Five-Year Review Report

Fourth Five-Year Review Report
for
Northside Landfill
WAD980511778

Spokane
Spokane County, Washington

August 2012

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For:
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Fourth Five-Year Review Report
for
Northside Landfill
West 5502 Nine Mile Road
Spokane
Spokane County, Washington

List of Acronyms **3**

Executive Summary **4**

Five-Year Review Summary Form **7**

1.0 Introduction **10**

2.0 Site Chronology **12**

3.0 Background **13**

3.1 PHYSICAL CHARACTERISTICS 13
3.2 LAND AND RESOURCE USE 16
3.3 HISTORY OF CONTAMINATION 16
3.4 INITIAL RESPONSE 16
3.5 BASIS FOR TAKING ACTION 17

4.0 Remedial Actions **18**

4.1 REMEDY SELECTION 18
4.2 REMEDY IMPLEMENTATION 19
4.3 OPERATION AND MAINTENANCE (O&M) 21

5.0 Progress Since the Last Five-Year Review **24**

6.0 Five-Year Review Process **26**

6.1 ADMINISTRATIVE COMPONENTS 26
6.2 COMMUNITY INVOLVEMENT 26
6.3 DOCUMENT REVIEW 26
6.4 DATA REVIEW 32
6.5 SITE INSPECTION 34
6.6 INTERVIEWS 35

7.0 Technical Assessment **37**

7.1 QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS? 37
7.2 QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEANUP LEVELS AND REMEDIAL ACTION OBJECTIVES (RAOS) USED AT THE TIME OF REMEDY SELECTION STILL VALID? 38
7.3 QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY? 38
7.4 TECHNICAL ASSESSMENT SUMMARY 38

8.0 Issues….. ..... **40**

9.0 Recommendations and Follow-up Actions **41**

10.0 Protectiveness Statement **42**

Appendix A: List of Documents Reviewed **A-1**
Appendix B: Press Notice **B-1**
Appendix C: Interview Forms **C-1**
Appendix D: Site Inspection Checklist **D-1**
Appendix E: Photographs from Site Inspection Visit **E-1**
Appendix F: Ground Water PCE Concentration Trends (1996-2010) **F-1**
Appendix G: Ground Water Monitoring Data 2007-2012 ..... **G-1**

Tables

Table 1: Chronology of Site Events 12
Table 2: Site Property Parcels 13
Table 3: Ground Water COCs 19
Table 4: O&M Costs Associated with PEW 23
Table 5: Progress on Recommendations from the 2007 FYR 24
Table 6: ARAR Review for Ground Water COCs 28
Table 7: Institutional Control (IC) Summary Table 30
Table 8: 2007-2012 PCE Sampling Data 33
Table 9: Current Site Issues 40
Table 10: Recommendations to Address Current Site Issues 41

Figures

Figure 1: Site Location Map 14
Figure 2: Detailed Site Map 15
Figure 3: Institutional Control Base Map 31

List of Acronyms

AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
IC	Institutional Control
MCL	Maximum Contaminant Level
MW	Monitoring Well
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
OU	Operable Unit
PCE	Tetrachloroethylene
PERC	Tetrachloroethylene
PEW	Pilot Extraction Well
POTW	Publicly Owned Treatment Works
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RCW	Revised Code of Washington
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SDWA	Safe Drinking Water Act
TBC	To-Be-Considered
TCE	Trichloroethylene
UECA	Uniform Environmental Covenants Act
VI	Vapor Intrusion
VOC	Volatile Organic Compound
WAC	Washington Administrative Code

Executive Summary

Introduction

The Northside Landfill Site (the Site) is located on approximately 345 acres of land in the northwestern part of the city of Spokane, Washington, approximately one mile east of the Spokane River. The Site includes a closed section of landfill cells, active landfill cells and land adjacent to the landfill. The City of Spokane owns the property, operates the active municipal solid waste landfill cells and conducts operation and maintenance (O&M) activities for the closed cells.

The City of Spokane and other parties began operating a city landfill at this location in 1931. Operations included open burning until the mid-1950s, when shallow excavation and fill operations replaced open burning. In the 1960s, the landfill used the process of covering refuse-filled trenches and canyons with soil. In the mid-1970s, operations included an area fill technique using 20-foot lifts (20-foot-thick layers) on previously buried refuse. In 1982, the City of Spokane drilled ground water monitoring wells at the Site and adjacent parcels, which revealed that leachate from the landfill's old refuse units had contaminated the ground water with volatile organic compounds (VOCs) including tetrachloroethylene (PCE or PERC), trichloroethylene (TCE), and trichloroethane, related to disposal of dry cleaning solvents. VOCs leached from the landfill and into the aquifer beneath the Site. In October 1983, the City identified VOCs in private residential wells adjacent to the Site.

The United States Environmental Protection Agency (EPA) listed the Site on the National Priorities List (NPL) in 1986. This is the fourth Five-Year Review (FYR) for the Site. The Site consists of one operable unit (OU). The triggering action for this statutory review is the third FYR, completed in September 2007.

Although the 1989 Record of Decision (ROD) did not specify remedial action objectives (RAOs), the 1989 ROD and 2009 Explanation of Significant Differences (ESD) selected a remedy to prevent, reduce or control the contaminants leaving the landfill and entering the ground water. The remedy selected in the 1989 ROD and revised by the 2009 ESD included the following remedial components:

- Closing the landfill, except new landfill units that meet the State Minimum Functional Standards.
- Capping the landfill waste units to reduce infiltration and contaminant migration to ground water.
- Pumping, treating and monitoring the ground water to prevent additional migration of contaminated ground water beyond the landfill boundary and to ensure that ground water achieves cleanup levels established for the Site.
- Providing alternative water to prevent exposure to contaminated ground water.
- Implementing institutional controls to protect the cover system, monitoring wells, and pumping and treatment system, as well as to restrict the construction of new wells and the use of existing wells in the area of the contaminated plume.
- Controlling landfill gas emissions.

Technical Assessment

The review of documents, Applicable or Relevant and Appropriate Requirements (ARARs), risk assumptions, institutional controls and the site inspection indicate that the remedy is functioning as intended by the Site's 1989 ROD and the subsequent 2009 ESD. Area residents were connected to municipal water supplies in 1983. Access controls and security measures ensure that no unauthorized activity is occurring at the landfill that may damage the capped area. The landfill cap is well-maintained and functions to prevent infiltration of surface water. The pilot extraction well (PEW) system has, until recently, operated consistently. As a result, concentrations of contaminants of concern (COC) in the ground water at the landfill boundary and in downgradient areas are below cleanup levels and have been for at least five years of monitoring, with the except of one quarter.

As provided by the ROD, the City can initiate the shutdown of the pilot extraction well (PEW) system, with a year of monitoring to demonstrate that the MCLs continue to be met at the landfill boundary and an additional five years before the system can be dismantled. Recent operational issues with the PEW system must be addressed so that operations can be resumed if necessary. In addition, the City must complete landfill repairs needed to ensure the efficient functioning of the gas extraction system.

Current concentrations of COCs in groundwater are comparable to those reviewed during the 2007 Five Year Review, which concluded that vapor intrusion (VI) is not of concern. Future FYRs should continue to monitor and assess changes in conditions potentially affecting the results of the 2007 VI analysis.

Conclusion

The remedy at the Site currently protects human health and the environment because area residents are connected to municipal water supplies; contaminants have been below cleanup levels at the landfill boundary and downgradient for over two years; access controls and security measures ensure that no unauthorized activity is occurring at the Site that may damage the capped area; the landfill cap is well-maintained and functions to prevent infiltration of surface water; and institutional controls are in place to prohibit land uses that could damage the cap and to prohibit installation of ground water supply wells on the landfill property. However, in order for the remedy to be protective in the long term, the following actions need to be taken:

- Complete necessary repairs to the PEW system.
- Complete the needed landfill repairs to ensure the efficient functioning of the gas extraction system.

The Superfund Sitewide Human Exposure Environmental Indicator Status for the Site remains "Current Human Exposures Controlled." Residents are not using contaminated groundwater and Institutional Controls are in place to ensure no unacceptable exposures occur at the landfill. To ensure this status continues over the long-term, the follow-up actions recommended in this review need to be completed. The Groundwater Migration Environmental Indicator Status for the Site remains "Under Control" because contaminated groundwater continues to be contained within the landfill boundaries.

Cross-Program Revitalization Measure Status: The Site was determined to meet all the Measure requirements and was determined to be “ready for reuse” on April 26, 2012.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Northside Landfill		
EPA ID: WAD980511778		
Region: 10	**State:** WA	**City/County:** Spokane/Spokane County

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

REVIEW STATUS
Lead agency: EPA
Author name: Treat Suomi and Lynette Wysocki (Reviewed by EPA)
Author affiliation: Skeo Solutions
Review period: December 2011 – August 2012
Date of site inspection: 04/19/2012
Type of review: Statutory
Review number: 4
Triggering action date: 09/28/2007
Due date *(five years after triggering action date)*: 09/28/2012

Issues/Recommendations

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1	Issue Category: Operations and Maintenance			
	Issue: The pump at the extraction well is inoperable.			
	Recommendation: The PRP will complete planned PEW system repairs. to ensure that the system can be reactivated as necessary during and for five years after yearlong shutdown period.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	State	12/31/2013

OU(s): 1	Issue Category: Operations and Maintenance			
	Issue: A 2010 engineering assessment identified areas of the closed landfill that are in need of repair.			
	Recommendation: The PRP will implement repairs according to the recommendations received from CH2M HILL in 2011 and provide a status report to Ecology and EPA upon completion.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	09/29/2013

Sitewide Protectiveness Statement

For sites that have achieved construction completion, enter a sitewide protectiveness determination and statement.

Protectiveness Determination:	*Addendum Due Date (if applicable):*
Short-term Protective	Click here to enter date.

Protectiveness Statement:

The remedy at the Site currently protects human health and the environment because area residents are connected to municipal water supplies; contaminants have been below cleanup levels at the landfill boundary and downgradient for over two years; access controls and security measures ensure that no unauthorized activity is occurring at the Site that may damage the capped area; the landfill cap is well-maintained and functions to prevent infiltration of surface water; and institutional controls are in place to prohibit land uses that could damage the cap and to prohibit installation of ground water supply wells on the landfill property. However, in order for the remedy to be protective in the long term, the following actions need to be taken:

• Complete necessary repairs to the PEW system.
• Complete the needed landfill repairs to ensure the efficient functioning of the gas extraction system.

Five-Year Review Summary Form (continued)

Environmental Indicators
- Current human exposures at the Site are under control. - Current ground water migration is under control.

Are Necessary Institutional Controls in Place?
☒ All ☐ Some ☐ None

Has the Site Been Designated as Sitewide Ready for Anticipated Use?
☒ Yes ☐ No

Has site been put into reuse?
☒ Yes ☐ No

Fourth Five-Year Review Report
for
Northside Landfill Superfund Site

1.0 Introduction

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

The United States Environmental Protection Agency (EPA) prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121 states:

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

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

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

Skeo Solutions, an EPA Region 10 contractor, conducted the FYR and prepared this report regarding the remedy implemented at the Northside Landfill Superfund site (the Site) in Spokane, Spokane County, Washington. This FYR was conducted from December 2011 to August 2012. The Washington Department of Ecology (Ecology) is the lead agency for developing and implementing the remedy for the Potentially Responsible Party (PRP)-financed cleanup at the Site. The Site's PRP is the City of Spokane. The Washington Department of Ecology, as the support agency representing the State of Washington, has reviewed all supporting documentation and provided input to EPA during the FYR process.

This is the fourth FYR for the Site. The triggering action for this statutory review is the third FYR completed in September 2007. The FYR is required due to the fact that hazardous

substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. The Site consists of one operable unit (OU).

2.0 Site Chronology

Table 1 lists the dates of important events for the Site.

