FIVE-YEAR REVIEW REPORT FOR MUSKEGON CHEMICAL COMPANY SUPERFUND SITE MUSKEGON COUNTY, MICHIGAN

Prepared by
Michigan Department of Environmental Quality
Lansing Michigan
and
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Region 5
Chicago, Illinois

for **Richard C. Karl, Director**
Superfund Division

Date April 3, 2013

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LIST OF ACRONYMS

1,2-DCA	1,2-dichloroethane
ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
Chlorex	bis (2-chloroethyl) ether
COC	Chemical(s)/Contaminant(s) of Concern
EPA	United States Environmental Protection Agency
FHR	Flint Hills Resources
FTC&H	Fishbeck, Thompson, Carr, & Huber
FYR	Five-Year Review
GAC	Granular Activated Carbon
gpm	Gallons Per Minute
GSI	Groundwater/Surface Water Interface
ICs	Institutional Controls
ICIAP	Institutional Controls Implementation and Assurance Plan
IRA	Interim Remedial Action
KCC	Koch Chemical Company
MCC	Muskegon Chemical Company
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MZGSI	Mixing Zone Groundwater/Surface Water Interface
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PCE	Perchloroethylene or Tetrachloroethylene
PID	Photolonization Detector
POTW	Publicly Owned Treatment Works
PRP	Potentially Responsible Party
RAG	Remedial Action Goal
RAP	Remedial Action Plan
RI/FS	Remedial Investigation/Feasibility Study
RAO	Remedial Action Objectives
ROD	Record of Decision
RPM	Remedial Project Manager
scfm	Standard Cubic Feet per Minute
SVE	Soil Vacuum Extraction
SVOC	Semi-Volatile Organic Compound
TDL	Target Detection Limit
TCE	Trichloroethylene
TGDC	bis (2-chloroethoxy) ethane
U.S. EPA	United States Environmental Protection Agency
UU/EU	Unlimited Use/Unrestricted Exposure
VOC	Volatile Organic Compound

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EXECUTIVE SUMMARY

This is the fourth Five-Year Review (FYR) for the Muskegon Chemical Company (MCC) Superfund (Site) located in Whitehall, Muskegon County, Michigan. The triggering action for this policy FYR was the signing of the previous FYR on April 4, 2008.

The former MCC production facility consists of 19.6 acres located at 1725 Warner Street, on the southern outskirts of Whitehall, Muskegon County, Michigan. The Site is located approximately 0.5 mile north of the Mill Pond Creek, and is close to White Lake and Lake Michigan. The area around the former plant is zoned light industrial. Howmet Corporation owns and operates production facilities on property west of the MCC plant. The land to the north and east is occupied by the Whitehall Industrial Park. The land south of the plant is owned by CSX Corporation, and to the south of that are the Whitehall Department of Public Works facilities. The MCC plant began producing specialty chemicals at the Whitehall facility in 1975. Groundwater contamination was initially discovered in 1977 during testing for installation of an industrial water supply well. A 1980 hydrogeologic investigation identified three primary organic contaminants of concern in the groundwater. The probable source of contamination was identified as a leak in the drainage system inside the MCC manufacturing facility, which was repaired. The MCC also installed one purge well centrally in the path of the plume. These leaks contaminated the local water table (upper) aquifer near the plant. Later investigations tracked the groundwater contaminant plume approximately one-half mile south southwest to its discharge point in Mill Pond Creek. In 1981, the groundwater contamination plume from the Whitehall facility was found to be discharging to Mill Pond C reek. As a result, the State of Michigan and the MCC entered into a consent agreement and a plea agreement in 1981 and 1983, respectively. The agreements required the MCC to conduct two hydrogeologic investigations; and to install several groundwater purge wells and a groundwater treatment system. In 1986, MCC and the State of Michigan entered into a consent decree which approved the existing purge well system and established a seven-year period of operation.

The Site was listed by EPA on the National Priorities List (NPL) in 1990. EPA prepared an interim Record of Decision (ROD) in 1993 to address the environmental contamination. The interim ROD consisted of removal or extraction of contaminated groundwater in the vicinity of Mill Pond Creek and treatment of the contaminated groundwater prior to disposal or discharge. The Site remedy continued under MDEQ oversight. The MDEQ approved the Remedial Action Plan (RAP) for the Site in June 1997. The 1997 remedy included groundwater extraction and treatment of groundwater; thermally enhanced soil vacuum extraction and air sparging institutional controls; and monitoring of soil and groundwater.

As the cleanup of the Site progressed, the active remediation system was no longer necessary, and the remedy shifted from active remediation to one of limiting exposures. The RAP was updated in 2000 and 2009 and these updates were implemented as amendments to the consent decree. Those amendments clarified the cleanup standards and institutional controls (ICs) and shut-off criteria for the air sparging system. The remedial action that is being implemented to address environmental contamination is fully described in the RAP and the associated consent decree. Currently, the air

sparging equipment has been dismantled, a cap has been placed over the areas of the Site where residual contamination remains, the groundwater has met the Tier I Standards, and ICs are in-place. Additional work is underway to ensure long-term protectiveness.

Flint Hills Resources (FHR), a wholly owned subsidiary of Koch Industries, is the successor to KCC. As such, FHR retains liability for response actions at the Muskegon Chemical Site. Koch Remediation and Environmental Services, another wholly owned subsidiary of Koch Industries, is in charge of conducting the remediation for FHR. Carr and Huber (FTCH) has been retained by Koch Remediation to undertake O&M activities at the Site.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Muskegon Chemical Company (MCC) Superfund Site		
EPA ID: MID072569510		
Region: 5	**State:** MI	**City/County:** Whitehall/Muskegon

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: State
Author name (Federal or State Project Manager): Carrie L. Geyer, Project Manager
Author affiliation: Michigan Department of Environmental Quality (MDEQ)
Review period: October 1, 2012 – April 4, 2013
Date of site inspection: October 3, 2012
Type of review: Policy
Review number: 4
Triggering action date: April 4, 2008
Due date ***(five years after triggering action date)***: April 4, 2013

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): *Site-Wide*	**Issue Category: Monitoring**			
	Issue: Vapor Intrusion (VI)			
	Recommendation: Conduct a study to assess the relevance of the VI pathway for long-term protectiveness.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	State	May 1, 2014

OU(s): *Site-Wide*	**Issue Category: Institutional Controls**			
	Issue: Effective ICs must be implemented, monitored, maintained, and enforced. ICs must be confirmed to be in-place and effective and subject to Long-Term Stewardship (LTS).			
	Recommendation: Submit an ICIAP to address additional IC evaluation activities and preparation of an LTS plan.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	State/EPA	May 1, 2014

Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The MCC remedy is protective of human health and the environment in the short-term. There is currently no known exposure pathway to MCC-related contaminants under existing conditions. The remedy is functioning as intended. To ensure long-term protectiveness several follow-up actions are required: (1) evaluation of the vapor intrusion (VI) pathway is recommended to be performed as a follow-up action to help ensure that long-term protectiveness is maintained. Based

on the remaining concentrations and known site conditions (i.e., soil type, depth to groundwater), it is not anticipated that VI will pose a risk. However, a study is still recommended to be performed to assure that the pathway has been adequately addressed.

(2) an Institutional Controls Implementation and Assurance Plan (ICIAP) or similar IC plan must be prepared to ensure LTS. This plan will include the results of conducting additional IC evaluation activities and planning for additional ICs, if needed, and to plan for on-going monitoring, maintenance and enforcement of ICs.

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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 functioning as intended and that it will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Contingency Plan (NCP). CERCLA 121 states:

> *"If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews."*

EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which states:

> *"If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such actions no less often than every five years after the initiation of the selected remedial action."*

The Michigan Department of Environmental Quality (MDEQ) conducted a FYR on the remedy implemented at the MCC Superfund Site in Whitehall, Muskegon County, Michigan. The MDEQ is the lead agency for developing and implementing the remedy for the Site. The EPA, as the support agency, has reviewed all supporting documentation and provided input to the MDEQ during the FYR process.

This is the fourth FYR for the MCC Superfund Site. The triggering action for this policy review is the completion date, April 4, 2008, of the third FYR. The FYR is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE). The Site remedy consists of One (1) Operable Unit or is Site-wide which is addressed in this FYR.

II. PROGRESS SINCE THE LAST REVIEW

This report focuses on progress since the last FYR conducted in 2008. The protectiveness statement presented in the 2008 FYR identified the remedy as short-term protective with the expectation that it would be long-term protective.

Table 1: Protectiveness Determinations/Statements from the 2008 FYR

OU #	Protectiveness Determination	Protectiveness Statement
Site-Wide	Short-term Protective	The MCC remedy has significantly reduced Site related contaminants. The remedy is protective of human health and the environment in the short-term since there is no present exposure pathway to MCC-related contaminants under existing conditions. Long-term protectiveness required compliance with effective ICs. Effective ICs must be monitored and maintained. Some follow up actions are recommended (review and potentially modify use restrictions, potential modification of cleanup criteria and define shut down criteria for soil vacuum extraction (SVE) system to help ensure long-term protectiveness is maintained.

Five issues and recommended actions were identified in the 2008 FYR. These are summarized in Table 2. Additional information regarding the recommendations and follow-up actions that were undertaken is discussed in greater detail below.

Table 2: Status of Recommendations from the 2008 FYR

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Party	Original Milestone Date	Current Status	Completion Date (if applicable)
Site-Wide	1. Vapor Intrusion (VI)	A VI study will be conducted	PRP	State/EPA	April 2008	Under Discussion	
Site-Wide	2. Remedial Action Plan (RAP) Modification	MDEQ will consider whether to propose a RAP modification. If so, the proposed RAP would go out for public comment	State	State	June 2009	Completed	January 2010
Site-Wide	3. Air Sparge System Shutdown Criteria Needed	MDEQ will continue working with PRP to develop shutdown criteria for the air sparge system that is protective and in compliance with state environmental regulations	PRP	State	June 2009	Completed	January 2010
Site-Wide	4. Institutional Controls (IC) - Review Needed	MDEQ and EPA will ensure that the IC study is completed	PRP	EPA/State	Oct. 2008	Partially Completed	May 2009
Site-Wide	5. Institutional Controls (IC) – Long Term Stewardship Needed	An IC Plan will be prepared for required follow-up actions, including ensuring that any necessary modifications to current deed restrictions are made and planning for implementation of ICs and long-term stewardship to ensure the remedy remains protective.	PRP	State	Dec. 2008	Partially Completed	January 2010

Issue/Recommendation 1 - Vapor Intrusion

The 2008 FYR identified the need to perform a vapor intrusion (VI) study to determine the relevance of the VI pathway and its possible impact on long-term protectiveness. Due to the time associated with addressing the other issues/recommendations that were addressed during this five year period, the VI study has not yet been performed. Based on the remaining concentrations and known site conditions, i.e., soil type, depth to groundwater, it is not anticipated that VI will pose a risk. However, the study will be performed to assure that the pathway has been adequately addressed. This recommendation will carry through as an issue to address as part of this five-year review.

Issue/Recommendation 2 – RAP Modification

The RAP Amendment addressed a number of critical items including: updating the institutional controls, determination of air sparge system shutdown criteria, replacement of the Tier 1 groundwater criteria with mixing zone groundwater/surface water interface (MZGSI) criteria, and approval of a multi-media capping of soils under the former process building. In addition, it included both an O&M Plan and a Long-Term Monitoring and Contingency Plan.

Issue/Recommendation 3 – Air Sparge System Shutdown Criteria

The need to establish an end point for the shutdown of the air sparge system was identified in the 2008 FYR. As part of the RAP Amendment, an agreement was negotiated to accomplish this goal. As part of the RAP Amendment it was determined that rather than establishing a concentration that must be reached, the shutdown criteria would be based on an additional time of system operation. To that end; it was determined that having the system operate for an additional 2 years would be sufficient. The system was put back in operation during 2009 and 2010, at which time the shutdown goal was officially achieved. Since that time the system has been shut down and decommissioned.

Issue/Recommendation 4 – Institutional Controls Review

The 2008 FYR identified the need to conduct a formal Institutional Controls (IC) study to determine if the existing ICs were protective and whether additional ICs were needed. Although a formal IC study was not conducted, a review of the then-currents ICs was undertaken. As a result of this review by the PRPs along with the MDEQ, it determined that the 1998 restrictive covenants (RCs) needed to be updated to bring the Site's ICs into compliance with current state requirements. The MDEQ determined that that additional ICs were needed to address the capped soils in the area of the former process building. These updated RCs impose restrictions on the MCC Processing Plant Property and the Mill Creek Property. However, a review will be undertaken to determine if the ICs should be further enhanced. The MDEQ prepared a model RC, titled *Declaration of Restrictive Covenant and Grant of Envionmental Protetion Easement,* for these types of situations to ensure that the covenants would be effective in the long-term. A further review will take place to determine if the 2010 RCs should be updated. Although U.S. EPA is not insisting that the model RC be used, it is available if needed. The goal is to ensure that the RCs (1) are sufficient to achieve site-specific goals (e.g., prevent future uses that pose human health threats) and (2) be valid as a matter of Michigan law. If updates to the RCs are necessary, then the parties should explore whether existing RCs should be replaced by model RC previously discussed to enhance them to ensure long-term protectiveness. On the third property associated with the Site, the Howmet Property, an agreement for a restrictive covenant could not be reached. As a result, ICs for the Howmet Property were addressed through the formal adoption, in 2005, of

a Muskegon County Groundwater Ordinance restricting ground water usage on the Howmet Property.

Issue/Recommendation 5 – Institutional Controls - Long Term Stewardship
The 2008 FYR identified the need to conduct a formal IC study to determine if the existing ICs were protective and whether additional ICs were needed. Although a formal study was not performed, the MDEQ determined that the 1998 restrictive covenants needed to be updated to bring the Site's ICs into compliance with current state requirements. In addition, MDEQ determined that additional ICs were needed to address the capped soils in the area of the former process building. All of these items were addressed in the 2009 RAP Amendment. New restrictive covenants were developed and recorded in 2010. The RAP Amendment included a Long-Term Monitoring and Contingency Plan that partially addressed the long-term stewardship to ensure the remedy will remain protective. The Plan will be updated to include additional measures for LTS.

Remedy Implementation Activities

Remedy implementation activities are discussed in more detail in Appendix A. The remedy implementation activities that took place since the 2008 FYR include the shutdown and decommissioning of the air sparge system and implementation of ICs. Also, since the last FYR, Flint Hills Resources (FHR), a wholly owned subsidiary of Koch Industries, is the successor to KCC. As such, FHR retains liability for response actions at the Muskegon Chemical Site. Michael Christopher of FHR is the Primary Contact. Koch Remediation and Environmental Services, another wholly owned subsidiary of Koch Industries, is in charge of conducting the remediation for FHR. Linda Childers is the primary contact for Koch Remediation. The consulting firm of Fishbeck, Thompson, Carr and Huber (FTCH) has been retained by Koch Remediation to undertake O&M activities at the Site. FTCH replaced Barr Engineering in 2008.

Air Sparge System
The air sparge system was temporarily shut down in 2006. As part of the 2009 RAP Amendment, it was determined that the system was to operate for an additional two year period to evaluate its effectiveness. In accordance with this requirement, the system operated in 2009 and 2010, at which time MDEQ determined that it could permanently be taken out of operation. In 2011, the wells and piping associated with the air sparge system were officially abandoned.

Institutional Controls (ICs)

ICs are required to ensure the protectiveness of the remedy. ICs are non-engineered instruments, such as administrative and/or legal controls, that help minimize the potential for exposure to contamination and protect the integrity of the remedy. Compliance with ICs is required to assure long-term protectiveness for any areas which do not allow for UU/UE.

The remedial action decision documents require that the Site be cleaned up to allow commercial/industrial uses of the Site. In addition, the decision documents call for the groundwater to be cleaned up to Tier I standards followed by Tier II standards. Tier II standards incorporate the state and federal drinking water standards.

The 1997 RAP required the placement of deed restrictions or RCs[1] 1) to prevent non-commercial/industrial uses on the property and any other activity that would impair the remedy's integrity and 2) for the areas above the contaminated groundwater plume, to prevent groundwater extraction and other activities that could result in contact with contaminated groundwater. There are three properties affected by the groundwater plume: two of the properties are owned by MCC/ Koch Industries (one is the plant property and the other is the Mill Creek Pond property), and the third property is owned by the Howmet Property. Koch Industries agreed to implement the RCs on its properties consisting of the plant property and the Mill Creek Pond property per a consent agreement. However, neither MCC/ Koch Industries nor MDEQ were able to reach agreement with Howmet Corporation on the placement of a deed restriction on its property. As a result, in 1999, MCC/Koch Industries petitioned MDEQ to revise the RAP to allow the use of the Muskegon County Sanitation Ordinance to serve as an acceptable IC to restrict the groundwater use on the Howmet property.

The MDEQ agreed to this RAP modification in 2000. Subsequent to the 2000 RAP modifications, the MDEQ conducted further review of the Muskegon County Sanitation Ordinance and concluded that the ordinance required certain modifications to ensure its effectiveness.

Previous FYRs addressed the need for deed restrictions at the Site including the parcel where the former MCC plant area exists, so as to prevent exposure to the residually contaminated soil under the MCC building. In addition, the previous FYR identified a need to update the groundwater regulation/ordinance and a need to review and replace the existing deed restrictions to bring the ICs into compliance with current state requirements.

Currently, ICs have been implemented at the Site which consists of RCs and a groundwater restriction ordinance. The needed changes to the ordinance were formally made and adopted by Muskegon County in 2005. Updated deed restrictions, to prohibit exposure to contaminated groundwater at the plant property and the Mill Pond Creek property, as well as to prevent disturbance of soil beneath the location of the former MCC plant, were proposed and approved as part of the 2009 RAP Amendment (see Appendix D of 2009 RAP). The RCs were subsequently implemented in 2010. Other measures include the use of permanent markers. The main marker is located at the primary entrance to the MCC Plant property (aka Warner Street Property) and identifies the restrictions associated with the Site. In addition, markers have also been placed at each corner of the multi-media cap to assure that the area of the cap can be easily identified.

[1] There terms deed restrictions and restrictive covenants (RCs) are often used interchangeably.

A summary of the ICs currently in-place is provided in Table 3.

Table 3: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in Decision Docs	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil: Capped Area of Site- Former MCC Processing Plant. Multi-Layer Capped Area. Site is fenced.	Yes	Yes	MCC Processing Plant- Multi-Layer Capped Area.	Prohibit interference with the cap; Prohibit use of Site except those uses that are consistent with zoning designation of MC-1 - limited industrial; residential uses prohibited.	Restrictive Covenant recorded at vol (liber 3834 page 958) at county recorder's office on January 22, 2010. Permanent Markers are present at the Site.
Soil: Former MCC property boundary except the capped area cleaned up to commercial/ industrial uses and remedy components. (Much of the area was never impacted by the site but uses are limited by zoning which is for limited industrial and commercial. (Warner Street and Mill Creek Properties). Site is fenced.	Yes	Yes	Former MCC property boundary except the capped area and remedy components	Prohibit use of Site except those uses that are consistent with zoning designation of MC-1; residential uses prohibited.	City of Whitehall Zoning Ordinance and Restrictive Covenant recorded at vol (liber 3834 page 958) at county recorder's office on January 22, 2010. Permanent Markers are present at the Site
Groundwater: Former MCC property boundary. Approx. 20 acres where groundwater exceeds performance standards **within plant** (includes buffer area).	Yes	Yes	Muskegon Chemical property boundary.	Prohibit consumptive use of the groundwater plume area until performance standards are achieved.	Restrictive Covenant recorded at vol (liber 3834 page 958) at county recorder's office on January 22, 2010.
Groundwater: Area of the Site where the groundwater plume exceeds performance standards outside of MCC property boundary known as **the Howmet property** (approximately 82 acres)	Yes	Yes	Howmet property	Prohibit consumptive use of the groundwater plume area until performance standards are achieved.	Sanitary Regulations of Muskegon County, effective April 26, 2005, as amended.
Groundwater: Area of the Site where the groundwater plume exceeds performance standards outside of MCC property boundary known as the **Mill Creek property** (approximately 80 acres, in two parcels) *	Yes	Yes	Mill Creek Property	Prohibit consumptive use of the groundwater plume area until performance standards are achieved.	Restrictive Covenants recorded at vol (liber 2078 page 597, and liber 2078 page 600) at county recorder's office on March 19, 1998.

Table 3: Summary of Planned and/or Implemented ICs					
Media, engineered controls, and areas that do not support UU/UE based on current conditions	**ICs Needed**	**ICs Called for in Decision Docs**	**Impacted Parcel(s)**	**IC Objective**	**Title of IC Instrument Implemented and Date (or planned)**
Site remedial components located in various locations: e.g. groundwater wells	Yes	Yes	Various Locations	Prohibit interference with the remedial systems and monitoring equipment.	Restrictive Covenant recorded at vol (liber 3834 page 958 and liber 3834 page 959) at county recorder's office on January 22, 2010.

* Area is bounded by White Lake Drive to the North, Berquist Road to the S, Simonelli Road to the East and Zellar Road to the West

A summary of IC evaluation activities, along with copies of groundwater ordinance and RCs are found in Appendix G.

Follow-up Actions

An Institutional Control Implementation and Assurance Plan (ICIAP) or similar plan is needed for the Site. The purpose of the ICIAP is to conduct additional IC evaluation activities to ensure that the ICs are effective and properly maintained, monitored, and enforced.

System Operation/ Operation and Maintenance Activities

As part of the 2009 RAP Amendment, an Operation and Maintenance (O&M) Plan and a Long Term Monitoring and Contingency Plan were developed. These can be found in the 2009 RAP Amendment, provided with this report as Attachment 1.

System Operation and Maintenance Activities that have taken place since the last FYR include:

- Adoption of new ICs for soil and groundwater in 2010.
- Operation of the air sparge system during 2009 and 2010, as discussed above.
- Installation of permanent markers at the site, as discussed above.
- Annual inspection of multi-media cap to ensure there was no settling, erosion, or vegetative stress.
- Attempts to re-establish ground cover over multi-media cap by installation of sod.
- Phase 1 well abandonments. Six wells were abandoned and one well casing repaired in October 2010 as part of this phase.
- Phase 2 well abandonments. Air sparge wells were abandoned in September 2011 as part of this phase.
- Two damaged wells were abandoned in September 2012.
- Quarterly monitoring of groundwater and submission of quarterly monitoring reports for the following periods:
    - 2008: First, Second, Third, and Fourth Quarters
    - 2009: First, Second, Third, and Fourth Quarters
    - 2010: First, Second, Third, and Fourth Quarters

- Annual monitoring of groundwater and submission of annual monitoring reports for the following periods:
    - 2011
    - 2012

Figure 4 provided in Appendix B gives a summary of all wells abandoned during 2010, 2011, and 2012. The System Operations and O&M Cost over the past five years are represented in Table 5 below.

Table 5. System Operations and O&M Costs

Dates		Total Cost Rounded to Nearest $1,000
From	To	
January 2008	December 2008	$126,000
January 2009	December 2009	$142,000
January 2010	December 2010	$124,000
January 2011	December 2011	$49,000
January 2012	December 2012	$28,000

III. FIVE-YEAR REVIEW PROCESS

Administrative Components

The PRP was notified of the initiation of the FYR on August 15, 2012. The MCC Superfund Site FYR was led by Carrie L. Geyer, the MDEQ Project Manager for the Site and included the EPA Remedial Project Manager (RPM) Sheri Bianchin and the EPA Community Involvement Specialist (CIC) Don de Blasio.

The review, which began on August 15, 2012, consisted of the following components:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection; and
- Five-Year Review Report Development and Review.

Community Notification and Involvement

A notice was published in the local newspaper, the "White Lake Beacon", on November 18, 2012, stating that a FYR was being conducted, and invited the public to submit any comments to the EPA. Neither the MDEQ nor the EPA received any responses from the public. A copy of the notice has been provided in Appendix C.

The completed FYR will be placed in the information repository located at the White Lake Community Library, 3900 W. White Lake Drive, Whitehall, MI. In addition, a notice will be published in the White Lake Beacon notifying communities of the completion of the FYR and it will also be posted to the EPA's website at:

http://epa.gov/region5/cleanup/muskegonchemical/index.html.

Document Review

This FYR consisted of a review of relevant documents including O&M records and monitoring data, the 1993 Record of Decision (ROD), the 1997, 2000, and 2009 RAPs, consent order, and consent decrees. Applicable soil and groundwater cleanup standards, as listed in the March 1993 ROD and 2009 RAP Amendment, were also reviewed. A summary of documents reviewed can be found in Appendix D.

Data Review

The bulk of the data review consisted of groundwater analytical data from the quarterly and annual monitoring reports. Attempts were made to determine trends, if any, in groundwater contaminant concentrations. MDEQ determined that contaminant concentrations in groundwater have remained relatively steady over the past several years. A copy of the most recent annual monitoring report is included as Attachment 2, "2012 Annual Progress Report". Table 5 of this Attachment provides a summary of the monitoring and sampling data for the Site.

Current Groundwater Action Levels

Previous treatment has resulted in greatly reduced groundwater contamination levels and as a result, active treatment of the site has now ceased. The 2009 RAP amendment resulted in the replacement of Tier 1 Remedial Action Goals (RAGs) with the mixing zone groundwater/ surface water interface (MZGSI) based discharge criteria. See Section IV - Technical Assessment of this report for further details on this topic.

Analytical results continue to demonstrate that site groundwater contaminant levels are in compliance with Tier 1 MZGSI criteria. However, levels continue to exceed the Tier II (drinking water) standards, which are required to be met for site closure. The extent of Tier II exceedances can be seen in Figure 3, provided in Appendix B. As a result, ongoing monitoring and appropriate ICs are required until such time as the groundwater concentrations are below the Tier II criteria. Table 4 summarizes the current remedial goals for the site.

Table 4. Current Site Action Levels

Chemical of Concern	Units	Current Tier I Mixing Zone GSI		Tier II Goal (Drinking Water Criteria)
		Acute	Chronic	
Chlorobenzene	µg/L	850	750	100
1,2-Dichloroethane	µg/L	15,000	-	5
cis-1,2-Dichloroethene	µg/L	-	-	70
trans-1,2-Dichloroethene	µg/L	-	-	100
Tetrachlorethene	µg/L	710	-	5
Trichloroethene	µg/L	3,500	3,200	5
Vinyl Chloride	µg/L	-	-	2
Bis(2-chloroethoxy)ethane (TGDC)	µg/L	26,000	23,000	5
Bis(2-chloroethyl) Ether (Chlorex)	µg/L	18,000	770	2

Site Inspection

The site inspection was conducted on October 3, 2012, and was attended by Robert L. Franks and Carrie L. Geyer of the MDEQ, Sheri Bianchin of the EPA, Dan Greene and Mary Crosby-Davies of FTC&H, and Michael Scates of Koch Remediation and Environmental Services. The purpose of the inspection was to assess the protectiveness of the remedy, provide a forum for discussion between MDEQ, EPA, and KCC representatives, and to discuss the five-year review process.

During the Site visit, the attendees toured the grounds of the former MCC process plant, inspected the cap and many of the monitoring wells located on the plant Site property, observed monitor well sampling activities, and inspected the Mill Pond Creek property. Results of the inspection revealed two items that warranted follow-up actions by KCC. Those items included:

1. Poor establishment of cover on the capped area. This would require re-seeding or sodding of the capped area. FTC&H reseeded the area following the October 3, 2012 Site inspection and will follow up in the spring of 2013 to assure establishment of the vegetation.
2. Several signs had fallen off from the fence surrounding the property and need to be reinstalled. This issue was addressed immediately following the October 3, 2012 Site inspection.

The Site inspection checklist can be found in Appendix F.

Interviews

During the FYR process, interviews were conducted with representatives for the current landowner: Mary Crosby-Davies and Chris Huver of Fishbeck, Thompson, Carr, & Huber. The purpose of the interviews was to document any perceived problems or successes with the remedy that has been implemented to date. Interviews were conducted on October 3, 2012, during the Site inspection and on January 17, 2013, a follow-up phone conversation with Mary Crosby-Davies took place.

During these interviews the parties discussed the history of the Site, status of remedial activities, and work that still needs to be conducted, primarily involving improving the cover in the area of the cap. Complete interviews are included in Appendix E.

IV. TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents? Yes.

Remedial Action Performance

Review of documents, Applicable or Relevant and Appropriate Requirements (ARARs), risk assumptions, groundwater monitoring data and the results of the Site inspection indicate that the remedy has functioned as intended in the 2009 RAP Amendment.

Tier I MZGSI RAGs, established as part of the 2009 RAP Amendment, have been achieved. At this time, only concentrations exceeding Tier II RAGs (drinking water standards) remain, resulting in the need to continue to monitor until such time as the

Tier II RAGs are achieved throughout the plume.

System Operations/O&M
System operations at the Site consists of an annual groundwater sampling event, cap maintenance and inspection, and inspection of fence and permanent markers to assure that they remain in-place and undamaged. These activities are adequate to determine the protectiveness and effectiveness of the remedy.

Opportunities for Optimization
The exposure pathway issues have been addressed, the Site remedy is functioning as intended, and the impacted area has been shown to be stable. As a result, the Site has recently moved from quarterly to annual monitoring.

Early Indicators of Potential Issues: None

Implementation of Institutional Controls and Other Measures
Access controls, to prevent exposure to site related soil contamination, are intact and functional. At the MCC Site, access controls consist of Site fencing and the existing cap. Institutional controls, through the use of restrictive covenants and a county groundwater use ordinance are in-place and appear to be functioning as intended.

The 2009 RAP Amendment provided an update to the restrictive covenant on KCC's Warner Street property. The RC was modified to prevent future development of the residually contaminated soil under the process building. Other measures include the use of permanent markers. Restrictive covenants are in-place which restrict the land and groundwater use at the Site. A groundwater restriction regulation ordinance is currently in-place. Based on inspections, monitoring and interviews with city officials, there appears to be compliance with the land and groundwater use restrictions. The ICs appear to be functioning as intended. Long-term protectiveness requires compliance with the ICs. An ICIAP is needed to ensure that 1) additional IC evaluation activities are conducted to ensure effectiveness of the ICs and 2) long-term stewardship is conducted. The plan must include a mechanism for inspecting and monitoring compliance with land use restrictions and groundwater restrictions along with enforcement, if needed, of the restrictions.

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?

Changes in Standards and To Be Considereds (TBCs)

The property is currently zoned for industrial use; however, the land is currently fenced and is vacant. Uses on adjacent parcels are not anticipated to impact the landfill.

The Tier II groundwater standards allowing unlimited use remain unchanged. The Tier 1 RAGs were modified as part of the 2009 RAP amendment to allow for groundwater/surface water mixing zone.

The original Tier 1 groundwater RAGs were established in the 1997 RAP using a computer model. The model was used to derive what has been termed "attenuated" GSI values. The attenuated GSI value was the concentration of a specific chemical constituent in groundwater such that by the time the groundwater reached Mill Pond Creek, the concentration of the chemical constituent will be equal to or below the published generic GSI value for that compound.

There is now a standardized method in-place to evaluate contaminated groundwater discharges to surface water bodies. This evaluation is called a mixing zone determination. The procedure for such a determination is detailed in the MDEQ's Remediation and Redevelopment Division Operational Memorandum #17 (see Attachment 3).

KCC requested a mixing zone determination for the MCC Site and site-specific discharge criteria were developed for the COCs at the Site based on this determination. In the 2009 RAP amendment, KCC requested the replacement of the Tier 1 RAGs with the mixing zone based discharge criteria. These revised criteria were approved as part of the 2009 RAP amendment and do not impact the protectiveness of the remedy. Table 6 summarizes the relationship between the old and new Tier I criteria.

Table 6. Revised Tier I Remedial Action Goals per 2009 RAP Amendment

Chemical of Concern	Units	Old Tier I Criteria			Current Tier I Mixing Zone GSI	
		Plant Area	Purge Well B Area	Mill Pond Creek	Acute	Chronic
Chlorobenzene	µg/L	1,362	670	71	850	750
1,2-Dichloroethane	µg/L	4,144	2,563	560	15,000	-
Tetrachlorethene	µg/L	14,829	3,106	22	710	-
Trichloroethene	µg/L	1,948	954	94	3,500	3,200
Bis(2-chloroethoxy)ethane (TGDC)	µg/L	16,600	8,017	500	26,000	23,000
Bis(2-chloroethyl) Ether (Chlorex)	µg/L	67	36	5.9	18,000	770

Changes in Toxicity and Risk Assessment Methods

There have been no changes in toxicity factors or standardized risk assessment methodologies that could affect the protectiveness of the remedy for the Site.

The exposure assumptions used to develop the Human Health Risk Assessment included both current exposures and potential future exposures. The risk assessment showed there is no present exposure pathway to MCC-related contaminants under existing conditions. Two potential future exposure settings identified in the risk assessment posed an excess lifetime cancer risk greater than 1×10^{-6}. One exposure setting is the potential future development of the Site and occupational or residential exposure to contaminated subsurface soil through direct contact or ingestion. The second setting is future residential development on the Site and use of contaminated groundwater for potable purposes.

The risk assessment did not identify unacceptable risk to human health or aquatic life as a result of present discharge of the groundwater plume to Mill Pond Creek. However,

specific remedial objectives and goals were developed for this exposure route so that future discharge of groundwater to the creek would not pose unacceptable risk.

Changes in Exposure Pathways and Other Contaminant Characteristics
There have been no changes in the land use, routes of exposure, identified contaminants or contaminant sources, possible byproducts of the remedy, or physical site conditions in a way that could affect the protectiveness of the remedy at the MCC Site.

Expected Progress Toward Meeting Remedial Action Objectives (RAOs)
The remedy is progressing as expected.

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

No other information, such as additional ecological impacts, unforeseen weather events or land use changes have been identified as part of this five-year review that would call into question the protectiveness of the remedy.

Technical Assessment Summary

The review documents and data, along with information gathered during the Site inspection indicate that the remedy has performed as anticipated in the RAP. Threats posed by impacted soils have been addressed by the construction of the multi-media cap. Tier 1 groundwater values have been replaced with groundwater mixing zone criteria and the new criteria values have been achieved throughout the plume. Access restrictions and institutional controls are in-place and function as intended. Monitoring is appropriate and ongoing.

No additional active remedial activities are planned at this time. If concentrations of site related COCs increase to unacceptable levels, actions outlined in the Contingency Plan would be undertaken to address the spike in concentrations.

As mentioned, the MCC remedy is protective of human health and the environment in the short-term. There is currently no known exposure pathway to MCC-related contaminants under existing conditions. The remedy is functioning as intended. To ensure long-term protectiveness several follow-up actions are required:

(1) evaluation of the vapor intrusion (VI) pathway is recommended to be performed as a follow-up action to help ensure that long-term protectiveness is maintained. Based on the remaining concentrations and known site conditions (i.e., soil type, depth to groundwater), it is not anticipated that VI will pose a risk. However, a study is still recommended to be performed to assure that the pathway has been adequately addressed.

(2) An IC plan such as an ICIAP must be prepared to ensure LTS. This plan will include the results of conducting additional IC evaluation activities and planning for additional ICs, if needed, and to plan for on-going monitoring, maintenance and enforcement of ICs.

V. ISSUES/RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Table 7: Issues and Recommendations/Follow-up Actions

OU #	Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
						Current	Future
Site-Wide	Vapor Intrusion	Conduct a study to address the relevance of the VI pathway for long-term protectiveness.	PRP	MDEQ	May 1, 2014	No	Yes
Site-Wide	Institutional Controls	Submit an ICIAP to address additional IC evaluation activities, and preparation of an LTS plan.	PRP	MDEQ/ EPA	May 1, 2014	No	Yes

In addition, the following recommendation is made that *improves the effectiveness of the remedy* but does not affect protectiveness:

Establish better ground cover on capped area at former MCC Processing Plant Site. Follow up in the spring of 2013 to determine if additional action is needed.

I. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement
Protectiveness Determination: Short-Term Protective
Protectiveness Statement: The MCC remedy is protective of human health and the environment in the short-term. There is currently no known exposure pathway to MCC-related contaminants under existing conditions. The remedy is functioning as intended. To ensure long-term protectiveness several follow-up actions are required: (1) evaluation of the vapor intrusion (VI) pathway is recommended to be performed. Based on the remaining concentrations and known site conditions (i.e., soil type, depth to groundwater), it is not anticipated that VI will pose a risk. However, a study is still recommended to be performed to assure that the pathway has been adequately addressed. (2) an Institutional Controls Implementation and Assurance Plan (ICIAP) or similar IC plan must be prepared to ensure effective ICs have been implemented and to ensure long-term stewardship of the Site. This plan will include the results of conducting additional IC evaluation activities and planning for additional ICs, if needed, and to plan for on-going monitoring, maintenance and enforcement of ICs.

II. NEXT REVIEW

The next FYR report for the MCC Superfund Site is required five years from the completion date of this review.

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APPENDIX A – HISTORY

A. Site Chronology

B. Background

=>Physical Characteristics, Geology, Hydrology, Land and Resource Use, History of Contamination, Initial Response

C. Remedial Action

=>Remedy Selection, Remedy Implementation- Groundwater, Remedy Implementation - Soil

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A. SITE CHRONOLOGY

Date	Activity
1975	MCC begins production at facility.
1977	**Initial discovery of problem or contamination:** MCC hires Williams and Works to conduct an investigation at the facility to install an industrial water supply well and observation wells to monitor groundwater quality. The investigation discovered MCC chemicals in the groundwater. The primary chemicals of concern are: • 1,2-dichlorethane (1,2-DCA) • bis(2-chloroethyl)ether (Chlorex) • bis(2-chloroethoxy)ethane (TGDC)
1978	Leaking floor drain and collection sump in process building identified as probable release point.
1977-81	Continued study by Williams and Works determines direction of groundwater movement and conducts preliminary assessment of the nature and extent of groundwater contamination down-gradient of facility. Williams and Works installs and samples 32 monitoring wells and drills and samples 17 borings.
1981	After environmental sampling is conducted by Williams and Works, surface water contamination is discovered at Mill Pond Creek and is attributed to plume discharge. MCC begins remediating groundwater contamination by pumping contaminated groundwater near facility and discharging it to the Whitehall Area Publicly Owned Treatment Works (POTW).
1983	MCC enters a plea agreement with Muskegon County to implement a plan for groundwater investigation and design of a more comprehensive groundwater extraction system.
1983-84	Groundwater extraction capacity added (extraction wells PW-B, PW-C).
1984-85	PW-D installed. Mill Pond Creek well point interception system installed.
1985	KCC acquires MCC facility and changes name to Koch Chemical Company.
1986	The Michigan Department of Natural Resources (MDNR) and KCC enter into a consent agreement to continue groundwater remediation and investigation activities.
1987-89	KCC expands the extraction system capacity at Mill Pond Creek based upon additional studies performed.
1989	MDNR evaluation concludes that groundwater extraction system next to Mill Pond Creek is not adequately protecting surface water. Recommends site for National Priorities List (NPL).
February 21, 1990	**Final NPL Listing:** EPA places MCC site on NPL.

Date	Activity
1990	KCC develops work plan for remedial investigation/feasibility study (RI/FS). KCC retains CH2M HILL to perform the RI/FS and holds kickoff meeting with MDNR. Revises work plan. KCC performs surface geophysics and well evaluation survey at the site.
March 1991	KCC enters into new consent agreement with the MDNR to perform RI/FS and Interim Remedial Action (IRA) to prevent further plume discharge to Mill Pond Creek.
Summer 1991	RI and IRA field program.
October 1991	Engineering Evaluation/Cost Analysis (EE/CA) report for IRA submitted.
December 1991	Draft RI report submitted.
April 1992	Public comment ROD for IRA. The MDNR selects improved extraction system at Mill Pond Creek.
Fall 1992	IRA construction. Add three new extraction wells (IW-1, IW-2 and IW-3) along north bluff of Mill Pond Creek.
January 1993	Bluff wells activated at average flow rate of 66 gallons per minute (gpm).
March 10, 1993	**ROD Signature:** MDEQ issues ROD for IRA (EPA/ROD/R05-93/240)..
1993-94	Bench-scale soil flushing tests and SVE/air sparging pilot test conducted to address vadose zone soils beneath process building. Extraction well PW-E added to sever source area from remainder of plume.
January 1994	The MDNR releases Public Comment Draft Risk Assessment. Annual sampling of Mill Pond Creek monitoring system and IRA extraction wells demonstrates bluff wells have cut off plume. No MCC contaminants of concern (COCs) detected in Mill Pond Creek.
January 1995	**Remedial Investigation/Feasibility Study Complete:** Final RI and FS report submitted to the MDNR (in September 1995 MDNR became MDEQ).
February 1995	The MDEQ selects expanded groundwater extraction/treatment and in situ technologies as preferred remedies for groundwater and soil.
Spring-Fall 1995	**Remedial Design Start:** KCC proceeds with remedial design and begins drafting RAP.
Fall-Winter 1995	**Remedial Design Complete:** Remedial design completed in late summer. Construction of conveyance piping and installation of new extraction wells (EXT1, EXT2 and EXT3) and associated monitor wells.

Date	Activity
Spring 1996	**<u>On-Site Remedial Action Construction Start:</u>** Air stripper and new carbon vessels arrive and new system shakedown begins. Expanded extraction and treatment system brought on line in May at flow rate of 410 gpm. Draft RAP submitted to the MDEQ in June. Samples of process building vadose zone soils show that about 95 percent of volatile organic compounds (VOCs) removed by SVE. In situ thermal desorption pilot tests begin in the vicinity of process building sump to address bis (2-chloroethyl) ether (Chlorex) and bis (2-chlorethoxy) ethane (TGDC).
Winter 1997	Vadose zone soil sampling results in process bldg. sump area demonstrates effectiveness of in situ thermal desorption in reducing concentrations of Chlorex and TGDC but higher heat needed to further reduce TGDC. Additional heating and blower capacity added to increase effectiveness and expand treatment area.
Spring-Summer 1997	PW-F installed in process building in May to expedite groundwater cleanup in plant area. Tetrachloroethylene (PCE) pocket delineated in shallow groundwater at east end of process building following an extensive groundwater grab sampling investigation. Two additional extraction wells (PW-G and PW-H) and seven additional monitor wells (KCC 30 through KCC36) installed to expedite and monitor progress of PCE cleanup. Additional capacity added to thermal desorption system and treatment area expanded.
June 1997	**<u>Remedial Action Plan (RAP) Approved</u>**
November 25, 1997	**<u>Consent Decree:</u>** Effective date of remedial action consent decree between the MDEQ and KCC filed in U.S. District Court for the Western District of Michigan. Case No. 5:97-CV-211. The 1991 RI/FS and IRA and all previous consent decrees terminated and superseded by this agreement.
1998	**<u>First Five Year Review:</u>** First five year review completed (March 13, 1998). Sequential expansion of the in situ thermal desorption system following sampling in February and May to verify achievement of RAGs. Continued operation and adjustments to the groundwater extraction system.
April 1999	Additional groundwater investigative work conducted at the eastern end of the process building to refine location of PCE around PW-H.
Summer 1999	Extensive soil verification sampling in July confirms industrial direct contact and groundwater protection values achieved for vadose zone soils beneath the process building. Active soil remediation terminated in October. Install PW-I & KCC37 east of PW-H and install EXT4 between EXT3 and IW1 in Mill Pond Creek Area to attack selected plume remnants.

Date	Activity
December 1999	KCC petitions the MDEQ to terminate active soil and groundwater remediation based on achieving remedial goals in soils and groundwater. The MDEQ generally agrees but administrative issues with RAP format prevent the MDEQ from being able to grant request.
2000	Groundwater extraction continued at selected plume remnants.
June 2000	**Remedial Action Plan (RAP) : Revision #1**
December 2000	**Consent Decree Amendment:** Amendment to the consent decree, entered between KCC and the MDEQ to incorporate the Muskegon County Ordinance as an accepted institutional control to prohibit water wells, is approved by the U.S. District Court for the Western District of Michigan, Southern Division.
2001	Negotiations on scope of long-term monitoring and revising cleanup criteria consistent with Part 201 criteria. Mixing zone determination request submitted.
Spring/Summer 2002	Mixing Zone GSI criteria provided by the MDEQ. KCC again petitions for and the MDEQ approves request to terminate active groundwater remediation (May 3, 2002). Prepare and submit draft RAP and long-term monitoring plan.
2003	**Second Five Year Review:** Second five-year review completed (April 4, 2003). KCC voluntarily installs air sparge system to address plant area PCE plume remnant. Location of City of Whitehall municipal well #4 and the City's wellhead protection program become an issue. KCC and MDEQ begin discussions with the City to resolve these issues.
2005	KCC and City of Whitehall abandon municipal well #4 and install new municipal well in another location in the city. Amendments to Muskegon County Sanitation Ordinance adopted. These changes address concerns expressed by MDEQ in 2003 five-year review.
2006	KCC demolishes old production plant and constructs a multilayer cap over the area. MDEQ approves temporary shutdown of air sparge system.
2007	MDEQ and KCC make substantial progress on changes to RAP to adopt mixing-zone based groundwater-surface water interface criteria and modify or replace many site related documents related to the remaining issues at the site.
January 2008	Fishbeck, Thompson, Carr, & Huber replace Barr as technical consultant on the project.
April 2008	**Third Five Year Review:** Third five-year review completed (April 4, 2008).

Date	Activity
May 2008	Groundwater vertical aquifer profile sampling was conducted to evaluate presence and distribution of PCE in groundwater
December 2008	Draft RAP Amendment submitted to MDEQ.
April 2009	Air Sparge System began operation to meet requirements of the O&M Plan of the RAP Amendment.
May 2009	Final RAP Amendment submitted to MDEQ.
August 2009	Public Availability Session held in Whitehall to present overview of RAP Amendment, discuss the progress of the remediation, and answer questions from the public.
November 2009	Air Sparge System shut down for winter.
December 2009	Signed GSI Mixing Zone Authorization submitted to MDEQ
January 2010	**Restrictive Covenants Revised:** Restrictive Covenants were filed with Muskegon County Register of Deeds and certified copies were submitted to MDEQ. **2009 RAP Amendment:** RAP Amendment dated May 8, 2009 was approved.
February 2010	All land use restrictions were completed and sent to the City of Whitehall and Fruitland Township Clerks and Zoning Authorities in accordance with Section 2.4.2 of the 2009 RAP Amendment.
April 2010	Air Sparge System was put back in operation to meet requirements of the O&M Plan of the 2009 RAP Amendment. Michael Scates replaces Marc Coggeshall as the Koch Remediation & Environmental Services Project Coordinator.
October 2010	Six wells were abandoned in accordance with the Phase I well abandonment activities required by the O&M Plan of the 2009 RAP Amendment. MCC-14 casing was repaired. Concrete support structures for mounting permanent markers were constructed.
November 2010	Sparge System Shut Down
June 2011	Permanent marker installation was completed.
September 2011	The above ground piping associated with the air sparge system was removed. Following the removal of the above ground system, the air sparge wells were also abandoned in accordance with the Phase II well abandonment activities required by the O&M Plan of the 2009 RAP Amendment.
September 2012	Damaged wells MCC-26 and MCC-33d were abandoned.
October 2012	Cap Re-seeded.
December 2012	Michael Christopher replaces Michael Scates as the Flint Hills Resources/Koch Remediation & Environmental Services Project Coordinator. Linda Childers replaces Nicole Cory as the Koch Remediation Project Coordinator.

B. BACKGROUND

Physical Characteristics

The former MCC production facility consists of 19.6 acres located at 1725 Warner Street on the southern outskirts of Whitehall, in Muskegon County, Michigan. The site is located approximately 0.5 mile north of the Mill Pond Creek, and is close to White Lake and Lake Michigan. The area around the former plant is zoned light industrial, and the land to the north and west is occupied by the Whitehall Industrial Park. Howmet Corporation owns and operates production facilities on property west of the site. The land south of the plant is owned by CSX Corporation, south of which are Whitehall Department of Public Works facilities. The surrounding area is largely residential.

Geology/Hydrology

In general, the geology at the site consists of the following units beginning at grade:

- A light red brown to gray brown, medium to fine grained sand unit that typically ranges in thickness from 60 to 120 feet, although in certain areas is as little as 40 feet and in others up to 210 feet thick. The sand unit is sometimes silty and contains discontinuous lenses of silty clay and gravelly sand. The clay lenses range in thickness form 1 foot to 10 feet. Gravelly sand lenses usually range in thickness from 10 to 25 feet.
- A gray or brown gray, stiff silty clay (Thickness unknown) with lenses of medium to very fine grained silty sand. The borings penetrated this clay unit below the sand anywhere from 2 to 60 feet. In general, the sand lenses in the clay layer are siltier and finer grained than the overlying sand unit. The sand lenses range in thickness from 5 to 40 feet and are usually about 15 feet thick.

Based on the depth to the basal clay and the composition of the overlying sand unit at several boring locations, there appears to be a buried erosional channel that has partially eroded the clay and extends south from the MCC plant area to just north of White Lake Drive. The channel appears to be about 200 feet wide and well defined.

A silt and clay layer 1 foot to 10 feet thick exists at depths of about 20 to 50 feet below grade near Mill Pond Creek. Unlike other clays within the sand unit, the layer appears to be continuous near the creek.

It appears that the uppermost aquifer is the sand unit that extends from the ground surface to the basal clay. The thickness of the unit ranges from 40 to 210 feet. The depth to groundwater ranges from 45 feet at the plant site to zero feet near the creek. The average saturated thickness of the aquifer is 85 feet, ranging from 50 feet outside the erosional channel to 175 feet within the channel. The lower clay unit, based on its estimated thickness, composition, and continuity appears to be a confining layer. Although the clay unit contains several water-bearing sand lenses, the lenses do not appear to be continuous and are confined by the surrounding clay.

The general direction of groundwater flow from the site is southwest toward Mill Pond Creek, located about 0.5 mile south of the site. Flow does not continue beyond Mill Pond creek in either the shallow or deep portions of the aquifer, but

discharges to the creek or possibly follows the creek valley near Mill Pond. Surface water within three miles downstream of the site is used for recreational activities.

Land and Resource Use
The MCC plant began producing specialty chemicals in 1975. Manufacturing was discontinued, and the plant was decommissioned at the end of 1991. Since 1991, no operations have been active at the site, and no process equipment or industrial chemicals remain on site.

The land use of the surrounding area is industrial, commercial and residential. The area around the plant is zoned light industrial.

Groundwater is used as a drinking water source, and private and public wells are located in the vicinity

History of Contamination
Groundwater contamination was initially discovered in 1977 during testing for installation of an industrial water supply well. A 1980 hydrogeologic investigation identified three primary organic contaminants of concern in the groundwater and the probable source of contamination was identified as a leak in the drainage system inside the Muskegon Chemical Company manufacturing facility, which was repaired. These leaks contaminated the local water table (upper) aquifer near the plant. Later investigations tracked the groundwater contaminant plume approximately one-half mile south southwest to its discharge point in Mill Pond Creek. Contamination was detected in both the soil and groundwater. The COCs for the Site are chlorobenzene, 1,2-DCA, Chlorex, TGDC, toluene, PCE and trichloroethene (TCE).

Initial Response
From 1977-1981, a hydrogeological investigation was conducted which consisted of installing and sampling 32 monitoring wells and 17 soil borings. The investigation determined the direction of groundwater flow toward Mill Pond Creek, provided a preliminary assessment of the groundwater contamination, and determined that surface water contamination was present in Mill Pond Creek. From 1981 to 1989, groundwater remediation was conducted by pumping and discharging to the Whitehall Area publicly owned treatment works (POTW). In 1983, MCC entered a plea agreement with Muskegon County to implement a plan for groundwater investigation and design of a more comprehensive extraction system.

In 1986, KCC, who had acquired the property in 1985, entered into a consent agreement with the MDNR to continue groundwater remediation and investigation activities. The system was expanded several times with additional extraction wells, but in 1989 the MDNR concluded that the extraction system was not adequately protecting surface water and recommended the site for the NPL. The site was finalized on the NPL on February 21, 1990.

In March 1991, KCC entered into a new consent agreement with the MDNR to perform RI/FS and IRA to prevent further plume discharge to Mill Pond Creek. The plant ceased operations and was decommissioned in 1991. Throughout 1990 and 1991 the RI and IRA were completed, and April 1992 began the public comment period. IRA construction was performed in 1992, and activated in January 1993. The ROD was issued for the site on March 10, 1993.

Basis for Taking Action

Hazardous substances that have been detected in the site soil and groundwater include:

> Clorex
> 1,2-DCA
> Chlorobenzene
> TCE
> PCE
> TGDC

Contaminated groundwater has discharged to Mill Pond Creek downgradient from the site, and water supply wells are present in the vicinity of the site.

The risk assessment for the site showed there is no present exposure pathway to MCC-related contaminants under current conditions. However, there are two potential exposure pathways which pose a carcinogenic risk. One potential exposure setting is the future development of the site and occupational or residential exposure to contaminated subsurface soil through direct contact or ingestion. The second potential exposure route is the future use of groundwater as a potable water source at the site.

The risk assessment did not identify unacceptable risk to human health or aquatic life as a result of the discharge of the groundwater plume to Mill Pond Creek.

Table 1. Summary of WasteLAN Protectiveness Status

Type of WasteLAN Regional Review	Date of most recent Review	Status Type	Status Determination
Human Exposure Indicator:	Feb 28, 2013	Human Exposure Survey Status	Current Human Exposure Controlled
Groundwater Migration Indicator:	Feb 28, 2013	Groundwater Migration Survey Status:	Contaminated Groundwater Migration Under Control
		Ready for Reuse Determination Status:	Protective For People But Not Site-Wide Ready For Anticipated Use

C. REMEDIAL ACTIONS

1. Remedy Selection

Following the listing of the MCC site on the NPL in 1990, a work plan was developed for RI/FS. In March 1991, a new consent agreement was filed to perform RI/FS and IRA to prevent further plume discharge to Mill Pond Creek. Following IRA activities,

the ROD was issued on March 10, 1993. Based on the RI/FS, expanded groundwater extraction/treatment and in situ technologies are selected for site remediation. A remedial action consent decree was filed November 25, 1997, between KCC and the MDEQ. The consent decree was amended in December 2000 to incorporate the Muskegon County Ordinance as an accepted IC to prohibit water wells. Remedial action continued until the MDEQ provided interim approval of the request to terminate active groundwater remediation on May 3, 2002.

2. Remedy Implementation - Groundwater

Two remedial actions were implemented at the site to control the migration of the MCC plume. The first was implemented in 1986 as a result of a consent agreement between the MDNR and KCC. This action included the installation of four groundwater extraction wells along the axis of the plume (purge wells PW-A, PW-B, PW-C, and PW-D) and a well point system along the bank of Mill Pond Creek. The second was an IRA pursuant to the 1990 Consent Order between KCC and the MDNR. Under the IRA, three new interception wells (IW-1, IW-2, and IW-3) replaced the well point system in 1992. An additional well (PW-E) was installed near the plant in 1993 to control migration of contaminated groundwater from this area.

The ROD was issued following IRA activities in March 1993. Prior to the 1996 remedial action, groundwater was treated via liquid phase carbon and discharged to the sanitary sewer under an existing permit with the Muskegon County Wastewater Treatment System. The maximum allowable discharge was 105 gpm, which had been the limiting factor controlling groundwater withdrawal rates and aquifer restoration.

By 1996, monitoring data showed that previous response actions had successfully cleaned up certain areas of impacted groundwater. However, pockets of elevated COCs remained in four areas: the plant area, Howmet North, Howmet South, and the area south of White Lake Drive termed the Mill Pond Creek area. These areas became the focus of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial action for groundwater.

Enhanced groundwater extraction focusing on the four plume remnants was the remedy selected at the conclusion of the FS. The remedy has three basic components: extraction, treatment of extracted groundwater to criteria defined in the RAP and discharge. The existing system required major upgrades for remedial goals to be achieved in a reasonable amount of time.

Extraction

Modeling conducted during the FS showed that the rate of groundwater extraction needed to be increased by a factor of four, from roughly 105 gpm to more than 400 gpm. The existing extraction wells were not designed to achieve these flow rates, so additional wells were designed and installed. Modeling showed that three strategically placed high capacity wells (EXT1, EXT2, and EXT3) combined with the three IRA wells would greatly accelerate mass removal and maintain the IRA requirement of preventing plume discharge to Mill Pond Creek. The design flow rate of the system was 420 gpm.

The three new high capacity extraction wells, two reinjection wells (INJ1 and INJ2), and 11 new monitoring wells were installed during the winter of 1995/1996. Step drawdown and pump tests were conducted to determine maximum and optimal pumping rates for each well. It was determined that EXT1 and EXT 2 could both be pumped at maximum rates of 300 gpm, and EXT 3 could be pumped at 75 gpm. Conveyance lines were also installed at this time. Treatment system upgrades occurred during the late winter and during the spring of 1996. Extraction rates from the wells are shown in Table 2.

TABLE 2

Initial Flow Distribution of 1996 Groundwater Remediation System
Muskegon Chemical Company NPL Site
Remedial Action Completion Report

Well	Flow Rate (gpm)
PWE	31
EXT1	150
EXT2	100
EXT3	70
IW1	23
IW2	23
IW3	23
	420

Discharge

To achieve the four-fold increase in groundwater extraction, it was necessary to identify an alternate discharge point. By 1996, the volume that could be discharged to the POTW had been lowered to 80 gpm, and up to 420 gpm of discharge volume was needed to accelerate plume cleanup. The discharge option selected was injection of treated water back into the aquifer under an MDEQ permit exemption. FS modeling and pre-design aquifer tests indicated that two high capacity injection wells located within the plume footprint, INJ1 and INJ2, could accept all of the projected flow.

Treatment

To achieve the non-detect injection standards specified in the permit exemption, two additional 10,000-lb liquid phase carbon vessels (for a total of four vessels), air stripping, and vapor phase carbon treatment were added to the treatment system. Air stripping was needed to remove 1,2-DCA, as well as other VOCs, because calculations showed that at anticipated influent concentrations, 1,2-DCA breakthrough would occur at a frequency that would make stand-alone granular activated carbon (GAC) treatment cost prohibitive if carbon were to be used alone.

1997 Upgrades

Extraction well PW-F was added inside the process building in May 1997 to accelerate aquifer restoration in the Plant Area. PW-F has a maximum sustainable pumping rate of 60 gpm. In response to an area of elevated PCE concentrations identified beneath and east of the process building, two additional extraction wells (PW-G and PW-H) were added and brought on line during October 1997. These

wells were similar in construction to PW-F. At the end of 1997, eight extraction wells were pumping a total rate of 390 gpm, as shown in Table 3.

TABLE 3

MCC Extraction Well Flow Balance c. 1997
Muskegon Chemical Company NPL Site

Well	Flow (gpm)
EXT-1	90
EXT-2	100
EXT-3	50
IW-1	20
IW-2	0
IW-3	0
PW-E	20
PW-F	30
PW-G	30
PW-H	30
Extracted	390
INJ-1	210
INJ-2	170
POTW	10
Discharged	390
Net	0

The success of PW-F in cutting off the process building source area and its contribution to the restoration of groundwater between PW-F and PW-E (a distance of about 150 ft) was evident from the groundwater quality in KCC 5S and PW-E which by March 1998 had fallen below target detection limits (TDLs). As a result, pumping was discontinued at PW-E and flow allocated to EXT2 to accelerate COC removal in the Howmet North plume remnant. Similarly, pumping was discontinued at PW-G shortly after installation because concentrations of PCE in PW-G and surrounding monitoring wells fell to below Tier 2 RAGs. The short duration of pumping, demonstrated that the occurrence of PCE in the PW-G was likely a small isolated spill that probably occurred during the 1992 plant decommissioning.

Final Upgrades – 1999

Two additional wells were added during August 1999:

- EXT4 is located equidistant between EXT3 and IW1 in the Mill Pond Creek area. It is similar in construction to EXT3. The purpose of EXT4 was to accelerate cleanup of the plume remnant south of White Lake Drive. It has a maximum sustainable pumping rate of 60 gpm.
- PW-I was installed in the plant area to expedite removal of the PCE plume remnant in the eastern portion of the plant area. PW-I, located approximately 75 feet east of PW-H, focuses on the plume remnant in the vicinity of monitoring well KCC37. Its construction and pumping rates are similar to PW-F, PW-G, and PW-H.

2003 Air Sparge System Installation and Operation

Although groundwater PCE concentrations in the plume remnant on the plant property were below Tier 1 RAGs, KCC voluntarily installed an air sparge system in 2003 to speed the removal of this plume and prevent its migration off property. The air sparge system successfully removed a great portion of the plume remnant in only approximately three years of operation. SVE operation ceased in 2006 temporarily, as KCC and MDEQ evaluated whether PCE concentrations would rebound and what would be appropriate permanent shutdown criteria for the air sparge system.

3. Remedy Implementation - Soil

The only area of the site where soil impacts were identified was the vadose zone and capillary fringe beneath the process building. These areas were the focus of soil remedial activities which began as voluntary SVE pilot tests in February 1993, and progressed to voluntary air sparge testing during January 1994. These tests occurred in conjunction with preparing the FS. Results of the pilot tests are detailed in the *Feasibility Study Report* (CH2M HILL 1995).

The FS evaluated several remedial technologies and developed six alternatives which included:

- No Action
- Capping
- Excavation and Offsite Disposal
- Soil Vacuum Extraction and Air Sparging
- Soil Vacuum Extraction, Excavation, and Offsite Disposal
- Excavation, Onsite Thermal Desorption, and Onsite Disposal

KCC chose to pursue in situ technologies over excavation, treatment and disposal for safety and cost reasons. Because of the mix of volatile and semivolatile compounds (SVOCs) in vadose zone soils, in situ technologies were largely limited to chemical oxidation or in situ thermal desorption combined with SVE. SVE is a proven technology for removing VOCs, but it is only marginally effective in removing SVOCs from the soil matrix because of their low volatility at ambient soil temperatures. Because of the potential drawbacks associated with chemical oxidation, in situ thermal desorption/SVE was the selected remedy.

Results of the early pilot tests showed that both SVE and air sparging were effective in removing VOCs, but they had only negligible effect on the primary SVOCs Chlorex and TGDC. Subsurface soil samples collected in 1995 showed that SVE alone had successfully removed more than 97 percent of the VOCs from beneath the process building, but concentrations of Chlorex and TGDC were essentially the same as before SVE testing began. It was clear that a different technology was needed to remove the SVOC fraction. Chemical oxidation was considered and dropped due to safety and residuals management issues. This left in situ thermal desorption as the only viable candidate.

Pilot testing of in situ thermal desorption as a remedial technology for remediating the SVOCs began in February 1996, and followed the procedures outlined in the *Hot Air Injection & SVE Pilot Study Workplan* (NSI 1996). The basic hot air injection/SVE operating principal is to heat the soil matrix sufficiently to mobilize the SVOCs by

injecting heated air and withdraw more air than is being injected to maintain a net inward gradient beneath the process building. Extracted air containing volatilized COCs is passed through vapor phase carbon and vented to the atmosphere. Emissions were monitored for breakthrough.

The initial plan of operation specified sequential remediation that injected hot air to raise the temperature of a given block of soil and withdrew the vapors from a single direction. Target temperatures were maintained until soil vapor monitoring suggested target analytes were no longer being volatilized, at which point confirmatory soil samples were collected. Once target cleanup levels were achieved, injection and extraction moved to an adjacent location, but the heated soil mass of the previously remediated zone was always taken advantage of to more efficiently and rapidly raise soil temperatures.

Chlorex and TGDC have boiling points of 350° F and 450° F, but pilot testing conducted during 1996 demonstrated that significant volatilization of Chlorex occurred at temperatures between 75° F and 100 ° F. However, it was still necessary to heat the soil to high temperatures to drive TGDC off of the soil matrix. Injecting heated air at temperatures of up to 500° F was selected as the best means of heating the soil.

The final design involved installing a hot air injection well surrounded by up to three SVE wells spaced 120° apart. The SVE wells were placed within 10 feet of the injector well, which was determined to be the optimal treatment radius from pilot tests. All wells were constructed of fully-penetrating 2-inch diameter stainless steel screens. Air injected into the central well was heated with an electric heater and injected under pressure at a flow rate of 200 standard cubic feet per minute (scfm). The surrounding SVE wells drew the injected air radially away from the central well at a rate of 300 scfm, facilitating propagation of the heating front and removing volatilized COCs from the soil. Vapors removed from the vadose zone were passed through the twin vapor phase carbon vessels that are part of the air stripper off gas treatment system. Treated vapors were vented to the atmosphere under MDEQ Air Quality permit 112-96. Emissions were monitored using a photoionization detector (PID).

1996 Pilot Testing

Pilot testing began in the vicinity of the waste water collection trench sump at the northwest corner of the process building during February 1996. This area had the highest concentrations of vadose zone COCs based on RI and subsequent investigations. Initial testing used a single injection and extraction point. A 5 kW electric heater was used to heat the air to approximately 500° F. The heated air was injected at an average rate of 70 scfm using a 2.5 hp blower and withdrawn from a point 10 feet away at a rate of approximately 100 scfm using a 5 hp blower. Emissions were directed to a 1,000 lb activated carbon vessel for treatment. Three sets of thermistor nests completed at 10, 20, and 30 ft below ground surface were installed to monitor the propagation of the heating front.

Testing continued through the rest of 1996 using the single injection/extraction configuration. About midway through the year, injection was switched to the

extraction well, and vapors were removed from another injection well located 10 ft to the south. At the conclusion of the pilot test, it was determined that the 5 kW heater did not have the capacity to heat the soil matrix to a temperature high enough high to drive off TGDC, but it was effective in removing Chlorex. It was also determined that the optimal spacing between the injection and extraction points was 10 ft.

System Expansion 1997 through 1999

In January 1997, a 9 kW heater and an additional 5 hp blower were added, and remediation progressed sequentially along the north south leg of the wastewater collection trench. In 1998, the decision was made to double the capacity to accelerate cleanup, and two additional blower/heater assemblies were added. Over this time, it was learned that it took approximately 4 weeks for the soil to reach the temperature needed to mobilize TGDC, and that it took an additional 4 weeks at this temperature, on average, to reach Tier 1 RAGs. By the end of 1998, configuration of the injection/extraction wells changed, with the optimal configuration determined to be injection at a single point and withdrawal from three extraction wells spaced approximately 120° apart.

2006 Building Demolition and Cap Construction

To address long term protectiveness issues related to direct contact threats, and to prevent threats associated with the potential future infiltration of water into the soils beneath the former process building, it was decided to demolish the building and construct a multilayer cap over the area. This work was accomplished in one construction season in the spring and summer of 2006. Components of the cap include the concrete floor from the former plant, followed by a soil capping layer, a flexible membrane liner, a drainage layer, topsoil and a grassy cover.

APPENDIX B – Additional maps, data, figures, or tables for reference

Figure 1. Site Location Map

Figure 2. Well Location and Groundwater Contour Map

Figure 3. Extent of Tier II Exceedances

Figure 4. 2012 Well Abandonment Summary

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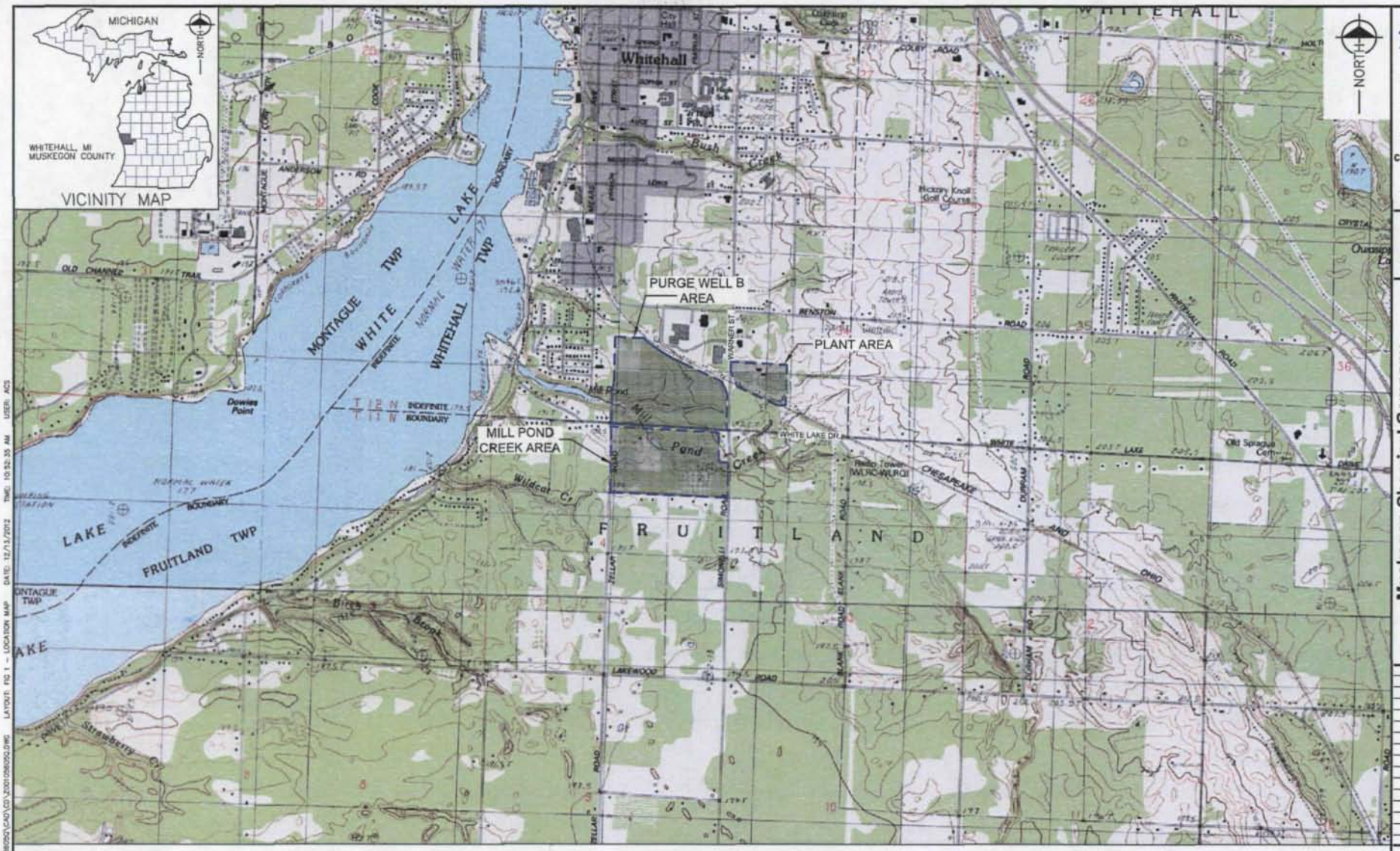

REFERENCE:
DALTON, MONTAGUE, MICHILLINDA AND FLOWER CREEK QUADRANGLES 7.5 MINUTE SERIES
DATED: 1983

Terrain Navigator Pro v. 8.0, (c)2006, Maptech Inc.

SITE LOCATION MAP

fr&h
engineers
scientists
architects
constructors

fishbeck, thompson, carr & huber, inc.

Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

Muskegon Chemical Company NPL Site (MID072569510)
Whitehall, Michigan
2012 Annual Progress Report

PROJECT NO.
G05605R4

FIGURE NO.
1

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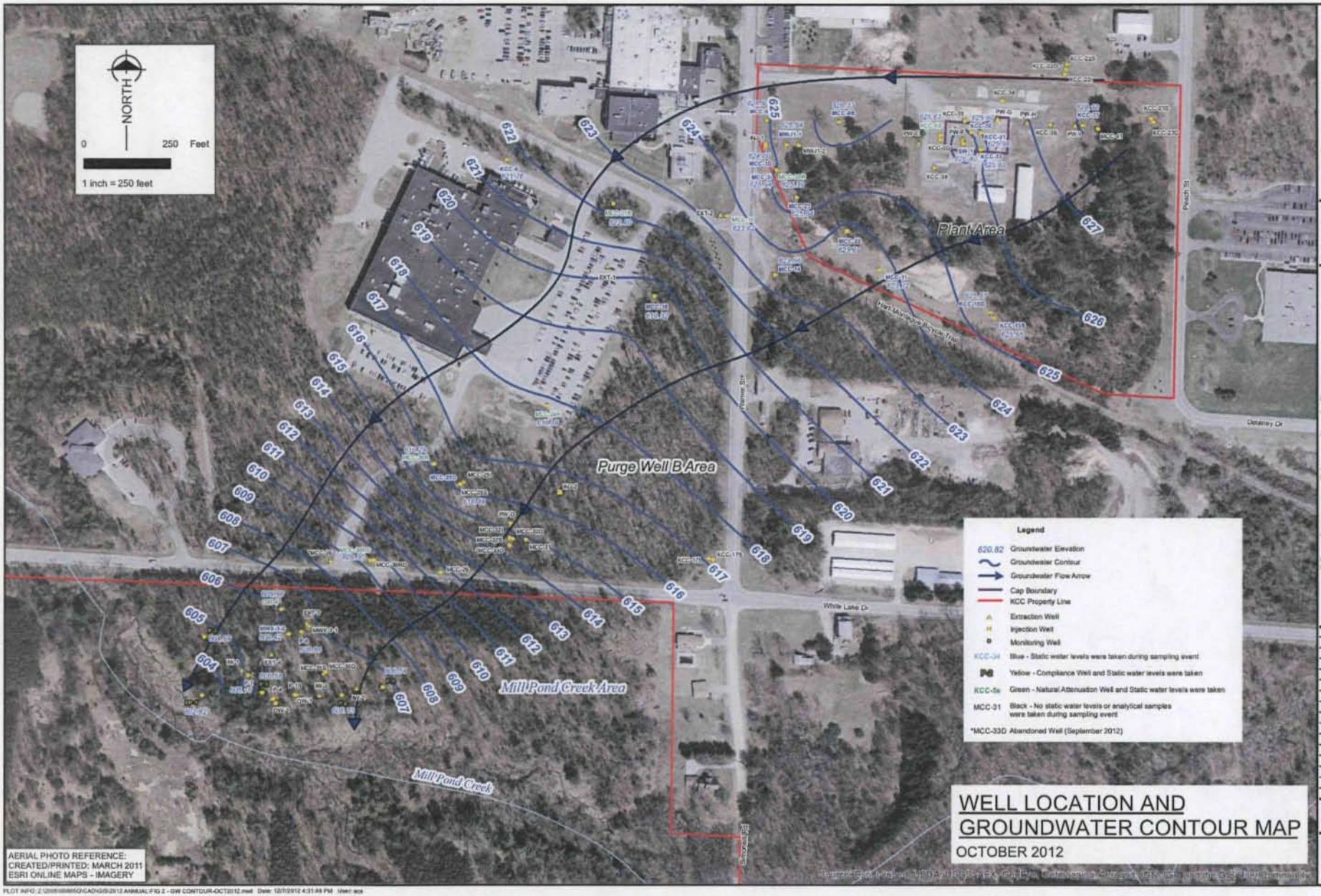

WELL LOCATION AND GROUNDWATER CONTOUR MAP

OCTOBER 2012

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Fishbeck, Thompson, Carr & Huber, Inc.

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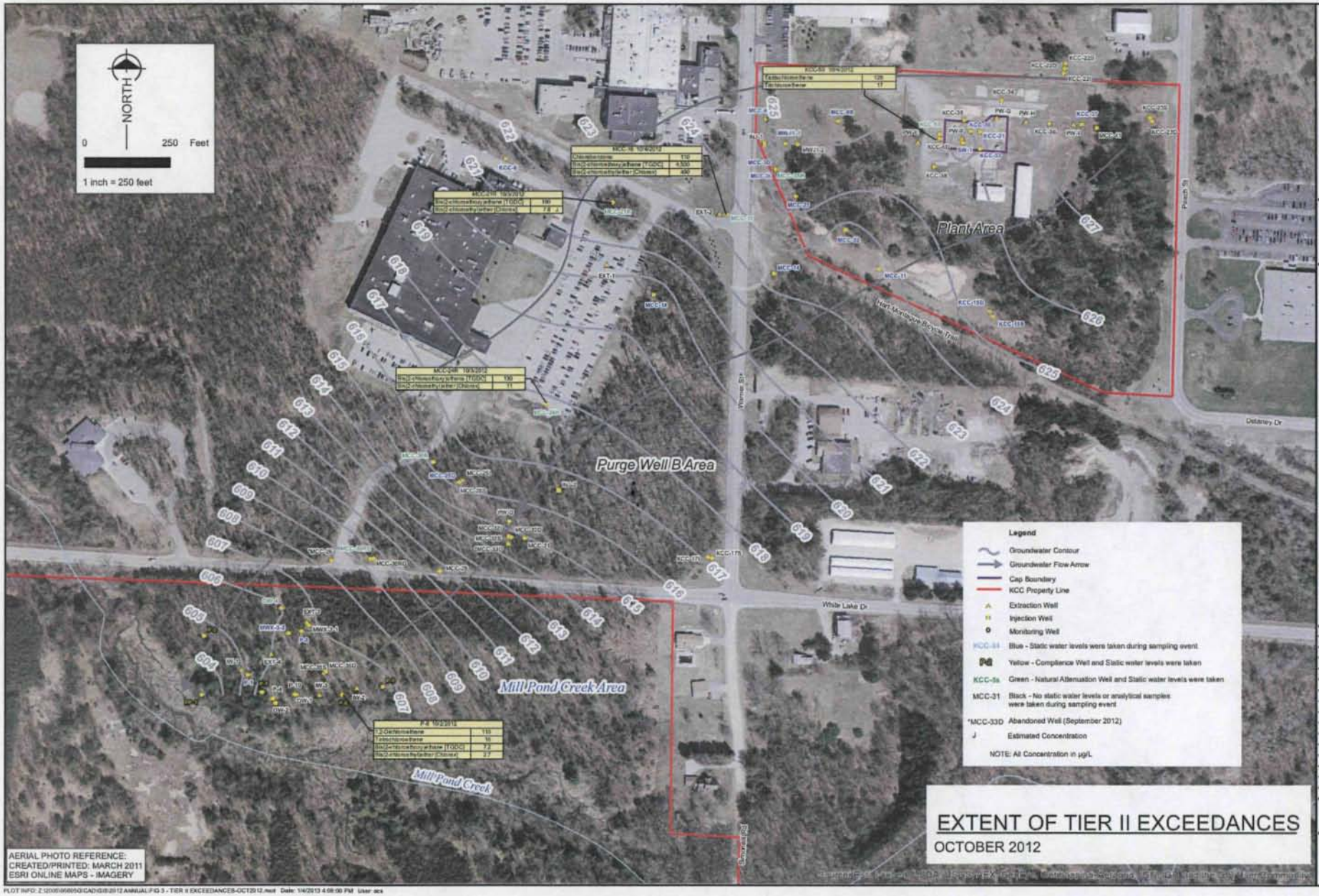
Muskegon Chemical Company
NPL Site (MID072569510)
Whitehall, Michigan

2012 Annual Progress Report

PROJECT NO.
G05605R4

FIGURE NO.
2

PLOT INFO: Z:\2005\05605\GIS\CAD\GIS\2012 ANNUAL\FIG 2 - GW CONTOUR-OCT2012.mxd Date: 12/7/2012 4:31:48 PM User: aca



EXTENT OF TIER II EXCEEDANCES

OCTOBER 2012

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architects
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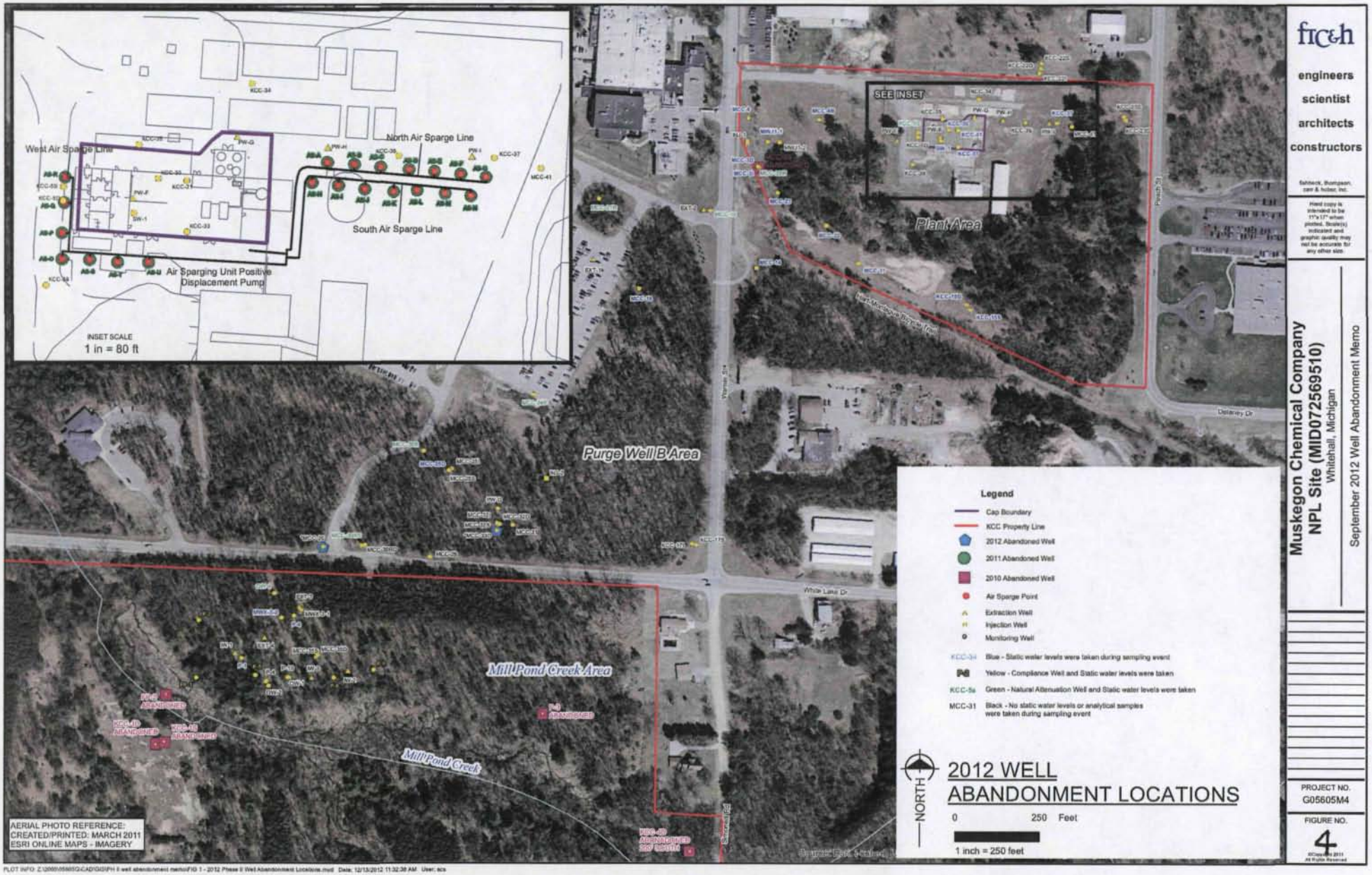
Muskegon Chemical Company
NPL Site (MID072569510)
Whitehall, Michigan
2012 Annual Progress Report

PROJECT NO.
G05605R4

FIGURE NO.
3

PLOT INFO: Z:\2005\05605\CAD\GIS\2012 ANNUAL\FIG 3 - TIER II EXCEEDANCES-OCT2012.mxd Date: 1/4/2013 4:08:00 PM User: dca



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engineers
scientist
architects
constructors

Fahnick, Thompson, carr & hubar, Inc.

Hard copy is intended to be 11"x17" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

Muskegon Chemical Company
NPL Site (MID072569510)
Whitehall, Michigan

September 2012 Well Abandonment Memo

PROJECT NO.
G05605M4

FIGURE NO.
4

PLOT INFO: Z:\2005\05605G\CAD\GIS\PH II well abandonment memo\FIG 1 - 2012 Phase II Well Abandonment Locations.mxd Date: 12/13/2012 11:32:38 AM User: acs

APPENDIX C – Community Involvement

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Contract...

Continued from 1a

percent in matching contributions into a 401 (k) account that can be used toward the purchase of retiree health care or for any other purpose. This replaces fully subsidized retiree health care premiums. It also allows existing members to opt out of retiree health care coverage whereby those employees' 3 percent retiree health contributions made to date would be credited to their 401 (k) account.

According to Governor Rick Snyder, the financial relief to school districts is substantial, capping the employer contribution rate at current levels, requiring an appropriation from the School Aid Fund to pay for any excess liabilities above the amount.

School...

Continued from 1a

votes.

Ogden is a pastor at Lebanon Lutheran Church in Whitehall. He has also taught German and Spanish at Whitehall High School, Montague NBC Middle School and at the White Lake Community Library. He is a substitute teacher, youth luge coach and has been on the Whitehall District Schools Crisis Team and on the Health & Sexuality Review Committee for the district.

The position is a four-year term and Ogden will serve with Mahoney Michael Sutton, Steven Mattol, Ruth Grenell, Randall Fielstra and Thomas Mallory.

The Whitehall District School Board meets the fourth Monday of the month at 7 p.m. in the board room at the Community Services Building.

Another write-in candidate in the area, David Robert Fisher, who ran for White River Township treasurer, received seven votes. Incumbent Terry Hughes won the position of treasurer with 569 votes.

Chamber...

Continued from 1a

trepreneur of the Year for the expansion of their business, including a wine bar.

Nordlund flew in from Florida on the day of the banquet to attend with members of his family who also play vital roles in the business.

In addition to owning the 130-year-old business on the corner of Mears Ave. and Colby St., Nordlund owns the adjacent Pitkin Sale Shoppe (opened in 1990) and the Vom by Pitkin (opened in 2005).

Recently, he had three of his stores and four apartments restored.

Nordlund was one of the proponents for returning on-street parking in a portion of downtown Whitehall in 2011.

The award winner was the last chairman of the Whitehall chamber of commerce when it reorganized with the Montague chamber of commerce into the current White Lake Area Chamber of Commerce. He has been a member of the chamber since 1962.

Along with running a business, Nordlund was a past board member and president of the West Michigan Pharmacist Assoc., has been a member of the Michigan Pharmacists Assoc. for 50 years, has been a Shelby State Bank board member for 15 years, is past-chair of the Retail Committee and past-chair of the White Lake festival. For three years he chaired the White Lake Hospital Board which sold its property to SHAWL. With the hospital fund monies, the White Lake Community Fund was started. It is now an advised fund with the Community Foundation of Muskegon County.

Nordlund has served the City of Whitehall as past chairman of the Planning Commission and is a current member of the Tax Increment Finance Authority. He serves on the Lakeshore Medical Assoc. board, and has been a Rotarian since 1965.

His busy schedule also included being a Senior Center board member for many years, past board member of the Arts Council of White Lake, and C.A.M. board member. His businesses have employed many high school and college students, and he has trained Ferris State University pharmacy students.

Helen Allhouse

"Helen and Dave have been in the White Lake area for 42 years, and has been a volunteer for all that time," said Carol Wood, a former chamber of commerce director and presenter. "From the Welcome Wagon to the Marketplace, Helen has given her all and wouldn't it be nice to thank her for all these years of service."

Allhouse began the floral beautification in the downtowns by working with White Lake Nursery and the Business and Professional Women Association. She also developed the current Holiday Walk, a weekend of special events to highlight local businesses in a shopping season kickoff.

Allhouse planned two high successful chamber of commerce fundraisers, "Dining At The Cinema" and "Dining Through the Doors."

Her community involved also included serving as a Girl Scout leader, and production for the Miss White Lake Scholarship Pageant, a feeder pageant for Miss Michigan.

She served on the Arts Council of White Lake board, and started the successful "Art in the Barn" fundraiser for that organization.

For the chamber of commerce, Allhouse also initiated the White Lake Area Arts and Crafts Festival poster contest, and was in charge of volunteers.

Her latest endeavor is the Artisan Marketplace, an outdoor space for artists and crafters to sell their goods, which is open in Montague during the summer.

Corrections

In the front page story "Democrat recaptures 91st House Seat" published for Nov. 11-17 2012, it was incorrectly reported the 91st District State Representative Holly Hughes, defeated incumbent Mary Valentine in the 2010 election. It should have read that Hughes defeated Democratic candidate Ben Gillette. Valentine did not run for re-election to the house seat, but ran and lost a bid for the 34th State Senate seat in 2010.

The Beacon apologizes for the error.

In last week's article regarding the election, the Village of Lakewood Club trustee position winners should have been named as Jack Cannon, Robert Sikkenga and John Abbatoy. Incumbent Mort Luss lost his position.

Snowmobile committee will debate routes in city

By Greg Means
Beacon Editor

The voters have approved an ordinance amendment allowing the use of snowmobiles inside the Whitehall city limits but now the details of the routes will be determined.

At last Tuesday's city council meeting, the city council approved the appointment of three of its members to a committee who will serve with City Manager Scott Huebler, Police Chief Roger Squiers, Public Works Director Brian Armstrong and City Attorney Rodger Sweeting.

The three council members appointed are Orville Smith, Jim Bartholomew and Tanya Cabala.

Voters in the Nov. 6 election approved an ordinance amendment to allow snowmobiles to operate in the city from Dec. 1 through April 1 between 7 a.m. and 12 a.m. on routes designated by the city council.

A tentative committee schedule calls for a meeting this week to draft an ordinance which would include the designated routes, and a presentation of that draft to the White Lake Area Chamber of Commerce and public review.

The schedule anticipates a presentation for adoption to the city council at its Nov. 27 meeting, a required publication of the new ordinance on Dec. 2 and an effective date of Dec. 12 for the new ordinance to take effect.

Cabala called the schedule "ambitious."

"Yes, that is ambitious," replied Mayor Mac Hatch.

"We want to do it as fast as we can," added Mayor Pro-Tem Edd Whalen.

City Manager Scott Huebler told the council there already is the impression that snowmobiles are now legal since the ballot issue passed.

Whitehall business owners John Dillivan and Josh Chamberlain said the ordinance change allowing snowmobiles will have a positive impact on local businesses.

Chamberlain, who owns Gary's Restaurant in Whitehall, said his business benefited from snowmobilers when it was located in neighboring Montague. "We had many snowmobilers in for breakfast and lunch."

Dillivan, who said he is a snowmobiler, offered to work with the committee in coming up with designated routes.

A Whitehall resident who is a member of the Whitehall planning commission, Steve Salter, told the council he is concerned that the route was not published before the vote, and people will think they can ride anywhere. He also challenged the supporters that allowing snowmobiling in the city will prove to be an economic benefit.

County Commissioners approve bonuses

Motion angers audience members

By Robyn Goodman
Beacon Staff Writer

The Muskegon County Board of Commissioners recently approved bonuses for county employees, and the public is not happy about it.

At the Ways and Means Committee meeting on Nov. 1, the committee approved bonuses for full-time, part-time and hourly county employees.

Full-time employees will receive a one time $700 bonus; part-time employees will receive $350, and hourly employees will receive $250.

Employees who will receive the bonuses are both union and nonunion employees.

At the committee meeting, seven audience members spoke against the motion.

Jim Riley addressed the board stating that the board approved a similar motion last year to bring the total of bonuses to around $2 million. He suggested that the money be used for programs in the community and also stated that the Republicans on the board (John Snider, Alan Jager and Bob Snider, Marvin Engle) said they would make sure that the citizens' tax dollars would be spent wisely. He also called out Jim Derezinski, stating that he said he would take care of the tax dollars and also make sure they are spent well.

"And yet we see county employees being laid off," Riley said. "How many laid off employee jobs could be saved?"

Matt Crehan also spoke to the group stating that Christmas came early for the county employees and said that because of this motion, the county government and representatives are doing nothing more than taking the county residents' money and giving it to county employees.

"It's almost as if we have a county against the people, against the rest of us," Crehan said, "because that's the way the general public perceives this."

But not all who spoke were opposed. Marcia Willis, chief deputy county clerk, stated that she has a son that works for the county as well, but only works part time. For him to get $250, that is a big deal, she said. He has no benefits, but makes too much to apply for anything else.

"To us it is a very big deal," Willis said.

According to Debbie Groeneveld, human resources director, the one time lump-sum payments are instead of a percentage increase which county employees haven't received in several years.

These specific amounts were negotiated with all the bargaining units and were decided as these three amounts, which were less than what was originally brought to the table by the bargaining units, said Groeneveld.

County Administrator Bonnie Hammersley stated that the $1.05 million total in bonuses was budgeted for and was covered with reduced expenditures in the insurance funds. By offering employees the option to sign up for a wellness program, the county anticipates a reduction in expenditures.

After much discussion between the commissioners and county employees, the motion was passed 9-1 with Derezinski excused and Alan Jager voting no.

The bonuses will be given out later this month.

The Log

Monday, Nov. 19

AMERICAN LEGION Auxiliary - Meets at 6 p.m. 808 E. Colby, Whitehall.
CITY OF MONTAGUE COUNCIL - Meets at Council Chambers on the lower level of City Hall at 5:30 p.m.
DEPRESSION AND BIPOLAR SUPPORT ALLIANCE (DBSA) - Meets from 7-9 p.m. at St. Patrick's Family Center, 901 Columbus, Grand Haven.
FRUITLAND TOWNSHIP BOARD - Meets 7 p.m. at the Township Hall, 4545 Nestrom Road.
OCEANA MARSP - Meets at 11:30 a.m. at Hart United Methodist Church, 308 South State Street.
ROTHBURY VILLAGE COUNCIL - Meets at 7:30 p.m. in the Village Hall, 7804 S. Michigan Ave.
WEST MICHIGAN FEATHERED FRIENDS - Meets at the Muskegon County Fair Grounds on Heights Ravenna Road at 7 p.m.
WHITEHALL TOWNSHIP BOARD - Meets at Whitehall Township Hall, 7644 Durham Rd., at 7 p.m.
THE WESTSHORE MICHIGAN TRANSPLANT SUPPORT GROUP THROUGH OF GIFT OF LIFE MICHIGAN - Meets at the Scottville Senior Center on Main St. in Scottville at 7 p.m. For more information call Dianne Longo (231) 462-3578 or email at happyheart719@yahoo.com.

Tuesday, Nov. 20

CENTER FOR INQUIRY'S (CFI) - Meets at 6:30 p.m. at 3268 Millard St., Muskegon.
FOOD ADDICTS IN RECOVERY (FA) - Meets weekly at 6:30 p.m. at Holton United Methodist Church.
GRIEF HEALING SUPPORT GROUP - Meets at 7 p.m. at Mercy VNS & Hospice Services, 888 Terrace Street, Muskegon.
LAKESHORE MILITARY FAMILIES - Support group will meet at 6:30 at the Red Cross building.
WHITE LAKE EAGLES - Meets 7 p.m., 1204 S. Lake St., Whitehall.
WHITE LAKE TOASTMASTERS - Meets at 7 a.m. at the Howmet Plant 10 in the Executive Conference Room. Matt 231-329-0091.
WHITE LAKE WRITER'S GROUP - Meets at 6:30 p.m. at White Lake Community Library.
WHITE RIVER TOWNSHIP - Planning and Zoning Commission Meets 7:30 p.m., 7386 Post Road.
WM.S.O.S. - Meets from 7-8:30 p.m. at Calvin Christian Reformed Church, 973 W. Norton Ave., Muskegon.

Wednesday, Nov. 21

CHRIST THE ROCK WORLD HARVEST CHURCH FOOD PANTRY - Every Wednesday 12:30 p.m.-6 p.m. and Clothing & Houseware Pantry open every Wednesday 1:30 p.m.-5:30 p.m., 6985 Indian Bay Rd., Montague. 893-8900.
LEBANON LUTHERAN CHURCH FOOD PANTRY - Every Wednesday 8:30 a.m.-11 a.m. hot breakfast available at 8:30 a.m., 1101 S. Mears Ave., Whitehall. 893-5745.
MONTAGUE VFW POST 3254 - Meets at 7:30 p.m. at 9370 Walsh Rd.
VILLAGE OF LAKEWOOD CLUB PLANNING COMMISSION - Meets at 6681 Automobile Road at 7:00 p.m.

Thursday, Nov. 22

ALCOHOLICS ANONYMOUS - Meeting times are Mon.-Sun. at 9:30 a.m. and 6 p.m. Women's meeting Thur. 9:30 a.m. downstairs. Last Sat. of the Month at 8 p.m. All meetings are NS and held at the W.L. Community Center, corner of South Shore Drive and Lamos, Whitehall.
PARENTS HELPING PARENTS - Meets at 7 p.m. at the White Lake Congregational UCC. A support group open to all foster and adoptive parents.
WHITE LAKE AREA SPORTFISHING ASSOCIATION (W.L.A.S.A.) - Meets 7 p.m. at the Montague VFW.
WHITE LAKE EAGLES AUXILIARY - Meets at 7 p.m. 1204 S. Lake St., Whitehall.

Saturday, Nov. 23

ST. JAMES CATHOLIC CHURCH CLOTHING CLOSET - Every Saturday 10 a.m. - Noon, 8930B Water St., Montague. 893-3085.
GAMBLERS ANONYMOUS - Every Saturday 10 a.m. at White Lake Congregational United Methodist Church of Christ 1809 S. Mears, Whitehall. 231-766-1137 or 1-800-270-7117.

EPA and MDEQ begin review at Muskegon Chemical Superfund Site

Whitehall, Michigan

The U.S. Environmental Protection Agency and Michigan Department of Environmental Quality are conducting a review of the Muskegon Chemical Co. Superfund site in Whitehall, Mich. The Superfund law requires regular checkups of sites that have been cleaned up – with waste managed on-site – to make sure the cleanup continues to protect people and the environment. This is the fourth five-year review of this site.

Muskegon Chemical Co. formerly produced a variety of specialty chemicals that have caused contamination in the soil and ground water. The cleanup remedy selected by EPA and MDEQ requires treating and monitoring of contaminated soil and groundwater and implementing institutional controls. Since the last review, a ground-water treatment system has been installed at the former plant. In addition, there has been ongoing maintenance of a multilayer cap over the former plant area, continued ground-water monitoring and favorable changes were made to a county ordinance requiring ground-water use restrictions.

More information is available at Whitehall City Library, 3900 White Lake Drive, Whitehall, and http://epa.gov/region5/cleanup/muskegonchemical/index.html. The review should be completed by the end of April.

The five-year review is an opportunity for you to tell EPA and MDEQ about site conditions and any concerns you have. Contact:

Don de Blasio
EPA Community Involvement Coordinator
312-886-4360

Sheri Bianchin
EPA Remedial Project Manager
312-886-4745
bianchin.sheri@epa.gov

Carrie L. Geyer
MDEQ Superfund Project Manager
517-335-6871
geyerc1@michigan.gov

You may also call EPA toll-free at 800-621-8431, 9:30 a.m. to 5:30 p.m., weekdays.

APPENDIX D – Document Review

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APPENDIX D – Document Review

Remedial Investigation Report, January 1995

Feasibility Study, January 1995

Baseline Human Health Risk Assessment, April 1996

Remedial Consent Decree, Case #5:97-CV-211, November 25, 1997

Remedial Action Plan, March 5, 2002 (as amended)

Remedial Action Plan Amendment, May 8, 2009

Quarterly/Annual Progress Reports:

- 69th Report – First Quarter 2008
- 70th Report – Second Quarter 2008
- 71st Report – Third Quarter 2008
- 72nd Report – Fourth Quarter 2008
- 73th Report – First Quarter 2009
- 74h Report – Second Quarter 2009
- 75st Report – Third Quarter 2009
  76nd Report – Fourth Quarter 2009
- 77th Report – First Quarter 2010
- 78th Report – Second Quarter 2010
- 79st Report – Third Quarter 2010
  80nd Report – Fourth Quarter 2010
- 81th Report – Annual 2011
- 82th Report – Annual 2012

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APPENDIX E – Five-Year Review Interviews

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INTERVIEW DOCUMENTATION FORM

The following is a list of individual interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
Mary Crosby-Davies	Project Manager	FTC&H	10/03/12 & 1/17/13
Chris Huver	Senior Sampling Technician	FTC&H	10/03/12

INTERVIEW RECORD

Site Name: **Muskegon Chemical Company**		EPA ID No.: **MID 072569510**
Subject: **Five Year Review**	Time:	Date: **10/3/2012 & 1/17/2013**
Type: ☒ Telephone ☒ Visit ☐ Other Location of Visit: **Muskegon Chemical Site Visit**		☐ Incoming ☒ Outgoing

Contact Made By:

Name: **Carrie L. Geyer**	Title: **Project Manager**	Organization: **MDEQ**

Individual Contacted:

Name: **Mary Crosby-Davies**	Title: **Project Manager**	Organization: **FTC&H**
Telephone No: **616-464-3749** Fax No: **616-464-3992** E-Mail Address: **mcdavies@ftch.com**		Street Address: **1515 Arboretum Drive, SE** City, State, Zip: **Grand Rapids, MI 49546**

Summary Of Conversation

Spoke with Mary Crosby-Davies both during the Site Inspection on October 3. 2012, and subsequently via telephone on January 17, 2013, regarding the status of the site and whether there were any issues or concerns regarding the site.

In general, we discussed the site history, the condition of the site, the status of the remedial activities and work that still needs to be conducted. Specifically, we discussed potential strategies to address improving the vegetative cover in the area of the cap.

In addition to an annual site inspection and sampling event which takes place in October, a lawn and maintenance service is retained to provide lawn mowing and landscaping services from May to September on a monthly basis. While there, they also perform a general inspection of the cap, fence, permanent markers, etc. related to the site. If an issue is identified, FTC&H are notified and can take action to resolve.

FTC&H has also a contingency in-place in the event that a significant snow event takes place that might obstruct viewing of the permanent marker. They will make a site visit and assure marker is visible and intact.

In general, Mary indicated that the remedy was performing as expected and that she did not have any real issues or concerns.

INTERVIEW RECORD

Site Name: **Muskegon Chemical Company**		EPA ID No.: **MID 072569510**
Subject: **Five Year Review**	Time:	Date: **10/3/2012**
Type: ☐ Telephone ☒ Visit ☐ Other Location of Visit: **Muskegon Chemical Site Visit**		☐ Incoming ☐ Outgoing

Contact Made By:

Name: **Carrie L. Geyer**	Title: **Project Manager**	Organization: **MDEQ**

Individual Contacted:

Name: **Chris Huver**	Title: **Senior Sampling Technician**	Organization: **FTC&H**
Telephone No: **616-575-3824** Fax No: E-Mail Address:	Street Address: **1515 Arboretum Drive, SE** City, State, Zip: **Grand Rapids, MI 49546**	

Summary Of Conversation

Spoke with Chris Huver during the Site Inspection on October 3. 2012, regarding any issues or concerns regarding the site. Chris was on site performing the annual groundwater sampling event.

The groundwater monitoring component of the project remains active, but has moved from taking place on a quarterly basis to taking place on an annual basis. Sampling is typically a 3-4 day process when it is performed. Chris demonstrated his sampling equipment and procedure for collecting groundwater samples. He had not encountered any problems nor was he aware of any issues of concern regarding the site.

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APPENDIX F – Site Inspection Checklist

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Site Inspection Checklist

I. SITE INFORMATION

Site name: Muskegon Chemical Company	**Date of inspection:** October 3, 2012
Location and Region: Muskegon MI, Region 5	**EPA ID:** MID 072569510
Agency, office, or company leading the five-year review: MDEQ	**Weather/temperature:** Cool

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Other: _____
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Mary Crosby-Davies, FTCH (Name) Project Manager (Title) October 3, 2012 (Date)
   Interviewed ☒ at site ☐ at office ☒ by phone Phone no. 616-464-3749
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Chris Huver, FTCH (Name) Senior Field Technician (Title) October 3, 2012 (Date)
   Interviewed: ☒ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

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) _____ (Date) _____ (Phone no.)
   Problems; suggestions; ☐ Report attached _____

   Agency _____
   Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone no.)
   Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

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 _____

2. **Site-Specific Health and Safety Plan** — ☐ Readily available — ☒ Up to date — ☐ N/A
   - ☐ Contingency plan/emergency response plan — ☐ Readily available — ☒ Up to date — ☐ N/A

   Remarks _____

3. **O&M and OSHA Training Records** — ☐ Readily available — ☒ Up to date — ☐ N/A

   Remarks _____

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 _____ — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

5. **Gas Generation Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

6. **Settlement Monument Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

7. **Groundwater Monitoring Records** — ☐ Readily available — ☒ Up to date — ☐ N/A

   Remarks _____

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Water (effluent) — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks _____

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — ☒ N/A

    Remarks _____

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
☐ Other _____

2. **O&M Cost Records**

☐ Readily available ☒ Up to date
☐ Funding mechanism/agreement in-place
Original O&M cost estimate _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From	January 2008 (Date)	To December 2008 (Date)	$126,000 (Total cost)	☐ Breakdown attached
From	January 2009 (Date)	To December 2009 (Date)	$142,000 (Total cost)	☐ Breakdown attached
From	January 2010 (Date)	To December 2010 (Date)	$124,000 (Total cost)	☐ Breakdown attached
From	January 2011 (Date)	To December 2011 (Date)	$49,000 (Total cost)	☐ Breakdown attached
From	January 2012 (Date)	To December 2012 (Date)	$28,000 (Total cost)	☐ Breakdown attached

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

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
   Remarks: ***All fencing and gates are in good repair with no indication of damage.***

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks: ***Several signs that had been mounted to the fence had fallen off and were laying on the ground. These need to be re-installed.***

C. Institutional Controls (ICs)

1. **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): procedures are under review
   Frequency: Annual
   Responsible party/agency: FTCH, Consultant to Flint Hills Resources/Koch Remediation & Environmental Services
   Contact: Mary Crosby-Davies (Name) Project Manager (Title) October 3, 2012 (Date) 616-464-3749 (Phone no.)

