dt (MVDT)	Meas Conc Avge (MCAV)	Meas Conc Minm (MCMN)	Meas Conc Maxm (MCMX)	Meas Quant Avge (MQAV)	Meas Quant Maxm (MQMX)	Meas Vio Evnt Cd (MVIO)	Meas Vio Evnt Cd Desc (MVIOD)	No Disc (NODI)	No Disc Desc (NODID)	Rpt Smp Type (RSAM)
19970731	7.3		10							
19970831	3.54		7							
19970930	1.73		8							
19971031	6.73		19							
19971130	8.42		23							
19971231	7.6		27							
19980131	9.3		36			E90	NUMERIC VIOLATION			
19980228	7.1		26			E00	MEASUREMENT ONLY, NO VIOLATION			
19980331	5.7		19			E00	MEASUREMENT ONLY, NO VIOLATION			
19980430	10		29			E00	MEASUREMENT ONLY, NO VIOLATION			
19980531	4.4		18			E00	MEASUREMENT ONLY, NO VIOLATION			
19980630	6.8		29			E00	MEASUREMENT ONLY, NO VIOLATION			
19980731	5.6		19			E00	MEASUREMENT ONLY, NO VIOLATION			
19980831	4.1		11			E00	MEASUREMENT ONLY, NO VIOLATION			
19980930	1.2		2			E00	MEASUREMENT ONLY, NO VIOLATION			
19981130	7.3		57			E90	NUMERIC VIOLATION			
19981231	3.1		7			E00	MEASUREMENT ONLY, NO VIOLATION			
19990131	7.6		15			E00	MEASUREMENT ONLY, NO VIOLATION			
19990228	2		7			E00	MEASUREMENT ONLY, NO VIOLATION			
19990331						E00	MEASUREMENT ONLY, NO VIOLATION	C	No Discharge	
19990430	3		21			E00	MEASUREMENT ONLY, NO VIOLATION			
19990531	1.1		6			E00	MEASUREMENT ONLY, NO VIOLATION			
19990630	2.5		9			E00	MEASUREMENT ONLY, NO VIOLATION			
19990731						E00	MEASUREMENT ONLY, NO VIOLATION	C	No Discharge	
19990831	7		105			E90	NUMERIC VIOLATION			
19990930	2.09		7			E00	MEASUREMENT ONLY, NO VIOLATION			
19991031	3.1		6			E00	MEASUREMENT ONLY, NO VIOLATION			
19991130	13.7		112			E90	NUMERIC VIOLATION			
19991231	9.2		22			E00	MEASUREMENT ONLY, NO VIOLATION			
20000131	10		79.5			E90	NUMERIC VIOLATION			
20000229	4.3		13			E00	MEASUREMENT ONLY, NO VIOLATION			
20000331	3.1		7			E00	MEASUREMENT ONLY, NO VIOLATION			
20000430	2.9		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20000531	1.8		4			E00	MEASUREMENT ONLY, NO VIOLATION			
20000630	2.2		4			E00	MEASUREMENT ONLY, NO VIOLATION			
20000731	2.6		5			E00	MEASUREMENT ONLY, NO VIOLATION			
20000831	5.7		31			E00	MEASUREMENT ONLY, NO VIOLATION			
20000930	7.8		17			E00	MEASUREMENT ONLY, NO VIOLATION			
20001031	19.6		350			E90	NUMERIC VIOLATION			
20001130	9		31			E00	MEASUREMENT ONLY, NO VIOLATION			
20001231	9.57		24			E00	MEASUREMENT ONLY, NO VIOLATION			
20010131	5		22.5			E00	MEASUREMENT ONLY, NO VIOLATION			
20010228	7.55		19			E00	MEASUREMENT ONLY, NO VIOLATION			
20010430	3.1		10			E00	MEASUREMENT ONLY, NO VIOLATION			
20010531	2.64		9			E00	MEASUREMENT ONLY, NO VIOLATION			
20010630	3.8		18			E00	MEASUREMENT ONLY, NO VIOLATION			
20010731	3.7		15			E00	MEASUREMENT ONLY, NO VIOLATION			
20010831	7.5		19			E00	MEASUREMENT ONLY, NO VIOLATION			
20011031	3.7		12			E00	MEASUREMENT ONLY, NO VIOLATION			
20011130	5.05		30			E00	MEASUREMENT ONLY, NO VIOLATION			
20011231	3.5		9			E00	MEASUREMENT ONLY, NO VIOLATION			
20020131	6.17		16			E00	MEASUREMENT ONLY, NO VIOLATION			
20020228	4.7		14			E00	MEASUREMENT ONLY, NO VIOLATION			
20020331	2.3		8			E00	MEASUREMENT ONLY, NO VIOLATION			
20020430	5.8		26			E00	MEASUREMENT ONLY, NO VIOLATION			
20020531	3.5		18			E00	MEASUREMENT ONLY, NO VIOLATION			
20020630	1.55		11			E00	MEASUREMENT ONLY, NO VIOLATION			

Monitoring Dt (MVDT)	Meas Conc Avge (MCAV)	Meas Conc Minm (MCMN)	Meas Conc Maxm (MCMX)	Meas Quant Avge (MQAV)	Meas Quant Maxm (MQMX)	Meas Vio Evnt Cd (MVIO)	Meas Vio Evnt Cd Desc (MVIOD)	No Disc (NODI)	No Disc Desc (NODID)	Rpt Smp Type (RSAM)
20020731	6.2		37			E00	MEASUREMENT ONLY, NO VIOLATION			
20020831	1.32		8			E00	MEASUREMENT ONLY, NO VIOLATION			
20020930	1.24		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20021031	2.4		9			E00	MEASUREMENT ONLY, NO VIOLATION			
20021130	0.1		1			E00	MEASUREMENT ONLY, NO VIOLATION			
20021231	3.33		25			E00	MEASUREMENT ONLY, NO VIOLATION			
20030131	3.86		11			E00	MEASUREMENT ONLY, NO VIOLATION			
20030228	1.05		9			E00	MEASUREMENT ONLY, NO VIOLATION			
20030331	5.95		20			E00	MEASUREMENT ONLY, NO VIOLATION			
20030430	3		10			E00	MEASUREMENT ONLY, NO VIOLATION			
20030531						E00	MEASUREMENT ONLY, NO VIOLATION	9	Monitoring Is Conditional/Not Req This Mp	
20030630	1.9		31			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20030731	5.86		83			E90	NUMERIC VIOLATION			GR
20030831	1.1		7			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20030930	1.14		8			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20031031	0.87		3			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20031130	1.5		8			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20031231	0.41		4			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040131	0.9		4			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040229	2		6			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040331	0.26		2			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040430	0.14		2			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040630	0.27		2			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040731	1.05		4			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040831	1.5		7			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040930	1.14		4			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20041031	2.2		10			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20041130	2.26		10.5			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20041231	3.26		16			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20050131	2.6		8.5			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20050228	2.4		9			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20050331	3.1		9			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20050430	4.5		7			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20050531	4.67		9			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20050630	3.9		9			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20050831	5.5		8			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20050930						E41	LIMITED, CONCENTRATION ABSENT			CG
20051031	4		5			E00	MEASUREMENT ONLY, NO VIOLATION			CG
20051130	5		6			E00	MEASUREMENT ONLY, NO VIOLATION			CG
20051231	6		7			E00	MEASUREMENT ONLY, NO VIOLATION			CG
20060131	4		6			E00	MEASUREMENT ONLY, NO VIOLATION			24
20060228	5		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20060430	5		9			E00	MEASUREMENT ONLY, NO VIOLATION			
20060531	6		9			E00	MEASUREMENT ONLY, NO VIOLATION			
20060630	5		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20060731	6		8			E00	MEASUREMENT ONLY, NO VIOLATION			
20060831	5		8			E00	MEASUREMENT ONLY, NO VIOLATION			
20060930	4		5			E00	MEASUREMENT ONLY, NO VIOLATION			
20061031	4		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20061130	5		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20070131	5		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20070228	5		5			E00	MEASUREMENT ONLY, NO VIOLATION			
20070331	5		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20070430	5		9			E00	MEASUREMENT ONLY, NO VIOLATION			
20070531	5		7			E00	MEASUREMENT ONLY, NO VIOLATION			
20070630	5		8			E00	MEASUREMENT ONLY, NO VIOLATION			
20070731	6		8			E00	MEASUREMENT ONLY, NO VIOLATION			

Monitoring Dt (MVDT)	Meas Conc Avge (MCAV)	Meas Conc Minm (MCMN)	Meas Conc Maxm (MCMX)	Meas Quant Avge (MQAV)	Meas Quant Maxm (MQMX)	Meas Vio Evnt Cd (MVIO)	Meas Vio Evnt Cd Desc (MVIOD)	No Disc (NODI)	No Disc Desc (NODID)	Rpt Smp Type (RSAM)
20070831	6		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20070930	5		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20071031	5		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20071130	6		8			E00	MEASUREMENT ONLY, NO VIOLATION			
20071231	5		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20080331	5		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20080430	4		4			E00	MEASUREMENT ONLY, NO VIOLATION			
20080930	4		5			E00	MEASUREMENT ONLY, NO VIOLATION			
20090228	6		7			E00	MEASUREMENT ONLY, NO VIOLATION			
20090331	5		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20090430	6		8			E00	MEASUREMENT ONLY, NO VIOLATION			
20091031	5		5			E00	MEASUREMENT ONLY, NO VIOLATION			
20091130	4		5			E00	MEASUREMENT ONLY, NO VIOLATION			
20091231	6		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20100131	5		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20100228	5		5			E00	MEASUREMENT ONLY, NO VIOLATION			
20100331	5		6			E00	MEASUREMENT ONLY, NO VIOLATION			
20100430	5		5			E00	MEASUREMENT ONLY, NO VIOLATION			
19920131								8	Other	
19920131								8	Other	
19920229								8	Other	
19920229								8	Other	
19920331								8	Other	
19920331								8	Other	
19920430								8	Other	
19920430								8	Other	
19920531								8	Other	
19920531								8	Other	
19920630								8	Other	
19920630								8	Other	
19920731								8	Other	
19920731								8	Other	
19970731			26900							
19970831			25100							
19970930			24800							
19971031			32800							
19971130			22800							
19971231			20500							
19980131			19.4			E00	MEASUREMENT ONLY, NO VIOLATION			
19980228			18300			E00	MEASUREMENT ONLY, NO VIOLATION			
19980331			17.8			E00	MEASUREMENT ONLY, NO VIOLATION			
19980430			16100			E00	MEASUREMENT ONLY, NO VIOLATION			
19980531			15.4			E00	MEASUREMENT ONLY, NO VIOLATION			
19980630			14.4			E00	MEASUREMENT ONLY, NO VIOLATION			
19980731			12.2			E00	MEASUREMENT ONLY, NO VIOLATION			
19980831			11.4			E00	MEASUREMENT ONLY, NO VIOLATION			
19980930			11			E00	MEASUREMENT ONLY, NO VIOLATION			
19981130			10.3			E00	MEASUREMENT ONLY, NO VIOLATION			
19981231			9.4			E00	MEASUREMENT ONLY, NO VIOLATION			
19990131			9.2			E00	MEASUREMENT ONLY, NO VIOLATION			
19990228			8.65			E00	MEASUREMENT ONLY, NO VIOLATION			
19990331						E00	MEASUREMENT ONLY, NO VIOLATION	C	No Discharge	
19990430			8.3			E00	MEASUREMENT ONLY, NO VIOLATION			
19990531			10.1			E00	MEASUREMENT ONLY, NO VIOLATION			
19990731						E00	MEASUREMENT ONLY, NO VIOLATION	C	No Discharge	
19990831			7.16			E00	MEASUREMENT ONLY, NO VIOLATION			
19990930			6.31			E00	MEASUREMENT ONLY, NO VIOLATION			

Monitoring Dt (MVDT)	Meas Conc Avge (MCAV)	Meas Conc Minm (MCMN)	Meas Conc Maxm (MCMX)	Meas Quant Avge (MQAV)	Meas Quant Maxm (MQMX)	Meas Vio Evnt Cd (MVIO)	Meas Vio Evnt Cd Desc (MVIOD)	No Disc (NODI)	No Disc Desc (NODID)	Rpt Smp Type (RSAM)
19991031			6.4			E00	MEASUREMENT ONLY, NO VIOLATION			
19991130			6.17			E00	MEASUREMENT ONLY, NO VIOLATION			
19991231			4.9			E00	MEASUREMENT ONLY, NO VIOLATION			
20000131			4.8			E00	MEASUREMENT ONLY, NO VIOLATION			
20000229			4.6			E00	MEASUREMENT ONLY, NO VIOLATION			
20000331			4.4			E00	MEASUREMENT ONLY, NO VIOLATION			
20000430			4.04			E00	MEASUREMENT ONLY, NO VIOLATION			
20000531			3.51			E00	MEASUREMENT ONLY, NO VIOLATION			
20000630			4.88			E00	MEASUREMENT ONLY, NO VIOLATION			
20000731			8.33			E00	MEASUREMENT ONLY, NO VIOLATION			
20000831			3.34			E00	MEASUREMENT ONLY, NO VIOLATION			
20000930			3			E00	MEASUREMENT ONLY, NO VIOLATION			
20001031			3.76			E00	MEASUREMENT ONLY, NO VIOLATION			
20001130			4.79			E00	MEASUREMENT ONLY, NO VIOLATION			
20001231			3.95			E00	MEASUREMENT ONLY, NO VIOLATION			
20010131			5.59			E00	MEASUREMENT ONLY, NO VIOLATION			
20010228			6.74			E00	MEASUREMENT ONLY, NO VIOLATION			
20010430			6			E00	MEASUREMENT ONLY, NO VIOLATION			
20010531			4.6			E00	MEASUREMENT ONLY, NO VIOLATION			
20010630			4.6			E00	MEASUREMENT ONLY, NO VIOLATION			
20010731			4.8			E00	MEASUREMENT ONLY, NO VIOLATION			
20010831			4.9			E00	MEASUREMENT ONLY, NO VIOLATION			
20011031			4.4			E00	MEASUREMENT ONLY, NO VIOLATION			
20011130			4.1			E00	MEASUREMENT ONLY, NO VIOLATION			
20011231			3.3			E00	MEASUREMENT ONLY, NO VIOLATION			
20020131			3.64			E00	MEASUREMENT ONLY, NO VIOLATION			
20020228			3.07			E00	MEASUREMENT ONLY, NO VIOLATION			
20020331			3.29			E00	MEASUREMENT ONLY, NO VIOLATION			
20020430			3.397			E00	MEASUREMENT ONLY, NO VIOLATION			
20020531			2.63			E00	MEASUREMENT ONLY, NO VIOLATION			
20020630			2.57			E00	MEASUREMENT ONLY, NO VIOLATION			
20020731			2.81			E00	MEASUREMENT ONLY, NO VIOLATION			
20020831			2.84			E00	MEASUREMENT ONLY, NO VIOLATION			
20020930			3.02			E00	MEASUREMENT ONLY, NO VIOLATION			
20021031			2.76			E00	MEASUREMENT ONLY, NO VIOLATION			
20021130			2.58			E00	MEASUREMENT ONLY, NO VIOLATION			
20021231			2.16			E00	MEASUREMENT ONLY, NO VIOLATION			
20030131			2.77			E00	MEASUREMENT ONLY, NO VIOLATION			
20030228			2.01			E00	MEASUREMENT ONLY, NO VIOLATION			
20030331			2.14			E00	MEASUREMENT ONLY, NO VIOLATION			
20030430			1.84			E00	MEASUREMENT ONLY, NO VIOLATION			
20030531			1.936			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20030630			1.96			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20030731			2.074			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20030831			2.09			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20030930			1.829			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20031031			1.95			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20031130			1.973			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20031231			1.78			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040131			1.64			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040229			1.68			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040331			2.4			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040430			1.57			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040630			1.62			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040731			1.27			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040831			1.43			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20040930			1.19			E00	MEASUREMENT ONLY, NO VIOLATION			GR

Monitoring Dt (MVDT)	Meas Conc Avge (MCAV)	Meas Conc Minm (MCMN)	Meas Conc Maxm (MCMX)	Meas Quant Avge (MQAV)	Meas Quant Maxm (MQMX)	Meas Vio Evnt Cd (MVIO)	Meas Vio Evnt Cd Desc (MVIOD)	No Disc (NODI)	No Disc Desc (NODID)	Rpt Smp Type (RSAM)
20041031			1.2			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20041130			10.5			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20041231			1.179			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20050131						E11	MONITOR ONLY, CONC ABSENT			GR
20050228			1.21			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20050331			1.23			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20050430			1.464			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20050531			1.37			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20050630			1.025			E00	MEASUREMENT ONLY, NO VIOLATION			GR
20050731			1.232			E00	MEASUREMENT ONLY, NO VIOLATION			GR
19920131								8	Other	
19920131								8	Other	
19920131								8	Other	
19920229								8	Other	
19920229								8	Other	
19920229								8	Other	
19920331								8	Other	
19920331								8	Other	
19920331								8	Other	
19920430								8	Other	
19920430								8	Other	
19920430								8	Other	
19920531								8	Other	
19920531								8	Other	
19920531								8	Other	
19920630								8	Other	
19920630								8	Other	
19920630								8	Other	
19920731								8	Other	
19920731								8	Other	
19920731								8	Other	
19920831								8	Other	
19920930								8	Other	
19921031								8	Other	
19921130								8	Other	
19921231								8	Other	
19930131								8	Other	
19930228								8	Other	
19930331								8	Other	
19930430								C	No Discharge	
19930531								8	Other	
19930630								8	Other	
19930731								8	Other	
19930831								8	Other	
19930930								8	Other	
19931031								8	Other	
19931130								C	No Discharge	
19931231								C	No Discharge	
19940131								C	No Discharge	
19940228								C	No Discharge	
19940331								C	No Discharge	
19940430								C	No Discharge	
19940531								C	No Discharge	
19940630								C	No Discharge	

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

NPDES ID	Permit Name	Issue Date	Effective Date	Expiration Date	Limits.Parameter Desc	Monitoring Location Desc	Statistical Base Short Desc	Limit Unit Desc	Limit Value Consolidation	vDMR Value
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

NPDES ID	Permit Name	Issue Date	Effective Date	Expiration Date	Limits.Parameter Desc	Monitoring Location Desc	Statistical Base Short Desc	Limit Unit Desc	Limit Value Consolidation	vDMR Value
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	3
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	3
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	3
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	9
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

NPDES ID	Permit Name	Issue Date	Effective Date	Expiration Date	Limits.Parameter Desc	Monitoring Location Desc	Statistical Base Short Desc	Limit Unit Desc	Limit Value Consolidation	vDMR Value
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	9
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.2

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

NPDES ID	Permit Name	Issue Date	Effective Date	Expiration Date	Limits.Parameter Desc	Monitoring Location Desc	Statistical Base Short Desc	Limit Unit Desc	Limit Value Consolidation	vDMR Value
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	4.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	4.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	4.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	3.9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	9.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.8

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

NPDES ID	Permit Name	Issue Date	Effective Date	Expiration Date	Limits.Parameter Desc	Monitoring Location Desc	Statistical Base Short Desc	Limit Unit Desc	Limit Value Consolidation	vDMR Value
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	9.8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4.9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7.3

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

NPDES ID	Permit Name	Issue Date	Effective Date	Expiration Date	Limits.Parameter Desc	Monitoring Location Desc	Statistical Base Short Desc	Limit Unit Desc	Limit Value Consolidation	vDMR Value
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	20
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4.9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	11
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	9.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	7.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

NPDES ID	Permit Name	Issue Date	Effective Date	Expiration Date	Limits.Parameter Desc	Monitoring Location Desc	Statistical Base Short Desc	Limit Unit Desc	Limit Value Consolidation	vDMR Value
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	8.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	11
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.1
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5.2
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6.6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	7

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

NPDES ID	Permit Name	Issue Date	Effective Date	Expiration Date	Limits.Parameter Desc	Monitoring Location Desc	Statistical Base Short Desc	Limit Unit Desc	Limit Value Consolidation	vDMR Value
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	9.9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.8
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	11
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	6.9
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	4.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	3.7
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	6
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	4.3
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	3.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	DAILY MX	Micrograms per Liter	22	4.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Effluent Gross	MO AVG	Micrograms per Liter	7	3.6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.449
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.545
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.549
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	500
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.451
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.57
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.536
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.493
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.467
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.542
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.562
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.559
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.548
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.527
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.595
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.567
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.586
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.547
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	482
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.55
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.418
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.48
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.49
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.53
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.57

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

NPDES ID	Permit Name	Issue Date	Effective Date	Expiration Date	Limits.Parameter Desc	Monitoring Location Desc	Statistical Base Short Desc	Limit Unit Desc	Limit Value Consolidation	vDMR Value
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.54
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.52
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.49
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.51
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.55
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.58
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.49
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.54
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.6
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.47
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.48
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.45
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.44
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.44
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.44
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.47
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.5
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.51
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.44
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.53
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.47
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.57
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.45
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	510
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.51
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.47
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.48
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.51
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.52
MI0048453	Pall Life Sciences	5/11/2010	10/1/2010	10/1/2014	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.49
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.49
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.46
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.49
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.51
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.48
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.46
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.44
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.46
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.44
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.46
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.46
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.47
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.41

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

NPDES ID	Permit Name	Issue Date	Effective Date	Expiration Date	Limits.Parameter Desc	Monitoring Location Desc	Statistical Base Short Desc	Limit Unit Desc	Limit Value Consolidation	vDMR Value
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.38
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.5
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.41
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.38
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.65
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.43
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.39
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.45
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.45
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.47
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.44
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.34
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.44
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.38
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.39
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.39
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.43
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.35
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.38
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.38
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.39
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.41
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.49
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.38
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.38
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.38
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.38
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.39

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

NPDES ID	Permit Name	Issue Date	Effective Date	Expiration Date	Limits.Parameter Desc	Monitoring Location Desc	Statistical Base Short Desc	Limit Unit Desc	Limit Value Consolidation	vDMR Value
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.37
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.37
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.41
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.48
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.45
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.35
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.43
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.34
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.39
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.46
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.44
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.52
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.59
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.63
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.41
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.46
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.48
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.44
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.46
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.45
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.38
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.48
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.53
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.46
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.47
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.46
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.54
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.44
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.49
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.45
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.42
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.52
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.49
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.47
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.4
MI0048453	Pall Life Sciences	1/26/2016	2/1/2016	10/1/2019	1,4-Dioxane	Raw Sewage Influent	DAILY MX	Milligrams per Liter	Req. Mon.	0.4

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

Monitoring Period End Date	DMR Value Received Date	Percent Exceedance	Violation Desc	RNC Detection Desc
10/31/2010		%		
10/31/2010		%		
11/30/2010	12/14/2010	%		
11/30/2010	12/14/2010	%		
12/31/2010	1/18/2011	%		
12/31/2010	1/18/2011	%		
01/31/2011	2/14/2011	%		
01/31/2011	2/14/2011	%		
02/28/2011		%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
02/28/2011		%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
03/31/2011	4/19/2011	%		
03/31/2011	4/19/2011	%		
04/30/2011	5/18/2011	%		
04/30/2011	5/18/2011	%		
05/31/2011	6/14/2011	%		
05/31/2011	6/14/2011	%		
06/30/2011	7/20/2011	%		
06/30/2011	7/20/2011	%		
07/31/2011		%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
07/31/2011		%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
08/31/2011		%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
08/31/2011		%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
09/30/2011	10/17/2011	%		
09/30/2011	10/17/2011	%		
10/31/2011	11/17/2011	%		
10/31/2011	11/17/2011	%		
11/30/2011	12/15/2011	%		
11/30/2011	12/15/2011	%		
12/31/2011	1/18/2012	%		
12/31/2011	1/18/2012	%		
01/31/2012	2/17/2012	%		
01/31/2012	2/17/2012	%		
02/29/2012	3/20/2012	%		
02/29/2012	3/20/2012	%		
03/31/2012	4/11/2012	%		
03/31/2012	4/11/2012	%		
04/30/2012	5/15/2012	%		
04/30/2012	5/15/2012	%		
05/31/2012	6/12/2012	%		
05/31/2012	6/12/2012	%		
06/30/2012	2/8/2013	%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
06/30/2012	2/8/2013	%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
07/31/2012	8/15/2012	%		
07/31/2012	8/15/2012	%		
08/31/2012	10/5/2012	%		

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

Monitoring Period End Date	DMR Value Received Date	Percent Exceedance	Violation Desc	RNC Detection Desc
08/31/2012	10/5/2012	%		
09/30/2012	11/5/2012	%		
09/30/2012	11/5/2012	%		
10/31/2012		%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
10/31/2012		%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
11/30/2012		%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
11/30/2012		%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
12/31/2012	1/14/2013	%		
12/31/2012	1/14/2013	%		
01/31/2013		%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
01/31/2013		%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
02/28/2013	3/19/2013	%		
02/28/2013	3/19/2013	%		
03/31/2013	4/16/2013	%		
03/31/2013	4/16/2013	%		
04/30/2013	5/15/2013	%		
04/30/2013	5/15/2013	%		
05/31/2013	6/18/2013	%		
05/31/2013	6/18/2013	%		
06/30/2013		%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
06/30/2013		%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
07/31/2013	8/15/2013	%		
07/31/2013	8/15/2013	%		
08/31/2013	9/16/2013	%		
08/31/2013	9/16/2013	%		
09/30/2013	10/10/2013	%		
09/30/2013	10/10/2013	%		
10/31/2013	11/14/2013	%		
10/31/2013	11/14/2013	%		
11/30/2013	12/16/2013	%		
11/30/2013	12/16/2013	%		
12/31/2013	1/13/2014	%		
12/31/2013	1/13/2014	%		
01/31/2014	2/11/2014	%		
01/31/2014	2/11/2014	%		
02/28/2014	3/13/2014	%		
02/28/2014	3/13/2014	%		
03/31/2014	2/13/2015	%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
03/31/2014	2/13/2015	%	DMR, Limited - Overdue	Non-receipt Violation, Non-Monthly Average
04/30/2014	5/9/2014	%		
04/30/2014	5/9/2014	%		
05/31/2014	6/16/2014	%		
05/31/2014	6/16/2014	%		
06/30/2014	7/16/2014	%		
06/30/2014	7/16/2014	%		

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

Monitoring Period End Date	DMR Value Received Date	Percent Exceedance	Violation Desc	RNC Detection Desc
07/31/2014	8/14/2014	%		
07/31/2014	8/14/2014	%		
08/31/2014	9/15/2014	%		
08/31/2014	9/15/2014	%		
09/30/2014	10/16/2014	%		
09/30/2014	10/16/2014	%		
10/31/2014	11/13/2014	%		
10/31/2014	11/13/2014	%		
11/30/2014	12/9/2014	%		
11/30/2014	12/9/2014	%		
12/31/2014	1/20/2015	%		
12/31/2014	1/20/2015	%		
01/31/2015	2/6/2015	%		
01/31/2015	2/6/2015	%		
02/28/2015	3/9/2015	%		
02/28/2015	3/9/2015	%		
03/31/2015	4/8/2015	%		
03/31/2015	4/8/2015	%		
04/30/2015	5/15/2015	%		
04/30/2015	5/15/2015	%		
05/31/2015	6/17/2015	%		
05/31/2015	6/17/2015	%		
06/30/2015	7/9/2015	%		
06/30/2015	7/9/2015	%		
07/31/2015	8/10/2015	%		
07/31/2015	8/10/2015	%		
08/31/2015	9/17/2015	%		
08/31/2015	9/17/2015	%		
09/30/2015	10/9/2015	%		
09/30/2015	10/9/2015	%		
10/31/2015	11/16/2015	%		
10/31/2015	11/16/2015	%		
11/30/2015	12/14/2015	%		
11/30/2015	12/14/2015	%		
12/31/2015	1/12/2016	%		
12/31/2015	1/12/2016	%		
01/31/2016	2/16/2016	%		
01/31/2016	2/16/2016	%		
02/29/2016	4/14/2016	%		
02/29/2016	4/14/2016	%		
03/31/2016	4/18/2016	%		
03/31/2016	4/18/2016	%		
04/30/2016	5/11/2016	%		
04/30/2016	5/11/2016	%		
05/31/2016	6/8/2016	%		

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

Monitoring Period End Date	DMR Value Received Date	Percent Exceedance	Violation Desc	RNC Detection Desc
05/31/2016	6/8/2016	%		
06/30/2016	7/15/2016	%		
06/30/2016	7/15/2016	%		
07/31/2016	8/10/2016	%		
07/31/2016	8/10/2016	%		
08/31/2016	9/7/2016	%		
08/31/2016	9/7/2016	%		
09/30/2016	10/13/2016	%		
09/30/2016	10/13/2016	%		
10/31/2016	11/10/2016	%		
10/31/2016	11/10/2016	%		
11/30/2016	12/19/2016	%		
11/30/2016	12/19/2016	%		
12/31/2016	1/9/2017	%		
12/31/2016	1/9/2017	%		
01/31/2017	2/10/2017	%		
01/31/2017	2/10/2017	%		
02/28/2017	3/13/2017	%		
02/28/2017	3/13/2017	%		
03/31/2017	4/11/2017	%		
03/31/2017	4/11/2017	%		
04/30/2017	5/12/2017	%		
04/30/2017	5/12/2017	%		
05/31/2017	6/9/2017	%		
05/31/2017	6/9/2017	%		
06/30/2017	7/18/2017	%		
06/30/2017	7/18/2017	%		
07/31/2017	8/4/2017	%		
07/31/2017	8/4/2017	%		
08/31/2017	9/14/2017	%		
08/31/2017	9/14/2017	%		
09/30/2017	10/12/2017	%		
09/30/2017	10/12/2017	%		
10/31/2017	11/13/2017	%		
10/31/2017	11/13/2017	%		
11/30/2017	12/12/2017	%		
11/30/2017	12/12/2017	%		
12/31/2017	1/9/2018	%		
12/31/2017	1/9/2018	%		
01/31/2018	2/14/2018	%		
01/31/2018	2/14/2018	%		
02/28/2018	3/8/2018	%		
02/28/2018	3/8/2018	%		
03/31/2018	4/5/2018	%		
03/31/2018	4/5/2018	%		

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

Monitoring Period End Date	DMR Value Received Date	Percent Exceedance	Violation Desc	RNC Detection Desc
04/30/2018	5/11/2018	%		
04/30/2018	5/11/2018	%		
05/31/2018	6/12/2018	%		
05/31/2018	6/12/2018	%		
06/30/2018	7/12/2018	%		
06/30/2018	7/12/2018	%		
07/31/2018	8/7/2018	%		
07/31/2018	8/7/2018	%		
08/31/2018	9/12/2018	%		
08/31/2018	9/12/2018	%		
09/30/2018	10/9/2018	%		
09/30/2018	10/9/2018	%		
10/31/2018	11/13/2018	%		
10/31/2018	11/13/2018	%		
11/30/2018	12/10/2018	%		
11/30/2018	12/10/2018	%		
12/31/2018	1/8/2019	%		
12/31/2018	1/8/2019	%		
01/31/2019	2/13/2019	%		
01/31/2019	2/13/2019	%		
02/28/2019	3/11/2019	%		
02/28/2019	3/11/2019	%		
03/31/2019	4/9/2019	%		
03/31/2019	4/9/2019	%		
04/30/2019	5/13/2019	%		
04/30/2019	5/13/2019	%		
05/31/2019	6/11/2019	%		
05/31/2019	6/11/2019	%		
06/30/2019	7/11/2019	%		
06/30/2019	7/11/2019	%		
07/31/2019	8/8/2019	%		
07/31/2019	8/8/2019	%		
08/31/2019	9/16/2019	%		
08/31/2019	9/16/2019	%		
09/30/2019	10/7/2019	%		
09/30/2019	10/7/2019	%		
10/31/2019	11/7/2019	%		
10/31/2019	11/7/2019	%		
11/30/2019	12/9/2019	%		
11/30/2019	12/9/2019	%		
12/31/2019	1/8/2020	%		
12/31/2019	1/8/2020	%		
01/31/2020	2/10/2020	%		
01/31/2020	2/10/2020	%		
02/29/2020	3/4/2020	%		

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

Monitoring Period End Date	DMR Value Received Date	Percent Exceedance	Violation Desc	RNC Detection Desc
02/29/2020	3/4/2020	%		
03/31/2020	4/9/2020	%		
03/31/2020	4/9/2020	%		
04/30/2020	5/8/2020	%		
04/30/2020	5/8/2020	%		
05/31/2020	6/10/2020	%		
05/31/2020	6/10/2020	%		
06/30/2020	7/17/2020	%		
06/30/2020	7/17/2020	%		
07/31/2020	8/14/2020	%		
07/31/2020	8/14/2020	%		
08/31/2020	9/18/2020	%		
08/31/2020	9/18/2020	%		
09/30/2020	10/20/2020	%		
09/30/2020	10/20/2020	%		
10/31/2020	11/19/2020	%		
10/31/2020	11/19/2020	%		
11/30/2020	12/19/2020	%		
11/30/2020	12/19/2020	%		
12/31/2020	1/19/2021	%		
12/31/2020	1/19/2021	%		
01/31/2021	2/17/2021	%		
01/31/2021	2/17/2021	%		
02/28/2021	3/19/2021	%		
02/28/2021	3/19/2021	%		
03/31/2021	4/20/2021	%		
03/31/2021	4/20/2021	%		
04/30/2021	5/20/2021	%		
04/30/2021	5/20/2021	%		
05/31/2021	6/18/2021	%		
05/31/2021	6/18/2021	%		
06/30/2021	7/20/2021	%		
06/30/2021	7/20/2021	%		
07/31/2021	8/20/2021	%		
07/31/2021	8/20/2021	%		
08/31/2021	9/20/2021	%		
08/31/2021	9/20/2021	9%	DMR, Limited - Numeric Violation	
09/30/2021	10/20/2021	%		
09/30/2021	10/20/2021	%		
10/31/2021	12/20/2021	%		
10/31/2021	12/20/2021	%		
11/30/2021	12/20/2021	%		
11/30/2021	12/20/2021	%		
12/31/2021	1/20/2022	%		
12/31/2021	1/20/2022	%		

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

Monitoring Period End Date	DMR Value Received Date	Percent Exceedance	Violation Desc	RNC Detection Desc
01/31/2022	2/17/2022	%		
01/31/2022	2/17/2022	%		
02/28/2022	3/20/2022	%		
02/28/2022	3/20/2022	%		
03/31/2022	4/20/2022	%		
03/31/2022	4/20/2022	%		
04/30/2022	5/20/2022	%		
04/30/2022	5/20/2022	%		
05/31/2022	6/20/2022	%		
05/31/2022	6/20/2022	%		
06/30/2022	7/20/2022	%		
06/30/2022	7/20/2022	%		
07/31/2022	8/19/2022	%		
07/31/2022	8/19/2022	%		
08/31/2022	9/20/2022	%		
08/31/2022	9/20/2022	%		
09/30/2022	10/20/2022	%		
09/30/2022	10/20/2022	%		
10/31/2022	11/18/2022	%		
10/31/2022	11/18/2022	%		
11/30/2022	12/20/2022	%		
11/30/2022	12/20/2022	%		
12/31/2022	1/19/2023	%		
12/31/2022	1/19/2023	%		
01/31/2023	2/20/2023	%		
01/31/2023	2/20/2023	%		
02/28/2023	3/20/2023	%		
02/28/2023	3/20/2023	%		
03/31/2023	4/20/2023	%		
03/31/2023	4/20/2023	%		
04/30/2023	5/18/2023	%		
04/30/2023	5/18/2023	%		
05/31/2023	6/21/2023	%		
05/31/2023	6/21/2023	%		
06/30/2023	7/19/2023	%		
06/30/2023	7/19/2023	%		
07/31/2023	8/17/2023	%		
07/31/2023	8/17/2023	%		
08/31/2023	9/20/2023	%		
08/31/2023	9/20/2023	%		
09/30/2023	10/20/2023	%		
09/30/2023	10/20/2023	%		
10/31/2023	11/20/2023	%		
10/31/2023	11/20/2023	%		
11/30/2023	12/20/2023	%		

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

Monitoring Period End Date	DMR Value Received Date	Percent Exceedance	Violation Desc	RNC Detection Desc
11/30/2023	12/20/2023	%		
12/31/2023	1/20/2024	%		
12/31/2023	1/20/2024	%		
01/31/2024	2/20/2024	%		
01/31/2024	2/20/2024	%		
02/29/2024	3/20/2024	%		
02/29/2024	3/20/2024	%		
03/31/2024	4/18/2024	%		
03/31/2024	4/18/2024	%		
04/30/2024	5/20/2024	%		
04/30/2024	5/20/2024	%		
05/31/2024	6/20/2024	%		
05/31/2024	6/20/2024	%		
10/31/2010		%		
11/30/2010	12/14/2010	%		
12/31/2010	1/18/2011	%		
01/31/2011	2/14/2011	%		
02/28/2011		%	DMR, Monitor Only - Overdue	Non-receipt Violation, Non-Monthly Average
03/31/2011	4/19/2011	%		
04/30/2011	5/18/2011	%		
05/31/2011	6/14/2011	%		
06/30/2011	7/20/2011	%		
07/31/2011		%	DMR, Monitor Only - Overdue	Non-receipt Violation, Non-Monthly Average
08/31/2011		%	DMR, Monitor Only - Overdue	Non-receipt Violation, Non-Monthly Average
09/30/2011	10/17/2011	%		
10/31/2011	11/17/2011	%		
11/30/2011	12/15/2011	%		
12/31/2011	1/18/2012	%		
01/31/2012	2/17/2012	%		
02/29/2012	3/20/2012	%		
03/31/2012	4/11/2012	%		
04/30/2012	5/15/2012	%		
05/31/2012	6/12/2012	%		
06/30/2012	2/8/2013	%	DMR, Monitor Only - Overdue	Non-receipt Violation, Non-Monthly Average
07/31/2012	8/15/2012	%		
08/31/2012	10/5/2012	%		
09/30/2012	11/5/2012	%		
10/31/2012		%	DMR, Monitor Only - Overdue	Non-receipt Violation, Non-Monthly Average
11/30/2012		%	DMR, Monitor Only - Overdue	Non-receipt Violation, Non-Monthly Average
12/31/2012	1/14/2013	%		
01/31/2013		%	DMR, Monitor Only - Overdue	Non-receipt Violation, Non-Monthly Average
02/28/2013	3/19/2013	%		
03/31/2013	4/16/2013	%		
04/30/2013	5/15/2013	%		
05/31/2013	6/18/2013	%		

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

Monitoring Period End Date	DMR Value Received Date	Percent Exceedance	Violation Desc	RNC Detection Desc
06/30/2013		%	DMR, Monitor Only - Overdue	Non-receipt Violation, Non-Monthly Average
07/31/2013	8/15/2013	%		
08/31/2013	9/16/2013	%		
09/30/2013	10/10/2013	%		
10/31/2013	11/14/2013	%		
11/30/2013	12/16/2013	%		
12/31/2013	1/13/2014	%		
01/31/2014	2/11/2014	%		
02/28/2014	3/13/2014	%		
03/31/2014	2/13/2015	%	DMR, Monitor Only - Overdue	Non-receipt Violation, Non-Monthly Average
04/30/2014	5/9/2014	%		
05/31/2014	6/16/2014	%		
06/30/2014	7/16/2014	%		
07/31/2014	8/14/2014	%		
08/31/2014	9/15/2014	%		
09/30/2014	10/16/2014	%		
10/31/2014	11/13/2014	%		
11/30/2014	12/9/2014	%		
12/31/2014	1/20/2015	%		
01/31/2015	2/6/2015	%		
02/28/2015	3/9/2015	%		
03/31/2015	4/8/2015	%		
04/30/2015	5/15/2015	%		
05/31/2015	6/17/2015	%		
06/30/2015	7/9/2015	%		
07/31/2015	8/10/2015	%		
08/31/2015	9/17/2015	%		
09/30/2015	10/9/2015	%		
10/31/2015	11/16/2015	%		
11/30/2015	12/14/2015	%		
12/31/2015	1/12/2016	%		
01/31/2016	2/16/2016	%		
02/29/2016	4/14/2016	%		
03/31/2016	4/18/2016	%		
04/30/2016	5/11/2016	%		
05/31/2016	6/8/2016	%		
06/30/2016	7/15/2016	%		
07/31/2016	8/10/2016	%		
08/31/2016	9/7/2016	%		
09/30/2016	10/13/2016	%		
10/31/2016	11/10/2016	%		
11/30/2016	12/19/2016	%		
12/31/2016	1/9/2017	%		
01/31/2017	2/10/2017	%		
02/28/2017	3/13/2017	%		

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

Monitoring Period End Date	DMR Value Received Date	Percent Exceedance	Violation Desc	RNC Detection Desc
03/31/2017	4/11/2017	%		
04/30/2017	5/12/2017	%		
05/31/2017	6/9/2017	%		
06/30/2017	7/18/2017	%		
07/31/2017	8/4/2017	%		
08/31/2017	9/14/2017	%		
09/30/2017	10/12/2017	%		
10/31/2017	11/13/2017	%		
11/30/2017	12/12/2017	%		
12/31/2017	1/9/2018	%		
01/31/2018	2/14/2018	%		
02/28/2018	3/8/2018	%		
03/31/2018	4/5/2018	%		
04/30/2018	5/11/2018	%		
05/31/2018	6/12/2018	%		
06/30/2018	7/12/2018	%		
07/31/2018	8/7/2018	%		
08/31/2018	9/12/2018	%		
09/30/2018	10/9/2018	%		
10/31/2018	11/13/2018	%		
11/30/2018	12/10/2018	%		
12/31/2018	1/8/2019	%		
01/31/2019	2/13/2019	%		
02/28/2019	3/11/2019	%		
03/31/2019	4/9/2019	%		
04/30/2019	5/13/2019	%		
05/31/2019	6/11/2019	%		
06/30/2019	7/11/2019	%		
07/31/2019	8/8/2019	%		
08/31/2019	9/16/2019	%		
09/30/2019	10/7/2019	%		
10/31/2019	11/7/2019	%		
11/30/2019	12/9/2019	%		
12/31/2019	1/8/2020	%		
01/31/2020	2/10/2020	%		
02/29/2020	3/4/2020	%		
03/31/2020	4/9/2020	%		
04/30/2020	5/8/2020	%		
05/31/2020	6/10/2020	%		
06/30/2020	7/17/2020	%		
07/31/2020	8/14/2020	%		
08/31/2020	9/18/2020	%		
09/30/2020	10/20/2020	%		
10/31/2020	11/19/2020	%		
11/30/2020	12/19/2020	%		

ATTACHMENT E - DMR Data Report - MI0048453(excerpt).xlsx (Gelman Dioxane data 2010-2024)

Monitoring Period End Date	DMR Value Received Date	Percent Exceedance	Violation Desc	RNC Detection Desc
12/31/2020	1/19/2021	%		
01/31/2021	2/17/2021	%		
02/28/2021	3/19/2021	%		
03/31/2021	4/20/2021	%		
04/30/2021	5/20/2021	%		
05/31/2021	6/18/2021	%		
06/30/2021	7/20/2021	%		
07/31/2021	8/20/2021	%		
08/31/2021	9/20/2021	%		
09/30/2021	10/20/2021	%		
10/31/2021	12/20/2021	%		
11/30/2021	12/20/2021	%		
12/31/2021	1/20/2022	%		
01/31/2022	2/17/2022	%		
02/28/2022	3/20/2022	%		
03/31/2022	4/20/2022	%		
04/30/2022	5/20/2022	%		
05/31/2022	6/20/2022	%		
06/30/2022	7/20/2022	%		
07/31/2022	8/19/2022	%		
08/31/2022	9/20/2022	%		
09/30/2022	10/20/2022	%		
10/31/2022	11/18/2022	%		
11/30/2022	12/20/2022	%		
12/31/2022	1/19/2023	%		
01/31/2023	2/20/2023	%		
02/28/2023	3/20/2023	%		
03/31/2023	4/20/2023	%		
04/30/2023	5/18/2023	%		
05/31/2023	6/21/2023	%		
06/30/2023	7/19/2023	%		
07/31/2023	8/17/2023	%		
08/31/2023	9/20/2023	%		
09/30/2023	10/20/2023	%		
10/31/2023	11/20/2023	%		
11/30/2023	12/20/2023	%		
12/31/2023	1/20/2024	%		
01/31/2024	2/20/2024	%		
02/29/2024	3/20/2024	%		
03/31/2024	4/18/2024	%		
04/30/2024	5/20/2024	%		
05/31/2024	6/20/2024	%		

Attachment C

U.S. Environmental Protection Agency, Final Site Assessment Technical Support Sampling and Analysis Plan, Gelman Sciences, Inc. Excerpt.

June 2022

FINAL
SITE ASSESSMENT TECHNICAL SUPPORT SAMPLING AND ANALYSIS PLAN

Gelman Sciences, Inc.
Ann Arbor, Washtenaw County, Michigan
Task Order No.: 68HE0721F0001
Subtask Order No.: 68HE0721F0001-001

Prepared for:

U.S. Environmental Protection Agency, Region 5
77 W. Jackson Blvd.
Chicago, IL 60604

Prepared by:

Weston Solutions, Inc.
615 Second Avenue, Suite 350
Seattle, WA 98104

June 29, 2022

GROUP A: PROJECT MANAGEMENT

A1. Title and Approval Sheet

Subtask Order No.: 68HE0721F0001-001 (U.S. Environmental Protection Agency [EPA], 2021a)
Plan Title: Sampling and Analysis Plan (SAP) for Gelman Sciences, Inc., Ann Arbor, Washtenaw County, Michigan (MI), Site Assessment (SA) Technical Support
Date - Revision (if necessary): N/A
Prepared By: Weston Solutions, Inc. (WESTON®) Superfund Technical Assessment and Response Team (START V)

Pursuant to EPA Region 10 START V Contract No. 68HE0720D0005 and Task Order (TO) No./Subtask Order No.: 68HE0721F0001/68HE0721F0001-001, WESTON will perform a Site Inspection (SI), focusing on potential and known contaminants at the Gelman Sciences, Inc. (Site) in Ann Arbor, Michigan (Figure 1). This document outlines the technical and analytical approaches WESTON will employ during field work. This document includes the definition of the problem being assessed; the Site description; the Site background and history; project objectives; and the processes for data generation, acquisition, and assessment.

The undersigned approves this SAP.

Lead Investigative Organization's Project Manager	Natalie Quiet/Senior Project Scientist *Printed Name/Title* Natalie Quiet 6/30/2022 *Signature/Date*
Lead Investigative Organization's Quality Assurance Officer (QAO)	Mark Woodke/Senior Project Scientist/Chemist *Printed Name/Title* Mark Woodke 6/30/2022 *Signature/Date*
Federal Regulatory Agency Task Order Contracting Officer's Representative (TOCOR)	EPA Nuria Muniz/Superfund National Priorities List (NPL) Coordinator *Printed Name/Title* Nuria Muniz 6/29/2022 *Signature/Date*
EPA Region 5 Quality Assurance (QA)	Michelle Kerr *Printed Name/Title* Michelle Kerr 6.30.22 *Signature/Date*

A2. Table of Contents

TABLE OF CONTENTS

Element **Page**

GROUP A: PROJECT MANAGEMENT 1
A1. Title and Approval Sheet 1
A2. Table of Contents 2
A3. Project Organization and Distribution List 8
A4. Problem Definition/Background 8
Problem Definition 8
Background Information 9
Operational History 9
Previous Investigation(s) and Regulatory Involvement 10
Project Objectives 11
Geological/Meteorological Information 12
Hazard Ranking System Pathway(s) 13
Regulatory Information 14
A5. Project/Task Description 14
Field Tasks 14
Coordination with State and Local Authorities 15
Project Schedule and Deliverables 16
A6. Quality Objectives and Criteria 16
A7. Special Training/Certification 18
A8. Documents and Records 18
Field Documentation 18
Laboratory Data Reporting 20
Project Documentation 20
GROUP B: DATA GENERATION AND ACQUISITION 21
B1. Sampling Process Design (Experimental Design) 21
B2. Sampling Methods 23
Surface Soil Sampling 23
Subsurface Soil Sampling 25
Groundwater Sampling 28
Surface Water Sampling 31
Sediment Sampling 33
Background Groundwater/Surface Water/Sediment Sampling 34

B3. Sample Handling and Custody 35
Investigation-derived Waste Management 35
Sample Handling 36
Soil Samples 36
Groundwater Samples 36
Surface Water Samples 37
Sediment Samples 37
Sample Custody 39
B4. Quality Control 40
Field Quality Control Samples 40
Laboratory Quality Control Samples 44
B5. Analytical Methods 46
B6. Instrument/Equipment Testing, Inspection, and Maintenance 49
Field Equipment Maintenance 49
Laboratory Equipment Maintenance 49
B7. Instrument/Equipment Calibration and Frequency 49
B8. Inspection/Acceptance of Supplies and Consumables 50
Standard Reagent Receipt and Traceability 50
B9. Non-Direct Measurements 50
B10. Data Management 51
Data Recording 51
Data Quality Assurance Checks 51
Data Transmittal 52
Data Tracking 52
Data Storage and Retrieval 52
GROUP C: ASSESSMENT AND OVERSIGHT **53**
C1. Assessment and Response Actions 53
Peer Review 53
Technical Editorial Review 53
Technical Systems Assessments 53
Corrective Action 53
C2. Reports to Management 54
GROUP D: DATA VALIDATION AND USABILITY **56**
D1. Data Review, Verification, and Validation 56
D2. Verification and Validation Methods 56

Evaluation of Completeness 57
Evaluation of Compliance 57
Data Validation Reporting 57
Field Data Review....57
D3. Reconciliation with User Requirements....58
REFERENCES....59

LIST OF TABLES

Table A-1 Project Distribution List* 8
Table A-2 Site Description 9
Table A-3 Site Timeline Summary 10
Table A-4 Proposed Project Schedule 16
Table B-1 Sample Design Strategy 21
Table B-2 Field Standard Operating Procedures (SOPs) 23
Table B-3 Sampling Design and Rationale Matrix = Surface Soil 25
Table B-4 Sampling Design and Rationale Matrix = Subsurface Soil 27
Table B-5 Sampling Design and Rationale Matrix = Groundwater 30
Table B-6 Sampling Design and Rationale Matrix = Surface Water 32
Table B-7 Sampling Design and Rationale Matrix = Sediment 34
Table B-8 Quality Control Sample Summary 46
Table B-9 Sampling and Analysis Summary 47

LIST OF FIGURES

Figure 1 Site Location Map
Figure 2 Source Area Proposed Sample Locations Map
Figure 3 Proposed Sample Locations and Site Features Map

LIST OF ATTACHMENTS

Attachment A Project Organization Chart
Attachment B Measurement Performance Criteria
Attachment C Data Quality Indicator Measurement Parameters
Attachment D Screening Levels
Attachment E Standard Operating Procedures

ABBREVIATIONS AND ACRONYMS

<	less than
>	greater than
µg/L	micrograms per liter
%D	percent difference
%RSD	percent relative standard deviation
%R	percent recoveries
°C	degrees Celsius
°F	degrees Fahrenheit
AES	Atomic Emission Spectrometry
AOI	Area of interest
bgs	below ground surface
BS	blank spike
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CJ	Consent Judgment
CLARC	Cleanup Levels and Risk Calculation
CLP	Contract Laboratory Program
COC	contaminants of concern
CVAA	Cold Vapor Atomic Absorption
DI	deionized
DMC	deuterated monitoring compounds
DOT	U.S. Department of Transportation
DPT	Direct-push technology
DQI	data quality indicator
DQO	Data quality objectives
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
ESA	Environmental Site Assessment
ESAT	Environmental Services Assistance Team
ft	feet
Gelman	Gelman Sciences, Inc.
GPS	Global Positioning System
GS/MS	gas chromatography/mass spectrometry
HASP	Health and Safety Plan
HCl	hydrochloric acid
HNO_3	nitric acid
HRS	Hazard Ranking System

ABBREVIATIONS AND ACRONYMS, CONTINUED

IATA	International Air Transport Association
ICP	Inductively Coupled Plasma
ID	Identification
IDW	investigation-derived waste
L	liter
L/min	liters per minute
LCS	laboratory control samples
LDL	laboratory detection limit
LFB	laboratory fortified blank
LFSM	laboratory fortified sample matrix
LFSMD	laboratory fortified sample matrix duplicate
LIMS	Laboratory Information Management System
LRB	laboratory reagent blank
MCL	maximum contaminant level
MDEQ	Michigan Department of Environmental Quality
MDL	method detection limit
MDNR	Michigan Department of Natural Resources
MDPH	Michigan Department of Public Health
mg/L	milligrams per liter
MI	Michigan
mL	milliliter
MPC	management performance criteria
MS	Mass Spectrometry
MS/MSD	matrix spike and matrix spike duplicate
mV	millivolt
MWRC	Michigan Water Resources Commission
N/A	not applicable
NaOH	sodium hydroxide
NIST	National Institute of Standards and Technology
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
ORP	oxidation reduction potential
oz.	ounce
PA	Preliminary Assessment
PAH	polycyclic aromatic hydrocarbon
Pall	Pall Acquisitions, Inc.
PCB	polychlorinated biphenyls

ABBREVIATIONS AND ACRONYMS, CONTINUED

PE	Performance Evaluation
PPE	probable point of entry
PRP	potentially responsible party
PTFE	polytetrafluoroethylene
QA	quality assurance
QAO	Quality Assurance Officer
QC	quality control
RL	reporting limits
RPD	relative percent difference
RRF	Relative Response Factors
RSCC	Regional Sample Control Coordinator
RSL	Regional Screening Level
SA	Site Assessment
SAM	Site Assessment Manager
SAP	Sampling and Analysis Plan
SCDM	Superfund Chemical Data Matrix
SD	standard deviation
SFAM	Superfund Analytical Method
SI	Site Inspection
SMO	Sample Management Office
SOP	Standard Operating Procedure
SRM	Standard Reference Material
START	Superfund Technical Assessment and Response Team
SVOC	semi-volatile organic compound
TAL	Target Analyte List
TAT	turnaround time
TBD	to be determined
TDL	target distance limit
TO	Task Order
TOCOR	Task Order Contracting Officer's Representative
TSD	treatment, storage, and disposal
TVA	toxic vapor analyzer
USDA	United States Department of Agriculture
VOA	volatile organic compound analysis
VOC	volatile organic compound
WESTON	Weston Solutions, Inc.

A3. Project Organization and Distribution List

Table A-1 Project Distribution List*

Name	Title	Organization	Phone Number/Email Address	Responsibilities
Nuria Muniz	Superfund NPL Coordinator	EPA	312-886-4439/ muniz.nuria@epa.gov	TOCOR
Erica Aultz	HRS Technical Specialist	EPA	312-353-7209/ aultz.erica@epa.gov	SAP Review
Michelle Kerr	QA	EPA	312-886-8961/ Kerr.michelle@epa.gov	QA
Natalie Quiet	Senior Project Scientist	WESTON	303-729-6124/ natalie.quiet@westonsolutions.com	Project Manager
Mark Woodke	Senior Project Scientist/ Chemist	WESTON	(253) 841-4542/ mark.woodke@westonsolutions.com	Project Chemist and QAO
Michael Castillo	Senior Project Geoscientist	WESTON	(773) 744-1823/ michael.castillo@westonsolutions.com	Field Team Leader
Janelle Myers	Project Geoscientist	WESTON	(517) 381-5952/ janelle.myers@westonsolutions.com	Field Technician/ Scribe Data Management

Notes:
* The Project Organization Chart is provided as Attachment A
HRS Hazard Ranking System
RSCC Regional Sample Control Coordinator

A4. Problem Definition/Background

Problem Definition

This SI is being performed to evaluate the Gelman Sciences, Inc. (Gelman) 1,4-dioxane plume as a Superfund NPL candidate. The Gelman Groundwater Plume has historically been regulated by a Washtenaw County Circuit Court (Court) Consent Judgment (CJ) and is currently subject to a June 2021 Response Activity Order implementing all requirements and activities stated in the Proposed "Fourth Amended and Restated Consent Judgement", but representatives of some of the affected municipalities have requested the Site be evaluated for eligibility for the NPL. EPA (START) initiated a Preliminary Assessment (PA) in 2016 but deferred further Site evaluation to the state. In 2020, key stakeholders sent a letter to Michigan's governor requesting support for NPL listing. On April 12, 2021, Michigan Department of Environment, Great Lakes, and Energy (EGLE) requested that EPA reinstate the evaluation process needed to consider the Site for inclusion on the NPL.

Background Information

Table A-2 Site Description

Site Name	**Gelman Sciences, Inc.**
EPA ID	**MID005341813**
Site Address	600 S. Wagner Rd, Ann Arbor, MI 48103
Latitude/Longitude	42.27540° North, 83.80146° West
Legal Description	Township 2 South, Range 5 East, Section 26
Size (acres)	Approximately 1,405 (Facility 20.4)
Owner(s)	Gelman Sciences, Inc. and 600 South Wagner LLC

The Site is comprised of the Gelman Sciences, Inc. manufacturing facility and the associated 1,4-dioxane plume. The Gelman Sciences, Inc. manufacturing facility is located near the approximate center of the Site (Figure 1). The facility, located at 600 S. Wagner Road (42.27540° North, 83.80146° West) occupied approximately 40 acres of land on the west end of the City of Ann Arbor, Scio Township, Washtenaw County, MI until 2015. Portions of the facility property were sold in 2015, decreasing the total acreage by more than half. The facility is bordered by Jackson Business Park to the north, by commercial and residential properties and Dolph Nature Area to the east, by an office park and community church to the south and southwest, and the Saginaw Forest to the west. Third Sister Lake is located within Saginaw Forest, approximately 50 feet (ft) west of the facility. Second Sister Lake is located within the Dolph Nature Area, approximately 150 ft east of the facility. Wetland areas are located to the north and west of the facility.

Operational History

Facility operations began in 1963, primarily with the manufacture of membrane filtration material and other products for the microelectronics, pharmaceutical, and pollution testing industries. Between 1966 and 1968, 1,4-dioxane was used for cellulose triacetate filter production and cleaning process lines (Tetra Tech, 2017). Leaching tanks and coating lines were also used to apply various solvents onto filters. In 1997, Gelman was acquired by Pall Acquisitions, Inc. (Pall), later named Pall Life Sciences, and began operation of a groundwater treatment system. Gelman/Pall Life Sciences (referred to as Gelman for the purposes of this report) continued operations until 2013.

Process wastewater was managed at the facility in several waste management units, including:

- Burn Pit (1968-1979)
- Former Pond 1 (1967-Unknown)
- Former Pond 2 (1968-1981)
- Pond 3 (1973-current)
- Spray Irrigation (1977-Unknown)

- Deep Underground Injection Well (1981-1994)

Previous Investigation(s) and Regulatory Involvement

The Site has had documented regulatory involvement as early as 1968, and several investigations have been completed beginning as early as 1981. A brief summary in approximate chronological order, summarized from the 2017 PA report (Tetra Tech, 2017) and currently available in public documents is provided below:

Table A-3 Site Timeline Summary

Year	Month	Regulatory Actions and/or Investigations
1968	--	MDPH observes open fire from solvents and pigments being burned in barrels
1969	February	MWRC noted Pond 2 was illegally discharging to the wetland area adjacent to the northwest facility boundary
	October	MDNR found Pond 2 was overflowing to adjacent park area
1977	May	NPDES permit M00337 for discharge of process waste and non-contact cooling water via spray irrigation and NPDES permit MI0048453 for discharge of treated groundwater to unnamed tributary to Honey Creek
	--	Illegal surface runoff observed at the western property boundary not authorized under the NPDES permit
1979	--	Neighborhood complaints of foam from Pond 3 being blown across the countryside, and Gelman plans replacement of torn Pond 3 liner
	November	Gelman discontinues use of unlined pit for dumping cellulose acetate membrane filters, solvents, and other fluid per MDNR (now EGLE)
1981	January	MDNR identified Pond 2 discharge in violation of NPDES permit
	--	Gelman permitted as small quantity generator of organic and solvent wastes (MID005341813)
	--	Detections of 1,4-dioxane and other compounds in Pond 3
1984	--	MDNR recommends ceasing spray irrigation after identifying 1,4-dioxane as carcinogenic
	--	Detections of 1,4-dioxane and other compounds in Third Sister Lake
1985	October	MDNR prepares PA Report of the Site
	November	Washtenaw County Health Department identifies 1,4-dioxane in private drinking water wells near the Gelman property
1986	--	Keck Consulting Services Inc. conducts Interim Hydrogeologic Investigations
	July	Gelman illegally discharges 18,000 gallons of process water from former Pond 2 near the northern property boundary
	January	Washtenaw County Health Department identifies 1,4-dioxane in Gelman property drinking water wells and commercial properties to the north of the facility
	October	EPA prepares SA
1987	June	EPA prepares SA Report
	--	Keck Consulting Services Inc. conducts Phase II Hydrogeologic Investigations
	--	Gelman begins using extraction well to remove 1,4-dioxane from the aquifer and discharging into the on-site deep injection well at the facility
	--	MDNR conducts biological survey of Honey Creek and First, Second, and Third Sister Lakes
	--	Keck Consulting Services Inc. conducts Phase III Hydrogeologic Investigations

Year	Month	Regulatory Actions and/or Investigations
1988	--	MDEQ and Keck Consulting Services, Inc. conduct soil boring investigations
1989	--	Gelman conducts study of ecological impact at Honey Creek
1992	October	**Consent Judgment** between Gelman, MDNR, MNRC, and MWRC
1995	--	MDNR prepares report of biological survey of Honey Creek and First, Second, and Third Sister Lakes
1996	September	**Consent Judgment** amendment #1
	--	Illegal discharge of treated groundwater containing 1,4-dioxane to Unit E aquifer
1997	--	Gelman begins operation of groundwater treatment system
1999	October	**Consent Judgment** amendment #2
2000	July	Court opinion and remediation enforcement order that required Gelman to reduce 1,4-dioxane in affected water supplies below acceptable levels by 2005
2001	February	City of Ann Arbor closes Montgomery Wellfield
2004	December	Court opinion and remediation enforcement order requires Gelman to remediate contamination in the Unit E aquifer
	--	Gelman prepares Final Feasibility Study and Proposed Interim Response Plan for Unit E aquifer plume
2005	May	Prohibition Zone established and Gelman responsible for connecting impacted residences to municipal water supply
2011	March	**Consent Judgment** amendment #3 and expanded Prohibition Zone
2015	--	Phase I Environmental Site Assessment (ESA) identifies staining and discoloration in floor and trench drains at the Gelman facility
2016	--	Gelman conducts shallow groundwater investigation in accordance with MDEQ work plan
2017	--	MDEQ prepares summary of recent activities and response actions and continues sampling residential and commercial water supply wells near the plume boundaries
	October	Tetra Tech prepares a PA
2020		Key stakeholders sent a letter to Michigan's governor requesting support for NPL listing
2021	April	EGLE requests that EPA reinstate the evaluation process needed to consider the Gelman Site for inclusion on the Superfund NPL
2021	June	**Consent Judgment** amendment #4

Notes:
MDEQ Michigan Department of Environmental Quality (now EGLE)
MDNR Michigan Department of Natural Resources (now EGLE)
MDPH Michigan Department of Public Health
MNRC Michigan Natural Resources Commission
MWRC Michigan Water Resources Commission
NPDES National Pollutant Discharge Elimination System

Project Objectives

A review of the PA report (Tetra Tech, 2017) and supporting references indicates that there are significant data gaps related to sources at the Site, and the existing source data dates back to the 1980s and 1990s, a period of over 30 years. The data are also incomplete, lacking supporting documentation such as laboratory quality control (QC) documentation and independent third-party data validation. Comprehensive and up-to-date source data is a key component in supporting a

listing of the Site on the NPL. Source data from the Site is also a key component of the EPA's HRS, which aids EPA in identifying and prioritizing high hazard sites.

Volatile organic compounds (VOCs) and 1,4-dioxane have been the focus of most previous investigations; however, there are other contaminant types (e.g., polychlorinated biphenyls [PCBs] or metals) that may be associated with the facility and Site sources. Although there is a considerable amount of monitoring well data available, it is essential to verify findings and support documenting an observed release according to HRS criteria

The objective of this SI is to determine if the Site should be placed on the NPL. The goals of the SI to achieve this objective are as follows:

- Collect and analyze soil, groundwater, surface water, and sediment samples to determine the presence of on-Site contaminants.
- Collect and analyze groundwater, surface water, and sediment samples to determine the potential for migration of contaminants.
- Provide EPA with adequate information to determine whether the Site is eligible for placement on the NPL, and
- Document any threat or potential threat to public health or the environment posed by the Site.

The following specific sampling considerations have been identified:

- Conduct surface and subsurface soil sampling in former waste management units in the source area.
- Conduct surface water and sediment sampling in former Pond 3 that received process wastewater and groundwater extraction system water prior to on-site treatment at the facility.
- Conduct groundwater sampling of the background monitoring wells, release monitoring wells, and release target wells including public water-supply wells, residential wells, and background water-supply wells.
- Conduct surface water and sediment sampling within the nearby wetlands and at other probable points of entry (PPEs) identified during site reconnaissance around the Site, and
- Analyze surface water, sediment, subsurface soil, and surface soil samples for contaminants of concern (COCs) identified in the PA, which include target analyte list (TAL) metals plus cyanide, PCBs, VOCs, and semi-volatile organic compounds (SVOCs) including polycyclic aromatic hydrocarbons (PAHs). Groundwater samples will only be analyzed for VOCs and SVOCs including 1,4 Dioxane.

Geological/Meteorological Information

According to the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service Web Soil Survey, soils at the Site consist primarily of Fox sandy loam and Wawasee loam. Fox

and Wawasee soils are classified as well drained with moderately high to high infiltration rates (USDA, 2022).

According to the National Oceanic and Atmospheric Administration (NOAA), the average annual precipitation as measured in Washtenaw County is 30.6 inches (NOAA, 2022,).

Hazard Ranking System Pathway(s)

Contaminated soils from waste disposal practices are considered potential sources of contamination at the Site. Several unlined and lined ponds were used for disposal of process wastewater as well as extracted untreated groundwater. Process wastewater was also used to irrigate grass-covered areas and was injected into a deep underground injection well into the Mt. Simon Sandstone briny aquifer. Waste was also burned at the facility from approximately 1968 to 1979. Subsurface contamination has been determined to be present beneath regularly occupied structures; however, the subsurface intrusion pathway requires further investigation.

The target distance limit (TDL) for the groundwater migration pathway is a 4-mile radius that extends from the sources at the Site. The Gelman Site is located on a topographic ridge that causes groundwater to flow away from the source areas, both generally to the east and west. Several hundred residential wells are located within the 4-mile TDL. Some residential wells have been impacted from Site-related contamination, and those wells have been abandoned and the residence has been connected to municipal water. City of Ann Arbor public water-supply well fields also exist downgradient of the Site within the 4-mile TDL (former Montgomery Well Field – now discontinued) and the Steer Farm Well Field located outside the 4-mile TDL approximately 5 miles southeast of the Site.

A Prohibition Zone was established in May 2005 and expanded in March 2011 with the Third Amended CJ order (Figure 3). The Prohibition Zone was expanded for a second time under the June 2021 Response Activity Order. These court orders prevent the installation of new water supply wells for drinking, irrigation, commercial, or industrial use within the Prohibition Zone, prohibit the consumption of groundwater from the Prohibition Zone, and require Gelman to ensure migration of contaminated groundwater beyond the Prohibition Zone is detected before such migration occurs.

The TDL for the surface water migration pathway is 15 downstream miles. Wetlands with greater than 0.1-mile of frontage are present at and adjacent to the Gelman property boundary. First, Second, and Third Sister Lakes are located within 1 mile east and west of the Gelman property boundary. The presence of 1,4 dioxane in Third Sister Lake has been documented as early as 1984. Additional tributaries west of the Gelman property feed downgradient to Honey Creek and ultimately to the Huron River approximately 2.5 miles from the Site. Honey Creek also received treated groundwater from the Site in accordance with NPDES permit requirements. Fish consumption advisories are posted by MDNR for First and Second Sister Lakes and parts of the Huron River, including Barton Pond within the 15-mile TDL.

Regulatory Information

Results of laboratory samples analyzed as part of this investigation will be compared against the following regulatory benchmarks and screening levels:

Surficial and Subsurface Soil

- EGLE Part 201 Generic Residential Cleanup Criteria and Screening Levels/Part 213 Risk-Based Screening Levels (EGLE, 2018).
- EPA Regional Screening Level (RSL) Summary Table – Industrial and Residential Soils (November 2021) (EPA, 2021b)

Groundwater

- EGLE Part 201 Generic Residential Cleanup Criteria and Screening Levels (EGLE, 2020a).
- EPA Maximum Contaminant Limit (MCL) 40 Code of Federal Regulations (CFR) 141 National Primary Drinking Water Regulations (July 2019) (EPA, 2019)
- EPA RSL Summary Table – Tap Water (May 2021) (EPA, 2021b)

Surface Water

- EGLE Rule 57 Surface Water Quality Values (EGLE, 2020b).

Sediment

- EPA Region 4 Ecological Risk Assessment (ERA) Supplemental Guidance Sediment Screening Values for Hazardous Waste Sites (EPA, 2018)

For HRS purposes, analytical results will be compared to background concentrations to determine if an observed release (i.e., are contaminants present at concentrations greater than background) has occurred (EPA, 1992).

In addition to the regulatory benchmarks and screening levels, results of laboratory samples analyzed as part of this investigation will be compared to the EPA Superfund Chemical Data Matrix (SCDM) benchmarks (EPA, 2022). The SCDM is a compilation of toxicity-based benchmarks and regulation-based benchmarks to be used as a source for factor values and screening concentration benchmarks that can be applied when evaluating potential NPL sites.

A5. Project/Task Description

Field Tasks

Based on the objectives developed, the following fieldwork tasks will be performed. Additional details are presented in Section B1. Sampling Process Design (Experimental Design). Proposed sample locations are shown in Figures 2and 3.

1) **Sample Collection**
   - Advance source borings in Ponds 1 through 3, the former burn pit, the grass strip west of the former drum storage area, the former spray irrigation fields, and the marsh area north

of the former ponds. Each boring will be advanced as a continuous core up to 25-50 ft below ground surface (bgs) with up to three soil samples collected from each boring (except for Ponds 1 and 2 due to fill material).

- Groundwater samples will be collected from existing wells within three primary aquifers (C_3, D_2, and E) (up to two wells from each aquifer). Samples will be collected from release target monitoring wells (up to six locations), a release target public water-supply well (one location from E aquifer only), release target wells (up to two locations), operable residential wells (up to eight locations), background monitoring wells (up to six locations), background public water supply wells (up to two locations from E aquifer only), and background residential wells (up to three locations).
- Co-located surface water and sediment samples will be collected in the source area within each pond (Green and Red) in former Pond 3.
- Co-located surface water and sediment samples will be collected in PPE areas 1 through 3 from Pond 2 overflow, spray irrigation runoff area, and the facility's NPDES permit discharge location.
- Co-located surface water and sediment samples will be collected within the wetlands north of PPE-1 and PPE-2.
- Co-located surface water and sediment samples will be collected along tributaries to Honey Creek at intervals sufficient to document the length of wetland frontage subject to actual contamination.
- Co-located background surface water and sediment samples will be collected from the unnamed stream in Dolph Nature Area located west of Wagner Road, and from a small, isolated freshwater forested/shrub wetland northeast of the facility.

2) Document Sample Locations

- Sample locations will be documented on a field map, in the logbook, and/or with a Global Positioning System (GPS) device, as appropriate.

Coordination with State and Local Authorities

WESTON will assist EPA with coordinating field sampling efforts with EGLE, Washtenaw County Health Department, the City of Ann Arbor, Scio Township, and other applicable state and local authorities. Coordination will include the preparation of letters requesting consent to access for sampling activities to be conducted on private property as well as municipal water supplies. Following the collection of samples and receipt of analytical data, WESTON will assist EPA in the preparation of residential well sampling packets that will be provided to the appropriate state and local authorities for review. WESTON will coordinate with EPA and Washtenaw County Health Department to determine the appropriate letterhead for delivery of the packets to the respective property owners.

Project Schedule and Deliverables

Table A-4 Proposed Project Schedule

Activity	Estimated Start Date	Estimated Completion Date	Comments
SAP Submittal	2/25/2022	6/24/2022	
Develop HASP	5/9/2022	6/3/2022	
Mobilize to the Site	7/24/2022	7/24/2022	
Sample Collection Activities	7/25/2022	7/29/2022	
Laboratory Receipt of Samples	7/26/2022	8/1/2022	Samples shipped daily, as needed to support VOC analysis.
Demobilize from the Site	7/30/2022	7/30/2022	
Laboratory Analysis	8/2/2022	8/30/2022	Assumes standard 21-day CLP TAT
Data Validation	8/31/2022	9/30/2022	Assumes 30-day expedited EPA TAT
Draft SI Report	8/31/2022	10/28/2022	
Final SI Report	Upon receipt of comments from EPA	2 weeks following receipt of comments	

Notes:
CLP Contract Laboratory Program
HASP Health and Safety Plan
TAT turnaround time

A6. Quality Objectives and Criteria

The following Data Quality Objectives (DQOs) have been developed following the seven-step process for the Site.

1. State the Problem

This SI is intended to collect sufficient data needed to provide a thorough review of the Site to determine eligibility for the NPL. Additional information is presented in Section A4. Problem Definition/Background – Problem Definition.

2. Goals of the Study	3. Information Inputs	4. Boundaries of the Study[a, b]
Determine the presence and concentrations of COCs in soil, surface water, and sediment (if present) in the source areas to associate with COCs found in target groundwater and surface water/sediment samples to document observed release(s).	Analytical results to characterize and identify source areas resulting from former on-site waste management at the facility.	Within the source area extent (Figure 2).
Identify if contamination is present in groundwater that is attributable to the Site, and compare against three times background, and/or regulatory benchmarks.	Analytical results to determine impacts to groundwater downgradient of the Gelman facility.	Vicinity of the Gelman property extent (Figures 2 and 3).
Identify if contamination is present in surface water and/or sediments that is attributable to the Site, and compare against three times background, and/or regulatory benchmarks.	Analytical results to determine impacts to surface water bodies downstream of the Gelman facility	

a. Site activities are proposed to occur in May 2022.

b. Practical constraints on data collection: Access to some sampling locations is through the Gelman property, but access to domestic water wells and surface water/sediment locations on adjacent residential properties and water-supply wells would require coordination with private landowners and municipalities. The sampling event presumes access agreements will be secured in coordination with EPA, EGLE, Washtenaw County Health Department, University of Michigan, private property owners, and any municipality with jurisdiction of water-supply wells. Field constraints may include equipment and sampling limitations due to weather conditions and accessibility issues at the Site. Scheduling adjustments will be made if physical constraints on planned field events occur, including health and safety considerations.

5. Develop the Analytical Approach

The analytical approach is presented in Section A5. Project/Task Description; Section B1. Sampling Process Design (Experimental Design); and Section B5. Analytical Methods. All valid analytical results for each media sampled will be compared to background concentrations (where applicable), applicable screening benchmarks and/or regulatory criteria presented in Section A4. Problem Definition/Background – Regulatory Information.

6. Specify the Performance or Acceptance Criteria

- If contaminants attributable to the Site are detected at levels three times above the background concentration in media, then a release of hazardous substances will be documented.

The data quality indicators are presented in the measurement performance criteria (MPC) tables included as Attachment B – Measurement Performance Criteria. Attachment C – Data Quality Indicator Measurement Parameters includes a definition of the precision, accuracy/bias, representativeness, completeness, comparability, and sensitivity measurements

used to aid in the evaluation process and the general calculations associated with the measurements, as applicable. Project action limits and laboratory detection limits (LDLs) for parameters of interest are presented in Attachment D – Screening Levels. Assessment of data usability, generated as part of this assessment, is presented in Group D: Data Validation and Usability.

7. Develop the Detailed Plan for Obtaining Data

The detailed plan for obtaining data is presented in Group B: Data Generation and Acquisition.

A7. Special Training/Certification

The Regional Health and Safety Manager is responsible for verifying that all project team members have the appropriate training and have maintained training records. General training requirements for the project field activities are as follows:

- Completion of the 40-hour health and safety training program and the cardiopulmonary resuscitation/first aid/automated external defibrillator certification course, and successful completion of a minimum of 8 hours of refresher training every year.
- All personnel who ship samples must complete the U.S. Department of Transportation (DOT) hazardous materials transportation training and certification, including training in specific International Air Transport Association (IATA) regulations (air shipments).

A8. Documents and Records

The primary documentation for this Site includes field records and analytical data packages.

Field Documentation

Sample Identification

All containers of samples collected in the field are identified prior to shipment using a label affixed to the sample container. Each sample is labeled, chemically preserved (if required), and sealed immediately after collection. To minimize handling of sample containers, labels are completed and printed prior to sample collection. The field team completes the sample labels using waterproof ink, which are firmly affixed to the sample containers. The sample label provides the following information:

- Date of collection
- Contract Laboratory Program (CLP) Case Number
- CLP Sample Identification (ID)
- Analysis required
- Preservation

The code for this SI includes the CLP sample ID as well as a unique alpha-numeric code. The unique code serves as the reference to the sample in the logbook, field sheet, and on the chain-of-custody record.

Samples collected with an additional volume for laboratory matrix spike/matrix spike duplicate (MS/MSD) procedures are designated on the chain of custody. Field duplicate samples are given a "blind" unique number that is completely different from the original sample. This number is recorded in the field logbook so that the duplicates can be identified at a later date.

Logbooks

Field logbooks will document where, when, how, and from whom any vital project information was obtained. Logbook entries will be completed with accuracy to permit reconstruction of field activities. The logbook is bound with consecutively numbered pages. Each page will be dated with the time of entry noted in military time. All entries will be legible, written in ink, and signed by the individual making them. Language will be factual, objective, and free of personal opinions. At a minimum, the following information will be recorded, if applicable, during the collection of each sample.

- Sampler's name(s)
- Date and time of sample collection
- Type of sample (e.g., groundwater)
- Type of sampling equipment used
- Field instrument readings and calibration readings for any equipment used, and equipment model(s) and serial number(s)
- Field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.)
- Sample preservation
- Lot numbers of the sample containers; sample identification numbers; and any explanatory codes, and chain-of-custody form numbers
- Shipping arrangements (overnight air bill number)
- Name(s) of recipient laboratory(ies)

In addition to sampling information, the following specifics may also be recorded in the field logbook for each day of sampling:

- Team members and their responsibilities
- Time of arrival and time of departure
- Other personnel
- Summary of any meetings or discussions with any potentially responsible parties (PRPs), or representatives of any federal, state, or other regulatory agency
- Deviations from sampling plans or site safety plan procedures
- Changes in personnel and responsibilities, as well as reasons for the change
- Levels of safety protection
- Record of photographs

Photographs

Photographs will be taken at sampling locations and at other areas of interest (AOIs) at the facility. They will verify information entered in the field logbook. When a photograph is taken, the following information will be written in the logbook or will be recorded in the field photography log:

- Date, location
- Description of the subject photographed
- Name of person taking the photograph

Laboratory Data Reporting

Data generated by the EPA CLP will follow the EPA-specified formats.

Project Documentation

The project documentation deliverables and schedule for this SI are included in **Table A-4**. The WESTON Project Manager is responsible for overseeing the report generation process and for providing a final QA review of all deliverables.

Project files include work planning documents, field documentation, analytical reports, and technical reports as described in this SAP. Files will be retained as required by Contract No. 68HE0720D0005.

GROUP B: DATA GENERATION AND ACQUISITION

B1. Sampling Process Design (Experimental Design)

Design Strategy and Sample Locations

Table B-1 lists the environmental concerns present at the Site along with the associated design strategy of assessment techniques, sample type, and specific information represented (e.g., size of the area, volume, or time period to be represented), estimated total number of samples to be collected, as applicable, and designation of sample information importance in relationship to the overall investigation.

Table B-1 Sample Design Strategy

Environmental Concern	Assessment Technique	Sample Type and Representation	Total # of Sample Locations	Sample Information Designation
TAL metals plus cyanide, PCBs, VOCs, and SVOCs (including PAHs) in soils at the facility that could potentially migrate into nearby wetlands and groundwater	Surficial Soil Sampling	Sample Type: Grab samples from 0 to 2 ft bgs Representation: Waste characterization and evaluation of potential contamination in former waste management areas on the Gelman property	9	Critical
TAL metals plus cyanide, PCBs, VOCs, and SVOCs (including PAHs) in soils at the facility that have migrated into subsurface soil	Subsurface Soil Sampling and Field Screening Using a Toxic Vapor Analyzer (TVA)	Sample Type: Biased grab samples collected at observed contamination based on field screening or field observations Representation: Waste characterization and evaluation of subsurface soils in former waste management and disposal areas on the Gelman property	14	Critical

Environmental Concern	Assessment Technique	Sample Type and Representation	Total # of Sample Locations	Sample Information Designation
TAL metals plus cyanide, PCBs, VOCs, and SVOCs (including PAHs) in soils at the facility that have migrated into subsurface soil	Subsurface Soil Sampling	Sample Type: Grab samples collected from the bottom 2 ft of each borehole or at refusal or at the groundwater interface. Representation: Characterization of subsurface soils in former waste management and disposal areas on the Gelman property	14	Critical
VOCs and SVOCs migrating from the Gelman property into groundwater	Groundwater Sampling	Sample Type: Direct samples Representation: Evaluation of groundwater beneath and down-gradient of the Gelman 1,4-dioxane plume	30	Critical
TAL metals plus cyanide, PCBs, VOCs, and SVOCs (including PAHs) migrating from the Site into nearby wetlands and surface water bodies	Surface Water Sampling	Sample Type: Grab samples from 0 to 1 ft beneath water surface Representation: Characterization of surface water in the vicinity of the Gelman property and the surface water pathway	10+	Critical
TAL metals plus cyanide, PCBs, VOCs, and SVOCs (including PAHs) migrating from the Site into nearby wetlands and surface water bodies	Sediment Sampling	Sample Type: Grab samples from 0 to 6 inches bgs Representation: Evaluate sediment in the vicinity of the Gelman property and the surface water pathway	10+	Critical

Sample locations will be located on a site map or with a GPS device after sample collection, which will be used for mapping purposes and to document sample locations selected in the field. Field conditions and access may require an iterative approach to proposed sample locations. If sampling locations become inaccessible, WESTON will attempt to identify alternate sampling locations that provide adequate or sufficient data as the original based on the project teams' best judgment, as necessary.

A schedule of project activities is presented in **Table A–4**. All samples will be submitted to the appropriate laboratory within the holding time identified in **Table B-8**.

B2. Sampling Methods

Table B-2 Field Standard Operating Procedures (SOPs)

SOP Number or Reference	Title, Revision, and Date	Originating Organization
R5-SFD-0006-r0	Groundwater Sampling Procedures, 05/13/2021	EPA
019	Investigation-Derived Waste Compliance Plan, Rev. 1.0, 08/2019	WESTON
101	Logbook Documentation, Rev. 1.0, 02/2020	WESTON
102	Field Notes, Rev. 1.0, 08/2019	WESTON
103	Chain-of-Custody Documentation, Rev. 1.0, 01/2019	WESTON
104	Photographic and Video Documentation, Rev. 1.0, 08/2019	WESTON
201	Groundwater Well Sampling, Rev. 1.0, 08/2019	WESTON
202	Residential Groundwater Sampling, Rev. 1.0, 08/2019	WESTON
203	Surface Water Sampling, Rev. 1.0, 09/2019	WESTON
302	Surface Soil Sampling, Rev. 1.0, 10/2019	WESTON
303	Sediment Sampling, Rev. 1.0, 10/2019	WESTON
304	Subsurface Soil Sampling, Rev. 1.0, 08/2019	WESTON
306	Soil Boring, Rock Coring, Soil and Rock Borehole Logging and Sampling, Rev. 1.0, 10/2019	WESTON
307	Surveying Environmental Sampling Locations, Rev. 1.0, 10/2019	WESTON

Notes:
SOPs are included as Attachment E.

Surface Soil Sampling

Collection Methods

A total of 10 discrete grab surficial soil samples (not including duplicates) will be collected from 0 to 2 ft bgs using a direct push technology (DPT) equipped with 5-ft rods (or similar) to collect a continuous core. Samples will be collected from borings at 10 locations: six from the former Spray Irrigation Fields, one from the former Burn Pit, one from the grass strip adjacent west of the former

Drum Storage Area, one from adjacent to Pond 3, and one from the marsh area north of Ponds 1 and 2 (Figure 2). The borings located within the former spray irrigation fields will be dispersed near the mapped corners of the southern irrigation field (four total), in the center (one total), and near the center of the northern former irrigation area (one total). All surface soil samples will be submitted for laboratory analysis for TAL metals plus cyanide, PCBs, VOCs, and SVOCs (including PAHs). The sampling design rationale is presented in **Table B-3**.

The samples will be collected in a non-dedicated core barrel with a dedicated acetate sampling sleeve and internal core catcher. Collected soil will be cut out of the core barrel and then homogenized in dedicated plastic bags for screening and sample collection. Samples for VOC analysis will be collected directly from the sampling sleeve using 5-gram En Core® samplers (or equivalent).

Decontamination of sampling equipment must be conducted consistently to assure the quality of samples collected. All non-dedicated equipment that comes into contact with potentially contaminated soil or water will be decontaminated. Decontamination will occur prior to and after each use of a piece of non-dedicated equipment. The following steps are to be carried out sequentially, as the recommended procedure for the decontamination of sampling equipment: non-phosphate detergent and tap-water wash, using a brush, if necessary, tap-water rinse, then deionized/distilled water rinse (twice). Equipment will be decontaminated in a predesignated area on pallets or plastic sheeting, and clean bulky equipment will be stored on plastic sheeting in uncontaminated areas.

Ponds 1 and 2 have reportedly been filled in and covered with gravel and have not been selected as part of the surface sampling design. These locations as well as any additional areas of potential contamination will be observed and surface soil opportunity samples may be collected and submitted for TAL metals plus cyanide, PCBs, VOCs, and/or SVOCs (including PAHs) analyses.

Sample Nomenclature

In addition to the CLP Sample ID format, as assigned by the Region, sample nomenclature will use the following to designate the property: G for the Gelman Site, followed by the surface soil sample location number (SO##) identifier. For example, G-SO03 would designate the third surface soil sample collected at the Site.

Surface Soil Sample Collection Summary Table

Sample Analysis	Sample Type	Sample Nomenclature
TAL metals plus cyanide	Grab	*Sample ID and G-SO##
PCBs		
VOCs		
SVOCs (including PAHs)		

*Laboratory-specific sample ID provided by EPA Regional Sample Control Center (RSCC)

Table B-3 Sampling Design and Rationale Matrix = Surface Soil

Sampling Location/ID Number	Depth (feet)	Analytical Parameter	Rationale
G-SO01 G-SO02 G-SO03 G-SO04 G-SO05 G-SO06	0 to 2	TAL metals plus cyanide, PCBs, VOCs, and SVOCs (including PAHs)	Samples collected to determine the presence and concentrations of COCs in surface soil in the former Spray Irrigation Fields.
G-SO07			Sample collected to determine the presence and concentrations of COCs in surface soil at the former Burn Pit.
G-SO08			Sample collected to determine the presence and concentrations of COCs in surface soil at the grass strip adjacent west of the former Drum Storage Area.
G-SO09			Sample collected to determine the presence and concentrations of COCs in surface soil adjacent to former Pond 3.
G-SO10			Sample collected to determine the presence and concentrations of COCs in surface soil in the marsh area near PPE 1 and downslope of site sources.
G-SO##			Opportunity samples collected to determine the presence and concentrations of COCs in surface soil at the Site as determined during field sampling activities.

Subsurface Soil Sampling

Collection Methods

A total of 28 biased grab subsurface soil samples (not including duplicates) will be collected using a DPT equipped with 5-ft rods (or similar). Subsurface soil samples will be collected from one depth interval based on field screening with a TVA or observation of contamination and a second sample will be collected from within 2 ft. of the bottom of the boring or the groundwater interface or refusal, whichever comes first. Samples will be collected from borings at 14 locations: two in Pond 1 (four samples), two in Pond 2 (four samples), six from the former Spray Irrigation Fields (12 samples), one from the former Burn Pit (two samples), one from the grass strip adjacent west of the former Drum Storage Area (two samples), one from the marsh area north of Ponds 1 and 2 (two samples), and one from beneath Pond 3 (two samples) (Figure 2). The borings located within the Spray Irrigation Field will be dispersed near the mapped corners of the southern irrigation field (four total), in the center (one total), and near the center of the northern former irrigation area (one total). At the former Pond 3, subsurface soil samples will be collected using a sonic-type drill rig equipped with 4-ft core rods (or similar) to collect a continuous core drilled at an angle beneath

the lined pond. The sampling design rationale is presented in **Table B-4**.

The borings will be advanced to approximately 25-50 ft bgs (if possible) and two subsurface soil samples will be collected from each boring. Soil cores obtained below 2 ft. bgs and above the bottom 2-foot sample interval will undergo field screening with a TVA for VOCs and SVOCs. The results of the field screening will be used to inform the selection of the subsurface soil interval in which the sample will be collected from for laboratory analysis. The subsurface soil interval selected for sample collection will be based on the highest response from any or all instruments and/or field observations (visual or olfactory). TVA screening will be conducted using the heated headspace procedure. Approximately 250 grams of soil will be placed into a sealable plastic bag and sealed. Sufficient air will be left in the bag so that the instrument can withdraw an adequate headspace sample. The sample will be agitated for 15 seconds and warmed within an approximately 70° degrees Fahrenheit (F) vehicle or building for a minimum of 10 minutes, but no more than 1 hour, for soil hydrocarbons to reach equilibrium with the headspace. The TVA will be used to measure the sample's headspace concentration by first re-agitating the plastic bag, and then inserting the probe of the TVA through the bag opening to half of the headspace depth and resealing the bag tightly around the probe. The highest reading that remains steady for 1 to 2 seconds will be recorded in the field logbook or data collection device. The samples will be collected in a non-dedicated core barrel with an acetate sampling sleeve and internal core catcher. Collected soil will be cut out of the core barrel to be homogenized in dedicated plastic bags for screening. Samples for VOC analysis will be collected directly from the sampling sleeve using 5-gram En Core® samplers (or equivalent). If no elevated TVA readings or visual signs of contamination are observed, one sample will be collected from approximately midway in the boring and an additional sample will be collected from the deepest 2 ft of the boring. In all cases, assuming a relatively low-permeability (i.e., silt and/or clay) interval is encountered at the boring's termination depth, the deepest sample would be collected from soils immediately above this interval. Subsurface soil samples will be submitted for laboratory analysis for TAL metals plus cyanide, PCBs, VOCs, and SVOCs (including PAHs).

Decontamination of sampling equipment must be conducted consistently to assure the quality of samples collected. All non-dedicated equipment that comes into contact with potentially contaminated soil or water will be decontaminated. Decontamination will occur prior to and after each use of a piece of non-dedicated equipment. The following steps are to be carried out sequentially, as the recommended procedure for the decontamination of sampling equipment: non-phosphate detergent and tap-water wash, using a brush, if necessary, tap-water rinse, then deionized/distilled water rinse (twice). Equipment will be decontaminated in a predesignated area on pallets or plastic sheeting, and clean bulky equipment will be stored on plastic sheeting in uncontaminated areas.

If additional areas of potential contamination in surface soils are observed in the field, additional subsurface soil samples may be collected and submitted for TAL metals plus cyanide, PCBs,

VOCs, and/or SVOCs (including PAHs) analyses.

Sample Nomenclature

In addition to the CLP Sample ID format as assigned by the Region, sample nomenclature will be used to designate the property: G for the Gelman Site, followed by the soil sample location number, followed by the deepest sample depth interval (SS##-XX). Subsurface soil samples will be collected in 6-inch intervals. For example, G-SS03-0405 would designate the third soil sample collected between 4-5 ft bgs at the Gelman Site.

Subsurface Soil Sample Collection Summary Table

Sample Analysis	Sample Type	Sample Nomenclature
TAL metals plus cyanide	Grab	*Sample ID and G-SS##-XXXX
PCBs		
VOCs		
SVOCs (including PAHs)		

*Laboratory-specific sample ID provided by EPA RSCC

Table B-4 Sampling Design and Rationale Matrix = Subsurface Soil

Sampling Location/ID Number	Depth (feet)	Analytical Parameter	Rationale
G-SS01-XXXX G-SS02-XXXX G-SS03-XXXX G-SS04-XXXX G-SS05-XXXX G-SS06-XXXX	TBD/midway or observed contamination in the boring	TAL metals plus cyanide, PCBs, VOCs, and SVOCs (including PAHs)	Samples collected to determine the presence and concentrations of COCs in subsurface soil at the Former Spray Irrigation Field.
G-SS07-XXXX			Sample collected to determine the presence and concentrations of COCs in subsurface soil at the Former Burn Pit.
G-SSO08-XXXX			Sample collected to determine the presence and concentrations of COCs in subsurface soil at the grass strip adjacent west of Former Drum Storage Area.
G-SS09-XXXX			Sample collected to determine the presence and concentrations of COCs in subsurface soil in the marsh area near PPE 1 and downslope of site sources.
G-SS10-XXXX G-SS11-XXXX			Sample collected to determine the presence and concentrations of COCs in subsurface soil at former Pond 1.
G-SS12-XXXX G-SS13-XXXX			Sample collected to determine the presence and concentrations of COCs in subsurface soil at former Pond 2.

Sampling Location/ID Number	Depth (feet)	Analytical Parameter	Rationale
G-SS14-XXXX			Sample collected to determine the presence and concentrations of COCs in subsurface soil at former Pond 3.
G-SS##-XXXX			Opportunity Samples collected to determine the presence and concentrations of COCs in subsurface soil at the Site as determined during field sampling activities.
G-SS01-XXXX G-SS02-XXXX G-SS03-XXXX G-SS04-XXXX G-SS05-XXXX G-SS06-XXXX	TBD/deepest two feet of boring	TAL metals plus cyanide, PCBs, VOCs, and SVOCs (including PAHs)	Samples collected to determine the presence and concentrations of COCs in subsurface soil at the Former Spray Irrigation Field.
G-SS07-XXXX			Sample collected to determine the presence and concentrations of COCs in subsurface soil at the Former Burn Pit.
G-SS08-XXXX			Sample collected to determine the presence and concentrations of COCs in subsurface soil at the grass strip adjacent west of Former Drum Storage Area.
G-SS09-XXXX			Sample collected to determine the presence and concentrations of COCs in subsurface soil in the marsh area near PPE 1 and downslope of site sources.
G-SS10-XXXX G-SS11-XXXX			Sample collected to the determine presence and concentrations of COCs in subsurface soil at Former Pond 1.
G-SS12-XXXX G-SS13-XXXX			Sample collected to determine the presence and concentrations of COCs in subsurface soil at Former Pond 2.
G-SS14-XXXX			Sample collected to determine the presence and concentrations of COCs in subsurface soil at Former Pond 3.
G-SS##-XXXX			Opportunity Samples collected to determine the presence and concentrations of COCs in subsurface soil at the Site as determined during field sampling activities.

Groundwater Sampling

Collection Methods

A total of 28 direct groundwater samples (not including duplicates) will be collected using the low-flow method and a submersible pump. Groundwater samples will be collected from the wells presented in Figure 3 from within each of the three primary aquifers (C_3, D_2, and E) (up to two wells from each aquifer). Samples will be collected from release target monitoring wells (up to six locations), a release target public water-supply well (one location from E aquifer only), release

target wells (up to two locations), operable residential wells (up to eight locations), background monitoring wells (up to six locations), background public water supply wells (up to two locations from E aquifer only), and background residential wells (up to three locations).

Water level measurements will be taken with a well sounder before monitoring well purging begins. Low-flow purging and sample collection techniques will be utilized to minimize aquifer disturbance as well as limit the volume of investigation-derived waste (IDW) generated. The flow rate shall not exceed 500 milliliters (mL) per minute (100 mL per minute for VOC sample collection) to minimize drawdown in the well to less than 0.1 ft. A non-dedicated submersible pump will be used to purge and sample the wells with the sample pump set in the mid-portion of the screened interval. The depth of the pump during sampling will be recorded. During the purging process, water quality parameters (pH, temperature, turbidity, oxidation-reduction potential (ORP), dissolved oxygen, and conductivity) will be monitored with a properly calibrated YSI and recorded on field forms. Low-flow sampling will commence once water quality parameters have stabilized to the tolerances outlined below:

± 0.1 standard unit for pH
± 3% for temperature and specific conductance
± 10% for turbidity or is less than 10 nephelometric turbidity units
± 0.2 milligrams per liter (mg/L) or 10% saturation for dissolved oxygen (optional)
± 10 millivolts (mV) for ORP (optional)

Samples will be pumped directly into pre-labeled sample containers and preserved as required upon sample collection completion and submitted for laboratory analysis for VOCs and SVOCs. After sampling is completed, internal and external components of the submersible pump and all non-dedicated equipment that has come into contact with well water will be decontaminated in accordance with these recommended sequential steps: non-phosphate detergent and tap-water wash, using a brush, if necessary, tap-water rinse, then deionized/distilled water rinse (twice). Equipment will be decontaminated in a predesignated area on pallets or plastic sheeting, and clean bulky equipment will be stored on plastic sheeting in uncontaminated areas. A new, disposable bladder will be installed after all internal and external decontamination is complete.

The residential and current and former public water-supply well locations are still pending homeowner approval and municipality access, respectively. If residential well sampling is not accessible, samples will be collected from a non-filtered and non-softened faucet with any aeration device removed at the access point. The faucet will be cleaned with a metal scouring brush to remove any residue and water will be allowed to flow for a minimum of 15 minutes prior to sampling. During purging, water quality parameters will be measured, and sampling will commence once parameters have stabilized over three consecutive readings as outlined above. Flow level will then be adjusted to between 0.1-0.5 liters per minute (L/min). Sample containers will be placed under a water stream and collected utilizing low-flow techniques to minimize the potential volatilization. VOCs will be sampled first followed by SVOCs. VOC sample vials will

be preserved prior to collection using hydrochloric acid (HCl). It should be noted that samples collected this way may exhibit low bias for VOCs due to aeration, as well as any other bias from pump house filters.

Well construction and in-place pump information are typically unavailable for most public water-supply wells and therefore requires special sampling considerations. For public water-supply wells that are currently in operation (i.e., Steere Farm well), the sample will be collected after allowing the sampling valve to flush for approximately 2 minutes. Field parameters will be recorded immediately prior to the time of sampling. For wells that are not currently in operation (i.e., PW-1), the well will be purged for approximately 15 minutes prior to sampling. Field parameters will be recorded in 5-minute intervals up to and immediately prior to the time of sampling. For all public-water supply well sampling, samples will be collected directly into the sample container(s).

Sample Nomenclature

In addition to the CLP Sample ID format as assigned by the Region, sample nomenclature will use the following to designate the property: G for the Gelman Site, followed by the groundwater matrix designation (GW) and one of the following options depending on sample location type:

- Release monitoring well ID (RS-MW- ##). For example, G-GWRS-MW-77 would designate a groundwater sample collected from release background monitoring well MW-77 at/near the Site.
- Public water-supply well ID (PW-#). For example, G-GWPW-1 would designate a groundwater sample collected from existing public water-supply well PW-1 near the Site.
- Residential well with address identifier (RW-##-XXXX). For example, G-GWRW-01 would designate a groundwater sample collected from existing residential well located near the Site.

Groundwater Sample Collection Summary Table

Sample Analysis	Sample Type	Sample Nomenclature
VOCs	Direct	*Sample ID and G-GW
SVOCs		

*Laboratory-specific sample ID provided by EPA RSCC.

Table B-5 Sampling Design and Rationale Matrix = Groundwater

Sampling Location/ID Number	Depth (bgs)	Analytical Parameter	Rationale
G-GWBK01	TBD	VOCs and SVOCs	Background samples from public wells located on Steere Farm to determine quality of groundwater outside the area of known 1,4-dioxane contamination.

Sampling Location/ID Number	Depth (bgs)	Analytical Parameter	Rationale
G-GWBK02			Background samples from public wells located in the Lakeview Ave Subdivision to determine quality of groundwater outside the area of known 1,4-dioxane contamination.
G-GWBK-MW-##			Samples collected to determine quality of groundwater in three primary aquifers from previously installed monitoring wells outside the area of known 1,4-dioxane contamination.
G-GWRS-MW-##	TBD	VOCs and SVOCs	Samples collected to determine impacts to groundwater in three primary aquifers from previously installed monitoring wells near potential source areas.
G-GWPW-##			Samples collected to determine impacts to groundwater in former and current public water-supply wells near the site.
G-GWRW-##			Samples collected to determine impacts to groundwater from previously installed residential wells near the Site.
G-GW##			Opportunity samples collected to determine impacts to groundwater beneath the Site from soil borings advanced during field sampling activities where groundwater is encountered.

Notes:
TBD to be determined

Surface Water Sampling

Collection Methods

Grab surface water samples will be collected from seven sample locations and will be submitted for laboratory analysis for TAL metals plus cyanide, PCBs, VOCs, and SVOCs (including PAHs). Additional samples may be collected within the 15-mile TDL to document wetland frontage subject to actual or potential contamination or an observed release using HRS criteria and will be determined in the field. The sampling design rationale is presented in **Table B-6**. Water quality parameters (pH, temperature, turbidity, oxidation-reduction potential, and conductivity) will be collected in situ and recorded at each sample location to assist in interpretation of analytical data. Observations of surface water quality (sheen, odor, etc.) will also be recorded. Surface water sampling will be completed in a downstream to upstream order with the surface water sample collected prior to the co-located sediment sample. Surface water samples will be collected from 0-1 ft below the water surface and will either be collected in a clean, unpreserved sample container by submersing through the water column (depth integrated) or by using a dip sampler, based on accessibility of the sample location. VOCs will be transferred to sample vials preserved prior to collection using HCl. Samples collected for TAL metals analyses will be preserved with nitric acid (HNO_3) to a pH less than (<) 2 in the field. Samples collected for cyanide analysis will be preserved

with sodium hydroxide (NaOH) to a pH greater than (>) 10 in the field. Dissolved metals samples will be field-filtered using a 0.45-micron filter into the sample container prior to preservation.

Sample Nomenclature

In addition to the CLP Sample ID format as assigned by the Region, sample nomenclature will use the following to designate the property: G for the Gelman site, followed by the surface water matrix designation (SW) and one of the following options depending on sample location type:

- Probable points of entry (PPE-##). For example, G-SWPPE-03 would designate the third surface water sample collected at a PPE at the Site.
- Release samples (RS-##). For example, G-SWRS-03 would designate the third surface water sample collected in potential release areas at the Site.
- Source samples (SS-##). For example, G-SWSS-01 would designate the first source water sample collected from Former Pond 3 at the Site.

Surface Water Sample Collection Summary Table

Sample Analysis	Sample Type	Sample Nomenclature
TAL metals plus cyanide	Grab	*Sample ID and G-SW
PCBs		
VOCs		
SVOCs (including PAHs)		

*Laboratory-specific sample ID provided by EPA RSCC.

Table B-6 Sampling Design and Rationale Matrix = Surface Water

Sampling Location/ID Number	Depth	Analytical Parameter	Rationale
G-SWBK01	0-1 ft below water surface	TAL metals plus cyanide, PCBs, VOCs, and SVOCs (including PAHs)	Background sample from unnamed stream in Dolph Nature Area to determine quality of surface water in an area outside of the influence of activities associated with the Site.
G-SWBK02			Background sample from small, isolated freshwater forested/shrub wetland north of the Site to determine quality of surface water in an area outside of the influence of activities associated with the Site.
G-SWPPE-##			Samples collected at PPEs 1-3 (Pond 2 overflow, spray irrigation runoff area, and the location of the facility's NPDES permit discharge location) to determine the presence and concentration of COCs.
G- SWRS-##			Samples collected in wetland areas and along tributaries to Honey Creek to determine if contaminants at the Site are impacting sensitive environments.

Sampling Location/ID Number	Depth	Analytical Parameter	Rationale
G-SWSS-##			Samples collected from the red and green ponds in former Pond 3 to determine the presence and concentration of COCs.
G-SW##			Opportunity sample(s) collected to determine impacts to surface water.

Sediment Sampling

Collection Methods

Co-located discrete grab sediment samples will be collected after surface water samples are collected at each of the seven sample locations. Samples will be submitted for laboratory analysis for TAL metals plus cyanide, PCBs, VOCs and SVOCs (including PAHs). Sediment sampling will be completed in a downstream to upstream order with the sediment sample collected after the co-located surface water sample. Samples will be collected using methods from wading, dipping, etc. Additional samples may be collected within the 15-mile TDL to document wetland frontage subject to actual or potential contamination or an observed release using HRS criteria and will be determined in the field. The sampling design rationale is presented in **Table B-7**. Sediment samples will be collected from 0 to 6 inches bgs using disposable scoops. Collected sediment for all analyses except VOCs will be scooped into dedicated plastic bags and homogenized before being transferred into pre-labeled sample containers. Samples for VOCs will be collected directly into 5-gram En Core® samplers (or equivalent).

Sample Nomenclature

In addition to the CLP Sample ID format as assigned by the Region, sample nomenclature will use the following to designate the property: G for the Gelman Site, followed by the sediment matrix designation (SE) and one of the following options depending on sample location type:

- Primary points of entry (PPE-##). For example, G-SEPPE-03 would designate the third surface water sample collected at a primary point of entry at the Site.
- Release samples (RS-##). For example, G-SERS-03 would designate the third surface water sample collected in potential release areas at the Site.
- Source samples (SS-##). For example, G-SWSS-01 would designate the first source sediment sample collected from Former Pond 3 at the Site.

Sediment Sample Collection Summary Table

Sample Analysis	Sample Type	Sample Nomenclature
TAL metals plus cyanide	Grab	*Sample ID and G-SE
PCBs		
VOCs		
SVOCs (including PAHs)		

*Laboratory-specific sample ID provided by EPA RSCC.

Table B-7 Sampling Design and Rationale Matrix = Sediment

Sampling Location/ID Number	Depth (inches)	Analytical Parameter	Rationale
G-SEBK01	0-6	TAL metals plus cyanide, PCBs, VOCs, and SVOCs (including PAHs)	Background sample from unnamed stream in Dolph Nature Area to determine quality of sediment in an area outside of the influence of activities associated with the Site.
G-SEBK02			Background sample from small, isolated freshwater forested/shrub wetland north of the site to determine quality of wetland sediment in an area outside of the influence of activities associated with the Site.
G-SEPPE-##			Samples collected at PPEs 1-3 (Pond 2 overflow, spray irrigation runoff area, and the location of the facility's NPDES permit discharge) to determine the presence and concentration of COCs.
G- SERS-##			Samples collected in wetland areas and along tributaries to Honey Creek to determine if contaminants at the Site are impacting sensitive environments.
G-SESS-##			Samples collected from the red and green ponds in former Pond 3 to determine the presence and concentration of COCs.
G-SE##			Opportunity sample(s) collected to determine impacts to sediment.

Background Groundwater/Surface Water/Sediment Sampling

Collection Methods

Background groundwater, surface water, and sediment samples will be collected as depicted on Figure 2 and Figure 3 or as determined by the field sampling team. The background samples are presumed to be collected from areas unaffected by historic and current Site operations. The background locations and number of samples may be adjusted in the field based on appropriateness for source area-specific background use and accessibility. Background samples will be collected following the same collection methods described above for each matrix and from monitoring wells

screened in each aquifer. Data will be used to identify the background concentrations for comparison against field samples.

Sample Nomenclature

In addition to the CLP Sample ID format as assigned by the Region, sample nomenclature will use the following to designate the property: G for the Gelman Site, followed by the groundwater (GW), surface water (SW), or sediment (SE) sample identifier.

Background Sample Collection Summary Table

Sample Media	Sample Type	Sample Nomenclature
Groundwater	Direct	*Sample ID and G-GWBK##
Surface Water	Grab	*Sample ID and G-SWBK##
Sediment		*Sample ID and G-SEBK##

*Laboratory-specific sample ID provided by EPA RSCC.

B3. Sample Handling and Custody

Investigation-derived Waste Management

IDW will be managed in accordance with WESTON SOP #019 IDW Compliance Plan. IDW anticipated to be generated during the investigation include wastewater from decontamination operations, groundwater generated during monitoring well purging, excess soil cuttings, disposable sampling equipment, and used personal protective equipment. IDW generated during field work will be gathered by WESTON and taken off the Gelman property for disposal. IDW generated at the facility, such as soil cuttings, purge water, and decontamination fluids will be contained in 55-gallon drums.

Reasonable efforts will be made to characterize IDW using available knowledge of historical and existing Site activities, and waste streams and samples. If off-site disposal of hazardous IDW is required, WESTON will coordinate with EPA to ensure that the hazardous IDW is transported by an approved hazardous waste transporter and disposed of at a permitted treatment, storage, and disposal (TSD) facility, and that the transporter and TSD facility have passed compliance verification. All IDW drums will be labeled, and WESTON will verify the labels comply with EPA, DOT regulations, and the requirements of the TSD-receiving facility. Disposable personal protective clothing and sampling equipment generated during field activities will be rendered unusable by tearing (when appropriate), bagged in opaque plastic garbage bags, and disposed of at a local municipal landfill. To the greatest extent possible, cardboard from sample boxes, other paper products, and used stainless-steel bowls and spoons will be recycled. The field team members will make every effort to minimize the generation of IDW throughout the field event.

Sample Handling

The transportation and handling of samples must be accomplished in a manner that not only protects the integrity of the sample but also prevents any detrimental effects due to the possible hazardous nature of the samples. Regulations for the packaging, marking, labeling, and shipping of hazardous materials are promulgated by the DOT in 49 CFR 171 through 177. WESTON provides training to all staff responsible for the shipment of samples in these regulations.

Soil Samples

Disposable gloves and disposable rod sleeves will be used during sample collection procedures. Sample locations will be recorded in a logbook, within a Survey 123 digital data form, and/or by using a GPS device.

Sample volume for samples to be analyzed for SVOCs, PAHs, PCBs, and TAL metals plus cyanide will be homogenized and transferred from the sample-dedicated homogenization bag into 8-ounce wide-mouth glass jars using a disposable scoop. The soil sample containers will be chilled to 6 degrees Celsius (°C), but not frozen, immediately upon collection. Soil samples analyzed for VOCs will be stored in their sealed En Core® samplers for no more than 2 days prior to analysis. Additional sample volume for percent moisture analysis will be placed in a 4-ounce wide-mouth glass jar using a disposable scoop. Samples will be chilled to ≤ 6 °C immediately upon collection. If samples are not shipped on the day of collection, samples will be frozen to < -7 °C prior to shipment.

The soil sample containers will be labeled and stored under proper chain-of-custody procedures.

Groundwater Samples

Disposable gloves will be used during sample collection procedures. Sample locations will be recorded in a logbook, within a Survey123 digital data form, and/or by using a GPS device.

Groundwater samples to be analyzed for VOCs will be collected in 40-mL glass vials, with HCl added to the vial prior to sample collection. A test vial will be filled with the sample at each location and the pH will be measured using a pH meter or pH paper to ensure that sufficient acid is present to maintain a pH < 2. If the pH is > 2, additional HCl will be added to the sample vials prior to sample collection. The tested vials will be discarded. The sample vials will be filled so that there is no headspace. The vials will be inverted and checked for air bubbles to ensure zero headspace. If a bubble appears, the vial will be discarded, and a new sample will be collected. The samples will be chilled to 6 °C immediately upon collection.

Groundwater samples analyzed for SVOCs will each be collected in two separate 1-liter (L) amber glass jars. The samples will be chilled to ≤ 6 °C, but not frozen, immediately upon collection.

The groundwater sample containers will be labeled and stored under proper chain-of-custody

procedures.

Surface Water Samples

Disposable gloves will be used during sample collection procedures. Sample locations will be recorded in a logbook, within a Survey123 digital data form, and/or by using a GPS device.

Surface water samples to be analyzed for VOCs will be collected in 40-mL glass vials, with HCl added to the vial prior to sample collection. A test vial will be filled with the sample at each location and the pH will be measured using a pH meter or pH paper to ensure that sufficient acid is present to maintain a pH < 2. If the pH is > 2, additional HCl will be added to the sample vials. The tested vials will be discarded. The sample vials will be filled so that there is no headspace. The vials will be inverted and checked for air bubbles to ensure zero headspace. If a bubble appears, the vial will be discarded, and a new sample will be collected. The samples will be chilled to ≤ 6 °C, but not frozen, immediately upon collection.

Surface water samples analyzed for SVOCs, PAHs, and PCBs will each be collected in two separate 1-L amber glass jars. The samples will be chilled to ≤ 6 °C, but not frozen, immediately upon collection.

Surface water samples collected for TAL metals analyses will each be collected in separate 1-L polyethylene bottles and preserved by adding HNO_3 to the sample bottle. The bottle will be capped and lightly shaken to mix the acid. A small quantity of the sample will be poured into the bottle cap where the pH will be measured using pH paper. The pH must be < 2. The sample in the cap will be discarded, and the pH of the sample will be adjusted further, if necessary. Samples collected for cyanide analysis will be preserved with NaOH to a pH > 10 and tested following the same procedure. Dissolved metals samples will be field-filtered using a 0.45-micron filter into the sample container prior to preservation. The samples will be chilled to ≤ 6 °C, but not frozen, immediately upon collection.

The surface water sample containers will be labeled and stored under proper chain-of-custody procedures.

Sediment Samples

Disposable gloves and disposable scoops will be used during sample collection procedures. Sample locations will be recorded in a logbook, within a Survey123 digital data form, and/or by using a GPS device.

Samples analyzed for SVOCs, PAHs, PCBs, and TAL metals plus cyanide will be placed in separate sample-dedicated homogenization bags prior to sample preparation. Upon sample preparation, all samples will be homogenized and transferred from the sample-dedicated homogenization bag into 8-ounce wide-mouth glass jars using a dedicated sample scoop. All samples will be chilled to ≤ 6 °C, but not frozen, immediately upon collection. Samples analyzed for VOCs will be stored in their sealed En Core® samplers, for no more than 2 days prior to analysis. Additional sample volume for percent moisture analysis will be placed in a 4-ounce wide-

mouth glass jar using a disposable scoop. Samples will be chilled to ≤ 6 °C immediately upon collection. If samples are not shipped on the day of collection, samples will be frozen to < -7 °C prior to shipment.

The sediment sample containers will be labeled and stored under proper chain-of-custody procedures.

Sample Packaging

Samples must be packaged carefully to avoid breakage or contamination and must be shipped to the laboratory at proper temperatures. The following sample packaging requirements are followed:

- Sample bottle lids must never be mixed. All sample lids must stay with the original containers.
- The sample volume level can be marked by placing the top of the label at the appropriate sample height or by using a grease pencil. This procedure helps the laboratory to determine if any leakage occurred during shipment. The label should not cover any bottle lot numbers.
- All sample bottles must be placed in a plastic bag to minimize the potential for contamination if breakage occurs.
- Shipping coolers must be partially filled with packing materials and ice (when required) to prevent the bottles from moving during shipping.
- The sample bottles must be placed in the cooler in such a way as to ensure that they do not touch one another.
- The environmental samples are to be cooled. Wet ice packaged in sealable, plastic bags is used to cool samples during shipping. Ice is not used as a substitute for packing materials.
- Any remaining space in the cooler is filled with inert packing material. Under no circumstances should material such as sawdust or sand be used.
- A duplicate custody record and traffic report, if required, must be placed in a plastic bag, and taped to the inside of the cooler lid. Custody seals are affixed to the sample cooler.
- All sample containers are generally segregated according to sample matrix and expected contaminant concentration. Low-concentration samples are not shipped with medium- and high-concentration samples, unless otherwise directed by the client. In addition, all containers for a given sample are shipped in the same cooler when possible. However, samples for volatile analysis should consolidate into a single cooler to minimize the number of required trip blanks.

Shipping Containers

Environmental samples are properly packaged and labeled for transport and dispatched to the laboratory facility. A separate chain-of-custody record must be prepared for each shipping container. The following requirements for shipping containers are followed.

Sample shipping containers generally are commercially purchased coolers. Each container is custody-sealed for shipment as appropriate. The container custody seal consists of filament tape wrapped around the package at least twice and custody seals affixed in such a way that access to the container can be gained only by cutting the filament tape and breaking a seal.

Field personnel arrange for transportation of samples to the laboratory. In most cases, samples are shipped using an overnight express carrier (e.g., Federal Express). For subcontracted laboratories, field personnel provide the laboratory with a shipment schedule and notify them of deviations from planned activities. The field personnel notify the laboratory of all of samples intended for Saturday delivery, no later than 3 p.m. (Eastern Standard Time) on Thursday.

For samples going to the CLP laboratory, field personnel will provide the RSCC with the shipping date, chain-of-custody number, shipping airbill number, number of samples, along with a copy of the chain of custody. The RSCC will supply the information to the Sample Management Office (SMO) coordinator who will then notify the CLP lab of the pending shipments. The Scribe chain-of-custody export file will be uploaded to the SMO Portal (for CLP coolers) on the evening of shipping.

Sample Custody

The purpose of sample custody procedures is to ensure that the quality of the samples is maintained during collection, transportation, and storage through to analysis. All chain-of-custody requirements comply with SOPs indicated in EPA sample-handling protocol and all required EPA CLP tracking forms will be completed. Sample identification documents must be carefully prepared so that sample identification and chain of custody can be maintained, and sample disposition controlled. Sample identification documents include:

- Field notebooks.
- Sample labels.
- Custody seals; and
- Chain-of-custody records.

The primary objective of the chain-of-custody procedures is to provide an accurate written or computerized record that can be used to trace the possession and handling of a sample from sampling through completion of all required analyses. A sample is in custody if it is:

- In a team member’s physical possession.
- In a team member’s view.
- Locked up; or

- Kept in a secured area that is restricted to authorized personnel.

Field Custody Procedures

Pre-cleaned sample containers will be relinquished to the Field Team Leader. The Field Team Leader records receipt of the sample containers in the project logbook. The following field custody procedure is used for collection of samples:

- As few persons as possible should handle samples.
- Coolers or boxes containing cleaned bottles should be sealed with a custody tape seal during transport to the field or while in storage prior to use.
- The sample collector is personally responsible for the care and custody of samples collected until they are transferred to another person or dispatched properly under chain-of-custody rules.
- The sample collector records sample data in the field logbook.
- The Field Team Leader determines whether proper chain-of-custody procedures were followed during the fieldwork and decides if additional samples are required.

Sample Labels

Sample labels attached to or affixed around the sample container must be used to properly identify all samples collected in the field. The sample labels are to be placed on the bottles so as not to obscure any lot numbers on the bottles, and sample information must be pre-printed, or hand printed in a legible manner using waterproof ink. Field identification must be sufficient to enable cross-referencing with the logbook. For chain-of-custody purposes, all QC samples are subject to exactly the same custodial procedures and documentation as actual samples collected for analysis.

Chain-of-Custody Record

The chain-of-custody form must be fully completed in duplicate. Project-specific chain of custody forms will be generated from Scribe. The custody record also indicates any special preservation techniques necessary or whether the samples have been field-filtered or frozen. Copies of the chain-of-custody records are maintained with the project file.

Custody Seals

Custody seals are preprinted, adhesive-backed seals with security slots designed to break if the seals are disturbed. Sample shipping containers are sealed in as many places as necessary to ensure security. Seals must be signed and dated before use. Upon receipt at the laboratory, the custodian must check and document on a cooler receipt form that seals on boxes and bottles are intact.

B4. Quality Control

Field Quality Control Samples

Field QC samples are QC samples shipped in coolers with investigative samples for the purpose of evaluating data quality. Types of field QC samples collected by WESTON personnel may

include diverse types of field blanks, field duplicates, temperature indicator bottles, and performance evaluation (PE) samples.

Field Blanks

Field blanks consist of blank matrix samples collected in the field. Field blanks include ambient field blanks, equipment blanks, trip blanks, and lot blanks. Each field blank type is described below.

Ambient Field Blank

An ambient field blank is primarily used to provide information about contaminants that may be introduced into samples from the atmosphere during sample collection. In addition, the ambient field blank may also be exposed to contamination during storage, transport, sample preparation, and analysis.

The ambient field blank is an aqueous sample exposed to field conditions to evaluate the potential for contamination by ambient site contaminants from a source not associated with the other field samples collected. Ambient field blank samples will only be collected for water samples for volatile constituents, such as VOCs, or as specifically required by the analytical method. Ambient field blanks will not be collected for soil samples.

Analyte-free water, typically deionized (DI) water, is carried to the sampling site in sealed containers, exposed to sampling conditions upon transfer into sample containers, preserved, transported to the laboratory, and treated as an environmental sample. Because field blanks are transported, stored, prepared, and analyzed in the laboratory, they may be exposed to contamination from both field and laboratory sources. Method blank results, which aid in identifying laboratory contaminants, are used to evaluate potential sources of contamination in field blanks during data validation. Certain drinking water methods refer to the field blank as a field reagent blank. Field reagent blanks and ambient field blanks are referred to as “ambient field blanks.”

Ambient field blanks will be collected at a minimum frequency of one per day or 1 per 20 water samples, whichever is more frequent. Ambient field blanks will be shipped to the same laboratory as the associated samples and analyzed for the same analytical parameters. If equipment blanks are collected, an ambient field blank may not be required. The need for collection of ambient field blanks will be evaluated during the site scoping process in conjunction with the Project Chemist.

Equipment Blanks (Rinsate Blank)

An equipment blank (i.e., “rinsate blank” or “equipment rinsate blank”) consists of a sample of analyte free DI water poured over or through decontaminated field sampling equipment. Rinsate blanks may be collected prior to, during, or following collection of environmental samples. Equipment blanks will be collected from non-dedicated sampling equipment only and will primarily be used to assess the adequacy of the equipment decontamination process. Because equipment blanks are transported, stored, prepared, and analyzed in the laboratory, they may be

exposed to contamination from both field and laboratory sources. The method blank results, which would aid in identifying laboratory contaminants, are used to evaluate potential sources of contamination in equipment blanks during data validation, and the qualified equipment blank results are compared with field sample results to assess the potential for contamination of field samples during sampling.

Equipment blanks will be collected at a minimum frequency of one per day per matrix or 1 per 20 samples per matrix, whichever is more frequent. Equipment blanks will be shipped to the same laboratory as the associated samples and analyzed for the same analytical parameters. The need for collection of equipment blanks will be evaluated during the site scoping process in conjunction with the Project Chemist. When disposable or dedicated sampling equipment is used, equipment blank samples are not required.

Trip Blank

A trip blank is primarily used to provide information about volatile contaminants that may be introduced into field samples during transport and sample storage. A trip blank is a sample prepared in the field or in the laboratory that accompanies the sample bottles to the laboratory and is analyzed for the same volatile target analytes as the associated field samples. For trip blanks prepared in the field, DI water is placed into pre-preserved sample containers. Because trip blanks are transported, stored, prepared, and analyzed in the laboratory, they may be exposed to contamination from both field and laboratory sources. The method blank results, which would aid in identifying laboratory contaminants, are used to evaluate potential sources of contamination in trip blanks during data validation, and the qualified trip blank results are compared with field sample results to assess the potential for contamination of field samples during transport and storage.

Trip blanks will be collected at a minimum frequency of one per cooler of solid (soil/sediment) or liquid VOC samples. Trip blanks will be shipped to the same laboratory as the associated VOC samples and analyzed for the same list of target analytes. It should be noted that trip blanks may also be needed for trace mercury analysis because mercury is a volatile metal. The need for collection of trip blanks will be evaluated during the site scoping process in conjunction with the Project Chemist. For VOC soils analyzed only by the medium (or high) level method, the trip blank may consist of methanol if the soil samples were only collected in methanol; the Project Chemist will determine the matrix of the trip blank.

Lot Blank

A lot blank is primarily used to identify contamination from the sampling media used to collect field samples (e.g., filters from cartridges used to collect air samples, gauze, and Ghost wipes media for wipe samples). The lot blank sample consists of an unopened unit of sampling media that can be tracked by lot number, is assigned a sample identifier, accompanies the field samples to the laboratory, and is analyzed for the same target analytes. Lot blank results are used in conjunction with method blank results to aid in identifying the source of contaminants which may

impact field sample results. The need for collection of lot blanks will be evaluated during the site scoping process in conjunction with the Project Chemist.

Field Duplicate

A field duplicate is a generic term for a field sample collected at the same time and in the same location as its associated parent sample. The pair of field duplicate samples is collected using the same equipment, placed in separate but identical types of sample containers, and preserved in the same manner. The field duplicates are shipped to the laboratory, are treated as separate samples by the laboratory, and are taken through identical sample preparation and analysis processes. Field duplicates provide information on the precision of the sample collection and the overall analytical process. There are two categories of field duplicate samples which are defined by the sample collection method: co-located field duplicates and subsample field duplicates.

Co-located field duplicates are independent samples collected from side-by-side locations at the same point in time and space, to be considered identical. Co-located field duplicate samples are not homogenized prior to placement in the sample container. An example of co-located field duplicates is soil samples collected for VOC analysis which are collected side-by-side using En Core® or similar sampling devices. It is not acceptable to homogenize soil for VOC analysis due to loss of VOCs during the homogenization process; therefore, collecting co-located field duplicates for VOCs is the only acceptable sampling method.

Subsample field duplicate samples are obtained from one sample collection at one sample location. Soil field duplicate samples will be homogenized and subsampled in the field into separate sample containers with separate sample identifiers to generate an original (parent) sample and a field duplicate sample.

For most field investigative sampling events, field duplicate samples will be collected at a frequency of 5% (1 field duplicate for every 20 samples collected per matrix). Depending on the site DQO, field duplicates may not be collected for some sample types; for example, a sample collected solely for the purpose of waste characterization would not require field duplicate analysis.

Temperature Indicator

A temperature indicator is a container of water that is packed and shipped to the laboratory with the field samples requiring preservation by cooling to 6 °C (±2 °C). Upon opening the sample cooler, the laboratory measures the temperature of the temperature indicator. The temperature reading is used to document whether field samples were received within the acceptable temperature range. This information is used by both the laboratory and by the data validator. If the temperature indicator is outside the acceptance criteria, the laboratory is expected to notify the Project Chemist immediately for guidance on whether to proceed with analysis. Samples received by the laboratory on the same day as collection may not have adequate time to achieve ideal preservation temperatures. However, by providing the laboratory documentation as evidence that

the preservation process is underway during sample receipt (e.g., solid ice remaining in the cooler), data quality likely will not be impacted.

Performance Evaluation Samples

A PE sample is a single-blind or double-blind spiked sample provided by EPA which contain known constituent concentration(s), unknown to the laboratory, and are provided to evaluate whether the laboratory can correctly identify and quantify target analytes. The need for PE samples will be evaluated during the site scoping process in conjunction with the Project Chemist.

Laboratory Quality Control Samples

Laboratory QC sample types include method blank, instrument blanks, laboratory control samples (LCS), laboratory duplicates, and MS/MSD. Although surrogates are not separate QC samples, but compounds added to field and QC samples, they are typically also included.

Method Blank

The laboratory method blank consists of analyte-free reagent water or solid matrix to which solvents, surrogates, internal standards, etc. are added in the same volumes or proportions as in field samples of the same matrix. The method blank is then carried through the complete sample preparation and analytical process. The purpose of the method blank is to assess contamination introduced during the sample preparation process but may also provide a way of assessing contamination introduced during the analysis process. A method blank shall be included in every volatile analytical batch and organic or inorganic preparation (extraction/digestion/distillation) batch. Most but not all analytical methods define a preparation batch as including up to 20 samples analyzed or prepared at the same time. Further, certain analytical methods refer to the laboratory method blank as a laboratory reagent blank (LRB). LRBs are referred to as “method blanks.”

Instrument Blanks

Instrument blanks consist of solvents which are introduced as sample injections into analytical instruments to verify that the analytical system of measurement is clean. Instrument blanks may be incorporated as a specific requirement by the analytical method (e.g., metals, pesticides, and PCBs) or may be injected after a highly contaminated sample is analyzed to confirm that contamination has not been carried over into subsequent field samples due to analytical instrument contamination.

Laboratory Control Sample

The LCS consists of analyte-free water (for analysis of aqueous samples), or analyte-free solid matrix (for analysis of solid samples) spiked with the target analytes of interest or, in the case of certain CLP methods, spiked with target analytes representative of chemical classes. The LCS is analyzed to assess accuracy by measuring analyte recovery from a clean matrix. LCS samples are generally prepared at the same frequency as method blanks: one per analytical or extraction/digestion/distillation batch. Certain analytical methods refer to the LCS as a laboratory fortified blank (LFB). LFBs are referred to as laboratory control samples or “LCS.”

Laboratory Duplicate Samples

Laboratory duplicate samples are performed by the analyst splitting a field sample into two separate aliquots and performing separate digestion/distillation and analyses on each aliquot. The analysis of laboratory duplicate samples monitors laboratory precision. Duplicate precision may be affected by sample non-homogeneity, particularly in the case of non-aqueous samples. Laboratory duplicates are typically performed for inorganic analyses (e.g., metals, mercury, and cyanide) and certain drinking water methods.

For the purposes of maintaining sampling program consistency, laboratory duplicates will be collected only for inorganic test parameters. Organic MSD samples will be collected in lieu of laboratory duplicates for drinking water methods because many target analyte organics are frequently not detected in drinking water samples and often do not provide sufficient evaluation of laboratory precision, the MSD allows evaluation of laboratory precision.

A laboratory duplicate will be run for every preparation batch of up to 20 inorganic field samples. The need for collection of additional sample volume for the field sample designated for laboratory duplicate analysis will be evaluated during the site scoping process in conjunction with the Project Chemist.

Matrix Spikes/Matrix Spike Duplicates

An MS is prepared from an aliquot of a field sample that is spiked by the laboratory with known concentrations of method-specific target analytes then carried through the entire sample preparation and analytical process. Accuracy is calculated from the spike recoveries in the MS sample and results are used to assess the nature of the sample matrix and any direction of analytical bias. Certain organic methods often refer to the MS as a Laboratory Fortified Sample Matrix (LFSM).

An MSD is prepared from a second aliquot of a field sample that is spiked by the laboratory with known concentrations of method-specific target analytes, then carried through the entire sample preparation and analytical process. Accuracy is calculated from the spike recoveries in the MSD sample and results are used to assess the nature of the sample matrix and any direction of analytical bias. The precision between the MS and MSD can also be calculated mathematically as the relative percent difference (RPD) and results are used to assess the nature of the sample matrix. Certain organic methods often refer to the MSD as a Laboratory Fortified Sample Matrix Duplicate (LFSMD).

Laboratory QC for inorganic samples typically includes a single MS analysis (e.g., metals, mercury, and cyanide) collected at a frequency of 1 per 20 field samples.

For organic analyses, a minimum of one MS/MSD pair will be collected per 20 field samples for each matrix collected. Sampling locations selected for the purpose of assigning an MS/MSD should be an area anticipated to be free from contamination or with low concentrations of targeted analytes. During collection of soil MS/MSD samples, field personnel will avoid areas that are

stained or known to have, or suspected to have, high levels of contamination. The need for the collection of MS and MSDs will be evaluated during the Site scoping process in conjunction with the Project Chemist.

For the purposes of maintaining sampling program consistency, MSD samples will be collected in lieu of laboratory duplicates for organic methods. Frequently, many organic target analytes are not detected in drinking water samples and often do not provide sufficient evaluation of laboratory precision; the MSD allows evaluation of laboratory precision.

Surrogate Spikes

Surrogates are organic compounds that are similar to the target analyte(s) in structure and chemical behavior but are not normally detected in environmental samples. Surrogate results are used to evaluate accuracy, method performance, and extraction efficiency. Surrogate compounds are spiked by the laboratory into environmental samples, QC samples, and blank samples according to method requirements. Several organic methods refer to surrogates as deuterated monitoring compounds (DMCs). Surrogates and DMCs are referred to as "surrogates."

Table B-8 indicates the frequency of QC activities for the project.

Table B-8 Quality Control Sample Summary

Quality Control Activity	Frequency
Field Duplicates	1 per matrix per 10 samples
MS/MSD	1 per matrix per 20 samples
Equipment Blank	1 per water and soil matrix per day
Trip Blanks	1 per day
Field Blanks	1 per day

Additional information regarding project-specific QC samples is presented in **Table B-9.**

B5. Analytical Methods

VOCs and 1,4-dioxane have been the focus of most previous investigations; however, other contaminant types (e.g., PCBs or metals) may be associated with the facility and Site sources. These include TAL metals plus cyanide, PCBs, and SVOCs (including PAHs).

A complete list of analytes for the analytical methods, along with laboratory reporting limits and appropriate screening levels, is presented in Attachment C. A comprehensive summary of sample analytical parameters, methods, containers, preservation requirements, QA/QC samples, and holding times is presented in **Table B-9.**

Table B-9 Sampling and Analysis Summary

Sample Type	Sample ID	Analytical Parameters	Analytical Method	Containers (Numbers, Size, and Type)	Preservation	Number of Samples[1]	Field Duplicates	MS / MSDs[1]	Blanks[2]	Total Samples to Lab	Holding Time
Matrix: Soil											
Grab	CLP ID, G-SO##, G-SS##-XXXX	TAL Metals + Mercury + Cyanide	EPA SFAM01.1 ICP-AES/MS/CVAA/ Spectrophotometry	Two 8-oz. glass jars with PTFE-lined lid	Store @ ≤ 6 °C, but not frozen	38	4	2	As needed	44	6 Months
		PCBs	EPA SFAM01.1	One 8-oz. glass jar with PTFE-lined lid	Store @ ≤ 6 °C, but not frozen	38	4	2	As needed	44	14 Days
		VOCs	EPA SFAM01.1	Three 5-gram En Core® samplers and one 4-oz. glass jar with PTFE-lined lid	Frozen to < -7°C or Iced to ≤ 6 °C, but not frozen	38	4	2	Trip and Field: 1 per day	44	48 Hours (Iced) or 14 Days (Frozen)
		SVOCs (Including PAHs)	EPA SFAM01.1	One 8-oz. glass wide-mouth jar with PTFE-lined lid	Store @ ≤ 6 °C, but not frozen	38	4	*	As needed	42	14 Days
Matrix: Groundwater											
Direct	CLP ID, G-GWBK##, G-GWBK-MW##, G-GWRS-MW##, G-GWPW##, G-GWRW##	VOCs	EPA SFAM01.1	Four 40-mL amber glass VOA vial	HCl pH < 2, Store @ ≤ 6 °C but not frozen	28	3	2	Trip and Field: 1 per day	33	14 Days
		SVOCs (Including PAHs)	EPA SFAM01.1	Two 1-L amber glass with PTFE-lined lid	Store @ ≤ 6 °C, but not frozen	28	3	*	As needed	31	7 Days
Matrix: Surface Water											
Grab	CLP ID, G-SWBK##, G-SWPPE##, G-SWRS##	Total/Dissolved TAL Metals + Mercury + Cyanide	EPA SFAM01.1 ICP-AES/MS/CVAA/ Spectrophotometry	Two 0.5-L polyethylene bottles	HNO_3 pH < 2 (TAL metals +mercury) NaOH pH > 10 (cyanide) & Store @ ≤ 6 °C but not frozen	10+	1	1	As needed	12	6 Months Except Mercury (28 Days)

Sample Type	Sample ID	Analytical Parameters	Analytical Method	Containers (Numbers, Size, and Type)	Preservation	Number of Samples[1]	Field Duplicates	MS / MSDs[1]	Blanks[2]	Total Samples to Lab	Holding Time
		PCBs	EPA SFAM01.1	Two 1-L amber glass with PTFE-lined lid	Store @ ≤ 6 °C, but not frozen	10+	1	1	As needed	12	7 Days
		VOCs	EPA SFAM01.1	Four 40-mL amber glass VOA vial	HCl pH < 2, Store @ ≤ 6 °C but not frozen	10+	1	1	Trip and Field: 1 per day	12	14 Days
		SVOCs (Including PAHs)	EPA SFAM01.1	Two 1-L amber glass with PTFE-lined lid	Store @ ≤ 6 °C, but not frozen	10+	1	*	As needed	11	7 Days
Matrix: Sediment											
Grab	CLP ID, G-SEBK##, G-SEPPE##, G-SERS##	TAL Metals + Mercury + Cyanide	EPA SFAM01.1	One 8-oz. glass jar with PTFE-lined lid	Store @ ≤ 6 °C, but not frozen	10+	1	1	As needed	12	6 Months
		PCBs	EPA SFAM01.1	One 8-oz. glass jar with PTFE-lined lid	Store @ ≤ 6 °C, but not frozen	10+	1	1	As needed	12	14 Days
		VOCs	EPA SFAM01.1	Three 5-gram En Core® samplers and one 4-oz. glass jar with PTFE-lined lid	Frozen to < -7 °C or Iced to ≤ 6 °C, but not frozen.	10+	1	1	Trip and Field: 1 per day	12	48 Hours (Iced) or 14 Days (Frozen)
		SVOCs (Including PAHs)	EPA SFAM01.1	One 8-oz. glass jar	Store @ ≤ 6 °C, but not frozen	10+	1	*	As needed	11	14 Days

Notes:
* – MS/MSD will not be collected for analysis; measurement performance criteria will be assessed from duplicate sample and laboratory control sample analysis
[1] – Estimated, actual number will be determined in the field. Additional volume for MS/MSD will be submitted in accordance with CLP requirements.
[2] – Equipment blanks will be collected 1 per day per matrix, when non-dedicated sampling equipment is utilized

AES Atomic Emission Spectrometry
CVAA Cold Vapor Atomic Absorption
ICP Inductively Coupled Plasma
MS Mass Spectrometry
N/A not applicable
oz. ounce
PTFE polytetrafluoroethylene
VOA volatile organic compound analysis

B6. Instrument/Equipment Testing, Inspection, and Maintenance

All laboratory and field instruments and equipment used for sample analysis must be serviced and maintained only by qualified personnel. Laboratory instrument maintenance procedures are evaluated to verify that there will be no impacts on analysis of project samples due to instrument malfunction. For example, the laboratory must have duplicate instrumentation and/or major laboratory instruments (e.g., Gas chromatography/mass spectrometry [GC/MS], Inductively Coupled Plasma [ICP], atomic absorption spectrometry) maintained under service agreements with the manufacturer that require rapid response by manufacturer-approved service agents.

Field Equipment Maintenance

Routine preventive maintenance is performed twice on each piece of field equipment: once prior to shipping it to a field job and again upon its return. The WESTON equipment store maintains WESTON's field instruments, or the instruments are returned to the manufacturer. All repairs, adjustments, and calibrations are documented in an appropriate maintenance logbook or data sheet that is kept on file. Any calibrations or adjustments in the field by WESTON personnel are documented in the field logbook. Calibration procedures described below are used to test or inspect the instrument's performance.

In most instances of a major equipment failure in the field, a replacement unit can be at the field site within 24 hours or less.

Laboratory Equipment Maintenance

The laboratory must maintain a stock of spare parts and consumables for all analytical equipment. Routine preventive maintenance procedures should be documented in SOPs. Maintenance performed on each piece of equipment must be documented in a maintenance logbook. Daily checks of the laboratory deionized water and other support systems are required. The laboratory must operate back-up instrumentation for most of its analytical equipment in the event of major instrument failure or have an alternative approach to ensure analytical work proceeds within holding times with no adverse impacts on data quality.

B7. Instrument/Equipment Calibration and Frequency

All instruments and equipment used during sampling and analysis are operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations as well as criteria set forth in the applicable analytical methodology references. All equipment is owned or procured by EPA, or their equipment support contractor. WESTON personnel will maintain and calibrate equipment in the field according to the Quick Start guidelines or supporting SOPs.

Personnel properly trained in these procedures will operate, calibrate, and maintain all instruments. Documentation of all routine and special maintenance and calibration information is maintained in an appropriate logbook or reference file and is available for inspection. All field personnel receive annual refresher training on the field operation of all health and safety-related equipment,

which includes calibration procedures. All equipment calibration in the field must be recorded in the field logbook.

B8. Inspection/Acceptance of Supplies and Consumables

WESTON establishes measures to assure that purchased material, equipment, and services, whether purchased directly or through contractors or subcontractors, conform to the procurement documents. Documentation regarding the purchase of material, equipment, and services is prepared, reviewed, and approved in accordance with the requirements set forth in WESTON's subcontracting procedures.

Supplies and consumables can be received at a WESTON office or at a site. When supplies are received at a WESTON office, the Field Team Leader will sort the supplies according to vendor, check packing slips against purchase orders, and inspect the condition of all supplies before the supplies are accepted for use on a project. If the supplies do not meet the acceptance criteria, deficiencies will be noted on the packing slip and purchase order. The item will then be returned to the vendor for replacement or repair.

Procedures for receiving supplies and consumables in the field are similar to those described above. Upon receipt, items will be inspected by the Field Team Leader against the acceptance criteria. Any deficiencies or problems will be noted in the field logbook, and deficient items will be returned for immediate replacement.

Standard Reagent Receipt and Traceability

All standards are obtained directly from EPA or through a reliable commercial supplier with a proven record for quality standards. All commercially supplied standards are traceable to EPA or National Institute of Standards and Technology (NIST) reference standards, and appropriate documentation is obtained from the supplier. The certificates are kept on file in a central location. When standards are received, they are documented with the date received, chemical, lot number, concentration, and date opened or expiration date. When standards are prepared from these source materials, information is included in a logbook with date of preparation, lot source, amount used, final volumes, resulting concentration, and preparer's initials.

For the field efforts, these requirements are primarily applicable to chemical preservatives. All laboratory reagents and chemicals are the responsibility of the laboratory, and they must maintain traceability records. Laboratory records are reviewed during laboratory audits or if QC problems arise to assure traceability requirements are met.

B9. Non-Direct Measurements

Data acquired from non-direct measurement sources include the following:

- Physical information such as descriptions of the sampling activities and geologic logs.
- State and local environmental agency files.
- Reference computer databases and literature files.

- Analytical data from non-EPA sources; and
- Historical reports on a site and subjective information gathered through interviews.

Data from non-direct measurement sources are typically considered for informational purposes only and are not subject to rigorous QC procedures. Information used for determination of specific site actions (e.g., sampling locations) will be reviewed by WESTON personnel and based on professional judgment, whether the data are adequate for the project requirements will be determined. Analytical data from non-EPA programs that will be used in deciding Site actions will be reviewed by the appropriate EPA decision-maker for adequacy and generally will not be re-collected and re-analyzed. The justification for using this type of analytical data will be documented either in the site-specific plan or other project planning document.

B10. Data Management

WESTON's data management policies are designed to comply with all EPA contract requirements for information management resources and financial data. Following collection, field data shall be processed to generate a Scribe-compatible file, which will be imported into a Scribe database. Scribe datasets shall be published to Scribe.net. At project completion, the Scribe project file should contain all the laboratory data and published to Scribe.net and the assigned Scribe Number.

The field data include approved work planning tables, labels, field sampling forms, chain of custodies, and logbooks. Surveyors may provide coordinates for all sample locations. The WESTON Project Manager or Field Team Leader will review all field data for accuracy. Any field data not provided by the laboratory will be entered into a database or spreadsheet or technical report as required.

Data Recording

Data are collected by computer and handwritten entries. Field observations and records such as sample collection information and shipping data will be recorded electronically in Scribe. Additional field-generated data include sample locations, which will be recorded by GPS and field observations and records will be entered into the Scribe data management with other project data.

Computer-generated data are primarily associated with laboratory activities and are managed under the control of the automated Laboratory Information Management System (LIMS) used by the laboratory.

Integration of manually recorded and computer-recorded data is done by the Scribe data management system to produce data summary reports for evaluation and for the final report.

Data Quality Assurance Checks

QC checks of data as early as possible in a project are essential to provide early warning of potential problems. Range checks are specified where appropriate for computerized data operations; this permits a level of "real-time" QC checking. Range checks are automated at the laboratory and field instruments to immediately notify the technical staff of out-of-range data for each monitored variable.

Additional QA assessment activities and data validation procedures are discussed in detail in Group C and Group D.

Data Transmittal

Data will be entered into the Scribe data system daily for ongoing management. Data entered into the laboratory's system are managed by the LIMS, beginning with sample check-in on the sample-receiving data terminal. The full laboratory data reports will be delivered to WESTON within the standard turnaround time based on the laboratory's receipt of the associated samples. Generally, the analytical report should include the following:

- Laboratory header information – Laboratory name, client name, laboratory work order, client project number, and date received.
- Sample information – Client sample identification, laboratory sample identification, date sampled, matrix, percent moisture, and pH (if applicable).
- Analytical Data – Test code, test name, analyte, analyte type, sample type, Chemical Abstracts Service registry number, date prepared, date analyzed, preparation batch identification, analytical batch identification, result, laboratory qualifier, MDL, reporting limit, and dilution factor; and
- QC Data (if available) – All fields provided for analytical data for method blanks, surrogates for all samples, LCSs, MS/MSDs, and duplicates. Fields also should include QC sample type, recoveries, RPDs, low limit, high limit, and any associated qualifiers.

Any electronic laboratory and/or field data should be verified against the hard copy results to check for transcription errors as part of the data review process, described in Group D.

Data Tracking

The Scribe data management system includes the milestones of planned project activity and the numbers of samples to be collected. Routines in the data system use this information to assist the WESTON Project Manager and the field teams by monitoring the progress of sample collection and processing to ensure that samples are indeed collected as planned. This monitoring continues throughout laboratory sample analysis by tracking the specified turn-around times for each sample.

Data Storage and Retrieval

Once delivered to the WESTON office, the hard-copy originals of field forms and notebooks containing manually recorded information will be stored in the custody of the Project Manager for the duration of the project, and the full laboratory data reports will be stored in the custody of the Project Chemist. The laboratory will maintain possession of original laboratory hard-copy documents and magnetic tape backups of analytical data.

GROUP C: ASSESSMENT AND OVERSIGHT

C1. Assessment and Response Actions

WESTON assessment activities include management assessments, development of SOPs, and performance evaluations. Management assessments include weekly meetings and conference calls to evaluate project readiness and staff utilization and regional manager office visits every 6 weeks. Assignment of qualified personnel, maintenance of schedules and budgets, and quality of project deliverables are verified as part of these assessments. The development of SOPs and performance evaluations are used to provide trained and qualified staff for the project.

WESTON's technical assessment activities include peer review, technical editorial review, data quality reviews, and technical system audits (i.e., laboratory and field). Procedures for assessment and audit of data quality are described in the specific analytical method and SOPs and guidance documents and are summarized in Group D: Data Validation and Usability. Procedures for reviews and technical assessments are summarized briefly below.

Both the overall and direct technical assessment activities may result in the need for corrective action. WESTON's approach to implementing a corrective action response program for both field and laboratory situations are summarized briefly below.

Peer Review

WESTON implements peer review for all project deliverables, including SAPs, draft and final reports, and technical memoranda. The peer review process provides for a critical evaluation of the deliverable by an individual or team to determine whether the deliverable meets the established criteria, DQOs, technical standards, and contractual obligations. The Project Manager will assign peer reviewers, depending on the nature and complexity of the project.

Technical Editorial Review

WESTON implements technical editorial reviews for all draft reports, including figures and tables, to proofread for clarity, punctuation, grammar, and content.

Technical Systems Assessments

The entire project team is responsible for ongoing assessment of the technical work performed by the team, identification of nonconformance with the project objectives, and initiation, implementation, and documentation of corrective actions. Independent performance and systems audits are technical assessments that also are an integral part of the overall QA/QC program.

Corrective Action

The WESTON Project Manager is responsible for initiating corrective action and implementing it in the field and office, and the laboratory project manager is responsible for implementing it in the laboratory. It is their combined responsibility to see that all sampling and analytical procedures

are followed as specified and that the data generated meet the prescribed acceptance criteria. Specific corrective actions will be clearly documented in the logbooks or analytical reports.

Field Situations

The need for corrective action in the field may be determined by technical assessments or by more direct means such as equipment malfunction. Immediate corrective actions taken in the field are documented in the project logbook. Corrective actions may include but are not limited to:

- Correcting equipment decontamination or sample handling procedures if field blanks indicate contamination.
- Recalibrating field instruments and checking battery charge.
- Training field laboratory personnel in correct sample handling or collection procedures; and
- Accepting data with an acknowledged level of uncertainty.

Corrective actions addressing more systematic problems may be documented in a memorandum and reviewed by the WESTON QAO and Project Manager for approval. If the action does not resolve the problem, appropriate personnel are assigned to investigate and effectively remediate the problem. Corrective actions recommended by EPA will be addressed in a timely manner.

Laboratory Situations

Out-of-control QC data, laboratory audits, or outside data review may determine the need for corrective action in the laboratory. Corrective actions may include but are not limited to:

- Reanalyzing samples, if holding times permit.
- Correcting laboratory procedures.
- Recalibrating instruments using freshly prepared standards.
- Replacing solvents or other reagents that give unacceptable blank values.
- Training additional laboratory personnel in correct sample preparation and analysis procedures; and
- Accepting data with an acknowledged level of uncertainty.

Specific laboratory corrective actions for analytical deficiencies must be consistent with the current EPA requirements. Laboratory corrective actions must be defined in the method or analytical SOPs. Any deviations from the EPA- or method-required corrective actions must be documented and approved by EPA if the actions have a significant impact on the usability of the data.

C2. Reports to Management

Upon completion of the sampling effort, a letter report, delivered via electronic mail, describing the sampling techniques, locations, problems encountered (with responses to those problems), and interpretation of analytical results will be prepared by the Project Manager and submitted to the

EPA Site Assessment Manager (SAM). WESTON has developed standardized report formats for various forms of fieldwork which are peer-reviewed as described above. Laboratory results from EPA-analyzed samples will be reported according to EPA SOPs. The following types of reports to management also may be provided as part of this SI:

- Data Review Reports – Data review reports will be completed by the Project Chemist and provided to EPA technical staff as soon as possible after receipt of the data from the laboratory (i.e., the goal is within 1 week). Data review reports will be done as described in Group D: Data Validation and Usability.
- Monthly Progress Reports – The reports are used to track the overall quality of performance on projects in regard to schedule, budgets, and other issues.
- Serious field and analytical problems will be reported as soon as possible to EPA. Time and type of corrected action (if needed) will depend on the severity of the problem and overall project importance.

GROUP D: DATA VALIDATION AND USABILITY

D1. Data Review, Verification, and Validation

The following general steps will be followed to conduct a data usability assessment, which evaluates whether underlying assumptions used during systematic planning are supported, sources of uncertainty have been accounted for and are acceptable, data are representative of the population of interest, and the results can be used as intended, with an acceptable level of confidence:

- Step 1 – Review the project's objectives and sampling design.
- Step 2 – Review the data verification and data validation outputs.
- Step 3 – Verify the assumptions of the selected statistical method (if applicable).
- Step 4 – Implement the statistical method (if applicable).
- Step 5 – Document data usability and draw conclusions.

The data usability assessment is considered the last step in the data evaluation process. All data will be assessed for usability, regardless of the data evaluation/validation process implementation.

D2. Verification and Validation Methods

The data review scheme for analytical results from the receipt of the analytical data through the validated report is described below. Validation will be performed on all laboratory analytical data. Project validation criteria as per Attachments B and C and cited EPA SW-846 methodology will generally be used. Data validation will be performed in accordance with EPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use (2009), National Functional Guidelines for Organic and Inorganic Superfund Methods Data Review (2020) and Using Qualified Data to Document an Observed Release and Observed Contamination (1996).

Analytical data generated through the CLP laboratory will be validated by an EPA Region 5 Environmental Services Assistance Team (ESAT) contractor at a Stage 3 evaluation level (100% S3VEM).

The following final qualifiers shall be used during data validation:

J = The associated analyte concentrations may be inaccurate or imprecise due to the quality of the data generated because certain QC criteria were not met.

Q = Detected concentration is below the method reporting limit/Contract Required Quantitation Limit but is above the method quantitation limit.

R = The sample results are rejected (analyte may or may not be present) due to gross deficiencies in QC criteria. Any reported value is unusable. Resampling and/or reanalysis is necessary for verification.

U = The analyte was analyzed for, but it was not detected. The associated numerical value is the sample quantitation limit.

UJ= The analyte was analyzed for, but it was not detected. The reported detection limit is estimated because QC criteria were not met.

Evaluation of Completeness

The ESAT validator verifies that the laboratory information matches the field information and that all the required items are included in the data package.

If the data package is incomplete, the ESAT validator contacts the laboratory, which must provide all missing information.

Evaluation of Compliance

The actual data validation effort follows procedures that are briefly outlined below:

- Review the data to check field and laboratory QC data, to verify that holding times and acceptance and performance criteria were met, and to note any anomalous values.
- Review chromatograms, mass spectra, and other raw data if provided as back-up information for any apparent QC anomalies.
- Ensure all analytical problems and corrections are reported in the case narrative and that appropriate laboratory qualifiers are added.
- For any problems identified, review concerns with the laboratory, obtain additional information if necessary, and check all related data to determine the extent of the error; and
- Apply validation codes to the analytical results to indicate potential limitations on data usability.

Data Validation Reporting

The ESAT validator will perform the following reporting functions:

- Alert the Project Manager to any QC problems, obvious anomalous values, or discrepancies between the field and laboratory data, and resolve any issues.
- Discuss QC problems in a data review memorandum for each laboratory report. The data review memorandum and a copy of the data package will be sent to the EPA technical staff.

Field Data Review

Field data are generated from in-field measurements, which may include a geo-physical survey, well development, groundwater sampling, and surface water sampling. The quality objective for the in-field measurement activities is to obtain accurate measurements of sample characteristics, including pH, conductivity, temperature, turbidity, and/or other measurements, using appropriate

equipment. Data are generally recorded in field logbooks or in a Survey 123 digital data form. Field logbooks/field forms are reviewed by the Project Manager and/or Project Chemist.

Field and laboratory data may be assessed against specific regulatory criteria determined to be applicable for the project. All criteria must be evaluated prior to the assessment to verify the current values are used. Regulatory and other guidance that may be used are discussed in the site-specific plan.

D3. Reconciliation with User Requirements

For routine assessments of data quality, the ESAT validator implements the data validation procedures described above and assign appropriate data qualifiers to indicate limitations on the data. The ESAT validator will be responsible for evaluating precision, accuracy, representativeness, comparability, and completeness of the analytical data. Any deviations from the analytical DQOs for the project will be documented in the data validation memo provided to the data users for the project.

The final users of the data will perform data quality assessments. The data quality assessment may include some or all the following steps:

- Data that are determined to be incomplete or not usable for the project will not be discussed in the final report. If critical data points are involved that impact the ability to complete the project objectives, the data users will report this immediately to the Project Manager. The Project Manager will discuss the resolution of the issue with EPA technical staff and implement the necessary corrective actions (for example re-sampling).
- Data that are non-detect but have reporting limits elevated due to blank contamination or matrix interference will be used in the final report and noted if the limits exceed any regulatory criteria.
- Data that are qualified as estimated will be used for project decision making. If an estimated result is close to a regulatory criteria or action level, then the data user must evaluate the potential uncertainty in developing or recommending site actions. If estimated results become critical data points in making final decisions on the site, the WESTON Project Manager and EPA technical staff should evaluate the use of the results and may consider the data point incomplete.

For issues internal to the laboratory, the laboratory Project Manager will be the responsible party for data resolution issues and will be responsible for conveying this information to the EPA or delegated authority. For external laboratory data and quality issues, the QAO or delegated authority will provide issue resolution information and will be the responsible party for conveying this information to data users. For quality documents, reports, and field information, the QAO, delegated authority, or other persons identified in the project team will be responsible for issue resolution of such items and will be the responsible party for conveying that information to data users.

REFERENCES

Michigan Department of Environment, Great Lakes, and Energy (EGLE), 2020a. *Part 201 Generic Residential Cleanup Criteria and Screening Levels*. December.

EGLE, 2020b. *Rule 57 Surface Water Quality Values*. February.

EGLE, 2018. *Part 201 Generic Residential Cleanup Criteria and Screening Levels/Part 213 Risk-Based Screening Levels*. June.

U.S. Environmental Protection Agency (EPA), 2022. Superfund Chemical Data Matrix (SCDM) database. Superfund, National Priorities List, HRS Toolbox. January.

EPA, 2021a. *TO #/Subtask #: 68HE0722F0001-001 "Gelman Science Inc."*. October.

EPA. 2021b. *Regional Screening Level (RSL) Summary Table – Industrial and Residential Soils*. November.

EPA, 2019. *Maximum Contaminant Level (MCL) 40 Code of Federal Regulations (CFR) 141 National Primary Drinking Water Regulations*. July.

EPA, 2018. *Region 4 Ecological Risk Assessment Supplemental Guidance Sediment Screening Values for Hazardous Waste Sites*. March

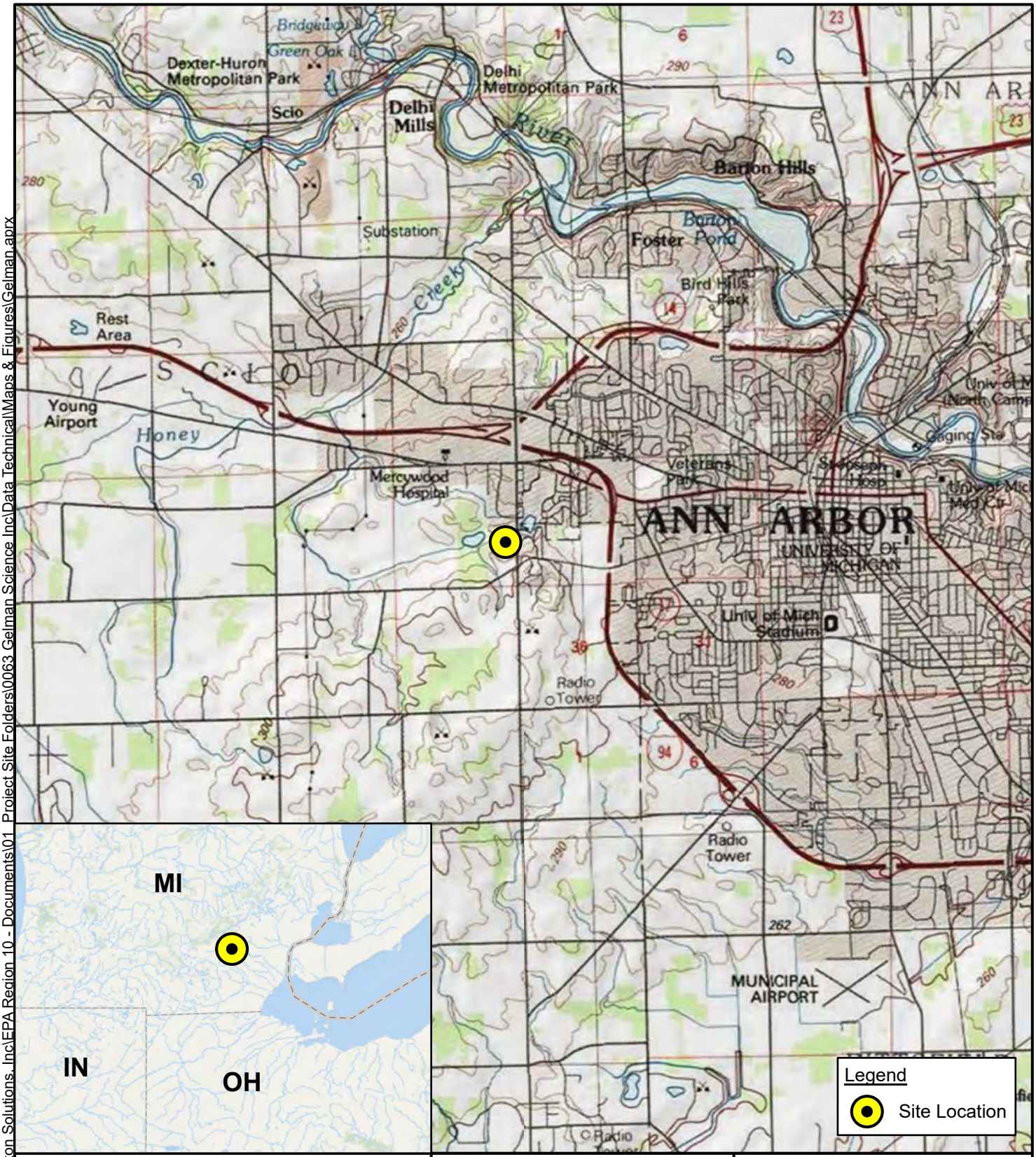
EPA, 1992. *Hazard Ranking System Guidance Manual.* OSWER Directive 9345.1-07. EPA540-R-92-026. November.

National Oceanic and Atmospheric Administration (NOAA), 2022. *Climate at a Glance – County Time Series*. Accessed on March 8, 2022.

Tetra Tech, 2017. *Final Preliminary Assessment Report, Gelman Sciences, Inc.,* Prepared for EPA, October.

U.S. Department of Agriculture (USDA), 2022. *Natural Resource Conservation System – Web Soil Survey*. Accessed on March 8, 2022.

FIGURES



Coordinate System:
WGS 1984 Web Mercator Auxiliary Sphere

Source:
Background: ESRI USA Topo Maps (2021)
Inset: ESRI Ocean Basemap (2021)

0 0.75 1.5 3 Miles

EPA Region 5

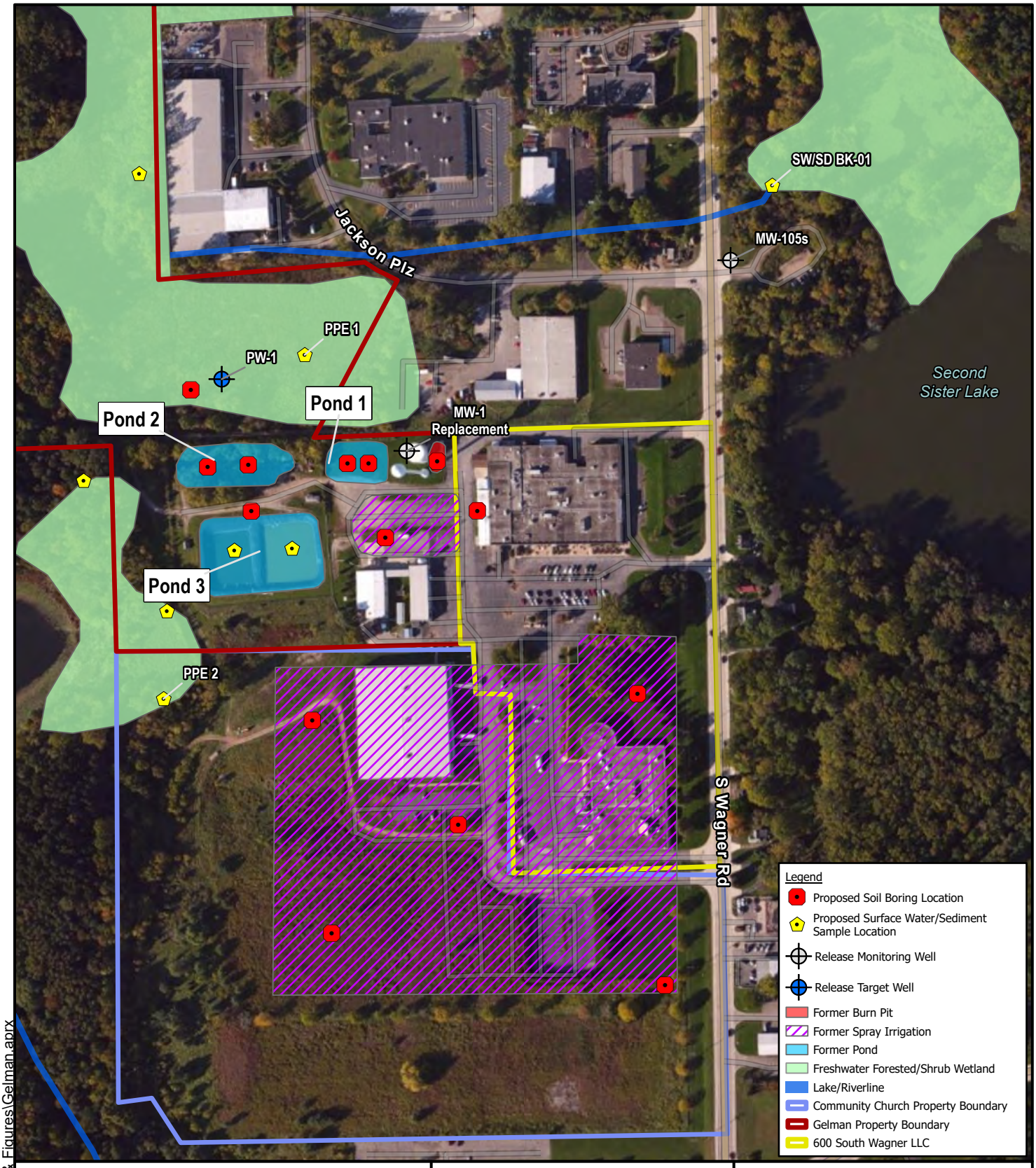
Weston Solutions Inc.

FIGURE 1
SITE LOCATION MAP

GELMAN SCIENCES, INC.
ANN ARBOR, MI

April 2022

Path: C:\Users\franczyx\Weston Solutions, Inc\EPA Region 10 - Documents\01_Project Site Folders\0063 Gelman Science Inc\Data Technical\Maps & Figures\Gelman.aprx



Coordinate System:
WGS 1984 Web Mercator Auxiliary Sphere

Source:
Background: ESRI World Imagery (Clarity)

0 350 700 Feet

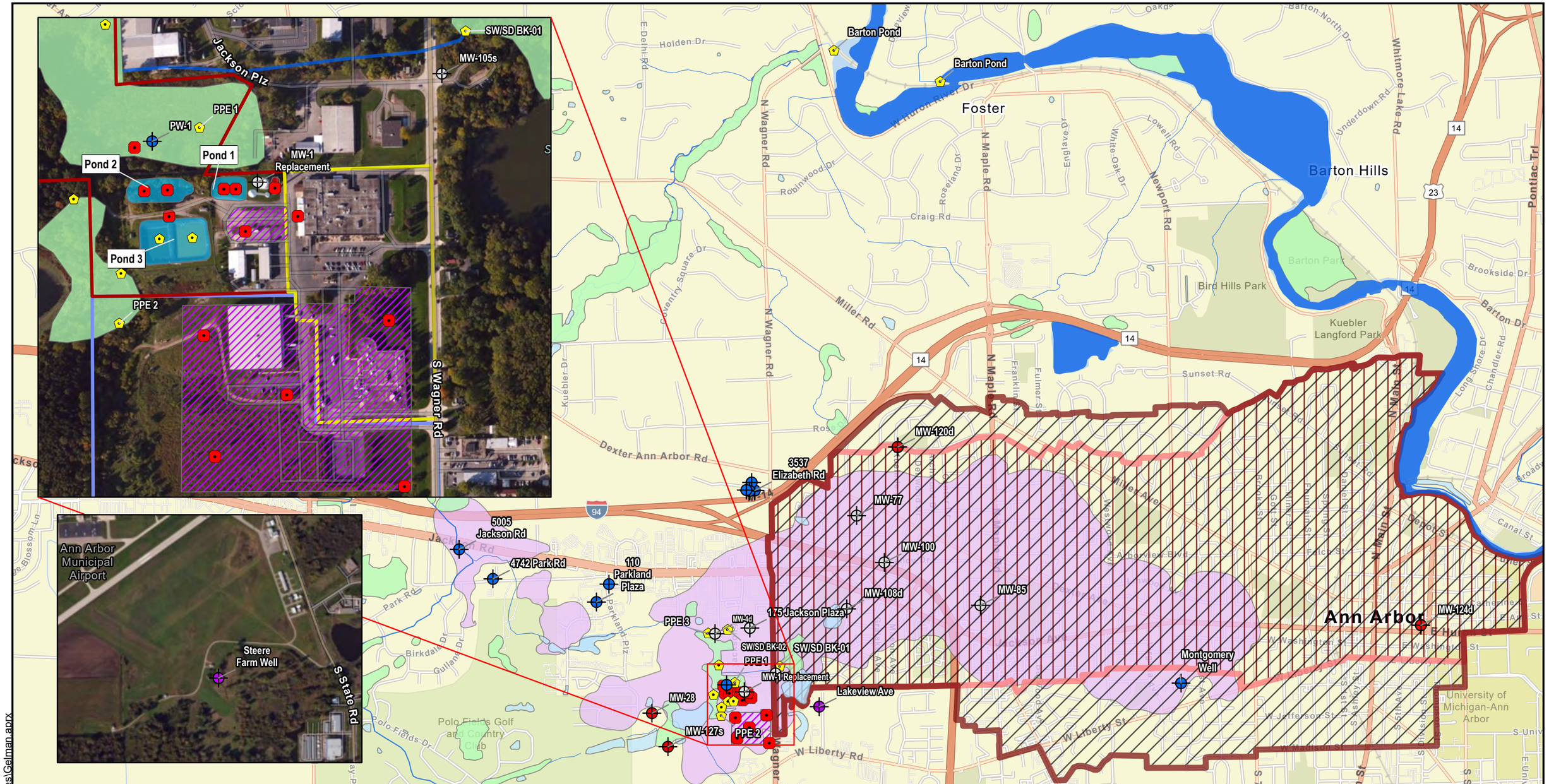
EPA Region 5

Weston Solutions Inc.

FIGURE 2
SOURCE AREA PROPOSED SAMPLE LOCATIONS MAP

GELMAN SCIENCES, INC.
ANN ARBOR, MI
June 2022

Path: D:\GIS\Gelman\Maps & Figures\Gelman.aprx



Coordinate System:
WGS 1984 Web Mercator Auxiliary Sphere
Source:
Background: ESRI World Street Map

0 0.5 1 2 Miles

Legend

Monitoring Well Locations
- Background Monitoring Wells
- Background Water-Supply Wells
- Release Monitoring Wells
- Release Target Wells

- Proposed Surface Water/ Sediment Sample Locations
- Proposed Soil Boring Location
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake/Riverline
- Prohibition Zone Boundary (2011)
- Prohibition Zone Boundary (2021)
- Dioxane Plume 2020

EPA Region 5

Weston Solutions Inc.

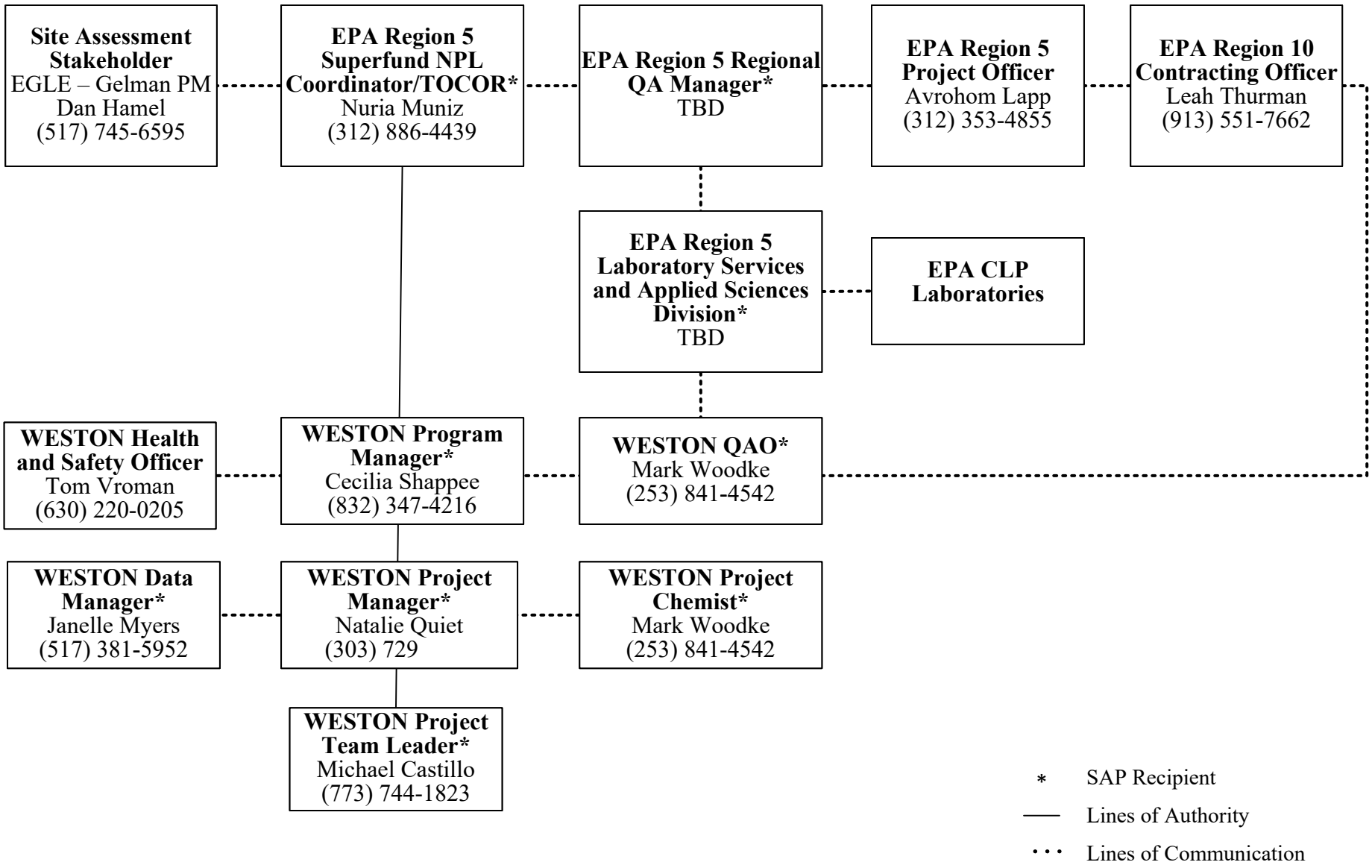
FIGURE 3
PROPOSED SAMPLE LOCATIONS AND SITE FEATURES MAP
GELMAN SCIENCES, INC.
ANN ARBOR, MI

June 2022

Path: D:\GIS\Gelman\Maps & Figures\Gelman.aprx

ATTACHMENT A

PROJECT ORGANIZATION CHART


Site Assessment Stakeholder
EGLE – Gelman PM
Dan Hamel
(517) 745-6595
EPA Region 5 Superfund NPL Coordinator/TOCOR*
Nuria Muniz
(312) 886-4439
EPA Region 5 Regional QA Manager*
TBD
EPA Region 5 Project Officer
Avrohom Lapp
(312) 353-4855
EPA Region 10 Contracting Officer
Leah Thurman
(913) 551-7662
EPA Region 5 Laboratory Services and Applied Sciences Division*
TBD
EPA CLP Laboratories
WESTON Health and Safety Officer
Tom Vroman
(630) 220-0205
WESTON Program Manager*
Cecilia Shappee
(832) 347-4216
WESTON QAO*
Mark Woodke
(253) 841-4542
WESTON Data Manager*
Janelle Myers
(517) 381-5952
WESTON Project Manager*
Natalie Quiet
(303) 729
WESTON Project Chemist*
Mark Woodke
(253) 841-4542
WESTON Project Team Leader*
Michael Castillo
(773) 744-1823
* SAP Recipient
Lines of Authority
Lines of Communication

ATTACHMENT B

MEASUREMENT PERFORMANCE CRITERIA

Measurement Performance Criteria for Volatile Organic Compounds (VOCs) by Gas Chromatography/ Mass Spectrometry (GC/MS)

Matrix: Water, Drinking Water, Soil/Sediment,
Analytical Group/Method: VOCs/SFAM01.1
Concentration Level: Trace/Low/Medium

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples	Water RPD: ≤30% Soil RPD: ≤50%
Precision - Laboratory	MS/MSD	One set per extraction batch when sufficient sample volume is provided or as requested per client
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples	%R within statistically derived laboratory acceptance limits
Accuracy/Bias – Laboratory (matrix interference)	MS/MSD	One set per extraction batch when sufficient sample volume is provided or as requested per client
Accuracy/Bias – Laboratory	Surrogates added to each field and QC sample as specified by the method and/or laboratory SOP	%R within limits specified in the method
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank: 1 per 12- hour shift Instrument blank: after samples with analytes exceeding the instrument calibration range or detector saturation Storage Blank: 1 per Sample Delivery Group (SDG)	▪ Method: concentrations < Contract Required Quantitation Limits (CRQL) except methylene chloride, acetone, and 2-butanone which must be < 2xCRQL ▪ Instrument: < CRQL ▪ Storage: <CRQL except methylene chloride, acetone, and 2-butanone which must be < 2xCRQL
Overall Accuracy/Bias (Contamination)	Field Blanks include: Trip Blank, Equipment Blank, Ambient Field Blank[1]	All analyte concentrations < CRQL

Measurement Performance Criteria for VOCs by GC/MS, continued

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Accuracy - Laboratory	PE samples	No missed analytes, no misidentified analytes, concentrations within 2 sigma limits
Sensitivity (method)	Review CRQL	Action Level at least 3 to 10x > CRQL

QC Samples for VOCs by GC/MS are listed along with their method-specified frequency and MPCs.

[1]Ambient field blanks will be collected for aqueous VOC samples if an Equipment Blank is not collected. Equipment Blanks are not required if the sample is collected with dedicated sampling equipment.

Measurement Performance Criteria for Semi-Volatile Organic Compounds (SVOCs) Including Polycyclic Aromatic Hydrocarbons (PAHs) by GC/MS With/Without Selected Ion Monitoring (SIM)

Matrix: Water, Drinking Water, Soil/Sediment,
Analytical Group/Method: SVOCs/SFAM01.1
Concentration Level: Trace/Low/Medium

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples	Water RPD: ≤30% Soil RPD: ≤50%
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples	%R within statistically derived laboratory acceptance limits
Accuracy/Bias – Laboratory	Surrogates added to each field and QC sample as specified by the method and/or laboratory SOP	%R within limits specified in the method
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank: 1 per extraction batch of 20 Instrument blank: after high concentration samples or detector saturation	▪ Method: concentrations < CRQL ▪ Instrument: < CRQL
Overall Accuracy/Bias (Contamination)	Equipment Blank	All analyte concentrations < CRQL
Accuracy - Laboratory	PE samples	No missed analytes, no misidentified analytes, concentrations within 2 sigma limits
Sensitivity (method)	Review CRQL	Action Level at least 3 to 10x > CRQL

QC Samples for SVOCs by GC/MS are listed along with their method-specified frequency and MPCs.

Measurement Performance Criteria for Polychlorinated Biphenyls (PCBs) as Aroclors by Gas Chromatography – Electron Capture Detector (GC/ECD)

Matrix: Water, Drinking Water, Soil/Sediment,
Analytical Group/Method: PCBs/SFAM01.1
Concentration Level: Low

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples	Water RPD: ≤30% Soil RPD: ≤50%
Precision - Laboratory	MS and MSD: 1 per 20 samples of each matrix	RPDs specified for each matrix in the method.
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples of each matrix	%R specified for each matrix in the method
Accuracy/Bias – Laboratory (matrix interference)	MS/MSD: 1 per 20 samples of each matrix	%R specified for each matrix in the method
Accuracy/Bias – Laboratory	Surrogates added to each field and QC sample as specified by the method and/or laboratory SOP	%R within limits specified in the method
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank: 1 per extraction batch of 20 Instrument blank: at the SOW frequency and/or after high concentration samples	▪ Method: concentrations < CRQL ▪ Instrument: < CRQL
Overall Accuracy/Bias (Contamination)	Equipment Blank	All analyte concentrations < CRQL
Accuracy - Laboratory	PE samples	No missed analytes, no misidentified analytes, concentrations within 2 sigma limits
Sensitivity (method)	Review CRQL	Action Level at least 3 to 10x > CRQL

QC Samples for PCBs by GC/ECD are listed along with their method-specified frequency and MPCs.

Measurement Performance Criteria for Metals and Mercury

Matrix: Water, Drinking Water, Soil/Sediment,
Analytical Group/Method: Metals and Mercury/SFAM01.1/ICP-AES/ICP-MS/CVAA*
Concentration Level: Low

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples	Water RPD: ≤30% Soil RPD: ≤50%
Precision - Laboratory	Lab Duplicate	RPDs specified for each matrix in the method.
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples of each matrix	%R specified for each matrix in the method
Accuracy/Bias – Laboratory (matrix interference)	MS/MSD: 1 per 20 samples of each matrix	%R specified for each matrix in the method
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank: 1 per digestion Instrument blank: at beginning of analytical run (initial calibration blank [ICB]), and after every 10 analytical samples (continuing calibration blank [CCB])	Method: positive or negative concentrations must be < absolute value of the CRQL if the associated sample concentrations are <10xCRQL Instrument: < CRQL
Overall Accuracy/Bias (Contamination)	Equipment Blank	All analyte concentrations < CRQL
Accuracy - Laboratory	PE samples	No missed analytes, no misidentified analytes, concentrations within 2 sigma limits
Sensitivity (method)	Review CRQL	Action Level at least 3 to 10x > CRQL

QC Samples for metals analyses are listed along with their method-specified frequency and MPCs
*Metals methods include Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES), Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS), and Cold Vapor Atomic Absorption (CVAA).

Measurement Performance Criteria for Total Cyanide

Matrix: Water, Drinking Water, Soil/Sediment,
Analytical Group/Method: Total Cyanide/SFAM01.1/Spectrophotometry
Concentration Level: Low

DQIs	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples	Water RPD: ≤30% Soil RPD: ≤50%
Precision - Laboratory	Lab Duplicate	If both initial and duplicate sample concentrations are ≥ 5xCRQL, 20% RPD; otherwise the control limit is ±CRQL.
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples	85-115%R
Accuracy/Bias – Laboratory (matrix interference)	MS/MSD: 1 per 20 samples of each matrix	75-125%
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank: 1 per distillation batch Instrument blank: at beginning of analytical run (ICB), and after every 10 analytical samples (CCB)	▪ Method: positive or negative concentrations must be < absolute value of the CRQL if the associated sample concentrations are <10xCRQL ▪ Instrument: < absolute value of the CRQL
Overall Accuracy/Bias (Contamination)	Equipment Blank	All analyte concentrations < CRQL
Accuracy - Laboratory	PE samples	No missed analytes, no misidentified analytes, concentrations within 2 sigma limits
Sensitivity (method)	Review CRQL	Action Level at least 3 to 10x > CRQL

QC Samples for total cyanide analysis are listed along with their method-specified frequency and MPCs

ATTACHMENT C

DATA QUALITY INDICATOR MEASUREMENT PARAMETERS

Data quality indicator (DQI) parameters, such as precision, accuracy/bias, representativeness, completeness, comparability, and sensitivity are defined in the following sections. Generally, each investigator will compare the performance achieved for each data quality criterion against the expected and planned performance. This comparison will follow from the DQIs used to define each DQO. This comparison is the most critical component of the assessment process. Any deviation from planned performance will be documented and evaluated to determine whether corrective action is advisable. Potential corrective actions will range from re-sampling and/or reanalysis of data, to qualification or exclusion of the data for use in the data interpretation. In the event that corrective action is not possible, the limitations, if any, of the data with regard to achieving the DQOs will be noted.

Precision

The most commonly used estimates of precision are the RPD for cases in which only two measurements are available, and the percent relative standard deviation (%RSD) when three or more measurements are available. This is especially useful in normalizing environmental measurements to determine acceptability ranges for precision because it effectively corrects for the wide variability in sample analyte concentration indigenous to samples.

Precision is represented as the RPD between measurement of an analyte in laboratory or field duplicate samples or in duplicate spikes (MS/MSD or LCS/LCSD). RPD is defined as follows:

$$RPD = \frac{|C_1 - C_2|}{\frac{C_1 + C_2}{2}} \times 100$$

Where:

C_1 = First measurement value
C_2 = Second measurement value

The RPD for field duplicate samples provides a tool for evaluating field and analytical precision of the sample matrix at a specific sampling location.

