FINAL
ANNUAL REPORT

PRIVATE WELL & WHOLE-HOUSE FILTER PROGRAM FOR MOSES LAKE WELLFIELD SUPERFUND SITE (FORMER LARSON AIR FORCE BASE) MOSES LAKE, WASHINGTON

CERCLIS Site No. WAD988466355

Prepared by

U.S. ARMY CORPS OF ENGINEERS

Seattle District Engineering & Technology Section (CENWS-EN-GB-ET)

Prepared for

U.S. EPA REGION 10

U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, WA 98101

Final – January 2013

This page is left intentionally blank.

TABLE OF CONTENTS

1. INTRODUCTION 2

1.1 PROJECT SCOPE OF WORK 2
1.2 SITE LOCATION 2
1.3 SITE BACKGROUND 2

2. SAMPLING AND ANALYTICAL METHODS 5

2.1 SAMPLING ACTIVITY 5
2.1.1 Event #1 (March 2012) 5
2.1.2 Event #2 (May 2012) 6
2.1.3 Event #3 (August 2012) 6
2.2 ANALYTICAL PROCEDURES 7

3. ANALYTICAL RESULTS 8

4. DATA QUALITY ASSESSMENT 12

5. STATE WELL INVENTORY DATABASE SEARCH 13

5.1 DATES AND SEARCH CRITERIA 13
5.2 RESULTS OF SEARCH 13

6. CONCLUSIONS AND RECOMMENDATIONS 14

6.1 CONCLUSIONS 14
6.2 RECOMMENDATIONS 16

7. REFERENCES 17

APPENDICES

A FIELD SAMPLING REPORT
B COMPREHENSIVE RESULTS TABLE
C WDOE WATER WELL REPORTS
D DATA VALIDATION REPORT (CD Only)
E QUALITY CONTROL SUMMARY REPORT AND DATA VALIDATION REPORT (CD Only)
F LABORATORY ANALYTICAL REPORTS (CD Only)

LIST OF FIGURES

FIGURE 1-1. GENERAL LOCATION MAP ……4

FIGURE 3-1. LOCATION OF PRIVATE WELLS SAMPLED IN 2012……11

FIGURE 5-1. EXTENT OF SEARCH OF NEW WATER WELLS……13

LIST OF TABLES

TABLE 3-1 DETECTED ANALYTE TABLE 8

LIST OF ACRONYMS AND ABBREVIATIONS

1,1-DCE	1,1-Dichloroethylene
ADR	Automatic Data Review
AFB	Air Force Base
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
cis-DCE	cis-1,2-Dichloroethene
DCA	1,2-Dichloroethane
DERP-FUDS	Defense Environmental Restoration Program - Formerly Used Defense Sites
DQIs	Data Quality Indicators
DQOs	Data Quality Objectives
DoD QSM	Department of Defense Quality Systems Manual for Environmental Laboratories
GAC	Granular Activated Carbon
ID	Identification
MCL	Maximum Contaminant Level
MWH	Montgomery Watson Harza
NC	Not Calculated
µg/L	Micrograms per Liter
PCE	Tetrachloroethylene
PE	Performance Evaluation
QC	Quality Control
QAPP	Quality Assurance Project Plan
QCSR	Quality Control Summary Report
RI	Remedial Investigation
RL	Reporting Limit
ROE	Rights-of-Entry
SEDD	Staged Electronic Data Deliverable
TCE	Trichloroethylene
trans-DCE	trans-1,2-Dichloroethylene
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VC	Vinyl Chloride
VOC	Volatile Organic Compounds
WDOE	Washington (State) Department of Ecology

This page is left intentionally blank.

.

EXECUTIVE SUMMARY

This report documents the year 2012 sampling events of the Moses Lake Private Well and Whole-House Filter Sampling Program conducted at the Moses Lake Wellfield Superfund Site in Moses Lake, Washington. Sampling of fifty-two (52) private water wells for selected volatile target analytes was performed March 5 (event #1), May 1-3 (event #2) and August 27-28 (event #3), 2012. Carbon filter cartridge change-outs on five whole-house filter (WHF) systems at WP-14, WP-70, WP-82, WP-83, and WP-86 will be performed in 2013 pending selection of a Contractor to perform this work. Field work was carried out by USACE staff, Analytical Resources, Inc (ARI) performed sample analysis, and Laboratory Data Consultants, Inc (LDC) validated analytical data.

The project scope of work includes installation, replacement, and maintenance of granular activated carbon (GAC) whole-house filters (WHFs), collection and analysis of tap-water samples from residences in the impacted area of the Moses Lake Wellfield Superfund Site, and updating of the project database with sampling results. In addition, the Washington State Department of Ecology (WDOE) Well Inventory Database is reviewed for newly constructed private wells which may be at risk for target VOC contamination.

