Draft Final

Third Installation-Wide Five-Year Review Report

Joint Base Lewis-McChord

Pierce County, Washington

Joint Base Lewis-McChord Public Works – Environmental Division

IMLM-PWE

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THIRD INSTALLATION-WIDE FIVE-YEAR REVIEW REPORT

JOINT BASE LEWIS-McCHORD

Prepared for

United States Department of the Army
Joint Base Command
Joint Base Lewis-McChord
Pierce County, Washington

and

United States Army Environmental Command
Fort Sam Houston, Texas

Signature	*Date*

Restoration Program Manager, Environmental Division
Joint Base Lewis-McChord

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Table of Contents

List of Tables

List of Figures

List of Appendices

ACRONYMS AND ABBREVIATIONS

%	percent
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
ADAF	age-dependent adjustment factors
AEDB-R	Army Environmental Database - Restoration
Aerostar	Aerostar Environmental and Construction LLC
AFB	Air Force Base
ALGT	American Lake Garden Tract
ALM	Adult Lead Model
AOPI	Area of Potential Interest
AR	Army Regulation
ARARs	Applicable or Relevant and Appropriate Requirements
AWQC	Ambient Water Quality Criteria
bgs	below ground surface
BRA	baseline risk assessment
CERCLA	Comprehensive Environmental Response, Compensation, & Liability Act
CFR	code of federal regulations
CMP	Compliance Monitoring Plan
COCs	contaminants of concern
cPAH	Carcinogenic PAH
cis-1,2-DCE	cis-1,2-dichloroethene
DCE	Dichloroethene
DCP	1,2-dichloropropane
DD	decision document
DDE	dichlorodiphenyldichloroethylene
DNAPL	dense non-aqueous phase liquid
DoD	Department of Defense
DLADS	Defense Logistic Agency Disposition Services
DPA	Digging Permit Approval
DRMO	Defense Reutilization Marketing Office
EA	EA Engineering, Science, and Technology, Inc. PBC
Ecology	Washington Department of Ecology
EGDY	East Gate Disposal Yard
EPA	Environmental Protection Agency
EPH	extractable petroleum hydrocarbon
ERP	Environmental Review Procedures
FFA	Federal Facilities Agreement
FFS	Focused Feasibility Study
FLR	Fort Lewis Regulation
FMD	Facilities and Maintenance Department

FS	Feasibility Study
ft	feet
FYR	Five-Year Review
GIS	Geographic Information System
gpm	gallons per minute
HA	Health Advisory
HHRA	human health risk assessment
HI	hazard index
HQAES	Headquarters Army Environmental System
IAG	Interagency Agreement
IAP	Installation Action Plan
IC	institutional control
IRIS	Integrated Risk Information System
IRP	Installation Restoration Program
JBLM	Joint Base Lewis-McChord
Kd	soil partition coefficient
LTM	long-term monitoring
LUC	Land Use Control
MAMC	Madigan Army Medical Center
MCL	maximum contaminant level
Mgal	million gallons
mg/kg	milligram per kilogram
mg/L	milligrams per liter
MNA	monitored natural attenuation
MTCA	Model Toxics Control Act
mV	millivolt
ng/L	nanogram per liter
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NFA	no further action
NPL	National Priorities List
O&M	operations and maintenance
OLEM	Office of Land and Emergency Management
ORR	Operating Range Regulation
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
P&T	pump and treat
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PCOR	Preliminary Close Out Report
PDB	passive diffusion bag
PG	Professional Geologist

PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutane sulfonic acid
PFHxS	perfluorohexane sulfonate
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PNNL	Pacific Northwest National Laboratory
ppt	parts per trillion
PQL	Practical Quantitation Limit
PRG	Preliminary Remediation Goal
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RAM	Remedial Action Monitoring
RAOs	Remedial Action Objectives
RfDi	inhalation Reference Dose
RG	remedial goal
RI	remedial investigation
RPM	Remediation Project Manager
RPMP	Real Property Master Plan
RSL	Regional Screening Level
SAL	State Action Levels
SFI	inhalation slope factor
SI	Site Investigation
SLA	Sea Level Aquifer
SLAPT	Sea Level Aquifer Pump and Treat
SLRA	Screening Level Risk Assessment
SMIS	Site Management Improvement Study
SRCPP	Solvent Refined Coal Pilot Plant
SVE	soil vapor extraction
TBC	To-Be-Considered
TCA	trichloroethane
TCE	trichloroethene
TCRA	Time-Critical Removal Action
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
URS	URS Corporation
U.S.	United States
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Command
U.S. Army	United States Department of the Army
USEPA	United States Environmental Protection Agency
UU/UE	unlimited use and unrestricted exposure

VC	Vinyl Chloride
VI	vapor intrusion
VISL	Vapor Intrusion Screening Level
VOCs	volatile organic compounds
WA	Washington
WAC	Washington Administrative Code
WSP	Water System Plan
YTM	Yakima Training Center

EXECUTIVE SUMMARY

Five-year reviews (FYRs) are required when implementation of a remedial action (RA) results in hazardous substances, pollutants, or contaminants remaining on site that are above the levels allowing for unlimited use and unrestricted exposure (UU/UE). To meet this requirement, the scope of this review includes assessing the protectiveness of remedies at all sites that, at the end of the review period, had hazardous substances remaining at levels that do not allow for UU/UE.

Introduction

In 2010, Fort Lewis Army Base (Lewis-Main) and McChord Air Force Base (AFB) were merged to become Joint Base Lewis-McChord (JBLM), which is located in Pierce and Thurston Counties in western central Washington (WA; Figure 1-1). The United States Army (U.S. Army) conducted this third installation-wide FYR for JBLM to evaluate if remedies selected for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites are and will continue to be protective of human health and the environment.

Sequentially, this FYR also serves as the sixth FYR for sites at both the former Fort Lewis Army Base and the former McChord AFB.

Fort Lewis Sites

- Logistics Center (including Landfill 2 [LF-2], also known as East Gate Disposal Yard [EGDY])
- Illicit Polychlorinated Biphenyls (PCB) Dump Site
- Landfill 1 (LF-1)
- Battery Acid Pit
- Defense Reutilization and Marketing (DRMO) Yard
- Industrial Wastewater Treatment Plant (IWTP)
- Pesticide Rinse Area
- Landfill 4 (LF-4)
- Solvent Refined Coal Pilot Plant (SRCPP)

McChord AFB Sites

- American Lake Garden Tract (ALGT)

Prior to incorporation as JBLM, sites associated with both McChord AFB and Fort Lewis were placed on the National Priorities List (NPL). NPL sites include ALGT at McChord AFB (listed in October 1984) and the Logistics Center site at Fort Lewis (listed in November 1989). In January 1990, an Interagency Agreement (IAG) (USEPA, 1990), also known as a Federal Facilities Agreement (FFA), between the U.S. Army, United States Environmental Protection Agency (USEPA), and WA State Department of Ecology (Ecology) was negotiated, establishing a working relationship between the three parties to ensure that environmental impacts from releases at Fort Lewis would be addressed to the satisfaction of all parties through an enforceable agreement. The FFA identified several non-NPL sites in addition to the sites listed on the NPL. In September 1993, a Record of Decision (ROD) was completed for two of the sites (Landfill 4 [LF-4] and the SRCPP), which were added to the NPL.

The triggering action for the FYR process was the start of RA construction at the Logistics Center at Lewis-Main in 1992. The last Lewis-Main FYR was done in 2007, while the last McChord FYR was done in 2010. The first installation wide JBLM FYR was prepared in 2012 after Fort Lewis and McChord AFB were combined. The second installation-wide FYR was completed in 2017.

During cleanup, the USEPA may divide a remedial response into discrete portions, called operable units (OUs), to make the remedial response more efficient. An OU is defined as a discrete action that comprises an incremental step toward comprehensively addressing site problems. These discrete portions of the remedial response manage migration, or eliminate or mitigate releases, threats of a release, or pathways of exposure. OUs may address geographic areas, specific environmental problems, or media (e.g., groundwater, soil) where a specific action is required. Such is the case with JBLM sites. However, the use of terminology for OUs and sites has not always been consistent at JBLM. The first installation wide FYR (2012) evaluated sites separately but provided protectiveness statements in terms of the JBLM installation as well as for sites association with Fort Lewis and those associated with McChord AFB. In the second FYR (2017), the 10 sites at JBLM were grouped into three OUs, consistent with USEPA designations based on RODs.

The following three OUs and the sites within them are included in this FYR because they have signed RODs or Decision Documents (DDs) and conditions that do not allow for UU/UE. The list of sites in the table below includes the Army Environmental Database - Restoration (AEDB-R) site designation (e.g., FTLE-33); also included is the new Headquarters Army Environmental System (HQAES) database designation (e.g., 53465.1021) as a cross reference for Army Tracking purposes. The locations of the three OUs and 10 sites evaluated in this FYR review are shown on Figure 1-2 and listed below:

Operable Unit	Site / Site Group Name	AEDB-R	HQAES
OU01	Logistics Center (NPL Site)	FTLE-33	53465.1021
	Illicit PCB Dump Site	FTLE-46	53465.1029
	LF-1	FTLE-54	53465.1029
	Battery Acid Pit	FTLE-16	53465.1009
	DRMO Yard	FTLE-31	53465.1019
	IWTP	FTLE-51	53465.1032
	Pesticide Rinse Area	FTLE-28	53465.1016
OU02	LF-4 (NPL Site)	FTLE-57	53465.1036
	SRCPP (NPL Site)	FTLE-32	53465.1020
OU03	ALGT (NPL Site)	MF-ALGT-LF-05	53465.1077

AEDB-R = Army Environmental Database – Restoration
DRMO = Defense Reutilization Marketing Office
IWTP = Industrial Wastewater Treatment Plant
OU = Operable Unit
SRCPP = Solvent Refined Coal Pilot Plant
ALGT = American Lake Garden Tract
HQAES = Headquarters Army Environmental System
NPL = National Priorities List
PCB = Polychlorinated Biphenyl

Protectiveness Determinations

The purpose of the FYR is to evaluate the implementation and performance of the selected remedy and to determine if it is, or will be, protective of human health and the environment. Remedies selected for each of the 10 sites addressed as part of this FYR are presented in separate RODs or DDs, or are separate response actions within one ROD (LF-4 and SRCPP); therefore, site-specific protectiveness determinations are provided in this FYR and summarized in Table ES-1, below. Table ES-1 also presents protectiveness determinations for each of the three OUs.

Table ES-1. JBLM Site Summary

Site	Media	Remedial Action Objectives	Primary Remedy Components	Protectiveness Determination	
				Protective	Short-Term Protective
OU01 – Logistics Center					✓
FTLE-33, Logistics Center	Soil and Ground-water	Restore groundwater to its beneficial use, which is, at this site, a drinking water source. The groundwater will be restored to levels consistent with state and Federal ARARs which will result in a cumulative excess cancer risk not to exceed 1 x 10^{-4}. Remediation levels will be attained throughout the contaminated plume.	Install and maintain groundwater P&T systems. P&T system performance monitoring. Implement and maintain LUCs summarized in Table ES-2 with the overarching LUC objective to minimize exposure to contaminants in soil and groundwater. Determine full extent of contaminant plume, including in deeper aquifers. Adjust remedial activities as needed for deeper aquifer to ensure short- and long-term protection of human health and environment. Confirmation soil sampling to ensure identification of all remaining source areas. Determine feasibility of conducting source control measures at Landfill 2 (LF-2) source.		✓
FTLE-46, Illicit PCB Dump Site	Soil	Prevent unacceptable risks via direct contact with soil by future residents or excavation workers.	Implement and maintain LUCs summarized in Table ES-2 with the overarching LUC objective to minimize exposure to contaminants in soil.		✓

Site	Media	Remedial Action Objectives	Primary Remedy Components	Protectiveness Determination	
				Protective	Short-Term Protective
FTLE-54, LF-1	Soil and Ground-water	Prevent inhalation and ingestion by human and ecological receptors of the VOCs in groundwater beneath and surrounding the landfill. Prevent direct exposure to landfill wastes.	Implement long-term groundwater monitoring. Implement and maintain LUCs summarized in Table ES-2 with the overarching LUC objective to minimize exposure to contaminants in soil and groundwater.	✓	
FTLE-16, Battery Acid Pit	Soil	Prevent unacceptable risks via direct contact with soil by future residents or industrial workers.	Implement and maintain LUCs summarized in Table ES-2 with the overarching LUC objective to minimize exposure to contaminants in soil.	✓	
FTLE-31, DRMO Yard	Soil	Ensure that the nature and extent of the site is considered during all planning decisions and that potential impacts from the site are mitigated as necessary before any proposed residential use.	Implement and maintain LUCs summarized in Table ES-2 with the overarching LUC objective to prevent residential land use.	✓	
FTLE-51, IWTP	Soil	Ensure that the nature and extent of the site is considered during all planning decisions and that potential impacts from the site are mitigated as necessary before any proposed residential use.	Implement and maintain LUCs summarized in Table ES-2 with the overarching LUC objective to prevent residential land use.	✓	
FTLE-28, Pesticide Rinse Area	Soil	Prevent direct contact of site soils under a residential exposure scenario.	Implement and maintain LUCs summarized in Table ES-2 with the overarching LUC objective to prevent residential land use.	✓	
OU02 – Landfill 4 and Solvent Refined Coal Pilot Plant					✓
FTLE-57, LF-4	Soil and Ground-water	Prevent exposure to contaminated groundwater. Restore contaminated groundwater to its beneficial use, which is drinking water.	Install and maintain a SVE system to treat source areas in soil. Install and maintain an in situ groundwater sparging system to treat contaminated groundwater. Monitor the effectiveness of treatment systems.		✓

Site	Media	Remedial Action Objectives	Primary Remedy Components	Protectiveness Determination	
				Protective	Short-Term Protective
		Minimize movement of contaminants from soil to groundwater. Prevent exposure to landfill contents.	Implement and maintain LUCs summarized in Table ES-2 with the overarching LUC objective to restrict access to and development of the site as long as hazardous substances remain onsite.		
FTLE-32, SRCPP	Soil and Ground-water	Prevent exposure to contaminated soils. Prevent movement of contaminants from soil to groundwater. Prevent exposure to contaminated upper aquifer groundwater beneath the former SRCPP.	Excavate and treat contaminated soil using low-temperature thermal desorption. Monitor groundwater to determine effectiveness of the soil treatment. Implement and maintain LUCs summarized in Table ES-2 with the overarching LUC objective to restrict access to and development of the site as long as hazardous substances remain onsite.		✓
OU03 – American Lakes Garden Tract					✓
OU03, (MF-ALGT-LF-05, ALGT)	Ground-water	To restore groundwater to its beneficial use, a drinking water source. The groundwater will be restored to levels consistent with state and Federal ARARs. Remediation levels will be attained throughout the contaminated plume.	Install and maintain groundwater extraction wells, including near areas of highest contamination, capable of capturing the groundwater contaminant plume. Install and maintain groundwater treatment systems, preferably carbon adsorption. Monitor performance of the P&T systems during remediation activities. Implement and maintain LUCs summarized in Table ES-2 with the overarching LUC objective to minimize exposure to contaminants during remediation.		✓

ALGT = American Lake Garden Tract
P&T = Pump & Treat
SRCPP = Solvent Refined Coal Pilot Plant
ARAR = Applicable or Relevant and Appropriate Requirements
PCB = Polychlorinated Biphenyl
SVE = Soil Vapor Extraction
LUC = Land Use Controls
RAO = Remedial Action Objective
VOC = Volatile Organic Compound

LUCs are common components of all the JBLM sites evaluated in this FYR. LUC objectives identified for the sites in Table ES-1 in general are intended to mitigate either risks associated with exposure to contamination during or residual to cleanup, instead of eliminating those risks by removing or treating the contaminated media to UU/UE levels. An overview of the LUCs that were selected in the DDs or RODs for the 10 sites within the three JBLM OUs evaluated in this FYR that have been implemented and are maintained are summarized below in Table ES-2.

Table ES-2. JBLM Land Use Controls Summary

Operable Unit	Site / Site Group Name	Administrative LUCs			Physical LUCs	
		LUC Data Layer in GIS LUC Overlay for RPMP LUC Overlay for ERP LUC Overlay for DPA Installation Access	LUC Inclusion in ORRs	LUC Inclusion in WSPs	Site Boundary Fencing & Warning Signs	Cap
OU01	Logistics Center (FTLE-33)	✓	✓	✓	✓	
	Illicit PCB Dump Site (FTLE-46)	✓	✓		✓	✓
	LF-1 (FTLE-54)	✓		✓		
	Battery Acid Pit (FTLE-16)	✓				✓
	DRMO Yard (FTLE-31)	✓				
	IWTP (FTLE-51)	✓				
	Pesticide Rinse Area (FTLE-28)	✓				✓
OU02	LF-4 (FTLE-57)	✓	✓	✓		
	SRCPP (FTLE-32)	✓		✓		
OU03	ALGT (MF-ALGT-LF-05)	✓				

ALGT = American Lake Garden Tract
ERP = Environmental Review Procedures
LUC = Land Use Control
PCB = Polychlorinated Biphenyl
WSP = Water System Plan
DPA = Digging Permit Approval
GIS = Geographic Information System
ORR = Operating Range Regulation
RPMP = Real Property Master Plan
DRMO = Defense Reutilization Marketing Office
IWTP = Industrial Wastewater Treatment Plant
OU = Operable Unit
SRCPP = Solvent Refined Coal Pilot Plant

Based on the FYR conducted for the three OUs and 10 sites within the OUs at JBLM, protectiveness statements are presented below for each OU and site, as well as Site-wide.

OU Protectiveness Statements

The OU protectiveness determinations for the three OUs at JBLM are based on whether the protectiveness determinations for the individual remedies at the sites within each of the OUs are cumulatively protective, as summarized below.

OU01, Logistics Center

The remedies at sites within OU01, Logistics Center, currently protect human health and the environment because potential exposure to contamination has been addressed through implementation and/or O&M of remedial systems and Long-Term Monitoring (LTM), and through implementation and maintenance of appropriate LUCs that achieve the following LUC objectives:

- **FTLE-33, Logistics Center.** Restrict access to known source areas at the site, restrict the site to industrial or administrative use, prevent unplanned excavation of contaminated soil, and prevent new drinking water wells without a USEPA-approved monitoring plan.

