SEVENTH FIVE-YEAR REVIEW REPORT FOR ST. REGIS PAPER COMPANY SUPERFUND SITE CASS COUNTY, MINNESOTA

Prepared by

U.S. Environmental Protection Agency
Region 5
Chicago, Illinois

7/14/2025

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Signed by: TIMOTHY FISCHER

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APPENDICES

LIST OF ABBREVIATIONS & ACRONYMS

AOC	Administrative Order on Consent
B(a)P	Benzo(a)pyrene
B(a)PE	Benzo(a)pyrene Equivalents
BNSF	Burlington Northern-Santa Fe Railway
CWA	Clean Water Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
CIP	Community Involvement Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of Concern
DRM	Division of Resource Management (the Band)
EDL	Estimated Detection Limit
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FYR	Five-Year Review
gpm	gallons per minute
GAC	Granular Activated Carbon
GWCL	Groundwater Cleanup Level
HSCA	Hazardous Substances Control Act (the Band)
HHERA	Human Health and Ecological Risk Assessment
HCZ	Hydraulic Capture Zone
HRL	Health Risk Limit
IC	Institutional Control
ICIAP	Institutional Control Implementation and Assurance Plan
IP	International Paper
LCM	Leachate Collection Manhole
LDM	Leak Detection Manhole
The Band	Leech Lake Band of Ojibwe
LTS	Long-Term Stewardship
MDL	Method Detection Limit
µg/L	micrograms per liter
MDH	Minnesota Department of Health
MEDD	Minnesota Enforcement Decision Document
MPCA	Minnesota Pollution Control Agency
NCP	National Contingency Plan
NPL	National Priorities List
NAPL	Non-Aqueous-Phase Liquid
ND	Not Detected
OU	Operable Unit
O&M	Operations and Maintenance
ppb	parts per billion

ppm	parts per million
ppq	parts per quadrillion
ppt	parts per trillion
PCP	Pentachlorophenol
PCDF	Polychlorinated dibenzofuran
PCDD	Polychlorinated dibenzo-p-dioxin
PAH	Polycyclic aromatic hydrocarbon
PRP	Potentially Responsible Party
QAPP	Quality Assurance Project Plan
ROD	Record of Decision
RPF	Relative Potency Factor
RI	Remedial Investigation
RCRA	Resource Conservation and Recovery Act
RAL	Response Action Level
RSL	Regional Screening Level
SEMS	Superfund Enterprise Management System
Site	St. Regis Paper Company Superfund Site
TEF	Toxicity Equivalence Factor
TEQ	Toxicity Equivalence
UAO	Unilateral Administrative Order
USGS	United States Geologic Survey
UU/UE	Unlimited Use/Unrestricted Exposure
WQS	Water Quality Standards
WHO	World Health Organization

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, commonly referred to as Superfund, and consistent with the National Contingency Plan (NCP) (40 CFR Section 300.430(f)(4)(ii)) and considering EPA policy.

This is the seventh FYR for the St. Regis Paper Company Superfund Site (Site). The triggering action for this statutory review for Operable Unit (OU) 7, and discretionary reviews for OUs 1, 2, and 3, is the completion of the previous FYR (July 16, 2020). The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use/unrestricted exposure (UU/UE).

The site consists of seven OUs (OUs 1, 2, 3, 4, 7, 8, and 9), as shown in Figure B-1 (Appendix B). While all seven OUs are referenced in this FYR, only the remedies for four OUs are evaluated in this FYR: OU1, OU2, OU3, and OU7, as shown in Table 1 below. This FYR evaluates the interim remedy for OU7 selected in 2005, but not the remedy for OU7 selected in the 2020 Record of Decision (ROD, Appendix A ref. 1), because it has not yet been implemented. As documented in a memo-to-file in the site record dated January 13, 2025 (Appendix A ref. 2), surficial soils in OUs 1, 2, and 3 have been separated out into two additional OUs: OU4 (City Dump Soils) representing the soils above the former City Dump groundwater plume (OU3) and OU8 (Non-Residential Soils) representing the soils above the OU1 and OU2 groundwater areas not addressed by OU7. There are no remedies selected yet for OU4, OU8, and OU9; however, information on these OUs is included in this section to help the reader better understand the nature and extent of the contamination at the site in general.

Table 1: Site Operable Unit (OU) Descriptions and Status on Evaluation of Their Remedies in This FYR

OU	Description	Remedy Evaluated in this FYR
1	Northwest Area Groundwater (treatment system)	Yes (Discretionary)
2	SW Area Landfill/Groundwater	Yes (Discretionary)
3	Former City of Cass Lake Dump Groundwater (treatment system)	Yes (Discretionary)
4	Former City of Cass Lake Dump Soils	No
7	House Dust/Residential Soils	Yes (Statutory)
8	Non-Residential Soils	No
9	Southwest Groundwater Plume (Fox Creek Valley)	No

The St. Regis Paper Company Superfund Site FYR was led by Zachary Sasnow and Brandon Pursel, Remedial Project Managers for the EPA. Participants included Eric Krumm and Craig Tangren, Leech

Lake Band of Ojibwe (the Band); Dan Cervin and Mark Elliott, Minnesota Pollution Control Agency (MPCA); Daniel Pena, Minnesota Department of Health (MDH), and Philip Gurley, Community Involvement Coordinator (CIC) for the EPA. The relevant entities such as the Band, MPCA, and potentially responsible parties (PRPs), including International Paper (IP) and Burlington Northern-Santa Fe Railway (BNSF), were notified of the initiation of the FYR. The review began on July 16, 2024.

Site Background

The approximately 163-acre site is located on the south side of the city of Cass Lake, Minnesota, population approximately 750, and is wholly within the exterior boundaries of the Leech Lake Reservation (See Appendix B, Figure B-1). The site is located in an area of flat to gently rolling topography, with glacial moraines and outwash plains, and low-lying bogs and lakes. Groundwater at the site is generally divided into two sand and gravel aquifers (upper outwash and lower outwash) separated by less permeable glacial till; however, there are areas at the site where the till layer is thinner or absent.

Corporate predecessors of IP operated a wood treater that contaminated soil and groundwater with polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated-dibenzofurans (PCDFs), often referred to as "dioxins and furans" in short, as well as polycyclic aromatic hydrocarbons (PAHs) and pentachlorophenol (PCP). Contaminated groundwater present at the site currently comprises three known plumes, a plume within the former wood treatment operations area (OU1), the former City of Cass Lake dump (OU3), and waste disposal pits near the Fox Creek Valley to the west of the dump (OU9). Waste sludges excavated from the former operations area were consolidated in an on-site landfill (OU2), also referred to in many site documents as a 'containment vault,' for which the surrounding groundwater is periodically monitored. OU9 was separated off from OU2 in 2023 to proceed with a full Remedial Investigation (RI) separately from the existing remedy for OU2 being evaluated in this FYR. The investigation is on-going as of this FYR and includes delineating the extents of the disposal pits and conducting groundwater sampling down-gradient of the disposal pits. Current contaminants at OU9 include primarily PAHs, PCP, and naphthalene, but a wider suite of potential contaminants is being evaluated during the OU9 RI.

The surficial soils at the site, which are not source areas to the groundwater plumes, comprise residential areas (OU7), non-residential areas (OU8), and soils above the former City of Cass Lake dump (OU4). The EPA is engaged on consultation with the Band on future remedy decisions at OU4 and OU8, and development of these decisions is pending additional risk assessment evaluation and data collection.

Properties on the site have a variety of current uses and owners. Two single family homes are on the site. Other on-site properties have a variety of uses, including: the groundwater treatment facility and hazardous waste landfill; an active BNSF rail line; a former municipal dump; the Band's Division of Resource Management (DRM) offices and facilities; private commercial and light industrial uses; and vacant property. The reasonably anticipated future uses of site properties are generally similar to existing uses, although it is reasonable to anticipate that vacant property may be returned to either commercial or residential use in the future. The land surrounding the Site is also used for residential,

recreational, and commercial/industrial purposes, consistent with City of Cass Lake zoning. The Band and the City of Cass Lake are developing reuse plans for properties located within the site, and the EPA is currently conducting a Reuse Assessment to document reasonably anticipated future land use at the site. Several surface water bodies lie to the east, including Pike Bay, Cass Lake, and a channel connecting the two (Pike Bay Channel). Fox Creek runs along the southern boundary of the site, discharging to Pike Bay. Surface water in the area is used for swimming, fishing, boating, and Tribal subsistence harvesting of fish and wild rice. The site is also adjacent to Chippewa National Forest lands and wetlands that may be used for hunting, and gathering of plants, including wild rice and other medicinal plants used for Tribal lifeways.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: St. Regis Paper Company		
EPA ID: MND057597940		
Region: 5	**State:** MN	**City/County:** Cass Lake/Cass County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** No	
REVIEW STATUS		
Lead agency: EPA		
Author names (Federal Project Managers): Zachary Sasnow, Brandon Pursel		
Author affiliation: EPA		
Review period: 7/16/2024 – 2/12/2025		
Date of site inspection: 10/9/2024		
Type of review: Statutory		
Review number: 7		
Triggering action date: 7/16/2020		
Due date: 7/16/2025		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The March and July 1986 Minnesota Enforcement Decision Documents (MEDDs, Appendix A refs. 3 and 4) identified the following contaminants of concern (COCs): PCDDs, PCDFs, metals, PCP, and PAHs in site groundwater (OU1, OU2, and OU3). Potential human exposure pathways identified as needing to be addressed in the MEDDs include ingestion of or direct contact with contaminated groundwater from residential wells and the Cass Lake municipal water supply system or contaminated surface water in Cass Lake/Pike Bay.

A separate interim remedial action for OU7 under EPA oversight from 2005 to present, is based on sampling conducted pursuant to the 2003 to 2011 Human Health and Ecological Risk Assessment (HHERA, Appendix A ref. 5). An October 2005 Interim ROD for OU7 (Appendix A ref. 6) identified dioxin, arsenic, and PAHs as the site COCs in indoor dust. It was determined the risks to residents from contaminated house dust can occur via ingestion, inhalation, and direct dermal contact exposure pathways and needed to be addressed.

Response Actions

Response Actions Initiated under MPCA Oversight (OUs 1, 2, and 3)

MPCA issued MEDDs for the site in March 1986 (Appendix A ref. 3) and for the Former Cass Lake City Dump area of the site in July 1986 (Appendix A ref. 4). The EPA did not sign or indicate concurrence or non-concurrence with the MEDDs. The March and July 1986 MEDDs both outline the following response goals and objectives:

> 1. Adequately protect the public against exposure to PCP, PAH, PCDD, and PCDF isomers through direct contact or ingestion of groundwater from private and public water supplies.
>
> 2. Adequately protect the public against exposure to PCP, PAH, PCDD and PCDF isomers potentially released to surface water from the groundwater.
>
> 3. Adequately protect and minimize damage to the environment from the migration of PAH, PCDD and PCDF isomers in the groundwater.

The March 1986 MEDD for the site called for the following response actions:

> 1. Installation of ten groundwater extraction wells with granular activated carbon (GAC) treatment, to pump and treat contaminated groundwater until acceptable levels in the groundwater are reached.
>
> 2. Construction of an on-site containment vault [landfill] designed to meet [Resource Conservation and Recovery Act (RCRA)] requirements for the deposition of hazardous waste sludges and contaminated soil to be excavated during source removal activities.

3. Extension of the Cass Lake Community Water System to residents not currently serviced and potentially affected by groundwater contamination from the site.

4. Long term monitoring of the treated groundwater discharge and selected fish species for site COCs to determine the effectiveness of the groundwater treatment system.

5. Long term operation and maintenance (O&M) of the groundwater extraction system and monitoring of groundwater and surface water to determine its effectiveness.

6. Long term O&M and monitoring of the on-site containment vault [landfill].

The July 1986 MEDD for the Former Cass Lake City Dump area of the site called for:

1. Long term O&M of a contaminated groundwater gradient control/extraction/treatment system.

2. Long term monitoring to assess response action performance.

The March 1986 MEDD identified Response Action Levels (RALs), or cleanup goals, for site groundwater cleanup as shown in Table 2 below. The remedial action was expected to reach groundwater cleanup goals within 25 years. Although the MEDD did not specify a groundwater cleanup level (GWCL) for PCDDs and PCDFs, it cited a draft EPA document that correlated a concentration of 1.3×10^{-7} micrograms per liter (µg/L) to the 10^{-5} excess lifetime cancer risk level and set this level as the cleanup goal. Because the RALs used at remedy selection were likely not within the EPA's target risk range of 10^{-4} to 10^{-6}, the EPA communicated to IP in a December 20, 2016, Cleanup Level Update letter (Appendix A ref. 7), the basis for updated GWCLs (Table 2). These updated GWCLs did not include GWCLs for non-carcinogenic PAHs, due to non-carcinogenic PAHs being several orders of magnitude below EPA's target risk range for tapwater ingestion Regional Screening Levels (RSLs).

The Band has also promulgated screening levels for groundwater for the Leech Lake Reservation as part of the Leech Lake Hazardous Substances Control Act (HSCA), enacted in 2000. These levels, and MDH Health Risk Limits (HRLs) for drinking water are also summarized on Table 2 for reference.

Table 2: Groundwater Screening Levels for the Site

Contaminant	1986 MEDDs		EPA 2016 Recommended Cleanup Levels		Band HSCA GWCL, µg/L	MDH HRL, µg/L
	Risk Goal	RAL, µg/L	Basis	CL, µg/L		
PCP	10^{-5} excess lifetime cancer risk	OU1 – 1010 OU3 – 220 (suggested)	Maximum Contaminant Level (MCL)	1	0.02	0.3
Carcinogenic PAHs		OU1 – 0.028 OU3 – 0.28 (suggested)	MCL for B(a)P	0.2	0.001 (B[a]P)	0.1 (B[a]P)
Non-carcinogenic PAHs	Not specified	0.300	Eliminated due to highest detections being orders of magnitude below RSLs		Varies	Varies

PCDDs/PCDFs	10^{-5} excess lifetime cancer risk	Not established; 1.3×10^{-7} suggested for 2,3,7,8-TCDD	MCL for 2,3,7,8-TCDD	3.0×10^{-5}	3.0×10^{-6}	Not specified

Response Actions Initiated under EPA Oversight

In 1995, the EPA became the lead oversight agency for the site and issued a UAO to Champion (Appendix A ref. 8) that required Champion to, among other things, continue response actions undertaken pursuant to the two MEDD Response Orders by Consent. The UAO remains in effect with Champion's successor, IP.

In October 2005, EPA issued an Interim ROD (Appendix A ref. 6) and in December 2005 issued a UAO (Appendix A ref. 9), which required IP to perform an interim remedial action to meet the RAO of reducing the volume of PCDD/PCDF/PAH-contaminated dust in residential properties and one business property adjacent to the site in OU7. The selected remedial actions included: 1) an initial comprehensive cleaning of 30 properties, 2) periodic cleaning for dust, 3) application of dust suppressant to the unpaved roads, and 4) application of 3 inches of clean soil and grass seed to 31 residential yards.

The EPA also signed a ROD for residential soil cleanup at OU7 in April 2020 (Appendix A ref. 1). The remedy selected in the 2020 ROD included:

1) Excavation of contaminated soil that exceeds Level 1 Preliminary Remedial Goals (10 parts per trillion [ppt] PCDD/PCDF and 1.6 parts per million [ppm] carcinogenic PAHs), backfill with clean soil fill, and revegetation;
2) Consolidation below grade with the other OUs excavated soil that does not pose a leaching threat, covered by a geotextile marker, clean fill, and topsoil, and then revegetated;
3) Placement of Institutional Controls (ICs) on the area of consolidated soil in order to maintain the protectiveness of the cover and prevent unauthorized excavation; and
4) Five-Year Reviews.

The EPA is currently evaluating data and has not yet issued a ROD for non-residential soil OUs (OU4 and OU8).

<u>Status of Implementation</u>

OU1, OU2, and OU3 Remedial Actions

In the mid- to late 1980s, under MPCA oversight, Champion performed the following actions: extension of the Cass Lake Community Water System to nearby residents; excavation of visibly contaminated sludge and soil and containment in an onsite RCRA Subtitle C landfill (a.k.a. containment vault - 37,500 cubic yards from OU1 and 4,500 cubic yards from OU3); and installation of a groundwater pump and treat system consisting of ten groundwater extraction wells in OU1, and three extraction wells in OU3 that convey water to an on-site treatment plant utilizing three 20,000-pound GAC vessels in series,

with effluent discharging to an outfall to the channel between Cass Lake and Pike Bay. In 1992, a product recovery plan was instituted by installing light non-aqueous phase liquid (NAPL) recovery wells to collect site-related diesel-range organics that accumulated near the extraction wells. This remedy continues to be operated and maintained as described below in the "Systems Operations/Operation & Maintenance" section of this report.

In an April 26, 2024, letter (Appendix A ref. 10), the EPA requested that IP prepare a work plan to complete delineation of principal threat waste NAPL present in OU1 and OU3 that may be serving as a continued source to the persistent groundwater plumes present in these OUs. IP provided a draft work plan to the EPA in October 2024 which is currently under review. The extents of NAPL present in OU3 has been partially delineated by IP in prior efforts; however, for OU1 the extents of NAPL are not known except for sporadic detections of NAPL in monitoring well W118. Additional extraction and monitoring wells may be necessary in these OUs in the future. The EPA will evaluate additional extraction and monitoring locations after completing the source area investigation, as a full understanding of the remaining source areas is needed to identify effective locations for these wells.

OU7 Interim Remedial Action

In 2006, IP performed interim remedial actions at residences in OU7, which included: 1) an initial comprehensive cleaning at 30 properties, 2) periodic cleaning for dust, 3) application of dust suppressant to the unpaved roads, and 4) application of three inches of clean soil and seed to 31 residential yards. These actions continue to be implemented in the manner described below in the "Systems Operations/Operation & Maintenance" section of this report.

Institutional Controls

Institutional controls (ICs) are not required by the two 1986 MEDDs (Appendix A refs. 3,4) nor by EPA's 2005 Interim ROD for OU7 (Appendix A ref. 6). However, ICs for a soil consolidation area are included as part of the final ROD for OU7 signed in April 2020 (Appendix A ref. 1). Table 3 below provides a summary of the ICs in place for the site, which cover areas of the site within the City of Cass Lake (OUs 1, 7, and 8).

Table 3: Summary of Implemented ICs For the Site

Media that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s) and OUs	IC Objective	Title of IC Instrument Implemented and Date
Groundwater, Soil	Yes	No	Site parcels listed in Attachment A of the Quit Claim Deed	Prevent installation of groundwater wells or any use which would disturb the property or adjoining property as contemplated by M.S 115B.16, subd. L	Quit Claim Deed, April 22, 1988
Soil	Yes	No	Site parcels within the City of Cass Lake	Limit use (e.g. small-scale industrial, low-density residential) of properties in Cass Lake	City of Cass Lake Zoning Ordinance No. 12282005, Jan. 25, 2006
Groundwater	Yes	No	Parcels between 1st and 3rd Streets South, and east of Hwy. 371	Prevent the construction and use of private water wells, and require the permanent sealing of a private water well	City of Cass Lake Resolution 14-2006, Jan. 24, 2007

Status of ICs and Current Compliance: There are currently no known uses of the site that are considered inconsistent with the objectives to be achieved by the current ICs in place. The 1998 Quit Claim Deed and City of Cass Lake Resolution 14-2006 place restrictions on drilling private water wells. However, with respect to zoning, there have historically been parcels within the site that are zoned for commercial use but used as residential, and *vice versa*. Although the City of Cass Lake does not strictly enforce its 2006 Zoning Ordinance, the unauthorized use of these properties does not pose current unacceptable risks to human health because the surface soil contaminant levels on properties in current residential use is within the EPA's acceptable residential risk range and are included in the 2020 remedy for OU7. As of the time of this FYR, there is only one parcel zoned commercial but used for residential purposes, and it is included in the scope of the OU7 remedy. Implementing additional ICs may be necessary in the future to ensure the long-term protectiveness of the remedy in the event a parcel cannot be remediated to UU/UE during the OU7 remedy.

Long Term Stewardship: The EPA will require the site PRP(s) to develop an Institutional Control Assurance and Implementation Plan (ICIAP) to document long-term stewardship (LTS) procedures for maintaining, monitoring, and enforcing ICs at the site, after any additional, necessary ICs for the site are established.

The ICIAP will also include an annual report requirement to be submitted to EPA to certify that 1) the site was inspected to ensure no inconsistent uses have occurred, 2) ICs remain in place and are effective, and 3) any necessary contingency actions have been executed. Additionally, the ICIAP will

include a communications plan and consider placement of the site on a one-call system used to locate underground utilities and identify any other alerts prior to digging.

IC Follow up Actions Needed: The 1998 Quit Claim Deed and City of Cass Lake Resolution 14-2006 prevent unacceptable exposure to contaminated site groundwater by placing restrictions on drilling private water wells within the current site boundaries; however, these are not documented in a decision document or ICIAP. Therefore, a decision document is needed to document these necessary ICs as part of the site remedy. A draft ICIAP was provided to EPA by IP in 2021, but revisions to this draft document are pending additional work at the site to assure a comprehensive ICIAP is prepared. For groundwater the need for additional ICs will also be determined after completing the groundwater source investigation work currently underway at the site and installing any necessary additional monitoring wells to determine the extents of groundwater plumes, which may require additional ICs to control current unacceptable exposures not addressed by Resolution 14-2006 or the Quit Claim Deed. More generally, IC evaluation activities for the site and may include preparing updated maps depicting current conditions in areas that do not allow for UU/UE, review of governmental controls (i.e., ordinances), and title work to ensure the restrictions are still recorded and that no prior-in-time encumbrances exist on the site that are inconsistent with the ICs. This evaluation would be conducted as part of developing an ICIAP for the site.

Systems Operations/Operation & Maintenance

The requirements for O&M are specified in the site O&M Plan (Appendix A ref. 11) and Quality Assurance Project Plan (QAPP, Appendix A ref. 12). The O&M Plan, revised most recently in January 2020, describes the extraction and treatment infrastructure, procedures for inspection of equipment, and recordkeeping. The QAPP, revised most recently in October 2018, outlines the data quality objectives and analytic and field procedures to ensure that data collected are suitable for their intended purpose.

IP continues to perform routine O&M activities such as: triannual (spring, summer, fall) measuring of groundwater levels, measuring surface water elevations, and collecting and analyzing groundwater and surface water samples; monthly collecting and analyzing water samples from the treatment system; periodic inspecting and dewatering of the OU2 landfill; and monitoring and collecting floating product. Some O&M activities are restricted by freezing weather conditions in the winter months. Additional routine maintenance activities performed include replacement of pumps and other well components, screen flushing, cleaning of force mains and other system piping, and change out and disposal of GAC. IP also recoated the interior lining of the GAC units in 2018-2019; the lining is expected to last 30 to 40 years per the O&M Plan (Appendix A ref. 11). Several actions have been taken since the last FYR to replace, upgrade, or add components to the existing groundwater remedy in OU1 and OU3.

OU1 Extraction System Modifications

In 2021, IP conducted a pilot investigation in OU1 to explore solutions to the inoperability of extraction well W404, which was shut down on August 27, 2021. The study's objectives were to establish whether the general location of W404 was appropriate, if the targeted extraction rate could be achieved at this

location, and if the vertical positioning of the pumping interval could be improved. The results of the investigation, documented in an October 26, 2021, memorandum to the EPA (Appendix A ref. 13), demonstrated the location of W404 and the pumping interval were sufficient to achieve the target pumping rate and remove contaminant mass, and that issues associated with the operation of W404 were due to a clogged force main. Past maintenance activities associated with this well and the limited resulting performance improvements indicated that disconnecting the force main and connecting W404 to a nearby force main would be more prudent. This work was completed on November 3, 2021, and since then the new force main has continued to have issues with clogging. IP is conducting an evaluation of the pumping of W404 including cleaning techniques to improve pumping rates, and wells W403R and W409 are pumped at an elevated rate currently to compensate for the losses at W404. In the event W404 cannot maintain target rates in 2025, alternatives to using W404 will be proposed (including maintaining higher pumping rates at nearby wells).

The EPA approved IP to cease pumping at extraction wells W406 and W407 in 2020 due to broken well screens and electrical issues for these wells. Both wells are located outside of the currently known extents of the OU1 groundwater plume.

The EPA approved IP to replace extraction well W405 due to issues with maintaining stable pumping levels and the need for frequent maintenance. In July 2023, it was replaced with well W405R.

OU2 Hazardous Waste Landfill

The landfill is inspected at least twice each year for settlement, and very little settlement has occurred since construction in 1986. The five settlement benchmarks measured have settled by less than 4 inches in total since construction. In the current FYR period, settlement has been at or below 0.7 inches.

The landfill has both a leachate collection manhole (LCM) and leak detection manhole (LDM) that are monitored; leachate is pumped from both manholes twice a year. The LCM is located near the bottom of the landfill wastes above the first high density polyethylene (HDPE) liner, and the LDM is located underneath that liner at the base of a second HDPE liner, which is underlain by three feet of compacted clay.

OU3 Extraction System Modifications

The 2019 EPA Optimization Review for the groundwater remedy (Appendix A ref. 14) recommended the evaluation of an organoclay filter medium for removal of entrained oil in OU3 extraction well W2401R. A pilot study was completed in July 2020, and due to the poor performance of the oil removal technologies tested, it was recommended to discontinue extraction from well W2401R and install a replacement well. The EPA approved this plan in 2020 and replacement well W2404 was installed in May 2022.

Extraction Network Performance

Figure B-2 (Appendix B) shows the site-wide rates of groundwater extraction in gallons per minute (gpm) since 2005, averaged by month, compared to the maximum effluent discharge rate of 139 gpm established by the EPA in 2005 (Appendix A ref. 15). The 2019 EPA Groundwater Optimization Report (Appendix A ref. 14) and 2020 FYR (Appendix A ref. 16) recommended increasing total extraction to improve capture; while the average monthly extraction rate during the 2020-2023 period has increased slightly from the 2020 FYR period, the rate is still below the maximum discharge rate of 139 gpm. Given that the treatment system itself is designed to treat a maximum rate of 295 gpm, there exists capacity in the system to increase extraction rates as needed.

Table C-1 (Appendix C) summarizes well maintenance activities from 2020-2024, as documented in Annual Reports (Appendix A refs. 17-20) and Quarterly Reports submitted to the EPA during this monitoring period (Appendix A refs. 21 – 39). Several wells in the extraction system have been replaced in the last decade (W402, W403, W405, W410, W2402, W2403) due to issues with maintaining sufficient extraction rates. Well W2401 and its replacement W2401R have been offline since 2015 due to oil entrainment. Well 2404, brought online in May 2022, is intended to improve capture within the OU3 plume. It is expected that as the treatment system continues to operate, further well replacement will be needed as aging well infrastructure introduces problems maintaining sufficient extraction rates. Well and plumbing components are periodically cleaned, with some wells needing more frequent cleaning than others.

The location and pumping rates for extraction wells were determined by outputs from the site groundwater model, which is updated annually with groundwater elevation data collected as part of each Annual Report. The groundwater model is governed by the 2011 Modeling QAPP (Appendix A ref. 40), and details on its use are included in the 2017 Groundwater Flow Model Application Assessment (Appendix A ref. 41). Broadly, geology used in the model is based off of a 2006 solids model, updated in 2014, providing inputs to a United States Geological Survey (USGS) MODFLOW groundwater flow model. The model is limited to conditions within the groundwater of OU1, 2, and 3, and only considers current groundwater flow conditions. The groundwater model does not consider transient conditions (changes over time) nor contaminant migration parameters (adsorption, retardation, etc.) that may impact the modeled location and migration patterns of site contamination in groundwater, and consequently increase uncertainty on the modeled capture of contamination. In OU1, the model estimates that the hydraulic capture zone (HCZ) of the OU1 extraction system extends to the north and west of W222, and to the south of W515, but there is not monitoring well data to verify this conclusion. More recent data collected as part of the ongoing OU9 investigation has showed differing geologic conditions (*e.g.* the absence of a till layer between the upper and lower outwash aquifers) that has not been fully incorporated into the solids model.

Goals for the groundwater pump-and-treat system, as contemplated in the 1986 MEDDs, included “pump[ing] and treat[ing] contaminated ground water until acceptable levels in ground water are reached,” and also stated that “[t]he time to achieve acceptable concentrations in the aquifer has been estimated at 25 years.” The EPA required IP to evaluate timelines to achieve cleanup levels using a best-fit trendline as part of Appendix K of the 2023 Annual Report (Appendix A ref. 20); while noting

the recent modifications to the extraction system and the uncertainty regarding the extents of the plumes noted elsewhere, the evaluation estimates cleanup goals will not be reached system-wide until 2051, 40 years beyond the estimate of 2011 contemplated in the MEDD. The best-fit exponential lines for some wells have coefficients of determination that suggest significant deviation from the trendlines (R^2 ranging from 35 to 84 percent), so timeline estimates may have significant uncertainty in their predictions and cleanup timelines could extend well beyond 2051 if the system were to remain operating as-is.

Further, the MEDD for the OU3 plume intended that connecting the OU3 plume to the OU1 pump-and-treat system would "remove contaminated groundwater and effectively minimize further migration of contaminated ground water from the Site," which as of this FYR has not been achieved by the system given the existence of the run-out plume beyond the capture zone of the system in OU3. It is expected that after the planned source area investigation is conducted and updates to the groundwater model are made, additional extraction locations will be necessary to fully address source areas and runout plumes in OU1 and OU3. It is important that the groundwater model be accurate before scoping the location of additional extraction points to ensure effectiveness.

Contingency Plan

The EPA approved a contingency plan developed by IP in 2021 (Appendix A ref. 42) to shorten the time needed to replace nonfunctioning extraction wells by preparing and reviewing plans to replace aging extraction wells in advance of failure. The extraction well replacement plans include having qualified contractors procured to perform the work, planning any connections to system infrastructure, acquiring permits and access from property owners as needed, coordinating disposal of investigative derived waste, and assessing whether the use of existing wells should be continued or terminated. The replacement of well W405 with W405R in 2023 was completed under this plan.

OU7 Interim Remedial Action

IP continued to provide supplemental house cleaning of the occupied residences on the site for which access has been granted until mid-2020, when house cleaning was suspended due to the COVID-19 pandemic. After efforts were resumed in 2021, the two remaining residences in OU7 declined to participate in further cleaning. Cleaning services will be resumed at occupied residences if requested.

IP has also continued to apply dust suppressant to the gravel roads on and adjacent to the site as required by the 2005 Interim ROD (Appendix A ref. 6). Magnesium chloride is applied to the unpaved roads on an as-needed basis during months that do not have frozen ground/snow cover. Dust suppressant is applied on an as-requested basis, and often there is significant lag time (several weeks) between dusty conditions arising at the site, the EPA being notified of these conditions by local contacts, and the application of dust suppression by IP. There are concerns that the lag time may cause unacceptable exposures to contaminated dust or re-contaminate previously remediated parcels within the site. The EPA has expressed its concerns to IP about the need for shorter lead times to initiate dust suppression, and sampling is planned as part of the OU7 Remedial Design to assess re-contamination of properties covered during a 2005 removal action (Appendix A ref. 43).

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR (Appendix A ref. 16) as well as the recommendations from the last FYR and the current status of those recommendations. Note that recommendations from the last FYR used different OU references, and soils within OU1, 2, and 3 are now managed in OUs 4, 7, and 8. The current designation of OUs for the site is described in more detail in Section I of this FYR and the January 2025 memo-to-file for the site (Appendix A ref. 2).

Table 4: Protectiveness Determinations/Statements from the 2020 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Short-term Protective	The remedy at OU1 currently protects human health and the environment because there are no current pathways that could result in unacceptable risks. However, in order to be protective in the long-term, the following actions need to be taken: 1) Identify and implement additions and/or modifications to the extraction network to improve hydraulic capture, 2) Select and implement a remedial action to address contaminated soils, 3) Develop an ICIAP and implement additional ICs if needed, to ensure that effective ICs are implemented, monitored, maintained, and enforced, and 4) Complete a decision document incorporating ICs as a component of the selected remedy.
2	Not Protective	The remedy at OU2 is not protective of the environment because soils pose unacceptable risks to terrestrial invertebrates; however, the remedy is currently protective of human health because soils and sludges are effectively contained within the containment unit and fencing prevents access to OU2. The following actions need to be taken to ensure protectiveness: 1) Select and implement a remedial action to address contaminated soils, 2) Develop an ICIAP and implement additional ICs if needed, to ensure that effective ICs are implemented, monitored, maintained, and enforced, 3) Further investigate the potential for discharge of the contaminant plume to surface waters and other exposure pathways, and 4) Complete a decision document incorporating ICs as a component of the selected remedy.
3	Short-term Protective	The remedy at OU3 currently protects human health and the environment because there are no current exposure pathways that could result in unacceptable risks. However, in order to be protective in the long term, the following actions need to be taken: 1) Identify and implement additions and/or modifications to the extraction network to improve hydraulic capture, 2) Select and implement a remedial action to address contaminated soils, 3) Develop an ICIAP and implement additional ICs if needed, to ensure that effective ICs are implemented, monitored, maintained, and enforced, and 4) Complete a decision document incorporating ICs as a component of the selected remedy, and 5) Complete the October 2019 EPA-approved bench-scale test to remove oil using a zeolite-based organoclay as filtration medium to remove oil from W2401, implement the process full-scale and return W2401R to target extraction rate.

OU #	Protectiveness Determination	Protectiveness Statement
7	Short-term Protective	The remedy at OU7 currently protects human health and the environment because exposure to contaminated soil and house dust is controlled. In addition, a final ROD was signed in April 2020 addressing contaminated soil. However, in order for the remedy to be protective in the long-term, the following action needs to be taken: Develop an ICIAP and implement additional ICs if needed, to ensure that effective ICs are implemented, monitored, maintained, and enforced.

It should be noted that, as documented in a memo-to-file in the site record, dated January 13, 2025 (Appendix A ref. 2), the soils in OUs 1, 2, and 3 have been separated out into two additional OUs since the 2020 FYR; OU4 is now representing the soils above the Former City of Cass Lake Dump groundwater plume (OU3) and OU8 is now representing the non-residential soils above the OU1 and OU2 groundwater areas and not addressed by OU7. Thus, the issues and recommendations in the 2020 FYR related to the soils in OUs 1, 2, and 3 will no longer be carried through this FYR and will be deferred to future FYRs after the selection and implementation of a remedy for OUs 4 and 8 and implementation of the remedy in OU7 selected in the 2020 ROD (Appendix A ref. 1).

Table 5 describes the issues and recommendations from the 2020 FYR (Appendix A ref. 16) and their current status, incorporating any changes in OUs since the 2020 FYR relevant to those issues and recommendations.

Other Findings

Two additional recommendations were identified in the 2020 FYR to improve performance of the remedy, reduce costs, and improve management of O&M. These do not affect current and/or future protectiveness. A status update on these recommendations is provided below.

Other Finding 1: EPA recommends that IP shorten the time needed to replace nonfunctional wells by preparing and reviewing plans to replace aging extraction wells in advance of failure. W405 and W409 are critical to groundwater capture at OU1 but are aging and replacement has not yet been addressed. This recommendation is made to improve O&M efficiency.