The target analytes related to solvent disposal at the former Larson Air Force Base are:

- trichloroethylene (TCE)
- 1,1-dichloroethylene (1,1-DCE)
- cis-1,2-dichloroethylene (cis-DCE)
- trans-1,2-dichloroethylene (trans-DCE)
- 1,2-dichloroethane (DCA)
- vinyl chloride (VC)
- tetrachloroethylene (PCE)
- 1,1,1-trichloroethane (TCA)
- 1,1-dichloroethane (1,1-DCA)

During the three sampling events, target analytes were detected in twenty-three of the fifty-two wells sampled. TCE was detected in samples at a maximum concentrations of 4.7 (WP-04). DCE was detected at a maximum concentration of 1.5 µg/L (WP-04). The Federal drinking water standards set for the maximum concentration level (MCL) for TCE is 5 µg/L and for DCE is 70 µg/L.

Five drinking water wells currently have whole house filter (WHF) systems designed to prevent exposure of residents above the MCLs. Filtration systems are constructed with a lead filter, followed by a lag filter as a safety system to capture any contaminant breakthrough. Lead filter breakthrough of TCE and cis-DCE occurred at four of the five WHF systems (WP-14, WP-70, WP-83, and WP-86). Samples collected after the lag filter (which represent household drinking water) had detected concentrations of TCE and cis-DCE below the MCL.

1. INTRODUCTION

This report documents the year 2012 sampling event of the Moses Lake Private Well and Whole-House Filter Program conducted at the Moses Lake Wellfield Superfund Site in Moses Lake, Washington. Sampling of private water wells was performed in March 5 (event #1), May 1-3 (event #2), and August 27-28, 2012 (event #3). Carbon filter cartridge change-outs at WP-14, WP-70, WP-83, and WP-86 will occur at a later date pending selection of a contractor. Sampling was performed by Seattle District staff. This work was conducted on behalf of EPA Region 10 under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, 1980) by Interagency Agreement (IA).

1.1 Project Scope of Work

The project scope of work includes collection and analysis of tap-water samples from private wells in the impacted area of the Superfund Site; installation, replacement, and maintenance of granular activated carbon (GAC) whole-house filters (WHFs); updating of the project database with sampling results; and review of the Washington State Department of Ecology (WDOE) Well Inventory Database for newly constructed wells which may be at risk for target VOC contamination.

1.2 Site Location

The Moses Lake Wellfield Superfund Site (Site) is located near Moses Lake, Washington. The Site is listed on the CERCLA National Priority List (NPL) for Uncontrolled Hazardous Waste Sites. The Site encompasses an area of approximately 9,600 acres, which includes the former Larson Air Force Base (AFB), commercial facilities, and residences. The former Larson AFB is located approximately three miles north of the City of Moses Lake (Figure 1-1).

1.3 Site Background

On February 16, 1988, groundwater samples were collected by the Washington Department of Social and Health Services (DSHS) from eight wells serving the City of Moses Lake municipal water supply system. Analytical results indicated that three wells contained elevated concentrations of TCE. Additional sampling by DSHS in both September and December of 1988 found TCE concentrations in excess of 5.0 µg/L in several City of Moses Lake and Skyline Water Company wells.

Based on these preliminary sampling results, the United States Environmental Protection Agency (USEPA) requested that Ecology and Environment, Inc. (E & E) outline possible approaches to identify the potential source or sources of TCE groundwater contamination in the Moses Lake area. E & E identified a number of potential source areas for the TCE contamination. In response to the detection of TCE in the municipal wells, USACE, the Department of Defense representative for deactivated armed forces bases, conducted interviews with former Larson AFB employees in 1989.

These interviews identified four potential chemical waste disposal areas and thirteen other potential areas where TCE may have been handled, as source areas for groundwater contamination.

In 1991, under contract with USACE, Dames & Moore initiated a Phase I Remedial Investigation (RI) at the former Larson AFB, which included a preliminary evaluation of the extent of TCE contamination in the upper aquifer system at the former Larson AFB and areas downgradient from the former base. In addition, four sites previously identified by record reviews and interviews were investigated for potential sources of TCE, tetraethyl lead and radionuclides. Field investigations were conducted between August 1991 and October 1992. The final results of the Phase I RI released in a report in March 1993 indicated that TCE was consistently found in shallow alluvial and upper basalt (a-basalt) groundwater in the central area of the former base. The investigation performed by Dames and Moore did not include the lower basalt (basalt-c) aquifer. The boundary of the TCE plume was partially defined to the north and east but the south and west were not clearly delineated.

On October 14, 1992, the affected areas of the former Larson AFB and off-site downgradient areas, were listed on the NPL for CERCLA. The former Larson AFB property is one part of the Site. The site also includes the contaminant plume.

In 1992, the underground storage tank area associated with Pumphouse No. 1 was found to have petroleum contamination in groundwater and soils. An Independent Remedial Action under the Model Toxics Control Act (MTCA) was performed by the Port of Moses Lake for the site and is documented in a 1998 report by Secor International, Inc. The pumphouse appears to be hydraulically upgradient of TCE contamination detected in groundwater at the Site.

In July 1995, Dames & Moore completed an addendum to the 1993 Phase I RI to further delineate TCE occurrences and potential TCE sources, and monitor TCE concentrations in the shallow alluvial and a-basalt aquifers. Chemical results from 1993 and 1994 combined with historical data indicated that TCE occurred in the central and southern portion of the former Larson AFB in alluvial and a-basalt groundwater. Groundwater concentrations of TCE were relatively consistent (within the same order of magnitude) during the Dames & Moore investigations. In 2004, USACE confirmed TCE contamination in the next lower basalt aquifer (c-basalt). As of 1995, the data suggest that more than one source may have contributed TCE to the alluvial and a-basalt groundwater in the central portion of the former Larson AFB.