- **FTLE-46, Illicit PCB Dump Site.** Prevent residential land use, prevent unplanned excavation of contaminated soil, restrict site access for training purposes, and by maintaining a boundary fence and signage.
- **FTLE-54, LF-1.** Prevent residential land use, prevent unplanned excavation of contaminated soil, and prevent new drinking water wells within 1,000 ft of landfill boundary without a USEPA-approved monitoring plan.
- **FTLE-16, Battery Acid Pit.** Prevent residential land use, prevent unplanned excavation of contaminated soil, and ensure that the asphalt covering the former pit is maintained.
- **FTLE-31, DRMO Yard.** Prevent residential land use.
- **FTLE-51, IWTP.** Prevent residential land use.
- **FTLE-28, Pesticide Rinse Area.** Prevent residential land use.

However, for OU01 to be protective in the long term, the following actions should be taken to ensure protectiveness at two of the sites:

- **FTLE-33, Logistics Center.** Additional monitoring wells must be installed to define and monitor the full extent of the groundwater plume and additional plume optimization of the existing treatment systems must be accomplished to fully capture upgradient TCE concentrations in groundwater that significantly exceed the RG and continue to impact downgradient areas.
- **FTLE-46, Illicit PCB Dump.** Maintenance of the clay cap must be conducted on a routine basis to ensure the integrity of the cap which is necessary to prevent direct contact with contaminated soil.

OU02, Landfill 4 and Solvent Refined Coal Pilot Plant

The remedies at OU02, LF-4 and SCRPP, currently protect human health and the environment. The remedy at FTLE-57, LF-4, currently protects human health and the environment because LUCs were implemented to prevent: residential land use; unplanned excavation of contaminated soil; drinking water well installation within 1,000 ft of the site boundary; and digging, bivouacking, or off-road vehicle maneuvering training, thereby ensuring protection of human health and the environment from potential threats associated with site contaminants. The remedy at FTLE-32, SCRPP currently protects human health and the environment because potential exposure to groundwater contamination at the site has been addressed through LUCs that prevent the installation of drinking water wells within 1,000 ft of the site boundary without USEPA-approved monitoring plans, and potential exposure to contaminated soil was addressed via excavation and the treatment of soil although residual soil contamination remains above the residential RG.

However, for OU02 to be protective in the long term, the following actions should be taken to ensure protectiveness:

- **FTLE-57, LF-4.** Enforce LUCs to include implementation of additional preventative measures that restrict access to the landfill cap to mitigate potential damage and prevent exposure to the landfill contents.

- **FTLE-32, SRCPP**. Implement LUCs to prevent residential land use of the site and unauthorized excavation of contaminated soil.

OU03, American Lake Garden Tract

The remedy at MF-ALGT-LF-05, Area D/ALGT, currently protects human health and the environment. Potential exposures have been addressed through groundwater extraction and treatment (i.e., Pump & Treat [P&T]), and the implementation and maintenance of appropriate LUCs that prevent residential land use, unplanned excavation of contaminated soil, and the installation of new drinking water wells within 1,000 ft of the LUC boundaries until USEPA concurs that groundwater quality has been restored. Ongoing groundwater LTM and reporting ensure that continuing progress towards achieving the RAO is being made by providing data that confirm the concentrations and extent of contaminants of concern (COCs) and monitor the natural attenuation of contaminants in accordance with the current monitoring plan for the site. However, for the remedy to remain protective in the long term, the ROD amendment needs to be finalized as the DD that changes the remedy from P&T to monitored natural attenuation (MNA), which is considered to be an effective alternative remedy that should replace groundwater extraction and treatment as the primary remedy for groundwater contamination.

Site-wide Protectiveness Statement

The site-wide protectiveness determination for JBLM is based on the protectiveness determinations for the three OUs, as summarized in the following table:

Protectiveness Determination	Location
Short-Term Protective	**JBLM Site-Wide**
Short-Term Protective	*OU01*
Short-Term Protective	Logistics Center (FTLE-33)
Short-Term Protective	Illicit PCB Dump Site (FTLE-46)
Protective	LF-1 (FTLE-54)
Protective	Battery Acid Pit (FTLE-16)
Protective	DRMO Yard (FTLE-31)
Protective	IWTP (FTLE-51)
Protective	Pesticide Rinse Area (FTLE-28)
Short-Term Protective	*OU02*
Short-Term Protective	LF-4 (FTLE-57)
Short-Term Protective	SRCPP (FTLE-32)
Short-Term Protective	*OU03*
Short-Term Protective	ALGT (MF-ALGT-LF-05)

ALGT = American Lake Garden Tract
IWTP = Industrial Wastewater Treatment Plant
OU = Operable Unit
SRCPP = Solvent Refined Coal Pilot Plant
DRMO = Defense Reutilization Marketing Office
JBLM = Joint Base Lewis-McChord
PCB = Polychlorinated Biphenyl

The RAs at OU01, OU2, and OU03 currently protect human health and the environment because potential exposures to contaminated media are controlled through site access, groundwater LTM, and the maintenance of LUCs, including caps installed over waste areas, in accordance with the RODs and DDs.

To ensure future protectiveness at OU01:

- **FTLE-33, Logistics Center.** Install additional monitoring wells to define and monitor the full extent of the groundwater plume, and conduct additional plume optimization of the existing treatment systems to fully capture upgradient TCE concentrations in groundwater that significantly exceed the RG and continue to impact downgradient areas.
- **FTLE-46, Illicit PCB Dump Site**. Maintenance of the clay cap must be conducted on a routine basis to ensure the integrity of the cap, which is necessary to prevent direct contact with contaminated soil.

To ensure future protectiveness at OU02:

- **FTLE-57, LF-4.** Enforce LUCs to include implementation of additional preventative measures that restrict access to the landfill cap to mitigate potential damage and prevent exposure to the landfill contents.
- **FTLE-32, SRCPP**. Implement LUCs to prevent residential land use of the site and unauthorized excavation of contaminated soil.

To ensure future protectiveness at OU03:

- **MF-ALGT-LF-05, Area D/ALGT**. Finalize the ROD amendment to document a change in the remedy selected in the 1991 ROD to replace the groundwater P&T system remedy with MNA.

Five-Year Review Summary Form

The results of the FYR for each of the in-place remedies at JBLM sites are summarized in the form below.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Joint Base Lewis-McChord		
EPA ID: 110070596041		
Region: 10	**State:** WA	**City/County:** Pierce, Thurston
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: Other Federal Agency **If "Other Federal Agency" was selected above, enter Agency name:** United States Department of the Army (U.S. Army)		
Author name (Federal or State Project Manager): Mark Mettler, Installation Restoration Program (IRP) Manager, Environmental Division		
Author affiliation: U.S. Army, JBLM		
Review period: 10 May 2021 – 28 September 2022		
Date of site inspection: 9 November 2021		
Type of review: Statutory		
Review number: 3		
Initial triggering action date: 28 September 1992		
Due date ***(five-year cycle after initial triggering action date)*****:** 28 September 2022		

Issues/Recommendations				
OUs Without Issues/Recommendations Identified in the Five-Year Review:				
None				
Issues and Recommendations Identified in the Five-Year Review:				
Site: OU01, Logistics Center	**Issue Category: Remedy Performance**			
	Issue: The northwestern edge of the lower Vashon aquifer plume is not well-defined downgradient of the I-5 pump and treat system. Currently, LC-237b is located on the edge of the monitoring network and had the highest TCE concentration of any lower Vashon aquifer monitoring well in 2020 and 2021.			
	Recommendation: Install additional well or wells in the lower Vashon aquifer to the northwest of existing well LC-237b to completely define the lower Vashon plume boundary in that area.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA	28 September 2026
Site: OU01, Logistics Center	**Issue Category: Remedy Performance**			
	Issue: The northwestern edge of the lower Vashon aquifer plume is not well defined at near LC-41b.			
	Recommendation: Install additional well or wells to the northwest or southeast of existing well LC-41b for the purpose of defining the northwestern edge of the lower Vashon aquifer plume.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA	28 September 2026
Site: OU01, Logistics Center	**Issue Category: Remedy Performance**			
	Issue: Groundwater contaminated with TCE at concentrations significantly exceeding the RG is bypassing the existing LF-2 treatment systems such that upgradient TCE concentrations continue to impact downgradient areas.			

	Recommendation: Complete a plume capture assessment to provide a comprehensive understanding of hydrogeologic conditions beneath the LF-2 area and, based on that understanding, optimize the LF-2 P&T system and associated monitoring network so that the contaminant plume beneath the LF-2 P&T system is completely contained.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA	28 September 2026

Site: OU01, Illicit PCB Dump site	**Issue Category: Operations and Maintenance**			
	Issue: Required maintenance of the clay cap is not occurring which could compromise the integrity of the cap and allow exposure to the contaminated soil.			
	Recommendation: Schedule and perform cap maintenance on a routine basis to ensure protection of human health and the environment.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA	28 September 2023

Site: OU02, Landfill 4	**Issue Category: Site Access/Security**			
	Issue: Off-road vehicle maneuvering training has the potential to cause damage to the LF-4 cap and expose landfill contents. These activities are in violation of the LF-4 LUCs that are intended to prevent exposure to the landfill contents thereby ensuring protection of human health and the environment from potential threats associated with site contaminants.			
	Recommendation: Enforce LUCs to include implementation of additional preventative measures that restrict access to the landfill cap to mitigate potential damage and prevent exposure to the landfill contents.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA	28 September 2023

<table>
<tr><td rowspan="3">Site: OU02, Solvent Refined Coal Pilot Plant</td><td colspan="4">Issue Category: Remedy Performance</td></tr>
<tr><td colspan="4">Issue: Residual soil contamination remains at the site above the RG and LUCs do not restrict access to and prevent residential development.</td></tr>
<tr><td colspan="4">Recommendation: Implement LUCs to prevent residential use of the site and unauthorized excavation of contaminated soil.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Implementing Party</td><td>Oversight Party</td><td>Milestone Date</td></tr>
<tr><td>No</td><td>Yes</td><td>Federal Facility</td><td>EPA</td><td>28 September 2023</td></tr>
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<table>
<tr><td rowspan="3">Site: OU03, American Lake Garden Tract</td><td colspan="4">Issue Category: Remedy Performance</td></tr>
<tr><td colspan="4">Issue: The groundwater P&T system is no longer an effective remedy for treating groundwater contamination.</td></tr>
<tr><td colspan="4">Recommendation: Finalize the ROD amendment as the DD that changes the remedy from P&T to MNA, which is considered to be an effective alternative remedy that should replace groundwater extraction and treatment as the primary remedy for groundwater contamination.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Implementing Party</td><td>Oversight Party</td><td>Milestone Date</td></tr>
<tr><td>No</td><td>Yes</td><td>Federal Facility</td><td>EPA</td><td>28 September 2023</td></tr>
</table>

Protectiveness Statement(s)		
Site: OU01, Logistics Center	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: The remedies at sites within OU01, Logistics Center, currently protect human health and the environment because potential exposure to contamination has been addressed through implementation and/or O&M of remedial systems and LTM and through implementation and maintenance of appropriate LUCs at each site within OU01. However, for OU01 to be protective in the long term, the following actions should be conducted to ensure protectiveness at two of the sites: FTLE-33, Logistics Center: Additional monitoring wells must be installed to define and monitor the full extent of the groundwater plume and additional plume optimization of the existing treatment systems must be accomplished to fully capture upgradient TCE concentrations in groundwater that significantly exceed the RG and continue to impact downgradient areas. FTLE-46, Illicit PCB Dump: Maintenance of the clay cap must be conducted on a routine basis to ensure the integrity of the cap which is necessary to prevent direct contact with contaminated soil.		
Site: OU02, Landfill 4 and Solvent Refined Coal Pilot Plant	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):*
Protectiveness Statement: The remedies at OU02, LF-4 and SCRPP, currently protect human health and the environment because potential exposure to contamination has been addressed through implementation and maintenance of appropriate LUCs at each site within OU02. The remedy at FTLE-57, LF-4, currently protects human health and the environment because LUCs were implemented to prevent: residential land use; unplanned excavation of contaminated soil; drinking water well installation within 1,000 ft of the site boundary; and digging, bivouacking, or off-road vehicle maneuvering training, thereby ensuring protection of human health and the environment from potential threats associated with site contaminants. The remedy at FTLE-32, SCRPP, currently protects human health and the environment because potential exposure to groundwater contamination at the site has been addressed through LUCs that prevent installation of drinking water wells within 1,000 ft of the site boundary without USEPA-approved monitoring plans and potential exposure to contaminated soil was addressed via excavation and treatment of soil although residual soil contamination remain above the residential RG. However, for OU02 to be protective, the following actions should be taken to ensure protectiveness: At FTLE-57, LF-4, enforce LUCs to include implementation of additional preventative measures that restrict access to the landfill cap to mitigate potential damage and prevent exposure to the landfill contents. At FTLE-32, SRCPP, implement LUCs to prevent residential land use of the site and unauthorized excavation of contaminated soil.		

Site: OU03, American Lake Garden Tract	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):*

Protectiveness Statement:

The remedy at MF-ALGT-LF-05, Area D/ALGT, currently protects human health and the environment. Potential exposures at the site have been addressed through groundwater extraction and treatment (i.e., P&T), and the implementation and maintenance of appropriate LUCs that restrict the site to industrial use, prevent unplanned excavation of contaminated soil, and prevent installation of new drinking water wells within 1,000 ft of the LUC boundaries until USEPA concurs that groundwater quality has been restored. Ongoing groundwater LTM and reporting ensure that continuing progress towards achieving the RAO is being made by providing data that confirm the concentrations and extent of COCs and monitor the natural attenuation of contaminants in accordance with the current monitoring plan for the site. However, for the remedy to remain protective in the long term, the ROD amendment needs to be finalized as the DD that changes the remedy from P&T to MNA, which is considered to be an effective alternative remedy that should replace groundwater extraction and treatment as the primary remedy for groundwater contamination.

Site-Wide Protectiveness Statement

Site: Site-wide	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):*

Protectiveness Statement:

The remedial actions at OU01, OU2, and OU03 currently protect human health and the environment because potential exposures to contaminated media are controlled through site access, groundwater LTM, and maintenance of LUCs, including caps installed over waste areas, in accordance with the RODs and DDs. To ensure future protectiveness at OU1 the following actions should be taken: At FTLE-33, Logistics Center, install additional monitoring wells to define and monitor the full extent of the groundwater plume and conduct additional plume optimization of the existing treatment systems to fully capture upgradient TCE concentrations in groundwater that significantly exceed the RG and continue to impact downgradient areas. At FTLE-46, Illicit PCB Dump Site Maintenance of the clay cap must be conducted on a routine basis to ensure the integrity of the cap which is necessary to prevent direct contact with contaminated soil. To ensure future protectiveness at OU2 the following actions should be taken: At FTLE-57, LF-4, enforce LUCs to include implementation of additional preventative measures that restrict access to the landfill cap to mitigate potential damage and prevent exposure to the landfill contents. At FTLE-32, SRCPP, implement LUCs to prevent residential land use of the site and unauthorized excavation of contaminated soil. To ensure future protectiveness at OU3 the following actions should be taken: At MF-ALGT-LF-05, Area D/ALGT finalize the ROD amendment to document a change in the remedy selected in the 1991 ROD to replace the groundwater P&T system remedy with MNA.

1 INTRODUCTION

1.1 PURPOSE

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

The United States Army (U.S. Army) conducted this FYR of the remedies implemented at three Operable Units (OUs) located at Joint Base Lewis-McChord (JBLM), located in Pierce and Thurston Counties, Washington (WA; Figure 1-1). The due date for this FYR is 28 September 2022. This is the third installation-wide FYR for these sites.

1.2 AUTHORITY

The U.S. Army is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (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 every five years after the initiation of the selected 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 United States Environmental Protection Agency (USEPA) 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 initiation of the selected remedial action.*

Prior to incorporation as JBLM, sites associated with both McChord AFB and Fort Lewis were placed on the National Priorities List (NPL). NPL sites include OU03, Area D/American Lake Garden Track (ALGT) at McChord Air Force Base (AFB) (listed in October 1984) and the OU01 Logistics Center site (also formerly referred to as the East Gate Disposal Yard [EGDY] associated with waste placed in Landfill 2 [LF-2] in historic documents) at Fort Lewis (listed in November 1989). In 1990, a Record of Decision (ROD) was completed for two additional sites, Landfill 4 (LF-4) and the Solvent Refined Coal Pilot Plant (SRCPP), which were added to the NPL.

The triggering action for the first statutory FYR was the start of remedial action (RA) construction at the Logistics Center in 1992. Sequentially, this FYR also serves as the sixth FYR for sites at both the former Fort Lewis Army Base and the former McChord AFB. These two installations, located in western central

WA, were combined as a joint base in February 2010 to form JBLM. The FYR for Lewis and McChord were first combined in 2012 and this represents the third installation-wide FYR.

The U.S. Army is the lead agency for the three OUs at JBLM and is represented by the U.S. Army Environmental Command (USAEC). OU terminology has not been used consistently at JBLM. The first installation wide FYR evaluated sites separately but provided protectiveness statements in terms of JBLM and the sites association with Fort Lewis and those associated with McChord AFB. However, in the second FYR, the 10 sites at JBLM were grouped into the three OUs, consistent with USEPA designations based on Records of Decision (ROD).

