Five-Year Review Report

Third Five-Year Review Report

for

Northside Landfill Superfund Site

Spokane County, Washington

September 2007

PREPARED BY:

US Environmental Protection Agency
Region 10
Seattle, WA

AND

US Army Corps of Engineers
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FOR:
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Date:

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List of Acronyms and Abbreviations

ARAR	applicable or relevant and appropriate requirement
AWQC	ambient water quality criteria
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	contaminant, or chemical, of concern
CWA	Clean Water Act
DCA	dichloroethane
DCE	dichloroethene
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
ft	foot or feet
FYR	Five-Year Review
IC	institutional control
IRIS	Integrated Risk Information System
MCL	Maximum Contaminant Level
MFS	minimum functional standards
MOA	Memorandum of Agreement
MTCA	Model Toxics Control Act
MW	monitoring well
NCP	National Contingency Plan
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
O&M	operation and maintenance
OU	operable unit
PEW	pilot extraction well
PERC	tetrachloroethene (also called PCE)
PCE	tetrachloroethene (also called PERC)
POC	point of contact
POTW	publicly-owned treatment works
PRP	potentially responsible party
Qtr	quarter
ns	not sampled
RA	remedial action
RAO	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RDBC	RDBC
RI/FS	Remedial Investigation/ Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SCAPCA	Spokane County Air Pollution Control Authority

SCHD	Spokane County Health District
SDWA	Safe Drinking Water Act
SRCAA	Spokane Regional Clean Air Agency
t	trans
TCA	trichloroethane
TCE	trichloroethene
ug/L	microgram per liter
USACE	US Army Corps of Engineers
USC	United States Code
UU/UE	unlimited use and/or unrestricted exposure
VC	vinyl chloride
VOC	volatile organic compounds
WA	Washington
WAC	Washington Administrative Code

Executive Summary

The remedy selected in the 1989 Record of Decision (ROD) for the Northside Landfill Superfund site in Spokane, Washington, included landfill closure and capping, pumping and treatment of contaminated groundwater, groundwater monitoring, providing an alternate drinking water source to local residents, administrative restrictions and institutional controls, and control of landfill gas emissions. The site achieved construction completion with the Construction Complete Report on September 2, 1993. The triggers for this five-year review (FYR) were the completion of the second FYR dated September 30, 2002 and hazardous substances, pollutants, or contaminants remaining at the site above levels that do not allow for unlimited use and unrestricted exposure.

This FYR found that the remedy was constructed in accordance with the requirements of the ROD. The remedy is functioning as designed. Releases to the environment are being controlled with the landfill closure and cap. Immediate threats have been addressed and the remedy is protective, as residents are on municipal drinking water. Groundwater contamination is being further reduced through onsite treatment.

This FYR recommends an Explanation of Significant Difference (ESD) for four purposes:

1. Clarify and document Federal drinking water standards as the groundwater cleanup levels at this site for tetrachloroethene and trans-1,2-dichloroethene. Federal Maximum Contaminant Levels (MCLs) did not exist for these two contaminants of concern at the time of the ROD.

2. Document the change in the groundwater treatment system from offsite to onsite treatment and discharge.

3. Clarify that the groundwater point of compliance described in the ROD is still the landfill boundary.

4. Document the new surface water point of compliance given the groundwater treatment system changes.

This FYR also recommends EPA action to assess future groundwater data to confirm that indoor air continues to be within acceptable risk levels and to verify that ICs will be effective in the long-term.

The FYR recommends that the City of Spokane (City) determine if contaminant concentrations remain below MCLs in compliance well(s) for one year without the operation of extraction and treatment system.

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Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Northside Landfill		
EPA ID *(from WasteLAN)*: WAD980511778		
Region: 10	**State:** WA	**City/County:** City of Spokane, Spokane County

SITE STATUS	
NPL status: Currently on the Final NPL	
Remediation status (choose all that apply): Operating O&M	
Multiple OUs?* No	**Construction completion date:** 09/02/1993
Has site been put into reuse? No	

REVIEW STATUS	
Lead agency: EPA	
Author name: Mr. Tim Brincefield	
Author title: Senior Policy Advisor	**Author affiliation:** EPA Region 10
Support agency: Washington Department of Ecology and USACE	
Author name: Ms. Sheri Moore	
Author title: Chemical Engineer	**Author affiliation:** USACE Seattle District
Review period**: 07/09/2007 to 09/30/2007	
Date(s) of site inspection: July 11, 2007	
Type of review: Post-SARA statutory	
Review number: 3 (third)	
Triggering action: Previous Five-Year Review Report	
Triggering action date *(from WasteLAN)*: 09/30/2002	
Due date *(five years after triggering action date)*: 09/30/2007	

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

Issues

Issues	Affects Protectiveness? (Y/N)	
	Current	Future
Post-ROD promulgation of MCLs for PCE and t-1,2-DCE, for which cleanup levels were unclear in ROD.	No	No
Changes to the groundwater treatment system and discharge location	No	No
Changes to the landfill property boundary, leading to confusion as to the point of compliance for groundwater.	No	No
The appropriate surface water point of compliance related to change in discharge of treated water.	No	No
The vapor intrusion pathway has not been considered until this FYR.	No	Yes
Lack of clarity regarding whether institutional controls will ensure remedy protectiveness in the long-term.	No	Yes
Timing and approach to assessing whether cleanup levels will be met if pumping and treatment is discontinued, as provided in ROD.	No	No

[1] Please see Acronyms and Abbreviations for acronyms used in the Summary Form.

Recommendations and Follow-up Actions

Recommendation/ Follow-Up Action	Party Responsible	Oversight Agency	Mile-stone Date	Affects Protectiveness? (Y/N)	
				Current	Future
Clarify and document MCLs as groundwater cleanup levels for PCE and t-1,2-DCE in the ESD.	EPA Region 10	EPA	Mar 2008	No	No
Document changes to pumping and treatment system in the ESD.	EPA Region 10	EPA	Mar 2008	No	No
Clarify groundwater point of compliance in the ESD.	EPA Region 10	EPA	Mar 2008	No	No
Revise the surface water point of compliance and any related monitoring changes in the ESD.	EPA Region 10	EPA	Mar 2008	No	No
Evaluate future groundwater data in light of vapor intrusion pathway, and consider additional assessment if groundwater concentrations rise.	EPA Region 10	EPA	Dec 2007	No	No
Conduct in-depth survey of ICs to assess long-term protectiveness.	EPA Region 10 and Ecology	EPA	Mar 2008	No	Yes
Initiate suspension of pumping and treatment for evaluation, including appropriate data gathering.	City of Spokane	EPA, Ecology	Sep 2008	No	No

Protectiveness Statements(s)

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.

Next Review

The next FYR for the Northside Landfill Superfund Site is required in September 2012, five years from the date this review is signed.

FIVE-YEAR REVIEW REPORT

I. Introduction

The purpose of the Five-Year Review (FYR) is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and identify recommendations to address them.

The US Environmental Protection Agency (EPA) is preparing this FYR report prepared pursuant to the Comprehensive Environmental Response, Compensation and Liability Act, as amended, (CERCLA) § 121 (42 U.S.C. Section 9621) and the National Contingency Plan (NCP). CERCLA § 121 states:

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

This requirement is further discussed in the NCP; 40 CFR § 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 action no less often than every five years after the initiation of the selected remedial action.*

This is the third post-SARA site-wide statutory FYR for the Northside Landfill Superfund site in the City of Spokane, Spokane County, Washington. The FYR is required due to hazardous substances, pollutants, or contaminants remaining at the site above levels that do not allow for unlimited use and unrestricted exposure. The initial triggering action for FYRs was the initiation of construction on March 16, 1992, and the trigger for this third review was the completion of the second FYR report, dated September 30, 2002. This review was conducted from July 2007 through September 2007; this report documents the results of the review.

In addition to meeting CERCLA requirements, this document is intended to satisfy the Model Toxics Control Act (MTCA) requirement (Washington Administrative Code [WAC] 173-340-420) for periodic review of post-cleanup site conditions and monitoring to assure that human health and the environment are being protected.

The Washington Department of Ecology (Ecology) is responsible for overseeing O&M at this joint-lead site. EPA Region 10 is responsible for completing this FYR of the remedial actions. Ecology and the City of Spokane (City) provided information and assistance for the review. The US Army Corps of Engineers (USACE) prepared the FYR report under an Interagency Agreement with EPA.

II. Site Chronology

Table 1 Chronology of Site Events

Event	Date
Site Discovery	01 Feb 1980
National Priorities List Listing	10 Jun 1986
Remedial Investigation/Feasibility Study report	30 Sep 1989
Record of Decision signed	30 Sep 1989
Consent Decree for Remedial Design/Remedial Action	23 Jan 1991
Remedial Design start	11 Feb 1991
Remedial Design complete	10 Mar 1992
Remedial Action start	16 Mar 1992
Construction Completion date	02 Sep 1993
Remedial Action complete	15 Mar 1995
Remedial Action Close-Out report	17 Mar 1995
First Five-Year Review report	17 Sep 1997
Second Five-Year Review report	30 Sep 2002

III. Background

The Northside Landfill is located in the northwest portion of the City of Spokane (the City), in Spokane County, Washington (see Figure 1). For purposes of this FYR only, the term "Site" refers to the fenced property owned by the City of Spokane which includes the closed landfill, active landfill cells, and land adjacent to the landfills. The City owns the Site, operates the active landfill, and conducts operation and maintenance for the closed landfill. The Site covers 345 acres. Contaminant sources appear to be contained within the closed landfill, although the extent of contamination includes impacted groundwater downgradient of the Site.

Physical Characteristics

The Northside Landfill is situated approximately one-half mile east of the Spokane River. The eastern two-thirds of the landfill overlie unsaturated glaciofluvial sands and gravels with less permeable glacial lake deposits and basalt occurring at depth. The western one-third of the landfill overlies a portion of the Spokane Valley-Rathdrum Prairie Aquifer. This aquifer was designated as a sole source of water supply for the Spokane-Coeur D'Alene area by EPA in

1978. 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 groundwater is approximately 80 feet below ground surface in the area.

Land and Resource Use

Portions of the Site are actively used as a permitted municipal solid waste landfill. As active cells are filled and closed, new cells are constructed, permitted, and opened for use. The City plans to continue landfill operations at this site until all remaining landfill cells are filled. At this time, the landfill will be permanently closed.

All of the residences which previously drew water from the contaminated plume now use the Spokane municipal system, which was extended into the area in 1984. The municipal system also supplies drinking water for new residences in the area. Offsite groundwater and/or potentially impacted surface water near the landfill are not used for drinking water. No changes in groundwater use are expected given that residences use the municipal water system. The Site perimeter is fenced. The Site is bordered by residential developments on three sides, and on the fourth side a road separates the Site from residential developments.

History of Contamination

The City's Northside Landfill began operating in the 1930s. Various fill and cover techniques were used. The older landfill was closed to disposal on December 31, 1991, at which time the municipal solid waste stream was diverted to a new waste incinerator.

The initial site investigation into water quality related to the landfill began in 1981. Site groundwater samples indicated volatile organic compounds (VOCs) present in low concentrations. In 1983, VOCs were found in neighboring private residential wells. The City of Spokane provided alternate water to the affected homes and, in 1984, connected homes near the landfill to the municipal water system.

Initial Response

The site was proposed for the NPL in 1984 and listed on the NPL in 1986. A Remedial Investigation/Feasibility Study (RI/FS) conducted in 1988 identified a contaminant groundwater plume extending approximately 1300 feet downgradient of the landfill boundary. The plume was found to have impacted private residential wells. That finding led the City of Spokane to provide water to the local residents. The ROD was signed in September 1989. The ROD specified remedial actions, including capping the landfill and installing a groundwater extraction and treatment system. The City was found to be the sole potentially responsible party (PRP). The City entered into a Consent Decree in September 1991 to implement the ROD with EPA and Ecology oversight.

Construction contracts to conduct the Remedial Design/Remedial Action had been awarded, prior to the signing of the ROD in 1989 and the Consent Decree in 1991. The initiated work was integrated into the final construction work plans for Remedial Action that EPA approved. Five different contracts were awarded by the City for construction to close and cap the landfill and install a single groundwater extraction well. Treatment of the extracted groundwater was performed at the City's publicly-owned treatment works (POTW). The site met the EPA Construction Completion requirements September, 1993, with all remaining punch list items completed in early 1994. EPA conducted a final inspection on April 1, 1994.

Basis for Taking Action

Contaminated site media identified in the remedial investigation include soils below the landfill and groundwater impacted by contaminants of concern, specifically chloroform, TCA, TCE, PCE, t-1,2 DCE, 1,1-DCA, and vinyl chloride. Tetrachloroethene (PCE or PERC) and trichloroethylene (TCE) were present in groundwater both onsite and offsite at levels which exceeded EPA's existing or proposed maximum contaminant levels (MCLs). Based on the human health risk assessment, ingestion and inhalation of groundwater containing these contaminants were the exposure pathways of greatest concern. Exposure via other media, including soil and surface water, was not considered to be significant. Under a residential scenario, based on data from the most contaminated offsite well and on the most contaminated onsite well, the risk assessment estimated excess cancer risks in the range of 10E-4.

IV. Remedial Actions

Remedial Action Objectives and Remedy Selection

On September 30, 1989, the ROD for the Northside Landfill Superfund Site was signed by EPA. The remedial action objectives in the ROD are to restore groundwater downgradient of the landfill property boundary to MCLs through source control and natural attenuation and to prevent human exposure to contaminated groundwater.

To accomplish these objectives, the ROD calls for the following:

- Closing the landfill, except new landfill units that meet the State Minimum Functional Standards,
- Capping the landfill to contain the refuse units and to provide a barrier to reduce infiltration into the waste, thereby reducing groundwater contaminant loadings,
- Pumping and treatment of groundwater, as an interim measure to control contamination migrating from the landfill,
- Monitoring the groundwater,
- Providing alternative water,

- Enacting administrative restrictions (institutional controls) to protect the landfill cap, monitoring wells, and pumping and treatment system and to prevent construction of new wells or the use of existing wells in the contaminated plume, and
- Controlling landfill gas emissions to prevent offsite migration, according to MFS requirements.

The ROD described the groundwater treatment system as "an interim measure to control contamination migrating from the landfill until such time as other remedial actions, principally the cap, have demonstrated their effectiveness at reducing the groundwater contamination." The installation of a pumping and treatment system was to be designed to serve two functions:

1. "Establish a system which will control the migration of contaminants downgradient from the landfill. The system must effectively control the concentration for contaminants of concern so that the groundwater downgradient from the point of compliance meets ARARS [applicable or relevant and appropriate requirements]; e.g. the Maximum Contaminant Levels [MCLs] of the Safe Drinking Water Act [SDWA]. The point of compliance is the landfill property boundary with performance monitoring to be located downgradient but beyond the zone of influence of the extraction wells."

2. "Treatment of the extracted groundwater. The treatment facility for the extracted contaminated groundwater will have to reduce the levels of all contaminants to required levels prior to discharge to the Spokane River. If the discharge from this facility is through the sewage treatment plant, the pretreatment requirements will also have to be met. The river discharge is considered offsite and, therefore, must meet all Federal, State, and local requirements such as obtaining a NPDES [National Pollution Discharge Elimination System] permit."

The ROD estimated that the extraction and treatment system would likely be needed for five to ten years and stated "The pumping and treatment can be discontinued when 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 pumping and treatment system cannot be dismantled for an additional five years after monitoring indicates it can be discontinued." Also "As soon as other remedial measures, specifically the cap, become effective in consistently lowering the contaminant levels to below MCLs at the point of compliance, then the pumping system can be evaluated for shutdown."

Remedy Implementation

Negotiations for remedial work with the City commenced after the ROD was signed. The City agreed to implement the remedial actions stated in the ROD, and a Consent Decree signed by the City of Spokane, EPA, and Ecology was entered on January 23, 1991. The Site achieved Construction Completion in 1993.

Components of the remedy successfully implemented were:

- Landfill closure. The existing landfill was closed to all new refuse disposal on December 31, 1991. Closure met the requirements of the Record of Decision and State MFSs for landfills. Figure 2 shows post-RA closed landfill and currently active landfill features overlaying an aerial photograph. Components of the remedy successfully implemented were:"

- Landfill capping. The cap met the requirements of the ROD and State MFSs for landfills. The cap was designed to minimize infiltration of precipitation into the refuse and reduce leachate production and future contamination of the groundwater, stabilize slopes, prevent surface erosion and control surface water runoff discharge. The cap includes a high density polyethylene liner, a surface water collection system, 18 inches or more of granular cover material, 12 inches or more of topsoil and low maintenance vegetation.

- Groundwater extraction and treatment system. A pilot extraction well (PEW) was placed on the western boundary of the landfill to remove contaminated groundwater for treatment and prevent further off-site migration of contaminants of concern. From 1993 to 2003 groundwater treatment was performed offsite at the POTW with discharge to the Spokane River. Since 2003, at the request of the City and with the approval of EPA and Ecology, treatment and discharge have been performed within the landfill property boundary downgradient the closed landfill as described below under "System Operations."

- Quarterly groundwater monitoring for the contaminants of concern. Compliance monitoring is performed at monitoring wells MW-BB, MW-T, MW-M, pilot extraction well (PEW), MW-C, MW-U, MW-G, MW-P, and MW-Q. Recently, monitoring of unused domestic wells has been reduced or discontinued. The groundwater monitoring network for the closed landfill is displayed on Figure 3.

- Alternative water supply. This was provided in the form of connection to the City-provided water system.

- Institutional controls. (See the following subsection and, for greater detail, Appendix H).

- Landfill gas emission collection and destruction. This work is ongoing, as required by the permit and the MFS.

In 1997, the Consent Decree was terminated, with a termination order requiring the City to continue to fulfill requirements for O&M, Long-Term Monitoring, Institutional Controls, access, and the funding of Ecology oversight pursuant to a memorandum of agreement.

The Site will be eligible for deletion from the National Priorities List (NPL) once monitoring documents that the cleanup goals have been met at the groundwater point of compliance for one

year without operating the extraction well and EPA confirms that effective institutional controls have been implemented.

Institutional and Engineering Controls

Access to the landfill and exposure to groundwater are currently controlled through a combination of engineering and institutional controls that satisfy the ROD requirement for "administrative restrictions." The primary engineering control is a fence along the Site boundary. The fence is maintained by the City. The City also provides Site security, currently including overnight patrols five nights a week on random evenings.

The ICs in place to protect the landfill cap, monitoring wells, and the pumping and treatment system are as follows:

- The 1990 Consent Decree, paragraph 29, set forth specific obligations: notify EPA and Ecology of any potential changes in Site ownership. It also requires the City to record a deed notice for the landfill property to notify future owners of the presence of hazardous substances, to restrict land uses that may "disturb the integrity of the cap or any other component of any containment system, pump and treat system, or the function of the Site's monitoring system" with specified exceptions, and to restrict groundwater use in compliance with the City of Spokane and Spokane County.

- As noted above, the Consent Decree was terminated in 1997, but the termination order requires the City to continue to comply with restrictions on conveyance and use of the property as specified in paragraph 29 of the Consent Decree. [A title search was not performed for this FYR to verify that the restrictions continue to be in place.]

The ICs in place to restrict the construction of new wells and the use of existing wells in the contaminated plume are as follows:

- No groundwater wells are to be drilled within 1000 feet of landfills as per State law, WAC 173-160.

    - As part of WAC 173-160, Ecology enforces 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 1000 feet of the landfill. [This FYR did not assess whether this procedure would be followed indefinitely after landfill closure].

    - In addition, the Spokane County Health District (SCHD) has responsibilities pursuant to WAC 246-290. SCHD does not approve permits for buildings with groundwater wells proposed in the landfill property overlay. Also, SCHD has the authority to require sampling and analysis if a proposed well is near a landfill zone. Permits in a

landfill zone require use of municipally supplied water. SCHD also provides information on landfill-related contamination during the new well permitting process. [As above, specifics of this requirement, including the duration, were not fully evaluated in this FYR review.]

These restrictions appear to be effective at least as long as the City is operating the landfill. The City does not have an estimated timeframe for closure of the active cells, but City representatives stated that closure would not occur before the next FYR.

System Operations/Operation and Maintenance

The City continues to perform operation and maintenance (O&M) at the Site pursuant to the Consent Decree termination order and the O&M plan. Ecology oversight is provided under a Memorandum of Agreement between the City and Ecology. Many of the O&M measures are also required under the permit for the active landfill.

- The Operations and Maintenance Plans specify 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. [This FRY review did not determine how the 30-year timeframe applies to the Site given that parts of the landfill are active and parts are closed. In any case, O&M may be needed beyond this timeframe and should be evaluated].

The landfill is visually inspected on a daily basis, coincident with daily inspections of the gas monitors, to assess:

- Landfill surface conditions for settling, cracks, erosion, holes, bulges, wet areas/water damage, slope instability, and vegetative cover needs.

- Benches (or berm) integrity.

- Conditions of cover penetrations (gas collection system, gas monitoring probes, groundwater 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.

Monitoring of the landfill cover is also conducted using landfill gas data. The gas generation data is monitored 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. Site personnel provided examples in the site interviews of how the gas data has been used to make repairs to the liner. The gas collection system is regularly monitored and repaired as needed.

The second FYR noted that the gas collection and treatment system had been modified in 2001 to produce energy via methane gas-fired generators. However, prior to the current FYR, energy production was discontinued, based on an assessment by the Spokane Regional Clean Air Agency (SRCAA, formerly Spokane County Air Pollution Control Agency [SCAPCA]). The assessment determined that the system was not meeting Clean Air Act (CAA) requirements. The CAA requirements are more stringent for energy production than for burning the gas in the flares. Therefore, the collected landfill gas is again being burned in flares as originally constructed.

Until this year, groundwater compliance monitoring under this remedial action has also been used to monitor the active landfill cell and includes field parameters (e.g., groundwater elevations), conventional parameters (e.g. alkalinity), dissolved and total metals, and VOCs. The City has taken steps to develop separate monitoring plans for the active cells and the closed landfill.

At remedy startup, the extraction system pumped groundwater to the City of Spokane POTW for treatment. The POTW releases all treated water directly to the Spokane River. Over time, the contribution of 1 million gallons per day from the landfill to the POTW system became viewed by the City as too demanding on the POTW, and an alternative groundwater treatment was sought.