   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: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
   Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
   Remarks

2. **Land use changes on site** ☒ N/A
   Remarks

3. **Land use changes off site** ☒ N/A
   Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate ☒ N/A
   Remarks_____

B. Other Site Conditions

Remarks _____

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** ☒ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks: *Vegetative cover is struggling to remain established. Further seeding is needed.*

6. **Alternative Cover (armored rock, concrete, etc.)** ☒ N/A
   Remarks_____

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent_____
   ☐ Ponding ☐ Location shown on site map Areal extent_____
   ☐ Seeps ☐ Location shown on site map Areal extent_____
   ☐ Soft subgrade ☐ Location shown on site map Areal extent_____
   Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent_____
Remarks_____

B. 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.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☒ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☒ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☒ N/A or okay
Remarks_____

C. 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.)

1. **Settlement** ☐ Location shown on site map ☒ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☒ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☒ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☒ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs Maintenance
   ☐ N/A
   Remarks_____

2. **Gas Monitoring Probes**
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
   Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
   ☐ Properly secured/locked ☐ Functioning ☐Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐Needs Maintenance ☐ N/A
   Remarks_____

4. **Leachate Extraction Wells**
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
   Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
   Remarks_____

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

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Areal extent _____ Depth _____ ☐ N/A
   ☐ Siltation not evident
   Remarks _____

2. **Erosion** Areal extent _____ Depth _____
   ☐ Erosion not evident
   Remarks _____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks _____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks _____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement _____ Vertical displacement _____
   Rotational displacement _____
   Remarks _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks _____

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

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent _____ Depth _____
   Remarks _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent _____ Type _____
   Remarks _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent _____ Depth _____
   Remarks _____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

A. Settlement ☐ Location shown on site map ☐ Settlement not evident

Areal extent _____ Depth _____

Remarks _____

B. Performance Monitoring Type of monitoring _____

☐ Performance not monitored

Frequency _____ ☐ Evidence of breaching

Head differential _____

Remarks _____

IX. TREATMENT SYSTEM ☐ Applicable ☒ N/A

1. **Treatment Train** (Check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☐ Filters _____

☐ Additive (*e.g.*, chelation agent, flocculent) _____

☐ Others _____

☐ 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 _____

☐ Quantity of surface water treated annually _____

Remarks _____

2. **Electrical Enclosures and Panels** (properly rated and functional)

☒ N/A ☐ Good condition ☐ Needs Maintenance

Remarks _____

3. **Tanks, Vaults, Storage Vessels**

☒ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance

Remarks _____

4. **Discharge Structure and Appurtenances**

☒ N/A ☐ Good condition ☐ Needs Maintenance

Remarks _____

5. **Treatment Building(s)**

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

☐ Chemicals and equipment properly stored

Remarks _____

6. **Monitoring Wells** (pump and treatment remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☒ All required wells located ☐ Needs Maintenance ☐ N/A

Remarks _____

X. MONITORING DATA

1. Monitoring Data
   ☒ Is routinely submitted on time ☐ Is of acceptable quality

2. Monitoring data suggests:
   ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

3. **Monitoring Wells** (natural attenuation remedy)
   ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
   ☒ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks _____

XI. 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.

XII. OVERALL OBSERVATIONS

A. 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.).

The site consists of 3 properties. The purpose of the remedy is to contain the contaminant plume and treat the areas of contamination on the Muskegon Chemical processing plant site. Previous treatment has resulted in greatly reduced groundwater contamination levels and, as a result, active treatment of the site has now ceased. Groundwater levels have been shown to be less than the Tier 1 MZGSI criteria but continue to exceed the Tier II (drinking water) standards. As a result, ongoing monitoring and appropriate ICs are required until such time as the groundwater concentrations are below Tier II criteria.

B. 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.

The remedy is considered to be long term protective as long as the ICs remain in-place. The O&M Plan and Long-Term Monitoring and Contingency Plan adequately address maintaining the ICs.

C. 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.

____N/A _____

D. Opportunities for Optimization

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

____N/A _____

E. Other Information

Flint Hills Resources (FHR), a wholly owned subsidiary of Koch Industries, is the successor to KCC. As such, FHR retains liability for response actions at the MCC Site. Michael Christopher of FHR is the primary contact. Koch Remediation and Environmental Services, another wholly owned subsidiary of Koch Industries, is in charge of conducting the remediation for FHR. Linda Childers is the primary contact for Koch Remediation and Environmental Services. consulting firm of Fishbeck, Thompson, Carr, & Huber (FTC&H) has been retained by Koch Remediation and Environmental Services to undertake operation and maintenance (O&M) activities at the Site. FTC&H replaced Barr Engineering in 2008

ATTACHMENT 1

2009 RAP Amendment

(see attached hard copy without attachments and full copy on enclosed Disk)

APPENDIX G – Summary of IC Evaluation Activities and Copies of ICs

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Appendix G

Summary of Institutional Controls Evaluation Activities and copies of Groundwater Ordinance and Restrictive Covenants (RCs)

ICs are required to ensure the protectiveness of the remedy. ICs are non-engineered instruments, such as administrative and/or legal controls, that help minimize the potential for exposure to contamination and protect the integrity of the remedy. Compliance with ICs is required to assure long-term protectiveness for any areas which do not allow for unlimited use or unrestricted exposure (UU/UE).

The remedial action decision documents require that the Site be cleaned up to allow commercial/industrial uses of the Site. In addition, the decision documents call for the groundwater to be cleaned up to Tier I standards followed by Tier II standards. Tier II standards incorporate the state and federal drinking water standards.

The 1997 RAP required the placement of deed restrictions or RCs[2] 1) to prevent non-commercial/industrial uses on the property and any other activity that would impair the remedy's integrity and 2) for the areas above the contaminated groundwater plume, to prevent groundwater extraction and other activities that could result in contact with contaminated groundwater. There are three properties affected by the groundwater plume: two of the properties are owned by MCC/ Koch Industries (one is the plant property and the other is the Mill Creek Pond property), and the third property is owned by the Howmet Property. Koch Industries agreed to implement the RCs on its properties consisting of the plant property and the Mill Creek Pond property per a consent agreement. However, neither MCC/ Koch Industries nor MDEQ were able to reach agreement with Howmet Corporation on the placement of a deed restriction on its property. As a result, in 1999, MCC/Koch Industries petitioned MDEQ to revise the RAP to allow the use of the Muskegon County Sanitation Ordinance to serve as the ICs to restrict the groundwater use on the Howmet property.

The MDEQ agreed to this RAP modification in 2000. Subsequent to the 2000 RAP modifications, the MDEQ conducted further review of the Muskegon County Sanitation Ordinance and concluded that the ordinance required certain modifications to ensure its effectiveness.

Previous FYRs addressed the need for deed restrictions at the Site including the parcel where the former MCC plant area exists to prevent exposure to the residually contaminated soil under the MCC building and protection of the remedy components. In addition, the previous FYR identified to update the groundwater regulation Ordinance and a need to review and replace the existing deed restrictions to bring the ICs into compliance with current state requirements.

Currently, ICs have been implemented at the Site which consists of RCs and a groundwater restriction ordinance. The needed changes to the ordinance were formally made and adopted by Muskegon County in 2005. Updated deed restrictions, to prohibit exposure to contaminated groundwater at the plant property and the Mill Pond Creek property, as well as to prevent disturbance of soil beneath the location of the former MCC plant and protection of the remedy,

[2] There terms deed restrictions and restrictive covenants (RCs) are often used interchangeably.

were proposed and approved as part of the 2009 RAP Amendment (see Appendix D of 2009 RAP). The RCs were subsequently implemented in 2010.

A summary of the ICs currently in-place is provided in the table below:.

Table 3: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in Decision Docs	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Soil: Capped Area of Site- Former MCC Processing Plant. Multi-Layer Capped Area. Site is fenced.	Yes	Yes	MCC Processing Plant- Multi-Layer Capped Area.	Prohibit interference with the cap; Prohibit use of Site except those uses that are consistent with zoning designation of MC-1 - limited industrial; residential uses prohibited.	Restrictive Covenant recorded at vol (liber 3834 page 958) at county recorder's office on January 22, 2010. Permanent Markers are present at the Site.
Soil: Former MCC property boundary except the capped area cleaned up to commercial/ industrial uses and remedy components. (Much of the area was never impacted by the site but uses are limited by zoning which is for limited industrial and commercial. (Warner Street and Mill Creek Properties). Site is fenced	Yes	Yes	Former MCC property boundary except the capped area and remedy components	Prohibit use of Site except those uses that are consistent with zoning designation of MC-1; residential uses prohibited.	City of Whitehall Zoning Ordinance and Restrictive Covenant recorded at vol (liber 3834 page 958) at county recorder's office on January 22, 2010. Permanent Markers are present at the Site
Groundwater: Former MCC property boundary. Approx. 20 acres where groundwater exceeds performance standards **within plant** (includes buffer area).	Yes	Yes	Muskegon Chemical property boundary.	Prohibit consumptive use of the groundwater plume area until performance standards are achieved.	Restrictive Covenant recorded at vol (liber 3834 page 958) at county recorder's office on January 22, 2010.
Groundwater: Area of the Site where the groundwater plume exceeds performance standards outside of MCC property boundary known as **the Howmet property** (approximately 82 acres)	Yes	Yes	Howmet property	Prohibit consumptive use of the groundwater plume area until performance standards are achieved.	Sanitary Regulations of Muskegon County, effective April 26, 2005, as amended.
Groundwater: Area of the Site where the groundwater plume exceeds performance standards outside of MCC property boundary known as the **Mill Creek property** (approximately 80 acres, in two parcels) *	Yes	Yes	Mill Creek Property	Prohibit consumptive use of the groundwater plume area until performance standards are achieved.	Restrictive Covenants recorded at vol (liber 2078 page 597, and liber 2078 page 600) at county recorder's office on March 19, 1998.

Table 3: Summary of Planned and/or Implemented ICs					
Media, engineered controls, and areas that do not support UU/UE based on current conditions	**ICs Needed**	**ICs Called for in Decision Docs**	**Impacted Parcel(s)**	**IC Objective**	**Title of IC Instrument Implemented and Date (or planned)**
Site remedial components located in various locations: e.g. groundwater wells	Yes	Yes	Various Locations	Prohibit interference with the remedial systems and monitoring equipment.	Restrictive Covenant recorded at vol (liber 3834 page 958 and liber 3834 page 959) at county recorder's office on January 22, 2010.

* Area is bounded by White Lake Drive to the North, Berquist Road to the S, Simonelli Road to the East and Zellar Road to the West

A summary of IC evaluation activities is found below. Copies of the groundwater ordinance and RCs are attached.

Current Status of ICs and IC Evaluation Activities:

Institutional controls, through the use of restrictive covenants and a county groundwater use ordinance are in-place and appear to be functioning as intended.

The entire property is zoned for commercial/ industrial uses. The county ordinance forbids water wells in areas (defined by the MDEQ as "facilities"), unless written permission is obtained from the MDEQ. Also, deed restrictions or restrictive covenants (RCs) have been implemented on two parcels. Exhibit 1 to each RC provides a survey of the property. Exhibit 2 depicts the portion of the property that is subject to the land use or resource use restrictions specified therein. The 2009 RAP Amendment included an update to the restrictive covenants. Other measures include the use of permanent markers. The main marker is located at the primary entrance to the MCC Plant property and identifies the restrictions associated with the site. In addition, markers have also been placed at each corner of the multi-media cap to assure that the area of the cap can be easily identified.

Maps depicting the current conditions of the Site have been developed. Additional maps will be prepared to ensure the ICs fully cover the areas which do not allow for UU/UE can be compared to the areas covered by the restrictions.

Muskegon Chemical Company Property – Capped and Industrial Use Areas:

Based on a review of existing information, The entire property is zoned for commercial/ industrial uses. Two RCs have been implemented in 2010. These ICs prohibit incompatible uses with the capped area and industrial use area as discussed below:

Objectives: On January 10, 2010 a restrictive covenant was recorded at 3834 (vol)or (liber) page 958 with the Muskegon County Recorder] by MCC for the plant property and another was recorded at 3834 (vol) or (liber) page 959 by MCC for the Mill Creek Property. The RC for the plant property prohibits interference with the capped area and underlying hazardous

waste and allows only limited commercial/industrial uses of the property (i.e., prohibits residential use at the property) and prohibits groundwater uses on the property. The RC for the Mill Creek property allows only limited commercial/industrial uses of the property (i.e., prohibits residential use at the property) and prohibits groundwater uses on the property

Physical Area: The exhibit attached to the RC for the plant property depicts the area where the landfill cap is constructed and the remaining areas will allow limited commercial / industrial activities. The legal description (or map) of the capped area in the attached restrictive covenant appears to covers the landfill cap area as constructed. Also, the entire Site is subject to the land use restrictions for limited future use (i.e., no residential) and for groundwater use restrictions. The exhibits attached to the RC for the plant property depicts the entire area subject to the land use restrictions for limited future use (i.e., no residential) and for groundwater use restrictions.

Recordation and Title work: No title work has been presented to review. Performing title work is required to confirm ownership, to determine if the RCs were appropriately recorded and to determine if any prior-in-time recorded encumbrances, such as utility easements, may interfere with the ICs. If prior-in-time encumbrances exist, then additional work is needed to ensure protectiveness of the remedy and to protect human health and the environment regarding any future repair work (excavations).

State covenant statute: The RCs were recorded under the authority of the state law (per 1937 PA 103, as amended (Act 103), MCL 565.201 *et seq.*) Each RC states that the restrictions may be enforced by the MDEQ and are binding on future owners. However, the existing RCs at the site were recorded prior to the model covenant being prepared by the State of Michigan in conjunction with the EPA. The model language was recently finalized and will ensure that the instruments are enforceable under state law by both U.S.EPA and MDEQ. For example, several provisions exist in the model which are not contained in the existing covenants such as including EPA as a third party beneficiary to be able to enforce the restrictions. Although U.S. EPA is not insisting that the model RC be used, it is available if needed. The goal is to ensure that the RCs (1) are sufficient to achieve site-specific goals (e.g., prevent future uses that pose human health threats) and (2) be valid as a matter of Michigan law. If updates to the RCs are necessary, then the parties should explore whether existing RCs should be replaced by model RC titled: *Declaration of Restrictive Covenant and Grant of Envionmental Protetion Easement* to enhance them to ensure long-term protectiveness.

Permanent Markers: Permanent markers were installed at various locations on the Plant Property to assure the effectiveness and integrity of the response activity. The main marker is a brass plate attached to a stone monolith and is located at the primary entrance to the site. The plaque measures 24-inches by 36-inches and includes a line drawing of the property boundary and the containment area along with text that briefly describes the restrictions. The plaque was installed such that it was more that 26-inches off the ground to assure it would not become obstructed by snow during the winter months. Four additional markers were installed at each corner of the multi-media cap to assure that the area of the cap could be easily identified.

Site-wide Groundwater Restriction Ordinance: Although the contamination in the groundwater has declined and the Tier I standards have been met, it is not anticipated that the groundwater will meet the Tier II cleanup standards for some time. Groundwater use restrictions are necessary to prohibit usage of the groundwater until groundwater cleanup standards are met throughout the plume.

Objective: In 1985, Muskegon County adopted the Sanitary Regulations. In 2000, the State of Michigan amended the RAP to allow the Ordinance to be used as an acceptable IC in lieu of a deed restriction the plume area down-gradient of the Site based on amendments that were made and required to be made to the Ordinance to make it more protective. Chapter III, Sections 7.2.2 and 15 relate to the issuance or denial of a water supply construction permit for well installation in certain areas. On April 26, 2005, the County of Muskegon amended its Ordinance. This ordinance is currently still in effect and requires the County to give advanced notice to the State if any changes are to occur. The ordinance is enforced by the County government.

Physical Area: The current groundwater area that exceeds cleanup standards is identified in Appendix B, Figure 3. The ordinance covers the entire County and therefore covers the entire geographical area of groundwater that exceeds groundwater cleanup standards as well as a buffer zone. The maps will be updated as new information becomes available.

Current Compliance of Groundwater and Land Use Restrictions: Based on inspections and interviews, there appears to be compliance with the stated objectives of the use restrictions. There are no known uses of the groundwater or land which conflict with the use restrictions. MDEQ and EPA are not aware of any wells installed within the groundwater restricted area except monitoring wells. The groundwater restriction ordinance appears to be functioning as intended. According to inspections, there is no current use of the property. Uses on adjacent parcels are not anticipated to protectiveness. It is envisioned that the cap must remain in-place indefinitely to prevent exposure to underlying waste. The property is currently zoned for industrial use; it is fenced and is currently not being used. Therefore, the remedy appears to be functioning as intended since the property is not being used in a manner which is inconsistent with the required use restrictions or other ICs. However, long term protectiveness requires compliance with effective ICs. Continued compliance with the ICs will be ensured by maintaining, monitoring and enforcing them. Therefore, a Long-Term Stewardship (LTS) plans needs to be put in-place.

Long-Term Stewardship: Long-term protectiveness requires continued compliance with the ICs consisting of land use and groundwater use restrictions ensure that the remedy continues to function as intended. LTS will ensure that the ICs are maintained, monitored and enforced.

A LTS plan (or O&M Plan revision) will be required by the PRPs to document long-term stewardship procedures. The plan must include the mechanisms and procedures to ensure LTS. For example, ICs should be inspected regularly and annual certifications should be provided to U.S. EPA and MDEQ that show that the required ICs are in-place and effective. The LTS plan should indicate that an annual report will be submitted to MDEQ and EPA that includes a summary of: a) periodic inspection of the capped area and properties subject to the RCs to ensure no inconsistent uses have occurred; b) review of the county ordinance to ensure it is still in existence; c) discussion of whether the boundaries of the restricted area are sufficient to prevent exposure to off-property groundwater contamination; d) inspection and location of any new wells located in and around the study area; and e) contingency actions.

Also, use of a communications plan should be explored along with the use of the one-call system for enhanced long-term protectiveness. Additionally, a communication plan should be developed and use of the State's one-call system should be explored for LTS.

Follow-up Actions: An Institutional Control Implementation and Assurance Plan (ICIAP) or similar plan is needed for the Site. The purpose of the ICIAP is to conduct additional IC evaluation activities to ensure that the ICs are effective and properly maintained, monitored, and enforced.

Attachment 1

Received & Sealed For Record
MARK F. FAIRCHILD REGISTER OF DEEDS
Muskegon County Michigan
01/22/2010 01:32P LIBER 3834 PAGE 958

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01/22/2010 01:3
Page: 1 of 20
Mark Fairchild, Muskegon Co ROD 044

DECLARATION OF RESTRICTIVE COVENANT

MDEQ Reference No.: RC-RRD-201-09-016

This Declaration of Restrictive Covenant ("Restrictive Covenant") completely supersedes the Declaration of Restrictions and Covenants recorded at liber 2078, page 594 (MDEQ Reference No. RC-ERD-98-016), Muskegon County Register of Deeds, and has been recorded with the Muskegon County Register of Deeds for the purpose of protecting public health, safety, and welfare, and the environment by prohibiting or restricting activities that could result in unacceptable exposure to environmental contamination present at the 19.6 acres of property located in the City of Whitehall, County of Muskegon, and legally described in Exhibit 1 attached hereto ("Property"). The Property is associated with the Muskegon Chemical Company Site, Site ID No. 61000029, for which a remedial action plan is being conducted. The remedial action that is being implemented to address environmental contamination is fully described in the Remedial Action Plan for the Muskegon Chemical Company NPL Site ("RAP"), dated June 1997 and submitted by Koch Chemical Company. The Michigan Department of Environmental Quality ("MDEQ") approved the RAP pursuant to Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended ("NREPA"), MCL 324.20101 et seq. The RAP was then incorporated into a Consent Decree that was entered by the United States District Court for the Western District of Michigan on November 25, 1997. The RAP and the Consent Decree were amended by order of that court on December 11, 2000. On January 6, 2010, the MDEQ approved the second amendment to the RAP, submitted by Flint Hills Resources, LP ("FHR"), entitled "Remedial Action Plan Amendment, Muskegon Chemical Company NPL Site," dated May 8, 2009. Pursuant to the terms of the Consent Decree, the second RAP amendment was incorporated into and made an enforceable part of the Consent Decree upon its approval by the MDEQ. The RAP and RAP amendments are together hereinafter referred to as the "RAP."

The RAP required the recording of this Restrictive Covenant with the Muskegon County Register of Deeds to: 1) restrict unacceptable exposures to hazardous substances located on the Property; 2) assure that the use of Property is consistent with the exposure assumptions utilized in the development of cleanup criteria pursuant to Sections 20120a(1)(i) and (2) of Part 201 of the NREPA and the exposure control measures relied upon in the RAP; and 3) to prevent damage or disturbance of any element of the response activity constructed on the Property. The restrictions contained in this Restrictive Covenant are based upon information available to the MDEQ at the time the RAP was approved by the MDEQ. Failure of the response activities to achieve and maintain the criteria, exposure controls, and requirements specified in the RAP; future changes in the environmental condition of the Property or changes in the cleanup criteria developed under Sections 20120a(1)(i) and (2) of Part 201 of the NREPA; the discovery of environmental conditions at the Property that were not accounted for in the RAP; or use of the Property in a manner inconsistent with the restrictions described herein, may result in this Restrictive Covenant not being protective of public health, safety, and welfare, and the environment.

The *"Limits of Land or Resource Use Restrictions,"* attached hereto as Exhibit 2, provides the legal description(s) and a survey that distinguishes those portions of the Property that are subject to land use or resource use restrictions as specified herein.

Summary of Response Activities

Hazardous substances, including 1,2 dichloroethane, bis (2-chloroethyl) ether (Chlorex), and triglycol dichloride were discovered in groundwater and soils on the Property. Prior to recording of this Restrictive Covenant, response activities have been undertaken to remove or treat in-place some of the contamination. However, residual contamination remains present at levels that require controls to prevent unacceptable exposures. Tetrachloroethylene, trichloroethylene, and bis (2-chloroethoxy) ethane remain present in groundwater at levels that require controls to prevent unacceptable exposures. 1,2-dichloroethane, bis (2-chloroethoxy) ethane, and bis (2-chloroethyl) ether remain present in soils at levels that require controls to prevent infiltration through soils into groundwater and unacceptable exposures to hazardous substances. An infiltration and exposure barrier, consisting of geomembrane and geotextile layers, has been placed, as described below, to prevent infiltration and direct contact with the impacted soils.

Definitions

"MDEQ" means the Michigan Department of Environmental Quality, its successor entities, and those persons or entities acting on its behalf.

"Owner" means at any given time the then current title holder of the Property or any portion thereof.

All other terms used in this document which are defined in Part 3, Definitions, of the NREPA; Part 201 of the NREPA; or the Part 201 Administrative Rules ("Part 201 Rules"), 1990 AACS R 299.5101 et seq., shall have the same meaning in this document as in Parts 3 and 201 of the NREPA and the Part 201 Rules, as of the date of filing of this Restrictive Covenant.

NOW THEREFORE,

Declaration of Land Use or Resource Use Restrictions

Pursuant to the Consent Decree, FHR, as Owner of the Property at the time this Restrictive Covenant was recorded, hereby declares and covenants that the Property shall be subject to the following restrictions and conditions:

1. The Owner covenants to restrict the use of the Property to industrial purposes only. Examples of industrial purposes include manufacturing, utilities, industrial research and development, and petroleum bulk storage. The Owner shall prohibit agricultural or residential uses of the Property including, but not limited to, living quarters of a watchman or caretaker, currently permissible under the City of Whitehall zoning code M1 District – Limited Industrial, Permitted Accessory Uses, 15-13-3. Except for this specific use, the Property shall only be used for the purposes that are described in the zoning code for industrially zoned property, attached hereto as Exhibit 3.

2. Soils and Exposure Barrier. The Owner shall prohibit activities on the Property that may result in exposures to hazardous substances in soils above levels established in the RAP. These prohibited activities include:

A. Any excavation or other intrusive activity that could disturb or affect the integrity of the geomembrane and geotextile layers, on the 0.37 acres of property designated in Exhibit 2 as the "exposure barrier area," except as authorized as part of an MDEQ-approved response activity.
B. Any excavation or other intrusive activity anywhere on the Property unless such activity is performed in full compliance with the requirements of Section 20107a(1)(a)-(c) of Part 201 of the NREPA, except as authorized as part of an MDEQ-approved response activity.
C. The Owner covenants to manage all soils within the Property in accordance with the requirements of MCL §324.20120c and MCL §§324.11101-11152 of the NREPA, and Subtitle C of the Resource Conservation and Recovery Act, 42 USC §6901 of the Solid Waste Disposal Act, and the administrative rules promulgated thereunder, and all other

relevant and applicable state and federal laws. This includes, but is not limited to, not removing soil from the facility to an offsite location or relocating soil within the facility without first determining whether or not such removal to an offsite location poses a threat to the public health, safety, or welfare, or the environment, or such relocation exacerbates the environmental condition of the facility.

3. Groundwater. The Owner shall prohibit activities on the Property that may result in exposures to hazardous substances in groundwater above levels established in the RAP. These prohibited activities include:

A. Any construction of wells or other devices to extract groundwater for consumption, irrigation, or any other use, except for wells and devices that are part of an MDEQ-approved response activity.
B. Any use of existing wells or other devices to extract groundwater for consumption, irrigation, or any other use, except as authorized as part of an MDEQ-approved response activity.

4. The Owner shall prohibit activities on the Property that may interfere with any element of the RAP, including the performance of operation and maintenance activities, monitoring, or other measures necessary to ensure the effectiveness and integrity of the remedial action in the RAP. These prohibited activities include:

A. Any activities that would interfere with access to the monitoring wells identified in the RAP.
B. Any activities that would interfere with access to the exposure barrier area shown in Exhibit 2.
C. Any activities that would interfere with the groundwater treatment system identified in the RAP.
D. Any activities that would interfere with contingency measures identified in the RAP.

5. Permanent Markers. The Owner shall not remove, cover, obscure, or otherwise alter or interfere with the permanent markers placed at the approximate locations noted in Exhibit 2. The Owner shall keep vegetation and other materials clear of the permanent markers to assure that the markers are readily visible.

6. Contaminated Soil Management. Soils beneath the exposure barrier identified in Exhibit 2 were, at the time of recording of this Restrictive Covenant, material that would constitute a "Hazardous Waste," as defined in Part 111, Hazardous Waste Management, of the NREPA, when generated. If the Owner undertakes any excavation or otherwise disturbs those soils, the Owner shall, at that time, confirm whether the soils are a Hazardous Waste. If so, the Owner shall handle and dispose of the soils in full compliance with all relevant requirements of state and federal laws that govern Hazardous Waste including, but not limited to, Part 111 of the NREPA; and Subtitle C of the Resource Conservation and Recovery Act, 42 U.S.C. Section 6901 et seq.; and the administrative rules promulgated thereunder. If the soils are not Hazardous Waste at the time of excavation or disturbance, the Owner shall manage such soils in accordance with the requirements of Section 20120c of the NREPA, the Part 201 Administrative Rules promulgated thereunder, and all other relevant state and federal laws.

7. Access. The Owner shall grant to the MDEQ and its designated representatives the right to enter the Property at reasonable times for the purpose of determining and monitoring compliance with the RAP, including the right to take samples, inspect the operation of the response activities and inspect any records relating thereto, and to perform any actions necessary to maintain compliance with Part 201 and the RAP.

8. Conveyance of Property Interest. The Owner shall provide notice to the MDEQ of the Owner's intent to transfer any interest in the Property at least fourteen (14) business days prior to consummating the conveyance. A conveyance of title, easement, or other interest in the Property shall not be consummated by the Owner without adequate and complete provision for compliance with the terms and conditions of this Restrictive Covenant and the applicable provisions of Section 20116 of the NREPA. The

notice required to be made to the MDEQ under this Paragraph shall be made to: Director, MDEQ, P.O. Box 30473, Lansing, Michigan 48909-7973; and shall include a statement that the notice is being made pursuant to the requirements of this Restrictive Covenant, MDEQ Reference Number RC-RRD-201-09-016. A copy of this Restrictive Covenant shall be provided to all future owners, heirs, successors, lessees, easement holders, assigns, and transferees by the person transferring the interest.

9. Term and Enforcement of Restrictive Covenant. This Restrictive Covenant shall run with the Property and shall be binding on the Owner; future owners; and all current and future successors, lessees, easement holders, their assigns, and their authorized agents, employees, or persons acting under their direction and control. This Restrictive Covenant may only be modified or rescinded with the written approval of the MDEQ.

The State of Michigan, through the MDEQ, and FHR, as Owner of the Property, may enforce the restrictions set forth in this Restrictive Covenant by legal action in a court of competent jurisdiction.

10. Severability. If any provision of this Restrictive Covenant is held to be invalid by any court of competent jurisdiction, the invalidity of such provision shall not affect the validity of any other provisions hereof, and all such other provisions shall continue unimpaired and in full force and effect.

11. Authority to Execute Restrictive Covenant. The undersigned person executing this Restrictive Covenant is the Owner, or has the express written permission of the Owner, and represents and certifies that he or she is duly authorized and has been empowered to execute and deliver this Restrictive Covenant.

IN WITNESS WHEREOF, Flint Hills Resources, LP, as Owner of the Property, has caused this Restrictive Covenant, RC-RRD-201-09-016, to be executed on this 18th day of January, 2010.

FLINT HILLS RESOURCES, LP
a Delaware limited partnership
By: FHR/GP, LLC, its General Partner

By: _____
Signature

Name: Phil Gearder
Print or Type Name

Its: VP Operations
Title

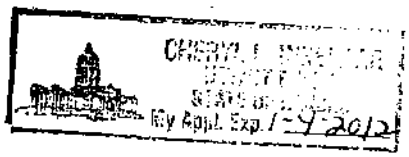
STATE OF Kansas
COUNTY OF Sedgwick

The foregoing instrument was acknowledged before me this 18th day of January, 2010, by Phil Gearder, VP Oper. of FHR/GP, LLC, General Partner of Flint Hills Resources, LP, a limited partnership.

_____
Notary Public

Acting in Sedgwick County, Kansas

My Commission Expires: 1-4-2012



THIS DOCUMENT PREPARED BY
AND WHEN RECORDED RETURN TO: (Fed X) REI
H. Kirk Meadows
HONIGMAN MILLER SCHWARTZ AND COHN LLP
222 N. Washington Square
Suite 400
Lansing, Michigan 48933-1800
(517) 377-0739

EXHIBIT 1

LEGAL DESCRIPTION OF PROPERTY

SAFECO TITLE INSURANCE

LIBER 1336 PAGE 367

WARRANTY DEED - CORPORATION - Statutory Form

KNOW ALL MEN BY THESE PRESENTS: That Muskegon Chemical Company

whose address is 1725 Warner Street, Whitehall, Michigan 49461

Convey(s) and Warrant(s) to Koch Refining Company

whose address is 4111 East 37th Street North, Wichita, Kansas 67220

the following described premises situated in the _____ of _____

County of Muskegon and State of Michigan, to-wit:

See Attachment "A"

(1)

for the consideration of Ten Dollars ($10.00) and other good and valuable consideration, receipt of which is acknowledged,

See Attachment "B"

Dated this 31 day of December, 85.

Signed and Sealed

John Snider, II

Wallina Whitlock

Muskegon Chemical Company

John R. Yost

PRESIDENT

Attest: David R. Munce

SECRETARY

STATE OF MICHIGAN, County of Muskegon ss.

The foregoing instrument was acknowledged before me this thirty-first day of December, 85 by John R. Yost and David R. Munce, President and Secretary, respectively of Muskegon Chemical Company, a Michigan corporation, on behalf of the corporation.

My commission expires 3/29/88.

L. John Snider II
Notary Public Muskegon County, Michigan

When recorded return to Name of grantee Address of grantee Drafter of instrument Name and address

Prepared by Gary A. Corman, Atty at Law Address P. O. Box 2256, Wichita, Kansas 67201

ATTACHMENT A

1. Legal Description:

That part of the West Half (W 1/2) of the Southwest Quarter (SW 1/4) of Section 34, Town 12 North, Range 17 West, City of Whitehall, described as follows and containing 19 acres, more or less: Commencing at the West Quarter corner of said Section, thence South along the West line of said Section 1082.00 feet for point of beginning, thence South 88°18' East parallel to the East and West Quarter line of said Section 1218.40 feet to a point which is 800.00 feet West of the East line of said West Half (W 1/2) of the Southwest Quarter (SW 1/4), thence South 0°09" East parallel to said East line of the West Half (W 1/2) of the Southwest Quarter (SW 1/4), 894.40 feet to the South line of the North Half (N 1/2) of the Southwest Quarter (SW 1/4) of said Southwest Quarter (SW 1/4), thence North 88°00' West along said South line of the North Half (N 1/2) of the Southwest Quarter (SW 1/4) of the Southwest Quarter (SW 1/4) 203.10 feet to the Northeasterly line of Chesapeake and Ohio Railway Company right of way, thence North 66°12' West along said Northeasterly line 930.10 feet, thence North 25°40' West along said Northeasterly line 383.93 feet to the West line of said Section, thence North along said West line 202.55 feet to point of beginning. The West 50.00 feet thereof to be used for road purposes.

LIBER 1336 PAGE 368

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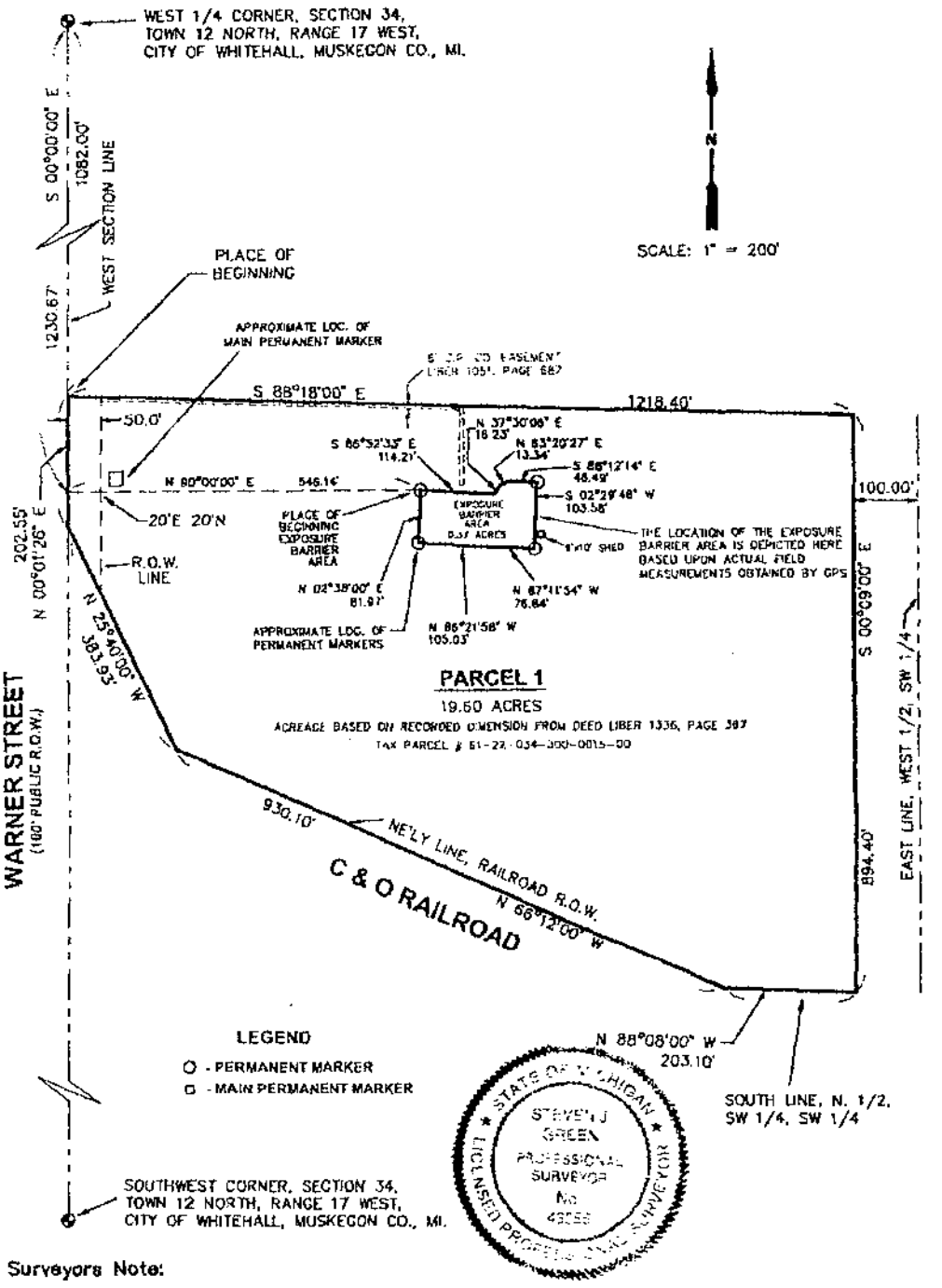
Page: 8 of 20
Mark Fairchild, Muskegon Co ROD 044

EXHIBIT 2

LIMITS OF LAND OR RESOURCE USE RESTRICTIONS

PROPERTY DESCRIPTION MAP
SHEET 1 OF 2



Surveyors Note:

I hereby certify that this Property Description Map was drafted from the description as recorded in Liber 1336, Page 367, of Muskegon County Records, for the Parcel 1 perimeter and actual field measurements obtained by GPS for the Exposure Barrier Area, and the bearings and distances depicted hereon accurately depict the same. The Surveyor did not perform field work, search for boundary irons or set irons, observe or locate any fences, buildings, or other improvements, or review an abstract of title and/or title policy, to determine title or possessory rights. The Exposure Barrier Area survey and description conforms to the requirements of P.A. 132, 1970 as amended.

