02-41-525029

952-935-1010

SITE OPERATION AND MAINTENANCE PLAN

Former Mobile Blasting Property

West Milwaukee, Wisconsin

Prepared for:

Wisconsin Department of Natural Resources
Milwaukee, Wisconsin

June __, 2002

Project No. 007269.000.0

SITE OPERATION AND MAINTENANCE PLAN

Former Mobile Blasting and Painting Site
West Milwaukee, Wisconsin

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SITE OPERATION AND MAINTENANCE PLAN
Former Mobile Blasting and Painting Site
West Milwaukee, Wisconsin

1.0 INTRODUCTION

Geomatrix Consultants, Inc. ("Geomatrix") has prepared this Site Operation and Maintenance Plan for the property located at 1604 Miller Park Way in West Milwaukee, Wisconsin ("Site") (see Figure 1). This document, prepared by Geomatrix on behalf of the Wisconsin Department of Natural Resources ("WDNR"), is submitted to the WDNR in accordance with the requirements of Chapter NR 724.13(2) of the Wisconsin Administrative Code.

Between June 2001 and December 2001, the WDNR completed remedial construction at the Site. Remedial Construction consisted of excavation and off-site disposal of soil impacted with free hydrocarbon product ("FHP") and removal of FHP-impacted groundwater. Additional remedial actions included removal of lead-impacted soil, geotechnical soil correction, and construction of an underfloor venting system. The current Site owner (SBC LLC) completed construction of the 45,000 ft^2 Stadium Business Center building at the Site in December 2001. The underfloor venting system was constructed concurrent with construction of the Stadium Business Center Building. The footprint of the Stadium Business Center building and associated pavement and landscape areas are depicted on Figure 2.

The objective of this document is to establish protocols for proper maintenance and monitoring of remedial components constructed at the Site to minimize the risk of future exposure to Site chemicals of concern and minimize infiltration of rainwater. Site background information is provided in Section 2. A Site Maintenance and Inspection Plan and schedule for the newly constructed engineering controls at the Site is presented in Section 3. The approach outlined in the Site Maintenance and Inspection Plan will allow prompt repairs to remedial components if the integrity of the components is affected by Site operations.

Requirements for performing any future earthwork at the Site are presented in Section 4. A plan for establishing and reviewing the status of institutional controls is presented in Section 5.

2.0 SITE BACKGROUND

2.1 Site History

The Site is approximately 3.3 acres in size. The northern portion of the Site was initially developed in the 1920's and was occupied by a boiler company, steel casting operation, and most recently by a sand blasting and painting operation. Mobile Blasting and Painting ("Mobile Blasting") operated on the Site from April 1985 through August 1998. Objects that were sand blasted included rail cars, automobiles, trucks, and steel beams. The southern portion of the Site was initially developed by the Sivyer Steel Casting Company ("Sivyer"), sometime before 1910. Historical records show that the southern portion of the Site was utilized as a foundry between 1927 and 1985.

The Site is located in an area that is predominately industrial and has been since the early 20th century. The Site immediately to the east of the Site was utilized by Mobile Oil Company as a bulk storage facility from the 1920s to the mid 1970s. The bulk storage facility had an approximate above-ground capacity of 6.5 million gallons of petroleum hydrocarbon products, which consisted of oil, fuel oil, lubricating oil, naphtha, gasoline, coal oil, mineral spirits, denatured alcohol, and sulfuric acid (URS, 1999).

2.2 Nature and Extent of Petroleum Impacts

Environmental investigations were performed at the Site by the WDNR and SBC LLC from October 1996 through January 2001. Naphthalene and benzene were detected in groundwater above Preventative Action Limits ("PALs") and Enforcement Standards ("ESs") at several on-Site locations. Free hydrocarbon product ("FHP"), consisting of petroleum distillates identified principally as lubricating oil and fuel oil, was identified on the water table in two separate areas at the Site. Dissolved groundwater concentrations were highest in areas where FHP was measured and decreased significantly with increased distance from the areas with measured FHP.

In areas of the Site where petroleum hydrocarbon dissolved groundwater impacts were identified, petroleum compounds were also detected in soil above the water table. Naphthalene was the most prevalent compound detected during Site investigations with detected concentrations ranging up to 690 mg/kg. However, detected concentrations generally decreased with increasing distance above the water table elevation (i.e., increased with depth), which was attributed to volatilization from impacted groundwater or FHP.

2.3 Remedial Action Selection

The WDNR established Monitored Natural Attenuation (MNA) of impacted groundwater (the selected groundwater remedy for the Site) as the Soil Performance Standard for petroleum hydrocarbons in Site soils. Due to the presence of FHP at the Site, FHP removal "to the extent practicable" was required under Section NR 708.13 of the Wisconsin Administrative Code. Additional Site engineering controls (capping and underfloor vent system construction) were performed to limit exposure to impacted Site soils and reduce infiltration to facilitate Site development.

The WDNR performed an analysis of potential remedial alternatives for removing FHP-impacted soil and groundwater at the Site. The analysis is presented in the *Remedial Action Options Report* for the Site (WDNR, 2001). Excavation and off-Site disposal of FHP-impacted soil and removal of FHP-impacted groundwater was selected by the WDNR as the preferred remedial alternative.

2.4 Remedial Design and Implementation

Geomatrix prepared a *Remedial Design Report* for the Site (Geomatrix, 2001), which detailed each component of the WDNR-selected remedial action and presented a remedial action implementation plan for the Site. The remedial components for the Site are listed below:

- Site Preparation, which included demolition of above-grade and below-grade structures from past Site operations;
- Removal of FHP-impacted soil and groundwater "to the extent practicable". The primary excavation areas (FHP Area A, FHP Area B, and the former UST Vault Area) are depicted on Figure 2;
- Removal of lead-impacted soil;
- Geotechnical soil correction to allow construction of the Stadium Business Center building;
- Construction of an underfloor vent system below the Stadium Business Center building;
- Natural Attenuation of petroleum hydrocarbons in groundwater.

In addition, the Stadium Business Center building floor and associated asphalt and concrete pavements constructed during development of the Site will limit infiltration of rainwater at the Site and provide a physical barrier between chemicals of concern and potential receptors.

Remedial construction and development of the Site was performed from June 2001 through December 2001 with the removal of impacted soil and groundwater and construction of the Stadium Business Center building, associated parking areas, and the underfloor vent system. A summary of remedial construction activities is presented in the *Construction Documentation Report* for the Site, dated May __, 2002 (Geomatrix, 2002).

Eight on-Site groundwater monitoring wells were constructed during February 2002. Locations of these monitoring wells are depicted on Figure 2. These monitoring wells will be utilized for the MNA remedy for impacted groundwater at the Site. Additional off-Site monitoring wells will likely be installed in the next few months to supplement these on-Site wells.

A list of relevant project documents (i.e., design documents, approval letters, and implementation reports) is provided as Appendix A.

3.0 MAINTENANCE AND INSPECTION OF REMEDIAL COMPONENTS

This section describes procedures for maintaining and monitoring the condition of remedial action components constructed at the Site. Routine maintenance is required to ensure that the remedial action components perform as designed and limit future infiltration or exposure to COCs. The condition of each remedial action component will be reviewed periodically to (a) identify unexpected Site conditions, which may threaten the integrity of remedial components, and (b) evaluate whether additional, non-routine maintenance activities are necessary to remedy the identified conditions.

3.1 Routine Maintenance of Remedial Components

Planned routine maintenance activities are described below for the remedial action components constructed at the Site.

3.1.1 Building Floor and Pavement Cover Areas

The Stadium Business Center Building floor and associated pavements limit infiltration of rainwater at the Site and provide a physical barrier between chemicals of concern and potential receptors. No routine maintenance is planned for building floors. If significant cracks are observed within the building floors during Site inspections, the Site owner will seal the cracks with an impermeable sealant.

Routine maintenance for the asphalt parking areas will consist of sealing minor cracks on an annual basis, applying an asphalt seal coat approximately every five years, and milling and re-paving the entire surface approximately every 20 years. The frequency of asphalt seal coats and re-paving may vary depending on the condition of the material during annual inspections. The Site owner will be responsible for seal coating and re-paving the parking areas, as needed. The Site owner will notify the WDNR in writing when seal coating or re-paving is performed.

3.1.2 Underfloor Vent System

Routine maintenance planned for the underfloor vent system below the Stadium Business Center Building includes annual testing of the vent system to ensure that the system is functioning properly. Testing of the underfloor vent system will be performed by an engineer designated by the WDNR ("Designated Engineer"). The WDNR will make repairs to vapor extraction system piping, as needed, to correct problems observed during Site inspections. The vent testing protocol is discussed below.

3.2 Site Inspections

The plan for performing routine site inspections, groundwater monitoring, and annual site inspections is described below.