To address the strain on the POTW, the City proposed onsite ex-situ air stripping as the alternative to POTW treatment. In late 2003, discharge of extracted groundwater to the landfill surface water collection system was initiated. Contact with ambient air strips the VOCs from the water as it flows in a lined surface drain approximately 1000 feet to an infiltration basin on Site (see Figure 2). The system's removal efficiency was calculated by comparing sample results from the extraction well and at the infiltration basin. The removal efficiency was demonstrated to be near 80 percent. Based on the contaminant removal results, EPA and Ecology approved this change to the remedy. The groundwater treatment change was described in the second FYR report. The system has been operating in cycles of three days on/four days off since onsite treatment was initiated. The rationale for system cycling is to reduce operation costs while maintaining hydraulic control of the contaminated groundwater.

Yearly O&M costs for the review period are included in Table 2 below. The O&M costs for the closed portion of the landfill are significantly higher than the annual amount estimated in the ROD. Appendix A contains the detailed cost information provided by the City. This FYR report recommends that EPA work with Ecology and the City to review this information and costing assumptions in the ROD and to determine the reason for the discrepancy.

Table 2 Annual Systems Operations/O&M Costs

Year	Cost in Dollars (not adjusted for inflation and rounded to nearest thousands)
Original estimate	75,000
2002	1,218,000
2003	1,255,000
2004	1,221,000
2005	1,247,000
2006	1,229,000

While costs savings to the City of Spokane may not be evident with respect to pumping the groundwater, the City regained capacity at its POTW when it switched to treating Northside Landfill groundwater on site, which may allow the POTW to generate revenue from treating other water. There also may be some cost savings for a reduced cycling schedule of water treatment. Such savings may not bring O&M costs down to what was originally estimated for this site; see Table 2 above.

V. Progress Since Last Review

No recommendations were made and no issues were raised in the first FYR. EPA made a single recommendation in the second FYR report. This recommendation was with respect to the change from offsite treatment in the POTW with discharge to the Spokane River to treatment and discharge within the landfill property boundary. The Report stated that such changes would have to be evaluated by the City and then reviewed and approved by EPA and Ecology. The Report also said that if such a change was approved, EPA would need to decide if an Explanation of Significant Difference (ESD) would have to be issued. The treatment and discharge system changes were evaluated and submitted by the City and were approved by EPA and Ecology in 2003.

The revised treatment system is now fully operational and both landfill groundwater treatment and discharge occur at the Site. At the time of the remedial action change approval, EPA and Ecology determined that the changes could be documented in a Memorandum for File rather than an ESD. However, to ensure the public is aware of the changes, this FYR recommends that the system change be presented to the public and added to the Administrative Record as part of an ESD for the Site.

A review of the groundwater data for the last five years indicates that the majority of quarterly samples meet the cleanup levels in the ROD. Tetrachloroethene (PCE) has been below the MCL of 5 ug/L in all quarterly well samples since the third quarter of 2004. All COC sampling results have been below MCLs since the third quarter of 2004 and below CWA cleanup levels in the proposed surface water compliance wells (MW-E and MW-F) for the last five years. In 2002 and 2003, TCE was detected in MW-BB at 0.6 ug/L; all results for TCE since 2003 have been nondetect at 0.5 ug/L (as compared to the TCE MCL of 5.0 ug/L). No other COCs have been detected in groundwater in the review period.

The City has indicated that, as part of phased shutdown based on reductions in groundwater COC concentrations, it may propose further reduction of the pumping and treatment schedule to two days on/five days off. EPA and Ecology evaluation of the compliance monitoring data indicate that the remedial actions have demonstrated their effectiveness at reducing the groundwater contamination and that it may be appropriate to discontinue pumping and treatment for a year, as provided in the ROD. EPA and Ecology will notify the City of this and will assure that the City's groundwater monitoring plan is appropriate to assess proposed operational changes or suspensions.

VI. Five-Year Review Process

Administrative Components

In June 2007, the third FYR team was assembled: Mr. Tim Brincefield of EPA Region 10, supported by Ms. Sheri Moore and Ms. Lisa Cass of the US Army Corps of Engineers, Seattle District. The project representatives for Ecology and the City were notified in July 2007 that the next FYR was required and would be initiated in July 2007. The review included site inspections, site interviews, published document review, and site record review. The schedule for completion was September 2007. Ms. Ellen Hale was assigned as RPM in September 2007 and joined in reviewing and revising final drafts. Inspection and interview report and site visit photographs are provided in Appendices F and G, respectively.

Community Notification and Involvement

The City of Spokane is responsible for the interactions with the community on a regular basis through the City of Spokane Solid Waste Management office. Community notification and involvement is part of the site O&M for both the closed Superfund site and the active landfilling operation. Community involvement and concern for the site has decreased over time since remedy implementation.

In July 2007, EPA sent postcard notices to those listed on EPA's Northside Landfill mailing list and published a public notice in the Spokane Review on July 12, 2007 that this FYR was being initiated. Copies of both are attached as Appendix B. Within 30 days of signature on this FYR, EPA will publish another notice and summary of the FYR.

Document Review – Record of Decision

Document review for this FYR focused on the 1989 ROD, the first two FYRs, and groundwater monitoring results for the last five year period. In addition, the following documents were consulted: the 1990 Consent Decree, 1997 Order Granting Motion to Terminate Consent Decree, the Remedial Action Report, and the Preliminary and Final Closeout Reports.

Applicable or Relevant and Appropriate Requirements

The ROD identified the following site ARARs to be attained by the remedy:

- Resource Conservation and Recovery Act (RCRA, 42 USC SS 6901 et seq.) regulations.
- Washington State Dangerous Waste Regulations (WAC Sections 173-303 and Section 70.105 RCW).
- Washington State Minimum Functional Standards for Solid Waste Handling (WAC 173-304 and 70.95 RCW).
- State Board of Health (WAC 248-54).
- MTCA, referred as "pending promulgation" and therefore not applicable.
- Safe Drinking Water Act (SDWA, 42 USC 300 et seq.), and its primary drinking water standards (40 CFR 141).
- CAA (72 USC 7401).
- Clean Water Act (CWA, 33 USC 1251 et seq).
- Offsite regulations, such as storm drainage and discharge of treated water to the Spokane River under National Pollution Discharge Elimination System (NPDES) effluent limits (40 CFR Section 122), NPDES permit program (WAC Section 173-220), and Water Pollution Control Act (RCW Section 90-48), as a minimum.

The detailed FYR ARARs analysis is carried out in detail in Appendix C. The results of the analysis are described in Section VII – Technical Analysis.

Contaminants of Concern

The 1989 risk assessment was summarized in the ROD. The risk assessment estimated risk from human exposure to contaminated groundwater in an offsite domestic well, using the arithmetic mean of all contaminant values measured for all sampling events at all offsite wells as exposure point concentrations. Three chemicals were consistently detected: PCE, trichloroethene (TCE), 1,1,1-trichloroethane (1,1,1-TCA). The mean concentrations for those three chemicals were: 3, 1, and 1 ug/L, respectively. The risk assessment also calculated risk associated with the use of the most contaminated offsite well. The average concentrations for PCE, TCE, and 1,1,1-TCA in that well were 28, 5, and 4 ug/L, respectively. The highest concentrations observed at the time of the risk assessment in any offsite well for PCE, TCE, and 1,1,1-TCA were 38, 8, and 10 ug/L, respectively. Three other VOCs were included in the risk assessment scenarios: 1,1-dichloroethane (1,1-DCA), trans-1,2-dichloroethene (t-1,2-DCE), and vinyl chloride (VC). A

seventh VOC, chloroform, was also detected in some offsite wells. The ROD states that exposures via surface water or direct contact with soils are not significant risks.

The RI/FS determined PCE, TCE, and 1,1,1-TCA to be the site COCs based on their frequency of occurrence and concentrations in both onsite and offsite wells. However, the ROD indicates that all seven VOCs were considered COCs, and chemical-specific ARARs were listed in the ROD for the seven VOCs listed above.

Cleanup Levels and Points of Compliance

Protection of Groundwater

For groundwater, the ROD described the selected remedy to include pumping and treatment of groundwater "so that the groundwater downgradient from the point of compliance meets ARARs, e.g. MCLs of the Safe Drinking Water Act." The ARARs discussion for the SDWA (Statutory Determinations, page 37 of the ROD) states, "groundwater will meet MCLs, the appropriate health based standards" and describes the remedial action operating "until the aquifer no longer exceeds drinking water levels." Table 3 (below) shows the information presented in the ROD as "Table 5 Chemical-Specific ARARs and TBCs for Organic Contaminants at the Northside Landfill," which includes SDWA MCLs, CWA Ambient Water Quality Criteria (AWQC), and Reference Dose Based Criteria (RDBC).

Table 3 1989 ROD COC Chemical-Specific ARARS (in ug/L)

	Groundwater			Surface Water			
	SDWA		Reference	CWA			
COC	MCL	MCL Goal	Dose Based Criteria	Fish and Water	Fish Only	Acute Toxicity	Chronic Toxicity
PCE	-	0	10	0.8	8.85	5,280	450
TCE	5	-	260	2.7	80.7	45,000	-
1,1,1-TCA	200	-	1,000	18400	1,030,000	-	-
Chloroform	100	-	350	0.19	15.7	28,900	1,240
1,1-DCA	-	-	4,500	0.94	243	-	-
t-1,2-DCE	-	-	350	0.33	1.85	11,600	-
VC	2	0	46	2.0	525	-	-

The ROD clearly stated, both in the Selected Remedy and Statutory Determinations sections, that cleanup levels at the groundwater point of compliance were the Maximum Contaminant Levels of the Safe Drinking Water Act. Thus, cleanup levels for the four COCs that had MCLs at the time of the ROD are clear. Three other COCs--PCE, 1,1-DCA, and t-1,2-DCE—did not have promulgated groundwater standards at the time of the ROD and as a result groundwater cleanup levels for these COCs are not as clear. MCLs had not been promulgated for these contaminants, and the State of Washington had not promulgated MTCA or State surface water quality standards.

Subsequent to the ROD, in 1992, the MCL for PCE was established at 5.0 ug/L. The March 1995 Final Close Out Report states on page 11 "...concentrations ... are now approaching the performance criteria (also the MCL for PCE) of 5 ug/l" and "The cleanup standards for the general aquifer are the Safe Drinking Water Act, Maximum Contaminant Levels (MCLs)." This value is also cited in the 1997 and 2002 five year reviews as the cleanup level for PCE. However, there is no record of the MCL being formally adopted as the cleanup level in a CERCLA decision document.

The groundwater point of compliance is referenced in the ROD in two different ways: the landfill property boundary (Site) and the landfill boundary. At the time of the ROD, these were the same. Following the ROD, the City acquired property for the infiltration basin, which is outside the landfill boundary. This FYR review recommends clarification that the point of compliance is the landfill boundary, not the property boundary.

The ROD required performance monitoring "downgradient but beyond the zone of influence of the extraction wells." According to Ecology, the compliance wells documented in the "Summary of Post Closure Monitoring" CH2M Hill, 2007 are MW-BB, MW-T, MW-M, PEW, MW-C, MW-U, MW-G, MW-P, and MW-Q. MW-BB is the only one of these wells that is outside the Site. The other compliance wells are located downgradient along the edge of the landfill itself. PEW, considered one of the compliance wells, also is the extraction well and is thus not strictly "beyond the zone of influence of the extraction wells." No action is recommended to remove PEW from the list of compliance wells, however, as it may be used for compliance monitoring once extraction is discontinued.

This FYR concludes that at the compliance wells, the applicable cleanup levels are MCLs. While the ROD also cites the CWA as an ARAR, the reference (quoted below in the discussion of discharge to surface water) appears to address discharge to surface water, while the SDWA citation was clearly meant to apply at the groundwater/drinking water point of compliance near the landfill boundary.

This FYR concludes that the ROD did not clearly identify groundwater cleanup levels for the COCs which did not have MCLs in 1989: PCE, 1,1-DCA, and t-1,2-DCE.

Protection of Surface Water

The basis for cleanup levels for protection of surface water is found in the ROD's ARARs citation for the CWA. It reads as follows:

"The selected remedy treats the extracted water to meet MCLs, health-based standards, or water quality criteria prior to discharge, whichever is lower. Therefore there will be no adverse impact on surface waters from discharge of treated groundwater." Table 5 of the ROD identifies the CWA criteria for the seven site COCs.

Since the selected remedy involved groundwater treatment at the POTW and discharge to the Spokane River, the POTW discharge point was the appropriate point of compliance for surface

water. However, treated water now infiltrates to groundwater on Site (outside the landfill footprint). While a change in point of compliance for surface water was not discussed in the previous FYR, this FYR concludes that it is appropriate to apply surface water standards where groundwater affected by the site "daylights" to surface water.

There is some uncertainty regarding where groundwater from the Site emerges to surface water, but it is likely that it emerges in the Spokane River northwest of the Site. Figure 5 shows the groundwater contours and the inferred flow direction to the northwest. For well monitoring data from 2002 – 2006, the detection limits for chloroform, 1,1-DCA, and t-1,2-DCE are slightly higher than their respective CWA criteria for consumption of fish and water. However, given that these COCs are undetected in all of the wells tested, it is likely that their concentrations are sufficiently diluted on the way to the Spokane River to meet the CWA cleanup levels for these COCs. In monitoring wells F, H, I, and K, which lie between the Site and the Spokane River, the CWA standards are clearly met for the four other COCs.

Data Review

Quarterly groundwater reports provided by the City over the past five years were reviewed during this FYR. The City has conducted groundwater monitoring of compliance and performance monitoring wells on a quarterly basis. Validated and verified results are reported to Ecology and EPA. PCE and TCE are the only COCs that have been detected in the past five years. PCE has not been detected above the MCL of 5.0 ug/L since the third quarter of 2004.

Table 4 below shows the PCE results in the compliance wells MW-BB, MW-C, PEW, MW-M, MW-T, MW-G, MW-P, and MW-U over the past five years. Figure 4 shows an analysis of PCE concentration trends (based on the data shown in Table 4). MW-Q is still used for water level measurements but was not sampled for COCs in the review period. TCE has not exceeded the cleanup level in any wells during that time period. In fact, TCE has not been detected in the groundwater compliance wells above the detection limit of 0.5 ug/L since first quarter 2003. Downgradient wells MW-E and MW-F have been non-detect for all COCs for the entire review period. Appendix D provides the groundwater monitoring data from all wells sampled in the past five years for all COCs. Figure 5 shows the groundwater contours and flow directions. Monitoring wells are also shown, including those used for a conceptual hydrogeologic cross section drawing, Figure 6.

Table 4 PCE Results in Compliance Wells for 2002 through 2006

Qtr	Year	MW-BB	MW-C	MW-PEW	MW-M	MW-T	MW-G	MW-P	MW-U
1st	2002	3.6	3.9	4.1	<0.5	2.7	ns	ns	ns
2nd	2002	2.8	<0.5	3.7	4.3	2.8	<0.5	<0.5	1.9
3rd	2002	5.8	0.7	5.4	6.0	3.6	ns	ns	ns
4th	2002	3.1	0.7	2.8	2.7	3.1	<0.5	<0.5	<0.5
1st	2003	3.2	<0.5	3.5	1.0	2.4	ns	ns	ns
2nd	2003	5.1	<0.5	4.7	5.9	3.2	<0.5	<0.5	1.3

Qtr	Year	MW-BB	MW-C	MW-PEW	MW-M	MW-T	MW-G	MW-P	MW-U
3rd	2003	3.2	0.5	3.8	4.2	2.8	ns	ns	ns
4th	2003	2.2	0.5	3.0	3.9	3.0	<0.5	<0.5	1.4
1st	2004	2.4	<0.5	2.3	0.9	1.8	ns	ns	ns
2nd	2004	3.7	0.6	3.9	4.0	2.4	<0.5	<0.5	<0.5
3rd	2004	4.7	0.5	5.4	5.4	2.7	ns	ns	ns
4th	2004	3.9	0.5	3.7	4.1	3.7	<0.5	<0.5	0.7
1st	2005	3.1	<0.5	2.9	1.7	2.1	ns	ns	ns
2nd	2005	3.5	0.6	3.4	3.7	1.9	<0.5	<0.5	0.8
3rd	2005	2.8	0.6	3.1	3.5	2.1	ns	ns	ns
4th	2005	2.9	< 0.5	ns	Ns	2.6	ns	ns	ns
1st	2006	3.2	0.6	3.6	2.0	2.3	ns	ns	ns
2nd	2006	2.9	< 0.5	ns	Ns	1.7	ns	ns	ns
3rd	2006	3.5	0.6	3.3	3.7	2.2	ns	ns	ns
4th	2006	4.2	0.6	4.2	4.1	3.1	ns	ns	ns

Table Notes:
"Qtr" quarter (calendar year) "<" less than "ns" not sampled

As shown in Figure 4, seasonal oscillations in concentrations are evident through 2005. Perhaps more importantly, the data show that PCE concentrations in the downgradient point of compliance well MW-BB track very closely the concentrations in the extraction well PEW. The effect of extraction at PEW is not evident in contaminant concentrations at the downgradient POC well MW-BB, and the effect of the change in the PEW pumping schedule in 2003 is not readily apparent. The similarity in concentrations at MW-BB and PEW suggests that groundwater at MW-BB comes from an area of the contaminant plume beyond the capture zone of PEW, but that both are showing attenuating contaminant levels, possibly due to effects of the landfill cover.

Documents reviewed also included randomly selected reports summarizing data from landfill flare station monitoring, gas probe monitoring, and interior gas collection wells. The reports were provided by the City at the time of the site inspection. These data were reviewed to assure that monitoring data are being collected with regular frequency, that the data are properly reviewed, and appropriate responses are being taken by the City. The reviewed reports are included as Appendix E.

Site Inspection and Interviews

The site inspection took place over two days, July 11 and July 12, 2007, at the Northside Landfill. Those who participated in the site visit on July 11, 2007 were Mr. Bill Fees, Ecology; Mr. Dean Fowler, City of Spokane; and Ms. Sheri Moore, Seattle District USACE. Activities included driving the site to look at general and specific conditions of the closed landfill and the operating portions of the landfill, as well as an inspection of the onsite groundwater pumping and treatment system. This inspection provided an overall understanding of the site functions and personnel. The site visit was extended to the City of Spokane Department of Solid Waste Office, where Mr. Fowler provided monitoring data to USACE.

The site visit on July 12, 2007 was conducted to complete the site inspection checklist (attached as Appendix F; site visit photographs are attached as Appendix G) with onsite personnel. Two City employees were available to participate in the site inspection, Mr. Steve Anderson and Mr. Rick Deibel. Both are in the position of "laboratory technicians," where Mr. Anderson manages the groundwater monitoring systems for the closed and active landfills and Mr. Deibel manages the landfill gas collection and treatment system. The site inspection checklist was completed by Mr. Anderson and Mr. Deibel and site photographs were taken. Later that day, Mr. Fowler also gave input to the checklist. Mr. Fowler stated that the City would likely propose to change the extraction frequency to two days on/five days off cycle in the near future, as the PCE levels continue to be below 5 ug/L.

The site is in good condition and appears to be well managed by the City. There were no significant issues identified regarding the remedy: concerning the cap, surface drainage, gas collection and treatment, groundwater collection and treatment, or ICs (fencing, security). Regulatory requirements for the active cell contribute to the good management of the remedy via onsite personnel, ICs, administrative controls, groundwater monitoring, leachate monitoring, safety, and employee training. Routine O&M and irregular events (such as an act of vandalism in 2003) appear to be addressed in a timely manner by the City based on documentation and Ecology oversight. Mr. Fowler indicated that the closed and active landfills continue to meet all applicable county and state permit requirements. A review of necessary permits was conducted by the City when the groundwater treatment system was changed from releasing to the POTW to releasing on site.

The close monitoring of the gas collection system is an effective way to assess the prevention of surface water infiltration. Onsite personnel described the procedures they use to monitor to the gas collection system due to system sensitivity to oxygen input. Oxygen concentrations directly correspond to the presence of damage to the landfill cover and/or liner. According to the technicians, the level of liner damage of concern to the gas collection and treatment system is lower that that for infiltration and groundwater source control.

The revised extraction and treatment system was visited. The site visit occurred on a day when groundwater was being extracted. The extracted water was seen to be discharged to the surface water collection system near the extraction well and to flow down hill to the surface water collection and infiltration basin. Tall grasses and birds were noted at the basin.

A follow up interview was conducted by Ms. Moore with Mr. Fees on July 20, 2007. On that call, Mr. Fees provided his insight on the information gained during the site inspections and document review.

No other interviews were deemed necessary. EPA did receive one phone call requesting information in response to the public announcement, which EPA addressed by directing the caller to site information documents on the EPA web site and the Administrative Record Information Repositories.

VII. Technical Assessment

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

Yes, the remedial action is functioning as intended by the ROD. Based on visual inspection and other information provided by the City, the cap is well maintained and functions to prevent infiltration of surface water. The decreasing COC concentrations apparent in the groundwater data review indicated that the cap is working to prevent the releases of landfill contaminants to the underlying groundwater. As demonstrated by quarterly groundwater monitoring, COC levels are below chemical-specific ARARs in the ROD, as well as current drinking water standards.

Other observations with respect to remedy function include the following:

- Operating procedures, as implemented, are maintaining the effectiveness of the response actions. Both the gas collection and destruction operation and the active landfill operation ensure that the landfill is appropriately maintained by the City.

- Opportunities for groundwater monitoring optimization as part of a typical FYR are not easily applied to this site. This site includes an operating landfill, and MFS requirements apply, such as quarterly groundwater monitoring. According to the City, however, the City intends to submit a groundwater optimization plan to Ecology and EPA which is likely to recommend reducing the operation of the groundwater treatment system to two days a week.

- O&M personnel appear to be well aware of landfill cap maintenance issues – settling, cracks, erosion, holes, sufficient vegetative cover, and gas collection system sensitivity – and take regular actions to repair and mitigate impacts as described in the site inspection report.

- Institutional and engineering controls are in place and functional to prevent direct contact with landfill material and contaminated groundwater. Engineering controls, mainly fencing and security services, serve to protect the cap and treatment equipment. ICs in place include State MFSs restricting the placement of any groundwater well within 1000 feet of a landfill, as well as requirements on drillers to report proposed well drilling locations prior to State approval for drilling and local zoning to prevent development on the landfill site. A summary and evaluation of the ICs is presented as Appendix H.

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

No; however the remedy remains protective as discussed below.

The primary change in cleanup levels since the ROD is the promulgation of MCLs for PCE and *t*-1,2-DCE. Three COCs did not have MCLs at the time of the ROD. While this FYR interprets

the ROD as not clearly specifying cleanup levels in groundwater for PCE, 1,1-DCA, and t-1,2-DCE, the ROD listed noncancer reference dose criteria for those COCs (see Table 5). The MCLs for PCE and t-1,2-DCA are significantly lower than the reference dose criteria, are based on cancer effects, and are enforceable drinking water standards. EPA and Ecology agree that an ESD should be prepared to formally adopt the MCLs for PCE and t-1,2-DCE as cleanup levels.

