Five-Year Review Report

Fourth Five-Year Review Report
for
Colbert Landfill
Spokane County, Washington

September 2009

PREPARED BY:

United States Environmental Protection Agency
Region 10
Seattle, Washington

Approved by:

Date:

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9/30/09

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Office of Environmental Cleanup
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TABLE OF CONTENTS

TABLES

FIGURES

ATTACHMENTS

Acronym List

ADs	Acceptable Doses
ARAR	Applicable or Relevant and Appropriate Requirements
ASILs	Acceptable Source Impact Levels
BACT	Best Available Control Technology
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
COCs	Contaminant of Concern
County	Spokane County
1,1 DCA	Dichloroethane
1,1-DCE	1,1-Dichloroethylene
DCE	Dichloroethene
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
FAFB	Fairchild Airforce Base
FS	Feasibility Study
GAC	Granular Activated Carbon
GE	Gas Exhaust
GETS	Ground Water Extraction and Treatment System
GI	Gas Influent
GP	Gas Probes
gpm	Gallons Per Minute
HDPE	High Density Polyethylene
HSWA	Hazardous Solid Waste Amendment
HWMA	Hazardous Waste Management Act
IC	Institutional Control
in.	Inch
IRIS	Integrated Risk Information System
Landfill	Colbert Landfill
LEL	Lower Explosive Limit
LFG	Landfill Gas
MAC	Maximum Acceptable Concentration
MC	Methylene Chloride
MCL	Maximum Contaminant Level
MCLGs	Maximum Contaminant Level Goals
µg/kg	Micrograms per Kilogram
µg/L	Micrograms per Liter
MFS	Minimum Functional Standards
mil	millimeter
MS	Manifold Stations
MTCA	Model Toxics Control Act
MV	Manifold Valves
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List

Acronym List Cont.

O&M	Operation and Maintenance
OU	Operable Unit
PCE	Tetrachloroethene
PCOR	Construction Closeout Report
ppb	Parts per billion
ppm	Parts per million
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RD	Remedial Design
RI	Remedial Investigation
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
RPG	Regulation of Public Groundwater
RPM	Remedial Project Manager
RSE	Remediation System Evaluation
SAP	Sampling Analysis Plan
SDWA	Safe Drinking Water Act
SWMA	Solid Waste Management Act
1,1,1-TCA	1,1,1-Trichloroethane
TBC	To Be Considered
TCE	Trichloroethene
TR	Trench Risers
TS	Trench Stations
UIC	Underground Injection Control
USACE	United States Army Corps of Engineers
VOCs	Volatile Organic Compounds
WAC	Washington Administrative Code
WA CAA	Washington Clean Air Act
WPCA	Water Pollution Control Act
WWCA	Water Well Construction Act

Executive Summary

This document presents the Five-Year Review for the Colbert Landfill (Landfill) Superfund site, located approximately 2.5 miles north of Colbert, Washington, which is 15 miles north of Spokane, Washington. The Landfill had been operating as a sanitary landfill from 1968 to 1986 when it officially began closure procedures.

During a five year period between 1975 and 1980, the Landfill accepted solvent and other chemical waste from a local manufacturing company, Key Tronic Corporation, and Fairchild Air Force Base. These chemical wastes were delivered to the Landfill in 55 gallon drums and were later poured into trenches to mix with existing refuse. It has been estimated that several hundred gallons of chemicals a month were disposed during this time frame. The Washington Department of Ecology began to receive complaints from local residents about the disposal practices in 1980. This subsequently led to Phase I and Phase II domestic groundwater investigations, which found dissolved phase solvent contamination in the groundwater from both the upper and lower regional aquifers. A variety of Volatile Organic Compounds (VOCs) were detected at concentrations greater than state and federal drinking water standards. Methylene chloride, 1,1,1-trichloroethane, 1,1-dichloroethylene, tetrachloroethylene, trichloroethylene, 1,1-dichloroethane make up the six primary Contaminants of Concern (COCs). Spokane County (County) and Key Tronic Corporation were identified as Potentially Responsible Parties (PRPs).

The September 1987 Record of Decision (ROD) selected an interim final remedy to manage the migration of contamination using a groundwater interception system and to attempt source control through extraction in the areas of highest contaminant concentrations. It also called for continuing to provide alternate water supplies to any residents deprived of their domestic water supply due to contamination from the landfill or operation of the extraction system, and institutional controls to ensure the remedy continues to protect human health and the environment. In addition, closure of the Colbert Landfill was required, which included capping, installation of a landfill gas management system, and a restrictive covenant for land use. The remedy was considered interim because it was not known how long the pump and treat system would have to operate and what, if any, modifications would be necessary to reach and maintain cleanup levels in the aquifer. Based on this review, the groundwater monitoring system and program needs to be updated and a remediation system evaluation (RSE) is necessary to determine if the current extraction and treatment system is adequate to meet long-term goals. A final ROD for this site has not been issued.

Performance criteria were developed in the ROD for discharge of treated water and termination of the remedial action. Performance criteria were based on federal Maximum Contaminant Levels (MCL) or calculated maximum acceptable concentrations (MAC). Adjustment criteria were developed in the Consent Decree to conservatively evaluate the need for extraction system operational changes and are also used to determine when an extraction well can be put into standby mode.

Operation and maintenance of the landfill cover, gas extraction system, and the groundwater extraction and treatment system has generally been conducted as designed. County officials regularly inspect the landfill cover for wear and settlement issues to prevent damage to the cover system and periodically survey the site for comparison with cover and permanent bench markers for elevation comparisons. The gas extraction system is sampled annually, monthly or quarterly depending on the port being sampled. The average methane and carbon dioxide production at the landfill has exhibited relatively low, constant volumes over the last five years. The groundwater extraction system's compliance monitoring wells are sampled annually and the extraction wells are sampled quarterly. In addition, every five years the County voluntarily collects

supplemental groundwater samples throughout the extent of the plume to track the progress of the remedial action. The most recent supplemental sampling was completed in May 2007. Potential impacts to public and private water supplies impacted by the contaminant plume are addressed by sampling wells in the domestic monitoring program.

The remedy is not currently fully functioning as intended because a restrictive covenant for the landfill has not been filed and an Institutional Control Plan with designated lead agency oversight has not been completed. The County has procedures in place to address access and exposure issues such as fencing surrounding the landfill to prevent cover disturbance and tracking the installation of wells through applications for new developments and the potential drilling of any wells into the impacted groundwater aquifer as part of a new development.

The extraction system is functioning as intended; the overall size and shape of the contaminated groundwater plume has not changed significantly, but active pumping has reduced contaminant concentrations in the upper and lower aquifers. Five out of the 10 extraction wells have been put in standby mode because they have met the adjustment criteria. However, the groundwater monitoring program described in the Consent Decree is inadequate to track the remaining contaminant concentrations within the plume area. The compliance monitoring program focuses on the down-gradient boundaries to determine if the interception systems are containing the groundwater plume. Sampling of monitoring and domestic wells within the plume, which can be used to monitor the progress of the remedial action, is not included. The County voluntarily collects supplemental samples throughout the extent of the plume approximately every five years to correct for this deficiency. This supplemental sampling indicates that concentrations of COCs above performance criteria remain in the lower aquifer to the north, east, and south of the landfill. A Remedial System Evaluation (RSE) is necessary to determine if the current extraction systems can meet performance criteria throughout the plume within a reasonable time frame.

The protectiveness statement follows:

The remedy at the Colbert Landfill Site currently protects human health and the environment because residences with affected wells have been connected to County water supplies; the groundwater extraction systems are preventing further migration of the groundwater plume; domestic wells are sampled on a schedule to confirm that the drinking water exposure pathway is blocked; and the Spokane County Health Department has procedures in place to detect any wells installed as part of a new development.

However, in order for the remedy to be protective of human health and the environment in the long term the following actions need to be taken:

- Put restrictive covenants in place for the landfill and complete an Institutional Control Plan that documents procedures to control installation of domestic wells.
- Improve the current groundwater monitoring program to track the remaining contaminant concentrations within the plume area. Currently, the County voluntarily collects samples throughout the plumes (upper and lower aquifer) approximately every five years to account for this short coming.
- Conduct a RSE to determine if the current extraction system is adequate to maintain containment and/or achieve long term cleanup goals within a reasonable timeframe.

The **Human Exposure Environmental Indicator** Status for the Site remains "Under Control." The landfill has been capped and no one is using contaminated groundwater at the site. Residents whose wells have been impacted by the site have been provided alternate water and the Spokane County Health Department has procedures in place to detect any wells installed as part of a new development.

The Groundwater Migration Environmental Indicator Status for the Site remains "Under Control" because the groundwater extraction systems are preventing further migration of the groundwater plume.

Cross Program Revitalization Measure Status: The Site continues to be "protective for people under current conditions." For the site to be designated "Ready for Anticipated Use" the follow-up actions recommended in this review need to be completed.

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iii. Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Colbert Landfill		
EPA ID *(from WasteLAN)*: WAD980514541		
Region: 10	**State:** WA	**City/County:** Colbert/Spokane
SITE STATUS		
NPL status: ☒ Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction ☒ Operating ☐ Complete		
Multiple OUs?* ☐ YES ☒ NO	**Construction completion date:** 9 / 9 / 1997	
Has site been put into reuse? ☐ YES ☒ NO		
REVIEW STATUS		
Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency		
Author name: Sharon Gelinas, Robin Smith		
Author title: Hydrogeologist, Environmental Scientist	**Author affiliation:** U.S. Army Corps of Engineers	
Review period:** 11 / 13 / 2008 to 9 / 30 / 2009		
Date(s) of site inspection: 2 / 27 / 2009		
Type of review: ☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion		
Review number: ☐ 1 (first) ☐ 2 (second) ☐ 3 (third) ☒ Other (specify) Fourth		
Triggering action: ☐ Actual RA On-site Construction at OU #___ ☐ Construction Completion ☐ Other (specify)	☐ Actual RA Start at OU# NA ☒ Previous Five-Year Review Report	
Triggering action date *(from WasteLAN)*: 9 / 30 / 2004		
Due date *(five years after triggering action date)*: 9 / 30 / 2009		

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

Five-Year Review Summary Form, cont'd.

Issues:

1. Status of landfill restrictive covenant unknown.
2. An Institutional Control Plan, with designated lead agency oversight, has not been completed.
3. Groundwater flow line analyses in quarterly reports are inadequate.
4. East extraction system (CP-E2) may not be operating at maximum efficiency.
5. The current groundwater monitoring program, as described in the Consent Decree, is inadequate to track the remaining contaminant concentrations within the plume area.
6. Residual contamination exists near monitoring well CD-40 down-gradient from the extraction systems near the Little Spokane River.
7. 1,4-dioxane concentrations detected in groundwater above MTCA cleanup levels.
8. Extraction systems have been operating for almost 20 years and a RSE should be completed.
9. Toxicity information for 1,1-DCA and PCE has been revised.
10. Landfill cover has not been surveyed since 2005.
11. A final Record of Decision has not been completed.
12. There is a potential for contaminated groundwater to act as a source of contamination to soil gas that may impact indoor air.

Recommendations and Follow-up Actions:

1. Determine if restrictive covenant limiting land use has been placed on the landfill. File if necessary.
2. Document the procedures for groundwater protection (i.e. installation of new domestic wells) in an Institutional Control Plan. Designate a lead agency for oversight.
3. Collect groundwater elevation measurements east of Elk Chattaroy/Yale Road. Include locations and measurements on groundwater flow maps or in a table to allow an accurate assessment of the flow line analysis.
4. Evaluate need for continued operation of CP-E2 in its current condition.
5. Include supplemental sampling in the groundwater monitoring program for the Site. Update the O&M Manual as necessary.
6. Continue sampling CD-40C1 on an annual basis and update the O&M Manual to include this location.
7. Evaluate 1,4-dioxane data at the completion of 4 quarters of monitoring. Include sampling of wells with concentrations of 1,4-dioxane above cleanup criteria in long-term monitoring program.
8. Complete RSE.
9. Evaluate the need for revising the risk-based performance criteria for 1,1-DCA and PCE.
10. Survey the Landfill cover.
11. Write a final Record of Decision for the site that will include any new, or modified ARARs, since interim final ROD was signed in 1987 (e.g., State Department of Ecology's Model Toxics Control Act) and recommendations from the RSE.
12. Evaluate vapor intrusion issues during the RSE.

Protectiveness Statement(s):

The remedy at the Colbert Landfill Site currently protects human health and the environment because residences with affected wells have been connected to County water supplies; the groundwater extraction systems are preventing further migration of the groundwater plume; domestic wells are sampled on a schedule to confirm that the drinking water exposure pathway is blocked; and the Spokane County Health Department has procedures in place to detect any wells installed as part of a new development.

However, in order for the remedy to be protective of human health and the environment in the long term the following actions need to be taken:

- Put restrictive covenants in place for the landfill and complete an Institutional Controls Plan that documents procedures to control installation of domestic wells.
- Improve the current groundwater monitoring program to track the remaining contaminant concentrations within the plume area. Currently, the County voluntarily collects samples throughout the plumes (upper and lower aquifer) approximately every five years to account for this short coming.
- Conduct a RSE to determine if the current extraction system is adequate to maintain containment and/or achieve long term cleanup goals within a reasonable timeframe.

Other Comments: The following operation and maintenance issues were also identified as needing follow-up, but do not affect protectiveness:

- Due to the lower COC reporting limits, evaluation criteria are no longer applicable.
- Landfill Closure monitoring, maintenance, and repair reports are not submitted to Ecology or EPA as required in the Consent Decree Section XI.
- Domestic water well sampling plan and schedule has not been updated since 2006.

Recommendation and follow-up actions:

- Use performance criteria to track progress of remedial actions.
- Submit Landfill Closure monitoring data, maintenance, and repair details to Ecology and EPA on an annual basis. Include any monitoring schedule revisions.
- Update the domestic water well sampling plan and schedule. Include a status review of all domestic wells within the plume area.

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I. Introduction

The purpose of the five-year review 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 Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and identify recommendations to address them.

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

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

The Agency interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) §300.430(f)(4)(ii) states:

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

With oversight from the EPA Region 10 Remedial Project Manager, the United States Army Corps of Engineers (USACE) Seattle District conducted the Five-Year Review of the remedy implemented at the Colbert Landfill located in Colbert, Washington. This report documents the results of the review, which was conducted from November 2008 through September 2009.

This is the fourth five-year review for the Colbert Landfill. The triggering action for this statutory review is the third five-year review dated September 30, 2004. Previous five-year reviews can be found on the EPA Region 10 website (EPA 2009). The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

Historic development and dates of important events of the site are presented below in Table 1.

Table 1. Chronology of Site Events

Event	Date
Initial Problem Identification	4/24/80
Final NPL Listing	9/8/83
Interim Remedial Measure (alternative water supply)	Fall 1985
RI/FS Completed	9/29/87
ROD Signed for Interim Remedial Action	9/29/87
RD/RA Consent Decree (effective date)	2/28/89
RA Construction Started (monitoring wells)	8/28/89
Design Completed (extraction/treatment system)	7/12/93
First Five-Year Review (during construction period)	7/13/94
Construction Start (landfill closure)	8/15/96
Construction Completed (extraction/treatment system)	2/13/97
Construction Completed (landfill closure)	5/31/97
EPA Construction Closeout Report (PCOR)	9/9/97
Three of four south system extraction wells (CP-S1, CP-S5, and CP-S6) placed on standby	4/30/98
Monitoring well sampling frequency reduced to annual	8/31/99
Second Five-Year Review	9/20/99
Fourth south system extraction CP-S4 well placed on standby	6/2/04
Third Five-Year Review	9/30/04
West system extraction well CP-W1 placed on standby	1/26/05

III. Background

A. Physical Characteristics

The Colbert Landfill (Landfill) Superfund site is a closed, municipal solid waste landfill located approximately 15 miles north of Spokane, Washington and about 2.5 miles north of Colbert, Washington (see Figure 1). Specifically, it is situated in the southeast corner of section 3, Township 27 North, Range 43 East and covers an approximate area of about 40-acres along Elk-Chattaroy, Yale and Big Meadows Roads. The site is located within the Whitworth Water District and the Spokane County Health Department jurisdiction. The site is owned and operated by Spokane County (County).

B. Land and Resource Use

The Colbert Landfill was operated as a sanitary landfill by the Spokane County Utilities Department from 1968 to 1986. The wastes disposed of at the Landfill primarily included municipal and commercial wastes. For a period between 1975 and 1980, the Landfill also accepted electronic manufacturing wastes and a variety of spent organic solvents and other chemicals. The Landfill did not accept hazardous waste for disposal; however, the solvents disposed between 1975 and 1980 have since been designated as hazardous wastes under state and federal laws. The landfill was filled to capacity and no longer accepted waste by 1986 and was subsequently covered. In 1996, the landfill cover was upgraded and the Landfill was capped and closed to meet the new State of Washington regulations for solid waste units.

The site sits on a plateau bounded by topographic high bluffs on the west running approximately north-south along with the river. The site is bounded to the east by knobby granite and basalt hills and lies entirely within the Little Spokane River drainage basin. The Little Spokane River is located about a half mile west of the Landfill and runs approximately north-south. Peone Creek is located about five miles south of the Landfill and runs approximately northeast to southwest.

The Landfill is surrounded primarily by residential developments and open lands. The area south of the site contains forested lands, open fields and a few residential homes. The Spokane County Recycling center and Transfer station is located immediately west of the site. Residents affected by contamination from the landfill were connected to the municipal water system of the Whitworth Water District No. 2. Residential development of this area has become denser in the past 20 years.

1. Geology. The geology of the site consists of a series of glacially-derived materials laid down on an eroded landscape of clays, basaltic lava flows and granitic bedrock. The stratigraphic units from youngest to oldest are:

- Fluvial unit formed by the Little Spokane River fluvial deposits;
- Upper sand and gravel unit composed of glacial outwash deposits from the Missoula floods;
- Lacustrine unit composed of glacial Lake Columbia silts and clays;
- Lower sand and gravel unit composed of older glacio-fluvial and or alluvial sands and gravels;

- Basalt flow unit interbedded with the Latah Formation, which is composed of unweathered Latah silts and clays and weathered Latah landslide deposits; and
- Granitic bedrock.

2. Hydrogeology. The hydrogeologic system in the vicinity of the Colbert Landfill can be divided into two primary aquifers. Both of these aquifers would be classified as drinking water sources according to US Environmental Protection Agency (EPA) groundwater classification system and are described below:

- The upper aquifer is unconfined and is considered a primary aquifer. It consists of a sand and gravel unit that extends from the eastern hills west to the bluffs of the Little Spokane River. Groundwater flow is predominantly toward the south. The fluvial unit associated with the Little Spokane River receives recharge from the upper aquifer.
- To the west of the landfill, the upper and lower aquifers are separated by the lacustrine unit. Therefore, the lower aquifer is confined to the west of the landfill and unconfined to the east. It consists of a lower sand and gravel unit (primary aquifer), the Latah and weathered Latah aquitard (interbedded basalts, sands, silts and clays), and the basalt aquifer (secondary aquifer interbedded with the Latah aquitard). Groundwater flow is predominantly toward the west.

C. History of Contamination

During the five year period between 1975 and 1980 the Landfill accepted solvent and other chemical waste from Key Tronic Corporation, a local electronic manufacturing company, and Fairchild Air Force Base (FAFB). Typically these wastes were delivered to the landfill in 55-gallon drums and were subsequently poured into open trenches to mix with the soil or ordinary municipal refuse already in the trench. It is reported that these solvents were disposed of at a rate of several hundred gallons a month for numerous years.

In 1980, nearby residents complained to the Eastern Regional Office of the Washington Department of Ecology (Ecology) about the chemical disposal practices. EPA and Ecology along with Spokane County Utilities Department conducted an investigation into these complaints by initiating a groundwater sampling study of nearby domestic water wells. Twenty domestic water wells had contaminants above drinking water standards which could in part be traced to the spent solvents disposed of at the landfill.

D. Initial Response

Following the initial domestic groundwater sampling investigation, Phase I and II studies resulted in the installation of monitoring wells, injection testing, and development of a groundwater monitoring program. In 1983, EPA placed the Colbert Landfill on the National Priorities List (NPL) and identified Spokane County, Key Tronic Corporation and FAFB as potentially responsible parties (PRP). In 1984, Ecology entered into a cooperative agreement with EPA for conducting a Remedial Investigation/Feasibility Study (RI/FS). During that same year, bottled water was supplied to some of the households with high contamination levels in their water wells. In 1985, the County extended the Whitworth Water District public water supply main to affected households. The hookup of residents was subsidized by the PRPs if: (1) concentrations of contaminants were greater than Maximum Contaminant Levels (MCLs), (2) the

resident was less than 500 feet from a water supply main, and (3) the resident signed a hold-harmless agreement. The final RI report was completed in 1987 and discovered that both the upper and lower sand and gravel aquifers were contaminated with solvents.

E. Basis for Taking Action

Drilling conducted during the RI found little evidence of contamination in soil near the landfill. This may have been because of the location of the borings or physical processes during drilling, such as volatilization. A soil gas survey was conducted in 1985 and found detectable levels of soil gas concentrations over much of the area of the groundwater plume. Maximum concentrations of 1,1,1-trichloroethane (1,1,1-TCA) in soil gas were found around the landfill and to the east, an area where secondary sources may be present.

Even though little contamination was found in soil near the landfill, the RI revealed that both the upper and lower aquifers had been contaminated by hazardous substances released to groundwater. A variety of volatile organic compounds (VOCs) were detected at concentrations greater than state and federal drinking water standards. Methylene chloride (MC) and 1,1,1-TCA were the contaminants most frequently disposed of at the Landfill. Trichloroethylene (TCE), 1,1-dichloroethylene (1,1-DCE), tetrachloroethylene (PCE) and 1,1-dichloroethane (1,1-DCA) were also disposed regularly. These six chemicals, which were also the most frequently detected contaminants, are known as the contaminants of concern (COCs).

For the indicator contaminants identified above, acceptable doses (ADs) for carcinogenic and non-carcinogenic compounds were developed. Non-carcinogen ADs were based on available toxicity data that indicate a no adverse effect level. Carcinogen ADs were based on 10^{-6}, or 1:1,000,000, incremental risk of developing cancer from a lifetime exposure, using the EPA Cancer Assessment Group evaluation of cancer potency. Exposure pathways analyzed include ingestion via drinking contaminated water or of crops, beef or dairy products irrigated with contaminated water, dermal contact from bathing with contaminated water or swimming in contaminated surface waters, inhalation of volatile contaminants during showering, and assessment of ecological receptors. The analysis resulted in the calculation of maximum acceptable concentration (MAC) values for 1,1-DCA, PCE and MC which should not be exceeded in water used for drinking (ingestion) or bathing (dermal). For the carcinogenic compounds PCE and MC, the MAC value was based on risk of 10^{-6}. Where MAC values were not developed (1,1,1-TCA, 1,1-DCE, and TCE), the federal drinking water MCLs were used.

IV. Remedial Actions

On September 29, 1987, EPA issued the Record of Decision (ROD) which selected an interim final remedy for the site based on the Remedial Investigation/Feasibility Study (RI/FS). The ROD states “It is an interim final action because the extraction and interception well systems will be in operation for decades before remediation is complete and changes in the selected action may be required during that period. The design therefore will be reassessed and adjusted periodically, at intervals not to exceed five years. It builds on the Interim Remedial Measure which provided alternate water supply, through the Colbert Extension of the Whitworth Water District No. 2, to residents whose wells had shown contamination from the landfill at levels above public health concern.”

The selected remedy included a groundwater extraction system to:

1. Prevent further spread of contaminated groundwater in the upper and lower aquifers by installing and operating interception wells,
2. Remove contaminated materials which have entered the aquifers and are contributing to the contaminant plume, by installing and operating extraction wells in the area where the plumes originate,
3. Reduce the toxicity, mobility, and volume of the contaminants by treating all extracted groundwater from both interception and extraction wells.

In addition to removing and controlling migration of contaminated groundwater, the selected remedy contained measures to protect human health. These additional requirements included:

- Residents who were deprived of water, either because their well water quality shows demonstrated contamination from the landfill or due to the action of the extraction systems, were to be connected to the alternate water supply system.
- Institutional controls were to be developed consistent with the design to assure the effectiveness of the remedial action.
- The Colbert Landfill was to be closed in accordance with the State Minimum Functional Standards (MFS, Washington Administrative Code (WAC) 173-304) for landfill closure, including capping, regrading-, groundwater and gas monitoring, and post-closure maintenance. The closure was to be evaluated to ensure consistency with RCRA Hazardous Waste Regulations and was to be addressed in the final ROD for the site.

A. Performance Criteria

The performance of the remedial action was defined in the ROD as:

> *…treating the wastewater effluent to or below the MCLs (40 CFR 141.65) or a similar health-based level (the 10-6 risk level for carcinogens) for contaminants for which MCLs have not been determined. Numeric standards are presented in [Table 2] for discharge levels and for termination of the remedial action.*

Table 2 Colbert Landfill Performance Criteria

Compound	Performance Criteria (ppb)	Basis
1,1,1-Trichloroethane	200	MCL[(a)]
1,1-Dichloroethene	7	MCL[(a)]
1,1-Dichloroethane	4050	MAC[(b)]
Trichloroethene	5	MCL[(a)]
Tetrachloroethene	0.7	MAC[(c)]
Methylene Chloride	2.5	MAC[(c)]

Source: Colbert Landfill ROD, Table 6

(a) Federal drinking water maximum contaminant level as of the date of the Consent Decree

(b) Maximum acceptable concentration presented in the ROD

(c) Maximum acceptable concentration based on EPA Cancer Assessment Group evaluation (10^{-6} evaluation)

In addition, treatment systems and their effluents were to be monitored to assure that they met the appropriate performance standards. Discharge of treated water was to be consistent with U.S. and Washington State laws and air emissions were to be designed and monitored to meet appropriate state Air Toxics Guidelines and to use Best Available Control Technology. Attachment 10 presents a summary table of all Applicable or Relevant and Appropriate Requirements (ARARs) for the Site.

B. Remedy Selection

The selected remedy should be permanent and should effectively reduce the toxicity, mobility, and volume of the contaminants. As stated in the ROD, the selected remedy was designed to:

- *Prevent further spread of contaminated groundwater (in the south and west) in two aquifers by installing and operating interception wells and treating the extraction groundwater,*
- *Remove contaminated materials (in the east) which have entered the aquifers and are contributing to the contaminant plume, by installing and operating extraction wells in the area where the plumes originate and treating the effluent, and*
- *Provide an alternate water supply system to any residents who are deprived of their domestic supply by demonstrated contamination from the landfill or due to the action of the extraction systems.*

The extraction system configuration was left to be determined during Remedial Design. The ROD stated that the placement of the extraction wells and pumping rates should be sufficient to prevent contamination from migrating beyond the down-gradient extent of the plume (at the time of the remedy implementation).

On January 23, 1989, a Consent Decree between EPA, Ecology, Spokane County and Key Tronics Corporation was lodged in federal court. Fairchild Airforce Base contributed waste to the landfill; however, they were not a party to this Consent Decree. The Decree addressed implementation of remedial actions specified in the ROD. On February 28, 1989, the Decree was entered by the Court.

The Consent Decree Scope of Work describes the configuration of the groundwater extraction systems and also additional criteria for use during the operation. For clarification, the three types of criteria discussed throughout the remainder of this report are presented in Table 3 and described below:

- Performance Criteria. Identified in the ROD (Section V, Alternatives Evaluation, Table 6). Numeric standards used for discharge levels of treated groundwater and groundwater performance standards for termination of the remedial action.
- Evaluation Criteria. Identified in the Consent Decree (Appendix B, Section IV.2.b, Table IV-1). At the time the Consent Decree was written, quantifying PCE and MC concentrations in the groundwater was not possible using the available analytical methods; therefore, alternative evaluation criteria were developed to substitute for the performance criteria for these two COCs. The evaluation criteria for the remaining COCs (1,1,1-TCA; 1,1-DCE; 1,1-DCA; and TCE) are equal to the performance criteria. As shown in Table 3 below, the evaluation criteria for PCE and MC are ten times higher than the performance criteria. The Consent Decree provided for potential improvements to the analytical methods and stated: “If the levels to which these compounds can be accurately quantified (using Method 8010)

change during the source of this project, the evaluation criteria will be adjusted accordingly." The project is now using EPA Method 524.2 to analyze for VOCs, which is capable of quantifying PCE and MC to the performance criteria. For this reason, the evaluation criteria for PCE and MC are no longer applicable and only the performance criteria should be used to determine compliance.

- Adjustment Criteria. Identified in the Consent Decree (Appendix B, Section V.A.2.a, Table V-1 and Section V.C.2.a). Adjustment criteria were developed to conservatively evaluate the need for extraction system operational changes and are also used to determine when an extraction well can be put into standby mode. The Consent Decree identified a method to develop adjustment criteria for indicator compounds (1,1,1-TCA; 1,1-DCA; 1,1-DCE; and TCE), which was equal to the lesser value of (1) the baseline concentration (average of the time-averaged concentrations in the performance monitoring wells following startup) plus 50% of the evaluation criteria or (2) 65% of the evaluation criteria. Adjustment criteria are only used to manage operation of the extraction systems. The termination of the entire remedial action will be complete when the performance criteria for groundwater have been met throughout the plume extent.

Table 3 Colbert Landfill Performance, Evaluation and Adjustment Criteria

Compound	Performance Criteria (ppb)	Evaluation Criteria (ppb)	Adjustment Criteria [(a)] (ppb)
1,1,1-Trichloroethane	200	200	103 (South), 101 (West)
1,1-Dichloroethene	7	7	4.5
1,1-Dichloroethane	4050	4050	2026
Trichloroethene	5	5	3.3
Tetrachloroethene	0.7	7	na
Methylene Chloride	2.5	25	na

[(a)] Calculated based on method presented in the Consent Decree.
na – not applicable

C. Remedy Implementation

The following remedial measures have been completed:

1. Groundwater Extraction and Treatment Systems. The ROD identified the need for three separate groundwater extraction systems to treat groundwater at the site in order to address management of the migration of contamination using a groundwater interception system and attempt source control through extraction in the areas of highest impact. These three groundwater extraction systems are shown on the site map in Figure 2.

The south and west extraction systems were designed for management of contaminant migration. The south system was intended to intercept contaminated groundwater in the upper aquifer. It consists of four extraction wells located approximately 1.5 miles south and down-gradient of the Landfill. The west system was intended to intercept contaminated groundwater in the lower aquifer. It consists of three extraction wells located near the western, down-gradient edge of the Landfill.

The east system was intended for source control, rather than management of migration, and consists of three extraction wells located near the eastern edge of the Landfill. As stated in the ROD, "Extraction will continue until all wells in contaminated zones show that the contaminants from the landfill have been reduced to and consistently remain below the health protection maximum levels.

The extracted groundwater from each system is conveyed through a piping system to a treatment facility located in the southwest corner of the Landfill property. At the facility, the contaminants are removed through air stripping technology and then discharged to the Little Spokane River.

2. Landfill Closure. As part of the remedy described in the ROD, the Colbert Landfill was closed in accordance with the State minimal functional standards (MFS) for landfill closure. As specified in the Consent Decree, "*The primary purposes of the cap are to: reduce the potential for infiltration and, thus, reduce the rate of leachate generation; address vector control; and restrict human access.*" The landfill closure requirements include a landfill cover system, drainage facilities, and a landfill gas collection and treatment system and are described in the Operation and Maintenance Manual for Colbert Landfill Closure (CH2M Hill, 1997).

The Consent Decree also states that the County shall develop a covenant restricting the use of the Colbert Landfill so that the function of the cover would not be impaired (Appendix B, Section VI). A fence currently surrounds the landfill to limit access; however, there is no record of the restrictive covenant.

All elements to the landfill closure and cover, except a restrictive covenant, were complete in August 1996. The cover was installed on approximately 32 acres of the closed landfill. A landfill gas (LFG) management system was installed to extract methane gas from the refuse and transmit it to the treatment facility in order to prevent both off-site gas migration and build-up of gas pressure. LFG is treated using air stripping technology and then discharged to the atmosphere.

