

# ASSESSMENT OF DRINKING WATER CONSUMPTION OR TASTE AND ODOR PROBLEMS IN THE WHITE LAKE AREA OF CONCERN

## Issue

The Michigan Department of Environmental Quality (MDEQ), United States Environmental Protection Agency (USEPA) and the White Lake Public Advisory Council (WLPAC) recommend removing the Restrictions on Drinking Water Consumption or Taste and Odor Problems Beneficial Use Impairment (BUI) from the White Lake Area of Concern (AOC), based on the review of relevant documentation pursuant to the process and criteria set forth in the *Guidance for Delisting Michigan's Great Lakes Areas of Concern* (MDEQ 2008) and in the WLPAC's more restrictive criteria.

## Introduction/Background

White Lake (Muskegon County, Michigan) is a 2,571 acre drowned river mouth lake located in western Michigan. The International Joint Commission (IJC) listed the lake as an Area of Concern (AOC) in 1987 due to severe environmental impairments related to the historic discharge of municipal and industrial wastes. This history created serious groundwater problems associated with the improper disposal of hazardous chemicals at Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) sites. Public surface water supplies of drinking water were not available and consequently, the integrity and protection of groundwater resources are important to insure the availability of potable water in the AOC. The Beneficial Use Impairment (BUI), Drinking Water Consumption or Taste and Odor Problems, was listed due to the need for additional treatment of drinking water in order to meet human health standards and address taste or odor issues.

## Removal Criteria

For the purposes of restoring this impairment, looking at the practical application in Michigan, standard treatment methods are those identified in the federal and Michigan Safe Drinking Water Acts. Standard treatment includes filtration, disinfection, coagulation/flocculation, sedimentation, iron removal (if necessary), well field management, new well location, and

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softening. Standards related to odor and taste are secondary Maximum Contaminant Levels, and are not adopted by Michigan law. Taste and odor concerns are typically tracked by citizen complaints and are investigated at the local level by county health departments.

The 1991 IJC general delisting guideline for treated drinking water supplies occurs: 1) when densities of disease-causing organisms or concentrations of hazardous or toxic chemicals or radioactive substances do not exceed human health objectives, standards or guidelines; 2) when taste and odor problems are absent; and 3) when treatment needed to make raw water suitable for drinking does not exceed the standard treatment used in comparable portions of the Great Lakes which are not degraded (i.e., settling, coagulation, disinfection), then delisting of the impairment may occur.

In consideration of the improvements to drinking water issues in the area and the remediation/restoration of Tannery Bay and Hooker Chemical, the White Lake Public Advisory Council (WLPAC) voted in 2006 to establish a target for delisting the Restrictions on Drinking Water Consumption BUI (WLPAC 2006) that was more restrictive than the State of Michigan criteria. The target created by MDEQ is summarized below:

The **Restrictions on Drinking Water Consumption BUI** will be considered restored by MDEQ when monitoring data for 2 (two) consecutive years indicates:

- 1) Public surface water supplies meet the current and most stringent human health standards, objectives, or guidelines (at the point of distribution into the water system) for levels of disease-causing organisms, hazardous or toxic chemicals, or radioactive substances; and
- 2) Treatment needed to make raw water potable and palatable does not exceed standard treatment methods

Due to the importance of groundwater as the only potable water source currently available in the White Lake AOC, the history of severe groundwater contamination, and the presence of large areas of contaminated groundwater that are undergoing remediation and further delineation, the WLPAC voted to adopt a target for delisting the Restrictions on Drinking Water Consumption BUI that was more restrictive than the State of Michigan criteria. The proposed target from WLPAC is summarized below and used for the consideration of the possible removal of this BUI even though the State did not approve the WLPACs criteria:

The **Restrictions on Drinking Water Consumption BUI** will be considered restored by WLPAC when the following three conditions are met:

- 1) State guidance criteria is met
- 2) Contamination plumes from the four sites\* listed below must be delineated, migration pathways documented, an approved MDEQ/EPA remediation plan established for each site, and monitoring data for a five year period (commencing 2009) must indicate a downward trend in contaminant levels. In addition, all public and private drinking water supplies contaminated at these sites either meet the MDEQ criteria for potable water or an alternate supply source (public or private) of potable water is available to impacted users. Public water supplies include associated wellhead protection areas. The WLPAC identifies the following sites where contaminated groundwater may pose a threat to drinking water:

- E.I. DuPont deNemours
- Muskegon Chemical/Koch Chemical
- Hooker Chemical/Occidental Chemical
- White Lake Tannery/Genesco

- 3) Contamination plumes from the five sites\*\* listed below will be documented and evaluated by the WLPAC to ensure that the current status demonstrates that sites are no longer impairing drinking water consumption. Information that will be used to determine status and impairment may include any or all of the following: delineation of groundwater contamination, delineation of migration pathways, approval of MDEQ/EPA remediation plan, and monitoring data indicate groundwater contamination has been or are being addressed. In addition, the WLPAC will confirm that all public and private drinking water supplies contaminated at the sites either meet the MDEQ criteria for potable water or an alternate water supply source (public or private) of potable water is available to impacted users. Public water supplies include associated wellhead protection areas. The WLPAC identifies the following sites where contaminated groundwater may pose a threat to drinking water:

- Whitehall Municipal Well #3 site (Funnel Field)
- White Lake Landfill/Shellcast Corp.

- Anderson Road Plume (Tech Cast Inc.)
- Alcoa Howmet
- Silver Creek/Whitehall Wastewater Facility

*\* Sites with remediation plans that are modified during the 5-year period will be evaluated by the WLPAC to determine if the plans are sufficient to meet delisting criteria for the BUI.*

*\*\* If it is revealed that additional groundwater contamination sites are identified as impacting drinking water the WLPAC will add them to the list, and use criteria as delineated in #3 above for delisting.*

## **Process**

The review of the Drinking Water Consumption or Taste and Odor Problems BUI was undertaken by many individuals working toward a common purpose, which is to provide a useful tool for guidance in delisting Michigan's AOCs with the creation of certain criteria to establish if the BUI could be removed. Technical staff in departments such as the MDEQ and USEPA, and Statewide Public Advisory Council for Michigan's AOC program like the WLPAC, gave freely of their time and provided a critical public perspective on the 'Guidance for Delisting Michigan's Great Lakes Areas of Concern' document. The departments and the council's purpose was to determine whether restrictions on drinking water consumption, due to ground water contamination, currently exist in the 5 Michigan AOCs listed as having this BUI.

## **Analysis**

The Howmet site (Attachments A<sub>1</sub> – A<sub>2</sub>; Figures A<sub>3</sub>) was approved for shutdown of the active remedial activities and the site was transferred to a monitoring phase by the MDEQ. Even though this site now meets the WLPAC criteria, continued monitoring is recommended on the site since two data sample points, one from within the Howmet property and one just outside the property, has not been meeting the MDEQ drinking water criteria. The people surrounding Mill Pond, just outside of the Howmet property, have private wells that have not been impacted. Monitoring wells 12, 14, 15, 16, 17, and 18 are used to check for contamination around these private wells. Monitoring well 12 had a decrease of tetrachloroethene (also known as perchloroethene, or PCE) (6.8 ug/L to ≤ 1 ug/L, with 5 ug/L being the MDEQ drinking water criteria (DWC)) from August 2009 to April 2010 and an increase of trichloroethylene (TCE) (≤ 1 ug/L to 4.2 ug/L, with 5 ug/L being the MDEQ DWC) between August 2009 and April 2010.

Monitoring well 15 had a decrease of cis-1,2-dichloroethene (cis-1,2-DCE) (5.4 ug/L to  $\leq 1$  ug/L, with 70 ug/L being the MDEQ DWC) from August 2009 to April 2010. Monitoring well 16 had an increase of chloroform ( $\leq 1$  ug/L to 5.2 ug/L, with 80 ug/L being the MDEQ DWC) from August 2009 to April 2010. There were no detected volatile organic compounds (VOCs) for wells 14, 17, and 18. The following monitoring well, 37, is located within the Howmet Property. Monitoring well 37 has shown to have an increasing level of TCE (3.6 ug/L to 7.7 ug/L) and cis-1,2-DCE (9.8 ug/L to 76 ug/L), but PCE has had no change (6.2 ug/L) between August 2009 and April 2010. Monitoring well 38, which is just outside of the property, has shown to have an increasing level of cis-1,2-DCE (160 ug/L to 170 ug/L) and a decreasing level of vinyl chloride (4.9 ug/L to 3.8 ug/L, with 2 ug/L being the MDEQ DWC) between the years 2009 and 2010. Overall, these numbers indicate that the concentrations are either showing an overall decrease and/or below MDEQ DWC with the exception of wells 37 and 38, which well 38 may be affected by the White Lake Congregational Church's irrigation well, and the site has a monitoring plan in place. Private ground wells and other wells in the vicinity have not shown levels above MDEQ DWC, therefore indicating that the drinking water is no longer being impaired from the Howmet Property.

The Whitehall Leather / Tannery Bay site (Attachments B<sub>1</sub> – B<sub>7</sub>; Figures B<sub>8</sub>) is meeting the criteria set by the WLPAC, and MDEQ has approved a post-closure plan, including hydrogeological monitoring. The VOC constituents of concern were detected in several well locations, but had no exceedances to the mixing zone based groundwater surfacewater interface (GSI) criteria or final acute values (FAVs). VOCs at the site have remained steady or slightly decreased since the November 2010 sampling event and are significantly lower than concentrations of 10 to 15 years ago. All shallow wells near the sparge system were below Generic GSI criteria for chlorobenzene and dichlorobenzenes. With the removal of over 187,000 tons of contaminated materials, groundwater contamination has been drastically reduced. In regards to the Mercury levels at the site, it has shown to be steady and within the water quality standard variance, and it is not biologically available in the system according to the "Preliminary Investigation of the Extent and Effects of Sediment Contamination in White Lake Near the Whitehall Leather Tannery" document (December 1997).

Anderson Road / Tech Cast site (Attachments C<sub>1</sub> – C<sub>5</sub>; Figure C<sub>6</sub>) meets criteria of having sample data showing downward or stable trend, delineation of the groundwater plume, and showing compliance with the GSI criteria set by WLPAC, with exception to the ordinance. Each resident with a private well in the area was connected into the city water line. The site was also approved for partial closure by MDEQ because criteria from current Operational Memoranda, and information supplied by MDEQ ERD toxicologists, staff determined that ingestion of the contaminated groundwater was the only relevant exposure pathway at the site. Any

groundwater that is contaminated with perchloroethene (PCE) and trichloroethene (TCE) may have the potential to migrate to White Lake; however, maximum concentrations in groundwater have been below the mixing zone based GSI values. MDEQ requested the City of Montague to enact a groundwater use ordinance to restrict groundwater use from private wells for any purpose as a conservative measure and if the City does this, MDEQ will pursue closure of the site. As of right now the plume buffer map has been finalized, and the ordinance document has been completed and looked over by the MDEQ's Remediation and Redevelopment Division (RRD). They stated that the overall ordinance looks good but needs a few minor changes before a possible resolution to the current amendment for the restriction of groundwater use for any purpose can proceed. The RRD said that the next biggest hurdle would be the abandoning of the private wells that may exist in the restricted zone, which is usually done prior to passing of an ordinance so that the municipality is not left with a large enforcement issue to deal with. Mailers to owners of the properties within the restricted zone would need to occur in order to make a good faith effort in locating any private wells. After this, once the ordinance is passed, the site can be officially closed by MDEQ and be concluded as meeting WLPAC criteria.

White Lake Landfill and Shellcast sites (Attachments D<sub>1</sub> – D<sub>7</sub>; Figures D<sub>8</sub> – D<sub>10</sub>) are meeting criteria. White Lake Landfill provided permanent alternate water supply to residences whose wells were contaminated. White Lake Landfill was given approval for a post-closure plan and a post-closure hydrogeologic monitoring plan by the MDEQ. This approval is from the site being in compliance with GSI criteria and data results showing a downward or stable trend for all sites. Shellcast site had a Baseline Environmental Assessment (BEA) completed by Core Tech 2 when they started to use the site after Shellcast shutdown operations, which disclosed the presence of tetrachloroethene (PCE) in the groundwater. A Phase I Environmental Site Assessment was conducted on the Shellcast property that revealed no evidence of recognized environmental conditions with the exceptions of the identification of the site as a site of contamination, its historic use as an investment casting foundry with finishing operations, historic hazardous substance use and former underground storage tanks presented a recognized environmental condition, and the surrounding properties presented a recognized environmental condition as a result of the closed landfill that was reportedly contaminated, other prior solid waste business activities and a used car business and the fact that contamination at the landfill property may have co-mingled with that from the site. The Landfill well that is downgradient of Shellcast had sampling of 5 ug/l tetrachloroethene in 2012 and had 4.2 ug/l in 2013 (5.0 ug/l DWC), which is a good indicator that the Shellcast site is below the drinking water criteria.

Whitehall Wastewater Treatment Facility / Silver Creek site (Attachments E<sub>1</sub> – E<sub>4</sub>; Figure E<sub>5</sub>) is close to meeting the criteria set by WLPAC. Further spread of the contamination has been impeded by the installation of nine purge wells in the northeast plume. Filters have been added to the private wells to help reduce concentrations below MDEQ DWC. MDEQ requested

a comprehensive evaluation of the entire facility. If it is concluded that contaminants in the groundwater will not reach the residential drinking wells at concentrations greater than the DWC than MDEQ will approve reduced or discontinued monitoring of the site. WRD, RRD and the County are awaiting development of clean-up criteria for several pollutants associated with the site. As of now, no action plan has been sent to the MDEQ. The pollutants in question are said to have come from Koch Chemical originally and leaked through the clay lining of the County's wastewater lagoon into the groundwater, which then vented into Mill Pond and Silver Creek in the 1970s – 80s. The County is still operating their purge/interception well system under the 1980's consent agreement, which also required that the County install and maintain individual activated carbon treatment systems on each homeowner's well in the impacted area and perform regular monitoring of dozens of homes in the area for the pollutants of concern. MDEQ staff had been meeting monthly with the County as they moved toward requesting release from consent agreement and some degree of site closure. MDEQ is still awaiting the development of the closure criteria for the Koch Chemical pollutants by the state and the County is still in the closure study-planning phase.

Muskegon Chemical Company / KOCH (Attachments F<sub>1</sub> – F<sub>5</sub>; Figures F<sub>6</sub>) Tier I\* data meets the WLPACs criteria since all COC (chemical of concern) concentrations are below compliance criteria for Tier I. The trend of COC concentrations that exceed Tier II\*\* compliance criteria is decreasing, which meets the WLPAC criteria. This site is showing ongoing signs of natural attenuation with the decreasing COCs and the breakdown of COCs.

*\*Tier I groundwater cleanup goals specified in the RAP Amendment for Long-Term Groundwater Monitoring and Contingency Plan. This is achieved through groundwater extraction and treatment, air sparging, and natural attenuation.*

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



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

*\*\*Tier II groundwater cleanup goals are designed to be met through natural attenuation for the relatively low remaining concentrations of chemicals of concern that exceed Tier II criteria (see above).*

Occidental / Hooker (Attachments G<sub>1</sub> – G<sub>3</sub>; Figure G<sub>4</sub>) met the criteria with its alternative remedial strategy, along with the required corrective measures and voluntary actions, that effectively provide layers of protection that prevent exposure to human and ecological receptors, and generally contain the source areas of the Occidental property, minimizes their risk, and prevents any impacts on the White Lake environment. Occidental stated that if a technology is found to be potentially capable of treating the source areas and clean up groundwater, they will submit a work plan to EPA for approval that describes the necessary work to evaluate and implement that technology in the source areas, if feasible. Data also shows that the contaminant plume is stable and controlled by the current purge well system at White Lake. EPA data that was collected in 2001 from groundwater at private wells just west of the site, along Old Channel Trail, confirmed that the site contaminants are not affecting any private wells. Residences also have water service agreements with Occidental and water is supplied by the Montague Public Water System.

DuPont (Attachments H<sub>1</sub> – H<sub>3</sub>; Figures H<sub>4</sub> – H<sub>5</sub>) as of right now cannot have a determination finalized for meeting WLPAC criteria. Recent investigations are still under review for the following sites by MDEQ: waste neoprene landfill, basin sludge area, Pierson Creek landfill, bury pit landfill, NPDES impoundments and corrosive treatment tanks, Northeast landfill, North landfill, CaF<sub>2</sub> basin, lime pile, and Mirror Lake. The site still needs a complete RAP.

Whitehall Well #3 / Funnel Field Well (Attachments I<sub>1</sub> – I<sub>3</sub>; Figures I<sub>4</sub>) has been permanently abandoned and accepted by EPA with no further action needed due to the findings of the remedial investigation indicating low levels of contamination in the wells, with no contaminant exceeding MDEQ DWC, which shows that this site meets WLPAC criteria.