PCE and TCE are the only COCs that continue to be detected in compliance monitoring wells. Quarterly monitoring indicates PCE concentrations from 0.5 to 5 ug/L since 2004 and TCE concentrations at or near the detection limit of 0.5 ug/L since 2002.

Because there is no MCL for 1,1-DCA, EPA reviewed the MTCA B noncarcinogenic standard formula value of 800 ug/L for groundwater as a comparison value. Given that 1,1-DCA has been undetected in the compliance wells at a detection limit of 0.5 ug/L, this FYR does not make any recommendations related to this COC.

Table 5 Changes in Chemical-Specific Standards and TBCs

COC	Medium	Standard		Citation/Year
PCE	Ground-water	Previous	10 ug/L	"Reference Dose Based Criterion" in the ROD.
		New	5 ug/L	SDWA MCL. Promulgated 1991, post-ROD
t-1,2-DCE	Ground-water	Previous	350 ug/L	"Reference Dose Based Criterion" in the ROD.
		New	100 ug/L	SDWA MCL. Promulgated 1991, post-ROD

Other related assessments:

- Ecological Exposures: Since 2003, water extracted from the extraction well (PEW) has been aerated on site and allowed to infiltrate in an area of the Site adjacent to the landfill. As a result, an area of grassy vegetation has developed, which attracts birds, small mammals, and wildlife that can cross the fenceline. The RI/FS did not assess ecological risk, and the ROD did not contemplate discharge to the ground surface. While ecological exposures are now occurring that were not addressed by the ROD, EPA does not believe that current conditions pose a significant ecological risk. Concentrations of COCs in the water being extracted at the PEW are below ecological screening levels for aquatic life (see Ecological Screening Levels in Appendix C). According to the City, treatability testing of onsite aeration indicated that contaminant concentrations following aeration were reduced by up to 80%. In addition, the vegetation is expected to decrease or to disappear entirely after groundwater extraction is discontinued (see EPA recommendations below). If pumping is not discontinued by the next five year review, it may be appropriate to collect plant and soil samples to confirm that conditions are protective.

- CWA Point of Compliance: As noted, groundwater extracted at the Site is no longer sent to the POTW for treatment but is aerated and allowed to infiltrate on Site. Thus, the point of compliance for surface water is no longer the POTW discharge to the Spokane River. Rather, because groundwater flows toward the Spokane River, the point of compliance with the CWA should be in the aquifer prior to discharge. Monitoring wells located between the groundwater compliance wells and the Spokane River are available to evaluate compliance with the CWA. While it appears that monitoring at some of these wells has been discontinued or reduced in frequency since 2005, COCs have not been detected at these wells in monitoring from 2002 through 2006. This review recommends that monitoring of well E be continued to assess compliance with the CWA.

- TCE slope factor: The inhalation slope factor for TCE has been withdrawn from the Integrated Risk Information System, and a replacement value has not been published. However, the TCE slope factor withdrawal does not affect this FYR review, as the MCL has not changed. In addition, the only recent detection of TCE in groundwater monitoring from 2002 through 2006 was at 0.5 ug/L, ten times below the MCL.

- Vapor Intrusion Pathway: Vapor intrusion is a process whereby volatile contamination in the subsurface enters buildings, where humans may be exposed through the inhalation pathway. Vapor intrusion is an emerging concern, and it was not evaluated in the RI/FS. To support this FYR, EPA performed a screening level evaluation for PCE using recent vapor intrusion guidance [OSWER Draft Guidance for Evaluating Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance, 2002)]. Based on a reasonably protective attenuation factor of 0.001 (and assuming that the chemical in groundwater obeys Henry's Law), a risk level of 1E-6 is associated with a groundwater screening concentration of 0.54 ug/L PCE. Measured concentrations of PCE in groundwater monitoring data from 2002 through 2006 range from <0.5 ug/L to a maximum of 5.9 ug/L (in 2003, at compliance well MW-M), indicating potential risks between 1E-6 and 1E-5. This is an order of magnitude below the unacceptable risk threshold of 1E-4. Based on this evaluation, EPA concludes that current levels are acceptable and are expected to remain so. Additional action under CERCLA is not required at this time. Future quarterly groundwater data should be reviewed with this pathway in mind, however, as pumping and treating may be reduced or discontinued. If future groundwater COC concentrations increase or if other information suggests that the vapor intrusion pathway could pose unacceptable risk, additional data collection may be appropriate. Monitoring at nearby domestic wells should periodically be assessed.

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

No. This FYR indicates that the remedy as it has been implemented is protective at this time. However, in light of the increasing emphasis on the adequacy of institutional controls, including recent guidance for five year reviews, an in-depth review should be performed to evaluate how

institutional controls at this site will be maintained in future, particularly after the active landfill units are closed.

VIII. Issues

Issues identified during the FYR are listed in Table 6.

EPA recommends that an Explanation of Significant Differences (ESD) be prepared to address some of the issues and that a review be undertaken to assess the long-term protectiveness of current institutional controls.

Table 6 Issues Identified in this FYR

Issue	Affects Protectiveness? (Y/N)	
	Current	Future
Post-ROD promulgation of MCLs for PCE and t-1,2-DCE, for which cleanup levels were unclear in ROD.	No	No
Changes to the groundwater treatment system and discharge location.	No	No
Changes to the landfill property boundary, leading to confusion as to the point of compliance for groundwater.	No	No
The appropriate surface water point of compliance related to change in discharge of treated water.	No	No
The vapor intrusion pathway has not been considered until this FYR	No	No
Lack of clarity regarding whether institutional controls will ensure remedy protectiveness in the long-term.	No	Yes
Timing and approach to assessing whether cleanup levels will be met if pumping and treatment is discontinued, as provided in ROD.	No	No

IX. Recommendations and Follow-Up Actions

Table 7 presents the recommendations and follow-up actions necessary to address the issues identified in this FYR. These recommendations and follow-up actions would address the issues identified above.

Table 7 Recommendations and Follow-Up Actions

Recommendation/ Follow-Up Action	Party Responsible	Oversight Agency	Mile-stone Date	Affects Protectiveness? (Y/N)	
				Current	Future
Clarify and document MCLs as groundwater cleanup levels for PCE and t-1,2-DCE in the ESD.	EPA Region 10	EPA	Dec 2007	No	No

				Affects Protectiveness? (Y/N)	
Document changes to pumping and treatment system in the ESD.	EPA Region 10	EPA	Dec 2007	No	No
Clarify the groundwater point of compliance in the ESD.	EPA Region 10	EPA	Dec 2007	No	No
Revise the surface water point of compliance and any related monitoring changes in the ESD.	EPA Region 10	EPA	Dec 2007	No	No
Evaluate future groundwater data in light of vapor intrusion pathway, and consider additional assessment if groundwater concentrations rise.	EPA Region 10	EPA	Dec 2007	No	No
Conduct in-depth survey of ICs to assess long-term protectiveness.	EPA Region 10, Ecology	EPA	Dec 2007	No	Yes
Initiate suspension of pumping and treatment for evaluation, including appropriate data gathering.	City of Spokane	EPA, Ecology	Sep 2008	No	No

X. Protectiveness Statement

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.

XI. Next Review

The next FYR for the Northside Landfill Superfund Site is required by September 30, 2012, five years from the date this review is signed.

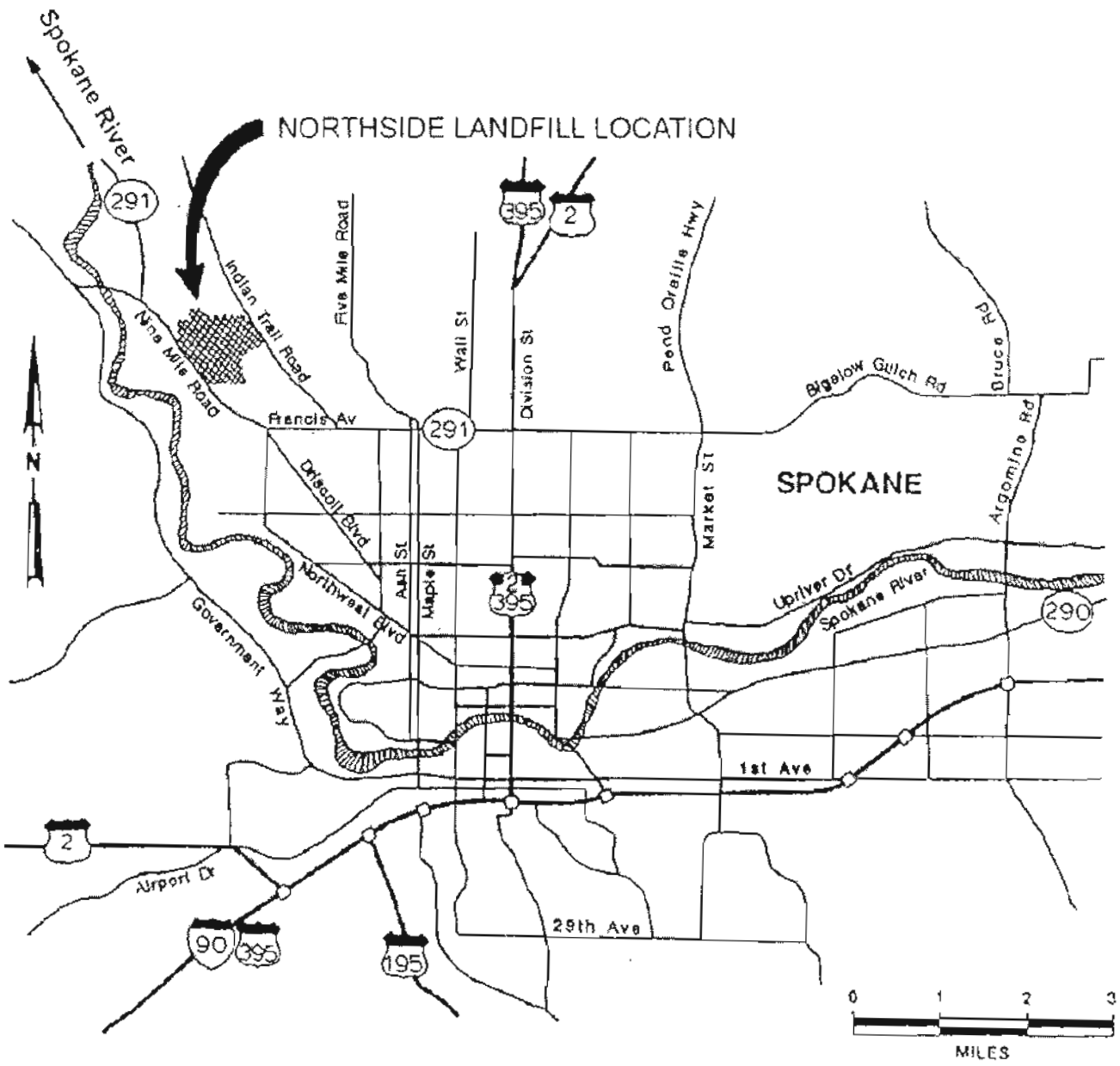


Figure 1
Site Map
Third FYR Report
September 2007

Figure source:
City of Spokane report, "Northside Landfill Groundwater Monitoring Plan Revision 2, March 2007." Report prepared by CH2MHill.

FIGURE 1-1
Vicinity Map
Northside Landfill
March 2007

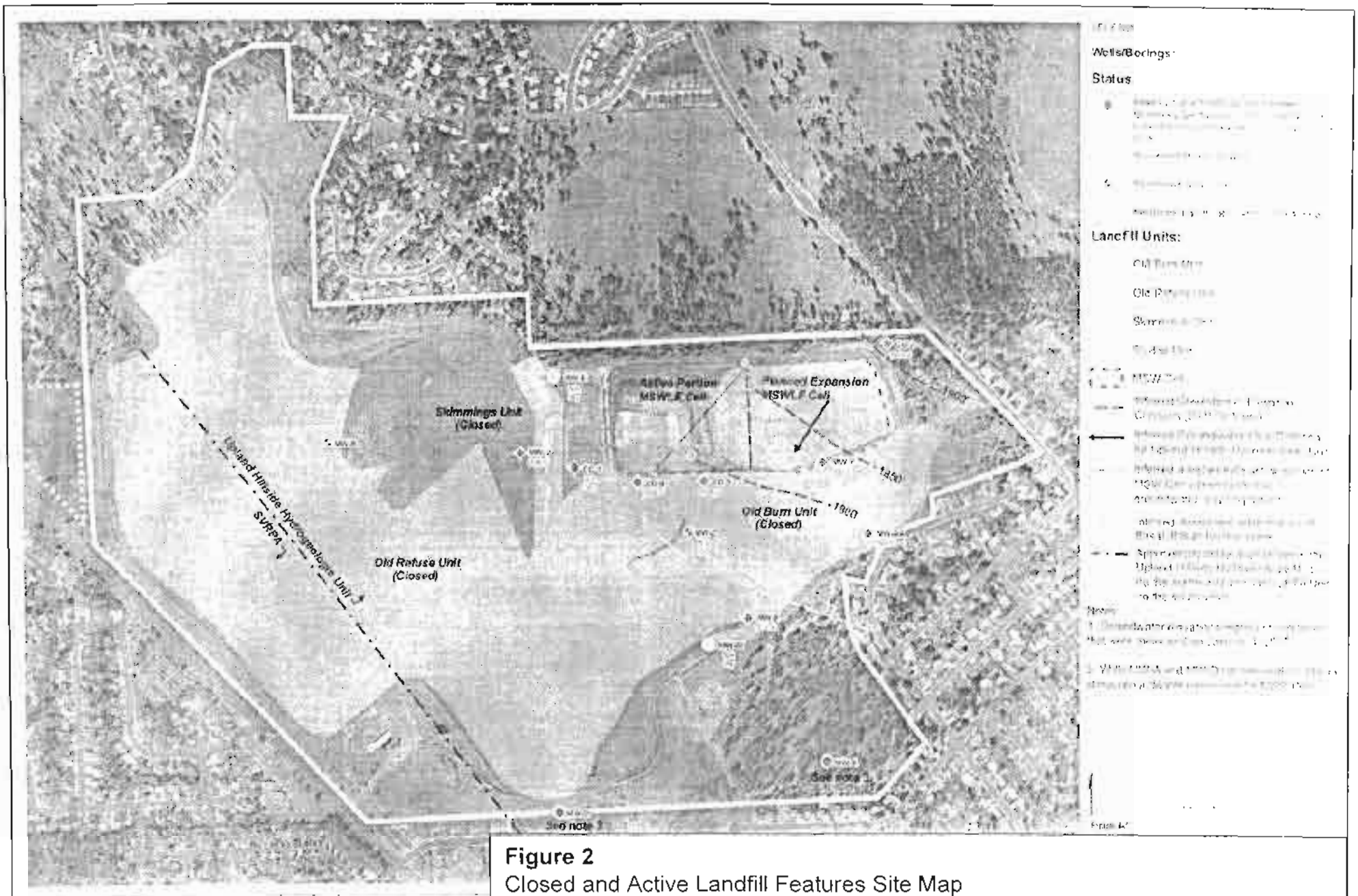
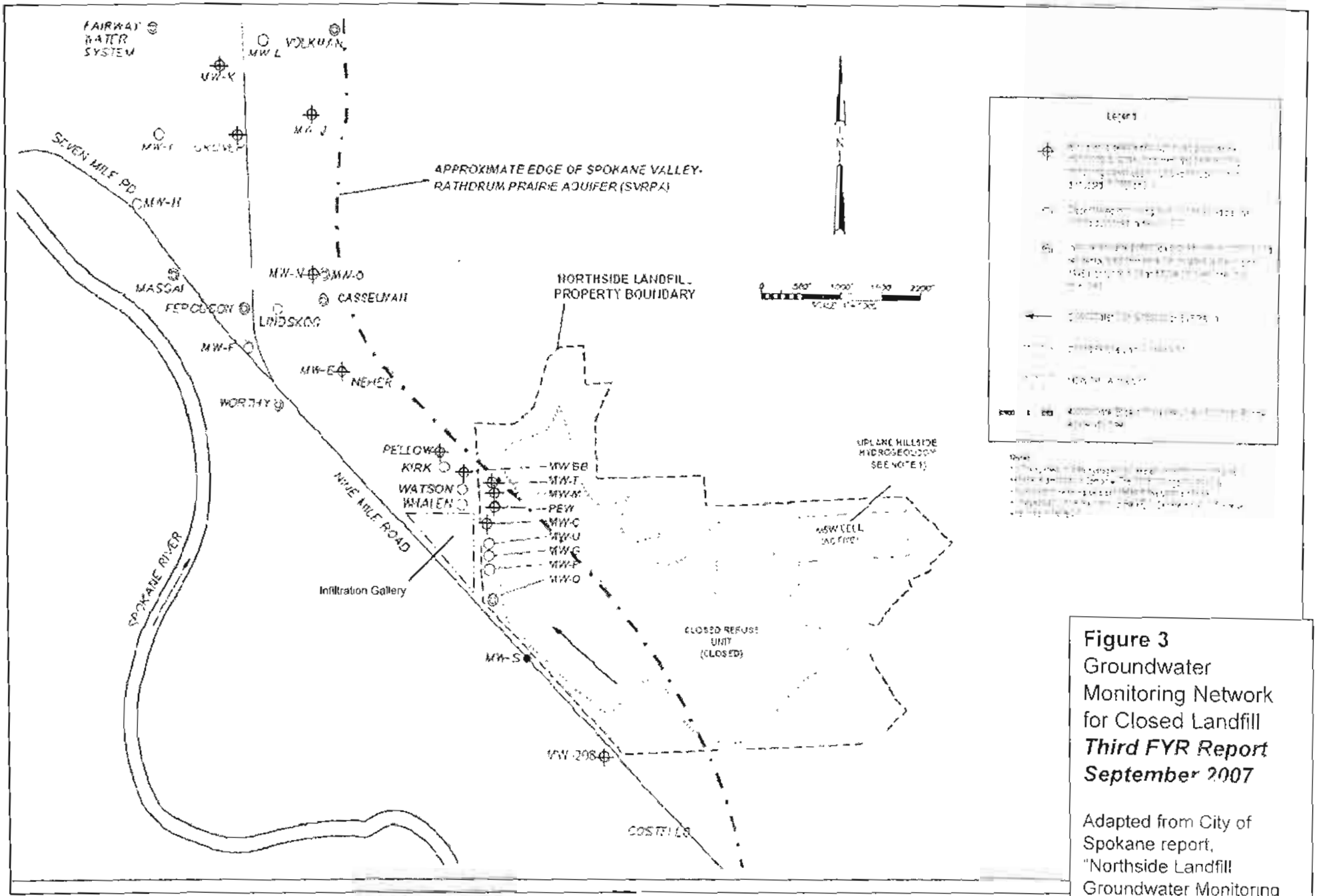


Figure 2
Closed and Active Landfill Features Site Map
Third FYR Report ***September 2007***

Note: City property extends to Nine Mile Road adjacent to the compliance groundwater wells as shown by the shape outlined by dashed line

Adapted from City of Spokane report, "Northside Landfill Groundwater Monitoring Plan Revision 2, March 2007." Report prepared by CH2MHill.



Note: City property extends to Nine Mile Road adjacent to the compliance groundwater wells as shown by the shape outlined by dashed line — · · — · · —

Figure 3
Groundwater Monitoring Network for Closed Landfill
Third FYR Report September 2007

Adapted from City of Spokane report, "Northside Landfill Groundwater Monitoring Plan Revision 2, March 2007." Report prepared by CH2MHill.