Precision, when represented as the %RSD between more than two replicate measurements, is calculated by dividing the standard deviation (SD) of the measurements by the mean value for the measurements $(\bar{x})$ then multiplying by 100. For example, the precision between calibration standard Relative Response Factors (RRFs) is evaluated using the %RSD between a minimum of five replicates. %RSD is mathematically expressed by the formula: $\%RSD = \frac{SD}{\bar{x}} \, x \, 100$

The mathematical formula for SD is:

$$SD = \sqrt{\frac{\sum_{i-1}^{n}(xi - \bar{x})^2}{(n-1)}}\ x\ 100$$

where:

xi = each individual value used to calculate the mean
$\bar{x}$ = the mean of *n* values
n = total number of values

Accuracy/Bias

Accuracy control limits are established by the analysis of organic surrogates and LCS, which are prepared in clean water and/or solid matrices. The LCS is typically identified as blank spikes (BS) for organic analyses. For multi-analyte methods, the LCS or BS may contain only a representative number of target analytes rather than the full list. The LCS is subjected to all sample preparation and analysis steps. The amount of each analyte recovered in an LCS analysis is recorded, then entered into a database to generate statistical laboratory control limits. Percent recoveries (%R) of the spiked surrogates or spiked analytes in the LCS and duplicate LCS (i.e., LCSD) provides information on how well the analyte can be recovered in a clean sample matrix.

The %Rs for spiked investigative sample analysis (e.g., MS and MSD samples) provides a tool for evaluating how well the analytes recovered in a specific sample matrix. These values are used to assess a reported result within the context of the project DQOs. For results that are outside the control limits provided in the QAPP or site-specific SAP, FSP, or QAPP, the outlier will be noted in the laboratory case narrative. Percent recovery (%R) is defined as follows:

$$\%\ \text{Recovery} = \frac{(A_T - A_0)}{A_F}\ \text{x}\ 100$$

Where:

A_T = Total amount recovered in fortified sample
A_0 = Amount recovered in unfortified sample
A_F = Amount added to sample

Accuracy for some procedures is evaluated as the degree of agreement between a new set of results and a historical database or a table of acceptable criteria for a given parameter. This is measured as percent difference (%D) from the reference value and is primarily used by the laboratory as a means for documenting acceptability of organic continuing calibration.

The %D is calculated by expressing, as a percentage, the difference between the original value and new value relative to the original value. This method for precision measurement can be expressed by the formula:

$$\%\ D = \frac{C_1 - C_2}{C_1}\ \text{x}\ 100$$

Where:

C_1 = Concentration of analyte in the initial aliquot of the sample.
C_2 = Concentration of analyte in replicate.

For field measurements such as pH, accuracy is often expressed in terms of bias (B) and is calculated as follows:

$$B = M - A$$

Where:

M = Measured value of Standard Reference Material (SRM)
A = Actual value of SRM

Representativeness

Representativeness is the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. It is a qualitative parameter that depends on proper design of the sampling program.

Data representativeness for this project is accomplished by implementing approved sampling procedures and analytical methods that are appropriate for the intended data uses, and which are established within the site-specific SAP, FSP, or QAPP.

Field personnel will be responsible for collecting and handling samples according to the procedures in this UFP-QAPP and the site-specific SAP, FSP, or QAPP so that samples are representative of field conditions. Errors in sample collection, packaging, preservation, or chain-of-custody procedures may result in samples being judged non-representative and may form a basis for rejecting the data.

Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another, whether it was generated by a single laboratory or during inter-laboratory studies. The use of standardized field and analytical procedures ensures comparability of analytical data. Sample collection and handling procedures will adhere to EPA-approved protocols. Laboratory procedures will follow standard analytical protocols, use standard units, use standardized report formats, follow the calculations as referenced in approved analytical methods, and use a standard statistical approach for QC measurements.

Completeness

Project-specific completeness goals account for all aspects of sample handling, from collection through data reporting. The level of completeness can be affected by loss or breakage of samples during transport, as well as external problems that prohibit collection of the sample. The following general formula is used for determining the percent complete:

$$\text{Completeness} = \frac{A}{B} \text{x} 100$$

Where:

A = Actual number of measurements judged valid (the validity of a measurement result is determined by judging its suitability for its intended use)

B = Total number of measurements planned to achieve a specified level of confidence in decision making

The formula for sampling completeness is:

$$\text{Sampling Completeness} = \frac{\text{Number of locations sampled}}{\text{Number of planned sample locations}} \text{ x } 100$$

An example formula for analytical completeness is:

$$\text{Metals Analytical Completeness} = \frac{\text{Number of Usable Data Points}}{\text{Expected Number of Usable Data Points}} \text{ x } 100$$

Project Completeness Goals

Task	Subtask	Completeness Goal
Sampling	Sample Collection	95%
Field Measurements	Conductivity	100% of applicable collected samples
	pH/Turbidity/Dissolved Oxygen	100% of applicable collected samples
Analytical Measurements	All Laboratory Analyses	95% of collected analytes
		90% of each target analyte

Sensitivity

Sensitivity is the ability of the analytical test method and/or instrumentation to differentiate between detector responses to varying concentrations of the target analyte. Methodology to establish sensitivity for a given analytical method or instrument includes establishing reporting limits (RLs) and method detection limit (MDL) studies. The findings of the usability of the data relative to sensitivity will be included in the report, including any limitations on the data set and/or individual analytical results.

Statistical tests may be conducted to identify potential outliers. Potential outliers will be removed if a review of the field and laboratory documentation indicates that the results are true outliers.

Method sensitivity is typically evaluated in terms of the MDL and is defined as follows for many measurements:

$$MDL = {}^{t}(n - 1, 1 - \alpha = 0.99)\,(s)$$

Where:

s = Standard deviation of the replicate analyses

${}^{t}(n - 1, 1 - \alpha = 0.99)$ = Student's t-value for a one-sided 99 percent confidence level and a standard deviation estimate with n-1 degrees of freedom

n = Number of measurements

α = Statistical significance level

ATTACHMENT D

SCREENING LEVELS

Attachment C - Screening Levels
Soil

Analyte	CAS No.	Units	EGLE Residential Soil DWPC	EGLE Residential Soil GSIPC	EPA Industrial Soil RSL	EPA Residential Soil RSL	CLP CRQL	
							Medium	Low
Volatile Organic Compounds (SFAM01.1)								
1,1,1-Trichloroethane	71-55-6	mg/kg	4	1.8	36,000	8,100	0.25	NA
1,1-Dichloroethane	75-34-3	mg/kg	18	15	16	3.6	0.25	NA
1,1,2-Trichloro-1,2,2-trichfluoroethane	76-13-1	mg/kg	9,000,000	1.7	28,000	6,700	0.25	NA
1,2,3-Trichlorobenzene	87-61-6	mg/kg	--	--	930	63	0.25	NA
1,2,4-Trichlorobenzene	120-82-1	mg/kg	2.1	0.57	110	24	0.25	NA
1,2-Dichlorobenzene	95-50-1	mg/kg	140	0.28	9,300	1,800	0.25	NA
1,4-Dichlorobenzene	106-46-7	mg/kg	1.7	0.36	11	2.6	0.25	NA
2-Butanone (MEK)	78-93-3	mg/kg	260	44	190,000	27,000	0.5	NA
2-Hexanone	591-78-6	mg/kg	20	--	1,300	200	0.5	NA
4-Methyl-2-pentanone (MIBK)	108-10-1	mg/kg	36	--	140,000	33,000	0.5	NA
Bromochloromethane	74-97-5	mg/kg	--	--	630	150	0.25	NA
Bromodichloromethane	75-27-4	mg/kg	1.6	--	1.3	0.29	0.25	NA
Bromoform	75-25-2	mg/kg	1.6	--	86	19	0.25	NA
Carbon disulfide	75-15-0	mg/kg	16	--	3,500	770	0.25	NA
Chlorobenzene	108-90-7	mg/kg	2	0.5	1,300	280	0.25	NA
Chlorodibromomethane	124-48-1	mg/kg	1.6	--	39	8.3	0.25	NA
Chloroethane	75-00-3	mg/kg	8.6	22	57,000	14,000	0.25	NA
Chloroform	67-66-3	mg/kg	1.6	7	1.4	0.32	0.25	NA
Chloromethane	74-87-3	mg/kg	5.2	--	460	110	0.25	NA
cis-1,2-Dichloroethene	156-59-2	mg/kg	1.4	12	2,300	160	0.25	NA
cis-1,3-Dichloropropene	10061-01-5	mg/kg	--	--	--	--	0.25	NA
Cyclohexane	110-82-7	mg/kg	--	--	27,000	6,500	0.25	NA
Dichlorodifluoromethane	75-71-8	mg/kg	95	--	370	87	0.25	NA
Ethylbenzene	100-41-4	mg/kg	1.5	0.36	25	5.8	0.25	NA
Isopropylbenzene	98-82-8	mg/kg	91	3.2	9,900	1,900	0.25	NA
m,p-Xylene	179601-23-1	mg/kg	5.6	0.98	--	--	0.25	NA
Methyl acetate	79-20-9	mg/kg	--	--	1,200,000	78,000	0.25	NA
Methylcyclohexane	108-87-2	mg/kg	--	--	--	--	0.25	NA
Methyl tert-butyl ether	1634-04-4	mg/kg	0.8	140	210	47	0.25	NA
o-Xylene	95-47-6	mg/kg	5.6	0.98	2,800	650	0.25	NA
Styrene	100-42-5	mg/kg	2.7	2.1	35,000	6,000	0.25	NA
Toluene	108-88-3	mg/kg	16	5.4	47,000	4,900	0.25	NA
trans-1,2-Dichloroethene	156-60-5	mg/kg	2	30	23,000	1,600	0.25	NA
trans-1,3-Dichloropropene	10061-02-6	mg/kg	--	--	--	--	0.25	NA
Trichlorofluoromethane (Freon 11)	75-69-4	mg/kg	52	--	350,000	23,000	0.25	NA
Volatile Organic Compounds (SFAM01.1)								
1,1,2,2-Tetrachloroethane	79-34-5	mg/kg	0.17	1.6	2.7	0.6	NA	0.005
1,1,2-Trichloroethane	79-00-5	mg/kg	0.1	6.6	5.0	1.1	NA	0.005
1,1-Dichloroethene	75-35-4	mg/kg	0.14	2.6	1,000	230	NA	0.005
1,2-Dibromo-3-Chloropropane	96-12-8	mg/kg	0.01	--	0.06	0.0053	NA	0.005
1,2-Dibromoethane (EDB)	106-93-4	mg/kg	0.02	0.11	0.16	0.036	NA	0.005
1,2-Dichloroethane (DCA)	107-06-2	mg/kg	0.1	7.2	2.0	0.46	NA	0.005
1,2-Dichloropropane	78-87-5	mg/kg	0.1	4.6	11	2.5	NA	0.005
1,3-Dichlorobenzene	541-73-1	mg/kg	0.17	0.68	--	--	NA	0.005
Acetone	67-64-1	mg/kg	15	34	670,000	61,000	NA	0.01
Benzene	71-43-2	mg/kg	0.1	4	5.1	1.2	NA	0.005
Bromomethane	74-83-9	mg/kg	0.2	0.1	30	6.8	NA	0.005
Carbon tetrachloride	56-23-5	mg/kg	0.1	0.76	2.9	0.65	NA	0.005
Methylene Chloride	75-09-2	mg/kg	0.1	30	1,000	57	NA	0.005
Tetrachloroethene	127-18-4	mg/kg	0.1	1.2	100	24	NA	0.005
Trichloroethene	79-01-6	mg/kg	0.1	4	6.0	0.94	NA	0.005
Vinyl chloride	75-01-4	mg/kg	0.04	0.26	1.7	0.059	NA	0.005

Notes:
-- = No benchmark established
Abbreviations:
CAS = Chemical Abstracts Service
CLP = Contract Laboratory Program
CRQL = Contract Required Quantitation Limit
DWPC = Drinking Water Protection Criteria
EGLE = Michigan Departmnet of Environment, Great Lakes, and Energy
EPA = U.S. Environmental Protection Agency
GSIPC = Groundwater Surface Water Interface Protection Criteria
mg/kg = milligrams per kilogram
NA = not applicable
RSL = Regional Screening Level
SFAM = Superfund Analytical Method

Attachment C - Screening Levels
Soil

Analyte	CAS No.	Units	EGLE Residential Soil DWPC	EGLE Residential Soil GSIPC	EPA Industrial Soil RSL	EPA Residential Soil RSL	CLP CRQL	
							Medium	Low
Semi-Volatile Organic Compounds (SFAM01.1)								
1,4-Dioxane	123-91-1	mg/kg	1,700	5,600	24	5.3	2	NA
2-Chloronaphthalene	91-58-7	mg/kg	620	--	60,000	4,800	5	NA
2-Nitroaniline	88-74-4	mg/kg	--	--	8,000	630	5	NA
2,4-Dimethylphenol	105-67-9	mg/kg	7.4	7.6	16,000	1,300	5	NA
2,4-Dinitrophenol	51-28-5	mg/kg	--	--	1,600	130	10	NA
2,4,5-Trichlorophenol	95-95-4	mg/kg	39	--	82,000	6,300	5	NA
3-Nitroaniline	99-09-2	mg/kg	--	--	--	--	10	NA
4-Nitroaniline	100-01-6	mg/kg	--	--	110	27	10	NA
4-Nitrophenol	100-02-7	mg/kg	--	--	--	--	10	NA
4-Bromophenyl phenyl ether	101-55-3	mg/kg	--	--	--	--	5	NA
Acetophenone	98-86-2	mg/kg	30	--	120,000	7,800	10	NA
Benzaldehyde	100-52-7	mg/kg	--	--	820	170	10	NA
Bis(2-chloroisopropyl) ether	108-60-1	mg/kg	--	--	47,000	3,100	10	NA
Bis(2-chloroethoxy)methane	111-91-1	mg/kg	--	--	2,500	190	5	NA
Bis(2-ethylhexyl) phthalate	117-81-7	mg/kg	--	--	160	39	5	NA
Butyl benzyl phthalate	85-68-7	mg/kg	2,200	120	1,200	290	5	NA
Caprolactam	105-60-2	mg/kg	120	--	400,000	31,000	10	NA
Di-n-octyl phthalate	117-84-0	mg/kg	100,000	--	8,200	630	10	NA
Dimethyl phthalate	131-11-3	mg/kg	1,500	--	--	--	5	NA
Isophorone	78-59-1	mg/kg	15	26	2,400	570	5	NA
n-Nitrosodiphenylamine(as diphenylamine)	86-30-6	mg/kg	--	--	470	110	5	NA
Phenol	108-95-2	mg/kg	88	9	250,000	19,000	10	NA
Semi-Volatile Organic Compounds (SFAM01.1)								
1,2,4,5-Tetrachlorobenzene	95-94-3	mg/kg	1,500	3.4	--	--	NA	0.17
2,3,4,6-Tetrachlorophenol	58-90-2	mg/kg	--	--	--	--	NA	0.17
2,4,6-Trichlorophenol	88-06-2	mg/kg	2.4	0.33	210	49	NA	0.17
2,4-Dichlorophenol	120-83-2	mg/kg	1.5	0.33	2,500	190	NA	0.17
2,4-Dinitrotoluene	121-14-2	mg/kg	0.43	--	7.4	1.7	NA	0.17
2,6-Dinitrotoluene	606-20-2	mg/kg	--	--	1.5	0.36	NA	0.17
2-Chlorophenol	95-57-8	mg/kg	0.9	0.36	5,800	390	NA	0.17
2-Methylphenol	95-48-7	mg/kg	7.4	1	41,000	3,200	NA	0.33
2-Nitrophenol	88-75-5	mg/kg	0.4	--	--	--	NA	0.17
3,3'-Dichlorobenzidine	91-94-1	mg/kg	2	2	5.1	1.2	NA	0.33
4,6-Dinitro-2-methylphenol	534-52-1	mg/kg	0.83	--	66	5	NA	0.33
4-Chloro-3-methylphenol	59-50-7	mg/kg	5.8	0.28	82,000	6,300	NA	0.17
Atrazine	1912-24-9	mg/kg	*0.06*	*0.15*	10	2.4	NA	0.33
Bis(2-chloroethyl)ether	111-44-4	mg/kg	*0.1*	*0.1*	1.0	*0.23*	NA	0.33
Carbazole	86-74-8	mg/kg	9.4	1.1	--	--	NA	0.33
Dibenzofuran	132-64-9	mg/kg	--	1.7	1,200	78	NA	0.17
Diethyl phthalate	84-66-2	mg/kg	110	2.2	660,000	51,000	NA	0.17
Di-n-butyl phthalate	84-74-2	mg/kg	960	11	82,000	6,300	NA	0.17
Hexachlorobenzene	118-74-1	mg/kg	1.80	0.35	0.96	0.21	NA	0.17
Hexachlorobutadiene	87-68-3	mg/kg	26	0.091	--	1.2	NA	0.17
Hexachlorocyclopentadiene	77-47-4	mg/kg	320	--	7.5	1.8	NA	0.33
Hexachloroethane	67-72-1	mg/kg	0.43	1.8	8.0	1.8	NA	0.17
Nitrobenzene	98-95-3	mg/kg	0.33	3.6	22	5	NA	0.17
N-Nitrosodi-n-propylamine	621-64-7	mg/kg	0.33	--	0.33	*0.078*	NA	0.17
Phenanthrene	85-01-8	mg/kg	56	2.1	--	--	NA	0.17

Notes:

-- = No benchmark established

0.1 = Regulatory benchmark is not attainable by lowest achievable CRQL; accepted as analyte is not a primary contaminant of concern

Abbreviations:
CAS = Chemical Abstracts Service
CLP = Contract Laboratory Program
CRQL = Contract Required Quantitation Limit
DWPC = Drinking Water Protection Criteria
EGLE = Michigan Departmnet of Environment, Great Lakes, and Energy
EPA = U.S. Environmental Protection Agency
GSIPC = Groundwater Surface Water Interface Protection Criteria
mg/kg = milligrams per kilogram
NA = not applicable
RSL = Regional Screening Level
SFAM = Superfund Analytical Method

Attachment C - Screening Levels
Soil

Analyte	CAS No.	Units	EGLE Residential Soil DWPC	EGLE Residential Soil GSIPC	EPA Industrial Soil RSL	EPA Residential Soil RSL	CLP CRQL Low by SIM
Polycyclic Aromatic Hydrocarbons (SFAM01.1)							
1-Methylnaphthalene	90-12-0	mg/kg	--	--	73	18	0.0033
2-Methylnaphthalene	91-57-6	mg/kg	57	4.2	3,000	240	0.0033
Acenaphthene	83-32-9	mg/kg	300	8.7	45,000	3,600	0.0033
Acenaphthylene	208-96-8	mg/kg	5.9	--	--	--	0.0033
Anthracene	120-12-7	mg/kg	41	--	230,000	18,000	0.0033
Benzo(a)anthracene	56-55-3	mg/kg	--	--	21	1.1	0.0033
Benzo(a)pyrene	50-32-8	mg/kg	--	--	2.1	0.11	0.0033
Benzo(b)fluoranthene	205-99-2	mg/kg	--	--	21	1.1	0.0033
Benzo(g,h,i)perylene	191-24-2	mg/kg	--	--	--	--	0.0033
Benzo(k)fluoranthene	207-08-9	mg/kg	--	--	210	1.1	0.0033
Chrysene	218-01-9	mg/kg	--	--	2,100	110	0.0033
Dibenzo(a,h)anthracene	53-70-3	mg/kg	--	--	2.1	0.11	0.0033
Fluoranthene	206-44-0	mg/kg	730	5.5	30,000	2,400	0.0033
Fluorene	86-73-7	mg/kg	390	5.3	30,000	2,400	0.0033
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	--	--	21	1.1	0.0033
Naphthalene	91-20-3	mg/kg	35	0.73	8.6	2	0.0033
Phenanthrene	85-01-8	mg/kg	56	2.1	--	--	0.0033
Pyrene	129-00-0	mg/kg	480	--	23,000	1,800	0.0033

Notes:
-- = No benchmark established
Abbreviations:
CAS = Chemical Abstracts Service
CLP = Contract Laboratory Program
CRQL = Contract Required Quantitation Limit
DWPC = Drinking Water Protection Criteria
EGLE = Michigan Departmnet of Environment, Great Lakes, and Energy
EPA = U.S. Environmental Protection Agency
GSIPC = Groundwater Surface Water Interface Protection Criteria
mg/kg = milligrams per kilogram
RSL = Regional Screening Level
SFAM = Superfund Analytical Method
SIM = Selected Ion Monitoring

Attachment C - Screening Levels
Soil

Analyte	CAS No.	Units	EGLE Residential Soil DWPC	EGLE Residential Soil GSIPC	EPA Industrial Soil RSL	EPA Residential Soil RSL	CLP CRQL
Metals (SFAM01.1 ICP-AES/CVAA/Spectrophotometry)							
Aluminum (B)	7429-90-5	mg/kg	6,900	--	1,100,000	77,000	20
Barium	7440-39-3	mg/kg	1,300	(G)	220,000	15,000	20
Beryllium	7440-41-7	mg/kg	51	(G)	2,300	160	0.50
Cadmium	7440-43-9	mg/kg	6	(G)	100	7.1	0.50
Chromium	7440-47-3	mg/kg	1,000,000	(G)	1,800,000	120,000	1.0
Copper	7440-50-8	mg/kg	5.8	(G)	47,000	3,100	2.5
Cyanide	57-12-5	mg/kg	4	*0.1*	150	23	0.50
Iron (B)	7439-89-6	mg/kg	12,000	--	820,000	55,000	10
Lead	7439-92-1	mg/kg	700	(G)	800	400	1.0
Manganese (B)	7439-96-5	mg/kg	440	(G)	26,000	1,800	1.5
Mercury	7439-97-6	mg/kg	1.7	0.05	46	11	0.10
Nickel	7440-02-0	mg/kg	100	(G)	22,000	1,500	4.0
Vanadium	7440-62-2	mg/kg	72	430	5,800	390	5.0
Zinc	7440-66-6	mg/kg	2,400	(G)	350,000	23,000	6.0
Metals (SFAM01.1 ICP-MS)							
Antimony	7440-36-0	mg/kg	4.3	94	470	31	1.0
Arsenic	7440-38-2	mg/kg	4.6	4.6	3	0.68	0.50
Cobalt	7440-48-4	mg/kg	0.8	2	350	23	0.50
Selenium	7782-49-2	mg/kg	4	*0.4*	5,800	390	2.5
Silver	7440-22-4	mg/kg	4.5	*0.1*	5,800	390	0.50
Thallium	7440-28-0	mg/kg	2.3	4.2	12	0.78	0.50

Notes:

-- = No benchmark established

0.4 = Regulatory benchmark is not attainable by lowest achievable CRQL; accepted as analyte is not a primary contaminant of concern

(B) = Background, as defined in R 299.1(b), may be substituted if higher than the calculated cleanup criterion

(G) = GSIPC depends on the pH or water hardness, or both, of the receiving surface water

Abbreviations:

AES = Atomic Emission Spectrometry
CAS = Chemical Abstracts Service
CLP = Contract Laboratory Program
CRQL = Contract Required Quantitation Limit
CVAA = Cold Vapor Atomic Absorption
DWPC = Drinking Water Protection Criteria
EGLE = Michigan Departmnet of Environment, Great Lakes, and Energy
EPA = U.S. Environmental Protection Agency
GSIPC = Groundwater Surface Water Interface Protection Criteria
ICP = Inductively Coupled Plasma
mg/kg = milligrams per kilogram
MS = Mass Spectometry
RSL = Regional Screening Level
SFAM = Superfund Analytical Method

Attachment C - Screening Levels
Sediment

Analyte	CAS No.	Units	Sediment Screening Values for Hazardous Waste Sites[1]				CLP CRQL
			Non-Narcotic Mode of Action: Fresh		Narcotic Mode of Action: Fresh		
			ESV[2]	RSV[3]	ESV[2]	RSV[3]	
Metals (SFAM01.1 ICP-AES/CVAA/Spectrophotometry)							
Aluminum	7429-90-5	mg/kg	25000	58000	--	--	20.0
Antimony	7440-36-0	mg/kg	2	25	--	--	6.0
Arsenic	7440-38-2	mg/kg	9.8	33	--	--	1.0
Barium	7440-39-3	mg/kg	20	60	--	--	20.0
Beryllium	7440-41-7	mg/kg	--	--	--	--	0.5
Cadmium	7440-43-9	mg/kg	*1*	5	--	--	0.5
Chromium	7440-47-3	mg/kg	43.4	111	--	--	1.0
Cobalt	7440-48-4	mg/kg	50		--	--	5.0
Copper	7440-50-8	mg/kg	31.6	149	--	--	2.5
Cyanide	57-12-5	mg/kg	--	--	--	--	0.5
Iron	7439-89-6	mg/kg	20000	40000	--	--	10.0
Lead	7439-92-1	mg/kg	35.8	128	--	--	1.0
Manganese	7439-96-5	mg/kg	460	1100	--	--	1.5
Mercury	7439-97-6	mg/kg	0.17	0.17	--	--	0.2
Nickel	7440-02-0	mg/kg	22.7	48.6	--	--	4.0
Selenium	7782-49-2	mg/kg	*0.72*	*2.9*	--	--	3.5
Silver	7440-22-4	mg/kg	1	2.2	--	--	1.0
Thallium	7440-28-0	mg/kg	--	--	--	--	2.5
Vanadium	7440-62-2	mg/kg	--	--	--	--	5.0
Zinc	7440-66-6	mg/kg	121	459	--	--	6.0

Notes:

[1]EPA Region 4 Ecological Risk Assessment Supplemental Guidance Sediment Screening Values for Hazardous Waste Sites (March 2018).

[2]ESVs are based on conservative endpoints and sensitive ecological effects data, they represent a preliminary screening of site chemical

[3]RSVs are screening values that are generally derived from other sources or site-specific information. The RSVs presented herein are based on less conservative values or lowest observed adverse effect level-based effects.

-- = No benchmark established

'*1* = Regulatory benchmark is not attainable by lowest achievable CRQL; accepted as analyte is not a primary contaminant of concern

Abbreviations:

AES = Atomic Emission Spectrometry

CRQL = Contract Required Quantitation Limit

CVAA = Cold Vapor Atomic Absorption

EPA = U.S. Environmental Protection Agency

ESV = Ecological Screening Value

ICP = Inductively Coupled Plasma

mg/kg = milligrams per kilogram

RSV = Refinement Screening Value

SFAM = Superfund Analytical Method

Attachment C - Screening Levels
Sediment

Analyte	CAS No.	Units	Sediment Screening Values for Hazardous Waste Sites[1]				CLP CRQL
			Non-Narcotic Mode of Action: Fresh		Narcotic Mode of Action: Fresh		
			ESV[2]	RSV[3]	ESV[2]	RSV[3]	
Polychlorinated Biphenyls (SFAM01.1)							
Aroclor-1016 (PCB-1016)	12674-11-2	mg/kg	--	--	--	--	0.033
Aroclor-1221 (PCB-1221)	11104-28-2	mg/kg	--	--	--	--	0.033
Aroclor-1232 (PCB-1232)	11141-16-5	mg/kg	--	--	--	--	0.033
Aroclor-1242 (PCB-1242)	53469-21-9	mg/kg	--	--	--	--	0.033
Aroclor-1248 (PCB-1248)	12672-29-6	mg/kg	--	--	--	--	0.033
Aroclor-1254 (PCB-1254)	11097-69-1	mg/kg	--	--	--	--	0.033
Aroclor-1260 (PCB-1260)	11096-82-5	mg/kg	--	--	--	--	0.033
Total Aroclors	1336-36-3	mg/kg	0.0598	0.676	--	--	0.033

Notes:

[1]EPA Region 4 Ecological Risk Assessment Supplemental Guidance Sediment Screening Values for Hazardous Waste Sites (March 2018).

[2]ESVs are based on conservative endpoints and sensitive ecological effects data, they represent a preliminary screening of site chemical concentrations to determine if there is a need to conduct further investigations at the site. ESVs are not recommended as remediation levels.

[3]RSVs are screening values that are generally derived from other sources or site-specific information. The RSVs presented herein are based on less conservative values or lowest observed adverse effect level-based effects.

-- = No benchmark established

Abbreviations:

CAS = Chemical Abstracts Service
CLP = Contract Laboratory Program
CRQL = Contract Required Reporting Limit
EPA = U.S. Environmental Protection Agency
ESV = Ecological Screening Value
mg/kg = milligrams per kilogram
PCB = polychlorinated biphenyl
RSV = Refinement Screening Value
SFAM = Superfund Analytical Method

Attachment C - Screening Levels
Sediment

Analyte	CAS No.	Units	Sediment Screening Values for Hazardous Waste Sites[1]				CLP CRQL	
			Non-Narcotic Mode of Action: Fresh		Narcotic Mode of Action: Fresh			
			ESV[2]	RSV[3]	ESV[2]	RSV[3]	Medium	Low
Volatile Organic Compounds (SFAM01.1)								
1,1-Dichloroethene	75-35-4	mg/kg	--	--	0.1	0.753	0.25	NA
1,1,2,2-Tetrachloroethane	79-34-5	mg/kg	--	--	0.25	2.23	0.25	NA
1,1,2-Trichloroethane	79-00-5	mg/kg	--	--	0.538	1.545	0.25	NA
1,2-Dibromo-3-Chloropropane	96-12-8	mg/kg	--	--	--	--	0.25	NA
1,2-Dibromoethane (EDB)	106-93-4	mg/kg	--	--	--	--	0.25	NA
1,2-Dichloroethane (DCA)	107-06-2	mg/kg	--	--	0.986	1.131	0.25	NA
1,2-Dichloropropane	78-87-5	mg/kg	--	--	0.428	0.876	0.25	NA
2-Butanone (MEK)	78-93-3	mg/kg	--	--	7.604	22.707	0.5	NA
Chloroethane	75-00-3	mg/kg	--	--	--	--	0.25	NA
Chloromethane	74-87-3	mg/kg	--	--	--	--	0.25	NA
cis-1,2-Dichloroethene	156-59-2	mg/kg	--	--	0.432	1.135	0.25	NA
cis-1,3-Dichloropropene	10061-01-5	mg/kg	--	--	--	--	0.25	NA
Cyclohexane	110-82-7	mg/kg	--	0.278	--	--	0.25	NA
Dichlorodifluoromethane	75-71-8	mg/kg	--	--	--	--	0.25	NA
Ethylbenzene	100-41-4	mg/kg	--	--	0.29	1.467	0.25	NA
m,p-Xylene	179601-23-1	mg/kg	--	--	--	--	0.25	NA
Methyl acetate	79-20-9	mg/kg	--	--	--	--	0.25	NA
Methyl tert-butyl ether	1634-04-4	mg/kg	--	--	0.304	4.433	0.25	NA
o-Xylene	95-47-6	mg/kg	--	--	--	--	0.25	NA
trans-1,2-Dichloroethene	156-60-5	mg/kg	--	--	0.389	1.135	0.25	NA
trans-1,3-Dichloropropene	10061-02-6	mg/kg	--	--	--	--	0.25	NA
Trichlorofluoromethane (Freon 11)	75-69-4	mg/kg	--	--	--	--	0.25	NA
Vinyl chloride	75-01-4	mg/kg	--	--	0.482	1.178	0.25	NA
Volatile Organic Compounds (SFAM01.1)								
1,1,1-Trichloroethane	71-55-6	mg/kg	--	--	0.07	0.367	NA	0.005
1,1-Dichloroethane	75-34-3	mg/kg	--	--	0.02	1.666	NA	0.005
1,2,3-Trichlorobenzene	87-61-6	mg/kg	--	--	0.113	0.495	NA	0.005
1,2,4-Trichlorobenzene	120-82-1	mg/kg	--	--	0.011	0.485	NA	0.005
1,2-Dichlorobenzene	95-50-1	mg/kg	--	--	0.095	0.477	NA	0.005
1,3-Dichlorobenzene	541-73-1	mg/kg	--	--	0.089	0.468	NA	0.005
1,4-Dichlorobenzene	106-46-7	mg/kg	--	--	0.03	0.468	NA	0.005
2-Hexanone	591-78-6	mg/kg	--	--	0.045	7.598	NA	0.01
4-Methyl-2-pentanone (MIBK)	108-10-1	mg/kg	--	--	0.073	8.165	NA	0.01
Acetone	67-64-1	mg/kg	--	--	0.065	38.133	NA	0.01
Benzene	71-43-2	mg/kg	--	--	0.01	2.185	NA	0.005
Bromodichloromethane	75-27-4	mg/kg	0.21	--	--	--	NA	0.005
Bromoform	75-25-2	mg/kg	0.142	--	--	--	NA	0.005
Bromomethane	74-83-9	mg/kg	0.0065	--	--	--	NA	0.005
Carbon disulfide	75-15-0	mg/kg	--	--	0.0078	1.58	NA	0.005
Carbon tetrachloride	56-23-5	mg/kg	--	--	0.057	0.706	NA	0.005
Chlorobenzene	108-90-7	mg/kg	--	--	0.03	0.939	NA	0.005
Chlorodibromomethane	124-48-1	mg/kg	0.198	--	--	--	NA	0.005
Chloroform	67-66-3	mg/kg	--	--	0.087	3.352	NA	0.005
Isopropylbenzene	98-82-8	mg/kg	--	--	0.035	0.713	NA	0.005
Methylene Chloride	75-09-2	mg/kg	0.018	2.404	--	--	NA	0.005
Styrene	100-42-5	mg/kg	--	--	0.126	1.621	NA	0.005
Tetrachloroethene	127-18-4	mg/kg	--	--	*0.002*	0.415	NA	0.005
Toluene	108-88-3	mg/kg	--	--	0.01	2.074	NA	0.005
Trichloroethene	79-01-6	mg/kg	--	--	0.078	0.692	NA	0.005

Notes:

[1]USEPA Region 4 Ecological Risk Assessment Supplemental Guidance Sediment Screening Values for Hazardous Waste Sites (March 2018).

[2]ESVs are based on conservative endpoints and sensitive ecological effects data, they represent a preliminary screening of site chemical concentrations to determine if there is a need to conduct further investigations at the site. ESVs are not recommended as remediation levels.

[3]RSVs are screening values that are generally derived from other sources or site-specific information. The RSVs presented herein are based on less conservative values or lowest observed adverse effect level-based effects.

-- = No benchmark established

0.002 = Regulatory benchmark is not attainable by lowest achievable CRQL; accepted as analyte is not a primary contaminant of concern

Abbreviations:

CLP = Contract Laboratory Program

CRQL = Contract Required Reporting Limit

EPA = U.S. Environmental Protection Agency

ESV = Ecological Screening Value

mg/kg = milligrams per kilogram

NA = not applicable

RSV = Refinement Screening Value

SFAM = Superfund Analytical Method

Attachment C - Screening Levels
Sediment

Analyte	CAS No.	Units	Sediment Screening Values for Hazardous Waste Sites[1]				CLP CRQL
			Non-Narcotic Mode of Action: Fresh		Narcotic Mode of Action: Fresh		
			ESV[2]	RSV[3]	ESV[2]	RSV[3]	Low
Semi-Volatile Organic Compounds (SFAM01.1)							
1,2,4,5-Tetrachlorobenzene	95-94-3	mg/kg	--	--	0.187	*0.135*	0.17
1,4-Dioxane	123-91-1	mg/kg	--	--	--	--	0.067
2,3,4,6-Tetrachlorophenol	58-90-2	mg/kg	--	--	*0.03*	0.948	0.17
2,4,5-Trichlorophenol	95-95-4	mg/kg	*0.034*	1.964	--	--	0.17
2,4,6-Trichlorophenol	88-06-2	mg/kg	*0.089*	1.964	--	--	0.17
2,4-Dichlorophenol	120-83-2	mg/kg	--	--	*0.057*	1.886	0.17
2,4-Dimethylphenol	105-67-9	mg/kg	*0.039*	1.437	--	--	0.17
2,4-Dinitrophenol	51-28-5	mg/kg	*0.223*	2.961	--	--	0.33
2,4-Dinitrotoluene	121-14-2	mg/kg	0.29	2.9	--	--	0.17
2,6-Dinitrotoluene	606-20-2	mg/kg	0.296	*0.131*	--	--	0.17
2-Chloronaphthalene	91-58-7	mg/kg	--	--	--	--	0.17
2-Chlorophenol	95-57-8	mg/kg	*0.055*	0.55	--	--	0.17
2-Methylphenol	95-48-7	mg/kg	*0.119*	1.773	--	--	0.33
2-Nitroaniline	88-74-4	mg/kg	--	--	--	--	0.17
2-Nitrophenol	88-75-5	mg/kg	*0.168*	3.589	--	--	0.17
3,3'-Dichlorobenzidine	91-94-1	mg/kg	*0.031*	*0.09*	--	--	0.33
3-Nitroaniline	99-09-2	mg/kg	--	--	--	--	0.33
4,6-Dinitro-2-methylphenol	534-52-1	mg/kg	1.477	2.304	--	--	0.33
4-Bromophenyl phenyl ether	101-55-3	mg/kg	--	--	*0.047*	*0.062*	0.17
4-Chloro-3-methylphenol	59-50-7	mg/kg	*0.005*	2.035	--	--	0.17
4-Nitroaniline	100-01-6	mg/kg	--	--	--	--	0.33
4-Nitrophenol	100-02-7	mg/kg	*0.153*	4.105	--	--	0.33
Acetophenone	98-86-2	mg/kg	--	--	--	--	0.33
Atrazine	1912-24-9	mg/kg	*0.0003*	*0.089*	--	--	0.33
Benzaldehyde	100-52-7	mg/kg	*0.059*	0.58	--	--	0.33
bis (2-chloroisopropyl) ether	108-60-1	mg/kg	--	--	--	--	0.33
Bis(2-chloroethoxy)methane	111-91-1	mg/kg	--	--	--	--	0.17
Bis(2-chloroethyl)ether	111-44-4	mg/kg	--	8.163	--	--	0.33
Bis(2-ethylhexyl) phthalate	117-81-7	mg/kg	--	--	0.18	2.6	0.17
Butyl benzyl phthalate	85-68-7	mg/kg	--	--	*0.1*	0.481	0.17
Caprolactam	105-60-2	mg/kg	--	--	--	--	0.33
Carbazole	86-74-8	mg/kg	--	--	*0.069*	4.561	0.33
Dibenzofuran	132-64-9	mg/kg	--	--	0.51	2.313	0.17
Diethyl phthalate	84-66-2	mg/kg	--	--	0.63	1.105	0.17
Dimethyl phthalate	131-11-3	mg/kg	--	--	0.678	2.031	0.17
Di-n-butyl phthalate	84-74-2	mg/kg	--	--	*0.011*	0.319	0.17
Di-n-octyl phthalate	117-84-0	mg/kg	--	--	*0.039*	1.1	0.33
Hexachlorobenzene	118-74-1	mg/kg	*0.02*	0.24	--	--	0.17
Hexachlorobutadiene	87-68-3	mg/kg	--	--	--	--	0.17
Hexachlorocyclopentadiene	77-47-4	mg/kg	*0.069*	0.81	--	--	0.33
Hexachloroethane	67-72-1	mg/kg	--	--	*0.027*	*0.075*	0.17
Isophorone	78-59-1	mg/kg	--	--	0.876	0.948	0.17
Nitrobenzene	98-95-3	mg/kg	--	--	0.407	9.007	0.17
N-Nitrosodi-n-propylamine	621-64-7	mg/kg	--	--	--	--	0.17
n-Nitrosodiphenylamine(as diphenylamine)	86-30-6	mg/kg	--	--	*0.11*	0.37	0.17
Phenanthrene	85-01-8	mg/kg	--	--	0.204	5.96	0.17
Phenol	108-95-2	mg/kg	*0.175*	*0.21*	--	--	0.33

Notes:

[1]EPA Region 4 Ecological Risk Assessment Supplemental Guidance Sediment Screening Values for Hazardous Waste Sites (March 2018).

[2]ESVs are based on conservative endpoints and sensitive ecological effects data, they represent a preliminary screening of site chemical concentrations to determine if there is a need to conduct further investigations at the site. ESVs are not recommended as remediation levels.

[3]RSVs are screening values that are generally derived from other sources or site-specific information. The RSVs presented herein are based on less conservative values or lowest observed adverse effect level-based effects.

-- = No benchmark established

0.03 = Regulatory benchmark is not attainable by lowest achievable CRQL; accepted as analyte is not a primary contaminant of concern

Abbreviations:

CLP = Contract Laboratory Program

CRQL = Contract Required Reporting Limit

EPA = U.S. Environmental Protection Agency

ESV = Ecological Screening Value

mg/kg = milligrams per kilogram

RSV = Refinement Screening Value

SFAM = Superfund Analytical Method

Attachment C - Screening Levels
Sediment

Analyte	CAS No.	Units	Sediment Screening Values for Hazardous Waste Sites[1]				CLP CRQL Low by SIM
			Non-Narcotic Mode of Action: Fresh		Narcotic Mode of Action: Fresh		
			ESV[2]	RSV[3]	ESV[2]	RSV[3]	
Polycyclic Aromatic Hydrocarbons (SFAM01.1)							
1-Methylnaphthalene	90-12-0	mg/kg	--	--	0.141	--	0.0033
2-Methylnaphthalene	91-57-6	mg/kg	--	--	0.0202	--	0.0033
Acenaphthene	83-32-9	mg/kg	--	--	0.0067	--	0.0033
Acenaphthylene	208-96-8	mg/kg	--	--	0.0059	--	0.0033
Anthracene	120-12-7	mg/kg	--	--	0.057	--	0.0033
Benzo[a]anthracene	56-55-3	mg/kg	--	--	0.108	--	0.0033
Benzo[a]pyrene	50-32-8	mg/kg	--	--	0.15	--	0.0033
Benzo[b]fluoranthene	205-99-2	mg/kg	--	--	0.19	--	0.0033
Benzo[g,h,i]perylene	191-24-2	mg/kg	--	--	0.17	--	0.0033
Benzo[k]fluoranthene	207-08-9	mg/kg	--	--	0.24	--	0.0033
Chrysene	218-01-9	mg/kg	--	--	0.166	--	0.0033
Dibenz(a,h)anthracene	53-70-3	mg/kg	--	--	0.033	--	0.0033
Dibenzofuran	132-64-9	mg/kg	--	--	0.51	2.313	0.0033
Fluoranthene	206-44-0	mg/kg	--	--	0.423	--	0.0033
Fluorene	86-73-7	mg/kg	--	--	0.077	--	0.0033
Indeno[1,2,3-cd]pyrene	193-39-5	mg/kg	--	--	0.2	--	0.0033
Naphthalene	91-20-3	mg/kg	--	--	0.176	3.85	0.0033
Phenanthrene	85-01-8	mg/kg	--	--	0.204	5.96	0.0033
Pyrene	129-00-0	mg/kg	--	--	0.195	--	0.0033

Notes:

[1]EPA Region 4 Ecological Risk Assessment Supplemental Guidance Sediment Screening Values for Hazardous Waste Sites (March 2018).

[2]ESVs are based on conservative endpoints and sensitive ecological effects data, they represent a preliminary screening of site chemical concentrations to determine if there is a need to conduct further investigations at the site. ESVs are not recommended as remediation levels.

[3]RSVs are screening values that are generally derived from other sources or site-specific information. The RSVs presented herein are based on less conservative values or lowest observed adverse effect level-based effects.

-- = No benchmark established

Abbreviations:

CLP = Contract Laboratory Program

CRQL = Contract Required Reporting Limit

EPA = U.S. Environmental Protection Agency

ESV = Ecological Screening Value

mg/kg = milligrams per kilogram

PAHs = Polycyclic Aromatic Hydrocarbons

RSV = Refinement Screening Value

SFAM = Superfund Analytical Method

SIM = Selected Ion Monitoring

Attachment C - Screening Levels
Surface Water

Analyte	CAS No.	Units	Rule 57 Surface Water Quality FCV	Rule 57 Surface Water Quality FAV	Surface Water Chronic Freshwater Screening Values for Hazardous Waste Sites		CLP CRQL
					Total Metals	Dissolved Metals*	
Metals (SFAM01.1 ICP-AES/CVAA/Spectrophotometry)							
Arsenic	7440-38-2	µg/L	150	680	(G)	150 (G)	10
Barium	7440-39-3	µg/L	(G)	(G)	220	220	200
Beryllium	7440-41-7	µg/L	(G)	(G)	11	11	10
Chromium	7440-47-3	µg/L	(G)	(G)	(G)	42 (G)	10
Cyanide	57-12-5	µg/L	*5.2*	44.0	*5.2*	*5.2*	10
Iron	7439-89-6	µg/L	--	--	1,000	1,000	100
Manganese	7439-96-5	µg/L	(G)	(G)	93	93	15
Mercury	7439-97-6	µg/L	(G)	(G)	0.77[1]/0.0013[2]	0.77[1]/0.0013[2]	0.2
Zinc	7440-66-6	µg/L	(G)	(G)	(G)	66 (G)	60
Metals (SFAM01.1 ICP-MS)							
Aluminum	7429-90-5	µg/L	--	--	87	87	20
Antimony	7440-36-0	µg/L	240	2300	190	190	2
Cadmium	7440-43-9	µg/L	(G)	(G)	(G)	*0.45 (G)*	1
Cobalt	7440-48-4	µg/L	100	740	19	19	1
Copper	7440-50-8	µg/L	(G)	(G)	(G)	4.95 (G)	2
Lead	7439-92-1	µg/L	(G)	(G)	(G)	1.25 (G)	1
Nickel	7440-02-0	µg/L	(G)	(G)	(G)	28.9 (G)	1
Selenium	7782-49-2	µg/L	5	120	(G)	5	5
Silver	7440-22-4	µg/L	*0.06*	1.1	(G)	*0.06 (G)*	1
Thallium	7440-28-0	µg/L	--	--	6	6	1
Vanadium	7440-62-2	µg/L	27	160	27	27	5

Notes:

* filtered dissolved metals

[1]aquatic based screening value

[2]wildlife based screening value

-- = No benchmark established

(G) = FCV depends on water hardness

5.2 = Regulatory benchmark is not attainable by lowest achievable CRQL; accepted as analyte is not a primary contaminant of concern

Abbreviations:

µg/L = micrograms per liter

AES = Atomic Emission Spectometry

CAS = Chemical Abstracts Service

CLP = Contract Laboratory Program

CRQL = Contract Required Quantitation Limit

CVAA = Cold Vapor Atomic Absorption

FAV = Final Acute Value

FCV = Final Chronic Value

ICP = Inductively Coupled Plasma

MS = Mass Spetrometry

SFAM = Superfund Analytical Method

Attachment C - Screening Levels
Surface Water

Analyte	CAS No.	Units	Surface Water Chronic Freshwater Screening Values for Hazardous Waste Sites		CLP CRQL
			Aquatic Life*	Wildlife*	
Polychlorinated Biphenyls (SFAM01.1)					
Aroclor 1016 (PCB 1016)	12674-11-2	µg/L	*0.014*	*0.00012*	1
Aroclor 1221 (PCB 1221)	11104-28-2	µg/L	*0.014*	*0.00012*	1
Aroclor 1232 (PCB 1232)	11141-16-5	µg/L	*0.014*	*0.00012*	1
Aroclor 1242 (PCB 1242)	53469-21-9	µg/L	*0.014*	*0.00012*	1
Aroclor 1248 (PCB 1248)	12672-29-6	µg/L	*0.014*	*0.00012*	1
Aroclor 1254 (PCB 1254)	11097-69-1	µg/L	*0.014*	*0.00012*	1
Aroclor 1260 (PCB 1260)	11096-82-5	µg/L	*0.014*	*0.00012*	1
Aroclor 1262 (PCB 1262)	37324-23-5	µg/L	*0.014*	*0.00012*	1
Aroclor 1268 (PCB 1268)	11100-14-4	µg/L	*0.014*	*0.00012*	1

Notes:

* = Screening values based on Total PCBs

-- = No benchmark established

0.014 = Regulatory benchmark is not attainable by lowest achievable CRQL; accepted as analyte is not a primary contaminant of concern

Abbreviations:

µg/L = micrograms per liter

CAS = Chemical Abstracts Service

CLP = Contract Laboratory Program

CRQL = Contract Required Quantitation Limit

PCB = polychlorinated biphenyl

RSL = Regional Screening Level

SFAM = Superfund Analytical Method

Attachment C - Screening Levels
Surface Water

Analyte	CAS No.	Units	Rule 57 Surface Water Quality FCV	Rule 57 Surface Water Quality FAV	CLP CRQL Low
Volatile Organic Compounds (SFAM01.1)					
1,1,1-Trichloroethane	71-55-6	µg/L	89	1,600	5
1,1,2,2-Tetrachloroethane	79-34-5	µg/L	200	1,800	5
1,1,2-Trichloroethane	79-00-5	µg/L	730	6,400	5
1,1-Dichloroethene	75-35-4	µg/L	130	2,300	5
1,2,3-Trichlorobenzene	87-61-6	µg/L	--	--	5
1,2,4-Trichlorobenzene	120-82-1	µg/L	130	850	5
1,2-Dibromo-3-Chloropropane	96-12-8	µg/L	--	--	5
1,2-Dibromoethane	106-93-4	µg/L	15	280	5
1,2-Dichlorobenzene	95-50-1	µg/L	13	240	5
1,2-Dichloroethane	107-06-2	µg/L	2,000	16,000	5
1,2-Dichloroethene, cis-	156-59-2	µg/L	150	2,800	5
1,2-Dichloroethene, trans-	156-60-5	µg/L	150	2,800	5
1,2-Dichloropropane	78-87-5	µg/L	230	4,000	5
1,3-Dichlorobenzene	541-73-1	µg/L	28	200	5
1,4-Dichlorobenzene	106-46-7	µg/L	17	210	5
2-Hexanone	591-78-6	µg/L	--	--	10
4-Methyl-2-pentanone	108-10-1	µg/L	--	--	10
Benzene	71-43-2	µg/L	200	1,900	5
Bromodichloromethane	75-27-4	µg/L	--	--	5
Bromoform	75-25-2	µg/L	--	--	5
Carbon Tetrachloride	56-23-5	µg/L	77	1,400	5
Chlorobenzene	108-90-7	µg/L	25	450	5
Chloroform	67-66-3	µg/L	630	11,000	5
cis-1,3-Dichloropropene	10061-01-5	µg/L	9.0	160	5
Dibromochloromethane	124-48-1	µg/L	--	--	5
Ethylbenzene	100-41-4	µg/L	21	370	5
Isopropylbenzene	98-82-8	µg/L	28	1,700	5
m,p-Xylene	179601-23-1	µg/L	49	890	5
Methyl tert-Butyl Ether (MTBE)	1634-04-4	µg/L	32,000	420,000	5
Methylene chloride	75-09-2	µg/L	1,500	17,000	5
o-Xylene	95-47-6	µg/L	49	890	5
Styrene	100-42-5	µg/L	160	2,900	5
Tetrachloroethene	127-18-4	µg/L	190	2,900	5
Toluene	108-88-3	µg/L	270	2,600	5
trans-1,3-Dichloropropene	10061-02-6	µg/L	9.0	160	5
Trichloroethylene	79-01-6	µg/L	200	3,500	5
Vinyl chloride	75-01-4	µg/L	930	1,700	5

Notes:
-- = No benchmark established
Abbreviations:
µg/L = micrograms per liter
CAS = Chemical Abstracts Service
CLP = Contract Laboratory Program
CRQL = Contract Required Quantitation Limit
FAV = Final Acute Value
FCV = Final Chronic Value
SFAM = Superfund Analytical Method

Attachment C - Screening Levels
Surface Water

Analyte	CAS No.	Units	Rule 57 Surface Water Quality FCV	Rule 57 Surface Water Quality FAV	CLP CRQL[1]
Semi-Volitial Organic Compounds (SFAM01.1/SIM)					
1,4-Dioxane	123-91-1	µg/L	22,000	390,000	**0.2**
1,2,4,5-Tetrachlorobenzene	95-94-3	µg/L	*3*	46	5
2,2'-Oxybis(1-chloropropane)	108-60-1	µg/L	--	--	10
2,3,4,6-Tetrachlorophenol	58-90-2	µg/L	*1.2*	22	5
2,4,5-Trichlorophenol	95-95-4	µg/L	--	--	5
2,4,6-Trichlorophenol	88-06-2	µg/L	5	79	5
2,4-Dichlorophenol	120-83-2	µg/L	11	180	5
2,4-Dimethylphenol	105-67-9	µg/L	380	2,700	5
2,4-Dinitrophenol	51-28-5	µg/L	19	270	10
2,4-Dinitrotoluene	121-14-2	µg/L	--	--	5
2,6-Dinitrotoluene	606-20-2	µg/L	--	--	5
2-Chloronaphthalene	91-58-7	µg/L	--	--	5
2-Chlorophenol	95-57-8	µg/L	18	320	5
2-Methylphenol	95-48-7	µg/L	76	1,400	10
2-Nitroaniline	88-74-4	µg/L	--	--	5
2-Nitrophenol	88-75-5	µg/L	56	1,000	5
3,3'-Dichlorobenzidine	91-94-1	µg/L	*4.5*	81	10
3-Nitroaniline	99-09-2	µg/L	--	--	10
4,6-Dinitro-2-methylphenol	534-52-1	µg/L	--	--	10
4-Bromophenyl-phenylether	101-55-3	µg/L	--	--	5
4-Chloro-3-methylphenol	59-50-7	µg/L	7.4	130	5
4-Nitroaniline	100-01-6	µg/L	--	--	10
4-Nitrophenol	100-02-7	µg/L	200	1,900	10
Acetophenone	98-86-2	µg/L	--	--	10
Atrazine	1912-24-9	µg/L	*7.3*	100	10
Benzaldehyde	100-52-7	µg/L	--	--	10
Bis(2-chloroethoxy)methane	111-91-1	µg/L	--	--	5
Bis(2-chloroethyl) ether	111-44-4	µg/L	--	--	10
Bis(2-ethylhexyl)phthalate	117-81-7	µg/L	--	--	5
Butylbenzylphthalate	85-68-7	µg/L	67	630	5
Caprolactam	105-60-2	µg/L	--	--	10
Carbazole	86-74-8	µg/L	*4*	72	10
Dibenzofuran	132-64-9	µg/L	*4*	72	5
Diethylphthalate	84-66-2	µg/L	110	2,000	5
Dimethylphthalate	131-11-3	µg/L	--	--	5
Di-n-butylphthalate	84-74-2	µg/L	9.7	75	5
Di-n-octylphthalate	117-84-0	µg/L	--	--	10
Hexachlorobenzene	118-74-1	µg/L	--	--	5
Hexachlorobutadiene	87-68-3	µg/L	*1*	15	5
Hexachlorocyclo-pentadiene	77-47-4	µg/L	--	--	10
Hexachloroethane	67-72-1	µg/L	13	210	5
Isophorone	78-59-1	µg/L	1,300	9,200	5
Nitrobenzene	98-95-3	µg/L	230	2,100	5
N-Nitroso-di-n propylamine	621-64-7	µg/L	--	--	5
N-Nitrosodiphenylamine	86-30-6	µg/L	--	--	5
Phenol	108-95-2	µg/L	450	6,800	10

Notes:

[1]**0.2** = CRQL for 1,4-Dioxane by SIM

-- = No benchmark established

Abbreviations:

µg/L = micrograms per liter

CAS = Chemical Abstracts Service

CLP = Contract Laboratory Program

CRQL = Contract Required Quantitation Limit

FAV = Final Acute Value

FCV = Final Chronic Value

SFAM = Superfund Analytical Method

Attachment C - Screening Levels
Surface Water

Analyte	CAS No.	Units	Rule 57 Surface Water Quality FCV	Rule 57 Surface Water Quality FAV	CLP CRQL By SIM
Polyaromatic Hydrocarbons (SFAM01.1 SIM)					
1-Methylnaphthalene	90-12-0	µg/L	--	--	0.1
2-Methylnaphthalene	91-57-6	µg/L	19	340	0.1
Acenaphthene	83-32-9	µg/L	38	200	0.1
Acenaphthylene	208-96-8	µg/L	--	--	0.1
Anthracene	120-12-7	µg/L	--	--	0.1
Benzo(a)anthracene	56-55-3	µg/L	--	--	0.1
Benzo(a)pyrene	50-32-8	µg/L	--	--	0.1
Benzo(b)fluoranthene	205-99-2	µg/L	--	--	0.1
Benzo(g,h,i)perylene	191-24-2	µg/L	--	--	0.1
Benzo(k)fluoranthene	207-08-9	µg/L	--	--	0.1
Chrysene	218-01-9	µg/L	--	--	0.1
Dibenzo(a,h)anthracene	53-70-3	µg/L	--	--	0.1
Fluoranthene	206-44-0	µg/L	1.6	28	0.1
Fluorene	86-73-7	µg/L	12	220	0.1
Indeno(1,2,3-cd)pyrene	193-39-5	µg/L	--	--	0.1
Naphthalene	91-20-3	µg/L	11	200	0.1
Phenanthrene	85-01-8	µg/L	1.7	11	0.1
Pyrene	129-00-0	µg/L	--	--	0.1

Notes:
-- = No benchmark established
Abbreviations:
µg/L = micrograms per liter
CAS = Chemical Abstracts Service
CLP = Contract Laboratory Program
CRQL = Contract Required Quantitation Limit
FAV = Final Acute Value
FCV = Final Chronic Value
SFAM = Superfund Analytical Method
SIM = Selected Ion Monitoring

Attachment C - Screening Levels
Groundwater

Analyte	CAS No.	Units	EGLE Residential Groundwater DWC	EGLE Residential Groundwater GSIC	EPA Groundwater Primary MCL	EPA Tapwater RSL	CLP CRQL		
							Low	Trace	Trace by SIM
Volatile Organic Compounds (SFAM01.1)									
1,1,1-Trichloroethane	71-55-6	µg/L	200	89	200	8,000	5	NA	--
1,1-Dichloroethene	75-35-4	µg/L	7	130	7	280	5	NA	--
1,2,3-Trichlorobenzene	87-61-6	µg/L	--	--	--	7	5	NA	--
1,2,4-Trichlorobenzene	120-82-1	µg/L	70	99	70	1.2	5	NA	--
1,2-Dichlorobenzene	95-50-1	µg/L	600	13	600	300	5	NA	--
1,2-Dichloroethene, cis-	156-59-2	µg/L	70	620	70	36	5	NA	--
1,2-Dichloroethene, trans-	156-60-5	µg/L	100	1,500	100	360	5	NA	--
1,3-Dichlorobenzene	541-73-1	µg/L	6.6	28	--	--	5	NA	--
2-Hexanone	591-78-6	µg/L	1,000	--	--	38	10	NA	--
4-Methyl-2-pentanone	108-10-1	µg/L	1,800	--	--	6,300	10	NA	--
Bromoform	75-25-2	µg/L	80	--	80	3.3	5	NA	--
Chlorobenzene	108-90-7	µg/L	100	25	100	78	5	NA	--
cis-1,3-Dichloropropene	10061-01-5	µg/L	--	--	--	--	5	NA	--
Ethylbenzene	100-41-4	µg/L	74	18	700	1.5	5	NA	--
Isopropylbenzene	98-82-8	µg/L	800	28	--	450	5	NA	--
m,p-Xylene	179601-23-1	µg/L	280	49	--	--	5	NA	--
Methyl tert-Butyl Ether (MTBE)	1634-04-4	µg/L	40	7,100	--	14	5	NA	--
Methylene chloride	75-09-2	µg/L	5	1,500	5	11	5	NA	--
o-Xylene	95-47-6	µg/L	280	49	--	190	5	NA	--
Styrene	100-42-5	µg/L	100	80	100	1,200	5	NA	--
Tetrachloroethene	127-18-4	µg/L	5	60	5	11	5	NA	--
Toluene	108-88-3	µg/L	790	270	1,000	1,100	5	NA	--
trans-1,3-Dichloropropene	10061-02-6	µg/L	--	--	--	--	5	NA	--
Volatile Organic Compounds (SFAM01.1)									
1,1,2,2-Tetrachloroethane	79-34-5	µg/L	8.5	78	--	*0.076*	NA	0.5	--
1,1,2-Trichloroethane	79-00-5	µg/L	5	330	5	*0.28*	NA	0.5	--
1,2-Dichloroethane	107-06-2	µg/L	5	360	5	*0.17*	NA	0.5	--
1,2-Dichloropropane	78-87-5	µg/L	5	230	5	0.85	NA	0.5	--
1,4-Dichlorobenzene	106-46-7	µg/L	75	17	75	*0.48*	NA	0.5	--
Benzene	71-43-2	µg/L	5	200	5	*0.46*	NA	0.5	--
Bromodichloromethane	75-27-4	µg/L	80	--	80	*0.13*	NA	0.5	--
Carbon Tetrachloride	56-23-5	µg/L	5	38	5	*0.46*	NA	0.5	--
Chloroform	67-66-3	µg/L	80	350	80	*0.22*	NA	0.5	--
Dibromochloromethane	124-48-1	µg/L	80	--	80	0.87	NA	0.5	--
Volatile Organic Compounds (SFAM01.1/SIM)									
1,2-Dibromo-3-Chloropropane	96-12-8	µg/L	0.2	--	0.2	*0.00033*	NA	NA	0.05
1,2-Dibromoethane	106-93-4	µg/L	0.05	5.7	0.05	*0.0075*	NA	NA	0.05
Trichloroethylene	79-01-6	µg/L	5	200	5	0.49	NA	NA	0.05
Vinyl chloride	75-01-4	µg/L	2	13	2	*0.019*	NA	NA	0.05

Notes:

-- = No benchmark or CRQL established

0.076 = Regulatory benchmark is not attainable by lowest achievable CRQL; accepted as analyte is not a primary contaminant of concern

Abbreviations:

µg/L = micrograms per liter
CAS = Chemical Abstracts Service
CLP = Contract Laboratory Program
CRQL = Contract Required Quantitation Limit
DWC = Drinking Water Criteria
EGLE = Michigan Departmnet of Environment, Great Lakes, and Energy
EPA = U.S. Environmental Protection Agency
GSIC = Groundwater Surface Water Interface Criteria
MCL = Maximum Contaminant Limit
RSL = Regional Screening Level
SFAM = Superfund Analytical Method
SIM = Selected Ion Monitoring

Attachment C - Screening Levels
Groundwater

Analyte	CAS No.	Units	EGLE Residential Groundwater DWC	EPA Groundwater Primary MCL	EPA Tapwater RSL	CLP CRQL[1]
Semi-Volitial Organic Compounds (SFAM01.1)						
1,4-Dioxane	123-91-1	µg/L	7.2	--	0.46	**0.2**
1,2,4,5-Tetrachlorobenzene	95-94-3	µg/L	1,300	--	--	5
2,2'-Oxybis(1-chloropropane)	108-60-1	µg/L	--	--	710	10
2,3,4,6-Tetrachlorophenol	58-90-2	µg/L	--	--	--	5
2,4,5-Trichlorophenol	95-95-4	µg/L	730	--	1,200	5
2,4,6-Trichlorophenol	88-06-2	µg/L	120	--	*4.1*	5
2,4-Dichlorophenol	120-83-2	µg/L	73	--	46	5
2,4-Dimethylphenol	105-67-9	µg/L	370	--	360	5
2,4-Dinitrophenol	51-28-5	µg/L	--	--	39	10
2,4-Dinitrotoluene	121-14-2	µg/L	7.7	--	*0.24*	5
2,6-Dinitrotoluene	606-20-2	µg/L	--	--	*0.049*	5
2-Chloronaphthalene	91-58-7	µg/L	1,800	--	750	5
2-Chlorophenol	95-57-8	µg/L	45	--	91	5
2-Methylphenol	95-48-7	µg/L	370	--	930	10
2-Nitroaniline	88-74-4	µg/L	--	--	190	5
2-Nitrophenol	88-75-5	µg/L	20	--	--	5
3,3'-Dichlorobenzidine	91-94-1	µg/L	*1.1*	--	*0.13*	10
3-Nitroaniline	99-09-2	µg/L	--	--	--	10
4,6-Dinitro-2-methylphenol	534-52-1	µg/L	20	--	1.5	10
4-Bromophenyl-phenylether	101-55-3	µg/L	--	--	--	5
4-Chloro-3-methylphenol	59-50-7	µg/L	150	--	1,400	5
4-Nitroaniline	100-01-6	µg/L	--	--	*3.8*	10
4-Nitrophenol	100-02-7	µg/L	--	--	--	10
Acetophenone	98-86-2	µg/L	1,500	--	1,900	10
Atrazine	1912-24-9	µg/L	*3*	*3*	*0.3*	10
Benzaldehyde	100-52-7	µg/L	--	--	19	10
Bis(2-chloroethoxy)methane	111-91-1	µg/L	--	--	59	5
Bis(2-chloroethyl) ether	111-44-4	µg/L	*2*	--	*0.014*	10
Bis(2-ethylhexyl)phthalate	117-81-7	µg/L	6	6	5.6	5
Butylbenzylphthalate	85-68-7	µg/L	1,200	--	16	5
Caprolactam	105-60-2	µg/L	5,800	--	9,900	10
Carbazole	86-74-8	µg/L	85	--	--	10
Dibenzofuran	132-64-9	µg/L	--	--	7.9	5
Diethylphthalate	84-66-2	µg/L	5,500	--	15,000	5
Dimethylphthalate	131-11-3	µg/L	73,000	--	--	5
Di-n-butylphthalate	84-74-2	µg/L	880	--	900	5
Di-n-octylphthalate	117-84-0	µg/L	130	--	--	10
Hexachlorobenzene	118-74-1	µg/L	*1*	*1*	*0.0098*	5
Hexachlorobutadiene	87-68-3	µg/L	15	--	*0.14*	5
Hexachlorocyclo-pentadiene	77-47-4	µg/L	50	50	*0.041*	10
Hexachloroethane	67-72-1	µg/L	7.3	--	*0.33*	5
Isophorone	78-59-1	µg/L	770	--	78	5
Nitrobenzene	98-95-3	µg/L	*3.4*	--	*0.14*	5
N-Nitroso-di-n propylamine	621-64-7	µg/L	5	--	*0.011*	5
N-Nitrosodiphenylamine	86-30-6	µg/L	270	--	12	5
Phenol	108-95-2	µg/L	4,400	--	5,800	10

Notes:

[1]**0.2** = CRQL for 1,4-Dioxane by SIM

-- = No benchmark established

4.1 = Regulatory benchmark is not attainable by lowest achievable CRQL; accepted as analyte is not a primary contaminant of concern

Abbreviations:

µg/L = micrograms per liter
CAS = Chemical Abstracts Service
CLP = Contract Laboratory Program
CRQL = Contract Required Quantitation Limit
DWC = Drinking Water Criteria
EGLE = Michigan Departmnet of Environment, Great Lakes, and Energy
EPA = U.S. Environmental Protection Agency
MCL = Maximum Contaminant Limit
RSL = Regional Screening Level
SFAM = Superfund Analytical Method

Attachment C - Screening Levels
Groundwater

Analyte	CAS No.	Units	EGLE Residential Groundwater DWC	EPA Groundwater Primary MCL	EPA Tapwater RSL	CLP CRQL By SIM
Polyaromatic Hydrocarbons (SFAM01.1 SIM)						
1-Methylnaphthalene	90-12-0	µg/L	--	--	1.1	0.1
2-Methylnaphthalene	91-57-6	µg/L	260	--	36	0.1
Acenaphthene	83-32-9	µg/L	1,300	--	530	0.1
Acenaphthylene	208-96-8	µg/L	52	--	--	0.1
Anthracene	120-12-7	µg/L	43	--	1,800	0.1
Benzo(a)anthracene	56-55-3	µg/L	2.1	--	0.03	0.1
Benzo(a)pyrene	50-32-8	µg/L	5	--	0.025	0.1
Benzo(b)fluoranthene	205-99-2	µg/L	1.5	--	0.25	0.1
Benzo(g,h,i)perylene	191-24-2	µg/L	1	--	--	0.1
Benzo(k)fluoranthene	207-08-9	µg/L	1	--	2.5	0.1
Chrysene	218-01-9	µg/L	1.6	--	25	0.1
Dibenzo(a,h)anthracene	53-70-3	µg/L	2	--	0.025	0.1
Fluoranthene	206-44-0	µg/L	210	--	800	0.1
Fluorene	86-73-7	µg/L	880	--	290	0.1
Indeno(1,2,3-cd)pyrene	193-39-5	µg/L	2	--	0.25	0.1
Naphthalene	91-20-3	µg/L	520	--	0.12	0.1
Phenanthrene	85-01-8	µg/L	52	--	--	0.1
Pyrene	129-00-0	µg/L	140	--	120	0.1

Notes:
-- = No benchmark established
Abbreviations:
µg/L = micrograms per liter
CAS = Chemical Abstracts Service
CLP = Contract Laboratory Program
CRQL = Contract Required Quantitation Limit
DWC = Drinking Water Criteria
EGLE = Michigan Departmnet of Environment, Great Lakes, and Energy
EPA = U.S. Environmental Protection Agency
MCL = Maximum Contaminant Limit
RSL = Regional Screening Level
SFAM = Superfund Analytical Method
SIM = Selected Ion Monitoring

ATTACHMENT E

STANDARD OPERATING PROCEDURES

U.S. Environmental Protection Agency, Region 5
Field Quality Procedures

SUPERFUND AND EMERGENCY MANAGEMENT DIVISION
FIELD STANDARD OPERATING PROCEDURE

Groundwater Sampling Procedures

Effective Date	Number
5/13/2021	R5-SFD-0006-r0

Author

Name: Judy Canova, Geologist
Remedial Response Section #6
Remedial Response Branch #1

Signature/Date:

Review & Approvals

Name: Joan Tanaka, Chief
Remedial Response Branch #1
Superfund and Emergency Management Division

Signature/Date:

Name: Tim Fischer, Chief
Remedial Response Branch #2
Superfund and Emergency Management Division

Signature/Date:

REVISION/CHANGE HISTORY

The table below identifies changes to this controlled document and the respective effective date(s) over time.

Revision Number	History/Change Description	Document Author/Owner	Management Approver	Effective Date
0	New SOP	Judy Canova		5/13/2021

Table of Contents

1. PURPOSE 5
2. APPLICABILITY/SCOPE 5
3. DEFINITIONS/ACRONYMS 6
4. SUMMARY OF METHOD/PROCEDURE 10
5. PERSONNEL QUALIFICATIONS/RESPONSIBILITIES 11
5.1 Qualifications 11
5.2 Responsibilities 11
6. EQUIPMENT AND SUPPLIES 12
6.1 Groundwater and Well Depth Measurement Devices 12
6.2 Multiparameter Indicator Measurement Devices 12
6.3 Field Care of Purging Equipment 12
6.4 Peristaltic Pumps 12
6.5 Submersible Centrifugal Pumps 13
6.6 Bladder Pumps 13
6.7 Bailers 14
6.8 Inertial Pumps 14
6.9 Wells with In-Place Plumbing 15
6.10 Temporary Monitoring Wells 15
7. REAGENTS, STANDARDS, AND PRESERVATION 17
7.1 Calibration of Field Equipment 17
7.2 Preservation 17
8. HEALTH AND SAFETY CONSIDERATIONS 18
9. INTERFERENCES/SPECIAL CONSIDERATIONS 18
9.1 General Precautions 18
9.2 Volatile Organic Compounds (VOC) Analysis Considerations 18
9.3 Special Precautions for Trace Contaminant Groundwater Sampling 19
9.4 Turbidity Considerations 20
9.5 Filtering 20
9.6 Wells Purged to Dryness 21
9.7 Sample Handling and Preservation Requirements 22
9.8 Well Redevelopment 22
9.9 Handling of Investigation-Derived Waste 22

10. PROCEDURE 22
10.1 Purging 22
10.2 Parameter Stabilization Criteria 23
Table 1: Stabilization Criteria for Various Purging Methods 24
10.3 Multiple-Volume (Conventional) Purge 24
10.4 Low-Flow Method 25
10.5 Minimum-Purge and No-Purge Sampling 27
11. DATA AND RECORDS MANAGEMENT 29
12. QUALITY CONTROL & QUALITY ASSURANCE 29
13. REFERENCES and LINKS 29
References 29
Links 30
14. ATTACHMENTS 33
Table 2: Purge and Sample Strategies with Equipment Considerations 33
Table 3: Well Casing Diameter Volume Factors 34

1. PURPOSE

This document describes general and specific procedures, methods, and considerations to be observed at Region 5 Superfund sites when collecting groundwater samples for field screening or laboratory analysis.

2. APPLICABILITY/SCOPE

The procedures contained in this document apply when collecting and handling groundwater samples at NPL, SAA, and other remedial program Superfund sites in Region 5. Contractors may develop site-specific Standard Operating Procedures (SOP) for groundwater sampling, but the site-specific SOP must meet or exceed the requirements and components of this SOP. On the occasion that the Project Team determines that any of the procedures described are either inappropriate, inadequate or impractical and that another procedure must be used to obtain a representative groundwater sample, the variant procedure must be documented in the Field Sampling Plan (FSP) or Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP). Mention of trade names or commercial products in this operating procedure does not constitute endorsement or recommendation for use.

The three main types of groundwater sampling include: low-flow groundwater sampling, conventional well purging and sampling, and no-purge. Low-flow groundwater sampling methodology can yield representative results and is recommended at sites with wells having a short saturated-screen length (i.e. 10 feet or less) and/or for sites where vertical contaminant stratification in groundwater is not of concern. However, at sites where saturated screen lengths in wells are longer or a heterogeneous distribution of contaminants is suspected to be present, conventional well purging and sampling would typically be recommended to obtain a groundwater sample representative of the aquifer. No-purge sampling methods such as passive diffusion bags (PDBs), Hydrasleeve™, and Snap Sampling™ are appropriate for a reduced parameter list based on the capability of the method and sample volume requirements.

Bailing wells for purging and sampling is not recommended as the process disturbs the sample and introduces air into the water column. Collection of representative indicator parameter measurements, a potential key component in understanding aquifer geochemistry, is compromised as a result of bailing. The only wells that should be purged and/or sampled with a bailer include wells with a short water column, wells with construction precluding the use of a pump, or wells having a slow recharge rate that causes the well to dry out as a result of low-flow purging. Using a bailer is not an approved method for collection of a no-purge sample. Other no-purge methods may be used to collect representative samples under specific conditions described in this document. The groundwater sampling method proposed for the site should be described in the site-specific planning documents.

These methods are not recommended for sampling of wells containing non-aqueous phase liquid (NAPL). NAPL may foul sampling equipment, and the effect of NAPL on sample representativeness would be unknown. Results would reflect the amount of NAPL entrained in the sample which is unknown and cannot be controlled. If a well must be sampled that contains NAPL, the presence of NAPL should be documented and reported.

This document does not apply to direct NAPL sampling or groundwater sampling for Per- and Polyfluoroalkyl Substances (PFAS) or low-level mercury analyses. Extra precautions required for PFAS and low-level mercury, including specialized equipment and rigorous decontamination procedures, are beyond the scope of this document. Sampling groundwater for PFAS and NAPL will be addressed in future addenda.

3. DEFINITIONS/ACRONYMS

Abandonment	The process of permanently sealing and/or removing a well to prevent future use of the well and eliminate the potential for contaminated water to move from the ground surface into the aquifer or from one aquifer to another within the well screen.
ASB	Analytical Services Branch (of Laboratory Services Division)
Bailer	A manually operated portable grab sampler; a hollow cylindrical device used to remove and sample groundwater from a well.
BGS	Below Ground Surface, also Below Land Surface (BLS)
Bladder pump	A non-contact, positive displacement, pneumatically operated pump that uses compressed air to remove water from a well.
Blank	A sample of clean analyte-free water used to evaluate extraneous sources of contamination that may affect sample quality.
BTEX	Benzene, Toluene, Ethylbenzene, Xylene; Components of gasoline.
Chain of Custody	Chronological documentation of sample collection, custody, control, transfer, transport, and analysis.
CLP	Contract Laboratory Program
Direct-Push	A sampling device capable of collecting soil and groundwater samples from the subsurface without installation of permanent casing. One example is a **Geoprobe®.**
DMP	Data Management Plan
DNAPL	Dense non-aqueous phase liquid
DO	Dissolved Oxygen. The amount of gaseous oxygen (O2) dissolved in the water. Must be measured in a closed flow-through cell; Requires a pump for well purging and sampling.
Drawdown	Lowering of groundwater level in a well caused by purging; measured with a water-level meter.
FSP	Field Sampling Plan
Groundwater Sampling	The process of obtaining, containerizing, and preserving (when required) a groundwater sample after purging is complete.
HASP	Health and Safety Plan

HAZWOPER	Hazardous Waste Operations and Emergency Response. 40-hour training for site workers who may encounter toxic or hazardous chemicals at a site.
HDPE	High-density polyethylene
Hydrasleeve™	A no-purge grab sampling device used to manually collect a groundwater sample from a specified depth interval.
IDW	Investigation-Derived Waste. Waste resulting from investigations; pertaining to groundwater sampling this may include disposable PPE, purge water, decontamination fluids, and spent calibration fluids.
Indicator parameter	Field-measured parameters such as temperature, pH, conductivity, DO, ORP, and turbidity which may provide a general indication of water quality; may be used to evaluate purging completeness.
Inertia Pump	A mechanical pump that uses manual displacement of water to remove water from a well.
ITRC	Interstate Technology Regulatory Council
K	Measure of hydraulic conductivity (aquifer property) indicating the rate that water will enter a well from the aquifer.
LDPE	Low-density polyethylene
Low-flow sampling	A procedure for groundwater sample collection using techniques that minimize drawdown and mixing within the well screen allowing representative sampling.
ml	milliliter
MIBK	Methyl isobutyl ketone
Monitoring Well	A non-potable well, generally of small diameter, used to measure the groundwater elevation and/or water quality. A piezometer is one type of monitoring well.
MTBE	Methyl-tert-butyl ether
NAPL	Non-Aqueous Phase Liquid. A separate phase of chemical product that either floats on the water or sinks to the bottom of a well.
NPL	National Priority List (Superfund)
NTU	Nephelometric Turbidity Units
ORP	Oxidation-Reduction Potential. An electronic measurement – usually in millivolts (mV) – of the ability of a chemical substance to oxidize or reduce another chemical substance; a geochemical indicator that reflects whether

	groundwater is oxidizing or reducing. Must be measured in a closed flow-through cell; this requires a pump for well purging and sampling.
PDB	Passive Diffusion Bag. A passive sampling device capable of sampling a subset of VOCs.
Peristaltic pump	A suction lift pump; effective for pumping and sampling groundwater from wells provided depth to groundwater surface is 25' bgs or less.
PFAS	A group of perfluorinated compounds
Piezometer	A type of monitoring well typically used for groundwater elevation measurement. Depending on well construction, a piezometer may also be suitable for groundwater sampling**.**
PPE	Personal protective equipment
Purging	The process of removing stagnant water from a well, immediately prior to sampling, causing its replacement by groundwater from the adjacent formation that is representative of aquifer conditions.
QC	Quality Control
QMP	Quality Management Plan
Representative groundwater sample	A sample of groundwater definitively reflective of adjacent aquifer conditions.
SAA	Superfund Alternative Approach Site
Screen	The portion of a well which admits water to the well.
SOP	Standard Operating Procedure
Submersible pump	A pump that is lowered into groundwater for the purpose of removing water.
Snap Sampler®	A mechanical device that enable instantaneous groundwater sample collection from a selected interval in a well and permits sealing of the sample in the subsurface prior to retrieval.
SVOC	Semi-volatile organic compound
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan. A document that outlines procedures used and implemented to ensure that collected data meets project goals.
VOC	Volatile Organic Compound

Well	A bored, drilled or driven shaft, or a dug hole whose depth exceeds the diameter installed to reach underground water to supply, inject, extract or monitor groundwater.
Well development	The process of removing drilling fluids and fine particles from a well to allow water from the aquifer to freely enter the well.

4. SUMMARY OF METHOD/PROCEDURE

This procedure addresses a variety of methods that may be applicable, depending on site conditions, for collection of a groundwater sample representative of the surrounding aquifer. It includes no-purge sampling as well as low-flow and conventional well sampling methods. These methods may be appropriate for temporary and permanent wells as described within this document.

Purging is the process of removing stagnant groundwater from a well, immediately prior to sampling, causing its replacement by groundwater from the adjacent formation that is representative of aquifer conditions. Sampling is the process of obtaining, containerizing, and preserving (when required) a groundwater sample after purging is complete. There are several approaches to well purging and sampling that may be appropriate in various circumstances or for various combinations of available equipment. They are briefly summarized below and in Table 1 (see Attachment), Purge and Sample Strategies with Equipment Considerations.

The Low-Flow method involves purging the well at a relatively low flow rate (typically 100 – 500 milliliters per minute [ml/min]) which minimizes drawdown, with the pump or tubing inlet carefully lowered to a pre-determined zone within the screened interval of the well. The well is sampled when indicator parameters are stable, adequately low turbidity is achieved, and the water level is stable (an unchanging amount of drawdown). Refer to Section 10.2 for stabilization criteria. This method is often faster than Multiple-Volume Purge and generates less purge water. The method requires more skill and judgment on the part of the samplers. If the purge rate causes the water level to drop below the top of the well screen, or if the water level will not stabilize, then conversion to the multiple-volume purge method is required.

The Multiple-Volume Purge method involves removing a minimum of three well volumes and up to five well volumes of water from the top of the water column followed by sampling when the well has achieved stability of indicator parameters and adequately low turbidity. This is a traditional method and consistent results are generally obtained. A drawback is that large volumes of purge water may be produced for large diameter or deep wells, and handling and proper disposal of the purge water may be more difficult (see LSASDPROC-202).

The Multiple-Volume Purge method and the Low-Flow method can be considered equivalent for conventionally screened and filter-packed wells with screen lengths of ten feet or less in that they both sample a flow-weighted average of water entering the well during pumping. However, other variables can result in differences between results with the two methods. In aquifers that have stratified contamination and/or lithologic heterogeneity in the formation adjacent to the screened interval, low-flow sampling results may vary depending on the depth of the intake.

Screened intervals that exceed ten feet may produce different results if the low-flow intake is set at different depths within the screened interval. Longer well screens may exhibit substantial vertical variability in water quality. This can be tested by comparing equilibrium indicator parameters from different depth intervals within the well screen. In repeat sampling events, the sampling design should not change from one method to the other or from one intake depth to another without appropriate cause. The transition should be noted in the report.

Minimum-Purge and No-Purge sampling includes PDBs, the Snap Sampler®, or HydraSleeves™. The methods assume that water within the screened interval of the well is at equilibrium with the groundwater

in the surrounding aquifer. Direct no-purge samples using a bailer are not accepted in Region 5 as representative of groundwater quality but may be considered screening level groundwater quality data.

When stratification of contaminants is present, minimum-purge and no-purge methods are not recommended because horizontal flow or vertical flow conditions within the well may result in non-intuitive and deceptive groundwater quality results. The type of minimum or no-purge sampling should be documented in the site-specific planning document(s). Tabulated results from minimum or no-purge sampling should clearly indicate the sampling method. In selected cases, the methods might be used to gather screening-level data from wells, but the sampling results would not be considered representative without an approved detailed and supportive comparison study. Because Snap Samplers® and HydraSleeves™ have volume limitations, they may be used for groundwater sample collection for a variety of parameters. At sites where the suite of contaminants is limited to volatile organic compounds (VOCs) or a limited suite of other contaminants amenable to diffusion sampling, PDBs may be considered based on aquifer and well screened interval characteristics. It is possible to nest passive diffusion bags with a baffle to reduce vertical flow within the screened interval to perform vertical profiling of VOCs. These methods require that the well is allowed to re-equilibrate for an adequate period of time after the samplers are placed in the well. A comparison study is recommended using historical data trends when transitioning a well to a different sampling method to evaluate the results.

5. PERSONNEL QUALIFICATIONS/RESPONSIBILITIES

5.1 Qualifications

Field personnel should have adequate training and experience to follow successfully and safely the Field Sampling Plan (FSP) and the UFP-QAPP, including well purging, groundwater sampling, sample preservation shipping, field documentation, and chain of custody requirements. Inexperienced personnel should be supervised in the field by someone with adequate training and experience so that all samples are collected and handled properly. Successful completion of a 40-hour HAZWOPER and annual 8-hour refresher training is required for all field sampling personnel at Superfund sites. Completion of a course in Hazardous Waste Site Sampling is also recommended. Completed training is documented within the FSP or UFP-QAPP, following each organization's procedures

5.2 Responsibilities

Field personnel should be familiar with the site-specific UFP-QAPP and knowledgeable regarding the requirements of the sampling plan as they pertain to groundwater sampling and analysis. Sampling personnel should be familiar with the site-specific Health and Safety Plan (HASP), and one member of the team should be designated as the health and safety officer responsible for ensuring the applicable components of the HASP are implemented.

At least one member of the sampling team should be responsible for documentation pertaining to indicator measurements, water levels, and site conditions before and during well purging as well as logging sample times and creating proper labels for sample bottles. Documentation should also include any deviations from approved sampling protocol and rationale for the deviations.

The sampling team is responsible for sample collection in accordance with the FSP and UFP-QAPP and for proper sample shipping including packaging and chain-of-custody documentation.

6. EQUIPMENT AND SUPPLIES

6.1 Groundwater and Well Depth Measurement Devices

Water level measurements are typically performed prior to sampling. Water level meters are used to measure depth to groundwater. Well sounders or weighted measuring tape is used to measure total well depth when necessary for conventional well purging.

6.2 Multiparameter Indicator Measurement Devices

In accordance with the site-specific plans, calibrated field equipment such as Horiba™, or YSI™ flow through cells capable of measuring all indicator parameters required for well purging must be available and fully functional prior to the commencement of well purging where applicable.

6.3 Field Care of Purging Equipment

New plastic sheeting should be placed on the ground surface around the well casing to prevent contamination of the pumps, hoses, ropes, etc., in the event they accidentally come into contact with the ground surface. It is preferable that hoses used in purging that come into contact with the groundwater be kept on a spool or contained in a large wash tub lined with plastic sheeting, both during transportation and during field use to further minimize contamination by the transporting vehicle or the ground surface.

Careful consideration shall be given to using submersible centrifugal or bladder pumps to purge wells which are excessively contaminated with oily compounds as it may be difficult to adequately decontaminate severely contaminated pumps under normal field conditions. When wells of this type are encountered, alternative equipment, such as bailers or peristaltic pumps, should be considered.

Equipment choices are dictated by the purging and sampling method used, the depth to water, the quantity of water to be pumped, and quality considerations. The advantages and disadvantages of various commonly used pumps are discussed in the sections below and summarized in Table 1: Purge and Sample Strategies with Equipment Considerations (see Attachment). Additional information on the use of individual pumps can be found in the manufacturer's users guide.

6.4 Peristaltic Pumps

Peristaltic pumps are simple, inexpensive, and reliable equipment for purging and sampling where the limit of suction is not exceeded (approximately 25-30 vertical feet from the groundwater surface to the pump). When used for sampling, they should be equipped with new HDPE or Teflon® tubing for each well. The flexible peristaltic pump-head tubing should also be changed between wells.

Unless sampling for trace contaminants, the appropriate order of sampling with a peristaltic pump is generally to fill 40 ml VOC vials, followed by glass bottles for semi-volatile organic compounds (SVOCs) and associated analyses, and finally fill poly containers for metals and classical analyses. Trace contaminant sampling should follow the procedures described in Section 9.3.

The following are step-by-step procedures for use of a peristaltic pump with both multi-volume Purge and Low-Flow methods with minor differences in the collection of VOCs:

- Deploy the lower end of the tubing to the desired point in the well. This can be the top-of-water for the multi-volume purge method but must be mid-screen for the Low-Flow method. Connect the well tubing to the flexible pump-head tubing and connect a short piece of tubing from the pump-head tubing to a measuring bucket.

- Turn on the pump and establish a suitable pumping rate using a graduated container and a stopwatch. For the multi-volume purge method, the rate will be the rate that the well will sustain without elevating turbidity. For the low-flow method, the pump rate is typically established at a slower rate (100 -500 ml/min) to maintain a minimal and stable drawdown level during purging.

- Proceed with the measurement of indicator parameters and adjust the pump rate as needed to achieve low turbidity and stable drawdown.

- When the purging has been determined to be sufficient (i.e. the well is considered stabilized), fill sample containers directly from the pump outlet; there is no need to interrupt pumping. The tubing should be held at the opening of the container and should not touch the container during filling. Protect caps from dust and debris during filling. Make sure that the tubing leading into the well is secured against movement during the following operations.

- When sampling for VOCs, carefully screw the septum-lid to the vial and fasten firmly. Invert the VOC vial and tap on your knuckles to check for bubbles. Carefully add additional volume to the vial if necessary. Small bubbles are undesirable but may be unavoidable with some media, especially when using pre-preserved vials. Repeat the filling process for additional vials.

6.5 Submersible Centrifugal Pumps

Submersible centrifugal pumps are used in wells of 2-inch diameter and larger. They are especially useful where large volumes of water are to be removed or when the groundwater surface is a large distance below ground surface, however these pumps may be used for low-flow sampling if approved in the FSP or UFP-QAPP. Commonly used pumps are the Grundfos® Redi-Flo2, the Geotech® GeoSub, and the various ProActive® 'Monsoon' style pumps. Other pumps are acceptable if constructed of suitable materials.

The pump and tubing must be decontaminated between wells per the decontamination SOP in the approved FSP or UFP-QAPP. The pump should be equipped with a check valve to prevent water in the discharge tubing or hose from running back down into the well.

6.6 Bladder Pumps

Bladder pumps use a source of compressed gas to compress and release a bladder straddled by check valves within the pump body. As the bladder is compressed, water is expelled out the upper check valve to the surface. When gas pressure is released, the bladder refills as well water enters the lower pump inlet. A control unit is used to control the pressure and timing of the bladder inflation gas flow.

Bladder pumps are able to pump groundwater from moderate depths but are not typically capable of high flow rates. As they operate cyclically, the well is surged slightly on each cycle and it may be difficult to lower turbidity in sensitive or poorly developed wells. They are ideal for sampling VOCs because the entire sample train is under positive pressure and the pumps develop little heat.

Prior to sampling and between each well, non-dedicated pumps are cleaned internally and externally per the decontamination SOP in the FSP or UFP-QAPP and a new Teflon® bladder installed. New (or dedicated) Teflon® or HDPE sample tubing is used at each well, although polyethylene tubing can be used for the compressed gas drive line provided it is cleaned between each well.

6.7 Bailers

Bailers are a means of sampling when the Multiple-Volume Purge method is used and should only be used when no other sampling method is viable due to conditions such as small well diameter limiting the use of a pump or a depth to groundwater exceeding 25 feet bgs, precluding the use of a peristaltic pump. Other limitations that could possibly justify the use of a bailer is a short water column, for example less than 3 feet, such that the well cannot provide adequate water to a pump without drying out the well or the presence of dense non-aqueous phase liquid (DNAPL) at the well bottom targeted for direct sampling. Measurement of indicator parameters such as oxidation-reduction potential (ORP) and dissolved oxygen (DO) are not reliable when bailers are used for well purging, and conductivity may be elevated as a result of colloidal suspension. When used for sampling, a bailer can elevate turbidity in a well before all sample volume is collected, as a bailer will surge the well on each withdrawal. If not lowered carefully into the top of the water column, the agitation may also strip volatile compounds. Due to the difficulties and limitations inherent in their use, other sampling or purging means should generally be given preference.

Bailers should be Teflon, HDPE or stainless steel, with a closed top. Bailers should be used with an inert leader to prevent contact between haul rope and the groundwater sample. They are lowered gently into the top of the water column, allowed to fill, and removed slowly. It is critical that bailers be slowly and gently immersed into the top of the water column, particularly during final stages of purging and during sampling, to minimize turbidity and loss of volatile organic constituents.

If the well has previously been purged with a pump, there is likely stagnant water at the top of the well that was above the pump or tubing inlet. Several bailers of water should be retrieved and discarded to assure the upper stagnant water has been removed.

When sampling, containers are filled directly by pouring from the outlet at the top of the bailer. Some bailers have attachments that can be used to obtain samples from the bottom of the bailer, but caution must be taken to ensure minimal sample agitation and to prevent sample contact with PPE. Containers for metals analysis should be filled first in case the bailing process increases well turbidity. VOC vials should be filled carefully and slowly with a laminar flow to reduce agitation and the stripping of VOCs.

6.8 Inertial Pumps

Inertial pumps consist of a check valve which is affixed to the lower end of semi-rigid tubing. The tubing and valve are cycled up and down, allowing groundwater to alternately be drawn into the check valve inlet and then pulled up towards the surface. Two commonly used inertial pumps are the Waterra® pump for wells larger than 1 inch and the Geoprobe® Tubing Check Valve for small diameter wells. The primary use of these pumps is in well development where their near immunity to silt is an advantage. Inertial pumps should not be used for purging or for sampling as there is a low likelihood of reducing turbidity to appropriate levels and they have the potential to strip volatiles from the water column through agitation.

To set up the pump, the check valve is screwed onto the discharge tubing where it will cut its own threads. In the case of the Waterra® pump, a surge block can also be pressed onto the check valve. The pump is lowered into the well to the screened interval and rapidly cycled up and down a distance of 3 to12 inches. The stroke length and speed are adjusted for pumping effect. Electric actuators can be used to reduce the effort involved. The pump should be moved to different levels in the screen to surge the entire screen.

The pump can occasionally be lowered to the bottom of the well to vacuum out silt. Any silt that clogs the valve is usually quickly rinsed out by the pump cycling and if the clog remains the pump is easily retrieved and redeployed.

The surging activity is usually continued until turbidity is lowered to a measurable range and cannot easily be lowered further. Further development or purging is then conducted with other pumps.

6.9 Wells with In-Place Plumbing

Wells with in-place plumbing are commonly found at municipal water treatment plants, industrial water supplies, private residences, and in other applications. Many permanent monitoring wells at active facilities are also equipped with dedicated, in-place pumps.

A permanent monitoring well with an in-place pump may be treated as other monitoring wells without pumps. Since the in-place pump is generally mounted at a pre-selected depth, it cannot be moved up or down during purging and sampling. If the pump inlet is above the screened interval, the well should be sampled using the Multiple- Volume Purge method. If the pump intake is located within the screened interval, the well can be sampled using Low-Flow procedures, provided the well and pump can meet low-flow pumping criteria. Details of pump type and construction, tubing types, pump setting depths, and any other available information about the system should be recorded in the field logbook.

In the case of the other types of wells, e.g., municipal, industrial, and residential supply wells, there is typically not enough known about the construction aspects of the wells to apply the same criteria as used for monitoring wells. The volume to be purged in these situations depends on several factors: whether the pumps are running continuously or intermittently and whether any storage or pressure tanks are located between the sampling point and the pump. The following considerations and procedures should be followed when purging wells with in-place plumbing under the conditions described.

Wells with Continuously Running Pumps

If the pump runs more or less continuously, no purge (other than opening a valve and allowing it to flush for a few minutes) is necessary. If a storage tank is present, a spigot, valve or other sampling point should be found between the pump and the storage tank. If no valve is present, locate and use the valve closest to the tank. Measurements of field parameters are recorded immediately prior to the time of sampling.

Wells with Intermittently or Infrequently Running Pumps

If the pump runs intermittently or infrequently, best judgment should be utilized to remove enough water from the plumbing to flush standing water from the piping and any storage tanks that might be present. Often under these conditions, 15 to 30 minutes of purging will be adequate. Measurements of pH, specific conductance, temperature, and turbidity should be made and recorded at intervals during the purge and the final measurements made at the time of sampling should be considered the measurements of record for the event.

6.10 Temporary Monitoring Wells

General Considerations

As temporary wells are installed for immediate sample acquisition, the procedures used to purge temporary groundwater monitoring wells may differ from those for permanent wells. Temporary wells include a standard well screen and riser placed in a borehole created by hand augering or drilling, or they may consist of a drive rod and screen such as a direct-push Geoprobe® Screen Point that is driven into place at the desired sampling interval. As aquifer water enters the sampler immediately upon deployment,

the requirement to remove several volumes of water to replace stagnant water does not necessarily apply. It is important to note, however, that the longer a temporary well is in place and not sampled, the more stagnant the water column becomes and the more appropriate it becomes to apply standard permanent monitoring well purging criteria to achieve representative aquifer conditions in the sample.

Development of Temporary Wells

In cases where the temporary well is to be sampled immediately after installation, purging is conducted primarily to mitigate the impacts of installation. In most cases, temporary well installation procedures disturb the existing aquifer conditions, causing extreme turbidity. The goal of purging is to reduce the turbidity and remove the volume of water in the area directly impacted by the installation procedure.

The following method has been found to be effective in developing and sampling small diameter temporary wells where a peristaltic pump can be used. Turbidity can generally be lowered to 50 Nephelometric Turbidity Units (NTU) at the time of sampling, and turbidity less than 5 NTU is often achieved.

- Cut peristaltic tubing to reach to the bottom of the well. Connect to a peristaltic pump and begin pumping at a high rate.
- Use the tubing to remove sediment from the bottom of the well.
- Aggressively surge the end of the tubing in the screened interval by cycling the tubing rapidly up and down. Periodically repeat surging and removal of sediment from the well bottom.
- When a substantial decrease in turbidity is observed, cease surging the well and begin lowering the pumping rate.
- When the water clears, (turbidity < 100-200 NTU) begin raising the end of the tubing to the top of the water column.
- Continue purging from the top of the water column, lowering the pump speed as required to lower turbidity. When adequately low turbidity and stable indicator parameters have been achieved, sampling can proceed.

When the water level is below the limit of suction in a small diameter temporary well, a Geoprobe® mechanical bladder pump can be used for purging and sampling. The well should first be developed with an inertial pump to remove the bulk of silt and suspended particles that could clog the check valves of the bladder pump. The inertial pump is used to remove sediments from the bottom of the well and surged in the screened interval until lower turbidity is observed prior to deployment of the bladder pump. Since the mechanical bladder pump requires cumbersome redeployment to change its pumping level, it should be deployed low enough in the water column that the water level will not be lowered below the pump during purging and sampling. The mechanical bladder pump is generally deployed above the screened interval to facilitate the settling of particles, but below the top of the water column to alleviate the need to reset the pump. Detailed instructions on the deployment of the pump can be found in *Pump Operation* (SESDGUID203).

Any type of contamination that can absorb onto colloidal or sediment particles may be entrained into the sample when temporary wells are employed, such as metals or PAHs, yielding a sample that is not

representative of aquifer conditions. As a result, professional judgement must be used when reviewing data obtained via temporary wells, considering turbidity effects.

Decommissioning of Temporary Wells

When a temporary well is no longer needed, it should be properly decommissioned in a manner similar to permanent wells. Decommissioning of wells must follow the SOP in the FSP or UFP-QAPP. In general, the casings and screens can be easily removed, and the borehole should then be pressure grouted from the bottom of the original borehole to ground surface to prevent surface contamination of the aquifer, cross-connection of aquifers, and to remove a potential vapor pathway.

Direct-push screen-point wells may be decommissioned by one of two methods:

- A disposable screen is used. The sampling sheath is pulled off the screen and a 30% solids bentonite grout is pumped down the tool string as the rods are withdrawn; or
- The screen is removed with the sampler sheath and tool string. The hole is immediately re-entered with an empty sample sheath with disposable point. Upon reaching the original total depth of the temporary well, 30% solids bentonite grout is pumped down the tool string with the pumped volume monitored during tool string withdrawal to assure that the hole is completely filled.

Grout volumes are measured during pumping to assure that the hole is completely filled. The disposable screen is left behind at the bottom of the borehole.

Other Considerations for Direct-Push Groundwater Sampling

With certain direct push sampling techniques, such as the Hydropunch™ and other discrete samplers used with cone-penetrometer rigs, purging is either not practical or not possible. The sampling device is simply pushed or driven to the desired depth and opened, whereupon the sample is collected and retrieved. As a result, some samples collected in this way may not be satisfactory or acceptable for certain analyses, i.e., the sampler may collect a turbid sample inappropriate for metals analyses or the sample may have inadequate volume.

7. REAGENTS, STANDARDS, AND PRESERVATION

7.1 Calibration of Field Equipment

Each day prior to the commencement of well purging, field equipment shall be calibrated using calibration standards pertinent to the analyses performed in accordance with manufacturers guidelines and procedures. Calibration fluids shall be properly maintained and disposed and shall not be expired. Calibration of field equipment should be documented in a calibration log in accordance with the site-specific FSP or UFP-QAPP.

7.2 Preservation

After sample collection, all samples requiring preservation (both chemical and temperature) must be preserved as soon as practical. Follow the laboratory's sample requirements for the correct preservative to use. Special preservatives may be required for samples with chlorinated compounds. If chlorinated compounds are anticipated to be present in the sample, please check with the laboratory to determine appropriate sample preservation reagents. All samples preserved using a pH adjustment (except VOCs) must be checked, using pH strips, to ensure that they were adequately preserved in the field before shipping to the laboratory. This is done by pouring a small volume of sample over the strip. Do not place the pH strip in the sample.

Samples requiring reduced temperature storage should be placed on ice immediately.

8. HEALTH AND SAFETY CONSIDERATIONS

Proper safety precautions must be observed when collecting groundwater samples. Refer to the pertinent site-specific HASP for safety precautions. The sampling team should be aware of any chemicals that pose specific toxicity or safety concerns and follow any other relevant safety requirements, as appropriate.

9. INTERFERENCES/SPECIAL CONSIDERATIONS

9.1 General Precautions

The following precautions should be considered when collecting groundwater samples:

- Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.
- Always sample in order of anticipated contamination from the least to the most contaminated location. This reduces the potential impact of cross-contamination during sampling. When contaminant distribution is unknown, begin with wells upgradient of likely contaminant source(s), continue with downgradient wells, and finish with wells in or closest to suspected contaminant source(s).
- Shipped samples shall conform to all U.S. Department of Transportation (DOT) rules of shipment found in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179), and/or International Air Transportation Association (IATA) hazardous materials shipping requirements found in the current edition of IATA's Dangerous Goods Regulations.

9.2 Volatile Organic Compounds (VOC) Analysis Considerations

Groundwater samples for VOC analysis must be collected in 40 ml glass vials with Teflon® septa. The vial may be either chemically pre-preserved with concentrated hydrochloric acid to a pH<2 or they may be chemically unpreserved. Preserved samples have a two-week holding time, whereas unpreserved samples have a maximum of a seven-day holding time. In most cases, chemical preservation is used to take advantage of the extended holding time. Regardless of chemical preservation, all VOC vials must be maintained on ice or refrigerated on-site until the samples are shipped to the laboratory.

In some situations, however, it may be necessary to use chemically unpreserved vials. For example, if the groundwater has a high amount of dissolved limestone, i.e., is highly calcareous, there will likely be an effervescent reaction between the hydrochloric acid and the water, producing large numbers of fine bubbles rendering the sample unacceptable. In this case, samples shall be collected in chemically unpreserved vials, and arrangements should be confirmed with the laboratory to ensure that they can meet the shorter sample holding times. Selected target compounds may be destroyed by the acid preservative or have a shorter holding time and require unpreserved vials. Always check with the laboratory for specific preservation, vial requirements, and holding times.

The samples should be collected with as little agitation or disturbance as possible. For this reason, submersible or bladder pumps are the preferred method of purging and sampling for VOCs, although peristaltic pumps may be used in conjunction with the soda-straw method for VOC sampling as described further in Section 9.3.

Care should be taken not to flush any preservative out of the vial during filling or topping off. The vial should be filled so that there is a meniscus at the top of the vial and no bubbles or headspace should be present in the vial after it is capped. After the cap is securely tightened, the vial should be inverted and carefully tapped to check for any undetected bubbles.

If a bubble or bubbles are present, the vial should be topped off using a minimal amount of sample to re-establish the meniscus. If, after topping off and capping the vial, bubbles are still present, a new vial should be obtained, and the sample re-collected.

9.3 Special Precautions for Trace Contaminant Groundwater Sampling

- Sampling equipment must be constructed of Teflon® or stainless-steel materials. Bailers and pumps should be of Teflon® or stainless-steel construction throughout.
- When tubing is required, new Teflon® tubing or HDPE must be used at each well. Tubing dedicated to a particular well may be reused, either after decontamination or storage in the well between sampling events. Reuse of dedicated tubing is permissible provided there is no evidence of tubing degradation or discoloration. The condition of dedicated tubing should be evaluated and documented for each well at each sampling event. If dedicated tubing is replaced, this should be documented and reported. Tubing should not be reused when early sampling events report high concentrations of contaminants.
- A clean pair of new, non-powdered, disposable gloves will be worn each time a different location is sampled, and the gloves should be donned immediately prior to sampling. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised.
- Sample containers for samples suspected of containing high concentrations of contaminants shall be stored and shipped separately from containers with suspected low or moderate concentrations of contaminants.
- If purging and sampling devices are to be reused, sample collection activities shall proceed progressively from the suspected least contaminated area to the suspected most contaminated area. Samples of waste or highly contaminated media must not be placed in the same cooler as environmental (i.e., containing low contaminant levels) or background samples.
- If possible, one member of the field sampling team should take all the notes and photographs, fill out tags, etc., while the other members collect the samples.
- Clean plastic sheeting should be placed on the ground at each sample location to prevent or minimize contaminating sampling equipment by accidental contact with the ground surface.
- Samplers must use new, certified-clean disposable or non-disposable equipment and bottle ware prepared according to EPA-approved procedures similar or equivalent to *ESD Operating Procedure for Field Equipment Cleaning and Decontamination* (LSASD-PROC--205 or ASBPROC-206).
- Samples for trace organic analyses should not be exposed to the flexible peristaltic pump-head tubing, both due to the risk that the tubing would sorb contaminants and the propensity of this tubing to contribute organic compounds to the sample. Samples can be collected without contact with the pump-head tubing by the use of vacuum transfer caps for analyses requiring 1-liter glass containers and the use of the ‘soda straw’ method for the filling of VOC vials.

Soda Straw Method for VOC sampling with Peristaltic Pump

- Create a crimp in the well tubing approximately one foot from the pump and grasp the crimped tubing in one hand. It is generally most effective to create a double ‘Z’ crimp.
- Cut the sample tubing between the crimp and the pump. The tightly held crimped tubing should keep water from running back into the well. Slowly remove the tubing from the well and coil it in one hand in loose coils. With the top end of the tubing blocked, water is retained in the tubing as it is withdrawn, much as in a capped soda straw, hence the name for this method.
- Place the free end (not crimped) of the tubing into the VOA sample vial.

- Very slowly release the 'Z' crimp in the sample tubing and gradually fill the VOC vial.
- Move the free end of the tubing to any additional bottles and repeat the filling process.
- Fill additional vials as needed. Be sure that any water that has contacted the flexible peristaltic tubing is not pumped into a vial.
- When a peristaltic pump is used for sampling, VOCs should be last to be collected because the soda straw method may cause an increase in turbidity in the well as the tubing is removed from the well. For this reason, the sample containers for the more turbidity-sensitive analyses should be filled first, as filling the VOC vials may disturb the well and increase turbidity.
- Avoid partially filling vials as the available water in the tubing is used. If more volume is required than that contained in the tubing, purge the remaining water from the tubing and reinsert the tubing in the well to the level marked previously. Run the pump to refill the tubing. If performing Low-Flow sampling, run additional volume through the pump to purge any water that may have been collected from the stagnant water column.
- All sampling equipment, including pumps, bailers, water level measurement equipment, etc., contacting the water in the well must be cleaned in accordance with the cleaning procedures described in the FSP or UFP-QAPP, equivalent to or exceeding LSASD-PROC205. Pumps should not be used for sampling unless the interior and exterior portions of the pump and the discharge hoses are thoroughly cleaned. Rinse blank samples must be collected to verify the adequacy of cleaning when using a sampling pump other than a peristaltic pump.

9.4 Turbidity Considerations

In many situations when sampling permanent or temporary monitoring wells, sufficiently low turbidity is difficult to achieve and maintain. Removal and insertion of equipment after the purge or during sampling may negate the low turbidities achieved during purging and elevate turbidity back to unacceptable levels. For this reason, it is important that special efforts be used to minimize any disturbance of the water column after purging and to fill sample containers for metals analysis first.

9.5 Filtering

As many contaminants are known to sorb to soil particles, the normal goal of sampling is to reduce the presence of these particles (measured by turbidity) in order that the dissolved concentration of contaminants can be obtained. However, transport of sorbed contamination on colloidal particles can be a means of contaminant transport at some sites. For this reason, the EPA Region 5 approach is to reduce turbidity through the careful purging of wells instead of filtering samples.

As a standard practice, groundwater samples should not be filtered for routine analysis. Filtering should only be performed to determine the fraction of major ions and trace metals passing the filter for the purpose of geochemical speciation modeling. Filtration is not acceptable to correct for improperly designed or constructed monitoring wells, inadequate well development, inappropriate sampling methods, or poor sampling technique.

When samples are collected for routine analyses and are filtered, both filtered and non- filtered samples shall be submitted for analyses. Samples for organic compounds analysis should not be filtered. Prior to filtration of the groundwater sample for any reason other than geochemical speciation modeling, the following criteria must be demonstrated:

- The monitoring wells, whether temporary or permanent, have been constructed and developed in accordance with *Design and Installation of Monitoring Wells* (SESD-GUID101-R1).

- The groundwater samples were collected using sampling techniques in accordance with this section, and the groundwater samples were analyzed in accordance with the FSP or UFP-QAPP; and
- Efforts have been undertaken to minimize any persistent sample turbidity problems. These efforts may consist of the redevelopment or re-installation of permanent groundwater monitoring wells or the implementation of carefully conducted low-flow rate sampling techniques.

Potential differences can result from variations in filtration procedures used to process water samples for the determination of trace element concentrations. A number of factors associated with filtration can substantially alter "dissolved" trace element concentrations; these include filter pore size, filter type, filter diameter, filtration method, volume of sample processed, suspended sediment concentration, suspended sediment grain-size distribution, concentration of colloids and colloidally-associated trace elements, and concentration of organic matter. Therefore, consistency is critical in the comparison of short-term and long-term results.

If filtration is necessary for purposes of geochemical modeling or other pre-approved cases, the following procedures are suggested:

- Accomplish in-line filtration using disposable, high capacity filter cartridges (barrel-type) or membrane filters in an in-line filter apparatus. The high capacity, barrel-type filter is preferred due to the higher surface area associated with this configuration. If a membrane filter is utilized, a minimum diameter of 142 millimeters is suggested.
- When using pumps for sampling, the filter can generally be attached directly to the pump outlet. When sampling with a bailer or when otherwise required, an initial unfiltered sample with extra volume will be collected, and a peristaltic pump with filter used to decant and filter the sample to the final sample container.
- Use a 0.45-micron (µm) pore-size filter to remove most non-dissolved particles. A 5 µm or 10 µm pore-size filter should be used for the purpose of determining colloidal constituent concentrations.
- Saturate the filter with approximately one additional volume prior to filling sample bottles.

Please see Section 13, References, for additional documents pertaining to filtration for metals analysis.

9.6 Wells Purged to Dryness

In some situations, even with slow purge rates, a well may be purged dry. In these cases, the well should be sampled immediately upon recovery of adequate volume for sampling. The field parameters should be measured and recorded at the time of sample collection as the measurements of record for the sampling event. If no recovery has occurred within 24 hours, the well should be noted as dry. Field notes and reporting should clearly indicate the wells that were purged to dryness, the time dry conditions were encountered, and the time the sample was collected. Because of available groundwater volume limitations, it may be necessary to target specific analytes depending on the primary contaminants of concern and thereby eliminate sample collection for lower priority analytes. Selection of priority analytes should be proposed and planned in advance for wells that typically have difficulty producing adequate water.

Sampling under these conditions is not ideal and suitable qualifications of the data should be included in the report. Water cascading down the screen into the well may strip volatile compounds and elevate turbidity. No-Purge sampling methods such as Hydrasleeve™, Snap Samplers®, or PDBs may prove useful for these wells depending on the volume or water available and desired analytes.

9.7 Sample Handling and Preservation Requirements

For detailed guidance and procedures on sample handling and management, refer to CLP Guidance to Field Samplers.

- Groundwater samples will typically be collected from the discharge line of a pump or from a bailer. Efforts should be made to minimize sample agitation.
- During sample collection, make sure that the pump discharge line or the bailer does not contact the sample container.
- Place the sample into appropriate, labeled containers. Samples collected for VOC analysis must be collected without headspace. A small amount of headspace is acceptable in all other sample containers. All labels must minimally contain the sampling location, the sample identification number, the date of sampling, the time of sampling, and the preservation.
- All samples requiring chemical preservation must be preserved as soon as practically possible, ideally immediately at the time of sample collection, and prior to shipping.
- Except for VOCs, the target pH must be verified in the field using pH paper or a calibrated pH probe when adding chemical preservatives. If additional preservative is needed, it should be added to achieve adequate chemical preservation. Preservation requirements for groundwater samples are found in the most current CLP Guidance for Field Samplers for samples being shipped to a CLP lab, the ASB sample requirements table for samples being shipped to the regional lab for analysis, or the receiving laboratory.
- Sample containers should be placed in an ice-filled cooler immediately after filling. Ice in coolers should be in double zip-lock bags with minimal pooled water and the cooler should be periodically checked and replenished to maintain sample storage temperature. Each cooler must have a temperature check bottle.

9.8 Well Redevelopment

Wells may be encountered that are difficult to sample effectively due to inadequate initial development or the need for redevelopment due to scaling, sedimentation, corrosion, or biofouling. These wells may produce water only at low flow rates or water with chronically elevated turbidity. Redevelopment of these wells should be considered as the process can improve sample quality and speed field operations. Well development procedures are included in the FSP or UFP-QAPP and should meet or exceed procedures presented in *Design and Installation of Monitoring Wells* (SESDGUID-101-R1).

9.9 Handling of Investigation-Derived Waste

Purging and field cleaning of equipment generates liquid investigation derived waste (IDW), the disposition of which must be considered. Handing of IDW must follow the SOP in the FSP or UFP-QAPP.

10. PROCEDURE

10.1 Purging

Wells are purged to eliminate stagnant water residing in the casing and/or screen that has undergone geochemical changes or loss of VOCs. At the conclusion of purging, the desired flow-weighted average of water entering the well under pumping conditions will be available for sampling. Turbidity is often elevated during purging by the disturbance of formation materials at the borehole walls. As many contaminants (metals and many organics) will sorb to the formation particles, a sample including these particles will not represent the dissolved concentrations of the contaminants. Thus, a secondary goal of

purging is to reduce the turbidity to the point that the sample will represent the dissolved concentration of contaminants.

In order to determine when a well has been adequately purged, field investigators should always monitor and report the pH, specific conductance and turbidity of the groundwater as it is removed, and the volume of water removed during purging. If low-flow purging is conducted or purging is performed with a pump, a closed flow-through cell should be used to measure these parameters in addition to DO and ORP. The measurements should be recorded in a purge table in the field logbook that includes the date, sampler name, start time of purging, the parameter measurements at intervals during purging along with the time of each measurement, estimated pumped volumes, flow-rate, depth to water, and any notes of unusual conditions or deviations from standard procedures. The depth to water in the well should be reported each time indicator parameters are measured and reported during low-flow purging.

Bailers and inertia pumps introduce turbidity and atmospheric oxygen into the well water column thereby negatively impacting data quality and bringing sample representativeness into question. DO and ORP measurements collected during well purging with a bailer or inertia pump are not representative and should not be reported. A bailer or inertia pump may be employed when the diameter of the well is too small for a conventional pump and the water level is too deep for use of a peristaltic pump. The rationale for use of a bailer or inertia pump for purging or sampling at any well should be included in the site-specific planning documents.

10.2 Parameter Stabilization Criteria

With respect to the groundwater chemistry, an adequate purge is achieved when the pH and specific conductance and groundwater has stabilized. Stabilization occurs when, for at least three consecutive measurements, the pH remains constant within 0.1 Standard Unit (SU), the specific conductance varies no more than 5 percent, and the turbidity is at or below 10 NTU, preferably 5 NTU or less. Other parameters, such as DO or ORP, may also be used as a purge adequacy parameter. If these parameters are consistently trending in one direction during purging, a slight trend reversal may suggest equilibrium conditions have been achieved. Normal stability goals for DO are 0.2 milligrams per liter (mg/L) or 10% change in saturation, whichever is greater. DO and ORP measurements must be conducted using a flow-through cell to minimize oxygenation of the sample during measurement. A reasonable ORP stability goal is a range of 20 millivolts (mV), although ORP is rarely at equilibrium in environmental media and often will not demonstrate enough stability to be used as a purge stabilization parameter. However, when an evaluation of the aquifer geochemistry is needed, purging until ORP stabilizes would be required to obtain an ORP representative of aquifer conditions.

Indicator parameters should be at least 5-10 minutes apart when evaluating well stabilization during low-flow purging and sampling. Measurements recorded at frequent intervals (less than 5-10 minutes) during low-flow purging rates can falsely indicate stability of parameters. Several measurements should be made early in the well purge to establish the direction and magnitude of trends, which can then inform the stability decision. In general, stability parameters should either be not trending or asymptotic when a stability determination is made. The following table summarizes stabilization criteria that should be met three consecutive times during well purging prior to initiation of groundwater sampling:

Table 1: Stabilization Criteria for Various Purging Methods

Purging Method	pH	Conductivity	Turbidity	DO (optional)	ORP (optional)	Drawdown (water level change)
Low-flow	0.1	3%	10% or <10 NTU	0.2 mg/l or 10% saturation	10 mV	<0.1 ft
3-5 well volume with Pump	0.1	5%	<10 NTU	0.2 mg/l or 10% saturation	20 mV	N/A
Bailer and inertia pumps	0.1	5%	<10 NTU	N/A	N/A	N/A

Because the measured groundwater temperature during purging is subject to changes related to surface ambient conditions and pumping rates, its usefulness is subject to question for the purpose of determining parameter stability. As such, it has been removed from EPA Region 5's list of parameters used for stability determination. Even though temperature is not used to determine stability, it is still advisable to record the temperature of purge water as it is often used in the interpretation of other parameters. Information on conducting the stability parameter measurements is available in the SESD Operating Procedures (See Links in Section 13) for *Field pH Measurement* (SESDPROC-100*), Field Specific Conductance Measurement* (LSASDPROC-101), *Field Temperature Measurement* (SESDPROC-102), *Field Turbidity Measurement* (SESDPROC-103), *Field Measurement of Dissolved Oxygen* (SESDPROC-106-R4) and *Field Measurement of Oxidation-Reduction Potential* (SESDPROC-113-R2).

10.3 Multiple-Volume (Conventional) Purge

In the traditional Multiple-Volume Purge method, water is removed from the top of the water column, causing water to enter the screen and flush stagnant casing water upward to be subsequently removed. In recognition of the mixing of fresh and stagnant water in the casing section, a minimum of three well volumes must be removed unless the well is purged to dryness. If parameters have stabilized after removal of three well volumes, purging can be terminated, and samples should be collected immediately. If required to achieve stabilization, four or five well volumes may be removed prior to sample collection. Wells can be assumed to be adequately purged when five well volumes have been removed, although further purging may be conducted to meet specific goals, such as further reduction of turbidity.

Purge Volume Determination

Prior to initiating the purge, the amount of water standing in the water column (water inside the well riser and screen) should be determined. The diameter of the well is determined and the water level and total depth of the well is measured and recorded prior to inserting a pump or tubing into the well. The water level is subtracted from the total depth, providing the length of the water column. Specific methodology for obtaining these measurements is found in the Operating Procedure for *Groundwater Level and Well Depth Measurement* (SESDPROC-105-R2).

Once this information is obtained, the volume of water to be purged can be determined using one of several methods. The well volume can be calculated using the equation:

$$V = 0.041\ d^2h$$

Where:

h = length of water column in feet

d = diameter of well in inches

V = one well volume in gallons

Alternatively, the volume of standing water in the well and the volume of three water columns may be determined using a casing volume per foot factor for the appropriate diameter well, see Table 2 (Attachment) Well Casing Diameter Volume Factors. The water column length is multiplied by the appropriate factor in the Table 2 to determine the single well volume, three well volumes, or five well volumes for the well in question.

An adequate purge is normally achieved when three to five well volumes have been removed. The field notes should reflect the single well volume calculations or determinations, according to one of the above methods, and a reference to the appropriate multiplication of that volume, i.e., a minimum three well volumes, clearly identified as an initial purge volume goal.

Pump Intake Placement

For multiple-volume purging, the pump or tubing inlet should be located at the top of the water column. If the pump is placed deep into the water column, the water above the pump may not be removed, and the subsequent samples, particularly if collected with a bailer, may not be representative of the aquifer conditions. If the recovery rate of the well is faster than the pump rate and no observable draw down occurs, the pump should be raised until the intake is as close as possible to the top of the water column for the duration of purging. If the pump rate exceeds the recovery rate of the well, the pump or tubing will have to be lowered to accommodate the drawdown.

Stability of Chemical Parameters

In the multiple-volume purge method, a stability determination may be made after three well volumes have been removed. If the chemical parameters have not stabilized according to the above criteria, additional well volumes (up to a total of five well volumes) should be removed. If the parameters have not stabilized after the removal of five well volumes, it is at the discretion of the project leader whether or not to collect a sample or to continue purging. If, after five well volumes, pH and conductivity have stabilized and the turbidity is still decreasing and approaching an acceptable level, additional purging should be considered to obtain the best sample possible.

Conventional Purging Sample Collection

There are several means by which sampling can proceed after adequate volume has been purged and indicator parameters have stabilized. If a submersible pump and tubing are of suitable material and cleanliness for sample collection, sampling can proceed immediately by directly filling bottles from the tubing outlet. Commonly with the multiple-volume purge method, the pump is set up and cleaned in a manner suitable only for purging. In these cases, the pump is stopped and removed from the well and sampling proceeds with a bailer per the procedure described in Sections 6.5 and 9.7. The pump should have a check valve to prevent water in the pump tubing from discharging back into the well when the pump is stopped. If a peristaltic pump is used, sampling can proceed as described in Section 6.3.

10.4 Low-Flow Method

This method involves placing the pump or tubing inlet within the screened interval of the well and purging at a low enough rate (i.e. below 500 ml/min, below 100 ml/min for VOCs) to achieve stable

drawdown and minimal depression of the water level. The well is sampled without interruption after field parameters are stable and low turbidity is achieved. In general, only water in the screened interval of the well is pumped and the stagnant water in the well casing above the screen is not removed. Wells can generally be sampled in less time with less purge volume than with the multi-volume purge method. More attention is required in the assessment of stability criteria than the multi-volume method.

Nomenclature

A variety of terminology has been used to describe this method by EPA Region 5 and others, including: 'low flow', 'low-flow/low-volume', 'tubing-in-screen method', 'low flow/ minimal drawdown', and 'micropurge'. The current preferred EPA Region 5 terminology for this method is 'Low-Flow'.

Placement of Pump Tubing or Intake

For wells with short screened intervals and groundwater occurrence above the top of the well screen, the inlet of the pump tubing or intake of the submersible pump is placed in the approximate mid-portion of the saturated screened interval of the well. While it is often thought that particular aquifer zones can be targeted by specific pump or intake placement, for short-screened and filter-packed monitoring wells, the zone monitored is only weakly dependent on the intake placement (Varljen, Barcelona, Obereiner & Kaminski, 2006). However, this impact becomes potentially more significant for wells with longer screens and needs to be considered and evaluated during sampling design.

Confirmation that the water level in the well is at or above the top of the screen should be completed before determining the appropriate depth of the pump intake interval. The pump or tubing can be placed by carefully lowering them to the bottom of the well and then withdrawing half of the screen length, plus the length of any sump sections at the bottom of the well assuming the screened interval is fully saturated. A drawback of this approach is that it may stir up sediment at the well bottom. An alternate approach is to lower the pump or tubing a measured distance to place it at mid-screen without touching the bottom of the well. In the case of pumps, special care should be used in lowering them slowly, especially in the screened interval, to prevent elevating turbidity needlessly by the surging action of the pump.

Drawdown during Pumping

Prior to initiation of pumping, a properly decontaminated well sounder should be lowered into the well to measure the water level prior to and during the purging process. Ideally, there should be only a slight and stable drawdown of the water column after pumping begins. In some cases, it will be necessary for the well to drawdown a considerable distance (10 ft or more in extreme cases) to maintain a minimal usable pumping rate for sampling (100 ml/min is ideal for VOCs). Excessive pumping rates and drawdown can result in increased turbidity, or aeration of the sample if the screen is exposed. Stable drawdown is an essential condition of the Low-Flow method. If a stable drawdown condition cannot be met, then a multiple well-volume purge should be employed. If the initial water elevation is above the screen and the water level changes such that the top of the water table is within the screened interval, a multiple well volume purge and sample approach should be used. Field data information sheets should indicate the depth to the top of the screen and the depth to groundwater during well purging in addition to other indicator parameters.

Stability of Chemical Parameters

As with the Multiple-Volume Purging method described, it is important that all indicator parameters be stable prior to sampling. It is common for wells to require the removal of one of more screened-interval volumes (~2 gal for a 10 ft screen in a 2" dia. well) to achieve stability. Although it is possible for wells to achieve stability with lower purge volumes, the sampler should exercise caution in making an early stability determination. If a trend is noted in an indicator parameter, particularly ORP or DO, the sampler

may choose to continue purging until the trend discontinues if a representative DO or ORP measurement is desired. If indicator parameter stability cannot be achieved using low-flow pumping, conversion to a three-to-five well volume purge prior to sampling may be necessary to collect a more representative groundwater sample.

Sample Collection

Low-Flow sampling is implemented using a suitable pump and tubing including a peristaltic, bladder, or submersible pump and teflon or HDPE tubing. After making the determination of parameter stability with stable drawdown, sampling can proceed immediately. Where submersible or bladder pumps are used, sampling can proceed by directly filling bottles from the tubing outlet. Where peristaltic pumps are used, sampling can proceed per the procedure described in Section 10.5.

10.5 Minimum-Purge and No-Purge Sampling

The underlying assumption when employing these methods is that the water within the well screen is equilibrated with the groundwater in the associated formation. This assumption should be demonstrated prior to use of these methods or the results should be qualified.

These methods are generally impractical to implement in early investigative phases because of the common lack of hydrogeological and water quality information. The necessity with some methods that the samplers be pre-deployed to allow equilibration should be considered along with an evaluation of the applicability of the sampling method with respect to the contaminants that could be present at the site. These methods are not advisable if the complete suite of contaminants present in groundwater is not known.

Vertical flow conditions and stratification of the water column have also been known to result in deceptive and non-intuitive analytical results. The use of these methods in the early phases of investigation can easily result in misinterpretation of site conditions and plume boundaries.

Particular caution is in order in the use of these methods when any of the following conditions exist:

- Low hydraulic conductivity (K<10-5 cm/sec)
- Low groundwater surface gradients
- Fractured bedrock
- Wells with long screened intervals (>10’)
- Wells screened in heterogeneous materials of varying hydraulic conductivities
- Wells in areas where contamination is thought to be stratified

If it is desired to transition a long-term monitoring program to Minimum-Purge or No- Purge sampling, a pilot study should be conducted where the Minimum-Purge or No- Purge sample results are compared to the conventional methods in use. Multiple samplers may be deployed in the screened interval to help establish appropriate monitoring intervals.

Several Minimum-Purge or No-Purge procedures that might be employed are shown below. It is not the intention to recommend particular equipment or vendors, and other equipment that can accomplish the same goals may be suitable.

Passive Diffusion Bags (PDB)

The no-purge PDB typically consists of a sealed low-density polyethylene (LDPE) bag containing deionized water. They are deployed in the screened interval of a well and allowed to equilibrate, commonly for two weeks, prior to retrieval and decanting of the water into sample containers. This

sampling method is limited to a subset of volatile organic compounds. Many volatile organic compounds will reach equilibrium across the LDPE material, including benzene, toluene, ethylbenzene, and xylene (BTEX) compounds and many chlorinated solvents. Compounds showing poor equilibration across LDPE include acetone, 1,4-dioxane, methyl-tert-butyl ether (MTBE), methyl isobutyl ketone (MIBK), and styrene. PDBs have been constructed of other materials for sampling other analytes, but the vast majority of PDB samplers are of the LDPE material. Various vendors, the USGS, and the Interstate Technology and Regulatory Council (ITRC) can provide additional information on these devices. Please see the Links portion of the Reference Section for specific references pertaining to PDBs.

HydraSleeves™

HydraSleeves™ are no-purge grab sampling devices consisting of a closed-bottom sleeve of low-density polyethylene with a reed valve at the top. They are deployed in a collapsed state to the desired interval and fill themselves through the reed valve when pulled upward through the sampling interval. The following is a summary of their operation:

Sampler placement – A reusable weight is attached to the bottom of the sampler or the sampler is clipped to a weighted line. The HydraSleeve™ is lowered on the weighted line and placed with the top of the sampler at the bottom of the desired sampling interval. In-situ water pressure keeps the reed valve closed, preventing water from entering the sampler. The well is allowed to return to equilibrium over a period of several days.

Sample collection - The reed valve opens to allow filling when the sampler is moved upward faster than 1 foot per second, either in one continuous upward pull or by cycling the sampler up and down to sample a shorter interval. There is no change in water level and only minimal agitation during collection.

Sample retrieval - When the flexible sleeve is full, the reed valve closes, and the sampler can be recovered without entry of extraneous overlying fluids. Samples are removed by puncturing the sleeve with the pointed discharge tube and draining the contents into containers for sampling or field parameter measurements.

Snap Sampler®

The Snap Sampler® is a patented no-purge groundwater sampling device that employs a double-end-opening bottle with “Snap” sealing end caps. The dedicated, device is deployed at the desired position in the screened interval with up to six Snap Samplers® and six individual sampling bottles. The device is allowed to equilibrate in the screened interval and retrieved between 3 and 14 days after deployment. Longer deployments are possible to accommodate sampling schedules.

To operate, Snap Samplers® are loaded with Snap Sampler® bottles and the "Snap" caps are set into an open position. Samplers are deployed downhole with an attachment/trigger line and left to equilibrate downhole. To collect samples, the Snap Sampler® bottles seal under the water surface by pulling a mechanical trigger line or using an electric or pneumatic trigger system. The trigger releases Teflon® "Snap Caps" that seal the double- ended bottles. The end caps are designed to seal the water sample within the bottles with no headspace vapor. After the closed vial is retrieved from the well, the bottles are prepared with standard septa screw caps and labeled for laboratory submittal.

The manufacturer of the Snap Sampler® provides considerable additional information on the validation and use of the device.

11. DATA AND RECORDS MANAGEMENT

Information generated or obtained by field personnel will be organized and accounted for in accordance with the approved UFP-QAPP, Data Management Plan (DMP), or Quality Management Plan (QMP). Documentation of field sampling shall be legible and complete and in accordance with the *R5 Field Documentation Procedures SOP*, R5-REG-005-r0 and applicable procedures in the site's FSP or UFP-QAPP.

During groundwater sample collection, it is important to record a variety of groundwater related data. Included in the category of auxiliary data are water levels measurements, well volume determinations, pumping rates during purging, and, driller or boring logs, temperature, etc. This information should be documented in the field records and tabulated for inclusion an appendix to quarterly or annual reports pertaining to groundwater sampling and analysis in accordance with procedures in the *Region 5 Field Documentation Procedure* (SOP R5-REG-0005.r0). Procedures for measurement of water levels and well depths are published in *Groundwater Level and Well Depth Measurement* (SESDPROC-105-R2).

12. QUALITY CONTROL & QUALITY ASSURANCE

Extra containers should be filled as required for QC samples such as matrix spikes, field blanks, trip blanks, and equipment blanks. Equipment blanks must be collected if equipment is field cleaned and reused on site or to document that low-level contaminants were not introduced by pumps, bailers, tubing, or other sampling equipment. For more information on blanks, please see: https://www.epa.gov/sites/production/files/2015-06/documents/blanks.pdf.

Volumes collected for matrix spike and matrix spike duplicates should adhere to the CLP field sampling guide, ASB sample requirements or the volume required by the commercial lab performing the analyses.

Collected samples must remain in the custody of the sampler or sample custodian until the samples are relinquished to another party. If samples are transported by the sampler, they shall remain under his/her custody or be secured until they are relinquished. Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished using SCRIBE (https://www.ertsupport.org/Scribe) or laboratory-specific procedures.

Where appropriate, a background sample upgradient of all known influences or a control sample upgradient of the site should be collected. Background and control samples should be collected as close to the sampled area as possible and from the same water- bearing formation. These samples should be collected before samples are collected from areas with known contamination.

All equipment used to collect groundwater samples shall be cleaned as outlined in the decontamination SOP in the FSP or UFP-QAPP and equivalent to LSASD-PROC205. Malfunctioning equipment should be labeled in the field and repaired, before being stored at the conclusion of field studies. Cleaning procedures utilized in the field or field repairs shall be thoroughly documented in field records.

13. REFERENCES and LINKS

References

Nielsen, David. Practical Handbook of Environmental Site Characterization and Ground-Water Monitoring. 2nd ed. Boca Raton, FL: Taylor&Francis, 2006. Print.

Puls, Robert W., and Michael J. Barcelona. 1989. Filtration of Ground Water Samples for Metals Analysis. Hazardous Waste and Hazardous Materials 6(4), pp.385-393. https://www.researchgate.net/publication/242714640_Ground_Water_Sampling_for_Metals_Analyses

Puls, Robert W., Don A. Clark, and Bert Bledsoe. 1992. Metals in Ground Water: Sampling Artifacts and Reproducibility. Hazardous Waste and Hazardous Materials 9(2), pp. 149-162. https://www.liebertpub.com/doi/10.1089/hwm.1992.9.149

US EPA. 1992. Potential Sources of Error in Ground-Water Sampling at Hazardous Waste Sites. ORD, K. F. Pohlmann and A. J. Alduin. EPA/540/S-42/019, August 1992. https://nepis.epa.gov/Exe/ZyPDF.cgi/9100O4RS.PDF?Dockey=9100O4RS.PDF

US EPA. 1995. Ground Water Sampling - A Workshop Summary. Proceedings from the Dallas, Texas November 30 – December 2, 1993 Workshop. ORD, Robert S. Kerr Environmental Research Laboratory. EPA/600/R-94/205, January 1995. Ground Water Sampling: A Workshop Summary (epa.gov)

US EPA 1996. Ground Water Issue. Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures. ORD, Robert W. Puls and Michael Barcelona. EPA/540/S-95/504, April 1996. https://www.epa.gov/sites/production/files/2015-06/documents/lwflw2a.pdf

US EPA 2002, Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers. OSWER, Douglas Yeskis and Bernard Zavala. EPA/540/S-02-001, May 2002. https://www.epa.gov/sites/production/files/2015-06/documents/gw_sampling_guide.pdf

US EPA, 2014, Sampler's Guide; Contract Laboratory Program Guidance for Field Samplers. https://www.epa.gov/clp/contract-laboratory-program-guidance-field-samplers

Varljen, M., Barcelona, M., Obereiner, J., & Kaminski, D. (2006). Numerical simulations to assess the monitoring zone achieved during low-flow purging and sampling. Ground Water Monitoring and Remediation, 26(1), 44-52. https://www.researchgate.net/publication/253947160_Numerical_Simulations_to_Assess_the_Monitoring_Zone_Achieved_during_Low-Flow_Purging_and_Sampling

Vrobelsky, Don A. 2001. User's Guide for Polyethylene-based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in wells. Part I, Deployment, Recovery, Data Interpretation, and Quality Control and Assurance. USGS WRI Report 2001-4060, 18 pp. https://pubs.er.usgs.gov/publication/wri014060

Links

Blank Collection and Use
https://www.epa.gov/sites/production/files/2015-06/documents/blanks.pdf

Contract Laboratory Program Guidance for Field Samplers
https://www.epa.gov/sites/production/files/2015-03/documents/samplers_guide.pdf

Design and Installation of Monitoring Wells (SESDGUID-101-R1)
https://www.epa.gov/sites/production/files/2016-01/documents/design_and_installation_of_monitoring_wells.pdf

Equipment Cleaning and Decontamination Guidelines (ASBPROC-206)
https://www.epa.gov/sites/production/files/2016-01/documents/field_equipment_cleaning_and_decontamination_at_fec206_af.r3_1.pdf

Equipment Cleaning and Decontamination Guidelines (LSASDPROC-205)
https://www.epa.gov/sites/production/files/2016-01/documents/field_equipment_cleaning_and_decontamination205_af.r3.pdf

Field Measurement of Dissolved Oxygen (SESDPROC-106-R4)
https://www.epa.gov/sites/production/files/2017-07/documents/field_do_measurement106_af.r4.pdf

Field Measurement of Oxidation-Reduction Potential (SESDPROC-113-R2)
https://www.epa.gov/sites/production/files/2017-07/documents/field_measurement_of_orp113_af.r2.pdf

Field Temperature Measurement (SESDPROC-102-R5)
https://www.epa.gov/sites/production/files/2015-06/documents/Field-Temperature-Measurement.pdf

Field Turbidity Measurement (SESDPROC-103-R4)
https://www.epa.gov/sites/production/files/2017-07/documents/field_turbidity_measurement103_af.r4.pdf

Investigation Derived Waste Guidelines (LSASDPROC-202)
https://www.epa.gov/sites/production/files/2015-06/documents/Management-of-IDW.pdf

Ground-water Sampling Guidelines for Superfund and RCRA Project Managers
https://www.epa.gov/sites/production/files/2015-06/documents/gw_sampling_guide.pdf

Measurement of Field pH (SESDPROC-100-R4)
https://www.epa.gov/sites/production/files/2017-07/documents/field_ph_measurement100_af.r4.pdf

Pump Operation (SESDGUID-203)
https://www.epa.gov/sites/production/files/2015-06/documents/Pump-Operation.pdf

Region 5 Field Documentation procedure (SOP R5-REG-0005.r0)
https://usepa.sharepoint.com/sites/R5_Work/fieldops/controlleddocs/CrossProgram/R5%20Field%20Documentation%20SOP.pdf

Sampling and Environmental Data Management
https://usepa.sharepoint.com/sites/R5_Work/fieldops/controlleddocs/CrossProgram/Sampling%20and%20Environmental%20Data%20Management.pdf

SCRIBE information for sample documentation and chain of custody
https://usepa.sharepoint.com/sites/R5_Work/fieldops/controlleddocs/CrossProgram/R5%20Field%20Documentation%20SOP.pdf

https://www.ertsupport.org/Scribe

Specific Conductance Field Measurement (LSASDPROC-101-R7)
https://www.epa.gov/sites/production/files/2016-07/documents/field_specific_conductance101_af.r6.pdf

Water Level and Well Depth Measurement Guidelines (SESDPROC-105-R2)
https://19january2017snapshot.epa.gov/sites/production/files/2015-06/documents/Groundwater-Level-Measurement.pdf

PDB and No Purge Sampling References

Protocol for Use of Five Passive Samplers to Sample for a Variety of Contaminants in Groundwater
https://www.itrcweb.org/GuidanceDocuments/DSP-5.pdf

Technical and Regulatory Guidance for Using Polyethylene Diffusion Bag Samplers to Monitor Volatile Organic Compounds in Groundwater
https://www.itrcweb.org/GuidanceDocuments/DSP-3.pdf

User's Guide for Polyethylene-based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in wells. Part I, Deployment, Recovery, Data Interpretation, and Quality Control and Assurance
https://pubs.er.usgs.gov/publication/wri014060

14. ATTACHMENTS

Table 2: Purge and Sample Strategies with Equipment Considerations

Purging Strategy	Purge Equipment	Sample Equipment	Comments
Multi-Volume Purge			Overall Method Comments – Advantages: Consistent results can be achieved with minimal skill level required. Common, simple equipment can be used. Disadvantages: Can result in large volumes of purge water. Can take extended periods of time with large diameter wells or long water columns.
In this traditional method, 3-5 well volumes of water are removed from the top of the water column while verifying the stability of water quality parameters. Following the well purge, the well is sampled from the top of the water column.	Bailer	Bailer	Bailers are rarely used for purging due to the effort required, the difficulty of lowering turbidity adequately, and the possibility of aerating the upper water column.
	Electric Submersible Pump	Bailer	Common multiple-volume setup when depth to water exceeds 25 feet. Abbreviated pump decontamination procedure can be used between wells.
	Electric Submersible Pump or Bladder Pump	Electric Submersible Pump or Bladder Pump	Requires full pump decontamination and new tubing at each well. In most cases the pump would be deployed to the screened interval instead to perform Low-Flow sampling.
	Peristaltic Pump	Peristaltic Pump	Common, multi-volume setup when depth to water is less than 25 feet. Special sampling techniques are required for the collection of SVOCs and VOCs.
Low-Flow methods			Overall Method Comments – Advantages: Lower volumes of purge water. May be faster, especially within longer water columns. Disadvantages: Requires greater skill for consistent results. Higher tubing costs than multi-volume method.
The pump or tubing inlet is placed within the screened interval and the well is purged to stable water quality parameters while maintaining stable drawdown of the water level.	Electric Submersible Pump	Electric Submersible Pump	Commonly used when depth to water exceeds 25 feet. Pump is cleaned to sample equipment standards prior to sampling each well and new or dedicated tubing used for each well. Concerns have been raised concerning VOC loss from agitation in the turbine section or from sample heating.
	Peristaltic Pump	Peristaltic Pump	Commonly used where depth to water is less than 25 feet. Special sampling techniques required for the collection of SCOCs and VOCs. Concerns have been raised concerning VOC loss from vacuum created in sample tubing.
	Bladder Pump	Bladder Pump	Least Danger of VOC loss as entire sample train is under positive pressure and little sample heating occurs. Difficult to remove large volumes of water in reasonable time. Mild surging effect may keep turbidity elevated in sensitive wells.
Minimum-Purge, No-Purge methods			Overall Method Comments – Advantages: Very little to no wastewater. Well suited to repeat sampling events. Likely faster with lower costs. Disadvantages: Not directly equivalent to other methods. Vertical stratification or vertical flow conditions in the screened interval can result in deceptive or non-intuitive analytical results.
	Not Applicable	Passive Diffusion Bags	In most common form, a sealed water-filled polyethylene bag is allowed to equilibrate in the water column. Suitable primarily for VOCs. Generally, require 2-week minimum in situ residence time.
	Not Applicable	Hydrasleeves™	Collect a fixed volume of water from a specific interval. Requires duplicate samplers or redeployment for larger volumes. Sorption issues may bias results.
	Not Applicable	Snap Sampler®	Deploys a sample container in the sampling interval where it is allowed to equilibrate (commonly for two weeks) before being sealed in situ by the sampler mechanism and retrieved. Limited to specific containers.

Table 3: Well Casing Diameter Volume Factors

Well Casing Diameter (inches)	1 Well Volume (Gallons/ft of water)	Minimum Purge 3 Well Volumes (Gallons/ft of water)	Maximum purge* 5 Well Volumes (Gallons/ft of water)
1	0.04	0.12	0.20
2	0.16	0.49	0.82
3	0.37	1.1	1.8
4	0.65	2.0	3.3
5	1.0	3.1	5.1
6	1.5	4.4	7.3
7	2.0	6.0	10.0
8	2.6	7.8	13.1
9	3.3	9.9	16.5
10	4.1	12.2	20.4
11	4.9	14.8	24.7
12	5.9	17.6	29.4
16	10.4	31.3	52.2
18	13.2	39.7	66.1
24	23.5	70.5	118
36	52.9	159	264
48	94.0	282	470

*If the well hasn't stabilized after 5 well volumes, a sample may be collected. Notes should include a statement that stability was not achieved prior to sample collection. It is also permissible to continue purging in excess of 5 well volumes before sample collection.

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 019 INVESTIGATIVE DERIVED WASTE COMPLIANCE PLAN
Revised August 2019

INTRODUCTION

This SOP/Environmental Compliance Plan was developed to document the disposal of investigation-derived waste (IDW) generated during field activities by Region III EPA and the Superfund Technical Assessment and Response Team (START). When site work is conducted at a removal action or other long-term site where significant wastes may be generated, these wastes are generally left on site, and disposal arrangements are made through the EPA cleanup contractor. This plan pertains to projects, especially short-term site work not associated with a cleanup contractor, where IDW cannot be disposed of or left on site.

OVERVIEW

IDW can be soil cuttings/borings, purge/development water, decontamination fluids, personal protective equipment (PPE), analytical standards/extracts, disposable sampling equipment, or anything else generated during site investigation activities. Typical IDW volumes are generally small, ranging in 1-gallon, 5-gallon, 15-gallon and 55-gallon amounts for each project. The EPA OSC/WAM and START Project Team Leader are responsible for the proper management and disposal of all IDW. Adequate planning prior to field activities will identify the types and amounts of wastes that are expected and how to handle the wastes properly. Every effort should be made to eliminate or minimize wastes that are generated.

For samples collected for analyses, the laboratory performing the analyses will be responsible for final disposal of those samples. These procedures are not included in this plan.

APPLICABLE REGULATIONS

40 CFR Part 261 – Identification and Listing of Hazardous Waste

- **Subpart** A—General
  1. § 261.1 Purpose and scope.
  2. § 261.2 Definition of solid waste.
  3. § 261.3 Definition of hazardous waste.
  4. § 261.4 Exclusions.

- **Subpart** B—Criteria for Identifying the Characteristics of Hazardous Waste and for Listing Hazardous Waste
  1. § 261.10 Criteria for identifying the characteristics of hazardous waste.
  2. § 261.11 Criteria for listing hazardous waste.

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 019 INVESTIGATIVE DERIVED WASTE COMPLIANCE PLAN
Revised August 2019

- **Subpart** C—Characteristics **of** Hazardous Waste
  1 § 261.20 General.
  2 § 261.21 Characteristic of ignitability.
  3 § 261.22 Characteristic of corrosivity.
  4 § 261.23 Characteristic of reactivity.
  5 § 261.24 Toxicity characteristic.

- **Subpart** D—Lists **of** Hazardous Wastes
  1 § 261.30 General.
  2 § 261.31 Hazardous wastes from non-specific sources.
  3 § 261.32 Hazardous wastes from specific sources.
  4 § 261.33 Discarded commercial chemical products, off-specification species, container residues, and spill residues thereof.
  5 § 261.35 Deletion of certain hazardous waste codes following equipment cleaning and replacement

PROCEDURE

1. Prior to site work, arrange with EPA and the property owner for secure storage of containerized IDW. “Secure storage” may mean a locked gate, a fence, a building, or other area; the bottom line is that EPA and the property owner must be aware of and comfortable with the proposed storage location.

2. Plan for the management and disposal of IDW, and know what you are going to do before you go in the field; IDW disposal options vary from site to site. The disposition of IDW should be specifically discussed in the site health and safety plan (HASP) and pre-sampling meeting. Some decontamination fluids (Liquinox/water and isopropanol) are often disposed of on site, but this is not always the case. Again, EPA and the property owner must be aware of and comfortable with plans for IDW disposal. IDW should be as fully segregated and delineated as practical. For example, do not put non-hazardous waste and common trash in with PPE if you are disposing of PPE as IDW. Sometimes only booties and gloves are considered IDW for disposal purposes; other times, all or none of PPE is considered IDW for disposal purposes. For larger sites, it may be worthwhile to use different drums for different wells/areas, or at least note which wells/areas are the source for which drum of IDW. Also for larger sites, it is often worthwhile to segregate flammable liquids or acids used for decontamination from soil cuttings and purge water. For smaller sites, all IDW fluids are often combined into one (or more) drums. If this practice is employed, potential incompatibilities must be considered.

3. IDW should be as fully characterized as possible, noting likely/possible contaminants, air monitoring results, color, odor, and matrices present. The pH of all drums of liquid IDW should be tested and recorded before the drum is sealed. The date when the IDW generation is complete and the container is sealed (accumulation date) should also be written on the container. All IDW must be sealed, secured, fully containerized, and ready for transportation at the completion of site work (all drums must have gaskets in place). Until analytical results are available, a label should be placed on the container stating "**Uncharacterized Investigation-Derived Waste**" (see Attachment 1 for a printable label). The label should list **U.S. EPA Region III** as the generator/owner, but with the START Environmental Health and Safety Officer (EHSO) name and phone numbers for contact information. The exception to this is if the drum contents are known to be hazardous (usually containing caustic or flammable liquids used during decontamination or sample preparation/analysis), in which case a label with similar contact information should be placed on the drum, as well as any appropriate warning label (caustic, flammable, etc.) and the proper UN number and Technical Name. A detailed description of the waste, including pH and PID headspace readings should be included on the Uncharacterized Investigation-Derived Waste label. These labels should all be removed at the time the IDW is shipped off site, when they will be replaced by appropriate labels supplied by the IDW disposal subcontractor. If IDW is known to be hazardous, the containers must be inspected weekly until they are shipped off site. A sample hazardous waste inspection form can be found at the end of this document. The local fire and police departments, as well as EPA and the property owner, are to be notified of any drums or containers of IDW being left on site. All IDW drums should be placed on pallets, and photographed prior to departing the site to document IDW drum conditions. The placement of the IDW drums/pallets should take into account security, visibility, likelihood of vandalism, and accessibility for removal.

4. Upon receipt of sampling analytical results, data summary tables will be created; Project Team Leaders are responsible for ensuring that a copy of the summary tables are forwarded to the disposal subcontractors. Quality assurance/quality control (QA/QC) sample results should not be included. Analytical results do not have to be validated for disposal purposes. Also include information on other materials included in the IDW. These are usually the various decontamination fluids used (be specific), but may include sample scoops, PPE, XRF cups, GC extracts, etc. The OSC/WAM or START PTL must obtain a temporary identification number (if one does not already exist) from the state in which the site is located.

5. The Project Team Leader must forward an e-mail to the START EHSO and the Division SO containing information on the IDW including site information, the dates when IDW generation occurred, what was generated (description and quantity), and any other pertinent information. The START EHSO will place this information in an IDW summary/tracking spreadsheet.

6. The disposal subcontractor will prepare waste profiles, which will be reviewed by the START EHSO and/or the RCO SO in coordination with the Project Team Leader to ensure completeness and accuracy. EPA should be listed as the generator, with contact information for both the EPA OSC/WAM and START Project Team Leader listed on the profile. If correct, the profiles should be forwarded to and signed by the EPA OSC/WAM. **START personnel are NOT permitted to sign IDW disposal documentation on behalf of EPA on this contract. All IDW disposal documentation MUST be signed by an EPA employee.**

7. The disposal contractor will identify potential disposal facilities for the IDW that are eligible to receive EPA wastes under the Off-Site rule (OSR); this information will be forwarded to the START PTL and EHSO. The START PTL will ensure compliance with the OSR by forwarding the facility information as well as information on the IDW to the EPA OSR Regional Contact for each region that waste is going to, to ensure that the waste is going to an EPA-approved facility. This information must include the name of the facility the waste being is sent to; the EPA ID number or other unique identifying number of the facility; the city and state the receiving facility is located in; the name of the site and location the waste or wastes are coming from; the type of waste or wastes to be shipped; the amount of each waste to be sent; the anticipated date for shipment of these wastes; and a copy of a representative waste analysis for screening purposes. EPA verification of a facility's eligibility to receive wastes under the OSR may take up to 2 weeks.

   All CERCLA investigations or response actions involving the off-site transfer of any hazardous substance, pollutant or contaminant (CERCLA wastes) must comply with the OSR as specified in 40 CFR 300.440. The OSR requires that CERCLA wastes (including investigative-derived wastes) may only be placed in a facility operating in compliance with the Resource Conservation and Recovery Act (RCRA) or other applicable Federal or State requirements. The purpose of the OSR is to avoid having CERCLA wastes from response actions authorized or funded under CERCLA contribute to present of future environmental problems by directing these wastes to management units determined to be environmental sound.

   The OSR establishes the criteria and procedures for determining by EPA whether facilities are acceptable for the receipt of CERCLA wastes from response actions authorized under CERCLA. The EPA Regional Off-Site Contacts are provided below and in the following link:

   https://www.epa.gov/superfund/site-rule#contacts

EPA OFF-SITE RULE POINTS OF CONTACT BY REGION		
Region	**Contact Name**	**Telephone**
1	Donald MacLeod (macleod.donald@epa.gov)	617.918.1405
2	Beckett Grealish (Region2_OSR@epa.gov)	732.321.4341
3	Stephen Forostiak (forostiak.stephen@epa.gov)	215.814.2136
4	Paula Whiting (r4cercla_offsitecontact@epa.gov)	404.562.9277
5	William Damico (r5cercla.roc@epa.gov)	312.353.8207
6	Wilkin (Ron) Shannon (shannon.wilkin@epa.gov)	214.665.2282
7	Mike Martin (martin.mike@epa.gov)	913.551.7149
8	Linda Jacobson (jacobson.linda@epa.gov)	303.312.6503
9	Sharon Lin (lin.sharon@epa.gov)	415.972.3446
10	Scott Wilder (wilder.scott@epa.gov)	206.553.6693

It is important to note that all off-site disposal sites are vetted through the EPA Regional Off-Site Contact, and should not be vetted by Weston, subcontracted waste brokers, or others.

8. The disposal subcontractor will generate manifests, labels, and other paperwork, and submit to the START PTL and EHSO for review. The disposal subcontractor will also submit copies of any licenses, permits or other required documentation possessed by the transporters or the

transportation/storage/disposal (TSD) facility involved in the disposal process. These may include TSD license, DOT/OSHA/RCRA training certifications, current DOT/Hazardous Materials Training certificates, current Hazardous Waste Transporter permits, current EPA and/or DOT Registration Numbers/Licenses/Permits

9. If everything is in order, a pickup date will be scheduled with the disposal subcontractor (work with the START procurement officer on this). Manifests and any other paperwork should be forwarded to the EPA OSC/WAM for signature and retained by the START member overseeing the IDW pickup. **START personnel are NOT permitted to sign IDW disposal documentation on behalf of EPA on this contract. All IDW disposal documentation, including hazardous and non-hazardous waste manifests MUST be signed by an EPA employee.**

10. A START staff member must be present for pick-up of all IDW. The START EHSO should be notified of the date that IDW is actually picked up from the site in order to document on the IDW tracking spreadsheets.

11. A copy of the manifests and any other paperwork should be placed in the site file, and a copy of the manifests should be given to the START EHSO.

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 101 LOGBOOK DOCUMENTATION

Revised February 2020

1.0 INTRODUCTION

The purpose of this Standard Operating Procedure (SOP) is to provide Weston Solutions, Inc. (WESTON®), Superfund Technical Assessment Response Team (START) members with a step-by-step guide for logbook documentation.

Note: A factual and objective record of contractor and safety activities is critical for future litigation. Logbooks and field notes prepared for EPA START projects are subject to subpoena and submission as evidence in Federal courts.

2.0 LOGBOOKS

2.1 Personal Logbooks

All START members are required to document daily office activities in personal logbooks. Information in these logbooks shall be factual and objective and must be kept current at all times. Entries should include daily events, such as specific technical directive document (TDD) activities, task numbers, phone calls and meetings. It is important to note that all personal logbooks are property of WESTON® and may be reviewed by management at any time. A copy of Attachment A "Logbook Operating Practices" must be affixed to the inside cover of the personal logbook. Personal logbooks must be obtained through WESTON® Administrative support staff and must include a WESTON® logbook tracking number.

2.2 Site Logbooks

All START members are required to document site activities in site logbooks which are required of all active U.S. Environmental Protection Agency (EPA) removal/enforcement sites. Information in these logbooks shall be factual and objective and must be kept current at all times. Entries should include daily events, such as site activities, safety meetings, names of personnel entering/exiting site, sampling data, etc. A copy of Attachment A "Logbook Operating Practices" must be affixed to the inside cover of the site logbook. All site logbooks are the property of EPA and must remain with the site file. Site logbooks will be maintained by the WESTON® Project Team Leader. Information may be entered into the site logbook by any appropriate team member. Entries will be made in waterproof ink. Site logbooks must be obtained through WESTON® Administrative support staff and must include a WESTON® logbook tracking number.

3.0 SPECIFIC PROTOCOL

Adhere to the following protocol for both personal and site logbooks (see Attachment A for additional information):

1. Logbooks are permanently bound, all pages numbered.
2. Entries begin on page 1.
3. Use only blue or black ink (waterproof).
4. Write Weston Solutions, Inc., as well as the mailing address and phone number on the inside covers of both the site and personal logbooks.
5. Print the site name, volume number, and coverage dates on the site logbook cover and inside cover.
6. Do not write in the margins or between written lines, and do not leave blank pages to fill in later.
7. Fill in all pages in all logbooks.
8. Place a single line through mistakes and initial each one.
9. At the end of any partial page, draw a single diagonal line across the page and initial the line to indicate the end of that pages notes.
10. If a line on the page is not completely filled, draw a horizontal line through the blank portion of the line and initial it.
11. Write late notes/entries as soon as possible and identify this entry as such (use “Late Note:” on a new line to begin a late note and “End Late Note” on a new line to finish a late note).
12. Be objective for all logbook entries
13. Ensure that the logbook clearly shows the sequence of the day’s events.
14. If an error is made, draw a single line through the error and initial it.
15. Sign or initial all completed pages (typically in the lower right corner) as they are completed.
16. Sign entries at the end of the day, or before someone else writes in the logbook.
17. Maintain control of the logbook and keep in a secure location.

Personal logbooks will contain (see Attachment A for additional information) the following information:

1. Employee’s name, work address, and telephone number.
2. Full names and affiliations for all persons cited in the logbook. Be sure to check the spelling of names and affiliations for accuracy.
3. Sequence of daily events.
4. Task numbers, full dates (i.e. 12 January 2012), and military time (i.e. 0800).
5. Initialed daily entries.

Site logbooks will contain (see Attachment A for additional information) the following information:

1. The name and location of the site.
2. Names of Site Leader and Assistant Site Leaders.
3. Site sketches if appropriate. Draw a box around the sketch to separate the sketch from the text in the logbook.
4. Dates of sample collection or event.
5. Time of sample collection or event.
6. Weather conditions on a daily basis.
7. Field observations.
8. Numbers and types of samples collected and sample identification numbers.
9. Description of sampling methodology by referenced Standard Operating Procedures or FSP.
10. Type(s) of laboratory analyses requested.
11. Phone calls and/or contacts with people at the site on a daily basis.
12. Name of subcontractor and excavation equipment.
13. Any modifications in work activities from approved work plans, FSPs, etc. (i.e., sampling locations, deviations from procedures with reasons, etc.).
14. Visual description of samples and test pits, as required. Includes color, texture, moisture, and other physical soil characteristics.
15. Levels of personal protective equipment worn for tasks performed.
16. Significant changes during the day (i.e., stoppage of work during a lightning storm).

3.1 Audits

Personal and Site logbooks are subject to audit by EPA and WESTON® Quality Assurance personnel at any time. Logbook audits will be documented and maintained in the site project file and/or personnel file. Attachment B Logbook Auditing Check sheet or another method of documentation will be used to document all logbook audits.

4.0 REFERENCES

WESTON® (Roy F. Weston, Inc.). 1993. Standard Operating Practices (SP) Manual. SP No. 16-11-016, "Test Pit Excavation and Sampling". West Chester, PA.

ATTACHMENT A
LOGBOOK OPERATING PRACTICES

Logbook Operating Practices

Procedure

- Logbooks are permanently bound, all pages numbered and entries begin on page 1.
- Use only blue or black ink (waterproof).
- Written Legibly.
- Write Weston Solutions, Inc., as well as the mailing address and phone number on the inside covers of both the site and personal logbooks.
- Print the site name, volume number, and coverage dates on the site logbook cover and inside cover.
- Do not write in the margins or between written lines; do not leave blank pages to fill in later.
- Fill in all pages in all logbooks.
- Include the date on every page.
- At the end of any partial page, draw a single diagonal line across the page and initial the line to indicate the end of that pages notes.
- If a line on the page is not completely filled, draw a horizontal line through the blank portion of the line and initial it.
- Write late notes/entries as soon as possible and identify this entry as such (use "Late Note:" to begin a late note and "End Late Note" to finish a late note).
- Be objective for all logbook entries.
- Ensure that the logbook clearly shows the sequence of the day's events.
- If an error is made, draw a single line through the error and initial it.
- Sign or initial all completed pages (typically in the lower right corner).
- Sign entries at the end of the day, or before someone else writes in the logbook.
- Maintain control of the logbook and keep in a secure location.
- End of Logbook noted on last page ("End of Logbook").

General Information

- Team members listed at beginning of day.
- Other Personnel & Affiliation (e.g. OSC-Smith, OSC-Jones) identified.
- Signatures when change of recorder.
- Team Members' Site Entries and Exits are documented.
- Late Entries Noted Appropriately.

Field Logbooks

- General Information.
- Name, location of site, and work order number.
- Name of the Site Manager or Field Team Leader.
- Names and responsibilities of all field team members using the logbook (or involved with activities for which entries are being made).
- Weather conditions.
- Objective narratives written.
- Field observations.
- Names of any site visitors including entities that they represent.

Sampling (a table in the logbook can be used for sample information)

- Time Collected.
- Grab/Composite.
- Sample Location.
- Type of Analysis.
- CLP Case Number(s)
- Shipping Information.
- Number and types of collected samples.
- Sample identification numbers, including any applicable cross-references to split samples or samples collected by another entity.
- A description of sampling methodology, or reference to any governing document (i.e. Work Plan, QAPP). Any deviations from governing document(s) are identified with reasons for deviations specified.
- Summary of equipment preparation and decontamination procedures.
- Sample description including depth, color, texture, moisture content, and evidence of waste material or staining.
- Air monitoring (field screening) results.
- Types of laboratory analyses requested.

Photo Logs

- Camera and PDA (IDs).
- Date of pictures.
- Time of pictures.
- Directions of photos.
- Description of photos.
- Photographer/Witness.

Safety

- All safety, accident, and/or incident reports.
- Real-time personnel air monitoring results, if applicable.
- Heat/cold stress monitoring data, if applicable.
- Level of protection for tasks.
- Reasons for upgrades or downgrades in personal protective equipment.
- Health and safety inspections, checklists (drilling safety guide), meetings/briefings.
- Equipment make, model, and serial number for monitoring instruments.
- Calibration records for monitoring instruments.
- Site Safety Meeting (time/topics).
- Site Objectives/ Plan of Activities.
- Chemical/Physical Hazards.
- Personnel Attending.

Equipment

- Equipment Type (make, model, a serial numbers).
- Calibration records.
- Background Readings & Locations.
- Monitoring Readings & Locations.
- Sampler(s) initials

Contractor Oversight Activities

- Progress and activities performed by contractors including operating times.
- Deviations of contractor activities with respect to project governing documents (i.e., specifications).
- Contractor sampling results and disposition of contingent soil materials/stockpiles.
- Excavation specifications and locations of contractor confirmation samples.
- General site housekeeping and safety issues by site contractors.
- Equipment and personnel on-site.
- Duration of equipment use vs. standby.
- Inventory of shipments received (or verification of items on packing slip).
- Document inspection of disposal trucks arriving at site (e.g., visual observation of clean tankers or truck trailers, etc.).

ATTACHMENT B

SITE LOGBOOK AUDITING CHECKSHEET

Site Name:_____

Work Assignment/TDD No. _____

Site Name:_____ Site Location:_____

Logbook Recorder:_____ Logbook Reviewer:_____

As a part of WESTON's quality assurance program, the following checklist should be used as a guide for items, at a minimum, to include in your logbook. In the future, please make your best effort to thoroughly document all field activities.

LOGBOOK AUDITING CHECKSHEET				
INFORMATION:	***YES***	***NO***	***N/A***	***COMMENTS***
Logbook is permanently bound, all pages numbered and entries begin on page 1.				
Only blue or black ink used.				
Written Legibly.				
"Weston Solutions, Inc." as well as the mailing address and phone number are included on the inside cover.				
The site name, volume number, and coverage dates (if the logbook is completed) are included on the site logbook cover and inside cover.				
No writing in the margins or between written lines.				
No blank pages; all pages are filled in.				
Date is included on every page.				
At the end of any partial page, a single diagonal line is drawn across the page and initialed.				
Where a line on the page is not completely filled, a horizontal line is drawn through the blank portion of the line and initialed.				
Any late notes/entries are identified as such (i.e., "Late Note:" to begin a late note and "End Late Note" to finish a late note).				
Logbook entries are objective.				
The logbook clearly shows the sequence of events.				
If an error was made, a single line was drawn through the error and it was initialed.				
All completed pages are signed or initialed (typically in the lower right corner).				

Logbook Reviewer:_____

ATTACHMENT B

SITE LOGBOOK AUDITING CHECKSHEET

Site Name:_____

LOGBOOK AUDITING CHECKSHEET				
INFORMATION:	***YES***	***NO***	***N/A***	***COMMENTS***
Signature of author at the end of the day				
Signature of author at change of recorder.				
End of Logbook noted on last page ("End of Logbook") for completed logbooks.				
General Information				
Team members are listed at beginning of day.				
Other Personnel & Affiliation (e.g. OSC-Smith, OSC-Jones) are identified.				
Team Members' Site Entries and Exits are documented.				
Name, location of site, and work order number is identified.				
Name of the Site Manager or Field Team Leader is identified.				
Weather conditions are noted.				
Field observations are sufficiently detailed.				
Sampling (a table in the logbook can be used for sample information)				
Sample identification numbers, are noted.				
Time Collected is identified.				
Grab/Composite is identified (or FSP/SAP is referenced).				
Sample Locations are identified (or FSP/SAP is referenced).				
Type of Analysis is identified (or FSP/SAP is referenced).				
CLP Case Number(s) is noted.				
Number and types of collected samples are identified (or FSP/SAP is referenced).				
A description of sampling methodology is included (or FSP/SAP is referenced).				
Any deviations from the FSP/SAP or other governing document(s) are noted, including specified reasons for deviations.				
Summary of equipment preparation and decontamination procedures are noted (or FSP/SAP is referenced).				

Logbook Reviewer:_____

ATTACHMENT B

SITE LOGBOOK AUDITING CHECKSHEET

Site Name:_____

LOGBOOK AUDITING CHECKSHEET				
INFORMATION:	***YES***	***NO***	***N/A***	***COMMENTS***
Sample description including depth, color, texture, moisture content, and evidence of waste material or staining are noted.				
Air monitoring (field screening) results are included.				
Types of laboratory analyses requested are identified (or FSP/SAP is referenced).				
Logbook is permanently bound, all pages numbered and entries begin on page 1.				
Only blue or black ink used.				
Written Legibly.				
"Weston Solutions, Inc." as well as the mailing address and phone number are included on the inside cover.				
The site name, volume number, and coverage dates (if the logbook is completed) on the site logbook cover and inside cover.				
No writing in the margins or between written lines				
No blank pages; all pages are filled in.				
Date is included on every page.				
At the end of any partial page, a single diagonal line is drawn across the page and initialed.				
Where a line on the page is not completely filled, a horizontal line is drawn through the blank portion of the line and initialed.				
Any late notes/entries are identified as such (i.e., "Late Note:" to begin a late note and "End Late Note" to finish a late note).				

_____ _____

Signature of Reviewer Date

Logbook Reviewer:_____

SUPERFUND TECHNICAL ASSESSMENT RESPONSE TEAM

STANDARD OPERATING PROCEDURES

SOP 102 FIELD NOTES
Revised August 2019

1.0 INTRODUCTION

The purpose of this Standard Operating Procedure (SOP) is to provide Weston Solutions, Inc. (WESTON®), Superfund Technical Assessment and Response Team (START) members with a general step-by-step guide to recording field notes.

2.0 DISCUSSION

The collection of data and other observations in the field is one of the most fundamental activities performed by field personnel. It is essential that field notes be complete and unambiguous. This is especially true because these notes must often undergo intense legal and scientific scrutiny. Field personnel should be familiar with the GEOLISTM Logging Reference Manual, or equivalent logging templates or programs, and any other relevant documents.

2.1 Preparation

Prior to mobilizing, field personnel should become familiar with the type of data and observations necessary. Background information on the history and environmental conditions at the site should be reviewed. The scope and objectives of the field effort should also be understood.

Appropriate logging materials must also be obtained. These materials would usually include a bound notebook containing blank, numbered pages of GEOLISTM data acquisition forms, and an ink pen or waterproof marker. If appropriate, water resistant paper should be used.

3.0 OPERATIONS

Note taking in the field should focus on data and administrative information required to fulfill the scope and objectives of the project. Notes should be recorded legibly in waterproof ink in a field logbook. Each page of the logbook should be numbered, dated, signed and dated at the end of each page. All lines should be used, fill in the end of unused portions of lines with single line and initial. The date and time of all entries should be recorded. Project information such as project name, location, time/date (for all observations), names of personnel/subcontractors/visitors working at the site, their roles/responsibilities, specific times (such as time arrived on site, sample time, etc.), and all observations. Sampling project information such as field measurements, equipment type and calibration information, visual observations (terrain, staining, distances to landmarks), GPS recordings, and atmospheric conditions should be included. Sampling activity information such as sampling dates and times, sample identifications, sample matrices, sample descriptions (e.g., odor and/or color), number of samples taken, and sampling methods/equipment should also be included. Sketches/diagrams of the site should also be included in the logbook.

Certain materials are not allowed to be used for sites where sampling is being performed for Per- and polyfluoroalkyl substances (PFAS).

All deviations from the sampling plan should be recorded as well as any unusual circumstances. Correct any errors by crossing a line through the error, initialing and dating the error, and then adding the correct information. Recording irrelevant information should be avoided because it detracts attention. Care should be taken to distinguish actual observations versus second-party reports and personal speculation. At the end of each day, the notebook should be signed by the logger. When collecting information using GEOLISTM Forms, procedures described in the GEOLIS$_{TM}$ Logging Reference Manual should be followed.

4.0 POST OPERATION

At the completion of field work, all field forms and notebooks should be accounted for. Depending on the scope of the data analysis effort, blank-page logbooks should be copied so that the original logbooks can be filed securely. GEOLIS$_{TM}$ forms should undergo QA/QC procedures specified by the Project Manager or the Work Plan. At the completion of their use, all field notebooks, and GEOLISTM Forms or other logging forms should be returned to the Project Manager for inclusion in the project file. If there are questions regarding the interpretation or the applicability of items in this operating practice, the Project Manager or Technical Manager should be consulted. In the absence of either of those, contact your Section Manager.

5.0 REFERENCES

Moran, C.F., Messinger, D.J., and Kufs, C.T. 1991. GEOLISTM Logging Reference Manual.

START (Superfund Technical Assistance and Response Team). 2015. *Operating Procedure, SOP No. 101 Logbook Documentation.* December.

United States Environmental Protection Agency (EPA). 2014. *Sampler's Guide – Contract Laboratory Program Guidance for Field Samplers.* October 2014.

ATTACHMENTS: 5

ATTACHMENT 1 SOIL SAMPLING DATA SHEET

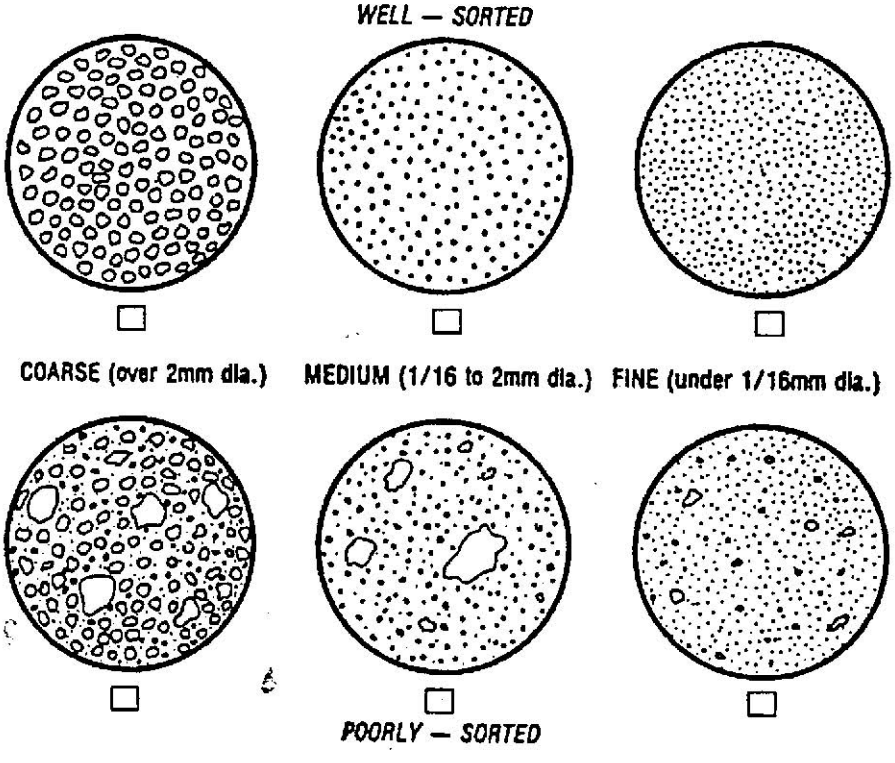
Sample Number(s): _____ Date: _____
Time: _____

Soil Sampling Data Sheet

Site Name: _____ **Sampler:** _____ **Sample Depth:** ____ Surface (0-0.5 ft) _____ Shallow (0.5-5.0 ft) **Sample Method(Circle One):**_____Scoop (2,3,4,5,6,7,8,A,C,+) ____ Hand Auger(2,3,4,5,6,7,B,+,-)
_____Slide-Hammer (1,2,3,4,5,6,7,8,A,B,+,-) ____ Open Tube (A,+,-)
_____Split/Solid Tube (1,2,3,4,5,6,7,8,A,B,-) ____ Thin-Wall Tube(8,A,-)

Preferred Methods 1 - Volatiles 5 - PCBs A - Grab + - Surface 2 - Semi-Volatiles 6 - TPH B - Composite (Vertical) -- Shallow 3 - Primary Metals 7 - Rad C - composite (Areal) 4 - Pesticides 8 - Geotechnical

Soil



Description (Munsell): Chart _____ Value _____ Hue _____ **Grain Size and Distribution:**

ATTACHMENT 2 RESIDENTIAL DRINKING WATER QUALITY PURGE DATA SHEET

Residential Drinking Water Quality Purge / Data Sheet

Date: _____ Time: _____

Resident's Name: _____

Address: _____

Number: _____(H) _____(W)

Resident ID #: _____ (Use on all sample correspondence)

Filter System: Yes No

Purge Method: 15 minute (preferred) Temperature (Temperature should be between 50º F and middle 60º F)

Purging Location (Circle One): Kitchen Tap Filter Well Outlet

Water Quality / Purge Data

Interval	Time	Temp	Turbidity
Start			H M L N
During			H M L N
During			H M L N
During			H M L N
During			H M L N
During			H M L N
During			H M L N
During			H M L N
Final			H M L N

H - High: Opaque/Muddy/Silty

M - Medium: Translucent/Cloudy

L - Low: Transparent/Cloudy

N - None: Clear/No Visible Silt

ATTACHMENT 3

WATER LEVEL and WATER QUALITY/WELL PURGING DATA SHEET

Water Level and Water Quality / Well Purging Data Sheet

Date: _____ Time: _____

Site Name: _____ **Well Number:** _____ **Sampler:** _____

Circle One): Poly Bailer Teflon® Bailer Steel Bailer Keck Pump WaTerra® Pump Piston Pump Bladder Pump

Circle One): Poly Bailer Teflon® Bailer Steel Bailer Bacon Bomb WaTerra® Pump Piston Pump Bottle Submersion

Water Level and Volume Measurements

Measure Point (Circle One): Top **o**f **C**asing **T**op **o**f **P**rotective **S**teel **C**asing **L**and **S**urface (mark measure point)

Depth to Water: _____ft_____in **Depth to Bottom:** _____ft_____in **Depth to Product:** _____ft_____in ___N/A

Height of Water Column (H): _____ft_____in (round up for volume calculation)

Gallons per Foot of Depth/Diameter (GPF): 1" **(.041)** 1.5" **(.092)** 2" **(.163)** 2.5" **(.255)** 3" **(.367)** 3.5" **(.500)**
4" **(.653)** 4.5" **(.826)** 5" **(1.020)** 5.5" **(1.234)** 6" **(1.469)**
7" **(2.000)** 8" **(2.611)** 9" **(3.305)** 10" **(4.080)**

One Well Volume: _____**(H)** x _____**(GPF)** = _____Gals **Volume to Purge:** _____Gallons x 3 = _____Gals

Actual Volume Purged: _____Gals (estimated) **Purge Rate:** _____Gals/min (estimated) (volume/time)

Water Quality / Purge Data

Interval	Time	Temp	pH	Conductivity	Turbidity	% Dissolved O_2	PID/FID
Start				mOhms	H M L N	% O_2	units
During				mOhms	H M L N	% O_2	units
During				mOhms	H M L N	% O_2	units
During				mOhms	H M L N	% O_2	units
During				mOhms	H M L N	% O_2	units
During				mOhms	H M L N	% O_2	units
During				mOhms	H M L N	% O_2	units
During				mOhms	H M L N	% O_2	units
Final				mOhms	H M L N	% O_2	units

H - High: Opaque/Muddy/Silty M - Medium: Translucent/Cloudy L - Low: Transparent/Cloudy N - None: Clear/No Visible Silt

ATTACHMENT 4 AIR SAMPLING DATA SHEET

Air Sampling Data Sheet

Date: _____ Sample ID No.: _____

Time: _____ Pump No.: _____

Site Name: _____

Pump Type

☐ DuPont Alpha 1 ☐Gillian HFS-113

Particulate Collection Devices

☐37mm Polystyrene 3-piece Filter Cassette
☐25mm Polystyrene 3-piece Filter Cassette
☐25mm Carbon filled black polypropylene w/cowl Filter Cassette
☐Cyclone
☐Cascade

Particulate Collection Media

☐Cellulose*
☐MCE (.8 :m)*
☐MCE (.45 :m)*
☐MCE (1.2 :m)*
☐PVC (.8 :m)*
☐PVC (.45 :m)*
☐PVC (5.0 :m)*
☐PTFE (.8 :m)*
☐PTFE (.45 :m)*
☐PTFE (.5 :m)*
☐PTFE (1.0 :m)*
☐PTFE (2.0 :m)*
☐ PTFE (5.0 :m)*
☐ Glass Fiber (1.0 :m)
☐ VAC (.8 :m)
☐ Silver membrane (.45 :m)
☐ Silver membrane (.8 :m)

*** Requires Support Pad**

Gas / Vapor Collection Devices

☐Charcoal Sorbent Tube
☐Chromosorb Sorbent Tube
☐Porapak-T Sorbent Tube
☐Cryogenic Trap
☐Tenax Sorbent Tube
☐Anasorb Sorbent Tube
☐Hopcalite Sorbent Tube
☐Impinger
☐XAD Sorbent Tube
☐Silica Gel Sorbent Tube
☐Tedlar Bag
☐ PUF

Calibration Data

	Run # 1	Run # 2	Run # 3	Average	Pre-Post Avg.
Pre-Cal	lpm	lpm	lpm	lpm	
Post-Cal	lpm	lpm	lpm	lpm	
Pre-Post					lpm **(V)**

Sample Start Time: _____ **Sample Stop Time**:_____ **Total Time Sampled**: _____ minutes **(TIME)**

Volume Calculations _____ **(TIME)** x _____ **(V)** = _____ liters **(VOLUME SAMPLED)**

ATTACHMENT 5 GEOLIS™ FORMS

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 103

CHAIN-OF-CUSTODY DOCUMENTATION

Revised January 2019

1.0 INTRODUCTION

The purpose of this Standard Operating Procedure (SOP) is to provide Weston Solutions, Inc. (WESTON®) Superfund Technical Assessment and Response Team (START) members with a step-by-step guide for documenting the sample chain-of-custody (COC) procedure from sample collection to receipt by the environmental laboratory.

2.0 SCOPE

This SOP describes the minimum requirements for START sample COC procedures. These procedures provide sample traceability from the time of sample collection to receipt by the environmental laboratory. These procedures are intended to document sample possession from the time of sample collection to delivery and receipt of the sample at the environmental laboratory.

3.0 GENERAL PROTOCOL

The key element of evidentiary documentation that a sample actually existed is the COC record. The U.S. Environmental Protection Agency (EPA) Superfund Contract Laboratory Program (CLP) refers to the COC as a Traffic Report/Chain-of-Custody (TR/COC) record. For the purposes of this SOP, the TR/COC record will be referred to as the COC. A COC will be initiated with sample collection.

At the direction of EPA, COC records used for samples collected under the START contract will be generated using SCRIBE data management software. Samples submitted to the EPA Regional Laboratory, CLP laboratories, or Delivery of Analytical Services (DAS) laboratories must be completed using SCRIBE software. The only exception to this procedure might be during a START Emergency Response when the EPA On-Scene Coordinator might approve a handwritten COC to relinquish samples. For the majority of Emergency Responses, START staff complete the COC using SCRIBE software. A checklist of items to be performed to generate SCRIBE COCs is provided in Attachment 1. Also refer to the CLP Sampler's Guide (EPA, 2014a) as well as the *ERT User Manual for SCRIBE CLP Sampling*, V3.10 (EPA).

3.1 Chain-of Custody Formats

SCRIBE software allows the field team member to select the COC template (format) type. Inorganic and organic samples submitted to CLP laboratories must be listed on separate COC forms. Therefore, the SCRIBE "CLP Organics" COC format will be selected for sample shipments containing samples to be analyzed for organic analytes and the SCRIBE "CLP Inorganics" COC

format will be selected for sample shipments containing samples to be analyzed for inorganic analytes. The SCRIBE "CLP High Resolution" COC format will be selected for samples collected for polychlorinated biphenyl (PCB) and polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (commonly referred to as "dioxins/furans") congener analyses. The customizable SCRIBE format COC template may be selected for non-standard analyses to accommodate samples with analysis parameters other than CLP methods or non-routine matrices (e.g., air samples or wipes). The SCRIBE COC can be customized to include additional columns of information needed by the laboratory for non-CLP types of analyses (e.g., volume of air drawn through a filter, area wiped).

3.2 Chain-of Custody Outputs

For each of these SCRIBE COC formats, the SCRIBE software typically generates three versions of COC information for each sample shipment: the Laboratory COC Record (LAB COPY), the Region COC Record (REGION COPY), and the electronic data version of the COC information in .xml file format.

The printed LAB COPY of the COC is included with samples shipped to CLP and DAS laboratories. The LAB COPY of the COC is considered the "original" COC, which has been signed by the Field Team member relinquishing sample custody and the person receiving custody of the samples (most frequently the laboratory's Sample Custodian). The LAB COPY of the COC does not include the Site Name or location.

The REGION COPY of the COC is provided only to the EPA Region and includes additional information for EPA and data validator use. For example, the REGION COPY of the COC includes the Site Name and Location and identities of field duplicate samples which are not included on the LAB COPY. The REGION COPY of the COC is the version shipped with samples to EPA Regional laboratories. For all non-EPA laboratories, the LAB COPY of the COC accompanies samples.

The xml format data file is uploaded to a website for EPA program use (for CLP sample tracking and CLP invoicing).

3.3 Chain-of-Custody Requirements

After a SCRIBE COC is printed, the LAB COPY of the COC is signed and dated by a Field Team member and placed in a sealable plastic bag taped to the underside of the lid of the sample cooler. The LAB COPY of the COC accompanies the samples to the CLP or DAS laboratory. The cooler is sealed and is either hand delivered to the laboratory, transported by courier, or shipped

by common carrier (i.e., FedEx). The Sample Custodian at the laboratory signs and dates the COC as part of the sample receipt process. The Sample Custodian then logs the sample information into the Laboratory Information Management System (LIMS) using the information provided on the COC. For the majority of START projects, the original LAB COPY of the COC is returned as part of the final analytical report and retained by EPA. An example of the LAB COPY of the COC provided as Attachment 2.

The LAB COPY shall include, at a minimum, the following information:

- CLP case number (for CLP laboratories) or DAS case number (for non-CLP laboratories)
- Chain-of-custody number
- Destination Laboratory information: Name, Contact, and telephone number.
- The name of the carrier, date shipped, and the airbill number
- Sample identifier
- CLP sample number
- Sample Matrix
- Sampler's name
- Collection method
- Requested analyses and turnaround times
- EPA Sample Tag numbers, preservation, and number of sample containers
- Sample Location
- Time and date of sample collection (military time)
- Sample ID for Laboratory quality control (QC) samples
- Signature of person relinquishing sample custody along with the date and time the cooler was sealed

After the samples are shipped to the laboratory, the Field Team Leader provides the REGION COPY of the COC to the WESTON Sampling Coordinator and also retains the LAB COPY and REGION COPY of the COCs in the site files on the WESTON server. For CLP sample shipments, the Field Team uploads the LAB COPY, REGION COPY, and the .xml file to the EPA Sample Management Office (SMO) portal.