3.2.1 Routine Site Inspections by the Property Owner

The current Site owner has retained a Property Manager that will visit the Site regularly to perform building maintenance and to communicate with the Site tenants. The Property Manager will observe the condition of on-Site pavement areas, vent system piping, and monitoring wells approximately one time every three months. If the Property Manager observes significant damage to on-Site pavement areas, vent system piping, or monitoring wells, the Property Manager will notify the Site Owner and WDNR Project Manager. Notification is not required for pavement cracks resulting from normal wear and tear.

The Property Manager will also notify Site Owner and WDNR Project Manager prior to performing earthwork at the Site (see Section 4).

3.2.2 Groundwater Monitoring

A groundwater monitoring well network consisting of 8 wells was installed at the Site in February 2002. These newly constructed monitoring wells will be monitored by the Designated Engineer in accordance with the WDNR-approved Long-Term Groundwater Monitoring Plan for the Site. Future groundwater monitoring events will include sampling and analysis for volatile organic compounds ("VOCs") and geochemical parameters (e.g., dissolved oxygen, nitrate, sulfate, and dissolved iron) to monitor the progress of the natural attenuation remedy at the Site on a semi-annual basis. These data will be compiled, analyzed, and reported as discussed below.

3.2.3 Annual Site Inspections

During June of each year, representatives of the WDNR and the Designated Engineer will inspect the condition of the response action elements at the Site. The Site Owner or Property Manager will be present during annual inspections. A copy of the Annual Site Inspection Form that will be completed by the Designated Engineer during Annual Site Inspections is provided as Appendix B. As required by Chapter NR 724.13(e) of the Wisconsin Administrative Code, the Designated Engineer will complete WDNR form 4400-194 annually and submit the form to the WDNR. A copy of the appropriate portions of WDNR form 4400-194 is provided as Appendix C.

A Site Contact List is provided in Table 1. This list includes the Site Owner, contractors that have performed work at the Site, regulatory agency contacts, the Designated Engineer, the project analytical laboratory, geotechnical consultants, land surveyors, and drilling contractors. The Site Contact List will be used to facilitate communication between the involved parties. The Site Contact List will be updated and submitted to the WDNR as part of the Annual Site Inspection Reports discussed below.

Specific issues that will be reviewed during Annual Site Inspections are listed below.

Building floor and pavement cover areas:

The Designated Engineer will inspect the building floor slabs and asphalt pavements for significant settling, sinkholes, cracking and/or damage.

Underfloor Vent System:

The Designated Engineer will check above-grade piping for damage, collect air temperature and air flow velocity data to confirm that the system is passively ventilating. The Designated Engineer will also measure organic vapor concentrations in the exhaust air using a calibrated, hand held photo-ionization detector. The protocol for annual testing of the underfloor vent system is provided as Appendix D.

Natural Attenuation Groundwater Monitoring Network:

The Designated Engineer will check above-grade portions of existing monitoring wells for damage.

Communication with the Site Owner and Property Manager:

In conjunction with the Annual Site Inspection, the Designated Engineer will ask the Site Owner and Property Manager if they identified damage to on-Site remedial components during routine Site inspections. The Site Owner and Property Manager will also be asked if they have plans for conducting earthwork at the Site, including utility construction or repairs. The Designated Engineer will remind the Site Owner that they should notify WDNR staff before conducting earthwork or subsurface drilling at the Site (see Section 4.0).

3.2.4 Annual Site Inspection Report

The Designated Engineer will prepare and submit a letter report to the WDNR within 30 days following Annual Site Inspections. The letter report will include a summary of observations made during the annual inspections, a description of site maintenance activities performed since the previous annual inspection report, and recommendations for future site maintenance activities.

The following items will be submitted along with the annual inspection report:

- A completed Annual Site Inspection Form (see Appendix B);
- A completed copy of WDNR form 4400-194 (see Appendix C);
- A copy of photographs taken during the annual inspection; and
- An updated version of the Site Contact List (see Table 1).

The Site Owner will receive a copy of the annual inspection report. If significant damage to remedial components is observed during annual site inspections, the Contingency Plan described in Section 3.3 will be utilized to characterize the extent of the problem.

3.3 Contingency Plan

This Contingency Plan presents procedures that will be followed if potential problems related to the remedial action components at the Site are reported to the WDNR or observed during Annual Site Inspections. The Contingency Plan will be implemented if one of the following conditions is observed:

- Significant cracking or disturbance of building floors, asphalt pavement cover areas, or Site soils;
- Damaged sub-slab vapor extraction system conveyance piping; or
- Damaged groundwater monitoring wells.

The Contingency Plan will not be triggered by routine maintenance issues (e.g., minor cracking of asphalt pavements).

The Contingency Plan for the Site will consist of Problem Identification, Communication, Isolation, and Resolution.

Problem Identification includes assessing the extent of the observed problem. If the identified problem is related to disturbance of building floors, asphalt pavement cover areas, or Site soils, Problem Identification will include obtaining photographs, measurements of affected areas and depths, organic vapor measurements with a photoionization detector, and interviews with persons identified as having a role in the damage or disturbance. If appropriate, environmental samples will be collected to fully characterize the extent of the problem.

Communication includes notifying the Designated Engineer, who will notify the WDNR and the Site Owner of the unanticipated condition, the preliminary assessment of the hazard, and the expected response. The response or resolution will include repairs by the WDNR, Site Owner, or Site tenant, which address the identified problem.

Isolation may include covering damaged cover areas with plastic sheeting and surrounding the area with temporary fencing. These measures will remain in place until a plan is developed for repairing surface cover materials and material disposal options are evaluated, if required. Isolation may also include plugging damaged conveyance piping for the sub-slab vapor extraction system to prevent flow from below the floor into the ambient air of the Stadium Business Center building.

4.0 REQUIREMENTS FOR PERFORMING EARTHWORK AT THE SITE

Prior to performing earthwork at the Site, the Site Owner shall submit a workplan that provides the following information:

- A description of the planned work with a figure showing the planned vertical and horizontal extents of the earthwork;
- A Site-specific health and safety plan, in accordance with the requirements of 29 CFR 1910.120;
- A description of planned decontamination procedures for workers and construction equipment; and
- A waste management plan that describes planned temporary storage procedures for excavated soil and procedures for characterization and disposal of excavated soil, if appropriate.

The Site owner shall not proceed with the earthwork project until the workplan is approved by the WDNR.

Submittal of a workplan is not required if the planned earthwork is within the existing utility corridors, depicted on Figure 2, or if planned earthwork will not extend more than 3 feet below ground surface. The Site Owner will notify the WDNR Project Manager in writing before performing earthwork at the Site, including earthwork within existing utility corridors and outside utility corridors at depths less than 3 feet.

5.0 INSTITUTIONAL CONTROLS

Plans for establishing and reviewing of Institutional Controls at the Site are discussed below.

5.1 Groundwater Use Restrictions

Due to residual groundwater impacts at the Site, the Site will be added to the WDNR's geographic information system ("GIS") registry of closed remediation sites, as a condition of Site closure, in accordance with Chapter NR 726.05 of the Wisconsin Administrative Code. The Site is located within a service area of a municipally owned water system. In accordance with Chapter 812.10(2) of the Wisconsin Administrative Code, well drillers are required to contact the WDNR Drinking and Groundwater Bureau before constructing or reconstructing groundwater extraction wells within municipally owned water systems to determine if the property on which the well is or will be located is listed on the WDNR's registry of closed remediation sites. After the Site is closed, WDNR staff will inform drilling contractors that contact the WDNR regarding potential well installation at the Site that groundwater extraction wells may not be constructed unless special authorization is granted from the WDNR.

The current Site Owner is aware of groundwater impacts at the Site and currently has no plans to install water production wells. The WDNR Project Manager will manage well drilling activities at the Site until the Site is added to the WDNR's GIS system. The Designated Engineer will include summaries of the status of Site Closure Activities and the Site's registry with the WDNR's GIS in future Annual Site Inspection Reports.

5.2 Deed Restrictions to Address Residual Soil Impacts

Due to residual soil impacts at the Site, the WDNR will require the Site Owner to establish institutional controls at the Site, as a condition of Site Closure, to notify future owners/users of the Site of the residual soil impacts. In accordance with NR726 of the Wisconsin Administrative Code, the WDNR will require the Site Owner to record a deed restriction with Milwaukee County that describes the location of residual soil impacts and on-Site engineering controls designed to prevent future exposures to impacted soil. The WDNR will also require the Owner to record an affidavit with Milwaukee County that will give notice to any prospective purchaser of the Site of residual soil contamination. **[Eric: what are the WDNR's plans for institutional controls for this Site.....NR 726 says that the WDNR <u>may</u> require these deed restrictions]**

GIS

The WDNR is currently considering rule changes that would establish a GIS registry for Sites closed with residual soil contamination as a means to notifying future owners/users of the Site. The soil GIS registry would be analogous to the WDNR's current GIS system for groundwater impacts. Sites closed with residual soil contamination would be placed in the soil GIS registry as a means of notifying future owners/users of the property of the existence of soil contamination. The Designated Engineer will summarize the status WDNR's soil GIS Program in future Annual Site Inspection Reports.