Steven J. Green 5-06-09

Steven J. Green Professional Surveyor No. 43055

CREATING COMMUNITY

Prepared by:

MOORE & BRUGGINK INC.

Consulting Engineers
2020 Monroe Avenue N.W.
Grand Rapids, Michigan 49505-6298
Phone: (616) 363-9801 Web: www.mbce.com

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Parcel 1:

That part of the West one-half of the Southwest one-quarter of Section 34, Town 12 North, Range 17 West, City of Whitehall, Muskegon County, Michigan, described as follows: COMMENCING at the West one-quarter corner of said section; thence South along the West line of said section 1082.00 feet for the POINT OF BEGINNING; thence South 88°18' East parallel to the East and West one-quarter line of said section 1218.40 feet to a point which is 100.00 feet West of the East line of said West one-half of the Southwest one-quarter; thence South 00°09' East parallel to said East line of the West one-half of the Southwest one-quarter, 894.40 feet to the South line of the North one-half of the Southwest one-quarter of said Southwest one-quarter; thence North 88°08' West along said South line of the North one-half of the Southwest one-quarter of the Southwest one-quarter, 203.10 feet to the Northeasterly line of Chesapeake and Ohio Railway Company right of way; thence North 66°12' West along said Northeasterly line 930.10 feet; thence North 25°40' West along said Northeasterly line 383.93 feet to the West line of said section; thence North along said West line 202.55 feet to the point of beginning. The West 50.00 feet thereof to be used for road purposes.

Exposure Barrier Area

Part of the West one-half of the Southwest one-quarter of Section 34, Town 12 North, Range 17 West, City of Whitehall, Muskegon County, Michigan, described as: COMMENCING at the West one-quarter corner of said Section 34; thence South 00°00'00" East 1230.67 feet along the West line of said section; thence North 90°00'00" East 546.14 feet perpendicular to said West section line to the TRUE PLACE OF BEGINNING; thence South 86°52'33" East 114.21 feet; thence North 37°30'06" East 16.23 feet; thence North 63°20'27" East 13.34 feet; thence South 88°12'14" East 46.49 feet; thence South 02°29'46" West 103.58 feet; thence North 87°11'54" West 76.84 feet; thence North 86°21'58" West 105.03 feet; thence North 02°38'00" East 81.97 feet to the place of beginning.

16,216 square feet

STATE OF MICHIGAN
STEVEN J. GREEN
PROFESSIONAL SURVEYOR
No. 48554
LICENSED PROFESSIONAL SURVEYOR

5-06-09

CREATING COMMUNITY

Prepared By:
Consulting Engineers
2020 Monroe Avenue N.W.
Grand Rapids, Michigan 49505-6298
Phone: (616) 363-9801 Web: www.mbce.com

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EXHIBIT 3

DESCRIPTION OF ALLOWABLE USES

The following uses are allowed on the Property:

1. Any activities authorized as part of the remedial action in the RAP.

2. Any industrial uses consistent with the City of Whitehall MC-1 District – Limited Industrial Commercial zoning code designation, but only if such uses are made in accordance with the terms of this Restrictive Covenant. The living quarters of a watchman or caretaker shall not be located on the Property.

ARTICLE XVIII
MC-1 DISTRICT - LIMITED INDUSTRIAL COMMERCIAL

15-18-1 PURPOSE

This Ordinance provides opportunity to place selective commercial uses in the City's Industrial Districts. It is the purpose of the MC-1 District to provide for the controlled expansion of those opportunities to specific geographic locations. Accordingly, certain personal, professional, and service operations have been added to the range of uses identified in the M1 District under the provisions of the MC-1 District. Creation of this unique district is considered desirable over that of expanding the range of uses permitted under other zone districts.

In pursuit of the above, the MC-1 District recognizes the advantages and beneficial relationships that may accrue from the integration of certain commercial uses with industrial uses; offers a suitable location for certain commercial uses which may be inappropriate for placement in one of the City's core commercial areas; and, offers additional flexibility in the use and development of land.

15-18-2 USES PERMITTED BY RIGHT

In an MC-1 Limited Industrial Commercial District, no building or land shall be used and no building erected except for one or more of the following specified land uses, unless otherwise provided for in this Ordinance.

(A) Uses permitted by right in the M1 District.
(B) Printing and copy services.
(C) Office of a professional engineer, surveyor, geologist, architect, planner, or similar professional.
(D) Offices of a manufacturer's and/or sales representative.
(E) Packaging, mailing, and delivery services.
(F) Retail and wholesale of office supplies, drafting equipment, computer equipment, and similar supplies and equipment.

15-18-3 PERMITTED ACCESSORY USES

(A) Permitted accessory uses as provided for in the M1 District.

15-18-4 USES PERMITTED BY SPECIAL USE PERMIT

(A) Uses permitted by special use permit as provided for in the M1 District.
(B) Fitness clubs and health spas.
(C) Sexually oriented businesses.

15-18-5 SITE DEVELOPMENT STANDARDS

All uses and structures shall comply with the SITE DEVELOPMENT STANDARDS OF THE M1 District [Refer also to Section 15-20-27 for additional site development standards for Sexually Oriented Businesses.]

ARTICLE XIII
M1 DISTRICT - LIMITED INDUSTRIAL

15-13-1 PURPOSE

The purpose of the M1 District is to encourage and facilitate the development of research, warehouse, and light industrial activities in a setting conducive to public health, economic stability and growth, protection from blight, deterioration and nonindustrial encroachment, and efficient traffic movement, including both employee and truck traffic. The above mentioned enterprises will be characterized by the absence of objectionable external effects and the potentiality of attractive industrial architecture.

Regulations contained in this District are designed to promote the development of industrial areas and industrial or research parks which will be compatible with one another and with adjacent or surrounding districts. The regulations contained herein are intended to prohibit residential or commercial uses as being incompatible with the primary permitted uses, as well as being adequately provided for in other districts.

15-13-2 USES PERMITTED BY RIGHT

In an M1 Limited Industrial District, no building or land shall be used and no building erected except for one or more of the following specified uses, unless otherwise provided in this Ordinance.

(A) Non-manufacturing research and development establishment such as laboratories; offices and facilities for research, both basic and applied, conducted by or for any individual, organization, or concern; production of prototyping products, limited to the scale necessary for full investigation of the merits of the product.

(B) The sale at wholesale or warehousing of automotive equipment; dry goods and apparel; groceries and related products; raw farm products except livestock; electrical goods; hardware; plumbing; heating equipment and supplies; machinery; tobacco and tobacco products; beer, wine and distilled alcoholic beverages; paper and paper products; furniture and home furnishings; any commodity the manufacture of which is permitted in this district; storage or transfer buildings; commercial laundries or cleaning establishments; and frozen food lockers.

(C) Industrial establishments such as:

(1) The assembly, fabrication, compounding, packaging, manufacture, or treatment of such articles as food products, candy, drugs, cosmetics and toiletries, musical instruments, toys, novelties, electrical instruments and appliances, radios and phonographs,

pottery and figurines or other similar ceramic products using only previously pulverized clay.

(2) The assembly, fabrication, compounding, packaging, manufacture, or treatment of products from previously prepared materials such as bone, canvas, cellophane, cloth, cork, felt, fibre, glass, leather, paper, plastic, precious or semiprecious metals or stones, sheet metal ferrous or nonferrous metals, shell textiles, wax, wire, wood (excluding saw and planing mills), yarn and paint.

(3) Tool and die shops, metal working machine shops involving the use of grinding or cutting tools, such as manufacturing tools, dies, jigs and fixtures, publishing, printing, or forming of box, carton, and cardboard products.

(D) Retail sales typically incidental to contractors establishments which require a workshop and retail outlet or showroom as accessory uses, such as:

(1) Plumbing and electrical contractors.
(2) Building and material suppliers and wholesalers such as lumber yards and other similar uses.
(3) Carpenter shops including door, sash, or trim manufacturing.
(4) Jobbing and repair machine shops.
(5) Commercial garage, bump shops, or automobile repair garages.
(6) Plastic products forming and molding.
(7) Printing and publishing.
(8) Trade, training, technical, and industrial facilities.
(9) Air conditioning and heating dealers including incidental sheet metal work.
(10) Furniture reupholstering and refinishing establishments.
(11) Sign painting establishments.
(12) Establishments producing and selling monuments, cut stone, stone, and similar products.
(13) Other uses similar to and compatible with the above uses.

(E) Communication facilities with buildings, public utility buildings, telephone exchange buildings, electric transformer stations and substations, gas regulator stations, communication and relay stations with outdoor storage.

(F) Credit Union which has as its primary purpose the providing of financial services to the employees and their families of an M1 or M2 District Industrial Business located in the City of Whitehall.

15-13-3 PERMITTED ACCESSORY USES

The following are permitted accessory uses.

(A) Any use customarily incidental to the permitted principal use.

(B) Living quarters of a watchman or caretaker employed on the premises.

(C) Dispensaries and clinics on the premises of and clearly incidental to any business, trade, or industry.

(D) Restaurant or cafeteria facilities for employees.

(E) Signs subject to the regulations established in Article XXIII.

(F) Off street parking as required by Article XXII.

15-13-4 USES PERMITTED BY SPECIAL USE PERMIT

The following uses of land and structures may be permitted in this district by the application for and the issuance of a Special Use Permit as provided for in Article XXIV.

(A) Planned research or industrial parks.

(B) Commercial television and radio towers and public utility microwaves or television transmitting towers and other attendant facilities.

(C) The exterior storage of semi-trucks, semi-trailers, mobile homes, campers, buses, and recreational vehicles.

(D) Public buildings and services.

15-13-5 SITE DEVELOPMENT STANDARDS

The following standards shall apply to all uses and structures in the M1 District.

(A) No structure or use shall be established on any parcel providing less than 12,000 square feet of lot area.

(B) The minimum lot width shall be 100 feet.

(C) Yard and Setback requirements
  (1) The required front yard setback shall not be less than 50 feet.
  (2) The required side and rear yard setbacks shall not be less than 20 feet except. In the case of a corner lot, the side yard shall not be less than the setback required for the front yard.
  (3) No structure shall be located less than 50 feet from any residential boundary line.

(D) The maximum height shall be 30 feet as measured from the average finished grade at the front setback line, unless each required yard setback is increased by one foot for every foot of height above 30 feet.

(E) Other requirements

(1) Unless specifically mentioned, all activities in this district shall be carried on in completely enclosed buildings.

(2) Storage of finished or unfinished materials, or any equipment or machinery necessary to the operation, is permitted, but all storage areas shall be effectively screened by solid, uniformly finished wall or fence with solid entrance and exit gates. Said wall or fence shall in no case be lower than the enclosed storage.

(3) Landscaping shall be maintained in all required yards, in accordance with plans approved by the Planning Commission as a part of site plan review.

(4) Lighting shall be accomplished in a manner that no illumination source is visible beyond the property lines of the lot upon which the use is located, and such that no illumination shall adversely affect the welfare of an adjacent property.

(5) Refuse containers shall be enclosed on all sides by an obscuring masonry wall or tight-board wooden fence of adequate height to obscure such containers and any refuse materials from view. In no case shall such wall or fence be less than six feet in height.

(6) Air conditioning units, heating, oil storage, or similar structures shall be screened as approved by the Planning Commission.

15-13-6 PERFORMANCE STANDARDS

It shall be unlawful to carry on or permit to be carried on any activity or operation or use of any land, building, or equipment that produces irritants to the sensory perceptions greater than the measures herein established which are hereby determined to be the maximum permissible hazards to humans or human activity. Such measures may be supplemented by other measures which are duly determined to be the maximum permissible hazards to humans or to human activity.

(A) Noise - The intensity level of sounds shall not exceed the following decibel levels when adjacent to the following types of uses as measured from any common lot line:

In Decibels (dba)	Adjacent Use
55	Residential Dwellings
65	Commercial
70	Industrial and Other

The sound levels shall be measured with a type of audio output meter approved by the Bureau of Standards. Objectionable noises due to intermittence, beat, frequency, or shrillness, shall be muffled so as not to become a nuisance to adjacent uses.

(B) Vibration - All machinery shall be so mounted and operated as to prevent transmission of ground vibration exceeding a displacement of .003 of one inch, as measured at the property line.

(C) Odor - The emission of noxious, odorous matter in such quantities as to be readily detectable at any point along lot lines when diluted in the ratio of one volume of odorous air to four or more volumes of clean air or as to produce a public nuisance or hazard beyond lot lines is prohibited.

(D) Gases - The escape or emission of any gas which is injurious or destructive or explosive shall be unlawful and may be summarily caused to be abated.

(E) Glare and Heat - Any operation producing intense glare or heat shall be performed within an enclosure so as to completely obscure and shield such operation from direct view from any point along the lot line, except during the period of construction of the facilities to be used and occupied.

(F) Light - exterior lighting shall be so installed that the surface of the source of light shall not be visible from any bedroom window, and shall be so arranged as far as practical to reflect light away from any residential use, and in no case shall more than one foot candle power of light cross a lot line 5 feet above the ground in a residential district.

(G) Electromagnetic Radiation - applicable rules and regulations of the Federal Communications Commission in regard to propagation of electromagnetic radiation are hereby made a part of this Ordinance.

(H) Smoke - It shall be unlawful to discharge into the atmosphere from any single source of emission whatsoever any air contaminator for a period or periods aggregating more than 4 minutes in any one-half hour which is:

(1) As dark or darker in shade as that designated as Number 2 on the Ringelmann Chart. The Ringelmann Chart, as published by the United States Bureau of Mines, which is hereby made a part of this Ordinance, shall be the standard. However, the Umbrascope readings of smoke densities may be used when correlated with the Ringelmann Chart. A Ringelmann Chart shall be on file in the office of the Building Inspector.

(2) Of such opacity as to obscure an observer=s view to a degree equal to or greater than the smoke described in (1) above, except when the emission consists only of water vapor.

(I) Drifted and Blown Material - the drifting or airborne transmission to areas beyond the lot line of dust, particles, or debris from any open stock pile shall be unlawful and may be summarily caused to be abated.

(J) Radioactive Material - radioactive materials shall not be emitted to exceed quantities established as safe by the U. S. Bureau of Standards, as amended from time to time.

(K) Sewage Wastes - No industrial sewage wastes shall be discharged into sewers that will cause chemical reaction, either directly or indirectly, with the materials of construction to impair the strength or durability of sewer structures, cause mechanical action that will destroy or damage the sewer structures, cause restriction of the hydraulic capacity of sewer structures, cause placing of unusual demands on the sewage treatment equipment or process, cause limitation of the effectiveness of the sewage treatment process, cause danger to public health and safety, or cause obnoxious conditions inimical to the public interest. Industrial sewage discharges shall meet all applicable State and Federal requirements.

Attachment 2

Received & Sealed For Record
MARK F. FAIRCHILD REGISTER OF DEEDS
Muskegon County Michigan
01/22/2010 01:32P LIBER 3834 PAGE 959

5336432
L-3834 P-959
01/22/2010 01:32P
Mark Fairchild, Muskegon Co ROD 044 Page: 1 of 10

DECLARATION OF RESTRICTIVE COVENANT

MDEQ Reference No.: RC-RRD-201-09-017

This Declaration of Restrictive Covenant ("Restrictive Covenant") completely supersedes the Declarations of Restrictions and Covenants recorded at liber 2078, page 597 (MDEQ Reference No. RC-ERD-98-018), Muskegon County Register of Deeds, and liber 2078, page 600 (MDEQ Reference No. RC-ERD-98-017), Muskegon County Register of Deeds, and has been recorded with the Muskegon County Register of Deeds for the purpose of protecting public health, safety, and welfare, and the environment by prohibiting or restricting activities that could result in unacceptable exposure to environmental contamination present at the property located in the Township of Fruitland, County of Muskegon, and legally described in Exhibit 1 attached hereto ("Property"). The Property is associated with the Muskegon Chemical Company Site, Site ID No. 61000029, for which a remedial action plan is being conducted. The remedial action that is being implemented to address environmental contamination is fully described in the Remedial Action Plan for the Muskegon Chemical Company NPL Site ("RAP"), dated June 1997 and submitted by Koch Chemical Company. The Michigan Department of Environmental Quality ("MDEQ") approved the RAP pursuant to Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended ("NREPA"), MCL 324.20101 et seq. The RAP was then incorporated into a Consent Decree that was entered by the United States District Court for the Western District of Michigan on November 25, 1997. The RAP and the Consent Decree were amended by order of that court on December 11, 2000. On January 6, 2010, the MDEQ approved the second amendment to the RAP, submitted by Flint Hills Resources, LP ("FHR"), entitled "Remedial Action Plan Amendment, Muskegon Chemical Company NPL Site," dated May 8, 2009. Pursuant to the terms of the Consent Decree, the second RAP amendment was incorporated into and made an enforceable part of the Consent Decree upon its approval by the MDEQ. The RAP and RAP amendments are together hereinafter referred to as the "RAP."

The RAP required the recording of this Restrictive Covenant with the Muskegon County Register of Deeds to: 1) restrict unacceptable exposures to hazardous substances located on the Property; 2) assure that the use of Property is consistent with the exposure assumptions utilized in the development of cleanup criteria pursuant to Section 20120a(1)(f) of Part 201 of the NREPA and the exposure control measures relied upon in the RAP; and 3) to prevent damage or disturbance of any element of the response activity constructed on the Property. The restrictions contained in this Restrictive Covenant are based upon information available to the MDEQ at the time the RAP was approved by the MDEQ. Failure of the response activities to achieve and maintain the criteria, exposure controls, and requirements specified in the RAP; future changes in the environmental condition of the Property or changes in the cleanup criteria developed under Section 20120a(1)(f) of Part 201 of the NREPA; the discovery of environmental conditions at the Property that were not accounted for in the RAP; or use of the Property in a manner inconsistent with the restrictions described herein, may result in this Restrictive Covenant not being protective of public health, safety, and welfare, and the environment.

Exhibit 1 provides a survey of the Property. Exhibit 2 depicts the portion of the Property that is subject to the land use or resource use restrictions specified herein.

Summary of Response Activities

Hazardous substances, including 1,2 dichloroethane, bis (2-chloroethyl) ether (Chlorex), and triglycol dichloride were discovered in groundwater on the Property. Prior to recording of this Restrictive Covenant, response activities have been undertaken to remove or treat in-place some of the contamination. However, hazardous substances remain present in groundwater at levels that require controls to prevent unacceptable exposures.

Definitions

"MDEQ" means the Michigan Department of Environmental Quality, its successor entities, and those persons or entities acting on its behalf.

"Owner" means at any given time the then current title holder of the Property or any portion thereof.

All other terms used in this document which are defined in Part 3, Definitions, of the NREPA; Part 201 of the NREPA; or the Part 201 Administrative Rules ("Part 201 Rules"), 1990 AACS R 299.5101 et seq., shall have the same meaning in this document as in Parts 3 and 201 of the NREPA and the Part 201 Rules, as of the date of filing of this Restrictive Covenant.

NOW THEREFORE,

Declaration of Land Use or Resource Use Restrictions

Pursuant to the Consent Decree, FHR, as Owner of the Property at the time this Restrictive Covenant was recorded, hereby declares and covenants that the Property shall be subject to the following restrictions and conditions:

1. The Owner shall prohibit activities within the area of the Property located north of the centerline of Mill Pond Creek, as depicted in Exhibit 2 ("Restricted Area"), that may result in exposures to hazardous substances in groundwater above levels established in the RAP. The following activities are prohibited in the Restricted Area:

   A. Any construction of wells or other devices to extract groundwater for consumption, irrigation, or any other use, except for wells and devices that are part of an MDEQ-approved response activity.
   B. Any use of existing wells or other devices to extract groundwater for consumption, irrigation, or any other use, except as authorized as part of an MDEQ-approved response activity.

2. The Owner shall prohibit activities in the Restricted Area that may interfere with any element of the RAP, including the performance of operation and maintenance activities, monitoring, or other measures necessary to ensure the effectiveness and integrity of the remedial action in the RAP. These prohibited activities include:

   A. Any activities that would interfere with access to the monitoring wells identified in the RAP.
   B. Any activities that would interfere with contingency measures identified in the RAP.

3. Access. The Owner shall grant to the MDEQ and its designated representatives the right to enter the Restricted Area at reasonable times for the purpose of determining and monitoring compliance with the RAP, including the right to take samples, inspect the operation of the response activities and inspect any records relating thereto, and to perform any actions necessary to maintain compliance with Part 201 and the RAP.

4. Conveyance of Property Interest. The Owner shall provide notice to the MDEQ of the Owner's intent to transfer any interest in the Property at least fourteen (14) business days prior to consummating the conveyance. A conveyance of title, easement, or other interest in the Property shall not be consummated by the Owner without adequate and complete provision for compliance with the terms and conditions of this Restrictive Covenant and the applicable provisions of Section 20116 of the NREPA. The notice required to be made to the MDEQ under this Paragraph shall be made to: Director, MDEQ, P.O. Box 30473, Lansing, Michigan 48909-7973; and shall include a statement that the notice is being made pursuant to the requirements of this Restrictive Covenant, MDEQ Reference Number RC-RRD-201-09-017. A copy of this Restrictive Covenant shall be provided to all future owners, heirs, successors, lessees, easement holders, assigns, and transferees by the person transferring the interest.

5. Term and Enforcement of Restrictive Covenant. This Restrictive Covenant shall run with the Property and shall be binding on the Owner; future owners; and all current and future successors, lessees, easement holders, their assigns, and their authorized agents, employees, or persons acting under their direction and control. This Restrictive Covenant may only be modified or rescinded with the written approval of the MDEQ.

The State of Michigan, through the MDEQ, and FHR, as Owner of the Property, may enforce the restrictions set forth in this Restrictive Covenant by legal action in a court of competent jurisdiction.

6. Severability. If any provision of this Restrictive Covenant is held to be invalid by any court of competent jurisdiction, the invalidity of such provision shall not affect the validity of any other provisions hereof, and all such other provisions shall continue unimpaired and in full force and effect.

7. Authority to Execute Restrictive Covenant. The undersigned person executing this Restrictive Covenant is the Owner, or has the express written permission of the Owner, and represents and certifies that he or she is duly authorized and has been empowered to execute and deliver this Restrictive Covenant.

IN WITNESS WHEREOF, Flint Hills Resources, LP, as Owner of the Property, has caused this Restrictive Covenant, RC-RRD-201-09-017, to be executed on this 18th day of January, 2010.

FLINT HILLS RESOURCES, LP
a Delaware limited partnership
By: FHR/GP, LLC, its General Partner

By: _____
Signature

Name: Phil Gaarder
Print or Type Name

Its: VP Operations
Title

STATE OF Kansas
COUNTY OF Sedgwick

The foregoing instrument was acknowledged before me this 18th day of January, 2010, by Phil Gaarder, VP-Oper. of FHR/GP, LLC, General Partner of Flint Hills Resources, LP, a limited partnership.

_____
Notary Public

NOTARY PUBLIC
STATE OF KANSAS
My Appt. Exp. 1-4-2012

Acting in Sedgwick County, Kansas

My Commission Expires: 1-4-2012

THIS DOCUMENT PREPARED BY
AND WHEN RECORDED RETURN TO:
H. Kirk Meadows
HONIGMAN MILLER SCHWARTZ AND COHN LLP
222 N. Washington Square
Suite 400
Lansing, Michigan 48933-1800
(517) 377-0739

REI 7.0X

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01/22/2010 01:32P
Page: 4 of 10
Mark Fairchild, Muskegon Co ROD 044

EXHIBIT 1

LEGAL DESCRIPTION AND SURVEY OF PROPERTY

PROPERTY DESCRIPTION MAP

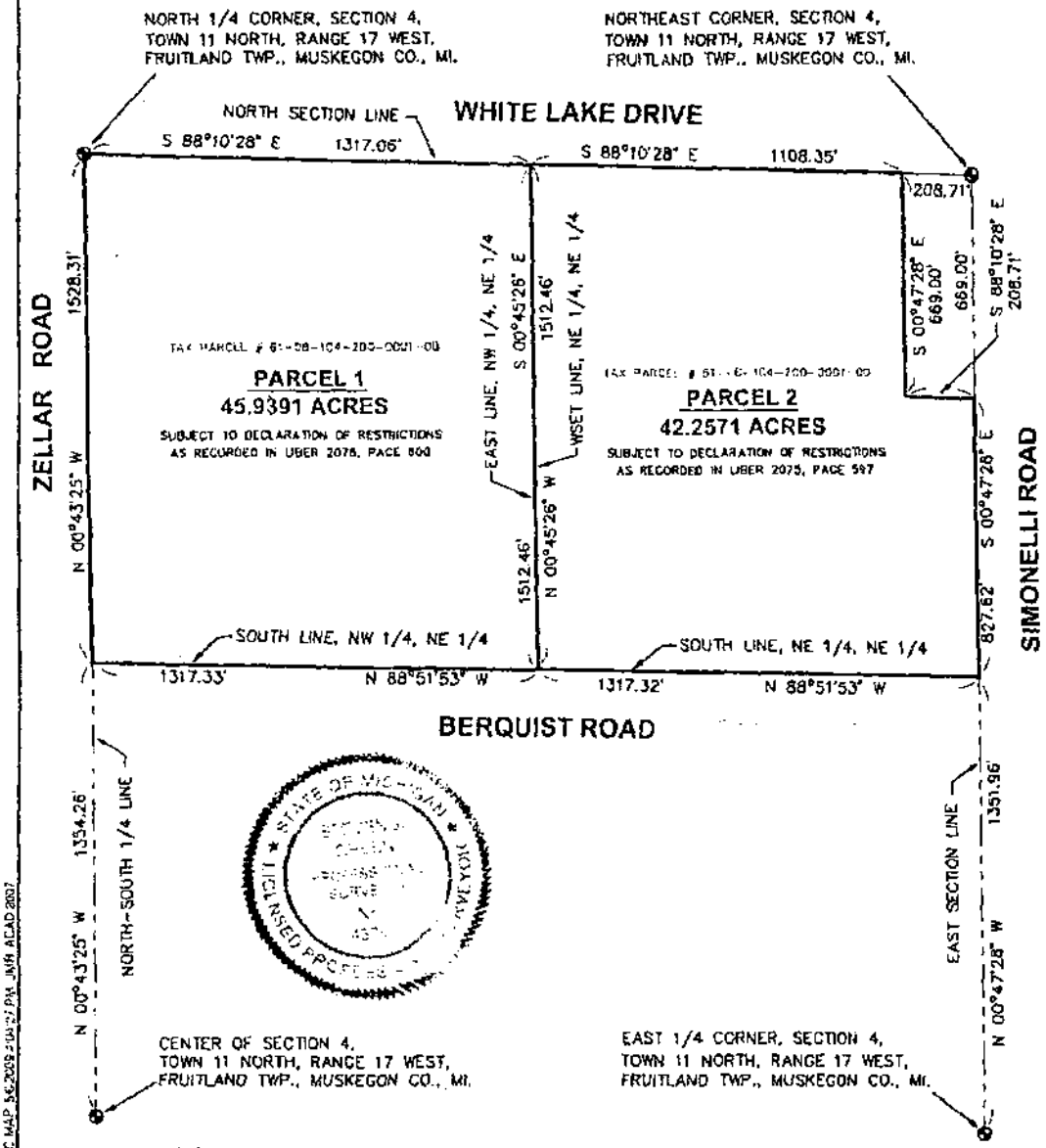
PROPERTY DESCRIPTION

Parcel 1:

The Northwest fractional one-quarter of the Northeast fractional one-quarter of Section 4, Town 11 North, Range 17 West, Township of Fruitland, Muskegon County, Michigan.

Parcel 2:

The Northeast one-quarter of the Northeast fractional one-quarter of Section 4, Town 11 North, Range 17 West, Township of Fruitland, Muskegon County, Michigan, EXCEPT the East 208.71 feet of the North 669 feet of the Northeast one-quarter of the Northeast fractional one-quarter of said Section 4.



Surveyors Note:

I hereby certify that this Property Description Map was drafted from the description as recorded in Liber 1572, Page 27, of Muskegon County Records, for the perimeter of Parcel 1, and Liber 1698, Page 479, of Muskegon County Records, for the perimeter of Parcel 2 and the bearings and distances depicted hereon accurately illustrate the same. The Surveyor did not perform field work, search for boundary irons or set irons, observe or locate any fences, buildings or other improvements, or review an abstract of title and/or title policy, to determine title or possessory rights.

5-06-09

Steven J. Green Professional Surveyor No. 43055

CREATING COMMUNITY RELATIONSHIPS FOR 75 YEARS

Prepared by:

MOORE & BRUGGINK INC.

Consulting Engineers

2020 Monroe Avenue N.W.

Grand Rapids, Michigan 49505-6298

Phone: (616) 363-9801 Web: www.mbce.com

M:\63072\dwg\063072-MILL PLN\Dwg\PROP DESC MAP 5-6-2009 10:12:7 PM JWH ACAD 2007

LIBER 1572 PAGE 27

AFTER REAL ESTATE TRANSFER TAX STAMP AFTER RECORDING

STATE OF MICHIGAN COUNTY OF MUSKEGON

WARRANTY DEED — STATUTORY FORM FOR INDIVIDUALS

TITLE OFFICE

Dated this day of:

MAY 30, 1991

This Indenture,

KNOW ALL MEN BY THESE PRESENTS THAT

HERBERT D. LONGWORTH AND HAI P. LONGWORTH, HUSBAND AND WIFE
56 STON STREET
WALTHAM, MA 02154

Convey(s) and Warrant(s) To:

KOCH CHEMICAL COMPANY, A DIVISION OF KOCH REFINING COMPANY, A DELAWARE CORPORATION,
4111 EAST 37TH STREET NORTH
WICHITA, KS 67201

for the sum of

SEE REAL ESTATE TRANSFER VALUATION AFFIDAVIT ATTACHED

the following described premises situated in

THE TOWNSHIP OF FRUITLAND, COUNTY OF MUSKEGON AND STATE OF MICHIGAN TO WIT:

THE NORTHWEST FRACTIONAL 1/4 OF THE NORTHEAST FRACTIONAL 1/4 OF SECTION 4, TOWN 11 NORTH, RANGE 17 WEST.

P.P. 061-066-004-004-00(20-49)

SUBJECT TO EASEMENTS, RESERVATIONS AND RESTRICTIONS OF RECORD, IF ANY.

TITLE OFFICE

RECORDERS ARCHIVE INFORMATION IRREGULAR ORIGINAL

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01/22/2010 01:32P
Mark Fairchild, Muskegon Co ROD 044 Page: 7 of 10

Witnesses:

Signed and Sealed

HERBERT D. LONGWORTH

HAI P. LONGWORTH

STATE OF MICHIGAN COUNTY OF
MASSACHUSETTS

The foregoing instrument was acknowledged before me

ON MAY 30, 1991 BY HERBERT D. LONGWORTH AND HAI P. LONGWORTH, HUSBAND AND WIFE

Notary Public

COLLEEN A. DEEHAN
NOTARY PUBLIC, MASSACHUSETTS
MY COMMISSION EXPIRES

Muskegon, Mich. 6-19-91

"I Hereby certify that there are no tax liens or tax liens held by the state or any municipality against the within corporation, and all taxes on same are paid for five years previous to the date of this instrument or such portion thereof as may be applicable."

TITLE OFFICE

LIBER 1698 PAGE 479

Rev 107.80

WARRANTY DEED

The Grantors, HOWARD W. BRANDT and wife, RUTH A. BRANDT, whose address is 1500 N.E. 103 Street, Miami Shores, Florida, 33138, convey and *warrant to KOCH CHEMICAL COMPANY, a division of Koch Refining Company, a Delaware corporation, whose address is P.O. Box 2256 Wichita, Kansas, 67201, the following-described premises situated in the Township of Fruitland, County of Muskegon, and State of Michigan:

The Northeast quarter of the Northeast fractional quarter of Section 4, Town 11 North, Range 17 West, except the East 208.71 feet of the North 669 feet of the Northeast quarter of the Northeast fractional quarter of said Section 4.

for the sum of NINETY-EIGHT THOUSAND DOLLARS ($98,000.00) and other valuable consideration subject to easements and building and use restrictions of record.

*Grantors make no warranties, either express or implied, regarding the condition of the property herein conveyed; subject property is granted and conveyed "as is".

Dated this 22nd day of May, 1993.

Signed in the presence of:

Kenneth R. Lampe
Rebecca I. DeYoung
Daniel W. Brandt
Francis J. Jimenez

Howard W. Brandt

Ruth A. Brandt

STATE OF MICHIGAN
COUNTY OF MUSKEGON
RECEIVED FOR RECORD
'93 JUN 10 AM 10:07
Carrie Carter
REGISTER OF DEEDS

STATE OF MICHIGAN) ss
COUNTY OF OTTAWA)

The foregoing instrument was acknowledged before me this 17th day of May, 1993 by Howard W. Brandt.

Muskegon, Mich. June 09 1993
"I hereby certify that there are no tax liens or titles held by the state or any individual against the within description, and all taxes on same are paid for five years previous to the date of this instrument, as appears by the records in my office."
No. 63035 [signature] Treas.

Rebecca I. DeYoung
Notary Public, Ottawa County, Michigan
My Commission Expires: 12-02-96

STATE OF MICHIGAN REAL ESTATE TRANSFER TAX
Dept of Treasury 107.80

STATE OF FLORIDA) ss
COUNTY OF Dade)

The foregoing instrument was acknowledged before me this 22 day of May, 1993 by Ruth A. Brandt.

