# Five-Year Review Report

## Second Five-Year Review Report
## Of the
## Onalaska Municipal Landfill Site
## Township of Onalaska
## La Crosse County, Wisconsin

**July 2003**

**PREPARED BY:**

**Wisconsin Department of Natural Resources**
**West Central Region**
**La Crosse, Wisconsin**

Approved by: [signature] Date: 7/16/03
Scott P. Hassett, Secretary
Wisconsin Department of Natural Resources

[signature] Date: 7/16/03
William E. Muno, Director
Superfund Division
U.S. EPA Region 5

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## List of Acronyms

| | |
|---|---|
| ARAR | Applicable or Relevant and Appropriate Requirement |
| CAMU | Corrective Action Management Unit |
| CD | Consent Decree |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CTH | County Trunk Highway |
| EPA | United States Environmental Protection Agency |
| CFR | Code of Federal Regulations |
| ECA | Environmental Contamination Assessment |
| ESD | Explanation of Significant Difference |
| MCL | Maximum Contaminant Level |
| MCLG | Maximum Contaminant Level Goal |
| NCP | National Contingency Plan |
| NPL | National Priorities List |
| O&M | Operation and Maintenance |
| PAH | Polyaromatic Hydrocarbon |
| PCB | Polychlorinated Biphenyl |
| PRP | Potentially Responsible Party |
| RA | Remedial Action |
| RAA | Remedial Action Alternatives |
| RAO | Remedial Action Objective |
| RD | Remedial Design |
| RI/FS | Remedial Investigation/Feasibility Study |
| RPM | Remedial Project Manager |
| ROD | Record of Decision |
| SDWA | Safe Drinking Water Act |
| TCE | Trichloroethylene |
| VOC | Volatile Organic Compound |
| WDNR | Wisconsin Department of Natural Resources |

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## Executive Summary

The United States Environmental Protection Agency (U.S. EPA), in consultation with the Wisconsin Department of Natural Resources (WDNR), began a Remedial Investigation and Feasibility Study (RI/FS) at the Onalaska Municipal Sanitary Landfill Site (Site), Onalaska, Wisconsin, in 1988. The RI/FS was completed in 1990, upon issuance of a cleanup decision by the U.S. EPA. The U.S. EPA determined that construction of a landfill cover (cap), a groundwater extraction and treatment system, and a bioremediation system would be protective of human health and the environment.

B,2 pen d, 1997

U.S. EPA, in concert with the WDNR, began construction of the cleanup remedy in 1993. The cleanup remedy was completed in July 1994; operation of the groundwater extraction and treatment and the bioremediation systems commenced at that time. The groundwater extraction and treatment system operated until November 2001, and the ~~bioremediation~~ system was shut down in ~~February 19~~97. The systems are currently shut down to allow the ~~WDNR to evaluate~~ the effectiveness of natural attenuation in reducing the levels of contamination through natural biological, physical and chemical processes.

2005 [illegible]

To date, the groundwater extraction and treatment system has pumped out 2.2 billion gallons of water for treatment (via air stripping), reducing the levels of contaminants in the groundwater. Current data indicates that two metals (iron and manganese) and two volatile organic chemicals (methylene chloride and trimethylbenzenes) are the only contaminants above the WDNR Enforcement Standards. Methylene chloride and acetone are common laboratory artifacts and their presence in the groundwater samples is attributed to the laboratory. Background levels of iron and manganese in shallow groundwater in Wisconsin are similar to the concentrations detected at the Site. Additional studies will be completed to confirm that exceedences of iron and manganese in shallow groundwater at the Site are attributed to background levels. The bioremediation system, which supplied oxygen (air) to the subsurface soil, effectively reduced the concentrations of the hydrocarbons in the soils. The bioremediation system was discontinued after soil gas data showed that the system no longer contributed to the cleanup. The first Five-Year Review was completed in July 1998 and determined the remedy was protective of human health and the environment. The next (third) 5 Year Review will be completed in July 2008.

The U.S. EPA completed an Explanation of Significant Differences (ESD) on September 29, 2000. This ESD addressed changes to the groundwater cleanup standards, bringing the standards up-to-date with current State cleanup standards.

On November 13, 2001 U.S. EPA completed a second ESD for the Site. This ESD allows for the temporary shut down of the groundwater treatment system to study natural attenuation as an alternative to cleanup the remaining groundwater contamination. The groundwater treatment system was shut down on November 26, 2001. It is anticipated that the system may be shut down indefinitely while U.S. EPA and the WDNR complete the monitored natural attenuation studies. The WDNR took over the operation and maintenance of the Site in June of 2002.

Currently, the Site is being evaluated for natural attenuation as a modification to the remedy (i.e. groundwater extraction). Monitoring for natural attenuation was implemented in the fall of 2001. Preliminary results from natural attenuation monitoring demonstrates that natural attenuation may be an effective modification to the remedy for this Site and would be protective of human health and the environment. Future monitoring and evaluation will be conducted to determine if natural attenuation should be implemented as a modification to the remedy.

Based upon this Five-Year Review, all immediate threats at the Site have been addressed, and the remedy is expected to be protective of human health and the environment after the groundwater goals are achieved through pumping and natural attenuation in an estimated 30 years or less.

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Five-Year Review Summary Form

| SITE IDENTIFICATION | | |
|---|---|---|
| **Site name *(from WasteLAN)*:** Onalaska Municipal Landfill Site | | |
| **EPA ID *(from WasteLAN)*:** WID980821656 | | |
| **Region:** 5 | **State:** WI | **City/County:** Onalaska/La Crosse |
| **SITE STATUS** | | |
| **NPL status:** Final | | |
| **Remediation status:** Operating | | |
| **Multiple OUs?*** Yes | **Construction completion date:** 6/1/94 | |
| **Has site been put into reuse?** No | | |
| **REVIEW STATUS** | | |
| **Lead agency:** State | | |
| **Author name:** David L. Carper | | |
| **Author title:** Remedial Project Manager | **Author affiliation:** WDNR. West Central Region | |
| **Review period:**** 4/23/2003 through 7/14/2003 | | |
| **Date(s) of site inspection:** 4/22/2003 | | |
| **Type of review:** Five Year Review | | |
| **Review number:** 2 | | |
| **Triggering action:** Five years after the first Five Year report completed on July 14, 1998 | | |
| **Triggering action date *(from WasteLAN)*:** 7/14/1998 | | |
| **Due date *(five years after triggering action date)*:** 7/14/2003 | | |

* ["OU" refers to operable unit.]

** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

**Five-Year Review Summary Form, cont'd.**

**Issues:**

Through this five-year process several issues were identified. The following is a list of issues identified.

1. Preliminary inspection of the natural attenuation data indicates that natural attenuation may be an effective modification to the ROD.
2. The limited list of chemicals of concern from the ROD did not include the trimethylbenzenes (1,2,4-trimethlbenzene and 1,3,5-trimethylbenzene). Testing for trimethylbenzenes did not begin until 2001 and thus were not evaluated in the risk assessment. The current natural attenuation monitoring program analyzes for 37 VOC including all chemicals of concern. The most recent sampling data indicates that trimethylbenzenes exceed NR 140 criteria in four of the 26 wells sampled.
3. Methylene chloride and acetone have been found in groundwater samples collected at the Site. These two VOCs are common laboratory artifacts and their presence in the groundwater samples is attributed to the laboratory.
4. Concentrations of iron and manganese in groundwater samples collected at the Site have exceeded criteria. Background levels of iron and manganese in shallow groundwater in Wisconsin are similar to the concentrations detected at the Site.
5. The Ackerman domestic residential well is 207 feet deep and is located downgradient of he Site. This well is used for potable uses.

**Recommendations and Follow-up Actions:**

The following recommendations address the issues identified above.

1. Continue natural attenuation monitoring and evaluation in accordance with plan approvals. Determine if natural attenuation can be an effective modification to the ROD remedy that remains protective to human health and the environment. The WDNR will continue with the natural attenuation monitoring and anticipates incorporating natural attenuation as a modification to the ROD by 2005.
2. Determine if the presence of the trimethylbenzenes requires an additional health analysis. The WDNR will evaluate the need to perform an additional health analyses by July 2004. If additional health analyses are needed this activity will be completed by July 2005.
3. Require that the laboratory instill better practices to reduce the occurrence of methylene chloride and acetone in samples. WDNR has already mandated better laboratory practices and if future laboratory performance does not improve corrective actions will be implemented.

4. Complete additional studies to evaluate the occurrence of iron and manganese (as well as other metals) in the groundwater with respect to background levels and develop Wisconsin Alternative Concentration Limits (WACLs) for iron and manganese. if applicable. Additional studies will be completed by the WDNR and it is anticipated that applicable WACLs will be determined by July 2005.
5. Increase sampling frequency of twice per year for Ackerman residential well to better determine changes in groundwater quality. Ongoing groundwater sampling will be completed by the WDNR.

**Protectiveness Statements:**

All immediate threats at the Site have been addressed, and the remedy is expected to be protective of human health and the environment after the groundwater cleanup goals are achieved through pumping and natural attenuation in an estimated 30 years. The cap has been effective in preventing human contact with the wastes, and by reducing infiltration at the Site.

**Long-Term Protectiveness:**

Long-term protectiveness of the remedial action will be verified by obtaining additional groundwater samples to fully evaluate the effectiveness of natural attenuation as a modification to the remedy. Current data indicate that natural attenuation may be an effective final remedy solution. Additional sampling and analysis will be conducted on a regular basis as required in the plan approvals. Routine inspection and maintenance of the cap will ensure long-term effectiveness.

**Other Comments:**

None.

**Onalaska Municipal Landfill**
**Onalaska, Wisconsin**
**Second Five-Year Review Report**

## I. Introduction

The purpose of the five-year review is to determine whether the remedy at the site is protective of human health and the environment. The methods, findings, and conclusions of review is documented in this Five-Year Review Report. In addition, Five-Year Review Reports identify issues found during the review, if any, and identify recommendations to address them.

The Department is preparing this Five-Year Review Report pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

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

The U.S. EPA interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

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

The Wisconsin Department of Natural Resources (WDNR) conducted the five-year review of the remedy implemented at the Onalaska Municipal Landfill Site (Site) located in Onalaska, Wisconsin. The State Remedial Project Manager (RPM) conducted this review for the entire Site from April 2003 through July 2003. This report documents the results of the review.

This is the second five-year review for the Onalaska Municipal Landfill. The triggering action for this statutory review is the previous Five-Year Review dated July 14, 1998. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. Table 1 lists the chronology for Site milestones.

## II. Site Chronology

***Table 1 - Chronology of Site Ev~nts***

| Event | Date |
|---|---|
| The Site was mined as a sand and gravel quarry in the early 1960's. Quarry operations ceased in the mid-1960's and the Town began to use the Site as a municipal landfill. | 1960's |
| In 1978, the Wisconsin Department of Natural Resources (WDNR) determined that the landfill operation did not meet state solid waste codes and ordered the Town to close the landfill by September 1980. After disposal operations ceased, the Town capped the landfill in June 1982. | 1978 to 1982 |
| In September 1982, the WDNR sampled four landfill monitor wells and several nearby residential wells for compliance with drinking-water standards, and determined that one residential well, located southwest of the landfill, was found to exceed the Federal drinking-water standard for barium (1.0 mg/L). The well sample also contained five organic compounds at concentrations above background levels. The Town replaced the contaminated residential well with a deep, uncontaminated well in January 1983. | 1982 to 1983 |
| Pursuant to CERCLA, U.S. EPA inspected the Onalaska Site in 1983. Subsequent to the submittal of the Site Inspection report in May 1983, the U.S. EPA placed the Site on the National Priorities List (NPL) in September 1984. | 1983 to 1984 |
| U.S. EPA, in consultation with the WDNR, completed a Remedial Investigation (RI) at the Onalaska Landfill on December 22, 1989. The RI concluded that the landfill is the source of groundwater contamination, and that original landfill cap had deteriorated and did not meet the landfill closure regulations in effect at the time the landfill closed. | 12/22/1989 |
| Based on the findings of the RI, U.S. EPA completed a feasibility study (FS) that evaluated remedial alternatives to address migration of the groundwater contaminant plume. U.S. EPA completed the FS in December 1989. | 12/1989 |
| U.S. EPA then issued a Record of Decision (ROD) on August 14, 1990, that called for the: installation of a landfill cap in accordance with federal and state requirements; Installation of a groundwater extraction and treatment system to capture and treat contaminants in the groundwater immediately downgradiant of the landfill; installation of an air injection system within the area of soils contamination to enhance the bioremediation of organic contaminants; and implementation of a groundwater, surface water, and sediment monitoring program to ensure the adequacy of the cleanup. | 8/14/1990 |
| U.S. EPA entered into a Superfund State Contract with WDNR in 1991, which provided that the state would fund 50 percent of the remedial action. | 1991 |
| U.S. EPA then began to implement the Remedial Design (RD) and Remedial Action (RA). | 1991 to 1992 |

**Table 1- Chronology of Site Events, cont'd.**

| Event | Date |
|---|---|
| U.S. EPA completed the landfill cap RD in July 1992 and the groundwater extraction and treatment and the bioremediation systems RD in September 1992. | 1992 |
| The landfill cap construction subcontract was awarded on March 25, 1993, and construction commenced on May 1, 1993. A multi-layer clay cap was installed over the landfill. The cap was completed in November 1993. The groundwater and soils construction subcontract was awarded on June 11, 1993, and construction began on July 12, 1993. The groundwater extraction and treatment system was completed in June 1994. | 1993 to 1994 |
| A pre-final inspection was conducted by the project managers for U.S. EPA and WDNR on June 1, 1994. At that time, it was determined that the landfill cap, groundwater, and bioremediation systems were constructed as designed and that they were operational. | 6/1/1994 |
| The five-year review at the Onalaska Site was completed on July 14, 1998. | 7/14/1998 |
| U.S. EPA issued an Explanation of Significant Difference (ESD) for the Onalaska Municipal Landfill on September 29, 2000. The ESD addressed changes to the performance standards addressed in the ROD based on changes to State of Wisconsin drinking Public Health and Public Welfare Groundwater Quality Standards. | 9/29/2000 |
| U.S. EPA issued an Explanation of Significant Difference (ESD) for the Onalaska Municipal Landfill on November 13, 2001. The ESD allows for the temporary shutdown of the groundwater extraction and treatment system to evaluate the need for continuous operation of the system and to determine whether natural attenuation processes exist at the Site, which might address the remaining groundwater contamination. | 11/13/2001 |
| In June 2002 WDNR assumed the lead in the operation and maintenance of the Site. | June 2002 |

## III. Background

### Physical Characteristics

The Onalaska Site is located in the Township of Onalaska, about 10 miles north of La Crosse. Wisconsin. *Figure 1, presented in Attachment 1, is a map illustrating the Site location.* The 11-acre Site includes the 7-acre former Township landfill and is situated 400 feet east of the Black River, near the confluence of the Mississippi and Black Rivers. The Black River is located within the Upper Mississippi River Wildlife and Fish Refuge, a wetlands area that supports numerous migrating species of birds and is also used for hiking, fishing, hunting, and other recreational purposes by area residents and visitors.