The REGION COPY of the COC is provided to EPA and used by the EPA's data validation contractor. The REGION COPY of the COC includes, in addition to key elements of the LAB COPY of the COC noted above, the Site Name and Location and the identity of the QC samples, including which samples are field duplicates of one another. An example of the SCRIBE REGION COPY of the COC is provided as Attachment 3.

4.0 PROTOCOL FOR SHIPMENTS

All sample shipments will include a SCRIBE-generated LAB COPY of the COC listing every analytical sample contained in the specific cooler or shipping container. For sample shipments to the EPA Regional laboratory, a SCRIBE-generated REGION COPY of the COC is included with the sample shipment. Each time the samples are relinquished to a different individual, the current sample custodian is required to relinquish the custody to the new individual. All signatures must be recorded legibly in black or blue ink. Errors can only be corrected by drawing a single line through the error and then initialing and dating the correction. Any manual corrections to the COC must also be changed in the SCRIBE database as soon as possible.

5.0 SAMPLE LABELS, SAMPLE TAGS, AND CUSTODY SEALS

In addition to COC forms, SCRIBE-generated sample labels, sample tags, and custody seals are printed and used by the Field Team for sample documentation and transfer of custody. Sample labels and sample tags are generated using SCRIBE software. An example of a sample label/ sample tag is included as Attachment 4. Custody seals are provided to START by EPA Region III and are affixed to the outside of the shipping container to document that the container has not been opened and tampered with during sample shipment. An example of a custody seal is included as Attachment 5. The sections below present the information needed for the sample labels, sample tags, and custody seals.

5.1 Sample Labels

The following information will be recorded on the sample labels affixed to each container and are produced using SCRIBE:

- Sample Tag number
- Case number (CLP Case number for CLP samples or DAS Case number for non-CLP samples)
- CLP sample number
- Time and date of sample collection
- Sample type (grab or composite)
- Sample Station Location ID (Sample Identifier)
- Analyses requested
- Preservatives used (chemical preservatives and/or ice)
- Sampler’s name
- Signature of sampler

In addition, any special remarks or instructions can be included on the label (optional).

5.2 Sample Tags

In addition to a sample label, one sample tag, printed using SCRIBE, will be affixed to each sample container. The following information, at a minimum, will be recorded on the sample tag:

- Sample Tag number
- Case number (CLP Case for CLP samples or DAS Case number for non-CLP samples)
- CLP sample number
- Time and date of sample collection
- Sample type (grab or composite)
- Sample Station Location ID (Sample Identifier)
- Analyses requested
- Preservatives used (chemical preservatives and/or ice)
- Sampler's name
- Signature of sampler

In addition, any special remarks or instructions can be included on the label (optional). Sample tags also provide evidentiary documentation that a sample actually existed, and may be used in court by EPA as part of enforcement proceedings. The laboratory returns Sample Tags as part of the analytical data package. The Sample Tags are retained in secure storage by EPA.

5.3 Custody Seals

Custody seals confirm that samples have not been tampered with. The Field Team sample custodian will sign and date both ends of the custody seal. The custody seals will be affixed in such a way to ensure that the line separating the two sides of the custody seal is placed along the opening to the cooler or shipping box that contains the samples to prevent it from being opened without breaking the seal. Two custody seals will be used per cooler or box. Wide clear tape will be placed over the seals to ensure that the seals are not accidentally broken during transportation.

6.0 REFERENCES

ASTM (American Standards for Testing and Materials). ASTM D4840-99(2018)e1, Standard Guide for Sample Chain-of-Custody Procedures, ASTM International, West Conshohocken, PA, 2018. www.astm.org.

EPA (U.S. Environmental Protection Agency). 2014a. Office of Superfund Remediation and Technology Innovation (OSRTI). *Sampler's Guide, Contract Laboratory Program Guidance for Field Samplers.* Office of Land and Emergency Management (OLEM, formerly known as Office of Solid Waste and Emergency Response [OSWER]) 9200.2-147, EPA-540-R-014-13. October.

EPA (U.S. Environmental Protection Agency). 2014b. *Sample Submission Procedures for the Office of Analytical Services & Quality Assurance Laboratory Branch Revision 13.* EPA Region 3 Environmental Science Center, Fort Meade, MD. January.

EPA (U.S. Environmental Protection Agency). *Environmental Response Team (ERT) User Manual for SCRIBE CLP Sampling*. The Scribe User Guide can be accessed at the following website: https://www.epaosc.org/sites/ScribeGIS/files/Scribe%20CLP%20User%20Guide.pdf

EPA (U.S. Environmental Protection Agency). The SCRIBE software tool can be downloaded from the followed website: https://response.epa.gov/site/site_profile.aspx?site_id=ScribeGIS

Weston Solutions Inc. (WESTON). 2015. *Uniform Federal Policy Program Quality Assurance Project Plan (UFP QAPP) for EPA Region III Superfund Technical Assessment and Response Team 5* (START-5 Contract). July 2015.

Attachments: 5

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 103

CHAIN-OF-CUSTODY DOCUMENTATION

Revised January 2019

ATTACHMENT 1
WESTON START 3-in-1 Checklist: SCRIBE COC Checklist Portion

Checked	Item Checked
☐	**General SCRIBE COC Information, Direction, and Reminders**
	One Scribe COC is created for each cooler and lists only the samples shipped in that cooler.
☐	Are you using the most recent version of SCRIBE software?
☐	Ask someone (Sampling Coordinator) or Chemist or experienced Site Leader to review your draft COC and Sample Tags.
☐	Select the correct COC format in SCRIBE. NOTE: "CLP Inorganics" is required for true CLP metals/cyanide and "CLP Organics" format is required for true CLP organic analyses. Air samples will require a customized COC using the SCRIBE COC template. Obtain help from the Sampling Coordinator for SCRIBE questions.
☐	LAB COPY of COC is submitted in cooler with samples sent to Lab. *(Don't send the Region COPY of COC to lab unless the Lab is an EPA Regional lab)*
	SCRIBE COC Header (Left to Right)
☐	Date Shipped listed
☐	Carrier Name Listed (or "hand delivered" if samples directly delivered to lab by WESTON)
☐	Airbill Number present (if shipped by air carrier)
☐	Site name/location are NOT listed on **LAB COPY** of COC (except if samples are being analyzed by EPA's Regional Lab). Site Name/Location are listed on **REGION COPY** of COC.
☐	CLP or DAS Case number present
☐	Lab Name, Lab Contact, Lab Phone number present
	SCRIBE COC – Main Body (general column order from Left to Right)
☐	Sample Identifier column: Station Location IDs listed
	CLP Sample No. Column:
☐	Organic CLP Sample No. listed (C#####) for organic samples on CLP Organic COC
☐	Inorganic CLP Sample No. listed (MC#####) for Inorganic samples on CLP Inorganic COC
☐	If Dissolved Metals are collected, the CLP Sample No. is different than the Total Metals CLP Sample No.
☐	Matrix/Sampler column: List matrix (e.g., potable water, groundwater, surface water, soil, sediment, blank, air, waste) For majority of START work, Sampler should be "START (last name)"
☐	Collection Method: "grab" or "composite"

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 103

CHAIN-OF-CUSTODY DOCUMENTATION

Revised September 2016

ATTACHMENT 1

WESTON START 3-in-1 Checklist: SCRIBE COC Checklist Portion (Continued)

Checked	Item Checked
☐	Analysis code listed. The Analysis Code needs to be defined in Analysis Key box for: • Samples to be analyzed using a Modified Analysis (MA): the MA####.# must be defined in the SCRIBE "Analysis Key" box. • For Tier 4 analysis, the method numbers are defined in the SCRIBE "Analysis Key" box. For example, hexavalent chromium analysis (Cr+6) might be defined in the Special Instructions box on the COC as "Cr+6 = EPA 218.4" – **Consult with START Chemist on proper methods.**
☐	Lab turnaround time (TAT) listed: • If Preliminary Results (PR) are needed, the PR TAT is to be listed on the COC in parentheses • If Preliminary Results are not needed, list the data package TAT on the COC in parentheses
☐	Sample Tag numbers listed on COC.
☐	Preservative type listed: • Chemical preservatives: HCl, HNO_3, NaOH, Trizma®, as needed • "Ice" or "4°C" for iced samples
☐	Number of sample containers listed: NOTE that each EnCore® sampler is considered a separate container. NOTE that the CLP and Station Location IDs listed on the extra bottles you provide for the MS/MSD and S/D are the <u>same</u> as the <u>parent</u> sample IDs. *Do NOT name the extra volume provided for lab QC with a different ID because this will confuse the lab.*
☐	Collection Date/Times present (military time)
☐	Sample Type listed for each sample: Field Sample, "Field Duplicate of C####" or "Field Duplicate of MC####", Lab QC (for the MS/MSD or S/D sample), Trip Blank, Rinsate Blank, Field Blank, Field Reagent Blank, or Lot Blank. Field duplicates are assigned a different CLP Sample number than the parent sample. **<u>NOTE: the Sample Type column only appears on the REGION version of the COC.</u>**
	Lower Section of SCRIBE COC
☐	Special Instructions box should include: • The CLP Sample No. for the Organics QC Sample (for MS/MSD) *<u>NOTE: MS/MSD for Organic parameters analyzed by GC PID, GC FID, GC ECD, or HPLC methods. Region 3 does not want MS/MSD for GC/MS methods. If in doubt, consult with START Chemist on MS/MSD.</u>* • The CLP Sample No. for the Inorganics QC Sample [Spike/Duplicate (S/D)] • High sample PID or FID readings (or other pertinent field screening readings) • Very high or very low sample pH readings
☐	Analysis Key box should include: • Definition of the analysis codes, which should include the method number. • MA number for any CLP Modified Analyses.
☐	Shipment for the Case Complete (Y or N as appropriate) *NOTE: The final COC for a case must list "Y" for Case Complete.*

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 103

CHAIN-OF-CUSTODY DOCUMENTATION

Revised September 2016

ATTACHMENT 1

WESTON START 3-in-1 Checklist: SCRIBE COC Checklist Portion (Continued)

Checked	Item Checked
☐	Relinquished by: Every page of the COC form must be dated and signed by the person relinquishing samples
	PARAMETER SPECIFIC INFORMATION (COC and Sample Shipping Checks)
	VOCs
☐	Trip blank included in the cooler with VOC samples (soil, water, any matrix). TB is to be listed on COC.
☐	If SOIL samples are collected for VOCs and the ONLY analysis sent to the CLP or DAS lab is a separate container for Percent Solids collected and listed for Percent Solids analysis on the COC? *If other soil parameters are requested for the VOC samples sent to that same lab, then a separate Percent Solids container is NOT required.*
☐	If trace level VOCs are requested, does COC indicate "Trace VOCs"? *NOTE: Drinking water samples are run by the "Trace VOC" CLP method.*
	SVOCs
☐	Do both full list SVOCs and trace-level PAHs need to be analyzed? If so, the Analysis should include BOTH "SVOCs" and "PAHs by SIM" *NOTE: For water samples, 4 Liters are required for EACH sample if both analyses are needed.*
	METALS
☐	Mercury (Hg) should be listed as a separate analysis than the TAL Metals analysis by ICP or ICP-MS. *NOTE: both the ICP metals and Hg can come out of the same sample container.*
☐	If trace level metals are requested, does COC indicate analysis by ICP-MS?
☐	If both **Total Metals and Dissolved Metals** are to be analyzed on water samples, the Dissolved Metals bottle MUST have a different CLP Sample Number than the Total metals bottle. *Remember to field filter BEFORE adding the water sample to the sample container that contains preservative. Remember to also include a different Station Location ID for the total and dissolved samples. Suggestion: Use a "T" suffix in the Station Location ID for Total Metals and an "F" suffix for Dissolved Metals.* If you need the lab to filter the sample, put the sample in an un-preserved bottle and indicate on the COC that the lab needs to filter the sample.
	WIPES
☐	The area wiped (e.g., 100 cm^2) or sampled must be listed on the COC if you expect the lab to report your results in mass/area units. *Otherwise you will get the concentration reported as mass/wipe and you will need to figure out the concentration.*
☐	Are unopened lot blanks supplied to the lab for analysis at the correct frequency?
☐	Are field blanks supplied to the lab for analysis at the correct frequency?
☐	Matrix is listed as "wipe"

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 103

CHAIN-OF-CUSTODY DOCUMENTATION

Revised September 2016

ATTACHMENT 1

WESTON START 3-in-1 Checklist: SCRIBE COC Checklist Portion (Continued)

Checked	Item Checked
	AIR SAMPLES (TO-15)
☐	Collect field duplicates using a T-splitter
☐	The sampling beginning and ending date/time to be listed on the COC. *When evaluating Holding Times, the holding time is calculated from when the sample is DONE being collected.*
☐	Summa canister serial number and regulator number should be listed on COC
☐	Clearly indicate on COC which samples are Trip Blanks and Field Blanks (if applicable)
☐	Summa canisters are shipped at ambient temperatures
	AIR SAMPLES COLLECTED IN CARTRIDGES (such as metals, asbestos, etc.)
☐	The volume of air sampled (in Liters) must be indicated on the COC if you expect the lab to report your results in mass/volume units (µg/L or µg/m^3). *If you do not include the air volume, then you will get the concentration reported as mass/cartridge and **you** will need to calculate the concentration.*
☐	Are unopened lot blanks supplied to the lab for analysis at the correct frequency? (often specified in the method)
☐	Are field blanks supplied to the lab for analysis at the correct frequency? (often specified in the method)
	SAMPLE TAG – Data Elements Required by EPA Region 3
☐	*Each container has its own sample tag and each tag has a unique number. Information on Sample Tags must match the bottle label and COC information. The sampler must SIGN the sample tag.* Tags MUST include: • Sample Tag Number • Case Number (CLP or DAS) • CLP Sample ID • Sample Station Location ID (Sample Identifier) • Date and time (of sample collection) • Designation of “grab” or “composite” sample • Sampler's name • Indication of whether sample has been chemically preserved or just ice • Analyses requested • Any special remarks or instructions (optional)

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 103

CHAIN-OF-CUSTODY DOCUMENTATION

Revised September 2016

ATTACHMENT 1

WESTON START 3-in-1 Checklist: SCRIBE COC Checklist Portion (Continued)

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 103

CHAIN-OF-CUSTODY DOCUMENTATION

Revised September 2016

ATTACHMENT 2
GENERIC LABORATORY COPY of TRAFFIC REPORT/CHAIN-OF-CUSTODY RECORD

Page 1 of 1

USEPA CLP COC (LAB COPY) — CHAIN OF CUSTODY RECORD — No: 1-070913-152917-0002

Date Shipped: 7/9/2013 — Lab: A4 Scientific, Inc
Carrier Name: — Project Code: XXXX — Lab Contact: Reddy Pakanati
Airbill No: — Cooler #: 2 — The Woodlands, TX 77380

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	For Lab Use Only
0458-0002	A0AA2	Ground Water/ START	Bailer	CLP VOA(21)	1004 (1)	MW-2	05/25/2013 08:00	
0458-0003	A0AA4	Ground Water/ START	Bailer	CLP VOA(21)	1004 (1)	MW-3	05/25/2013 08:00	
0458-0007	MA0AB3	Soil/ START	Grab	ICP/MS(21)	1008 (1)	A001	05/25/2013 08:00	
0458-0008	MA0AB5	Soil/ START	Grab	ICP/MS(21)	1008 (1)	A002	05/25/2013 08:00	
0458-0002	PA0AA2	Ground Water/ START	Bailer	12 Toxic CBCs(35), 209 CBCs(35), CDD/CDF(35)	1000, 1001, 1002 (3)	MW-2	05/25/2013 08:00	
0458-0003	PA0AA4	Ground Water/ START	Bailer	12 Toxic CBCs(35), 209 CBCs(35), CDD/CDF(35)	1000, 1001, 1002 (3)	MW-3	05/25/2013 08:00	

Sample(s) to be used for Lab QC: 0458-0002 Tag 1004, 0458-0003 Tag 1004, 0458-0002 Tag 1000, 0458-0003 Tag 1000

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: CLP VOA=CLP TCL Volatiles, ICP/MS=CLP TAL Total Metals ICP-MS, 12 Toxic CBCs=CLP 12 Toxic Congeners, 209 CBCs=CLP 209 Congeners, CDD/CDF=CLP Dioxins/Furans

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 103

CHAIN-OF-CUSTODY DOCUMENTATION

Revised September 2016

ATTACHMENT 3

GENERIC REGION COPY of TRAFFIC REPORT/CHAIN-OF-CUSTODY RECORD

Page 1 of 1

USEPA CLP COC (REGION COPY) | **CHAIN OF CUSTODY RECORD** | **No: 1-070913-152917-0002**

DateShipped: 7/9/2013 | PalmMetals | Lab: A4 Scientific, Inc
CarrierName: | DAS #: | Lab Contact: Reddy Pakanati
AirbillNo: | Cooler #: 2 | Lab Phone: 281-292-5277

Sample Identifier	CLP Sample No.	Matrix/ Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
0458-0002	A0AA2	Ground Water/ START	Bailer	VOA(14)	1004 (1)	MW-2	05/25/2013 03:00	Field Sample
0458-0003	A0AA4	Ground Water/ START	Bailer	VOA(14)	1004 (1)	MW-3	05/25/2013 03:00	Field Sample
0458-0007	MA0AB3	Soil/ START	Grab	ICP-MS(21)	1008 (1)	A001	05/25/2013 03:00	Field Sample
0458-0008	MA0AB5	Soil/ START	Grab	ICP-MS(21)	1008 (1)	A002	05/25/2013 03:00	Field Sample
0458-0002	PA0AA2	Ground Water/ START	Bailer	12 Toxic CBCs(35), 209 CBCs(35), CDD/CDF(35)	1000, 1001, 1002 (3)	MW-2	05/25/2013 03:00	Field Sample
0458-0003	PA0AA4	Ground Water/ START	Bailer	12 Toxic CBCs(35), 209 CBCs(35), CDD/CDF(35)	1000, 1001, 1002 (3)	MW-3	05/25/2013 03:00	Field Sample

Sample(s) to be used for Lab QC: 0458-0002 Tag 1004, 0458-0003 Tag 1004, 0458-0002 Tag 1000, 0458-0003 Tag 1000

Shipment for Case Complete? N
Samples Transferred From Chain of Custody #

Analysis Key: VOA=CLP Volatiles, ICP-MS=CLP ICP-MS Metals, 12 Toxic CBCs=CLP 12 Toxic Congeners, 209 CBCs=CLP 209 Congeners, CDD/CDF=CLP Dioxins/Furans

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 103

CHAIN-OF-CUSTODY DOCUMENTATION

Revised September 2016

ATTACHMENT 4

EXAMPLE OF A SAMPLE LABEL/SAMPLE TAG

Case No. 12345
Sample No. MC0AA0 / Tag No. 1000
Location: SS-0006
Sample Date: 6/29/2015 / Time: 11:05
Analyses: CLP TAL Total Metals/ICP-AES
Preservation: 4 C
Collection: Composite
Sampler: Laura Mathew

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 103

CHAIN-OF-CUSTODY DOCUMENTATION

Revised September 2016

ATTACHMENT 5

EXAMPLE OF A CUSTODY SEAL



SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 104 PHOTOGRAPHIC AND VIDEO DOCUMENTATION

Revised August 2019

1.0 INTRODUCTION

The purpose of this Standard Operating Procedure (SOP) is to provide Weston Solutions, Inc. (WESTON®), Superfund Technical Assessment and Response Team (START) members with a step-by-step guide for photographic and video documentation. Photographs/videos should be used to document field activities including initial site conditions during assessments and emergencies prior to, during and after removal and remedial actions, during enforcement actions, and at EPA special events and outreach programs.

2.0 PHOTOGRAPHIC AND VIDEO DOCUMENTATION

2.1 Photographs

Unless specifically requested by the EPA Assignor, START will document all site, sampling and special events using digital photographs. Film photographs or film slides will only be taken if specifically requested by the EPA Assignor.

Date and time should be accurately set for all digital cameras to document the date of the photography. Descriptions of the photograph subject, date, time, site name and location should be documented in the site logbook for all photographs. This information can also be documented in the digital camera or other electronic data collection device; however, written logbook descriptions should be maintained.

2.2 Video

When requested on a TDD, START members will document site activities using digital video cameras. Film video will only be taken if specifically requested by the EPA Assignor, and such documentation, as well as High-definition digital video or other specialized video services, may require subcontractor support.

Date and time should be accurately set for all digital video cameras to document the date of the video. Descriptions of the video subject, date, time, site name and location should be documented in the site logbook for all video. This information can also be documented in the digital camera or other electronic data collection device; however, written logbook descriptions should be maintained.

3.0 SPECIFIC PROTOCOL

Adhere to the following protocol for both photographic and video documentation:

- Enter description of filming activities in the site logbook documenting type of camera, time

(military time) and date, filming individual, and orientation angle of the viewing angle.

- Print the site name, the project TDD number, and coverage dates on each storage media that has been used.
- Prepare a photographic log and label all photographs with the following information: the project TDD number, site name, site location, date and time, description of photograph, orientation, and photographer.
- Store all storage media (SandDisk [SD] or other memory card, MicroSD, Digital tape, Universal Serial Bus [USB] flash drive, site negatives, original videos or other media) in the official site file.
- Be objective for all photographs/video. Ensure the purpose of the photograph is entered into the site log (e.g., documenting labels for enforcement, or condition of neighboring properties prior to the initiation of a removal action, or documenting an exposure pathway).

4.0 REFERENCES

NEIC Policies and Procedures. EPA-330/9-78-001-R, May 1978 (Revised 1983)

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 104 PHOTOGRAPHIC AND VIDEO DOCUMENTATION

Revised August 2019

Attachment A: Example Photographic Documentation Log

PHOTOGRAPHIC DOCUMENTATION LOG

Client:	U.S. EPA Region III	**Prepared by:**	Weston Solutions, Inc.
Site Name:	BoRit Asbestos NPL Site	**Photographer(s):**	C. Hikel; D. Sweatt (START)
Location:	Ambler, PA	**TDD Number:**	WS01-10-07-002
Phase:	Rose Valley Reconstruct	**Date:**	May 30, 2014

Date: 9/9/2011

Time: 09:00

Orientation: SW

Description: Damage assessment of Rose Valley Creek after Tropical Storm Lee.



Date: 9/14/2011

Time: 13:50

Orientation: E

Description: Collection and staging of flood debris for disposal.



SUPERFUND TECHNICAL ASSESSMENT RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 201 GROUNDWATER WELL SAMPLING

Revised August 2019

1.0 SCOPE AND APPLICATION

The objective of this Standard Operating Procedure (SOP) is to provide general reference information on sampling groundwater from monitoring wells. This guideline is primarily concerned with the collection of water samples from the saturated zone of the subsurface. Every effort must be made to ensure that the samples are representative of the aquifer groundwater in the direct vicinity of the well being sampled. These procedures are designed to be used in conjunction with analyses for the most common types of groundwater contaminants (e.g., volatile and semi-volatile organic compounds, pesticides, metals, biological parameters).

Note that this SOP is NOT appropriate for perfluorinated compound (PFC) sampling. See appropriate SOP for PFC sampling.

2.0 METHOD SUMMARY

Prior to sampling a monitoring well, the well must be purged of stagnant water within the well. This may be done with a number of pumping/purging devices. The most common of these are bailers, submersible pumps, non-gas contact bladder pumps and inertia pumps. Prior to sampling a well, it is normal convention to remove a minimum of three well volumes to ensure that the samples collected are representative of the surrounding aquifer water and not stagnant water within the well. Equipment used for purging and sampling must be fully decontaminated prior to use and between wells. Once purging is completed and the correct laboratory-cleaned sample containers have been prepared, sampling may proceed. Samples may be collected from the discharge lines of any of the above listed pumps, or retrieved manually using a bailer. Care should be taken when choosing and/or operating the sampling device as some compounds such as volatile organics may be volatilized by the sampling process if flow rates are too high or excess agitation of the sample occurs. In order to minimize the risk of cross- contamination between wells, in addition to decontamination of all purging/sampling devices between wells, sampling should generally occur in a progression from the least to most contaminated wells, if this information is known. If unknown, headspace screening of all site wells should be conducted while collecting a complete static water level round of the site wells prior to sampling.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING AND STORAGE

The type of analyses for which samples are being collected determines the type of bottle, preservative, holding time, and filtering requirements. These should all be specified in the site work plan. Samples should be collected directly from the sampling device into the appropriate laboratory-cleaned containers. Check that Teflon or polyethylene liners are present in the bottle caps, if required. Following sample collection, attach the completed sample identification labels to the bottles and complete the field data sheets, chain of custody form(s) and record all pertinent data in the site logbook.

Samples shall be appropriately preserved, labeled, logged, and placed in a cooler on ice to be maintained at 4°C. Samples should be shipped well before the technical holding times, as specified in the site work plan and/or laboratory quality control plan, are met or exceeded. Ideally, groundwater samples are shipped within 24 hours of sample collection in order to maximize the time available for the laboratory to

perform the analyses. The sample bottles should be shipped with adequate packing material and sufficient ice/cold packs to maintain the samples at 4°C.

Certain conditions may require special sample handling or testing techniques. For example, treatment of samples for volatile organic analysis (VOA) with sodium thiosulfate preservative is required if there is residual chlorine in the water (such as in a public water supply) that could cause free radical chlorination and change the concentration of any potential volatile organic compounds (VOCs) present in the sample. However, sodium thiosulfate should not be used if chlorine is not present in the water. Commercially available chlorine test kits are utilized to screen water samples for the presence of free chlorine. Special requirements such as these must be identified during the planning prior to conducting fieldwork.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

4.1 General

The primary goal of groundwater sampling is to obtain representative samples of the aquifer groundwater in the direct vicinity of the well. Analyses can be compromised by field personnel in two primary ways: (1) taking unrepresentative samples within a well that are not in equilibrium with the surrounding aquifer water, or (2) by incorrect handling of the samples following collection. There are numerous ways of introducing foreign contaminants into a sample, and these must be avoided by following strict sampling procedures and employing only trained field personnel.

4.2 Purging

In monitoring wells that are not routinely under pumping conditions (such as a water supply wells), there will be little or no vertical mixing of the groundwater in the well, and some stratification will occur. The well water in the screened or open-hole section of the well will mix with the aquifer groundwater due to normal flow patterns. However, the groundwater above the screened or open-hole section of the well may remain isolated and become stagnant, potentially lacking the chemical characteristics of the aquifer groundwater surrounding the well. Sampling personnel should also realize that the stagnant water column may also contain foreign material inadvertently or deliberately introduced from the surface. To safeguard against collecting non-representative stagnant water, follow these guidelines during sampling:

- As a general rule, all monitoring wells should be pumped or bailed prior to sampling. Purge water should be containerized/treated on site or handled as specified in the site-specific project plan. Depending on contaminant levels, most states allow purge water to be discharged directly to the ground around a well, provided the well is in an unpaved, grassy area, which would promote infiltration of the purge water. In addition, purge water should not be allowed to discharge directly into a surface stream or pond.
- Evacuation of a minimum of one well volume from a well prior to collecting a sample is recommended for obtaining a representative sample of the aquifer groundwater in the vicinity of a well. For most applications, two to three well volumes are normally purged from a well prior to sampling, provided general water quality parameters have stabilized. In low-yielding wells or wells

with very short screen or open-hole lengths, low-flow groundwater purging and sampling has gained widespread acceptance. In these cases, the pump intake must be set at the precise depth of the primary water-bearing zone or fracture in the well, and general water quality parameters must reached stabilization.

- For low-yielding wells that can be dewatered during purging (i.e., excessive water level drawdown to the pump intake), the well should be evacuated and allowed to fully recover prior to sample collection. In these cases, the well may be allowed to fully recover overnight, and then slowly pumped to achieve stabilization of general water quality parameters prior to sample collection.

4.3 Materials

Sampling and evacuation equipment (bladders, pumps, bailers, tubing, inertial check-valves, etc.) should be limited to those made with inert materials such as stainless steel, Teflon and High Density Polyethylene (HDPE) to minimize the leaching out or adsorption of compounds being investigated, especially when contaminant concentrations are expected to be at or near the method detection limits. A good example of this is when sampling for Perfluorinated Compounds (PFCs), which routinely require extremely low method detection limits (often in the parts per trillion range). In this case, the use of any devices or materials containing PFCs is to be strictly avoided. See appropriate SOP for PFC sampling. **Table 1** discusses the advantages and disadvantages of the most common ground water purging and sampling devices.

Table 1
Advantages and Disadvantages of Various Groundwater Sampling Devices

Device	Advantages	Disadvantages
Bailers	• The only practical limitations are size and materials • No power source needed • Portable • Inexpensive; can be dedicated to wells thus eliminating/reducing the chances of cross-contamination • Easy to disassemble and decontaminate between locations • Readily available in polyethylene, Teflon or stainless steel • Removes stagnant water above the screen/open hole interval first • Rapid, simple method for removing small volumes of purge water	• Time consuming, especially for large wells • Labor intensive • Transfer of sample may cause aeration of VOC samples
Submersible Pumps	• Portable; can be used on multiple wells	• Potential for effects on analysis of trace volatile organics.

	• Can be decontaminated between wells by running in a potable water & detergent bath. • Relatively high pumping rates achievable (dependent on depth and size of pump) • Generally very reliable; does not require priming	• Heavy and cumbersome, particularly in wells with deep static water levels (100 ft or more) • Expensive (relative to dedicated sampling devices) • Power source needed • Susceptible to damage from sand or gritty sediment • Thorough decon required between locations
Non-Gas Contact Bladder Pumps	• Maintains integrity of sample • Easy to use and operate • Bladders & tubing can be dedicated to wells eliminating the need for extensive decontamination	• Only useful to approximately 100 ft in depth • Generally limited to low flow rates (<1-2 gpm) • Supply of gas for operation (bottled gas or compressor required)
Inertia Pumps (Wattera check-valve or equivalent	• Portable • Inexpensive – can dedicate check-valve and tubing system to each well • Readily Available in polyethylene, stainless steel and Teflon • Rapid method for purging relatively shallow wells, small diameter wells (<50 ft/2-inch diameter)	• Only useful to approximately 50 feet or less in depth • May be time consuming to use (<0.5 gpm flow rates) • Labor intensive unless electric powered actuator is used

5.0 EQUIPMENT/APPARATUS

The following section outlines the general list of supplies and materials needed for conducting a groundwater sampling event, followed by a list of recommended supplies specific to each of the sampling devices listed above in **Table 1**.

5.1 General

- Water level indicators
  - electronic water level meter
  - sonic water level meter
  - steel tape measure

- YSI (or equivalent) General Water Quality Instrument with flow-through cell
- Appropriate keys for locking well caps
- Decontamination brushes & tubs
- Flame or photoionization detectors (FID or PID) with check gas (whichever is most appropriate)
- Field logbook and sampling data sheets
- Chain-of-custody forms and seals
- Sample bottles/containers
- Engineer's ruler and calculator
- Sharp knife (locking blade)
- Tool box (to include at least: screwdrivers, ratchet set, pliers, hacksaw, bolt cutters, hammer, flashlight, and adjustable wrench)
- Leather work gloves, nitrile gloves, and safety glasses
- 5-gallon bucket or 1-liter graduated cylinder (for flow rate measurements)
- Stopwatch
- Plastic sheeting
- Shipping coolers
- Packing materials, shipping tape, gallon resealable bags (for ice)
- DOT-approved 55-gal drums or 250-gal Polypropylene totes with discharge hose for purge water
- Phosphate-free detergents (Liquinox) for decontamination
- Potable water source for decontamination
- Distilled or deionized water for field rinse blanks

Provided below are lists of additional field supplies and equipment which are specific to each type of sampling device listed in **Table 1** above. These items would be in addition to the general list of supplies cited above.

5.2 Bailers

- Clean, decontaminated bailer(s) of appropriate size (1/2-inch, 2-inch or 4-inch diameter)
- Sufficient length of nylon line to dedicate to each well (based upon number and total depths of the wells)

5.3 Submersible Pumps

- Pump(s) Grundfos Redi-Flo or equivalent
- Pump controller(s) to allow for adjustable flow rates
- Generator (110, 120, or 240 volt) or 12-volt battery (for DC powered pumps)
- Rolls of ¾-inch polyethylene or Teflon tubing for pump discharge line – enough to dedicate to each well
- Stainless steel hose clamps
- Safety cable
- tool box supplements
  - wire strippers

- electrical tape
- heat shrink
- hose connectors
-Teflon tape

- Winch or pulley system (for deep wells as needed)
- Gasoline for generator and gas can
- Flow meter with gate valve for non-variable rate pumps

5.4 Non-Gas Contact Bladder Pump

- Non-gas contact bladder pump(s)
- Air compressor or nitrogen gas cylinder
- Batteries, charger and/or fuel to run compressor
- Poly or Teflon discharge tubing – enough to dedicate to each well
- Swagelock fittings
- Toolbox supplements – (**same as submersible pump**)

5.5 Inertia Pumps

- Pump assembly (WaTerra pump, piston pump) stainless steel or poly
- Generator or Battery to run actuator piston pump
- Rolls of 3/4-inch Poly Tubing sufficient to dedicate to each well
- Stainless steel hose clamps & hose connectors

6.0 REAGENTS

Reagents will be utilized for preservation of samples and for decontamination of sampling equipment. The preservation required is specified by the analysis to be performed, as stated in the site work plan. Decontamination solutions are specified in SOP No. 301, Decontamination Procedures.

7.0 PROCEDURES

7.1 Preparation

- Review the approved site-specific work plan and HASP to determine the extent of the sampling effort, the sampling methods to be employed, and which equipment and supplies are needed.
- Obtain necessary sampling and monitoring equipment.
- Decontaminate or pre-clean any equipment to be used in the wells, and inspect the equipment to ensure that it is in working order.
- Prepare scheduling and coordinate with staff, clients and regulatory agency, if appropriate.

- Perform a general site survey prior to site entry in accordance with the site-specific health and safety plan.
- Identify and mark all sampling locations.

7.2 Field Preparation

- 1. Start at the least-contaminated well, if known, and move progressively to more contaminated wells.
- 2. Lay plastic sheeting around the well to minimize likelihood of contamination of equipment from soil or other materials adjacent to the well.
- 3. Remove locking well cap, note well ID and location, time of day and date in field notebook or an appropriate field log form.
- 4. Remove inner well casing cap.
- 5. Screen headspace of well with an appropriate monitoring instrument (FID/PID) to determine if volatile organic compounds are present and record instrument reading in site field logbook and sampling form.
- 6. Lower depth to water instrument into well until water surface is encountered (indicated by audible alarm on probe.
- 7. Measure distance from water surface to reference measuring point on well casing or protective barrier post and record in site logbook. Alternatively, if there is no reference point, note that water level measurement is from top of steel casing, top of PVC riser pipe, from ground surface, or some other position on the well head.
- 8. Measure total depth of well (do this at least twice to confirm measurement) and record in site logbook and/or on field log form.
- 9. Calculate the volume of water in the well and the volume to be purged using the calculations in Section 8.0.

7.3 Evacuation of Static Water (Purging)

The amount of purging a well receives prior to sample collection depends on the intent of the monitoring program as well as the hydrogeologic conditions. Programs where overall quality determination of water resources are involved may require long pumping periods to obtain a sample that is representative of a large volume of that aquifer. The pumped volume can be determined prior to sampling to ensure that the samples are representative of the aquifer groundwater quality in the direct vicinity of the well and not the stagnant water within the upper portion of the well's water column. The best indication that the purge water is representative of the near well aquifer groundwater is when stabilization of general water quality parameters such as specific conductance, temperature, dissolved oxygen (DO), oxidation/reduction potential (ORP) or pH has occurred.

Purging prior to sampling requires that the well be pumped enough to remove the stagnant water column from the well and to bring in the near well aquifer water, but not enough to induce flow from long distances. Generally, two to three well volumes are considered sufficient to achieve representative aquifer

samples. Calculations can also be made to determine, on the basis of the aquifer parameters and well dimensions, the appropriate volume of purge water to remove prior to sampling.

During purging, regular water level measurements should be taken regularly at 3 to 5 minute intervals, along with pumping flow rate measurements. This pumping and drawdown data may be used to estimate aquifer transmissivity and the specific capacity of the well.

The following subsections include descriptions of the most commonly used purging and sampling devices whose advantages and disadvantages were summarized earlier on **Table 1**. Other evacuation devices are available, but have been omitted in this discussion due to their limited use.

7.3.1 Bailers

Bailers are the simplest purging device used and have many advantages. They generally consist of a rigid length of tube, usually with a ball check-valve at the bottom. A line is used to lower the bailer into the well and retrieve a volume of water. The three most common types of bailer are PVC, Teflon, and stainless steel.

This manual method of purging is best suited to shallow or narrow diameter wells. For deep, larger diameter wells which require evacuation of large volumes of water, other mechanical devices may be more appropriate.

Bailing equipment includes a clean, decontaminated bailer. Teflon or nylon line, a sharp knife, and plastic sheeting.

- Determine the volume of water to be purged as described in Section 7.2 Field Preparation.
- Lay plastic sheeting around the well to prevent contamination of the bailer line with foreign materials.
- Attach the line to the bailer and lower until the bailer is completely submerged.
- Pull bailer out ensuring that the line either falls onto a clean area of plastic sheeting or never touches the ground.
- Empty the bailers into a pail or tote to track the volume of purge water being removed in order to achieve the required purge volume calculated.
- Following purging and sampling, dispose of the purge water as specified in the site-specific project plan.

7.3.2 Submersible Pumps

Submersible pumps are generally constructed of stainless steel, polyethylene/plastic and rubber parts that are intended to have a minimal effect on the analysis of samples. Submersible pumps are very useful for purging deep or large diameter wells that require larger volumes of purging prior to sampling. Pumps should have an internal check valve to prevent water in the pump and discharge line from rushing back into the well when shut down. Submersible pumps generally use one of two types of power supplies, electric or compressed gas. Electric pumps can be powered by a 12-volt DC rechargeable battery, or a 110-

or 220-volt AC power supply. Those units powered by compressed gas normally use a small electric compressor which also needs 12volt DC or 110-volt power. They may also utilize compressed gas cylinders. Submersible pump sizes differ according to the depth and diameter of the monitoring wells and the amount of head they would be required to pump.

- Determine the volume of water to be purged as described in Section 7.2, Field Preparation.
- Lay plastic sheeting around the well to prevent contamination of pumps, hoses or lines with foreign materials.
- Assemble pump, hoses and safety cable, and lower the pump into the well to the depth specified in the work plan (generally at the mid-screen or primary water-bearing zone to be targeted.
- Attach an in-line flow meter to the pump discharge line to measure the rate & volume of water purged. Alternately, flow rates can be easily measured manually using graduated cylinders or buckets and timing the purge volumes. Flow rates should be adjusted to balance drawdown with the flow rate, taking special care to not draw the water level down to the pump intake which could damage the pump.
- Attach power supply, and purge well until the specified minimal volume of purge water has been evacuated, then reduce the flow rate (generally to 0.5 gpm or less) and begin measuring the general water quality parameters (pH, temp., DO, ORP, Specific Conductance, etc.). Once the general water quality parameters stabilize (as specified in the site specific work plan), sample collection can begin.
- Dispose of all purge water as specified in the site-specific project plan.

7.3.3 Non-Contact Gas Bladder Pumps

For this procedure, an all stainless-steel and Teflon squeeze bladder pump (e.g., Well Wizard or equivalent) is used to provide the least amount of material interference to the sample (Barcelona, 1985). Water comes into contact with the inside of the bladder (Teflon) and the sample tubing, also Teflon or polyethylene, each of which can be dedicated to each well. Some wells may have permanently installed bladder pumps that can be used to sample for all parameters and minimizes the risk of cross-contamination.

- Assemble Teflon or polyethylene tubing, pump and charged control box.
- Use the same procedure for purging with a bladder pump as for a submersible pump.
- Be sure to adjust flow rates prior to sampling to prevent violent jolting of the hose as samples are drawn in.

7.3.4 Inertia Pumps

Inertia pumps, such as the WaTerra pump and piston pump can be operated manually or through the use of an electric actuator device. Inertia pumps are simple to operate and are appropriate to use when wells are too deep to bail by hand, but are not inaccessible enough to warrant an automatic (submersible, etc.) pump. These pumps are generally small diameter ½ inch to ¾-inch and made of either stainless steel, polyethylene/plastic or Teflon and may be either decontaminated between wells, dedicated to wells or

discarded, after use.

- Determine the volume of water to be purged as described in Section 7.2 Field Preparation.
- Lay plastic sheeting around the well to prevent contamination of pumps or hoses with foreign materials.
- Attach discharge tubing to the pump, and lower to the depth in the well specified in the work plan (generally at the mid-screen or primary water-bearing zone to be targeted).
- Begin pumping either manually or by utilizing the actuator device, discharging water into a 5-gallon bucket (or other graduated vessel) until the minimum required purge volume is achieved. Begin collecting general water quality measurements and purge until readings stabilize as specified in the site specific work plan.
- Dispose of purge waters as specified in the site-specific project plan.

7.4 Sampling

Sample withdrawal methods require the use of pumps, compressed air, bailers, and manual check valve samplers. Ideally, purging and sample withdrawal equipment should be completely inert, economical to use, easily cleaned, reusable, able to be operated at remote sites and be capable of delivering variable flow rates for sample collection.

There are several factors to take into consideration when choosing a sampling device. Care should be taken when reviewing the advantages or disadvantages of any one device. It may be appropriate to use a different device to sample than that which was used to purge. The most common example of this is the use of a submersible pump to purge and bailer to sample.

7.4.1 Bailer

The positive-displacement volatile sampling bailer (by GPI) is perhaps the most appropriate for collection of water samples for volatile analysis. Other bailer types (messenger, bottom fill, etc.) are less desirable, but may be mandated by cost and site conditions. Generally, bailers can provide an acceptable sample, providing that sampling personnel use extra care in the collection process.

- Surround the monitoring well with clean plastic sheeting.
- Attach a line to the bailer. If a bailer was used for purging, the same bailer and line may be used for sampling.
- Lower the bailer slowly and gently into the well taking care not to shake the casing sides or to splash the bailer into the water. Stop lowering at a point adjacent to the screen.
- Allow bailer to fill and then slowly and gently retrieve the bailer from the well, avoiding contact with the casing, so as not to knock flakes of rust or other foreign materials into the bailer.
- Remove the cap from the sample container and place it on the plastic sheet or in a location where it will not become contaminated. See Section 7.7 for special consideration on VOA samples.
- Begin pouring slowly from the bailer.
- Filter and preserve samples as required by sampling plan.

- Cap the sample container tightly and place pre-labeled sample container in a carrier.
- Replace the well cap.
- Log all samples in the site logbook and on field data sheets and label all samples.
- Package samples and complete necessary paperwork.
- Transport sample to decontamination zone to prepare it for transport to analytical laboratory.

7.4.2 Submersible Pump

Although it is recommended that samples not be collected with a submersible pump due to the reasons stated in Section 4.0, there are some situations where they may be used.

- Allow the monitoring well to recharge after purging, maintaining the pump at the depth specified in the work plan (mid screen or primary water-bearing zone).
- Attach gate valve to hose (if not already fitted), and reduce flow of water to a manageable sampling rate.
- Assemble the appropriate bottles.
- If no gate valve is available, run the water down the side of a clean jar and fill the sample bottles from the jar.
- Cap the sample container tightly and place pre-labeled sample container in a carrier.
- Replace the well cap.
- Log all samples in the site logbook and on the field data sheets and label all samples.
- Package samples and complete necessary paperwork.
- Transport sample to decontamination zone for preparation for transport to analytical laboratory.
- Upon completion, remove pump and assembly and fully decontaminate prior to setting into the next sample well. Dedicate the tubing to the hole.

7.4.3 Non-Gas Contact Bladder Pump

The use of a non-gas contact positive displacement bladder pump is often mandated by the use of dedicated pumps installed in wells. These pumps are also suitable for shallow (less than 100 feet) wells. They are somewhat difficult to clean, but may be used with dedicated sample tubing to avoid cleaning. These pumps require a power supply and a compressed gas supply (or compressor). They may be operated at variable flow and pressure rates making them ideal for both purging and sampling.

Barcelona (1984) and Nielsen (1985) report that the non-gas contact positive displacement pumps cause the least amount of alteration in sample integrity as compared to other sample retrieval methods.

- Allow well to recharge after purging.
- Assemble the appropriate bottles.
- Turn pump on, increase the cycle time and reduce the pressure to the minimum that will allow the sample to come to the surface.
- Cap the sample container tightly and place pre-labeled sample container in a carrier.
- Replace the well cap.

- Log all samples in the site logbook and on field data sheets and label all samples.
- Package samples and complete necessary paperwork.
- Transport sample to decontamination zone for preparation for transport to analytical laboratory.
- On completion, remove the tubing from the well and either replace the Teflon tubing and bladder with new dedicated tubing and bladder or rigorously decontaminate the existing materials.
- Collect non-filtered samples directly from the outlet tubing into the sample bottle.
- For filtered samples, connect the pump outlet tubing directly to the filter unit. The pump pressure should remain decreased so that the pressure build-up on the filter does not blow out the pump bladder or displace the filter. For the Geotech barrel filter, no actual connections are necessary so this is not a concern.

7.4.4 Inertia Pump

Inertia pumps may be used to collect samples. It is more common, however, to purge with these pumps and sample with a bailer.

- Following well evacuation, allow the well to recharge.
- Assemble the appropriate bottles.
- Since these pumps are manually operated, the flow rate may be regulated by the sampler. The sample may be discharged from the pump outlet directly into the appropriate sample container.
- Cap the sample container tightly and place pre-labeled sample container in a carrier.
- Replace the well cap.
- Log all samples in the site logbook and on field data sheets and label all samples.
- Package samples and complete necessary paperwork.
- Transport sample to decontamination zone for preparation for transport to analytical laboratory.
- Upon completion, remove pump and decontaminate or discard, as appropriate.

7.5 Filtering

For samples that require filtering, such as samples which will be analyzed for total metals, the filter must be decontaminated prior to use and between uses. Filters work by two methods. A barrel filter such as the "Geotech" filter works with a bicycle pump, which is used to build up positive pressure in the chamber containing the sample. The sample is then forced through the filter paper (minimum size 0.45 µm) into a jar placed underneath. The barrel itself is filled manually from the bailer or directly via the hose of the sampling pump. The pressure must be maintained up to 30 psi by periodic pumping.

A vacuum type filter involves two chambers, the upper chamber contains the sample and a filter (minimum size 0.45 µm) divides the chambers. Using a hand pump or a Gillian type pump, air is withdrawn from the lower chamber, creating a vacuum and thus causing the sample to move through the filter into the lower chamber where it is drained into a sample jar, repeated pumping may be required to drain all the sample into the lower chamber. If preservation of the sample is necessary, this should be done after filtering.

7.6 Post Operation

SUPERFUND TECHNICAL ASSESSMENT RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 201 GROUNDWATER WELL SAMPLING

Revised August 2019

After all samples are collected and preserved, the sampling equipment should be decontaminated prior to sampling another well. This will prevent cross-contamination of equipment and monitoring wells between locations.

- Decontaminate all equipment
- Replace sampling equipment in storage containers.
- Prepare and transport water samples to the laboratory. Check sample documentation and make sure samples are properly packed for shipment.

7.7 Special Considerations for VOA Sampling:

The proper collection of a sample for volatile organics requires minimal disturbance of the sample.

Sample retrieval systems suitable for the valid collection of volatile organic samples are: positive displacement bladder pumps, gear driven submersible pumps, syringe samplers and bailers (EPA. 1991). Field conditions and other constraints will limit the choice of appropriate systems. The focus of concern must be to provide a valid sample for analysis, one which has been subjected to the least amount of turbulence possible.

The following procedures should be followed:

- Open the vial, set cap in a clean place, and collect the sample during the middle of the cycle. When collecting duplicates, collect both samples at the same time.
- Fill the vial to just overflowing. Do not rinse the vial, nor excessively overfill it. There should be a convex meniscus on the top of the vial.
- Check that the cap has not been contaminated (splashed) and carefully cap the vial. Place the cap directly over the top and screw down firmly. Do not overtighten and break the cap.
- Invert the vial and tap gently. Observe vial for at least 10 seconds. If an air bubble appears, discard the sample and begin again. It is imperative that no entrapped air is in the sample vial.
- Immediately place the vial in the protective foam sleeve and place into the cooler, oriented so that it is lying on its side, not straight up.
- The holding time for VOAs is 7 days. Samples should be shipped or delivered to the laboratory daily so as not to exceed the holding time. Ensure that the samples remain at 4°C, but do not allow them to freeze.

8.0 CALCULATIONS

There are no calculations necessary to implement this procedure. However, if it is necessary to calculate the volume of the well, utilize the following equation:

SUPERFUND TECHNICAL ASSESSMENT RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 201 GROUNDWATER WELL SAMPLING

Revised August 2019

Well volume = nr^2h (cf) [Equation 1] where:

n= pi, r = radius of monitoring well (feet), h = height of the water column (feet)
[This may be determined by subtracting the depth to water from the total depth of the well as measured from the same reference point.]

cf = conversion factor (gal/ft^3) = 7.48 gal/ft^3 [In this equation, 7.48 gal/ft^3 is the necessary conversion factor.]

Monitoring wells are typically 2, 3, 4, or 6 inches in diameter. If you know the diameter of the monitoring well, there are a number of standard conversion factors which can be used to simplify the equation above.

The volume, in gallons per linear foot, for various standard monitoring well diameters can be calculated as follows.

$v = nr^2$ (cf) [Equation 2]

where:

v = volume in gallons per linear foot n= pi r = radius of monitoring well (feet) cf = conversion factor (7.48 gal/ft^3)

For a 2-inch diameter well, the volume in gallons per linear foot can be calculated as follows:

v= nr^2 (cf) [Equation 2]

= 3.14 (1/12 ft^2) 7.48 gal/ft^3 = 0.1632 gal/ft

Remember that if you have a 2-inch diameter well you must convert this to the radius in feet to be able to use the equation.

The volume in gallons per linear foot for the common size monitoring wells are as follows:

Well Diameter v (volume in gal/ft.)

2 inches 0.1632 3 inches 0.3672 4 inches 0.6528 6 inches 1.4688

If you utilize the conversion factors above, Equation 1 should be modified as follows:

Well volume = (h)(v) [Equation 3]

where:

SUPERFUND TECHNICAL ASSESSMENT RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 201 GROUNDWATER WELL SAMPLING

Revised August 2019

h = height of water column (feet)
v = volume in gallons per linear foot as calculated from Equation 2

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance activities which apply to the implementation of these procedures. However, the following general QA procedures apply:

- All data must be documented on field data sheets or within site logbooks.
- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation and they must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA and specific health and safety procedures. More specifically, depending upon the site-specific contaminants, various protective programs must be implemented prior to sampling the first well. The site health and safety plan should be reviewed with specific emphasis placed on the protection program planned for the well sampling tasks. Standard safe operating practices should be followed such as minimizing contact with potential contaminants in both the vapor phase and liquid matrix through the use of respirators and disposable clothing.

For volatile organic contaminants:

- Avoid breathing constituents venting from the well.
- Pre-screen the well head-space with an FID/PID prior to sampling.
- If instrument screening results indicate organic constituents are present, sampling activities may be conducted in Level C protection if reading remain elevated in the breathing space around the well head. At a minimum, skin protection should be worn such as disposable nitrile gloves and protective clothing.
- Physical hazards associated with well sampling include:
  1. Lifting injuries associated with pump and bailer retrieval; moving equipment (generators).
  2. Use of pocket knives for cutting discharge hoses.
  3. Heat/cold stress as a result of exposure to extreme temperatures (may be heightened by protective clothing).
  4. Slip, trip, fall conditions as a result of pump discharge lines and power cords.

SUPERFUND TECHNICAL ASSESSMENT RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 201 GROUNDWATER WELL SAMPLING

Revised August 2019

12.0 REFERENCES

EPA (U.S. Environmental Protection Agency). 1991. Compendium of ERT waste sampling procedures. Office of Solid Waste and Emergency Response, Washington, DC. EPA/540/P-91/008.

EPA, Region III. 1997. Groundwater Sampling SOP. *Recommended Procedure for Low-Flow Purging and Sampling of Groundwater Monitoring Wells.* October 1997.

EPA. 1999. Compendium of ERT Groundwater Sampling Procedures. Office of Solid Waste and Emergency Response, Washington, DC. EPA/540/P-91/007.

SUPERFUND TECHNICAL ASSESSMENT RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 201 GROUNDWATER WELL SAMPLING

Revised August 2019

ATTACHMENT 1

WATER LEVEL and WATER QUALITY/WELL PURGING DATA SHEET

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 202 RESIDENTIAL GROUNDWATER SAMPLING

Revised August 2019

1.0 INTRODUCTION

The following Standard Operating Procedure (SOP) has been prepared to assist Weston Solutions, Inc. (WESTON®), Superfund Technical Assessment and Response Team (START) members with a step-by-step guide and the recommended protocol for sampling residential groundwater.

Ingestion or contact with hazardous chemicals introduced through potable water supplies is a great threat to the public. START members generally perform residential groundwater sampling for the following reasons:

- To determine the presence and magnitude of contamination;
- To delineate the extent of contamination; or
- To evaluate the effectiveness of in-place treatment systems.

Parameters most frequently sampled for are volatile organic compounds (VOCs), metals, semi-volatile organics (a.k.a. base/neutral/acids [BNAs]), polychlorinated biphenyls (PCBs)/pesticide compounds and cyanide compounds; therefore, these parameters are the focus of this SOP. *Note that this SOP is NOT appropriate for perfluorinated compound (PFC) sampling. See appropriate SOP for PFC sampling.*

2.0 MATERIALS REQUIRED

The following materials required generally apply to all analytical parameters covered by this SOP; see below for parameter-specific materials and see site-specific Field Sampling Plan for additional required materials.

- Sampling plan
- Maps/sketches/plot plan
- Personal protective equipment (as specified in the Health and Safety Plan)
- Cooler (size and number) dependent on number of samples)
- Ice for sample preservation
- GPS, and/or tape measure/compass as needed to locate and document sample ,location
- Sample bottles
- Preservatives (see below)
- Sample labels/tags
- pH/temperature/conductivity meter

- Chain-of-Custody forms
- EPA Chain-of-custody seals
- Paper towels
- Re-sealable plastic bags or bubble wrap bags
- Plastic garbage bags
- Nitrile or latex sample gloves
- Shipping documents (Federal Express forms/shipping labels/etc.)
- Strapping/packing tape

2.1 VOC Sampling Materials

The following materials are required for collecting VOC samples:

- 40-mL VOA vials with Teflon™ septum (provide enough bottles for a triple volume at each sample location)
- Hydrochloric acid (HCl) solution for preserving VOC samples containing BTEX compounds or to comply with Contract Laboratory Programs (CLP) laboratory requirements
- pH paper

2.2 Metals Sampling Materials

The following materials are required to sample for metals in groundwater:

- 1-L polyethylene bottle
- Nitric Acid (HNO3) solution (20%)
- pH paper

2.3 Semi-Volatile Organics Sampling Materials

The following materials are required for collecting BNA samples:

- 1-L amber bottles (provide enough bottles for a 1 volume for each routine sample plus QC samples)

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 202 RESIDENTIAL GROUNDWATER SAMPLING

Revised August 2019

2.4 PCB/Pesticide Sampling Materials

The following materials are required for collecting PCB/pesticide samples:

- 1-L amber bottles (provide enough bottles for a 1 volume for each routine sample plus QC samples)

2.5 Cyanide Sampling Materials

The following materials are required for collecting cyanide samples:

- 1-L polyethylene bottle
- Sodium Hydroxide (NaOH) solution (50%)
- pH paper

3.0 SAFETY PRECAUTIONS

Due to the levels and concentrations of contaminants normally found in groundwater, exposure to these chemicals does not usually present a threat to the sampler. Physical hazards, such as explosion, may exist. These threats may be present in outdoor well casings.

In addition, the following precautions are to be taken:

1. Record head space readings using a flame ionization detector (TVA-1000) or a Multi RAE 5 Gas detector.
2. Ventilate the head space to alleviate the aforementioned hazards.
3. Follow the procedures outlined in START SOP No. 201, Monitoring Well Sampling, if you are required to sample from the well casing.
4. Wear nitrile or latex gloves to prevent skin contact with water, as well as to lessen the chances of contaminating the samples with essential skin oils, etc.
5. Wear safety glasses or splash goggles when adding caustic or acid preservatives.

4.0 SAMPLING PROCEDURES

For documentation purposes, a copy of the Residential Drinking Water Quality Purge/Data Sheet is included for your reference (see Attachment 1). Photograph sample locations with landmarks in view. Keep in mind that sample locations may need to be referenced in

the future, often years after your sampling event.

4.1 General Procedures

1. Present your credentials as an EPA contractor and answer any questions that you can with the exception of policy questions.
2. Politely, but firmly refer the resident to the EPA if the resident poses questions concerning policies or future actions at the site.
3. Wear Tyvek booties or be sure boots are clean before entering a residential home to prevent tracking dirt and other debris into the home.
4. Locate sampling points within the home. These may vary depending on the type of sampling performed. Document these locations in the site logbook.
5. Note in site logbook any type of treatment or filter system connected in the home. In most cases, samples will be collected from a point prior to any treatment or filter system.
6. Don nitrile surgical (or other appropriate) gloves.
7. Use the pH/temperature/conductivity meter and document the water parameters at the start of the system purge in the site logbook. Purging typically will occur from an outside spigot or at a sink or other faucet either at or downstream from the sample point.
8. Purge the system for at least 15 minutes prior to performing any sampling. Approximately 75 gallons of water will cycle through the system, allowing a representative groundwater sample to be obtained.
9. Use the pH/temperature/conductivity meter to ensure that you have flushed the system and that you have introduced groundwater into the system. Normal groundwater temperatures should range from the low 50s to the mid 60s at the end of the purge period.
10. Obtain three readings of all parameters approximately 1 to 2 minutes apart. Some meters are not temperature compensating; therefore, adjustments may need to be made to obtain accurate pH and conductivity readings.
11. Collect samples when you have obtained three consecutive parameter readings that are within 10% of each other.
12. Record all information in the site logbook. Notations must include all purge data, meter readings and sample times.
13. Use a unique repeatable designator to protect the resident's privacy when assigning sample identification designators. Do not use the resident's name or address. Where

more than one volume is required at a sampling point, all samples will have the same designator.

14. Seal, dry and Label all sample jars immediately at the collection site.

Wear fresh sample gloves when collecting water samples at each new sample location, even within the same home.

4.2 VOC Sampling Procedures

1. Wear sample gloves.
2. If sampling containers are not pre-preserved by the laboratory, place one drop of HCl in the vial. *Use a surrogate sampling vial to verify with pH paper that the pH of the samples will be pH < or = 2 using 1 drop of HCl and document this in the site logbook. This surrogate vial is only to verify pH and should not be used for sample collection. If the pH is not < or = 2 with 1 drop of HCl, repeat the surrogate pH test with 2 drops, and so on until a pH < or = 2 is obtained. Use this number of HCl drops for all samples to be collected.*
3. Collect samples in the designated vials. A triple volume sample must be collected at each location. Note: VOC samples should be collected **without** aeration devices in place and at the slowest possible flow.
4. Fill the vial slowly until a convex meniscus is formed.
5. Add a small amount of the water to the cap.
6. Affix the cap to the vial.
7. Gently shake the vial to uniformly distribute the preservative.
8. Turn the vial upside down and strike the vial sharply on the palm of the hand and observe for bubbles. (Bubbles cannot be present in the sample.)
9. Dry the vial with a paper towel.
10. Label the vial immediately.
11. Collect QC samples at frequency specified in the site-specific Field Sampling Plan (i.e., trip blank samples, field blank samples, rinsate blank samples, field duplicate samples, matrix spike/matrix spike duplicate samples, etc.).
12. Place the samples on ice as soon as possible and cool to 4° C (39° F); include a temperature indicator (temperature “blank”) with each sample cooler (this indicator is NOT analyzed for analytical parameters, but is used by the laboratory to document temperature of samples upon receipt).

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 202 RESIDENTIAL GROUNDWATER SAMPLING

Revised August 2019

4.3 Metals Sampling Procedures

1. Wear sample gloves.
2. Collect samples in the designated bottles leaving enough room in the bottle for the addition of the preservative.
3. Preserve the sample to a pH < or = 2 by slowly adding HNO_3 solution (20%) with a Pasteur pipette.
4. Affix the cap to the bottle.
5. Gently shake the bottle to uniformly distribute the preservative.
6. Uncap the bottle and check the sample with pH paper. If the pH is not < or = 2, repeat steps 4 - 7.
7. Dry the bottle with a paper towel.
8. Label the bottle immediately.
9. Collect QC samples at frequency specified in the site-specific Field Sampling Plan (i.e., field blank samples, rinsate blank samples, field duplicate samples, matrix spike/matrix spike duplicate samples, etc.).
10. Place the samples on ice as soon as possible and cool to 4° C (39° F); include a temperature indicator (temperature "blank") with each sample cooler (this indicator is NOT analyzed for analytical parameters, but is used by the laboratory to document temperature of samples upon receipt).

4.4 Semi-Volatile Organics Sampling Procedures

1. Wear sample gloves.
2. Collect samples in the designated bottles.
3. Allow room in the bottle for expansion. Do not overfill the bottle.
4. Affix the cap to the bottle.
5. Dry the bottle with a paper towel.
6. Label the bottle immediately.
7. Collect QC samples at frequency specified in the site-specific Field Sampling Plan (i.e., field blank samples, rinsate blank samples, field duplicate samples, matrix spike/matrix spike duplicate samples, etc.).
8. Place the samples on ice as soon as possible and cool to 4° C (39° F); include a temperature indicator (temperature "blank") with each sample cooler (this indicator is NOT analyzed for analytical parameters, but is used by the laboratory to document temperature of samples upon receipt).

4.5 PCB/Pesticide Sampling Procedures

1. Wear sample gloves.
2. Collect samples in the designated bottles.
3. Allow room in the bottle for expansion. Do not overfill the bottle.
4. Affix the cap to the bottle.
5. Dry the bottle with a paper towel.
6. Label the bottle immediately.
7. Collect QC samples at frequency specified in the site-specific Field Sampling Plan (i.e., field blank samples, rinsate blank samples, field duplicate samples, matrix spike/matrix spike duplicate samples, etc.).
8. Place the samples on ice as soon as possible and cool to 4° C (39° F); include a temperature indicator (temperature "blank") with each sample cooler (this indicator is NOT analyzed for analytical parameters, but is used by the laboratory to document temperature of samples upon receipt).

4.6 Cyanide Sampling Procedures

1. Wear sample gloves.
2. Collect the sample in the designated bottles leaving enough room in the bottle for the addition of the preservative.
3. Preserve the sample to a pH > or = 12 by slowly adding NaOH solution (50%) with a Pasteur pipette.
4. Affix the cap to the bottle.
5. Gently shake the container to uniformly distribute the preservative.
6. Uncap the bottle and check the sample with pH paper. If the pH is not > or = 12, repeat steps 4 – 7.
7. Recap the bottle and turn it upside down and strike the bottle sharply on the palm of the hand and observe for bubbles. Bubbles cannot be present in the sample.
8. Dry the bottle with a paper towel.
9. Label the bottle immediately.
10. Collect QC samples at frequency specified in the site-specific Field Sampling Plan (i.e., field blank samples, rinsate blank samples, field duplicate samples, matrix spike/matrix spike duplicate samples, etc.).
11. Place the samples on ice as soon as possible and cool to 4° C (39° F); include a temperature indicator (temperature "blank") with each sample cooler (this indicator is NOT analyzed for analytical parameters, but is used by the laboratory to document temperature of samples upon receipt).

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 202 RESIDENTIAL GROUNDWATER SAMPLING

Revised August 2019

5.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance activities which apply to the implementation of these procedures. However, the following QA procedures apply:

- All data must be documented on field data sheets or within site logbooks.
- Field QA/QC samples (e.g., field blanks, equipment rinsate blanks, trip blanks, duplicate samples, MS/MSD, etc.) must be collected in accordance with the FSP and QAPP
- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

6.0 HEALTH AND SAFETY

- When working with potentially hazardous materials follow U.S. EPA, OSHA and specific health and safety procedures.

- When working on private property be mindful of site circumstances such as traffic, pets, household hazards, etc.

7.0 REFERENCES

EPA. 1999. Compendium of ERT Groundwater Sampling Procedures. Office of Solid Waste and Emergency Response, Washington, DC.

EPA. 2015. ERT SOP #2007 Groundwater Well Sampling. June.

WESTON® (Roy F. Weston, Inc.). 1993. Standard Practices Manual for Potable Water Sampling. West Chester, PA.

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 202 RESIDENTIAL GROUNDWATER SAMPLING

Revised August 2019

ATTACHMENT 1 RESIDENTIAL DRINKING WATER QUALITY PURGE/DATA SHEET

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 202 RESIDENTIAL GROUNDWATER SAMPLING

Revised August 2019

Residential Drinking Water Quality Purge/Data Sheet

Resident's Name: _____ **Date**: _____ **Time**: _____

Address: _____ **Telephone Number**: _____ (H)

_____ _____ (W)

_____

Resident ID# _____ (Use on all sample correspondence)

Filter System: Yes No

Purge Method: 15 Minute (preferred)

Temperature (temperature should be between 50F and middle 60F)

Purging Location (Circle One): Kitchen Tap Filter Well Outlet

Water Quality/ Purge Data

Interval	Time	Temp	Turbidity
Start			H M L N
During			H M L N
During			H M L N
During			H M L N
During			H M L N
During			H M L N
During			H M L N
During			H M L N
Final			H M L N

H- High: Opaque/Muddy/Silty M- Medium: Translucent/Cloudy L- Low: Transparent/Cloudy N- None: Clear/No Visible Silt

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 203 SURFACE WATER SAMPLING

Revised September 2019

1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) is applicable to the collection of representative liquid samples from streams, rivers, lakes, ponds, lagoons, and surface impoundments. It includes samples collected from depth, as well as samples collected from the surface.

2.0 METHOD SUMMARY

Sampling situations vary widely and therefore no universal sampling procedure can be recommended.

However, sampling of liquids from the above mentioned sources is generally accomplished through the use of one of the following samplers or sampling techniques:

- Kemmerer bottle
- Van dorn sampler
- bacon bomb sampler
- dip sampler
- direct method

These sampling techniques will allow for the collection of representative samples from the majority of surface waters and impoundments encountered. See SOP 202a for special precautions when sampling for Per- and polyfluoroalkyl substances (PFAS).

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Once samples have been collected, follow these procedures:

1 Transfer the sample(s) into suitable labeled sample containers.
2 Preserve the sample if appropriate, or use pre-preserved sample bottles.
3 Cap the container, put it in a resealable plastic bag and place it on ice in a cooler.
4 Record all pertinent data in the site logbook and on a field data sheet.
5 Complete the chain-of-custody form.
6 Attach custody seals to the cooler prior to shipment.
7 Decontaminate all sampling equipment prior to the collection of additional samples.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 203 SURFACE WATER SAMPLING

Revised September 2019

There are two primary interferences or potential problems with surface water sampling. These include cross-contamination of samples and improper sample collection.

- Cross-contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary.
- Improper sample collection can involve using contaminated equipment, disturbance of the stream or impoundment substrate, and sampling in an obviously disturbed area.

Following proper decontamination procedures and minimizing disturbance of the sample site will eliminate these problems.

5.0 EQUIPMENT/APPARATUS

Equipment needed for collection of surface water samples includes:

- Kemmerer bottles
- Van dorn sampler
- Bacon bomb sampler
- Dip sampler
- Line and messengers
- Sample bottles and preservatives
- pH paper
- Resealable plastic bags
- Ice for sample preservation
- Coolers
- Ball-point pen, permanent marker, grease pencil, marking spray paint
- Chain of custody forms, EPA custody seals, field data sheets
- Sample bottle labels/tags
- Decontamination equipment (brushes, buckets, garden sprayer, alconox or liquinox, water, etc.)
- Paper towels
- Plastic sheeting
- Map/plot plan/sketches
- Personal protective equipment and monitoring equipment (as specified in the Health and Safety Plan)
- Field data measurement equipment as specified in the FSP (such as YSI)
- Compass
- Tape measure (up to 300 ft)

- Survey stakes, flags, or buoys and anchors
- Global positioning system (GPS) unit with sub-meter accuracy or better
- Digital camera with adequate storage media
- Logbook/waterproof pen and field data sheets
- Plastic garbage bags
- Scissors
- Nitrile or latex sample gloves
- Shipping documents (Federal Express forms/shipping labels/etc.)
- Strapping/packing tape

6.0 REAGENTS

Reagents will be utilized for preservation of samples and for decontamination of sampling equipment. The preservatives required are specified by the analysis to be performed. Decontamination solutions are specified in START SOP No. 301, Decontamination Procedures.

7.0 PROCEDURES

7.1 Preparation

- Determine the extent of the sampling effort, the sampling methods to be employed, and which equipment and supplies are needed.
- Obtain necessary sampling and monitoring equipment.
- Decontaminate or pre-clean equipment, and ensure that it is in working order.
- Prepare scheduling and coordinate with staff, clients, and regulatory agency, if appropriate.
- Perform a general site survey prior to site entry in accordance with the site specific health and safety plan.
- Use stakes, flags, or buoys to identify and mark all sampling locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.

7.2 Sampling Considerations

7.2.1 Representative Samples

In order to collect a representative sample, the hydrology and morphometrics (e.g., measurements of volume, depth, etc.) of a stream or impoundment should be determined prior to sampling. This will aid in determining the presence of phases or layers in lagoons or impoundments, flow patterns in streams, and appropriate sample locations and depths.

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 203 SURFACE WATER SAMPLING

Revised September 2019

Water quality data should be collected in impoundments to determine if stratification is present. Measurements of dissolved oxygen, pH, and temperature can indicate if strata exist that would affect analytical results. Measurements should be collected at one-meter intervals from the substrate to the surface using an appropriate instrument, such as a YSI (or equivalent).

Water quality measurements such as dissolved oxygen, pH, temperature, conductivity, and oxidation-reduction potential can assist in the interpretation of analytical data and the selection of sampling sites and depths anytime surface water samples are collected.

Generally, the deciding factors in the selection of a sampling device for sampling liquids in streams, rivers, lakes, ponds, lagoons, and surface impoundments are:

- Will the sample be collected from the shore or from a boat on the impoundment?
- What is the desired depth at which the sample is to be collected?
- What is the overall depth and flow direction/flow rate of river or stream?

7.2.2 Sampler Composition

The appropriate sampling device must be of a proper composition. Samplers constructed of glass, stainless steel, polyvinyl chloride (PVC) or Polytetrafluoroethylene (PFTE such as Teflon®) should be used based upon the analyses to be performed.

7.3 Sample Collection

Photograph sample locations with landmarks in view. Keep in mind that sample locations may need to be referenced in the future, often years after your sampling event.

7.3.1 Kemmerer Bottle

Kemmerer bottle may be used in most situations where site access is from a boat or structure such as a bridge or pier, and where samples at depth are required. Sampling procedures are as follows:

1. Using a properly decontaminated Kemmerer bottle, set the sampling device so that the sampling end pieces are pulled away from the sampling tube, allowing the substance to be sampled to pass through the tube.
2. Lower the pre-set sampling device to the predetermined depth. Avoid bottom disturbance.
3. When the Kemmerer bottle is at the required depth, send down the messenger, closing the sampling device.
4. Retrieve the sampler and discharge the first 10 to 20 mL to clear any potential contamination on the valve. Transfer the sample to the appropriate sample container.

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 203 SURFACE WATER SAMPLING

Revised September 2019

7.3.2 Van Dorn Sampler

A Van Dorn sampler is used to collect surface water from a very specific sampling depth or from a shallow water body. Since the sampler is suspended horizontally, the depth interval sampled is the diameter of the sampling tube. The sampling procedure is as follows:

1. Use a properly decontaminated Van Dorn sampler. Set the device so that the end stoppers are pulled away from the body allowing surface water to enter the tube.

2. Lower the pre-set sampling device to the predetermined depth. Avoid disturbance of the bottom.

3. When the Van Dorn is at the required depth, send the weighted messenger down the suspension line, closing the sampling device.

4. Retrieve the sampler and discharge the first 10-20 milliliters (mL) from the drain to clear potential contamination from the valve. This procedure may be repeated if additional sample volume is needed to fulfill analytical requirements. Subsequent grabs may be composited or transferred directly to appropriate sample containers.

7.3.3 Bacon Bomb Sampler

A bacon bomb sampler may be used in similar situations to those outlined for the Kemmerer bottle. Sampling procedures are as follows:

1. Lower the bacon bomb sampler carefully to the desired depth, allowing the line for the trigger to remain slack at all times. When the desired depth is reached, pull the trigger line until taut.
2. Release the trigger line and retrieve the sampler.
3. Transfer the sample to the appropriate sample container by pulling the trigger.

7.3.4 Dip or Swing Sampler

A dip sampler and/or a swing sampler are useful for situations where a sample is to be recovered from an outfall pipe or along a lagoon bank where direct access is limited. The long handle on such a device allows access from a discrete location. Sampling procedures are as follows:

1. Assemble the device in accordance with the manufacturer's instructions.
2. Extend the device to the sample location and collect the sample.
3. Retrieve the sampler and transfer the sample to the appropriate sample container.

7.3.5 Direct Method

For streams, rivers, lakes and other surface waters, the direct method may be utilized to collect water samples from the surface. This method is not to be used for sampling lagoons or other impoundments where contact with contaminants are a concern. This method should not be used for PFAS sampling if the containers already containing preservatives such as Trizma®.

Using adequate protective clothing, access the sampling station by appropriate means. For shallow stream stations, collect the sample under the water surface, pointing the sample container upstream. The container must be upstream of the collector. Avoid disturbing the substrate. For lakes and other impoundments, collect the sample under the water surface avoiding surface debris and the boat wake.

When using the direct method, do not use pre-preserved sample bottles as the collection method may dilute the concentration of preservative necessary for proper sample preservation.

8.0 QUALITY ASSURANCE/QUALITY CONTROL

The following general QA/QC procedures apply:

- Field QA/QC samples (e.g., field blanks, equipment rinsate blanks, trip blanks, duplicate samples, MS/MSD, etc.) must be collected in accordance with the FSP and QAPP
- All data must be documented in site logbooks.
- All sample locations should be recorded using a GPS unit.
- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout must occur prior to sampling/operation and should be documented.

9.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA and specific health and safety procedures.

More specifically, when sampling lagoons or surface impoundments containing known or suspected

hazardous substances, take adequate precautions. The sampling team member collecting the sample should not get too close to the edge of the impoundment, where bank failure may cause him or her to lose their balance. The person performing the sampling should be on a lifeline and be wearing adequate protective equipment, including a Type II PFD.

Sampling over and around water can be dangerous, be sure to follow all HAS procedures and have an approved HASP. Whenever boats are to be used to collect samples, a Float Plan must be prepared and included as part of the approved HASP. When working around and over cold water, appropriate survival suits are required (such as Mustang suits), as specified in the approved HASP.

10.0 REFERENCE

EPA. 1991. Compendium of Emergency Response Team (ERT) Surface Water and Sediment Sampling Procedures. Office of Solid Waste and Emergency Response, Washington, DC. EPA/540/P-91/005.

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 203 SURFACE WATER SAMPLING

Revised September 2019

ATTACHMENT 1 FIGURES

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 203 SURFACE WATER SAMPLING

Revised September 2019

Figure 1: Kemmerer Bottle

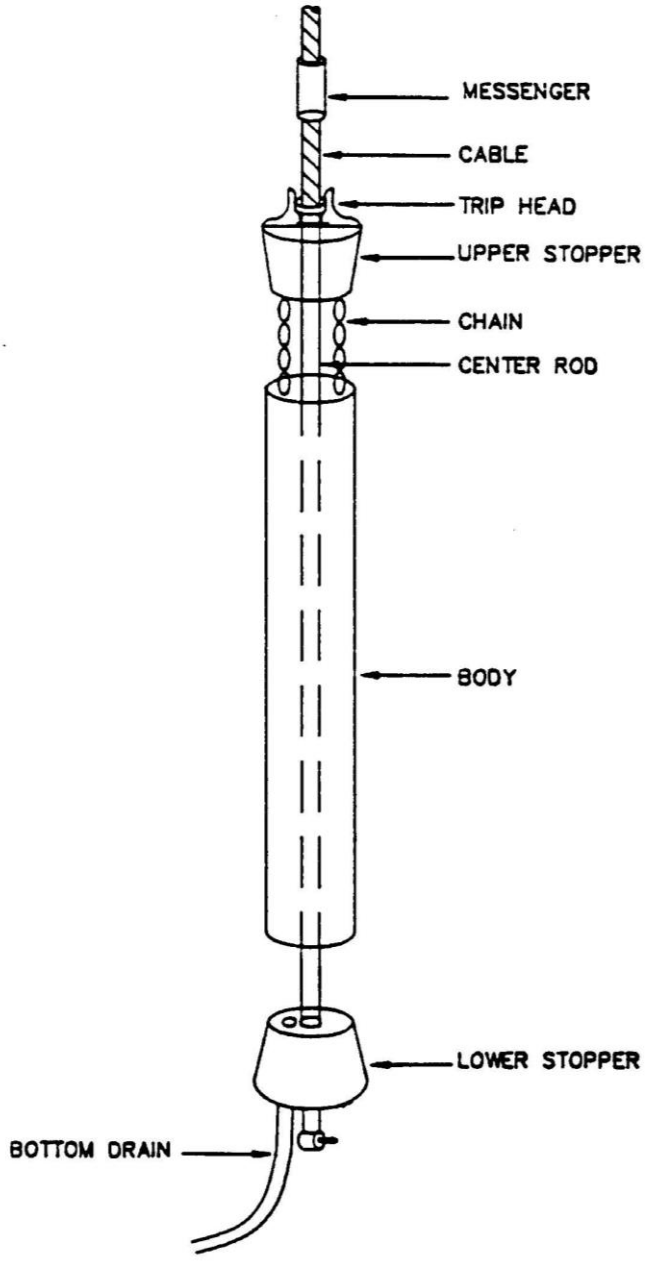


Figure 2: Van Dorn Sampler

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 203 SURFACE WATER SAMPLING

Revised September 2019

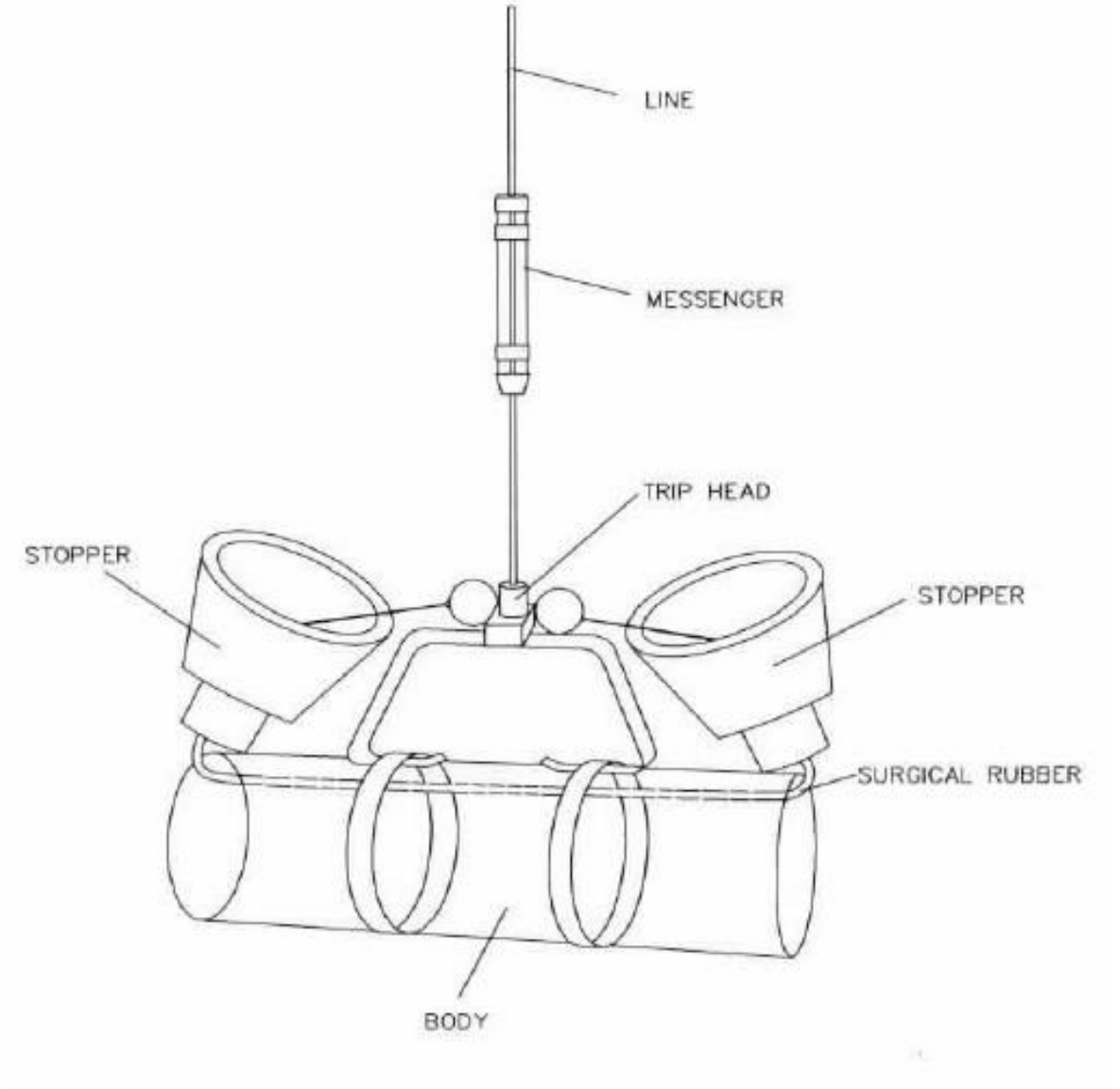


Figure 3: Bacon Bomb Sampler

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 203 SURFACE WATER SAMPLING

Revised September 2019

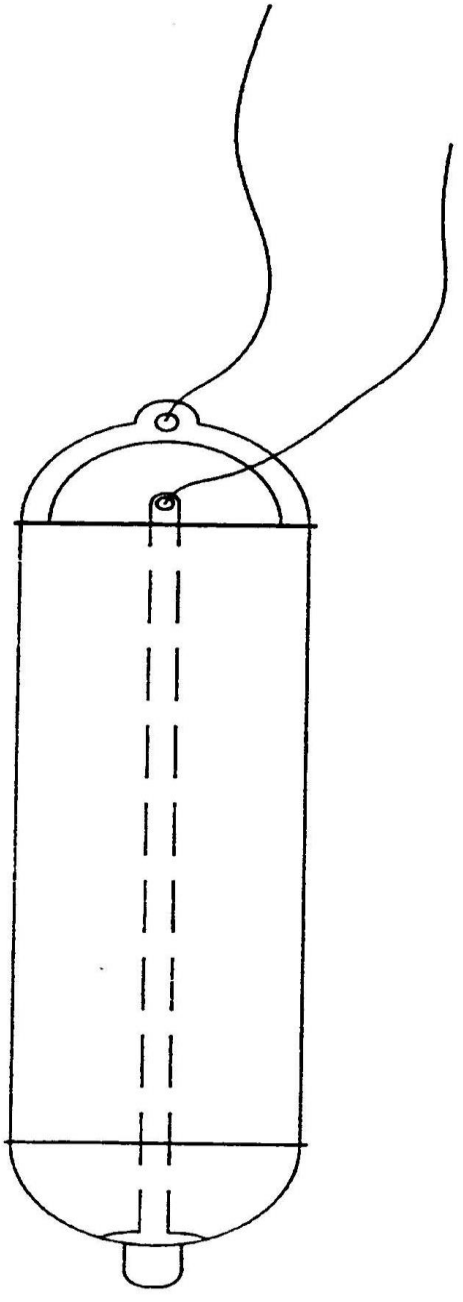
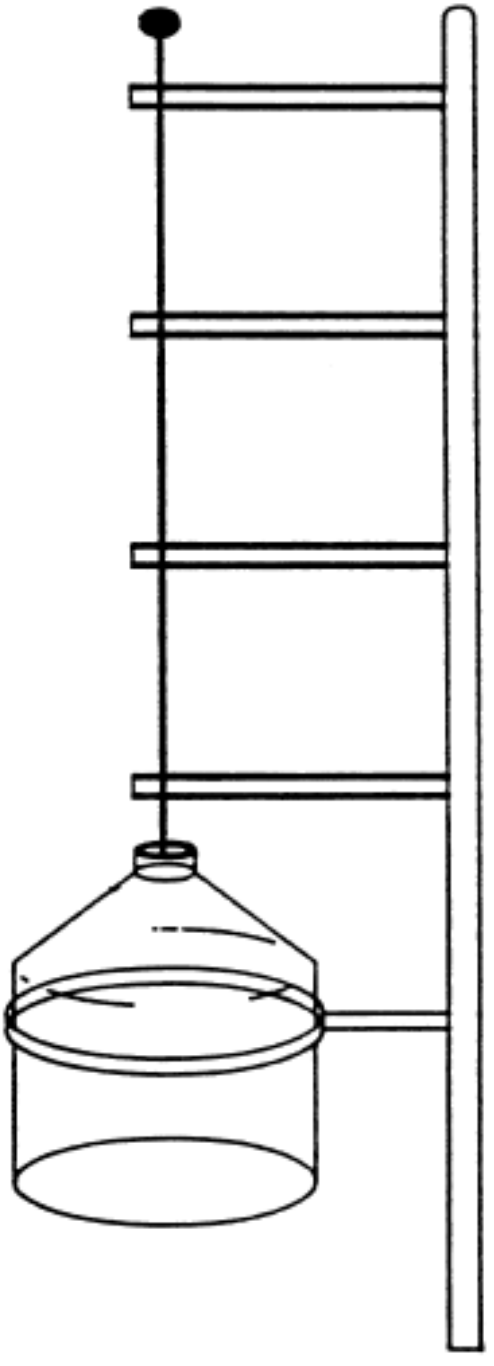


Figure 4: Dip Sampler



SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 203 SURFACE WATER SAMPLING

Revised September 2019

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 302 SURFACE SOIL SAMPLING

Revised October 2019

1.0 INTRODUCTION

The purpose of this Standard Operating Procedure (SOP) is to provide Weston Solutions, Inc. (WESTON®), Superfund Technical Assessment and Response Team (START) members with a step-by-step guide for collecting representative surface soil samples using scoops and bucket augers.

See SOP 202a for special precautions when sampling for Per- and polyfluoroalkyl substances (PFAS).

2.0 MATERIALS REQUIRED

Below is a list of the materials needed for surface soil sampling events. Both dedicated and reusable sampling equipment are required.

- Personal protective equipment (as specified in the Health and Safety Plan)
- Sampling plan
- Maps/sketches/plot plan
- Compass
- Tape measure (up to 300 ft.)
- Survey flags/stakes
- Global positioning system unit with sub-meter accuracy or better
- Aluminum, stainless steel, or plastic (as appropriate) homogenization pans/buckets (note that aluminum should NOT be used if PFAS compounds are a contaminant of concern)
- Sample jars
- EnCore® samplers
- Logbook and field data sheets
- Sample labels/tags
- Chain-of-custody forms and EPA custody seals
- Coolers
- Ice for sample preservation
- Decontamination equipment (brushes, buckets, garden sprayer, Liquinox®, water, etc.)
- Resealable plastic bags
- Plastic sheeting
- Paper towels
- Ball-point pen, waterproof/permanent marker, grease pencil, marking spray paint
- Digital camera with adequate storage media
- Air monitoring equipment [Micro FID, Multi RAE 5 Gas detector, etc.]
- Plastic sample scoops, if applicable
- Bucket auger, if applicable
- Thin-walled tube sampler, if applicable
- Plastic garbage bags

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 302 SURFACE SOIL SAMPLING

Revised October 2019

- Scissors
- Nitrile or latex sample gloves
- Shipping documents (Federal Express forms/shipping labels/etc.)
- Strapping tape

3.0 SAFETY PRECAUTIONS

Due to unknown constituents of the soil media, the exposure potential for personnel exists and must be of primary concern. Before any soil sampling is performed, a Health and Safety Plan (HASP) must be approved by the Safety Officer.

1. Follow the HASP safety schedule.
2. Determine the appropriate levels of protection to be worn by personnel.
3. Conduct air monitoring in the breathing zones and screen the sample location holes once they are selected.
4. Ensure that equipment is properly decontaminated and in working condition prior to the mobilizing to the site.
5. Coordinate efforts and staffing with the client or agency with which you are working.

4.0 SAMPLING PROCEDURES

Photograph sample locations with landmarks in view. Keep in mind that sample locations may need to be referenced in the future, often years after your sampling event.

1. Perform a general site reconnaissance to verify actual site conditions consistent with the HASP.
2. Identify and mark all sampling locations using sample flags or stakes as specified in the sampling plan. The geographic coordinates of all sample locations should be documented using GPS.
3. Mark the pertinent site information in a site logbook and on field data sheets. When large amounts of samples are collected, field data sheets allow for easy organization in addition to logbook entries.
4. Make sure all sampling equipment is properly decontaminated prior to sampling.
5. Wear clean, disposable nitrile surgical gloves for each sampling location.
6. Begin sampling by cutting or pulling back debris with a stainless steel or dedicated plastic scoop.
7. Cover the sample location area with plastic sheeting if the soil has a high probability of contamination.
8. Sample collection should begin with collecting a soil sample for volatile organic analysis directly into an EnCore® Sampler.
9. Continue cutting to the required depth. Generally, surface sampling is considered 0 to 6 inches below the surface. Sample collection will focus on soil particles, not plant and tree roots,

stones, rocks, concrete and other materials intermixed in the soil matrix.

10. Transfer the sample volume to a homogenization container for analysis other than VOCs and thoroughly mix the soils to obtain a homogenous, representative sample. Do not homogenize samples for VOC analysis. A grab sample pertains to a discreet depth or area in a given matrix. A composite sample is a mixture of different depths, areas, and/or strata. Composite samples are not recommended for the collection of VOC samples because mixing causes volatile compounds to evaporate.

    There are several homogenization techniques. The "quartering technique" requires the total volume of samples be divided into fourths inside the aluminum or stainless steel pan. Each quarter is then mixed individually, then the quarters are combined. This technique is repeated until a thorough mixing has occurred. The second method is the "bakers' technique", which simply entails mixing the soil volume. The "shake and bake technique" allows the cleanest mixing. This technique requires emptying the sample volume into a re-sealable plastic bag, sealing the bag, and then shaking the bag until the sample volume is thoroughly mixed. Note the qualities (color, texture, etc.) of the homogenized sample.

11. Place the sample in the designated sample container after the sample has been homogenized.
12. Label the sample container. Sample labels and tags are to be filled out with a permanent marker (ball point pen ink bleeds when wet). Use a grease pencil to fill out labels and tags for samples to be analyzed for VOCs. Additionally, it is recommended that the bottom of the sample jar be marked with the time of collection, the sample location, and the sampler's initials, in case the labels are rendered illegible.
13. Place the sample jar into an appropriate sized resealable plastic bag.
14. Place the sample on ice.
15. Abandon the sample hole(s) in accordance with state regulations. Generally, holes can be back filled with removed soil materials.
16. Decontaminate the sampling apparatus using the proper procedure (see Section 6.0 Decontamination of Sampling Equipment).
17. Complete the chain-of-custody form in a clear and concise manner.
18. Repeat steps 1-17 for each sample location.

5.0 SAMPLING DEVICES

Four common sampling devices used by START personnel include the sample scoop, the auger, the EnCore® sampler, and the thin-walled sampler/corer. The sample scoop includes both dedicated disposable plastic scoops and stainless steel scoops. Augers include bucket augers and hand augers. EnCore® samplers (or equivalent) include a 5-gram or 25-gram Teflon sampling container and a "T" handle and is used for volatile organic compound analyses only. The thin-walled sampler/corer is the least used device of the three.

5.1 Scoops

Scoops make sampling quick and easy. Any time rough terrain is encountered, scoops are the ideal device. Generally disposable scoops are used because no wet decontamination is required. Never reuse dedicated scoops and always make sure proper decontamination has been performed for non-disposable sample scoops. Follow sampling procedures in Section 4.0.

5.2 Bucket and Hand Augers

Augers are manually driven stainless steel sampling devices. The hand auger is a smaller version of the bucket auger. Augers tend to fluff sample volumes. Because of their design, augers are recommended for composite sampling. Augers are not recommended for VOC sampling because volatiles will be driven off.

5.2.1 Auger Sampling Procedures

1. Decontaminate augers before collecting first sample.
2. Cut a 12-inch hole in the plastic sheeting around sample location using scissors.
3. Discard debris and other surface material.
4. Place the auger perpendicular to the ground and twist the "T" handle in a clockwise rotation until the desired depth is achieved. To determine the depth of the sample measure the actual removed core or the depth of the newly bore hole.
5. Retrieve the specified sample volume. Any additional sample volume can be returned to the sample hole.
6. Place the sample volume for VOC analysis directly in the sample container. Place for sample volume for other analyses into a homogenization pan and mix thoroughly.
7. Place the sample in the designated sample container.

Note: Only VOA containers are to be packed tightly.

8. Label the sample container. Sample labels and tags are to be filled out with a permanent marker (ball point pen ink bleeds when wet). Use a grease pencil to fill out labels and tags for samples to be analyzed for VOCs. Additionally, it is recommended that the bottom of the sample jar be marked with the time of collection, the sample location, and the sampler's initials, in case the labels are rendered illegible.
9. Place the sample jar into an appropriate sized resealable plastic zipper bag.
10. Place the sample on ice.
11. Abandon the sample hole(s) in accordance with state regulations. Generally, holes can be back filled with removed soil materials.
12. Decontaminate the auger using the proper procedure (see Section 6.0 Decontamination of Sampling Equipment).
13. Complete the chain-of-custody form in a clear and concise manner.

14. Repeat steps 1-13 for each sample location.

Note: A major drawback for auger sampling is that roots, stones and other materials will not allow for good penetration. Alternative sample locations may have to be selected to collect samples; any change in sampling should be discussed with the OSC, if possible, prior to collection if samples. If an alternative location in needed, it should be selected as close as possible to the original proposed location.

5.3 EnCore® (or Equivalent) Sampler

Before Collecting the Sample:

1. Hold the coring body and push the plunger rod down until the small o-ring rests against the tabs. This will assure that the plunger moves freely.
2. Depress the locking lever on EnCore® T-Handle. Place coring body, plunger end first, into the open end of the T-Handle, aligning the (2) slots on the coring body with the (2) locking pins in the T-Handle. Twist the coring body clockwise to lock the pins into the slots. Check to ensure that the sampler is locked in place. The sampler is ready for use.

Collecting the Sample:

1. Turn the T-Handle with T-up and coring body down. This positions plunger bottom flush with bottom of the coring body (ensure that the plunger bottom is in position). Using the T-Handle, push the sampler into the soil until the coring body is completely full. When full, the small o-ring will be centered in the T-Handle viewing hole. Remove the sampler from soil. Wipe any excess soil from the coring body exterior.
2. Cap the coring body while it is still on the T-handle. Push the cap over the flat area of the ridge. Push and twist the cap to lock the arm in place. The cap must be seated to seal the sampler.
3. Follow steps 8-14 in Section 5.2.1.

NOTES:
1. The EnCore® Sampler is a Single Use device. It cannot be cleaned and/or reused.
2. The EnCore® Sampler is designed for soil only. Do not use the EnCore Sampler for solvent or free product.
3. The EnCore® Sampler must be used with EnCore® T-Handle and/or EnCore® Extrusion Tool exclusively.

5.4 Thin-Walled Sampler/Corer

The thin-walled sampler/corer is the least used of the common sampling devices. It works similar to an auger; however, it has a much smaller diameter and the core is visible from the side of the sampler barrel. This device is even more prone to refusal than the bucket auger. This device works well in moist soils with small grain sizes.

5.4.1 Corer Sampling Procedures

15. Decontaminate the augers before collecting the first sample.
16. Cut a 12-inch hole into plastic sheeting around sample location.
17. Discard debris and other surface material.
18. Place the thin-walled sampler perpendicular to the ground and twist the "T" handle in a clockwise rotation until desired depth is achieved.
19. Retrieve the specified sample volume. Any additional sample volume can be returned to the sample hole.
20. Place the sample volume into a homogenization pan and mix thoroughly (Do not homogenize samples for VOC analysis).
21. Place the sample in the designated sample container.
22. Follow steps 8-14 in Section 5.2.1.

6.0 DECONTAMINATION OF SAMPLING EQUIPMENT

This procedure is arguably the most important step in sound sample collection. Poor decontamination will result in cross-contamination and inaccurate sample results. The adequacy of the decontamination is generally tested by daily rinsate blanks. The following procedures pertain to the three sampling re-usable sampling devices noted in this SOP. These procedures do not apply to the EnCore® (or EPA- approved equivalent) samplers and are not intended to supersede site-specific decontamination procedures. The procedures outlined in *START SOP 301 Decontamination Procedures* may be used in lieu of the procedures outlined below.

1. Determine an area to be used as a decontamination station and lay plastic sheeting down.
2. Fill and pressurize a garden sprayer with distilled water. Fill one decontamination bucket with distilled water and Alconox® or Liquinox®. Fill and pressurize another garden sprayer (if available) with de-ionized water for the final rinse.
3. Brush off soil residue from the sampling device with a dry brush.
4. Quickly spray the sampling device with the garden sprayer to loosen the soil before placing the sampling device into the soapy water.
5. Put the sampling device into soapy water bucket. Remove soil residue with a long-handled

brush, toilet brush or cleaning device. Spray off soap residue with distilled water.

6. Place the sampling device into another bucket and spray the sampling device thoroughly again with distilled water.
7. Final rinse the sampling device with de-ionized water. If solvents or weak acids are used in the decontamination procedure, see *START SOP No. 019 Investigative Derived Waste Compliance Plan*.
8. If stainless steel scoops are used, use multiple scoops so that decontamination does not have to be after every hole.
9. Repeat steps 1-7.
10. Contact the OSC to determine if decontaminated water may be dumped on site. Be sure to address this issue before the sampling event occurs. All PPE and other refuse generated can be disposed as solid industrial waste.

7.0 QUALITY ASSURANCE/QUALITY CONTROL

The following QA procedures apply:

- All data must be documented on field data sheets or within site logbooks.
- Field QA/QC samples (e.g., field blanks, equipment rinsate blanks, trip blanks, duplicate samples, MS/MSD, etc.) must be collected in accordance with the FSP and QAPP
- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

8.0 HEALTH AND SAFETY

- When working with potentially hazardous materials follow U.S. EPA, OSHA and specific health and safety procedures.

- When working on site be mindful of site circumstances such as traffic, tripping hazards, biological hazards, electrical lines, etc.

9.0 REFERENCES

EPA. 1991. Compendium of Emergency Response Team (ERT) Soil Sampling and Surface Geophysic Procedures. Office of Solid Waste and Emergency Response, Washington, DC. EPA/540/P-91/006.

EPA 1991. Removal Program Representative Sampling Guidance. Volume 1 - Soil. Office of Solid

Waste and Emergency Response, Washington, DC. 9630.4-10 P892-963408. {1995 revision available on EPA website}

WESTON® (Roy F. Weston, Inc.) 1993. Standard Practices Manuel for Soil Sampling With a Spade, Scoop and Stainless Surface Soil Sampler Auger and Tube Sampler.

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 302 SURFACE SOIL SAMPLING

Revised October 2019

ATTACHMENT 1

SOIL SAMPLING DATA SHEET

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 302 SURFACE SOIL SAMPLING

Revised October 2019

Soil Sampling Data Sheet

Site Name: _____ **Sampler:** _____ **Sample Date:** _____

Sample ID: _____ **Time**: _____

Sample Depth: ___Surface (0-0.5 ft.) ____ Shallow (0.5-5.0 ft.)

Sample Method: _____Scoop (2,3,4,5,6,7,8,A,C,+) ____ Hand Auger(2,3,4,5,6,7,B,+,-)
_____Slide-Hammer (1,2,3,4,5,6,7,8,A,B,+,-) ____ Open Tube (A,+,-)
_____Split/Solid Tube (1,2,3,4,5,6,7,8,A,B,-) ____ Thin-Wall Tube(8,A,-)

Preferred Methods

1 - Volatiles	5 - PCBs	A - Grab	+ - Surface
2 - Semi-Volatiles	6 - TPH	B - Composite (Vertical)	-- Shallow
3 - Primary Metals	7 - Rad	C - composite (Areal)	
4 - Pesticides	8 – Geotechnical		

Soil Description (Munsell): Chart _____ Value _____ Hue _____

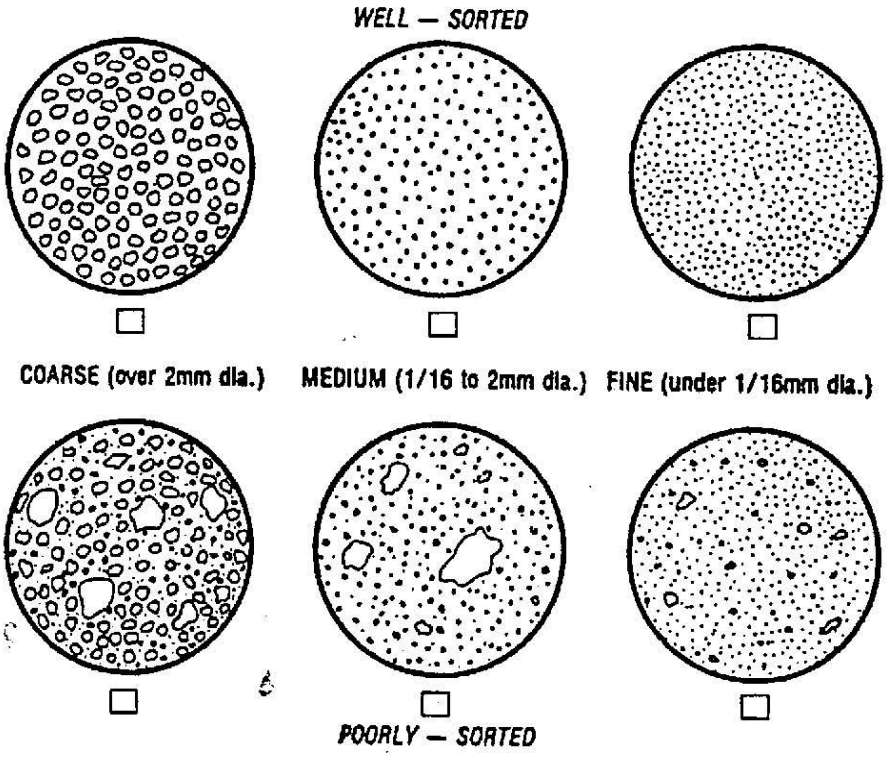
Grain Size and Distribution:

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 302 SURFACE SOIL SAMPLING

Revised October 2019



SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 303 SEDIMENT SAMPLING

Revised October 2019

1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) is applicable to the collection of representative sediment samples. Analysis of sediment may determine whether concentrations of specific contaminants exceed established threshold action levels, or if the concentrations present a risk to public health, welfare, or the environment.

The methodologies discussed in this procedure are applicable to the sampling of sediment in both flowing and standing water. They are generic in nature and may be modified in whole or part to meet the handling and analytical requirements of the contaminants of concern, as well as the constraints presented by the sampling area. However, if modifications occur, they should be documented in the site logbook and in the report summarizing field activities.

For the purposes of this procedure, sediments are those mineral and organic materials situated beneath an aqueous layer. The aqueous layer may be either static, as in lakes, ponds, or other impoundments or flowing, as in rivers and streams.

See SOP 202a for special precautions when sampling for Per- and polyfluoroalkyl substances (PFAS).

2.0 METHOD SUMMARY

Sediment samples may be recovered using a variety of methods and equipment, depending on the depth of the aqueous layer, the portion of the sediment profile required (surface versus subsurface), the type of sample required (disturbed versus undisturbed) and the sediment type.

Sediment is collected from beneath an aqueous layer either directly, using a hand-held device such as a shovel, trowel, or auger, or indirectly using a remotely activated device such as an Ekman or Ponar dredge. Following collection, the sediment is placed into a container constructed of inert material, homogenized, and transferred to the appropriate sample containers. The homogenization procedure should not be used if sample analysis includes volatile organics.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

- Chemical preservation of solids is generally not recommended but all samples are to be placed on ice and cooled to 4^{o}C.
- Wide-mouth glass containers with Teflon-lined caps are utilized for sediment samples. The sample volume is a function of the analytical requirements and will be specified in the work plan.
- Transfer sediment from the sample collection device to an appropriate sample container using a stainless steel or dedicated plastic scoop or equivalent. If composite samples are collected, place the sediment sample in a stainless steel, plastic or other appropriate

composition (e.g., Teflon) bucket, and mix thoroughly to obtain a homogeneous sample representative of the entire sampling interval. Then place the sediment sample into labeled containers.

- Samples for volatile organic analysis must be collected directly from the bucket, before mixing the sample, to minimize loss due to volatilization of contaminants.
- All non-dedicated sampling devices should be decontaminated, then wrapped in aluminum foil (note: if perfluorinated compounds are contaminants of concern, aluminum foil must NOT be used. The sampler should remain in this wrapping until it is needed. Each sampler should be used for only one sample. Dedicated samplers for sediment samples may be impractical due to the large number of sediment samples which may be required and the cost of the sampler. In this case, samplers should be cleaned in the field using the decontamination procedure described in SOP No. 301, Decontamination Procedures.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

Substrate particle size and organic content are directly related to water velocity and flow characteristics of a body of water. Contaminants are more likely to be concentrated in sediments typified by the fine particle size and a high organic content. This type of sediment is most likely to be collected from depositional zones. In contrast, coarse sediments with low organic content do not typically concentrate pollutants and are found in erosional zones. The selection of a sampling location can, therefore, greatly influence the analytical results.

For volatile organics analyses where EnCore® samplers are typically utilized, those EnCore® samplers may be ineffective in very wet or loose sediments. An alternative method of volatile organics sampling may be necessary in these cases. If EnCore® samplers can be utilized, note that it is imperative to collect a separate sample of the sampled media container for determination of percent solids at the laboratory.

5.0 EQUIPMENT/APPARATUS

Equipment needed for collection of sediment samples may include:

- maps/plot plan/sketches
- Personal protective equipment (as specified in the Health and Safety Plan)
- compass
- tape measure (up to 300 ft.)
- survey stakes, flags, or buoys and anchors
- Global positioning system (GPS) unit with submeter accuracy or better
- Digital camera and appropriate storage media
- stainless steel, plastic, aluminum, or other appropriate composition bucket (note that aluminum should NOT be used if PFAS compounds are a contaminant of concern)

- 4-oz., 8-oz., and one-quart, wide-mouth jars w/Teflon-lined lids
- re-sealable plastic bags
- logbook and field data sheets
- sample jar labels/tags
- chain of custody forms and EPA chain of custody seals
- cooler(s)
- ice for sample preservation
- Decontamination equipment (brushes, buckets, garden sprayer, Liquinox®, water, etc.)
- Plastic sheeting
- Paper towels
- Ball-point pen, waterproof/permanent marker, grease pencil, marking spray paint
- Air monitoring equipment [Micro FID, Multi RAE 5 Gas detector, etc.]
- Plastic garbage bags
- Scissors spade or shovel
- spatula
- scoop
- trowel
- bucket auger
- thin-walled auger
- extension rods
- T-handle
- sampling trier
- sediment coring device (tubes, points, drive head, drop hammer, “eggshell” check valve devices, acetate cores)
- Ponar dredge
- Ekman dredge
- nylon rope
- Nitrile or latex sample gloves
- Shipping documents (Federal Express forms/shipping labels/etc.)
- Strapping/packing tape

6.0 REAGENTS

Reagents are not used for preservation of sediment samples. Decontamination solutions are specified in *START SOP 301 Decontamination Procedures*.

7.0 PROCEDURES

7.1 Preparation

- Determine the extent of the sampling effort, the sampling methods to be employed, and which equipment and supplies are required.
- Obtain necessary sampling and monitoring equipment.
- Decontaminate or pre-clean equipment, and ensure that it is in working order.
- Prepare schedules, and coordinate with staff, client, and regulatory agencies, if appropriate.
- Perform a general site survey prior to site entry in accordance with the site-specific health and safety plan.
- Use stake, flags, or buoys to identify and mark all sampling locations. Specific site characteristics, including flow regime, basin morphometry, sediment characteristics, depth of overlying aqueous layer, and extent and nature of contaminant, should be considered when selecting sample location. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.

7.2 Sample Collection

Photograph sample locations with landmarks in view. Keep in mind that sample locations may need to be referenced in the future, often years after your sampling event.

Selection of a sampling device is most often contingent upon:

1. The depth of water at the sampling location, and
2. The physical characteristics of the medium to be sampled.

7.2.1 Sampling Surface Sediments with a Trowel or Scoop From Beneath a Shallow Aqueous Layer

Collection of surface sediment from beneath a shallow aqueous layer can be accomplished with tools such as spades, shovels, and scoops. Surface material can be removed to the required depth; then a stainless steel or plastic scoop should be used to collect the sample.

This method can be used to collect consolidated sediments but is limited somewhat by the depth of the aqueous layer. Accurate, representative samples can be collected with this procedure depending on the care and precision demonstrated by the sample team member. A stainless steel or plastic scoop or lab spoon will suffice in most applications. Care should be exercised to avoid the use of devices plated with chrome or other materials. Plating is particularly common with garden trowels.

Follow these procedures to collect sediment samples with a scoop or trowel:

1. Using a pre-cleaned stainless steel scoop or trowel, remove the desired thickness of sediment from the sampling area.
2. Transfer the sample into an appropriate sample or homogenization container.

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 303 SEDIMENT SAMPLING

Revised October 2019

7.2.2 Sampling Surface Sediments with a Thin-Wall Tube Auger From Beneath a Shallow Aqueous Layer

This system consists of an auger, a series of extension rods, and a "T" handle (see Figure 1, Attachment 1). The auger is driven into the sediment and used to extract a core. A sample of the core is taken from the appropriate depth.

Use the following procedure to collect sediment samples with a thin-walled auger:

1. Insert the auger into the material to be sampled at a 0° to 45° angle from vertical. This orientation minimizes spillage of the sample from the sampler. Extraction of samples may require tilting of the sampler.
2. Rotate the auger once or twice to cut a core of material.
3. Slowly withdraw the auger, making sure that the slot is facing upward.
4. An acetate core may be inserted into the auger prior to sampling, if characteristics of the sediments or body of water warrant. By using this technique, an intact core can be extracted.
5. Transfer the sample into an appropriate sample or homogenization container.

7.2.3 Sampling Deep Sediments with Augers and Thin-Wall Tube Samplers From Beneath a Shallow Aqueous Layer

This system uses an auger, a series of extension rods, a "T" handle, and a thin-wall tube sampler (Figure 4, Attachment 1). The auger bores a hole to a desired sampling depth and then is withdrawn. The auger tip is then replaced with a tube core sampler, lowered down the borehole, and driven into the sediment at the completion depth. The core is then withdrawn and the sample collected. This method can be used to collect consolidated sediments, but is somewhat limited by the depth of the aqueous layer.

Several augers are available which include bucket and posthole augers. Bucket augers are better for direct sample recovery, are fast, and provide a large volume of sample. Posthole augers have limited utility for sample collection as they are designed more for their ability to cut through fibrous, rooted, swampy areas.

Follow these procedures to collect sediment samples with a hand auger:

1. Attach the auger bit into a drill extension rod, then attach the "T" handle to the drill extension rod.
2. Clear the area to be sampled of any surface debris.
3. Begin augering, periodically removing any accumulated sediment from the auger bucket.
4. After reaching the desired depth, slowly and carefully remove the auger from boring. (When sampling directly from the auger, collect sample after the auger is removed from

boring and proceed to Step 10).

5. Remove the auger tip from the drill rods and replace it with a pre-cleaned thin-wall tube sampler. Install the proper cutting tip.
6. Carefully lower the tube sampler down borehole. Gradually force the tube sampler into sediment. Care should be taken to avoid scraping the borehole sides. Also, avoid hammering of the drill rods to facilitate coring, since the vibrations may cause the boring walls to collapse.
7. Remove the tube sampler and unscrew the drill rods.
8. Remove the cutting tip and remove the core from the device.
9. Discard the top of the core (approximately 1 inch), as this represents material collected by the tube sampler before penetration of the layer of concern.
10. Transfer the sample into an appropriate sample or homogenization container. Samples for VOC analysis should not be homogenized.

7.2.4 Sampling Surface Sediments From Beneath a Deep Aqueous Layer with an Ekman or Ponar Dredge

This technique consists of lowering a sampling device to the sediment by use of a rope, cable, or extended handle. The mechanism is triggered, and the device entraps sediment in spring-loaded jaws, or within lever-operated jaws.

Follow these procedures for collecting sediment with an Ekman dredge (Figure 2, Attachment 1):

1. Thread a sturdy nylon or stainless steel cable through the bracket, or secure the extended handle to the bracket with machine bolts.
2. Attach springs to both sides. Arrange the Ekman dredge sampler so that the jaws are in the open position and trip cables are positioned over the release studs.
3. Lower the sampler to a point just above the sediment surface.
4. Drop the sampler sharply onto the sediment.
5. Trigger the jaw release mechanism by lowering a messenger down the line, or by depressing the button on the upper end of the extended handle.
6. Raise the sampler and slowly decant any free liquid through the top of the sampler. Be careful to retain fine sediments.
11. Open the dredge and transfer the sediment into a stainless steel or plastic bucket. Continue to collect additional sediment until sufficient material has been secured. Thoroughly mix sediment to obtain a homogeneous sample, and then transfer to the appropriate sample container. Samples for VOC analysis should not be homogenized.
7. Samples for volatile analysis must be collected directly from the bucket before mixing the sample to minimize volatilization of contaminants.

Follow these procedures for collecting sediment with a Ponar dredge (Figure 3, Attachment 1):

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 303 SEDIMENT SAMPLING

Revised October 2019

1. Attach a sturdy nylon or steel cable to the hook provided on top of the dredge.
2. Arrange the Ponar dredge sampler in the open position, setting the trip bar so the sampler remains open when lifted from the top.
3. Slowly lower the sampler to a point just above the sediment.
4. Drop the sampler sharply into the sediment, then pull sharply up on the line, thus releasing the trip bar and closing the dredge.
5. Raise the sampler to the surface and slowly decant any free liquid through the screens on top of the dredge. Be careful to retain fine sediments.
12. Open the dredge and transfer the sediment to a stainless steel or plastic bucket. Continue to collect additional sediment until sufficient material has been gained. Thoroughly mix sediment to obtain a homogeneous sample, and then transfer to the appropriate sample container. Samples for VOC analysis should not be homogenized.
6. Samples for volatile organic analysis must be collected directly from the bucket before mixing the sample to minimize volatilization of contaminants.

7.2.5 Sampling Subsurface Sediments From Beneath a Deep Aqueous Layer with a Sample Coring Device

Follow these procedures when using a sample coring device (Figure 4, Attachment 1) to collect subsurface sediments. It consists of a coring device, handle, and acetate core utilized in the following procedure:

1. Assemble the coring device by inserting the acetate core into the sampling tube.
2. Insert the "eggshell" check valve mechanisms into the tip of the sampling tube with the convex surface positioned inside the acetate core.
3. Screw the coring point onto the tip of the sampling tube.
4. Screw the handle onto the upper end of the sampling tube and add extension rods as needed.
5. Place the sampler in a perpendicular position on the material to be sampled.
6. This sampler may be used with either a drive hammer for firm consolidated sediments, or a "T" handle for soft sediments. If the "T" handle is used, place downward pressure on the device until the desired depth is reached. Rotate the sampler to shear off the core of the bottom, retrieve the device and proceed to Step 15.
7. If the drive hammer is selected, insert the tapered handle (drive head) of the drive hammer through the drive head.
8. With left hand holding the tube, drive the sampler into the material to the desired depth. Do not drive the tube further than the tip of the hammer's guide.
9. Record the length of the tube that penetrated the sample material, and the number of blows required to obtain this depth.
10. Remove the drive hammer and fit the keyhole-like opening on the flat side of the hammer onto the drive head. In this position, the hammer serves as a handle for the sampler.
11. Rotate the sampler at least two revolutions to shear off the sample at the bottom.

12. Lower the sampler handle (hammer) until it just clears the two ear-like protrusions on the drive head, and rotate about 90°.
13. Withdraw the sampler by pulling the handle (hammer) upwards and dislodging the hammer from the sampler.
14. Unscrew the coring point and remove the "eggshell" check valve.
13. Slide the acetate core out of the sampler tube. The acetate core may be capped at both ends. The sample may be used in this fashion, or the contents transferred to a stainless steel or plastic bucket and mixed thoroughly to obtain a homogeneous sample representative of the entire sampling interval. Samples for VOC analysis should not be homogenized.
15. Samples for volatile organic analysis must be collected directly from the bucket before mixing the sample to minimize volatilization of contaminants.

8.0 QUALITY ASSURANCE/QUALITY CONTROL

The following QA/QC procedures apply:

1. All data must be documented in site logbooks.
2. Field QA/QC samples (e.g., field blanks, equipment rinsate blanks, trip blanks, duplicate samples, MS/MSD, etc.) must be collected in accordance with the FSP and QAPP
3. All sample locations should be recorded using a GPS unit.
4. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout must occur prior to sampling/operation, and should be documented.

9.0 HEALTH AND SAFETY

When working with potentially hazardous materials follow U.S. EPA, OSHA and specific health and safety procedures.

More specifically, when sampling sediment from bodies of water containing known or suspected hazardous substances, adequate precautions must be taken to ensure the sampler's safety. The team member collecting the sample should not get too close to the edge of the water, where bank failure may cause him or her to lose their balance. To prevent this, the person performing the sampling should be on a lifeline, and be wearing adequate protective equipment. If sampling from a vessel is necessary, implement appropriate protective measures.

Sampling over and around water can be dangerous, be sure to follow all HAS procedures and have an approved HASP. Whenever boats are to be used to collect samples, a Float Plan must be prepared and included as part of the approved HASP. When working around and over cold water, appropriate survival suits are required (such as Mustang suits), as specified in the approved HASP.

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 303 SEDIMENT SAMPLING

Revised October 2019

10.0 REFERENCES

EPA. 1991. Compendium of ERT Surface Water and Sediment Sampling Procedures. Office of Solid Waste and Emergency Response, Washington, DC. EPA/540/P-91/008. Attachments: (2)

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 303 SEDIMENT SAMPLING

Revised October 2019

ATTACHMENT 1 FIGURES

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 303 SEDIMENT SAMPLING

Revised October 2019

Figure 1: Sampling Auger

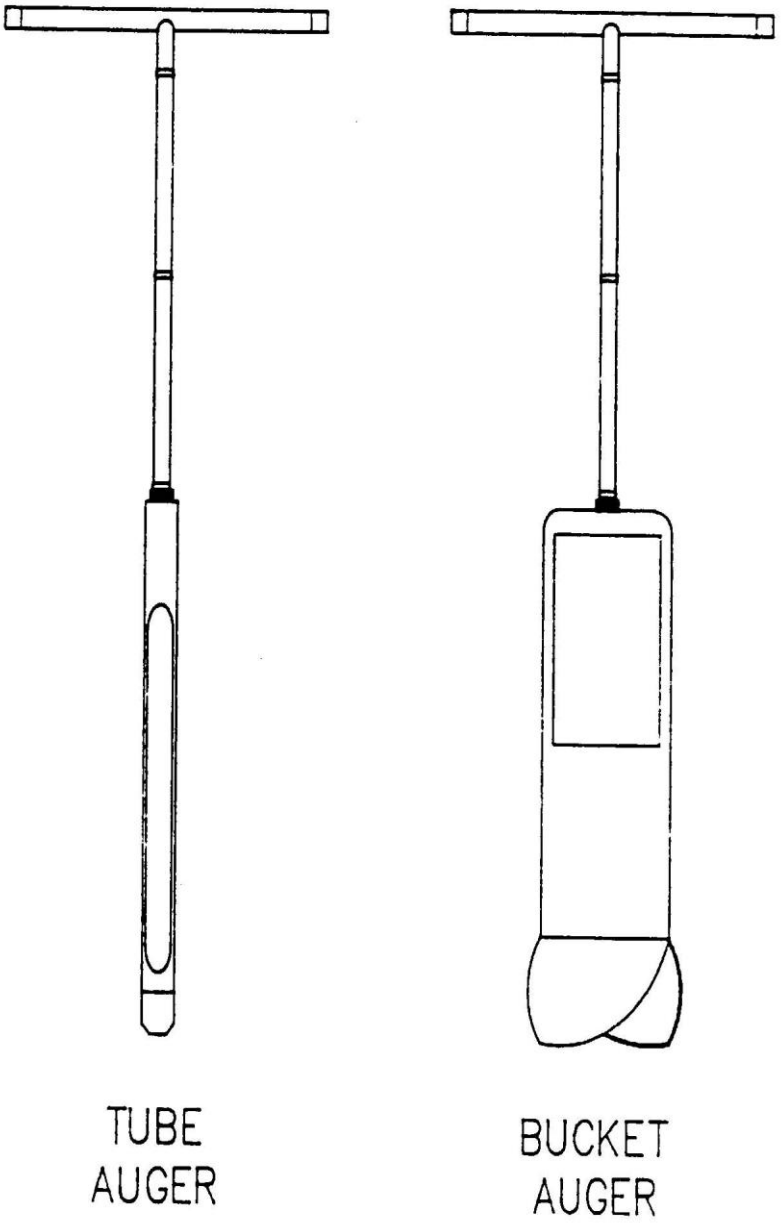


Figure 2: Ekman Dredge

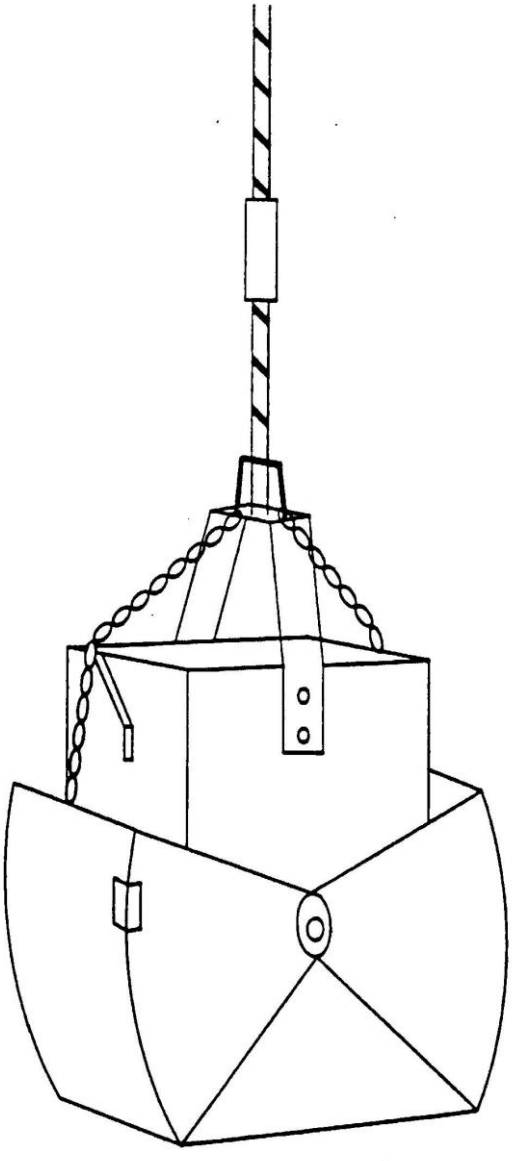


Figure 3: Ponar Dredge

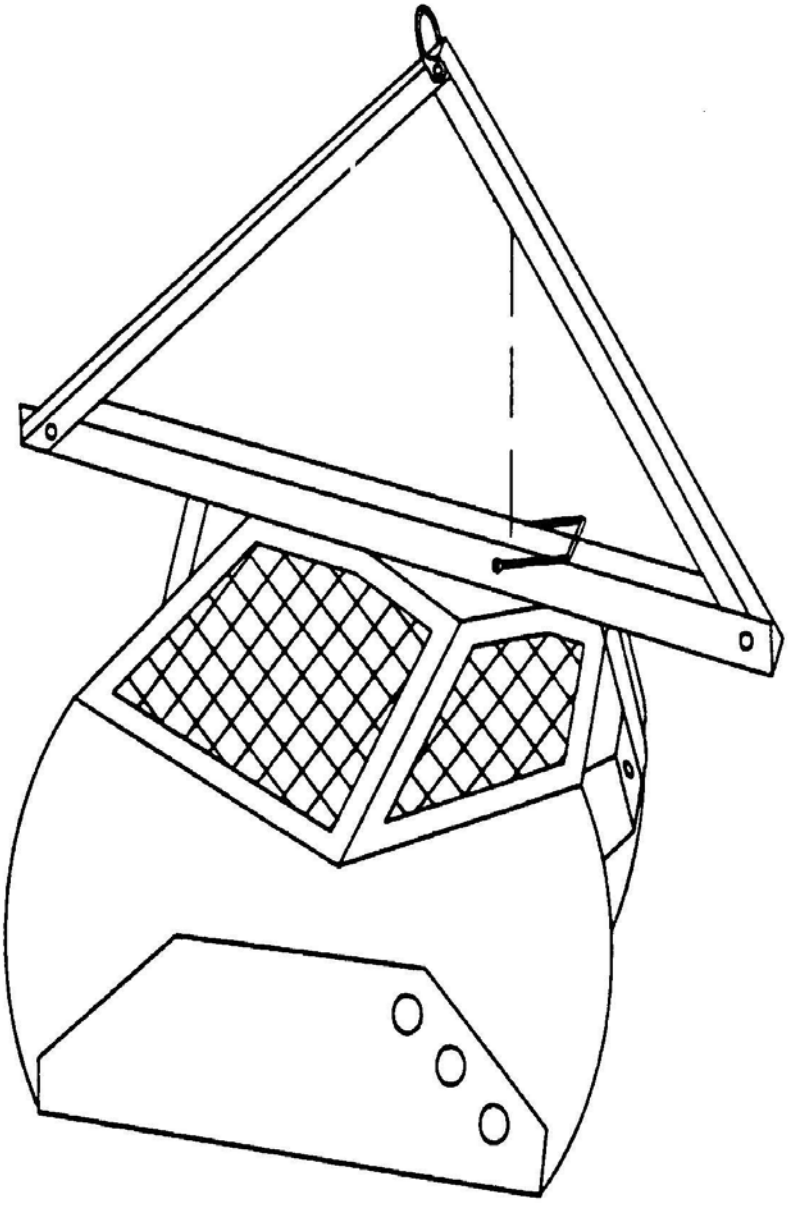
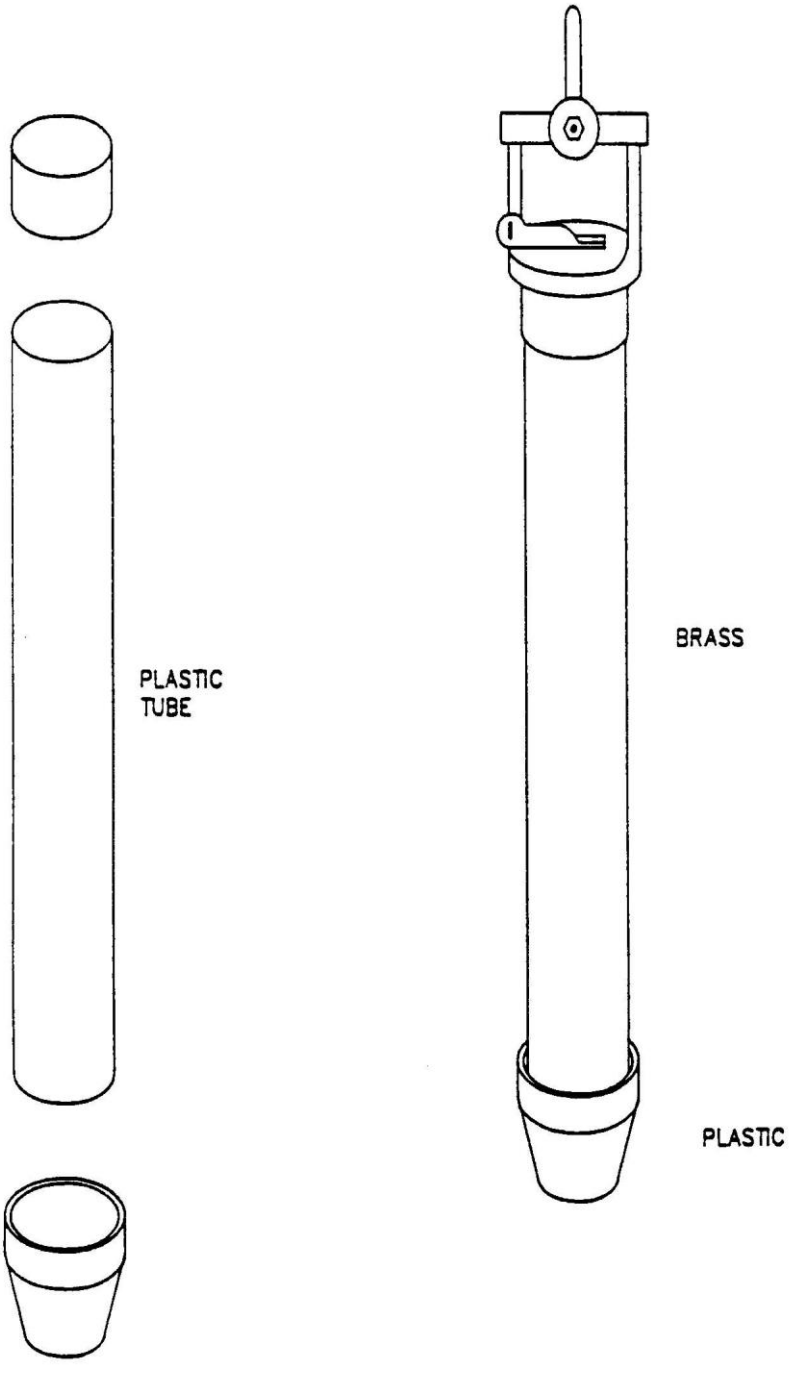


Figure 4: Sample Coring Device



SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 303 SEDIMENT SAMPLING

Revised October 2019

ATTACHMENT 2 SOIL SAMPLING DATA SHEET

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 303 SEDIMENT SAMPLING

Revised October 2019

Soil Sampling Data Sheet

Site Name: _____ **Sampler:** _____ **Sample Date:** _____

Sample ID: _____ **Time**: _____

Sample Depth: ___Surface (0-0.5 ft) ____ Shallow (0.5-5.0 ft)

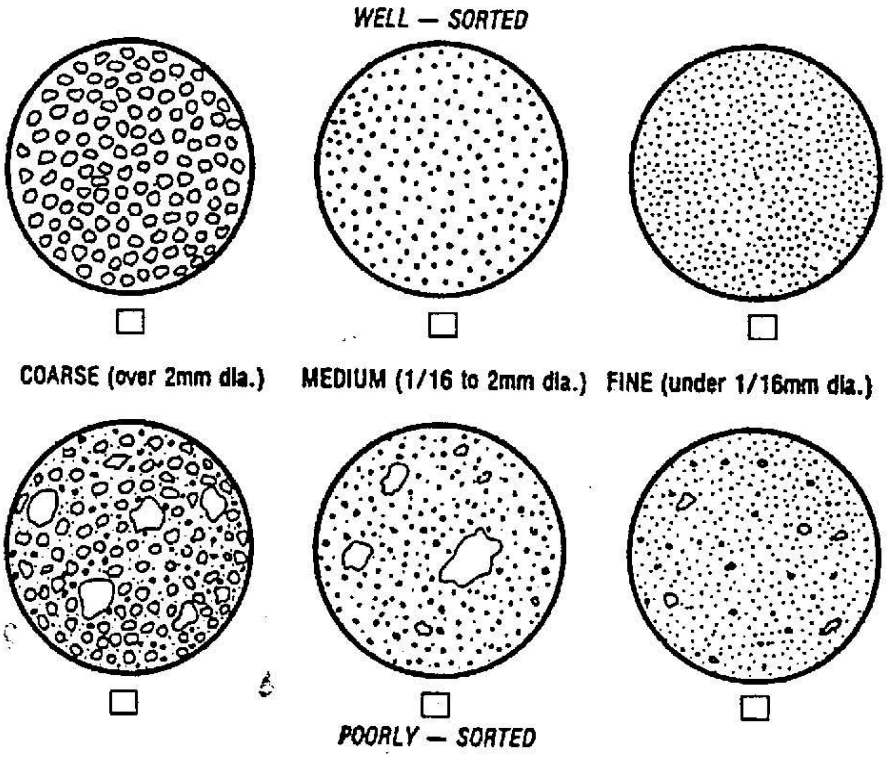
Sample Method: _____Scoop (2,3,4,5,6,7,8,A,C,+) ____ Hand Auger(2,3,4,5,6,7,B,+,-)
_____Slide-Hammer (1,2,3,4,5,6,7,8,A,B,+,-) ____ Open Tube (A,+,-)
_____Split/Solid Tube (1,2,3,4,5,6,7,8,A,B,-) ____ Thin-Wall Tube(8,A,-)

Preferred Methods

1 - Volatiles	5 - PCBs	A - Grab	+ - Surface
2 - Semi-Volatiles	6 - TPH	B - Composite (Vertical)	-- Shallow
3 - Primary Metals	7 - Rad	C - composite (Areal)	
4 - Pesticides	8 – Geotechnical		

Soil Description (Munsell): Chart _____ Value _____ Hue _____

Grain Size and Distribution:



SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

STANDARD OPERATING PROCEDURE

SOP 303 SEDIMENT SAMPLING

Revised October 2019

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM STANDARD OPERATING PROCEDURE

SOP 304 SUBSURFACE SOIL SAMPLING

Revised October 2019

1.0 INTRODUCTION

The purpose of this Standard Operating Procedure (SOP) is to provide Weston Solutions, Inc. (WESTON®), Superfund Technical Assessment and Response Team (START) members with a step-by-step guide for collecting representative subsurface soil samples.

See SOP 202a for special precautions when sampling for Per- and polyfluoroalkyl substances (PFAS).

2.0 MATERIALS REQUIRED

Pre-assemble all sampling equipment that requires assembly prior to departure (especially split-spoon apparatus) to ensure all components are present.

Equipment for subsurface sampling is as follows:

- Personal protective equipment (as specified in the Health and Safety Plan)
- Air monitoring equipment [Micro FID, Multi RAE 5 Gas detector, etc.]
- Sampling plan
- Global positioning system (GPS) unit with sub-meter accuracy or better
- Maps/sketches/plot plan
- Tape measure (up to 300 ft)/compass
- Survey stakes/flags
- Aluminum, stainless steel, or plastic (as appropriate) homogenization trays/buckets (note that aluminum should NOT be used if PFAS compounds are a contaminant of concern)
- Sample jars and EnCore® samplers
- Logbook
- Sample labels/tags
- Chain of custody forms and EPA custody seals
- Field data sheets
- Coolers
- Ice for sample preservation
- Decontamination equipment (brushes, buckets, garden sprayer, Liquinox®, water, etc.)
- Methanol/hexane/nitric acid if necessary
- Resealable plastic bags
- Plastic sheeting
- Paper towels
- Ball-point pen, waterproof/permanent marker, grease pencil, marking spray paint
- Digital camera with adequate storage media
- Plastic sample scoops
- Stainless steel trowels

- Plastic garbage bags
- Scissors
- Nitrile or latex sample gloves
- Shipping documents (Federal Express forms/shipping labels/etc.)
- Strapping tape
- Screw auger
- Bucket auger
- Post-hole auger
- T-handle Extension rods
- Split spoon halves (2 sets) with shoes (2)
- Plastic sample baskets
- Split-spoon drive head adapter
- Drive head
- Bit(s)
- Extension (optional)
- Slam bar (manual sampling only)
- Slam hammer (manual sampling only)
- Extraction head
- Gas can
- Generator oil
- Generator
- Jackhammer (rental)
- Heavy duty lift-jack
- Wheel barrow
- Ground fault interrupter (GFI)
- 24-inch pipe wrenches (2)
- Manual sledge hammer
- Rubber mallet
- Spray-lubricant (ingredients must not interfere with analysis parameters)
- Shovel/spade
- Roofing nails
- Tool box (vice grips, adjustable wrenches, pliers, channel locks, etc.)
- Back support belt(s)

3.0 SAFETY PRECAUTIONS

Due to unknown constituents of the soil media, the exposure potential for personnel exists and must be of primary concern. Before any soil sampling is performed, a Health and Safety Plan (HASP) must be approved by the Regional Safety Officer.

1. Follow the HASP safety schedule.
2. Determine the appropriate levels of protection to be worn by personnel.

3. Conduct air monitoring in the breathing zones and screen the sample location holes once they are selected.
4. Ensure that equipment is properly decontaminated and is in working condition prior to mobilization to the site.
5. Coordinate efforts and staffing with the client or agency with which you are working.

4.0 SAMPLING PROCEDURES

4.1 Sampling Preparation

1. Perform a general site reconnaissance to verify actual site conditions consistent with the HASP.
2. Identify and mark all sampling locations using sample flags or stakes as specified in the sampling plan. The geographic coordinates of all sample locations should be documented using GPS.
3. Make sure all sampling equipment is properly decontaminated prior to sampling.
4. Notify utility companies to check sampling areas for underground utilities prior to digging, boring, or coring operations. Most states require 7-day notice, and have a toll-free number to arrange a single, all-inclusive, free inspection.

4.2 Auger Sampling

1. Wear appropriate personal protective equipment (PPE), as defined by the site Health and Safety Plan (HASP). Remember that a clean pair of sample gloves must be worn for each sample collected.
2. Assemble the auger unit, if required.
3. Clear the area to be sampled of any surface debris.
4. Spread plastic sheeting near the sample location to allow for easy accessibility and to prevent equipment contamination.
5. Remove surface soil to expose the desired depth of soil to be sampled using a screw auger, bucket auger, post-hole auger, power auger, shovel, or backhoe. The sampling device (auger, split-spoon, etc.) can be marked with a grease pencil.
6. Stage removed soil on plastic sheeting near the hole. Special care should be taken to avoid allowing surface soil to cross-contaminate soil at the desired sampling depth.
7. Use auger extension rods to sample to depths up to approximately 9 feet.
8. Use a decontaminated auger to collect sample(s) after digging or boring to the desired sample depth. The best way to retrieve desired soil, while avoiding cross-contamination, is with a bucket auger. Each 6-inch bucket auger will hold approximately 3-4 inches of augered (“fluffed”) soil.
9. Decontaminate the augers after each sample-depth is collected. Note: Discarding the top inch of soil from the retrieved sample also reduces cross-contamination.

10. Sample collection should begin with collecting a soil sample for volatile organic analysis directly into an EnCore® Sampler.
11. Deposit sample into a homogenization tray for analysis other than volatile organics and thoroughly mix the soils to obtain a homogenous, representative sample.
12. Place homogenized sample into an appropriate, labeled sample container with a plastic scoop or stainless steel trowel, depending on the requested analysis.
13. Record all field notes on field data sheets and in the site logbook as specified in the sampling plan. The sample location should be documented using GPS, and should be mapped and described in the site logbook.
14. Photograph sample locations with landmarks in view. Keep in mind that sample locations may need to be referenced in the future, often years after your sampling event.
15. Abandon the sample hole(s) in accordance with state regulations. Generally, holes can be backfilled with removed soil materials.
16. Decontaminate all sampling equipment in accordance with SOP No. 301 Decontamination Procedures.

4.3 Split Spoon Sampling

1. Wear appropriate personal protective equipment (PPE), as defined by the site HASP. Remember that a clean pair of sample gloves must be worn for each sample collected.
2. Assemble cleaned spoon halves by aligning threads, inserting a clean sample basket, and screwing on the shoe.
3. Screw on the appropriate adapter for a slam bar or jackhammer apparatus. For manual sample collection, attach the slam bar to the adapter. For jackhammer-driven sample collection, attach the drive head to the adapter.
4. Clear the area to be sampled of any surface debris.
5. Spread plastic sheeting near the sample location.
6. Remove surface soil to expose the desired depth of soil to be sampled using a screw auger, bucket auger, post-hole auger, power auger, shovel, or backhoe.
7. Stage removed soil on plastic sheeting near the hole. Special care should be taken to avoid allowing surface soil to cross-contaminate soil at desired sampling depth.
8. Use a decontaminated split-spoon to collect the sample(s) after digging or boring to desired sample depth.
9. For the manual collection of a sample, slide the slam hammer over the slam bar. Slam the hammer repeatedly until the core is driven to desired depth.
10. For jackhammer-facilitated sampling, attach and lock the bit to the jackhammer. Carefully lift the jackhammer, slide the bit into the adapter, and drive the core to the desired depth. One person should support the spoon halves and the adapter during coring operations to insure that the apparatus remains vertical and that individual parts do not come unscrewed.
11. Attach the appropriate extraction head to the in-ground split spoon apparatus.
12. Using a heavy-duty lift-jack, carefully retrieve the sample core. This step usually requires two people: one to hold the jack in a vertical position while the other operates the jack.
13. Lay the core on a plastic sheeting after the core is retrieved and carefully unscrew the

extraction head and the adapter.

14. Unscrew the shoe, but make sure the split spoon core does not open. Often, pipe wrenches are required to unscrew the shoe.
15. Lay out labeled homogenization trays alongside the sample core.
16. Open the split spoon and take care not to spill or disturb the sample core.
17. Measure the desired soil depths.
18. Use clean gloves and a clean polyethylene scoop to retrieve each sample. Do not slide the soil down the spoon to retrieve it. Instead, use the scoop to carefully lift the sample into a homogenization tray.
19. Collect samples for volatile organic analysis directly into an EnCore® Sampler.
20. Deposit the sample into a homogenization tray for analysis other than volatile organics, and thoroughly mix the soils to obtain a homogenous, representative sample.
21. Place the homogenized sample into an appropriate, labeled sample container using a plastic scoop or stainless steel trowel, depending on the requested analysis.
22. Record all field notes on field data sheets and the site logbook, as specified in the sampling plan. The sample location should be documented using GPS, and should be mapped and described in the site logbook.
23. Photograph sample locations with landmarks in view. Keep in mind that sample locations may need to be referenced in the future, often years after your sampling event.
24. Abandon the sample hole(s) in accordance with state regulations. Generally, holes can be back filled with removed soil materials.
25. Decontaminate all sampling equipment in accordance with applicable SOPs or procedures.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

The following QA procedures apply:

- All data must be documented on field data sheets or within site logbooks.
- Field QA/QC samples (e.g., field blanks, equipment rinsate blanks, trip blanks, duplicate samples, MS/MSD, etc.) must be collected in accordance with the FSP and QAPP
- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

6.0 HEALTH AND SAFETY

- When working with potentially hazardous materials follow U.S. EPA, OSHA and specific health and safety procedures.

- When working on site be mindful of site circumstances such as traffic, tripping hazards, biological hazards, electrical lines, etc.

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM STANDARD OPERATING PROCEDURE

SOP 304 SUBSURFACE SOIL SAMPLING

Revised October 2019

7.0 REFERENCES

EPA. 1991. Compendium of Emergency Response Team (ERT) Waste Sampling Procedures. Office of Solid Waste and Emergency Response, Washington, DC. EPA/540/P-91/008.

EPA 1991. Removal Program Representative Sampling Guidance. Volume 1 - Soil. Office of Solid Waste and Emergency Response, Washington, DC. 9630.4-10 P892-963408. {1995 updated available in EPA website}

WESTON® (Roy F. Weston, Inc.) 1993. Standard Practices Manual for Soil Sampling With a Spade, Scoop and Stainless Surface Soil Sampler Auger and Tube Sampler. West Chester, PA. {Not available on Weston Portal search}

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM STANDARD OPERATING PROCEDURE

SOP 304 SUBSURFACE SOIL SAMPLING

Revised October 2019

ATTACHMENT 1 SOIL SAMPLING DATA SHEET

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM STANDARD OPERATING PROCEDURE

SOP 304 SUBSURFACE SOIL SAMPLING

Revised October 2019

Soil Sampling Data Sheet

Site Name: _____ **Sampler:** _____ **Sample Date:** _____

Sample ID: _____ **Time**: _____

Sample Depth: ___Surface (0-0.5 ft) ____ Shallow (0.5-5.0 ft)

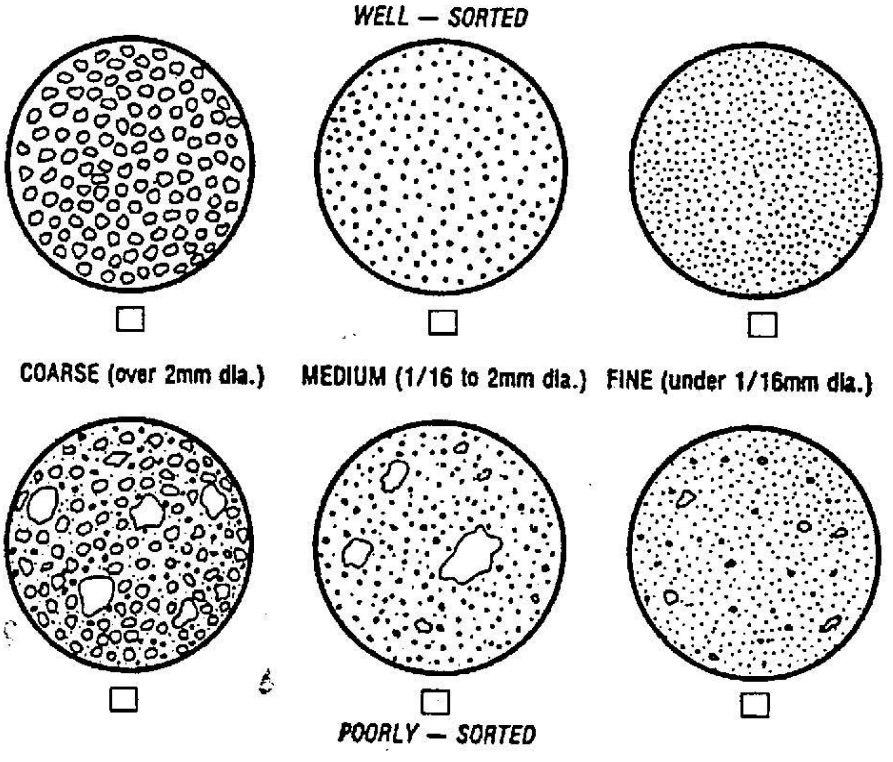
Sample Method: _____Scoop (2,3,4,5,6,7,8,A,C,+) ____ Hand Auger(2,3,4,5,6,7,B,+,-)
_____Slide-Hammer (1,2,3,4,5,6,7,8,A,B,+,-) ____ Open Tube (A,+,-)
_____Split/Solid Tube (1,2,3,4,5,6,7,8,A,B,-) ____ Thin-Wall Tube(8,A,-)

Preferred Methods

1 - Volatiles	5 - PCBs	A - Grab	+ - Surface
2 - Semi-Volatiles	6 - TPH	B - Composite (Vertical)	-- Shallow
3 - Primary Metals	7 - Rad	C - composite (Areal)	
4 - Pesticides	8 – Geotechnical		

Soil Description (Munsell): Chart _____ Value _____ Hue _____

Grain Size and Distribution:



SUPERFUND TECHNICAL ASSESSMENT & RESPONSE TEAM
STANDARD OPERATING PROCEDURES

SOP 306 SOIL BORING, ROCK CORING, SOIL AND ROCK BOREHOLE LOGGING AND SAMPLING
October 2019

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide Weston Solutions, Inc. (WESTON®), Superfund Technical Assessment and Response Team (START) members with technical guidance in the description, classification and logging of soils, sediments, bedrock and other natural and man-made materials encountered during drilling and subsurface sampling activities. This operating practice is not intended to outline procedures related to the collection and retrieval of soils, sediments, bedrock, etc.

2.0 DISCUSSION

2.1 Introduction

The objectives of any logging and sampling procedures must be to provide data that are reliable, accurate, pertinent, and useable by a wide range of disciplines throughout the evaluation process. WESTON's Geologic Logging and Interpretation System (GEOLIS™) forms are to be used to provide a common, consistent, standardized system of terminology and descriptors, and to ensure that data will be complete for all disciplines involved in the study regardless of the collector's background, training or experience. Alternative data entry forms may be used as presented in the Field Sampling Plan and approved by Weston Quality or Program Manager, and EPA. Additional informational on soil and bedrock logging procedures can be found in the GEOLIS™ Logging Reference Manual (Moran, Messinger and Kufs, 1991, Roy F. Weston, Inc.).

2.2 Logging Methods

GEOLIS Data Acquisition Procedures (GDAPs)

The GEOLIS Data Acquisition Procedures (GDAPs) are implemented primarily through the use of a series of forms (see Attachments 1 through 13). The forms ensure consistent, complete data collection using standardized terminology. The data collection forms serve as checklists. Each data element is collected and managed as a discrete field. The forms use both valid-value fields (i.e., "pick one") and open fields (i.e., "fill in the blanks") where appropriate. All fields must be filled in to ensure data consistency and completeness. These forms include:

- **Logbook Identification Form**: identifies the site, borehole or test pit number, and logger, and is used as a cover when the other forms are compiled into a bound book
- **Location Identification Form**: provides an overview of the location and work completed at a site
- **Borehole Logging Form**: provides a detailed checklist for describing earth materials sampled from boreholes
- **Test Pit Logging Form**: provides a detailed checklist for describing soils from test pits and surface exposures

- **Well Construction Form**: provides a detailed checklist for describing the construction of a well or piezometer placed in a borehole

- **Well Development Form**: used to document how a well was developed and what changes were observed in groundwater field parameters (e.g., pH, specific conductance)

- **Well Purging Form**: used to document how a well was evacuated prior to sampling

- **Water Level Form**: used to collect data on depths to groundwater under a variety of different situations

- **Water/Soil Sampling Forms**: are used to document when, where, and how samples were collected

- **Activity Logging Form**: tracks driller (and other subcontractor) time and materials to verify invoices

- **Notes and Sketches Form**: used to document qualitative observations and drawings that are not entered on any of the other forms

GDAP forms can be used individually or bound together in appropriate numbers so that each borehole can be treated as a separate package. This facilitates document tracking and helps ensure legal defensibility.

3.0 PROCEDURES

3.1 Associated Procedures

Most field efforts, work projects, and sampling events will require participants to have a thorough understanding of multiple operating practices. Field personnel performing soil and rock logging will, at a minimum, need to be familiar with the following associated procedures and documents.

- SOP 102 Field Notes

- SOP 601 Oversight of Monitoring Well Installation

- SOP 204 Water Level Measurements

- SOP 301 Decontamination Procedures

- GEOLIS Logging Reference Manual

3.2 Preparation

3.2.1 Office

It is required that Site Leaders and other key project members meet with the Project Manager to discuss contractual requirements related to soil and rock logging procedures. At a minimum, this discussion is to address the following items:

- The extent of the sampling effort, including the type and extent of QA/QC criteria, including field QC checks. Determine the logging methods to be employed, and the types and amounts of equipment and supplies required. Review available background information (i.e., topographic maps, soil survey maps, geologic survey maps, other site reports, etc.). If appropriate, prepare a sampling plan.

- Prepare or request appropriate WESTON personnel to prepare a Health and Safety Plan. The plan must be approved and signed by the Regional Safety Officer or his/her designee prior to performance of field activities.

- Review associated operating practices (see Section 3.1) for information on the performance of all relevant field activities that will require to complete soil and rock logging activities.

- Obtain a logbook for documentation of equipment checks and all other miscellaneous activities not documented in GEOLIS Forms.

- Prepare schedules and coordinate with staff, client, and regulatory agencies, if appropriate.

- Determine the need for GEOLIS training or refresher training for the assigned field data entry team. This training should include project-specific needs and a review of site geology and conditions.

- The intended use of data and how the data is to be analyzed.

- What contract requirements (i.e., classification type, structure for reporting) must be met.

- The numbering convention for wells and boreholes.

- Obtain the appropriate GEOLIS Forms, which at a minimum will include, the Log-book Identification Form, the Borehole Identification Form, Lithologic Logging Form and optional Notes and Sketch Forms. See Attachments 1 through 13 for samples of GEOLIS Forms.

- Requisition any necessary equipment and supplies (Attachment 14).
- The degree of resolution required in lithologic logging.
- The data management sequence including whether forms are to be bound, who receives the finished field forms and when and how are corrections to be made and documented.

3.2.2 Field

- Verify that permission to work on the site has been granted.
- Conduct a site survey prior to site entry in accordance with the Health and Safety Plan.
- Identify and stake all sampling locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.
- All staked locations are required to be utility-cleared by the property owner or utility companies prior to any intrusive soil sampling activities. Verify utility checking has been completed prior to sampling. In no instance shall WESTON personnel perform utility clearances or act on behalf of a client to obtain utility clearances.
- Set up the area around the borehole (consistent with the site safety plan) to facilitate data collection.
- Log samples and fill out the appropriate GEOLIS Forms. Detailed procedures for completing GEOLIS forms can be found in the GEOLIS Logging Reference Manual. Be sure to use the most current version of this manual as it is periodically updated as the GEOLIS system is expanded and improved. The manual includes reference materials (i.e., tables, charts, diagrams, figures) pertinent to evaluation and definition of the various fields present on the forms as well as examples of completed forms.

3.3 Post-Operation

3.3.1 Field

- At a minimum, check each form for accuracy and completeness at the completion of activities at each location. Be certain that each form is signed and dated and that changes are initialed and dated prior to releasing the forms to the Project Manager (or his/her designee) for QA/QC.
- Finish labeling and secure all lithologic samples and move to the

designated storage area.

- Ensure that all equipment is accounted for, decontaminated (see SOP 301, Decontamination Procedures), and ready for shipment.
- To the extent practicable restore the site to presampling conditions.
- Make sure all sampling locations are properly staked and the location ID is readily visible on the location stake.

3.3.2 Office

- Deliver the original GEOLIS forms to the Project Manager (or his/her designee). The original forms should be copied and filed.
- Follow the QA/QC regimen established for the data. At a minimum, this should include documentation of all corrections or changes to the field forms, reports or graphics whenever they are made. The logger should review these changes for accuracy at appropriate times during the QA/QC process.

4.0 DOCUMENTATION

4.1 Sample Label

All environmental samples shall be documented in accordance with the project specific work plan.

The sample label is filled out prior to collecting the sample, and should contain the following:

- Site name or identification.
- Sample location and identifier.
- Date samples were collected; in a day, month, year format (e.g., 03 JAN 20 for January 3, 2020).
- Time of sample collection, using 24 hour clock in format hours and minutes.
- Sample depth interval. Units used for depths should be in feet and tenths of feet.
- Preservative used, if any.
- Sampling personnel.
- Comments and other relevant observations (e.g., color, odor, sample technique).

4.2 Logbook

A bound, field notebook will be maintained by field personnel to record daily activities, including sample collection and tracking information. A separate entry will be made for each sample collected. These entries should include information from the sample label and a complete physical description of the sample including texture, color (including notation of soil mottling) consistency, moisture content, cementation and structure.

4.3 GEOLIS

Appropriate GEOLIS Forms will need to be completed as specified in Section 3.3 of this document.

5.0 INTERPRETATION

If there are questions regarding the interpretation or the applicability of items in this operating practice, the Project Manager or Technical Manager should be consulted. In the absence of either of those, contact your Program Manager.

6.0 REFERENCES

Moran, C.F., Messinger, D. J., and Kufs, C.T., 1991, GEOLIS™ Logging Reference Manual, Roy. Weston, Inc. 8 May 1991.

Kufs, C.T., Moran, C.F., and Messinger, D.J., Control and Management of Geologic Data, Proceedings of the Fifth National Outdoor Action Conference on Aquifer Restoration, Ground Water Monitoring, and Geophysical Methods, Book 5, National Water Well Association, May 1991.

Moran, C.F., Kufs, C.T., and Messinger, D.J., "Logging and Interpreting Geologic Data: An Innovative Approach", Superfund Risk Assessment in Soil Contamination Studies, ASTM STP 1158, K.B. Huddincott and G.D. Knowles, ed., American Society For Testing and Materials, Philadelphia, 1992.

Attachments: 14

ATTACHMENT 1 GEOLIS LOGBOOK IDENTIFICATION FORM

ATTACHMENT 2 GEOLIS DRILLING ACTIVITY LOG FORM

ATTACHMENT 3 GEOLIS LOCATION IDENTIFICATION FORM

ATTACHMENT 4 GEOLIS SOIL SAMPLING FORM

ATTACHMENT 5 GEOLIS NOTES AND SKETCHES FORM

ATTACHMENT 6 GEOLIS BOREHOLE LOGGING FORM

ATTACHMENT 7 GEOLIS WELL DEVELOPMENT FORM

ATTACHMENT 8 GEOLIS WATER LEVEL FORM

ATTACHMENT 9 GEOLIS WATER SAMPLING FORM

ATTACHMENT 10 GEOLIS WELL PURGING FORM

ATTACHMENT 11 GEOLIS WELL DEVELOPMENT FORM

ATTACHMENT 12 GEOLIS WELL CONSTRUCTION FORM

ATTACHMENT 13 GEOLIS TEST PIT LOGGING FORM

SOP 306 SOIL BORING, ROCK CORING, SOIL AND ROCK BOREHOLE LOGGING AND SAMPLING
October 2019

ATTACHMENT 14

EQUIPMENT AND SUPPLIES CHECKLIST FOR SOIL-BEDROCK LOGGING

SUPERFUND TECHNICAL ASSESSMENT & RESPONSE TEAM
STANDARD OPERATING PROCEDURES

SOP 306 SOIL BORING, ROCK CORING, SOIL AND ROCK BOREHOLE LOGGING AND SAMPLING
October 2019

EQUIPMENT AND SUPPLIES CHECKLIST FOR SOIL -BEDROCK LOGGING

GEOLIS Logbook or individual logging forms
Munsell Color Chart
GSA Color Chart
Laminated GEOLIS Reference Book
Grain Size Card
Scale Hand Lens
10% HCl
Clip Board
Measuring tape or Folding rule (in feet and tenths)
Pocket Penetrometer (if required)
Torvane Device (if required)
Pocket Knife
Indelible Ink Markers, two colors (for marking core)
Squirt Bottle (with deionized water)
Plastic Sheeting
Paper Towels
Pens (blue or black)
Compass
Rock Hammer
Eye Protection
Work Gloves
Surgical Gloves
Sample Jars
Sample Jar Labels
Chain-of-Custody Forms
PID/FID Multi-Rae meter with LEL
Depth to Water Meter
GPS (if in scope of work)

SUPERFUND TECHNICAL ASSESSMENT & RESPONSE TEAM
STANDARD OPERATING PROCEDURE

SOP 307 SURVEYING ENVIRONMENTAL SAMPLING LOCATIONS
Revised October 2019

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide Weston Solutions, Inc. (WESTON®), Superfund Technical Assessment and Response Team (START) members with technical guidance and quality assurance criteria for the surveying of environmental sampling locations. This SOP covers surveying by a licensed surveyor. In some instances it can be acceptable for locations to be surveyed using a hand-held Global Positioning System (GPS). Sampling locations/stations covered in this operating practice are: wells, piezometers, soil borings, test pits, surface soil, sediment stations, and staff gages.

This operating practice, however, can also be referenced for surveying other data points, as necessary. The objective of this operating practice is to identify the specific data and reporting requirements for measuring of the coordinates and elevations for environmental sampling locations.

2.0 DISCUSSION

2.1 Introduction

The objective of a sample location surveying effort is to provide accurate and well documented coordinate and elevation information that is referenced to an appropriate benchmark. It is equally important that the calculated coordinate and elevation information is reported in a pre-established format to facilitate the timely uploading of this information into a projects locational database. An increasing number of environmental projects have begun to use integrated geological, hydrological analytical and geographical databases to effectively manage, analyze and report the large amounts of technical information. The link between the projects technical databases and the locational database provides a system for the generation of accurate data presentations (including 2-D and 3-D maps and cross-sections). Thus, when planning for a survey effort, or preparing a survey RFP, the scope of work should include a detailed explanation of the deliverable format of the survey information.

2.2 Surveying

All surveying activities shall be performed under the direct supervision of a certified land surveyor.

Location and elevations surveyed shall be measured as the distance in feet from a reference location(s) which is tied to the applicable state plane coordinate system or other coordinate system, as required by the project. The surveys shall be third order (cf. Urquhart, L.C., 1962 Civil Engineering Handbook, 4th edition, pp. 96 and 97). Elevations shall be surveyed to a precision of ±0.01 feet. Horizontal precision shall be to the nearest 0.1 foot. An x,y-coordinate system shall be used to identify horizontal locations. The x-coordinate is the

north-south axis, and the y-coordinate is the east-west axis. All x,y values shall be positive.

2.3 Surveying Drilling/Sampling Locations

The surveyor will survey the location (referenced to the applicable coordinate system) and ground elevations of soil borings, test pits, and surface soil sampling points. Wells and piezometers will require the following survey measurements:

- Adjacent ground surface elevation
- Top of outer casing elevation
- State plane coordinate location of inner casing

In most instances, wells and piezometers will have a locking cap and will be opened and re-locked by the surveyor using keys supplied by WESTON. Elevations for both the outer and inner well casings will be surveyed from pre-established reference points. A casing reference point will be designated by either a notch of the casing rim or an arrow point painted on the inside well casing, just below the rim. If no reference point is observed, the surveyor will establish a reference point. Well locations will be surveyed from the inner casing reference point.

The surveyor shall provide only the state plane coordinates (or other specified) for surface water/sediment sampling points; no elevation control is required. The top of each staff gage will be surveyed for state plane coordinate (or other specified) and elevation information.

2.4 Electronic Deliverable

The survey data will be provided electronically. The electronic data will be provided in a sortable table (such as MS Excel) or American Code for Information Interchange (ASCII) file format. The hardcopy will include a table listing the northing, easting, and vertical elevations (ft msl) for each location, along with a site map if required.

Each electronic file must contain the following fields or entries for each drilling/sampling location surveyed:

- Client Name
- Site Name

- Site number (NA if not applicable).
- Location ID number.
- Location type (e.g., piezometer, soil boring, test pit, etc.).
- Northing (state plane (or other specified) coordinate in feet).
- Easting (state plane (or other specified) coordinate in feet).
- Ground surface elevation (excluding surface water/sediment sampling locations).
- Top of inner casing elevation (for wells and piezometers only).
- Top of outer casing elevation (for wells and piezometers only).
- Reference elevation (see below for definitions).

All fields must be filled out. If a particular field is not applicable, such as top of inner casing elevation for a soil boring location, then "NA" should be placed in that particular field.

Reference elevations vary with location type; the following definitions shall be used for determining reference elevations:

- Wells and piezometers - the reference elevation equals the top of inner casing elevation, which is the reference point for water level measurements.

- Boring and test pits - The reference elevation equals the ground surface elevation.

- Staff gages - the reference elevation equals the elevation measured from the top of the staff gage.

- Surface water/sediment sampling locations - reference elevation is not applicable for these sampling locations.

2.5 Surveyor Notes

One copy of all field notes collected during the performance of the survey effort plus any survey data reduction notes shall be delivered to WESTON along with the survey electronic deliverable and shall be maintained in the project file.

3.0 INTERPRETATION

If there are questions regarding the interpretation or the applicability of items in this operating practice, the Project Manager or Technical Manager should be consulted. In the absence of either of those, contact your Program Manager.

Attachment D

Michigan Department of Environment, Great Lakes, and Energy: Additional Background Well Data

(obtained from Wellogic: https://www.egle.state.mi.us/wellogic/Login.aspx?ReturnUrl=%2fwellogic)

Various Dates

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID:

Tax No:	Permit No: WEL2020-00292	County: Washtenaw	Township: Scio

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
02S 05E	13	Active		

Well ID: 81000024118

Elevation:
Latitude:
Longitude
Method of Collection: GPS Std Positioning Svc SA Off

Distance and Direction from Road Intersection:

Well Owner:

Well Address:	Owner Address:
COLE DR. ANN ARBOR, MI 48103	MILLER RD. ANN ARBOR, MI 48103

Drilling Method: Rotary
Well Depth: 216.00 ft. **Well Use:** Household
Well Type: New **Date Completed:** 7/8/2021

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting: None

Diameter: 5.68 in. to 200.00 ft. depth SDR: 21.00
5.68 in. to 210.00 ft. depth SDR: 17.00

Borehole: 9.00 in. to 216.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 7/15/2021 **HP:** 1.50
Manufacturer: Franklin Electric **Pump Type:** Submersible
Model Number: 20FV15P4 **Pump Capacity:** 18 GPM
Drop Pipe Length: 125.00 ft. **Pump Voltage:** 230
Drop Pipe Diameter: 1.25 in. **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Well-Rite-Flexcon
Model Number: WR 360 **Tank Capacity:** 119.0 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 80.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 80.00 ft. after 2.00 hrs. at 12 GPM
Pumping level 216.00 ft. after 2.00 hrs. at 100 GPM

Formation Description	Thickness	Depth to Bottom
Clay Sandy	16.00	16.00
Gray Clay	175.00	191.00
Gravel & Clay	17.00	208.00
Gravel	8.00	216.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 5.00 in. **Blank:**
Screen Material Type: PVC-slotted
Screen Installation Type: Attached

Slot	Length	Set Between
20.00	6.00 ft.	210.00 ft. and 216.00 ft.

Fittings: None

Well Grouted: Yes **Grouting Method:** Grout pipe outside casing

Grouting Material	Bags	Additives	Depth
Bentonite slurry	15.00	None	0.00 ft. to 210.00 ft.

Wellhead Completion: Pitless adapter, 12 inches above grade

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	100 ft.	West

Geology Remarks:

Drilling Machine Operator Name: Ken Pearce
Employment: Employee
Pump Installer: Dan Rowe, Kevin Huver

Contractor Type: Water Well Drilling Contractor **Reg No:** 81-2014
Business Name: Cribley Drilling Company
Business Address: 8300 Dexter-Chelsea Rd, Dexter, MI, 48130

Water Well Contractor's Certification

This well and/or pump installation was performed under my registration.

Signature of Registered Contractor **Date**

General Remarks: USED 600# SAND PACK.
Other Remarks:

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER LABORATORY
USEPA Region V Drinking Water Cert. No. MI00003

P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Official Laboratory Report

Report To: 6130

Sample ID: LK70579
Work Order: 30600630_27

System Name/Owner:		WSSN/Pool ID:		
Collection Address:	COLE DR,ANN ARBOR	Source:	Single Family Dwelling	
Collected By:	MARISSA DICICCO	Site Code:	GELSC	
Township/Well#/Section:	SCIO//	Collector:	Other	
County:	Washtenaw	Date Collected:	06/06/2023	13:59
Sample Point:	OUTSIDE FAUCET	Date Received:	06/07/2023	09:16
Water System:	Untreated Private Well	Purpose:	Routine Monitoring	

TESTING INFORMATION					REGULATORY INFORMATION		
Analyte Name	**Result**	**Units**	**RL**	**Date Tested**	**MCL/AL**	**Method**	**CAS #**
1,4 Dioxane by GC/MS							
1,4 Dioxane	Not Detected	mg/L	0.0005	06/08/2023		8260 SIM	123-91-1

The analyses performed by the EGLE Drinking Water Laboratory were conducted using methods approved by the U .S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below.

Washtenaw Co Dept. of Planning & Environment
705 N. Zeeb Road
Ann Arbor, MI 48107-8645
734 222-3800

RL: Reporting Limit
MCL: Maximum Contaminant Level
AL: Action Level
Not Detected: Not detected at or above the reporting limit (RL)

mg/L: milligrams / Liter (ppm)
ng/L: nanograms / Liter (ppt)
MPN: Most Probable Number

CFU: Colony Forming Unit
CAS: Chemical Abstract Service
Laboratory Contact: Marlene Kane

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No: S00689WN	County: Washtenaw	Township: Scio

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
02S 05E	35	Active		

Well ID: 81000032652

Elevation:
Latitude:
Longitude:
Method of Collection: Interpolation-Map

Distance and Direction from Road Intersection:

Well Owner:

Well Address:
SOUTHWOOD CT
ANN ARBOR, MI 48103

Owner Address:
PO BX
ANN ARBOR, MI 48103

Drilling Method: Rotary
Well Depth: 247.00 ft. **Well Use:** Household
Well Type: New **Date Completed:** 7/14/1989

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Unknown
Casing Fitting:

Diameter: 5.00 in. to 249.00 ft. depth SDR: 21.00

Borehole: 8.00 in. to 160.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 1.00
Manufacturer: Red Jacket **Pump Type:** Submersible
Model Number: CN14BC **Pump Capacity:** 12 GPM
Drop Pipe Length: 135.00 ft. **Pump Voltage:** 220
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Amtrol
Model Number: WX250 **Tank Capacity:** 13.1 Gallons
Pressure Relief Valve Installed: Unknown

Static Water Level: 110.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Unknown
Pumping level 111.00 ft. after 2.00 hrs. at 12 GPM

Formation Description	Thickness	Depth to Bottom
Brown Clay	16.00	16.00
Sand & Gravel	18.00	34.00
Gray Clay	16.00	50.00
Brown Clay	10.00	60.00
Sand & Gravel	109.00	169.00
Gray Clay	71.00	240.00
Sand & Gravel	17.00	257.00

Screen Installed: Yes **Filter Packed:** Unknown
Screen Diameter: 4.00 in. **Blank:** 1.00 ft. Above
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Unknown

Slot	Length	Set Between
30.00	8.00 ft.	249.00 ft. and 257.00 ft.

Fittings: Neoprene packer

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite slurry		Unknown	0.00 ft. to 160.00 ft.

Wellhead Completion: Pitless adapter

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	200 ft.	Southwest

Geology Remarks:

Drilling Machine Operator Name: LARRY CLARK
Employment: Unknown

Contractor Type: Water Well Drilling Contractor **Reg No:** 81-0524
Business Name: CRIBLEY DRILLING CO INC
Business Address: DEXTER, MI, 48130

Water Well Contractor's Certification

This well and/or pump installation was performed under my registration.

Signature of Registered Contractor **Date**

General Remarks:
Other Remarks:

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER LABORATORY
USEPA Region V Drinking Water Cert. No. MI00003

P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Official Laboratory Report

Report To: 6130

Sample ID: LK70623
Work Order: 30600630_71

System Name/Owner:		WSSN/Pool ID:		
Collection Address:	SOUTHWOOD COURT,ANN ARBOR	Source:	Single Family Dwelling	
Collected By:	S AGUINAGA	Site Code:	GELSC	
Township/Well#/Section:	SCIO//	Collector:	Other	
County:	Washtenaw	Date Collected:	06/06/2023	09:42
Sample Point:	OUTSIDE FAUCET W/HOSE CONNECTED	Date Received:	06/07/2023	09:16
Water System:	Untreated Private Well	Purpose:	Routine Monitoring	

TESTING INFORMATION					REGULATORY INFORMATION		
Analyte Name	**Result**	**Units**	**RL**	**Date Tested**	**MCL/AL**	**Method**	**CAS #**
1,4 Dioxane by GC/MS							
1,4 Dioxane	Not Detected	mg/L	0.0005	06/10/2023		8260 SIM	123-91-1

The analyses performed by the EGLE Drinking Water Laboratory were conducted using methods approved by the U .S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below.

Washtenaw Co Dept. of Planning & Environment
705 N. Zeeb Road
Ann Arbor, MI 48107-8645
734 222-3800

RL: Reporting Limit
MCL: Maximum Contaminant Level
AL: Action Level
Not Detected: Not detected at or above the reporting limit (RL)

mg/L: milligrams / Liter (ppm)
ng/L: nanograms / Liter (ppt)
MPN: Most Probable Number

CFU: Colony Forming Unit
CAS: Chemical Abstract Service
Laboratory Contact: Marlene Kane

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Wellogic

Import ID:

Tax No:	Permit No: 9706470	County: Washtenaw	Township: Scio

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
02S 05E	13	Active		

Well ID: 81000028891

Elevation:
Latitude:
Longitude
Method of Collection: Interpolation-Map

Distance and Direction from Road Intersection:

Well Owner: GLAMOUR HOMES INC

Well Address:	Owner Address:
MILLER RD ANN ARBOR, MI 48103	8386 JACKSON ANN ARBOR, MI 48103

Drilling Method: Rotary
Well Depth: 226.00 ft. **Well Use:** Household
Well Type: New **Date Completed:** 3/10/1998

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Unknown
Casing Fitting:

Diameter: 5.00 in. to 216.00 ft. depth SDR: 21.00

Borehole:

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 1.00
Manufacturer: Red Jacket **Pump Type:** Submersible
Model Number: 100SESWI-8SCC **Pump Capacity:** 20 GPM
Drop Pipe Length: 85.00 ft. **Pump Voltage:** 230
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Relief Valve Installed:

Static Water Level: 60.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Unknown

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: in. **Blank:**
Screen Material Type: PVC-slotted
Screen Installation Type: Unknown

Slot	Length	Set Between
		216.00 ft. and 226.00 ft.

Fittings: Unknown

Formation Description	Thickness	Depth to Bottom
Yellow Clay	10.00	10.00
Sand	26.00	36.00
Clay	9.00	45.00
Sand	9.00	54.00
Gray Clay	113.00	167.00
Sand	1.00	168.00
Gray Clay	46.00	214.00
Sand	6.00	220.00
Gravel	8.00	228.00

Well Grouted:

Geology Remarks:

Wellhead Completion: Unknown

Nearest Source of Possible Contamination:

Type	Distance	Direction
None		

Drilling Machine Operator Name:
Employment: Unknown

Contractor Type: Water Well Drilling Contractor **Reg No:** 81-0524
Business Name:
Business Address:

Water Well Contractor's Certification

This well and/or pump installation was performed under my registration.

Signature of Registered Contractor **Date**

General Remarks:
Other Remarks:

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER LABORATORY
USEPA Region V Drinking Water Cert. No. MI00003

P.O. Box 30270
Lansing, MI 48909
TEL: (517) 335-8184
FAX: (517) 335-8562

Official Laboratory Report

Report To: 6130

Sample ID: LK70557
Work Order: 30600630_05

System Name/Owner:		WSSN/Pool ID:	
Collection Address:	MILLER RD,ANN ARBOR	Source:	Single Family Dwelling
Collected By:	MG	Site Code:	GELSC
Township/Well#/Section:	SCIO//	Collector:	Other
County:	Washtenaw	Date Collected:	06/06/2023 13:48
Sample Point:	OUTSIDE FAUCET/HOSE	Date Received:	06/07/2023 09:16
Water System:	Untreated Private Well	Purpose:	Routine Monitoring

TESTING INFORMATION					REGULATORY INFORMATION		
Analyte Name	**Result**	**Units**	**RL**	**Date Tested**	**MCL/AL**	**Method**	**CAS #**
1,4 Dioxane by GC/MS							
1,4 Dioxane	Not Detected	mg/L	0.0005	06/07/2023		8260 SIM	123-91-1

The analyses performed by the EGLE Drinking Water Laboratory were conducted using methods approved by the U .S. Environmental Protection Agency in accordance with the Safe Drinking Water Act, 40 CFR parts 141-143, and other regulatory agencies as appropriate.

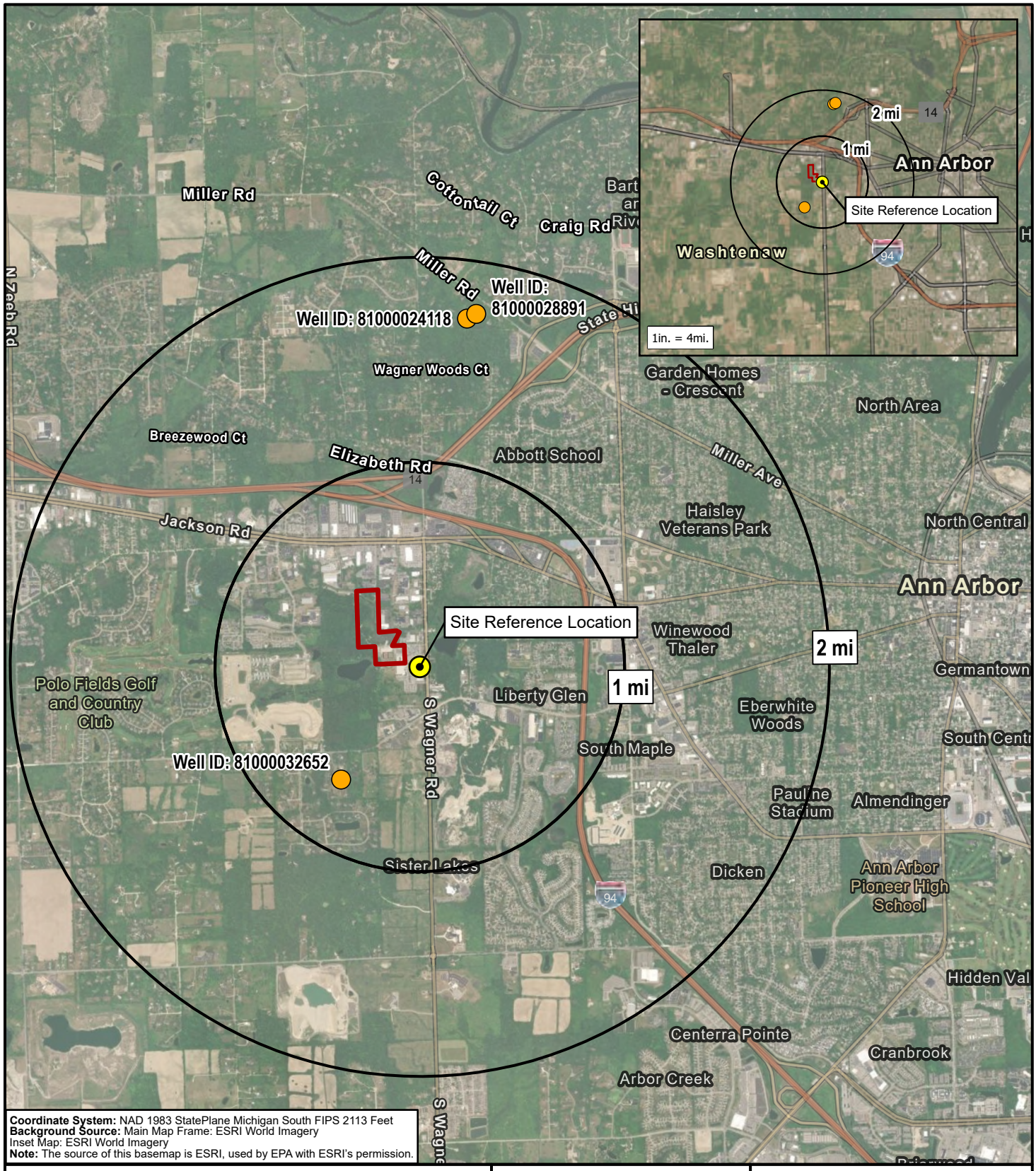
Your local health department has detailed information about the quality of drinking water in your area. If you have concerns about the health risks related to the test results of your sample, please contact the Environmental Health Section through the address and telephone number listed below.

Washtenaw Co Dept. of Planning & Environment
705 N. Zeeb Road
Ann Arbor, MI 48107-8645
734 222-3800

RL: Reporting Limit
MCL: Maximum Contaminant Level
AL: Action Level
Not Detected: Not detected at or above the reporting limit (RL)

mg/L: milligrams / Liter (ppm)
ng/L: nanograms / Liter (ppt)
MPN: Most Probable Number

CFU: Colony Forming Unit
CAS: Chemical Abstract Service
Laboratory Contact: Marlene Kane



Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet
Background Source: Main Map Frame: ESRI World Imagery
Inset Map: ESRI World Imagery
Note: The source of this basemap is ESRI, used by EPA with ESRI's permission.

Legend

- Site Reference Location
- Residential Well Location
- Current Gelman Property Boundary

Latitude: 42.276144
Longitude: -83.799940

0 1,750 3,500 7,000 Feet

EPA Region 5

Weston Solutions Inc.

FIGURE 1

RESIDENTIAL WELL LOCATIONS
GELMAN SCIENCES, INC.
ANN ARBOR, MI

July 2024

Attachment E

MI LUST U000266410 - Montgomery Pumping Station

CU903 **MONTGOMERY PUMPING STATION** **MI LUST** **U000266410**
East **432 MONTGOMERY AVE** **MI UST** **N/A**
> 1 **ANN ARBOR, MI 48103** **MI DEL PART 201**
1.788 mi. **MI WDS**
9443 ft. **Site 2 of 5 in cluster CU**

Relative:
Lower

Actual:
847 ft.