Mary A. Gault
Notary Public, Dade County, Florida
My Commission Expires:

OFFICIAL NOTARY SEAL
MARY A GAULT
NOTARY PUBLIC STATE OF FLORIDA
COMMISSION NO.
MY COMMISSION EXP. MAY 24, 1994

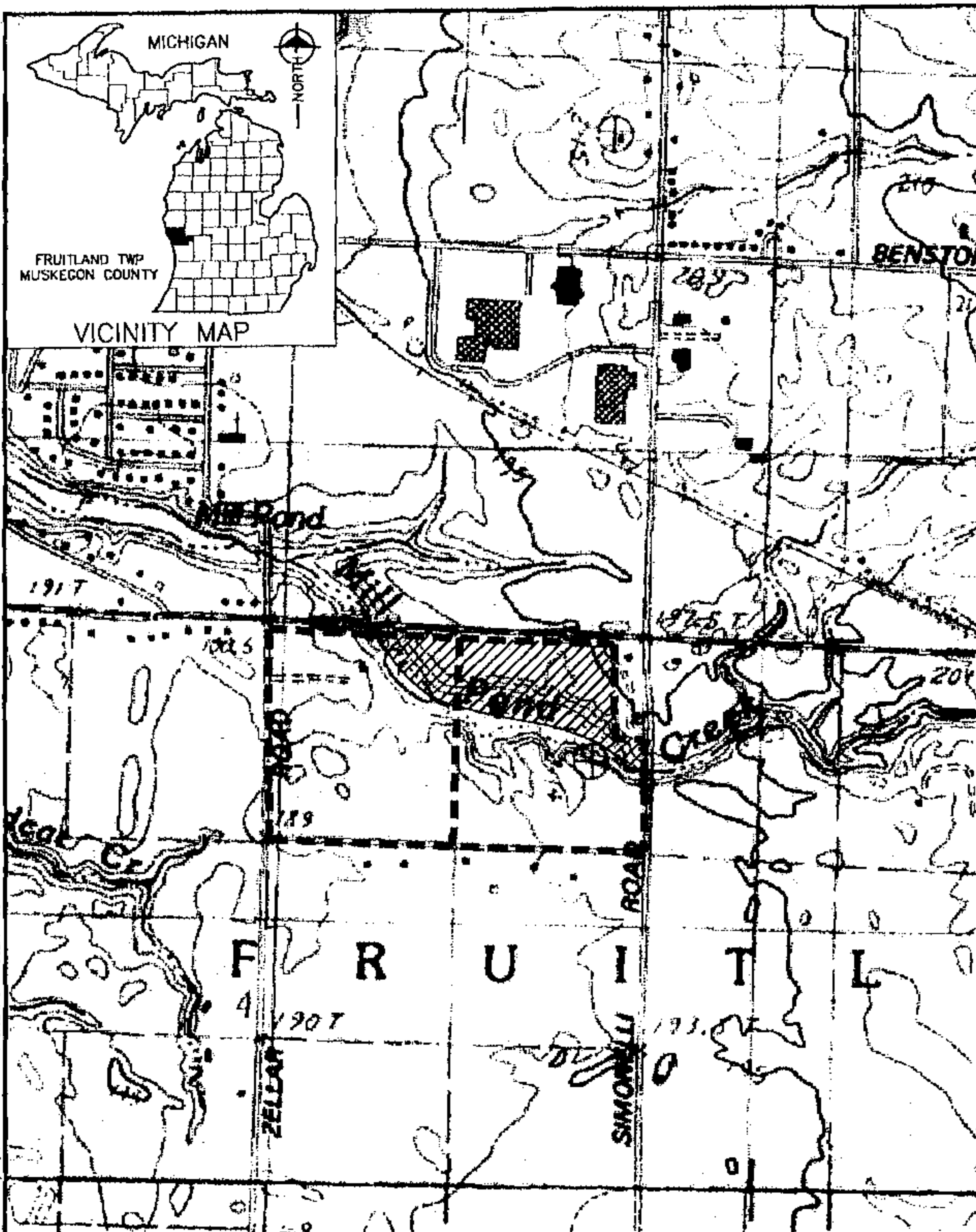
PREPARED BY:
Kenneth R. Lampe
Attorney at Law
509 Franklin Avenue
Grand Haven, MI 49417

06/104 200 0002 00

(3)

EXHIBIT 2

RESTRICTED AREA



fishbeck, thompson, carr & huber, inc.
engineers
scientists
architects
constructors

Hard copy is intended to be 8.5"x11" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

Muskegon Chemical Company
NPL Site (MID 072 569510)
Fruitland Twp., Muskegon County, Michigan

LEGEND

RESTRICTED AREA

PROPERTY BOUNDARY

CENTERLINE OF MILL POND CREEK

Scale: 1" = 1000'

0 500 1000

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Page: 10 of 10
Mark Fairchild, Muskegon Co ROD 044

REFERENCE:
DALTON, MONTAGUE, MICHILLINDA AND FLOWER CREEK QUADRANGLES 7.5 MINUTE SERIES
DATED: 1983

Terrain Navigator Pro v. 8.0, (c)2006, Maptech Inc.

PROPERTY WITH RESTRICTIVE COVENANT

PROJECT NO.
G05605Q

FIGURE NO.
1

DATE: 1/19/2010 TIME: 12:28:12 PM USER: ACS

MICHIGAN
WATER WELL CONSTRUCTION
AND PUMP INSTALLATION CODE

GROUNDWATER QUALITY CONTROL

Part 127 - Act 368 of the Public Acts of 1978, as amended, and rules

- WELL CONSTRUCTION CODE
- DRILLING CONTRACTORS' AND PUMP INSTALLERS' REGISTRATION
- DRILLING MACHINES AND SERVICE VEHICLES
- DEWATERING WELLS

1994 Revision

Michigan Department of Public Health

PREFACE

Exerpts of the Public Health Code and related Groundwater Quality Control Rules are reprinted under the editorial direction of the Legislative Service Bureau from the text of the *Michigan Compiled Laws*, supplemented through Act 315 of the 1994 Regular Session of the Michigan Legislature, and from text of the *Michigan Administrative Code*, supplemented through Issue No. 7 of the *Michigan Register*.

Materials in boldface type, particularly catchlines and annotations to the statutes, and appendices are not part of the statutes as enacted by the Legislature.

Legal Editing and Law Publications Division
Legislative Service Bureau

Requests for additional copies of this publication can be directed to the Michigan Department of Public Health, Bureau of Environmental and Occupational Health, Division of Water Supply, 3423 N. Martin L. King Jr. Blvd., P.O. Box 30195, Lansing, MI 48909 or the Michigan Department of Public Health, Division of Upper Peninsula, 305 Ludington Street, Escanaba, MI 49829.

CHAPTER II
SEWAGE DISPOSAL

Scope: These regulations relate to sewage disposal systems and apply to all lots and premises used for residential purposes.

SECTION A General Definitions

Words and Terms

The following words and terms used in this chapter, unless otherwise expressly stated, shall have the following meaning:

1. "Sewage" shall mean the liquid wastes from all habitable buildings, and shall include human excreta and wastes from sink, lavatory, bathtub, shower, and laundry, and any other water-carried wastes of organic or inorganic nature excluding roof, footing and storm drainage, either singly or in any combination thereof. Clear water waste from water-cooled machinery and brine wastes from water softeners shall also be excluded.

2. "Block trench absorption system" shall man an underground enclosure connected to the outlet of a septic tank constructed of concrete block, brick, or precast concrete units laid within open joints so as to allow the septic tank effluent or overflow to be absorbed directly into the surrounding soil. Covers shall be reinforced and easily removable or provided with portholes for cleaning and inspection purposes.

3. "Sewer" shall mean a conduit pipe for carrying off sewage.

4. "Absorption field" shall mean a system for distributing septic tank overflow or effluent below the ground surface by means of a series of branch lines of drain tile laid with open joints or other approved pipe so as to allow the overflow or effluent to be absorbed by the surrounding soil.

5. "Sewage disposal system" shall mean the method of disposing of sewage by means of a sewer line connected to a septic tank and one or more of the following: block trench, seepage bed, tile field or any other similar device or devices approved by the Health Officer.

6. "Septic tank" shall mean a watertight tank or receptacle of sufficient size used for the purpose of receiving wastes from flush toilets, sinks, lavatories, bathtubs, showers, laundry drains, basements floor drains, or other similar waste lines, and intended to provide for the separation of substantial portions of the suspended solids in such wastes and for the partial destruction by bacterial action of the solids so separated.

7. "Flush toilet" shall mean a type of closet or plumbing receptacle containing a portion of water which receives human excreta and so designed as by means of a flush of water to discharge the contents of the receptacle to an outlet connection.

8. "Other toilet devices" shall mean privies, septic toilets, composting toilets, chemical toilets, and other such devices used for the disposal of human excreta.

9. "Dosing tank: is a watertight tank or receptacle used for the purpose of retaining the overflow or effluent from a septic tank, pending its automatic discharge to a selected point.

10. "Automatic siphon" is a mechanical device which will automatically cause a liquid entering a receptacle to be retained until a predetermined high-water level has been attained after which it is automatically released from the receptacle until a second predetermined level has been reached, at which time the flow from such receptacle ceases until the high-water level has again been attained.

11. "Mean seasonal high water" shall mean the average of the seasonal high groundwater levels over a period of the ten years last past.

12. "Percolation test" is measuring the rate by which water drops in a presaturated test hole. The rate expresses the soil's ability to transmit water in all directions simultaneously and is usually expressed in inches per hour.

13. "Public sanitary sewer system" means a sanitary sewer or a combined sanitary and storm sewer used or intended for use by the public for the collection and transportation of sanitary sewage for treatment or disposal and owned or operated by a governmental agency or a private corporation, association, partnership or individual.

14. "Permit" shall mean a document issued by the Muskegon County Health Department authorizing the construction and operation of a sewage disposal system for an individual structure or group of structures according to plans and specifications as approved by the Health Department.

15. "Fill sand" shall mean clean sand free of clay, silt, black dirt, and vegetation.

16. "Structure in which sanitary sewage originates" means a building in which toilet, kitchen, laundry, bathing or other facilities which generate water-carried sanitary sewage, are used or are available for use for household, commercial, industrial or other purposes.

17. "Available sanitary sewer" shall mean a public sanitary sewer system located in a right-of-way, easement, highway, street or public way which crosses, adjoins or abuts upon the property and passing not more than 200 feet at the nearest point from a structure in which sanitary sewage originates.

18. "Health Officer" means the Public Health Officer of the Muskegon County Health Department or any other employee of the Department designated or authorized by the Public Health Officer to perform services or functions pursuant to the provisions of these regulations.

Section B Approved Type Sewage Disposal System on All Premises

1. Disposal Facilities Required Prior to Occupancy

It shall be unlawful for any person to occupy, or permit to be occupied, any premise which is not equipped with adequate facilities for the disposal in premise which is not equipped with adequate facilities for the disposal in a sanitary manner of human excreta and sewage. Such facilities shall be constructed in accordance with the provisions of these regulations. All privies and other toilet devices shall be constructed and maintained in accordance with the regulations adopted by the State Council of Health, June 6, 1940, as last revised on July 20, 1946, entitled "A Regulation Pertaining to the Construction and Maintenance of Outhouses and to Safeguard the Public Health by Preventing the Spread of Disease and the Existence of Sources of Contamination" in accordance with Act No. 273, Public Acts of 1939.

2. No Liquid Wastes on Ground Surfaces

Under no condition may the sewage from any existing or hereafter constructed premise, facility, travel trailer, camper, motor travel home or any waterborne craft be deposited upon the surface of the ground, into roadside ditches, water courses, ponds, lakes, or streams or into any closed drain other than a sanitary sewer.

Section C Privies Prohibited Where a Municipal Sewerage System is Provided

No privy shall hereafter be constructed on, or moved to, any premise where the service of a publicly operated sewerage system is available, or if not available at the time of construction, then within 18 months after the same becomes available. Such systems shall be deemed available whenever a public sewer is located in a right-of-way, easement, street, highway or public right-of-way which crosses, adjoins or abuts upon the property and passes not more than 200 feet from a structure in which sanitary sewage originates, provided that the owner and operator of said public sewer will permit such connection. All privies on premises connected to the publicly operated sewerage system shall be removed from over the vault when said connection is completed. The privy vault shall then be covered with at least twelve inches of compact earth, and the building rendered unusable as a toilet facility. All other sewage disposal facilities replaced by connections to a publicly operated sewerage system shall be abandoned in such a manner as to prevent any nuisance or menace to the public health.

Section D Connection Required to a Municipal Sewerage System

All flush toilets, lavatories, bathtubs, showers, and laundry drains hereafter constructed on a premise shall be connected with a publicly operated sewerage system when such system is available. Such systems shall be deemed available whenever a public sewer is located in a right-of-way, easement, street, highway or public right-of-way which crosses, adjoins or abuts upon the property and passes not more than 200 feet at the nearest point from a structure in which sanitary sewage originates, provided that the owner and operator of said public sewer will permit such connection. In the absence of an available public sewerage system, connection shall be made to a sewage disposal system constructed in accordance with the provisions of these regulations. Footing drainage, roof water, and any other waste water not defined as sewage shall not be connected to or discharged into the septic tank system, the absorption field, or into a publicly operated sewage system. When any existing sewage disposal facility, serving any premise where a publicly operated sewerage system is available as above set forth, is found in violation of any provision of these regulations, or of any other applicable health law, ordinance, or regulation, the owner shall correct the violation by proper connection to said publicly operated sewerage system. Such connection shall be made within a time limitation, as specified herein. The Health Officer shall send a written notice to the property owner pursuant to the State Health Code.

Within a period of 18 months after a public sanitary sewage system becomes available as above set forth, all premises shall connect to the public sanitary sewer system.

Section E Separate Systems

Unless specifically approved by the Health Officer, each on-site disposal system shall serve only one and two-family dwellings.

Section F Public or Private Drain

Whenever the Health Officer shall determine that improperly treated sewage is flowing or emanating from the outlet of any public or private drain, he shall notify in writing persons owning, leasing, or residing in such premises from which such sewage originates, to connect such sewage flow to publicly operated sewage systems, if available, or in the absence thereof, to comply with the provisions of this Ordinance.

The notice to the owner, lessees, or residents of such properties shall inform said persons of such unlawful discharge of improperly treated sewage into such drain and shall specify the maximum period of time within which such unlawful discharge shall be terminated, which shall not be less than 30 days, except where there is an immediate hazard to the public health, safety and welfare by the continued improper drainage.

If, after the expiration of the minimum period of time specified in the notice, such unlawful discharge continues, the Health Officer may plug or cause to be plugged, the outlet or outlets to the drain through which the sewage is being conveyed. In instances where the sewage disposal system of the premises is incapable of satisfactory operation without such discharge of improperly treated sewage to the public drain, or, where the Health Officer is unable to plug the flow of sewage, the Health Officer shall institute all necessary and proper legal remedies to abate the nuisance and threat to the public health, safety and welfare, which shall include restraining orders, temporary and permanent injunctions and summary proceedings to vacate the premises until such time as the sources of pollution have been eliminated.

Section G Type and Location of Private Sewer Lines

Any buried sewer or pipe used to conduct untreated sewage from a dwelling or habitable building shall be constructed of service weight or heavier cast iron soil pipe with leaded and caulked joints tested for water tightness, or PVC Schedule 40 pipe or other acceptable material approved by the Health Officer. No buried sewer line shall be located less than ten (10) feet from a water suction line, well casing, spring structure, or other drinking water source. Where such pipes or sewers are located inside or beneath a habitable building, or within five (5) feet outside the inner face of such building, they shall be constructed of such materials as specified in this section.

Section H Condemnation of Existing Installations

The Health Officer may condemn any existing sewage disposal system where the effluent therefrom is exposed to the surface of the ground or permitted to drain onto the surface of the ground or into any lake, river, storm sewer, or stream, or where the seepage of effluent therefrom may endanger a public or private water supply or where a public nuisance is created by any such system improperly constructed or maintained. An individual sewage disposal system so condemned shall be repaired, rebuilt, or replaced by a system constructed according to the provisions of these regulations within a period of time specified by the Health Officer. This becomes the responsibility of the owner of record for such repairs so ordered.

Section I Permit for Sewage Disposal System

From and after the effective date of these regulations, it shall be unlawful for any person to construct, repair, or extend any sewage disposal system within Muskegon County unless he has a permit issued by the Health Officer. Failure to construct according to specifications herein shall be deemed a violation of these regulations for which the installer of the system may be held liable.

Section J Application and Fees for a Sewage Disposal System Permit

1. Permit Required

A permit to construct a sewage disposal system shall be in writing and shall be signed by the applicant.

2. Information Required on Application

The person making application for a permit (hereinafter called the applicant) shall, on forms to be provided by the Health Officer of the Muskegon County Health Department, provide the following information:

a. Legal description and/or address of property where sewage disposal system is to be installed.
b. The name and address of the owner and applicant.
c. Date
d. Proposed use of the lot if other than for a single family residence shall be indicated.
e. The water table level on the date of the application and the elevation of the mean seasonal high groundwater table where the same is within six (6) feet of the finished ground surface.
f. The Health Officer may require soil percolation rates in minutes per inch as determined by the standard percolation test procedure as outlined in the Manual of Septic Tank Practice, U.S. Public Health Service.

3. Fee to Accompany Application

A fee shall be charged for each permit issued for the installation of a sewage disposal system as defined herein. This fee shall be payable at the time of filing the application for permit by the owner to the Muskegon County Health Department to be deposited with the Muskegon County Treasurer. Such fee shall be established by the Muskegon County Board of Health.

4. Variances

These regulations provide minimum standards to be used in the design and construction of all subsurface sewage disposal systems. However, special circumstances, limitations, dimensions, or features may exist creating a physical impossibility for compliance. Such circumstances or limitations may justify a variance from a portion of these regulations. Such variances may be granted in writing by the Muskegon County Health Officer if the variance will not create the potential for a public health hazard or nuisance condition, and if the variance will provide suitable treatment of the sewage.

5. A sewage disposal permit shall remain valid for a period of two years from date of issuance unless an extension is requested from, and approved by, the Health Officer. A sewage disposal permit shall not be transferable as to permit holder or property location.

Section K Criteria for Building Site Acceptance

1. Drainage and Soil Conditions

No permit shall be issued where percolation tests indicate the stabilized percolation rate exceeds 45 minutes per inch.* All percolation tests shall be conducted at the proposed depth of the absorption field. A permit shall not be issued when the building site is subject to ponding or flooding in the areas proposed for the absorption field or where flooding of the area has occurred more than once within the preceding ten (10) years or if the proposed sewage disposal system cannot be built to comply with construction requirements set forth in these regulations. Percolation tests shall be made in the general area to be used for subsurface disposal systems. Health Department personnel shall not be required to run percolation tests. The person making the percolation tests shall furnish a certified statement as to the results of such tests. The person making the test shall be a licensed professional engineer or registered sanitarian in the State of Michigan. If fill sand is used to comply with these regulations, it must be of an approved type.

Grading of seepage field areas shall be so designed and executed with respect to elevation and slope that surface drainage is off the area and away from all nearby wells.

*Soils with a percolation rate of more than 45 min./inch are unsuitable for subsurface absorption and site modification approved by the Health Officer must be pursued.

2. Protection of Sewage Disposal Systems

After a seepage system has been approved, the area shall not be disturbed in any way unless alterations are specified in the permit. To prevent compaction, the seepage field area shall be protected against all vehicular traffic. Paving should not occur over a seepage system. No permanent structure shall be built over any portion of a sewage disposal system.

3. Sewage Disposal Systems in Close Proximity with Lakes, Lagoons, Rivers, or Similar Bodies of Water

No permit shall be issued within 400 feet of a lake, lagoon, river, or similar body of water where the seasonal mean high water table is less than 48 inches below the bottom of the drainage system, unless site modifications as set forth in Section M of these regulations are approved by the Health Officer.

4. Health Officer May Reject Application

The Health Officer shall have the right to reject an application under the following conditions:

a. Where a publicly operated sewage system is available.
b. Where the septic tank would be inaccessible for cleaning or inspection purposes.
c. Where the property served is too small for proper isolation from existing water wells, the premise water well, surface waters, or has insufficient drainage area.
d. Where percolation rate exceeds 45 minutes per inch and site modification plans have not been approved by the Health Officer.

5. Appeal Board

Any applicant who has been denied a permit to install a sewage disposal system may request a hearing from the Appeal Board. The Appeal Board shall consist of the Muskegon County Board of Health and the township supervisor in whose township the permit was denied. A request for a hearing shall be submitted in writing to the Muskegon County Health Department not later than 30 days after the date of the permit denial.

Section L Existing Septic Tanks

When repairs are made to an existing sewage disposal facility, existing septic tanks which are part of such facility, and which do not meet the standards contained in these regulations, may remain in service without modification. This provision shall apply only if the Health Officer determines that such existing septic tanks are capable of performing their intended function in an acceptable manner, and that no dangers to human health and safety, nuisances, or degradation of the natural environment will result from their continued usage.

Section M Elevated Seepage Beds and Perimeter Fill Sand

Site modifications such as cutting, grading, or filling, may be permitted in some cases for the purpose of overcoming soil permeability or high groundwater limitations of natural soils. When elevated seepage beds are used, the perimeter fill sand must extend from the final finished grade and extend in all directions from the seepage bed in a 4:1 slope.

Section N Specific Requirements for a Sewage Disposal System

A. Construction and Location

Any or all of the following requirements which are applicable shall be complied with in the location and construction of a sewage disposal system.

1. Inspection of Construction

An authorized representative of the Health Officer shall inspect and approve the completed facility before backfilling may be started.

2. Size of Septic Tank

To serve the plumbing fixtures and appliances commonly used in a single-family residence:

Number of Bedrooms	Minimum Liquid Capacity
1 or 2	800 gal.
3 or 4	1,000 gal.
5	1,250 gal.

Note: Each additional bedroom requires 250 gal. additional septic tank capacity. The above septic tank capacities are to be used only with a single-family residence. Larger septic tanks may be required for public and semi-public facilities. Consult the Muskegon County Health Department regarding the capacity of such septic tanks. Two septic tanks will also be required if an ejector pump is used to pump all of the raw sewage from a lower elevation to a higher elevation.

Note: In tight soils of loam or clay, or a combination of sandy loam or sandy clay, or where a garbage disposal unit will be used, two septic tanks in series shall be required.

3. Specifications for Septic Tank Construction

a. (1) A rectangular tank should be 2½ times longer than its width.
(2) A minimum of 4 horizontal feet shall be provided between inlet and outlet.
(3) Install a 4-inch concrete floor throughout which supports side walls.
(4) All concrete block walls must be constructed with the use of mortar.
(5) Inside walls must be sealed with brushed mortar or a block sealing tar compound or equivalent.
(6) The sections of a precast concrete tank shall be sealed with a watertight compound at time of installation.
(7) All septic tanks must be equipped with an outlet device consisting of a sanitary tee or vented ell or a precast baffle.
(8) Inlet and outlets to be properly sealed 360 degrees around pipe.
(9) The outlet device must extend downward to approximately 40% of the liquid depth.
(10) The tank shall be provided with a minimum liquid depth of 30 inches; 48 inches is preferred.
(11) An air space equivalent to 12-15% of the liquid depth shall be provided.
(12) Provide reinforced prefabricated covers or reinforced concrete slabs.
(13) Two manholes are strongly recommended in the top of a septic tank. As a minimum, one shall be provided at one end of a septic tank and an inspection opening installed at the opposite end. The manhole shall have a least dimension of 18 inches.
(14) The vertical distance between the bottom of the inlet pipe shall be at least 2 inches higher than the bottom of the outlet pipe.

b. When the top of a tank is more than 20 inches below finished grade, manhole risers must extend to grade, or approximately 8 inches below finished grade.

c. Abandoned septic tanks shall be emptied of their contents and filled with earth or rock.

d. Any tank used as a pump chamber and installed within the groundwater or below the mean seasonal high groundwater elevation shall have all seams double-sealed so as to provide a leak-proof receptacle.

e. When sewage must be pumped from a lower elevation to a higher elevation, the pump unit must be of a design to meet the purpose for which it is used.

4. Isolation Distances - Minimum safe distances in feet

From	Cast Iron Soil Pipe*	Other	Septic Tank	Absorption Field
Well	10	50	50	50
Property	2	5	10	5
Basement Wall	(1)	(1)	10	10
Water Lines	10	10	10	10
Bank or Drop-off	5	10	10	15
Lake or Stream	10	25	75	75

*Pipe materials and type of joints as set forth in Michigan Department of Public Health Policy Letter No. 36-3, issued July 19, 1966, and Michigan Department of Licensing and Regulation, Plumbing Board Letter No. 68-1, September 20, 1968, can be substituted for cast iron soil pipe and leaded joints.

5. Absorption Area for Disposal Field, Seepage Bed, or Block Trench Based on Percolation Rate - Minimum required trench bottom area per bedroom

Stabilized Percolation Rate (Average time in minutes for water to fall one inch)	Single Family Residence Number of Bedrooms			
Minutes/Inch	1	2	3-4	Each additional
Subsurface Absorption Bed - Minimum Absorption Area Requirements (sq.ft)				
0-5	300	400	540	100
6-10	350	450	600	150
11-15	400	540	650	200
16-30	540	650	750	250
31-45	650	750	1000	300
over 45*				
Subsurface Absorption Trenches - Minimum Absorption Area Requirements (sq.ft.)				
0-5	300	350	400	75
6-10	325	375	450	90
11-15	375	450	550	100
16-30	450	550	700	150
31-45*	550	650	900	200
Block Trenches or Precast Units - Length of Trench (ft.)				
0-5	45	45	45	15
6-10	50	55	60	15
11-15	60	75	90	15
over 15	Not suitable			

*Soils with a percolation rate of more than 45 minutes/inch are unsuitable for subsurface absorption, and site modification approved by the Health Officer must be pursued.

6. Construction Details of Tile Fields or Seepage Beds

Items	Unit	Maximum	Minimum
Number of lateral trenches	--	–	2
Length of trenches	feet	100	–
Width of trenches	inches	36	18
Separation between trench side walls	feet	–	3
Depth of tile lines (top) below finish grade	inches	26	8
Distance between distribution lines in seepage beds	feet	3	3
Distance between distribution lines and wall in seepage bed	feet	1-1½	1-1½
Slope of tile lines	in./100 ft.	4	level preferred
Depth of stone			
Under tile	inches	–	6
Over tile	inches	–	2
Size of stone	inches	1-1½	3/8
Depth of backfill over stone	inches	24	6
Depth to mean seasonal high groundwater below stone	inches	–	30
Depth to mean seasonal high groundwater below stone within 400 feet of surface bodies of water	inches	--	48
Amount of gap between tile in disposal trenches	inches	½	¼

Tarpaper strips 5" x 8" shall be placed over the gap between sections of tile and so placed as to cover the top half of tile.

Other methods of protecting the gap between tile can be approved.

Straw or equivalent shall be placed between the stone and the backfill material.

7. Construction Details of a Block Trench Absorption System

Outside dimensions: Length: 33 blocks (standard concrete blocks)
Width: 2½ blocks (standard concrete blocks)

	Maximum	Minimum
Depth of stone	*	16 inches
Width of stone	—	8 inches
Size of stone	3 inches	6A
Slope of Block Trench	1 inch/10 feet	level preferred
Depth to mean seasonal high groundwater below trench bottom	—	30 inches
Depth to mean seasonal high groundwater below trench within 400 feet of surface bodies of water	—	48 inches

Straw or equivalent shall be placed between stone and backfill material.

Tarpaper or equivalent may be used to cover gaps between covers.

Bottom of inlet pipe into block trench shall be a minimum of 16 inches above bottom of trench.

Connections between block trenches shall be made using elbows or tees and shall be made near the downstream end of the failed trench.

* Stone must cover all side openings.

CHAPTER III
REGULATIONS GOVERNING WATER SUPPLIES

Section 1.0 Purpose

The purpose of this ordinance is to establish an enforcement mechanism for the control and regulation of water supplied to the consumer and residents of Muskegon County.

The purpose of this Ordinance is to provide a means for safe-guarding the environment in order to protect the health and welfare of the consumer and all residents of Muskegon County through the regulation of water supply facilities.

Section 2.0 Authority

This Ordinance is adopted pursuant to the authority vested in the County, by and through its Board of Commission, under Section 46.11 of the Michigan Compiled Laws and pursuant to authority vested in said Board, and its Department of Health, through Sections 333.2435 and 2441 of the Michigan Compiled Laws, being Sections 2435 and 2441 of Act 368 of the Public Acts of 1978, State of Michigan, as amended.

Section 3.0 Scope

This Ordinance shall apply to all suppliers or suppliers of water, all water supply facilities either existent or which may be hereafter constructed except for Type I public water supplies, as defined by Michigan's Safe Drinking Water Act, Act 399 of the Public Acts of 1976, and Administrative Rules, promulgated thereunder, as amended.

This Ordinance shall furthermore apply to all persons constructing a well or installing a pump as defined under Part 127 of Act 368 of the Public Acts of 1978, and Administrative Rules, promulgated thereunder, as amended.

Section 4.0 Definitions

Section 4.1 General Incorporation by Reference

Except as may be otherwise specifically defined hereunder, the terms used in this Ordinance shall convey the definitions as set forth under Part 127 of Public Act 368 of 1978, as amended, and Administrative Rules of the Department of Public Health, as promulgated thereunder, as amended, and under Act 399 of the Public Acts of 1976, and Administrative Rules promulgated thereunder, as amended.

Section 4.2 "Water Supply"

For purposes of this Ordinance, "water supply" shall mean a system of pipes and structures through which water is obtained, including, but not limited to, the source of the water, such as wells, surface water intakes, or hauled water storage tanks, and pumping and treatment equipment, storage tanks, pipes and appurtenances, or a combination thereof, used or intended to furnish water for domestic or consumer use.

Section 5.0 Incorporation of Other Regulations

The following State of Michigan Codes and regulations are hereby incorporated by reference into this Ordinance:

(a) The "Safe Drinking Water Act", Act 399 of the Public Acts of 1976, being Sections 325.1001 through 325.1023 of the Michigan Compiled Laws, and the Administrative Rules promulgated pursuant to that Act, as amended.

(b) Part 127 of Act 368 of the Public Acts of 1978, of Michigan's Public Health Code, being Section 333.12701 through 333.12715 of the Michigan Compiled Laws, and the Administrative Rules promulgated pursuant to that Act, as amended.

Section 6.0 Water Supply Requirements

It shall be unlawful for any person to occupy, or permit to be occupied, any building which is not provided with a safe and adequate water supply.

It shall furthermore be unlawful for any person to supply water in violation of any provision of the laws and regulations set forth in Section 5.0 of this Ordinance.

Section 7.0 Water Supply Construction Permit

Section 7.1 Requirement of a Permit

No person shall begin construction of a new water supply, or make significant change to an existing water supply, without first obtaining a water supply construction permit from the Muskegon County Health Department. Significant change to existing water supply would include, by way of illustration, but not by way of limitation, replacing the well casing, removing a well casing from the ground, changing aquifers or sources of water, changing screen elevation, deepening or plugging back a bedrock well, changing the pump type, installing a liner pipe, or significantly increasing the capacity of the water supply.

A water supply which has not been in use for more than one year shall not be put back into operation unless it can be shown to be in substantial compliance with this Code.

Provided, however, this Section shall not apply either to a water supply excluded under Section 12703 of Part 127 of Act 368, the same being MCL 333.12703, or to a water supply that is to be used to provide water for plants, livestock, or other agricultural processes, and will not be used to supply water to habitable structures or for human consumption provided that the well and water supply are not physically connected to any habitable structure.

Section 7.2 Permit Procedure

Section 7.2.1 Application for Permit

An application for a Water Supply Construction Permit shall be made on forms provided by the Health Department. A completed application shall include all information as may be deemed necessary by Health Department, including at a minimum:

a. Signature of the property owner or their authorized representative;

b. Information regarding proposed location of water supply facility, relationship of same to buildings, property lines, known, suspected or potential sources of contamination;

c. Information regarding property restrictions or limitations.

Section 7.2.2 Issuance or Denial of Permit

The Health Officer shall issue a Water Supply Construction Permit when the information provided indicates that the requirements of this Code and/or applicable State statutes have been or will be met, and that the quality of the groundwater will not be degraded. The Health Officer may propose limitations or conditions which the Health Officer deems necessary to protect the public health, or groundwater supply.

→ Shall deny.

The Health Officer may deny an application for a Water Supply Construction Permit when incomplete or false information has been supplied by the applicant, or when the Health Officer determines that the requirements of the Ordinance and/or applicable State statutes have not or cannot be met. The denial shall be forwarded to the applicant in writing or in person.

Section 7.3 Effect of Issuing Construction Permit

The issuance of a Construction Permit shall serve as authorization to the permittee to construct the proposed water supply in accordance with the application and any conditions or limitations imposed in the Permit. Such authorization shall not, however, relieve permittee of any obligation or limitation that may otherwise be imposed under any other applicable law, nor shall issuance of a Construction Permit be deemed in any way to authorize permittee to use water supply except for testing purposes.

Section 8.0 Approval to use Water Supply

Section 8.1 Unlawful Use of Water Supply

No person shall use, or permit use, of a water supply subject to the permit requirements of this Ordinance except for testing purposes, unless and until the construction and installation of same has been approved by the Health Officer.

Section 8.2 Issuance of Use Permit

The Health Officer shall, upon determination that the water supply has been constructed and installed in accordance with Construction Permit requirements, conditions and limitations, issue a Use Permit. Such Use Permit may be issued conditionally pending receipt by Health Officer of a completed "Water Well and Pump Record" prepared by the well driller and/or pump installer, as applicable.

The Health Officer may elect to perform an onsite inspection prior to issuance of Use Permit.

Provided, however, Health Officer shall not issue a Use Permit until Health Officer has received copies of the results of the analysis of water samples indicating that raw water quality meets minimum public health standards. Water sample analysis shall include coliform bacteria and any other parameter deemed necessary by the Health Officer. Analysis of water samples shall be performed by laboratories certified by the Michigan Department of Public Health. All water samples shall be collected in accordance with protocol established by Health Department.

Section 9.0 Deviations

The Health Officer may issue a deviation from the requirements set forth herein, or incorporated herein by reference, provided such deviation does not result in a violation of State Law, if the spirit and intent of such requirements and laws are observed and the public health, safety and welfare are assured.

Section 10.0 Application and Approval Fee

A fee to be determined by the Health Department shall be paid by any person for each water supply facility subject to the permit and approval requirements of this Ordinance. Such fee shall be paid on date of application for permit which shall be non-refundable. No permit shall be issued prior to satisfaction of the fee payment requirement.

Section 11.0 Enforcement

The Health Officer and subordinates shall be authorized to administer and enforce this Ordinance and to pursue legal action as may be necessary and appropriate, to assure compliance with same.

Section 12.0 Penalties

Any person who shall fail to comply with the provisions set forth herein shall be deemed guilty of a misdemeanor and may be punished by a fine of not more than $200 or imprisonment in the County Jail for not more than 90 days or both, in the discretion of the Court.

Section 13.0 Incorporation into Muskegon County Sanitary Regulations Amendment and Repeal

Section 13.1 Incorporation

This Ordinance, in its entirety, shall be incorporated upon adoption into that Ordinance and Regulatory document entitled *"Muskegon County Sanitary Regulations"*, effective October 14, 1984,, constituting Chapter III, entitled *"Water Supply"*.

Section 13.2 Amendment

By adoption of same, the Ordinance entitled *"Muskegon County Sanitary Regulations, Effective October 14, 1984"*, is amended.

Section 13.3 Repeal

Chapter III of the *"Muskegon County Sanitary Regulations, Effective October 14, 1984"*, in previous form, is hereby repealed.

Section 14.0 Savings Clause

Should any part or provision of this amendatory Ordinance be deemed of no force and effect, then any part or provision not so determined infirm shall remain in full force and effect.

Section 15.0 Notification

Notification of the adoption of these regulations [CHAPTER III] under authority of Act 368 of the Public Acts of 1978, as amended, shall be published in a newspaper circulated in the County within thirty (30) days after such action, indicating where copies of such regulations can be obtained.

Section 16.0 Effective Date [CHAPTER III]

These regulations shall become effective 45 days after the date of publication.

Adopted this 26th day of April, 1994.

[Chapter III, Notice of Adoption, published May 16, 1994, effective July 1, 1994]

CHAPTER IV
GARBAGE, RUBBISH AND TRASH

Section A Definition of Words and Terms

The following words and terms used in this chapter, unless otherwise expressly stated, shall have the following meaning:

1. "Garbage" shall mean rejected food wastes including waste accumulation of animal, fruit, or vegetable matter used or intended for food or that attend the preparation, use, cooking, dealing in or storing of meat, fish, fowl, fruit, or vegetable.

2. "Rubbish" shall mean tin cans, bottles, paper cartons, rags, discarded clothing, discarded utensils, discarded containers, sweeping, glass, crockery, nails, tine, wire, light bulbs, signs, advertising matter, and such other material as are normally discarded from a household. This does not include discarded household furniture and appliances or building wastes.

3. "Trash" shall include such items of discard which are not normally associated with residential usage; also discarded household appliances, dismantled vehicles or their parts; discarded or dismantled machinery or tools and such other items that shall constitute a health or safety hazard or menace to persons residing in the neighborhood.

Section B Garbage and Rubbish Storage

1. No person, firm or corporation shall store garbage or rubbish on any premises unless such materials be completely contained within watertight containers, having a capacity of not less than 10 gallons, nor more than 34 gallons with sides tapered to an enlarged opening and equipped with handles and a tightly fitting cover, except that plastic garbage and rubbish bags shall not be stored outside awaiting collection by a refuse service for a period exceeding twelve hours. Putrescible wastes shall not be stored more than seven (7) days.

2. The owner of every multiple dwelling, and in the case of private and two-family dwellings, shall keep clean and in place, proper watertight containers having a capacity of not less than ten gallons, nor more than 34 gallons with sides tapered to an enlarged opening and equipped with handles and a tightly fitting cover. Putrescible wastes shall not be stored more than seven (7) days.

3. Containers used for the storage of garbage or rubbish shall be maintained in a clean an sanitary condition, and shall be tightly covered except at such times as material is being placed within or removed from containers.