The area surrounding the Site is generally rural, although several residences are located within 500 feet to t: e north and to the south of the landfill. A subdivision of about 50 homes is located about 1.25 miles southeast of the Site. Agricultural lands are located south of the landfill, and intermittent woods and grasslands border the Site to the east.

### Land and Resource Use

The Site was mined as a sand and gravel quarry in the early 1960's. Quarry operations ceased in the mid-1960's and the Town began to use the Site as a municipal landfill, although for a time both municipal and chemical wastes were disposed of in the landfill. In 1978, the WDNR determined that the landfill operation did not meet state solid waste codes and ordered the Town to close the landfill by September 1980. After disposal operations ceased, the Town capped the landfill in June 1982.

### History of Contamination

In September 1982, the WDNR sampled four landfill monitor wells and several nearby residential wells for compliance with drinking-water standards. The investigation documented that the sand and gravel aquifer beneath the landfill serves as the primary source of drinking water for area residents and that groundwater contamination had occurred within and around the site. One residential well, located southwest of the landfill, was found to exceed the Federal drinking-water standard for barium (1.0 mg/L). The residential well sampie also contained five organic compounds at concentrations above background levels. A landfill monitor-well sample was found to be contaminated with toluene at a concentration of 14.7 mg/L, which is above the State groundwater-quality Enforcement Standard (1.0 mg/L) and the federal drinking water (1.0 mg/L) standard. The Town replaced the contaminated residential well with a deep, uncontaminated well in January 1983.

**Initial Response**

Pursuant to CERCLA, U.S. EPA inspected the Onalaska Site in 1983. Subsequent to the submittal of the Site Inspection report in May 1983, the U.S. EPA placed the Site on the National Priorities List (NPL) in September 1984.

**Basis for Taking Action**

U.S. EPA, in consultation with the WDNR, conducted a Remedial Investigation and Feasibility Study (RI/FS) at the Site from April 1988 through December 1989. The major findings of the RI included:

- The landfill is the source of groundwater contamination. Soils located above the water table and adjacent to the southwestern edge of the landfill were contaminated with naphtha solvents derived from the landfill. The contaminated soil zone occurred from 11 feet to 15 feet below ground surface and up to 150 feet from the landfill. Soil samples indicated that contaminant levels of up to 550 mg/kg were present and were a continual source of groundwater contamination.
- The plume consisting of organic and inorganic compounds had migrated at least 800 feet from the southwestern edge of the landfill. The leading edge of the contaminant plume appeared to be discharging into nearby wetlands and the adjacent Black River.
- The upper groundwater aquifer consists primarily of sand and is approximately 135 feet thick. Local residences utilized this aquifer as a primary source of drinking water.
- The predominant organic compounds of concern included toluene, xylene, 1, 1 -dichloroethane (1, 1 -DCA), and trichloroethene (TCE), based upon concentrations and potential impacts to human health and the environment.
- The original landfill cap at the Site had deteriorated and did not meet the landfill closure regulations in effect at the time the landfill closed. The cap was originally to be composed of 2 feet of compacted clay, but the RI showed that the cap is composed of sandy soils in certain portions and that it is only 1-foot thick in other portions.
- Magnetometer anomalies, as well as Site records, suggested that up to 1000 55-gallon drums were likely to have been disposed of in the landfill. Although several crushed and empty drums were found in the landfill during excavation of test pits, the RI could not ascertain whether the drums are concentrated in any one area, although it may be likely that many of the drums would be in the same condition as the drums that were found in the test pits.
- The average depth to the water table and the depth of waste disposal was 15 feet. Thus, the refuse was periodically in direct contact with groundwater. Soil below the water table did not appear to be greatly affected by landfill contaminants, in that the hazardous substances found in the groundwater are soluble. Soluble contaminants would tend to remain dissolved in the groundwater rather than sorbing onto sand particles.

Potential long-term exposure to low levels of VOCs through the use of private wells in contaminated groundwater and plausible adverse discharges of contaminants to the wetlands and Black River downgradiant of the landfill were identified as the principal threats to human health and the environment.

## IV. Remedial Actions

### Remedy Selection

Based on the findings of the RI, U.S. EPA completed a feasibility study (FS) that evaluated remedial alternatives to address migration of the groundwater contaminant plume. U.S. EPA completed the FS in December 1989. U.S. EPA then issued a Record of Decision (ROD) in August 1990 that called for the following actions to mitigate the areas of concern:

- Installation of a landfill cap in accordance with federal and state requirements;
- Installation of a groundwater extraction and treatment system to capture and treat contaminants in the groundwater immediately downgradiant of the landfill;
- Installation of an air injection system within the area of soils contamination to enhance the bioremediation of organic contaminants; and
- Implementation of a groundwater, surface water, and sediment monitoring program to ensure the adequacy of the cleanup.

The selected remedy established a containment and treatment system to eliminate the principal threat posed to human health and the environment by isolating the source of groundwater contaminants in the landfill and eliminating those in the adjacent soils, preventing the further migration of VOCs in groundwater, and by treating extracted groundwater to acceptable discharge limits.

The selected remedy established cleanup standards for groundwater based on Safe Drinking Water Act Maximum Contaminant Levels (MCLS) and Wisconsin Administrative Rule Chapter NR 140 Enforcement Standards (ES) and Preventive Action Limits (PAL) for groundwater protection. The selected remedy established an estimated cleanup goal of 80 to 95 percent biodegradation of the organic compounds in the soils adjacent to the landfill.

### Remedial Implementation

U.S. EPA entered into a Superfund State Contract with WDNR in 1991, which provided that the state would fund 50 percent of the remedial action. U.S. EPA then began to implement the Remedial Design (RD) and Remedial Action (RA).

The construction of the landfill cap, groundwater extraction and treatment facility, and the bioremediation system was completed in June 1994 and operation and maintenance is ongoing. The U.S. EPA recommended that the groundwater treatment facility continue to be operated as designed until final groundwater cleanup levels are achieved. The Town of Onalaska is responsible to monitor the landfill cap and landfill gas levels in accordance with State requirements and recommendations.

**Completed Activities**

- U.S. EPA completed the landfill cap RD in July 1992 and the groundwater extraction and treatment and the bioremediation systems RD in September 1992.
- A Wisconsin Pollution Discharge Elimination System (WPDES) "permit" was issued by the WDNR for the discharge of treated groundwater to the Black River. WDNR determined that air stripping and iron precipitation were acceptable Best Available Technology (BAT) for treatment.
- A 3-month treatability study was conducted in the laboratory to determine the ability of the organic contaminants to degrade and to attempt to determine plausible cleanup goals, optimal air injection conditions, and losses of VOCs due to air stripping or volatilization. Testing showed that approximately 15% of the hydrocarbons were biodegraded during the 3-month test and that approximately 5-6 years of air injection would be needed to reach the target cleanup goal. As a result, U.S. EPA recommended that a full-scale biotreatment system be installed, for the cost of performing a pilot study in the field would approach that of a full-scale treatment system.
- The landfill cap construction subcontract was awarded on March 25, 1993, and construction commenced on May 1, 1993. A multi-layer clay cap was installed over the landfill. The cap was completed in November 1993.
- The groundwater and soils construction subcontract was awarded on June 11, 1993, and construction began on July 12, 1993. Five groundwater extraction wells were installed downgradiant of the landfill and are designed to pump a total of 800 to 1000 gallons per minute. A treatment plant was constructed nearby, where the extracted groundwater is subjected to aeration and pH adjustment (iron precipitation), clarification (iron removal), air stripping (VOC removal), and pH readjustment prior to discharge to the Black River. Temporary activated carbon units were placed in the treatment train prior to discharge as a back-up measure while the treatment plant components underwent a 3-month "shakedown" period. The groundwater extraction and treatment system was completed in June 1994.
- Approximately 29 shallow air-injection wells were installed to bioremediate the organic compounds in the contaminated soils adjacent to the landfill. During start-up, the contractor turned the air injection system on to achieve steady-state conditions, and then off to measure oxygen uptake (respiration) rates in the wells. Results showed that biodegradation was occurring as oxygen levels began to fall rapidly. The air permeability of the soil was measured and found to be as predicted, based on the laboratory study.

Lastly, the system was balanced so that each well was injecting the proper amount of air into the soil. Installation of the biotreatment system was completed in June 1994.

- The project managers conducted a pre-final inspection for U.S. EPA and WDNR on June 1, 1994. At that time, it was determined that the landfill cap, groundwater, and bioremediation systems were constructed as designed and that they were operational. A punch list of minor tasks to be completed was developed and a schedule for completion of those items was given to both the landfill cap and the groundwater subcontractors by U.S. EPA's contractor.
- Region 5 signed the Onalaska preliminary close-out report (PCOR) on July 29, 1994, and within that document scheduled the completion of the first Five-Year Review by May 1998.
- On September 29, 2000, U.S. EPA completed an Explanation of Significant Difference (ESD) revising the Site cleanup standards to reflect the current State of Wisconsin groundwater cleanup standards.
- U.S. EPA issued an ESD for the Onalaska Municipal Landfill on November 13, 2001. The ESD allows for the temporary shutdown of the groundwater extraction and treatment system to evaluate the need for continuous operation of the system and to determine whether natural attenuation processes exist at the site, which might address the remaining groundwater contamination.
- On November 26, 2001, the groundwater treatment system was shut down.
- In June 2002 WDNR assumed responsibility for the operation and maintenance of the Site.

**Systems Operations and Maintenance**

The construction of the landfill cap, groundwater extraction and treatment facility, and the bioremediation system was completed in June 1994 and operation and maintenance is ongoing. Systems operation and Maintenance includes groundwater extraction, wastewater treatment plant operation and maintenance, sampling and monitoring efforts, other routine maintenance and reporting. The U.S. EPA recommended that the groundwater treatment facility continue to be operated as designed until final groundwater cleanup levels are achieved. Currently the system is on stand-by while natural attenuation is being evaluated as a modification to the ROD.

The Town of Onalaska is responsible for monitoring the landfill cap and landfill gas levels in accordance with State requirements and recommendations. The system began operation in the spring of 1994. Quarterly sampling began in March 1995 and was reduced to semi-annual monitoring in March 1997. The results of the monitoring program are summarized in the Annual Groundwater Quality and Capture Report for each year, which are available at the Site information repositories.

**Operation and Maintenance Costs**

Operation and Maintenance costs include groundwater extraction, wastewater treatment plant operation and maintenance, sampling and monitoring efforts, monitoring well maintenance, and reporting. Prior to the shut down of the system, annual O&M costs for the years of 1998 through 2001 were approximately $200,000 per year. Since shut down of the system, O&M costs for 2002 and 2003 are approximately $60,000 per year. Future yearly costs during the natural attenuation study are expected to average $60,000 per year.

**Quality Assurance/Quality Control**

Details of the analytical procedures used to ensure the quality of the work were contained in the approved Quality Assurance Project Plan (QAPP) dated July 1997 and the two Addendums/Revision dated February 19, 2002 and April 1, 2002. The remaining groundwater monitoring activities during the conduct of the Long Term Response Action (LTRA), Operation and Maintenance (O&M) and natural attenuation monitoring phases have been performed in accordance with an approved QAPP and Addendums/Revisions. The laboratories used for the analysis of groundwater quality have been approved by U.S. EPA or have been audited by U.S. EPA to ensure that proper analytical protocols were employed.

## V. Progress Since the Last Five-Year Review

The groundwater quality continues to exhibit low levels of contaminants (e.g. VOC). The consistency of the low levels has allowed for evaluation of certain modifications to the ROD. Specifically, the November 2001 ESD allows for the temporary shutdown of the groundwater extraction and treatment system to study the effectiveness of continued operation and to study whether natural attenuation processes exist at the Site, which might address the remaining groundwater contamination. This potential modification will not alter the scope of the remedy selected in the August 1990 ROD.

Prior to the temporary shut down study, the groundwater monitoring program was revised. The revised and current monitoring program will monitor the plume behavior under non-pumping condition^ and ensure that any potential migration of contamination will be detected. If monitoring results show that the contaminant plume is expanding after the shut down, the groundwater extraction/treatment system will be reactivated before the contaminants move beyond the extraction wells' zones of influence.

The revised monitoring program also includes natural attenuation parameters that will be used to assess the fate of the remaining contaminants. At the conclusion of the study the treatment system may be reactivated. It is possible that the results of the study may indicate that the permanent shut down of the treatment system is appropriate. However, before such a permanent change could be implemented a ROD Amendment and consideration of public comments would be required.

Information obtained during the Long-Term Remedial Action (LTRA) phase of work at the Site provided the basis for temporary shutdown of the groundwater extraction and treatment system. U. S. EPA has determined that these modifications are necessary and appropriate. In particular, the decision to temporarily shut down the system was based upon the results of the long-term groundwater monitoring program in place at the Site.

Currently, groundwater samples are collected from 26 monitoring points comprised of six air-injection wells, five piezometers, 13 monitoring wells, and two residential wells. Figure 2, presented as Attachment 2, shows the current monitoring point locations. As discussed further below, the monitoring program has shown that two organic contaminants, trimethylbenzene and methylene chloride, remain above the ES established by the State of Wisconsin. Two inorganic metals, manganese and iron remain above their respective criteria however, are not considered by the State of Wisconsin to be substances of public health concern. but rather aesthetic (taste or odor) criteria.

As stated above, groundwater extraction, treatment, and monitoring will be required until it has been demonstrated that groundwater clean-up levels have been attained. The ROD estimated that the groundwater extraction and treatment system would need to operate for between 5 and 30 years to achieve required cleanup levels. However, after 5 years of operation, and thereafter in increments of 5 years, groundwater quality will be evaluated to determine if the remedial action objectives have been met. If, after the groundwater extraction and treatment system has been operating for a minimum of 5 years, it becomes apparent that it is not technically or economically feasible to achieve clean-up levels, then a (Wisconsin) alternative concentration limit (WACL) may be established for the target compounds. Except where the background concentration of a compound exceeds an ES, the WACL established may not exceed the ES for that compound. Once the standards are met, whether they are ROD standards or WACLs, the groundwater cleanup program will have been completed.

Between April 1999 and September 2000, no organic contaminants of concern identified in the original ROD were detected in any of the monitoring wells above the current Enforcement Standards. In 1999 a full priority pollutant scan was performed on the Site groundwater samples. Previous rounds of monitoring were limited to the chemicals of concern identified in the ROD. The list of chemicals tested for in a full priority pollutant scan is more inclusive than the limited list of chemicals of concern from the ROD but did not include the trimethylbenzenes (1,2,4-trimethlbenzene and 1,3,5-trimethylbenzene). Testing for trimethylbenzenes did not begin until 2001. The current natural attenuation monitoring program analyzes for 37 VOC including all chemicals of concern. Currently, trimethylbenzenes are the most prominent chemical found in the groundwater.

## VI. Five-Year Review Process

### Administrative Components

WDNR staff met with representatives of the Town of Onalaska to notify them of the initiation of the Five-Year Review. The Five-Year Review for the Onalaska Landfill was conducted by Dave Carper of the WDNR, Remedial Project Manager (RPM) for the Onalaska Landfill.