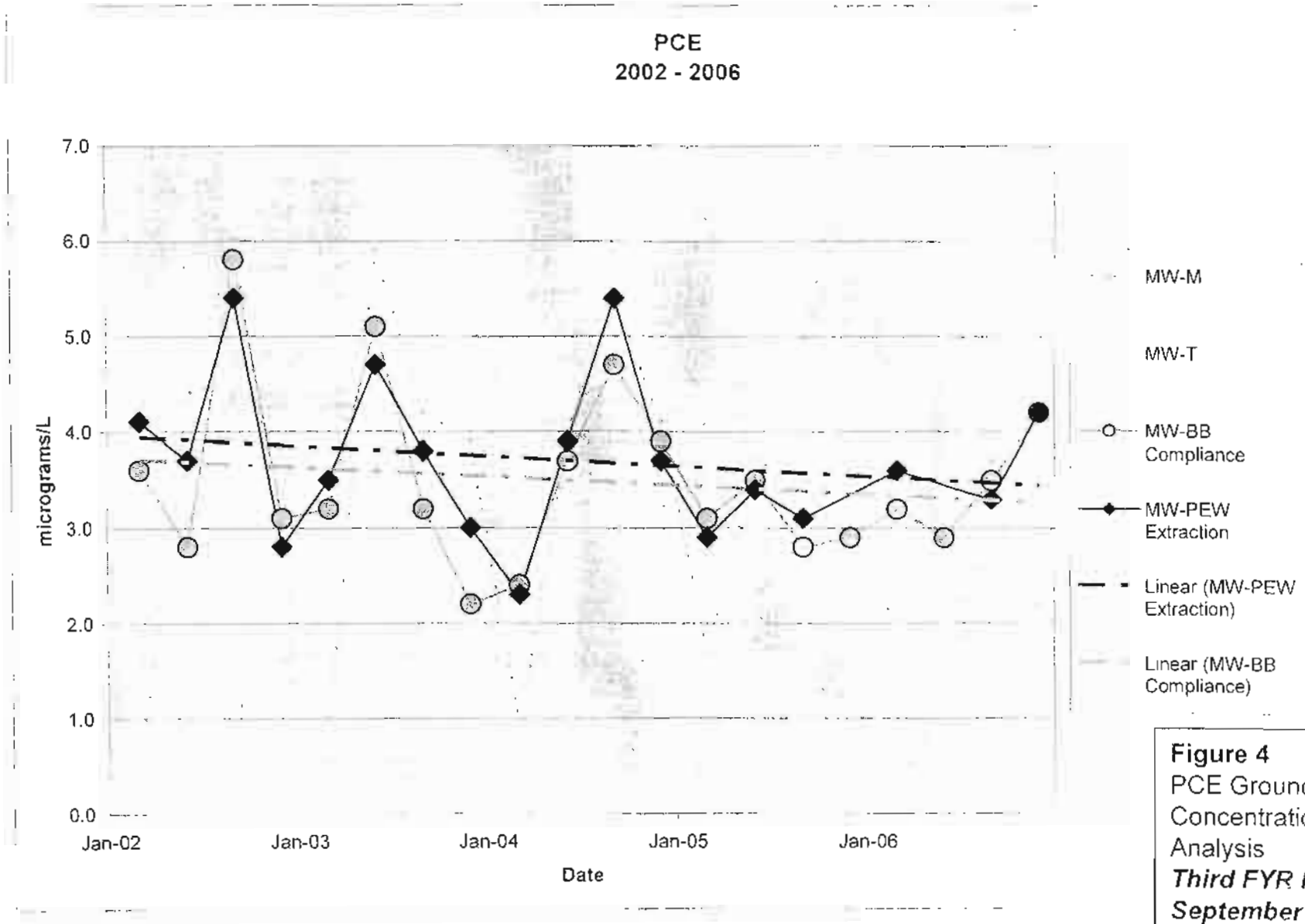
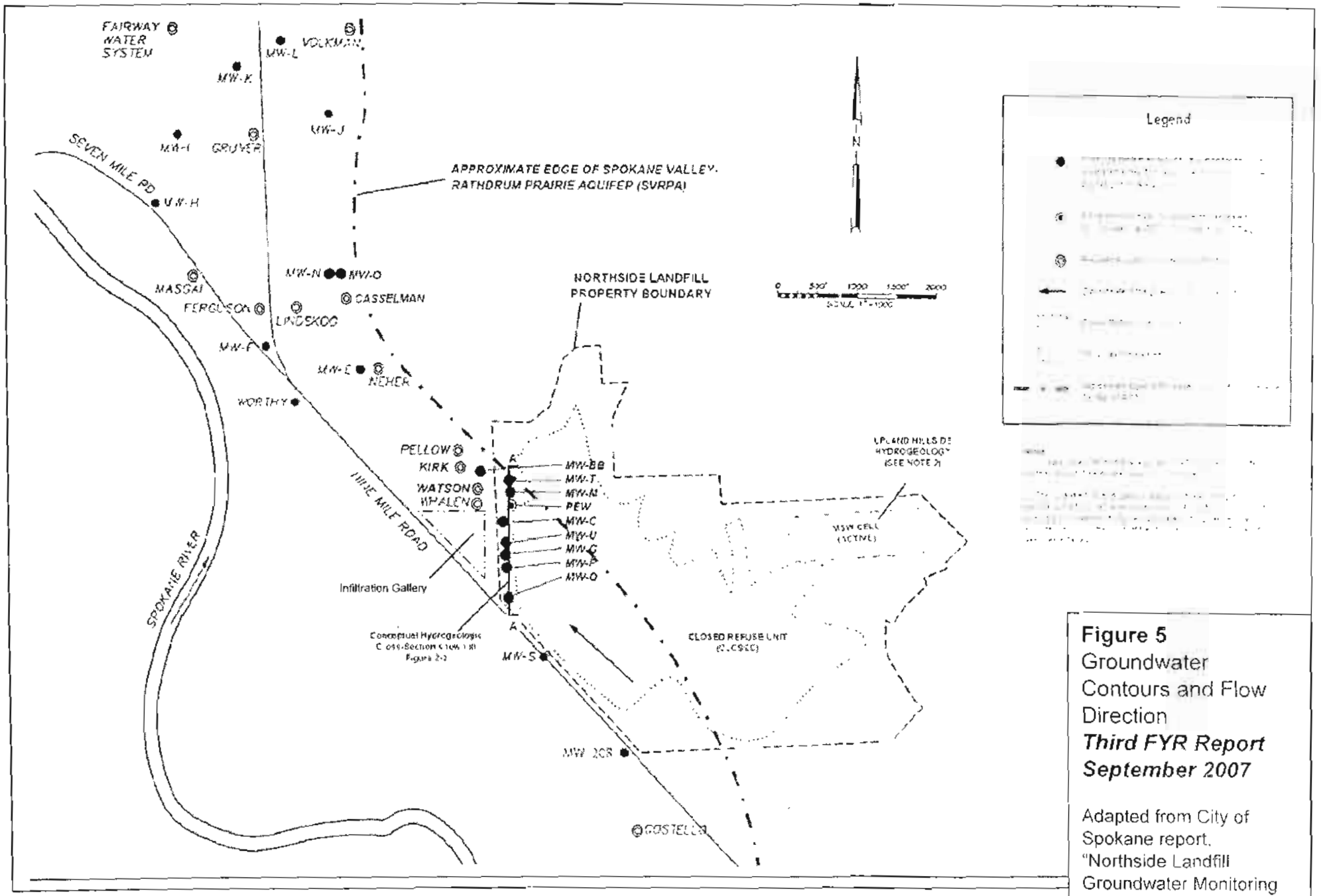


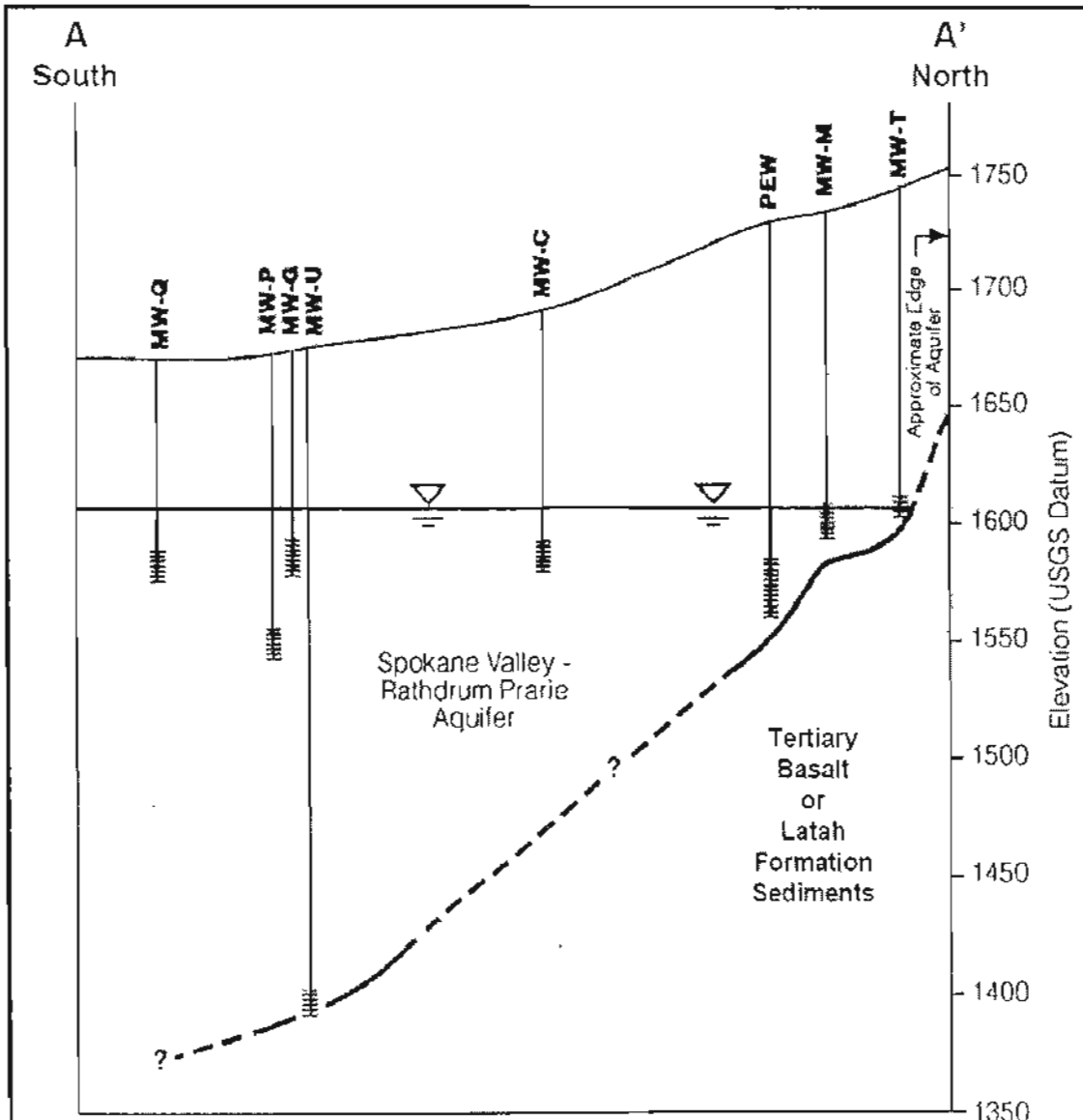
Figure 4
PCE Groundwater Concentration Limited Analysis
Third FYR Report
September 2007



Note: City property extends to Nine Mile Road adjacent to the compliance groundwater wells as shown by the shape outlined by dashed line — · · — · · .

Figure 5
Groundwater Contours and Flow Direction
Third FYR Report
September 2007

Adapted from City of Spokane report, "Northside Landfill Groundwater Monitoring Plan Revision 2, March 2007." Report prepared by CH2MHill.



LEGEND

Groundwater level (April 14, 1992)

Approximate screened interval of well

Base of Spokane Valley-Rathdrum Prairie Aquifer

NOTES:

1. Hydrogeologic conditions at the monitoring wells are projected
2. See Figure 2-1 for plan view location of wells shown.
3. Cross-section modified from "Pilot Groundwater Extraction Test, North Landfill Spokane, Washington" (CH2M HILL, 1993).

100 Feet

Horizontal Scale

FIGURE 2-2
Conceptual Hydrogeologic Cross-
Northside Landfill
March 2007

Figure 6
Conceptual Hydrogeologic Cross-sections
Third FYR Report
September 2007

Figure source:
City of Spokane report, "Northside Landfill Groundwater Monitoring Plan Revision 2, March 2007." Report prepared by CH2MHill.

Appendix A – Detailed O&M Cost Information

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	A	B	C	D	E
1					Acct 4500-44850-*****-*****-00000
2	Code	Description	Actual FFF	Actual FFF	Actual FFF
3			0/13 2002/2002	0/13 2003/2003	0/13 2004/2004
4	37080	OTHER NONOPERATING EXPENSE			
5	54101	PROFESSIONAL CONTRACTS		15,000.00	
6	55124	WA STATE DOE	1,056.00	480.88	679.00
7	59101	INTERFUND PROFESSIONAL SERVICE	63,160.00	61,781.00	65,205.00
8		Total	64,216.00	77,261.88	65,884.00
9					
10	37143	DEPRECIATION/AMORT/DEPLETION			
11	61020	AMORTIZATION	871,474.00	871,474.00	871,474.00
12		Total	871,474.00	871,474.00	871,474.00
13					
14	37145	MAINTENANCE			
15	54802	BUILDING REPAIRS/MAINTENANCE		47.63	
16	54803	EQUIPMENT REPAIRS/MAINTENANCE	1,069.92	16,471.58	12,713.89
17	54850	OTHER REPAIRS/MAINT SUPPLIES	892.65	1,202.84	3,738.45
18	54899	OTHER REPAIRS/MAINTENANCE	2,659.26	1,529.50	2,485.54
19	59801	INTERFUND REPAIRS/MAINTENANCE	3,427.28	3,061.98	1,481.73
20		Total	8,049.11	22,313.53	20,419.61
21					
22	37148	OPERATIONS-GENERAL			
23	02330	SENIOR ENGINEER	22,859.98	24,371.21	25,279.11
24	05010	LABORER I			13,261.95
25	05020	LABORER II	32,931.94	33,505.10	6,697.61
26	05510	LANDFILL/TRANSFER STN FOREPRSN	43.74		
27	05550	SW DISPOSAL SUPERINTENDENT	14,281.92	14,656.79	17,289.92
28	06540	LABORATORY TECHNICIAN	47,549.19	48,051.57	48,957.66
29	51210	OVERTIME	1,811.93	745.81	655.89
30	51220	OUT OF GRADE	1,300.48	1,283.13	613.76
31	51230	SHIFT DIFFERENTIAL PREMIUM	16.94	3.39	5.23
32	51290	LONGEVITY PAY	606.63	694.19	456.89
33	51400	SPECIALTY PAY	217.41	275.81	41.60
34	51600	AUTO ALLOWANCE	887.97	887.96	891.74
35	51610	CLOTHING ALLOWANCE	450.00	450.00	350.00
36	51640	DEFERRED COMPENSATION-MATCHING	2,701.36	3,521.58	3,403.80
37	52110	SOCIAL SECURITY	9,631.41	9,776.15	8,961.96
38	52210	RETIREMENT	8,173.01	8,304.97	7,611.00
39	52270	HEALTH REIMBURSEMENT ACCOUNT			6.82
40	52280	LONG TERM CARE			2.62
41	52310	MEDICAL INSURANCE	19,244.44	19,412.35	18,345.25
42	52320	DENTAL INSURANCE	3,068.74	3,390.24	3,462.98
43	52330	LIFE INSURANCE	347.89	346.71	-425.46
44	52340	DISABILITY INSURANCE	123.27	128.55	-161.57
45	52400	INDUSTRIAL INSURANCE	121.26	176.22	172.24
46	52500	UNEMPLOYMENT INSURANCE	838.00		
47	53101	OFFICE SUPPLIES		189.83	169.71
48	53103	POSTAGE	125.45	82.12	110.83
49	53201	OPERATING SUPPLIES	1,053.55	1,452.90	2,596.11
50	53502	MINOR EQUIPMENT	5,009.54	3,800.18	5,618.93
51	54201	CONTRACTUAL SERVICES	38,498.21	39,174.24	43,409.33
52	54302	CELL PHONE			480.02
53	54401	TRAVEL	1,137.12	1,625.70	3,628.63
54	54451	ADVERTISING	151.20		
55	54501	OPERATING RENTALS/LEASES	483.96		324.30
56	54602	RETIREES' INSURANCE BENEFIT	69.60	69.60	63.60
57	54701	PUBLIC UTILITY SERVICE	591.08	361.44	123.24

	A	B	C	D	E
1					Acct 4500-44850-*****-*****-00000
2	Code	Description	Actual FFF	Actual FFF	Actual FFF
3			0/13 2002/2002	0/13 2003/2003	0/13 2004/2004
58	54702	UTILITY LIGHT/POWER SERVICE	37,317.22	35,387.52	29,890.52
59	54902	REGISTRATION/SCHOOLING	765.00	845.00	
60	54908	PERMITS/OTHER FEES	4,191.32	4,399.18	
61	54940	EMISSION TESTING		10,823.95	
62	54999	OTHER MISC CHARGES	363.21	561.54	841.68
63	59201	INTERFUND COMMUNICATIONS	1,386.34	1,394.39	1,693.87
64	59303	INTERFUND OPERATING SUPPLIES	22.48		
65	59602	INTERFUND UNEMPLOYMENT		2,543.00	29.00
66	59603	INTERFUND WORKERS COMPENSATION	1,868.00	2,393.00	2,714.00
67	59901	INTERFUND-MIS	8,859.96	8,859.96	9,540.96
68	59903	INTERFUND-REPROGRAPHICS		32.00	
69		Total	269,100.75	283,977.28	257,115.73
70					
71	94000	CAPITAL OUTLAY			
72	56201	BUILDING ACQUISITION	3,948.79		
73	56203	BUILDING IMPROVEMENTS	859.99		
74	56401	MACHINERY/EQUIPMENT			6,384.12
75	56408	OFFICE FURNITURE/EQUIPMENT	0.00		
76		Total	4,808.78	0.00	6,384.12
77					
78		Total	1,217,648.64	1,255,026.69	1,221,277.46

	A	B	C	D
1			Acct 4500-44850-*****-*****-00000	
2	Code	Description	Actual FFF	Actual FFF
3			0/13 2005/2005	0/13 2006/2006
4	37080	OTHER NONOPERATING EXPENSE		
5	55124	WA STATE DOE	1,164.00	2,403.20
6	59101	INTERFUND PROFESSIONAL SERVICE	68,608.00	22,630.49
7		Total	69,772.00	25,033.69
8				
9	37143	DEPRECIATION/AMORT/DEPLETION		
10	61020	AMORTIZATION	871,474.00	871,474.00
11		Total	871,474.00	871,474.00
12				
13	37145	MAINTENANCE		
14	54803	EQUIPMENT REPAIRS/MAINTENANCE	2,735.22	18,656.83
15	54850	OTHER REPAIRS/MAINT SUPPLIES	1,302.00	906.39
16	59801	INTERFUND REPAIRS/MAINTENANCE	1,215.31	14,654.52
17	59910	MISC INTERFUND	262.58	
18		Total	5,515.11	34,217.74
19				
20	37148	OPERATIONS-GENERAL		
21	02330	SENIOR ENGINEER	25,684.98	24,382.66
22	05010	LABORER I	20,086.49	26,712.05
23	05020	LABORER II	2,619.21	
24	05550	SW DISPOSAL SUPERINTENDENT	18,263.22	17,311.22
25	06540	LABORATORY TECHNICIAN	49,754.10	51,910.34
26	51210	OVERTIME	2,264.46	3,201.03
27	51220	OUT OF GRADE	122.00	686.70
28	51230	SHIFT DIFFERENTIAL PREMIUM	40.75	72.31
29	51250	TERMINATED SICK LEAVE PAY	852.02	
30	51260	TERMINATED VACATION LEAVE PAY	1,497.94	
31	51290	LONGEVITY PAY	364.72	317.40
32	51400	SPECIALTY PAY	152.36	259.81
33	51600	AUTO ALLOWANCE	884.27	947.58
34	51610	CLOTHING ALLOWANCE	450.00	450.00
35	51640	DEFERRED COMPENSATION-MATCHING	3,656.00	2,628.00
36	52110	SOCIAL SECURITY	9,545.36	9,682.51
37	52210	RETIREMENT	8,020.36	8,389.88
38	52270	HEALTH REIMBURSEMENT ACCOUNT	78.43	78.43
39	52280	LONG TERM CARE	20.07	19.32
40	52310	MEDICAL INSURANCE	21,610.60	21,968.05
41	52320	DENTAL INSURANCE	3,708.39	3,645.86
42	52330	LIFE INSURANCE	654.82	652.95
43	52340	DISABILITY INSURANCE	137.02	126.77
44	52400	INDUSTRIAL INSURANCE	175.29	168.78
45	53101	OFFICE SUPPLIES	282.40	157.50
46	53103	POSTAGE	98.66	260.04
47	53201	OPERATING SUPPLIES	2,310.05	2,572.52
48	53501	SMALL TOOLS	205.69	93.33
49	53502	MINOR EQUIPMENT	8,872.39	1,833.38
50	54101	PROFESSIONAL CONTRACTS		4,081.50
51	54201	CONTRACTUAL SERVICES	42,047.07	32,588.45
52	54302	CELL PHONE	493.61	399.47
53	54401	TRAVEL	2,990.79	2,887.91
54	54501	OPERATING RENTALS/LEASES	55.00	11.78
55	54602	RETIREES' INSURANCE BENEFIT	64.60	66.35
56	54701	PUBLIC UTILITY SERVICE	278.30	908.19
57	54702	UTILITY LIGHT/POWER SERVICE	30,534.46	24,976.10

	A	B	C	D
1			Acct 4500-44850-*****-*****-00000	
2	Code	Description	Actual FFF	Actual FFF
3			0/13 2005/2005	0/13 2006/2006
58	54850	OTHER REPAIRS/MAINT SUPPLIES	5.86	
59	54902	REGISTRATION/SCHOOLING	1,390.00	2,010.00
60	54908	PERMITS/OTHER FEES	3,845.98	3,923.01
61	54940	EMISSION TESTING	7,295.00	
62	54999	OTHER MISC CHARGES	1,345.72	7,355.66
63	59201	INTERFUND COMMUNICATIONS	1,765.94	1,621.50
64	59602	INTERFUND UNEMPLOYMENT	1,174.00	1,265.00
65	59603	INTERFUND WORKERS COMPENSATION	3,206.00	4,081.00
66	59901	INTERFUND-MIS	10,695.00	11,619.96
67	59903	INTERFUND-REPROGRAPHICS	122.76	0.00
68	59910	MISC INTERFUND	30.00	
69		Total	289,752.14	276,324.30
70				
71	94000	CAPITAL OUTLAY		
72	56401	MACHINERY/EQUIPMENT	10,272.18	21,362.74
73	56408	OFFICE FURNITURE/EQUIPMENT	0.00	
74		Total	10,272.18	21,362.74
75				
76	97180	OPERATING TRANSFER TO MIS		
77	80101	OPERATING TRANSFERS OUT		480.64
78		Total	0.00	480.64
79				
80		Total	1,246,785.43	1,228,893.11

Appendix B – Community Notification of Third Five-Year Review

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U.S. Environmental Protection Agency
1200 Sixth Avenue. ETPA-081
Seattle. Washington 98101-11128

Northside Landfill
5-Year Review
Spokane County
July 2007

EPA to Review Northside Landfill Superfund site in Spokane County

The U.S. Environmental Protection Agency (EPA) is doing the third Five-Year Review of the Northside Landfill Superfund site, located on a 345-acre of parcel of land northwest of Spokane.

The review will insure the waste cleanup put in place by the city of Spokane in 1993 remains effective. The cleanup included closure, capping and landscaping of the landfill; treatment to reduce groundwater contaminants, installation of a gas collection system to control landfill gas, and restriction and monitoring of the site from unauthorized access. Reviews are required at least every five years when a remedy leaves waste in place above levels that allow for unrestricted use and unlimited exposure.

How You Can Get Involved:

EPA welcomes your participation during our review, in July and August, 2007. If you have information that may help EPA with the review, contact Tim Brincefield, EPA Project Manager, by phone at 206-553-2100 or toll free at 800-424-4372. Email: *brincefield.timothy@epa.gov*.

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

Wed. Hit 5: **3-11-13-18-20.**
No winner. Next jackpot: $390,000.
Wed. Powerball: **8-20-29-42-43.**
Power Ball: **35**

Battle of the Boyne in Ireland.
1993: Some 200 people were killed when an earthquake measuring a magnitude of 7.8 struck northern Japan.

Spokesman Rev. 7/12/07

EPA to Review Northside Landfill Superfund site in Spokane County

The U.S. Environmental Protection Agency (EPA) is doing the third Five-Year Review of the Northside Landfill Superfund site, located on a 345-acre of parcel of land northwest of Spokane.

The review will insure the waste cleanup put in place by the city of Spokane in 1993 remains effective. The cleanup included closure, capping and landscaping of the landfill; treatment to reduce groundwater contaminants, installation of a gas collection system to control landfill gas, and restriction and monitoring of the site from unauthorized access. Reviews are required at least every five years when a remedy leaves waste in place above levels that allow for unrestricted use and unlimited exposure.