While remedial and closure actions under the federal Superfund program are exempt from specific permit acquisition requirements, Colbert Landfill was still required to meet the ARARs that would be required under those permits. As such, the LFG management system met the Best Available Control Technology (BACT) by using the activated carbon adsorbers and Spokane Regional Clean Air Agency's Acceptable Source Impact Levels (ASILs) for toxic air contaminant impacts as defined in the Washington State Clean Air Act WAC-173-460 (CH2M Hill 1997).

3. Alternate Drinking Water Supply. The ROD required an alternate water supply system be provided to any residents who are deprived of their domestic supply by demonstrated contamination from the landfill or due to the action of the extraction systems.

The Consent Decree (Appendix B, Section VIII) describes the remedial actions to be taken if any compound originating from the site is identified in any domestic water supply well in use prior to issuing the Consent Decree. It states that if concentrations of any COC exceed performance standards in the follow up sample collected from the domestic well, the County will promptly provide an alternative drinking water supply source to that resident. The new water supply could include either bottled water (on an interim basis) or connecting the residence to the Whitworth Water Supply System or an approved class IV system. The Whitworth water supply has been extended to include the residents affected by the groundwater contamination plume. Twenty-three residents were connected when the new water supply extension was completed in 1985. Since that time several additional residences have reportedly been connected to municipal water due to their proximity to the groundwater plume.

The Consent Decree also states that institutional controls may be used to prevent the installation of domestic wells in areas known to be contaminated. Installation of new wells is tracked by the County Health Department. This process is discussed in Section IV.D.3 below.

D. System Operation/Operation and Maintenance

Original operations and maintenance costs were estimated to be approximately $300,000 per year. Actual costs over the last five years have ranged from approximately $251,000 to $434,000 per year. This includes average Ecology and EPA oversight costs of about $16,000 and $10,000 per year, respectively.

1. Groundwater Extraction and Treatment Systems. The extraction systems have seen few major improvements since their original installation in February 1997. At the treatment facility, the groundwater is processed through a counter current, forced draft air stripping tower and conveyed via an underground, gravity flow, 12 inch (in.) diameter pipeline to the discharge point in the Little Spokane River. Scale inhibitor chemicals are used in the stripper tower; therefore, acid washing to remove scale and biological buildup from the internal packing material has not been necessary. The tower was disinfected in 2003 using a sodium hypochlorite solution to remove a small amount of biological build up.

The County conducts annual system maintenance and system upgrades, and performs routine pump replacement. Spokane County officials perform regularly scheduled monthly, quarterly, semi-annual and seasonal maintenance on the system to ensure that optimal system performance is maintained.

Currently, five out of the ten groundwater extraction wells are operating. The south interception system ceased pumping operations and was put into standby, per the Consent Decree Appendix B, Section V-7, on June 2, 2004, after twelve consecutive rounds of COC concentrations were below the adjustment criteria. During the 2006 fourth quarter groundwater monitoring event, water from one of the south extraction wells contained a concentration of TCE of 3.3 μg/L, just over the adjustment criteria. This well was reactivated and ran until January 2007 when concentrations of TCE decreased to below the adjustment criteria. All of the south extraction wells have been on standby since this date and are sampled quarterly. Similarly, the western extraction well CP-W1 was put on standby on January 26, 2005, and groundwater COC concentrations have been below the adjustment criteria since that time.

Compliance monitoring was described in the Consent Decree and consists of the following locations (see Figure 8):

- South Interception System. Six upper aquifer monitoring wells are used to monitor performance: four wells are located directly down-gradient of the south extraction system (CD-31A1, CD-36A1, CD-37A1, and CD-38A1) and two wells are located near the western and eastern outboard limits of the system (CP-3 and CD-34A1).
- West Interception System. Two sets of wells are used to monitor performance. Set A monitoring wells are located down-gradient of the system and monitor those portions of the lower aquifer within the capture zone of existing supply wells (CD-41C1/2/3, CD-42C1/2/3, and CD-48C1/2/3). These wells are located directly up-gradient of the existing supply wells. Set B monitoring wells monitor those portions of the lower aquifer not directly impacting the water quality of the existing supply wells (CD-43C1/2/3 and CD-44C1/2/3). Two monitoring

well clusters were also placed at the outboard limit of the interception system (CD-45C1/2/3 and CD-48C1/2/3).

- East Extraction System. The east extraction system was intended for source control and does not require performance monitoring.

In addition, flow in the Little Spokane River and contaminant concentrations in the treatment system effluent are measured to verify that the treated groundwater is meeting performance criteria and National Pollutant Discharge Elimination System (NPDES) substantive discharge monitoring requirements for protection of the River. All monitoring has been completed in accordance with the Sampling Analysis Plan (SAP) as described in the Colbert Landfill Operations and Maintenance (O&M) Plan and the Quality Assurance and Field Sampling Plan. The results of the monitoring are discussed in Section VI.D.1.d and show that the groundwater treatment system has little to no impact to the water quality of the River.

2. Landfill Closure. The O&M Manual for Landfill Closure (CH2M Hill, 1997) describes monitoring components for the landfill cover, drainage system, and gas extraction system. MFS groundwater monitoring requirements are described in the Colbert Landfill O&M Plan. With the exception of MFS groundwater data submitted in the second quarter monitoring reports, Landfill Closure data reports are not submitted to the Ecology or EPA as required in the Consent Decree Section XI. The County was asked to compile all landfill data and maintenance issues discussed below for the specific purpose of this Five-Year review report. The information discussed below was submitted electronically in March 2009. It is recommended that reports on Landfill Closure monitoring, maintenance, and repairs be submitted to Ecology and EPA in the future for review on an annual basis.

Landfill Cover

The landfill cover was installed on approximately 32 acres of the closed landfill. The cover consists of one 60 millimeter (mil) High Density Polyethylene (HDPE) liner installed over a 6 in. prepared subgrade of 1 in. minus native material. The HDPE is covered with a free-draining 18 inch sand layer, then a 6 inch layer of topsoil. A strip drain collection system is installed directly on top of the cover system. These drains serve to carry surface water that has infiltrated through the topsoil and granular cover material, off the liner to a toe discharge system or directly into the perimeter drainage ditch. The landfill does not have a bottom liner installed (CH2M Hill 1997).

County officials regularly inspect the Landfill cover for wear and settlement issues to prevent damage to the cover system. Landfill cover components such as toe discharge areas, soil/vegetation sloping and ditches are inspected monthly to ensure the cover is not being damaged and no settling is occurring. Twice a year, County officials perform tree sapling removal on the cover system as well as other vegetation maintenance to prevent cover damage.

County officials have performed regular settlement monitoring. There are several settle markers installed on the cover and permanent bench markers just off the cover for elevation comparisons. Surveying was completed on a yearly basis from 1999 to 2005. Since changes in elevations were negligible and the Landfill has very low slopes, the County has increased the period between surveys. The last survey was completed in September 2005; however, the County has not stated when the next survey will be completed. Since surveying began in 1999, there as not been a change of elevation at any of the settlement markers greater than 0.1 ft. There have been two smaller areas of settlement located on the south and north end of the Landfill. The south end settlement area was repaired prior to 2003. The north

end settlement area occurred adjacent to the drainage ditch and covers an area approximately 10 ft in diameter. A settlement marker was installed and elevations are being monitored. The County has stated that there is currently not a need for repair work in this area.

Landfill Gas System

This LFG system currently consists of a network of interior and perimeter wells and trenches which collect gas and route it to the treatment facility where it is treated with activated carbon adsorbers. The gas is then discharged from the exhaust pipe that is secured to the air stripping tower adjacent to the gas collection system and discharged to the atmosphere. A 15-horsepower exhauster creates a differential pressure vacuum within and around the refuse mass, allowing the LFG to move through the landfill where it is collected at the trenches. Two condensate traps remove condensate droplets and other particles from the gas stream by isolating portions of the system operating at different pressures. Collected condensate is then manually drained into a transport vehicle and is treated off-site. This system is operated year-round or continually.

The effectiveness of the LFG management system is evaluated through regular monitoring of gas probes situated within and adjacent to the Landfill for pressure (vacuum), methane and carbon dioxide (CO_2) concentrations. Gas samples for VOC analysis are collected on an annual basis at the main exhaust system and analyzed using Method TO-14A. Gas-tech (tube) readings are taken after the carbon adsorbers to monitor for possible break out compounds on a monthly basis. See Figure 3 for a map of the gas monitoring stations.

Sampling of the LFG system occurs either annually, monthly or quarterly depending on the port being sampled. Sampled on an annual basis are the Trench Stations (TS), Manifold Stations (MS) and Manifold Valves (MV). The MS and MV stations are located along the manifold which runs across the landfill. The TS stations are located at the distal ends of the trenches that run perpendicular to the central manifold. The Trench Risers (TR) are sampled on a quarterly basis. These ports are located at the intersections of the trenches and the manifold. Sampled on a monthly basis are the Gas Probes (GP), Gas Influent (GI) and Gas Exhaust (GE). The GPs are located around the perimeter and within the landfill. The GI port is sampled prior to and the GE is sampled after the carbon adsorber canisters. In general the landfill produces low volumes of methane and carbon dioxide; average production has remained relatively stable for the last five years.

Monthly gas management maintenance includes evaluating the condition of probes, valves and casings which are observed for wear. On a quarterly basis, the condensate traps, sump pump and associated piping, trench riser vaults and pipe fitting connections are inspected. In November 2008, the trench riser vaults were fitted with 12” square HDPE panels to prevent sand from entering the vault during the wet season. The panels were cut and fit over the pipe and fastened to the side of the fiberglass vault.

Due to the extreme climate variations of the region, seasonal maintenance to the LFG management system is routinely conducted. For example, the heat tracing system for above ground gas extraction equipment is turned off and on to inspect for proper operation. Along with the seasonal maintenance schedule, issues that arise due to the volume of snow received at the site are promptly fixed. For example, a gas monitoring port on the inlet side of the exhaust fan was broken by heavy snow in February 2009. The pipe jacketing was removed and the broken port was extracted with tap and die and a new port was installed.

MFS Groundwater Monitoring

MFS groundwater monitoring is used to monitor the water quality down-gradient of the Landfill according to WAC 173-304 and has been completed in accordance with the Colbert Landfill O&M Plan. Additional details are presented in Section VI.D.2.

3. Alternate Drinking Water Supply. The Spokane County Health Department maintains procedures for groundwater protection and prevention of the use of contaminated water within the Colbert Landfill plume boundaries. The following procedures were described by Jim Sackville-West of the Spokane County Health Department. The historical extent of the 1,1,1-TCA plume is used to define the groundwater protection area. For reference, the 1994/1995 1,1,1-TCE plumes for the upper and lower aquifers are presented on Figures 4 and 6. According to Spokane County Health Department officials, new wells are identified through applications for new development. If a proposed development is within the plume boundaries, they are encouraged to connect to municipal water. If a proposed residence is within 0.5 miles of the plume boundary and a well is installed, the Health Department will sample the groundwater for VOCs to verify that groundwater is not contaminated. This procedure does not detect any new wells that would be installed at existing residences; however, the Health Department reviews start cards (i.e. notice of intent to construct a water well) from Ecology for new wells and should be able to detect wells installed within the groundwater protection area. No official documentation of these procedures exists; maintenance of such procedures is based on Health Department officials working in conjunction with Ecology to ensure institutional controls for the Colbert Landfill area are met. An Institutional Control Plan is needed to ensure that the process for permitting wells is protective of human health and a lead agency is designated for oversight.

According to the Appendix B, Section VII of the Consent Decree, all wells in the domestic well monitoring program are required to be sampled annually. Specific wells can be sampled more frequently if necessary. Sampling of a well may be discontinued or reduced if (1) an alternative water supply has been provided, (2) it is determined the well is not threatened by contamination from the Colbert Landfill Site or (3) the remedial action is complete. The County uses the following methodology to determine the appropriate sampling frequency:

- Quarterly – Wells near the leading edge of the plume or in areas where contaminants are not migrating in the direction of groundwater flow and contaminants have been detected at levels below Evaluation Criteria; wells in areas where contaminants exceeding Evaluation Criteria were detected in nearby wells; multiple user wells where contaminants were previously detected at levels below Evaluation Criteria.
- Semi-Annual – Wells in close proximity of the leading edge of the plume that are not separated from the plume by another well currently in the sampling program.
- Annual – Previously contaminated wells that currently show non-detectable levels of contaminants; wells without detectable concentrations of contaminants and that do not fall into the Bi-annual sampling category.
- Bi-Annual – wells previously in the sampling program that do not fall into any of the above categories (could be used as a transition from annual to no sampling).

- No Sampling - Wells hooked up to an Alternate Water Supply; wells not used for domestic purposes; wells that the owner requests not to be tested; no access to the property or sampling site.

Since the last Five-Year Review, only one well has reportedly been removed from the sampling plan. Whitworth Water well 1073D-2 was removed from service in 2006 due to detections of 1,4-dioxane above Ecology's Model Toxics Control Act (MTCA) Method B groundwater cleanup level. According to the County, the domestic sampling plan is updated every two years. The plan was only updated once since the last Five-Year review (in 2006) and is presented in Attachment 6. The County plans to update the domestic sampling plan once the required four quarters of 1,4-dioxane sampling are complete. Since there is little documentation on the domestic wells that have been connected to municipal water since the original water supply extension, it is recommended that a review of all residences within the groundwater plume area also be completed at this time. In the future, any changes to the domestic sampling program or new wells installed within the groundwater plume area should be documented in the quarterly reports. Documentation of domestic wells should include the sampling frequency (quarterly, semi-annual, etc), well numbers and addresses, and location map.

V. Progress Since the Last Five-Year Review

A. Previous Protectiveness Statement

The protectiveness statement in the last Five-Year Review (2004) stated:

> *Because the remedial actions at this site are protective, the site is protective of human health and the environment.*

B. Status of Recommendations

One recommendation was presented in the previous Five-Year Review (2004):

> *The request for analyzing for the constituent 1,4-dioxane to the data gathered from the site is new. The change needed in the Sample Plan will be discussed among the County, Ecology, and EPA to obtain this data. No other specific actions for improvements or changes are being forwarded to the PRPs based on this Five-Year Review.*

Status: Ongoing. The County sampled for 1,4-dioaxne at 35 wells in 2005. Several wells contained concentrations above Ecology's MTCA Method B cleanup level. Beginning in April 2008, the County is currently sampling six locations and analyzing for 1,4-dioxane on a quarterly basis. The permanent addition of these wells into the sampling program will be determined at the end of four quarters of monitoring (April 2009). Additional details on the 1,4-dioxane sampling results can be found in Section VI.D.

VI. Five-Year Review Process

A. Administrative Components

The County was notified of the initiation of the Five-Year Review in December 2008. The Five-Year Review team was lead by Piper Peterson Lee of EPA, Remedial Project Manager (RPM), and included Sharon Gelinas (Hydrogeologist) and Robin Smith (Environmental Scientist) of the USACE Seattle District.

From January to April 2009, the review team established the review schedule; those components included:

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

B. Community Involvement

Activities to involve the community in the Five-Year Review included a notice run in the Spokesman Review local newspaper in July 9, 2009 that a Five-Year Review was to be conducted. A fact sheet was sent to the community surrounding the Landfill on July 10, 2009. Several phone calls were received by residents inquiring about the need to have their water sampled. As none of these residents lived within the plume boundaries, no additional sampling was conducted. No other comments from the community have been received on this review.

C. Document Review

This Five-Year Review consisted of a review of relevant documents as summarized in Attachment 1. Applicable groundwater and surface water cleanup standards were also reviewed.

D. Data Review

1. Groundwater Extraction and Treatment Systems. Data reviewed for the extraction systems includes compliance groundwater monitoring data, groundwater level data, extraction well operational parameters, treatment system performance data, and supplement groundwater monitoring data. Attachment 2 shows the well designations as presented in the quarterly reports. Figures 4 through 7 show that the overall size and shape of the contaminated groundwater plume has not changed significantly, but active pumping has reduced contaminant concentrations in the upper and lower aquifers.

a. Compliance Monitoring Data. Attachment 3 presents the compliance monitoring well data and Attachment 4 presents the compliance extraction well data from the past 5 years. Figure 8 shows the

location of the monitoring and extraction wells. Monitoring wells are sampled annually and analyzed for VOCs. Extraction wells are sampled quarterly and analyzed for VOCs.

South Interception System (Upper Aquifer)

With the exception of one detection of PCE (CD-34A1 in April 2004 at a concentration of 0.81 μg/L), there have been no exceedances of the performance criteria in the last five years at the south interception compliance monitoring wells.

All of the south interception extraction wells have been shutdown since June 2004 and are sampled quarterly. 1,1,1-TCA , 1,1-DCA, 1,1-DCE, and methlyene chloride have been below the performance criteria for the past 5 years at all of the south extraction wells. The County elected to briefly operate CP-1 from October 2006 through January 2007 due to an exceedance of TCE above the adjustment criteria at CP-1. Figure 9 shows that TCE remains close to the adjustment criteria in extraction well CP-S1 but is below the performance criteria. PCE has been detected above the performance criteria at extraction well CP-S4 at concentrations ranging from 0.6 to 1.17 μg/L during the past five years and is shown on Figure 10. As stated in the Consent Decree (Appendix B, Section X), *if groundwater monitoring at a standby extraction well exceeds performance standards in three consecutive samples, the appropriate portion of the interception system will be placed in operation until standby criteria is achieved again.* Since the detections of PCE are only slightly above the performance criteria, there may be little benefit to human health and the environment for re-starting extraction well CP-S4. CP-S4 should continue to be monitored on a quarterly basis. If concentrations of PCE increase, re-starting extraction well CP-S4 should be considered. Private wells in this area are sampled to confirm that concentrations of COCs are below performance standards.

West Interception System (Lower Aquifer)

There have been no exceedances of the performance criteria at any of the west interception system compliance monitoring wells in the last 5 years.

1,1,1-TCA, 1,1-DCA, MC, and PCE have been below the performance criteria at all of the west extraction wells for the past 5 years. Extraction well CP-W1 was shutdown in January 2005 because all COCs were below the adjustment criteria. All COCs remain below the performance criteria in CP-W1. Figures 11 and 12 show that concentrations of 1,1-DCE and TCE, respectively, at extraction wells CP-W2 and CP-W3 still remain above the adjustment and performance criteria. TCE at CP-W2 has had an overall increasing trend since the system started, indicating the center of mass of the plume is migrating towards the extraction well. Since TCE has not been detected at any of the compliance monitoring wells, this increase does not present an immediate concern, but may represent the changing conditions of the groundwater plume.

East Extraction System (Source Contaminant Control)

Concentrations of COCs at extraction wells CP-E1, CP-E2, and CP-E3 have decreased significantly since system startup; however, concentrations of 1,1-DCE, PCE, and TCE still remain above performance criteria (Figures 13, 14 and 15, respectively). COC concentrations at CP-E1 and CP-E2 appear to be asymptotically approaching minima that are above the performance criteria. If these trends continue, it is unlikely that remedy goals will be achieved in a reasonable time frame. CP-E2, located at the southeast corner of the landfill, contains the highest concentrations of COCs; however, it has the lowest extraction

rate (averages less than 1gallon per minute (gpm)). The 2007 supplemental sampling (see Section VI.D.1.e) indicates that contamination remains to the north, east, and south of the landfill in areas potentially influenced by the east extraction system. An evaluation of the data near the east extraction system should be completed to determine if the current source removal system is adequate.

b. Groundwater Flow Analysis. As recommended in the O&M manual, groundwater flow maps with associated flow lines were created quarterly to evaluate the hydraulic control of the extraction systems. Tables 12 and 13 from the O&M manual present a list of wells that should be used to construct the flow maps. Due to temporary access restrictions (land owners not available to grant access) or domestic well use drawdown (if a well is in use, it is not used in the static groundwater flow maps), the number and location of wells that the County measures varies from quarter to quarter. For reference, the location of the wells from Table 12 and 13 from the O&M manual are presented on the July 2008 groundwater flow maps (Figures 17 and 19); however, since the wells used to create the contours are not presented on the map, the groundwater contours cannot be accurately reviewed.

Figures 16 and 17 show the groundwater contours in the upper aquifer when the system was in operation (January 2004) and the most recent data (July 2008). The July 2008 groundwater contour map indicates that flow in the upper aquifer continues to be influenced by the south interception system even though it has been turned off since 2004. Since data are not presented on the maps, it is difficult to determine if this is caused by an erroneous measurement (such as the domestic well use drawdown) or is an on-going feature. Future quarterly reports should present the locations and data used to create the maps either directly on the groundwater flow maps or in a table.

Figures 18 and 19 show the groundwater contours in the lower aquifer when all extraction wells were in operation (January 2004) and the most recent data (July 2008). Due to their proximity, the east and west systems can be considered as a single system for evaluation of hydraulic containment. The flow maps show the hydraulic containment near the landfill; however, groundwater elevations are not collected east of Elk Chattaroy/Yale Road, likely because the lower sand and gravel aquifer does not extent east of the landfill (the basalt unit of the lower aquifer is located to the east).

More extensive water level measurements should be collected periodically to the east of Elk Chattaroy/Yale road to evaluate hydraulic containment of the lower aquifer. Water levels are no longer collected at the following wells (from the O&M Manual Table 7-13): 0273L-1, 1173L-1, 0273P-3, 1573H-1, 0273F-4, 0273F-1, 1473D-1, 1473C-3, and 0273C-1. In addition, since hydraulic containment is assessed using the groundwater flow maps, the data at each measured location should be presented on the maps in the quarterly reports.

c. Extraction Well Operational Parameters. Individual well operating parameters, specific capacity and flow rates, were reviewed to determine if well performance has decreased over time. If an extraction well experiences no decrease in performance, the specific capacity should remain fairly constant. If a well has become clogged or has lost efficiency, a decrease in the specific capacity will be observed.

Two extraction wells remain in operation in the western containment system (lower aquifer): CP-W2 and CP-W3. Average quarterly flow rates and specific capacity are shown on Figures 20 and 21 for the past five years. Since CP-W1 was turned off, CP-W3 has been operating near its maximum extraction rate of 250 gpm. The average quarterly specific capacities at well CP-W2 have been fairly constant while the specific capacities at CP-W3 have been highly variable. The variability in flows and specific capacity

could be due to down time or equipment errors and the overall data trends do not indicate a loss of well efficiency.

The east system (source contaminant control) consists of three extraction wells: CP-E1, CP-E2, and CP-E3. Average quarterly flow rates and specific capacity are shown on Figure 22 and 23, respectively. Flow rates and specific capacity data have been relatively steady for CP-E1 and CP-E3. Average specific capacity data at CP-E1 became highly variable between 2006 and 2009. This could be typical patterns associated with of downtime and equipment errors rather than a loss of well efficiency and will be further evaluated during the RSE. As discussed above, CP-E2 typically contains the highest concentrations of COC but has the lowest extraction rates. Since CP-E2 was completed in the basalt unit, which has low transmissivity, slow recharge, and is governed by fractured flow, contaminant removal rates are much lower. Typically, the contribution of CP-E2 to the overall mass removal of the extraction system is less than 1 percent. The continued operation of this extraction well in its current state and its effectiveness on the overall source removal rates should be evaluated. Potential remedies include replacement, pulse pumping, or shutdown.

d. Treatment System Performance Data.

Grab samples are collected monthly from the treatment system effluent and analyzed for COCs, chloride, iron, manganese, and nitrite + nitrate. All concentrations for the past five years have been below the NPDES substantive requirement with the exception of two detections of manganese above 0.05 mg/L: January 2006 with a concentration of 0.115 mg/L and July 2008 with a concentration of 0.0564 mg/L. The monitoring indicates that the groundwater treatment system has little to no impact on the water quality of the River.

e. Supplemental Monitoring Data. The remedial action described in the ROD was a performance based design. The compliance monitoring focuses on the down-gradient boundaries to determine if the interception systems are containing the groundwater plume; it is, however, inadequate to track remaining contaminant concentrations within the plume area. To rectify this problem, the County voluntarily collects supplemental groundwater samples about every 5 years throughout the extent of the plume. The last supplemental sampling was completed in May 2007 and the data were presented in the second quarter 2007 monitoring report. It is recommended that this supplemental sampling be included in the groundwater monitoring program for the Site. The O&M Manual should be updated to include these supplemental monitoring events and evaluate their frequency. Overall, the RSE will evaluate the entire O&M Manual.

The 2007 supplemental data indicate that, with the exception of three detections of PCE, the upper aquifer COC plumes have been reduced to concentrations below the performance criteria. Figure 24 shows that the PCE detections above the performance criteria were located at CD-60A1 and CD-2A1 near the landfill and CP-S4, which is an extraction well at the southern interception system. All of these detections were less than 2 times the performance criteria.

For the lower aquifer, the 2007 data indicate that 1,1-DCE, PCE, and TCE concentrations above performance criteria remain near the Landfill. Figure 25 shows that detected PCE concentrations in the lower aquifer are limited to the immediate Landfill area. Figure 26 and 27 show that 1,1-DCE and TCE, respectively, are still detected in the lower aquifer surrounding the landfill to the north, east, and south. Extraction wells are located near areas of contamination remaining to the north and east of the Landfill. According to the groundwater flow maps presented in the quarterly reports, groundwater in the area to the

south should flow toward the extraction wells for treatment, even with CP-W1 at the southwest corner of the landfill in standby mode. Contamination has not been found in the compliance wells for the western interception system indicating that contaminated groundwater in the lower aquifer is currently contained. An evaluation of the necessity for additional source removal should be completed.

Residual 1,1-DCE contamination remains near monitoring well CD-40 near the Little Spokane River (see Figure 26). Shallow groundwater in this area of the site is likely connected to the upper aquifer. Contaminants could migrate from the landfill through upper colluvium. Monitoring well CD-40C1, where concentrations of COCs have historically been detected below performance criteria, may be influenced by contamination emanating from the upper aquifer near the landfill. 1,4-dioxane has been detected at CD-40C1 at concentrations above the MTCA Method B cleanup level (see Attachment 8). In addition, concentrations of COCs (below performance criteria) and 1,4-dioxane have been detected at nearby domestic wells 1073D-1 and 1073D-2 (see Attachments 7 and 8). The County currently collects annual samples at CD-40C1. Since this area is located down-gradient of the landfill in an area that is not treated by the extraction systems, monitoring should continue on an annual basis and the O&M manual should be updated to incorporate monitoring at this location.

2. Landfill Closure. Data reviewed as part of the landfill closure include the landfill gas monitoring data and MFS groundwater monitoring data.

a. Landfill Gas Monitoring. According to WAC 173-304, gas levels at the landfill property boundary should not be above the Lower Explosive Limit (LEL) (5% methane by volume). All of the gas monitoring probes around the perimeter of the landfill have been below the LEL during the past five years.

b. Minimal Functional Standards Groundwater Monitoring. Attachment 5 presents the minimal functional standards (MFS) groundwater monitoring data for the past five years. The well locations are presented on Figure 8. Initially MFS groundwater samples were collected quarterly at four upper aquifer monitoring wells and two lower aquifer monitoring wells. Quarterly monitoring and monitoring of the lower aquifer wells stopped in January 1999. Currently, annual samples are collected at four upper aquifer monitoring wells: CD-3A1, CD-60A1, CD-61A1, and CS-4A1. All samples are analyzed for COCs and the parameters listed in WAC 173-304-490 (chloride, nitrite/nitrate/ammonia, sulfate, total organic carbon, chemical oxygen demand, iron, manganese, and zinc). During the past 5 years, only CD-60A1 has had an exceedance of the performance criteria (PCE in 2006, 2007, and 2008) which is likely related to the residual upper aquifer plume. In addition CS-04A1 consistently contains manganese above the Washington State Secondary Drinking Water Standard.

3. Domestic Well Monitoring. Forty domestic wells are monitored according to the schedule presented in Attachment 6. Monitoring data are presented in Attachment 7. Figure 28 presents the locations of the wells. The domestic well monitoring data show that there have been no exceedances of the performance criteria during the past 5 years. 1,4-Dioxane was detected above MTCA Method B cleanup levels at the Whitworth Water Supply well. This well was taken out of service in 2006 and is only sampled as part of the 1,4-dioxane monitoring program.

4. 1,4-Dioxane Monitoring. 1,4-Dioxane was identified as a new COC in the previous Five-Year Review. Monitoring data are presented in Attachment 8; the MTCA Method B value is presented for comparison. The County first sampled and analyzed for 1,4-dioxane in 2005 after it was identified as an emerging contaminant in the last Five-Year review. It was detected at wells in three distinct areas which

are shown on Figure 29: at the landfill (CP-W2 and CD-04C1/E1), in the upper aquifer near the Little Spokane River (1073D-1, 1073D-2, CD-40C1/2), and in the upper aquifer near the south interception system (CP-S1, 1573A-1, and 1473M-1). The County is currently collecting quarterly samples at the well locations near the Little Spokane River (1073D-1, 1073D-2, CD-40C1) and near the south interception system (1573A-1, 1473M-1, and CP-S1).

1,4-Dioxane has been found in association with 1,1,1-TCA for its use as a stabilizer and corrosion inhibitor, but is also used as a solvent in typical household products such as paints, varnishes, and cleaning preparations. It is a highly mobile contaminant that is typically found at the leading edge of groundwater plumes. The detections of 1,4-dioxane at the landfill indicates that it was likely associated with the solvents disposed of in the landfill. The detections near the Little Spokane River and the south interception system likely indicate residual sources from the landfill but could be from other household sources. Continued monitoring of these wells may be necessary following the four quarters of monitoring.

E. Site Inspection

An inspection of the site was conducted on January 27, 2009, by the EPA RPM, Piper Peterson Lee; the USACE review team Sharon Gelinas and Robin Smith; and Bill Wedlake and Deb Geiger of Spokane County Utilities Department. Site photographs are presented in Attachment 9. The purpose of the inspection was to observe ongoing remedial measures and system operation.

Overall the site appeared to be functioning with no noticeable maintenance repairs needed for the groundwater extraction and treatment system or the gas extraction system. A fence surrounds the landfill property. At the time of the site visit, the area was blanketed with about one foot of snow, so if any maintenance needs are required on the landfill, they were not observable. Ground cover and vegetation were also not observed.

Inspection of the groundwater treatment system itself appeared in good condition and was functioning as intended. The network of influent pipes and pumps that was located in the indoor housing appeared to be in good condition with no visible wear on the pipes or staining or leaking on the pumps. Regular upkeep of the system controls was apparent with clean electronic surfaces and without dust buildup.

External groundwater treatment and gas extraction system features also appeared in good condition. System extraction wells were located below grade in vaults covered with a metal door and pad locked. The one well vault inspected appeared clean with little staining or rusting of pipes, or degradation of electronic equipment. Air stripper tower and external gas extraction piping appeared in good condition.

F. Interviews

Deb Geiger and Bill Wedlake from the Spokane County Utilities Department were interviewed on January 27, 2009, regarding site history, landfill daily operations, groundwater extraction and gas management system operation and maintenance. Because of low community interest in environmental issues at the site, no community members were interviewed.

Jim Sackville-West from the Spokane County Health Department was interviewed on March 12, 2009, regarding the groundwater institutional controls procedures. Results of this interview were discussed in Section IV.D.3.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents? No

The institutional control component of the remedy is not functioning as intended by the decision documents. A restrictive covenant for the landfill has not been filed and an Institutional Control Plan with designated lead agency oversight has not been completed. The County has informally addressed these issues by using fencing to prevent disturbance of the landfill cover and by tracking the installation of new domestic wells within the plume area through applications for new developments.

The County maintains the extraction system, LFG management system, and landfill cover in good working condition. The agencies do not receive documentation on the monitoring and maintenance of the LFG management system and landfill cover to determine if the landfill closure requirements are being met.

The extraction system is generally functioning as intended; the overall size and shape of the contaminated groundwater plume has not changed significantly, but active pumping has reduced contaminant concentrations in the upper and lower aquifers. As of October 2008, the groundwater extraction systems have treated 5,670 million gallons of water and removed 10,397 pounds of contaminants. Five out of the ten extraction wells have been put in standby mode because they have met the adjustment criteria. However, the groundwater monitoring program described in the Consent Decree is inadequate to track remaining contaminant concentrations within the plume area. The compliance monitoring focuses on the down-gradient boundaries to determine if the interception systems are containing the groundwater plume. Sampling at monitoring and domestic wells within the plume, which can be used to monitor the progress of the remedial action, is not included. The County voluntarily collects supplement samples throughout the extent of the plume approximately every five years to correct for this deficiency. This supplemental sampling indicates that concentrations of COCs above performance criteria remain in the lower aquifer to the north, east, and south of the landfill.