The review components included:

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

### Community Involvement

Activities to involve the community in the Five-Year Review were initiated with a public notice prepared by the WDNR and sent to the local newspaper that a Five-Year Review was to be conducted at the Onalaska Landfill. The press release date was May 2, 2003. The notice invited members of the public to submit any comments to WDNR by July 1, 2003. The notice was also circulated through the WDNR's public and internal information systems.

There were no responses to the public notice.

On June 13, 2003, Mr. Dave Carper interviewed three people knowledgeable about the Site; a nearby resident, the long term Site Operator at the treatment plant, and the town of Onalaska supervisor. The general consensus of the interviews was that the remedial effort has been a success and the public has been kept well informed of Site conditions. The interview records are presented in Attachment 3.

### Document Review

This five-year review consisted of a review of relevant documents including O&M records and monitoring data collected since 1998. Applicable groundwater cleanup standards, as listed in the ROD and Wisconsin NR 140, were reviewed. Attachment 4 presents a list of major documents reviewed as part of this Five-Year Review.

**Data Review**

Monitoring

A monitoring program was established for the LTRA , O&M and Natural Attenuation phases of the cleanup. Initially, quarterly groundwater monitoring was performed to ensure that hydraulic capture of the plume was occurring and that chemical levels in the groundwater were decreasing. Analytes include the chemicals of concern listed in the ROD and those parameters required under the WPDES discharge "permit" issued by WDNR. As of this date, the monitoring is performed on a semi-annual basis in accordance with the December 4, 2001, Natural Attenuation Plan. The WDNR, in consultation with the U.S. EPA, will certify completion of groundwater remediation activities once it has been determined that clean-up levels have been attained and maintained for all chemicals of concern listed in the ROD or ESD(s).

Soil gas was sampled periodically to ensure that bioremediation of the organic compounds in the sandy soils was occurring. Based on current data, U.S. EPA, in consultation with WDNR, now certifies that soil remediation activity is complete since it has been demonstrated that the bioremediation system no longer contributes to the cleanup of the contaminated soils.

The landfill cap is inspected periodically by the Town of Onalaska, in accordance with the Consent Decree reached with U.S. EPA. The Town will also perform required maintenance.

Results

As stated above, groundwater extraction, treatment, and monitoring will be required until it has been demonstrated that groundwater clean-up levels have been attained.

Monitoring for Natural Attenuation began in October 2001 (baseline natural attenuation monitoring event). This baseline sampling event was completed immediately after the system was turned off. The system was reactivated (for approximately one month) immediately after the baseline sampling event was completed to use up remaining chemicals used in the treatment process. The following are the findings from the most recent two sampling events completed in December 2002 and April 2003. The results from the December 2002 and April 2003 sampling events are summarized and contained as Attachment 5.

- The most common VOC contaminants detected were the trimethylbenzenes (1,2,4 & 1,3,5), acetone and methylene chloride. For the December 2002 sampling event methylene chloride and acetone were found in most wells sampled and in Quality Assurance/ Quality control samples (two trip blanks). It is inferred that the methylene chloride and acetone are laboratory artifacts. Methylene chloride and trimethylbenzene were the only VOCs that exceeded the WDNR Enforcement Standards (ES). Methylene chloride exceeded the ES in AW-25 and trimethylbenzene exceeded the ES in MW-4S, AW-13 and AW-20.

- Of the 37 VOCs analyzed, only 14 VOCs were detected. The following is a list of detected VOCs.

| | | |
|---|---|---|
| 1,2,4-Trimethylbenzene | Naphthalene | 1,1-Dichloroethene |
| 1,3,5-Trimethylbenzene | Toluene | 1,1-Dichloroethane |
| Acetone | Benzene | cis-1,2-Dichloroethene |
| Methylene chloride | Chlorobenzene | 2-butanone |
| Xylenes (total) | Ethylbenzene | |

- Manganese and iron are the only metals that exceeded the ES. The concentrations of manganese and iron detected at the Site are within a general range of background levels of manganese and iron in the shallow groundwater in Wisconsin. Additional studies will be completed to determine if the landfill is a source of manganese and iron or if the iron and manganese are within background levels in the groundwater surrounding the Site.
- Preliminary inspection of the natural attenuation parameters indicates that the subsurface conditions are conducive to natural attenuation.
- Groundwater from the Site is flowing south towards the Black River and adjacent wetlands.
- The Ackerman residential well is located downgradient of the Site. During the most recent sampling event (April 2003) the Ackerman well was tested. No VOCs were detected. Monitoring well MW-15M is located between the Site and Ackerman well. MW-15M was tested in December 2002. The PAL for methylene chloride was exceeded but can be attributed as a laboratory artifact. Two other VOCs were detected but are below the respective PAL.

Table 2 provides a comparison of groundwater quality over time from three wells. Wells MW-5S and MW-4S were selected to evaluate water quality immediately downgradient of the landfill. MW-5S and MW-4S have historically been two of the most impacted wells. MW-6S was selected as a well that is located downgradient of the extraction system. All three of these monitoring wells were installed prior to activation of the groundwater extraction system. Data from three different eras (pre-pumping, pumping and post pumping) are included in Table 2. The VOCs listed in the table were identified during the RI as the predominant organic compounds of concern. The groundwater extraction system operated from June 1994 through November 2001.

**Table 2 - Comparison of Concentrations of Certain VOCs in the Groundwater**

| Well Number | Sample Date | Concentration in ppb | | | | |
|---|---|---|---|---|---|---|
| | | benzene | toluene | xylenes | 1-1, DCA | TCE |
| MW-4S | 10/31/93 | 0.93 | 54.64 | 317 | 5.71 | 0.13 |
| | 12/19/96 | <0.3 | 7 | 371.4 | <0.2 | <1.0 |
| | 10/26/98 | <8 | <8 | 86 | <8 | <8 |
| | 11/1/01 | <0.16 | <0.18 | 30 | <0.16 | <0.14 |
| | 4/22/03 | <11 | <11 | 54 | <8.6 | <12 |
| MW-5S | 10/31/93 | 0.78 | 160 | 469 | 3.39 | 0.29 |
| | 12/18/96 | 0.7 | 490.5 | 174.9 | 0.3 | <1.0 |
| | 10/26/98 | <0.4 | 28 | 27 | <0.4 | <0.4 |
| | 11/02/01 | <0.16 | 0.48 | 180 | <0.16 | 0.14 |
| | 4/22/03 | <2.1 | <2.2 | 13 | <1.7 | <2.4 |
| MW-6S | 10/31/93 | 0.5 | 1.78 | 0.1 | 7.1 | 0.14 |
| | 10/2/96 | <1 | <1 | <1 | 0.3 | <1 |
| | 10/27/98 | <0.4 | <0.4 | <0.4 | <0.4 | <0.4 |
| | 10/31/01 | <0.16 | <0.18 | <0.33 | 0.33 | 0.16 |
| | 12/12/03 | <0.37 | <0.39 | <0.44 | 0.55 | <0.42 |

Discharge Monitoring

Periodic analysis of extracted groundwater samples system found that levels of contaminants of concern were decreasing. Table 3 provides a comparison of concentrations of certain VOCs in the influent from two of the five groundwater extraction wells (EW-2 and EW-4).

**Table 3 - Comparison of Concentrations of the Influent**

| Well Number | Sample Date | Concentration in ppb | | | | |
|---|---|---|---|---|---|---|
| | | benzene | toluene | xylenes | 1-1, DCA | TCE |
| EW-2 | 6/29/95 | <1 | 31.8 | 44 | <1 | <1 |
| | 11/24/97 | <0.3 | 5 | 41 | <0.5 | <0.5 |
| | 4/29/99 | <1 | <1 | 18.1 | <1 | <1 |
| | 5/18/01 | <5 | <5 | 24 | Not reported | Not reported |
| EW-4 | 6/29/95 | <1 | 415 | 96.9 | <1 | <1 |
| | 11/24/97 | <0.3 | 10 | 43 | <0.5 | <0.5 |
| | 4/29/99 | <1 | <1 | 5.6 | <1 | <1 |
| | 5/18/01 | <1.4 | <1.4 | 1.1 | Not reported | Not reported |

**Site Inspection**

A Site inspection was conducted on April 22, 2003, by the RPM (See Attachment 6). The purpose of the inspection was to assess the protectiveness of the remedy, including the maintenance and operation of the groundwater extraction and treatment system, and the condition of the monitoring wells.

No significant issues were identified regarding the landfill cap or the groundwater extraction and treatment system. Minor repair is required on several of the monitoring wells. The monitoring wells will be repaired later this summer.

**Public Input**

On May 2, 2003, the WDNR prepared a press release that was sent to all of the local newspapers. The release was also posted on the WDNR's Internet Site, which is accessible to the public. The release contained a brief summary of the Site activities, the Five-Year Review process and a solicitation for public comment. The public comment period ended July 1, 2003. No comments concerning the Onalaska Landfill or the Five-Year Review process were received during this period.

## VII. Technical Assessment

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

The review of documents and the results of the Site inspection indicate that the remedy is functioning as intended by the ROD, as modified by the ESD. The capping of contaminated wastes within the landfill has achieved the remedial objectives to minimize the migration of contaminants to groundwater and surface water and prevent direct contact with, or ingestion of, contaminants in waste materials. The effective implementation of institutional controls has prevented exposure to, or ingestion of, contaminated groundwater.

The groundwater extraction and treatment system operated from June 1994 until November 2001, and the bioventing system was operated from May 1994 to February 1997. The bioventing system was shut down after the remedial goals of the bioventing system had been achieved. The groundwater extraction system is currently shut down to allow the WDNR to evaluate the effectiveness of natural attenuation in reducing the levels of contamination through natural biological and chemical processes. The monitoring network provides sufficient data to assess the progress of natural attenuation within the plume.

No activities were observed that would have violated the institutional controls. The cap and the surrounding area were in good repair, there were no signs of unauthorized access, and no new uses of groundwater were observed. The gate and fence to the site is intact and in good repair.

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

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

The exposure assumptions used to develop the Human Health Risk Assessment included the ingestion of contaminated groundwater, ingestion of and/or dermal contact with Site soils, and direct contact with contaminated surface waters or sediments due to recreational use of the Black River and wetlands area. Based on data collected to date, there has been no impact to surface waters or sediments surrounding the Site, and thus there is no exposure risk associated with the recreational use of the Black River or wetlands area. The remaining exposure pathways would consist of ingestion of and/or dermal contact with contaminated groundwater and with Site soils. There are currently institutional controls that prohibit construction in or disturbance of Site soils and construction of wells near the Site. Overall the concentrations of total VOC and other chemicals at the Site have been reduced since the 1992 health assessment, through operation of the treatment systems and through natural attenuation. Thus the resulting toxicity of the chemicals are lower, and the risk associated with Site soils and groundwater has been minimized. Groundwater monitoring has demonstrated that impacts to the groundwater are not affecting potable wells.

The original toxicity data is still valid but may need to be modified to include the trimethylbenzenes. The trimethylbenzenes were not included as chemicals of concern in the health assessment and have only recently been found as prominent chemicals in the groundwater at the Site. There have been no known changes in the toxicity factors for the contaminants of concern that were used in the original risk assessment. These original assumptions are considered to be conservative and reasonable in evaluating risk and developing risk-based cleanup levels. No change to these assumptions, or the cleanup levels developed from them is warranted. There have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy.

Changes in Cleanup Levels and To Be Considered

ARARs that still must be met at this time and that have been evaluated include: ch. NR 140, Wisconsin Administrative Code (Enforcement Standards and Preventative Action Levels); the Safe Drinking Water Act (SDWA) (40 CFR 141.11-141.16) from which many of the groundwater cleanup levels were derived - [Maximum Contaminant Levels (MCLs), and MCL Goals (MCLGs)]; and ARARs related to monitoring, landfill capping, and operation of the groundwater extraction system.

U.S. EPA issued an Explanation of Significant Difference (ESD) for the Onalaska Municipal Landfill on September 29, 2000. The ESD addressed changes to the performance standards addressed in the ROD based on changes to State of Wisconsin drinking Public Health and Public Welfare Groundwater Quality Standards. In March 2000, the revised ES of 1 mg/L and PAL of 0.2 mg/L for toluene and revised ES of 10 mg/L and PAL of 1 mg/L for xylenes were adopted in NR 140. No other changes to water quality standards have occurred during this 5-year review period. Attachment 7 presents a table that identifies the groundwater ARARs for the Site and lists the groundwater cleanup standards for the chemicals of concern.

Changes to the cleanup levels for iron and manganese should be considered. Additional studies would be needed to further evaluate the occurrence of iron and manganese (as well as other metals) in the groundwater with respect to background levels and develop Wisconsin Alternative Concentration Limits (WACLs) for iron and manganese, if applicable. Iron and manganese historically exceed WDNR PALs in most monitoring points but the concentrations appear to be attributable to background levels.

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

There is no information generated during the 5-year review process or other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary

According to the data reviewed, the Site inspection, and the interviews, the remedy is functioning as intended by the ROD, as modified by the ESDs. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. There have been no changes in the toxicity factors for the contaminants of concern that were used in the health assessment, and there have been no change to the standardized health assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

## VIII. Issues

Through this five-year process several issues were identified. The following is a list of issues identified.

1. Preliminary inspection of the natural attenuation data indicates that natural attenuation may be an effective modification to the ROD.
2. The limited list of chemicals of concern from the ROD did not include the trimethylbenzenes (1,2,4-trimethlbenzene and 1,3,5-trimethylbenzene). Testing for trimethylbenzenes did not begin until 2001 and thus were not evaluated in the health assessment. The current natural attenuation monitoring program analyzes for 37 VOC including all chemicals of concern. The most recent sampling data indicates that trimethylbenzenes exceed NR 140 criteria in four of the 26 wells sampled.
3. Methylene chloride and acetone have been found in groundwater samples collected at the Site. These two VOCs are common laboratory artifacts and their presence in the groundwater samples is attributed to the laboratory.
4. Concentrations of iron and manganese in groundwater samples collected at the Site have exceeded criteria. Background levels of iron and manganese in shallow groundwater in Wisconsin are similar to the concentrations detected at the Site.
5. The Ackerman domestic residential well 207 feet deep and is located downgradient of he Site. This well is used for potable uses.

## IX. Recommendations and Follow-Up Actions

The following are recommendations for this Site resulting from this Five-Year Review.

1. Continue natural attenuation monitoring and evaluation in accordance with plan

approvals. Determine if natural attenuation can be an effective modification to the ROD remedy that remains protective to human health and the environment. The WDNR will continue with the natural attenuation monitoring and anticipates incorporating natural attenuation as a modification to the ROD by 2005

2. Determine if the presence of the trimethylbenzenes requires an additional health analysis. The WDNR will evaluate the need to perform an additional health analysis by July 2004. If an additional health analysis is needed, this activity will be completed by July 2005.
3. Require that the laboratory instill better practices to reduce the occurrence of methylene chloride and acetone in samples. WDNR has already mandated better laboratory practices and if future laboratory performance does not improve, corrective actions will be implemented.
4. Complete additional studies to evaluate the occurrence of iron and manganese (as well as other metals) in the groundwater with respect to background levels and develop Wisconsin Alternative Concentration Limits (WACLs) for iron and manganese, if applicable. Additional studies will be completed by the WDNR and it is anticipated that applicable WACLs will be determined by July 2005.
5. Increase sampling frequency of twice per year for Ackerman residential well to better determine changes in groundwater quality. Ongoing groundwater sampling will be completed by the WDNR.