Status update: The EPA approved a Contingency Plan on May 6, 2021, that streamlines the process for extraction well replacement.

Other Finding 2: Field activities are routinely planned with a step-by-step approach incorporating a number of small-scope projects, one predicated upon the other. The amount of time per project (to scope, prepare, review, revise, approve, and execute a work plan; then to prepare, review, revise, and approve documentation of the work) results in long timelines to accomplish major goals. Adaptive planning with larger-scale work plans that include phasing and decision points would facilitate a focus on the issues rather than process, reduce time-to-action, and result in lower resource requirements.

Status update: More recent efforts for investigations in OU7 and OU9 have incorporated phasing and contingencies into planning documents, and this will continue in the future.

Table 5: Status of Recommendations from the 2020 FYR

2020 FYR OU	Issue	Recommendations	Current OU	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	The groundwater plumes are not fully contained.	Identify and implement additions and/or modifications to the extraction network to improve hydraulic capture.	1	Ongoing	One well (W405) was replaced (W405R) due to poor performance. A source area investigation is planned for 2025-26 to complete delineation of the source area in OU1. Further modifications to the extraction system will be contemplated after completing that investigation.	N/A
1	A remedy has not been selected to address potential future unacceptable human health exposures to contaminated soil.	Issue a remedy decision document to address contaminated soils.	7	Completed	A Record of Decision was issued for OU7 on April 2, 2020 (Appendix A ref. 1). Remedial Design work is ongoing.	4/2/2020
			8	Considered But Not Implemented	Soils within OU1 were separated out to OU8 as documented in the January 13, 2025, Memo to File (Appendix A ref. 2). OU8 is not included in this FYR and will not be included in future FYRs until a remedy is chosen and implemented.	1/13/2025
1	The effectiveness, including enforceability, of current institutional controls to prevent ingestion of groundwater and land disturbance has not been adequately evaluated and documented. LTS procedures have not been documented.	Develop an ICIAP and implement additional ICs if needed, to ensure that effective ICs are implemented, monitored, maintained, and enforced.	1	Ongoing	The need for ICs to address groundwater in OU1 will be contemplated after completion of the source area investigation planned for 2025-26 and completing delineation of the OU1 groundwater plume, and incorporated into an ICIAP and ROD as appropriate.	N/A
			7	Ongoing	The need for ICs to address soils will be contemplated once remedial actions have been completed for OU7 and incorporated into an ICIAP as appropriate.	N/A
			8	Considered But Not Implemented	Soils within OU1 were separated out to OU8 as documented in the January 13, 2025, Memo to File (Appendix A ref. 2). OU8 is not included in this FYR and will not be included in future FYRs until a remedy is chosen and implemented.	1/13/2025

2020 FYR OU	Issue	Recommendations	Current OU	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	Lack of a decision document requiring ICs.	Complete a decision document incorporating ICs as a component of the selected remedy.	1	Ongoing	The EPA has determined a decision document is needed for the OU1/2/3 groundwater treatment system and landfill that encompasses more than ICs. This issue and recommendation has been carried over in this FYR and been expanded to include a decision document incorporating ICs as part of the remedy, as well as for addressing aspects of the OU1/3 groundwater treatment system and OU2 landfill.	N/A
2	A remedy has not been selected to address potential future unacceptable human health exposures to contaminated soil.	Issue a remedy decision document to address contaminated soils.	8	Considered But Not Implemented	Soils within OU2 were separated out to OU8 as documented in the January 13, 2025, Memo to File. OU8 is not included in this FYR and will not be included in future FYRs until a remedy is chosen and implemented.	1/13/2025
2	The effectiveness, including enforceability, of current institutional controls to prevent ingestion of groundwater and land disturbance has not been adequately evaluated and documented. LTS procedures have not been documented.	Develop an ICIAP and implement additional ICs if needed, to ensure that effective ICs are implemented, monitored, maintained, and enforced.	2	Ongoing	The need for ICs to address groundwater in OU2 will be contemplated after assessing the landfill integrity and any potential impacts to the Fox Creek Valley area and incorporated into an ICIAP and ROD as appropriate.	N/A
			8	Considered But Not Implemented	Soils within OU2 were separated out to OU8 as documented in the January 13, 2025, Memo to File. OU8 is not included in this FYR and will not be included in future FYRs until a remedy is chosen and implemented.	1/13/2025

2020 FYR OU	Issue	Recommendations	Current OU	Current Status	Current Implementation Status Description	Completion Date (if applicable)
2	Lack of a decision document requiring ICs.	Complete a decision document incorporating ICs as a component of the selected remedy.	2	Ongoing	The EPA has determined a decision document is needed for the OU1/3 groundwater treatment system and OU2 landfill that encompasses more than ICs. This issue and recommendation has been carried over in this FYR and been expanded to include a decision document incorporating ICs as part of the remedy, as well as for addressing aspects of the OU1/3 groundwater treatment system and OU2 landfill.	N/A
2	There are current ecological exposures to contaminated soil.	Select and implement a remedial action to address contaminated soils.	8	Considered But Not Implemented	Soils within OU2 were separated out to OU8 as documented in the January 13, 2025, Memo to File. OU8 is not included in this FYR and will not be included in future FYRs until a remedy is chosen and implemented.	1/13/2025
3	The groundwater plumes are not fully contained.	Identify and implement additions and/or modifications to the extraction network to improve hydraulic capture.	3	Ongoing	One well was replaced in 2020 due to poor performance (W2402R) and an additional well was brought on-line in 2022 (W2404). A source area investigation is planned for 2025-26 to complete delineation of the source area in OU3. Further modifications to the extraction system will be contemplated after completing that investigation.	N/A
3	A remedy has not been selected to address potential future unacceptable human health exposures to contaminated soil.	Issue a remedy decision document to address contaminated soils.	4	Considered But Not Implemented	Soils within OU3 were separated out to OU4 as documented in the January 13, 2025, Memo to File. OU4 is not included in this FYR and will not be included in future FYRs until a remedy is chosen and implemented.	1/13/2025

2020 FYR OU	Issue	Recommendations	Current OU	Current Status	Current Implementation Status Description	Completion Date (if applicable)
3	The effectiveness, including enforceability, of current institutional controls to prevent ingestion of groundwater and land disturbance has not been adequately evaluated and documented. LTS procedures have not been documented.	Develop an ICIAP and implement additional ICs if needed, to ensure that effective ICs are implemented, monitored, maintained, and enforced.	3	Ongoing	The need for ICs to address groundwater in OU3 will be contemplated after completion of the source area investigation planned for 2025-26, and incorporated into an ICIAP and ROD as appropriate.	N/A
			4	Considered But Not Implemented	Soils within OU3 were separated out to OU4 as documented in the January 13, 2025, Memo to File. OU4 is not included in this FYR and will not be included in future FYRs until a remedy is chosen and implemented.	1/13/2025
3	Lack of a decision document requiring ICs.	Complete a decision document incorporating ICs as a component of the selected remedy.	3	Ongoing	The EPA has determined a decision document is needed for the OU1/2/3 groundwater treatment system and landfill that encompasses more than ICs. This issue and recommendation has been carried over in this FYR and been expanded to include a decision document incorporating ICs as part of the remedy, as well as for addressing aspects of the OU1/3 groundwater treatment system and OU2 landfill.	N/A
3	W2401R has been inoperable since its installation due to oil-water separation issues.	Implement appropriate method to remove oil from groundwater extracted from W2401 and return W2401 to target extraction rate.	3	Completed	W2401R is used for oil recovery and is no longer used for extraction. Well W2404 was installed in May 2022 to replace W2401R for extraction. Additional extraction wells will likely be necessary and will be contemplated after completion of the source area delineation planned for 2025-26.	5/1/2022
7	The effectiveness, including enforceability, of current institutional controls to prevent ingestion of groundwater	Develop an ICIAP and implement additional ICs if needed, to ensure that effective ICs are	1	Ongoing	The need for ICs to address groundwater in OU1 will be contemplated after completion of the source area investigation planned for 2025-26 and completing delineation of the OU1 groundwater plume, and incorporated into an ICIAP and ROD as appropriate.	N/A

2020 FYR OU	Issue	Recommendations	Current OU	Current Status	Current Implementation Status Description	Completion Date (if applicable)
	and land disturbance has not been adequately evaluated and documented. LTS procedures have not been documented.	implemented, monitored, maintained, and enforced.	7	Ongoing	The need for ICs to address soils will be contemplated once remedial actions have been completed for OU7 and incorporated into an ICIAP as appropriate.	N/A

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

A public notice was posted in the September 21, 2024, edition of the *Bemidji Pioneer* and the September 2024 issue of the *DeBahJiMon* paper, stating that there was a FYR and inviting the public to submit any comments to the EPA. A notice was also announced on the local KOJB radio station from September 27 to October 4, 2024. Finally, the EPA prepared an in-the-moment video discussing the FYR process, which was posted on the St. Regis Paper Company Superfund Site webpage, located at https://www.epa.gov/superfund/st-regis-paper, and the EPA Region 5 social media accounts.

No comments or requests for interviews were received relating to these FYR notices; however, the EPA conducted community interviews in May and October 2024 as part of efforts to revise the Community Involvement Plan (CIP) for the site. The FYR was discussed on occasion during these interviews; specifically, the public shared their views on the remedy that has been implemented to date. The public expressed concerns about the extended timeline to reach groundwater cleanup goals within OU1 and OU3, as well as concerns about the effectiveness of dust mitigation within OU7. The results of the review and the report will be made available on the site webpage, under the 'Site Documents & Data' tab on the left side of the screen. Specific documents can be found by searching the title or document ID as identified in the Administrative Record (found under the 'Site Documents & Data' tab). The EPA also provides local space for the public to view records related to Superfund work at the site. These documents can be accessed online at the Leech Lake Tribal College Library (6945 Little Wolf Rd NW, Cass Lake, MN 56633).

Data Review

The EPA's data review included analytical data of COCs in groundwater and treatment plant effluent samples. The EPA also reviewed data pertaining to monitoring and dewatering of the OU2 hazardous waste landfill and O&M of the groundwater extraction system. These data were provided by IP as part of a required Electronic Data Deliverable (EDD) and are found in the Annual Reports submitted by IP (Appendix A refs. 17-20). Figures B-3, B-4, and B-5 in Appendix B provide maps of monitoring locations at OU1, 2, and 3, respectively.

OU1 and OU3 Groundwater

Tables C-2, C-3, C-4, and C-5 (Appendix C) list groundwater sampling data collected at OU1, 2, and 3 wells since the 2020 FYR. Wells are divided by OU, geologic formation (upper outwash and lower outwash aquifers) and intervals within those formations (top, middle, and bottom). Details on well construction can be found in the site Annual Reports, the most recent being Table 2 of the 2023 Annual Report (Appendix A ref. 20). As of the writing of this FYR, the 2024 Annual Report is under review by the EPA and is expected to be finalized later in 2025. As a result, the 2024 data will be included in the next FYR. Wells are sampled on varying schedules based on historic contaminant trends and other data needs; the monitoring schedule can be found in the *Proposed Monitoring Program: 2019-2024* technical memorandum (Appendix A ref. 44), approved by the EPA in March 2019. Generally, wells are

either sampled during a spring, summer, or fall sampling event; in the event a well is sampled twice during the same seasonal event, the higher of the two results is reported in these tables.

The 2020-2023 monitoring results are compared to historical maxima at each well, with the date of each maximum detection provided, to show the current conditions in relation to those maxima. Maxima were not provided for wells installed during the last five years (W405R, W412, W2402R, W2403R, W2404) or wells with insufficient historical monitoring data to provide a meaningful comparison (STP-15, W2103, W2104, W2501, W510). The number of wells with sampling results, and wells with historical maxima, varies by analyte based on the site monitoring plan (Appendix A ref. 44). Additionally, monitoring data is compared to several screening criteria and bolded where a detection exceeds one of these criteria. The criteria used for comparison are site recommended GWCLs specified in the December 20, 2016, letter from the EPA to IP (Appendix A ref. 7), preliminary cleanup levels identified in the 1980s MEDDs (Appendix A refs. 3,4), HSCA GWCLs, and MDH HRLs. Data is provided for PCP, carcinogenic PAHs, and PCDD/PCDFs; while historically not considered a COC for the site, naphthalene monitoring data is also provided to show the estimated extents of the diesel range organics that often serve as a carrier for PCP in wood treatment and can increase solubility of PCP and PCDDs/PCDFs in groundwater.

Table C-2 (Appendix C) documents monitoring data for PCP in parts per billion (ppb), equivalent to µg/L. Of the 89 monitoring locations evaluated, 58 had detections of PCP during at least one of the monitoring events during this five-year period. Detections at all of these 58 locations exceeded the HSCA standard for PCP, 36 of these locations exceeded the recommended GWCL for the site, and 7 exceeded the cleanup levels originally established in the MEDD (1010 ppb for OU1, 220 for OU3). 68 locations have historical maxima provided; at these locations, 58 have maximum concentrations at dates prior to 2020. Thus, generally concentrations of PCP in the monitoring network are at or below historical highs, indicating a general decreasing trend in the areas sampled.

Table C-3 (Appendix C) documents monitoring data for naphthalene in ppb. Of the 87 monitoring locations sampled for naphthalene during this period, 56 had detections of naphthalene during at least one of the monitoring events in this period. While the EPA has not set site-specific cleanup levels for naphthalene at the site, of the 56 wells with detections, 36 of these locations exceeded the HSCA groundwater standard of naphthalene (0.1 ppb).

Table C-4 (Appendix C) documents monitoring data for carcinogenic PAHs. PAHs represent a large group of organic compounds that pose varying levels of carcinogenic (cancer-causing) and non-carcinogenic risk. To summarize risks from carcinogenic PAH exposures, monitoring data is presented in benzo(a)pyrene equivalents (B(a)PE) in ppb. Each carcinogenic PAH is given a relative potency factor (RPF) listed in Table C-6 (Appendix C), and the sample results for each PAH are multiplied by their RPF and summed together to calculate a B(a)PE. Benzo(a)pyrene, being the most carcinogenic PAH, is given an RPF of 1.0 and all other PAHs are given RPFs relative to Benzo(a)pyrene. Non-carcinogenic PAHs are also monitored at the site and are present above HSCA GWCLs, typically co-located with areas with higher carcinogenic PAHs.

To provide for a more statistically robust estimate of risk and account for lower-level concentrations not detectable by laboratories, when three or more carcinogenic PAHs are detected in a sample, a Kaplan-Meier estimation is used to calculate the B(a)PE, which incorporates both detected and non-detected carcinogenic PAHs. Otherwise, B(a)PEs are calculated using an assumed concentration of one-half the MDL. B(a)PE calculations at wells with no detected carcinogenic PAHs (i.e., wells where B(a)PE values are entirely based off MDLs) are denoted with an asterisk. It should be noted that MDH has published guidance titled *Guidance for Evaluating the Cancer Potency of Polycyclic Aromatic Hydrocarbon (PAH) Mixtures in Environmental* Samples, recommending the inclusion of fluoranthene and benzo(g,h,i)perylene as carcinogenic PAHs and recommending updated RPFs that are not reflected in the RPFs specified by the EPA in 2016 (Appendix A ref. 7) and listed in Table C-6 (Appendix C); the EPA is reviewing this guidance to evaluate its applicability to the site. Monitoring data in Table C-3 is compared to the cleanup level recommended by the EPA in 2016, equivalent to the benzo(a)pyrene Maximum Contaminant Level (MCL) under the Safe Drinking Water Act (SDWA) of 0.2 ppb. Additionally, data is compared to the cleanup levels established in the MEDDs (0.028 ppb carcinogenic PAHs in OU1, 0.28 ppb in OU3), as well as the HSCA groundwater standard for benzo(a)pyrene (0.001 ppb). Of the 87 monitoring locations sampled for PAHs during this period, 22 had detections of carcinogenic PAHs during this monitoring period, with two locations exceeding the EPA recommended cleanup level, three exceeding the MEDD cleanup levels, and 22 exceeding the HSCA standard.

Table C-5 (Appendix C) documents monitoring data for PCDDs and PCDFs, which similarly to PAHs represent a broad group of organic compounds that vary in carcinogenic risk and potency. To evaluate PCDD/PCDF data, monitoring results are provided in Toxicity Equivalence (TEQ) concentrations. TEQ concentrations are analogous to B(a)PEs; each PCDD and PCDF congener is assigned a Toxicity Equivalence Factor (TEF), assessing the toxicity of each congener relative to the most toxic congener, 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD), assigned a TEF of 1. TEFs for each congener are presented in Table C-7 (Appendix C). TEQ concentrations are calculated by summing the product of the monitoring result of each PCDD and PCDF congener and its respective TEF. Similarly to PAHs, when three or more congeners are detected in the sample, a Kaplan-Meier estimate is calculated to incorporate the uncertainty regarding the presence of potential low-level congeners not detectable by laboratories. When fewer than three congeners are detected in the sample, TEQs are calculated using one-half the laboratory's estimated detection limit, or EDL.

Monitoring data in Table C-5 (Appendix C) is provided in parts per quadrillion (ppq), equivalent to picograms per liter (pg/L) and one million times smaller than ppb (or µg/L). Data is compared to the cleanup level recommended by the EPA in 2016, set as the MCL for 2,3,7,8-TCDD (30 ppq), as well as the cleanup level from the MEDD cited in Table 2 (0.13 ppq) and the HSCA groundwater standard of 3 ppq. Wells with no detections of PCDD/PCDF congeners (i.e. where the TEQ calculation is based entirely off of EDLs) are denoted with an asterisk. Of the 24 monitoring locations sampled for PCDDs and PCDFs this period, 21 locations had detectable concentrations of PCDD/PCDF congeners. Of those 21, all locations exceeded the suggested MEDD cleanup level, but no locations exceeded the EPA recommended cleanup level or the HSCA standard. Generally, fewer wells are sampled for PCDDs and PCDFs than other site contaminants given the relatively low level of these congeners found at the site and their relatively low water solubility and preferential adsorption to soil. It is expected that higher levels of dioxins may be present in OU1 and OU3 source areas given the higher solubility of PCDDs and

PCDFs in organic aqueous solutions, such as exists in the core of the pentachlorophenol and naphthalene groundwater plumes.

PCP, being the most prevalent site contaminant in groundwater, is generally used to assess the characteristics of groundwater plumes in OU1 and OU3 and monitor plume progress. As part of the 2023 Annual Report (Appendix A ref. 20) and prior reports, the EPA required IP to assess contaminant trends for PCP at wells outside of the plume cores at OU1 and OU3 using the Mann-Kendall statistical test, which evaluates the presence or absence of a significant increasing or decreasing trend in a dataset. For the wells tested in OU1 (see Appendix D of the Annual Report), the test showed a decreasing trend at 11 of 13 wells tested, with no evidence of a trend in the remaining two wells. 11 wells were tested at OU3, with nine showing a decreasing trend and two without evidence of a trend. While decreasing trends in PCP are observed in most of these locations, it should be noted that significant run-out plumes exist in both OU1 and OU3 outside of the capture zone of the groundwater pump-and-treat system that are not being assessed for trends due to a lack of permanent monitoring locations. In OU1, Braun Intertec Corporation, on behalf of the Band, collected data east of Pike Bay Channel showing contamination present beneath the wetland area east of the Channel in the middle of the upper outwash aquifer (Appendix A ref. 45). Data collected from the existing permanent monitoring well network, particularly from locations at the outer edges of the plume have contaminant levels above criteria. There are no permanent monitoring locations in the area east of the Pike Bay Channel to document any changes in plume conditions over time and document a “compliance line” demonstrating the extents of the plume above cleanup levels; Figure B-6 (Appendix B) shows the estimated extents of the OU1 plume.

While it is not currently known where within the plume contaminant levels attenuate below applicable cleanup standards, it is not anticipated that any down-gradient drinking water wells are impacted based on the data currently available to the EPA. Pore water sampling conducted by IP (Appendix A ref. 46) did not show signs of contaminated groundwater discharge to Pike Bay Channel in shallow sampling locations, but further data collection is needed to verify the actual extents of the run-out plumes in OU1 and OU3 and assess if any discharge is occurring to Pike Bay or Pike Bay Channel from deeper groundwater contamination, or un-delineated source areas.

Significant uncertainty remains about the presence of residual source areas not addressed during previous remedial efforts undertaken in the 1980s. Well W118, located east of the OU1 extraction well network, has been discontinued from regular sampling due to detections of NAPL in the well. The extents of NAPL contamination around W118, and whether residual source area(s) exist at OU1, are not fully understood currently. Similarly, in OU3, monitoring locations nearest to Pike Bay and at the edges of the OU3 plume have detections of site contaminants above cleanup levels in the top of the upper outwash aquifer, and thus the full extents of the plume above cleanup levels are not known at this time. While IP has conducted an evaluation of the extent of NAPL present in OU3 (most recently in 2013) there remains uncertainty around the depth and extent of NAPL, particularly along the western edge of the source area (Appendix B, Figure B-7). A source area investigation is planned for OU1 and OU3 to address this uncertainty; the EPA expects this work to be underway later this year. The MEDD for OU1 (Appendix A ref. 3) intended the selected remedy to “remov[e] all sources (sludge and

contaminated soil) of groundwater contamination from the Site" so it is critical to understand what sources remain.

Figures B-8 and B-9 (Appendix B) show the original extents of the plumes as described in the 1985 RI for the site (Appendix A ref. 47) for OU1 at the base and surface of the upper outwash aquifer; the plumes remain at the same general extents as described in the MEDD except for a northward bulge. However, the concentrations within the core of the plume have reduced an order of magnitude since the 1980s, supporting the overall decreasing trend found in most monitoring locations.

Figure B-10 (Appendix B) shows the original extents of the plume as described in the 1986 Alternatives Assessment Report for OU3 (Appendix A ref. 48). The concentrations in the core of the plume have also substantially reduced since the 1980s. Additionally, the northeast/southwest extents of the OU3 plume have shrunk relative to the plume extents in the 1980s, though the run-out plume to the southeast was not known at the time of the MEDDs; specifically, the MEDD assumed that "[c]ontaminated ground water has not reached Pike Bay."

Treatment Plant Effectiveness and Effluent Quality

Extracted groundwater passes through three GAC vessels to remove contaminants prior to being discharged through piping to Pike Bay Channel. The water is sampled for PCP monthly before passing through treatment and after passing through each GAC vessel. The amount of PCP removed at each step of the treatment process is an indication of the effectiveness of that treatment step, and the degree to which the capacity of the GAC in the vessel to remove contaminants is spent.

Table C-8 (Appendix C) shows PCP concentrations after each GAC vessel for each monitoring event from 2020-2023. Treatment efficiency in percentages was calculated for treated groundwater leaving each of the three GAC vessels. Treated effluent from the third GAC vessel, which is discharged to Pike Bay Channel, was also compared to treatment system effluent limits, established by the EPA in an August 15, 2005, letter to IP (Appendix A ref. 15), as well as HSCA standards for surface water; both criteria have a value of 5.5 ppb for PCP. Greater than 99.99% removal was achieved by the treatment system from 2020-2023, with most effluent sample results below detectable limits. No effluent samples exceeded their corresponding screening criteria during this monitoring period. Naphthalene and PAHs are also monitored in treatment plant effluent monthly and were below applicable EPA and HSCA criteria during this monitoring period.

PCDD and PCDF congeners are monitored on a quarterly basis; Table C-9 (Appendix C) shows effluent PCDD/PCDF congener concentrations and TEQ concentrations during the 2020-2023 period. Data is compared to treatment system effluent limits, established by the EPA in an August 15, 2005, letter to IP (Appendix A ref. 15), as well as HSCA standards for surface water. The treatment system effluent does occasionally have detections of PCDD/PCDF congeners, however during this five-year monitoring period, no detections of PCDD/PCDF congeners exceeded the EPA effluent limits. TEQ concentration calculations exceeded the HSCA surface water standard in 10 of 16 monitoring events, however only four of these events had detectable levels of PCDD/PCDF congeners. TEQ calculations consider uncertainty from laboratory capabilities to detect PCDD/PCDF congeners at the parts per quadrillion

level, calculating an estimated value for non-detected congeners that factor in this uncertainty. Given the evaluated screening levels for PCDDs/PCDFs are close to or below current laboratory capabilities, situations arise where effluent TEQ calculation exceed the HSCA surface water standard despite no detections of PCDD/PCDF congeners in the effluent sample.

OU2 Hazardous Waste Landfill

Ten monitoring wells are installed near the OU2 landfill (also referred to as the containment vault); see Figure B-4 (Appendix B) for well locations and Tables C-2 through C-5 (Appendix C) for monitoring data for these wells. Seven of these wells are screened in the upper outwash aquifer, and three in the lower outwash aquifer. Monitoring data for PCDDs/PCDFs were not collected at these wells during the 2020-2023 monitoring period for this FYR; PCDD/PCDF data in select OU2 wells was collected as part of the 2024 Annual Report, for which the draft is currently under review by the EPA. Wells in OU2 had detections of naphthalene and carcinogenic PAHs below the corresponding 2016 EPA recommended cleanup levels, but above HSCA groundwater standards.

Figures B-11 and B-12 (Appendix B), both adapted from the 2023 Annual Report (Appendix A ref. 20), document leachate elevations in both manholes along with volumes of leachate removed. Figure B-11 shows all data since landfill construction, with Figure B-12 limiting the dataset to monitoring done since 2018. Aside from expected drops in elevation after dewatering, leachate levels in both the LCM and LDM are consistent generally since the early 2000s. The accumulation of leachate in both the LCM and LDM indicates that the primary liner is leaking, allowing leachate to accumulate in the LDM. Analytical data has not been collected for leachate dewatered from the LCM and LDM since 1996, however monitoring data at that time showed PCP present in both LCM and LDM leachates. It is not clear whether the leachate that currently accumulates in the landfill is comprised of drainage from the materials consolidated in the landfill, precipitation infiltrating into the landfill, or a mixture of the two.

Given the detections of site contaminants above HSCA groundwater standards in OU2, as well as the evidence of a leak in the primary liner, the in-progress RI for OU9 includes groundwater sampling between the OU2 Landfill and the Fox Creek Valley area to confirm whether or not the landfill is leaking from the secondary liner and contributing to groundwater contamination present in OU9. There are detections of site COCs in monitoring wells to the east of the landfill that may be distinct from any contributions to the OU9 plume.

OU7 Interim Remedy

There was no generated data for the OU7 interim remedial action to evaluate during this FYR. The house cleaning program remains available for residents to use if requested, however, currently there are no residents within OU7 participating in the program. Dust suppressant is applied by IP to gravel roads within the site when requested by the EPA.

Site Inspection

The inspection of the site was conducted on 10/9/2024. In attendance were Zachary Sasnow, Brandon Pursel and Philip Gurley of the EPA; Eric Krumm and Craig Tangren, the Band; Dan Cervin and Mark

Elliott, MPCA; Daniel Pena, MDH; Janie Smith and Tom Richardson, IP; Greg Jeffries, BNSF; and Jim Eidem and Tom Mattison, Barr Engineering. The purpose of the inspection was to assess the protectiveness of the remedy.

The EPA observed the treatment plant, extraction, and monitoring wells in OU1 and OU3, the discharge location in the channel, the OU2 hazardous waste landfill, and fenced in areas, roads, and yards in OU7. The EPA did not observe any indications of equipment failure and found that fences were adequately maintained and secured. The Site Inspection Checklist and corresponding photolog is attached to this FYR report (Appendix B).

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

Generally, no. There are no current known exposures to contaminated groundwater above unacceptable risk levels, given that there is no current use of site groundwater and ICs otherwise effectively prohibit current groundwater use in these areas. The EPA, based on current information available, does not have reason to believe that the plumes extend to any areas where potable use is occurring and/or the current land use or ICs restrict the use of groundwater. The areas downgradient of the OU1 and OU3 groundwater plumes and the OU2 landfill are owned by State, Tribal, or City government and do not have potable use wells installed. However, the 1986 MEDDs for OU1, OU2, and OU3 identified several remedial goals that have not been met by the treatment system as it currently functions and will not be met without changes to the remedial strategy.

Remedial Action Performance

The MEDD for the OU1 groundwater treatment system (Appendix A ref. 3) identified the goals of "pump[ing] and treat[ing] contaminated ground water until acceptable levels in ground water are reached." While concentrations have reduced in the plume core, the current extraction system does not completely capture the OU1 plume, and a run-out plume of contaminated groundwater extends beneath Pike Bay Channel, to the northwest, and to the southeast, with significant concentrations of PCP outside of the modeled capture zone of the pump-and-treat system. In addition, the source removal undertaken as directed in the MEDD was intended to "remov[e] all sources (sludge and contaminated soil) of groundwater contamination from the Site." The detections of NAPL in well W118, the extents of which are not currently understood, suggests the potential for other source areas not addressed by the removal actions undertaken in the 1980s. The source area investigation currently underway is intended to assist with determining whether any remaining significant source areas exist, or whether the extraction system is fully capturing the remaining contaminant mass.

The MEDD also stated, "[t]he time to achieve acceptable concentrations in the aquifer has been estimated at 25 years." As of this FYR, the groundwater treatment system has been in operation for 38 years, and preliminary estimates of timelines to achieve cleanup goals based

on current conditions (Appendix A ref. 20) suggest cleanup goals within OU1 will not be achieved until 2049 at the earliest, 62 years after the beginning of treatment system operation. However, these estimates contain a significant amount of uncertainty, and it is possible that cleanup timelines will extend even further beyond these estimates or be unattainable without additional actions to address source material. Contrasting Figure B-6 with Figures B-8 and B-9 (Appendix B), substantial progress has been made toward reducing concentrations in the core of the OU1 plume; however, the majority of this progress was made during the first decade of system operation and plume reduction has been significantly slower in recent years. Given the uncertainties around the full extents of the OU1 plume and the presence of any residual source areas, it is not clear at this time if the 2049 estimate is reliable, and cleanup timeline estimates will be refined as uncertainties are addressed.

For the OU2 landfill, the intent of the MEDD was to prevent migration of contamination from contaminated soils and sludges by "securing them in a RCRA approved on-site containment vault." The landfill, which is constructed to RCRA Subtitle C standards for hazardous waste landfills, is leaking from its primary liner given the accumulation of leachate in the LDM. It is not clear at this time if leachate accumulation, which has reached steady-state conditions since the early 2000s (see Figure B-11 in Appendix B), is caused by liquids being expressed from soils and sludges within the landfill or permeation of precipitation through the clay/HDPE-lined cap into the landfill contents. This assessment was performed as part of the 2024 Annual Report, which is currently under review by the EPA at the time of this FYR. Given there are detections of site contaminants in downgradient OU2 monitoring wells, there is some evidence that a release could be occurring from the landfill, but detected concentrations in existing wells are well below the GWCLs recommended in the 2016 EPA letter (Appendix A ref. 7). Further investigation is needed to determine if there is a release from the landfill or if these detections result from the nearby OU9 source areas or surficial soils near the landfill (OU8). In the event there is a release from the landfill, the land downgradient of the landfill is owned by the United States Forest Service and is not used for any potable purposes.

The 1986 OU3 MEDD (Appendix A ref. 4) expected that expanding the treatment system to OU3 would "remove contaminated groundwater and effectively minimize further migration of contaminated ground water from the Site." These goals have not been attained by the treatment system as it currently functions. As shown contrasting Figures B-7 and B-10 (Appendix B), the MEDD conceived of a plume that was much smaller in extents than the current known extents of the OU3 plume. While concentrations in the core of the plume have been substantially decreased since the time of the MEDD, similarly to OU1 there exists a run-out plume reaching Pike Bay, the full extents of which are not known at this time. The OU3 MEDD also stated that "No source of ground water contamination now exists since the sludge and contaminated soil has been excavated and removed from the Site." A NAPL source exists in OU3 that will continue to serve as a source to the groundwater plume without additional remedial actions. While the MEDD did not set cleanup timeline expectations for the OU3 plume, the preliminary estimate calculated by IP suggests cleanup goals will not be reached at OU3 until 2051 at the earliest, 64 years after beginning operation of the pump-and-treat system. The treatment system is effective at removing PCP from contaminated groundwater

prior to discharge, however PCDD/PCDF congeners have historically been detected in effluent samples after treatment from the system.

Based on the EPA's review of the data available, it is not clear if the interim remedy for OU7 is functioning as intended by the 2005 OU7 Interim ROD.

The two remaining residences in OU7 are not currently participating in the house cleaning program, although road dust suppressant continues to be applied when requested by the EPA or identified as necessary by IP. However, the process for applying dust suppressant often requires residents and/or Tribal and City government staff to notify the EPA that conditions in the area are dusty and require suppressant. The EPA then notifies IP to apply the suppressant, resulting in a lag period between the request and suppressant application. This lag time is of particular concern during periods of drought when dusty periods are prolonged between precipitation events. This delay may result in contaminated dust migrating from the road to OU7 parcels, potentially re-contaminating previously remediated parcels or houses within the Site. Concentrations of COCs in road dust have not been assessed at this time, complicating the evaluation of the risk posed by windblown road dust. The OU7 Interim ROD assumed that road dust was a contributor to contaminated house dust found in OU7 residences based on surrounding soil concentrations.

Once the remedial action described in the 2020 OU7 ROD is complete, there may be potential for re-contamination of remediated parcels via windblown dust, particularly during periods of drought or low precipitation. The EPA has communicated to IP the need to reduce timelines for applying dust suppressant during dusty conditions, and sampling is planned on parcels that were previously provided with clean soil cover in 2005-2006 as part of Remedial Design sampling for the 2020 ROD. This sampling is intended to assess the potential for recontamination of the remediated properties at the site and assess if a more permanent solution is needed to avoid re-contamination. Sampling of roadways within the site is also anticipated to ensure any remaining exposure pathways are evaluated and addressed.

Implementation of Institutional Controls and Other Measures

Cass Lake's well drilling ordinance (City of Cass Lake Resolution 14-2006) and the 1998 Quit Claim Deed prohibits the construction of private water wells within the boundaries of OU1, OU2, and OU3, preventing any potential exposures to contaminated groundwater within these OUs. No new supply wells have been installed within OU1, 2, or 3 that could cause exposures to contaminated groundwater. The fencing surrounding the OU2 landfill is in good repair, securely locked, and appropriate signage is posted preventing unauthorized access to the landfill.

However, currently there are no EPA decision documents documenting the necessary ICs implemented on the site, or any additional ICs that may be needed, as part of the EPA-selected CERCLA remedy for OU1, 2, and 3. Therefore, a decision document is needed for that purpose. In addition, maps of areas that do not allow for UU/UE, review of existing governmental controls, and title work to ensure that no prior-in-time encumbrances exist on the site

inconsistent with ICs are needed. Also, LTS procedures for maintaining, monitoring and enforcing ICs at the site should be clarified and documented in an ICIAP after any additional, necessary ICs for the site have been implemented.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Question B Summary:

Generally, no. There exist some uncertainties in toxicity data, cleanup levels, and RAOs that require further evaluation by the EPA and may change the current assumptions around exposure, toxicity data, cleanup levels, and RAOs.