Table 1: Chronology of Site Events

Event	Date
Initial discovery of contamination	February 1, 1980
City of Spokane identified ground water contamination	1983
City of Spokane extended the public water supply to local residents	1983-1984
State completed preliminary assessment	August 28,1984
EPA proposed the Site for listing on the National Priorities List (NPL)	October 15, 1984
EPA completed site inspection	April 2, 1985
EPA finalized listing of the Site on the NPL	June 10, 1986
EPA issued Administrative Order on Consent (AOC) for remedial design/remedial action Remedial Investigation/Feasibility Study (RI/FS) began	March 16, 1988
RI/FS completed EPA signed Record of Decision (ROD)	September 30, 1989
EPA, Ecology and City of Spokane signed Consent Decree (CD)	January 23, 1991
PRP began remedial design	February 11, 1991
PRP completed remedial design	March 10, 1992
PRP began remedial action	March 16, 1992
PRP completed remedial action	March 15, 1993
EPA prepared Preliminary Close-Out Report	August 17, 1993
Site achieved Construction Completion	September 2, 1993
EPA conducted a final inspection of the Site	April 1, 1994
EPA issued Remedial Action Close-Out Report	March 17, 1995
CD Termination Order required City of Spokane implement Institutional Controls	1997
EPA signed first FYR	September 19, 1997
EPA signed second FYR	September 30, 2002
EPA signed third FYR	September 28, 2007
EPA issued Explanation of Significant Differences (ESD)	October 21, 2009
EPA, the City of Spokane and Ecology signed an environmental covenant to restrict uses of the landfill property	April 27, 2011
The environmental covenant was recorded in Spokane County	June 17, 2011
EPA determined the site is Ready for Anticipated Use (RAU)	April 26, 2012

3.0 Background

3.1 Physical Characteristics

The Site is located on approximately 345 acres of land in the northwestern part of the City of Spokane, Washington, approximately one mile east of the Spokane River (Figure 1). The Site includes the closed landfill cells, active landfill cells and land adjacent to the landfill (Figure 2). The City of Spokane owns the Site, operates the active municipal solid waste landfill and conducts operation and maintenance (O&M) activities for the closed landfill. A small office complex near the entrance to the Site is utilized by landfill personnel. Three on-site flares are located next to the offices for use in burning gas collected through the gas extraction and collection system. As seen in Figure 2, Nine Mile Road (State Route 291) borders the Site to the west and separates the Site from residential areas located immediately to the west. Additional residential areas border the facility to the north, east and south. Chain link fencing surrounds the facility's perimeter.

The landfill property includes seven property parcels, all of which are owned by the City of Spokane (Table 2).

Table 2: Site Property Parcels

Owner	Parcel Identification Number
City of Spokane	26223.0004
City of Spokane	26223.0016
City of Spokane	26262.0021
City of Spokane	26262.0033
City of Spokane	26275.0029
City of Spokane	26275.0030
City of Spokane	26281.0029

The eastern two-thirds of the Site overlie unsaturated glaciofluvial sands and gravels with less permeable glacial lake deposits and basalt occurring at depth. The western one-third of the Site overlies a portion of the Spokane Valley-Rathdrum Prairie Aquifer. In 1978, EPA designated this aquifer as a sole source of water supply for the Spokane-Coeur d'Alene area. Highly permeable sands and gravels deposited by glacial meltwater streams (glaciofluvial deposits) make up the majority of the aquifer, with subordinate lenses of clay and zones of cobbles. The depth to ground water ranges from 40 to 130 feet below ground surface depending on well location. Ground water flows to the northwest.

Figure 1: Site Location Map

Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site, and is not intended for any other purpose.

Figure 2: Detailed Site Map

Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site, and is not intended for any other purpose.

3.2 Land and Resource Use

Since 1931, the Site has been in operation as a city landfill. Land use surrounding the facility includes predominantly residential land. Residential areas border the facility on all sides. A 15-acre portion of the Site has remained in continued use as active landfill cells. As active cells fill and close, new cells on site will be constructed, permitted and opened for use. The City of Spokane plans to continue landfill operations at the Site until all remaining landfill areas are filled. A portion of the landfill closed on December 31, 1991, and diverted the municipal solid waste stream to a new waste incinerator. Active cells at the landfill continue to accept demolition waste and serve as an incinerator bypass disposal area when waste is unable to be sent to the incinerator.

The Spokane Valley-Rathdrum Prairie Aquifer is the sole source of water supply for the Spokane-Coeur d'Alene area. In 1983, the City of Spokane connected residences near the facility, in the vicinity of the original contaminated ground water plume, to the public water supply. All potentially affected properties were connected to municipal water and all new construction in the area is added to the municipal system. No changes in ground water use are expected given that residences use the municipal water system. In the long term, ground water in the area is expected to meet Safe Drinking Water Act (SDWA) standards and be available for future use as a water supply.

3.3 History of Contamination

In 1931, the City of Spokane and other parties began operating a city landfill at the Site; at the time, it was the largest refuse disposal operation in Spokane County. Operations included open burning until the mid-1950s, when shallow excavation and fill operations replaced open burning. In the 1960s, the landfill used the process of covering refuse-filled trenches and canyons with soil. In the mid-1970s, operations included an area fill technique using 20-foot lifts (20-foot-thick layers) on previously buried refuse.

The initial site investigation into water quality related to the landfill began in 1981. The City worked with the Spokane County Health Department to hire consulting engineers to design and construct a ground water monitoring system at the Northside Landfill. In 1982, the City of Spokane drilled ground water monitoring wells at the Site and adjacent parcels. The well monitoring revealed that leachate from the landfill's old unlined refuse units had contaminated the ground water with volatile organic compounds (VOCs) including tetrachloroethylene (PCE or PERC), trichloroethylene (TCE) and trichloroethane, related to disposal of dry cleaning solvents. VOCs leached through the landfill and into the aquifer beneath the Site. In October 1983, the City identified VOCs in private residential wells adjacent to the Site.

3.4 Initial Response

In October 1983, the City provided affected residents with an alternate water supply. By November 1983, the City had extended the municipal water system to the area and connected all of the affected residences.

EPA proposed the Site for the National Priorities List (NPL) in 1984. In 1985, EPA identified the City of Spokane as the sole PRP for the Site. In 1986, EPA finalized the Site on the NPL.

3.5 Basis for Taking Action

The City began a remedial investigation/feasibility study (RI/FS) in 1986 under an agreement with Ecology. Subsequently, EPA signed a consent order with the City in March 1988 to complete the RI/FS. The RI/FS, completed in 1988, found contamination in ground water and soil beneath the landfill. Contaminants identified included chloroform, PCE, TCE, 1,1,1-trichloroethane, trans-1,2-dichloroethylene, vinyl chloride and 1,1-dichlorethane. PCE and TCE occurred in ground water both on site and off site at levels that exceeded EPA's existing or proposed maximum contaminant levels (MCLs). Exposure pathways of greatest concern included ingestion and inhalation of contaminated ground water, based on the human health risk assessment. EPA found that risks from exposure to other media, including soil and surface water, were not significant. Under a residential scenario based on data from the most contaminated off-site well and the most contaminated on-site well, the risk assessment estimated that the excess cancer risk was on the order of 10^{-4} (that is, one additional cancer per 10,000 people).

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). A number of remedial alternatives were considered for the Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(e)(9)(iii) of the NCP. The nine criteria include:

1. Overall Protectiveness of Human Health and the Environment
2. Compliance with ARARs
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility or Volume of Contaminants through Treatment
5. Short-term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

4.1 Remedy Selection

EPA issued the Site's Record of Decision (ROD) on September 30, 1989. Although the 1989 ROD did not specify remedial action objectives (RAOs), it did state that EPA selected the remedy to prevent, reduce or control the contaminants leaving the landfill and entering the ground water. The selected remedy consisted of the following remedial components:

- Closing the landfill, except new landfill units that meet the State Minimum Functional Standards.
- Capping the landfill waste units to reduce infiltration and contaminant migration to ground water.
- Pumping and treating ground water as an interim measure to control contamination migrating from the landfill, with natural attenuation of the downgradient plume.
- Monitoring ground water.
- Providing alternative water to prevent exposure to contaminated ground water.
- Implementing institutional controls to protect the cap, monitoring wells, and pumping and treatment system, as well as to restrict the construction of new wells and the use of existing wells in the area of the contaminated plume.
- Controlling landfill gas emissions.

The 1989 ROD states that the pumping and treatment system was considered an interim measure to control contamination migrating from the landfill until such time as other remedial measures, specifically the cap, become effective in consistently lowering the contaminant levels to below MCLs. The 1989 ROD states that, after a year of meeting ground water cleanup levels, ground water extraction and treatment operations can be

suspended, provided monitoring demonstrates that contaminant concentrations continue to meet the cleanup levels without treatment. The pumping and treatment system cannot be dismantled for an additional five years after monitoring indicates it can be discontinued.

In September 2009, EPA issued an Explanation of Significant Differences (ESD) to document the following modifications to the remedy selected in the 1989 ROD:

- Clarified that SDWA MCLs are the selected cleanup level for all contaminants of concern (COCs) at the Site. This clarifies ground water cleanup levels for PCE and trans-1,2-dichloroethylene.
- Changed the ground water treatment system from off-site treatment at POTW to on-site treatment by aeration.
- Clarified that the ground water point of compliance is the downgradient side of the landfill, not the additional property acquired downgradient of the landfill for infiltration of surface water and treated ground water.
- Changed the surface water point of compliance from the point where the Publicly Owned Treatment Works (POTW) discharged to surface water (the Spokane River) to the location where treated water enters the on-site infiltration area.
- Clarified the objectives of the institutional controls required in the 1989 ROD, specified that land use restrictions are needed in perpetuity, listed the property parcels that require institutional controls and specified that the preferred and anticipated means of implementation was through a covenant under the Uniform Environmental Covenants Act (UECA –Chapter 64.70 RCW).

The cleanup levels selected in the 1989 ROD and clarified by the 2009 ESD were the MCLs under the SDWA (Table 3). The 2009 ESD states that in the future, if EPA issues a SDWA MCL for 1,1-dichloroethane, the MCL will also be considered the cleanup level for this COC.

Table 3: Ground Water COCs and Cleanup Levels

COC	Selected Cleanup Levels (µg/L)
PCE	5
TCE	5
1,1,1-trichloroethane	200
Chloroform	100
trans-1,2-dichloroethylene	100
vinyl chloride	2
1,1-dichloroethane	MCL (when promulgated)

4.2 Remedy Implementation

On January 23, 1991, the City of Spokane, Ecology and EPA signed a Consent Decree (CD) that directed the City to implement the remedial actions stated in the ROD. The PRP began the remedial design on February 11, 1991, and completed the remedial design March 10, 1992. The PRP began remedial action on March 16, 1992, and completed it on March 15, 1993. The Site achieved construction completion in September 1993.

The older, previously used landfill cells were closed to all new refuse disposal on December 31, 1991. Closure met the requirements of the ROD and Washington State Minimum Functional Standards (Chapter 173-304 WAC) for landfills. Closure was made possible by the operation of a new regional refuse incinerator. In addition, to allow for a future use of the Site, the wastewater treatment plant Sludge Disposal Area was consolidated into the refuse, which allowed for the construction of a new 15-acre lined landfill waste unit. This new permitted waste unit was designed to handle incinerator bypass and non-combustibles.

Capping of the refuse area within the Site was completed in June 1993 as part of the closure of old closed landfill cells. This area extended over 130 acres and contained waste to a depth of about 200 feet. The cap met the requirements of the ROD and State Minimum Functional Standards for landfills. The design of the cap minimized infiltration of precipitation into the refuse and reduced leachate production and future contamination of the ground water, stabilized slopes, prevented surface erosion and controlled surface water runoff discharge. The cap included a 60-mil high density polyethylene (HDPE) liner, a surface water collection system, 18 inches or more of granular cover material of which 6 inches or more is topsoil and low maintenance vegetation.

Landfill gas emission collection and destruction is being accomplished through the operation of the gas collection system, which was constructed starting in June 1992 and was completed with the construction of the gas flare in September 1992. Landfill gas collection and destruction is ongoing as required by the State Minimum Functional Standards. In 2001, the PRP modified the gas collection and treatment system to produce energy via methane gas-fired generators. However, prior to the 2007 FYR, the Spokane Regional Clean Air Agency determined that the system did not meet Clean Air Act requirements; energy production terminated and landfill gas emission collection and destruction resumed.

The installation of the pilot extraction well (PEW) on the western boundary of the Site was completed in May 1992. The PEW was designed to remove contaminated ground water for treatment and prevent further off-site migration of COCs as ground water flows northwest from the Site. From 1993 to 2003, the POTW treated ground water off site and discharged into the Spokane River. In 2003, treatment and discharge began to occur within the landfill property boundary downgradient from the closed portion of the landfill. The 1989 ROD required ground water pumped from the Site to be treated at the City of Spokane POTW and discharged in compliance with the National Pollutant Discharge Elimination System (NPDES) permit for the POTW. The City came to view the high volumes of water as a strain on the POTW, particularly as the contaminant concentrations declined. By 2003, capping of old landfill areas began to reduce ground

water COC concentrations and the PRP began to seek alternative treatment possibilities to reduce the demand on the POTW. The PRP proposed to use the on-site stormwater collection system as an air stripping system for extracted ground water and to allow the treated water to infiltrate to ground water in an on-site infiltration pond. In 2003, following pilot testing, Ecology (with EPA verbal agreement) approved this change to the water treatment and discharge, which was later documented in the 2009 ESD. In 2003, the PRP began to treat water through passive air stripping at the Site and discharge treated water in an infiltration basin adjacent to the landfill. The PEW system was operating regularly until 2010, when it started having operational issues. Despite these issues, monitoring has indicated a reduction in the extent of the plume, and for at least 2 years, concentrations at the landfill boundary monitoring wells have been at concentrations below the cleanup levels. The City of Spokane has plans to replace the PEW pump, make repairs to the landfill and gas collection system, and seek Ecology and EPA approval for PEW system shutdown with continued groundwater monitoring.