**X.Protectiveness Statement**

The remedy is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals, through operation of the groundwater extraction system (as necessary) and natural attenuation, which is expected to require 30 years or less to achieve. In the interim, exposure pathways that could result in unacceptable risks are being controlled and institutional controls are preventing exposure to, or the ingestion of, contaminated groundwater. All threats at the Site have been addressed through capping of contaminated waste materials and the implementation of institutional controls.

Potential long-term exposure to low levels of VOCs through the use of private wells in contaminated groundwater is the principal threats to human health and the environment. Long-term protectiveness of the remedial action will be verified by obtaining additional groundwater samples to fully evaluate potential migration of the contaminant plume downgradient from the landfill and towards wells. Additional sampling and analysis in accordance with the monitoring plan will be completed semi-annually until the ARARs (or future WACLs) are met. Current monitoring data indicate that the remedy is functioning as required to achieve groundwater cleanup goals.

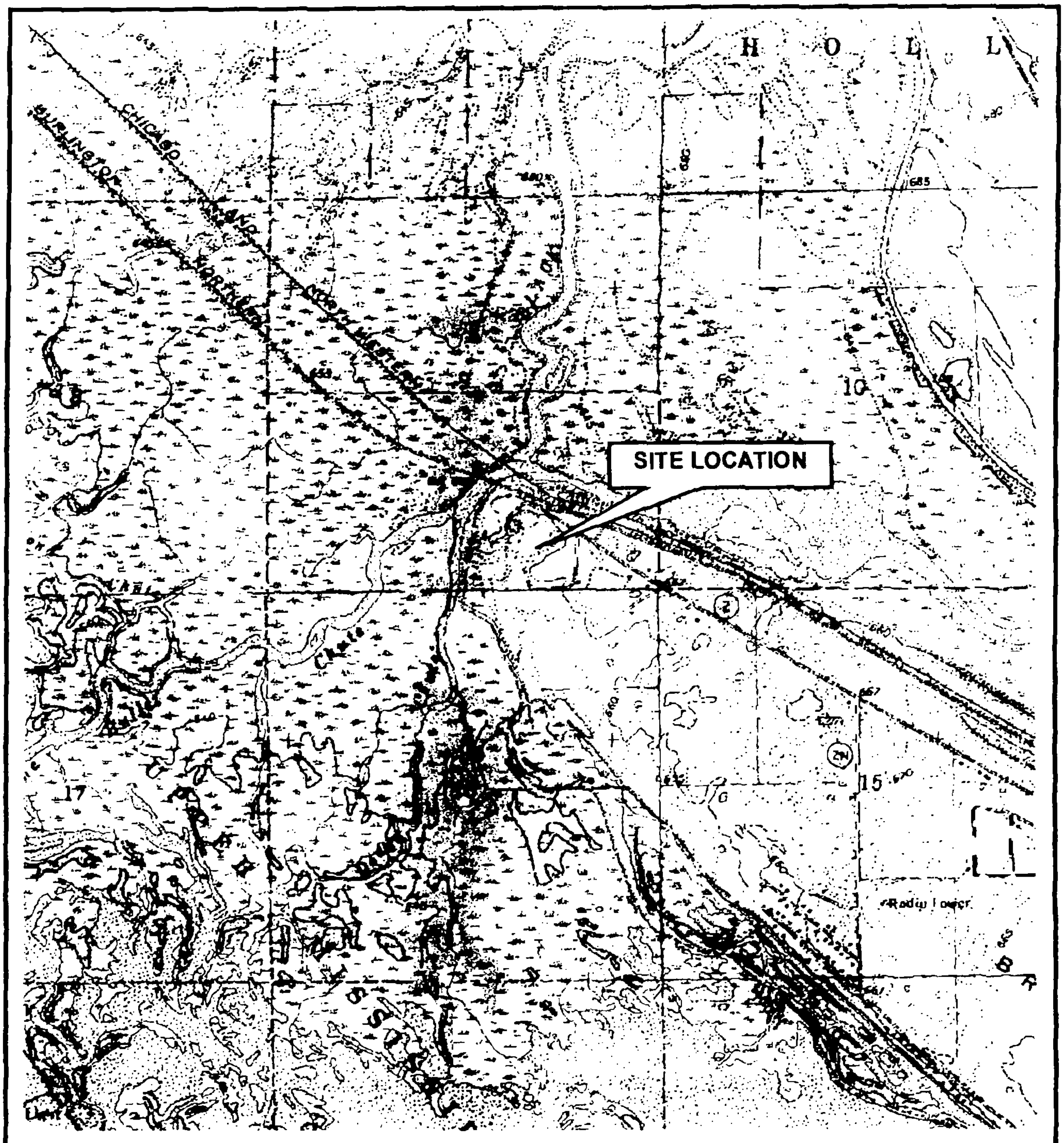
## XI. Next Review

The next five-year review for the Onalaska Landfill Site is required by July 14, 2008, five years from the end date of this review.

ATTACHMENTS

**Attachment 1**

**Site Location Map**




SOURCE: USGS 7½ Minute Topographic Quadrangle Holmen, Wi-Minn., dated 1973, obtained from DeLorme

SCALE

0 1/4 1/2 1 MILE

N

FIGURE 1

SITE LOCATION MAP

Onalaska Landfill

Onalaska, Wisconsin

| | | | |
|---|---|---|---|
| DRAWN: CMB | DATE: June 2003 | PROJECT NO. | REV |
| FILE NO: FIG1.DOC | CHECKED: PJM | 09413-114 | 0 |

## Attachment 2

**Site Plan**

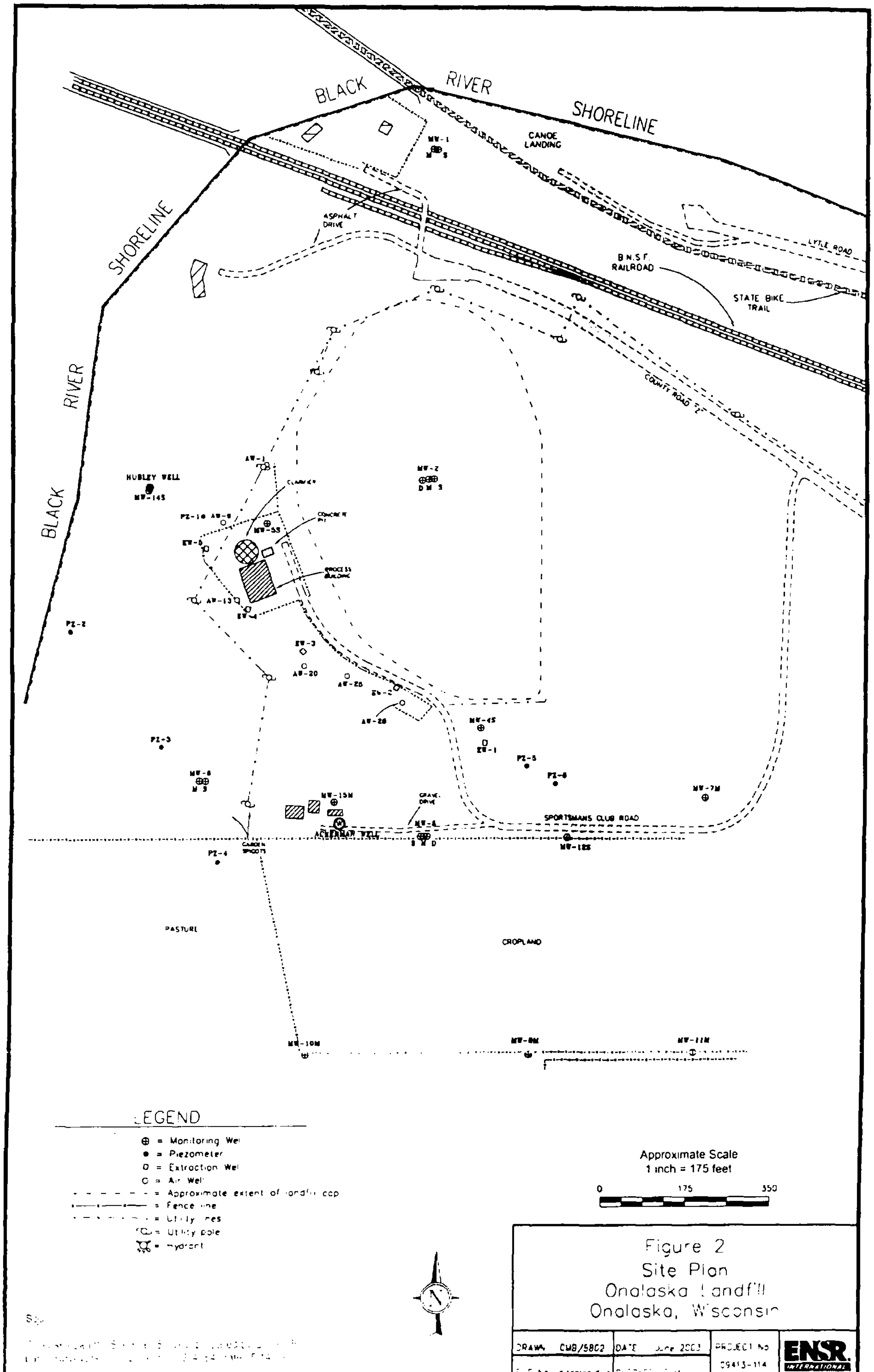



Figure 2
Site Plan
Onalaska Landfill
Onalaska, Wisconsin

## Attachment 3

**Interview Records**

# INTERVIEW RECORD

| | | |
|---|---|---|
| **Site Name:** Onalaska Landfill Superfund Site | | **EPA ID No:** |
| **Subject:** 5 Year Review | | **Time:** 11:00a.m. **Date:** 06/13/03 |
| **Type:** X Telephone ☐ Visit ☐ Other **Location of Visit:** | | ☐ Incoming ☐ Outgoing |
| **Contact Made By::** | | |
| **Name:** Dave Carper | **Title:** Project Manager | **Organization:** WDNR |
| **Individual Contacted:** | | |
| **Name:** Bill Wood | **Title:** Site Operator | **Organization:** ENSR |
| **Telephone No:** 608/788-8571 **Fax No:** **E-Mail Address:** | | **Street Address:** W2788 Birch Lane **City, State, Zip:** La Crosse, WI 54601 |

## Summary of Conversation

Mr. Wood has been the primary site operator since the remediation system was started. He feels that the remedial system has operated well throughout the remediation. He feels that the remediation has been a success, exceeding expectations. It his opinion that it was a "good decision" to evaluate the effectiveness of natural attenuation on the remaining contaminants in the groundwater at the site.

# INTERVIEW RECORD

| | |
|---|---|
| **Site Name:** Onalaska Landfill Superfund Site | **EPA ID No:** |
| **Subject:** 5 Year Review | **Time:** 11:00a.m. **Date:** 06/13/03 |
| **Type:** X Telephone ☐ Visit ☐ Other<br>**Location of Visit:** | ☐ Incoming ☐ Outgoing |

**Contact Made By::**

| | | |
|---|---|---|
| **Name:** Dave Carper | **Title:** Project Manager | **Organization:** WDNR |

**Individual Contacted:**

| | | |
|---|---|---|
| **Name:** Ray Hubley | **Title:** Neighbor | **Organization:** |

| | |
|---|---|
| **Telephone No:** 608/781-0965<br>**Fax No:**<br>**E-Mail Address:** | **Street Address:** W8672 CTH Z<br>**City, State, Zip:** Onalaska, WI 54650 |

**Summary of Conversation**

Mr. Hubley observed that the project has "served it's purpose" and the cleanup was effective. He felt that since the inception of the remediation that the degree of contamination did not merit the remedial effort. He feels he has been kept well informed, and would like to see the area developed as a natural area.

# INTERVIEW RECORD

| | |
|---|---|
| **Site Name:** Onalaska Landfill Superfund Site | **EPA ID No:** |
| **Subject:** 5 Year Review | **Time:** 11:00a.m. **Date:** 06/13/03 |
| **Type:** X Telephone ☐ Visit ☐ Other<br>**Location of Visit:** | ☐ Incoming ☐ Outgoing |

**Contact Made By::**

| | | |
|---|---|---|
| **Name:** Dave Carper | **Title:** Project Manager | **Organization:** WDNR |

**Individual Contacted:**

| | | |
|---|---|---|
| **Name:** Dave Paudler | **Title:** Town Supervisor | **Organization:** Town of Onalaska |

| | |
|---|---|
| **Telephone No:** 608-781-0952<br>**Fax No:**<br>**E-Mail Address:** | **Street Address:** W7769 CTH ZB<br>**City, State, Zip:** Onalaska, WI 54650 |

**Summary of Conversation**

Mr. Paudler has been aware of the site since the initiation of the site investigation. He believes that de-listing the site would save a considerable amount of money. He felt that there has been minimal effect on the surrounding community from the landfill site, and that the community has been kept "pretty well informed". He is pleased to see the apparent success of the cleanup effort.

## Attachment 4

**Major Documents Reviewed**

References, Major Documents Reviewed


CH2M HILL. *Quality Assurance Project Plan, Onalaska Municipal Landfill Site*. 2002.

U.S. Department of Health and Human Services. *Public Health Assessment for: Interim. Onalaska Municipal Landfill*. July 1992.

CH2M HILL. *Groundwater Treatment Facility Shutdown/Restart Plan, Onalaska Municipal Landfill*. December 2001.

CH2M HILL. *Monitored Natural Attenuation Plan, Onalaska Municipal Landfill Site*. 2001.

CH2M HILL. *Sampling and Analysis Plan, Onalaska Municipal Landfill Site*. 1997.

U.S. EPA. *Annual Groundwater Quality and Capture Report for 2001, Onalaska Municipal Landfill*. 2002.

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U.S. EPA. *Annual Groundwater Quality and Capture Report for 1999, Onalaska Municipal Landfill*. 2000.

U.S. EPA. *Record of Decision: Selected Remedial Alternative for the Onalaska Municipal Landfill Site*. October 10, 2000.

U.S. EPA. *Explanation of Significant Differences: Onalaska Municipal Landfill*. September 29, 2000.

U.S. EPA. *Annual Groundwater Quality and Capture Report for 1998, Onalaska Municipal Landfill*. 1999.

U.S. EPA. *Annual Groundwater Quality and Capture Report for 1997, Onalaska Municipal Landfill*. 1998.

U.S. EPA. *Five-Year Review (Type 1a): Onalaska Municipal Landfill.* July 14, 1998.