The current Site Owner is aware of residual soil impacts at the Site and currently has no plans to perform earthwork. The WDNR Project Manager will manage earthwork activities at the Site as described in Section 4. The Designated Engineer will summarize the status of Site closure activities and institutional controls in future Annual Site Inspection Reports.

REFERENCES

Geomatrix, 2001: Geomatrix Consultants, Inc.; April 9, 2002; Final Remedial Design Report, Former Mobile Blasting Property, West Milwaukee, Wisconsin.

Geomatrix, 2002: Geomatrix Consultants, Inc.; May __, 2002; Construction Documentation Report, Former Mobile Blasting Property, West Milwaukee, Wisconsin.

URS, 1999: URS Greiner Woodward Clyde; June 10, 1999; NR716 Site Investigation, Former Mobile Blasting and Painting Property, 1604 South 43rd Street, West Milwaukee, Wisconsin.

WDNR, 2001: Wisconsin Department of Natural Resources; February 20, 2001; Written Decision and Remedial Action Options Report for Soil and Groundwater Restoration at the Former Mobile Blasting Site in the Village of West Milwaukee, Wisconsin.

TABLE 1
SITE CONTACT LIST

Former Mobile Blasting Site, West Milwaukee, Wisconsin

WDNR PROJECT MANAGER

Name:	Wisconsin Department of Natural Resources
Address:	2300 North Martin Luther King Jr. Drive
	Milwaukee, WI 53212
Phone No.:	(414) 263-8639
Fax No.:	(414) 263-8606
Project Manager:	Mr. Eric Amadi

PROPERTY OWNER

Name:	Mobile Blasting, LLC.
Address:	3060 Metropolitan Centre
	333 South Seventh Street
	Minneapolis, Minnesota 55402
Phone No.:	(612) 904-1513 x 11
Fax No.:	(612) 904-1590
Contact:	Mr. Jeff Hall

PROPERTY MANAGER

Name:	Inland Properties
Address:	10850 West Park Place #970
	Milwaukee, WI 53224
Phone No.:	(414) 979-8311
Fax No.:	(414) 359-9024
Contact:	Mr. Marley Miller

DESIGNATED ENGINEER

Name:	Geomatrix Consultants, Inc.
Address:	14525 Highway 7, Suite 104
	Minneapolis, Minnesota 55343
Phone No.:	(952) 935-1010
Fax No.:	(952) 935-1254
Project Manager:	Mr. Michael Beck, P.E.
Field Representative:	Mr. Brad Schwie

TABLE 1
SITE CONTACT LIST

Former Mobile Blasting Site, West Milwaukee, Wisconsin

GENERAL CONTRACTOR

Name:	Inland Construction
Address:	10850 West Park Place #970
	Milwaukee, WI 53224
Phone No.:	(414) 979-8311
Fax No.:	(414) 359-9024

Contractor Project Manager: Mr. Bruce Stern

Contractor Site Superintendent: Mr. Steve Thomann

REMEDIATION CONTRACTOR

Name:	Dakota Intertek Corporation
Address:	16600 West National Avenue
	New Berlin, WI 53151
Phone No.:	(262) 784-8844
Fax No.:	(262) 784-8833

Contractor Project Manager: Mr. Paul Herbert

Contractor Site Superintendent: Mr. Bob Lezczynski

GEOTECHNICAL ENGINEER

Name:	KTE Consultants, Inc.
Address:	3315 North 124th Street, Suite A
	Brookfield, Wisconsin 53005
Phone No.:	(262) 790-5540
Fax No.:	(262) 790-5541
Project Manager:	Doug Dettmers

TABLE 1
SITE CONTACT LIST

Former Mobile Blasting Site, West Milwaukee, Wisconsin

ANALYTICAL LABORATORY

Name:	Legend Technical Services, Inc.
Address:	775 Vandalia Street
	St. Paul, Minnesota 55114
Phone No.:	(651) 642-1150
Fax No.:	(651) 642-1239
Laboratory Manager:	Ms. Amy Hietala

SURVEY CONTRACTOR

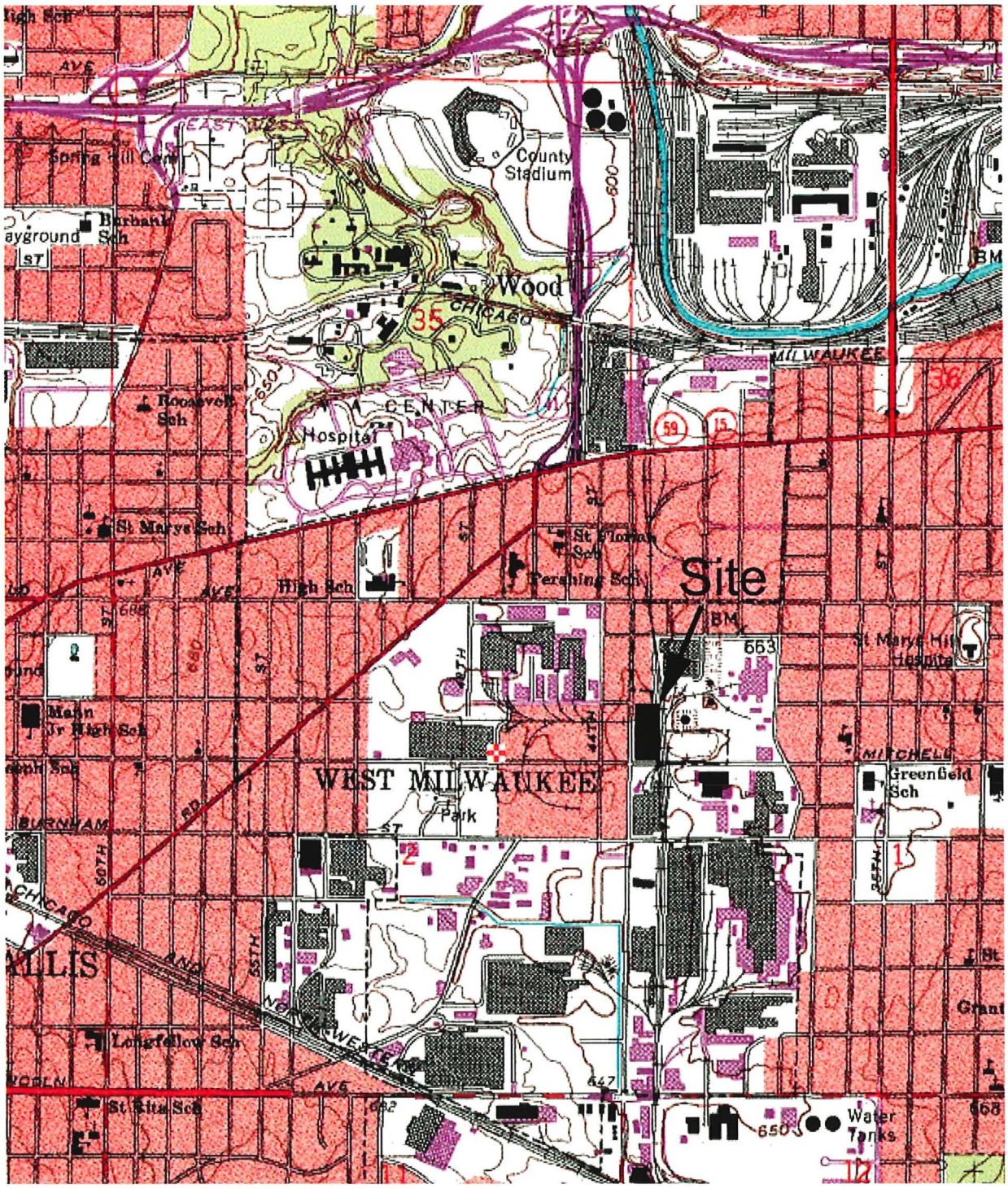
Name:	North Shore Engineering
Address:	11433 North Port Washington Road
	Mequon, Wisconsin 53092
Phone No.:	(262) 241-9400
Fax No.:	(262) 241-5337
Project Manager:	Mr. Jim Hensel
Survey Crew Chief:	TBD

DRILLING CONTRACTOR (DIRECT-PUSH RIG)

Name:	Groundwater Management Service Inc.
Address:	P.O. Box 252
	Northlake, WI 53064-0252
Phone No.:	(800) 538-1934
Fax No.:	(262) 538-1958
Project Manager:	Mr. Dan Bendorf

MONITORING WELL INSTALLATION CONTRACTOR

Name:	Badger State Drilling, Inc.
Address:	360 Business Park Circle
	Stoughton, WI 53589
Phone No.:	(608) 877-9770
Fax No.:	(608) 877-9771
Project Manager:	Mark Garwick



GEOMATRIX

SITE MAP
Mobile Blasting
1604 Miller Park Way, West Milwaukee, WI

Project No.
7269

Figure
1

ELECTRICITY CORRIDOR

CHICAGO NORTHWESTERN R.R.