In accordance with the Guidance document and the criteria set, the WLPAC reviewed the most recent data samples, Remedial Action Plans (RAP), closure documents, and other supporting documentation for the White Lake AOC that was provided by MDEQ and USEPA (please see attachments). Even though this information almost shows that the Removal of the Drinking Water Consumption or Taste and Odor Problems BUI for White Lake can be considered, the WLPAC voted unanimously to support the approval of the removal of this BUI, acknowledging that three sites still need work. From the three sites, the WLPAC requested acknowledgment of the outstanding issues by MDEQ. Anderson Road / Tech Cast site will need to have mailers sent



out by the WLPAC to landowners of the properties within the restricted zone to locate any private wells that may need to be abandoned. Once completed, the ordinance can be finalized by the WLPAC and passed by the City of Montague, allowing MDEQ to officially close the site and meet WLPAC criteria. Whitehall Wastewater Treatment Facility / Silver Creek site will need finalization of a Remedial Action Plan by the county of Muskegon to address the control of the contaminants at the site and set monitoring programs and protocols, to meet WLPAC criteria. DuPont site will need to complete a Remedial Action Plan, along with the completion of a satisfactory investigation of all suspected source locations for soil and groundwater contamination before it can meet WLPAC criteria. In all, the WLPAC agrees that removal criteria have been met, while still acknowledging the outstanding issues summarized above and/or in the WLPAC approval letter (attachment 1). The WLPAC also understands that there are a number of sites in the White Lake area that will need continued attention, which would include monitoring and oversight by the state and federal agencies and the local community for many years to come.

## **Recommendation**

Upon review of the data gathered and technical input, removal of the Drinking Water Consumption or Taste and Odor Problems BUI in the White Lake AOC is recommended. The WLPAC concurred with the assessment results and this recommendation at a meeting held on December 5, 2013.

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Muskegon Conservation District  
White Lake Public Advisory Council  
December 17, 2013

## **Attachments:**

*\*Attachments and Figures noted in this document may be found on CD*

### Timeline

## **Attachments and Figures:**

1 – WLPAC Drinking Water Consumption or Taste and Odor Problems Beneficial Use Impairment acceptance letter

### A – Howmet Corporation

A<sub>1</sub> – Plant 4, Howmet Corporation, Whitehall, Michigan 1999 Semiannual Remedial Action Progress Report (shows plume from November 2, 1995) - (September 9, 1999)

A<sub>2</sub> – Groundwater Monitoring Progress Reports (March & August 2009 and April 2010)

A<sub>3</sub> – Map of Well Areas (May 6, 2010) and 1995 Plume

### B – Whitehall Leather

B<sub>1</sub> – Monitoring Analytical Reports (2011-2012)

B<sub>2</sub> – Mixing Zone Data (2010)

B<sub>3</sub> – Consent Decree between MDNR and Genesco (October 20, 2010)

B<sub>4</sub> – Horizon Environmental Scope of Work for Alternative Remedy #1-5 (September 8, 2010)

B<sub>5</sub> – Horizon Environmental Groundwater Monitoring Report (December 2010)

B<sub>6</sub> – Sediment Contamination near Tannery Site Report (1997)

B<sub>7</sub> – Preliminary Investigation of the Extent and Effects of Sediment Contamination in White Lake near the Whitehall Leather Tannery (December 1997)

B<sub>8</sub> – Plume Map and Map of Well Areas (April 13, 2010)

### C – Anderson Road / Tech Cast

C<sub>1</sub> – MDEQ Lab Sampling Results (April 1996 & 1997 and October 1996)

C<sub>2</sub> – Approved Partial Closure Request (December 15, 1997)

C<sub>3</sub> – Action Plan with Approved Partial Closure (March 1, 1999)

C<sub>4</sub> – Anderson Road Groundwater Quality Summary with Rough Plume Map (1998)

C<sub>5</sub> – Draft Ordinance for City of Montague (2013)

C<sub>6</sub> – Anderson Road Groundwater Ordinance Map (2013)

D – White Lake Landfill / Shellcast

- D<sub>1</sub> – Post-Closure Plan Letter (March 21, 2002)
- D<sub>2</sub> – Site-Wide Post-Closure Hydrogeologic Monitoring Plan (November 2007)
- D<sub>3</sub> – Monitoring Reports - Analytical and Event Data (2010)
- D<sub>4</sub> – Second Semi Annual Monitoring Report (2012)
- D<sub>5</sub> – Shellcast Files (1993-1995)
- D<sub>6</sub> – White Lake Landfill Sample Results (2013)
- D<sub>7</sub> – Phase I Environmental Site Assessment with BEA (December 2011)
- D<sub>8</sub> – Groundwater Monitoring/Collection Points Map and Elevation/Contour Map (2010)
- D<sub>9</sub> – MDNR Sampling Results Map (1989)
- D<sub>10</sub> – Shellcast Facility Site Map (1989)

E – Silver Creek Wastewater Facility

- E<sub>1</sub> – Hydrogeologic Investigation (August 29, 1983)
- E<sub>2</sub> – Detected Compounds and Number of Analysis Performed (2011)
- E<sub>3</sub> – Monthly Operating Reports (11/2011 & 12/2011)
- E<sub>4</sub> – Stipulation and Final Order of Remedial Action (December 21, 1984)
- E<sub>5</sub> – Well Monitoring Map (old map)

F – Muskegon Chemical / Koch Chemical

- F<sub>1</sub> – 2011 Annual Progress Report (January 2012)
- F<sub>2</sub> – 2009 Remedial Action Plan Amendment – with historic plume map (2009) – *hard copy only (MCD office)*
- F<sub>3</sub> – 2008 Third 5-Year Review Report (April 2008)
- F<sub>4</sub> – 2003 Second 5-Year Review Report (April 2003)
- F<sub>5</sub> – 2000 Remedial Action Plan
- F<sub>6</sub> – Well Locations, Contours and Plume Maps (1996, 2011)

G – Occidental Chemical Company

- G<sub>1</sub> – Progress Reports (2011) and Technical Documents (2010 & 2011) – *on web*  
<http://www.epa.gov/region5/cleanup/rcra/occidental/index.html>
- G<sub>2</sub> – Post-Implementation Technical Impracticability Evaluation for Groundwater Restoration at the Occidental Chemical Corporation Site in Montague, Michigan (September 22, 2009) – *hard copy only (MCD office)*
- G<sub>3</sub> – Plume Boundary Well Location Map and Analytical Results (2011)
- G<sub>4</sub> – Plume Boundary Well Location Map (2011)

## H – DuPont

H<sub>1</sub> – Corrective Action Documents (2007 & 2011) and Groundwater Monitoring Results (2010 & 2011) – *on web*

[http://www.michigan.gov/deq/0,4561,7-135-3312\\_4118\\_4240-241452--,00.html](http://www.michigan.gov/deq/0,4561,7-135-3312_4118_4240-241452--,00.html)

H<sub>2</sub> – Groundwater Data (2011)

H<sub>3</sub> – Corrective Action Status Table Draft (2013)

H<sub>4</sub> – URS Maps and Plume Maps (PCE and Freon 113)

H<sub>5</sub> – Mixing Zone Map (2007)

## I – Well #3 / Funnel Field

I<sub>1</sub> – Superfund Site Close Out Report (September 7, 1990)

I<sub>2</sub> – Superfund Site Whitehall Municipal Wells Letter (March 2012)

I<sub>3</sub> – Superfund Record of Decision and Site Boundary Map (March 29, 1989)

I<sub>4</sub> – Well and Site Maps

## References

Michigan Department of Environmental Quality. 2008. *Guidance for Delisting Michigan's Great Lakes Areas of Concern*, revised. MI/DEQ/WB-06-001.

White Lake Public Advisory Council. 2006. Target of Delisting the Restrictions on Drinking Water Consumption or Taste and Odor Problems Beneficial Use Impairment for the White Lake Area of Concern, revised.

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## GROUND WATER BUI TIMELINE

### **Alcoa-Howmet**

- 2013** Sample collection taken from monitoring wells (MW-12 and MW-14 thru MW-18) located along North shore of Mill Pond by ENVIRON International Corporation
- 2010** Sampling results showed that concentrations of tetrachloroethene (6.2 ug/L), trichloroethylene (7.7 ug/L), and cis-1,2 dichloroethylene (76 ug/L) were above their respected drinking water criteria Risk Based Screening Level (RBSL) (5 ug/L, 5 ug/L, & 70 ug/L) on MW-37 (on site)
- Cis-1,2 dichloroethylene (170 ug/L) and vinyl chloride (3.8 ug/L) were above their respected drinking water criteria RBSL (70 ug/L & 2 ug/L) on MW-38 (just off site).
- 2009** MDEQ approved shut down of the active remedial activities and the transfer of the site to a monitoring phase
- Ground water sampling results from early 2009: MW-14 was 1.8 ppb of PCE over drinking water standards (5.0), MW-38 was 90ppb of cis-1, 2 DCE over DWS (70), MW-38, and IRW-Church was 2.9 and 2.2 ppb of VCM over DWS (2.0)
- 1999** Groundwater extraction system shut down
- 1998** Air sparge/soil vapor extraction system shut down
- 1996** Groundwater extraction system installed and operated
- 1994** Air sparge/soil vapor extraction system installed and operated

### **Tannery Bay/Whitehall Leather**

- 2012** Next quarterly groundwater monitoring event to be conducted in early March
- 2011** VOC constituents of concern were detected in several well locations but had no exceedances to the mixing zone based GSI criteria or the FAVs. VOCs at the site have remained steady or slightly decreased since November 2010 sampling event and significantly lower than concentrations of 10 to 15 years ago
- All shallow wells near the sparge system were below Generic GSI criteria for chlorobenzene and dichlorobenzenes (MW-7S and MW-25s are outside the remedial system area)
- 2010** Excavation of lagoons nearest to the shoreline started and completed

Groundwater discharge within the limits of the mixing zone determination and the variance of the water quality standard for mercury was authorized by the Consent Decree between Genesco and MDEQ

**2007** Existing buildings, outbuildings, and other tannery-related structures demolished by City of Whitehall under a Brownfield Redevelopment Grant

IRA initiated to remove tannery related fill materials from building footprint

**2006** IRA initiated to remove tannery related fill materials from north wetland

**2005** Genesco submitted draft Remedial Action Plan to MDEQ

Third supplemental hydrogeological investigation report

Draft remedial action plan (limited residential land use)

**2004** Wetland restoration completed

DEQ to begin post remedial monitoring activities within Tannery Bay

Removed 66 cubic yards of metallic debris and soil and 2.5 cubic yards of segregated non-hazardous solid waste (paint solids, tar-like liquid, red powder/sand mix and oil sorbent material) from south upland area

**2003** All remedial activities have been completed for bottomland cleanup as of October 21 (95,000 yd<sup>3</sup> of tannery wastes removed from site; 4,100 tons of timber waste associated with Timber Island removed and disposed of in Type 2 landfill in Coopersville; Placement of 14,000 tons of sand backfill within Tannery Bay to reduce steep slopes within the bay and help control bank erosion)

Upland portion of site needs additional work in the disposal areas to remove buried drums and install monitoring wells

In October, an investigative work plan to address these upland areas and others was submitted

After third phase of investigative work are completed, remedial actions to address contamination in the soils can be determined and implemented

Existing groundwater treatment system up gradient of Tannery Bay continues to operate effectively

Proposed interim remedial action to address un-ionized ammonia in groundwater

- Sediment removal from the bay (final removal volume 85,000 yd<sup>3</sup>)
- 2002** Sediment removal from the bay
- 2001** Second supplemental hydrogeological investigation report
- Amended voluntary remedial action plan (limited industrial/commercial land use)
- 2000** Genesco purchased tannery and operations ceased shortly thereafter
- IRA initiated to remove tannery related fill materials from south upland (30 cubic yards of metallic debris)
- 1999** Voluntary remedial action plan (limited industrial/commercial land use)
- Installation of groundwater sparge system (~17 feet below ground surface) up gradient of Tannery Bay as an interim remedial activity (IRA)
- Mixing zone determination made, establishing mixing zone based Ground Surface water Interface (GSI) criteria for chlorobenzene, dichlorobenzenes, arsenic, barium, and vanadium
- 1997** Preliminary Investigation of the Extent and Effects of Sediment Contamination in White Lake near the Whitehall Leather Tannery completed
- 1996** Hydrogeological investigation of site
- 1994** Remedial investigation starts and documents groundwater impact due to chlorobenzene and dichlorobenzenes
- 1970s** Wastewater lagoons were closed and all but one of the lagoons were filled
- 1866** Operation started from here to 1976

#### **Anderson Road/Tech Cast**

- 2013** Ordinance map created
- Ordinance document finalized and needs to be looked over by MDEQ's Remediation and Redevelopment Division
- 2012** Site is no longer active and groundwater was not discharging to White Lake during the monitoring period (MAP)



Ordinance has not been approved yet from the 1997 DEQ requesting  
If ordinance is enacted, DEQ will pursue lawful Part 201 closure of site

**1999** All wells, except MW 14, were abandoned

Partial closure approved

Note stating that municipal water supply was extended to homes with contaminated and threatened private wells

**1998** Last sampling occurred only for MW 14 and showed no detection (CHARTS)

No sampling was conducted on MW 11 and MW 15D even though in April 1997 they showed PCE concentrations (180 and 6.1) over DWC (5 ppb)

**1996** Approved partial closure request, "Utilizing site data, criteria from current Operational Memoranda, and information supplied by ERD toxicologists, staff have determined that ingestion of the contaminated groundwater is the only relevant exposure pathway at the site at the present time."

"Groundwater which is contaminated with perchloroethene (PCE) and trichloroethene (TCE) also has the potential to migrate to White Lake, however maximum concentrations in groundwater are below the mixing zone based GSI value of 220 ug/l for PCE and 940 ug/l for TCE utilizing a dilution factor of 10 as determined by SWQD. New generic GSI values promulgated pursuant to the GLI for PCE and TCE are 45 ug/l and 200 ug/l respectively, which are double the pre-GLI values. Therefore, with a dilution factor of 10, the historical maximum concentrations do not exceed either of the mixing zone based GSI values."

DEQ requests the City of Montague enact a groundwater use ordinance to restrict groundwater use from private wells for any purpose as a conservative measure

DEQ will request an approved partial closure for the site pending the outcome of the ordinance request, and if an ordinance is enacted, they intend to pursue closure of the site

**1995** Eleven residences in the area were offered municipal water connection

**1993** Three private residential wells confirmed as being contaminated with PCE

MDPH extended municipal water system to the three residences on Anderson Road

**1992** MDNR remedial investigation identified PCE (300 ppb at depths exceeding 90 ft) in monitoring wells in a plume (3,000 foot long) known to cross Anderson Road

- 1982** MDNR conducted hydrogeological study in 1982 to identify source but was unsuccessful
- 1979** MDNR investigation indicated a plume of PCE contaminated groundwater originated near the Tech Cast facility
- 1978** Two private water supplies in Montague were contaminated with PCE

**White Lake Landfill and Shellcast**

- 2013** Landfill well that is downgradient of Shellcast had sampling of 4.2 ug/l tetrachloroethene which is below generic drinking water criteria of 5.0 ug/l
- 2012** Landfill well that is downgradient of Shellcast had sampling of 5.0 ug/l tetrachloroethene with generic drinking water criteria being 5.0 ug/l
- 2011** Landfill Phase V data results indicate there are no parameters at the wells with continued verified exceedances

Phase I Environmental Site Assessment conducted on Shellcast site by Westshore, which revealed no evidence of recognized environmental conditions with the following exceptions:

The identification of the site as a site of contamination, its historic use as an investment-casting foundry with finishing operations, historic hazardous substance use and former underground storage tanks presented a recognized environmental condition.

Surrounding properties presented a recognized environmental condition as a result of the closed landfill that was reportedly contaminated, other prior solid waste business activities and a used car business. Contamination at the landfill property may have co-mingled with that from the site.