U.S. EPA. *Record of Decision: First Remedial Action - Final, Onalaska Municipal Landfill, Wisconsin.* 1990.

U.S. EPA. *Alternative Array Memorandum and Preliminary Identification of ARARS. Onalaska Municipal Landfill.* April 1989.

U.S. EPA. *Remedial Investigation Report, Onalaska Municipal Landfill Site.* December 1989.

WDNR. *Guidance on Natural Attenuation for Petroleum Releases. Pub-RR-614.* March 2003.

WDNR. *Understanding Chlorinated Hydrocarbon Behavior in Groundwater: (Draft) Pub-RR-69.* December 2002.

Wisconsin Division of Health. *Preliminary Health Assessment, Onalaska Municipal Landfill.* December 1988.

**Attachment 5**

**Monitoring Data**

Table 1
AW-1
**Summary of Detected Compounds**
**Former Onalaska Landfill**

| Volatile Organic Compounds (VOC), ug/L | 12/12/02 | 4/23/03 | PAL | ES |
|---|---|---|---|---|
| 1,2,4-Trimethylbenzene | 25 | 8.4 | 96 | 480 |
| 1,3,5-Trimethylbenzene | 22 | 6.1 | 96 | 480 |
| Acetone | 6 | < 1.1 | 200 | 1000 |
| Methylene chloride | **3.8** | < 0.29 | 0.5 | 5 |
| Xylenes (total) | 4 | 4.7 | 1,000 | 10,000 |

**Metals, mg/L**

| | | | | |
|---|---|---|---|---|
| Arsenic | < 0.0021 | < 0.0021 | 0.005 | 0.05 |
| Barium | 0.25 | 0.13 | 0.4 | 2 |
| Cadmium | **0.0032** | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | 0.0043 | < 0.00074 | 0.008 | 0.04 |
| Iron | **4.5** | **0.39** | 0.15 | 0.3 |
| Lead | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **6** | **0.7** | 0.025 | 0.05 |
| Mercury | < 0.000087 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | < 0.00067 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | | |
|---|---|---|---|---|
| Ethane | < 3 | < 3 | --- | --- |
| Ethene | < 2.9 | < 2.9 | --- | --- |
| Methane | 1500 | 690 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | | |
|---|---|---|---|---|
| Chloride | 2.1 | 5.6 | 125 | 250 |
| Nitrate as N | < 0.0076 | 0.83 | 2 | 10 |
| Sulfate | 9.1 | 6.2 | 125 | 250 |
| Total Alkalinity | 290 | 210 | --- | --- |
| Total Organic Carbon | 6 | 2 | --- | --- |

Note: Please see notes provided at the end of this table.

Table 1
AW-9
Summary of Detected Compounds
Former Onalaska Landfill

| ***Volatile Organic Compounds (VOC), ug/L*** | **12/12/02** | **4/23/03** | **PAL** | **ES** |
|---|---|---|---|---|
| 1,2,4-Trimethylbenzene | 1.6 | < 0.37 | 96 | 480 |
| Acetone | 2.9 | < 1.1 | 200 | 1000 |
| Methylene chloride | **3.8** | 0.34 | [illegible] | 5 |

| **Metals, mg/L** | | | | |
|---|---|---|---|---|
| Arsenic | < 0.0021 | < 0.0021 | 0.005 | 0.05 |
| Barium | 0.072 | 0.051 | 0.4 | 2 |
| Cadmium | < 0.00028 | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | < 0.00074 | < 0.00074 | 0.008 | 0.04 |
| Iron | 0.067 | < 0.042 | 0.15 | 0.3 |
| Lead | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **0.041** | 0.016 | 0.025 | 0.05 |
| Mercury | < 0.000087 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | < 0.00067 | 0.006 | 0.03 |

| ***Dissolved Gases, ug/L*** | | | | |
|---|---|---|---|---|
| Ethane | < 0.3 | < 0.6 | --- | --- |
| Ethene | < 0.29 | < 0.58 | --- | --- |
| Methane | 260 | 220 | --- | --- |

| **Natural Attenuation Parameters, mg/L** | | | | |
|---|---|---|---|---|
| Chloride | 3.1 | 3 | 125 | 250 |
| Nitrate as N | 0.42 | 1.1 | 2 | 10 |
| Sulfate | 3.5 | 3.1 | 125 | 250 |
| Total Alkalinity | 220 | 170 | --- | --- |
| Total Organic Carbon | 1 | 0.8 | --- | --- |

Note: Please see notes provided at the end of this table.

## Table 1
### AW-13
### Summary of Detected Compounds
### Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/12/02 | Duplicate 12/12/2002 | 4/22/03 | PAL | ES |
|---|---|---|---|---|---|
| 1,2,4-Trimethylbenzene | 2 | 1.8 | **860** | 96 | 480 |
| 1,3,5-Trimethylbenzene | < 0.4 | 1.1 | **32** | 96 | 480 |
| Acetone | 2.5 | 5.9 | < 24 | 200 | 1000 |
| Methylene chloride | **3.6** | **3.6** | < 6.4 | 0.5 | 5 |
| Xylenes (total) | < 0.44 | < 0.44 | 10 | 1,000 | 10,000 |

**Metals, mg/L**

| | | | | | |
|---|---|---|---|---|---|
| Arsenic | 0.0033 | < 0.0021 | 0.0048 | 0.005 | 0.05 |
| Barium | 0.28 | 0.27 | 0.2 | 0.4 | 2 |
| Cadmium | < 0.00028 | < 0.00028 | 0.00034 | 0.0005 | 0.005 |
| Cobalt | 0.0043 | 0.0044 | < 0.00074 | 0.008 | 0.04 |
| Iron | **4.7** | **5.1** | **34.8** | 0.15 | 0.3 |
| Lead | < 0.0016 | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **24.3** | **23.7** | **11.4** | 0.025 | 0.05 |
| Mercury | < 0.000087 | < 0.000087 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | < 0.00067 | < 0.00067 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | | | |
|---|---|---|---|---|---|
| Ethane | < 1.5 | < 0.6 | < 3 | --- | --- |
| Ethene | < 1.4 | < 0.58 | < 2.9 | --- | --- |
| Methane | 300 | 340 | 2200 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | | | |
|---|---|---|---|---|---|
| Chloride | 2.6 | 2.3 | 6.7 | 125 | 250 |
| Nitrate as N | 0.2 | 0.28 | 0.01 | 2 | 10 |
| Sulfate | 3.1 | 2.7 | 0.49 | 125 | 250 |
| Total Alkalinity | 550 | 550 | 260 | --- | --- |
| Total Organic Carbon | 5 | 4 | 5 | --- | --- |

Note: Please see notes provided at the end of this table.

Table 1
AW-20
Summary of Detected Compounds
Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/12/02 | 4/22/03 | Duplicate 4/23/03 | PAL | ES |
|---|---|---|---|---|---|
| 1,2,4-Trimethylbenzene | 22 | **450** | **450** | 96 | 480 |
| 1,3,5-Trimethylbenzene | 17 | **200** | **190** | 96 | 480 |
| Acetone | 3.6 | < 17 | < 17 | 200 | 1000 |
| Methylene chloride | **3.4** | < 4.5 | < 4.5 | 0.5 | 5 |
| Naphthalene | 0.64 | **8.2** | **8.9** | 8 | 40 |
| Xylenes (total) | 1.1 | 30 | 28 | 1,000 | 10,000 |

**Metals, mg/L**

| | | | | | |
|---|---|---|---|---|---|
| Arsenic | **0.0088** | < 0.0021 | < 0.0021 | 0.005 | 0.05 |
| Barium | 0.29 | 0.13 | 0.23 | 0.4 | 2 |
| Cadmium | 0.00037 | < 0.00028 | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | **0.011** | < 0.00074 | **0.01** | 0.008 | 0.04 |
| Iron | **23.3** | **0.39** | **5.4** | 0.15 | 0.3 |
| Lead | < 0.0016 | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **17** | **0.7** | **11.8** | 0.025 | 0.05 |
| Mercury | 0.000087 | < 0.000087 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | < 0.00067 | < 0.00067 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | | | |
|---|---|---|---|---|---|
| Ethane | < 3 | < 3 | < 3 | --- | --- |
| Ethene | < 2.9 | < 2.9 | < 2.9 | --- | --- |
| Methane | 1600 | 690 | 830 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | | | |
|---|---|---|---|---|---|
| Chloride | 1.8 | 5.6 | 7.1 | 125 | 250 |
| Nitrate as N | < 0.0076 | 0.83 | 1.9 | 2 | 10 |
| Sulfate | 1.1 | 6.2 | 3.9 | 125 | 250 |
| Total Alkalinity | 600 | 210 | 400 | --- | --- |
| Total Organic Carbon | 15 | 2 | 10 | --- | --- |

Note: Please see notes provided at the end of this table.

Table 1
AW-25
*Summary of Detected* Compounds
Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/12/02 | 4/22/03 | PAL | ES |
|---|---|---|---|---|
| 1,2,4-Trimethylbenzene | **240** | 52 | 96 | 480 |
| 1,3,5-Trimethylbenzene | **38** | 9.1 | 96 | 480 |
| Methylene chloride | **5.1** | < 0.72 | 0.5 | 5 |
| Naphthalene | 4.5 | < 1 | 8 | 40 |
| Xylenes (total) | 5.6 | 2.9 | 1,000 | 10,000 |

**Metals, mg/L**

| | | | | |
|---|---|---|---|---|
| Arsenic | 0.0034 | < 0.0021 | 0.005 | 0.05 |
| Barium | **0.43** | 0.23 | 0.4 | 2 |
| Cadmium | < 0.00028 | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | 0.0049 | 0.0021 | 0.008 | 0.04 |
| Iron | **13.8** | **3.6** | 0.15 | 0.3 |
| Lead | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **6.6** | **2.3** | 0.025 | 0.05 |
| Mercury | < 0.000087 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | < 0.00067 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | | |
|---|---|---|---|---|
| Ethane | < 3 | < 3 | --- | --- |
| Ethene | < 2.9 | < 2.9 | --- | --- |
| Methane | 570 | 1400 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | | |
|---|---|---|---|---|
| Chloride | | 15.2 | 125 | 250 |
| Nitrate as N | 0.97 | **2.2** | 2 | 10 |
| Sulfate | 4.4 | 1.9 | 125 | 250 |
| Total Alkalinity | 520 | 320 | --- | --- |
| Total Organic Carbon | 7 | 6 | --- | --- |

Note: Please see notes provided at the end of this table.

Table 1
AW-28
Summary of Detected Compounds
Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/12/02 | 4/22/03 | PAL | ES |
|---|---|---|---|---|
| 1,2,4-Trimethylbenzene | 45 | 44 | 96 | 480 |
| 1,3,5-Trimethylbenzene | 21 | 18 | 96 | 480 |
| Acetone | 5.4 | < 2.2 | 200 | 1000 |
| Methylene chloride | **4.6** | < 0.58 | 0.5 | 5 |
| Toluene | 0.83 | < 0.78 | 200 | 1,000 |
| Xylenes (total) | 2.9 | 1.6 | 1,000 | 10,000 |

**Metals, mg/L**

| | | | | |
|---|---|---|---|---|
| Arsenic | 0.0026 | < 0.0021 | 0.005 | 0.05 |
| Barium | 0.26 | 0.22 | 0.4 | 2 |
| Cadmium | < 0.00028 | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | 0.0064 | 0.0036 | 0.008 | 0.04 |
| Iron | **9.8** | **3.7** | 0.15 | 0.3 |
| Lead | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **5** | **2.4** | 0.025 | 0.05 |
| Mercury | < 0.000087 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | < 0.00067 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | | |
|---|---|---|---|---|
| Ethane | < 3 | < 3 | --- | --- |
| Ethene | < 2.9 | < 2.9 | --- | --- |
| Methane | 1200 | 1700 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | | |
|---|---|---|---|---|
| Chloride | 10.8 | 14 | 125 | 250 |
| Nitrate as N | 1.1 | 1.7 | 2 | 10 |
| Sulfate | 1.4 | 2.7 | 125 | 250 |
| Total Alkalinity | 370 | 360 | --- | --- |
| Total Organic Carbon | 9 | 11 | --- | --- |

Note: Please see notes provided at the end of this table.

Table 1
MW-1S
**Summary of Detected Compounds**
**Former Onalaska Landfill**

| Volatile Organic Compounds (VOC), ug/L | 12/11/02 | 4/22/03 | PAL | ES |
|---|---|---|---|---|
| 2-Butanone | < 0.59 | 0.82 | --- | --- |
| Acetone | 3.7 | < 1.1 | 200 | 1000 |
| Methylene chloride | 2.4 | 0.37 | 0.5 | 5 |

**Metals, mg/L**

| | | | | |
|---|---|---|---|---|
| Arsenic | 0.0029 | < 0.0021 | 0.005 | 0.05 |
| Barium | 0.034 | 0.039 | 0.4 | 2 |
| Cadmium | < 0.00028 | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | < 0.00074 | < 0.00074 | 0.008 | 0.04 |
| Iron | **0.15** | 0.12 | 0.15 | 0.3 |
| Lead | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **0.86** | **0.76** | 0.025 | 0.05 |
| Mercury | < 0.000087 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | 0.00088 | 0.0012 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | | |
|---|---|---|---|---|
| Ethane | < 0.3 | < 0.3 | --- | --- |
| Ethene | < 0.29 | < 0.29 | --- | --- |
| Methane | 18 | 150 | --- | --- |

**Natural Attenuation *Parameters, mg/L***

| | | | | |
|---|---|---|---|---|
| Chloride | 5.5 | 7.3 | 125 | 250 |
| Nitrate as N | < 0.0076 | 0.14 | 2 | 10 |
| Sulfate | 19.7 | 12.9 | 125 | 250 |
| Total Alkalinity | 120 | 140 | --- | --- |
| Total Organic Carbon | 4 | 3 | --- | --- |

Note: Please see notes provided at the end of this table.

Table 1
MW-1M
Summary of Detected Compounds
Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/11/02 | 4/22/03 | PAL | ES |
|---|---|---|---|---|
| Acetone | 3.4 | < 1.1 | *200* | *1000* |
| Methylene chloride | **2.4** | 0.32 | 0.5 | 5 |

| Metals, mg/L | | | | |
|---|---|---|---|---|
| Arsenic | ***0.014*** | ***0.01*** | *0.005* | 0.05 |
| Barium | 0.32 | 0.33 | 0.4 | 2 |
| Cadmium | < 0.00028 | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | < 0.00074 | < 0.00074 | 0.008 | 0.04 |
| Iron | **8.7** | **7.7** | 0.15 | 0.3 |
| Lead | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **1.7** | **1.6** | 0.025 | 0.05 |
| Mercury | < 0.000087 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | < 0.00067 | 0.006 | 0.03 |

| Dissolved Gases, ug/L | | | | |
|---|---|---|---|---|
| Ethane | < 0.3 | < 0.3 | --- | --- |
| Ethene | < 0.29 | < 0.29 | --- | --- |
| Methane | 9.9 | 89 | --- | --- |

| Natural Attenuation Parameters, mg/L | | | | |
|---|---|---|---|---|
| Chloride | 7.8 | 8.1 | 125 | 250 |
| Nitrate as N | < 0.0076 | < 0.0076 | 2 | 10 |
| Sulfate | 5.2 | 5.7 | 125 | 250 |
| Total Alkalinity | 76 | 72 | --- | --- |
| Total Organic Carbon | 4 | 3 | --- | --- |

Note: Please see notes provided at the end of this table.