The three OUs and the sites within them are included in this FYR because RAs selected in signed RODs or Decision Documents (DDs) have resulted in conditions that do not allow for unlimited use and unrestricted exposure (UU/UE). The list of sites in the table below includes the Army Environmental Database - Restoration (AEDB-R) site designation (e.g., FTLE-33); also included is the new Headquarters Army Environmental System (HQAES) database designation (e.g., 53465.1021) as a cross reference for Army Tracking purposes. The locations of the three OUs and 10 sites evaluated in this FYR are shown on Figure 1-2 and listed below:

Operable Unit	Site / Site Group Name	AEDB-R	HQAES
OU01	Logistics Center (NPL Site)	FTLE-33	53465.1021
	Illicit Polychlorinated Biphenyls (PCBs) Dump Site	FTLE-46	53465.1029
	Landfill 1 (LF-1)	FTLE-54	53465.1029
	Battery Acid Pit	FTLE-16	53465.1009
	Defense Reutilization and Marketing Office (DRMO) Yard	FTLE-31	53465.1019
	Industrial Wastewater Treatment Plant (IWTP)	FTLE-51	53465.1032
	Pesticide Rinse Area	FTLE-28	53465.1016
OU02	Landfill 4 (LF-4) (NPL Site)	FTLE-57	53465.1036
	Solvent Refined Coal Pilot Plant (SRCPP) (NPL Site)	FTLE-32	53465.1020
OU03	ALGT (NPL Site)	MF-ALGT-LF-05	53465.1077

AEDB-R = Army Environmental Database – Restoration
DRMO = Defense Reutilization and Marketing Office
IWTP = Industrial Wastewater Treatment Plant
LF-4 = Landfill 4
OU = Operable Unit
SRCPP = Solvent Refined Coal Pilot Plant
ALGT = American Lake Garden Tract
HQAES = Headquarters Army Environmental System
LF-1 = Landfill 1
NPL = National Priorities List
PCB = Polychlorinated Biphenyl

Aerostar Environmental and Construction LLC (Aerostar) conducted this FYR on behalf of the USAEC. This report documents the results of the Third FYR, which was conducted from 10 May 2021 through 28 September 2022. The previous FYR was completed on 14 November 2017 (United States Army Corp of

Engineers [USACE], 2017), with addendum approved by USEPA on 8 March 2019. This third installation-wide FYR for JBLM is required because hazardous substances, pollutants, or contaminants remain at the 10 JBLM sites above levels that would allow for UU/UE.

1.3 COMMON ELEMENTS OF THE FIVE-YEAR REVIEW PROCESS

1.3.1 Administrative Components

The U.S. Army initiated this FYR in May 2021 and scheduled its completion for 28 September 2022. The review team included C. Allison Bailey, professional geologist (PG), Corey Wallace, Margaret (Meg) Stemper, and Andrea Heinzenberger, with ASL. On 10 May 2021, a scoping call was held with the USACE and USAEC to discuss JBLM and items of interest as they relate to the protectiveness of the remedy. A review schedule was established that consisted of the following:

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

This third installation-wide FYR consisted of interviews with U.S. Army staff and regulatory agencies, review of relevant site documents, and a site inspection conducted 9 November 2021. In addition, changes in cleanup levels, toxicity values and Applicable or Relevant and Appropriate Requirements (ARARs) were also reviewed, as well as relevant regulatory guidance documents

1.3.2 Community Involvement

On 14 December 2021, a public notice was published in the News Tribune, a local newspaper for Tacoma and surrounding communities. The notice announced the commencement of the FYR process and included a brief description of the sites being reviewed and the FYR process, provided contact information, and invited community participation. The public notice is presented in Appendix A. A second Public Notice will be issued to announce the completion of the FYR.

The FYR report will be made available to the public once it has been finalized. Copies of this document will be placed in the designated information repository on post:

Grandstaff Memorial Library
2109 N. 10th St.
JBLM-Lewis Main, WA 98433

And off post, at:

Pierce County, Lakewood Library
6300 Wildaire Rd SW
Lakewood, WA 98499

1.3.3 Document Review

During this FYR, relevant site-related documents including site investigation (SI) and remedial investigation (RI) reports, feasibility study (FS) reports, RODs and other DDs, a preliminary close out report (PCOR), groundwater long-term monitoring (LTM) plans, LUC plans, Operations and Maintenance (O&M) annual reports, remedial action monitoring (RAM) reports, LUC inspection records, the 2012 Installation-Wide FYR report and 2017 Installation-Wide FYR report (with 2019 addendum), and relevant correspondence documents were reviewed. All required groundwater sampling, system O&M, and LUC inspections were conducted in 2020 and 2021, as documented in monthly status reports; however, the final versions of all annual reporting documents were not available for review during the review period for this FYR. Information was used, at the request of the Army, from the draft final 2020 and draft 2021 Logistics Center RAM and O&M reports, the draft final 2020 and draft 2021 ALGT groundwater monitoring report, and the draft final 2020 and draft 2021 LF-4 groundwater monitoring reports. A complete reference list of the documents reviewed is provided as Appendix B.

1.3.4 Site Inspection

A FYR site inspection was conducted on 9 November 2021, to visually assess and document site conditions. The site inspection included a teleconference with stakeholders including JBLM, USACE, USEPA, WA State Department of Ecology (Ecology), and Aerostar. Following the teleconference, JBLM contractor Jerome Lambiotte (AGEISS), USACE (Gary Richards), and Aerostar (Allison Bailey and Andrea Heinzenberger) performed the site inspections. Appendix C provides details of the Site Inspection including the participants, FYR site inspection checklists, and photographs. Observations made during the inspection are provided in the site-specific discussions in the following Sections.

1.3.5 Interviews

During the FYR process, interviews were conducted by email with parties knowledgeable or aware of the site conditions, including regulatory agencies involved in site activities. The purpose of the interviews is to document views about current site conditions, problems, or related concerns. Table 1-1 provides a list of persons interviewed. A summary of the interviews is provided below. The completed interview records are included in Appendix D.

Table 1-1. Interviewee List

Name	Title/Affiliation	Date Interviewed	Interview Method	Contact Information
Jason G. Cook	HG3, Ecology	29 November 2021	Email	360-763-2777 ASCO461@ecy.wa.gov
Patrick Hickey	Remedial Project Manager, USEPA	30 November 2021	Email	206-553-6295 hickey.patrick@epa.gov

Ecology = Washington State Department of Ecology   USEPA = United States Environmental Protection Agency

Ecology representative, Mr. Jason Cook, noted that his involvement with JBLM is limited to the ALGT site, which he has been associated with for approximately two years. Mr. Patrick Hickey, the USEPA

Remediation Project Manager (RPM), stated that he has only been involved with JBLM since June 2021. As the RPM, Mr. Hickey oversees cleanup operations at the facility and provides document review and recommendations and/or concurrence.

Interviewees indicated that, overall, the remedies at the JBLM sites for which they are responsible are effective, and the environmental program is well managed, coordinated, and effective. Neither interviewee noted any unexpected changes to the O&M requirements or O&M difficulties, maintenance schedules, or sampling routines over the past five years. No opportunities to further optimize the O&M or sampling efforts were noted by the interviewees. Interviewees noted no intrusive work, changes in land use, or trespassing issues at the sites. Neither interviewee received complaints, violations, or comments from the community or other stakeholders that required a response by their office.

Mr. Hickey noted that, as a contaminant that is not directly linked to the NPL listed sites at JBLM, there is an ongoing investigation for per- and polyfluoroalkyl substances (PFAS), which may have contaminants located within the 10 sites addressed by this FYR, as well as other areas at JBLM. Mr. Hickey further noted that the State of WA is proceeding with establishing state action levels (SALs) on perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), and other PFAS-related chemicals in drinking water, which could affect the ongoing PFAS investigation.

Both interviewees responded that no information had been brought to their attention that would call into question the protectiveness of the implemented remedies. Specific comments provided by the interviewees concerning a particular site are presented in the Interviews sections included in the site-specific discussions.

2 INSTALLATION BACKGROUND AND LAND USE CONTROLS

The information presented in this section includes a description of the installation background, physical characteristics, land resources and use, history of contamination, and land use controls (LUCs). Sources for the information include the ROD for the Logistics Center (USEPA, 1990), the ROD for the Area D/ALGT (USEPA, 1991), the *2017 Final Comprehensive Land Use Controls Plan, Joint Base Lewis-McChord, Pierce County, Washington* (2017 LUC Plan) (Sealaska, 2018a), the ROD for the Landfill 4 and the SRCPP (USEPA, 1993), the Second Installation-Wide FYR Report (USACE, 2017), and the 2019 Annual Logistics Center RAM Report (EA Engineering, Science, and Technology, Inc., PBC [EA], 2020)

As an outcome of the 2005 Base Realignment and Closure Commission, Fort Lewis Army Base and McChord AFB merged in 2010 to become one of 12 joint bases across the Department of Defense (DoD). JBLM leadership includes an Army joint base commander and an Air Force deputy commander. Base services are managed and provided by the Army. JBLM is currently home to U.S. Army I Corps and 7th Infantry Division, the U.S. Air Force 62nd Airlift Wing, Madigan Army Medical Center (MAMC), 1st Special Forces Group, U.S. Navy and U.S. Marine Corps elements, as well as other command and tenant organizations. The facilities at JBLM provide training, mobilization, and worldwide military airlift capability for Army, Navy, Air Force, and Marines. JBLM also oversees training operations at the associated 323,431-acre Yakima Training Center (YTC) in nearby Yakima County, WA.

2.1 LAND RESOURCES AND USE

JBLM encompasses 90,283 acres in Pierce and Thurston Counties, just off the Puget Sound in WA State, about three miles south of Tacoma along Interstate 5 (I-5, Figure 1-1). The facility is surrounded by the communities of Lakewood to the north (population of 60,538), Olympia, Lacey, and Tumwater (metro area population of 290,536) to the south, DuPont to the west (population 9,503), and unincorporated Spanaway/Parkland to the east.

JBLM, exclusive of the YTC, is comprised of three adjoining designated areas, shown on Figure 2-1: Lewis-Main (former Fort Lewis), former McChord AFB, and Lewis-North (the part of former Fort Lewis that lies north of I-5).

Lewis-Main was established as Camp Lewis in 1917, becoming Fort Lewis in 1927, and has been in continuous use since that time. The initial development of the main industrial area within Lewis-Main, now called the Logistics Center, began in 1941 with construction of the Fort Lewis Quartermaster Motor Base. In August 1942, the facility was transferred to ordnance jurisdiction and renamed the Mount Rainier Ordnance Depot, which operated until 1963. In 1963 the facility became the Logistics Center to serve as the primary non-aircraft maintenance facility for the post.

Lewis-North includes administration, housing, and recreational areas, as well as areas designated for training.

The former McChord AFB started as McChord Army Air Field in 1938 and became McChord AFB when the Air Force became a separate military service in 1947. The base served as a component in the strategic air defense command structure as an airlift base from World War II to present day.

As the largest military installation on the west coast, JBLM includes the main cantonment area (approximately 10,000 acres) and close-in training ranges (approximately 80,000 acres). The cantonment area is comprised of on-post residential, commercial, and industrial areas interspersed with parks, wooded, and open areas. Range and training areas at JBLM consist of open areas separated by forested areas.

2.2 PHYSICAL CHARACTERISTICS

JBLM is located within the Puget lowland region of the Pacific Border physiographic province, a long, narrow province running along the western margin of the United States. Within the Pacific Border province, JBLM is part of the Puget lowland region, a low-lying valley deepened by glaciers lying between the Cascade Range to the east and the Olympic Mountains to the west. The region extends from the San Juan Islands in the north to past the southern end of the Puget Sound and includes most of WA's more populated areas. Unoccupied open areas at JBLM support the majority of the remaining prairie habitat in the south Puget Sound area (USDA, 2021).

JBLM and the immediate areas surrounding Puget Sound are underlain by over 1,000 ft of unconsolidated glacial and interglacial sediments (Prych, 1999). Within these Quaternary-age glacial deposits, three aquifers have been identified beneath JBLM – the unconfined upper Vashon aquifer (upper aquifer), the semiconfined lower Vashon aquifer (lower aquifer), and the confined sea level aquifer (SLA). These water-bearing units are separated by aquitard layers composed of interglacial fine grained silts and clays. Groundwater flow patterns are complex, due to interbedded less permeable lenses within the glacial deposits, but in the Vashon aquifer, groundwater predominantly flows to the northwest, and in the SLA, flow is to the west (USACE, 2017).

Communication between the upper and lower Vashon aquifers is significant, as their potentiometric surfaces are generally equal. The confining unit above the SLA is the regionally extensive Qpon aquitard, which is composed of more than 30 ft of fine-grained, non-glacial sediments. A breach, or window, in the Qpon aquitard was identified beneath an existing trichloroethene (TCE) plume in groundwater at JBLM. A downward hydraulic gradient at this window provides a pathway for contaminated groundwater to flow from the lower aquifer to the SLA. The extent of the window in the Qpon aquitard is not fully known.

2.3 HISTORY OF CONTAMINATION

Previous investigations across the JBLM have identified impacts to soil and groundwater resulting from historical activities including the extensive use and subsequent disposal of volatile organic compounds (VOCs), predominantly TCE, at various locations on former Fort Lewis and McChord AFB. In 1985, the Army identified traces of TCE in several monitoring wells installed in the unconfined aquifer beneath the Logistics Center located at Fort Lewis which led to additional investigations that identified the full extent of the contaminated groundwater and traced the primary source to LF-2. Waste disposal in other landfills, spills, and illicit dumping are responsible for VOCs, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and metals contamination that has been identified at the remaining Fort Lewis site. At McChord Field, investigations identified TCE in the groundwater at concentrations above drinking water standards at the ALGT in 1991.

The following three OUs at JBLM include:

- OU01: The Logistics Center was added to the NPL in 1989 after investigations confirmed an extensive groundwater TCE plume at the site. Subsequent investigations were completed and six sites were eliminated as sources of the TCE contamination for the Logistics Center, however at the Battery Acid Pit, Industrial Wastewater Treatment Plant (IWTP), DRMO Yard Illicit PCB Dump site, LF-1, and the Pesticide Rinse Area other contaminants were identified. Therefore, these six sites are addressed separately from the Logistics Center with their own actions but remain part of OU01. The USEPA prepared a PCOR in September 2015 documenting completion of construction for the Logistics Center and approval of the separate response actions for the individual sites.
- OU02: This OU is comprised of LF-4 and SCRPP, which were included as sites added to the NPL in 1989 (with the Logistics Center) after investigations confirmed at LF-4, TCE and VC were identified in the groundwater; and at the SCRPP, total petroleum hydrocarbons were identified. Each site has their own response actions.
- OU03: This OU is comprised of Area D/ALGT, which was placed on the NPL in 1984 after TCE was identified in the groundwater.

A site-specific history of contamination is provided within the subsections for each site reviewed in this FYR report.

2.4 Initial Response

In 1989, a Federal Facility Agreement (FFA) (USEPA, 1989) between the Air Force, USEPA, and Ecology was signed to address sites identified in the 1991 Consent Decree at the McChord AFB that were suspected of having environmental contamination, including Area D/ALGT now included under OU03.

In 1990, an Interagency Agreement (IAG) (USEPA, 1990) between the Army, USEPA and Ecology was signed to address sites at the Fort Lewis Army Base that were suspected of having environmental contamination, including: the Logistics Center and six waste sites now included under OU01 (Battery Acid Pit, IWTP, DRMO Yard, Illicit PCB Dump site, LF-1, and Pesticide Rinse Area); and two waste sites now included under OU02 (Solvent Refined Coal Plant, LF-4).

2.5 Land Use Controls, Groundwater Use Restrictions, and Land Use Restrictions

2.5.1 Land Use Controls

JBLM has LUCs to restrict use/limit access of property, including groundwater through engineering, institutional and other governmental or administrative controls to ensure protection of human health and the environment.

Summary of LUCs and LUC Objectives

LUCs are common components of all the JBLM sites evaluated in this FYR. LUC objectives identified for the sites in general are intended to mitigate either risks associated with exposure to contamination during or residual to cleanup, instead of eliminating those risks by removing or treating the contaminated media to UU/UE levels.

Typically, the LUCs for the JBLM environmental program are designed to achieve some or all of the following LUC objectives depending on site-specific conditions:

- Prevent or restrict residential land use;
- Restrict construction of water supply wells without agency approval;
- Prevent unauthorized excavation; and
- Improve awareness/avoidance of possible encounters with munitions.

LUCs that achieve the LUC objectives are defined in Army Regulation (AR) 210-20 as follows:

- Any type of physical, legal, or administrative mechanism that restricts the use of, or limits access to, real property to prevent or reduce risks to human health, safety and the environment.
- Physical mechanisms encompass a variety of engineered remedies to contain or reduce contamination and physical barriers intended to limit access to property, such as fences or signs.
- Legal mechanisms include restrictive covenants, equitable servitudes, and deed notices.
- Administrative mechanisms include notices, construction permitting, or land use management systems that may be used to ensure compliance with use restrictions.

Annual monitoring of the LUCs are conducted as described in the *2017 Final Comprehensive Land Use Controls Plan, Joint Base Lewis-McChord, Pierce County Washington* (2017 LUC Plan) for JBLM (Sealaska, 2018a). Responsibilities include, but are not limited to:

- Conducting routine monitoring, including interviewing Army staff and visually inspecting sites;
- Preparing LUC Monitoring Checklists to document routine monitoring;
- Notifying the JBLM Installation Restoration Program (IRP) Manager immediately upon discovery of any land use activity that is inconsistent with the LUC objectives;
- Maintaining boundary fences at LUC sites;
- Maintaining signage;
- Maintaining landfill or other site caps; and
- Updating LUC Plans as necessary. (Notes: The next version of the 2017 LUC Plan is anticipated to be finalized in 2022. This task includes providing appropriate GIS data/information to JBLM for their use in installation geospatial databases.)

The 2017 Comprehensive LUC Plan outlines the following mechanisms for ensuring site-specific LUC objectives are maintained:

- **LUC Data Layer in Geographic Information System (GIS):** The LUC data layer in GIS contains the specific LUC locations at JBLM and the specific LUC objectives for each location.

  Incorporation of LUCs as a GIS data layer ensures that LUC information is available for real-time reference during meetings regarding land use planning, environmental reviews, construction activities, and maintenance activities. The LUC locations and objectives of all of the 10 sites at JBLM included in this FYR are incorporated into the GIS layer.
- **LUC Overlay for Real Property Master Plan (RPMP):** The JBLM RPMP delineates the major uses of real property and represents the formal decision process for the use of all land at JBLM through AR 210-20, which requires maintenance of the RPMP and LUC overlay.