In 1997, a court order terminated the CD with the exception of certain ongoing requirements on the PRP, such as performing O&M, monitoring and institutional controls, under oversight by Ecology.

On April 27, 2011, EPA, the City of Spokane and the State of Washington signed an environmental covenant under the Washington State UECA to satisfy the institutional controls requirements in the 1989 ROD and 2009 ESD. The covenant, recorded with the deeds for the City-owned landfill property on June 17, 2011, restricts the use of ground water, prohibits actions that could affect the integrity of the remedy, and requires advance notice to EPA and the State of Washington of planned property ownership changes.

4.3 Operation and Maintenance (O&M)

The City of Spokane continues to perform O&M at the Site in accordance with the 2011 environmental covenant, the 2008 Northside Landfill Groundwater Monitoring Plan and the O&M Manual. Ecology oversees the O&M performed by the City. Many of the O&M measures correspond with those required under the permit for the active landfill.

The City routinely monitors ground water conditions in the immediate vicinity of the Northside Landfill in accordance with the provisions of its operating permit and with applicable state and federal regulations. In 1996, the City began performing routine ground water monitoring for the Site in accordance with the 1995 Post-Closure Groundwater Monitoring Plan. The original plan included provisions for periodic review, reassessment and modification of the monitoring program, as needed, to accommodate changing ground water conditions and satisfy applicable regulatory changes that might occur during the anticipated period of post-closure monitoring. The monitoring plan was revised in September 2008 based on applicable site investigation activities and monitoring program changes that occurred from 2004 through 2008. The 2008 monitoring plan created separate monitoring programs for the active municipal solid waste landfill cell (not part of O&M for the Site, but a continued use of the City-owned property at the Site) and the closed refuse unit (required by site decision documents). The

active municipal solid waste landfill is regulated and permitted by the Spokane Regional Health District with technical assistance from Ecology.

The O&M manual specifies inspection frequency and requirements for maintenance and repairs for the cover system, pursuant to the City's Washington State Landfill Permit to maintain the closed landfill for 30 years. O&M personnel at the Site visually inspect the landfill on a daily basis, coincident with daily inspections of the gas monitors. The visual inspections assess:

- Landfill surface conditions for settling, cracks, erosion, holes, bulges, wet areas/water damage, slope instability and vegetative cover needs.
- Bench (or berm) integrity.
- Conditions of cover penetrations (gas collection system, gas monitoring probes, ground water monitoring wells and several wells through the closed landfill cover that are part of the leachate extraction system for the active landfill cell).
- Cover drainage and surface water infiltration basin effectiveness.

The O&M personnel also monitor landfill gas data in order to analyze the effectiveness of the landfill cover. The O&M personnel monitor the gas generation data for system contributions of methane, carbon dioxide and oxygen as the collected gas is burned in the flares. Oxygen concentration data also serve to determine potential leakage through the landfill cap liner. The gas collection system is regularly monitored and repaired as needed.

The City of Spokane developed separate ground water compliance monitoring plans for the active cells and the closed cells. Long-term ground water monitoring for the closed refuse unit began in 1995 and is anticipated to occur for a minimum 30-year period. The objectives of long-term monitoring include:

- Compliance with the ground water monitoring requirements of Washington State Minimum Functional Standards for Solid Waste Handling, WAC 173-304.
- Protection of human health and the environment.
- Assessment of spatial and temporal changes in general water quality following closure and capping of the landfill and operation of the ground water extraction system.

Extraction system performance monitoring (performance monitoring) is conducted in conjunction with the operation of the ground water extraction system and concurrent with the long-term monitoring program. The objectives of performance monitoring are to:

- Monitor the changes in water quality at the landfill boundary resulting from removal of contaminated ground water by the extraction system.
- Monitor the hydraulic gradient effect induced by operation of the ground water extraction system.

The City does not currently track the costs associated with performance of O&M at the Site separately from operation requirements for the active landfill cell. The City provided estimated expenses related to O&M of the PEW from January 2007 through February 2012 totaling $156,750 (Table 4). These costs average $30,000 a year, but they do not include O&M of the landfill cover or sampling and analysis. The ROD estimated total O&M costs of $75,000 per year.

Table 4: O&M Costs Associated with PEW

Expense	Cost Estimates[1]
Actual energy costs reported (January 2007 – February 2012)	$140,000 (average of $27,000 per year)
Actual personnel costs reported (January 2007 – February 2012)	$16,000 (average of $3,100 per year)
Actual replacement part costs reported	$1,000 (average of $200 per year)
Total	$157,000 (average of $30,000 per year)

1.Cost estimates provided by the City of Spokane in an email from Rich Hanson to Ellie Hale April 13, 2012

The ROD states that the pumping and treatment can be discontinued after one year of groundwater monitoring indicates that groundwater does not exceed the MCLs at the point of compliance for the contaminants of concern, without running the pump and treat system. The system cannot be dismantled for an additional five years after monitoring indicates pumping and treatment can be discontinued. At least two years of meeting cleanup levels have passed, despite intermittent PEW system operation between September 2010 and the present. At the time of this FYR, the system is not operational.

5.0 Progress Since the Last Five-Year Review

The protectiveness statement from the 2007 FYR for the Site stated the following:

> *"The remedy at the Northside Landfill Superfund Site is currently protective of human health and the environment, because sources have been reduced through landfill closure, cleanup levels are being achieved through interim measures (pumping and treatment), and exposure pathways are being controlled through engineering and institutional controls. However, in order to ensure that the remedy remains protective in the long-term, this FYR recommends that EPA further evaluate the institutional controls to assess their long-term effectiveness and, if deemed appropriate, issue an ESD to address any deficiencies identified. This evaluation will be performed within a year of this FYR."*

The 2007 FYR included seven issues and recommendations. All of the recommendations have been addressed. Each recommendation and how it was addressed is discussed in Table 5.

Table 5: Progress on Recommendations from the 2007 FYR

Recommendation	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Clarify and document MCLs as ground water cleanup levels for PCE and trans-1,2-dichloroethylene in the ESD.	EPA	December 2007	ESD was issued in October 2009 clarifying that MCLs are the remediation goals for all site COCs.	10/21/2009
Document changes to pumping and treatment system in the ESD.	EPA	December 2007	ESD was issued documenting changes to the pumping and treatment system.	10/21/2009
Clarify the ground water point of compliance in the ESD.	EPA	December 2007	ESD was issued clarifying the location of the point of compliance.	10/21/2009
Revise the surface water point of compliance and any related monitoring changes in the ESD.	EPA	December 2007	ESD was issued revising the surface water point of compliance.	10/21/2009
Evaluate future ground water data in light of vapor intrusion pathway and consider additional assessment if ground water concentrations rise.	EPA, Ecology	December 2007	Ground water COCs are shown to be declining and there are no additional changes to conditions considered in the 2007 vapor intrusion (VI) analysis. Any changes in conditions will be considered during routine technical assessment during future FYRs.	10/21/2009

Recommendation	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
Conduct in-depth survey of institutional controls to assess long-term protectiveness.	City of Spokane	December 2007	EPA completed an institutional control review in 2008 and later clarified the objectives of the institutional controls in the 2009 ESD. The 2011 UECA covenant achieves these objectives.	6/20/2008

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 10 initiated the FYR in December 2011 and scheduled its completion for September 2012. The EPA site review team was led by EPA Remedial Project Manager (RPM) Ellie Hale and included contractor support provided to EPA by Skeo Solutions. In December 2011, EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. A review schedule was established that consisted of the following activities:

- Community notification.
- Document review.
- Data collection and review.
- Site inspection.
- Local interviews.
- FYR Report development and review.

6.2 Community Involvement

In April 2012, a public notice was published in *The Spokesman-Review* newspaper announcing the commencement of the FYR process for the Site, providing contact information for Ellie Hale and inviting community participation. The press notice is available in Appendix B. No one contacted EPA as a result of this advertisement.

The FYR Report will be made available to the public once it has been finalized. Copies of this document will be placed in the designated site repository: Spokane Public Library, located at 906 West Main Street, Spokane, Washington 99201. In addition, a copy will be kept on file at Department of Ecology, North 4601 Monroe St. Spokane, Washington 99205.

6.3 Document Review

This FYR included a review of relevant, site-related documents including the ROD, ESD, remedial action reports and recent monitoring data. A complete list of the documents reviewed can be found in Appendix A.

<u>ARARs Review</u>

CERCLA Section 121(d)(1) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substance, pollutants, and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate. Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal

environmental or state environmental or facility siting laws that specifically address a hazardous substance, remedial action, location, or other circumstance found at a CERCLA site. Relevant and appropriate requirements are those standards that, while not "applicable," address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are more stringent than federal requirements may be applicable or relevant and appropriate. To-Be-Considered (TBC) criteria are non-promulgated advisories and guidance that are not legally binding, but should be considered in determining the necessary remedial action. For example, TBCs may be particularly useful in determining health-based levels where no ARARs exist or in developing the appropriate method for conducting a remedial action.

Chemical-specific ARARs are health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish an acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. Examples of chemical-specific ARARs include MCLs under the federal SDWA and ambient water quality criteria enumerated under the federal Clean Water Act.

Action-specific ARARs are technology- or activity-based requirements or limits on actions taken with respect to a particular hazardous substance. These requirements are triggered by a particular remedial activity, such as discharge of contaminated ground water or in-situ remediation.

Location-specific ARARs are restrictions on hazardous substances or the conduct of the response activities solely based on their location in a special geographic area. Examples include restrictions on activities in wetlands, sensitive habitats and historic places.

Remedial actions are required to comply with the chemical-specific ARARs identified in the ROD. In performing the FYR for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed.

Ground Water ARARs

According to the 1989 ROD and 2009 ESD, cleanup goals for ground water COCs were based on the SDWA and its primary drinking water standards. ARARs from the 1989 ROD and 2009 ESD were compared to current SDWA MCLs (Table 6). Based on MCL changes since the 2009 ESD, the current ARAR for chloroform is now more stringent. The MCLs for other COCs remain unchanged.

Table 6: ARAR Review for Ground Water COCs

COCs	1989 ROD SDWA MCLs (µg/L)	2009 ESD SDWA MCLs (µg/L)	2012 SDWA[a] MCLs (µg/L)	ARARs Change
PCE	Not promulgated	5	5	None
TCE	5	No change	5	None
1,1,1-trichloroethane	200	No change	200	None
chloroform	100[b]	No change	80[b]	More stringent
trans-1,2-dichloroethylene	Not promulgated	100	100	None
vinyl chloride	2	No change	2	None
1,1-dichloroethane[c]	Not promulgated	Not promulgated	Not promulgated	Not applicable

a. 2012 National Primary Drinking Water MCLs are available at: http://water.epa.gov/drink/contaminants/index.cfm#List (accessed 5/30/2012).
b. Criterion for total trihalomethanes.
c. The Washington Model Toxics Control Act Method B level for 1,1-dichloroethane in groundwater is 1600 µg/L, based on the 10^{-5} risk. However, this COC has not been detected in quarterly groundwater monitoring above 0.5 µg/L.

Surface Water ARARs

The 1989 ROD includes the Clean Water Act as an ARAR related to discharge to surface water. Until 2003, however, water pumped from the extraction well was piped to the City's POTW for treatment and discharge in compliance with the POTW permit. EPA and Ecology later approved onsite discharge to the landfill's infiltration basin. The 2009 ESD documented the change and noted that while ecological criteria and drinking water standards are met, surface water standards are not applicable.

Institutional Controls Review

EPA conducted a review of site institutional controls in June 2008. At that time EPA determined that the City had not yet implemented any permanent controls to satisfy the institutional controls required by the 1989 ROD and CD. As a result, EPA utilized the 2009 ESD to clarify the objectives of the necessary institutional controls and provide specificity on the types of controls required to achieve the objectives. The ESD stated that institutional controls must include recordation of the CD with the deeds for the City-owned landfill properties, deed notices restricting the use of ground water and actions that could affect the integrity of the remedy, and obligated the City to notify EPA and the State of Washington if property ownership of these parcels changed.

On April 27, 2011, EPA, the City of Spokane and the State of Washington signed an environmental covenant under the Washington State UECA to satisfy the institutional controls requirements in the 1989 ROD and 2009 ESD. Research during this FYR confirmed that the environmental covenant was filed and recorded with the Spokane County Auditor on June 17, 2011.