## Table 1
### MW-2S
### Summary of Detected Compounds
### Former Onalaska Landfill

**Volatile Organic Compounds (VOC), ug/L**

| Volatile Organic Compounds (VOC), ug/L | 12/11/02 | 4/22/03 | PAL | ES |
|---|---|---|---|---|
| Acetone | 3.8 | < 1.1 | 200 | 1000 |
| Benzene | **0.91** | 0.45 | 0.5 | 5 |
| Chlorobenzene | 19 | 1.5 | --- | --- |
| Methylene chloride | **2.8** | < 0.29 | 0.5 | 5 |

**Metals, mg/L**

| Metals, mg/L | 12/11/02 | 4/22/03 | PAL | ES |
|---|---|---|---|---|
| Arsenic | **0.012** | **0.012** | 0.005 | 0.05 |
| Barium | 0.17 | 0.14 | 0.4 | 2 |
| Cadmium | < 0.00028 | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | **0.008** | 0.0013 | 0.008 | 0.04 |
| Iron | **29.5** | **29.3** | 0.15 | 0.3 |
| Lead | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **1.9** | **2.8** | 0.025 | 0.05 |
| Mercury | < 0.000087 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | 0.00084 | 0.002 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| Dissolved Gases, ug/L | 12/11/02 | 4/22/03 | PAL | ES |
|---|---|---|---|---|
| Ethane | < 1.5 | < 1.5 | --- | --- |
| Ethene | < 1.4 | < 1.4 | --- | --- |
| Methane | 520 | 540 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| Natural Attenuation Parameters, mg/L | 12/11/02 | 4/22/03 | PAL | ES |
|---|---|---|---|---|
| Chloride | 26.1 | 18.4 | 125 | 250 |
| Nitrate as N | < 0.0076 | 0.01 | 2 | 10 |
| Sulfate | < 0.11 | 0.22 | 125 | 250 |
| Total Alkalinity | 180 | 170 | --- | --- |
| Total Organic Carbon | 6 | 4 | --- | --- |

Note: *Please see notes provided at the end of this table.*

# Table 1
## MW-2M
## Summary of Detected Compounds
## Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/11/02 | 4/22/03 | PAL | ES |
|---|---|---|---|---|
| Acetone | 5.5 | < 1.1 | 200 | 1000 |
| Methylene chloride | 3.1 | < 0.29 | 0.5 | 5 |

**Metals, mg/L**

| | | | | |
|---|---|---|---|---|
| Arsenic | **0.019** | **0.019** | 0.005 | 0.05 |
| Barium | 0.37 | **0.66** | 0.4 | 2 |
| Cadmium | < 0.00028 | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | < 0.00074 | < 0.00074 | 0.008 | 0.04 |
| Iron | **5** | **9.6** | 0.15 | 0.3 |
| Lead | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **0.41** | **0.64** | 0.025 | 0.05 |
| Mercury | 0.000092 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | < 0.00067 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | | |
|---|---|---|---|---|
| Ethane | < 0.3 | < 0.6 | --- | --- |
| Ethene | < 0.29 | < 0.58 | --- | --- |
| Methane | 22 | 310 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | | |
|---|---|---|---|---|
| Chloride | 4.8 | 16 | 125 | 250 |
| Nitrate as N | < 0.0076 | < 0.0076 | 2 | 10 |
| Sulfate | 0.13 | < 0.11 | 125 | 250 |
| Total Alkalinity | 100 | 160 | --- | --- |
| Total Organic Carbon | 4 | 4 | --- | --- |

Note: Please see notes provided at the end of this table.

## Table 1
### MW-4S
### Summary of Detected Compounds
### Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/12/02 | Duplicate 12/12/2002 | 4/22/03 | PAL | ES |
|---|---|---|---|---|---|
| 1,2,4-Trimethylbenzene | **540** | **570** | **780** | 96 | 480 |
| 1,3,5-Trimethylbenzene | **120** | **130** | **170** | 96 | 480 |
| Ethylbenzene | 10 | < 10 | 16 | 140 | 700 |
| Naphthalene | < 10 | < 10 | **14** | 8 | 40 |
| Xylenes (total) | 29 | 27 | 54 | 1,000 | 10,000 |

| Metals, mg/L | | | | | |
|---|---|---|---|---|---|
| Arsenic | **0.0089** | **0.009** | **0.0065** | 0.005 | 0.05 |
| Barium | 0.3 | 0.32 | 0.26 | 0.4 | 2 |
| Cadmium | < 0.00028 | < 0.00028 | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | < 0.00074 | < 0.00074 | < 0.00074 | 0.008 | 0.04 |
| Iron | **16.9** | **17.2** | **15.4** | 0.15 | 0.3 |
| Lead | < 0.0016 | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **2.1** | **2.1** | **1.8** | 0.025 | 0.05 |
| Mercury | < 0.000087 | < 0.000087 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | < 0.00067 | < 0.00067 | 0.006 | 0.03 |

| Dissolved Gases, ug/L | | | | | |
|---|---|---|---|---|---|
| Ethane | < 3 | < 3 | < 3 | --- | --- |
| Ethene | < 2.9 | < 2.9 | < 2.9 | --- | --- |
| Methane | 1200 | 750 | 1700 | --- | --- |

| Natural Attenuation Parameters, mg/L | | | | | |
|---|---|---|---|---|---|
| Chloride | 13.5 | 13.5 | 10.2 | 125 | 250 |
| Nitrate as N | < 0.0076 | < 0.0076 | < 0.0076 | 2 | 10 |
| Sulfate | 0.98 | 0.92 | 0.22 | 125 | 250 |
| Total Alkalinity | 280 | 280 | 260 | --- | --- |
| Total Organic Carbon | 5 | 6 | 5 | --- | --- |

Note: Please see notes provided at the end of this table.

## Table 1
MW-5S
Summary of Detected Compounds
Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/12/02 | 4/22/03 | PAL | ES |
|---|---|---|---|---|
| 1,2,4-Trimethylbenzene | **210** | **180** | 96 | 480 |
| 1,3,5-Trimethylbenzene | **47** | **38** | 96 | 480 |
| Ethylbenzene | 6.2 | 5.1 | 140 | 700 |
| Methylene chloride | **3.9** | < 1.7 | 0.5 | 5 |
| Naphthalene | 6.2 | 5.4 | 8 | 40 |
| Xylenes (total) | 12 | 13 | 1,000 | 10,000 |

| Metals, mg/L | | | | |
|---|---|---|---|---|
| Arsenic | **0.0098** | **0.011** | 0.005 | 0.05 |
| Barium | 0.18 | 0.28 | 0.4 | 2 |
| Cadmium | < 0.00028 | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | 0.0025 | 0.0041 | 0.008 | 0.04 |
| Iron | **10.2** | **19.4** | 0.15 | 0.3 |
| Lead | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **1.6** | **2** | 0.025 | 0.05 |
| Mercury | 0.000088 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | < 0.00067 | 0.006 | 0.03 |

| Dissolved Gases, ug/L | | | | |
|---|---|---|---|---|
| Ethane | < 3 | < 0.3 | --- | --- |
| Ethene | < 2.9 | < 0.29 | --- | --- |
| Methane | 130 | 230 | --- | --- |

| Natural Attenuation Parameters, mg/L | | | | |
|---|---|---|---|---|
| Chloride | 5.8 | 5.7 | 125 | 250 |
| Nitrate as N | 0.1 | 0.62 | 2 | 10 |
| Sulfate | 0.34 | 3.3 | 125 | 250 |
| Total Alkalinity | 140 | 160 | --- | --- |
| Total Organic Carbon | 5 | 4 | --- | --- |

Note: Please see notes provided at the end of this table.

# Table 1
**MW-6S**
**Summary of Detected Compounds**
**Former Onalaska Landfill**

| Volatile Organic Compounds (VOC), ug/L | 12/12/02 | PAL | ES |
|---|---|---|---|
| 1,1-Dichloroethane | 0.55 | 85 | 850 |
| Acetone | 2.6 | 200 | 1000 |
| Methylene chloride | **2.2** | 0.5 | 5 |

**Metals, mg/L**

| | | | |
|---|---|---|---|
| Arsenic | < 0.0021 | 0.005 | 0.05 |
| Barium | 0.17 | 0.4 | 2 |
| Cadmium | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | 0.0022 | 0.008 | 0.04 |
| Iron | 0.065 | 0.15 | 0.3 |
| Lead | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **2.7**[illegible] | 0.025 | 0.05 |
| Mercury | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | |
|---|---|---|---|
| Ethane | < 0.3 | --- | --- |
| Ethene | < 0.29 | --- | --- |
| Methane | 2.9 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | |
|---|---|---|---|
| Chloride | 6.7 | 125 | 250 |
| Nitrate as N | < 0.0076 | 2 | 10 |
| Sulfate | 4 | 125 | 250 |
| Total Alkalinity | 160 | --- | --- |
| Total Organic Carbon | 6 | --- | --- |

Note: Please see notes provided at the end of this table.

Table 1
MW-6M
Summary of Detected Compounds
Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/12/02 | PAL | ES |
|---|---|---|---|
| Acetone | 2.1 | 200 | 1000 |
| Methylene chloride | 2.1 | 0.5 | 5 |

**Metals, mg/L**

| | | | |
|---|---|---|---|
| Arsenic | 0.0024 | 0.005 | 0.05 |
| Barium | **0.75** | 0.4 | 2 |
| Cadmium | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | < 0.00074 | 0.008 | 0.04 |
| Iron | < 0.042 | 0.15 | 0.3 |
| Lead | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **1.7** | 0.025 | 0.05 |
| Mercury | 0.000097 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | |
|---|---|---|---|
| Ethane | < 0.3 | --- | --- |
| Ethene | < 0.29 | --- | --- |
| Methane | 1.1 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | |
|---|---|---|---|
| Chloride | 6 | 125 | 250 |
| Nitrate as N | < 0.0076 | 2 | 10 |
| Sulfate | 0.42 | 125 | 250 |
| Total Alkalinity | 100 | --- | --- |
| Total Organic Carbon | 4 | --- | --- |

Note: Please see notes provided at the end of this table.

## Table 1
### MW-8S
### Summary of Detected Compounds
### Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/11/02 | PAL | ES |
|---|---|---|---|
| Acetone | 2.2 | 200 | 1000 |
| Methylene chloride | 2.6 | 0.5 | 5 |

**Metals, mg/L**

| | | | |
|---|---|---|---|
| Arsenic | < 0.0021 | 0.005 | 0.05 |
| Barium | 0.088 | 0.4 | 2 |
| Cadmium | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | < 0.00074 | 0.008 | 0.04 |
| Iron | 0.052 | 0.15 | 0.3 |
| Lead | < 0.0016 | 0.0015 | 0.015 |
| Manganese | 0.59 | 0.025 | 0.05 |
| Mercury | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | 0.006 | 0.03 |

***Dissolved Gases, ug/L***

| | | | |
|---|---|---|---|
| Ethane | < 0.3 | --- | --- |
| Ethene | < 0.29 | --- | --- |
| Methane | 0.58 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | |
|---|---|---|---|
| Chloride | 9.5 | 125 | 250 |
| Nitrate as N | 1.5 | 2 | 10 |
| Sulfate | 12.3 | 125 | 250 |
| Total Alkalinity | 190 | --- | --- |
| Total Organic Carbon | 0.9 | --- | --- |

Note: Please see notes provided at the end of this table.

## Table 1
### MW-8M
### Summary of Detected Compounds
### Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/11/02 | PAL | ES |
|---|---|---|---|
| Acetone | 2.9 | 200 | 1000 |
| Methylene chloride | 3.2 | 0.5 | 5 |

**Metals, mg/L**

| | | | |
|---|---|---|---|
| Arsenic | < 0.0021 | 0.005 | 0.05 |
| Barium | **0.68** | 0.4 | 2 |
| Cadmium | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | < 0.00074 | 0.008 | 0.04 |
| Iron | < 0.042 | 0.15 | 0.3 |
| Lead | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **2.7** | 0.025 | 0.05 |
| Mercury | 0.00009 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | |
|---|---|---|---|
| Ethane | < 0.3 | --- | --- |
| Ethene | < 0.29 | --- | --- |
| Methane | 2 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | |
|---|---|---|---|
| Chloride | 2.6 | 125 | 250 |
| Nitrate as N | < 0.0076 | 2 | 10 |
| Sulfate | 5.7 | 125 | 250 |
| Total Alkalinity | 220 | --- | --- |
| Total Organic Carbon | 2 | --- | --- |

Note: Please see notes provided at the end of this table.

Table 1
MW-12S
Summary of Detected Compounds
Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/11/02 | PAL | ES |
|---|---|---|---|
| Acetone | 3 | 200 | 1000 |
| Methylene chloride | 2.7 | 0.5 | 5 |

**Metals, mg/L**

| | | | |
|---|---|---|---|
| Arsenic | < 0.0021 | 0.005 | 0.05 |
| Barium | 0.021 | 0.4 | 2 |
| Cadmium | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | < 0.00074 | 0.008 | 0.04 |
| Iron | < 0.042 | 0.15 | 0.3 |
| Lead | 0.0034 | 0.0015 | 0.015 |
| Manganese | 0.0023 | 0.025 | 0.05 |
| Mercury | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | |
|---|---|---|---|
| Ethane | < 0.3 | --- | --- |
| Ethene | < 0.29 | --- | --- |
| Methane | < 0.39 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | |
|---|---|---|---|
| Chloride | 24.3 | 125 | 250 |
| Nitrate as N | 1.6 | 2 | 10 |
| Sulfate | 7.2 | 125 | 250 |
| Total Alkalinity | 170 | --- | --- |
| Total Organic Carbon | 1 | --- | --- |

Note: Please see notes provided at the end of this table.

# Table 1

## MW-14S

## Summary of Detected Compounds

## Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/12/02 | 4/23/03 | PAL | ES |
|---|---|---|---|---|
| 1,2,4-Trimethylbenzene | 1.7 | 0.97 | 96 | 480 |
| 1,3,5-Trimethylbenzene | 0.64 | < 0.4 | 96 | 480 |
| Acetone | 4.3 | < 1.1 | 200 | 1000 |
| Methylene chloride | **2.1** | < 0.29 | 0.5 | 5 |
| Naphthalene | 5 | 2.2 | 8 | 40 |
| Xylenes (total) | 1.4 | 0.47 | 1,000 | 10,000 |

**Metals, mg/L**

| | | | | |
|---|---|---|---|---|
| Arsenic | < 0.0021 | < 0.0021 | 0.005 | 0.05 |
| Barium | 0.18 | 0.084 | 0.4 | 2 |
| Cadmium | 0.00045 | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | 0.0052 | 0.0015 | 0.008 | 0.04 |
| Iron | **11.6** | **2.5** | 0.15 | 0.3 |
| Lead | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **3.7** | **0.83** | 0.025 | 0.05 |
| Mercury | 0.000088 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | < 0.00067 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | | |
|---|---|---|---|---|
| Ethane | < 3 | < 0.6 | --- | --- |
| Ethene | < 2.9 | < 0.58 | --- | --- |
| Methane | 450 | 430 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | | |
|---|---|---|---|---|
| Chloride | 5 | 5.4 | 125 | 250 |
| Nitrate as N | 0.01 | 0.34 | 2 | 10 |
| Sulfate | 3 | 5.4 | 125 | 250 |
| Total Alkalinity | 210 | 150 | --- | --- |
| Total Organic Carbon | 14 | 5 | --- | --- |

Note: Please see notes provided at the end of this table.