FHP Area A

MW-105

MW-104

I-3

I-5

I-6

I-4

I-2

UTILITY CORRIDOR (12' DEEP)

4-INCH PVC WATER LATERAL

W. MITCHELL ST.

MW-108

FORMER UST–VAULT AREA

I-7

FHP Area B

STADIUM BUSINESS CENTER BUILDING

MW-106

MW-997R

MW-101

J-1

I-8

I-9

I-10

I-11

MW-103

MW-102

STORM SEWER

UTILITY CORRIDOR FOR STORM SEWER

UTILITY CORRIDOR (12' DEEP)

MILLER PARK WAY

6-INCH SANITARY LATERAL

N

0 50

SCALE IN FEET

LEGEND

SITE BOUNDARY

MW-101 MONITORING WELLS

CURRENT SITE PLAN
Former Mobile Blasting & Painting Site
West Milwaukee, Wisconsin

GEOMATRIX

Project No. 7269

Figure 2

APPENDIX A

SITE DOCUMENT LIST

Former Mobile Blasting Site
West Milwaukee, Wisconsin

Geomatrix, 2001: Geomatrix Consultants, Inc.; April 9, 2001; Final Remedial Design Report, Former Mobile Blasting Property.

Geomatrix, 2002: Geomatrix Consultants, Inc.; June __, 2002; Construction Documentation Report, Former Mobile Blasting Property, West Milwaukee, Wisconsin.

WDNR, 1996: Wisconsin Department of Natural Resources; August 27, 1996; Phase I Environmental Assessment Report.

WDNR, 1997: Wisconsin Department of Natural Resources; April 8, 1997; Phase II Environmental Assessment Report.

WDNR, 2001A: Wisconsin Department of Natural Resources; February 20, 2001, Written Decision and Remedial Action Options Report for Soil and Groundwater Restoration at the Former Mobile Blasting Site in the Village of West Milwaukee, Wisconsin.

WDNR, 2001B: Wisconsin Department of Natural Resources; Contract Documents, Former Mobile Blasting and Painting Site Remedial Action Implementation, Village of West Milwaukee, Milwaukee County, Wisconsin.

URS, 1999: URS Greiner Woodward Clyde; April 19, 1999; Geotechnical Investigation Former Mobile Blasting Property, West Milwaukee, Wisconsin.

URS, 1999: URS Greiner Woodward Clyde; June 10, 1999; Remedial Action Plan, Former Mobile Blasting and Painting Property, 1604 South 43rd Street.

URS, 1999: URS Greiner Woodward Clyde; November 5, 1999; Supplemental Site Investigation, Former Mobile Blasting and Painting Site, West Milwaukee, Wisconsin.

URS, 2000: URS Greiner Woodward Clyde; February 9, 2000; Results of Recent Investigation, Former Mobile Blasting and Painting Site, 1604 South 43rd Street.

URS, 2000: URS Greiner Woodward Clyde; February 9, 2000; Technical Memorandum Submitted in Support of Mobile Blasting, LLC Request for Off-Site Determinations, Former Mobile Blasting and Painting Site 1604 South 43rd Street.

URS, 2000: URS Greiner Woodward Clyde; April 21, 2000; Summary of Data, Former Mobile Blasting and Painting Site, West Milwaukee, Wisconsin.

URS, 2000: URS Greiner Woodward Clyde; July 7, 2000; Submittal of Off-Site Investigation Data, Former Mobile Blasting and Painting Site, West Milwaukee, Wisconsin.

APPENDIX B

ANNUAL SITE INSPECTION FORM

Former Mobile Blasting Site
West Milwaukee, Wisconsin

Date of Inspection:_____ Time:_____
Day/Month/Year

INDIVIDUALS PRESENT FOR INSPECTION:

Print Name:	Company/Agency:	Signature:
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

INSPECTION OF BUILDING FLOORS AND PAVEMENT COVER AREAS:

General Condition of Building Floors: _____

_____

Description of Damage/Cracking Observed: _____

_____

General Condition of Asphalt Pavement Cover Areas: _____

_____

Description of Damage/Cracking Observed: _____

_____

INSPECTION OF VAPOR BARRIER/EXTRACTION SYSTEM:

General Condition of Above-grade Piping, Exhaust Stack, and Vents:_____

_____

Description of Damage Observed: _____

_____

Exhaust System Air Measurements (see Appendix D for instructions):

Outdoor Temperature: _____

Background PID Reading: _____

Calibration Gas PID Reading: _____

Calibration Gas type and concentration: _____

Exhaust Air Temperature: _____

Exhaust Flow-Rate: _____

Exhaust Air PID Reading: _____

General Observations: _____

_____

_____

INSPECTION OF GROUNDWATER MONITORING NETWORK:

General Condition of Monitoring Wells:_____

_____

Description of Damage Observed: _____

_____

_____

OTHER:

Relevant Site Activities Observed by Property Tenants: _____

_____

_____

General Observations: _____

_____

_____

ACTION ITEMS:

Action Required	Planned Date of Action	Follow-Up Inspection Required?
1.		
2.		
3.		

14525 Highway 7
Suite 104
Minneapolis, Minnesota 55343
(952) 935-1010 • FAX (952) 935-1254

GEOMATRIX

Transmittal

Sent Via: ☐ Messenger ☐ U.S. Mail ☒ Overnight Mail

Date: June 19, 2002

To: Mr. Eric Amadi
Wisconsin Department of Natural Resources
2300 North ML King Jr. Drive
Milwaukee, WI 53212

From: Michael Beck, P.E.
Geomatrix Consultants

cc:

RECEIVED
JUN 2 0 2002
By

Project Number: 007269.000.0

Project Name: Former Mobile Blasting & Painting Site

Item	Description
1 Orginal	Draft Site Operation and Maintenance Plan

Remarks

Eric:

I have attached a draft of the Site Operation and Maintenance Plan for your review. We are still working on Appendix D. If you have any questions, please call me at (952) 935-1010. Thanks – Mike.

OPERATION, MAINTENANCE, MONITORING AND OPTIMIZATION REPORTING OF SOIL AND GROUNDWATER REMEDIATION SYSTEMS

PURPOSE AND APPLICABILITY OF THIS FORM: Completion of this form is required under s. NR 724.13(e), Wis. Adm. Code. Use of this form is mandatory. Failure to submit this form as require is a violation of s. NR 724.13, Wis. Adm. Code, and is subject to the penalties in s. 144.99, Wis. Stats. This form must be submitted every six months for active soil and groundwater remediation projects and every twelve months for passive (natural attenuation) remediation projects that are regulated under the NR 700 series of Wis. Adm. Code. Specifically, for sites meeting any of the following criteria:

- Soil or groundwater remediation projects that report progress in accordance with s. NR 700.11(1), Wis. Adm. Code.
- Soil or groundwater remediation projects that report progress in accordance with s. NR 724.13(3), Wis. Adm. Code. (Note: s. NR 724.13(3) requires progress reports for operation and maintenance of active systems to be submitted every three months however the Department considers submittal of this form every six months to satisfy the requirements of the rules, unless otherwise directed by the Department on a site specific basis.)
- Soil or groundwater remediation projects that report progress in accordance with s. NR 724.17(3), Wis. Adm. Code. (Note: s. NR 724.17(3) requires progress reports every time that samples are collected however the Department considers submittal of this form every twelve months to satisfy the requirements of the rules for monitoring natural attenuation, unless otherwise directed by the Department on a site specific basis.)

Submittal of this form is not a substitute for reporting required by Department programs such as Wastewater or Air Management. Personally identifiable information on this form is not intended to be used for any other purpose than tracking progress of the remediation by the Bureau for Remediation and Redevelopment.

Please refer to the instructions that are attached to the back of these forms starting on page INS-1. In all cases, when asked to "explain," those explanations are to be included on separate sheets of paper. Explanations must include a title that refers to the page and item number, for example: Page GI-2, C.1.a.