- 2010** Landfill Phases I-IV data indicate a downward or stable trend for the parameters analyzed at each well (No further evaluation of Phase I-IV groundwater data is recommended)  
  
Landfill Phase V data indicates continued exceedances of Ammonia (MW 10SR), Arsenic (MW 10SR), Barium (MW 10SR) and Iron (MW 10SR)
- 2007** DEQ Waste and Hazardous Materials Division revised the Operational Memo 115-14 to state the new required reporting limit for Trans-1,4,-Dichloro-2-Butene (TBD) and Acrylonitrile to be set at 5 ug/l for both chemicals (TBD increased from 1 to 5 ug/l)

- 2002** Core Tech 2, an investment casting company and structural engineering company, used Shellcast site after its shutdown
- Core Tech 2 completed Baseline Environmental Assessment (BEA), which disclosed the presence of tetrachloroethene (PCE) in the groundwater
- White Lake Ambulance Authority provided a Baseline Environmental Assessment (BEA) for the Shellcast property and tetrachloroethene was found
- 2000** DEQ approved closure of the entire landfill site in accordance with Part 115
- 1999** Landfill Phase V stopped receiving waste and the entire site was capped and closed with groundwater monitoring being performed through 2029
- 1996** Due to agreements nearing completion, a license was issued for further operation of the landfill (license called for a Remedial Action Plan)
- 1995** DEQ attempts to close landfill but was stopped by a “temporary restraining order” from the court
- DEQ and landfill subsequently entered settlement negotiations where organic chemical contamination such as solvents and degreasers were separated from inorganic contamination (e.g., metals)
- DEQ believed the majority of organic contamination derived from Shell Cast
- 1993** During licensing discussions, a workplan was proposed by landfill for investigating the groundwater contamination
- Shellcast discontinued significant operations at site
- 1991** DEQ found arsenic above established State levels in the groundwater
- 1989** Landfill design requirements called for liner system with a leak detection system and further agreements required monitoring of groundwater
- 1985** Landfill entered into consent agreement with EPA to provide permanent alternate water supply to residences whose wells were contaminated
- North adjacent landfill has groundwater use restriction imposed on properties in the vicinity
- 1984** Tried to expand landfill again but not allowed due to groundwater contamination detected by DEQ

- 1983** Monitoring wells constructed on Landfill down gradient of Shellcast, but up gradient of the Landfill
- Tetrachloroethylene and 1,1,1-trichloroethylene were detected
- 1982** Landfill allowed to expand
- 1981** MDEQ determines Shellcast site is contaminated
- Shellcast had unpermitted discharge of noncontact cooling water from plant on site
- 1974** Landfill could only receive demolition debris and later general refuse as long as there were controlled cells where the waste could be placed
- 1969** First active as a dump under state license
- 1963** Shellcast starts investment-casting foundry with finishing operation with metalworking activities begin

#### **Silver Creek / Whitehall Wastewater Treatment Facility**

- 2011** Comprehensive evaluation of the entire facility was requested by DEQ in order for them to give approval of reduced or discontinued monitoring if it is concluded that contaminants in the groundwater will not reach the residential wells at concentrations greater than the drinking water criteria (NFA report can be submitted by County)
- 9160 and 9210 Mill Pond Trail sites had 0.0007 & 0.0004 mg/L of Bis(2-chloroethoxy) ethane, and 0.00086 & 0.00063 mg/L Pentaethylene glycol dichloride before filter was added (after filter added sites were both < 0.0003 & < 0.00055 mg/L)
- 2274MPA – 0.0065 mg/L Bromochloromethane; 0.0008 mg/L Chloroform; 0.0007 mg/L Methylene chloride;
- 2288MPA – 0.0064 mg/L Bromochloromethane; 0.0008 mg/L Methylene chloride
- 9160MPA – 0.0066 mg/L Bromochloromethane; 0.0008 mg/L Methylene chloride
- 9180MPA – 0.0065 mg/L Bromochloromethane; 0.0008 mg/L Methylene chloride
- 9234MPA – 0.0066 mg/L Bromochloromethane; 0.0008 mg/L Methylene chloride
- 9626SCA – 0.0007 mg/L Methylene chloride

9216MPA – 0.0005 mg/L Chloroform; 0.0005 mg/L Dichlorobromomethane

**\*NOTE:** *methylene chloride is a very common lab contaminant that cannot be eliminated due to budget limitations*

*Bis(2-ethylhexyl)phthalate is a very common lab contaminant since it is present in many plastics (vinyl gloves)*

**2010** Further spread of contamination has been impeded by installation of nine purge wells in the northeast plume

Wells in the 9100 and 9200 blocks of Mill Pond Trail were in northeast plume that carried the contamination off the WWTP property toward Silver Creek, where Silver Creek was contaminated but it intercepted the groundwater flow of the shallow part of the aquifer preventing migration of contamination to the residential wells north of the creek

Well in the 2200 block of Mill Pond Trail and the contaminated wells on Silver Creek Road were created by the pooling of water at the dam which caused a reverse flow from the creek into the groundwater

Organic contamination markers (bis(2-chloroethoxy)ethane and its homologs) have still been observed in the residential wells in the 9100 and 9200 blocks of Mill Pond Trail

2200 hundred block of Mill Pond Trail has had no detections of contamination markers since 2004

Silver Creek Road wells have had no detections of contamination markers since 1997

Silver Creek stream has had no detections of contamination markers since 2001 (MCWMS ceased monitoring the creek in 2004)

All other residential wells in the monitoring program has never had detections of contamination markers

All residents are protected by carbon filtration systems that have been installed in each home and by MCWMS providing them with bottled water for drinking and cooking

**1997** DEQ asks County to perform applicable drinking water analytical methods for VOC analysis of drinking water samples

Two VOC's (cis 1,2-dichloroethylene and chlorobenzene) detected in residential well samples collected and analyzed by the DEQ's Drinking Water Lab

**1996** Was agreed that Muskegon County will submit a plan to evaluate the progress of the Whitehall WWTP groundwater remediation system and residential well filter program

DWRPD has determined that a trace amount (below analytical level of detection) of Bis(2-chloroethyl)ether was detected in sample collected prior to the Culligan filter system on Judith Atchison's drinking water well

Detection of the Bis(2-chloroethyl)ether indicates that more data on the overall effectiveness of the groundwater capture system may be warranted

Since drinking water standard for this compound was below the analytical detection level of 5 ppb, it was agreed that there is a need to determine if actual concentration on the pre-filtered drinking water exceed this standard

County advised to contact MDEQ Laboratory Analyst John Snyder to have samples looked at under newly achieved levels of detection that can measure compliance with the drinking water standard

**1984** Stipulation and Final Order of Remedial Action entered by consent between Muskegon County Board of Public Works and the State of Michigan DNR

Agreed that the County operates the Muskegon County Wastewater Management System Facility

County and Department agree that waters in the vicinity are contaminated with Bis (2-chloroethyl) ether and Bis (2-chloroethoxy) ethane and other pollutants, which needs additional monitoring

**MCC/KOCH**

**2012** 2011 Annual Progress Report published

**2010** January 2011 until December 2015, groundwater monitoring will be conducted annually (October of each year)

Inspection of the air sparge wells completed (after shutdown of the air sparge system, the same year)

Inspection of the multimedia cap

Phase I of well abandonment (and plugging) activities conducted

Monitoring well MCC-14 well casing was repaired which included a new surface protective casing being installed

Groundwater sample collection conducted (most within acceptable limits)

MCC-3SR contained PCE (7.6 micrograms/L, trending towards Tier II goal of 5 micrograms/L)-(MCC-3SR is a replacement well for MCC-3S and first sampled on 2009)

MCC-16 contained TGDC, Chlorex, and chlorobenzene at concentrations of 3,400, 620, and 110 micrograms/L (decrease in concentration from 2005)

MCC-21R contained TGDC and Chlorex at concentrations of 110 and 7.8 micrograms/L (decrease in concentration from 2005)

MCC-36R detected concentration of DCA of 5.1 micrograms/L (decrease in concentration from 2008-Tier II goal for DCA is 5 micrograms/L)

MCC-30RS detected DCA and Chlorex of 9.6 and 3.3 micrograms/L (decrease in concentration from 2006-Tier II goal for Chlorex is 2 micrograms/L)

OW-4 contained DCA of 10 micrograms/L (concentrations have been stable through the period of data collection)

**2009** Low levels of site related contamination will remain on-site indefinitely

Cap is in place to prevent exposure to contaminants in soil

Potential exposure to contaminants in groundwater is effectively prevented through deed restrictions and/or the Muskegon County Sanitary Regulations

No control permit was needed for PCE vapors because of the small volume but the air sparge systems (to remediate a shallow tetrachloroethylene groundwater plume) will be left in place and shut down in two years

Under existing RAP and Consent Decree between Koch and the State of Michigan, Koch was required to remediate groundwater to levels that are protective of Mill Pond Creek, which has been accomplished

Most of the property could be put back into productive use, should Koch decide to move in that direction

**2008** The remedy is functioning as intended and it is protective of human health and the environment (MDEQ)

Tier 1 soil remedial action goals have been achieved and (site specific standards for protection of Mill Pond Creek) groundwater RAGs have been achieved through the vast majority of the plume

**2005** MDEQ provided contingent approval of the demolition plan for MCC superfund site



- 2003** Mill Pond Creek had been removed from its "non-attainment" list of impacted surface water bodies after microcosm studies were sampled, which showed healthy populations of stream microorganisms
- 2002** Active pumping of the wells ceased (FS from 1995 showed drinking water criteria will be achieved in ~2042)
- 1995** Feasibility study showed ~40 years of natural attenuation needed to achieve levels protective of drinking water

### Occidental/Hooker

- 2011** Progress reports and technical documents can be found at [www.epa.gov/region5/cleanup/rcra/occidental/index.html](http://www.epa.gov/region5/cleanup/rcra/occidental/index.html)
- 2010** Proposed installation of six new extraction wells on southern portion of facility  
 Placement of conservation easements and establishment of environmental stewardship program was decided upon versus installing new extraction wells  
 Groundwater treatment system operates to contain a contaminated plume  
 Continued restoration work
- 2003** 10,500 cy of sediment removed from White Lake at the old outfall pipe location  
 Treatment of C-56 and PCBs completed
- 2001** Soils with C-56 were removed
- 1996** Demolition of chemical factory
- 1993** Order from EPA to complete the remaining corrective action cleanup obligations at the facility  
 Completed additional corrective actions in soils and surface water sediments and is working to complete removal of free product in groundwater
- 1986** Start of groundwater treatment system with 8 purge wells treating 1 million gallons/day (2-stage activated carbon filtering system to treat the organo-chlorides in groundwater, with treated water returned to WL)
- 1983** Plant shut down
- 1980s** Vault has been closed and is being monitored under terms of the 1979 consent judgment

**1979** Consent judgment was entered by the State of Michigan with Oxy to dispose of contaminated equipment and soils in a vault on-site

## **DuPont**

**2013** Progress reports and technical documents can be found at [www.michigan.gov/deq/0,4561,7-135-3312\\_4118\\_4240-241452--,00.html](http://www.michigan.gov/deq/0,4561,7-135-3312_4118_4240-241452--,00.html)

**2009** Enhanced groundwater pumping, capture, and treatment system put in place

Mixing zone determination obtained

WHMD will continue to monitor, review, and approve corrective action activities at the facility

Corrective action activities will be long-term

**2007** Attempting to properly locate some compliance monitoring wells associated with the system

Waste and Hazardous Materials Division identified 14 remaining waste management units/AOCs that require further assessment and possible investigation, evaluation, and remedy implementation with respect to potential sources of contamination

**2003** Working to extend availability of the municipal water supply to more neighboring residents

Evaluating potential remedial options (expanding the existing pump-and-treat system, augmented bioremediation, natural attenuation, or a combination thereof)

**2000** MDNRE certified clean closure of all the permitted hazardous waste management units

**1998** Most buildings were demolished

**1996** Facility operations ceased

Eleven residential wells sampled to 24' - 204' depth (all were clean south of site (San Juan, Long, and Indian Point))

Three holes (eastern most portion of property) found contamination

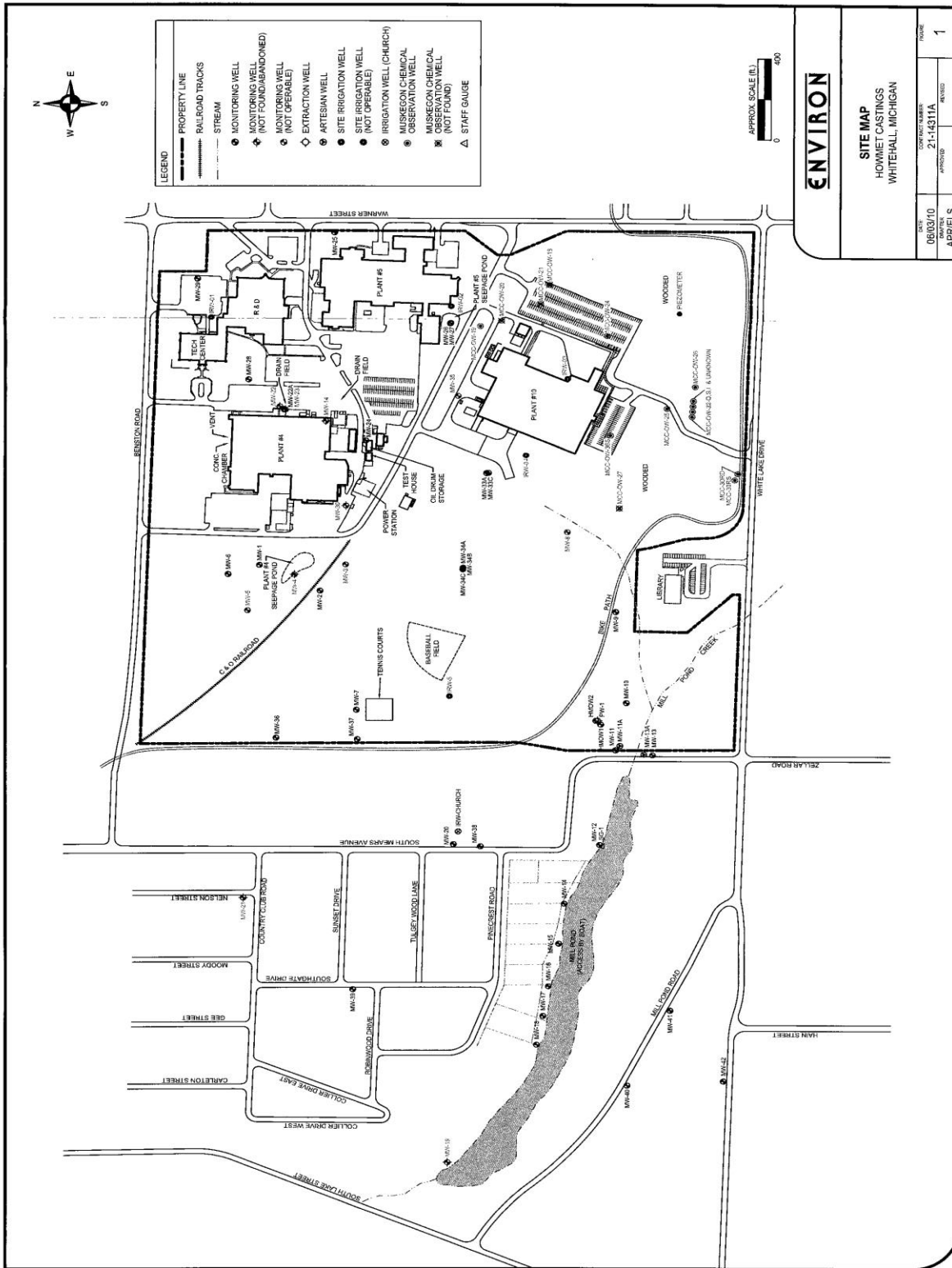
**1980** Organic solvent (tetrachloroethylene) was detected in water

### Whitehall Well #3/Funnel Field Well

- 1989** Permanently abandoned PW-3
- 1988** No pesticides found in any of the samples
- City took PW-3 offline due to its lack of water production due to sand clogging and thought it was not cost-effective to rehabilitate it
- 1987** Six monitoring well (PW-3 did not contain any organic contaminants) samples contained organic pesticides (alpha, delta, and gamma-BHC; heptachlor; aldrin; heptachlor epoxide; and endosulfan sulfate) and other contaminants (1,1,1-trichloroethane; phenol; toluene; benzene; and benzoic acid) – contaminants detected were all below the MCLs or MCLGs for drinking water
- All monitoring well samples contained elevated inorganic concentrations of cadmium; chromium; lead; and nickel (PW-3 did not contain any inorganic contaminants) – concentrations reported for all samples did not exceed the drinking water standards
- 1986** Pump test conducted (700 gallons/minute for three days) showed no contamination
- 1985** White Lake Landfill/Shellcast entered into consent agreement with EPA to provide permanent alternate water supply (connected to city water supply) to residences whose wells were contaminated
- 1982** Samples collected from homes along Peterson Road indicated the area groundwater was contaminated with VOCs from White Lake Landfill and Shellcast
- No signs of contamination after this year
- 1981** City took PW-3 offline and increased pumping rates in three other city wells (PW-2, PW-4 and PW-5) and installed another municipal well (PW-6) in replace of PW-3
- 1980** Presence of PCE detected in PW-3
- 1947** PW-3 constructed