LUST:

Name:	MONTGOMERY PUMPING STATION
Address:	432 MONTGOMERY AVE
City,State,Zip:	ANN ARBOR, MI 48103
Facility ID:	10243
Source:	Not reported
Owner Name:	City Comm Hospital, Traverse
Owner Address:	Not reported
Owner City,St,Zip:	Not reported
Owner Contact:	Not reported
Owner Phone:	Not reported
Country:	Not reported
District:	Jackson
Site Name:	Ann Arbor, Montgomery Pumping St
Latitude:	42.27864
Longitude:	-83.76463
Date of Collection:	Not reported
Method of Collection:	The geographic coordinate determination method based on address matching-house number.
Accuracy:	100
Accuracy Value Unit:	Not reported
Horizontal Data:	North American Datum of 1983
Point Line Area:	Not reported
Desc Category:	Not reported
Regulatory Program:	Not reported
Risk Condition:	Not reported
Project Manager:	Not reported
Senate District:	Not reported
House District:	Not reported
US Congressional District:	Not reported

Leak Number:	2963
Release Date:	10/11/1991
Substance Released:	Not reported
Release Status:	Closed
Release Closed Date:	08/20/1992

Leak Number:	C-2234-91
Release Date:	10/11/1991
Substance Released:	Unknown
Release Status:	Closed
Release Closed Date:	08/20/1992

UST:

Name:	MONTGOMERY PUMPING STATION
Address:	432 MONTGOMERY AVE
City,State,Zip:	ANN ARBOR 48103-4117
Facility Type:	CLOSED
Facility ID:	00010243
Owner Name:	CITY OF ANN ARBOR
Owner Address:	PO BOX 8647 100 N FIFTH AVE
Owner City:	ANN ARBOR
Owner State:	MI
Owner Zip:	48107

Owner Contact:	Not reported
Owner Phone:	7347946000
Contact:	DANIEL J. CULLEN
Contact Phone:	(734) 994-6696
Date of Collection:	01/11/2001
Accuracy:	100
Horizontal Datum:	NAD83
Accuracy Value Unit:	FEET
Source:	STATE OF MICHIGAN
Point Line Area:	POINT
Desc Category:	Plant Entrance (Freight)
Method of Collection:	Address Matching-House Number
District:	Region 2 - Jackson District Office
Tank ID:	1
Capacity:	5000
Tank Status:	Removed from Ground
Substance:	Diesel
Install Date:	03/17/1966
Remove Date:	09/15/1991
Tank Number:	Not reported
Tank Details Compartments:	Not reported
Tank Release Detection:	Not reported
Pipe Release Detection:	Not reported
Piping Material:	Not reported
Piping Type:	Not reported
Tank Construction:	Not reported
Impressed Device:	Not reported
Latitude:	42.27864
Longitude:	-83.76463

DEL_PART201:

Facility ID:	81000314
Status:	Delisted - no longer meets criteria specified in rules

WDS:

Name:	CITY OF ANN ARBOR
Address:	432 MONTGOMERY AVE
City,State,Zip:	ANN ARBOR, MI 48103
Site Id:	MIG000029069
WMD Id:	448371
Site Specific Name:	CITY OF ANN ARBOR
Mailing Address:	432 MONTGOMERY AVE
Mailing City/State/Zip:	48103
Mailing County:	WASHTENAW

Attachment F

Summary of Unsewered Neighborhoods with Non-Detect Concentrations of 1,4-Dioxane

(Information obtained from: maps from EGLE's Gelman Site of 1,4-Dioxane Contamination; well/data tables from the database associated with EGLE's website, and Washtenaw County Sewer Area map confirming that these neighborhoods are not sewered, from MapWashtenaw https://gisappsecure.ewashtenaw.org/Geocortex/WebViewer/?app=f0327644649f4fab96af11ca00b7e3b4&)

Gelman Site of 1,4-Dioxane Contamination

More Information Download Data

by Bore Name or Address

State Highway 14

Ann Arbor

Province of Ontario, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/N

0.6km
0.4mi
-83.805 42.286 Degrees

Legend

All Bore Locations

- Monitoring Wells
- Residential Wells
- Extraction Wells
- Injection Wells
- Horizontal Wells
- Test Boring
- Seismic Interpretation Point
- Surface Water
- other

Prohibition Zone (2021)

- Prohibition Zone Boundary (2021)

Prohibition Zone (2011)

- Prohibition Zone Boundary (2011)

Surface Water Features

- Named Surface Water Feature
- Unnamed Surface Water Feature

Allen Creek Drain

Gelman Property Boundary (approximate)

- Gelman Property Boundary

2023 Sample Locations (with Max Dioxane Values)

- Groundwater Sample Location (2023)

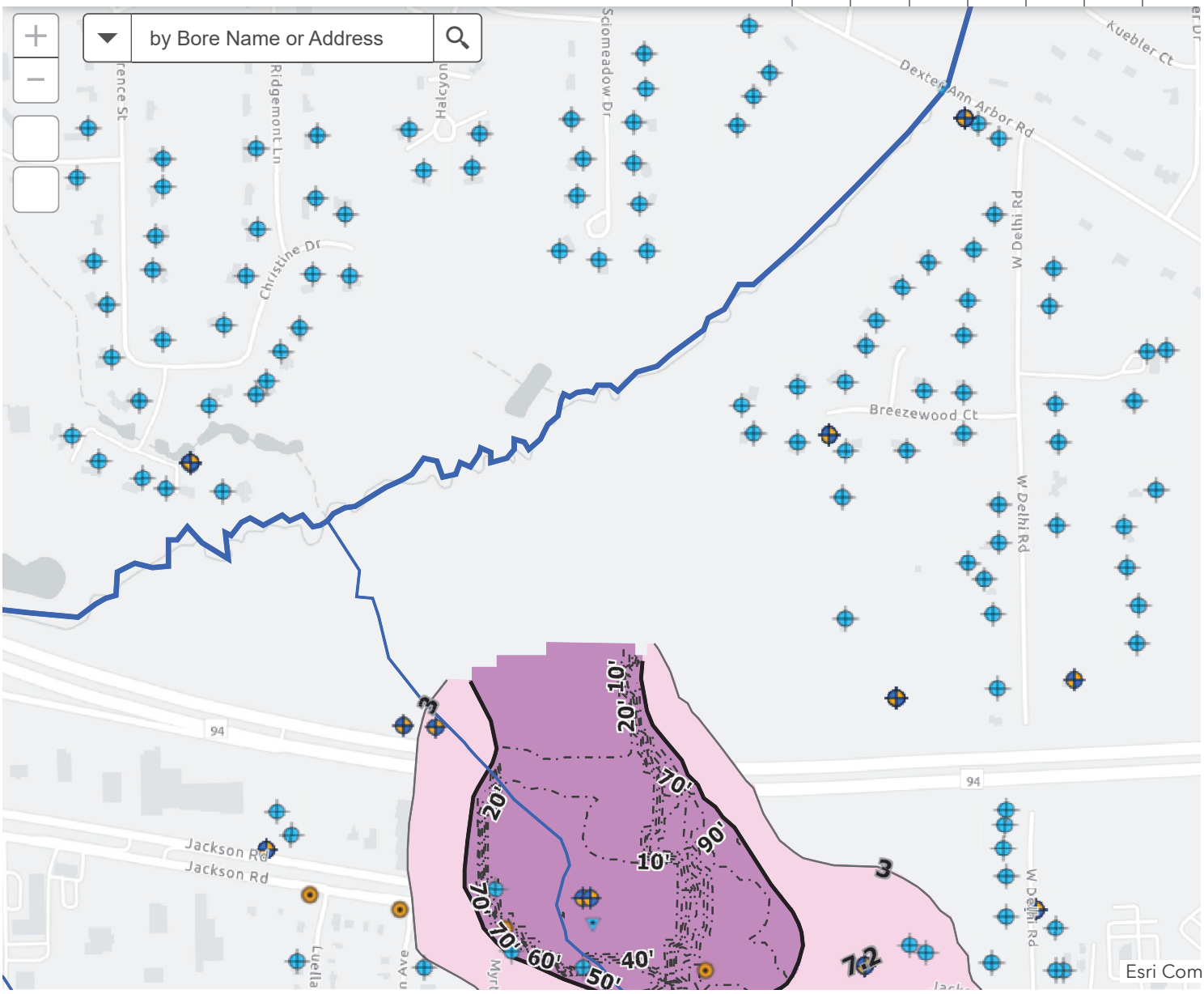
Depth to Dioxane (2023)

- Estimated Depth to 7.2 ppb or greater of 1,4-Dioxane (feet below ground)

1,4-Dioxane Isoconcentration Contours (2023)

- 3.0 ppb
- 7.2 ppb

Gelman Site of 1,4-Dioxane Contamination

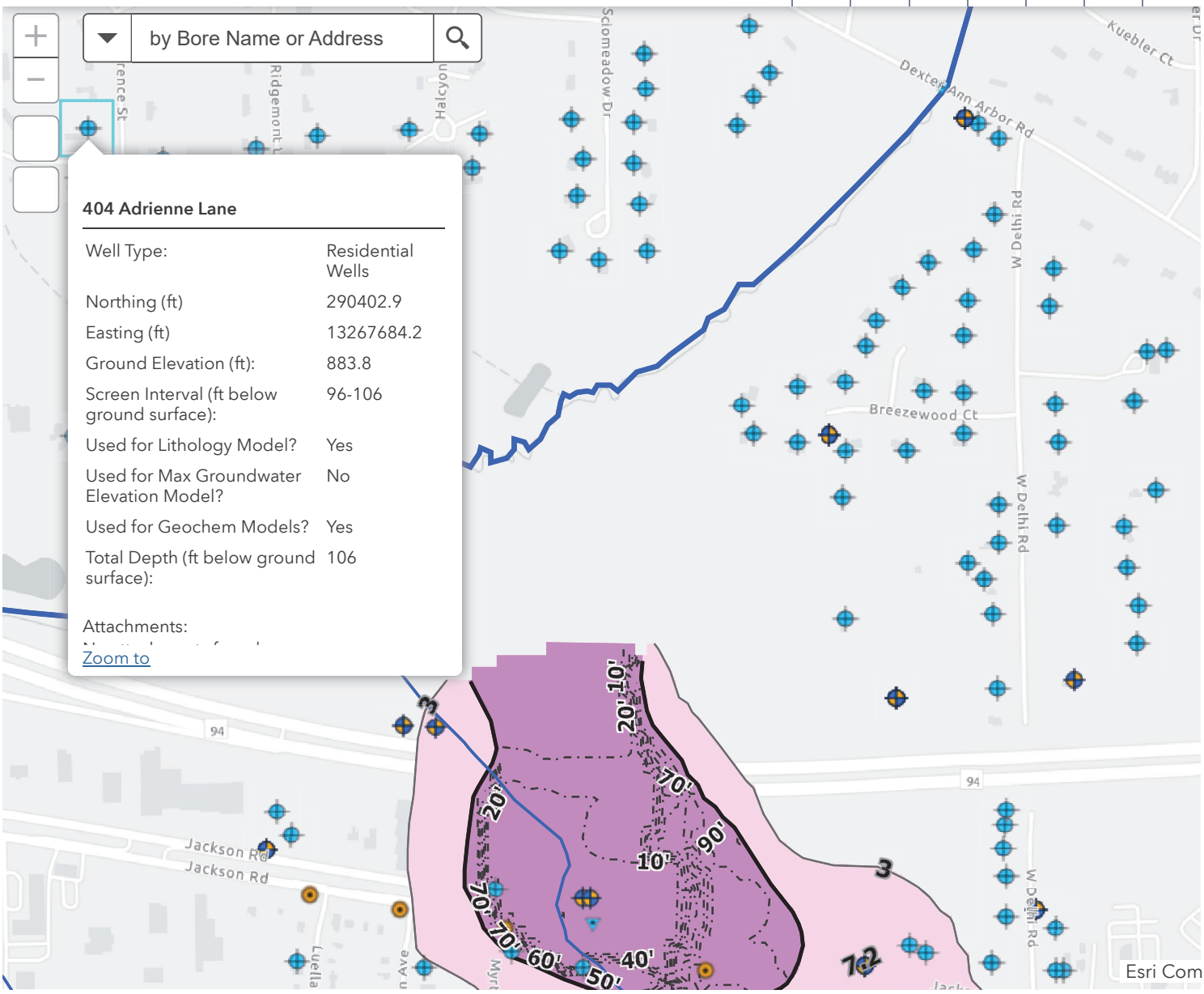




200m
600ft

-83.812 42.296 Degrees

Gelman Site of 1,4-Dioxane Contamination

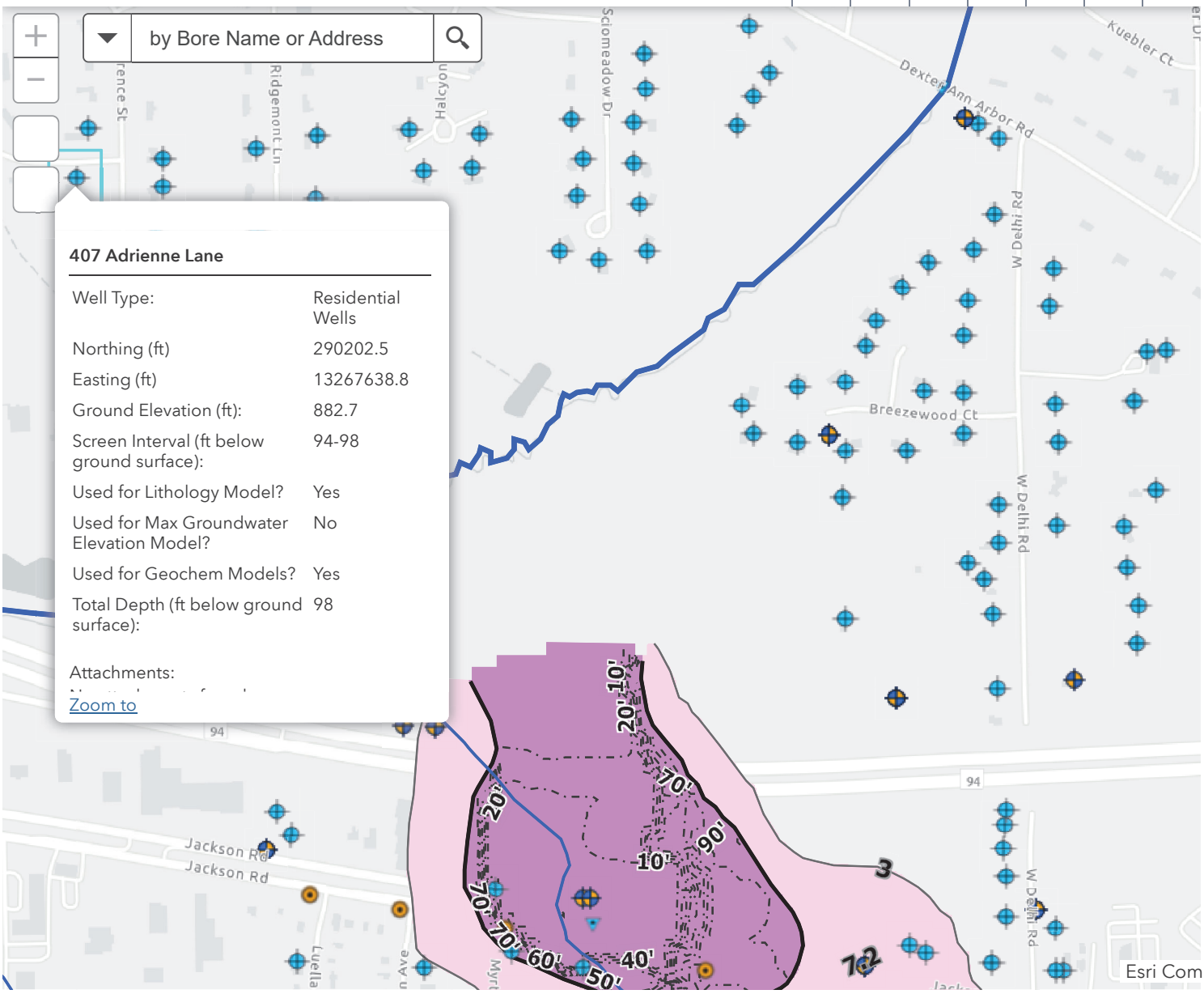




200m
600ft

-83.825 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination



407 Adrienne Lane

Well Type:	Residential Wells
Northing (ft)	290202.5
Easting (ft)	13267638.8
Ground Elevation (ft):	882.7
Screen Interval (ft below ground surface):	94-98
Used for Lithology Model?	Yes
Used for Max Groundwater Elevation Model?	No
Used for Geochem Models?	Yes
Total Depth (ft below ground surface):	98

Attachments:

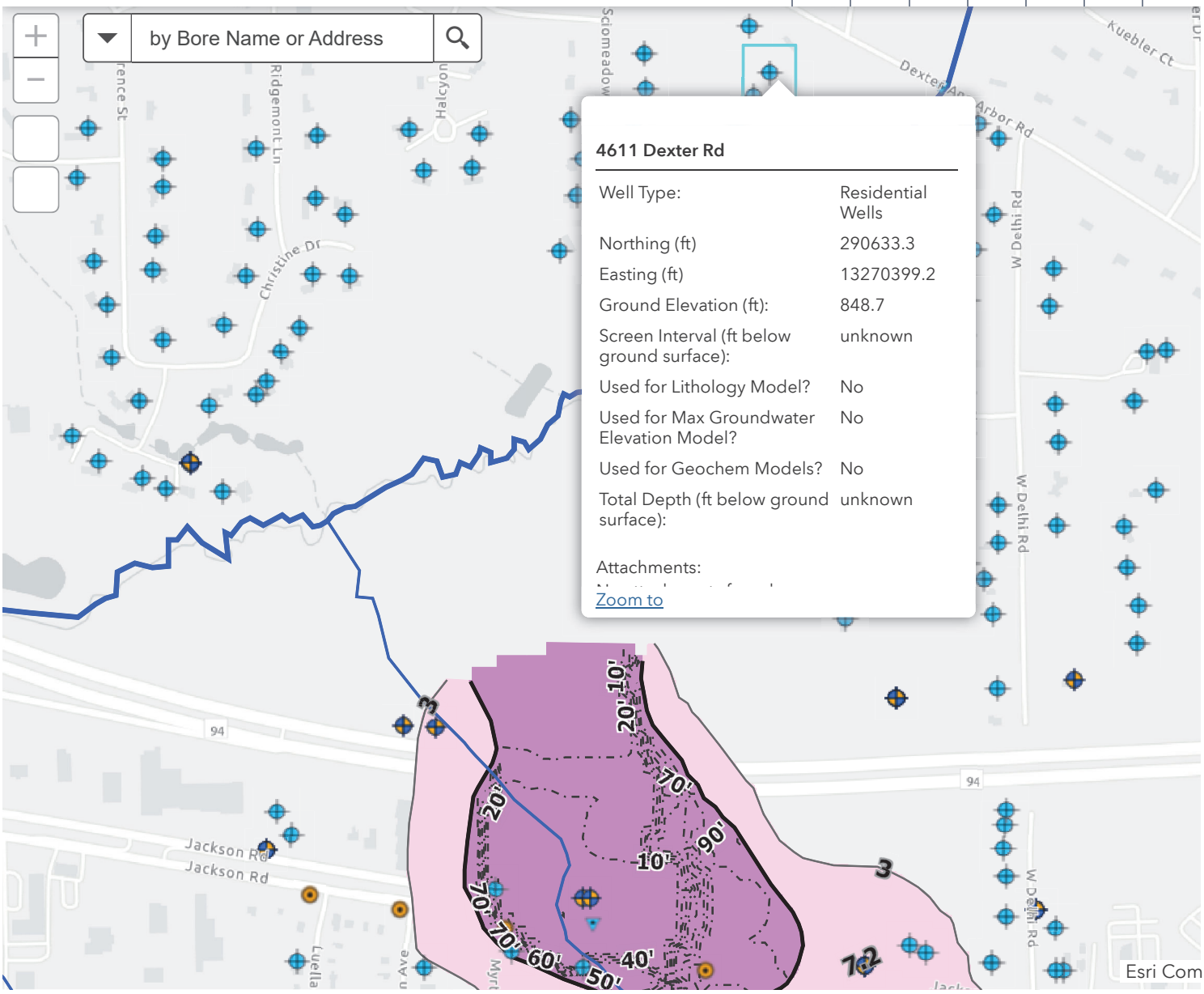
Zoom to



200m
600ft

-83.824 42.292 Degrees

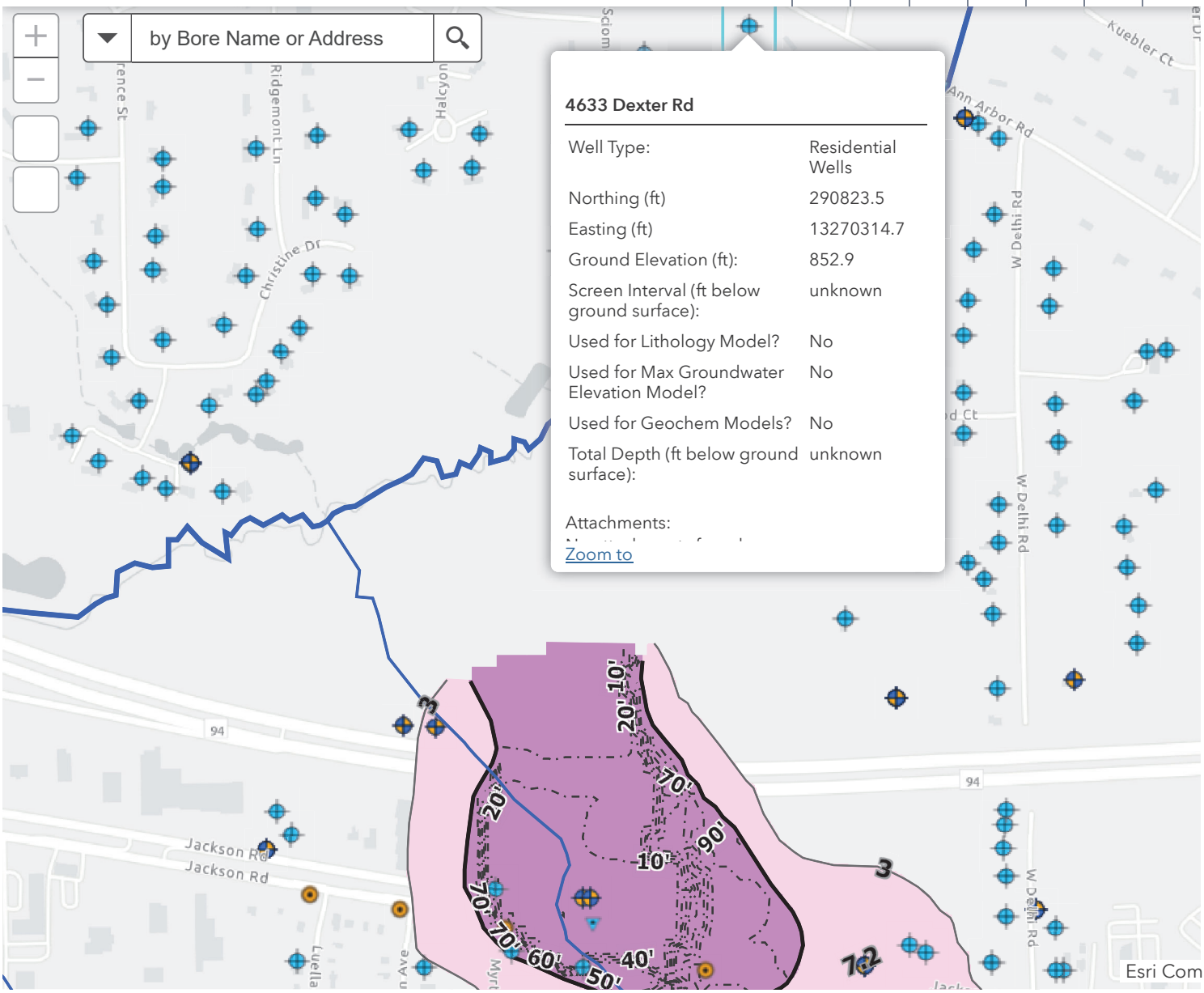
Gelman Site of 1,4-Dioxane Contamination





200m
600ft

-83.829 42.293 Degrees

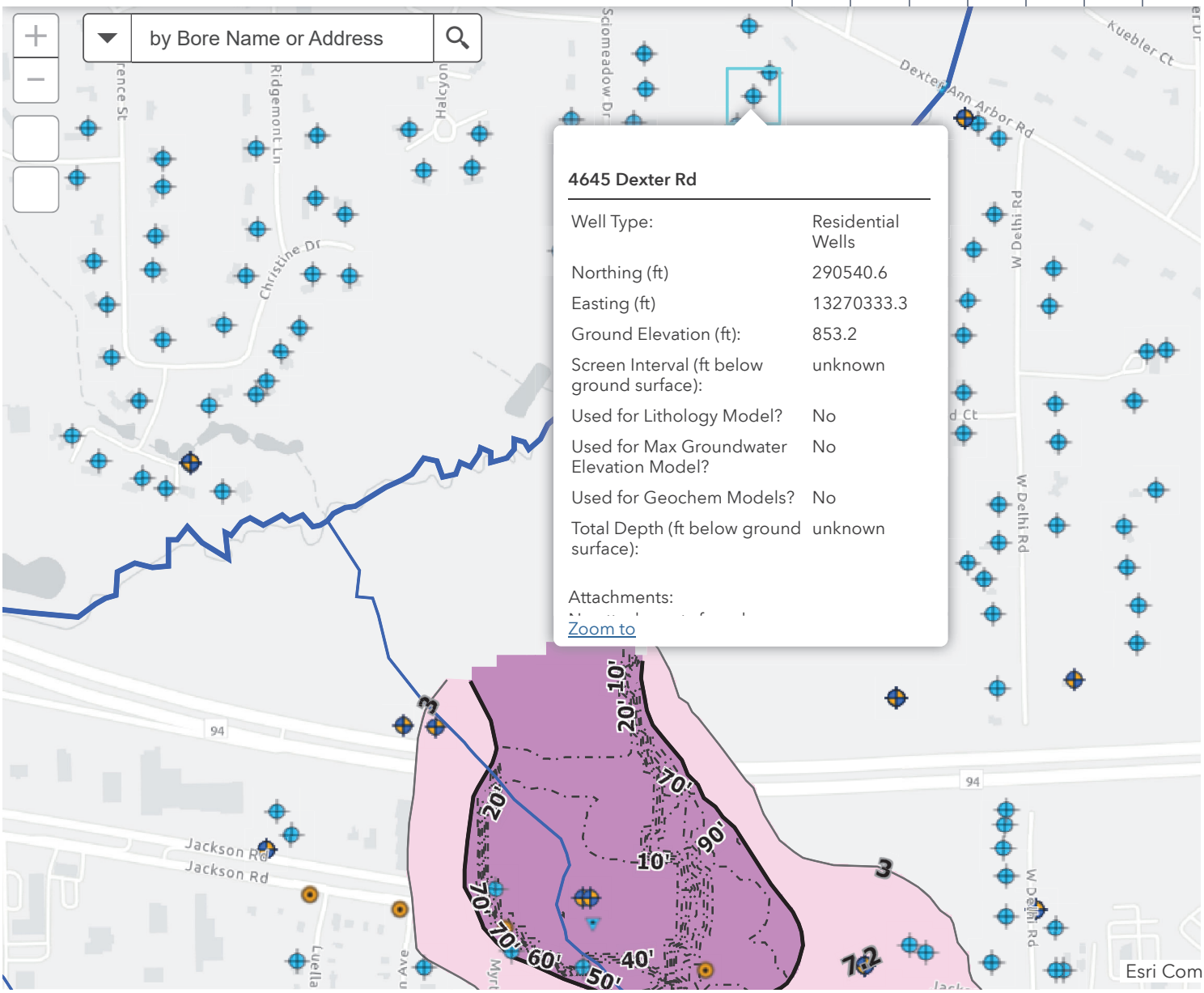




200m
600ft

-83.831 42.290 Degrees

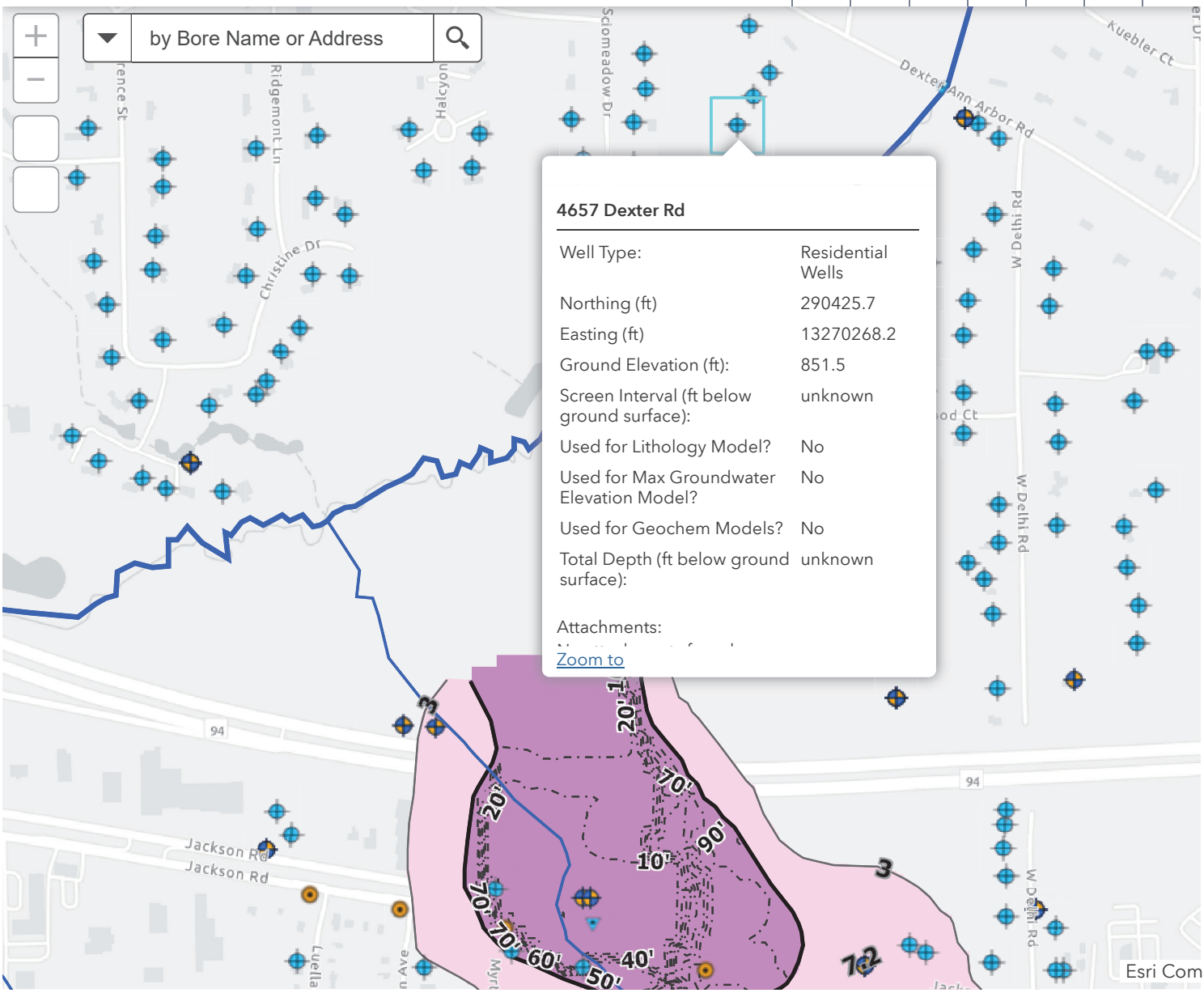
Gelman Site of 1,4-Dioxane Contamination





200m
600ft

-83.831 42.290 Degrees

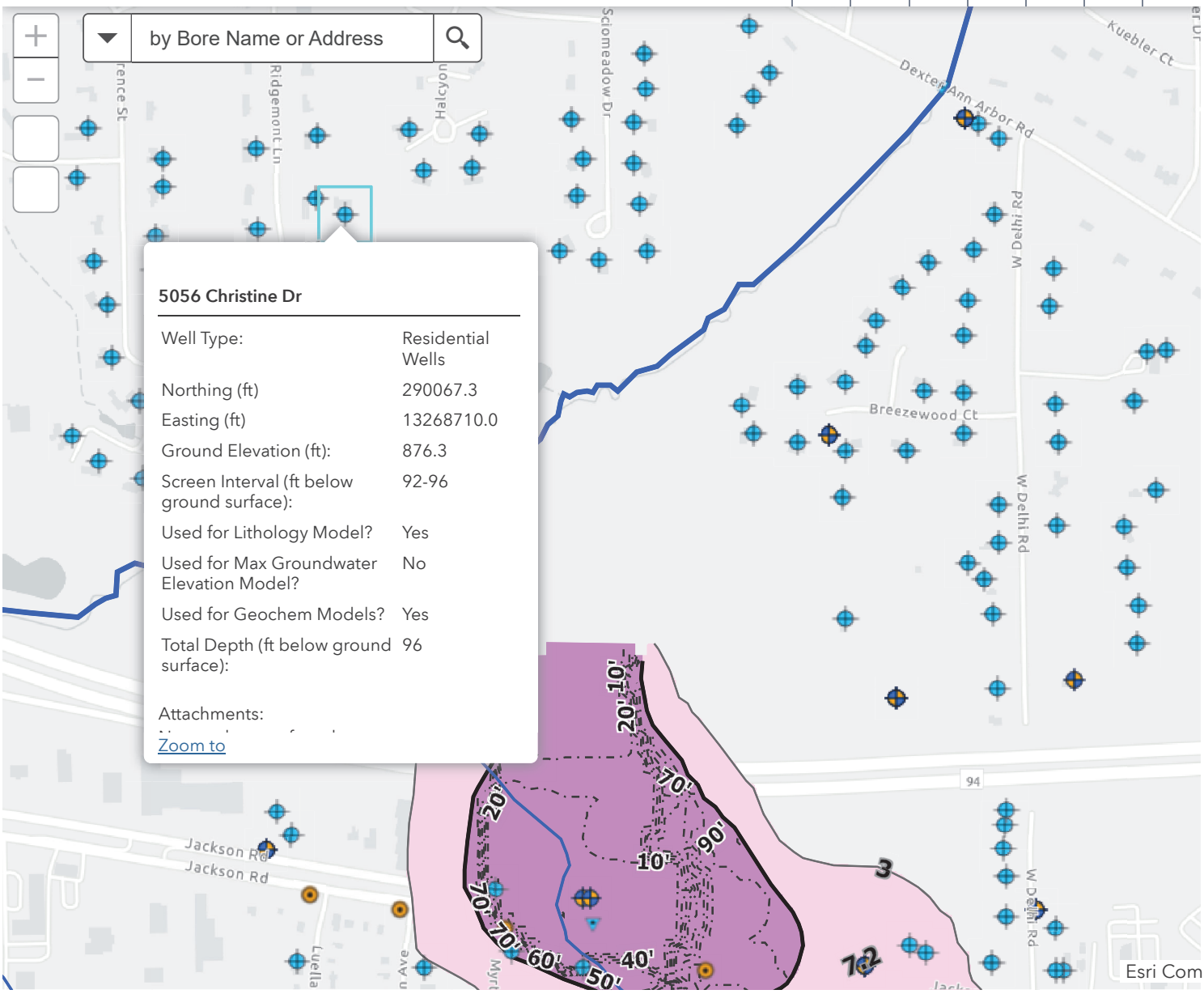




200m
600ft

-83.828 42.293 Degrees

Gelman Site of 1,4-Dioxane Contamination

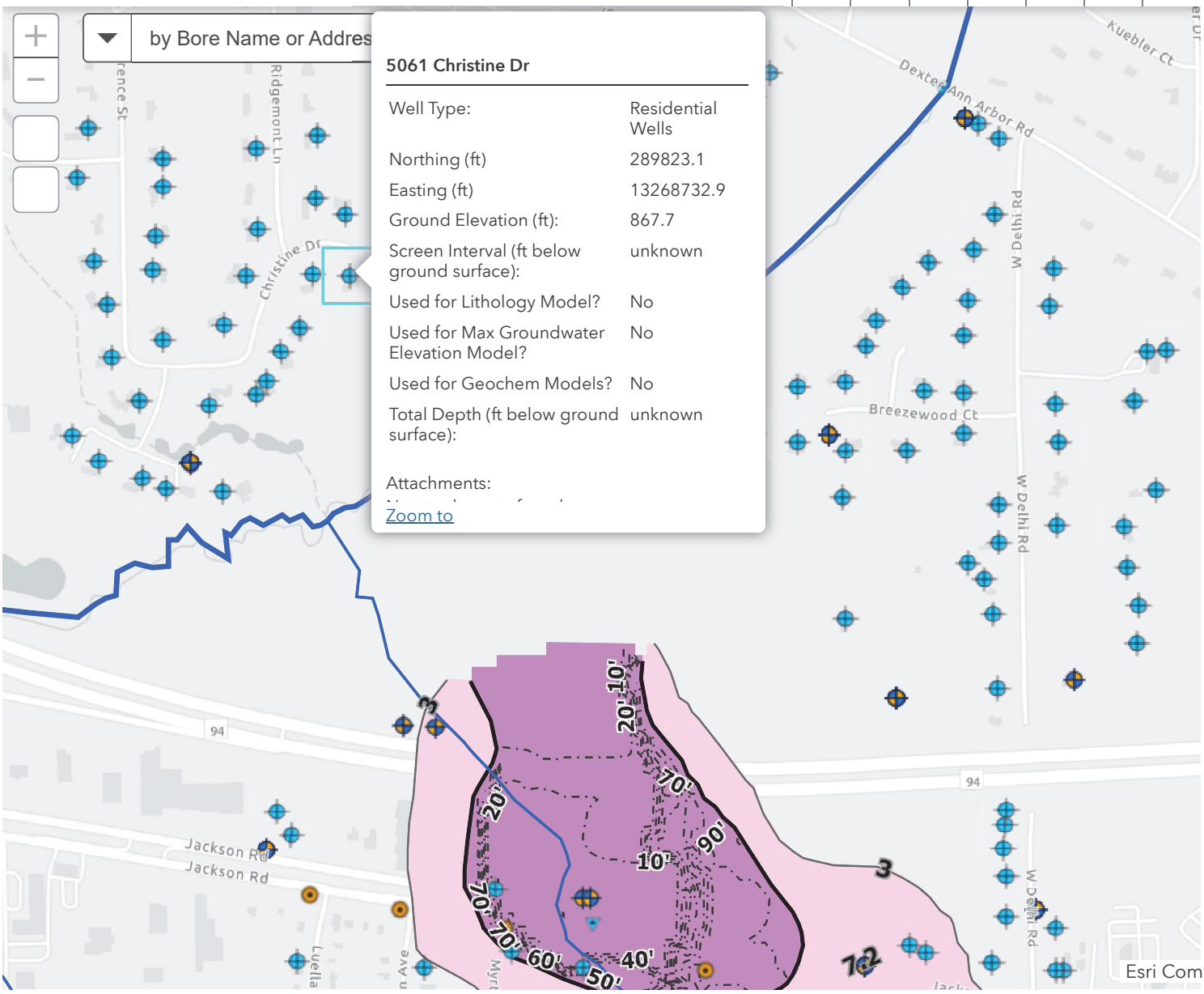




200m
600ft

-83.825 42.292 Degrees

Gelman Site of 1,4-Dioxane Contamination

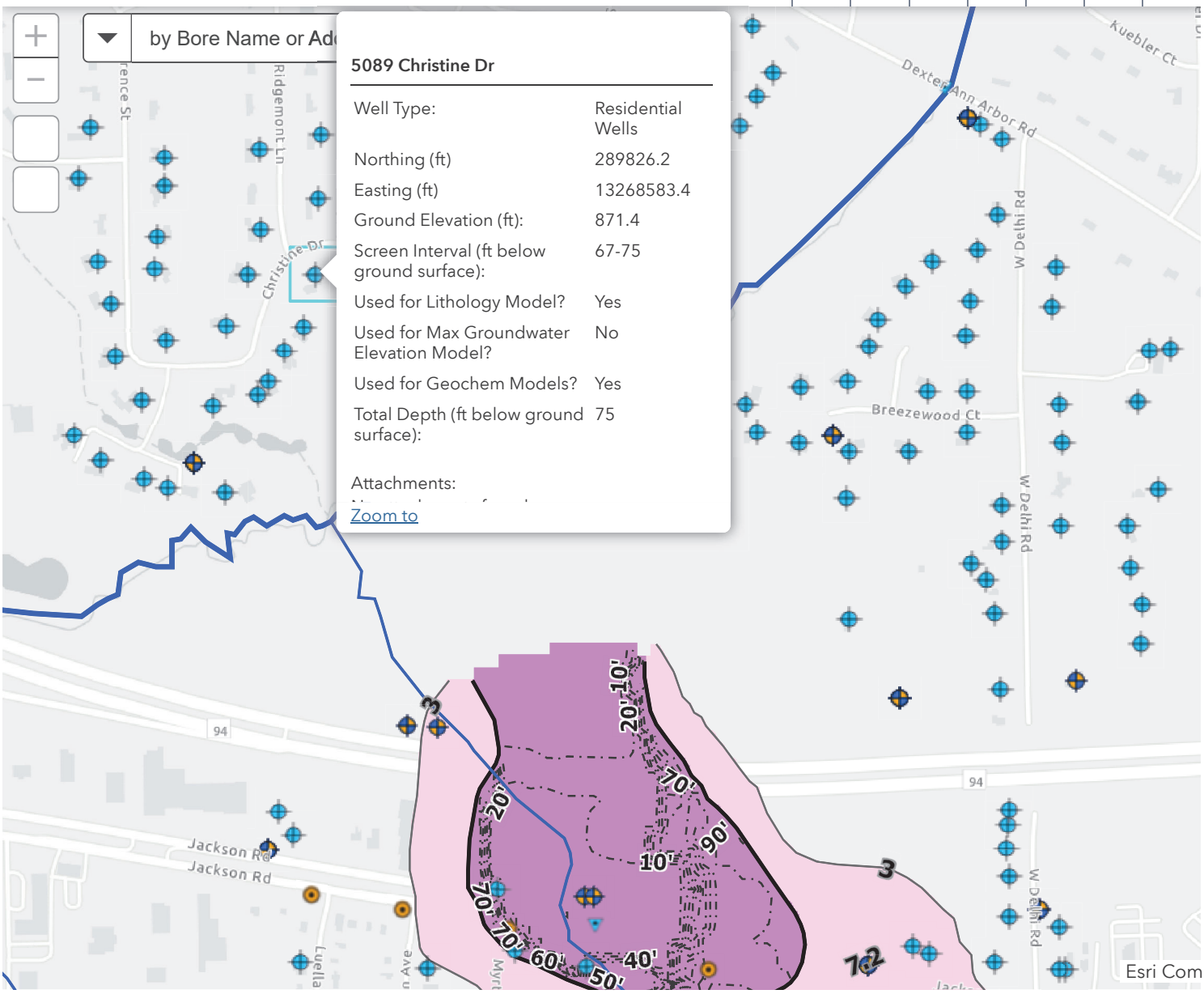




200m
600ft

-83.828 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination

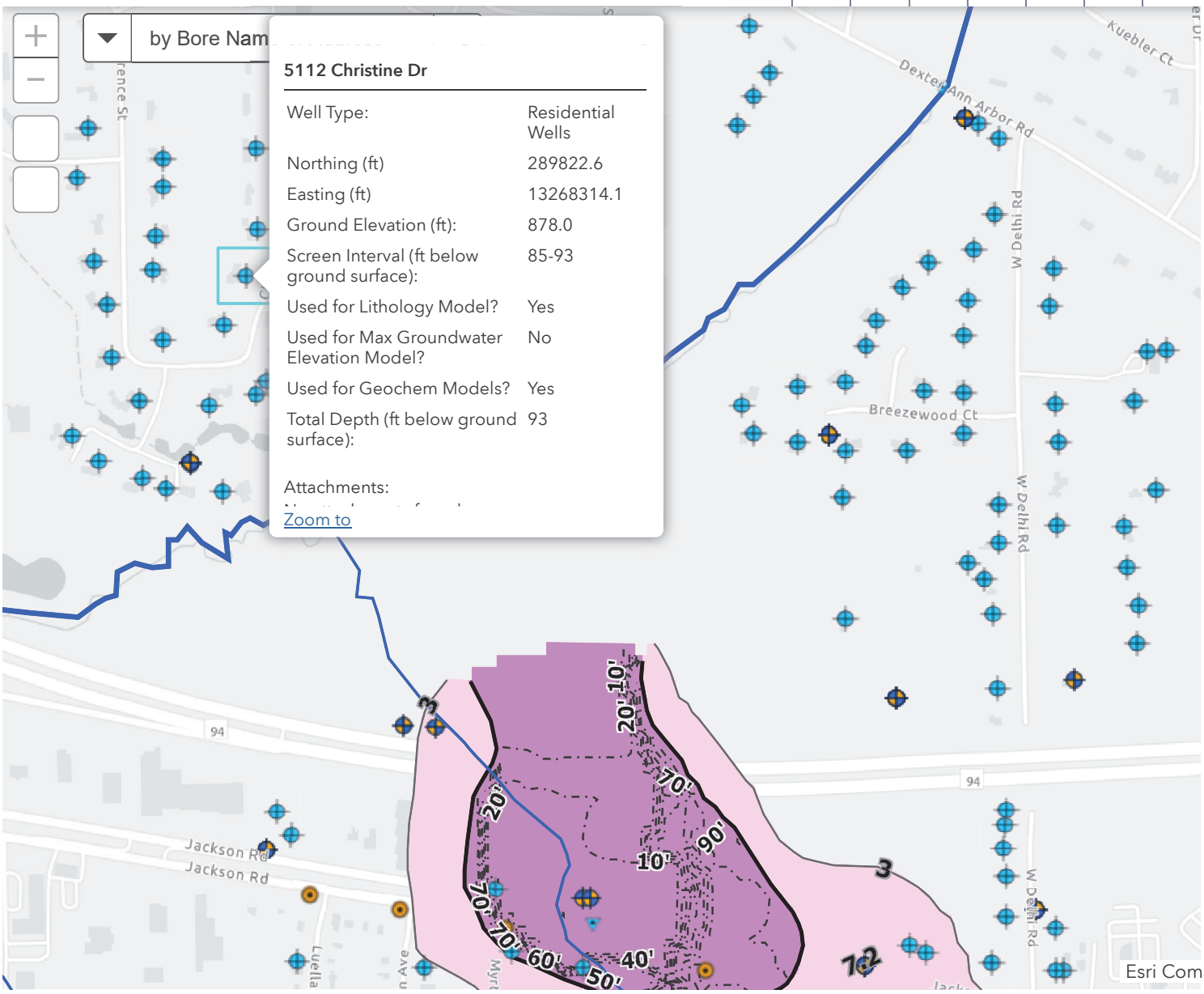




200m
600ft

-83.824 42.290 Degrees

Gelman Site of 1,4-Dioxane Contamination

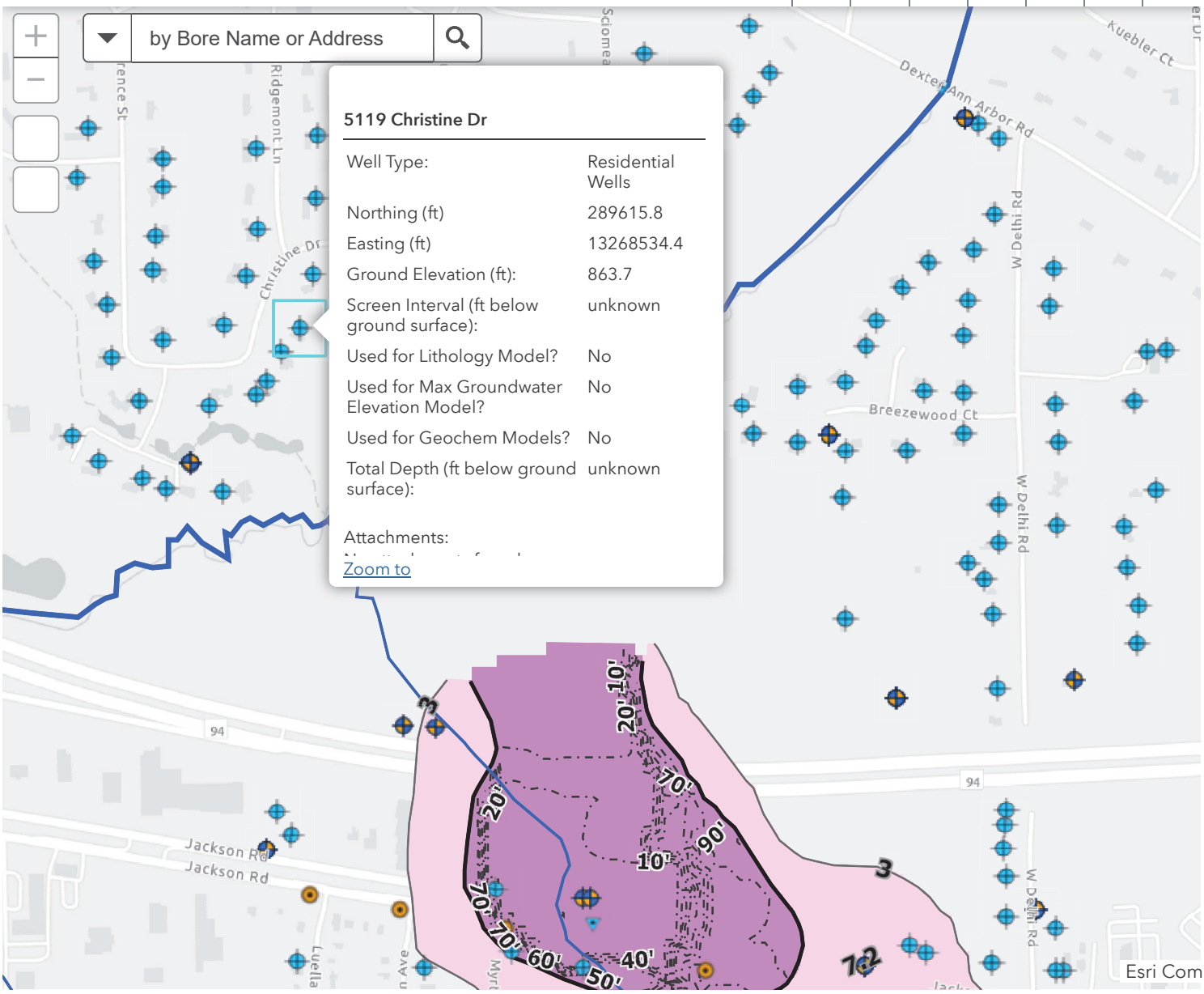




200m
600ft

-83.831 42.289 Degrees

Gelman Site of 1,4-Dioxane Contamination

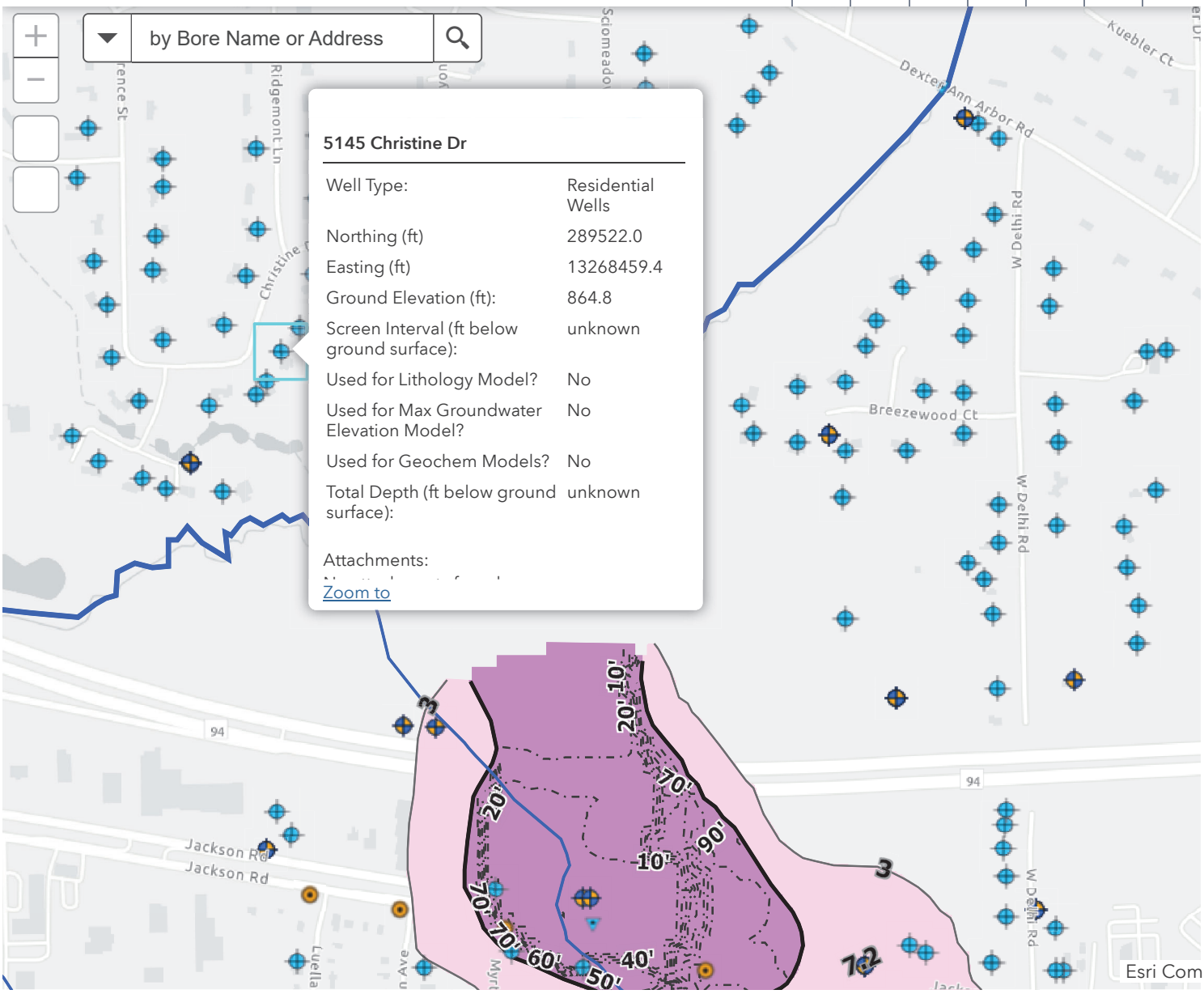




200m
600ft

-83.823 42.289 Degrees

Gelman Site of 1,4-Dioxane Contamination

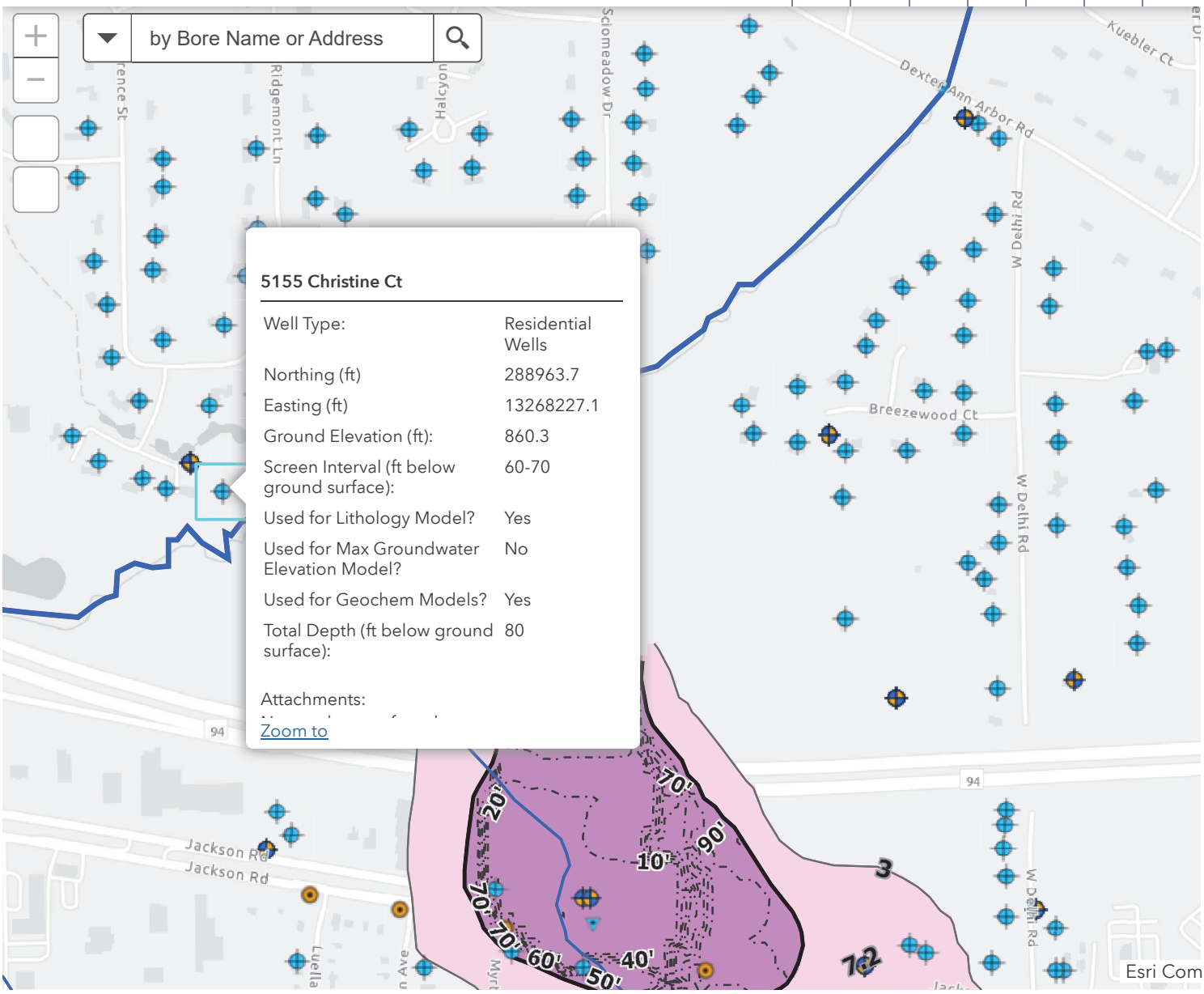




200m
600ft

-83.822 42.297 Degrees

Gelman Site of 1,4-Dioxane Contamination

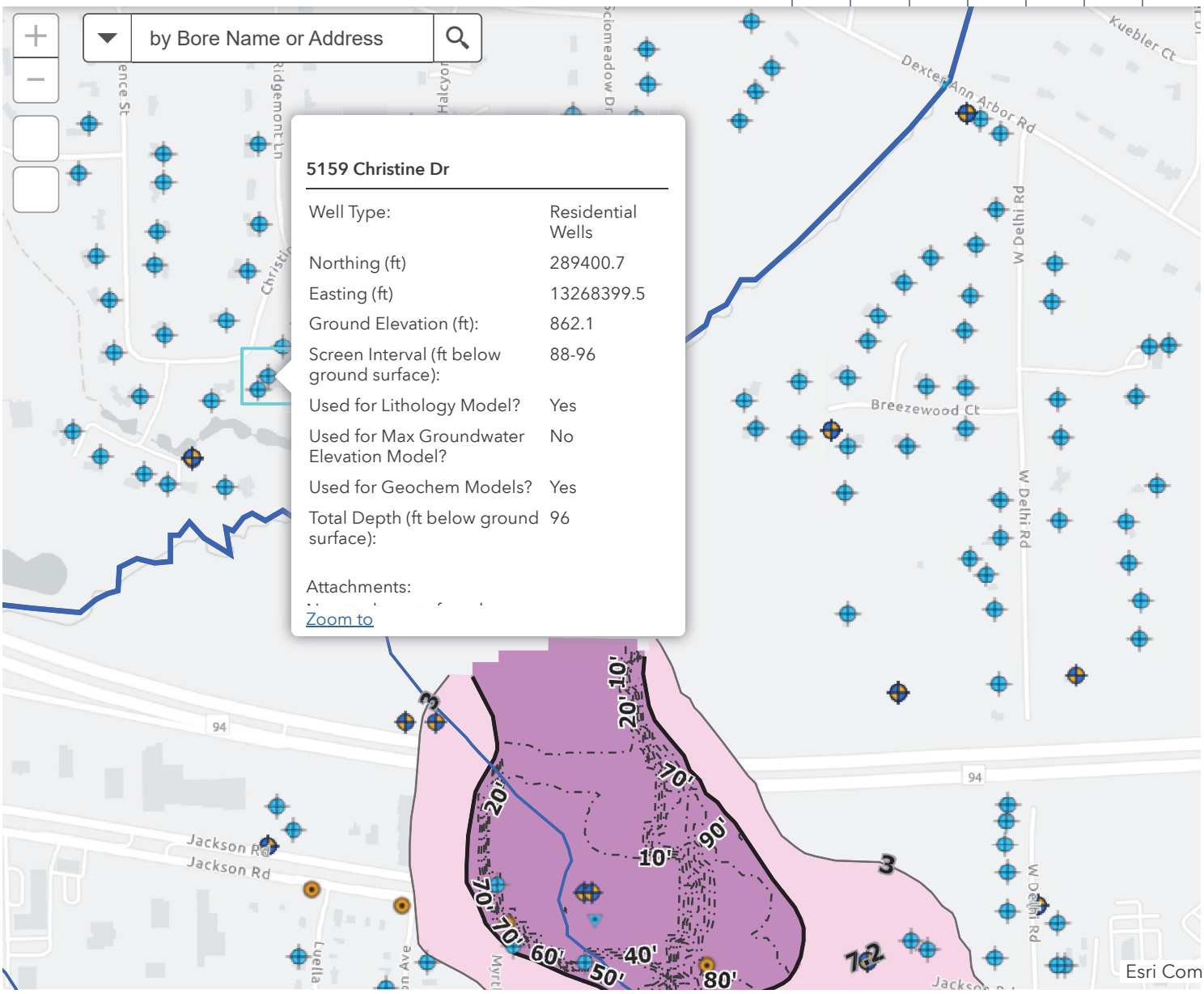




200m
600ft

-83.824 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination

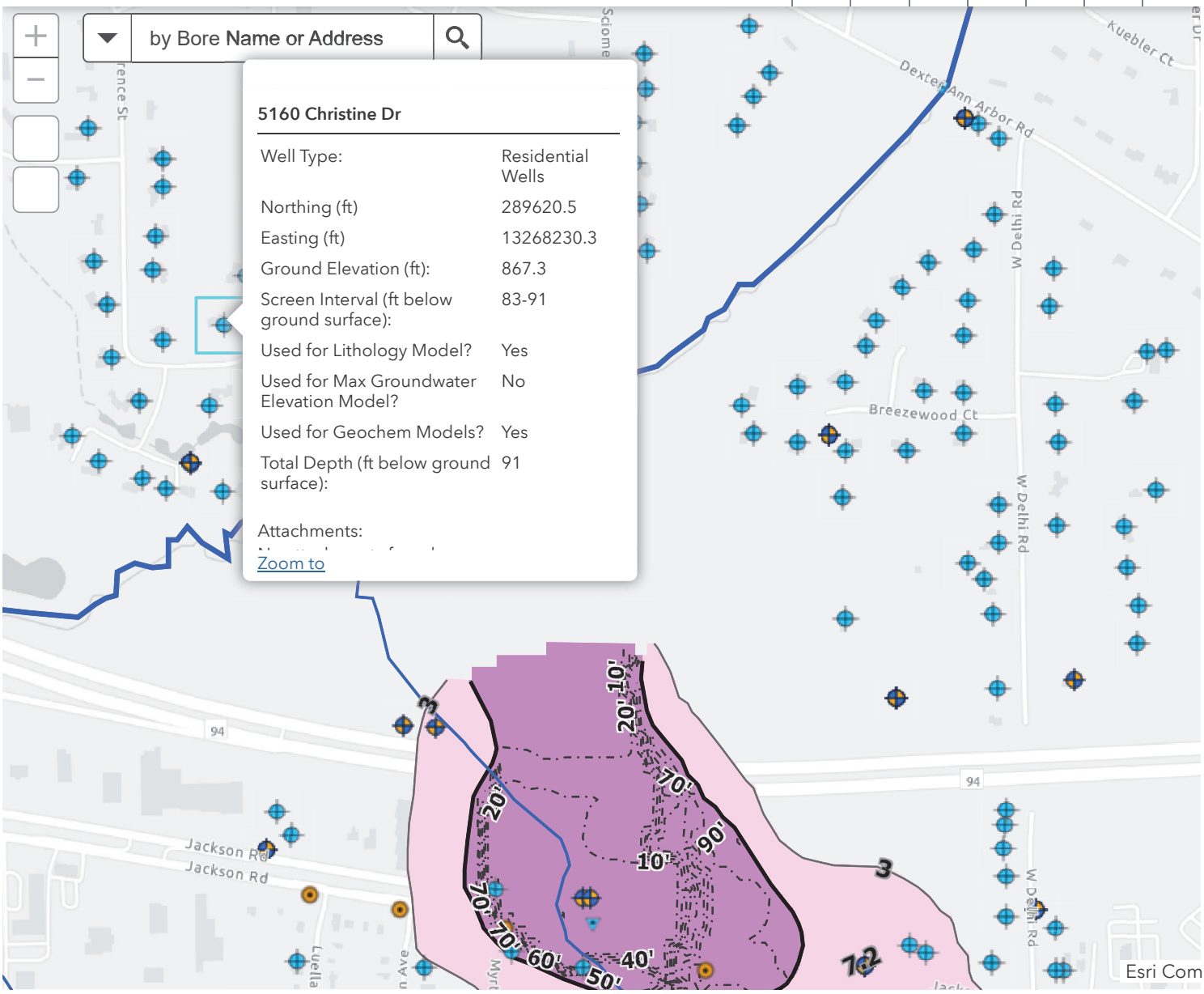




200m
600ft

-83.832 42.289 Degrees

Gelman Site of 1,4-Dioxane Contamination

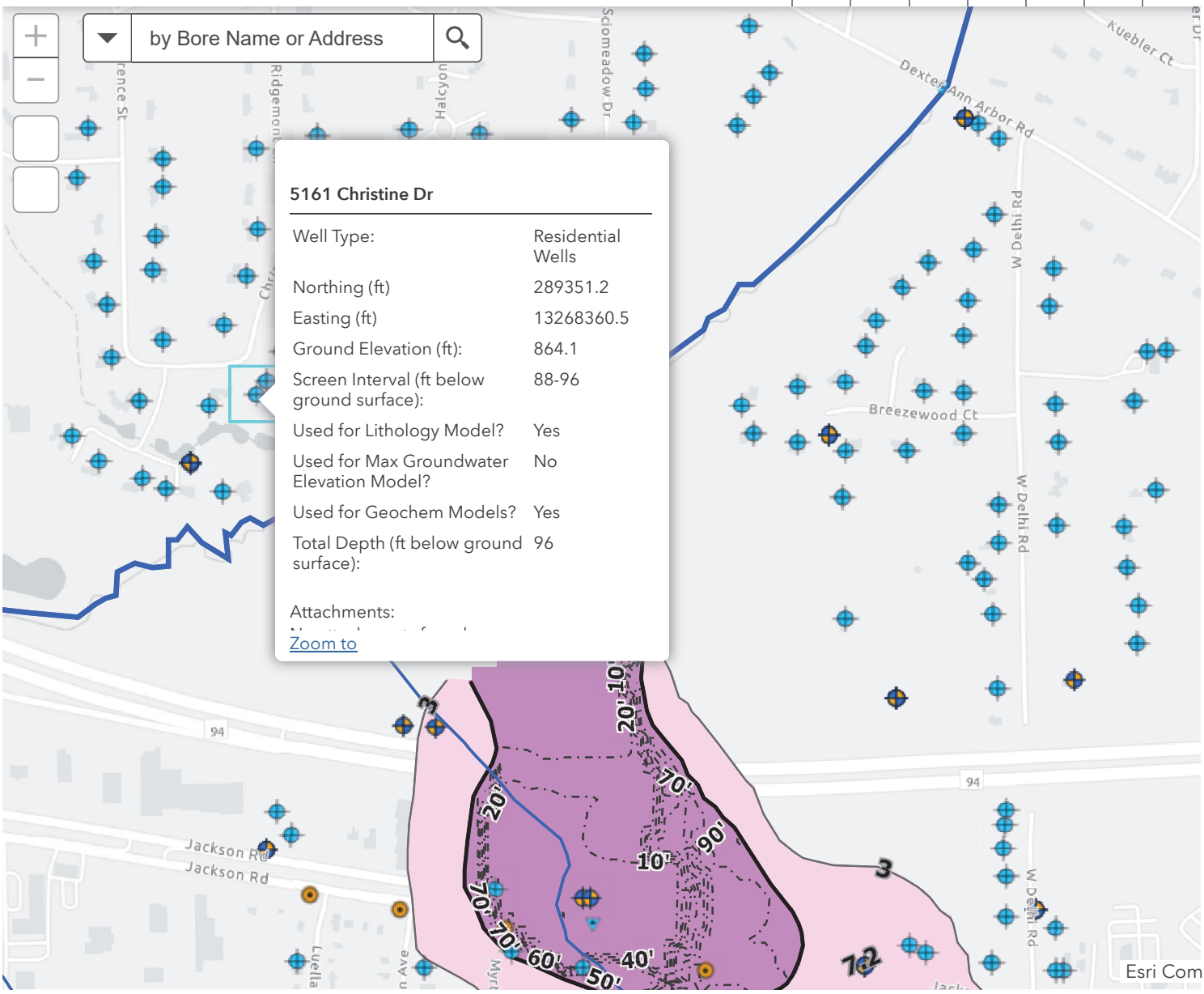




200m
600ft

-83.831 42.289 Degrees

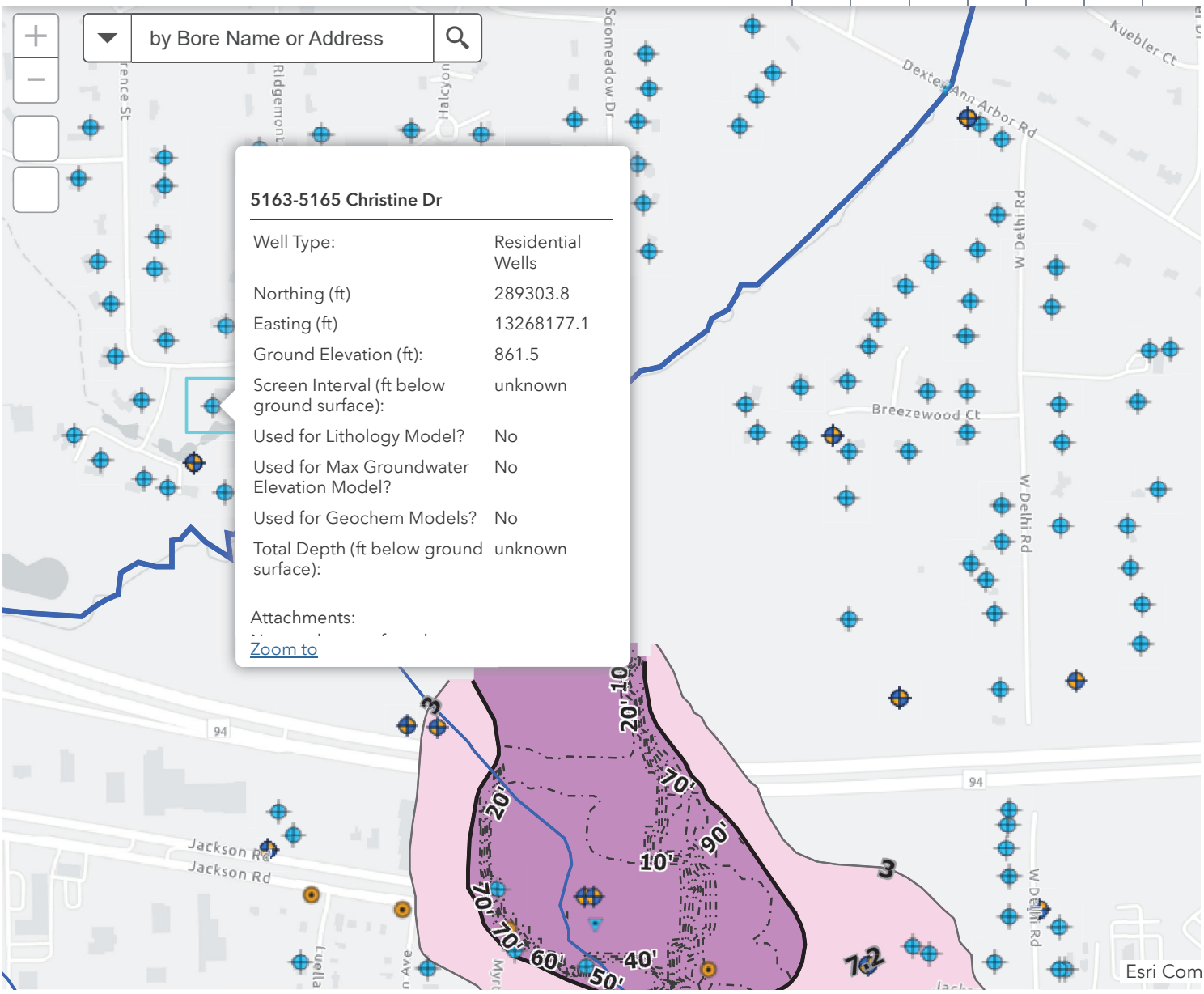
Gelman Site of 1,4-Dioxane Contamination





200m
600ft

-83.823 42.290 Degrees

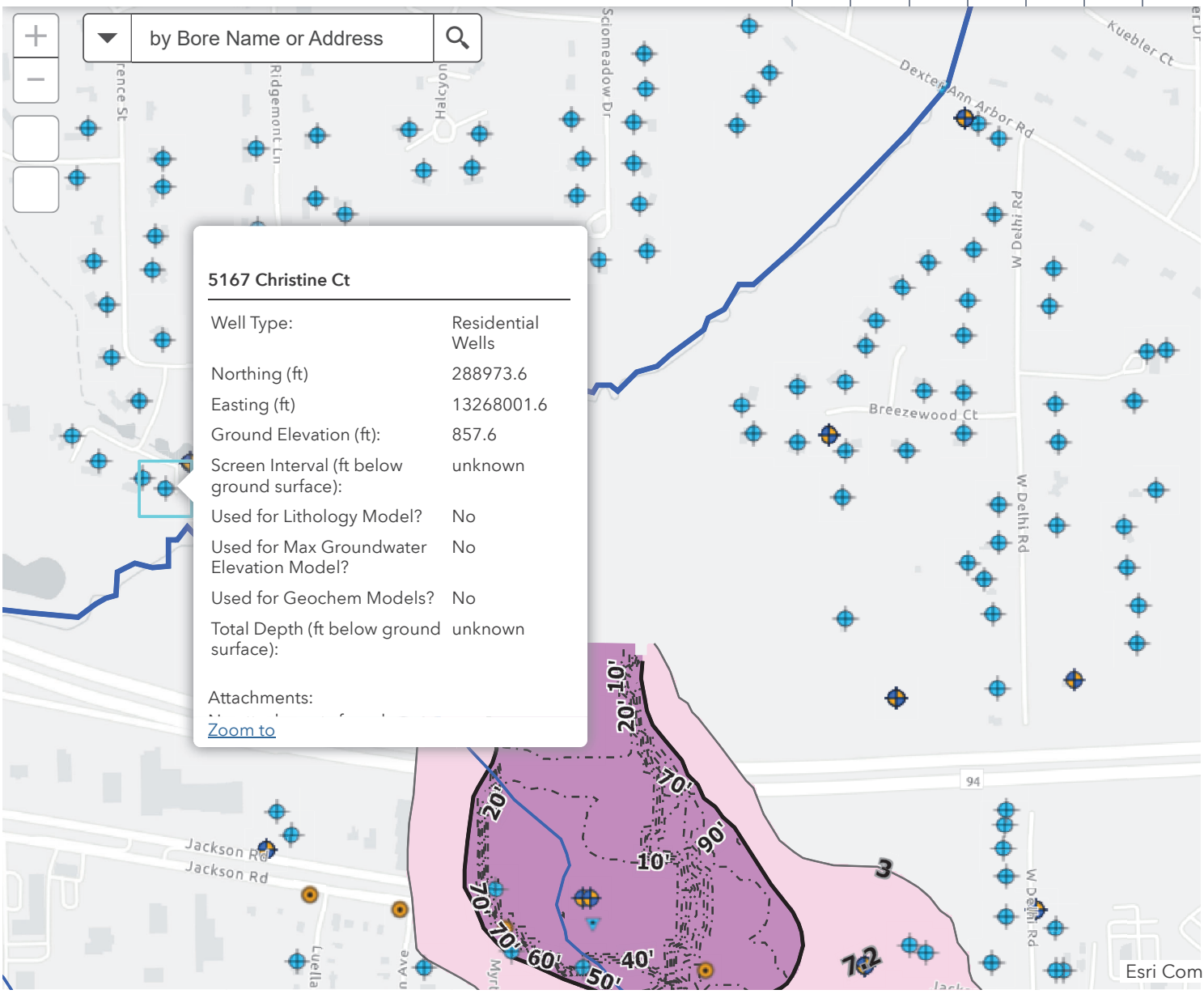




200m
600ft

-83.824 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination

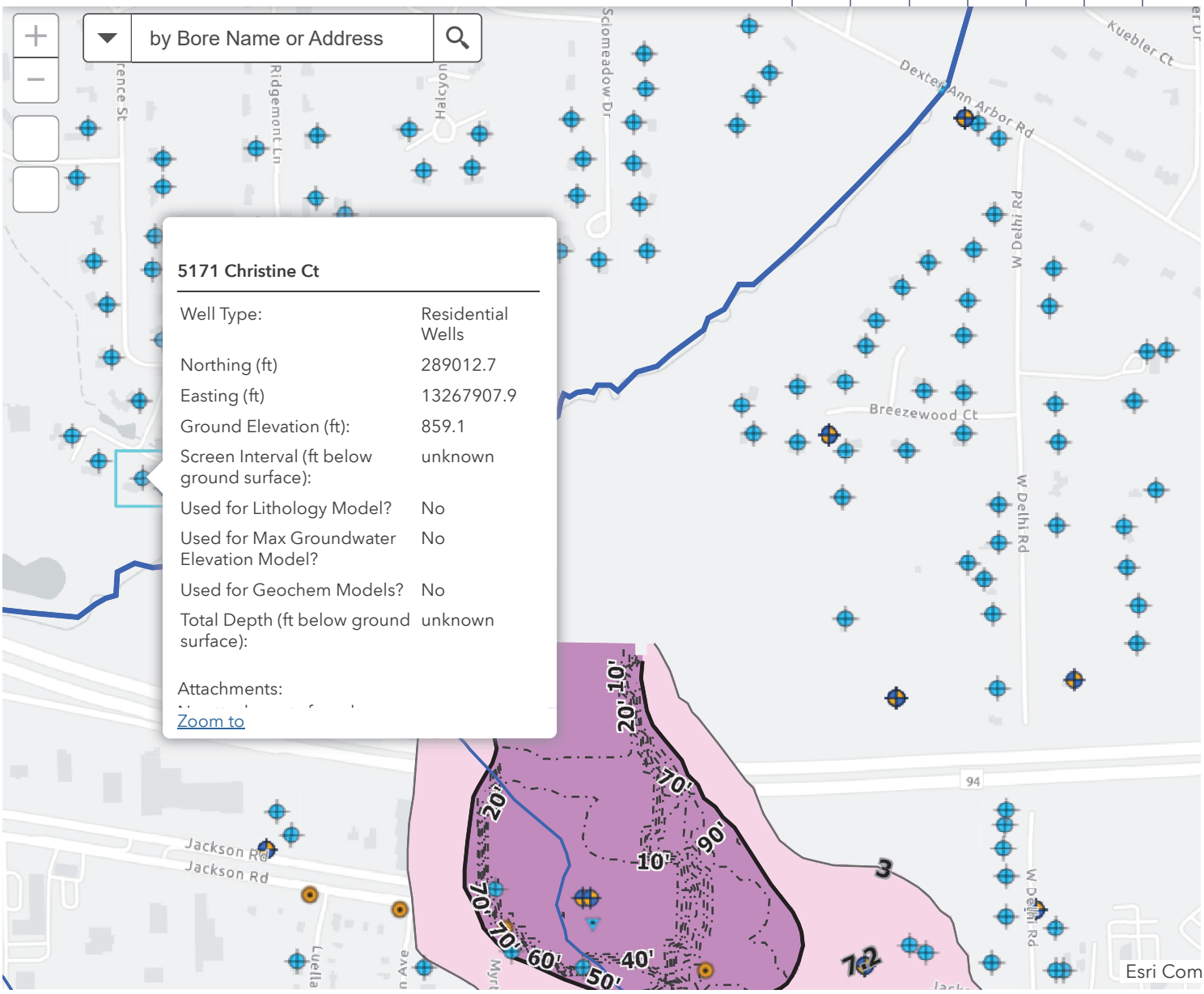




200m
600ft

-83.825 42.292 Degrees

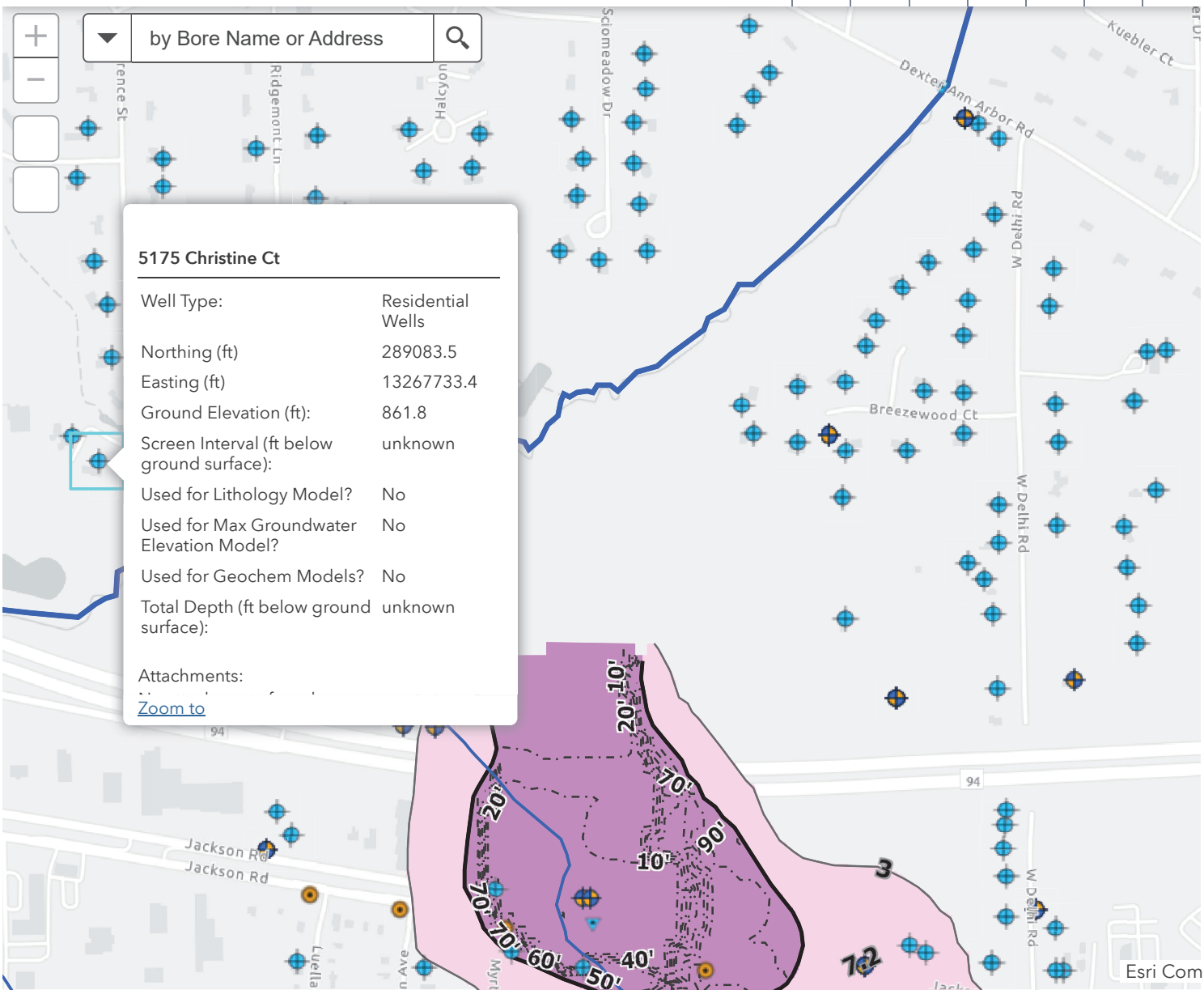
Gelman Site of 1,4-Dioxane Contamination





200m
600ft

-83.825 42.292 Degrees

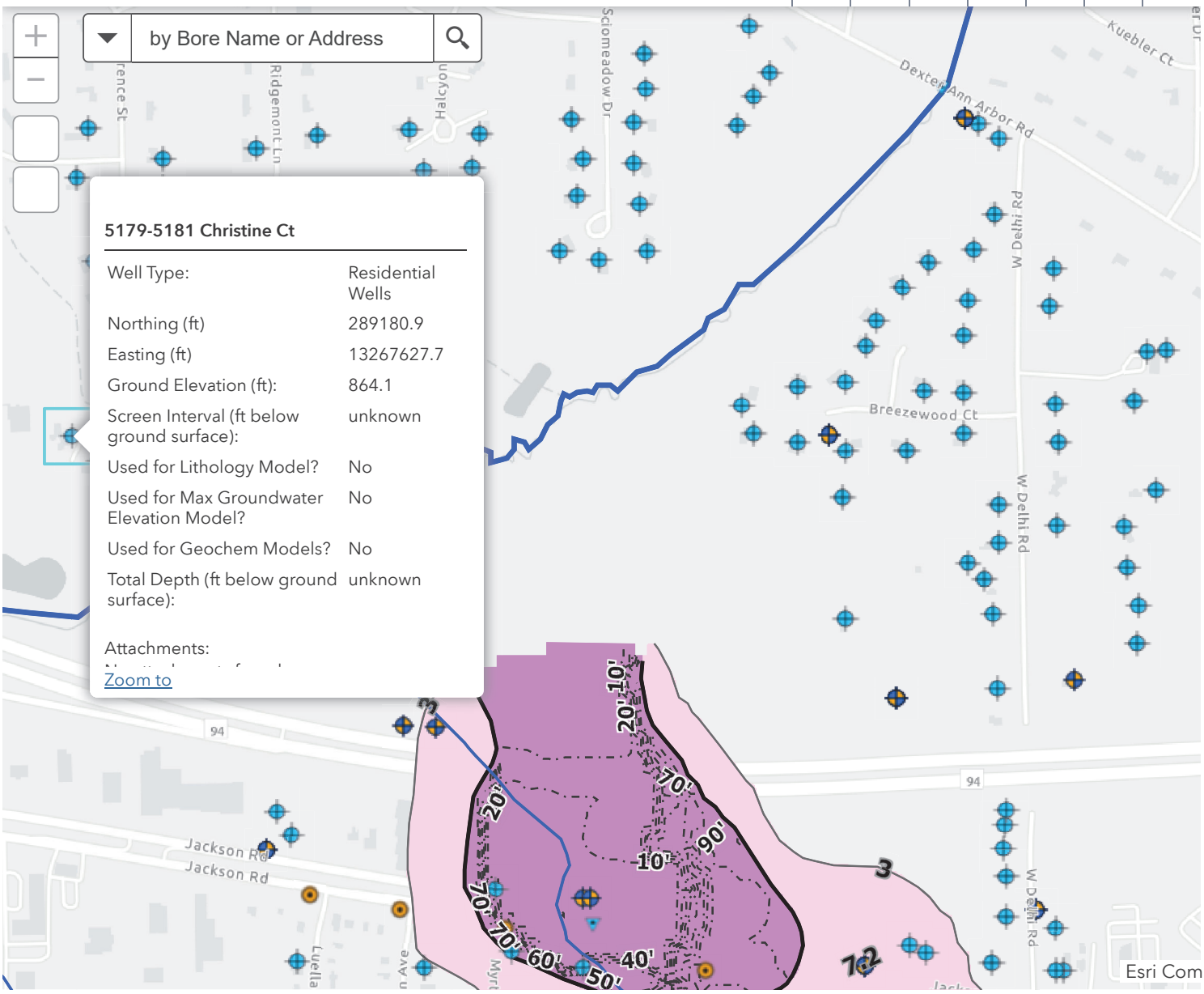




200m
600ft

-83.825 42.292 Degrees

Gelman Site of 1,4-Dioxane Contamination

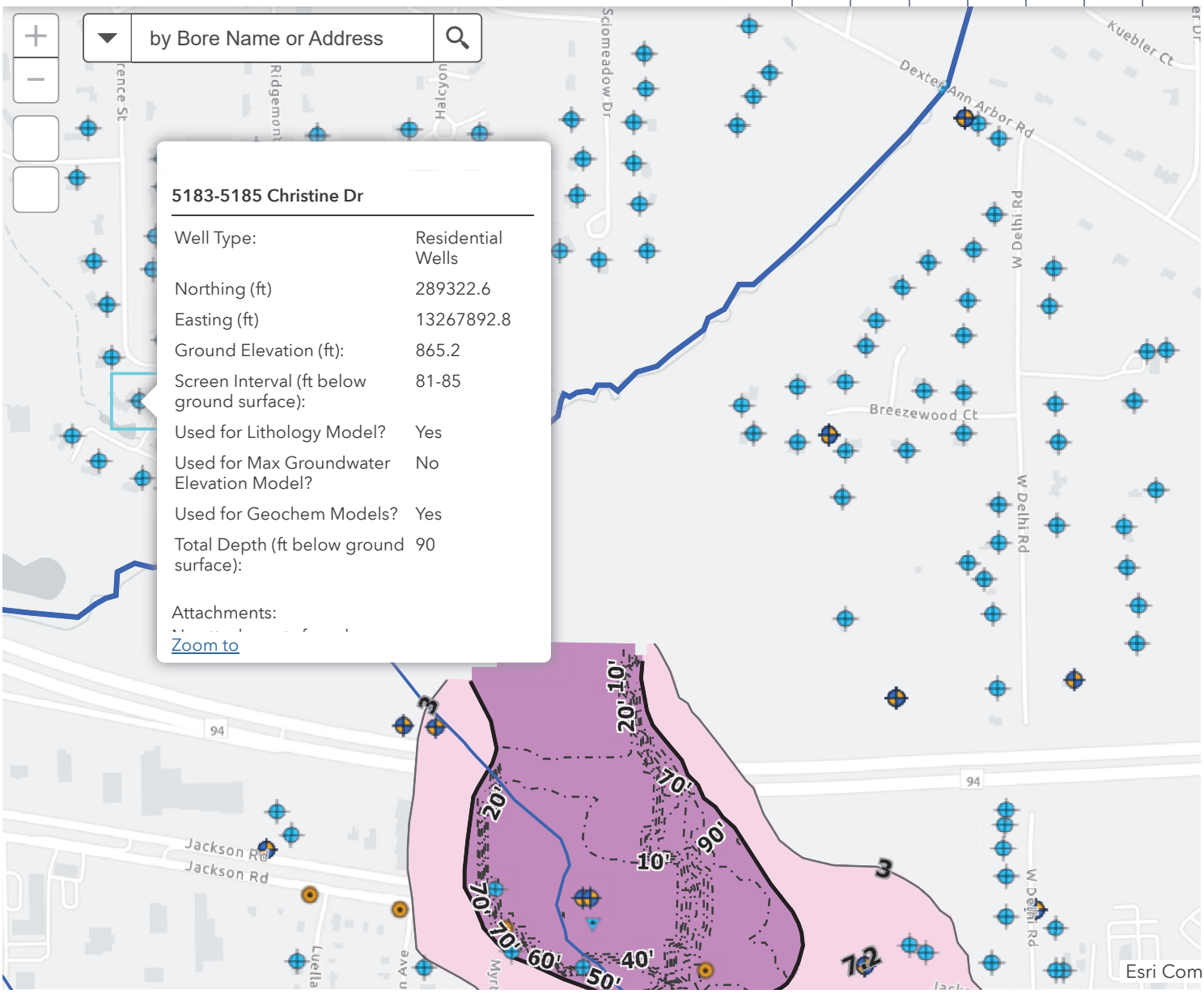




200m
600ft

-83.823 42.292 Degrees

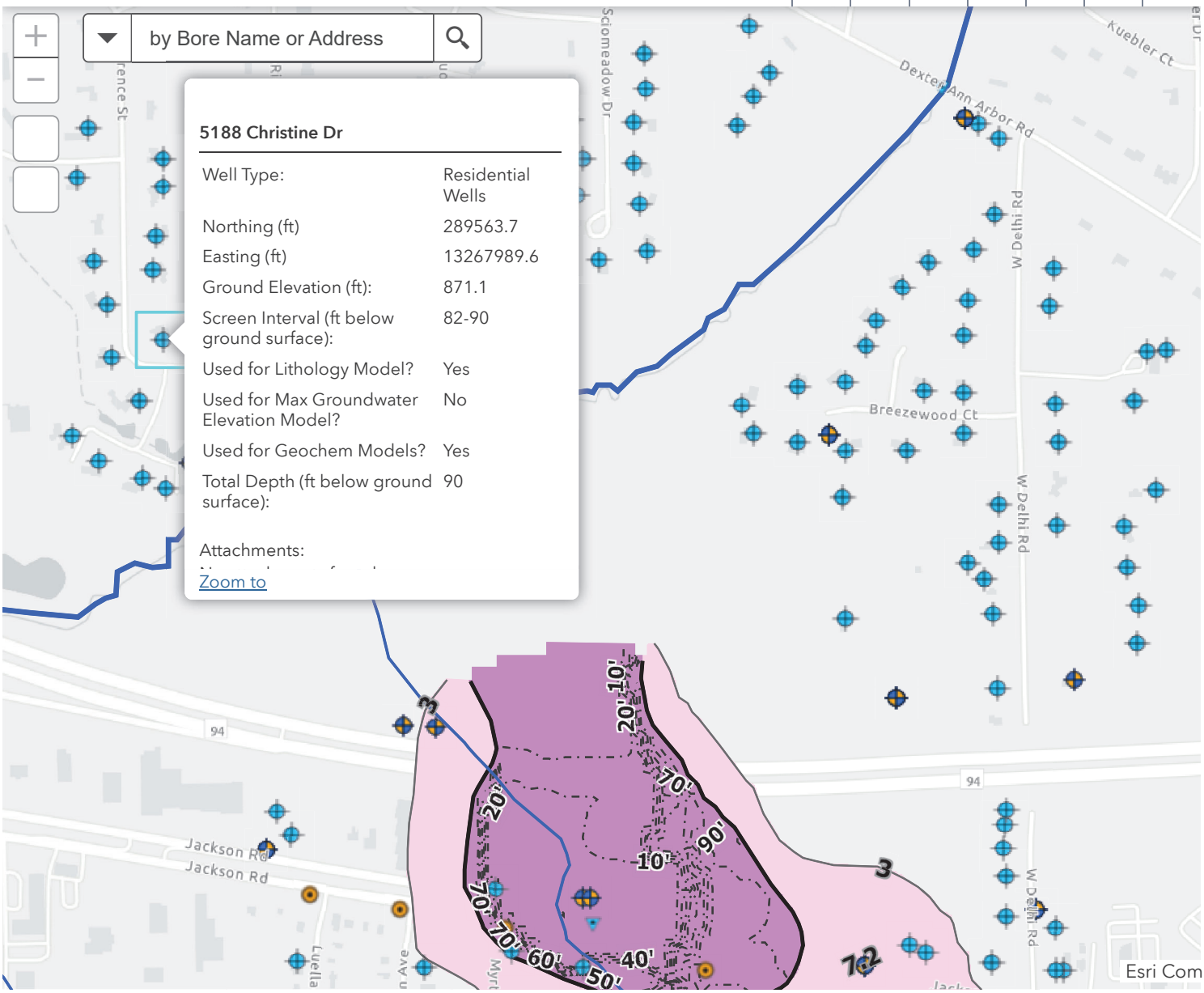
Gelman Site of 1,4-Dioxane Contamination





200m
600ft

-83.825 42.292 Degrees

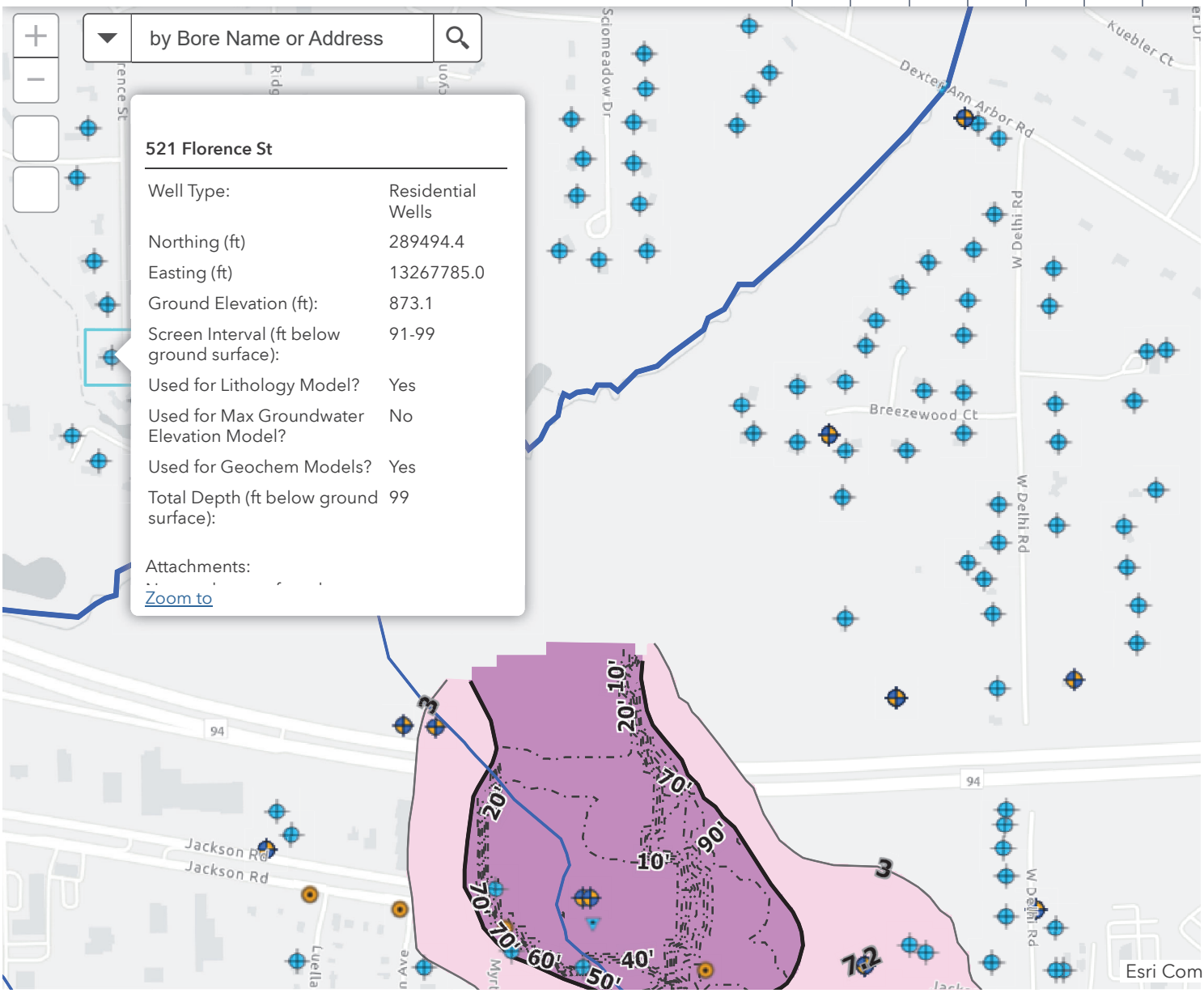




200m
600ft

-83.832 42.289 Degrees

Gelman Site of 1,4-Dioxane Contamination

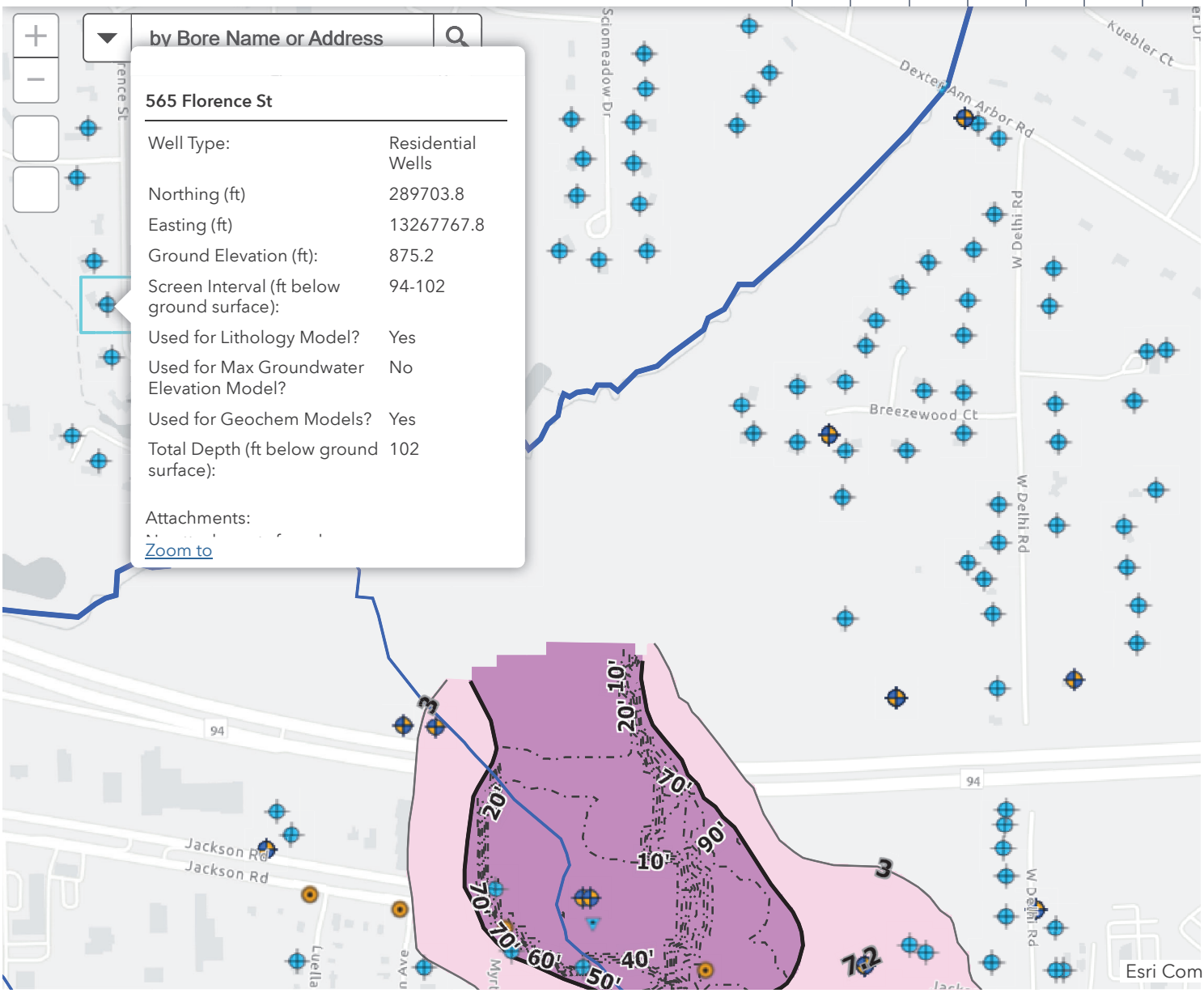




200m
600ft

-83.815 42.292 Degrees

Gelman Site of 1,4-Dioxane Contamination

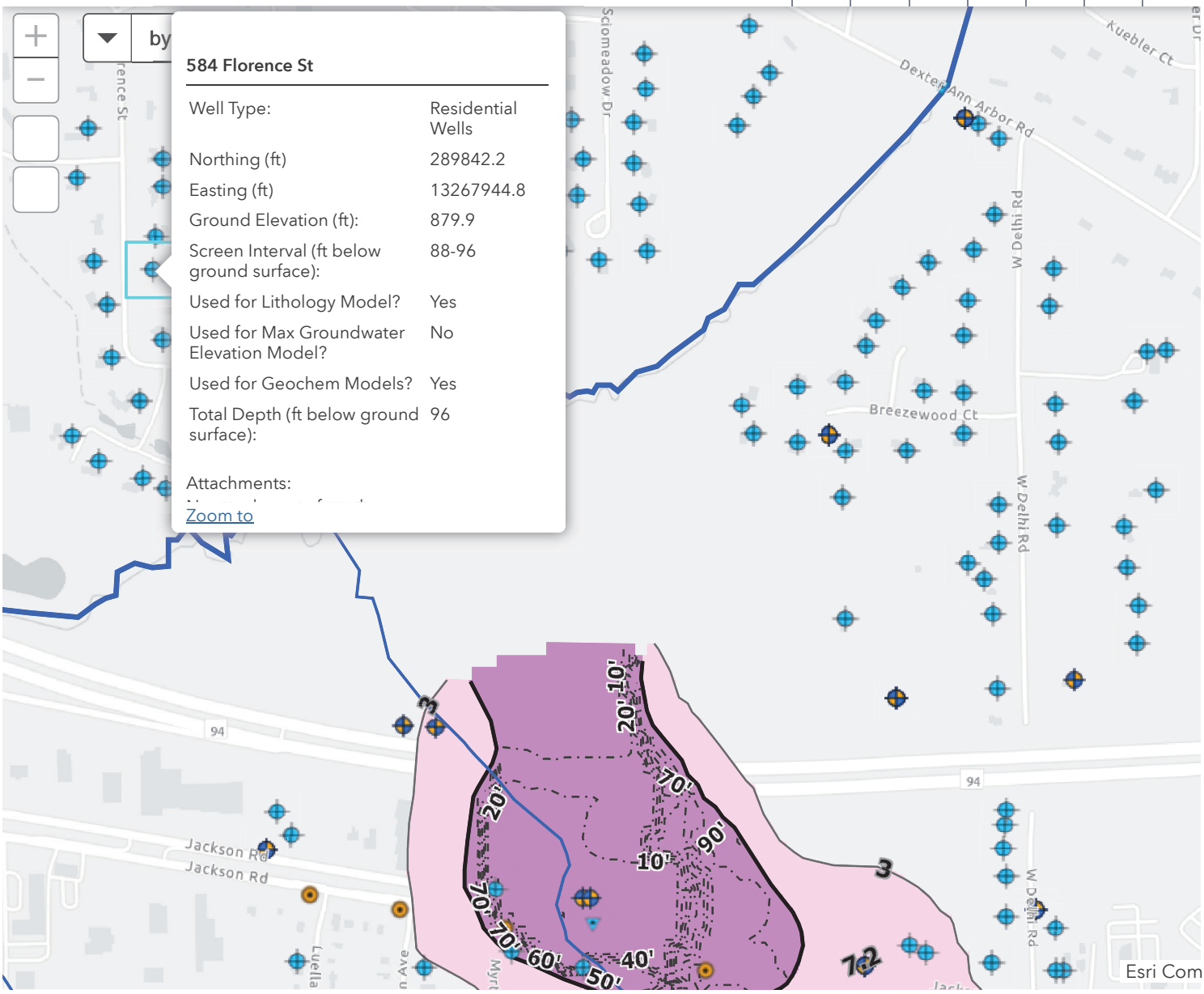




200m
600ft

-83.825 42.293 Degrees

Gelman Site of 1,4-Dioxane Contamination

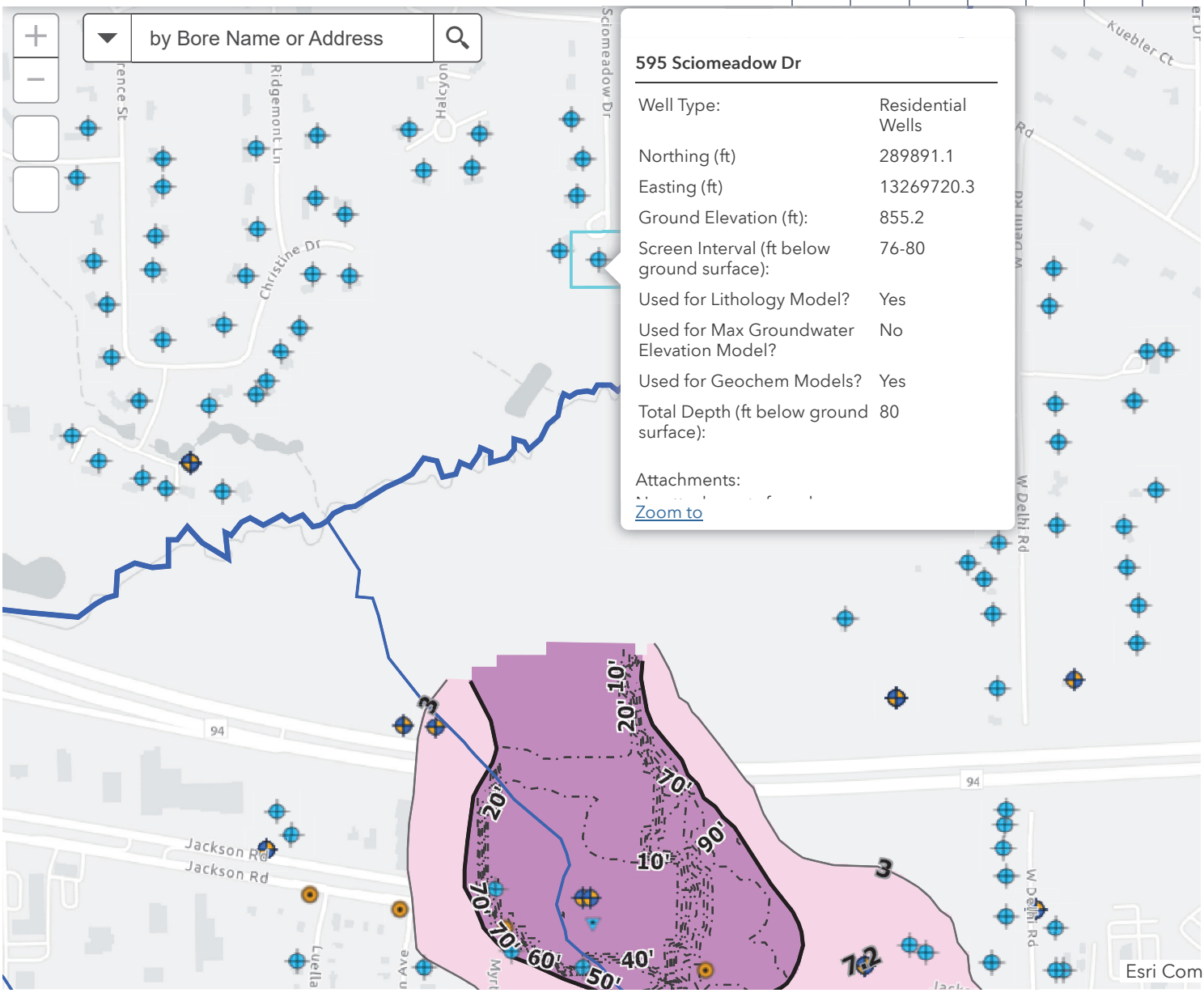




200m
600ft

-83.824 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination

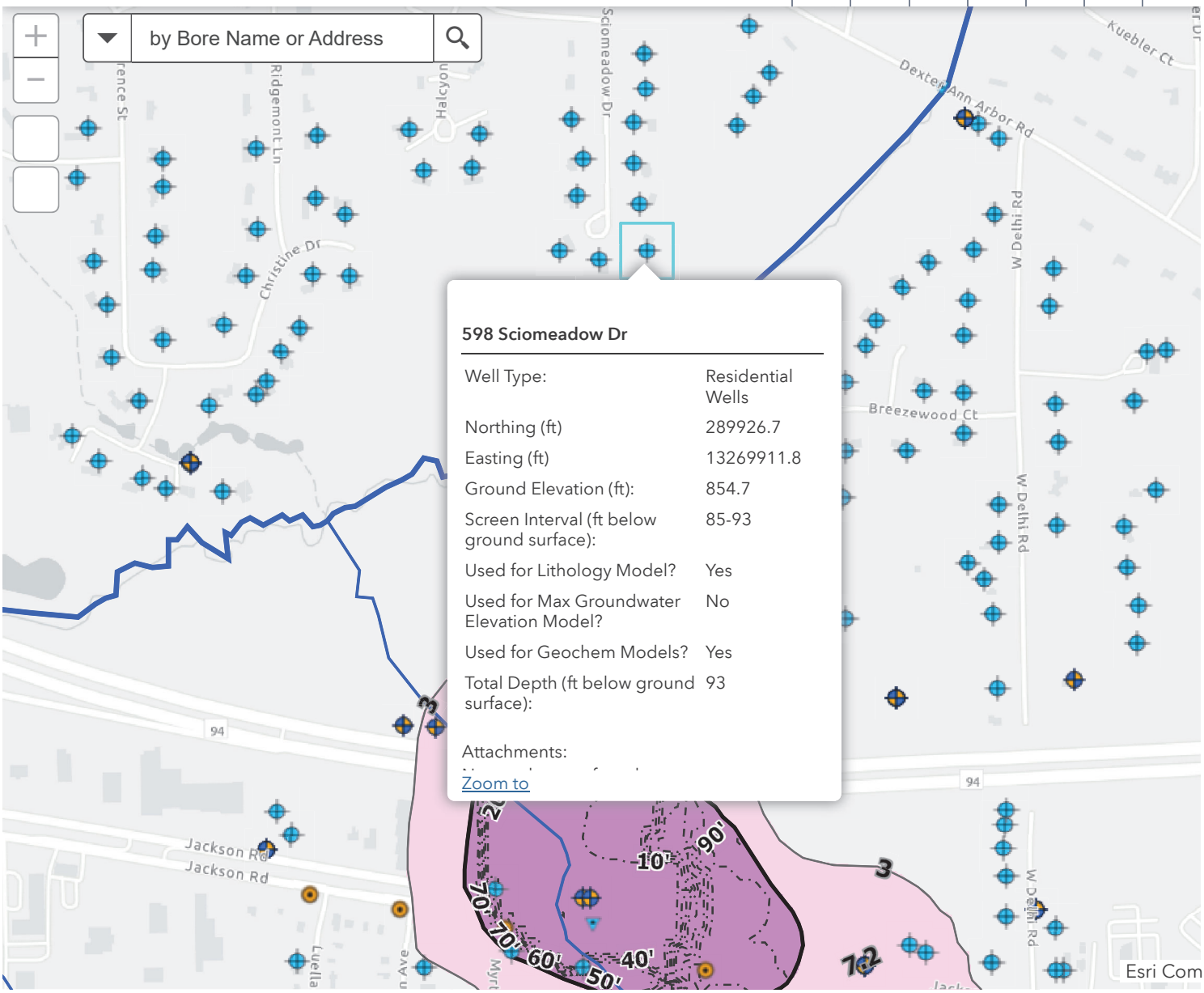




200m
600ft

-83.823 42.290 Degrees

Gelman Site of 1,4-Dioxane Contamination

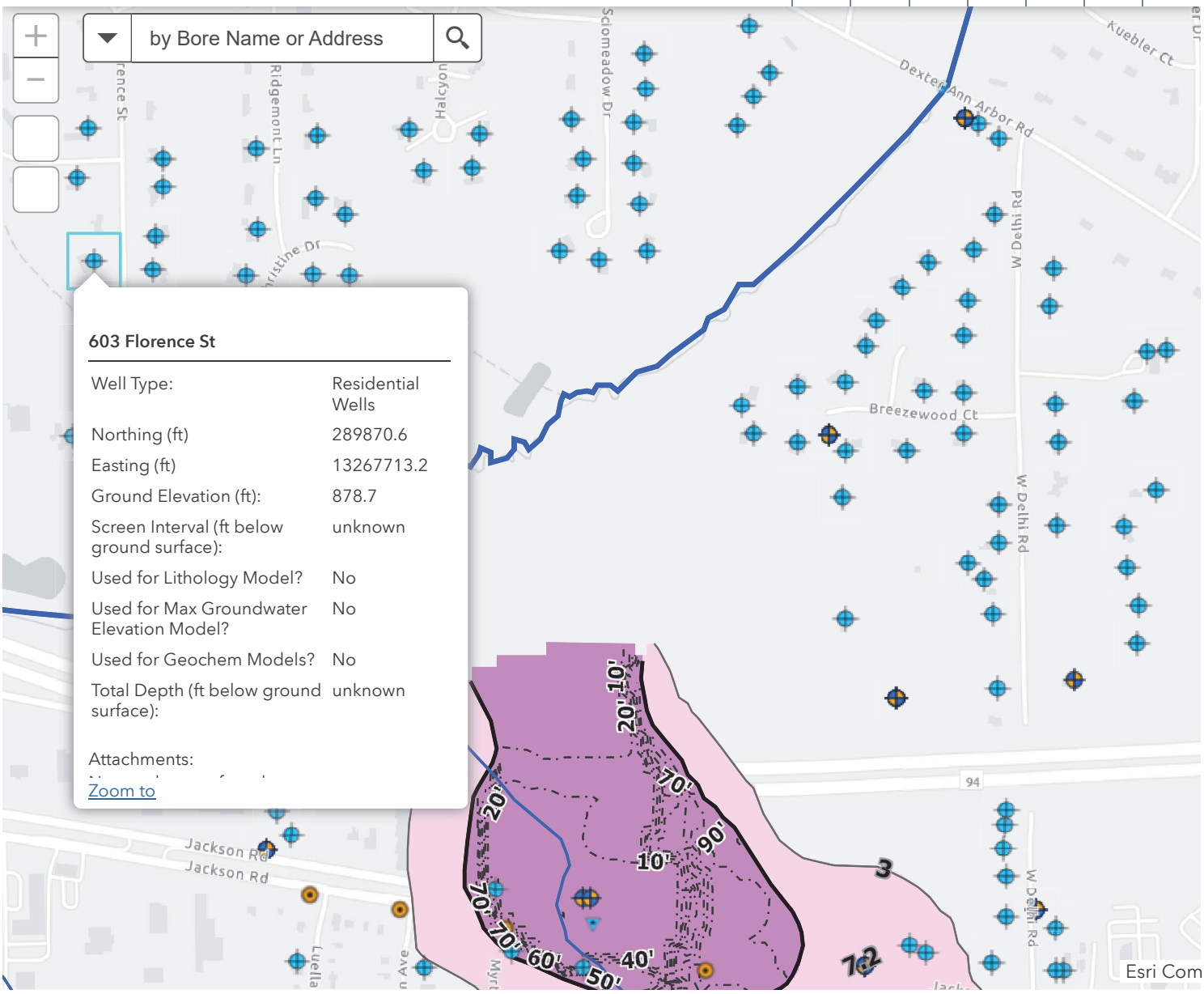




200m
600ft

-83.830 42.290 Degrees

Gelman Site of 1,4-Dioxane Contamination

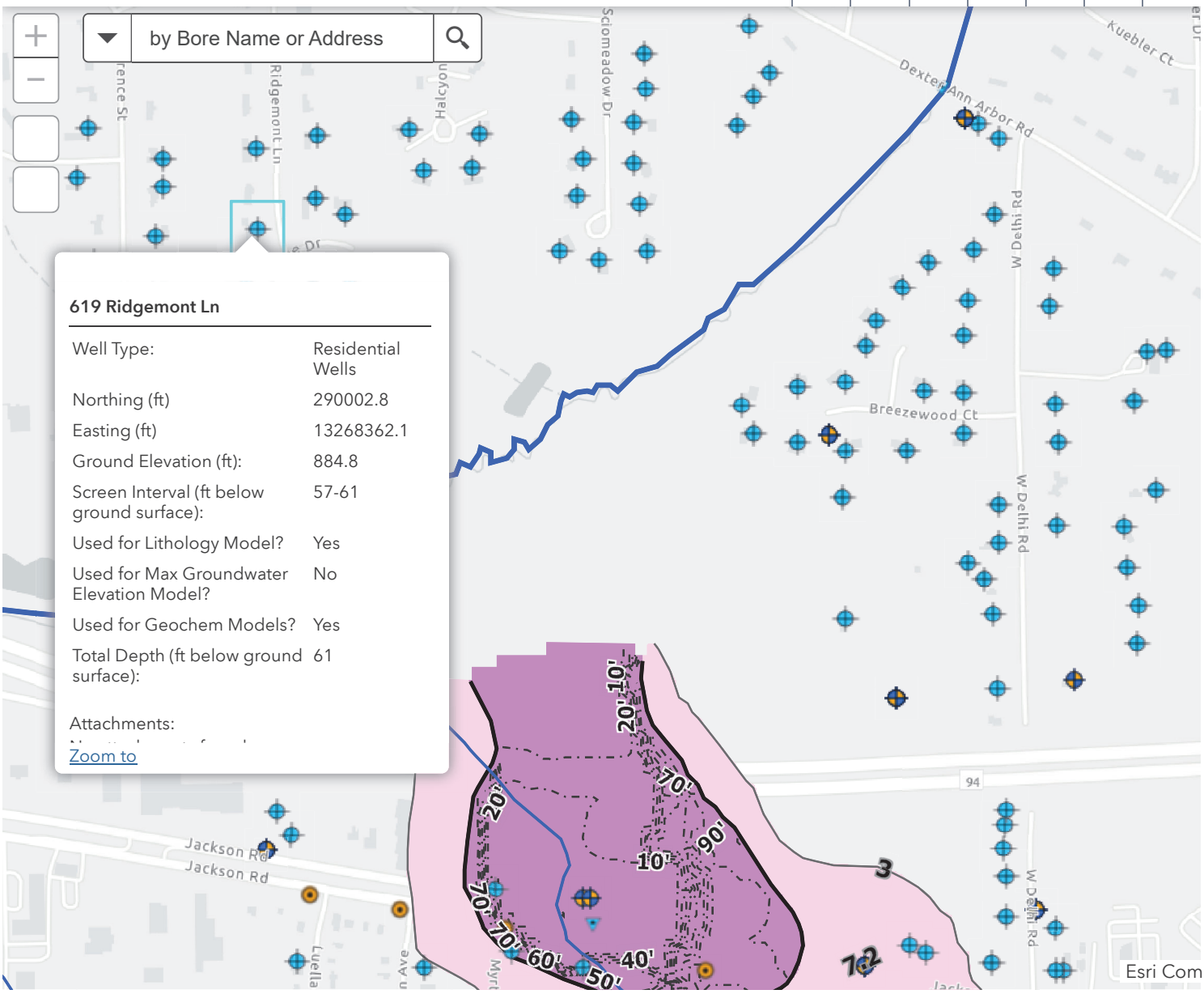




200m
600ft

-83.824 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination



619 Ridgemont Ln

Well Type:	Residential Wells
Northing (ft)	290002.8
Easting (ft)	13268362.1
Ground Elevation (ft):	884.8
Screen Interval (ft below ground surface):	57-61
Used for Lithology Model?	Yes
Used for Max Groundwater Elevation Model?	No
Used for Geochem Models?	Yes
Total Depth (ft below ground surface):	61

Attachments:

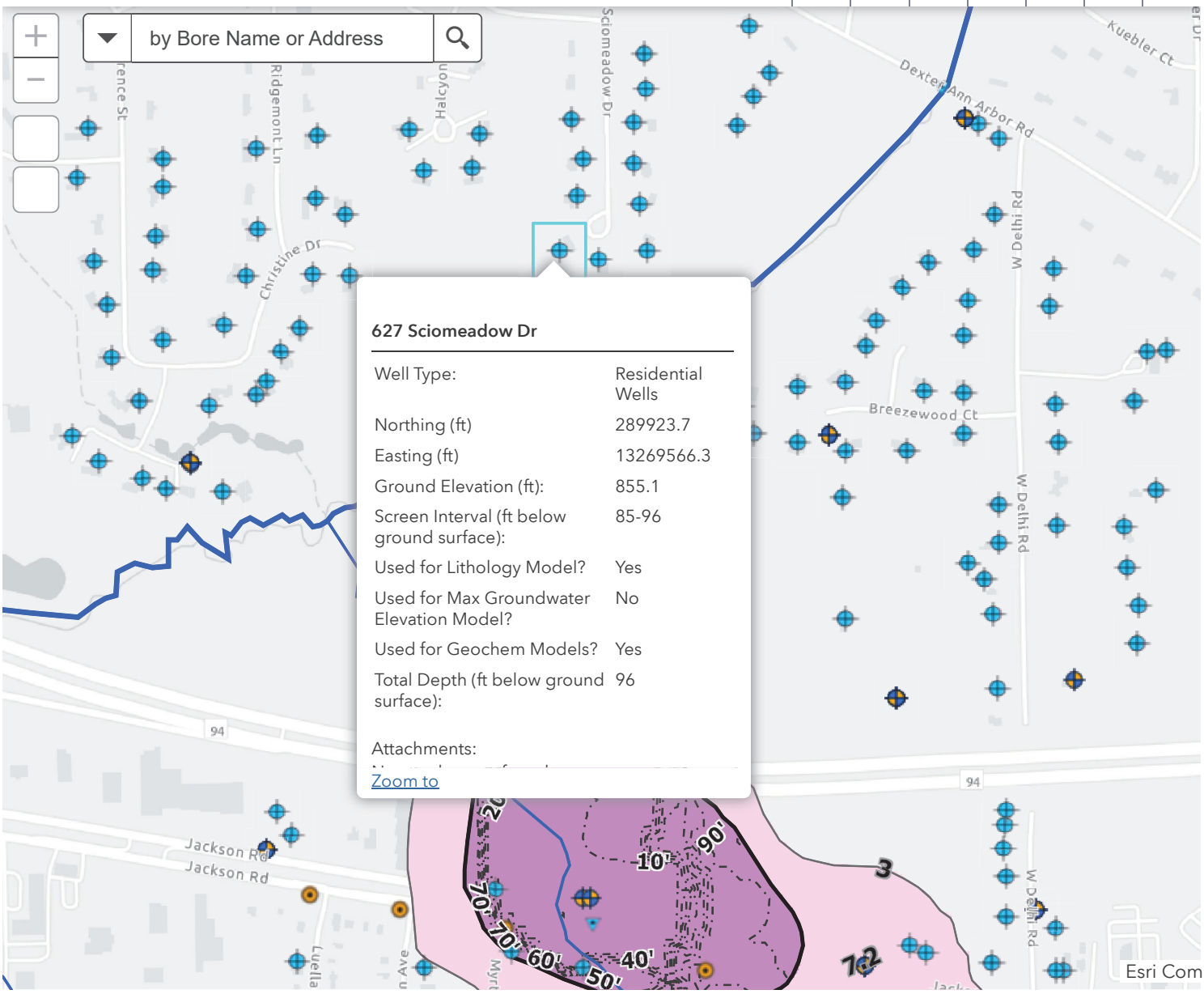
Zoom to



200m
600ft

-83.825 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination

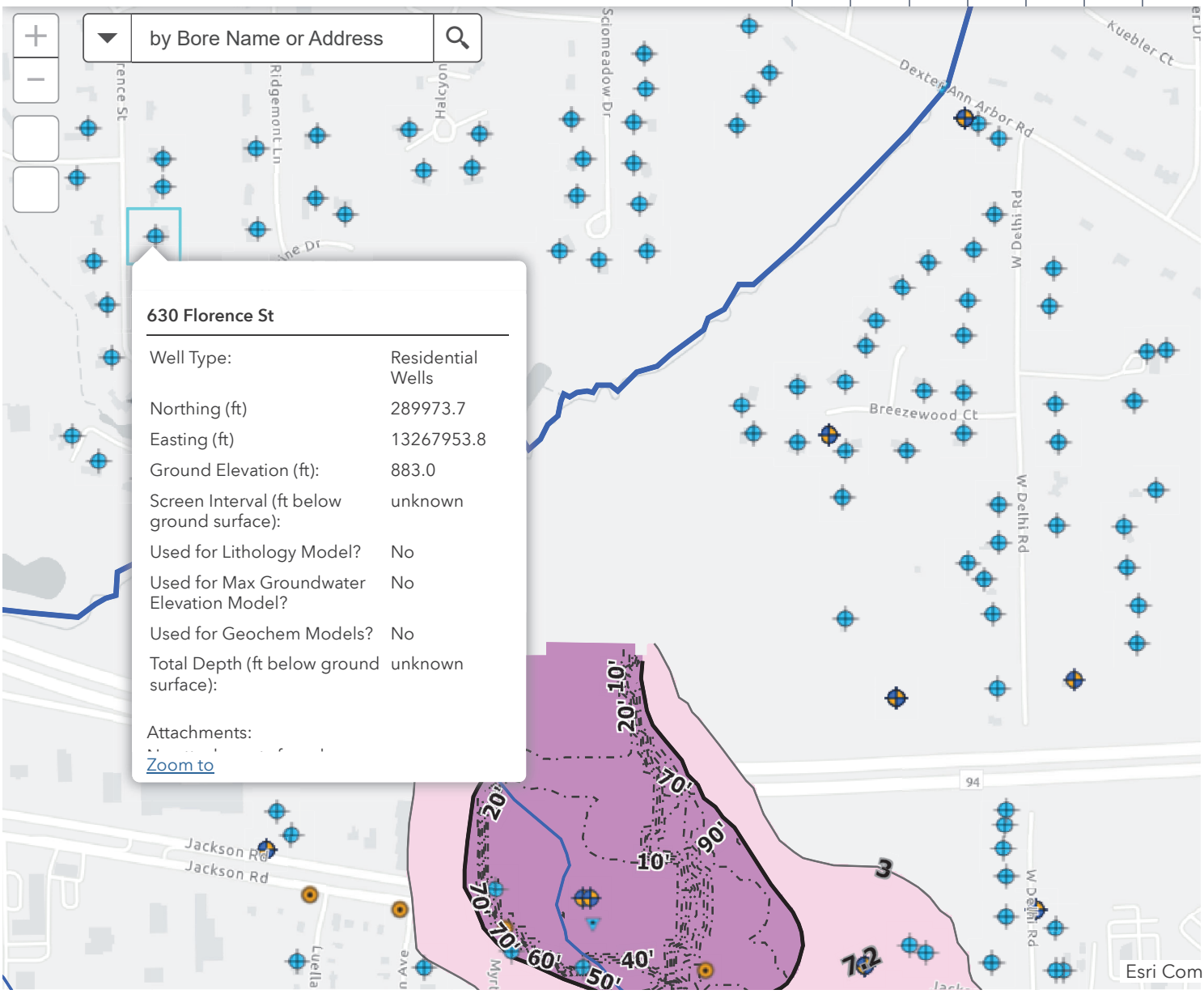




200m
600ft

-83.822 42.289 Degrees

Gelman Site of 1,4-Dioxane Contamination

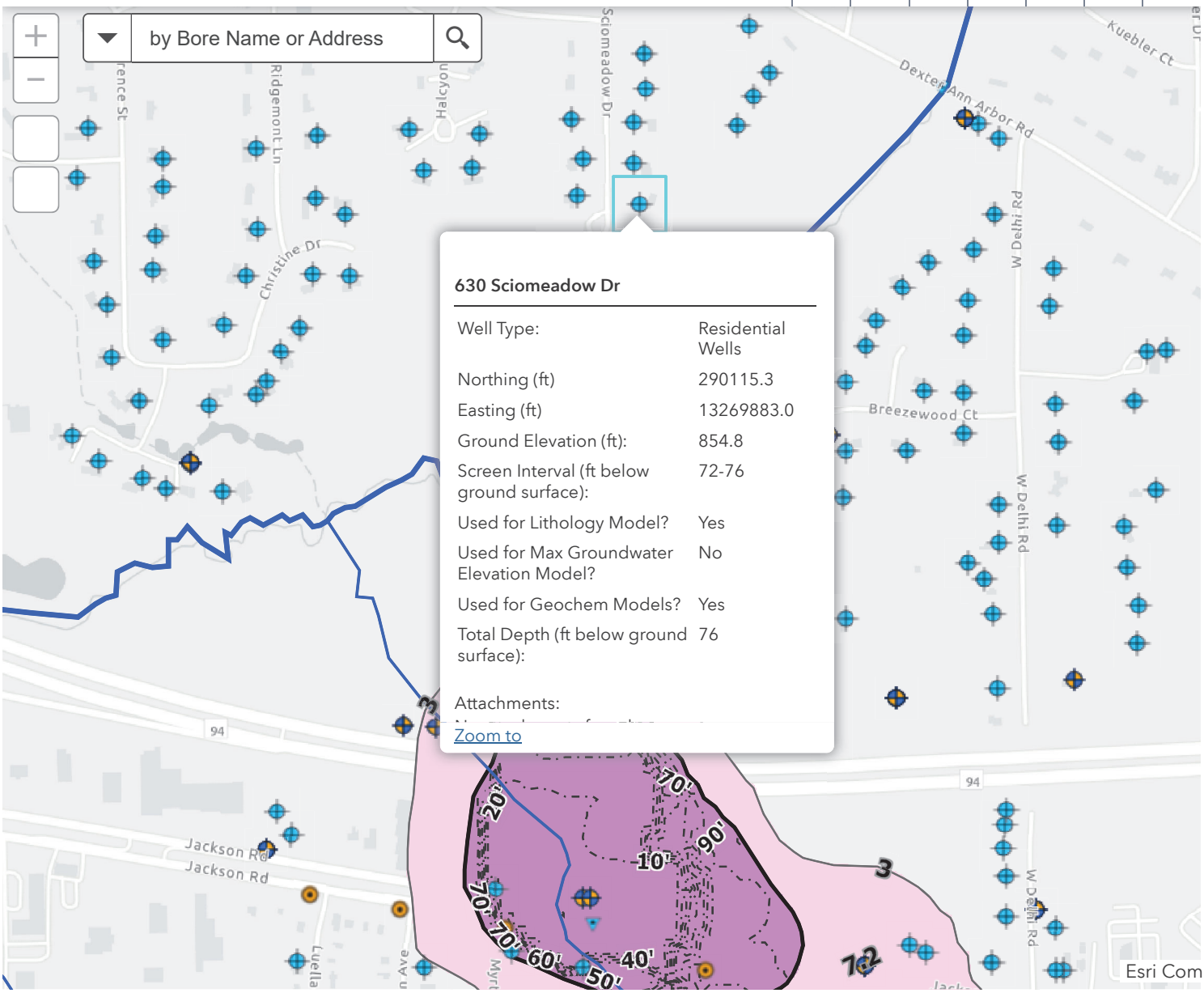




200m
600ft

-83.824 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination

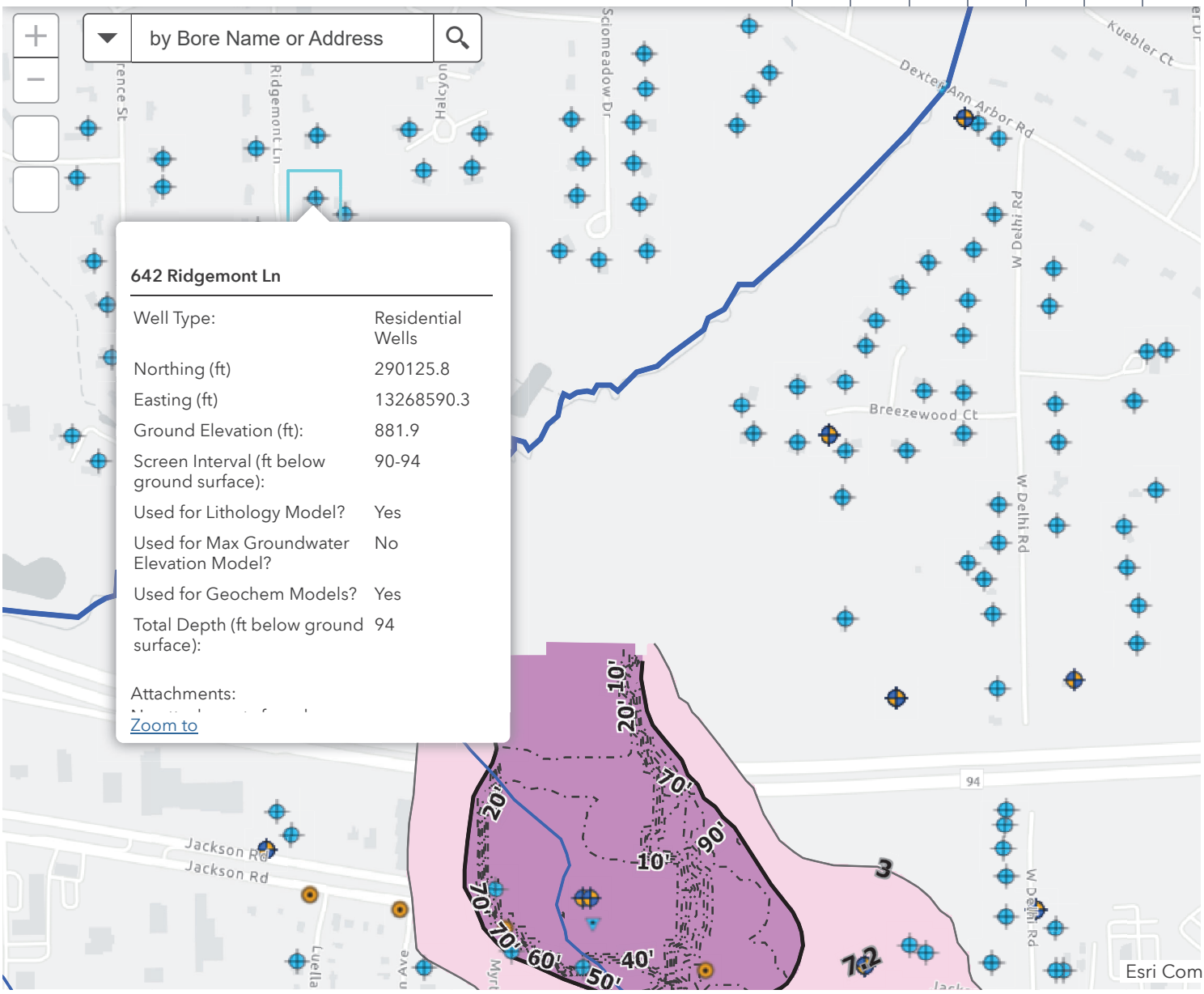




200m
600ft

-83.831 42.290 Degrees

Gelman Site of 1,4-Dioxane Contamination

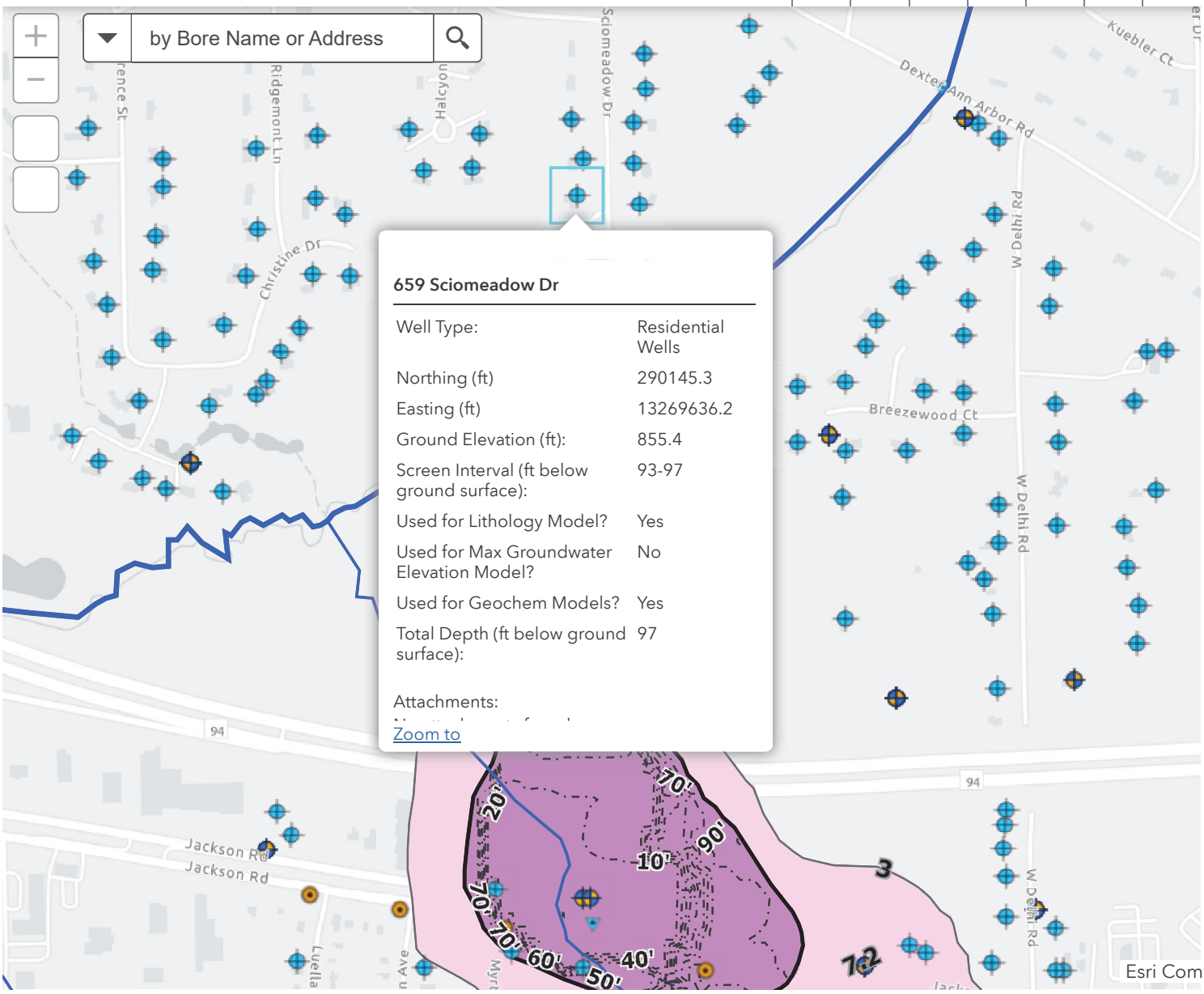




200m
600ft

-83.824 42.292 Degrees

Gelman Site of 1,4-Dioxane Contamination

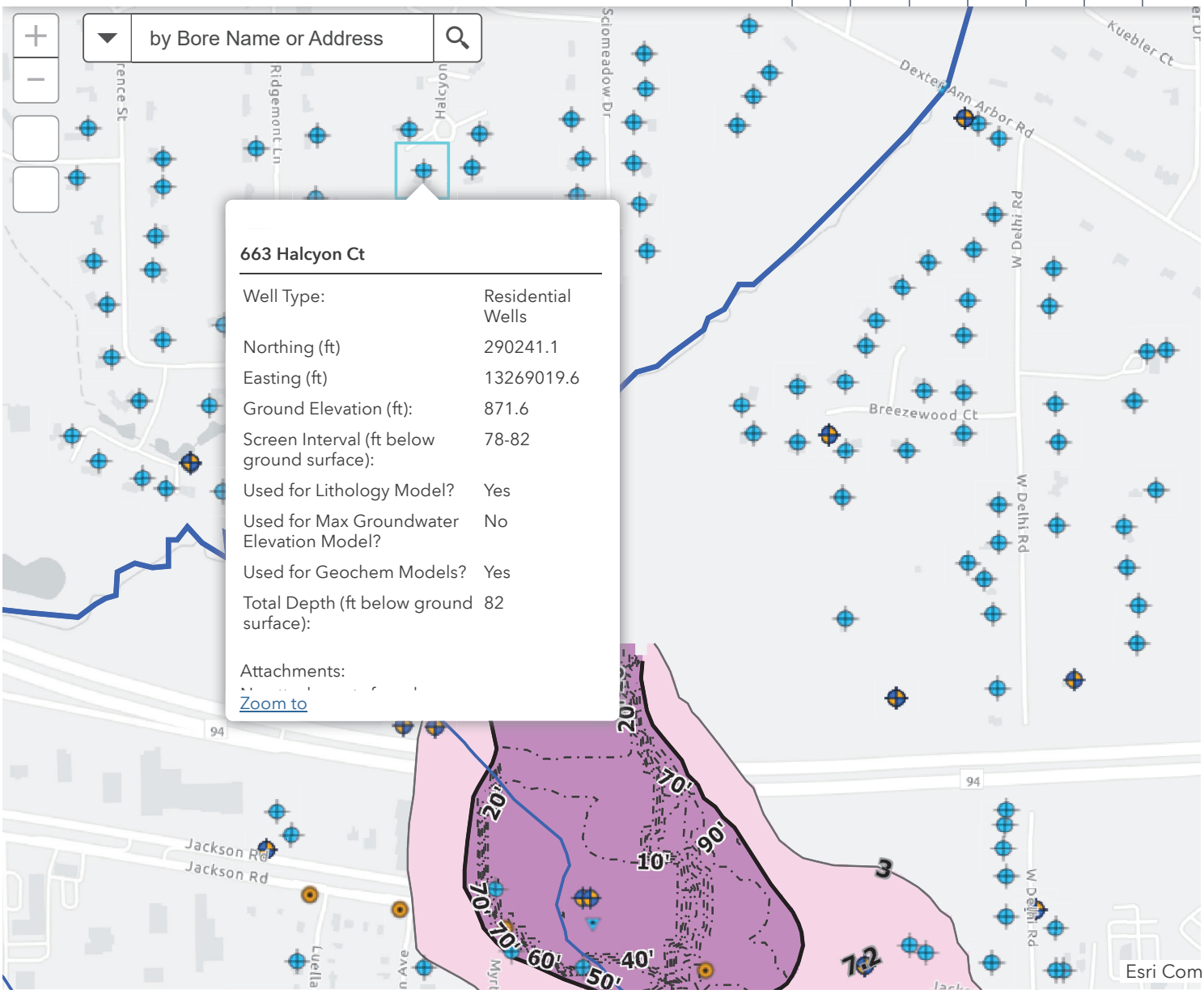




200m
600ft

-83.830 42.290 Degrees

Gelman Site of 1,4-Dioxane Contamination

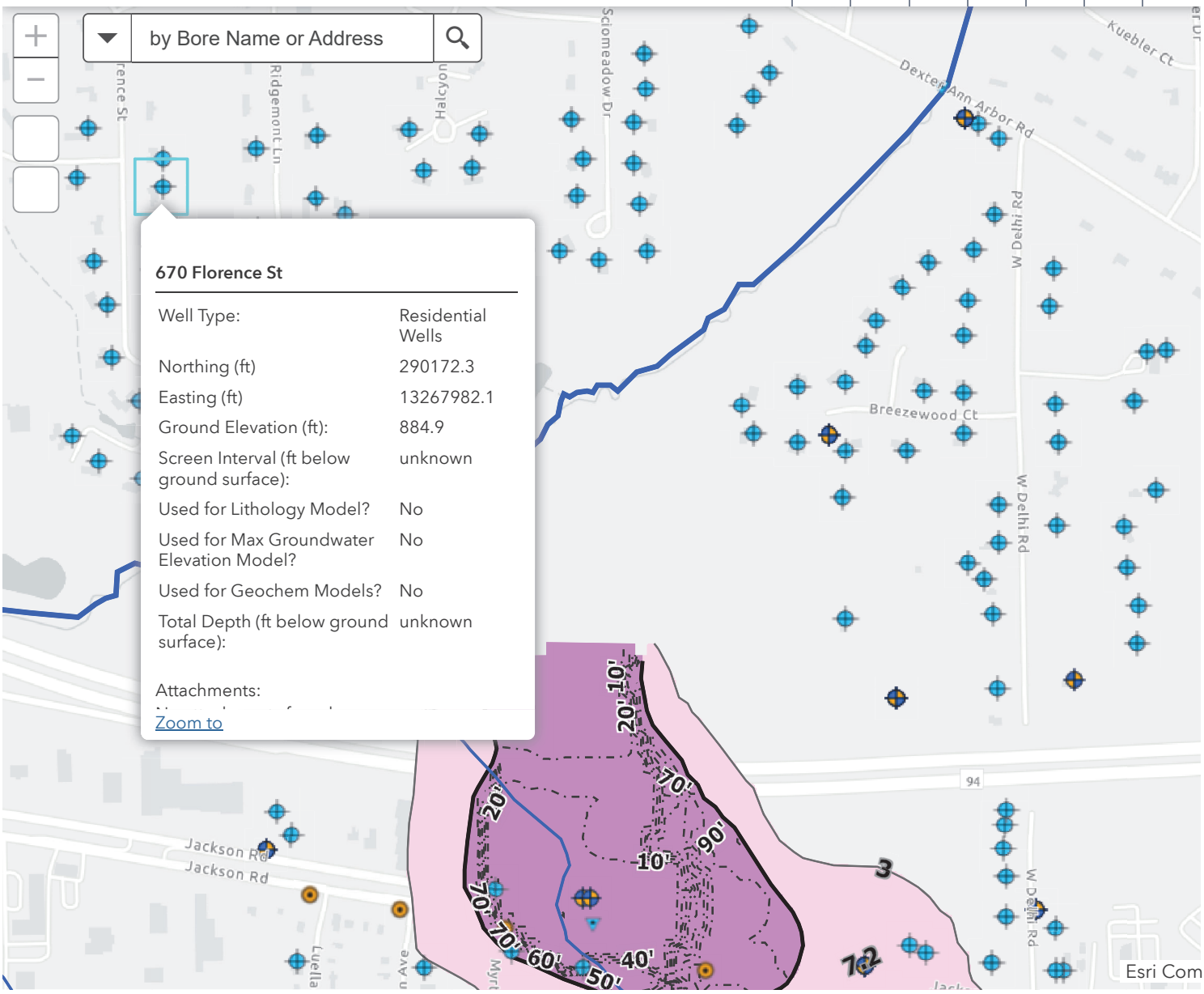




200m
600ft

-83.824 42.292 Degrees

Gelman Site of 1,4-Dioxane Contamination

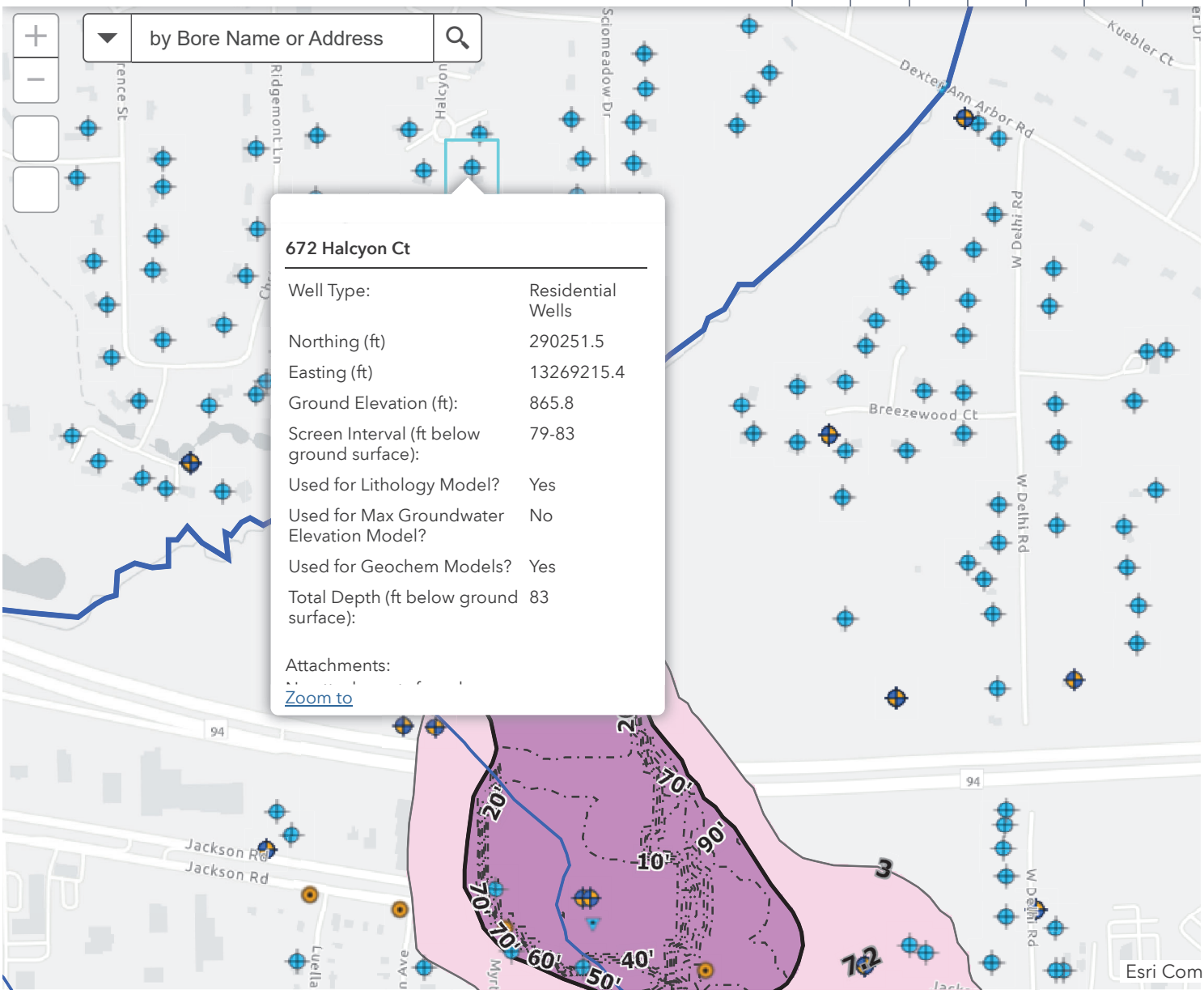




200m
600ft

-83.825 42.292 Degrees

Gelman Site of 1,4-Dioxane Contamination

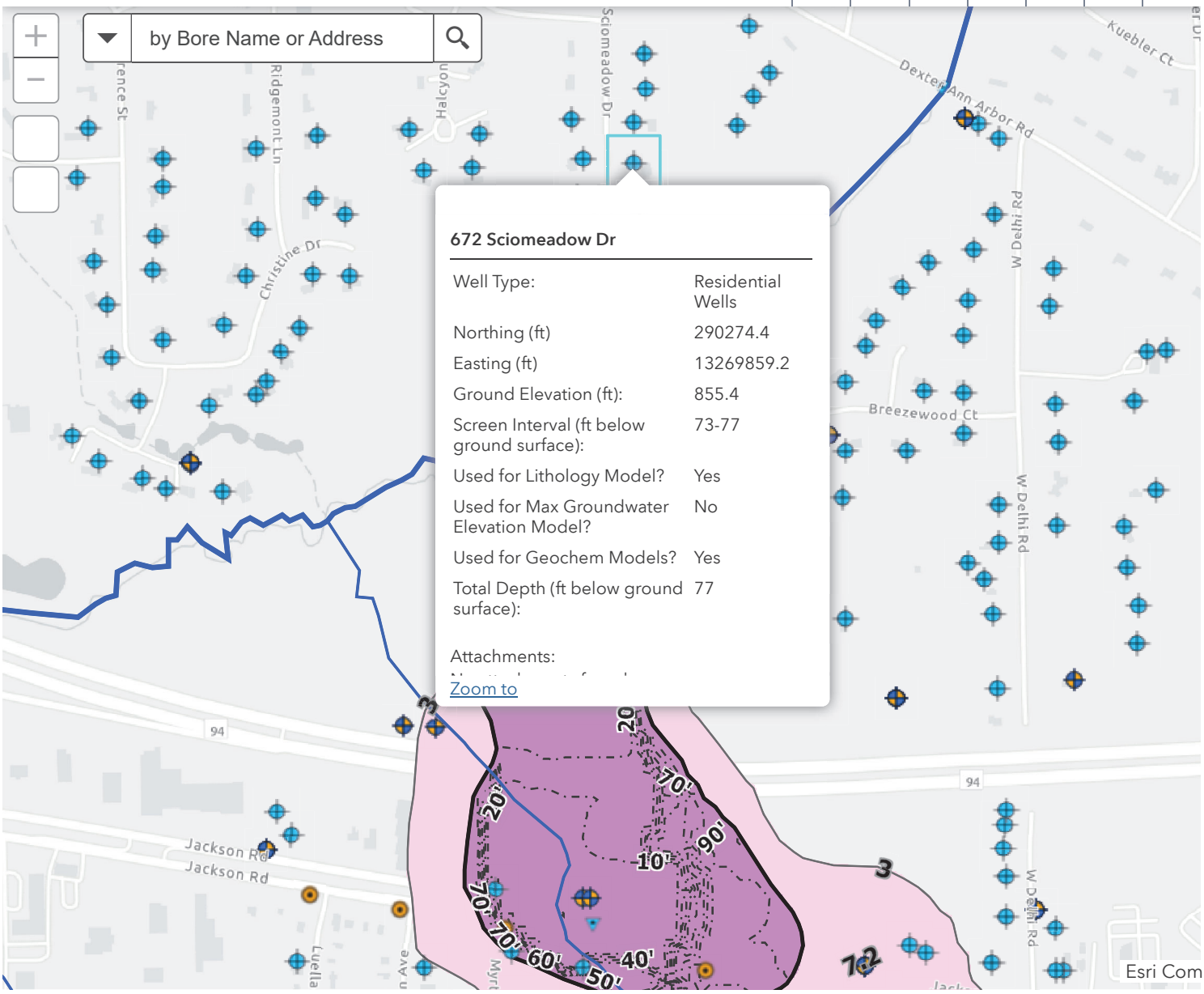




200m
600ft

-83.824 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination

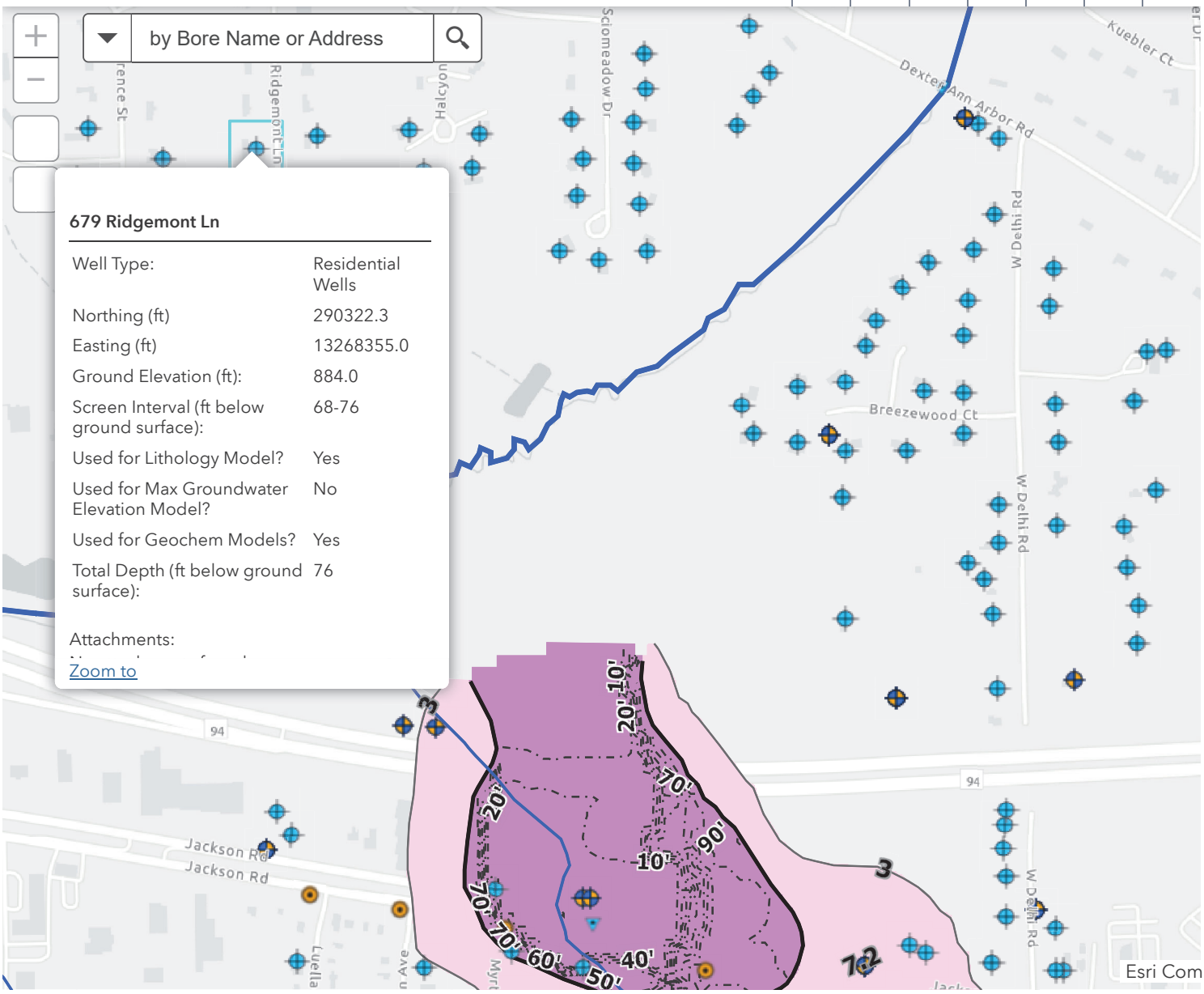




200m
600ft

-83.831 42.290 Degrees

Gelman Site of 1,4-Dioxane Contamination

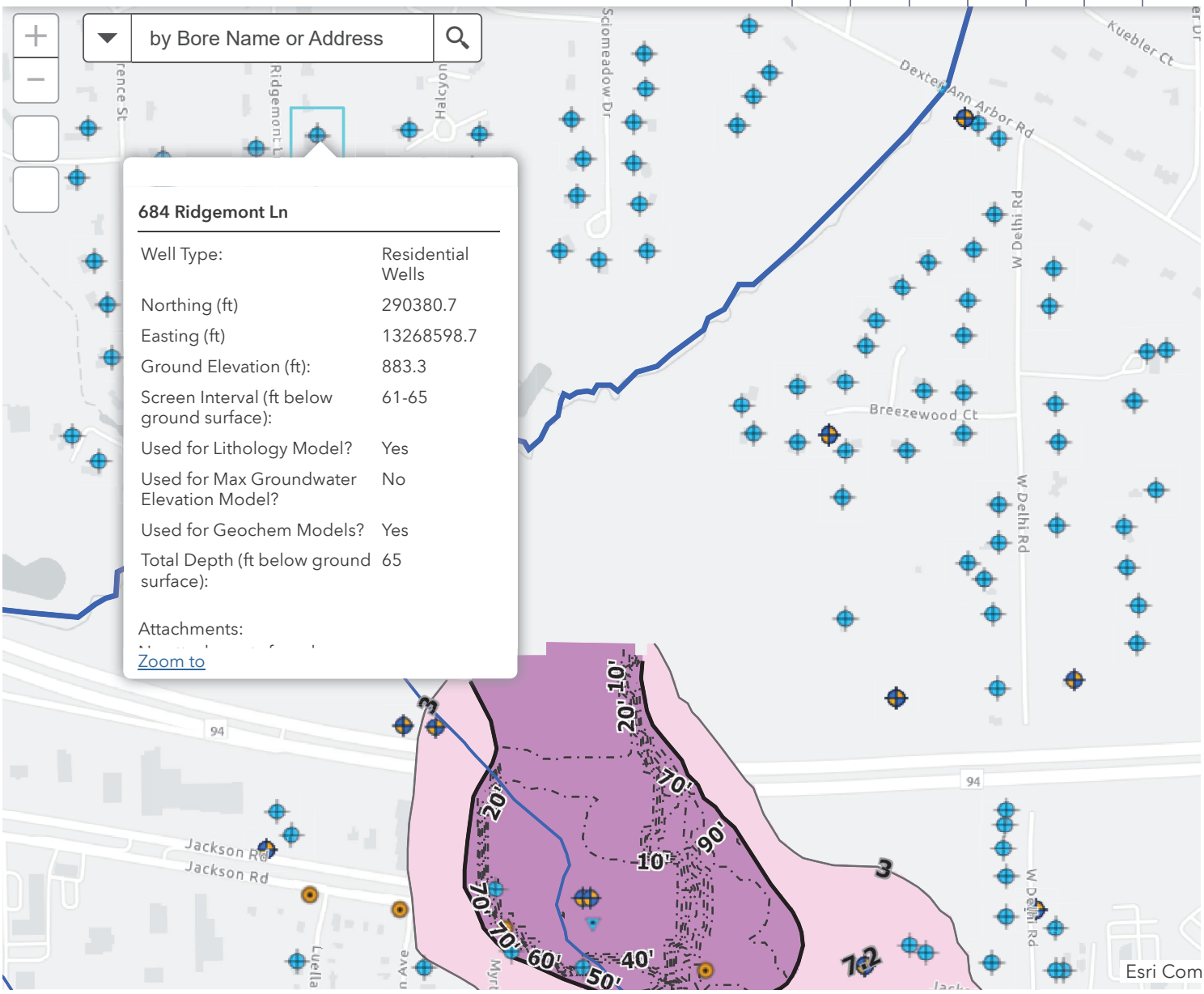




200m
600ft

-83.824 42.292 Degrees

Gelman Site of 1,4-Dioxane Contamination

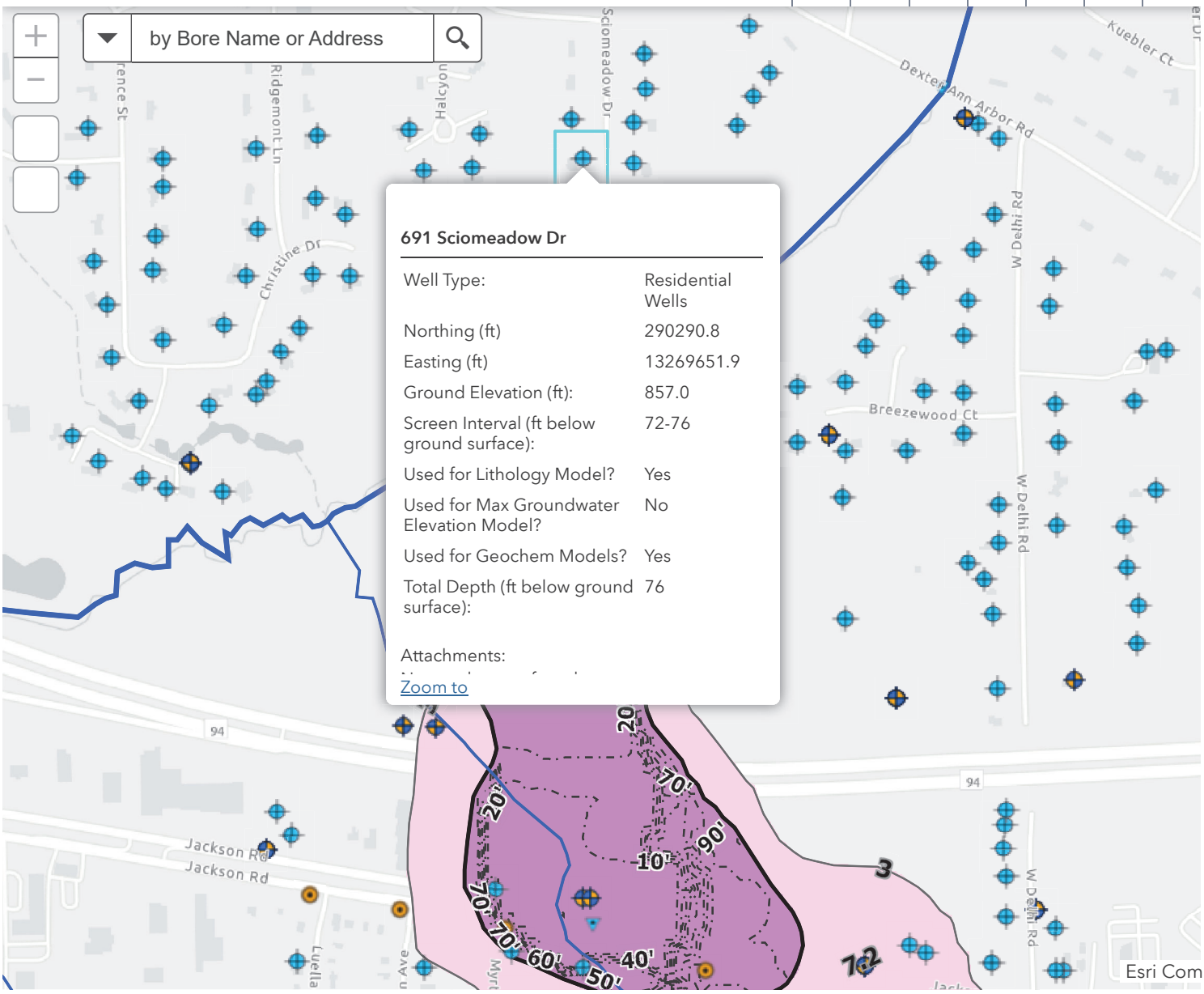




200m
600ft

-83.823 42.297 Degrees

Gelman Site of 1,4-Dioxane Contamination

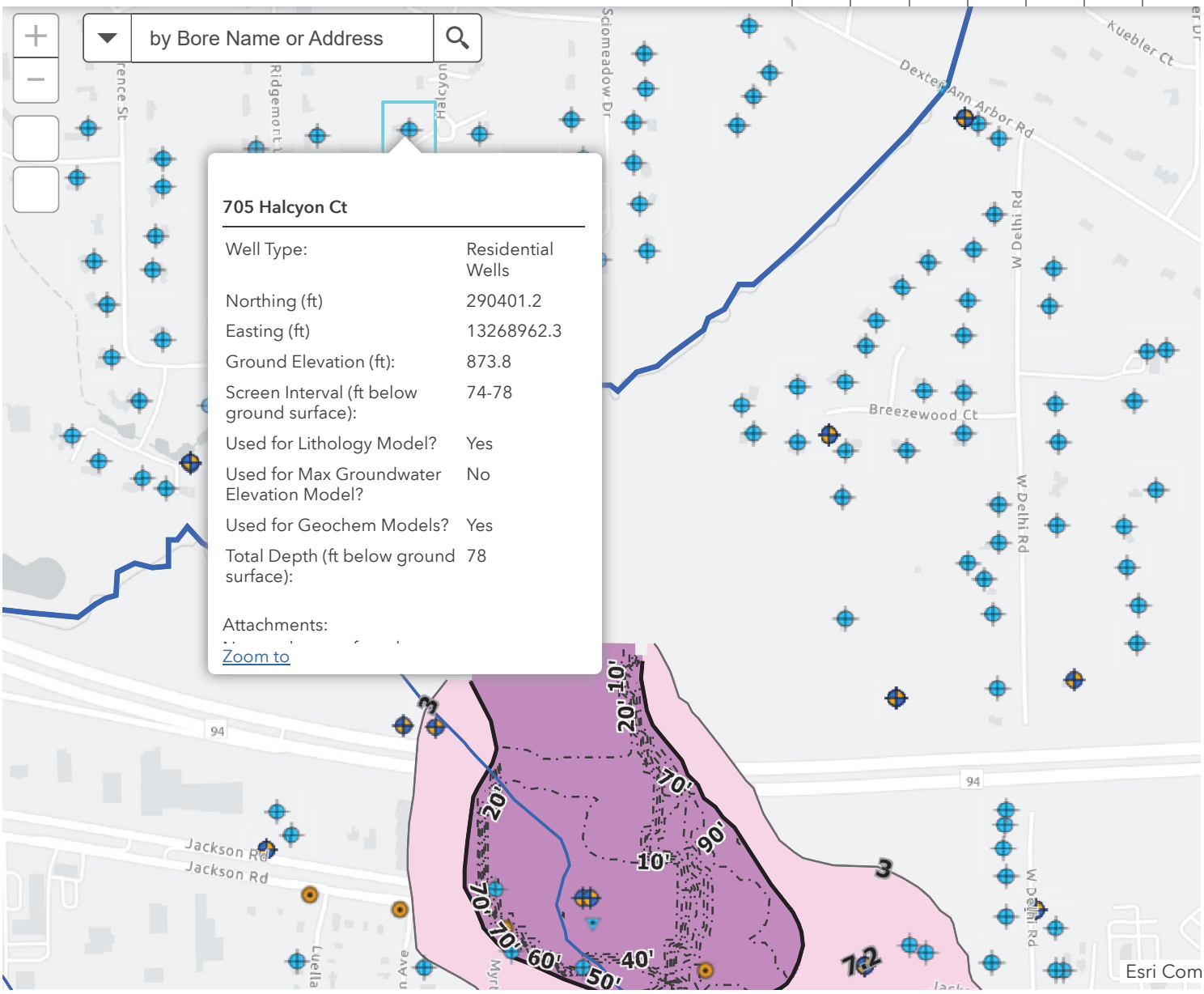




200m
600ft

-83.814 42.294 Degrees

Gelman Site of 1,4-Dioxane Contamination

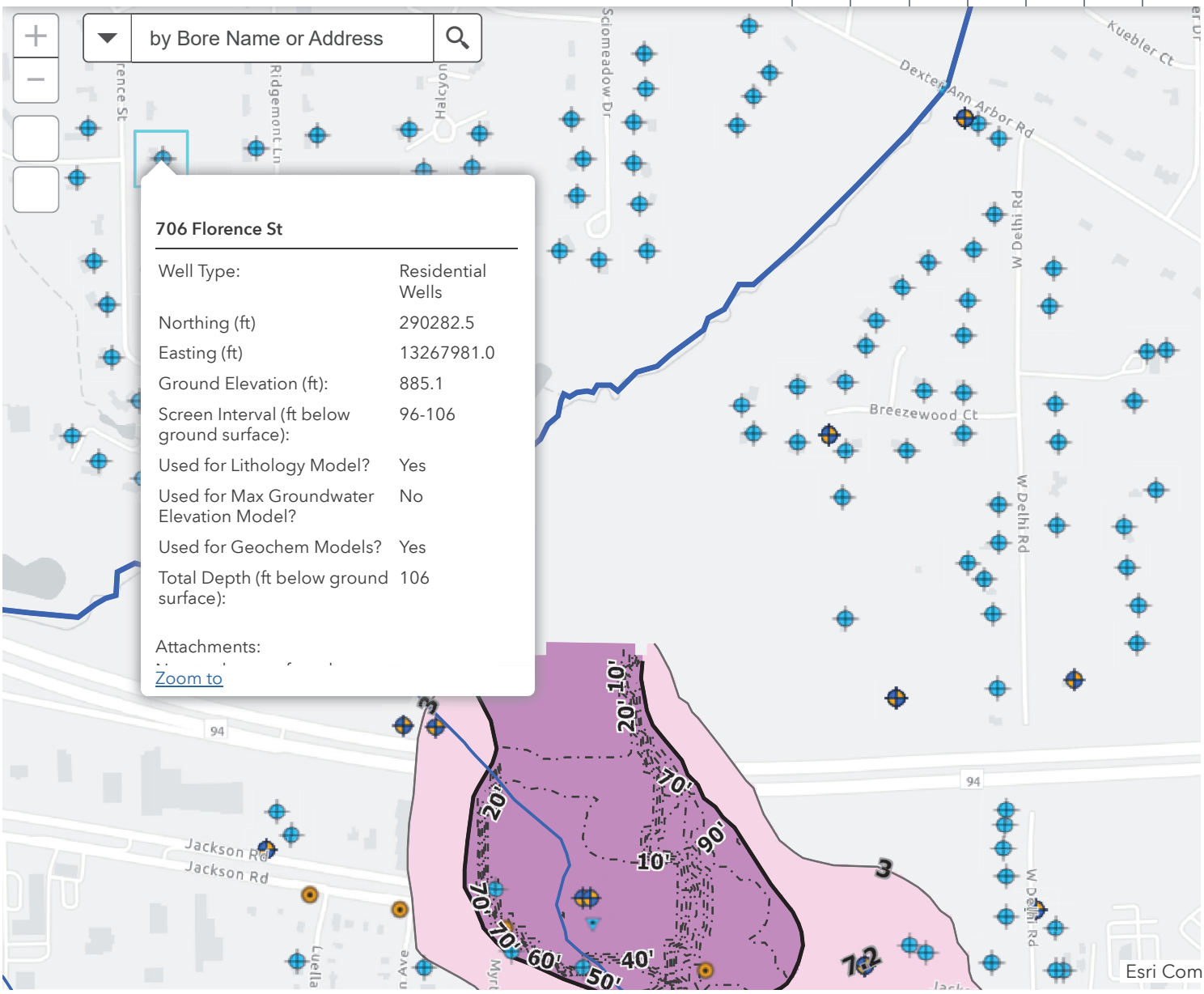




200m
600ft

-83.824 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination

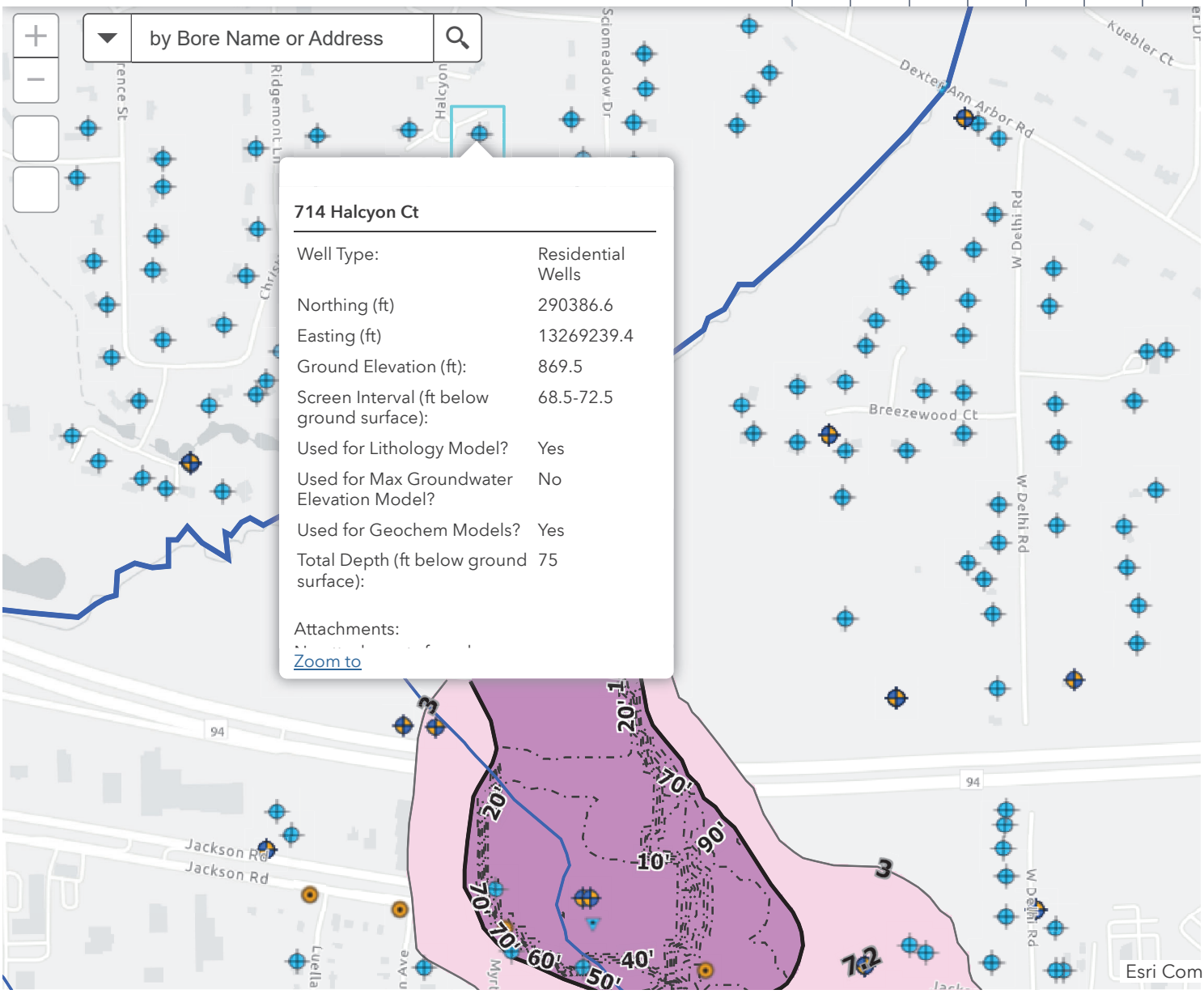




200m
600ft

-83.824 42.292 Degrees

Gelman Site of 1,4-Dioxane Contamination

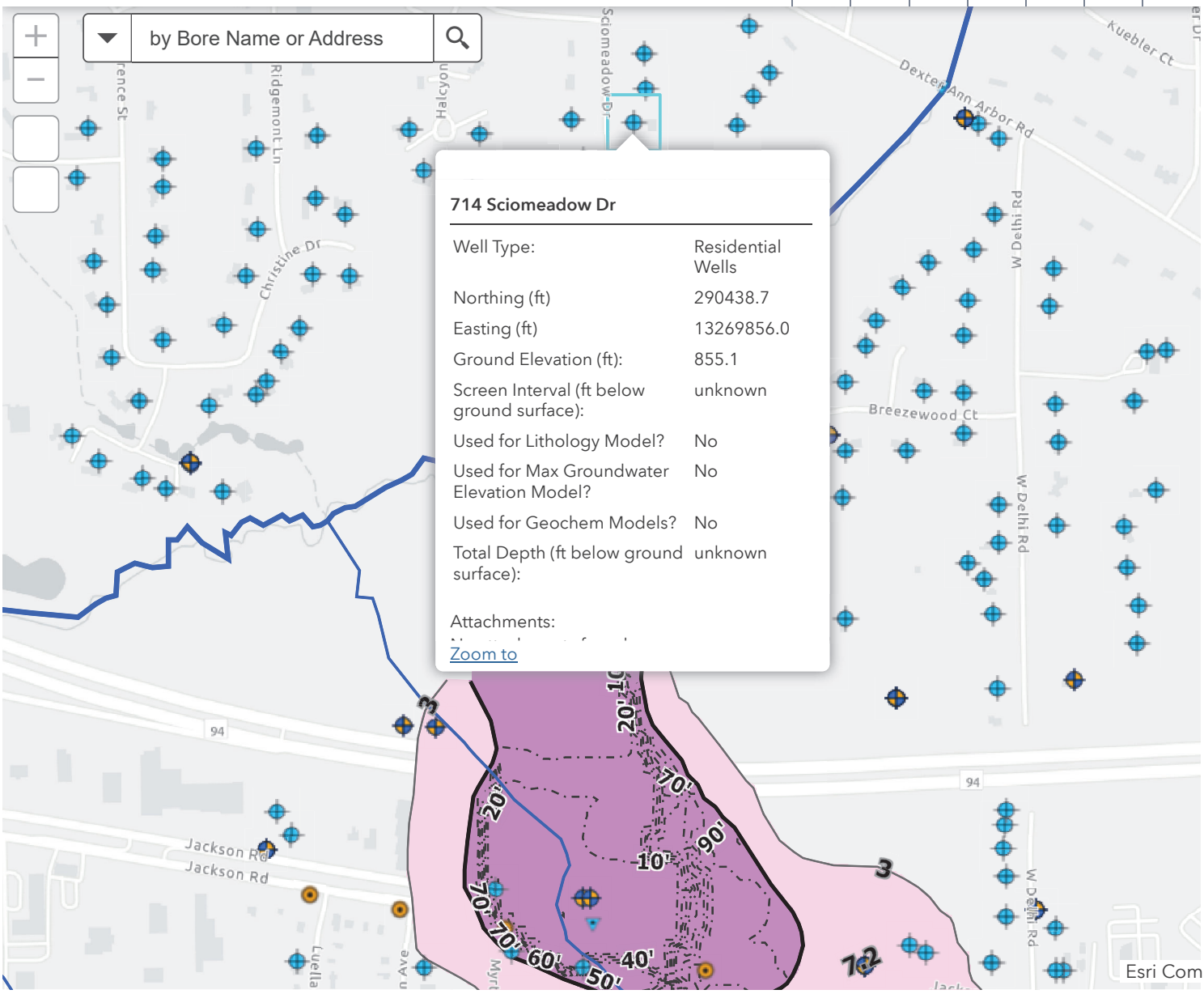




200m
600ft

-83.823 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination

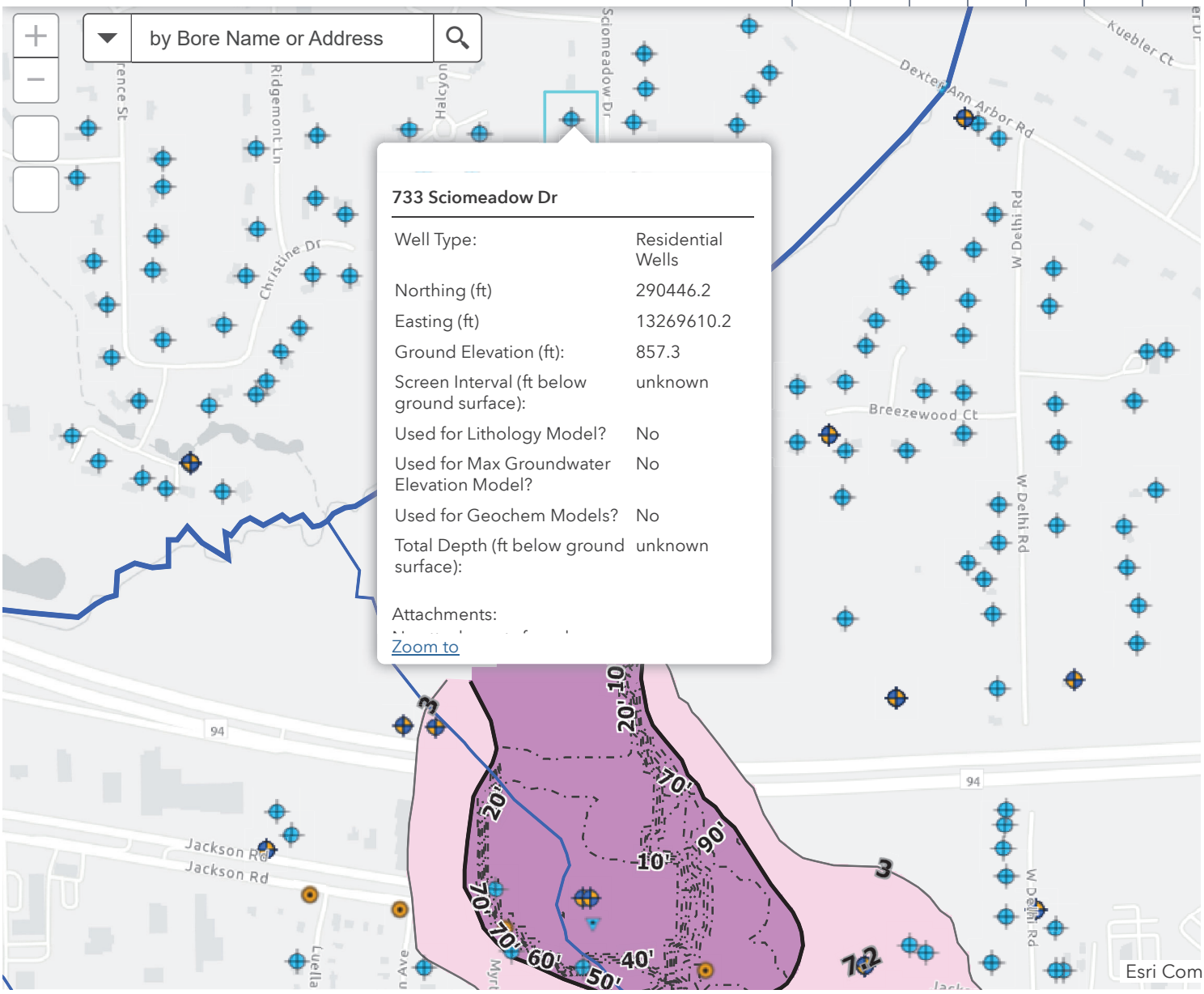




200m
600ft

-83.831 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination

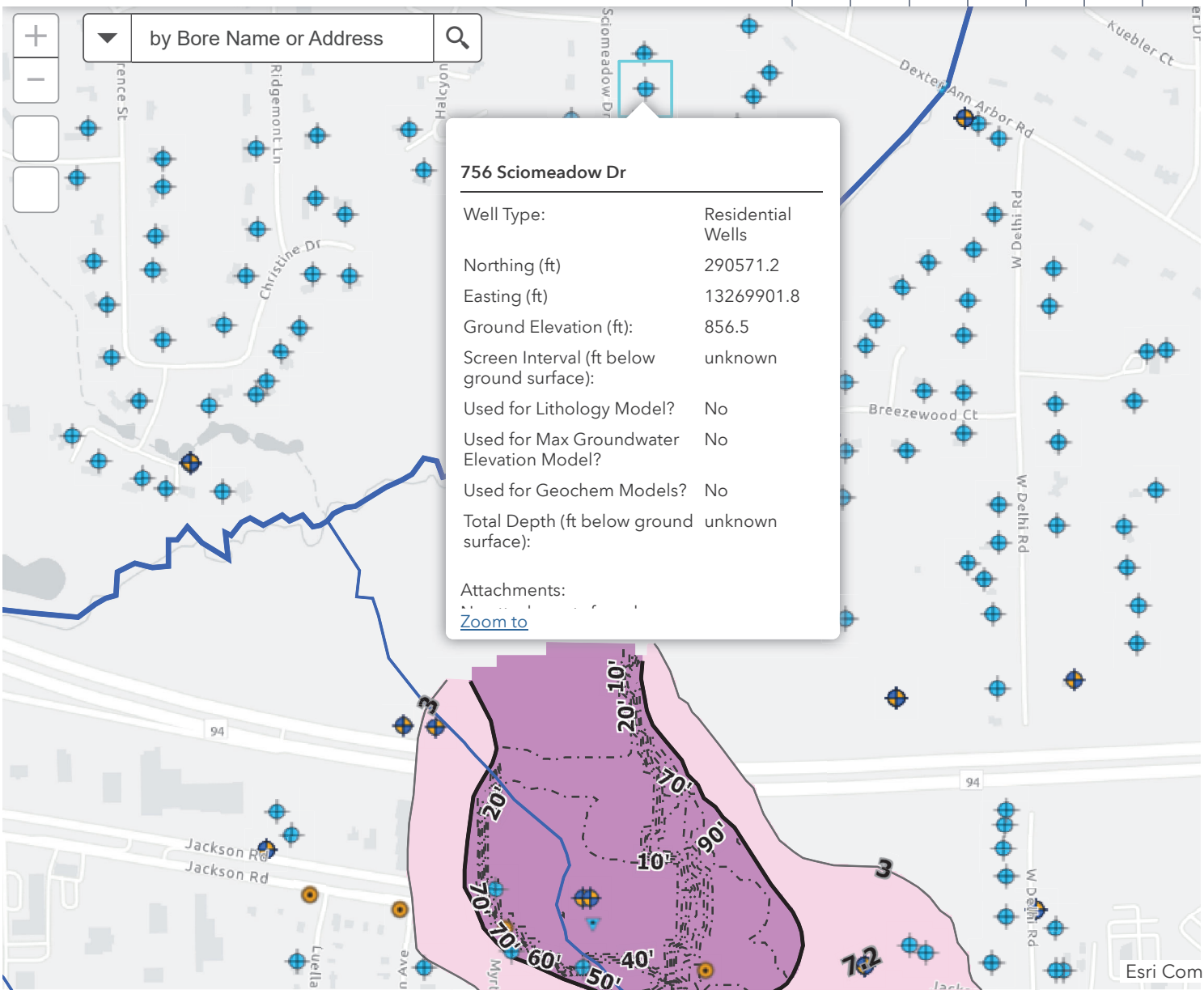




200m
600ft

-83.831 42.290 Degrees

Gelman Site of 1,4-Dioxane Contamination



756 Sciomeadow Dr

Well Type:	Residential Wells
Northing (ft)	290571.2
Easting (ft)	13269901.8
Ground Elevation (ft):	856.5
Screen Interval (ft below ground surface):	unknown
Used for Lithology Model?	No
Used for Max Groundwater Elevation Model?	No
Used for Geochem Models?	No
Total Depth (ft below ground surface):	unknown