In 1998, URS Greiner completed a sampling round of private water wells and wells for Class A and Class B water systems east, south and southwest of the previously known TCE plume. There were eight detections of TCE during this study. Four wells that were previously outside the plume extent were found to be above the detection limit (MW-a, September 23, 1999).

During 1999, the USACE Seattle District retained Montgomery Watson to perform a remedial investigation at the Site. During the course of the RI, several private private wells were tested and found to be contaminated with TCE. In 2001, the USACE contracted with MSC Environmental to

install single stage filter carbon filtration units at five of these wells. Seven rounds of monitoring have occurred since the filters were installed. In 2007 CALIBRE began replacing the original single filter units with the current lead-lag system. In 2008, two rounds of monitoring occurred in April and June, and change outs of filter carbon cartridges at WP-14, WP-70, WP-82, WP-83, and WP-86 during the June 2008 monitoring event were performed by CALIBRE under contract for the USACE. In 2009-2011, three rounds of monitoring occurred in conjunction with change-outs of filter carbon cartridges from whole-house filter systems at wells WP-14, WP-82, WP-83, and WP-86 were performed by EHS-International (EHSI) under contract with USACE.

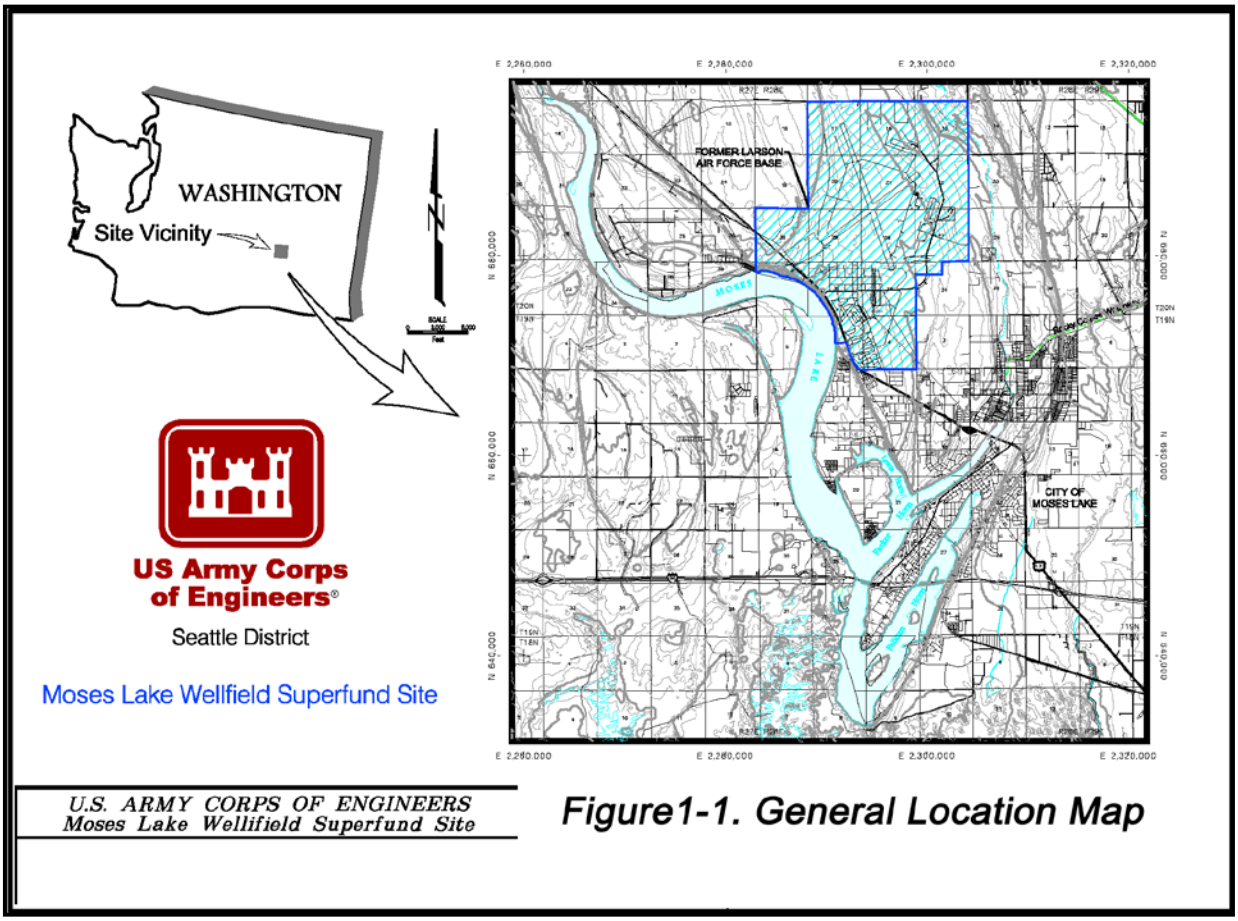


Figure1-1. General Location Map

1.4 Investigation Strategy

The investigation strategy for the private well sampling program begins with a list of existing private wells within the 5 µg/L TCE plume boundary or near the leading edge of the plume boundary. Most of the well owners were recruited in the 1990s and early 2000s, and have been carried through to the present. Other residents have asked to be included in this sampling program