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

Appendix C – Risk Assessment Parameters and Toxicology Updates

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Table 1. Updated ARAR Information for Northside Landfill COCs.

Chemical	MCL (MCLG), µg/L	NRWQC: Human Health by Consumption of Fish and Water, µg/L	NRWQC: Human Health by Consumption of Fish Only, µg/L	Comparison to ROD Values (Table 5)
Chloroform	100 (none)	5.7	3.3	• MCL has not changed • NRWQC > ROD • Surface water driver would be 3.3 µg/L
Dichloroethane, 1,1-	None (none)	No Value	No Value	• No MCL has been established • NRWQC withdrawn • Surface water driver would be 5 µg/L
Dichloroethene, 1,2-trans-	100 (100)	140	10000	• MCL established post-ROD • NRWQC now higher than ROD • Surface water driver would be 140 µg/L
Tetrachloroethene	5 (none)	0.69	3.3	• MCL established post-ROD • NRWQC now lower than ROD • Surface water driver would be 0.69 µg/L
Trichloroethane, 1,1,1-	200 (20)	No Value	No Value	• No change in MCL • NRWQC withdrawn • Surface water driver would be 200 µg/L
Trichloroethylene	5 (0)	2.5	30	• No change in MCL • NRWQC slightly lower • Drivers would be 5 µg/L (groundwater) or 2.5 µg/L (surface water)
Vinyl Chloride	2 (0)	0.025	2.4	• No change in MCL • NRWQC much lower • Drivers would be 2 µg/L (groundwater) or 0.025 µg/L (surface water)

MCL = Maximum Contaminant Level; MCLG = Maximum Contaminant Level Goal.
NRWQC = National Recommended Water Quality Criteria.
http://www.epa.gov/waterscience/criteria/wqcriteria.html.
No values for chronic or acute toxicity were found at this site.

Table 2. Current Toxicity Value Information for Northside Landfill COCs.

Chemical	Last Significant Revision in IRIS	Comment	Dermal RfD - Chronic (mg/kg-day)	Dermal RfD - Subchronic (mg/kg-day)	Dermal SF (mg/kg-day)-1	Inhalation RfC - Chronic (mg/m3)	Inhalation RfD - Chronic (mg/kg-day)	Inhalation RfD - Subchronic (mg/kg-day)	Oral RfD - Chronic (mg/kg-day)	Inhalation SF (mg/kg-day)-1	Oral SF (mg/kg-day)-1
Chloroform	**10/19/2001**		2.00E-03	2.00E-03 e	3.05E-02 w				1.00E-02	8.05E-02 u	6.10E-03 w
Dichloroethane, 1,1						5.00E-01 [c]	1.43E-01 [c]		2.00E-01		
Dichloroethylene, 1,2-trans-	1/1/1989		2.00E-02	2.00E-01		6.00E-02	1.71E-02		2.00E-02		
Tetrachloroethylene	3/1/1988		1.00E-02	1.00E-01	5.40E-01 ai	6.00E-01 v	1.71E-01 v		1.00E-02	2.07E-02 u	5.40E-01 ai
Trichloroethane, 1,1,1-	**2/1/1996**	RfDo withdrawn; Class D carcinogen	1.80E-01 v			2.20E+00 v	6.29E-01 v	6.3E+00 v	2.00E-01 v		
Trichloroethylene	CSF withdrawn 7/1/1989	**Values are from 8/1/2001 Draft Reassessment**	4.50E-05 ah		2.67E+00 ah	4.00E-02 ah	1.14E-02 ah		3.00E-04 ah	4.00E-01 u	4.00E-01 ah
Vinyl Chloride	**8/7/2000**		3.00E-03		1.50E+00	1.00E-01	2.86E-02		3.00E-03	3.08E-02 u	1.50E+00

Shading: Gray – updated since ROD; yellow – caveat as to use

MCLs are from **http://www.epa.gov/safewater/contaminants/index.html#listmcl** 8/2007 accession.

Footnotes (from RAIS)

c - These subchronic and chronic non-cancer toxicity values are found in Agency documents, but were calculated by alternative methods that are not currently practiced by the RfD/RfC Work Group. These values are considered to be adequate provisional values for risk assessment purposes at Superfund and RCRA sites, but are subject to be reviewed by the RfD/RfC Work Group and revised when necessary to reflect current work group practices.

e - The chronic oral RfD was adopted as the subchronic oral [RfD]. (HEAST)

u - The Inhalation Slope Factor was calculated from inhalation unit risk as described in Supplemental Guidance from *RAGS: Region 4 Bulletins, Human Health Risk Assessment* (Interim Guidance) (November 1995).

v - The Risk Assessment Program has contacted Superfund and been given provisional values which should be used for DOE-ORR projects. This value should be clearly documented as provisional.

w - This value was withdrawn by NCEA. "The cancer slope factor was withdrawn because of the re-evaluation of the rodent data which does not support genotoxic mode of action based on our proposed cancer guidelines. This chemical is now being reassessed for IRIS which automatically flags further use of any provisional cancer or non-cancer assessments." If this chemical is identified as a risk driver, the risk assessor should consult The EPA Superfund Technical Support Center. All withdrawn values should be clearly documented when used in any risk assessment activity.

ah - These toxicity values present EPA's most current evaluation of the potential health risks from exposure to trichloroethylene (TCE). The citation presented is as follows: *2001. TRICHLOROETHYLENE HEALTH RISK ASSESSMENT: SYNTHESIS AND CHARACTERIZATION (EXTERNAL REVIEW DRAFT). USEPA EPA/600/P-01/002A. 01 AUGUST 2001. U.S. Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment, Washington Office, Washington, DC, .* This NCEA report can be viewed here. EPA Region IX and Region III have adopted these toxicity values as well.

ai - Tetrachloroethylene cancer toxicity values are taken from California EPA and EPA Region 9. -- See the letter (PDF below) justifying the use of these values. EPA Regions VI and III have adopted these toxicity values as well: **http://rais.ornl.gov/homepage/Southerland.pdf** Tetrachloroethylene is stated in the ROD to be a Class B carcinogen. In a recent recommendation from the EPA Science Advisory Board, it was suggested that the classification be C-B2. That is, between a possible and a probable human carcinogen. **http://rais.ornl.gov/tox/profiles/tetrachloroethylene_f_V1.shtml#t44**

Showering Inhalation, Ingestion, and Dermal Contact

Exposure parameters selected in accordance with USEPA (1991), USEPA (1997), USEPA (1998), and USEPA (2004) are listed in Table 2.

Table 3. Summary of Exposure Parameters for Human Health Receptors

Exposure Parameter	Units	Adult Residential RME	Industrial Worker RME
General			
Groundwater Concentrations	mg/L	SS	SS
Exposure Frequency - EF	day/year	350	250
Body Weight - BW	kg	70	70
Averaging Time - AT			
Carcinogens	years total days	70 70*350 =24,500	70 70*250=17,500
Noncarcinogens	years total days	24 24*350=8,400	25 25*250=6,250
Ingestion of Groundwater			
Groundwater Ingestion Rate - IR	L/day	2	2
Groundwater Ingestion During Shower	L/day	0.015	0.015
Exposure Duration - ED	yr	30	25
Inhalation of Constituents Volatilizing from Groundwater			
Inhalation Rate - InhR	m^3/day	20	20
Exposure Time - ET	hr/day	0.25	0.25
Dermal Contact with Groundwater			
Contact Rate	hr	0.25	0.25
Dermal Surface Area - SA	cm^2/event	18,000	18,000
Dermal Permeability Constant - PC		CS	CS
Exposure Time - ET	hr/day	0.25	0.25
Volatility Factor - VF	$m^{3/}$kg	CS	CS

CS - Chemical Specific; SS – Site Specific

This shows the exposure assumptions for residential and industrial contact with groundwater.

Tables 4a-4 Equations Used For Groundwater Calculations

Table 4a

Residential Ingestion Of Groundwater Pathway		
$$CDI\ (mg/kg\text{-}d) = \frac{CW \times IR \times EF \times ED}{BW \times AT}$$		
Variable	**Value used**	**Explanation/source**
AT = Averaging time	365 days/year ED	Averaging time for noncarcinogens (EPA 1989a, 1991b)
	365 days/year 70 years	Averaging time for carcinogens (EPA 1989a, 1991b)
BW = Body weight	70 kg	Adult (EPA 1991b)
CW = Concentration in water	Chemical-specific (mg/L)	Concentration is obtained from sample data
ED = Exposure duration	30 years	Residential exposure for a 30-year duration (OSWER Directive, EPA 1991b)
EF = Exposure frequency	350 days/year	OSWER Directive (EPA 1991b)
IR = Ingestion rate	2 L/day	EPA 1989a; OSWER Directive (EPA 1991b)

Table 4b

Residential And Industrial Dermal Contact With Groundwater While Showering Pathway		
$$CDI\ (mg/kg\text{-}d) = \frac{CW \times EF \times ED \times ET \times SA \times K_p \times \left(\frac{L}{1{,}000\ cm^3}\right) \times \left(\frac{10{,}000\ cm^2}{m^2}\right)}{BW \times AT}$$		
Variable	**Value used**	**Explanation/source**
AT = Averaging time	365 days/year ED	Averaging time for noncarcinogens (EPA 1989a, 1991b)
	365 days/year 70 years	Averaging time for carcinogens (EPA 1989a, 1991b)
BW = Body weight	70 kg	Adult (EPA 1991b)
CW = Concentration in water	Chemical-specific (mg/L)	Concentration is obtained from sample data
ED = Exposure duration	30 years	Residential exposure for 30-year duration (OSWER Directive, EPA 1991b)
EF = Exposure frequency	350 days/year	OSWER Directive (EPA 1991b)
ET = Exposure time	0.58 hours/day	RAGs Part E
K_p = Permeability constant	Chemical-specific (cm/hour)	Dermal Exposure Assessment (EPA 1992a)
SA = Available surface area	1.8 m^2	RAGs Part E

Table 4c

Industrial Ingestion Of Groundwater Pathway		
$$CDI\ (mg/kg\text{-}d) = \frac{CW \times IR \times EF \times ED}{BW \times AT}$$		
Variable	**Value used**	**Explanation/source**
AT = Averaging time	365 days/year ED	Averaging time for noncarcinogens (EPA 1989a, 1991b)
	365 days/year 70 years	Averaging time for carcinogens (EPA 1989a, 1991b)
BW = Body weight	70 kg	Adult (EPA 1991b)
CW = Concentration in water	Chemical-specific (mg/L; pCi/L)	Concentration is obtained from sample data
ED = Exposure duration	25 years	Residential exposure for a 30-year duration (OSWER Directive, EPA 1991b)
EF = Exposure frequency	250 days/year	OSWER Directive (EPA 1991b)
IR = Ingestion rate	1 L/day	OSWER Directive (EPA 1991b)

Table 4d

Residential And Industrial Inhalation Of VOCs From Groundwater During Indoor Use Pathway		
$$CDI\ (mg/kg\text{-}day) = \frac{CW \times HR \times EF \times ED \times K}{BW \times AT}$$		
Variable	**Value used**	**Explanation/source**
AT = Averaging time	365 days/year ED	Averaging time for noncarcinogens (EPA 1989a, 1991b)
	365 days/year 70 years	Averaging time for carcinogens (EPA 1989a, 1991b)
CW = Concentration in water	Chemical-specific (mg/L)	Concentration is obtained from sample data
ED = Exposure duration	30 years	Residential exposure for a 30-year duration (OSWER Directive, EPA 1991b)
EF = Exposure frequency	350 days/year	OSWER Directive (EPA 1991b)
HR = Inhalation rate	20 m^3/d	Region IV Supplemental Guidance to RAGS (EPA 1995a)
K = Volatilization factor	0.0005 x 1000 L/m^3	(EPA 1991a)

Ecological Screening Levels

Freshwater Screening Benchmarks

CAS#	Analyte	Screening Value (ug/l)	Ref	End Note	Class of Compound	Bioaccumulative-B[q]
67-66-3	Chloroform	1.8	b	2	Volatile	
75-34-3	1,1-Dichloroethane	47	c	1	Volatile	
156-60-5	1,2-Trans-Dichloroethylene	970	g	5	Volatile	
127-18-4	1,1,2,2-Tetrachloroethylene (PCE)	111	b	2	Volatile	
71-55-6	1,1,1-Trichloroethane	11	a	1	Volatile	
79-01-6	1,1,2-Trichloroethene (TCE)	21	b	2		
75-01-4	Vinyl chloride	930	d	3	Volatile	

Note: Values are expressed in terms of dissolved analyte in the water column except for those indicated with endnote 2 which are expressed in terms of total concentration.

Source: http://www.epa.gov/reg3hwmd/risk/eco/btag/sbv/fw/screenbench.htm
Accessed on line: 25 September 2007

Appendix D – Quarterly Groundwater Monitoring Data 2002 through 2006

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			Compliance Wells																					
Qtr	**Year**	**COC**	**208**	**208 QC**	**BB**	**BB QC**	**C**	**CC QC**	**PEW**	**PEW QC**	**M**	**M QC**	**T**	**T QC**	**G**	**P**	**U**	**E**	**E QC**	**F**	**H**	**I**	**J**	**J QC**
1st	2002	PERC	<0.5		**3.6**	**3.8**	<0.5		**4.1**	**3.9**	**2.7**		**3.0**											
2nd	2002	PERC	<0.5		**2.8**		<0.5	<0.5	**3.7**		**4.3**	**4.3**	**2.8**		<0.5	<0.5	**1.9**	<0.5	**0.5**	<0.5	<0.5	<0.5	**2.2**	**2.2**
3rd	2002	PERC	<0.5		**5.8**	**5.8**	**0.7**		**5.4**	**5.4**	**6.0**		**3.6**											
4th	2002	PERC	<0.5		**3.1**		**0.7**		**2.8**		**2.7**	**2.7**	**3.1**	**3.1**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1.2**	**1.2**
1st	2003	PERC	<0.5		**2.9**	**3.2**	<0.5		**3.4**	**3.5**	**1.0**		**2.4**											
2nd	2003	PERC	<0.5	<0.5	**5.1**		<0.5		**4.7**		**5.8**	**5.9**	**3.2**		<0.5	<0.5	**1.3**	**0.6**	**0.6**	<0.5	<0.5	<0.5	**2.0**	**2.0**
3rd	2003	PERC	<0.5		**3.2**	**3.2**	**0.5**		**3.8**	**3.8**	**4.2**		**2.8**											
4th	2003	PERC	<0.5		**2.2**		**0.5**		**3.0**		**3.9**	**3.9**	**2.9**	**3.0**	<0.5	<0.5	**1.4**	<0.5		<0.5		<0.5	**1.8**	**1.9**
1st	2004	PERC	<0.5		**2.4**	**2.4**	<0.5		**2.3**	**2.2**	**0.9**		**1.8**											
2nd	2004	PERC	<0.5	<0.5	**3.7**		**0.6**		**3.9**		**3.9**	**4.0**	**2.4**		<0.5	<0.5	<0.5	**0.6**	**0.6**	<0.5	<0.5	<0.5	**1.9**	**1.9**
3rd	2004	PERC	<0.5		**4.7**		**0.5**		**5.3**	**5.4**	**5.4**		**2.7**	**2.5**										
4th	2004	PERC	< 0.5		**3.9**		**0.5**		**3.7**		**4.1**	**4.1**	**3.7**	**3.7**	<0.5	<0.5	**0.7**	< 0.5	< 0.5	<0.5	<0.5	<0.5	**1.6**	**1.7**
1st	2005	PERC	<0.5		**3.1**	**3.1**	<0.5		**2.9**	**2.9**	**1.7**		**2.1**											
2nd	2005	PERC	<0.5	<0.5	**3.5**		**0.6**		**3.4**		**3.7**	**3.7**	**1.9**		<0.5	<0.5	**0.8**	**0.5**	**0.6**	<0.5	<0.5	<0.5	**1.7**	**1.7**
3rd	2005	PERC	< 0.5		**2.8**	**2.7**	**0.6**		**3.0**	**3.1**	**3.5**		**2.1**											
4th	2005	PERC	< 0.5		**2.9**		< 0.5						**2.6**	**2.6**				< 0.5						
1st	2006	PERC	< 0.5		**3.2**		**0.6**		**3.6**		**2.0**		**2.3**	**2.3**										
2nd	2006	PERC	< 0.5		**2.8**	**2.9**	< 0.5						**1.7**					**0.5**						
3rd	2006	PERC	< 0.5		**3.4**	**3.5**	**0.6**		**3.3**		**3.7**		**2.2**											
4th	2006	PERC	< 0.5		**4.2**		**0.6**	**0.6**	**4.2**		**4.1**		**3.1**											
1st	2002	TCE	<0.5		**0.5**	**0.6**	<0.5		<0.5	<0.5	<0.5		**0.5**											
2nd	2002	TCE	<0.5		**0.5**		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.5**	**0.5**
3rd	2002	TCE	<0.5		**0.6**	**0.6**	<0.5		**0.5**	**0.5**	<0.5		<0.5											
4th	2002	TCE	<0.5		**0.6**		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.5**	**0.5**
1st	2003	TCE	<0.5		**0.6**	**0.6**	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2003	TCE	<0.5	<0.5	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.5**	**0.5**
3rd	2003	TCE	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
4th	2003	TCE	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5		<0.5	**0.5**	**0.5**
1st	2004	TCE	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2004	TCE	<0.5	<0.5	**0.5**		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.5**	**0.5**
3rd	2004	TCE	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5										
4th	2004	TCE	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1st	2005	TCE	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2005	TCE	<0.5	<0.5	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3rd	2005	TCE	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5											
4th	2005	TCE	< 0.5		< 0.5		< 0.5						< 0.5	< 0.5				< 0.5						
1st	2006	TCE	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5	< 0.5										
2nd	2006	TCE	< 0.5		< 0.5	< 0.5	< 0.5						< 0.5					< 0.5						
3rd	2006	TCE	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5		< 0.5		< 0.5											
4th	2006	TCE	< 0.5		< 0.5		< 0.5	< 0.5	< 0.5		< 0.5		< 0.5											

Qtr	Year	COC	K	K QC	L	N	N QC	GRUVER	GRUVER QC	LINDSKOG	PELLOW	PELLOW QC
1st	2002	PERC										
2nd	2002	PERC	<0.5		<0.5	**1.8**	**1.8**	**0.6**		<0.5	**3.3**	**3.3**
3rd	2002	PERC										
4th	2002	PERC	<0.5		<0.5	**0.9**	**0.9**	<0.5		<0.5	**2.6**	**2.5**
1st	2003	PERC										
2nd	2003	PERC	<0.5		<0.5	**1.4**	**1.4**	**0.7**		**0.5**	**4.9**	**5.1**
3rd	2003	PERC										
4th	2003	PERC	<0.5	<0.5	<0.5	**1.4**	**1.4**	<0.5	<0.5	<0.5	**3.5**	**3.6**
1st	2004	PERC										
2nd	2004	PERC	<0.5		<0.5	**1.4**	**1.4**	**0.5**		**0.5**	**3.9**	**3.9**
3rd	2004	PERC										
4th	2004	PERC	<0.5		<0.5	**1.2**	**1.2**	<0.5	<0.5		**4.2**	**4.3**
1st	2005	PERC										
2nd	2005	PERC	<0.5		<0.5	**1.2**	**1.2**	**0.6**		<0.5	**3.4**	**3.2**
3rd	2005	PERC										
4th	2005	PERC	< 0.5	< 0.5								
1st	2006	PERC										
2nd	2006	PERC	< 0.5									
3rd	2006	PERC										
4th	2006	PERC										
1st	2002	TCE										
2nd	2002	TCE	<0.5		<0.5	**0.5**	**0.5**	<0.5		<0.5	**0.5**	<0.5
3rd	2002	TCE										
4th	2002	TCE	<0.5		<0.5	**0.5**	**0.5**	<0.5		<0.5	**0.5**	**0.5**
1st	2003	TCE										
2nd	2003	TCE	<0.5		<0.5	**0.5**	**0.5**	<0.5		<0.5	<0.5	<0.5
3rd	2003	TCE										
4th	2003	TCE	<0.5	<0.5	<0.5	**0.5**	**0.5**	<0.5	<0.5	<0.5	<0.5	<0.5
1st	2004	TCE										
2nd	2004	TCE	<0.5		<0.5	**0.5**	**0.5**	<0.5		<0.5	**0.5**	<0.5
3rd	2004	TCE										
4th	2004	TCE	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
1st	2005	TCE										
2nd	2005	TCE	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
3rd	2005	TCE										
4th	2005	TCE	< 0.5	< 0.5								
1st	2006	TCE										
2nd	2006	TCE	< 0.5									
3rd	2006	TCE										
4th	2006	TCE										

			Compliance Wells																					
Qtr	Year	COC	208	208 QC	BB	BB QC	C	CC QC	PEW	PEW QC	M	M QC	T	T QC	G	P	U	E	E QC	F	H	I	J	J QC
1st	2002	1,1,1-TCA	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2002	1,1,1-TCA	<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3rd	2002	1,1,1-TCA	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
4th	2002	1,1,1-TCA	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1st	2003	1,1,1-TCA	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2003	1,1,1-TCA	<0.5	<0.5	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3rd	2003	1,1,1-TCA	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
4th	2003	1,1,1-TCA	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5		<0.5	<0.5	<0.5
1st	2004	1,1,1-TCA	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2004	1,1,1-TCA	<0.5	<0.5	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3rd	2004	1,1,1-TCA	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5										
4th	2004	1,1,1-TCA	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1st	2005	1,1,1-TCA	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2005	1,1,1-TCA	<0.5	<0.5	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3rd	2005	1,1,1-TCA	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5											
4th	2005	1,1,1-TCA	< 0.5		< 0.5		< 0.5						< 0.5	< 0.5				< 0.5						
1st	2006	1,1,1-TCA	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5	< 0.5										
2nd	2006	1,1,1-TCA	< 0.5		< 0.5	< 0.5	< 0.5						< 0.5					< 0.5						
3rd	2006	1,1,1-TCA	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5		< 0.5		< 0.5											
4th	2006	1,1,1-TCA	< 0.5		< 0.5		< 0.5	< 0.5	< 0.5		< 0.5		< 0.5											
1st	2002	1,1-DCA	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2002	1,1-DCA	<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3rd	2002	1,1-DCA	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
4th	2002	1,1-DCA	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1st	2003	1,1-DCA	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2003	1,1-DCA	<0.5	<0.5	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3rd	2003	1,1-DCA	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
4th	2003	1,1-DCA	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5		<0.5	<0.5	<0.5
1st	2004	1,1-DCA	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2004	1,1-DCA	<0.5	<0.5	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3rd	2004	1,1-DCA	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5										
4th	2004	1,1-DCA	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	< 0.5	<0.5	<0.5	<0.5	<0.5
1st	2005	1,1-DCA	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2005	1,1-DCA	<0.5	<0.5	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3rd	2005	1,1-DCA	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5											
4th	2005	1,1-DCA	< 0.5		< 0.5		< 0.5						< 0.5	< 0.5				< 0.5						
1st	2006	1,1-DCA	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5	< 0.5										
2nd	2006	1,1-DCA	< 0.5		< 0.5	< 0.5	< 0.5						< 0.5					< 0.5						
3rd	2006	1,1-DCA	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5		< 0.5		< 0.5											
4th	2006	1,1-DCA	< 0.5		< 0.5		< 0.5	< 0.5	< 0.5		< 0.5		< 0.5											