Changes in Standards and TBCs

As no EPA decision document has been published for the OU1, 2, and 3 groundwater treatment system and landfill, the enforceable standards for these remedies remain the RALs set in the 1986 MEDDs. However, the EPA provided updated, recommended GWCLs in 2016 by letter to IP to measure remedial progress. The State of Minnesota also promulgated updated HRLs in 2023, which include drinking water criteria for both non-carcinogenic and carcinogenic PAHs. The recommended GWCLs 2016 EPA letter do not consider the updated MDH guidance and HRLs or Tribal groundwater cleanup standards.

As of December 2024, the EPA has approved WQS for the Band under the CWA. The EPA is currently evaluating the applicability of these WQS to site remedial actions. The effluent limitations set by the EPA in 2005 also do not consider the recently approved WQS for the Leech Lake Reservation.

Therefore, the 2005 effluent limitations and the 2016 GWCL EPA letter need to be updated to reflect current Federal, State and Tribal standards and guidance, and longer-term a decision document may be needed to document the groundwater cleanup levels that are now applicable.

Changes in Toxicity and Other Contaminant Characteristics

The EPA is aware that MDH published guidance titled "*Guidance for Evaluating the Cancer Potency of Polycyclic Aromatic Hydrocarbon (PAH) Mixtures in Environmental Samples"*, recommending the inclusion of fluoranthene and benzo(g,h,i)perylene as carcinogenic PAHs and recommending updated RPFs that are not reflected in the RPFs specified by the EPA as groundwater cleanup goals in 2016. The EPA is reviewing this guidance to evaluate its applicability to the site.

Additionally, the WHO has proposed updated TEFs for PCDD/PCDFs in 2022 that differ from the 2005 values used by the EPA in the 2016 GWCL letter (Appendix A ref. 7). The EPA is evaluating the 2022 TEFs and has not yet formally adopted them, continuing to use the 2005 TEFs.

However, if the EPA adopts the 2022 TEFs the corresponding TEQ concentrations for site data will need to be updated and re-evaluated to ensure exposure assumptions remain valid.

Changes in Risk Assessment Methods

The EPA is currently re-evaluating the HHERA for the site, which was completed in 2011. Since 2011, there have been several updates, revisions, and publications of new EPA risk assessment guidance, as well as updated toxicity standards mentioned in the previous section and located elsewhere in EPA guidance. The EPA is reviewing these guidance and toxicity data to determine whether they impact the site risk assessment methods, which may change risk assumptions governing current protectiveness determinations for the site.

Changes in Exposure Pathways

There are no changes to exposure pathways since the 2020 FYR. Land use and expected future land use remains a mixture of commercial/industrial and residential. However, the EPA is currently conducting a Reuse Assessment for the site to evaluate any future land uses that may differ from current use and assess any needed changes in exposure assumptions resulting from a change in future land use. Additionally, the re-evaluation of the HHERA mentioned in the previous section may also change assumptions around exposure pathways.

Expected Progress Towards Meeting RAOs

It is evident that reaching the GWCLs in OU1 and OU3 has already exceeded timelines anticipated in the MEDD, and the existence of unmitigated source areas within OU3 and potentially OU1 (pending results of the source area investigation) contributes to these extended timelines. However, even with measures to address source areas, there will still be a significant period needed to monitor residual contamination present adsorbed to organic matter or diffusing from low-permeability areas. Preliminary estimates of timelines to reach remedial goals (Appendix A ref. 20) suggest cleanup levels may not be met until approximately 2050 or later.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. No other information beyond what has already been mentioned above has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1, 2, 3	**Issue Category:** Monitoring			
	Issue: The Groundwater Cleanup Levels recommended by the EPA in 2016 do not consider updated MDH guidance and HRLs or Tribal groundwater cleanup standards. Additionally, the effluent limitations set by the EPA in 2005 do not consider this guidance or the recently approved WQS for the Leech Lake Reservation.			
	Recommendation: Update the 2005 effluent limitation and 2016 GWCL letters to reflect current applicable Federal, State, and Tribal standards and guidance.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	12/31/2025

OU(s): 1, 2, 3	**Issue Category:** Remedy Performance			
	Issue: Since the completion of the 2011 HHERA, there have been several updates, revisions, and publications of new EPA risk assessment guidance, as well as updated toxicity standards.			
	Recommendation: Review current guidance and toxicity data to determine whether they impact the conclusions from the 2011 HHERA and conduct additional data collection and risk assessment as needed to address any deficiencies.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/31/2027

OU(s): 1, 3	**Issue Category:** Monitoring			
	Issue: The full extents of NAPL contaminated areas present is not currently known in OU1, and to a lesser extent OU3.			
	Recommendation: Complete the in-progress source area investigation to complete delineation of any potential source areas remaining in OU1 and OU3.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/30/2026

OU(s): 1, 2, 3	**Issue Category:** Remedy Performance			
	Issue: The current groundwater model does not fully consider factors that may not directly align with modeled plume flow paths, such as contaminant transport or transient flow conditions. This reduces the efficacy of the model in effectively managing the groundwater plumes, predicting extents of run-out plumes or discharges to surface water bodies, and adequate locations for future extraction and monitoring points and/or extraction rates. The current solids model does not consider recent data collected as part of investigations in OU9 and other areas that could impact inputs to the groundwater model.			
	Recommendation: Update the solids and groundwater models to more accurately represent current site conditions, predict hydraulic capture and plume extents, and improve the sourcing of additional extraction wells.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/30/2026

OU(s): 2	**Issue Category:** Remedy Performance			
	Issue: Evidence suggests that the primary liner of the OU2 Landfill is leaking and there are detections of groundwater contaminants downgradient of the landfill. Whether the secondary liner is leaking and a release is occurring is not currently known, making it difficult to know if the landfill containing wastes completely as required in the MEDD.			
	Recommendation: Collect analytical data on OU2 landfill leachate and conduct a hydrologic assessment of the landfill to calculate leakage rates and otherwise assess the integrity of the landfill liners and sources of leachate. Conduct additional monitoring to assess any potential releases from the landfill and their magnitude.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	3/31/2027

OU(s): 1, 2, 3	**Issue Category:** Monitoring			
	Issue: The current monitoring well network does not bracket extents of the plume above criteria, both vertically and horizontally, and does not allow a full assessment of hydraulic capture, potential landfill releases, discharges to surface water, and/or the need for ICs.			
	Recommendation: Install additional monitoring points to collect data establishing points of compliance bounding the plume and source areas below applicable criteria, both horizontally and vertically, including groundwater discharges to surface water bodies.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/30/2026

OU(s): 1, 3	**Issue Category:** Remedy Performance			
	Issue: The groundwater plumes are not fully contained.			
	Recommendation: After completing the source area investigation and improving the groundwater model, identify and implement additions and/or modifications to the extraction network to improve hydraulic capture.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	12/31/2027

OU(s): 1, 2, 3	**Issue Category:** Institutional Controls			
	Issue: The effectiveness, including enforceability, of current institutional controls to prevent ingestion of groundwater and land disturbance has not been adequately evaluated and documented. Additional ICs may be needed to address deficiencies in effectiveness of current ICs.			
	Recommendation: Evaluate the effectiveness of current ICs and determine the need for additional ICs to address groundwater ingestion and/or land disturbance.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	9/30/2028

OU(s): 1, 2, 3	**Issue Category:** Remedy Performance			
	Issue: Updated effluent limitations and groundwater cleanup levels, and current ICs in place limiting groundwater use, are not documented in a decision document. Additional ICs and/or remedial actions needed to ensure long-term protectiveness of the groundwater system, address remaining source areas, and achieve CERCLA goals for groundwater must also be documented in a decision document.			
	Recommendation: Develop a decision document for OUs 1, 2, and 3 documenting any additional remedial actions needed, applicable groundwater cleanup levels, current institutional controls, and any additional institutional controls needed to ensure protectiveness.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	12/31/2029

OU(s): 7	**Issue Category:** Remedy Performance			
	Issue: There is no data demonstrating the level of current COC contamination in roadways or roadway dust. Re-contamination of OU7 parcels with road dust may be occurring.			
	Recommendation: Evaluate the levels of COCs in roadways and the potential for re-contamination of remediated OU7 parcels which may cause unacceptable exposures from windblown dust.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA	12/31/2026

OU(s): 7	Issue Category: Remedy Performance			
	Issue: There are currently lag times in applying dust suppressant to the roads when dusty conditions arise, resulting in concerns it may cause unacceptable exposures to contaminated dust at the nearby parcels.			
	Recommendation: Evaluate options to reduce or eliminate lag time in applying dust suppressant. After characterizing road dust and the potential for re-contamination of OU7 parcels, if appropriate, evaluate a more permanent solution such as paving or replacing contaminated gravel, to eliminate or reduce the need for continued dust suppression activities.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA	12/31/2027

OU(s): 1, 2, 3, 7	Issue Category: Institutional Controls			
	Issue: LTS procedures have not been documented for site ICs.			
	Recommendation: After the need for any additional ICs has been determined and documented in decision documents, update and finalize the 2021 ICIAP to ensure that site ICs are monitored, maintained, and enforced.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/30/2029

OTHER FINDINGS

In addition, the following are recommendations that were identified during the FYR and will improve performance of the remedy and management of O&M, but do not affect current nor future protectiveness:

- The EPA's Quality Program generally expects that work planning documents such as QAPPs, or other plans governing environmental data collection, should be reviewed and revised as needed, at a minimum of every 5 years. The QAPP governing the groundwater model was last updated in 2011 (Appendix A ref. 40), and the QAPP for O&M of the OU1, 2, and 3 groundwater treatment system/landfill was last updated in 2018 (Appendix A ref. 12). Further, the O&M plan for the groundwater treatment system was last updated in 2020 (Appendix A ref. 11). Any QAPPs last reviewed in 2020 or earlier, as well as any still in-effect work plans last reviewed in 2020 or earlier, should be reviewed and updated as necessary, and going forward plan review should be conducted every 5 years or more often as needed. Routine schedules for updating

and revising all site quality documents should be developed and implemented to ensure environmental data collection procedures follow current EPA policy and guidance.

- OU1 extraction well W404 continues to have issues with clogging, and wells W403R and W409 continue to be pumped at an elevated rate to compensate for decreases in W404 pumping rates. In the event W404 cannot maintain target rates in 2025, alternatives to using W404 will be evaluated and proposed, including maintaining higher pumping rates at nearby wells or installing replacement wells.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: 1	*Protectiveness Determination:* Short-term Protective

Protectiveness Statement:

The remedy at OU1 currently protects human health and the environment because there are no current pathways that could result in unacceptable risks. However, in order to be protective in the long-term, the following actions need to be taken to ensure protectiveness:

1) Update the 2005 effluent limitation and 2016 GWCL letters to reflect current applicable Federal, State, and Tribal standards and guidance;
2) Review current guidance and toxicity data to determine whether the conclusions from the 2011 HHERA are impacted, and conduct additional data collection and risk assessment as needed to address any deficiencies;
3) Complete the in-progress source area investigation to complete delineation of any potential source areas remaining in OU1;
4) Update the solids and groundwater models to more accurately represent current site conditions, predict hydraulic capture and plume extents, and improve the sourcing of additional extraction wells;
5) Install additional monitoring points that establishing points of compliance bounding the plume and source areas below applicable criteria, both horizontally and vertically, including groundwater discharges to surface water bodies;
6) After completing the source area investigation and improving the groundwater model, identify and implement additions and/or modifications to the extraction network to improve hydraulic capture;
7) Evaluate the effectiveness of current ICs and determine the need for additional ICs to address groundwater ingestion and/or land disturbance;
8) Develop a decision document for OU1 documenting any changes to the remedy or institutional controls needed to ensure long-term protectiveness of the remedy implemented under the 1986 MEDDs; and
9) After the need for any additional ICs has been determined and documented in decision documents, update and finalize the 2021 ICIAP to ensure that site ICs are monitored, maintained, and enforced.

Protectiveness Statement(s)	
Operable Unit: 2	*Protectiveness Determination:* Short-term Protective

Protectiveness Statement:

The remedy at OU2 currently protects human health and the environment because there are no current pathways that could result in unacceptable risks. However, in order to be protective in the long-term, the following actions need to be taken to ensure protectiveness:

1) Update the 2005 effluent limitation and 2016 GWCL letters to reflect current applicable Federal, State, and Tribal standards and guidance;
2) Review current guidance and toxicity data to determine whether the conclusions from the 2011 HHERA are impacted, and conduct additional data collection and risk assessment as needed to address any deficiencies;
3) Update the solids and groundwater models to more accurately represent current site conditions, predict hydraulic capture and plume extents, and improve the sourcing of additional extraction wells;
4) Collect analytical data on OU2 landfill leachate and conduct a hydrologic assessment of the landfill to calculate leakage rates and otherwise assess the integrity of the landfill liners and sources of leachate. Conduct additional monitoring to assess any potential releases from the landfill and their magnitude;
5) Install additional monitoring points to collect data establishing points of compliance bounding the plume and source areas below applicable criteria, both horizontally and vertically, including groundwater discharges to surface water bodies;
6) Evaluate the effectiveness of current ICs and determine the need for additional ICs to address groundwater ingestion and/or land disturbance;
7) Develop a decision document for OU2 documenting any additional remedial actions needed, applicable groundwater cleanup levels, current institutional controls, and any additional institutional controls needed to ensure protectiveness; and
8) After the need for any additional ICs has been determined and documented in decision documents, update and finalize the 2021 ICIAP to ensure that site ICs are monitored, maintained, and enforced.

Protectiveness Statement(s)	
Operable Unit: 3	*Protectiveness Determination:* Short-term Protective

Protectiveness Statement:

The remedy at OU3 currently protects human health and the environment because there are no current exposure pathways that could result in unacceptable risks. However, in order to be protective in the long term, the following actions need to be taken to ensure protectiveness:

1) Update the 2005 effluent limitation and 2016 GWCL letters to reflect current applicable Federal, State, and Tribal standards and guidance;
2) Review current guidance and toxicity data to determine whether the conclusions from the 2011 HHERA are impacted, and conduct additional data collection and risk assessment as needed to address any deficiencies;
3) Complete the in-progress source area investigation to complete delineation of any potential source areas remaining in OU3;
4) Update the solids and groundwater models to more accurately represent current site conditions, predict hydraulic capture and plume extents, and improve the sourcing of additional extraction wells;
5) Install additional monitoring points to collect data establishing points of compliance bounding the plume and source areas below applicable criteria, both horizontally and vertically, including groundwater discharges to surface water bodies;
6) After completing the source area investigation and improving the groundwater model, identify and implement additions and/or modifications to the extraction network to improve hydraulic capture;
7) Evaluate the effectiveness of current ICs and determine the need for additional ICs to address groundwater ingestion and/or land disturbance;
8) Develop a decision document for OU3 documenting any additional remedial actions needed, applicable groundwater cleanup levels, current institutional controls, and any additional institutional controls needed to ensure protectiveness; and
9) After the need for any additional ICs has been determined and documented in decision documents, update and finalize the 2021 ICIAP to ensure that site ICs are monitored, maintained, and enforced.

Protectiveness Statement(s)		
Operable Unit: 7	*Protectiveness Determination:* Protectiveness Deferred	*Planned Addendum Completion Date:* 10/31/2027

Protectiveness Statement:

A protectiveness determination of the remedy at OU7 cannot be made at this time until further information is obtained. Further information will be obtained by taking the following actions:

1) Evaluate the levels of COCs in roadways and the potential for re-contamination of remediated OU7 parcels which may cause unacceptable exposures from windblown dust; and
2) Evaluate options to reduce or eliminate lag time in applying dust suppressant. After characterizing road dust and the potential for re-contamination of OU7 parcels, if appropriate, evaluate a more permanent solution such as paving or replacing contaminated gravel, to eliminate or reduce the need for continued dust suppression activities.

It is expected that these actions will take approximately two years to complete, at which time a protectiveness determination will be made.

VIII. NEXT REVIEW

The next FYR report for the St. Regis Paper Company Superfund Site is required five years from the completion date of this review.

APPENDIX A: Reference List

Site documents are maintained in the EPA's Superfund Enterprise Management System (SEMS). Documents referenced in this FYR are available on the EPA's site webpage are at: https://www.epa.gov/superfund/st-regis-paper, under the "Site Documents & Data" tab, "Reports and Documents" section. A request to add site documents not already on the webpage can be made by contacting Remedial Project Manager Zachary Sasnow (312-886-0258, sasnow.zack@epa.gov), Remedial Project Manager Brandon Pursel (312-353-9229, pursel.brandon@epa.gov), or by submitting a Freedom of Information Act request.

Ref.	Date	Author	Title	SEMS ID
1	4/2/2020	EPA	OU7 Record of Decision	955551
2	1/13/2025	EPA	Memo-to-File: Operable Unit Designation	998533
3	3/5/1986	MPCA	Minnesota Enforcement Decision Document: St. Regis Paper Co. Site	141766
4	7/29/1986	MPCA	Minnesota Enforcement Decision Document: Former Cass Lake City Dump Site	141777
5	1/19/2011	Integral Consulting	Human Health and Ecological Risk Assessment	953104
6	10/14/2005	EPA	OU7 Interim ROD	924284
7	12/20/2016	EPA	Cleanup Level Update	955545
8	1/24/1995	EPA	Unilateral Administrative Order - V-W-95-C-308	179646
9	12/2/2005	EPA	Unilateral Admnistrative Order - Interim Remedial Action - V-W-05-C-833	243415
10	4/26/2024	EPA	2022 Annual Report Approval and Source Area Investigation Work Plan Request	990045
11	1/30/2020	Barr Engineering	Operations and Maintenance Plan	955536
12	9/28/2018	Barr Engineering	Quality Assurance Project Plan	955535
13	10/26/2021	Barr Engineering	Technical Memorandum, OU1 Pilot Investigation	998780
14	6/21/2019	EPA	Groundwater Optimization Review	2002694
15	8/15/2005	EPA	Amendments to O&M Plan (Effluent Limitations)	415950
16	7/16/2020	EPA	Sixth Five Year Review Report	959032
17	12/1/2021	Barr	2020 Annual Report	2004365
18	9/1/2022	Barr Engineering	2021 Annual Report	2005094
19	2/9/2024	Barr Engineering	2022 Annual Report	988761

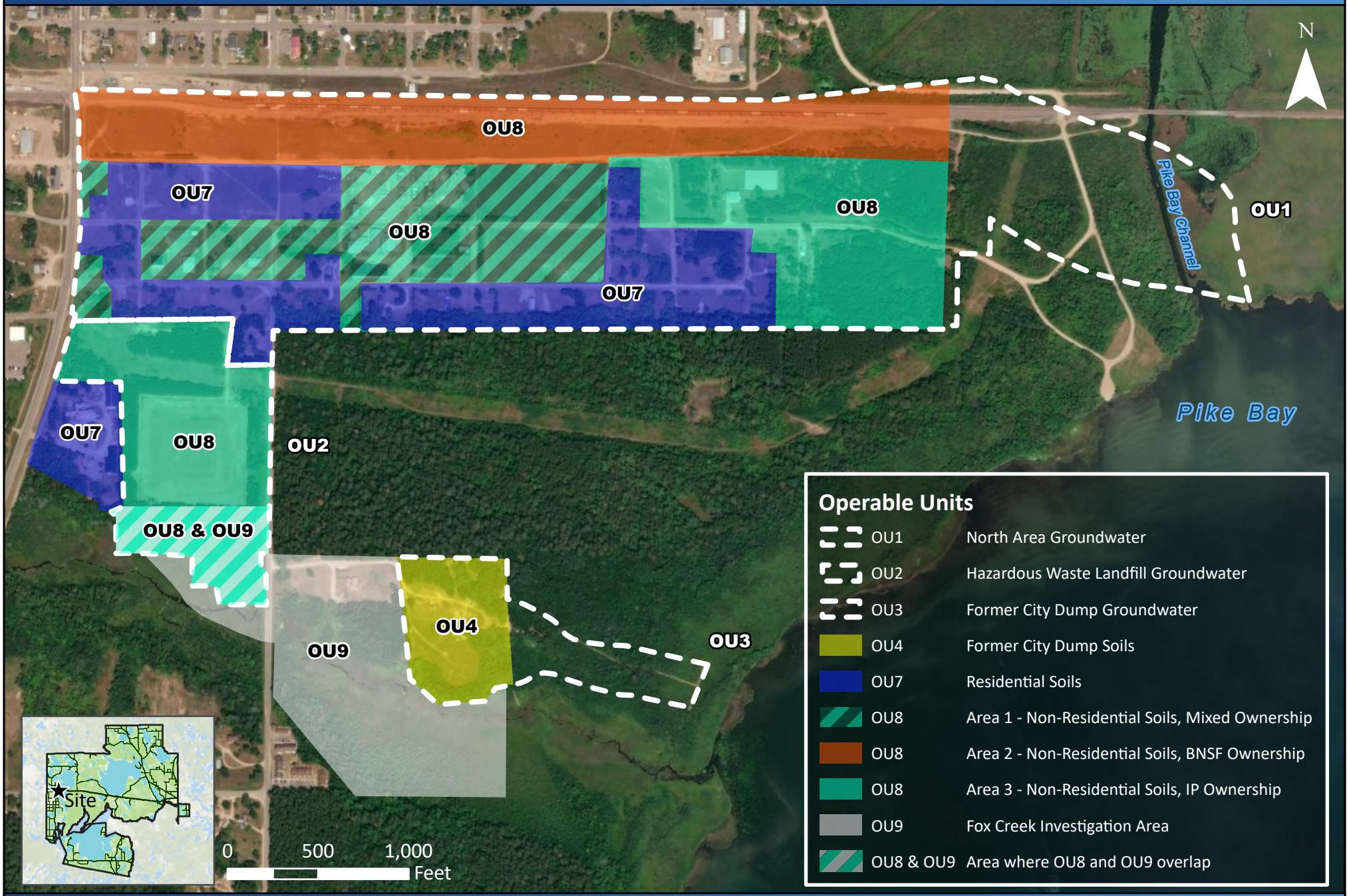
Ref.	Date	Author	Title	SEMS ID
20	9/24/2024	Barr Engineering	2023 Annual Report	995621
21	4/24/2020	Barr Engineering	1st Quarter 2020 Progress Report	2003121
22	7/30/2020	Barr Engineering	2nd Quarter 2020 Progress Report	2003122
23	10/30/2020	Barr Engineering	3rd Quarter 2020 Progress Report	976040
24	1/31/2021	Barr Engineering	4th Quarter 2020 Progress Report	976042
25	4/30/2021	Barr Engineering	1st Quarter 2021 Progress Report	998781
26	7/31/2021	Barr Engineering	2nd Quarter 2021 Progress Report	976041
27	11/1/2021	Barr Engineering	3rd Quarter 2021 Progress Report	967044
28	1/31/2022	Barr Engineering	4th Quarter 2021 Progress Report	976043
29	4/28/2022	Barr Engineering	1st Quarter 2022 Progress Report	976045
30	8/1/2022	Barr Engineering	2nd Quarter 2022 Progress Report	998782
31	10/31/2022	Barr Engineering	3rd Quarter 2022 Progress Report	998783
32	1/31/2023	Barr Engineering	4th Quarter 2022 Progress Report	998784
33	5/1/2023	Barr Engineering	1st Quarter 2023 Progress Report	998785
34	7/31/2023	Barr Engineering	2nd Quarter 2023 Progress Report	998786
35	10/30/2023	Barr Engineering	3rd Quarter 2023 Progress Report	998787
36	2/7/2024	Barr Engineering	4th Quarter 2023 Progress Report	998788
37	4/30/2024	Barr Engineering	1st Quarter 2024 Progress Report	990078
38	7/31/2024	Barr Engineering	2nd Quarter 2024 Progress Report	994033
39	10/30/2024	Barr Engineering	3rd Quarter 2024 Progress Report	996802
40	8/23/2011	Barr Engineering	Modeling QAPP	957040
41	1/18/2017	Barr Engineering	Groundwater Flow Model Application Assessment	976062

Ref.	Date	Author	Title	SEMS ID
42	3/22/2021	Barr Engineering	Extraction Well Contingency Plan	998779
43	9/15/2005	Barr Engineering	Final Report: Soil Removal Action	363293
44	3/18/2019	Barr Engineering	Proposed Monitoring Program: 2019-2024	955540
45	9/24/2018	Braun Intertec Corporation	Groundwater Investigation Report - Wetland Area	2002801
46	3/7/2016	Barr Engineering	Porewater Report	942178
47	4/1/1985	Barr Engineering	Remedial Investigation/Alternatives Report	382059
48	6/1/1986	Barr Engineering	Alternatives Assessment, City Dump Site	415907

APPENDIX B: Figures

St. Regis Paper Company Superfund Site

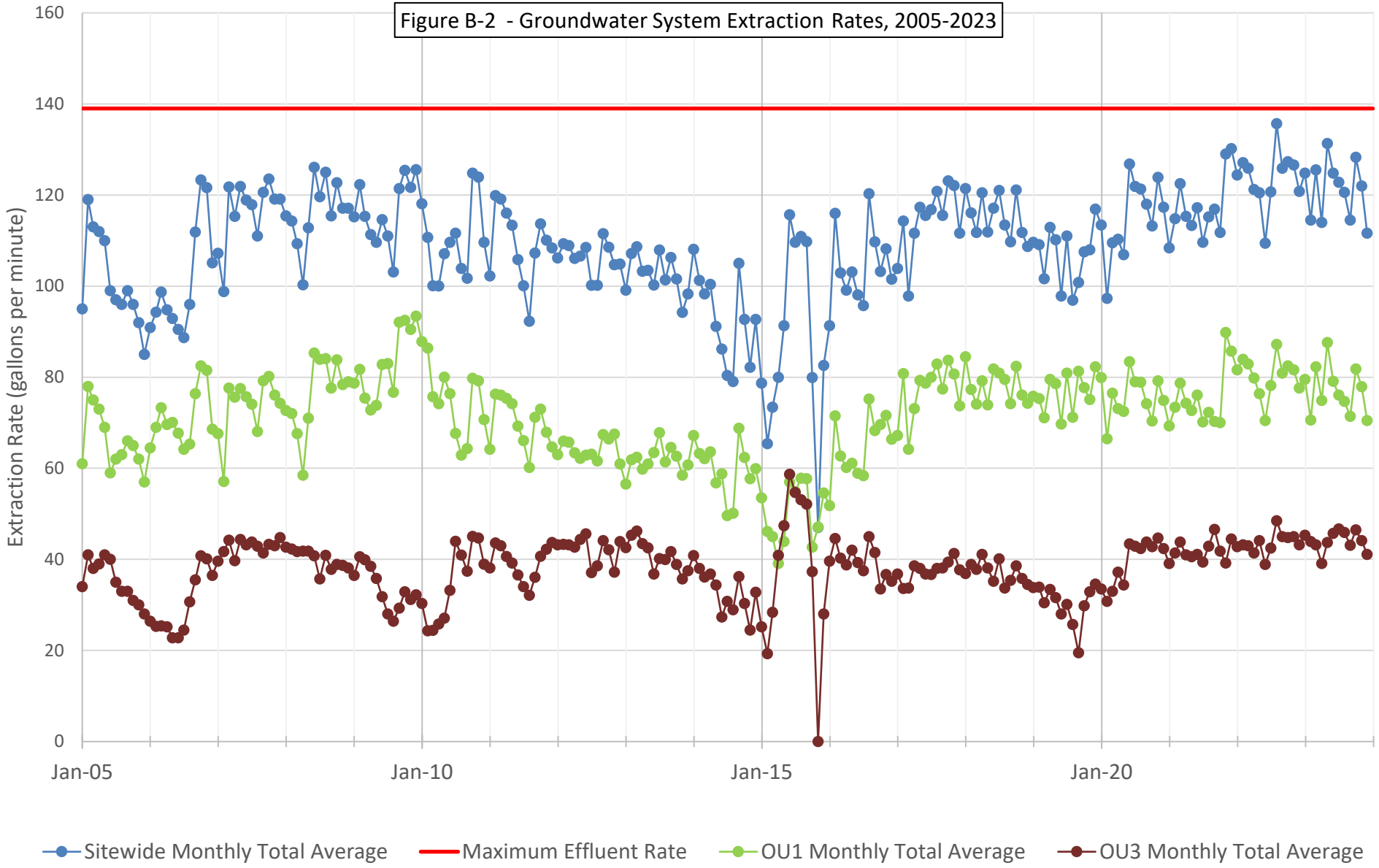
Figure B-1: Site Location and Operable Unit (OU) Boundaries | Published on 4/3/2025



This map is for reference use only. OU Boundaries are approximate and subject to change at any time. OU Boundaries from EPA. Leech Lake Band of Ojibwe (LLBO) Reservation Boundary from U.S. Census Bureau. Basemap provided by Esri.

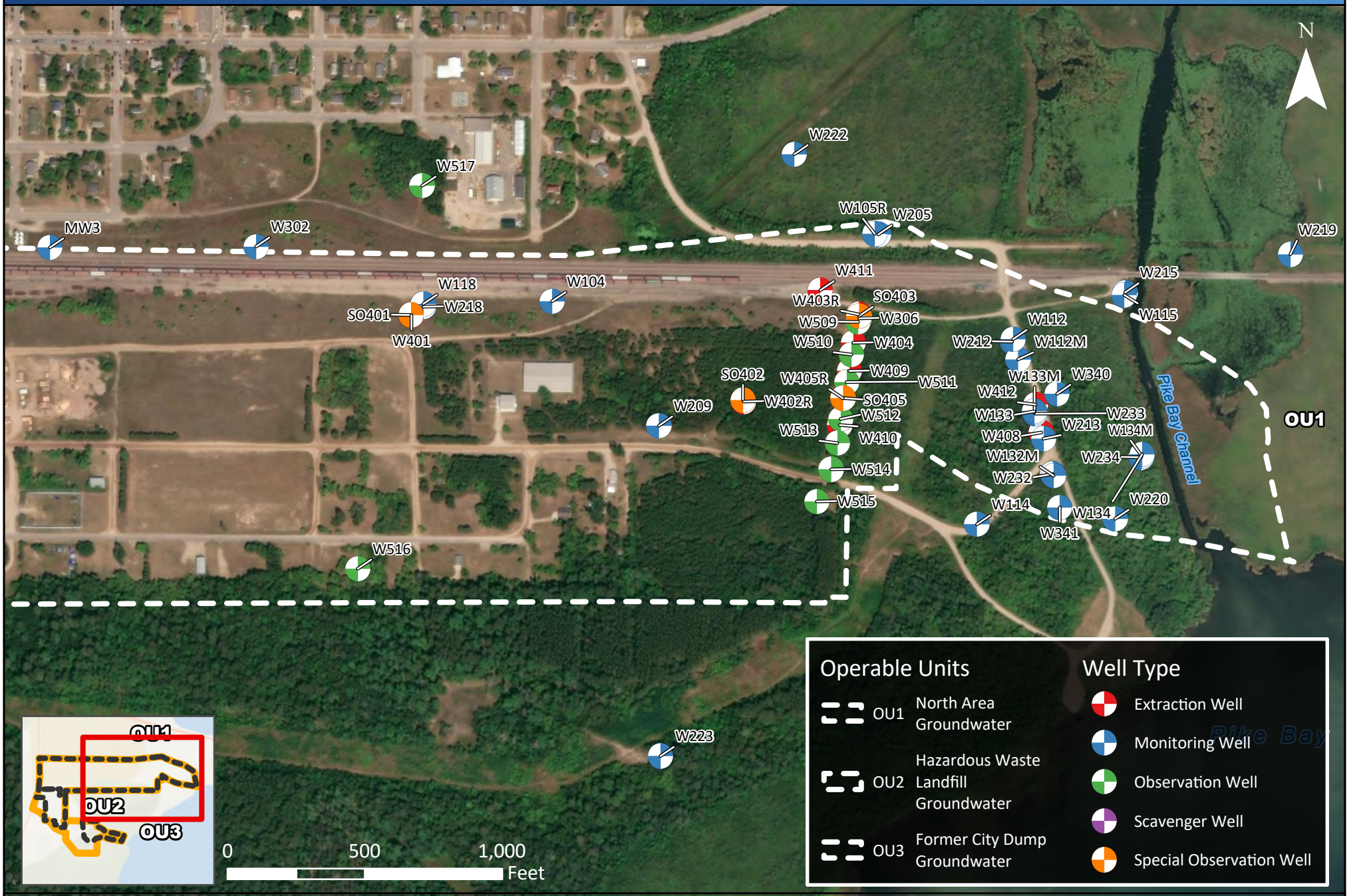
Projection: NAD 1983 2011 StatePlane Minnesota Central FIPS 2202 Ft US

Figure B-2 - Groundwater System Extraction Rates, 2005-2023



St. Regis Paper Company Superfund Site

Figure B-3: OU1 Monitoring Locations | Published on 1/24/2025



This map is for reference use only. OU Boundaries are approximate and subject to change at any time. OU Boundaries from EPA. Leech Lake Band of Ojibwe (LLBO) Reservation Boundary from U.S. Census Bureau. Basemap provided by Esri.

Projection: NAD 1983 2011 StatePlane Minnesota Central FIPS 2202 Ft US

St. Regis Paper Company Superfund Site

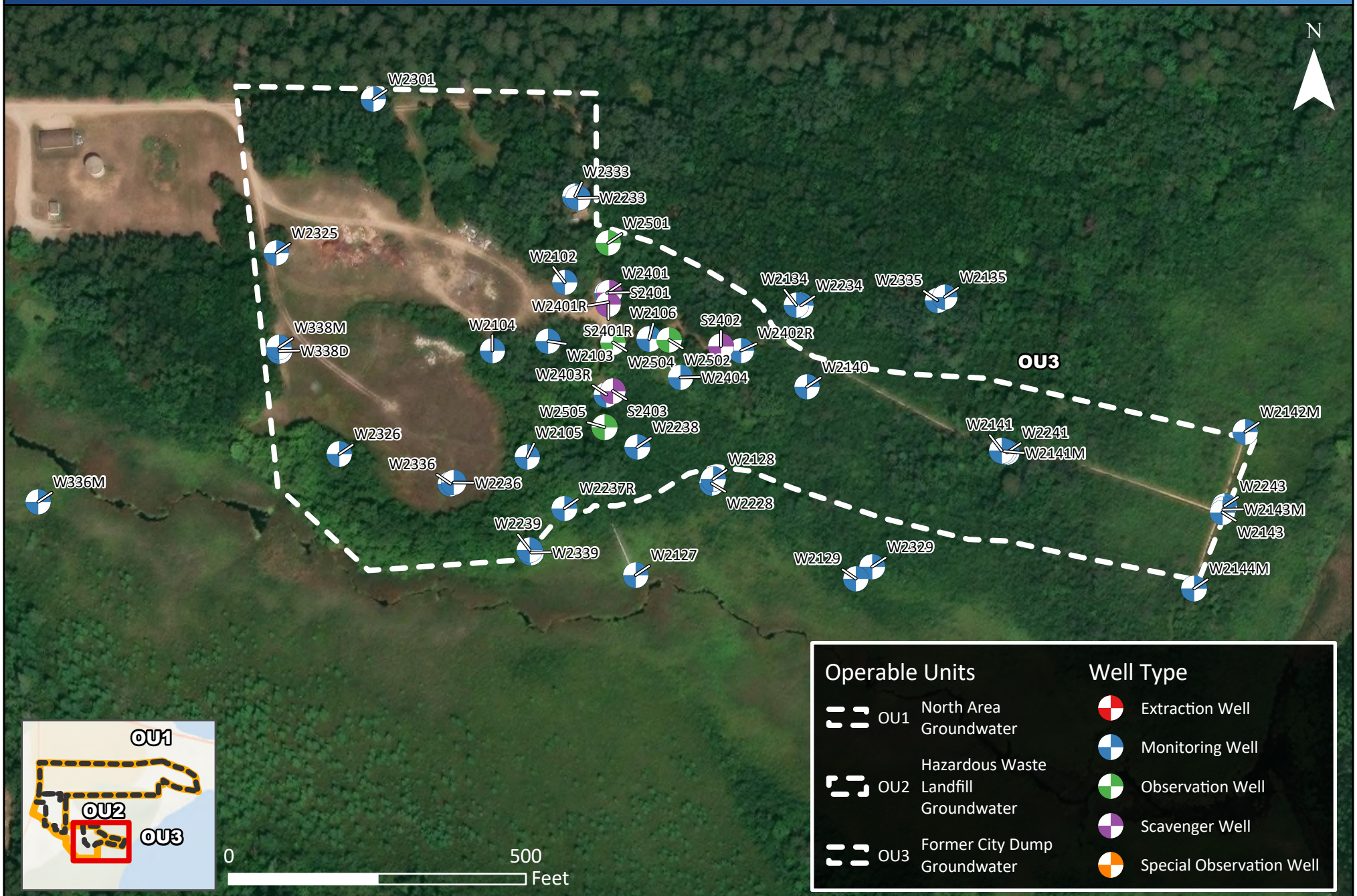
Figure B-4: OU2 Monitoring Locations | Published on 1/24/2025

This map is for reference use only. OU Boundaries are approximate and subject to change at any time. OU Boundaries from EPA. Leech Lake Band of Ojibwe (LLBO) Reservation Boundary from U.S. Census Bureau. Basemap provided by Esri.