### Figures A<sub>3</sub>

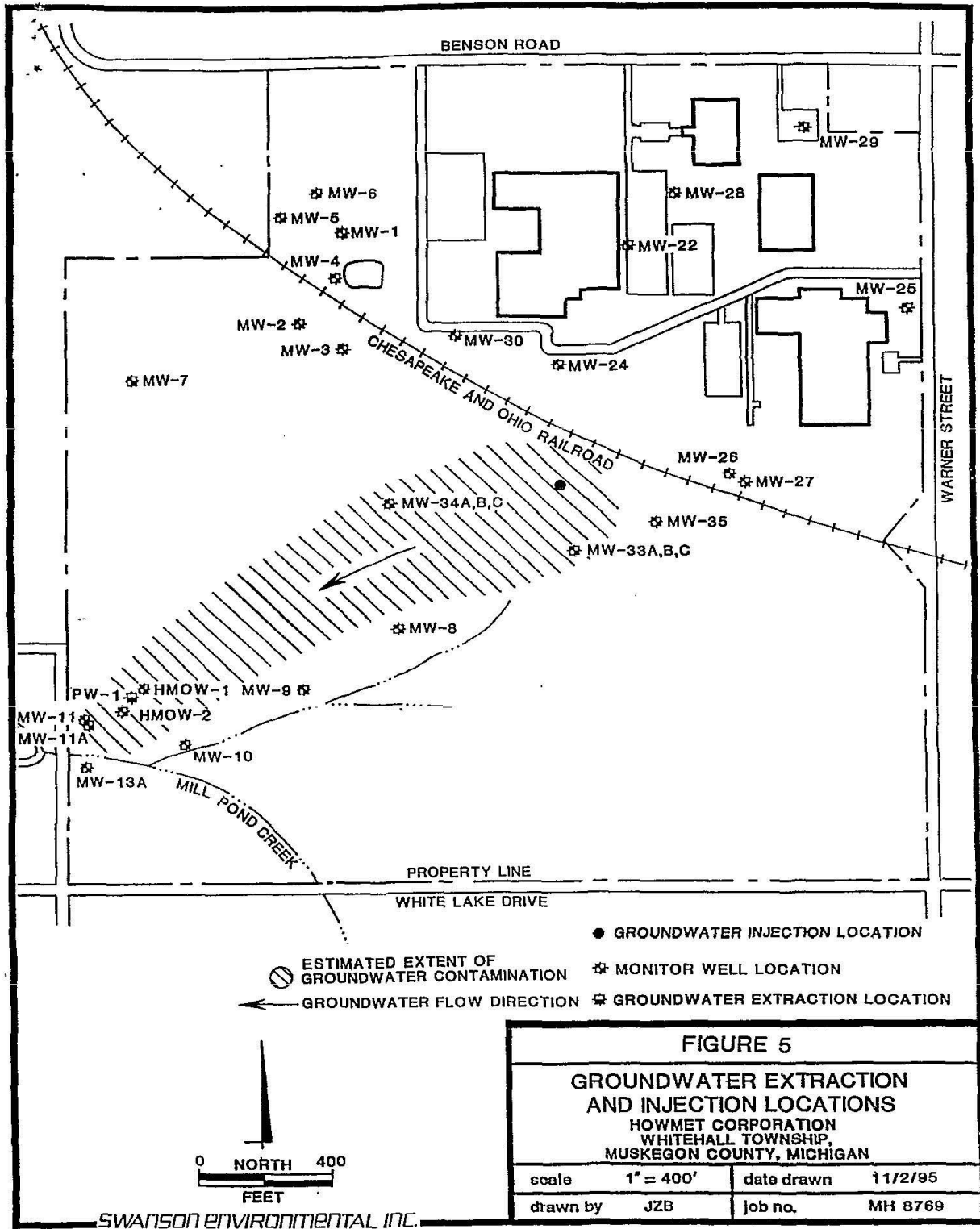
Figure A3(a)



Briefing Paper

Removal of the Drinking Water Consumption or Taste and Odor Problems BUI for White Lake AOC

Figure A3(b)



## Figures B<sub>8</sub>





Figure B8(b)

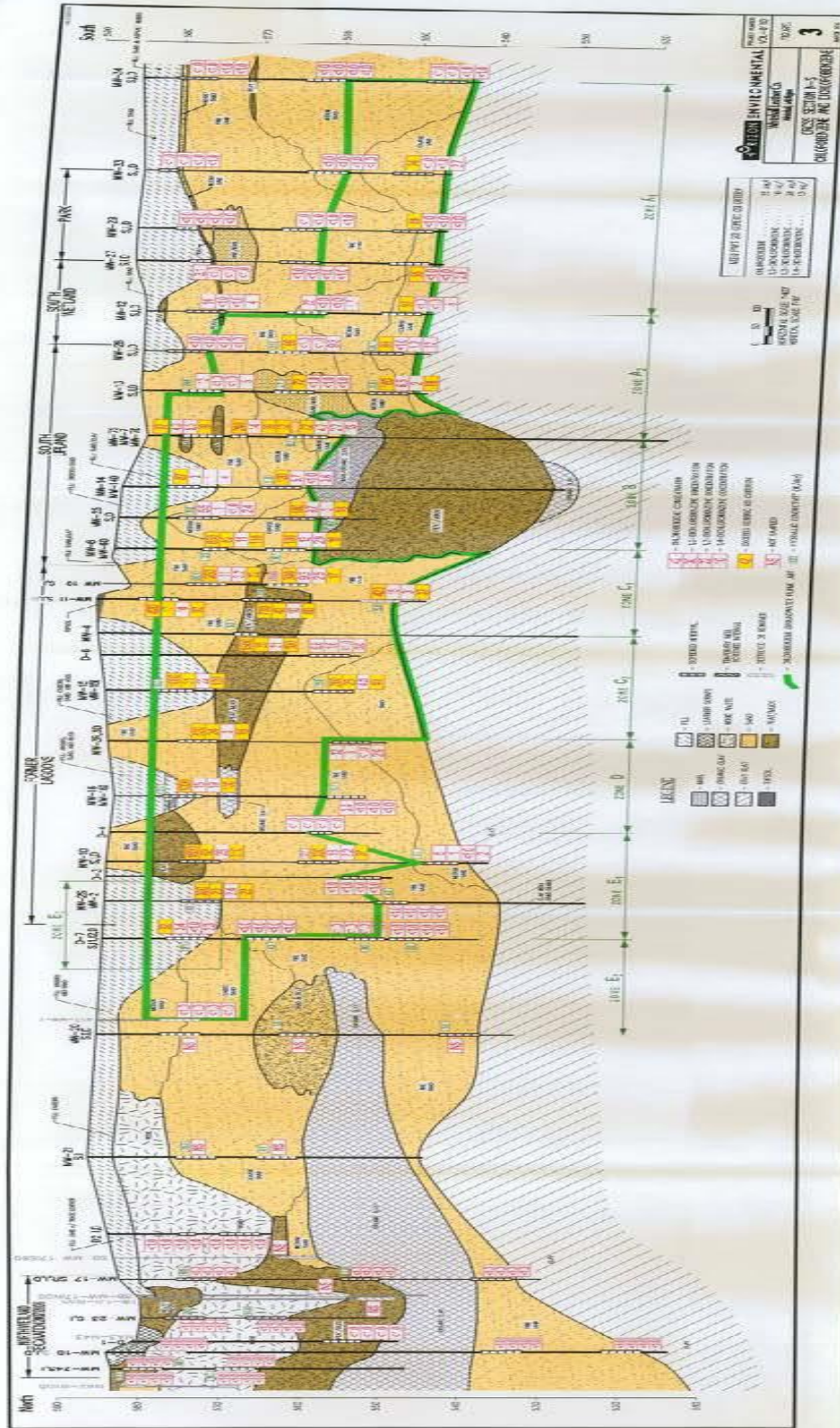


Figure B<sub>8</sub>(c)

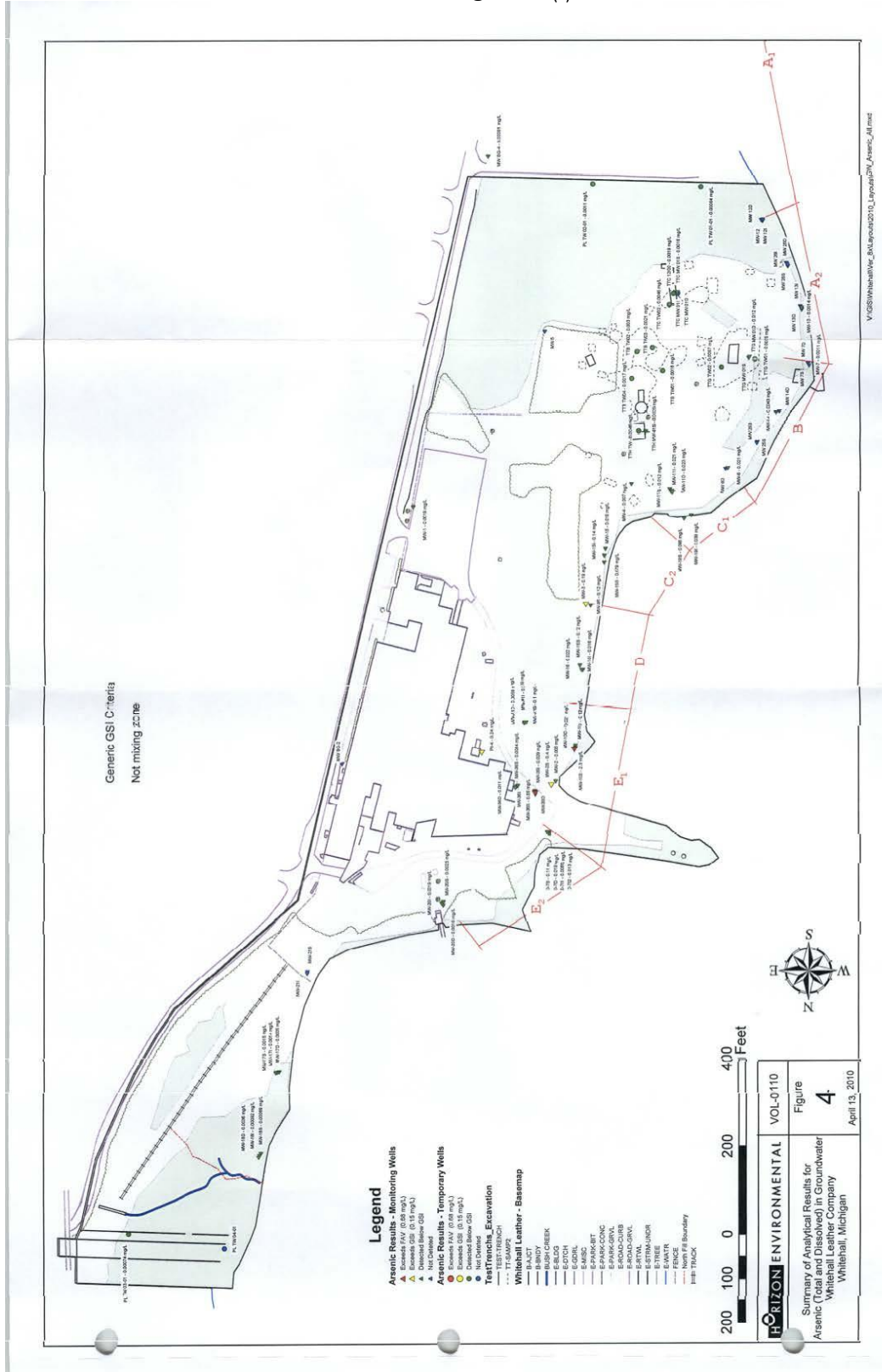




Figure B8(d)

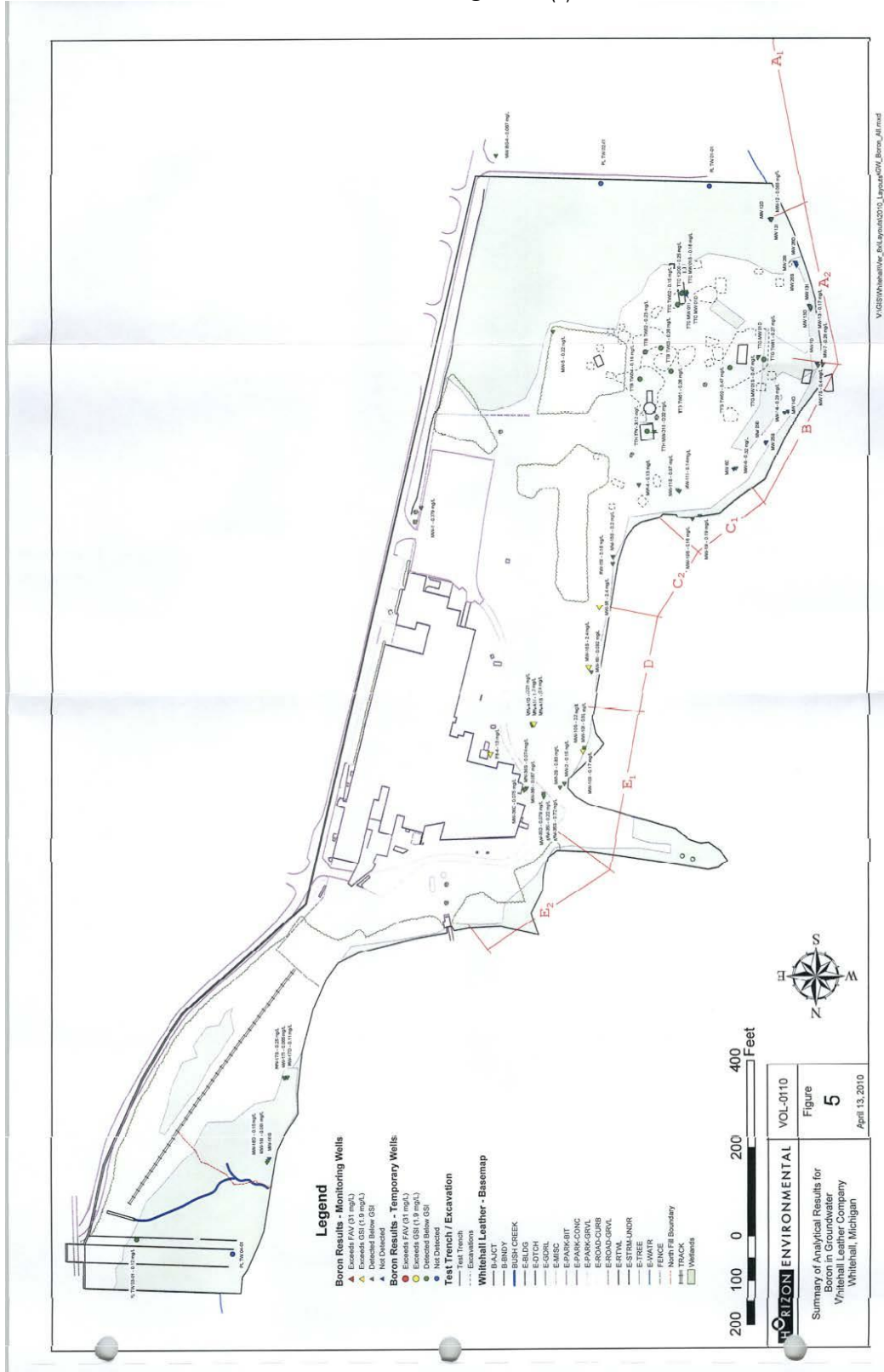


Figure B<sub>8</sub>(e)

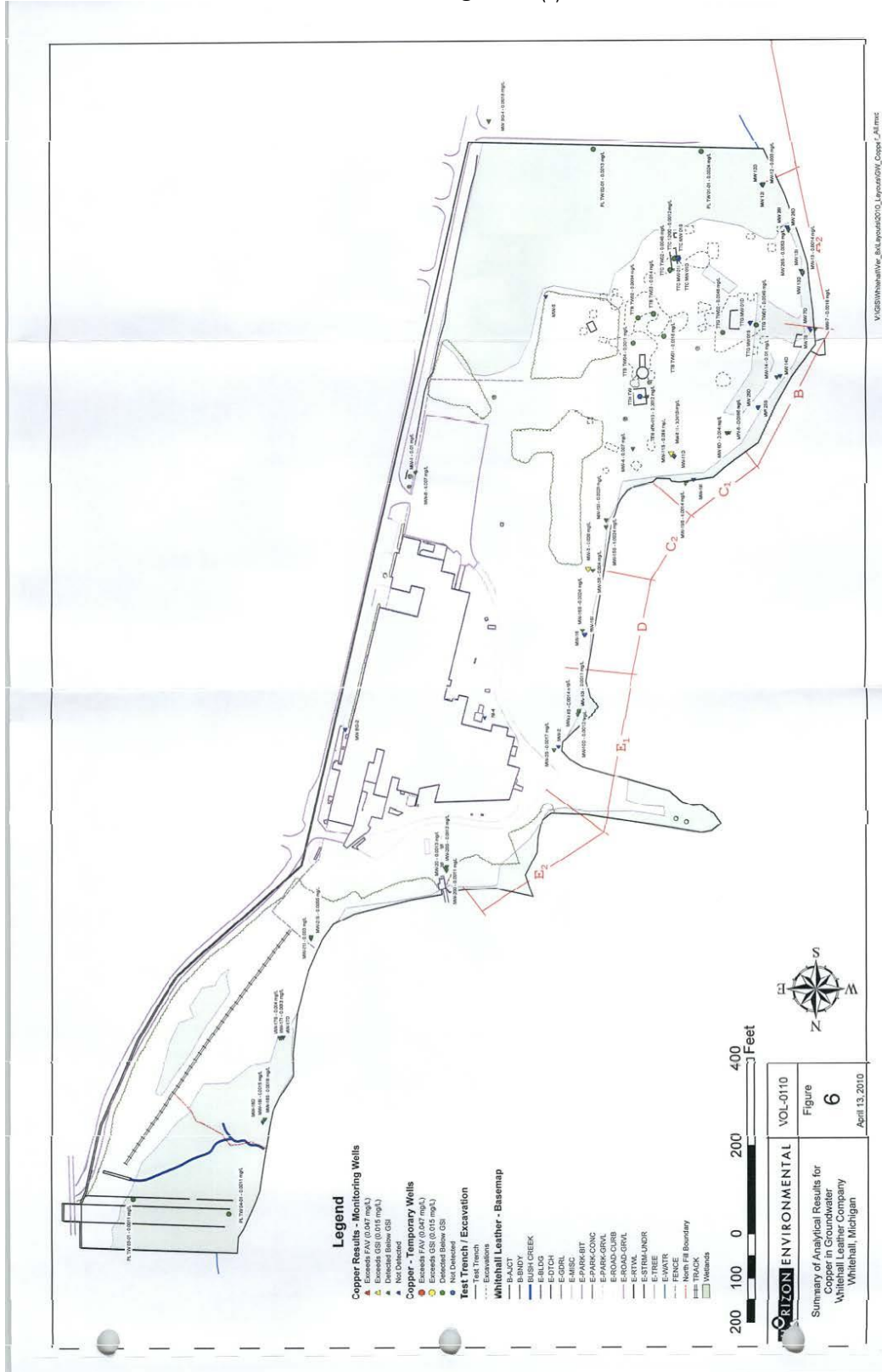


Figure B8(f)