Incorporation of LUCs as an overlay on the JBLM RPMP is necessary for delineating all major uses of real property and in the formal decision process for the use of all land at JBLM. The LUC locations of all of the 10 sites at JBLM included in this FYR are incorporated into the RPMP and LUC overlay.

- **LUC Overlay for Environmental Review Procedures (ERP):** These ERPs ensure that all environmental considerations, including LUCs, are accounted for and adequately addressed during the preliminary project planning process.

  Incorporation of LUCs in JBLM ERPs ensures that LUCs are accounted for during the preliminary project planning process. The LUCs for all of the 10 sites at JBLM included in this FYR are incorporated into the ERPs.

- **LUC Overlay for Digging Permit Approval (DPA):** Before any digging or excavation activities are undertaken at JBLM, a JBLM Digging Permit must be obtained. The JBLM Environmental Restoration Program maintains the LUC overlay and provides to the staff responsible for issuing the dig permits.

  Incorporation of LUCs as an overlay on JBLM ERPs ensures that LUCs are accounted for during the preliminary project planning process and that LUC objectives are considered before a Digging Permit is issued. The LUCs for all of the 10 sites at JBLM included in this FYR are incorporated into the JBLM DPA process.

- **LUC Inclusion in Operational Range Regulations (ORRs):** Use of ranges and training areas at JBLM are regulated in accordance with Fort Lewis Regulation (FLR) 350-30, Range Regulation. The Range Division of the JBLM Directorate of Plans, Training, Mobilization, and Security is responsible for implementing this regulation, which ensures LUCs are considered in ORRs and range-related activities.

  LUC inclusion in FLR 350-30 is designed to ensure that the training related LUCs for the landfills (prevent digging, bivouacking, or off-road vehicle maneuvering) and other sites within or partially within the JBLM operational range area (prevent training access) are maintained. The Illicit PCB Dump Site, and portions of the Logistics Center and LF-4 are located within the JBLM operational range.

- **LUC Incorporation in Water System Plans (WSPs):** The 2017 Comprehensive LUC Plan stated that the LUC objectives would be incorporated into the next update of the JBLM Cantonment Area WSP.

  The JBLM Cantonment Area WSP is the primary planning tool for all public water systems and typically used to plan future construction, including installation of new drinking water wells. Incorporating the LUC objectives into updates to the WSP ensures that new drinking water wells are not installed within the boundaries of designated sites or within 1000 ft of the landfill boundaries without obtaining a variance from Ecology. The JBLM Cantonment Area WSP was updated in 2018 to incorporate the LUC objectives for the Logistics Center (FTLE-33), LF-1 (FTLE-54), LF-4 (FTLE-57), and SRCPP (FTLE-32), which all have groundwater managed under the WSP.

- **Installation Access:** JBLM is a controlled military installation that limits access to authorized personnel.

- Limited installation access restrictions support LUC objectives by keeping the general public and unauthorized personnel out of JBLM. Access is limited to authorized personnel at all of the 10 sites at JBLM included in this FYR.

LUCs are monitored through annual inspection of the sites and interviews with the staff responsible for maintaining the LUC overlays. Annual checklists were reviewed for 2018 through 2020 (final documents) and 2021 (draft document) as part of this FYR. The checklist for 2017 was not available for review. Site-specific details for the LUC inspections are discussed within the subsections for the individual sites. An overview of the LUCs that were selected in the DDs or RODs for the 10 sites within the three JBLM OUs evaluated in this FYR that have been implemented and are maintained are summarized in Table 2-1.

Table 2-1. JBLM Land Use Controls Summary

Operable Unit	Site / Site Group Name	Administrative LUCs			Physical LUCs	
		LUC Data Layer in GIS LUC Overlay for RPMP LUC Overlay for ERP LUC Overlay for DPA Installation Access	LUC Inclusion in ORRs	LUC Inclusion in WSPs	Site Boundary Fencing & Warning Signs	Cap
OU01	Logistics Center (FTLE-33)	✓	✓	✓	✓	
	Illicit PCB Dump Site (FTLE-46)	✓	✓		✓	✓
	LF-1 (FTLE-54)	✓		✓		
	Battery Acid Pit (FTLE-16)	✓				✓
	DRMO Yard (FTLE-31)	✓				
	IWTP (FTLE-51)	✓				
	Pesticide Rinse Area (FTLE-28)	✓				✓
OU02	LF-4 (FTLE-57)	✓	✓	✓		
	SRCPP (FTLE-32)	✓		✓		
OU03	ALGT (MF-ALGT-LF-05)	✓				

ALGT = American Lake Garden Tract
ERP = Environmental Review Process
LUC = Land Use Control
PCB = Polychlorinated Biphenyl
WSP = Water System Plan
DPA = Digging Permit Approval
GIS = Geographic Information System
ORR = Operating Range Regulation
RPMP = Real Property Master Plan
DRMO = Defense Reutilization Marketing Office
IWTP = Industrial Wastewater Treatment Plant
OU = Operable Unit
SRCPP = Solvent Refined Coal Pilot Plant

2.5.2 Groundwater Use Restrictions

Many of the CERCLA sites include an LUC objective to restrict installation of new drinking water wells without a USEPA approved monitoring plan. The 2017 LUC Plan states that incorporating the LUC objectives into future updates of the JBLM Cantonment Area WSP will be an LUC mechanism to ensure that a new drinking water well is not installed within 1,000 ft of the landfill boundaries without obtaining a variance from Ecology.

These LUC boundaries are within the service area boundary of the JBLM Cantonment Area WSP. A WSP is the primary planning tool for all public water systems and is typically used to plan future construction, including installation of new drinking water wells. WSPs are required to be updated every six years in accordance with WA Department of Health regulations in WA Administrative Code 246-290-100. The WA Department of Health will not approve installation of a new drinking water well without adequate documentation of the need for a new well in the WSP as well as adequate incorporation of the proposed well in the Wellhead Protection Program portion of the WSP. The JBLM Water Systems Manager within the JBLM Public Works O&M Division is responsible for maintaining the WSP as well as a variety of other planning, design, and operation tasks related to the JBLM Cantonment Area Water System. The JBLM Environmental Restoration Program provides the JBLM Water Systems Manager with a copy of LUC Plans and access to the GIS LUC data layer to incorporate the drinking water well related objectives in the WSP update. Annual LUC inspections and certifications include interviewing the Water Systems Manager to ensure they have access to environmental drinking water restrictions, LUCs and any updates continue to be included in WSPs, and to identify plans for new drinking water wells in the JBLM Cantonment Area Water System.

2.5.3 Land Use Restrictions

This FYR reviewed the current and anticipated future land use for each of the sites and compared the land use to assumptions used in the definition of the land use restrictions outlined in the 2017 Comprehensive LUC Plan (Table 2-2). Current and future land use was gathered through document review, inspections during the site visit, and a review of the RPMP. Figure 2-2 presents the land use plan included in the current RPMP. Based on this review, the current and future land use for each of the sites in this FYR was consistent with LUC objectives.

Table 2-2. Land Use Summary

Operable Unit	FYR Site	Current and Anticipated Future Land Use	Land Use Restriction (if present)	LUC Plan Meets Land Use Restriction?
OU01	Logistics Center	Current land use at Landfill 2 (LF-2) is as a restricted industrial cleanup area within Training Area 7 of the Lewis-Main operational range area. Current and anticipated land use designated in the Fort Lewis RPMP for the areas over the downgradient Vashon Aquifer and SLA TCE plumes is mixed. The majority is industrial/maintenance with a smaller percentage of land designated for family housing (residential), medical (equivalent to commercial), and open space. Current and anticipated land use in the off-post Tillicum community is a mix of residential, commercial, and open space.	LF-2: Prevent residential land use. Upper Vashon aquifer TCE 100 µg/L isoconcentration contour[1]: Prevent residential land use.	LF-2: yes Upper Vashon aquifer TCE 100 µg/L isoconcentration contour: Yes
	Illicit PCB Dump	The current and anticipated future land use at the site is restricted within the JBLM operational range area.	Site boundary: prevent residential land use.	Yes.
	Landfill 1 (LF-1)	LF-1 is located in an area designated for maintenance in the Lewis-Main RPMP. The main portion of the landfill is currently not being used and has vegetation growing on the cap. Paved parking lots are constructed over former open pit dumping areas. Future land use for the site may include development of recreational ball fields. The current and anticipated future land use designated for LF-1 in the Lewis-Main RPMP is industrial/maintenance.	Site boundary: prevent residential land use.	Yes.

Operable Unit	FYR Site	Current and Anticipated Future Land Use	Land Use Restriction (if present)	LUC Plan Meets Land Use Restriction?
	Battery Acid Pit	The current and anticipated future land use designated for the site in the Lewis-Main RPMP is industrial/maintenance.	Site boundary: prevent residential land use.	Yes.
	DRMO	The site is currently used as an active industrial laydown yard for surplus material to be recycled.The anticipated future land use designated for the site in the Lewis-Main RPMP is industrial/maintenance.	Site boundary: prevent residential land use.	Yes.
	IWTP	The site is currently used as an active industrial laydown yard for surplus material to be recycled.The anticipated future land use designated for the site in the Lewis-Main RPMP is industrial/maintenance.	Site boundary: prevent residential land use.	Yes
	Pesticide Rinse Area	The current and anticipated future land use designated for the Pesticide Rinse Area in the Lewis-Main RPMP is administration, which is equivalent to commercial (residentialuse is not allowed).	Site boundary: prevent residential landuse.	Yes.
OU02	Landfill4	Current and anticipated future land use for LF-4 is restricted training within Training Area 2 of the Lewis-Main operational range area.	Landfill boundary: prevent residential landuse.	Yes.
	SRCPP	The current and anticipated future land use designated for the SRCPP in the Lewis-MainRPMP is administration, which is equivalent to commercial.	None.	Not applicable
OU03	ALGT	ALGT is an off-base residential tract abutting the southwestern boundary of McChord AFB that lies between JBLM property and I-5. This tract consists largely of apartments, but includes single family housing, as well. A base golf course and driving range now overlie former landfills that were part of the Area D disposal area.	Landfills 4, 6, 7 and OT-39: prevent residential landuse.	Yes.

[1] – The 2014 LUC Plan identified the LUC boundary of 100 µg/L based on the groundwater threshold concentration calculated in the 2007 Madigan Family Housing Area Vapor Intrusion Study.

µg/L = micrograms per liter
AFB = Air Force Base
ALGT = American Lake Garden Tract
FYR = Five-Year Review
IWTP = Industrial Wastewater Treatment Plant
JBLM = Joint Base Lewis-McChord
LUC = Land Use Control
OU = Operable Unit
RPMP = Real Property Master Plan
SRCPP = Solvent Refined Coal Pilot Plant

2.6 EMERGING CHEMICALS

PFOS, PFOA, perfluorobutane sulfonic acid (PFBS), and perfluorohexane sulfonate (PFHxS), are part of a larger class of emerging chemicals known as PFAS.

In 2016, the USEPA issued new lifetime health advisories (HAs) for two PFAS: PFOS and PFOA. The HAs established by USEPA are 70 nanograms/liter [ng/L] or 70 parts per trillion [ppt]) for PFOS or PFOA individually, or 70 ppt as the total concentration of PFOS and PFOA. In June 2022, USEPA (2022) issued interim updated lifetime HAs of 0.004 ppt for PFOA and 0.02 ppt for PFOS, and final lifetime HAs of 2000 ppt for PFBS and 10 ppt for hexafluoropropylene oxide dimer acid (HFPO-DA, or GenX).

The risk-based screening levels for PFOA, PFOS, and PFBS for soil and groundwater are documented in the December 2019 *USEPA Interim Recommendations to Address Groundwater Contaminated with Perfluorooctanoic Acid and Perfluorooctanesulfonate* (USEPA, 2019) while the risk-based screening levels for PFBS for groundwater are documented in the April 2021 *USEPA Human Health Toxicity Values for PFBS and Related Compound PFBS* (USEPA, 2021). In July 2022, DoD established a screening level of 600 ppt for PFBS, 4 ppt for PFOS, 39 ppt PFHxS, and for 6 ppt for individual PFOA, perfluorononanoic acid (PFNA), and HFPO-DA in groundwater when evaluating the nature and extent of PFAS at DoD installations (DoD, 2022). HFPO-DA has primarily been used as a replacement for PFOA in the manufacture of fluoropolymers, so it is not likely to have been released at the vast majority of DoD properties (DoD, 2022). Screening levels are risk-based, chemical-specific values based on default exposure parameters, USEPA-approved toxicity values, and a hazard quotient of 0.1 and an incremental lifetime cancer risk of 1E-06. In general, when contaminant concentrations fall below screening levels, further action or investigation is not required.

It should be noted that in January 2022, the WA State Board of Health (Washington Administrative Code [WAC] 246-290-315) established SALs for five PFAS compounds: PFOA (10 ppt); PFOS (15 ppt); PFBS (345 ppt); Perfluorohexane sulfonate (PFHxS) (65 ppt); and Perfluorononanoic acid (PFNA) (9 ppt) (Ecology, 2022). The DoD has not provided guidance on SALs for DoD installations in the state of WA, and the SALs are not promulgated standards. Therefore, the SALs are currently not appliable to investigation of PFAS in groundwater at JBLM or protectiveness determinations.

As part of the Army's commitment to supplying quality drinking water at its installations and in response to the lifetime HA released by USEPA, the Army implemented a comprehensive PFAS drinking water testing program. As a proactive measure, JBLM began testing for PFOS and PFOA contaminants in 23 drinking water supply wells across the installation. January and April 2017 testing results confirmed the presence of PFAS at concentrations exceeding the 70 ppt lifetime HA in five of the tested water supply wells. In response to the identified PFAS contamination, a Preliminary Assessment (PA)/Site Inspection (SI) for groundwater and surface water was conducted at JBLM. The objective of the PA was to identify locations that are areas of potential interest (AOPIs) based on whether there was use, storage or disposal of any PFAS-containing material and determine the presence or absence of PFOS, PFOA, or PFBS at or above screening levels. The Final PA/SI report, published in August 2020 (AECOM), concluded that four areas associated with the FYR including the Logistics Center LF-2 (AOPI 11), ALGT landfill source areas (AOPI 8), LF-1 (AOPI 21), and LF-4 (AOPI 12) require no further evaluation for PFAS.

An evaluation of the PFAS groundwater data for each of the four identified areas against the current USEPA RSLs and DoD guidelines is provided in the subsequent Emerging Chemical discussion provided in the Question B Technical Assessment for each of the respective areas.

3 OU01 – LOGISTICS CENTER

OU01 is comprised of the following sites:

- Logistics Center (NPL) – FTLE-33
- Illicit PCB Dump Site (non-NPL) – FTLE-46
- Landfill 1 (non-NPL) – FTLE-54
- Battery Acid Pit (non-NPL) – FTLE 16
- DRMO Yard (non-NPL) – FTLE-31
- IWTP (non-NPL) – FTLE-51
- Pesticide Rinse Area (non-NPL) – FTLE-28

The Logistics Center was added to the NPL in 1989 after investigations confirmed an extensive groundwater TCE plume originating from source areas at the site. In addition to the Logistics Center, six other non-NPL sites are included within OU01 (USEPA, 2015). Initial attempts to define the contaminant source included assessment of many sites in the vicinity of the Logistics Center area which is located on Lewis-Main. As environmental investigations evolved and source areas became better defined, the ultimate source of the Logistics Center groundwater plume was identified as LF-2 (formerly known as EGDY) and referenced throughout this FYR as part of the Logistics Center. Although subsequent investigations eliminated the six other sites as potential sources of the TCE contamination in groundwater associated with the Logistics Center, other contaminants were identified. Therefore, these six sites are addressed separately from the Logistic Center with their own actions but remain part of OU01. Because the sites above have different response actions, this Chapter 3 is structured to provide a separate evaluation of each site in terms of their respective remedy and includes an individual protectiveness statement for each site. A combined set of issues and single OU01 protectiveness statement is provided at the conclusion of Chapter 3.

3.1 FTLE–33 (LOGISTICS CENTER)

3.1.1 Site Description

The Logistics Center site (FTLE-33; HQAES Site ID 53465.1021) is the largest and most impacted site at JBLM. The Logistics Center encompasses approximately 650 acres in the western portion of the former Fort Lewis Main area. The Logistics Center is an industrial complex comprised of warehouses, motor pools, maintenance facilities, former landfills, and an equipment disposal yard.

The primary source area for groundwater contamination beneath the Logistics Center is the former LF-2, located at the southeastern edge of the Logistics Center (Figure 3-1). LF-2 (formerly known as the EGDY) was a 23-acre landfill used between the 1940s and late 1960s/early 1970s.

Current land use for LF-2 is as a restricted industrial cleanup area within Training Area 7 of the Lewis-Main operational range area. Current and anticipated land use designated in the Fort Lewis RPMP for the areas over the downgradient Vashon Aquifer and SLA TCE plumes is mixed. The majority is industrial/maintenance with smaller percentages of land designated for family housing (residential), medical (equivalent to commercial), and open space. Current and anticipated land use in the off-post Tillicum community is a mix of residential, commercial, and open space.

3.1.2 Site Chronology

The chronology of key events for FTLE–33 is provided in Table 3-1.