Projection: NAD 1983 2011 StatePlane Minnesota Central FIPS 2202 Ft US

St. Regis Paper Company Superfund Site

Figure B-5: OU3 Monitoring Locations | Published on 1/24/2025



This map is for reference use only. OU Boundaries are approximate and subject to change at any time. OU Boundaries from EPA. Leech Lake Band of Ojibwe (LLBO) Reservation Boundary from U.S. Census Bureau. Basemap provided by Esri.

Projection: NAD 1983 2011 StatePlane Minnesota Central FIPS 2202 Ft US

- Extraction Well
- Monitoring Well
- Groundwater Investigation Location (Braun Intertec, 2018)
- PCP Concentration Contour *(dashed where inferred)*

Notes:
1) Wells with no data boxes were not sampled in 2023.
2) PCP in groundwater extends approximately 400 feet east of channel between Cass Lake and Pike Bay based on investigation by others. Highest PCP concentration was 914 ug/L (Braun Intertec, 2018).
3) Where multiple samples collected in 2023 from a monitoring location, PCP concentration contours based on average of sample results.

N

Feet
0 500 1,000

Figure B-6
Current Extents - OU1 PCP Plume
Upper Outwash Aquifer
Adapted from Figure 3 of the 2024 Annual Report

St. Regis Paper Company Site
Cass Lake, MN

Aerial Imagery: Pictometry 2020, Licensed by Cass County

Extraction Well

Monitoring Well

PCP Concentration Contour
(dashed where inferred)

Notes:
1) PCP data from the OU9 Groundwater Quality Investigation (Barr, 2021a) were used to develop the displayed PCP concentration contours.
2) Wells with no data boxes were not sampled in 2023.
3) See Figure 6 for the concentration contours in the Fox Creek valley outwash (which is laterally equivalent to the lower outwash aquifer) (Barr, 2021a).

N

Feet
0 350 700

Figure B-7
Current Extents - OU3 PCP Plume
Upper Outwash Aquifer
Adapted from Figure 5 of the 2024 Annual Report

St. Regis Paper Company Site
Cass Lake, MN

Aerial Imagery: Pictometry 2020, Licensed by Cass County

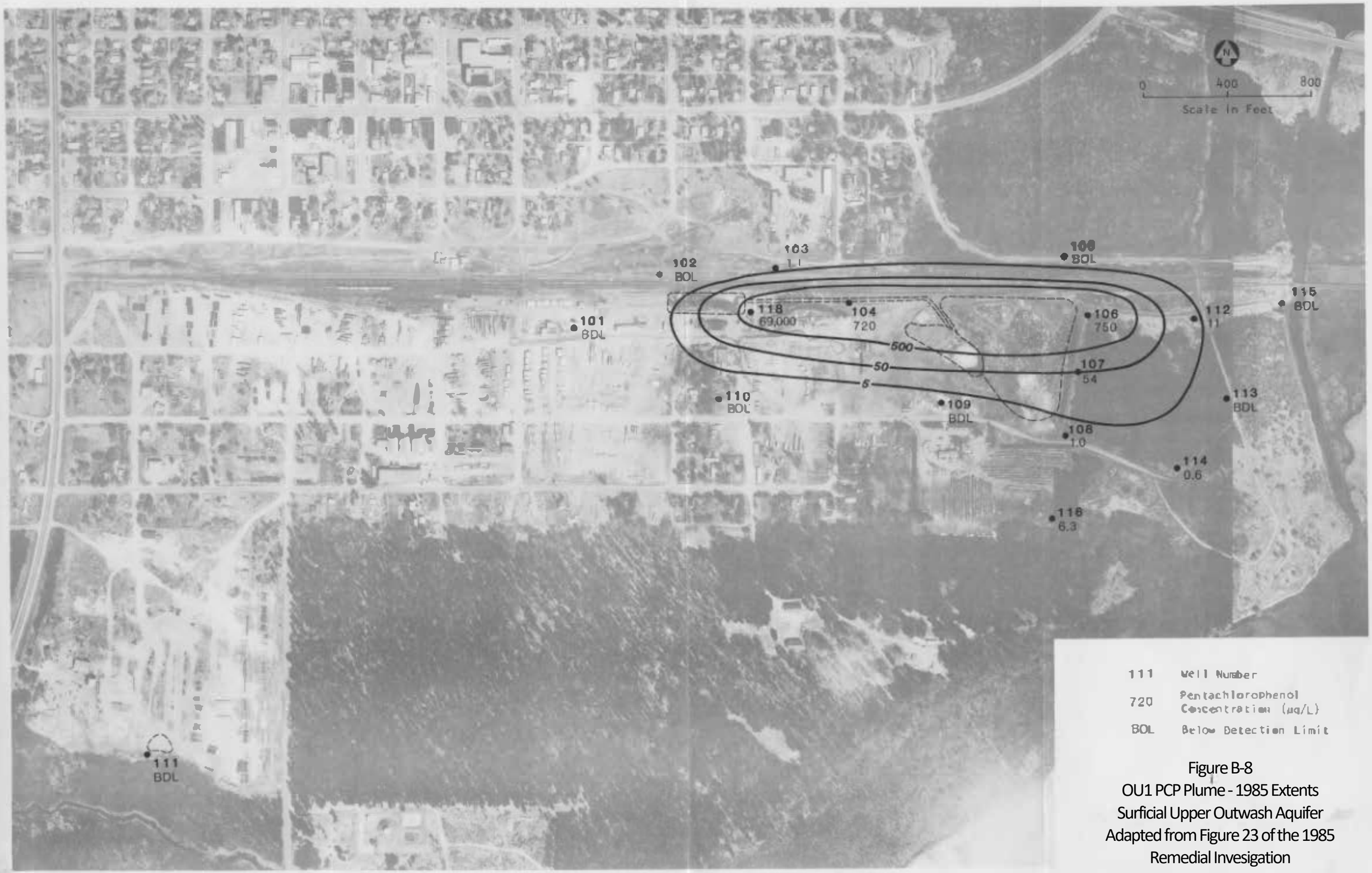
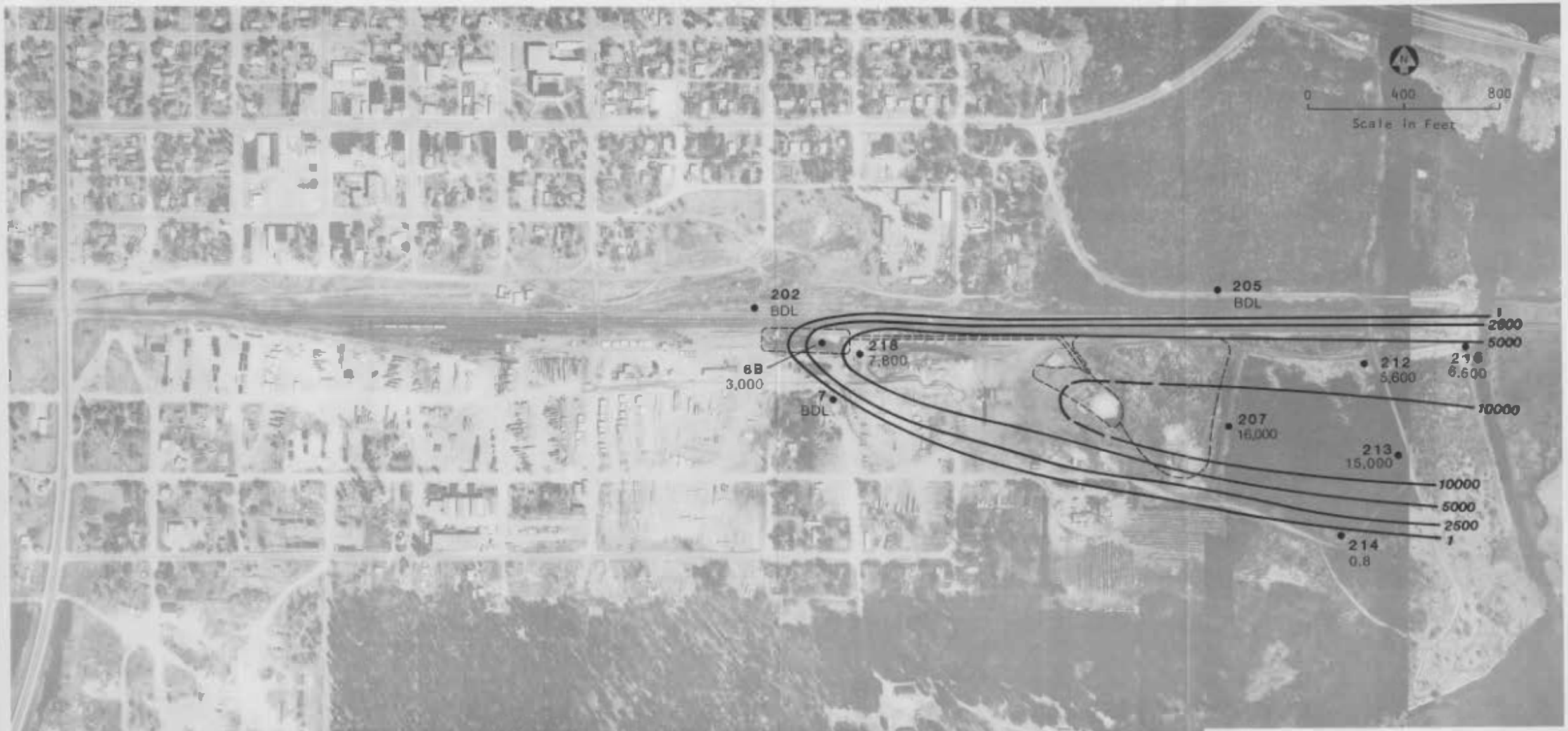
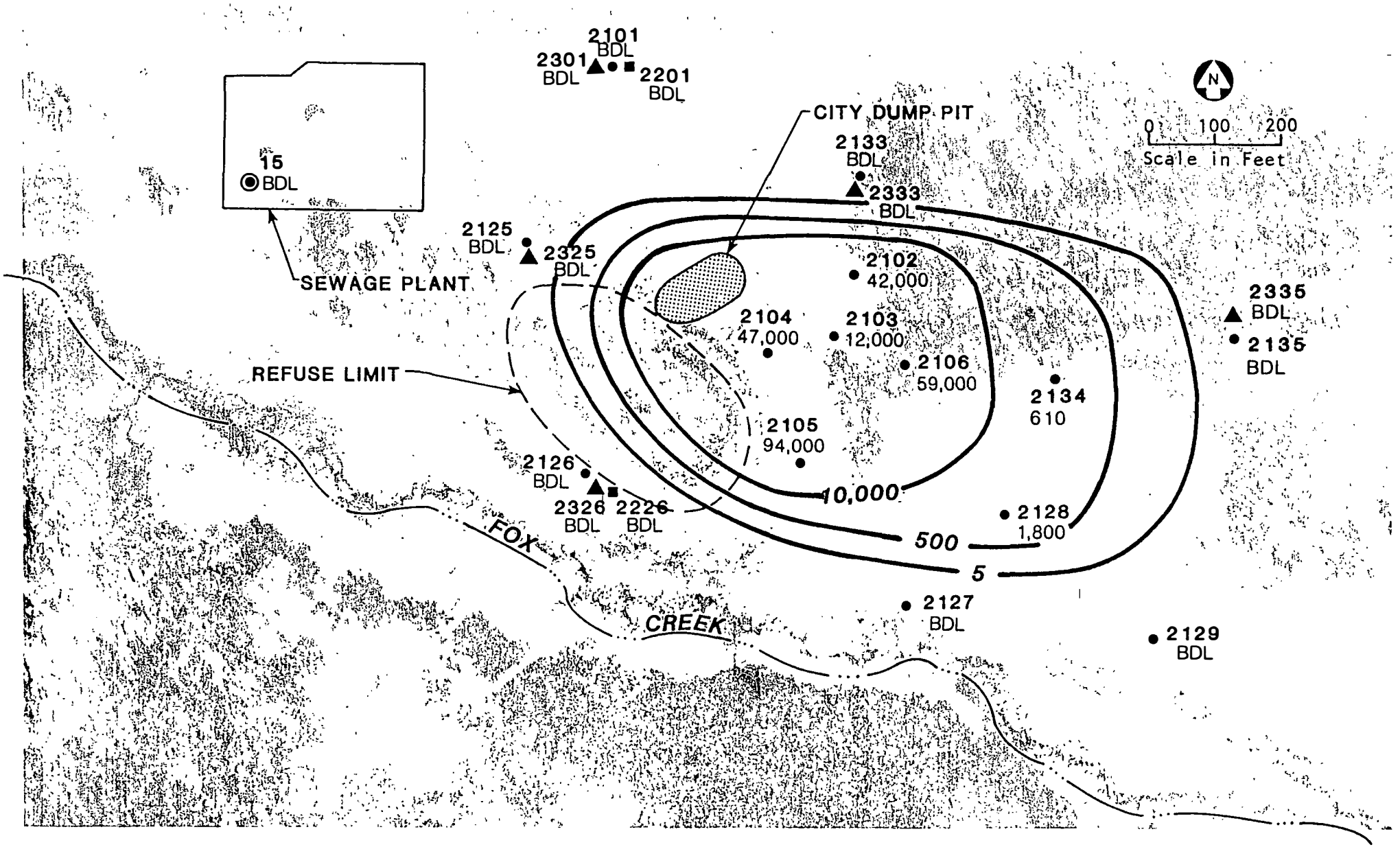


Figure B-8
OU1 PCP Plume - 1985 Extents
Surficial Upper Outwash Aquifer
Adapted from Figure 23 of the 1985
Remedial Invesigation



202	Well Number
17,000	Pentachlorophenol Concentration (µg/L)
BDL	Below Detection Limit

Figure B-9
OU1 PCP Plume - 1985 Extents
Base of Upper Outwash Aquifer
Adapted from Figure 25 of the 1985
Remedial Invesigation



2104 Well Number

57,000 Pentachlorophenol Concentration (ug/L)

BDL Not Detectable

● Shallow Monitoring Well

■ Mid Depth Monitoring Well

▲ Lower Aquifer Monitoring Well

◉ City Well

500 Contour of Equal Pentachlorophenol Concentration (ug/L)-Upper Aquifer

Figure B-10
OU3 PCP Plume - 1986 Extents
Upper Outwash Aquifer
Adapted from Figure 5 of the 1986
Alternatives Assessment Report

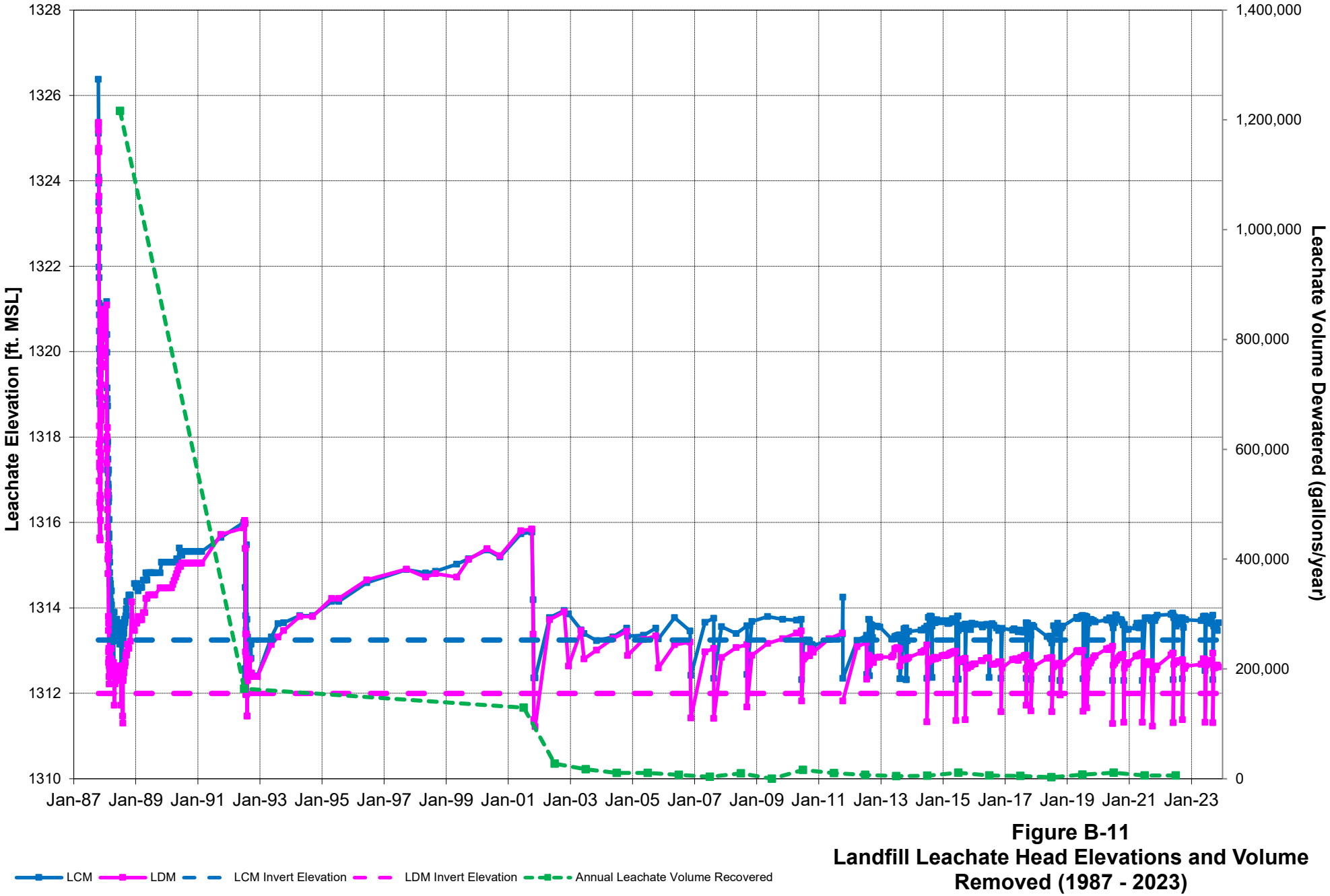


Figure B-11
Landfill Leachate Head Elevations and Volume Removed (1987 - 2023)

Adapted from Figure 14 of the 2023 Annual Report

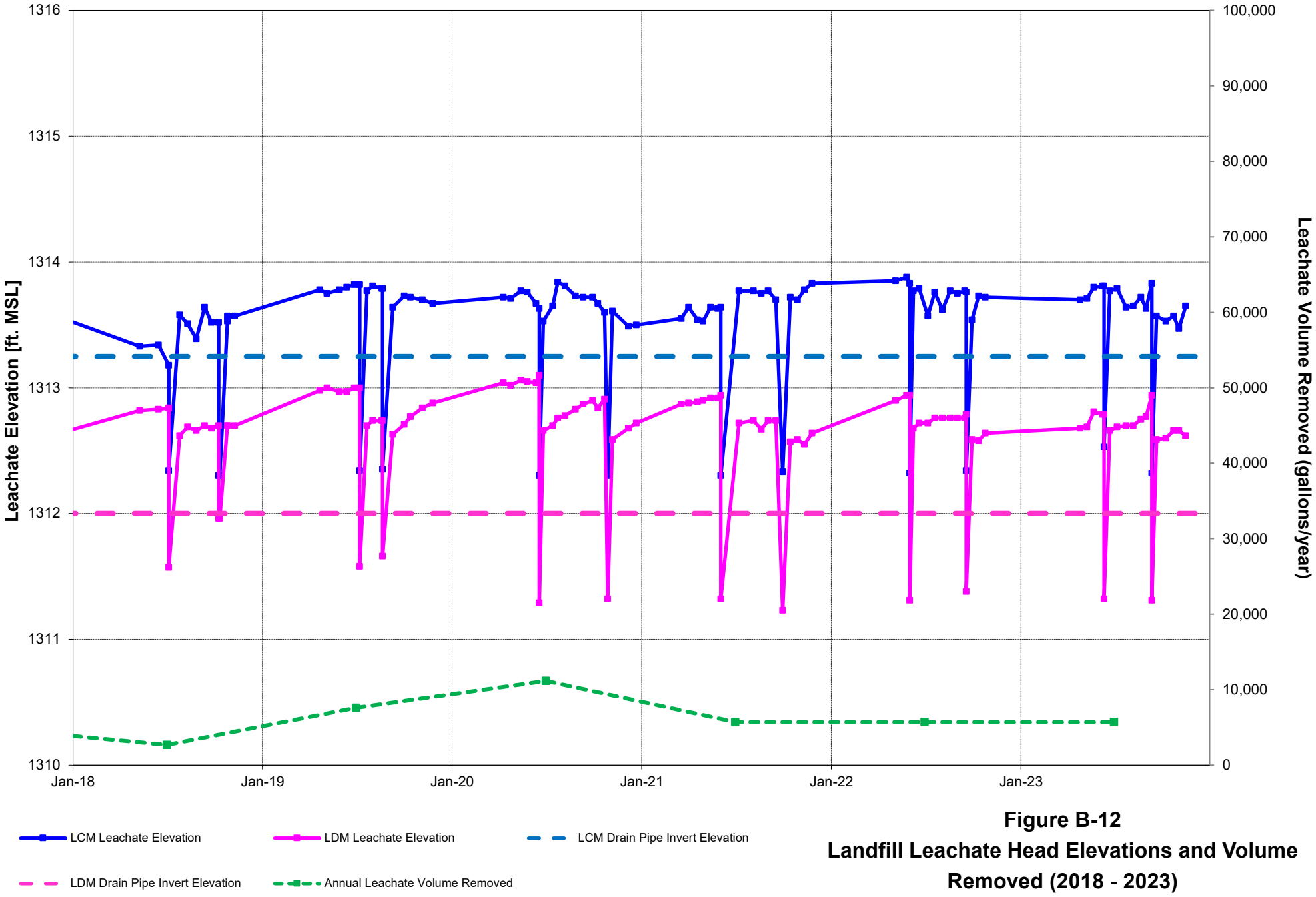


Figure B-12
Landfill Leachate Head Elevations and Volume Removed (2018 - 2023)
Adapted from Figure 15 of the 2023 Annual Report

APPENDIX C: Tables

Table C-1. Extraction System Maintenance Events

Date	W401 (Offline)	W402R	W403R	W404	W405/ 405R	W406 (Offline)	W407 (Offline)	W408	W409	W410 (Offline)	W411 (Offline)	W412	W2401/ 2401R (Offline)	W2402/ W2402R	W2403/ W2403R	W2404
Jan-20																
Feb-20																
Mar-20		A/E			A			A						A	B	
Apr-20																
May-20		A/F	A/F		A/E/F				B/E/F							
Jun-20														H		
Jul-20				A/C/F				A/E/F				H				
Aug-20																
Sep-20																
Oct-20		E	A	A/E	A/D											
Nov-20		E														
Dec-20																
Jan-21																
Feb-21																
Mar-21		A/F	A/F	A/F	A/F			A/F/L	A/F						E	
Apr-21																
May-21																
Jun-21														A/D	A/D/F	
Jul-21																
Aug-21		A/E	A	A/I	A			A						A/D	A/D	
Sep-21		E	E													
Oct-21																
Nov-21				C/J		G	G							B		
Dec-21																

Table C-1. Extraction System Maintenance Events

Date	W401 (Offline)	W402R	W403R	W404	W405/ 405R	W406 (Offline)	W407 (Offline)	W408	W409	W410 (Offline)	W411 (Offline)	W412	W2401/ 2401R (Offline)	W2402/ W2402R	W2403/ W2403R	W2404
Jan-22																
Feb-22																
Mar-22																
Apr-22																
May-22		A/E/F	A/D/F	A/E/F	A/E/F			A/F								
Jun-22																
Jul-22																
Aug-22																
Sep-22		A/F		A/F	A/F			A/F								
Oct-22																C
Nov-22																
Dec-22																
Jan-23					E				C							
Feb-23				E												
Mar-23																
Apr-23					E											
May-23			A/E/F	A/E/F				A/F								
Jun-23					A									F	A/F	C
Jul-23					H										G	
Aug-23																
Sep-23			A	A	G			A						G		
Oct-23																
Nov-23												E				
Dec-23									A						C	

Table C-1. Extraction System Maintenance Events

Date	W401 (Offline)	W402R	W403R	W404	W405/ 405R	W406 (Offline)	W407 (Offline)	W408	W409	W410 (Offline)	W411 (Offline)	W412	W2401/ 2401R (Offline)	W2402/ W2402R	W2403/ W2403R	W2404
Jan-24					K											
Feb-24																
Mar-24																
Apr-24			A/E/F	A/F	A/F			A/F	C					A/C/F	A/F	F
May-24																
Jun-24																
Jul-24					A/E											
Aug-24																
Sep-24												C/E			E	E
Oct-24			C/E	A/C	A/E									C/E		F
Nov-24																
Dec-24																

Key:

A	Plumbing Component (Forcemain, Drop Pipe, Spool, Check Valve, Backflow Preventor, Meter) Cleaned
B	Plumbing Component (Forcemain, Drop Pipe, Spool, Check Valve, Backflow Preventor, Meter) Repaired
C	Plumbing Component (Forcemain, Drop Pipe, Spool, Check Valve, Backflow Preventor, Meter) Replaced
D	Pump Cleaned
E	Pump Replaced
F	Well Screen Cleaned
G	Original Well Sealed
H	Replacement/New Well Installed and Online
I	Well Taken Offline
J	Well Returned Online
K	Bag Filter Installed
L	Blank Assembly Removed

Table C-2. Pentachlorophenol Groundwater Monitoring Data

Well ID	Pentachlorophenol Groundwater Concentration (ppb)												Historical Maximum		Screening Levels (ppb)			
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppb)	Date	EPA GWCL (2016)	MEDD Cleanup Goal	HSCA GWCL	MDH HRL
OU1 Extraction Wells																		
W402R	**130**	-	-	**290 H**	-	-	**44**	-	-	-	-	-	230	5/12/2019	1	1010	0.02	0.3
W403R	**76**	-	-	**74 H**	-	-	**45**	-	-	**75**	-	-	71	5/22/2018	1	1010	0.02	0.3
W404	**1800**	-	-	**1800 H**	-	-	**1300**	-	-	**1800**	-	-	2100	5/12/2012	1	1010	0.02	0.3
W405	**390**	-	-	**320 H**	-	-	**60**	-	-	**76**	-	-	11000	5/29/2008	1	1010	0.02	0.3
W405R	-	-	-	-	-	-	-	-	-	-	**420**	-	-	-	1	1010	0.02	0.3
W406	**0.43 J**	-	-	-	-	-	-	-	-	-	-	-	58	6/4/1997	1	1010	0.02	0.3
W407	**0.33 J**	-	-	-	-	-	-	-	-	-	-	-	0.33	5/24/2020	1	1010	0.02	0.3
W408	**180**	-	-	**95 H**	-	-	**54**	-	-	**71**	-	-	2000	6/5/1996	1	1010	0.02	0.3
W409	**4800**	-	-	**3900 H**	-	-	**2400**	-	-	**3900**	-	-	5600	5/10/2012	1	1010	0.02	0.3
W410	**1.1**	-	-	-	-	-	< 0.11 B	-	-	-	-	-	110	5/29/2008	1	1010	0.02	0.3
W411	**0.61**	-	-	**2.1**	-	-	**3**	-	-	**2.8**	-	-	350	5/15/1999	1	1010	0.02	0.3
W412	**83**	**380**	-	**220 H**	-	-	**120**	-	-	**200**	-	-	-	-	1	1010	0.02	0.3
OU1 Monitoring Wells - Top of Upper Outwash Aquifer																		
W104	**40**	-	-	**200**	-	-	**130**	-	-	**490 H**	-	-	3200	5/11/2003	1	1010	0.02	0.3
W105R	**28**	-	-	**12**	-	-	**8.2**	-	-	**7.5 H**	-	-	140	8/24/2007	1	1010	0.02	0.3
W112	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	ND	-	1	1010	0.02	0.3
W114	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	ND	-	1	1010	0.02	0.3
W115	< 0.071	-	-	-	-	-	**0.071 JP**	-	-	-	-	-	0.74	5/1/2016	1	1010	0.02	0.3
W133	**0.091 J**	-	-	< 0.071	-	-	< 0.071	-	-	< 0.43 H	-	-	12	11/14/2018	1	1010	0.02	0.3
W134	< 0.077	-	-	< 0.17 B	-	-	< 0.14 B	-	-	< 0.43 H	-	-	0.57	5/3/2015	1	1010	0.02	0.3
OU1 Monitoring Wells - Middle of Upper Outwash Aquifer																		
W112M	**210**	-	-	**150**	-	**140**	**110**	-	**88**	**110 H**	-	**55**	630	5/4/2015	1	1010	0.02	0.3
W132M	**14**	-	-	**11**	-	**12**	**13**	-	-	**33 H**	-	**8.9**	41	8/23/2016	1	1010	0.02	0.3
W133M	**800 H**	-	**370**	**66**	-	**150**	**81**	-	**120**	**120 H**	-	**74**	1500	8/20/2018	1	1010	0.02	0.3
W134M	**980**	-	**840**	**1100**	-	**850**	**1000**	-	**1100**	**1400 H**	-	**320**	2200	5/3/2015	1	1010	0.02	0.3
W510	-	-	-	-	-	-	-	-	-	-	-	**11 J-**	-	-	1	1010	0.02	0.3

Table C-2. Pentachlorophenol Groundwater Monitoring Data

Well ID	Pentachlorophenol Groundwater Concentration (ppb)												Historical Maximum		Screening Levels (ppb)			
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppb)	Date	EPA GWCL (2016)	MEDD Cleanup Goal	HSCA GWCL	MDH HRL
OU1 Monitoring Wells - Bottom of Upper Outwash Aquifer																		
W205	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	ND	-	1	1010	0.02	0.3
W209	< 0.16 H	-	-	-	-	-	-	< 0.13	-	-	-	-	ND	-	1	1010	0.02	0.3
W212	**6.8**	-	-	**2.6**	-	-	**1.6**	-	-	**1.2 H**	-	-	2300	6/8/1995	1	1010	0.02	0.3
W213	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	1900	4/4/2000	1	1010	0.02	0.3
W215	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	1600	6/8/1995	1	1010	0.02	0.3
W217	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	ND	-	1	1010	0.02	0.3
W218	**0.44 J**	-	-	< 0.31 B	-	-	**4.8**	-	-	< 0.43 H	-	-	110	5/14/2005	1	1010	0.02	0.3
W219	< 0.071	-	-	-	-	-	**-**	< 0.15	-	-	-	-	ND	-	1	1010	0.02	0.3
W220	< 0.071	-	-	< 0.071	-	-	< 0.074 B	-	-	**1.2**	-	-	570	6/8/1995	1	1010	0.02	0.3
W221	< 0.11 H	-	-	-	-	-	< 0.071	-	-	-	-	-	ND	-	1	1010	0.02	0.3
W232	**11**	-	-	**7.1**	-	-	**3.8**	-	-	**5.8 H**	-	-	31	10/24/2016	1	1010	0.02	0.3
W233	< 0.071	-	-	< 0.086	-	-	< 0.071	-	-	< 0.43	-	-	8.1	8/22/2016	1	1010	0.02	0.3
W234	**55**	-	-	**40**	-	-	**11**	-	-	**22**	-	-	92	5/3/2015	1	1010	0.02	0.3
OU1 Monitoring Wells - Lower Outwash Aquifer																		
MW3	**0.51**	-	-	< 0.086	-	-	< 0.078	-	-	-	-	-	0.51	5/23/2020	1	1010	0.02	0.3
W302	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	0.14	9/17/2006	1	1010	0.02	0.3
W306	< 0.16 H	-	-	-	-	-	< 0.071	-	-	-	-	-	0.19	9/18/2006	1	1010	0.02	0.3
W340	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	0.26	4/23/2017	1	1010	0.02	0.3
W341	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	0.098	4/28/2017	1	1010	0.02	0.3
OU2 Monitoring Wells - Upper Outwash Aquifer																		
W124	< 0.071	-	-	< 0.071	-	-	< 0.071	-	-	< 0.43 H	-	-	ND	-	1	1010	0.02	0.3
W125	< 0.071	-	-	< 0.071	-	-	< 0.071	-	-	< 0.43 H	-	-	0.5	4/29/2016	1	1010	0.02	0.3
W126	< 0.071	-	-	< 0.071	-	-	< 0.071	-	-	< 0.43 H	-	-	ND	-	1	1010	0.02	0.3
W127	< 0.094 BH	< 0.071	-	< 0.071	-	-	-	< 0.41 B	-	< 0.43 H	-	-	1.8	5/9/2007	1	1010	0.02	0.3
W128	< 0.071	-	-	< 0.071	-	-	-	< 0.46 B	-	< 0.43 H	-	-	ND	-	1	1010	0.02	0.3
W129	< 0.071	-	-	< 0.12 B	-	-	-	< 0.3 B	-	< 0.43 H	-	-	ND	-	1	1010	0.02	0.3
W130	< 0.071	-	-	< 0.079	-	-	< 0.071	-	-	< 0.43 H	-	-	ND	-	1	1010	0.02	0.3