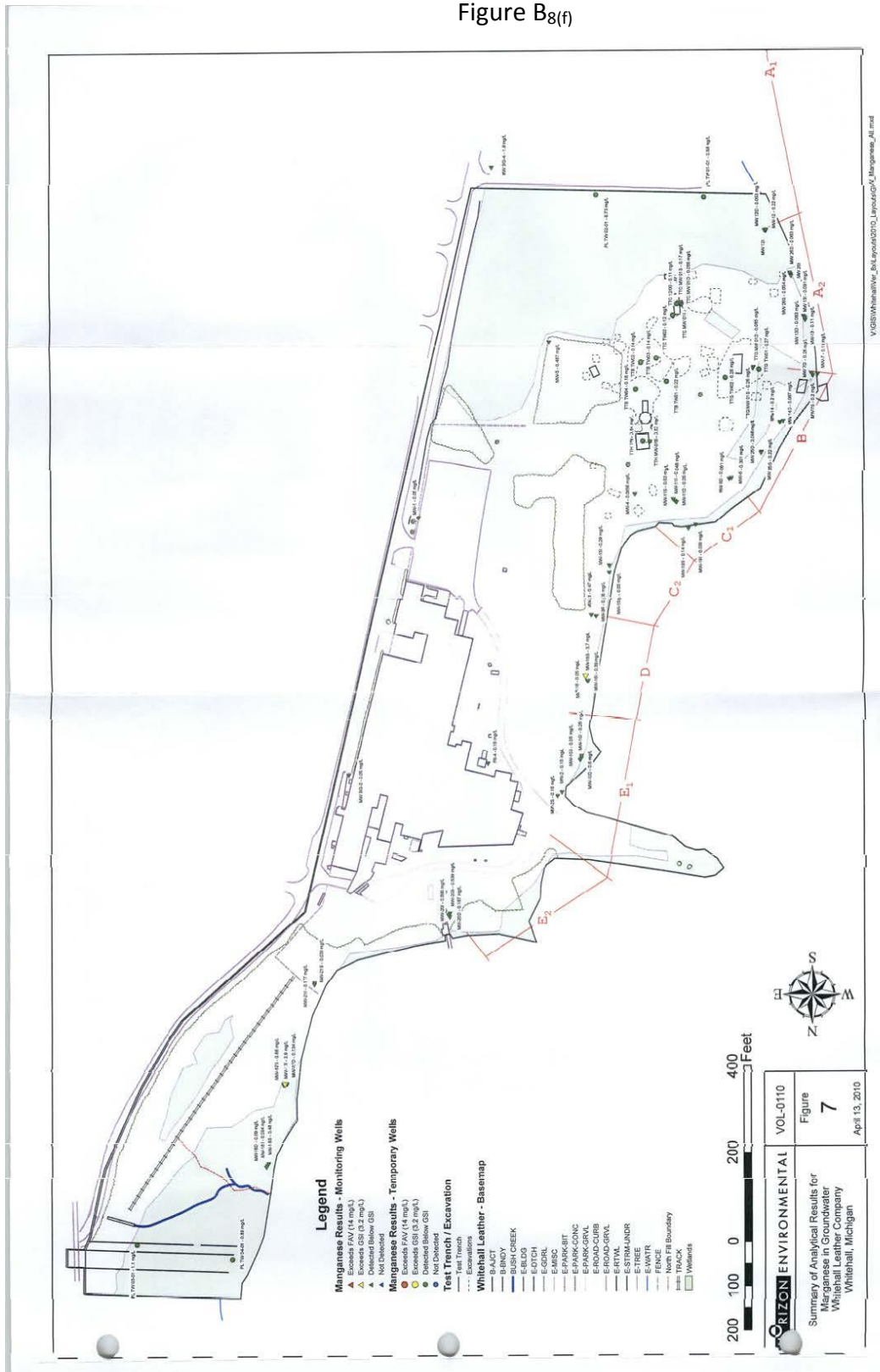
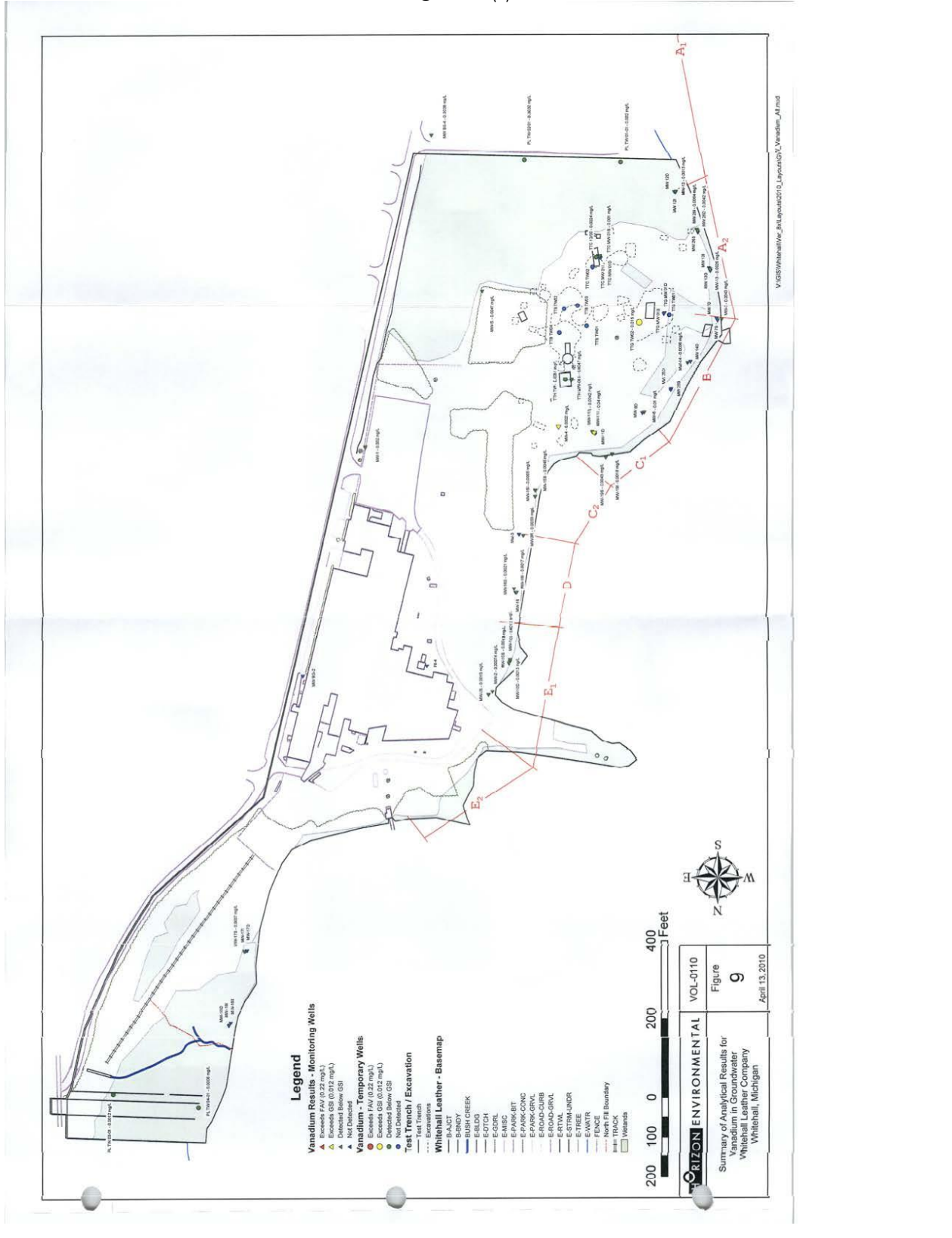






Figure B<sub>8</sub>(h)



## Figures C<sub>6</sub>

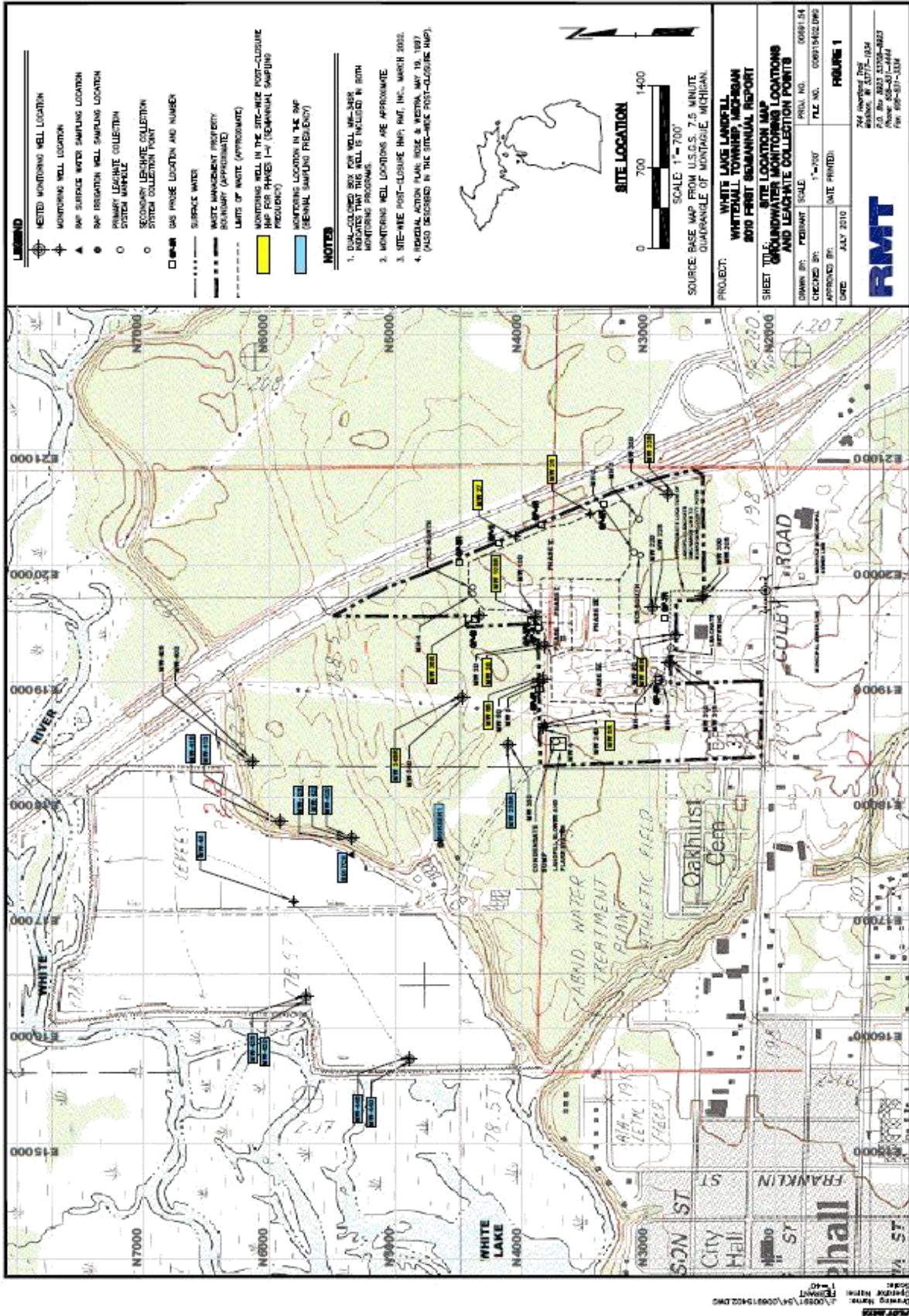
Figure C<sub>6</sub>



**Figures D<sub>8</sub> – D<sub>10</sub>**



Figure D8(a)

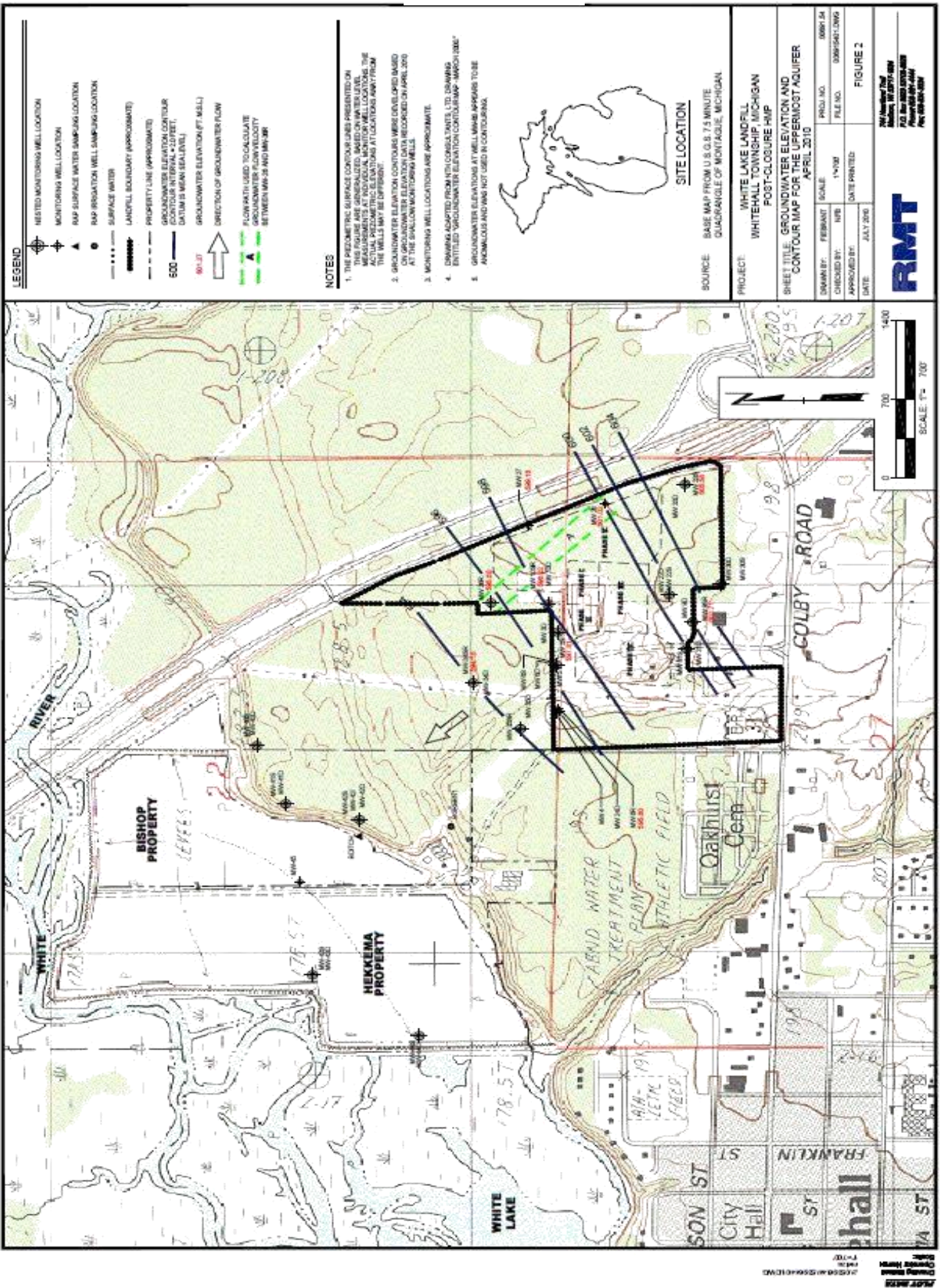


Briefing Paper

Removal of the Drinking Water Consumption or Taste and Odor Problems BUI for White Lake AOC