Table 3-1. Chronology of Site Events

Event	Date
TCE discovered in shallow groundwater beneath the Logistics Center	1985
RFA completed	1986
RI conducted	1986
As an interim measure, use of domestic water wells in the Tillicum community was discontinued due to TCE contamination detected in the Vashon Aquifer	Late 1980s
Logistics Center added to NPL	1989
FS completed	1990
FFA signed; Logistics Center ROD signed	1990
Construction of two Logistics Center P&T systems in Vashon aquifer begins	1992
LF-4/SRCPP ROD signed and sites added as OUs to Logistics Center	1993
Logistics Center Vashon aquifer P&T systems begin operation	1995
First FYR for Logistics Center	1997
Logistics Center ESD signed	1998
LF-2 P&T Completion Report	1998
DD for Logistics Center source area drum removal action signed	2000
Drum removal action at Logistics Center source area conducted	2000 – 2001
Phase II RI for Logistics Center conducted	2002
DD for Logistics Center source area in-situ thermal treatment signed	2002
Second FYR for Logistics Center completed	2002
Logistics Center source area Vashon aquifer P&T system re-configured (LF-2 P&T)	2003 – 2006
In-situ thermal treatment at Logistics Center source area conducted	2003 – 2007
Sampling for 1,4-dioxane completed for LF-2 (formerly known as EGDY)	2004
DD for LUCs at Logistics Center source area (LF-2 [EGDY] soil) signed	2006
Optimization of downgradient Vashon aquifer P&T system (Interstate 5 [I-5] P&T)	2006 – Present
ESD for Logistics Center SLA signed	2007
Third FYR for Logistics Center completed	2007
Startup of SLAPT system	2009
First Installation Wide FYR (Fourth FYR for Logistics Center NPL).	2012

Event	Date
I-5 P&T Performance Assessment.	2013
PCOR (documents Operational and Functional)	2015
2011-2015 Logistics Center RA Monitoring Reports	2012 – 2016
PCOR (documents Operational and Functional)	2015
Final Second Installation-Wide FYR Report with Addendum	2017
SMIS completed	February 2018
Optimization Review completed	December 2018
LF-2 source area investigation initiated	January 2021
Plans for LF-2 Aquifer Testing and Capture Zone Analysis completed	September 2021
Supplemental LF-2 source area investigation conducted	October 2021
LF-2 Capture Zone Analysis completed	January 2022

DD = Decision Document
FFA = Federal Facilities Agreement
LF = Landfill
OU = Operable Unit
RA = Risk Assessment
RI = Remedial Investigation
SMIS = Site Management Improvement Study
EGDY = East Gate Disposal Yard
FS = Feasibility Study
LUC = Land Use Control
P&T = Pump & Treat
RCRA = Resource Conservation and Recovery Act
ROD = Record of Decision
SRCPP = Solvent Refined Coal Pilot Plant
ESD = Explanation of Significant Difference
FYR = Five-Year Revie
NPL = National Priorities List
PCOR = Preliminary Close Out Report
RFA = RCRA Facility Assessment
SLAPT = Sea Level Aquifer Pump & Treat
TCE = Trichloroethene

3.1.3 History of Contamination

TCE was used in large quantities at the Logistics Center for over 30 years, beginning in 1942, as the principal degreasing agent for vehicle maintenance (USACE, 2017). In 1975, the use of TCE was discontinued, being replaced by 1,1,1-trichloroethane (TCA). Used TCE solvent sludge was treated and disposed, along with waste petroleum products, at various locations within the Logistics Center, but primarily at LF-2.

In 1985, the Army identified traces of TCE in several monitoring wells installed in the unconfined aquifer beneath the Logistics Center. TCE-contaminated groundwater originating from the Logistics Center was determined to be a potential threat to a Lakewood Water District well located in nearby Tillicum. The USEPA confirmed that groundwater contamination had impacted Tillicum water production wells and in 1987, the impacted wells were shut down.

3.1.4 Initial Response

In 1990, an IAG (USEPA, 1990) between the Army, USEPA and Ecology was signed to address sites at the Fort Lewis Army Base that were suspected of having environmental contamination, including the Logistics Center. In 1987, the use of domestic water wells in the Tillicum community was discontinued due to the TCE contamination detected in the Vashon Aquifer and residents were encouraged to connect to the Lakewood Water District water supply system.

3.1.5 Basis For Taking Action

The baseline risk assessment (BRA) (USEPA, 1990) conducted for the Logistics Center site considered both human health and ecological risks from exposure to contaminants of concern (COCs) identified in soil, sediment, groundwater and surface water. The BRA considered potential future risks to an on-post worker, an on-post resident, and an off-post resident; ecological receptors evaluated included aquatic organisms and local small mammals. Exposure routes for human receptors considered included ingestion of contaminated water and soil, inhalation of contaminated soil, ingestion of fish from contaminated surface water, and dermal contact with contaminated soil, groundwater, and surface water.

The results of the BRA indicated the only unacceptable risks were associated with exposure to groundwater contaminated with concentrations of COCs that exceeded drinking water standards (maximum contaminant levels [MCLs]) within the contaminant plume based on use of groundwater as a drinking water source.

The COCs identified in groundwater at the Logistics Center were:

- TCE
- cis-1,2-DCE
- Tetrachloroethylene (PCE)

The presence of COCs in groundwater within the FTLE-33 plume at concentrations that exceeded MCLs provided the basis for taking action under CERCLA.

3.1.6 Remedial Action

3.1.6.1 Remedy Selection

The selected remedy for the Logistics Center NPL Site (FTLE-33) is documented in the following ROD, ESDs, and DDs:

- *Record of Decision for the Department of the Army Logistics Center, Fort Lewis, Washington* (USEPA, 1990), signed September 25, 1990.
- *Explanation of Significant Difference for the Department of the Army Logistics Center, Fort Lewis, Washington* (USEPA, 1998), signed September 9, 1998.
- *Decision Document, Landfill 2, Fort Lewis, Washington (Removal Action for Containerized Source from Landfill 2)*, July 7, 2000.
- *Decision Document, Non-Time Critical Removal Action, In-Situ Thermal Treatment, Landfill 2, Fort Lewis, Washington*, August 20, 2002.
- *Decision Document, Direct Contact with Landfill 2 Soil, Fort Lewis, Washington*, 1 May 2006e.
- *Explanation of Significant Difference, Logistics Center National Priority List Site, Fort Lewis, Washington* (USEPA, 2007), signed August 16, 2007.

3.1.6.1.1 Remedial Action Objectives

The remedial action objective (RAO) provided in the 1990 Logistics Center ROD is:

- To restore groundwater to its beneficial use, which is, at this site, a drinking water source. The groundwater will be restored to levels consistent with state and Federal ARARs which will result in a cumulative excess cancer risk not to exceed 1 x 10^{-4}. Remediation levels will be attained throughout the contaminated plume.

3.1.6.1.2 Remedial Goals

3.1.6.1.2.1 Groundwater Cleanup Levels

Remedial Goals (RGs) selected in the ROD as site-specific cleanup levels for contaminated groundwater at FTLE-33 are federal MCLs for the following COCs: TCE, cis-1,2-DCE, and PCE. Table 3-2 lists the selected cleanup levels for the groundwater COCs at FTLE-33.

Table 3-2. Groundwater COCs and Cleanup Levels, FTLE-33

COCs	Groundwater Cleanup Level (µg/L)	Basis for Cleanup Level
Trichloroethene (TCE)	5	MCL
cis-1,2-Dichloroethene (cis-1,2-DCE)	70	MCL
Tetrachloroethene (PCE)	5	MCL

µg/L = micrograms per liter
MCL= Maximum Contaminant Level
COC = contaminant of concern
PCE = Tetrachloroethene
DCE = Dichloroethene
TCE = Trichloroethene

3.1.6.1.2.2 Surface Water Cleanup Levels

The 1990 ROD provided a site-specific cleanup level for TCE in surface water bodies receiving contaminated groundwater discharge associated with the FTLE-33 TCE plume. The cleanup level, based on the Ambient Water Quality Criteria (AWQC), was determined necessary due to the potential for future increases in surface water TCE concentrations resulting from the groundwater contamination.

Table 3-3 lists the selected cleanup levels for TCE in surface water associated with FTLE-33.

Table 3-3. Surface Water COCs and Cleanup Levels, FTLE-33

COCs	Surface Water Cleanup Level (µg/L)
Trichloroethene (TCE)	80

µg/L = micrograms per liter
COC = contaminant of concern
TCE = Trichloroethene

3.1.6.1.3 Remedy Description

The major components of the remedy selected for FTLE-33 in the 1990 ROD, and modified over the years, include installation of groundwater extraction/air stripping systems, source reduction actions (drum removal and in situ thermal treatment/enhanced bioremediation of source material), LUCs, and groundwater LTM. Subsequent ESDs and DDs provide explanation of modifications in the scope of the original remedy presented in the 1990 ROD.

The components specific to the 1990 ROD include the following:

- Install groundwater extraction wells capable of capturing the groundwater contaminant plume in the unconfined aquifer.

- Install on-site groundwater treatment facilities to remove contaminants from the collected groundwater.
- To expedite groundwater remediation, install groundwater extraction wells near areas of highest concentration of contaminants and discharge treated groundwater upgradient of these extraction wells to facilitate flushing secondary sources from the groundwater.
- Monitor the groundwater contaminant plume and the extraction/treatment system during groundwater remediation activities to ensure that both groundwater and surface water RGs are achieved.
- Implement administrative controls and ICs (herein referred to as LUCs) that supplement engineering controls and minimize exposure to releases of hazardous substances during remediation.
- Investigate the lower aquifer(s) to determine the presence of contamination and to evaluate the extent of contamination, if necessary. If contamination is found, a groundwater extraction system will be installed which is capable of capturing the contaminant plume with subsequent treatment of the extracted groundwater in the on-site treatment facility. The RGs specified for the unconfined aquifer will also apply to any contaminated lower aquifers.
- Perform confirmation soil sampling to ensure that all remaining sources of soil contamination have been identified and characterized.

The ESD completed in 1998 (USEPA, 1998) specified follow-on actions necessary to address the results of the investigations completed after the 1990 ROD. The 1998 ESD included the following major components and was based on new site characterization data; performance data on the existing P&T systems; new information on the effectiveness of P&T systems in general; and the study of availability of new and innovative treatment options at the time:

- Investigate LF-2 to determine the feasibility of conducting source control measures there.
- Continue O&M of the existing groundwater P&T systems and investigate/implement ways to improve the efficiency of those systems.
- Continue the groundwater monitoring program and enhance the monitoring program, as necessary. Monitoring wells screened across separate water-bearing units were to be decommissioned.
- Determine the full extent of the contaminant plume in the unconfined aquifer and improve the understanding of hydrological forces influencing plume migration through installing additional monitoring wells south of the I-5 extraction system, adding shallow and deep well pairs within the unconfined aquifer plume, and investigating the impact of irrigation practices at a nearby technical college.
- Modify the existing groundwater capture systems as necessary to ensure that the plume in the unconfined aquifer is fully contained, or implement alternate remedial measures as needed to mitigate the spread of contamination.
- Investigate new and innovative technologies to reduce the migration of or toxicity of the dissolved contaminant plume in the unconfined aquifer.
- Adjust remedial activities for the lower aquifer to ensure both short- and long-term protection of human health and the environment
- Comprehensively reassess the RA and the need for additional RA at the site, using the information gathered during the efforts listed above, by September 2000.

The 2000 DD was prepared for a Time-Critical Removal Action (TCRA) at LF-2. The TCRA was conducted to excavate and remove drummed hazardous waste in the vadose zone at LF-2. Wastes were buried in approximately 37 trenches and the TCRA resulted in excavation of the trenches to the water table and removal of the containerized waste and waste soil.

The 2002 DD presented an additional non-TCRA for LF-2. It was determined that groundwater RGs for FTLE-33 would not be met in a timely manner without removing dense non-aqueous phase liquid (DNAPL) source material. The TCRA presented the thermal remediation of DNAPL contamination, primarily TCE, in the vadose and saturated zones at LF-2. The 2002 DD presented the in-site thermal treatment of three discrete DNAPL areas within LF-2, as well as continuation of the P&T systems in the upper aquifer with due course optimization and implementation of innovative treatment technologies to address dissolved-phase TCE and small source areas remaining after the thermal treatment.

The 2006 DD selected a remedy to close the potential direct contact pathway at LF-2 for child trespassers and construction workers scenarios. The URS Risk Assessment Addendum (URS Corporation [URS], 2002) concluded that LF-2 soil could pose unacceptable risks and hazards to child trespassers playing in LF-2 soil and construction workers in direct contact with LF-2 soil. The remedy selected in the 2006 DD called for installation and maintenance of a perimeter fence around the landfill and implementing ICs to control land use.

The 2007 ESD was prepared to expand the FTLE-33 remedy in order to remove contamination identified in the deeper SLA during investigations conducted after the 1990 ROD. The selected alternative was to install a P&T system similar to the existing LF-2 and I-5 systems to extract and remove TCE concentrations from groundwater within the SLA.

The following LUC objectives were identified as part of the Logistics Center remedy to prevent exposure to contaminants remaining in the soil at LF-2 and exposure to contaminants within groundwater within the defined groundwater plume:

- Maintain boundary fencing and signs around the LF-2 boundary.
- Prevent residential land use and training access within the LF-2 boundary.
- Prevent unplanned excavation of contaminated soil within the LF-2 boundary.
- Prevent installation of drinking water wells within 1,000 ft of the Logistics Center site or facility boundary without a USEPA-approve monitoring plan.
- Annual notification to the Lakewood Water District that the Logistics Center should remain listed as possible source of contamination in its Wellhead Protection Program.
- Prevent residential land use above groundwater contamination in the upper Vashon aquifer area defined by the area within the 100 micrograms per liter (µg/L) TCE isoconcentration contour line.

The LUC objectives are achieved through maintenance of the following LUCs described in further detail in Section 2.5.1 and conducting annual inspections of the sites and interviews with the staff responsible for maintaining the LUC overlays and filling out LUC checklists:

- <u>Administrative LUCs</u> Maintain and update as needed the following LUC mechanisms: LUC Data Layer in GIS; LUC Overlay for RPMP; LUC Overlay for ERP; LUC Overlay for DPA; LUC Inclusion in ORRs; LUC Inclusion in WSPs; Installation Access.

- Physical LUCs Maintain the site boundary fencing & warning signs.

3.1.6.2 Remedy Implementation

Implementation of the remedy for the Logistics Center NPL site included two major components, source material removal and groundwater extraction/treatment. The source removal remedy at LF-2 included 1) the excavation of buried drums and contaminated soils, and 2) source area treatment using electro resistive heating for DNAPL removal. The excavation phase of source removal activities was completed in July 2001; source area treatment activities were completed in 2007.

The groundwater extraction/treatment portion of the selected remedy required the installation of three groundwater pump and treatment (P&T) systems. One system was installed to contain VOCs specifically around LF-2, the main source area (Figure 3-2). A second system was installed in the upper Vashon Aquifer along the western base boundary along I-5 to prevent TCE migration off-post (Figure 3-3).

As part of the 2007 ESD, a third system was installed in response to the discovery of TCE in the deeper SLA (Figure 3-4). The third system was necessary to prevent contamination in the SLA from migrating off-post. The SLA P&T (SLAPT) system was certified Operational and Functional in March 2010. All three P&T systems utilize air stripping for treatment of the VOC-contaminated groundwater before its reuse and/or reinjection. The completion of remedy construction activities for the Logistics Center NPL site was documented in the 2015 PCOR for the Logistics Center NPL site (USEPA, 2015).

Implementation of LUCs began in December 2007 and is ongoing through the mechanisms discussed in Section 2.5.1. LUC details presented in the 2017 LUC Plan are provided in Appendix E.

3.1.6.3 Operations and Maintenance

O&M activities at FTLE-33 include:

- Operation of the three P&T systems until groundwater is restored to beneficial use;
- Maintaining LUCs that prevent residential land use, training, and unplanned excavations; and
- Periodic groundwater and performance monitoring, system inspections/system O&M, and annual reporting of O&M and sampling activities.

The 2017 through 2021 O&M activities required for FTLE-33 were conducted in accordance with the Logistics Center P&T systems O&M manual including those prepared in 2017

(Sealaska, 2017b) and 2019 (EA, 2019d) and with the 2017 LUC plan (Sealaska, 2018a). Groundwater sampling was conducted in accordance with the Compliance Monitoring Plans prepared in 2016, (Sealaska, (2016a) in 2018 (2018e) and the Site-Specific QAPP prepared in 2018 (EA, 2018b).

3.1.6.3.1 Pump & Treat Systems

Documentation of the annual O&M of the three P&T systems at FTLE-33 was provided for review in the draft 2017, final 2018, draft-final 2019, draft-final 2020, and draft 2021 O&M annual reports (Sealaska, 2018c; EA, 2020a; EA, 2021a; EA, 2021c, EA, 2022e).

System Operation

The three P&T systems at the Logistics Center operate to extract contaminated groundwater from the Vashon and SLA systems and remove VOC concentrations from the groundwater to below cleanup levels through air stripping. As reported in the 2018 through 2021 O&M annual reports, the three Logistics Center P&T systems are designed to extract and treat a maximum combined groundwater flow rate of approximately 4,865 gallons per minute (gpm). Actual average total flow rates reported for the three P&T systems from data available for review during this FYR period are shown in Table 3-4.

Table 3-4. Average Extraction Well Flow Rates, LF-2, I-5, and SLAPT Systems

Design Total Flow Rate, All Pumping Wells (gpm)	Year	Average Total Flow, All Pumping Wells (gpm)
LF-2 System		
770	2018	519
	2019	477
	2020	503
	2021	389
I-5 System		
1,845	2018	1,304
	2019	1,157
	2020	1,309
	2021	1,212
SLAPT System		
2,250	2018	1,389
	2019	1,307
	2020	1,314
	2021	1,313

Notes: Flow rate represents average of rates when pumps were considered to be at optimum setting. Any downtime is not included in average.
gpm = gallons per minute SLAPT = Sea Level Aquifer Pump & Treat

System Maintenance

System maintenance tasks were implemented when the systems were brought online and are currently ongoing. O&M tasks at the LF-2 and I-5 P&T systems are performed by a JBLM Public Works contractor. Operation of the SLAPT system is managed by MAMC Facilities and Maintenance Department (FMD) personnel, although any repairs needed at the SLA system are performed by the JBLM Public Works contractor. All operational and performance information is presented for the previous year in an *Annual Operations and Maintenance Annual Report*, including discussions of system modifications, repair and maintenance activities, issues identified, and recommendations going forward. Annual O&M reports reviewed for this FYR report include the draft 2017 report, final 2018 and 2019 reports, draft-final 2020 report, and draft 2021 report.