Attachments:

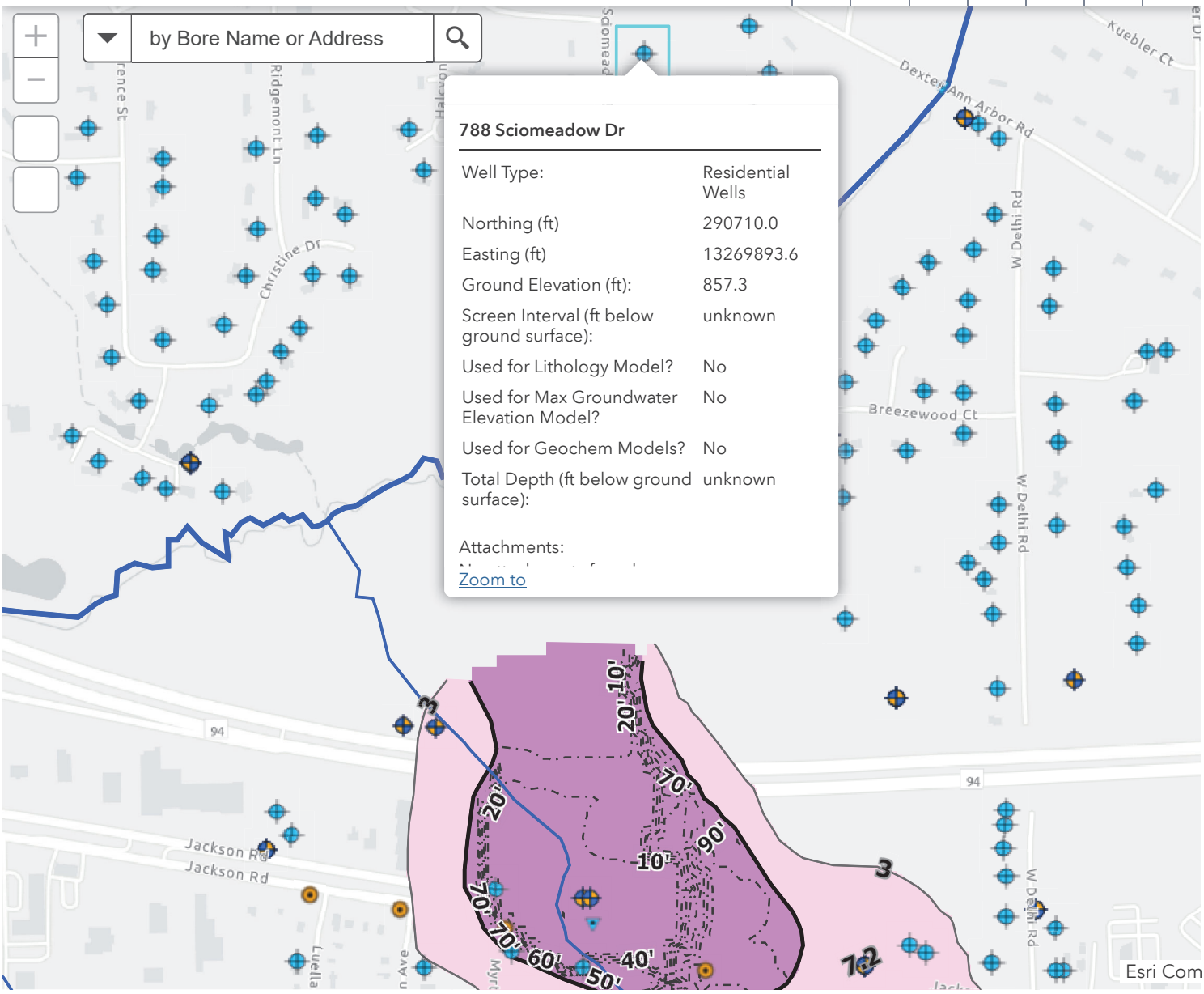
Zoom to



200m
600ft

-83.815 42.292 Degrees

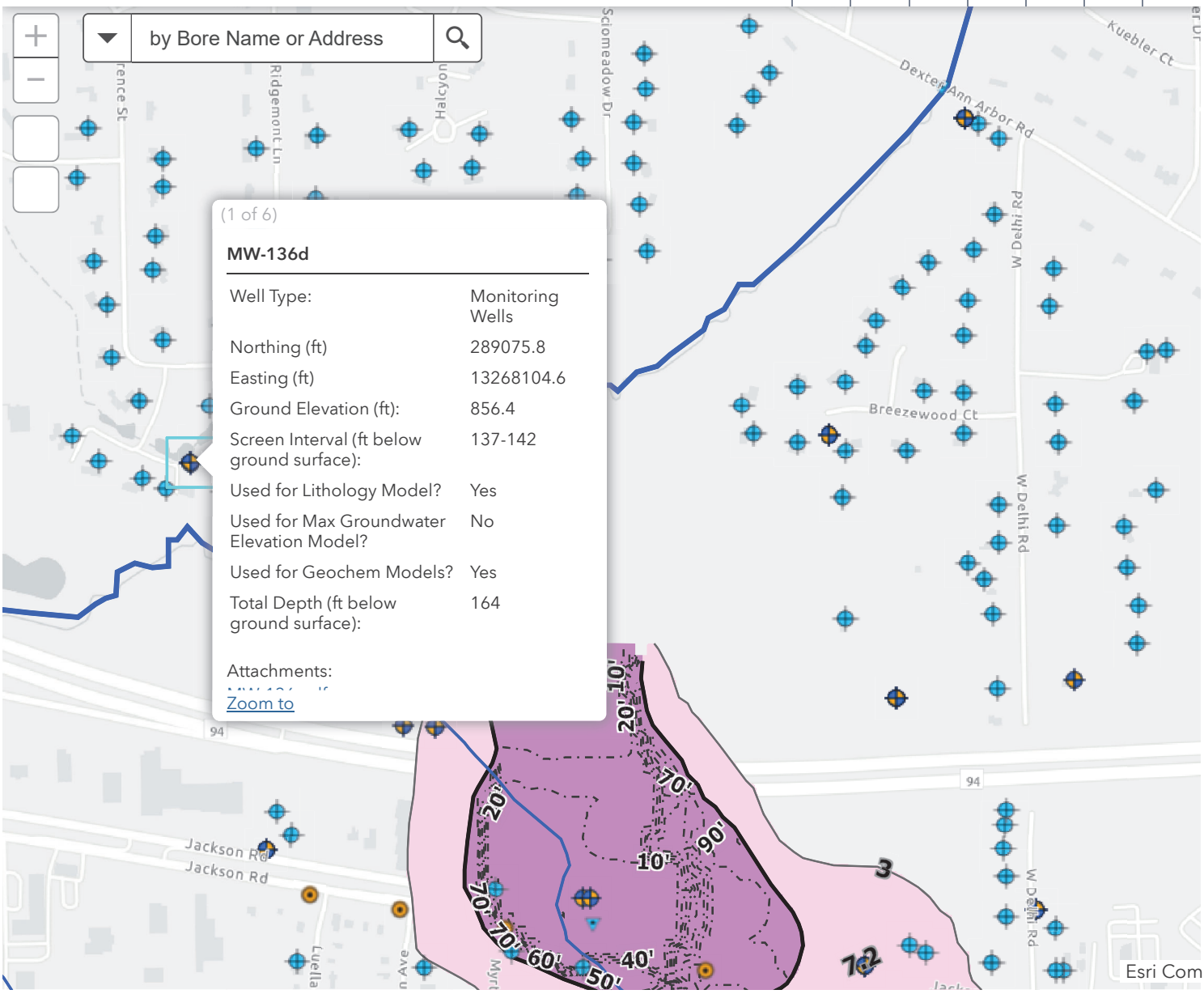
Gelman Site of 1,4-Dioxane Contamination





200m
600ft

-83.831 42.290 Degrees

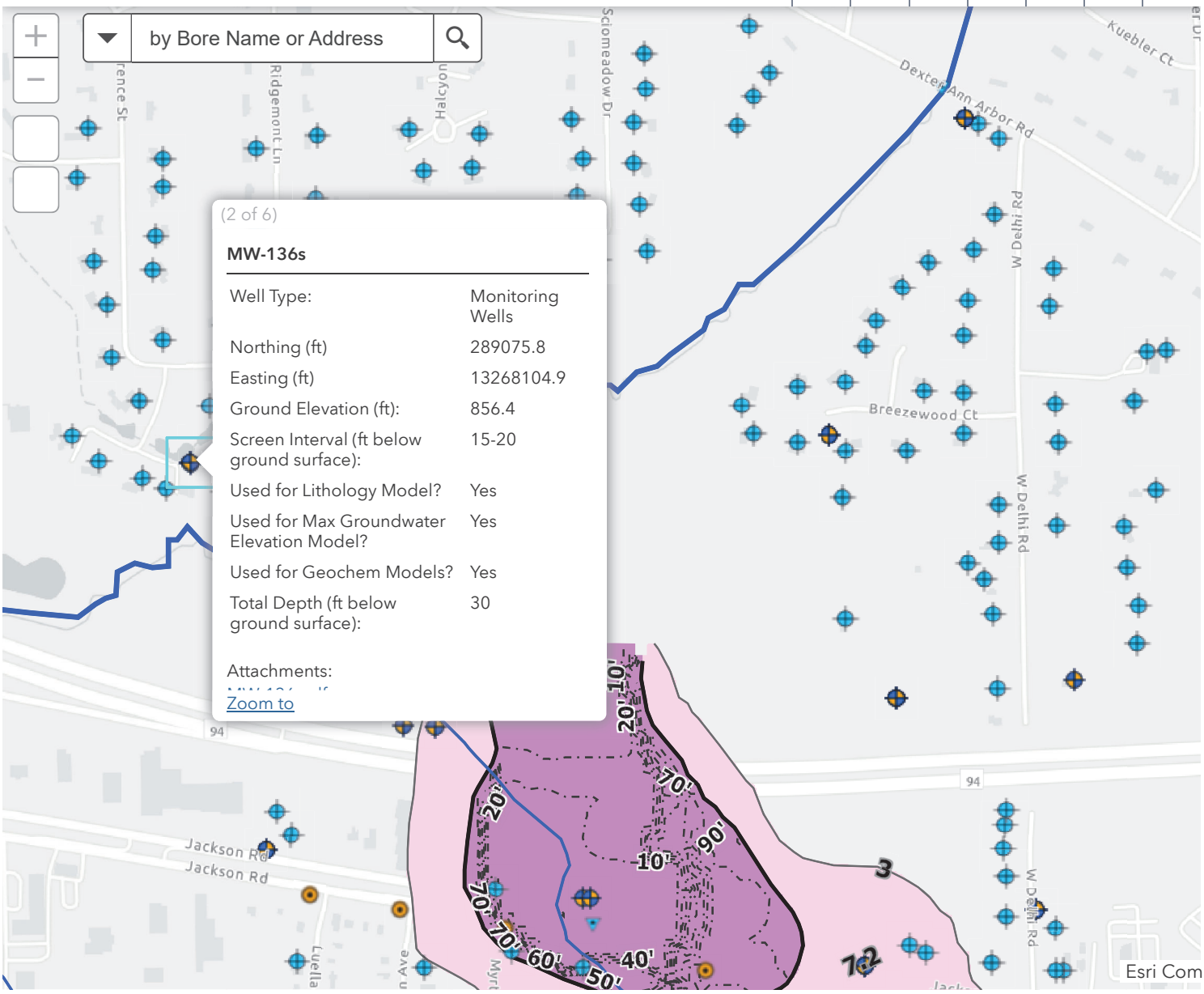




200m
600ft

-83.823 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination

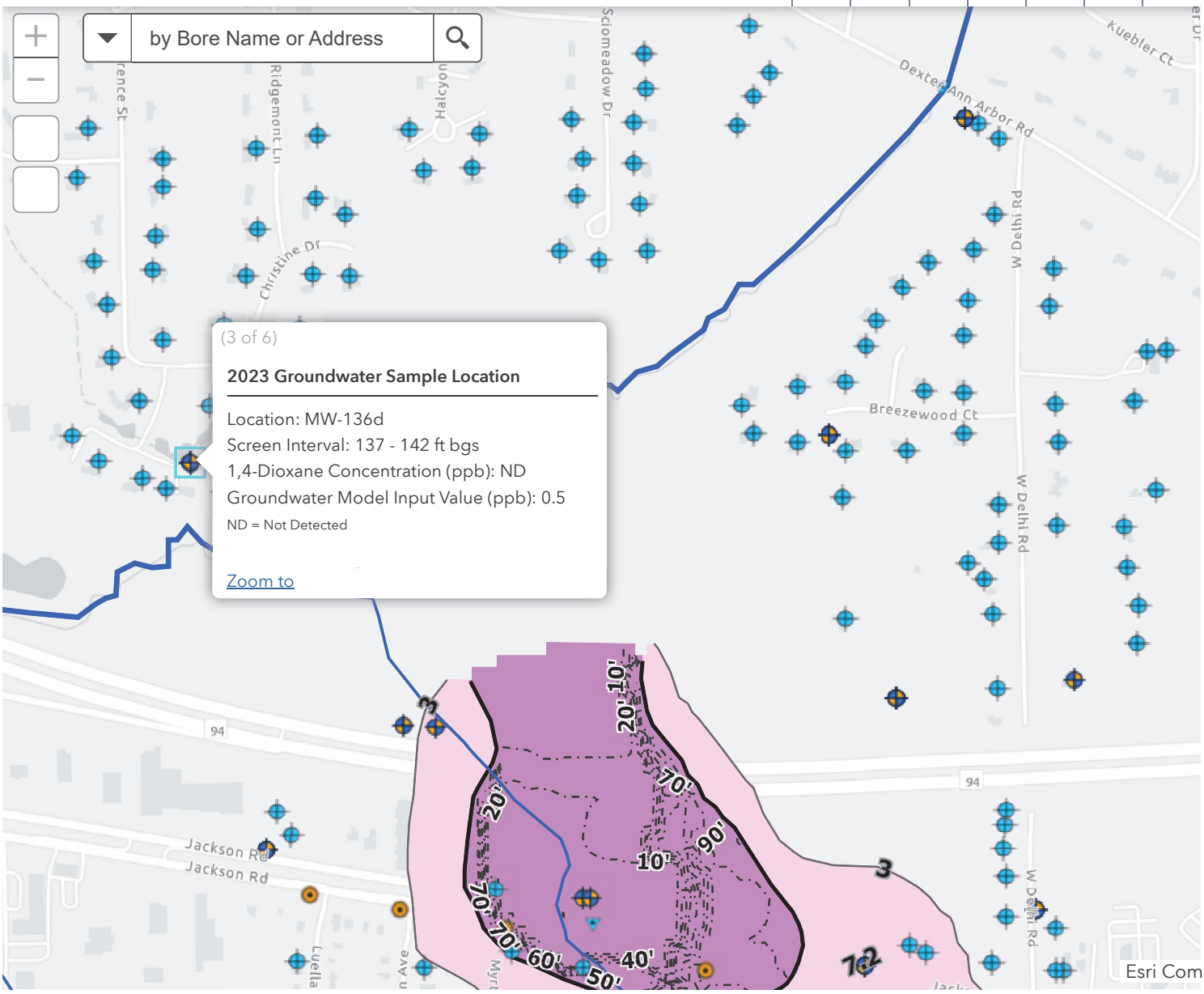




200m
600ft

-83.824 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination

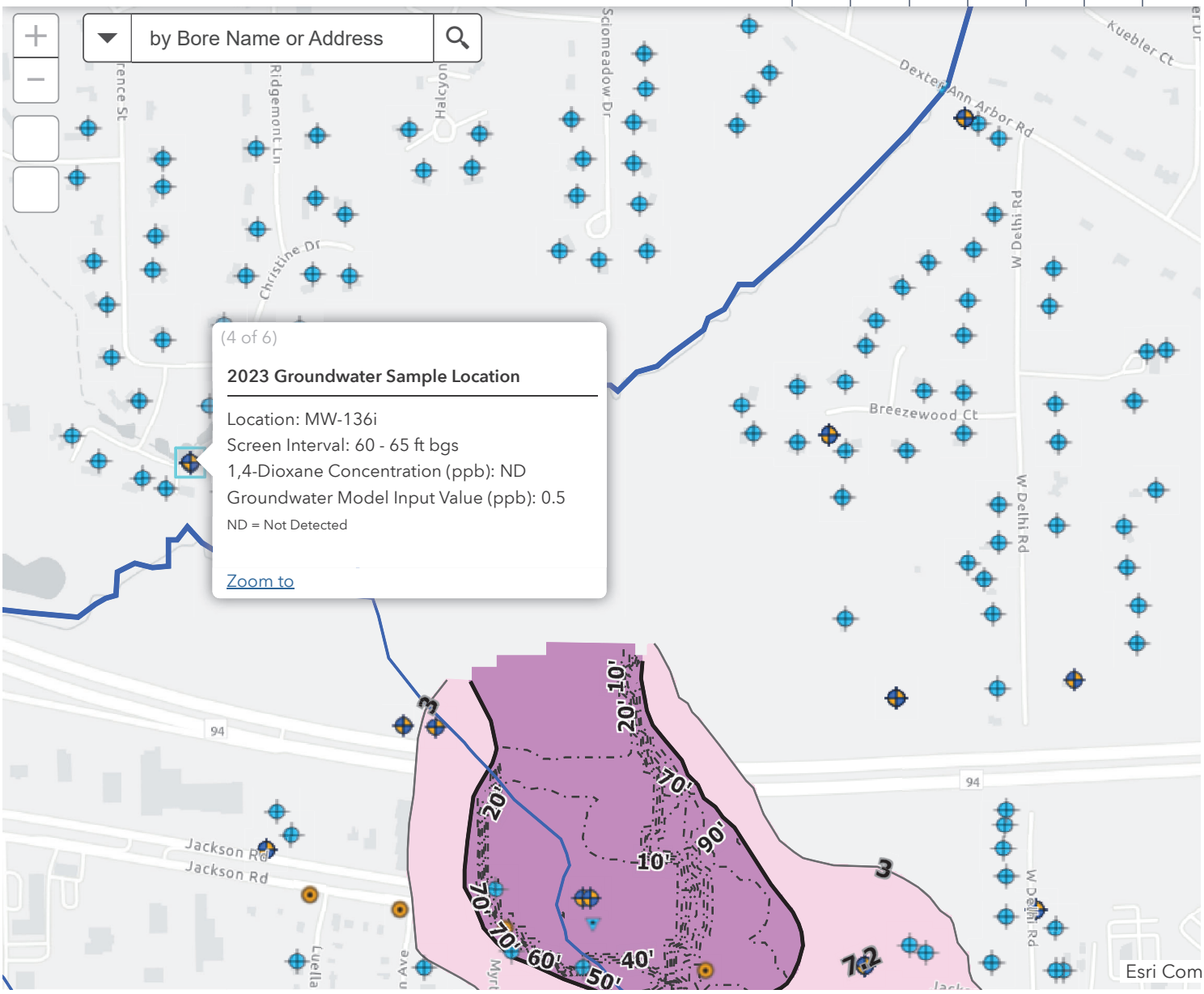




200m
600ft

-83.824 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination

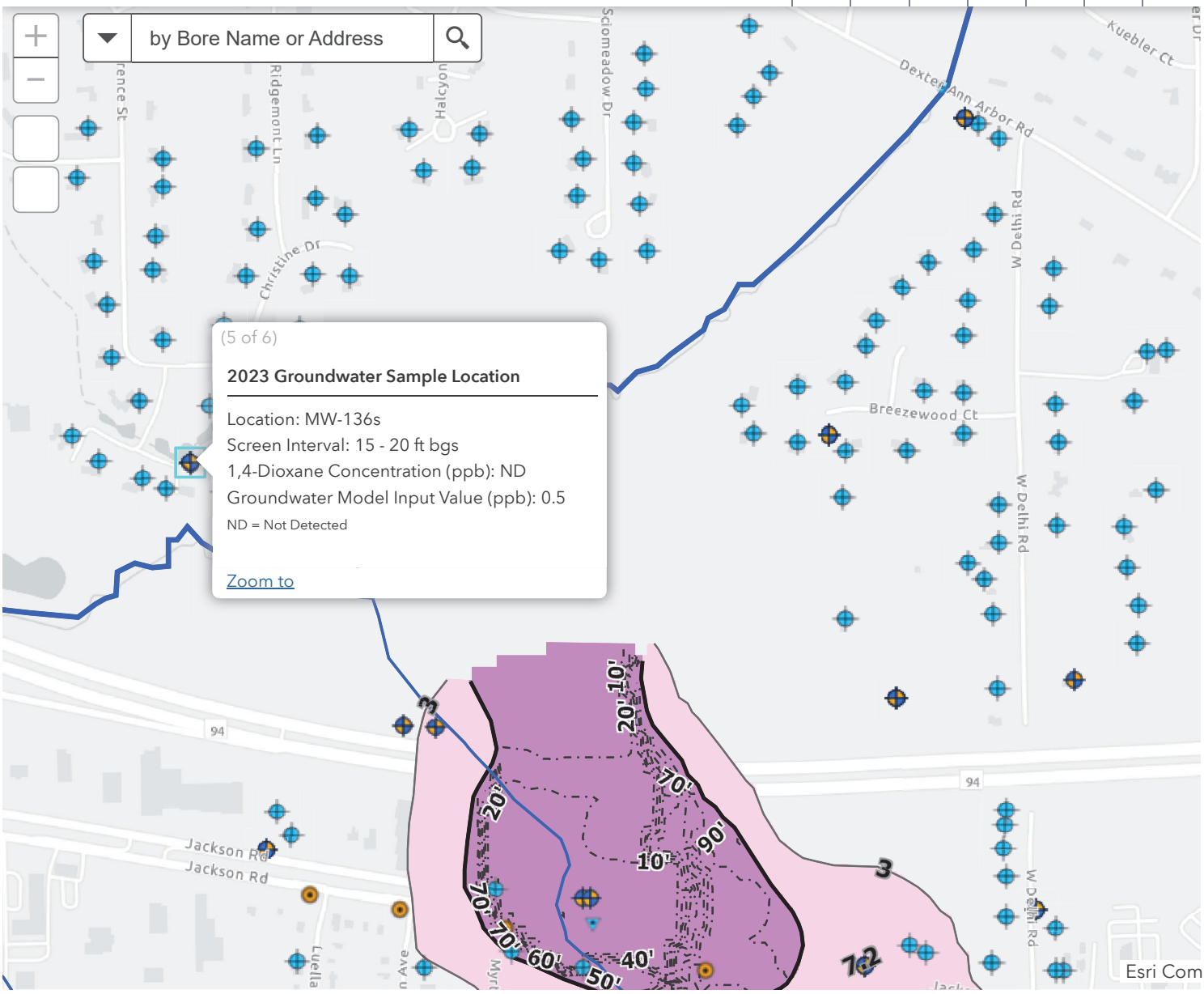




200m
600ft

-83.824 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination

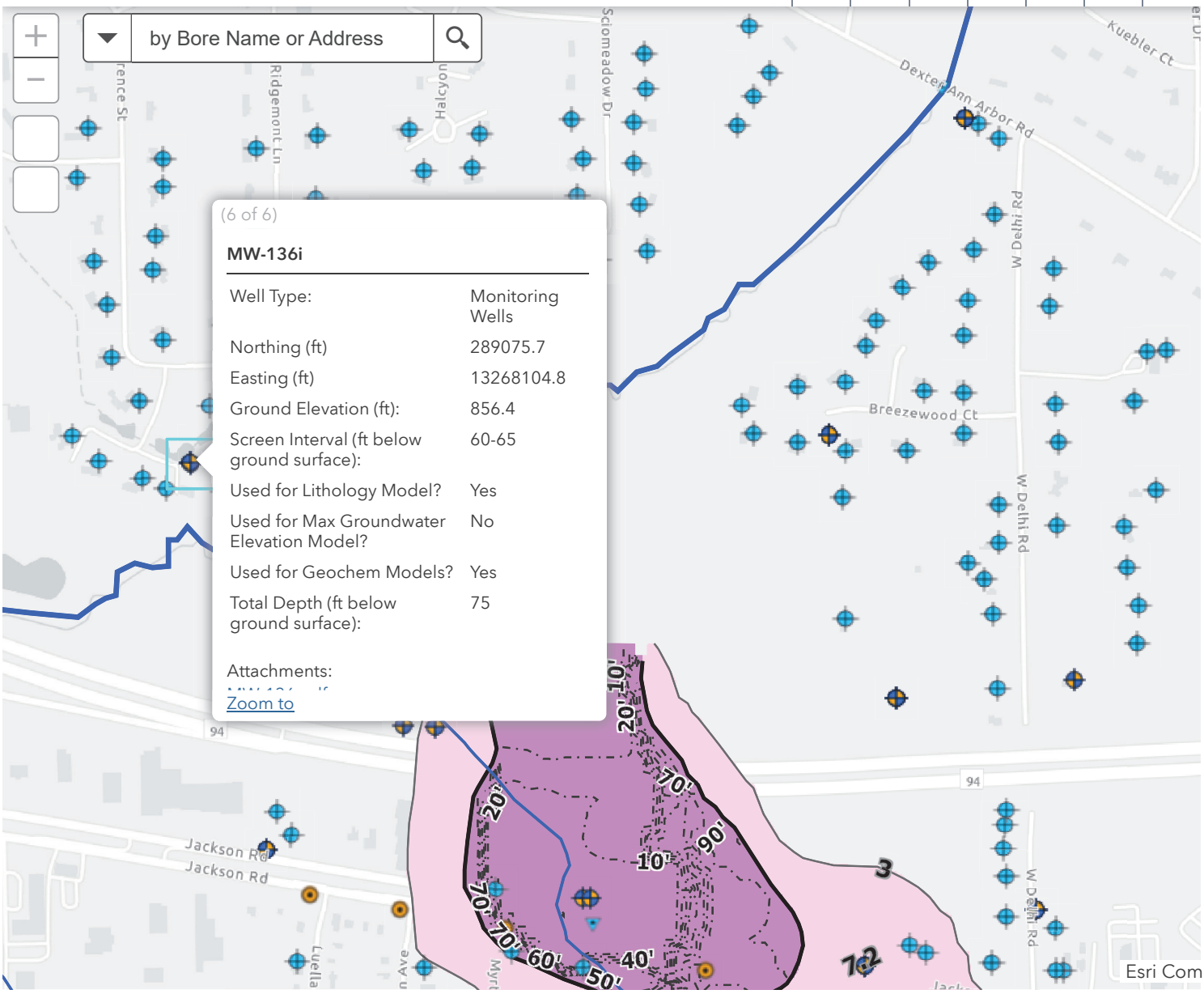




200m
600ft

-83.815 42.291 Degrees

Gelman Site of 1,4-Dioxane Contamination





200m
600ft

-83.823 42.291 Degrees

Well Information - NW Area, Page 1 of 1

Well ID	Aquifer	Well Name	Map Location	X CORD	Date Installed	Y CORD	Well Driller (if known)	Sampling Interval	Well Types	Boring Depth (Feet bgl)	Ground Elevation	Depth from TOC to bottom of screen (Feet)	TOC Elevation AMSL (Feet)	Bottom of Screen 1	Top of Screen 1	Screen Length (Feet)	Bottom of Screen 2	Top of Screen 2	ID	Well Comments
29000	Not Determined	404 Adrienne Lane	B -		27.09.2013		Cribley Drilling company	Randomly	Residential Wells	106		107		106	96	10			1133	Replaced original 102 ft well installed in 1969
29500	Not Determined	407 Adrienne Lane	C -		20.08.1968			Randomly	Residential Wells			98		98	94	4			1134	
33164		4611 Dexter Rd							Residential Wells										1270	
33166		4633 Dexter Rd							Residential Wells										1271	
33168		4645 Dexter Rd							Residential Wells										1272	
33170		4657 Dexter Rd							Residential Wells										1273	
31497	Not Determined	5056 Christine Dr	C-1		28.02.1974			Randomly	Residential Wells	96		96		96	92	4			1148	
31499	Not Determined	5061 Christine Dr	C-1					Randomly	Residential Wells										1149	
31501	Not Determined	5089 Christine Dr	C-1		17.06.1987			Randomly	Residential Wells	75		76		75	67	8			1150	
31503	Not Determined	5112 Christine Dr	C-0		10.11.1986			Randomly	Residential Wells	93		94		93	85	8			1151	
31505	Not Determined	5119 Christine Dr	C-1					Randomly	Residential Wells										1152	
31507	Not Determined	5145 Christine Dr	D-1					Randomly	Residential Wells										1153	
31487	Not Determined	5155 Christine Ct	E-1		22.08.2003		Ann Arbor Well Drilling, Inc.	Randomly	Residential Wells	80		71		70	60	10			1143	
31509	Not Determined	5159 Christine Dr	D-1		30.10.1985			Randomly	Residential Wells	96		97		96	88	8			1154	
31511	Not Determined	5160 Christine Dr	D-0		16.07.1986			Randomly	Residential Wells	91		92		91	83	8			1155	
31513	Not Determined	5161 Christine Dr	D-1		06.11.1985			Randomly	Residential Wells	96		97		96	88	8			1156	
31515	Not Determined	5163-5165 Christine Dr	E-0					Randomly	Residential Wells										1157	
31489	Not Determined	5167 Christine Ct	E-0					Randomly	Residential Wells										1144	
31491	Not Determined	5171 Christine Ct	E-0					Randomly	Residential Wells										1145	
31493	Not Determined	5175 Christine Ct	E -					Randomly	Residential Wells										1146	
31495	Not Determined	5179-5181 Christine Ct	E -					Randomly	Residential Wells										1147	
31517	Not Determined	5183-5185 Christine Dr	D-0				Ann Arbor Well Drilling, Inc.	Randomly	Residential Wells	90		86		85	81	4			1158	
31519	Not Determined	5188 Christine Dr	D-0		11.11.1986			Randomly	Residential Wells	90				90	82	8			1159	
33379	Not Determined	521 Florence St	D -		28.05.1987			Randomly	Residential Wells	99		100		99	91	8			1164	
33381	Not Determined	565 Florence St	C -		07.07.1987			Randomly	Residential Wells	102		103		102	94	8			1165	
33383	Not Determined	584 Florence St	C-0		10.12.1986			Randomly	Residential Wells	96		97		96	88	8			1166	
39617	Not Determined	595 Sciomeadow Dr	C-3		24.04.1986			Randomly	Residential Wells	80		80		80	76	4			1179	
39618	Not Determined	598 Sciomeadow Dr	C-4		08.09.1984			Randomly	Residential Wells	93		93		93	85	8			1180	
33385	Not Determined	603 Florence St	C -					Randomly	Residential Wells										1167	
38665	Not Determined	619 Ridgemont Ln	C-1		25.03.1978			Randomly	Residential Wells	61		61		61	57	4			1175	
39619	Not Determined	627 Sciomeadow Dr	C-3		17.02.1981			Randomly	Residential Wells	96		96		96	85	11			1181	
33387	Not Determined	630 Florence St	C-0					Randomly	Residential Wells										1168	
39629	Not Determined	630 Sciomeadow Dr	C-4		27.02.1987			Randomly	Residential Wells	76		76		76	72	4			1182	
38670	Not Determined	642 Ridgemont Ln	C-1		01.05.1979			Randomly	Residential Wells	94		94		94	90	4			1176	
39621	Not Determined	659 Sciomeadow Dr	C-3		21.10.1986			Randomly	Residential Wells	97				97	93	4			1183	
33412	Not Determined	663 Halcyon Ct	C-2		25.11.1980			Randomly	Residential Wells	82		82		82	78	4			1172	
33389	Not Determined	670 Florence St	C-0					Randomly	Residential Wells										1169	
33414	Not Determined	672 Halcyon Ct	C-2		19.12.1980			Randomly	Residential Wells	83		83		83	79	4			1171	
39622	Not Determined	672 Sciomeadow Dr	B-4		08.01.1987			Randomly	Residential Wells	77		77		77	73	4			1184	
38675	Not Determined	679 Ridgemont Ln	B-0		21.06.2013		Ann Arbor Well Drilling, Inc.	Randomly	Residential Wells	76		77		76	68	8			1177	
38680	Not Determined	684 Ridgemont Ln	B-1		22.05.1974			Randomly	Residential Wells	65		65		65	61	4			1178	
39623	Not Determined	691 Sciomeadow Dr	B-3		27.02.1987			Randomly	Residential Wells	76		76		76	72	4			1185	
33416	Not Determined	705 Halcyon Ct	B-2		01.08.1980			Randomly	Residential Wells	78		78		78	74	4			1173	
33391	Not Determined	706 Florence St	B-0		05.06.2001			Randomly	Residential Wells	106		108		106	96	10			1170	
33418	Not Determined	714 Halcyon Ct	B-3		04.02.1980			Randomly	Residential Wells	75		72.5		72.5	68.5	4			1174	
39624	Not Determined	714 Sciomeadow Dr	B-4					Randomly	Residential Wells										1186	
39626		733 Sciomeadow Dr							Residential Wells										1258	
39627		756 Sciomeadow Dr							Residential Wells										1259	
39628		788 Sciomeadow Dr							Residential Wells										1260	
15475	E	MW-136d	D1	13268104.60	10.11.2014	289075.76	Cascade Drilling	Semi-Annual	Monitoring Wells	164	856.85		856.32	142	137	5			1020	
15474	D0	MW-136i	D1	13268104.76	10.11.2014	289075.65	Cascade Drilling	Semi-Annual	Monitoring Wells	164	856.85		856.33	65	60	5			1019	
15473	D0	MW-136s	D1	13268104.86	10.11.2014	289075.83	Cascade Drilling	Semi-Annual	Monitoring Wells	164	856.85		856.31	20	15				1018	

Sample ID	Well Name	Entered	1,4-Dioxane Results (ppb)	Date Sampled	Time Sampled	Date Received	Date Analyzed	Reporting Limit	Reporting Lab	Static Reading	Static Time	Static Only?	Qualifier(s)	Comments
74325	404 Adrienne Lane	11/01/14	nd	10/31/14	9:30		11/12/14	1.0	PLS			FALSE	O	DEQ Lab
74326	407 Adrienne Lane	11/01/14	nd	10/31/14	9:40		11/12/14	1.0	PLS			FALSE	O	DEQ Lab
85532	4611 Dexter Rd	06/09/22	nd	06/08/22	10:28		06/17/22	0.5	PLS			FALSE	O	EGLE Lab- Current address identified as 4611 Dexter-Ann Arbo
81458	4611 Dexter Rd	06/25/20	nd	06/24/20	14:30		07/01/20	1.0	PLS			FALSE	O	EGLE Lab- Current address identified as 4611 Dexter-Ann Arbo
85533	4633 Dexter Rd	06/09/22	nd	06/08/22	10:20		06/15/22	0.5	PLS			FALSE	O	EGLE Lab- Current address identified as 4633 Dexter-Ann Arbo
81459	4633 Dexter Rd	06/25/20	nd	06/24/20	14:41		06/30/20	1.0	PLS			FALSE	O	EGLE Lab- Current address identified as 4633 Dexter-Ann Arbo
85534	4645 Dexter Rd	06/09/22	nd	06/08/22	10:38		06/15/22	0.5	PLS			FALSE	O	EGLE Lab- Current address identified as 4645 Dexter-Ann Arbo
81460	4645 Dexter Rd	06/25/20	nd	06/24/20	14:35		06/30/20	1.0	PLS			FALSE	O	EGLE Lab- Current address identified as 4645 Dexter-Ann Arbo
85535	4657 Dexter Rd	06/09/22	nd	06/08/22	10:37		06/16/22	0.5	PLS			FALSE	O	EGLE Lab- Current address identified as 4657 Dexter-Ann Arbo
81461	4657 Dexter Rd	06/27/20	nd	06/24/20	14:45		06/30/20	1.0	PLS			FALSE	O	EGLE Lab- Current address identified as 4657 Dexter-Ann Arbo
74075	5056 Christine Dr	10/30/14	nd	10/29/14	10:15		10/31/14	1.0	PLS			FALSE	O	DEQ Lab
85472	5061 Christine Dr	06/09/22	nd	06/08/22	14:00		06/15/22	0.5	PLS			FALSE	O	EGLE Lab
79998	5061 Christine Dr	06/25/20	nd	06/24/20	14:03		07/01/20	1.0	PLS			FALSE	O	EGLE Lab
74077	5061 Christine Dr	04/23/18	nd	04/19/18	14:50		04/25/18	1.0	PLS			FALSE	O	DEQ Lab
74076	5061 Christine Dr	10/30/14	nd	10/29/14	9:30		10/31/14	1.0	PLS			FALSE	O	DEQ Lab
85473	5089 Christine Dr	06/09/22	nd	06/08/22	14:00		06/17/22	0.5	PLS			FALSE	O	EGLE Lab
79999	5089 Christine Dr	06/25/20	nd	06/24/20	13:54		07/01/20	1.0	PLS			FALSE	O	EGLE Lab
74079	5089 Christine Dr	04/26/18	nd	04/24/18	10:12		05/01/18	1.0	PLS			FALSE	O	DEQ Lab
74078	5089 Christine Dr	11/01/14	nd	10/31/14	10:40		11/12/14	1.0	PLS			FALSE	O	DEQ Lab
85474	5112 Christine Dr	06/09/22	nd	06/09/22	14:14		06/16/22	0.5	PLS			FALSE	O	EGLE Lab
80000	5112 Christine Dr	06/25/20	nd	06/24/20	14:10		06/30/20	1.0	PLS			FALSE	O	EGLE Lab
74081	5112 Christine Dr	04/23/18	nd	04/19/18	14:36		04/26/18	1.0	PLS			FALSE	O	DEQ Lab
74080	5112 Christine Dr	10/30/14	nd	10/29/14	10:00		10/31/14	1.0	PLS			FALSE	O	DEQ Lab
85475	5119 Christine Dr	06/09/22	nd	06/08/22	14:26		06/15/22	0.5	PLS			FALSE	O	EGLE Lab
80001	5119 Christine Dr	06/25/20	nd	06/24/20	13:44		06/30/20	1.0	PLS			FALSE	O	EGLE Lab
74083	5119 Christine Dr	04/23/18	nd	04/19/18	14:35		04/26/18	1.0	PLS			FALSE	O	DEQ Lab
74082	5119 Christine Dr	10/30/14	nd	10/29/14	13:00		10/31/14	1.0	PLS			FALSE	O	DEQ Lab
85476	5145 Christine Dr	06/09/22	nd	06/08/22	14:15		06/14/22	0.5	PLS			FALSE	O	EGLE Lab
80002	5145 Christine Dr	06/25/20	nd	06/24/20	13:30		06/30/20	1.0	PLS			FALSE	O	EGLE Lab
74085	5145 Christine Dr	04/23/18	nd	04/19/18	14:25		04/26/18	1.0	PLS			FALSE	O	DEQ Lab
74084	5145 Christine Dr	10/30/14	nd	10/29/14	10:20		10/31/14	1.0	PLS			FALSE	O	DEQ Lab
85483	5155 Christine Ct	06/09/22	nd	06/08/22	13:45		06/16/22	0.5	PLS			FALSE	O	EGLE Lab
80009	5155 Christine Ct	06/25/20	nd	06/24/20	13:10		06/30/20	1.0	PLS			FALSE	O	EGLE Lab
74099	5155 Christine Ct	04/23/18	nd	04/19/18	13:55		04/26/18	1.0	PLS			FALSE	O	DEQ Lab
74098	5155 Christine Ct	10/30/14	nd	10/29/14	11:03		11/01/14	1.0	PLS			FALSE	O	DEQ Lab
85477	5159 Christine Dr	06/09/22	nd	06/08/22	14:25		06/15/22	0.5	PLS			FALSE	O	EGLE Lab
80003	5159 Christine Dr	06/25/20	nd	06/24/20	13:30		06/30/20	1.0	PLS			FALSE	O	EGLE Lab
74087	5159 Christine Dr	04/23/18	nd	04/19/18	14:15		04/24/18	1.0	PLS			FALSE	O	DEQ Lab
74086	5159 Christine Dr	10/30/14	nd	10/29/14	10:30		10/31/14	1.0	PLS			FALSE	O	DEQ Lab
85478	5160 Christine Dr	06/09/22	nd	06/08/22	14:40		06/17/22	0.5	PLS			FALSE	O	EGLE Lab
80004	5160 Christine Dr	06/25/20	nd	06/24/20	13:55		06/30/20	1.0	PLS			FALSE	O	EGLE Lab
74089	5160 Christine Dr	04/23/18	nd	04/19/18	14:24		04/24/18	1.0	PLS			FALSE	O	DEQ Lab
74088	5160 Christine Dr	10/30/14	nd	10/29/14	10:15		10/31/14	1.0	PLS			FALSE	O	DEQ Lab
85479	5161 Christine Dr	06/09/22	nd	06/08/22	14:35		06/17/22	0.5	PLS			FALSE	O	EGLE Lab
80005	5161 Christine Dr	06/25/20	nd	06/24/20	13:35		06/30/20	1.0	PLS			FALSE	O	EGLE Lab
74091	5161 Christine Dr	04/26/18	nd	04/25/18	9:30		05/01/18	1.0	PLS			FALSE	O	DEQ Lab
74090	5161 Christine Dr	10/30/14	nd	10/29/14	10:30		11/01/14	1.0	PLS			FALSE	O	DEQ Lab
85480	5163-5165 Christine Dr	06/09/22	nd	06/08/22	14:45		06/09/22	0.5	PLS			FALSE	O	EGLE Lab
80006	5163-5165 Christine Dr	06/25/20	nd	06/24/20	13:20		07/01/20	1.0	PLS			FALSE	O	EGLE Lab
74093	5163-5165 Christine Dr	04/23/18	nd	04/19/18	13:59		04/24/18	1.0	PLS			FALSE	O	DEQ Lab
74092	5163-5165 Christine Dr	10/30/14	nd	10/29/14	10:45		10/31/14	1.0	PLS			FALSE	O	DEQ Lab
85484	5167 Christine Ct	06/09/22	nd	06/08/22	13:45		06/15/22	0.5	PLS			FALSE	O	EGLE Lab
80010	5167 Christine Ct	06/25/20	nd	06/24/20	13:12		07/01/20	1.0	PLS			FALSE	O	EGLE Lab

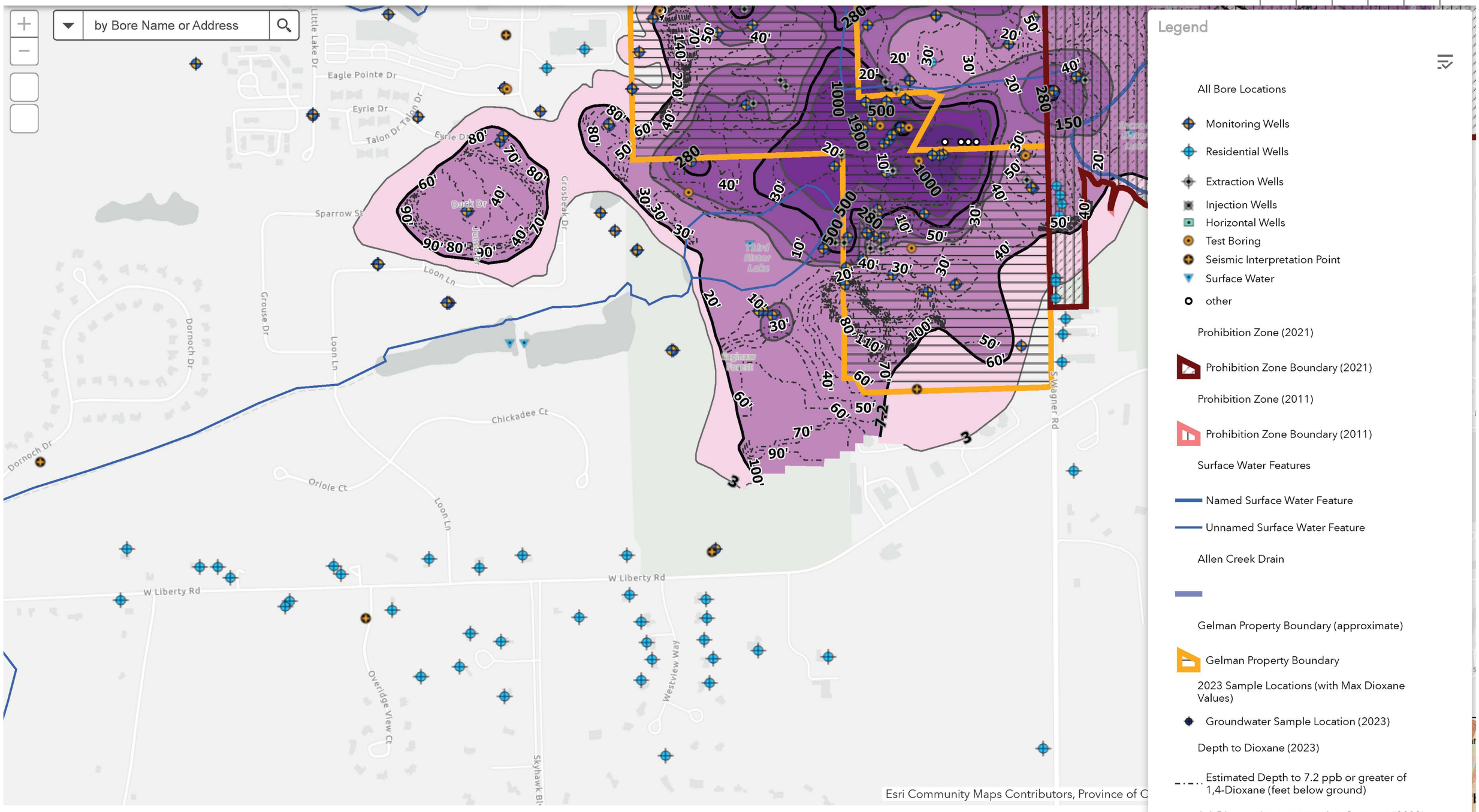
Sample ID	Well Name	Entered	1,4-Dioxane Results (ppb)	Date Sampled	Time Sampled	Date Received	Date Analyzed	Reporting Limit	Reporting Lab	Static Reading	Static Time	Static Only?	Qualifier(s)	Comments
74101	5167 Christine Ct	04/23/18	nd	04/19/18	14:00		04/26/18	1.0	PLS			FALSE	O	DEQ Lab
74100	5167 Christine Ct	10/30/14	nd	10/29/14	11:00		11/01/14	1.0	PLS			FALSE	O	DEQ Lab
85485	5171 Christine Ct	06/09/22	nd	06/08/22	14:48		06/16/22	0.5	PLS			FALSE	O	EGLE Lab
80011	5171 Christine Ct	06/25/20	nd	06/24/20	13:10		07/01/20	1.0	PLS			FALSE	O	EGLE Lab
74358	5171 Christine Ct	08/14/18	nd	08/13/18	9:30		08/15/18	1.0	PLS			FALSE	O	DEQ Lab
74102	5171 Christine Ct	10/30/14	nd	10/29/14	13:15		11/06/14	1.0	PLS			FALSE	O	DEQ Lab
85486	5175 Christine Ct	06/09/22	nd	06/08/22	14:00		06/15/22	0.5	PLS			FALSE	O	EGLE Lab
80012	5175 Christine Ct	06/25/20	nd	06/24/20	12:55		06/30/20	1.0	PLS			FALSE	O	EGLE Lab
74104	5175 Christine Ct	04/23/18	nd	04/19/18	13:39		04/26/18	1.0	PLS			FALSE	O	DEQ Lab
74103	5175 Christine Ct	10/30/14	nd	10/29/14	13:10		11/06/14	1.0	PLS			FALSE	O	DEQ Lab
85487	5179 Christine Ct	06/09/22	nd	06/08/22	13:55		06/13/22	0.5	PLS			FALSE	O	EGLE Lab
74106	5179-5181 Christine Ct	04/23/18	nd	04/19/18	13:40		04/24/18	1.0	PLS			FALSE	O	DEQ Lab
74105	5179-5181 Christine Ct	10/30/14	nd	10/29/14	13:35		11/06/14	1.0	PLS			FALSE	O	DEQ Lab
85488	5181 Christine Ct	06/09/22	nd	06/08/22	13:45		06/13/22	0.5	PLS			FALSE	O	EGLE Lab
85481	5183-5185 Christine Dr	06/09/22	nd	06/09/22	14:10		06/15/22	0.5	PLS			FALSE	O	EGLE Lab
80007	5183-5185 Christine Dr	06/25/20	nd	06/24/20	13:28		07/01/20	1.0	PLS			FALSE	O	EGLE Lab
74095	5183-5185 Christine Dr	04/26/18	nd	04/24/18	13:59		05/01/18	1.0	PLS			FALSE	O	DEQ Lab
74094	5183-5185 Christine Dr	10/30/14	nd	10/29/14	13:50		11/06/14	1.0	PLS			FALSE	O	DEQ Lab
85482	5188 Christine Dr	06/09/22	nd	06/08/22	14:20		06/13/22	0.5	PLS			FALSE	O	EGLE Lab
80008	5188 Christine Dr	06/25/20	nd	06/24/20	13:45		07/01/20	1.0	PLS			FALSE	O	EGLE Lab
74097	5188 Christine Dr	04/23/18	nd	04/19/18	15:00		04/26/18	1.0	PLS			FALSE	O	DEQ Lab
74096	5188 Christine Dr	10/30/14	nd	10/29/14	10:50		10/31/14	1.0	PLS			FALSE	O	DEQ Lab
74068	521 Florence St	04/23/18	nd	04/19/18	13:22		04/24/18	1.0	PLS			FALSE	O	DEQ Lab
74067	521 Florence St	10/30/14	nd	10/29/14	13:45		11/06/14	1.0	PLS			FALSE	O	DEQ Lab
74069	565 Florence St	10/30/14	nd	10/29/14	14:05		11/06/14	1.0	PLS			FALSE	O	DEQ Lab
74070	584 Florence St	10/30/14	nd	10/29/14	14:05		11/01/14	1.0	PLS			FALSE	O	DEQ Lab
85457	595 Sciomeadow Dr	06/09/22	nd	06/08/22	10:50		06/10/22	0.5	PLS			FALSE	O	EGLE Lab
79985	595 Sciomeadow Dr	06/18/20	nd	06/18/20	10:51		06/26/20	1.0	PLS			FALSE	O	EGLE Lab
74349	595 Sciomeadow Dr	10/29/14	nd	10/28/14	14:40		10/30/14	1.0	PLS			FALSE	O	DEQ Lab
85458	598 Sciomeadow Dr	06/09/22	nd	06/08/22	11:00		06/14/22	0.5	PLS			FALSE	O	EGLE Lab
79986	598 Sciomeadow Dr	06/18/20	nd	06/18/20	11:03		06/26/20	1.0	PLS			FALSE	O	EGLE Lab
74350	598 Sciomeadow Dr	10/29/14	nd	10/28/14	14:25		10/30/14	1.0	PLS			FALSE	O	DEQ Lab
74071	603 Florence St	11/01/14	nd	10/31/14	10:15		11/12/14	1.0	PLS			FALSE	O	DEQ Lab
74345	619 Ridgemont Ln	10/30/14	nd	10/29/14	11:20		11/12/14	1.0	PLS			FALSE	O	DEQ Lab
85459	627 Sciomeadow Dr	06/09/22	nd	06/08/22	11:00		06/14/22	0.5	PLS			FALSE	O	EGLE Lab
79987	627 Sciomeadow Dr	06/18/20	nd	06/18/20	11:11		06/26/20	1.0	PLS			FALSE	O	EGLE Lab
74351	627 Sciomeadow Dr	10/29/14	nd	10/28/14	14:18		10/30/14	1.0	PLS			FALSE	O	DEQ Lab
74072	630 Florence St	11/01/14	nd	10/31/14	10:15		11/12/14	1.0	PLS			FALSE	O	DEQ Lab
85460	630 Sciomeadow Dr	06/09/22	nd	06/08/22	10:52		06/15/22	0.5	PLS			FALSE	O	EGLE Lab
82733	630 Sciomeadow Dr	04/15/21	nd	04/15/21	11:00		04/20/21	1.0	PLS			FALSE	O	EGLE Lab
79988	630 Sciomeadow Dr	06/18/20	nd	06/18/20	11:22		06/26/20	1.0	PLS			FALSE	O	EGLE Lab
74352	630 Sciomeadow Dr	10/29/14	nd	10/28/14	14:50		10/30/14	1.0	PLS			FALSE	O	DEQ Lab
74346	642 Ridgemont Ln	10/30/14	nd	10/29/14	9:45		10/31/14	1.0	PLS			FALSE	O	DEQ Lab
85461	659 Sciomeadow Dr	06/09/22	nd	06/08/22	11:05		06/15/22	0.5	PLS			FALSE	O	EGLE Lab
79989	659 Sciomeadow Dr	06/18/20	nd	06/18/20	11:26		06/26/20	1.0	PLS			FALSE	O	EGLE Lab
74353	659 Sciomeadow Dr	10/29/14	nd	10/28/14	14:28		10/30/14	1.0	PLS			FALSE	O	DEQ Lab
85466	663 Halcyon Ct	06/09/22	nd	06/08/22	11:35		06/17/22	0.5	PLS			FALSE	O	EGLE Lab
79993	663 Halcyon Ct	06/25/20	nd	06/24/20	14:14		07/01/20	1.0	PLS			FALSE	O	EGLE Lab
74339	663 Halcyon Ct	11/01/14	nd	10/31/14	10:55		11/12/14	1.0	PLS			FALSE	O	DEQ Lab
74073	670 Florence St	11/01/14	nd	10/31/14	10:02		11/12/14	1.0	PLS			FALSE	O	DEQ Lab
85467	672 Halcyon Ct	06/09/22	nd	06/08/22	11:43		06/15/22	0.5	PLS			FALSE	O	EGLE Lab
79994	672 Halcyon Ct	06/25/20	nd	06/24/20	14:23		06/30/20	1.0	PLS			FALSE	O	EGLE Lab
74340	672 Halcyon Ct	11/01/14	nd	10/31/14	11:12		11/12/14	1.0	PLS			FALSE	O	DEQ Lab

Sample ID	Well Name	Entered	1,4-Dioxane Results (ppb)	Date Sampled	Time Sampled	Date Received	Date Analyzed	Reporting Limit	Reporting Lab	Static Reading	Static Time	Static Only?	Qualifier(s)	Comments
85462	672 Sciomeadow Dr	06/09/22	nd	06/08/22	11:13		06/14/22	0.5	PLS			FALSE	O	EGLE Lab
79990	672 Sciomeadow Dr	06/18/20	nd	06/18/20	11:35		06/24/20	1.0	PLS			FALSE	O	EGLE Lab
74354	672 Sciomeadow Dr	10/29/14	nd	10/28/14	14:50		10/30/14	1.0	PLS			FALSE	O	DEQ Lab
74347	679 Ridgemont Ln	10/30/14	nd	10/29/14	11:20		11/01/14	1.0	PLS			FALSE	O	DEQ Lab
74348	684 Ridgemont Ln	10/30/14	nd	10/29/14	11:30		11/01/14	1.0	PLS			FALSE	O	DEQ Lab
85463	691 Sciomeadow Dr	06/09/22	nd	06/08/22	11:15		06/09/22	0.5	PLS			FALSE	O	EGLE Lab
79991	691 Sciomeadow Dr	06/18/20	nd	06/18/20	11:44		06/26/20	1.0	PLS			FALSE	O	EGLE Lab
74355	691 Sciomeadow Dr	10/29/14	nd	10/28/14	15:05		10/30/14	1.0	PLS			FALSE	O	DEQ Lab
74341	705 Halcyon Ct	11/01/14	nd	10/31/14	11:05		11/12/14	1.0	PLS			FALSE	O	DEQ Lab
74074	706 Florence St	11/01/14	nd	10/31/14	9:50		11/12/14	1.0	PLS			FALSE	O	DEQ Lab
74342	714 Halcyon Ct	11/01/14	nd	10/31/14	11:20		11/12/14	1.0	PLS			FALSE	O	DEQ Lab
79992	714 Sciomeadow Dr	06/18/20	nd	06/18/20	11:57		06/26/20	1.0	PLS			FALSE	O	EGLE Lab
74356	714 Sciomeadow Dr	10/29/14	nd	10/28/14	15:00		10/30/14	1.0	PLS			FALSE	O	DEQ Lab
85464	733 Sciomeadow Dr	06/09/22	nd	06/08/22	11:20		06/16/22	0.5	PLS			FALSE	O	EGLE Lab
81441	733 Sciomeadow Dr	06/19/20	nd	06/18/20	11:53		06/26/20	1.0	PLS			FALSE	O	EGLE Lab
85465	756 Sciomeadow Dr	06/09/22	nd	06/08/22	11:30		06/10/22	0.5	PLS			FALSE	O	EGLE Lab
81442	756 Sciomeadow Dr	06/19/20	nd	06/18/20	12:04		06/26/20	1.0	PLS			FALSE	O	EGLE Lab
81443	788 Sciomeadow Dr	06/19/20	nd	06/18/20	12:10		06/24/20	1.0	PLS			FALSE	O	EGLE Lab
90470	MW-136d	05/01/24	nd	05/01/24	13:30		05/03/24	1.0	PLS	1.88	9:52	FALSE		
89808	MW-136d	12/11/23	nd	12/11/23	12:28		12/13/23	1.0	PLS	3.09	9:04	FALSE		
86624	MW-136d	06/19/23	nd	06/19/23	12:52		06/20/23	1.0	PLS	3.32	9:24	FALSE		
85031	MW-136d	11/29/22	nd	11/29/22	13:31		11/30/22	1.0	PLS	3.40	10:08	FALSE		
85680	MW-136d	09/22/22		09/22/22					PLS	3.30	13:16	FALSE		3rd Qtr 22 Maps
84392	MW-136d	06/10/22	nd	06/10/22	12:20		06/14/22	1.0	PLS	1.44	9:06	FALSE		
82860	MW-136d	12/15/21	nd	12/15/21	11:58		12/16/21	1.0	PLS	1.83	11:15	FALSE	O	
81398	MW-136d	06/07/21	nd	06/07/21	11:31		06/08/21	1.0	PLS	3.14	10:25	FALSE		
79613	MW-136d	11/30/20	nd	11/30/20	11:56		12/09/20	1.0	PLS	2.85	10:48	FALSE	O	
78687	MW-136d	05/07/20	nd	05/07/20	9:01		05/11/20	1.0	PLS	1.56	7:52	FALSE		
77969	MW-136d	12/02/19	nd	12/02/19	11:07		12/06/19	1.0	PLS	2.30	9:59	FALSE		
75641	MW-136d	04/11/19	nd	04/11/19	11:01		04/12/19	1.0	PLS	2.14	8:48	FALSE		
74689	MW-136d	10/29/18	nd	10/29/18	9:21		11/02/18	1.0	PLS	3.36	8:14	FALSE	O	
73489	MW-136d	04/19/18	nd	04/19/18	11:25		04/20/18	1.0	PLS	1.43	9:08	FALSE		
72623	MW-136d	10/24/17	nd	10/24/17	9:36		10/27/17	1.0	PLS	3.04	8:30	FALSE	O	ATS
71671	MW-136d	04/18/17	nd	04/18/17	8:55		04/19/17	1.0	PLS	1.15	7:38	FALSE		
71397	MW-136d	03/21/17		03/21/17			03/21/17		PLS	1.86	9:38	FALSE		
70825	MW-136d	11/03/16	nd	11/03/16	10:45		11/04/16	1.0	PLS	2.80	9:15	FALSE		
70227	MW-136d	09/21/16		09/21/16					PLS	3.52	10:37	FALSE		
68730	MW-136d	04/20/16	nd	04/20/16	14:34		04/23/16	1.0	PLS	1.85	14:12	FALSE		
68435	MW-136d	03/22/16		03/22/16	11:16		03/22/16		PLS	2.14	11:16	FALSE		
67477	MW-136d	10/19/15	nd	10/19/15	13:49		10/22/15	1.0	PLS	3.05	13:11	FALSE		
66517	MW-136d	04/15/15	nd	04/15/15	13:41		04/17/15	1.0	PLS	2.38	13:04	FALSE		
66136	MW-136d	03/30/15		03/30/15					PLS	2.55	11:29	FALSE		
65950	MW-136d	02/24/15		02/24/15					PLS	3.05	8:40	FALSE		
65807	MW-136d	01/20/15		01/20/15					PLS	2.81	10:53	FALSE		
65691	MW-136d	12/09/14	nd	12/09/14	11:45		12/17/14	1.0	PLS	2.87	11:04	FALSE		
90471	MW-136i	05/01/24	nd	05/01/24	12:12		05/03/24	1.0	PLS	2.11	9:50	FALSE		
89807	MW-136i	12/11/23	nd	12/11/23	11:16		12/13/23	1.0	PLS	3.31	9:03	FALSE		
86625	MW-136i	06/19/23	nd	06/19/23	11:38		06/28/23	1.0	PLS	3.60	9:22	FALSE		
85030	MW-136i	11/29/22	nd	11/29/22	12:20		11/30/22	1.0	PLS	3.72	10:06	FALSE		
85545	MW-136i	09/22/22		09/22/22					PLS	3.50	13:16	FALSE		3rd Qtr 22 Maps
84391	MW-136i	06/10/22	nd	06/10/22	11:11		06/14/22	1.0	PLS	1.83	9:05	FALSE		
82861	MW-136i	12/15/21	nd	12/15/21	12:38		12/16/21	1.0	PLS	2.03	11:16	FALSE	O	
81399	MW-136i	06/07/21	nd	06/07/21	12:40		06/08/21	1.0	PLS	3.32	10:29	FALSE		

Sample ID	Well Name	Entered	1,4-Dioxane Results (ppb)	Date Sampled	Time Sampled	Date Received	Date Analyzed	Reporting Limit	Reporting Lab	Static Reading	Static Time	Static Only?	Qualifier(s)	Comments
79612	MW-136i	11/30/20	nd	11/30/20	13:05		12/09/20	1.0	PLS	3.10	10:50	FALSE	O	
78688	MW-136i	05/07/20	nd	05/07/20	10:12		05/11/20	1.0	PLS	2.02	7:58	FALSE		
77968	MW-136i	12/02/19	nd	12/02/19	12:30		12/06/19	1.0	PLS	2.50	10:07	FALSE		
75646	MW-136i	04/11/19	nd	04/11/19	9:47		04/12/19	1.0	PLS	2.31	8:38	FALSE		
74690	MW-136i	10/29/18	nd	10/29/18	10:36		11/02/18	1.0	PLS	3.59	8:22	FALSE	O	
73490	MW-136i	04/19/18	nd	04/19/18	12:44		04/20/18	1.0	PLS	1.67	10:44	FALSE		
72624	MW-136i	10/24/17	nd	10/24/17	10:52		10/27/17	1.0	PLS	3.31	8:40	FALSE	O	ATS
71669	MW-136i	04/18/17	nd	04/18/17	10:15		04/19/17	1.0	PLS	1.61	7:37	FALSE		
71398	MW-136i	03/21/17		03/21/17			03/21/17		PLS	2.11	9:37	FALSE		
70824	MW-136i	11/03/16	nd	11/03/16	11:40		11/04/16	1.0	PLS	3.01	9:16	FALSE		
70226	MW-136i	09/21/16		09/21/16					PLS	3.76	10:38	FALSE		
68729	MW-136i	04/20/16	nd	04/20/16	14:06		04/23/16	1.0	PLS	2.14	13:57	FALSE		
68436	MW-136i	03/22/16		03/22/16	11:16		03/22/16		PLS	2.40	11:16	FALSE		
67478	MW-136i	10/19/15	nd	10/19/15	14:16		10/22/15	1.0	PLS	3.41	13:15	FALSE		
66518	MW-136i	04/15/15	nd	04/15/15	14:03		04/17/15	1.0	PLS	2.55	13:05	FALSE		
66137	MW-136i	03/30/15		03/30/15					PLS	2.78	11:28	FALSE		
65949	MW-136i	02/24/15		02/24/15					PLS	3.41	8:39	FALSE		
65808	MW-136i	01/20/15		01/20/15					PLS	3.18	10:52	FALSE		
65690	MW-136i	12/09/14	nd	12/09/14	12:20		12/17/14	1.0	PLS	3.17	11:08	FALSE		
90469	MW-136s	05/01/24	nd	05/01/24	10:57		05/03/24	1.0	PLS	2.10	9:45	FALSE		
89806	MW-136s	12/11/23	nd	12/11/23	10:02		12/13/23	1.0	PLS	3.27	8:55	FALSE		
86626	MW-136s	06/19/23	nd	06/19/23	10:24		06/20/23	1.0	PLS	3.48	9:15	FALSE		
85029	MW-136s	11/29/22	nd	11/29/22	11:07		11/30/22	1.0	PLS	3.67	10:01	FALSE		
85546	MW-136s	09/22/22		09/22/22					PLS	3.50	13:14	FALSE		3rd Qtr 22 Maps
84390	MW-136s	06/10/22	nd	06/10/22	10:05		06/14/22	1.0	PLS	1.85	8:59	FALSE		
82862	MW-136s	12/15/21	nd	12/15/21	13:40		12/16/21	1.0	PLS	2.05	11:17	FALSE	O	
81400	MW-136s	06/07/21	nd	06/07/21	13:50		06/08/21	1.0	PLS	3.28	10:31	FALSE		
79611	MW-136s	11/30/20	nd	11/30/20	10:46		12/09/20	1.0	PLS	3.06	9:40	FALSE	O	
78686	MW-136s	05/07/20	nd	05/07/20	8:24		05/11/20	1.0	PLS	2.06	8:00	FALSE		
77967	MW-136s	12/02/19	nd	12/02/19	13:49		12/06/19	1.0	PLS	2.45	10:09	FALSE		
75645	MW-136s	04/11/19	nd	04/11/19	10:10		04/12/19	1.0	PLS	2.33	8:49	FALSE		
74691	MW-136s	10/29/18	nd	10/29/18	11:49		11/01/18	1.0	PLS	3.58	8:24	FALSE	O	
73491	MW-136s	04/19/18	nd	04/19/18	13:56		04/20/18	1.0	PLS	1.73	10:47	FALSE		
72625	MW-136s	10/24/17	nd	10/24/17	12:14		10/27/17	1.0	PLS	3.27	8:42	FALSE	O	ATS
71670	MW-136s	04/18/17	nd	04/18/17	11:40		04/19/17	1.0	PLS	1.71	7:39	FALSE		
71399	MW-136s	03/21/17		03/21/17			03/21/17		PLS	2.12	9:36	FALSE		
70819	MW-136s	11/03/16	nd	11/03/16	12:40		11/04/16	1.0	PLS	3.00	9:17	FALSE		
70225	MW-136s	09/21/16		09/21/16					PLS	3.72	10:39	FALSE		
68728	MW-136s	04/20/16	nd	04/20/16	13:50		04/23/16	1.0	PLS	2.17	13:42	FALSE		
68437	MW-136s	03/22/16		03/22/16	11:16		03/22/16		PLS	2.39	11:16	FALSE		
67479	MW-136s	10/19/15	nd	10/19/15	14:31		10/22/15	1.0	PLS	3.37	13:16	FALSE		
66519	MW-136s	04/15/15	nd	04/15/15	14:16		04/16/15	1.0	PLS	2.55	13:06	FALSE		
66138	MW-136s	03/30/15		03/30/15					PLS	2.76	11:27	FALSE		
65948	MW-136s	02/24/15		02/24/15					PLS	3.37	8:37	FALSE		
65809	MW-136s	01/20/15		01/20/15					PLS	3.15	10:51	FALSE		
65689	MW-136s	12/09/14	nd	12/09/14	12:43		12/17/14	1.0	PLS	3.14	11:09	FALSE		

Gelman Site of 1,4-Dioxane Contamination

More Information Download Data



Legend

All Bore Locations

- Monitoring Wells
- Residential Wells
- Extraction Wells
- Injection Wells
- Horizontal Wells
- Test Boring
- Seismic Interpretation Point
- Surface Water
- other

Prohibition Zone (2021)

- Prohibition Zone Boundary (2021)

Prohibition Zone (2011)

- Prohibition Zone Boundary (2011)

Surface Water Features

- Named Surface Water Feature
- Unnamed Surface Water Feature

Allen Creek Drain

Gelman Property Boundary (approximate)

- Gelman Property Boundary

2023 Sample Locations (with Max Dioxane Values)

- Groundwater Sample Location (2023)

Depth to Dioxane (2023)

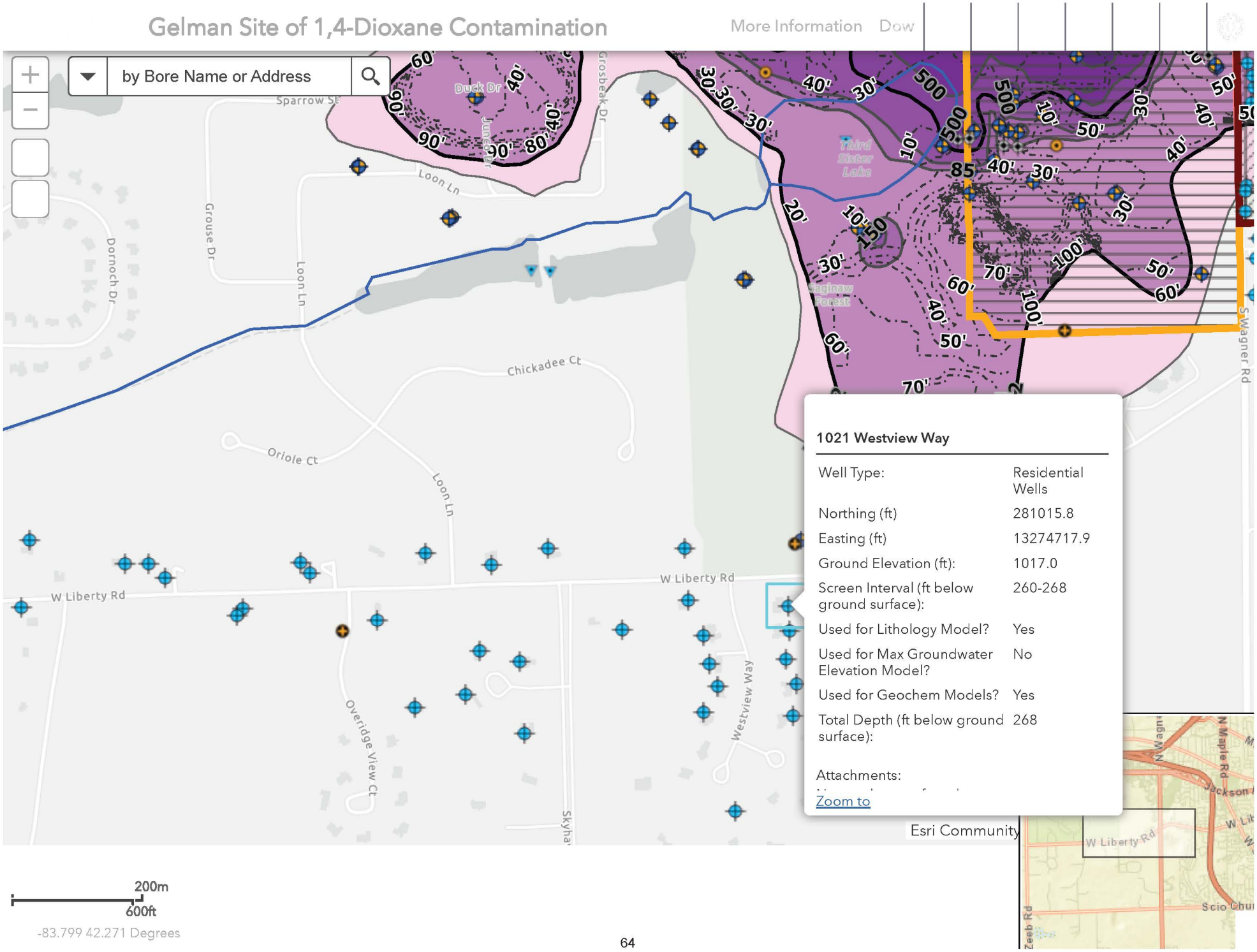
- Estimated Depth to 7.2 ppb or greater of 1,4-Dioxane (feet below ground)

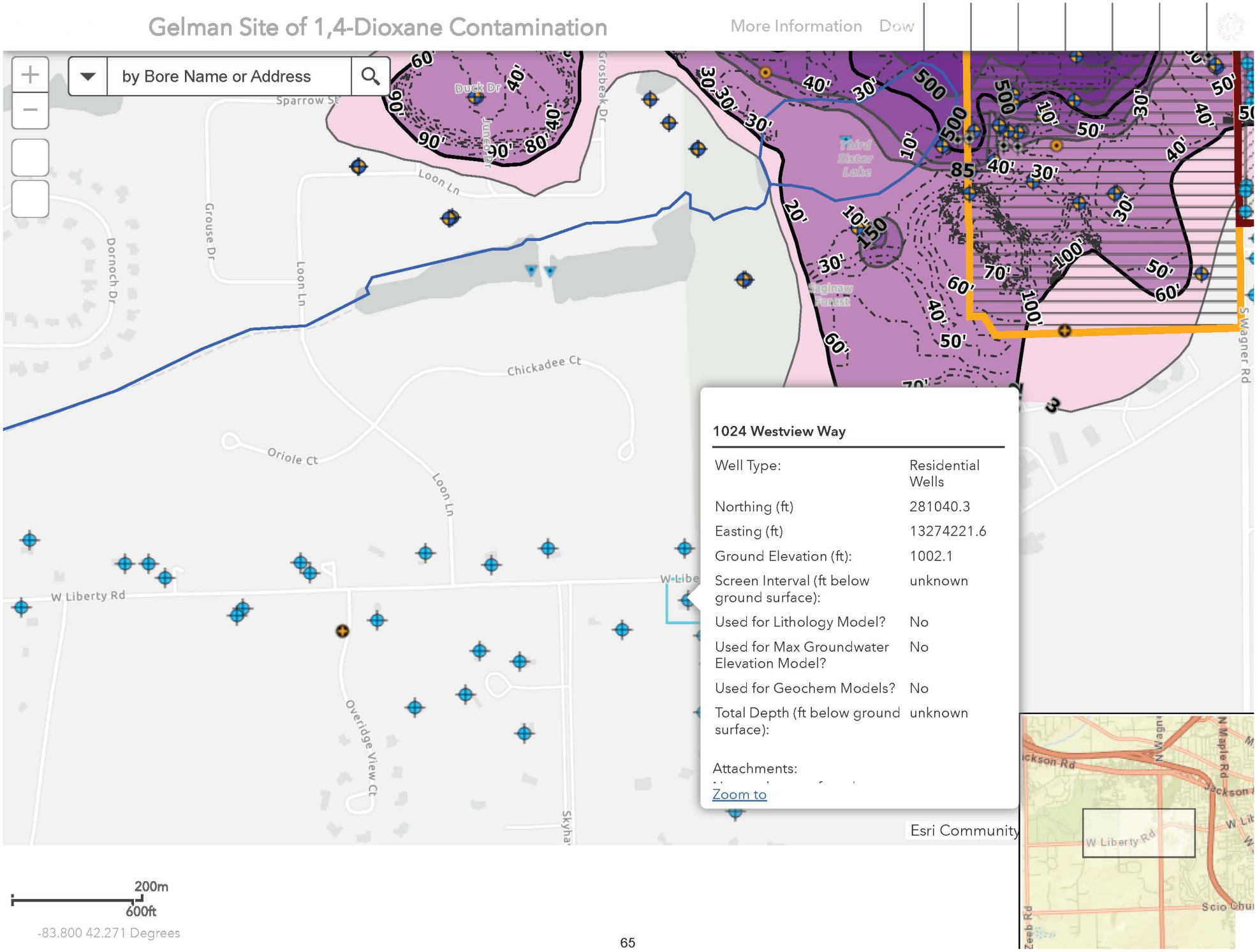
1,4-Dioxane Isoconcentration Contours (2023)

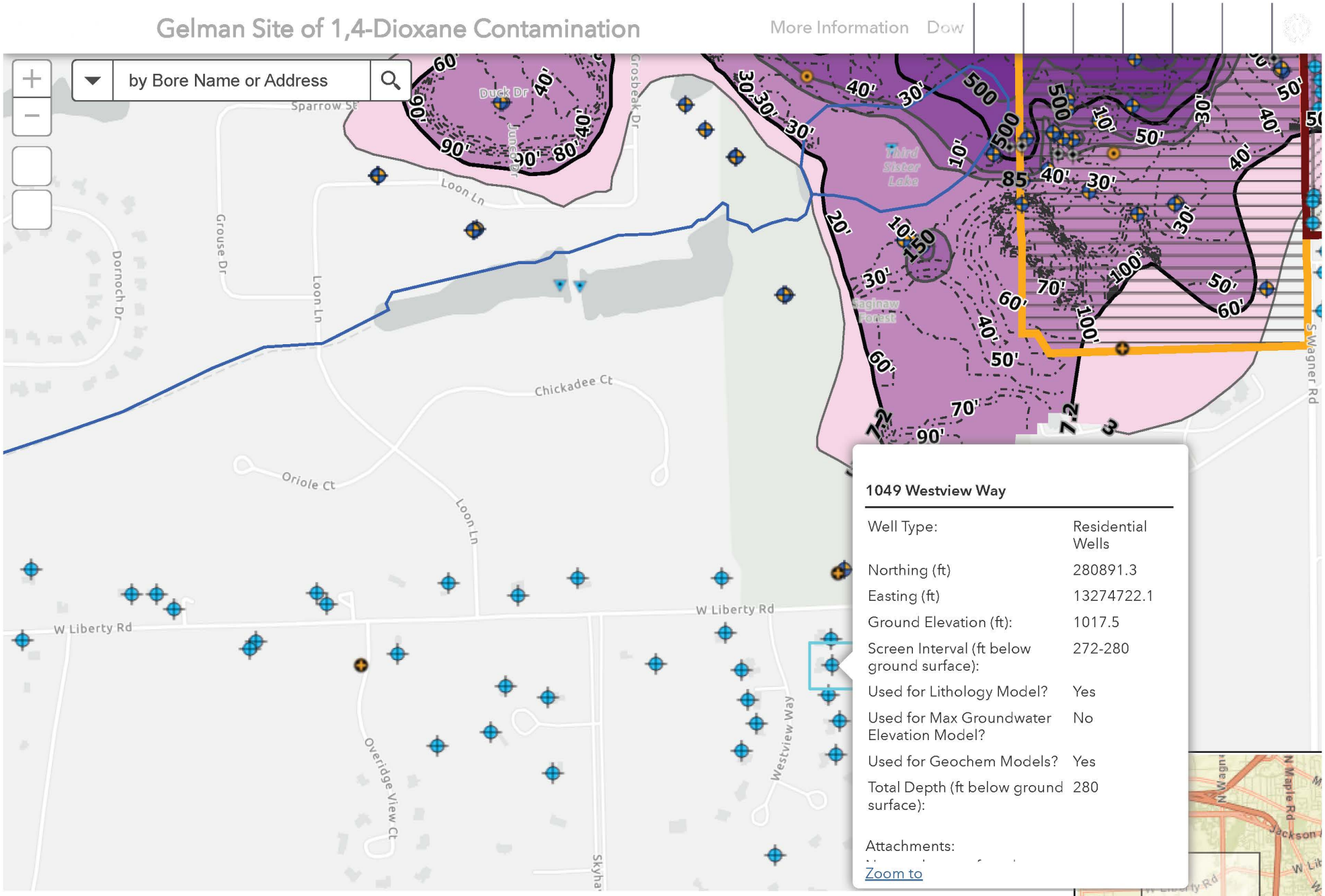
- 3.0 ppb
- 7.2 ppb

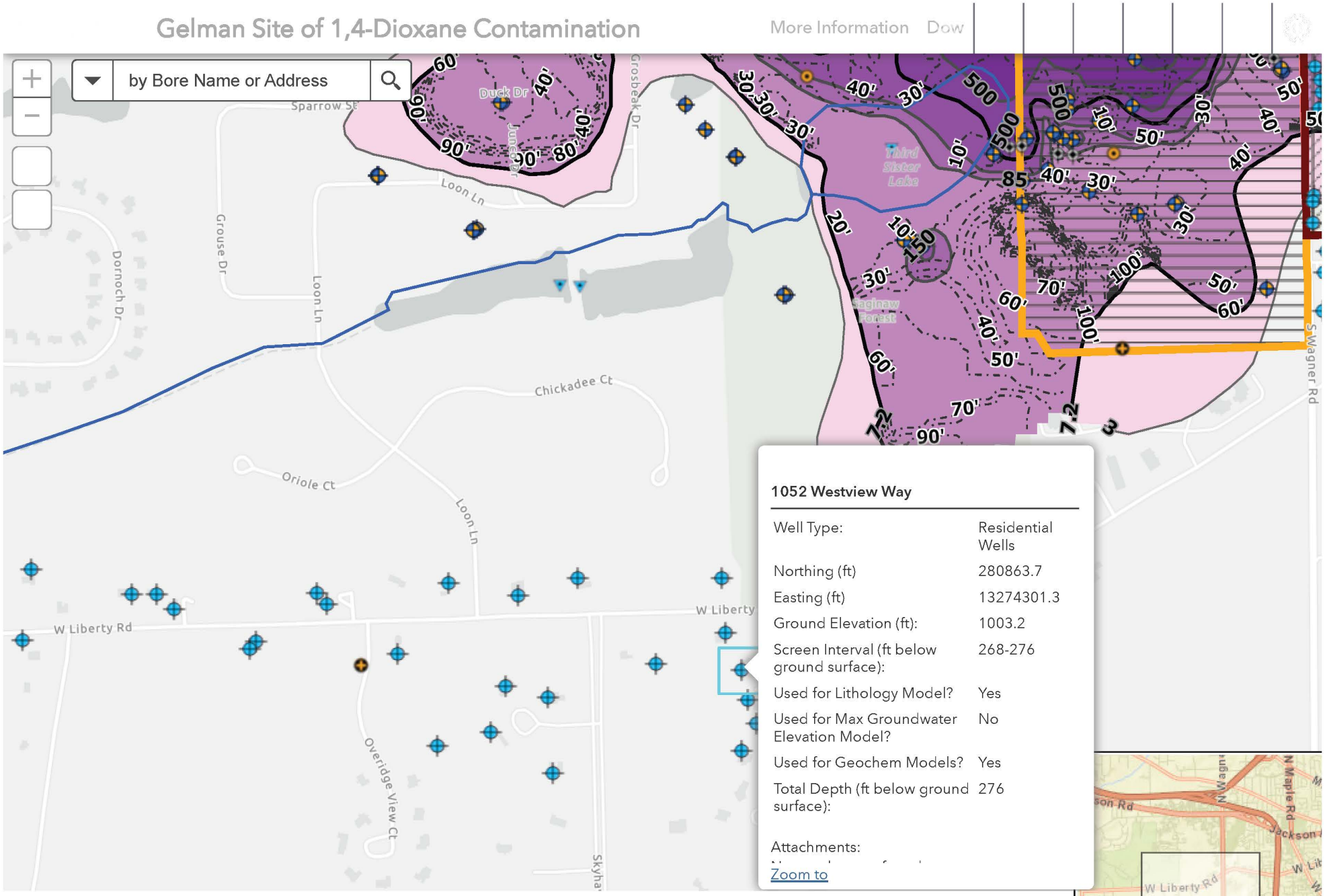
200m
600ft

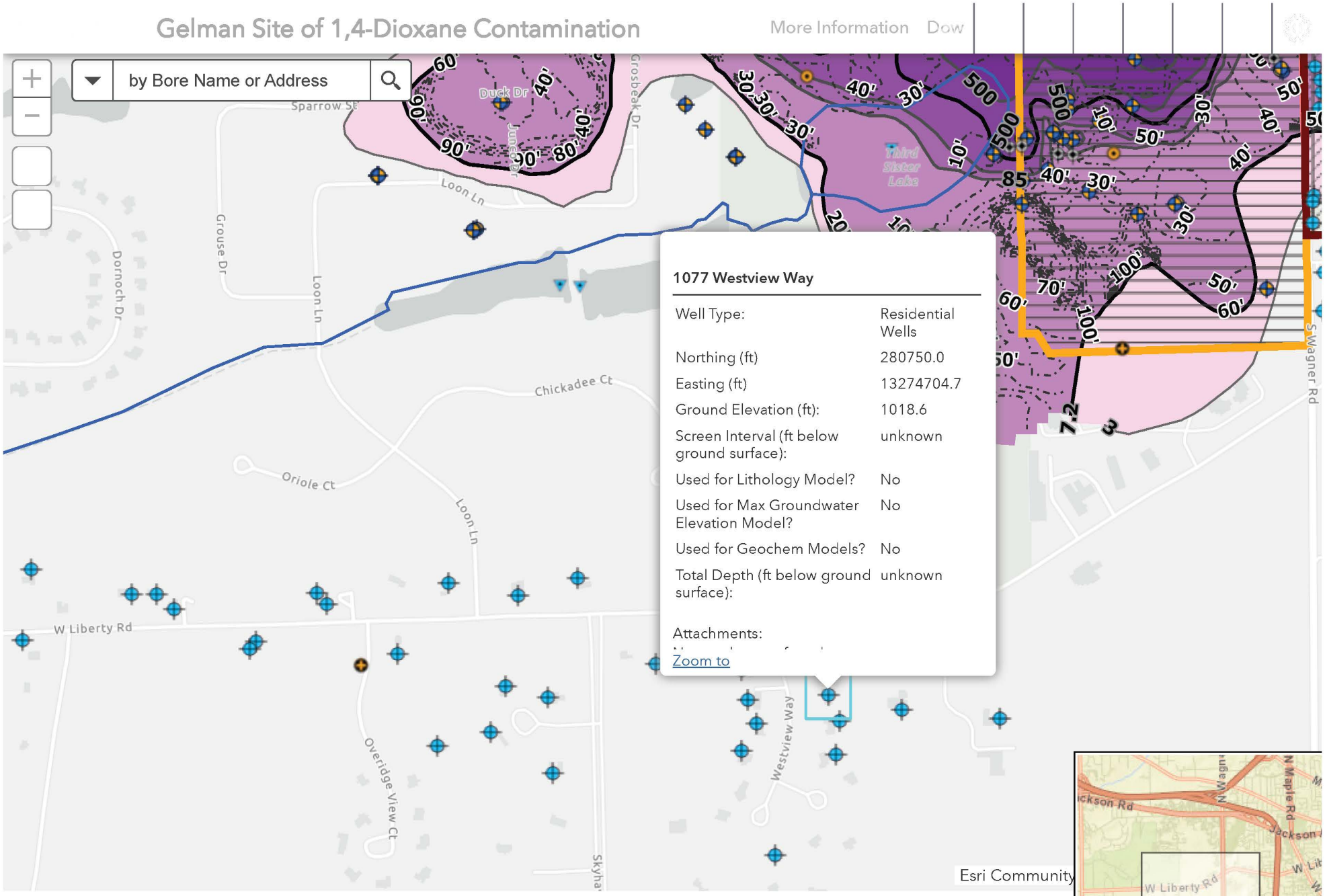
-83.804 42.271 Degrees

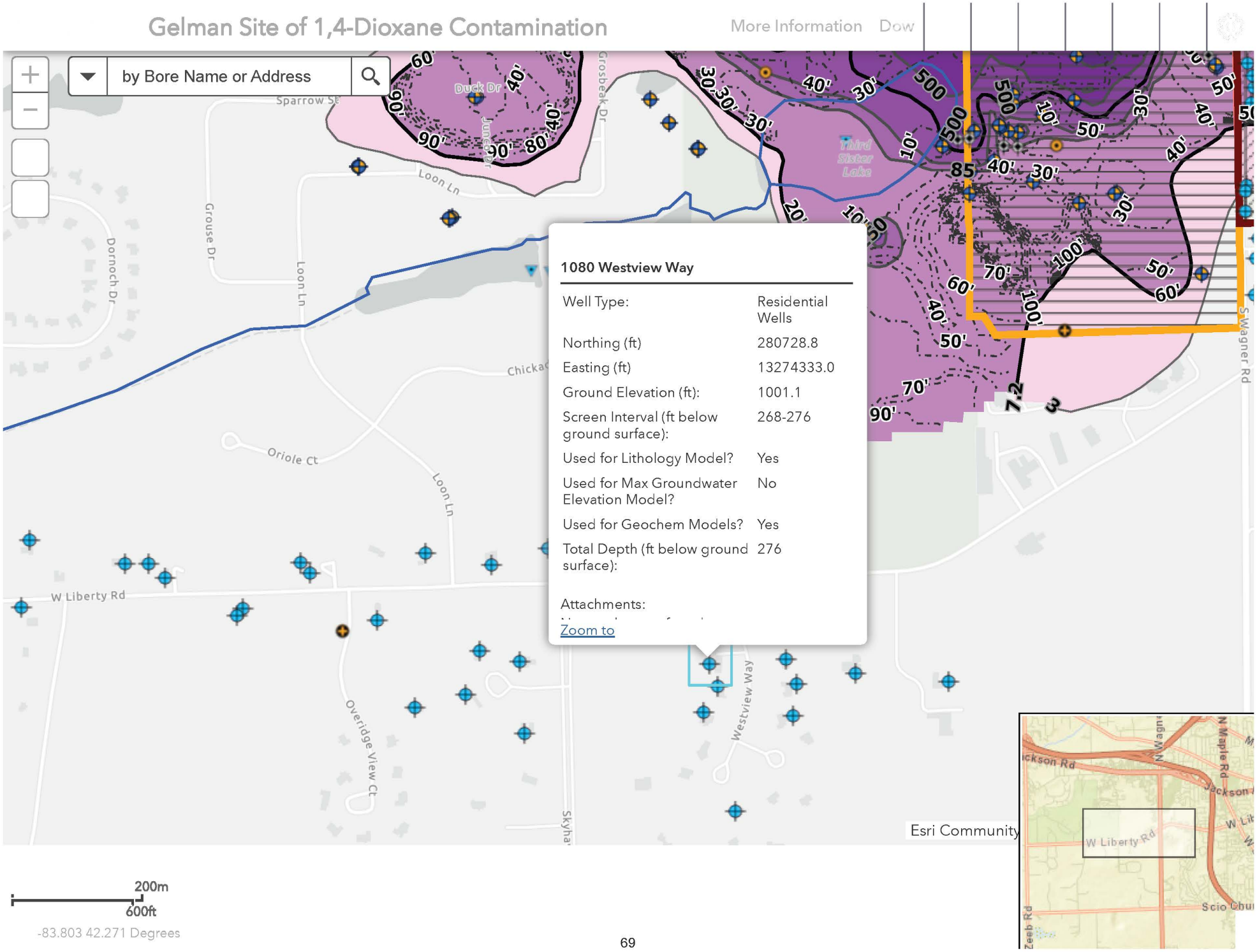

Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
Duck Dr
Sparrow St
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Chickadee Ct
Oriole Ct
W Liberty Rd
Overidge View Ct
Westview Way
Third Sister Lake
Saginaw Forest
S Wagner Rd
1021 Westview Way
Well Type: Residential Wells
Northing (ft) 281015.8
Easting (ft) 13274717.9
Ground Elevation (ft): 1017.0
Screen Interval (ft below ground surface): 260-268
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 268
Attachments:
Zoom to
Esri Community
N Maple Rd
Scio Church Rd
200m
600ft
-83.799 42.271 Degrees

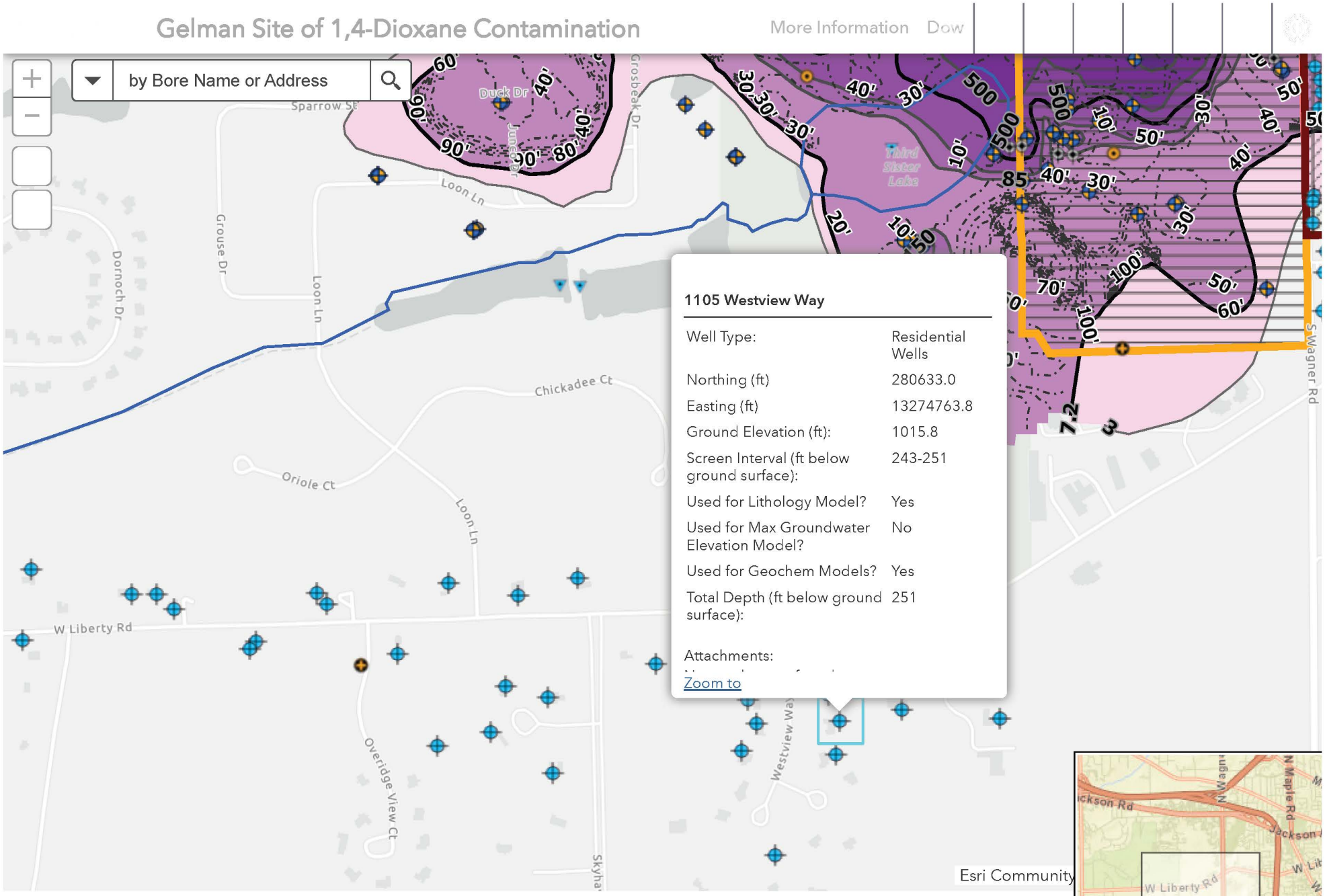

Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
Duck Dr
Sparrow St
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Chickadee Ct
Oriole Ct
W Liberty Rd
Overidge View Ct
Third Sister Lake
Saginaw Forest
Wagner Rd
1024 Westview Way
Well Type: Residential Wells
Northing (ft) 281040.3
Easting (ft) 13274221.6
Ground Elevation (ft): 1002.1
Screen Interval (ft below ground surface): unknown
Used for Lithology Model? No
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? No
Total Depth (ft below ground surface): unknown
Attachments:
Zoom to
Esri Community
200m
600ft
-83.800 42.271 Degrees

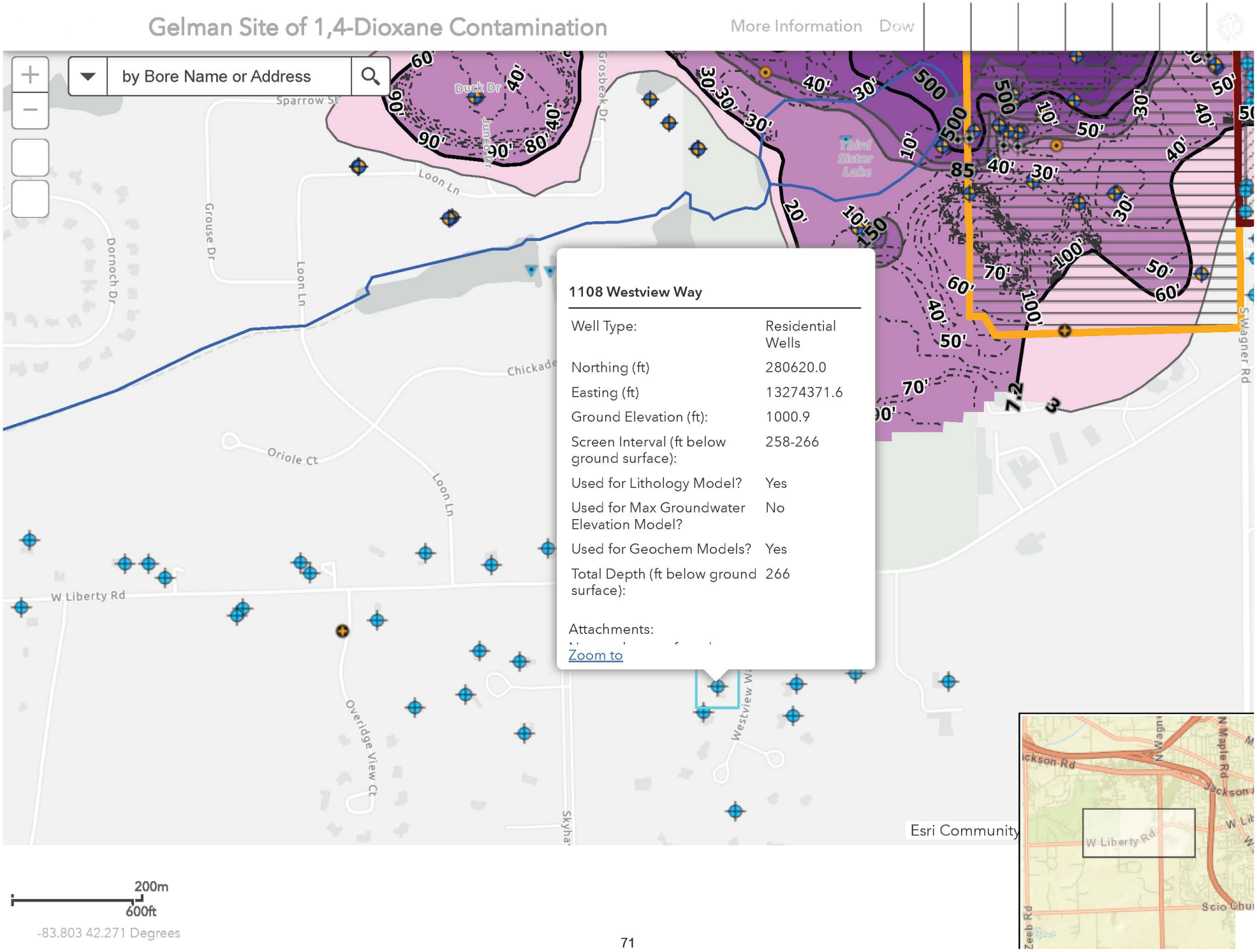

by Bore Name or Address
Duck Dr
Sparrow St
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Chickadee Ct
Oriole Ct
W Liberty Rd
Overidge View Ct
Westview Way
Third Sister Lake
Saginaw Forest
S Wagner Rd
1049 Westview Way
Well Type: Residential Wells
Northing (ft) 280891.3
Easting (ft) 13274722.1
Ground Elevation (ft): 1017.5
Screen Interval (ft below ground surface): 272-280
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 280
Attachments:
Zoom to
200m
600ft
-83.811 42.272 Degrees

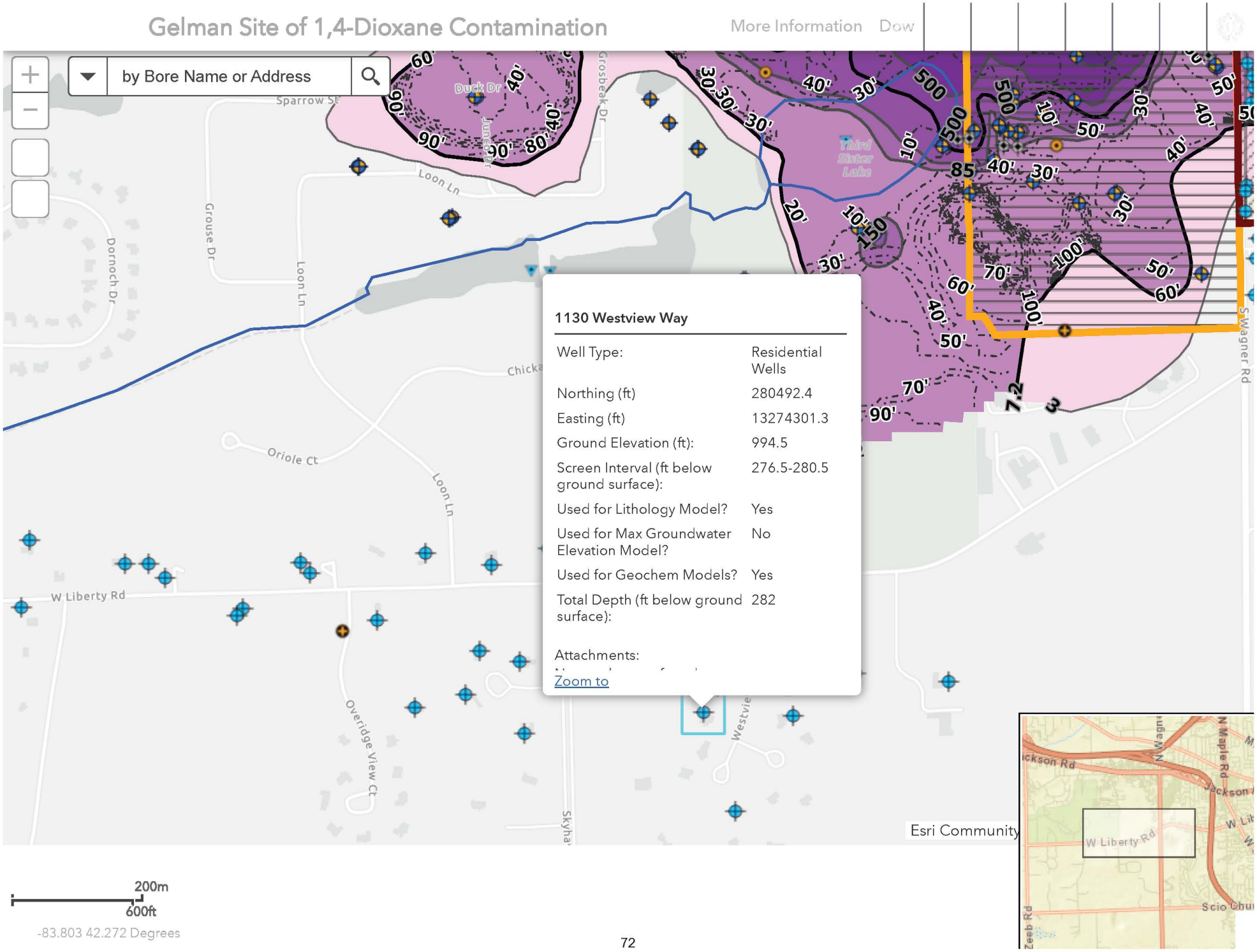

by Bore Name or Address
Duck Dr
Sparrow St
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Chickadee Ct
Oriole Ct
W Liberty Rd
Overidge View Ct
Third Sister Lake
Saginaw Forest
S Wagner Rd
1052 Westview Way
Well Type: Residential Wells
Northing (ft) 280863.7
Easting (ft) 13274301.3
Ground Elevation (ft): 1003.2
Screen Interval (ft below ground surface): 268-276
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 276
Attachments:
Zoom to
200m
600ft
-83.802 42.271 Degrees

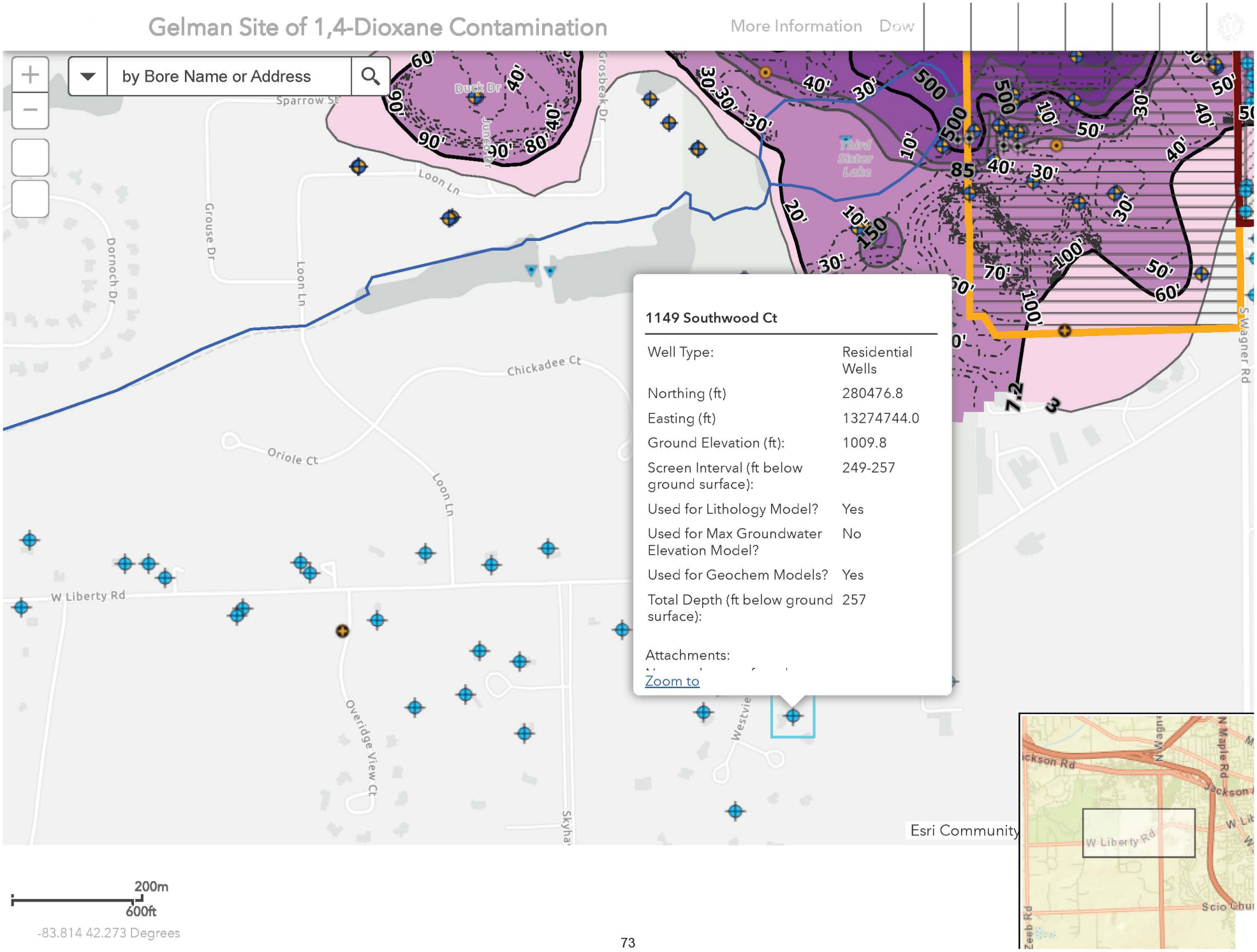

by Bore Name or Address
1077 Westview Way
Well Type: Residential Wells
Northing (ft) 280750.0
Easting (ft) 13274704.7
Ground Elevation (ft): 1018.6
Screen Interval (ft below ground surface): unknown
Used for Lithology Model? No
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? No
Total Depth (ft below ground surface): unknown
Attachments:
Zoom to
Duck Dr
Sparrow St
Grosbeak Dr
Third Sister Lake
Loon Ln
Grouse Dr
Dornoch Dr
Chickadee Ct
Oriole Ct
W Liberty Rd
Westview Way
Overidge View Ct
S Wagner Rd
Esri Community
200m
600ft
-83.803 42.271 Degrees

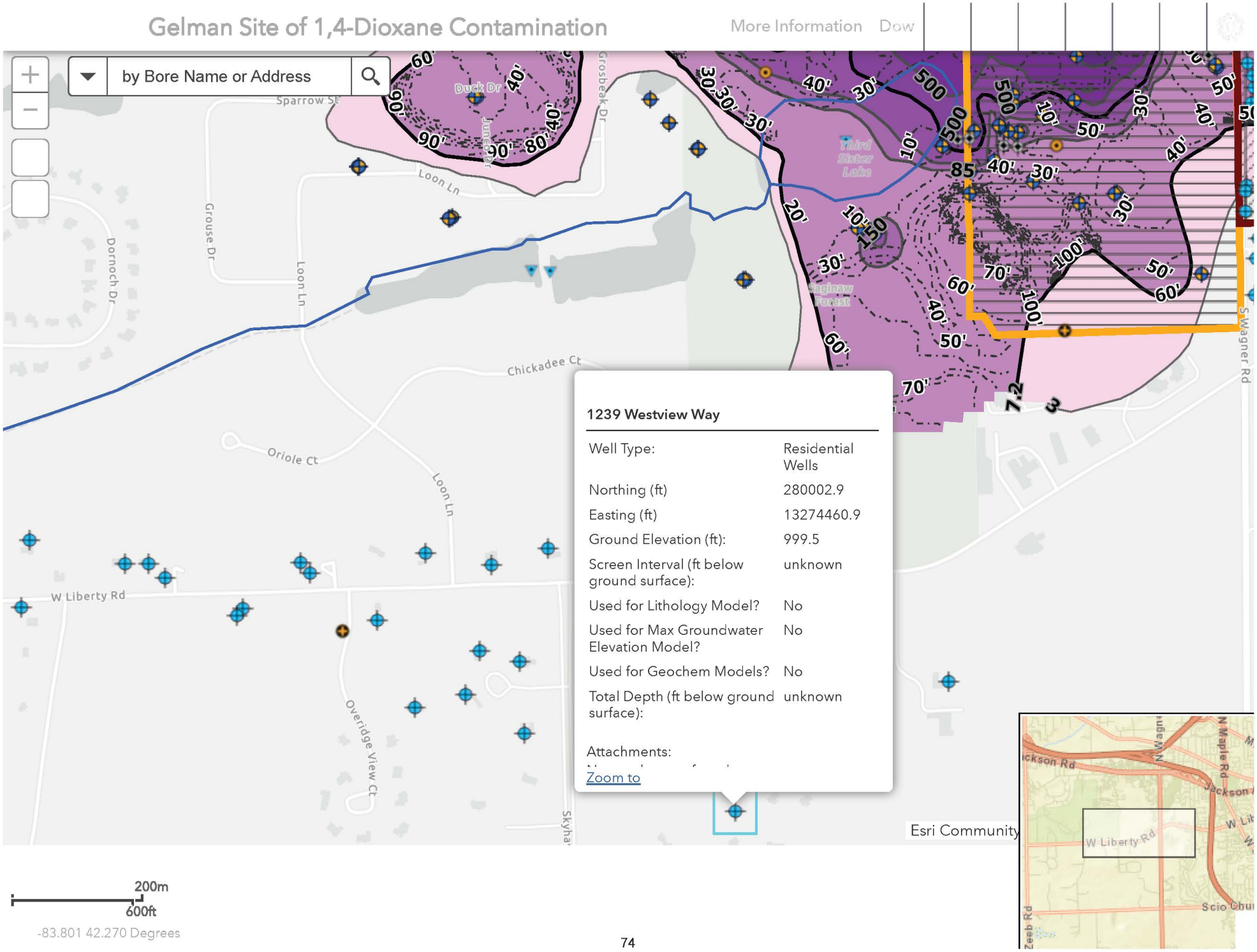

Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
1080 Westview Way
Well Type: Residential Wells
Northing (ft) 280728.8
Easting (ft) 13274333.0
Ground Elevation (ft): 1001.1
Screen Interval (ft below ground surface): 268-276
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 276
Attachments:
Zoom to
Duck Dr
Sparrow St
Grosbeak Dr
Third Sister Lake
Loon Ln
Grouse Dr
Dornoch Dr
Oriole Ct
W Liberty Rd
Westview Way
Overidge View Ct
S Wagner Rd
Esri Community
200m
600ft
-83.803 42.271 Degrees

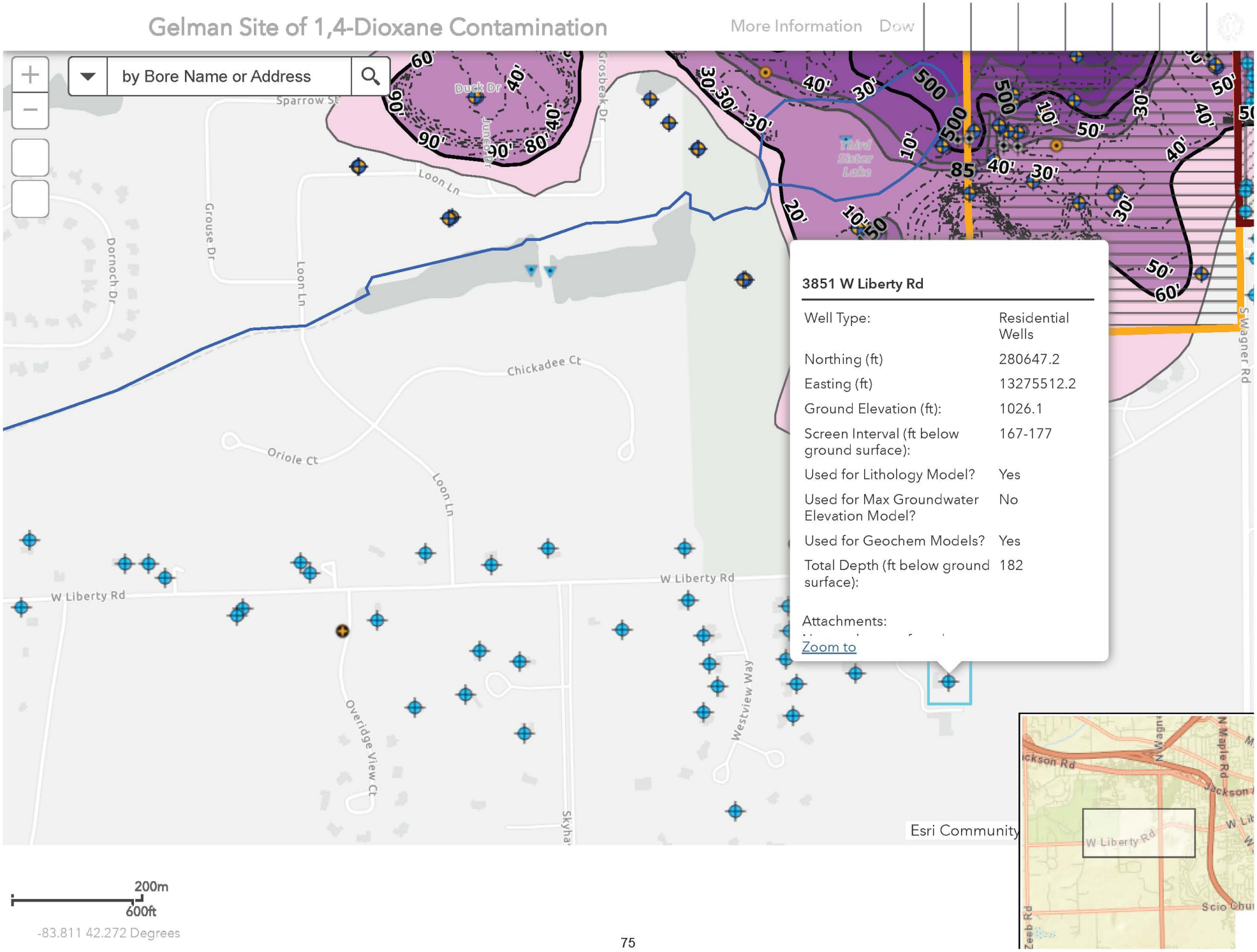

by Bore Name or Address
Duck Dr
Sparrow St
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Chickadee Ct
Oriole Ct
W Liberty Rd
Overidge View Ct
Westview Way
Third Sister Lake
S Wagner Rd
1105 Westview Way
Well Type: Residential Wells
Northing (ft) 280633.0
Easting (ft) 13274763.8
Ground Elevation (ft): 1015.8
Screen Interval (ft below ground surface): 243-251
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 251
Attachments:
Zoom to
Esri Community
200m
600ft
-83.811 42.272 Degrees


Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
1108 Westview Way
Well Type: Residential Wells
Northing (ft) 280620.0
Easting (ft) 13274371.6
Ground Elevation (ft): 1000.9
Screen Interval (ft below ground surface): 258-266
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 266
Attachments:
Zoom to
Duck Dr
Sparrow St
Grosbeak Dr
Third Sister Lake
Loon Ln
Grouse Dr
Dornoch Dr
Chickade
Oriole Ct
W Liberty Rd
Overidge View Ct
Westview W
S Wagner Rd
Esri Community
200m
600ft
-83.803 42.271 Degrees

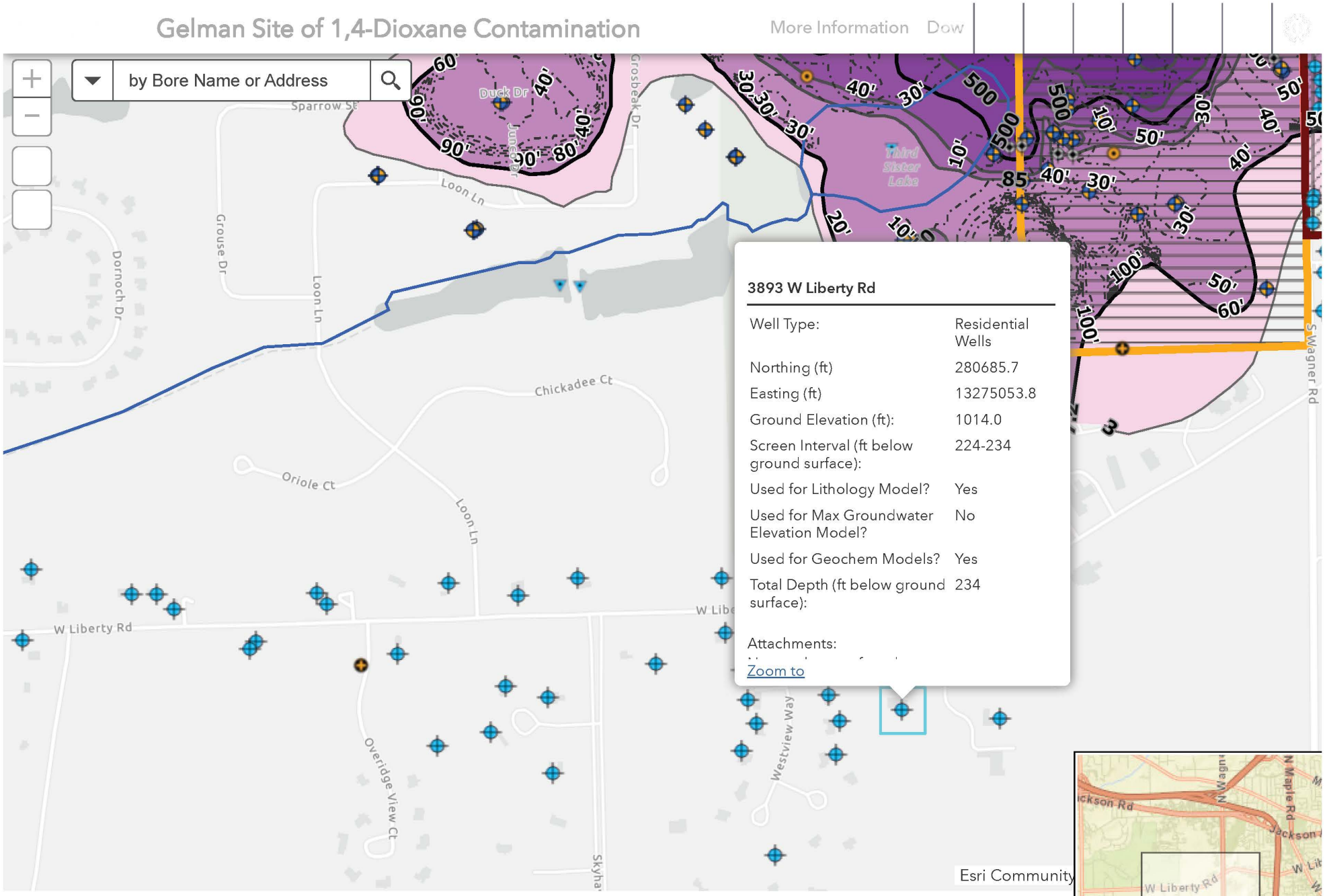

Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
1130 Westview Way
Well Type: Residential Wells
Northing (ft) 280492.4
Easting (ft) 13274301.3
Ground Elevation (ft): 994.5
Screen Interval (ft below ground surface): 276.5-280.5
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 282
Attachments:
Zoom to
Duck Dr
Sparrow St
Grosbeak Dr
Third Sister Lake
Loon Ln
Grouse Dr
Dornoch Dr
Oriole Ct
W Liberty Rd
Overidge View Ct
Esri Community
200m
600ft
-83.803 42.272 Degrees

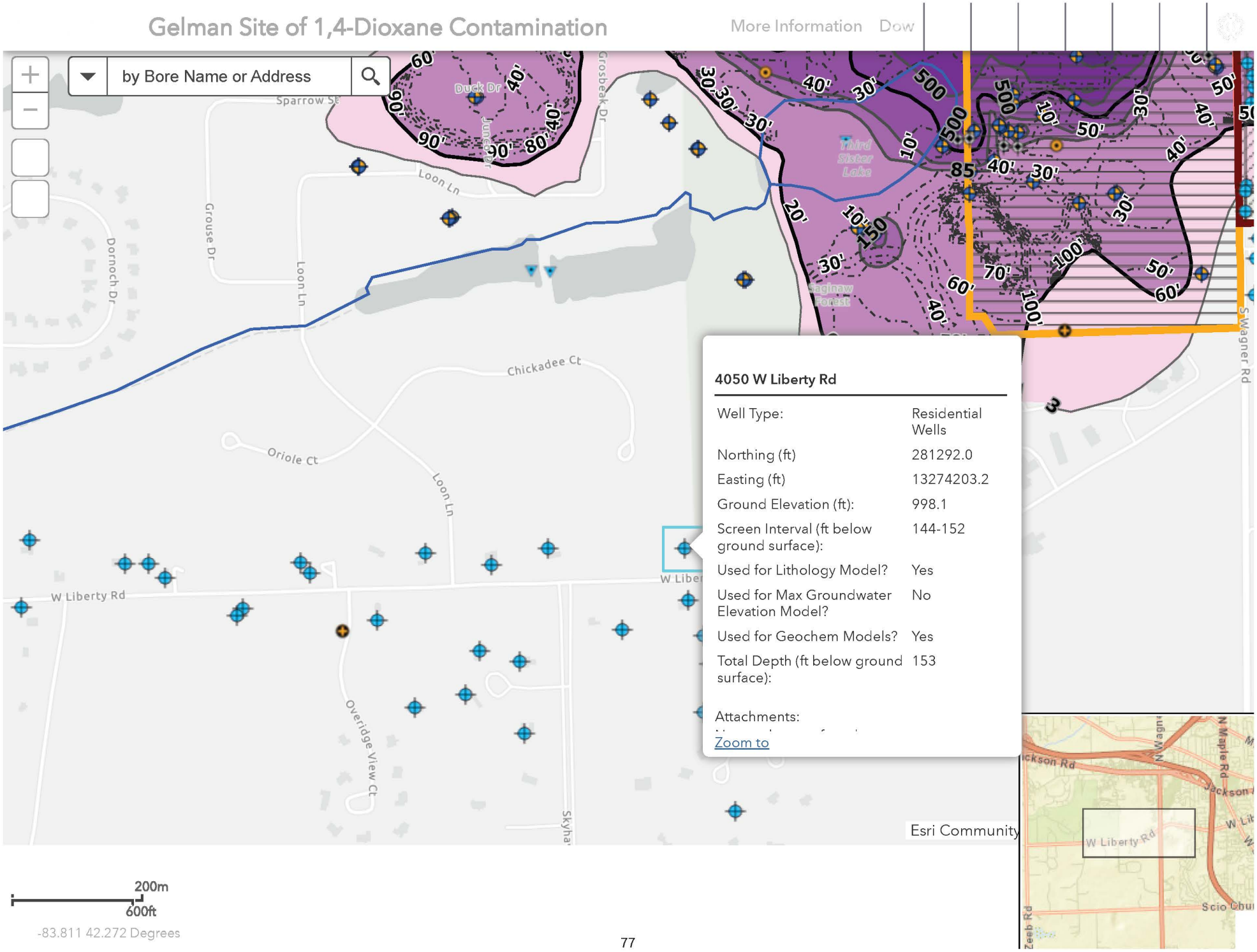

by Bore Name or Address
Duck Dr
Sparrow St
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Chickadee Ct
Oriole Ct
W Liberty Rd
Overidge View Ct
Third Sister Lake
S Wagner Rd
1149 Southwood Ct
Well Type: Residential Wells
Northing (ft) 280476.8
Easting (ft) 13274744.0
Ground Elevation (ft): 1009.8
Screen Interval (ft below ground surface): 249-257
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 257
Attachments:
Zoom to
Esri Community
200m
600ft
-83.814 42.273 Degrees

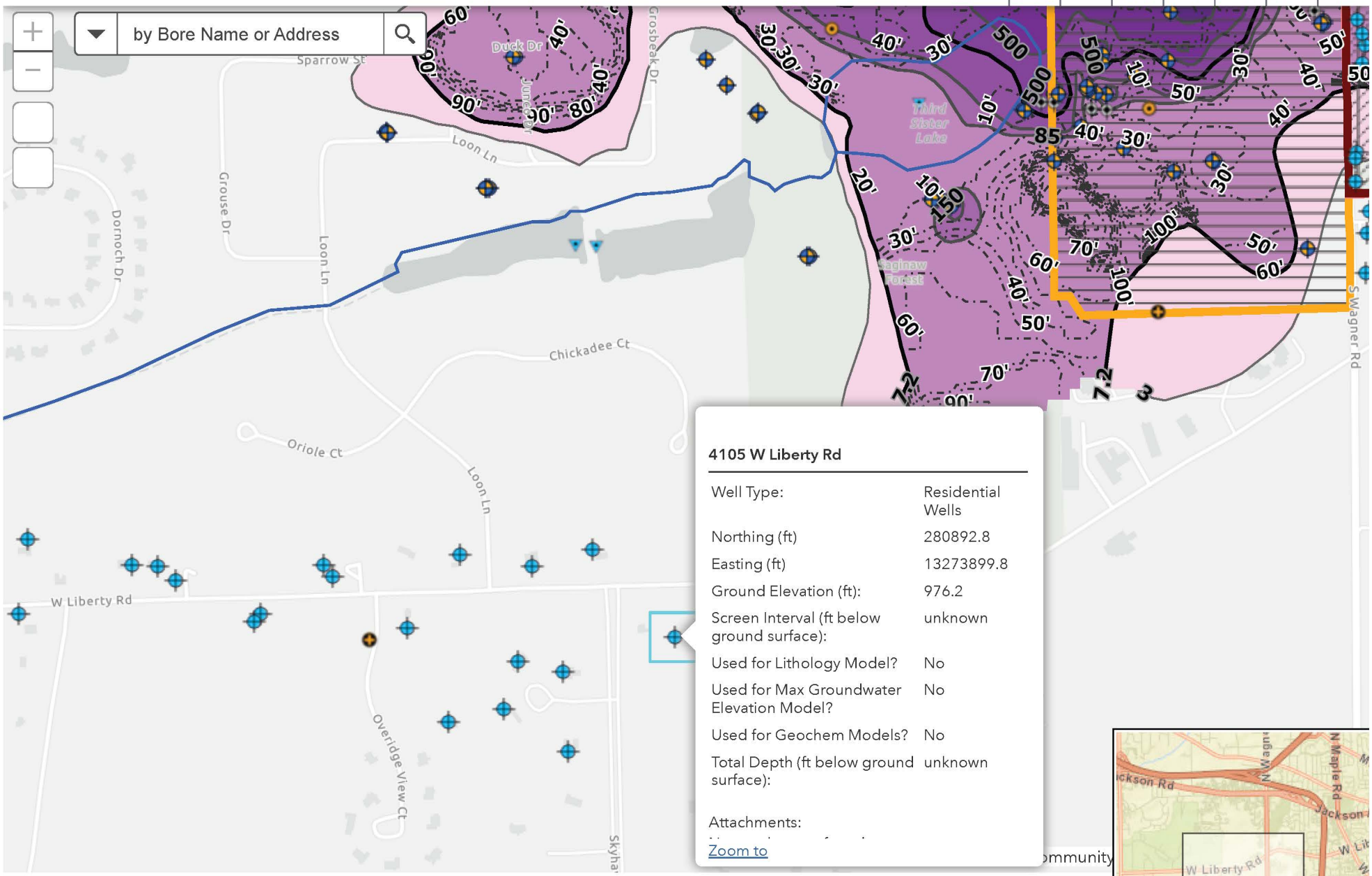

Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
Duck Dr
Sparrow St
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Chickadee Ct
Oriole Ct
W Liberty Rd
Overidge View Ct
Third Sister Lake
Saginaw Forest
S Wagner Rd
1239 Westview Way
Well Type: Residential Wells
Northing (ft) 280002.9
Easting (ft) 13274460.9
Ground Elevation (ft): 999.5
Screen Interval (ft below ground surface): unknown
Used for Lithology Model? No
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? No
Total Depth (ft below ground surface): unknown
Attachments:
Zoom to
Esri Community
200m
600ft
-83.801 42.270 Degrees

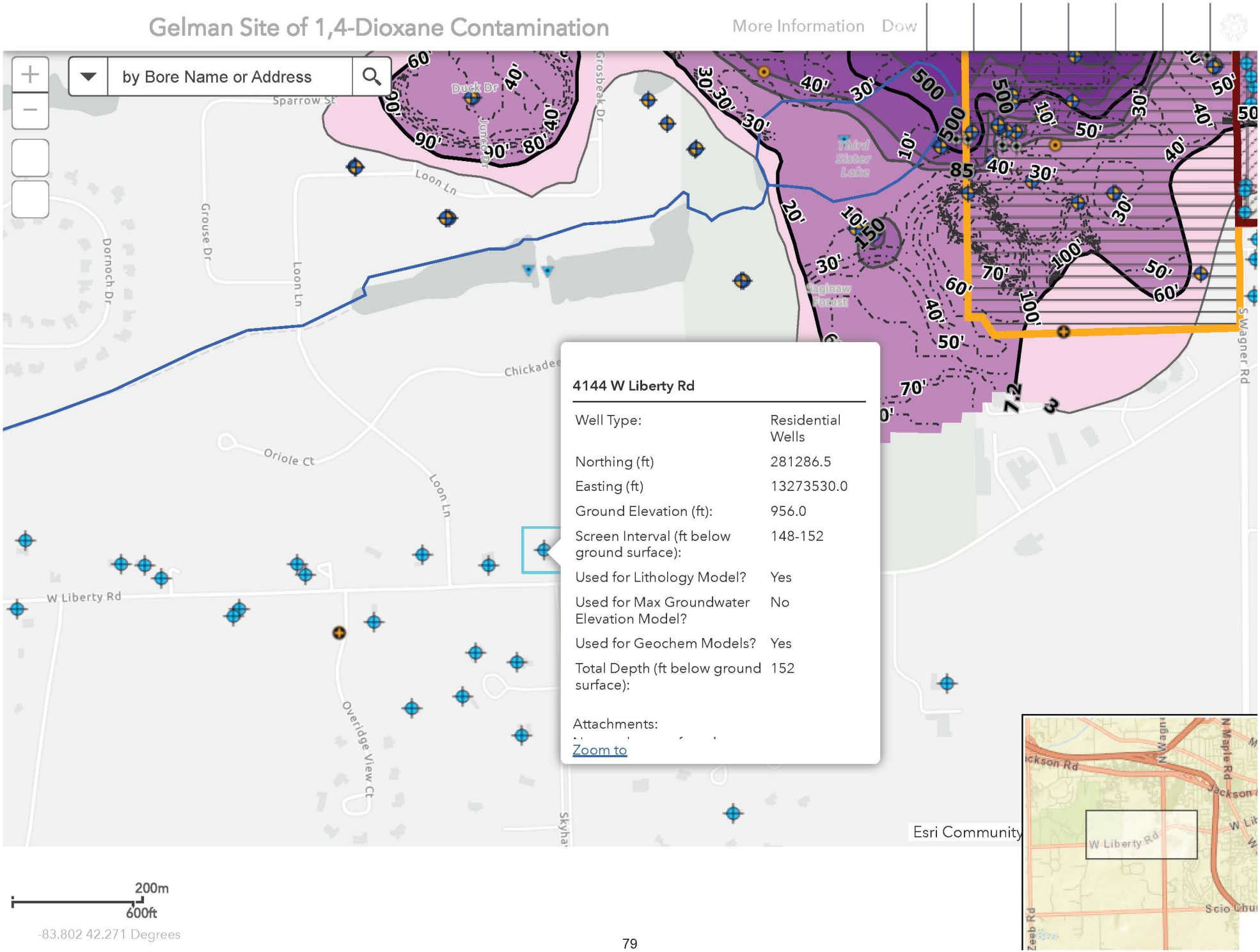

Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
3851 W Liberty Rd
Well Type: Residential Wells
Northing (ft) 280647.2
Easting (ft) 13275512.2
Ground Elevation (ft): 1026.1
Screen Interval (ft below ground surface): 167-177
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 182
Attachments:
Zoom to
Duck Dr
Sparrow St
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Chickadee Ct
Oriole Ct
W Liberty Rd
Overidge View Ct
Westview Way
Third Sister Lake
S Wagner Rd
Esri Community
200m
600ft
-83.811 42.272 Degrees

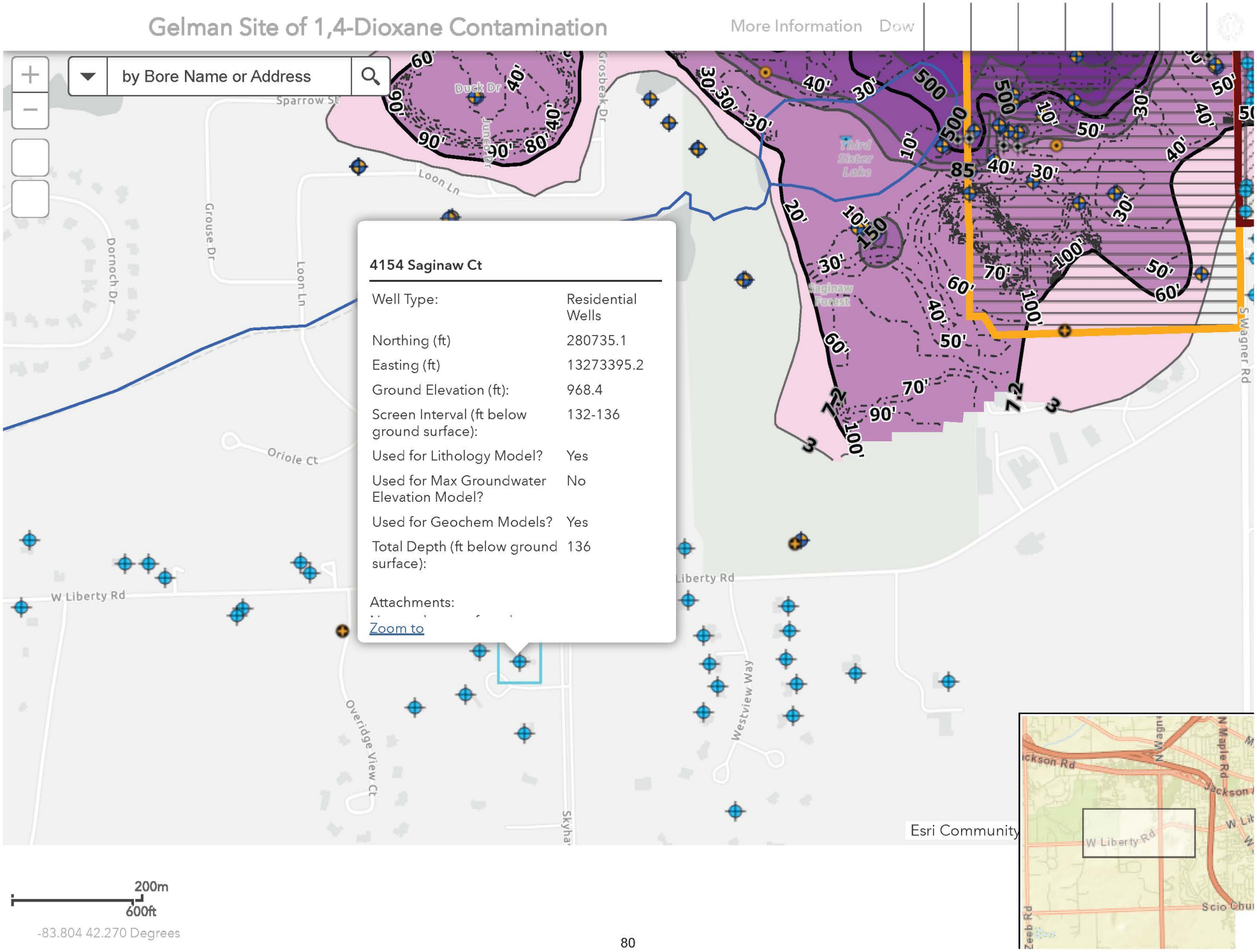
Gelman Site of 1,4-Dioxane Contamination

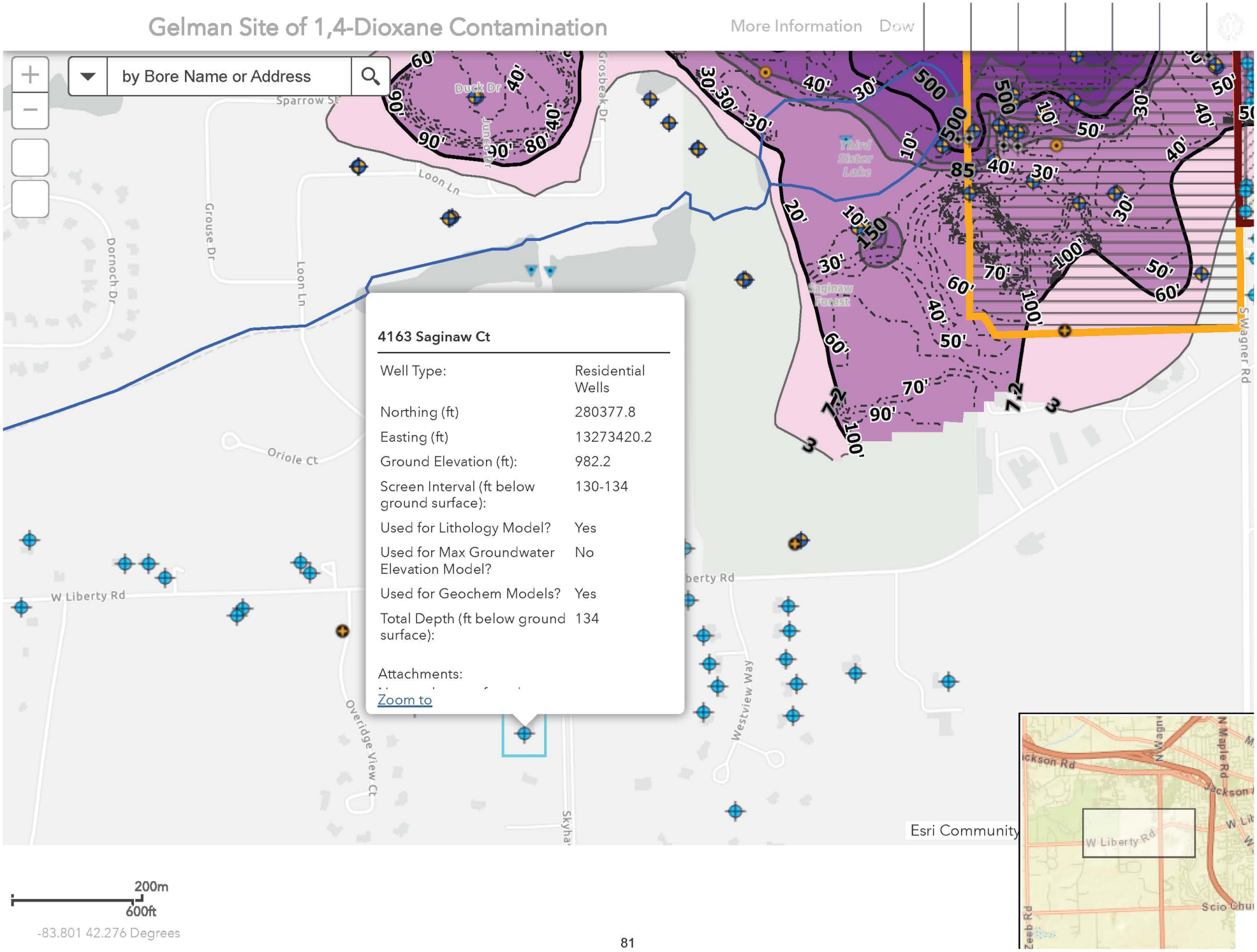


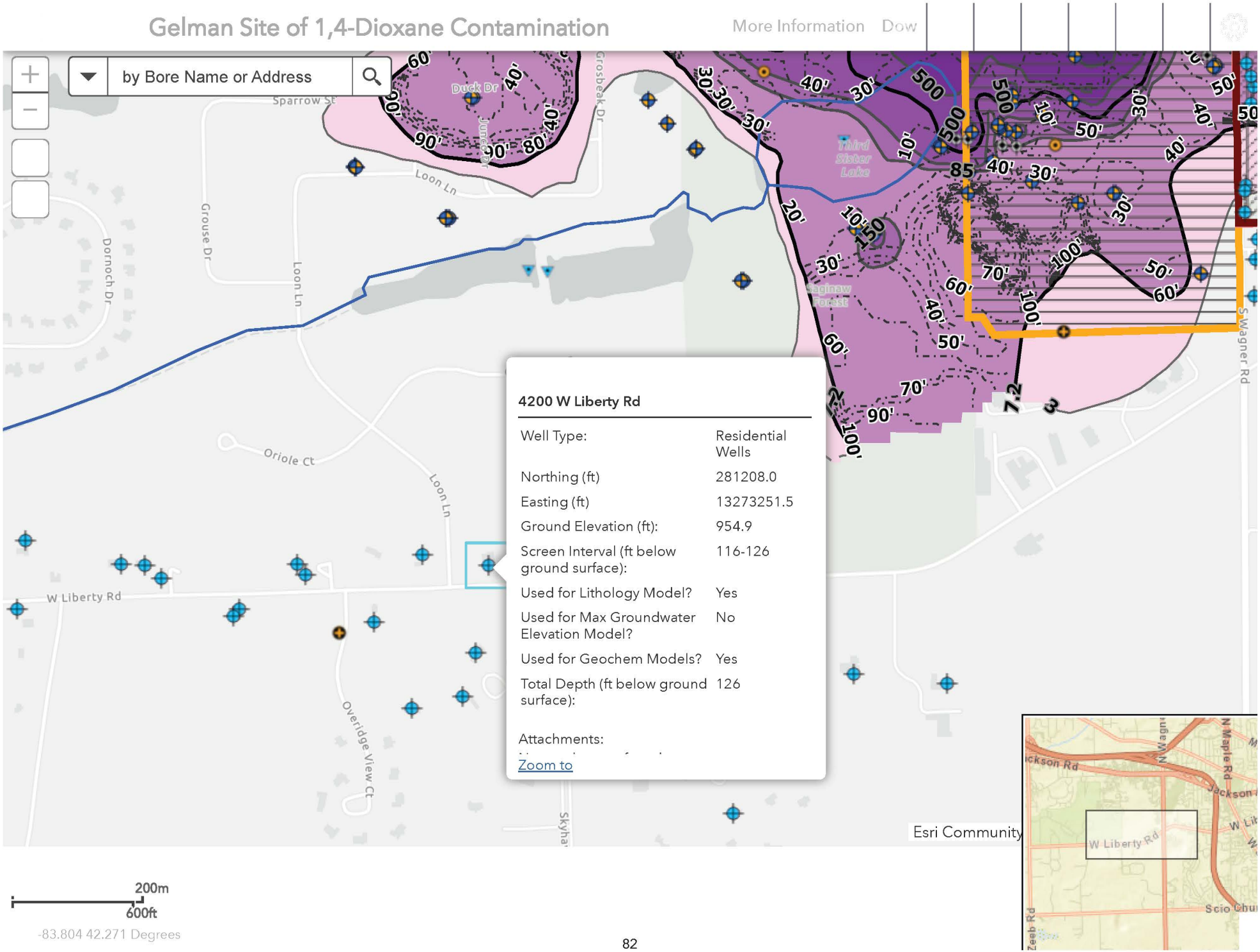

Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
Duck Dr
Sparrow St
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Chickadee Ct
Oriole Ct
W Liberty Rd
Overidge View Ct
Third Sister Lake
Saginaw Forest
Swagner Rd
4050 W Liberty Rd
Well Type: Residential Wells
Northing (ft) 281292.0
Easting (ft) 13274203.2
Ground Elevation (ft): 998.1
Screen Interval (ft below ground surface): 144-152
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 153
Attachments:
Zoom to
Esri Community
200m
600ft
-83.811 42.272 Degrees

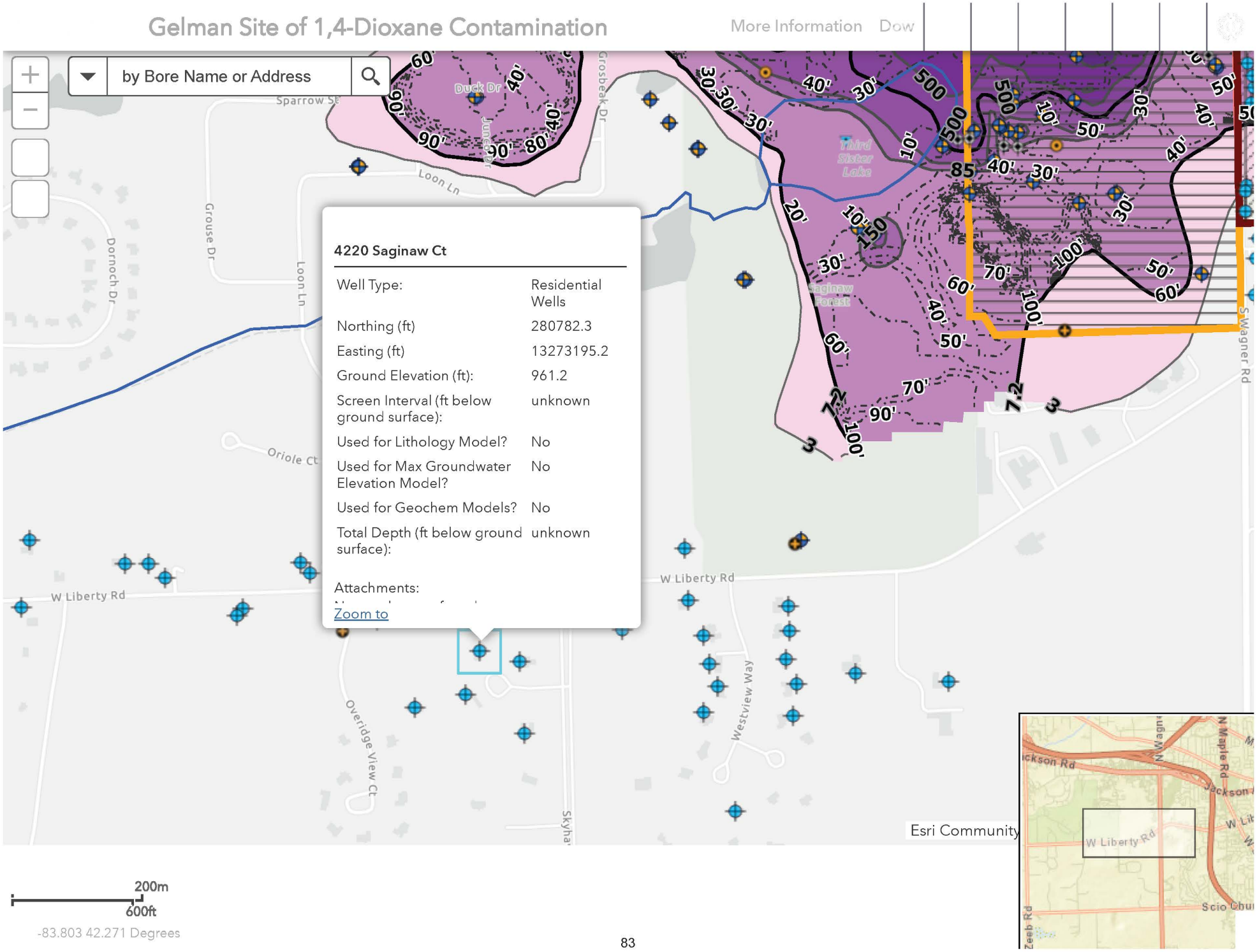

by Bore Name or Address
Sparrow St
Duck Dr
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Chickadee Ct
Oriole Ct
W Liberty Rd
Overidge View Ct
Third Sister Lake
Saginaw Forest
S Wagner Rd
4105 W Liberty Rd
Well Type: Residential Wells
Northing (ft) 280892.8
Easting (ft) 13273899.8
Ground Elevation (ft): 976.2
Screen Interval (ft below ground surface): unknown
Used for Lithology Model? No
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? No
Total Depth (ft below ground surface): unknown
Attachments:
Zoom to
200m
600ft
-83.801 42.270 Degrees

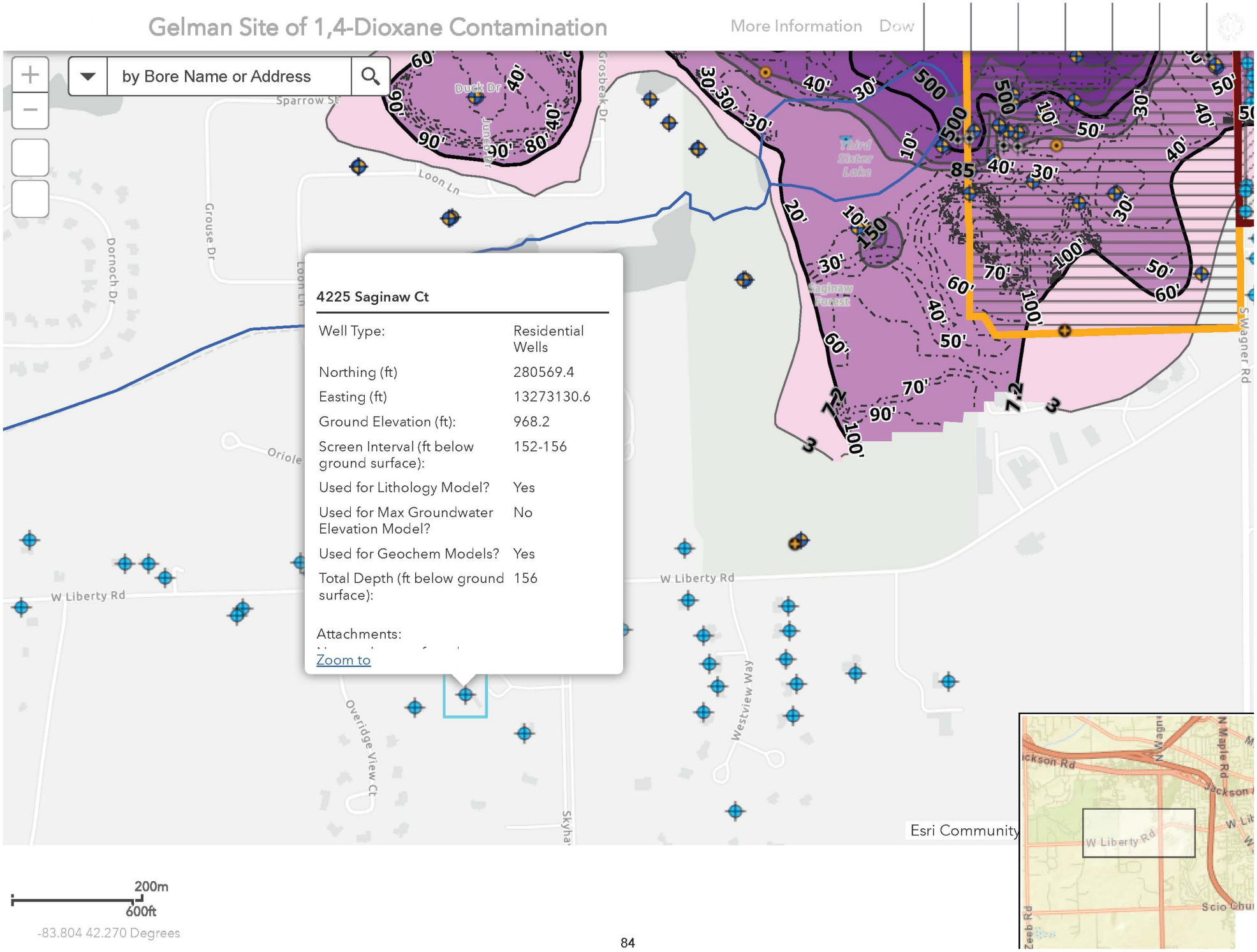

Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
Duck Dr
Sparrow St
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Chickadee
Oriole Ct
W Liberty Rd
Overidge View Ct
Third Sister Lake
Saginaw Forest
S Wagner Rd
4144 W Liberty Rd
Well Type: Residential Wells
Northing (ft) 281286.5
Easting (ft) 13273530.0
Ground Elevation (ft): 956.0
Screen Interval (ft below ground surface): 148-152
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 152
Attachments:
Zoom to
Esri Community
200m
600ft
-83.802 42.271 Degrees

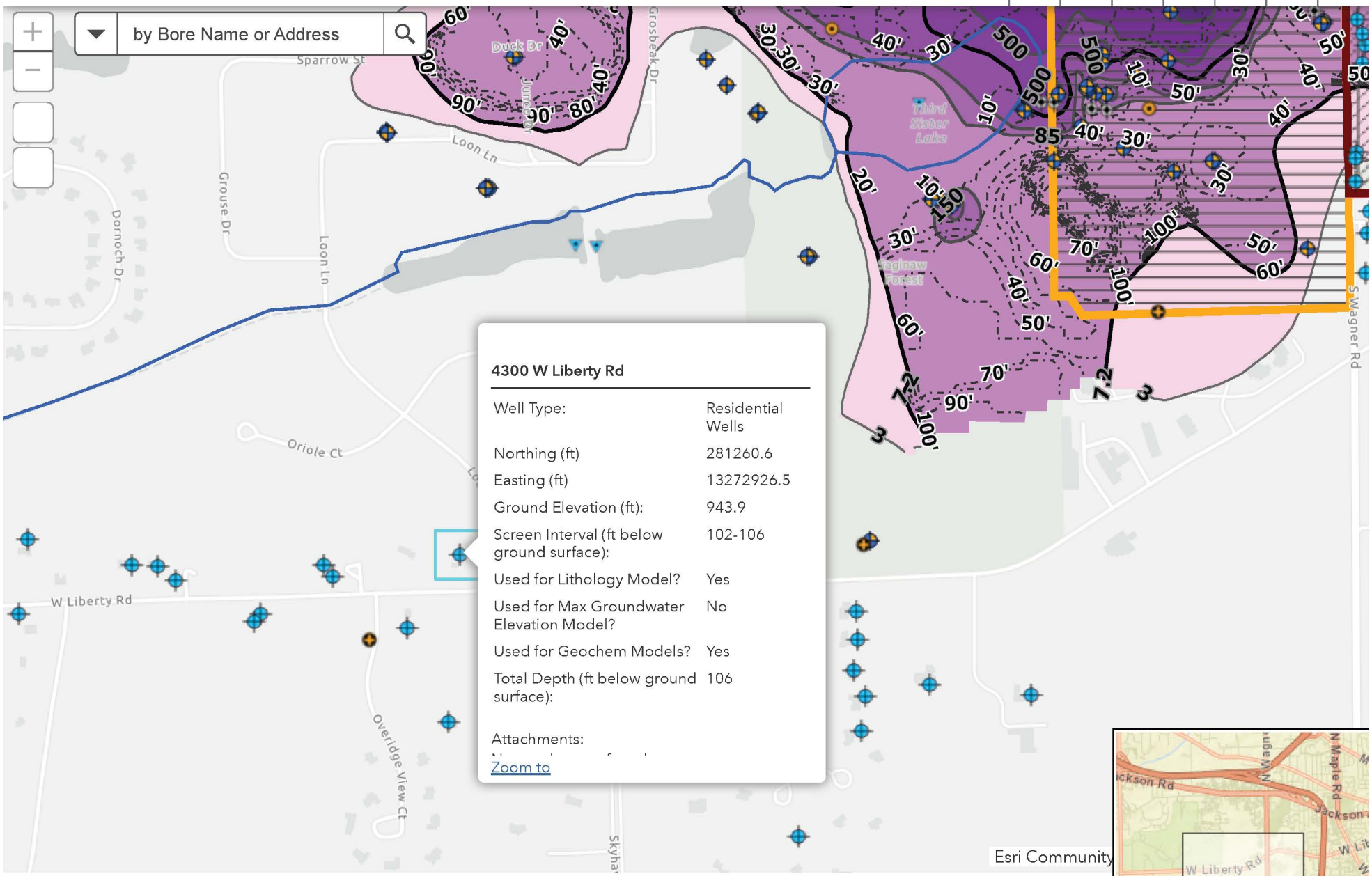

Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
4154 Saginaw Ct
Well Type: Residential Wells
Northing (ft) 280735.1
Easting (ft) 13273395.2
Ground Elevation (ft): 968.4
Screen Interval (ft below ground surface): 132-136
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 136
Attachments:
Zoom to
Sparrow St
Duck Dr
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Oriole Ct
W Liberty Rd
Liberty Rd
Overidge View Ct
Westview Way
Third Sister Lake
Saginaw Forest
S Wagner Rd
Esri Community
200m
600ft
-83.804 42.270 Degrees

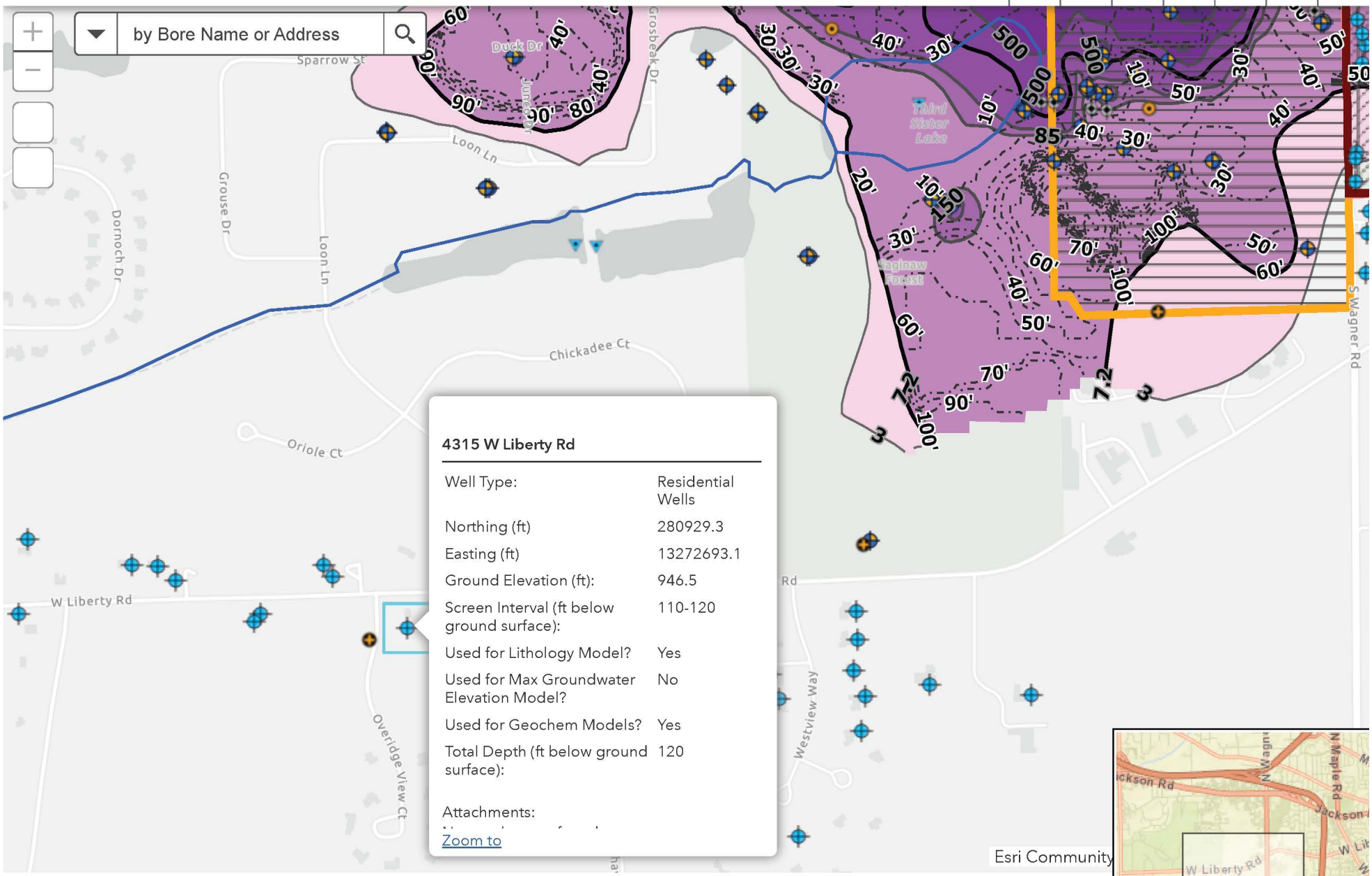

Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
4163 Saginaw Ct
Well Type: Residential Wells
Northing (ft) 280377.8
Easting (ft) 13273420.2
Ground Elevation (ft): 982.2
Screen Interval (ft below ground surface): 130-134
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 134
Attachments:
Zoom to
Sparrow St
Duck Dr
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Oriole Ct
W Liberty Rd
Overidge View Ct
Westview Way
Third Sister Lake
Saginaw Forest
S Wagner Rd
Esri Community
200m
600ft
-83.801 42.276 Degrees

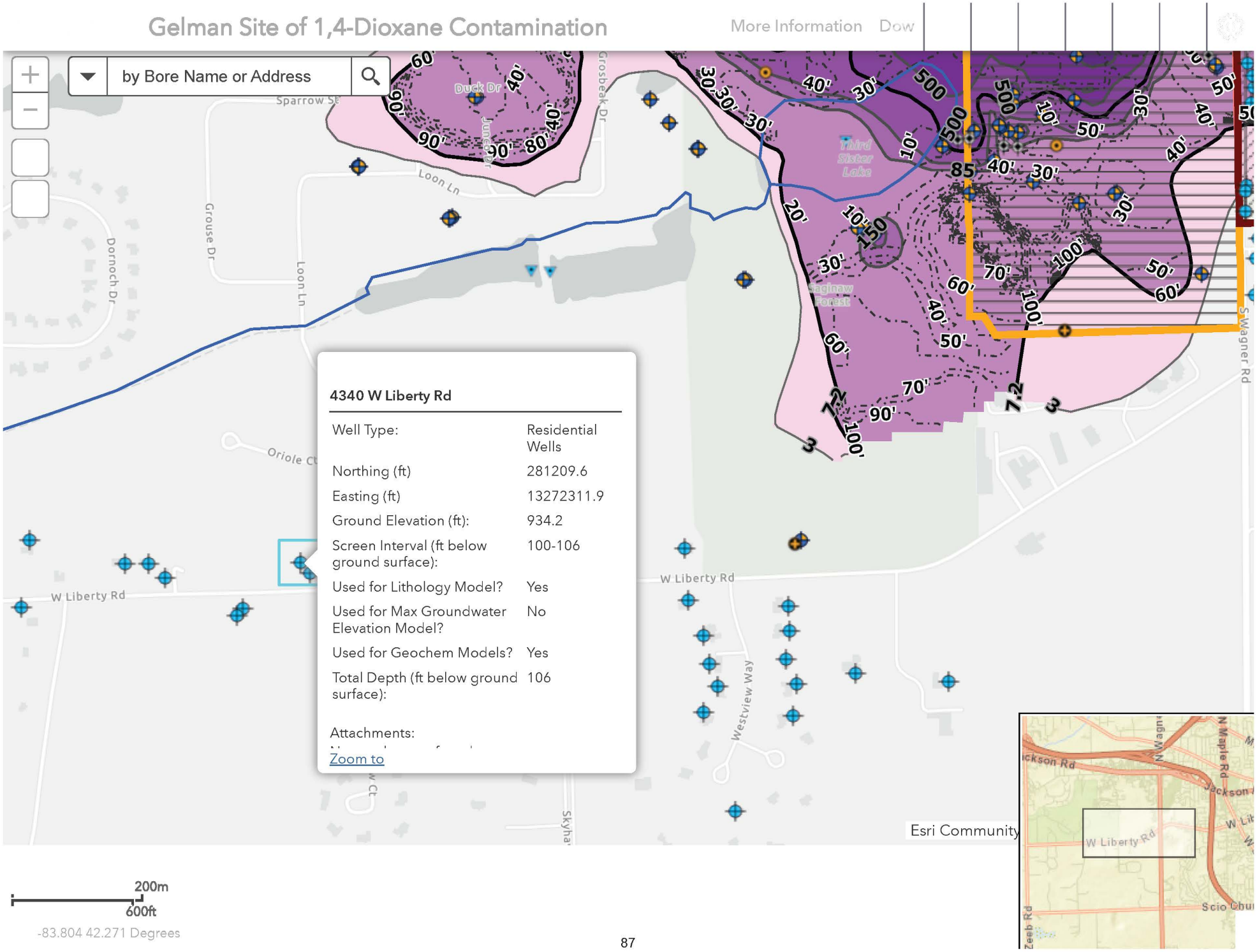

Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
Sparrow St
Duck Dr
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Oriole Ct
W Liberty Rd
Overidge View Ct
Third Sister Lake
Saginaw Forest
S Wagner Rd
4200 W Liberty Rd
Well Type: Residential Wells
Northing (ft) 281208.0
Easting (ft) 13273251.5
Ground Elevation (ft): 954.9
Screen Interval (ft below ground surface): 116-126
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 126
Attachments:
Zoom to
Esri Community
200m
600ft
-83.804 42.271 Degrees

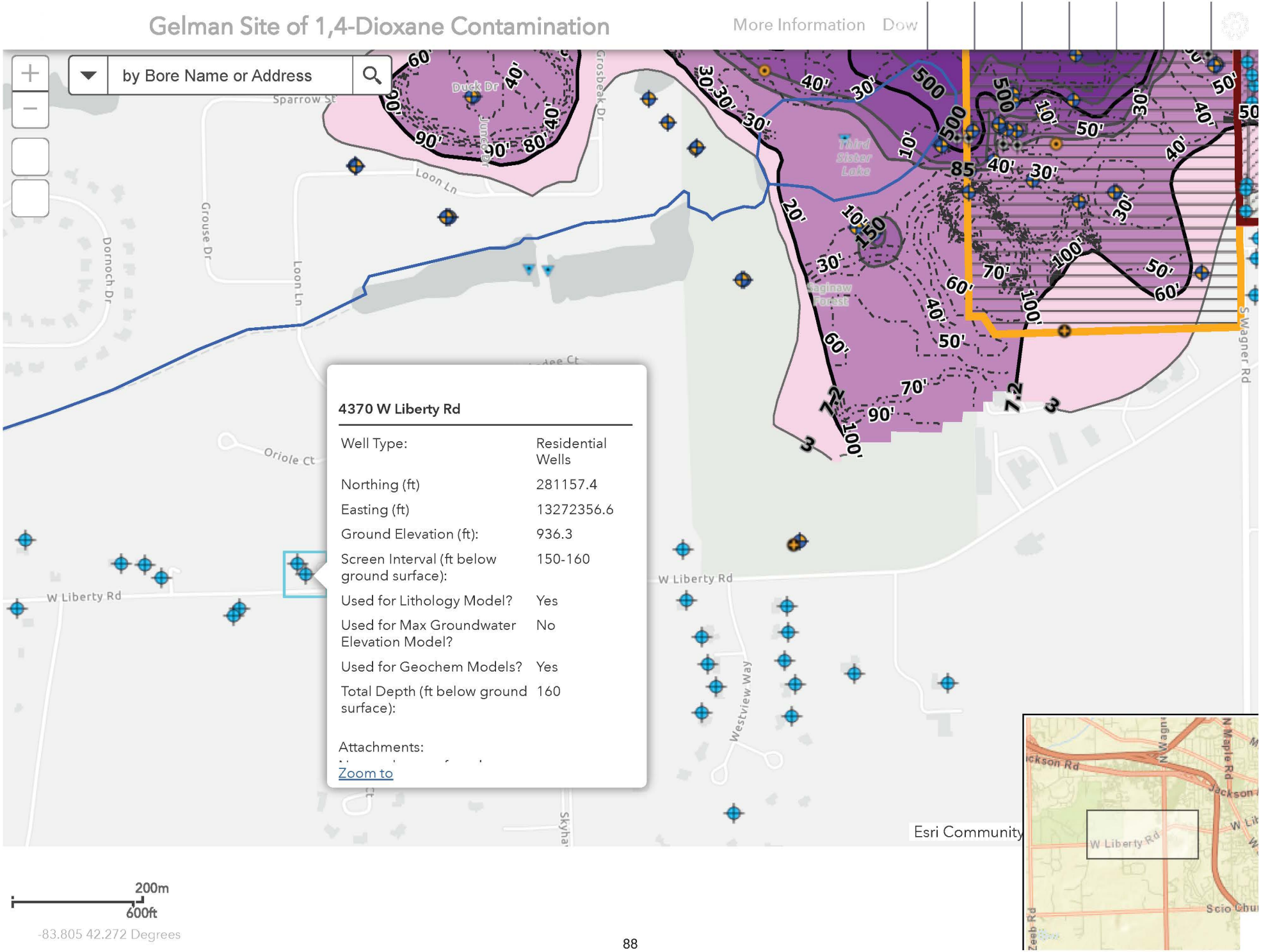

Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
4220 Saginaw Ct
Well Type: Residential Wells
Northing (ft) 280782.3
Easting (ft) 13273195.2
Ground Elevation (ft): 961.2
Screen Interval (ft below ground surface): unknown
Used for Lithology Model? No
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? No
Total Depth (ft below ground surface): unknown
Attachments:
Zoom to
Duck Dr
Sparrow St
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Oriole Ct
W Liberty Rd
Third Sister Lake
Saginaw Forest
Swagner Rd
Westview Way
Overidge View Ct
Esri Community
200m
600ft
-83.803 42.271 Degrees


Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
4225 Saginaw Ct
Well Type: Residential Wells
Northing (ft) 280569.4
Easting (ft) 13273130.6
Ground Elevation (ft): 968.2
Screen Interval (ft below ground surface): 152-156
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 156
Attachments:
Zoom to
Duck Dr
Sparrow St
Loon Ln
Grosbeak Dr
Grouse Dr
Dornoch Dr
Oriole
W Liberty Rd
Overidge View Ct
Westview Way
Third Sister Lake
Saginaw Forest
S Wagner Rd
Esri Community
200m
600ft
-83.804 42.270 Degrees


by Bore Name or Address
Duck Dr
Sparrow St
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Oriole Ct
W Liberty Rd
Overidge View Ct
Third Sister Lake
Saginaw Forest
S Wagner Rd
4300 W Liberty Rd
Well Type: Residential Wells
Northing (ft) 281260.6
Easting (ft) 13272926.5
Ground Elevation (ft): 943.9
Screen Interval (ft below ground surface): 102-106
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 106
Attachments:
Zoom to
Esri Community
200m
600ft
-83.805 42.271 Degrees

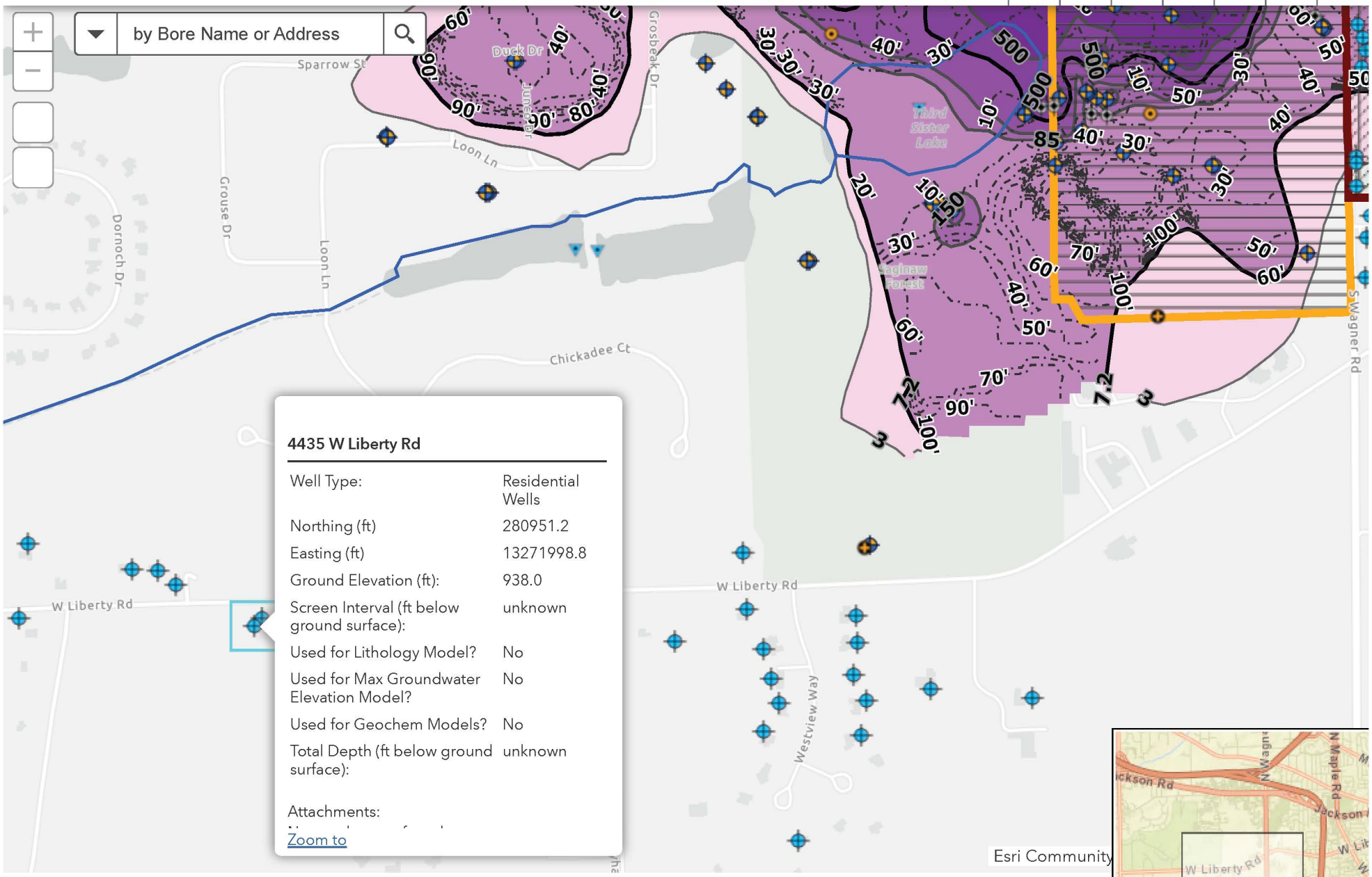

by Bore Name or Address
Sparrow St
Duck Dr
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Chickadee Ct
Oriole Ct
W Liberty Rd
Overidge View Ct
Westview Way
S Wagner Rd
Third Sister Lake
Saginaw Forest
4315 W Liberty Rd
Well Type: Residential Wells
Northing (ft) 280929.3
Easting (ft) 13272693.1
Ground Elevation (ft): 946.5
Screen Interval (ft below ground surface): 110-120
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 120
Attachments:
Zoom to
Esri Community
200m
600ft
-83.804 42.277 Degrees

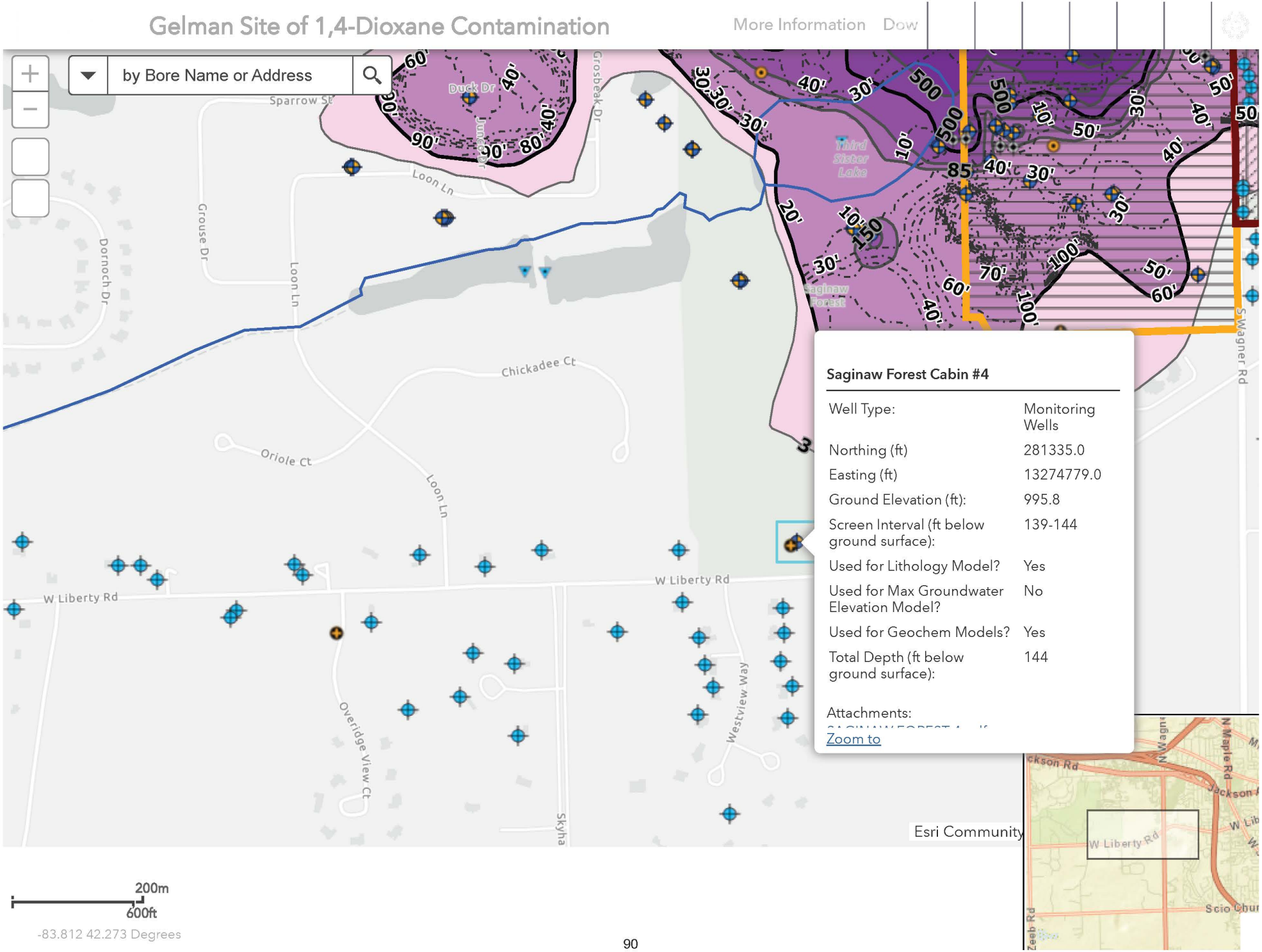

Gelman Site of 1,4-Dioxane Contamination
More Information
Dow
by Bore Name or Address
4340 W Liberty Rd
Well Type: Residential Wells
Northing (ft) 281209.6
Easting (ft) 13272311.9
Ground Elevation (ft): 934.2
Screen Interval (ft below ground surface): 100-106
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 106
Attachments:
Zoom to
W Liberty Rd
Loon Ln
Grouse Dr
Dornoch Dr
Sparrow St
Duck Dr
Grosbeak Dr
Oriole Ct
Westview Way
Third Sister Lake
Saginaw Forest
S Wagner Rd
Esri Community
200m
600ft
-83.804 42.271 Degrees


by Bore Name or Address
Sparrow St
Duck Dr
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Loon Ln
Oriole Ct
W Liberty Rd
W Liberty Rd
Westview Way
Third Sister Lake
Saginaw Forest
S Wagner Rd
4370 W Liberty Rd
Well Type: Residential Wells
Northing (ft) 281157.4
Easting (ft) 13272356.6
Ground Elevation (ft): 936.3
Screen Interval (ft below ground surface): 150-160
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 160
Attachments:
Zoom to
Esri Community
200m
600ft
-83.805 42.272 Degrees

Gelman Site of 1,4-Dioxane Contamination

More Information Dow




by Bore Name or Address
Saginaw Forest Cabin #4
Well Type: Monitoring Wells
Northing (ft) 281335.0
Easting (ft) 13274779.0
Ground Elevation (ft): 995.8
Screen Interval (ft below ground surface): 139-144
Used for Lithology Model? Yes
Used for Max Groundwater Elevation Model? No
Used for Geochem Models? Yes
Total Depth (ft below ground surface): 144
Attachments:
Zoom to
Duck Dr
Sparrow St
Grosbeak Dr
Loon Ln
Grouse Dr
Dornoch Dr
Chickadee Ct
Oriole Ct
W Liberty Rd
Overidge View Ct
Westview Way
Third Sister Lake
Saginaw Forest
S Wagner Rd
Esri Community
200m
600ft
-83.812 42.273 Degrees

Well ID	Aquifer	Well Name	Map Location	X CORD	Date Installed	Y CORD	Well Driller (if known)	Sampling Interval	Well Types	Boring Depth (Feet bgl)	Ground Elevation	Depth from TOC to bottom of screen (Feet)	TOC Elevation AMSL (Feet)	Bottom of Screen 1	Top of Screen 1	Screen Length (Feet)	Bottom of Screen 2	Top of Screen 2	ID	Well Comments
40106	Not Determined	1021 Westview Way			12.07.1994		Cribley Well Drilling	Randomly	Residential Wells	268		269		268	260	8			1247	
40107	Not Determined	1024 Westview Way						Randomly	Residential Wells										1248	
40108	Not Determined	1049 Westview Way			24.10.1994		Cribley Drilling Company	Randomly	Residential Wells	280		281		280	272	8			1246	
40109	Not Determined	1052 Westview Way			21.02.1996		Cribley Drilling Company	Randomly	Residential Wells	276		277		276	268	8			1249	
40114	Not Determined	1077 Westview Way						Randomly	Residential Wells										1282	
40110	Not Determined	1080 Westview Way			29.10.1996		Cribley Drilling Company	Randomly	Residential Wells	276		277		276	268	8			1250	
40111	Not Determined	1105 Westview Way			21.06.1990		Cribley Well Drilling	Randomly	Residential Wells	251		252		251	243	8			1251	
40112	Not Determined	1108 Westview Way			01.09.1993		Cribley Well Drilling	Randomly	Residential Wells	266		267		266	258	8			1252	
40113	Not Determined	1130 Westview Way			03.04.1992		Cribley Well Drilling	Randomly	Residential Wells	282		281.5		280.5	276.5	4			1253	
38753	Not Determined	1149 Southwood Ct			14.07.1989		Cribley Drilling Company	Randomly	Residential Wells	257		258		257	249	8			1226	
40115	Not Determined	1239 Westview Way		13274460.94		280002.86		Not Set	Residential Wells								0	0	465	Sampling requested by owner selling home.
40072	Not Determined	3851 W Liberty Rd			15.02.2005		ann Arbor Well Drilling	Randomly	Residential Wells	182		178		177	167	10			1230	
40073	Not Determined	3893 W Liberty Rd			11.09.2001		Cribley Drilling Company	Randomly	Residential Wells	234		234		234	224	10			1239	
40074	Not Determined	4050 W Liberty Rd			18.05.1982			Randomly	Residential Wells	137		137		137	131	6			1240	
40074	Not Determined	4050 W Liberty Rd			21.06.1991		Ann Arbor Well Drilling	Randomly	Residential Wells	152		153		152	144	8			1241	
40075	Not Determined	4105 W Liberty Rd						Randomly	Residential Wells										1256	
40076	Not Determined	4144 W Liberty Rd			02.10.1989		Cribley Well Drilling	Randomly	Residential Wells	152		153		152	148	4			1242	
38756	Not Determined	4154 Saginaw Ct			29.10.1986			Randomly	Residential Wells	136		137		136	132	4			1224	
38759	Not Determined	4163 Saginaw Ct			05.09.1984		Ann Arbor Well Drilling	Randomly	Residential Wells	134		135		134	130	4			1223	
40077	Not Determined	4200 W Liberty Rd			11.08.2015		Cribley Well Drilling	Randomly	Residential Wells	126		127		126	116	10			1243	
38760	Not Determined	4220 Saginaw Ct							Residential Wells										1281	
38762	Not Determined	4225 Saginaw Ct			17.11.1988		Cribley Drilling Company	Randomly	Residential Wells	156		157		156	152	4			1225	
40079	Not Determined	4300 W Liberty Rd			03.01.1980			Randomly	Residential Wells	106		106		106	102	4			1244	
40080	Not Determined	4315 W Liberty Rd			18.10.2003		Cribley Drilling Company	Randomly	Residential Wells	120		120		120	110	10			1232	
40081	Not Determined	4340 W Liberty Rd			15.06.2012		cribley Well Drilling	Randomly	Residential Wells			107		106	100	6			1233	
40082	Not Determined	4370 W Liberty Rd			16.11.2009		Cribley Drilling Company	Randomly	Residential Wells	160		161		160	150	10			1234	
40083	Not Determined	4435 W Liberty Rd			30.07.2001		Cribley Well Drilling	Randomly	Residential Wells	112		114		112	102	10			1235	
40704	C3	Saginaw Forest Cabin #4	Q-14	13274779.00	23.12.2002	281335.00	Cribley Drilling	Annual	Residential Wells	144				144	139	5	0	0	478	Water Supply Well In Use.