Qtr	Year	COC	K	K QC	L	N	N QC	GRUVER	GRUVER QC	LINDSKOG	PELLOW	PELLOW QC
1st	2002	1,1,1-TCA										
2nd	2002	1,1,1-TCA	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5		<0.5
3rd	2002	1,1,1-TCA										
4th	2002	1,1,1-TCA	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5		<0.5
1st	2003	1,1,1-TCA										
2nd	2003	1,1,1-TCA	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
3rd	2003	1,1,1-TCA										
4th	2003	1,1,1-TCA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1st	2004	1,1,1-TCA										
2nd	2004	1,1,1-TCA	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
3rd	2004	1,1,1-TCA										
4th	2004	1,1,1-TCA	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
1st	2005	1,1,1-TCA										
2nd	2005	1,1,1-TCA	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
3rd	2005	1,1,1-TCA										
4th	2005	1,1,1-TCA	< 0.5	< 0.5								
1st	2006	1,1,1-TCA										
2nd	2006	1,1,1-TCA	< 0.5									
3rd	2006	1,1,1-TCA										
4th	2006	1,1,1-TCA										
1st	2002	1,1-DCA										
2nd	2002	1,1-DCA	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5		<0.5
3rd	2002	1,1-DCA										
4th	2002	1,1-DCA	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5		<0.5
1st	2003	1,1-DCA										
2nd	2003	1,1-DCA	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
3rd	2003	1,1-DCA										
4th	2003	1,1-DCA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1st	2004	1,1-DCA										
2nd	2004	1,1-DCA	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
3rd	2004	1,1-DCA										
4th	2004	1,1-DCA	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
1st	2005	1,1-DCA										
2nd	2005	1,1-DCA	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
3rd	2005	1,1-DCA										
4th	2005	1,1-DCA	< 0.5	< 0.5								
1st	2006	1,1-DCA										
2nd	2006	1,1-DCA	< 0.5									
3rd	2006	1,1-DCA										
4th	2006	1,1-DCA										

			Compliance Wells																					
Qtr	Year	COC	208	208 QC	BB	BB QC	C	CC QC	PEW	PEW QC	M	M QC	T	T QC	G	P	U	E	E QC	F	H	I	J	J QC
1st	2002	chloroform	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2002	chloroform	<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3rd	2002	chloroform	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		< 0.5											
4th	2002	chloroform	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1st	2003	chloroform	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		< 0.5											
2nd	2003	chloroform	<0.5	<0.5	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	< 0.5	<0.5	<0.5	<0.5	<0.5
3rd	2003	chloroform	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		< 0.5											
4th	2003	chloroform	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5		<0.5	<0.5	<0.5
1st	2004	chloroform	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		< 0.5											
2nd	2004	chloroform	<0.5	<0.5	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	< 0.5	<0.5	<0.5	<0.5	<0.5
3rd	2004	chloroform	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	< 0.5										
4th	2004	chloroform	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1st	2005	chloroform	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		< 0.5											
2nd	2005	chloroform	<0.5	<0.5	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	< 0.5	<0.5	<0.5	<0.5	<0.5
3rd	2005	chloroform	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5											
4th	2005	chloroform	< 0.5		< 0.5		< 0.5						< 0.5	< 0.5				< 0.5						
1st	2006	chloroform	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5	< 0.5										
2nd	2006	chloroform	< 0.5		< 0.5	< 0.5	< 0.5						< 0.5					< 0.5						
3rd	2006	chloroform	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5		< 0.5		< 0.5											
4th	2006	chloroform	< 0.5		< 0.5		< 0.5	< 0.5	< 0.5		< 0.5		< 0.5											
1st	2002	trans-1,2-DCE	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2002	trans-1,2-DCE	<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3rd	2002	trans-1,2-DCE	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
4th	2002	trans-1,2-DCE	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1st	2003	trans-1,2-DCE	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2003	trans-1,2-DCE	<0.5	<0.5	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3rd	2003	trans-1,2-DCE	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
4th	2003	trans-1,2-DCE	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5		<0.5	<0.5	<0.5
1st	2004	trans-1,2-DCE	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2004	trans-1,2-DCE	<0.5	<0.5	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3rd	2004	trans-1,2-DCE	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5										
4th	2004	trans-1,2-DCE	<0.5		<0.5		<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1st	2005	trans-1,2-DCE	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2005	trans-1,2-DCE	<0.5	<0.5	<0.5		<0.5		<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3rd	2005	trans-1,2-DCE	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5											
4th	2005	trans-1,2-DCE	< 0.5		< 0.5		< 0.5						< 0.5	< 0.5				< 0.5						
1st	2006	trans-1,2-DCE	< 0.5		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5	< 0.5										
2nd	2006	trans-1,2-DCE	< 0.5		< 0.5	< 0.5	< 0.5						< 0.5					< 0.5						
3rd	2006	trans-1,2-DCE	< 0.5		< 0.5	< 0.5	< 0.5		< 0.5		< 0.5		< 0.5											
4th	2006	trans-1,2-DCE	< 0.5		< 0.5		< 0.5	< 0.5	< 0.5		< 0.5		< 0.5											

Qtr	Year	COC	K	K QC	L	N	N QC	GRUVER	GRUVER QC	LINDSKOG	PELLOW	PELLOW QC
1st	2002	chloroform										
2nd	2002	chloroform	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5		<0.5
3rd	2002	chloroform										
4th	2002	chloroform	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5		<0.5
1st	2003	chloroform										
2nd	2003	chloroform	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
3rd	2003	chloroform										
4th	2003	chloroform	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1st	2004	chloroform										
2nd	2004	chloroform	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
3rd	2004	chloroform										
4th	2004	chloroform	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
1st	2005	chloroform										
2nd	2005	chloroform	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
3rd	2005	chloroform										
4th	2005	chloroform	< 0.5	< 0.5								
1st	2006	chloroform										
2nd	2006	chloroform	< 0.5									
3rd	2006	chloroform										
4th	2006	chloroform										
1st	2002	trans-1,2-DCE										
2nd	2002	trans-1,2-DCE	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5		<0.5
3rd	2002	trans-1,2-DCE										
4th	2002	trans-1,2-DCE	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5		<0.5
1st	2003	trans-1,2-DCE										
2nd	2003	trans-1,2-DCE	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
3rd	2003	trans-1,2-DCE										
4th	2003	trans-1,2-DCE	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1st	2004	trans-1,2-DCE										
2nd	2004	trans-1,2-DCE	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
3rd	2004	trans-1,2-DCE										
4th	2004	trans-1,2-DCE	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
1st	2005	trans-1,2-DCE										
2nd	2005	trans-1,2-DCE	<0.5		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5
3rd	2005	trans-1,2-DCE										
4th	2005	trans-1,2-DCE	< 0.5	< 0.5								
1st	2006	trans-1,2-DCE										
2nd	2006	trans-1,2-DCE	< 0.5									
3rd	2006	trans-1,2-DCE										
4th	2006	trans-1,2-DCE										

			Compliance Wells																					
Qtr	**Year**	**COC**	**208**	**208 QC**	**BB**	**BB QC**	**C**	**CC QC**	**PEW**	**PEW QC**	**M**	**M QC**	**T**	**T QC**	**G**	**P**	**U**	**E**	**E QC**	**F**	**H**	**I**	**J**	**J QC**
1st	2002	VC	<0.5		<0.5	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5											
2nd	2002	VC	<0.5		<0.5		<0.5	<0.5	<0.3		<0.3	<0.3	<0.5		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
3rd	2002	VC	<0.5		<0.5	<0.5	<0.5		<0.3	<0.3	<0.3		<0.5											
4th	2002	VC	<0.5		<0.5		<0.5		<0.5		<0.3	<0.3	<0.3	<0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
1st	2003	VC	<0.5		<0.5	<0.5	<0.5		<0.3	<0.3	<0.3		<0.5											
2nd	2003	VC	<0.5	<0.5	<0.5		<0.5		<0.3		<0.3	<0.3	<0.5		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
3rd	2003	VC	<0.5		<0.5	<0.5	<0.5		<0.3	<0.3	<0.3		<0.5											
4th	2003	VC	<0.5		<0.5		<0.5		<0.3		<0.3	<0.3	<0.5	<0.5	<0.3	<0.3	<0.3	<0.3		<0.3		<0.3	<0.3	<0.3
1st	2004	VC	<0.5		<0.5	<0.5	<0.5		<0.3	<0.3	<0.3		<0.5											
2nd	2004	VC	<0.5	<0.5	<0.5		<0.5		<0.3		<0.3	<0.3	<0.5		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
3rd	2004	VC	<0.5		<0.5		<0.5		<0.3	<0.3	<0.3		<0.5	<0.5										
4th	2004	VC	<0.5		<0.5		<0.5		<0.3		<0.3	<0.3	<0.5	<0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
1st	2005	VC	<0.5		<0.5	<0.5	<0.5		<0.3	<0.3	<0.3		<0.5											
2nd	2005	VC	<0.5	<0.5	<0.5		<0.5		<0.3		<0.3	<0.3	<0.5		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
3rd	2005	VC	< 0.3		< 0.3	< 0.3	< 0.3		< 0.3	< 0.3	< 0.3		< 0.3											
4th	2005	VC	< 0.3		< 0.3		< 0.3						< 0.3	< 0.3				< 0.3						
1st	2006	VC	< 0.3		< 0.3		< 0.3		< 0.3		< 0.3		< 0.3	< 0.3										
2nd	2006	VC	< 0.3		< 0.3	< 0.3	< 0.3						< 0.3					< 0.3						
3rd	2006	VC	< 0.3		< 0.3	< 0.3	< 0.3		< 0.3		< 0.3		< 0.3											
4th	2006	VC	< 0.3		< 0.3		< 0.3	< 0.3	< 0.3		< 0.3		< 0.3											

Qtr	Year	COC	K	K QC	L	N	N QC	GRUVER	GRUVER QC	LINDSKOG	PELLOW	PELLOW QC
1st	2002	VC										
2nd	2002	VC	<0.3		<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3
3rd	2002	VC										
4th	2002	VC	<0.3		<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3
1st	2003	VC										
2nd	2003	VC	<0.3		<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3
3rd	2003	VC										
4th	2003	VC	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
1st	2004	VC										
2nd	2004	VC	<0.3		<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3
3rd	2004	VC										
4th	2004	VC	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3
1st	2005	VC										
2nd	2005	VC	<0.3		<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	<0.3
3rd	2005	VC										
4th	2005	VC	< 0.3	< 0.3								
1st	2006	VC										
2nd	2006	VC	< 0.3									
3rd	2006	VC										
4th	2006	VC										

Appendix E – Selected Landfill Monitoring Reports

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City of Spokane, Washington **Northside Landfill** **Report for July, 2006**
Solid Waste Management **Interior Gas Field Report**

Well No.	Well Depth	Date/Time	CH4	CO2	O2	Bal	Temp	Static Pres	Comp Ratio	Comments
	Ft.		%	%	%	%	Deg. F	" H2O		
1	49	7/26/2006 13:36	25.1	24.4	0.1	50.4	107	-0.2	0.081	
2	90	7/26/2006 14:04	32.4	25.8	0	41.8	83	-0.7	0.058	
3	43	7/26/2006 13:47	11.9	18.6	0	69.5	89	-0.5	0.137	
4	55	7/26/2006 13:51	14.6	19.8	0	65.6	93	-0.5	0.124	
4	55	7/31/2006 14:05	11.5	19.7	0	68.8	78	-0.3	0.139	opened valve slightly
4	55	7/31/2006 14:08	11.8	19.7	0	68.5	79	-0.4	0.138	
5	79	7/26/2006 14:10	41.8	27.3	0	30.9	94	-0.2	0.032	
6	105	7/28/2006 9:23	47.5	34.8	0	17.7	89	-2.3	0.019	
7	69	7/26/2006 14:16	21.1	22.1	0	56.8	89	-0.4	0.097	
8	92	7/27/2006 8:47	37.1	25.2	0	37.7	77	-0.3	0.044	
9	97	7/28/2006 9:19	48.3	35.6	0	16.1	85	-1.9	0.017	
10	74	7/26/2006 14:21	19.9	22	0	58.1	87	-0.4	0.101	
11	96	7/27/2006 8:42	36.3	27	0.7	36	77	-0.2	0.042	
12	96	7/28/2006 9:13	43.4	32.4	0	24.2	89	-3.1	0.028	
13	95	7/7/2006 14:37	45.1	34.5	0.1	20.3	89	-1.7	0.024	
13	95	7/27/2006 10:37	44.2	35.1	0.1	20.6	90	-2.4	0.026	closed valve slightly
13	95	7/27/2006 14:21	47.9	34.1	0	18	98	-1	0.018	
13	95	7/28/2006 9:16	44.8	35.4	0	19.8	90	-2.7	0.025	
14	71	7/26/2006 14:26	18.6	21	0	60.4	87	-0.3	0.107	
15	92	7/26/2006 14:32	33	25.7	0	41.3	85	-0.1	0.056	
16	96	7/28/2006 9:08	47.5	36.3	0	16.2	95	-3.7	0.019	
17	61	7/26/2006 14:38	23.4	23.3	0.4	52.9	81	-0.3	0.085	
18	91	7/27/2006 8:11	21.2	24.6	1.3	52.9	93	-0.1	0.087	opened valve slightly
18	91	7/27/2006 8:21	23.6	25.1	1	50.3	94	-0.3	0.080	
19	88	7/28/2006 9:05	50.7	37.7	0	11.6	91	-3.9	0.012	
20	91	7/27/2006 10:42	26.4	29.1	0.1	44.4	83	-0.6	0.076	
21	59	7/26/2006 14:43	18.4	22.3	0.7	58.6	85	-0.3	0.102	
22	95	7/27/2006 8:03	27.9	24	0.6	47.5	83	-0.1	0.068	
23	90	7/27/2006 10:19	2.4	16.8	3.8	77	83	0.1	0.157	Well closed
24	89	7/28/2006 9:01	42.2	34.9	0	22.9	72	-0.4	0.031	
25	67	7/27/2006 7:57	1.4	18.2	0.8	79.6	76	0.1	0.192	Well closed
26	51	7/27/2006 10:15	2.4	14.6	2.4	80.6	88	0.2	0.170	Well closed
27	60	7/27/2006 10:11	34.5	31.6	0.4	33.5	86	-0.106	0.049	
28	71	7/28/2006 8:44	45.4	35.9	0	18.7	81	-0.5	0.024	
29A	41	7/31/2006 15:47	15.5	23.6	0.4	60.5	76	-0.035	0.117	Vlv not closing properly
29B	56	7/27/2006 11:00	35.1	30.8	1.3	32.8	99	-0.3	0.042	
30	43	7/27/2006 11:19	12.6	20.3	3.8	63.3	119	-0.144	0.103	opened valve slightly
30	43	7/27/2006 11:23	13	20.7	3.6	62.7	106	-0.1	0.103	
31	61	7/27/2006 11:29	30.9	29.5	1.4	38.2	76	-0.7	0.053	
32	61	7/28/2006 8:57	43.1	35.3	0	21.6	86	-1	0.029	
33	44	7/28/2006 8:49	40.3	34.5	0	25.2	71	-0.3	0.036	
34	67	7/27/2006 11:38	40.2	34.7	0.3	24.8	82	-0.2	0.035	
35	59	7/28/2006 8:53	38.9	33.6	0	27.5	78	-0.3	0.040	
36	52	7/27/2006 11:51	39.3	35.3	0.3	25.1	76	-0.2	0.037	
37	60	7/27/2006 11:55	27.6	30.4	0.2	41.8	78	-0.3	0.072	
38	37	7/27/2006 12:20	12.2	23.8	0.3	63.7	81	-0.2	0.133	
39	31	7/27/2006 12:23	4.4	19.6	0.6	75.4	94	0	0.174	Well closed
40	76	7/27/2006 12:01	20.1	24.9	0.2	54.8	78	-0.3	0.099	

City of Spokane, Washington **Northside Landfill** **Report for July, 2006**
Solid Waste Management **Interior Gas Field Report**

Well No.	Well Depth	Date/Time	CH4	CO2	O2	Bal	Temp	Static Pres	Comp Ratio	Comments
	Ft.		%	%	%	%	Deg. F	" H2O		
41	97	7/28/2006 9:29	39.8	29.3	0	30.9	82	-0.7	0.037	
42	61	7/27/2006 12:09	21.5	21.7	0.3	56.5	78	-0.2	0.093	
43	90	7/27/2006 12:14	32.2	26.9	0.3	40.6	78	-0.2	0.056	
44	52	7/26/2006 13:41	2.4	16.5	0	81.1	100	0	0.193	Well closed
44	52	7/27/2006 12:33	3.1	16.5	0.2	80.2	101	0	0.186	Well closed
45	Trench	7/27/2006 12:28	21.8	23.2	0.2	54.8	88	0	0.092	P = -0.003
46	Trench	7/27/2006 14:49	16.4	20.4	0	63.2	67	-0.1	0.116	
47	Trench	7/27/2006 14:27	18.4	15.8	0	65.8	104	0.2	0.108	Well closed
48	Trench	7/27/2006 14:34	19.9	19.9	0	60.2	71	-0.1	0.101	
49	Trench	7/27/2006 14:38	13.4	19	0	67.6	77	0	0.130	opened valve slightly
49	Trench	7/27/2006 14:41	13.3	18.9	0	67.8	73	-0.1	0.131	

Comments

The valve at IW-29A will be replaced, as I have not been able to clean it well enough to close properly.

January

MAIN LFG SUCTION - TEST PT. D
14" diameter line

Date/Time	CH4	CO2	O2	Bal	Adj Flow	Temp	Static Pres	Comp. Ratio	Comments
	%	%	%	%	scfm	Deg F	" H20		
1/4/2006 8:37	25.8	26.8	1.0	46.4	1190	40	-45	0.072	O2 too high. Looked for problem
1/4/2006 12:57	26.5	27.2	0.5	45.8	1199	40	-44.3	0.073	Problem was gas from Pt. "H"
1/19/2006 15:07	27.9	28.3	0.5	43.3	960	40	-47	0.069	
1/26/2006 16:11	29	28.6	0.2	42.2	997	39	-48.7	0.067	

INTERIOR LFG SYSTEM-M1- EXCESS FOR FLARE- TEST PT. E
14" diameter line

Date/Time	CH4	CO2	O2	Bal	Adj Flow	Temp	Static Pres	Comp. Ratio	Comments
	%	%	%	%	scfm	Deg F	" H20		
1/4/2006 8:41	35.9	31.2	0.5	32.4	610	41	-22.6	0.045	
1/4/2006 13:08	36.3	31.6	0.1	32	595	41	-19.3	0.046	
1/19/2006 15:12	36.8	31.7	0.0	31.5	639	40	-22.3	0.045	
1/26/2006 16:14	36.6	31.3	0.0	32.1	901	40	-22.3	0.046	

INTERIOR LFG SYSTEM - M1 - TOTAL FLOW - TEST PT. F
14" diameter line

Date/Time	CH4	CO2	O2	Bal	Adj Flow	Temp	Static Pres	Comp. Ratio	Comments
	%	%	%	%	scfm	Deg F	" H20		
1/4/2006 8:44	35.9	31.3	0.3	32.5	596	40	-22.7	0.046	
1/4/2006 13:11	36.5	31.7	0.0	31.8	574	41	-21.5	0.046	
1/19/2006 15:15	37.3	31.9	0.0	30.8	676	40	-21.1	0.044	
1/26/2006 16:16	36.4	31.4	0.0	32.2	681	39	-23.9	0.046	

INTERIOR LFG SYSTEM - M2 - TEST PT. G
8" diameter line

Date/Time	CH4	CO2	O2	Bal	Adj Flow	Temp	Static Pres	Comp. Ratio	Comments
	%	%	%	%	scfm	Deg F	" H20		
1/4/2006 8:46	20.7	25.8	1.0	52.5	404	40	-25	0.091	
1/4/2006 13:14	21.5	26.3	0.6	51.6	378	41	-24.3	0.091	
1/19/2006 15:18	21.6	26.5	0.5	51.4	456	40	-24.7	0.091	
1/26/2006 16:18	23.4	27.1	0.3	49.2	511	39	-25.7	0.086	

INTERIOR LFG SYSTEM - T1 - TEST PT. H
10" diameter line

Date/Time	CH4	CO2	O2	Bal	Adj Flow	Temp	Static Pres	Comp. Ratio	Comments
	%	%	%	%	scfm	Deg F	" H20		
1/4/2006 8:48	14.4	18.2	1.7	65.7	171	42	-42.4	0.112	O2 higher than normal. Check wells
1/4/2006 13:17	15.6	19	0.6	64.8	65	43	-41.5	0.115	Adjusted wells on T1 line.
1/19/2006 15:20	16.1	19.9	0.0	64	56	41	-46.4	0.117	
1/26/2006 16:20	16.8	19.9	0.0	63.3	107	41	-47.2	0.114	

Comments

Gas quality has been low this month, but we do see drops during the winter months. During the first week higher than normal O2 was noticed in a flare station reading. It was traced back to wells on the T1 line which were readjusted. The flare station readings then went back to normal range.