The environmental covenant applies to all current and future owners of any part of or operation at the landfill property and carries out the institutional control objectives incorporated into the 2009 ESD. The specific objectives of the institutional controls are to:

- Prohibit activity on the landfill property that could damage or disturb the integrity or maintenance of the landfill cap or any other component of any containment system, pumping and treatment system, gas collection system, or the function of the landfill monitoring system, or otherwise result in the release or exposure to the environment of any hazardous substances beneath the cap without prior written approval from Ecology.
- Ensure that current and future owners of the landfill property maintain the cap, including the minimum 12-inch cover of topsoil and the minimum 18-inches of granular cover material.
- Prohibit access to ground water on the landfill property unless ground water removal is part of monitoring activities established in a plan approved by EPA and Ecology.
- Ensure that EPA and Ecology are notified at least 60 days in advance of any conveyance of the property.
- Ensure that in any conveyance of any interest in the landfill property, current and future owners provide for these institutional controls to continue.
- Restrict leases to uses and activities consistent with the institutional controls and notify all lessees of the restrictions on the use of the landfill property.
- Provide EPA and Ecology access to the landfill property to inspect and evaluate the remedial action.

In addition to the institutional controls implemented as part of the remedy selected in the 1989 ROD and 2009 ESD, Washington State law (WAC 173-160) restricts the construction of new wells with 1,000 feet of a landfill boundary. The environmental covenant clearly delineates the boundary of the landfill and state law restricts ground water use, as illustrated in Figure 3. Ecology is authorized to enforce the State law through their "Start Card" program. This program requires well drillers to submit well location information prior to the initiation of the well drilling. The Start Card process allows Ecology to check the proposed location against landfill boundaries and deny permission to drill if the location is within 1,000 feet of a landfill. However, an EPA review of the program in 2008 revealed that the process in place for reviewing this information does not include comparison of the notice of intent to drill against a database that would allow Ecology to ensure no new wells are drilled within 1,000 feet of the landfill. Licensing of well contractors and operators is required as set forth in WAC 173-162. Violating state well drilling requirements may result in suspension or revocation of a contractor's license. Therefore, local licensed well drillers' knowledge of the law and the landfill location are the primary tool for ensuring state restrictions are followed and no new wells are drilled in the area. Because new homes are connected to the public water supply, residents are unlikely to have wells drilled. However, EPA will consider the need to review whether any new wells are installed near the landfill that may potentially affect the contaminant plume.

Table 7 lists the institutional controls associated with the Site.

Table 7: Institutional Control (IC) Summary Table

Landfill Area (Parcels: 26223.0004, 26223.0016, 26275.0029, 26275.0030, 26281.0029, 26262.0021, and 26262.0033)				
Medium	**ICs Needed?**	**ICs Called for in the Decision Documents?**	**Instrument in Place**	**Notes**
Ground Water	Yes	Yes	2011 environmental covenant	The 2011 environmental covenant fulfills the institutional control objectives stated in the 2009 ESD.
Soil	Yes	Yes	2011 environmental covenant	The 2011 environmental covenant fulfills the institutional control objectives stated in the 2009 ESD.

Figure 3: Institutional Control Base Map

Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site, and is not intended for any other purpose.

6.4 Data Review

O&M personnel monitor the landfill cover using landfill gas data. The O&M personnel monitor the gas generation data for system contributions of methane, carbon dioxide and oxygen as the collected gas is burned in the flares. Oxygen concentration data also serve to determine potential leakage through the landfill cap liner. The gas collection system is regularly monitored and repaired as needed. Landfill gas collection and destruction is ongoing as required by the permit and the State Minimum Functional Standards.

The current FYR reviews ground water data collected by the PRP from February 2007 through January 2012. The PRP has collected and analyzed ground water samples four times per year from MW-208, MW-BB, MW-C, PEW, MW-M and MW-T. The PRP collected and analyzed samples from MW-E, MW-J, MW-K and MW-N annually. The PRP also collected and analyzed samples from two area private residential wells that are no longer used for potable water. The (b) (6) well was sampled annually from 2007 through 2010 and the (b) (6) well was sampled from 2007 to 2009.

All COCs, except PCE, have remained well below MCLs and cleanup goals at all wells throughout the review period (Appendix G). According to the 2007 FYR, PCE had not been detected above the cleanup goal of 5 µg/L since the third quarter of 2004. However, during the current FYR, the PCE cleanup goal of 5 µg/L was exceeded during the July 2008 sampling event in three wells, MW-BB, PEW and MW-M. Sampling in July 2008 detected PCE in MW-BB at a concentration of 5.09 µg/L, in PEW at 5.75 µg/L and in MW-M at 5.76 µg/L. Table 8 lists the ground water data for PCE from 2007 to 2012. Additionally, the 2009 Extraction System Performance Monitoring Report indicated that during the July 2009 sampling event a duplicate sample from MW-BB exceeded the PCE cleanup goal. Samples from MW-BB had a PCE concentration of 4.74 µg/L and 5.22 µg/L in the sample duplicate. In response to this, the PRP conducted an additional sampling event in August 2009. This sample had a concentration of 2.05 µg/L.

Graphs of historical PCE concentrations in MW-BB, PEW and MW-M are shown in Appendix F. MW-208, MW-C, MW-E, MW-K and the off-site residential (b) (6) well all had concentrations near or below the sampling method detection limit of 0.5 µg/L. Over the review period, concentrations in MW-J have decreased from approximately 2 µg/L to near the sampling method detection limit of 0.5 µg/L. MW-N has consistently had PCE concentrations of approximately 1-2 µg/L. Although PEW, MW-M and MW-T have had variations in PCE concentrations over the review period, they have had concentrations of PCE below cleanup levels for the prior three years, from the fourth quarter 2008 through the first quarter 2012.

The ROD states that the pumping and treatment can be discontinued after one year of groundwater monitoring indicates that groundwater does not exceed the MCLs at the point of compliance for the contaminants of concern, without running the pump and treat system. The system cannot be dismantled for an additional five years after monitoring indicates pumping and treatment can be discontinued. At least two years of meeting cleanup levels have passed, despite intermittent PEW system operation between

September 2010 and the present. At the time of this review, the system is not operational. The PRP is currently working on repairing the PEW system and will request concurrence from EPA and Ecology to discontinue operation of the PEW system and monitor its post-operation performance in accordance with the 1989 ROD and 2008 Groundwater Monitoring Plan.

Table 8: 2007-2012 PCE Sampling Data

Date	PCE Concentration (µg/L)									
	MW-208	MW-BB	MW-C	PEW	MW-E	MW-J	MW-K	MW-M	MW-N	MW-T
Feb-07	ND	3.6	ND	3.4	NS	NS	NS	3.4	NS	2
May-07	ND	3.3	ND	3.78	ND	1.63	ND	3.51	1.09	1.73
Aug-07	ND	2.83	0.64	3.63	NS	NS	NS	3.63	NS	ND
Oct-07	ND	3.44	0.55	3.38	NS	NS	NS	3.23	NS	2.95
Feb-08	ND	3.68	0.59	3.64	NS	NS	NS	2.22	NS	1.82
May-08	ND	3.17	0.56	3.5	0.61	2.09	ND	2.93	1.44	1.78
Jul-08	ND	**5.09**	0.56	**5.75**	NS	NS	NS	**5.76**	NS	2.65
Oct-08	ND	2.08	ND	3.04	NS	NS	NS	3.03	NS	2.17
Feb-09	ND	ND	ND	2.45	NS	NS	NS	1.35	NS	1.63
Apr-09	ND	1.85	ND	3.19	0.65	2.34	NS	1.74	1.55	1.81
Jul-09	ND	4.74	0.7	4.87	NS	NS	NS	4.27	1.82	2.03
Oct-09	ND	1.68	ND	2	NS	NS	NS	1.89	NS	1.49
Jan-10	ND	1.54	ND	1.75	NS	NS	NS	1.04	NS	1.05
May-10	ND	1.72	ND	2.62	ND	2.05	ND	1.4	1.41	0.99
Jul-10	ND	1.9	ND	1.92	NS	NS	NS	1.62	NS	0.92
Oct-10	ND	4.38	0.5	NS	NS	NS	NS	2.93	NS	1.73
Jan-11	ND	3.42	0.54	NS	NS	NS	NS	1.57	NS	1.52
Apr-11	ND	3.43	0.61	NS	0.51	0.51	ND	NS	NS	1.31
Jul-11	ND	3.83	0.74	3.58	NS	NS	NS	3.28	NS	1.29
Oct-11	ND	4.18	0.61	4.12	NS	NS	NS	2.96	NS	1.79
Jan-12	ND	4.26	0.58	3.48	NS	NS	NS	3.01	NS	1.99

Bold-above PCE ESD cleanup goal (5 µg/L)
ND-not detected/below detection limit
NS-not sampled

During the 2007 FYR, EPA performed a screening level evaluation for PCE using the 2002 Subsurface Vapor Intrusion (VI) Guidance. Based on a reasonably protective attenuation factor of 0.001 (and assuming that the chemical in ground water obeys Henry's Law), a risk level of 10^{-6} is associated with a ground water screening concentration of 0.54 µg/L PCE. Measured concentrations of PCE in ground water monitoring data from 2002 through 2006 ranged from <0.5 µg/L to a maximum of 5.9 µg/L (in 2003, at compliance well MW-M), indicating potential risks between 10^{-6} and 10^{-5}. This is an order of magnitude below the unacceptable risk threshold of 10^{-4}. Based on that evaluation, EPA concluded that levels were acceptable.

A review of PCE concentrations over the past five years has shown that PCE concentrations have not exceeded the parameters used in the 2007 evaluation. Therefore, the evaluation that there is no unacceptable risk remains valid. However, PCE concentrations have experienced fluctuations during the previous five years. If future ground water COC concentrations increase or if other information suggests that the VI pathway could pose unacceptable risk, additional data collection may be appropriate. In February 2012, EPA completed a five year effort to update the toxicity values for PCE. The new oral and inhalation cancer slope factors are less stringent than the values used by the State of Washington, whereas the new oral reference dose is slightly more stringent than the current Ecology Cleanup Levels and Risk Calculations database. EPA also published a new reference concentration that can be used to calculate air cleanup levels. These changes do not affect the protectiveness of the remedy.

Although the MCL for chloroform is more stringent than at the time of the decision documents, all chloroform concentrations for the last five years were below the detection level of 0.5 µg/L and therefore below the more stringent ARAR of 80 µg/L.

6.5 Site Inspection

The site inspection was held on April 19, 2012. Participants included EPA RPM Ellie Hale; Bill Fees, Ecology; Rich Hanson, City of Spokane; and Treat Suomi and Johnny Zimmerman-Ward of Skeo Solutions. The group toured the Site, including the extraction well, detention pond, monitoring wells and flares. General conditions were noted and photographed (Appendix E). Results of the site inspection are available in the completed site inspection checklist in Appendix D.

The site inspection was led by Rich Hanson who explained the present status of site activities, particularly O&M activities including landfill cover maintenance, well sampling and extraction well conditions. Mr. Hanson indicated that the extraction well had stopped working properly in September 2010 and a new pump would be installed over the summer of 2012. Gas wells and probes are sampled monthly. The fenceline of the landfill was observed to be intact and Mr. Hanson stated it was patrolled hourly during the night to keep it secure. Staff has observed wildlife on the landfill, but not trespassers. The landfill vegetation was well-maintained. Mr. Hanson indicated that over the past five years there has been settlement observed of the landfill, as well as some gas hot spots identified, typically during the winter months with snow melt. The City had a contractor perform an engineering assessment of the landfill in 2010 that identified areas needing repairs. The landfill repairs will be addressed by a contractor in the summer and fall of 2012. Monitoring wells off site were observed. Some are no longer monitored and some are not secured. The flares were observed outside of the landfill office. Only one of the three flares is currently operational. The City would like to have two running and decommission the third.

On April 18, 2012, Skeo Solutions staff visited the designated site repository, Spokane Public Library, as part of the site inspection. The library has several site documents

available to the public but does not contain the entire administrative record and is specifically missing some of the more recent documents, including the 2002 FYR, 2007 FYR and the 2009 ESD. EPA is ensuring that copies of some of the more recent documents are submitted to the library but Ecology and the City of Spokane should ensure that records at the library are maintained and up-to-date.

6.6 Interviews

During the FYR process, interviews were conducted with parties impacted by the Site, including the current landowners, and regulatory agencies involved in site activities or aware of the Site. The purpose of the interviews was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy that have been implemented to date. All of the interviews were conducted during the site inspection on April 19, 2012. Interviews are summarized below and complete interviews are included in Appendix C.