A. GENERAL INFORMATION:

1. Site name: _____
2. Reporting period from: _____ To: _____ Days in period: _____
3. Regulatory agency (enter DNR, DCOM, DATCP and/or other): _____
4. DNR issued site number: _____
5. State reimbursement fund claim number and fund name (if not applicable, enter NA): _____
6. Site location:
   a. DNR region and county: _____
   b. Street address and municipality: _____
   c. Township, range, section and quarter quarter section: _____
7. Responsible party:
   a. Name: _____
   b. Mailing address: _____
   _____
   c. Phone number: _____
8. Consultant:
   a. Company name: _____
   b. Mailing address: _____
   _____
   c. Phone number: _____
9. Contaminants: _____
10. Soil types (USCS or USDA): _____
11. Hydraulic conductivity (cm/sec): _____ 12. Average linear velocity of groundwater (ft/yr): _____

GENERAL SITE INFORMATION, CONTINUED

SITE NAME AND REPORTING PERIOD:

Site name: _____

Reporting period from: _____ To: _____ Days in period: _____

A. GENERAL INFORMATION (CONTINUED):

13. If soil is treated ex situ, is the treatment location off site? (Y/N) If yes, give location:

    a. DNR region and county: _____

    b. Township, range, section and quarter quarter section: _____

B. REMEDIATION METHOD: Only submit pages that apply to an individual site. Check all that apply:

_____ Groundwater extraction (submit a completed page GW-1).
_____ Free product recovery (submit a completed page GW-1).
_____ In situ air sparging (submit a completed page GW-2).
_____ Groundwater natural attenuation (submit a completed page GW-3).
_____ Other groundwater remediation method (submit a completed page GW-4).
_____ Soil venting (including soil vapor extraction and bioventing, submit a completed page IS-1).
_____ Soil natural attenuation (submit a completed page IS-2).
_____ Other in situ soil remediation method (submit a completed page IS-3).
_____ Biopiles (submit a completed page ES-1).
_____ Landspreading/thinspreading of petroleum contaminated soil (submit a completed page ES-2).
_____ Other ex situ soil remediation method (submit a completed page ES-3).

C. GENERAL EFFECTIVENESS EVALUATION FOR ALL ACTIVE SYSTEMS: If the remediation is active (not natural attenuation), complete this subsection.

1. Is the system operating at design rates and specifications? (Y/N): _____
   If the answer is no, explain whether or not modifications are necessary to achieve the goal that was previously established in design.
2. Are modifications to the system warranted to improve effectiveness? (Y/N) If yes, explain: _____
3. Is natural attenuation an effective low cost option at this time? (Y/N): _____
4. Is closure sampling warranted at this time? (Y/N): _____
5. Are there any modifications that can be made to the remediation to improve cost effectiveness? (Y/N) If yes, explain: _____

D. ECONOMIC AND COST DATA TO DATE:

1. Total investigation costs ($): _____
2. Implementation costs (design, capital and installation costs, excluding investigation costs) ($): _____
3. Total costs during the previous reporting period ($): _____
4. Total costs during this reporting period ($): _____
5. Total anticipated costs for the next reporting period ($): _____
6. Are any unusual or one-time costs listed in the reporting periods covered by D.3., D.4. or D.5. above? (Y/N) If yes explain: _____
7. If close out is anticipated within 12 months, estimated costs for project closeout ($): _____

GENERAL SITE INFORMATION, CONTINUED

SITE NAME AND REPORTING PERIOD:

Site name: _____

Reporting period from: _____ To: _____ Days in period: _____

E. NAME(S), SIGNATURE(S) AND DATE OF PERSON(S) SUBMITTING FORM: Legibly print name, date and sign. Only persons qualified to submit reports under ch. NR 712 Wis. Adm. Code are to sign this form.

Registered Professional Engineers:

I (print name) _____, hereby certify that I am a registered professional engineer in the State of Wisconsin, registered in accordance with the requirements of ch. A-E 4, Wis. Adm. Code; that this document has been prepared in accordance with the rules of Professional Conduct in ch. A-E 8, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code.

Signature, title, P.E. number and date: _____

Hydrogeologists:

I (print name) _____, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03(1), Wis. Adm. Code, and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code.

Signature, title and date: _____

Scientists:

I (print name) _____, hereby certify that I am a scientist as that term is defined in s. NR 712.03(3), Wis. Adm. Code, and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code.

Signature, title and date: _____

Professional Seal(s), if applicable:

NATURAL ATTENUATION (PASSIVE BIOREMEDIATION) IN GROUNDWATER

SITE NAME AND REPORTING PERIOD:

Site name: _____

Reporting period from: _____ To: _____ Days in period: _____

A. EFFECTIVENESS EVALUATION:

1. If free product is not present, determine the single contaminant that requires the greatest percent reduction to achieve ch. NR 140 ES and PAL. Perform this calculation for all contaminants that were present at the site that have ch. NR 140 standards. Use the highest contaminant concentration measured in any sampling points during reporting period. If free product is present, write "FREE PRODUCT" in A.1.a.

    a. Contaminant: _____

    b. Percent reduction necessary to reach ch. NR 140 ES and PAL: _____

    c. Maximum contaminant concentration level in any monitoring well (µg/L): _____

2. Aquifer parameters:

    a. Hydraulic conductivity (cm/sec): _____

    b. Groundwater average linear velocity (ft/yr): _____

3. Is there a downgradient monitoring well that meets ch. NR 140 standards (Y/N): _____

4. Based on water chemistry results, is the plume expanding, stabilized or contracting: _____

5. If the answer in 4. (above) is "expanding," is natural attenuation still the best option? (Y/N) If yes, explain: _____

6. Biodegradation parameters:

    a. Upgradient (or other site specific background) DO level (mg/L): _____

    b. DO levels in the part of the plume that is most heavily contaminated (mg/L): _____

7. Is site closure a viable option within 12 months from the date of this form? (Y/N): _____

8. Are there any modifications that can improve cost effectiveness? (Y/N) If yes, explain: _____

9. Have groundwater table fluctuations changed the contaminant level trends over time? (Y/N) If yes, explain): _____

10. Has the direction of ground water flow changed during the reporting period? (Y/N) If yes, approximate change in degrees: _____

B. ADDITIONAL ATTACHMENTS: Attach the following to this form:

- Groundwater contour map.
- Groundwater contaminant distribution map (may be combined with contour map).
- When contaminants are aerobically biodegradable, attach a dissolved oxygen in groundwater map (dissolved oxygen may be combined with the contaminant data on a single map).
- Graph of contaminant concentrations versus time for the contaminant listed in A.1.a. (above) for the monitoring point with the greatest level of contamination.
- Graph of contaminant concentrations versus distance.
- Groundwater contaminant chemistry table.
- Groundwater biological parameters.
- Groundwater elevations table.

INSTRUCTIONS AND INFORMATION.

Specific Page by Page Instructions for This Form. The site name and reporting period is listed on every page. Then if the pages are inadvertently separated, that information can be used to determine which pages form the report.

When the form specifies that the person filling in the form "explain," those explanations are to be included on separate sheets of paper. Explanations must include a title that refers to the page and item, for example: Page GI-2, C.1.a.

Page GI-1, General Site Information.

— A.1. List the name as it appears on the DNR tracking system. If the person filling out the form does not know what the name on the tracking system is, use the name that the DNR used in the most recent correspondence.

— A.2. The reporting period should be either from January 1 to June 30 or July 1 to December 31 for active systems. For passive systems, use a calendar year basis. If however the report covers a newly installed system, list the actual startup date instead of January 1 or July 1. For new passive systems, use the first date that monitoring data is available as the date of startup.

— A.3. Enter all regulatory agencies that regulate the site.

— A.4. This form is a DNR form. For that reason, list the DNR site number. If there are other agencies regulating the site, listing identification numbers for other agencies is also recommended, but not mandatory, unless specified by those other agencies.

— A.5. Some sites are eligible for reimbursement from one or more state agencies. List all agencies that will be asked to reimburse costs on this site and the claim numbers issued by those agencies.

— A.6. If the information listed for the site location is not sufficient information for a person to use to drive to a site (example: no street address in a rural area), also include a map that is sufficient for a person to use to drive to the site. A U.S.G.S. topographic map that shows the site location may be used.

— A.7. Self explanatory.

— A.8. Self explanatory.

— A.9. List the contaminants that have at one time exceeded the PALs or Table Values in ch. NR 720. If GRO and/or DRO exceed the ch. NR 720 standards, also list GRO and/or DRO. Do not list other contaminants that have never exceeded state standards at the site. If more room is necessary, write "SEE ATTACHED SHEETS" and list all contaminants on a separate sheet.

— A.10. List the predominant soil types that are contaminated. If there is both contaminated soil and groundwater at the site, list soil types both above and below the water table. If only some soil is contaminated, do not list the soil types that are uncontaminated. If the site soils meet soil cleanup criteria, but groundwater is contaminated, so state that. Specify if the USCS or USDA system is used for soil descriptions. This line specifies soil because the vast majority of contaminated sites do not have contaminated bedrock. If bedrock is contaminated, also list that bedrock type.

— A.11. If the groundwater meets ch. NR 140 standards, enter "NA - NO NR 140 EXCEEDANCES". Otherwise, list the estimated hydraulic conductivity and the method used to estimate it (bail-down tests, calculations based on grain size, pumping test, etc.) If the hydraulic conductivity has not been determined, state when the tests are to be conducted. When a number of test results are available, list the range of results and the geometric mean. If however some results have a low level of accuracy and some results have a high level of accuracy, you should only list the most accurate results. See the Section on aquifer testing in the *Guidance on Design, Installation and Operation of Ground Water Extraction and Product Recovery Systems* for more information.