Figure D8(b)



Briefing Paper

Removal of the Drinking Water Consumption or Taste and Odor Problems BUI for White Lake AOC

Figure D9

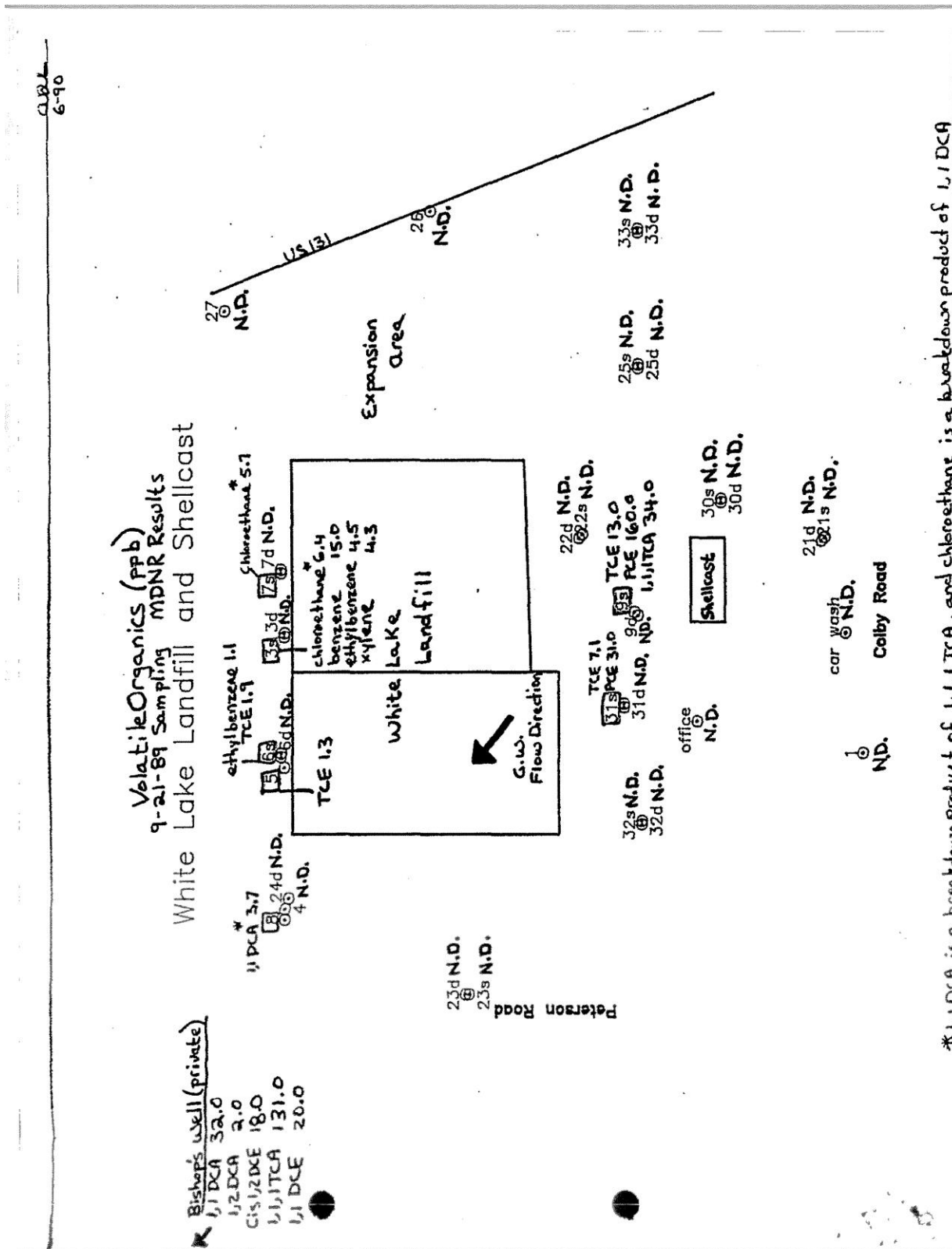
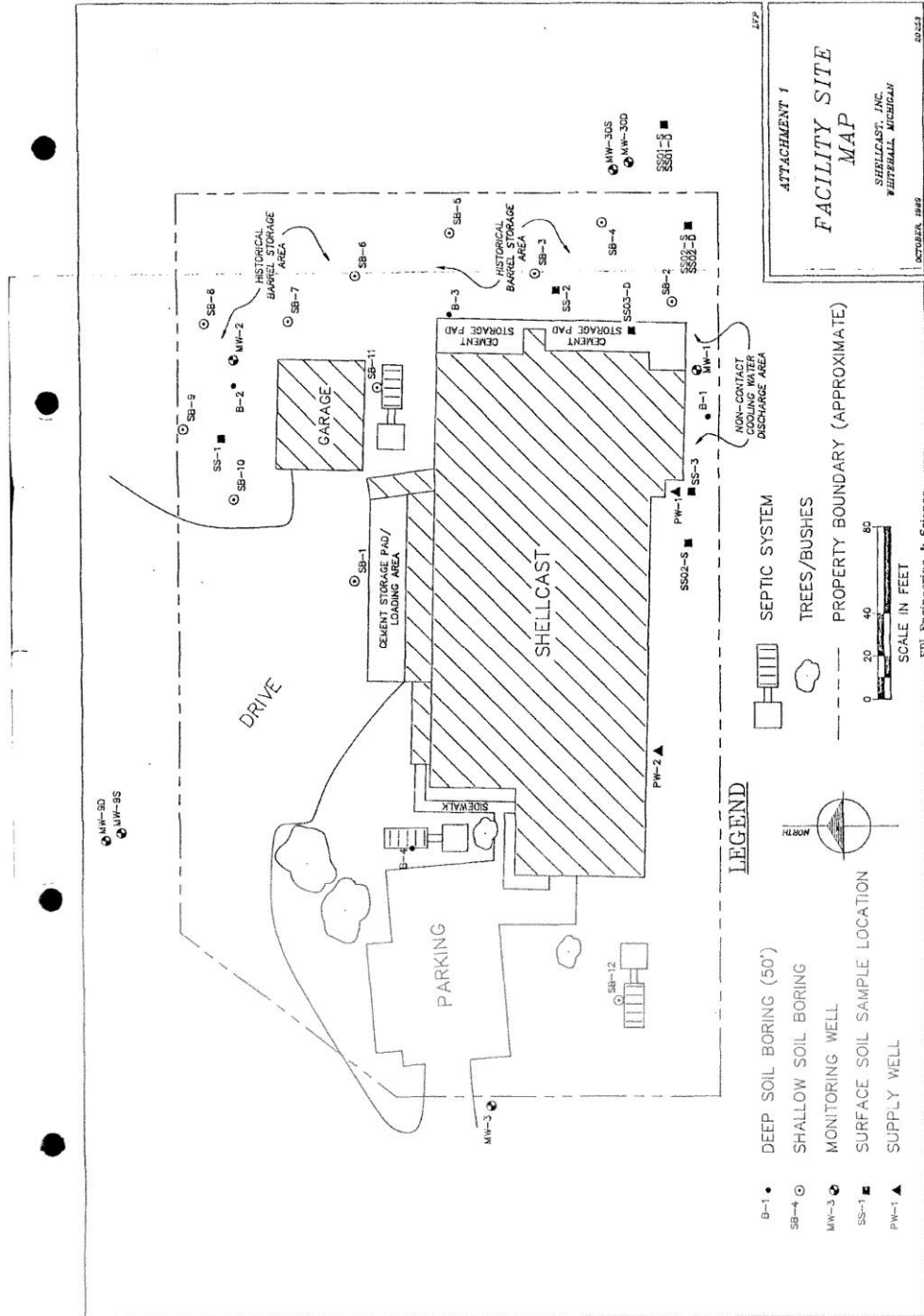


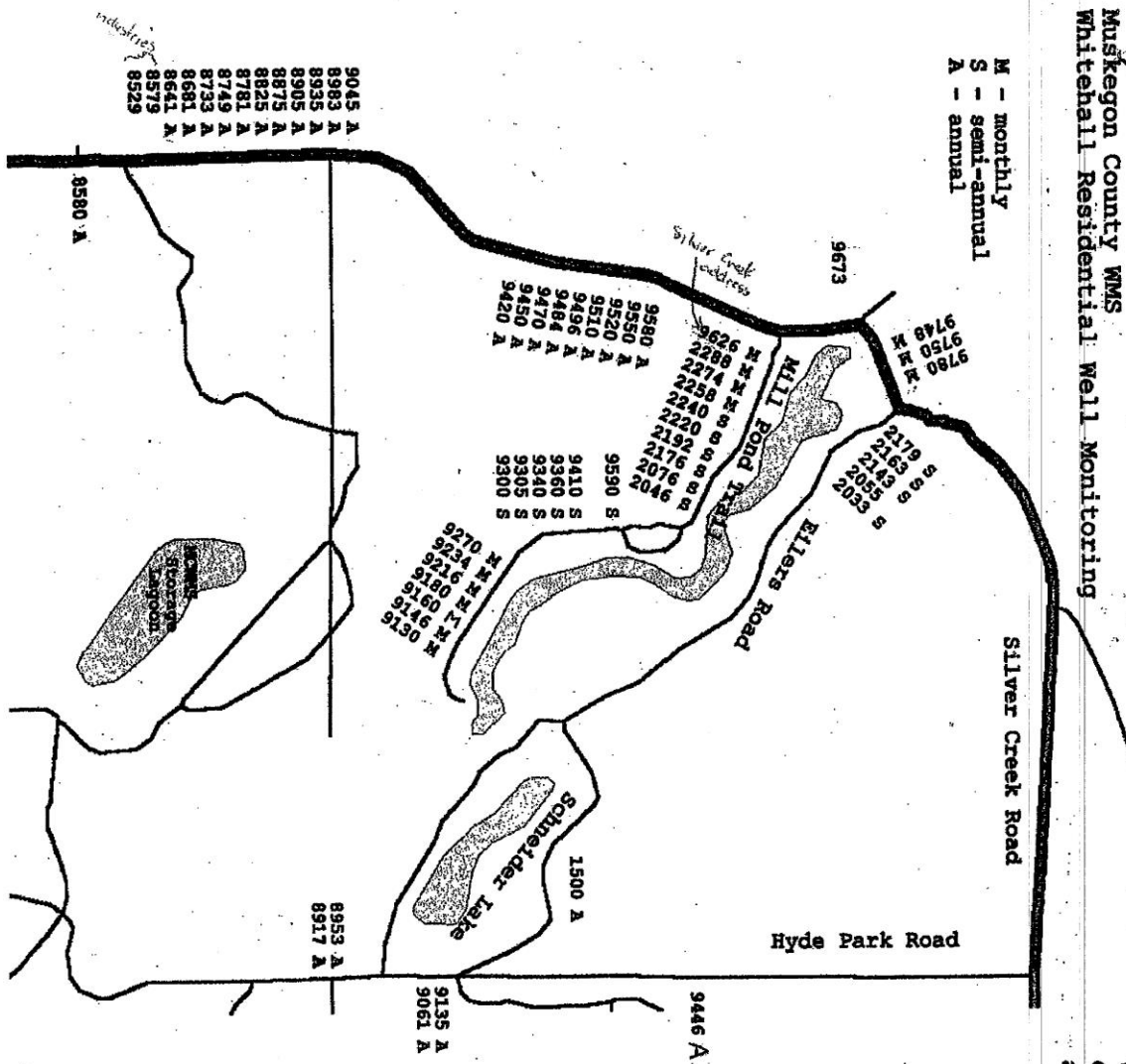
Figure D<sub>10</sub>





**Figure E<sub>5</sub>**

Figure E5



**Enclosure 2**  
 Whitehall area map. It's very old and some new houses are not on it.

## Figures F<sub>6</sub>

Figure F6(a)

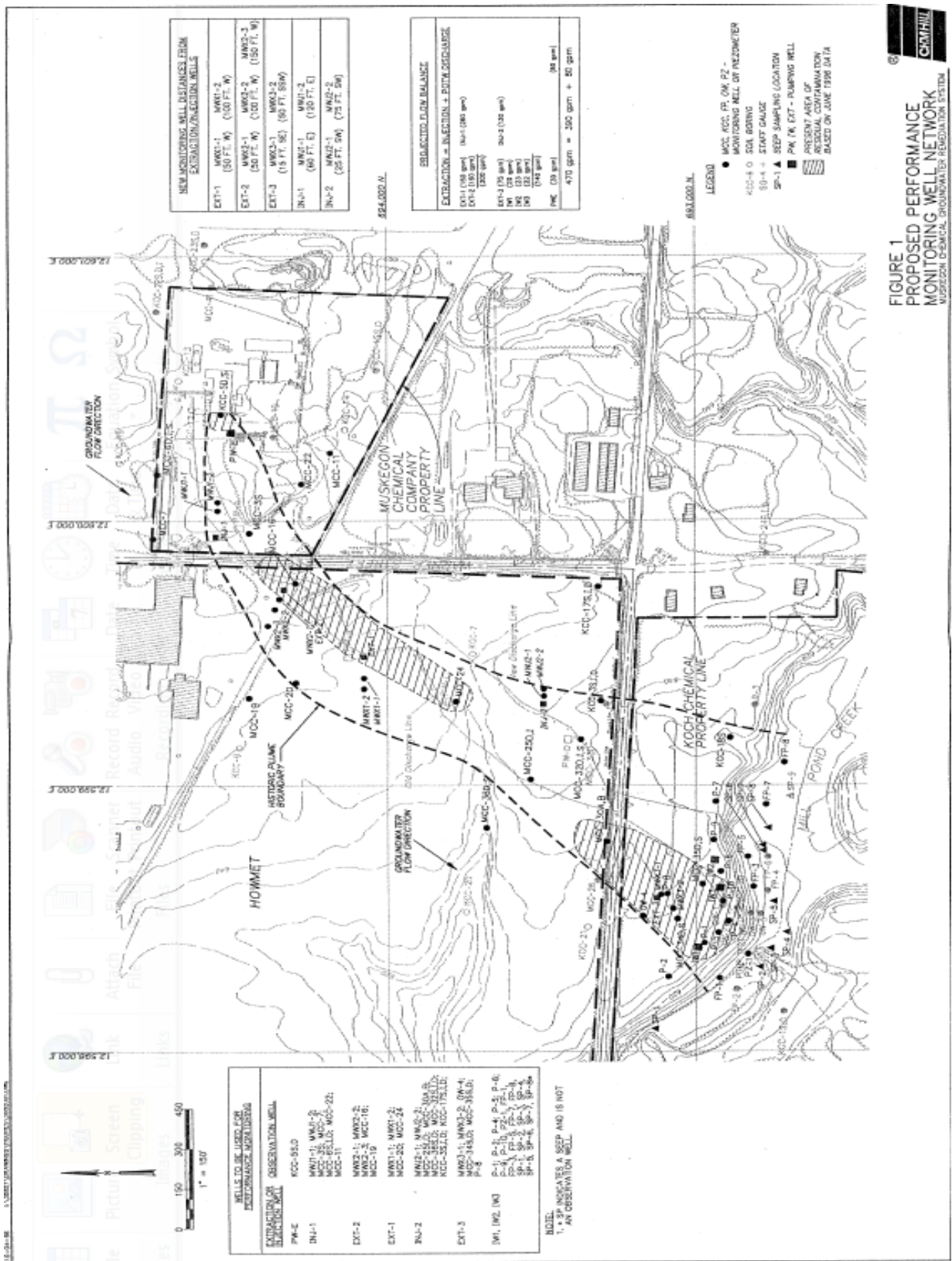
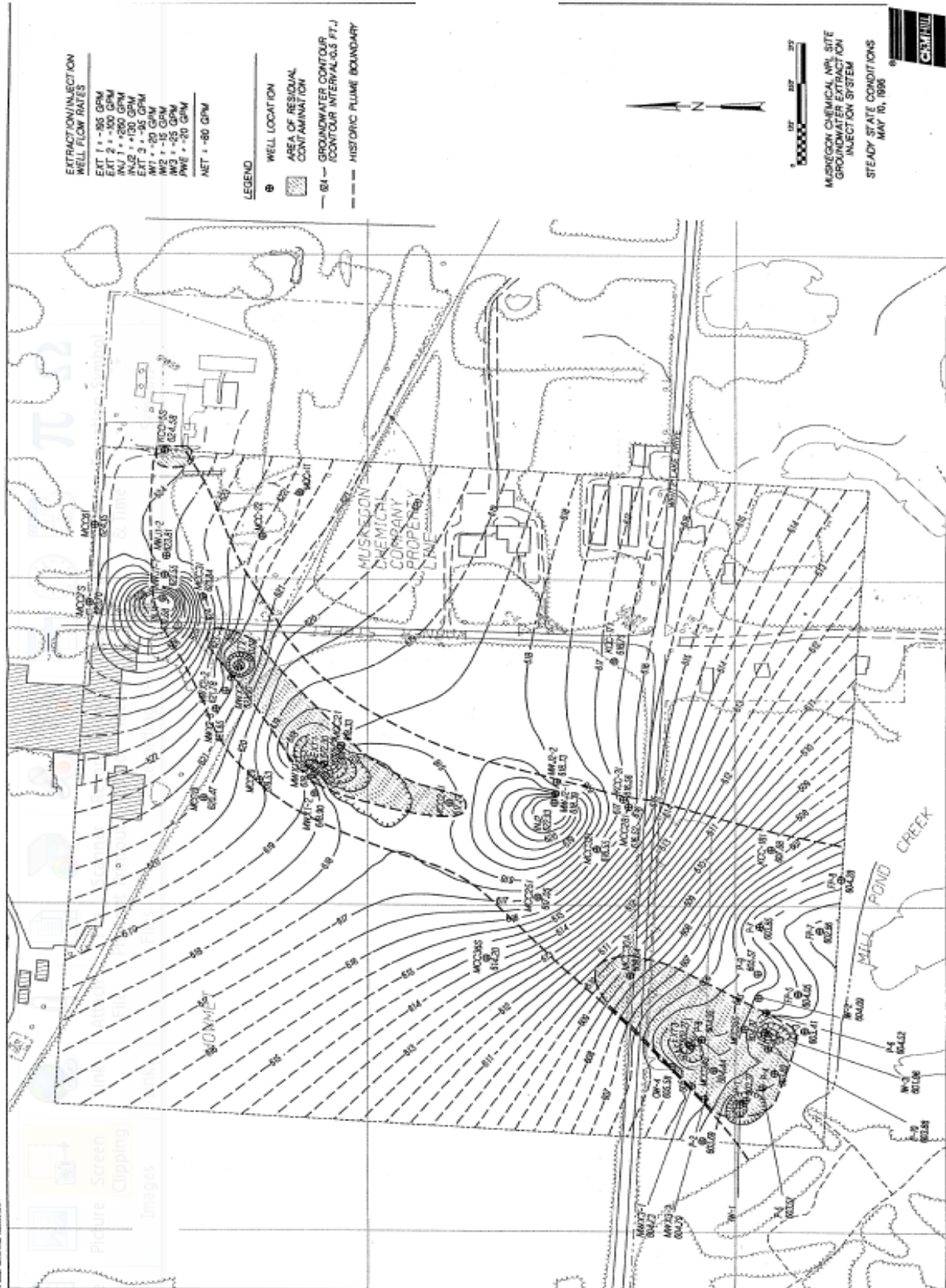