Rich Hanson: Rich Hanson is a representative from the City of Spokane, the Site's PRP. Mr. Hanson believes that the remedial actions and the current remedy in place are working. Mr. Hanson feels well-informed about the Site and the remedial progress. He stated that the City is working to complete overdue maintenance this year and to establish better communication with the regulators. Better communication with regulators has helped the City improve operations and better protect the public. Mr. Hanson also stated that the City worked with the local community to resolve concerns that came up when community members were exploring the possibility of creating baseball fields at the Site. Nearby residents were not interested in having fields and their traffic near their homes. The City has also responded to requests from residents for the removal of trees but the City does not cut down trees surrounding the landfill. Other than these issues, there have not been any other effects on the community.

Bill Fees: Bill Fees is a state representative for the Site from Ecology. Mr. Fees believes that the current remedy is performing well. He stated that the intent of the ROD was to use the pumping and treatment system to reduce the plume and intercept COCs until the cover system was effective at limiting the migration of COCs into groundwater. With the cover in place and COC concentrations in groundwater meeting the cleanup levels, pumping and treatment may no longer be needed. Mr. Fees explained that Ecology conducts site-related activities because of the new cell, which is subject to regulatory management, and has installed new wells to monitor the new cell. Ecology has also responded to requests for installation of private wells but they do not allow this. Mr. Fees is not aware of any changes to state laws or projected land uses that would affect the protectiveness of the Site's remedy. Overall, he feels that the City has done a great job at the Site.

Jerry Richardson and Tyson Schultz: Jerry Richardson and Tyson Schultz are representatives from the Spokane Regional Solid Waste System, the O&M contractors for the Site. Their overall impression of the project's cleanup and maintenance is good. They believe that the current performance of the remedy is excellent. Mr. Richardson and Mr.

Schultz do not review the monitoring data but maintain a continuous on-site presence, performing all maintenance activities at the Site. They explained that there have not been any changes to the O&M activities nor any unexpected difficulties or costs relating to O&M.

Ellie Hale: Ellie Hale is the EPA Remedial Project Manager for the Site. Her overall impression of the project is that the Site has a well designed and implemented cleanup with good workers conducting day to day maintenance tasks. She stated that five year reviews are useful as reminders that overall assessments are needed periodically, along with investments in landfill repairs. Ms. Hale explained that because Ecology has the day-to-day local oversight role and EPA engages mostly in connection to five year reviews, it is hard to ensure consistently good communication. In addition, Ms. Hale stated that the unplanned PEW shutdown is an issue, but the City plans to repair the well. She further explained that as the PEW shutdown gets closer, it will be important to document that the system is available and operable, in case a problem arises, and that there is general agreement between Ecology, EPA and the PRP on the conceptual site model and on the monitoring necessary to evaluate the remedy, both during that year and beyond.

7.0 Technical Assessment

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

Yes. The review of documents, ARARs, risk assumptions, institutional controls and the site inspection indicate that the remedy is functioning as intended by the Site's 1989 ROD and the subsequent 2009 ESD. Area residents were connected to municipal water supplies in 1983. Access controls and security measures ensure that no unauthorized activity is occurring at the Site that may damage the capped area. The landfill cap is well-maintained and functions to prevent infiltration of surface water. All COCs are below cleanup goals and MCLs.

In accordance with the 2009 ESD, institutional controls have been implemented in the form of an environmental covenant prohibiting land uses that could damage the cap and installation of ground water supply wells on the landfill property. No violations of the ICs have been identified. The ICs meet the objectives of the Selected Remedy and ESD, and no new or modified ICs are warranted.

The City has reported that the PEW system has been malfunctioning since September 2010. From September 2010 until the time of the 2012 FYR site inspection, the pump only worked intermittently. The City has plans to conduct repairs in 2012 and after completing repairs will begin the process of gaining formal concurrence with EPA and Ecology to discontinue the operation of the PEW system and monitor its post-operation performance according to the 1989 ROD. In order to ensure long-term protectiveness, the City should develop a plan for PEW system shutdown that includes a monitoring plan for analyzing the effectiveness of post-operation performance in accordance with the 1989 ROD and 2008 O&M Plan.

The City reported that there had been settlement observed on the landfill, as well as some gas hot spots identified, typically during the winter months with snow melt. The City commissioned an engineering study in 2010 to investigate notable trouble spots related to the gas extraction system and provide recommendations for corrective measures and repairs, as well as ways to increase the efficiency of the landfill gas extraction system. The City will address the landfill repairs with the use of a contractor in the summer and fall of 2012. In order to ensure long-term protectiveness, the City should provide Ecology and EPA with a progress report upon completion of the repairs.

Monitoring wells off site were observed. Some are no longer monitored, at least one is in need of maintenance, and some are not secured. All off-site wells should be properly abandoned or repaired, secured and routinely inspected.

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

Yes. The ROD did not include narrative RAOs, but identified MCLs as groundwater cleanup levels for the COCs. The ground water MCL for chloroform has become more stringent since the signing of the 1989 ROD and 2009 ESD. However, quantifiable chloroform concentrations detected at the Site are below the more stringent 2012 ARAR and do not pose a risk to human health and the environment. EPA and Ecology agree that for this reason the new MCL does not need to be adopted in a decision document.

The Washington Model Toxics Control Act Method B level for 1,1-dichloroethane in groundwater is 1600 µg/L, based on the 10^{-5} risk. However, this COC has not been detected in quarterly groundwater monitoring above 0.5 µg/L. EPA and Ecology agree that for this reason the new MCL does not need to be adopted in a decision document.

During the 2007 FYR, EPA performed a screening level evaluation for PCE using the 2002 Subsurface Vapor Intrusion Guidance and determined that concentrations are such that there is not a completed exposure pathway. A review of PCE concentrations over the past five years has shown that PCE concentrations have not exceeded the parameters used in the 2007 evaluation. Therefore, the evaluation that there is no unacceptable risk remains valid. However, PCE concentrations have experienced fluctuations during the previous five years. If future ground water COC concentrations increase or if other information suggests that the VI pathway could pose unacceptable risk, additional data collection may be appropriate. In February 2012, EPA concluded a five year effort to update the toxicity values for PCE. The new oral and inhalation cancer slope factors are less stringent than the values used by the State of Washington, whereas the new oral reference dose is slightly more stringent than the current Ecology Cleanup Levels and Risk Calculations database. EPA also published a new reference concentration that can be used to calculate air cleanup levels. These changes do not affect the protectiveness of the remedy.

There have been no other changes in exposure assumptions or toxicity data that would call into question the protectiveness of the remedy. There are currently no proposed reuse plans at the Site that would affect the protectiveness of the remedy.

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

No. No other information has come to light that could call into question the protectiveness of the remedy.

7.4 Technical Assessment Summary

The review of documents, Applicable or Relevant and Appropriate Requirements (ARARs), risk assumptions, institutional controls and the site inspection indicate that the remedy is functioning as intended by the Site's 1989 ROD and the subsequent 2009 ESD.

Area residents were connected to municipal water supplies in 1983. Access controls and security measures ensure that no unauthorized activity is occurring at the landfill that may damage the capped area. The landfill cap is well-maintained and functions to prevent infiltration of surface water. Although there have been some fluctuations in PCE concentrations, contaminant of concern (COC) levels in the ground water currently remain below cleanup levels.

Ground water COCs are declining and there are no additional changes to conditions considered in the 2007 vapor intrusion (VI) analysis. Any changes in conditions potentially affecting the results of the 2007 VI analysis will be considered during routine technical assessment during future FYRs.

The City should complete the necessary repairs to the pilot extraction well (PEW) system and develop a plan for PEW system shutdown that includes a monitoring plan for analyzing the effectiveness of post-operation performance in accordance with the 1989 ROD and 2008 ground water monitoring plan. The City will address the needed landfill repairs to ensure the efficient functioning of the gas extraction system. In addition, the City should develop a plan to ensure that all off-site monitoring wells are properly abandoned or repaired, secured and routinely inspected.

8.0 Issues

Table 9 summarizes the current site issues.

Table 9: Current Site Issues

Issue	Affects Current Protectiveness (Yes or No)	Affects Future Protectiveness (Yes or No)
The pump at the extraction well is inoperable.	No	Yes
A 2010 engineering assessment identified areas of the closed landfill that are in need of repair.	No	Yes

The following additional items, though not expected to affect protectiveness, are issues that warrant additional follow-up:

- Formal concurrence with EPA and Ecology is needed to discontinue the operation of the PEW system and monitor its post-operation performance according to the 1989 ROD.
- Monitoring wells off site were observed. Some are no longer monitored, at least one is in need of maintenance, and some are not secured.

9.0 Recommendations and Follow-up Actions

Table 10 provides recommendations to address the current site issues.

Table 10: Recommendations to Address Current Site Issues

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Yes or No)	
					Current	Future
The pump at the extraction well is inoperable.	The PRP will complete planned PEW system repairs to ensure that the system can be reactivated as necessary during and for five years after yearlong shutdown period.	PRP	State	12/31/2012	No	Yes
A 2010 engineering assessment identified areas of the closed landfill that are in need of repair.	The PRP will implement repairs according to the recommendations received in 2011from CH2M HILL and provide a status report to Ecology and EPA upon completion.	PRP	State/EPA	9/29/2013	No	Yes

The following additional items, though not expected to affect protectiveness, warrant additional follow-up:

- EPA recommends the City of Spokane support and resubmit its request to shut down PEW operations for a year for approval by EPA and Ecology. The request should include documentation that the PEW is operable and available, should it be needed, that the necessary cover system repairs have been completed, and that monitoring will address the objectives of the shutdown period.
- EPA recommends the City of Spokane develop a plan to ensure that all off-site monitoring wells are properly abandoned or repaired, secured and routinely inspected.

10.0 Protectiveness Statement

The remedy at the Site currently protects human health and the environment because area residents are connected to municipal water supplies; contaminants have been below cleanup levels at the landfill boundary and downgradient for over two years; access controls and security measures ensure that no unauthorized activity is occurring at the Site that may damage the capped area; the landfill cap is well-maintained and functions to prevent infiltration of surface water; and institutional controls are in place to prohibit land uses that could damage the cap and to prohibit installation of ground water supply wells on the landfill property. However, in order for the remedy to be protective in the long term, the following actions need to be taken:

- Complete necessary repairs to the PEW system.
- Complete the needed landfill repairs to ensure the efficient functioning of the gas extraction system.

11.0 Next Review

The Site requires ongoing statutory FYRs as long as waste is left on site that does not allow for unrestricted use and unlimited exposure. The next FYR will be due within five years of the signature/approval date of this FYR in August 2017.

Appendix A: List of Documents Reviewed

Assessment Summary and Recommendations Report for the Closed Landfill Unit. CH2MHill. March 2011.

Annual Groundwater Monitoring Report Northside Landfill Closed Refuse Unit, 2008 City of Spokane, Washington. Chuyn Environmental Services. December 21, 2009.

CERCLA Information System Site Information accessed from website http://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=1000836. Accessed December 22, 2011.

Environmental Covenant & Subordination Agreement. Assistant City Attorney, City of Spokane, Carrie E Holtan. June 17, 2011.

EPA Superfund Record of Decision: Northside Landfill Superfund Site. U.S. Environmental Protection Agency. September 30, 1989.

Explanation of Significant Differences Northside Landfill Superfund Site Spokane, Washington. U.S. Environmental Protection Agency Office of Environmental Cleanup Superfund Program, Region 10. October 21, 2009.

Extraction System Performance Monitoring Report for Northside Landfill Closed Refused Unit 2009, City of Spokane. Chuyn Environmental Services. March 8, 2011.

Five-Year Review Type 1, Northside Landfill, Spokane WA. U.S. Environmental Protection Agency Office of Environmental Cleanup Superfund Program, Region 10. September 19, 1997.

Final Close Out Report Northside Landfill Superfund Site, Spokane Washington. Neil B. Thompson EPA Region 10. March 15, 1995.

Northside Landfill 2007 Annual Groundwater Monitoring Report. CH2MHILL. April 2008.

Northside Landfill Groundwater Monitoring Plan. CH2MHILL September 2008.

Preliminary Close out Report, Northside Landfill Superfund Site. U.S. Environmental Protection Agency. August 17, 1993.

Second Five-year Review Report for Northside landfill Superfund Site, Spokane, Spokane County, Washington. United States Environmental Protection Agency Region 10 Seattle, Washington. September 2002

Third Five-year Review Report for Northside landfill Superfund Site, Spokane, Spokane County, Washington. United States Environmental Protection Agency Region 10 Seattle, Washington. September 2007.

United States District Court. Order Granting City's Motion to Terminate Consent Decree. Senior United States District Judge, Justin Quackenbush. February 24, 1997.