Table 1
MW-15M
Summary of Detected Compounds
Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/12/02 | PAL | ES |
|---|---|---|---|
| 1,1-Dichloroethane | 1 | 85 | 850 |
| cis-1,2-Dichloroethene | 0.56 | 7 | 70 |
| Methylene chloride | 3 | 0.5 | 5 |

**Metals, mg/L**

| | | | |
|---|---|---|---|
| Arsenic | **0.0054** | 0.005 | 0.05 |
| Barium | **0.86** | 0.4 | 2 |
| Cadmium | 0.00031 | 0.0005 | 0.005 |
| Cobalt | 0.0012 | 0.008 | 0.04 |
| Iron | **1.1** | 0.15 | 0.3 |
| Lead | **0.0049** | 0.0015 | 0.015 |
| Manganese | **3.6** | 0.025 | 0.05 |
| Mercury | 0.000092 | 0.0002 | 0.002 |
| Vanadium | *< 0.00067* | *0.006* | *0.03* |

**Dissolved Gases, ug/L**

| | | | |
|---|---|---|---|
| Ethane | < 0.3 | --- | --- |
| Ethene | < 0.29 | --- | --- |
| Methane | 12 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | |
|---|---|---|---|
| Chloride | 5.2 | 125 | 250 |
| Nitrate as N | 0.03 | 2 | 10 |
| Sulfate | 2.4 | 125 | 250 |
| Total Alkalinity | 240 | --- | --- |
| Total Organic Carbon | 3 | --- | --- |

Note: Please see notes provided at the end of this table.

# Table 1
## PZ-1
## Summary of Detected Compounds
## Former Onalaska Landfill

| **Volatile Organic Compounds (VOC), ug/L** | **12/12/02** | **4/23/03** | **Duplicate 4/23/03** | **PAL** | **ES** |
|---|---|---|---|---|---|
| Methylene chloride | 3.4 | < 0.29 | < 0.29 | 0.5 | 5 |
| **Metals, mg/L** | | | | | |
| Arsenic | 0.0029 | < 0.0021 | < 0.0021 | 0.005 | 0.05 |
| Barium | 0.024 | 0.031 | 0.031 | 0.4 | 2 |
| Cadmium | < 0.00028 | < 0.00028 | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | < 0.00074 | < 0.00074 | < 0.00074 | 0.008 | 0.04 |
| Iron | < 0.042 | < 0.042 | < 0.042 | 0.15 | *0.3 |
| Lead | < 0.0016 | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **0.19** | **0.3** | **0.29** | 0.025 | 0.05 |
| Mercury | 0.000091 | < 0.000087 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | 0.0013 | 0.0011 | 0.0012 | 0.006 | 0.03 |
| **Dissolved Gases, ug/L** | | | | | |
| Ethane | < 0.3 | < 0.3 | < 0.3 | --- | --- |
| Ethene | < 0.29 | < 0.29 | < 0.29 | --- | --- |
| Methane | 6.6 | 1.5 | 1.9 | --- | --- |
| **Natural Attenuation Parameters, mg/L** | | | | | |
| Chloride | 9.4 | 12.8 | 13 | 125 | 250 |
| Nitrate as N | 0.23 | 0.23 | 0.23 | 2 | 10 |
| Sulfate | 1.6 | 5.5 | 5.4 | 125 | 250 |
| Total Alkalinity | 120 | 130 | 140 | --- | --- |
| Total Organic Carbon | 3 | < 0.7 | 2 | --- | --- |

Note: Please see notes provided at the end of this table.

# Table 1
## PZ-2
## Summary of Detected Compounds
## Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/11/02 | PAL | ES |
|---|---|---|---|
| Acetone | 2.6 | 200 | 1000 |
| Methylene chloride | 2.4 | 0.5 | 5 |

**Metals, mg/L**

| | | | |
|---|---|---|---|
| Arsenic | **0.056** | 0.005 | 0.05 |
| Barium | **0.66** | 0.4 | 2 |
| Cadmium | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | **0.011** | 0.008 | 0.04 |
| Iron | **98.8** | 0.15 | 0.3 |
| Lead | **0.0062** | 0.0015 | 0.015 |
| Manganese | **5.2** | 0.025 | 0.05 |
| Mercury | 0.00013 | 0.0002 | 0.002 |
| Vanadium | **0.026** | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | |
|---|---|---|---|
| Ethane | < 0.6 | --- | --- |
| Ethene | < 0.58 | --- | --- |
| Methane | 98 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | |
|---|---|---|---|
| Chloride | 8.6 | 125 | 250 |
| Nitrate as N | < 0.0076 | 2 | 10 |
| Sulfate | 2.4 | 125 | 250 |
| Total Alkalinity | 160 | --- | --- |
| Total Organic Carbon | 15 | --- | --- |

Note: Please see notes provided at the end of this table.

Table 1
PZ-3
Summary of Detected Compounds
*Former Onalaska Landfill*

| Volatile Organic Compounds (VOC), ug/L | 12/11/02 | PAL | ES |
|---|---|---|---|
| Acetone | 3.1 | 200 | 1000 |
| Methylene chloride | 2.5 | 0.5 | 5 |

**Metals, mg/L**

| | | | |
|---|---|---|---|
| Arsenic | 0.0038 | 0.005 | 0.05 |
| Barium | 0.097 | 0.4 | 2 |
| Cadmium | **0.00099** | 0.0005 | 0.005 |
| Cobalt | 0.0018 | 0.008 | 0.04 |
| Iron | **1.2** | 0.15 | 0.3 |
| Lead | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **2.7** | 0.025 | 0.05 |
| Mercury | 0.00012 | 0.0002 | 0.002 |
| Vanadium | 0.0028 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | |
|---|---|---|---|
| Ethane | < 0.3 | --- | --- |
| Ethene | < 0.29 | --- | --- |
| Methane | 2.4 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | |
|---|---|---|---|
| Chloride | 6.3 | 125 | 250 |
| Nitrate as N | < 0.0076 | 2 | 10 |
| Sulfate | 1.2 | 125 | 250 |
| Total Alkalinity | 160 | --- | --- |
| Total Organic Carbon | | --- | --- |

Note: Please see notes provided at the end of this table.

## Table 1
### PZ-4
### Summary of Detected Compounds
### Former Onalaska Landfill

| **Volatile Organic Compounds (VOC), ug/L** | **12/12/02** | **PAL** | **ES** |
|---|---|---|---|
| Acetone | 3.5 | 200 | 1000 |
| Methylene chloride | 2.6 | 0.5 | 5 |

**Metals, mg/L**

| | | | |
|---|---|---|---|
| Arsenic | < 0.0021 | 0.005 | 0.05 |
| Barium | 0.12 | 0.4 | 2 |
| Cadmium | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | 0.001 | 0.008 | 0.04 |
| Iron | < 0.042 | 0.15 | 0.3 |
| Lead | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **2.6** | 0.025 | 0.05 |
| Mercury | 0.000088 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | 0.006 | 0.03 |

**Dissolved Gases, ug/L**

| | | | |
|---|---|---|---|
| Ethane | < 0.3 | --- | --- |
| Ethene | < 0.29 | --- | --- |
| Methane | < 0.39 | --- | --- |

**Natural Attenuation Parameters, mg/L**

| | | | |
|---|---|---|---|
| Chloride | 5.5 | 125 | 250 |
| Nitrate as N | < 0.0076 | 2 | 10 |
| Sulfate | 4.2 | 125 | 250 |
| Total Alkalinity | 130 | --- | --- |
| Total Organic Carbon | 5 | --- | --- |

Note: Please see notes provided at the end of this table.

# Table 1
## PZ-5
## Summary of Detected Compounds
## Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/12/02 | 4/23/03 | PAL | ES |
|---|---|---|---|---|
| Acetone | 3 | < 1.1 | 200 | 1000 |
| Methylene chloride | 2.5 | 0.34 | 0.5 | 5 |

| Metals, mg/L | | | | |
|---|---|---|---|---|
| Arsenic | < 0.0021 | < 0.0021 | 0.005 | 0.05 |
| *Barium* | *0.091* | *0.075* | *0.4* | *2* |
| Cadmium | < 0.00028 | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | < 0.00074 | < 0.00074 | 0.008 | 0.04 |
| *Iron* | 0.13 | 0.12 | 0.15 | 0.3 |
| Lead | < 0.0016 | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **0.18** | **0.17** | 0.025 | 0.05 |
| Mercury | 0.000098 | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | 0.0011 | 0.00075 | 0.006 | 0.03 |

| Dissolved Gases, ug/L | | | | |
|---|---|---|---|---|
| Ethane | < 0.6 | < 0.3 | --- | --- |
| Ethene | < 0.58 | < 0.29 | --- | --- |
| Methane | 130 | 210 | --- | --- |

| Natural Attenuation Parameters, mg/L | | | | |
|---|---|---|---|---|
| Chloride | 9.7 | 8.6 | 125 | 250 |
| Nitrate as N | 0.48 | 0.37 | 2 | 10 |
| Sulfate | 5.7 | 10.1 | 125 | 250 |
| Total Alkalinity | 260 | 220 | --- | --- |
| Total Organic Carbon | 2 | 1 | --- | --- |

Note: Please see notes provided at the end of this table.

Table 1
Ackerman
Summary of Detected Compounds
Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 4/22/03 | PAL | ES |
|---|---|---|---|
| | (No VOCs Detected) | | |
| **Metals, mg/L** | | | |
| Arsenic | < 0.0021 | 0.005 | 0.05 |
| Barium | 0.024 | 0.4 | 2 |
| Cadmium | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | < 0.00074 | 0.008 | 0.04 |
| Iron | **5.9** | 0.15 | 0.3 |
| Lead | **0.0034** | 0.0015 | 0.015 |
| Manganese | **0.12** | 0.025 | 0.05 |
| Mercury | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | 0.006 | 0.03 |

Note: Please see notes provided at the end of this table.

Table 1
**Hubley**
**Summary of Detected Compounds**
**Former Onalaska Landfill**

| **Volatile Organic Compounds (VOC), ug/L** | **4/22/03** | **PAL** | **ES** |
|---|---|---|---|
| | (No VOCs Detected) | | |
| **Metals, mg/L** | | | |
| Arsenic | < 0.0021 | 0.005 | 0.05 |
| Barium | 0.084 | 0.4 | 2 |
| Cadmium | < 0.00028 | 0.0005 | 0.005 |
| Cobalt | < 0.00074 | 0.008 | 0.04 |
| Iron | **0.16** | 0.15 | 0.3 |
| Lead | < 0.0016 | 0.0015 | 0.015 |
| Manganese | **0.2** | 0.025 | 0.05 |
| Mercury | < 0.000087 | 0.0002 | 0.002 |
| Vanadium | < 0.00067 | 0.006 | 0.03 |

Note: Please see notes provided at the end of this table.

# Table 1
## TRIP BLANK
### *Summary of Detected Compounds*
### Former Onalaska Landfill

| Volatile Organic Compounds (VOC), ug/L | 12/12/02 | 12/12/02 | 4/22/03 | PAL | ES |
|---|---|---|---|---|---|
| 2-Butanone | < 0.59 | < 0.59 | 2.2 | --- | --- |
| Acetone | < 1.1 | < 1.1 | 3.5 | 200 | 1000 |
| Methylene chloride | **1.9** | **2** | 1 | 0.5 | 5 |
| **Metals, mg/L** | | | | | |
| Arsenic | | | | 0.005 | 0.05 |
| Barium | | | | 0.4 | 2 |
| Cadmium | | | | 0.0005 | 0.005 |
| Cobalt | | | | 0.008 | 0.04 |
| Iron | | | | 0.15 | 0.3 |
| Lead | | | | 0.0015 | 0.015 |
| Manganese | | | | 0.025 | 0.05 |
| Mercury | | | | 0.0002 | 0.002 |
| Vanadium | | | | 0.006 | 0.03 |
| **Dissolved Gases, ug/L** | | | | | |
| Ethane | | | | --- | --- |
| Ethene | | | | --- | --- |
| Methane | | | | --- | --- |
| **Natural Attenuation Parameters, mg/L** | | | | | |
| Chloride | | | | 125 | 250 |
| Nitrate as N | | | | 2 | 10 |
| Sulfate | | | | 125 | 250 |
| Total Alkalinity | | | | --- | --- |
| Total Organic Carbon | | | | --- | --- |

Note: Please see notes provided at the end of this table.

Table 1
Notes
Summary of Detected Compounds
Former Onalaska Landfill

For the VOC only; the compounds reported are the only VOC that have been detected since the December 2002 sampling event

Shaded cells indicate the compound exceeds the WDNR Preventive Action Level (PAL)

Shaded cell and bold number indicates the compound exceeds the WDNR PAL and Enforcement Standard (ES)

The ES and PAL criteria for trimethylbenzene (TMB) is the sum of 1,2,4-TMB and 1,3,5-TMB

< indicates the compound was not detected at or above the detection limit

--- indicates no criteria associated with that compound

Ackerman and Hubley residential wells were sampled for VOC and metals

Attachment 6

Site Inspection Record

# Site Inspection Checklist

| I. SITE INFORMATION | |
|---|---|
| **Site name:** Onalaska Municipal Landfill | **Date of inspection:** 04/22/2003 |
| **Location and Region:** Onalaska, WI Region V | **EPA ID:** WID980821656 |
| **Agency, office, or company leading the five-year review:** WDNR | **Weather/temperature:** Sunny, 55°F |

**Remedy Includes:** (Check all that apply)

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

**Attachments:** Site map attached as Attachment 2

**II. INTERVIEWS** (Check all that apply)

1. **O&M site manager** Dave Carper (Name) — Remedial Project Manager (Title) — 04/22/2003 (Date)

   Interviewed ☒ at site   at office   by phone   Phone no. __________

   Problems, suggestions; Report attached

   ______________________

2. **O&M staff** Peter Moore (Name) — Hydrogeologist (Title) — 04/22/2003 (Date)

   Interviewed ☒ at site   at office   by phone   Phone no. __________

   Problems, suggestions; Report attached ______________________

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

Agency ______________________
Contact ______________________ ______________ ______ ______

Name | Title | Date | Phone no.

Problems; suggestions; Report attached

______________________________________

______________________________________

Agency ______________________
Contact ______________________ ______________ ______ ______

Name | Title | Date | Phone no.