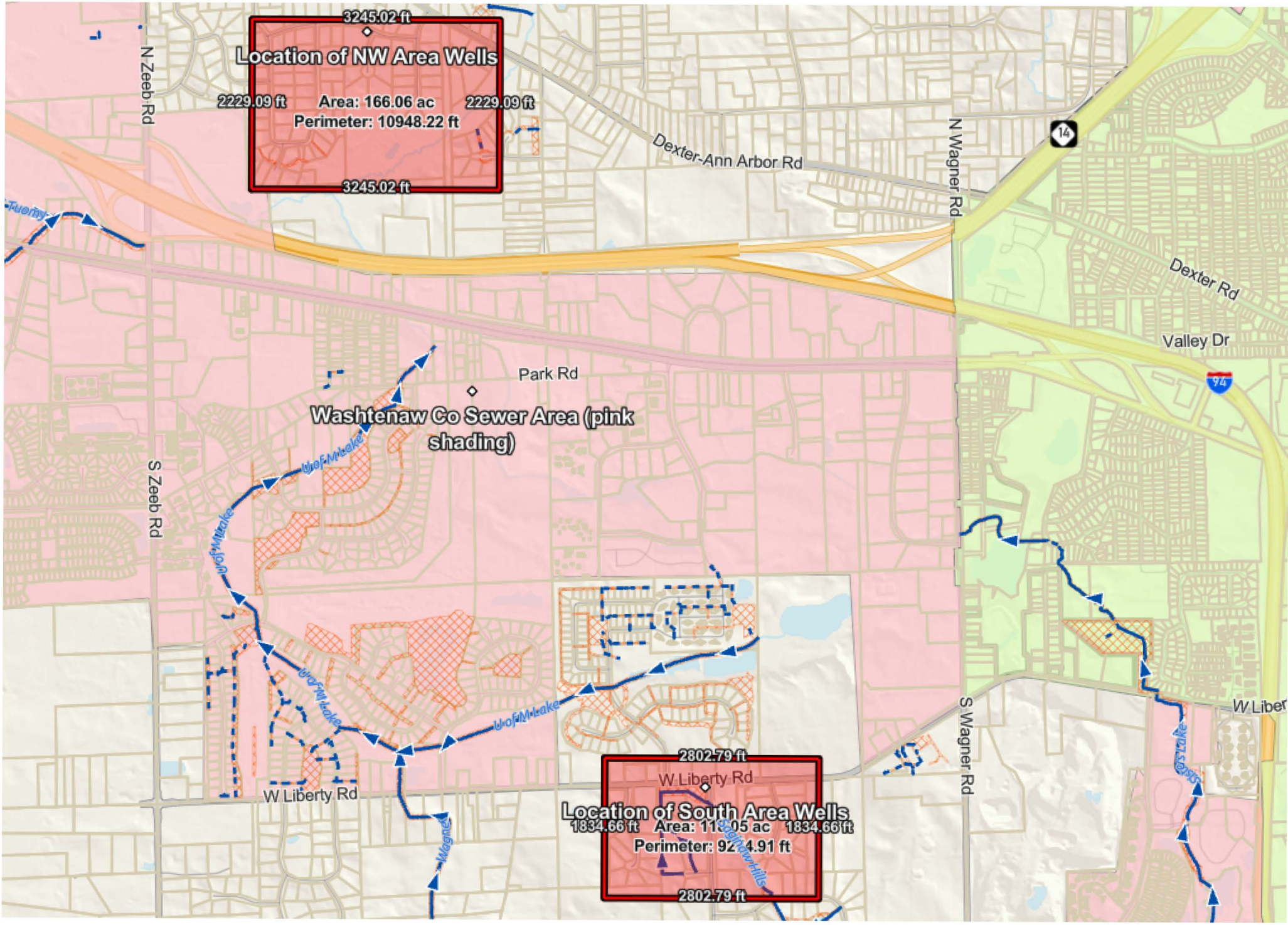
Dioxane Data - South Area Wells, Page 1 of 2

Sample ID	Well Name	Entered	1,4-Dioxane Results (ppb)	Date Sampled	Time Sampled	Date Received	Date Analyzed	Reporting Limit	Reporting Lab	Static Reading	Static Time	Static Only?	Qualifier(s)	Comments
81567	1021 Westview Way	05/04/21	nd	05/04/21	10:13		05/06/21	1.0	PLS			FALSE	O	EGLE Lab
76970	1021 Westview Way	05/10/19	nd	05/08/19	14:05		05/15/19	1.0	PLS			FALSE	O	EGLE Lab
81568	1024 Westview Way	05/04/21	nd	05/04/21	10:15		05/06/21	1.0	PLS			FALSE	O	EGLE Lab
76971	1024 Westview Way	05/10/19	nd	05/08/19	14:18		05/15/19	1.0	PLS			FALSE	O	EGLE Lab
81569	1049 Westview Way	05/04/21	nd	05/04/21	10:22		05/07/21	1.0	PLS			FALSE	O	EGLE Lab
76969	1049 Westview Way	05/10/19	nd	05/08/19	14:43		05/14/19	1.0	PLS			FALSE	O	EGLE Lab
81570	1052 Westview Way	05/04/21	nd	05/04/21	10:25		05/07/21	1.0	PLS			FALSE	O	EGLE Lab
76972	1052 Westview Way	05/10/19	nd	05/08/19	14:28		05/15/19	1.0	PLS			FALSE	O	EGLE Lab
81571	1077 Westview Way	05/04/21	nd	05/04/21	10:41		05/07/21	1.0	PLS			FALSE	O	EGLE Lab
81572	1080 Westview Way	05/04/21	nd	05/04/21	10:30		05/06/21	1.0	PLS			FALSE	O	EGLE Lab
76973	1080 Westview Way	05/15/19	nd	05/14/19	15:35		05/17/19	1.0	PLS			FALSE	O	EGLE Lab
81573	1105 Westview Way	05/04/21	nd	05/04/21	10:30		05/06/21	1.0	PLS			FALSE	O	EGLE Lab
76974	1105 Westview Way	05/10/19	nd	05/08/19	14:34		05/14/19	1.0	PLS			FALSE	O	EGLE Lab
81574	1108 Westview Way	05/04/21	nd	05/04/21	10:40		05/07/21	1.0	PLS			FALSE	O	EGLE Lab
76975	1108 Westview Way	05/10/19	nd	05/08/19	14:45		05/14/19	1.0	PLS			FALSE	O	EGLE Lab
81575	1130 Westview Way	05/04/21	nd	05/04/21	10:35		05/06/21	1.0	PLS			FALSE	O	EGLE Lab
76976	1130 Westview Way	05/15/19	nd	05/14/19	15:00		05/17/19	1.0	PLS			FALSE	O	EGLE Lab
76964	1149 Southwood Ct	05/10/19	nd	05/08/19	14:43		05/14/19	1.0	PLS			FALSE	O	EGLE Lab
13671	1239 Westview Way		nd	03/27/03		03/27/03	03/27/03	1.0	PLS			FALSE		
81562	3851 W Liberty Rd	05/04/21	nd	05/04/21	10:20		05/05/21	1.0	PLS			FALSE	O	EGLE Lab
76954	3851 W Liberty Rd	05/10/19	nd	05/08/19	15:15		05/13/19	1.0	PLS			FALSE	O	EGLE Lab
81561	3893 W Liberty Rd	05/04/21	nd	05/04/21	10:14		05/05/21	1.0	PLS			FALSE	O	EGLE Lab
76946	3893 W Liberty Rd	05/10/19	nd	05/08/19	15:07		05/13/19	1.0	PLS			FALSE	O	EGLE Lab
81560	4050 W Liberty Rd	05/04/21	nd	05/04/21	9:52		05/05/21	1.0	PLS			FALSE	O	EGLE Lab
76947	4050 W Liberty Rd	05/10/19	nd	05/08/19	15:18		05/15/19	1.0	PLS			FALSE	O	EGLE Lab
81559	4105 W Liberty Rd	05/04/21	nd	05/04/21	9:45		05/06/21	1.0	PLS			FALSE	O	EGLE Lab
76945	4105 W Liberty Rd	05/10/19	nd	05/08/19	12:15		05/15/19	1.0	PLS			FALSE	O	EGLE Lab
81558	4144 W Liberty Rd	05/04/21	nd	05/04/21	9:25		05/06/21	1.0	PLS			FALSE	O	EGLE Lab
76944	4144 W Liberty Rd	05/15/19	nd	05/14/19	15:45		05/17/19	1.0	PLS			FALSE	O	EGLE Lab
81576	4154 Saginaw Ct	05/04/21	nd	05/04/21	9:48		05/06/21	1.0	PLS			FALSE	O	EGLE Lab
76962	4154 Saginaw Ct	05/10/19	nd	05/08/19	12:28		05/15/19	1.0	PLS			FALSE	O	EGLE Lab
81577	4163 Saginaw Ct	05/04/21	nd	05/04/21	9:40		05/05/21	1.0	PLS			FALSE	O	EGLE Lab
76961	4163 Saginaw Ct	05/10/19	nd	05/08/19	12:32		05/14/19	1.0	PLS			FALSE	O	EGLE Lab
81557	4200 W Liberty Rd	05/04/21	nd	05/04/21	9:15		05/06/21	1.0	PLS			FALSE	O	EGLE Lab
76943	4200 W Liberty Rd	05/10/19	nd	05/08/19	12:11		05/14/19	1.0	PLS			FALSE	O	EGLE Lab
81578	4220 Saginaw Ct	05/04/21	nd	05/04/21	9:42		05/05/21	1.0	PLS			FALSE	O	EGLE Lab
81579	4225 Saginaw Ct	05/04/21	nd	05/04/21	9:52		05/05/21	1.0	PLS			FALSE	O	EGLE Lab
76963	4225 Saginaw Ct	05/10/19	nd	05/08/19	12:42		05/14/19	1.0	PLS			FALSE	O	EGLE Lab
81555	4300 W Liberty Rd	05/04/21	nd	05/04/21	9:21		05/06/21	1.0	PLS			FALSE	O	EGLE Lab
76967	4300 W Liberty Rd	05/10/19	nd	05/08/19	11:45		05/14/19	1.0	PLS			FALSE	O	EGLE Lab
81554	4315 W Liberty Rd	05/04/21	nd	05/04/21	9:15		05/06/21	1.0	PLS			FALSE	O	EGLE Lab
76952	4315 W Liberty Rd	05/10/19	nd	05/08/19	11:40		05/14/19	1.0	PLS			FALSE	O	EGLE Lab

Dioxane Data - South Area Wells, Page 2 of 2

Sample ID	Well Name	Entered	1,4-Dioxane Results (ppb)	Date Sampled	Time Sampled	Date Received	Date Analyzed	Reporting Limit	Reporting Lab	Static Reading	Static Time	Static Only?	Qualifier(s)	Comments
81553	4340 W Liberty Rd	05/04/21	nd	05/04/21	9:11		05/06/21	1.0	PLS			FALSE	O	EGLE Lab
78038	4340 W Liberty Rd	08/08/19	nd	08/07/19	11:58		08/12/19	1.0	PLS			FALSE	O	EGLE Lab
76966	4340 W Liberty Rd	05/10/19	nd	05/08/19	11:29		05/15/19	1.0	PLS			FALSE	O	EGLE Lab
81552	4370 W Liberty Rd	05/04/21	nd	05/04/21	8:57		05/06/21	1.0	PLS			FALSE	O	EGLE Lab
78037	4370 W Liberty Rd	08/08/19	nd	08/07/19	11:39		08/12/19	1.0	PLS			FALSE	O	EGLE Lab
76965	4370 W Liberty Rd	05/10/19	nd	05/08/19	11:16		05/14/19	1.0	PLS			FALSE	O	EGLE Lab
81550	4435 W Liberty Rd	05/04/21	nd	05/04/21	8:57		05/06/21	1.0	PLS			FALSE	O	EGLE Lab
76951	4435 W Liberty Rd	05/10/19	nd	05/08/19	11:18		05/15/19	1.0	PLS			FALSE	O	EGLE Lab
66970	Saginaw Forest Cabin #4	07/29/15	nd	07/29/15	11:12		08/07/15	1.0	PLS			FALSE	O	Brighton Analytical
64454	Saginaw Forest Cabin #4	08/27/14	nd	08/27/14	9:03		09/08/14	1.0	PLS			FALSE	O	Brighton Analytical
60999	Saginaw Forest Cabin #4	07/31/13	nd	07/31/13	8:50		08/01/13	1.0	PLS	0.00		FALSE		
41295	Saginaw Forest Cabin #4	10/16/12	nd	10/16/12	9:15		10/30/12	1.0	PLS	0.00		FALSE		
39081	Saginaw Forest Cabin #4	08/09/12	nd	08/09/12	9:05		09/13/12	2.0	PLS	0.00		FALSE		sample analyzed outside 14 day window due to autosampler pro
38528	Saginaw Forest Cabin #4	11/21/11	nd	11/21/11	8:55		11/28/11	1.0	PLS			FALSE		
34783	Saginaw Forest Cabin #4	08/09/10	nd	08/06/10	8:45	08/06/10	08/06/10	1.0				FALSE		
32585	Saginaw Forest Cabin #4	08/21/09	nd	08/19/09	8:35	08/19/09	08/20/09	1.0				FALSE		
29783	Saginaw Forest Cabin #4	08/01/08	nd	07/31/08	8:45			1.0	PLS			FALSE		
29727	Saginaw Forest Cabin #4	08/01/08		07/31/08	8:45	07/31/08	07/31/08	1.0				FALSE		
27874	Saginaw Forest Cabin #4	10/26/07	nd	10/25/07	8:05	10/25/07	10/26/07	1.0				FALSE		
25799	Saginaw Forest Cabin #4	05/21/07	nd	05/18/07	6:50	05/18/07	05/21/07	1.0				FALSE		
21697	Saginaw Forest Cabin #4	10/17/06	nd	10/16/06	8:00	10/16/06	10/17/06	1.0	PLS			FALSE		
20625	Saginaw Forest Cabin #4	05/22/06	nd	05/18/06	10:40	05/18/06	05/19/06	1.0	PLS			FALSE		
19419	Saginaw Forest Cabin #4	11/09/05	nd	11/07/05	14:25	11/07/05	11/10/05	1.0	PLS			FALSE		
18315	Saginaw Forest Cabin #4	04/22/05	nd	04/21/05	8:10	04/21/05	04/22/05	1.0	PLS			FALSE		
17556	Saginaw Forest Cabin #4	10/25/04	nd	10/22/04	8:38	10/22/04	10/26/04	1.0	PLS			FALSE		
16700	Saginaw Forest Cabin #4	04/20/04	nd	04/16/04	8:35	04/17/04	04/20/04	1.0	PLS			FALSE		
15293	Saginaw Forest Cabin #4	10/14/03	nd	10/13/03	8:11	10/13/03	10/16/03	1.0	PLS			FALSE		
14029	Saginaw Forest Cabin #4		nd	04/30/03	7:31	04/30/03	04/30/03	1.0	PLS			FALSE		
13810	Saginaw Forest Cabin #4		See Comments	04/02/03				1.0				FALSE		No Static Taken Per Steve O'Rielly
13280	Saginaw Forest Cabin #4		nd	01/22/03	9:15	01/22/03	01/23/03	1.0	PLS			FALSE		
12705	Saginaw Forest Cabin #4		nd	11/06/02	10:20	11/06/02	11/06/02	1.0	PLS			FALSE		

Washtenaw County Sewer Area Map, with markup showing well location areas



Source: https://gisappsecure.ewashtenaw.org/Geocortex/WebViewer/?app=f0327644649f4fab96af11ca00b7e3b4& (accessed 12/12/24)

Attachment G

Gelman-Related Municipal Water Connections Due to 1,4-Dioxane Contamination. Excerpt.

(Pages 4 and 5 of Reference F [the Planning and Development Services Staff Report for Planning Commission Meeting of August 16, 2011] are omitted and available at the EPA Region 5 docket upon request; Reference G of this Attachment [the Fourth Amended Consent Judgment] is omitted.**)**

January 10, 2025

PROJECT NOTE	WESTON SOLUTIONS, INC.
To: Gelman Sciences Inc (Gelman) Site File	**Date:** January 10, 2025
Task Order No.: 68HE0723F0077	
From: G. Gilliland, Weston Solutions, Inc.	
Subject: Gelman-Related Municipal Water Connections Due to 1,4-Dioxane Contamination	

Purpose

This project note describes some of the institutional controls and response activities implemented since 1986 in response to 1,4-dioxane contamination in private wells near the Gelman site in Ann Arbor, MI.

Discussion

Beginning in September 1985, testing of private drinking water wells in the immediate vicinity of Gelman showed 1,4-dioxane contamination, which had been released into the groundwater from the former Gelman manufacturing facility [Ref. A, pp. 45–46]. The State of Michigan began supplying bottled water to property owners with private wells contaminated by 1,4-dioxane in early 1986 [Ref. A, pp. 16, 46–47]. In February 1986, Gelman agreed to pay for a water-line extension to seven wells on Wagner Road and Jackson Plaza, in the immediate vicinity of Gelman [Ref. A, p. 48]. In April 1986, contamination was discovered in the Westover Hills subdivision and Gelman agreed to pay for water-line extensions to all businesses and homes with contaminated wells [Ref. A, p. 48]. The Westover Hills subdivision is just east of Wagner Road to the northeast of the former Gelman manufacturing facility [Ref. A, pp. 48, 64; B, pp. 1–2]. In July 1986, Gelman agreed to pay for water main hook-ups to 32 homes in the Westover Hills subdivision, after which the City of Ann Arbor would annex the properties; the first of the water main hook-ups in the Westover Hills subdivision was completed in November 1986, and Ann Arbor annexed the subdivision in January 1987 [Ref. A, pp. 53, 54, 168].

By 1987, more than 40 business and residential wells had tested positive for 1,4-dioxane; the groundwater contamination extended to the commercial area north of Gelman, the Westover Hills residential subdivision, and as far as 1.5 miles northwest of Gelman in a mixed-use area [Ref. A, p. 64]. At the time, the Michigan Department of Public Health (MDPH) requested an additional $409,000 from the Michigan Department of Natural Resources (MDNR) to extend water lines to areas for which Gelman had not agreed to fund the water-line extension [Ref. A, pp. 18, 64]. In February 1988, the Michigan Attorney General sued Gelman on behalf of MDNR; the state was seeking monetary compensation for bottled water ($28,000) and water main extensions ($446,000), as well as establishment of a fund for alternate water supply to residences that might yet become contaminated by releases of 1,4-dioxane and other toxic chemicals from Gelman [Ref. A, pp. 75–76].

In October 1991, the Ann Arbor City Council reported that Gelman had paid water main improvement charges for a property in the Evergreens subdivision due to 1,4-dioxane contamination in the owner's well [Ref. C, p. 9]. Ann Arbor also reported that MDPH agreed to pay the water main improvement charges for four additional properties in the Evergreens subdivision and one property in the Scioto Hills subdivision due to 1,4-dioxane contamination in the owner's wells [Ref. C, pp. 8, 10–13]. The Evergreens and Scioto Hills subdivisions are northeast of the former Gelman manufacturing facility [Refs. D, pp. 1–2; Ref. E, p. 1].

In March 2011, MDNR entered into a consent agreement with Pall Life Sciences to expand the well prohibition zone north of its current boundary into the Evergreen [*sic*] Subdivision, in response to groundwater contamination from the former Gelman facility located on Wagner Road [Ref. F, p. 2]. In August 2011, six property owners within the expanded well prohibition zone petitioned Ann Arbor requesting annexation from Scio Township; all connection and improvement charges for water and sanitary sewer service, as well as petition filing fees, were paid by Pall Corporation [Ref. F, pp. 2–4].

In 2023, Gelman agreed by signature to the Fourth Amended and Restated Consent Judgment, which defined Municipal Water Connection Contingency Plan (MWCCP) as "a contingency plan to identify the steps necessary to connect properties that rely on a private drinking water well to municipal water in the event those wells are threatened by 1,4-dioxane concentrations in excess of the applicable drinking water cleanup criterion and the estimated time necessary to implement each step of the water connection process" [Ref. G, pp. 1, 5, 73]. The Consent Judgment stipulated the following institutional controls and response activities regarding private drinking water wells:

- Gelman shall plug and replace any private drinking water wells identified in any areas newly included in the Prohibition Zone by connecting those properties to the municipal water supply [Ref. G, pp. 9, 12].

- Gelman shall develop an MWCCP addressing the potential provision of municipal water to properties using private drinking water wells in the Calvin Street, Wagner Road, and Lakeview Avenue areas, according to a schedule to be approved by Michigan Department of Environment, Great Lakes, and Energy (EGLE; successor to MDNR) [Ref. G, pp. 4, 9, 13].

- Gelman shall develop an MWCCP addressing the potential provision of township water to properties using private drinking water wells on Elizabeth Road, according to a schedule to be approved by EGLE [Ref. G, pp. 30, 33].

- Gelman shall complete a focused hydrogeological assessment and, if the assessment determines that there is a reasonable likelihood for 1,4-dioxane greater than 7.2 ug/L to migrate beyond the Prohibition Zone boundary, Gelman will review the MWCCP and initiate preliminary activities related to provision of municipal water to potentially impacted private drinking water wells [Ref. G, pp. 18, 19].

References (Attached, except Reference G because it is already part of the official record as it was included as Attachment 3 to Gelman's comments found here: https://www.regulations.gov/comment/EPA-HQ-OLEM-2024-0067-0147**)**

A. Engelbert, Phillis et al, University of Michigan. A Case Study of Environmental Contamination: Gelman Sciences, Inc. 1988. [267 pages]

B. Piper Partners. Search Results for Westover Hills. Available at https://www.piperpartners.com/areas/ann-arbor/neighborhoods/westover-hills/. Accessed and downloaded January 2025. [6 pages]

C. Ann Arbor City Council. Regular Session – October 21, 1991, Text. October 21, 1991. [26 pages]

D. Piper Partners. Search Results for The Evergreens. Available at https://www.piperpartners.com/areas/ann-arbor/neighborhoods/the-evergreens/. Accessed and downloaded January 2025. [5 pages]

E. Homes.com. Search Results for Scioto Hills, Ann Arbor, MI. Available at https://www.homes.com/ann-arbor-mi/scioto-hills-neighborhood/. Accessed and downloaded January 2025. [1 page]

F. Ann Arbor City Planning Commission. Planning and Development Services Staff Report for Planning Commission Meeting of August 16, 2011, Subject: Scio Township Annexations and Zonings. August 11, 2011. [5 pages]

G. State of Michigan Circuit Court for the County of Washtenaw. Fourth Amended and Restated Consent Judgment, Attorney General for the State of Michigan *ex rel.* [EGLE] v. Gelman Sciences LLC., File No. 88-34734-CE; with attachments. May 2023. [386 pages]

Gerald V. Gilliland, P.G.
Principal Project Scientist

A CASE STUDY OF ENVIRONMENTAL CONTAMINATION: GELMAN SCIENCES, INC.

by

Phillis Engelbert
Stephanie Finn
Thomas Fryman
Jeff Gearhart
Scott Pearson

A project submitted in partial fulfillment
of the requirements for the degree of
Masters of Science
(Natural Resources)
Masters of Art
(Landscape Architecture)
at the University of Michigan
1988

Project Advisor:

Associate Professor Bunyan Bryant

Teaching Assistant:

Michelle Youngquist

TABLE OF CONTENTS

I. **Introduction** pp. 1-14

II. **The Story (events from 1959 to the present)**

A. Events from 1959-1980 pp. 15-24

B. Events from 1980-present pp. 24-71

III. **Analysis Sections**

A. Introduction to analysis p. 72

B. Science and technology

1. Risk assessment pp. 73-96

2. An analysis of deep well injection and its application to the Gelman case pp. 97-136

C. Social, Economic, and Political issues of the case study

1. Land use planning issues pp. 137-154

2. An analysis of the response of citizens to the contamination issue pp. 155-168

3. An analysis of the response of the University of Michigan to the contamination issue pp. 169-174

4. An analysis of the response of the Department of Natural Resources to the contamination issue pp. 175-182

5. An analysis of the response of Gelman Sciences to the contamination issue pp. 183-195

IV. **Discussion** pp. 196-204

V. **Recommendations** pp. 205-206

V. **References** pp. 207-224

VI. **Appendices**

A. Federal and State Statues and their application to the Gelman case pp. 226-245

B. Gelman permit information pp. 246-251

C. Glossary of abbreviations pp. 252-253

D. Interview with James C. Marshall, Senior Vice President of Operations, Gelman Sciences, Inc., 2/4/88 (amended 3/4/88, 4/22/88, and 4/26/88) pp. 254-261

E. Maps

1. Plume inventory see inserts

2. Washtenaw County planning see inserts

ACKNOWLEDGEMENTS

The project has come to fruition through the efforts and support of many individuals. In particular we would like to thank our advisor, Bunyan Bryant , and our teaching assistant, Michelle Youngquist. We would also like to thank the following people for their guidance, information, or support: Leslie Propp, Alfin Vaz, Bob Reichel, Brian Ewart, Carl Brauer, Carol Dudley, Dan Bicknell, David Stead, Don McDevitt, Kathy Edgren, Ed Norman, Elizabeth Polk, Jack Larsen, Jack Weidenbach, James Marshall, James Schafer, Janet Cohen, Jeffrey Foran, Jim Crowfoot, Karen Clark, Ken Schatzle, Kenneth Polakowski, Mary Mickelson, Mary Vanderlaan, Priscilla Cheever, Rebecca Head, and Ron Kooistra.

ABSTRACT

This project is a case study of an incident of groundwater contamination, the suspected source of which is Gelman Sciences, Inc. ("Gelman"). Gelman is an international corporation based in Ann Arbor, Michigan. At the Ann Arbor facility production occurs of microporous membranes and filters, for medical use.

Toxic chemicals (most significantly 1,4-dioxane) used in Gelman's production process have been dumped, sprayed, and seeped into the environment. These contaminants have affected the quality of the groundwater (and possibly the air), and have rendered over 50 wells in the area unusable. 1,4-dioxane ("dioxane") was first shown to be an animal carcinogen in1965 and is a suspected human carcinogen.

Research by the Gelman Master's Project group was undertaken with the intent of providing useful information to those most personally affected by the situation--the citizens living in the vicinity of Gelman Sciences. Our process of information-gathering has included conducting literature reviews of relevant topics, researching the DNR files on the case, and conducting interviews with those involved in the case.

In this case study we have examined the chain of events surrounding the Gelman contamination issue and have attempted to understand them in the context of larger societal constructs. We have also broken the case study down into its components for further analysis. Areas of inquiry in regard to environmental contamination include: land use concerns, sciences and technologies, the response of government and industry, the response of the University of Michigan, and citizen efficacy in protecting their environment and health.

We have examined the roles of science and technology in our society, based on the understanding that sciences are not studied, nor are technologies created, in a social, economic, or political vacuum. Through an analysis of risk assessment and deep well injection, two practices undertaken by Gelman Sciences, we have discussed how science

and technology can contribute to the environmental problems which they are expected to solve.

This case study illustrates many of the inadequacies of our political, social, and economic systems in addressing environmental contamination. Remedial responses to contamination, like those used in the Gelman case, demonstrate a lack of willingness to confront the root causes of pollution. Unless proactive measures are taken, society will be perpetually committed to costly response activities.

INTRODUCTION

Groundwater flows unseen beneath the surface of the earth, occurring in saturated sand and gravel and in fractured or porous rock. It helps to sustain both human populations and ecological communities. The amount of groundwater present within the continental United States is immense. That which can be retrieved with current technology is at least six times greater than all the water stored in our surface lakes and reservoirs. It provides almost one-fourth of all water used in the country. Withdrawals of groundwater in the U.S. nearly tripled between 1950 and 1980, growing to 88 billion gallons per day in 1980. Groundwater serves these important purposes (Conservation Foundation, 1987):

- Groundwater is the source of drinking water for more than 50 percent of the total U.S. population and for 97 percent of rural residents.
- Of all water withdrawn for municipal water supplies, 35 percent comes from the ground.
- Groundwater accounts for some 40 percent of all agricultural irrigation water and 26 percent of industrial withdrawals, excluding electric power plants.
- Groundwater sustains many ecosystems. These ecosystems provide areas for fish production, wildlife habitat, recreation opportunities, and other attributes. In periods of droughts groundwater serves important ecological functions, such as providing fresh water for many lakes, rivers, inland wetlands, bays, and estuaries.

Nationally the threat to groundwater is not definitively known. As of October 1987, the United States Environmental Protection Agency (EPA) had placed 951 landfills, impoundments, and other waste sites on its National Priority List, which covers sites requiring urgent remedial action (EPA, 1987). The agency estimates that the list will grow to not more than 2,500 sites and that cleanup costs may total some $23 billion. The Congressional Office of Technology Assessment (OTA) estimates that the number of

priority sites could climb to 10,000 resulting expenditures of $100 billion; roughly $400 for every U.S. resident (OTA, 1985). The majority of these sites contain hazardous wastes. According to the Resource Conservation and Recovery Act, toxic or hazardous wastes are those which may "cause or significantly contribute to an increase in mortality or....serious irreversible or incapacitating illness; or pose a substantial present or potential threat to human health and environment." Thousands of well closures have occurred throughout the U.S. More than 200 organic and inorganic chemicals have been identified in various groundwater supplies (OTA, 1984). Groundwater's slow movement and complicated pattern (making it difficult to trace), often delay the detection of pollution.

In recent years our understanding of contaminants and the threats they pose to groundwater, has become greater. Today, specific organic chemicals in water can be measured to the parts-per-billion or parts-per-trillion level. New toxicological studies have supplied information regarding the toxicity of various substances to humans. Hydrogeologists are gaining a better understanding of water movement below the earth's surface and from the surface to the subsurface. Public outcry has brought attention to various contamination sites. As a result, many response efforts have focused on clean-up.

There are two major threats to groundwater: 1) withdrawals are in excess of natural recharge, leading to groundwater depletion; and 2) there is a decline in quality caused by a growing number of groundwater contaminants (Conservation Foundation, 1987).

Historically, the dumping of various hazardous substances onto the land and into surface water has been an acceptable practice. The earth's natural filtering system was relied upon to cleanse groundwater. As a result of the accelerated rate of dumping both historically and currently, contaminants are now present in the groundwater that threaten human health and the integrity of the environment.

Today, contaminants in the groundwater include biological, inorganic, organic, and radioactive contaminants. Biological contaminants include bacteria, viruses, parasites, and other biological agents that can cause illness. There is very little information about which

specific pathogens are actually present in groundwater. An Office of Technology Assessment report indicated that several different types of bacteria and viruses, including those that cause typhoid, tuberculosis, cholera, and hepatitis, exist in groundwater throughout the U.S. (OTA, 1984).

Inorganic substances include metals, nitrates, salts, and other compounds that do not contain carbon. The Office of Technology Assessment has identified 37 inorganic substances (including 27 metals) in the groundwater (OTA, 1984). The Environmental Protection Agency has established primary drinking water standards for ten inorganic compounds; between 1975 and 1985, these standards were exceeded in an estimated 1,500 to 3,000 groundwater supplies. The most commonly exceeded standards were for fluoride (in 1,000 to 2,000 supplies) and for nitrate (in 500 to 600 supplies) (Rice, 1985).

Organic compounds are those which contain carbon. There are many naturally occurring organic substance, petroleum being the most notable. There are also tens of thousands of synthetic organic compounds, which have been developed in laboratories. These are used in common products such as dyes, food additives, detergents, plastics, and pesticides. For years there was little groundwater monitoring for contamination from organic chemicals. Today, organic chemicals are being detected in groundwater supplies throughout the country.

Almost all groundwater contains a small amount of naturally occurring radioactive substances. Activities associated with nuclear power generation, atmospheric testing of nuclear weapons, and the use of radionuclides in medical or scientific research, releases additional (both natural and human-produced) radiation into the environment. The presence of increasing quantities of radionuclides in groundwater is alarming because of the threats these substances pose to human and environmental health.

The sources of groundwater contamination are diverse. They include waste disposal, handling and storage of hazardous materials, mining and drilling, agricultural practices, etc. The disposal of society's waste is probably the greatest threat to

groundwater quality. Substantial amounts of solid, liquid, and gaseous waste are generated in the U.S. There are approximately 29 metric tons of waste generated per person per year (Conservation Foundation, 1984). The technologies posing the greatest threat to groundwater include on-site sewage disposal, underground injection wells, surface impoundments, land application such as (spray irrigation), and landfills. Hazardous and radioactive wastes, which are two types of waste requiring special handling and disposal, are of increasing concern to human and environmental health.

Political and economic context of contamination

The way in which contamination is viewed in our society, changes with the political, economic, and scientific constructs off the time. Traditionally, pollution has not been accounted for as a factor in the cost of production. Instead, it became an externality incurred by the American people. Until the late 1960's and 1970's there was no comprehensive system of laws and regulations to govern the production, use, and disposal of hazardous materials. The production and use of these materials often precede our understanding of the threats they pose to human health and the environment. The initial large scale production of synthetic organic chemicals occurred in the 1940's. However, it is was not until the mid 1960s that there was a widespread recognition within the scientific community of the potential threats to human health and the environment posed by many of these chemicals. This changing political, economic, and scientific context of pollution provides insights into why incidents, such as the Gelman case, are so prevalent in the U.S.

The development of the synthetic organic chemical industry is a good example of the economic and political context that allows and promotes the development of technologies that threaten human health and the environment. During World War II many materials were in short supply. The science of organic chemistry made it possible to create substitutes for the materials needed. The U.S. annual production of synthetic organic

chemicals rose fifteen times between 1945 and 1985, from 6.7 million metric tons to 102 million metric tons (U.S. International Trade Commission, 1986). Worldwide, some 70,000 chemicals are presently in daily use, with between 500 and 1,000 added to the list each year (Shodell, 1985).

Synthetic substitutes help to provide a better material life. Synthetic organic chemicals are used in the production of items ranging from antibiotics and birth control pills, to detergents and plastics. However, these synthetics are manufactured in a high-temperature, pressurized, and energy intensive process of distillation and evaporation which often results in contaminants in solid, liquid, and gaseous states. Some of these synthetic organic chemicals (e.g. 1,4-dioxane) do not readily biodegrade and are persistent as carcinogens in the environment.

Events reveal that "better living through chemistry" comes with serious costs. In the absence of either imposed government regulations or self-imposed responsibility for the environment, the synthetic organic chemical industry has created an ecological nightmare. For example, pesticides thought to degrade in soils are turning up in rural drinking wells; chemicals from abandoned waste sites and other unsound disposal methods, have contaminated soils and created plumes of groundwater contamination; and a gas leak from a chemical production plant in Bhopal, India resulted in the death of more than 2,000 people. As of 1980, chemical production accounted for an estimated 60 percent of hazardous waste produced in the U.S. (Brown, 1980). As of 1983, more than 77 billion pounds of hazardous waste were generated in the U.S. per year, which comes to about 20 pounds for each person on earth. There are 48,500 different chemical compounds on the market (EPA, 1983). The U.S. National Research Council (NRC) estimates that for 79 percent of the more than 48,500 chemicals listed in the inventory prepared by the Environmental Protection Agency, no information on the toxic effects is available (NRC, 1986).

The extent of groundwater contamination by synthetic organic chemicals is alarming in terms of the potential threats to human health and to the future use of this resource. The

Office of Technology Assessment has found 175 different organic chemicals present in groundwater supplies (OTA, 1984). Synthetic organic chemicals have been found in groundwater often in concentrations several orders of magnitude higher than found in the most contaminated surface water (Council on Environmental Quality, 1981). A nationwide groundwater supply survey was conducted during 1980-1981 and found 29 volatile organic compounds in 945 groundwater systems (EPA, 1983).

The clean up of contaminated soils and groundwater is extremely expensive and billions of dollars have already been spent in this pursuit. Even the cleanup of a single site can be very costly and there are more than 2,500 included on the National Priority Lists. The EPA spent $33 million to buy Times Beach, Missouri after the streets had been sprayed with oil contaminated with 2,3,7,8-TCDD, one of a class of chemicals called "dioxins" (Boraiko, 1985).

At the same time, very high profits are generated by the production of synthetic organic chemicals. The annual value of synthetic organic chemicals to the chemical industry in 1980 was approximately $70 billion (Crone 1986, Fig. 2.4). Pesticide sales alone totaled nearly $6.6 billion in 1985 (Brown, et. al 1988).

The political climate of the past 40 years has produced a laissez-faire attitude toward the regulation of industry. This allowed the production of synthetic organic chemicals to grow almost unchecked. Until the late 1960s, there were no federal laws specifically designed to protect the public from toxins. The hands-off policy of the Federal government allowed production of synthetic organic chemicals without accountability and responsibility for the harmful effects of these chemicals. The only public recourse for damage caused by toxins previous to the late 1960s were private lawsuits, known as damage suits, to stop one person (or company) from doing harm to another. As the scope of the hazardous waste problem became more clear, it became obvious that litigation was an inadequate vehicle for protecting human health.

Citizens, interest groups, scientists, and politicians during the 1960s and early 1970s, focused attention on and increased awareness of the extent of the threats presented by synthetic organic chemicals. In 1962, Rachel Carson's Silent Spring called public attention to the dangers that organic chemical insecticides pose to health and ecosystems. The publication of Silent Spring coincided with the development of laboratory techniques and equipment capable of measuring minute amounts of DDT, mercury, and other pollutants. Later, scientists and citizens at Love Canal linked birth defects with toxins found in the canal. They also called attention to the dangers of synthetic organic chemicals.

As a result of public outcry, a system of laws was developed in the late 1960s and the 1970s, designed to restrain these environmentally unsound activities. These laws include the National Environmental Health Policy Act, the Toxic Substances Control Act, the Clean Air Act, the Federal Water Pollution Control Act, and the Resource and Conservation Recovery Act. These statutes contain broad imminent-hazard provisions that enable the EPA to take immediate action to restrain activities posing a threat to human health and any feature of the environment, including groundwater.

Few of these laws have been vigorously enforced by Federal government officials since their passage. However, some enforcement of these statutes has occurred due to pressure applied to citizen action by citizens. For example, the Clean Water Act requires the EPA to control the discharge of toxic chemicals into waterways, but litigation by environmental interest groups was necessary to cause these regulations to be enforced. Citizens and various interest groups are becoming more effective at creating political change. These groups have been able to mobilize and effectively use various resources (such as information) to appeal to fundamental moral values, and to consequently mobilize large numbers of people around environmental issues. These groups have also gained many skills needed to create change (for example, leadership, organization, legal knowledge and communication). Laws, although they may look strong on paper, are meaningless if not enforced.

The synthetic organic chemical industry is beginning to respond to the high costs the various regulations have imposed upon them for creating, storing, and disposing of hazardous wastes. Incineration of organic chemicals costs between $500 and $1,200 per ton. Waste management costs for Du Pont, the nation's largest chemical producer, now exceed $100 million annually. Paul Chubb, Vice Chairman of Du Pont's Manufacturing Committee, says that "an economical and environmentally acceptable" waste management plan now "holds the key to success or failure of many of our businesses" (Brown, L. et al., 1988). The various laws and regulations governing hazardous waste, like many of those governing synthetic organic chemicals, force industry to become more responsible in the production, storage, and disposal of these wastes. As the costs to industry increase, they may look to less destructive waste management alternatives, e.g. waste reduction, reuse, and recycling.

To locate and clean up every leaking landfill, waste lagoon and contaminated groundwater source throughout the country would be extremely costly. Remedying the legacies of irresponsibility and mismanagement only begins to address the dilemma of environmental contamination. Unless the wastes currently produced are better managed, society will perpetually be committed to costly response activities. Moreover, new "out of sight out of mind" technologies of waste disposal promoted by the Federal government, such as deep well injection, do not address the hazardous waste problem. These technologies relocate the hazard further below the earth's surface, where the waste can slowly migrate back up into the aquifers containing drinking water. Without concerted efforts to reduce and recycle hazardous waste and to develop biodegradable alternatives, the quantities and varieties produced will overwhelm even the best treatment and disposal systems, and the goal of safe and sustainable waste management will remain unattainable. To achieve this goal requires that federal and state governments force industry to adopt safe and sustainable waste management strategies and that citizens demand accountability.

The Gelman case

The Gelman case is a local incident of groundwater contamination which illustrates many of the issues pertinent to layer issue of environmental contamination. Specifically, this case provides an opportunity to explore the social, political, and economic context of groundwater contamination. Specific areas of inquiry in regard to environmental contamination include: land use concerns, sciences and technologies, the response of government and industry, and citizen efficacy in protecting their environment and health.

Gelman Sciences, Inc. ("Gelman") is located on 600 Wagner Road in Scio Township, Washtenaw County. The site covers approximately 55 acres. The Gelman facility contains offices for its world headquarters and a manufacturing plant where it produces microporous membranes and filters used in hospitals and laboratories. Gelman currently employs approximately 600 people at the Wagner Road facility. The Gelman facility is located in an area of interspersed agricultural, rural residential, commercial, high-tech research and development, and light industrial land uses.

Gelman's past wastewater handling and disposal practices are widely believed to have caused widespread groundwater and surface water contamination with synthetic organic chemicals. Since 1963 Gelman has used the following methods of waste disposal at the 600 Wagner Road site: direct surface discharge, seepage from unlined lagoons where aerobic and anaerobic microbial treatment occurred, disposal and burning of chemical wastes in an unlined pit, spray irrigation after aerobic and anaerobic microbial treatment, and deep well injection.

The chemical of most concern is 1,4-dioxane (which will subsequently be referred to as "dioxane"). Dioxane was first shown to be an animal carcinogen in 1965 (Argus et al, 1965) and has been on Michigan's Critical Material Register every year since 1980. (The Critical Material Register is a list of toxic chemicals which, if used or discharged by a business or industry, must be reported annually to the State, (Kelley et. al v. Gelman,

2/26/88). Dioxane is a highly volatile, flammable colorless, water soluble liquid compound used in solvents. Long-term animal studies have shown dioxane to induce nasal and liver tumors. Dioxane is a suspected human carcinogen (Kelley et al v. Gelman, 2/26/88, and Michigan Department of Public Health (MDPH) Dioxane Risk Assessment - DNR files, 6/87).

Gelman used dioxane in the process of making filters from 1966 through 1986. In June 1980 Gelman reported using or storing 60,000 pounds of dioxane annually (Kelley et al. v. Gelman, 2/26/88). A recent hydrogeology study commissioned by Gelman indicates that the most likely source of dioxane in the groundwater was Gelman's early seepage lagoon (EPA, 9/24/86).

The presence of dioxane in the ground and surface waters was confirmed in 1985. Gelman was subsequently ranked 84th on the annual Priority List of cases of environmental contamination under the Michigan Environmental Response Act. Early in 1986 some of the residents in the area for whom groundwater was their water supply, were notified not to drink or bathe in their water. Bottled water was supplied to these homes by the State.

In April 1987 the Gelman site was ranked second on the annual Priority List. At present over fifty residential and commercial wells are known to be contaminated. The plume of contamination has spread as far as one mile from the Gelman facility. To date, no successful action has been taken to stop the spread of contaminated water.

As a result of this environmental contamination, Gelman, citizens, and state and local governmental agencies have responded in various ways. We will be exploring in detail the response activities, the interests and motivations, the resources available, and the efficacy of the different actors involved.

Specifically, this document first, introduces the case and our reasons for studying it. Second it provides the background to the case and includes the history of Gelman's waste disposal practices, and the resource activities of Gelman, the Department of Natural

Resources, the Department of Public Health, and the citizens; and third it analyzes various response activities and other specific aspects of the case. Finally, it explores the root causes of environmental contamination within the context of our society's political, social, and economic constructs.

Goals and objectives

The following is a list of the reasons we chose to study the Gelman case of groundwater contamination: 1) It provided an opportunity to explore a real case study of environmental contamination as opposed to theoretical research; 2) It is a local issue; 3) It provided an opportunity to help the surrounding community by providing them with information that is helpful in understanding the case; 4) The case affects the members of the Gelman Masters Project group directly because of the contamination of Third Sister Lake, a University property; 5) Many of the members of the group are environmental educators and advocates who will be dealing with concerns similar to those presented in this case after leaving the University; 6) The case study allows us to analyze the existing and proposed land use pattern of Ann Arbor in relation to industry and to develop recommendations to prevent similar land use conflicts in the future; and 7) this case study has provided opportunities to gain valuable experiences and skills in the areas of group process, information gathering, problem solving, etc.

Our specific goals and objectives are as follows:

Goals

1) Use the contamination of groundwater with 1,4-dioxane on and surrounding the Gelman Science, Inc. property as a case study. The expected outcome of this study is to develop a story of what occurred and future directions for the case, including the interactions and efficacy of the various actors involved, the use of various sciences and technologies for

resolving the contamination problem, and the relationship between industrial and rural land uses.

2) Explore the political and economic context of environmental contamination in the Gelman case in order to gain insight into the causes of pollution.

3) Make this document available to those most personally affected by the contamination, the community residents, with the intent of providing them with useful information about the case.

4) Present our findings, analysis, and recommendations to interested parties (i.e., the Michigan Department of Natural Resources, Gelman, the Michigan Department of Public Health, etc.), with the intention of providing helpful information for resolving this and other incidents of environmental contamination.

Objectives

1) Reconstruct the history of Gelman Science, Inc. as it relates to the groundwater contamination issue and analyze their response.

2) Document the response of the Michigan Department of Natural Resources to the contamination, and evaluate the effectiveness of that response.

3) Explore the roles of public participation and citizen actions in the Gelman case.

4) Explore the roles of the School of Natural Resources and the University of Michigan in the Gelman case.

5) Examine how the sciences of hydrogeology and risk assessment, and the technology of deep well injection, shape the response to contamination.

6) Visually demonstrate the contamination plume in order to gain a better understanding of the study area.

7) Evaluate the relationship between industrial and rural residential land uses and the potential for contamination when developing recommendations for future land use planning.

8) Research the various laws and regulations governing groundwater contamination and the Gelman case.

9) Explore the root causes of environmental contamination in our country and the implications for future contamination.

Methodology

Research by the Gelman Master's Project group was conducted with the intention of providing information which is useful to those most personally affected by the situation--the citizens. In addition, it is hoped that the document will serve as a case study relevant to any of a growing number of instances of groundwater contamination and communities which are faced with similar problems.

The Gelman Masters Project group adopted an approach where research has led group members, not vice-versa. The end result of the document was not decided upon prior to conducting research. Rather, each step of gathering information has led to a next step, which in turn determines the next direction, and so on. After each step of information-gathering, reflection occurred to evaluate the relevance of the material and to provide insights for future directions of research. This has been a process of developing a story and an understanding of the events that led to the contamination of the groundwater, along with the various responses by state and federal agencies and citizen groups. Our process of gathering information included conducting literature reviews of relevant topics, researching the DNR files on the case, and conducting interviews with the various actors within the case.

The development of "The Story" was a lengthy process of gathering information. For an overview of the various events that led to the contamination and the response activities that followed we found newspaper articles very helpful. (The Ann Arbor Public Library has updated files.) We also used the Michigan Freedom of Information Act (Act 442, P.A. 1976) to gain access to Department of Natural Resources and Environmental Protection Agency files. (For helpful information see East Michigan Environmental Action Council, "Groundwater Contamination Sites: A Citizen's Guide to Fact Finding and Follow-up," 1984, or contact your local Representative.) Finally, we found it necessary to conduct interviews with various individuals to obtain their personal perspectives and to

further develop the story. This information along with current literature provided the basis for our analysis.

THE STORY (EVENTS FROM 1959-PRESENT)

Events from 1959-1980

An introduction to Gelman, Science, Inc.

In 1959, the Gelman Instrument Company was founded by Charles Gelman, an enterprising graduate of the University of Michigan School of Public Health. Gelman had served in the U.S. Public Health Service from 1956-57, where he had developed an air pollution monitoring device for the government (the Automatic Sequential Air Sampler). After leaving the service in 1957, he was commissioned by the government to produce the device, and within two years his fledgling business had outgrown its basement location. From 1959-63, Gelman Instrument Company operated out of a storefront in Chelsea, Michigan, and in 1963 the company moved to a larger facility in Scio Township at 600 South Wagner Road, where it has been headquartered ever since (Gelman Science, Inc, 1987 a,b).

Gelman specializes in perfecting filtration membranes used in a variety of purification and separation processes. Today the company produces over 3,000 different microfiltration products and is divided along two lines: 1) the Filtration Division and 2) the Membrane and Device Division. The Filtration Products Division produces supplies used in clinical and research laboratories and industrial processes. These include products used in electrophoresis, cell and tissue culture, as well as specialized products used by industry. Pharmaceutical and beverage companies are just two of the industries which use Gelman products. Gelman also produces environmental testing products, including products used in sewage treatment plants, air pollution monitoring devices, acid rain filters, and asbestos monitoring materials. The Membrane and Device Divison produces supplies for hospital wards and operating rooms (Gelman Science, Inc., 1987 a).

In 1978, Gelman Instrument Company became Gelman Science, Inc. ("Gelman") to reflect the diversification of its product line. The company has thrived in Scio Township, and in 1986 was listed in "The 101 Best Performing Companies in America" (Gelman Science, Inc., 1987 a).

Problems with Gelman's waste treatment methods

It is ironic that Gelman, a company founded to produce environmental monitoring devices, now ranks second on the Priority List of Michigan Sites of Environmental Contamination. Gelman's problems with its waste stream began in the 1960's. During those years local residents began complaining about the foul odor emitted by the plant's waste storage lagoons. Two lagoons had been built (one in 1964 and the other in 1967) on Gelman's property to receive its waste stream from production processes (Reynolds , 11/7/69). The waste stream, containing water and organic solvents, was pumped into one lagoon for "minor degradation and then into a second one for aerobic treatment" (DNR files, 5/21/87). The aerobic lagoon contained bacteria which were supposed to "feed" upon the solvents. Unfortunately, the production of a new type of filter in late 1967 increased Gelman's wastewater output to approximately 20,000 gallons per day. Gelman's degradative bacteria were unable to keep up with this increased discharge (Reynolds, 11/7/69).

These odor complaints prompted investigation by the Water Resources Commission (WRC), a state agency responsible for water quality monitoring. Samples taken from the waste discharge in March and April 1968 revealed a high biological oxygen demand (BOD) of 420 mg/l (Reynolds, *Ann Arbor News* , 11/7/69). High BOD is an indication that waste contains a high amount of oxidizable organic chemicals. WRC officials also discovered at this time that waste water was overflowing from the lagoons into a swamp, and possibly into Honey Creek via a drainage ditch. (Honey Creek is a tributary adjacent to the Gelman property which flows into the Huron River.) Gelman was notified that the company was in

violation of the Order of Determination issued in 1965 which prohibited surface water discharge, and limited the company's wastewater output to 9,000 gallons per day. Gelman's high BOD was also in violation of the Order (DNR files, 3/3/68).

Although an inspection by the WRC in October 1968 found no overflow from the lagoons, problems with the treatment lagoons began anew in early 1969. In February, the WRC inspected Gelman again and found that the newest of two lagoons was discharging into a swampy area adjacent to Honey Creek. A memo in the DNR files notes, "The 20 gal. per minute flow was brackish (dark gray) in color and possessed a septic odor" (DNR files, 2/21/69). The DNR memo noted that Gelman must be aware of the discharge, since "it traverses through a corrugated metal pipe from the secondary lagoon placed there no doubt by the company" (DNR files, 2/19/69). The BOD was measured at 820 mg/l. Soon after this the WRC circulated an internal memo which suggested that the high organic load of Gelman's waste stream might be harmful to the "receiving stream," Honey Creek. The memo, written by J.M. Bohunsky, Regional Engineer for the WRC, urged WRC District Engineer W. Denniston, who had visited the site, to make a follow-up visit as soon as possible (DNR files, 3/12//69).

Denniston subsequently informed Vice President of Manufacturing G.J. MacMahon of the company's violations, and told him the company would have to apply for an amended Order of Determination (DNR files, 3/17/69). MacMahon replied in April that the company was actively working to reduce its waste output (DNR files, 4/3/69).

Effluent from the lagoons sampled in July showed the BOD had increased to an extremely high level--1200 mg/l. A letter from the WRC informed Gelman that its "second treatment lagoon was inadequate" as shown by the high BOD. The letter noted that such effluent could prove detrimental to Honey Creek, and that any effluent discharged into the creek should have a BOD no higher than 15 mg/l (DNR files, 8/22/69). David Dennis, then a regional water quality director for the State, described the BOD levels as"being four times the amount of organic solvent in normal, untreated sewage" (Reynolds, 11/7/69).

After the March and August notifications from the WRC concerning their violations, Gelman applied for an increase in their permitted discharge limit to 50,000 gallons per day. Their "Statement of New or Increased Use" filed under Act 245 noted that continued discharge of their waste stream into Honey Creek was an option being studied. Gelman had commissioned J.A. Borchardt, a civil engineering professor at the University of Michigan, to study the feasibility of this discharge route and to determine how Gelman's wastewater could best be treated. The application describes the proposed method of treatment: waste water would be treated by activated sludges in the lagoons, along with aeration and the addition of additives. 30-40 percent of the waste water would be lost through seepage and evaporation. The remaining waste water would either go (depending on the outcome of feasibility studies) into a "tile" field or into surface water flowing into Honey Creek (DNR files, 8/14/69).

In the same month that Gelman filed this permit, the WRC filed a statement of potential environmental impact cautioning against discharge into Honey Creek. The statement warned that increased BOD in the creek would harm existing fish populations. The report described the Honey Creek watershed as a high quality "warm-water feeder stream" and concluded, "do not permit any waste waters to leave the factory via surface drainage" (DNR files, 8/27/69).

Possible impacts on Saginaw Forest

At this time, concern was expressed for Saginaw Forest, a research property of the University of Michigan contiguous with Gelman's property. Odors had been detected within the forest and the WRC warned that Gelman's waste might damage the property. The WRC noted in a September 1969 memo that, "the University of Michigan uses the Third Sister Lake for experimental studies and for special educational purposes. It is a very high quality lake, there is serious concern over possible contamination of any ground water which might gain entrance to the lake " (DNR files, 9/12/69).

Two University of Michigan Forestry faculty, John R. Bassett and Beverly L. Driver, expressed concern over Gelman's activities and its possible impacts on the forest. They thought the ecology of the forest might be adversely affected and its research potential diminished. They called for seepage studies to determine where Gelman's waste water was flowing, and an elimination of the odors (Reynolds, 11/7/69). Walter E. Lewis, Consulting Engineer to Gelman, denied that overflow from the lagoons could enter the lake, saying, "It would have to run uphill" (Reybolds, 11/7/69).

Gelman attempts to solve the odor problem

Professor Borchardt, in addition to studying the feasibility of discharging waste into Honey Creek, had installed new aeration devices in the lagoons. He was testing their ability to inject a level of oxygen into the ponds sufficient to maintain a population of bacteria capable of degrading solvents in the waste. Borchardt's device was designed to overcome problems unique to Gelman's waste stream--the stability of the solvent and the high oxygen requirements of the degradative bacteria. His device consisted of rotating plastic disks on which colonies of bacteria could anchor themselves. These disks operated partially submerged and allowed the bacterial colonies to "work on " the solvent. Ultimately, the disk-bound colonies were exposed to the air and dried out (Reynolds, 3/10/70).

Gelman requested that the WRC not take any actions against the company while Borchardt was completing his study, nor draw up a new Order of Determination until its completion. Robert C. Medl, Manager of Chemical Engineering, commented to *The Ann Arbor News*, "We've told the Water Resources Commission any order issued could be out of date almost as soon as they issue it. We've urged them to wait for Prof. Borchardt's results. We're asking, 'Why do it twice?' Our target date is February (1970)" (Reynolds, *The Ann Arbor News, 11/7/69)*. Borchardt completed the first phase of his study in October 1969, but did not complete the entire study until October 1970, well after the

proposed deadline. The WRC received no progress reports on Borchardt's study until late 1970. In August the WRC had asked Gelman to submit a progress report within 30 days. Gelman then notified the WRC that it would submit a report soon, and that the problem had turned out to be more intractable then expected; thus, the reason for the delay. They also reported no waste had been discharged since November 1969.

The Borchardt report was finally submitted on October 2, 1970. It stated that the first lagoon had been converted to an anaerobic lagoon during the summer. A supplement to the report, issued a week later, noted that for the past nine to twelve months, waste discharge had averaged 7,500 gallons per day. At this time, Gelman noted its waste stream had been reduced and withdrew its request for a waste discharge increase.

The Ann Arbor News reported soon after this in an article entitled, "Pollution Paradox is Solved" that Gelman had taken a number of measures to rectify its waste problems, and had received an "A" rating for 1970. Gelman had received an "E" rating from the WRC for two consecutive years (1968-69), the worst rating a company could get for its waste disposal practices. The article noted that the lagoons had been deepened and the overflow stopped and that changes in the production process had significantly reduced Gelman's waste output. The odor problem proved more difficult to solve and the article commented that Borchardt's rotating disk aerators had just been installed to cope with the problem (Reynolds, *The Ann Arbor News*, 4/28/71).

The News' optimism proved premature, as new problems surfaced in 1973. At that time residents filed complaints with the Air Quality Division (AQD) concerning mist and foam blowing off the lagoons (DNR files, 8/2/73). Furthermore, the complaints received by the AQD characterized the odor as extremely gaseous and septic-like. Although Gelman agreed to shut off its aerators during high wind conditions to reduce foaming on August 2, a report was filed with the WRC a week later by Transidyne General, a company on Wagner Road. Employees there had complained of an odor which had lasted for one week, and which caused "slight nausea" (DNR files, 8/9/73).

Gelman attempted to attack the continuing odor problem by installing a new cover on the anaerobic lagoon. The AQD was satisfied with this measure and believed it had resolved the odor problem (DNR files, 9/10/73).

In 1973 Gelman began a new waste treatment process--spray irrigation. The company had installed a three million gallon holding lagoon on its property which was used to contain its waste stream while it was aerated, and "stabilized" through aerobic digestion. The "digested" waste was then spray irrigated onto Gelman property (DNR files, 5/21/87).

Odor problems surfaced again in June and July 1975. In that month complaints of a severe odor problem at the Gelman plant initiated another investigation of Gelman's waste treatment processes. Air Pollution Control came to the plant in July and found holes in the plastic covers on the lagoons. Gelman installed a new cover on the anaerobic lagoon on July 11 and equipped the second lagoon with new aerators. Gelman pronounced the situation firmly under control and notified Air Pollution Control in 1975 that there had been a "noticeable reduction in odor" (DNR files, 7/15/75).

Within a month after this pronouncement, the AQD received several more odor complaints (as documented in DNR files). The AQD returned to the site for another investigation, but could not determine the source of the problem. Residents continued to complain of the odor emanating from Gelman, and the AQD responded to complaints by returning to the site to inspect it. The DNR followed up some of the first complaints and attributed the odor to a tear in one of the lagoon covers (DNR files, 8/23/76). However, the odor had existed before the cover was torn, and the AQD suspected that the damaged cover was not the only culprit (DNR files, 9/26/76). The AQD requested that Gelman keep spare covers on hand (DNR files, 9/27/76).

Gelman's spray irrigation comes under fire

Continuing odor complaints resulted in the WRC sending a letter to Gelman on September 20, 1976 informing the company that it was in violation of its Order of

Determination. "We have a number of complaints regarding odors coming from your process waste water treatment ponds and from your use of spray irrigation..." The WRC told Gelman to, "...cease and desist the spray irrigation...immediately" (DNR files, 9/20/76). The WRC claimed that Gelman's waste water from the spray irrigation process was entering surface waters, and thus was in violation of the permit.

Barbara Carr, a local resident, filed a complaint with the AQD stating, "The noxious odors which have been bothering us for the past month appear to be caused by Gelman's new spray irrigation procedures as well as the absence of a plastic cover on the lagoon." She requested a written report on the status of Gelman's activities and the AQD's actions (DNR files, 9/27/76). The AQD replied that the cover had been "faulty" since June or July and that its replacement would reduce the odor greatly. The AQD also noted that Gelman had ceased spray irrigating its wastes, while trying to determine if this process violated its permit (DNR files, 9/28/76).

Gelman complied with the WRC's order to stop spray irrigating on its property, but soon requested temporary permission to resume it. Gelman estimated their water discharge to be 25,000 gallons per day process waste and 3,000 gallons per day sanitary waste. (The original permit allowed 9,000 gallons per day of all discharge.) Because the lagoons had limited storage capacity, and Gelman's discharge had reached such a high rate, temporary permission to spray irrigate became a necessity. Since at that rate of discharge output, the lagoon would overflow. The WRC granted the temporary permit and informed Gelman that it had to apply for a state discharge permit.

Gelman filed the state discharge permit application in November. The permit process continued through 1977, with several revisions in the terms of the permit made by both parties. A draft was issued to Gelman on April 6, but soon after this Gelman requested an increase in the amount of waste water it could discharge. The company requested that the permit read, "112, 700 gallons/day rather than 44,000 gallons/day," because it could only spray irrigate during the growing season months of March to

November. In order for the lagoon to store discharge generated in the winter months, spray irrigation would have to occur at a rate twice that currently permitted.

The WRC sent Gelman a revised permit which contained the desired provisions in July 1978 and the State approved the permit in September. The new permit, in addition to increasing Gelman's allowed output, specified that "There shall be no runoff from spray irrigation to any surface watercourse" (DNR files, 9/5/78)

Odor complaints occurred less frequently in 1977. In July a Wagner Road resident informed the State that Gelman's waste disposal practices created "obnoxious fumes" which aggravated respiratory problems from which both she and her husband suffered. She also attributed headaches and nausea to the odor (DNR files, 7/8/77).

Despite the number of complaints filed in the preceding years, the State's inspections, and Gelman's purported efforts to deal with the problem, things did not improve in 1979. In July, another local resident wrote that there were "excessive, terrible odors from Gelman instruments. Smells like dog waste. Can't stand to be out in the yard. Son can't breathe. Severe nuisance." He noted that the problem had been occurring for four years (DNR files, 7/16/79).

This letter brought prompt action from the AQD, which investigated the site within one day of receiving it. The AQD found that Gelman's lagoons had been malfunctioning. The anaerobic lagoon had been shut down in 1977, but the aerated lagoons continued to serve as reservoirs for Gelman's waste. The aeration system had broken down for several weeks in the spring, which initiated a severe odor problem as the lagoon became partially anaerobic. The AQD noted that Gelman was attempting to rectify the situation by installing four new aerators. The AQD believed the odor problem would temporarily persist until the aerators had operated long enough to make the lagoon aerobic again (DNR files, 8/1/79). In response to the AQD's inquiry about Gelman's waste water treatment system, the WQD replied that Gelman had no "real" problems with its system.

In November 1979, the WRC was summoned to investigate a new complaint filed by a Gelman employee. The employee saw a fellow employee dump an "unknown substance" into a hole in the ground near the water tower. The WRC found that the site contained waste plastics (DNR files, 11/14/79). Gelman was notified that it had violated its NPDES Industrial Wastewater permit, and was ordered to clean up the site. Gelman wrote to the WRC explaining that the it no longer used the pit to dispose of "cellulose acetate and miscellaneous research mixtures" and did not intend to use the pit for the disposal of any materials in the future. In 1980, Gelman received an "I" (inadequate) rating for using the waste pit on its property during 1979 (DNR files, 1/28/80).

History from 1980-present

Introduction to dioxane

It was in the year 1980 that 1,4-dioxane ("dioxane") issue first surfaced. Although Gelman's waste disposal practices have been frequently questioned by citizens and the Department of Natural Resources (DNR) over its years of operation, the contamination of the groundwater by dioxane has become area residents' and state regulatory agencies' primary concern.

Dioxane was first shown to be an animal carcinogen in 1965 (Argus et al, 1965) and has been on Michigan's Critical Material Register every year since 1980. (The Critical Material Register is a list of toxic chemicals which, if used or discharged by a business or industry, must be reported annually to the State. MCL 323.6b; MSA 3.526 (2)) (Kelley et. al v. Gelman, 2/26/88 (DNR lawsuit against Gelman)).

On March 18, 1980, a former Gelman employee notified the DNR that one of Gelman's wastewater holding ponds leaked and had been draining waste into Third Sister Lake in the University of Michigan (hereafter U-M)-owned Saginaw Forest. He also

accused Gelman of having operated a chemical pit, which they had buried the previous month.

This pressed the DNR into sampling Gelman's wastewater. Dioxane was detected in each of Gelman's three holding lagoons. One sample showed dioxane at a concentration of 25,000 parts per billion (ppb) (DNR Files, 2/20/81). Gelman had been reporting their dioxane usage in their yearly reports to the DNR for several years. However, it seems that these reports were not being read carefully, as this was the first time that DNR officials became aware that Gelman was using dioxane. Tetrahydrofuran, another organic solvent (although not carcinogenic), was also detected in the lagoons (Kelley et al v. Gelman, 2/26/88). Tetrahydrofuran, in large doses, is known to cause liver and kidney damage in laboratory animals (Cohen, 2/2/86).

In June 1980, Gelman reported using or storing 60,000 pounds of dioxane annually. Half of this volume was disposed of by spray irrigation, of which 25 percent was expected to evaporate. In 1981-82, Gelman used approximately 4,400 pounds of dioxane per month. Gelman was spray irrigating in violation of a permit issued by the Michigan Water Resources Commission in December 1965, which prohibited the discharge of "any substance that was or might become injurious to public health, or to commercial, industrial, or domestic uses of State water resources" (see Federal and State Statutes section). Any discharge of dioxane to groundwater or surface waters was therefore unauthorized. Gelman, however, has consistently claimed that they were not in violation because the DNR had known that Gelman was discharging dioxane, and had allowed this to continue.

On October 27, 1980 the Environmental Enforcement Division (EED) received a complaint that Gelman was illegally discharging wastes being held in a storage lagoon. The next day the EED investigated and found the following:

> The pond at the northwest corner of the Gelman property had a pump which was running, sitting on the southwest bank, with one hose running into the

> almost entirely drained pond water, and the other end running up onto the west bank and toward the northwest property line. The line terminating approximately 15 feet from the fenceline at the northwest corner of the pond. The natural ditch in that bank was leading the water towards the fence line and off of the Gelman property. A wooden structure at the fenceline appeared to be made specifically to let water through the fence" (DNR files, 10/28/80).

In this way, Gelman was illegally discharging wastewater into the adjacent swamp area.

On February 20, 1981, the EED of the DNR sent a memo to the Water Quality Division (WQD) concerning the contamination detected in Gelman's lagoons.

> The presence of dioxane is of concern because it is an animal positive carcinogen and was added to the Critical Materials Register this year. If dioxane is present in the lagoons, dioxane could potentially enter the groundwater through spray irrigation of the wastes and seepage from the lagoons. You agreed to re-sample the lagoons to determine whether dioxane is still present... Please send me a copy of the results when they are available (DNR files, 4/9/81).

Results from samples collected on April 9, 1981 showed no detectable contamination; however, those taken on May 26 showed dioxane in pond No. 3 at 90 parts per million (ppm).

Unlike the DNR (which is concerned with the quality of groundwater in general), the Michigan Department of Public Health (MDPH) is concerned only with groundwater quality as it affects drinking water supply wells. In a memo sent to the DNR on June 10, 1981, the MDPH stated:

> Gelman information indicates that the site is located on a narrow outwash channel. Groundwater flow is to the north and southwest and is intercepted by intermittent streams. There appears to be no water supply wells between the source and its point of surface discharge from the area. Based on this, no sampling is recommended with respect to this site (DNR files, 6/10/81).

Permit violations and air quality complaints

Gelman committed another violation in September 1981. On September 1 contacted the DNR regarding complaints received by the "Action Please" column that burning was

taking place at Gelman. An official from the DNR's Air Quality Division (AQD) contacted Gelman and Gelman indicated that the burning was conducted as part of a fire extinguisher burning demonstration, by a local fire equipment company. However, later in the day, James Marshall, Vice President of Operations for Gelman, called back the AQD to change his statement to include that "small stacks of confidential papers were infrequently burned." The AQD informed him that this practice was prohibited and Marshall agreed to discontinue it (DNR files, 9/1/81).

From July 1980 to October 1982, according to the monthly discharge reports submitted to the DNR by Gelman, the maximum daily discharge permitted limit of 112,700 gallons was often exceeded, sometimes by more than 100,000 gallons. Nutrient (i.e. organic components of the waste stream which are broken down by bacteria in holding ponds) levels also often exceeded permitted levels (Cohen, 4/27/86).

Throughout 1980, 1981, and 1982, Gelman was the cause of excessive odor problems, for which the DNR received numerous complaints. In August 1980 alone, the AQD received twelve telephone complaints. The odors were verified by AQD staff on several occasions. On August 12, 1980, the AQD conducted a community survey of residences in the vicinity of Gelman. Of the fifteen residents interviewed, eleven indicated they felt there was an air pollution problem in their neighborhood. The most frequently mentioned problems were odors and/or fumes. Ten of the eleven residences identified Gelman as the suspected source of the problem.

The odors have been described in complaints to the DNR as follows: "...a sickening smell, worse than rotting garbage" (8/20/80). "...smells like decomposing animals. People are getting sick and nauseous from breathing this and would like some action on the matter" (8/10/81). "Gelmans [sic] has been a serious problem for our neighborhood for several years. We have complained to Gelmans [sic] every summer about the terrible smell their plant emits, only to be given excuse after excuse and never any relief from the odor" (8/18/81). "Last summer our neighborhood was polluted by the

Gelman smell. It made breathing uncomfortable. On some days my nasal passage was so irritated a bloody nose resulted and my throat had a burning sensation. At other times it made me nauseous..." (8/18/81) (All complaints taken from DNR files). In addition, several citizens appeared before the Michigan Air Pollution Control Commission monthly meeting in August 1981 to complain about problems they had been experiencing since 1966 with the terrible odors in the neighborhood, caused by Gelman (DNR files, 8/18/81).

The AQD did investigate the odors on numerous occasions (DNR files: 7/7/75, 8/6/75, 8/7/75, 7/15/80, etc.). Gelman responded to requests by the AQD to address the odor problems by installing plastic covers on the company's anaerobic wastewater treatment lagoon in order to reduce odors (DNR files, 9/10/73), and by keeping a spare cover on hand (DNR files, 10/27/76). However, responses by Gelman were inadequate in addressing the odor problems. The covers installed by Gelman were reported to have holes in them and to be emitting odors on several occasions (DNR files: 7/7/75, 8/76, 7/79). The Washtenaw County Health Inspector found the cover to be off the lagoon on September 3, 1976. The aerators within the lagoons were reported to be malfunctioning by both Gelman and the DNR on numerous occasions (DNR files: 9/76, 7/17/79, 8/1/79, 7/15/80, 8/19/80).

According to Gelman, the odors were caused by a die-off of microorganisms which are present in the lagoons to break down waste. The die-off occurs when the aerators in the lagoons fail and dissolved oxygen levels fall to a level too low to support aerobic bacteria. When the bacteria become anaerobic, the foul odor results. It's also possible that some of the problems being experienced by residents were due to the evaporated dioxane. According to Brenda Irish of the DNR's Site Assessment Unit (SAU), in a February 1987 report, "Dioxane vapor is known to be harmful and a known lung and mucous membrane irritant" (DNR files, 2/87).

Gelman's production lines

As of October 1981, Gelman was operating two production lines: a fabric coating line and a membrane casting belt. The existing fabric coating line was covered by permit 757-80. This line was in operation since late 1979 and did not use dioxane. The two membrane casting belts (at the time, one existed and one was proposed) were covered by two then un-approved permits (544-81 for the existing line and 126-81 for an identical line not yet completed).

A wide variety of solvents were used in those lines, including approximately 4,400 pounds of dioxane per month. The fact that dioxane was being used on the existing membrane casting line was only discovered during an AQD investigation of Gelman on June 25, 1981 (DNR files, 6/25/81). The AQD's main concern was with the two existing lines (757-80 and 544-81) which were running uncontrolled. The AQD instructed Gelman to install a scrubber to control air pollution on the existing line in a letter dated June 30, 1981. The AQD felt that the emissions from the membrane casting line, including dioxane, constituted a likely violation of the existing permit. The permit application for installing a new scrubber on the existing membrane casting line (544-81) was approved on March 12, 1982. The permit for the new solution casting belt (126-81) was approved on March 22, 1982 (Laura Lodisio's AQD summary, DNR files, 10/16/81).

Gelman's deep well

Early in 1981, the need to explore alternative disposal technologies was apparent to Gelman. Building more holding lagoons and maintaining the spray irrigation system was becoming very costly and was allegedly environmentally unsound (and consequently was coming under fire from DNR officials). Gelman also claimed they had grown impatient, having waited fifteen years to be hooked into a sewage line (as had been promised by Scio

Township authorities). Thus, Gelman began construction of a 6,500-foot underground injection well.

The well was available in December 1981 for use. In this system, wastes are pumped into rock formations a mile underground. The spray irrigation system was to be used as a backup in case of malfunction of the deep well system (see Deep well section).

The Geological Survey Division (GSD) of the DNR was responsible for issuing deep well permits until 1984 under Act 315 of 1969, the Mineral Wells Act (see Federal and State Statutes section). Whereas the AQD only discovered that Gelman was drilling the deep well during an on-site investigation on June 25, 1981, the GSD, in an internal DNR memo dated June 30, indicated that they had granted Gelman all the necessary permits and that they did "not foresee any adverse environmental impacts." The GSD had issued the permit for well construction on May 12, 1981 (DNR files, 5/12/81).

The deep well issue, however, generated much concern among some DNR officials. Some concerns of these officials were whether an environmental impact assessment had been performed, the nature of the waste to be disposed of in the deep well, the opportunity for the public to have input on the granting of a deep well permit, and which unit of state government would be responsible for monitoring the well (DNR files: 7/7/81, 7/8/81, 7/29/81).

The response by the Mineral Well Unit of the GSD was to describe briefly the evaluation which the GSD had conducted prior to approval of the well and to include the description of waste submitted by Gelman. The GSD also claimed that the Michigan Environmental Review Board (MERB) had reviewed the disposal well permitting program in 1978 and "found it to be both effective and safe." It was also noted that the Environmental Protection Bureau had conducted a review of the process (DNR files, 8/12/81).

The Office of Toxic Materials Control, however, indicated that the Environmental Protection Bureau's review of injection well disposal processes was inadequate and largely

unregulated. It stated that the GSD is mainly concerned with well construction and maintenance and does not take into consideration the control of the disposal of toxic organic compounds. It was also stated that the entire process merits a detailed review by the DNR, MERB, and Toxic Substance Control Commission (TSCC), which was not the current practice (DNR files: 7/7/81, 7/8/81) (see Deep well section).

To test public reaction to the well, Gelman had an open house in early July and invited all parties with drinking water wells within a one-half mile radius, to hear a review of their proposed plan. According to GSD officials, however, "There didn't seem to be much interest as only two families were present out of some 50 or 60 that were invited" (DNR files, 11/12/81).

Several citizens, however, did express concern over the deep well in the coming months. Citizens who wrote to the DNR were responded to by a GSD form letter claiming:

> We understand the concern of the people over groundwater pollution with all of the misuses in the past, but I can assure you that this type of liquid waste disposal can cause no such problem. This type of waste disposal (deep well) has been in use in Michigan for over 20 years and not a single groundwater pollution problem has been attributable to the use of one of these wells... Michigan geology is ideal for their use; I am sure there have been problems in other states where unconsolidated rock has been used (DNR files: 8/17/81, 9/9/81).

Several citizens appearing before a Michigan Air Pollution Control Commission monthly public meeting also expressed concern that there may be problems from the deep well injection system and submitted letters from neighbors, as well. These people were referred to the GSD.

On December 15, 1981, the Mineral Well Unit of DNR's Geological Survey Division approved the use of Gelman's deep well for disposal of waste (DNR files, 12/15/81). Gelman began using the well the first week in January (see Deep well section).

Possible RCRA violations and Act 307 listing

In April 1982, Gelman applied for a reissuance of their expired groundwater discharge (spray irrigation) permit. Questions arose in the DNR as to whether Gelman should be classified as a Hazardous Waste Management Facility due to their handling of dioxane. Their permit reapplication was subsequently reviewed for two and a half years, during which time Gelman was allowed to legally operate. Only in September 1984, after Gelman had been disposing of dioxane under their original permit for seven and a half years, did the DNR inform them that the permit did not allow them to dispose of dioxane and other organic chemicals. The Groundwater Quality Division (GQD) advised Gelman to cease all spray-irrigation practices and to dispose of all process waste water in the deep well. At this time, plans were initiated to connect Gelman to the Scio Township sewer line. Soon after, Gelman ceased spray irrigating.

On May 21, 1982, an inspector from the DNR's Resource Recovery Division (RRD) inspected Gelman for hazardous waste problems. In the investigation,

> the key question was whether or not this process water was considered hazardous because it had not been determined if the waste still exhibited the hazardous characteristics managed by Resource Conservation and Recovery Act (RCRA). It is quite possible that because the wastes are so diluted in the process water that they no longer exhibit such characteristics and are not managed (DNR files, 5/21/81).

The EPA (Environmental Protection Agency) later used the same RCRA criteria in making a non-hazardous determination of Gelman's waste stream and the contaminated groundwater when granting Gelman's deep well permit (see Deep well section).

The RRD, in its investigation, also noted that Gelman had approximately fifty 55-gallon drums of waste which had been stored on Gelman property for over 90 days without having a storage permit for the waste (DNR files, 5/21/82). On June 1, 1982 the RRD sent

Gelman official notice of these violations and the next day, according to AQD records, Gelman disposed of the waste through a licensed hauler.

On June 4, the RRD determined that the Gelman waste stream would not be classified as "hazardous/toxic" under RCRA management. This determination was made because "none of the solvents listed in the November 17, 1981 Federal Register with restrictions of 1 parts per million (ppm) and 25 ppm are in their waste water" (DNR files). Gelman, on June 9, submitted an action plan for correcting their RCRA deficiencies. They also claimed that their waste "... does not exhibit any of the characteristics of hazardous waste" (DNR files, 6/9/81).

However, on March 30, 1984, the non-hazardous determination was reversed. DNR officials acting as representatives of the EPA, conducted an investigation to evaluate compliance with the requirements of Subtitle C of RCRA (see Federal and State Statutes section). "The inspection revealed that your (Gelman) facility was a generator of hazardous waste and was not in compliance with personnel training requirements as specified in 40 CFR 265.16(d)." On April 11, Gelman responded to the RCRA violations notice of March 30 and outlined a formal training program that was to begin within six weeks (DNR files, 4/11/84).

The Hazardous Waste Division, on March 19, 1985, again notified Gelman of violations of Subtitle C of RCRA based on an inspection which occurred on March 6. The violations included no weekly inspection program for containers and no contingency fire and evacuation plan (DNR files, 3/19/85).

DNR officials learned of further possible RCRA violations by Gelman when they talked with Janet Cohen of *The Ann Arbor News* on January 29, 1985.

> Ms. Cohen stated that in conversations with the company she learned that the sludge from filtering the hazardous waste before deep well disposal is put in a lined surface impoundment. I did not see Gelman listed on the recent list of regulated land disposal facilities, so the question arises as to whether, in fact, they do have hazardous waste in the lagoon and, if so,

> what is the status of compliance with RCRA and Act 64 (Clean Water Act) activities" (DNR files, 1/29/85) (see Federal and State Statutes section).

On April 15, 1986 DNR conducted an investigation of Gelman for the EPA to evaluate compliance with RCRA. Gelman had several violations one of which was discharging acetone in their waste stream. DNR gave Gelman an April deadline to correct deficiencies (DNR files, 4/15/86).

On June 12, the DNR sent Gelman a memo acknowledging their receipt of materials submitted by Gelman, addressing DNR's (acting as representatives of EPA) concerns about RCRA violations.

> Your submittal has addressed the concerns that were raised as a result of the inspection, and is adequate demonstration of compliance with the provisions of RCRA evaluated at the time of the inspection. Compliance with these requirements does not limit the applicability of other provisions of the RCRA regulations. Staff will return to your facility to verify compliance (DNR files, 6/12/86).

When dioxane was first detected in Gelman's discharge and lagoon, Gelman had been placed on DNR's list of suspected sites of groundwater contamination of the 1982 environmental assessment. In late 1982, James Marshall (Vice President of Gelman) contacted the DNR about this status. Marshall felt that Gelman should be removed from the suspect list, since at the time Gelman was injecting wastes into the deep well. The WQD responded that "Gelman was on the suspect list because they met the criteria, and the way to get off was to clearly show that groundwater is not contaminated" (DNR files, 12/1/82).

In 1983, Gelman was placed on the Priority List of Michigan Sites of Environmental Contamination. The Priority List was established by Act 307, and defines locations "where there has been a release, or where potential for a release of a discarded hazardous substance exists" (DNR files, 5/21/87) (see State and Federal Regulations section).

In February 1984, Gelman requested to be removed from the Act 307 list. In response to this, the DNR began a review of the decision to list Gelman. The results of the review did not convince the DNR to change their decision. In December 1985, Gelman again requested a review of their site, this time to prevent being placed on the Act 307 list for 1985. Gelman stated they were originally listed due to "... concerns related to the disposal of dilute solutions of various solvents by impoundment in an aeration lagoon followed by spray-irrigation of treated wastes of Gelman property" and that since November 1984, all wastes had been disposed of down the deep well (DNR files, 12/11/85) (see Deep well section). In 1985, however, Gelman was placed 89th on the Priority List of contaminated sites. As the contamination situation grew ever more complex, Gelman's Priority List ranking for 1986 jumped to "2".

Dan Bicknell and the discovery of dioxane in Third Sister Lake

The discoveries of contamination which led to Gelman's high ranking on the Act 307 list, began on April 4, 1984. On that date, Dan Bicknell, then a School of Public Health graduate student at the University of Michigan (U-M), took water samples from Third Sister Lake. (Third Sister Lake is in Saginaw Forest, a U-M-owned property which borders Gelman's property on the west side.) As part of a classroom demonstration, the samples were run (using gas chromatography) by Clifford Rice, then a research scientist at the U-M Institute of Science and Technology. Very low concentrations were found of dioxane and other compounds, as follows: chloroform, methylene chloride, tetrahydrofuran, hexane, benzene, and an unknown alkaline. In June of that year, Dan Bicknell released his report entitled, "Hazardous Waste Introductions into Third Sister Lake, Washtenaw County, Michigan." In this report, Bicknell concluded that more research on this question needed to be done.

In August 1984, Bicknell did more sampling. This time, in addition to Third Sister Lake, he tested the small tributary (now known as "Bicknell Creek") which runs from

Gelman's property, into the lake. In this study he showed the same elements were present, but in different concentrations. Most importantly, Bicknell found that levels of dioxane were several times higher in the creek than in the lake. Therefore, he was able to identify the creek, coming from Gelman, as the source of the pollution (Interview with Dan Bicknell, 2/23/88).

Bicknell's study was swiftly criticized from all sides. "Gelman officials questioned Bicknell's results, saying he did not explain how the test was conducted or provide an error rate, and that a misspelling of the compound dimethylformamide in the study raised questions about Bicknell's scientific knowledge" (Jones, Detroit Free Press , 9/13/84). Gelman's response to Bicknell's findings in Gelman's "Summary of Waste Water Treatment" was, "U/M Student running for drain commissioner alleged that GSI was polluting. The allegations were based on non-empirical evidence. A public issue was created, which in turn became a political issue."

Bicknell's report was also criticized for reporting results in parts per trillion (ppt), whereas parts per billion (ppb) is the standard measure. "The concentration levels he's talking about are so small there's nothing in the Federal Register that regulates amounts that small," said Tim Gibelyou, Gelman's operations manager (Jones, 9/13/84). Soon after, Gelman decided to attempt to begin monitoring wastes in ppt, thus lending credibility to the notion that wastes can be monitored in such small quantities.

In order to more actively address this potential environmental hazard and other contamination problems in the county, Bicknell filed as Republican candidate for Washtenaw County Drain Commissioner that June. In a Detroit Free Press article of 9/13/84, it was reported that:

> Bicknell...stated he is especially concerned about the presence of dioxane. Although the lake is used solely for research, Bicknell contends that if Gelman is the source of dioxane, surface or groundwater near the Gelman lab may be contaminated as well and could end up in drinking water supplies, water used by farmers and in swimming water (Jones, *The Detroit Free Press* 9/13/84).

Bicknell responded to the criticism being leveled against him and his report by stating, "What I know is I found dioxane and the solvents in the lake. (Gelman) is trying to discredit me and my numbers, but by discrediting me, (Gelman) isn't dealing with the issue. It's whether dioxane is out there" (Jones, 9/13/84).

Although Gelman doubted the validity of Bicknell's results, they were very concerned about what Bicknell was saying in public and how that affected Gelman's image. Gelman officials tracked down a list of Bicknell's scheduled campaign appearances. Paul Chalmers, Gelman's chemist, told the Detroit Free Press reporter, "We want to know anything (Bicknell) might be saying about us. We might not necessarily do anything about it. We just wanted to know" (Jones, 9/13/84).

Bicknell's report also initiated other types of action. It succeeded in bringing about further testing of Third Sister Lake by Gelman and the DNR. Gelman commissioned studies by a U-M research lab and a private firm, Canton Analytical Labs (CAL). CAL's results, which Gelman released in a meeting with the DNR on October 9, were negative for dioxane. DNR's tests were also reported to be negative. Accordingly, a DNR memo regarding the October 9 meeting between Gelman and the DNR stated, "Gelman - The CAL test data confirm DNR tests - did not confirm Bicknell's reported results. Gelman now prefers to let that matter drop." In a follow up letter to the DNR which included CAL's complete test results, Gelman's attorney, Philip Grashoff, Jr., stated, "Since the report substantiates the MDNR results, it is the company's (Gelman's) understanding that it need not undertake any additional activity relating to the Bicknell charges" (DNR files, 10/9/84).

CAL's samples were held for fourteen days before they were tested. Some believe that holding times for sample testing were violated by Canton and this may be the reason dioxane was not detected (Ewart, 10/87; and Interview with Dan Bicknell, 2/23/88). However, others, including Mary Vanderlaan of the DNR, claim that the holding time has no bearing when testing for dioxane (Interview with Mary Vanderlaan, 2/24/88).

A controversy arose when Gelman refused to publicize the results from Clifford Rice, the U-M researcher who conducted the study for Gelman (and who also originally tested Bicknell's samples). Both the DNR and Bicknell requested Clifford Rice's results from Gelman. Gelman refused to release them, stating they were "inconclusive" and "would serve no useful purpose" (Ewart, 10/87). Dr. Rice, despite his commitment of confidentiality to Gelman, chose to go to the press with his findings. "I do believe that the dioxane was present (in Bicknell's samples), and my tests definitely show that it's present in the lake...and it was definitely present in the samples that Gelman gave me," Rice said (Jones, 9/13/84).

The DNR, in the meantime, was consistently reporting negative results for dioxane in their tests. Gene Hall, the DNR water quality specialist who investigated charges of Gelman's 1,4-dioxane contamination, stated in a recent interview that the reason the DNR's dioxane test results always came back "No Detect" was because the DNR lab could not test for dioxane (our emphasis). Hall maintains that the reason agency officials informed Gelman, Bicknell, and the public that the DNR's test results for dioxane, tetrahydrofuran and hexane were negative was because the lab had never run the tests for the chemicals and DNR staff members had simply not understood their test results. Dan Bicknell, whose tests first identified the contamination problem, says the DNR fully understood the limits of its tests for dioxane in 1984, but made a decision to rely on tests obtained by Gelman Sciences, Inc. (Ewart, 10/87).

The DNR chose not to push for the release of those tests. "As it stands now, Gelman's attorney has stated that Gelman will not release those results to us due to the fact that they feel the results are inconclusive," Gene Hall wrote to Bicknell on January 23, 1985 in response to Bicknell's inquiry (Ewart, 10/87).

The second week in August Bicknell was invited to the Gelman site, along with Gene Hall and Ron Kooistra of DNR. They toured the site and examined the surface water being discharged into Bicknell Creek (which leads to Third Sister Lake). Gelman claimed

that all that was discharged there was groundwater that they had used in production, with iron removed. Nonetheless, Gelman and DNR officials present agreed that this was an illegal discharge (according to Bicknell) and that an NPDES (National Pollutant Discharge Elimination Systems) permit was required. However, it took three years and much pressure placed upon the DNR by Bicknell and a local environmental group, Tocsin, before the DNR even made Gelman apply for the permit. During this time, Gelman continued to illegally discharge into Bicknell Creek.

On March 8, 1985 the DNR Site Assessment Unit concluded the matter by writing to Grashoff that the DNR was satisfied with having received the results which Gelman chose to reveal. "Thank you for providing me with the CAL and MDNR sample data for the Gelman Sciences, Inc. facility," the letter stated. "Based on this information, the site listing for Gelman has been changed to include nothing in the 'Resources Affected' column, and groundwater, soil, and surface water in the 'Resources Potentially Affected' column." The DNR did not pursue the matter further (Ewart, 10/87).

Well-testing and contamination plume identification begins

In late April 1985, Bicknell drew up a petition which was circulated by a local resident, requesting testing of residents' wells. Bicknell presented the petition to Dr. Atwater, Medical Director of the Washtenaw County Health Department. Two weeks later, on May 15, Bicknell presented the petition at the Washtenaw County Board of Commissioners meeting. The following day, the Board instructed the Department of Public Health to begin testing residents' wells.

The well testing finally began in September 1985, nearly one year and five months after Bicknell first detected dioxane in Third Sister Lake. Dr. Barry Johnson, Washtenaw County Director of Environmental Health, admitted during a recent interview that the well testing would not have happened if not for the citizens' petition. Johnson claimed that a lack of resources, lack of public concern, and a lack of established testing procedures

prevented the Public Health Department from beginning a well testing program when the contamination was first discovered in Third Sister Lake (Ewart, 10/87).

Testing of Third Sister Lake and nearby Honey Creek have yielded results of up to 510 ppb and 2,000 ppb dioxane, respectively. 20,000 ppb dioxane has been detected in the wetland adjacent to Gelman's property (Ewart, 10/87). To date, water samples analyzed by the Michigan Department of Public Health (MDPH) have tested positive for dioxane and/or tetrahydrofuran for over 50 private water supply wells (residential and commercial) to the north, northeast, and northwest of Gelman (Kelley, et al. v. Gelman, 2/26/88). The State limitation for dioxane in drinking water is 2 ppb and the limitation for body contact is 100 ppb. The discovery of dioxane contamination has led to the 1987 ranking of Gelman as the second worst environmental site in the state.

Testing began with the wells of industries in the immediate vicinity of Gelman. One of those tested earliest was the drinking water well of nearby Redskin Industries. On December 3, 1985 dioxane was found in this well at 180,000 ppb and tetrahydrofuran was found at 300 ppb (Kelley, et al. v. Gelman, 2/26/88). In January further testing was conducted and yielded positive for dioxane in the wells of five area industries as follows: Redskin Industries (up to 200,000 ppb), H&H, Inc. in Jackson Plaza (up to 800 ppb), Automated Data Processing (up to 90,000 ppb), Frito Lay (up to 90,000 ppb), and Guldberg Agency on Wagner Road (up to 500 ppb). The Frito Lay well also tested positive for tetrahydrofuran in concentrations up to 909 ppb and benzene up to 4 ppb. In February, a water sample taken from the caretaker's well in Saginaw Forest showed 24 ppb dioxane (Kelley, et al. v. Gelman, 2/26/88).

In January 1986, while the DNR requested an initial remedial action plan from Gelman (to be submitted by February 28), the MDPH began sending health advisories to area residents and businesses warning them that it is unsafe to drink water contaminated with more than 2 ppb dioxane. MDPH claimed that the risk assessment implied that if one were to drink water with 2 ppb dioxane for 70 years, one would have a one in one million

chance (greater than if not exposed to dioxane) of getting cancer. Arrangements were also made to provide bottled water to those affected under Act 307, the Michigan Environmental Response Act (MERA). Residents were notified of these arrangements by the following letter from the Washtenaw County Health Department (WCHD):

> Dear Property Owner:
>
> It has come to our attention that your drinking water has been found to contain chemicals in concentrations that may be harmful to your health.
>
> The Michigan Environmental Response Act, Act 307, P.A. 1982, was enacted to provide a mechanism for identifying and assessing sites of environmental contamination. Act 307 also provides funding for connection to community water supply or well replacement, and bottled water delivery. Bottled water will be offered free of charge to you until connection to a community water supply or well replacement can be completed. It has been determined that the average person consumes a half gallon of water per day, including use for cooking purposes. Bottled water will be delivered once every two weeks in boxes containing six one-gallon plastic jugs. You may receive additional amounts of water if you need it...

Many questions which arose at that time are still unanswered today. For instance, which of Gelman's waste disposal methods is the source of the contamination? Possibilities include Gelman's original unlined waste storage/seepage lagoon, the wastewater which was spray irrigated, direct discharge into nearby surface waters, an underground storage tank, a waste water spill from a cut hose, or the deep well injection system. While it is not known for sure, the most recent hydrogeological study contends that Gelman's early seepage lagoon is the most likely source of the contamination (EPA, 9/24/86).

Another unanswered question is the extent of the plume of contamination. New tests continue to yield new results. Furthermore, sites up to three miles away from Gelman have tested positive for dioxane contamination, with uncontaminated stretches between these sites and Gelman. Thus, it is presently impossible to determine definitively for which sites Gelman is the source of the contamination.

As of February 23, 1986, seven wells on Wagner Road and in Jackson Plaza (in the immediate vicinity of Gelman) had been confirmed as contaminated with dioxane. Gelman agreed to pay for an extension of Ann Arbor water lines to these areas within a month, according to an article of February 23, 1986 in *The Ann Arbor News* . At the same time, construction would begin to connect Gelman and neighboring businesses to Ann Arbor's wastewater treatment system.

Original tests, conducted by the Washtenaw County Health Department (WCHD), indicated that the plume of contamination was limited to a small area north of Gelman. However, Barry Johnson, Environmental Health Director of the WCHD, stated in *The Ann Arbor News* on February 23 that the testing was not near completion. It seemed that the more contamination was found, the more complex the problem was discovered to be. Johnson expressed disappointment that Gelman had not yet provided the groundwater study which the WCHD had requested. "We have no information on the direction of (groundwater) flow. We've been having to test a lot of wells to determine if there is contamination," Johnson claimed (Cohen, 2/23/86).

By mid-April, eleven wells (eight businesses and three residences) had tested positive for dioxane. One of these residential wells was beyond the small plume which had already been determined -- in a Westover subdivision (east of Wagner Road) well, dioxane was found at 10 ppb. This caused the WCHD to expand its testing area. Gelman responded by again agreeing to pay for water line hook-ups (which was to be completed by the end of May) for all businesses and homes with contaminated wells. Gelman also claimed to have cut back on its use of dioxane, with plans to eliminate it completely by the end of May (Cohen, 4/27/86).

On May 5, a public meeting was called by state and county officials and representatives of Gelman. The meeting was to update residents of Scio Township on progress made in studying the dioxane contamination. Approximately 100 residents attended to ask about the effect the contaminated water may have on the health of

themselves and their children. They also had questions about falling property values. Some of the residents voiced that they felt their concerns were not being taken seriously. Gelman representatives claimed that they were working hard toward a solution. "Gelman's Marshall called efforts by Gelman and state and local officials 'heroic' and said, 'No one, by any stretch of the imagination, has been sitting around doing nothing'" (Hooper, 5/6/86).

The contamination: whose fault?

The issue soon heated up and accusations began to fly. This began when reporter Janet Cohen wrote a piece entitled "Gelman resisted DNR warnings of water contamination" for the *The Ann Arbor News* on April 27, 1986. In this article, Cohen made the following assertions: 1) that Gelman had been warned by the DNR of a problem as early as 1980; 2) "that Gelman resisted performing studies and installing monitoring equipment that could have detected groundwater contamination before toxic chemical wastes migrated off company property;" and 3) that Gelman did not monitor itself as it is required to do under its permits, which is "particularly disappointing because the company makes precise filters used in medical and pollution control equipment and had the scientific expertise to do so" (Cohen, 4/27/86).

In addition, Cohen reported that former Gelman employees had informed the DNR of Gelman's illegal waste disposal practices. One such allegation was that Gelman had instructed employees to dispose of barrels of hundreds of different chemicals in a "pit." An informer had also notified the DNR of someone known as "the Professor" in Lansing, who was on Gelman's payroll. Cohen quoted a DNR memo describing "the Professor" as: "He advises (Gelman) of pending inspections before the fact, allowing (Gelman) to disguise or dismantle illegal operations until after the inspection." Although the allegation of "the Professor" was never confirmed, Warren Hutchinson, the supervisor of the DNR's criminal investigation unit, claimed that the informant had proven very reliable in previous

allegations, but that there was just not enough information to pursue the case of "the Professor" (Cohen, 4/27/86).

James Marshall, Vice President of Gelman, responded to Cohen's article by issuing a letter to the community on May 5. Excerpts from that letter are as follows:

> As an employee of Gelman Sciences with more information about the groundwater contamination issue than was displayed in *The Ann Arbor News*, April 27th, may I comment on some of the inaccuracies and the false impression that Gelman resisted contamination warnings and acted irresponsibly in the disposal of wastes...
>
> The reporter injects dramatic color with the account of a nameless Lansing "Professor" who magically pulled government strings to benefit Gelman. Colorful, yes; true, no. Our only "Professor" was an eminent consultant at the University of Michigan who served for several years and helped us design a waste treatment system. Perhaps reporters should resist reporting everything they read in DNR's gossipy informant files...
>
> The irony of all this is how hard we have worked to cooperate with DNR and the voluntary steps taken to improve its waste disposal systems. My conclusions from the inaccuracies in the April 27th article is that there are dangers in using non-scientists to report on complex scientific issues because they are unqualified to evaluate and interpret what they are told...Why is it the good stories in companies never seem to get printed? Gelman's well known and widespread community services, for instance, were shoved aside unmentioned because we used something called dioxane before it was suspected of being a problem. The article should have made clear, but did not, that the scare phrase "tainted with the carcinogenic solvent 1,4 dioxane" does not and never has applied to the situation here. No known toxic effects have occurred involving employees, residents or the environment in the vicinity at the levels found of 1 part per billion to 200 parts per million. (DNR files, 5/5/86)

Cohen, in her April 27 article, also discussed problems with the DNR's environmental enforcement capabilities in relation to the Gelman contamination issue. Cohen mentioned inadequate numbers of DNR employees as a reason for DNR's failure to follow through with investigations into illegal waste disposal practices. She claimed that the DNR "can barely manage to check complaints. Routine inspection and monitoring of industrial sites throughout the state are virtually nonexistent." Another problem attributed to the DNR was lack of communication between divisions. Regarding the Gelman case, Cohen stated, "No one can say with certainty that prompt action by the DNR on warnings

and complaints would have prevented the current problem. But environmental leaders familiar with the case say the Gelman situation is too typical for comfort, almost a textbook example of what's wrong with Michigan's pollution control system" (Cohen, 4/2786).

Water supply and annexation issues

On May 16, the WCHD issued a Drinking Water Advisory to all residents (approximately 35 homes) in the Westover area. On May 14, eleven more wells in the Westover area had been found contaminated with dioxane at levels ranging from 1 ppb to 650 ppb, bringing the total number of contaminated wells to 24. The WCHD recommended that all residents of the Westover area not use their well water for drinking and that bottled water would be provided to all residents with wells contaminated with dioxane levels greater than 2 ppb. (On May 28 it was announced by the MDPH that all Westover residents would be supplied with bottled water.) It also warned residents against using water with greater that 100 ppb for bathing. It stated that Gelman would be working with residents to arrange for bathing facilities (DNR files, 5/16/86 and 5/28/86). Gelman's response to the situation is stated in their "Groundwater Project Progress Outline" in the May 14th entry: "Learned of Westover area being contaminated. Residents panicked by Health Department. (Gelman) confirmed results, talked to neighborhood, and set up rooms at Holiday Inn."

Two more businesses' wells were also found to be contaminated in the May 14 results. The sampling yielded the first confirmation of contamination north of Jackson Road, at Busy Bee Collision. The new findings alarmed some DNR officials. "Things are getting a lot more serious,' said (DNR) groundwater geologist Matt Frisch, after learning of the new findings Thursday" (Cohen, 5/16/86). He explained that the new findings indicated that the plume of contamination was wider than originally thought.

Gelman rented rooms for bathing at the nearby Holiday Inn for the six families with well contamination of over 100 ppb dioxane. However, many of the community's

problems due to the contamination, went unaddressed. Residents were not only inconvenienced by the lack of running water, but were worried about the potential health effects. "You forget how many times you use it (water)," said Debbie Lau, a resident of Ferry Street. Mary Jo Campbell, who had settled in Westover in 1967, stated, "What worries us is, was it (the water) more contaminated years ago than it is now? We'll never know" (Cohen, 5/18/86).

Residents also voiced frustration with Gelman. They claimed that their earlier complaints to Gelman received no response. "We called, we complained. They ignore you. We didn't get anyplace...They (Gelman) pay big taxes, we pay little taxes, the township doesn't care... We do not like anything Gelman has done or said," stated Campbell. Her neighbor, Bonnie Knapp, added, "Everyone's really upset with Gelman" (Cohen, 5/18/86).

The installment of a replacement water supply was a major concern of Westover residents. In early June, discussions began with the city of Ann Arbor to hook Westover into the city water main. The issue became very complicated, involving questions of how the water main construction would be funded, costs of a new sewer system, and annexation of Westover to Ann Arbor.

Originally, Gelman made the offer to front the $315,000 that was the estimated cost of the water hook-up. Under the proposal, if it were determined in the future that Gelman was not responsible for the groundwater contamination, the city would have to pay Gelman back in full.

This proposal met with much negative response. Ann Arbor City Council member Jeff Epton questioned Gelman's motives at a City Council meeting in early June. "I'm wary of supporting this... What is Gelman's public position on why they're willing to pay for the consequences of an event for which they're not accepting liability?" (DeSimone, 6/3/86). Epton was concerned over how Gelman's "innocence" would be judged (by a

court, the DNR, or by Gelman's own studies). Epton suggested that Gelman should just agree to pay for the water main at the outset.

Westover residents, wary of having costs passed on to themselves, echoed Epton's response. One resident, Genevieve Wright, stated, "It seems like there's a shady deal going on, and we're trying to find out where it is... Why should we be responsible? All we want is water" (DeSimone, 6/3/86).

Gelman's attorney (and former Ann Arbor Mayor), Robert Harris, offered a different viewpoint at the June 9 Ann Arbor City Council meeting. "Harris said Gelman made the offer for three reasons: 'good citizenship,' 'public relations' and protection from coercive action by the state Department of Natural Resources, which could sue if the firm does not make every effort to cooperate with the push to get water to the residents" (DeSimone, 6/10/86). Harris stated, "It's not a gift of hundreds of thousands of dollars... Nobody's found Gelman guilty and Gelman doesn't think it's guilty. We thought we'd made everyone happy, and now we're being told to pay for a whole new water system" (DeSimone, 6/10/86).

Soon after, however, a new proposal was discussed in which Gelman would pay, outright, the costs for water main hook-ups to occupied properties (but not vacant lots) in the Westover area. The estimated cost for this was $215,000; substantially less than the initial figure of $315,000. Gelman therefore agreed to this. Gelman's Harris, accordingly, changed his tune. "It's a gift this time... Gelman is trying to be a good citizen" (DeSimone, 6/24/86).

Westover residents were still not completely satisfied with this proposal. On June 23 they requested that Ann Arbor City Council delay approval of the agreement for one month. Westover residents were concerned about annexation to Ann Arbor (and the resulting higher taxes), which is the usual procedure followed when a city provides water service. It was clear that Scio Township would not oppose the annexation of Westover to Ann Arbor, as they had signed an agreement with Ann Arbor several years prior

designating Westover for future annexation. Even not becoming part of Ann Arbor would be costly. If annexation would not be an immediate result, those receiving city water or sewer service would pay the non-resident rate, which is double the resident rate, plus a special fee.

The residents also had questions about the costs associated with the new $439,000 sewer system which would be another result of annexation to Ann Arbor. Westover residents would be required to hook into the Ann Arbor sewer system once a failure occurred in their septic systems. The DNR had rejected Westover's request for emergency funding for the new sewer system. Residents then turned to Gelman and were having closed meetings to discuss the projected costs. It appears that an agreement was never reached in those talks.

On July 21, a plan to provide city water to Westover residents was approved. The agreement stipulated the following: 1) Gelman would foot the bill for water main hook-ups to residences in Westover subdivision and would retain the right to sue any other party that was found to be responsible for the pollution; 2) residents would be annexed to Ann Arbor as soon as they were connected to the water main; and 3) vacant land would only be annexed to the city once it was sold (Rzepka, 7/22/86). The first of the water hook-ups were completed in November 1986.

The plan, however, did not address the residents' concerns about future costs of the sewer system. Residents were left with the possibility of paying approximately $10-15,000 per household in the future, when their septic systems would fail.

Preliminary cleanup plans

Meanwhile, the DNR began pushing Gelman to clean up the contamination plume. In a May 29, 1986 article from *The Ann Arbor News* , both Gelman representatives and DNR officials voiced optimism that the cleanup could start as early as that summer. The DNR claimed that Gelman would be made to pay for the cleanup of any contamination for

which they were responsible. John Shauver, of the DNR's Environmental Enforcement Division, stated, "If they clean up, to our satisfaction, we'll close the file on them and say that's the end. If not, we'll go see the Attorney General" (Schimdt, 5/29/86).

On June 12, the DNR sent Gelman a memo requesting results of the initial hydrogeological investigation of dioxane contamination, for which Gelman had commissioned Keck Consulting Co. The memo also requested that the following issues be addressed by Gelman: groundwater cleanup methods to be used, alternative storage methods of wastewater, and plans to lower concentrations of "contamination in soils on and adjacent to Gelman's property" (DNR files, 6/12/86).

Gelman offered a preliminary cleanup plan on July 14. They proposed to purge the contaminated aquifers and to inject the contaminated water down the deep well. The Redskin well, which was the well of highest dioxane concentration, would be purged first. The main obstacle was the hook-up of Gelman to the Ann Arbor sewer line. Once hooked up, Gelman could dispose of process wastes in the sewer, thus saving the deep well for disposal of contaminated groundwater (Cohen, 7/15/86).

After examining Gelman's preliminary cleanup plan, the DNR responded on September 4 by requesting that a "draft remedial action plan be developed and submitted by Oct. 15, 1986 for DNR approval. The initial phase of the remedial action should be ready for implementation by Nov. 15, 1986" (DNR files, 10/15/86). The DNR also requested that a vertical and horizontal inventory of the plume of contamination be completed by December 1, 1986. Gelman's attorney responded that he felt those dates were unrealistic.

Several concerns, however, were raised over the prospect of Gelman using the sewer to dispose of dioxane. It was feared that the sewer system could be damaged by a heavy chemical load. The Ann Arbor system was designed to handle municipal, as opposed to industrial waste. (Gelman is now the largest industrial user of the sewer system.) Ann Arbor and Scio Township officials agreed that companies using the sewer would be responsible for recording their waste stream components and pre-treating

potentially harmful effluents. Nonetheless, the fear remained that bacteria used to break down organic sewage would be killed by the chemicals, or that the chemicals would escape through the process into the Huron River.

The condition of Third Sister Lake and Saginaw Forest

In late July, another site was added to the list of those contaminated. A U-M study determined that dioxane was present in the caretaker's well in Saginaw Forest (37 ppb) and in the water (53-98 ppb) and sediment (40 ppb, average) of Third Sister Lake. Tests had been showing significant levels of dioxane since late May. This was in contrast to the results of sampling done by the DNR and Gelman in late 1984, after the Bicknell report came out. At that time the DNR and Gelman had asserted that dioxane was not present in Third Sister Lake. The new detection of dioxane in the lake expanded the geographical area known to be contaminated to the southwest, and indicated that the area's surface water system was also polluted.

Bottled water was provided for the Saginaw Forest caretaker under the Michigan Environmental Response Act, but no apparent action was taken by the University. It was decided by the director of U-M's Occupational Safety and Environmental Health Department, Ken Schatzle, and (then) U-M Business Operations Director, Jack Weidenbach, that only additional testing should be pursued by the University at that time. "It appears that we may have a problem, but I don't want to put a lot of faith in one set of samples... We don't want to make any decisions based on one set of data," Schatzle said (Cohen, 7/27/86).

A second set of samples taken in mid-August showed no dioxane in the caretaker's well, but still showed dioxane in the water and sediments of the lake. There had also been samples taken in February and March, in which dioxane had not been detected in the caretaker's well. This pattern of contamination proved puzzling to county and state health officials (Cohen, 9/9/86). A third set of samples was taken in September, showing

dioxane in concentrations of 33 ppb - 200 ppb in lake water and 110 ppb - 880 ppb in the lake's sediments.

A wastewater spill occurs on Gelman property

On July 14, another incident occurred which brought Gelman into the headlines. A hose leading from the lined lagoon to the deep well on Gelman's property had been cut, according to Gelman, when it was run over by the tractor-lawn mower of a contracted lawn mowing company. The wastewater, which was being pumped into the deep well from the lagoon, contained a solution of 99.7 percent water and .3 percent various solvents, including dioxane. The exact concentration of dioxane in the lagoon water was not known, but according to Gelman it was below 20 ppm.

Gelman notified the DNR of the spill in a letter dated July 22, which was received on July 24. In the letter it was stated:

> Around 8:30 a.m. on Monday, July 14, during a routine maintenance check, the line was found to have been lacerated along the top of a three foot section, and to be leaking water onto the ground. The pump was immediately shut off and the standing water to the north of the pipe covering about a 10-20 foot wide area extending toward the north. The pipe had apparently been cut during lawn mowing operations carried out over the weekend... (DNR files, 7/22/86)

On July 30, an article entitled "Gelman failed to give timely notice of spill" appeared in the *The Ann Arbor News*. In this article, *News* reporter Janet Cohen wrote, "Gelman Sciences, Inc. has violated a state law by failing to give the Department of Natural Resources timely notice of a wastewater spill earlier this month." The article pointed out that the spill had occurred the same day (July 14) that DNR officials had been at Gelman, discussing a groundwater study of the dioxane contamination with Gelman officials and touring the Gelman site. The spill was not mentioned during the meeting and the area of the spill was avoided during the tour, according to DNR officials present at Gelman that day.

It was further stated that the DNR didn't learn of the incident until Friday, July 25, which constituted a violation of Gelman's discharge permit. The permit required the company "to alert the DNR immediately following any unexpected discharge and to follow the verbal notice in writing within 10 days" (Cohen, 7/30/86).

DNR geologist, Matt Frisch, was quoted as saying, "They missed on both counts... You've got to wonder sometimes about these guys... In some ways they appear to be coming clean, but at the same time they are remaining really sneaky" (Cohen, 7/30/86).

The day after that article appeared, James Marshall responded to Matt Frisch with a letter. The letter criticized both Janet Cohen and Matt Frisch for what Marshall felt was unfair treatment of Gelman. Following are excerpts from Marshall's letter to Frisch:

> The enclosed article is the most devastating yet to Gelman Sciences and personally, to Paul Chalmer and myself. The essence of this article was also aired on local radio...
>
> Janet Cohen and *The Ann Arbor News* are taking the position "absence of malice" as a facade and there is nothing Gelman Sciences, Paul or myself can do to correct this posture. We certainly deserve more credit and respect than given us by Cohen and the News...
>
> I respectfully urge the DNR to work with us rather than the news media. You can clearly see the effect of how opinions and side comments can be used...
>
> Matt, I certainly don't believe you intended to paint this type of picture of Gelman Sciences, Paul or myself...
>
> We urge you to respond in strong language to *The Ann Arbor News* responding to the incredible disservice done to us... (DNR files, 7/31/86).

On August 1, Matt Frisch responded in a letter to Paul Chalmers of Gelman, claiming he regretted having told *The Ann Arbor News*. what he did. Frisch wrote,

> It is not my intention to cast (Gelman) as "really sneaky" or as purposefully misleading the DNR. I realize such statements undermine (Gelman's) and your credibility. My comments were voiced out of frustration regarding the wastewater spillage incident. They were made prior to gaining full

> knowledge of the circumstances surrounding its discovery and (Gelman's) actions thereafter... (DNR files, 8/1/86)

Soon after, *The Ann Arbor News* ran a story entitled "DNR unfair about spill, Gelman says." In this article, the News printed Gelman's assertions that 1) it took Gelman officials 36 hours to discover what had happened and that they attempted to call the DNR within 24 hours after that, 2) Gelman officials were not aware of the spill at the time of their meeting with the DNR on Gelman's property on July 14, and 3) the DNR was notified in writing of the spill within eight working days.

Nonetheless, Gelman received a letter from the DNR dated August 8, informing them of permit violations due to the spill and its untimely reporting. The letter claimed that a violation had occurred of the section of Gelman's Groundwater Discharge Permit which reads, "A person shall not discharge into the groundwaters any substance that is, or may become, injurious to the public health, safety or welfare or to the domestic, commercial, industrial, agricultural, recreational, or other uses which are being or may be made of the groundwaters" (DNR files, 8/8/86). Furthermore, the letter claimed that Gelman was required to notify the DNR immediately after the spill and to file a report within ten days of the spill. "Notification of this incident took place nearly sixty hours after Gelman had information that a spill had occurred. This type of response is not immediate nor acceptable to MDNR" (DNR files, 8/8/86).

The deep well issue heats up

In August 1986, Gelman's deep well disposal system again came into question. On August 15, Gelman's application for a permit to continue injecting approximately 70,000 gallons/day of process waste water was complete, and soon thereafter was made available for public review. Gelman had been required to file this application in 1984, when deep well permitting responsibilities were transferred from the Michigan DNR to the U.S. EPA. The original application had several deficiencies which required Gelman to supply

additional information. During the permit application process Gelman had been allowed to continue operating the deep well under interim rules.

A public hearing over the deep well permit was held by the EPA on September 17, 1986. At that hearing, sixteen area residents spoke--all in opposition to the deep well. Although residents' concerns at the hearing were supposed to be limited to the EPA's technical review of the deep well, the issue of the groundwater contamination was also raised. The contamination had by that time affected the wells of approximately 40 businesses and residences.

By the time of the hearing, Gelman had been disposing of most of its wastes through the Ann Arbor sewer system, to which it had been connected in May. Gelman claimed to want the deep well for the following purposes: as a back-up system to the sewer, to dispose of certain chemicals that were not acceptable to the Ann Arbor Wastewater Treatment Plant, and for disposal of contaminated groundwater being purged from the nearby Redskin well.

Despite several citizen concerns (none of which the EPA considered valid), the EPA granted the deep well permit on September 30, 1986. Soon after, members of Tocsin, a citizen group which had been formed around the issue, filed appeals. During the appeal period, Gelman was allowed to continue to operate the deep well under interim rules. In December 1987, the appeal was overturned.

Beginning in the summer of 1987 Gelman had been using the deep well to dispose of contaminated water being purged from the Redskin well. This was allowed under interim rules. However, since the appeal was overturned Gelman's use of the deep well has been regulated by the permit which was granted to them in September 1986. This permit was only for "process waste." Consequently, Gelman has had to cease the purge operation and file for a minor modification of the permit. Gelman is still awaiting the EPA's granting of this modification.

The contamination spreads - Gelman's response is questioned

By November 1986, six more wells had tested positive for dioxane in "relatively high levels" (Cohen, 11/23/86). The contamination had spread through the groundwater as far as one mile from Gelman. This raised the concern that the contamination may be entering previously pristine aquifers. The belief that the dioxane would continue to spread prompted the DNR to pressure Gelman to purge the contaminated aquifers.

Washtenaw County Drain Commissioner Jim Murray and DNR staff expressed frustration with Gelman's cleanup progress. Jim Murray stated:

> I'm concerned that there doesn't seem to be any action out there... We need a program to stop the migration (of chemicals) from the site. It's been well over a year since they discovered very high levels and to just let it go is unconscionable. It's taking too long, in my opinion (Cohen, 11/23/86).

"There's no particular indication that the company (Gelman) is not moving forward, but we don't know exactly what they are doing," added Dave Dennis, DNR Chief of Compliance (Cohen, 11/23/86). Mary Vanderlaan (EED), also expressed skepticism. "There was the concern that they potentially aren't sharing all their material," she stated (Cohen, 11/23/86).

Gelman Vice President James Marshall, however, denied the allegations and claimed that the company was making substantial progress. According to Marshall, Gelman had been working with a hydrogeologist to define the plume of contamination, had continued testing wells and surface water (with their new system which could detect dioxane down to 1 ppb), had hired a U-M toxicologist (Rolf Hartung) to review the literature on dioxane and to propose cleanup standards, had begun working on ways to break down dioxane, and had hired an engineer to work with the Ann Arbor Wastewater Treatment Plant to assess the quality of Gelman's waste (Cohen, 11/23/86).

A leak is reported in Gelman's underground storage tank

In early February 1987 Gelman reported to the DNR that they had discovered a leak in their 3,200 gallon underground storage tank. The leak was due to a crack in the lower right corner of the concrete tank. It was not known when the crack had first developed. The leak was discovered by Gelman staff the first week in February, "when they ran into wet soil during maintenance operations on a pipeline from the main building to the wastewater disposal well" (Cohen, 2/7/87). DNR staff, in field notes taken during a February 9 site visit, noted, "Significantly, there had been a well alongside the vault for leak detection, but GSI either hadn't sampled it or had ignored it until recently. The well wasn't what tipped off GSI to the leak" (DNR files, 2/9/87).

According to notes taken by DNR representatives on February 9, prior to Gelman's construction of the deep well, this tank had been used to hold Gelman's "most contaminated" process wastewater (DNR files, 2/9/87). Gelman scientist Paul Chalmers claimed that the wastewater was considered nonhazardous by RCRA standards. DNR officials disagreed. In a February 10 memo regarding the incident, DNR geologist Charles San Juan wrote, "(I) suspect that Gelman's wastewater may be hazardous in nature. Most of the chemicals are organic solvents of some sort or another" (DNR files, 2/10/87). Contamination of surrounding soils resulted from the leak. The DNR and Gelman each had different ideas of what to do with the contaminated soils. During the February 9 site visit, DNR officials had recommended excavation of all contaminated soils. Chalmers, however, proposed that contaminated soils not be excavated, but be treated on the site. The DNR expressed concerns that if soils were to be kept, they would have to be kept in a "diked containment area with an impermeable membrane," in order to prevent groundwater contamination (DNR files, 2/9/87). In a follow up memo of February 10, Charles San Juan elaborated on the matter:

> I recommended to Chalmers that all contaminated soil be transported as hazardous waste to a Type 1 facility. Chalmers stated that he would like to

> develop some sort of in-situ treatment for the soil, however, it was my contention that if the volume of soil to be removed was a fairly small quantity (less than 1,000 cubic yards) it would behoove Gelman to get rid of it instead of fooling with some mumbo-jumbo in-situ treatment system (he mentioned something about spreading the soil out on visquene and then letting the "leachate," i.e. wastewater, drain to a central point and then be discharged via their deep well system) (DNR files, 2/10/87).

According to allegation #30 of the DNR lawsuit against Gelman,"...Gelman removed some, but not all, of these contaminated soils" (Kelley et al v. Gelman, 2/26/88).

Groundwater contamination was another possible consequence of the leak. According to Charles San Juan's memo,

> (I) also suspect that up to 1,000 gallons may have leaked out from the lift tank to local groundwater (based on the assumption that the crack in the tank leaked at least 1 gal/day for a theoretical period of three years). Soils were predominantly fine sands/silt, some clay observed. Groundwater is at least 20 ft + deep. Depending on porosity, hydraulic conductivity, and the volume of wastewater lost from the tank, local groundwater may have been severely impacted by leakage from the tank. Recommend monitor wells in the area of the tank and wastewater line (DNR files, 2/10/87).

Gelman ranked as second worst environmental hazard in Michigan

In 1987, Gelman's ranking on the Michigan Priority List of Environmental Contamination jumped to "2" (up from the previous year's ranking of "89"), making Gelman, according to DNR scoring methods, the second worst environmental hazard in Michigan. The ranking of sites is required by Act 307, the Michigan Environmental Response Act (see State and Federal Statutes section).

Sites' rankings on the Priority List are determined by a numerical scoring system. Points are assessed for factors regarding the nature of the pollution, such as its toxicity and the resources it is affecting. Also taken into consideration is the potential for human exposure and environmental damage. Gelman's score for 1987 was 986 out of a possible 2,000 points. A Michigan site has never scored higher than 1,200 (Cohen, 4/5/87).

"The dramatic jump in rank reflects new information indicating that contamination is spreading and that growing numbers of people are faced with contaminated wells," said

Brenda Irish, a DNR environmental quality analyst who helped prepare the list (Cohen, 4/5/87).

Some felt that Gelman's ranking was still too low. Barry Johnson of the Washtenaw County Health Department stated, "It should be at the top of the list. Even at the top ranking site, no one's wells are affected. I don't think the contamination has even gone off the site" (Cohen, 4/5/87).

At the time the list was published, over forty business and residential wells, up to one and a half miles from Gelman, had tested positive for dioxane. Sixteen families and businesses with polluted wells were still receiving bottled water. The known extent of the contamination was:

> Groundwater is polluted in a commercial area to the north, the residential Westover subdivision to the northeast, and a mixed-use area as much as 11/2 miles to the northwest. In addition, dioxane has been detected in surface water and sediment samples from Third Sister Lake...; an un-named lake due west of Third Sister Lake; Little Lake to the northwest; and along a tributary of Honey Creek, which flows to the northwest from Gelman (Cohen, 4/5/87). Contamination had also been detected in a second unnamed lake west of Gelman and a wetland adjacent to Gelman (DNR files, 4/10/87).

Another function of Act 307 is that it "requires the DNR to recover public monies spent on sites where a responsible party can be identified" (Cohen, 4/5/87). It was reported at the time the Priority List was published that the state had spent $21,000 on bottled water through March 1, 1987. In addition, the DNR's Jackson District office requested "just over $1 million for investigation and clean-up activities in the Gelman area" (Cohen, 4/5/87). The Michigan Department of Public Health requested an additional $409,000 from the DNR to extend water lines to areas for which Gelman had not agreed to fund the extension (Cohen, 4/5/87).

Gelman officials had expressed disagreement and disappointment with their 1986 ranking of 89th, and had been working to convince the DNR that Gelman was not such a significant contamination problem. In November 1986 the DNR came out with an Act 307

Proposed Priority List. On this list, Gelman was ranked 86th. Two attorneys from one of the three law firms representing Gelman, wrote to the DNR on January 5 1987, regarding the proposed list.

> Dear Sirs [sic]:
> ...(We have a) strenuous objection...to the proceeding in light of the failure of the Department of Natural Resources ("DNR") to prepare a revised proposed Site Assessment System Score for Gelman. Due to the DNR's inaction, Gelman has not been and will not be afforded an opportunity to comment at a public hearing as required by Act 307...We hereby reiterate our objection to this denial of Gelman's rights and accordingly request a public hearing and an opportunity to comment once the reevaluation of Gelman's Site Assessment System Score has been completed. Gelman and its attorneys also renew their request for an opportunity to meet with officials within the Site Assessment Unit to further discuss issues relating to Gelman's Site Assessment System Score sheet (DNR files, 1/5/87).

Gelman's lawyers also provided a point-by-point critique of DNR's scoring of the Gelman site.

When the actual 1987 Priority List came out, Gelman's score ("2") was much higher than the proposed list had indicated. James Marshall responded to the ranking, stating, "If Gelman is rated No. 2 in the state, then the state is in pretty good shape... The toxicity level is not that high. It's (dioxane's) not that critical a material" (Cohen, 4/10/87). Gelman had similar objections to the DNR's 1988 ranking of Gelman as No. 11 on the Priority List.

More contamination discovered

Through 1987 the contamination continued to spread and the question of the extent of the plume grew more puzzling. In July, up to 106 ppb dioxane was found in wells approximately three miles from Gelman, near Zeeb Road, Enterprise Drive, Metty Drive, and Staebler Road (Cohen, 7/13/87). At that time, DNR officials did not suspect that Gelman was the source of this newly discovered dioxane because the pattern of groundwater movement appears to be from the aforementioned area toward Gelman, and

not vice-versa. The groundwater patterns of the area are, however, exceedingly complicated. Both Gelman and the DNR have sought other possible sources of the dioxane contamination in the area, but have yet to find one. At present, the source of the contamination in the Staebler Road-Zeeb Road area is still not known.

A hydrogeological study done for Gelman by Keck in March 1987 reported that at least four of the aquifers beneath and near the Gelman site were contaminated with dioxane, among other organic solvents. Three of those four aquifers supplied drinking water (Kelley et al v. Gelman, 2/26/88). In addition, it is stated in the DNR lawsuit against Gelman that the "plumes (or zones) of groundwater contamination have spread and are continuing to spread outward from the Gelman site" (Kelley et al v. Gelman, 2/26/88).

According to Dan Bicknell (who is presently employed with the EPA Region V), it is very possible that the wells in the Staebler Road-Zeeb Road area were contaminated by Gelman's dioxane. Bicknell contends that of all known solvents, dioxane is one of the fastest-moving in groundwater. Bicknell claims that it should be expected that the dioxane will move out of certain areas and into others (Interview with Dan Bicknell, 4/8/88).

Recognizing the scope of contamination attributable to Gelman, as well as that potentially attributable to Gelman, the DNR filed a request with the Region V EPA to include Gelman on the National Priorities List, which would make the Gelman site eligible for Superfund funding. The letter, sent by Gary Guenther, Chief of the Environmental Response Division, stated:

> The (Gelman) site is of great concern to the State of Michigan. Groundwater contamination is currently documented two miles from the site, with nearly 60 drinking wells being affected, to date... Given the impact and extent of this groundwater problem, the State believes that the (Gelman) site must be included on the October 1987 proposed listing of sites for inclusion on the National Priorities List... (DNR files, 9/1/87).

Gelman's recent cleanup proposals

On January 16, 1987 Gelman offered Phase I of their Groundwater Cleanup Project. According to Gelman's proposal, "The primary objective of the first phase is to reduce the dioxane concentration in the core area (the area of highest dioxane contamination, to the north of the unlined lagoon), to preclude this area from serving as a source for further spread" (DNR files, 1/16/87).

Gelman's plan included purging the wells in the area of highest contamination, for which they were considering two methods. One possible method was to dispose of purged, contaminated groundwater into the deep well (which would be allowed under EPA's interim rules while Gelman's deep well permit was under appeal) (see Deep well section). This was contingent on Gelman being hooked into the Ann Arbor sewer system. (Since the deep well had limited capacity, it would be necessary for Gelman to dispose of their waste stream in the sewer.) The other possibility was to chemically treat the purged water and then to discharge it either to surface water (which would require an NPDES permit), to an unlined lagoon, or to the municipal sewer (DNR files, 1/16/87). Gelman's proposal further stated:

> The choice among these possibilities is contingent on regulatory acceptance, and issuance of appropriate permits.
>
> The injection option can be implemented more quickly than any of the other mentioned options, subject to the approvals noted above. We propose to begin this method as rapidly as possible, while the development of the chemical treatment method is completed...
>
> At 35 GPM (gallons per minute), one well will be capable of producing up to 18 million gallons of water per year...
>
> With 2-3 wells in service, using a rough estimate of 40 million gallons as the capacity of the affected aquifer, one aquifer volume could be treated in about a year (DNR files, 1/16/87).

Gelman submitted a "Comprehensive Cleanup Program Preliminary Outline" to the DNR on May 21, 1987. This document discussed methods of cleanup and locations in

which cleanup efforts would be concentrated. The cleanup outline included a tentative timeline, with plans extending into 1992.

In this document Gelman proposed to begin pumping groundwater from the most contaminated areas and to initially dispose of this water in the deep well. This plan was contingent on the fact that Gelman's waste stream would be connected to the sewer system sometime in June. Given the capacity limitations of the deep well, Gelman would be able to pump approximately 50,000 gallons per day of groundwater into the deep well. It was stated in the report, "Injection can provide a good start to the core area cleanup, but additional treatment methods would accelerate the process considerably" (DNR files, 5/21/87). Gelman also discussed the possibilities of disposing of the groundwater (once a treatment system had been developed) via surface water discharge (into Honey Creek tributary), groundwater recharge (into the core area aquifer), spray irrigation, or the sewer system (DNR files, 5/21/87).

It was stated in mid-June that Gelman was considering patenting the technology it had been developing to degrade dioxane. Gelman representatives indicated that the system utilized ultraviolet light, but would give no details. "'We are developing a proprietary system and are protecting it. No one has ever treated dioxane before,' (Gelman attorney, Philip) Grashoff said" (Cohen, 6/15/87).

Even today, Gelman is quite secretive about their ultraviolet treatment method of dioxane. The DNR has become skeptical (Interview with Mary Vanderlaan, 2/24/88) about Gelman's secrecy on this matter and doubts have been expressed by others as to the prospects of such a system working. Westover resident and U-M research chemist, Alfin Vaz, when asked, "What do you think about Gelman's proposed cleanup plan?" answered as follows:

> I would rather see Gelman put the money into finding a way to biologically degrade the waste.

> Dioxane is like water in its physical properties. It is completely immiscible in water, boils at the same temperature as water, and does not evaporate easily. It cannot be easily separated from water in a lab. There are millions and millions of gallons of water in the aquifers. If that water can dissipate, then the dioxane can eventually dissipate. But this is very unlikely.
>
> The money could be best spent by giving it to someone at the University studying bacteriology. The UV (ultraviolet) process that Gelman has been talking about has been known to chemists since the 1940's. If you take dioxane, expose it to UV in the presence of oxygen, the oxygen gets excited, goes to a peroxy intermediate, reacts with the dioxane and forms an acetic acid derivative with ethylene glycol. This derivative breaks down faster than dioxane. The problem is that it is a very inefficient reaction.
>
> I can't believe that all of a sudden Gelman would do this. It's a stalling technique. They have nothing to show. Once they take it to the patent office, it's no longer a secret. It will be available for public scrutiny. Gelman is trying to make the neighborhood feel like they are taking care of the problem.
>
> I am a strong proponent of not cleaning up the aquifers irrationally. The money spent by Gelman on PR (public relations) and lawyers should be spent productively to develop some way of breaking down the contamination (Interview with Alfin Vaz, 3/12/88).

On June 15 it was stated in *The Ann Arbor News* that the initiation of Gelman's cleanup was only awaiting approval of Gelman's permit to hook in to the Ann Arbor sewer system. This permit was granted on July 17 and the purge of the Redskin well (Gelman's neighboring industry, with dioxane at the highest concentration levels discovered thus far--approximately 200 ppm) began on July 20 (Cohen, 6/15/87, and Gelman, March 1988).

On July 28, Gelman's lawyer Grashoff discussed the initial stages of the groundwater purge operation. "It's going fine. There have been no problems," Grashoff said (Cohen, 7/28/87). DNR officials, however, could not be quite as confident about the success of the operation.

> Matt Frisch, the DNR geologist assigned to the Gelman case until earlier this month, said the company had not told him that the cleanup had started. The company last week denied DNR's request to access company property to inspect the purge setup, he added.
>
> The DNR's new project manager, Roger Jones, also said he had not heard from Gelman that the purging had begun (Cohen, 7/28/87).

Throughout January 1988, Gelman was working to supplement its 1987 "Comprehensive Cleanup Program Preliminary Outline." On January 12, a technical meeting was held with representatives from Gelman, Keck, DNR, and MDPH. At this meeting Gelman presented a first draft of their cleanup program supplement. According to DNR representative Mary Vanderlaan, "James Marshall said he was not ready to distribute the document and thus requested that no notes be taken during the presentation and we would be unable to keep the document presented" (DNR files, 1/12/88).

On February 3, Gelman released their 1988 "Comprehensive Remedial Program." It was sent to the DNR along with a cover letter dated February 4, stating, "The provision of the enclosed program outline further demonstrates Gelman's continued cooperation. Gelman does not acknowledge responsibility for any or all of the presence of 1,4-dioxane in the aquifers and surface waters" (DNR files, 2/4/88). This remediation document, as did the previous year's, discussed the following: areas of potential contamination concern, proposed remedial activities, and treatment methods (which in our copy of the remediation document were omitted and in its place was stated, "This section contains proprietary information which is deemed to be confidential and is being supplied under separate cover, in accordance with Michigan's Freedom of Information Act."). Also included was a task list for 1988 and various appendices (DNR files, 2/4/88).

At the outset of the report it is stated:

> In the following pages, a plan is presented with the objective of reducing the concentrations of 1,4-dioxane to levels which will ensure a negligible risk to human health and to the environment, and to do so in a manner which will not cause damage to the affected area. In accordance with statements in the May 21, 1987 submittal, Gelman is proposing target levels... Parenthetically, these levels are consistent with the purpose of Act 307.
>
> GSI (Gelman) proposed a target level of 3 mg/l (3 ppm) in groundwater, which is consistent with (U-M School of Public Health professor) Dr. Rolf Hartung's draft assessment. With respect to surface water, since the University of Michigan studies indicate 16 mg/l (16 ppm) in surface water, which is 1/10 of the level at which adverse effects were observed in the most sensitive organisms, GSI proposes 16 mg/l as a target level (DNR files, 2/4/88).

Thus Gelman, through the results of a privately contracted risk assessment of dioxane, was attempting to reestablish "acceptable" levels of dioxane in groundwater, to redefine dioxane as a "threshold" carcinogen (meaning that there are certain levels below which dioxane is not carcinogenic), and to determine the area requiring cleanup, based on these findings.

The legal arena

In recent months attempts at cooperation between various parties in the dispute involved have failed, and a number of lawsuits have resulted. To date, the State of Michigan has sued Gelman and Gelman has sued the DNR. Gelman has also filed suit against its insurance company (which has refused to pay Gelman's cleanup costs), and against Dow Chemical and seven other dioxane manufacturers.

The lawsuit which the DNR requested the Attorney General's office bring against Gelman, represents one of the first cases ever to be brought to trial under Act 307. The DNR's policy, as summarized by reporter Janet Cohen, is

> ... to start by assuming polluted resources must be cleaned to background levels. Companies which contend that such levels are economically or technically impossible to achieve may be given the opportunity to demonstrate that a less stringent cleanup would not harm human health or the environment (Cohen, 11/29/87).

In the same article of November 29, Donald Inman, Chief of the DNR's Environmental Enforcement Division (EED), explained that the state would outline cleanup requirements which it would press Gelman to meet "whether it takes Gelman to court or sets up a voluntary, court-supervised consent agreement with the company" (Cohen, 11/29/87).

As of June 15, 1987, the State Attorney General's office assumed responsibility from the DNR for the Gelman case. The reason for this was described by Mary

Vanderlaan of the DNR: "Every time we met, their lawyers were speaking for them so we thought it would be better if our lawyers spoke for us" (Cohen, 6/15/87).

The involvement of the Attorney General in the case was also sought by Washtenaw County Drain Commissioner, Jim Murray. Murray felt that the DNR was not pressing Gelman forcefully enough to move along in their cleanup plans. Murray claimed, "It's been more than a year, and nothing has been cleaned up yet" (Cohen, 6/15/87).

On April 1, 1987 a draft of a letter had been prepared, from the DNR's EED to the Attorney General's office. It stated:

> Environmental Enforcement Division requests your assistance in exploring possible legal action against (Gelman) for contaminating groundwater and drinking water supply wells in the vicinity of their facility...
>
> Presently, Gelman is conducting bench tests for treatment of 1,4-dioxane. However, they have not started any clean-up of the ground or surface waters, nor provided a complete remedial clean-up plan or schedule. In DNR's opinion Gelman is not pursuing the completion of the hydrogeologic investigation in a very timely manner nor have they provided a schedule for completing this work.
>
> Thus your assistance is requested to provide guidance on how to proceed with this company to affect a clean-up and obtain reimbursement for State monies spent. Presently, this site ranks number 2 on the MERA Sites of Environmental Contamination List. EED feels Gelman should fund the groundwater clean-up, not the State (DNR files, 4/1/87).

Soon after, a memo was sent from Mary Vanderlaan of the DNR's Environmental Response Division to several DNR divisions in the Lansing and Jackson offices, and to Lois Elliot-Wilson of the MDPH. It stated,

> (Gelman) has contaminated the groundwater in the vicinity of their plant... This groundwater contamination problem has been referred to the Attorney General's office for further action. (Gelman) has been instructed to direct all communication with the DNR through the assistant attorney general assigned to the case... (DNR files, 4/29/87).

Even as the DNR was initiating legal action against Gelman, Gelman had not accepted responsibility for the contamination. In a May 14 letter to Robert Reichel (Assistant Attorney General), Grashoff wrote, "(Gelman's) commitment continues notwithstanding the fact that no discrete source of (dioxane) has been found on or under the (Gelman) site. (Gelman) does not, therefore, believe that (dioxane) is presently being 'released from the Gelman facility' or is 'emanating from the Gelman facility'" (DNR files, 5/14/87). This opinion stated by Gelman's lawyer was contradictory even to Keck Consulting Company, the company hired by Gelman to study the hydrogeology of the area, which had concluded that the most likely source of the dioxane was Gelman's original unlined seepage lagoon.

The State's intention to sue Gelman was made public on November 29, 1987. According to Donald Inman, Chief of the DNR's EED, the Attorney General's office would likely seek a court-ordered cleanup program, in addition to damages, fines, and penalties (Cohen, 11/29/87). Despite Gelman's claim of having pumped 2.7 million gallons of groundwater from the Redskin well by the end of September, DNR officials were frustrated by the pace and scope of Gelman's cleanup efforts. According to Mary Vanderlaan of the EED, Gelman had not presented a plan for halting the spread of dioxane in the groundwater and had not submitted a comprehensive remedial action plan. Vanderlaan also voiced that "Gelman has... been slow to deliver technical data requested by the DNR, has declined to pay for the $500,000 water line along Park Road, and has refused to enter a voluntary, court-ordered consent agreement defining cleanup standards" (Cohen, 11/29/87).

Donald Inman added:

> What we saw was significant groundwater contamination with (chemicals) that are hazardous and toxic, and a company to the point of wanting to replace the water system but write off the resource, and a company that is technically and economically able to take care of (the problem) but is not (taking care of it) (Cohen, 11/29/87).

Stuart Freeman, Chief of the Attorney General's Environmental Division, added that he felt it was important to pursue the Gelman case in court because "a concensus of health professionals, elected representatives and attorney colleagues have said it is serious." *News* reporter Janet Cohen added that Freeman felt that "'tactics' of Gelman attorneys and a 'circle the wagons mentality' on the part of the company convinced him that litigation was the only way to proceed toward a cleanup" (Cohen, 11/29/87).

Soon after this, Gelman initiated a lawsuit against the DNR (DNR Director Gordon E. Guyer was named as defendant) over their No. 2 ranking on the Act 307 list.

> The suit contends that the DNR's rating of the firm, issued in April 1987, was assigned without evaluating all related data or holding a public hearing, and without following all provisions of state administrative law. By doing this, the DNR violated Gelman's right to due process and equal protection of law... (Reynolds, 1/26/88).

The suit, which challenged the DNR to provide evidence in court supporting Gelman's rating of "2" on the Priority List, also asked $10,000 in damages and sought an injunction against publication of the 1988 Act 307 list. The lawsuit claimed that without reevaluation, Gelman "will suffer irreparable harm through loss of or damage to reputation or goodwill with customers, with the public and with its employees, jeopardizing of its position with local, state and federal government entities and exposure to liability through public and private claims" (Reynolds, 1/26/88).

On February 2 the DNR responded to Gelman's charges by calling them "conclusory and unsupported" (Cohen, 2/2/88). The DNR claimed that it was "undisputed" that Gelman was responsible for the contamination of groundwater by dioxane in the area. The DNR response further stated:

> Between April 1987 and January 1988, as groundwater contamination continued to spread essentially unremedied, Gelman's officers, lawyers, and public relations specialists have attempted to convince DNR staff that the Gelman site assessment score was erroneous and/or the process by which it was derived improper (Cohen, 2/2/88).

The next in the chain of lawsuits emerged on January 7, when Gelman filed suit against Dow Chemical Company, Union Carbide, and six smaller chemical companies: Ashland Chemical Company, Chemcentral Detroit Corporation, McKesson Corporation, Van Waters & Rogers Inc., PVS-Nolwood Chemicals, and Ecclestone Industrial Chemical Company (all of which allegedly sold dioxane to Gelman).

According to Stephen Cain and Roy Reynolds, reporters for *The Ann Arbor News*, "The key to the Gelman suit is the accusation that the defendants were negligent in not testing dioxane for persistence in the environment or giving the company adequate instruction on how to handle the substance" (Cain and Reynolds, 2/24/88). In the suit, Gelman asked for all costs of cleanup and costs to cover any claims filed against Gelman. It also asked for compensation for loss of reputation, goodwill, present and future revenues, and property value (Cohen, 2/24/88).

Attorneys for two of the defendants, PVS-Nolwood and Ecclestone, denied that their clients had ever sold dioxane to Gelman. Dow's lawyers also denied any liability in the case (Cohen, 2/24/88).

On February 26, the Attorney General's office, on behalf of the DNR, the Natural Resources Commission, and the Water Resources Commission, filed suit against Gelman. A press release prepared by the Attorney General's office stated:

> Gelman has engaged not one, but three high-priced law firms to fight us on this case. These firms have tried to turn the focus in every direction except where it belongs, with Gelman. Instead of spending millions of dollars on fighting their responsibility, Gelman should be working to clean up the mess they have caused (Cohen, 2/26/88).

The Attorney General's lawsuit contained many allegations of misconduct by Gelman over the years. Some of the main points addressed are as follows:

> Gelman's releases of toxic chemicals, including, but not limited to, 1,4-dioxane, have polluted, impaired, or destroyed the State's resources, including groundwaters, surface waters, and soils. The continued presence

> of toxic chemicals in soils, groundwaters, and surface waters at and near the Gelman site will, until abated, cause further leaching and migration of contaminants, threatening public health, welfare, and natural resources.
>
> Based on hydrogeologic and groundwater quality data on the Gelman site available to MDNR, including hydrogeological investigation reports and data prepared by Gelman's consultant, releases of toxic chemicals from the Gelman site are principally, if not exclusively, responsible for the groundwater, surface water, and soil contamination at and around the Gelman site (Kelley et al. v. Gelman, 2/26/88, p. 19).

The suit also addressed monetary compensation the State was seeking for bottled water and water main extensions, for which the State had spent $28,000 and $446,000, respectively. In addition, the State was seeking the establishment of a fund for alternate water supply for residences which may become contaminated in the future (Kelley et al v. Gelman, 2/26/88, p. 18).

The allegations of the lawsuit conclude with, "Despite repeated requests by Plaintiffs, Gelman has refused to enter into an enforceable commitment to comprehensively investigate, abate, and remedy the environmental contamination at and emanating from its site" (Kelley et al. v. Gelman, 2/26/88, p. 19).

On April 11, Gelman's lawyers filed their response to the State's lawsuit against Gelman, which denied allegations made by the Attorney General. The response stated,

> Gelman admits that reports of analyses of samples taken from water supply wells...indicated the presence of...dioxane, but denies that these wells are or were contaminated...The defendant has not caused and is not responsible for any pollution, impairment, destruction or contamination of the waters or other resources of the state (Cohen, 4/13/88).

Gelman's response challenged many of the State's specific allegations. For example, Gelman claimed not to have refused to enter into a voluntary cleanup agreement with the DNR. Gelman also claimed to have been in full compliance with all state licenses and permits which had been granted them. (Cohen, 4/13/88).

At present, these lawsuits are awaiting further action in the courts. It is not unlikely that the litigation will continue into the 1990's. Gelman's cleanup is presently on hold, awaiting a modification for their deep well permit. Although Gelman claims to have spent approximately one million dollars thus far in cleanup activities (Cohen, 4/17/88), it is very possible that the contamination is continuing to spread. Gelman's manufacturing process continues and wastewater is currently injected in to the deep well or disposed of in the Ann Arbor municipal sewer system. There are many who believe that both of these disposal methods are potential sources of future contamination.

INTRODUCTION TO ANALYSIS SECTION

This case study raises many questions: how dangerous is dioxane? how safe is Gelman's deep well? how effective have government regulatory agencies been? and how are rural residential areas of Ann Arbor affected by groundwater contamination? We have investigated these issues and others in an effort to form a comprehensive picture of the Gelman case.

While investigating incidents specific to the Gelman case, it became obvious to us that we could not isolate this case from its larger social, political, and economic context. This section, in addition to analyzing this specific case, addresses many of these general issues and themes surrounding environmental contamination:

- The use of technological solutions, rather than the examination of the root causes of pollution, in response to environmental problems.
- The tendency of government agencies to act "reactively" as opposed to "proactively" to find solutions to our waste management problems.
- The exclusion of citizens from the various decision making processes which affect the general health and welfare of society.
- The University of Michigan's role as "expertise-provider" for industry.
- Grassroots citizens' movements as an effective force in creating change.

The analysis section is divided into seven parts. The first two explore risk assessment and deep well technology--scientific and technological issues relevant to Gelman. The remaining five explore social, political and economic issues. These include land use planning, citizen participation, the University of Michigan's role, the DNR's role, and Gelman's response to the contamination.

SCIENCE AND TECHNOLOGY ISSUES IN THE CASE STUDY

RISK ASSESSMENT AND THE HARTUNG REPORT

In September 1987, Dr. Rolf Hartung, professor of Environmental Toxicology in the School of Public Health at the University of Michigan ("U-M"), issued a report entitled "Draft Health and Environmental Effects Assessment for 1,4-Dioxane" ("the Hartung Report"). The report, commissioned by Gelman Sciences, Inc. ("Gelman"), is a literature review of all toxicological and epidemiological studies on 1,4-dioxane ("dioxane"). It concludes with an estimation of risk for dioxane using a variety of statistical models.

Dr. Hartung, a member of the Science Advisory Board for the United States Environmental Protection Agency, is a respected member of the Public Health community. Thus, his report may figure prominently in the outcome of the lawsuits which the Michigan Department of Natural Resources and Gelman have filed against one another. The DNR is suing Gelman because Gelman has neither submitted a remedial action plan in a timely manner for the contaminated area, nor submitted a plan to stop the spread of the contamination. Gelman is suing the DNR because Gelman feels it has been ranked too highly and unfairly on Michigan's priority list of contaminated sites (see The Story, p. 69)

Based on this report, an exposure level corresponding to a predetermined "acceptable level of risk," and therefore an acceptable level of contamination, may be set. This will determine what (if any) level of cleanup will be undertaken. Gelman has used the Hartung report to support its position that the safe level for groundwater be set at 3 parts per million (ppm), with 16 ppm established as the safe concentration for surface water (Gelman Remediation Plan, DNR Files, 2/4/88). These target levels would entail less

extensive cleanup than that required by the DNR. The DNR maintains that groundwater must be cleaned up to background levels.

We do not pretend to be toxicologists and will not attempt to analyze Hartung's report. However, we feel it is important to present the major issues surrounding the Hartung report and the field of risk assessment in general. There is considerable debate about the scientific models and techniques employed in risk assessment. A thorough discussion of this debate will place the Hartung report in a larger context and demonstrate the uncertainty, as well as the political nature of risk assessment. This section concludes with a summary of carcinogenic theory, an overview of the Hartung report, and the DNR's critique of that report.

Risk assessment: what is it?

Every day we engage in risk assessment at some level or another--consciously estimating the probability that we will suffer harm or loss from an activity, while simultaneously estimating the probability that we will benefit from that activity. We also consider the magnitude of harm or benefit in our calculations before choosing between our alternatives. For example, we may choose not to run a red light because the expected benefits (getting home one minute earlier) do not exceed the possible costs (a traffic accident or ticket). If we run the light at the height of rush hour traffic, our chances of being in an accident are very high. Similarly, we are exposed to many hazards in our environment (e.g. pollutants in the air and drinking water). In these situations we are dependent upon government regulatory agencies to assess risks for us .

Risk assessment is defined as the "process of determining the adverse consequences that result from the use of technology or some other action" (Conservation Foundation 1985, p.6). This process consists of three parts:

1) an estimate of the probability of a hazard occurring;

2) the determination of the types of hazard posed; and

3) an estimate of the number of people, wildlife, and environmental elements likely to be exposed to the hazard and the number likely to suffer adverse consequences.

Although the Conservation Foundation speaks in general terms, this definition can be applied to the risk assessment of chemical compounds--the use of scientific studies (toxicological, epidemiological, etc.) to determine if a compound poses any threat to humans or other organisms and the degree to which this threat exists. More specifically, it entails determining if a chemical causes a particular effect (usually through experiments on animals), and the probability that a particular effect will occur at different dosage levels in test animals. The last steps consist of extrapolating dose-response data to human populations and then estimating how many individuals are exposed to the particular hazard and to what extent they are exposed. Finally, the magnitude of human risk is calculated ("risk characterization"), taking into account the exposure assessment and dose-response extrapolation.

Risk characterization includes presenting estimates of numerical risk. For example, numerical risk for a hypothetical carcinogen "x" might be expressed as the concentration of "x" in drinking water which will produce one excess case of cancer in a population of 1,000,000 persons exposed to "x" for a lifetime (70 years). The numerical risk assessment usually assumes the average person weighs 70 kg (170 lbs) and consumes 2 liters (approximately one half gallon) of water a day. Concentration is often expressed as parts per million (ppm) or parts per billion (ppb) and refers to the milligrams of "x" in one liter of water (Nesmith, 9/7/83(b), Federal Register, 9/24/86, pp.33993-99; and Cohen, 4/3/86).

In a typical toxicological study, a researcher might test a chemical on a group of several hundred rats. Some of the rats become "controls" and are not exposed to the

chemical, but are treated like the exposed rats in every other way. The non-control rats are exposed to the chemical by one of several routes: intravenously, orally, through the air they breathe, or dermally (skin contact). Dosages of the chemical are administered at different concentrations ranging from zero to the maximum dose which can be tolerated by the animal. High doses are used to increase the incidence of cancer, thus reducing the number of rats that would typically be needed in a low-dosage study. This would also shorten the time frame of the experiment, which is important since the lifespan of a rat is only two years. After a predetermined period the tissues of the animals are examined for effects of the chemical. If they die before the preordained period, their tissues are also examined. If rats exposed to the chemical show a higher incidence of tumors (that is statistically significant) than control rats, then the chemical would be a suspected carcinogen, and the dosage at which carcinogenesis occurs will be determined from the dosages administered. Such evidence suggests, but does not conclude, that a substance is carcinogenic in humans (Cohen, 4/3/86; and Nesmith, 9/7/83(b)).

From the high dosages administered, statistical models are used to extrapolate to the low dose region. A low-dose response curve is constructed so that the carcinogenicity of small concentrations (which are more likely to be encountered under non-experimental conditions) can be determined This low-dose response curve is extrapolated from rats to humans using conversion or safety factors. There are a number of uncertainties inherent in extrapolating as outlined above. Depending on the statistical models and safety factors used, the results can vary tremendously.

There are many types of studies used to assess the various aspects of a compound. In addition to carcinogenicity, other effects assayed include teratogenicity and mutagenicity. A teratogen is "an agent or factor that produces physical defects in the developing embryo or that otherwise produces an adverse birth outcome" (Legator, et al., 1985, p.25). Mutagens, which may or may not be carcinogens, are agents which damage the genetic

material of the cell. They may cause point mutations* or genetic changes which affect entire chromosomes (e.g. through breakage or duplication).

It is important to note that the impetus behind risk assessment is not to predict how many individuals exposed to a chemical will contract cancer, but to determine the exposure level which corresponds to "acceptable risk" levels. For instance, one in one million excess deaths may be considered the acceptable level of risk. Given this, risk assessment attempts to define the concentration of a contaminant a person can be exposed without incurring a higher risk than that.

The politics of risk assessment

"Environmental Risk Assessment," defined in a broad sense is a process in which scientific, political, economic, and social data are considered in making an ultimate decision regarding the "prohibition, control, or management of chemicals in the environment" (Conway, 1982). This definition recognizes that scientific studies are insufficient to make a judgment on a compound and also recognizes that decisions regarding the use of a chemical are not made in a political or economic vacuum. It describes the larger process of regulating a chemical.

The EPA, in "Guidelines for Carcinogen Risk Assessment," describes "risk assessment" and "risk management" as two separate processes. Risk assessment deals only with the assessment of the "adverse health consequences of exposure to toxic agents..." (Federal Register, 1986, p. 33993). The EPA describes "risk management" as the merging of these scientific data with socio-economic, political and other factors in

* Point mutations affect single nitrogen bases in the DNA. Nitrogen bases are the "letters" of the genetic code; there are only four bases or four letters in the DNA "alphabet." (A,T, C, and G for adenine, thymine, cytosine and guanine respectively). Changes in these "letters" affect the message encoded, and may be detrimental to the organism.

deciding how to control exposure to a toxic chemical. Thus, according to either definition above, scientific studies contribute to, but do not dictate, decisions regarding regulation of chemicals.

Priorities for determining which chemicals undergo risk assessment

There are an estimated 60,000 chemicals in use in the United States. Since it would be nearly impossible to assess each of these chemicals, not every chemical is tested. How do agencies decide which chemicals to assess? Some direction is provided by the scientific community, but other parties and factors also influence the agenda (Conservation Foundation, 1985).

Chemicals which cause birth defects are also dangerous, and one might argue worse than carcinogens, because they affect an individual's entire life. Nonetheless, assessment priority is usually given to suspected carcinogens, perhaps due to the public's fear of contracting cancer. Also important in determining which chemicals will receive assessment priority is the number of deaths the chemical causes. This raises questions of whether chemicals that increase the death rate in older individuals are as dangerous as ones that increase childhood mortality (Conservation Foundation, 1985).

Furthermore, if a chemical does not cause cancer, but is correlated with an increase in some chronic disease, should it be more heavily weighted? How do we compare the loss of work time to society due to chronic illness, with cancer deaths of retired individuals? How do we weigh the risks to non-human populations?
These are some of the many questions underlying the risk assessment process which cannot be answered through an objective ranking system. Priorities are set and risks are often evaluated in terms of non-scientific criteria.

We will return to this point repeatedly; risk assessment is not an exact science. There is much uncertainty involved and much disagreement about methods of risk

assessment. In Hartung's report alone, there are 50 different risk estimates for dioxane. He used five statistical models and ten studies to arrive at these estimates.

Scientists are limited in their ability to arrive at risk assessments for many chemicals because of the lack of adequate models and data available for most compounds. Furthermore, the assessment and regulation of a compound does not occur in a political vacuum. Those parties interested in the prohibition of a chemical may influence the assessment process, as can those parties who would benefit from its continued use. The National Research Council has concluded that "the choices encountered in risk assessment rest to various degrees on a mixture of scientific fact and consensus, on informed scientific judgement and on policy determinations" (Conservation Foundation, 1985, p. 31).

The economic debate

There is ongoing debate between the regulatory agencies and industry as to what constitutes fair risk assessment. Garrett (1979), in her article "Understanding Cancer," describes the debate over carcinogen regulation as "the most heated scientific-governmental-industrial debate our country has ever witnessed." On one side of the debate are industry supporters who say that because our technological ability to detect chemical contamination has outstripped our ability to assess the risks posed by each chemical, government is being overly cautious in restricting chemical use (Nesmith, 9/4/83(b)). They claim that it takes much higher concentrations of a chemical than previously suspected to cause cancer. (Gelman maintains that this is true of dioxane.)

Joining the debate are environmentalists--scientists and citizens who argue that, because the interpretation of scientific data is so uncertain, "...the whole business of regulating carcinogens is too uncertain to take any chances with public health." They support the hypothesis that it only takes minute quantities of a substance to initiate

carcinogenesis, and that regulatory policy must reflect this (Nesmith, 9/4/83(b)). (The DNR has taken this position with respect to dioxane.)

Industry maintains that overzealous regulation is harming the nation economically. According to Gio Batta Gori, former deputy director of the Division of Cancer Cause and Prevention at the National Cancer Institute, "undeniably human life has transcendent value. But excessive regulation hampers technological development and denies its fruits to the poor in our own society and elsewhere in the world" (Gori, 1982, p.176.).

Gori's concerns about the unreliability of scientific methods used in risk assessment are shared by individuals on both sides of the debate. However, his assertion that over-regulation will hurt the poor appears to be a conviction shared only by those on the "industry side." He assumes that technological development helps the poor, while ignoring the fact that often the economically and politically disenfranchised are those most affected by environmental contamination. The United Church of Christ Commission for Racial Justice found a significant correlation between race and the location of uncontrolled toxic waste sites. "Three out of every five Black and Hispanic Americans lived in communities with uncontrolled toxic waste sites." It was also found that the likelihood of the siting of a hazardous waste facility in one's community increases as socio-economic status decreases (The Commission for Racial Justice, United Church of Christ, 1987, pp. xii-iv).

Gori suggests that the process of risk assessment be removed from the political domain : "Safety might be achieved with greater fairness, by an approach that explicitly recognized the socio-political nature of regulation and resisted the temptation to force arguments under scientific disguise" (Gori, 1982, p.177). He implies that the risk assessment agenda is under the influence of special interests pushing a hardline or "zero-risk" stance. Although he argues for objectivity and political neutrality, it appears he is "pushing" the interests of a large special interest--industry. He is essentially arguing that one political agenda be replaced by another. His article concludes, "All human lives cannot be preserved at all costs" (Gori, 1982, p.177)

This statement echoes those of James Tozzi of the Office of Management and Budget (OMB)--"the number two person in the White House regulatory reform office in the early '80s"(Nesmith, 12/25/83).* Tozzi stated, "What we are saying is the government will protect you to the degree of economic prudence, but some Americans are going to die" (Nesmith, 12/25/83). Tozzi had been a driving force behind the Reagan administration's efforts to enact regulatory reform, and had strongly pushed for more lenient regulation of carcinogens. Tozzi pressured the Food and Drug Administration (FDA) to go easy on Red Dye No. 19, a suspected carcinogen, after meeting with industry representatives. The FDA subsequently delayed action on Red Dye No. 19. These events caused a commotion in Congress; former EPA chief of staff John Daniel testified in a House hearing that the OMB was allowing itself to be used as a "conduit" between industry and regulatory agencies for influencing regulatory policy (Nesmith, 12/25/83).**

In another case, the Reagan administration implemented a policy of evaluation of EPA employees based on how quickly they resolved pesticide/herbicide issues (Nesmith, 9/4/83(a)). Since the rejection of an application usually leads to a protracted battle between the company which proposed the pesticide/herbicide and the government, this policy change increased the odds that a pesticide/herbicide would not be reviewed thoroughly before it was approved.

An example of this occurred in 1982 when Uniroyal applied for approval of its herbicide Harvade. Although the raw data submitted with the application indicate the chemical causes brain tumors in rats, this evidence was disregarded in Uniroyal's interpretive report. An EPA employee then copied the Uniroyal report verbatim, and also ignored the data's true implications. Although in this case this blatant oversight was later

* James Tozzi later resigned from OMB and started a consulting agency to assist companies having trouble with government regulations (Nesmith, 12/25/83).

detected by another EPA employee who reviewed the data, the pesticide had been well on its way to approval.

Ethylene dibromide (EDB), a fumigant and suspected potent carcinogen, was being phased out under the Carter administration. In toxicological assays it had been shown to cause at least seven types of cancer, including those of the liver, lung, spleen, kidney, mammary gland , adrenal gland and stomach. It also caused mutations in several plant and animal species. Dr. Victor Alexander, medical officer at the Occupational Safety and Health Administration (OSHA), commented that the case against EDB was "so strong," there was no question that it should be banned.

In sharp contrast, John Todhunter, then assistant administrator of the EPA, recommended not only that the phasing out order be rescinded, but that the office that had recommended this action be disbanded. At that time, 450 million pounds of EDB were produced annually for use in agriculture and the petroleum industry; manufacturers of EDB and farmers had lobbied to keep it on the market. It is likely that Todhunter's actions resulted from this lobbying effort (Nesmith, 9/25/83).*

When profits are at stake, industry's argument that strict regulation is harmful to everyone, appears particularly specious. In this regard, Dr. Samuel Epstein, professor of environmental medicine at the University of Illinois commented, "Attempts by industry and its consultants to dismiss or explain away the carcinogenicity data, lack scientific validity and are patently self-serving" (Nesmith, 9/4/83).

Science is often portrayed as an unbiased and objective field. It is not, however, conducted in a vacuum. These examples are cited to illustrate the highly political nature of scientific regulatory policy.

* John Todhunter was one of the EPA officials (along with Anne Burford) who resigned during the House's investigation of EPA handling of Superfund. (Nesmith, 9/25/83(a)).

This case study involves two parties with unequal distributions of money and influence. Gelman has the money to hire experts, the resources to do their own studies, and access to high-powered legal counsel. The residents neighboring Gelman do not. This disparity in resources has given Gelman greater influence and leverage throughout the case history.

The uncertainties of science

A discussion of scientific studies will elucidate some of the problems associated with making definitive statements about the risks associated with toxic chemicals. In determining whether a chemical is teratogenic, carcinogenic, or otherwise toxic to humans, the scientist must rely (in most cases) upon data from animal experiments. Because humans differ metabolically from animals, the researcher can never be sure results will apply to humans. Test data are also complicated by the fact that there is not only interspecific (between species) variation, but also intraspecific (within a single species) variation. A chemical may be categorized as having low carcinogenicity, but this categorization does not account for variability among individuals in their genetic susceptibility to particular carcinogens (Federal Register, 1986).

Researchers extrapolate from high to low dose regions using statistical models. However, there is no consensus on which model to use. The EPA notes, "...different extrapolation models may fit the observed data reasonably well but may lead to large differences in projected risk at low doses" (Federal Register, 1986, p. 33997). It is also likely that different models will be appropriate for different chemicals. When there are limited data and much uncertainty regarding the "mechanisms of carcinogenic action," the EPA recommends the use of a linear model for extrapolations into low dose regions (Federal Register, 1986, p. 33997).

Another complication arises when the low dose response curve is extrapolated to humans. This involves the use of some conversion or safety factor to account for the differences between humans and animals. Two commonly used factors are based on surface area and body weight; each yields different results. In the absence of adequate data, the EPA recommends surface area conversion (a conservative approach), because "certain pharmacological effects commonly scale according to surface area" (Federal Register, 1986, p. 33998).

An example of how use of different statistical models, species, and scaling factors can lead to widely disparate risk estimates is illustrated in the case of the cleaning solvent perchloroethylene (PCE). Two studies which used mice and rats, and employed different models and safety factors, yielded risk assessments which differed by a factor of 35,000 (Conservation Foundation, 1986).

It is often assumed (sometimes incorrectly) that compounds which are carcinogenic in animals will also be cancer-causing in humans. The reverse may also be true. Compounds which are carcinogenic in humans, but not in animals, will go undetected in animal assays (Rall, 1980).

There are other problems with experimental results. Due to time and cost constraints, few chemicals have been tested over a wide range of species. Also, even though a study may adequately demonstrate carcinogenicity, little has been learned of its reproductive, developmental, neurobehavioral, and mutagenic effects (Rall, 1980). Unfortunately, assays to demonstrate these other effects (except for mutagenicity) have not been well developed (Interviews with Foran 3/31/88, and Head. 3/30/88).

Quite often very few studies have been done on a particular chemical, and those conducted may have used an experimental protocol which makes it difficult to adjust the results to human standards. For example, those making an assessment may find themselves trying to extrapolate from studies in which rats received a compound by

intravenous injection, when the human exposure route is more likely to be by ingestion or by inhalation.

Most chemicals are assayed alone, rather than in conjunction with other chemicals. A problem results, then, if two chemicals are synergistic--exhibiting greater carcinogenicity or toxicity when administered together (in a multiplicative fashion) than when administered alone. Exposure to a myriad of compounds occurs in the course of one's lifetime. Synergistic, as well as additive effects may thus be particularly important (Conservation Foundation, 1985). Some (e.g. Hartung), however, claim that synergistic and antagonistic factors may cancel each other out.

Epidemiological evidence (evidence from studies done on human populations) is preferred for use in risk assessment. However such data, if existent, are often sparse. A population's exposure to a particular chemical is difficult to determine since individual lifestyles and activities vary greatly. Furthermore, human populations are exposed to many compounds, making it difficult to distinguish the effects of one specific chemical. An exception to this is occupational studies, in which the exposure to a chemical is well known and the population may be fairly homogenous. Human control populations (i.e. unexposed populations for comparison purposes) may be difficult (if not impossible) to find (Conservation Foundation, 1985).

Carcinogenesis: current theories and controversies

An overview

Much of the confusion over methods of risk assessment, stems from a lack of knowledge of the mechanisms of carcinogenesis. Cancer research is proceeding rapidly, but many unknowns remain. Currently, researchers believe that chemical carcinogens are of two general categories: 1) initiators, and 2) promoters. It is believed that the two act at

different stages in carcinogenesis. Initiators lead to permanent genetic damage. The role of the promoter ("cocarcinogen") is less well understood. Due to these different actions, many have proposed that promoters be less stringently regulated than initiators. Because mechanisms are uncertain, and few assays exist for differentiating between carcinogen types, others have resisted this trend. EPA guidelines treat promoters and initiators equally, except in cases when "there is evidence to the contrary because it is, at present, difficult to determine whether an agent is only a promoting or cocarcinogenic agent" (Federal Register, 1986, p. 33995).

This issue is crucial to understanding the Hartung report, which posits that dioxane is a threshold* carcinogen. Hartung states, "It is most probable that 1, 4- dioxane acts as a promoter or epigenetic** carcinogen at those high dose levels. This approach to risk assessment of 1, 4-dioxane implies a threshold below which no carcinogenic responses would occur" (Hartung, 1987, p. 80). The DNR maintains that there is not enough evidence to support this hypothesis, and that dioxane should therefore be handled as a non-threshold carcinogen. In the following section, we develop these distinctions more clearly, in order that their impact on the Gelman case becomes evident.

Carcinogenesis: Cancer cells are cells characterized by unrestrained growth. They do not die off as normal cells do, but continue dividing, resulting in a mass of tissue called a tumor. If not removed or controlled in some way, death of the organism will result.

Scientists understand generally the way chemical carcinogenesis works. They believe it to be a multi-step process in most cases. The initiator begins the process by inducing a permanent change in a cell's genetic material (e.g. a point mutation or chromosomal rearrangement). This change leads to cancer when the promoter, a second

* Threshold carcinogens act only at a threshold dosage level; below this dosage the chemical is rapidly metabolized and excreted without causing harm to the organism.

** An epigenetic carcinogen is capable of causing the activation or expression of genes leading to transformation, but does not alter genetic material.

chemical, is present. The promoter causes the cell to divide, thus expressing the change made by the initiator. The initiator and promoter do not necessarily act on the cell simultaneously. In most cases the promoter is believed to act on the cell much later than the initiator. It is known that the initiator must always precede the promoter. This delayed activation of the carcinogenic change may explain the tendency for humans to be more likely to develop cancer as they become older. They have lived longer and thus a have a greater likelihood of having encountered initiators and promoters (Prescott and Flexer, 1982).

Some initiators are termed **complete** or **ultimate** carcinogens, because they are capable of producing both the necessary genetic change and promoting this change.

There is presently enough data to support the existence of promoters, although their actions are not well understood (Interview with Head, 3/30/88). The fact that some cancer cells will revert to normal cells under certain conditions provides evidence for promoter existence. The genetic makeup of such cells has not changed. Thus, promoters are said to be **epigenetic**--they may cause the activation or expression of genes leading to transformation, but they do not alter genetic material as initiators do (Oppenheimer, 1982). It is unclear how this actually occurs; researchers propose that the promoter could lead to the expression of genes coding for a certain protein. This protein may precipitate a series of events leading to the cell's transformation into a cancerous cell (Interview with Head, 3/30/88). This change may last only as long as the promoter is in contact with the cell. Thus, if the promoter is only present for a short while, the cell may revert to normal.

The initiator-promoter process can be compared to damage done to a wooden board. If a nail is driven into the board, a change results. This is analogous to the genetic change created by the initiator. The board remains essentially the same despite the nail, and can still "function" normally as a bookshelf (or other intended purpose). Similarly, if the board is soaked in water, it will dry, returning to its initial state. However, if this treatment is continued, the board will become permanently warped. If a nail had been driven into a

weak spot, the warped board might split into two pieces, thus becoming permanently damaged. Both the nail and soakings would be necessary to bring about this "split" state (Interview with Head, 3/30/88).

This analogy illustrates the difference between promoters and initiators and the reasons some researchers believe the two should be regulated differently. The initiator affects permanent genetic change, requiring an event to occur only once. The amount of carcinogen involved may be small--one "nail." The promoter, on the other hand, must work repeatedly to alter the cellular control mechanisms. Thus, prolonged contact with it may be necessary. (The cell can "dry out" if only "soaked " once, or for a few short periods.) Thus, the hypothesis has been established that promoters act at some "threshold" dose, below which they are not harmful to the cell.

Although evidence supports this mechanism, much remains unknown about the promoter-initiator process. Presently, initiators and promoters cannot be readily differentiated in laboratory assays (Interview with Foran, 3/31/88). Scientists are thus reluctant to revise regulations to classify promoters as threshold carcinogens. This fundamental disagreement about the initiator-promoter process has created a divergence of opinion between industry and environmentalists concerning carcinogen regulation.

The state of Michigan has not been immune to this controversy. In June 1987, the Critical Materials Register (CMR) Scientific Advisory Board* in Michigan proposed that chemicals currently on the CMR be reevaluated in terms of their mechanisms of carcinogenesis (promoter vs. initiator). The proposal would have removed some chemicals from the CMR and would have directly affected the ranking of all chemicals. The National Wildlife Federation noted in a letter to the director of the DNR that many different state and federal agencies use the CMR to identify "potential pollutants of concern," and that this proposal would affect "the MDNR's toxic pollution control programs," and would

* Dr. Rolf Hartung and Dr. Jeffery Foran are both members of the CMR Advisory Board.

"undermine the state's enforcement position in several pending matters." Gelman's case was among the pending matters. If this proposal had been adopted, dioxane would have been one of the first chemicals reevaluated for exclusion from the CMR (Foran, and Van Putten, 6/27/87).

The National Wildlife Federation opposed these changes on the grounds that good science (i.e. differentiating between different types of carcinogens) does not necessarily imply good policy. "Our conclusion is that the CMR should continue to weight all suspected human carcinogens, regardless of theories of action" (Foran, and Van Putten, 6/27/87). At present there have been no changes in the CMR; the matter remains under discussion. (Interview with Foran, 4/19/88)

The Hartung report

The Hartung Report is an extensive review of scientific studies done on 1,4-dioxane. It concludes by using a series of statistical models to estimate risk using the gathered data. The risk estimates determined from these models exhibit great variation, depending on the model and data used. Both threshold and non-threshold models were used in this risk assessment; however, Hartung recommends a threshold model as more suited for estimating the risk level of dioxane. He concludes that the data collected support the hypothesis that dioxane acts as an epigenetic or threshold carcinogen (Hartung, 1987, p. 80). Based upon a threshold mechanism, the reference dose of dioxane for humans becomes 3 ppm in water (0.096 mg/kg/day or 3.36 mg/l for a 70 kg human). The Michigan Department of Natural Resources has critiqued this report, maintaining that studies to date do not provide sufficient evidence to characterize dioxane as an epigenetic carcinogen.

Major points discussed in the Hartung report

1,4-dioxane is a solvent with many industrial applications. It dissolves in water and some organic solvents, and readily moves through groundwater. It is subject to photo-oxidation and will break down in sunlight and air in 3.9 days. Dioxane is described as relatively resistant to biodegradation in water and soils. It does not appear to bioaccumulate or bioconcentrate (Hartung, 1987, p. 3).

The report surveys experimental tests of dioxane's toxicity (chronic and acute) in rats, mice, guinea pigs, bacteria, and aquatic organisms, and observational studies in humans. In studies done on aquatic organisms to date, it has shown low toxicity (Hartung, 1987, pp. 25-27). Pharmacokinetic studies (referring to the absorption, metabolism, distribution, and excretion of a chemical) in rats indicate that dioxane is metabolized to HEAA (ß-hydroxyethoxcyacetic acid) in the body. At high dosages in rats the metabolic pathways become saturated, and the ability of the body to metabolize dioxane declines. This evidence supports the contention that dioxane causes toxic effects at some threshold level, below which it is rapidly metabolized and excreted without causing harm to the organism (Hartung, 1987, pp. 28-42).

The liver and kidneys are target organs of 1,4-dioxane. High levels of dioxane have been associated with kidney and nasal tumors in rats, and liver tumors in mice (in drinking water studies). Two small epidemiological studies of workers exposed to 1,4-dioxane were discussed; neither study showed an increase in cancers over the general population. Hartung cites two human studies to conclude that the pharmacokinetic properties of dioxane are similar in both rats and humans (Hartung, 1987, pp. 67-68).

1,4-dioxane shows no signs of teratogenicity in the studies Hartung cites, though it does exhibit mild fetotoxicity (harmful to the fetus). It tested negative for mutagenicity in the Ames test.* This lack of mutagenicity is evidence that dioxane does not act as an initiator (Hartung, 1987, p. 78). It did, however, increase DNA breakage and repair

frequency** in studies on rat hepatocytes (liver cells) at high doses (Hartung, 1987, pp. 43-68).

The DNR critique

Dr. Hartung and the DNR disagree over the fundamental mechanisms by which dioxane operates. Maria Martinez, Waste Management Division Toxicologist, authored the DNR's critique of the report. Martinez objects to the classification of dioxane as a threshold carcinogen, stating, "It is my opinion that evidence supporting the epigenetic mechanism of carcinogenesis for dioxane is limited with numerous significant issues remaining unaddressed" (Martinez, 1987, p. 9). The distinction between a threshold (epigenetic) and non-threshold carcinogen is crucial, since it may affect the manner in which the dioxane contamination is handled. Although Hartung uses both threshold and non-threshold models to assess the data, he prefers the threshold model because he believes the pharmacokinetic, genotoxic, and dose-response data can be linked to support a threshold mechanism (Hartung, 1987, p. 78).

Incompatibility of pharmacokinetic and toxicological studies

Hartung cites pharmacokinetic studies done by Young et al. (1978) on rats as evidence that dioxane exerts toxic effects only at high dosages. As mentioned previously, the major metabolic product of dioxane is believed to be HEAA. Rats were given

---

* The Ames test is an assay in which mutant bacteria, lacking the ability to synthesize the nutrient histidine, are grown in cultures lacking that nutrient. Only bacteria which reverse this mutation and aquire the ability to synthesize histidine, are able to survive and give rise to colonies. Thus, by counting the number of reverse mutant bacterial colonies capable of growing in histidine deficient media, experimenters can assess the mutagenic ability of a chemical added to the media.

** High DNA repair rates indicate that a chemical induced genetic damage which has been subsequently repaired.

intravenous doses of 3, 10, 30, 100, 300, and 1000 mg/kg, and showed that at high dosages (above 30 mg/kg) the metabolic pathways responsible for converting dioxane to HEAA became saturated. This is evidenced by the decreased rate at which HEAA is excreted in the urine.

In another study by Young (1978), seventeen single consecutive oral doses of dioxane were given to rats, and again showed that, "the proportion of unmetabolized 1,4-dioxane increased as the dose was increased". Hartung also cites a study by Young, in which humans were exposed to low levels of dioxane, as evidence that rats and humans metabolize HEAA similarly (Hartung, 1987, p. 35).