A Remediation System Evaluation (RSE) is necessary to determine if the current extraction systems can meet performance criteria throughout the plume within a reasonable time frame. Components of this RSE should address issues and recommendations from this Five-Year review including, but not be limited to, an evaluation of the performance of the source control system (east extraction system) and containment system (west extraction system), and evaluation of the need for additional source control, and location of remaining contamination.

The current state of each ROD objective and any indicators of remedy problems are described below.

1. Prevent further spread of contaminated groundwater (in the south and west) in two aquifers by installing and operating interception wells and treating the extracted groundwater. All of the south system interception wells, which treat upper aquifer contamination, were shut off in 2004 because concentrations met the adjustment criteria. Concentrations of PCE at extraction well CP-S4 are still slightly above the performance criteria, but there may be little benefit to human health and the

environment for re-starting this extraction well unless concentrations begin to have an increasing trend. In addition, PCE has not recently been detected at any of the south system compliance monitoring wells. Two out of the three extraction wells in the west interception system, which treat lower aquifer contamination, are currently in operation. The third well (CP-W1) was turned off in 2005 because the adjustment criteria were met. Quarterly groundwater flow maps indicate that hydraulic containment of the plume is still being maintained.

2. Remove contaminated materials (in the east) which have entered the aquifers and are contributing to the contaminant plume by installing and operating extraction wells in the area where the plumes originate. The three extraction wells in the east area are currently operating. Extraction well CP-E2, near the southeast corner of the landfill contains the highest concentrations of contaminants; however, due to its completion in the basalt unit, it has a very low extraction rate. The continued operation of this extraction well in its current state should be evaluated. Performance monitoring of the east extraction system was not required in the Consent Decree since these wells were designated for source removal only. The recommended RSE should include an evaluation of the source control extraction system.

3. Provide an alternate water supply system to any residents who are deprived of their domestic supply by demonstrated contamination from the landfill or due to the action of the extraction system. Domestic wells are sampled according to the schedule presented in Attachment 6. Performance criteria have not been exceeded at any of the sampled domestic wells in the past five years. 1,4-Dioxane was detected above the MTCA Method B groundwater cleanup level at the Whitworth Water well (1073D-2), and this well was subsequently taken out of service in 2006. The Spokane County Health Department checks for new wells that may be installed within 0.5 miles of the groundwater plume area through applications for new development. The Health Department reviews start cards from Ecology for new wells and should be able to detect wells installed within the groundwater protection area

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid? No.

At the time the Consent Decree was written, quantifying PCE and MC were not possible at the low levels suitable for protecting human health using the analytical methods available, and therefore alternative evaluation criteria (i.e., evaluation criteria and adjustment criteria) were developed. Technology is now capable of detecting the analytes at the performance criteria levels, so the evaluation criteria are no longer applicable. A review of operation decisions that may have utilized evaluation criteria indicates the site is still protective. Of the compliance monitoring and domestic well data, only extraction well CP-S4, which is currently in standby mode, slightly exceeds the PCE performance criteria. As stated above, re-starting this extraction well may have little benefit to human health and the environment.

1. Changes in Standards and To Be Considered (TBCs). A review was done to identify any changes in standards that were identified as Applicable or Relevant and Appropriate Requirements (ARARs) in the ROD; newly promulgated standards including revised chemical-specific requirements (such as MCLs); revised action and location-specific requirements; and State standards and 'to be considered' (TBCs) identified in the ROD that bear on the protectiveness of the remedy. Changes were then evaluated to establish whether the new requirements may indicate that the remedy is no longer protective. A summary table is presented in Attachment 10. It should be noted that the passage of the Washington State MTCA Cleanup Regulations in 1989 followed the ROD completion in 1987. This Five-Year review

does not consider changes to the performance criteria that would result from inclusion of MTCA as an ARAR. MTCA will be an ARAR in the final ROD.

The MCL for TCE was 5 µg/L when the ROD was issued in 1987 and remains unchanged. The MCL for 1,1,1-TCA and 1,1-DCE used as standards in the ROD also remain unchanged.

2. Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics. At the time the ROD was signed, risk-based MAC values were used as performance standards for the chemicals MC, 1,1-DCA, and PCE. These are risk-based standards calculated using an excess cancer risk of 10^{-6}. MC and PCE were evaluated as carcinogens and 1,1-DCA was evaluated as a non-carcinogen. Since that time, EPA has listed 1,1-DCA as a possible human carcinogen. Toxicity data are not available in the Integrated Risk Information System (IRIS) database for 1,1-DCA or PCE, but an evaluation using the Tier 3 California EPA toxicity values indicates that the performance criteria may not be protective for 1,1-DCA and PCE. A comparison of the most recent compliance monitoring and domestic well COC concentrations to the California EPA derived values indicates that the site remains protective. A re-evaluation of the risk-based performance criteria may be necessary in the future to assure long-term protectiveness of the remedial action.

The toxicity factor used to estimate the excess cancer risk associated with the exposure to TCE was withdrawn from the IRIS database in 1989. The following paragraph summarizes recent developments regarding the oral toxicity of TCE in the nation and region.

EPA (2001) published the *Trichloroethylene Health Risk Assessment: Synthesis and Characterization (External Review Draft),* which included a range of draft toxicity values. According to a memorandum (EPA Region 10, 2008, from Joyce Kelly to Dan Opalski) titled *Review of draft working memo, Interim Recommended Trichloroethylene (TCE) Toxicity Values to Assess Human Health Risk and Recommendations for the Vapor Intrusion Pathway Analysis,* either the EPA (2001) "Reassessment" oral cancer slope factor of 0.089 $(mg/kg\text{-}day)^{-1}$, or the California EPA oral cancer slope factor of $(0.013\ mg/kg\text{-}day)^{-1}$ should be used for ingestion. The January 15, 2009, EPA memorandum from Susan Parker Bodine to Regional Administrators affirmed that EPA will determine toxicity values for TCE consistent with the National Contingency Plan (e.g., 40 CFR 300.430(e)) and the 2003 Toxicity Hierarchy (OSWER Directive 9285.7-53, December 5, 2003). The EPA (2009) memorandum recommends the use of the California EPA inhalation unit risk value of $2.0E\text{-}06(ug/m3)^{-1}$ and an oral cancer slope factor of 0.013 $(mg/kg\text{-}day)^{-1}$ for evaluating the carcinogenic effects of TCE in site-specific risk assessments at sites addressed under CERCLA. Use of either the EPA (2001) or California EPA oral cancer slope factors lead to groundwater values that are a fraction of the MCL of 5 ug/L for TCE. However, because the ROD selected the MCL, and the MCL has not been updated in response to this change in toxicity, the recent TCE deliberations do not affect the protectiveness of the groundwater remedy for this chemical.

The exposure pathway to contaminated groundwater water remains incomplete through the use of institutional controls by the County. Land use in the vicinity of the landfill continues to be residential or open lands. Direct contact with soil is not a concern. The potential risk due to the intrusion of VOCs into indoor air has recently been recognized as a potentially significant pathway that was not fully evaluated at the time that the original risk evaluation was prepared.

The potential for contaminated groundwater to act as a source of contamination to soil gas that may impact indoor air was screened during this Five-Year Review. Given the current landfill gas management

program, it is unlikely that an active pathway for indoor air in residences or businesses adjacent to the landfill is occurring; however, the groundwater to indoor air pathway may occur outside of the area influenced by the gas management system. The most recent groundwater data were compared to values calculated using the screening level version of the Johnson and Ettinger (J&E) Vapor Intrusion Model, Version 3.1 (EPA 2002) to determine if concentrations of COCs in the upper aquifer pose a risk to indoor air outside the area influenced by the gas management system. The parameters and model results are presented in Attachment 11. California EPA toxicity values were used to evaluate TCE. Default values within the J&E Model were used for 1,1,1-TCA; 1,1-DCA; 1,1-DCE; PCE and MC. The worst case scenario (near the Little Spokane River where the depth to groundwater can be as shallow as 3 feet) indicates that concentrations of COCs in the upper aquifer do not appear to pose a risk to indoor air. However, further evaluation of the vapor intrusion issue should be completed during the RSE to confirm these results.

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

1,4-Dioxane was recognized as a potential chemical of concern during the last Five-Year Review. Subsequent sampling showed that 1,4-dioxane was detected above the MTCA Method B groundwater cleanup level at the Whitworth Water well (1073D-2). This well was subsequently taken out of service in 2006. The Spokane County Health Department checks for new wells that may be installed within 0.5 miles of the groundwater plume area through applications for new development.

Technical Assessment Summary

The remedy is not currently fully functioning as intended because a restrictive covenant for the landfill has not been filed and an Institutional Control Plan with designated lead agency oversight has not been completed. The County has unofficial procedures in place to address these issues such as fencing surrounding the landfill to prevent cover disturbance and tracking the installation of wells through applications for new developments.

The extraction system is functioning as intended; the overall size and shape of the contaminated groundwater plume has not changed significantly, but active pumping has reduced contaminant concentrations in the upper and lower aquifers. Five out of the 10 extraction wells have been put in standby mode because they have met the adjustment criteria. However, the groundwater monitoring program described in the Consent Decree is inadequate to track the remaining contaminant concentrations within the plume area. The compliance monitoring program focuses on the down-gradient boundaries to determine if the interception systems are containing the groundwater plume. Sampling of monitoring and domestic wells within the plume, which can be used to monitor the progress of the remedial action, is not included. The County voluntarily collects supplement samples throughout the extent of the plume approximately every five years to correct for this deficiency. This supplemental sampling indicates that concentrations of COCs above performance criteria remain in the lower aquifer to the north, east, and south of the landfill. A RSE is necessary to determine if the current extraction systems can meet performance criteria throughout the plume within a reasonable time frame.

VIII. Issues

Table 4 below lists the issues for the Colbert Landfill site.

Table 4. Issues

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. Status of landfill restrictive covenant unknown.	N	Y
2. An Institutional Control Plan, with designated lead agency oversight, has not been completed.	N	Y
3. Groundwater flow line analyses in quarterly reports are inadequate.	N	Y
4. East extraction system (CP-E2) may not be operating at maximum efficiency.	N	Y
5. The current groundwater monitoring program, as describe in the Consent Decree, is inadequate to track the remaining contaminant concentrations within the plume area.	N	Y
6. Residual contamination exists near CD-40 down-gradient from the extraction systems near the Little Spokane River.	N	Y
7. 1,4-Dioxane concentrations detected in groundwater above MTCA cleanup levels.	N	Y
8. Extraction systems have been operating for almost 20 years and a RSE should be completed.	N	Y
9. Toxicity information for 1,1-DCA and PCE has been revised.	N	Y
10. Landfill cover has not been surveyed since 2005	Y	Y
11. Final ROD has not been completed	N	Y
12. There is a potential for contaminated groundwater to act as a source of contamination to soil gas that may impact indoor air.	Y	Y

The following operation and maintenance issues were also identified as needing follow-up, but do not affect protectiveness:

- Due to the lower COC reporting limits, evaluation criteria are no longer applicable.
- Landfill Closure monitoring, maintenance, and repair reports are not submitted to Ecology or EPA as required in the Consent Decree Section XI.
- Domestic sampling plan and schedule has not been updated since 2006.

IX. Recommendations and Follow-Up Actions

Table 5 below lists recommendations for the Colbert Landfill site.

Table 5. Recommendations and Follow-Up Actions

Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
				Current	Future
1. Determine if a restrictive covenant has been placed on the landfill. File if necessary.	County	Ecology/EPA	12/31/2009	N	Y
2. Document the procedures for groundwater protection (i.e. installation of new domestic wells) in an Institutional Control Plan. Designate a lead agency for oversight.	County	Ecology/EPA	6/1/2010	N	Y
3. Collect groundwater elevation measurements east of Elk Chattaroy/Yale Road. Include locations and measurements on groundwater flow maps or in a table to allow an accurate assessment of the flow line analysis.	County	Ecology/EPA	3/1/2010	N	Y
4. Evaluate need for continued operation of CP-E2 in its current condition during the RSE.	EPA	Ecology/EPA	6/30/2010	N	Y
5. Include supplemental sampling in the groundwater monitoring program for the Site. Update the O&M Manual as necessary.	County	Ecology/EPA	6/1/2010	N	Y
6. Continue sampling CD-40C1 on an annual basis and update the O&M Manual as necessary.	County	Ecology/EPA	12/31/2009	N	Y
7. Evaluate 1,4-dioxane data at the completion of 4 quarters of monitoring. Include sampling of wells with concentrations of 1,4-dioxane above cleanup criteria in long-term monitoring program.	County	Ecology/EPA	12/31/2009	N	Y
8. Complete RSE.	EPA	Ecology/EPA	12/31/2010	N	Y
9. Evaluate the need for revising the risk-based performance criteria for 1,1-DCA and PCE during the RSE.	EPA	Ecology/EPA	12/31/2010	N	Y

Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
				Current	Future
10. Conduct regular surveys of the Landfill cover.	County	Ecology/EPA	12/31/2010	Y	Y
11. Complete Final ROD.	EPA	Ecology/EPA	9/30/2011	N	Y
12. Evaluate vapor intrusion issues during the RSE.	EPA	Ecology/EPA	12/31/2010	Y	Y

The following Recommendations and Follow-up Actions relate to O&M Issues which were also identified in this review and which need follow-up, but do not affect protectiveness:

- Use ROD performance criteria to track progress of remedial actions.
- Submit Landfill Closure monitoring data, maintenance, and repair details to Ecology and EPA on an annual basis. Include any monitoring schedule revisions.
- Update the domestic sampling plan and schedule. Include a status review of all domestic wells within the plume area.

X. Protectiveness Statement

The remedy at the Colbert Landfill Site currently protects human health and the environment because residences with affected wells have been connected to County water supplies; the groundwater extraction systems are preventing further migration of the groundwater plume; domestic wells are sampled on a schedule to confirm that the drinking water exposure pathway is blocked; and the Spokane County Health Department has procedures in place to detect any wells installed as part of a new development.

However, in order for the remedy to be protective of human health and the environment in the long term the following actions need to be taken:

- Put restrictive covenants in place for the landfill and complete an Institutional Controls Plan that documents procedures to control installation of domestic wells.
- Improve the current groundwater monitoring program to track the remaining contaminant concentrations within the plume area. Currently, the County voluntarily collects samples throughout the plumes (upper and lower aquifer) approximately every five years to account for this short coming.
- Conduct a RSE to determine if the current extraction system is adequate to maintain containment and/or achieve long term cleanup goals within a reasonable timeframe.

XI. Next Review

The next five-year review for the Colbert Landfill Site is required by September 2014, five years from the date of this review.