FLARE STATUS REPORT

Date/Time	Flow scfm	Temperature deg F
1/4/2006 6:54	826	1561
1/9/2006 7:01	808	1578
1/19/2006 7:09	795	1581
1/26/2006 6:54	800	1569

Energy Statistics

	January		Summary: Year to Date
AVG CH4 %/month *	31.9	Avg.	31.9
TOTAL CH4 scf/month	11,370,691	Total	11,370,691
Btu/scf Incoming LFG	322.8	Avg.	322.8
AVG FLOW scfm *	800	Avg.	800
AVG FLOW scfm/month	35,644,800	Avg.	35,644,800
MAX FLOW RATE During Month scf *	822	Avg.	822
AVG MAX FLOW scfm/month	36,625,032	Avg.	36,625,032
MAX HOURLY FLOW RATE scf	49,320	Avg.	49,320
TOTAL FLOW FLARES scf/month	35,644,800	Total	35,644,800
EST. ENERGY Flared/month Btu	11,507,139,494	Total	11,507,139,494
TOTAL TIME IN MONTH (minutes) *	44,640	Total	44,640
DOWN TIME IN MONTH (minutes) *	84	Total	84
TOTAL OPERATING TIME (minutes)	44,556	Total	44,556

City of Spokane, Washington **Northside Landfill** **Report for July, 2006**
Solid Waste Mangement **Gas Probes**

Gas Probe ID	Probe Depth	Date/Time	CH4	CO2	O2	Bal	Static Pres	Comments
	Ft.		%	%	%	%	" H2O	
1	18.0	7/20/2006 9:04	0	1.8	12.9	85.3	0	
2	17.5	7/20/2006 9:08	0	3.1	7	89.9	0	
3	17.5	7/12/2006 9:46	0	0	21	79	0	
3	17.5	7/20/2006 9:12	0	14.2	3.3	82.5	0	
4A	10.8	7/20/2006 9:40	0	1.3	19.2	79.5	0	
4B	39.8	7/20/2006 9:43	0	0.6	19.8	79.6	0	
4C	96.3	7/20/2006 9:45	0	0.3	20.4	79.3	0	
5A	11.8	7/24/2006 10:55	0	0.2	20.4	79.4	-0.1	
5B	40.8	7/24/2006 10:57	0	1.4	19.4	79.2	0	
5C	96.6	7/24/2006 10:59	0	0.6	20	79.4	0	
6A	11.3	7/20/2006 9:56	0	1.8	18.9	79.3	0	
6B	40.8	7/20/2006 9:58	0	0.4	20.4	79.2	0	
6C	96.4	7/20/2006 10:01	0	1.3	19.4	79.3	0	
7A	10.8	7/24/2006 11:35	0	0.8	18.1	81.1	0.4	
7B	30.8	7/24/2006 11:36	0	0.8	13.6	85.6	0	
7C	76.8	7/24/2006 11:38	0	0.2	16.6	83.2	0	
8A	10.3	7/24/2006 12:14	0	0	20.5	79.5	-0.1	
8B	30.4	7/24/2006 12:16	0	0.7	19.8	79.5	-0.1	
8C	66.8	7/24/2006 12:18	0	1.4	13.5	85.1	0	
9A	11.8	7/24/2006 10:40	0	1.3	19.6	79.1	0	
9B	40.8	7/24/2006 10:42	0	0	20.7	79.3	0	
9C	96.8	7/24/2006 10:44	0	0	20.5	79.5	0	
10A	12.5	7/7/2006 14:21	0	0.1	20.4	79.5	0	
10A	12.5	7/25/2006 10:27	0	0.4	19.4	80.2	0	
10B	41.7	7/25/2006 10:30	0	0	20.3	79.7	0	
10C	62.0	7/25/2006 10:33	0	0	20.4	79.6	0	
11A	14.2	7/24/2006 12:01	0	0	20.4	79.6	0	
11B	42.7	7/24/2006 12:02	0	0.6	18.1	81.3	0	
11C	61.8	7/24/2006 12:04	0	0.2	20.1	79.7	-0.1	
12A	13.8	7/24/2006 11:51	0	0.2	20.5	79.3	-0.1	
12B	42.5	7/24/2006 11:52	0	0.1	20.7	79.2	0	
12C	67.0	7/24/2006 11:54	0	0	21.1	78.9	0	
13A	14.1	7/25/2006 10:41	0	0.7	19.7	79.6	0	
13B	41.6	7/25/2006 10:43	0	0.1	20.3	79.6	0	
13C	79.3	7/26/2006 11:04	0	0	21.1	78.9	0	
14A	14.2	7/7/2006 14:28	0	1.9	14.5	83.6	0	
14A	14.2	7/26/2006 9:49	0	4.7	12.1	83.2	0	
14B	42.5	7/26/2006 9:51	0	0	19.1	80.9	0	
14C	55.5	7/26/2006 9:53	0	0.3	20	79.7	0	
15A	13.2	7/26/2006 10:24	0	0.4	19.3	80.3	0	
15B	42.0	7/26/2006 10:26	0	0	20.9	79.1	0	
15C	65.1	7/26/2006 10:28	0	0.2	19.8	80	0	
16A	14.1	7/24/2006 12:25	0	0.4	20.3	79.3	-0.1	
16B	42.7	7/24/2006 12:27	0	0	20.8	79.2	-0.1	
16C	58.1	7/24/2006 12:29	0	0	21	79	0	

City of Spokane, Washington **Northside Landfill** **Report for July, 2006**
Solid Waste Mangement **Gas Probes**

Gas Probe ID	Probe Depth	Date/Time	CH4	CO2	O2	Bal	Static Pres	Comments
	Ft.		%	%	%	%	" H2O	
17A	16.0	7/25/2006 10:59	0	0.6	16.7	82.7	0	
17B	47.5	7/25/2006 11:00	0	0.7	19.1	80.2	0	
17C	63.5	7/25/2006 11:02	0	0.2	19.8	80	0	
18A	15.0	7/25/2006 11:07	0	0.8	16.2	83	0	
18B	47.5	7/25/2006 11:09	0	1.4	18.1	80.5	0	
18C	63.5	7/25/2006 11:11	0	0.9	17.6	81.5	0.1	
19A	15.0	7/25/2006 11:29	0	4.5	11.8	83.7	0	
19B	47.5	7/25/2006 11:31	0	3.1	14.7	82.2	0	
19C	65.5	7/25/2006 11:33	0	0.9	17.3	81.8	0	
20AA	16.5	7/25/2006 12:01	0	0.4	19	80.6	0	
20AB	47.5	7/25/2006 12:02	0	2.4	16.9	80.7	0	
20AC	67.0	7/25/2006 12:05	0.2	3.4	9.6	86.8	0	Detected CH4
20BA	16.5	7/25/2006 12:18	0	0.4	19.3	80.3	0	
20BB	47.5	7/25/2006 12:20	0	1.3	18	80.7	0	
20BC	72.5	7/25/2006 12:22	0	1.3	7.8	90.9	0.1	
20XA	16.5	7/25/2006 11:54	0	1.3	14.4	84.3	0	
20XB	46.0	7/25/2006 11:55	0	2	16.5	81.5	0	
20XC	65.5	7/25/2006 11:57	0	2.1	14.1	83.8	0	
21A	16.5	7/25/2006 14:25	0	4.2	9.2	86.6	0	
21B	47.5	7/25/2006 14:27	0	1.9	17.3	80.8	0	
21C	66.5	7/25/2006 14:29	0	1.6	8.4	90	0.1	
22A	16.5	7/25/2006 14:45	0	1.3	12.6	86.1	0	
22B	47.5	7/25/2006 14:47	0	1	16.1	82.9	0	
22C	64.5	7/25/2006 14:49	0	0.9	15.9	83.2	0.1	
23A	16.5	7/26/2006 8:46	0	1.1	13.6	85.3	0	
23B	47.5	7/26/2006 8:48	0	1.6	14.1	84.3	0	
23C	62.5	7/26/2006 8:50	0	1.7	15.1	83.2	0	
24A	16.5	7/26/2006 9:02	0	6.4	6.8	86.8	0	
24B	47.5	7/26/2006 9:03	0	1.4	14.7	83.9	0	
24C	62.5	7/26/2006 9:05	0	1.4	11.8	86.8	0	
25A	16.5	7/26/2006 9:32	0	3.5	10.2	86.3	0	
25B	47.5	7/26/2006 9:34	0	0.3	18.1	81.6	0	
25C	67.5	7/26/2006 9:36	0	0.8	18.8	80.4	0	
26A	16.5	7/26/2006 10:04	0	0.9	14.6	84.5	0	
26B	50.5	7/26/2006 10:05	0	1.2	16.5	82.3	0	
26C	85.5	7/26/2006 10:07	0	0.7	18.4	80.9	0	
MWB1	22.0	7/26/2006 10:43	0	0	20.4	79.6	0	
MWB2	102.0	7/26/2006 10:46	0	0	20.9	79.1	0	
MWB3	168.0	7/26/2006 10:49	0	0	20.8	79.2	-0.8	

Comments

20AC: Found 0.2% CH4. Increased vaccuum at interior gas well 04 to draw gas back to landfill interior.

Appendix F – Completed Site Inspection Checklist

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Site Inspection Checklist

I. SITE INFORMATION	
Site name: Navtesi	**Date of inspection:** 7/11/2007
Location and Region: Spokane Co. WA	**EPA ID:**
Agency, office, or company leading the five-year review: USACE for USEPA	**Weather/temperature:** Sunny, 90

Remedy Includes: (Check all that apply)

- (G) Landfill cover/containment
- (G) Access controls
- (G) Institutional controls
- (G) Groundwater pump and treatment
- (G) Surface water collection and treatment
- G Other _____

- G Monitored natural attenuation
- (G) Groundwater containment (via PRT)
- G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Dean Fowler (Name) Senior Engr (Title) 07/11/07 (Date)
   Interviewed (G) at site G at office G by phone Phone no. (509) 625-7890
   Problems, suggestions; G Report attached
   O&M plan has been updated & submitted to Ecology & local website in June 2007.

2. **O&M staff** Steve Andersen (Name) Lab Technician (Title) 07/12/07 (Date)
   Interviewed (G) at site G at office G by phone Phone no. (509) 625 6905
   Problems, suggestions; G Report attached
   Remedy appears to be working since the levels have been steadily reducing.

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

Agency	Contact Name	Title	Date	Phone no.
Ecology (WA State)	Bill Rees	Environmental Engineer	07/11/07	509 329-3589

Problems; suggestions; G Report attached _____

Agency	Contact Name	Title	Date	Phone no.

Problems; suggestions; G Report attached _____

Agency	Contact Name	Title	Date	Phone no.

Problems; suggestions; G Report attached _____

Agency	Contact Name	Title	Date	Phone no.

Problems; suggestions; G Report attached _____

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

None

Rick Deibel, Lab Technician, 07/12/07
(509) 625-6905

Spokane Region Clean Air Agency

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

1. **O&M Documents** constantly evolving - sampling plan
   - G O&M manual — G Readily available — G Up to date — G N/A
   - G As-built drawings — G Readily available — G Up to date — G N/A
   - G Maintenance logs — G Readily available — G Up to date — G N/A
   - Remarks

2. **Site-Specific Health and Safety Plan** — G Readily available — G Up to date — G N/A
   - G Contingency plan/emergency response plan — G Readily available — G Up to date — G N/A
   - Remarks SSHP hasn't been checked for the O&M, but safety is managed via the active cell; on its way

3. **O&M and OSHA Training Records** — G Readily available — G Up to date — G N/A
   - Remarks Annual training

4. **Permits and Service Agreements** worked w/ local authority to show it, no permit needed due to low concs of PCE & small
   - G Air discharge permit state waste — G Readily available — G Up to date — G N/A
   - G Effluent discharge line discharge permit — G Readily available — G Up to date — G N/A - does to stormwater
   - G Waste disposal, POTW Not needed — G Readily available — G Up to date — G N/A - changed from original design
   - G Other permits based on concs. — G Readily available — G Up to date — G N/A ? system has to be available as backup
   - Remarks Two air discharges: methane & GW for treatment; permit for methane - venting; check on GW

5. **Gas Generation Records** — G Readily available — G Up to date — G N/A
   - Remarks many forms; examples provided & the flow meter; grab samples - daily & weekly; visually managed

   multiple lines gas field management to adjust

6. **Settlement Monument Records** — G Readily available — G Up to date — G N/A
   - Remarks

7. **Groundwater Monitoring Records** — G Readily available — G Up to date — G N/A
   - Remarks

8. **Leachate Extraction Records** — G Readily available — G Up to date — G N/A
   - Remarks

   sampling at initial pilot study. Ecology was satisfied (incl. to EPA) 1997/1998

9. **Discharge Compliance Records**
   - G Air — G Readily available — G Up to date — G N/A
   - G Water (effluent) - hasn't been — G Readily available — G Up to date — G N/A
   - Remarks few sample = samples at the time of switching over pilot extraction water not sampled

10. **Daily Access/Security Logs** — G Readily available — G Up to date — G N/A
    - Remarks Security company - keeps up security; no sign in/out for maintenance area. Security after hours every 15 min; 5 days a week, which alternates

Compliance monitoring - perimeter probes, SCAPCA lead agency

problems w/ liner -

settling as garbage decomposes; wells have shifted due to settling/shifting of garbage.

not specifically for COCs but submitted info SCAPCA

SCAPCA changed name

IV. O&M COSTS

1. **O&M Organization**

G State in-house G Contractor for State
G PRP in-house G Contractor for PRP
G Federal Facility in-house G Contractor for Federal Facility
G Other City of Spokane

2. **O&M Cost Records** phone call to accountant

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

Total annual cost by year for review period if available

YR	~~From~~ 2002 Date	~~To~~ Date	Total cost	G Breakdown attached
YR	From 2003 Date	~~To~~ Date	Total cost	G Breakdown attached
YR	~~From~~ 2004 Date	~~To~~ Date	Total cost	G Breakdown attached
YR	~~From~~ 2005 Date	~~To~~ Date	Total cost	G Breakdown attached
YR	~~From~~ 2006 Date	~~To~~ Date	Total cost	G Breakdown attached

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

Describe costs and reasons: None at initial thought
Used run generators to offset electrical costs of running pumps.

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

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

Remarks Fencing was intact for the 3 quarters of site driven. Other ¼ was wooded & not visited. Should be intact

B. Other Access Restrictions

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

Remarks in place & proven to be effective; after vandalism in 2003

Confirm Dean is ICs manager

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — (G Yes) G No G N/A
Site conditions imply ICs not being fully enforced — (G Yes) G No G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) self-reporting driven by site manager & facility rep
Frequency Daily - operating landfill
Responsible party/agency City of Spokane
Contact Dean Fowler

Name	Title	Date	Phone no.

Reporting is up-to-date — G Yes (G No) G N/A
Reports are verified by the lead agency — G Yes G No (G N/A)
verifying w/ Bill
Specific requirements in deed or decision documents have been met — (G Yes) G No G N/A
Violations have been reported — G Yes (G No) G N/A
Other problems or suggestions: G Report attached
Past vandalism in 2004 (one incident), NO zoning overlay.
State law - no well w/in 1000' of landfill specifically w/ the
water drillers knowing city
Health dept permits new wells are aware of the issue

2. **Adequacy** (G ICs are adequate) G ICs are inadequate G N/A
Remarks

D. General

1. **Vandalism/trespassing** G Location shown on site map G No vandalism evident heavy
one time, fmr area
Remarks one time break in & breaking of equipment
windows in 2004.

2. **Land use changes on site** G N/A
Remarks Chlor. closing of one cell and opening of another

3. **Land use changes off site** G N/A
Remarks none since the build up of residences along
landfill; build up on another side; low density on NW side

VI. GENERAL SITE CONDITIONS

A. Roads (G Applicable) G N/A

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A
Remarks maintained & fully operable.

B. Other Site Conditions

Remarks _____

VII. LANDFILL COVERS G Applicable G N/A

A. Landfill Surface

1. ✓ **Settlement** (Low spots) yes — G Location shown on site map — G Settlement not evident
   Areal extent noestimate — Depth doesn't appear to be signif. cant, but does impact GPS flow and causes surging
   Remarks of settlement - doesn't seem to be a sinchole, but gravity downhill
   2" or more in spots, but not many feet

2. ✓ **Cracks** — G Location shown on site map — (G Cracking not evident)
   Lengths _____ Widths _____ Depths _____
   Remarks 1 mention of cracks

3. ✓ **Erosion** — G Location shown on site map — G Erosion not evident
   Areal extent minimal — Depth _____
   Remarks vegetative cover is sufficient; on some of the verges

4. ✓ **Holes** — G Location shown on site map — (G Holes not evident)
   Areal extent _____ — Depth _____
   Remarks places at edge of cover have more some GPS, but set repaired (lift areas)

5. ✓ **Vegetative Cover** G Grass — (G Cover properly established) — G No signs of stress
   G Trees/Shrubs (indicate size and locations on a diagram)
   Remarks good as it gets for the 3rd climate

6. X **Alternative Cover (armored rock, concrete, etc.)** (G N/A)
   Remarks _____

7. ✓ **Bulges** — G Location shown on site map — (G Bulges not evident)
   Areal extent _____ — Height _____
   Remarks _____

8. **Wet Areas/Water Damage** G Wet areas/water damage not evident

G Wet areas	G Location shown on site map	Areal extent_____
G Ponding	G Location shown on site map	Areal extent_____
G Seeps	G Location shown on site map	Areal extent_____
G Soft subgrade	G Location shown on site map	Areal extent_____

Remarks_____

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

B. Benches G Applicable G 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** G Location shown on site map G N/A or okay
Remarks_____

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

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

C. Letdown Channels G Applicable G 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** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

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

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

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent _____ Depth _____
Remarks _____

5. **Obstructions** Type _____ G No obstructions
G Location shown on site map Areal extent _____
Size _____
Remarks _____

6. **Excessive Vegetative Growth** Type _____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent _____
Remarks _____

D. Cover Penetrations (G Applicable) G N/A

1. **Gas Vents** collection G Active (G) Passive
(G) Properly secured/locked G Functioning (G) Routinely sampled (G) Good condition
(G) Evidence of leakage at penetration (G) Needs Maintenance
G N/A
Remarks just closed

2. **Gas Monitoring Probes**
G Properly secured/locked (G) Functioning (G) Routinely sampled (G) Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks outside of fence, so could be a problem but never has been

3. **Monitoring Wells** (within surface area of landfill) yes
G Properly secured/locked (G) Functioning (G) Routinely sampled (G) Good condition
G Evidence of leakage at penetration none G Needs Maintenance G N/A
Remarks _____

4. **Leachate Extraction Wells** onsite POTW active site only
G Properly secured/locked (G) Functioning (G) Routinely sampled (G) Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks _____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks _____

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

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

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks except for issues w/ settling that are being repaired

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

F. Cover Drainage Layer G Applicable G N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks

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

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks

2. **Erosion** Areal extent_____ Depth_____ N/A
   G Erosion not evident
   Remarks

3. **Outlet Works** G Functioning G N/A
   Remarks

4. **Dam** G Functioning G N/A
   Remarks

H. Retaining Walls G Applicable G N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
   Remarks_____

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

1. **Siltation** G Location shown on site map G Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
   G Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

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

4. **Discharge Structure** G Functioning G N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable G N/A

1. **Settlement** G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   G Performance not monitored
   Frequency_____ G Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES	G Applicable G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable G N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells properly operating G Needs Maintenance G N/A
   Remarks New System installed since 2002. Pumps were observed during visit; every once & while few wells go down for maintenance but would be at most 2 months/pit not in last 3-4yrs

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks everything looked clean & operational

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks

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

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks Surface water collection system was never used, but was now been accepting extracted GW.

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided ~~N/A~~
   Remarks

C. Treatment System G Applicable G N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   G Air stripping via exposure to ambient air G Carbon adsorbers
   G Filters_____
   G Additive (*e.g.*, chelation agent, flocculent)_____
   G Others_____
   G Good condition G Needs Maintenance
   G Sampling ports properly marked and functional
   G Sampling/maintenance log displayed and up to date
   G Equipment properly identified
   G Quantity of groundwater treated annually_ 800K per day x 3 days a week
   G Quantity of surface water treated annually_ 0
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   G N/A G Good condition G Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   G N/A G Good condition G Proper secondary containment G Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   G N/A G Good condition G Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   G N/A G Good condition (esp. roof and doorways) G Needs repair
   G Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   G Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks_____

D. Monitoring Data

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

2. Moritoring data suggests:
   G Groundwater plume is effectively contained G Contaminant concentrations are declining

*blue-conv w/ B.U

D. Monitored Natural Attenuation

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

G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance G N/A
Remarks applies downgradient beyond capture via flushing setting

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

The remedy is to prevent further leaching to gw of landfill COCs & to address gw contamination from original source prior to remedy in place.
The gw concentrations of COCs have been declining in the past years which indicate both components of the remedy are working. the remedy is functioning as designed

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 quarterly monitoring is done for compliance and the active component of the landfill. So that portion of the O&M isn't subject to much optimization. O&M for the P&T consists of operating the system at for 3days on/4days off to maintain control. A request will likely be made to reduce it to 2 days on/5days off. The czp is monitored via gas monitoring. A recent event where there was a high level of O2 in the monitoring led to the discovery of the 2 hole in the liner.

evidence? → double check.

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 observed or discussed Settling - issues w/ settling impacting liner; small identified construction [not indicative a major contributor to infiltration of GW [insignificant ($\frac{1}{2}$ sq ft) wrt GW · expected to be able to meet GW treatment requirements if down due to meeting
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. none - pausing w/ greater downtime on the GW treatment -- Meeting nothing other than ORM, repairs will continue · Haven't done capture zone analysis recently been done, which may allow for the lowering of system run time.