and a few additional wells have been recruited in recent years. Nearly all these wells have sufficient information, such as from driller's logs or the owner's knowledge, to believe that we are sampling groundwater from upper basalt water sources. The contamination plumes are located in the upper basalt aquifers. Though a couple of wells on the list may be drawing water from the overlying alluvium (drill logs suggest these wells are open only in the basalt), the Interim ROD has deemed that the alluvial aquifer is not a source of concern. Next, the list is reduced to slightly more than the number of wells possible to sample within the IA. This list is reviewed collaboratively by USACE and EPA. Finally, rights-of-entry (ROE) are sought for as many wells as possible with the constraints of the IA. This becomes the final selection of wells to be sampled.

2. SAMPLING AND ANALYTICAL METHODS

Well water samples and associated quality control (QC) samples were collected in accordance with the Work Plan. At wells with whole-house filtration systems, samples were collected upstream of the filtration system, in-between the two filter units (lead and lag filter units), and following lag filter unit from the filter system effluent. Field QC samples included field duplicates, field blanks, trip blanks, and matrix spike (MS) and matrix spike duplicates (MSD) samples. A performance evaluation (PE) sample, provided by Environmental Resource Associates (ERA) of Arvada, Colorado, was submitted for VOC analysis. Appendix A documents all sampling activities for all sampling events and is summarized below.

2.1 Sampling Activity

The 2012 sampling round consisted of three events as described below. A total of ninety (90) samples (including field QC samples) were collected for fifty-two private wells. Samples were analyzed by Analytical Resources, Inc. (ARI) in Tukwila, Washington, for VOC analysis by USEPA Method SW-8260C or 524.3. Appendix B lists the wells that were sampled for all events and their analytical results. Results are also depicted in Figure 2.

2.1.1 Event #1 (March 2012)

All five WHF wells (WP-14, WP-70, WP-82, WP-83, and WP-86) were sampled in accordance with the Field Sampling Plan during event #1. Samples were collected from ports upstream of the filtration system (untreated water), between the lead and lag filter units (partially treated water), and following the lag filter unit (tap water).

Sample ports for whole-house filter systems consisted of PVC threaded gate valves, water pressure valves, or ball valves. Field personnel reported that laminar flow of less than 100 mL/min could not be achieved from sampling ports at three locations (WP-14, WP-83 and WP-86). Data from these three locations are considered to be of unknown quality for sampling event #1 since turbulent flow may result in the loss of VOCs. Repairs were made to the sampling ports

in August, 2012 and samples were collected again from all WHF wells (Event #3) to ensure that drinking water concentrations are below the MCLs (Section 2.1.3).

2.1.2 Event #2 (May 2012)

Forty-seven private well were sampled during event #2 in accordance with the Field Sampling Plan. Sample ports for most private well locations were exterior hose bibs as close to the wellhead as practical. Water from WP-74 was initially collected at a hose bib in front of the house. It was later determined that there was a collection point in the well house and a sample was also collected from this location during event #3. The WP-55 sample was determined not to be representative since laminar flow could not be achieved. It was resampled in August after the addition of Teflon®-lined tubing to provide laminar flow during event #3 (Section 2.1.3).

2.1.3 Event #3 (August 2012)

All WHF wells from event #1 were resampled after laminar flow was restored and two private well (WP-55 and WP-74) from event #2 were resampled during event #3. In all WHF wells except WP-86, the influent VOC concentrations were higher than the corresponding results from event #1. Results indicate that VOC loss due to nonlaminar flow may have contributed to slightly lower concentrations in event #1. In addition, lag filter breakthrough occurred for TCE and cis-DCE at WP-83, and WP-14 had cis-DCE breakthrough. However, these concentrations were both below the MCL for those analytes (Appendix B).

2.2 Analytical Procedures

The analytical laboratory for this project was Analytical Resources, Inc (ARI) of Tukwila, WA. ARI is accredited by the Department of Defense Environmental Laboratory Accredited Program (ELAP), and the State of Washington Department of Ecology. Samples were analyzed by USEPA Methods SW-8260C in accordance with the Quality Assurance Project Plan (QAPP) or 524.3. Method 8260C was utilized for all sampling events through March of 2012. The method was changed to EPA 524.3 in March of 2012 because it is the recognized procedure for drinking water samples under the Safe Drinking Water Act (42 U.S.C. §300f et seq. (1974)). Both methods produce data with the analytical sensitivity required to evaluate whether drinking water meets the Federal MCLs.