ATTACHMENTS

FIGURES

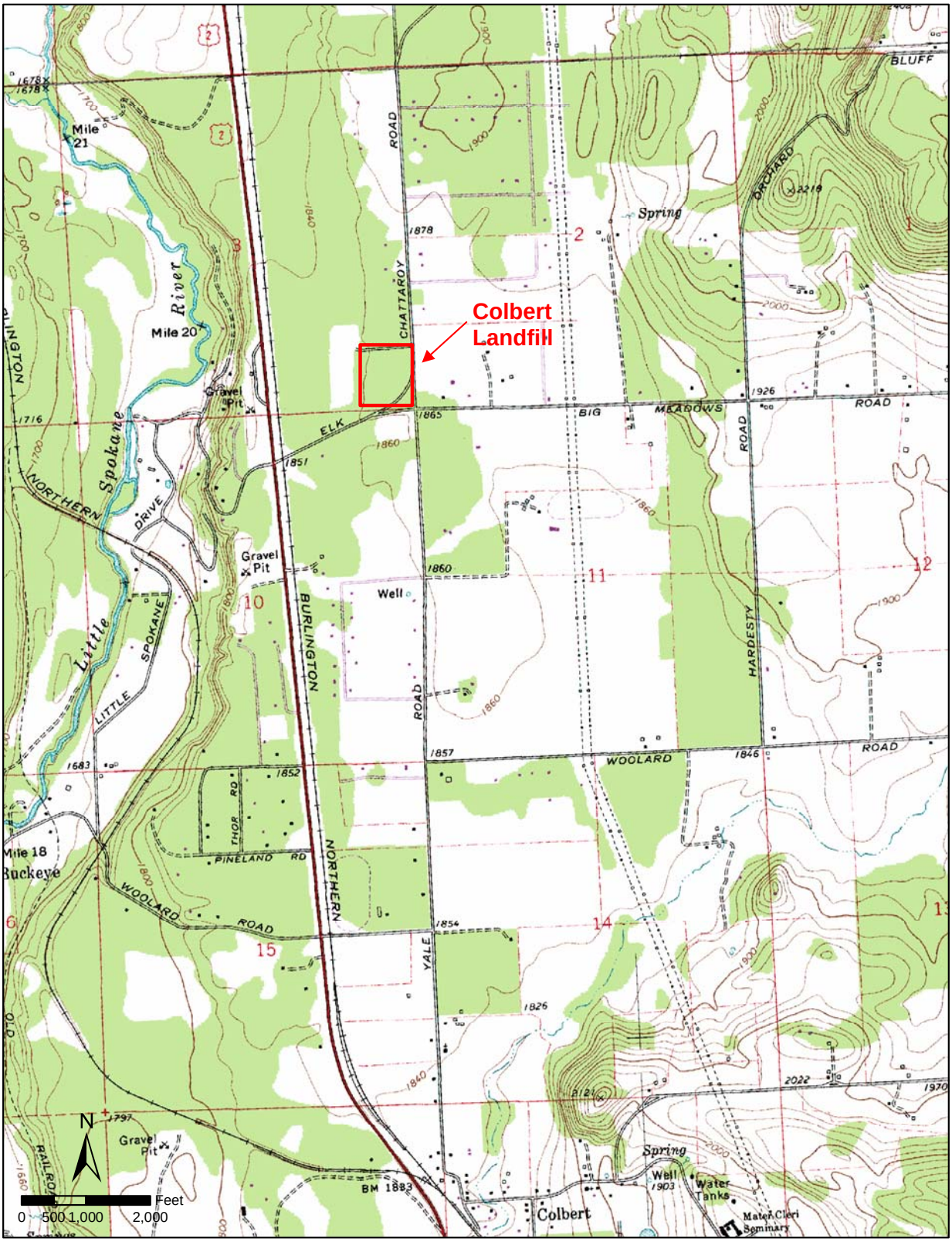

Figure 1. Location of Colbert Landfill

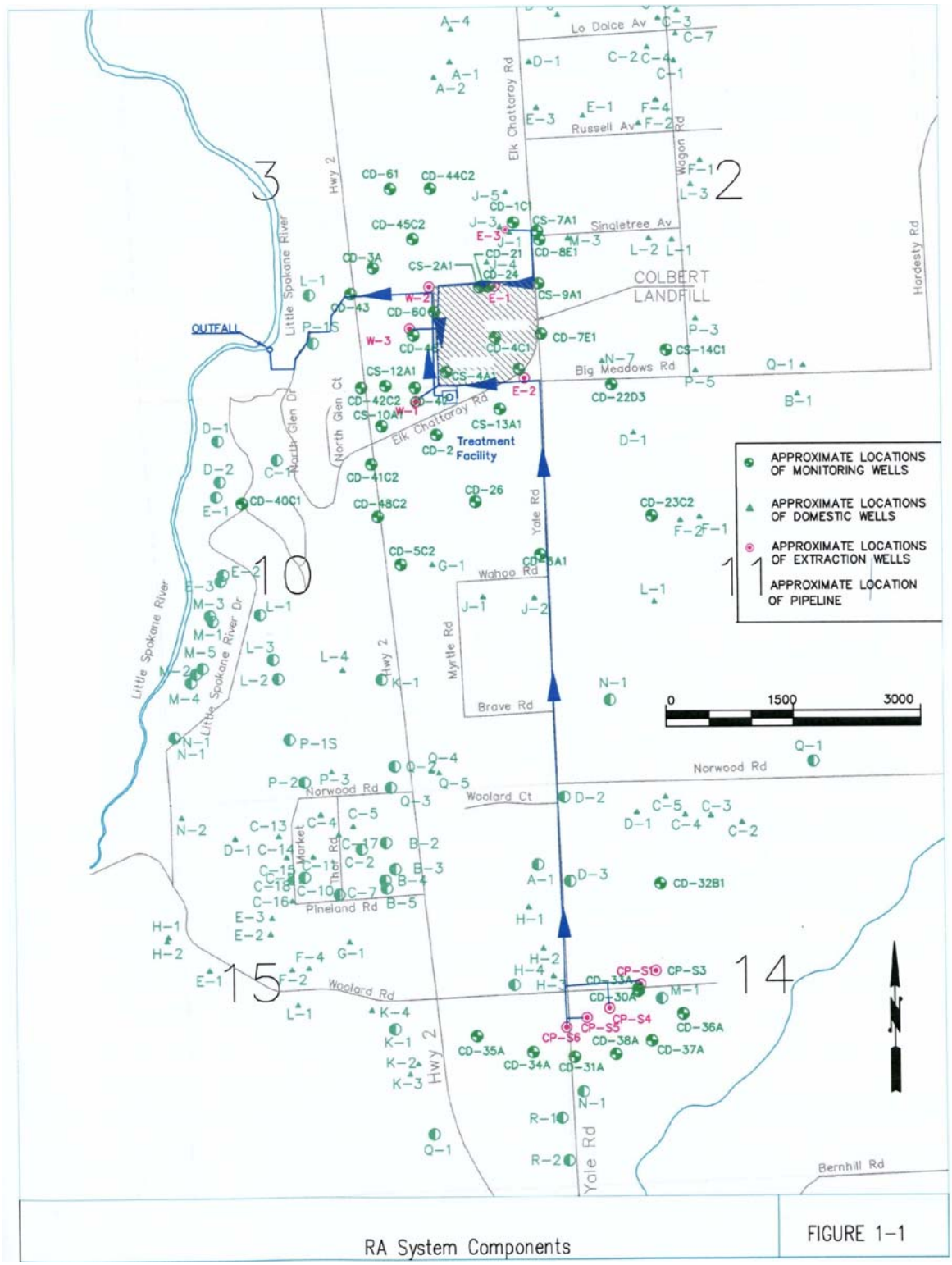

Figure 2. Colbert Landfill Site Map

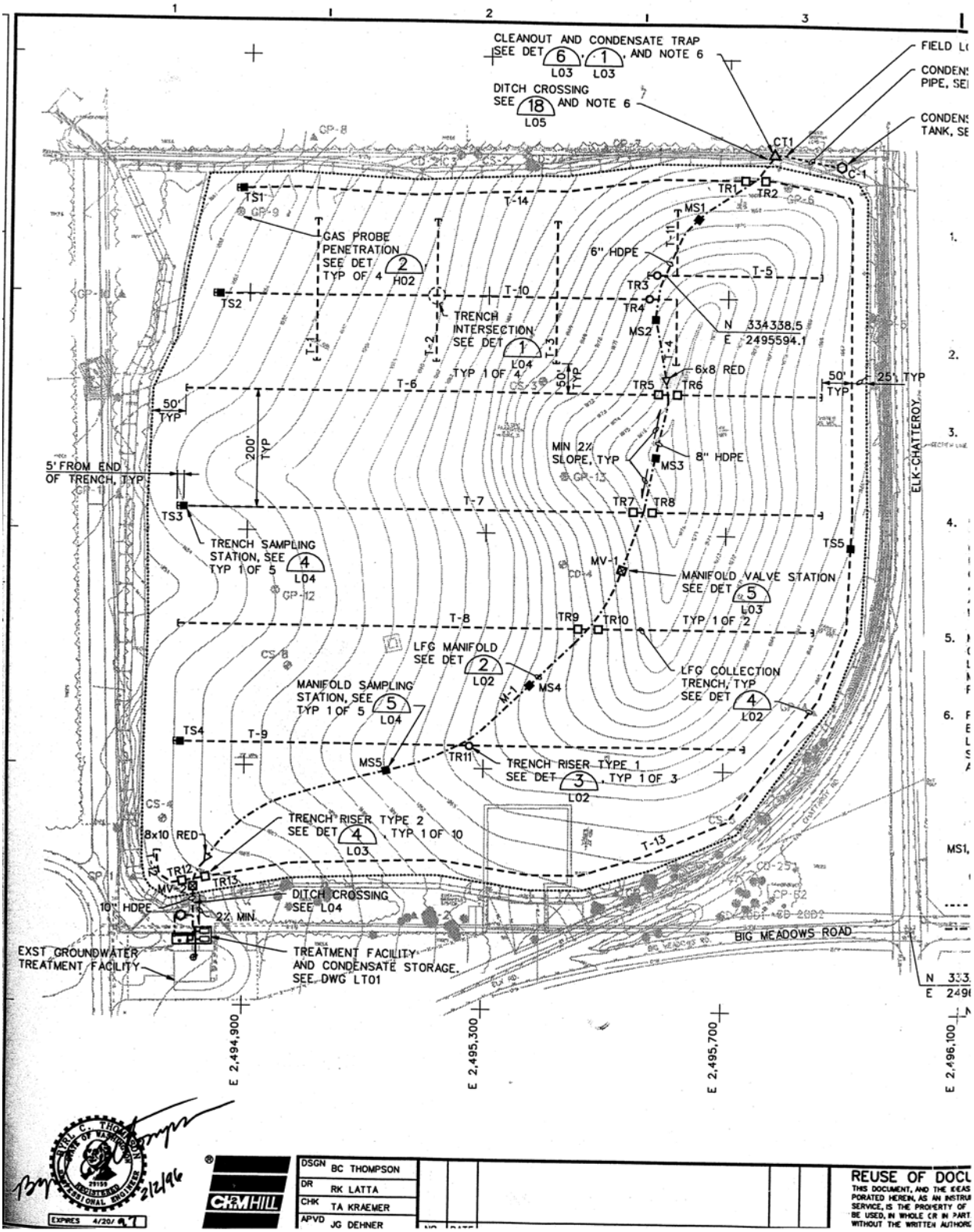

Figure 3. Colbert Landfill Gas Management System

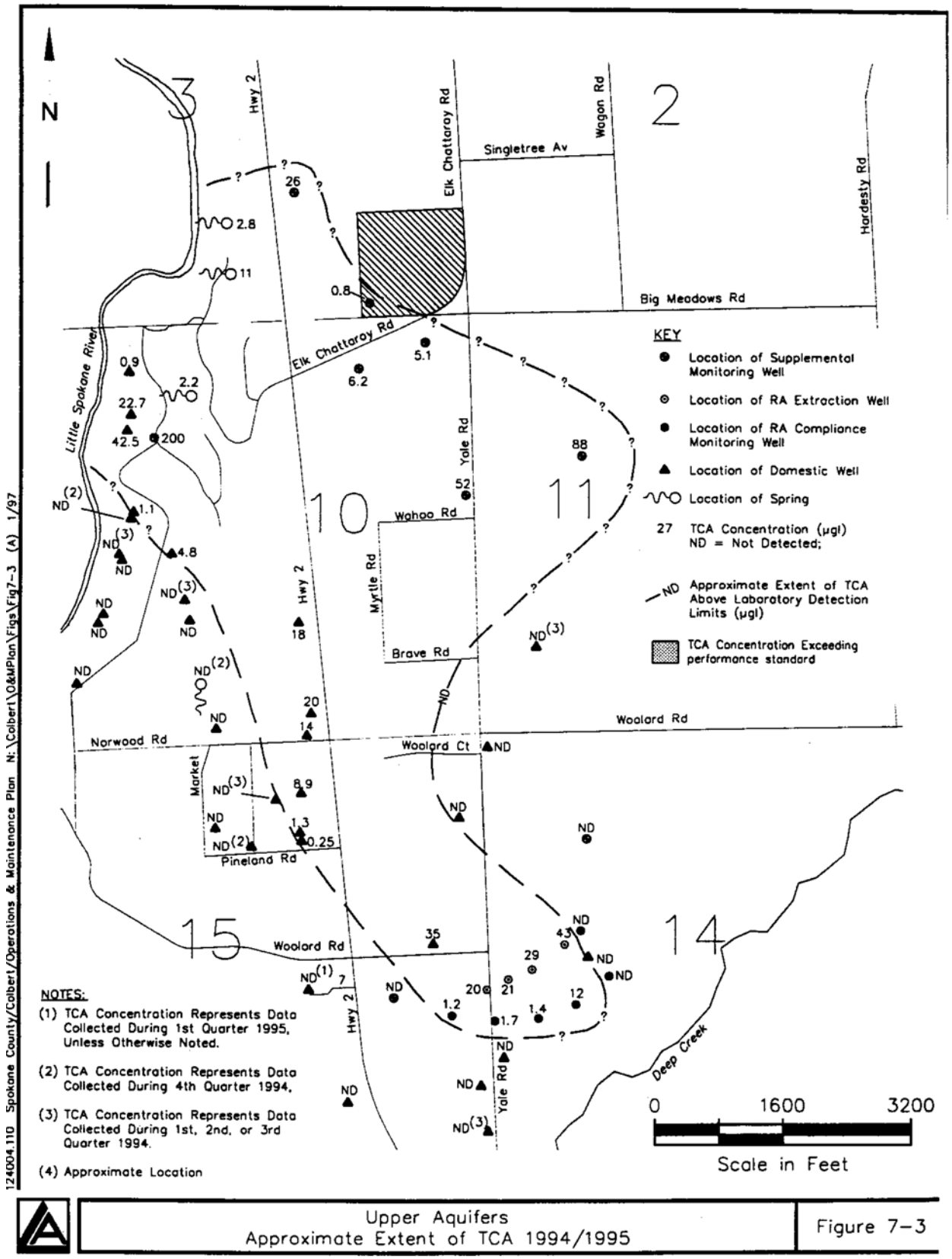

Figure 4. 1,1,1-TCA Plume Extent in the Upper Aquifer, 1994/1995

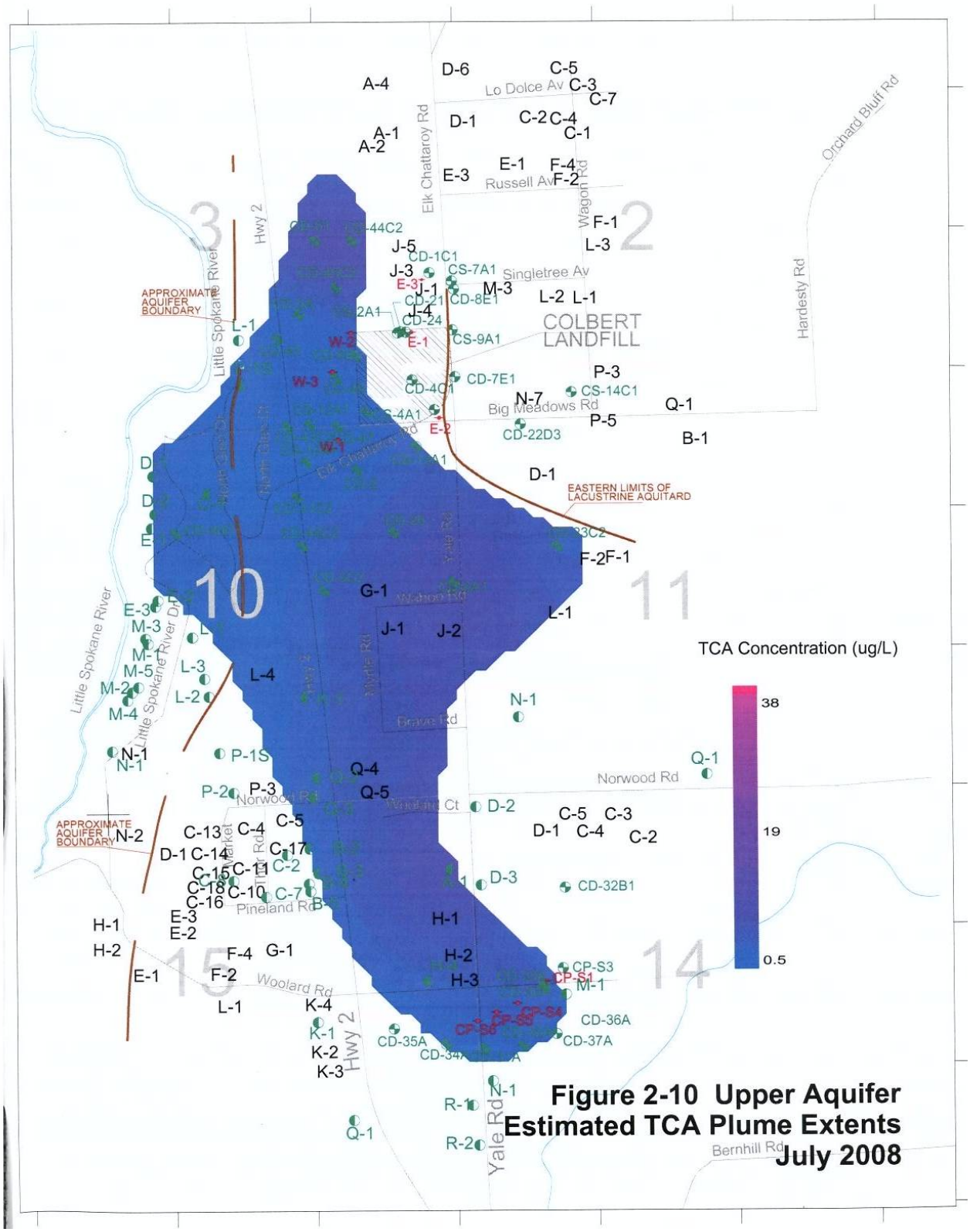

Figure 5. Estimated 1,1,1-TCA Plume Extent in the Upper Aquifer, July 2008

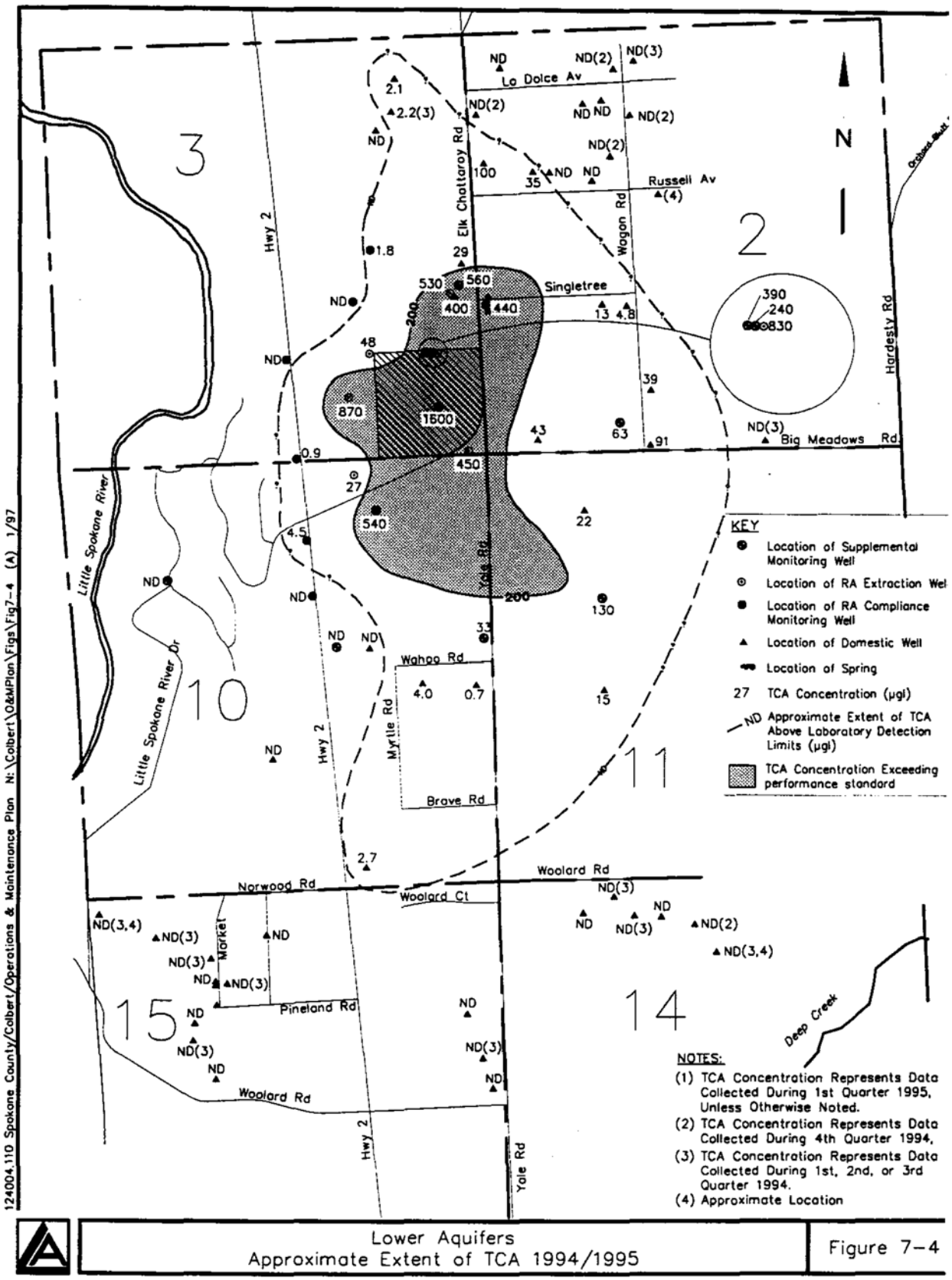

Figure 6. 1,1,1-TCA Plume Extent in the Lower Aquifer

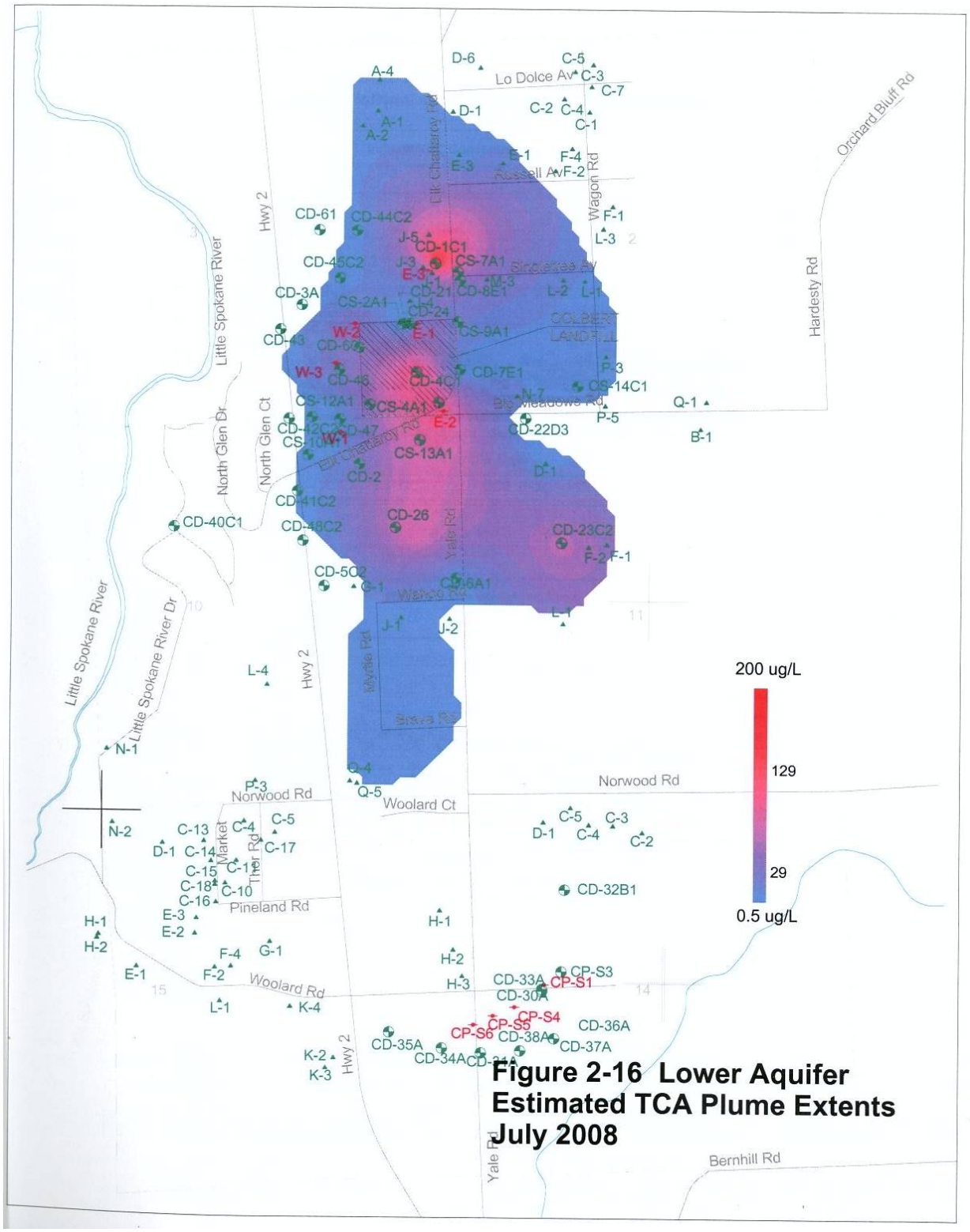

Figure 7. Estimated 1,1,1-TCA Plume Extent in the Lower Aquifer, July 2008

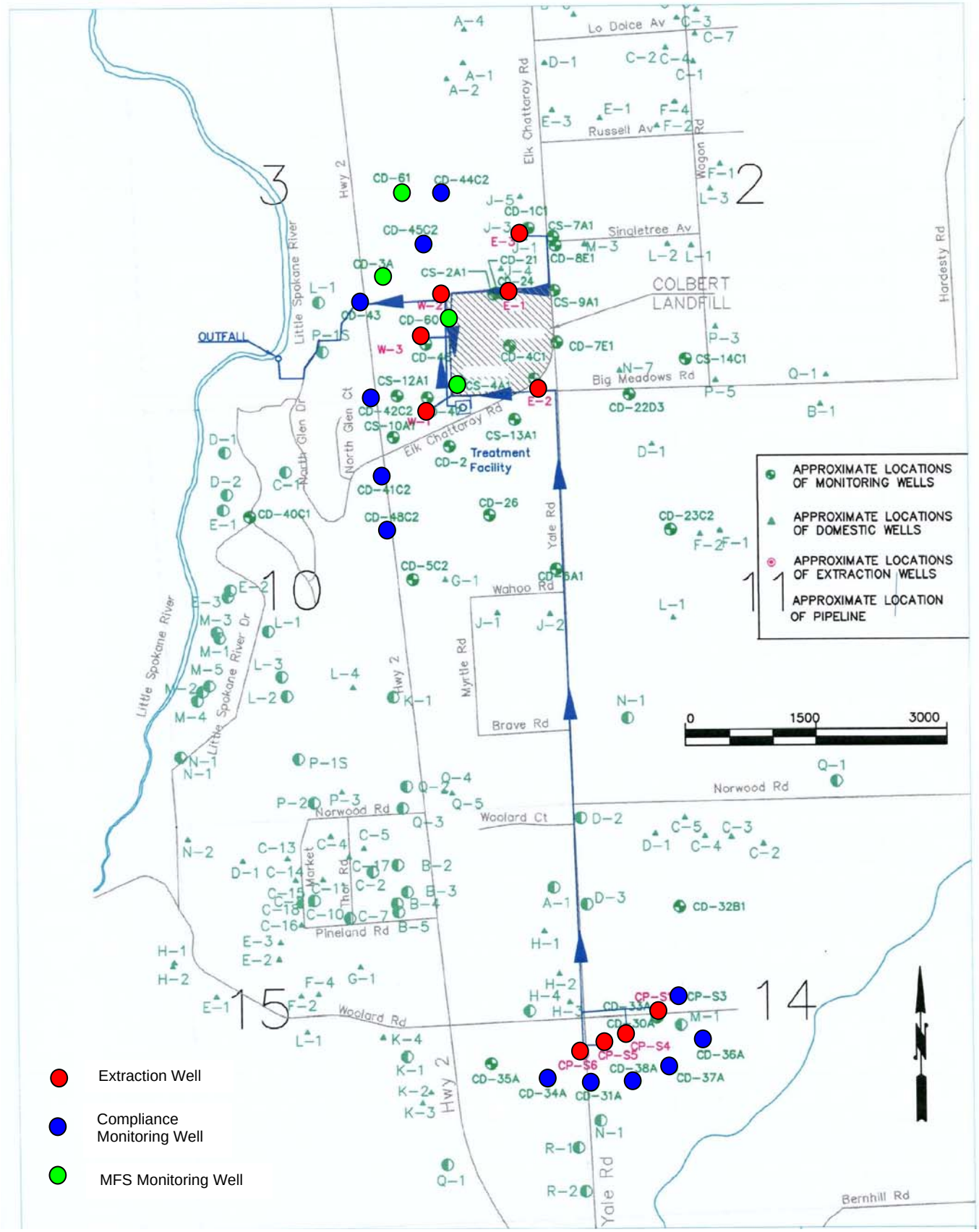

Figure 8. Groundwater Monitoring Locations

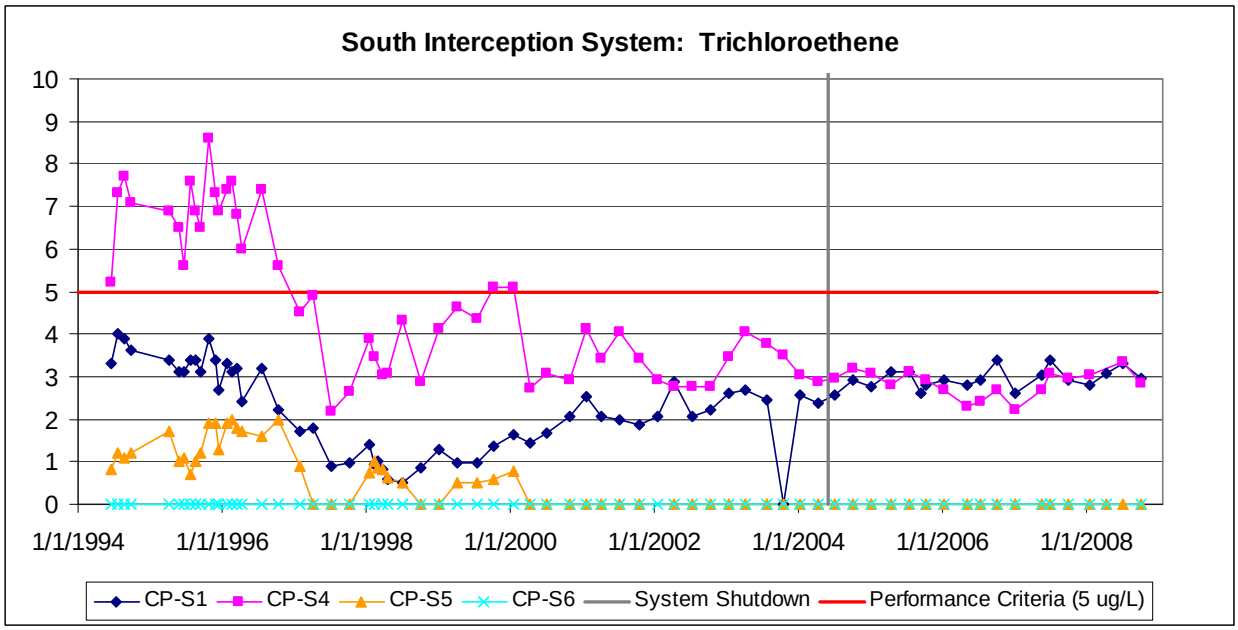

Figure 9. Concentration of TCE in South Interception System Extraction Wells

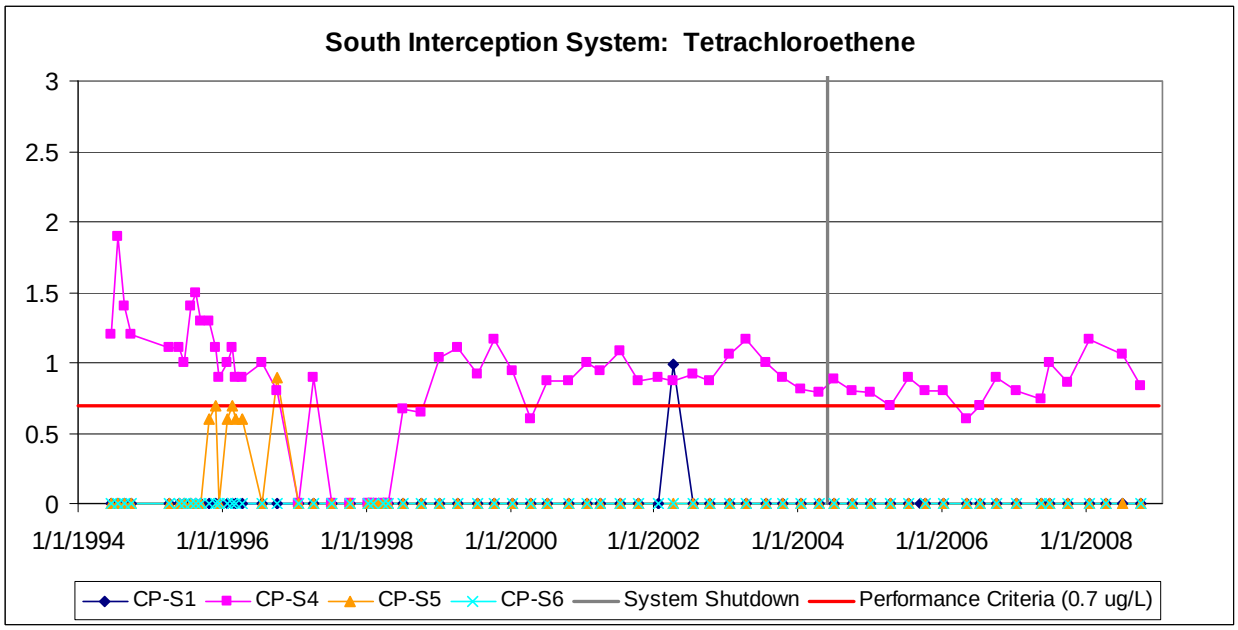

Figure 10. Concentration of PCE in South System Extraction Wells

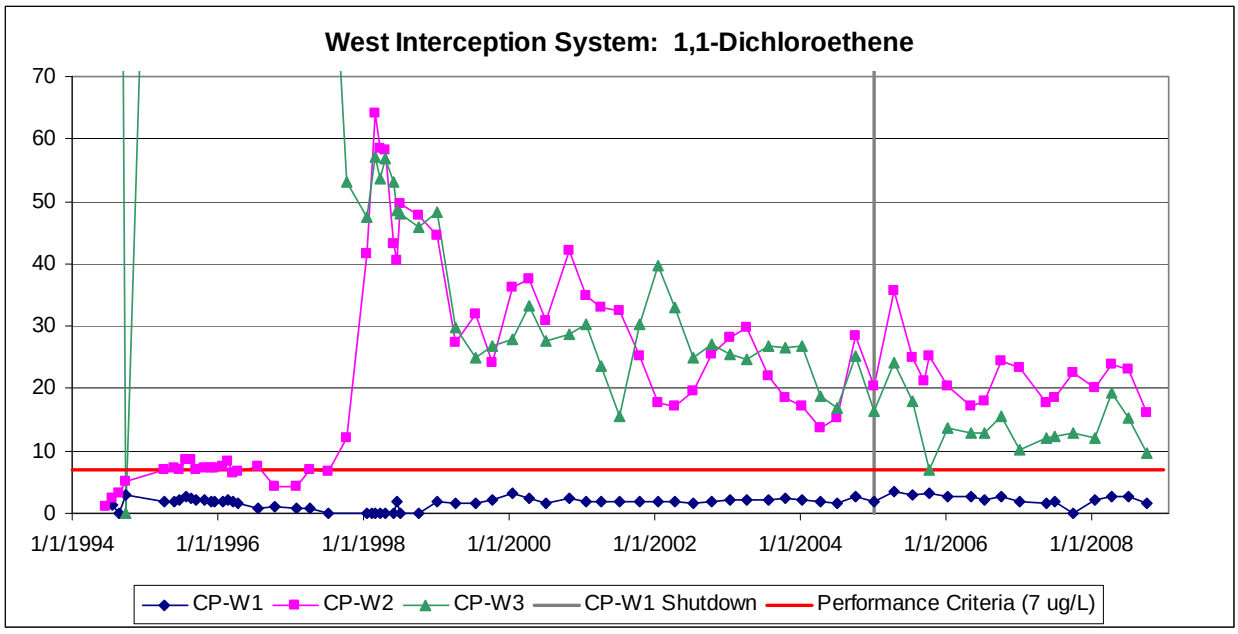

Figure 11. Concentration of 1,1-DCE in West System Extraction Wells

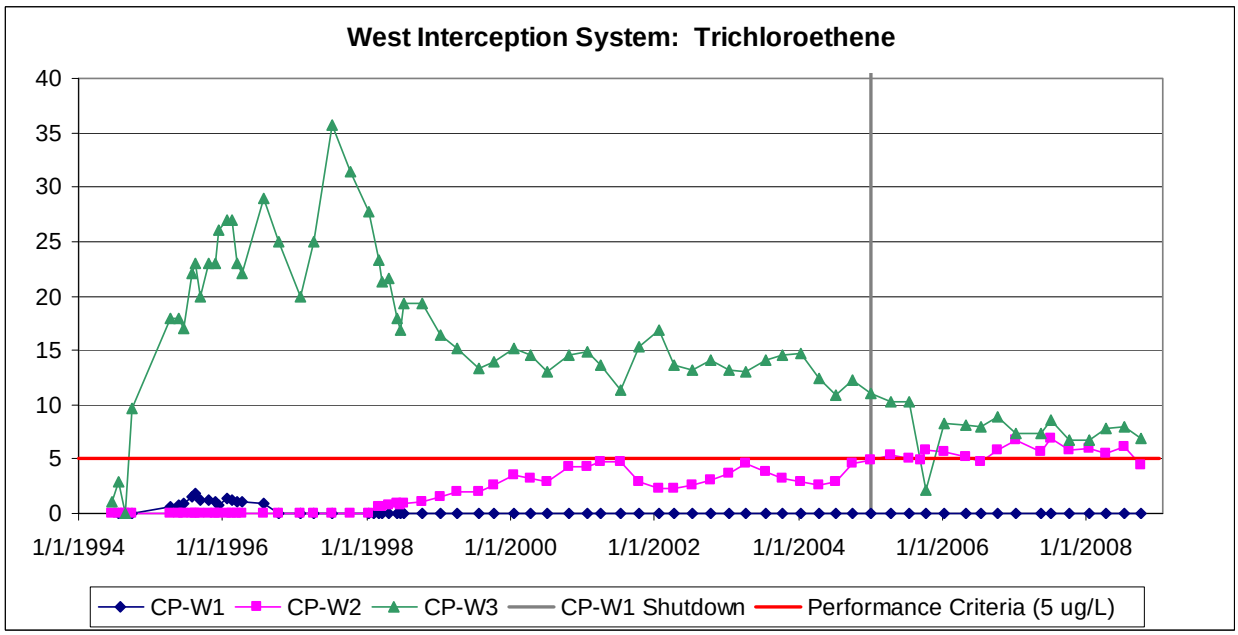

Figure 12. Concentrations of TCE in West System Extraction Wells

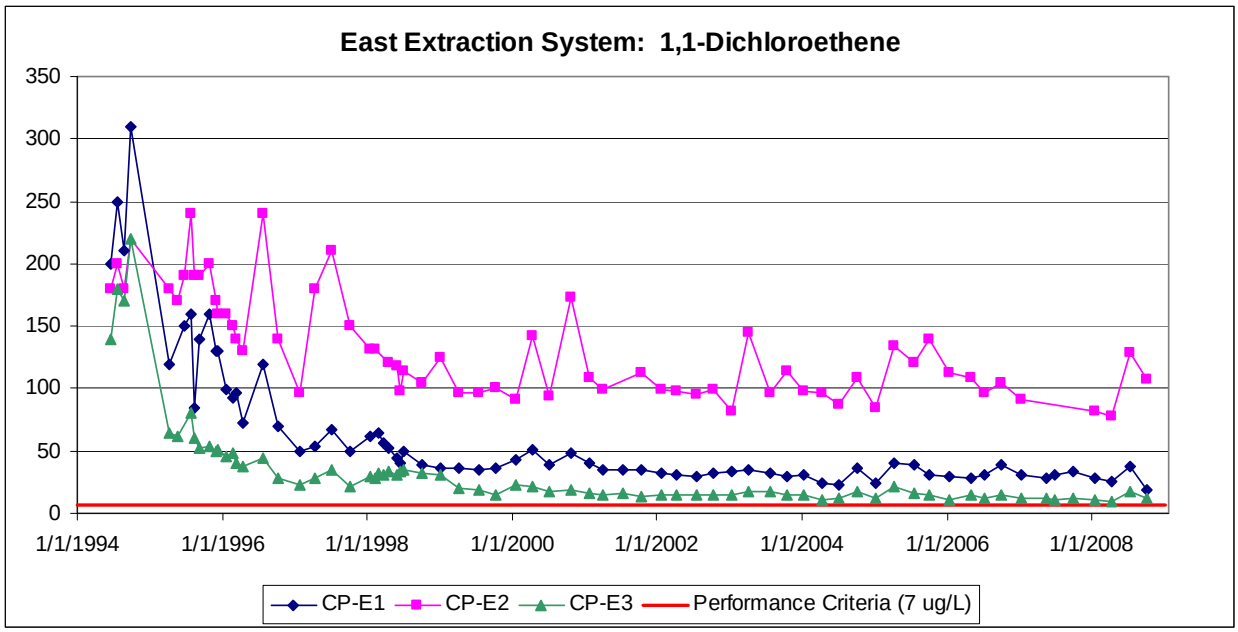

Figure 13. Concentrations of 1,1-DCE in East System Extraction Wells