— A.12. If the groundwater meets ch. NR 140 standards, enter "NA - NO NR 140 EXCEEDANCES". Otherwise, enter groundwater average linear velocity as a function of hydraulic conductivity, effective porosity and the groundwater gradient. You should use the geometric mean from A.11. (above) and the most representative value for the gradient at the site. Estimate the effective porosity based on soil types and geologic origin of the soil. If there are reasons to believe that the average liner velocity estimate is less than the actual rate at the site, so state that reason. Secondary porosity effects, flow through submerged utility trenches, widespread contaminant distribution in low permeability soils, etc., are reasons to assume that the actual migration rate is much greater than the predicted average linear velocity. In such cases, you should explain the reasoning for doubting the predicted average linear velocity.

Page GI-2, General Site Information Continued.

List site name as shown on page GI-1 and the reporting period.

— A.13. If the information listed for the soil treatment location is not sufficient information for a person to use to drive to a site, also include a map that is sufficient for a person to use to drive to the site. A U.S.G.S. topographic map or a plat map that shows the site location may be used.

Page GI-2, General Site Information Continued.

— B. Check all methods used at a site. For example, if groundwater extraction, free product recovery and soil venting are used, check all three methods and submit the additional pages for those methods. If dual-phase or bioslurping are used, these methods extract both air and groundwater, check boxes for and attach additional pages for both soil venting and pump and treat.

— C. Remediation systems that use any form of enhancement are considered "active" and sites where there are no enhancements of any kind are considered "passive" forms of remediation. For purposes of these forms, natural attenuation (also called naturally occurring bioremediation) is "passive" and all other remediation methods are "active" methods.

— C.1. Design flow rates refers to flow rates such as gallons per minute extracted by a ground water extraction system, standard cubic feet per minute extracted by a soil venting system, standard cubic feet per minute injected by an in situ air sparging system, etc. If the actual flow rate is within 80 percent of the rate predicted in the design, consider that as meeting the design specification.

— C.2. Self explanatory.

— C.3. Self explanatory.

— C.4. Self explanatory.

— C.5. Self explanatory.

— D. The cost data in this section is used by DNR staff to evaluate whether or not the selected remedy is the most cost effective remedy and whether or not system modifications may be warranted to improve efficiency and/or cost effectiveness. Responsible parties and consultants are encouraged to submit cost information so that DNR staff may assist responsible parties and consultants accomplish environmental cleanups in the most cost effective manner.

Total costs for past costs are all costs to date. This information is for all costs that were incurred to investigate and/or remediate the site. These costs include but are not limited to: consulting labor and supplies, laboratory testing, transportation, equipment, etc. If the consultant does not pass all costs through the consulting firm, the consultant will need to contact their client for other non-consulting costs to determine total costs. Exceptions include costs for attorney fees, accounting, claim assistance in preparing claims to state reimbursement funds, or other indirect expenses that are not essential to remediating the site.

— D.1. Self explanatory.

— D.2. The initial implementation costs are all costs that are incurred to start implementing a remedy at a site. Costs for the investigation however are excluded because those costs are incurred prior to remedy selection. Since costs for treatability and/or pilot testing are used to procure data for remedial design and are specific to different remediation methods, these costs should be included in implementation costs and not investigation costs. Startup or shakedown costs are also considered implementation costs and should not be considered operation and maintenance costs.

— D.3. Costs for implementation or investigation should not be repeated here or they will be double counted.

— D.4. Costs for implementation or investigation should not be repeated here or they will be double counted.

— D.5. Costs for implementation or investigation should not be repeated here or they will be double counted.

— D.6. Examples of one-time or unusual costs include the following:
- o Replacing a burned out motor on a pump.
- o Replacement of a well that was destroyed by a snowplow.
- o Confirmation sampling to determine if the site meets closeout criteria. This type of cost is considered an unusual cost because this type of sampling is not conducted during most reporting periods.

— D.7. This estimate of costs is for all costs to close out a site minus the salvage value of any remediation equipment. Pertinent costs include items such as well abandonment, equipment removal from the site, consulting costs associated with these items, etc. Do not include any costs that will not be paid by a state reimbursement fund, such as repaving.

Page GI-3, General Site Information Continued.

— E. Self explanatory.

Page GW-1, Groundwater Extraction and Product Recovery.

List site name as shown on page GI-1 and the reporting period.

— A.1. List two numbers, the total number of extraction wells at the site and the number that were in actual use during the period. If all wells were in use, state that on the form.

— A.2. The number of days of operation are the number of days that the system was actually operated. If the system was shut down for reasons such as: repairs were necessary, piping froze, shut down to provide time for subsurface conditions to equilibrate before sampling, etc., do not list those days as being in operation.

— A.3. System utilization is a measure of the amount of time that the system operated relative to the amount of time that it could have operated.

Page GW-1, Groundwater Extraction and Product Recovery (Continued).

— A.4. Self explanatory.
— A.5. The average is for the entire site, not per well or trench. For purposes of determining the average ground water extraction rate, calculate the average based on the total volume of groundwater extracted divided by the time of the reporting period. For example, if the system operated at 10 gallons per minute for one month, the amount of water extracted would be approximately 432,000 gallons. If the reporting period was six months long, then the time period is approximately 260,000 minutes. Therefore, the average flow rate over six months is 432,000 divided by 260,000 minutes for an average flow rate of 1.67 gallons per minute (gpm).
— A.6. Calculate the total dissolved contaminants removed in pounds. If the estimate is a sum of BTEX and not based on a total hydrocarbon test (GRO and/or DRO), so state that on the form.

— B.1. Self explanatory.
— B.2. Self explanatory.
— B.3. The average should be based on the entire site over the entire reporting period. See instructions above for A.5. List the free product recovery rate as gallons per day (gpd), not gallons per minute (gpm).

— C.1. To answer this question, a thorough evaluation of water levels and chemical analyses in all monitoring points at the site is necessary.
— C.2. If the capture zone has not been determined mathematically, it will need to be determined to answer this question. See the *Guidance on Design, Installation and Operation of Ground Water Extraction and Product Recovery Systems* for and any recent update or errata sheets for more information on plume capture.
— C.3. Self explanatory.
— C.4. When free product is present, line C.4.a. should state "FREE PRODUCT" and lines C.4.b. through C.4.d. are left blank. Otherwise, complete the following calculations.
There typically are several compounds at most contaminated sites that exceed the standards in ch. NR 140. The purpose of this question is to focus on the single contaminant that requires the most treatment to achieve groundwater quality standards on a percent reduction basis. For example, the most recent round of sampling at an example site demonstrated the highest levels of contaminants were 1,000 µg/L benzene and 1,000 µg/L toluene in the most heavily contaminated monitoring well. The ES and PAL for benzene is 5 µg/L and 0.5 µg/L (respectively) and for toluene the ES and PAL is 343 µg/L and 68.6 µg/L (ES and PAL data as of August 1995). Therefore the percent reduction to meet the ES and PAL for benzene is 99.5 and 99.95 percent and for toluene it is 65.7 and 93.14 percent. For that reason, the single contaminant that is most critical to reaching state groundwater standards is benzene. Therefore benzene is entered on line a. In this example, 99.5 and 99.95 percent is entered on line b. In this example, 1,000 µg/L is entered on line c. In this example, benzene is the driving factor, therefore enter the maximum benzene level in the single most heavily contaminated extraction well during the most recent sampling period on line d.

— D. See the generic discussion at the end of the instructions (below) for figures, graphs and tables, starting on page INS-7.

Page GW-2, In Situ Air Sparging.

List site name as shown on page GI-1 and the reporting period.

— A.1. Self explanatory.
— A.2. Self explanatory.
— A.3. Self explanatory.

— B.1. See instructions for Page GW-1, Item C.4.
— B.2. Self explanatory.
— B.3. Self explanatory.

— C. See the generic discussion at the end of the instructions (below) for figures, graphs and tables, starting on page INS-7.

Page GW-3, Natural Attenuation in Groundwater.

List site name as shown on page GI-1 and the reporting period.

— A.1. See instructions for page GW-1, Item C.4.
— A.2.a. List the estimated hydraulic conductivity that was listed on line A.11 on page GI-1.
— A.2.b. List the groundwater average linear velocity that was listed on line A.12 on page GI-1.
— A.3. Assess the monitoring well network to determine if there is a down gradient well that has not been impacted by the contaminants. Consider the possibility of a submerged (or diving) plume in that assessment. If all evidence indicates that the plume does not extend to the farthest "clean" downgradient well, indicate "YES" on the form. Otherwise indicate "NO" on the form. If there are not plans to install such a well, explain.

Page GW-3, Natural Attenuation in Groundwater (Continued).

— A.4. Based on the contaminant distribution, evaluate whether or not the plume is expanding, stabilized, or contracting. When making this determination, consider the contaminant that requires the greatest percent reduction to achieve ch. NR 140 standards.
— A.5. If the plume is expanding and a justification is necessary, add additional sheets justifying why natural attenuation is still the appropriate remedy. If it is not, further describe in the explanation the plans to use a different remedy.