Problems; suggestions; Report attached

______________________________________

______________________________________

Agency ______________________
Contact ______________________ ______________ ______ ______

Name | Title | Date | Phone no.

Problems; suggestions; Report attached

______________________________________

______________________________________

Agency ______________________
Contact ______________________ ______________ ______ ______

Name | Title | Date | Phone no.

Problems; suggestions; Report attached

______________________________________

______________________________________

Surface water collection and treatment

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

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

| | | | | |
|---|---|---|---|---|
| 1. | **O&M Documents** | | | |
| | O&M manual | ☒ Readily available | ☒ Up to date | N/A |
| | As-built drawings | ☒ Readily available | ☒ Up to date | N/A |
| | Maintenance logs | ☒ Readily available | ☒ Up to date | N/A |
| | Remarks____________ | | | |
| 2. | **Site-Specific Health and Safety Plan** | ☒ Readily available | ☒ Up to date | N/A |
| | Contingency plan/emergency response plan | ☒ Readily available | ☒ Up to date | N/A |
| | Remarks____________ | | | |
| 3. | ***O&M and OSHA Training Records*** | ☒ *Readily available* | ☒ *Up to date* | *N/A* |
| | Remarks____________ | | | |
| 4. | **Permits and Service Agreements** | | | |
| | Air discharge permit | Readily available | Up to date | ☒ N/A |
| | Effluent discharge | ☒ Readily available | ☒ Up to date | N/A |
| | Waste disposal, POTW | Readily available | Up to date | ☒ N/A |
| | Other permits____________ | Readily available | Up to date | ☒ N/A |
| | Remarks____________ | | | |
| 5. | **Gas Generation Records** | Readily available | Up to date | ☒ N/A |
| | Remarks____________ | | | |
| 6. | **Settlement Monument Records** | Readily available | Up to date | ☒ N/A |
| | Remarks____________ | | | |
| 7. | **Groundwater Monitoring Records** | ☒ Readily available | ☒ Up to date | N/A |
| | Remarks____________ | | | |
| 8. | **Leachate Extraction Records** | Readily available | Up to date | ☒ N/A |
| | Remarks____________ | | | |
| 9. | **Discharge Compliance Records** | | | |
| | Air | Readily available | Up to date | ☒ N/A |
| | Water (effluent) | ☒ Readily available | ☒ Up to date | N/A |
| | Remarks____________ | | | |
| 10. | **Daily Access/Security Logs** | Readily available | Up to date | ☒ N/A |
| | Remarks____________ | | | |

## IV. O&M COSTS

1. **O&M Organization**

State in-house ☒ Contractor for State

PRP in-house Contractor for PRP

Federal Facility in-house Contractor for Federal Facility

Other

2. **O&M Cost Records**

☒ Readily available ☒ Up to date

Funding mechanism/agreement in place

Original O&M cost estimate Breakdown attached

Total annual cost by year for review period if available

| | | | |
|---|---|---|---|
| From ____ Date | To ____ Date | ____ Total cost | Breakdown attached |
| From ____ Date | To ____ Date | ____ Total cost | Breakdown attached |
| From ____ Date | To ____ Date | ____ Total cost | Breakdown attached |
| From ____ Date | To ____ Date | ____ Total cost | Breakdown attached |
| From ____ Date | To ____ Date | ____ Total cost | Breakdown attached |

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

Describe costs and reasons: None

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

**A. Fencing** No issues

1. **Fencing damaged** Location shown on site map ☒ Gates secured N/A

Remarks

**B. Other Access Restrictions** No issues

1. **Signs and other security measures** Location shown on site map N/A

Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — Yes ☒No N/A

Site conditions imply ICs not being fully enforced — Yes ☒No N/A

Type of monitoring (*e.g.*, self-reporting, drive by): ______

Frequency: variable

Responsible party/agency: WDNR

Contact: Dave Carper — Remedial Project Manager — 04/22/2003 — (608)785-9973

Name — Title — Date — Phone no.

Reporting is up-to-date — ☒ Yes No N/A

Reports are verified by the lead agency — ☒ Yes No N/A

Specific requirements in deed or decision documents have been met — ☒ Yes No N/A

Violations have been reported — Yes No ☒ N/A

Other problems or suggestions: Report attached

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

Remarks

**D. General**

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

Remarks

2. **Land use changes on site** ☒N/A

Remarks

3. **Land use changes off site** ☒N/A

Remarks

## VI. GENERAL SITE CONDITIONS

**A. Roads** ☒ Applicable N/A

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

Remarks

B. Other Site Conditions

Remarks ______________________________________________

______________________________________________

VII. LANDFILL COVERS ☒ Applicable N/A

**A. Landfill Surface**

1. **Settlement** (Low spots) Location shown on site map ☒ Settlement not evident
   Areal extent__________ Depth__________
   Remarks ______________________________________________

2. **Cracks** Location shown on site map ☒ Cracking not evident
   Lengths__________ Widths__________ Depths__________
   Remarks ______________________________________________

3. **Erosion** Location shown on site map ☒ Erosion not evident
   Areal extent__________ Depth__________
   Remarks ______________________________________________

4. **Holes** Location shown on site map ☒ Holes not evident
   Areal extent__________ Depth__________
   Remarks ______________________________________________

5. **Vegetative Cover** Grass Cover properly established ☒ No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks ______________________________________________

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

7. **Bulges** Location shown on site map ☒ Bulges not evident
   Areal extent__________ Height__________
   Remarks ______________________________________________

| | | | |
|---|---|---|---|
| 8 | **Wet Areas/Water Damage** | ☐ Wet areas/water damage not evident | |
| | Wet areas | Location shown on site map | Areal extent______ |
| | Ponding | Location shown on site map | Areal extent______ |
| | Seeps | Location shown on site map | Areal extent______ |
| | Soft subgrade | Location shown on site map | Areal extent______ |
| | Remarks______ | | |

9. **Slope Instability** Slides Location shown on site map ☒ No evidence of slope instability
Areal extent______
Remarks______

**B. Benches** Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

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

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

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

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

1. **Settlement** Location shown on site map ☒ No evidence of settlement
Areal extent______ Depth______
Remarks______

2. **Material Degradation** Location shown on site map ☒ No evidence of degradation
Material type______ Areal extent______
Remarks______

3. **Erosion** Location shown on site map ☒ No evidence of erosion
Areal extent______ Depth______
Remarks______

| | |
|---|---|
| 4. | **Undercutting** Location shown on site map ☐ No evidence of undercutting<br>Areal extent__________ Depth__________<br>Remarks____________________ |
| 5. | **Obstructions** Type__________ ☒ No obstructions<br>Location shown on site map Areal extent__________<br>Size__________<br>Remarks____________________ |
| 6. | **Excessive Vegetative Growth** Type none<br>No evidence of excessive growth<br>Vegetation in channels does not obstruct flow<br>Location shown on site map Areal extent__________<br>Remarks____________________ |
| **D.** | **Cover Penetrations** ☒ Applicable N/A |
| 1. | **Gas Vents** Active ☒ Passive<br>Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition<br>Evidence of leakage at penetration Needs Maintenance<br>N/A<br>Remarks____________________ |
| 2. | **Gas Monitoring Probes**<br>Properly secured/locked Functioning Routinely sampled Good condition<br>Evidence of leakage at penetration Needs Maintenance ☒ N/A<br>Remarks____________________ |
| 3. | **Monitoring Wells** (within surface area of landfill)<br>☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition<br>Evidence of leakage at penetration Needs Maintenance N/A<br>Remarks____________________ |
| 4. | **Leachate Extraction Wells**<br>Properly secured/locked Functioning Routinely sampled Good condition<br>Evidence of leakage at penetration Needs Maintenance ☒ N/A<br>Remarks____________________ |
| 5. | **Settlement Monuments** Located Routinely surveyed ☒ N/A<br>Remarks____________________ |

| | |
|---|---|
| **E. Gas Collection and Treatment** Applicable ☐ N/A | |
| 1. | **Gas Treatment Facilities**<br>Flaring Thermal destruction Collection for reuse<br>Good condition Needs Maintenance<br>Remarks______________________________ |
| 2. | **Gas Collection Wells, Manifolds and Piping**<br>Good condition Needs Maintenance<br>Remarks______________________________ |
| 3. | **Gas Monitoring Facilities** *(e.g., gas monitoring of adjacent homes or buildings)*<br>Good condition Needs Maintenance N/A<br>Remarks______________________________ |
| **F. Cover Drainage Layer** Applicable ☒ N/A | |
| 1. | **Outlet Pipes Inspected** Functioning N/A<br>Remarks______________________________ |
| 2. | **Outlet Rock Inspected** Functioning N/A<br>Remarks______________________________ |
| **G. Detention/Sedimentation Ponds** Applicable ☒ N/A | |
| 1. | **Siltation** Areal extent__________ Depth__________ G N/A<br>G Siltation not evident<br>Remarks______________________________ |
| 2. | **Erosion** Areal extent__________ Depth__________<br>G Erosion not evident<br>Remarks______________________________ |
| 3. | **Outlet Works** Functioning N/A<br>Remarks______________________________ |
| 4. | **Dam** Functioning N/A<br>Remarks______________________________ |

| | | |
|---|---|---|
| **H. Retaining Walls** | Applicable ☒ N/A | |
| 1. **Deformations** | Location shown on site map | Deformation not evident |
| Horizontal displacement______ | Vertical displacement______ | |
| Rotational displacement______ | | |
| Remarks______ | | |
| 2. **Degradation** | Location shown on site map | Degradation not evident |
| Remarks______ | | |
| **I. Perimeter Ditches/Off-Site Discharge** | ☒ Applicable N/A | |
| 1. **Siltation** | Location shown on site map | ☒ Siltation not evident |
| Areal extent______ | Depth______ | |
| Remarks______ | | |
| 2. **Vegetative Growth** | Location shown on site map | N/A |
| ☒ Vegetation does not impede flow | | |
| Areal extent______ | Type______ | |
| Remarks______ | | |
| 3. **Erosion** | Location shown on site map | ☒ Erosion not evident |
| Areal extent______ | Depth______ | |
| Remarks______ | | |
| 4. **Discharge Structure** ☒ Functioning N/A | | |
| Remarks When system is operating | | |
| **VIII. VERTICAL BARRIER WALLS** | Applicable ☒ N/A | |
| 1. **Settlement** | Location shown on site map | Settlement not evident |
| Areal extent______ | Depth______ | |
| Remarks______ | | |
| 2. **Performance Monitoring** | Type of monitoring______ | |
| Performance not monitored | | |
| Frequency______ | | Evidence of breaching |
| Head differential______ | | |
| Remarks______ | | |

| C. Treatment System ☐ Applicable N/A |
|---|
| 1. **Treatment Train** (Check components that apply)<br>☒ Metals removal Oil/water separation Bioremediation<br>☒ Air stripping Carbon adsorbers<br>Filters ____<br>☒ *Additive (e.g., chelation agent, flocculent)* ____<br>Others ____<br>☒ Good condition Needs Maintenance<br>*Sampling ports properly marked and functional* YES<br>Sampling/maintenance log displayed and up to date YES<br>Equipment properly identified YES<br>*Quantity of groundwater treated annually* System currently on standby during Natural Attenuation Evaluation<br>Quantity of surface water treated annually N/A<br>Remarks ____ |
| 2. **Electrical Enclosures and Panels** (properly rated and functional)<br>N/A ☒ Good condition Needs Maintenance<br>Remarks ____ |
| 3. **Tanks, Vaults, Storage Vessels**<br>N/A ☒ Good condition Proper secondary containment Needs Maintenance<br>Remarks ____ |
| 4. **Discharge Structure and Appurtenances**<br>N/A ☒ Good condition Needs Maintenance<br>Remarks ____ |
| 5. **Treatment Building(s)**<br>N/A ☒ Good condition (esp. roof and doorways) Needs repair<br>Chemicals and equipment properly stored<br>Remarks ____ |
| 6. **Monitoring Wells** (pump and treatment remedy)<br>☒ Properly secured/locked Functioning Routinely sampled ☒ Good condition<br>All required wells located Needs Maintenance N/A<br>Remarks ____ |
| **D. Monitoring Data** |
| 1. Monitoring Data<br>☒ Is routinely submitted on time ☒G Is of acceptable quality |
| 2. Monitoring data suggests:<br>☒G Groundwater plume is *effectively contained* ☒G *Contaminant concentrations are declining* |

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A

Remarks ______________________________

## X. OTHER REMEDIES

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

## XI. OVERALL OBSERVATIONS

### A. Implementation of the Remedy

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

Currently, the Site is being monitored for Natural Attenuation as a modification to the remedy (i.e. groundwater extraction). Monitoring for Natural Attenuation was implemented in the fall of 2001. Preliminary results from Natural Attenuation monitoring demonstrates that Natural Attenuation may be an effective modification to the remedy for this site, and would be protective of human health and the environment. Future monitoring and evaluation will be conducted for determining if Natural Attenuation should be implemented as a modification to the remedy.

### B. Adequacy of O&M

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

Based upon the Five-Year Review, all immediate threats at the Site have been addressed, and the remedy is expected to be protective of human health and the environment. After the groundwater goals are achieved through pumping and Natural Attenuation in an estimated 30 years or less.

| C. | Early Indicators of Potential Remedy Problems |
| --- | --- |
| | Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.<br>None |
| **D.** | **Opportunities for Optimization** |
| | Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.<br>Determine if Natural Attenuation can be an effective modification to the ROD remedy. |

Attachment 7

Groundwater ARAR's

| Table 1<br>Comparison of Cleanup Standards | | | | |
|---|---|---|---|---|
| Compound | 1990 ROD Cleanup Standard (ppb) | Current State Standard[2] PAL (ppb) | Current State Standard[1] ES (ppb) | Federal Standard[3] MCL (ppb) |
| Benzene | 0.067 | 0.5 | 5 | 5 |
| Toluene | 68.6 | 200 | 1,000 | 1,000 |
| Xylene | 124 | 1,000 | 10,000 | 10,000 |
| TCE | 0.18 | 0.5 | 5.0 | 5.0 |
| 1,1-DCA | 0.04[4] | 85 | 850 | 850 |
| Lead | 5.0 | 1.5 | 15 | 50 |
| Arsenic | 5.0 | 5.0 | 50 | 50 |
| Barium | 200 | 400 | 2000 | 2000 |
| Ethylbenzene | 272 | 140 | 700 | 700 |
| 1,1,1-TCA | 40 | 40 | 200 | 200 |
| 1,1-DCE | 0.024 | 0.7 | 7.0 | 7.0 |
| Manganese | NA | 25 | 50 | NA |
| Iron | NA | 150 | 300 | NA |

Notes: ppb: "parts per billion" or ug/L
[1]: Enforcement standards (ESs) under Ch. NR 140, WAC
[2]: Preventative action limits (PALs) under Ch. NR 140, WAC
[3]: Maximum Contaminant Level (MCLs) under Safe Drinking Water Act
[4]: Health-based cleanup standard consistent with cleanup objectives

Table [illegible] ESD)

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