Table C-2. Pentachlorophenol Groundwater Monitoring Data

Well ID	Pentachlorophenol Groundwater Concentration (ppb)												Historical Maximum		Screening Levels (ppb)			
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppb)	Date	EPA GWCL (2016)	MEDD Cleanup Goal	HSCA GWCL	MDH HRL
OU2 Monitoring Wells - Lower Outwash Aquifer																		
W324	< 0.071	-	-	< 0.071	-	-	< 0.071	-	-	< 0.43 H	-	-	ND	-	1	1010	0.02	0.3
W329	< 0.16 H	-	-	< 0.12	-	-	-	< 0.32 B	-	< 0.43 H	-	-	0.26	5/10/2020	1	1010	0.02	0.3
W330	< 0.071	-	-	< 0.071	-	-	< 0.071	-	-	< 0.43 H	-	-	ND	-	1	1010	0.02	0.3
OU3 Extraction Wells																		
W2402	**130 H**	-	-	-	-	-	-	-	-	-	-	-	1400	5/14/1999	1	220	0.02	0.3
W2402R	-	**180**	**98**	**100**	-	-	**68**	-	-	< 0.43	-	-	-	-	1	220	0.02	0.3
W2403R	**1400 H**	-	**1100**	**1200**	-	-	**810**	-	-	**800**	-	-	-	-	1	220	0.02	0.3
W2404	-	-	-	-	-	-	**220**	-	-	**1600**	-	-	-	-	1	220	0.02	0.3
OU3 Monitoring Wells - Top of Upper Outwash Aquifer																		
W2103	**5700 H**	-	-	-	-	-	**3400**	-	-	-	-	-	-	-	1	220	0.02	0.3
W2104	**4100 H**	-	-	-	-	-	**2300**	-	-	-	-	-	-	-	1	220	0.02	0.3
W2127	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	0.09	5/13/2018	1	220	0.02	0.3
W2128	**0.46 J**	-	-	< 0.3 B	-	-	**0.4 J**	-	-	**0.64**	-	-	120	6/6/1995	1	220	0.02	0.3
W2129	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	1.5	4/20/2001	1	220	0.02	0.3
W2134	< 0.071 H	-	-	-	-	-	< 0.071	-	-	-	-	-	ND	-	1	220	0.02	0.3
W2135	< 0.071 H	-	-	-	-	-	< 0.071	-	-	-	-	-	0.28	5/7/2011	1	220	0.02	0.3
W2140	**37**	-	-	**0.8**	-	-	< 0.071	-	-	< 0.43 H	-	-	3000	5/4/2010	1	220	0.02	0.3
W2141	**200**	-	-	**34**	-	-	**14**	-	-	**2 H**	-	-	370	4/29/2017	1	220	0.02	0.3
W2143	**40**	-	-	**15**	-	-	**5.1**	-	-	**4.3 H**	-	-	69	4/29/2017	1	220	0.02	0.3
W2501	-	-	< 0.45	-	-	-	-	-	-	-	-	-	-	-	1	220	0.02	0.3
OU3 Monitoring Wells - Middle of Upper Outwash Aquifer																		
W2141M	**39**	-	-	**15**	-	-	**9.7**	-	-	**17**	-	-	98	10/25/2019	1	220	0.02	0.3
W2142M	**0.3 JP**	-	-	< 0.35 B	-	-	**0.22 J**	-	-	< 0.43 H	-	-	0.65	10/16/2017	1	220	0.02	0.3
W2143M	**120**	-	-	**110**	-	-	**72**	-	-	**76 H**	-	-	220	10/18/2017	1	220	0.02	0.3
W2144M	< 0.071	-	-	< 0.093	-	-	< 0.071	-	-	< 0.43 H	-	-	ND	-	1	220	0.02	0.3

Table C-2. Pentachlorophenol Groundwater Monitoring Data

Well ID	Pentachlorophenol Groundwater Concentration (ppb)												Historical Maximum		Screening Levels (ppb)			
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppb)	Date	EPA GWCL (2016)	MEDD Cleanup Goal	HSCA GWCL	MDH HRL
OU3 Monitoring Wells - Bottom of Upper Outwash Aquifer																		
W2228	**0.36 J**	-	-	< 0.16 B	-	-	**0.14 J**	-	-	< 0.43	-	-	0.36	5/17/2020	1	220	0.02	0.3
W2233	< 0.071	-	-	-	-	-	< 0.11	-	-	-	-	-	6.5	9/27/2010	1	220	0.02	0.3
W2234	< 0.2 H	-	-	-	-	-	< 0.076	-	-	-	-	-	0.12	5/6/2011	1	220	0.02	0.3
W2236	< 0.071	-	-	-	-	-	**0.1 J**	-	-	-	-	-	1.3	3/21/2013	1	220	0.02	0.3
W2237R	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	0.34	5/17/2009	1	220	0.02	0.3
W2238	**1.4**	-	-	**1.1**	-	-	**1.2**	-	-	**0.98 H**	-	-	6.3	5/4/2010	1	220	0.02	0.3
W2239	< 0.18 H	-	-	-	-	-	< 0.071	-	-	-	-	-	0.072	5/12/2018	1	220	0.02	0.3
W2241	**59**	-	-	**35**	-	-	**24**	-	-	**20 H**	-	-	79	8/15/2018	1	220	0.02	0.3
W2243	**35**	-	-	**18**	-	-	**7.1**	-	-	**7.5**	-	-	68	4/29/2017	1	220	0.02	0.3
OU3 Monitoring Wells - Lower Outwash Aquifer																		
STP-15	-	< 0.071	-	-	-	-	-	< 0.12 B	-	-	-	-	ND	-	1	220	0.02	0.3
W2301	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	0.2	9/14/2006	1	220	0.02	0.3
W2325	**0.082**	-	-	-	-	-	< 0.071	-	-	-	-	-	0.082	5/19/2020	1	220	0.02	0.3
W2326	< 0.071	-	-	-	-	-	**0.089 J**	-	-	-	-	-	68	5/28/1992	1	220	0.02	0.3
W2329	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	0.096	5/13/2018	1	220	0.02	0.3
W2333	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	0.1	5/13/2018	1	220	0.02	0.3
W2335	**0.31**	-	-	-	-	-	< 0.071	-	-	-	-	-	0.12	5/7/2011	1	220	0.02	0.3
W2336	< 0.17	-	-	-	-	-	**0.097 J**	-	-	-	-	-	0.24	5/16/2009	1	220	0.02	0.3
W2339	< 0.071	-	-	-	-	-	< 0.071	-	-	-	-	-	0.083	5/12/2018	1	220	0.02	0.3

Bold results are above one or more of the screening levels listed in the rightmost columns.

< - Not detected in sample. The number listed is the detection limit for the laboratory analytical method.

B - Analyte was detected in an associated blank sample.

H - Holding time for sample preservation, extraction, or analysis was exceeded.

J - Estimated detected value.

P - Result had a relative percent difference greater than 40% between the primary and confirmatory gas chromatograph columns.

Table C-3. Naphthalene Groundwater Monitoring Data

Well	Naphthalene Groundwater Concentration (ppb)												Historical Maximum		HSCA GWCL (ppb)	MDH HRL (ppb)
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppb)	Date		
OU1 Extraction Wells																
W402R	< 0.35	-	-	**0.51**	-	-	0.01 J	-	-	-	-	-	0.51	5/3/2021	0.1	70
W403R	**1.1**	-	-	**1.1**	-	-	**1**	-	-	**0.14**	-	-	1.1	5/3/2021	0.1	70
W404	**220**	-	-	**140**	-	-	**140**	-	-	**140**	-	-	220	5/24/2020	0.1	70
W405	< 2	-	-	**2.2**	-	-	**0.24**	-	-	**0.42**	-	-	2400	5/29/2008	0.1	70
W405R	-	-	-	-	-	-	-	-	-	-	**79**	-	-	-	0.1	70
W406	< 0.0081 B	-	-	-	-	-	-	-	-	-	-	-	10	6/4/1997	0.1	70
W407	< 0.0081 B	-	-	-	-	-	-	-	-	-	-	-	0.039	5/8/2005	0.1	70
W408	**0.12**	-	-	**0.2**	-	-	**0.26**	-	-	**0.23**	-	-	650	6/4/1997	0.1	70
W409	**1500**	-	-	**1500**	-	-	**1600**	-	-	**1200**	-	-	2200	6/4/1997	0.1	70
W410	< 0.011 B	-	-	-	-	-	< 0.0016	-	-	-	-	-	0.87	5/8/2005	0.1	70
W411	< 0.0071 B	-	-	< 0.0016	-	-	< 0.0017	-	-	0.018 J	-	-	0.87	6/11/2014	0.1	70
W412	0.061	< 18	-	**4.2**	-	-	**2**	-	-	**1**	-	-	-	-	0.1	70
OU1 Monitoring Wells - Top of Upper Outwash Aquifer																
W104	**0.21**	-	-	**1.1**	-	-	**2.8**	-	-	**0.75**	-	-	30	5/11/2003	0.1	70
W105R	< 0.0034 B	-	-	**0.32**	-	-	< 0.0042	-	-	**0.11**	-	-	0.78	5/6/2007	0.1	70
W112	< 0.0061 B	-	-	-	-	-	< 0.0016	-	-	-	-	-	0.091	4/30/2012	0.1	70
W114	< 0.0048 B	-	-	-	-	-	< 0.0042	-	-	-	-	-	0.38	4/30/2012	0.1	70
W115	< 0.0047 B	-	-	-	-	-	< 0.0044	-	-	-	-	-	0.13	5/31/2013	0.1	70
W133	< 0.0044 B	-	-	< 0.0042	-	-	0.0045 J	-	-	< 0.0044	-	-	0.07	5/4/2015	0.1	70
W134	0.046	-	-	**0.72**	-	-	**0.83**	-	-	**0.61**	-	-	0.72	5/6/2021	0.1	70
OU1 Monitoring Wells - Middle of Upper Outwash Aquifer																
W112M	< 0.014 B	-	-	**0.11**	-	-	**2**	-	-	**0.16**	-	-	2	5/12/2022	0.1	70
W132M	< 0.0066 B	-	-	0.0049 J	-	-	< 0.0016	-	-	< 0.0044	-	-	0.029	5/3/2015	0.1	70
W133M	0.062	-	-	0.023	-	-	0.037	-	-	0.016 J	-	-	0.48	5/7/2016	0.1	70
W134M	**0.15**	-	-	**0.14**	-	-	**0.53**	-	-	**0.36**	-	-	0.58	5/9/2016	0.1	70
W510	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	70

Table C-3. Naphthalene Groundwater Monitoring Data

Well	Naphthalene Groundwater Concentration (ppb)												Historical Maximum		HSCA GWCL (ppb)	MDH HRL (ppb)
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppb)	Date		
OU1 Monitoring Wells - Bottom of Upper Outwash Aquifer																
W205	< 0.0039 B	-	-	-	-	-	< 0.0044	-	-	-	-	-	0.16	5/2/2012	0.1	70
W209	< 0.0042 B	-	-	-	-	-	< 0.0044	-	-	-	-	-	0.076	6/3/2014	0.1	70
W212	< 0.0097 B	-	-	0.0085 J	-	-	0.0079 J	-	-	< 0.0044	-	-	5	6/4/1996	0.1	70
W213	**0.42**	-	-	-	-	-	**0.2**	-	-	-	-	-	470	5/26/2008	0.1	70
W215	< 0.02 B	-	-	-	-	-	0.0068 J	-	-	-	-	-	1	6/4/1996	0.1	70
W217	< 0.0042 B	-	-	-	-	-	< 0.0044	-	-	-	-	-	0.066	6/3/2014	0.1	70
W218	< 0.0086 B	-	-	**0.13**	-	-	0.0093 J	-	-	0.075	-	-	5.2	9/16/2006	0.1	70
W219	0.019 J	-	-	-	-	-	< 0.0044	-	-	-	-	-	0.22	4/20/2001	0.1	70
W220	**0.19**	-	-	**0.16**	-	-	0.094	-	-	0.07	-	-	200	6/8/1995	0.1	70
W221	< 0.0042 B	-	-	-	-	-	< 0.0044	-	-	-	-	-	0.075	6/3/2014	0.1	70
W232	0.028	-	-	0.021 J	-	-	0.029	-	-	0.0094 J	-	-	0.34	5/3/2015	0.1	70
W233	**1.3**	-	-	**0.73**	-	-	**0.86**	-	-	**1.2**	-	-	12	8/22/2016	0.1	70
W234	**0.47**	-	-	**0.42**	-	-	**1.4**	-	-	**0.5**	-	-	6	8/9/2017	0.1	70
OU1 Monitoring Wells - Lower Outwash Aquifer																
MW3	< 0.01 B	-	-	-	-	-	0.014 J	-	-	-	-	-	0.074	5/1/2010	0.1	70
W302	< 0.0053 B	-	-	-	-	-	< 0.0016	-	-	-	-	-	0.3	5/1/2012	0.1	70
W306	< 0.0034 B	-	-	-	-	-	< 0.0016	-	-	-	-	-	0.23	5/1/2012	0.1	70
W340	0.027	-	-	-	-	-	0.017 J	-	-	-	-	-	0.12	6/1/2013	0.1	70
W341	0.019 J	-	-	-	-	-	0.013 J	-	-	-	-	-	0.083	6/3/2014	0.1	70
OU2 Monitoring Wells - Upper Outwash Aquifer																
W124	< 0.0047 B	-	-	**0.31**	-	-	0.018 J	-	-	< 0.0044	-	-	0.31	4/27/2021	0.1	70
W125	< 0.0043 B	-	-	0.025	-	-	< 0.0042	-	-	< 0.0044	-	-	0.08	4/24/2010	0.1	70
W126	< 0.0047 B	-	-	< 0.0042	-	-	< 0.0042	-	-	< 0.0044	-	-	0.072	5/10/2009	0.1	70
W127	< 0.0042 B	< 0.0095	-	< 0.0041	-	-	< 0.0042	-	-	< 0.0045	-	-	0.042	5/11/2009	0.1	70
W128	< 0.0052 B	-	-	< 0.0042	-	-	0.016 J	-	-	< 0.0044	-	-	0.051	6/1/2014	0.1	70
W129	< 0.0048 B	-	-	< 0.0042	-	-	< 0.0042	-	-	< 0.0045	-	-	0.033	5/11/2009	0.1	70
W130	< 0.0045 B	-	-	< 0.0041	-	-	< 0.0042	-	-	< 0.0044	-	-	0.11	5/10/2009	0.1	70

Table C-3. Naphthalene Groundwater Monitoring Data

Well	Naphthalene Groundwater Concentration (ppb)												Historical Maximum		HSCA GWCL (ppb)	MDH HRL (ppb)
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppb)	Date		
OU2 Monitoring Wells - Lower Outwash Aquifer																
W324	< 0.012 B	-	-	0.018 J	-	-	< 0.0041	-	-	0.042	-	-	0.042	5/2/2023	0.1	70
W329	< 0.0084 B	-	-	0.0078 J	-	-	0.0067 J	-	-	< 0.0045	-	-	0.13	4/24/2010	0.1	70
W330	< 0.016 B	-	-	0.017 J	-	-	0.0058 J	-	-	0.069	-	-	0.069	5/2/2023	0.1	70
OU3 Extraction Wells																
W2402	< 0.007 BH	-	-	-	-	-	-	-	-	-	-	-	3.4	6/11/2014	0.1	70
W2402R	-	< 0.0095	-	< 0.0015	-	-	0.0068 J	-	-	0.0063	-	-	-	-	0.1	70
W2403R	**1200 H**	-	-	**1500**	-	-	**950**	-	-	**1100**	-	-	-	-	0.1	70
W2404	-	-	-	-	-	-	**51**	-	-	0.079	-	-	-	-	0.1	70
OU3 Monitoring Wells - Top of Upper Outwash Aquifer																
W2103	**4600 H**	-	-	-	-	-	**3000**	-	-	-	-	-	-	-	0.1	70
W2104	**2300 H**	-	-	-	-	-	**660**	-	-	-	-	-	-	-	0.1	70
W2127	< 0.006 B	-	-	-	-	-	0.042	-	-	-	-	-	0.091	6/10/2014	0.1	70
W2128	**0.22**	-	-	**0.39**	-	-	**0.12**	-	-	**0.46**	-	-	96	6/5/1997	0.1	70
W2129	< 0.0022 B	-	-	-	-	-	< 0.0043	-	-	-	-	-	0.034	5/3/2002	0.1	70
W2134	< 0.0079 BH	-	-	-	-	-	< 0.0042	-	-	-	-	-	0.084	4/25/2010	0.1	70
W2135	< 0.0087 BH	-	-	-	-	-	< 0.0044	-	-	-	-	-	0.046	5/5/2002	0.1	70
W2140	**1.8**	-	-	**0.35**	-	-	**0.3**	-	-	< 0.0044	-	-	210	5/17/2009	0.1	70
W2141	**58**	-	-	**27**	-	-	**9.5**	-	-	**6.6**	-	-	100	11/8/2018	0.1	70
W2143	**1.5**	-	-	**0.55**	-	-	**5.6**	-	-	**2.8**	-	-	15	8/10/2017	0.1	70
W2501	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	70
OU3 Monitoring Wells - Middle of Upper Outwash Aquifer																
W2141M	0.073	-	-	**1.1**	-	-	**0.83**	-	-	**0.58**	-	-	7.9	4/29/2017	0.1	70
W2142M	< 0.0023 B	-	-	< 0.0016	-	-	< 0.0042	-	-	< 0.0043	-	-	0.028	4/29/2017	0.1	70
W2143M	< 0.0059 B	-	-	< 0.014 B	-	-	0.012 J	-	-	0.015 J	-	-	0.046	4/29/2017	0.1	70
W2144M	**0.34**	-	-	**0.32**	-	-	**0.33**	-	-	**0.21**	-	-	3.1	8/10/2017	0.1	70

Table C-3. Naphthalene Groundwater Monitoring Data

Well	Naphthalene Groundwater Concentration (ppb)												Historical Maximum		HSCA GWCL (ppb)	MDH HRL (ppb)
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppb)	Date		
OU3 Monitoring Wells - Bottom of Upper Outwash Aquifer																
W2228	< 0.0048 B	-	-	< 0.0079 B	-	-	< 0.0043	-	-	< 0.0044	-	-	0.14	5/7/2011	0.1	70
W2233	< 0.002 B	-	-	-	-	-	< 0.0044	-	-	-	-	-	0.24	12/1/2010	0.1	70
W2234	< 0.0055 BH	-	-	-	-	-	< 0.0042	-	-	-	-	-	0.048	5/29/2013	0.1	70
W2236	< 0.0072 BH	-	-	-	-	-	0.029	-	-	-	-	-	0.19	8/31/2011	0.1	70
W2237R	< 0.0041 B	-	-	-	-	-	< 0.0043	-	-	-	-	-	0.022	5/8/2011	0.1	70
W2238	**120**	-	-	**42 J**	-	-	**84**	-	-	**120**	-	-	310	5/8/2011	0.1	70
W2239	< 0.0034 B	-	-	-	-	-	< 0.0043	-	-	-	-	-	0.055	4/28/2010	0.1	70
W2241	< 0.0046 B	-	-	< 0.0095 B	-	-	0.018 J	-	-	0.0067 J	-	-	0.042	4/29/2017	0.1	70
W2243	0.011 J	-	-	**0.18**	-	-	**0.17 J**	-	-	0.07	-	-	0.18	4/30/2021	0.1	70
OU3 Monitoring Wells - Lower Outwash Aquifer																
STP-15	-	< 0.0095	-	-	-	-	0.013 J	-	-	-	-	-	-	-	0.1	70
W2301	< 0.0031 B	-	-	-	-	-	< 0.0044	-	-	-	-	-	0.52	4/28/2010	0.1	70
W2325	< 0.0021 B	-	-	-	-	-	0.0045 J	-	-	-	-	-	0.06	4/26/2010	0.1	70
W2326	< 0.0024 B	-	-	-	-	-	< 0.0044	-	-	-	-	-	0.25	5/11/2005	0.1	70
W2329	< 0.0016 B	-	-	-	-	-	< 0.0042	-	-	-	-	-	0.015	5/21/2008	0.1	70
W2333	< 0.0021 B	-	-	-	-	-	< 0.0044	-	-	-	-	-	0.52	5/3/2012	0.1	70
W2335	< 0.006 BH	-	-	-	-	-	0.016 J	-	-	-	-	-	0.1	4/29/2010	0.1	70
W2336	0.016 JH	-	-	-	-	-	**0.23**	-	-	-	-	-	0.52	5/16/2009	0.1	70
W2339	< 0.0055 B	-	-	-	-	-	< 0.0043	-	-	-	-	-	0.068	6/7/2014	0.1	70

Bold results are above one or more of the screening levels listed in the rightmost columns.

< - Not detected in sample. The number listed is the detection limit for the laboratory analytical method.

B - Analyte was detected in an associated blank sample.

H - Holding time for sample preservation, extraction, or analysis was exceeded.

J - Estimated detected value.

Table C-4. Carcinogenic Polycyclic Aromatic Hydrocarbon Groundwater Monitoring Data

Well	Benzo(a)Pyrene Equivalent Groundwater Concentration (ppb)												Historical Maximum		Screening Levels (ppb)			
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppb)	Date	EPA GWCL (2016)	MEDD Cleanup Goal	HSCA B(a)P GWCL	MDH B(a)P HRL
OU1 Extraction Wells																		
W402R	**0.0045**	-	-	**0.0064**	-	-	**0.0017**	-	-	-	-	-	0.0064	5/3/2021	0.2	0.028	0.001	0.1
W403R	**0.0041***	-	-	**0.0016***	-	-	**0.0086**	-	-	**0.0079***	-	-	0.0086	5/9/2022	0.2	0.028	0.001	0.1
W404	**0.0014***	-	-	**0.0015***	-	-	**0.0043***	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1
W405	**0.0041***	-	-	**0.0015***	-	-	**0.0043***	-	-	**0.0079***	-	-	0.0043	5/6/2016	0.2	0.028	0.001	0.1
W405R	-	-	-	-	-	-	-	-	-	-	**0.0071***	-	-	-	0.2	0.028	0.001	0.1
W406	**0.0015***	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.028	0.001	0.1
W407	**0.0014***	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.028	0.001	0.1
W408	**0.0014***	-	-	**0.0015***	-	-	**0.0042***	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1
W409	**0.0014***	-	-	**0.0016***	-	-	**0.0045**	-	-	**0.0079***	-	-	0.0045	5/9/2022	0.2	0.028	0.001	0.1
W410	**0.0014***	-	-	-	-	-	**0.0016***	-	-	-	-	-	0.0039	5/6/2016	0.2	0.028	0.001	0.1
W411	**0.0014***	-	-	**0.0016***	-	-	**0.0016***	-	-	**0.0073***	-	-	-	-	0.2	0.028	0.001	0.1
W412	**0.003 J**	**0.0099***	-	**0.0015***	-	-	**0.017**	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1
OU1 Monitoring Wells - Top of Upper Outwash Aquifer																		
W104	**0.0014***	-	-	**0.015***	-	-	**0.0015***	-	-	**0.014**	-	-	0.014	5/4/2023	0.2	0.028	0.001	0.1
W105R	**0.0014***	-	-	**0.0059***	-	-	**0.0043***	-	-	**0.0079***	-	-	0.0041	10/25/2016	0.2	0.028	0.001	0.1
W112	**0.0022 J**	-	-	-	-	-	**0.01 J**	-	-	-	-	-	0.0048	5/1/2016	0.2	0.028	0.001	0.1
W114	**0.0014***	-	-	-	-	-	**0.0043***	-	-	-	-	-	-	-	0.2	0.028	0.001	0.1
W115	**0.0014***	-	-	-	-	-	**0.0045***	-	-	-	-	-	-	-	0.2	0.028	0.001	0.1
W133	**0.0014***	-	-	**0.0043***	-	-	**0.0043***	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1
W134	**0.0014***	-	-	**0.0043***	-	-	**0.0015***	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1
OU1 Monitoring Wells - Middle of Upper Outwash Aquifer																		
W112M	**0.0014***	-	-	**0.0043***	-	-	**0.0043**	-	-	**0.0079***	-	-	0.0043	5/12/2022	0.2	0.028	0.001	0.1
W132M	**0.0014***	-	-	**0.0043***	-	-	**0.0016***	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1
W133M	**0.0014***	-	-	**0.0043***	-	-	**0.0043***	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1
W134M	**0.0015***	-	-	**0.0043***	-	-	**0.0016***	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1
W510	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.028	0.001	0.1

Table C-4. Carcinogenic Polycyclic Aromatic Hydrocarbon Groundwater Monitoring Data

Well	Benzo(a)Pyrene Equivalent Groundwater Concentration (ppb)												Historical Maximum		Screening Levels (ppb)			
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppb)	Date	EPA GWCL (2016)	MEDD Cleanup Goal	HSCA B(a)P GWCL	MDH B(a)P HRL
OU1 Monitoring Wells - Bottom of Upper Outwash Aquifer																		
W205	**0.0014***	-	-	-	-	-	**0.0045***	-	-	-	-	-	-	-	0.2	0.028	0.001	0.1
W209	**0.0014***	-	-	-	-	-	**0.0045***	-	-	-	-	-	-	-	0.2	0.028	0.001	0.1
W212	**0.0014***	-	-	**0.0043***	-	-	**0.0016***	-	-	**0.0079***	-	-	0.0068	8/8/2017	0.2	0.028	0.001	0.1
W213	**0.0014***	-	-	-	-	-	**0.0016***	-	-	-	-	-	0.0042	8/22/2016	0.2	0.028	0.001	0.1
W215	**0.0014***	-	-	-	-	-	**0.0045***	-	-	-	-	-	-	-	0.2	0.028	0.001	0.1
W217	**0.0014***	-	-	-	-	-	**0.0045***	-	-	-	-	-	0.0039	4/30/2016	0.2	0.028	0.001	0.1
W218	**0.0014***	-	-	**0.0015***	-	-	**0.0016***	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1
W219	**0.0015**	-	-	-	-	-	**0.0045***	-	-	-	-	-	0.0039	4/30/2016	0.2	0.028	0.001	0.1
W220	**0.0014***	-	-	**0.0043***	-	-	**0.0016***	-	-	**0.0079***	-	-	0.0041	8/23/2016	0.2	0.028	0.001	0.1
W221	**0.0014***	-	-	-	-	-	**0.0045***	-	-	-	-	-	-	-	0.2	0.028	0.001	0.1
W232	**0.0014***	-	-	**0.0043***	-	-	**0.0016**	-	-	**0.0079***	-	-	0.0016	5/21/2022	0.2	0.028	0.001	0.1
W233	**0.0014***	-	-	**0.0042***	-	-	**0.0043***	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1
W234	**0.0014***	-	-	**0.0043***	-	-	**0.0017***	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1
OU1 Monitoring Wells - Lower Outwash Aquifer																		
MW3	**0.0014***	-	-	-	-	-	**0.0016***	-	-	-	-	-	-	-	0.2	0.028	0.001	0.1
W302	**0.0014***	-	-	-	-	-	**0.0015***	-	-	-	-	-	-	-	0.2	0.028	0.001	0.1
W306	**0.0014***	-	-	-	-	-	**0.0016***	-	-	-	-	-	-	-	0.2	0.028	0.001	0.1
W340	**0.0013***	-	-	-	-	-	**0.0016***	-	-	-	-	-	-	-	0.2	0.028	0.001	0.1
W341	**0.0014***	-	-	-	-	-	**0.0016***	-	-	-	-	-	-	-	0.2	0.028	0.001	0.1
OU2 Monitoring Wells - Upper Outwash Aquifer																		
W124	**0.0014***	-	-	**0.0042***	-	-	**0.0045***	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1
W125	**0.0014***	-	-	**0.0043***	-	-	**0.0043***	-	-	**0.0079***	-	-	0.0040	4/22/2017	0.2	0.028	0.001	0.1
W126	**0.0014***	-	-	**0.0043***	-	-	**0.0043***	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1
W127	**0.0014***	**0.0099***	-	**0.0084 J**	-	-	**0.0043***	-	-	**0.0080***	-	-	0.0084	4/27/2021	0.2	0.028	0.001	0.1
W128	**0.0014***	-	-	**0.0043***	-	-	**0.13**	-	-	**0.0079***	-	-	0.13	5/8/2022	0.2	0.028	0.001	0.1
W129	**0.0014***	-	-	**0.0043***	-	-	**0.0043***	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1
W130	-	-	-	**0.0042***	-	-	**0.0043***	-	-	**0.0079***	-	-	-	-	0.2	0.028	0.001	0.1

Table C-4. Carcinogenic Polycyclic Aromatic Hydrocarbon Groundwater Monitoring Data

Well	Benzo(a)Pyrene Equivalent Groundwater Concentration (ppb)												Historical Maximum		Screening Levels (ppb)			
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppb)	Date	EPA GWCL (2016)	MEDD Cleanup Goal	HSCA B(a)P GWCL	MDH B(a)P HRL
OU2 Monitoring Wells - Lower Outwash Aquifer																		
W324	**0.0014***	-	-	**0.0043***	-	-	**0.0042***	-	-	**0.0079***	-	-	0.0049	4/29/2016	0.2	0.028	0.001	0.1
W329	**0.0014***	-	-	**0.0042***	-	-	**0.0043***	-	-	**0.0079***	-	-	0.0049	4/30/2016	0.2	0.028	0.001	0.1
W330	**0.0014**	-	-	**0.0043***	-	-	**0.0043***	-	-	**0.0079***	-	-	0.005	4/29/2016	0.2	0.028	0.001	0.1
OU3 Extraction Wells																		
W2402	**0.01 J**	-	-	-	-	-	-	-	-	-	-	-	0.01	5/20/2020	0.2	0.28	0.001	0.1
W2402R	-	**0.010**	-	**0.0017***	-	-	**0.0043***	-	-	**0.0079***	-	-	-	-	0.2	0.28	0.001	0.1
W2403R	**0.0015***	-	-	**0.0017***	-	-	**0.0043***	-	-	**0.0084**	-	-	-	-	0.2	0.28	0.001	0.1
W2404	-	-	-	-	-	-	**0.011**	-	-	**0.014 J**	-	-	-	-	0.2	0.28	0.001	0.1
OU3 Monitoring Wells - Top of Upper Outwash Aquifer																		
W2103	**0.45**	-	-	-	-	-	**0.35**	-	-	-	-	-	-	-	0.2	0.28	0.001	0.1
W2104	**2.1**	-	-	-	-	-	**0.68**	-	-	-	-	-	-	-	0.2	0.28	0.001	0.1
W2127	**0.0014***	-	-	-	-	-	**0.0016***	-	-	-	-	-	-	-	0.2	0.28	0.001	0.1
W2128	**0.0014***	-	-	**0.0016***	-	-	**0.0086 J**	-	-	**0.0079***	-	-	0.004	9/5/2006	0.2	0.28	0.001	0.1
W2129	**0.0014***	-	-	-	-	-	**0.0045***	-	-	-	-	-	-	-	0.2	0.28	0.001	0.1
W2134	**0.0014***	-	-	-	-	-	**0.0043***	-	-	-	-	-	-	-	0.2	0.28	0.001	0.1
W2135	**0.0014***	-	-	-	-	-	**0.0045***	-	-	-	-	-	-	-	0.2	0.28	0.001	0.1
W2140	**0.0014***	-	-	**0.0016***	-	-	**0.0045***	-	-	**0.0079***	-	-	0.0041	4/30/2017	0.2	0.28	0.001	0.1
W2141	**0.0014***	-	-	**0.0015***	-	-	**0.0043***	-	-	**0.0079***	-	-	-	-	0.2	0.28	0.001	0.1
W2143	**0.0014***	-	-	**0.0016***	-	-	**0.0045***	-	-	**0.0079***	-	-	-	-	0.2	0.28	0.001	0.1
W2501	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.28	0.001	0.1
OU3 Monitoring Wells - Middle of Upper Outwash Aquifer																		
W2141M	**0.0014***	-	-	**0.0016***	-	-	**0.0045***	-	-	**0.0079***	-	-	-	-	0.2	0.28	0.001	0.1
W2142M	**0.0014**	-	-	**0.0017***	-	-	**0.0043***	-	-	**0.0079***	-	-	0.0014	5/16/2020	0.2	0.28	0.001	0.1
W2143M	**0.0014***	-	-	**0.0023***	-	-	**0.0045***	-	-	**0.0079***	-	-	-	-	0.2	0.28	0.001	0.1
W2144M	**0.0014***	-	-	**0.0011***	-	-	**0.0045***	-	-	**0.0079***	-	-	-	-	0.2	0.28	0.001	0.1

Table C-4. Carcinogenic Polycyclic Aromatic Hydrocarbon Groundwater Monitoring Data

Well	Benzo(a)Pyrene Equivalent Groundwater Concentration (ppb)												Historical Maximum		Screening Levels (ppb)			
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppb)	Date	EPA GWCL (2016)	MEDD Cleanup Goal	HSCA B(a)P GWCL	MDH B(a)P HRL
OU3 Monitoring Wells - Bottom of Upper Outwash Aquifer																		
W2228	**0.0014***	-	-	**0.0016***	-	-	**0.0045***	-	-	**0.0079***	-	-	0.0040	4/30/2017	0.2	0.28	0.001	0.1
W2233	**0.0014***	-	-	-	-	-	**0.0045***	-	-	-	-	-	0.0039	5/4/2016	0.2	0.28	0.001	0.1
W2234	**0.0014***	-	-	-	-	-	**0.0043***	-	-	-	-	-	0.0039	5/5/2016	0.2	0.28	0.001	0.1
W2236	**0.0014***	-	-	-	-	-	**0.0015***	-	-	-	-	-	0.0061	8/25/2016	0.2	0.28	0.001	0.1
W2237R	**0.0014***	-	-	-	-	-	**0.0046**	-	-	-	-	-	0.0041	4/30/2017	0.2	0.28	0.001	0.1
W2238	**0.0027**	-	-	**0.0025**	-	-	**0.0073 J**	-	-	**0.018 J**	-	-	0.0087	4/30/2017	0.2	0.28	0.001	0.1
W2239	**0.0014***	-	-	-	-	-	**0.0045***	-	-	-	-	-	0.0040	4/30/2017	0.2	0.28	0.001	0.1
W2241	**0.0014***	-	-	**0.0015***	-	-	**0.0045***	-	-	**0.0080***	-	-	-	-	0.2	0.28	0.001	0.1
W2243	**0.0014***	-	-	**0.0015***	-	-	**0.0043***	-	-	**0.0079***	-	-	-	-	0.2	0.28	0.001	0.1
OU3 Monitoring Wells - Lower Outwash Aquifer																		
STP-15	-	**0.0099***	-	-	-	-	**0.0015***	-	-	-	-	-	-	-	0.2	0.28	0.001	0.1
W2301	**0.0014***	-	-	-	-	-	**0.0045***	-	-	-	-	-	0.0039	5/6/2016	0.2	0.28	0.001	0.1
W2325	**0.0014***	-	-	-	-	-	**0.0043***	-	-	-	-	-	-	-	0.2	0.28	0.001	0.1
W2326	**0.0014***	-	-	-	-	-	**0.0045***	-	-	-	-	-	-	-	0.2	0.28	0.001	0.1
W2329	**0.0014***	-	-	-	-	-	**0.0043***	-	-	-	-	-	-	-	0.2	0.28	0.001	0.1
W2333	**0.0014***	-	-	-	-	-	**0.0045***	-	-	-	-	-	0.0039	5/4/2016	0.2	0.28	0.001	0.1
W2335	**0.0014***	-	-	-	-	-	**0.0043***	-	-	-	-	-	-	-	0.2	0.28	0.001	0.1
W2336	**0.0014***	-	-	-	-	-	**0.0016***	-	-	-	-	-	0.0041	5/1/2017	0.2	0.28	0.001	0.1
W2339	**0.0014***	-	-	-	-	-	**0.0045***	-	-	-	-	-	-	-	0.2	0.28	0.001	0.1

* - Denotes a sample where no carcinogenic PAHs were detected and 1/2 MDL was used for all PAHs in B(a)PE calculations.