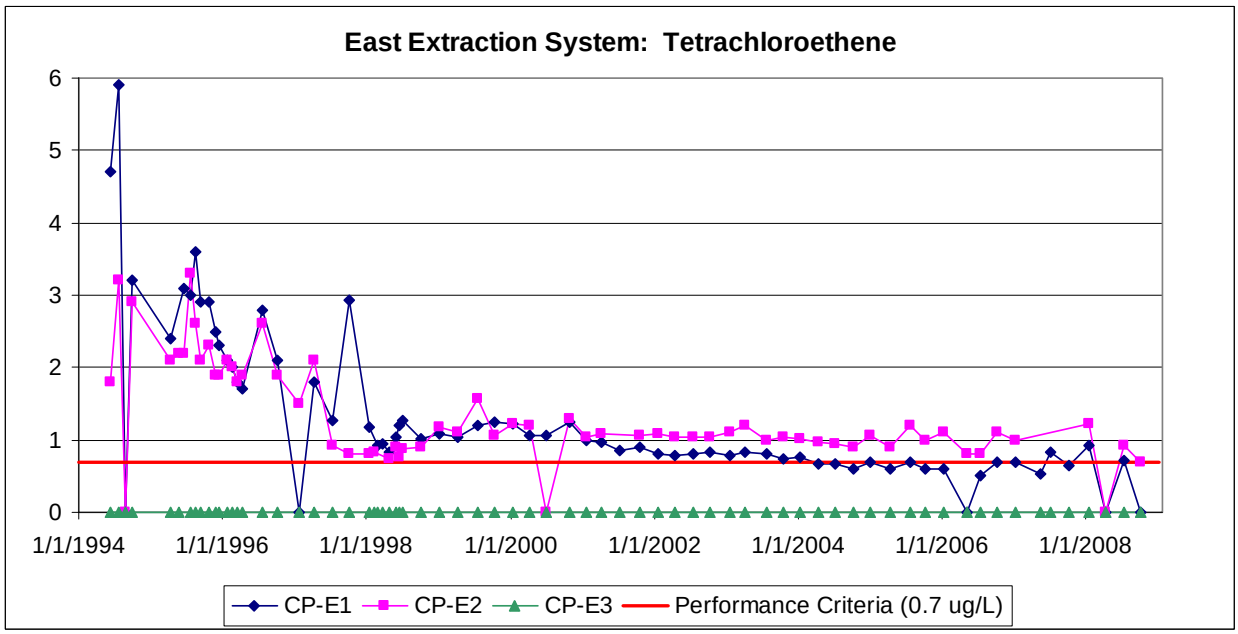

Figure 14. Concentrations of PCE in East System Extraction Wells

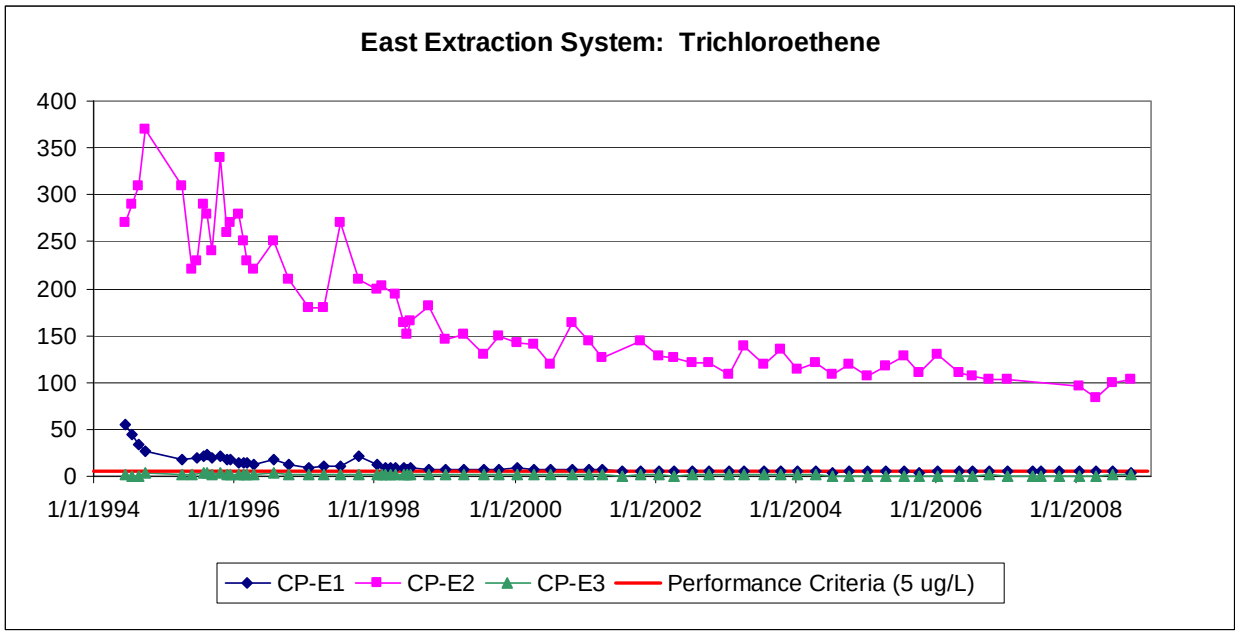

Figure 15. Concentrations of TCE in East System Extraction Wells

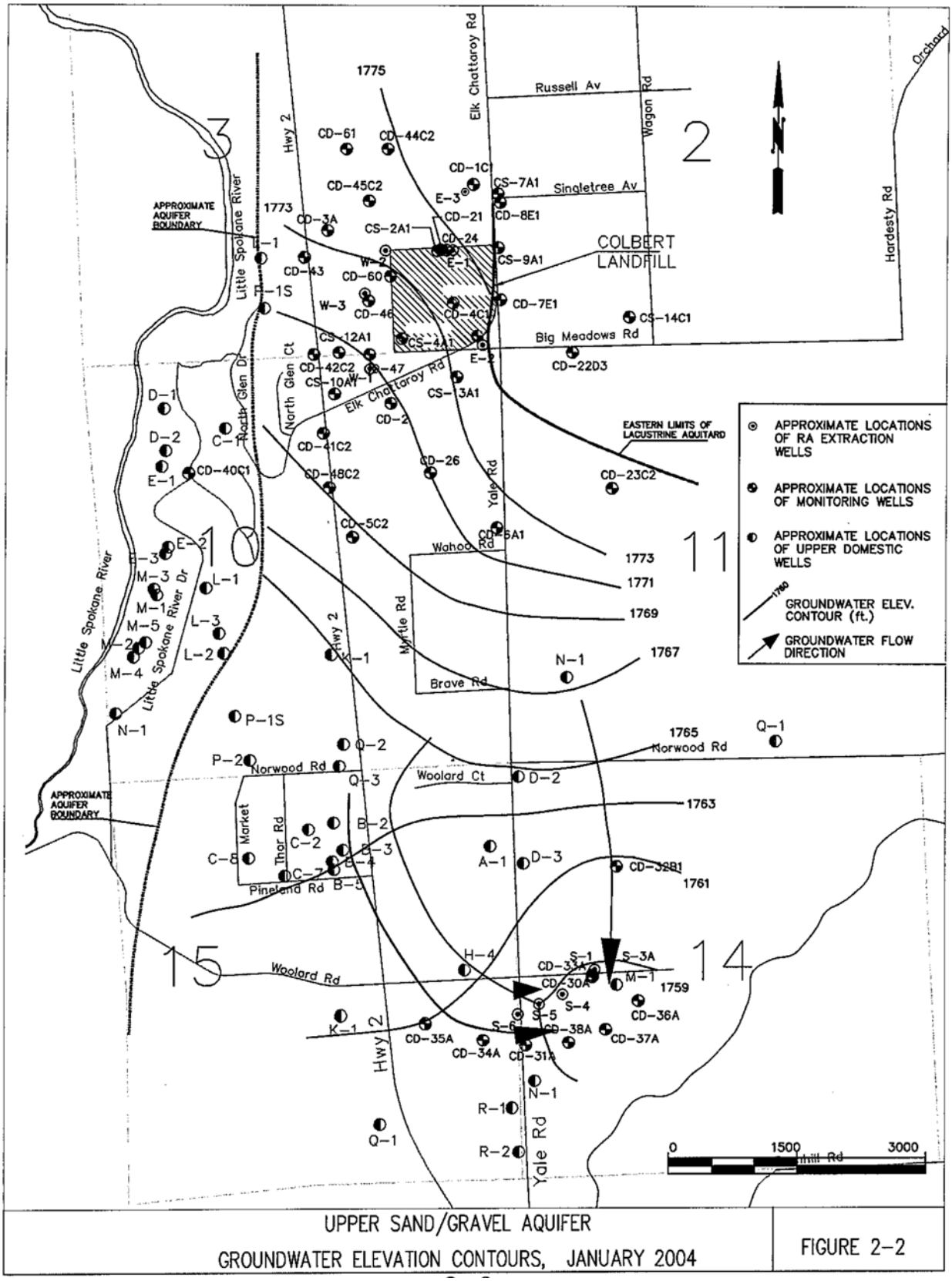

Figure 16. Upper Aquifer, January 2004 Groundwater Elevation Contours

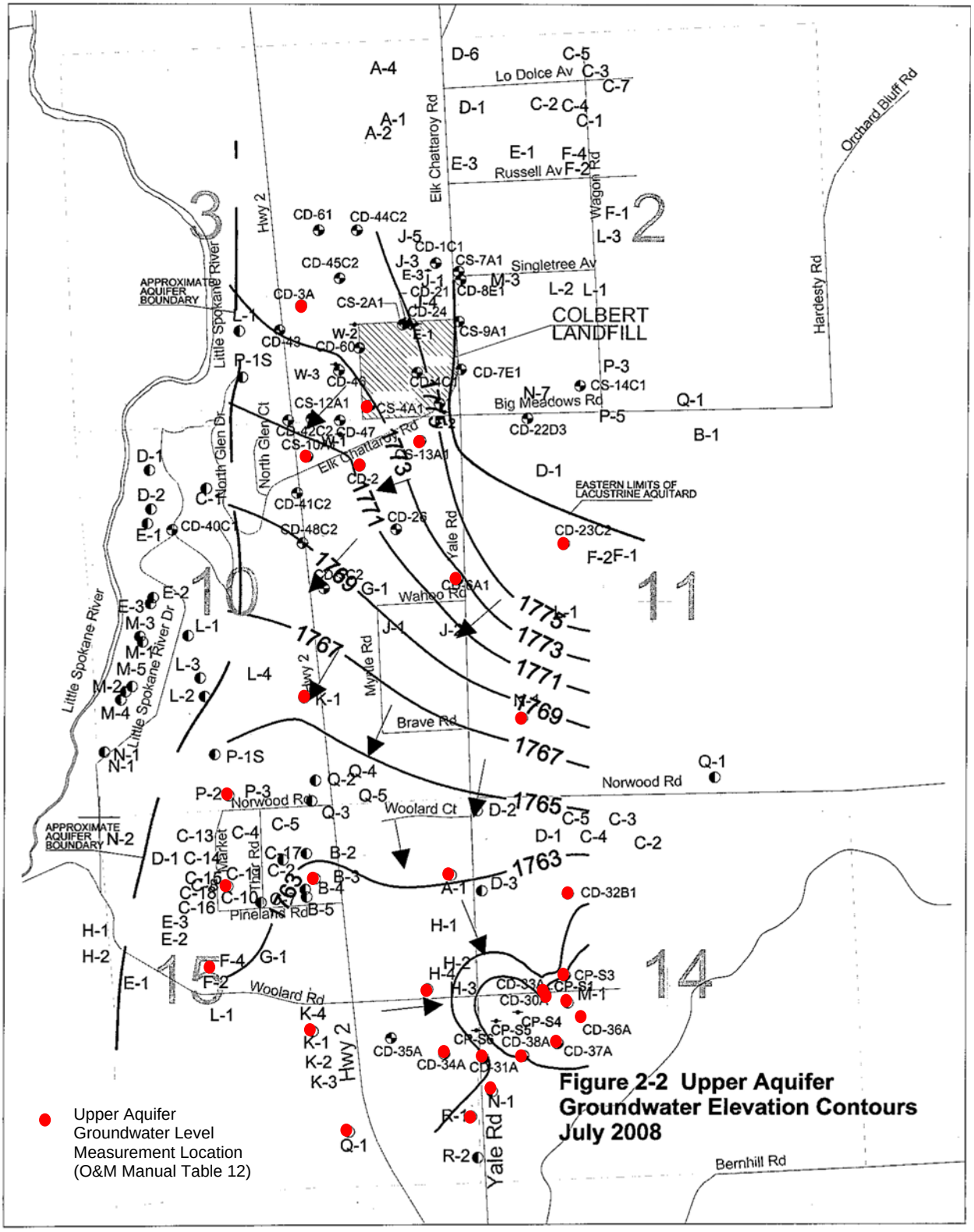

Figure 17. Upper Aquifer, July 2008 Groundwater Elevation Contours

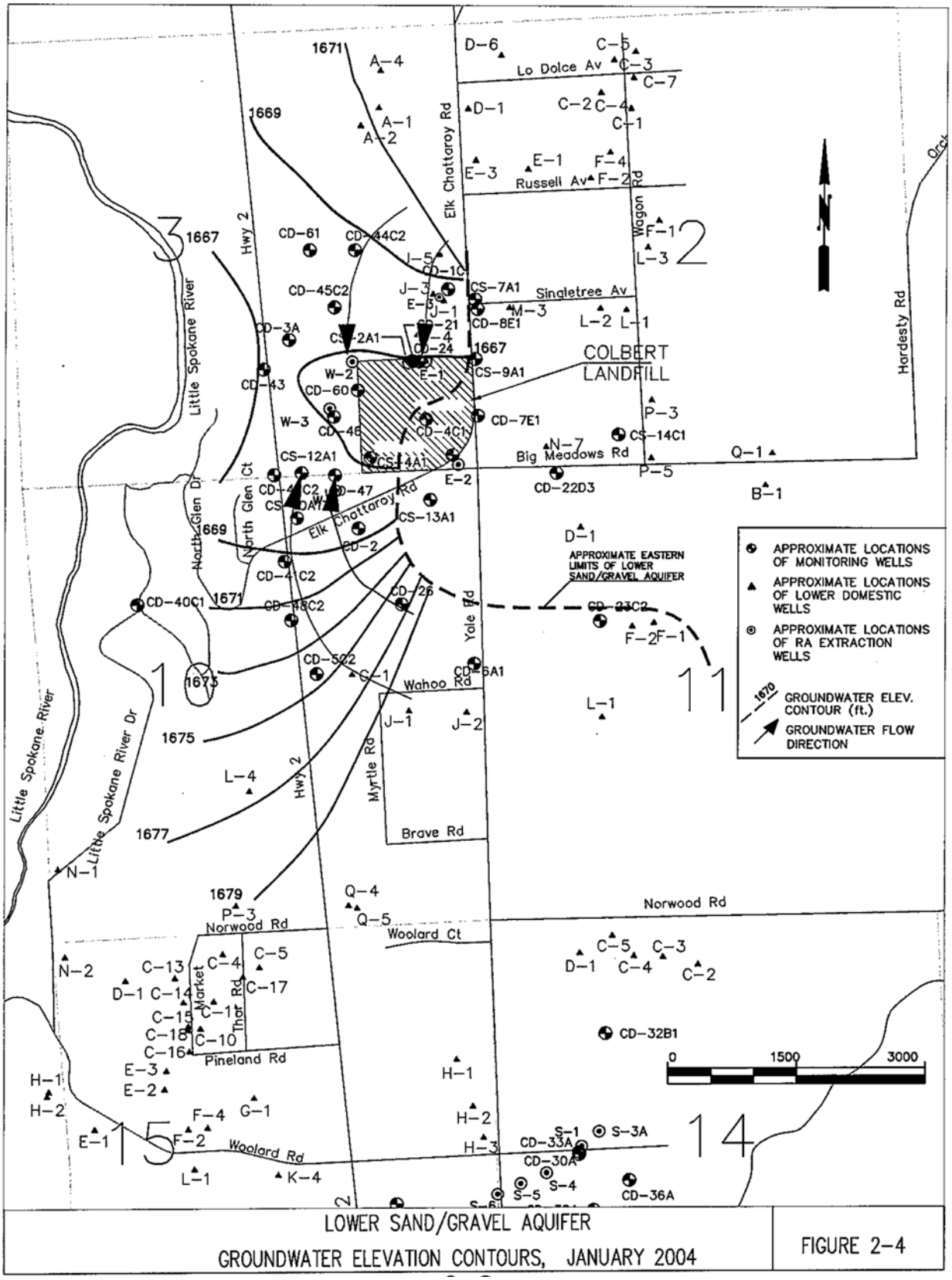

Figure 18. Lower Aquifer, January 2004 Groundwater Elevation Contours

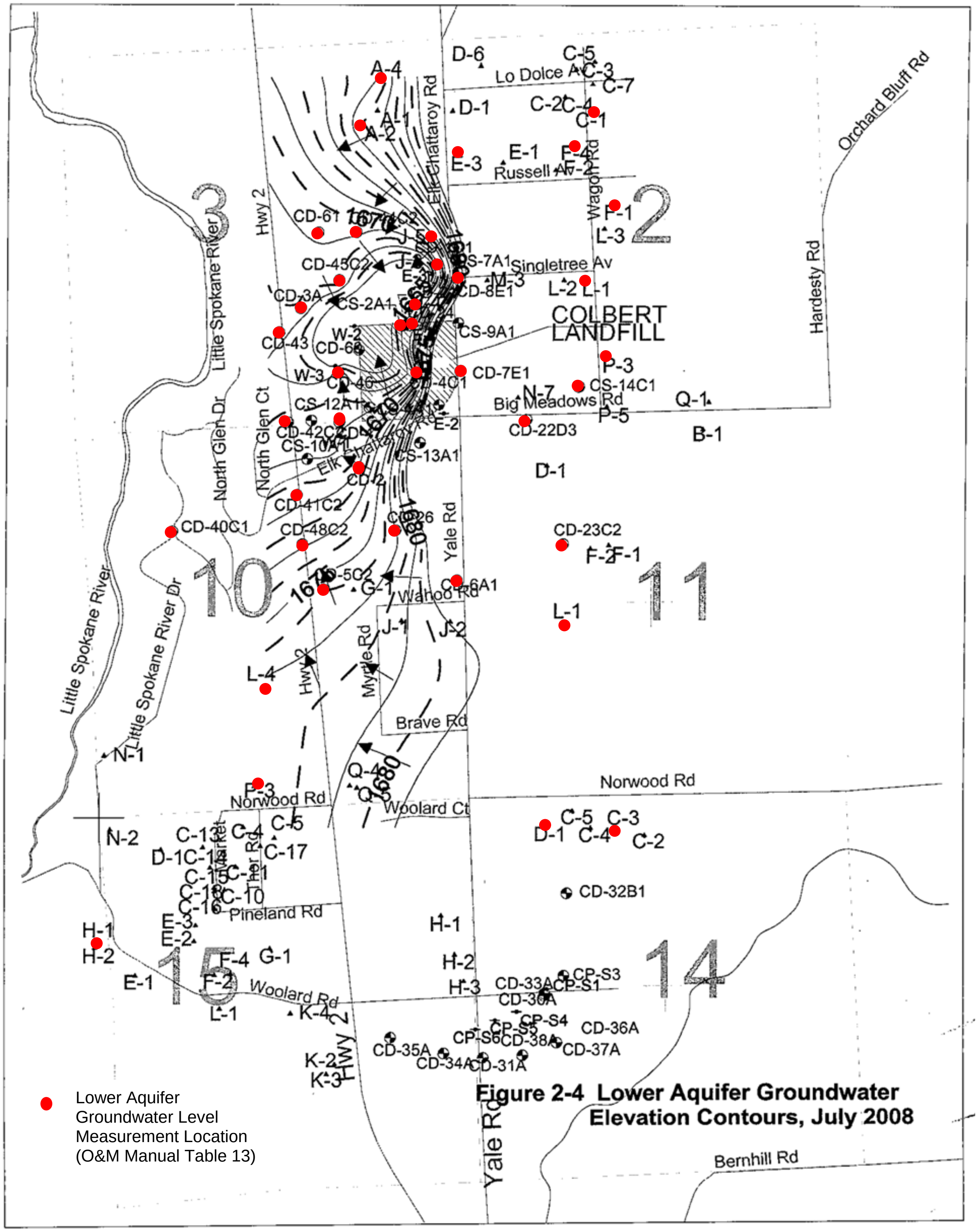

Figure 19. Lower Aquifer, July 2008 Groundwater Elevation Contours

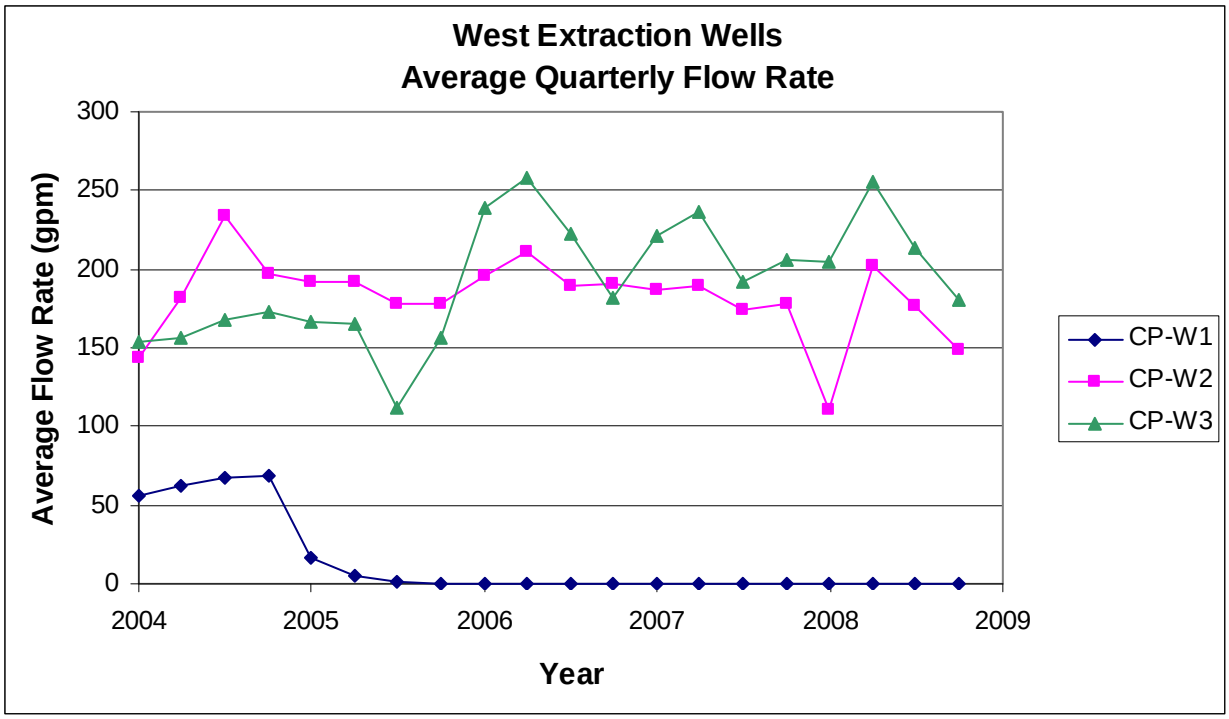

Figure 20. Average Flow Rates for West System Extraction Wells

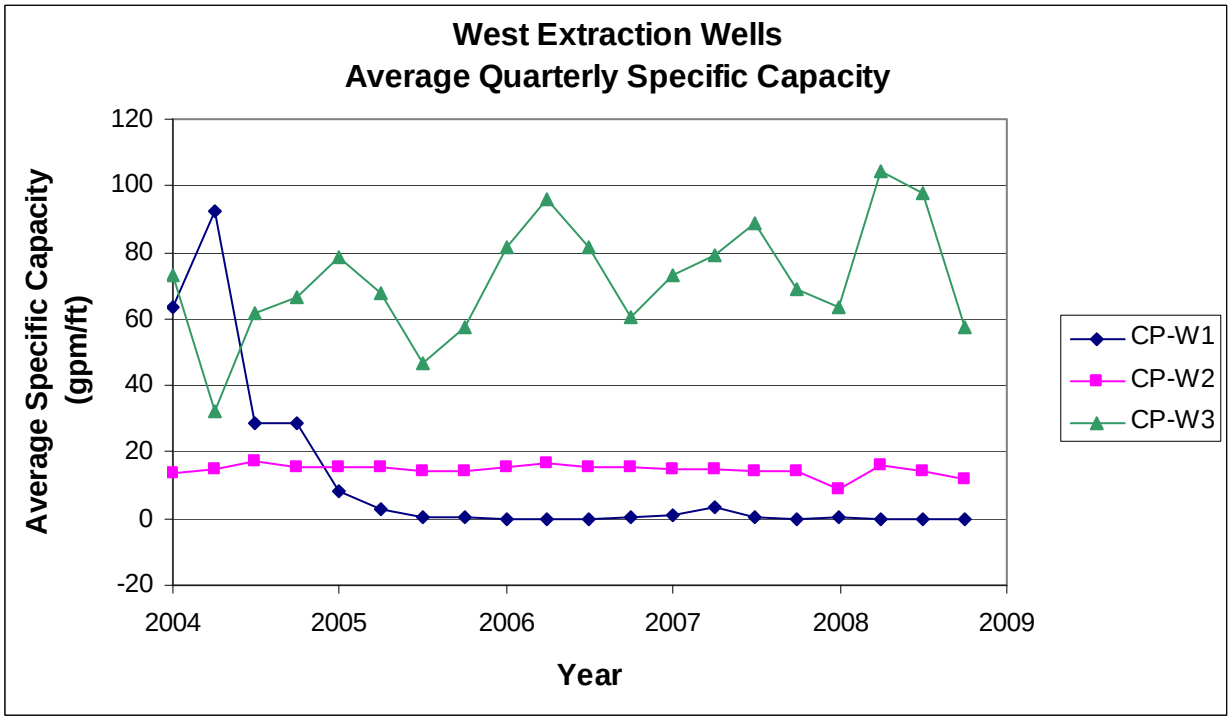

Figure 21. Average Specific Capacity Values for West System Extraction Wells

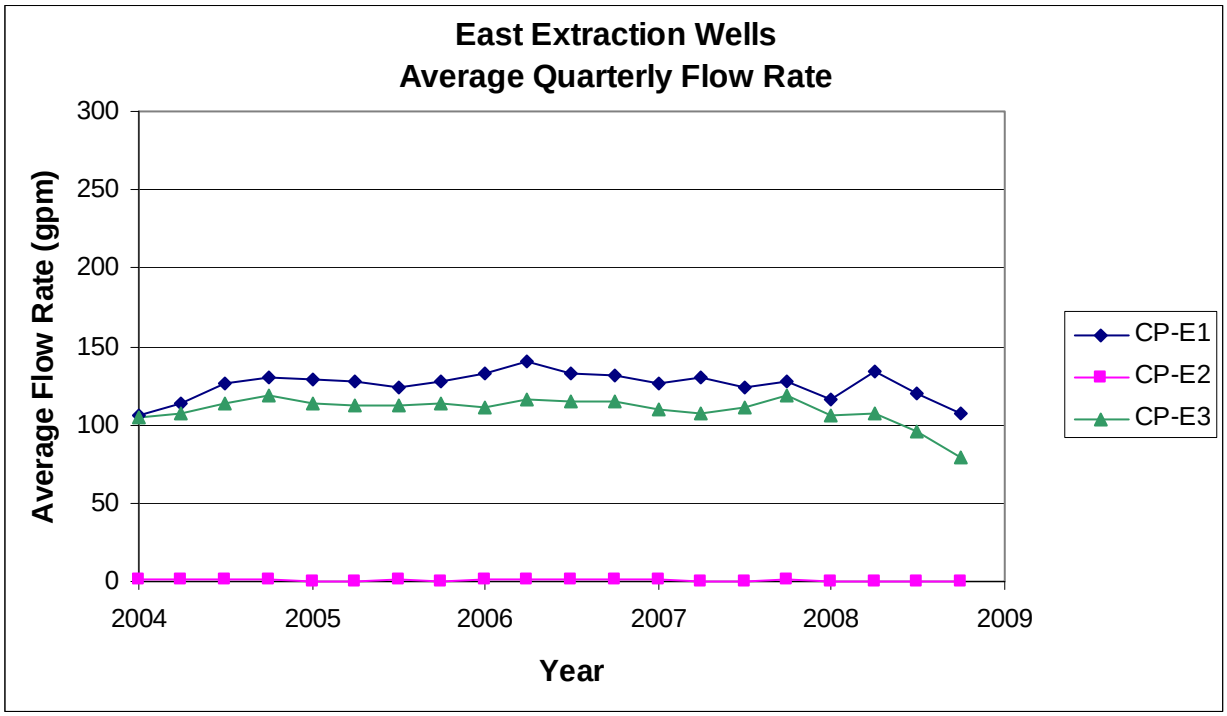

Figure 22. Average Flow Rates for East System Extraction Wells

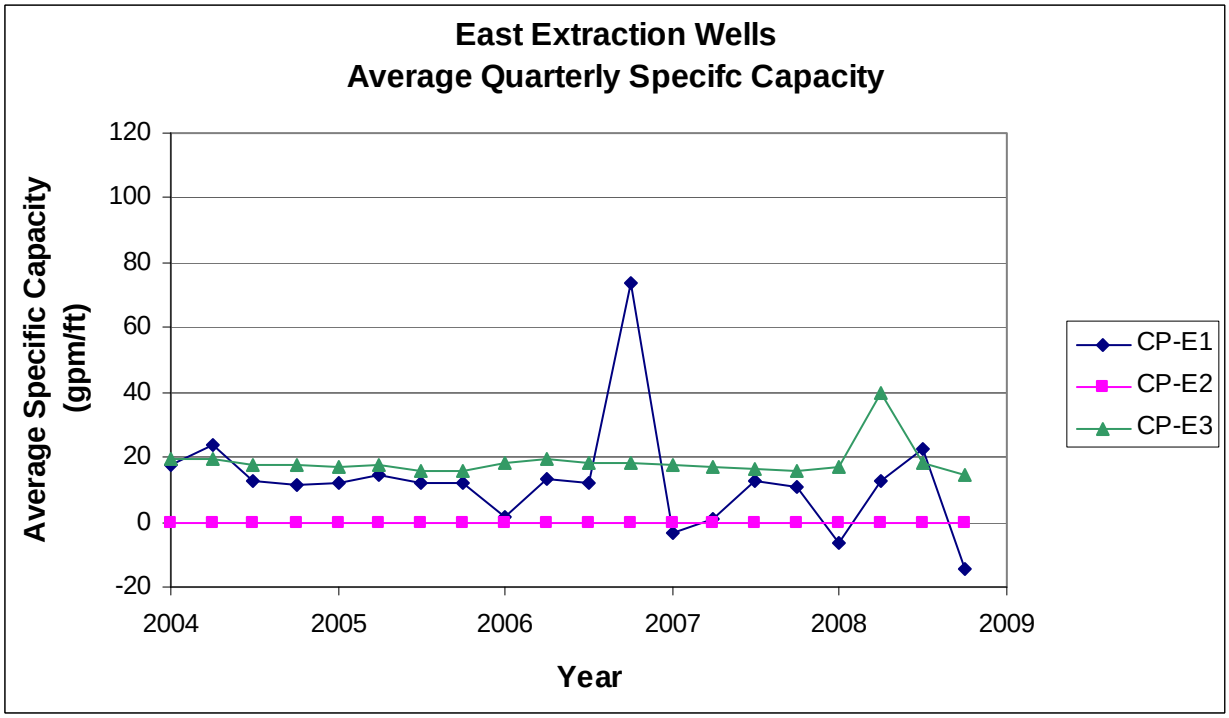

Figure 23. Average Specific Capacity Values for East System Extraction Wells

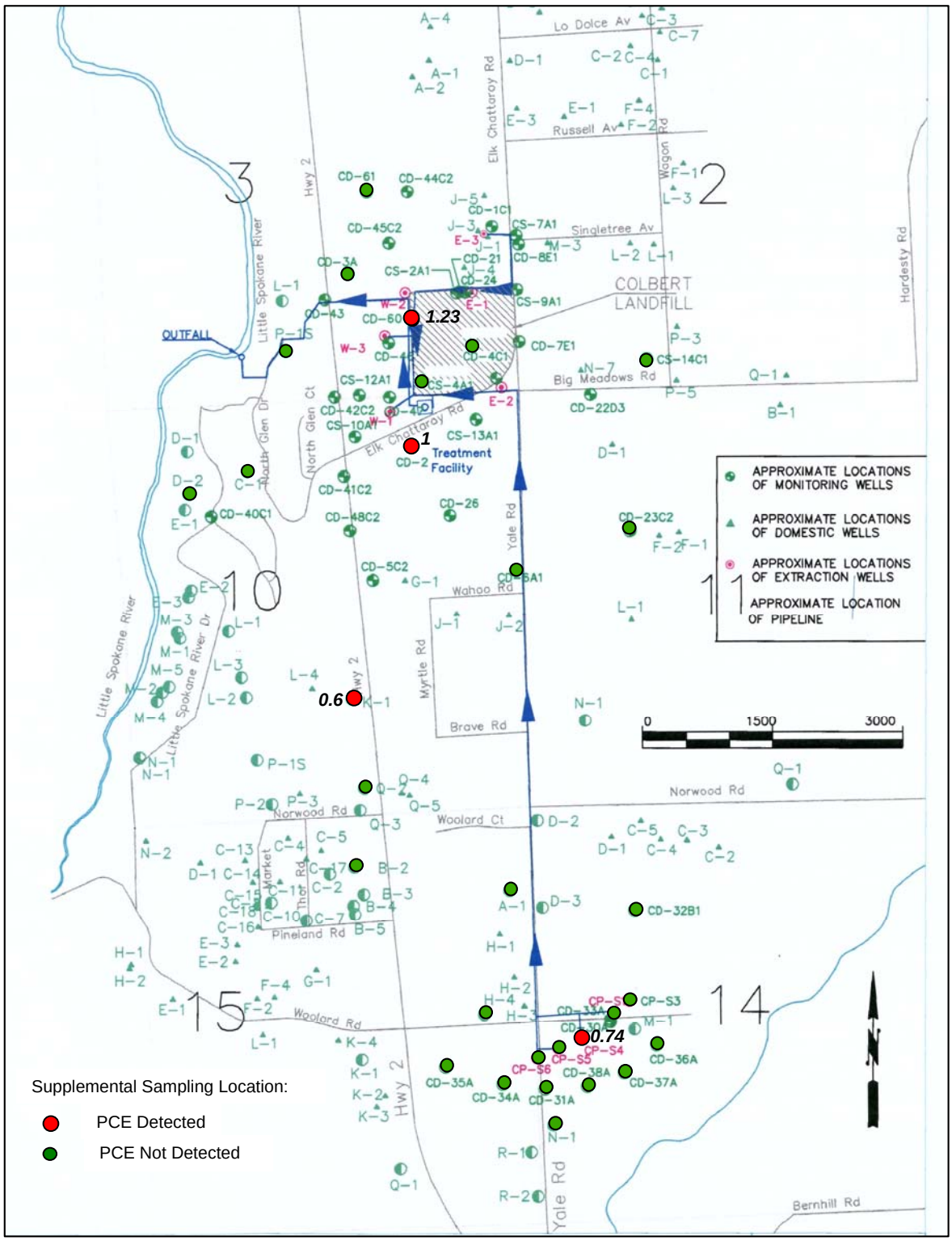

Figure 24. PCE concentrations detected in Upper Aquifer during Supplemental Sampling

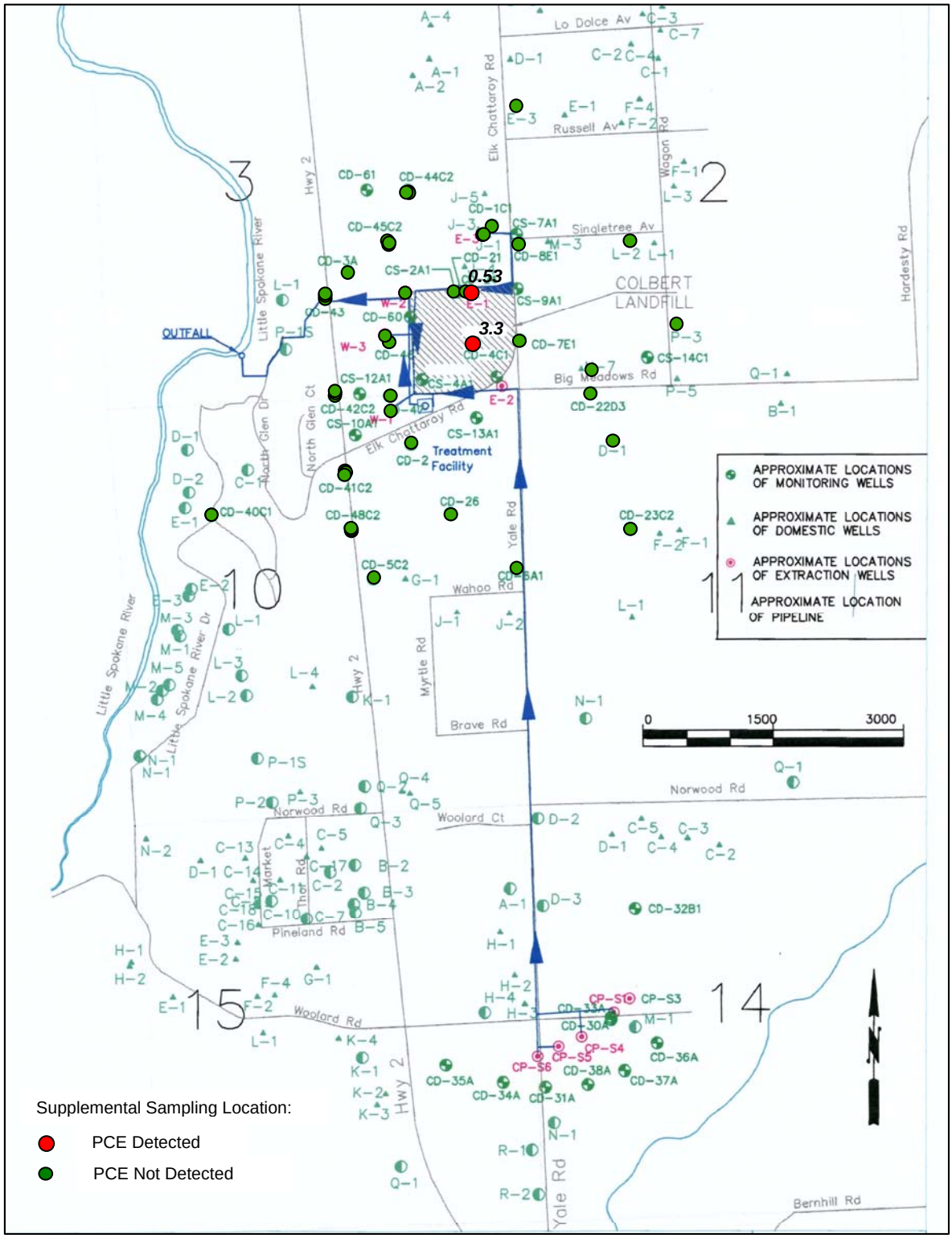

Figure 25. PCE concentrations detected in Lower Aquifer during Supplemental Sampling