Routine inspection and upkeep are required to sustain proper operating conditions, maintain equipment, evaluate maintenance requirements, and gather system data for reporting purposes. Routine O&M site visits are conducted on a weekly basis. Additional tasks are performed during monthly, quarterly, and semiannual inspections. The following routine O&M activities were performed during the reporting period at the LF-2, I-5, and SLAPT systems:

- Check well pump operations and conditions of extraction well houses and recorded finding. Data logged by the automated system controller and user interface are downloaded from the LF-2 and I-5 systems.
- System information and data logged from the SLAPT system are tabulated and emailed from the MAMC FMD operators to the Army contractor each month.
- Operations Log Sheets are completed each week and a logbook maintained to document system conditions and O&M activities.

System shutdowns, repairs, and maintenance activities completed during the review period for the three treatment systems, and the estimated production losses during these activities, are described in the RAM reports. A shutdown or system outage is defined as any pump or blower failure, or equipment being turned off for a maintenance activity lasting approximately 1 hour or longer.

System Optimization

From 2017 to 2018, an Optimization Review and Site Management Improvement Study (SMIS) were conducted for the Logistics Center P&T systems.

The Optimization Review (USEPA et. al., 2018) was conducted to evaluate the goals of the remedy, available site data, conceptual site model, remedy performance, protectiveness, cost-effectiveness, and closure strategy. Based on the results of the review, recommendations included:

- <u>Recommendations to Improve Protectiveness/Effectiveness</u>
    - Modify the air stripper discharge configuration for the SLA system to allow better dispersion of contaminant vapors from the stripper.
    - Conduct additional sampling of Murray Creek and Lynn Lake.
    - Improve capture under the I-5 system by strategic injection of treated water.
    - Assess capture of the northwest lobe of the SLA plume through installation of a deeper monitoring well near existing LC-166D.
- <u>Recommendations to More Quickly Attain Site Closure</u>
    - Intercept shallow plume before the contamination migrates to deeper SLA by installing new extraction wells upgradient of the "window" in the aquitard separating the shallow and deep aquifers. This would allow the more rapid restoration of the deeper SLA.
    - Improve capture at the LF-2 extraction system through the addition of multiple new extraction wells and more strategic placement of treated water injection

The SMIS was conducted with the following primary objectives:

1. Determine if the current LF-2 P&T system is meeting the RAO of plume capture.
2. Provide better delineation of the TCE plume; ongoing position/footprint, and migration.

3. Identify potential sources within LF-2 that could prevent the overall Logistics Center RA from being completed within a reasonable timeframe.
4. Evaluate and provide recommendations to the I-5 P&T system, LF-2 P&T system, and SLAPT system.
5. Update the LF-2 conceptual site model using historical and newly gathered information.
6. Present report which will assist in development of an exit strategy for RA at the Logistics Center.

The SMIS report (Sealaska, 2018b) presented the results of the study and provided recommendations as follows:

- Conceptual Site Model: Little surface water data is available to assess the groundwater/surface water interaction within the groundwater TCE footprint, which could lead to the discharge of TCE to surface water. Lynn Lake and Murray Creek in the vicinity of MAMC both have the potential to receive TCE-impacted groundwater when the water table is high in the winter months. Additional data is needed to assess the risk level associated with potential contact with these waters if contamination exists.
- Additional TCE Plume Delineation: The plume appears to be adequately characterized with the addition of the new monitoring wells. No additional groundwater TCE plume delineation is recommended at this time.
- Treatment System Improvements and Repairs: Improvements and repairs for the three P&T systems should be made to well pumps and electrical components.
- LF-2 Groundwater Capture: Additional LF-2 capture zone analysis was considered necessary and was conducted in Fall 2021 under Work Plan, LF-2 Aquifer Testing And Capture Zone Analysis, finalized in 2021 (EA, 2021b). The capture zone analysis report is currently in preparation.
- SLAPT System Plume Capture: Continued monitoring and trend analysis is recommended for well LC-101D-1. If the upward trend continues at the well, an additional monitoring well may be required between SLAP-1 and SLAP-2 to determine if TCE is escaping the extraction system.

3.1.6.3.2 Groundwater and System Performance Monitoring

The Logistics Center RAM program includes groundwater, surface water, and influent/effluent water sampling from the treatment systems, with the analysis of COCs that include TCE, cis-1,2-DCE, and PCE (TCA, and VC are considered COCs for sampling and analysis purposes, but RGs were not stated in the ROD for TCA and VC). Groundwater monitoring data have been collected at FTLE-33 since 1986. Under the RAM program, groundwater samples are collected annually or semiannually. Groundwater elevation data are also collected semiannually, once in the first quarter (wet season) and again in the third quarter (dry season). Objectives of the groundwater monitoring program are to verify that the plume remains hydraulically controlled and is not migrating beyond its current boundaries and to verify that progress is being made toward achieving the RAO.

Groundwater Monitoring

The Logistics Center groundwater monitoring well network was established to identify the extent of TCE contamination in groundwater and to monitor the three P&T systems' performance. The monitoring network includes:

- Resource protection monitoring wells screened in the upper Vashon, lower Vashon, and SLAs.
- Production wells (wells which may be used to provide water for drinking, heating, and/or cooling [not associated with a P&T system]) screened in the lower Vashon and SLAs.
- P&T system extraction wells screened in the upper Vashon and SLAs.
- Surface water sampling points located on the east side of the MAMC cooling system discharge pond and along Murray Creek south and west of the Logistics Center.

Sampling and analysis is accomplished in accordance with the groundwater monitoring plan that was approved at the time of the sampling event. Sampling at the Logistics Center was completed in 2017 in accordance with the 2016 Compliance Monitoring Plan (CMP) (Sealaska, 2016a). The 2018 sampling was completed in accordance with the 2017 updates to the CMP (Sealaska, 2018e). In 2019, 2020, and 2021, sampling was accomplished in accordance with the Site-Specific Quality Assurance Project Plan (QAPP) for Logistics Center RAs Operations and Performance Monitoring Activities (EA, 2018b).

Groundwater monitoring data reviewed for this FYR report are included in the 2017 through 2021 Annual RAM reports (Sealaska, 2018e, and EA, 2019a, 2020b, 2021f, and 2022e).

The most recent analytical results available for review for this FYR are further discussed in Section 3.1.8.1.

System Performance Monitoring

System performance monitoring includes analyses of treatment system operational information, including system component operation and performance, groundwater extraction rates, influent/effluent concentrations, and mass removal rates.

System performance data reviewed for this FYR report are included in the 2017 through 2021 O&M Annual Reports for the Logistics Center (Sealaska, 2018c and EA, 2020a, 2021a, 2022a, and 2022f).

The most recent system performance monitoring results available for review for this FYR are further discussed in Section 3.1.8.1.

3.1.6.3.3 LUC and Site Inspections

The FTLE-33 site and LUCs are monitored and inspected annually. Copies of the completed LUC inspection checklists are provided to the JBLM IRP Manager for submittal to the appropriate regulatory agencies, including Ecology and USEPA, as described in the LUC plan (Sealaska, 2018a). Copies of the LUC checklists completed during this FYR period are provided in Appendix E.

Annual inspections were performed at FTLE-33 during the 2017 to 2021 FYR review period to document that land use within the LUC boundary conforms to the LUC requirements and to identify any LUC deficiencies, violations, or inconsistencies. Documentation of the annual inspection activities was provided for review in the 2018, 2019, 2020 and 2021 LUCs Checklists (EA, 2019f; 2020d; 2022c; and 2022g). Annual inspections were reportedly performed in 2017, but no checklist was available for review. A monthly status report was provided stating that the 2017 inspections were conducted as part of the Environmental Remediation Program Services (Sealaska, 2017a).

No LUC deficiencies, violations, or inconsistencies were noted in 2018, 2019, 2020, or 2021 concerning restrictions on residential land use, construction/excavation activities, training activities within the LF-2 boundary, or installation of or plans for drinking water wells within 1,000 ft of the site. However, the 2018, 2019, and 2020 LUC checklists all state that LF-2 fencing needs maintenance/repair. Specifically, the 2018 checklist notes the fence near the LF-2 entrance was hit by a vehicle and needs repair. The 2019 checklist also noted a tree had fallen on the southwest portion of the LF-2 fencing. Likewise, a note in the 2020 checklist stated that a tree had fallen across the fence near Rainier Drive and Lincoln Road, breaching the cantonment fence (based on the location description, it is believed the note also refers to the LF-2 fence, possibly the same issue noted in the 2019 checklist). Repairs were made to the LF-2 fencing before the 2021 LUC inspection and the 2021 LUC checklist states the LF-2 fence and signage require no additional maintenance.

The 2021 LUC inspection report also noted that plans to replace contaminated and retired drinking water wells for the Cantonment Area are in place or are being investigated. No other issues were noted with LUCs at the Logistics Center site.

Interviews are also conducted with installation personnel as part of the annual site/LUC inspections to confirm that LUC requirements are available in the JBLM GIS and RPMP systems for real-time reference during land use planning, environmental reviews, construction and maintenance activities, and as part of the JBLM National Environmental Policy Act (NEPA) implementation. The interview portion of the LUC checklists was reviewed for the 2018 through 2021 checklists and confirms that the LUC information necessary for real-time reference remains available and current.

3.1.7 Progress Since the Last Five-Year Review

3.1.7.1 Protectiveness Statement From The Last Review

Protectiveness statements presented in the 2017 FYR were organized by OU rather than by individual sites. The protectiveness for OU01 was deferred in the 2017 FYR but was revised in a 2019 addendum. The original protectiveness statement along with the revised protectiveness statement are presented below.

Protectiveness statement for OU01 as presented in the 2017 FYR

> *A protectiveness determination for the OU1 – Logistics Center Remedy cannot be made at this time until further information is obtained. Further information will be obtained by taking the following action: an investigation and evaluation of the presence of PFASs within the three pump and treat systems at the Logistics Center. It is expected that this action will take approximately three years to complete, at which time a protectiveness determination will be made.*
>
> *The following elements of the remedy have ensured that RAOs are being met. LUCs prevent exposure to groundwater by restricting installation of new drinking water wells within the areal extent of the TCE groundwater plume inside the JBLM boundary. Existing LUCs are preventing exposure to soil by maintaining a fence with signs around the perimeter of LF-2 and restricting training activities and unauthorized digging and construction within LF-2. LUCs are preventing*

exposure by preventing residential land use at LF-2 or within the 100 µg/L groundwater isoconcentration contour. The I-5 and SLA P&T systems prevent migration of contaminated groundwater within the Upper Vashon, Lower Vashon, and SLA.

Additionally, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness: a thorough evaluation of whether the LF-2 system is providing complete capture of the plume in accordance with the RAOs through monitoring and capture zone analysis. If capture zone analysis shows lack of capture, pumping should be increased (through additional extraction well(s) and/or increased pumping).

At the Illicit PCB Dump Site, LUCs prevent exposure to contaminated soils by maintaining a fence with signs warning against unauthorized excavation and digging, restricting access, and ensuring the site is not used for training or residential land use. Maintenance of the cap also restricts exposure to contaminated soils.

At Landfill 1, LUCs are preventing exposure to groundwater and landfill wastes by restricting residential development, unplanned excavation, and installation of new drinking water wells within a 1,000 feet of the site boundary.

At the Battery Acid Pit, DRMO Yard, IWTP, and Pesticide Rinse Area, LUCs are preventing exposure to contaminated soils through maintenance of the asphalt cap and excavation and construction restrictions at the Battery Acid Pit and through prevention of residential land use at the Battery Acid Pit, DRMO Yard, IWTP, and the Pesticide Rinse Area.

Revised protectiveness statement for OU01 as presented in the 2019 Addendum

Based on new information and/or actions taken since the Five-Year Review completion date, the protectiveness statement for OU1 - Logistics Center Remedy is being revised to currently protective of human health and the environment because the sum of PFOS/PFOA was found to be below the current HAL of 70 ppt in the Landfill 2 source area wells and Landfill 2, I-5, and Sea Level Aquifer pump and treat system influent and effluent samples.

Although the 2019 Addendum does not identify specific issues affecting protectiveness, the protectiveness statement (currently protective) implies that issues affecting future protectiveness were identified. The protectiveness statement from the 2017 FYR indicates the following for FTLE-33:

Additionally, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness: a thorough evaluation of whether the LF-2 system is providing complete capture of the plume in accordance with the RAOs through monitoring and capture zone analysis. If capture zone analysis shows lack of capture, pumping should be increased (through additional extraction well(s) and/or increased pumping).

3.1.7.2 Status of Recommendations and Follow-Up Actions from Last Review

Table 3-5 lists the FTLE-33/OU01 issues presented in the 2017 FYR. The table summarizes the status of the recommendation and follow-up actions taken by the U.S. Army to address this issue.

Table 3-5. Actions Taken Since the Last Five-Year Review, FTLE-33/OU01

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Action Taken and Outcome	Date of Action
Issue Category: Changed Site Conditions Groundwater extraction and treatment systems may be intercepting groundwater containing PFAS. If present, reinjection may be redistributing PFAS, in some cases, in areas near the JBLM boundary.	Evaluate presence of PFAS at the Logistics Center through collection of water samples at Landfill 2 and the influent and effluent at three P&T systems (LF-2, I-5, and SLA).	U.S. Army	A PA/SI was completed to assess PFAS in groundwater at OU01, OU02, and OU03. Samples collected from source areas and treatment systems determined that PFAS at concentrations above the lifetime HA were not present in groundwater or in treated water intended for beneficial reuse or reinjection.	PA/SI report was finalized in August 2020. Preliminary data submitted as an addendum to the 2017 FYR was approved by USEPA in March 2019.
Issue Category: Remedy Performance System capture may not be complete and contaminants may be migrating beyond the Landfill 2 capture zone. Further information is needed to evaluate the Landfill 2 groundwater extraction and treatment system's capability to capture the TCE emanating from the Landfill.	Evaluate if the system is providing complete capture of the plume in accordance with the RAOs through monitoring and capture zone analysis. The evaluation strategy could include installation of additional wells downgradient of the wells of concern, capture zone analysis, and rehabilitation or replacement of PW-1.	U.S. Army	The SMIS reported the results of the LF-2 capture zone assessment and provided recommendations for optimization of the three OU01 P&T systems. Additional LF-2 capture zone analysis was completed in Fall 2021. The work was completed under the *Work Plan, Landfill 2 Aquifer Testing And Capture Zone Analysis*, finalized in 2021 (EA, 2021b).	February 2018 (Final Logistics Center SMIS Report issued)

FYR = Five-Year Review
HA = Health Advisory
JBLM = Joint Base Lewis-McChord
OU = Operable Unit
P&T = pump and treat
PA = Preliminary Assessment
PFAS = per- and polyfluoroalkyl substances
RAO = Remedial Action Objective
SI = Site Inspection
SLA = Sea Level Aquifer
SMIS = Site Management Improvement Study
TCE = trichloroethene
USEPA = United States Environmental Protection Agency

3.1.8 Five-Year Review Process

3.1.8.1 Data Review

Based on the data review, Table 3-6 summarizes the current status of COCs in groundwater at FTLE-33 that is summarized in more detail below.

Table 3-6. FTLE-33 Current Status of COCs in Groundwater

COC	RG (µg/L)	Maximum COC Concentration Detected in 2021 (µg/L)	Location of Maximum Detection	Number of Wells Where Concentration Exceeded the RG
Upper Vashon Aquifer				
TCE	5	210	LC-53	80
Lower Vashon Aquifer				
TCE	5	77	LC-237b	9
Sea Level Aquifer (SLA)				
TCE	5	75	LC-67D	25

µg/L = micrograms per liter COC = Contaminant of Concern RG = remedial goal TCE = trichloroethene
SLA = Sea Level Aquifer

The FYR process consists of a review and evaluation of data generated to evaluate the performance of the remedy. Groundwater monitoring data reviewed for this FYR report are included in the 2017 through 2021 Annual Logistics Center RAM reports (Sealaska, 2018e, 2020a, and 2021, and EA, 2022a and 2022e). System performance data (influent/effluent concentrations, mass removal data, etc.) review for this FYR report are included in the 2017 through 2021 O&M Annual reports (Sealaska, 2018c; EA, 2020a; EA, 2021a; EA, 2021c, EA, 2022f). Data reviewed from other reports related to changes in the monitoring program, P&T system operation, and optimization and site improvement studies are described in Section 3.1.6.3.1. Appendix G provides a summary of the analytical data, historic contaminant concentration graphs, statistical analyses, and system performance data from the most recent Draft 2021 Logistics Center RAM report (EA, 2022e) and the most recent Draft 2021 O&M Annual Report (EA, 2022f).

Based on the review of data as described below, progress has been made overall towards achieving the RAO identified in the ROD to restore the aquifer to its beneficial use through ongoing O&M of the three P&T systems, which exhibit hydraulic control on the areas of the contaminant plume within their influence and have reduced and/or stabilized concentrations of TCE that exceed the RG in all three aquifers. In addition, progress has been made to address the remedy performance issue identified in the previous FYR regarding the LF-2 capture zone (see Table 3-5) through conducting optimization and site improvement studies and implementing ongoing recommended improvements to the components of the P&T systems and additional source investigations (see Section 3.1.6.3.1). No further degradation of groundwater has occurred in the upper Vashon aquifer within or immediately downgradient of the LF-2 source area.

Summary of TCE Plume Status

Review of the 2017 through most recent 2021 groundwater sampling data provides the following information:

- In the most recent sampling event in 2021, TCE was the only COC detected at a concentration that exceeded the RG. In general, the highest TCE concentrations continue to be associated with the upper Vashon monitoring wells immediately downgradient of the LF-2 source area. However, in 2021, the highest TCE concentration detected in the upper Vashon aquifer (210 µg/L) was found in well LC-53, located approximately 2,000 feet west of the LF-2 source area. All other COCs in 2021 were not detected or were detected at concentrations below their RG/MCL.