3. ANALYTICAL RESULTS

Analytical results for samples from twenty-nine of the fifty-two wells sampled had no target analytes reported above the analytical test method reporting limits (nondetect). Target analytes were detected in samples collected from the remaining twenty-three wells. TCE was detected in nineteen samples at concentrations up to 4.7 µg/L. Six well samples had cis-1,2 DCE concentrations up to 1.5 µg/L. The Federal drinking water standards set for maximum concentration level for TCE is 5 µg/L and for cis-1,2 DCE it is 70 µg/L. The TCE concentrations in all nineteen detected samples were below Federal drinking water standards of 5.0 µg/L. The detected concentrations of DCE were also below the MCL of 70 µg/L. However, it should be noted that WP-04 had a TCE concentration of 4.4 µg/L (4.7 µg/L in the field duplicate), which is close to the MCL. It is unlikely that a filtration system will be installed at this location since the well is not used for drinking water.

Results indicate TCE and cis-DCE breakthrough in all WHFs except WP-82 which did not have any detected VOCs. Breakthrough of the lead filter unit is thought to be occurring due to channels within the GAC and/or clogging of the filter bed, reducing filter efficiency. The filter systems in all wells except WP-82 will be replaced to eliminate this problem in 2013. Since VOCs have not been detected in WP-82 since 2004, this WHF system will be removed in 2013. In the interim, the filter systems are still providing drinking water with concentrations below the MCLs for target VOCs.

Several of the wells sampled are in the Cascade Valley area immediately downgradient of the southern plume. These wells act as sentinels for plume migration. Nearly all private wells show no or decreasing TCE trends, WP-04 indicates an increasing trend and possible advancement of the Main Plume. Possible increasing TCE trend in WP-27 suggest that the South Plume, while not advancing in a downgradient direction, may be shifting to the east.

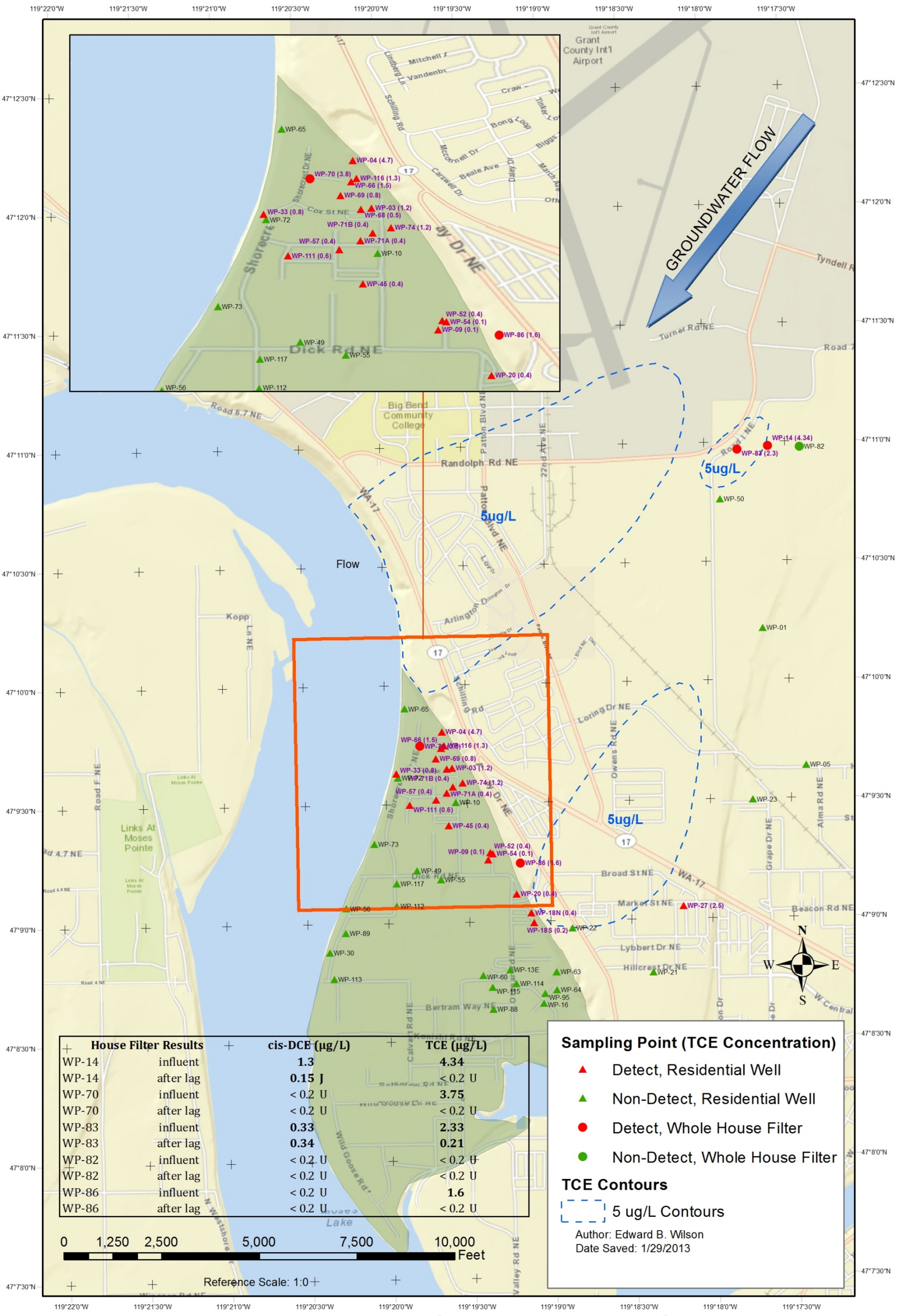
Table 3-1 lists all results of target analytes detected in the nineteen wells. Results for WHF Well TCE and cis-DCE concentrations and other private well TCE concentrations are depicted in Figure 3-1. Complete laboratory analytical reports for all samples are attached as Appendix F.