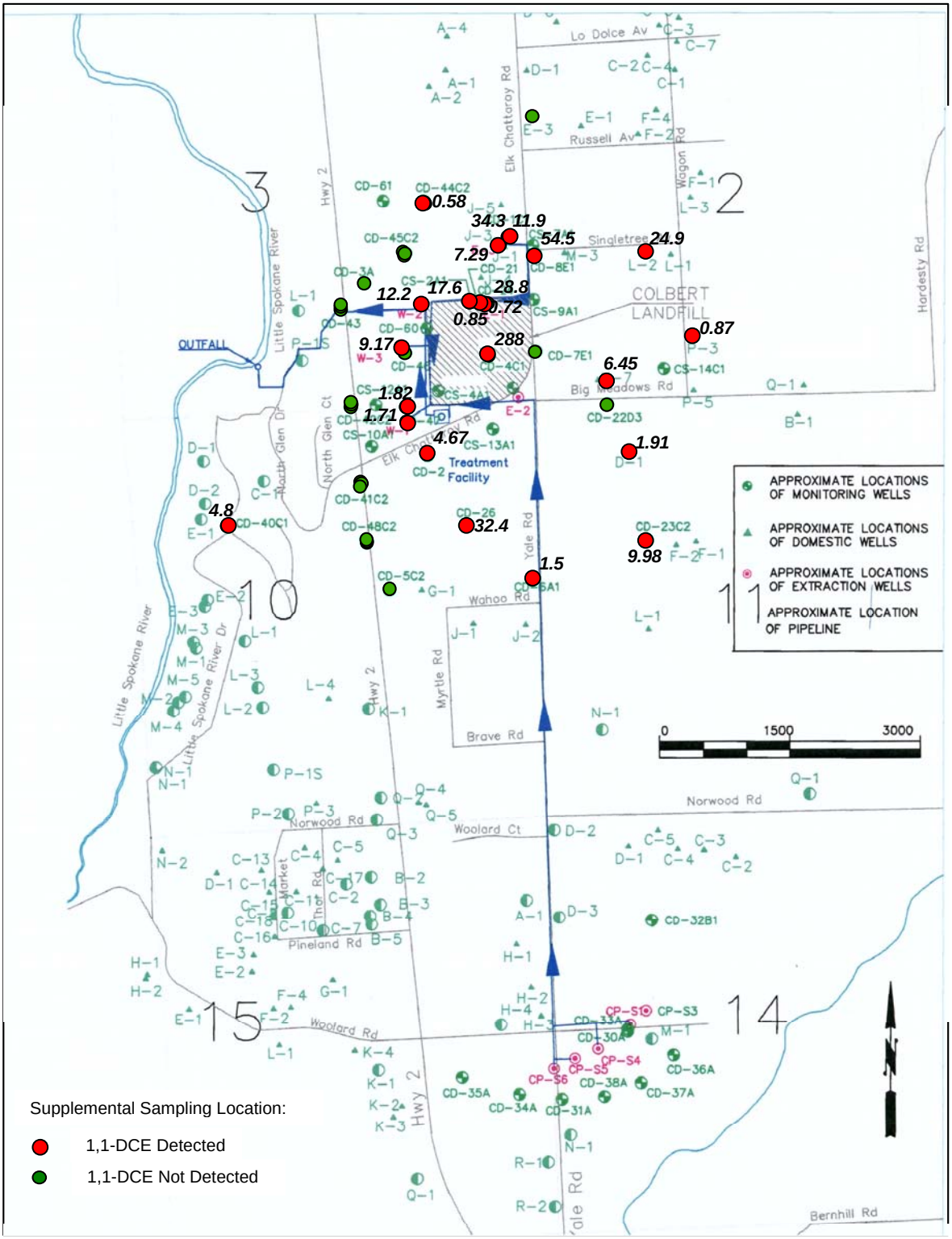

Figure 26. 1,1-DCE concentrations detected in Lower Aquifer during Supplemental Sampling

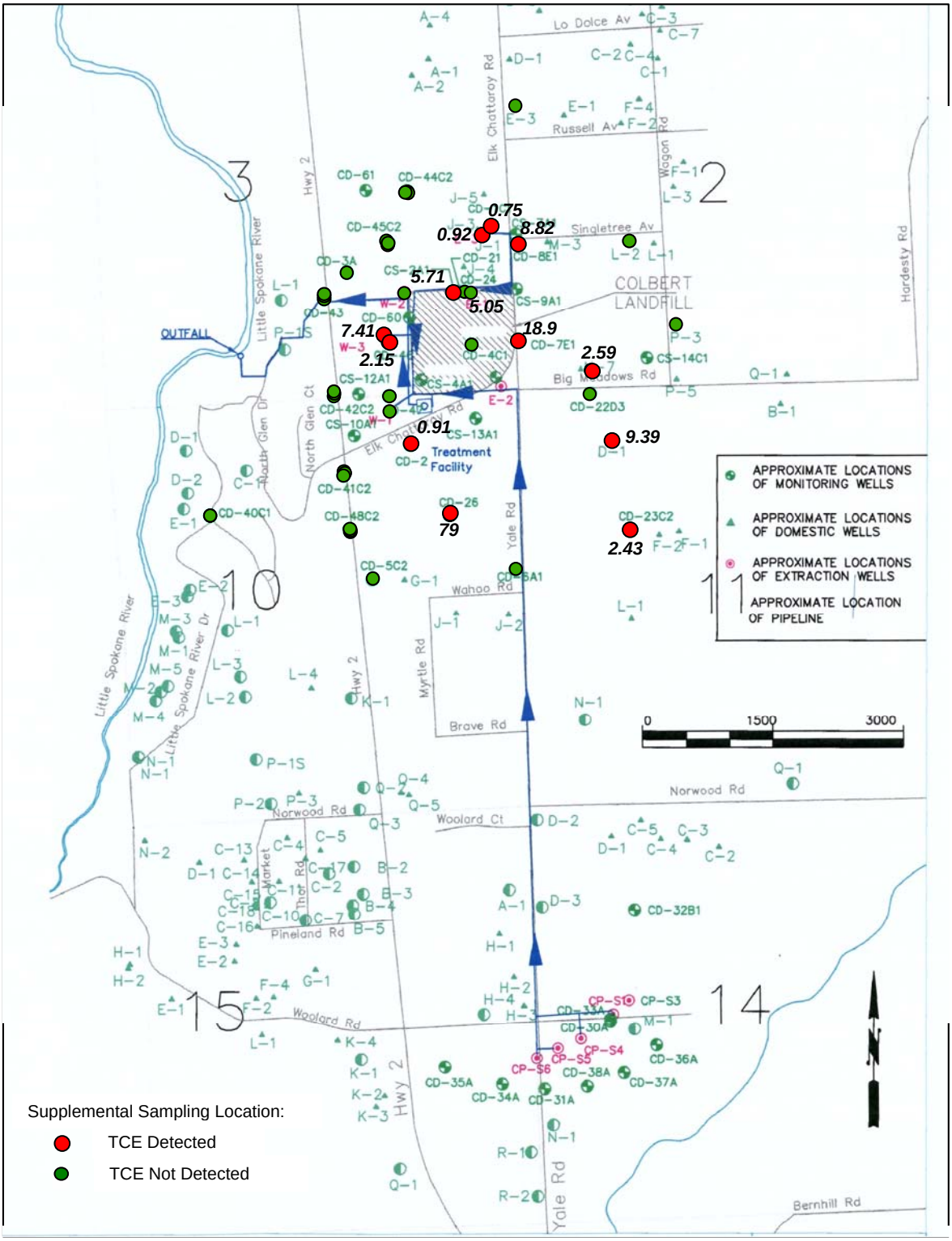

Figure 27. TCE Concentrations detected in Lower Aquifer during Supplemental Sampling

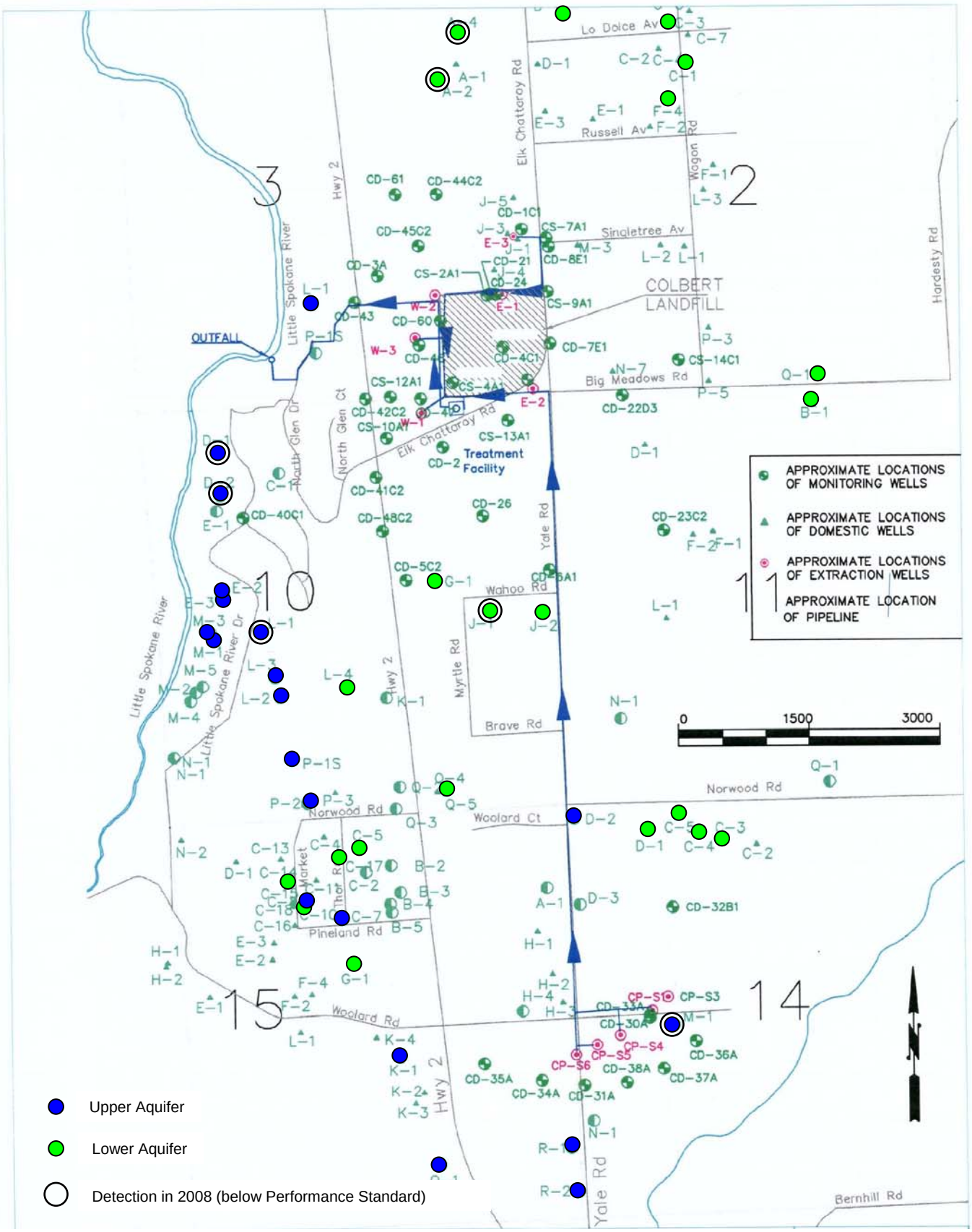

Figure 28. Domestic well monitoring locations (2004 – 2008)

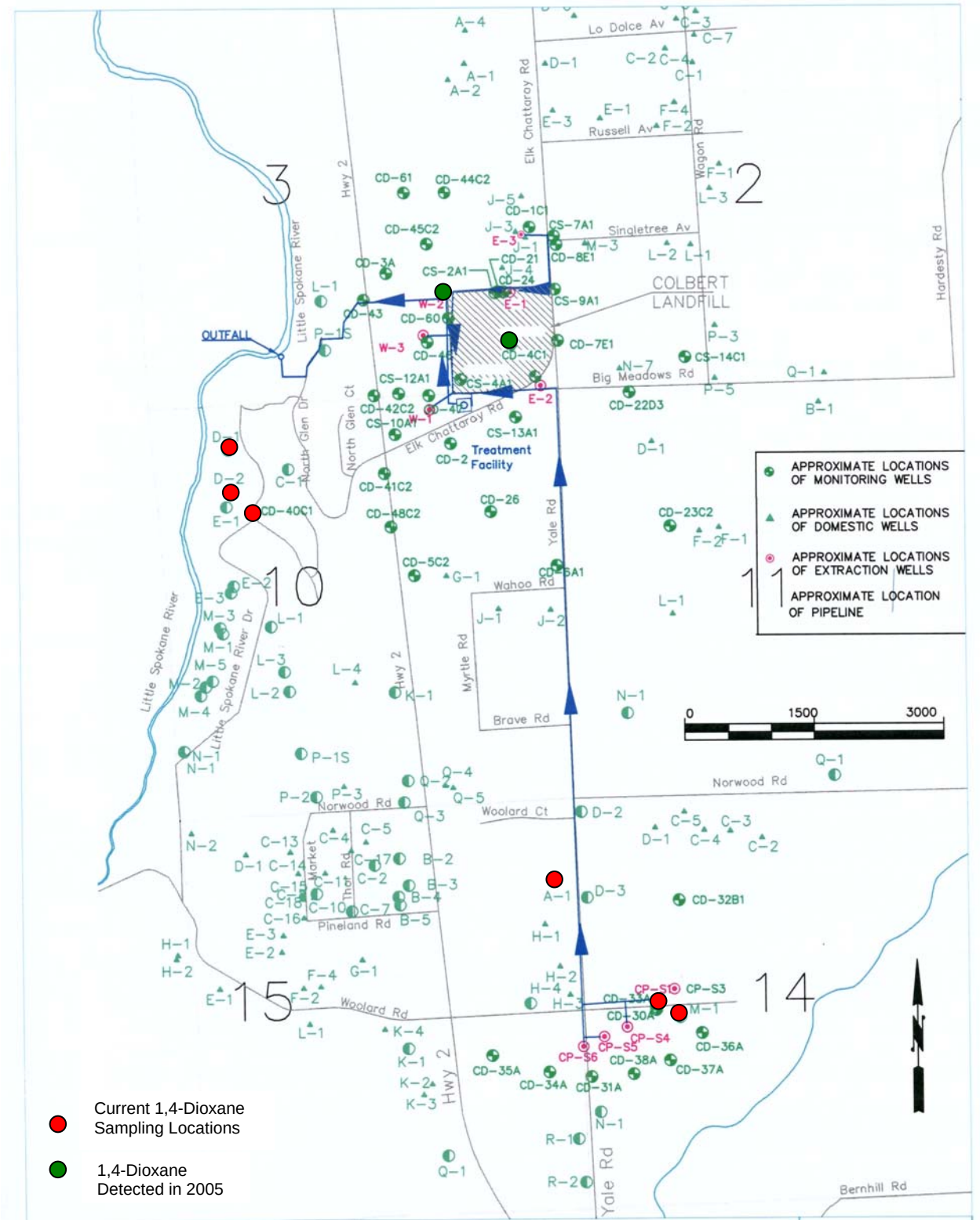

Figure 29. 1,4-Dioxane Sampling Locations

ATTACHMENTS

Attachment 1. Documents Reviewed

CH2M Hill, 1997. Operations and Maintenance Manual for Colbert Landfill Closure. Prepared for Spokane County Utilities. May 1997.

Colbert Landfill Consent Decree. January 23, 1989.

Environmental Protection Agency (EPA), 1987. Record of Decision, Colbert Landfill. EPA ID: WAD980514541, OU 01, Spokane, WA. 9/27/1987. EPA/ROD/R10-87/010.

EPA, 1994. First Five-Year Review Report for the Colbert Landfill.

EPA, 1999. Second Five-Year Review Report for the Colbert Landfill.

EPA, 2004. Third Five-Year Review Report for the Colbert Landfill.

EPA, 2009a. Interim Recommended Trichloroethylene (TCE) Toxicity Values to Assess Human Health Risk and Recommendations for the Vapor Intrusion Pathway Analysis Memo. January 15, 2009.

EPA, 2009b. http://yosemite.epa.gov/r10/cleanup.nsf/346a4822da38ae7088256da6005fc923/86c9d796626d306d88256555006a9b17!OpenDocument.

Golder Associates, 1987. Feasibility Study Colbert Landfill, Spokane Washington. May 1987.

Golder Assoicates, 1987. Remedial Investigation, Colbert Landfill, Spokane Washington. May 1987.

Landau Associates, Inc., 1991. Final Phase I Engineering Report, Colbert Landfill, Remedial Design/Remedial Action, Spokane County, Washington. December 30, 1991.

Landau Associates, Inc., 1999. Operation and Maintenance Manual, Colbert Landfill, Colbert Washington. December 15, 1999.

Spokane County, 2004 through 2008. Colbert Landfill Quarterly Progress Report First Quarter 2004 through Fourth Quarter 2008.

Attachment 2. Colbert Landfill Well Designations

Table 1-2 Colbert Landfill Well Designations

WELL ID	AQUIFER	DESIGNATION	MONITORING PROGRAM
CD-31A1	upper	Downgradient	Compliance
CD-34A1	upper	Outboard	Compliance
CD-36A1	upper	Downgradient	Compliance
CD-37A1	upper	Downgradient	Compliance
CD-38A1	upper	Downgradient	Compliance
CP-S3	upper	Outboard	Compliance
CD-41C1	lower	Set A	Compliance
CD-41C2	lower	Set A	Compliance
CD-41C3	lower	Set A	Compliance
CD-42C1	lower	Set A	Compliance
CD-42C2	lower	Set A	Compliance
CD-42C3	lower	Set A	Compliance
CD-43C1	lower	Set B	Compliance
CD-43C2	lower	Set B	Compliance
CD-43C3	lower	Set B	Compliance
CD-44C1	lower	Set B	Compliance
CD-44C2	lower	Set B	Compliance
CD-44C3	lower	Set B	Compliance
CD-45C1	lower	Outboard	Compliance
CD-45C2	lower	Outboard	Compliance
CD-45C3	lower	Outboard	Compliance
CD-48C1	lower	Set A/Outboard	Compliance
CD-48C2	lower	Set A/ Outboard/MFS	Compliance/MFS
CD-48C3	lower	Set A/Outboard	Compliance
CD-03A1	upper	MFS	MFS
CD-60A1	upper	MFS	MFS
CD-61A1	upper	MFS	MFS
CS-04A1	upper	MFS	MFS
CP-S1	upper	Extraction	Compliance
CP-S4	upper	Extraction	Compliance
CP-S5	upper	Extraction	Compliance
CP-S6	upper	Extraction	Compliance
CP-E1	lower	Extraction	Compliance
CP-E2	lower	Extraction	Compliance/MFS
CP-E3	lower	Extraction	Compliance
CP-W1	lower	Extraction	Compliance
CP-W2	lower	Extraction	Compliance
CP-W3	lower	Extraction	Compliance

Attachment 3. Compliance Monitoring Well Data

Well ID	Aquifer	Designation	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethane (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria				***200***	***4050***	***7***	***2.5***	***0.7***	***5***
CD-31A1	upper	Downgradient	4/13/2004	**0.69**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-31A1	upper	Downgradient	4/11/2005	**0.9**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-31A1	upper	Downgradient	5/1/2006	**0.6**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-31A1	upper	Downgradient	5/15/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-31A1	upper	Downgradient	4/7/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-34A1	upper	Outboard	4/13/2004	**0.92**	0.5 U	0.5 U	0.5 U	**0.81**	0.5 U
CD-34A1	upper	Outboard	4/11/2005	**0.9**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-34A1	upper	Outboard	5/1/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-34A1	upper	Outboard	5/15/2007	**0.56**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-34A1	upper	Outboard	4/7/2008	**0.73**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-36A1	upper	Downgradient	4/12/2004	0.5 U	**20.8**	0.5 U	0.5 U	0.5 U	0.5 U
CD-36A1	upper	Downgradient	4/11/2005	0.5 U	**25.6**	0.5 U	**0.8**	0.5 U	0.5 U
CD-36A1	upper	Downgradient	7/19/2005	0.5 U	**23.7**	0.5 U	0.5 U	0.5 U	0.5 U
CD-36A1	upper	Downgradient	5/1/2006	0.5 U	**19**	0.5 U	0.5 U	0.5 U	0.5 U
CD-36A1	upper	Downgradient	5/15/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-36A1	upper	Downgradient	4/7/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-37A1	upper	Downgradient	4/12/2004	**1.45**	**0.57**	0.5 U	0.5 U	0.5 U	0.5 U
CD-37A1	upper	Downgradient	4/11/2005	**1.7**	**0.6**	**0.6**	0.5 U	0.5 U	0.5 U
CD-37A1	upper	Downgradient	5/1/2006	**1.4**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-37A1	upper	Downgradient	5/16/2007	**1.32**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-37A1	upper	Downgradient	4/7/2008	**1.26**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-38A1	upper	Downgradient	4/12/2004	**0.58**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-38A1	upper	Downgradient	4/11/2005	**0.9**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-38A1	upper	Downgradient	5/1/2006	**1.8**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-38A1	upper	Downgradient	5/15/2007	**0.88**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-38A1	upper	Downgradient	4/7/2008	**1.46**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CP-S3	upper	Outboard	1/14/2004	0.5 U	0.5 U	0.5 U	**0.78**	0.5 U	0.5 U
CP-S3	upper	Outboard	4/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CP-S3	upper	Outboard	7/7/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CP-S3	upper	Outboard	4/11/2005	0.5 U	0.5 U	0.5 U	**0.7**	0.5 U	0.5 U
CP-S3	upper	Outboard	7/19/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CP-S3	upper	Outboard	5/1/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CP-S3	upper	Outboard	5/14/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CP-S3	upper	Outboard	7/8/2008	**1.27**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Attachment 3. Compliance Monitoring Well Data

Well ID	Aquifer	Designation	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethane (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria				***200***	***4050***	***7***	***2.5***	***0.7***	***5***
CD-41C1	lower	Set A	4/13/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-41C1	lower	Set A	4/12/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-41C1	lower	Set A	5/1/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-41C1	lower	Set A	5/14/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-41C1	lower	Set A	4/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-41C2	lower	Set A	4/13/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-41C2	lower	Set A	4/12/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-41C2	lower	Set A	5/1/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-41C2	lower	Set A	5/14/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-41C2	lower	Set A	4/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-41C3	lower	Set A	4/13/2004	**4.2**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-41C3	lower	Set A	4/12/2005	**4**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-41C3	lower	Set A	5/1/2006	**2.9**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-41C3	lower	Set A	5/14/2007	**2.78**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-41C3	lower	Set A	4/8/2008	**2.19**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C1	lower	Set A	4/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C1	lower	Set A	4/12/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C1	lower	Set A	5/1/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C1	lower	Set A	5/14/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C1	lower	Set A	4/7/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C2	lower	Set A	4/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C2	lower	Set A	4/12/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C2	lower	Set A	5/1/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C2	lower	Set A	5/14/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C2	lower	Set A	4/7/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C3	lower	Set A	4/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C3	lower	Set A	4/12/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C3	lower	Set A	5/1/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C3	lower	Set A	5/14/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-42C3	lower	Set A	4/7/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-43C1	lower	Set B	4/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-43C1	lower	Set B	4/12/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-43C1	lower	Set B	5/1/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-43C1	lower	Set B	5/14/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Attachment 3. Compliance Monitoring Well Data

Well ID	Aquifer	Designation	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethane (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria				***200***	***4050***	***7***	***2.5***	***0.7***	***5***
CD-43C1	lower	Set B	4/7/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-43C2	lower	Set B	4/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-43C2	lower	Set B	4/12/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-43C2	lower	Set B	5/1/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-43C2	lower	Set B	5/14/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-43C2	lower	Set B	4/7/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-43C3	lower	Set B	4/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-43C3	lower	Set B	4/12/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-43C3	lower	Set B	5/1/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-43C3	lower	Set B	5/14/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-43C3	lower	Set B	4/7/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-44C1	lower	Set B	4/13/2004	**7.85**	0.5 U	**0.6**	0.5 U	0.5 U	0.5 U
CD-44C1	lower	Set B	4/13/2005	**9.1**	0.5 U	**1.6**	0.5 U	0.5 U	0.5 U
CD-44C1	lower	Set B	5/2/2006	**7.5**	0.5 U	**0.7**	0.5 U	0.5 U	0.5 U
CD-44C1	lower	Set B	5/15/2007	**5**	0.5 U	**0.58**	0.5 U	0.5 U	0.5 U
CD-44C1	lower	Set B	4/8/2008	**4.55**	0.5 U	**0.75**	0.5 U	0.5 U	0.5 U
CD-44C2	lower	Set B	4/13/2004	**0.94**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-44C2	lower	Set B	4/13/2005	**1**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-44C2	lower	Set B	5/2/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-44C2	lower	Set B	5/15/2007	**1.07**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-44C2	lower	Set B	4/8/2008	**0.93**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-44C3	lower	Set B	4/13/2004	**0.82**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-44C3	lower	Set B	4/13/2005	**0.6**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-44C3	lower	Set B	5/2/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-44C3	lower	Set B	5/14/2007	**0.54**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-44C3	lower	Set B	4/8/2008	**0.73**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-45C1	lower	Outboard	4/13/2004	**5.22**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-45C1	lower	Outboard	4/13/2005	**5.3**	0.5 U	**0.6**	0.5 U	0.5 U	0.5 U
CD-45C1	lower	Outboard	5/2/2006	**3.4**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-45C1	lower	Outboard	5/15/2007	**2.58**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-45C1	lower	Outboard	4/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-45C2	lower	Outboard	4/13/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-45C2	lower	Outboard	4/13/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-45C2	lower	Outboard	5/2/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Attachment 3. Compliance Monitoring Well Data

Well ID	Aquifer	Designation	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethane (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria				***200***	***4050***	***7***	***2.5***	***0.7***	***5***
CD-45C2	lower	Outboard	5/15/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-45C2	lower	Outboard	4/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-45C3	lower	Outboard	4/14/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-45C3	lower	Outboard	4/13/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-45C3	lower	Outboard	5/2/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-45C3	lower	Outboard	5/15/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-45C3	lower	Outboard	4/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C1	lower	Set A/Outboard	4/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C1	lower	Set A/Outboard	4/13/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C1	lower	Set A/Outboard	5/1/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C1	lower	Set A/Outboard	5/15/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C1	lower	Set A/Outboard	4/7/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C2	lower	Set A/Outboard	4/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C2	lower	Set A/Outboard	4/13/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C2	lower	Set A/Outboard	5/1/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C2	lower	Set A/Outboard	5/15/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C2	lower	Set A/Outboard	4/7/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C3	lower	Set A/Outboard	4/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C3	lower	Set A/Outboard	4/13/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C3	lower	Set A/Outboard	5/1/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C3	lower	Set A/Outboard	5/15/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-48C3	lower	Set A/Outboard	4/7/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:

Bold indicates a detected concentration
Highlight indicates detected concentration above Performance Criteira

Attachment 4. Compliance Extraction Well Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethane (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
Adjustment Criteria			***103 (South)/ 101 (West***	***4.5***	***2026***	***na***	***na***	***3.3***
CP-S1	upper	1/14/2004	**4.71**	**5.75**	**1.32**	0.5 U	0.5 U	**2.58**
CP-S1	upper	4/15/2004	**4.48**	**5.27**	**1.27**	0.5 U	0.5 U	**2.39**
CP-S1	upper	7/6/2004	**4.11**	**5.78**	**1.22**	0.5 U	0.5 U	**2.55**
CP-S1	upper	10/5/2004	**6.4**	**6.8**	**1.7**	0.5 U	0.5 U	**2.9**
CP-S1	upper	1/4/2005	**4.27**	**5.59**	**1.35**	0.5 U	0.5 U	**2.76**
CP-S1	upper	4/13/2005	**6.2**	**7.4**	**2.5**	**0.5**	0.5 U	**3.1**
CP-S1	upper	7/19/2005	**4.8**	**6.5**	**1.9**	**0.6**	0.5 U	**3.1**
CP-S1	upper	9/14/2005	**4.3**	**5.9**	**1.6**	0.5 U	0.5 U	**2.6**
CP-S1	upper	10/6/2005	**4.7**	**6.2**	**1.7**	0.5 U	0.5 U	**2.8**
CP-S1	upper	1/11/2006	**4.5**	**6.4**	**1.5**	0.5 U	0.5 U	**2.9**
CP-S1	upper	5/3/2006	**4.4**	**6.6**	**1.6**	0.5 U	0.5 U	**2.8**
CP-S1	upper	7/12/2006	**4.3**	**6.5**	**1.6**	0.5 U	0.5 U	**2.9**
CP-S1	upper	10/4/2006	**4.6**	**7.1**	**1.7**	0.5 U	0.5 U	**3.4**
CP-S1	upper	1/9/2007	**2.7**	**5**	**1**	0.5 U	0.5 U	**2.6**
CP-S1	upper	5/16/2007	**3.49**	**6.32**	**1.15**	0.5 U	0.5 U	**3.03**
CP-S1	upper	7/2/2007	**3.45**	**5.6**	**0.98**	0.5 U	0.5 U	**3.39**
CP-S1	upper	10/3/2007	**3.45**	**5.52**	**1.28**	0.5 U	0.5 U	**2.92**
CP-S1	upper	1/17/2008	**3.38**	**5.24**	**1.2**	0.5 U	0.5 U	**2.82**
CP-S1	upper	4/9/2008	**3.78**	**5.21**	**1.8**	0.5 U	0.5 U	**3.09**
CP-S1	upper	7/8/2008	**4.41**	**5.83**	**1.72**	0.5 U	0.5 U	**3.31**
CP-S1	upper	10/7/2008	**3.76**	**5.79**	**1.14**	0.5 U	0.5 U	**2.95**
CP-S4	upper	1/14/2004	**3.09**	**2.82**	**0.96**	0.5 U	**0.81**	**3.03**
CP-S4	upper	4/15/2004	**3.69**	**3.19**	**1.01**	0.5 U	**0.79**	**2.88**
CP-S4	upper	7/6/2004	**2.73**	**2.23**	**0.82**	0.5 U	**0.88**	**2.96**
CP-S4	upper	10/5/2004	**4**	**2.7**	**1.2**	0.5 U	**0.8**	**3.2**
CP-S4	upper	1/4/2005	**3.23**	**2.34**	**1.07**	0.5 U	**0.79**	**3.07**
CP-S4	upper	4/13/2005	**3.3**	**2.1**	**1.1**	**0.6**	**0.7**	**2.8**
CP-S4	upper	7/19/2005	**2.9**	**1.9**	**1.2**	0.5 U	**0.9**	**3.1**
CP-S4	upper	10/6/2005	**3.1**	**2.1**	**1.1**	0.5 U	**0.8**	**2.9**
CP-S4	upper	1/11/2006	**2.4**	**1.8**	**0.8**	0.5 U	**0.8**	**2.7**
CP-S4	upper	5/3/2006	**2**	**1.4**	**0.6**	0.5 U	**0.6**	**2.3**
CP-S4	upper	7/12/2006	**2.1**	**1.3**	**0.7**	0.5 U	**0.7**	**2.4**