- TCE was detected at concentrations exceeding the 5 µg/L RG in 80 of the 111 sampled upper Vashon wells, in 9 of the 24 sampled lower Vashon wells, and in 25 of the 66 sampled SLA wells.
- Source removal and treatment, ongoing groundwater P&T, and optimization of the P&T systems has significantly reduced concentrations of COCs in groundwater over time and hydraulic control of the plume has been achieved in all three impacted aquifers.
- The three P&T systems installed to extract and treat groundwater are all generally functioning as intended and continue to remove and treat groundwater with concentrations of COCs exceeding RGs and exhibit hydraulic control on the areas of the contaminant plume within their influence.
- Dissolved-phase TCE concentrations continue to form a laterally extensive contaminant plume in the upper and lower Vashon and SLA aquifers at concentrations above the RG; however, TCE has not migrated further to the northeast, in an off-post direction.
- No further degradation of groundwater has occurred in the upper Vashon aquifer within or immediately downgradient of the LF-2 source area.
- The extent of TCE contamination in the upper and lower Vashon aquifers has not significantly changed from 2017 to 2021. In the SLA, the downgradient extent of TCE concentrations that exceed the RG has been significantly reduced from 2017 to 2021.

Summary of Groundwater Monitoring Data

The results of the data review also indicate that, in order to make further progress towards achieving the RAO and optimize the P&T systems, the plume should be better defined in two areas, and additional plume capture analysis results in one of the P&T areas should be evaluated when they become available, as follows:

- The northwestern edge of the Lower Vashon aquifer plume is not well-defined downgradient of the I-5 P&T system.
- The northwestern edge of the Lower Vashon aquifer plume is not well defined near LC-41b.
- The LF 2 P&T system has not achieved complete capture of the downgradient portion of the plume.

In 2021, the lateral extent of the TCE groundwater plume was determined using data from the first quarter (wet season) of 2021 for each of the three monitored zones. TCE concentration contours are depicted, along with monitoring locations, in Figures 3-5 (upper Vashon), 3-6 (lower Vashon), and 3-7 (SLA). Tables providing the RAM program cumulative groundwater analytical and groundwater elevation data through 2020 are included in Appendix G, and trend analysis information from the 2021 Annual Logistics Center RAM Report are also included in Appendix G.

Groundwater samples were analyzed for the COCs identified in the 1990 ROD, which include TCE, cis-1,2-DCE, and PCE. Results for TCA and VC are included in the annual RAM reports as COCs, but RGs were not identified for those compounds in the 1990 ROD or subsequent remedy modifications. In the annual RAM reports, COCs are screened against their RGs for TCE (5 µg/L), cis-1,2-DCE (70 µg/L), and PCE (5 µg/L). TCA and VC are screened against their Federal MCLs, 200 µg/L and 2 µg/L, respectively.

A single surface water sample was collected in the first quarter of 2017 and analyzed for TCE, the only COC identified in the 1990 ROD for surface water. The result for cis-1,2-DCE was also reported in the 2017 annual RAM report as a COC, but an RG was not identified for that compound in the ROD or subsequent remedy modifications. TCE in surface water was screened against its 80 µg/L RG. No screening value for cis-1,2-DCE was provided in the 2017 RAM report. Neither TCE nor cis-1,2-DCE were detected in the 2017 surface water sample.

Groundwater elevation data collected semiannually from RAM program monitoring wells were used to generate groundwater potentiometric surface maps, depicting groundwater elevation contours through which groundwater flow direction is estimated. Groundwater in the Vashon aquifer flows generally to the northwest. Based on the available water level data, operation of the I-5 P&T system has altered groundwater flow in the Vashon aquifer to induce flow toward the system's extraction wells, LX-2 through LX-15. However, the hydraulic effect of the I-5 P&T system on the Vashon aquifer appears to be localized near the extraction wells and the infiltration system where treated groundwater is returned to the aquifer.

In the SLA, groundwater flow is generally to the northwest beneath the cantonment area, then to the west beneath the southwestern end of America Lake. Groundwater flow in the SLA has also been altered by SLAPT system extraction wells. The SLAPT system has drawn down water levels as much as 30 ft in wells nearest the system, including locations that are downgradient from the system. The change in groundwater elevations induced by the SLAPT system from 2009 to 2021 is depicted on Figure 8 in Appendix G. The 2021 groundwater elevation data and flow directions in the upper Vashon and SLAs are consistent with data included in the other annual RAM reports reviewed for this FYR report.

Summary of Current Trend Analysis and Plume Extent

Results of the trend analyses, data distribution histograms and graphs from the 2021 Annual RAM report are provided in Appendix G.

The trend analyses provide the following information summarized in more detail below:

Vicinity of LF-2 Source Area and P&T System

- In the vicinity of the LF-2 source area and P&T system, the TCE contaminant plume is generally stable; no statistically significant upward trends in TCE concentrations were identified in the Upper or Lower Vashon aquifers.
- The 2021 RAM report concludes that the few significant downward trends and TCE concentrations that continue to be well above the RG in wells immediately downgradient of LF-2 P&T extraction system possibly indicates remnant TCE in the source area or incomplete groundwater plume capture.

Vicinity of I-5 P&T System

- Wells downgradient of the I-5 P&T system show no statistically significant upward trends in TCE concentrations in the upper or lower Vashon aquifer; however, neither have there been significant decreases in TCE concentrations in wells located in the center of the plume downgradient of the I-5 system.
- The 2021 RAM report indicates that it is also possible that the TCE exceedances downgradient of the I-5 system are remnant contamination from before the system was started.

<u>Vicinity of SLA P&T System</u>

- Three wells exhibit statistically significant increasing TCE concentration trends.
- The downgradient SLA well closest to the SLAPT system (LC-98D-1) shows a statistically significant downward trend and the highest concentrations observed in the SLA are upgradient of the system.
- The 2020 RAM report concluded that it appears the TCE exceedances downgradient of the SLAPT system are associated with remnant TCE present before the system was started and contamination does not appear to be migrating around the extraction wells.

The documents available for review for this third FYR include O&M information and analytical data from monitoring events conducted from 2017 through 2021. Based on the reviewed information, the highest TCE concentrations continue to be associated with the Upper Vashon monitoring wells downgradient of the LF-2 source area. TCE concentrations over the past several years in monitoring locations within and immediately downgradient of the source area remain above the RG, even though the LF-2 P&T system is considered to be generally performing as designed. In the vicinity of the LF-2 source area and P&T system, the TCE contaminant plume is generally stable. No statistically significant upward trends in TCE concentrations were identified in upper or lower Vashon aquifer wells in the immediate vicinity of the LF-2 system. However, the 2020 RAM report concludes that the few significant downward trends and TCE concentrations that continue to be well above the RG in wells immediately downgradient of LF-2 P&T extraction system possibly indicates remnant TCE in the source area or incomplete groundwater plume capture. The recommendation is that system performance should continue to be evaluated on an annual basis to determine if system capture remains adequate to prevent migration of impacted groundwater, or if modification to system infrastructure or operating conditions is necessary to ensure that the remedy remains effective.

The I-5 P&T system is also considered to be generally performing as designed and the TCE plume remains hydraulically controlled in the vicinity of the system. Wells downgradient of the I-5 P&T system show no statistically significant upward trends in TCE concentrations in the upper or lower Vashon aquifer; however, neither have there been significant decreases in TCE concentrations in wells located in the center of the plume downgradient of the I-5 system. TCE concentrations in samples from upper and lower Vashon aquifer wells downgradient of the I-5 system remain above the RG. Elevated concentrations in lower Vashon wells near the western plume boundary downgradient of the I-5 system (LC-219 [consistently above 40 µg/L] and LC-237b [71 µg/L in Fall 2021]) possibly indicates incomplete plume capture in the lower Vashon aquifer (Figure 3-6). The 2021 annual RAM report indicates that it is also possible that the TCE exceedances downgradient of the I-5 system are remnant contamination from before the system was started.

The SLAPT system is also reportedly performing as designed and is reducing concentrations of TCE in the SLA downgradient of the system. However, TCE concentrations above the RG continue to be observed in several wells downgradient of the SLAPT system (Figure 3-7) and three wells exhibit statistically significant increasing TCE concentration trends (LC-91D [shallow and deep screened intervals] and LC-101D [only shallow screened interval – deep interval exhibits downward trend]). The downgradient SLA well closest to the SLAPT system (LC-98D-1) shows a statistically significant downward trend and the highest concentrations observed in the SLA are upgradient of the system. Although the downward trends in deep SLA wells located west of the SLAPT system are likely attributable to natural attenuation, the downward trends in monitoring wells adjacent to the SLAPT extraction wells likely indicates the system is directing contamination toward the extraction system and the plume is shrinking in the immediate area around the system. The 2021 RAM report concluded that it appears the TCE exceedances downgradient of the SLAPT system are associated with remnant TCE present before the system was started and contamination does not appear to be migrating around the extraction wells.

TCE concentrations continue to exceed the 1990 ROD RG in monitoring wells installed within the Vashon and sea level aquifers. TCE was not detected in the surface water sample collected in 2017 and surface water sampling was discontinued after 2017. The P&T systems installed to remove groundwater contamination associated with releases within the Logistics Center have successfully contained and even reduced the contaminant plume footprint, particularly in the downgradient SLA. However, the lack of substantial reduction in contaminant levels and even monitoring locations with upward concentration trends in downgradient monitoring locations indicates the remedy is unlikely to be successful in a timely manner. The LF-2 P&T system may allow plume escape between extraction wells (most likely between PW-1 and PW-4 where concentrations are highest) and/or around the eastern edge of the extraction system, which will undoubtedly prolong groundwater impacts at downgradient locations.

Summary of Treatment System Performance

Treatment system optimization and site improvement evaluations conducted in 2017 and 2018 are discussed in Section 3.1.6.3.1 and included the following recommendations which are being incorporated into the ongoing monitoring and O&M activities for FTLE-33:

- Treatment System Improvements and Repairs: Improvements and repairs for the three P&T systems should be made to well pumps and electrical components.
- LF-2 Groundwater Capture: Additional LF-2 capture zone analysis was considered necessary and was conducted in Fall 2021 (EA, 2022h) under Work Plan, LF-2 Aquifer Testing And Capture Zone Analysis, finalized in 2021 (EA, 2021b). The capture zone analysis report is currently in preparation.
- SLAPT System Plume Capture: Continued monitoring and trend analysis is recommended for well LC-101D-1. If the upward trend continues at the well, an additional monitoring well may be required between SLAP-1 and SLAP-2 to determine if TCE is escaping the extraction system. The three Logistics Center P&T systems are designed to extract and treat a maximum combined groundwater flow rate of approximately 4,755 gpm. The actual 2021 average total flow rate reported for the three P&T systems from data available for review during this FYR period was 2,914 gpm. Flow rates include times when individual wells were not operational (flow equals 0 gpm).

The following table provides a summary of the 2021 performance data including the estimated production losses resulting from various system shutdowns.

System	Volume Water Treated (Mgal)	TCE Removed (lbs)	Production Lost From Downtime (Mgal)
I-5	657	153	71.52
LF-2	262	52	119.6
SLAPT	692	69.4	0.79
Total	**1,611**	**274.4**	**191.9**

lbs = pounds mgal = Million gallons SLAPT = Sea Level Aquifer Pump and Treat
TCE = trichloroethene

Downtime at the I-5 system for planned maintenance and unplanned outages in 2020 resulted in lost production of approximately 28.62 million gallons (Mgal), compared to 15.25 gal of lost production in 2019. Four unplanned outages occurred in 2020. Downtime at the LF-2 system for planned maintenance and unplanned outages resulted in lost production of 19.97 Mgal in 2020, compared to approximately 1.7 Mgal of lost production in 2019.

Additional treatment system performance data is summarized as follows:

- Treatment System Volumes: Annual treatment system volumes during the review period ranged from 1,785 Mgal in 2017 to 1,541 Mgal in 2021. The reduction in annual treated volumes over the review period is attributed to unplanned downtime and the need for upgrades to the system components identified in the optimization and site improvement studies conducted in 2017 and 2018, and downtime experienced during optimization assessment activities.

- Mass Removal: Annual TCE mass removal during the review period ranged from 363 pounds in 2017 to 274.4 pounds in 2021. The reduction in TCE mass removal over the review period is attributed to unplanned downtime the need for upgrades to the system components identified in the optimization and site improvement studies conducted in 2017 and 2018, and downtime experienced during optimization assessment activities.

- Influent and Effluent Concentrations: Annual average treatment system influent and effluent TCE concentrations over the review period were similar. Annual average treatment system influent TCE concentrations during the review period ranged from 23, 30, and 15 µg/L for the LF-2, I-5, and SLAPT systems, respectively in 2017 to 28, 27, and 15 µg/L for the LF-2, I-5, and SLAPT systems, respectively in 2021. Average treatment system effluent TCE concentrations during the review period ranged from 0.15, 0.24, and 0.51 µg/L for the LF-2, I-5, and SLAPT systems, respectively in 2017 to 0.26, 0.32, and 0.59 µg/L for the LF-2, I-5, and SLAPT systems, respectively in 2021. Effluent TCE concentrations in treated water from the P&T systems met WA State discharge standards, and TCE concentrations in effluent air from all three air stripper treatment systems were below the WA State mass limits for TCE air emissions (EA, 2022f).

Conclusions

The following conclusions summarized below were made based on review of the 2017 through most recent 2021 groundwater sampling and treatment system performance data.

TCE Plume Status

- In the most recent sampling event in 2021, TCE was the only COC detected at a concentration that exceeded the RG. The highest TCE concentrations are typically associated with the Upper Vashon monitoring wells downgradient of the LF-2 source area although the highest TCE concentration detected in 2021 (210 µg/L) was detected 2,000 feet west of the LF-2 system.
- Dissolved-phase TCE concentrations continue to form a laterally extensive contaminant plume in the upper and lower Vashon and SLA aquifers at concentrations above the RG; however, TCE has not migrated further to the northeast, in an off-post direction.
- No further degradation of groundwater has occurred in the upper Vashon aquifer within or immediately downgradient of the LF-2 source area.
- The extent of TCE contamination in the upper and lower Vashon aquifers has not significantly changed from 2017 to 2021. In the SLA, the downgradient extent of TCE concentrations that exceed the RG has been significantly reduced from 2017 to 2021.

Plume Capture Assessment

- The northwestern edge of the Lower Vashon aquifer plume is not well-defined downgradient of the I-5 P&T system.
- The northwestern edge of the Lower Vashon aquifer plume is not well defined near LC-41b.
- The LF-22 P&T system has not achieved complete capture of the downgradient portion of the plume. Additional LF-2 capture zone analysis was considered necessary and was conducted in Fall 2021 under Work Plan, LF-2 Aquifer Testing And Capture Zone Analysis, finalized in 2021 (EA, 2021b). The capture zone analysis report is currently in preparation.

Treatment System Performance and Optimization

- Source removal and treatment, ongoing groundwater P&T, and optimization of the P&T systems has significantly reduced concentrations of COCs in groundwater over time and hydraulic control of the plume has been achieved in all three impacted aquifers; however, the downgradient portion of the LF-2 P&T system requires optimization to achieve complete capture.
- The three P&T systems installed to extract and treat groundwater are all generally functioning as intended and continue to remove and treat groundwater with concentrations of COCs exceeding and exhibit hydraulic control on the areas of the contaminant plume within their influence.
- Treatment system optimization and site improvement evaluations conducted in 2017 and 2018 included recommendations for treatment system improvements and repairs and capture zone analyses for the LF-2 and SLAPT systems, which are being incorporated into the ongoing monitoring and O&M activities.
- Annual treatment system volumes during the review period were similar, with some overall reduction attributed to unplanned downtime and the need for upgrades to the system components and downtime experienced during optimization assessment activities.

- Annual TCE mass removal amounts during the review period were similar, with some overall reduction attributed to unplanned downtime and the need for upgrades to the system components and downtime experienced during optimization assessment activities.
- Annual average treatment system influent and effluent TCE concentrations during the review period were similar. Effluent TCE concentrations in treated water from the P&T systems met WA State discharge standards, and TCE concentrations in effluent air from all three air stripper treatment systems were below the WA State mass limits for TCE air emissions (EA, 2022f).

The review of the 2017 through 2021 O&M, monitoring, and P&T system performance data conducted as part of this FYR found no evidence that would contradict the conclusions or recommendations presented in the monitoring reports and supporting documents including the SMIS. Ongoing O&M, monitoring, and optimization of the P&T systems as documented in the SMIS is supported by the data review performed for this FYR.

3.1.8.2 Site Inspection

The Site Inspection for FTLE-33 was conducted on 9 November 2021 and included inspection of the three P&T systems at the site, including the LF-2 System, I-5 System, and SLAPT System. Appendix C provides the detailed Site Inspection Trip Report and includes the inspection participants, FYR Site Inspection Checklists, and photographic log.

The systems were operational at the time of inspection and have operated for over 25 years, but are in need of upgrades, enhancements, and repairs to ensure optimum system performance. Specific recommendations for each system's maintenance needs were presented in the Draft 2021 O&M Annual Report (EA, 2022f). Repairs were completed to fencing around the LF-2 source area and documented in the 2021 Draft LUC inspection report (EA 2022g). Furthermore, a source zone investigation was initiated in January 2021, following the *Field Sampling Plan for the Landfill 2 Source Area Investigation* (EA, 2020c) with supplemental investigation conducted in September/October 2021 (Addendum to the Field Sampling Plan, September 2021). These activities were conducted following recommendations from the 2017 FYR and the Logistics Center Groundwater Monitoring program.

3.1.8.3 Interviews

As discussed in Section 1.3.5, interviews were conducted by email with parties with knowledge or awareness of the site, including regulatory agencies involved in site activities. The USEPA RPM, Mr. Patrick Hickey, responded to the FYR interview questionnaire. In addition to the general responses concerning the JBLM environmental program presented in Section 1.3.5, Mr. Hickey provided the following responses specific to the FTLE-33, Logistics Center site. Mr. Hickey indicated that, even though the remedy is functioning as expected, contaminant levels at the Logistic Center site, based on monitoring data and trend analyses, do not appear to be lowering. The complete interview records are included in Appendix D.

3.1.9 Technical Assessment

The technical assessment of the protectiveness of the remedy for FTLE-33 is based on the responses to these three questions:

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

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

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

3.1.9.1 Question A: Is The Remedy Functioning As Intended By The Decision Document?

Yes, the remedy at FTLE-33 is currently functioning as intended by the ROD based on review of documents, data, interviews, and site inspection.