— A.6.a. Enter the upgradient dissolved oxygen (DO) level(s). If however there are contaminants measured in the upgradient well, it is not a true background measurement. In that case enter "UNKNOWN" on the form.
— A.6.b. Enter the range of DO values measured in wells within the plume.
— A.7. Self explanatory.
— A.8. Self explanatory.
— A.9. Self explanatory.
— A.10. Self explanatory.

— B. See the generic discussion at the end of the instructions (below) for figures, graphs and tables, starting on page INS-7.

Page GW-4, Other Groundwater Remediation Methods.

List site name as shown on page GI-1 and the reporting period.

— A.1. See instructions for page GW-1, Item C.4.
— A.2. Self explanatory.
— A.3-4. Enter the information specified by the DNR for this method at this site.

Page IS-1, Soil Venting (Including both Soil Vapor Extraction and Bioventing).

List site name as shown on page GI-1 and the reporting period.

— A.1. Self explanatory.
— A.2. Self explanatory.
— A.3. Self explanatory.

— B.1 Self explanatory.
— B.2. Self explanatory.
— B.3. This subsection is used as a trigger for determining if the system requires an evaluation for future activities, such as improvements, converting the site to monitoring for natural attenuation, closure, etc. If an in situ respiration test must be performed, see Hinchee, R.E. and Ong, S.K. 1992. A Rapid In Situ Respiration Test for Measuring Aerobic Biodegradation Rates of Hydrocarbons in Soil. *Journal of the Air and Waste Management Association.* Volume 42, Number 10. Pages 1305 to 1312 for general procedures. For a discussion of methane monitoring, see the instructions for page IS-2, item A.1.d., below. If the contaminant extraction rate in B.3. is greater than the trigger levels, leave lines B.3.a.i. and B.3.a.ii. blank.

— C. See the generic discussion at the end of the instructions (below) for figures, graphs and tables, starting on page INS-7.

Page IS-2, Natural Attenuation in Soil.

List site name as shown on page GI-1 and the reporting period.

— A.1. This data is used to assess subsurface conditions based on soil gas data. Whenever possible, a permanently installed gas probe should be used. If at all possible, the gas probe should be located in the part of the site that is most heavily contaminated, since that is the part of the site that is likely to take the longest amount of time to meet ch. NR 720 standards. Water table wells that have screen exposed above the water table are also good measuring points. When installing permanent gas probes, you should install the screen deep enough that a true measure of the most heavily contaminated soil is possible, but install the screen shallow enough to assure that it is not submerged by groundwater table fluctuations. In some situations where the depth of contamination is variable, consideration should be given to using nested gas probes instead of only using probes at a single depth. Measuring points that should not be used include temporary gas probes because these points are less repeatable from one monitoring event to the next. Also, if there has been an active soil venting system in use at the site, the air extraction wells should not be used because these wells are in locations that have had much more aggressive treatment than the rest of the site.
— A.1.a. A flame ionization detector (FID) is specified instead of a photo ionization detector (PID) because PIDs often read inaccurately in moist oxygen deficient/carbon dioxide rich atmospheres. Also, PIDs do not detect some petroleum compounds.

Figures, Graphs and Tables. When figures and graphs are specified, they should at a minimum contain the following information, or an explanation as to why the information is not necessary.

Maps. All maps should include the applicable information specified in s. NR 724.11(6), Wis. Adm. Code. In most cases, all information can be combined into a single map. There are times that a single map will have so much data that it is essentially unreadable. The consultant should use professional judgement when determining if a single map or multiple maps best portray the information necessary.

- Groundwater Contour Map Guidelines.

  — List groundwater elevations for each measuring point on the map.
  — Use the most recent data available.
  — For water table maps, do not use data from deeper piezometers. If piezometer data is shown, use a different symbol for the piezometers than used for water table wells.
  — If any wells are dry, indicate that on the map.
  — If free product is present at site, shade the area where free product is estimated to be present.
  — If groundwater is extracted with a pump and treat system, also denote plume capture zone.
  — If in situ air sparging or soil venting is in use, specify on the map if the system was operating or shut down during the water level measurements. See the Subsection on water table maps in the *Guidance on Design, Installation and Operation of Ground Water Extraction and Product Recovery Systems* for more information on this topic.

- Groundwater Contaminant Distribution Map Guidelines.

  — Only contaminants that exceed the ch. NR 140 ES or PAL should be shown on the map. When contaminants are above the PAL or ES at some data points and below the PAL or ES at other data points, list the data for all locations to portray which areas of the site meet ch. NR 140 groundwater quality standards.
  — If a well is not sampled due to the presence of free product indicate "FREE PRODUCT" at those data points.
  — If more than five contaminants exceed ch. NR 140 ES, only the five contaminants that require the greatest percent reduction to achieve ch. NR 140 ES or PAL should be shown on the map.
  — Drawing isoconcentration lines is optional, unless specified for the site on a site specific basis.
  — If the contamination has crossed the property line, that property line should be clearly denoted on the map.
  — If in situ air sparging is used, water samples from ch. NR 141 type monitoring wells may not represent aquifer water quality as a whole. For that reason, groundwater data should be obtained from driven probes with no filter pack. If there are no driven probes and conventional ch. NR 141 monitoring wells are used, shut down the air injection system at least two weeks prior to collecting groundwater samples. See the *Guidance on Design, Installation and Operation of In Situ Air Sparging Systems* and the August 1995 update sheets for more information on this topic.

- Dissolved Oxygen Map Guidelines.

  — Dissolved oxygen data may be shown on the contaminant concentration graphs or on a separate graph.
  — Dissolved oxygen maps are optional for ground water extraction and product recovery systems.
  — When in situ air sparging is used, monitoring points may not represent aquifer water quality as a whole. For that reason, groundwater data should be obtained from driven probes with no filter pack. If there are no driven probes and conventional ch. NR 141 monitoring wells are used, shut down the air injection system at least two weeks prior to collecting groundwater samples for DO. See the *Guidance on Design, Installation and Operation of In Situ Air Sparging Systems* and the August 1995 update sheets for more information on this topic.

- Well and Soil Sample Location Map Guidelines. Well and sample location maps for all methods should clearly indicate the location(s) of the release or the area where soil contamination historically has been highest. Also, if part of the contamination has been excavated, the pit boundaries.

  The recommended documentation for each remedial method is as follows:

  — Groundwater Extraction and Product Recovery - separate well location maps should not be provided, instead the wells should be indicated on the groundwater contour and contaminant distribution maps.
  — In Situ Air Sparging - the map should indicate all air injection wells, soil venting extraction wells, and all groundwater monitoring points.
  — Natural Attenuation in Groundwater - separate well location maps should not be provided, instead the wells should be indicated on the groundwater contour maps.
  — Soil Venting - indicate all air extraction wells. If any gas probes are used to assess subsurface conditions in either contaminated zones or background locations, also indicate those data points with a different symbol. If soil samples have been collected recently to track progress, indicate those locations with the date of sampling noted on the map.
  — Natural Attenuation in Soil - show all monitoring points. Indicate which data points are background measuring points. If soil samples have been collected recently to track progress, indicate those locations with the date of sampling noted on the map. If the site was previously treated by soil venting, the locations of former air extraction wells should also be shown since these are areas where aggressive treatment has been applied. Also show area(s) of paved and unpaved ground surface. If pavement is significantly broken to allow significant water infiltration and air diffusion, map that area as broken pavement.

Graphs. All graphs that show time versus contaminant concentration or cumulative contaminant removal should be based on total time, not only operation time. All graphs that denote cumulative removal should use pounds of contaminant removed. Graphs should accurately show the time period(s) when the system was not operating. Plot time on the X axis, concentration or cumulative removal data on the Y axis.

- Time Versus Cumulative Removal. The recommended documentation for each remedial method is as follows:

  — Groundwater Extraction and Product Recovery - separate graphs should be used for free product recovery and dissolved phase recovery. A single graph for each phase is adequate, per well graphs are only necessary when specified by the Department on a site specific basis.
  — In Situ Air Sparging - no graph is necessary (removal data is shown on the graphs for the soil venting system).
  — Natural Attenuation in Groundwater - no graph is necessary.
  — Soil Venting - provide a graph of cumulative removal for total VOCs for the total system.
  — Natural Attenuation in Soil - no graph is necessary.
  — Ex Situ Soil Treatment Using Biopiles - Provide two graphs, one showing cumulative removal of total VOCs and a second graph showing total contaminant biodegradation over time.
  — Ex Situ Soil Treatment Using Landspreading/Thinspreading - no graphs are needed.

- Time Versus Contamination Concentration Graphs. Create graphs with contamination level on the y axis (semilog scale) and time on the x axis (linear scale). If free product is present, time versus contamination concentration graphs are not necessary.