Attachment 4. Compliance Extraction Well Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethane (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
Adjustment Criteria			***103 (South)/ 101 (West***	***4.5***	***2026***	***na***	***na***	***3.3***
CP-S4	upper	10/4/2006	**2.3**	**1.3**	**0.7**	0.5 U	**0.9**	**2.7**
CP-S4	upper	1/9/2007	**1.6**	**0.9**	0.5 U	0.5 U	**0.8**	**2.2**
CP-S4	upper	5/16/2007	**2.72**	**1.96**	**0.77**	0.5 U	**0.74**	**2.69**
CP-S4	upper	7/2/2007	**2.4**	**1.9**	**0.55**	0.5 U	**1**	**3.08**
CP-S4	upper	10/3/2007	**2.46**	**1.95**	**0.94**	0.5 U	**0.86**	**2.95**
CP-S4	upper	1/17/2008	**2.24**	**1.8**	**0.82**	0.5 U	**1.17**	**3.03**
CP-S4	upper	7/8/2008	**2.88**	**1.49**	**0.84**	0.5 U	**1.06**	**3.34**
CP-S4	upper	10/7/2008	**2.03**	**1.56**	**0.65**	0.5 U	**0.84**	**2.83**
CP-S5	upper	1/14/2004	**1.98**	**0.89**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S5	upper	4/15/2004	**1.81**	**0.77**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S5	upper	7/6/2004	**1.66**	**0.78**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S5	upper	10/5/2004	**2.5**	**0.9**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S5	upper	1/4/2005	**1.89**	**0.77**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S5	upper	4/13/2005	**2.4**	**0.9**	**0.7**	**0.6**	0.5 U	0.5 U
CP-S5	upper	7/19/2005	**2**	**0.8**	**0.7**	0.5 U	0.5 U	0.5 U
CP-S5	upper	10/6/2005	**2**	**0.8**	**0.5**	0.5 U	0.5 U	0.5 U
CP-S5	upper	1/11/2006	**2**	0.5 U	**0.8**	0.5 U	0.5 U	0.5 U
CP-S5	upper	5/3/2006	**1.7**	**0.7**	**0.5**	0.5 U	0.5 U	0.5 U
CP-S5	upper	7/12/2006	**1.6**	**0.6**	**0.5**	0.5 U	0.5 U	0.5 U
CP-S5	upper	10/4/2006	**1.7**	**0.6**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S5	upper	1/9/2007	**1.4**	**0.6**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S5	upper	5/16/2007	**1.67**	**0.65**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S5	upper	7/2/2007	**1.83**	**0.68**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S5	upper	10/3/2007	**1.6**	**0.66**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S5	upper	1/17/2008	**1.69**	**0.67**	**0.55**	0.5 U	0.5 U	0.5 U
CP-S5	upper	4/9/2008	**1.87**	**0.72**	**0.61**	0.5 U	0.5 U	0.5 U
CP-S5	upper	7/8/2008	**2.36**	0.5 U	**0.51**	0.5 U	0.5 U	0.5 U
CP-S5	upper	10/7/2008	**1.77**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CP-S6	upper	1/14/2004	**2.16**	**0.96**	**0.57**	0.5 U	0.5 U	0.5 U
CP-S6	upper	4/15/2004	**2.11**	**0.91**	**0.7**	0.5 U	0.5 U	0.5 U
CP-S6	upper	7/6/2004	**1.92**	**0.83**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S6	upper	10/5/2004	**2.7**	**1**	0.6	0.5 U	0.5 U	0.5 U

Attachment 4. Compliance Extraction Well Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethane (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
Adjustment Criteria			***103 (South)/ 101 (West***	***4.5***	***2026***	***na***	***na***	***3.3***
CP-S6	upper	1/4/2005	**1.91**	**0.76**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S6	upper	4/13/2005	**2.4**	**0.8**	**0.8**	0.5 U	0.5 U	0.5 U
CP-S6	upper	7/19/2005	**2**	**0.8**	**0.8**	0.5 U	0.5 U	0.5 U
CP-S6	upper	10/6/2005	**2.1**	**0.7**	**1.3**	0.5 U	0.5 U	0.5 U
CP-S6	upper	1/11/2006	**1.6**	0.5 U	**0.6**	0.5 U	0.5 U	0.5 U
CP-S6	upper	5/3/2006	**1.8**	**0.6**	**0.6**	0.5 U	0.5 U	0.5 U
CP-S6	upper	7/12/2006	**1.6**	**0.5**	**0.6**	0.5 U	0.5 U	0.5 U
CP-S6	upper	10/4/2006	**1.9**	**0.6**	**0.6**	0.5 U	0.5 U	0.5 U
CP-S6	upper	1/9/2007	**1.6**	**0.6**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S6	upper	5/16/2007	**1.55**	**0.53**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S6	upper	7/2/2007	**1.63**	**0.53**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S6	upper	10/3/2007	**1.57**	**0.52**	0.5 U	0.5 U	0.5 U	0.5 U
CP-S6	upper	1/17/2008	**1.48**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CP-S6	upper	4/9/2008	**1.59**	0.5 U	**0.59**	0.5 U	0.5 U	0.5 U
CP-S6	upper	10/7/2008	**1.92**	**0.56**	**1.03**	0.5 U	0.5 U	0.5 U
CP-E1	lower	1/14/2004	**64.9**	**16.43**	**29.4**	**2.06**	**0.72**	**5.11**
CP-E1	lower	4/15/2004	**68.6**	**14.74**	**24.42**	**1.08**	**0.67**	**4.58**
CP-E1	lower	7/6/2004	**49.26**	**12.79**	**21.07**	**1.22**	**0.62**	**4.14**
CP-E1	lower	10/5/2004	**65.1**	**16.9**	**35.7**	**0.7**	**0.6**	**5**
CP-E1	lower	1/4/2005	**54.4**	**15.5**	0.5 U	**0.62**	**0.65**	**4.88**
CP-E1	lower	4/13/2005	**62.6**	**16.2**	**40.5**	**1.4**	**0.6**	**4.6**
CP-E1	lower	7/20/2005	**59.1**	**15.7**	**38.7**	**1.2**	**0.7**	**4.9**
CP-E1	lower	10/6/2005	**44.7**	**14.8**	**31.5**	**0.8**	**0.6**	**4.4**
CP-E1	lower	1/11/2006	**56.4**	**15**	**29.4**	**0.9**	**0.6**	**4.5**
CP-E1	lower	5/3/2006	**59.3**	**16.7**	**27.8**	**1**	0.5 U	**4.6**
CP-E1	lower	7/12/2006	**56.9**	**15.9**	**30.9**	**0.8**	**0.5**	**4.5**
CP-E1	lower	10/4/2006	**48.2**	**12.7**	**27.4**	**0.7**	0.5 U	**3.9**
CP-E1	lower	1/9/2007	**53.4**	**15.2**	**29.6**	**0.6**	**0.6**	**5.2**
CP-E1	lower	5/16/2007	**49.9**	**15.8**	**28.8**	**0.52**	**0.53**	**5.05**
CP-E1	lower	7/2/2007	**51**	**15.8**	**29.8**	**0.55**	**0.8**	**6.01**
CP-E1	lower	10/3/2007	**39.4**	**14.9**	**33.1**	**0.59**	**0.65**	**5.25**
CP-E1	lower	1/17/2008	**40.2**	**13**	**28.7**	0.5 U	**0.87**	**4.91**

Attachment 4. Compliance Extraction Well Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethane (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
Adjustment Criteria			***103 (South)/ 101 (West***	***4.5***	***2026***	***na***	***na***	***3.3***
CP-E1	lower	4/9/2008	**38.9**	**12.6**	**25.4**	0.5 U	0.5 U	**4.51**
CP-E1	lower	7/8/2008	**48.5**	**12.6**	**35.6**	0.5 U	**0.68**	**5.83**
CP-E1	lower	10/7/2008	**38.1**	**8.96**	**18.4**	0.5 U	0.5 U	**4.04**
CP-E3	lower	1/14/2004	**57**	**3.7**	**14.28**	0.5 U	0.5 U	**1.08**
CP-E3	lower	4/15/2004	**52.5**	**3.23**	**10.59**	0.5 U	0.5 U	**0.9**
CP-E3	lower	7/6/2004	**49.7**	**3.09**	**11.8**	0.5 U	0.5 U	**0.71**
CP-E3	lower	10/5/2004	**54.8**	**3.5**	**17.6**	0.5 U	0.5 U	**0.7**
CP-E3	lower	1/4/2005	**44.3**	**3.32**	**12.2**	0.5 U	0.5 U	**0.73**
CP-E3	lower	4/13/2005	**49.3**	**3.3**	**21.9**	**0.7**	0.5 U	**0.7**
CP-E3	lower	7/20/2005	**42.4**	**2.9**	**16.3**	0.5 U	0.5 U	**0.7**
CP-E3	lower	10/6/2005	**42.9**	**2.7**	**11.9**	0.5 U	0.5 U	**0.5**
CP-E3	lower	1/11/2006	**39.5**	**2.7**	**11.2**	0.5 U	0.5 U	**0.6**
CP-E3	lower	5/3/2006	**45.3**	**3.4**	**15.1**	0.5 U	0.5 U	**0.7**
CP-E3	lower	7/12/2006	**41.3**	**2.9**	**12.3**	0.5 U	0.5 U	**0.7**
CP-E3	lower	10/4/2006	**34.4**	**3.4**	**14.9**	0.5 U	0.5 U	**0.9**
CP-E3	lower	1/9/2007	**37.9**	**2.9**	**11.6**	0.5 U	0.5 U	**0.8**
CP-E3	lower	5/16/2007	**37.6**	**3.35**	**11.9**	0.5 U	0.5 U	**0.75**
CP-E3	lower	7/2/2007	**39.5**	**2.99**	**10.8**	0.5 U	0.5 U	**0.82**
CP-E3	lower	10/3/2007	**35**	**2.82**	**12.3**	0.5 U	0.5 U	**0.66**
CP-E3	lower	1/17/2008	**34.8**	**2.67**	**11.3**	0.5 U	0.5 U	**0.69**
CP-E3	lower	4/9/2008	**35.6**	**2.44**	**9.78**	0.5 U	0.5 U	**0.62**
CP-E3	lower	7/8/2008	**37.3**	**3.52**	**17.5**	0.5 U	0.5 U	**1.51**
CP-E3	lower	10/7/2008	**39.7**	**3.27**	**12.4**	0.5 U	0.5 U	**1.54**
CP-W1	lower	1/14/2004	**7.89**	0.5 U	**2.2**	0.5 U	0.5 U	0.5 U
CP-W1	lower	4/15/2004	**7.13**	0.5 U	**1.79**	0.5 U	0.5 U	0.5 U
CP-W1	lower	7/6/2004	**6.2**	0.5 U	**1.65**	0.5 U	0.5 U	0.5 U
CP-W1	lower	10/5/2004	**8.3**	0.5 U	**2.6**	0.5 U	0.5 U	0.5 U
CP-W1	lower	1/4/2005	**5.45**	0.5 U	**1.79**	0.5 U	0.5 U	0.5 U
CP-W1	lower	4/13/2005	**8.1**	0.5 U	**3.5**	0.5 U	0.5 U	0.5 U
CP-W1	lower	7/20/2005	**7.1**	0.5 U	**2.9**	0.5 U	0.5 U	0.5 U
CP-W1	lower	10/6/2005	**6.7**	0.5 U	**3.3**	0.5 U	0.5 U	0.5 U
CP-W1	lower	1/11/2006	**6.8**	0.5 U	**2.6**	0.5 U	0.5 U	0.5 U

Attachment 4. Compliance Extraction Well Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethane (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
Adjustment Criteria			***103 (South)/ 101 (West***	***4.5***	***2026***	***na***	***na***	***3.3***
CP-W1	lower	5/3/2006	**6.1**	0.5 U	**2.7**	0.5 U	0.5 U	0.5 U
CP-W1	lower	7/12/2006	**5.5**	0.5 U	**2.2**	0.5 U	0.5 U	0.5 U
CP-W1	lower	10/4/2006	**6.2**	0.5 U	**2.6**	0.5 U	0.5 U	0.5 U
CP-W1	lower	1/9/2007	**5.2**	0.5 U	**2**	0.5 U	0.5 U	0.5 U
CP-W1	lower	5/16/2007	**5.01**	0.5 U	**1.71**	0.5 U	0.5 U	0.5 U
CP-W1	lower	7/2/2007	**5.39**	0.5 U	**1.84**	0.5 U	0.5 U	0.5 U
CP-W1	lower	10/3/2007	**4.72**	**2.3**	0.5 U	0.5 U	0.5 U	0.5 U
CP-W1	lower	1/17/2008	**4.76**	0.5 U	**2.14**	0.5 U	0.5 U	0.5 U
CP-W1	lower	4/9/2008	**4.78**	0.5 U	**2.77**	0.5 U	0.5 U	0.5 U
CP-W1	lower	7/8/2008	**5.53**	0.5 U	**2.56**	0.5 U	0.5 U	0.5 U
CP-W1	lower	10/7/2008	**4.8**	0.5 U	**1.5**	0.5 U	0.5 U	0.5 U
CP-W2	lower	1/14/2004	**42.02**	**3.53**	**17.2**	0.5 U	0.5 U	**2.94**
CP-W2	lower	4/15/2004	**44.2**	**3.11**	**13.71**	0.5 U	0.5 U	**2.54**
CP-W2	lower	7/6/2004	**41.45**	**3.43**	**15.16**	0.5 U	0.5 U	**2.95**
CP-W2	lower	10/5/2004	**64.7**	**5.5**	**28.3**	0.5 U	0.5 U	**4.6**
CP-W2	lower	1/4/2005	**51.2**	**5.19**	**20.4**	0.5 U	0.5 U	**4.88**
CP-W2	lower	4/13/2005	**63.7**	**5.6**	**35.8**	**0.7**	0.5 U	**5.4**
CP-W2	lower	7/20/2005	**51.5**	**5**	**24.9**	0.5 U	0.5 U	**5.1**
CP-W2	lower	9/14/2005	**41.8**	**4.7**	**21.2**	0.5 U	0.5 U	**4.9**
CP-W2	lower	10/6/2005	**45.9**	**5.5**	**25.3**	0.5 U	0.5 U	**5.9**
CP-W2	lower	1/11/2006	**41.8**	**4.5**	**20.4**	0.5 U	0.5 U	**5.6**
CP-W2	lower	5/3/2006	**39.1**	**4.3**	**17.2**	0.5 U	0.5 U	**5.2**
CP-W2	lower	7/12/2006	**41.8**	**3.9**	**18**	0.5 U	0.5 U	**4.7**
CP-W2	lower	10/4/2006	**41.2**	**4.6**	**24.5**	0.5 U	0.5 U	**5.9**
CP-W2	lower	1/9/2007	**50**	**4.8**	**23.4**	0.5 U	0.5 U	**6.7**
CP-W2	lower	5/16/2007	**37.3**	**4.26**	**17.4**	0.5 U	0.5 U	**5.68**
CP-W2	lower	7/2/2007	**39.1**	**4.18**	**18.5**	0.5 U	0.5 U	**6.82**
CP-W2	lower	10/3/2007	**32.5**	**4.04**	**20.3**	0.5 U	0.5 U	**5.65**
CP-W2	lower	1/17/2008	**33.6**	**3.7**	**20.1**	0.5 U	0.5 U	**6.03**
CP-W2	lower	4/9/2008	**34.2**	**3.24**	**23.9**	0.5 U	0.5 U	**5.52**
CP-W2	lower	7/8/2008	**35.6**	**3.37**	**23**	0.5 U	0.5 U	**6.12**
CP-W2	lower	10/7/2008	**39.2**	**2.98**	**16.2**	0.5 U	0.5 U	**4.5**

Attachment 4. Compliance Extraction Well Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethane (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
Adjustment Criteria			***103 (South)/ 101 (West***	***4.5***	***2026***	***na***	***na***	***3.3***
CP-W3	lower	1/14/2004	**76.7**	**6.43**	**26.84**	0.5 U	0.5 U	**14.76**
CP-W3	lower	4/15/2004	**59.3**	**5.4**	**18.9**	0.5 U	0.5 U	**12.34**
CP-W3	lower	7/6/2004	**49.5**	**4.42**	**16.9**	0.5 U	0.5 U	**10.92**
CP-W3	lower	10/5/2004	**51.9**	**5.1**	**25.2**	0.5 U	0.5 U	**12.2**
CP-W3	lower	1/4/2005	**40.1**	**4.53**	**16.3**	0.5 U	0.5 U	**11**
CP-W3	lower	4/13/2005	**38.9**	**4.1**	**24.1**	0.5 U	0.5 U	**10.3**
CP-W3	lower	7/20/2005	**43.6**	**3.9**	**18**	0.5 U	0.5 U	**10.2**
CP-W3	lower	10/6/2005	**21.4**	**1**	**7.1**	0.5 U	0.5 U	**2.1**
CP-W3	lower	1/11/2006	**33**	**3.3**	**13.7**	0.5 U	0.5 U	**8.3**
CP-W3	lower	5/3/2006	**31.9**	**3.4**	**12.8**	0.5 U	0.5 U	**8.1**
CP-W3	lower	7/12/2006	**29.9**	**3.1**	**13**	0.5 U	0.5 U	**7.9**
CP-W3	lower	10/4/2006	**32.1**	**3.4**	**15.6**	0.5 U	0.5 U	**8.9**
CP-W3	lower	1/9/2007	**23.5**	**2.4**	**10.2**	0.5 U	0.5 U	**7.3**
CP-W3	lower	5/16/2007	**29**	**3.26**	**12.2**	0.5 U	0.5 U	**7.41**
CP-W3	lower	7/2/2007	**27.9**	**3**	**12.4**	0.5 U	0.5 U	**8.52**
CP-W3	lower	10/3/2007	**22.6**	**2.7**	**12.9**	0.5 U	0.5 U	**6.73**
CP-W3	lower	1/17/2008	**22.9**	**2.6**	**12**	0.5 U	0.5 U	**6.73**
CP-W3	lower	4/9/2008	**27.6**	**2.93**	**19.4**	0.5 U	0.5 U	**7.86**
CP-W3	lower	7/8/2008	**23**	**2.6**	**15.4**	0.5 U	0.5 U	**8.03**
CP-W3	lower	10/7/2008	**25.3**	**2.09**	**9.69**	0.5 U	0.5 U	**6.97**
CP-E2	lower	1/14/2004	**129.2**	**37.94**	**98**	0.5 U	**1.01**	**114.4**
CP-E2	lower	4/15/2004	**136.2**	**32.9**	**86.3**	0.5 U	**0.9**	**108.3**
CP-E2	lower	7/6/2004	**127.3**	**32.47**	**87**	0.5 U	**0.94**	**109.2**
CP-E2	lower	10/5/2004	**148**	**39.2**	**108**	0.5 U	**0.9**	**118**
CP-E2	lower	1/4/2005	**123**	**36.5**	**84.7**	0.5 U	**1.07**	**107**
CP-E2	lower	4/13/2005	**149**	**39.2**	**134**	0.5 U	**0.9**	**118**
CP-E2	lower	7/20/2005	**143**	**40.4**	**121**	0.5 U	**1.2**	**128**
CP-E2	lower	10/6/2005	**123**	**34.7**	**139**	0.5 U	**1**	**111**
CP-E2	lower	1/11/2006	**136**	**39**	**113**	0.5 U	**1.1**	**129**
CP-E2	lower	5/3/2006	**124**	**38**	**108**	0.5 U	**0.8**	**111**
CP-E2	lower	7/12/2006	**121**	**32.3**	**96.7**	0.5 U	**0.7**	**106**
CP-E2	lower	10/4/2006	**125**	**38.7**	**104**	0.5 U	**1.1**	**103**

Attachment 4. Compliance Extraction Well Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethane (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
Adjustment Criteria			***103 (South)/ 101 (West***	***4.5***	***2026***	***na***	***na***	***3.3***
CP-E2	lower	1/9/2007	**117**	**34.3**	**91.6**	0.5 U	**1**	**103**
CP-E2	lower	1/17/2008	**95.8**	**31.8**	**81.7**	0.5 U	**1.23**	**95.6**
CP-E2	lower	4/9/2008	**97**	**30.8**	**77.2**	0.5 U	0.5 U	**84.3**
CP-E2	lower	7/8/2008	**124**	**31.3**	**129**	0.5 U	**0.93**	**99.9**
CP-E2	lower	10/7/2008	**137**	**20.5**	**107**	0.5 U	**0.7**	**103**

Notes:

Bold indicates a detected concentration

Highlight indicates detected concentration above Performance Criteira

na not applicable

Attachment 5. MFS Groundwater Data

Well ID	Date	Chloride (mg/L)	Temp-erature (°C)	Cond-uctivity (uS/cm)	pH	Chemical Oxygen Demand (mg/L)	Iron (mg/L)	Manganese (mg/L)	Ammonia (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)
Criteria		***250*** [b]	***na***	***na***	***6.5-8.5*** [b]	***na***	***0.3*** [b]	***0.05*** [b]	***na***	***1*** [a]	***10*** [a]
CD-03A1	4/14/2004	0.74	9	397	7.66	<5	<0.02	<0.002	0.17	<0.05	0.238
CD-03A1	4/12/2005	0.754	9.8	442	7.64	<5	<0.06	<0.004	0.04	<0.05	0.266
CD-03A1	5/2/2006	1.04	9.4	349	7.4	<5	<0.06	<0.004	<0.03	<0.05	0.26
CD-03A1	5/15/2007	0.87	10	391	7.61	<5	<0.06	<0.004	<0.03	<0.05	0.408
CD-03A1	4/8/2008	1.03	9.2	398	7.56	--	<0.06	<0.004	<0.03	--	0.751
CD-03A1	4/16/2008	--	12.4	382	7.63	--	<0.06	<0.004	--	--	--
CD-60A1	4/14/2004	3.14	10.7	550	6.94	<5	<0.02	<0.002	0.04	<0.05	2.3
CD-60A1	4/13/2005	4.87	11.9	510	6.9	<5	<0.06	<0.004	0.08	<0.05	3.26
CD-60A1	5/2/2006	1.24	11.8	722	6.6	<5	<0.06	<0.004	<0.03	<0.05	0.88
CD-60A1	5/15/2007	9.44	11	672	6.89	<5	<0.06	<0.004	<0.03	<0.05	2.73
CD-60A1	4/9/2008	6.13	10.1	698	6.75	<5	<0.06	<0.004	<0.03	<0.05	3.21
CD-61A1	4/14/2004	0.73	10.3	360	7.49	<5	<0.02	<0.002	0.03	<0.05	0.244
CD-61A1	4/13/2005	0.621	11.2	490	7.46	<5	<0.06	<0.004	0.05	<0.05	0.141
CD-61A1	5/2/2006	0.66	10.7	350	7.36	<5	<0.06	<0.004	<0.03	<0.05	0.14
CD-61A1	5/14/2007	0.84	11.6	387	7.53	<5	<0.06	<0.004	<0.03	<0.05	0.28
CD-61A1	4/9/2008	0.784	10.2	403	7.46	<5	<0.06	<0.004	<0.03	<0.05	0.373
CS-04A1	4/14/2004	11	9.9	803	6.65	<5	<0.02	***0.712***	0.33	<0.05	2.17
CS-04A1	4/12/2005	6.5	10.7	1050	6.66	<5	<0.06	***0.867***	<0.03	<0.05	3.03
CS-04A1	5/2/2006	4.4	9.8	930	6.2	<5	<0.06	***0.17***	<0.03	0.06	2.13
CS-04A1	5/15/2007	13.8	11	795	6.63	<5	<0.06	***0.31***	<0.03	<0.05	3.55
CS-04A1	4/8/2008	1.47	9.3	846	6.54	--	0.235	***0.203***	<0.03	--	1.8
CS-04A1	4/16/2008	--	9.7	804	6.48	--	<0.06	***0.147***	--	--	--

Notes:

Bold indicates a detected concentration

Highlight indicates detected concentration above Performance Criteira

[a] Washington State Primary Drinking Water Standard

[b] Washington State Secondary Drinking Water Standard

ROD Performance Criteria

Attachment 5. MFS Groundwater Data

Well ID	Date	Sulfate (mg/L)	Total Organic Carbon (mg/L)	Zinc (mg/L)	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethane (ug/L)	Trichloro-ethene (ug/L)
Criteria		***250*** [b]	***na***	***5*** [b]	***200*** [c]	***4050*** [c]	***7*** [c]	***2.5*** [c]	***0.7*** [c]	***5*** [c]
CD-03A1	4/14/2004	7.42	<1	0.009	2.51	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-03A1	4/12/2005	7.49	<1	0.011	1	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-03A1	5/2/2006	6.25	<1	<0.01	1.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-03A1	5/15/2007	7.68	<1	<0.01	0.56	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CD-03A1	4/8/2008	7.22	<1	<0.01	1.09	0.5 U	0.5 U	0.5 U	0.56	0.5 U
CD-03A1	4/16/2008	--	--	<0.01	--	--	--	--	--	--
CD-60A1	4/14/2004	9.99	1.4	<0.005	0.71	0.5 U	0.5 U	0.5 U	0.65	0.66
CD-60A1	4/13/2005	12	<1	<0.01	0.9	0.5 U	0.5 U	0.5 U	0.6	0.8
CD-60A1	5/2/2006	3.7	<1	<0.01	0.5 U	0.5 U	0.5 U	0.5 U	***1***	0.6
CD-60A1	5/15/2007	8.86	1.1	<0.01	0.71	0.5 U	0.5 U	0.5 U	***1.09***	0.68
CD-60A1	4/9/2008	12.9	1.5	<0.01	0.63	0.5 U	0.5 U	0.5 U	***0.89***	0.89
CD-61A1	4/14/2004	9.76	<1	<0.005	14.7	0.5 U	0.82	0.5 U	0.5 U	0.5 U
CD-61A1	4/13/2005	11.5	<1	<0.01	10.9	0.5 U	2.2	0.5 U	0.5 U	0.5 U
CD-61A1	5/2/2006	10.1	<1	<0.01	5.9	0.5 U	0.5	0.5 U	0.5 U	0.5 U
CD-61A1	5/14/2007	9.16	<1	<0.01	14.2	0.5 U	1.16	0.5 U	0.5 U	0.5 U
CD-61A1	4/9/2008	8.88	<1	<0.01	9.79	0.5 U	1.68	0.5 U	0.5 U	0.5 U
CS-04A1	4/14/2004	15.5	<1	0.0052	0.86	3.3	0.5 U	0.5 U	0.5 U	1.07
CS-04A1	4/12/2005	11.9	<1	<0.01	0.9	3.9	0.5 U	0.5 U	0.5 U	1.4
CS-04A1	5/2/2006	12.7	<1	<0.01	0.5	3.1	0.5 U	0.5 U	0.5 U	1
CS-04A1	5/15/2007	14.4	<1	<0.01	0.75	3.21	0.5 U	0.5 U	0.5 U	1.03
CS-04A1	4/8/2008	6.09	2.07	<0.01	0.5 U	1.04	0.5 U	0.5 U	0.5 U	1.13
CS-04A1	4/16/2008	--	--	<0.01	--	--	--	--	--	--

Notes:

Bold indicates a detected concentration

Highlight indicates detected concentration above Performance Criteira

[b] Washington State Primary Drinking Water Standard

[c] Washington State Secondary Drinking Water Standard

ROD Performance Criteria

Attachment 6. Domestic Well Sampling Schedule

Colbert Residential Sampling Plan 2006

StationID	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	School Comments
0273C-3	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	BiAnnual (07)
0273C-4	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
0273D-6	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	
0273F-4	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	
0273Q-1	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	Alt w/1173B-1
0373A-1	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	
0373A-2	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	
0373A-4	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	
0373L-1	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	
1073D-1	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	
1073D-2	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	
1073E-2	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	Alt w/1073E-3
1073E-3	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	Alt w/1073E-2
1073G-1	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	
1073J-1	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	Alt w/1073J-2
1073J-2	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	Alt w/1073J-1
1073L-1	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	
1073L-2	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Alt w/1073L-3
1073L-3	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Alt w/1073L-2
1073L-4	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	
1073M-1	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Alt w/1073M-3
1073M-3	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	Alt w/1073M-1
1073P-1	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	
1073P-2	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	
1073Q-4	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	

Attachment 6. Domestic Well Sampling Schedule

StationID	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Sched Comments
1173B-1	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Alt w/0273Q-1
1473C-4	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	BiAnnual (07)
1473C-5	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	Alt w/1473D-2
1473D-1	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Alt w/1473C-5
1473D-2	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	Alt w/1473C-5
1473M-1	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	
1573C-10	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	BiAnnual (07)
1573C-17	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	
1573C-5	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	
1573C-7	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	
1573C-8	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	BiAnnual (08)
1573G-1	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	BiAnnual (03)
1573H-1	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
1573K-1	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	
1573Q-1	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	BiAnnual (07)

Attachment 7. Domestic Well Sampling Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethene (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
1073E-4	upper	9/14/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-3	upper	4/19/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-3	upper	10/11/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-3	upper	4/18/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-3	upper	10/5/2005	**2.9**	**1**	**0.7**	0.5 U	0.5 U	0.5 U
1073E-3	upper	1/9/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-3	upper	4/18/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-3	upper	10/10/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-3	upper	5/22/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-3	upper	10/9/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-3	upper	4/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-3	upper	10/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-2	upper	1/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-2	upper	7/7/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-2	upper	2/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-2	upper	8/8/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-2	upper	1/9/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-2	upper	7/26/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-2	upper	1/23/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-2	upper	7/23/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-2	upper	2/19/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073E-2	upper	7/15/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273C-3	lower	10/11/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273C-3	lower	10/5/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273C-3	lower	6/14/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273C-3	lower	6/12/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273C-3	lower	6/10/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273C-4	lower	2/10/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273C-4	lower	2/10/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273C-4	lower	2/7/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273C-4	lower	2/9/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273C-4	lower	2/19/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273D-6	lower	2/10/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273D-6	lower	8/9/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273D-6	lower	2/10/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273D-6	lower	8/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273D-6	lower	2/7/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273D-6	lower	7/26/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273D-6	lower	2/8/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Attachment 7. Domestic Well Sampling Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethene (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
0273D-6	lower	9/4/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273D-6	lower	2/19/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273D-6	lower	8/7/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273F-4	lower	1/19/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273F-4	lower	12/12/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273F-4	lower	6/14/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273F-4	lower	12/11/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273F-4	lower	6/12/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273F-4	lower	11/14/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273F-4	lower	6/10/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273Q-1	lower	5/17/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273Q-1	lower	8/8/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273Q-1	lower	7/25/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0273Q-1	lower	6/12/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	3/10/2004	**1.68**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	6/7/2004	**1.56**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	9/20/2004	**1.8**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	1/19/2005	**1.53**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	3/9/2005	**1.2**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	6/13/2005	**1.1**	0.5 U	0.5 U	0.6 R	0.5 U	0.5 U
0373A-2	lower	9/15/2005	**0.8**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	12/12/2005	**0.7**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	3/22/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	6/14/2006	**1.3**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	9/21/2006	**1**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	12/11/2006	**0.9**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	3/12/2007	**1.1**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	6/11/2007	**1.04**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	9/4/2007	**1.19**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	11/13/2007	**1.22**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	3/4/2008	**1.2**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	6/10/2008	**1.38**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-2	lower	9/18/2008	**0.53**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-4	lower	8/9/2004	**1.1**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-4	lower	5/10/2005	**1**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-4	lower	8/9/2005	**0.8**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-4	lower	11/2/2005	**1**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-4	lower	2/7/2006	**0.9**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-4	lower	5/22/2006	**1.1**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Attachment 7. Domestic Well Sampling Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethene (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
0373A-4	lower	7/26/2006	**0.8**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-4	lower	11/16/2006	**0.8**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-4	lower	2/8/2007	**0.7**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-4	lower	5/22/2007	**0.6**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-4	lower	9/4/2007	**0.77**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-4	lower	11/14/2007	**0.62**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-4	lower	5/8/2008	**0.73**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373A-4	lower	8/7/2008	**0.7**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373L-1	upper	2/10/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373L-1	upper	5/18/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373L-1	upper	8/9/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373L-1	upper	11/9/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373L-1	upper	2/10/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373L-1	upper	5/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373L-1	upper	8/10/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373L-1	upper	11/2/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373L-1	upper	2/8/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373L-1	upper	5/23/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373L-1	upper	11/15/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373L-1	upper	5/22/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373L-1	upper	11/14/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
0373L-1	upper	5/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073D-1	upper	2/10/2004	**4.4**	**1.42**	0.5 U	0.5 U	0.5 U	0.5 U
1073D-1	upper	5/17/2004	**5.4**	**1.9**	**0.8**	0.5 U	0.5 U	0.5 U
1073D-1	upper	8/10/2004	**4.8**	**1.4**	0.5 U	0.5 U	0.5 U	0.5 U
1073D-1	upper	11/9/2004	**4.2**	**1.5**	**0.6**	0.5 U	0.5 U	0.5 U
1073D-1	upper	2/11/2005	**4.2**	**1.3**	**0.7**	0.5 U	0.5 U	0.5 U
1073D-1	upper	5/10/2005	**4.3**	**1.3**	**0.8**	0.5 U	0.5 U	0.5 U
1073D-1	upper	8/8/2005	**3.5**	**1.3**	**0.9**	0.5 U	0.5 U	0.5 U
1073D-1	upper	9/14/2005	**3.1**	**1.2**	**0.7**	0.5 U	0.5 U	0.5 U
1073D-1	upper	11/2/2005	**3.4**	**1**	**0.5**	0.5 U	0.5 U	0.5 U
1073D-1	upper	2/8/2006	**2.7**	**1**	**0.5**	0.5 U	0.5 U	0.5 U
1073D-1	upper	5/23/2006	**2.7**	**1.2**	**1.1**	0.5 U	0.5 U	0.5 U
1073D-1	upper	7/26/2006	**2.4**	**1**	**0.6**	0.5 U	0.5 U	0.5 U
1073D-1	upper	11/16/2006	**2.9**	**1.2**	**0.7**	0.5 U	0.5 U	0.5 U
1073D-1	upper	2/8/2007	**2.4**	**1**	0.5 U	0.5 U	0.5 U	0.5 U
1073D-1	upper	9/5/2007	**2.35**	**1.01**	**0.61**	0.5 U	0.5 U	0.5 U
1073D-1	upper	11/14/2007	**2.69**	**1.14**	**0.81**	0.5 U	0.5 U	0.5 U
1073D-1	upper	2/19/2008	**2.25**	**0.96**	**0.8**	0.5 U	0.5 U	0.5 U