Appendix B: Press Notice

bas, trombones

**Winston-Salem plays
and other musicians
e sunrise service.**

arly morning darkness.
ls are a crucial
ravian worship, and
organized in the 18th
members. Today,
the official
but not all of them
ster service.
nds have been making
or decades and tend to
egardless of what may
stops every year at the
once a bustling hotel,
king garage.
stuck on tradition,"
52, who started playing
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orked 240 years ago, so
"
nds made their rounds,
n the Moravian Home
lem to eat breakfast
l prepare for the
y 6:15, a huge crowd
ear the Rev. John
on a bare platform
he Lord is risen,"
Lord is risen indeed."
came to North
th century, when
rriving in the American
ravian Church itself,
t denomination,
rmation by decades. It
57 by followers of the
eformer Jan Hus, who
e saw as flaws in the
Church.

EPA
United States
Environmental Protection
Agency

Northside Landfill Superfund Site Cleanup 5-Year Review

The U.S. Environmental Protection Agency (EPA) is conducting the fourth Five-Year Review of the Northside Landfill Superfund site, located on a 345-acre parcel of land in northwest Spokane, Washington. Reviews are required at least every five years at sites where the cleanup leaves waste in place above safe levels.

The review will ensure the cleanup at the Northside Landfill site continues to protect human health and the environment. The cleanup included closure, capping, and landscaping of the old landfill; treatment to reduce groundwater contaminants; installation of a gas collection system to control landfill gas; maintenance of the cleanup; and restrictions on access and use of the site.

Volatile organic compounds in the Northside Landfill entered the local groundwater. The City of Spokane provided an alternate water supply for affected residents and in 1984 connected homes in the area to the municipal water supply. The landfill cap was constructed in 1993.

EPA welcomes your participation during our review, which will be completed this summer. If you have information that may help with the review, contact Ellie Hale, EPA Project Manager, by phone at 206-553-1215 or by email at hale.ellie@epa.gov.

TTY users may call the Federal Relay Service at 800-877-8339 and give the operator Ellie Hale's phone number.

Additional site information is available at:

- **Spokane Public Library, 906 W Main, Spokane, WA**
- **City of Spokane, Engineering Services Division, W 808 Spokane Falls Blvd, Room 318, Spokane, WA**

You can also access information at the EPA website:
http://yosemite.epa.gov/r10/cleanup.nsf/webpage/Superfund+(CERCLA)

Appendix C: Interview Forms

Northside Landfill Superfund Site **Five-Year Review Interview Form**

Site Name: **Northside Landfill** **EPA ID No.:** **WAD980511778**
Interviewer Name: **Johnny Zimmerman-Ward** **Affiliation:** **Skeo Solutions**
Subject Name: **Rich Hanson** **Affiliation:** **City of Spokane**
Subject Contact Information: **RAHanson@spokanecity.org**
Time: **10:00 A.M.** **Date:** **April 19, 2012**
Interview Location: **Site**

Interview Format (circle one): **In Person** **Phone** **Mail** **Other:**

Interview Category: **Potentially Responsible Parties (PRPs)**

1. What is your overall impression of the remedial activities at the Site?
   Working with the regulators is good and is very helpful. This year we are completing overdue maintenance. We are acknowledging that we need to have better communication efforts with the regulators.

2. What have been the effects of this Site on the surrounding community, if any?
   None, we have had communications with the local community, especially when little league baseball fields were being explored. We worked with the community to resolve the issue.

3. What is your assessment of the current performance of the remedy in place at the Site?
   It is working.

4. Are you aware of any complaints or inquiries regarding environmental issues or the remedial action from residents since implementation of the cleanup?
   We had an issue with trees; neighboring residents have requested that we cut down trees to improve their view. We do not cut down trees surrounding the land fill.

5. Do you feel well-informed regarding the Site's activities and remedial progress? If not, how might Department of Ecology, EPA, and the City of Spokane communicate about site-related information in the future?
   Yes

6. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?
   The City has done a good job to try to operate the site in good faith (both the open cell and the Superfund site). Discussions with regulators helps us improve our operations and protecting the public.

Site Name: **Northside Landfill** **EPA ID No.:** **WAD980511778**
Interviewer Name: **Johnny Zimmerman-Ward** **Affiliation:** **Skeo Solutions**
Subject Name: **Bill Fees** **Affiliation:** **WA Dept. of Ecology**
Subject Contact Information: **WFEE461@ecy.wa.gov**
Time: **9:00 A.M.** **Date:** **April 19, 2012**
Interview Location: **Site**

Interview Format (circle one): **In Person** **Phone** **Mail** **Other:**

Interview Category: **State Agency**

1. What is your overall impression of the project; including cleanup, maintenance, and reuse activities (as appropriate)?
   Great.

2. What is your assessment of the current performance of the remedy in place at the Site?
   The remedy is performing very well. The intent of the ROD was to use the pumping and treatment system to reduce the plume and intercept COCs until the cover system was effective at limiting the migration of COCs into groundwater. With the cover in place and COC concentrations in groundwater meeting the cleanup levels, pumping and treatment may no longer be needed.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?
   No, every once in a while people will purchase a property down gradient and ask about installing wells, but we do not allow that.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.
   We conduct site-related activities because of the new cell which is subject to regulatory management. Ecology placed new wells to monitor the new cell.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?
   No, although there are discussions about new PCE levels at the federal level.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?
   Yes

7. Are you aware of any changes in projected land use(s) at the Site?
   No, because of the active cell, which will probably be expanded?

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?
   No, the City has done a great job.

Site Name:	**Northside Landfill**	**EPA ID No.:**	**WAD980511778**
Interviewer Name:	**Johnny Zimmerman-Ward**	**Affiliation:**	**Skeo Solutions**
Subject Name:	**Jerry Richardson and Tyson Schultz**	**Affiliation:**	**Spokane Regional Solid Waste System**
Subject Contact Information:	**509-625-6934**		
Time:	**8:45 A.M.**	**Date:**	**April 19, 2012**
Interview Location:	**Site**		
Interview Format (circle one):	**In Person**	**Phone**	**Mail** **Other:**

Interview Category: O&M Contractor

1. What is your overall impression of the project; including cleanup, maintenance, and reuse activities (as appropriate)?
   Good.

2. What is your assessment of the current performance of the remedy in place at the Site?
   Excellent.

3. What are the findings from the monitoring data? What are the key trends in contaminant levels that are being documented over time at the Site?
   We do not review the data.

4. Is there a continuous on-site O&M presence? If so, please describe staff responsibilities and activities. Alternatively, please describe staff responsibilities and the frequency of site inspections and activities if there is not a continuous on-site O&M presence.
   Yes, especially because of the open cell on site. We perform all maintenance activities.

5. Have there been any significant changes in site O&M requirements, maintenance schedules or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.
   No

6. Have there been unexpected O&M difficulties or costs at the Site since start-up or in the last five years? If so, please provide details.
   No

7. Have there been opportunities to optimize O&M activities or sampling efforts? Please describe changes and any resulting or desired cost savings or improved efficiencies.
   No

8. Do you have any comments, suggestions or recommendations regarding O&M activities and schedules at the Site?
   No, the site and maintenance is pretty cut and dry.

Northside Landfill Superfund Site Five-Year Review Interview Form

Site Name: **Northside Landfill** **EPA ID No.:** **WAD980511778**
Subject Name: **Ellie Hale** **Affiliation:** **EPA, Region 10**
Subject Contact Information: **Tel: 206-553-1215, email; hale.ellie@epa.gov**
Time: **12:57 A.M.** **Date:** **04/24/2012**
Interview Location: **Email interview**

Interview Format (circle one): In Person Phone Mail Electronic mail

Interview Category: EPA Remedial Project Manager

1. What is your overall impression of the project; including cleanup, maintenance, and reuse activities (as appropriate)? "This appears to be a well designed and implemented cleanup, with good landfill workers doing day to day maintenance tasks. Larger maintenance tasks take more funding and require energy on the part of the City project manager. Five year reviews are useful as reminders that overall assessments are needed periodically, along with investments in landfill repair/mods. Because Ecology has the day-to-day local oversight role and EPA engages mostly in connection to five year reviews, it is hard to ensure consistently good communication. Setting clear expectations could help but would require considerable effort, however."

2. What have been the effects of this Site on the surrounding community, if any? "I don't know this community well, but my sense is that it is very much a backdrop site. People aren't exposed to site contamination and they assume the landfill is doing fine. In my experience, the types of issues that activate this community are mostly related to views, access, and development."

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities since the implementation of the cleanup? "I have not heard any concerns from the community, other than a flurry of activity and concern related to potential development of Little League fields in an undeveloped portion of the property."

4. What is your assessment of the current performance of the remedy in place at the Site? "I believe the staff have identified some issues with settling and gas collection systems: these are being responded to. In addition, the PEW shutdown--unplanned--is an issue, but the City plans to repair the well. As we head towards the formal yearlong PEW shutdown, it will be important to document that the system is available and operable, in case a problem arises, and that we have agreement on the conceptual site model and the monitoring that is appropriate to evaluate the remedy, both during that year and beyond, and how it fits with the MFS monitoring."

5. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues? "I am comfortable with these. It would probably be good to get a copy of the access agreements Steve Anderson said he has with well owners."

6. Are you aware of any community concerns regarding the Site or the operation and

management of its remedy? If so, please provide details. “none that I am aware of.”

7. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site’s remedy? “I think Ecology and the City should reassess the monitoring plan--it may be just fine--and should also evaluate well security and a schedule for abandoning wells that are not going to be used in future. I routinely recommend that some kind of solar or other alt energy be considered. The gas to energy system is not operative, due to the quality of the gas, but Rich is considering some other use of heat generated by the flares. He's also planning to have two operable flare systems and dismantle the third. Currently of the 3 in place, only one can be used.”

Appendix D: Site Inspection Checklist

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Northside Landfill	**Date of Inspection: April 19, 2012**
Location and Region: Spokane, WA Region 10	**EPA ID: WAD980511778**
Agency, Office or Company Leading the Five-Year Review: EPA Region 10	**Weather/Temperature: Sunny 60s**

Remedy Includes: (Check all that apply)

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

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** Rich Hanson (Name) _____ (Title) 04/19/2012 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone: _____
   Problems, suggestions ☐ Report attached: Appendix C

2. **O&M Staff** Jerry Richardson and Tyson Schultz (Name) _____ (Title) 04/19/2012 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone: _____
   Problems/suggestions ☐ Report attached: Appendix C

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

   Agency Washington Department of Ecology
   Contact Bill Fees (Name) _____ (Title) 04/19/2012 (Date) _____ (Phone No.)
   Problems/suggestions ☐ Report attached: Appendix C

4. **Other Interviews** (optional) ☐ Report attached: EPA RPM Ellie Hale Appendix C

III. ON-SITE DOCUMENTS AND 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.	**Ground Water 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
	☐ _____	

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place ☒ Unavailable

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	
From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	
From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	
From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	
From: mm/dd/yyyy	To: mm/dd/yyyy	_____	☐ Breakdown attached
Date	Date	Total cost	

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

Describe costs and reasons: _____

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

A. Fencing

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

Remarks: _____

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☐ N/A

Remarks: The Site is secured at all times and the Site fence line is patrolled hourly overnight.

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): Self Reporting

Frequency: Daily awareness of institutional control implementation by on-site staff

Responsible party/agency: PRP

Contact	Rich Hansen	City of Spokane, Landfill Engineer	04/19/2012	509-625-7890
	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: The Site is well-maintained.

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☐ Settlement not evident

Arial extent: _____ Depth: _____

Remarks: Settlement has been observed in some areas.

2.	**Cracks**	☐ Location shown on site map	☒ Cracking not evident
	Lengths: _____	Widths: _____	Depths: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☒ Erosion not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
4.	**Holes**	☐ Location shown on site map	☒ Holes not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	**Vegetative Cover**	☒ Grass	☐ Cover properly established
	☐ No signs of stress	☐ Trees/shrubs (indicate size and locations on a diagram)	
	Remarks: Some areas have die off due to hot spots.		
6.	**Alternative Cover** (e.g., armored rock, concrete)		☒ N/A
	Remarks: _____		
7.	**Bulges**	☐ Location shown on site map	☒ Bulges not evident
	Arial extent: _____		Height: _____
	Remarks: _____		
8.	**Wet Areas/Water Damage**	☒ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Arial extent: _____
	☐ Ponding	☐ Location shown on site map	Arial extent: _____
	☐ Seeps	☐ Location shown on site map	Arial extent: _____
	☐ Soft subgrade	☐ Location shown on site map	Arial extent: _____
	Remarks: _____		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☒ No evidence of slope instability		
	Arial 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** (Low spots)	☐ Location shown on site map	☐ No evidence of settlement
	Arial extent: _____		Depth: _____
	Remarks: _____		
2.	**Material Degradation**	☐ Location shown on site map	☐ No evidence of degradation
	Material type:_____		Arial extent: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☐ No evidence of erosion
	Arial extent: _____		Depth: _____
	Remarks: _____		
4.	**Undercutting**	☐ Location shown on site map	☐ No evidence of undercutting
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	**Obstructions**	Type: _____	☐ No obstructions
	☐ Location shown on site map	Arial extent: _____	
	Size: _____		
	Remarks: _____		
6.	**Excessive Vegetative Growth**	Type: _____	
	☐ No evidence of excessive growth		
	☐ Vegetation in channels does not obstruct flow		
	☐ Location shown on site map	Arial extent: _____	
	Remarks: _____		
D. Cover Penetrations		☒ Applicable	☐ N/A
1.	**Gas Vents**	☒ Active	☐ Passive
	☒ Properly secured/locked	☒ Functioning	☒ Routinely sampled	☒ Good condition
	☐ Evidence of leakage at penetration	☐ Needs maintenance	☐ N/A
	Remarks: _____		

2. **Gas Monitoring Probes**

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

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

3. **Monitoring Wells** (within surface area of landfill)

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

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

4. **Extraction Wells Leachate**

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

☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A

Remarks: _____

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

Remarks: _____

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

1. **Gas Treatment Facilities**

☒ Flaring ☐ Thermal destruction ☐ Collection for reuse

☐ Good condition ☐ Needs maintenance

Remarks: One of three flares is functional.