Hartung links the pharmacokinetic studies on rats and humans to acute and chronic toxicity studies done by Kociba (1974) and the National Cancer Institute (NCI) (1978). Since these studies show only tissue damage and tumor formation at high doses, Hartung concludes, "At the high doses at which cancers have been produced, the metabolic pathways for 1,4-dioxane have been saturated, and liver or kidney damage, including liver tumors, have not been detected at exposure levels where metabolic pathways were not overwhelmed" (Hartung, 1987, p. 78).

Martinez criticizes Hartung's conclusion that those dosages at which the metabolic pathway are saturated are the dosages at which toxic effects occur (dosages in excess of 100 mg/kg/d). She disputes this conclusion on the grounds that the routes of administration of dioxane in the pharmacokinetic studies differed from those of the toxicity studies. In the pharmacokinetic studies, dioxane was administered by a single intravenous injection of 100 mg/kg/day. In the toxicity studies dioxane was administered orally, in single or multiple doses. Since we do not know how efficiently dioxane is absorbed into the bloodstream via these routes, Martinez claims we cannot assume that saturation will be reached at the same doses for each route of administration (oral vs. intravenous). We therefore cannot be certain of the equivalent oral dose at which saturation occurs (Martinez, 1987, p.2).

Martinez comments that it is also important to consider the temporal distribution of dioxane. She criticizes Hartung's conclusion that toxic effects observed in rats in which oral doses were increased to 100 mg/kg/day are due to the saturation of metabolic pathways. In the study cited by Hartung, dioxane was administered in the drinking water; the dose was actually administered in small increments (rats do not drink continuously) over the course of 24 hours. Those increments totaled approximately 100 mg/kg/day. Martinez comments, "...it is safe to say that it is very unlikely that plasma level (level in blood) of dioxane would be equal to the level observed when 100 mg/kg was administered in a single bolus i.v. dose" (Martinez, 1987, p. 3).

Martinez notes that there is sufficient pharmacokinetic data from repeated oral doses administered to rats at 1000 mg/kg to conclude that the metabolic pathway is saturated at this level. However, one cannot maintain that tumor formation only occurs at saturation doses simply by linking this conclusion to studies in which 1000 mg/kg doses produced tumors. The pharmacokinetic studies were done at doses of 10 mg/kg and 1000 mg/kg. Thus, even though tumors were formed at 1000 mg/kg, and we are confident the pathway was saturated, we do not know the lowest point of saturation. Tumors and liver damage have been observed at doses of 100 mg/kg and 350 mg/kg, but we have no evidence as to whether saturation occurs at these dosage levels (Martinez, 1987, p. 3). Martinez further notes that the routes of administration between the two oral studies differed.

Martinez's major complaint throughout the Hartung report seems to be that incompatible studies are compared to predict the actions of the compound. We cannot adequately integrate the results of carcinogenic studies and pharmacokinetic studies unless we know more about the pharmacokinetics of dioxane (and its metabolites) when it is inhaled or ingested. We also know nothing of dioxane's carcinogenic moiety, i.e. we do not know whether it is dioxane itself or one of its metabolic products that is the actual carcinogen.

Hartung has concluded from mutagenicity assays that dioxane is not likely genotoxic (toxic at the genetic level). Martinez contends that dioxane's genotoxic potential has not been adequately explored. It tested negative for mutation in the Ames test under varied conditions, and did not increase DNA alkylation* on in vivo studies in rats. These results are taken as indications that dioxane is non-mutagenic. It did, however, stimulate DNA repair at high chronic doses. Martinez further notes that dioxane's actions on chromosomes have not been explored. This may be significant, since many cancers are believed to result from chromosomal damage. Martinez also questions the dosage levels, and length of experiments in the DNA assays which tested negative. "The maximum dose levels used in a lifetime bioassay are determined such that there are sufficient animals surviving at the end of the study. Thus, for less than chronic studies (i.e. short term), higher doses should be used to compensate for the shorter exposure periods" (Martinez, 1987, p. 4).

Finally, Martinez discusses Hartung's inclination to dispense with the surface area conversion (or "safety") factor. Normally, in extrapolating data from rats or other animals, a conversion factor is employed to correct for differences between species. These differences (according to Martinez) include metabolism, size, and pharmacokinetics. Hartung believes the surface area conversion is unnecessary because it appears that the metabolism of dioxane is the same in both rats and humans. Martinez disputes this, arguing that there is not enough evidence to support this claim. Even if there were, the conversion factors do not account simply for metabolic differences, but also for a number of other "pharmacodynamic" properties. These properties include the ability of the organism to scavenge free radicals (important if we assume carcinogens are generally electrophilic compounds looking to "steal" electrons away from DNA or proteins), and to alter DNA repair rate and cell turnover. Furthermore evidence that the pharmacokinetics of

* Alkylating agents are highly reactive chemicals that attack molecules like DNA and RNA and can alter genetic information (Creasey, 1981).

rats and humans are the same is insufficient. Plasma and urinary clearance rates (i.e. the distribution of dioxane and its metabolic products in the blood plasma and urine over time at different dosage levels) have been studied in humans, but the distribution of dioxane and its metabolites in tissues has not been studied (Martinez, 1987, pp.5-6).

The DNR's critique has been presented not because we are certain that all the criticisms contained within it are correct, but to portray the divergence of opinion existing between Hartung and the DNR, as well as to underscore the uncertainties of risk assessment.

Conclusion

In an age when scientists are elevated to a lofty status, the language of science becomes mystical and laden with jargon which bars the uninitiated from participating in the discourse. Marvin Legator, an ex-branch chief of the FDA, calls the belief that only individuals who are well-versed in scientific method have the right to participate in scientific debate, the "myth of exclusivity." He believes that not only can laypeople comprehend scientific procedures and principles, but that they can use them to their benefit. For instance, Legator feels that residents near toxic sites have the ability to conduct their own health surveys and collect reliable epidemiological data to document problems at those sites (Legator, 1985). We do not deny the importance of science, nor deny that some individuals have earned a level of expertise in the sciences. However, we do question the exclusion of citizens from discussion concerning issues that affect their lives.

Dr. Hartung favors a threshold model, while the DNR favors a non-threshold model for the carcinogenicity of dioxane. The residents are essentially removed from the debate, but they will be most affected by its outcome.

It is significant to note that all concern thus far has focused on dioxane as a carcinogen, but what of its other effects? How well has the incidence of chronic illnesses (e.g. rashes, respiratory problems, and reproductive problems) been documented?

Residents in the contaminated region have undergone months of stress and inconvenience. Perceived health threats, family disruption, and emotional distress are important factors which directly affect the quality of life. These should not be overlooked.

Scientific methods for conducting risk assessment are uncertain, as carcinogenesis is not fully understood. Thus, risk assessment is, as of yet, only a tool which can be used to help society decide how to best protect its members. The issue of "How clean is clean" is decided outside the realm of science (Interview with Head, 3/30/88). How is this decision made? One would hope it is made in the interests of multiple parties. Unfortunately, from some of the examples cited, it is apparent that those who have access to power and the money to hire experts, also have the ability to influence decisions. Notably, the residents surrounding Gelman lack this ability.

AN ANALYSIS OF DEEP WELL INJECTION AND ITS APPLICATION TO THE GELMAN CASE

Introduction

In 1981, for a variety of reasons, Gelman began considering the use of deep well injection for disposal of their waste stream. Deep well injection is in many ways symptomatic of our society's attempts to deal with its growing waste treatment problem. The role of science and technology and its relation to our growing waste disposal crisis is a relationship which is seldom considered. Deep well disposal is generally considered a technical solution to a technical problem. The technical problem is characterized as one in which an engineering oversight has created environmental contamination or a waste product which neither economically, scientifically, nor politically can be dealt with adequately by society. Clearly, deep well injection can be more accurately characterized as a way to avoid dealing with this growing problem.

Rather than exploring ways to reduce production of toxic chemicals which our society is not equipped to handle, we simply push this generation's problems onto future generations. The issue of deep well injection must be viewed in terms of the modern economic system's struggle to deal with what is generally considered an "externality." Obviously there is a problem with "externalities" in a closed system. They do not go away. They are either exported to developing countries (e.g. banned pesticides and herbicides), belched out of taller smokestacks onto unsuspecting neighbors (e.g. acid rain-Canada), burned in incinerators which spew toxic fumes, or pumped into deeper and deeper wells. As far as our economic system is concerned, these so-called "externalities" impede economic growth and progress. As a result the system imposes these "externalities" on those who have been externalized by the system itself. Minorities in the U.S. and people

of color in developing countries receive the bulk of the poison produced in the economic centers of industrialized nations.

The following is a detailed analysis of the history of deep wells in general, and a review of the specific issues surrounding Gelman's deep well. This detailed analysis includes a point-by-point discussion of the inadequacies of regulations regarding deep wells. On a broader scale, this analysis is used to provide a picture of how the national push to develop deep wells has blatantly ignored both public safety and environmental protection. We will argue that the direction of resources away from recycling, source reduction, and other alternative treatment and production technologies, is symptomatic of the national problem of the disposal of human generated poisons. Our society's blind reliance on unecological technologies to solve environmental problems must be questioned.

Deep Well Injection

Underground injection has become an increasingly popular form of disposal for hazardous waste in the last twenty years. For the purposes of this case study we will discuss only "deep wells"--wells which transport hazardous waste below "usable" drinking water supplies to depths which are typically one-quarter to one mile below the surface of the earth. These wells are called Class I wells by the Environmental Protection Agency (EPA). Other classes of injection wells include those in which wastes are injected directly into or above usable drinking water.

Most deep well injection occurs either in the Gulf Coast or in the Great Lakes regions. EPA Region V (headquarters in Chicago), which includes Michigan, contains approximately twenty percent of these types of wells (EPA, 5/85, p. 6). The largest user of deep wells is overwhelmingly the chemical industry. Use is divided among manufacturers of organic chemicals (64 percent), petrochemical refining and industry (25 percent), metals and minerals industry (6 percent), aerospace (2 percent), and general

commercial facilities (4 percent) (EPA, 5/85, p. 2). Today, approximately ten billion gallons, or 60 percent of the disposed hazardous waste, is injected (not all in deep wells) (Gordon and Bloom, 1985, p. 1). Most deep wells (89 percent) are operated directly by manufacturers, while only 11 percent of wells are off-site commercial wells. Commercial wells pose a number of problems due to the wide variety of waste they receive, the difficulties in predicting movement of the wastes underground, and the reactivity of mixed wastes. Among the most frequently injected wastes are corrosive wastes, organic compounds, reactive wastes and metals, and spent solvents. Acetone (an element of Gelman's waste stream) is a commonly injected waste (Gordon and Bloom, 1985, p. 6).

The main reason that deep well disposal technologies have been so widely adopted is because in the short term it is economically preferable. One study has shown that even the best alternatives to deep well injection at Class I facilities would be between sixteen and forty times costlier than the current injection system (Guthrie et al 1986). Many have also argued that the reduction of environmental risk is an important factor in the increasing use of deep well injection. For example, the May 1986 Michigan Department of Natural Resources (DNR) study, "Deep Well Injection of Hazardous Waste in Michigan," states this position, yet bases it on several unsubstantiated assumptions about deep wells. While acknowledging that risk can only be assessed on a case-by-case basis, the report goes on to state,"...the risks would generally be higher for the alternative (surface disposal above 'usable aquifers'), since the contaminants would be placed above the aquifers being protected rather than below them" (DNR, 5/86). This statement ignores the fact that the same pathway by which downward migration of contaminants occurs, upward migration may also occur. Yet, as we feel this case study shows, this argument is typical of those used by deep well proponents to convince the public of the safety of deep well disposal.

Rather than investing our future in another unproven disposal technology we should be exploring how to contain the wastes which are being generated so that we know

where they are and where they are going. Deep well technology advocates ignore this issue by assuming that containment (by an unidentified mechanism) of the wastes will occur.

The increase in use of deep well disposal technology has occurred due to several factors. First, increasing concern over illegal, unregulated surface disposal has forced companies to seek alternative disposal techniques. Second, a lack of sufficient state or federal regulation of this activity, especially in Michigan, has led to a lack of commitment to seriously address the issue of industrial wastes in this country.

History of Deep Well Injection

Deep well injection was originally used in the 1930's as an alternative to surface disposal for brines produced from oil fields. The injection of brines into oil fields is a technique for increasing oil yields and is still extensively used today. According to "Deeper Problems: Limits to Underground Injection as a Hazardous Waste Disposal Method" by Wendy Gordon and Jane Bloom of the Natural Resource Defense Council, Inc., almost 100,000 of these enhanced recovery wells are known to be in operation. These wells use injected water or brines to maintain pressure within and thus prolong the life of the oil bearing structure. Brines are injected into both enhanced recovery wells and at least 20,000 wells used strictly for the purpose of brine disposal (Gordon and Bloom, 1985, p. 8). The injection of brines in Michigan began in 1943 when the Dow Chemical Company in Ludington began using a deep well.

Deep well injection of industrial waste began in the 1950's (Clark, 1983, p.2). The first deep well of this type was the Parke-Davis facility in Holland, Michigan, which began operation in 1951. According to the May 1986 DNR report, "deep well injection was considered a method to isolate wastes that could not be easily treated by placing them in deep formations. It was believed that this would separate the waste from the accessible

environment for geological time." However, others familiar with the track record of deep well disposal were not nearly as optimistic.

Problems With Deep Wells and Deep Well Construction

According to Gordon and Bloom (1985), there are at three basic reasons for questioning the safety of this disposal method.

> First, as the experience of the oil and gas industry indicates, underground injection is not an appropriate method for disposal of industrial wastes. Over half (17) of the 32 oil and gas producing states reported cases of groundwater contamination from the disposal of brines (Feliciano, 1983). Contamination of groundwater by injected hazardous waste is now also being reported.
>
> Second, in contrast to oil production brines which are typically returned to the formations from which the oil-gas-brine mixture was originally pumped, chemical wastes are entirely foreign to the rock strata into which they are being injected and may not be compatible with the strata of their native fluids. The injection of incompatible waste streams has proven to be a problem at a number of injection operations, and has resulted in environmental damage, including groundwater contamination.
>
> Third, although the most popular locations for hazardous waste injection operations have been the oil and gas producing regions where abundant macro-scale subsurface geological data are available, very little may be known about the micro-scale geochemical parameters that affect the suitability of a formation to accept and contain hazardous waste. The absence of this information significantly increases the uncertainty associated with injection of hazardous waste (Gordon and Bloom, 1985, pp. 8-9).

The most critical concern for deep well injection is the possible escape of hazardous materials from the injection zone. The United States Office of Technology Assessment (OTA) developed a set of potential contamination pathways out of the injection zone (OTA, 1983, p. 196):

(1) Leak through inadequate confining beds.

(2) Leak through confining beds due to unplanned hydraulic fracturing.

(3) Displacement of saline water into potable aquifer.

(4) Migration of injection liquid into a potable water zone within the same aquifer.

(5) Injection into a saline aquifer that is eventually classified as a potable water source.

(6) Upward migration of waste liquid from the receiving zone along the outside of the well casing.

(7) Escape into potable aquifer due to wellbore failure.

(8) Vertical migration and leakage through abandoned or closed wells in the vicinity.

There many examples where deep wells are suspected of causing contamination of underground water supplies. Two cases indicate some of the potentially extreme effects of deep well disposal.

In Denver, Colorado the Rocky Mountain Arsenal injected wastewater into a deep well from 1962 to 1966. After seven weeks of injection, the well (which was over 12,000 feet deep) began to trigger earthquakes. The earthquakes ranged in magnitude from 0.5 to 5.3 on the Richter scale, with epicenters up to five kilometers from the well. 1,514 earthquakes were recorded between 1962 and 1967. Studies have shown a strong correlation between the amounts of waste injected and the frequency of the earthquakes. The well was finally shut down in 1966, although earthquakes continued into 1967 (Gordon and Bloom, 1985, p. 16, and DNR, 5/86, p. 72).

The second case (this one not involving earthquakes) occurred in 1979 at Presque Island State Park in Erie, Pennsylvania when noxious liquids began seeping out of an abandoned gas well. After initial investigation of companies which produced the seeping liquids, it was discovered that Hermill Paper Company had operated three injection wells from 1964 to 1972 in Erie, Pennsylvania, approximately four miles away. The deep wells are now considered the source of the contamination at the island and government officials are concerned that the contaminants may show up in other abandoned wells in the area. The distance which these wastes migrated has challenged previous assumptions about the

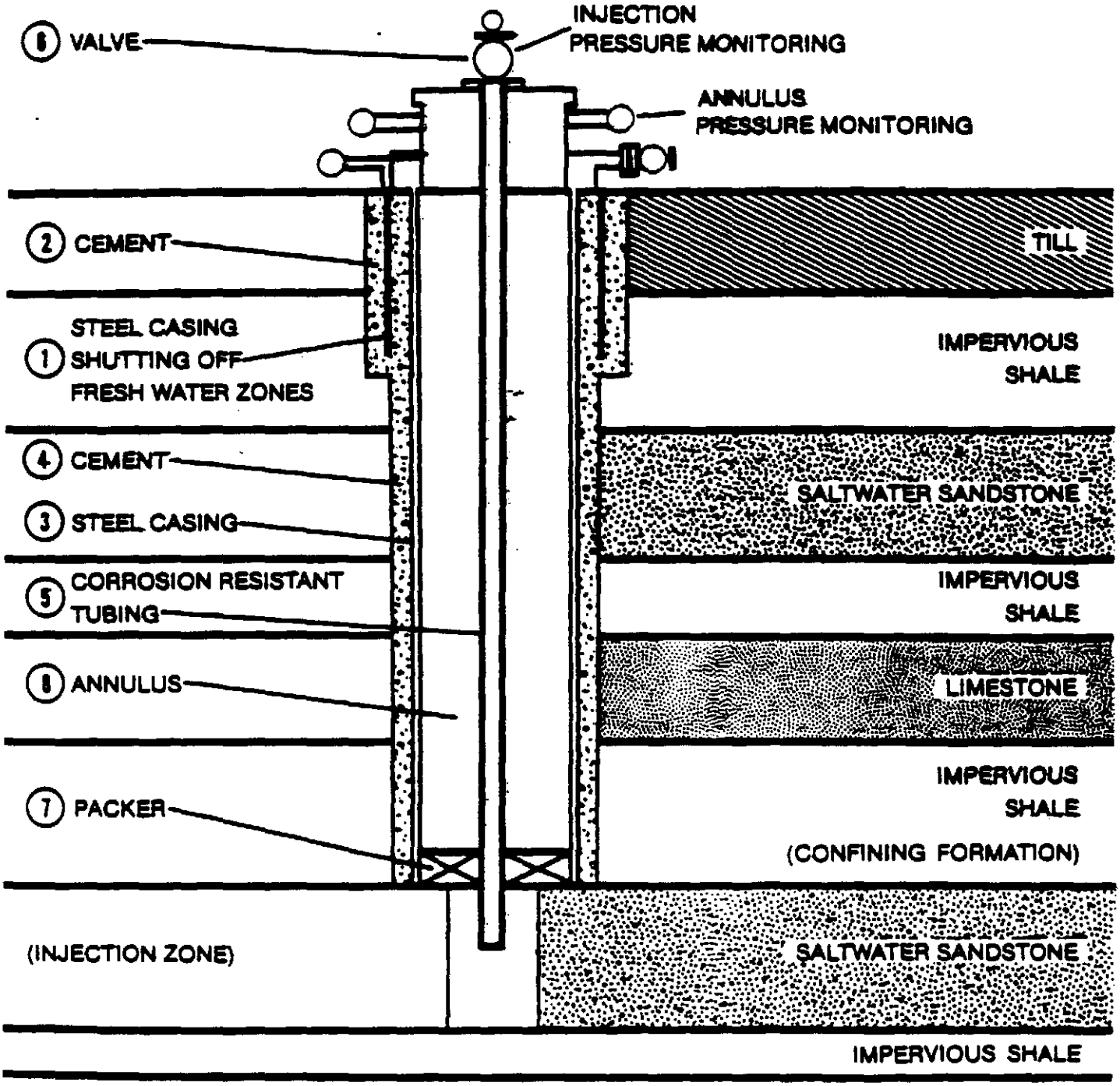
ability of wastes to migrate once they are injected into the ground (Gordon and Bloom, 1985, p. 10, and DNR, 5/86, p. 68).

The existence of multiple potential paths of migration of waste, combined with the fact that we know very little about the actual fate of injected wastes, makes it even more important that we monitor and control injection well facilities closely. Theoretically, a properly designed, built, and monitored injection well should safely deliver waste to the injection zone. Figure 1 shows the usual structure of an injection well to be used for hazardous waste disposal.

These wells are constructed from the outside to the inside. First, a hole is drilled below the level of all drinking water. A steel pipe (1) is placed along the full length of the hole and cement (2) is used on the outside of the pipe to seal the casing to the hole. This steel and concrete barrier provides the first and innermost protection of drinking water sources. Next, the hole is drilled deeper (into the injection zone) and another steel pipe (3) is installed, this time from the surface to the injection zone. This pipe is again sealed with cement (4) on the outside and provides the second barrier between the drinking water and the well. The injection tube (5) is usually a small pipe about 2 1/2 inches in diameter, which is secured and sealed both at the top (6) and at the bottom (8). Once this is done, the space ("annulus" (7)), between the injection tube (5) and outside casing (3), is filled with a non-corrosive fluid that is kept under pressure. Both the annulus and injection pressures are continually monitored to assure that injection waste is not leaking out of the injection tubing at any any point. However, without other systems, such as monitoring wells, annulus and injection pressure monitoring provide little assurance against waste migration (see Monitoring and Well Integrity later in this section).

FIGURE 1.

ENGINEERING AND ENVIRONMENTAL CHARACTERISTICS FOR A TYPICAL DISPOSAL WELL REGULATED BY THE UNDERGROUND INJECTION CONTROL PROGRAM



Source: Adapted from Patrick Sullivan, An Assessment of Class I Hazardous Waste Injection Wells, Ball State University, Muncie, Indiana: 1983.

History of Gelman's Deep Well

In 1978 Gelman was given a National Pollutant Discharge Elimination Systems (NPDES) permit by the DNR to dispose of their liquid plant wastes. The wastes were first placed in a treatment pit and then spray irrigated on company land. According to Gelman officials, alternatives to this process were sought after expansion plans showed that not enough land was available to continue the spray irrigation (Interview with James Marshall, 3/3/88). However, documents obtained from Gelman show that there were other reasons as well. According to a time line prepared by Gelman in 1981, "Deep well injection became the preferred method of disposal--non-controversial." It appears it was a combination of both of these factors, plus increasing public attention on Gelman's existing disposal methods, which led Gelman to consider deep well technology.

The Geological Survey Division of the DNR was contacted regarding the feasibility of deep well injection at the site. According to DNR files, "They (Gelman) were informed (in 1981) that the geology of the area was not well defined but it might be feasible" (DNR Files, 11/3/86). DNR files show that Gelman then contacted the Mineral Well Permit Unit (DNR) regarding a feasibility study. This study was completed and the DNR issued a construction and drilling permit on May 12, 1981. The well was inspected by a DNR engineer during construction and later was pressure tested as required by law. The well, which cost approximately $2 million (Cohen, 11/3/87), began operating in late 1981.

Under the Safe Drinking Water Act (FPL 93-523) which was implemented in 1984, the well had to be retested for mechanical integrity as part of the transfer of permit responsibility from the state level to the federal level. Throughout this permitting process the well was operated under interim rules as mandated by the EPA, which allowed Gelman to continue to use the deep well. Gelman's application for the EPA Underground Injection Control permit ("EPA-UIC" or "UIC") was received on December 20, 1984. After several notices of deficiencies and the resultant filing of new information by Gelman, the application was deemed complete on August 15, 1986. The EPA held a public meeting in

Ann Arbor on September 17, 1986 to answer questions about the well. Residents and others expressed a variety of concerns (EPA, 9/24/86), to which the EPA provided written responses. The permit was granted on September 30, 1986, after the EPA Region V office found none of the citizens' concerns "valid" (EPA, 9/24/86).

After reviewing these comments from the EPA one member of a group of fifteen appellants filed an appeal with 556 signatures, requesting an administrative (national EPA) review of EPA Region V's permitting process The appeals, filed between November 25, 1986 and January 16, 1987, were based on a wide variety of issues and exposed many of the problems with the EPA-UIC regulations. Gelman continued to operate the deep well under interim rules during the appeal process. According to EPA officials in Washington, the appeal was receiving high priority during the summer of 1987 (Interview with Moretta, 7/87). However, the decision did not come until December 1987. The request for administrative review was turned down and Gelman received the permit which was originally granted in September 1986.

Throughout the EPA-UIC permitting process, Gelman continued to use the deep well, despite what was then identified as an expanding contamination plume. The well was first used for disposal of process waste. Beginning in the summer of 1987, in compliance with interim rules of the appeal period, it was used for the disposal of contaminated water which was purged from aquifers. When the request for administrative review was turned down, the original permit once again became effective. Gelman's original permit (granted 9/86) was only for "process waste." Therefore Gelman had to cease disposal of purged contaminated groundwater in the deep well. As a result, Gelman's clean-up operations also came to a halt while Gelman filed for the necessary permit modification. The EPA has recently stated that the Gelman request is only a "minor modification," therefore the entire permit is not up for review (Interview with Moretta, 2/88). Because the contamination has already been classified as non-hazardous by the EPA, Arthur Moretta felt there would be no major problems in granting the permit modification. Gelman, however, is required to hold

a public hearing over this modification because of an agreement with citizens from the first public meeting.

Many of the following concerns arose specifically out of citizen opposition to the EPA-UIC permitting process and the subsequent appeal. In particular, one citizens' group, Tocsin, a main appellant, contributed a very thorough analysis of the issue. Much of the following is a summary of the work done by Tocsin. Other issues appeared in our own investigation of the issues surrounding Gelman's deep well and other deep wells around the country. We feel the following are the most important issues involving the deep well; other concerns will be briefly summarized.

Geology

There is considerable uncertainty inherent in any description of the geology of an area thousands of feet beneath the earth's surface. Modeling and other forms of predictive theory are used in an attempt to assure, with a certain probability, that an expected event will or will not occur. However, interpretations vary of the degree of certainty achieved and the degree of certainty needed. Assessment of a particular activity's risk to human health or the environment is a difficult and highly controversial task (see Risk assessment section). The controversy over differing descriptions of the geology of Washtenaw County and of the Gelman site serves as an excellent case for examining the problems associated with evaluating risk. It also illustrates one of the main concerns with deep well disposal--the uncertainty that the waste will stay where it is placed.

The DNR permitting system, through which Gelman's original deep well permit was granted in 1981, required very little information regarding the geology of the area. At the time, one DNR official stated that "...injection well disposal of wastes is largely unregulated from a water quality standpoint" (DNR Files, 9/9/81). The unregulated nature of deep well disposal (especially in regard to geology) in the 1970's and early 1980's, has

left Michigan and other states with a number of potentially unsafe wells. In 1984 the EPA assumed responsibility for the permitting process and for uniformly regulating deep wells throughout the country. Many problems, however, still exist with the EPA regulations.

In 1984 the EPA began to collect the information needed to develop an UIC permit for Gelman's deep well. Based on information from EPA files and statements regarding the permitting process, the EPA consulted the following sources: the permit application (prepared for Gelman by Golden Strata Services); Gelman's deep well log (prepared by Tooke Engineering); the plat book for the area; "The Hydrogeological Atlas of Michigan" (published by Western Michigan University); Jeanne Ann Fisher's Master's thesis, "Fault Patterns In Southeastern Michigan;" and additional information requested by the EPA and provided by Golden Strata Services for Gelman.

On May 15, 1985 the EPA sent a letter to Gelman stating, "Agency reports indicate the presence of the Washtenaw Anticlinorium: a system of basement faults in Southeastern Michigan, which include the proposed area of review. The information regarding structural geology in your application is so generalized that no reference to this feature was made." On receiving more information and completing their review, the EPA decided to grant the permit. "EPA geologists did not find evidence indicating structural geological problems that could allow upward migration of waste fluids" (EPA, 1/87, p. 9). It is notable that whereas the EPA "did not find evidence indicating structural geological problems," the EPA was not able to find evidence that structural problems did not exist.

Tocsin felt, as did many others, that the EPA had not adequately supported its decision to grant Gelman's deep well permit. The thoroughness of the information available about the region's geology was also called into question. Based on review of EPA documents, Tocsin concluded that the Fisher study (one of the few general studies of southeastern Michigan geology) and the site-specific information provided by Gelman's well log were the primary sources used by the EPA for evaluating the safety of the geology for deep well disposal.

The EPA originally singled out the Fisher study as the one which resolved the "issue of structural geology" (EPA, 9/24/86, p. 10). The Fisher report addresses several theoretical questions about southeastern Michigan geology and cites the existence of fault structures in Washtenaw County (which are both complex and not well documented). The presence of these structures raises serious questions about the safety of southeastern Michigan for deep well injection.

The EPA attempted to support their decision to grant Gelman's deep well permit by citing the Fisher study as proof of a "lack of evidence" of fault structures in the immediate vicinity of GSI. However, nowhere in the report is the specific question of the suitability of southeastern Michigan geology for deep well injection addressed (Fisher, 1981, and Tocsin, 11/26/86). It thus appears to us that the EPA, in the absence of more relevant information, misinterpreted the information provided in the Fisher study. The EPA then used this information to support their position of granting Gelman's deep well permit.

Only after the request for administrative review was filed and the appellants asserted that the Fisher study, contrary to the EPA's contentions, raised more concerns about the region's geology than it resolved, did the EPA acknowledge its error. The EPA stated that the Fisher study "does not provide a detailed analysis of the GSI site nor its suitability for deep well injection" (EPA, 1/87, pp. 9-10).

Issues raised by the EPA's permitting process

The EPA's decision to grant Gelman the deep well permit raises two important questions: 1) the relevance of the Fisher study, and 2) the ability to generalize about the geology of an area from the information generated at one well (the Gelman well). The discussion of the relevance of the Fisher study has focused on two points: first, the relevance of the geological information printed in the study for evaluating the safety of deep well injection; and second, whether or not the Fisher study reflects a general consensus among professionals about the geology of the area.

Geological Information in the Fisher Study

In her report Fisher discussed faults, although their relevance to the safety of Gelman's deep well is unknown. The features addressed in the Fisher report which were most applicable to the Gelman site, include the Howell Fault and the Lucas-Monroe Fault. According to the request for administrative review filed by Tocsin (Tocsin, 11/26/86, p. 3), "The former lies more than ten miles to the North of Gelman," and "the latter cuts directly through Washtenaw County in such a way that the Lucas-Monroe Fault is likely to either directly or indirectly influence the Gelman site." Fisher mapped the fault as passing directly through Washtenaw County. She also claimed that "the Lucas-Monroe is probably a series of faults rather than one single continuous fault" (Tocsin, 11/26/86, p. 64). Therefore, even if one fault was identified, it was implied that there may exist other faults in the area. Because of the complex nature of the faults and a lack of information about them, it is purely conjecture to attempt to deduce the exact location of the fault or faults, and their possible impact on the deep well's integrity.

Yet the EPA contends that "actual data on the location and extent of any such faults is not provided (by Fisher)" (Tocsin, 11/26/86, p. 4). The main reason this is not possible is not because of inadequacies in the Fisher study, but because of a lack of adequate data to document the existence, location, and extent of the faults. It appears that the EPA interprets this "lack of evidence" as proof that the area is fault free, rather than as a lack of information (i.e. a lack of the necessary studies), on the exact location of the fault. Despite what apparent professional consensus that a fault exists in the area, the EPA was unwilling to require that the necessary studies be performed to actually document the faulting pattern. In fact, the EPA demands for "specific evidence" directly pushed the burden of proof onto the citizens who were involved in the appeal. If there is no specific evidence, EPA regulations state, it is up to the operator of the well to provide the necessary information. It should not be the responsibility of citizens to prove the disposal is unsafe.

The need for more complex studies was also reflected in Fisher's study. According to the Requests for Judicial Review (Tocsin 11/26/86, p. 4), " (the) Fisher thesis clearly indicates that while a macro analysis may be suitable for other regions, in this particular case area only a detailed micro analysis of the site's suitability for injection will prevent the agency from taking an unnecessary risk with the public's health and safety." While it is clear that the Fisher study does not provide a definitive statement about the region's geology, the study does recognize the need for more information to accurately assess the geological structures.

Consensus on the area's geology

Information used to evaluate geology in the permit, the appeal, and EPA's assessment of the appeal included Briggs (1969), Fisher (1969), Ells (1969), Dorr and Eschman (1970), Simpson (1975), Syrjamaki (1977), and Cohee and Landes (1984), in addition to previously mentioned resources. The consensus reached in all of this work is stated by Syrjamaki, 1977. "Structures within the Michigan Basin (Howel Anticline, Lucas-Monroe Monocline, Albion Scipio Trend, etc.) are generally thought to be fault controlled [i.e. the geology of the area is heavily influenced by faults]...(our emphasis)" (Syrjamaki, 1977).

Briggs (1968) states, "There are two known faults in southeastern Michigan. One associated with the Howel Anticline... another, associated with the Lucas-Monroe structure... Faults of this type are difficult to find in the subsurface unless they have large displacement, because most of the area is mantled by glacial drift which hides the bedrock structure." Fisher states, "The structural trends in the southeastern Michigan Basin are most likely controlled by many fault blocks which lie in a rectilinear pattern... This idea has been suggested by several researchers" (Fisher, 1981, p. 48).

Fisher also cites work done by Ells (1969) which "summarized all previous work done in the Michigan Basin." Fisher states that "In the area he (Ells) designates as the

Washtenaw Anticlinorium, he postulates the existence of three major fault blocks which have moved relative to one another in a vertical manner" (Fisher, 1981, pp. 31-32). Fisher also notes that "The placement of faults on a structural map is a subjective process, and may differ between workers" (Fisher, 1981, p. 53). The difficulties in locating faults at this depth are also stated by Syrjamaki (1977). "As well control is poor at the depth involved the problems of trying to exactly deduce displacements, as well as the approximate position of the fault itself, are extremely difficult." This means that despite all assurances, we may never be fully certain as to the exact location of the faulting pattern. This raises many questions about the safety of placing waste at these depths.

The sources discussed above indicate a general consensus around the theory that a series of complex faulting patterns exists in Washtenaw County. However, the exact nature of these faulting structures remains undetermined and as a result, it is difficult to generalize about the location of such faults. It thus appears that Fisher's proposed faulting structures do represent the most widely agreed upon interpretation of the existing information.

The use of site specific geological information

Despite the general consensus cited above, the EPA relied heavily on the site-specific information prepared by Golden Strata Services for Gelman. A brief section of the Golden Strata study provides an example of the generality with which the complex faulting structures of the region are addressed.

"Within the area of review there is a lack of complex geological structures such as faults and folds (our emphasis). The Mt. Simon Sandstone, Eau Claire, Dresbach, and Franconia Members of the Munising Formation are nearly flat lying with a shallow dip as seen in the structure contour maps... They are areally extensive and not bound by faulting or folding which might pose a constraint to waste disposal operations" (Tocsin, 11/26/86, p. 7).

Again, this is site specific information which the EPA cited. The Golden Strata geological analysis represents a minority opinion. It reaches a largely unsubstantiated conclusion about the region's geology based on information from one well, and ignores most of the prior work which has been done on the region's geology.

The EPA contends that, "The lack of adequate geological data was resolved with information generated by drilling the well" (EPA. 9/24/86, pp. 9-10). The EPA and Gelman claim that the site specific data generated from the drilling of the deep well does not indicate the presence of any "fractures, faults or solution channels which could compromise (the well)" (Tocsin, 5/10/87, p. 5). Yet, given the complex geology of the area, the possible existence of multiple faults, and the widespread groundwater contamination, it would seem to be unwise to generalize about the region's geology from the information generated from one well.

For example, during the drilling of the deep well there was a six degree deviation in the hole. There are several possible interpretations of this event. One interpretation is that the drill encountered a change in hardness or porosity in the rock. Another is that the drill encountered a fault or fracture, by which it was deflected. Because of the absence of a geologist during the drilling, there was no analysis of the deviation done at the time. The EPA's contention that the deviation was due to a change in hardness seems questionable given the presence of faults and extensive groundwater contamination in the area.

Existing Contamination and Violations

To date there has been no determination of the source of the groundwater contamination at the Gelman site. The EPA (EPA, 1/87, p. 12,) contends that, "no evidence was found to indicate the deep well as a source of groundwater contamination." However, the simple fact that there has been "no evidence" does not prove that any of Gelman's past or present practices are not the source of the contamination. Regulators,

especially the EPA, have frequently confused (purposefully or not) this "lack of evidence" with positive proof showing the safety of the well and ruling out other potential sources of contamination. In doing so the EPA appears to be willing to side with industry in a "pollute until proven guilty" position, and has placed the burden on citizens to develop information which "proves" the well is unsafe. Again, this is clearly not the true intent of the federal regulations.

The EPA contradicts itself for a second time in its response to the appellants (EPA, 9/24/86, p. 1) when it states that "...the existing groundwater contamination was not determined to be due to the injection practices." Again, the EPA apparently feels that "no evidence" to indicate the wells as a source of the contamination means that the well is not the source of the contamination. No evidence means no evidence. It means that more monitoring, and more detailed studies need to be conducted. The absence of information, especially in regard to specific concerns does not mean that we should settle for broad and unsubstantiated generalizations.

The reality of this situation was emphasized by James Bernard, formerly of the Michigan Environmental Council. "There's a large credibility gap in the ability of the EPA to determine where the contamination is coming from. Is it from spray irrigation? Is it coming from the deep well injection? Is it from a leaking lagoon? (The) EPA has systematically failed to make a determination" (Cohen, 9/25/86). The EPA failed to require Gelman to generate the information needed to make an accurate determination about the safety of the deep well and, as a result, was forced to make a decision based only on existing information. While this is not in itself illegitimate, the EPA made an interpretation which we feel is clearly not substantiated by the literature.

This attitude also contradicts both the letter and spirit of the EPA regulations. EPA regulation 40 CFR @144.12 (a) states that "No owner or operator shall construct, operate,...or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into Underground Sources of Drinking Water,...if the

presence of that contaminant may cause a violation of any primary regulation under 40 CFR Part 142 or may otherwise adversely affect the health of persons. The applicant for a permit shall have the burden of showing that the requirements of this paragraph are met" (our emphasis).

Studies conducted by Keck Consulting, Inc. ("Keck") for Gelman in July 1986 (Phase I), and March 1987 (Phase II), which provide the most specific information on groundwater movement on the site, do not determine the source of the contamination (Keck, 7/14/86, and Keck, 3/30/87). The EPA summarized the findings of the Phase I report by stating "The study concluded that the most likely cause of the breaching of the layers was due to GSI's (Gelman's) past practices of deepening the unlined lagoon which caused penetration of the (clay) layers that led to contamination of the drinking water aquifer" (EPA, 9/24/86, p. 3). Rather than resolving questions, the hydrogeological studies have revealed the complexity of groundwater flow in the area and the need for further study to document what is actually occurring thousands of feet under the earth's surface. It is anticipated that the Phase III report (of which completion is projected to be at the time of this writing) will shed more light on this question. However, it is significant that the EPA made their decision to grant the deep well permit before completion of hydrogeological work (the Keck studies). According to the EPA (EPA, 1/87, p. 12), "The GSI record of compliance with other environmental regulations has no bearing on the present permit." Significantly, the EPA did not, at least in this case, consider Gelman's extensive history of permit violations to be an indication of likely problems with a new permit. According to comments filed with the request for administrative review (Tocsin, 11/26/86, p. 9-10), "GSI never reported, as requested in the UIC permit application, that there was a known groundwater contamination problem at the site. Moreover, in the permit questionnaire section, GSI did not indicate they have failed to comply with or even apply for a required NPDES permit (a surface discharge permit which was only applied for and received after considerable pressure from citizens in the Fall of 1987). These infractions in

the application process are a violation of the UIC permit." The EPA, in its effort to present deep well injection as a safe disposal option, appears to have ignored its own regulations and refused to acknowledge a lack of the information necessary to protect public safety,

Hazardous Determination

A central issue in the granting of the deep well permit by the EPA was the hazardous vs. non-hazardous determination of Gelman's waste stream. Hazardous determination of Gelman's waste stream would have meant that Gelman's permit application would have subjected to the much more stringent EPA and Resource Conservation and Recovery Act (RCRA) regulations (joint regulation by both RCRA and the Safe Drinking Water Act (SDWA)). A non-hazardous ruling (which Gelman's waste stream received) allowed Gelman to avoid the above regulations. Gelman's waste stream was defined as non-hazardous even though it contained 1,4-dioxane, a suspected human carcinogen.

The hazardous waste stream determination would also have forced Gelman to seriously explore alternative disposal techniques under RCRA, HWSD (1984) (EPA, 1/88, p. 22). Since Gelman received a non-hazardous permit, the EPA was under no obligation to force Gelman to pursue alternative disposal techniques.

The listing of Gelman's waste stream as non-hazardous, followed by a subsequent evaluation of the dioxane-contaminated groundwater also as non-hazardous, is questionable indeed. Over 52 residential and commercial wells have been condemned by the Michigan Department of Public Health due to contamination by dioxane(Toxic Substance Control Committee Meeting, 3/10/88), yet the material is considered non-hazardous. Gelman's waste <u>is</u> hazardous to public health, however EPA regulations do not consider this fact. An excerpt from an EPA response to the aforementioned concern highlights the obvious contradictions.

> EPA's classification of the GSI waste stream as non-hazardous was made in accordance with 40 CFR @261.3 (a)(2)(iii) which states: 'When a characteristic hazardous waste is mixed with a solid waste and the waste no longer exhibits the characteristic for which it was listed, it is not a hazardous waste.' In this case, acetone, the only constituent of the waste stream which is listed under 40 CFR @261.31 (hazardous waste from non-specific sources) as hazardous is only listed because it exhibits the characteristic of ignitability. When the acetone is mixed with other constituents of the GSI waste stream, it is no longer ignitable; therefore rendering the waste stream's classification as non-hazardous.
>
> Two other constituents of the GSI waste, 1,4-dioxane and tetrahydrofuran, as well as acetone, are listed under 40 CFR @261.33 (f) as hazardous waste from discarded commercial chemical products, off-speciation species, container residues, and spill residues thereof. This hazardous waste listing does not refer to manufacturing process waste such as the GSI injection fluid. (EPA, 1/88, p. 16)

Thus, according to the EPA, the fact that dioxane was part of the waste stream, as opposed to being a single discarded product or residue, classified it as less toxic to the environment and people. This is a clear example of the type of logic which allows the EPA to make what appear to be arbitrary decisions regarding the "hazard" of a substace. Regarding the EPA's contentions, Maroline Hense, a local resident, stated, "If it is non-hazardous, why are people telling us not to drink our water or to wash with it?" (Cohen, 9/25/86).

Monitoring and Well Integrity

The problems of confirming well integrity are directly related to a lack of strong EPA-UIC regulations to assure the integrity of a wells. Mechanical integrity refers in general to the ability of the monitoring system to assure that wastes are not migrating upward, in, or around the well. During well construction a variety of tests are performed to assess the initial sealing of the well and formation of the annulus test zone. Once a well

is in operation, the operators of the deep well are required to continually monitor annulus pressure and injection pressure (see deep well diagram).

In this manner a determination is made on the long term integrity of deep wells. According to the EPA (EPA, 1/87, p.14), "... it is the director's discretion, pursuant to 40 CFR @144.28 (g) (i) (iii) to require ground water monitoring." In the same memo (p.14) the EPA explains its basis for such a decision. The concerns are: "(a) that detection of leaks in the injection well can be more readily detected by monitoring and mechanical integrity testing than by groundwater monitoring, (b) that placement of monitoring wells in a deep aquifer may be unsound because the monitoring well may itself create a route for fluid movement through confining formations, and (c) that in the unlikely prospect that a confining formation has been breached, fluids would only reach a monitor well after an extremely long time due to naturally slow rates of fluid movement in the subsurface."

Concern (a) should be expressed as "may" rather then "can." Indeed, past experience shows that this is a largely unsupported statement. Both Sullivan (1983), and Gordon and Bloom (1985) describe traditional problems of injection well monitoring systems. An injection well at Vickey, Ohio was assumed to be operating properly with an EPA approved monitoring system. Yet, over twenty million gallons of hazardous waste leaked from the well into an aquifer above the injection zone when a "minor loss" of fluid pressure was treated as insignificant. Based on this example and many others (Gordon and Bloom, 1985, pp. 10-19), the authors conclude that, "The success of monitoring well head injection rates and annulus pressure to detect and prevent waste injection (migration) has not been demonstrated. Indeed, evidence from actual injection operations indicates that injection rate and annulus pressure monitoring are quite limited in their ability to detect leaks and cannot support the claim that an injection operation is not or will not contaminate a drinking water supply or otherwise adversely affect the environment".

Concern (b) does not address the fact that monitoring wells are increasingly becoming the preferred method for assuring that wastes are contained. At least six states

currently require monitoring wells for all hazardous waste injection (Gordon and Bloom, 1985, p. 27). Furthermore, wells which monitor aquifers above the injection zone cannot provide avenues for waste migration because they do not penetrate the zone which seals the waste. Even wells which do not penetrate the injection zone can and have been designed so as to not allow migration of wastes (Gordon and Bloom, 1985, p. 27). The EPA's position is particularly contradictory on this point because it maintains that a deep well can be constructed and guaranteed safe, while the same is not presumed true for a monitoring well. In addition, the monitoring wells do not need to be pumped (monitored) constantly, and therefore would not affect either the natural migration of groundwater or an aquifer (Gordon and Bloom, 1985, p. 26).

Even if the migration of waste to the monitoring wells would take "an extremely long time," as stated in concern (c), it would still be advantageous to discover this migration (which apparently would be undetected by mechanical monitoring at the well). The only other way to detect the contamination would be in sources of drinking water. This is especially relevant to the Gelman site where contamination exists and monitoring wells could provide important information regarding the source of the contamination.

Significantly, there is no direct monitoring of groundwater (i.e. there are no monitoring wells at the appropriate depth) for Gelman's deep well. Monitoring wells which Keck Consulting Company, Gelman, the DNR, and the EPA have used, were explicitly constructed to monitor movement and concentration of the contamination--not to monitor the deep well. The function of these monitoring wells has been a source of much confusion both in the press and among regulators.

A number of concerns were raised in the deep well permit appeal, in reference to the mechanical integrity of Gelman's well. Again, many of these concerns typify the issues surrounding the integrity of deep wells in general.

First, the EPA's interpretations of the data seem to ignore what little is known about the region's geology. The potential presence of faults, combined with the presence of

groundwater contamination and the potential for this contamination to affect significant residential populations, would seem to argue for greater caution in the EPA's decision.

The second issue is that Gelman has experienced repeated problems with the maintenance of its deep well. On two occasions Gelman has had to replace the well's injection tubing due to deterioration and leakage (Rogers, 1/25/87). Not only does this call into question the general issue of the durability of deep wells, but also Gelman's ability (in particular) to prevent leakage. According to the EPA (EPA, 1/87, p. 8), "Pursuant to 40 CFR @146.8, an injection well has mechanical integrity if there is no significant leak in the casing, tubing, or packing." However, on at least two occasions there have been leaks in the injection tubing of the Gelman deep well. Gelman has been unable to prevent "significant" leaks since the well began operating in 1981, and there is no evidence that the company will be able to prevent such leaks in the future.

A number of other specific concerns have been raised by the appellants regarding the integrity of the well construction (Tocsin, 11/26/86, and Tocsin, 5/10/87). However, for many of the issues raised, there exists two equally viable interpretations of the data. We feel that in these situations the EPA should be making the most conservative decision possible, i.e. the decision which provides the greatest possible protection for human health and natural resources. Yet, based on a review of the well integrity and monitoring well information in the DNR and EPA files, it appears that decisions with reference to the deep well were consistently made in a very non-conservative manner. There seems to be a lack of initiative on the part of regulatory agencies to demand from companies the generation of the new information necessary to adequately consider the issues before making decisions.

Environmental Impact Statement and Disposal Alternatives

Gelman was not required to prepare an Environmental Impact Statement (EIS) or to fully explore possible alternatives to deep well disposal before being granted the permit by

EPA. The National Environmental Policy Act (NEPA), which requires EIS's of all federal agencies, states that the agencies must consider "any adverse environmental effects" and "alternatives" to the proposed actions. However, court decisions from 1973-1979 have repeatedly stated that since the EPA's statutory mandate insured the consideration of environmental impacts, the agency was exempt from this requirement. The court did conclude that the EPA must show "functional equivalent" to the requirements of NEPA. In the Gelman instance, the EPA cites the case State of Maryland v. Train, as the best summary of what is required for the functional equivalency test. The court stated, "Where federal regulatory action in circumscribed by extensive procedures, including public participation, for evaluating environmental issues and is taken by an agency with recognizable environmental expertise, formal adherence to the NEPA requirements is not required unless Congress has specifically directed" (EPA, 1/87, p. 24)

While no court has specifically exempted the EPA from NEPA requirements, the Congress has exempted the EPA from the EIS requirement of NEPA under the Clean Water Act (44 FR 64174, 1979 or 40 CFR Part 6) as long as the "functional equivalent" is met. The EPA contends that public hearings, such as the one held on September 24, 1986 in Ann Arbor, meet the functional equivalent. However, based on EPA files, it appears that the functional equivalent of the information normally required under NEPA Section 102 (2)(c) was not met at the public hearing. Alternatives to deep well disposal do exist; apparently, none of these were explored in the permitting process.

Further, it appears that the EPA was not aware of any alternatives to deep well injection that Gelman was exploring, or had already developed, at the time of the permitting. In fact, Gelman had for several years been requesting to beconnected to the Ann Arbor Sewage Treatment System, and less then a year after they received the deep well permit; they were connected to the system.

Furthermore, Gelman had publicly announced its intention to use the deep well for injection of contaminated groundwater, in addition to process waste, throughout the

permitting process. The permit they were applying for, however. clearly did not allow disposal of purged, contaminated groundwater. The EPA's decision to grant the permit when Gelman clearly had other disposal options available, (and when Gelman was considering alternative uses of the deep well) must be questioned. It appears that the EPA either failed to meet the functional equivalence test, or was ignoring both the disposal alternatives available to Gelman, and Gelman's real plans for the use of the injection well. It seems logical that the "functional equivalence" of exploring all possible alternatives should not be met by selectively ignoring facts and concerns which are raised.

In our group's discussions with Gelman Vice President Jim Marshall, we also learned that Gelman has conducted reviews of several alternative treatment systems. However, according to DNR officials (Interview with Mary Vanderlaan, 2/24/88) the company has not provided this information to the DNR when requested. The DNR contends that Gelman's unwillingness to provide written documentation of these studies has limited the DNR's ability to assess Gelman's cleanup plans.

Suggestions for Federal Regulatory Change

The following summary of suggestions for regulatory change is taken from Gordon and Bloom (1985), which contains a more detailed analysis of each of the points raised below.

Lax regulations are only an agent which allows potentially harmful disposal technologies to be used. As such it is important to look at the regulations, but it is even more important to understand how the inadequacies of the regulations are characteristic of the limitations of the general regulatory approach. The efficacy of regulations depends on the social, political, and economic climate in which they are being developed and implemented. An examination of the role of regulations and regulatory agencies, i.e. the DNR and the EPA, (see DNR analysis section) must be accompanied by the following analysis.

Regulatory Analysis:
(1) The UIC regulations fail to prohibit the injection of wastes that are incompatible with the well materials, the injection zone and confining layers.

Currently the EPA administrator is required to consider the compatibility of the waste intended for injection with the well materials and the fluids and minerals of the injection zone (47 FR 32274-32388, 6/82). However the regulations fail to provide specific parameters needed to evaluate the compatibility of the wastes. As a result, the EPA has been able to make a relatively small number of compatibility determinations. The development of new regulatory parameters, testing procedures, and analyses are needed to fully examine the long term fate and effect of injected wastes on the injection zone (Gordon and Bloom, 1985, p. 45).

(2) The UIC regulations fail to require the monitoring of (a) underground sources of drinking water through which or near where the well bore passes; (b) the injection zone; and (c) the confining layers to determine whether contaminants have migrated.

This aspect is perhaps of greatest significance to the Gelman case. UIC regulations only require continuous monitoring of annulus pressure and injection pressure, flow rate, and volume. Other methods, such as groundwater monitoring, are not required except on a case-by-case basis as determined by the EPA administrator. In general, the EPA has assumed that "as long as an owner or operator is in compliance with 'good engineering' practices such as mechanical integrity of the tubular goods and the absence of man-made (sic) communication between the injection zone and higher strata, endangerment of nearby underground sources of drinking water will have been avoided" (45 FR 42487, 6/24/80).

However, the EPA itself acknowledges that "... a great deal is still unknown about the movement of fluids below the surface," and that "...monitoring of interactions (below the surface) is both difficult and uncertain" (45 FR 42477, June 24 1980). These contradictory statements again point to the fact that the "...monitoring (of) well head injection rates and annulus pressure to determine 'significant leaks' has not been demonstrated" (Gordon and Bloom, 1985, p. 46). Leaks have not been detected in several instances because the leak is too slow to be detected by pressure monitoring devices.

As explained by Gordon and Bloom (1985), the monitoring of other forms of disposal, such as landfills, is much more stringent. Monitoring wells are generally required at both the walls of a landfill and at aquifers downgrade from the fill, to monitor the major potential migration pathways. The EPA's failure to provide assurances (in the form of monitoring wells) for deep well technology, "...demonstrates the agency's failure to show sufficient caution when confronted with both significant uncertainty and risk to invaluable groundwater" (Gordon and Bloom, 1985, p. 47).

(3) The regulations rely on highly speculative and in some cases inaccurate assumptions about the migration of waste in the subsurface.

Current UIC regulations require the operator of an injection well to determine an area of review around the well, within which they must identify fractures, faults, abandoned wells, or other potential conduits for wastes. This area is based on a mathematical model which establishes a zone of endangering influence of fixed radius. The zone of endangering influence is defined as an area, "the radius of which is the lateral distance from an injection well, field or project in which the pressures in the injection zone may cause the migration of the injection and/or formation fluid into an underground source of drinking water" (40 CFR Part 264.03 (a)). The regulations provide a formula which is used to develop the exact distance which must be included in the area of review. Applicants for Class I well permits (i.e. Gelman's) must also identify all known wells within the area of review and assure that they are either plugged or cannot serve as a conduit for the movement of fluids (40 CFR 146.30 (b)(c) and 40 CFR 122.44). Gelman was required to identify all wells within two miles of the site.

Most concerns center around assumptions which are made about the ability of the waste to move once it has been injected. First, the formula used relies on numerous assumptions about the homogeneity of underground geological structures. For example, the formula does not account for the fact that underground formation pressures may differ from point to point. Therefore, the pressure measured at the injection point (the usual

practice) may differ from another point in the zone of endangerment. Second, calculations of radial movement assume that the waste moves outward in a cylindrical shape versus moving directly horizontally. The use of the cylindrical model can greatly underestimate the distance which the waste will move (Texas Department of Water Resources, 1983). In the case of the Gibraltar Chemical Resources facility in Owentown, Texas, only five feet of a 150 foot injection zone were found to be receiving wastes (Moldenhauer, 1984). The assumption of cylindrical movement needs to be closely examined. Third, several instances of long-distance migration of waste (up to three miles from the injection site) brings into question the applicability of the one-quarter mile rule.

Clearly, new methods for documenting the ultimate fate of wastes are needed. Only by understanding what happens to these wastes over the course of many years will accurate parameters be established to predict waste behavior. However, even with this capability the variability of local geological conditions may make it nearly impossible to accurately track wastes.

(4) The UIC regulations provide insufficient safeguards against potential pressure effects.

UIC regulations currently limit injection pressure to insure that increases in pressure do not initiate new fractures or faults, or cause waste migration through an existing fault (40 CFR 146.13). However, the adequacy of this aspect of the regulations is often undermined by the one-quarter mile area of review provision (Gordon and Bloom, 1985, p. 51). Based on the regulations (40 CFR 146.06), faults and fractures outside of the one-quarter mile radius of the well are not required to be identified; therefore, any potential pressure effects on these faults or fractures are not considered.

According to Gordon and Bloom (1985, p. 51), "Technically, it is quite possible to predict pressure changes over considerable distances as a result of pressure increases at a point. Consequently, the 1/4 mile limit is not only inadequately protective, but patently arbitrary." Pressure effects have been documented up to 40 miles from injection wells and earthquakes caused by injection of wastes have occurred up to three miles from an injection

site (Gordon and Bloom, 1985, p. 51). Despite this evidence, the EPA has been reluctant to expand the area-of-review around deep wells to better reflect the potential area of impact from injection.

(5) The UIC regulations require insufficient mechanical integrity testing to detect damage to the well bore before significant leaking occurs.

Current EPA-UIC regulations (40 CFR 146.08) state that an injection well possesses mechanical integrity if there is no significant leak in the casing, tubing, or packer, and if there is no significant fluid movement into underground sources of drinking water through vertical channels adjacent to the well. Leaks in the casing, tubing, and packer are monitored using annulus pressure. Vertical movement along the well bore is tested with a temperature or noise log. These tests must be run at least every five years or at the time of every new permit application or renewal.

The central problem with these limited monitoring requirements is that several documented cases of leakage have occurred less than three years after the wells have begun operating (Leenheer and Malcolm, 1973). The testing is useful in detecting leaks after they have already occurred. More frequent testing is needed to catch leaks before they can become major problems.

(6) The UIC regulations fail to require post-closure monitoring and maintenance and the showing of financial responsibility for post-closure care, third-party liability, and cleanup of contaminated groundwater.

All other hazardous waste disposal in the U.S. requires the development of a waste containment system for at least 30 years after closure (RCRA Regulations). Injection wells are exempt from this requirement.

According to the EPA (1980),

> "financial responsibility for UIC facilities differs from that of RCRA permitted facilities...the circumstances are fundamentally different... (a) [the] properly sited, designed and operated Class I disposal well offers little risk of leakage and contamination during the period of injection... Thus, the primary purpose of financial responsibility is to insure proper plugging and abandonment.... After the well is plugged, the plugging operation leaves an impermeable barrier between the injection zone and any USDW... Thus,

post-closure monitoring wells and other post-closure maintenance required under RCRA are unnecessary" (45 Fed. Reg. 33335, 5/19/80).

In May 1984 the EPA reaffirmed this statement. "...Requirements for post-closure care, while a necessary part of the RCRA requirements, have no referent in the UIC program since the technology of underground injection is designed to place fluids into confined formations and isolate them from the accessible environment for geological time" (Gordon and Bloom, 1985, p. 55).

The EPA's statements make many assumptions about the safety of injection well disposal. Most of these assumptions (such as the one that a properly operated, state-of-the-art well will not cause contamination either during or after the period of operation) simply ignore the fact that accidents, leaking, and underground movement of wastes have occurred due to injection wells across the United States. Recent well-plugging techniques have not withstood the test of time and there is little evidence on which to evaluate the long term integrity of well plugs (Gordon and Bloom, 1985, p. 56). The EPA's assertion that wastes cannot migrate up through a sealed well is simply not true. Wastes can and do migrate upward, along the outside of the well bore (Gordon and Bloom, 1985, p. 56).

Unfortunately, by not requiring post-closure care or third party liability insurance, the regulations under Superfund impose the risk of injection activities on surrounding landowners and residents, or on the public. Instead, the cost of risks should be imposed on those parties in the best position to minimize risks, and who are directly benefited by the risk-creating activity--the injection well owner. Requiring financial assurance will not impose undue burdens on injection well owners and operators if the technology is as safe as it has been represented to be.

Three states; Louisiana, Mississippi, and Ohio, already require financial insurance for injection wells (Gordon and Bloom, 1985, p. 57). Well owners and operators should be required to perform post-closure monitoring for groundwater contamination, and also to demonstrate financial ability to take responsibility for third party liability and cleanup.

(7) The UIC regulations authorize the use of underground sources of drinking water as depositories for hazardous wastes in direct contradiction to the spirit of the Safe Drinking Water Act.

The Safe Drinking Water Act states, "Underground injection endangers drinking water sources if such injection may result in the presence in the underground water which supplies or can reasonably be expected to supply any public water system of any contaminant, and if the presence of such contaminant may result in such system's not complying with any national primary drinking water regulation or may otherwise adversely affect the health of persons "(42 U.S.C. @300 (h)(d)(2)).

While there are clearly alternative interpretations of the Safe Drinking Water Act's intent, the above quote highlights the Congressional intention to protect present and future sources of drinking water from degradation. However, the EPA has declined to specify criteria by which the determination of whether a potential source of drinking water is "not reasonably expected to supply a public water system" (Gordon and Bloom, 1985, p. 60). Perhaps more troubling is the fact that the EPA has not established criteria for determining which sources of drinking water are "economically and technologically impractical" to be made fit to drink. Given our rapidly changing technological capabilities, it is very likely that water which is unusable today may become usable in the future. Instead of making these determinations, the EPA has left the decisions largely up to individual states.

Thus, states are left to make seemingly arbitrary decisions about what constitutes an unusable aquifer. As usual, the burden of enforcing the SWDA falls not on the federal or state levels of government, but on the citizens.

(8) The UIC regulations do not prohibit underground injection of hazardous wastes when more environmentally sound alternatives are commercially available.

Underground injection is economical because the "true costs" of this disposal practice are simply passed on to future generations. The current UIC regulations fail to establish the "true costs" of operating a deep well. Deep well disposal would be much more expensive if monitoring was required and full financial responsibility was

established. The EPA regulations should require the use of the most environmentally sound treatment alternative which is available and industries should be held responsible for assuming the total costs of their waste management methods.

The Politics of Deep Wells

> Trillions of gallons of wastes have been pumped down these wells for years. It's an out-of-sight, out-of-mind disposal method that worries us.
>
> --Diane Hebert, Environmental Congress of Mid-Michigan (ECOMM)

> Instead of dealing with pollution, we're simply building our smokestacks higher and our injection wells lower. But it always comes back to haunt us.
>
> --Jim Butler, Aide, Texas Department of Agriculture

> It's a giant problem, but it's a stepchild within both the environmental movement and the regulatory systems. I've been distraught over how little attention it has received. We can't show dead bodies right now. It's a classic out-of-sight, out-of-mind technology. I feel that underground injection is posing the greatest threat to our groundwater because of inadequate regulations. They're just postponing our day of reckoning with the hazardous waste problem.
>
> --Suzi Ruhl, Legal Environmental Assistance Fund(LEAF)

Deep well disposal is indeed a classic out-of-sight, out-of-mind disposal practice. As Michael Brown has stated (Brown, 1986, p. 17), "While the more familiar surface dumps remain one of the hottest issues on Capitol Hill (and last Autumn dominated the gubernatorial race in New Jersey), the federal government has not even tabulated all of the problems associated with deep well disposal." Indeed the lack of public awareness about deep well disposal, and the resulting lack of political opposition to it, has created an environment of lax governmental regulations for the "low visibility" practice of deep well disposal. This pro-deep well mentality has permeated regulatory agencies, which attempt to silence voices of dissent both within their own ranks and in the public at large. From

information we have surveyed, it appears that there is a rapidly increasing pro-deep well mentality in national and state regulatory agencies.

Nearly every DNR official we spoke with regarding this issue with had reservations, some very strong, about the use of deep wells. However, it appears that these concerns are systematically ignored by high level bureaucrats in the DNR and EPA. During the initial permitting and construction processes in 1981, a variety of concerns over the use of deep well injection were raised by DNR staff close to the project. In a July 16, 1981 letter from Jack Larsen, District Engineer, Ann Arbor Office (now Jackson Office) to Bob Miller of DNR's Air Quality Division (AQD) raised several specific concerns.

> To reiterate my comment from the July 1, 1981 meeting. Gelman Science of Ann Arbor will soon be converting from aerated lagoon for treatment of wastewaters, to a deep well injection system. Based on A.Q.D. (Air Quality Division) Permit No. 126-81, we expect the wastewater stream to periodically receive slugs of 1,4-dioxane (demonstrated animal carcinogen) to the extent of 4,360 pounds per month. I request you continue to treat as confidential much of this proprietary information. In light of available alternative disposal possibilities, I question the appropriateness of this new well, (our emphasis) In general, it seems that the EPB and Public Health would desire some routine input into the State well-permitting process (DNR files, 7/17/81).

Judging by the absence of correspondence on alternatives to deep well disposal in the DNR files it appears that alternatives were never given serious consideration by the DNR. On June 28, 1981 the *The Ann Arbor News* published an article on the Gelman deep well and its proposed future uses (Fulton, 6/28/81). In response to this article Larsen sent a memo to the Michigan Environmental Review Board (MERB) on June 29, 1981 asking, "(1) did MERB review this project?; (2) was the proposal publicly aired, complete with published notices in the local newspaper?; (3) was it declared a major state action?; (4) what are the names of the organic chemicals which will be going down the well?; (5) what unit of state government is responsible for monitoring what is going down the well?" (DNR files, 6/29/81). On August 4, 1981 the MERB responded (DNR files, 8/4/81) that

they "...had no knowledge of the disposal well..." and referred Larsen's letter to the Geological Survey Division which responded on August 12, 1981. The Geological Survey Division stated (DNR files, 8/12/81) that the original permit was only for drilling, and "... did not cover its ultimate use." The letter also noted that Gelman had an open house (apparently DNR regulations didn't require this) in which all parties with wells within one-half mile were invited to review the proposed plan. According to the memo, "There didn't seem to be much interest as only two families were present out of some 50 or 60 that were invited." The letter again emphasizes the lack of public concern by noting to Larsen that "Yours has been the only inquiry about the well..." (DNR files, 8/12/81). However, it appears the source of this lack of public concern was the fact that both Gelman and the DNR failed to adequately inform the local residents about the new well.

The Geological Survey Division's responses to Larsen's specific questions were as follows:

> To answer your questions: (1) MERB made a detailed review of the disposal well permitting program in early 1978 and found it to be both effective and safe. (2) There will be public notices made prior to issuing an operating permit or letter of confirmation of the well. (3) This is not a major State action. There are over 100 of these wells permitted in the State and there has not been one case of groundwater pollution that was attributed to their use. (4) I am attaching a list supplied by Gelman of the organic chemicals that will be expected to be in their waste. This will probably vary from time to time due to the batch process they utilize but it is and has been in the past 99+ percent water. No other chemicals may be included without this office's approval. (5) As indicated in number 4, the Geological Survey Division is responsible for the monthly monitoring of the operation of these wells. In that effort a monthly operating report is reviewed by this office for each well operating in the State." (DNR files, 8/12/81)

However, the MERB review of the State of Michigan's deep well permitting process in 1978 was conducted before substantial changes in regulations, such as RCRA, significantly altered the regulatory climate and efforts to control wastes. Also, the assurance that "... there has not been one case of groundwater pollution that was attributable to their (deep wells') use" has not been proven and is another example of DNR's efforts to promote deep well disposal as a cheap, simple solution to a complex

problem at the expense of public safety. In fact, the copy of the memo contains an unidentified handwritten note next to this response inquiring, "How about Hemlock, Mich.?" referring to a then suspected site of deep well contamination. The response to question #4 indicates the State's willingness to allow the injection of a suspected carcinogen into the deep well. In an interview with James Marshall, Gelman's Senior Vice President for Operations, (Interview with James Marshall, 3/3/88), he highlighted the fact that Gelman could inject anything they desired with the original permit. This was the message which the DNR, intentionally or not, was communicating to industry.

The DNR's letters to concerned citizens also provide a revealing look at the State's efforts to assuage citizens' concerns over deep wells. In an August 17, 1981 letter to a concerned citizen, the Geological Survey Division stated (DNR files, 8/17/81),

> I understand the concern of the people over groundwater pollution with all of the surface misuses in the past, but I can assure you that this type of liquid waste disposal can cause no such problem. This type of waste disposal well has been in use in Michigan for over 20 years and not a single groundwater pollution problem has been attributed to the use of one of these wells. Michigan geology is ideal for their use...

Despite DNR's assurances that deep wells are perfectly safe, the track record of these wells shows differently. The Hemlock, Michigan case cited earlier is a case in point. In addition, in the late 1960's and throughout the 1970's Dow Chemical of Midland, Michigan disposed of up to 300,000 gallons of waste per day by pumping it into deep wells. Dow's Midland factory produces over 500 different chemicals, some of which produce a deadly by-product, dioxin. Many of the residents in Hemlock, which is fourteen miles from Midland, have shown signs of dioxin poisoning. The deep well disposal is the most likely source of the contamination (Culver, 1984, p. 4). Over half a billion gallons of fluids, including phenolic compounds, chlorinated benzene compounds, tardon (Agent White), and 2,4,5-T were injected into three wells at the site prior to 1973 (Culver, 1984, p. 4). Additional fluids were injected until the mid-1980's when Dow decided to quit using most of its injection wells. According to Diane Hebert of the Legal Environmental

Assistance Fund (Culver, 1984, p. 4) "the same strata that have been used for extracting brine, oil, and gas have also been used to inject chemical waste. The possibility for intermingling of these materials seems to be a real possibility [sic] that has never been seriously evaluated, even though all of the clues have been there." According to Culver, "Dow has limited the number and scope of the tests on the brine" which would be needed to "prove" the source of the contamination. Thus, even in Michigan's "favorable geology," there is no solid basis on which to "assure" citizens that "...this type of disposal can cause no such problems."

As stated earlier, the DNR's public position on deep wells is also reflected internally. On August 31, 1981 Jack Larsen, District Supervisor at the Jackson DNR Office, sent a letter to the Office of Toxic Materials Control (DNR) asking, "Do you basically agree with this letter (8/12/81 response to Larsen's inquiry) from Geology Division?" In the letter he also asked,

> (1) Do you think it's time for a MERB (or other) review of the disposal well permitting process?; (2) Does Geology notify Public Health and Environmental Protection whenever they receive an application? Are you offered routine input?; (3) Have disposal wells ever contaminated groundwater? In Michigan?; (4) Is WQD (Water Quality Division) ever consulted as to whether the well is essential, or (if) alternative disposal methods are available? Or whether the waste quantity and species on the well application agree with WQD's (Water Quality Division) reports?" (DNR files, 8/31/81)

On September 9, 1981 Thomas Roehrer, Office of Toxic Materials Control, issued the following response (DNR Files):

> I share many of your concerns about the entire deep well disposal process. Unfortunately past attempts at getting anyone in our Bureau to thoroughly review this process have been unsuccessful. <u>As a result, injection well disposal of wastes is largely unregulated from a water quality standpoint</u> (our emphasis). Geological Survey concerns itself only with the physical aspects of well construction and maintenance and assumes that the Water Quality Division determines what is acceptable for disposal by this method. To my knowledge water quality has never attempted to control the disposal of toxic organic compounds via injection wells. I will refer your particular questions to the Office of Hazardous Waste Management for additional review. In my opinion the entire process merits a detailed review by this agency, MERB, and the Toxic Substance Control Commission. However,

> I have not been able to generate any interest in instigating such a review. I hope that you meet with more success. (DNR files, 9/9/81)

It is revealing that even DNR officials admitted in 1981 that deep wells at the time were "...largely unregulated from a water quality standpoint," when water quality is the main concern related to deep wells. Yet, despite the fact that Roehrer and Larsen had serious concerns about "...the entire deep well process" it is readily apparent that neither was able to generate any action within the regulatory agencies and that their complaints fell on deaf ears. Several officials within the DNR who were/are involved in the case have anonymously stated that they have been very "frustrated" with the lack of concern higher-ups have shown on the deep well and other issues.

Even more notable is the discrepancy between the DNR's public and private statements. In a June 28, 1981 article in the *The Ann Arbor News* (Fulton, 6/28/81), Ray Ellison of the DNR's Geological Survey Division explained the DNR's public position on deep well safety. "We not only have the requirement for periodic inspection as the well is being drilled, but we also require monthly reports of operation, and make periodic inspections on the site. Michigan has very strong laws to control deep disposal wells. In fact, our laws serve as models for the federal regulations which will be enforced by the EPA..." Ellison also assures the public that "Michigan has some of the best geology in the country for this type of disposal" and that "this (geological) formation has been extensively studied for a long period and over a wide range." Clearly these statements regarding the area's geology are contradictory and oversimplified.

Of even more concern is the EPA's reliance on unproven technologies. There is no consensus within the DNR or EPA on the safety of deep wells. However, deep well disposal is portrayed to the public as a highly regulated, very safe disposal technology. At the same time that one DNR official is saying the "injection well disposal is largely unregulated from a water quality standpoint," a second official is telling the public that the laws are "very strong" and "serve as models for the federal regulations."

The DNR and EPA are not alone in their smoke and mirror show. Charles Gelman, referring to the drilling of the deep well, stated "I guess we should have told some of our neighbors, and explained the process to them, so they wouldn't be worried...but this kind of disposal well is unusual, and we didn't want to attract a nuisance suit from those who might not understand it , and get all tied up in court" (Fulton, 6/28/81). Clearly, both the DNR and Gelman realize that the only obstacle to the use of deep wells is public opposition (see Citizen Response section).

One must wonder why, if deep well disposal is such a safe solution, the DNR, EPA, and Gelman appear to have gone to great extents to misinform the public, and to silence their critiques. If deep well disposal was truly "not only environmentally acceptable, but also the best way to solve Gelman's problem" (Fulton, 6/29/81) the company, DNR, and EPA should have great interest in publicizing this fact.

Other officials within the DNR have also voiced their concerns about deep wells. Dr. James Truchan of the DNR claims "It's (deep in the earth) the worst place you want to put toxic wastes" (Gearhart and Weinstein, 6/87). Environmentalists, especially of the Natural Resource Defense Council (NRDC) and the Legal Environmental Assistance Foundation (LEAF), have consistently raised concerns and proposed alternatives to deep wells. However, all of the concerns raised by, environmentalists, citizens those within the DNR, and others appear to have done little to curb the "out of sight, out of mind" mentality of industry and top-level environmental bureaucrats. This attitude is reinforced by the powerful economic, political, and social forces which have become institutionalized in our regulatory agencies. Excessive reliance on unproven and potentially unsound technological solutions to deal with synthetic chemicals, is a major problem with how regulatory agencies and industries regard waste.

Summary

As stated earlier in this section, lax regulations, public misinformation, and other issues raised in this section are only the agents which allow irresponsible disposal practices employed by industries to destroy the environment. The details are presented here only to illustrate the intricate workings of this system. The more important goal of this section is to provide insights into the systematic causes of environmental destruction.

Gelman's use of deep well injection is part of a national trend in waste disposal. Industries are increasingly seeking out inexpensive and, less visible ways to dispose of wastes. Incineration and deep well disposal are two forms of disposal which have become increasingly popular. One method removes the waste from sight, while the other change the waste's form. These methods create a distance, both physically and metaphorically, between the waste and the industry which generated it. Deep well disposal merely prolongs the day of reckoning with the hazardous wastes which have been created in tremendous amounts in recent years.

However, an opposing trend also exists in this country. Many industries are modifying their production processes in response to the ecological problems that have occurred due to past waste disposal practices. Increasing attention is being focused on alternative means of reducing the amount of waste produced. Source reduction, recycling and reuse of chemicals, and the replacement of highly toxic chemicals with less toxic ones, are for the first time being seriously examined by some industries. However the pace of this development, and it's ability to curb the systematic forces at work, remains to be determined.

SOCIAL, ECONOMIC, AND POLITICAL ISSUES OF THE CASE STUDY

LAND USE PLANNING ISSUES

What is planning? Why should we be concerned with planning? How does planning work in Michigan? And how does planning relate to the case study?

Planning, more specifically land use planning, in its most basic sense is concerned with the allocation of resources (natural, human, and financial) toward some end. Consequently, the resources and their various interrelationships become limiting factors in the development of any site. Land use planning is a critical tool used to shape the present and future built environment in which we live, and that our children will inherit. "Planning provides a means to iron out issues before they develop into conflicts, prevent over-extensions of public services, protect natural resources, and provide an opportunity for coordination among all (significant actors)" (Washtenaw County Metropolitan Planning Commission ("WCMPC"), 1986, p.i).

An important role of planners is to determine the types of land uses that are compatible with one another, and those that are not. For example, residential areas are very compatible with public parks and are often "planned" to be together. Parks are often sited with particular emphasis given to the proximity of large residential areas. Commercial land uses are often grouped together near major circulation corridors, and away from residential areas.

Planners make decisions about land use compatibility and many other concerns as part of their responsibility in government agencies or as private consultants. The field, by its very nature, requires a general knowledge about many areas such as economics,

architecture, engineering, and politics. Consequently, planners must be able to communicate with many different kinds of people to be effective in their jobs.

In a general sense, the planning responsibilities lie in the hands of local governments. The townships, towns, and cities of Michigan have jurisdiction over their specific areas in terms of writing planning documents and enforcing their various planning regulations. The counties of Michigan have county planning agencies which have been charged with the task of providing consultation to all parties within their boundaries. Thus, the counties are a natural governing body to which communities, especially those which cannot afford to hire outside consultants, look for assistance. This assistance often takes the form of developing zoning ordinances, development guidelines, and master planning documents.

County Planning Agencies also develop master plans at the county level, beyond assisting the smaller legal entities within their boundaries. These master plans look at a multitude of factors that can affect the physical growth of a county. These factors include major institutions, natural features like rivers and mountains, transportation systems, existing infrastructure such as sewer and water systems, and macro-economic trends that influence the national economy. From a basic understanding of these factors and many others, planners make projections about the future. They attempt to project the needs of the people within their county and to decide how these demands will become expressed physically in terms of new development or redevelopment of existing facilities.

In a sense, planners create a framework from which development interests operate. In turn, developers try to respond to the demands of the "marketplace" by financing construction projects that will fulfill those demands.

Zoning ordinances are a common and powerful tool used to regulate the growth of an area. Government bodies typically use zoning ordinances to regulate the allowed uses of land within their domain. These ordinances, however, are subject to change. Development interests can alter zoning designations for a parcel of land if they can provide

a reasonable argument for their requests. This situation is not uncommon. At times, however, zoning is based on outdated assumptions or development trends, and serves to hinder positive future growth (i.e. growth benefiting the best interests of our society). The task of projecting the "right" land uses for particular pieces of land is very difficult. However, it is important that growth and development proceed in some established order or pattern.

Planners, with the aid of zoning ordinances and master plans, serve a very important function for the growth and development of an area. They create a vision of the pattern of future growth in that area based on their knowledge of the present and their perception of the future. Underlying this vision of the future are overriding concepts. These concepts are expressed in terms of written regulations in zoning ordinances and in terms of graphics as master plans. Together, these documents paint a conceptual picture of what a local government body wishes to see in the development of their area of responsibility.

There are a number of environmental issues raised by the case study that directly relate to land use planning. For instance, what are the risks, in terms of human health and welfare in allowing residential and industrial land uses to be adjacent to one another? How compatible are all other land uses with industry? These questions focus on the potential danger that industry poses if its activities pollute the environment, as this case study demonstrates has happened.

Washtenaw County

Gelman Sciences, Inc. ("Gelman") is located in Washtenaw County in southeastern Michigan. The facility is approximately 45 minutes from downtown Detroit. Ann Arbor is the largest city within the County, with Ypsilanti being the second largest city. This urban core holds the majority of the County's population, with many smaller communities and

rural residential areas dotting the landscape. Surrounding this urban core is a major transportation network that connects the County to other nearby cities.

Gelman's site is located just west of Ann Arbor within the Jackson Road Corridor. This corridor is one of strip development comprised of varied land uses. There are at least six major types of land uses located along this strip, including light industrial, commercial, office space, agricultural, and residential land uses. This is not an ideal situation aesthetically, but that, in and of itself, is not disastrous. A more serious consequence of this type of development is environmental degradation. This has occurred as major aquifers spreading from the vicinity of the Gelman site have been contaminated due to waste management practices. The Jackson Road Corridor is typical of much of the development of approximately the past thirty years in America.

Linear mixed use development addresses the extensive use of automobiles as well as lower land costs away from urban areas. Outlying areas around cities often consider any development as a positive sign of growth, allowing it to grow (however disorderly) into the countryside. Seldom is there any attempt made to predetermine land uses along development corridors other than in the most general terms. Consequently, incompatible land uses wind up neighboring one another, as is demonstrated by Gelman and the Westover Hills Neighborhood.

Washtenaw County Metropolitan Planning Commission ("WCMPC"): land use policies

With a basic understanding of what planning is, who is responsible for it, and why it is important, we can examine the current master plan for Washtenaw County. In particular, we will review the relationship between rural residential and industrial land uses. Some issues that arise in this context are the viability of agricultural lands in the face of nonagricultural uses in rural areas, the cost of providing urban services such as sewer and water to rural residential areas, the effect on local traffic of rural industrial sites, and the

potential contamination of rural wells by industry. There are many more concerns surrounding the compatibility of these two land uses, but these are the major ones that will be addressed.

The County master plan addresses what it sees as the current trends in development. Recent trends in development signal a more thorough, compact type of development, some combining different types of land uses. Several examples of this can be cited throughout the County, especially in urban fringe areas that surround the Ann Arbor/Ypsilanti urban area, and some of the smaller urban centers in the County. This development calls for larger blocks of land and is aimed at specific markets, mostly technological and research oriented groups. There are areas of growth which are still oriented towards strip development. Strip development is responsible for the convergence of the Ann Arbor/Ypsilanti communities into one urban form and for major extentions of urban growth along major transit corridors. In the urban fringe, strip development and development in general is due to independent thinking on the part of each of the townships surrounding the Ann Arbor/Ypsilanti area and how each township views their future. The fact that each of the surrounding communities have been willing to extend public services for development indicates that this independence and competition will continue. Some strip development of compact self-contained activity centers is adequately served by public utilities and urban services. Newly planned activity centers, and those currently under construction have produced and are expected to produce significant spin-off uses...Other proposals, especially the high-tech/research parks are expected to have major impact on the County's economy and future development. Additionally both the Ann Arbor and Ypsilanti areas have recently completed new sewer treatment plants that will more than adequately serve growth in the Ann Arbor/Ypsilanti urban areas (WCMPC, 1986, p.12).

In more specific terms the County sees a 48 percent population increase from 264,740 persons in 1980 to 391,669 persons in 2005 (WCMPC, 1986). Juxtaposing the

projected population increase with a 22 percent decrease in manufacturing jobs over the last ten years shows a distinct county-wide shift away from manufacturing. The workforce in the county increased from 1970 to 1985 by 42,000 persons. "Almost one-half of these wage and salary earners are employed by the University of Michigan, Eastern Michigan University, Ford Motor Company and General Motors" (WCMPC, 1986, p.14).

Further, Washtenaw County is considered by many to be a desirable place to live. The expanding metropolitan Detroit area is exerting development pressures on the county from the east. Likewise, there is a general trend toward the dispersion of certain wholesale, finance, and retail trade functions. These commercial activities prefer dispersed locations so they can attract a larger regional market, and take advantage of lower rural land prices and a highly efficient circulation system. The cities of Ann Arbor and Ypsilanti, as well, are attractive to new businesses and residents. These cities offer a high quality of life. "The abundant natural resources, (and) the attractiveness of much of (the) existing urban development (and) the varied labor force..." will continue to draw businesses and new residents (WCMPC, 1986, p.33).

In both its cities and the outlying areas, Washtenaw County is an attractive area to development interests. Much of the new industrial growth is projected to involve high-tech research and development businesses. There are three prime areas for this type of development as determined by the County. They are the new University of Michigan Technology Park northeast of Ann Arbor, the State Street Corridor which runs south of Ann Arbor to Michigan State Route 12, and the Jackson Road Corridor which moves westward from Ann Arbor. All these sites are located on the fringe of the city, taking advantage of the surrounding freeway system. These areas are projected to expand from the city into the rural landscape beyond Ann Arbor. The way this expansion occurs and which land uses are determined to be compatible to these areas are of critical importance. The scale of the projected high-tech industrial growth is quite large in comparison with the existing size of Ann Arbor. These development areas will contain much of the future

growth of Ann Arbor.

The continued growth of Ann Arbor and the areas around the growth corridors is the focus of the Washtenaw County Map provided in appendix E. This map shows a simplified version of the land use pattern that exists in the county. The employment zone (including commercial, office, and industrial uses) shown is based on the County's Master Plan, which depicts the WCMPC's projection for the development of the County. Purposefully, all other land uses are represented as they exist. This has been done to examine the treatment of the "edges" of the employment zone.

Much of the current thought in planning for high-tech industrial sites is that they are very compatible with single family housing. High-tech industry is perceived by the planning community to be very "clean." They don't pollute, they don't make noise, and they don't emit foul odors. However, if the assumption about the "cleanliness" of these sites is false, a major conflict arises with the theory of compatibility of residential and high-tech land uses. This is where the Gelman case leaves us--in a major conflict, with the well-being of human lives at stake. A specialized high-tech manufacturing operation has polluted a large area of groundwater, contaminating the wells of many neighboring businesses and homes. Unfortunately, this settlement pattern is fixed. However, there is time to redirect the development patterns of the bordering high-tech land uses that are to come.

From analysis of the County's Master Plan, it is clear that they do not share the same apprehensions of allowing rural residential uses to border high-tech industrial sites. Their plan shows extensive rural residential tracts bordering all three of the aforementioned high-tech industrial areas. By definition, rural residential areas lack urban services. Often this means that rural homes use well water for consumption and septic systems to treat their sewage. Until recently, this was the case along the Jackson Road Corridor. However, in 1986 and 1987, sewer services (and some water lines) were extended along Jackson Road with some minor extension of water lines.

The residents of Scio Township, in which Gelman is located, want to preserve the existing atmosphere of a rural landscape. They would like to see any new housing in the area built on large lots of from one to ten acres. This density is very low for single family housing and would indeed insure a strong rural condition. The residents argue that they have chosen to locate in the township for its rural ambiance. Yet, the Westover Hills Neighborhood has been annexed into the City of Ann Arbor in order to receive water services as a result of the groundwater contamination. Most of these homes use well water and septic systems, and this makes them vulnerable to the quality of the water of the aquifer below them.

This type of development, a very low density residential fabric, is in conflict with adjacent industrial land uses that the County proposes as an employment zone in their land use plan for the area. In particular, the close proximity of high-tech industry to rural housing that uses well water is a very unstable settlement pattern. The lower the density of a rural residential area, the greater the expense of extending water and sewer lines will be in the future. More water line connections will need to be made if more groundwater is contaminated or is found to be unfit for human consumption. This is likely to occur with the advent of more sophisticated testing technology and new epidemiological studies.

This situation applies to other townships as well. Rural residential sites neighbor both present and proposed industrial sites in Lima, Ann Arbor, Superior, Pittsfield, and Lodi Townships. This settlement pattern seems to be establishing itself. It is unlikely that this will change given the present County planning which supports it. However, contamination of residential groundwater by Gelman is a case in point that such a pattern may be unwise. Given the considerable uncertainty in terms of compatibility between high-tech industrial and rural residential land uses, it seems quite short-sighted of the County to ignore these potential problems.

Analysis

While planning policies may look very good on paper, there is often a discrepancy between those policies and the built environment. Planning policies for a community are only as good as their implementation. There are multi-faceted weak links in the chain between planning and construction. This disparity can be considered from many perspectives. Ours is based on trying to understand the role of planners, planning commissions, and developers in the shaping of the built environment.

Planning agencies are staffed by people employed by a municipality or some other government body. As such, planners are civil servants and in this respect their role differs from that of members of a planning commission (or board). Members of a planning commission are typically appointed by a mayor and approved by a city council, in the case of a city, and serve as public servants. While a seat on a planning commission carries a public responsibility, the position tends to be political in nature.

A commissioner's responsibilities are very different from those of a person in a planning agency. A commissioner attends weekly or bi-weekly zoning meetings and may have other minor responsibilities beyond this. Commissioners do not establish planning policy nor do they receive much financial compensation. On the contrary, planners develop or revise an area's planning policies, and are full time employees of a given municipality. While a member of a planning staff may be much more qualified to make specific land use decisions, planning commissioners are shouldered with this responsibility. Planning commissions bridge the gap between proposal and policy by deciding whether or not to approve developments.

An important aspect of planning commissions is their political nature, as appointees tend to reflect the opinions and biases of those who appointed them. Commissioners tend to outstay those who appointed them, thus creating a legacy for future elected public officials to handle. Therefore, a mayor (or other appointer), while still in office, can significantly impact an area's development for years to come through appointments to the

planning commission.

Although it is important to understand the relationship between the staff members of planning agencies and planning commissions it is possibly more important to understand the role of developers and the development of our lands. Developers take an active role in bringing a building project from an idea into reality. They typically employ architects, engineers, and landscape architects in the early stages of a project to develop an idea, to appropriate the necessary permits, and to complete drawings for the construction of a project. General contractors then build the project. Not only do developers guide architects and contractors, but they arrange the financing, marketing, and sale of a project through to its completion.

Developing land is a risky business. When the economy is "strong" the pay-off on successful developments can be among the highest of all conventional investments. However, if the economy is "weak" or if the project is difficult to market, developers can take a loss. It is not unreasonable to expect a 10 to 15 percent return on invested capital from land development projects. Quite substantial gains can be made by one who has several million dollars invested in a project. Developers desire a quick turnover of their capital, in order that they may continue to reinvest it. This mind-set, one of making a fast buck at whomevers' expense, can cause a great deal of resentment toward developers from their employees and the public in general A general lack of trust pervades public sentiment toward developers.

From a development standpoint, major concerns include raising the capital to begin a project, and engaging in a project that will yield a high rate of return, with a consequential short term committment. Accordingly, most of the projects of the recent past (commissioned by corporations and wealthy individuals) have been undertaken with these concerns in mind. While much construction of the past five years has been focused on expensive single family homes, and commercial and office space, there have, of course, been many other types of development. The focus of development, however, is always on

those groups that can afford the services, be it the private or public sector.

Developers seek markets that will have a high rate of return. Very seldom will the private sector originate projects for lower income people. Rather, developers will do marketing research and determine the building needs of those who can pay.

The arena

Given this description of the main actors, the focus will shift to the arena in which these actors meet and make decisions about development, planning commission meetings. All meetings of the planning commission which concern the granting of zoning variances are open to the public. Variances may be granted to parties interested in changing the zoning designation on a parcel of land so that they can construct a structure, or use the parcel for some other function not allowed under the existing zoning ordinance. Variances are commonly granted and this is a point at which the planning commission becomes extremely influential in the development process. An example of a case where variances are routinely requested is Ann Arbor, which is a desirable city to many developers, as well as others. The general factors that influence desirability are: the quality of an area's schools and recreation opportunities, employment potential, the educational level of an area's residents, entertainment opportunities, etc. Conversely, an area that is not perceived as desirable is not likely to attract development interests. Its planning infrastructure, therefore, will have few development options to consider.

Developers are knowledable when it comes to working with the "system." When a variance is needed for a project, it is the architect or the landscape architect who goes before the planning commission to convince them of the merit of the project. The developer keeps a low profile to avoid aggravating those opposed to the development. The practice of planning has inherent weaknesses in that it is impossible to always predict accurately what is best for a community. Variances, an integral part of the planning process, may be

manipulated in both positive and negative ways, depending on the interests and values of the developers and the commissioners who make variance decisions.

Scio Township

Scio Township is an example of a planning commission trying to respond to intense external and internal pressures. The township residents are very adamant about keeping the area as it is (farmland with scattered low-density housing mixed within it). The Jackson Road Corridor slices the township in two and continues to attract mixed land uses (i.e. light industrial and commercial).

While the township residents are very vocal about keeping Scio Township as it is, there is financial pressure on the township adminstrators to pay off the debt they have incurred recently in extending sewer services from Ann Arbor. According to Jim Schafer of the Washtenaw County Metropolitan Planning Commission, the township is facing a $1,000,000 annual payment on these capital improvements. This is a substantial burden on the township. The response of the township administrators is to encourage new development to broaden their tax base and to ease the township's financial burden. Further, industrial sites pay substantially higher taxes than residential areas, and have a certain appeal to Scio Township administrators at this time.

Consequently, the planning commission is aware of the township's financial pressure and have been influenced by it to some degree. There are two large housing developments that have been approved in the township within the last year. The Jackson Road Corridor is also growing rapidly, with the extension of the sewer line. Meanwhile, the citizens have become increasingly vocal in their opposition to this. Several members of our group attended a February public meeting of the planning commission that was held to help revise the township's land use plan. The residents were very upset by the recent planning decisions, supposedly made in their best interests. They felt the planning process

had not been adequately addressing many of their interests , and they were mad enough to go out and provide input to the process.

Certainly the groundwater contamination from Gelman has made local residents very conscious and concerned about their property and the future of the township. When one works a lifetime to buy their own home and becomes part of a community, any threat to the well being of that will motivate people to respond. We believe that is the situation for many Scio Township residents. They are being threatened by mushrooming land development, and directly or indirectly by groundwater contamination. This is the time for the planning process to effectively respond to their needs. We believe that the citizens of the township must be vocal in expressing their needs and should attend the meetings of the planning commission on a regular basis to ensure that their needs are being addressed. The planning process is convoluted with multiple interests and divergent needs at times, and if left to itself often does not respond to the needs of local citizens. The process, however, is designed to incorporate the input of citizens and should be utilized by the residents of Scio Township.

Since a planning commission is designed to serve the people of a municipality, planning commission members are obligated to listen to the needs of local residents. Often public participation is lacking from planning decisions because people are uninterested, uninformed, or simply lack knowledge of how to enter the arena. While this cycle of public interest is difficult to remedy the planning commission can make efforts to see that the public remains informed of their actions, and to actively seek public input on decisions.

Future growth in relation to rural residential areas and high-tech sites

Planning can be seen as both a proactive and reactive public service. It is proactive when it seeks to prevent problems from occurring (i.e. planning and zoning ordinances) and is reactive when it seeks to accomodate the interests of developers. The following

discussion addresses both aspects of planning and attempt to challenge the "system" to make it serve the general public better than it does currently.

In terms of the development of high-tech industry, there are several measures that could help minimize the potential for groundwater contamination. A primary means of addressing this issue would be to mandate that all new industrial sites recycle waste materials on site and seek ways to reduce the volume and toxicity of substances routinely used. These regulations could be written into the land use policies that currently exist, and an enforcement arm of the local public health department could be given jurisdiction over their implementation. While planning agencies typically do not make recommendations of this scope, it is a positive means of expressing the public's concern for a clean environment. This type of regulation makes it clear to the producer that the status quo is not acceptable and a progressive means of waste management must be sought within the given area.

Another primary means of denying industry the opportunity to contaminate groundwater would be to require all new industrial sites to have sanitary sewer service and to dispose of their wastes through a centralized wastewater treatment plant. There would be no individual on-site waste disposal permitted in the area. The wastewater treatment plant could monitor its inflow and treat it accordingly.

Requiring new high-tech industrial sites to use sanitary sewers would provide incentive for the physical infrastructure (i.e. sewer and water services) to develop compact technology centers or "parks." A compact development pattern is useful in two spheres. First, it uses urban services more efficiently because the distance between hook-ups is shorter than in an urban sprawl situation. Second, if the environment is accidentally contaminated, a compact industrial park will more likely be able to respond financially and technologically to it than sprawling industrial development. Likewise industrial parks would be concerned with their public image and would likely seek a unified response to contamination regardless of an individual site's responsibility. In contrast, individual

industrial sites have much less of a resource base from which to clean up their own mistakes and protect neighboring land uses. Also, if several industrial sites have contaminated their own "backyard," it would be easier to accomplish environmental clean-up efforts in a concentrated area.

Further, a system of monitoring wells on high-tech industrial sites using toxic substances should become part of local land use policies. In our opinion the cost of the installation and maintenance of the wells should be borne by the industry and routinely checked by the Michigan Department of Natural Resources. This type of environmental monitoring would serve as a safeguard against the contamination of groundwater for local residents and employees of these industrial facilities.

Land use buffers should be established between rural residential areas and the proposed employment zone. Presently, these areas contain a mix of commercial, wholesale, office and industrial uses. As the County currently depicts this relationship, there is no buffer between the different land uses. Without prior knowledge of the land use that will occur in these employment zones, there is a potential for high-tech industry to locate anywhere within them. Not knowing where the industrial uses will locate, it becomes impossible to adequately isolate rural residential areas from them. Buffer zones of agricultural or park land would serve, to a degree, as physical barriers to prevent contaminated groundwater from spreading too rapidly to residential wells. Periodic well monitoring may be the only way to ensure the knowledge of the quality of well water of residents in close proximity to industrial sites. Further, by providing some physical distance between these land uses, it may at least buy individuals and the government regulatory agencies time to react to groundwater contamination problems should they arise.

It is important to regulate industrial practices--waste disposal in particular--for the well being of people and the environment. Also, the siting of high-tech manufacturing plants should be done with sensitivity to rural residential areas. The compatibility of industrial sites with existing hydrogeologic conditions of an area needs to be determined to

prevent industry from locating on very sensitive groundwater recharge areas.

Likewise, development of new residential areas may need to be more carefully regulated in the future. Particular attention needs to be paid to the location of high-tech industrial sites when developing new rural residential areas. A healthy respect for the potential threat of industrial sites must be conveyed to builders and other development interests.

The current pattern of rural residential areas is one of linear dispersion along various rural roads. This pattern is easy to accomplish and relatively inexpensive in the short run when compared to "planned" rural centers. Often, the requirements for septic tanks' leaching fields are such that dispersed housing is the only way possible to properly dispose of domestic sewage.

Another option to the sprawled rural residential fabric which pocks our country's landscape would be to cluster rural areas. By clustering homes, urban services (water and sewer) would be less expensive to provide. This clustering of homes onto small areas in the countryside would not only preserve agricultural land, it would be visually less obtrusive to the landscape as a whole. The potential for rural residential areas to receive municipal water and sewer services would greatly reduce the threat of ingesting contaminated groundwater (although it would not prevent groundwater contamination). This land use pattern would also be a more "responsible" form of land stewardship.

Conclusion

While "planning" has it weaknesses as a means of guiding the future of land use patterns, it serves a very important function. Planning forces us to look at where we are and where we want to go. This process of evaluation and reflection on the quality of our built environment and its effectiveness helps us to direct a response to the development issues of the day. Presently, we are improving our understanding of the physical

environment, both in terms of its effect on us, and on our effect on it. Our heightened understanding is forcing us to recognize our abuse of the environment. From some industries' mistakes, the public is experiencing a serious health threat in terms of exposure to carcinogens. This case study offers a glimpse at the complexity of one industry's contamination of the environment, and the ensuing situation's impact on various people, institutions, and organizations.

Planning cannot stop development or force all land uses into rigid, predetermined locations, but it can acknowledge real and potential hazards to people. When potentially hazardous land use relationships exist, planning can regulate these problems by changing zoning ordinances and drawing attention to particularily sensitive areas. Also, those most affected by conflicting land use relationships, the local residents, can use the planning process to voice their opinions and demand that the "system" work in their best interests.

To reiterate, our recommendations are broad and seek to address the role planning can play, both in terms of proactive and reactive ways to minimize the present threat of groundwater contamination to our society. Industrial sites should be required to recycle their wastes on site, and to seek ways to reduce the volume and toxicity of their waste. New industrial sites can be required to have sanitary sewer hook-ups and to locate in compact industrial parks. Also, monitoring wells and land use buffers can be required of all new industrial sites.

Lastly, it must be recognized that in our industrial society groundwater contamination has been a problem, still is one, and will continue to be one for at least the near future. We believe that with a concerted effort, the threat of groundwater contamination can be minimized and eventually eliminated. At present, however, the resources have not been made available to clean all existing sites of contamination. Thus, we must adapt our development of the land so that we can live healthy productive lives with this threat. This type of reactive response, however, is not good enough. We must push planning agencies to be the visionaries they are paid to be, and encourage them to take a

proactive stance toward environmental pollution. The more difficult government policy becomes for industry to ignore, the sooner a new status quo can be molded into a more environmentally sensitive aspect of our culture. We must also push for tougher regulations which work to prevent industry from engaging in environmentally unsound practices.

AN ANALYSIS OF THE RESPONSE OF CITIZENS TO THE CONTAMINATION ISSUE

> To not be able to drink, cook in, bathe in, wash clothes or dishes in, or touch your main water supply is a deprivation of a basic right to which we have always believed we were entitled. To have to scream at a small child for taking a drink of water is an outrage. To be ignored by the Health Department, gambled with by the DNR, and manipulated by the Ann Arbor City Council and Scio Township has been a totally humiliating experience. When this happened to us, we found that we were left alone to beg for what we assumed was a basic human right.
>
> -Timothy and Elizabeth Polk, residents of the Westover neighborhood with a contaminated well (Polk, *The Ann Arbor News*, 9/11/1986).

Citizens who one day find that their well is contaminated by a synthetic, organic chemical such as 1,4-dioxane ("dioxane"), also find themselves with little or no experience and few skills for coping with the situation. They are faced with a problem they neither created nor even realized would be created. Residents and businesses surrounding the Gelman Sciences, Inc. ("Gelman") site have had to put up with odor problems for over fourteen years, and with contaminated groundwater and associated health risks for an unknown number of years. They recently had to be annexed into the city of Ann Arbor, the result of which is that residents are faced with increased taxes and future costs for sewer hook-ups. The objectives of public participation have changed with the immediate concerns posed by Gelman, the City of Ann Arbor, and Scio Township. The following is a list of citizen objections and how they have evolved over time.

- Citizens alerted the Department of Natural Resources (DNR) Air Quality Division (AQD) about odors emitted by Gelman's treatment lagoons for over fourteen years.
- Citizens brought to DNR's attention incidents of illegal waste discharge and burning of wastes by Gelman.
- Citizens sought to get their drinking water tested by the Department of Public Health after learning of the groundwater contamination problem.

- Citizens requested a safe alternative water supply system for their homes.
- Citizens fought the increased taxes and the costs of future sewer hook-ups that would result from annexation to Ann Arbor.
- Citizens demanded timely remedial action to address health and environmental concerns.
- Citizens tried to understand the health and environmental risks associated with dioxane, the extent of contamination, and with whom the responsibility lies.
- Citizens challenged the injection well permit granted by the Environmental Protection Agency (EPA) as a means of waste disposal at the Gelman site.
- Citizens could potentially seek compensation for economic costs and personal injury resulting from the contamination.

We have defined five phases of public participation in the Gelman incident of environmental contamination. These phases include odor complaints and complaints about illegal waste disposal, Bicknell's discovery of dioxane, activity surrounding annexation issues, Tocsin, and the functions of the Citizen Information Committee. It is our intent to explore the importance of public participation and efficacy of public involvement in the Gelman case.

Citizen complaints over odor problems and illegal waste disposal

The first phase of citizen involvement focused on odors emitted by Gelman's treatment lagoons and illegal waste disposal by Gelman. Citizens first complained about the odors in October 1967. According to Gelman Vice President for Operations James Marshall, the odors were a result of both the treatment lagoons becoming anaerobic and the covers on the ponds ripping (Interview with James Marshall, 2/5/88). These complaints continued for over fourteen years; the last odor complaint was received by the AQD of the DNR in March 1982 (see The Story section, pp. 16-28).

According to complaints filed with the DNR, citizens expressed feeling disempowered next to a large and powerful company like Gelman. According to Westover

resident Mary Jo Campbell, "Mr. Gelman and his fellow employees would never permit anything such as this happening in his neighborhood but we who are not as financially well off as he have to put up with this health hazard" (DNR files, 8/17/81). Mary Jo Campbell in a later interview with Janet Cohen, a reporter from *The Ann Arbor News* , said, "We called, we complained. They ignore you. We didn't get anyplace. They (Gelman) pay big taxes, we pay little taxes, the township doesn't care" (Cohen, 5/18/86).

Some individuals complained directly to Gelman. Carl A. Brauer, a local realtor who developed the Jackson Plaza Business Park, informed Charles Gelman on October 31, 1967 that run-off from Gelman's treatment lagoons was flowing onto portions of lots 21 and 22 that he owned in Jackson Plaza. He claimed that the runoff had a "strong sewage odor." Charles Gelman wrote a letter responding to Brauer's concerns on November 2, 1967. In his letter Mr. Gelman stated,

> We hope to turn our pond into an asset in short order. Designed as a holding pond for runoff water, it has worked well. Unfortunately, at present there is no circulation or aeration within the pond. The water pumped into the pond is pure enough to drink... We are in the process of installing a pump to aerate the pond water and also plan to stock the pond with fish. Once there has been enough growth, we hope to be able to invite you to share in our harvest (DNR files, 11/2/67).

Mr. Gelman, in his letter, claimed that the pond containing runoff water from the parking lots was overflowing onto Brauer's property. However, the pond containing runoff water from the parking lots was several hundred yards to the south of Jackson Plaza at the time, and would not have contained sewage sludge or smelled like sewage. The lagoons that were adjacent to Jackson Plaza and Brauer's property, according to DNR records, and our interview with James Marshall were unlined treatment lagoons. In these lagoons, anaerobic and aerobic treatment occurred on Gelman's waste stream (which contained dioxane as of 1966). Marshall also informed us that sewage from the Ann Arbor Sewage Treatment Plant was added to these ponds to encourage microbial action. These lagoons, according to Marshall, would periodically overflow into the bog north of Gelman's lagoon, which is in the direction of Brauer's property (Interview with James

Marshall, 2/5/88). Therefore, it seems that the letter Mr. Gelman wrote was inaccurate and very misleading.

During a telephone conservation on March 28, 1987, Carl Brauer informed us that he had traced the water to Gelman's treatment lagoons. He found Mr. Gelman to be "self serving and vague" in his letter. Brauer felt that Mr. Gelman used this letter as a "smoke screen to diffuse the issue."

During the period from 1967 to 1982, many citizens felt as though the DNR had failed to adequately address their concerns about the odors emanating from Gelman's treatment lagoons. Mrs. Mary Mickelson, a community member, stated in an interview with us that she was "very disappointed with the DNR" and had written a letter to them several years ago complaining about the odor problem. "We've put up with a lot over the years" (Interview with Mary Mickelson, 2/17/88). The AQD did investigate the odors on numerous occasions (DNR files: 7/7/75, 8/6/75, 8/7/75, 7/15/80, etc.), yet the odor problem lasted for over fourteen years.

Gelman responded to the AQD's requests to reduce odors by installing plastic covers on the company's anaerobic wastewater treatment lagoon (DNR files, 9/10/73), and by keeping a spare cover on hand (DNR files, 10/27/76). However, responses by Gelman were inadequate in addressing the odor problems. The covers installed by Gelman were reported to have holes in them and emitted odors on several occasions (DNR files: 7/7/75, 8/76, 7/79). The Washtenaw County Health Inspector found the cover off the lagoon on September 3, 1976 (DNR files, 9/3/76). The aerators within the lagoons were reported to be malfunctioning by both Gelman and the DNR on numerous occasions (DNR files: 9/76, 7/17/79, 8/1/79, 7/15/80, 8/19/80). When the aerators malfunctioned, the dissolved oxygen within the lagoons would fall to a level too low to support aerobic bacteria. The lagoons would then become anaerobic, and the foul odor would result (see The Story section, p. 28). The AQD did follow up on many of the citizen complaints regarding both

odor problems, yet the odor problem was not remedied until Gelman began disposing of wastes in its deep injection well.

Complaints, such as those from Brauer, help to record a pattern of irresponsible behavior by Gelman and to alert government officials to illegal waste discharges and practices. Other examples of illegal waste disposal by Gelman were brought to light by citizens. On October 27, 1980, the DNR Environmental Enforcement Division ("EED") received an anonymous complaint. According to the DNR files, the complainant informed them that Gelman was "emptying the second pond, at the rear of the property, by draining it off of the property." The EED investigated and verified the report (see The Story pp. 26-27).

Citizens and the deep well

In 1981 Gelman began construction of a deep injection well. To many of Gelman's neighbors, the well came as a surprise. In an article entitled, "Gelman drills a well to solve waste problem," Charles Gelman states, "I guess we should have told some of our neighbors, and explained the process to them, so they wouldn't be worried, but this kind of disposal well is unusual, and we didn't want to attract a nuisance suit from those who might not understand it, and get it all tied up in court" (Fulton, 6/28/81). Consequently, in order to test public reaction to the well, Gelman had an open house in early July and invited all parties with drinking water wells within a one-half mile radius to hear a review of their proposed plan. According to GSD officials, however, "There didn't seem to be much interest as only two families were present out of some 50 or 60 that were invited" (DNR files, 11/12/81). Accordingly, in Gelman's "Summary of Waste Water Treatment," they state that in 1981, "there was no public opposition to use of deep well."

Several citizens, however, did raise concerns over the deep well in the coming months. Citizens appearing before a Michigan Air Pollution Control Commission monthly

public meeting expressed concern that there may be problems from the deep well injection system and submitted letters from neighbors. Citizens who wrote to the DNR were responded to by a GSD form letter claiming that "this type of waste disposal (deep well) has been in use in Michigan for over twenty years and not a single groundwater pollution problem has been attributable to the use of one of these wells" (DNR files: 8/17/81, and 9/9/81). However, several problems with deep wells in the United States have been documented and there is no guarantee that these types of problems won't occur in Michigan (see Deep well section).

The Bicknell discovery

In June 1984, Dan Bicknell released his report entitled, "Hazardous Waste Introductions into Third Sister Lake, Washtenaw County, Michigan." In the report, Bicknell traced the source of the dioxane and other chemicals to Gelman by sampling the creek which runs from Gelman's property into the lake. Bicknell's study was criticized by Gelman and others because of his "lack of credibility," his misuse of titles, and his political motivations. However, his discovery of dioxane (among other chemicals) alerted the public to the potential health and environmental hazards (see The Story section, pp. 35).

In late April 1985, Bicknell drew up a petition, which was circulated by a local resident, requesting that residents' wells be tested by the Washtenaw County Health Department (WCHD). Bicknell first gave the petition to WCHD Medical Director Dr. Atwater. Two weeks later Bicknell presented the petition at a meeting of the Washtenaw County Board of Commissioners. The following day the WCHD was instructed by the Board of Commissioners to begin testing residents' wells. Subsequently, the WCHD found dioxane in six commercial wells, a drainage ditch and a swampy area north of the Gelman property. To date, over 50 wells have been found to be contaminated. It was the work of citizens like Dan Bicknell and those who signed the petition that helped to force the

State and Gelman to recognize that there was a contamination problem and to start addressing it.

The annexation issue

The first organized citizen involvement in the Gelman case began when a group of approximately 40 homeowners organized around the issue of annexation to the City of Ann Arbor. In order to provide a safe source of drinking water to residents with contaminated wells, the decision had been made to extend the Ann Arbor water supply system to them. This action mandated the annexation of the Westover Hills subdivision to the City of Ann Arbor. Gelman agreed to pay for the original water hook-ups, but residents still faced higher taxes and future costs for sewer hook-ups that would result from annexation. According to our interview with Alfin Vaz, a Westover resident and a University of Michigan chemistry professor, these costs would amount to close to $1,000 per year in increased taxes (Interview with Alfin Vaz, 3/12/88). It would also cost $10,000 to $15,000 per household over approximately a five year period for capital improvements (i.e. sewer construction). The City of Ann Arbor wanted Scio Township residents, if they were not annexed, to pay twice the price for water that Ann Arbor residents pay. According to Alfin Vaz, these were lower to middle income residents, many of them with fixed incomes who had lived there for 40 years or more, and they were not able to pay the increase in taxes and costs for sewer hook-ups.

Residents postponed the vote over the city water hook-up and annexation four times. In an interview with the *The Ann Arbor News*, Priscilla Cheever, an attorney and resident of the Westover area, said, "We have some concerns other than just getting the water. We're nervous about the possibility of a sewer, which would be very expensive for all of us." Cheever continued, "As a 'price' for getting the water. residents would be required to agree to annexation to the City of Ann Arbor, which could also entail

connecting to the sewer at a cost of $439,000" (Cohen, 7/16/86). Approximately 40 homeowners organized a meeting with the Ann Arbor City Council Democratic Caucus in order to arrange for a five year grace period before the taxes would increase during early July 1986. This would allow those who could not afford the tax increase time to move or to make arrangements for payment.

According to Alfin Vaz, during the meeting with the Democratic Caucus all of the Democrats except for Larry Hunter agreed to provide the homeowners with a five year grace period before taxes would be increased. However, two weeks later, on July 22 when it came to a vote, all members of the Democratic Caucus (except for Hunter) reversed their position on this issue. The approved agreement said that Gelman would pay the cost of the water main constructed for the homes in the Westover Hills subdivision just east of Wagner Road. The agreement also stated that lots with homes on them would be annexed to the City as soon as the water hook-ups were connected. No sanitary sewers were planned at the time for the 32 houses in the subdivision. However, once sewer lines were installed, residents would have to hook into the system when their septic systems failed.

The Westover Hills subdivision was officially annexed to Ann Arbor in January 1987. Some of the Westover residents' septic systems are already beginning to show signs of failing. This may be a result of adding Ann Arbor water to the septic fields. According to Alfin Vaz, Ann Arbor water has a pH of 10 and is heavily chlorinated. It is not known definitively, but it is likely that the bacteria within the septic field would not survive in Ann Arbor city water (Interview with Alfin Vaz, 3/12/88).

In addition to the added costs of annexation, some of the residents in the area contend that property values have fallen as a result of the contamination problem. Carol Dudley, Executive Assistant of Saginaw Hills Development Company, stated, "We can't sell property--I wouldn't consider buying it." However, Scio Township manager Don McDevitt, when asked how this situation impacted the communities adjacent to Gelman,

replied that there is no adverse effect on growth and that property values in the Township have risen by 20 percent over the last two years.

Tocsin

In 1986 a citizen group formed, claiming to represent residents of the Scio Township subdivisions of Westover, Lakeview, and Lakeside, as well as a growing number of concerned citizens of southeastern Michigan. This citizen environmental action group named themselves "Tocsin," which means an alarm bell or warning signal. The reasons Tocsin formed are,

> ...because of the many problems that are believed to be associated with Gelman Sciences' poor history of waste management. We are concerned about what the companies' [sic] chemical waste may mean to our health, our safety, our property and our interests in a decent environment. We share concerns about the contamination of our groundwater, the effects this has had or might have on our families, the reduction of our property values, the short term and long term danger posed by the deep injection well, and the threat Gelman's waste might pose to Ann Arbor's Sewage treatment system" (Introductory Tocsin newsletter, undated).

Tocsin members felt that Gelman, government authorities, and other organizations had not adequately responded to their needs. Specifically, these parties had at times failed to alert them about the dangers posed by Gelman's waste management practices, to provide timely notification of the contamination problem, and to provide adequate remedial action. Tocsin was successful in organizing community members around several issues.

Tocsin members, and residents of Westover not associated with Tocsin, organized around the issue of Gelman's deep injection well for industrial waste disposal. They attended a public hearing sponsored by EPA regarding the injection well on September 25, 1986. Citizens at the public hearing demanded proof that the deep well was safe. "Until someone can make a statement 'your kids aren't going to be poisoned again,' I see no reason...to issue the permit," said Elizabeth Polk, who was not a member of Tocsin.

According to Brian Ewart, the founder and primary organizer of Tocsin, the serious questions that community members were posing to the EPA were met with superficial answers (Interview with Brian Ewart, 3/28/88).

In October 1986, Tocsin had pressured the County Board of Commissioners to write a strong letter to the EPA in support of their stand against granting Gelman a deep injection well permit (Interview with Brian Ewart, 3/28/88). The main objections to the deep well were that there was: 1) no adequate monitoring system, and 2) no knowledge of the source and extent of the current groundwater problem (see Deep well section). In November 1986, more than 400 area residents signed a petition (drafted by Tocsin) asking federal and state legislators to intervene in the EPA's decision to grant a permit to Gelman for the injection well. The petition was presented to Governor James Blanchard, U.S. Representative Carl Pursell, and U.S. Senators Carl Levin and Donald Riegle.

In December 1986 Tocsin organized another petition. They collected over 1,000 signatures and attached a 29 page document addressing the problems with the injection well. They again called for a denial of the injection well permit. Copies of the petition and letter were sent to both state and local government representatives. Tocsin claimed that the EPA had evaluated the well using "test data that bears evidence of possible tampering, analyses that are often superficial and incomplete, and interpretations of fact that are grossly inaccurate" (Rogers, 12/23/86) Tocsin based its analysis on two reviews done on the primary source used by the EPA. Both individuals who reviewed the report (a graduate student in geology and a person who does deep well testing) agreed that there was evidence that the geology of the area was not safe for deep injection wells (Interview with Brian Ewart, 3/28/88). Based on the opinions of these individuals, Ewart and Tocsin challenged the integrity of the geology surrounding Gelman's injection well.

In January 1986, Tocsin asked the EPA to monitor Gelman's waste well, citing a loss of pressure in the well's injection tubing and the well's possible contribution to the nearby groundwater contamination. The loss of pressure indicates a possible leak from the

injection well into the surrounding strata. Ewart claims he uncovered evidence of this upon examination of U.S. EPA documents, and felt the EPA had been trying to hide this. Ewart brought this to the attention of Gelman and the governmental agencies in order to let them know that they were being held accountable. Tocsin and other community residents also wrote letters to Ronald McCallum, Chief Judicial Officer, U.S. EPA, requesting a review of the permit decision (Interview with Brian Ewart, 3/28/88).

On June 12, 1987 Tocsin called for regulatory action regarding illegal wastewater discharge by Gelman. Tocsin informed both the press and Governor James Blanchard that for over two years Gelman had been illegally discharging wastewater via a drainage ditch (known as Bicknell Creek) which originated at a Gelman building. Tocsin also informed the press that in July 1986, DNR officials had notified Gelman that this discharge was illegal and had requested that the corporation obtain the required National Pollutant Discharge Elimination Systems ("NPDES") permit. With this action, Tocsin attempted to focus attention on Gelman's "unsatisfactory record of waste disposal" and the DNR's "casual attitude" toward these violations (Tocsin Press Release, 6/12/87). Following Tocsin's press release, the DNR wrote to Gelman and mandated the registration of Gelman's "currently unauthorized discharge" into Bicknell Creek (DNR files, 7/1/86).

When the EPA Region V decision to issue Gelman a deep well permit met with considerable opposition from citizens, the national EPA office decided to review the Region V decision. The draft permit approved by EPA Region V had called for a monitoring well system proposal to be submitted for approval within 45 days after granting the permit. However, a review would prolong the decision for several months and Gelman, during the process, would be allowed to continue to operate the injection well without monitoring wells. Therefore, on January 23, 1987 Tocsin members requested that U.S. EPA Region V Water Division Director Charles H. Sutfin order Gelman to immediately install both deep and shallow wells for the monitoring of the company's underground injection of liquid waste. Tocsin's appeal of Gelman's injection well was denied in December 1987.

Tocsin was quite successful at focusing attention on critical information and pushing for remedial action. They alerted the public about the questions associated with the technology and sciences surrounding the deep injection well, and alerted government officials and agencies to illegal surface discharge by Gelman. They also found evidence of a leak in the injection well, organized the community around the issue, and attempted to make both the government and Gelman accountable.

Citizen information committee

In addition to the usual methods of keeping citizens informed about local issues (e.g. public meetings, progress reports, making available file information), the DNR has formed a Citizen Information Committee (CIC) due to the long term nature of the Gelman case. The purpose of the committee is as follows:

> 1) To ensure that community representatives are informed about the details and status of the groundwater investigation and proposed clean-up.
>
> 2) To ensure that local citizens have a consistent and easily accessible means of receiving up-to-date information regarding project progress and of expressing concerns to DNR staff and local government officials;
>
> 3) To advise the DNR project staff and local and state officials regarding local concerns and alternatives for communicating information about the projects to citizens
> (Letter from DNR to CIC representatives, DNR files, 6/17/87).

The CIC in the Gelman case is comprised of local residents, Scio Township officials, a representative from affected businesses, state and local government representatives, and a Gelman representative.

We interviewed seven of the nineteen CIC members listed on DNR Progress Report #1 of September 22, 1987 (DNR files, 9/22/87). Of these one wasn't aware he was a CIC member and was never formally told that he was a member (James Crowfoot, Dean of the

University of Michigan School of Natural Resources), and another needed to be reminded (Ken Schatzle, University of Michigan Office of Safety and Environmental Health).

DNR direction of the CIC also appears to be lacking. When asked who was in charge of the CIC, Karen Clark of the Jackson office of the DNR was not certain. Clark, who has been employed by the DNR since late 1987, responded that she "guessed" she was in charge (Interview with Clark, Larsen, and Kooistra, Jackson DNR, 2/25/88).

CIC members were asked, "How does the CIC disseminate information to and collect information from the community? Describe how the CIC actually functions." Responses ranged from, "There exist no formal channels for disseminating information" and it is "haphazard," to "information is disseminated by word of mouth. Each neighborhood has a representative (for approximately 100-150 residents) on the committee. DNR sends out mailings to all residents announcing public meetings. Residents are supposed to call representatives with questions" (Interview with Douglas Mark, 1/6/88). One CIC representative, Westover resident and attorney Priscilla Cheever, distributed periodical newsletters to the community on her own initiative (Interview with Priscilla Cheever, 1/4/88). Another CIC member felt that the CIC was set up "to make it look like something was going on. Its purpose was to get together a bunch of opinion leaders and sway their opinions" (Interview with Kathy Edgren, 2/25/88).

Information we were able to gather indicates that the CIC has met on only two occasions, July 30, 1987 and September 2, 1987. We were told that the first meeting was not announced to the public. The CIC has not met since early Fall, and no formal channels exist through which CIC members can disseminate information to citizens. It seems to be a haphazard attempt by the DNR to involve citizens in the remediation process.

Citizens have been actively involved in this case in several ways. They have worked to protect their own interests--both financially and in terms of health. They have also attempted to hold Gelman accountable for the contamination of the environment, and to hold the DNR accountable for enforcing environmental regulations. The citizens have

interjected themselves into the process through self-initiated efforts, in the absence of effective channels for participation.

THE RESPONSE OF THE UNIVERSITY OF MICHIGAN TO THE CONTAMINATION ISSUE

The University of Michigan administration response

The official University of Michigan ("U-M" or "University") position regarding the contamination of Third Sister Lake, a U-M property located in Saginaw Forest, is one of not addressing the problem. The School of Natural Resources (SNR) has stewardship over the land, but the U-M Board of Regents, in whose name the land is titled, have the ultimate authority and responsibility for the land. Actions to address the problem must come from the U-M Administration. According to Jack Weidenbach, then-U-M Business Operations Director, the University's position on the contamination is one of "wait and see" (Interview with Weidenbach 2/18/88). Weidenbach explained that in order to sue Gelman, the University must be able to prove damages either to the value of the land, or to ongoing academic research on the site. According to Weidenbach, the University is waiting for: 1) evidence from the School of Natural Resources which shows decreasing land value due to contamination; 2) more information regarding the risks associated with 1,4-dioxane ("dioxane") to human health and the environment; and 3) a court decision establishing responsibility for the contamination.

Ken Schatzle, Director of Occupational Safety and Environmental Health (OSEH) at U-M, claims that the University's only concern is Third Sister Lake and that it's not known if the contamination therein is caused by Gelman (Interview with Schatzle, 1/4/88). Schatzle found Gelman's response to the contamination to be "very favorable." Schatzle was thus condoning Gelman's response. Gelman's response has been characterized by: taking responsibility for the contamination, and inadequate response to the surrounding community.,

It appears that there are grounds on which the University could pursue a lawsuit against Gelman. The University is currently liable for the well that supplies water to the caretaker's cabin in Saginaw Forest, thus, the University will need to continue monitoring the well for dioxane. Carl Brauer, owner of land adjacent to Gelman, states that he is liable to his tenants in the Jackson Plaza and is continually monitoring these wells, although dioxane has not been detected thus far. He is holding a suit in abeyance against Gelman for these reasons.

According to Carol Dudley, Executive Assistant of Saginaw Hills Development Company, property values in the area have fallen and sales in the area have slowed significantly (Interview with Dudley, 2/23/88). If the same land value assessment applies to Saginaw Forest, then the University would have another basis on which to pursue legal action.

The University has made little or no attempt to determine the extent of environmental damage at the site. Saginaw Forest, including Third Sister Lake, is currently used for research. A study of the environmental effects of dioxane could be initiated to answer the above question.

It is possible that the University has adopted a "wait and see" policy because of financial ties to Gelman or due to other political pressures. Since July 1975 Gelman has given gifts to the University totalling $63,532. As of February of this fiscal year, Gelman has contributed $6,000. These contributions are significant, relative to other donations received by the University, and could influence the University's response to the contamination. Another possibly influential factor is that U-M economics professor Saul Hymans, is a member of Gelman's five-person Board of Directors.

In addition, if the University were to pursue legal action in this case, it may discourage the high-tech industrial development which the University is committed to attracting to the Ann Arbor area. The University's support for high-tech research and

development coincides with the State of Michigan's interests in diversification and stimulation of the economy.

> In 1987 the State captured three major national centers for manufacturing science space robotics and super computer communications. It became a finalist for the $5.6 billion Superconducting Supercollider...
>
> Researchers at more than twenty Ann Arbor campus locations have agreements with 336 industrial affiliates in Michigan and the County (Blanchard, Frank, 1980).

Accordingly, this commitment to high-tech growth by the State and U-M, has resulted in the reduction or elimination of numerous environmental programs. For example, the University recently cut the budget of the School of Natural Resources by 28% as of a 1981 review, and the elimination of the School was considered in 1983. This reflects a national tendency which is to favor development over protection of the environment. It also transmits a message to industry that consequences for pollution are minimal, while quelling the voices of those who might oppose this policy.

According to Weidenbach, U-M does not act on local issues, but always waits for a local governing body to take the initiative (Interview with Weidenbach, 2/18/88). Yet, the University has boldly proclaimed its support for high-tech development such as the Supercollider, and has outlined the importance of the Supercollider to the State of Michigan. However, the University does not address the problems of environmental contamination in the State--even if it affects their own property! Is it ethical for U-M to support research and development without also encouraging responsible behavior toward human health and the environment?

School of Public Health and the School of Natural Resources response

When Dan Bicknell released his report in June 1984, Gelman chemist Paul Chalmers quickly contacted the SNR office because Bicknell's report resembled an

"official" University report (SNR files, 6/84). The School of Natural Resources then contacted the School of Public Health (SPH) and conveyed Gelman's concerns. On September 18, 1984, SPH Dean June E. Osborn wrote a memo to Dan Bicknell. She explained that the title "Principle Investigator" (which Bicknell had used on his report) has a very specific meaning in University governance, being generally restricted to individuals on professorial or scientist appointment tracks. Dan Bicknell also claimed (in his campaign fliers while running for Drain Commissioner) to have his M.S. in Public Health, although at the time he had not yet received a degree. The University thus responded quickly to Gelman's concerns, but apparently made no effort to congratulate a U-M student who discovered the contamination and alerted the public to the potential threat to health and the environment.

The School of Natural Resources has responded by collecting data on the levels of contamination in the caretaker's well in Saginaw Forest, and in the sediments and water of Third Sister Lake. SNR administrators have met a number of times with representatives from Gelman, the Washtenaw County Public Health Department, and the DNR to address the issues surrounding the contamination. Bottled water was supplied to the caretaker at Saginaw Forest beginning in February 1986. Samples taken from the caretaker's well in February, and again in May, showed the presence of dioxane, as did the water and sediment of Third Sister Lake. Hexane, benzene, and methlyene chloride were detected in the lake's sediments as well. The results of tests performed since July have detected contamination in the lake water and sediments but have shown no dioxane in the well water. A number of SNR faculty members have expressed concern over the contamination situation and have recommended "that the School of Natural Resources urge the University legal counsel to vigorously pursue all appropriate action to halt further damage to University assets at Saginaw Forest, including Third Sister Lake, and to obtain appropriate compensation for loss of research opportunities at this property" (Memo from nine SNR

faculty members to SNR Dean Jim Crowfoot, 4/28/86). Never have these concerns been discussed in an open forum with SNR faculty and students.

Significantly, the School of Natural Resources is still struggling to preserve itself as an independent academic unit within the University. The School has been subject to an ongoing review process as required by the University Administration, despite its continued top ratings among natural resource schools nationwide. The School occupies a weak position politically within the University hierarchy. The administrators of SNR are presently concerned with the long-term viability of the School and are not willing to pursue actions contrary to the official University position regarding the contamination of Saginaw Forest. It has been brought to our attention that members of the University community have questioned the continued existence of our Masters Project group. We are grateful to the School of Natural Resources for its continued support of our project and its support of academic freedom.

SNR's mission includes a commitment to the pursuit of sustainable development. Sustainable development, in our opinion, does not include development without responsibility for the environment. SNR should not silently observe while industry pollutes the immediate environment, particularly when University property is being contaminated.

Contracting of professors by Gelman

Under contract, U-M professors, over the years, have performed various studies for Gelman. For example, Gelman hired Professor Borchardt from the U-M Department of Engineering to develop a microbiological digestive process which Gelman then used for approximately ten years. Another example is that Rolf Hartung, professor of Environmental Toxicology in the School of Public Health, was commissioned by Gelman to perform a risk assessment of dioxane. Gelman commissioned this study with the

intention of developing regulatory standards for dioxane. Hartung's report has provided Gelman with the information they are using to attempt to redefine what is a "safe" level of dioxane in drinking water. Gelman now considers this level to be three parts per million, as opposed to the State's established level of two parts per billion.

Gelman was able to hire this U-M expert to help redefine toxicity levels of dioxane, at considerable expense. Citizens' groups, in contrast, cannot afford to hire such experts. For example, when the citizens' group Tocsin was attempting to assess the integrity of Gelman's deep well, they were unable to find a U-M faculty member to assist them without a large consultation fee. This raises the question of who is able to hire U-M experts and also illustrates the influence of University professors on the decision-making process.

The University of Michigan, by choosing to ignore the problem and not pursuing meaningful action to resolve an environmental threat on their own land, infers a lack of concern for environmental health and integrity. Despite costs incurred for testing, potential loss of property value, and future liabilities, the University has adopted a "wait and see" approach. The Gelman contamination issue exemplifies the University's commitment to industry, as opposed to the community of which it is a part.

AN ANALYSIS OF THE RESPONSE OF THE DEPARTMENT OF NATURAL RESOURCES TO THE CONTAMINATION ISSUE

The years following World War II have been a time of tremendous industrial expansion in the United States. During this period the manufacture of chemical products, e.g. pesticides, herbicides, solvents, and other synthetic organic chemicals was initiated. Along with industrial development and the evolution of the field of organic chemistry, has come an increased hazardous waste problem. This problem was created, in part, by the very lax environmental regulations existent at the time. Presently "...as many as 10,000 sites may be contaminated in Michigan alone" (Bradford, 12/87, p.10). In this regard, the need for a more comprehensive regulatory framework had become apparent.

In the early 1960's, state and federal statutes protecting water and air quality were at their early stages of development. As this regulatory framework was defined, the Michigan Department of Natural Resources (MDNR) was charged with the task of implementation of the regulations. This was a particularly difficult task given that industrial practices had been proceeding virtually unchecked and that pollution had been considered an externality, rather than a cost of production.

The State has placed great importance on the development of high-tech industries as a means by which to diversify and stimulate a faltering and unpredictable economy. It was stated in a 1988 University of Michigan Special Report:

> The state snared three major national centers for manufacturing science, space robotics and supercomputer communications. It became a finalist for the $5.6 billion Superconducting Supercollider with its promise of thousands of jobs and billions in economic enterprise...The British journal *The Economist* hailed southeast Michigan as "the fastest growing high-tech corridor in the United States today (Blanchard, F., 1988).

The late 1960's and 1970's were also a period of a growing societal awareness of problems due to environmental contamination. Citizens and newly formed environmental groups began to demand that this country's resources be preserved. They pushed for more stringent environmental regulations governing industry, and pressured government regulatory agencies to fulfill their stated mission of enforcing these regulations.

Environmental regulations vary from state to state. Accordingly, since these regulations have the effect of increasing the cost of production, industry is more likely to locate in a state with less stringent regulations. The MDNR has been charged with the nearly impossible task of trying to implement environmental regulations, while at the same time being expected to support the economic priorities of the State.

The case study

In the immediate vicinity of Gelman Sciences, Inc. ("Gelman") there are now over 50 residential and commercial wells known to be contaminated with 1,4-dioxane ("dioxane"). Dioxane is an organic solvent and a potential human carcinogen used in Gelman's production process. It is believed that the dioxane entered groundwater and surface waters through one of Gelman's several unsound past disposal methods.

The DNR has been involved in this case in the following roles: issuing permits for waste disposal practices, monitoring the site, enforcing regulations, providing information to the public, and pushing Gelman to clean up the contamination. The DNR places blame for the contamination on Gelman.

The DNR as a reform-oriented agency

The mission of the DNR is clearly mandated and narrowly defined by state and federal governments. A framework has been constructed within which the DNR must

ork to implement and enforce regulations. Inherent in this framework is the notion that the DNR must not regulate or monitor industry in such a way that it interferes with the expansion of industry within the state. The DNR's efforts have not been entirely successful at forcing industries to internalize costs. Pollution is still considered, to a degree, an externality, which is passed on to taxpayers.

Thus, in the case of Gelman, the DNR is limited in the role they can play. For instance, the DNR does not instruct Gelman not to produce waste, but rather aids Gelman in finding the best available methods for disposal of their waste. The DNR does not tell Gelman not to discharge into the ground or the surface water, but rather sets limits on the amounts Gelman may discharge. When one disposal practice proves problematic, the response is to work with industry to identify a more suitable disposal practice. When that practice proves unsound, another is suggested, and so on. This type of process has led to Gelman's current disposal practices: deep well injection and discharge to the Ann Arbor sanitary sewer. Both methods are potential environmental hazards--the safety of these practices has been widely questioned.

Reactive vs. proactive efforts

Many of the DNR's reform activities can also be characterized as being reactive in nature. For example, since the contamination problem was discovered, the DNR has responded by monitoring the site, attempting to define the plume of contamination, acting to protect the health of the community (by providing alternative water supplies), and pushing Gelman to clean-up the contamination. While this type of regulatory action is needed, it does little to address the cause of the contamination.

In contrast, proactive efforts are directed at the root of the problem. Proactive measures not only work to stop contamination from occurring, but they also have greater long-term economic viability for the regulator and for society. Prevention is less costly

than the development of a remedy after soil, water, or air is already contaminated. Proactive measures would force companies to internalize externalities by not allowing them to treat factors such as waste products, as though they exist outside of the economic equation. The use of source reduction and recycling are examples of ways in which it is possible to require companies to take full responsibility for all materials used in the production process.

Institutional factors

> The system is one of putting a finger in a dike. When you have 30,000 to 40,000 industries & 50,000 known or potential sites of groundwater contamination, and 300 to 400 people (in the DNR) to keep on top of it all, it's damned impossible to be in a preventive mode--John Sauver, DNR Environmental Enforcement Division (Cohen, 4/27/86b).

The DNR has been charged with the very impressive task of monitoring and enforcing regulations at industries all throughout the state. The agency, however, lacks the funding and staff needed to satisfactorily fulfill this mission. DNR staff at the Jackson Office have acknowledged that these factors impair their ability to respond to complaints and take the proper steps to prevent or abate contamination (Interview with Clark, Kooistra, and Larsen; Jackson DNR, 2/25/88).

Another limitation placed upon the DNR is the structure they must work within to enforce regulations--this structure places the DNR in a weak bargaining position. First, although industries are expected to monitor themselves and turn in reports to the DNR in the case of a suspected wrongdoing, the burden of proof falls on the DNR (rather than industries being required to prove they were in compliance with regulations). In a case of alleged contamination, the process then relies on the good faith of industries, as negotiations between the industry and the DNR ensue. Finally, if the negotiations do not succeed in achieving a mutually consented clean-up agreement, the DNR may initiate a

lawsuit against the company. As a result, the effectiveness of the DNR in compelling industries to comply with regulations, which in many cases entails convincing polluters to clean up, is questionable.

The Gelman case is a prime example of this. The DNR, after collecting the evidence, was able to identify Gelman as the "potentially responsible party" for contamination. The DNR and Gelman then engaged in clean-up negotiations, which continued for nearly two years (during which time Gelman refused to accept responsibility for the contamination). The DNR's threat of legal action was not sufficient to convince Gelman to enter into a voluntary (and legally binding) consent agreement. Thus, the DNR has finally turned the case over to the Attorney General's office for legal action. As seen in the case of Gelman, the consequence of the process described is that it may be a very lengthy one, during which time contamination goes unabated and may continue to spread.

Other restraints due to institutional factors

Other ways in which the institutional factors outlined above work to impede the DNR's effectiveness, include placing limitations on the DNR's ability to generate information (i.e. perform studies), to monitor reports and sites, and to run tests for the presence of contaminants.

The generation of information

The DNR, due to lack of staff and funds, faces quite severe limitations in its ability to generate information. In most instances the DNR relies on industry to provide the necessary information regarding a site. In this case, the DNR has been reliant on Gelman to provide information on the integrity of the deep well, and the extent of the contamination and the way in which it may be treated. Citizens have also supplied the DNR with the necessary information in many cases. Citizens originally exposed the existence of the

dioxane contamination, incidents of illegal waste discharge, and the potential problems with Gelman's deep well.

Two problems inherent in this system of information gathering are: 1) the DNR cannot be assured that the information it receives and upon which it bases its actions is always accurate or complete, and 2) the DNR is not capable of providing citizens with complete information regarding the site around which they live. The second aspect is particularly important, because an informed citizenry is a basic tenet of our notion of a participatory democracy. There is no guarantee that the company will provide the public with all the pertinent information they need to make informed decisions and to participate in the remediation process (see Citizen response section).

Monitoring industry

The DNR is largely dependent on industry to monitor itself and to submit periodic reports. There exists the obvious problem with this system that a company may not accurately monitor or report its activities. This problem is often compounded by the DNR's inability to monitor industries' reports due to a lack of the necessary staff-hours.

Both problems have been evident in the Gelman case. For example on July 14, 1986 approximately 18,000 gallons of contaminated water spilled on the Gelman property when a hose running from a storage lagoon to the deep well was cut. DNR officials were meeting with Gelman officials at the Gelman plant the day the spill was detected; however, they were not informed of the problem. The DNR finally learned of the spill on July 25, over ten days later (Cohen, 7/30/86). Thus, the DNR's dependence on industries to monitor themselves may result in untimely reporting or lack of reporting of incidences of contamination.

In addition, many of Gelman's monitoring reports were never examined by the DNR. Between July 1980 and October 1982 Gelman submitted routine daily discharge reports. During this period the reports showed that the discharge of waste water often

exceeded the maximum allowable discharge of 112,700 gallons per day, "...sometimes by more than 100,000 gallons" (Cohen, 4/27/86a). The DNR has acknowledged that they do not generally review these reports unless there is a complaint filed. Thus, it is not uncommon that such violations go unnoticed by the DNR.

Gelman was also required to submit yearly summaries which listed the chemicals used in their production process. While the DNR contends that until 1981 they were unaware that Gelman was using dioxane, Gelman had included dioxane as a component of their waste stream in yearly summaries prior to this date. However, in this case again, the DNR claims that these forms are seldom read by DNR officials (Interview with Vanderlaan, 2/24/88). It appears that the DNR has no systematic way of dealing with this information in order to help catch problems before they become very severe. In addition, there appears to be a lack of communication, and consequently a degree of discrepancy, in the way in which regulations are interpreted by the various divisions with the DNR.Had the DNR been examined reports submitted by Gelman, the contamination problem that exists today may have been averted.

Testing for contamination

The DNR, in the initial stages of discovery and confirmation of the problem (in 1984-85), relied on Gelman to finance tests. Although the DNR split samples with Gelman on several occasions, it was later revealed that the DNR's lab could not test for dioxane. (During the time that the DNR was running tests for a compound they were unable to detect, they were mistakenly reporting the results as "no detect" (Ewart, 10/87)). Thus, the DNR was dependent on the results of tests financed by Gelman.

The basic problem which resulted was that Gelman then had control over the test results. On at least one occasion Gelman refused to release results which showed dioxane contamination (Ewart, 10/87). The results were later made public by the University of

Michigan researcher (Clifford Rice) who ran the test. The DNR, however, did not to push Gelman to release those results.

Conclusion

The DNR, in the case of Gelman, has been left in the frustrating position of attempting to force the company to clean up, without possessing adequate enforcement capabilities. Thus, over two years after the discovery of the contamination, the case has finally been relinquished to the courts. The DNR, however, has not always adequately addressed violations committed by Gelman. If they had done this at an early date, the contamination problem may not have reached its present-day scope.

The DNR has been structurally reorganized several times over the last twenty years. These changes have coincided with efforts by state and federal governments to enlarge the scope of environmental concerns addressed in the existent regulatory framework.

The way in which the DNR operates is mandated by the guidelines set forth in these regulations, and is still, for the most part, reactive. There are, however, forward-thinking individuals in the DNR, who are questioning the traditional methods by which the DNR operates. These people are challenging the "out of sight, out of mind" mentality which still exists in the agency's approaches to waste management (most notably, deep well injection).

AN ANALYSIS OF THE RESPONSE OF GELMAN SCIENCES, INC. TO THE CONTAMINATION ISSUE

An overview

There exists a very serious case of groundwater contamination in Scio Township, which the State of Michigan has attributed to Gelman Sciences, Inc. (Kelley, et al. v. Gelman Sciences, Inc., 2/26/88). (Gelman Sciences Inc. will hereafter be referred to as "Gelman" and any references to Charles Gelman, founder of Gelman Sciences, Inc., will be made explicit.) Toxic chemicals (most significantly, 1,4-dioxane ("dioxane")) have been dumped, spilled, leaked, sprayed, seeped, burned, and drained by Gelman Sciences into the environment. These contaminants have affected the quality of the groundwater (and possibly the air), and have rendered over 50 wells in the area unusable (Kelley, et al. v. Gelman Sciences, Inc., 2/26/88). Gelman claims they had no knowledge that dioxane was hazardous until recently (Interview with James Marshall, 2/5/88); however, dioxane has been a known animal (and potential human) carcinogen since 1965 and has been on Michigan's Critical Materials Register every year since 1980 (see The Story, p. 26). Charles Gelman, who has a Master's degree from the University of Michigan (U-M) School of Public Health, should have been aware that his unsound disposal practices could have negative environmental effects.

Earlier this year, two members of our project group were walking in Saginaw Forest and encountered an elderly man. We began chatting about how the contamination might be affecting Saginaw Forest. This man then told us an interesting account of an incident which had recently taken place at the Rotary Club in Manchester. He said that Charles Gelman was there to "reassure" people that the contamination wasn't much of a problem at all. To demonstrate his sincerity, Mr. Gelman took two glasses of clear liquid

(one which he claimed contained water and the other, dioxane), combined them, and drank the solution. He then stated, "And this is what they're condemning me for."

It's one thing if Charles Gelman, who in 1986 claimed a yearly salary of $250,000 (and had tucked away a "golden parachute" of $1.95 million in case he would choose to leave the company (Haglund, 4/27/86)), chooses to drink the poisons of his treasure. It's an entirely different story to subject hundreds of local residents, who had no say in the matter, to drinking contaminated water on a daily basis, for an unknown number of years.

Gelman's interactions with various concerned parties

This section takes a look at how Gelman conducts itself in its interactions with the various groups of individuals who are in some way affected by Gelman's operations or the resulting contamination problem. By examining these relationships, we will address the question of Gelman's accuracy in its claim to be a responsible corporate citizen.

Our experiences with Gelman Sciences, Inc.

On February 5, 1988, two members of our group conducted an interview with James Marshall, Gelman's Vice President of Operations. In the ground rules created for the interview, we had stated, "We will provide a written summary of the questions and the responses given so that you can modify them and then return them to us as your official responses" (Letter to James Marshall, 1/24/88). (We had included this provision due to the fact that Gelman is currently involved in four lawsuits and therefore may have concerns about statements they release to the public.) We would then be able to use the interview in our report. We also tape recorded the interview but were not permitted to leave the premises with the tapes.

Shortly after the interview, we submitted our notes to Marshall. The next several weeks were spent attempting to contact Marshall regarding the notes. When we finally

contacted him, he asked that we set up a second meeting at which we could discuss the modifications he had made.

Thus, in early March we returned to speak with Marshall. It turned out that the modifications he had referred to were relatively few in number and insignificant. He requested that we re-type the interview with his modifications. We could then bring it back out to the site and he would sign it. A few days later we brought the interview to Marshall and since he was not there, we left it for him.

Shortly thereafter, Marshall informed us that he had turned the interview over to his lawyers who were studying it. He said he would get back to us when his lawyers had approved it.

In the following weeks we placed several calls to Marshall's office, but were unable to contact him. When we did finally reach him on April 8, Marshall explained that his lawyers had recommended he not release the interview to us. He further stated that he could not return our tapes but would pay for them. We told him that we would send him a bill to cover the cost of the tapes.

On April 21 we called Marshall to invite him to our project presentation. Marshall took this opportunity to express his wishes that we not include his interview in our report. He felt that if it were included, it would indicate that we had breached the ground rules agreement. We responded that we felt that he had already breached the agreement and that we were intending to use the interview.

Approximately one hour later, Marshall called back to request changes in the interview. We asked him, "Does this mean you're giving us permission to use the interview?" "No," he replied. We said we would consider the changes he wanted to make. Marshall was then abruptly called away from the phone.

The following day, April 22, Marshall called us back to discuss the changes he wanted to make. The changes, again, were relatively insignificant and we agreed to incorporate them into the final interview. Marshall then requested that we give his lawyers

until Tuesday April 26, to add their comments to his responses. We agreed to consider his lawyer's comments, but did not commit to incorporating them, particularly due to the late date in our project timeline.

We feel that we met the requirements of the ground rules because we provided a written summary of the questions and Marshall's responses, which Marshall then returned to us with modifications. To return them a second time for review by their attorneys was above and beyond the stated ground rules. We have, therefore, decided to go ahead and use the interview in our report. It is our belief that Marshall never intended to return the interview, but intended to stall until our project deadline had passed. His unwillingness to permit us to use the interview notes or tapes, we feel, is typical of Gelman's unwillingness to share information with other parties, which will be discussed in more detail later (see Interview with James Marshall in Appendix IV.D).

Gelman's interactions with the public

Area citizens claim they have been "ignored," "stonewalled," "deceived," and otherwise mistreated by Gelman. "We called, we complained. They ignore you. We didn't get anyplace... They (Gelman) pay big taxes, we pay little taxes... We do not like anything Gelman has done or said," stated Mary Jo Campbell, a Scio Township resident (Cohen, 5/18/86). These comments embody the frustration and disempowerment that many citizens have felt when attempting to deal with Gelman.

More examples of this type of response are as follows:

- "They (Gelman) schmooze over trying to pacify us. They think we're a bunch of dummies" - Carol Dudley, Executive Assistant of Saginaw Hills Development Company (Interview, 2/23/88).

- "They (Gelman) have admitted nothing and have stonewalled for three years. They are not responsive to the public. They supply limited information which is favorable to them. They have put on a facade of openness" - Priscilla Cheever, Attorney and Westover resident (Interview, 1/4/88).

> • "At the first meeting after dioxane was detected in residential wells, Gelman's scientist (Paul Chalmers) tried to make people feel that dioxane isn't any more dangerous than water... Soon after, I met with Marshall and Chalmers. Again, they claimed there was no problem... Chalmers tried to defend the company's stance on dioxane, then backed down when he found that I was a chemist" - Alfin Vaz, Research Chemist at U-M and Westover resident (Interview, 3/12/88).

Gelman's interactions with citizens have also been characterized by a lack of honesty and a tone of arrogance. This is well illustrated in the account of Carl Brauer, a local realtor and Jackson Plaza Business Park developer. Brauer first approached Charles Gelman in 1967 over a concern about runoff with a "strong sewage odor" which was coming from Gelman's treatment lagoons and flowing onto his property. Mr. Gelman asserted, "... The water pumped into the pond is pure enough to drink..." Gelman also stated that he planned to stock the lagoon with fish and invited Brauer to "share in (the) harvest" (see Citizen response section).

Another instance in which Gelman did not properly inform its neighbors was in 1981, when it was first drilling a deep well. Charles Gelman admitted in *The Ann Arbor News* (Fulton, 6/29/81) that local residents had not been told of this activity. Mr. Gelman then claimed that there was no public opposition to this type of technology, which he described as "non-controversial" (see Citizen response section).

It thus appears, by the way Gelman interacts with area citizens, that Gelman is purposely concealing information from citizens and that it attempts to discourage individuals from asking questions and becoming involved. It is clear to us that the area citizens represent nothing more than another element in Gelman's cost equation -- an equation that Gelman attempts to minimize. For this reason, Gelman will take steps toward remedying the problem, i.e. paying for the water hookup to affected residences. This is the minimum with which Gelman feels they can get away. The citizens, by being forced to pay for a sewer, are internalizing Gelman's externality (pollution), thereby inflating Gelman's profits.

Gelman is attempting to make citizens feel that it is a "responsible corporate citizen" by absorbing some of the costs. However, responsibility for the problem rests squarely on the shoulders of Gelman. The citizens did not cause the pollution, therefore there is no reason why the citizens should have to pay. In order to be a "responsible corporate citizen," Gelman should pay all costs out of its own profits.

Gelman's interactions with the DNR

DNR officials have also expressed anger and frustration over their attempts to work with Gelman. Gelman has been described as "variably cooperative" and "minimally cooperative" by DNR officials at the Jackson office and the Lansing office, respectively (Interview with Clark, Kooistra, and Larsen, 2/25/88; and Interview with Vanderlaan, 2/24/88). One DNR official said he was glad our group was doing this study. "There are a lot of skeletons to be found here and those skeletons have to pay," he remarked.

One point that has been mentioned to us several times by the DNR is their sense of Gelman's unwillingness to share information. In an interview at the Jackson office, DNR staff stated, "Things have been progressing, but very slowly. Gelman hasn't given the DNR all required information. It's been frustrating working with them" (Interview Clark, Kooistra, and Larsen, 2/25/88). In our interview with Mary Vanderlaan, she stated also stated that it had been difficult to get written information from Gelman. She claimed that in many of the meetings at Gelman's headquarters, Gelman officials had refused to let DNR staff leave the meeting with certain information and had restricted what they could copy. "The only way we will get to see their files is to sue them,"she commented (Interview with Vaderlaan, 2/24/88).

The sentiments voiced by DNR officials strike a common chord with those voiced by area citizens and are reinforced by the experiences of our group. Gelman consistently conducts its business in a way that infers that they have something to hide. Whether regarding the deep well, technical data, or simply their responses in an interview conducted

by a group of students, the company chooses to withhold the information that if released, may cause interested parties to question their practices. One could presume that if a company is acting in a legal and ethical manner, they wouldn't feel the need to be so tight-lipped about their activities.

Gelman's interactions with their employees

The way a company relates to their employees may be another indication of how they run their affairs in general. A former Gelman employee, in an interview conducted February 29, provided us with insight into this matter.

Ruth Kraut is presently employed by the Ecology Center as editor of their newsletter. Prior to this, she worked for eight months as editor of Gelman's internal newsletter. Ruth's opinion is that Gelman is a "poorly run company" in terms of labor relations. She claimed that working at Gelman presents several occupational hazards and that "employees are...treated a lot worse than the earth is being treated."

Ruth told us that in production areas fumes "get really fierce." She has experienced headaches after going into these areas for just ten minutes to interview people. The production work is done mostly by young women. The women protect each other (in the absence of formal mechanisms) by not letting pregnant women work in the worst areas.

Ruth gave an example of the type of problems experienced by Gelman employees. She told of a graphics artist with whom she had shared an office, who had eight miscarriages. This woman, who had previously worked in production, also had throat problems which her doctor said were work-related. When she went to see a lawyer because she wanted to sue Gelman, however, she was told that it would be difficult to prove the cause of her miscarriages.

Ruth also described how attempts at unionization were "squashed" by Gelman officials. If workers had been unionized, events such as the following may have been prevented: In 1986 about thirty workers were laid off. Ruth felt that they weren't laid off

on the basis of the utility of the position they were filling, rather on the basis of whether or not Charles Gelman liked them personally.

This account by a former Gelman employee strengthens the pattern that has been established through analysis of Gelman's community and professional relations. That pattern seems to be one of Gelman officials working to disempower those who may challenge Gelman's practices, while showing little or no regard for those who may be harmed by those practices.

Gelman and the press

Gelman, quite concerned with its public image, attempts to influence what does and does not appear in the press. It does this in several ways, one of which is by placing pressure on agencies and individuals to keep the contamination issue out of the press. An example of this occurred after DNR geologist Matt Frisch criticized Gelman in the press for taking over ten days to report a leak of hazardous substances to the DNR. James Marshall immediately wrote to Frisch and said, "...We certainly deserve more credit and respect than given us by (Janet) Cohen and the News... I respectfully urge the DNR to work with us rather than the news media... We urge you to respond in strong language to the Ann Arbor News responding to the incredible disservice done to us..." (DNR files, 7/31/86). Approximately one week later another article appeared in *The Ann Arbor News,* this one much more favorable toward Gelman.

Gelman also tries to influence what is published about them by attempting to discredit reporters who disclose information that is unfavorable to Gelman. This has been the case with Janet Cohen, a reporter for *The Ann Arbor News*. On April 27, 1986, Cohen wrote an article entitled, "Gelman resisted DNR warnings of water contamination." After this was published, Gelman circulated a letter in the community refuting what had been said

in the article and claiming that "there are dangers in using non-scientists to report on complex scientific issues."

This second tactic is one commonly used by Gelman in its interactions with the community. Gelman may feel it is in control of the situation as long as the issues are framed in such a technical way that people cannot understand them. It is quite disempowering to community members to think they must be experts to understand anything because the issues are "complex" and "scientific." However, once the issues are demystified and made accessible to the general public, it becomes risky to Gelman. It is at this point that people can stop depending on the "experts" to shape their opinions and can assess and challenge situations on their own.

Are Gelman's attempts to censor the media effective? To a degree, yes. It is also possible that the press, to a certain extent, engages in self-censorship. Although the Gelman issue has received much attention in the press, there have been certain issues that *The Ann Arbor News* (the news medium which has covered the Gelman case more than any other) has refused to cover. One issue not covered by *The News* was the unpermitted discharge by Gelman into Bicknell Creek --a practice which went unchallenged by the DNR for almost three years from the time the DNR discovered it. *The Ann Arbor News* also did not pick up on the fact that the DNR had for several months reported "no detect" in their tests for dioxane, when in fact the DNR lab could not test for dioxane. In both of these cases *The Ann Arbor News* was provided with information by the citizens' environmental group, Tocsin, and both stories were later covered in Ann Arbor's alternative news monthly, *Agenda*.

We also noticed that Gelman's statements to the press often go unchallenged. An example of this is that Gelman will repeatedly refuse to claim responsibility for the contamination. However, a hydrogeological study commissioned by Gelman points to Gelman's original unlined seepage lagoon as the most likely source of the contamination

(EPA, 9/24/86). These obvious contradictions have not been exposed by *The Ann Arbor News*.

Another significant fact is that in late February 1988, *The Ann Arbor News* ran an editorial discussing sites of environmental contamination around the state and the need for tougher regulations by the DNR and greater compliance by industry. However, this article failed to mention anything about the contamination site nearest to *The News*, which at the time had been ranked Number 2 in the state -- Gelman Sciences! Whether this was an omission or an oversight, it is significant that Gelman was not mentioned. Information is crucial and people must be able to depend on the press for careful reporting and critical analyses of issues which affect an entire community.

How Gelman has responded to the contamination issue

When an industry discovers that its manufacturing processes have polluted the environment, the following are some steps which that industry should take:

1. accept responsibility for the damage done,

2. work cooperatively with state regulatory agencies to undertake a prompt and thorough cleanup operation,

3. pay any costs that state agencies or surrounding residents may have incurred as a result of the contamination, and

4. explore and implement sustainable practices (i.e. waste reduction and recycling) which would prevent such an incident from occurring in the future.

Gelman, however, has done none of these. In this section we will examine how Gelman has responded to the contamination situation.

First, Gelman has denied responsibility for the contamination. As has been determined thus far, Gelman was (until 1986) the only industrial user of large quantities of dioxane in the immediate area, used dioxane for over twenty years (some years in quantities of 60,000 pounds or more per year) and has engaged in unsound disposal practices (i.e. an

unlined seepage lagoon, spray irrigation, and direct discharge of wastes into surrounding surface waters and wetlands) for over twenty years. The groundwater of residential, agricultural, industrial, and recreational areas surrounding Gelman has shown contamination with dioxane in levels up to 200,000 ppb. The DNR, the Washtenaw County Drain Commissioner, and the Michigan Attorney General's office, among other state and county agencies, point confidently to Gelman as the source of the contamination. At this time, Gelman stands virtually alone in its position of questioning its responsibility for the creation of the problem.

Gelman has undertaken several different strategies in its attempt to absolve itself of responsibility in this situation. One tactic used is that of trying to shift the blame. In an interview conducted on February 5, 1988, we asked James Marshall if Gelman was responsible for the contamination. He responded, "A lot of people are responsible." Among those he listed as responsible were Dow Chemical Company, the DNR, other state agencies, and "possibly" Gelman. Gelman has also carried its attempts to shift the blame into the courts. At this time Gelman is suing its insurance agency for not funding the cleanup; Dow, Union Carbide, and six smaller chemical companies which allegedly sold dioxane to Gelman for not giving proper instructions for how to handle dioxane; and the DNR for its allegedly unfair ranking of Gelman on the Priority List of Sites of Environmental Contamination. Thus, the contamination remains and possibly continues to spread while the issue is tied up (possibly for years) in court.

Another tactic used by Gelman is that of downplaying the harmful nature of dioxane, thus attempting to diffuse the seriousness of the contamination problem. For instance, at a public meeting held in 1986, Gelman told area citizens that dioxane "isn't any more dangerous than water" (Interview with Alfin Vaz, 3/12/88). Marshall reinforced this stance when, upon discovering that Gelman had been ranked Number 2 on the 1987 Priority List, he stated, "If Gelman is rated Number 2 in the state, then the state is in pretty good shape... The toxicity level is not that high. It's (dioxane's) not that critical a material"

(Interview with Marshall, 4/10/87). Finally, Gelman has attempted to redefine the levels at which dioxane is harmful to humans through a risk assessment study Gelman commissioned from Dr. Rolf Hartung of the U-M School of Public Health. According to Hartung's conclusions (which have been widely criticized by state and County toxicologists, who claim there is no threshhold level for a carcinogen) dioxane is toxic to humans only at levels much greater than those levels defined by the State. In the February 5 interview, James Marshall also stated: "... There are acceptable risks. We take risks every day -- when we drive in our cars, when we breathe the air..." The point that Marshall is missing is that these are risks we choose to take. It is another matter when risks we are faced with are mandated by the actions of another party.

Gelman has consequently applied Hartung's standards of dioxane toxicity to redefine the plume of "significant" contamination. Dioxane has been a known carcinogen since 1965 and has been defined as a Critical Material by the State since 1980. Its exact toxicity levels are not known, but that is not the central issue. The issue is that the groundwater has been polluted such that the potential exists for damage to human health, as well as to the environment. The task before Gelman should be to return the groundwater its condition before the dioxane contamination occurred.

Another way in which Gelman has responded to the contamination issue is through an intensive public relations campaign. To convince the public of the sincerity of their efforts, Gelman has held public meetings, has sent out several glossy mailings, has bought space in various local publications, and has sent out numerous press releases. Through this PR, Gelman has tried to win public sympathies by casting themselves in the role of "innocent victim" and "hero." For example, at a public meeting on May 5, 1986 when area residents voiced that they felt their concerns were not being taken seriously, "Gelman's Marshall called efforts by Gelman and state and local officials 'heroic' and said, 'No one, by any stretch of the imagination, has been sitting around doing nothing'" (Hooper, 5/6/86). This was further illustrated in our interview with Marshall. He first

claimed disappointedly, "We will never be a hero..." He later stated, "The only way to develop sympathy for what we have been through is to go through it yourself" (Hooper, 2/5/88).

On February 5, 1988, James Marshall stated, "I don't believe that you will find a company that deliberately contaminates the environment." Given that "...about 90 percent it (toxic waste) is disposed of in open dumps, unlined land fills, midnight dumpings, or in equally unsafe ways," (Vandermeer, 1986) we do not concur with his position. Even of companies that don't "deliberately contaminate the environment," many do not go out of their way to prevent contamination from occurring. Environmental quality often doesn't receive a high priority in a company's economic equation. Thus, perhaps a more relevant question would be: did that company prevent the contamination of the environment? In the case of Gelman, the answer is "no."

Gelman is not going to correct the contamination problem by denying responsibility for it, by diffusing the issue, by redefining pollution, by attempting to foster public sympathy, or by denying that a problem exists ("There is no evidence of any damage done whatsoever" -- Interview with Marshall, 2/5/88). It is true that Gelman has paid for water hookups to affected residences and has begun on a purge operation of contaminated groundwater from one industrial well. This, however, is only a start. Gelman's foot-dragging activities have forced the DNR to turn the process over to the courts. The only way Gelman will be regarded as a "hero" is if they accept responsibility and begin serious efforts in cleaning up their mess.

While this analysis is very specific to the case of Gelman Sciences, the larger questions must be examined. How do political and economic constructs in our society allow for industries to regard contamination as an "externality?" What must be done to make industry more accountable to the public and the environment? What must done to prevent contamination cases such as this from occurring in the future?

DISCUSSION

The Problem

This case study illustrates many of the inadequacies of our political, social, and economic systems in addressing environmental contamination. Remedial responses to contamination, like those used in the Gelman case, demonstrate a lack of willingness to confront the root causes of pollution. Unless proactive measures are taken, society will be perpetually committed to costly response activities. Cleanup costs are soaring at Superfund sites with contaminated groundwater. For example, groundwater contamination at the U.S. Army's Rocky Mountain Arsenal in Colorado is projected to cost 1.8 billion dollars to cleanup (Boraiko, 1985). Efforts are needed to develop biodegradable alternatives, to encourage reduction, reuse, and recycling. Without these efforts the quantities and varieties of hazardous waste produced will overwhelm even the "best" treatment and disposal systems.

The U.S. needs a strong commitment to promoting "cleaner technologies". EPA's 1988 budget request waste minimization activities totals $398,000. This is just 0.03 percent of its $1.5 billion operating program budget, and less than was spent in 1986. The nation is facing costs between $20 billion and $100 billion to clean up existing toxic waste sites (Brown, et al. 1988).

The role of science and technology in our society often goes unquestioned. They are often viewed as value-free, neutral and objective tools that can cure all societal ailments. However, as our case study has shown, the role of science and technology in our society is not so simple. The synthetic organic chemical industry and the production of products like 1,4-dioxane (dioxane) exemplify many of the complex problems associated with science and technology.

In the Gelman case risk assessment and deep injection wells have been used to respond to the contamination problem. The science of risk assessment provides a valuable tool for defining risks associated with contamination. However, this science can also help to perpetuate the problem.

Risk assessment is a process used to determine the adverse consequences resulting from the use of technology and helps us to measure associated risks. Risk assessment incorporates scientific, political, economic, and social information in determining risks associated with, and the management of chemicals (Conway 1982, p.264).

James Tozzi, the number two person in the White House Regulatory Reform Office in the early '80s stated, "What we are saying is the government will protect you to the degree of economic precedence, but some Americans are going to die" (Nesmith, 12/25/83). People, driven by a paradigm of economic progress that does not include social and ecological responsibility, are deciding how many people are going to die and how much of our environment is going to be destroyed. Risk assessment in this context becomes a tool to balance the "need" for progress and with the deaths that result from progress.

It is often argued that science and technology will aid the poor in our country and in developing nations. According to Gio Batta Gori, a former deputy director of the Division of Cancer Cause and Prevention at the National Cancer Institute, "undeniably human life has transcendent value. But excessive regulation hamper technological development and denies its fruits to the poor in our own society and elsewhere in the world" (Gori, G. 1982, p.176). It is often the wealthy few receive the "fruits" of technology while the poor in our country and in developing countries receive the poisoned fruit.

Racial and ethnic communities in the U.S. have been, and continue to be beset by poverty, unemployment, and problems related to poor housing, poor education and inadequate health care. The members of these communities cannot afford the luxury of being primarily concerned about the quality of their environment. Findings from a recent

study entitled "Toxic Wastes and Race in the United States" show that the "fruits" of technology received by Black and Hispanic communities include an inordinate presence of hazardous waste facilities and a disproportionate concentration of uncontrolled toxic waste sites (Lee, 1987). Some of the specific findings of this study include:

> •Race proved to be the most significant among variables tested in association with the location of commercial hazardous waste facilities. This presented a consistent national pattern.
>
> •In communities with one commercial hazardous waste facility, the average minority percentage of the population was twice the average minority percentage of the population communities without such facilities.
>
> •Three out of every five Black and Hispanic Americans lived in communities with uncontrolled toxic waste sites.
>
> •More than 8 million Hispanics lived in communities with one or more uncontrolled toxic waste sites (Lee, 1987).

Technology exported to developing countries often results in negative consequences. After a U.S. ban on cyclamites in food, U.S. corporations deliberately dumped products containing cyclamates on overseas markets. Cancer-causing Tris was found in baby clothes in developing countries after Tris was banned by the U.S. Congress. Currently, at least 25 percent of U.S. pesticide exports are products that are banned, heavily restricted, or have never been registered for use here (Weir et al, 1981). Some of these pesticides are widely known to cause cancer, birth defects and genetic mutations. Yet, the Federal Insecticide, Fungicide, and Rodenticide Act explicitly states that banned or unregistered pesticides are legal for export (Weir et al, 1981).

Conclusions derived from scientific data can be uncertain. such as the carcinogenic effects associated with dioxane, and the hydrogeological information used to justify the use of deep injection wells. Citizens who one day find their well contaminated do not typically have the skills and resources to interpret the integrity of these technologies.

Information surrounding the various sciences and technologies are often laden with jargon and technical terms that make it difficult to understand. It is a language of experts that often excludes citizens from the decision making process. The arguments presented by scientists, politicians, lawyers, economists, etc., are often perceived as legitimate, while those presented by citizens affected by contamination are often perceived as irrational, emotional, and uneducated. Thus, the language of experts often becomes the language of exclusivity and power. This is particularly frightening in a society driven by economic progress with little concern for human health and the environment.

The problems created by various technologies often keep scientists busy trying to develop technologies to fix these mistakes, or "technological fixes." Deep well technology is a good example of a "technological fix." The technology of deep injection well, in the Gelman case, is responding to problems created by a previous technologies that used dioxane. Deep well injection perpetuates the problem by relocating the hazard further below the earth's surface, from where the waste can potentially migrate back up into the aquifers containing drinking water. This technological fix does not address the the root causes of pollution and it does not promote source reduction, reuse, and recycling. Instead, deep well technology justifies the continued production of these harmful chemicals by providing the opportunity to claim that we have safe and proper methods for disposal of these materials.

George Bradford, in a pamphlet against the Detroit Incinerator (another technological fix), stated that "society's response to our growing waste problem has simply been more business-as-usual." The business-as-usual paradigm is to not address the problem but to let it continue. By the year 2,000 one quarter of the world's drinking water will be contaminated by industrial waste. Ninety percent of the 90 million pounds of toxic waste produced annually in the U.S. is disposed of improperly. Even if waste is disposed of "properly" can we trust that it will not again, one day, become a problem. As many as 10,000 sites in Michigan alone may be contaminated (Bradford. 12/87). Our response has

been to let those who know best, the politicians, scientists, and technical experts, take care of the problem. Those who know best often turn to technological fixes and do not address the root causes of pollution. They do not address the real task of reduction, recycling, reuse, and the eventual elimination of hazardous products and their waste by-products.

Directions for the Future

> In our progress-minded society, anyone who presumes to explain a serious problem is expected to offer to solve it as well. But none of us - singly or sitting in a committee - can possibly blueprint a specific "plan" for resolving the environmental crisis. To pretend otherwise is only to evade the real meaning of the environmental crisis: that the world is being carried to the brink of ecological disaster not by a singular fault, which some clever scheme can correct, but by the phalanx of powerful economic, political, and social forces that constitute the march of history. Anyone who proposes to cure the environmental crisis undertakes thereby to change the course of history.
>
> -Barry Commoner, 1971

The collection of values, beliefs, and attitudes that form society's reference or worldview is dominated by progress. Progress in our country is often defined by economic growth or the accumulation of capital. Pollution is not considered as a factor in the cost of production but instead it becomes an externality incurred by society. The environmental crisis that we face today, the problems of acid rain, ozone depletion, the clearing of the earth's tropical rain forests, and the contamination of our water, soil and air, are all symptoms of powerful political, social, and economic forces that shape our relationship with the natural environment. Efforts must be made to develop a new paradigm of progress that includes social and ecological responsibility.

An ecologically responsible relationship between people and the natural environment is one that is sustainable. A sustainable relationship removes people from the role of conqueror and steward of the ecosystem to an integral member of the ecosystem. A

sustainable relationship with the ecosystem requires that we protect the system from depletion, waste, and damage, so that it can continue to exist through perpetuity.

Social responsibility requires that pollution not be considered a cost to be incurred by society. It requires that those who are poor, those who are black and Hispanic, and those who live in developing nations not receive a disproportional amount of pollution.

A new paradigm or worldview is needed that incorporates social and ecological responsibility. This worldview needs to be included in education reform, grass roots organizing, community empowerment, Institutional change, and legislative reform. Change is required before people will explore the social and ecological consequences of science and technology and the powerful economic, political, and social forces that drive them. A change is needed before we can effectively work toward solutions that address the root causes of pollution. While we do not pretend to have the answers to the environmental crisis we must explore potential directions for the future.

The various statues protecting our environment have been used primarily to respond to problems as they arise. New statues and approaches at the state and federal level are needed that prevent the occurrence of contamination and that encourage hazardous waste reduction, reuse, and recycling. Statues are needed that change the role of pollution in our economic system from that of an externality to a factor in the cost of production.

Legislation introduced in the U.S. Congress in June 1987 contains some of the elements needed to address the need for waste reduction. This legislation would create an Office of Waste Reduction within EPA. It authorizes up to $18 million for waste reduction activities: $8 million to operate the new office and $10 million for grants to the states (Brown, et al. 1988).

A Lawsuit, such as the current lawsuit against Gelman by the DNR, is one measure that can potentially force industry to cleanup after incidents of contamination. However, lawsuits often become protracted disputes while the contamination goes unabated. A state Superfund law, similar to the federal Superfund law, would provide the

leverage needed to force industry to respond to incidents of contamination. This law could impose heavy fines on industry for every day the pollution goes unabated along with imposing triple charges for any state cleanup activities.

Measures need to be taken to prevent the export of our destructive technologies to developing nations. Proactive measures like including a ban within the Federal Insecticide, Fungicide, and Rodenticide Act to make it illegal to export pesticides, drugs, and other chemicals that are banned and unregistered within this country.

Changes in the education system of this country are needed that promote social justice and a sustainable relationship between people and their environment. Our current educational system teaches the rudiments of communication, mathematics, biological and physical sciences, social sciences, etc. However, students are rarely taught how to address the problems that we face in society and how to work toward solutions. Students are not taught the connections between an economic system without environmental and social responsibility, a political system that has historically adopted a hands off policy toward this economic system, and a society driven by progress.

Environmental education is one approach that contains many of the elements necessary to develop a citizenry that understands the root causes of the ecological and social problems that we face. Environmental education helps people to develop the skills necessary to work toward solutions of these complex problems. Environmental educators seek to develop a world population that is,

> ....aware of, and concerned about the total environment and its associated problems, and which has the knowledge, attitudes, motivations, commitments, and skills to work individually and collectively toward solutions of current problems and the prevention of new ones (Stapp, 1981).

Citizens who one day find themselves with contaminated wells have few skills and resources for addressing their concerns. They find themselves with very few if any formal channels or power to express these concerns. However, citizens are becoming more

effective in utilizing information, emotional appeal, the courts, the press, etc. in helping them achieve their objectives. Tocsin is a good example of grass roots organizing by citizens in the Gelman case. Tocsin successfully alerted the public about the problems surrounding Gelman's deep injection well, they notified government officials about illegal waste discharges, they held both Gelman and the government accountable for their actions, and they organized the community around the issue. This form of community organizing can help to prevent the contamination of local ecosystems and can publicize incidents that do occur.

Formal channels such as the Citizen Information Committee, provide citizens with no formal power and often become a haphazard attempt to include them in the remediation process. These channels for citizen involvement could serve a valuable function if they were implemented more effectively. The CIC has the potential of creating channels of communication between citizens and the DNR. Currently, there is no assurance that citizen concerns will be addressed. It is important that the DNR and other agencies recognize the importance of citizen participation and that they provide effective channels for participation. Citizens have provided the DNR with valuable information regarding illegal waste disposal practices and discharges. Therefore, we feel that the DNR should work closely with the citizens and provide formal channels for citizen participation.

The only formal channel for citizens to address their concerns is the legal system. The legal process is very expensive and often requires expert testimony that can exclude citizens. Private suits are often lengthy and require a great deal of time and energy. Currently, they are the only means for citizens to receive compensation for economic costs incurred or for personal injury resulting from incidents of contamination.

A new worldview is needed that includes social and ecological responsibility. This worldview should be included in education reform, grass roots organizing, institutional change, community empowerment, and legislative reform. These are directions for the future that will begin to address the root causes of pollution. Powerful economic, social,

and political forces shape our relationship with the land. It is these forces that must be addressed before we well experience a more socially responsible and ecologically sustainable future.

RECOMMENDATIONS

Based on the findings made in this case study, we present the following recommendations:

1. Sustainable land use practices should be adopted in which priority is given to the protection of the environment.

2. Incompatible land uses (e.g. industrial and rural residential) should not be planned in the same general vicinity.

3. The social, political, and economic implications should be considered in all scientific research, and in the development and use of technologies.

4. The citizens living in the vicinity of Gelman Sciences should continue to place pressure on the company in an attempt hold it accountable for all past, present, or future contamination of the environment.

5. The citizens living in the vicinty of Gelman Sciences should attempt to negotiate with the company for complete reimbursement of costs incurred by citizens as a direct or indirect result of the contamination of their water supply. In the case that negotiations do not succeed, citizens should pursue legal action against Gelman Sciences.

6. The University of Michigan should not encourage industrial development without accompanying, environmentally sustainable practices.

7. The University of Michigan should assume responsibility to the citizenry in the community of which the University is a part (i.e. providing access to information and experts).

8. The University of Michigan should assess any loss of property value or other damages incurred in Saginaw Forest due to contamination by chemicals that are or have been used in Gelman's production process.

9. The University should attempt to negotiate with Gelman Sciences for payment equal to the assessed damages. In the case that negotiations do not succeed, the University of Michigan should pursue legal action against Gelman Sciences.

10. The Michigan Department of Natural Resources should attempt to work within the financial and other limitations imposed on it by the State, to improve its monitoring of industrial sites.

11. The Michigan Department of Natural Resources should encourage industries to adopt sustainable waste management practices. Examples of these practices include waste reduction, recycling, and the replacement of highly toxic substances used in production with less toxic substances.

12. The Michigan Department of Natural Resources should encourage Gelman Sciences to undertake cleanup activities during the time that the lawsuits regarding this matter are pending.

13. Gelman Sciences should accept responsibility for the environmental contamination that has resulted from their past (and possibly present) unsound waste disposal practices.

14. Gelman Sciences should work cooperatively with state regulatory agencies to undertake a prompt and thorough cleanup operation.

15. Gelman Sciences should pay any costs that state agencies or surrounding residents may have incurred as a result of the contamination.

16. Gelman Sciences should explore and implement sustainable practices (i.e. waste reduction and recycling) which would lessen the chances that contamination would occur in the future.

REFERENCES

Introduction

Argus, et al. 1965. in "International Agency on Research of Cancer 1984 Composium." Washington, D.C.

Backman, J. 1970. "The Economics of the Chemical Industry." Manufacturing Chemists' Association: Washington, D.C.

Boraiko, Alan A. March, 1985. "Storing Up Trouble--Hazardous Waste." National Geographic vol. 167, no.3, Washington, D.C.

Brown, Larry & Deborah Allen. 1983. "Toxic Waste and Citizen Action." Science for the People. vol. 15, no. 4. July/August.

Brown, Lester R., et al. 1988. State of the World 1988. W.W. Norton and Company: New York.

Brown, Michael. 1980. EAF News. Environmental Action Foundation: Washington, D.C.

Chemical and Engineering News. June 14, 1982. "Production by the U.S. Chemical Industry." pp.32-38.

Commoner, Barry. 1974. The Closing Circle: Nature, Man and Technology. Alfred A. Knopf, Inc.: New York, N.Y.

Conservation Foundation, The. 1987. Ground Water Protection. Washington, D.C.

Conservation Foundation, The. 1984. "State of the Environment: An Assessment at Mid-Decade." Washington, D.C.

Council on Environmental Quality. 1981. "Contamination of Ground Water By Toxic Organic Chemicals." U.S. Government Printing Office: Washington, D.C.

Crone, Hugh D. 1986. Chemicals and Society: A Guide to the New Chemical Age. Cambridge University Press: New York.

Eastern Michigan Environmental Action Council (EMEAC). 1984. Groundwater Contamination Sites: a citizens's guide to fact-finding and follow-up. Birmingham, Michigan.

Huisingh, Donald et al. 1986. "Proven profits from pollution prevention: case studies in resource conservation and waste reduction." Institute for Local Self-Reliance: Washington, D.C.

Kelley Frank J., Attorney General, et al. v. Gelman.Sciences Inc., File No. 88-34734-CE. February 26, 1988.

National Research Council. 1984. Toxicity Testing: Strategies to Determine Needs and Priorities. National Academy Press: Washington, D.C.

National Research Council. 1986. Ground Water Quality Protection: State and Local Strategies. Committee on Ground Water Quality Protection. National Academy Press: Washington, D.C.

Office of Technology Assessment, U.S. Congress. 1984. "Protecting the Nations Groundwater From Contamination." U.S. Government Printing Office: Washington, D.C.

Office of Technology Assessment, U.S. Congress. 1985. "Superfund Strategy." U.S. Government Printing Office: Washington, D.C.

Patrick, Ruth et al. 1987. Groundwater Contamination in the United States. 2nd ed. University of Pennsylvania Press: Philadelphia.

Rice, Rip G. ed. 1985. Safe Drinking Water: The Impact of Chemicals on a Limited Resource. Drinking Water Research Foundation: Virginia.

Shodell, Michael. October 1985. "Risky Business." Science.

U.S. Congress, Committee on Government Operations. 1984. "Groundwater Protection: The Quest for a National Policy." 98th Congress, 2d Session--House Report 98-1136. U.S. Government Printing Office: Washington, D.C.

U.S. Environmental Protection Agency. 1983. "The Groundwater Supply Survey: Summary of Volatile Organic Contaminant Occurrence Data." By Westrick, et al. U.S. EPA, Office of Drinking Water, Technical Support Division: Cincinnati.

U.S. Environmental Protection Agency. 1984. "National Statistical Assessment of Rural Water Conditions." Office of Drinking Water: Washington, D.C. EPA 570/9-84-004.

U.S. Environmental Protection Agency. 1985. RCRA/CERCA Hotline: Washington, D.C.

U.S. Environmental Protection Agency. July 31, 1987. "Overview of State Ground-Water Program Summaries Vol. I." Office of Ground-Water Protection: Washington, D.C.

U.S. International Trade Commission. 1986. "Synthetic Organic Chemicals: United States Production and Sales 1985." U.S. Government Printing Office: Washington, D.C.

The Story (events from 1959-present)

Argus, et al. 1965. In International Agency on Research of Cancer Composium. 1984. Composium: Washington, D.C.

Bicknell, Daniel J. June 26, 1984. "Hazardous Waste Introductions into Third Sister Lake, Washtenaw County, Michigan."

Cain, Stephen & Roy Reynolds. February 24, 1988. "Gelman blames dioxane makers for tainted wells." The Ann Arbor News.

Child, Charles. October 22, 1984. "State may clear Gelman Sciences of pollution charges." The Ann Arbor News.

Cohen, Janet. April 5, 1987. "Gelman second in state for toxins." The Ann Arbor News.

Cohen, Janet. April 13, 1988. "Gelman denies charges." The Ann Arbor News.

Cohen, Janet. April 27, 1986. "Dioxane tests near site worry health experts." The Ann Arbor News.

Cohen, Janet. April 27, 1986. "Gelman resisted DNR warnings of water contamination." The Ann Arbor News.

Cohen, Janet. August 10, 1986. "DNR unfair about spill, Gelman says." The Ann Arbor News.

Cohen, Janet. August 29, 1986. "Gelman deep well draft permit available for public to review." The Ann Arbor News.

Cohen, Janet. February 2, 1986. "Filter maker waits, and waits, on sewer." The Ann Arbor News.

Cohen, Janet. February 2, 1986. "Tests verify pollutants in wells west of city." The Ann Arbor News.

Cohen, Janet. February 2, 1988. "Gelman strategy dangerous, DNR says." The Ann Arbor News.

Cohen, Janet. February 7, 1987. "Crack found in Gelman's waste tank." The Ann Arbor News.

Cohen, Janet. February 23, 1986. "Gelman to pay for water line extension so neighbors can avoid tainted wells." The Ann Arbor News.

Cohen, Janet. February 26, 1988. "Pollution suit names Gelman." The Ann Arbor News.

Cohen, Janet. July 13, 1987. "Dioxane find sparks new round of tests." The Arbor News.

Cohen, Janet. July 13, 1987. "Gelman plans groundwater cleanup." The Ann Arbor News.

Cohen, Janet. July 15, 1986. "Gelman offers disposal plan for polluted groundwater." The Ann Arbor News.

Cohen, Janet. July 16, 1986. "Annexation fears delay water deal." The Ann Arbor News.

Cohen, Janet. July 27, 1986. "Study shows dioxanes on U-M tract." The Ann Arbor News.

Cohen, Janet. July 28, 1987. "Gelman begins groundwater purge operation." The Ann Arbor News.

Cohen, Janet. July 30, 1986. "Gelman failed to give timely notice of spill." The Ann Arbor News.

Cohen, Janet. June 15, 1987. "Gelman develops method to treat polluted water." The Ann Arbor News.

Cohen, Janet. March 1, 1988. "Gelman denies violating laws." The Ann Arbor News.

Cohen, Janet. May 18, 1986. "Toxins disrupt tranquil Scio area." The Ann Arbor News.

Cohen, Janet. May 21, 1986. "Westover area may not have water for several weeks." The Ann Arbor News.

Cohen, Janet. May 28, 1986. "Residents of contaminated Scio area to get bottled water." The Ann Arbor News.

Cohen, Janet. May 29, 1986. "Gelman cleanup may begin soon." The Ann Arbor News.

Cohen, Janet. May 30, 1986. "Toxic wastes may be threat to city sewer." The Ann Arbor News.

Cohen, Janet. May16, 1986. "More toxins found in Scio well water." The Ann Arbor News.

Cohen, Janet. November 3, 1986. "Residents fighting deep well." The Ann Arbor News.

Cohen, Janet. November 23, 1986. "Gelman cleanup pressure mounts." The Ann Arbor News.

Cohen, Janet. November 29, 1987. "State may sue Gelman Sciences over pollution." The Ann Arbor News.

Cohen, Janet. November 29, 1987. "Water and soil tests bear out predictions dioxane fanning out in different layers." The Ann Arbor News.

Cohen, Janet. September 9, 1986. "EPA's probe of Gelman leaves officials frowning." The Ann Arbor News.

Cohen, Janet. September 9, 1986. "Puzzling pattern of contamination revealed." The Ann Arbor News.

Cohen, Janet. September 25, 1986. "Residents want proof disposal well is safe." The Ann Arbor News.

DeSimone, Bonnie. June 3, 1986. "City puts Gelman proposal on hold." The Ann Arbor News.

DeSimone, Bonnie. June 10, 1986. "Gelman water main offer 'not a gift'." The Ann Arbor News.

DeSimone, Bonnie. June 24, 1986. "Gelman agrees to foot bill for water main construction." The Ann Arbor News.