Attachment 7. Domestic Well Sampling Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethene (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
1073D-1	upper	5/8/2008	**2.28**	**0.88**	**0.63**	0.5 U	0.5 U	0.5 U
1073D-1	upper	8/7/2008	**2.09**	**0.94**	**0.63**	0.5 U	0.5 U	0.5 U
1073D-2	upper	1/12/2004	**5.79**	**3.58**	**1.57**	0.5 U	0.5 U	0.5 U
1073D-2	upper	4/19/2004	**5.62**	**3.62**	**1.59**	0.5 U	0.5 U	0.5 U
1073D-2	upper	7/7/2004	**4.52**	**3.36**	**1.52**	0.5 U	0.5 U	0.5 U
1073D-2	upper	11/9/2004	**5**	**3.3**	**1.6**	0.5 U	0.5 U	0.5 U
1073D-2	upper	1/20/2005	**5.6**	**3.57**	**2.25**	0.5 U	0.5 U	0.5 U
1073D-2	upper	4/18/2005	**4.8**	**3.4**	**1.8**	0.5 U	0.5 U	0.5 U
1073D-2	upper	8/8/2005	**4.9**	**3.7**	**2.9**	0.5 U	0.5 U	0.5 U
1073D-2	upper	9/14/2005	**3.8**	**3.1**	**1.7**	0.5 U	0.5 U	0.5 U
1073D-2	upper	10/5/2005	**4.2**	**3.3**	**2.8**	0.5 U	0.5 U	0.5 U
1073D-2	upper	1/10/2006	**3**	**2.2**	**1.1**	0.5 U	0.5 U	0.5 U
1073G-1	lower	1/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073G-1	lower	7/7/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073G-1	lower	2/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073G-1	lower	8/10/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073G-1	lower	1/10/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073G-1	lower	7/26/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073G-1	lower	1/23/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073G-1	lower	7/23/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073G-1	lower	2/20/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073G-1	lower	7/16/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	1/13/2004	**4.31**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	4/20/2004	**3.88**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	7/8/2004	**3.84**	0.5 U	**1.04**	0.5 U	0.5 U	**1.18**
1073J-1	lower	8/9/2004	**3.4**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	10/11/2004	**4**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	1/19/2005	**4.2**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	4/18/2005	**3.6**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	1/10/2006	**3**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	4/19/2006	**2.7**	0.5 U	**0.5**	0.5 U	0.5 U	0.5 U
1073J-1	lower	10/9/2006	**1.9**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	1/23/2007	**2.7**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	4/10/2007	**1.89**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	7/23/2007	**2.16**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	10/8/2007	**1.88**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	3/5/2008	**2.18**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	7/16/2008	**2.05**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-1	lower	10/8/2008	**2**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Attachment 7. Domestic Well Sampling Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethene (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
1073J-2	lower	2/10/2004	**0.8**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	5/17/2004	**0.9**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	8/9/2004	**1.1**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	11/9/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	2/9/2005	**0.5**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	5/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	8/8/2005	**0.6**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	9/14/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	11/2/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	2/7/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	5/22/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	7/25/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	11/15/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	2/9/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	5/22/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	9/4/2007	**0.53**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	11/13/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	2/19/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	5/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073J-2	lower	9/18/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-1	upper	3/9/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-1	upper	9/20/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-1	upper	3/9/2005	0.5 U	**0.7**	0.5 U	0.5 U	0.5 U	0.5 U
1073L-1	upper	9/14/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-1	upper	3/23/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-1	upper	9/21/2006	0.5 U	**0.5**	0.5 U	0.5 U	0.5 U	0.5 U
1073L-1	upper	3/12/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-1	upper	9/5/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-1	upper	3/5/2008	0.5 U	**0.72**	0.5 U	0.5 U	0.5 U	0.5 U
1073L-1	upper	9/19/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-2	upper	3/9/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-2	upper	3/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-2	upper	4/18/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-2	upper	3/12/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-2	upper	3/4/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-3	upper	9/20/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-3	upper	9/15/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-3	upper	9/21/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-3	upper	9/5/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Attachment 7. Domestic Well Sampling Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethene (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			*200*	*4050*	*7*	*2.5*	*0.7*	*5*
1073L-3	upper	9/19/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-4	lower	3/8/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-4	lower	9/21/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-4	lower	3/10/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-4	lower	9/15/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-4	lower	3/22/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-4	lower	9/20/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-4	lower	9/5/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073L-4	lower	9/18/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073M-1	upper	3/9/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073M-1	upper	3/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073M-1	upper	3/23/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073M-1	upper	3/12/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073M-1	upper	3/4/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073M-3	upper	9/21/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073M-3	upper	9/15/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073M-3	upper	9/21/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073M-3	upper	9/19/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073M-5	upper	6/7/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073M-5	upper	6/14/2005	0.5 U	0.5 U	0.5 U	0.7 R	0.5 U	0.5 U
1073P-1	upper	1/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-1	upper	4/19/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-1	upper	7/7/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-1	upper	10/11/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-1	upper	2/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-1	upper	5/10/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-1	upper	8/8/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-1	upper	10/5/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-1	upper	1/9/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-1	upper	4/18/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-1	upper	10/9/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-1	upper	4/10/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-1	upper	10/9/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-1	upper	4/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-1	upper	10/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-2	upper	2/10/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-2	upper	8/9/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-2	upper	2/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-2	upper	8/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Attachment 7. Domestic Well Sampling Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethene (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
1073P-2	upper	3/21/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-2	upper	7/26/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-2	upper	3/13/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-2	upper	10/9/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-2	upper	2/20/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073P-2	upper	8/7/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	3/8/2004	**0.84**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	6/7/2004	**0.56**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	9/20/2004	**0.8**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	1/19/2005	**1.11**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	3/9/2005	**1**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	6/13/2005	**0.7**	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U
1073Q-4	lower	9/14/2005	**0.6**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	12/12/2005	**0.7**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	3/22/2006	**0.7**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	6/14/2006	**0.6**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	9/20/2006	**0.6**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	12/11/2006	**0.7**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	3/12/2007	**0.6**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	6/11/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	9/4/2007	**0.52**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	11/13/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	3/4/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	6/10/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1073Q-4	lower	9/18/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1173B-1		1/20/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1173B-1		12/12/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1173B-1		12/11/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1173B-1		11/13/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473C-3	lower	3/10/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473C-3	lower	3/10/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473C-3	lower	3/23/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473C-4	lower	6/7/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473C-4	lower	6/13/2005	0.5 U	0.5 U	0.5 U	0.7 R	0.5 U	0.5 U
1473C-4	lower	6/14/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473C-4	lower	6/11/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473C-4	lower	6/11/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473C-5	lower	8/9/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473C-5	lower	8/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Attachment 7. Domestic Well Sampling Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethene (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
1473C-5	lower	7/25/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473C-5	lower	9/5/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473C-5	lower	8/7/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473D-1	lower	2/10/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473D-1	lower	2/10/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473D-1	lower	2/8/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473D-1	lower	2/9/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473D-1	lower	2/20/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473D-2	upper	6/9/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473D-2	upper	11/9/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473D-2	upper	5/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473D-2	upper	11/2/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473D-2	upper	6/15/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473D-2	upper	11/16/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473D-2	upper	6/12/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	1/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	4/19/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	7/7/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	10/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	1/20/2005	**0.76**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	4/18/2005	**0.7**	**0.5**	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	8/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	10/5/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	1/9/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	4/18/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	7/26/2006	**1.1**	**0.7**	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	10/9/2006	**0.9**	**0.5**	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	1/23/2007	**1.1**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	4/10/2007	**1.02**	**0.56**	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	7/24/2007	**0.89**	0.5 U	**0.54**	0.5 U	0.5 U	0.5 U
1473M-1	upper	10/8/2007	**0.5**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	2/19/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	4/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	7/15/2008	**0.99**	**0.6**	0.5 U	0.5 U	0.5 U	0.5 U
1473M-1	upper	10/7/2008	**0.5**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-10	lower	7/7/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-10	lower	8/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-10	lower	7/26/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-10	lower	7/23/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Attachment 7. Domestic Well Sampling Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethene (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
1573C-10	lower	7/15/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-14	lower	9/21/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-14	lower	9/15/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-17	lower	3/8/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-17	lower	3/10/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-17	lower	3/21/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-17	lower	3/13/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-17	lower	3/4/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-20		11/2/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-5	lower	4/19/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-5	lower	5/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-5	lower	6/15/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-5	lower	6/12/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-5	lower	6/11/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-7	upper	4/19/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-7	upper	10/11/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-7	upper	4/18/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-7	upper	10/5/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-7	upper	4/19/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-7	upper	10/10/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-7	upper	4/10/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-7	upper	10/8/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-7	upper	4/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-7	upper	10/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-8	upper	2/10/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-8	upper	2/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-8	upper	2/8/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-8	upper	2/9/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573C-8	upper	2/20/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573G-1	lower	5/18/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573G-1	lower	5/10/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573G-1	lower	5/23/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573G-1	lower	5/22/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573G-1	lower	5/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573H-1	lower	1/13/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573H-1	lower	2/10/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573H-1	lower	1/9/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573H-1	lower	1/24/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573H-1	lower	2/19/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Attachment 7. Domestic Well Sampling Data

Well ID	Aquifer	Date	1,1,1-Trichloro-ethane (ug/L)	1,1-Dichloro-ethane (ug/L)	1,1-Dichloro-ethene (ug/L)	Methylene Chloride (ug/L)	Tetrachloro-ethene (ug/L)	Trichloro-ethene (ug/L)
Performance Criteria			***200***	***4050***	***7***	***2.5***	***0.7***	***5***
1573K-1	upper	4/19/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573K-1	upper	10/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573K-1	upper	4/19/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573K-1	upper	10/5/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573K-1	upper	4/19/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573K-1	upper	10/10/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573K-1	upper	4/10/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573K-1	upper	10/8/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573K-1	upper	4/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573K-1	upper	10/8/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573Q-1	upper	1/12/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573Q-1	upper	5/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573Q-1	upper	7/25/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573Q-1	upper	7/24/2007	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573Q-1	upper	7/15/2008	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573R-1	upper	2/10/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573R-1	upper	8/9/2004	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573R-1	upper	2/10/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573R-1	upper	8/9/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573R-1	upper	2/8/2006	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1573R-2	upper	9/15/2005	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:

Bold indicates a detected concentration

* Whitworth Water was taken out of service in 2006

Attachment 8. 1,4-Dioxane Data

Well ID	Aquifer	Date	1,4-Dioxane (ug/L)
MTCA Method B Groundwater Cleanup Level			***4***
0273E-3	lower	5/11/2007	2 U
0273C-4	lower	2/7/2006	5 U
0273F-4	lower	10/4/2005	5 U
0273L-2	lower	5/9/2007	2 U
0273N-7	lower	5/9/2007	2 U
0273P-3	lower	5/7/2007	2 U
0373A-2	lower	10/4/2005	5 U
0373A-4	lower	10/4/2005	5 U
0373J-3	lower	5/14/2007	2 U
0373L-1	upper	11/2/2005	5 U
0373P-1S	upper	5/11/2007	2 U
1073C-1S	upper	5/11/2007	2 U
1073D-1*	upper	9/14/2005	5 UJ
1073D-1*	upper	2/8/2006	5 U
1073D-1*	upper	5/11/2007	**2.4**
1073D-1*	upper	4/8/2008	**2.2**
1073D-1*	upper	7/8/2008	2 U
1073D-2*	upper	7/20/2005	**11.3**
1073D-2*	upper	9/14/2005	**11.1 J**
1073D-2*	upper	10/5/2005	**13.8**
1073D-2*	upper	5/22/2007	**3.3**
1073D-2*	upper	4/8/2008	**2.9**
1073D-2*	upper	7/8/2008	**2.3**
1073G-1	lower	10/4/2005	5 U
1073J-1	lower	1/10/2006	5 U
1073J-2	lower	9/14/2005	5 UJ
1073K-1	upper	5/11/2007	2 U
1073L-1	upper	10/4/2005	5 U
1073L-2	upper	10/4/2005	5 U
1073L-3	upper	10/4/2005	5 U
1073L-4	lower	10/4/2005	5 U
1073P-2	upper	10/4/2005	5 U
1073Q-2	upper	5/14/2007	2 U
1073Q-4	lower	9/14/2005	5 UJ
1173D-1	lower	5/8/2007	2 U
1473C-3	lower	3/23/2006	5 U
1473D-1	lower	10/4/2005	5 U
1473D-2	upper	11/2/2005	5 U
1473M-1*	upper	10/5/2005	5 U
1473M-1*	upper	4/8/2008	2 U
1473M-1*	upper	7/8/2008	2 U
1473N-1	upper	5/7/2007	2 U
1573A-1*	upper	5/7/2007	**4.9**
1573A-1*	upper	7/8/2008	2 U
1573B-2	upper	5/11/2007	2 U
1573C-8	upper	2/8/2006	5 U
1573H-1	lower	10/4/2005	5 U
1573H-4	upper	5/8/2007	2 U
1573K-1	upper	10/5/2005	5 U
1573R-1	upper	10/4/2005	5 U

Attachment 8. 1,4-Dioxane Data

Well ID	Aquifer	Date	1,4-Dioxane (ug/L)
MTCA Method B Groundwater Cleanup Level			***4***
CD-01C1	lower	5/10/2007	2 U
CD-02RA1	upper	5/8/2007	2 U
CD-02RC2	lower	5/9/2007	2 U
CD-03A1	upper	5/15/2007	2 U
CD-03C1	lower	5/7/2007	2 U
CD-04C1	upper	5/11/2007	**96 E**
CD-04E1	lower	5/11/2007	**41**
CD-05C2	lower	5/7/2007	2 U
CD-06A1	upper	5/9/2007	2 U
CD-06C2	lower	5/9/2007	2 U
CD-07E1	lower	5/9/2007	2 U
CD-08E1	lower	5/10/2007	2 U
CD-21C1	lower	5/10/2007	2 U
CD-22D1	lower	5/7/2007	2 U
CD-23B1	upper	5/9/2007	2 U
CD-23C2	lower	5/10/2007	2 U
CD-24C2	lower	5/8/2007	2 U
CD-26	lower	5/10/2007	2 U
CD-31A1	upper	5/15/2007	2 U
CD-32B1	upper	5/7/2007	2 U
CD-34A1	upper	5/15/2007	2 U
CD-35A1	upper	5/7/2007	2 U
CD-36A1	upper	5/15/2007	2 U
CD-37A1	upper	5/16/2007	2 U
CD-37A1	upper	5/16/2007	2 U
CD-38A1	upper	5/15/2007	2 U
CD-40C1*	lower	9/14/2005	**23.9 J**
CD-40C1*	lower	5/16/2007	**11**
CD-40C1*	lower	4/8/2008	**13**
CD-40C1*	lower	7/8/2008	**11**
CD-40C2	lower	9/14/2005	**8.8 J**
CD-40C2	lower	5/8/2007	2 U
CD-40C3	lower	9/14/2005	5 UJ
CD-41C1	lower	5/14/2007	2 U
CD-41C2	lower	5/14/2007	2 U
CD-41C3	lower	5/14/2007	2 U
CD-42C1	lower	5/14/2007	2 U
CD-42C2	lower	5/14/2007	2 U
CD-42C3	lower	5/14/2007	2 U
CD-43C1	lower	5/14/2007	2 U
CD-43C2	lower	5/14/2007	2 U
CD-43C3	lower	5/14/2007	2 U
CD-44C1	lower	7/20/2005	5 U
CD-44C1	lower	5/15/2007	2 U
CD-44C2	lower	5/15/2007	2 U
CD-44C3	lower	5/14/2007	2 U
CD-45C1	lower	5/15/2007	2 U
CD-45C2	lower	5/15/2007	2 U
CD-45C3	lower	5/15/2007	2 U
CD-46	lower	5/8/2007	2 U

Attachment 8. 1,4-Dioxane Data

Well ID	Aquifer	Date	1,4-Dioxane (ug/L)
MTCA Method B Groundwater Cleanup Level			***4***
CD-47	lower	5/10/2007	2 U
CD-47	lower	5/10/2007	2 U
CD-48C1	lower	5/15/2007	2 U
CD-48C2	lower	5/15/2007	2 U
CD-48C3	lower	5/15/2007	2 U
CD-60A1	upper	5/15/2007	2 U
CD-61A1	upper	5/14/2007	2 U
CP-E1	lower	7/20/2005	5 U
CP-E2	lower	10/6/2005	5 U
CP-E3	lower	5/16/2007	2 U
CP-S1*	upper	7/19/2005	**25.8**
CP-S1*	upper	9/14/2005	**30 J**
CP-S1*	upper	4/9/2008	**9.4**
CP-S1*	upper	7/8/2008	**15**
CP-S3	upper	5/14/2007	2 U
CP-S4	upper	10/6/2005	5 U
CP-S5	upper	10/6/2005	5 U
CP-S6	upper	10/6/2005	5 U
CP-W1	lower	5/16/2007	2 U
CP-W2	lower	7/20/2005	**6.3**
CP-W2	lower	9/14/2005	**11.1 J**
CP-W2	lower	5/16/2007	2 U
CP-W3	lower	10/6/2005	5 U
CS-04A1	upper	5/15/2007	2 U
CS-14C1	upper	5/8/2007	2 U

Notes:

Bold indicates a detected concentration

Highlight indicates detected concentration above Performance Criteira

* Included in quarterly sampling program

Attachment 9. Photos

Figure 1. General site conditions on 27 January 2009

Figure 2. Mainframe computer controlling the pump and treat system. Note the area is free of clutter and dust build-up

Attachment 9. Photos

Figure 3. Image displays the inflow and outflow lines of the treatment system. Note the space is clutter free and pipes are well maintained.

Figure 4. Extraction Well Vault external features.

Attachment 9. Photos

Figure 5. Inside the extraction well vault. Note the good condition of the vault.

Figure 6. Two southern upper aquifer extraction wells, located off site approximately 1.5 miles, in a residential area.

Attachment 9. Photos

Figure 7. Residential area located south of the site and down gradient in the upper aquifer.

Figure 8. Groundwater Treatment System air stripping tower. Round ports along side of tower are windows to view condition of the contents of the tower. The LFG system discharge pipe is secured to the exterior of the air stripping tower.

Attachment 9. Photos

Figure 9. Inlet piping for gas management system. Blue tanks are carbon adsorbers that treat the landfill gas vapors

Figure 10. View of the carbon adsorbers (blue tanks).

Attachment 9. Photos

Figure 11. Image of the Little Spokane River immediately upstream of discharge point. Note the topographic high ridge in the background

Attachment 10– ARAR Analysis

Applicable or Relevant and Appropriate Requirements (ARARs)

Medium / Authority	ARAR	Status	Standard Applied in ROD	Current Standard
Groundwater / Safe Drinking Water Act	Federal – SDWA – Maximum Contaminant Levels (MCLs) (40 CFR Part 141.11-141.6) and non-zero Maximum Contaminant Levels Goals (MCLGs)	Relevant and Appropriate	Federal or State MCL, whichever is most stringent.	Federal standards are unchanged from the date the ROD was finalized.
Groundwater / Safe Drinking Water Act	Federal-SDWA-Underground Injection Control (UIC) Standards-(40 CFR 146)	Relevant and Appropriate	Regulating the discharge of fluids into UIC wells	No discharge of fluids into UIC wells is occurring
Groundwater/Water Pollution Control Act (WPCA)	State-WPCA-Underground Injection Control Standards (WAC 173-218)	TBC	Regulating the discharge of fluids into UIC wells	No discharge of fluids into UIC wells is occurring
Landfills Closure/ Hazardous Waste Management Act (HWMA)	Federal-(40 CFR 264.114-264.118; Subpart G)	Relevant and Appropriate	Applies to owners and operators of all hazardous waste management facilities	PRP currently meeting post-closure requirements
Landfill Closure / HWMA	State-HWMA-Dangerous Waste Regulations (WAC 173-303)	Relevant and Appropriate	Designates those solid wastes that are hazardous to public health and the environment	PRP currently meeting post-closure requirements
Solid Waste Handling/Solid waste Management (SWMA)	State-SWMA-Standards for solid waste handling (WAC 173-304)	Relevant and Appropriate	Minimum functional standard requirements for closure of solid waste disposal facilities	PRP currently conducting MFS sampling as required by SWM

Attachment 10– ARAR Analysis

Medium / Authority	ARAR	Status	Standard Applied in ROD	Current Standard
Surface Waters/Federal Water Pollution Control Act (WPC)	State-WPCA-Water Quality Standards for Surface Waters (WAC 173-201)	Relevant and Appropriate	Establish water quality standards for surface waters consistent with public health and protection of fish, shellfish and wildlife	Remedial activities will comply with all provisions of this regulation
Liquid Discharges/ WPCA	State - WPCA - National Pollutant Discharge Elimination System (NPDES) state permit program (WAC 173-220)	Relevant and Appropriate	Establish a state individual permit program applicable to the discharge of pollutants and other wastes and materials to the surface waters of the state.	Remedial activities will comply with all provisions of this regulation
Air/CAA	Federal-CAA-National Ambient Air Quality Standards (NAAQS) (42 USC 7401)	Applicable	National emission standards for hazardous air pollutants	Remedial activities will comply with all provisions of this regulation
Air/WA CAA	State-WA CAA-Emission Standards and controls for Sources Emitting VOCs (WAC 173-490)	Relevant and Appropriate	Establishes technically feasible and reasonably attainable standards for sources emitting VOCs and revise such standards as new information and better technology are developed and become available.	Remedial activities will comply with all provisions of this regulation
Air/Washington Clean Air Act (WA CAA)	State-WA CAA-(RCW 70.94)-Discharging pollutants into the atmosphere from a new source	Relevant and Appropriate	Complies with the federal Clean Air Act and secures and maintains levels of air quality that protects human health and safety.	Determined not necessary by Phase I modeling

Attachment 10– ARAR Analysis

Medium / Authority	ARAR	Status	Standard Applied in ROD	Current Standard
Air/WA CAA	State- WA CAA- General Regulations for Air Pollution Sources (WAC 173-400)	TBC	Establishes technically feasible and reasonably attainable standards and establishes rules controlling and/or preventing the emissions of air contaminants.	Determined not necessary by Phase I modeling
Air/ WA CAA	State-Air Pollution Control Agency (WAC 173-403)	Relevant and Appropriate	Implementation of regulations for air contaminant sources	Governed by local clean air agencies
Water/Ecology	State-Water Policy (RCW 90.03) and Water Rights (RCW-90.14)	TBC	Establishes water rights permits necessary for the water withdrawals, including groundwater extraction	Remedial activities will comply with all provisions of this regulation
Water/Regulation of Public Groundwater (RPG)	State – RPG – Protection of withdrawal facilities associated with groundwater rights (WAC 173-150)	TBC	Restricts activities which would impair senior groundwater rights, including water level lowering and water quality degradation.	Remedial activities will comply with all provisions of this regulation
Water/Ecology	State-Protection of Upper Aquifer Zones (WAC 173-154)	TBC	Restricts activities which would impair senior groundwater rights, including water level lowering and water quality degradation.	Remedial activities will comply with all provisions of this regulation
Well Design/Water Well Construction Act (WWCA)	State-WWCA-Standards for construction and maintenance of water wells (WAC 173-160)	TBC	Governs design of extraction and recharge wells	Remedial activities will comply with all provisions of this regulation

Attachment 10– ARAR Analysis

Medium / Authority	ARAR	Status	Standard Applied in ROD	Current Standard
Handling and Storage of Hazardous Waste/Resource Conservation and Recovery Act (RCRA)	Federal-RCRA and Hazardous Solid Waste Amendment (HSWA) Standards (42 U.S.C. 6901-6987)	Relevant and Appropriate	Regulations for the disposal of treatment media, such as GAC, in which the RCRA contaminants are present.	Remedial activities will comply with all provisions of this regulation

Attachment 11
Johnson and Ettinger Vapor Intrusion Model Results

DATA ENTRY SHEET

GW-SCREEN
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES: X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES:

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
75343		1,1-Dichloroethane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	91	S	10	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
S		1.00E-08	S	1.66	0.375	0.054

Enter either a vadose zone SCS soil type OR a user-defined permeability.

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

1,1-Dichloroethane

CHEMICAL PROPERTIES SHEET

ABC

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.42E-02	1.05E-05	5.61E-03	25	6,895	330.55	523.00	3.16E+01	5.06E+03	0.0E+00	5.0E-01

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
76	0.321	0.003	9.92E-08	0.998	ERROR	17.05	0.375	0.122	0.253	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
1.69E+04	1.00E+06	4.00E-04	15	7,450	2.88E-03	1.24E-01	1.75E-04	1.20E-02	4.81E-04	1.88E-03

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
76	15	1.24E+02	0.10	8.33E+01	1.20E-02	4.00E+02	2.69E+75	1.13E-03	1.40E-01	NA	5.0E-01

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	3.73E+03	3.73E+03	5.06E+06	3.73E+03

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE SUMMARY BELOW:
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

END

]

DATA ENTRY SHEET

GW-SCREEN
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES: X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES:

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
75354		1,1-Dichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (^oC)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	91	S	10	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
S		1.00E-08	S	1.66	0.375	0.054

Enter either a vadose zone SCS soil type OR a user-defined permeability.

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

1,1-Dichloroethene

CHEMICAL PROPERTIES SHEET

ABC

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
9.00E-02	1.04E-05	2.60E-02	25	6,247	304.75	576.05	5.89E+01	2.25E+03	0.0E+00	2.0E-01

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
76	0.321	0.003	9.92E-08	0.998	ERROR	17.05	0.375	0.122	0.253	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
1.69E+04	1.00E+06	4.00E-04	15	6,392	1.47E-02	6.33E-01	1.75E-04	1.45E-02	5.78E-04	2.26E-03

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
76	15	6.33E+02	0.10	8.33E+01	1.45E-02	4.00E+02	1.54E+62	1.30E-03	8.19E-01	NA	2.0E-01

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	2.55E+02	2.55E+02	2.25E+06	2.55E+02

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE SUMMARY BELOW:
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

END

]

DATA ENTRY SHEET

GW-SCREEN
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES: X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES:

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
75092		Methylene chloride

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (^oC)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	91	S	10	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
S		1.00E-08	S	1.66	0.375	0.054

Enter either a vadose zone SCS soil type OR a user-defined permeability.

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

Methylene Chloride

CHEMICAL PROPERTIES SHEET

ABC

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
1.01E-01	1.17E-05	2.18E-03	25	6,706	313.00	510.00	1.17E+01	1.30E+04	4.7E-07	3.0E+00

END

INTERMEDIATE CALCULATIONS SHEET

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
76	0.321	0.003	9.92E-08	0.998	ERROR	17.05	0.375	0.122	0.253	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
1.69E+04	1.00E+06	4.00E-04	15	7,034	1.16E-03	5.01E-02	1.75E-04	1.63E-02	6.64E-04	2.60E-03

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
76	15	5.01E+01	0.10	8.33E+01	1.63E-02	4.00E+02	2.59E+55	1.43E-03	7.17E-02	4.7E-07	3.0E+00

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
7.22E+01	4.38E+04	7.22E+01	1.30E+07	7.22E+01

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE SUMMARY BELOW:
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

END

]

DATA ENTRY SHEET

GW-SCREEN
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES: X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES:

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
127184		Tetrachloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (^oC)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	91	S	10	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
S	OR	1.00E-08	S	1.66	0.375	0.054

Enter either a vadose zone SCS soil type OR a user-defined permeability.

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

Tetrachloroethene

CHEMICAL PROPERTIES SHEET

ABC

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	6.0E-01

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
76	0.321	0.003	9.92E-08	0.998	ERROR	17.05	0.375	0.122	0.253	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
1.69E+04	1.00E+06	4.00E-04	15	9,553	7.81E-03	3.36E-01	1.75E-04	1.16E-02	4.63E-04	1.81E-03

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
76	15	3.36E+02	0.10	8.33E+01	1.16E-02	4.00E+02	5.42E+77	1.10E-03	3.68E-01	5.9E-06	6.0E-01

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
1.12E+00	1.70E+03	1.12E+00	2.00E+05	1.12E+00

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE SUMMARY BELOW:
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

END

]

DATA ENTRY SHEET

GW-SCREEN
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES: X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES:

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
71556		1,1,1-Trichloroethane

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (^oC)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	91	S	10	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
S		1.00E-08	S	1.66	0.375	0.054

Enter either a vadose zone SCS soil type OR a user-defined permeability.

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

1,1,1-Trichloroethane

CHEMICAL PROPERTIES SHEET

ABC

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.80E-02	8.80E-06	1.72E-02	25	7,136	347.24	545.00	1.10E+02	1.33E+03	0.0E+00	2.2E+00

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
76	0.321	0.003	9.92E-08	0.998	ERROR	17.05	0.375	0.122	0.253	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
1.69E+04	1.00E+06	4.00E-04	15	7,885	8.48E-03	3.65E-01	1.75E-04	1.26E-02	5.01E-04	1.96E-03

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
76	15	3.65E+02	0.10	8.33E+01	1.26E-02	4.00E+02	5.68E+71	1.16E-03	4.25E-01	NA	2.2E+00

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	5.40E+03	5.40E+03	1.33E+06	5.40E+03

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE SUMMARY BELOW:
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

END

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DATA ENTRY SHEET

GW-SCREEN
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES: X

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES:

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016		Trichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (^oC)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	91	S	10	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)		ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
S	OR	1.00E-08	S	1.66	0.375	0.054

Enter either a vadose zone SCS soil type OR a user-defined permeability.

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

Trichloroethene

CHEMICAL PROPERTIES SHEET

ABC

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	2.0E-06	1.2E-03

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
76	0.321	0.003	9.92E-08	0.998	ERROR	17.05	0.375	0.122	0.253	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
1.69E+04	1.00E+06	4.00E-04	15	8,557	4.78E-03	2.06E-01	1.75E-04	1.28E-02	5.09E-04	2.00E-03

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
76	15	2.06E+02	0.10	8.33E+01	1.28E-02	4.00E+02	7.02E+70	1.18E-03	2.42E-01	2.0E-06	1.2E-03

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
5.02E+00	5.16E+00	5.02E+00	1.47E+06	5.02E+00

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA

MESSAGE SUMMARY BELOW:
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

END

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