2. **Gas Collection Wells, Manifolds and Piping**

☒ Good condition ☐ Needs maintenance

Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)

☒ Good condition ☐ Needs maintenance ☐ N/A

Remarks: _____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

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

Remarks: _____

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

Remarks: _____

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

1. **Siltation** Area extent: _____ Depth: _____ ☐ N/A

☒ Siltation not evident

Remarks: Detention pond holds very little water and instead has grass and small trees.

2.	**Erosion**	Area extent: _____	Depth: _____
	☒ Erosion not evident		
	Remarks: _____		
3.	**Outlet Works**	☒ Functioning	☐ N/A
	Remarks: _____		
4.	**Dam**	☒ Functioning	☐ N/A
	Remarks: _____		
H. Retaining Walls		☐ Applicable	☒ N/A
1.	**Deformations**	☐ Location shown on site map	☐ Deformation not evident
	Horizontal displacement: _____		Vertical displacement: _____
	Rotational displacement: _____		
	Remarks: _____		
2.	**Degradation**	☐ Location shown on site map	☐ Degradation not evident
	Remarks: _____		
I. Perimeter Ditches/Off-Site Discharge		☒ Applicable	☐ N/A
1.	**Siltation**	☐ Location shown on site map	☒ Siltation not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
2.	**Vegetative Growth**	☐ Location shown on site map	☐ N/A
	☒ Vegetation does not impede flow		
	Area extent: _____		Type: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☒ Erosion not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
4.	**Discharge Structure**	☒ Functioning	☐ N/A
	Remarks: _____		
VIII. VERTICAL BARRIER WALLS		☐ Applicable	☒ N/A
1.	**Settlement**	☐ Location shown on site map	☐ Settlement not evident
	Area extent: _____		Depth: _____
	Remarks: _____		

2. **Performance Monitoring** Type of monitoring: _____

☐ Performance not monitored

Frequency: _____ ☐ Evidence of breaching

Head differential: _____

Remarks: _____

IX. GROUND WATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Ground Water Extraction Wells, Pumps and Pipelines ☐ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing and Electrical**

☐ Good condition ☐ All required wells properly operating ☒ Needs maintenance ☐ N/A

Remarks: Extraction well does not work.

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☒ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

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

1. **Collection Structures, Pumps and Electrical**

☐ Good condition ☐ Needs maintenance

Remarks: _____

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

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

C. Treatment System ☐ Applicable ☒ N/A

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

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☐ Filters: _____

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

☐ Others: _____

☐ Good condition ☐ Needs maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of ground water treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: _____

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

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

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

☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

5. **Treatment Building(s)**

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

☐ Chemicals and equipment properly stored

Remarks: _____

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

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

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☐ Is routinely submitted on time ☐ Is of acceptable quality

2. **Monitoring Data Suggests:**

☐ Ground water plume is effectively contained ☐ Contaminant concentrations are declining

E. 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: Some ground water monitoring wells are no longer sampled and are not secured.			

X. OTHER REMEDIES
If there are remedies applied at the site and 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 designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions). The remedy was designed to restore ground water downgradient of the Site and to prevent human exposure to contaminated ground water.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. The ROD states that, following two years of meeting ground water cleanup levels, ground water extraction and treatment operations shall be suspended for a year of monitoring to evaluate whether contaminant concentrations continue to meet the cleanup levels without treatment. The extraction well has not been working consistently, but no plan is in place to evaluate whether contaminant concentrations are changing. EPA and the Washington Department of Ecology are working with the City to assess proposals on an appropriate operating schedule for ground water extraction and treatment.
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. None currently identified.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Shutdown of the PEW system may provide opportunities for lower O&M costs related to operation of the remedy.

Site Inspection Team:
Bill Fees, Washington Department of Ecology
Ellie Hale, EPA
Rich Hanson, City of Spokane
Treat Suomi, Skeo Solutions
Johnny Zimmerman-Ward, Skeo Solutions

Appendix E: Photographs from Site Inspection Visit

Fencing surrounding the landfill

View of site offices and flares

Flare at site offices

Condensation drain on edge of landfill from gas extraction system

View of landfill from center of the Site

PEW, which will be replaced

Water being pumped at PEW into top of outfall aeration ditch

Outfall aeration ditch and site road

Outfall aeration ditch drain that goes under site road to infiltration pond

Infiltration pond

Construction waste area at new cell

New cell waste area

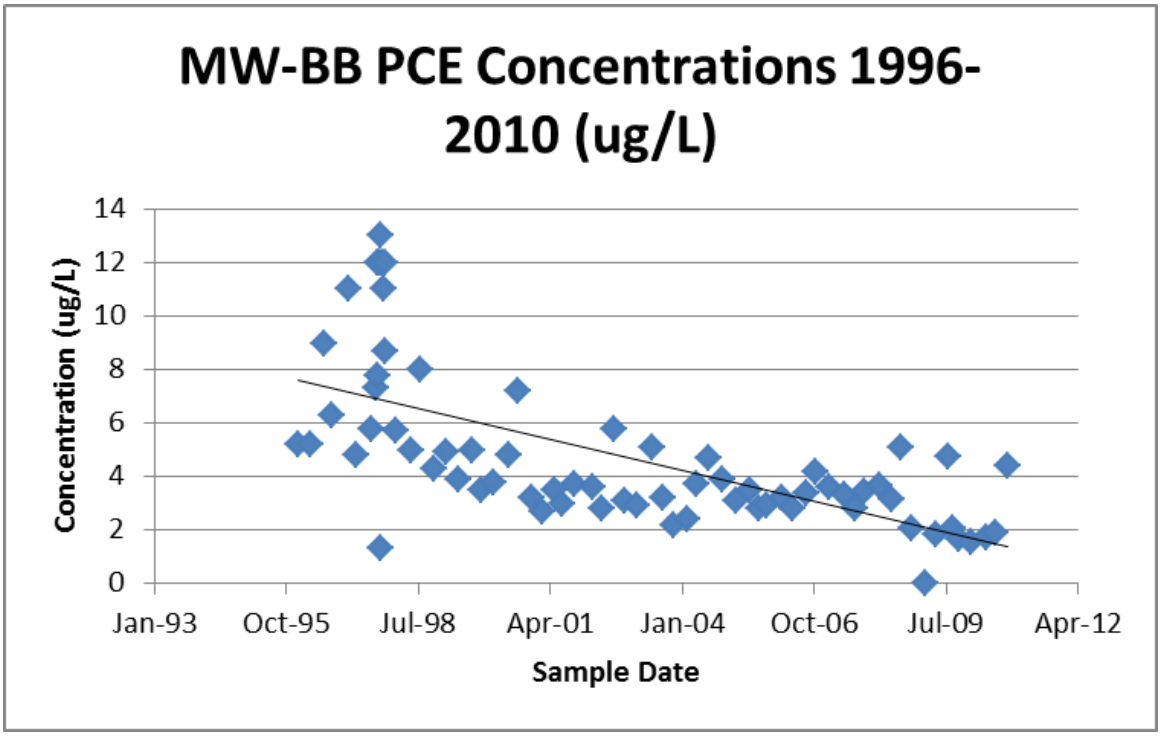
Borrow pit area near center of the Site

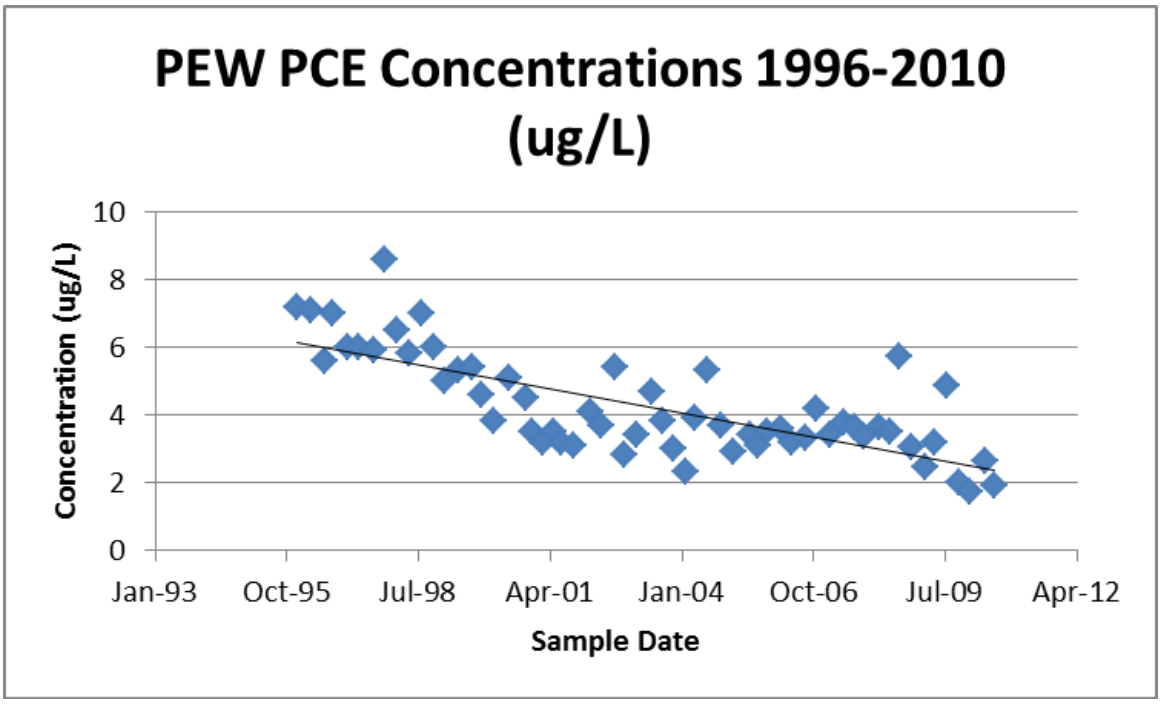
Ground water monitoring well 208 across Nine Mile Road from entrance of the Site

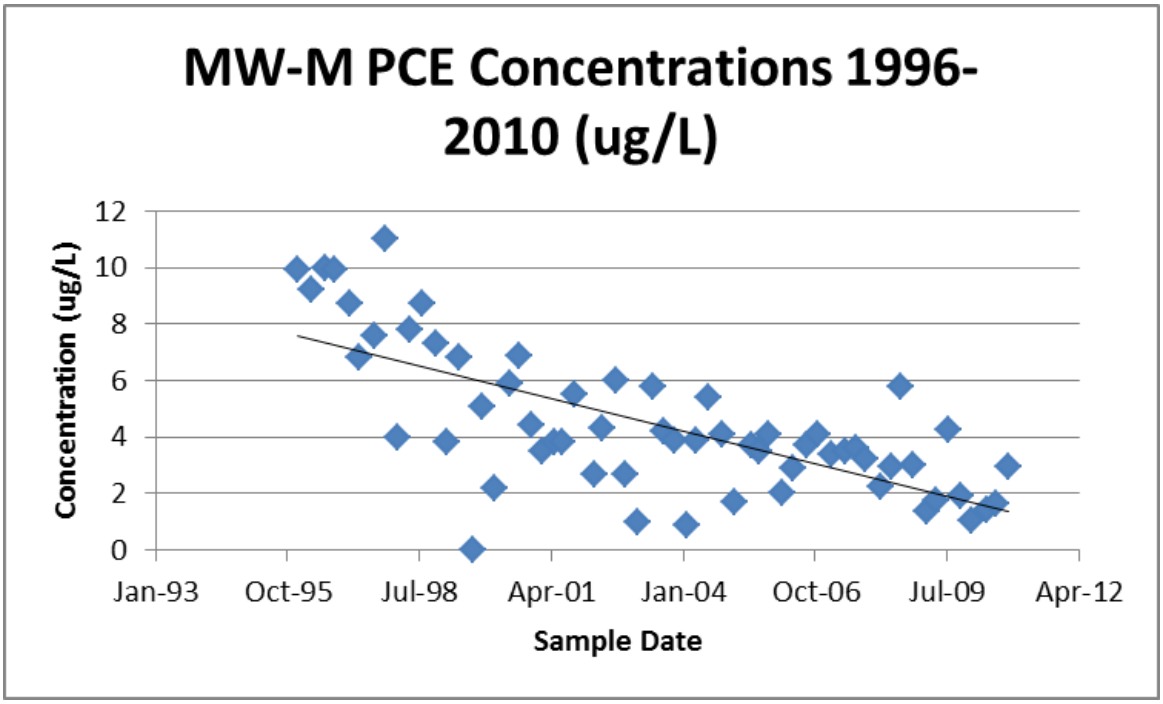
Unknown, unsecured ground water monitoring well along Seven Mile Road that is no longer sampled