TABLE 3-1. DETECTED ANALYTE TABLE

			Analyte Name CASRN®	cis-1,2-DCE 156-59-2 ug/l		TCE 79-01-6 ug/l	
Well ID	**Sample ID**	**Sample Type**	**Date**	**Result (MCL = 70 µg/L)**	**Q**	**Result (MCL = 5 µg/L)**	**Q**
Whole House Filter Wells:							
WP-14	12MLW00AWP14 *(influent)*	N	3/5/2012	**0.9**		**3.5**	
	12MLW00BWP14 *(between lead/lag)*	N	3/5/2012	**0.8**		**3.3**	
	12MLW0AAWP14 (influent resample)	*N*	*8/28/2012*	***1.3***		***4.24***	
	12MLW0CCWP14 (after lag resample)	*N*	*8/28/2012*	***0.15***		*< 0.2*	*U*
WP-70	12MLW00AWP70 *(influent)*	N	3/5/2012	< 0.2	U	**3.4**	
	12MLW00BWP70 *(between lead/lag)*	N	3/5/2012	< 0.2	U	**3.3**	
	12MLW0AAWP70 (influent resample)	*N*	*8/27/2012*	*< 0.2*	*U*	***3.75***	
	12MLW0CCWP70 (after lag resample)	*N*	*8/27/2012*	*< 0.2*	*U*	*< 0.2*	*U*
WP-83	12MLW00AWP83 *(influent)*	N	3/5/2012	**0.2**		**1.0**	
	12MLW00BWP83 *(between lead/lag)*	N	3/5/2012	**0.2**		**1.2**	
	12MLW0AAWP83 (influent resample)	*N*	*8/27/2012*	***0.33***		***2.33***	
	12MLW0CCWP83 (after lag resample)	*N*	*8/27/2012*	***0.31***		***0.2***	
	12MLW2CCWP83 (after lag resample)	*FD*	*8/27/2012*	***0.34***		***0.21***	
WP-86	12MLW00AWP86 *(influent)*			< 0.2	U	**1.6**	
	12MLW00BWP86 *(between lead/lag)*	N	3/5/2012	< 0.2	U	**1.9**	
	12MLW0AAWP86 (influent resample)	*N*	*8/27/2012*	*< 0.2*	*U*	***1.04***	
	12MLW0CCWP86 (after lag resample)	*N*	*8/27/2012*	*< 0.2*	*U*	*< 0.2*	*U*
Other Private Wells:							
WP-03	12MLW001WP03	N	5/1/2012	**0.3**		**1.2**	
WP-04*	12MLW001WP04	N	5/1/2012	**1.4**		**4.4**	
WP-04*	12MLW201WP04	FD	5/1/2012	**1.5**		**4.7**	
WP-18N	12MLW001WP18N	N	5/2/2012	< 0.2	U	**0.4**	

			Analyte Name CASRN®	cis-1,2-DCE 156-59-2 ug/l		TCE 79-01-6 ug/l	
Well ID	**Sample ID**	**Sample Type**	**Date**	**Result (MCL = 70 µg/L)**	**Q**	**Result (MCL = 5 µg/L)**	**Q**
WP-18N	12MLW201WP18N	FD	5/2/2012	< 0.2	U	**0.4**	
WP-18S	12MLW001WP18S	N	5/2/2012	< 0.2	U	**0.2**	
WP-18S	12MLW201WP18S	FD	5/2/2012	< 0.2	U	**0.2**	
WP-20	12MLW001WP20N	N	5/2/2012	< 0.2	U	**0.4**	
WP-27	12MLW001WP27	N	5/1/2012	< 0.2	U	**2.5**	
WP-33	12MLW001WP33	N	5/3/2012	< 0.2	U	**0.8**	
WP-45	12MLW001WP45	N	5/2/2012	< 0.2	U	**0.4**	
WP-52	12MLW001WP52	N	5/2/2012	< 0.2	U	**0.4**	
WP-54	12MLW001WP54	N	5/2/2012	< 0.2	U	**0.1**	**J**
WP-57	12MLW001WP57	N	5/1/2012	< 0.2	U	**0.4**	
WP-66	12MLW001WP66	N	5/1/2012	**0.3**		**1.5**	
WP-66	12MLW201WP66	FD	5/1/2012	**0.3**		**1.2**	
WP-68	12MLW001WP68	N	5/1/2012	< 0.2	U	**0.5**	
WP-69	12MLW001WP69	N	5/1/2012	< 0.2	U	**0.8**	
WP-69	12MLW201WP69	FD	5/1/2012	< 0.2	U	**0.8**	
WP-71A	12MLW001WP71A	N	5/1/2012	< 0.2	U	**0.4**	
WP-71B	12MLW001WP71B	N	5/1/2012	< 0.2	U	**0.4**	
WP-74	12MLW001WP74	N	5/1/2012	**0.2**		**1.2**	
WP-74	12MLW201WP74	FD	5/1/2012	**0.3**		**1.3**	
WP-111	12MLW001WP111	N	5/1/2012	<0.2	U	**0.6**	
WP-116	12MLW001WP116	N	5/3/2012	**0.3**		**1.3**	

N - normal sample
FD - field duplicate sample
CASRN® – Chemical Abstract Service Registry Number
Italics – resampling results (Event #3)
Bold – detected analytes
Q – Data validation qualifier
U – The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J – The analyte was positively identified; the associated numerical value is the approximate concentration in the sample.
* Private Well-04 is an industrial well not used for drinking water.