Appendix G – Site Visit Photographs – July 12, 2007

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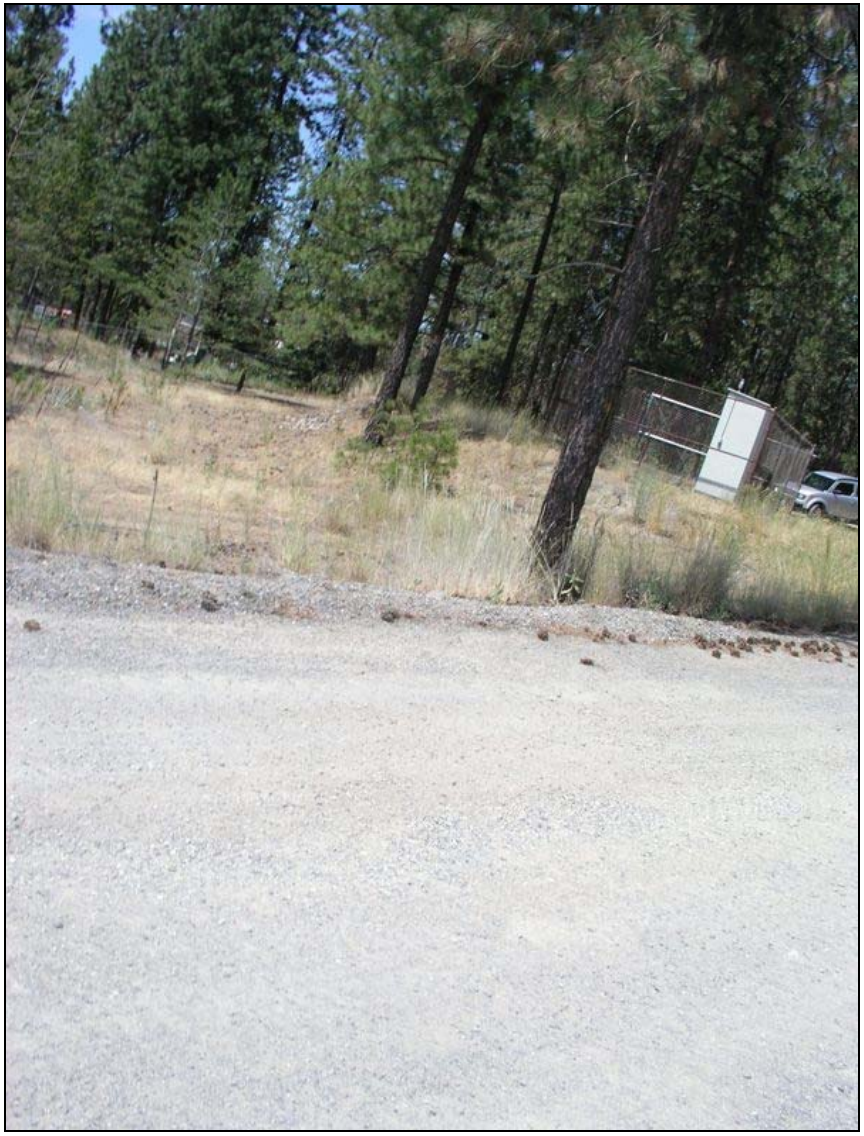
Extraction well (MW-PEW) pump house and power supply

Extraction well outfall

Collection rip rap along road from extraction well outfall to drain

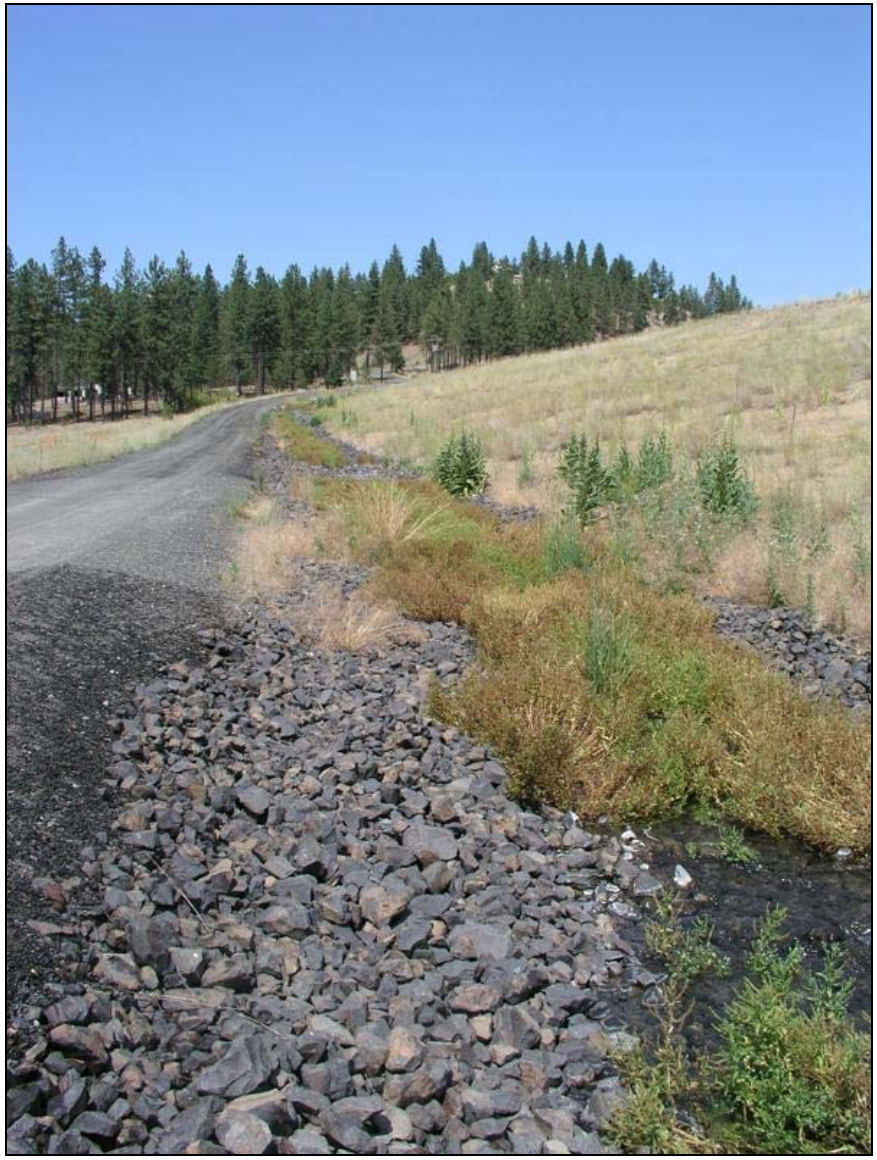
Surface water collection drain on west side of landfill access road



Extraction well pump house – view from road adjacent to outfall

View from extraction well outfall down west side of landfill road (1)

View from extraction well outfall down west side of landfill road (2)



View from west drain looking up to extraction well

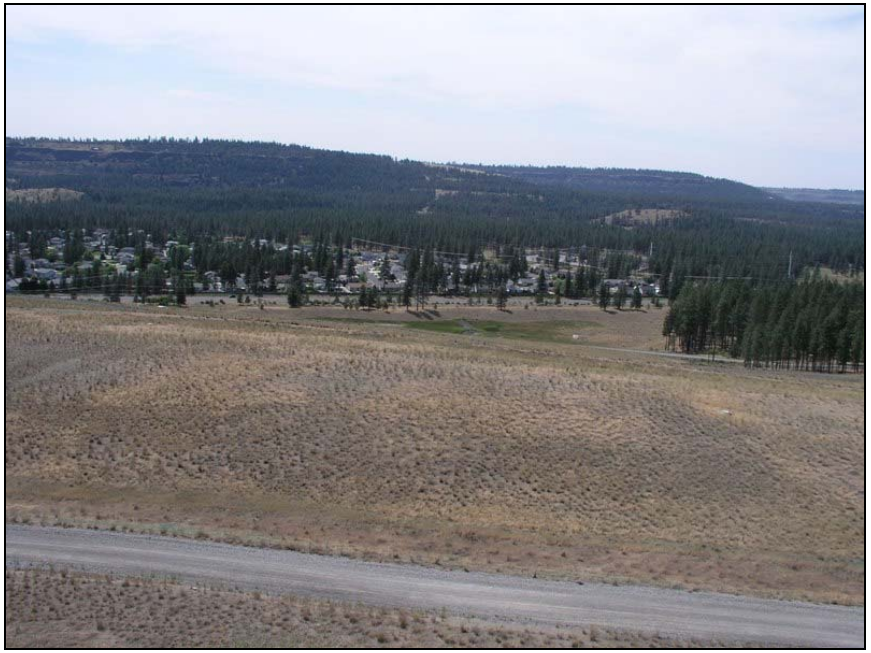
Surface water collection drain on east side of landfill road

Grassy area where extracted groundwater infiltrates surface (1)

Grassy area where extracted groundwater infiltrates surface (2)

Grassy area where extracted groundwater infiltrates surface (3)

NE view of landfill



East view of landfill (1)

East view of landfill (2)

Southeast view of landfill

South view of landfill (1)

Southwest view of landfill

South view of landfill (2)

Maintenance buildings, used primarily for active landfill

Security at landfill entrance

Entrance to maintenance facility

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Appendix H – Detailed Institutional Controls Assessment

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Evaluation of Institutional Controls

Institutional controls (ICs) are designed to prevent exposure to contamination, usually through restrictions on the use of land, ground and surface water, and other media, where contaminant levels do not allow for unlimited use and/or unrestricted exposure (UU/UE). ICs also may be used to prevent interference with remedy components or operation of the remedy.

ICs were required in the 1989 Record of Decision (ROD) for the Northside Landfill site (the Site) due to hazardous substances remaining on site at levels that do not allow for UU/UE.

As part of the 2007 Five-Year Review (FYR), the US Army Corps of Engineers (USACE) reviewed the status of Site ICs for their effectiveness in ensuring the remedy's protectiveness. Available guidance included a 2007 working draft of USEPA Guidance *Supplement to the Comprehensive Five-Year Review Guidance: Evaluation of Institutional Controls*.

This review primarily relied on following documents: The ROD, two subsequent FYRs, portions of the 1991 Consent Decree pertaining to ICs, and a 1997 court order granting the City's motion to terminate the Consent Decree. The USACE also conducted interviews with relevant personnel at the City, Ecology, and the County Health District and inspected the site.

While this review supports a determination that the existing ICs, in combination with engineering controls, are currently effective in accomplishing the goals identified in the ROD, further work is necessary to determine whether the existing ICs will be effective in the long term. At a minimum, the following is recommended:

- A review of the operating permit for the landfill and the MFS to determine the nature and duration of state-required ICs
- A review of the Institutional Controls Plan (referenced in the CD Scope of Work)
- A title search for the City's landfill property to review encumbrances and verify that deed notices are still in place
- A review of the need for access to monitoring wells on private properties, including coordination with Ecology regarding existing conveyance notification requirements, whether they are being complied with, and whether they are necessary (paragraph 55 of CD).
- A review of nearby homes with monitoring wells for compliance with conveyance notification.
- Zoning documents for the landfill property
- An evaluation of the effectiveness of the "start card" system
- Clarification of the Spokane County Health District role in ICs

It may be appropriate to include in the proposed ESD an update of ROD ICs, to address specifics of duration, extent, implementation procedures, mapping, and reporting requirements.

1. Decision Document Review

For this FYR, the 1989 Record of Decision (ROD) was reviewed for site-specific administrative restrictions and ICs. The ROD did not detail specific administrative restrictions or ICs (e.g., current zoning ordinance, enforcement mechanisms, easements, etc.), but stated the following for administrative restrictions in the "Selected Remedy" section:

> Administrative restrictions or institutional controls need to be enacted which will protect the landfill cap, monitoring wells, and the pumping and treatment system. Restrictions should be placed on the construction of new wells and the use of existing wells in the contaminated plume. These actions must be part of the planning for implementation of the remedial action.

The ROD lists as ARARs the Resource Conservation and Recovery Act and its regulations, Washington Dangerous Waste Regulations, and the Washington State Minimum Functional Standards for Solid Waste Handling. It includes the following language in the Statutory Determinations section:

> *Administrative restrictions will be effective in keeping the long-term exposure low by protecting the cap and monitoring wells system and controlling use of wells in the contaminated portions of the aquifer, until the aquifer remediation is complete.*
>
> *Nearby residents affected by contaminated groundwater, or by the action of the pumping and treatment system, will receive alternative water supplies. The City of Spokane has extended its municipal water system into the area and is supplying potable water to those residences which have contamination in excess of MCLS in their wells.*

Thus, the remedial action objectives (RAOs) for the ICs are:

- maintaining the landfill cap integrity,
- protecting remedy infrastructure, and
- protecting against exposures to contaminants of concern (COCs) in the groundwater.

Landfill cap integrity is critical to the effectiveness of the remedy in order to minimize surface water infiltration that results in contaminant migration to groundwater and prevent direct contact with landfill contaminants below the cap. The cap also prevents human exposure to COCs within the landfill.

In addition to the alternative water supply required by the ROD, the solid and hazardous waste regulations cited as ARARs in the ROD may provide sufficient controls to prevent exposure to groundwater contaminants, as discussed below. ICs should prevent drinking water wells from being placed within the contaminated plume and should prevent the use of existing wells located and screened in the contaminated zone. If the extent of the contaminated plume is understood to mean the extent of groundwater exceeding MCLs, it is likely that certain institutional controls

will not be needed outside the landfill boundary in future. Cleanup levels are now met at the landfill boundary as a result of landfill capping and interim pumping and treating. When cleanup levels are consistently met following the discontinuation of pumping and treating, it may be appropriate to modify the institutional controls.

The ROD describes the IC objectives and areas where administrative restrictions are needed, distinguishing between the landfill itself, where the cover must be protected indefinitely, and the contaminated plume, which should change over time. The duration of certain ICs is not entirely clear, and the ROD does not specify the exact mechanisms by which the ICs are to be implemented. While additional documentation is provided in various State and County laws, this area should be further evaluated.

2. Enforcement Document Review

Following the ROD, EPA entered into a Consent Decree with the City of Spokane (City) for implementation of the remedy. Paragraph 29 of the Consent Decree (Conveyance of the Site/Institutional Controls) specified the following:

A. *The restrictions and obligations set forth in this Consent Decree or developed under it shall run with the land and shall be binding upon any and all persons who acquire any interest in any property included in those portions of the Site owned by the City. Within thirty (30) calendar days of approval by the Court of this Decree, the City of Spokane as a Settling Defendant and owner of the Site shall record a coy of this Decree with the Auditor's Office, Spokane County, State of Washington. The City shall send a copy of the recorded notice to the Government Plaintiffs within five (5) days of recording.*
B. *Those portions of the Site owned by the City and described herein may be freely alienated, provided that at least sixty (60) days prior to the date of such alienation, the City notifies Government Plaintiffs of such proposed alienation, the name of the grantee, a copy of the proposed contract between the grantor and grantee, and a description of the City's obligations under this Consent Decree, if any, to be performed by such grantee. In the event of such alienation, all of the City's obligations pursuant to this Decree shall continue to be met by the City and, subject to approval by the U.S. EPA, the grantee.*
C. *Any deed, title, or other instrument of conveyance regarding those portions of the Site owned by the City shall contain a notice that the Site is the subject of this Consent Decree, setting forth the style of the case, case number, and the Court having jurisdiction herein. Said notation shall also notify any potential purchasers of property contained with the Site that:*
    a. *The land has been used to manage hazardous substances, and the hazardous substances, including those listed in the ROD attached and incorporated into this Consent Decree, remain under the cap.*
    b. *Post-remedial action land use is restricted such that use of the property must never be allowed to disturb the integrity of the cap, or any other component of any containment system, pump and treat system, or the function of the Site's monitoring system, unless the Regional Administrator for U.S. EPA Region 10, after consultation with Ecology, finds that the disturbance:*

i. Is necessary to the proposed use of the property and will not increase the potential hazard to human health or the environment; or
ii. Is necessary to reduce a threat to human health or the environment.

c. Restrictions upon the use of groundwater beneath the Site must also comply with all additional present and future restrictions placed on the use of such groundwater by the City of Spokane and Spokane County.

D. The City shall perform all actions necessary and appropriate to implement the above-referenced Institutional Controls, as defined in Paragraph 29, on the respective properties including, but not limited to, the recording of notices, plot plans, and other similar documents, and giving notice to local zoning authorities or other governmental entities. The City shall report to the Government Plaintiffs, concerning its performance of all such actions, as provided in Section IX of this Decree.

In addition, the CD included the following language in paragraph 55:

> *If the work includes the installation and operation of monitoring wells, pumping wells, treatment facilities, or other response actions, the City shall ensure for purposes of its own property that no conveyance of title, easement, or other interest in the property shall be consummated without provisions for the continued operation of such wells, treatment facilities, or other response actions on the property, and also provide that the owners of any property where monitoring wells, pumping wells, treatment facilities, or other response actions are located shall notify Government Plaintiffs and the City by Certified Mail, at last thirty (30) days prior to any conveyance, of the property owner's intent to convey any interest in the property and of the provisions made or to be made for the continued operation of monitoring wells, pumping wells, treatment facilities, or other response actions installed pursuant to this Consent Decree.*

The CD was terminated by court order on February 2, 1997, but the order required that City continue to:

a. Finance and perform required maintenance and other routine maintenance that would normally be performed by a landfill owner (such as care of the landfill cap and vegetative cover);
b. Monitor ground water as set forth in the Scope of Work and Schedule of Deliverables attached to the Consent Decree;
c. Comply with restrictions on conveyance and use of the property as specified in paragraph 29 of the Consent Decree [above];
d. Comply with applicable Department of Ecology regulations governing landfill closure and post-closure;
e. Provide access to Plaintiffs as specified in Section X of the Consent Decree;
f. Comply with the letter of Agreement with Ecology dated November 30, 1996 [nb: this letter of agreement is attached to the termination and establishes that the City will fund Ecology oversight];
g. Comply with the retention of records requirements established in Section XXV of the Consent Decree; and

h. Comply with all requirements of Paragraph 55 of the Consent Decree. [above]

3. Interviews regarding IC Status

The PRP for the Site is the City of Spokane (the City). While the City continues to operate active portions of the landfill and the gas collection system, City technicians and security contractors are present on site. The gas-burning system has costly equipment and could be hazardous to trespassers. It also requires daily inspection of the system and the landfill cap.

With respect to engineering controls, the City has the responsibility to protect the landfill cap, on-site and off site groundwater monitoring wells, and the pumping and treatment system. Informational signs associated with the site ICs are still intact and legible based on the site inspection.

According to interviews with City personnel, the City maintains engineering controls (site fencing) and security patrols. The perimeter of the landfill property is fenced with a cyclone fence, and the landfill access road is gated. According to the landfill technicians interviewed, contracted security patrols occur five nights out of seven on a random schedule. Two breaches of onsite PRP engineering controls have occurred in the past five years. One was an act of vandalism where individuals got onto the site overnight and broke windows in some of the heavy equipment onsite. The other incident was a fire that burned through an adjacent property and threatened the landfill. No damage was done to the landfill. Both incidents were reported to the agencies.

City personnel indicated that the requirements of the termination order regarding deed notices and conveyance were being met. This was not independently verified.

The City continues to provide water to residents in the area through connection to the municipal water system. In addition, City personnel stated that the active landfill is in compliance with its operating permit and that the MFS requirements are being met. In an interview with Ecology, its representative stated that the Ecology "start card" process is effective at preventing drilling within 1000 feet of the landfill, as required by the MFS. This program requires well drillers to submit well location information for Ecology approval 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 1000 feet of the landfill.

This FYR notes that there is some ambiguity regarding the area where restrictions on drilling are needed. Since the groundwater compliance wells are below the cleanup levels and have been for several years, the 1000 foot distance is sufficient at this time. However, the extent of the plume where COCs were detected is a larger area. Ecology procedures should be reviewed to determine the area where they are applying drilling restrictions, and if it reflects the landfill boundary, the current property boundary (which includes the infiltration basin), or the past or current extent of the plume.

The City referenced Spokane County Health District (SCHD) controls. While not cited as

ARARs, the court order terminating the Consent Decree requires the City to comply with County requirements. SCHD can prevent access to contaminated groundwater water through its building permit process. The SCHD does not allow a building overlying a known contaminant plume to have its drinking water supplied by groundwater and requires that the building be connected to municipal water. In an interview with the County, its representative stated that the County is utilizes map with landfill overlays or other information regarding this Site to limit installation of wells or to require new construction to use the municipal water supply. This FYR did not independently verify the maps or their use.

4. Current Effectiveness of ICs

Currently, the RAOs related to ICs are being met for the Site.

Because the landfill is active, the City continues to own and control the landfill property, so requirements for notification regarding conveyance of the property have not been triggered. Land/resource use on or near the site has not changed since the execution of the ROD. There are no current/impending land/resource changes for the City property.

Because groundwater outside the landfill boundary meets MCLs and because residents are connected to the municipal water supply, exposure to contaminated groundwater is not occurring. New housing continues to be developed in the vicinity of the landfill, and existing housing is likely to change hands. However, the City continues to have access to the wells in the groundwater monitoring system at this time.

The City states that it has provided the State and County with Site groundwater contamination plume boundary maps to enable proper decision-making with respect to well drilling and new building construction. It appears that the plume maps match the extent of restrictions needed. The 1000 ft rule combined with the City contaminant plume overlay is adequate to prevent access to contaminated groundwater.

Based on the interviews with Ecology, Spokane County, and City personnel, it appears that relevant information is reaching the pertinent people at the appropriate time given the State's well drilling approval process and the County's construction permitting process. Citizens' awareness and compliance could not be documented, but community involvement efforts by the City, combined with the drilling and permitting processes, appear to be effective.

5. Long-Term Effectiveness of ICs

Because the landfill will not always include active cells, this FYR recommends a review of MFS requirements for post-closure ICs and a title search and review to assess whether current standards for ensuring long-term protectiveness of ICs are met by the requirements of the ROD.

When the last active cell closes and when gas collection is no longer needed, the City may seek to scale back their level of onsite activity. This topic and the anticipated timing for final closure should be discussed with Ecology and the City.

While it is expected that cleanup levels will continue to be met in groundwater downgradient of the landfill in the long-term, access to monitoring wells on private property will be necessary for long-term monitoring. Certain requirements are in place to assure that property transfers will not impact access to the wells; however, this review did not assess compliance with these requirements. Ecology and EPA should discuss this issue to determine what additional review is needed.

6. Protectiveness Determination for Institutional Controls

In combination with remedial action and O&M, the ICs are currently protective. In order to ensure long-term protectiveness, this FYR recommends additional review of ICs related to property (transfer, notices, encumbrances), zoning, and details of IC implementation mechanisms (duration, extent, specific procedures).

7. Follow-up Actions

Follow-up actions should involve coordination with Ecology and the City and should include the following, as appropriate:

- A review of the operating permit for the landfill and the MFS to determine the extent, nature and duration of state-required ICs
- A review of the Institutional Controls Plan (referenced in the CD Scope of Work)
- A title search for the City's landfill property to review encumbrances and verify that deed notices are still in place and up to date (in light of purchased land for infiltration basin).
- A review of the need for access to monitoring wells on private properties, including coordination with Ecology regarding existing conveyance notification requirements, whether they are being complied with, and whether they are necessary (paragraph 55 of CD).
- Documentation of zoning and zoning procedures for the landfill property and nearby areas.
- An evaluation of the effectiveness and enforceability of the "start card" system and the map used to support well-drilling approvals.
- Clarification of the Spokane County Health District permit process, the map used to support requirements for city well use, and the role these have in long-term effectiveness.

It may be appropriate to include in an ESD an update of ROD ICs, to address specifics of duration, extent, implementation procedures, mapping, and reporting requirements.