  The recommended documentation for each remedial method is as follows:

  — Groundwater Extraction and Product Recovery - graph the contaminant level over time for the groundwater that is extracted by the extraction system. List all compounds that exceed ch. NR 140 ES or PAL. If over five contaminants exceed ch. NR 140 ES or PAL, only list the five contaminants that exceed ch. NR 140 standards by the greatest percent.
  — In Situ Air Sparging - provide a graph for the single monitoring well that is most heavily contaminated. If over five contaminants exceed ch. NR 140 ES or PAL, only list the five contaminants that exceed ch. NR 140 standards by the greatest percent.
  — Natural Attenuation in Groundwater - provide a graph for all monitoring wells that contain any compounds that exceed ch. NR 140 standards. If over five contaminants exceed ch. NR 140 ES or PAL, only list the five contaminants that exceed ch. NR 140 standards by the greatest percent.
  — Soil Venting - provide a graph of contaminant concentration over time for the entire system for total VOCs. If any gas probes are used to assess subsurface conditions in either contaminated zones, also provide a graph with the data from the most heavily contaminated gas probe.
  — Natural Attenuation in Soil - provide a graph of contaminant concentration over time for total vapor phase VOCs as measured with an FID, oxygen, carbon dioxide and methane in an gas probe.
  — Ex Situ Soil Treatment Using Biopiles - no graph is necessary.
  — Ex Situ Soil Treatment Using Landspreading/Thinspreading - no graphs are needed.

- Graph of Contaminant Concentrations Versus Distance. If free product is present, a graph of contaminant concentrations versus distance is not necessary.

  The recommended documentation for each remedial method is as follows:

  — Groundwater Extraction and Product Recovery - no graph is necessary.
  — In Situ Air Sparging and Natural Attenuation in Groundwater - plot a graph with distance (on the x axis, linear scale) and contaminant concentrations (y axis, log scale) from the upgradient measurement point to the farthest downgradient data point along the centerline of the plume. List the same contaminants as shown on the Time Versus Contaminant Concentration Graphs. Clearly show the source area on the graph. If free product has been present, label the data points that previously contained free product. For in situ air sparging, see comments above about samples collected from conventional monitoring wells with filter packs versus driven probes.

Tables. Whenever possible, data over the life of the project should be listed.

The recommended documentation for each type of table is as follows:

- Groundwater Contaminant Chemistry Data.

  List:

  — Contamination levels for all contaminants that exceed ch. NR 140 standards.
  — Dissolved oxygen levels if applicable.
  — Other biological parameters, if applicable (nitrogen, phosphorous, manganese, sulphate, iron, dissolved methane, redox potential, pH, microbial population size, etc.). See instructions for page GW-3 for more information on these parameters. Also, list the dates the samples were collected and the standard methods used to analyze the samples.

- Groundwater Biological Parameters.

  For natural attenuation in groundwater only, these measurements should be listed (if known) to provide information on biodegradation. This table is not necessary for free product extraction, groundwater extraction or in situ air sparging.

  Provide a table that includes any results of tests conducted for dissolved oxygen, nitrate, manganese, iron, sulphate, methane, redox potential, heterotrophic and/or hydrocarbon degrading microorganism populations. Identify on the table if the monitoring locations are upgradient, side gradient, downgradient, or within the plume, dates of sampling, and the analytical methods used for those parameters. Include all data for the life of the project. Since some of these tests are only conducted once, or periodically - enter "NS" in the table for not sampled for any parameters that were not sampled during a particular round of sampling.

  When asked to list the standard methods, list the method if a standard method exists. There are however some tests (for example dissolved methane) where there are no official standard laboratory or field methods. In this case the laboratory will have to create their own standard procedures. In these cases list the name of the laboratory and that laboratory's name for that test.

  Specific considerations for each parameter are as follows:

  — Dissolved oxygen (mg/L). The most efficient mechanism for natural or enhanced biodegradation of petroleum compounds is aerobic biodegradation.
  — Nitrate (mg/L as N). Nitrate (NO_3^{-1}) is a potential electron acceptor for denitrification and also serves as a nutrient for heterotrophic microbial populations to enhance aerobic biodegradation. Decreasing nitrate levels from background wells to wells within the plume are an indication of either aerobic or anaerobic biodegradation.
  — Manganese as Mn^{+2} (mg/L). Manganese as Mn^{+4} is converted to soluble manganese as Mn^{+2} under anaerobic biodegradation. For this reason, total manganese analysis is not appropriate, only soluble manganese as Mn^{+2}. When the levels of soluble manganese are higher in wells within the plume than in background wells, that is an indication of anaerobic biodegradation.
  — Iron as Fe^{+2} (mg/L). Iron as Fe^{+3} is converted to soluble iron as Fe^{+2} under anaerobic biodegradation. For this reason, total iron analysis is not appropriate, only soluble iron as Fe^{+2}. When the levels of soluble iron are higher in wells within the plume than in background wells, that is an indication of anaerobic biodegradation.
  — Dissolved sulphate (SO_4^{-2}, mg/L). Sulphate (SO_4^{-2}) is a potential electron acceptor. Decreasing sulphate levels from background wells to wells within the plume are an indication of anaerobic biodegradation.
  — Dissolved methane (mg/L). Methane is produced under anaerobic conditions. Since background methane levels can usually be assumed to be zero, in most cases only measurements within the plume are used. Exceptions are when the natural soils have very high levels of TOC (for example peat), background methane levels are also warranted. When the contaminant is crude oil instead of a refined petroleum product, methane measurements may however cause erratic results. Significant amounts of methane may be created when other electron acceptors (NO_3^{-1}, Mn^{+4}, Fe^{+3} and SO_4^{-2}) are exhausted. For this reason, significant levels of methane are indicative of very very anaerobic conditions.
  — Redox potential (millivolts, include + or - sign). Redox potential is another measure of the level of aerobic/anaerobic conditions, however it is a much more sensitive measurement than DO at very low levels of DO.
  — Heterotrophic and hydrocarbon degrading microorganism populations (CFU/mL). Heterotrophic and specific hydrocarbon degrader population sizes should be listed for both background locations and locations within the plume, if there is information available. There is disagreement by many of the experts within the field as to the merits of sampling for this parameter. Refer to other DNR guidance documents on natural attenuation (or passive bioremediation) for more information on this topic.

- Groundwater Elevations.

  Self explanatory.

- Soil Contaminant Chemistry Data.

  Self explanatory.

Tables (Continued).

- Soil Gas Data.

  The recommended documentation for each remedial method is as follows:

  — When natural attenuation in soil is used, provide a graph of all soil gas readings over time for every data point.
  — When soil venting is used, if a gas probe is used to assess subsurface conditions over time in a location where air is not extracted, provide that data in a table.

- System Operational Data.

  The recommended documentation for each remedial method is as follows:

  — Groundwater Extraction and Product Recovery:

    o Well by well flow rates in gpm for each extraction well. If a well is off line, list flow rate as "ZERO." Clearly denote on the table periods of system shutdown.

  — In Situ Air Sparging:

    o Air pressure and injection flow rates in scfm for each well. If a well is off line, list flow rate as "ZERO." Clearly denote on the table periods of system shutdown.

  — Natural Attenuation in Groundwater - no table needed.

  — Soil Venting:

    o Vacuum readings and extraction rates in scfm for each well. If a well is off line, list flow rate as "ZERO." Clearly denote on the table periods of system shutdown.
    o Air concentrations in ppm_v or in mg/L for total VOCs.
    o Total system contaminants removed in pounds and the pounds per day removal rate.

  — Natural Attenuation in Soil - no table needed.

  — Ex Situ Soil Treatment Using Biopiles:

    o If forced air ventilation is used:

      - System extraction rates in scfm.
      - Air concentrations in ppm_v for total VOCs.
      - Total system contaminants removed in pounds and the pounds per day removal rate.
      - Temperature.

    o If passive ventilation is used, a table of temperatures.

  — Ex Situ Soil Treatment Using Landspreading/Thinspreading - no table is needed.

Acronyms and Abbreviations:

CFU/mL	colony forming units per milliliter
cm/sec	centimeters per second
DATCP	Department of Agriculture, Trade and Consumer Protection
DCOM	Department of Commerce
DNR	Department of Natural Resources
DO	Dissolved Oxygen
DRO	Diesel Range Organics
ES	Enforcement Standards in NR 140
FID	Flame Ionization Detector
ft/yr	feet per year
gpd	gallons per day
gpm	gallons per minute
GRO	Gasoline Rage Organics
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NR	prefix for rules established by the DNR
P.E.	Registered Professional Engineer
P.G.	Registered Professional Geologist
PAL	Preventative Action Limit in NR 140
PECFA	the state sponsored cleanup fund for certain petroleum contaminated sites
ppm$_v$	parts per million by volume (vapor phase only)
scfm	standard cubic feet per minute
TOC	Total Organic Carbon
USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
µg/kg	micrograms per kilogram
µg/mL	micrograms per milliliter
VOC	Volatile Organic Compounds
Y/N	Yes or No