House Filter Results		cis-DCE (µg/L)	TCE (µg/L)
WP-14	influent	**1.3**	**4.34**
WP-14	after lag	**0.15 J**	< 0.2 U
WP-70	influent	< 0.2 U	**3.75**
WP-70	after lag	< 0.2 U	< 0.2 U
WP-83	influent	**0.33**	**2.33**
WP-83	after lag	**0.34**	**0.21**
WP-82	influent	< 0.2 U	< 0.2 U
WP-82	after lag	< 0.2 U	< 0.2 U
WP-86	influent	< 0.2 U	**1.6**
WP-86	after lag	< 0.2 U	< 0.2 U

Figure 3-1 - WHF Results and Other Domestic Well TCE Results

4. DATA QUALITY ASSESSMENT

Data quality assessment is based on the data quality objectives (DQOs) developed during project planning. DQOs ensure that results are of known and sufficient quality to meet project needs. All sampling and analysis activities are covered by the DQO process. Field sample data quality is ensured by compliance with the Field Sampling Plan. The analytical process is ensured through compliance with the requirements of the Department of Defense Quality Systems Manual for Environmental Laboratories Version 4.2 (DoD QSM) as well as laboratory standard operating procedures.

All sampling and analytical activities were executed in compliance with DQOs and results are considered acceptable for use in comparison against the MCLs. A full chemical data quality assessment is provided in the Data Validation Report (Appendix D). The Quality Control Summary Report (QCSR) summarizing analytical performance expressed in terms of data quality indicators (DQIs) can be found in Appendix E.

The overall quality of data is known and acceptable for the intended use.

5. State Well Inventory Database Search

In order to determine if additional private wells were drilled within or near the VOC plume, a query was performed of the Washington State Department of Ecology (WDOE) Well Logs database for wells constructed between 1 January 2010 and 18 June 2012 to determine whether additional wells would be added to the 2013 sampling event. This task was performed during June 2012.

5.1 Dates and Search Criteria

The search dates were filtered for wells constructed between 1 January 2010 through 18 June 2012, and screened or open to the upper basalt flows - the Priest Rapids, Roza 1 and Roza 2 geologic members (Figure 5-1).

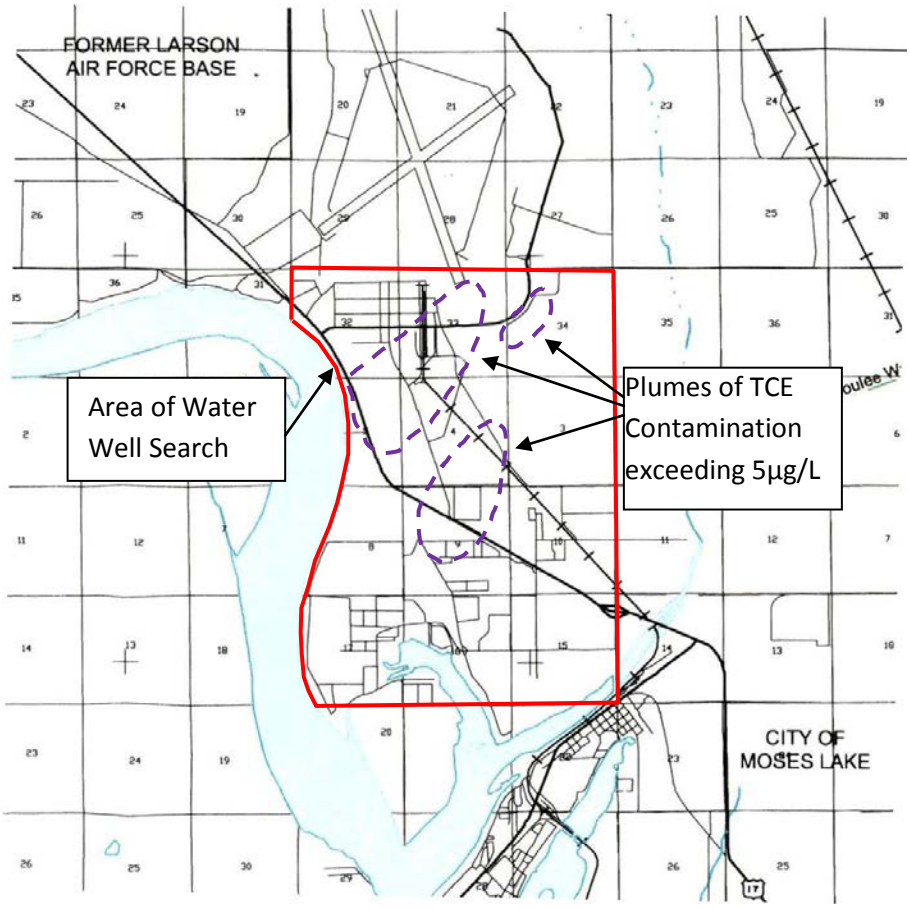


Figure 5-1. Extent of Search of New Water Wells

5.2 Results of Search

One new well was identified that met the search criteria, and a copy of the State of Washington Water Well Report is provided in Appendix C. The well is located in the Cascade Valley