"DNR files on Gelman Sciences Inc. Reveal Gaps, inconsistencies." April 27, 1986. The Ann Arbor News.

*DNR files on Gelman Sciences, Incorporated. 1965-1988. Lansing, Michigan.

Ewart, Brian. October, 1987. "Lack of proper testing keeps Gelman disaster a secret for 17 months." Agenda. p. 1.

Fulton, Doug. June 29, 1981. "Gelman drills a well to solve waste problem." The Ann Arbor News.

Gearhart, Jeff and Mark Weinstein. June, 1987. "Gelman Second Worst Environmental Disaster in Michigan." Agenda. p. 3.

Gearhart, Jeff. July, 1987. "EPA ruling on Gelman permit due." Agenda. p.1.

Gearhart, Jeff. July, 1987. "When watchdogs only bark." Agenda. p. 1.

"Gelman official downplays DNR's pollution ranking." April 10, 1987. The Ann Arbor News.

Gelman Sciences, Inc. 1987a. "Innovations in Microfiltration for Science and Industry."

Gelman Sciences, Inc. 1987b. "Management Sketchbook." Gelman Sciences Management Personnel: A Collection of Biographical references.

Gelman Sciences, Inc. March 1988. "Groundwater project progress outline, 1986-1988."

Gelman Sciences, Inc. March 1988. "Summary of waste water treatment, 1963-1986."

"Gelman site still ranks No. 2 worst." November 24, 1987. The Ann Arbor News.

Haglund, Rick. April 27, 1986. "Charles Gelman banking on 'Sunbeam' to rescue his troubled kingdom." The Ann Arbor News.

Hooper, Celia. May 6, 1986. "Scio Township residents get update on study of Gelman dioxanes." The Ann Arbor News.

Interview with Alfin Vaz. March 12, 1988.

Interview with Dan Bicknell. April 8, 1988

Interview with Dan Bicknell. February 23, 1988.

Interview with Mary Vanderlaan. February 24, 1988.

Jones, Jackie. September 13, 1984. "What's in the lake? Scientists studying chemical samples." Detroit Free Press.

Kelley Frank J., Attorney General, et al. v. Gelman.Sciences Inc., File No. 88-34734-CE. February 26, 1988.

"One million spent on cleanup, so far, firm says." April 17, 1988. The Ann Arbor News.

Reynolds, Roy. April 28, 1971. "Pollution Paradox is Solved." The Ann Arbor News.

Reynolds, Roy. January 26, 1988. "Gelman sues DNR chief over pollution ranking." The Ann Arbor News.

Reynolds, Roy. March 10, 1970. "Ironic Industrial Pollution Problem May be Solved Soon." The Ann Arbor News.

Reynolds, Roy. November 7, 1969. "Gelman Firm's Case Illustrates State Industry Conflict." The Ann Arbor News.

Rogers, Tom. Dec. 23, 1986. "Citizens group opposing Gelman's deep well permit." The Ann Arbor News.

Rogers, Tom. January 25, 1987. "Group, citing leak, asks EPA to monitor Gelman's waste well." The Ann Arbor News.

Rzepka, Marianne. July 22, 1986. "Gelman to pay city water bill for Westover." The Ann Arbor News.

Schmidt, Wayne. May 29, 1986. "More monitoring of drinking water urged." The Ann Arbor News.

U.S. Environmental Protection Agency. March 31, 1987. "p-Dioxane: Health Advisory." Office of Drinking Water. U.S. Government Printing Office, Washington, D.C.

*DNR files on Gelman Sciences, Inc. is unbound and unpublished. It consists of thousands of uncatalogued documents which are organized chronologically. They are stored at the Michigan Department of Natural Resources, Lansing Michigan, and can be obtained through the Freedom of Information Act.

Risk assessment

Cohen, Janet. April 3, 1986. "The uncertain science of risk assessment." The Ann Arbor News.

Conservation Foundation, The. 1985. Risk Assessment and Risk Control. Washington, D.C.

Conway, R. A. 1982. "Introduction to environmental risk analysis." in R.A. Conway, ed.. Environmental Risk Analysis for Chemicals. Van Nostrand Reinhold Company: New York, New York.

Creasey, William A. 1981. Cancer: An Introduction. Oxford University Press: New York, New York.

*DNR files on Gelman Sciences Incorporated. 1965-1988. Lansing, Michigan.

Federal Register, The. September 24, 1986. Part II U.S. EPA "Guidelines for risk assessment." Vol. 51, No. 185 Washington, D.C.

Foran, Jeffery & Mark Van Putten. June 27, 1987. Letter to Gordon Guyer, Director Michigan Department of Natural Resources. Re: Critical Materials Registry. National Wildlife Federation: Ann Arbor, Michigan.

Garrett, Laurie. 1979. "The biology of cancer." In Mark Renneker, and Steven Leib, eds. Understanding Cancer. Bull Publishing Company: Pao Alto, California.

Gori, Gio Batta 1982. "The regulation of carcinogenic hazards." In Christoph Hohenemser and Jeanne X. Kasperson, eds. Risk in the Technological Society. Westview Press, Inc.: Boulder, Colorado.

Hartung, Rolf 1987. "Draft health and environmental effects assessment for 1,4-doxane." Prepared for Gelman Sciences, Inc. The School of Public Health, The University of Michigan: Ann Arbor, Michigan.

Interview with Jeffrey Foran. March 31, 1988.

Interview with Jeffrey Foran. April 19, 1988.

Interview with Rebecca Head. March 30, 1988.

Kociba, R.J., et al. 1974. "1,4-dioxane toxicity as determined by a two-year dose-response study in rats." Meeting abstract. Toxicol. and Appl. Pharmacology 2: 263-282.

Legator, Marvin S., et al. 1985. The Health Detective Handbook: A Guide to the Investigation of Environmental Health Hazards by Non-Professionals. The Johns Hopkins University Press: Baltimore, Maryland.

Martinez, Maria Carmen F. 1987. "Critique of the draft health and environmental effects assessment for 1, 4-dioxane." Michigan Department of Natural Resources: Lansing, Michigan.

Nesmith, Jeff. December 25, 1983a. "Chemical deaths expected; Reagan policy claims protection has limits." The Washington Post.

Nesmith, Jeff. December 25, 1983. "White House tied to halt FDA ban on dye." The Atlanta Journal and Constitution.

Nesmith, Jeff. September 4, 1983a. "Billions spent studying how carcinogens cause cancer in cells." The Atlanta Journal and Constitution.

Nesmith, Jeff. September 4, 1983b. "Critics claim policy on carcinogens is lax." The Atlanta Journal and Constitution.

Nesmith, Jeff. September 4, 1983c. "The great debate on carcinogens." The Atlanta Journal and Constitution.

Nesmith, Jeff. September 7, 1983a. "Dispute on health rules is inevitable, report says." The Atlanta Journal Constitution.

Nesmith, Jeff. September 7, 1983b. "White House fears cost of cancer programs." The Atlanta Journal and Constitution.

Nesmith, Jeff. September 25, 1983a. "U.S. ignored warnings on carcinogens." The Atlanta Journal and Constitution.

Nesmith, Jeff. September 25, 1983b. "EPA Position Flip Flop on Threat." The Atlanta Journal and Constitution.

Oppenheimer, Steven B. 1982. Cancer: a Biological approach and clinical introduction. Allyn and Bacon, Inc.: Boston, Massachusetts.

Prescott, David M. and Abraham S. Flexer. 1982. Cancer: The Misguided Cell. Charles Scribner and Sons: New York, New York.

Rall, David P. 1980. "Three decades of environmental concern." In H. Burchenal and Herbert F. Oettgen, eds. Cancer: achievements, challenges and propects for the 1980's. Grune and Stratton: New York, New York.

Theiss, Jeffrey C. 1980. "Detection of carcinogens." In H. Burchenal and Herbert F. Oettgen, eds. Cancer: achievements, challenges and prospects for the 1980's. Grune and Stratton: New York, New York.

Young, J.D., W.H. Braun, & P.J. Gehring. 1978. "The dose-dependent fate of 1,4-dioxane in rats." J. Environ. Pathol. and Toxicology. 2: 263-282.

*DNR files on Gelman Sciences, Inc. is unbound and unpublished. It consists of thousands of uncatalogued documents which are organized chronologically. They are stored at the Michigan Department of Natural Resources, Lansing Michigan, and can be obtained through the Freedom of Information Act.

Briggs, Louis I. 1968. "Geology of Subsurface Waste Disposal in the Michigan Basin." in John E. Galley, ed. Subsurface Disposal in Geological Basins: A Study of Reservoir Strata. American Association of Petroleum Geologists. Tulsa, Oklahoma.

Clark, Lyman H. December 1983. "Briefing & Policy Review: Underground Injection of Hazardous Waste, Draft." U.S. EPA: Washington, D.C. p. 2.

Cohee, G.V. & Kenneth H. Landes. 1958. "Oil in the Michigan Basin." Habitat of Oil. American Association of Petroleum Geology: Tulsa, Oklahoma.

Cohen, Janet. September 25, 1986. "Residents want proof disposal well is safe." The Ann Arbor New

Cohen, Janet. November 3, 1986. "Residents fight deep well." The Ann Arbor New

Cohen, Janet. November 23, 1986. "Gelman Clean-up Pressure Mounts." The Ann Arbor New

Dorr, John A. & Eschman, Donald F. 1970. Geology of Michigan. University of Michigan Press: Ann Arbor, Michigan.

*DNR Files on Gelman Sciences, Inc. 1965-1988. Lansing, Michigan.

DNR (May 1986). "Deep Well Injection of Hazardous Waste in Michigan." Michigan Department of Natural Resources: Lansing Michigan.

Ells, Garland D. 1969. "Architecture of the Michigan Basin." Michigan Basin Geological Society, Annual Guidebook. Lansing, Michigan.

Fisher, J.H. 1969. "Early Paleozoic History of the Michigan Basin." Michigan Basin Geological Society Annual Field Conference. Lansing, Michigan. pp. 89-93.

Fisher, Jeanne Ann. 1981. "Fault Patterns in Southeastern Michigan." Master's Thesis. Michigan State University: East Lansing, Michigan.

Fulton, Doug. June 13, 1981. "Gelman drills a well to solve waste problem." The Ann Arbor News.

Gelman Sciences, Inc. "Groundwater Project Progress Outline 1996-1988."

Gelman Sciences, Inc. "Summary of Waste Water Treatment 1963-1988."

Gearhart, Jeff and Mark Weinstein. June, 1987. "Gelman Second Worst Environmental Disaster in Michigan." Agenda. p. 3.

Gordon, Wendy & Bloom, Jane. 1985. "Deeper Problems: The Limits to Underground Injection as a Hazardous Waste Disposal Option." Natural Resources Defense Council, Inc.: Washington, D.C.

Guthrie, M., et al. March 1986. "The Impacts of Alternative Technologies for Treatment and Disposal of Liquid Hazardous Wastes." Presented at the International

Symposium on Subsurface Injection of Hazardous Wastes. Unpublished manuscript.

Interview with Mary Vanderlaan. February 24, 1988.

Interview with Arthur Moretta. July 7, 1987. Region V EPA, Chicago, IL.

Interview with Arthur Moretta. February, 1988. Region V EPA, Chicago, IL.

Interview with James Marshall, March 3, 1988.

Keck Consulting Services, Inc. July 14, 1986. "Interim Report, Hydrogeologic Investigation, Gelman Sciences, Inc. Section 25, Scio Township, Washtenaw County Michigan." Prepared by James W. Brode and Robert C. Minning: Williamston, Michigan.

Keck Consulting Services, Inc. Mach 30, 1987. "Report of Phase II Hydrogeologic Investigation, Gelman Sciences, Inc. Section 25, Scio Township, Washtenaw County Michigan." Prepared by James W. Brode and Robert C. Minning: Williamston, Michigan.

Leenheer, J.A. & R.L. Malcolm. 1973. "Case History of Subsurface Waste Injection of and Industrial Organic Waste." Underground Waste Management & Artificial Recharge. vol. 1. pp. 565-569.

Moldenhauer, David. 1984. "Draft Report on Deep Well Injection of Hazardous Waste in Texas." Texas Department of Agriculture: Austin, Texas.

Office of Technological Assessment, U.S. Congress. 1983. "Technologies & Management Strategies for Hazardous Waste Control." U.S. Government Printing Office: Washington, D.C.

Rogers, Tom. January 25, 1987. "Group, citing leak, asks EPA to monitor Gelman's waste well." The Ann Arbor News.

Simpson, Frank. 1975. "Deep Well Injection of Fluid, Industrial Wastes in Canada." Unpublished paper. University of Windsor.

Sullivan, Patrick. 1983. "An Assessment of Class I Hazardous Waste Injection Wells." Ball State University: Muncie, Indiana. pp. 1-2.

Syrjamaki, Robert M. 1977. "The Prairie Du Chien Group of the Michigan Basin." Master's Thesis. Michigan State University: East Lansing, Michigan.

Texas Department of Water Resources. 1983. "Report 274: Underground Injection Control Technical Assistance Manual," Austin, Texas. pp. 22-33.

Toxic Substance Control Committee Meeting, March 10, 1988. Presentation by Dave Rymph and Mary Vanderlaan. Ann Arbor, Michigan

Tocsin, November 26, 1986. "Request for Administrative Review," 2349 Arrowwood Trail, Ann Arbor, Michigan.

Tocsin, 1987. "Update of Request for Administrative Review," 2349 Arrowwood Trail, Ann Arbor MI.

U.S. Environmental Protection Agency. September 1985. "Report to Congress on Injection of Hazardous Waste." U.S. Government Printing Office: Washington, D.C. 570-9/85-003.

U.S. Environmental Protection Agency. September 24, 1986. "Response to Comments and Permit Revisions to Underground Injection Control Permit, #MI-161-1I-0001, Gelman Sciences, Inc.," EPA Region V: Chicago IL.

U.S. Environmental Protection Agency. September 24, 1986. " Regional Response to Request for Review of Underground Injection Control Permit, #MI-161-1I-0001, Gelman Sciences, Inc.," EPA Region V: Chicago IL.

U.S. Environmental Protection Agency. January 1987. "Regional Response to Request for Review of Underground Injection Control Permit , #MI-161-1I-0001, Gelman Sciences, Inc.," EPA Region V: Chicago IL.

*DNR files on Gelman Sciences, Inc. is unbound and unpublished. It consists of thousands of uncatalogued documents which are organized chronologically. They are stored at the Michigan Department of Natural Resources, Lansing Michigan, and can be obtained through the Freedom of Information Act.

Land use planing issues

Beal, Frank, et al. 1980. The Practice of Local Government Planning. International City Management Association: New York. pp 202-13, 262-272.

Bennett, Charles F. 1983. Conservation and Management of Natural Resources in the United States. John Wiley and Sons: New York.

Interview with Jim Schafer. January 22, 1988.

Michigan Department of Natural Resources, Groundwater Quality Division (undated). "Michigan's Hidden Resource." Lansing, Michigan.

Ritter, Dale F. 1978. Process Geomorphology. W.M.C. Brown: Dubuque, Iowa.

U.S. Water Resources Council. 1978. "The Nation's Water Resources 1975-2000." Vol. 2. Water Quantity, Quality, and Related Land Considerations. U.S. Government Printing Office: Washington, D.C.

Washtenaw County Metropolitan Planning Commission, 1986. "Washtenaw County Land Use Policies." Ann Arbor, Michigan.

An analysis of the citizens response to the contamination issue

Cohen, Janet. July 16, 1986. "Annexation fears delay water deal." The Ann Arbor News.

Cohen, Janet. May 18, 1986. "Toxins disrupt tranquil Scio area." The Ann Arbor News.

*DNR files on Gelman Sciences Incorporated. 1965-1988. Lansing, Michigan.

Eastern Michigan Environmental Action Council--EMEAC 1984. Groundwater Contamination Sites: a citizens's guide to fact-finding and follow-up. Eastern Michigan Environmental Action Council: Birmingham, Michigan.

Fulton, Doug. June 28, 1981. "Gelman drills a well to solve waste problem." The Ann Arbor News.

Huisingh, Donald et al. 1986. "Proven Profits from Pollution Prevention." Case Institute for Local Self-Reliance: Washington, D.C..

Interview with Alfin Vaz. March 12, 1988.

Interview with Brian Ewart. March. 28, 1988.

Interview with Carl Brauer. March 28, 1988.

Interview with Priscilla Cheever. January 4, 1988.

Interview with Karen Clark, Ron Kooistra, & Jack Larsen (Jackson DNR). February 25, 1988.

Interview with Jim Crowfoot. February 7, 1988.

Interview with Carol Dudley. February 23, 1988.

Interview with Kathy Edgren, February 25, 1988.

Interview with Douglas Mark, January 6, 1988.

Interview with James Marshall. February 5, 1988.

Interview with Ken Schatzle. December 5, 1987.

Interview with Mary Mickelson. February 17, 1988.

Introductory Tocsin Newsletter. Undated. Ann Arbor, Michigan.

Polk, Timothy and Elizabeth Polk. September 11, 1986. "Public should voice concern over deep-well injecting." The Ann Arbor News. Letter to the editor.

Rogers, Tom. December 23, 1986. "Citizens group opposing Gelman's deep well permit." The Ann Arbor News.

*DNR files on Gelman Sciences, Inc. is unbound and unpublished. It consists of thousands of uncatalogued documents which are organized chronologically. They

are stored at the Michigan Department of Natural Resources, Lansing Michigan, and can be obtained through the Freedom of Information Act.

An analysis of the response of University of Michigan to the contamination issue.

Blanchard, Frank. 1988. "U-M Profs Pitch In." The University of Michigan Special Report: The U-M in Partnership with Buisness. Office of News and Information Services: `Ann Arbor, Michigan.

*DNR files on Gelman Sciences Incorperated. 1965-1988. Lansing, Michigan.

Interview with Carl Brauer. March 28, 1988.

Interview with Carol Dudley. February 23, 1988.

Interview with Jack Weidenbach. February 18, 1988.

Interview with Jim Crowfoot. Febuary 7, 1988.

Interview with Ken Schatzle. January 4, 1988.

Interview with Ken Schatzle. December 5, 1987.

SNR files on Gelman Sciences Incorporated. 1984-1988. University of Michigan: Ann Arbor.

SNR files on Third Sister Lake, 1984-Present. Ann Arbor, Michigan.

*DNR files on Gelman Sciences, Inc. is unbound and unpublished. It consists of thousands of uncatalogued documents which are organized chronologically. They are stored at the Michigan Department of Natural Resources, Lansing Michigan, and can be obtained through the Freedom of Information Act.

Ann Arbor News, The. April 27, 1986a. "DNR files on Gelman Sciences, Inc. shows gaps, inconsistencies."

Blanchard, Frank. 1988. "U-M Profs Pitch In." The University of Michigan Special Report: The U-M in Partnership with Buisness. Office of News and Information Services: `Ann Arbor, Michigan.

Bradford, George. December 1987. Evergreen Alliance Newsletter. Detroit, Michigan.

Cohen, Janet. April 27, 1986b. "Gelman resusted DNR warnings of water contamination." The Ann Arbor News.

Cohen, Janet. July 30, 1986. "Gelman failed to give timely notice of spill." The Ann Arbor News.

Ewart, Brian. October, 1987. "Lack of proper testing keeps Gelman disaster a secret for 17 months." Agenda. p. 1.

Interview with Karen Clark, Ron Kooistra, & Jack Larsen (Jackson DNR). February 25, 1988.

Interview with Mary Vanderlaan. Febuary 24, 1988.

An analysis of the response of Gelman Sciences, Inc. to the contamination issue

Ann Arbor News, The. April 10, 1987. "Gelman official downplays DNR's pollution ranking."

Cohen, Janet. May 18, 1986. "Toxins disrupt tranquil Scio area." The Ann Arbor News.

Gelman, Charles. April, 1988. Washtenaw Jewish News.

Fulton, Doug. June 29, 1981. "Gelman drills a well to solve waste problem." The Ann Arbor News.

Haglund, Rick. April 27, 1986. "Charles Gelman banking on 'Sunbeam' to rescue his troubled kingdom." The Ann Arbor News.

Hooper, Celia. May 6, 1986. "Scio Township residents get update on study on Gelman dioxanes." The Ann Arbor News.

Interview with Alfin Vaz. March 12, 1988.

Interview with Bob Reichel. March 15, 1988.

Interview with Dan Bicknell. April 8, 1988.

Interview with Dan Bicknell. Febuary 23, 1988.

Interview with Karen Clark, Ron Kooistra, & Jack Larsen (Jackson DNR). February 25, 1988.

Interview with James Marshall, February 5, 1988.

Interview with Mary Vanderlaan. Febuary 24, 1988.

Interview with Priscilla Cheever. January 4, 1988.

Vandermeer, John. 1986. "Toxic Wastes." Unpublished Manuscript. The University of Michigan. Ann Arbor, Michigan.

Discussion

Boraiko, Alan A. March, 1985. "Storing Up Trouble--Hazardous Waste." National Geographic Vol. 167, No.3, Washington, D.C.

Bradford, George. December 1987. Evergreen Alliance Newsletter. Detroit, Michigan.

Brown, Lester R. et al. 1988. State of the World 1988. W.W. Norton and Company: New York, N.Y.

Commoner, Barry 1974. The Closing Circle: Nature, Man and Technology. Alfred A. Knopf, Inc.: New York, N.Y.

Conway, R. A. 1982. "Introduction to environmental risk analysis." in Conway, ed. Environmental Risk Analysis for Chemicals. Van Nostrand Reinhold Company: NewYork, New York.

Devall, Bill & George Sessions. 1985. Deep Ecology: Living as if Nature Mattered. Peregrine Smith Books: Salt Lake City, Utah.

Gori, Gio Batta 1982. "The regulation of carcinogenic hazards." In Christoph Hohenemser and Jeanne X. Kasperson, eds. Risk in the Technological Society. Westview Press, Inc.: Boulder, Colorado.

Nesmith, Jeff. December 25, 1983. "White House tied to halt FDA ban on dye." The Atlanta Journal and Constitution.

Stapp, William B. and Dorothy A. Cox 1981. Environmental Education Activities Manual. E.P. Dalton: New York.

Weir, David and Mark Schapiro. 1981. Circle of Poison: Pesticides and People in a Hungry World. Institute for Food and Development Policy: San Francisco, CA.

Federal and state statutes and their application to the Gelman Case

Conservation Foundation The. 1987. Ground Water Protection. The Conservation Foundation: Washington, D.C.

Eastern Michigan Environmental Action Council--EMEAC 1984. Groundwater Contamination Sites: a citizens's guide to fact-finding and follow-up. Birmingham, Michigan.

Gordon, Wendy & Jane Bloom. 1985. "Deeper Problems: The Limits to Underground Injection as a Hazardous Waste Disposal Option." Natural Resources Defense Council, Inc.: Washington, D.C.

Patrick, Ruth et al. 1987. Groundwater Contamination in the United States. 2nd ed. University of Pennsylvania Press: Philadelphia.

U.S. Congress, Committee on Government Operations. 1984. "Groundwater Protection: The Quest for a National Policy." 98th Congress, 2d Session--House Report 98-1136. U.S. Government Printing Office: Washington, D.C.

APPENDIX A: FEDERAL AND STATE STATUTES AND THEIR APPLICATION TO THE GELMAN CASE.

The following is a summary of the state and federal statutes pertinent to the Gelman incident of groundwater contamination. These statutes provide for the protection of human health and the environment, the regulation and monitoring of waste disposal by state and federal agencies, and response and enforcement activities by state and federal agencies.

Human health and the environment

Since 1963 Gelman has used the following methods for the disposal of its processed waste at the 600 Wagner Road site: direct surface discharge, seepage from unlined lagoons where aerobic and anaerobic microbial treatment occurred, disposal and burning of chemical wastes in an unlined pit, spray irrigation after aerobic and anerobic microbial treatment, and deep well injection. Regardless of the method used for waste disposal by Gelman, the waste, according to law, must not be injurious to either public health or the environment. The State Water Resources Commission Act (WRCA) prohibits any discharge, either directly or indirectly into the waters of the state, that is or might become injurious to public health, the environment, or to commercial, industrial, or domestic uses of State water resources. According to the WRCA waters of the State include groundwater, lakes, rivers and streams. The Michigan Environmental Protection Act (MEPA) also prohibits any conduct that has or is likely to pollute, impair, or destroy water or other resources.

WRCA authorizes the Attorney General to bring a civil action for injunctive relief, penalties, and natural resource damages as well as the authority to bring actions to abate

violations. MEPA empowers the Court to grant equitable relief to protect the water and other natural resources, and public health.

Registration and permitting

WRCA requires that all toxic chemicals be registered with the Critical Materials Register (established in 1971). This register is a list of toxic chemicals which, if used or discharged by a business or industry, must be reported annually to the State. Businesses are required to indicate the quantities of the material used and the nature of the enterprise in these reports. 1,4-dioxane was placed on Michigan's Critical Material Register effective October 1, 1980 and has been included on the Register every year since. Gelman first reported discharging 30,000 pounds annually of 1,4-dioxane, via spray irrigation in 1981, as required by WRCA.

All waste disposal into the waters of the State by Gelman requires a permit from the Water Resources Commission. The Clean Water Act and the 1972 ammendments to it established a system for imposing effluent limitations on, or otherwise preventing discharges of "pollutants" into any "waters of the United States" from any "point source." A permit program, known as the National Pollutant Discharge Elimination System -- NPDES, is one element of this system. Under the NPDES program, any person responsible for the discharge of a pollutant or polutants into any waters of the United States from any point source must apply for and obtain a NPDES permit. The state of Michigan elected to take over the program from the Environmental Protection Agency and made it a part of WRCA on April 15, 1973. According to section 7 of WRCA any waste discharged after April 15, 1973 into the waters of the State requires an NPDES permit.

Previous to the NPDES permitting program, any business discharging waste into the waters of the state required an "Order of Determination" permit from the Water Resources Commission pursuant to WRCA. Orders of Determination permits include

provisions for waste discharge. Gelman's initial 1965 discharge permit provided that the wastewater "be disposed of into the ground in such a manner by means of such facilities and at such location that they shall not injuriously affect public health or commercial, industrial and domestic water supply use." Any new method of waste discharge required that Gelman apply for a new permit.

Injection wells

The ways in which permits for injection wells are granted have undergone many revisions since Gelman received their initial permit in 1981. The first injection wells in Michigan were permitted under an "Order of Determination" by the Water Resources Commission pursuant to WRCA. There were no specific regulations regarding waste injection wells at that time. The MDNR paid close attention to well design, but did not examine the geologic formations or abandoned oil exploratory wells of the area.

The Mineral Wells Act, 1969 P.A. 315, and the Administrative Rules of the act provided additional State regulatory control. This act provides control over the drilling, operation, and abandoning of mineral wells to prevent surface and underground contamination. After the passage of this act the MDNR conducted a review of all wells used for waste injection, with special attention focused on relatively shallow wells. Under orders of the DNR, those shallow wells were phased out by 1977 and have since been replaced with deeper wells. New regulations under the Mineral Wells Act included (1) the requirement for a feasibility study which includes an area review of dry holes, (2) proof of an acceptable receiver reservoir, (3) a monthly reporting system and (4) full time professional staff trained in the technical aspects of injection wells.

Gelman contacted the Mineral Well Permit Unit (DNR) regarding a feasibility study in 1980. Once this study was completed the DNR issued a construction and drilling permit on May 12, 1981. The well was inspected by a DNR engineer and pressure-tested as required by law. The well began operating in late 1981.

The practice of underground injection came under Federal control in 1974, when the Safe Drinking Water Act (SDWA) was passed. Subtitle C of the SDWA, designed to prevent "endangerment" of underground drinking water sources by injection wells, contains the Underground Injection Control (UIC) program. The Safe Drinking Water Act required the U.S. EPA to write a set of regulations that would be used for nationwide regulation of waste disposal wells. These regulations, known as the UIC regulations, took effect in 1980. The UIC program directs the EPA to establish minimum requirements for underground injection of wastes. Under the regulations, all injection wells must have a permit in order to operate and must meet all the applicable technical criteria and standards set forth. Once the EPA established these technical requirements, each state was required to develop and submit for approval a state UIC program meeting the EPA's criteria. Recognizing that several years might pass before the EPA could approve state UIC programs under the SDWA, the EPA decided that the disposal of hazardous waste by underground njection in each state would be regulated under Resource Conservation and Recovery Act's (RCRA) "interim status" regulations until an approved UIC program had been established in that state. Thereafter, injection operations permitted under the UIC program would automaticallly be granted a permit under RCRA. Today, both the State Mineral Wells Act and the Federal (UIC) permits are required before an injection well can be constructed. Gelman applied for a UIC permit from the EPA on December 20, 1984 and the permit was granted on August 15, 1986. This permit only allowed for the injection of processed waste. Therefore, Gelman was not permitted to use the well to dispose of purged, contaminated groundwater.

The Solid Waste Amendments to RCRA of 1984 mandated the ban of land disposal of hazardous waste unless the EPA Administrator were to find that the practice is protective of public health and the environment. Under the amendments, deep well injection is permitted. Wells are tested by the EPA to determine whether or not injection is safe and should continue.

The 1984 amendments further prohibit injection of hazardous waste into or above a formation which contains an underground source of drinking water within one-quarter mile of the well bore, unless the aquifer has been exempted or the injection is a response action or part of a corrective action taken under the Comprehensive Environmental Response, Compensation and Liability Act of 1980. Gelman's waste stream was identified as non-hazardous. If the waste stream had been deemed hazardous, more intense monitoring requirements would have been necessary and Gelman may have had to adopt an alternative disposal technique.

Response to environmental contamination

Environmental response and enforcement for contamination sites within Michigan are governed by the Michigan Environmental Response Act (MERA). The MERA provides an objective process for evaluating sites of environmental contamination. MERA provides for the indentification, risk assessment, and priority evaluation of environmental contamination sites in the State. Known and suspected sites of contamination in Michigan are listed on an annual priority list. Sites are ranked according to the relative risk of harm they pose to human health and the environment. The sites are scored according to the Site Assessment System, a numerical scoring system which takes into account present and potential hazards to health and the environment, along with the types and amounts of waste on the site. The Site Assessment System is used as a guide for allocating limited state funds to individual sites. The DNR has included the Gelman site on the annual priority lists every year since 1983. In 1987 the DNR nominated the Gelman site to be included on the federal National Priority List pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERLA). This would provide federal monies for responding to the contamination at the Gelman site.

An annual appropriation of State funds for response activities is authorized by MERA. Funds may be used if there is an immediate health threat or to address long-term health and environmental protection. Money has already been spent by the DNR at the Gelman site to provide temporary and permanent replacement of private water supplies contaminated by hazardous substances, and for water sampling and investigation. MERA provides the Attorney General with the authority to seek compensation and reimbursement from a party whose action has required the expenditure of state funds under MERA.

The Michigan Public Health Code (MPHC) gives the Department of Public Health and county health departments the power to use several different methods to reduce and eliminate public health threats. Health agencies must respond if a determination is made that there is imminent danger to public health. In the Gelman incident of groundwater contamination, private drinking water wells were initially sampled by the Washtenaw County Health Department from September through December, 1985. In response to the widespread contamination by 1,4-dioxane in the vicinity of the Gelman site, the Michigan Department of Public Health, in January 1986, issued a health advisory warning affected residents and businesses not to drink waters contaminated with 1,4-dioxane in concentrations greater than 2 ppb.

At sites where a potentially responsible party has been identified, environmental enforcement is pursued by the DNR. Environmental enforcement involves notification, follow-up, and possible legal action. The goal of environmental enforcement is to obtain a voluntary agreement with the responsible party for clean-up and necessary response activities such as supplying bottled water. This agreement is known as a Consent Agreement and is legally binding. When a voluntary agreement is not forthcoming, the Attorney General's Office may pursue legal action. According to the Attorney General's Office, despite repeated requests, "Gelman has refused to enter into an enforceable commitment to comprehensively investigate, abate, and remedy the environmental contamination at and emanating from its site" (Kelley, et al., v. Gelman Sciences, Inc.).

The identification of responsible parties, the preparation of court documents, and the negotiation of cleanup agreements with responsible parties may increase the time required to complete actions at some sites. The State Attorney General, Frank Kelley, filed a civil action suit for "injunctive and monetary relief to abate and remedy illegal releases of toxic chemicals into the environment from an industrial facility owned and operated by Gelman Sciences, Inc. " This civil action suit was filed on February 26, 1988 (Frank J. Kelly, Attorney General for the State of Michigan v. Gelman Sciences, Inc.).

Federal Statutes and Strategies pertaining to groundwater protection and regulation.

Although there is no statute specifically aimed at protecting groundwater, there are many programs that provide some measure of protection. The following are the federal statutes and strategies concerning groundwater.

Environmental Protection Agency Groundwater Protection Strategy

In 1984 the EPA set forth a groundwater protection strategy which addressed four main objectives needed for effective groundwater protection: 1) the need to strengthen state groundwater programs; 2) the need to address groundwater contamination problems of national concern; 3) the need to create a policy framework for guiding EPA programs; and 4) the need to strengthen regulations pertaining to groundwater.

In order to strengthen state groundwater programs, the EPA has provided states with funds to establish state strategies, to support necessary program development and planning, to create data systems, to assess legal and institutional impediments to comprehensive state management, and to develop state regulatory programs such as permitting and classification.

In order to address groundwater contamination problems of national concern, the EPA has undertaken reviews of a number of groundwater contamination sources that appear to have caused widespread problems (e.g., leaking underground storage tanks and other faulty disposal facilities). Guidelines were greatly needed for the assurance of consistency within EPA's groundwater protection programs. The strategy's framework is based on the rationale that not all groundwater is of equal value. Therefore, protection should be based on its vulnerability to contamination and its respective value. Lastly, in order to strengthen groundwater regulations, the EPA has established the office of Groundwater Protection to oversee the implementation of this strategy.

Resource Conservation and Recovery Act (1976) -- RCRA

RCRA outlines a "cradle to grave" management program for all hazardous wastes. The Hazardous Waste program establishes standards for treatment, storage, and disposal of hazardous waste; it seeks to protect groundwater as a principal point of vulnerability to contamination from hazardous wastes.

Under Subtitle C. Section 3004, the EPA must promulgate regulations establishing standards applicable to owners or operators of hazardous waste treatment, storage and disposal facilities. A "hazardous waste," under Section 1004, (5), because of its quantity, concentration, or physical, chemical, or infectious characteristics, may either (a) lead to illness or mortality or (b) "pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed." This section, by referring to protection of "human health or the environment," covers all natural resources, including groundwater.

Subtitle D (Solid Waste regulations) contains provisions ensuring that land disposal facilities present "no reasonable probability of adverse effects on health or the environment from disposal of solid waste at such a facility." These standards also address groundwater. The Act also authorizes enforcement actions to abate imminent hazards caused by solid waste or hazardous waste.

In 1980, the Environmental Protection Agency decided that the disposal of hazardous waste by underground injection in each state would be regulated under RCRA's "interim status" regulations until an approved Underground Injection Control (UIC) program had been established in that state. Thereafter, injection operations permitted under the UIC program would automatically receive a permit under RCRA.

Comprehensive Environmental Response, Compensation, and Liability Act (1980) -- CERCLA

CERCLA authorizes the EPA to respond to substantial threats posed by releases into the environment (including groundwater) of any hazardous substance, pollutant, or contaminant which may present an imminent and substantial danger to the public health and welfare. CERCLA is often called the "Superfund" law, since it created a special fund for responding to severe contamination sites.

Section 101(3) defines environment as including "navigable waters, the waters of the contiguous zone, and the ocean waters of which the natural resources are under the exclusive management authority of the United States under the Fishery Conservation and Management Act of 1976" and any other surface water, groundwater, drinking water, water supply, land surface or subsurface strata, or ambient air within the United States..."

As required by CERCLA, the EPA has published the National Oil and Hazardous Substances Contingency Plan, also called the National Contingency Plan (NCP). Officially published in July 1982, regulations in the NCP specify the procedures to be used in identifying, removing, or responding to releases of hazardous substances. The NCP provides for priority listing for response to hazardous waste sites, and for the preparation of separate response programs for each contamination site.

The National Priority List (NPL) ranks contamination sites according to degree of hazard to a human population or the environment. Sites are scored according to the Hazard Ranking System (HRS). For each site, the potential for exposure to humans via groundwater, surface water, air, direct contact, and fire and explosions is estimated. The scoring and ranking is the first step in considering a site for CERCLA funding. The NPL is revised and updated on an annual basis, although information about sites may be submitted by citizens, agencies or businesses at any time. Periodically the Michigan DNR nominates sites to the EPA for inclusion on the NPL.

Safe Drinking Water Act (1974) -- SDWA

This statute authorizes the EPA to set maximum contaminant levels and monitoring requirements for public water systems.

The Underground Injection Control (UIC) program regulates the uses of underground injection wells to protect drinking water aquifers. The SDWA states that the program regulations must contain "minimum requirements for effective programs to prevent underground injection which endangers drinking water sources." Section 1421(d)(2) specifies that the source of concern is "undergroundwater which supplies or can reasonably be expected to supply any public water system." This is further defined as a system providing piped water for human consumption, for at least 15 connections or 25 individuals.

The Sole Source Aquifer provisions allow the EPA to designate an aquifer as the sole source of drinking water for an area, guaranteeing its protection from contamination by projects receiving Federal financial assistance. Section 1424(e) of the SDWA provides local, regional, or state agencies a legal mechanism (petitioning the EPA Administrator) to protect the recharge zones of special aquifers. The EPA Administrator may designate an aquifer which is a sole or principal drinking water source if contamination "would create a significant hazard to public health." If the designation is made, no federal financial commitment may be made for any project which the Administrator determines may contaminate such an aquifer through a recharge zone so as to create a significant public health hazard.

Clean Water Act --CWA

The CWA's objective (Section 101) is to "restore and maintain the chemical, physical and biological integrity of the Nation's waters." This statute makes general reference to groundwater protection in municipal wastewater treatment, planning, and research programs. Its principal regulatory programs, however, focus on surface water.

The first part of the Act to address groundwater (Section 104) requires the EPA to "establish, equip and maintain a water quality surveillance system for the purpose of monitoring the quality of the navigable waters and groundwaters..." This section has been most often applied to surface waters, with only limited surveillance of groundwater.

The principal mechanism for achievement of the goals and objectives proposed originally by the 1972 Act is a system for imposing effluent limitations on or otherwise preventing discharges of "pollutants" into any waters of the United States from any "point source." A permit program (the National Pollutant Discharge Elimination System -- NPDES) is one element of this system (Section 402). Under the NPDES program, any person responsible for the discharge of a pollutant or pollutants into any waters of the United States from any point source must apply for and obtain a permit. The EPA has jurisdiction over all NPDES permits in a state until such time as the state elects to take over program administration and obtains EPA approval of its program. Approximately two-thirds of the states have approved NPDES programs and function as the issuing authorities for permits in their jurisdictions, including Michigan.

Toxic Substances Control Act (1976) -- TSCA

The TSCA authorizes the EPA to restrict or prohibit the manufacture, distribution, and use of products presenting an unreasonable risk of injury to public health or the environment. Section 3(5) defines "environment" to include "water, air and land and the inter-relationship which exists among and between water, air, and land and all living things". Groundwater is included in this definition.

Uranium Mill Tailings Radiation Control Act (1984)

This statute establishes health and environmental standards applicable to management of uranium mill tailings.

Atomic Energy Act (1954)

This act gives the EPA authority to establish standards applicable to materials, including radioactive materials, governed by the Act. These standards are implemented by the Nuclear Regulatory Commission.

Federal Insecticide, Fungicide, and Rodenticide Act (1971) -- FIFRA

This statute gives EPA the responsibility to control the use of pesticides. Environmental impacts, including those affecting groundwater, must be taken into consideration.

Michigan Acts pertaining to groundwater protection and regulation

Two state agencies, the Department of Public Health and the Department of Natural Resources, regulate and manage Michigan's groundwater resources. The Department of Public Health issues permits for domestic and public supply wells and requires well drillers to submit copies of their drilling records to the county health departments. This department also monitors the quality of public water supplies and tests wells for contaminants.

The Department of Natural Resources assists those who use groundwater by maintaining files of drilling records and by performing hydrogeological groundwater quality studies. The department also maps and describes geological formations and monitors mineral wells and subsurface injection of brine (USGS, 1985). The Water Resources Commission of DNR established rules for the non-degradation of groundwater quality, a permitting system for a discharge into groundwater, and monitoring requirements for existing and new discharges. The non-degradation policy of the State of Michigan calls for the protection of groundwater at its existing quality. The following are the State of Michigan statutes pertaining to groundwater, and those pertinent to the Gelman incident of contamination.

The Michigan Environmental Response Act (1982) -- MERA

MERA was established in 1982 by the State legislature to provide an objective process for evaluating sites of environmental contamination. The Groundwater Quality Division of the Michigan Department of Natural Resources has been designated by the Governor to administer the program. An annual appropriation of State funds for response activities is authorized by the MERA. Funds may be used in the case of an immediate health threat or for addressing long-term health and environmental protection. Unlike the CERCLA program, funds may be used at sites with contamination caused by gasoline and fuel products.

Known and suspected sites of contamination in Michigan are listed on the Act 307 Priority List. Sites are ranked according to the relative risk of harm the sites pose to human health and the environment. The Michigan Department of Public Health (MDPH) shares responsibility with MDNR to determine whether a hazard is being posed to human health through direct contact with waste or contaminated soils, or through a contaminated water supply system. Local health departments also play an important role in identifying sites, providing information on site conditions, and sampling private water supply wells. The sites are scored according to the Site Assessment System (SAS), a numerical scoring system which considers present and potential hazards to health and the environment, and the nature and amount of waste on the site. The SAS is used as a guide for allocating limited state funds to individual sites. Funded actions at a site can include replacing a contaminated well, supplying bottled drinking water, fencing off a site, investigating a site to better define problems, and/or providing for comprehensive cleanup.

Environmental enforcement involves notification, follow-up, and possible legal action at sites where a potentially responsible party has been identified. Such identification is always the first goal pursued by the Environmental Enforcement Division of the DNR. When a voluntary response from the identified party is not forthcoming, the Attorney General's Office may pursue legal action. MERA requires the State Attorney General to seek compensation and reimbursment of State funds from those whose actions resulted in a contamination site that required MERA funds for cleanup. The identification of responsible parties, preparation of court documents, and negotiation of cleanup agreements with responsible parties may increase the time required to complete actions at some sites. Environmental enforcement, when possible, is always the first step before the expenditure of public monies is considered. In the case of a long-term project a Citizen Information Committee (CIC) may be established as a liaison between the community and the DNR. The EPA carries out enforcement activities when federal laws have been violated. When

both federal and state statutes are involved, state and federal staff coordinate their efforts to avoid duplication.

The Michigan Water Resources Commission Act (1929) -- WRCA

The Water Resources Commission ("Commission") was established in 1929 under the WRCA. The Commission's mandate is to "protect and conserve the water resources of the state, to have control over the pollution of any waters of the state and the Great Lakes, (and) to have control over the alteration of the watercourses and the flood plains of all rivers and streams..." The Commission has the authority to regulate pollutant discharges and to prevent and abate pollution, to establish restrictions and water quality standards, to control alterations of watercourses and floodplains, to provide surveillance and monitoring programs, to prohibit pollution of any waters of the state and Great Lakes, to assure compliance with federal law and regulation, and to create and prescribe the power and duties of a commission. Finally, the Commission has the authority to provide penalties for the violation of this act.

Section 323.6(a). "It shall be unlawful for any persons directly or indirectly to discharge into the waters of the state any substance which is or may become injurious to the public health, safety or welfare; or which is or may become injurious to domestic commercial, industrial, agricultural, recreational, or other uses which are being or may be made of such waters; or which is or may become injurious to the value or utility of riparian lands; or which is or may become injurious to livestock, wild animal, birds, fish, aquatic life, or plants or the growth or propagation thereof be prevented or injuriously affected; or whereby the value of fish and game is or may be destroyed or impaired."

"Every industrial or commercial entity which discharges liquid wastes into any surface or groundwaters or underground or on the ground other than through a public sanitary sewer shall have waste treatment or control facilities under the specific supervision

and control of persons who have been certified by the commission as properly qualified to operate the facilities."

Section 323.11. "Waters of the state" include groundwater, lakes, rivers, and streams.

Section 323.6(c). "A violation of a provision of this is evidence of the existence of a public nuisance and, in addition to the remedies provided for in this act, may be abated according to law in an action brought by the attorney general."

Section 323.6(b). "Every person doing business within this state, discharging wastewater to the water of the state or to any sewer system, which contains wastes in addition to sanitary sewage shall file annually reports on forms provided by the commission setting forth the nature of the enterprise, indicating the quantities of material used in and incidential to its manufacturing processes and including by-products and waste products, which appear on a register of critical materials as compiled by the commission with the advice of an advisory committee of environmental specialists designated by the commission and the estimated annual total number of gallons of wastewater including but not limited to process and cooling water to be dicharged to the waters of the state or to any sewer system."

Section 323.7(a). "After April 15, 1973, a person shall not discharge any waste or waste effluent into the waters of this state unless he is in possession of a valid permit therefore from the commission."

Section 323.10. This section authorizes the Attorney General to bring a civil action for injunctive relief, penalties, and natural resource damages for violations of WRCA or rules promulgated thereunder.

Rule 323.1057. This rule was added to the WRCA in 1986 and governs toxic substances. "Toxic substances shall not be present in the waters of the state at levels which are or may become injurious to the public health, safety, or welfare; plant and animal

life; or the designated uses of those waters. Allowable levels of toxic substances shall be determined by the commission using appropriate scientific data."

Rule 323.1233. This rule established the critical material register in October, 1971.

Rule 323.1234. "A list of those critical materials listed on the register, including the annual amounts thereof, which are to be disposed of as waste products or by-products to the waters of the state or any sewer."

Rule 323.2101 (1973). "These rules are promulgated to implement the 1972 amendment to the commission act which authorized the initation of a waste or waste effluent discharge permit system compatible with the National Pollutant Discharge Elimination System (NPDES). The NPDES has been initiated by the Federal Congress through the enactment of "The Federal Water Pollution Control Act Amendments of 1972....." Rule 2106. "A person discharging wastes into the surface or groundwaters of the state or on the ground as a point source discharge, whether or not in compliance with an outstanding order of determination, final order of determination or stipulation with the commission, shall promptly make application for and obtain from the commission a valid national or state permit pursuant to section 7 or 8 of the commission act and according to procedures and deadlines set forth in these rules."

Rule 323.2201. This rule establishes groundwater quality standards and was added to WRCA in 1980. 1) "The purpose of the groundwater quality rules is to protect the public health and welfare and to maintain the quality of groundwaters in all usable aquifers for individual, public, industrial, and agricultural water supplies." 2) "These rules provide for the nondegradation of groundwater quality in usable aquifers, define the requirements for hydrogeological study before permitting a discharge into groundwaters, establish groundwater monitoring requirements for new and existing groundwater discharges, and establish a procedure for obtaining variances from these rules."

Michigan Environmental Protection Act (1970) -- MEPA

The Michigan Environmental Protection Act was enacted to promote resolution of environmental disputes and allow judicial review by the Attorney General of all activities likely to cause "pollution, impairment, or destruction of natural resources and the public trust therein."

Section 51. "The public health and general welfare of the people of the state are hereby declared to be matters of primary public concern. The legislature shall pass suitable laws for the protection and promotion of the public health."

Section 52. "The conservation and development of the natural resources of the state are hereby declared to be of paramount public concern in the interest of the health, safety and general welfare of the people. The legislature shall provide for the protection of the air, water and other natural resources of the state from pollution, impairment, and destruction."

MEPA imposes a duty on individuals and organizations to prevent or minimize environmental degradation. It specifically prohibits conduct that has or is likely to pollute, impair, or destroy water or other resources or the public trust.

Mineral Wells Act (1970)

"The Mineral Wells Act provides control of the drilling operation and abandoning of mineral wells to prevent surface and underground waste. This act requires a feasibility study for any underground injection well which includes an area review of dry holes, proof of an acceptable receiver reservoir, a monthly reporting system, and a full time professional staff trained in the technical aspects of injection wells."

The Hazardous Waste Management Act (1979) -- HWMA

"The HWMA is an act to protect public health and the environment, to regulate removal and disposal of hazardous waste, to provide hazardous waste facilities, to create a site approval board, to provide inspection, monitoring and manifesting of hazardous

wastes, to develop hazardous waste management plans, to regulate the siting, design, construction and operation of hazardous waste facilities, to establish trust and service trust funds, to promulgate rules, and to prescribe the powers and duties of certain state agencies."

Michigan Public Health Code (1978)--MPHC

"MPHC is a comprehensive statement of the broad legal authority of the Michigan Department of Public Health and county health departments. The code gives health agencies the power to use many different remedies to reduce and eliminate public health threats. Health agencies must respond if a determination is made that there is imminent danger to public health."

APPENDIX B: GELMAN PERMIT INFORMATION

NPDES (National Pollutant Discharge Elimination Systems):

1978 - "Gelman Sciences, Inc. was given an [NPDES] Permit by the [DNR] in 1978 to dispose of their liquid plant waste by placing it in an approved pit where the various organics would be biodegraded, at which time the fluid could then be spray irrigated onto lands owned by Gelman adjacent to the plant." [DNR memo - letter from Gordon Guyer to David Dempsey, Dec. 3, 1986].

April 2, 1982 - WQD receives Gelman's application for reissuance of their NPDES permit ("to discharge to the waters of the state"), Act 245.

757-80 Existing Fabric Coating Line:

Aug. 25, 1980 - Permit application for reissuance of Gelman's existing fabric coating line received is by AQD.

Oct. 1, 1980 - Permit application is incomplete and placed on inactive status pending receipt of additional information requested by AQD.

Nov. 10, 1980 - Gelman submits additional information for permit application.

March 3, 1981 - AQD contacts Gelman and requests additional information to complete the review of their permit application.

June 10, 1981 - Gelman and AQD Permit Unit agree on volatile organic compound limits of 18 tons per year on permit.

June 23, 1981 - Permit approved.

June 29, 1981 - Gelman submits request to operate equipment under permit.

July 6, 1981 - AQD informs Gelman of modifications and supplement to Permit to Install.

126-81 New Solution Casting Line:

Feb. 16, 1981 - Gelman submits application for a permit to install a new solution casting belt with wet scrubber control proposed to be completed by Oct. 1, 1982.

March 23, 1981 - AQD Permit Unit sends a letter to Gelman indicating that their permit application for the new solution casting line is incomplete and has been placed on inactive status pending receipt of additional information including toxicity data, final specifications for proposed control equipment, demonstration of BACT and a test procedure for 1,4-dioxane (hereafter "dioxane"), a suspected carcinogen, using the most sensitive available analytical procedures and a detection limit for the compound. In the letter an explanation is given for AQD's policy on carcinogens: i.e. that the control equipment must be capable of removing dioxane from the exhaust stream such that concentrations at the stack exit point are at a not detectable concentration using the most sensitive test procedures.

June 25, 1981 - AQD contacts EED. AQD expresses concern that the process covered by the permit for solution casting lines uses approximately 4,400 pounds of dioxane per month. EED had informed AQD that during a routine monitoring of Gelman's ponds, conducted by DNR, samples tested positive for dioxane.

Aug. 13, 1981 - AQD internal memo is generated by Jack Larsen regarding this permit. It states that dissolved oxygen (D.O.) in the treatment lagoon should not be less than 1.0 ppm.
March 12, 1982 - Permit to install for Permit 126-81 approved.

March 22, 1982 - AQD, in response to odor complaints received from Gelman's neighbors, informs Gelman that 126-81 requires that D.O. in the lagoon be not less than 2 ppm.

544-81 Installation of scrubber existing on membrane casting line:

June 25, 1981 - AQD investigates Gelman. It was determined that the existing solution casting line (pre-1967 installation) presently being run at the plant is identical to the process covered in 126-81 and is not a duplicate of process equipment covered in 757-80 for a film coating operation. The existing line uses identical process material (including dioxane) as that covered in the new permit. Up until this time DNR had been under the impression that the existing line was using the same chemicals as the coating lines (757-80) and that dioxane was not being used.

June 30, 1981 - Letter to Gelman indicates that due to the nature of air emissions from the existing casting line (i.e. dioxane), it is AQD's opinion that there have been likely permit violations and that AQD was requiring installation of appropriate air pollution equipment as approved. It is also stated that Gelman would be required to apply for appropriate air use permit (544-81) for the installation of such control equipment.

Aug. 13, 1981 - AQD receives the permit application to install a new scrubber on the existing membrane coating line at Gelman. This is the old line which is very similar to equipment covered in 126-81.

Aug. 17, 1981 - AQD internal memo regarding Gelman's "Permit to Install Scrubber on existing counting line (old line)" addresses special conditions for use. These include: "1. Maintain 2 ppm oxygen in ponds. 2. Company shall not use dioxane formulations on the 'old line' after 6-15-82 unless equipped with approved scrubber control device."

Oct. 13, 1981 - A letter to Gelman from AQD Permit Unit indicates that despite several attempts to obtain requested information, application numbers 126-81 and 544-81 remain incomplete. AQD requests that one of the following alternatives be taken to dispose of pending application: 1) submit the requested information, 2) request application to be voided, or 3) do not submit requested information such that AQD will recommend denial of all the application at November commission meeting. Gelman is informed that if no response is delivered by Oct. 23, 1981, permits will be denied.

Oct. 23, 1981 - Gelman provides AQD with the information requested on Oct. 13. Gelman notes that during a meeting with DNR officials on Sept. 15, it was agreed that, because of the time needed to hook-up dioxane removal equipment on the old line (544-81), if Gelman would hook up all dioxane production onto the new line (to become

operational May/June 1982) they would not have to install any other pollution control equipment on the old line (even though dioxane was still being used in old line).

March 12, 1982 - Permit to install for Permit 544-81 approved.

June 24, 1982 - AQD inspection yields the response: "... scrubber is installed and operating satisfactorily."

Dec. 15, 1982 - AQD contacts Gelman and Gelman states they have still not developed adequate test procedures for wastewater discharge from scrubber (which are required in their permit).

March 8, 1983 - AQD activity report states, "The 1,4-dioxane is run 1 to 2 days/month, with three days being the maximum. Currently he [Tim Gibelyou of Gelman] is getting readings of up to 300 ppm out of the scrubber exhaust. The permit limit equals about 21 ppm. He isn't sure what exactly is the problem but thinks it might be a combination of several items. Initial estimates of amounts vaporizing may be inaccurate, the scrubber may be considerably less efficient than the 95% guaranteed. He indicated that he hasn't notified the AQD of permit exceedances before because he wasn't real certain due to scanty data. But now that more GC (Gas Chromatography) data has been accumulated he can now identify distinct problems."

March 26, 1985 - AQD notifies Gelman that their Permits to Install (126-81 and 544-81) require them to develop an acceptable standard for monitoring stack emissions. AQD states that permits to operate will not be granted and lines should not be operated unless compliance with the monitoring standard can be proved. AQD promises to send information on acceptable testing procedures and asks Gelman to submit plan by May 15.

October 16, 1985 - Gelman submits proposed stack testing procedures, but cannot submit complete information because AQD failed to provide the information promised on March 26. However, it appears Gelman also missed the May 15 deadline for submitting the plan.

<u>M 00337 Groundwater discharge permit (i.e. spray irrigation):</u>

Jan. 11, 1982 - GSD indicates to AQD that Gelman should be granted a variance of the requirement for a hydrogeological study for their discharge permit (for spray irrigation), stating that "... I [B.F. Shirey, GSD] do not feel that 1,4-dioxane in any great concentrations is to be expected in groundwater offsite, and that private water supplies downgradient will not be effected by the spray irrigation at the Gelman site." GSD adds that no dioxane had been detected in surrounding waters, after over five years of spray irrigation.

April 1, 1982 - Office of Toxic Materials Control sends a memo to AQD regarding Critical Materials Discharge by Gelman. The memo indicates that Gelman requested a permit modification on Sept. 16, 1980 to their groundwater discharge (spray irrigation) permit and on the permit stated that no Critical Materials were used in the manufacturing process. However, dioxane was placed on the Critical Materials Register which became effective Oct. 1, 1980. Information from WQD files shows that samples collected in March, 1980 and June, 1981 each showed the presence of dioxane in Gelman's treatment lagoons.

Aug. 27, 1984 - Ron Kooistra, DNR district groundwater quality supervisor in Jackson, writes to the Chief of Compliance for GQD in Lansing. He recommends that a review of the Gelman permit renewal application receive "high priority," since the company was legally entitled to follow past practices until the DNR officially acted on the permit renewal application. "Bicknell's study raises questions regarding the potential impact of Gelman wastes on surface and groundwater."

Sept. 20, 1984 - A letter is sent from DNR Permits Section of the GQD, to Gelman regarding Gelman's permit application. It states that after a site visit, Ron Kooistra (GQD) found dioxane in spray irrigation discharge, which is unauthorized under the existing permit. "Therefore, the discharge is in violation of the permit and must be terminated." GQD refuses to process Gelman's application for reissuance until Gelman is in compliance with the existing permit. The matter is referred to Compliance Section for "appropriate action."

Sept. 25, 1984 - Interoffice memo from AQD to GQD states: "Jack Larsen of the AQD's Jackson district office has asked the Technical Services Section and Permit Section to comment on the potential emission of dioxane by Gelman, through the spray irrigation of process waste containing this chemical. Greg Edwards of the Permit Section has evaluated the potential for dioxane to be emitted into the air through this process. Based on his evaluation, Edwards stated the following: essentially no volatilization of this compound is expected to occur under these conditions. Therefore, from an air quality standpoint, spray irrigation of dioxane-contaminated process waste is not expected to be a problem. There is a concern from a total environmental standpoint, however, since dioxane has been shown to be carcinogenic in laboratory animals, and therefore has the potential to cause cancer in humans. Since dioxane is not expected to volatilize during spray irrigation, contamination of the groundwater with this carcinogenic chemical may occur from treatment in this manner."

Oct. 12, 1984 - A letter from Gelman's law firm (Honigman, Miller, Schwartz and Cohn) to Kooistra states that Gelman understands that "Permit M 00337 continues in full force and effect during the period of time that its reissuance application is pending with MDNR." Reference is made to a letter from Weston (DNR) - it is claimed that the letter does not indicate that Gelman must cease any of its present discharge practices (including spray irrigation). Gelman intends to continue to spray irrigate.

Oct. 15, 1984 - Ron Kooistra sends a letter to Jim Marshall (Vice President of Gelman) with the discharge permit application. Gelman must submit the completed application including a complete waste characterization report, an updated hydrogeological study, and irrigation site soil tests and monitoring well data to determine impacts from past irrigation. There is a reminder that the permit does not authorize discharge of dioxane - this must be terminated. Gelman may or may not receive the discharge permit pending results of their application. Seven suggestions were made: 1) The revisions and specifications for the proposed liner replacement for pond No. 2 were not included and need to be sent. An analysis is requested as to why the existing liner failed after only approximately10 years and how new liner will be more durable. What seepage and impacts on the ground and groundwater have occurred due to failed liner? Would a leak detection system be feasible such as between the old and new liner? 2) A storage permit may be needed for the buried, 12,000 gallon steel storage tank located between ponds 2 and 3. Gelman's discharge permit renewal application should include this tank. What is the function of the tank? 3) Provisions must be made for proper removal, handling and disposal of accumulated sludge (potentially hazardous) from Pond 3 prior to placement of new liner. 4) Overflow pipes from garage piping chamber would allow raw or partially treated process wastewater to flow to ponds 1 and/or 2 (unlined earthen pits). Why are these overflows necessary? 5)

The irrigation area must be fenced off and an isolation zone should be shown which prevents aerosol drift from irrigation equipment from reaching areas occupied or frequented by people.

Nov. 5, 1984 - Gelman responds to DNR's Oct. 15 correspondence: 1) The proposed replacement liner is of same material as original liner. The only difference is that the new one will not only line sides of lagoon (as original did), but bottom also. 2) "Buried 12,000 gallon steel tank" to which DNR referred has never existed. 3) Sludge from Pond 3 has been analyzed and is non-hazardous. 4) Overflow pipes are no longer necessary since deep well is fully operational. 5) "We are currently determining if a problem of unauthorized access to the spray irrigation area exists, and what our options may be. Our course of action depends on many factors, including the status of the spray irrigation permit renewal."

March 4, 1985 - Gelman submits results from a test for base, neutral, and acid extraction analyses in conjunction with their permit application.

Sept. 4, 1986 - A letter is sent from GQD to Gelman. "It is our understanding from our Jackson District Staff that your facility will not require a discharge permit because all discharges from the site will either be to the Ann Arbor Sewer System or to deep well injection." Gelman should request a withdrawal of their groundwater discharge permit application and a termination of their current groundwater discharge permit.

Storage permit for lagoon and chemical storage:

Sept. 4, 1986 - A memo is sent from GQD to Gelman stating, "Due to the lagoon and the on-site chemical storage our district staff indicates you will need a storage permit under Act 245, P.A. 1929, as amended."

Additional notes on permits:

Sept. 15, 1981 - At a meeting with several Gelman representatives and representatives from AQD District Office and Permit Unit, the following is discussed: AQD's requirement of the additional information on permits 126-81 and 544-81 in the immediate future in order to evaluate for approval/denial; the need for a firm commitment from Gelman on air pollution control equipment and their ability to meet BACT limits; stack testing and risk assessment considerations; and the fact that Gelman is presently running dioxane on their old line uncontrolled and that AQD would make some decision on whether Gelman would be allowed to continue this until air pollution control equipment was installed. The proposed date for completion of the new line with applicable air pollution control equipment is indicated to be approximately 12 months. Gelman requests permission to build only one scrubber instead of two and to continue running dioxane on their old line until the new line is installed with adequate control equipment. At that time, Gelman would run all dioxane-containing products on the new line. AQD recommends that they control the existing line immediately and run dioxane products only on that line.

Oct. 15, 1981 - Laura Lodisio (AQD) provides a 0historical summary of AQD concerns relating to Gelman. As of Oct. '81, Gelman operated two production lines, a fabric coating line and a membrane casting belt. The existing fabric coating line is covered by approved Permit 757-80. This line has been in operation for approximately two years and does not use dioxane. The membrane casting belt units (one existing, one proposed) are covered by two un-approved permits: 544-81 for the existing line, and 126-81 for an identical line to

be completed by the fall of 1982. A wide variety of solvents are used in these lines, including approximately 4,400 pounds per month of dioxane. Gelman has an approved groundwater discharge permit (spray irrigation - not NPDES permit) from the MWRC. "Our correspondence with the WQD, however, has indicated that they feel the system is in compliance with their regulations and special conditions of their permit. WQD does not appear willing to take action against the company regarding excessive odors. The discharge permit has minimal monitoring requirements but no discharge limits." The report goes on to state that AQD's main concern is with "the two existing lines (757-80 and 544-81) [which] are presently running uncontrolled. The company has proposed air pollution control equipment on the new line (126-81). Though the company has made no firm commitment on what exactly this control will be, it is required that it be BACT and capable of meeting either nondetectable or specified emission limits set by risk assessment evaluation, due to dioxane emissions."

APPENDIX C: GLOSSARY OF ABBREVIATIONS

Abbreviation	Complete name
AQD	Air Quality Division (of the MDNR)
BACT	Best Available Control Technology
CAL	Canton Analytical Labs
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIC	Citizen Information Committee
CMR	Critical Materials Register
CWA	Clean Water Act
DNA	Deoxyribonucleic Acid
DNR	Department of Natural Resources
EED	Environmental Enforcement Divison (of the MDNR)
EPA	Environmental Protection Agency
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
GC	Gas Chromatography
GQD	Groundwater Quality Division (of the MDNR)
GSD	Geological Survey Division (of the MDNR)
HEAA	beta-hydroxyethoxcyacetic acid
HWMA	Hazardous Waste Management Act
KG	Kilogram
MAPCC	Michigan Air Pollution Control Commission
(M)DNR	(Michigan) Department of Natural Resources
MDPH	Michigan Department of Public Health
MEPA	Michigan Environmental Protection Act
MERA	Michigan Environmental Response Act
MERB	Michigan Environmental Review Board
MG	Milligram
MPHC	Michigan Public Health Code
MWRC	Michigan Water Resources Commission
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List

OSEH	Occupation Safety and Environmental Health
OTA	Office of Technology Assessment
PEAS	Pollution Emergency Alerting System
ppb	parts-per-billion
ppm	parts-per-million
ppt	parts-per-trillion
RCRA	Resource Conservation and Recovery Act
Rfd	Reference Dose
RRD	Resource Recovery Division (of the MDNR)
SAS	Site Assessment System
SAU	Site Assessment Unit (of the MDNR)
SDWA	Safe Drinking Water Act
SNR	School of Natural Resources
SPH	School of Public Health
TSCA	Toxic Substances Control Act
TSCC	Toxic Substance Control Commission
U-M	University of Michigan
UIC	Underground Injection Control Program
(U.S.)EPA	(United States) Environmental Protection Agency
WCDH	Washtenaw County Department of Health
WCMPC	Washtenaw County Metropolitan Planning Commission
WQD	Water Quality Divison (of the MDNR)
WRCA	Water Resources Commission Act

APPENDIX D: Interview with James C. Marshall Senior Vice President of Operations, Gelman Sciences, Inc. 2/5/1988

Dates amended, 3/4/1988, 4/22/1988, and 4/26/1988.

Is Gelman Sciences, Inc. responsible for the contamination of the groundwater?

"A lot of people are responsible." There is a the need to define the term responsible. Those responsible include Dow, DNR, state agencies, and possibly Gelman Sciences, Inc (Gelman).

History

In 1963 Gelman Sciences, Inc. established a membrane casting plant. Gelman Sciences used solvents in the process of casting membranes. The waste flow at the time consisted of approximately 2,000 gallons per day. This water contained fragments of membranes and was released into a ditch on Gelman's property (a tributary of Honey Creek). Gelman realized that this was an unacceptable practice because the stream banks were becoming lined with the white membrane fragments.

Gelman hired Professor Borchardt from the Engineering Department within the University of Michigan to develop a new method for disposing of Gelman's waste. Dr. Borchardt developed a microbiological digestive process which the company then used for approx. 10 years. Two lagoons were built to contain the waste. Sewage sludge from the Ann Arbor Waste Water Treatment Plant was added to the ponds to encourage microbial action and the breakdown of "biodegradable" organic compounds. The waste would seep into the ground after microbial action had begun. The DNR was working with Gelman throughout this process and approved of seepage as an acceptable practice. Seepage was suggested by governmental agencies as the preferred method. These ponds would periodically overflow into the bog north of Gelman's lagoon. We had been working with the DNR on BOD and COD so the DNR was inspecting the site regularly and never said anything." It was very difficult for them to manage the microbial balance necessary to make the ponds efficient. Occasionally the lagoons would become anaerobic and microbes within the ponds would die off. More sludge would then be required to reactivate the ponds. Occasionally the covers on the ponds would rip. At these times odors from the ponds would create problems. in the surrounding neighborhoods. DNR, during this

period, complained about Gelman not getting the BOD and COD levels to those suggested by the state. Gelman first started using 1,4-dioxane in the production of filters in 1966.

When seepage became an unacceptable practice in 1972, a new lined lagoon was added. The intent of the third lagoon was to develop a recycling system. This system did not work so in 1976 Gelman obtained permits to spray irrigate. The permits allowed Gelman to apply waste at a rate of .23 gallons per square foot per day and only between the dates of May 15 and October 1. The waste water was pre-treated in lagoons and then spray irrigated. The waste stream at this time consisted of around 30,000 gal per day. The waste stream has remained at approximately 20,000-40,000 gallons a day for the past fifteen years. This practice required Gelman to buy more land in order to treat the waste stream because Gelman's original land was needed for building expansion and parking lots. (The result was an increase in the properties at the Ann Arbor site to an area of approximately 55 acres.) It became very expensive to cut the grass twice a week (the grass grew quickly as a result of spray irrigation) and to purchase the land needed to spray the pre-treated water on.

In 1981, deep well injection became the preferred method of disposal and Gelman obtained a permit for the well. The well was completed in 1981 and injection began. Spray irrigation was slowly phased out, in part because the lagoons needed to be drained. In 1984 spray irrigation ceased. In 1986, Gelman stopped the use of 1,4-dioxane because they learned that it is was not biodegradable and it was responsible for the high BOD and COD. Gelman phased out the line of filters that required the use of 1,4-dioxane in production and replaced this line with a new and improved filter. Dow had never informed Gelman that 1,4-dioxane was not biodegradable and that it was considered a carcinogen at extremely high doses. Gelman does not manufacture chemicals and presently uses only "common" chemicals that are biodegradable.

In the summer of 1987, Gelman hooked up its waste stream to the city of Ann Arbor's waste water treatment plant. Because of the high levels of both BOD and COD, Gelman is forced to pay a surcharge to the city of Ann Arbor. The connection with the city treatment plant was set up in conjunction with an engineering group. The waste flow was built so that it ran parallel to the city waste stream. This arrangement allowed comparisons to be performed between Gelman's waste stream and Ann Arbor's. It was found that waste from Gelman did break down completely within a matter of hours. In the future, Gelman may be required by the city to do pre-treatment in order to bring COD and BOD levels to acceptable levels. This would be at considerable expense to Gelman.

How do you explain Gelman's rating on the 307 list?

"The original E rating previous to the 307 list was a result of odor problems caused by the lagoons." The DNR became aware of the odor problem from citizen complaints.

Gelman hired outside consultants to drill monitoring wells to confirm allegations by Dan Bicknell that Gelman was polluting the groundwater and Third Sister Lake (January of 1984). Tests did not indicate the presence of 1,4-dioxane and were submitted to the DNR. A memo that Gelman received from Elmore E. Eltzroth of the DNR stated that no detectable levels of 1,4-dioxane were found in tests conducted at a 25 ppb detection level (Feb. 6, 1984). Gene Hall, from the DNR, continually informed Gelman that no contamination could be found (Oct.- Nov). The County Health Department also monitored testing wells and citizen wells for contamination throughout 1984-1986 period and found no detectable levels of 1,4-dioxane.

In January of 1986 the Redskin well was found to have 1,4-dioxane at levels of 150ppm (See outline provided for further summary of events).

How did GELMAN respond to the Bicknell report?

Dan Bicknell, who was a U/M SPH student, reported in January of 1984 that he detected levels of 1,4-dioxane, among other chemicals, in Third Sister Lake. He wrote a report accusing Gelman of contaminating the lake. Gelman found the report to contain questionable language. The report contained no validation of the techniques used for testing and also indicated the presence of a number of chemicals not used by Gelman. Gelman believes that the report was politically motivated because Bicknell was, at the time, running for the position of Drain Commissioner.

What new technology has Gelman developed to treat the contaminated groundwater?

The DNR is concerned that the new technology developed by Gelman to treat dioxane will not work. According to Gelman, extensive studies have been submitted to the DNR. However, they insist that they still do not have enough information. Gelman, on the other hand, insists that they have provided more than enough information. Gelman investigated a number of other technologies to break down dioxane, including ozone treatment, steam stripping, ultraviolet treatment, freezing, carbon treatment and burning. ""We have not written a thesis on each of these technologies, we are not in the writing

business." The DNR has not received our experimental design and we are not going to write it up for them. The DNR has received all of our results from these various tests.

Gelman developed a group to work cooperatively and share information with DNR and the Health Department. Gelman has provided assistance to another company in North Carolina with a similar problem. "We are the experts on 1,4-dioxane treatment technology, and we have been developing the technology to break it down." It is important to note that the technology for treating dioxane did not exist previous to this case and there is presently no established method for removing the contamination from the environment.

Costs to Gelman

- High costs in terms of dollars, time, and research.
- Created a poor public image.
- Costs and time required for litigation
- Employee distractions
- Customer anxieties (Gelman is often the sole source of a product for a customer.)

How do you view the role of the media in this case?

"We have found the media to be irresponsible in their approach to reporting." The articles written about the incident have been "full of partial truths." Information and quotes have been used out of context. A partial truth is that 1,4-dioxane is a carcinogen. The truth is that 1,4-dioxane is a carcinogen at very high levels in laboratory animals, at the 1% level. Another partial truth occurred in the Detroit Free Press article of September 6, 1984, where they showed a picture of Third Sister Lake with a sign that read, please no swimming or fishing. However, the sign had been there long before the contamination in the groundwater was discovered. The various newspapers and television stations have not been reporting the efforts that Gelman has made to work toward a solution. The media has often used third-hand information, such as the article that claimed that Gelman had an informant in Lansing who informed them of plant inspections ahead of time. Channel 7 News arrived one day and interviewed people in the surrounding community but never talked to Gelman representatives -- we were ready to talk with them but never got the opportunity. Instead, Channel 7 filmed Fran Coy's beauty shop business and showed film clips of her customers. She had requested that her customers' faces not be shown. It is important to note that her well was not one of those that was contaminated. It is important to note that Gelman has been making considerable progress toward the resolution of this problem, which is never included in the press' reports.

Why did you contract Dr. Hartung to compile a risk assessment for 1,4-dioxane?

According to the State Health Department and Dr. Sidu, 2 ppb of 1,4-dioxane is the health advisory set by the state for safe drinking water. This advisory is based on a model for one additional case of cancer in one million people, if each person drinks three liters a day for 70 years. The state guideline for body contact is 100 ppb. Gelman feels that there are no problems associated with 1,4-dioxane at the levels present in the environment . "We (Gelman) would normally choose the low range of a risk assessment if it is based on the correct model, and the state model is not an acceptable model. There are acceptable risks. We take risks every day--when we drive in our cars, when we breath the air..." We feel that the levels should be based upon a correct model. The advisories could be 3 ppm for drinking water, according to the Hartung risk assessment.

How would your describe your relationship with the DNR and are they partially responsible?

"Everyone is involved when it comes to responsibility. We were working cooperatively to develop answers to the questions. We were working scientifically to determine the extent of the problem, and to develop technologies for solving the problem. However, when the process departed from the realm of science, it became a game of politics and bureaucracy...it became uncontrollable and unpredictable." We blame the State for the way they have been handling themselves as professionals, and for their scientific information.

We submitted the third remedial action program this week. The DNR is claiming that it is incomplete. "We have removed effectively 4,000 lbs of 1,4-dioxane. The level of 1,4-dioxane in the Redskin well has been reduced from 200 ppm to 60 ppm . We have taken over 1200 samples. We have talked face to face with over 300 people. We have developed the technology to clean up 1,4-dioxane at our initiative and expense." The DNR should "take credit for this progress in a proper manner" and should present a mood of cooperation "rather then playing an adversarial role. I don't believe that you will find a company that deliberately contaminates the environment. Things happen that you don't know about and you have to accept that." Accidents are bound to happen, but in general, no industry wishes to pollute or degrade the environment.

"We will never be a hero," yet we would like to be treated in a responsible manner by the DNR and the media. The news media has scared people in the surrounding area.

Many residents do feel that we have done a good job and sympathize with us. "There is no evidence of any damage done whatsoever."

A Gelman employee notified Washtenaw County Health Department of a dump located on Gelman property and the practice of burning wastes in the dump (November 1979). How do you explain this incident?

"Gelman uses mixing vessels for mixing various compounds. On occasion, a batch of compounds has been incorrectly mixed. The standard practice for this situation was to dump the vessels' contents into a pit dug into a clay base. The residue would then be burned. We did not feel that this practice was improper. We did not have a permit and did not think we needed one. The DNR site inspectors had walked by it 100 times and had never said anything. Therefore, Gelman thought that the practice was acceptable."

DNR Environmental Enforcement Division observed the Gelman Property and noted that "the pond at the Northwest corner of the Gelman property had a pump which was running, sitting on the Southwest bank, with one hose running into the almost entirely drained pond water, and the other end running up onto the west bank and toward the Northwest property line, the line terminating approximately 15 feet from the fenceline at the NW corner of the pond. The natural ditch in that bank was leading the water towards the fenceline and appeared to be made specifically to let water through the fence." How do you explain this incident?

"The pond was built by Gelman to hold runoff water from our parking lots." The pond consisted of runoff water from the parking lot and back-flush water from our water softeners. "There was no processing water in the pond." It was our "nature pond with turtles in it." We put a pipe in the dam and drained the overflow water into Bicknell Creek.

What are your reasons for suing the DNR?

"There are two issues here: the first is the refusal by the DNR to give a proper evaluation." There is a great deal that the DNR doesn't know. They need to work more closely with industry. Gelman gave the DNR suggestions on the rating system but the DNR did not listen to these suggestions. They refused to talk with Gelman about the

system. "Gelman feels that industry should be able to sit down with DNR and see that the process is done fairly. They refuse to consider progress being made at this site." In justifying Gelman's ranking on the 307 list they claim that "Gelman is a chemical and rubber manufacturing company," that gives Gelman 40 points. "Gelman is not a chemical and rubber manufacturing company." The DNR did not follow its own rules for the list. There is a mathematical mistake in the ranking and there are areas where it is subjective. Evaporation of 1,4-dioxane from water is not a linear relationship but the DNR claims that it is. "People are not at risk." The second major issue Gelman has with the ranking system is that "the DNR has never promulgated rules and regulations for the system." You cannot have a system without rules and regulations. The system is not approved as a part of the legislature.

How would you evaluate the process for dealing with the contamination and your response to the contamination?

Gelman paid for bottled water. We paid for the hookup of City water lines to the houses of affected residents. There have been many hidden agendas and the process of working toward a solution has become political. We cannot reach solutions being reactive, instead the process must be pro-active. "I don't believe that any company would intentionally endanger people or the environment." Chloroform which is used to help purify drinking water is ten times more toxic than 1,4-dioxane. The national average for chloroform in drinking water is 83 ppb which is 40 times that which was suggested for 1,4-dioxane. State and federal agencies need to work with companies and permit their activities. They need to demonstrate alternatives, the technology is there. We do everything possible to protect our workers. We looked up information that was known about the chemicals that we were using. "1,4-dioxane is not a toxic substance. We believe that Dow knew that 1,4-dioxane would not break down." Dow also claims to have stewards who visit companies that use their chemicals. Stewards check to see if the chemicals are being handled properly. "We have never seen a Dow Chemical Steward. We probably would not have used dioxane if we had known."

The total thrust of DNR needs changing. "The technical expertise is often zero as a result of constantly changing staff." We have, on occasions, had to train and educate DNR people here. We need an agency that works with industry. "We have been forced to rely on our own experts." Hartung developed the risk assessment for us. He sent it to six world scientists for review. It was then sent to the EPA and to the State. It has been four months now and we have received no feedback. These cases must be dealt with on an

individual case level. "The only way to develop sympathy for what we have been through is to go through it yourself."

Deep Well Injection

The first permit for the deep well from the DNR allowed Gelman to inject "processing and non-processing water." Almost any material could have been injected except for materials like radioactive substances, PCB's, etc.

On our new permit we made the mistake of stating that the well would be used for "the injection of our processing water." This was a mistake because now we can no longer inject purged water from the Redskin well.

"The deep well is not a long-term solution but for the short-term it is perfectly acceptable." What we need for the future is "total destruction of compounds or recycling." Businesses should be forced to use recyclable materials or materials that are totally destructible. "What we need is a program to work with companies toward that end." The government needs to assume a proactive role and "stop it before it gets out there." Remedial action and a"strong arm approach is not doing anybody any good." "The State should require permits for every single activity and work with the people." State resources should be transferred from a reactive approach (remedial action) to a proactive approach.

Login (https://www.piperpartners.com/login)

(tel:+17348459700) (mailto:andy@piperpartners.com)

piperpartners.com
local, trusted, connected

(https://www.piperpartners.com)

Search Home Listings

Westover Hills

Subscribe to this Neighborhood

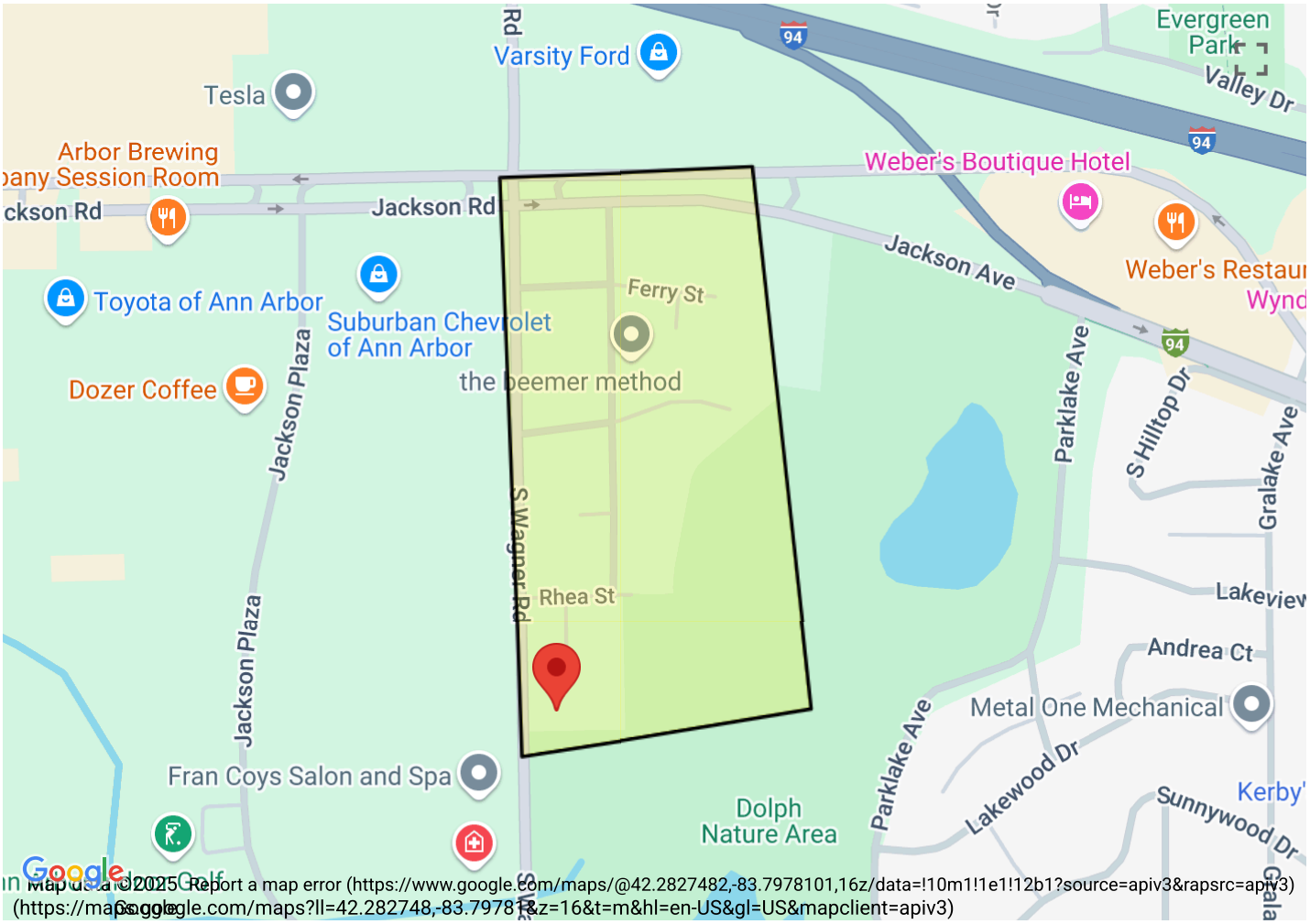
Westover Hills subdivision in Ann Arbor borders Dolph Park, First and Second Sister Lakes. The homes were built between 1928-2004 o ering 2-Story and Bi-level styles with 1535-3856 square feet oor plans, 2-4 bedrooms, 1-3 baths, most have full basements, and 1-2/2 car garages.

Westover Hills is located in western Ann Arbor o S. Wagner Road, south of

Jackson Road.

Students attend Ann Arbor Schools: Lakewood Elementary, Forsythe Middle, Pioneer High and Skyline High School

1 Available Listing In Westover Hills



Westover Hills Market Update

Active Statistics

Active Listings	1
Avg. Listing Price	$375,000
Avg. Days on Market	226

Sold Statistics

Total Sold	1
Avg. Sold Price	$145,000
Avg. Sold Price per sq.ft.	$123
Avg. Sold Days on Market	241

All statistics are based on the last 12 months

Westover Hills Property Listings

Newest Single Family Homes | **Sold Listings**

ACTIVE

$375,000 **More Info**

(https://www.piperpartners.com/property/359-s-wagner-road-ann-arbor-mi-48103/)
3 bed, 2. bath, 1,496 sqft
359 S Wagner Road, Ann Arbor

Search All Ann Arbor Homes for Sale ❯ (/search/?mls_city=ann-arbor)

View All Ann Arbor Neighborhoods ❯ (/areas/ann-arbor/neighborhoods)

Request More Information

First Name *(Required)*

Last Name *(Required)*

Email *(Required)*

Phone *(Required)*

Comments/Questions

I agree to receive marketing, customer service calls and text messages from piperpartners.com. Consent is not a condition of purchase. Msg/data rates may apply. Reply STOP to unsubscribe. Privacy Policy (https://www.piperpartners.com/privacy-policy/) & Terms of Service (https://www.piperpartners.com/terms-of-service/).

SUBMIT

Testimonials

We enjoyed all of our interactions with Andy, and in particular felt that closing was unbelievably smooth. He knew what had to be done, arranged everything so that we had only to approve, accept and be there when necessary. -Bonnie and Michael Fauman
Read More Testimonials (https://www.piperpartners.com/sellers/seller-testimonials/)

Recently Viewed Neighborhoods



(https://www.piperpartners.com/areas/ann-arbor/neighborhoods/the-evergreens/)

Ann Arbor
The Evergreens
(https://www.piperpartners.com/areas/ann-arbor/neighborhoods/the-evergreens/)
0 active, 3 sold



(https://www.piperpartners.com/areas/ann-arbor/neighborhoods/westover-hills/)

Ann Arbor
Westover Hills (https://www.piperpartners.com/areas/ann-arbor/neighborhoods/westover-hills/)
1 active, 1 sold

Contact Us

Piper Partners

912 N Main
Ann Arbor, Michigan 48103

Phone: 734-845-9700 (tel:7348459700)
Email: andy@piperpartners.com (mailto: andy@piperpartners.com)

Our Mission

We improve lives by delivering 5-star real estate service with the highest levels of competence, trust, and integrity. We are known as connected, compassionate, and giving leaders in the communities we serve.

Our Team

The Piper Partners Real Estate Team in Ann Arbor is one of the top-ranking teams in Southeast Michigan. Piper Partners serves Washtenaw, West-Wayne, Livingston, and parts of Oakland counties, including the cities of Ann Arbor, Brighton, Canton, Chelsea, Dexter, Milan, Northville, Plymouth, Saline, South Lyon, and Ypsilanti.

© Piper Partners 2025

Privacy Policy (https://www.piperpartners.com/privacy-policy/)
Terms of Service (https://www.piperpartners.com/terms-of-service/)

Sign In

City Home City Clerk Home Legislation Calendar City Council Boards and Commissions
People Watch Live Public Meetings

RSS Alerts

Details Reports

File #:	07-1023 Version: 1	Name:	1991-10-21 Council Minutes
Type:	Minutes	Status:	Filed
File created:	10/21/1991	In control:	City Council
On agenda:	10/21/1991	Final action:	10/21/1991
Enactment date:		Enactment #:	
Title:	REGULAR SESSION - OCTOBER 21, 1991		

History (1) Text

Title
REGULAR SESSION - OCTOBER 21, 1991
Body
Council - October 21, 1991 1

The regular session of the Ann Arbor City Council was called to order at 7:35 p.m. by Mayor Elizabeth S. Brater.
Council stood for a moment of silence.
Mayor Brater led the Pledge of Allegiance.
ROLL CALL OF COUNCIL
Present: Councilmembers Larry Hunter, Ann Marie Coleman, Ingrid Sheldon, Kirk Dodge, Robert Grady, Nelson Meade, Kurt Zimmer, Mark Ouimet, Thais Anne Peterson, Robert Eckstein, Mayor Elizabeth S. Brater, 11
Absent: 0
INTRODUCTIONS
PRESENTATION OF UNITED NATIONS DAY PROCLAMATION BY MAYOR BRATER
Mayor Brater presented a proclamation declaring October 24 as United Nations Day to June Reston, president of the Huron Valley Chapter of the United Nations Association of the United States, and Toni Gonzalez, vice president. This is the 46th year of the United Nations.
ANN ARBOR SUMMER FESTIVAL PRESENTATION BY SUSAN POLLAY, RUTH WHITAKER AND EMMY HARRIS
Ann Arbor Summer Festival, Inc. representatives Susan Pollay, Ruth Whitaker president of the Board of Trustees, and Amy Harris, Development person of the Festival, all presented a report on activities of this year's Festival. City funds are used to sponsor free programs at the "Top of the Park."
AUDIENCE PARTICIPATION - RESERVED TIME
MATT COMMERS - NOISE ORDINANCE
Matt Commers, 619 E. University, representing the Inter-Fraternity Council, said that initially recommendation to this body from the Noisy Party Task Force was a jail sentence
2 Council - October 21, 1991
for a third violation. He said that a compromise was reached to recommend community service instead.
LEO SIMON - DOMESTIC PARTNERSHIP ORDINANCE
Leo Simon, 2760 Holyoke, submitted a written statement which was filed with the City

Clerk. He spoke against the proposed Domestic Partnership Ordinance. He said that the wording was ambiguous and that the ordinance distorts the true meaning of family. He said that its enactment will not provide appropriate public recognition, but rather, public indignation.

TOM NASH - DOMESTIC PARTNERSHIP ORDINANCE

Tom Nash, 2435 Traver, opposed the proposed Domestic Partnership Ordinance. He cited many instances where the ordinance may contribute to unacceptable behavior. He expressed the opinion that the ordinance could lead to serious social consequences, damage and death.

PAUL REIMANN - DOMESTIC PARTNERSHIP ORDINANCE

Paul Reimann, 1167 Pomona, said that approval of the Domestic Partnership Ordinance would encourage the wrong types of moral behavior. He said that straight people are being imposed upon as a result of recent judicial rulings, and that consciences are being conditioned to think that a lesbian or gay lifestyle is acceptable.

BRENDON QUILTER - DOMESTIC PARTNERSHIP ORDINANCE

Brendon Quilter, 459 Skydale, said that he is against the Domestic Partnership Ordinance. He said that laws against practices outlined in the ordinance are still on the books. He asked Council to examine all ramifications.

CHARLES GRAHAM - DOMESTIC PARTNERSHIP ORDINANCE

Charles Graham, 1800 Hanover, expressed concern over the impact the Domestic Partnership Ordinance would have on the community, particularly children from nonmarried heterosexual relationships, its impact on the City's budget and on health care systems.

Council - October 21, 1991 3

PUBLIC HEARINGS

CHO LAND DIVISION

A public hearing was conducted on the Cho Land Division, 0.43 acre, 3190 Lorraine Street.

There being on one to speak at this public hearing the Chair declared the hearing closed.

DAY PROPERTY REZONING

A public hearing was conducted on the proposed Amendment to Chapter 55, the rezoning of 0.19 acre from TWP (Township District) to R1C (Single-Family Dwelling District), Day Property, 350 Rose Drive (Ordinance No. 51-91)

There being on one to speak at this public hearing, the Chair declared the hearing closed.

GRAMMATICO PROPERTY REZONING

A public hearing was conducted on the proposed Amendment to Chapter 55, the rezoning of 0.48 acre from TWP (Township District) to R1B (Single-Family Dwelling District), Grammatico Property, 1605 North Maple Road (Ordinance No. 52-91)

There being on one to speak at this public hearing, the Chair declared the hearing closed.

HAMMOND PROPERTY REZONING

A public hearing was conducted on the proposed Amendment to Chapter 55, the rezoning of 0.41 acre from TWP (Township District) to R1C (Single-Family Dwelling District), Hammond Property, 426 Rose Drive (Ordinance No. 53-91)

There being on one to speak at this public hearing, the Chair declared the hearing closed.

4 Council - October 21, 1991

HUIZINGA PROPERTY REZONING

A public hearing was conducted on the proposed Amendment to Chapter 55, the rezoning of 0.17 acre from TWP (Township District) to R1C (Single-Family Dwelling District), Huizinga Property, northwest corner of Robert and Victoria Avenue (Ordinance No. 54-91)

There being on one to speak at this public hearing, the Chair declared the hearing closed.

KAPP PROPERTY REZONING

A public hearing was conducted on the proposed Amendment to Chapter 55, the rezoning of 0.39 acre from TWP (Township District) to R1C (Single-Family Dwelling District), Kapp Property, 330 Rose Drive (Ordinance No. 55-91).

There being on one to speak at this public hearing, the Chair declared the hearing closed.

MCGEE PROPERTY REZONING

A public hearing was conducted on the proposed Amendment to Chapter 55, the rezoning of 0.53 acre from TWP (Township District) to R1C (Single-Family Dwelling District), McGee Property, 3270 Valley Drive (Ordinance No. 56-91).

There being no one to speak at this public hearing, the Chair declared the hearing closed.

SINDLINGER PROPERTY REZONING

A public hearing was conducted on the proposed Amendment to Chapter 55, the rezoning of 0.25 acre from TWP (Township District) to R1C (Single-Family Dwelling District), Sindlinger Property, 390 Glenwood (Ordinance No. 57-91).

There being no one to speak at this public hearing, the Chair declared the hearing closed.

Council - October 21, 1991 5

SPRIK PROPERTY REZONING
A public hearing was conducted on the proposed Amendment to Chapter 55, the rezoning of 0.20 acre from TWP (Township District), to R1C (Single-Family Dwelling District), Sprik Property, 3245 Kingwood (Ordinance No. 58-91).
There being no one to speak at this public hearing, the Chair declared the hearing closed.
WILLIAM AND FIRST PARKING RATES
A public hearing was conducted on the proposed William and First Parking Lot Rates - $40.00 per month.
There being no one to speak at this public hearing, the Chair declared the hearing closed.
APPROVAL OF AGENDA
Councilmember Coleman moved that the agenda be approved with the following changes:
ORDINANCES - SECOND READING
Delete: Ordinance Adding new Chapter 110 - Domestic Partnerships (Ordinance No. 62-91) - Public hearing and second reading scheduled for November 4, 1991
MOTIONS AND RESOLUTIONS
Revised: Resolution Supporting Cooperation Between the City of Ann Arbor and Washtenaw County to Reduce Duplication of Governmental Services
Communication: Communication from Gary Hillman, president of The 3rd Coast, Inc., regarding the Class C Resort liquor license transfer to 613-615 E. William Street.
Delete: Resolution to Approve Library Block Study
Delete: Resolution Regarding Domestic Partnership Benefits (Councilmember Coleman)
Add: Resolution Regarding Michigan Senate Bill #522 (Councilmember Eckstein)
6 Council - October 21, 1991
COMMUNICATIONS FROM THE MAYOR
Revised: Appointments
COMMUNICATIONS FROM THE CITY ADMINISTRATOR
Add: Availability of Quarterly Report on Line-item Budget Transfers
Add: City of Ann Arbor 1990-1991 Annual Report
On a voice vote, the Chair declared the motion carried.
APPROVAL OF COUNCIL MINUTES
MINUTES APPROVED AS PRESENTED
Councilmember Eckstein moved that the special session minutes of September 30, 1991 and regular session minutes of October 7, 1991 be approved as presented.
On a voice vote, the Chair declared the motion carried.
CONSENT AGENDA
CONSENT AGENDA APPROVED
The following Consent Agenda was approved:
R-600-10-91 APPROVED
RESOLUTION TO APPROVE BATES ANNEXATION
A communication was received from the City Planning Commission transmitting its recommendation of approval (8 yeas and 0 nays) of the Bates Annexation, 0.44 acre, 303 Glenwood.
Whereas, The territory hereinafter described is located in the township of Scio and is adjacent to the corporate limits of the City of Ann Arbor;
Whereas, Richard and Bona Jean Bates are the owners of the
Council - October 21, 1991 7
property; and
Whereas, It is the desire of Richard and Bona Jean Bates to annex said territory to the City of Ann Arbor, pursuant to the provisions of Act 279 of the Public Acts of the State of Michigan for the year 1909, as amended;
RESOLVED, That the following described lands and premises situated and being in the Township of Scio, Washtenaw County, Michigan, be detached from said Township of Scio and annexed to the City of Ann Arbor, to-wit:
Lots 24 and 26 of The Evergreens, Scio Township, Washtenaw County.
****
R-601-10-91 APPROVED
RESOLUTION TO APPROVE CHO LAND DIVISION

A communication was received from the City Planning Commission transmitting its recommendation of approval (6 yeas and 0 nays) of the Cho Land Division, 0.43 acre, 3190 Lorraine Street.
Whereas, Kyung H. Cho has requested approval of the division of the existing parcel at 2190 Lorraine Street into two separate parcels; and
Whereas, The Ann Arbor City Planning Commission, at its meeting of September 10, 1991, recommended approval of said request;
RESOLVED, That the Cho Land Division is hereby approved.
****

R-602-10-91 APPROVED
RESOLUTION TO APPROVE MARCICH/WOODWARD ANNEXATION
A communication was received from the City Planning Commission transmitting its recommendation of approval (8 yeas and 0 nays) of the Marcich/Woodward Annexation, 0.37 acre, 195 Barton Drive.
Whereas, The territory hereinafter described is located in the Township of Ann Arbor and is adjacent to the corporate limits of the City of
8 Council - October 21, 1991
Ann Arbor; and
Whereas, Ivo P. Marcich and Heather Woodward are the owners of the property;
Whereas, it is the desire of Ivo P. Marcich and Heather Woodward to annex said territory to the City of Ann Arbor, pursuant to the provisions of Act 279 of the Public Acts of the State of Michigan for the year 1909, as amended;
RESOLVED, That the following described lands and premises situated and being in the Township of Ann Arbor, Washtenaw County, Michigan, be detached from said Township of Ann Arbor and annexed to the City of Ann Arbor, to-wit:
Lot 2, Long Shore Park, City of Ann Arbor, Washtenaw County, Michigan.
****

R-603-10-91 APPROVED
RESOLUTION TO APPROVE TALBOT ANNEXATION
A communication was received from the City Planning Commission transmitting its recommendation of approval (8 yeas and 0 nays) of the Talbot Annexation, 0.42 acre, 1850 Robert Street.
Whereas, The territory hereinafter described is located in the Township of Pittsfield and is adjacent to the corporate limits of the City of Ann Arbor;
Whereas, Elsie J. Talbot is the owner of the property; and
Whereas, it is the desire of Elsie J. Talbot to annex said territory to the City of Ann Arbor, pursuant to the provisions of Act 279 of the Public Acts of the State of Michigan for the year 1909, as amended;
RESOLVED, That the following described lands and premises situated and being in the Township of Pittsfield, Washtenaw County, Michigan, be detached from said Township of Pittsfield and annexed to the City of Ann Arbor, to-wit:
Lots 21, 22, 25, and the East 5 feet of the North 60 feet of Lot 20, Packard Hills Subdivision, Pittsfield Township, Washtenaw
Council - October 21, 1991 9
County, including adjacent Robert Street and Joseph Street rights-of-way.
****

R-604-10-91 APPROVED
RESOLUTION TO APPROVE THE PURCHASE OF THREE 4-DOOR PASSENGER CARS AND SIX 3/4 TON PICKUP TRUCKS - BID NO. 2190, ITEMS #1 AND #5 ($114,414.00)
Whereas, Three existing 4-door station wagons and six existing pickup trucks used by the Utilities Department are fully-depreciated and their economically usable service lives have been expended;
Whereas, The Purchasing Department has, following the necessary request from the Utilities Department Field Division, secured competitive bids, No. 2190, item #1, and Item #5, received September 26, 1991, and has determined that Varsity Ford was the sole bidder in the amount of $26,370.00 for three 4-door passenger cars, and John Lefere Ford is the lowest responsible bidder meeting specifications for six 3/4 ton pickup trucks in the

amount of $88,044.00;
Whereas, The Personnel/Human Rights Department has approved Varsity Ford and John Lefere Ford on October 10, 1991 as meeting the City's Human Rights requirements; and
Whereas, Funds for the purchase of these replacement vehicles have been budgeted in the fiscal year 1991-92 operating budget appropriations for water and sanitary sewer system revolving equipment capital replacements;
RESOLVED, That Council accepts the bid of Varsity Ford in the amount of $26,370.00 as the sole bidder for the three 4-door passenger cars; and the bid of John Lefere Ford in the amount of $88,044.00 as the lowest responsible bidder for the six 3/4 ton pickup trucks; and
RESOLVED, That the City Administrator is directed to issue purchase orders in the amount of $26,370.00 to Varsity Ford to supply the three 4-door passenger cars to John Lefere Ford in the amount of $88,044.00 to supply the six 3/4 ton pickup trucks as specified in Bid No. 2190.
****

R-605-10-91 APPROVED
10 Council - October 21, 1991
RESOLUTION TO AWARD CONTRACT FOR REPLACEMENT OF FILTER UNDERDRAINS AT THE WATER TREATMENT PLANT - BID NO. 2194 ($92,000.00)
Whereas, At the Water Treatment Plant the existing underdrains in filters 1-10, the original 1938 and 1949 installations, are plugged and need to be replaced;
Whereas, It is proposed to replace the underdrains and install surface wash in one filter at the Water Treatment Plant as a prototype to evaluate the performance and to finalize the design of this underdrain replacement and filter upgrade;
Whereas, The Purchasing Department has secured competitive bids for this work and in counsel with the Utilities Department has determined that Lerner-Linden, Inc. has submitted the lowest responsible bid for said work in the total amount of $83,500.00;
Whereas, The Contractual proposal specifies the services to be performed by the said company, and the payments to be made by the City, and all are agreeable to the City; and
Whereas, On September 30, 1991 the Personnel/Human Rights Department approved Lerner-Linden, Inc. for said contract;
RESOLVED, That the Council accept the proposal and award a contract to Lerner-Linden, Inc. in the amount of $83,500.00 for the underdrain and surface wash work in one filter at the Water Treatment Plant;
RESOLVED, That the Council approve the appropriation of a contingency in the amount of $8,500.00 to finance change orders to be approved by the City Administrator;
RESOLVED, That the Council appropriate $92,000.00 as an interim advance from the Water Supply System Fund to be repaid by Water Revenue Bond Series R; and
RESOLVED, That the Mayor and the City Clerk are authorized and directed to sign said contract approved as to form by the City Attorney and approved as to substance by the City Administrator.
****

R-606-10-91 APPROVED
Council - October 21, 1991 11
RESOLUTION TO APPROVE FIVE (5) 1992 FORD TEMPO GL's - BID NO. 2190 (FISCAL YEAR 1991-92) ($47,859.00)
Whereas, The Purchasing Department solicited bids for the purchase of five (5) new 1992 passenger cars;
Whereas, Varsity Ford was the lowest responsible bidder, Bid No. 2190, September 26, 1991, for the purchase of five (5) 1992 Ford Tempo GL's, at a cost of $47, 859.00; and
Whereas, Varsity Ford received City of Ann Arbor Human Rights Approval on May 16, 1991;
RESOLVED, That City Council approve the issuance of a Purchase Order to Varsity Ford, for $47,859.00.
****

R-607-10-91 APPROVED
RESOLUTION TO AWARD CONTRACT TO REPLACE TWO MOTOR CONTROL CENTERS AT THE WASTEWATER TREATMENT PLANT - BID NO. 2126 ($28,000.00)

Whereas, At the Ann Arbor Wastewater Treatment Plant there are two old motor control centers, No.'s 2 and 4R, that need to be replaced;
Whereas, The Utilities Department-Wastewater Treatment Division, through the Purchasing Department, advertised for bids to perform this work as specified in Bid No. 2126;
Whereas, Three (3) bids were received and reviewed, Turner Electric Service Inc. is recommended as the lowest responsible bidder of a base bid of $25,291.00;
Whereas, On September 25, 1991, the Personnel/Human Rights Department approved Turner Electric Service Inc. to perform the work; and
Whereas, Funds are available in the FY 91/92 Wastewater Treatment Plant Operating budget to finance this project;
RESOLVED, That Council accepts the bid and awards the contract to Turner Electric Service, Inc. for $25,291.00 to perform the work as specified in Bid No. 2126;
12 Council - October 21, 1991
RESOLVED, That Council approve a contingency for this work in the amount of $2,709.00 to finance change orders to be approved by the City Administrator;
RESOLVED, That the following project budget be adapted for the life of the project, to be available unit expended without regard to fiscal year;
Contract Work $25,291.00
Contingency $ 2,709.00
$28,000.00
RESOLVED, That the Mayor and Clerk are authorized and directed to sign said contract approved as to form by the City Attorney, and approved as to substance by the Administrator.
Funding Source: Sewage Disposal Fund
FY 91/92 Wastewater Treatment Plant Operating Budget.
****

R-608-10-91 APPROVED
RESOLUTION TO APPROVE PURCHASE OF CURB INLET AND MANHOLE CASTINGS - BID NO. 2196 ($18,290.00)
Whereas, The Utilities Department Field Services Division revolving supplies inventory of stormsewer catch basin curb inlet and manhole ring and cover castings needs to be replenished;
Whereas, The Purchasing Department has secured competitive bids, Bid No. 2196, received October 2, 1991, and in counsel with the Utilities Department has determined that Neenah Foundry Company is the lowest responsible bidder for cast iron storm sewer catch basin curb inlets and cast iron 21" manhole rings and covers in the total amount of $18,290;
Whereas, On October 10, 1991 the Personnel/Human Rights Department approved Neenah Foundry Company to provide these castings to the City of Ann Arbor; and
Whereas, These castings will be purchased with the fiscal year 1991/92 operating budget appropriations in the Water Fund revolving supplies account 042-073-6210-3900 and Sanitary Sewer Fund revolving supplies account 043-073-7210-3900;
Council - October 21, 1991 13
RESOLVED, That Council accept and award the bid for these castings to Neenah Foundry Company in the total amount of $18,290.00; and
RESOLVED, That the City Administrator is directed to issue a purchase order in the amount of $18,290.00 to Neenah Foundry Company for these castings.
Funding Source: Water Supply and Sewage Disposal Funds - Revolving Supply Field.
****

R-609-10-91 APPROVED
RESOLUTION TO PURCHASE GRANULAR ACTIVATED CARBON FOR ONE FILTER AT THE WATER TREATMENT PLANT - BID NO. 2101 ($18,000.00)
Whereas, It is necessary to replace Granular Activated Carbon in one filter at the Water Treatment Plant;
Whereas, For Bid No. 2101 Calgon Carbon Corporation submitted the low responsible bid of $21.95/cft on March 22, 1991 and is willing to supply Granular Activated Carbon at this price now; and
Whereas, On October 10, 1991 the Personnel/Human Rights Department approved Calgon Carbon Corporation;
RESOLVED, That Council accepts the bid proposal of Calgon Carbon Corporation and approves the purchase in the amount of $18,000.00 to supply Granular Activated Carbon at the Water Treatment Plant; and

14 Council - October 21, 1991
RESOLVED, That the City Administrator be directed to issue a purchase order in the amount of $18,000.00 to Calgon Carbon Corporation to supply Granular Activated Carbon at the Water Treatment Plant.
Source of Funds: Water Supply System, Water Treatment Plant FY-91-92 Operations and Maintenance Budget
****

R-610-10-91 APPROVED
RESOLUTION TO APPROVE CHANGE ORDER NO. 1 FOR MECHANICAL REPAIRS IN SEDIMENTATION BASIN #2 AT THE WATER TREATMENT PLANT BID NO. 2106 ($1,824.00)
Whereas, Goyette Mechanical Company was originally awarded a contract to perform mechanical repairs on Sedimentation Basin #2 for $30,900.00;
Whereas, Council approved a $3,000.00 contingency in the FY 91/92 Budget for this project to fund necessary change orders;
Whereas, It was necessary to do extra work at a cost of $1,824.00 in Basin No. 2; and this extra work was not delayed in order to meet water demands; and
Whereas, On April 9, 1991 the Personnel/Human Rights Department approved Goyette Mechanical Company for said work;
RESOLVED, That Mayor and Council approve the Change Order No. 1 to Goyette Mechanical Company in the amount of $1,824.00 for Mechanical Repairs in Basin No. 2 at the Water Treatment Plant, and that the City Administrator is authorized and directed to issue this change order.
Source of Funds: Water Supply System, Water Treatment Plant FY 91-92 Operations and Maintenance Budget.
****

Council - October 21, 1991 15
R-611-10-91 APPROVED
RESOLUTION TO GRANT WATER AND SEWER SERVICES OUTSIDE CITY LIMITS TO LOT 47 OF THE EVERGREENS (2923 DEXTER ROAD)
Whereas, Theodore Graham and Ruth Ryan, owners of the property at 2923 Dexter Road have requested that on October 9, 1991 the City extend public water and sewer services for their use to the property in Scio Township prior to the completion of the annexation process;
Whereas, They desire to enter into the standard agreements with the City which provide an equitable method of obtaining City services outside of its Corporate Boundaries; and
Whereas, On May 13, 1991, Theodore Graham and Ruth Ryan petitioned the City for annexation under Planning Department file number 8244J4.1 & .2;
RESOLVED, That the Mayor and Clerk are authorized and directed to sign the agreements on behalf of the City allowing City water and sewer services to the land during the time it is still outside of the Corporate Limits; the City Clerk is directed and ordered to send a copy of this resolution and the agreements by first class mail to the property owners and the Utilities Department shall promptly have this resolution and the agreements recorded in the Office of the Register of Deeds of Washtenaw County, Michigan.
****

R-612-10-91 APPROVED
RESOLUTION TO APPROVE PURCHASE OF A 1978 JOHN DEERE ROAD GRADER - BID NO. 2184 ($31,000.00)
Whereas, The Street Division of the Transportation Department does not presently own a road grader;
Whereas, The Street Division of the Transportation Department requires the use of a road grader for operations such as: snow removal, road grading, shoulder maintenance, road construction;
Whereas, AIS Continental Company submitted the lowest bid in the sum of $46,000 and included a credit of $15,000 for the previous rental of this unit to be applied towards the purchase price; and
16 Council - October 21, 1991
Whereas, AIS Continental Company received City of Ann Arbor Human Rights Approval on May 17, 1991;
RESOLVED, That $31,000 be approved for a purchase of a used 1978 John Deere

Road Grader from AIS Continental Company for the Street Division of the Transportation Department from the Municipal Garage Equipment Fund 012-091-0130-5480.

****

R-613-10-91 APPROVED

RESOLUTION AUTHORIZING WATER MAIN, SANITARY SEWER AND STORM SEWER IMPROVEMENT CHARGES FOR 2460 JAMES STREET ($10,418.92)

Whereas, The City has previously constructed a water main, sanitary sewer and storm sewer described as follows:

Water Main: 8" water main in James St.; District No. 452; File No. 87100 $5,117.42/connection; one connection = $5,117.42

Sanitary Sewer: 8" sanitary sewer in James St.; District No. 452; File No. 87100; $5,185.16/connection; one connection = $5,185.16.

Storm Sewer: Land contributing to oversize on Packard from Kensington to Independence and on Independence from Packard to James; District No. 56; Job Nos. 3568, 3569; $0.0098/S.F.; 11881 S.F. = $116.34;

Whereas, This Council desires, pursuant to Section 1:278, Chapter 12, of the Code of the City of Ann Arbor, to levy against certain properties their fair share of the cost of said improvements, such fair share not having heretofore been paid nor contracted for;

RESOLVED,

1. That Council hereby levy an improvement charge against the following newlyannexed property which is specially benefitted by the above improvements:

Annexation Address: 2460 James St.

City Assessor Code: 12-04-122-005

Annexation Number : A90-18

Planning File No. : 12041D18.1 & .2

Lot 3 and northerly 30 feet of Lot 4, Packard Hills Subdivision, including that portion of adjacent James Street right-of-way. Now situated in the City of Ann

Council - October 21, 1991 17

Arbor.

2. That the improvement charge so levied be in the amount of $10,418.92 and be hereby designated as Utilities Improvement Charge No. 576;

3. That said improvement charge be divided into 15 equal installments, the first to be due on December 1, 1991 and the 14 subsequent installments to be due on June 1 of each and every year thereafter, with the deferred installments of said improvement charge to bear interest at the rate of 8% per annum commencing December 1, 1991;

4. That the City Clerk be directed and ordered to send a copy of this resolution and give notice by first class mail to the persons chargeable therewith of the amounts hereby determined, and promptly have this resolution recorded in the office of the Register of Deeds of Washtenaw County, Michigan; and

5. That the improvement charge so levied be invoiced to John K. Musgrave and Elizabeth C. Musgrave, 2460 James Street, Ann Arbor, Michigan, 48104-6303 and be credited in the amount of $5,117.42 to Fund 042-073-7151, and $5,185.16 to Fund 043-073-7151 and $116.34 to Fund 031-073-7151.

****

R-614-10-91 APPROVED

RESOLUTION AUTHORIZING WATER MAIN AND SANITARY SEWER IMPROVEMENT CHARGES FOR LOT 156 AND 157 THE EVERGREENS SUBDIVISION 426 ROSE DRIVE ($9,191.79)

Whereas, The City has previously constructed a water main and a sanitary sewer described as follows:

Water Main: 16" water main in Rose Dr.; Non-Dist No. A-516W; $20.85 front foot; 120 front feet = $2,502.00

Sanitary Sewer: 8" Sanitary Sewer in Rose Drive; File No. 90060; District No. 461 $6,583.33/connection, one (1) connection = $6,583.33

Trunkline Improvement Charge = $106.46

Total of Sanitary Sewer Improvement Charges = $6,689.79

Whereas, This Council desires, pursuant to Section 1;278, Chapter 12, of the Code of the City of Ann Arbor, to levy against certain properties their fair share of the cost of said

18 Council - October 21, 1991

improvements, such fair share not having heretofore been paid nor contracted for; and

Whereas, Due to the 1,4 Dioxane contamination in the owner's well, the State of Michigan Department of Public Health has agreed to pay the water main improvement charges;

RESOLVED,
1. That Council hereby levy an improvement charge against the following newlyannexed property which is specially benefitted by the above improvements:
Annexation Address: 426 Rose Drive
City Assessor Code: 08-24-304-006
Annexation Number : A91-08
Planning File No. : 8243L15.1 & .2
Lot 156 and 157 of Evergreens Subdivision, including adjacent Rose Drive right-of-way. 426 Rose Drive. Now situated in the City of Ann Arbor.
2. That the improvement charge so levied be in the amount of $9,191.79 and be hereby designated as Utilities Improvement Charge No. 575;
3. That said sanitary sewer improvement charge be divided into 15 equal installments, the first to be due on December 1, 1991 and the 14 subsequent installments to be due on June 1 of each and every year thereafter, with the deferred installments of said improvement charge to bear interest at the rate of 8% per annum commencing December 1, 1991.
4. That said water main improvement charge be due upon receipt of an invoice to the State of Michigan Department of Public Health;
5. That the City Clerk be directed and ordered to send a copy of this resolution and give notice by first class mail to the persons chargeable therewith of the amounts hereby determined, and promptly have this resolution recorded in the office of the Register of Deeds of Washtenaw County, Michigan;
6. That the sanitary sewer improvement charge so levied be invoiced to Frederick W. Hammond and Linda K. Hammond, 426 Rose Drive, Ann Arbor, Mi. 48103, and that the amount of $6,689.79 be credited to Fund 043-073-7151; and
7. That the water main improvement charge so levied be invoiced to Ms. Lois Graham, R.S., Michigan Department of Public Health, Division of Water Supply, P.O. Box 30195, Lansing, MI. 48909, in the amount of $2,502.00 and be credited to Fund 042-073-7151.
Council - October 21, 1991 19
****

R-615-10-91 APPROVED
RESOLUTION AUTHORIZING SANITARY SEWER IMPROVEMENT CHARGE FOR LOT 177 THE EVERGREENS SUBDIVISION, 3245 KINGWOOD ($6,695.78)
Whereas, The City has previously constructed a water main and a sanitary sewer described as follows:
Water Main: 16" water main in Rose Dr.; Non-Dist Job No. A516W; $20.80 front foot; 134 front feet = $2,793.90
Sanitary Sewer: 8" Sanitary sewer in Kingwood; Dist. No. 444; File No. 86035; $6,589.32/connection, one (1) connection = $6,589.32
Trunkline Improvement Charges: $106.46
Total Sanitary Sewer Charge: $6,695.78
Whereas, This Council desires, pursuant to Section 1;278, Chapter 12, of the Code of the City of Ann Arbor, to levy against certain properties their fair share of the cost of said improvements, such fair share not having heretofore been paid nor contracted for; and
Whereas, Due to the 1,4 Dioxane contamination in the owner's well, Gelman Sciences, Inc. has paid the water main improvement charges;
RESOLVED,
1. That Council hereby levy an sanitary sewer improvement charge against the following newly-annexed property which is specially benefitted by the above improvements:
Annexation Address: 3245 Kingwood
City Assessor Code: 08-24-308-005
Annexation Number : A91-11
Planning File No. : 8243F14.1 & .2
Lot 177, The Evergreens, including adjacent Rose Drive right-of-way. 3245 Kingwood Street. Now situated in the City of Ann Arbor.
2. That the improvement charge so levied be in the amount of $6,695.78 and be hereby designated as Utilities Improvement Charge No. 570;
20 Council - October 21, 1991
3. That said sanitary sewer improvement charge be divided into 15 equal installments, the first to be due on December 1, 1991 and the 14 subsequent installments to be due on June 1 of each and every year thereafter, with the deferred installments of said improvement charge to bear interest at the rate of 8% per annum commencing December 1, 1991;

4. That the City Clerk be directed and ordered to send a copy of this resolution and give notice by first class mail to the persons chargeable therewith of the amounts hereby determined, and promptly have this resolution recorded in the office of the Register of Deeds of Washtenaw County, Michigan; and
5. That the sanitary sewer improvement charge so levied be invoiced to Timothy L. Sprik and Jill S. Sprik, 3245 Kingwood, Ann Arbor, MI. 48103, and $6,695.78 be credited to Fund 043-073-7151.

****

R-616-10-91 APPROVED
RESOLUTION AUTHORIZING WATER MAIN IMPROVEMENT CHARGE FOR LOTS 185 AND 187 THE EVERGREENS SUBDIVISION 3270 VALLEY DRIVE ($2,982.35)

Whereas, The City has previously constructed a water main described as follows:
Water Main: 16" water main in Rose Drive; Non-Dist Job No. A-516W; $20.85/front foot; 191 front feet = $3,982.35
Whereas, This Council desires, pursuant to Section 1:278, Chapter 12, of the Code of the City of Ann Arbor, to levy against certain properties their fair share of the cost of said improvements, such fair share not having heretofore been paid nor contracted for; and
Whereas, Due to the 1,4 Dioxane contamination in the owner's well, the State of Michigan Department of Public Health has agreed to pay the water main improvement charges;
RESOLVED,
1. That Council hereby levy an improvement charge against the following newlyannexed property which is specially benefitted by the above improvements:
Annexation Address: 3270 Valley Drive
City Assessor Code: 08-24-308-002
Council - October 21, 1991 21
Annexation Number : A91-10
Planning File No. : 8243D15.1 & .2
Lots 185 and 187 of Evergreens, and including adjacent Valley Drive and Rose Drive right-of-way; now situated in the City of Ann Arbor;
2. That the improvement charge so levied be in the amount of $3,982.35 and be hereby designated as Utilities Improvement Charge No. 572;
3. That said water main improvement charge be due upon receipt of an invoice to the State of Michigan Department of Public Health;
4. That the City Clerk be directed and ordered to send a copy of this resolution and give notice by first class mail to the persons chargeable therewith of the amounts hereby determined, and promptly have this resolution recorded in the office of the Register of Deeds of Washtenaw County, Michigan; and
5. That the water main improvement charge so levied be invoiced to Ms. Lois Graham, R.S., Michigan Department of Public Health, Division of Water Supply, P.O. Box 30195, Lansing, MI. 48909; and $4,483.45 be credited to Fund 042-073-7151.

****

R-617-10-91 APPROVED
RESOLUTION AUTHORIZING WATER MAIN AND SANITARY SEWER IMPROVEMENT CHARGES FOR LOT 42 THE EVERGREENS SUBDIVISION, 401 GLENWOOD ($1,045.23)

Whereas, The City has previously constructed a water main and sanitary sewer described as follows:
Water Main: 6" water main in Glenwood; Non-Dist. Job No. 4-410; $307.97 connection; one (1) connection = $307.97
Sanitary Sewer: 12" Sanitary Sewer in Glenwood; Non-Dist. No. 3680-5 $737.26/connection; one (1) connection = $737.26
Whereas, This Council desires, pursuant to Section 1:278, Chapter 12, of the Code of the City of Ann Arbor, to levy against certain properties their fair share of the cost of said improvements, such fair share not having heretofore been paid nor contracted for;
22 Council - October 21, 1991
RESOLVED,
1. That Council hereby levy an improvement charge against the following newlyannexed property which is specially benefitted by the above improvements:
Annexation Address: 401 Glenwood
City Assessor Code: 08-24-405-008
Annexation Number : A91-06

Planning File No. : 8244H4.1 & .2
Lot 42, The Evergreens Subdivision, a subdivision of part of the S 1/2 of Section 24, Town 2 South, Range 5 East, Scio Township, Washtenaw County, Michigan, according to the plat thereof as recorded in Liber 7 of Plats, page 42, Washtenaw County Records; also a parcel described as follows: Commencing at the SE corner of Lot 44 in The Evergreens, a subdivision of part of the S 1/2 of Section 24, Scio Township, Washtenaw County, Michigan; thence W 142.32 feet in the S line of Lot 44 to the SW corner of said lot; thence NE 26.35 feet to the W line of Lot 44; thence E 134.47 feet parallel to the S line of Lot 44 to the W line of Glenwood Street; thence S in the W line of Glenwood Street, 25.0 feet to the place of beginning, being a part of Lot 44 of the Evergreens, according to the plat thereof as recorded in Liber 7 of Plats, page 42, Washtenaw County Records, including adjacent Glenwood Street right-of-way. Now situated in the City of Ann Arbor.
2. That the improvement charge so levied be in the amount of $1,045.23 and be hereby designated as Utilities Improvement Charge No. 567;
3. That said sanitary sewer improvement charge be divided into 15 equal installments, the first to be due on December 1, 1991 and the 14 subsequent installments to be due on June 1 of each and every year thereafter, with the deferred installments of said improvement charge to bear interest at the rate of 8% per annum commencing December 1, 1991;
4. That said water main improvement charge be due upon receipt of an invoice to the State of Michigan Department of Public Health;
5. That the City Clerk be directed and ordered to send a copy of this resolution and give notice by first class mail to the persons chargeable therewith of the amounts hereby determined, and promptly have this resolution recorded in the office of the Register of Deeds of Washtenaw County, Michigan; and
6. That the sanitary sewer improvement charge so levied be invoiced to Robert and Mary Beth West, 401 Glenwood, Ann Arbor, MI. 48103 and $737.26 be credited to Fund
Council - October 21, 1991 23
043-073-7151; and
RESOLVED, That the water main improvement charge so levied be invoiced to Ms. Lois Graham, R.S., Michigan Department of Public Health, Division of Water Supply, P.O. Box 30195, Lansing, MI. 48909, in the amount of $307.97 and be credited to Fund 042-073-7151.
****
R-618-10-91 APPROVED
RESOLUTION AUTHORIZING WATER MAIN AND SANITARY SEWER IMPROVEMENT CHARGES FOR LOT 4 THE EVERGREENS SUBDIVISION - 390 GLENWOOD ($1,045.23)
Whereas, The City has previously constructed a water main and a sanitary sewer described as follows:
Water Main: 6" water main in Glenwood.; Non-Dist. Job No. 4-410; $307.97/connection; one (1) connection = $307.97
Sanitary Sewer: 12" Sanitary Sewer in Glenwood; Non-Dist. No. 3680; $737.26/connection; one (1) connection = $737.26
Whereas, This Council desires, pursuant to Section 1:278, Chapter 12, of the Code of the City of Ann Arbor, to levy against certain properties their fair share of the cost of said improvements, such fair share not having heretofore been paid nor contracted for; and
Whereas, Due to the 1,4 Dioxane contamination in the owner's well, the State of Michigan Department of Public Health has agreed to pay the water main improvement charges;
RESOLVED,
1. That Council hereby levy an improvement charge against the following newlyannexed property which is specially benefitted by the above improvements:
Annexation Address: 390 Glenwood
City Assessor Code: 08-24-404-022
Annexation Number : A91-09
Planning File No. : 8244F5.1 & .2
Lot 4 of the Evergreens, including adjacent Glenwood Street right-of-way. 390 Glenwood Street, now situated in the City of Ann Arbor.
24 Council - October 21, 1991
2. That the improvement charge so levied be in the amount of $1,045.23 and be

hereby designated as Utilities Improvement Charge No. 571;
3. That said sanitary sewer improvement charge be divided into 15 equal installments, the first to be due on December 1, 1991 and the 14 subsequent installments to be due on June 1 of each and every year thereafter, with the deferred installments of said improvement charge to bear interest at the rate of 8% per annum commencing December 1, 1991;
4. That said water main improvement charge be due upon receipt of an invoice to the State of Michigan Department of Public Health;
5. That the City Clerk be directed and ordered to send a copy of this resolution and give notice by first class mail to the persons chargeable therewith of the amounts hereby determined, and promptly have this resolution recorded in the office of the register of Deeds of Washtenaw County, Michigan;
6. That the sanitary sewer improvement charge so levied by invoiced to Harold W. Sindlinger and Teruko Sindlinger, 390 Glenwood Street, Ann Arbor, Mi. 48103 and $737.26 be credited to Fund 043-073-7151; and
7. That the water main improvement charge so levied be invoiced to Ms. Lois Graham, R.S., Michigan Department of Public Health, Division of Water Supply, P.O. Box 30195, Lansing, Mi. 48909, in the amount of $307.97 and be credited to Fund 042-073-7151.
****

Council - October 21, 1991 25
R-619-10-91 APPROVED
RESOLUTION AUTHORIZING WATER MAIN AND
SANITARY SEWER IMPROVEMENT CHARGES FOR
LOT 15 SCIOTO HILLS SUBDIVISION,
2819 DEXTER ROAD ($764.96)

Whereas, The City has previously constructed a water main and a sanitary sewer described as follows:
Water Main: 16" water main in Dexter Road; Non-Dist. Job No. A-168; $252.84 connection; one (1) connection = 252.84
Sanitary Sewer: 8" Sanitary Sewer in Dexter Road; Dist. No. 359; Job No. 2903; $512.12/connection, one (1) connection = $512.12
Whereas, This Council desires, pursuant to Section 1:278, Chapter 12, of the Code of the City of Ann Arbor, to levy against certain properties their fair share of the cost of said improvements, such fair share not having heretofore been paid nor contracted for; and
Whereas, Due to the 1,4 Dioxane contamination in the owner's well, the State of Michigan Department of Public Health has agreed to pay the water main improvement charges;
RESOLVED,
1. That Council hereby levy an improvement charge against the following newlyannexed property which is specially benefitted by the above improvements:
Annexation Address: 2819 Dexter Road
City Assessor Code: 08-24-404-021
Annexation Number : A91-05
Planning File No. : 8244F8 .1 & .2
Lot 15, Scioto Hills, including adjacent Dexter Road right-of-way. Now situated in the City of Ann Arbor.
2. That the improvement charge so levied be in the amount of $764.96 and be hereby designated as Utilities Improvement Charge No. 566;
3. That said sanitary sewer improvement charge be divided into 15 equal installments, the first to be due on December 1, 1991 and the 14 subsequent installments to be due on June 1 of each and every year thereafter, with the deferred installments of said improvement charge to bear interest at the rate of 8% per annum commencing December 1, 1991;
4. That said water main improvement charge be due upon receipt of an invoice to the
26 Council - October 21, 1991
State of Michigan Department of Public Health;
5. That the City Clerk be directed and ordered to send a copy of this resolution and give notice by first class mail to the persons chargeable therewith of the amounts hereby determined, and promptly have this resolution recorded in the office of the Register of Deeds of Washtenaw County, Michigan;
6. That the sanitary sewer improvement charge so levied be invoiced to Eric S. Kasischke, 2819 Dexter Road, Ann Arbor, Mi. 48103, in the amount of $512.12 to Fund 043-073-7151; and
7. That the water main improvement charge so levied be invoiced to Ms. Lois Graham, R.S., Michigan Department of Public Health, Division of Water Supply, P.O. Box 30195,

Lansing, MI. 48909 in the amount of $252.84 and be credited to Fund 042-073-7151.
****

R-620-10-91 APPROVED
RESOLUTION AUTHORIZING WATER MAIN AND
SANITARY SEWER IMPROVEMENT CHARGES FOR
LOT 49 THE EVERGREENS SUBDIVISION
2963 DEXTER ROAD ($764.95)
Whereas, The City has previously constructed a water main and a sanitary sewer described as follows:
Water Main: 16" water main in Dexter Road; Non-Dist Job No. A-168; $252.83/connection; one (1) connection = $252.83
Sanitary Sewer: 8" Sanitary Sewer in Dexter Road; Dist. No. 359; Job No. 2903; $512.12/connection, one (1) connection = $512.12
Whereas, This Council desires, pursuant to Section 1:278, Chapter 12, of the Code of the City of Ann Arbor, to levy against certain properties their fair share of the cost of said improvements, such fair share not having heretofore been paid nor contracted for; and
Whereas, Due to the 1,4 Dioxane contamination in the owner's well, the State of Michigan Department of Public Health has agreed to pay the water main improvement charges;
RESOLVED,
1. That Council hereby levy an improvement charge against the following newlyannexed property which is specially benefitted by the above improvements:
Council - October 21, 1991 27
Annexation Address: 2963 Dexter Road
City Assessor Code: 08-24-405-009
Annexation Number : A91-03
Planning File No. : 8244J3 .1 & .2
Lot 49, according to the recorded plat of the Evergreens, a subdivision of part of the South half of Section 24, T2S, R5E, including adjacent Dexter Road right-of-way. Now situated in the City of Ann Arbor.
2. That the improvement charge so levied be in the amount of $764.95 and be hereby designated as Utilities Improvement Charge No. 564;
3. That said sanitary sewer improvement charge be divided into 15 equal installments, the first to be due on December 1, 1991 and the 14 subsequent installments to be due on June 1 of each and every year thereafter, with the deferred installments of said improvement charge to bear interest at the rate of 8% per annum commencing December 1, 1991;
4. That said water main improvement charge be due upon receipt of an invoice to the State of Michigan Department of Public Health;
5. That the City Clerk be directed and ordered to send a copy of this resolution and give notice by first class mail to the persons chargeable therewith of the amounts hereby determined, and promptly have this resolution recorded in the office of the Register of Deeds of Washtenaw County, Michigan;
6. That the sanitary sewer improvement charge so levied be invoiced to Elizabeth A. Bjork, 2963 Dexter Road, Ann Arbor, MI. 48103, and $512.12 be credited to Fund 043-073-7151; and
7. That the water main improvement charge so levied be invoiced to Ms. Lois Graham, R.S., Michigan Department of Public Health, Division of Water Supply, P.O. Box 30195, Lansing, MI. 48909, in the amount of $252.83 and be credited to Fund 042-073-7151.
****

28 Council - October 21, 1991
R-621-10-91 APPROVED
RESOLUTION TO GRANT WATER SERVICE OUTSIDE
CITY LIMITS TO LOTS 175 AND 176
THE EVERGREENS (3250 KINGWOOD)
Whereas, Donald E. Johnston, owner of the property at 3250 Kingwood has requested on August 19, 1991 the City extend public water service for their use to the property in Scio Township prior to the completion of the annexation process;
Whereas, Mr. Johnston desires to enter into the standard agreement with the City which provides an equitable method of obtaining City service outside of its Corporate Boundaries; and
Whereas, On June 3, 1991 he petitioned the City for annexation under Planning Department file number 8243K22.1 & .2, described as follows:
Lot 175 & Lot 176, The Evergreens a Subdivision of Part of the South Half Section 24, Scio Township, Washtenaw County, Michigan. Rec'd L. 7, P. 42

plats WCR. 3250 Kingwood at Rose, Ann Arbor, MI.;
RESOLVED, That the Mayor and Clerk are authorized and directed to sign the agreement on behalf of the City allowing City water service to the land during the time it is still outside of the Corporate Limits; the City Clerk is directed and ordered to send a copy of this resolution and the agreements by first class mail to the property owner and the Utilities Department shall promptly have this resolution and the agreements recorded in the office of the Register of Deeds of Washtenaw County, Michigan.
****

R-622-10-91 APPROVED
RESOLUTION TO TRANSFER DELINQUENT
MOWING FEES TO THE CITY TAXROLL
Whereas, The property at 1004 Woodlawn (vacant lot), Assessor Code #81-09-33-213-018 owned by Jack Schwarcz, was in violation of the City vegetation and Weed Control, Chapter 40;
Whereas, This property was brought into compliance by the City following notification as required by the Code; and
Whereas, An invoice for service was issued in the amount of $63.25 to the applicable property owner and to date has not been paid;
RESOLVED, That such unpaid charges be levied as a special assessment against
Council - October 21, 1991 29
the owner and premises together with an additional penalty charge of 10% of the total unpaid, as provided for in Section 1.292 of the City Code; and
RESOLVED, That the City Assessor shall place the same on the next taxroll of the City and that such charges will be collected in the same manner as general City taxes.
****

R-623-10-91 APPROVED
RESOLUTION AUTHORIZING LEVY OF MILLAGE ON
THE DECEMBER, 1991 COUNTY TAX LEVY FOR
THE CITY'S SHARE OF VARIOUS STORM DRAIN
DEBT PAYMENTS (LEVY OF .1095 MILLS)
Whereas, Washtenaw County has levied assessments on the City of Ann Arbor for various storm sewer capital and maintenance projects, as follows:
Allen Creek Drain 1 of 1 $8,634.38
County Farm Drain 1 of 1 1,548.98
Swift Run Drain 1 1 of 1 2,710.20
Swift Run Drain 2 2 of 2 2,830.73
Swift Run Drain 3 3 of 3 4,168.64
Pittsfield-Ann Arbor Drain 1 of 1 5,808.72
Subtotal Maintenance 25,701.65
Pittsfield-Ann Arbor Drain 15 of 26 225,582.65
Subtotal Capital 225,582.65
GRANT TOTAL $251,284.30
and,
Whereas, The Council in prior years has authorized a special millage on the December Washtenaw County tax levy (on City of Ann Arbor properties only) for the payment of these items;
RESOLVED, That Council does hereby authorize a levy of .1095 mills on the December, 1991 Washtenaw County tax levy (City of Ann Arbor properties only) for the City share of drain payments as outlined above.
Councilmember Dodge moved that the Consent Agenda be approved.
On a voice vote, the Chair declared the motion carried.
ORDINANCES - SECOND READING
30 Council - October 21, 1991
60-91 APPROVED
REDUCED FEES FOR RESTRICTED PEDDLER PERMITS
AN ORDINANCE TO AMEND SECTION 7:67 OF CHAPTER 79 OF TITLE VII OF THE CITY OF ANN ARBOR.
This amendment would allow the Clerk to reduce by 75% the fee charged for a peddler's permit or license, for applicants under 14 years old, who reasonably anticipate less than $100 profit from the activity.
Councilmember Dodge moved that the ordinance be approved at second reading.
On roll call the vote was as follows: Yeas, Councilmembers Coleman, Sheldon, Dodge, Grady, Meade, Zimmer, Ouimet, Peterson, Eckstein, Mayor Brater, 10
Nays, 0
The Chair declared the motion carried.

61-91 APPROVED AS AMENDED
NOISE - LIABILITY OF OWNER, LESSEE, OR OCCUPANT
AN ORDINANCE TO AMEND SECTIONS 9:369 AND 9:370 OF CHAPTER 119 OF TITLE IX OF THE CODE OF THE CITY OF ANN ARBOR
This amendment would provide for fines and penalties for noise violations.
Councilmember Dodge moved that the ordinance be approved.
Councilmember Grady moved that the ordinance be amended as follows:
Section 1. That Section 9:369 of Chapter 119 of Title IX of the Code of the City of Ann Arbor is amended to read as follows:
9:369. Liability of owner, lessee, or occupant.
If the person responsible for an activity which violates this article cannot be determined, the any owner, any lessee or any occupant of the property on which the activity is located shall be deemed responsible for the violation. A person found responsible under this section shall be guilty of a civil infraction punishable by a fine of up to $50 to $500 plus costs. For a second offense within a two-year period the fine shall be $100 to
Council - October 21, 1991 31
$500 plus costs. For third and subsequent offenses within a two-year period the fine shall be $200 to $500 plus costs.
Section 2. That Section 9:370 of Chapter 119 of Title IX of the Code of the Cit of Ann Arbor is amended to read as follows:
9:370. Penalty.
Except as provided in section 9:369, all violations of an activity which violates this article shall be punishable by a fine of not more than $50 to $500 plus costs. For a second offense within a two-year period the fine shall be $100 to $500 plus costs. For third and subsequent offenses within a two-year period the penalty shall be $200 to $500 plus costs and/or, in the discretion of the court, up to 240 hours community service.
On a voice vote, the Chair declared the motion carried.
The question on the floor is approval of the ordinance as amended at second reading.
On roll call the vote was as follows: yeas, Councilmembers Coleman, Sheldon, Dodge, Grady, Meade, Zimmer, Ouimet, Peterson, Eckstein, Mayor Brater, 10
Nays, 0
The Chair declared the motion carried.
51-91 APPROVED
DAY ZONING
AN ORDINANCE TO AMEND THE ZONING MAP BEING A PART OF CHAPTER 55 OF TITLE V OF THE CODE OF THE CITY OF ANN ARBOR.
This is the rezoning of 0.19 acre from TWP (Township District) to R1C (Single-Family Dwelling District), Day Property, 350 Rose Drive.
Councilmember Dodge moved that the ordinance be approved at second reading.
On roll call the vote was as follows: Yeas, Councilmembers Coleman, Sheldon, Dodge, Grady, Meade, Zimmer, Ouimet, Peterson, Eckstein, Mayor Brater, 10
Nays, 0
The Chair declared the motion carried.
52-91 APPROVED
32 Council - October 21, 1991
GRAMMATICO REZONING
AN ORDINANCE TO AMEND THE ZONING MAP BEING A PART OF CHAPTER 55 OF TITLE V OF THE CODE OF THE CITY OF ANN ARBOR.
This is the rezoning of 0.48 acre from TWP (Township District) to R1B (Single-Family Dwelling District), Grammatico Property, 1605 North Maple Road.
Councilmember Coleman moved that the ordinance be approved at second reading.
On roll call the vote was as follows: Yeas, Councilmembers Coleman, Sheldon, Dodge, Grady, Meade, Zimmer, Ouimet, Peterson, Eckstein, Mayor Brater, 10
Nays, 0
The Chair declared the motion carried.
53-91 APPROVED
HAMMOND REZONING
AN ORDINANCE TO AMEND THE ZONING MAP BEING A PART OF CHAPTER 55 OF TITLE V OF THE CODE OF THE CITY OF ANN ARBOR.
This is the rezoning of 0.41 acre from TWP (Township District) to R1C (Single-Family Dwelling District), Hammond property, 426 Rose Drive.
Councilmember Coleman moved that the ordinance be approved at second reading.
On roll call the vote was as follows: Yeas, Councilmembers Coleman, Sheldon, Dodge, Grady, Meade, Zimmer, Ouimet, Peterson, Eckstein, Mayor Brater, 10

Nays, 0
The Chair declared the motion carried.
54-91 APPROVED
HUIZINGA REZONING
AN ORDINANCE TO AMEND THE ZONING MAP BEING A PART OF CHAPTER 55 OF TITLE V OF THE CODE OF THE CITY OF ANN ARBOR.
This is the rezoning of 0.17 acre from TWP (Township District) to R1C
Council - October 21, 1991 33
(Single-Family Dwelling District), Huizinga property, northwest corner of Robert and Victoria Avenue.
Councilmember Coleman moved that the ordinance be approved at second reading.
On roll call the vote was as follows: Yeas, Councilmembers Coleman, Sheldon, Dodge, Grady, Meade, Zimmer, Ouimet, Peterson, Eckstein, Mayor Brater, 10
Nays, 0
The Chair declared the motion carried.
55-91 APPROVED
KAPP REZONING
AN ORDINANCE TO AMEND THE ZONING MAP BEING A PART OF CHAPTER 55 OF TITLE V OF THE CODE OF THE CITY OF ANN ARBOR.
This is the rezoning of 0.39 acre from TWP (Township District) to R1C
(Single-Family Dwelling District), Kapp Property, 330 Rose Drive.
Councilmember Coleman moved that the ordinance be approved at second reading.
On roll call the vote was as follows: Yeas, Councilmembers Coleman, Sheldon, Dodge, Grady, Meade, Zimmer, Ouimet, Peterson, Eckstein, Mayor Brater, 10
Nays, 0
The Chair declared the motion carried.
56-91 APPROVED
MCGEE REZONING
AN ORDINANCE TO AMEND THE ZONING MAP BEING A PART OF CHAPTER 55 OF TITLE V OF THE CODE OF THE CITY OF ANN ARBOR.
This is the rezoning of 0.53 acre from TWP (Township District) to R1C
(Single-Family Dwelling District), McGee property, 3270 Valley Drive.
Councilmember Coleman moved that the ordinance be approved at second reading.
On roll call the vote was as follows: Yeas, Councilmembers Coleman, Sheldon, Dodge, Grady, Meade, Zimmer, Ouimet, Peterson, Eckstein, Mayor Brater, 10
34 Council - October 21, 1991
Nays, 0
The Chair declared the motion carried.
57-91 APPROVED
SINDLINGER PROPERTY
AN ORDINANCE TO AMEND THE ZONING MAP BEING A PART OF CHAPTER 55 OF TITLE V OF THE CODE OF THE CITY OF ANN ARBOR.
This is the rezoning of 0.25 acre from TWP (Township District) to R1C
(Single-Family Dwelling District), Sindlinger Property, 390 Glenwood.
Councilmember Peterson moved that the ordinance be approved at second reading.
On roll call the vote was as follows: Yeas, Councilmembers Coleman, Sheldon, Dodge, Grady, Meade, Zimmer, Ouimet, Peterson, Eckstein, Mayor Brater, 10
Nays, 0
The Chair declared the motion carried.
58-91 APPROVED
SPRIK REZONING
AN ORDINANCE TO AMEND THE ZONING MAP BEING A PART OF CHAPTER 55 OF TITLE V OF THE CODE OF THE CITY OF ANN ARBOR.
This is the rezoning of 0.20 acre from TWP (Township District) to R1C
(Single-Family Dwelling District), Sprik Property, 3245 Kingwood.
Councilmember Coleman moved that the ordinance be approved at second reading.
On roll call the vote was as follows: Yeas, Councilmembers Coleman, Sheldon, Dodge, Grady, Meade, Zimmer, Ouimet, Peterson, Eckstein, Mayor Brater, 10
Nays, 0
The Chair declared the motion carried.
ORDINANCES - FIRST READING
Council - October 21, 1991 35
63-91 APPROVED
CITY-OWNED PARCEL (FORMER KATZ PROPERTY) REZONING
AN ORDINANCE TO AMEND THE ZONING MAP BEING A PART OF CHAPTER 55 OF

TITLE V OF THE CODE OF THE CITY OF ANN ARBOR.
This is the rezoning of 27.94 acres from UNZ (Unzoned) to PL (Public Land District), City-Owned parcel (Former Katz Property) northwest corner of Ellsworth and Platt Roads. (City Planning Commission recommendation: Approval - 8 yeas and 0 nays)
Councilmember Meade moved that the ordinance be approved at first reading.
On a voice vote, the Chair declared the motion carried.
*****

RESOLUTION TO TRANSFER OWNERSHIP OF A CLASS C LICENSED BUSINESS WITH DANCE PERMIT AND NEW ENTERTAINMENT PERMIT LOCATED AT 310 MAYNARD STREET

RESOLVED, That the request from Gamekeepers, Inc. to transfer ownership of a 1990 Class C licensed business with Dance Permit, located in escrow at 310 Maynard, Ann Arbor, Michigan, Washtenaw County, from Dooley's of Ann Arbor II, Limited partnership and request for new Entertainment Permit, be approved.

Councilmember Hunter moved that the resolution be approved.

On a voice vote, the Chair declared the motion carried.

****

R-626-10-91 APPROVED

RESOLUTION RECOMMENDING THAT THE RETIREMENT BOARD INVEST LOCALLY IN AFFORDABLE HOUSING

Whereas, There is a demonstrated need for affordable housing in the City of Ann Arbor;

Whereas, Some cities, states, and unions have begun directing small portions of their employee pension funds toward affordable housing initiatives; and

38 Council - October 21, 1991

Whereas, The City of Ann Arbor's Retirement System's assets exceed $192,000,000 with $4,000,000 currently in real estate holdings;

RESOLVED, That the Ann Arbor City Council request that the Board of Trustees of the City of Ann Arbor Employees Retirement System research potential methods of investing in local housing initiatives consistent with its fiduciary responsibility and report back to City Council within six months of this date.

Councilmember Hunter moved that the resolution be approved.

On a voice vote, the Chair declared the motion carried.

****

R-627-10-91 APPROVED

RESOLUTION TO ELIMINATE THE $100 PREFERRED PARKING SPACE PROGRAM

Whereas, Rate structures in the Parking System should be competitive and respond to the market demands of the consumer as well as simple to administer; and

Whereas, The existing "reserved" parking space program leads to confusion and anger from other regular permit holders and short term parking users; and

Whereas, The revenue implications are relatively minor compared to the goodwill that would be created with the general public;

20 holders x $40 x 6 months = $4800 less fees generated by hourly sale of that space which could possibly even be a net gain to the revenue stream (20 spaces x 154 days x 12 hours x .40/hour x .5 use rate = $7392 as an example);

RESOLVED, That the City of Ann Arbor abolish the "reserved" parking space program provided that existing permit holders are allowed to purchase "regular" parking permits for the structure where the space is located and at the approved rate scale. This resolution would take full effect January 1, 1992.

Councilmember Sheldon moved that the resolution be approved.

On a voice vote, the Chair declared the motion carried.

****

Council - October 21, 1991 39

RESOLUTION REVISED AND TABLED

RESOLUTION REGARDING OPEN MEETINGS

Whereas, The City Council desires that all of the City Boards, Task Forces, Commissions and Committees conform to the spirit of the Open Meetings Act;

RESOLVED, That all City Boards, Task Forces, Commissions, Committees and their Sub-Committees hold their meetings in a manner that is open to the public in the manner that is required of bodies covered by the Open Meetings Act; and

RESOLVED, That closed meetings of such bodies shall be held only under situations where a closed meeting would be specifically authorized by the Open Meetings Act.

Councilmember Sheldon moved that the resolution be approved.

Councilmember Zimmer moved that the resolution be amended as follows:

RESOLVED, That all City Boards, Task Forces, Commissions and Committees and their sub-committees hold their meetings in a manner that is open to the public in the manner that is required of bodies covered by the Open Meetings Act, WITH THE ADDITION THAT A COPY OF ANY

RECORDINGS MADE AT THE MEETINGS, AUDIO OR VIDEO, SHALL BE MADE AVAILABLE TO THE BOARD, TASK FORCE, COMMISSION AND COMMITTEE AND THEIR SUB-COMMITTEE, IF REQUESTED BY THEM IN WRITING WITHIN SEVEN DAYS.

Councilmember Hunter moved that the resolution be tabled to November 4, 1991 pending a determination of the ramifications of opening all meetings to the public in a manner required by the Open Meetings Act, and (per Councilmember Peterson) its impact on those boards, committees, commissions and sub-committees whose meetings are held on an irregular basis and those who may be ill-served by being open to the public.

On a voice vote, the Chair declared the motion carried and the resolution tabled.

****

40 Council - October 21, 1991

R-628-10-91 APPROVED

RESOLUTION PETITIONING DRAIN COMMISSIONER TO CONDUCT A DRAIN STUDY OF EBERWHITE WOODS

Whereas, The City Engineer has presented to this City Council a general description of a proposed storm drain project for the properties in the vicinity of the Allen Creek Drain within the City;

Whereas, This City Council intends to file with the Drain Commissioner for Washtenaw County a petition to study alternatives for the improvement of storm water runoff management within that portion of the Allen Creek watershed which drains through the Eberwhite Woods and to subsequently make improvements pursuant to Section 463 of Chapter 20 of the Drain Code of 1956;

Whereas, It is the desire of the City Council to have the Mayor and Clerk sign and file the necessary petition with the Washtenaw County Drain Commissioner; and

Whereas, A suggested form of such petition has been presented to this City Council;

RESOLVED, That:

1. The City Council hereby determines to proceed with the proposed drain project for a portion of the Allen Creek Drainage District as more fully described in the petition;

2. The Mayor and Clerk be and they are hereby authorized and directed to execute such petition for and on behalf of the City and to file the same with the Drain Commissioner of the County of Washtenaw; and

3. The City Council hereby consents to the study of alternatives for improvement of the existing storm drainage system within the limits of the City and the assessment of a portion of the cost of such a study and subsequent improvements, so located, against the City.

Councilmember Peterson moved that the resolution be approved.

On a voice vote, the Chair declared the motion carried.

****

R-629-10-91 APPROVED AS REVISED

Council - October 21, 1991 41

RESOLUTION TO AUTHORIZE A PROFESSIONAL SERVICES AGREEMENT WITH THE TRAVERSE GROUP, INC. AND ESTABLISH PROJECT BUDGETS FOR GROUNDWATER MONITORING PROGRAMS AT THE CITY OF ANN ARBOR LANDFILL ($368,695.00)

Whereas, The City is required by Public Act 641, the Consent Order with the Michigan Department of Natural Resources, and the Cell IV Operating License to monitor the groundwater and surface water in the vicinity of the landfill;

Whereas, A new contract to perform groundwater and surface water monitoring for the next two years is needed to replace the previous program which was completed in July, 1991;

Whereas, Requests for proposals were solicited from qualified environmental consulting firms;

Whereas, Based on the proposals received and the interviews conducted, the City selection committee recommends The Traverse Group, Inc. as the most qualified and cost effective firm to provide the City with continuing groundwater monitoring programs; and

Whereas, The Traverse Group, Inc. was approved by the Personnel/Human Rights Department on October 2, 1991;

RESOLVED, That the Mayor and Clerk are hereby authorized and directed to sign a Professional Services Agreement after approval as to form by the City Attorney and as to substance by the City Administrator; and

RESOLVED, That $368,695 be appropriated for the life of the project with the specific account appropriations determined by the City Administrator.

Councilmember Hunter moved that the revised resolution placed on the table this date be

approved.
On a voice vote, the Chair declared the motion carried.
****

42 Council - October 21, 1991
R-630-10-91 APPROVED
RESOLUTION TO APPROPRIATE FUNDS AND
ESTABLISH A BUDGET FOR THE DESIGN PHASE
OF THE 1992 ANNUAL STREET RESURFACING
PROJECT ($85,000.00)
Whereas, It is necessary to begin the Design Phase of the 1992 Annual Street Resurfacing Project; and
Whereas, This project is to be funded by the 1991 Street Resurfacing Millage;
RESOLVED, That Council appropriates $85,000 from the 1991 Street Resurfacing Millage (Fund 062) for the Design Phase of the 1992 Annual Street Resurfacing Project; and
RESOLVED, That the following project budget be adopted for the life of the project, to be available until expended without regard to fiscal year;
SECTION I - REVENUE
$85,000 From the 1991 Street Resurfacing Millage Fund
$85,000 TOTAL
SECTION II - APPROPRIATION
$26,000 Design Engineering
$20,000 Consulting
$ 5,000 City Owned Vehicles
$ 3,000 Printing and Binding
$ 3,000 Materials and Supplies
$26,000 Department Overhead
$ 2,000 Miscellaneous Charges
$85,000 TOTAL
Councilmember Hunter moved that the resolution be approved.
On a voice vote, the Chair declared the motion carried.
****

Council - October 21, 1991 43
R-631-10-91 APPROVED
RESOLUTION NO. 1 - PREPARE PLANS AND SPECIFICATIONS
FOR THE WESTOVER HILLS SUBDIVISION SANITARY
SEWER PHASE III TO SERVE PROPERTIES ON WAGNER
ROAD BETWEEN JACKSON AND PORTER, WESTOVER
AVENUE BETWEEN JACKSON AND FERRY AND
JACKSON ROAD EAST OF WAGNER
($10,000.00)
Whereas, Council deems it necessary to acquire and construct the following improvement: Sanitary Sewer Construction, District No. 466; File No. 91059; described as: Westover Hills Subdivision Sanitary Sewer - Phase III, to serve properties on Wagner Road between Jackson and Porter, Westover Avenue between Jackson and Ferry and Jackson Road east of Wagner;
RESOLVED, That:
1. The City Administrator is directed to have prepared plans and specifications for said improvement project, and an estimate of the cost thereof;
2. The City Administrator is directed to file a report of same with the City Clerk, including a recommendation as to what proportion of the cost should be paid by special assessment and what part, if any, should be a general obligation of the City, the number of installments in which the assessments may be paid, and the land which should be included in the special assessment district;
3. The City Clerk shall present said report to the Council and make it available for public examination;
4. The sum of $10,000 is appropriated for the planning and design of said project, such sum being advanced from the Sewage System fund pending the sale of appropriate bonds;
5. Any unspent portion of said sum is re-appropriated and re-advanced as above for said project for succeeding fiscal years until bonds are sold and the Sewage System fund reimbursed, or until said project is officially closed; and
6. Council declares its intent to issue bonds to pay all or part of the cost of such improvement project, funding reserves, paying for credit enhancement , and the cost of issuance of such bonds (either initially or ultimately), provided that such bonds are issued

in conformity with applicable State statutes and all documents, provisions, and details pertaining to such bonds are acceptable to and approved by this Council and provided,
44 Council - October 21, 1991
further, that such bonds can be sold.
Councilmember Hunter moved that the resolution be approved.
On a voice vote, the Chair declared the motion carried.
****

R-632-10-91 APPROVED
RESOLUTION TO ESTABLISH MONTHLY PARKING RATE
FOR WILLIAM AND FIRST PARKING LOT
RESOLVED, That the Ann Arbor City Council establish a monthly rate of $40.00 for the William and First parking lot.
Councilmember Hunter moved that the resolution be approved.
On a voice vote, the Chair declared the motion carried.
****

R-633-10-91 APPROVED
RESOLUTION TO TRANSFER DELINQUENT HOUSING
INSPECTION FEES TO THE 1991 DECEMBER CITY TAXROLL
Whereas, There are unpaid charges for housing inspections of private properties within the City which were unpaid on June 30, 1991
Whereas, This Council did, on December 9, 1974, resolve that notice should be given by first class mail to the owners of such properties of the amount due, and that this Council did intend that such amount would be assessed against such property as a special assessment unless paid on, or before October 31, 1991;
Whereas, The City Clerk has on file a list of such recently unpaid charges; and
Whereas, Notice has been sent to all owners of property affected by such delinquent inspection fees, in accordance with the Council resolution of December 9, 1974; to advise said property owners of the impending assessment;
RESOLVED, That the City Clerk shall forthwith certify to the City Assessor such unpaid charges and the names of the owners of the premises so served; and
Council - October 21, 1991 45
RESOLVED, That such charges be levied as special assessments against such owners and premises together with an additional penalty charge of 10% of the total unpaid, as provided in Section 1:292 of the Ann Arbor City Code, and that the City Assessor shall place the same on the next taxroll of the City and that such charges will be collected in the same manner as general city taxes.
Councilmember Hunter moved that the resolution be approved.
On a voice vote, the Chair declared the motion carried.
****

R-634-10-91 APPROVED AS REVISED
RESOLUTION SUPPORTING COOPERATION BETWEEN THE
CITY OF ANN ARBOR AND WASHTENAW COUNTY TO
REDUCE DUPLICATION OF GOVERNMENTAL SERVICES
Whereas, The City of Ann Arbor and Washtenaw County have separate singular Risk Management and Public Purchasing programs which represent significant annual costs to the City and County and current demands for increased services in a context of limited revenues require that governments be more efficient and creative in providing services;
Whereas, The City of Ann Arbor and Washtenaw County have an opportunity to explore cooperative and centralize service delivery systems especially in the areas of Risk Management and Public Purchasing which could offer cost savings to both the taxpayers program administration and in the purchase of public goods;
Whereas, It is responsible and prudent for the City Council and the County Board to explore the options available for the establishment of combined centralized administration of programs in the areas of Risk Management and Public Purchasing; and
Whereas, A successful cooperative effort by the City and County may have application to other municipalities in Washtenaw County which would offer even greater eventual savings in Risk Management and Public Purchasing;
RESOLVED, That the Ann Arbor City Council and the Washtenaw County Board of Commissioners wholeheartedly support a cooperative effort between the City and County that can result in better services and lower costs and encourage and request the City and County Administrators to explore the possibility of establishing combined single administration of Risk Management and Public Purchasing activities;
46 Council - October 21, 1991
RESOLVED, That in support of the joint planning effort, the City and the County

each commit a sum of $9,000 to be available, if necessary, for the retention of a qualified consultant to assist in reviewing current Risk and Purchasing programs; identifying opportunities for combined management; designing single administrative systems with standardized procedures and, if appropriate, preparing a draft cooperative agreement for review by the City Council and County Board; and
RESOLVED, That the City and County Administrators submit to the Ann Arbor City Council and the Board of Commissioners for review and discussion the results of the joint planning effort with recommendations that are appropriate and consistent with the policy direction of the City Council and Board of Commissioners cited in this resolution; and
RESOLVED, That the City Administrator, if appropriate, work with the Ann Arbor School System, Intermediate School District and Washtenaw Community College to further any efficiencies or cost savings that may be realized in the effort.
Councilmember Peterson moved that the resolution be approved.
On a voice vote, the Chair declared the motion carried.
****

R-635-10-91 APPROVED
RESOLUTION ESTABLISHING 1991 FEES AND CHARGES
FOR DEPARTMENT OF PARKS AND RECREATION
BUHR PARK ICE RINK
Whereas, The Department of Parks and Recreation recommends the proposed fees for 1991 to achieve budgeted levels of recreational facility self support;
Whereas, Support material has been prepared which summarizes facility self support levels for the past ten year and pre-audited levels for 1990-91;
Whereas, The Park Advisory Commission and Recreation Advisory Commission have recommended the proposed fees;
Whereas, The following significant issues and conclusions have been identified;
ISSUE CONCLUSIONS
Facility Self Support In order to maintain the self support level, as established by resolution in March 17, 1980; March 23, 1981; February 22, 1982; February 14, 1983; February 11, 1985, and October 15, 1990, the proposed fee schedule is recommended for implementation for the 1991-92
Council - October 21, 1991 47
budget year.
Whereas, The Department of Parks and Recreation has previously been directed as outlined in resolutions on March 17, 1980; March 23, 1981; February 22, 1982; February 14, 1983; February 23, 1984; February 11, 1985, and October 15, 1990 implement policies to achieve 53% level of self support at Buhr Park; and
Whereas, The Department of Parks and Recreation has just completed renovation and covering of the rink which will lead to an extended season;
RESOLVED, That the schedule of recreation facilities fees, on file with the City Clerk's Office, be adopted and implemented for the 1991-92 budget year.
Councilmember Peterson moved that the resolution be approved.
On a voice vote, the Chair declared the motion carried.
****

R-636-10-91 APPROVED
RESOLUTION TO APPROVE FEES FOR HURON HILLS SKI CENTER
Whereas, The Department of Parks and Recreation recommends the proposed fees for 1991-92 to achieve specific levels of recreational facility self-support;
Whereas, The Department of Parks and Recreation has previously been directed as outlined in a Resolution in 1985;
Whereas, The fees for the cross country ski center have remained the same since 1985; and
Whereas, The Park Advisory Commission and Recreation Advisory Commission have recommended the proposed fees;
RESOLVED, That the proposed fees for Huron Hills Ski Center, on file with the Clerk's Office, be adopted and implemented for the 1991-92 budget year.
Councilmember Coleman moved that the resolution be approved.
On a voice vote, the Chair declared the motion carried.
****

48 Council - October 21, 1991
R-637-10-91 APPROVED
RESOLUTION TO APPROVE TRANSFER OF OWNERSHIP OF A

**1988 12 MONTH RESORT CLASS C LICENSED BUSINESS
LOCATED AT 613-615 E. WILLIAM STREET**

RESOLVED, That the request from the 3rd Coast, Inc. of Michigan to transfer ownership of a 1988 12 Month Resort Class C licensed business with Dance-Entertainment Permit, located in escrow at 20430 Northland, Hwy. US-131, Paris, MI. 49338, Green Twp. Mescosta County, from Mutual Savings and Loan Association; and transfer location (governmental unit) to 613-615 E. William, Ann Arbor, MI. 48104, Washtenaw County, and the request to drop Dance-Entertainment Permit, be approved.

Councilmember Coleman moved that the resolution be approved.

On a voice vote, the Chair declared the motion carried.

****

**R-638-10-91 APPROVED AS AMENDED
RESOLUTION APPROVING PARKING RATES
ASHLEY/WILLIAM PARKING LOT**

Councilmember Coleman moved that the resolution be approved.

Councilmember Peterson moved that the resolution be amended as follows:

BE IT FURTHER RESOLVED, That the following parking rates are hereby authorized:

A. Ashley/William (Attended) - .30 cents per half hour for first four hours, $8.00 daily for any time beyond four hours.

B. Main/William (metered) - .30 cents per half hour. (Two hour meters only);

and to schedule this for a vote on November 4, 1991 pending review by the Parking Advisory Committee.

On a voice vote, the chair declared the motion carried.

The question on the floor is approval of the resolution as amended. On a voice vote, the Chair declared the motion carried.

Following is the resolution as approved:

Council - October 21, 1991 49

**R-638-10-91
RESOLUTION REGARDING ASHLEY/WILLIAM SURFACE PARKING LOT**

RESOLVED, That council approve the issuance of a purchase order in the amount of $78,428 to Traffic & Safety Control Systems, Inc. for furnishing and installing equipment necessary for the attended portion of the lot;

RESOLVED, That the sum of $90,000 is appropriated from the parking system fund undesignated fund balance, to be reimbursed from funds lawfully available therefor including a bond issue or tax increment revenues;

RESOLVED, That the City Administrator is hereby authorized to formulate and administer a program for third party reimbursement of parking fees (merchant validations) for the attended lot as necessary; and

RESOLVED, That the City Administrator is authorized to take necessary administrative actions to implement this resolution.

****

**R-639-10-91 APPROVED
RESOLUTION TO ESTABLISH SPECIAL EVENTS PARKING RATES**

RESOLVED, That a special event parking rate of $6.00 per space is herein established by the Ann Arbor City Council at the following structures: Fourth and William; Washington and First.

Councilmember Hunter moved that the resolution be approved.

On a voice vote, the Chair declared the motion carried.

****

**R-640-10-91 APPROVED AS SUBSTITUTED
RESOLUTION REGARDING MICHIGAN SENATE BILL #522**

Councilmember Eckstein moved that the substitute resolution be approved.

Whereas, Michigan State Senator Paul Wartner has introduced legislation

50 Council - October 21, 1991

(Michigan Senate Bill #522) which would prohibit the formulation of local wetland ordinances, and nullify existing local wetland ordinances;

Whereas, Bill #522 would prohibit local governments from fully controlling what is historically a local government function (land development and zoning), to the detriment of the home rule concept and local quality of life;

Whereas, Bill #522 would significantly reduce, or totally eliminate the protection afforded wetlands presently covered by local ordinances in the state;

Whereas, Local ordinances may be more restrictive than state-wide legislation in order to address specific local needs, but rarely less restrictive; and

Whereas, Ann Arbor is currently in the process of developing a Natural Features

Ordinance (including wetland protection) to replace existing Natural Features Guidelines;
RESOLVED, That the Mayor and City Council of Ann Arbor Michigan is opposed to the special interest driven rational for this bill and its goals, and strongly recommends that Senate Bill #522 be defeated. The Mayor and Council further instruct the City Clerk to forward copies of this resolution to State Senator Paul Wartner, State Senator Lana Pollack, Governor John Engler, the Director of the Michigan Department of Natural Resources, and the Natural Resources Sub-Committees of the Michigan State Senate and Michigan House of Representatives.
On a voice vote, the Chair declared the motion carried.

REPORTS FROM COUNCIL COMMITTEES

NOISE COMMITTEE

Councilmember Grady acknowledged and thanked Councilmember Dodge, all those members of the Noisy Party Task Force as well as neighborhood, University of Michigan student and administrative organizations, and City officials who helped to develop the amendments to the Noise Ordinance approved this date. He said that these people would be coming back in January to assess events of the fall and make further recommendations to the Council.

SOLID WASTE COMMISSION

Councilmember Peterson, member of the Solid Waste Commission, announced that beginning October 30 through November 16, citizens can recycle their phone books at all Kroger stores and at the recycling drop-off station on South Industrial. Commercial establishments who have a large number of phone books can make arrangements with Council - October 21, 1991 51
Recycle Ann Arbor. This program is sponsored by the Kroger Company, Ameritech Publishing, Pepsi Cola, Recycle Ann Arbor, NuWool and the City of Ann Arbor. The phone books will be made into insulation and a mulch.

JOINT TAXING UNIT MEETING

Councilmember Ouimet reported on the Joint Taxing Units of Washtenaw County meeting held on October 17. He attended this meeting along with Mayor Brater and City Administrator Gatta. He said that a number of approaches were discussed that may help if not resolve some tax challenges. One of the items discussed is coordination of efforts between taxing units who have millage questions on the ballot, and joint projects that slow down the expansion of government where it makes economic sense.

COMMUNICATIONS FROM THE MAYOR

APPOINTMENTS APPROVED

Mayor Brater asked for confirmation of the following appointments which were placed in nomination at the last Council session:

EMPLOYEES' RETIREMENT SYSTEM - BOARD OF TRUSTEES
Ronald Bishop (to complete membership requirements)
1011 Lincoln
Term: 10-21-91 to 10-21-94

CITY ATTORNEY SEARCH COMMITTEE
P. E. Bennett
1108 Vesper
Suellyn Scarnecchia
3183 Homestead Commons
Robert E. Guenzel
1703 Morton
Gail Altenburg
2718 Hampshire

COMMUNITY DEVELOPMENT CITIZEN PARTICIPATION EXECUTIVE COMMITTEE
Samuel G. Offen (representing City Planning Commission)
52 Council - October 21, 1991
2330 Adare
Term: 10-21-91 to 10-21-93

INDIVIDUAL HISTORIC PROPERTIES HISTORIC DISTRICT STUDY COMMITTEE
Alex Deparry (upon the resignation of Robert Harrington)
403 South Fifth Avenue
(Term of office ends when Council takes final action on this Committee's recommendations)

HISTORIC DISTRICT COMMISSION
George Dodd (reappointment)
722 Spring Street
Term: 10-21-91 to 10-21-94
Jean Ledwith King (to replace David Copi upon term expiration)

277 East Liberty
Term: 10-21-91 to 10-21-94
Councilmember Peterson moved that Council concur in the recommendation of the Mayor.
On a voice vote, the Chair declared the motion carried.
APPOINTMENTS NOMINATED
Mayor Brater placed the following names in nomination for confirmation at a later date:
DOWNTOWN DEVELOPMENT AUTHORITY
David A. DeVarti (upon resignation of John Finn)
415 Detroit
Term: 11-4-91 to 11-4-95
Tom Kittel (upon the resignation of Arnold Laubengayer)
365 Hazelwood
Term: 11-4-91 to 11-4-95
LOCAL OFFICERS' COMPENSATION COMMISSION
Kathy Edgren (upon moving out of the City of Reverend Hillegonds)
606 Linda Vista
Term: 11-4-91 to 9-30-98
Council - October 21, 1991 53
Mayor Brater expressed sympathy to the family of Vernon Phelps who recently passed away. She noted that Vernon Phelps served for thirty years as the Chair of the Board of Examiners of Electricians and Electrical Contractors.
COMMUNICATIONS FROM THE CITY ADMINISTRATOR
City Administrator Alfred A. Gatta presented the following information memorandums:
□Î City Ownership of the Property at William and First Streets
□Î On-Street Meter Locations
□Î Solid Waste Department Monthly Progress Report
□Î 1990-91 Crime and Incident Report
□Î 1991-92 Sidewalk Repair Program
□Î Legal Services Rendered with Respect to City of Ann Arbor Landfill
□Î Evaluation Committee Report - Request for Proposals #274 - Collection Services of Residential and Commercial Multi-Family Solid Waste
□Î Comerica Bank Site
□Î Payment of Sidewalk Claims
□Î Council Follow-up 1/7-4 - Preparing Parking Structures for Winter
□Î Termination of Parking Lease Arrangement with the Ann Arbor Development Council, Inc.
□Î Bulk, Appliance and Supplemental (Commercial) Solid Waste Services in Surrounding Communities Analysis
□Î Shefman Property
□Î Availability of Quarterly Report on Line-item Budget Transfers
□Î City of Ann Arbor 1990-1991 Annual Report
54 Council - October 21, 1991
The City Administrator received additional requests for information from Councilmembers to be reported at a later date.
COMMUNICATIONS FROM THE CITY ATTORNEY
City Attorney Mel Laracey presented the following for the information of Council:
□Î Conditioning Utility Service on Compliance with Erosion Control Ordinance
COMMUNICATIONS FROM COUNCIL
None.
CLERK'S REPORT OF COMMUNICATIONS, PETITIONS AND REFERRALS
The following communications were received
□Î Governor John Engler acknowledging receipt of a Council approved resolution - File
□Î Dwayne and Colleen Hayes - Domestic Partnership Ordinance
The following minutes were received and are filed with the City Clerk:
□Î Zoning Board of Appeals - August 21, 1991
□Î Housing Board of Appeals - September 4, 1991
□Î Ann Arbor Energy Commission - August 15, 1991
□Î Human Rights Commission - June 24, 1991
□Î Ann Arbor Historic District Commission - September 12, 1991
Councilmember Hunter moved that the Clerk's report be approved.
On a voice vote, the Chair declared the motion carried.
AUDIENCE PARTICIPATION - GENERAL
None.
Council - October 21, 1991 55
ADJOURNMENT

There being no further business, Councilmember Hunter moved that the meeting be adjourned.
On a voice vote, the Chair declared the motion carried and the meeting was adjourned at 10:35 p.m.
W. Northcross
Clerk of the Council
Linda J. Wise
Recording Secretary

Login (https://www.piperpartners.com/login)

(tel:+17348459700) (mailto:andy@piperpartners.com)

piperpartners.com
local, trusted, connected

(https://www.piperpartners.com)

Search Home Listings

Area Index (https://www.piperpartners.com/areas/)
Ann Arbor (https://www.piperpartners.com/areas/ann-arbor)
Neighborhoods (https://www.piperpartners.com/areas/ann-arbor/neighborhoods/)
The Evergreens

The Evergreens

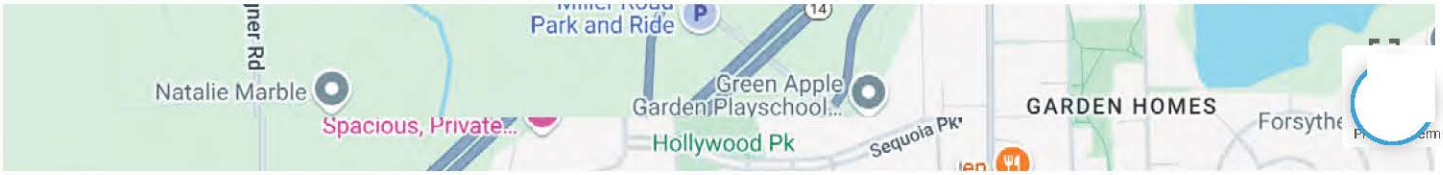
Subscribe to this Neighborhood

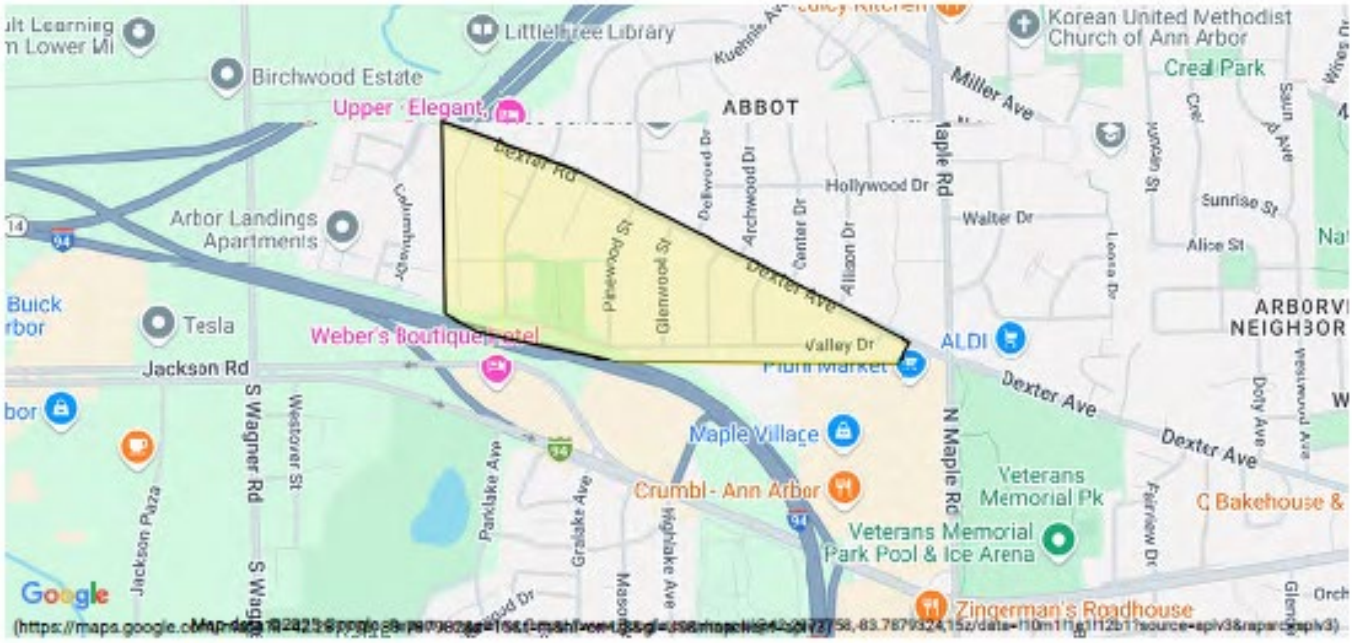
The Evergreens are located just west of downtown Ann Arbor o Dexter Ave. This quaint subdivision o ers wooded lots and a ordable Ann Arbor living. Homes were built between 1925 and 2001 with Ranch, Bungalow, Colonial and Two-Story styles with 950-2000 sq ft oor plansLayouts include 2-5 bedrooms, 1-3 baths, full basements and 1.5-2 car garages.

Nearby is Plum Market, Vet's Park and Westgate shopping and dining such as Zimmerman's Roadhouse and Seva. Downtown Ann Arbor is just minutes away, and University of Michigan is easily accessible as well.

Students attend highly rated Ann Arbor Schools: Abbot Elementary, Forsythe Middle, and Skyline High School.

0 Available Listings In The Evergreens





The Evergreens Market Update

Active Statistics

No active listings available

Sold Statistics

Total Sold	3
Avg. Sold Price	$443,866
Avg. Sold Days on Market	56.667

All statistics are based on the last 12 months

The Evergreens Property Listings

Sold Listings

SOLD

SOLD **More Info**

SOLD

SOLD **More Info**

(https://www.piperpartners.com/property/330-rose-drive-ann-arbor-mi-48103/)
Sold on November 19, 2024 for $345,000
3 bed, 2. bath, 2,002 sqft
330 Rose Drive, Ann Arbor

(https://www.piperpartners.com/property/2701-dexter-road-ann-arbor-mi-48103/)
Sold on July 15, 2024 for $553,100
4 bed, 2. bath, 1,661 sqft
2701 Dexter Road, Ann Arbor

SOLD

SOLD **More Info**

(https://www.piperpartners.com/property/411-barber-ann-arbor-mi-48103/)
Sold on April 24, 2024 for $433,500
4 bed, 2. bath, 2,224 sqft
411 Barber, Ann Arbor

Search All Ann Arbor Homes for Sale ❯ (/search/?mls_city=ann-arbor)

View All Ann Arbor Neighborhoods ❯ (/areas/ann-arbor/neighborhoods)

Request More Information

First Name *(Required)*

Last Name *(Required)*

Email *(Required)*

Phone *(Required)*

Comments/Questions

I agree to receive marketing, customer service calls and text messages from piperpartners.com. Consent is not a condition of purchase. Msg/data rates may apply. Reply STOP to unsubscribe. Privacy Policy (https://www.piperpartners.com/privacy-policy/) & Terms of Service (https://www.piperpartners.com/terms-of-service/).

SUBMIT

Testimonials

Excellent service from a great team. Great experience. -Jesus Tome

Read More Testimonials (https://www.piperpartners.com/buyers/buyer-testimonials/)

Recently Viewed Neighborhoods



(https://www.piperpartners.com/areas/ann-arbor/neighborhoods/westover-hills/)

Ann Arbor

Westover Hills (https://www.piperpartners.com/areas/ann-arbor/neighborhoods/westover-hills/)

1 active, 1 sold

Contact Us

Piper Partners

912 N Main
Ann Arbor, Michigan 48103

Phone: 734-845-9700 (tel:7348459700)
Email: andy@piperpartners.com (mailto: andy@piperpartners.com)

Our Mission

We improve lives by delivering 5-star real estate service with the highest levels of competence, trust, and integrity. We are known as connected, compassionate, and giving leaders in the communities we serve.

Our Team

The Piper Partners Real Estate Team in Ann Arbor is one of the top-ranking teams in Southeast Michigan. Piper Partners serves Washtenaw, West-Wayne, Livingston, and parts of Oakland counties, including the cities of Ann Arbor, Brighton, Canton, Chelsea, Dexter, Milan, Northville, Plymouth, Saline, South Lyon, and Ypsilanti.

© Piper Partners 2025 Privacy Policy (https://www.piperpartners.com/privacy-policy/)
Terms of Service (https://www.piperpartners.com/terms-of-service/)



Sort Recommended

No properties matching your criteria were found.
Try modifying your search and try again.



Michigan > Ann Arbor > Scioto Hills > Real Estate & Homes for Sale in Scioto Hills, Ann Arbor

Frequently Asked Questions

What are the most popular zip codes in Scioto Hills, Ann Arbor, MI?

The most popular zip codes in Scioto Hills, Ann Arbor, MI include 48111, 48178, 48176, 48103 and 48197.

What are the most popular neighborhoods near Scioto Hills, Ann Arbor, MI?

The most popular neighborhoods near Scioto Hills, Ann Arbor, MI are Arborview, Garden Homes, Sister Lakes, Wildwood Park and Eberwhite.

PLANNING AND DEVELOPMENT SERVICES STAFF REPORT

For Planning Commission Meeting of August 16, 2011

SUBJECT: SCIO TOWNSHIP ANNEXATIONS AND ZONINGS

Andres Annexation and Zoning (305 Pinewood Street)
File Nos. A11-008 and Z11-008

Ellis Annexation and Zoning (3313 Dexter Road and vacant)
File Nos. A11-007 and Z11-007

French Annexation and Zoning (3225 Dexter Road)
File Nos. A11-005 and Z11-005

Morris Annexation and Zoning (427 Barber Avenue)
File Nos. A11-004 and Z11-004

Skelley Annexation and Zoning (545 Allison Drive)
File Nos. A11-003 and Z11-003

Zummer Annexation and Zoning (3249 Dexter Road)
File Nos. A11-006 and Z11-006

PROPOSED CITY PLANNING COMMISSION MOTION
The Ann Arbor City Planning Commission hereby recommends that the Mayor and City Council approve the Scio Township Annexations at 305 Pinewood Street, 3313 Dexter Road and adjacent, 3225 Dexter Road, 427 Barber Avenue, 545 Allison Drive, and 3249 Dexter Road, and R1C (Single-Family Dwelling District) Zonings.

STAFF RECOMMENDATION

Staff recommends that the petitions be **approved** because the parcels are within the City's water and sewer service area and the recommended zoning designations are consistent with the adjacent zoning designations, the surrounding land uses and the City's Master Plan.

LOCATION

All parcels are located in Scio Township on or off Dexter Road between North Maple Road and M-14. Specific site locations are indicated on the attached parcel and zoning maps.

DESCRIPTION OF PROJECT

The petitioners, each of whom has applied separately, request annexation from Scio Township and R1C single-family zoning designation. No new construction is proposed on any of the petition sites except for connection to public water and sanitary sewer mains.

The petitions have been combined into one staff report for economy and efficiency.

COMPARISON CHART

Site Name, Address	Existing Lot Area	Existing Lot Width	Proposed District	Min. Lot Area	Min Lot Width
Andres, 305 Pinewood	13,182 sq ft	107 ft	R1C	7,200 sq ft	60 ft
Ellis, 3313 Dexter	14,375 sq ft	143 ft	R1C	7,200 sq ft	60 ft
Ellis, Dexter Road vacant	34,848 sq ft	185 ft	R1C	7,200 sq ft	60 ft
French, 3225 Dexter	8,712 sq ft	58 ft	R1C	7,200 sq ft	60 ft
Morris, 427 Barber	9,000 sq ft	60 ft	R1C	7,200 sq ft	60 ft
Skelley, 545 Allison	11,761 sq ft	107 ft	R1C	7,200 sq ft	60 ft
Zummer, 3249 Dexter	17,424 sq ft	119 ft	R1C	7,200 sq ft	60 ft

SURROUNDING LAND USES AND ZONING

Site Name, Address	Surrounding Land Use	Surrounding Zoning Districts
Andres, 305 Pinewood	Single-family residential, public parkland	R1C, PL
Ellis, 3313 Dexter and vacant	Multiple-family residential, single-family residential	R4A, R1C
French, 3225 Dexter	Single-family residential	R1C, Township
Morris, 427 Barber	Single-family residential	R1C
Skelley, 545 Allison	Single-family residential	R1C
Zummer, 3249 Dexter	Single-family residential	R1C, Township

HISTORY AND PLANNING BACKGROUND

In March 2011, the Michigan Department of Natural Resources and Environment entered into a consent agreement with Pall Life Sciences to expand the well prohibition zone north of its current boundary into the Evergreen Subdivision. Each property is within the expanded well prohibition zone, created in response to groundwater contamination from the predecessor of the Pall Corporation facility located on Wagner Road. Background and resources for additional information about the 1,4 dioxane groundwater contamination can be found on the Washtenaw County website (direct link provided in footnote[1]).

[1] http://www.ewashtenaw.org/government/departments/environmental_health/card

The Master Plan: Lane Use Element recommends continued single-family residential uses for each of the properties.

COMMENTS PENDING, DISMISSED OR UNRESOLVED

Planning – All petition filing fees as well as all connection and improvement charges for water and sanitary sewer service have been paid by Pall Corporation.

Prepared by Alexis DiLeo
Reviewed by Wendy Rampson
8/11/11

Attachments: Zoning/Parcel Maps

c: Petitioners/Owners:

Carolyn B. Andres, 305 Pinewood Street, Ann Arbor, MI 48103
Robert B. Ellis, 3313 Dexter Road, Ann Arbor, MI 48103
Richard K. and Betty Ann French, 3225 Dexter Road, MI 48103
Lawrence R. Morris, 2420 Gladstone Avenue, Ann Arbor, MI 48104
Stephen V. Skelley, 545 Allison Drive, Ann Arbor, MI 48103
Robert and Patricia Zummer, 3249 Dexter Road, Ann Arbor, MI 48103
Laurel Beyer, Pall Corp. Life Sciences, 600 S. Wagner Rd., Ann Arbor, MI 48103-9019

Assessor
Systems Planning
File Nos. A11-003 and Z11-003 [Skelley]
File Nos. A11-004 and Z11-004 [Morris]
File Nos. A11-005 and Z11-005 [French]
File Nos. A11-006 and Z11-006 [Zummer]
File Nos. A11-007 and Z11-007 [Ellis]
File Nos. A11-008 and Z11-008 [Andres]