Well BB

Appendix F: Ground Water PCE Concentration Trends (1996-2010)






MW-M PCE Concentrations 1996-2010 (ug/L)
Concentration (ug/L)
12
10
8
6
4
2
0
Jan-93
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Sample Date

Appendix G: Ground Water Monitoring Data 2007-2012

Monitoring Well	Date	COCs Concentration (µg/L)					
		vinyl chloride	trans-1,2-dichloroethene	chloroform	1,1,1-trichloroethane	trichloroethene	tetrachloroethene
MW208	2/15/2007	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5
	5/24/2007	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	8/21/2007	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	10/26/2007	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	2/18/2008	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	5/13/2008	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	7/23/2008	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	10/17/2008	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	2/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	4/21/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	10/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1/7/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	5/4/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	7/15/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	10/20/2010	<0.02	<0.5	<0.5	<0.5	<0.5	<0.5
	1/27/2011	<0.02	<0.5	<0.5	0.5	<0.5	<0.5
	4/12/2011	<0.02	<0.5	<0.5	0.5	<0.5	<0.5
	7/20/2011	<0.02	<0.5	<0.5	0.5	<0.5	<0.5
	10/13/2011	<0.02	<0.5	<0.5	0.5	<0.5	<0.5
	1/11/2012	<0.02	<0.5	<0.5	0.5	<0.5	<0.5
MWBB	2/6/2007	<0.3	<0.5	<0.5	<0.5	<0.5	3.6

Monitoring Well	Date	COCs Concentration (µg/L)					
		vinyl chloride	trans-1,2-dichloroethene	chloroform	1,1,1-trichloroethane	trichloroethene	tetrachloroethene
	5/23/2007	<0.5	<0.5	<0.5	<0.5	<0.5	3.3
	8/21/2007	<0.5	<0.5	<0.5	<0.5	<0.5	2.83
	10/26/2007	<0.5	<0.5	<0.5	<0.5	<0.5	3.44
	2/18/2008	<0.5	<0.5	<0.5	<0.5	<0.5	3.68
	5/14/2008	<0.5	<0.5	<0.5	<0.5	<0.5	3.17
	7/23/2008	<0.5	<0.5	<0.5	<0.5	<0.5	5.09
	10/20/2008	<0.5	<0.5	<0.5	<0.5	<0.5	2.08
	2/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	4/21/2009	<0.5	<0.5	<0.5	<0.5	<0.5	1.85
	7/16/2009	<0.5	<0.5	<0.5	<0.5	0.53	4.74
	8/20/2009	<0.5	<0.5	<0.5	<0.5	<0.5	2.05
	10/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	1.68
	1/7/2010	<0.5	<0.5	<0.5	<0.5	<0.5	1.54
	5/4/2010	<0.5	<0.5	<0.5	<0.5	<0.5	1.72
	7/14/2010	<0.5	<0.5	<0.5	<0.5	<0.5	1.9
	10/19/2010	<0.02	<0.5	<0.5	<0.5	0.56	4.38
	1/26/2011	<0.02	<0.5	<0.5	<0.5	<0.5	3.42
	4/12/2011	<0.02	<0.5	<0.5	<0.5	<0.5	3.43
	7/19/2011	<0.02	<0.5	<0.5	<0.5	<0.5	3.83
	10/12/2011	<0.02	<0.5	<0.5	<0.5	0.53	4.18
	10/12/2011 duplicate	<0.02	<0.5	<0.5	<0.5	<0.5	4.17
	1/10/2012	<0.02	<0.5	<0.5	<0.5	<0.5	4.26
MWC	2/14/2007	<0.3	<0.5	<0.5	<0.5	<0.5	<0.5
	5/24/2007	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Monitoring Well	Date	COCs Concentration (µg/L)					
		vinyl chloride	trans-1,2-dichloroethene	chloroform	1,1,1-trichloroethane	trichloroethene	tetrachloroethene
	8/21/2007	<0.5	<0.5	<0.5	<0.5	<0.5	0.64
	10/26/2007	<0.5	<0.5	<0.5	<0.5	<0.5	0.55
	2/19/2008	<0.5	<0.5	<0.5	<0.5	<0.5	0.59
	5/13/2008	<0.5	<0.5	<0.5	<0.5	<0.5	0.56
	7/23/2008	<0.5	<0.5	<0.5	<0.5	<0.5	0.56
	10/20/2008	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	2/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	4/22/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	0.7
	10/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	1/7/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	5/3/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	7/14/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	10/19/2010	<0.02	<0.5	<0.5	<0.5	<0.5	0.5
	1/26/2011	<0.02	<0.5	<0.5	<0.5	<0.5	0.54
	4/13/2011	<0.02	<0.5	<0.5	<0.5	<0.5	0.61
	7/20/2011	<0.02	<0.5	<0.5	<0.5	<0.5	0.74
	10/13/2011	<0.02	<0.5	<0.5	<0.5	<0.5	0.61
	1/11/2012	<0.02	<0.5	<0.5	<0.5	<0.5	0.58
	1/11/2012 duplicate	<0.02	<0.5	<0.5	<0.5	<0.5	0.6
PEW	2/12/2007	<0.3	<0.5	<0.5	<0.5	<0.5	3.4
	5/23/2007	<0.5	<0.5	<0.5	<0.5	<0.5	3.78
	8/21/2007	<0.5	<0.5	<0.5	<0.5	<0.5	3.63
	10/25/2007	<0.5	<0.5	<0.5	<0.5	<0.5	3.38

Monitoring Well	Date	COCs Concentration (µg/L)					
		vinyl chloride	trans-1,2-dichloroethene	chloroform	1,1,1-trichloroethane	trichloroethene	tetrachloroethene
	2/19/2008	<0.5	<0.5	<0.5	<0.5	<0.5	3.64
	5/15/2008	<0.5	<0.5	<0.5	<0.5	<0.5	3.5
	7/23/2008	<0.5	<0.5	<0.5	<0.5	<0.5	5.75
	10/17/2008	<0.5	<0.5	<0.5	<0.5	<0.5	3.04
	2/4/2009	<0.5	<0.5	<0.5	<0.5	<0.5	2.45
	4/17/2009	<0.5	<0.5	<0.5	<0.5	<0.5	3.19
	7/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	4.87
	10/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	2
	1/8/2010	<0.5	<0.5	<0.5	<0.5	<0.5	1.75
	5/5/2010	<0.5	<0.5	<0.5	<0.5	<0.5	2.62
	7/15/2010	<0.5	<0.5	<0.5	<0.5	<0.5	1.92
	7/19/2011	<0.02	<0.5	<0.5	<0.5	<0.5	3.58
	10/12/2011	<0.02	<0.5	<0.5	<0.5	<0.5	4.12
	1/11/2012	<0.02	<0.5	<0.5	<0.5	<0.5	3.48
MWE	5/24/2007	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	5/13/2008	<0.5	<0.5	<0.5	<0.5	<0.5	0.61
	4/21/2009	<0.5	<0.5	<0.5	<0.5	<0.5	0.65
	5/4/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	4/13/2011	<0.02	<0.5	<0.5	<0.5	<0.5	0.51
MWJ	5/25/2007	<0.5	<0.5	<0.5	<0.5	<0.5	1.63
	5/15/2008	<0.5	<0.5	<0.5	<0.5	<0.5	2.09
	4/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	2.34
	5/5/2010	<0.5	<0.5	<0.5	<0.5	<0.5	2.05
MWK	5/24/2007	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	5/13/2008	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Monitoring Well	Date	COCs Concentration (µg/L)					
		vinyl chloride	trans-1,2-dichloroethene	chloroform	1,1,1-trichloroethane	trichloroethene	tetrachloroethene
	4/22/2009	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	5/4/2010	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	4/13/2011	<0.02	<0.5	<0.5	<0.5	<0.5	<0.5
MWM	2/12/2007	<0.3	<0.5	<0.5	<0.5	<0.5	3.4
	5/23/2007	<0.5	<0.5	0.68	<0.5	<0.5	3.51
	8/21/2007	<0.5	<0.5	<0.5	<0.5	<0.5	3.63
	10/25/2007	<0.5	<0.5	<0.5	<0.5	<0.5	3.23
	2/19/2008	<0.5	<0.5	<0.5	<0.5	<0.5	2.22
	5/15/2008	<0.5	<0.5	<0.5	<0.5	<0.5	2.93
	7/23/2008	<0.5	<0.5	<0.5	<0.5	<0.5	5.76
	10/17/2008	<0.5	<0.5	<0.5	<0.5	<0.5	3.03
	2/4/2009	<0.5	<0.5	<0.5	<0.5	<0.5	1.35
	4/17/2009	<0.5	<0.5	<0.5	<0.5	<0.5	1.74
	7/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	4.27
	10/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	1.89
	1/8/2010	<0.5	<0.5	<0.5	<0.5	<0.5	1.04
	5/5/2010	<0.5	<0.5	<0.5	<0.5	<0.5	1.4
	7/15/2010	<0.5	<0.5	<0.5	<0.5	<0.5	1.62
	10/20/2010	<0.02	<0.5	<0.5	<0.5	<0.5	2.93
	1/26/2011	<0.02	<0.5	<0.5	<0.5	<0.5	1.57
	7/20/2011	<0.02	<0.5	<0.5	<0.5	<0.5	3.28
	10/13/2011	<0.02	<0.5	<0.5	<0.5	<0.5	2.96
	1/11/2012	<0.02	<0.5	<0.5	<0.5	<0.5	3.01
MWN	5/25/2007	<0.5	<0.5	<0.5	<0.5	<0.5	1.09
	5/15/2008	<0.5	<0.5	<0.5	<0.5	<0.5	1.44

Monitoring Well	Date	COCs Concentration (µg/L)					
		vinyl chloride	trans-1,2-dichloroethene	chloroform	1,1,1-trichloroethane	trichloroethene	tetrachloroethene
	4/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	1.55
	7/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	1.82
	5/5/2010	<0.5	<0.5	<0.5	<0.5	<0.5	1.41
MWT	2/14/2007	<0.3	<0.5	<0.5	<0.5	<0.5	2
	5/23/2007	<0.5	<0.5	<0.5	<0.5	<0.5	1.73
	8/21/2007	<0.5	<0.5	<0.5	2.38	<0.5	<0.5
	10/26/2007	<0.5	<0.5	<0.5	<0.5	<0.5	2.95
	2/19/2008	<0.5	<0.5	<0.5	<0.5	<0.5	1.82
	5/14/2008	<0.5	<0.5	<0.5	<0.5	<0.5	1.78
	7/23/2008	<0.5	<0.5	<0.5	<0.5	<0.5	2.65
	10/17/2008	<0.5	<0.5	<0.5	<0.5	<0.5	2.17
	2/3/2009	<0.5	<0.5	<0.5	<0.5	<0.5	1.63
	4/22/2009	<0.5	<0.5	<0.5	<0.5	<0.5	1.81
	7/16/2009	<0.5	<0.5	<0.5	<0.5	<0.5	2.03
	10/15/2009	<0.5	<0.5	<0.5	<0.5	<0.5	1.49
	1/7/2010	<0.5	<0.5	<0.5	<0.5	<0.5	1.05
	5/3/2010	<0.5	<0.5	<0.5	<0.5	<0.5	0.99
	7/14/2010	<0.5	<0.5	<0.5	<0.5	<0.5	0.92
	10/19/2010	<0.02	<0.5	<0.5	<0.5	<0.5	1.73
	1/27/2011	<0.02	<0.5	<0.5	<0.5	<0.5	1.52
	4/12/2011	<0.02	<0.5	<0.5	<0.5	<0.5	1.31
	7/19/2011	<0.02	<0.5	<0.5	<0.5	<0.5	1.29
	10/12/2011	<0.02	<0.5	<0.5	<0.5	<0.5	1.79
	1/10/2012	<0.02	<0.5	<0.5	<0.5	<0.5	1.99