4. Containers for garbage and rubbish of greater capacity than 34 gallons of a design and construction specifically approved by the Director of the Muskegon County Health Department may be used for the storage of garbage and rubbish within Muskegon County, Michigan.

Section C Trash Storage

Storage, deposit or accumulation of trash is prohibited on any lot or parcel located in Muskegon County.

Section D Transportation

No person, firm or corporation shall transport garbage, rubbish or other waste materials upon any street, alleys, roads, rights-of-way or highways in Muskegon County in any vehicle unless such vehicle is so constructed and maintained as to prevent offensive odors or exhalations therefrom, and leaking, sifting, dropping, spilling or blowing of the contents thereof upon any street, alley, road, right-of-way, highways, public or private property.

Section E Disposal

1. No person, firm or corporation shall deposit any garbage, rubbish, trash, or other waste matter upon any road, street, alley, highway, right-of-way, or within any park, stream, lake, or river in Muskegon County.

2. Disposal or deposit of garbage rubbish, trash and other waste material shall be permitted upon a site licensed under Act 641 of the Public Acts of 1978 and Regulations.

99-466 APPROVE THE AMENDATORY ORDINANCE TO THE MUSKEGON COUNTY SANITARY REGULATIONS

The Human Resources Committee recommends, moved by Kobza, supported by Start, to approve the Amendatory Ordinance to the Muskegon County Sanitary Regulations.

Roll Call
Ayes: Baade, Fairchild, Frye, Funkhouser, Gill, Kobza, McMurray, Start, Hulka

Nays: None

Motion Carried

99-467 DIRECT TO THE COUNTY ADMINISTRATOR TO REVIEW THE BAY COUNTY RESOLUTIONS REGARDING FOC FUNDING FOR CUSTODY AND PARENTING TIME ACTIVITIES AND INCENTIVES

The Human Resources Committee recommends, moved by Kobza, supported by Start, to direct to the County Administrator to review the Bay County resolutions regarding FOC Funding for Custody and Parenting Time Activities and Incentives and report back to the Board.

Roll Call
Ayes: Baade, Fairchild, Frye, Funkhouser, Gill, Kobza, McMurray, Start, Hulka

Nays: None

Motion Carried

CHAIR'S REPORT

None.

ADMINISTRATOR'S REPORT

99-468 AUTHORIZE THE ADMINISTRATOR TO GO FORWARD WITH BUILDING SECURITY PROJECT

The Administrator/Controller recommends, moved by Kobza, supported by Frye, to authorize the Administrator to go forward with building security project and to rebid in accordance with memorandum signed September 14, 1999, by Judge Nolan.

PUBLIC NOTICE
MUSKEGON COUNTY SANITATION REGULATIONS
AMENDATORY ORDINANCE

Amend Section 7.2.2 "Issuance or Denial of Permit" by the addition of the following language:

"The Health Officer shall deny issuing a Water Supply Construction Permit for well installations in areas defined by the Michigan Department of Environmental Quality (MDEQ) as "Facilities" under Part 201 "sites of environmental contamination, and/or Part 213 "Leaking Underground Storage Tank" (LUST) facilities. No well permit variance shall be given without the written approval from MDEQ."

Amend section 15.0 "Notification" by the addition of the following language:

"The Michigan Department of Environmental Quality (MDEQ) will be notified within thirty (30) days if any changes to the well permit program are enacted."

In all other respects, ordinance 10 remain unchanged. This ordinance to become effective 30 days after publication in accordance with MCLA 46.11

This is to certify that this Amendatory Ordinance was adopted at a meeting of the Muskegon County Board of Commission held on the 14 day of September, 1999.

PUBLISH: September 30, 1999

STATE OF MICHIGAN
County of Muskegon ss.

Gary Ostrom being duly sworn deposes and says that he is the Publisher of the MUSKEGON CHRONICLE, a newspaper printed and circulated within said County of Muskegon; that the annexed notice was duly printed and published in said MUSKEGON CHRONICLE, for One (1) day(s); that is to say, on the 30th day(s) of September 1999, and the _____ day(s) of _____ 19___, and that said publication was continued during said time without any intermission or omission, and that he has a personal knowledge of the facts above set forth.

Gary Ostrom

Subscribed and sworn to before me this 30th day of September A.D. 1999

Dawn M. Ritz
Notary Public, Muskegon County, Mich.

Printer's fees: _____ inches _____ times, $_____

DAWN M RITZ
NOTARY PUBLIC STATE OF MICHIGAN
MUSKEGON COUNTY
MY COMMISSION EXP. MAR. 17,2004

MUSKEGON COUNTY

SANITARY REGULATIONS

Enforcing Agency:
Muskegon County Health Department
Environmental Health Division
1611 East Oak Avenue
Muskegon, Michigan 49442
(616) 724-6208

Effective October 14, 1984
As Amended April 26, 1994
[Chapter III, Board Resolution, HR-94/04-49]

SANITATION REGULATIONS

MUSKEGON COUNTY HEALTH DEPARTMENT

October 14, 1984
Amended April 26, 1994 [CHAPTER III]

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MUSKEGON COUNTY
SANITATION REGULATIONS

CHAPTER I
PURPOSE, ADMINISTRATION, AND GENERAL DEFINITIONS

Section A Purpose

The broad objective of these regulations is to provide a means for safeguarding the environment necessary for the health and welfare of the consumer and all residents of Muskegon County.

Section B Authority, Jurisdiction, and Administration

1. Authority

By virtue of the power vested in the Board of Health of Muskegon County under the authority of Act 368 of the Public Acts of 1978, as amended, there are hereby provided regulations affecting the public health, safety, and welfare relating to sewage disposal and garbage disposal within the County of Muskegon, State of Michigan, and to provide penalties for the violations of such regulations.

2. Jurisdiction

The Muskegon County Health Department shall have jurisdiction throughout Muskegon County, including all cities, villages and townships, in the administration and enforcement of these regulations, including all amendments hereafter adopted unless otherwise specifically stated.

Nothing herein contained shall be construed to restrict or abrogate the authority of any municipality in Muskegon County to adopt more restrictive ordinances, or to enforce existing ordinances relating to these regulations, control or issuance of licenses, or the renewal or revocation thereof, or to charge and collect a fee therefore, provided that whenever inspection relating to health or sanitation is required, no such municipality shall issue or renew such license without first having obtained a written statement from the Muskegon County Health Department indicating compliance with the requirements of these regulations.

3. Enforcement

All premises affected by the requirements of these regulations shall be subject to inspection by the health officer, and the health officer may collect such samples for laboratory examination as he deems necessary for the enforcement of these regulations.

4. Right of Entry and Inspection

No persons shall refuse to permit the health officer to inspect any premises nor shall any person molest or resist the health officer in the discharge of his duty, and the protection of the public health. In the event entry is refused, the department shall be authorized to procure a search warrant pursuant to Sections 2241 through 2246 of the State Health Code.

5. Fees

All fees collected by the Health Officer shall be receipted for and be deposited with the Treasurer of Muskegon County to the credit of the Muskegon County Health Department.

6. Penalty - Criminal

Any person who shall fail to comply with any provision herein shall be deemed guilty of a misdemeanor and, on conviction hereof, shall be punished by a fine of not more than One Hundred ($100.00) Dollars or by imprisonment in the County Jail of not more than ninety (90) days or both such fine and imprisonment in the discretion of the Court. Each twenty-four hours that said owner shall knowingly permit said violation of these regulations shall be deemed an additional offense.

7. Interference with Notices

No person shall remove, mutilate, or conceal any notice or placard posted by the health officer except by permission of the Health Officer.

8. Validity

If any section, subsection, clause, or phrase of these regulations is, for any reason, adjudged unconstitutional or invalid, it is hereby provided that the remaining portions of these regulations shall not be affected thereby.

9. Other Laws and Regulations

These regulations are supplemental to the rules and regulations duly enacted by the Michigan Department of Public Health and to laws of the State of Michigan relating to public health which shall supersede all local ordinances heretofore enacted inconsistent therewith and these regulations.

10. Notification

Notification of the adoption of all regulations promulgated by the Board of Health, under authority of Act 368 of the PA of 1978, as amended, and approved by the Board of Commissioners of Muskegon County shall be published in a newspaper circulated in the County within 30 days after such action, indicating where copies of such regulations can be obtained.

11. Effective Date

These regulations or amendments thereto shall become effective on the 30th day after the date of publication.

Section C General Definitions

Words and Terms

When consistent with the context, words used in the present tense include the future, words used in the singular number include the plural and words in the plural include the singular number. The word "shall" is always mandatory and not merely directional. Words and terms not defined herein shall be interpreted in the manner of their common usage.

The following words and terms used in these regulations, unless otherwise expressly stated, shall have the following meaning:

1. "Board of Health" shall mean the Board of Health of Muskegon County comprised of its Health Committee.

2. "Health Department" shall mean the Muskegon County Health Department.

3. "Health Officer" shall mean the Director or the Acting Director of the Muskegon County Health Department and/or his authorized representative.

4. "Municipality" shall mean any incorporated city, village or township within the County of Muskegon.

5. "Habitable building" shall mean any structure where persons reside, are employed, or congregate.

6. "Premise" shall mean any tract of land containing a habitable building.

7. "Person" shall mean an individual, or a firm, partnership, company, corporation, trustee, association, or any public or private entity.

8. "Dwelling" shall mean any house, building, structure, tent, shelter, trailer, or vehicle, or portion hereof, which is occupied in whole or in part as a home residence, living or sleeping place of one or more human beings, either permanently or transiently.

ATTACHMENT 1

2009 RAP Amendment

(see attached hard copy without attachments and full copy on enclosed Disk)

Remedial Action Plan Amendment

Muskegon Chemical Company NPL Site

May 8, 2009
Project No. G05605

FTC&H
Fishbeck, Thompson, Carr & Huber
engineers • scientists • architects • constructors

fitch

REMEDIAL ACTION PLAN AMENDMENT

MUSKEGON CHEMICAL COMPANY NPL SITE

MAY 8, 2009
PROJECT NO. G05605

Fishbeck, Thompson, Carr & Huber, Inc. Engineers • Scientists • Architects • Constructors
1515 Arboretum Drive, SE, Grand Rapids, MI 49546 Telephone: 616-575-3824

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LIST OF ABBREVIATIONS/ACRONYMS

COC	chemicals of concern
FHR	Flint Hills Resources, LP
FS	Feasibility Study
FTC&H	Fishbeck, Thompson, Carr & Huber, Inc.
GSI	Groundwater Surface Water Interface
MCC	Muskegon Chemical Company
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MZGSI	Mixing Zone Groundwater Surface Water Interface
NPL	National Priorities List
NREPA	Natural Resources and Environmental Protection Act
O&M	Operation and Maintenance
PCE	tetrachloroethene
RAP	Remedial Action Plan
RI	Remedial Investigation

1.0 INTRODUCTION

This First Amendment to the RAP for the Muskegon Chemical Company NPL Site is being submitted by FHR to amend the RAP for the MCC NPL Site (RAP), dated June 1997 (Revision 1: June 26, 2000), and submitted by Koch Chemical Company pursuant to Part 201, Environmental Remediation, of the NREPA, MCL 324.20101 et seq., which was then incorporated into a Consent Decree that was entered by the United States District Court for the Western District of Michigan on November 25, 1997, and amended by order of that Court dated December 11, 2000.

The Consent Decree governing remedial actions at the Muskegon Chemical Company Site is an agreement between the Attorney General of Michigan and MDEQ (Plaintiffs) and Koch Chemical Company, a division of Koch Refining Company, LP, a Delaware Limited Partnership (Defendant). See November 25, 1997 Consent Decree, Section 4.5 (defining "Plaintiffs") and Section 4.2 (defining "Defendant") (emphasis added). The Consent Decree applies to and is binding on the Plaintiffs and the Defendant and its successors and assigns. See id., Section 2.1 (describing parties bound). On January 1, 1999, Koch Refining Company, L.P. changed its name to Koch Petroleum Group, L.P., and on January 1, 2002, Koch Petroleum Group, L.P. changed its name to Flint Hills Resources, LP. FHR no longer has a division called "Koch Chemical Company," which is why the RAP Amendment refers to FHR as the party conducting the cleanup at the Site. FHR is 100% indirectly owned by Koch Industries, Inc. Reiss Remediation LLC is also 100% indirectly owned by Koch Industries, Inc. today.

Pursuant to Sections 4.1, 17.1, and 17.2 of the Consent Decree, upon the written approval of this RAP Amendment by the Chief of the Remediation and Redevelopment Division of the MDEQ, this RAP Amendment is incorporated into and made an enforceable part of the Consent Decree.

Previously, FHR submitted draft revised RAPs for MDEQ review and comment. FHR has elected to work with the MDEQ to amend the existing RAP rather than prepare a new RAP. Therefore, this RAP Amendment supersedes the previous draft revised RAPs.

This RAP Amendment is consistent with the proposal for modifying the existing RAP presented to the MDEQ staff on July 21, 2006. On August 21, 2006, MDEQ staff indicated concurrence with the approach for RAP modifications set forth in the July 21, 2006 letter. A draft of this RAP Amendment was submitted to the MDEQ on October 13, 2006. FHR and MDEQ staff met on May 1, 2007 to discuss the draft RAP Amendment and agreed upon required modifications and additional site investigation (snapshot sampling) near the GSI of Mill Pond Creek. Based on the MDEQ comment letter dated April 16, 2007, to the Draft RAP Amendment, and a meeting between FHR and MDEQ on December 4, 2007, additional site groundwater characterization was also performed in the downgradient area of the former Plant Property in April 2008. FHR and MDEQ staff met again on August 26, 2008, to resolve all outstanding issues and

agreed on the required modifications to the Draft RAP Amendment. Concurrence of FHR's and the MDEQ's understanding of the required modifications was included in a letter to FHR from the MDEQ dated September 19, 2008. This current RAP Amendment incorporates the agreed upon changes.

The following summarizes the organization and content of this RAP Amendment:

Section 2.0 – Site Information
Section 3.0 – Compliance Criteria
Section 4.0 – Amended Work Plans Required by the RAP

Attachment A – Property Information
Attachment B – Operations and Maintenance Plan
Attachment C – Long-Term Monitoring and Contingency Plan
Attachment D – Deed Restriction Documentation
Attachment E – Easement Documentation
Attachment F – Muskegon County Sanitary Regulations and Clarification
Attachment G – Financial Assurance Mechanism Documentation

Table 1 summarizes and cross-references the elements of the RAP Amendment to the 1997 RAP. There are three main amendments to the 1997 RAP:

1. The change of Tier I goals to the MDEQ approved MZGSI criteria at the Mill Pond Creek GSI.
2. The MDEQ-approved construction and use of a multi-media cap in place of the former building roof cap system over the remnant COCs in the soil.
3. The voluntary construction and operation by FHR of the air sparge system to remediate remnant traces of site COCs in the groundwater in the immediate vicinity of the multi-media cap and former process building.

Table 1 presents a summary of all cross-references between the RAP (1997, CH2M HILL) and RAP Amendment elements that have been materially changed (Tier I criteria, multi-media cap, and air sparge system). Table 1 identifies all locations in the 1997 RAP document containing elements that have been materially changed, a description of the changes, and the location of the applicable changes in the 2008 RAP Amendment.

2.0 SITE INFORMATION

2.1 SITE DESCRIPTION

The former MCC Site is located at 1725 Warner Street, City of Whitehall, Muskegon County, Michigan. The MCC Site is comprised of three property areas, as described below and depicted in Attachment A. Legal descriptions for the property areas are also included in Attachment A.

The Plant Property, containing impacted soils and groundwater, is in the City of Whitehall, north of the former CSX railroad and east of Warner Street, and is zoned MC-1–Limited Industrial Commercial. The Plant Property is the location of the former MCC plant, but is now vacant and is owned by FHR.

The Howmet Property, containing impacted groundwater, is in the City of Whitehall, north of White Lake Drive and west of Warner Street. FHR does not own the Howmet Property.

The Mill Pond Creek Property, containing impacted groundwater is a 88-acre undeveloped parcel in Fruitland Township, south of White Lake Drive. The northern one-half of the Mill Pond Creek Property is zoned MDR-Medium Density Residential, and the southern one-half is zoned RR-Rural Residential. The Mill Pond Creek Property is owned by FHR.

2.2 SITE HISTORY

The MCC plant began producing specialty chemicals in 1975. In 1977 it was discovered that process chemicals had leaked from a floor drain/sump system and impacted the local water table aquifer near the plant. Investigation and remediation of MCC began in 1977 under state enforcement actions, and has continued through the present day under state and federal requirements. FHR acquired the assets of MCC in 1985 and expanded site characterization and remediation efforts through three successive consent agreements with the State of Michigan. The site was placed on the NPL in 1989. FHR discontinued operations at the facility and the plant was decommissioned at the end of 1991. No process equipment or industrial chemicals remain on site.

The investigations conducted since the discovery of the MCC NPL site COC release have characterized the physical features of the site and the distribution of MCC-related chemicals. Since investigations began in the late 1970s, soil and groundwater samples have been collected from hundreds of locations. The investigative work culminated in the RI and FS reports submitted to MDNR in January 1995 (CH2M HILL, 1995a and 1995b).

The RI found that:

- MCC-related COCs are only present in the soil beneath the former process building in the Plant Area. The former process building in the Plant Area is the original release location.
- MCC-related COCs were present in the groundwater beneath the former process building. The COCs extended southwest in a well-defined, narrow plume to Mill Pond Creek.
- Based on the residential well survey and sampling program conducted by FHR and the MDNR during June 1991, MCC-related COCs are not present in residential wells.
- The MCC site is not located within the City of Whitehall wellhead protection zone. The City of Whitehall Well 4 was previously located approximately one-quarter mile northwest (upgradient) of the MCC site. This well has been properly abandoned in accordance with applicable regulations.

Included in the RAP (June 1997) are activities undertaken to comply with the requirements of Part 201 (e.g., long-term monitoring) and interim actions that have been approved by the MDEQ (e.g., facility characterization, soil treatment, and groundwater treatment).

The existing RAP relied on the former process building to serve as a cap over the remnant COCs in soil under that building. The process building was no longer used or occupied after 1991 and the roof of the building was falling into disrepair. In order to assure that an adequate cover was maintained over the impacted soil, FHR proposed that a multi-media cap be installed over this area to substitute for the previously approved cap. The MDEQ concurred with that approach.

An air sparge system was voluntarily installed by FHR in 2003 to remediate remnant traces of site COCs in groundwater in the immediate vicinity of the former process building. Details regarding the construction and operation (i.e., description of the system, goals, and status of its performance) of the air sparge system are included in the O&M Plan (Attachment B). Plans for the future operation are included in the LTMCP (Attachment C). The MDEQ approved the temporary shut down of the air sparge system on August 1, 2006.

Additional "snapshot" sampling was requested by the MDEQ 2007 to define the lateral and vertical extent of the groundwater plume upgradient of Mill Pond Creek. The results of the snapshot sampling are provided in Attachment C (LTMCP). The results of the snapshot sampling were used to help select compliance monitoring wells for demonstrating the protection of Mill Pond Creek.

Additional investigation of the groundwater in the plant area of the site was requested by the MDEQ to determine if there is a new or expanding PCE plume emanating from the site and if new compliance criteria at the plant property boundary are necessary. Based on the results of the additional investigation

it was determined that no new or expanding plume is present on the plant property and the MZGSI criteria are appropriate for use as the amended Tier I compliance criteria.

A meeting was held between FHR and the MDEQ on August 26, 2008, and as indicated by letter dated September 19, 2008, from the MDEQ, it was agreed that the air sparge system would resume operation for a two-year period upon approval of this RAP Amendment.

2.3 ADMINISTRATIVE RECORD

The following table summarizes the sum and substance of the agreements and milestones that have been reached with respect to the form and content of the RAP and RAP Amendment. The intent of this summary is to document the administrative record for future reference purposes. Additionally, a CD is attached in Appendix 1 that contains copies of important historical documents for the Muskegon Chemical Company site. The historic documents provide an interested reader with context in understanding the actions that have taken place at the site and how that meshes with those actions required in the RAP Amendment.

June 1997	RAP approved by the MDEQ.
November 1997	Consent Decree executed between Koch Chemical Company and the MDEQ.
December 2000	RAP and Consent Decree modified to incorporate the use of the Muskegon County Sanitation Ordinance as an acceptable land use control in lieu of a restrictive covenant.
May 2001	Modified groundwater monitoring program agreed to during a meeting between the MDEQ and Reiss Remediation, LLC. Modified program was referred to as the "Bridge" program, and incorporated into the next quarterly sampling event.
April 2002	The MDEQ approved interim shut down of the pump and treat system while the parties revise the RAP.
June 2002	MZGSI Determination completed by the MDEQ and Mill Pond Creek removed from non-attainment list. The MDEQ requested MZGSI criteria be incorporated into the amended RAP.
June 2002	Draft RAP submitted to the MDEQ.
July 2002	The MDEQ requested modification to the draft RAP.
May 2003	Installation of the air sparge system approved by the MDEQ.
July 2003	Revised draft RAP submitted to the MDEQ.
August 2003	The MDEQ requested modification to the draft RAP.
June 2004	The MDEQ provided comments on July 2003 draft RAP.

May 2005	Revised draft RAP submitted to the MDEQ.
October 2005	The MDEQ provided comments on the draft RAP.
October 2005	Demolition of process building and installation of building foundation cap approved by the MDEQ contingent on addressing six items.
October 2005	The MDEQ approves demolition plan and the response to MDEQ comments.
July 2006	FHR prepared and submitted proposal to the MDEQ for modifying the existing RAP through the operative terms of the existing Consent Decree. On August 21, 2006, MDEQ staff indicated concurrence with the approach for RAP modification set forth in the July 21, 2006 letter.
August 2006	The MDEQ approves the temporary shut down of the MCC site air Sparge system.
October 2006	Draft RAP Amendment submitted to the MDEQ.
April 2007	MDEQ comments on Draft RAP Amendment.
May 2007	Snapshot sampling to further evaluate GSI.
April 2008	Additional site characterization in downgradient area of former Plant property.
September 2008	The MDEQ agreed to the requirements for completing the RAP Amendment and confirmed the acceptability of FHR's proposal for two additional years of voluntary air sparge system operation.

2.4 EASEMENT, INSTITUTIONAL CONTROLS, AND FINANCIAL ASSURANCE MECHANISM DOCUMENTATION

2.4.1 RESTRICTIVE COVENANTS

The MDEQ has requested that FHR rescind any existing deed restrictions that were implemented pursuant to the RAP, and replace them with restrictions that more adequately protect against the risk of exposure to hazardous substances at the MCC Site. The Plant and Mill Pond Creek properties are currently subject to restrictive covenants that were recorded pursuant to the 1997 RAP. However, as suggested by the MDEQ, the new restrictive covenants (Attachment D) will supersede the original restrictive covenants. Language in the new restrictive covenants explicitly states that they supersede the original restrictive covenants.

The restrictive covenants FHR proposes to implement were developed using the MDEQ model restrictive covenant and have been revised to reflect MDEQ's comments. They are attached as Attachment D to this RAP Amendment.

FHR proposes to implement deed restrictions on the Plant Property and Mill Pond Creek Property prohibiting groundwater extraction and use, as well as prohibiting any activities that may adversely impact the multi-media cap or otherwise interfere with or impact the effectiveness of the remedy. As described in

the O&M Plan (Attachment B), the former process building has been demolished and replaced with a multi-media cap. The integrity of the cap will be maintained through monitoring and maintenance as specified in Section 3 of the O&M Plan.

The restrictive covenants will be recorded with the register of deeds within 21 days of the MDEQ's approval of this RAP amendment, and a true copy will be provided to MDEQ within 10 days of receiving the true copy from the register of deeds. Notice of the land use restrictions will be submitted to the Whitehall and Fruitland Township zoning authorities within 30 days of approval of this RAP amendment.

FHR will provide confirmation to the MDEQ through periodic progress reports that the restrictive covenants are being complied with. In addition, provisions for reporting to the MDEQ about the condition of the multi-media cap are described in the O&M Plan.

2.4.2 EASEMENTS

The proposed restrictive covenants will not materially interfere with any easements. Easement documentation is set forth in Attachment E. The only easement crossing the Plant Property is a Consumers Power electrical service easement. That easement does not cross the multi-media cap, as depicted in the survey in Attachment E. Therefore, the excavation prohibition relating to the multi-media cap does not impact the easement. Moreover, the prohibition on groundwater use and extraction does not materially affect those easement rights, which involve only electrical service lines.

As shown by the easement information set forth in Attachment E, the only easements crossing the Mill Pond Creek Property are three highway easements along the northern border of that property, none of which should be materially affected by a prohibition on the use and extraction of groundwater.

2.4.3 MUSKEGON COUNTY SANITARY REGULATIONS AND CLARIFICATION

The Muskegon County Sanitary Regulations provide a mechanism for the control and regulation of water supplied to the consumers and residents of Muskegon County. As part of this regulation, a water supply construction permit is required by the Muskegon County Health Department for construction of a new water supply or making significant changes to an existing water supply, which includes installation or modification of a drinking water well.

The Muskegon County Health Department has updated their drinking water well permit database to deny permits to properties affected by impacts associated with the former MCC Site. This assures that future use of groundwater within the impacted areas not owned by FHR will be restricted by the Muskegon County Health Department. Documentation clarifying that the regulations are being enforced and monitored, as well as the Muskegon County Sanitary Regulations are included in Attachment F.

2.4.4 PERMANENT MARKERS

Permanent markers will be installed at various locations on the Plant Property. The composition, language, and placement of the permanent markers, as well as their operation and maintenance, are discussed in Section 4 of the O&M Plan (Attachment B).

2.4.5 FINANCIAL ASSURANCE

Financial assurance mechanism documentation materials are included in Attachment G. The Consent Decree required that FHR demonstrate to the MDEQ that they are maintaining an MDEQ-approved financial assurance mechanism for the estimated costs of response activities to be performed under the Consent Decree. In order to verify that the previously approved mechanism and letter of credit in the amount of $1,355,900 is adequate, current site operating costs were calculated as shown in Attachment G, to be consistent with the RAP Amendment and attachments. These costs were calculated on a 30-year basis assuming a 3% annual inflation rate.

The costs are based on meeting the requirements specified in the O&M Plan (Attachment B) and the LTMCP (Attachment C). The 30-year costs to conduct sampling and laboratory analysis, reporting, site maintenance, and project management is calculated to be $882,310.

3.0 COMPLIANCE CRITERIA

This RAP Amendment incorporates site-specific criteria under section 20120a(2) of Part 201 of NREPA, as follows:

Compliance wells will be used to assure compliance with Tier I remedial goals. Compliance wells have been selected to be 1) in close proximity to Mill Pond Creek, 2) upgradient of Mill Pond Creek, and 3) not directly influenced by recharge from Mill Pond Creek.

The Consent Decree specified the use of Tier I and Tier II cleanup goals. Tier I goals will be applicable to the compliance wells adjacent to Mill Pond Creek. The applicable Tier I remediation criteria at the compliance wells for groundwater are the MZGSI criteria presented in Table 2. If the concentration of a site COC(s) in a compliance well exceeds Tier I remedial goals, response actions will be taken according to the LTMCP. The Tier II cleanup goals have not changed and are the final site cleanup goals and are applicable to all wells at the site. The Tier II remedial goals are also presented in Table 2.

3.1 CONSISTENCY WITH USES OF PROPERTY

The Plant Property is vacant and owned by FHR, and is currently being used solely for purposes of implementing the remedial action. The Mill Pond Creek Property is vacant, undeveloped, and owned by FHR, and is currently being used solely for purposes of implementing the remedial action. FHR also proposes to implement a deed restriction limiting any uses of those properties that may be inconsistent with the remedial action described in the RAP and RAP Amendment. Therefore, the proposed criteria are consistent with any foreseeable future uses of the Plant Property and Mill Pond Creek Property.

3.2 AIR SPARGE SYSTEM

Operation of the existing air sparge system will be conducted for a period of two years commencing upon approval of this RAP Amendment, as agreed to by the MDEQ during the August 26, 2008 meeting and as specified in the O&M Plan (RAP Attachment B). The air sparge performance monitoring wells will be analyzed for PCE during the two year period of operations.

4.0 WORK PLANS

The existing groundwater monitoring program for the site will be replaced by the LTMCP (Attachment C), and the existing O&M Plan will be replaced by the new, updated version of the O&M Plan presented in Attachment B.

The plans were updated to be consistent with current conditions at the Site. The LTMCP was prepared to document that Tier I MZGSI criteria are met at the compliance wells, demonstrate cleanup to Tier II goals, identify evidence of changes in groundwater flow direction (should they occur), and monitor the effectiveness of the existing air sparge system.

The LTMCP provides a seamless document to cover the collection of data, the evaluation of the data, and the evaluation and implementation, if needed, of contingency measures. The LTMCP details actions to be taken in the event that Tier I remedial goals are exceeded at compliance wells or may be expected to be exceeded in the future.

The O&M Plan modifications address cap maintenance, use restrictions, permanent markers, and easement identification.

Tables

Table 1 – 1997 RAP and 2008 RAP Amendment Cross-References
Remedial Action Plan Amendment
Muskegon Chemical Company NPL Site

RAP Section		Elements Modified	Description of Change	RAP Amendment Section
1.0	Introduction	Tier I Goals	Tier I Goals - The RAP is amended by adoption of the MZGSI criteria as the Tier I goals in the Amended RAP.	Sections 2.2, 2.3, 3.0, 3.1, and 4.0
3.0	Remedial Action Goals	Tier I Goals	Tier I Goals - The RAP is amended by adoption of the MZGSI criteria as the Tier I goals in the Amended RAP.	Sections 2.2, 2.3, 3.0, 3.1, and 4.0
3.1	Tier I Remedial Action Goals	Tier I Goals	Tier I Goals - The RAP is amended by adoption of the MZGSI criteria as the Tier I goals in the Amended RAP.	Sections 2.2, 2.3, 3.0, 3.1, and 4.0
3.1.2	Tier I Remedial Action Goals for Groundwater	Tier I Goals	Tier I Goals - The RAP is amended by adoption of the MZGSI criteria as the Tier I goals in the Amended RAP.	Sections 2.2, 2.3, 3.0, 3.1, and 4.0
3.1.2.1	Attenuated GSI Values	Tier I Goal	Tier I Goals - The RAP is amended by adoption of the MZGSI criteria as the Tier I goals in the Amended RAP.	Sections 2.2, 2.3, 3.0, 3.1, and 4.0
4.0	Proposed Remedial Action	Multi-Media Cap, Air Sparge	Multi-Media Cap - The RAP is amended by use of the multi-media cap to replace the former process building roof and floor as a barrier.	Sections 2.2, 2.3, 2.4.1, 2.4.2, and 4.0
			Air Sparge System - The RAP is amended by the use of air sparging as a remedial alternative at the site.	Section 2.2, 2.3, and 3.2
4.1	Proposed Remedy for Soil	Multi-Media Cap, Air Sparge	Multi-Media Cap - The RAP is amended by use of the multi-media cap to replace the former process building roof and floor as a barrier.	Sections 2.2, 2.3, 2.4.1, 2.4.2, and 4.0
			Air Sparge System - The RAP is amended by the use of air sparging as a remedial alternative at the site.	Section 2.2, 2.3, and 3.2
4.1.1	Remedy Description	Tier I Goals, Multi-Media Cap, Air Sparge	Tier I Goals - The RAP is amended by adoption of the MZGSI criteria as the Tier I goals in the Amended RAP.	Sections 2.2, 2.3, 3.0, 3.1, and 4.0
			Multi-Media Cap - The RAP is amended by use of the multi-media cap to replace the former process building roof and floor as a barrier.	Sections 2.2, 2.3, 2.4.1, 2.4.2, and 4.0
			Air Sparge System - The RAP is amended by the use of air sparging as a remedial alternative at the site.	Section 2.2, 2.3, and 3.2
4.2	Proposed Remedy for Groundwater	Tier I Goals, Air Sparge	Tier I Goals - The RAP is amended by adoption of the MZGSI criteria as the Tier I goals in the Amended RAP.	Sections 2.2, 2.3, 3.0, 3.1, and 4.0
			Multi-Media Cap - The RAP is amended by use of the multi-media cap to replace the former process building roof and floor as a barrier.	Sections 2.2, 2.3, 2.4.1, 2.4.2, and 4.0
			Air Sparge System - The RAP is amended by the use of air sparging as a remedial alternative at the site.	Section 2.2, 2.3, and 3.2
4.2.1	Remedy Description	Tier I Goals, MMC, Air Sparge	Tier I Goals - The Approved RAP is amended by adoption of the Tier I MZGSI criteria as the Tier I goals in the Amended RAP.	Sections 2.2, 2.3, 3.0, 3.1, and 4.0
			Multi-Media Cap - The Approved RAP is amended by use of the multi-media cap to replace the former process building roof and floor as a barrier.	Sections 2.2, 2.3, 2.4.1, 2.4.2, and 4.0
			Air Sparge System - The RAP is amended by the use of air sparging as a remedial alternative at the site.	Section 2.2, 2.3, and 3.2
5.0	Operation and Maintenance Requirements	Multi-Media Cap, Air Sparge	Multi-Media Cap - The RAP is amended by use of the multi-media cap to replace the former process building roof and floor as a barrier.	Sections 2.2, 2.3, 2.4.1, 2.4.2, and 4.0
			Air Sparge System - The RAP is amended by the use of air sparging as a remedial alternative at the site.	Section 2.2, 2.3, and 3.2
7.2	Consent Agreement	Tier I Goals	Tier I Goals - The RAP is amended by adoption of the MZGSI criteria as the Tier I goals in the Amended RAP.	Sections 2.2, 2.3, 3.0, 3.1, and 4.0

Table 2 · Chemicals of Concern and Remedial Goals
Remedial Action Plan Amendment
Muskegon Chemical Company NPL Site
Whitehall, Michigan

		Tier I Mixing Zone GSI		Tier II Goal*
		Acute	Chronic	
Volatile Organics	*Units*			
Chlorobenzene	µg/L	850	750	100
1,2-Dichloroethane	µg/L	15,000	--	5
cis-1,2-Dichloroethene	µg/L	--	--	70
trans-1,2-Dichloroethene	µg/L	--	--	100
Tetrachloroethene	µg/L	710	--	5
Trichloroethene	µg/L	3,500	3,200	5
Vinyl Chloride	µg/L	--	--	2
Semivolatile Organics	*Units*			
Bis(2-chloroethoxy)ethane [TGDC]	µg/L	26,000	23,000	5
Bis(2-chloroethyl) Ether [Chlorex]	µg/L	18,000	770	2

* Part 201 drinking water criteria, MDEQ Opeational Memorandum No. 1, January 23, 2006.

Appendix 1

CD Containing Important Historical Documents for the Muskegon Chemical Co. Site

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ATTACHMENT 2

2012 Annual Monitoring Report

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ATTACHMENT 3

MDEQ Remediation and Redevelopment Division Operational Memorandum #17

September 8, 1998

TO: All Environmental Response Division Staff

FROM: Alan J. Howard, Chief, Environmental Response Division

SUBJECT: **Environmental Response Division Operational Memorandum #17**: Instructions for Obtaining Determinations on Mixing Zone-Based Groundwater Surface Water Interface Criteria for Inclusion in Remedial Action Plans and Monitoring Compliance with Criteria for Discharges of Groundwater Contaminants to Surface Water

THIS OPERATIONAL MEMORANDUM HAS BEEN PREPARED TO FACILITATE IMPLEMENTATION OF THE 1995 AMENDMENTS TO PART 31, WATER RESOURCES PROTECTION, AND PART 201, ENVIRONMENTAL REMEDIATION, OF THE NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT, 1994 PA 451, AS AMENDED.

Introduction

The location at which groundwater enters a surface water body is commonly referred to as the groundwater/surface water interface (GSI). This Operational Memorandum describes the information required and the process for requesting determinations regarding criteria to be met at the GSI for contaminated groundwater discharges to surface water.