neighborhood directly downgradient from the southern plume. It appears to be drawing groundwater from the Roza 1 and Roza 2 basalt members. Groundwater from these formations has historically had results with VOC contamination in some areas. Therefore, USACE will attempt to contact the well owner prior to the next sampling event in 2013 in order to gain right of entry to sample the well.

6. Conclusions and Recommendations

6.1 Conclusions

Analytical results for samples from twenty-three of the fifty-two wells sampled had target analytes reported above the analytical method reporting limits. TCE was detected in nineteen well samples at concentrations ranging up to 4.7 µg/L (WP-04). Six well samples had cis-1,2- DCE concentrations up to 1.5 µg/L. The detected TCE and DCE concentrations in all samples were below Federal MCLs. WP-04 is not used as a drinking water source. Therefore, it is unlikely that a WHF system will be installed at WP-04.

Lead filter breakthrough of VOC contaminants occurred at four of the five WHF systems (WP14, WP-70, WP-83, and WP-86) between July 2011 and March 2012. Water sampled after the lag filter in these wells was nondetected for TCE and cis-DCE in 2012 sampling event #1. However, resampling results for cis-DCE showed increased concentrations - 0.15J µg/L at WP-14 and 0.34 µg/L at WP-83. Resampling results for TCE were 0.21 µg/L in WP-83. All detected WHF resampling results of water after the lag filters were below the MCLs indicating that the filter system is protective.

Because lead and lag filter breakthrough has occurred in this and past events, it is believed that the aging filter system should be replaced. In order to avoid the occurrence of breakthrough in the new systems, USACE will performing more frequent sampling until the filter efficiency of the new system is known. Analysis of concentration changes over time will become a predictive tool for when breakthrough is expected to occur and will inform decisions regarding the filter changeout and future sampling schedules.

The residential wells in Cascade Valley are immediately downgradient of the contaminant plumes and act as sentinels for plume migration. Nearly all private wells show no or decreasing TCE trends, WP-04 indicates an increasing trend and possible advancement of the Main Plume. Possible increasing TCE trend in WP-27 suggest that the South Plume, while not advancing in a downgradient direction, may be shifting to the east.

After consultation with EPA, USACE concurs that there are a number of well logs (mostly late 1990s-2000s) that have never been evaluated for inclusion in the sampling program Many of these are in the northern part of Cascade Valley (based on well address information) and thus have a fairly high chance of VOC detections. EPA and USACE will make a joint effort to fully document the

results of this evaluation. Several small public water systems within the ROD Institutional Controls area have never been sampled and should also be included in future events. A comprehensive list for EPA concurrence will be developed for sampling in 2013.

6.2 Recommendations

Recommendations for the 2013 sampling program include the following:

- Replacement of the WHF systems at four existing residences (Section 6.1);
- Removal of the WHF system from WP-82 (Section 3);
- Monitoring the efficiency of the new WHF systems (Section 6.1);
- Addition of a new private wells, public water system and monitoring wells with high likelihood of VOC detections (Section 5.2, 6.1).

7. References

CALIBRE, Inc., Draft Sampling Event Summary Report prepared for the Domestic Well Whole-House Filter Program for Moses Lake Wellfield Superfund Site (Former Larson Air Force Base), Moses Lake, Washington, August 2008.

DoD Quality Systems Manual for Environmental Labs, Version 4.2, October 25, 2010.

EHS-International, Inc., Final Management Plan, Domestic Well Whole-House Filter Program for Moses Lake Wellfield Superfund Site (Former Larson AFB), Moses Lake, Washington, Updated June 2009.

EHS-International, Inc., Sampling Event Summary Report, Domestic Well Whole-House Filter Program for Moses Lake Wellfield Superfund Site (Former Larson Air Field Base), Moses Lake, Washington, FINAL, November 2009.

Montgomery Watson (MWH), Management Plan Volume II - Part 1, Field Sampling Plan Remedial Investigation/Feasibility Study Moses Lake Wellfield Superfund Site – FINAL, September 1999.

MWH, Supplemental Management Plan, January 13, 2003.

APPENDIX A

FIELD SAMPLING REPORT

APPENDIX B

COMPREHENSIVE RESULTS TABLE

APPENDIX C

WDOE WATER WELL REPORTS

APPENDIX D

WDOE WATER WELL REPORTS
(CD Only)

APPENDIX E

QUALITY CONTROL SUMMARY REPORT AND DATA VALIDATION REPORT (CD Only)

APPENDIX F

LABORATORY ANALYTICAL REPORTS
(CD Only)