Bold results are above one or more of the screening levels listed in the rightmost columns.

Table C-5. Polychlorinated Dibenzo-p-dioxin and Dibenzofuran Groundwater Monitoring Data

Well	PCDD/PCDF Toxicity Equivalence Groundwater Concentration (ppq)												Historical Maximum		Screening Levels (ppq)		
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppq)	Date	EPA GWCL (2016)	MEDD Cleanup Goal	HSCA GWCL
OU1 Extraction Wells																	
W402R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W403R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W404	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W405	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W405R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W406	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W407	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W408	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W409	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W410	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W411	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W412	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
OU1 Monitoring Wells - Top of Upper Outwash Aquifer																	
W104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W105R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W114	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W133	**0.84**	-	-	**0.56**	-	-	**0.98***	-	-	**1.3**	-	-	1.78	4/28/2017	30	0.13	3
W134	**0.66***	-	-	**0.58**	-	-	**1.8**	-	-	**0.94***	-	-	3.05	10/26/2016	30	0.13	3
OU1 Monitoring Wells - Middle of Upper Outwash Aquifer																	
W112M	**0.75***	-	-	**0.52**	-	-	**0.81***	-	-	**1.7***	-	-	4.75	4/25/2017	30	0.13	3
W132M	**0.96**	-	-	**0.69***	-	-	**1.1**	-	-	**2.9***	-	-	3.73	10/19/2017	30	0.13	3
W133M	**0.52**	-	-	**0.43**	-	-	**0.92**	-	-	**1.2**	-	-	3.92	4/28/2017	30	0.13	3
W134M	**0.68***	-	-	**0.84 J**	-	-	**1.5**	-	-	**1.2***	-	-	3.26	10/20/2017	30	0.13	3
W510	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3

Table C-5. Polychlorinated Dibenzo-p-dioxin and Dibenzofuran Groundwater Monitoring Data

Well	PCDD/PCDF Toxicity Equivalence Groundwater Concentration (ppq)												Historical Maximum		Screening Levels (ppq)		
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppq)	Date	EPA GWCL (2016)	MEDD Cleanup Goal	HSCA GWCL
OU1 Monitoring Wells - Bottom of Upper Outwash Aquifer																	
W205	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W209	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W212	**1**	-	-	**0.72***	-	-	**1.3***	-	-	**1.7***	-	-	4.70	10/17/2017	30	0.13	3
W213	**1.6 J**	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W218	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W219	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W220	**0.78***	-	-	**0.33***	-	-	**0.87***	-	-	**1.6***	-	-	1.38	8/23/2016	30	0.13	3
W221	-	-	-	-	-	-	-	-	-	**-**	-	-	-	-	30	0.13	3
W232	**0.53***	-	-	**0.42***	-	-	**1.3**	-	-	**1.4***	-	-	1.89	8/15/2018	30	0.13	3
W233	**1.3**	-	-	**0.55***	-	-	**0.56**	-	-	**1.1***	-	-	3.91	4/28/2017	30	0.13	3
W234	**0.55**	-	-	**0.5**	-	-	**0.69***	-	-	**1.2***	-	-	5.94	10/19/2017	30	0.13	3
OU1 Monitoring Wells - Lower Outwash Aquifer																	
MW3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W306	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W340	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W341	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
OU2 Monitoring Wells - Upper Outwash Aquifer																	
W124	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W126	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W127	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W128	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W129	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3

Table C-5. Polychlorinated Dibenzo-p-dioxin and Dibenzofuran Groundwater Monitoring Data

Well	PCDD/PCDF Toxicity Equivalence Groundwater Concentration (ppq)												Historical Maximum		Screening Levels (ppq)		
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppq)	Date	EPA GWCL (2016)	MEDD Cleanup Goal	HSCA GWCL
W130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
OU2 Monitoring Wells - Lower Outwash Aquifer																	
W324	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W329	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W330	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
OU3 Extraction Wells																	
W2402	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2402R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2403R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2404	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
OU3 Monitoring Wells - Top of Upper Outwash Aquifer																	
W2103	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2127	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2128	**0.8***	-	-	**0.36 J**	-	-	**0.69***	-	-	**1.5***	-	-	1.06	8/13/2018	30	0.13	3
W2129	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2134	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2140	**0.87**	-	-	**0.48**	-	-	**0.73**	-	-	**2.6**	-	-	4.17	4/30/2017	30	0.13	3
W2141	**0.62***	-	-	**0.42***	-	-	**2.2***	-	-	**1.2**	-	-	5.46	10/18/2017	30	0.13	3
W2143	**1***	-	-	**0.45**	-	-	**0.5***	-	-	**1.2***	-	-	1.23	8/15/2018	30	0.13	3
W2501	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3

Table C-5. Polychlorinated Dibenzo-p-dioxin and Dibenzofuran Groundwater Monitoring Data

Well	PCDD/PCDF Toxicity Equivalence Groundwater Concentration (ppq)												Historical Maximum		Screening Levels (ppq)		
	Spring 2020	Summer 2020	Fall 2020	Spring 2021	Summer 2021	Fall 2021	Spring 2022	Summer 2022	Fall 2022	Spring 2023	Summer 2023	Fall 2023	Concentration (ppq)	Date	EPA GWCL (2016)	MEDD Cleanup Goal	HSCA GWCL
OU3 Monitoring Wells - Middle of Upper Outwash Aquifer																	
W2141M	**0.88***	-	-	**0.31***	-	-	**1.3***	-	-	**1.6**	-	-	3.42	4/29/2017	30	0.13	3
W2142M	**0.71***	-	-	**0.43**	-	-	**0.77***	-	-	**1.2***	-	-	2.00	5/16/2007	30	0.13	3
W2143M	**1**	-	-	**0.38***	-	-	**0.73***	-	-	**1.1***	-	-	4.90	10/18/2017	30	0.13	3
W2144M	**0.54***	-	-	**0.43***	-	-	**3.2***	-	-	**1.2***	-	-	1.44	4/29/2017	30	0.13	3
OU3 Monitoring Wells - Bottom of Upper Outwash Aquifer																	
W2228	**0.68 J**	-	-	**0.55**	-	-	**1.6***	-	-	**1.3**	-	-	1.92	4/30/2017	30	0.13	3
W2233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2234	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2236	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2237R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2238	**0.83***	-	-	**0.68**	-	-	**0.84***	-	-	**0.97***	-	-	1.30	4/30/2017	30	0.13	3
W2239	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2241	**0.78***	-	-	**0.38**	-	-	**0.61***	-	-	**1.3**	-	-	2.98	4/29/2017	30	0.13	3
W2243	**0.75***	-	-	**0.33***	-	-	**0.74***	-	-	**1.2***	-	-	1.41	4/29/2017	30	0.13	3
OU3 Monitoring Wells - Lower Outwash Aquifer																	
STP-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2301	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2325	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2326	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2329	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2333	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2335	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2336	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3
W2339	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	0.13	3

* - Denotes a sample where no PCDD/PCDF congeners were detected and 1/2 EDL was used for all congeners in TEQ calculations.

Bold results are above one or more of the screening levels listed in the rightmost columns.

Table C-6. Relative Potency Factors (RPFs) for Carcinogenic PAHs

Carcinogenic PAH	RPF
Benz(a)anthracene	0.1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.01
Chrysene	0.001
Dibenz(a,h)anthracene	1
Indeno(1,2,3-cd)pyrene	0.1

Table C-7. Toxicity Equivalence Factors (TEFs) for PCCDs/PCDFs

Dioxin/Furan Congener	TEF
2,3,7,8-TCDD	1
1,2,3,7,8-PCDD	1
1,2,3,4,7,8-HxCDD	0.1
1,2,3,6,7,8-HxCDD	0.1
1,2,3,7,8,9-HxCDD	0.1
1,2,3,4,6,7,8-HpCDD	0.01
1,2,3,4,6,7,8,9-OCDD	0.0003
2,3,7,8-TCDF	0.1
1,2,3,7,8-PeCDF	0.03
2,3,4,7,8-PeCDF	0.3
1,2,3,4,7,8-HxCDF	0.1
1,2,3,6,7,8-HxCDF	0.1
2,3,4,6,7,8-HxCDF	0.1
1,2,3,7,8,9-HxCDF	0.1
1,2,3,4,6,7,8-HpCDF	0.01
1,2,3,4,7,8,9-HpCDF	0.01
1,2,3,4,6,7,8,9-OCDF	0.0003

Table C-8. Treatment System PCP Removal Efficiency

	PCP Concentrations (ppb)							Screening Levels (ppb)	
Date	Influent	After 1st GAC Vessel	% Removed	After 2nd GAC Vessel	% Removed	After 3rd GAC Vessel (Effluent)	% Removed	EPA Effluent Limit (2005)	HSCA Surface Water Standard
1/9/2020	1500	140	90.67%	0.1	99.99%	< 0.071	> 99.99%	5.5	5.5
2/5/2020	1500	220	85.33%	< 0.071	> 99.99%	< 0.071	> 99.99%	5.5	5.5
3/23/2020	1400	320	77.14%	0.089	99.99%	< 0.071	> 99.99%	5.5	5.5
4/6/2020	1800	480	73.33%	< 0.28	> 99.99%	< 0.11	> 99.99%	5.5	5.5
5/7/2020	1700	1100	35.29%	0.28	99.98%	0.25	> 99.99%	5.5	5.5
6/8/2020	1400	870	37.86%	0.28	99.98%	0.25	> 99.99%	5.5	5.5
7/8/2020	1200	1.7	99.86%	< 0.21	> 99.99%	< 0.11	> 99.99%	5.5	5.5
8/4/2020	1500	3.8	99.75%	< 0.16	> 99.99%	0.33	> 99.99%	5.5	5.5
9/8/2020	1700	8.1	99.52%	< 0.071	> 99.99%	< 0.071	> 99.99%	5.5	5.5
10/8/2020	1200	10	99.17%	< 0.071	> 99.99%	0.1	> 99.99%	5.5	5.5
11/4/2020	980	30	96.94%	0.11	99.99%	0.075	> 99.99%	5.5	5.5
12/7/2020	1100	54	95.09%	0.13	99.99%	< 0.071	> 99.99%	5.5	5.5
1/4/2021	1100	100	90.91%	0.15	99.99%	< 0.071	> 99.99%	5.5	5.5
2/3/2021	1100	160	85.45%	< 0.093	> 99.99%	< 0.085	> 99.99%	5.5	5.5
3/4/2021	1000	210	79.00%	0.33	99.97%	< 0.071	> 99.99%	5.5	5.5
4/6/2021	930	240	74.19%	2.1	99.77%	< 0.085	> 99.99%	5.5	5.5
5/10/2021	1300	350	73.08%	6.4	99.51%	< 0.071	> 99.99%	5.5	5.5
6/22/2021	1300	100	92.31%	< 0.071	> 99.99%	< 0.071	> 99.99%	5.5	5.5
7/8/2021	1300	170	86.92%	< 0.071	> 99.99%	< 0.084	> 99.99%	5.5	5.5
8/4/2021	1300	350	73.08%	< 0.071	> 99.99%	< 0.071	> 99.99%	5.5	5.5
9/8/2021	920	270	70.65%	< 0.071	> 99.99%	< 0.23	> 99.99%	5.5	5.5
10/5/2021	990	530	46.46%	0.14	99.99%	0.13	> 99.99%	5.5	5.5
11/4/2021	1300	< 0.21	> 99.99%	< 0.21	> 99.99%	< 0.071	> 99.99%	5.5	5.5
12/7/2021	1100	< 0.66	> 99.99%	< 0.22	> 99.99%	< 0.18	> 99.99%	5.5	5.5

Table C-8. Treatment System PCP Removal Efficiency

	PCP Concentrations (ppb)							Screening Levels (ppb)	
Date	Influent	After 1st GAC Vessel	% Removed	After 2nd GAC Vessel	% Removed	After 3rd GAC Vessel (Effluent)	% Removed	EPA Effluent Limit (2005)	HSCA Surface Water Standard
1/5/2022	920	61	93.37%	< 0.072	> 99.99%	< 0.28	> 99.99%	5.5	5.5
2/2/2022	1100	120	89.09%	< 0.18	> 99.99%	< 0.25	> 99.99%	5.5	5.5
3/8/2022	1000	200	80.00%	< 0.23	> 99.99%	< 0.11	> 99.99%	5.5	5.5
4/5/2022	960	220	77.08%	< 0.13	> 99.99%	< 0.11	> 99.99%	5.5	5.5
5/4/2022	880	200	77.27%	< 0.13	> 99.99%	< 0.091	> 99.99%	5.5	5.5
6/2/2022	950	390	58.95%	< 0.071	> 99.99%	< 0.071	> 99.99%	5.5	5.5
7/5/2022	970	< 0.071	> 99.99%	< 0.071	> 99.99%	< 0.071	> 99.99%	5.5	5.5
8/3/2022	1100	5.9	99.46%	< 0.17	> 99.99%	< 0.18	> 99.99%	5.5	5.5
9/6/2022	800	8.8	98.90%	< 0.24	> 99.99%	< 0.24	> 99.99%	5.5	5.5
10/5/2022	1000	69	93.10%	< 0.093	> 99.99%	< 0.071	> 99.99%	5.5	5.5
11/2/2022	1200	250	79.17%	< 0.13	> 99.99%	< 0.072	> 99.99%	5.5	5.5
12/6/2022	1500	450	70.00%	< 0.25	> 99.99%	< 0.16	> 99.99%	5.5	5.5
1/4/2023	1400	430	69.29%	3.1	99.78%	< 0.43	> 99.99%	5.5	5.5
2/7/2023	1200	620	48.33%	25	97.92%	< 0.55	> 99.99%	5.5	5.5
3/8/2023	1000	510	49.00%	45	95.50%	< 0.99	> 99.99%	5.5	5.5
4/6/2023	1300	250	80.77%	< 0.57	> 99.99%	< 0.5	> 99.99%	5.5	5.5
5/3/2023	840	1.1	99.87%	< 0.43	> 99.99%	< 0.43	> 99.99%	5.5	5.5
6/7/2023	890	140	84.27%	< 0.43	> 99.99%	< 0.43	> 99.99%	5.5	5.5
7/5/2023	1100	280	74.55%	< 0.43	> 99.99%	< 0.43	> 99.99%	5.5	5.5
8/8/2023	760	360	52.63%	< 0.43	> 99.99%	< 0.43	> 99.99%	5.5	5.5
9/5/2023	850	340	60.00%	< 0.54	> 99.99%	< 0.49	> 99.99%	5.5	5.5
10/9/2023	860	< 1.1	> 99.99%	< 0.43	> 99.99%	< 0.43	> 99.99%	5.5	5.5
11/6/2023	1100	63	94.27%	< 0.43	> 99.99%	< 0.43	> 99.99%	5.5	5.5
12/5/2023	970	150	84.54%	< 0.43	> 99.99%	< 0.43	> 99.99%	5.5	5.5

Table C-9. Treatment System Effluent PCDD/PCDF Monitoring Data

PCDD/PCDF Congener	PCDD/PCDF Congener Concentrations and Toxicity Equivalence Calculations (ppq)								Screening Levels (ppq)	
	February 2020	May 2020	August 2020	November 2020	February 2021	May 2021	August 2021	November 2021	EPA Effluent Limits (2005)	HSCA Surface Water Standard
2,3,7,8-Tetrachlorodibenzo-p-dioxin	< 2.08	< 0.961	< 0.824	< 0.546	< 0.288	< 0.104	< 0.137	< 0.793	0.0038	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	< 2.63	< 1	< 0.748	< 0.648	< 0.795	< 0.269	< 0.226	< 1.62	0.0084	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	< 1.5	< 0.853	< 1.33	< 1	< 0.437	< 0.366	< 0.779	< 1.5	0.1267	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	< 1.51	< 0.763	< 1.38	< 0.954	< 0.463	< 0.394	< 0.821	< 1.61	0.38	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	< 1.82	< 0.967	< 1.41	< 1.12	< 0.505	< 0.377	< 0.849	< 1.6	0.38	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	< 2.07	< 1.27	< 1.19	3.52	< 0.656	< 1.07	0.709	< 1.59	7.6	--
Octachlorodibenzo-p-dioxin	< 2.12	< 8.29	5.13	32.2	< 2.57	10.1	4.35	42.1	380	--
2,3,7,8-Tetrachlorodibenzofuran	< 1.57	< 0.555	< 0.61	< 0.26	< 0.306	< 0.0797	< 0.121	< 1.75	0.0475	--
1,2,3,7,8-Pentachlorodibenzofuran	< 0.988	< 0.696	< 0.487	< 0.434	< 0.241	< 0.199	< 0.22	< 1.25	0.38	--
2,3,4,7,8-Pentachlorodibenzofuran	< 0.994	< 0.58	< 0.457	< 0.388	< 0.209	< 0.166	< 0.162	< 1.15	0.00475	--
1,2,3,4,7,8-Hexachlorodibenzofuran	< 0.88	< 0.538	< 0.398	< 0.529	< 0.221	< 0.197	< 0.254	< 0.863	0.475	--
1,2,3,6,7,8-Hexachlorodibenzofuran	< 0.869	< 0.516	< 0.362	< 0.495	< 0.21	< 0.194	< 0.262	< 0.825	0.19	--
1,2,3,7,8,9-Hexachlorodibenzofuran	< 1.21	< 0.859	< 0.561	< 0.936	< 0.223	< 0.286	< 0.597	< 1.21	0.0633	--
2,3,4,6,7,8-Hexachlorodibenzofuran	< 0.894	< 0.566	< 0.396	< 0.586	< 0.24	< 0.215	< 0.292	< 1.01	0.0543	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran	< 1.11	< 0.641	< 0.543	< 1.19	< 0.288	< 0.194	< 0.222	< 4.05	38	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	< 1.07	< 0.98	< 0.632	< 1.25	< 0.291	< 0.208	< 0.245	< 4.44	0.95	--
Octachlorodibenzofuran	< 2.87	< 1.15	< 1.2	< 2.26	< 0.585	< 0.507	< 0.63	< 2.06	190	--
TEQ	**3.1**	**1.4**	**1.2**	**1.0**	0.71	0.34	0.42	**2.0**	--	1

Table C-9. Treatment System Effluent PCDD/PCDF Monitoring Data

PCDD/PCDF Congener	PCDD/PCDF Congener Concentrations and Toxicity Equivalence Calculations (ppq)								Screening Levels (ppq)	
	February 2022	**May 2022**	**August 2022**	**November 2022**	**February 2023**	**May 2023**	**August 2023**	**November 2023**	**EPA Effluent Limits (2005)**	**HSCA Surface Water Standard**
2,3,7,8-Tetrachlorodibenzo-p-dioxin	< 0.718	< 0.29	< 0.508	< 1.13	< 0.334	< 0.582	< 0.749	< 1.1	0.0038	--
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	< 0.846	< 0.831	< 0.551	< 3.57	< 0.57	< 1.23	< 1.25	< 1.99	0.0084	--
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	< 0.847	< 0.377	< 1.43	< 0.788	< 0.51	< 1.44	< 1.49	< 2.1	0.1267	--
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	< 0.906	< 0.387	< 1.5	< 0.891	< 0.588	< 1.59	< 1.67	< 2.52	0.38	--
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	< 0.954	< 0.415	< 1.61	< 0.98	< 0.578	< 1.64	< 1.43	< 2.57	0.38	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	< 1.11	< 0.452	< 0.961	< 1.12	1.03	< 0.659	< 1.56	< 2.58	7.6	--
Octachlorodibenzo-p-dioxin	< 6.85	< 3.64	< 5.98	< 1.65	5.35	< 2.87	7.3	< 15.1	380	--
2,3,7,8-Tetrachlorodibenzofuran	< 0.366	< 0.299	< 0.286	< 0.707	< 0.174	< 0.288	< 0.958	< 1.1	0.0475	--
1,2,3,7,8-Pentachlorodibenzofuran	< 0.583	< 0.356	< 0.659	< 0.75	< 0.366	< 0.814	< 0.649	< 1.49	0.38	--
2,3,4,7,8-Pentachlorodibenzofuran	< 0.454	< 0.264	< 0.531	< 0.592	< 0.305	< 0.698	< 0.595	< 1.51	0.00475	--
1,2,3,4,7,8-Hexachlorodibenzofuran	< 0.415	< 0.253	< 0.371	< 0.327	< 0.378	< 0.709	< 1.02	< 1.07	0.475	--
1,2,3,6,7,8-Hexachlorodibenzofuran	< 0.388	< 0.247	< 0.375	< 0.379	< 0.396	< 0.742	< 1.04	< 1.05	0.19	--
1,2,3,7,8,9-Hexachlorodibenzofuran	< 0.536	< 1.83	< 0.529	< 0.578	< 0.54	< 1.13	< 1.67	< 1.57	0.0633	--
2,3,4,6,7,8-Hexachlorodibenzofuran	< 0.463	< 0.266	< 0.445	< 0.399	< 0.439	< 0.852	< 1.17	< 1.24	0.0543	--
1,2,3,4,6,7,8-Heptachlorodibenzofuran	< 1.04	< 0.306	< 0.459	< 0.351	< 0.407	< 1	< 1.2	< 1.36	38	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	< 1.32	< 0.415	< 0.445	< 0.563	< 0.547	< 1.21	< 1.83	< 1.81	0.95	--
Octachlorodibenzofuran	< 1.63	< 1.17	< 1.44	< 0.992	< 0.861	< 1.37	< 3.41	< 4.39	190	--
TEQ	**1.1**	0.82	0.96	**2.7**	0.70	**1.5**	**1.6**	**2.5**	--	1

APPENDIX D: Site Inspection Checklist and Photolog

Site Inspection Checklist

I. SITE INFORMATION	
Site name: **St. Regis Paper Company**	**Date of inspection:** **10/9/2024**
Location and Region: **Cass Lake, MN – Region 5**	**EPA ID:** **MND057597940**
Agency, office, or company leading the FYR: US EPA	**Weather/temperature:** Partly Coundy/52 degrees (F)

Remedy Includes: (Check all that apply)

☒ Landfill cover/containment	☐ Monitored natural attenuation
☒ Access controls	☐ Groundwater containment
☒ Institutional controls	☐ Vertical barrier walls
☒ Groundwater pump and treatment	☐ Other: Click or tap here to enter text.
☐ Surface water collection and treatment	

Attachments:

☒ Inspection team roster attached	☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M Site Manager** Name , Title , Click or tap to enter a date.

   Interviewed: ☒ at site ☐ at office ☐ by phone Phone Number: Click here to enter text.

   Problems, suggestions: ☐ Report attached

   Click or tap here to enter text.

2. **O&M Staff** **Jamie Eidsmoe,** Title , **10/9/2024**

   Interviewed: ☒ at site ☐ at office ☐ by phone Phone Number: Click here to enter text.

   Problems, suggestions: ☐ Report attached

   When replacing gaskets at carbon tank bottom, very small amounts of water leak due to uneven bolt tightening around the gasket (see Figures 15 and 17). These leaks are captured in a bucket and are treated along with the plant influent. Efforts are made by O&M staff to minimize these leaks, and there are no current suggestions for preventative maintenance.

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   Agency:

   Contact: Name , Title , Click or tap to enter a date., P: Phone Number

   Problems, suggestions: ☐ Report attached

   Click or tap here to enter text.

   Agency: Click or tap here to enter text.

   Contact: Name , Title , Click or tap to enter a date., P: Phone Number

   Problems, suggestions: ☐ Report attached

   Click or tap here to enter text.

   Agency: Click or tap here to enter text.

   Contact: Name , Title , Click or tap to enter a date., P: Phone Number

   Problems, suggestions: ☐ Report attached

   Click or tap here to enter text.

   Agency: Click or tap here to enter text.

   Contact: Name , Title , Click or tap to enter a date., P: Phone Number

   Problems, suggestions:

   Click or tap here to enter text.

4. **Other Interviews (optional):** ☐ Report attached

Click or tap here to enter text.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Documents

☒ O&M manual	☒ Readily available	☐ Up to date	☐ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☐ Up to date	☐ N/A

Remarks: **No records in OU2 forcemain junction, O&M plan last revised in 2020, available electronically**

2. Site-Specific Health and Safety Plan ☐ Readily available

☒ Contingency Plan/Emergency Response Plan ☒ Readily available

Remarks: Records are well kept in treatment plant building

3. O&M and OSHA Training Records

☒ Readily available ☒ Up to date ☐ N/A

Remarks: Click or tap here to enter text.

4. Permits and Service Agreements

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A

☐ Other permits: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

5. Gas Generation Records

☐ Readily available ☐ Up to date ☒ N/A

Remarks: Click or tap here to enter text.

6. Settlement Monument Records

☐ Readily available ☐ Up to date ☐ N/A

Remarks: Reported in Annual Report

7. Groundwater Monitoring Records

☒ Readily available ☒ Up to date ☐ N/A

Remarks: Reported in Annual Report, however available via EDD

8. Leachate Extraction Records

☒ Readily available ☒ Up to date ☐ N/A

Remarks: Reported in Annual Report and available in EDD

9. Discharge Compliance Records

☐ Air ☐ Readily available ☐ Up to date ☐ N/A

☒Water (effluent) ☒ Readily available ☒ Up to date ☐ N/A

Remarks: Available in annual reports and in EDD

10. Daily Access/Security Logs

☒ Readily available ☒ Up to date ☐ N/A

Remarks: Click or tap here to enter text.

IV. O&M COSTS

1. O&M Organization

☐ State in-house ☐ Contractor for State

☐ PRP in-house ☒ Contractor for PRP

☐ Federal Facility in-house ☐ Contractor for Federal Facility

Remarks: Click or tap here to enter text.

2. O&M Cost Records

☐Readily available ☐ Up to date ☐ Funding mechanism/agreement in place

Original O&M cost estimate $582,000 (in 1986) – $1.7 million (in 2025) ☐ Breakdown attached

Total annual cost by year for review period if available

From	To	Total cost	
Click or tap to enter a date.	Click or tap to enter a date.	Click or tap here to enter text.	☐ Breakdown attached
From Click or tap to enter a date.	To Click or tap to enter a date.	Total cost Click or tap here to enter text.	☐ Breakdown attached
From Click or tap to enter a date.	To Click or tap to enter a date.	Total cost Click or tap here to enter text.	☐ Breakdown attached
From Click or tap to enter a date.	To Click or tap to enter a date.	Total cost Click or tap here to enter text.	☐ Breakdown attached
From Click or tap to enter a date.	To Click or tap to enter a date.	Total cost Click or tap here to enter text.	☐ Breakdown attached

3. Unanticipated or Unusually High O&M Costs During Review Period

Describe costs and reasons:

Click or tap here to enter text.

V. ACCESS AND INSTITUTIONAL CONTROLS

☐ Applicable ☐ N/A

1. Fencing Damaged ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: OU1/OU2 gates are secure, access to effluent discharge location is unrestricted however difficult due to brush. Evidence of vehicle traffic through brush due to tire marks and license plate found on the ground.

2. Other Access Restrictions ☐ Location shown on site map ☐ Gates secured

Remarks: City of Cass Lake gate (OU3) is sometimes unlocked due to unrestricted access needs to animal shelter, otherwise signs are visible in OU1/2/3.

3. Institutional Controls (ICs)

A. Implementation and Enforcement

Site conditions imply ICs not properly implemented	☐ Yes	☒ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☒ No	☐ N/A
Type of monitoring (*e.g.*, self-reporting, drive by)	Drive-by, communication with local governments		
Frequency	Click or tap here to enter text.		
Responsible party/agency	International Paper		
Contact: Jamie Eidsmoe, Title , Click or tap to enter a date., P: Phone Number			
Reporting is up-to-date	☐ Yes	☐ No	☒ N/A
Reports are verified by the lead agency	☐ Yes	☐ No	☒ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☒ No	☐ N/A
Violations have been reported	☐ Yes	☐ No	☒ N/A

Other problems or suggestions:

Groundwater use restrictions in placed for OUs 1/2/3, OU7 remedy not yet completed however no ICs anticipated on residentially zoned parcels. ICs are anticipated in in soil consolidation area.

B. Adequacy ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: Click or tap here to enter text.

4. General

A. Vandalism/Trespassing ☐ Location shown on site map ☒ No vandalism evident

Remarks: Access to OU1/2/3 discharge point is unrestricted, however no evidence of tampering by trespassers.

B. Land use changes on site ☒ N/A

Remarks: Click or tap here to enter text.

C. Land use changes off site ☒ N/A

Remarks: Click or tap here to enter text.

VI. GENERAL SITE CONDITIONS

1. Roads ☐ Applicable ☒ N/A

A. Roads damaged ☐ Location shown on site map ☐ Roads adequate ☐ N/A

Remarks: Click or tap here to enter text.

B. Other Site Conditions

Remarks: Click or tap here to enter text.

VII. LANDFILL COVERS

1. Landfill Surface ☒ Applicable ☐ N/A

A. Settlement (Low Spots) ☐ Location Shown on Site Map ☒ Settlement Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Settlement is extremely little since landfill construction and closure

B. Cracks ☐ Location Shown on Site Map ☒ Cracking Not Evident

Lengths: Click or tap here to enter text. Widths: Click or tap here to enter text. Depths: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

C. Erosion ☐ Location Shown on Site Map ☒ Erosion Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

D. Holes ☐ Location Shown on Site Map ☒ Holes Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

E. Vegetative Cover ☒ Grass ☒ Cover Properly Established

☐ Tress/Shrubs (indicate size and locations on a diagram ☒ No Signs of Stress

Remarks: Grass mowed several times/year. Some trees growing into fence along south and west fence lines

F. Alternative Cover (armored rock, concrete, etc.) ☒ N/A

Remarks: Click or tap here to enter text.

G. Bulges ☐ Location Shown on Site Map ☒ Bulges Not Evident

Areal Extent: Click or tap here to enter text. Height: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

H. Wet Areas/Water Damage ☒ Wet Areas/Water Damage Not Evident

☐ Wet Areas	☐ Location Shown on Site Map	Areal Extent: Click or tap here to enter text.
☐ Ponding	☐ Location Shown on Site Map	Areal Extent: Click or tap here to enter text.
☐ Seeps	☐ Location Shown on Site Map	Areal Extent: Click or tap here to enter text.
☐ Soft Subgrade	☐ Location Shown on Site Map	Areal Extent: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

I. Slope Instability ☐ Location Shown on Site Map ☒ Slope Instability Not Evident

☐ Slides Areal Extent: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

2. Benches ☐ Applicable ☒ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

A. Flows Bypass Bench ☐ Location Shown on Site Map ☐ N/A or Okay

Remarks: Click or tap here to enter text.

B. Bench Breached ☐ Location Shown on Site Map ☐ N/A or Okay

Remarks: Click or tap here to enter text.

C. Bench Overtopped ☐ Location Shown on Site Map ☐ N/A or Okay

Remarks: Click or tap here to enter text.

3. Letdown Channels ☐ Applicable ☒ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

A. Settlement ☐ Location Shown on Site Map ☐ Settlement Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

B. Material Degradation ☐ Location Shown on Site Map ☐ Degradation Not Evident

Material Type: Click or tap here to enter text.

Areal Extent: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

C. Erosion ☐ Location Shown on Site Map ☐ Erosion Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

D. Undercutting ☐ Location Shown on Site Map ☐ Undercutting Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

E. Obstructions ☐ Location Shown on Site Map ☐ Undercutting Not Evident

Type: Click or tap here to enter text.

Areal Extent: Click or tap here to enter text. Size: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

F. Excessive Vegetative Growth ☐ Location Shown on Site Map ☐ Excessive Growth Not Evident

Areal Extent: Click or tap here to enter text. ☐ Vegetation in channels does not obstruct flow

Remarks: Click or tap here to enter text.

4. Cover Penetrations ☐ Applicable ☒ N/A

A. Gas Vents ☐ Active ☐ Passive

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled

☐ Good condition ☐ Evidence of leakage at penetration

☐ Needs Maintenance ☐ N/A

Remarks: Click or tap here to enter text.

B. Gas Monitoring Probes

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled

☐ Good condition ☐ Evidence of leakage at penetration

☐ Needs Maintenance ☐ N/A

Remarks: Click or tap here to enter text.

C. Monitoring Wells

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled

☐ Good condition ☐ Evidence of leakage at penetration

☐ Needs Maintenance ☐ N/A

Remarks: Click or tap here to enter text.

D. Leachate Extraction Wells

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled

☐ Good condition ☐ Evidence of leakage at penetration

☐ Needs Maintenance ☐ N/A

Remarks: Click or tap here to enter text.

E. Settlement Monuments ☐ Located ☐ Routinely Surveyed ☐ N/A

Remarks: Click or tap here to enter text.

5. Gas Collection and Treatment ☐ Applicable ☒ N/A

A. Gas Treatment Facilities

☐ Flaring ☐ Thermal Destruction ☐ Collection for Reuse

☐ Good condition ☐ Needs Maintenance

Remarks: Click or tap here to enter text.

B. Gas Collection Wells, Manifolds, and Piping

☐ Good condition ☐ Needs Maintenance ☐ N/A

Remarks: Click or tap here to enter text.

C. Gas Monitoring Facilities (e.g. gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs Maintenance ☐ N/A

Remarks: Click or tap here to enter text.

6. Cover Drainage Layer ☐ Applicable ☒ N/A

A. Outlet Pipes Inspected ☐ Functioning ☐ N/A

Remarks: Click or tap here to enter text.

B. Outlet Rock Inspected ☐ Functioning ☐ N/A

Remarks: Click or tap here to enter text.

7. Detention/Sediment Ponds ☐ Applicable ☒ N/A

A. Siltation ☐ Siltation Not Evident ☐ N/A

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

B. Erosion ☐ Erosion Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

C. Outlet Works ☐ Functioning ☐ N/A

Remarks: Click or tap here to enter text.

D. Dam ☐ Functioning ☐ N/A

Remarks: Click or tap here to enter text.

8. Retaining Walls ☐ Applicable ☒ N/A

A. Deformations ☐ Location Shown on Site Map ☐ Deformation Not Evident

Horizontal Displacement: Click or tap here to enter text.

Vertical Displacement: Click or tap here to enter text.

Rotational Displacement: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

B. Degradation ☐ Location Shown on Site Map ☐ Deformation Not Evident

Remarks: Click or tap here to enter text.

9. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

A. Siltation ☐ Location Shown on Site Map ☐ Siltation Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

B. Vegetative Growth ☐ Location Shown on Site Map ☐ N/A

☐ Vegetation Does Not Impede Flow

Areal Extent: Click or tap here to enter text. Type: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

C. Erosion ☐ Location Shown on Site Map ☐ Erosion Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

D. Discharge Structure ☐ Functioning ☐ N/A

Remarks: Click or tap here to enter text.