Section 20120a(15) of Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA), requires that if a Remedial Action Plan (RAP) allows for discharges of groundwater venting from a facility to the surface water then the discharge must comply with the requirements of Part 31, Water Resources Protection, of the NREPA and the rules promulgated under that Part. Section 3109a(1) of Part 31 allows for mixing zones for discharges of venting groundwater in the same manner as for point source discharges, except that no permit is required where mixing zones are provided for in an approved RAP. Where a mixing zone has not been provided for in an approved RAP or permit, the groundwater quality at the GSI must meet the "generic GSI criteria." (Generic GSI criteria are listed in column #3 in the table of "Groundwater: Residential and Industrial-Commercial, Part 201 Generic Cleanup Criteria and Screening Levels" available from the Environmental Response Division [ERD] of the Department of Environmental Quality [DEQ]. This table is also available on the DEQ, ERD Internet homepage at www.deq.state.mi.us.)

Mixing zones for venting groundwater contaminant plumes may be most appropriate to consider in situations where bioaccumulative contaminants are not present, source materials are controlled, the nature and extent of soil and groundwater contamination are adequately defined, and contaminant concentrations are less than final acute criteria at the GSI. (Final acute criteria are listed as FAV's in the table of Rule 323.1057 Water Quality Values available from the Surface Water Quality Division [SWQD] of the DEQ. This table is also available on the DEQ, SWQD Internet homepage at www.deq.state.mi.us. Bioaccumulative compounds are identified in Table 5 of Rule 323.1057 of the Part 31 Rules.)

Rule 323.1098 of the Part 31 Rules requires that waters of the state which are of better quality than the water quality standards not be allowed to be degraded by a "new or increased discharge" unless there is an "antidegradation demonstration" or it is demonstrated that the discharge is exempt under Rule 323.1098(7) or (8). Where a groundwater contaminant plume with concentrations above the generic GSI has not yet reached the surface water or where groundwater contaminant concentra-tions entering the surface water will increase significantly, it will be considered to be a new or increased discharge. Therefore, in such circumstances, in order to obtain mixing zone-based GSI criteria an antidegradation demonstration or a demonstration of qualification for an exemption will be required. An antidegradation demonstration must show that the discharge would be in the public interest based on social or economic benefit to the area in which the new or increased discharge will occur. The information required to make the antidegradation demonstration is outlined in Attachment A. Where the new discharge includes bioaccumulative contaminants no mixing zone will be allowed. Where concentrations will increase in an existing discharge, which contains bioaccumu-lative compounds, alternatives to eliminate or significantly reduce them in the discharge must be evaluated as specified in Attachment A.

Determining Mixing Zone-Based GSI Criteria

In order to obtain a determination of "mixing zone-based GSI criteria" for a discharge of contaminated groundwater to be covered by a RAP, the District Supervisor or Unit Chief will submit a request for a mixing zone determination to the Field Operations Supervisor. The Field Operations Supervisor will assign the appropriate priority to the request and then forward it to the SWQD, Great Lakes and Environmental Assessment Section. Any party requesting a mixing zone determination must provide the following information to the ERD for evaluation:

1) The name (if any) of the receiving surface water body and the location of the venting groundwater plume.
2) The location, nature, and chemical characteristics of past and ongoing source(s) of the groundwater contaminant plume.
3) The name, Chemical Abstract Service (CAS) Number, and concentration of the contaminants in the groundwater contaminant plume at the GSI and upgradient of it to the source area.
4) The discharge rate in cubic feet per second (cfs) of the venting groundwater contaminant plume (the discharge rate of the groundwater plume should be calculated using that portion of the contaminant plume which is or may become contaminated at concentrations above the generic GSI).
5) The location of other contaminant plumes entering the same surface water body in the vicinity of the facility and their constituents and concentrations, if available.
6) If this is a "new or increased discharge," an explanation of the social or economic benefits to the area that would be foregone if the discharge is not allowed.
7) If bioaccumulative contaminants are in the "new or increased discharge," a description of alternatives to eliminate those contaminants from the discharge.

A form memorandum for ERD's submittal of a request for a mixing zone determination is found as Attachment A. To assure that valid information is provided in a mixing zone determination request, some or all of the information described in Attachments A and B need to be evaluated by ERD staff. Due to the individual circumstances of sites of environmental contamination, not all of the information outlined in Attachment B will be required in every case. Professional judgment should be used on a case by case basis to determine what will be necessary to derive the information required for the request for mixing zone determination.

The SWQD is responsible for supplying the remaining information necessary to perform the mixing zone determination. This includes information on the flow and quality of the receiving surface water body, any other pertinent point and non-point source discharges, and the total loading of contaminants to the surface water body. The SWQD will determine the allowable mixing zone-based GSI criteria for the contaminants in the venting groundwater. Chronic criteria are calculated based on dilution and other contaminant loadings in the surface water body in order to meet water quality criteria after mixing. Final acute criteria are calculated as maximum concentrations not to be exceeded at the GSI in order to prevent immediate harm to aquatic life. These will be calculated on a contaminant and site-specific basis. The resulting mixing zone-based GSI criteria will then be forwarded by SWQD to the appropriate District Supervisor or Unit Chief, with a copy to the Field Operations Supervisor, for incorporation into the RAP.

Parties seeking a mixing zone determination should submit a request and supporting documentation to the appropriate ERD District Supervisor, Unit Chief, or analogous personnel in another Division overseeing or having regulatory authority over the response action. These will then be reviewed and forwarded as appropriate through the Field Operations Supervisor to the SWQD, Great Lakes and Environmental Assessment Section. When the information necessary to make a mixing zone determination has been submitted to the department, a determination will be made within six months. The determination will be forwarded to the requester after it is received by ERD. Parties may ask to meet with staff of ERD, SWQD, and/or other involved divisions to discuss their request prior to submittal, during the evaluation, or after a determination has been made.

In limited circumstances, chemical-specific criteria may not be protective of aquatic life due to the number or nature of toxic substances and/or unidentified substances found in the venting contaminant plume. Toxicity testing of the groundwater contaminant plume may also be required. This testing will be similar to the whole effluent toxicity testing required for certain point source discharges. The SWQD will specify any requirements for such testing in the mixing zone determination.

In some instances it may be helpful to obtain preliminary mixing zone-based criteria prior to development of a RAP. Parties considering obtaining a mixing zone determination for a site can request a preliminary mixing zone determination by providing preliminary information for evaluation and specifying that it is a "preliminary request prior to RAP submittal." When submitting the request to SWQD, ERD should also indicate on Attachment A that this is a preliminary request prior to RAP submittal. A party may instead choose to estimate the mixing zone-based GSI criteria by following Rules 323.1041 through 323.1117, Part 4, and Rules 323.1201 through 323.1221, Part 8, of the Part 31 Rules. Regardless, the final mixing zone-based GSI criteria will be established by the SWQD and approved by the ERD as part of a RAP.

For certain chemicals and for stream segments with waste load allocations, the dilution afforded by the surface water body may not be the limiting factor in determining mixing zone-based GSI criteria because the assimilative capacity of the stream segment has been reached for specific contaminants. Attachment C provides a list of stream segments with waste load allocations and the specific contaminants effected. Dilution will not generally be permitted to adjust generic GSI criteria for polychlorinated biphenyls (PCBs) or mercury because the concentrations, which would be protective of aquatic life, are below detection limits, even where substantial dilution will occur. In addition, other bioaccumulative compounds are required to be phased out of discharges within seven years. It may be advantageous to evaluate the potential for PCBs, mercury, or other bioaccumulative chemicals to be of concern at a site and/or test for their presence early on. This will allow for a reasonable evaluation of the value of pursuing mixing zone-based GSI criteria.

It should also be recognized that in accordance with Rule 323.1082(5) of the Part 31 Rules groundwater contaminant plumes venting into lakes will not be allowed a dilution factor greater than ten

parts receiving water to one part venting groundwater for the development of mixing zone-based GSI criteria. In some situations a lesser dilution factor than ten to one will be allowed based on site-specific circumstances.

Parties may seek alternate mixing zone-based GSI criteria by submitting a demonstration that they are appropriate in accordance with Rule 323.1082(7) of the Part 31 Rules.

Determining Monitoring Requirements

Mixing zone-based GSI criteria will be identified by the SWQD as either chronic or final acute criteria. A monitoring schedule must be approved by the DEQ and specified in the approved RAP for the facility.

Extended monitoring of the GSI will not be necessary when it is demonstrated that the venting groundwater will always comply with the GSI criteria (whether they are generic criteria or mixing zone-based criteria). In other situations, a method must be established to ensure that groundwater venting to the surface water body meets the established GSI criteria. Generally, this will be accomplished in two ways. First, through monitoring of the groundwater at compliance monitoring points and, where possible, sentinel monitoring points [in compliance with Section 20118(10)(a), (b), and (c) of the NREPA]. And secondly, through implementation of contingent remedial action where needed to prevent harm to human health, wildlife, or aquatic like from exceedances that are predicted or have occurred. In the event that exceedances are predicted or have occurred, compliance monitoring plans may call for increased monitoring, evaluation of the severity of any exceedance and evaluation of the need to implement further remedial actions. Facility-specific requirements for compliance monitoring and contingency plans, if required, must be specified in the RAP. Further discussion on compliance monitoring plans and contingency plans is found in Attachment D.

Groundwater samples should be representative of the chemistry of groundwater within the contaminant plume discharging to the surface water. Groundwater concentrations should be measured in the groundwater contaminant plume or in the path of the contaminant plume to establish compliance with either generic or mixing zone-based GSI criteria. These measurements should be taken as close to the surface water body as feasible, where and when groundwater gradients show that the groundwater is moving toward the surface water body. GSI compliance monitoring points should generally be in locations where groundwater is not normally recharged by the surface water (i.e., where periodic flooding and associated bank storage is not a factor). Static water levels in the surface water and groundwater should be determined for each sampling event. In addition, the monitoring plan may require determination of the groundwater flow direction for each sampling event or at some other specified frequency. In certain circumstances groundwater modeling may be a useful tool for making certain decisions.

The cross sectional area of the contaminant plume used for averaging monitoring results for compliance with the chronic mixing zone-based GSI criteria should generally be the same as that used to estimate the discharge rate of the venting groundwater indicated in the request for a mixing zone determination and will generally consist of that portion of the groundwater where contaminants exceed or are expected to exceed the generic GSI criteria. The area of the contaminant plume to be monitored for compliance with mixing zone-based GSI criteria (compliance area) must be defined in the RAP for each contaminant for which mixing zone-based criteria have been determined. This may result in multiple compliance areas being identified for the venting contaminant plume. An example where this could occur would be where contaminants with different specific gravities such as benzene and trichloroethylene are present in the groundwater plume at different depths in the aquifer. Depending on facility-specific circumstances, it may be necessary to adjust the monitoring points used to judge compliance with mixing zone-based GSI criteria during implementation of the RAP. Factors to be considered are discussed in Attachment D.

Evaluating Compliance

For each sampling event, the average of the contaminant concentrations in groundwater samples taken from monitoring points within the contaminant plume in the areas selected for GSI compliance monitoring must not exceed the chronic criteria for the area(s) of the contaminant plume defined for monitoring compliance. Data used to calculate the average concentrations should only include data from monitoring points within the areas specified in the RAP as described above.

The final acute criteria should not be exceeded at the GSI. Any exceedances of final acute criteria should be promptly evaluated to determine their significance and potential harm to aquatic life and to determine if any further remedial action is needed, as described in Attachment D.

Contacts For More Information

General questions about this memorandum or requesting mixing zone determinations should be directed to ERD District Supervisors for Part 201 sites or Claudia Kerbawy, 517-335-3397, the Superfund Section Chief for National Priorities List sites. A map identifying ERD districts, supervisors, addresses, and telephone numbers is found in Attachment E.

This memorandum is intended to provide guidance to Division staff to foster consistent application of Part 201 of the NREPA and associated Administrative Rules. This document is not intended to convey any rights to any parties nor create any duties or responsibilities under law. This document and matters addressed herein are subject to revision.

Attachments

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

_____
(Date)

TO: [William Creal (for facilities in Southern Lower Peninsula)
Gerald Saalfeld (for facilities in Northern Lower Peninsula and Upper Peninsula)]
Great Lakes and Environmental Assessment Section
Surface Water Quality Division

FROM: Daniel Schultz, Field Operations Supervisor
Environmental Response Division

SUBJECT: _____ (facility name)
Mixing Zone Determination Request
_____ District

We are requesting a mixing zone determination for the above referenced facility, located in the ____ 1/4 of the ____ 1/4 of Section ____, T_____, R_____ in _____ County.

Priority: [ ] 1 (4 week response)
[ ] 2 (8 week response)

Project Manager: _____ Phone #: _____

District Supervisor / Unit Chief: _____

Phone #: _____ FAX #: _____

The facility characteristics include:

1. The name of the receiving water body and the location of the venting groundwater contaminant plume (map attached). This is a [ ] new [ ] increased or [ ] existing loading.

2. The location, nature, and chemical characteristics of the source of the groundwater contamination plume: (Please note that landfill or other leachate, which is above the groundwater table, such as leachate in a collection system, should be identified here as a source.)

3. The name, Chemical Abstract Service (CAS) Number, and worst case maximum concentration of contaminants predicted to reach the groundwater/surface water interface (GSI). Generally the highest concentration of the contaminant found in the groundwater would be appropriate to represent the worst case maximum. If source contaminants have not yet reached the groundwater but are expected to do so, source concentrations should be identified and noted as such. Mixing zone-based GSI criteria will not be developed for contaminants that are not identified as having a reasonable potential to exceed water quality criteria. For contaminants that do not have mixing zone-based GSI criteria, the generic GSI criteria will apply. Attach additional sheets, if necessary.

Chemical or General Chemistry Parameter	CAS #	Predicted Worst Case Maximum GSI Discharge Concentration	Average Surface Water Conc. Upstream If available

4. The discharge rate of the venting groundwater contaminant plume in cubic feet per second (cfs).

5. The location of other contaminant plumes entering the receiving surface water body, their constituents and concentrations, if available:

6 The lowest monthly 95 percent exceedance low flow at the discharge location: _____CFS
The harmonic mean flow at the discharge location: _____CFS
The 90dQ10 flow at the discharge location: _____CFS

[ ] has been determined by the Hydrologic Studies Unit of the Land and Water Management Division (memo attached).
[ ] as indicated in the Land and Water Management Division Low-Flow Data Base.
[ ] has been requested from the Hydrologic Studies Unit of the Land and Water Management Division.
[ ] has not yet been determined.

If this is a new loading, or increased loading above previously authorized levels, an antidegradation demonstration, which includes the information in 8 and 9 below, or a demonstration of qualification for an exemption under Rule 323.1098 (7) or (8), is required.

7. Please check whether there is
   a) ___ an antidegradation demonstration (Fill out 8 and 9.) or
   b) ___ a demonstration of qualification for an exemption (Refer to 323.1098 (7) and (8) for elements needed for this demonstration.)

Please identify below who prepared the antidegradation or exemption demonstration.

Name	Division/Agency/Company

8. This is a new or increased loading from venting groundwater. The social or economic development and the benefits to the area in which the waters are located that would be foregone if the new or increased discharge is not allowed include:

- Employment increases:
- Production level increases:
- Employment reductions avoidance:
- Efficiency increases:
- Industrial, commercial, or residential growth:
- Environmental or public health problem corrections:
- Economic or social benefits to the community:
- Other relevant factors:

If the new or increased loading includes the following bioaccumulative chemicals of concern (BCCs), Chlordane, 4,4'-Dichlorodiphenyldichloroethane, 4,4'-Dichlorodiphenyldichloroethylene, 4,4'-Dichlorodiphenyltrichloroethane, Dieldrin, Hexachlorbenzene, Hexachlorobutadiene, Hexachlorocyclohexanes, alpha-Hexachlorocyclohexane, beta-Hexachlorcyclohexane, delta-Hexachlorocyclohexane, Lindane, Mercury, Mirex, Octachlorostyrene, Polychlorinated biphenyls, Pentachlorobenzene, Photomirex, 2,3,7,8-Tetrachlorodibenzodioxin, 1,2,3,4-Tetrachlorobenzene, 1,2,4,5-Tetrachlorobenzene, Toxaphene, complete the following:

9. BCCs are included in the discharge. The alternatives evaluated and the alternatives to be implemented that will comply with minimizing the discharge of the BCC by implementation of any cost-effective pollution prevention alternatives (such as source control) and techniques reasonably available that would eliminate or significantly reduce the discharge of the BCC are:

If pollution prevention alternatives would not eliminate the increased discharge of the BCC, the person making the demonstration shall evaluate alternative or enhanced groundwater treatment techniques that would eliminate the discharge of the BCC. The techniques that have a cost that is reasonable relative to the cost of treatment necessary to achieve generic GSI criteria shall be implemented. The alternatives evaluated and the alternatives to be implemented that will comply with this requirement are:

Basis for Information to be Considered in Mixing Zone Determinations

The following information should be provided to and/or evaluated by DEQ staff as appropriate. Not all of this information will be needed in every case. Best professional judgment should be used on a case-by-case basis in determining what is necessary to derive the information requested in Attachment A. This is intended to be a fairly comprehensive listing of what should be considered in gathering and evaluating information related to discharges of groundwater to the surface water. It is not expected that all of the information discussed in this attachment will need to be evaluated in all cases. In general, only that information identified on Attachment A will need to be forwarded to the SWQD when submitting a request for a mixing zone determination. Other factors described here may need to be evaluated by DEQ staff to assure that the information provided to SWQD in Attachment A is complete and accurate.

1. **Receiving Surface Water Body and Location of the Venting Groundwater Plume(s)**

   - This information should be supplied in narrative and map form.

2. **Location, Nature and Chemical Characteristics of the Source of the Groundwater Contaminant Plume**

   - A map(s) should be provided which show(s), at a minimum:
     - The receiving surface water body or bodies and the property and facility boundaries.
     - Buildings and other structures on the property where the plume originates and under which the plume migrates.
     - The location of sources of contamination.
   - Information should be provided on the following:
     - The location and nature of the source or sources of contamination, and if removed or still present.
     - The type of source contaminants and their chemical characteristics and concentration.
     - The mobility of the contaminants.
     - The amount of recharge from precipitation over the source area in inches/year. (This information may be obtained from the Hydrologic Studies Unit of the Land and Water Management Division using the form memorandum found in Attachment F.) When calculating the amount of recharge, consideration should be given to the amount of impervious surface that exists over the source area.

3. **Name, CAS Number, and Concentration of the Contaminants in the Groundwater Contaminant Plume at the GSI and Upgradient from the GSI to the Source Area**

   - A map(s) indicating, at a minimum:
     - The locations of monitoring wells and borings.
     - The location of the contaminant plume in plan view (where appropriate, concentration contours should be shown for individual contaminants or groups of contaminants).
     - Cross-sections of the contaminant plume, as close to the receiving water body as possible to show the nature of the plume as it enters the surface water body. (See note above on contouring.)

   - The following information should be provided for each plume:
     - The name and CAS number of contaminants and other parameters present in the contaminant plume (CAS numbers can be obtained from a variety of sources, including

chemical dictionaries and the National Institute of Occupational Safety and Health Pocket Guide to Chemical Hazards).

- The presence of any dense or light non-aqueous phase liquids (DNAPLs or LNAPLs).
- Contaminant concentrations from the source area to the GSI.
  - To characterize the contaminant concentrations at the GSI, representative
  - groundwater samples should be gathered as close to the surface water body as feasible without being impacted by recharge from the surface water body (i.e., the hydraulic gradient should be toward the surface water body during sampling.)
  - Maximum concentrations should be identified for individual groundwater and source area contaminants.
  - Groundwater samples should be representative of the water moving through the aquifer in the contaminant plume. The United States Environmental Protection Agency's (EPA) low-flow sampling protocol (purging and sampling using a flow rate of 100-500 ml/min) should be used if feasible. Other sampling methodologies may be approved if use of the low flow protocol is not feasible and it can be demonstrated that they will be as effective in characterizing the parameters of concern as the low-flow methodology. Samples should not be filtered unless it is not feasible to collect samples that have turbidity that is representative of the water flowing in the aquifer. In that situation both filtered and unfiltered samples should be collected for inorganic analysis. Samples to be analyzed for organic substances should not be filtered regardless of sample turbidity. In most instances a 0.45 micron filter will be appropriate; although site-specific circumstances may require larger filters to collect representative samples.
  - Analyses should be performed for general chemistry parameters, such as major cations and anions, ammonia, chemical and biological oxygen demand, chlorides, and phosphorous, where they are likely to be elevated. (These water quality parameters have not traditionally been evaluated at sites of environmental contamination, but are of particular concern where an impact to surface water may occur. Landfills are an example of facilities where many of these parameters may be of concern.)
  - Where previously collected data exists that does not conform to the above specifications, the data could be evaluated to determine whether it is suitable for site evaluation and mixing zone determinations or whether it is necessary to acquire additional data.
  - Predicted worst case maximum GSI discharge concentrations should be developed and identified where concentrations of contaminants at the GSI may increase.

4. Discharge Rate of the Venting Groundwater Plume (Based on the Hydrogeological Characteristics of the Source Area and Along the Path of the Plume to the Surface Water Body)

- The geology of the area of the contaminant plume(s) should be defined to the extent necessary to understand the impact of the groundwater discharge to surface water. This may include consideration of:
  - Materials in the saturated zone (e.g., sands, silts, clays, sandstone, limestone, granite, and fill).
  - Factors which may impact contaminant transport, such as the amount of organic carbon, available nutrients and overall chemical composition of materials in the saturated zone.
  - Stratigraphy of the facility.
  - Confining lenses or layers.
  - Geologic structures such as faults, fractures, and buried glacial valleys.

- Geomorphology and topography of the facility.

- The hydrogeology of the area of the contaminant plume(s) should be defined to the extent necessary to understand the impact of the groundwater discharge to surface water. This may include consideration of:
  - The uppermost aquifer or saturated zone present below the facility.
  - The thickness and elevations of the aquifer(s) and/or saturated zone(s).
  - Direction(s) of groundwater flow (shown on a potentiometric contour map).
  - Groundwater discharge and recharge patterns at the facility.
  - Horizontal and vertical flow gradients in the aquifer(s) and/or saturated zone(s), particularly in the area adjacent to the surface water body.
  - Any seasonal changes in flow directions represented on groundwater potentiometric contour maps (this requires that several samples be taken over the course of the year in wet and dry seasons).
  - Transmissivity or hydraulic conductivity and effective porosity of the aquifer(s) and/or other saturated zone(s).
  - Specific yield, storativity, and specific storage of the aquifer(s) and/or other saturated zone(s).
  - The portion of the groundwater plume(s) discharging to the surface water body and/or flowing under the surface water body, and any seasonal changes that occur.
- Based on the hydrogeologic information described above and the characteristics of the plume as it enters the surface water body, calculate the discharge rate in cubic feet per second (cfs), for the portion of the groundwater plume contaminated above the generic GSI criteria that is discharging to the surface water.
- Where applicable, use maps to illustrate the above information both in plan and cross-sectional view.

5. **Location of Other Known Contaminant Plumes Entering the Same Surface Water Body, Their Constituents and Concentrations (if available)**

   - On a map, identify the location of the subject groundwater discharge plume and the location of any other contaminant plumes entering the same surface water body in the vicinity of the facility, if known.
   - Identify the contaminants contained in the other plumes and their concentrations, if known.
   - Information on other contaminant plumes may be available from the ERD district office or other local sources.

September 8, 1998

WASTELOAD ALLOCATIONS*

The following waterbodies and facilities have been identified as involved in Wasteload Allocations where more than one facility is considered when performing the allocation.

Receiving Water	County	Facility	Permit #	Parameter
Black River	Sanilac	Aunt Jane Foods		CBOD
		Croswell WWTP	MI0021083	Ammonia
		Mich Sugar Co-Croswell	MI0002542	
Cass River	Saginaw	Bridgeport Twp. WWTP	MI0022446	CBOD
		Frankenmuth WWTP	MI0022942	Ammonia
		Vlasic Foods-Bridgeport	MI0001651	
Clinton River	Oakland	Pontiac WWTP	MI0023825	CBOD
	Macomb	Rochester WWTP	MI0023931	Ammonia
		Warren WWTP (via Red Run Drain)	MI0024295	
Detroit River	Wayne	Detroit WWTP + several	MI0022802	Cadmium
				Lead
Fish Creek	Montcalm	Carson City WWTP	MI0020192	CBOD
		Crystal Refining	MI0002801	Ammonia
Flint River	Genesee	Flint WWTP	MI0022926	CBOD
		Flushing WWTP	MI0020281	Ammonia
		Genesee Co-Ragnone WWTP	MI0022977	
Ford/Belleville Lakes	Washtenaw	Ann Arbor WWTP	MI0022217	Phosphorus
		Chelsea WWTP	MI0020737	
		Dexter WWTP	MI0022829	
		Loch Alpine WWTP	MI0024066	

Receiving Water	County	Facility	Permit #	Parameter
Grand River	Ingham	Lansing WWTP	MI0023400	CBOD
		Delta WWTP	MI0022781	Ammonia
Grand River	Kent	Grand Rapids WWTP	MI0026069	Metals
		Grandville WWTP	MI0023027	CBOD
		Wyoming WWTP	MI0024392	
Grand River	Ottawa	Grand Haven WWTP	MI0021245	CBOD
		Eagle Ottawa Leather Co.	MI0050253	Ammonia
Hayworth Creek	Clinton	Federal Mogul		CBOD
		St. Johns WWTP	MI0026468	Ammonia
Kalamazoo River	Kalamazoo	Kalamazoo WWTP	MI0023299	CBOD
		Simpson Plainwell Paper	MI0003794	Ammonia
Kent Lake	Oakland	Wixom WWTP	MI0024384	Phosphorus
		Ford-Wixom	MI0028151	
Limekiln Lake	Oakland	South Lyon WWTP	MI0020273	Phosphorus
		Quanex Corp-MI Seamless Tube	MI0001902	
Muskegon Lake	Muskegon	Muskegon WWTP	MI0029173	Phosphorus
		MDNR-ERD/Ott/Story	MI0053309	
Paw Paw River	VanBuren	Paw Paw Lake WWTP	MI0023779	CBOD
		Fletcher Paper	MI0000817	Ammonia
Pine River	Gratiot	Total Petroleum	MI0001066	CBOD
		Alma WWTP	MI0020265	Ammonia
		St. Louis WWTP	MI0021555	

Receiving Water	County	Facility	Permit #	Parameter
Rouge River	Wayne	Rouge Steel	MI0043524	Cadmium
		Double Eagle Steel	MI0044415	Lead
		Power and Utility	MI0050903	
Saginaw River	Bay	Bay City WWTP	MI0022284	Ammonia
		Essexville WWTP	MI0022918	
		West Bay County WWTP	MI0042439	
Salt River	Macomb	Richmond WWTP	MI0023906	CBOD
		New Haven Foundry	MI0038032	Ammonia
Swan Creek (Drain 30)	Branch	Bronson WWTP	MI0020729	CBOD
		Bronson Plating	MI0000825	Ammonia
		Douglas Autotech	MI0005720	Copper
				WET
				Phosphorus
Swan Creek	Monroe	City Sand & Landfill		CBOD
		Holiday Woods MHP	MI0043079	Ammonia
		Carleton WWTP	MI0022543	
		Guardian Ind.	MI0037001	(not considered for CBOD & Ammonia)
		Flat Rock MHP	MI0025844	
Tittbawassee River	Midland	Dow Chemical-Midland	MI0000868	TDS
		Midland WWTP	MI0023582	Ammonia
		Midland Cogeneration Venture	MI0042668	

ACRONYMS:
CBOD - Chemical and Biological Oxygen Demand WET - Whole Effluent Toxicity TDS - Total Disolved Solids

* Please note that this table is current as of February, 1996. Current information on waterbodies having Wasteload Allocations can be obtained from the Surface Water Quality Division, Great Lakes and Environmental Assessment Section.

Compliance Monitoring and Contingency Plans

Extended monitoring of the GSI will not be necessary when it is demonstrated that the venting groundwater will always comply with the GSI criteria (whether they are generic criteria or mixing zone-based criteria). In other situations, a method must be established to ensure that groundwater venting to the surface water body complies with established GSI criteria. Generally, this will be accomplished in two ways. First, through monitoring and evaluation of results of monitoring of the groundwater at compliance and, where possible, sentinel monitoring points [in compliance with Section 20118(10)(a), (b), and (c) of the NREPA]. And secondly, through implementation of further remedial action where needed to prevent harm to human health, wildlife or aquatic life from exceedances that are predicted or have occurred. Facility-specific requirements for compliance monitoring and contingency plans must be included in the approved Remedial Action Plan (RAP). Because of the difference in objectives and methods, locations for compliance monitoring may differ from locations for monitoring done as a part of investigating a site. Monitoring and contingency plans may include the following, as appropriate to the site.

1. Monitoring Plans

- Monitoring plans should identify the portion of the contaminant plume to be monitored for compliance with mixing zone-based GSI criteria as defined in the RAP. This will generally consist of that portion of the groundwater where contaminants exceed or are expected to exceed the generic GSI criteria. Compliance areas should be specifically identified in the monitoring plan for each contaminant for which mixing zone-based criteria have been determined. This may result in multiple compliance areas being identified for the venting contaminant plume. The cross section(s) of the contaminant plume used for averaging monitoring results for compliance with the chronic mixing zone-based GSI criteria should generally be the same as that used to estimate the discharge rate of the venting groundwater indicated in the request for a mixing zone determination. Depending on facility-specific circumstances, it may be necessary to adjust the monitoring points used to judge compliance with mixing zone-based GSI criteria during implementation of the RAP. Factors to be considered include:
  - Movement, expansion, or shrinkage of the contaminant plume.
  - Changes in concentration of contaminants in the plume.
  - Changes in the contaminants present in the plume.
  - New information clarifying the location, concentration, or contaminants present in the contaminant plume and/or at the GSI.
- Monitoring plans should include a map of monitoring points and well screen depths in both plan and cross-sectional view. Both GSI compliance monitoring points and sentinel monitoring points should be identified, as appropriate.
  - Compliance monitoring points should be located in the groundwater contaminant plume, or in
  - the path of the contaminant plume, as close to the surface water body as practical without being influenced by recharge from the surface water body (groundwater gradients, determined from static groundwater and surface water elevations, should be toward the surface water body during sampling events). The GSI compliance monitoring points should generally be in locations where groundwater is not normally recharged by the surface water (i.e., where seasonal flooding and associated bank storage is not a factor). Monitoring point locations and sampling events should be adequate to identify any seasonal migration or other variation in the groundwater contaminant plume.
  - Sentinel monitoring points should be located downgradient of the source of the groundwater contamination and far enough upgradient of the surface water body to allow any necessary further remedial actions to be implemented prior to exceedances of the relevant GSI criteria at the GSI. The need for sentinel monitoring points will be dependent on whether the source of the groundwater contamination has been removed and whether there are, or is the potential for, significant variations in the contaminant concentration upgradient of the GSI. Where sources of contamination are in close proximity or adjacent to the surface water body,

this approach will need to be modified as appropriate to the site-specific circumstances.

- Monitoring plans should identify methods to be used for sampling and analysis. Groundwater samples should be representative of water migrating through the aquifer within the groundwater plume. The EPA's low-flow sampling protocol (purging and sampling at 100-500 ml/min) should be used if feasible. Other sampling methodologies may be approved for use by the DEQ if low-flow protocols are not feasible and if it can be demonstrated that they will be as effective in characterizing the parameters of concern as the low-flow methodology. If it is not feasible to collect samples that have turbidity that is representative of the water flowing in the aquifer, filtering may be appropriate for inorganic constituents. In such cases, both filtered and unfiltered samples should be collected for inorganic analysis. In most instances, a 0.45-micron filter will be appropriate, although site-specific circumstances may require larger filters to collect representative samples. Samples to be analyzed for organic substances should not be filtered regardless of sample turbidity.

- Monitoring plans should address the remaining items required in R299.5519(2)(a) to (l) of the Part 201 Rules. The items required in R299.5519(2)(a) to (l) include:
  - Location of monitoring points.
  - Environmental media to be monitored.
  - Monitoring schedule.
  - Monitoring methodology, including sample collection procedures (static groundwater and surface water elevations and groundwater quality should be monitored).
  - Substances to be monitored.
  - Laboratory methodology, including the name of the laboratory responsible for analysis of monitoring samples, method detection limits, and practical quantitation levels.
  - Quality control/quality assurance plan.
  - Data presentation and evaluation plan.
  - Contingency plan to address ineffective monitoring.
  - Operation and maintenance plan for monitoring.
  - An explanation of how the monitoring data will be used to demonstrate the effectiveness of the response activities.
  - Other elements required by the department to determine the adequacy of the monitoring plan.
- Monitoring plans should identify the conditions when no further monitoring is required.

2. Contingent Monitoring and Evaluation Plans

- Contingent monitoring plans should identify action(s) to be taken in the event that either the compliance monitoring or sentinel monitoring systems identify or predict exceedance of the relevant GSI criteria. At a minimum, this should address the following:
  - Reporting necessary.
  - Increased sampling frequency.
  - Installation of additional sampling points.
  - The process to evaluate the significance of the exceedance and the potential to impact human health, wildlife, or aquatic life.

Any exceedances of final acute criteria should be immediately evaluated to determine their significance and potential to harm aquatic life and to determine if any further remedial action is needed.

3. Contingent Remedial Action Plans

- Contingent remedial action plans should identify further remedial actions that will be taken when they are determined to be needed as a result of an evaluation of the significance of exceedances that are occurring or predicted to occur.
- Contingent remedial action plans should identify who will be responsible for taking the further remedial action and the time frame in which action will be taken.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

[Date]

TO: Jim Pawloski, Acting Chief, Hydrologic Studies Unit
Water Management Section
Land and Water Management Division

FROM: Daniel Schultz, Field Coordinator
Environmental Response Division

SUBJECT: _____ [facility name]
Low-Flow Development Request

_____, County

We are requesting development of the following information for the above referenced facility:

[ ] - lowest monthly 95 percent exceedance flow rate
[ ] - harmonic mean flow
[ ] - recharge rate from precipitation
[ ] - 90dQ10 flow

We are providing the following information to assist in development of this information. Please complete the second page of this request and return it to the indicated Environmental Response Division District Supervisor or Unit Chief.

Priority: 1 [ ] (2 week response) 2 [ ] (4 week response)

Project Manager: _____ Phone #: _____

District Supervisor / Unit Chief: _____

Phone #: _____ FAX #: _____

1. Name of Surface Water Body:_____

2. Discharge location:_____1/4 of the _____ 1/4 of Section ____, T_____, R_____, of

_____ County

3. USGS Topographical Map Name: _____ ____ Quadrangle
(map with location clearly marked is attached)

2. 4 Remarks:_____

_____

Attachment

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

_____
[Date]

TO: _____(Project Manager)
Environmental Response Division

FROM: Jim Pawloski, Acting Chief, Hydrologic Studies Unit
Land and Water Management Division

SUBJECT: _____[facility name]
Low-Flow Determination

LOW-FLOW DATA

1. Surface Water Body is: ____ Perennial ____ Intermittent ____ Ephemeral

2. Drainage Area: _____

3. Monthly 95 percent Exceedance Flows in cubic feet per second (CFS):

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER

4. Lowest Monthly 95 percent Exceedance Flow: _____ CFS
5. Harmonic Mean Flow: _____ CFS
6. 90dQ10 Flow _____ CFS

7. Remarks: _____

_____

RECHARGE RATE FROM PRECIPITATION

1. The recharge rate from precipitation at this location is estimated to be _____ inches per year.

2. Remarks: _____

_____

_____ _____ _____
Hydrologic Studies Unit Supervisor Date LWMD Record Number

cc: Daniel Schultz, ERD

_____ (district supervisor or unit chief), ERD

Bill Creal / Jerry Saalfeld, SWQD