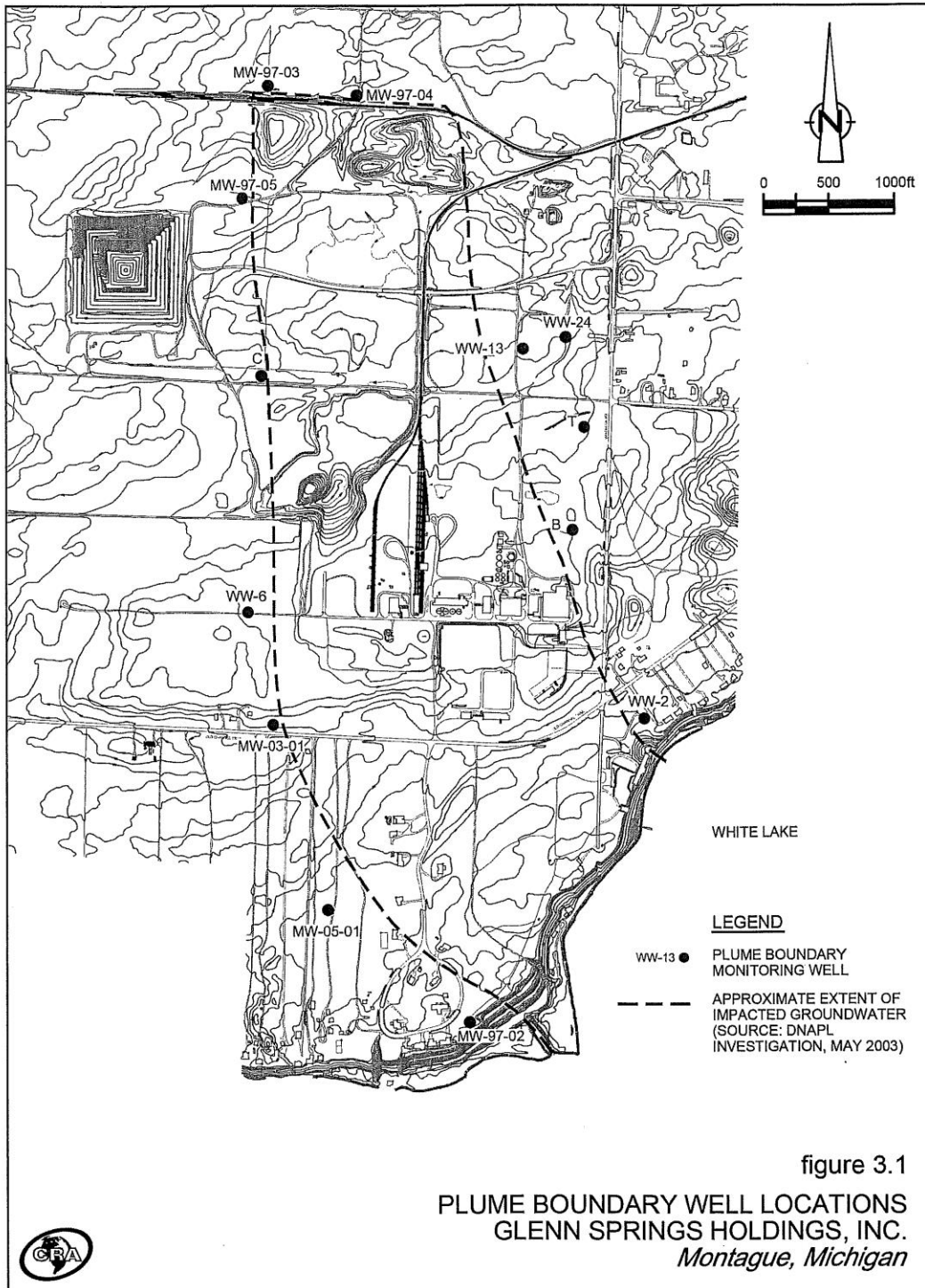
Figure F6(c)



**Figure G<sub>4</sub>**



Figure G<sub>4</sub>



09970-D23101(034)GN-WA003 FEB 21/2012



**Figures H<sub>4</sub> – H<sub>5</sub>**

Figure H4(a)

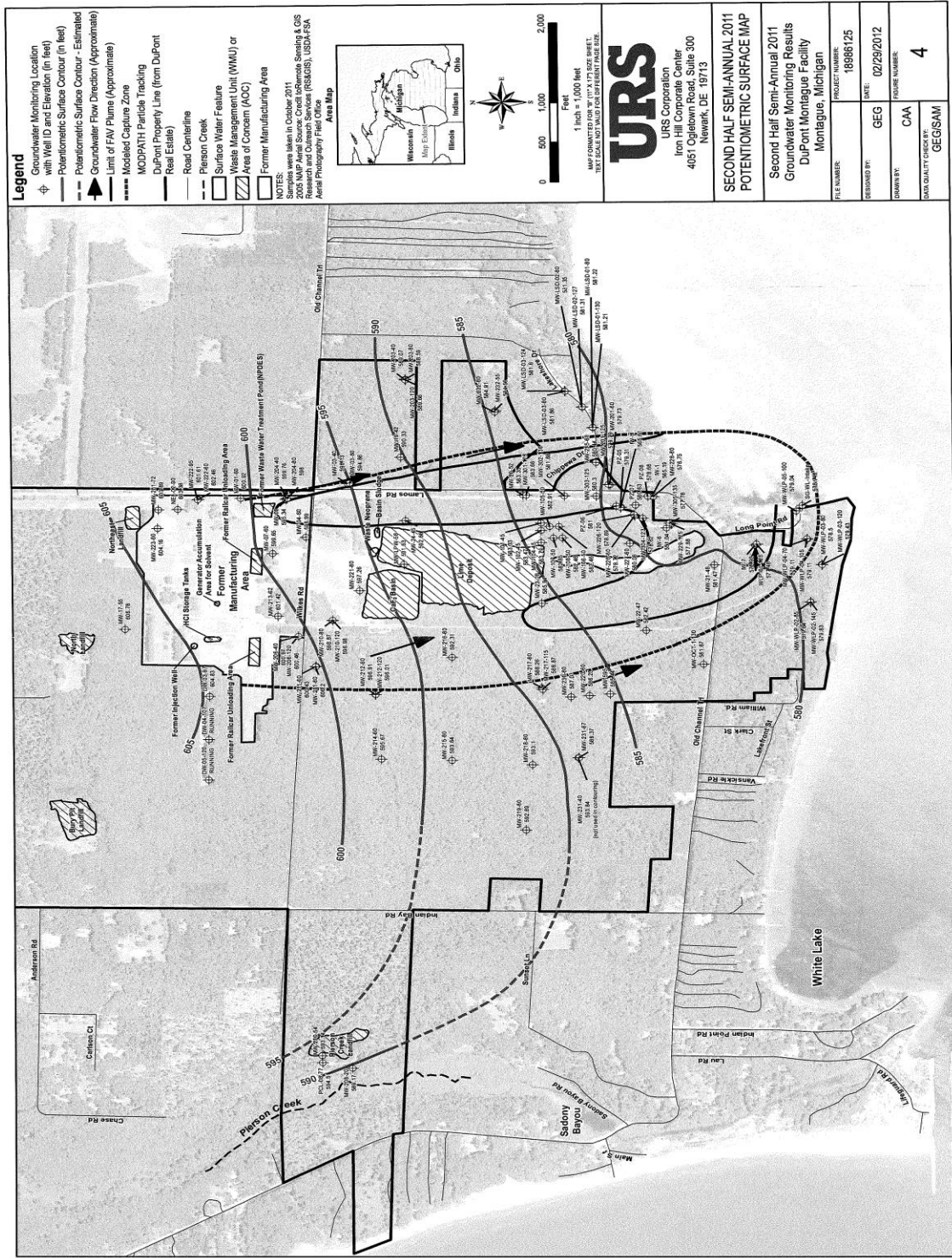




Figure H4(b)

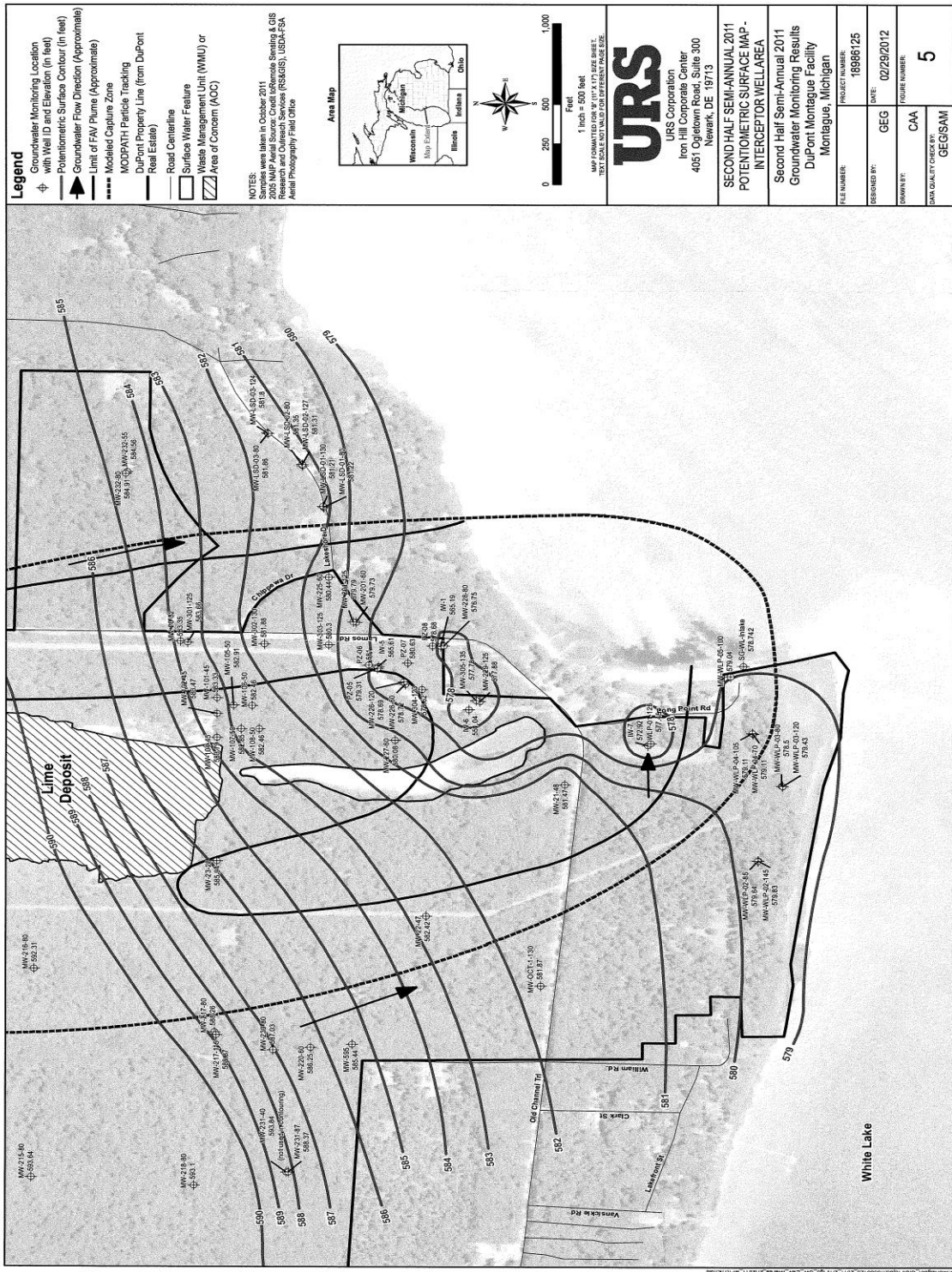


Figure H4(c)