VIII. VERTICAL BARRIER WALLS

☐ Applicable	☒ N/A

1. Settlement ☐ Location Shown on Site Map ☐ Settlement Not Evident

Areal Extent: Click or tap here to enter text. Depth: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

2. Performance Monitoring Type of Monitoring: Click or tap here to enter text.

☐ Performance Not Monitored ☐ Evidence of Breaching

Frequency: Click or tap here to enter text. Head Differential: Click or tap here to enter text.

Remarks: Click or tap here to enter text.

IX. GROUNDWATER/SURFACE WATER REMEDIES

☒ Applicable	☐ N/A

1. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A

A. Pumps, Wellhead Plumbing, and Electrical ☐ N/A

☒ Good Condition ☒ All Required Wells Properly Operating ☐ Needs Maintenance

Remarks: Treatment plant in good condition, organized and everything is labeled

B. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances

☒ Good Condition ☐ Needs Maintenance

Remarks: Click or tap here to enter text.

C. Spare Parts and Equipment ☐ Needs to be Provided

☒ Readily Available ☐ Good Condition ☐ Requires Upgrade

Remarks: Corrosion evident at joints

2. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

A. Collection Structures, Pumps, and Electrical

☐ Good Condition ☐ Needs Maintenance

Remarks: Click or tap here to enter text.

B. Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances

☐ Good Condition ☐ Needs Maintenance

Remarks: Click or tap here to enter text.

C. Spare Parts and Equipment ☐ Needs to be Provided

☐ Readily Available ☐ Good Condition ☐ Requires Upgrade

Remarks: Click or tap here to enter text.

3. Treatment System ☒ Applicable ☐ N/A

A. Treatment Train (Check components that apply)

☐ Metals removal ☐ Oil/Water Separation ☐ Bioremediation

☐ Air Stripping ☒ Carbon Absorbers

☐ Filters Click or tap here to enter text.

☐ Additive (e.g. chelation agent, flocculent) Click or tap here to enter text.

☐ Others Click or tap here to enter text.

☒ Good Condition ☐ Needs Maintenance

☐ Sampling ports properly marked and functional

☒ Sampling/maintenance log displayed and up to date

☒ Equipment properly identified

☒ Quantity of groundwater treated annually Available electronically in annual reports

☐ Quantity of surface water treated annually Click or tap here to enter text.

Remarks: Routine maintenance occurs with documentation available in treatment plant building

B. Electrical Enclosures and Panels (properly rated and functional)

☐ N/A ☒ Good Condition ☐ Needs Maintenance

Remarks: Click or tap here to enter text.

C. Tanks, Vaults, Storage Vessels ☐ N/A

☒ Proper Secondary Containment ☒ Good Condition ☐ Needs Maintenance

Remarks: Some corrosion evident at tank bottom valves

D. Discharge Structure and Appurtenances

☐ N/A ☒ Good Condition ☐ Needs Maintenance

Remarks: Click or tap here to enter text.

E. Treatment Building(s)

☐ N/A ☒ Good condition (esp. roof and doorways)

☐ Needs repair ☐ Chemicals and equipment properly stored

Remarks Click or tap here to enter text.

F. Monitoring Wells (Pump and Treatment Remedy) ☐ N/A

☒ Properly secured/locked ☒ Functioning

☒ Routinely sampled ☒ All required wells located

☐ Good condition ☐ Needs Maintenance

Remarks Wells generally easy access, aside from wells within Fox Creek Valley area or if behind locked gates

4. Monitoring Data

A. Monitoring Data:

☒ Is Routinely Submitted on Time ☒ Is of Acceptable Quality

B. Monitoring Data Suggests:

☐ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

5. Monitored Natural Attenuation

A. Monitoring Wells (natural attenuation remedy) ☒ N/A

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled

☐ All required wells located ☐ Needs Maintenance ☐ Good condition

Remarks: Click or tap here to enter text.

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

1. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Click or tap here to enter text.

2. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Click or tap here to enter text.

3. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

Click or tap here to enter text.

4. Early Indicators of Potential Remedy Problems

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Click or tap here to enter text.

Inspection Team Roster

Name	Agency/Company
Zack Sasnow	EPA
Brandon Pursel	EPA
Phil Gurley	EPA
Caeli Cleary	TetraTech
Dan Cervin	MPCA
Mark Elliot	MPCA
Eric Krumm	Leech Lake Band of Ojibwe
Craig Tangren	Leech Lake Band of Ojibwe
Dan Pena	MDH
Tom Richardson	International Paper
Janie Smith	International Paper
Jamie Eidsmoe	International Paper
Jim Eidem	Barr Engineering
Tom Mattison	Barr Engineering
Greg Jeffries	BNSF

Photographs:

Photograph 1: OU2 Force main Shed

Photograph 2: OU2 Monitoring Wells 329 and 129 (looking east)

Photograph 3: OU2 fence line with tree/shrubbery growth (looking south)

Photograph 4: OU2 Leachate Collection Manhole and Leak Detection Manhole

Photograph 5: OU2 Surface water runoff conveyance pipe

Photograph 6: OU3 Extraction Well house

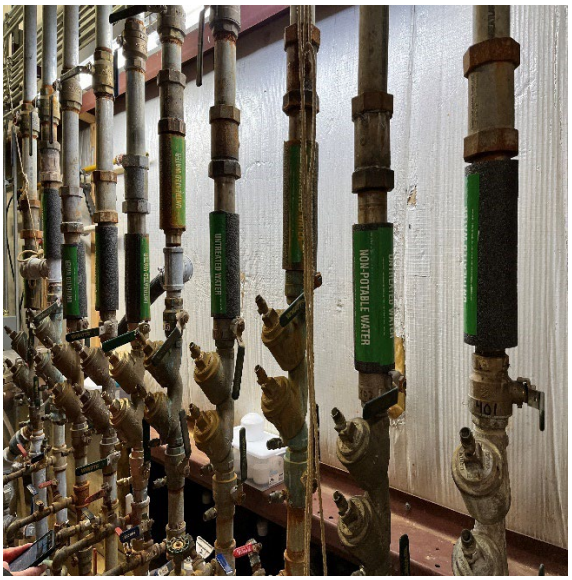
Photograph 7: OU3 monitoring well (MW-2144) and access path in Fox Creek Valley area

Photograph 8: OU3 Fox Creek Valley monitoring well access path

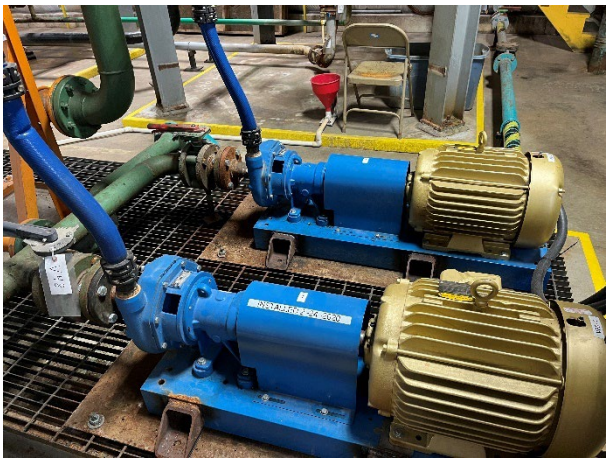
Photograph 9: OU3 Force main shed

Photograph 10: Inside OU3 force main shed

Photograph 11: OU1 treatment plant building contact list outside entryway



Photograph 12: OU1 treatment plant extraction well manifold

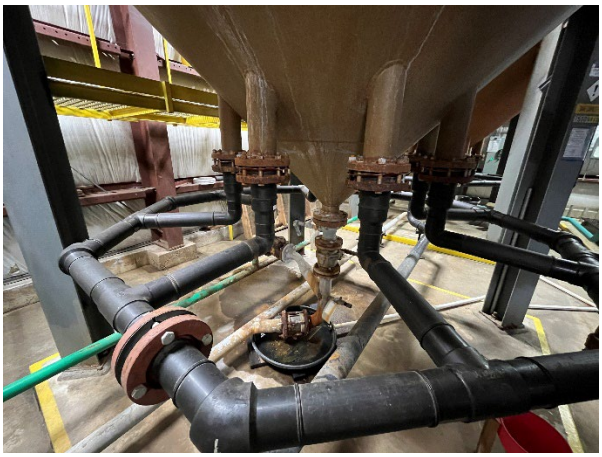


Photograph 13: Treatment plant pumps

Photograph 14: Carbon vessel access point

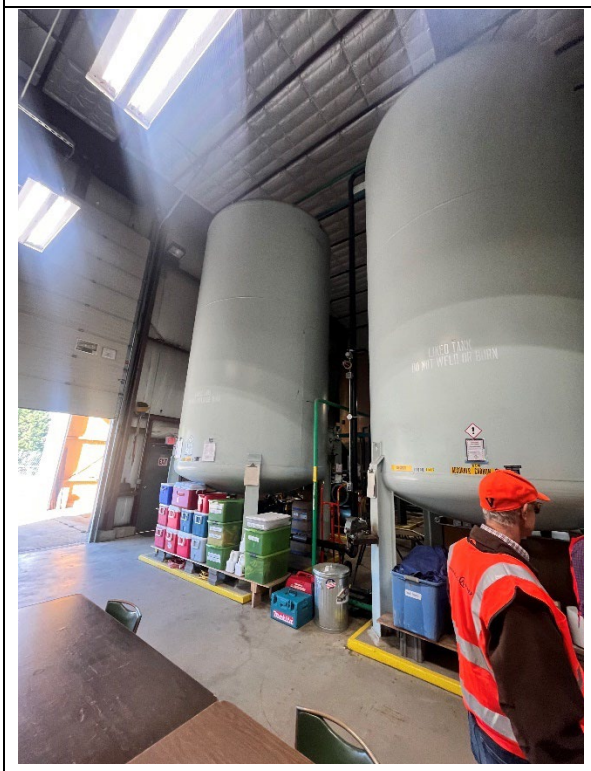
Photograph 15: Carbon vessel connection corrosion

Photograph 16: Treatment plant sample valve



Photograph 17: Carbon vessel connection leaks w/containment and conveyance

Photograph 18: Treatment plant supply and replacement parts organization



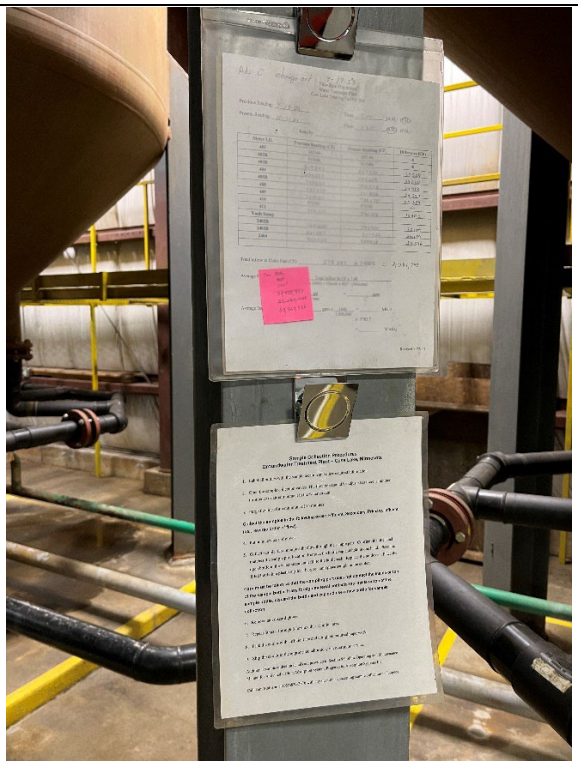
Photograph 19: Treatment plant interior and tanks

Photograph 20: OU1 Treatment plant discharge point.

Photograph 21: OU2 monitoring well W324 (looking north)

Photograph 22: OU3 monitoring well 2402

Photograph 23: OU2 east side looking north toward force main shed



Photograph 24: OU1 Treatment plant flow rates and sampling procedures.

APPENDIX E: Comments from the Leech Lake Band of Ojibwe

LEECH LAKE BAND OF OJIBWE
DIVISION OF RESOURCE MANAGEMENT

September 11, 2024

Zack Sasnow
Remedial Project Manager
Superfund and Emergency Management Division
Sent via email: sasnow.zack@epa.gov.

Re: Scoping for 7th Five-Year Review for the St. Regis Superfund Site Process and Review of HHERA and FS

Dear Zack,

Thank you for providing notice that the EPA has begun planning the seventh Five-Year Review for the St. Regis Superfund Site, as well as the letter describing a process for review of Tribal comments on the 2007 Human Health and Environmental Risk Assessment (HHERA) and the 2015 Supplemental Feasibility Study (FS). This letter outlines the scope of issues and actions recommended for consideration by the Leech Lake Band of Ojibwe, as well as suggestions for making the review process fairer and more efficient.

As you know, the Leech Lake Band has significant concerns with uncontained migration of contamination as well as other aspects of the remedy at St. Regis. We appreciate that the EPA has directed a complete delineation of contaminant sources. The Band is also encouraged that EPA has obtained contractor support to conduct a review of the HHERA. We urge the EPA to use this Five-Year Review as an opportunity to review the site comprehensively, and to order the source removal work needed to protect public health and welfare.

QUESTION A: Is the remedy functioning as intended by the decision documents?

The 2020 Five-Year Review provided the following answer: "In most respects, yes. The extraction and treatment systems are generally operating as planned…." The Leech Lake Band requests that the EPA to reconsider this conclusion, for the following reasons:

1) The 1986 decision documents called for aggressive control of plume migration and attainment of cleanup levels within 25 years. The 2020 Groundwater Review documents chronic failure to contain spreading groundwater contamination, slow pace to address system failures, reliability concerns associated with aging equipment, and no predictable date for attainment of cleanup levels.[1] Regardless of risk evaluations in the HHERA, the NCP sets an expectation to return usable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable. 40 CFR §300.430(a)(1)(iii)(F)).

2) The 1986 enforcement decision called for "removing all sources (sludge and contaminated soil) of groundwater contamination from the site and securing them in a RCRA approved on-site containment vault."[2] The 2012/2013 Soil Investigation documents large volumes of source contamination at the former operations area, waste ponds, and disposal pits.[3] As a result of failure to remove source contamination, the groundwater treatment system at St. Regis has never been sufficient to contain migration. As noted by the MPCA, the groundwater treatment system does not operate as intended because it was designed to control plume migration rather than achieve source reduction.[4]

The 2020 Five-Year Report found that on-site containment of the soils and sludges in the OU2 hazardous waste landfill continues to be effective. The Leech Lake Band requests reconsideration.

3) In the 2021 annual monitoring report, IP disclosed the presence of leachate in the leak detection utility hole for the hazardous waste landfill.[5] Given the leak in the first HDPE liner, there are concerns that both HDPE liners have exceeded their useful life. These concerns are reinforced by leachate volume data. The landfill was designed as a "dry tomb" intended to isolate hazardous waste from moisture. If functioning as intended, the amount of leachate would diminish over time. This is not the case at the St. Regis landfill, where the landfill must be "dewatered" twice annually. Finally, vertical aquifer sampling from OU9 (sample OU2-VAS12) suggests that there is an additional source area upgradient from the disposal pits. The OU2 hazardous waste landfill cannot be ruled out as the origin of this upgradient source area. Given the landfill's location near Fox Creek and the risks of breech, the Leech Lake Band requests that the EPA begin leachate testing for "fingerprint" analysis,

[1] Appendix F to Sixth Five-Year Report: Five-Year Groundwater Review Technical Memorandum, prepared on behalf of EPA by Subterranean Research, Inc., April 2020.)
[2] March 1986 Minnesota Enforcement Decision Document. https://semspub.epa.gov/work/05/141766.pdf
[3] Soil Sampling for Feasibility Study Report – 2012 and 2013 Investigations. Barr. November 2013.
[4] MPCA Comments on draft Sixth Five-Year Review for St. Regis, June 11. 2020.
[5] Barr Engineering, "2021 Annual Report St. Regis Paper Company Site Cass Lake, Minnesota," 2022, https:semspub.epa.gov/work/05/2005094.pdf

improve the monitoring system, and begin the evaluation and planning necessary for off-site disposal of the hazardous waste landfill.

Implementation of Institutional Controls

4) Prior FYRs state that institutional controls have yet to be implemented but are necessary to ensure protectiveness for contaminated soil and groundwater on site. Institutional controls are not intended to circumvent groundwater restoration.[6] The Leech Lake Band also encourages the EPA to review the guidance, *Implementing Institutional Controls in Indian Country*.[7] This guidance details obstacles to implementing institutional controls on Indian reservations, particularly with checkerboard jurisdiction and 3rd party landownership. OU1 includes a parcel of land that is Tribal property held in trust by the federal government. (Parcel Number 85-344-177 is on Second St. SW near the corner with Basswood Ave. SW.) Note that any type of proprietary restriction on Tribal trust land requires Tribal approval and approval by the Bureau of Indian Affairs. There are no examples of deed language for a proprietary control on BIA land title.

Question B: Are the exposure pathways, toxicity data, cleanup levels, and remedial action objectives (RAO's) used at the time of the remedy selection still valid?

1) ***Review of HHERA and Feasibility Study*** – The Leech Lake Band has provided extensive comments on deficiencies in the 2015 Supplemental Feasibility Study (FS) and 2007 HHERA and appreciates EPA's July 31 letter describing plans to review. However, the Band has profound concerns about the process. The EPA would complete its initial HHERA review this winter, then engage in government consultation, prepare comments, and work through a long process for revisions or updates with IP. EPA plans to review the FS under a similar process after reaching resolution on issues in the HHERA. The Leech Lake Band is deeply concerned about years of delay and the risk of bias.

   We encourage the EPA to conduct the HHERA update with contractor support rather than direct IP to do so, and to use the 2025 FYR process to act on source removal without delay. Expecting IP's contractors to update the HHERA is both inefficient and unlikely to result in a quality risk assessment. The EPA has a federal trust obligation to the Leech Lake Band, and it is important to have an impartial party conduct work that influences the scope of remedial action.

[6] Institutional Controls: A Guide to Planning, Implementing, Maintaining and Enforcing Institutional Controls at Contaminated Sites, OSWER 9300.0-89, December 2012, p. 5.
[7] www.epa.gov/sites/default/files/2013-11/documents/ics-indiancountry-cleanup-osre.pdf

2) ***Changes in Exposure Pathways*** – Since the 2020 FYR, the Leech Lake Band has provided information regarding Tribal land held in trust by the federal government within OU1; as well as the Leech Lake Band's Treaty right to "permanent homes" in the affected area. EPA should anticipate future land use for unrestricted residential purposes.

   As noted above, IP has also disclosed a leak in one of the liners of the OU2 hazardous waste landfill, and vertical aquifer sampling data (OU2-VAS12) from OU9 suggests an additional source area upgradient from the disposal pits. Furthermore, the OU2 hazardous waste landfill monitoring well network along the southern border is not adequately designed to characterize potential releases, as the two monitoring wells W126 and W127 are screened within a till layer which attenuates contaminant measurements. Also, there are no wells along the southern border that measure contaminant levels in the lower aquifer.

3) ***Expected Progress Towards Meeting RAOs –*** After 35 years of operation, there is no anticipated timeframe for meeting cleanup goals for either OU1 or OU3. The 2020 Five-Year Review reached a conclusion that source removal will not reduce the time to meet cleanup goals because "the percentage of source material available for removal in a defined addressable area is not sufficiently high…."[8] This conclusion is difficult to reconcile with the soil boring and test pit logs from the 2012/13 Soil Investigation.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

As noted above, the detected leak in the liner of the OU2 hazardous waste landfill raises questions about the protectiveness of the remedy. In addition, Leech Lake Band has provided information on the HHERA and FS, as well as Tribal Treaty rights, trust lands, and the availability of institutional controls.

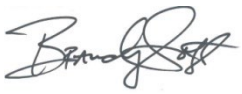
The 2020 FYR raised the issue of vulnerability to climate change with increased precipitation. This analysis should be expanded to cover the risks from drought. Northern Minnesota is experiencing increasing drought cycles in recent decades and well contamination is a threat with increased pumping. The future will include drought cycles and altered groundwater flows between the upper and lower aquifer. Further migration of the plume to the lower aquifer is a significant risk and a direct pathway to human consumption. Source removal is necessary to protect the lower aquifer from further contamination.

[8] 2020 Five Year Review, p. 31.

Conclusion

The Leech Lake Band respectfully urges the EPA to consider the issues identified above as well as the process for addressing them. The EPA should use the 2025 FYR process to review the site comprehensively and order the source removal work necessary to restore groundwater, protect public health and welfare, and honor the Treaty rights of the Leech Lake Band of Ojibwe.

Very Respectfully,



Brandy Toft
Environmental Director
Leech Lake Band of Ojibwe

Cc: Debra Shore, Regional Administrator
Clifford Villa, Deputy Asst. Administrator
Brandon Pursel, Remedial Project Manager
Jamie Stoik, Program Analyst

LEECH LAKE BAND OF OJIBWE
DIVISION OF RESOURCE MANAGEMENT

March 31, 2025

Zack Sasnow, Remedial Project Manager
Brandon Pursel, Remedial Project Manager
U.S. Environmental Protection Agency
77 West Jackson Blvd., SR-6J
Chicago, IL 60604
Email: sasnow.zack@epa.gov; pursel.brandon@epa.gov

Re: Comments on the 7th Five-Year Review for the St. Regis Superfund Site

Dear Mr. Sasnow and Mr. Pursel:

Thank you for the opportunity to comment on the draft *Seventh Five-Year Review (FYR) Report* for the St. Regis Paper Company Superfund Site. When the Site came to public attention in the 1980s, the Leech Lake Band of Ojibwe was promised that all sources of groundwater contamination had been removed, the treatment system would remediate groundwater and contain contaminant plumes, and the landfill would safely isolate hazardous waste sludges and soils. Since that time, our community has been repeatedly disappointed and deeply troubled by the ongoing contamination of our homeland and the lack of progress in mitigating impacts to our lands and waters. The 7th FYR should avoid the vague recommendations found in prior FYRs and instead direct actions that will produce results. The Leech Lake Band of Ojibwe offers the following comments on the draft 7th FYR.

1) **St. Regis Remedy Not Functioning as Intended.** The Leech Lake Band appreciates EPA's analysis of how the remedy at St. Regis is not functioning as intended by the decision documents. As discussed in the draft FYR:

   a) Source Contamination. The July 29, 1986, decision approving the groundwater treatment system provided that: "*No source of ground water contamination now exists since the sludge and contaminated soil has been excavated and removed from the Site*."[1] This statement was not and is not correct. Large volumes of visible contamination are present throughout the former operations area, waste ponds, and disposal pits.[2] The remedy does not function as intended because the source of contamination remains on site. Furthermore, the groundwater treatment system is not

[1] July 9 MEDD, p. 2.
[2] Soil Sampling for Feasibility Study – 2012 and 2013 Investigations, St. Regis Site, Barr, Nov. 2013.

suitable or appropriate because it was designed to control plume migration rather than achieve source reduction.[3]

b) Uncontrolled Migration of Groundwater Contaminants. In 1986 the same decision approved a groundwater treatment system: "*Long-term operation and maintenance of a contaminated ground water gradient control, pumpout and treatment system which will prevent migration of contaminated ground water*."[4] The NCP also sets an expectation to contain and prevent migration. 40 CFR §300.430(a)(1)(iii)(F)). Pentachlorophenol (PCP) concentrations outside the capture zone remain elevated over the last five-year period, as evidenced in the tables provided with the draft FYR. In OU1 there are concentrations as high as 1,400 micrograms per liter (ug/L) at W134M. This represents contamination at 1,400 times the maximum contaminant level (MCL), outside the treatment system capture zone, 39 years after the decision documents. The groundwater treatment system does not function as intended because the incomplete hydrologic barrier results in uncontrolled mass flux into the environment from source areas inside the capture zone.

c) Failure to Attain Cleanup Standards within a Reasonable Timeframe. The March 5, 1986, decision estimated attainment of acceptable concentrations in the aquifer at 25 years.[5] The NCP sets an expectation to return usable ground waters to their beneficial uses within a timeframe that is reasonable (40 CFR §300.430(a)(1)(iii)(F)). Thirty-nine years later, there is no predictable date for attainment or even containment.[6] The 2020 Groundwater Review described the system as "an under-pumped, non-redundant extraction well operation that is not addressing mid-elevation contamination."[7] The treatment system does not function as intended because there is no predictable date for attainment, and plume contaminant concentrations remain consistently elevated after four decades of treatment.

d) Leaking OU2 Hazardous Waste Landfill. The Band supports the FYR's recognition of problems at the OU2 Hazardous Waste Landfill, which contains an estimated 42,000 cubic yards of heavily contaminated and uncharacterized sludges and soils, sited on a bluff overlooking Fox Creek and the Mississippi River watershed. The draft FYR indicates that the landfill "is leaking from its primary liner," and addresses Tribal concerns with contaminant detections in downgradient monitoring wells, as well as continuous leachate collection after decades of expression from waste sludge. Although the draft 7th FYR states that the facility was constructed to RCRA Subtitle C

[3] MPCA Letter to EPA, June 11, 2020. Appendix H to 6th FYR.
[4] July 9, 1986 MEDD, p. 1.
[5] March 5, 1986 MEDD, p. 23.
[6] The 2023 Annual Report, Appendix K, estimated attainment dates on a well-by-well basis, with no decreasing trend observed in numerous extraction wells. See also, LLBO Comments on 2023 Annual Monitoring Report, May 30, 2024.
[7] Five-Year Groundwater Review Technical Memorandum, prepared on behalf of EPA by Subterranean Research, Inc., April 2020, p. 26. (Hereinafter 2020 Groundwater Review.)

standards, it is more accurate to state that the facility does not meet modern day RCRA Subtitle C Landfill standards that include redundant leachate detection and collection systems. The landfill is pushing the limits of its useful life, and liner failure is a suspected source contributing to OU2/OU9 groundwater contamination.

The Leech Lake Band appreciates that EPA has acknowledged that the 1986 remedy is not functioning as intended. The draft 7th FYR is a sign of progress that can be shared with our community, but the ultimate goal is to eliminate toxic waste, return the land to productive use, and protect human health and the environment in both the present and the long-term. The Leech Lake Band appreciates EPA's attention and diligent efforts to address these issues.

2) **Land Use Changes.** The Leech Lake Band urges EPA to include a description of land use changes taking place at the Site. Land use and future land use are relevant to evaluations of protectiveness and community engagement. Land use matters are generally considered under Question C, "has any other information come to light that could call into question the protectiveness of the remedy?"

   The Leech Lake Band requests that EPA acknowledge that International Paper has purchased and destroyed all but a few homes and businesses surrounding the former wood processing plant. These properties comprise most of the land area of OU7. Since 2005, IP has acquired 85 separate properties for a total of 106 acres, destroyed 38 single-family homes, as well as multiple businesses that were an important part of the Cass Lake community. The contaminated footprint of St. Regis extends farther, to approximately 389 acres and properties owned by the Tribe, the City, and individual owners. The implementation of the 1986 remedy is being carried out by holding the south side of Cass Lake, about half of our City, in a state of perpetual contaminated vacancy, effectively displacing the community (see figure).

Map showing impact area of St. Regis site, displacement of homes and businesses, and blockade of development. Impact area is approximately 389 acres. City of Cass Lake occupies 697 acres.

The destruction of residential properties is ongoing. Each month IP submits a progress report to EPA highlighting efforts to buy up more houses. For each house destroyed, IP requests the property's exclusion from the OU7 remedy for residential soils. If IP's practice of destroying residential homes is relevant to monthly progress reports and the overall remedy, it is also relevant to the 7th FYR.

Land use is important to include in any consideration of the remedy's effectiveness. The site was supposed to be cleaned up within 25 years, yet IP is continuing to purchase and destroy neighboring properties 39 years after the initial MEDD decision documents. It is also relevant to protectiveness determinations. Redeveloped properties are generally considered more protective than barren sites because reuse discourages inappropriate activities, such as unauthorized dumping.[8]

The Leech Lake Band appreciates that the 7th FYR finds it "reasonable to anticipate that vacant property may be returned to either commercial or residential use."[9] The FYR also

[8] See, OWSER Directive 9355.7-19, (Directive urges Regions to consider interplay of land use with remedy protectiveness and long-term effectiveness.)
[9] See, Draft 7th FYR, p. 6.

notes that the Band and the City of Cass Lake are developing reuse plans for properties located within the site. We request that the draft FYR include additional information on the land use changes that are taking place at St. Regis. As an example, the EPA addressed the land use problem in the 2020 ROD for OU7:

> *EPA believes it is neither the purpose nor the most beneficial application of the CERCLA process for a business entity to purchase properties that a local community or municipality intends to be residential for the purpose of defying local zoning ordinances, maintaining them as non-residential, and obtaining a less expensive remedy.*[10]

The Leech Lake Band requests that the FYR include a similar statement from EPA about land use and the CERCLA process. The purpose of CERCLA, and the 1986 decision documents, is to protect human health, welfare, and the environment. A secondary purpose of CERCLA is to prevent blight and return land to productive use. At St. Regis, the spread of blight has become a strategy to avoid the higher costs required to remediate to residential standards – a strategy that is contrary to the purpose of the law and the 1986 decision documents.

Prior to the remedy, the south side of Cass Lake was a vital community, a closely intertwined mix of homes and small businesses. Although many homes have been removed, the Site remains surrounded by the City of Cass Lake. OU2 is 400 yards north of an apartment complex. OU1 is 600 yards east of a grocery store. Providing more information about land use will support the conclusion that it is reasonable to anticipate that vacant property will be returned to residential use.

Finally, the Leech Lake Band has provided the EPA with an analysis of Treaty Rights relevant to the St. Regis remedy.[11] The 1855 Treaty with the Chippewa specifically set aside Cass Lake "for the permanent homes of the said Indians." Displacement of homes and businesses at the scale of St. Regis undermines the 1855 Treaty promise. In addition to immediate threats, the EPA, as an agency of the Federal government, has a fiduciary responsibility to the Tribe to consider sustainability, future protectiveness, and future use of land. Treaty Rights require protection of the Reservation for residential purposes, and federal recognition of Tribal laws as applicable, relevant, and appropriate requirements for cleanup.

3) **Failure to Contain Groundwater Pollution for 40 Years Undermines Findings of Short- Term Protectiveness.** The draft 7th FYR suggests that the remedy at OU1, 2, 3, and 7 is short-term protective of both human health and the environment based on its finding that there are no current pathways that could result in unacceptable risks. The Leech Lake Band requests that the EPA reconsider this analysis. The ongoing release of

[10] Record of Decision, St. Regis Paper Co. Site, U.S. EPA Region 5, December 2020, p. 57.
[11] See, Report on Treaty Rights and Remedy Selection. Leech Lake Band DRM. August 26, 2024.

persistent organic pollutants into groundwater outside the capture zone is an accumulating and unacceptable risk, with ongoing exposures to ecological receptors as well as humans practicing Tribal lifeways afforded as a Treaty Right.

Notably, PCP concentrations outside the capture zone remain elevated over the last five-year period, as evidenced in the tables provided with the draft FYR. In OU1 there are concentrations as high as 1,400 ug/L at W134M; as mentioned above, this value is 1,400 times the MCL (1 ug/l), and is present outside the treatment system capture zone, 39 years after the decision documents.

The 6th FYR raised concerns about spreading groundwater plumes to new locations:

> *In OU1, the overall size of the PCP plume, as defined by the 1 µg/L contour, is largely unchanged, with two exceptions: the northward bulge of the plume was either not known or did not exist in earlier decades, and the downgradient edge of the OU1 plume is not delineated.*[12]

During consultation we discussed "mature" plumes and how it is difficult to know if they are spreading due to of the lack of monitoring at the downgradient edge. Despite the difficulties in assessing the spread of groundwater plumes, evidence in the record indicates the plumes are expanding. The OU9 plume has clearly spread since the mid-1980s, and again since the 2007 HHERA.[13] Further, the historical record includes discoveries of new runout plumes.[14] Moreover, with highly elevated concentrations of PCP outside the capture zone, it is reasonable to assume continued migration. PCP does not biodegrade readily in aquatic environments, bioaccumulates, and is subject to long-range environmental transport.[15] PCP may be diluted by the hydrology of northern Minnesota, but it simply adds to the contaminant load of Cass Lake and the Mississippi headwaters.

For this reason, the Leech Lake Band questions the draft's reliance on a 2016 porewater investigation to support any conclusions regarding contaminant migration.[16] Elevated concentrations are unlikely in the middle of the Pike Bay Channel. The Conceptual Site Model at St. Regis confirms groundwater migration to the surface waters, sediments, and

[12] 6th FYR at 19.

[13] See, Human Health and Ecological Risk Assessment (HHERA) for St. Regis Superfund Site. 2008. P. 3-9

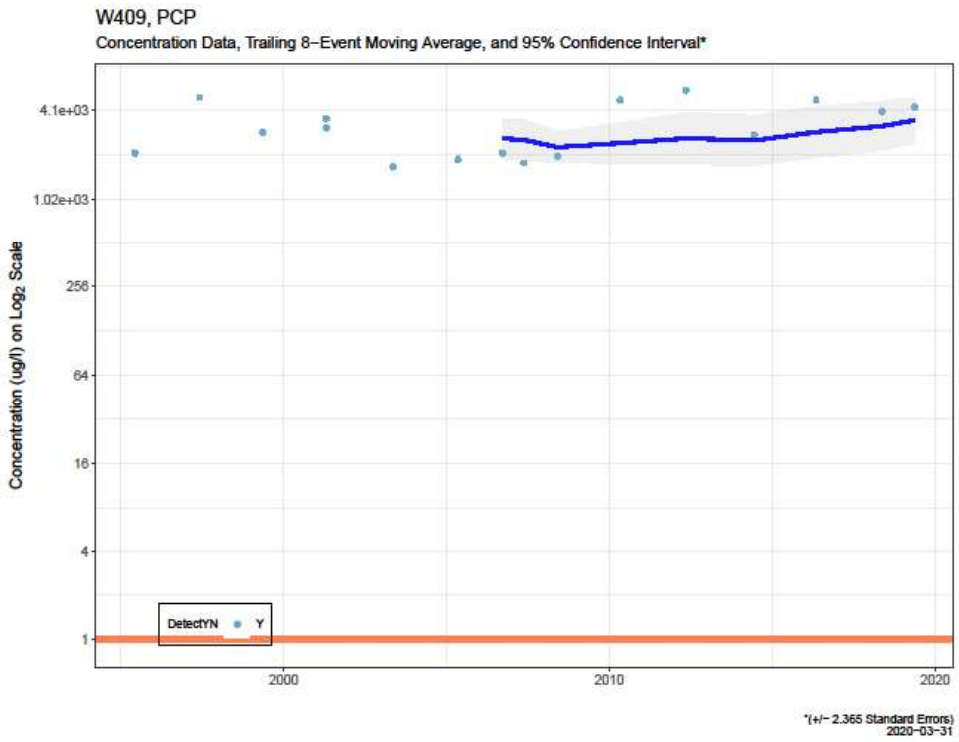
[14] MPCA Review of St. Regis Annual Monitoring Report, May 7, 2009, p. 5. Also 2020 Groundwater Review Report, p. 11

[15] PCP and other chlorophenols can be metabolized by numerous aquatic and soil microorganisms, but environmental conditions are usually unfavorable for biodegradation (Salkinoja-Salonen et al., 1989; Bajpai & Banerji, 1992; Orser & Lange, 1994; Laine & Jørgensen, 1996). Slow elimination in surface waters, high persistence in sediments, formation of stable metabolites, and the limited adaptation of microorganisms to chlorophenols owing to their high microbial toxicity imply that chlorophenols are practically non-biodegradable in the aquatic environment (UBA, 1996). PCP is accumulated by aquatic organisms through uptake from the surrounding water or along the food-chain (WHO, 1987).

[16] Porewater Quality Investigation Report, St. Regis Paper Co. Site, March 2016.

wetlands of Pike Bay, Cass Lake, and the connecting channel: "Surface water bodies interacted with groundwater at subsurface contacts intermediated by stream- or lake-bed sediments."[17]

The Leech Lake Band also questions IP's estimates of cleanup attainment by 2049. The estimates are not supported by evidence and should be given no credence in the draft FYR. Trendlines for PCP concentrations at extraction wells such as W401, W405, W409, W2106, W2401, W2402, and W2403 show no predictable date for attainment,[18] and instead demonstrate a long-term residuum of upgradient source contamination.



On page 24, the draft FYR suggests that concentrations of PCP in the monitoring network are at or below historical highs, "indicating a general decreasing trend in the areas sampled." In fact, PCP concentrations decreased significantly in the first eight years of operation, then settled at elevated concentrations far above the MCL, and then trended slightly upward or stable thereafter. Historical maximums have no relevance to recent trends, and we encourage the EPA to reconsider faulty assumptions put forward when characterizing the data trends.

[17] Five-Year Groundwater Review, St. Regis Superfund, April 20, 2020, p. 10
[18] See, 2020 Groundwater Review and accompanying concentration log tables.

In prior FYRs, EPA relied on the 2007 HHERA to reach conclusions of short-term protectiveness. A key assumption in the HHERA is that groundwater contamination is contained.[19] As discussed above, groundwater contamination at St. Regis has not been and is not currently contained. The EPA should not continue to rely on the 2007 HHERA for conclusions of short-term protectiveness where there are widespread, uncontained groundwater plumes of persistent organic pollutants. In addition, the Leech Lake Band has submitted comments listing the numerous significant technical deficiencies that call into question the entirety of its conclusions.[20]

The Leech Lake Band would also like more clarity about what standard applies when determining if a groundwater treatment system is short-term protective of the environment? Groundwater response actions are governed by CERCLA 121(d)(2)(A), which ties remedial action attainment to the Safe Drinking Water Act and the Clean Water Act. This requirement is reflected in the NCP: "[MCLs] shall be attained where relevant and appropriate to the circumstances of the release."[21]

The NCP also recognizes that groundwaters of the United States are valued natural resources:

> EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site. When restoration of ground water to beneficial uses is not practicable, EPA expects to prevent further migration of the plume, prevent exposure to the contaminated ground water, and evaluate further risk reduction.[22]

Consistent with CERCLA and the NCP, groundwater is protected as an environmental resource. [23] Groundwater threats include not just direct contact, but also as a source of contamination into other media, such as intrusion into sediments, surface water, and wetlands. The groundwater remedy at St. Regis is not protective of the environment, as the groundwater itself is an environmental resource, and a direct pathway for contamination to surface waters, wetlands, sediments, and associated flora and fauna.

Finally, Leech Lake Band's Treaty Rights include the safe harvest of wild rice. [24] However, for decades the Division of Resource Management (DRM) has banned the sale

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[19] "The two groundwater plumes, one beneath the St. Regis Site and one beneath the City Dump Site, have been stable in size with decreasing concentrations for years (Barr and Integral 2003)." P. 4.6
"In addition, chemical concentrations in the plume are decreasing, and the extent of contamination has not expanded in the period since the pumpout system became operational." P. 4.21 Human Health and Ecological Risk Assessment, St. Regis Paper Company Site, Vol. I., Sept. 28, 2007.

[20] See, LLBO Comment Letter on the 2007 Human Health and Ecological Risk Assessment for the St. Regis Superfund Site (HHERA), June 6, 2024.

[21] 40 CFR §300.430{3)(C).

[22] 40 CFR §300A30(a)(I)(iii)(F).

[23] See, OSWER Directive 9283.1-33, Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration, June 26, 2009.

[24] See, Treaty Rights and Remedy Selection, supra.

or purchase of wild rice from the Pike Bay Channel. IP cites the 2008 HHERA for exposure estimates, but those are out of date, and no reasonable person would recommend consumption of wild rice from the Pike Bay Channel given the contamination in St. Regis groundwater plumes and treatment plant effluent. The groundwater remedy at St. Regis is not protective of the environment and the resulting contamination precludes the Band's exercise of Treaty Rights on the Leech Lake Reservation.

Map showing St. Regis contaminant plumes, treatment plant, effluent discharge outfall, and Pike Bay Channel wild rice bed, marked as "manoomin."

4) **Specific Actions with Timelines Needed.** The Leech Lake Band urges the EPA to require more concrete actions in the 7th FYR. The review process is governed by Section 121(c) of CERCLA. If after review EPA determines that action is needed, consistent with the NCP, EPA is directed to require such action.

The Leech Lake Band has seen decades of vague recommendations and subsequent inaction. As a primary example, since at least 2005, EPA has provided generalized recommendations that IP increase pumping rates and improve hydraulic capture. Twenty years later little has changed, except the system is older with more frequent failures.[25] More recently, the 6th FYR in 2020 recommended a source area investigation, but nothing happened until 2024 when EPA provided a specific work order with a deadline. The 7th FYR, excellent in many respects, does itself a disservice by reverting to toothless, unclear recommendations. Instead, EPA should seize the opportunity to direct actions, and the St. Regis site needs a project management structure that will produce tangible and effective outcomes.

With respect to Section VI. Issues/Recommendations, the Leech Lake Band recommends that this section be deleted. It will do more harm than good. The fundamental problem at St. Regis is that activities are planned with a step-by-step, small-scope investigatory approach, one predicated upon another, such that little is accomplished towards major goals.[26] The recommendations in Section VI fall into this trap:

P. 74 OU1&3 Remedy Performance. Recommendation would encourage IP to avoid any improvements to the extraction well network, such as expediting replacement of failed wells, until completing the source investigation and improving the monitoring well network.

- P. 75 OU1&3 Monitoring. Redundant with existing work order.
- P. 75 Institutional Controls. Recommendation is the same as previous FYRs. As the Band has described, institutional controls (IC) are inappropriate for a Reservation established by Treaty for "permanent homes," and governmental controls are frequently unavailable on checkerboard jurisdictions in Indian country.
- P. 76 OU1,2&3 Monitoring. Additional monitoring is critical to bounding expanding plumes, but these monitoring efforts should not be delayed until the source investigation, and a vague recommendation will not produce results. This is a task that should go into EPA's overall project management for St. Regis, with a workplan and deadlines.
- P. 76 OU 1, 2&3 Remedy Performance. As noted above, ICs are complicated to implement on a Treaty Reservation. This issue should be taken up as a joint project

[25] The 2020 Groundwater Review describes systemic failures where 40% of OU1 wells and 33% of OU3 wells are not operated, and pumping rates far below design capacity, see pgs. 24-25.

[26] See, 2020 Groundwater Review at 27, which describes the how repeated recommendations for improvements to the groundwater system are met with a slow deployment of modeling and monitoring and little actual improvement. The goal is to focus the process on major objectives.

with EPA and the Leech Lake Band as a part of overall St. Regis project management. A vague recommendation from EPA to itself, with a deadline in five years, will not be helpful.

- P. 77 OU1,2&3 Remedy Performance. The recommendation encourages IP to update the groundwater model yet again, before any actual improvements to the extraction network. This is counterproductive.
- P. 77 OU1,2&3 Monitoring. The recommendation is for EPA to update groundwater cleanup levels (GCL). The work is overdue but a recommendation from EPA to itself with a deadline five years from now will not help. This task should go into EPA's project management for St. Regis, with a workplan and deadlines. The Tribe is pleased to see the Tribal GCLs (specifically the HSCA) are included in the regulations required to update the 2016 GCLs.
- P. 78 OU2 Remedy Performance. The Band strongly supports addressing the leak at the hazardous waste landfill, but this effort should be completed through the specific actions and deadlines described in Section VII Protectiveness determinations.
- P. 78 OU7 Remedy Performance. There is an ongoing study as a part of the OU7 Remedy included in the OU7 Work Plan Documents, so this recommendation is unnecessary.
- P. 79 OU7 Remedy Performance. This is redundant with an existing Record of Decision.
- Every recommendation has a milestone date of July 16, 2030, allowing IP to avoid taking any action for the next five years.
- P. 79 Other Findings. The recommendation on QAPPs is important but should be queued up in project management on a five-year schedule.

Rather than recommendations, EPA should focus the FYR on the "actions" authorized by CERCLA, tied to the protectiveness statements in Section VII. As discussed above, the Leech Lake Band encourages EPA to reconsider the findings of short-term protectiveness due to ongoing releases of contaminated groundwater into the environment. The Band also encourages specificity in the prescribed actions, with deadlines that do not push work into the future years.

Operable Unit 1 - To improve capture of contaminated groundwater, actions should include interim remedial efforts to eliminate identified source areas and changes to the configuration of the extraction wells, including adding new wells. The in-progress source area investigation will necessarily precede remedial action on source areas; however, the investigation should be considered a delineation process with remedial action to follow. Improved capture should be addressed immediately. The EPA's 2019 Optimization Review provided that "rates must be increased in the most appropriate and expeditious manner (for example, installation of additional extraction wells, reconfiguring screened

intervals, or increasing rates at existing extraction wells)."[27] Six years later, it is time for recommendations to become actions.

Operable Unit 2 – The Leech Lake Band appreciates the action items for the hazardous waste landfill and encourages more specificity in terms of actions and deadlines.

- Hydrologic assessment of the landfill to calculate leakage rates will presumably be modeled with HELP v4.0. The FYR should say this directly, prescribe a workplan, and impose a deadline.
- Leachate should be tested for compatibility with the HDPE liner. Most records of historical contamination at St. Regis contain similar information that the soils and sludges included large volumes of diesel fuel and methyl ethyl ketone (MEK), a solvent commonly used in wood finishing. HDPE liners are not compatible with diesel fuel or MEK.[28] We are unable to find evidence of liner testing in the record.
- Chemical composition of the landfill leachate should be compared to the groundwater contamination emanating from VAS-12 and followed up with a dye tracer study. The FYR should prescribe a workplan and deadline for completion.
- An upgraded monitoring well network should include sentinel wells, with a workplan and deadlines. This network would need to provide both horizontal coverage and vertical coverage across the aquifers present below the landfill.
- The OU2 landfill is an aging facility on the verge of failure, with rapidly increasing maintenance costs. The landfill is not sustainable in the long term. Given the landfill's location on a bluff above Fox Creek and the risks of breach, EPA should begin planning for off-site disposal of the hazardous waste landfill along with other contaminated soils identified on site. The long-term goal should be to eliminate this OU and return land and water resources within the footprint of the Hazardous Waste Landfill to productive use.

Operable Unit 3 – Same as recommendations for OU1: interim remedial actions to eliminate identified source areas and expeditious upgrades to the configuration of the extraction wells, with a workplan and deadlines.

Operable Unit 7 – The Leech Lake Band appreciates the attention to the long-standing problem of wind-blown contaminated dust. However, the remedy should not be considered protective when the homes of remaining residents cannot be cleaned, and IP is failing to suppress dust for weeks after dusty conditions arise. Further, surface soil contamination has not been adequately characterized, and it is likely that surface soil contamination is being blown and tracked into houses and vehicles outside OU7.

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[27] *Final Optimization Review Technical Memorandum, St. Regis Superfund Site, June 21, 2019. p. 20.*

[28] EPA testing in 2001 confirmed that MEK remains on-site in underwater locations. See, Appendix D of 2020 FYR. HDPE liners and MEK are not compatible, see HDPE Resistance Chart by Chemical. https://www.professionalplastics.com/professionalplastics/HDPE-LDPEChemicalResistanceChart.pdf

Before asking IP to consider paving the roads in our community, we ask for consultation with the Tribal government. The issue is complicated by the use of heavy equipment on these roads and the general process of roadbuilding in northern Minnesota. In addition, we again note that institutional controls are inappropriate for a Reservation established by Treaty for "permanent homes," and governmental controls are generally unavailable or extraordinarily difficult to implement on checkerboard jurisdictions in Indian country.

Along with these comments the Leech Lake Band is forwarding several reference documents. We encourage a comparison of the 2009 MPCA review, and the 2020 Groundwater Review. Well-informed experts have been pointing out the same fundamental problems at St. Regis for decades. The Band requests that EPA use its authorities under CERCLA to direct action.

5) **Operable Units Excluded from 7th Five-Year Review.** The 7th FYR takes a new approach and does not review the entire site. EPA has separated contaminated soils in OU1, 2, and 3 into two additional units. OU4 now represents the contaminated soil above the City Dump plume, and OU8 represents all other non-residential soils. OU9 was created earlier and represents the groundwater plume extending from the disposal pits, surface dumping, and the hazardous waste landfill. The remedy for OU7, residential soil, is not yet completed.

   The Leech Lake Band appreciates that the separation of operable units is a step towards new remedies. As stated in the draft, there are no remedies selected yet for OU4, OU8, and OU9. It is encouraging that EPA is planning to develop additional remedies for these units. However, CERCLA 121(c) provides that if a remedial action that results in contaminants remaining at the site, "the President shall review such remedial action no less often than each 5 years…." Our view is that such reviews should continue until new remedies have been implemented.

   The excluded operable units are the most contaminated, and their exclusion from the FYR makes it more difficult to track progress. As an example, previous FYR's found that the remedy at OU2 was not protective of the environment because soil samples with high levels of PCP were highly toxic to invertebrates. Earthworm studies found mortality rates as high as 80% in soil samples from the disposal pits.[29] By excluding non-residential soils from the analysis, the "not protective" determination is no longer included. Tracking progress is important. Two decades after the earthworm tests, the disposal pits have contributed significantly to groundwater pollution.

   The Leech Lake Band requests that the FYR include more information on the excluded operable units and suggests the following as a starting point:

[29] Human Health and Ecological Risk Assessment, St. Regis Paper Company Site, Cass Lake, MN September 28, 2007, p. 5-75.

OU4 - City Dump Soils –Between 1957 and 1975, contaminated sludge from St. Regis was transported to a pit at the city dump and periodically burned. In addition, MPCA files include reports of St. Regis employees dumping wastewater into the manhole adjacent to the City's water treatment plant on the dump site.[30] In 1987, sludge and contaminated soil were excavated from the city dump and placed in the OU2 hazardous waste landfill. Subsequent sampling shows PCP concentrations up to 1.6 mg/kg remaining in unexcavated city dump soils.[31] Runout plumes from the city dump continue to evade capture by the treatment system.[32] On April 26, 2024, EPA directed further investigation and delineation of contaminant source areas including the City Dump. Given that a soil remedy will not address the pump and treat system, EPA has separated the soil remedy at the City Dump (OU4) from the treatment system (OU3).

1981 photo shows a hose dumping contaminated wastewater into the manhole adjacent to the City's treatment plant, five years after RCRA became federal law.

OU7 – Residential Soils – OU7 was created in a 2005 Interim Record of Decision designed to address contaminated dust in houses surrounding the former operations area. At that time the area included approximately 40 single-family homes.[33] EPA projected that the interim remedy was needed for approximately one year until the implementation

[30] Human Health and Ecological Risk Assessment (HHERA) for St. Regis Superfund Site. 2008. P. 1-8
[31] HHERA, Appendix D, Table D1-8.
[32] See, Five-Year Groundwater Review, St. Regis Superfund Site, Subterranean Research, Inc., April 2020.
[33] Interim Record of Decision, St. Regis Paper Co. Site, U.S. EPA Region 5, October 2005, p. 1.

of the final remedy.[34] Since 2005, IP has purchased and destroyed most of these houses. Soil samples show PCP concentrations up to 2.5 mg/kg at depths up to 2.5 feet.[35] The highest concentrations were found on residential properties used for or adjacent to wood storage.[36] A 1976 MPCA memo reported: "Most of the complaints are due to the fact that the newly treated wood products are stored very close to homes. One home we observed…had freshly treated wood material stacked on three sides – right next to the property line…the odor was almost unbearable."[37] EPA issued a Record of Decision for the OU7 final soil remedy in 2020. As of 2025, the OU7 soil remedy awaits implementation.

OU8 – Non-Residential Soils – EPA has separated contaminated soils from OU1 and OU2 into a new OU8 for the same reasons as the City Dump: to separate a pending remedy for large volumes of contaminated soil from the treatment of groundwater plumes. Photographs from the 2012 soil investigation illustrate:

Photo 3: Discolored soil at boring OU1-GP3 (2012)


Photo 4: Visibly oily soil at boring OU1-GP9 (2012)

The first photograph is a 2012 soil boring from the former wood processing area, with PCP concentrations at 850 mg/kg. The second is from the former waste ponds, with PCP concentrations at 12 mg/kg.[38] For context, the EPA Regional Screening Value for PCP in residential soil is 1.0 mg/kg, which represents a 1E-06 cancer risk under default conditions; the risk-based soil screening level for groundwater protection (using a 20-fold dilution-attenuation factor) is 0.00114 mg/kg. As with OU4, EPA is engaged in consultation with the Leech Lake Band on the development of additional soil remedies and EPA has directed further investigation and delineation of contaminant source areas in what is now OU8.

[34] Id. p.3.
[35] Soil Sampling for Feasibility Study Report, St. Regis Paper Co. Site. November 2013. P. 14.
[36] Id.
[37] Health Consultation: Final Edition St. Regis Paper Company Site Community Health Concerns and Health Outcome Data Review , 2007, p. 16.
[38] See photolog, data tables from Soil Sampling for Feasibility Study Report, St. Regis Paper Co. Site. November 2013.

Photos show a bucket dredge removing sludge from an OU1 waste pond in 1986. The ponds were not drained and were backfilled with contaminated soil from OU2.

OU9 – Southwest Groundwater Plume (Fox Creek Valley) – After the City Dump stopped accepting waste pond sludge in 1975, employees of the wood treating facility hauled tankers of contaminated sludge and discharged it in a wooded area west of Highway 147 and north of Fox Creek. This area includes the "disposal pits" in the southwest corner and surface dumping area in the southeast corner. An EPA memo dated July 9, 1994 reports that for a period of at least three years, a former employee indicated "…he would haul a 3,000 gallon tanker of sludge at least once a week and dispose of its contents upon the open ground. The sludge was identical to those he had placed within the city's landfill."[39] Some contamination was excavated in the mid-1980's and placed in the hazardous waste landfill. Much of it remains in place. Since 2008 it has also been known as the "eco-risk area" as testing found 80% earthworm mortality in soil samples.[40] The 2012-13 soil investigation found large volumes of visibly contaminated soil (see photo below). Samples from this location showed PCP concentrations at 3500 mg/kg:[41]

[39] Public Health Assessment for Groundwater, Surface Water, and Sediments at the St. Regis Superfund Site, Agency for Toxic Substances and Disease Registry, U.S. Dept. of Health and Human Services, Dec. 8, 2005, p. 3.
[40] HHERA, p. 5-75.
[41] See photolog and data tables from Soil Sampling for Feasibility Study Report. November 2013.

Photo 6: Discolored soil at test trench OU2-TT2A in the east pit (2012)

From 2014 to 2022, IP conducted groundwater investigations which found PCP concentrations in groundwater extending approximately 1500 feet roughly parallel to Fox Creek from the disposal pits to the lower outwash aquifer. As a result, the plume appears to be in direct hydraulic contact with the upper and lower aquifers along the north edge of the Fox Creek valley. The 2019 Optimization Review recommended that the east and west disposal pits be excavated to below the water table to remove the contaminant mass associated with the OU9 plume.[42] This recommendation remains unimplemented. In February 2022, five monitoring wells were installed in the Fox Creek Valley outwash. In January of 2023, EPA ordered IP to develop a feasibility study for remedial action in OU9.[43] Groundwater concerns at OU9 are complicated by reports of leakage through the primary liner of the OU2 hazardous waste landfill.[44] EPA has directed IP to install additional monitoring wells. IP has yet to evaluate the full extent of the OU9 groundwater plume or implement any measures to address it,[45] 39 years after the original cleanup decisions.

The Leech Lake Band is encouraged by recent progress at St. Regis but has seen previous cleanup efforts redirected and stalled in a blizzard of studies and reports. The St. Regis Site has too many pending projects. We strongly encourage that remedial action on the excluded OU's be directed with work plans and deadlines in an organized management structure.

[42] *Final Optimization Review Technical Memorandum, St. Regis Superfund Site, June 21, 2019. p. 24.*

[43] Unilateral Administrative Order for Remedial Investigation and Feasibility Study for Operable Unit 9, St. Regis Paper Co. Site, January 20, 2023. P. 8-10.

[44] Barr Engineering, "2021 Annual Report St. Regis Paper Company Site Cass Lake, Minnesota," 2022, https:semspub.epa.gov/work/05/2005094.pdf

[45] Id.

Reference Documents: EPA has begun a new process where documents referenced in this FYR are available in a separate docket on the St. Regis Site webpage in the Superfund Enterprise Management System. The Leech Lake Band requests the addition of the following documents:

1) Treaty with the Chippewa of 1855. 10 Stat. 1165.
2) Treaty with the Chippewa of 1837, 7 Stat., 547.
3) Report on Treaty Rights and Remedy Selection. Leech Lake Band DRM. August 26, 2024.
4) Five-Year Groundwater Review Technical Memorandum, prepared on behalf of EPA by Subterranean Research, Inc., April 2020, narrative and excerpts of maps and tables.
5) MPCA Review of St. Regis Annual Monitoring Report, May 7, 2009.
6) Leech Lake Band Comments on 2023 Annual Monitoring Report for St. Regis Superfund Site, May 30, 2024.
7) LLBO DRM Letter Re: Disapproval of Institutional Controls for St. Regis Soil Remedies as Proposed by the 2015 Supplemental Feasibility Study, December 6, 2024.

Conclusion: The purpose of the Five-Year Review is to look comprehensively at the remedy, evaluate protectiveness, and to direct additional actions as needed. EPA should avoid fragmenting St. Regis into tiny projects of small consequence. The fundamental problems at the St. Regis site are straightforward. The source elimination work required by MPCA's 1986 enforcement order remains unfinished, the groundwater system has never been sufficient, and the OU2 hazardous waste landfill is a substantial threat astride the headwaters of the Mississippi.

While the problems are clear, the process to remediation at St. Regis is sidetracked and delayed far too readily. Thirty-five years of reports have been making similar recommendations with little result. The Leech Lake Band respectfully urges the EPA to consider the issues identified above as well as the process for addressing them. The EPA should use the 2025 FYR process to review the site comprehensively and order the work necessary to restore groundwater, protect public health and welfare, and honor the Treaty Rights of the Leech Lake Band of Ojibwe.

Respectfully submitted,

Brandy Toft, Environmental Director

APPENDIX F: Comments from the Minnesota Pollution Control Agency

MINNESOTA POLLUTION CONTROL AGENCY

Duluth Office | 525 Lake Avenue South | Suite 400 | Duluth, MN 55802 | 218-723-4660

800-657-3864 | Use your preferred relay service | info.pca@state.mn.us | Equal Opportunity Employer

April 18, 2025

VIA EMAIL

Zack Sasnow, P.E., Remedial Project Manager
U.S. Environmental Protection Agency
77 W Jackson Blvd
Chicago, IL 60604

Brandon Pursel, Remedial Project Manager
U.S. Environmental Protection Agency
77 W Jackson Blvd
Chicago, IL 60604

RE: Seventh Five-Year Review Report for the St. Regis Paper Company Superfund Site
Cass Lake, Minnesota
MPCA Site ID: SR0000008

Dear Zack Sasnow and Brandon Pursel:

Thank you for the opportunity to review and provide comments on the draft *Seventh Five-Year Review Report* (2025 5YR, report) for the St. Regis Paper Company Superfund Site, prepared by the U.S. Environmental Protection Agency (EPA). The Minnesota Pollution Control Agency (MPCA) supports many of the recommendations and follow-up actions identified in the review and agrees that implementation of these recommendations is needed to ensure that current remedial actions are functioning as intended. We have the following comments on the draft report:

General 5YR Report Comments and Questions

- It appears some minor boundary adjustment could be made for OU2 and OU9 areas on Figure 1 (Site Map). The OU9 does not extend far enough north to the source area.

- Page 10, Table 2: consider also listing Minnesota Department of Health (MDH) drinking water Health Risk Limits (HRLs) for reference. The HRLs for several site contaminants of concern (COCs) including pentachlorophenol (PCP), benzo(a)pyrene (B(a)P), and non-carcinogenic polyaromatic hydrocarbons (PAHs) have been revised since 2015.

- Page 10, Table 2: the MPCA questions the reasoning for eliminating non-carcinogenic PAHs due to concentrations being below screening values. This may be correct for compliance point samples but is this true for areas of the site with higher contaminant concentrations and nonaqueous phase liquids (NAPLs)? Please check this information with lab reports as results for non-carcinogenic PAHs are not summarized in recent annual monitoring report data tables.

- Section II, page 14, Long-Term Stewardship: the MPCA suggests the 5YR should include a description of the Institutional Control Implementation and Assurance Plan (ICIAP) for groundwater that International Paper submitted to the EPA in 2021 and the status of the development of this ICIAP for the site.

- Page 21, Table 5, Status of Recommendations from 2020 5YR, OU1 and OU3: the MPCA suggests the status statements also could include improvements made to the extraction systems with new extraction wells that have resulted in improvements in extraction well performance and overall pumping rates and that potential improvements of plume capture are still being evaluated through routine monitoring.

- Page 24, Section IV, Data Review: the review and analysis of data trends also should consider changes in trend rates over time versus just comparing current concentrations to the historic maximum. This comparison to the historic max is important, but using the current trend rates or models that are more representative of rate changes over time may be more accurate for estimating future concentrations. Multiple or changing trend rates have occurred over time due to changing conditions and response actions at some key monitoring points.

- Page 24, Section IV, Data Review: current State of Minnesota drinking water and surface water discharge standards also could be considered for reference or used for screening. The MPCA provided a comment related to this for the previous 5YR.

- Page 26, Section IV: the discussion regarding pore water sampling near the Pike Bay Channel and plume boundary should include more context on the uncertainty regarding the plume extent and potential discharge. The MPCA recommends considering further investigation of the plume fate and potential for discharge into the lake including work to investigate where deeper groundwater is moving toward the surface and discharging beneath the channel area.

- Page 56, Treatment Plant Effectiveness and Effluent Quality Section: the discussion on the number of toxic equivalent (TEQ) results exceeding Leech Lake Band of Ojibwe (LLBO) Hazardous Substance Control Act (HSCA) standards could include more context on why there are some instances with standards being exceeded with no detections. For example, explain that there may have been higher detection levels used for these samples that would drive up TEQ calculation based on using estimated values or higher detection levels.

Section V. Question A: Is the remedy function as intended by the decision documents?

- The MPCA agrees with most of the analysis and conclusions provided in this section regarding remedy function and effectiveness objectives not being met for OU1 and OU3 contaminated groundwater. Groundwater monitoring results over the course of many years have continued to indicate contaminant plumes migrating beyond the intended capture zones for both the OU1 and OU3 plumes and intersecting surface water bodies of Cass Lake. It is clear that the effectiveness of these systems needs to be improved. The MPCA continues to agree optimization of the current remediation systems is a primary goal for the groundwater remedy at OU1 and OU3.

- Some additional points the MPCA proposes that the EPA consider are:

    - The restoration objectives for OU1 have not been met in the estimated timeframe and likely will not be achieved in in a reasonable period of time in the foreseeable future. Complete containment of the plumes has not been achieved since the pump and treat remedies have been in place for these two areas. Ongoing operations of these systems and maintaining capture over the long-term will be expensive and difficult.

    - Even though COC levels have reduced from maximum levels in the plume cores at OU1 and OU3, the rates of decline have not been significant in the core source areas in more recent years. Most of the reduction occurred in the few years after the initial removal actions and systems coming online. These changed rates likely indicate a much longer time than projected to meet water quality standards.

Section V. Question B: Are the exposure assumption, toxicity data, cleanup levels, and Remedial Action Objectives (RAOs) still valid?

- The Minnesota drinking water HRLs for two of the primary site COCs (PCP and B(a)P) were updated since the 2015 5YR. For state-led sites, the MPCA would recommend or require response actions to remedy any completed pathways with contaminant concentrations above current state health advisory levels, including when these levels may be more stringent than cleanup goals established at the time of a previous remedy decision. The updated HRLs of 0.3 micrograms per liter (µg/L) for PCP and 0.1 µg/L for B(a)P could also be referenced in Table 2 as current State drinking water standards that have changed since the 2015 5YR. The State also has drinking water standards for several individual carcinogenic and non-carcinogenic PAHs that are present at higher concentrations near the source areas.

Section V. Question C: Has any other information come to light that calls into question the protectiveness of the remedy?

- **Previous MPCA Comment for 2020 5YR is still applicable:** In addition to the source area and groundwater plume that have been identified to the south of OU2, the results of the LLBO-sponsored 2018 groundwater investigation should also be included in response to Question C. The investigation was conducted in March 2018 and documented the presence of a PCP plume on the east side of the Cass Lake – Pike Bay Channel. Further investigation is needed to determine the migration path and full extent of the plume.

Section VI. Issues/Recommendation

- The MPCA agrees with the proposed recommendations.

- For OU1 and OU3 the MPCA requests also including:

    - Continued routine sampling of groundwater and surface monitoring networks to evaluate hydraulic capture and concentrations trends.

  - Further evaluation of groundwater to surface water pathways and identifying potential locations of mixing and discharge zone(s) to monitor where OU1 and OU3 plumes intersect Cass Lake.

- Also consider referencing or using current MDH guidance for drinking water screening value concentrations for some site COCs if updated guidance values are needed. Also, it is important to note that Tribal HSCA values are lower for many of the site COCs.

- The Changes in Toxicity and Other Contaminant Characteristics section could also reference recently updated MDH drinking water screening values. This section does make reference to recent MDH guidance on evaluating the cancer potency of PAH Mixtures. If considering this, does it also make sense to consider the most up to date MDH drinking standards for B(a)P, PCP and several non-carcinogenic PAHs?

- For the OU2 Remedy Performance Evaluation Issue, consider a forensic analysis to evaluate the source of water accumulating in the leak-detection layer (groundwater, original waste leachate, atmospheric precipitation, or combination). The leak-detection layer really should be able to provide a reliable means of monitoring for potential leakage and because it is leaking, this means of monitoring is not available. Are there any other steps that could be taken to evaluate how well the vault is functioning and the source of water getting into the leak-detection layer?

- In addition to the source area and groundwater plume that have been identified to the south of OU2, the results of the LLBO-sponsored 2018 groundwater investigation should also be included in response to Question C. The investigation was conducted in March 2018 and documented the presence of a PCP plume on the east side of the Cass Lake – Pike Bay Channel. Further investigation is needed to determine the migration path and full extent of the plume.

Section VII. Protectiveness Statement

Section VII. Protectiveness Determinations

- OU1 and OU3 Protectiveness Statements: the protectiveness statements indicate these remedies are protective in the short term because there are groundwater capture and treatment systems in place and there are currently no exposure pathways that could result in unacceptable risk. The MPCA suggests that this determination should be qualified with issues needing to be addressed because the PCP plumes in groundwater continue to intersect the nearest downgradient surface water receptor, Cass Lake, and recent treatment system improvements still are being evaluated to determine if capture of the plumes is improving.

  Efforts are being made to improve the pump and treat systems and plume capture at these two areas; however, it has not been determined whether COC concentrations above water quality objectives are discharging into the lake, and contaminated groundwater is intersecting the lake at depth.

At OU1 and OU3: the MPCA recommends continuing to evaluate response actions needed to achieve plume stability and limit contaminants in groundwater from reaching Cass Lake. In the short-term this would involve improving hydraulic capture of plumes and in the longer-term reducing mass-flux of COCs from the source areas enough so that the plumes are stable and diminishing without the need for continued operation of the extraction and treatment systems.

Other General Comment

- A re-evaluation of the long-term objectives for the groundwater remedy should be considered. The original decision documents envisioned the groundwater treatment system attaining the cleanup levels within a 25-year time period. Currently there is not a good estimate of the length of time to attain the target cleanup levels, or an indication of the ability of the current extraction systems to do so within any specified time frame. The current groundwater remedy, which is only designed to control plume migration and not source area reduction, will require a high level of active operational effort and maintenance for an indefinite period of time to remain permanently protective of the environment. Eliminating or reducing the need for operating an active pump and treatment system to contain plume migration to Cass Lake within a reasonable time frame could be considered a goal. The MPCA continues to maintain that source area reductions could lead to significant long-term cost savings and benefits to the environment.

- Expected Progress Towards Meeting RAOs: if the records of decision (RODs) for these areas are revised, consider re-evaluating the cleanup goals to be protective of human health and the environment over the long term, but to also be feasible and achievable in a shorter timeframe.

If you have any questions regarding this letter, please contact me at 218-302-6633, dan.cervin@state.mn.us or Mark Elliott 218-302-6649, mark.elliott@state.mn.us.

Sincerely,

Dan Cervin

This document has been electronically signed.

Dan Cervin
Project Manager
Remediation Division

Mark Elliott

This document has been electronically signed.

Mark C. Elliott, P.G., M.S.
Hydrologist
Remediation Division

ME/DC:km

cc: Eric Krumm, Environmental Program Leech Lake Band of Ojibwe (electronic)

Disclaimers

St. Regis Paper Company Superfund Site

MPCA Site ID: SR0000008

1. Reservation of authorities

   The Minnesota Pollution Control Agency (MPCA) Commissioner reserves the authority to take any appropriate actions with respect to any release, threatened release, or other conditions at the Site. The MPCA Commissioner also reserves the authority to take such actions if the voluntary party does not proceed in the manner described in this letter or if actions taken or omitted by the voluntary party with respect to the Site contribute to any release or threatened release, or create an imminent and substantial danger to public health and welfare.

2. No MPCA assumption of liability

   The MPCA, its Commissioner and staff do not assume any liability for any release, threatened release or other conditions at the Site or for any actions taken or omitted by the voluntary party with regard to the release, threatened release, or other conditions at the Site, whether the actions taken or omitted are in accordance with this letter or otherwise.

3. Letter based on current information

   All statements, conclusions and representations in this letter are based upon information known to the MPCA Commissioner and staff at the time this letter was issued. The MPCA Commissioner and staff reserve the authority to modify or rescind any such statement, conclusion or representation and to take any appropriate action under her authority if the MPCA Commissioner or staff acquires information after issuance of this letter that provides a basis for such modification or action.

4. Disclaimer regarding use or development of the property

   The MPCA, its Commissioner and staff do not warrant that the Site is suitable or appropriate for any particular use.

5. Disclaimer regarding investigative or response action at the property

   Nothing in this letter is intended to authorize any response action under Minn. Stat. § 115B.17, subd. 12.

6. This approval does not supplant any applicable state or local stormwater permits, ordinances, or other regulatory documents.