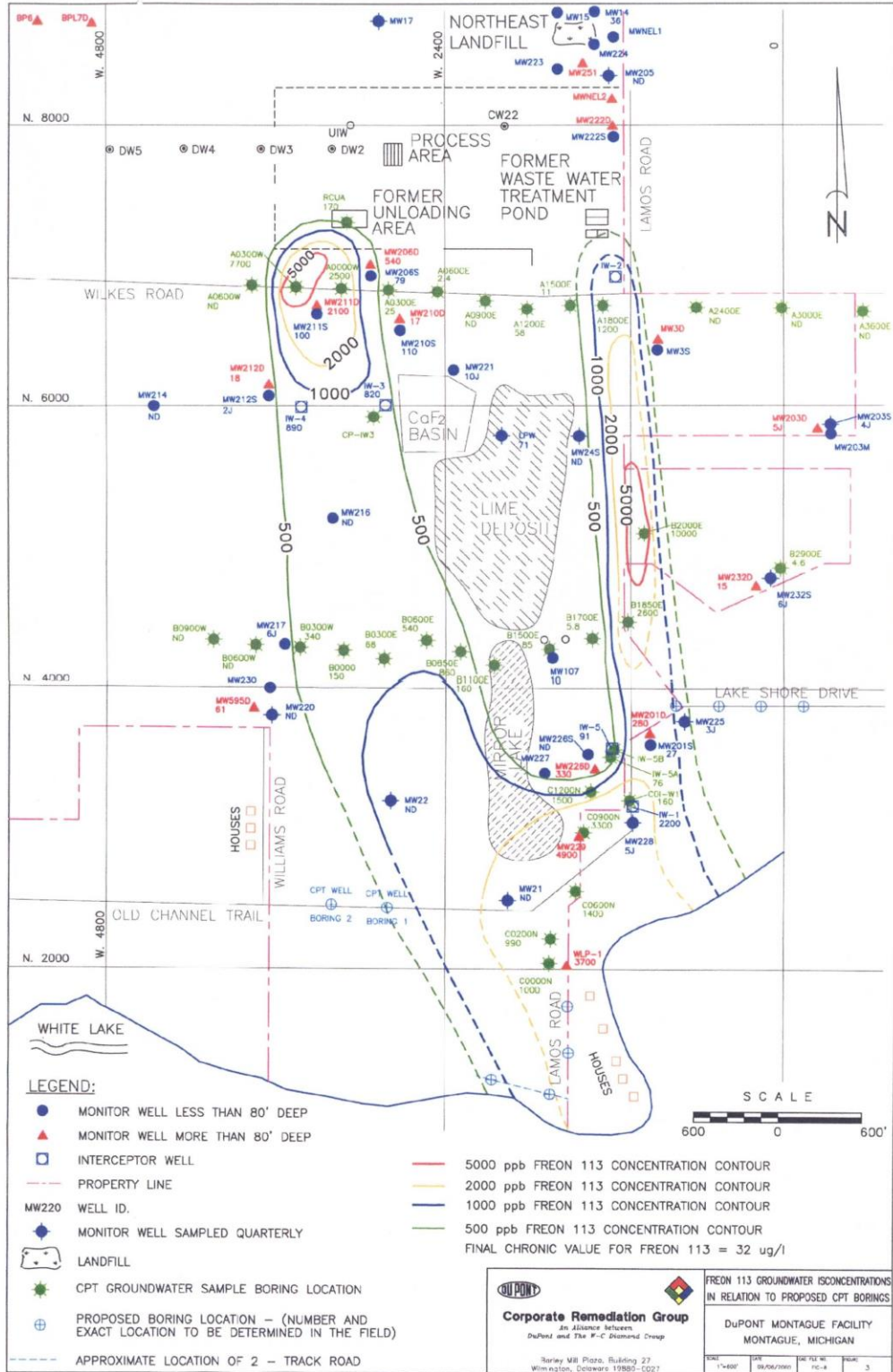
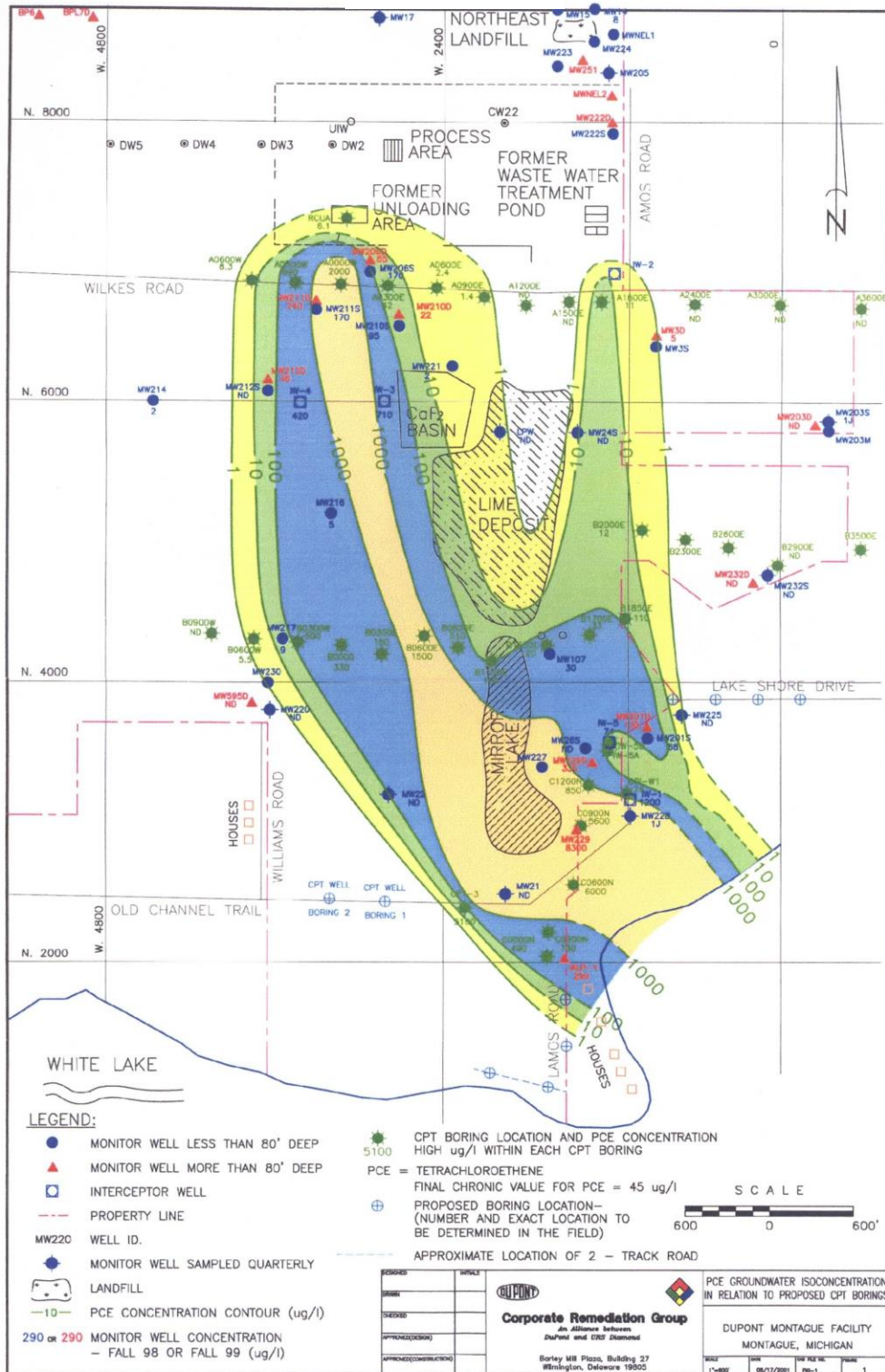




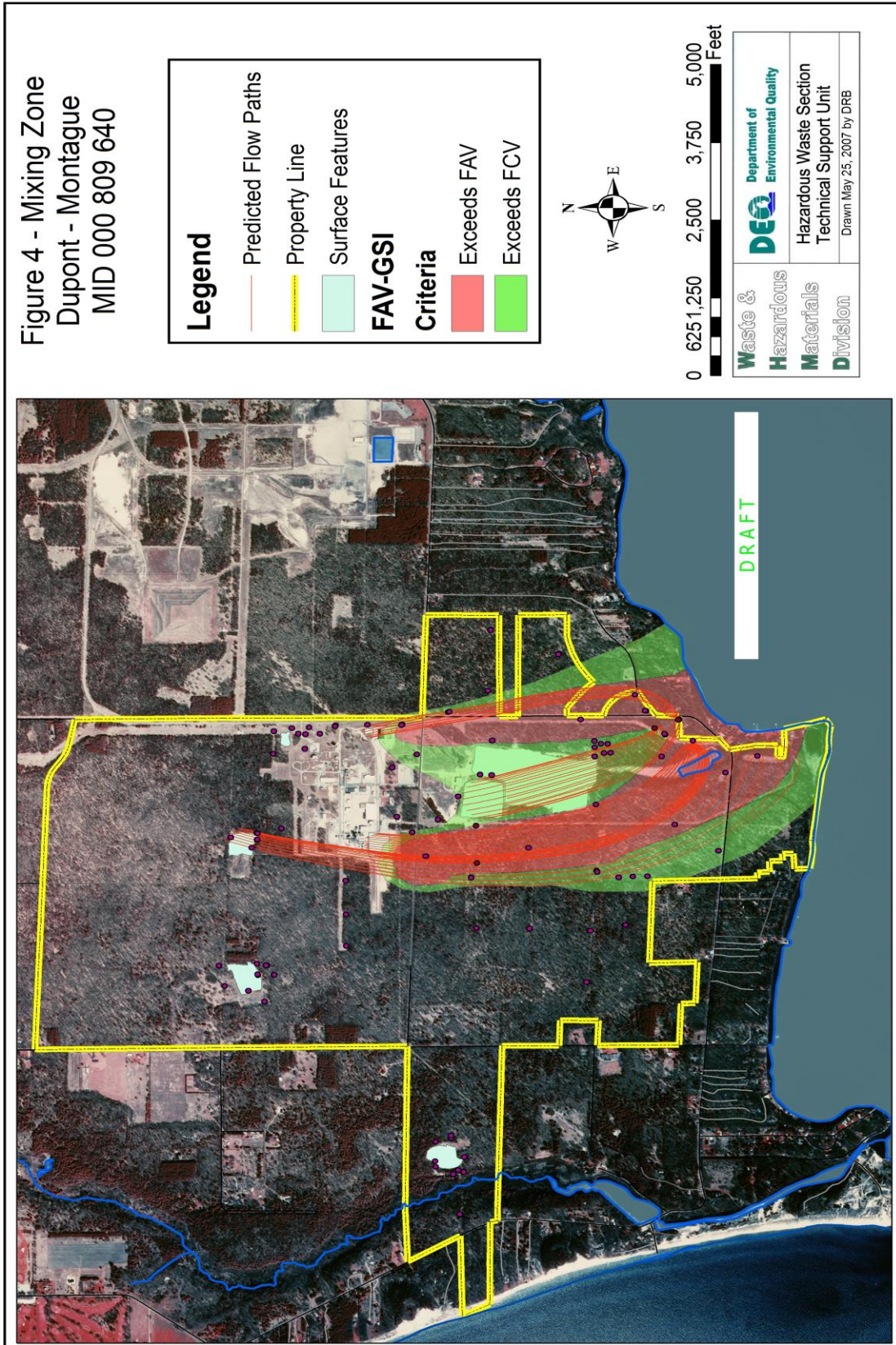
Figure H4(d)



Briefing Paper

Removal of the Drinking Water Consumption or Taste and Odor Problems BUI for White Lake AOC

Figure H<sub>5</sub>



## Figures I<sub>4</sub>



Figure 1<sub>4</sub>(a)

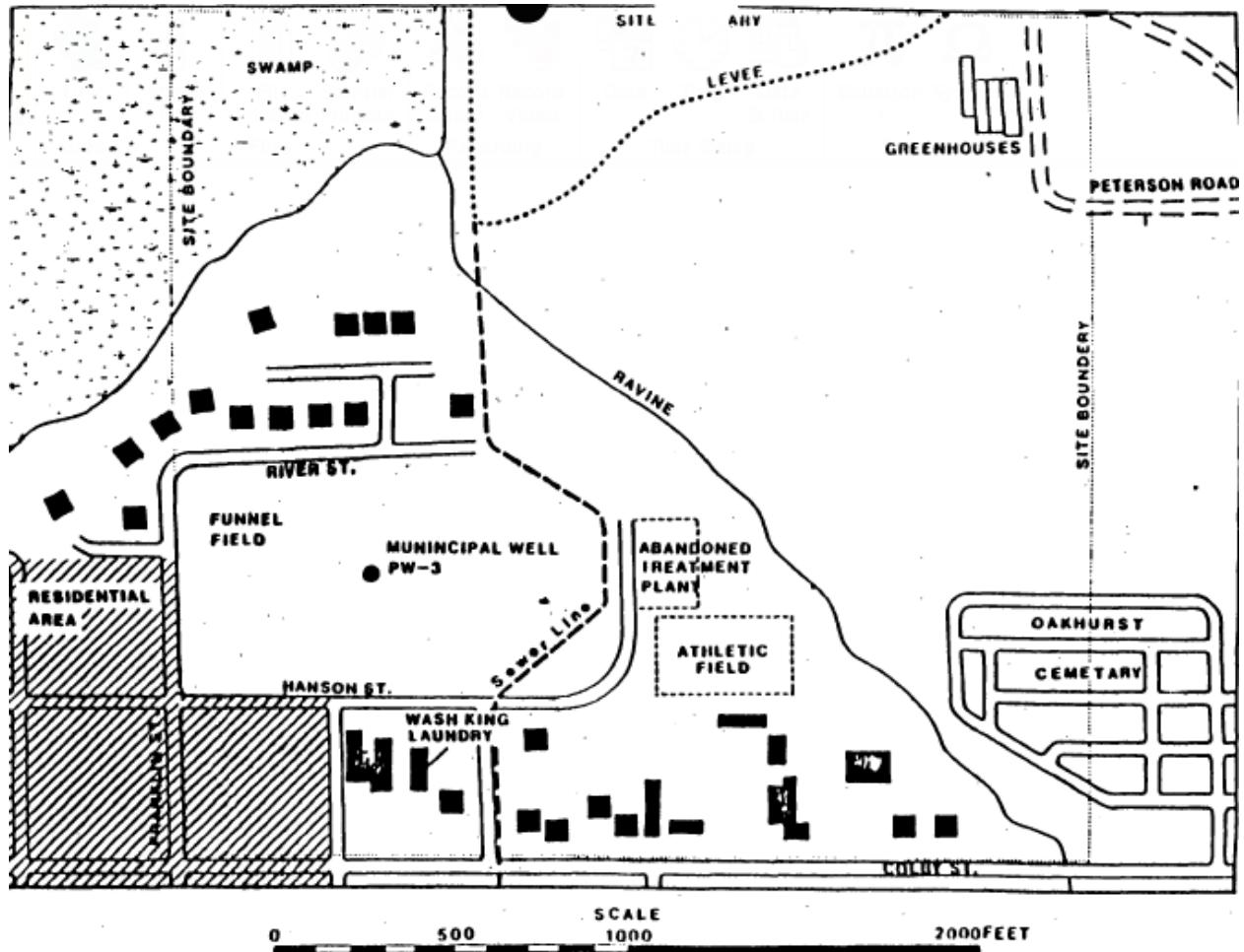


FIGURE 2 SITE BOUNDARY MAP



Figure 14(b)

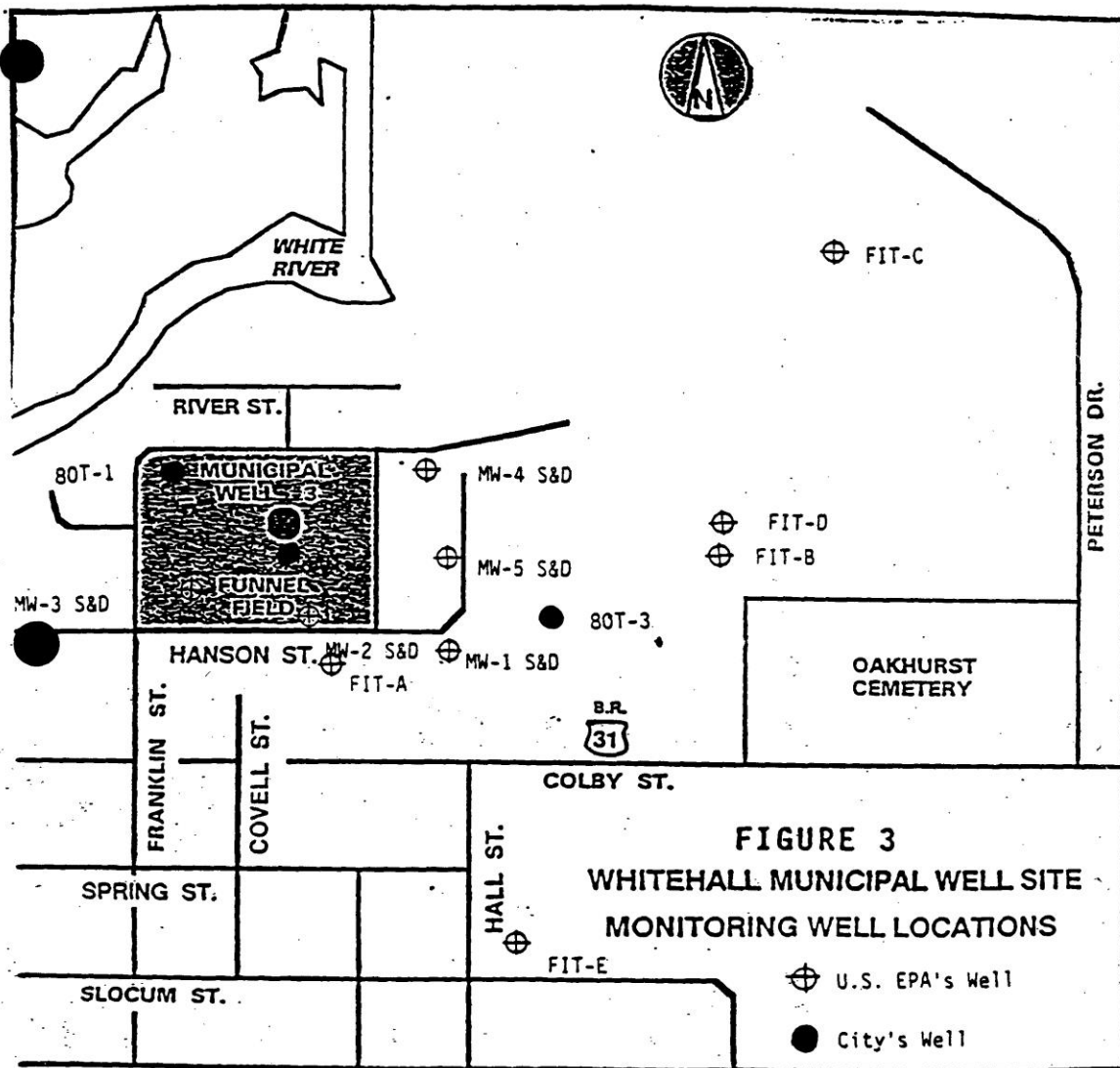


Figure 14(c)