The remedy includes groundwater extraction/air stripping systems for source reduction, LUCs, and groundwater and surface water LTM. The review indicates that LUC controls are being implemented, the site continues to be restricted to nonresidential use only and remains under government control, and the groundwater P&T systems are generally performing as designed. Based on the review of data, progress has been made overall towards achieving the RAO identified in the ROD to restore the aquifer to its beneficial use through ongoing O&M of the three P&T systems. The three P&T systems exhibit hydraulic control on the areas of the contaminant plume within their influence and have reduced and/or stabilized concentrations of TCE that exceed the RG in all three aquifers. In addition, progress has been made to address the remedy performance issue identified in the previous FYR regarding the LF-2 capture zone (see Table 3-5) through conducting optimization and site improvement studies and implementing ongoing recommended improvements to the components of the P&T systems and additional source investigations (see Section 3.1.6.3.1). No further degradation of groundwater has occurred in the upper Vashon aquifer within or immediately downgradient of the LF-2 source area.

3.1.9.2 Question B: Are The Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used At the Time Of The Remedy Selection Still Valid?

Yes. While there have been changes to exposure assumptions, toxicity data and cleanup levels since the remedy, these do not call the protectiveness of the remedy into question. The groundwater ARARs have not changed since the remedy. However, the surface water criterion for TCE was lowered but measured surface water concentrations are below lowered values; surface water sampling was discontinued after 2017. The RAO presented in the 1990 ROD (and not altered by a 1998 ESD, and DDs from 2000, 2002, and 2006) to restore drinking water to its beneficial use as a potential groundwater drinking source remains valid.

3.1.9.2.1 Changes in Standards and To-Be-Considereds (TBCs)

As shown on Table 1 in Appendix H, chemical specific ARARs for the groundwater COCs (TCE, cis-1,2-dichloroethene [DCE], and PCE) have not changed since the ROD, however, the surface water criteria for TCE has changed. The surface water RG of 80 µg/L for TCE is based on the human health AWQC for consumption of aquatic organisms only (this value is presented in the USEPA Quality Criteria for Water 1986; USEPA 440/5-86-001). The AWQC was updated in June 2015 to a value of 7 µg/L, which is based on a 10^{-6} risk level. The associated updated noncancer toxicity AWQC for TCE is 30 µg/L. The state freshwater human health criteria for consumption of organisms only (WAC 173-201A-240) for TCE is 0.86

µg/L, which is also based on a 10^{-6} risk level. The ROD RG is within the acceptable risk management range of 10^{-4} to 10^{-6} but exceeds the updated noncancer toxicity AWQC. As presented in the 2021 Annual RAM Report, the maximum detected TCE concentration in surface water samples collected 2005 to 2021 was 0.79 µg/L (SW-MC-08; 8/24/2012) and did not exceed these updated criteria. No surface water AWQC was provided in the ROD for cis-1,2-DCE; no updated AWQC is available for cis-1,2-DCE. Because TCE concentrations in surface water are below updated AWQC, this change does not call the protectiveness of the remedy into question.

The ROD required monitoring of TCA and VC, though no RGs were set for either parameter. Concentrations of TCA and VC detected in groundwater and surface water samples collected for remedial action monitoring are compared to their respective MCL (200 µg/L and 2 µg/L). The MCLs for TCA and VC have not changed. The current AWQC for TCA (200,000 µg/L) and VC (1.6 µg/L at 10^{-6} risk level) are similar to or greater than the MCLs, indicating that MCLs are also protective of surface water.

3.1.9.2.2 Changes in Exposure Pathways

There have been no changes in the exposure pathways at the site since the implementation of the remedy and LUCs implement the ICs established in the remedy through the mechanisms discussed in Section 2.5.1. Thus, the RAOs at the time the remedy was selected are still valid. However, there have been changes to how the vapor intrusion (VI) pathway is evaluated.

Vapor Intrusion

The 2002 Human Health Risk Assessment (HHRA) Addendum evaluated the VI pathway into buildings using the USEPA Johnson and Ettinger model (JEM) to calculate indoor air concentrations from groundwater concentrations. The HHRA used groundwater data from upper aquifer wells LC-137A and LC-137B to assess risk to workers exposed to chemicals in indoor air in buildings at the Logistics Center and data from wells in the immediate vicinity of the Madigan Family Housing Area to assess risk to the residential area. An indoor air study was conducted in September 2007 (KTA, 2007) at the Madigan Housing Area. The results indicated that neither TCE nor DCE represent an unacceptable risk to indoor receptors, although the VI pathway into indoor air was apparently complete. Risks associated at the time were considered acceptable.

However, TCE toxicity criteria were updated by USEPA in 2011. The maximum detected concentration of TCE during this residential study was 1.3 micrograms per cubic meter (µg/m^3), which is compared to the May 2022 residential indoor air RSLs in the table below. This concentration falls within the acceptable cancer risk range and below the noncancer RSL.

A VI study was conducted in 2016 (Versar, Inc, 2016), and indoor air sampling was conducted in six buildings located above the plume where historically the highest concentrations of TCE have been detected. Indoor air samples were collected from six buildings with TCE concentrations reported below a target risk concentration of 3 µg/m^3. The 2016 study concluded that VI does not pose an unacceptable risk of human exposure to TCE vapors within the buildings. However, one indoor air sample collected from the cubicle area of Building 9669 had a reported TCE concentration of 1.6 µg/m^3. This detected concentration of TCE is compared to the May 2022 industrial indoor air RSLs in Table 3-7, below. This concentration falls below the cancer and noncancer RSLs.

Table 3-7. TCE in Indoor Air Results, FTLE-33

TCE Indoor Air Result (µg/m³)	May 2022 Indoor Air RSL (µg/m³)[1]	
	Cancer (TR = 1E-6 to 1E-04)	Noncancer (THQ =1)
2007 VI Study; Madigan Family Housing Area (KTA, 2007)		
1.3	0.48 – 48	2.1
2016 VI Study; Logistics Center Buildings (Versar, 2016)		
1.6	3 – 300	8.8

[1] Madigan Housing Area Study results compared to residential RSL; Logistics Center Building results compared to industrial RSL
µg/m3 = micrograms per cubic meter RSL = Regional Screening Level

The most recent (2021) reported maximum detected concentration of TCE in groundwater (21 µg/L, LC-218) for monitoring wells closest to the Madigan Housing Area (FL-1; FL-4b; LC-178; LC-218; LC-222; LC-223; LC-224; LC231; LC232) is compared to the maximum 2007 concentration of 39 µg/L to assess current conditions. Groundwater concentrations of TCE have decreased since the 2007 sampling event, indicating that VI likely does not represent an unacceptable risk to residential receptors at the Madigan Housing Area under current conditions. In addition, the 2021 annual monitoring report indicates TCE datasets for wells within the Madigan Housing Area exhibit statistically significant downward trends or no trends.

In 2021, the maximum concentrations of TCE continued to be measured in samples from wells located cross gradient (e.g., LC-53 [210 ug/L]) or immediately downgradient (e.g., LC-137b [110 µg/L]) of the LF-2 system extraction wells. Well LC-137b (LC-53 during the 2021 annual groundwater monitoring. is located in the center of the Upper Vashon aquifer TCE plume between the LF-2 and I-5 P&T systems and was used to assess VI risk to workers at the nearby Logistics Center in the 2002 HHRA Update. In comparison, the maximum concentration of TCE in this well during 2016 was 200 µg/L, and the 2021 annual monitoring report indicates the TCE datasets for monitoring well LC-137b exhibit a statistically significant downward trend and data for monitoring well LC-53 had no trend. As groundwater concentrations of TCE in proximity of the Logistics Center are decreasing, VI likely does not represent an unacceptable risk to industrial receptors under current conditions.

Emerging Chemicals

The likelihood of emerging chemicals being present at the site has been considered for the LF-2 plume. The 2nd FYR indicates monitoring for 1,4-dioxane was conducted at the Logistics Center in 2004 and 2005. USEPA considers 1,4-dioxane as a likely contaminant at many sites contaminated with certain chlorinated solvents because of its widespread use as a stabilizer for chlorinated solvents. Results were below the practical quantitation limit (PQL) of 5 µg/L according to the previous FYR; however, the data were unavailable for this review. The July 2021 MTCA Method B limit is 0.44 µg/L, which is based on a 10^{-6} cancer risk. The corresponding risk of a detection at 5 µg/L was evaluated using the USEPA RSL on-line calculator for a residential tap water use scenario. The cancer risks from 1,4-dioxane occurring at the PQL is $1.1x10^{-5}$, which falls well within the "acceptable" cancer risk range and the hazard quotient is 0.088, which is below the noncancer threshold of 1. Therefore, 1,4-dioxane if present below the PQL would not call the protectiveness of the remedy into question.

The presence of PFAS at or near the Logistics Center LF-2 was evaluated in 2020 due to the potential for disposal of PFAS containing waste. The P&T system has the potential to intercept groundwater containing PFAS, whether a result of historical contamination associated with the CERCLA sites or broader PFAS contamination at JBLM and redistribute PFOS and PFOA in groundwater from potential upgradient sources. The previous FYR recommended sampling because the treatment system is not configured to adequately treat PFAS prior to discharging, and thus, determined the protectiveness of the remedy may be affected if PFAS is presented above the lifetime HAs. The 2020 PA/SI indicated that PFOS and PFOA were not measured at concentrations greater than 40 ppt in any of the eight groundwater samples from existing monitoring wells and an influent and effluent sample from three operating remediation systems. Based on these results, it was determined that further evaluation of the groundwater associated with the Logistics Center LF-2 (AOPI – 11) was not warranted. As shown on Table 3 in Appendix H, the current USEPA tapwater RSL for PFOS (40 ppt), PFOA (40 ppt) and PFBS (40,000 ppt) applied in the 2020 PA/SI have, been reduced to 4 ppt for PFOS, 6 ppt for PFOA, and 600 ppt for PFBS. The maximum concentration of PFOS (31 ppt) and the maximum concentration of PFOA (10 ppt) in LF-2 exceed the current (May 2022) RSL. The maximum concentration of PFBS in LF-2 was 3.0 ppt, which does not exceed the current RSL. In addition, the USEPA (May 2022) provided RSLs for two additional compounds (Perfluorohexanesulfonic acid [PFHxS] and perfluorononanoic acid [PFNA]) that were analyzed for during the PA/SI. The maximum concentrations of PFHxS (20 ppt) and PFNA (3 ppt) do not exceed the RSLs of 39 ppt for PFHxS and 5.9 ppt for PFNA. The PFAS compounds exceeding RSLs were considered in the risk assessment process through the calculation of site specific noncancer hazard index (Table 3 in Appendix H). The individual chemical HQ for each PFAS compound and the total hazard index for the PFAS compounds do not exceed the threshold of one. Therefore, the presence of PFAS in groundwater at the Logistics Center LF-2 does not call the protectiveness of the remedy into question.

3.1.9.2.3 Changes in Toxicity, and Other Contaminant Characteristics

A number of changes in toxicity data have taken place since the risk assessment was performed for the Logistics Center.

- The toxicity data for the COCs was updated in the USEPA Integrated Risk Information System (IRIS) as shown in Table 2 in Appendix H.
- USEPA has also concluded that TCE and VC are carcinogenic by a mutagenic mode of action, and currently applies age-dependent adjustment factors (ADAFs) when assessing risk associated with early-life exposure.

While risk-based screening levels have changed due to changes in toxicity data, they do not call the protectiveness of the remedy into question because the ARAR based RGs and monitoring levels for TCE, cis-1,2-DCE, PCE, TCA, and VC are based on Federal MCLs that have not changed since the implementation of the remedy, as shown in Table 1 in Appendix H. Therefore, the changes in toxicity data do not change the protectiveness of the remedy.

3.1.9.2.4 Changes in Risk Assessment Methods

A number of changes in risk assessment methods have taken place since the risk assessment was performed for the Logistics Center.

- The default exposure parameters for residential and industrial land use have changed since the implementation of the remedy.
- USEPA no longer recommends using inhalation toxicity values that are derived from oral data (i.e., no longer using inhalation slope factor [SFi] or inhalation reference doses [RfDi]). Inhalation toxicity values are currently presented as inhalation unit risk for cancer risks and reference concentrations for non-cancer hazards. No inhalation toxicity data is currently available for cis-1,2-DCE.

While risk-based screening levels have changed due to changes in risk assessment methods, they do not call the protectiveness of the remedy into question because the ARAR based RGs and monitoring levels for TCE, cis-1,2-DCE, PCE, TCA, and VC are based on Federal MCLs that have not changed since the implementation of the remedy, as shown in Table 1 in Appendix H. Therefore, the changes in risk assessment methods do not change the protectiveness of the remedy.

3.1.9.2.5 Expected Progress Toward Meeting RAOs

Progress has been made during the five years covered by this FYR toward restoring groundwater to its beneficial, drinking water use. The groundwater P&T systems installed as the remedy for FTLE-33 have been successful at maintaining the extent of contaminated groundwater in the upper and lower Vashon aquifer and reducing the downgradient extent in the SLA, and concentrations of COCs in groundwater have been significantly reduced since operation of the P&T systems began. However, in the short term, TCE concentrations continue to exceed the RG in all three monitored zones in areas that are downgradient of the treatment systems and analysis of available data indicates that significant contaminant level reduction is unlikely to occur under current conditions. P&T system optimization recommendations described in Section 3.1.6.3.1 are being incorporated to improve progress towards meeting RAOs in the long term. Additional LF-2 capture zone analysis was considered necessary and was conducted in Fall 2021 under Work Plan, LF-2 Aquifer Testing And Capture Zone Analysis, finalized in 2021 (EA, 2021b). The capture zone analysis report is currently in preparation.

3.1.9.3 Question C: Has Any Other Information Come To Light That Could Call Into Question The Protectiveness of the Remedy

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

3.1.10 Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. The northwestern edge of the lower Vashon aquifer plume is not well-defined downgradient of the I-5 P&T system. Currently, LC-237b is located on the edge of the monitoring network and had the highest TCE concentration of any lower Vashon aquifer monitoring well in 2020 and 2021.	N	Y
2. The northwestern edge of the lower Vashon aquifer plume is not well defined near LC-41b.	N	Y
3. Groundwater contaminated with TCE at concentrations significantly exceeding the RG is bypassing the existing LF-2 treatment systems such that upgradient TCE concentrations continue to impact downgradient areas.	N	Y

µg/L = micrograms per liter N = No P&T = Point & Treat RG = Remedial Goal
TCE = trichloroethene Y = Yes

3.1.11 Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1.	Install additional well or wells in the lower Vashon aquifer to the northwest of existing well LC-237b to completely define the lower Vashon plume boundary in that area.	U.S Army	USEPA	28 September 2026	N	Y
2.	Install additional well or wells to the northwest or southeast of existing well LC-41b for the purpose of defining the northwestern edge of the lower Vashon aquifer plume.	U.S Army	USEPA	28 September 2026	N	Y
3.	Complete a plume capture assessment to provide a comprehensive understanding of hydrogeologic conditions beneath the LF-2 area and, based on that understanding, optimize the LF-2 P&T system and associated monitoring network so that the contaminant plume beneath the LF-2 P&T system is completely contained.	U.S Army	USEPA	28 September 2026	N	Y

P&T = Point & Treat N = No USEPA = United States Environmental Protection Agency Y = Yes

3.1.12 FTLE-33 Protectiveness Statement

The remedy at the FTLE-33, Logistics Center currently protects human health and the environment. Potential exposures have been addressed through ongoing groundwater extraction and treatment (i.e., P&T), the implementation and maintenance of appropriate LUCs that restrict access to known source areas at the site, restrict the site to industrial or administrative use, prevent unplanned excavation of contaminated soil, and prevent new drinking water wells without a USEPA-approved monitoring plan. Ongoing operations and optimization of the P&T systems and groundwater LTM and reporting ensure that continuing progress towards achieving the RAO is being made by providing data that confirm the concentrations and extent of COCs and monitor the treatment system performance in accordance with the current system O&M and LTM monitoring plans for the site. However, for the remedy to be protective in the long term, additional monitoring wells must be installed to define and monitor the full extent of the groundwater plume and optimization of existing treatment systems must be accomplished to fully capture upgradient TCE concentrations in groundwater that significantly exceed the RG and continue to impact downgradient areas.

3.2 FTLE–46 (ILLICIT POLYCHLORINATED BIPHENYLS DUMP SITE)

3.2.1 Site Description

The Illicit PCB Dump site (FTLE-46; HQAES Site ID 53465.1029) encompasses approximately 1.4 acres and is located in a remote wooded area of the operational range area in Training Area 11 (Figure 3-8). This area was part of the West Sterling Timber Sale Area and is approximately eight miles east of the JBLM Main Cantonment Area. The current and anticipated future land use at the site is restricted within the JBLM operational range area.

3.2.2 Site Chronology

The chronology of key events for FTLE–46 is provided in Table 3-8.

Table 3-8. Chronology of Site Events

Event	Date
Interim Removal Action: Soil removal, cap, and fence installation	1983-1984
RIs	1994
GW	1994-2000
DD	2000
FYRs	2002, 2007, 2012, and 2017
DD to obtain USEPA concurrence (Needed because 2000 DD was contingent upon results of additional groundwater monitoring)	2006
Implementation of LUCs	2008
Annual LUC Inspections	2011-2021
PCOR (documents Operational and Functional)	2015
Comprehensive LUCs Plan	2018

DD = Decision Document GW = Groundwater Monitoring FYR = Five-Year Review
LUC = Land Use Control PCOR = Preliminary Close Out Report RI = Remedial Investigation
USEPA = United States Environmental Protection Agency

3.2.3 History of Contamination

In 1983, an unauthorized dump site was identified in a vegetated area and along a gravel road. PCBs and trichlorobenzene were identified during an initial investigation.

3.2.4 Initial Response

An emergency removal action was conducted in 1983 as an initial response to the identified PCB contamination. Approximately 1,869 tons of PCB contaminated soils were excavated from areas where reported concentrations exceeded 50 milligrams per kilogram (mg/kg) total PCBs, the established cleanup level recommended by Ecology. The 50 mg/kg total PCBs requirement was met with the exception of two small areas where soils with PCB concentrations of 280 and 390 mg/kg were not removed (Pacific Northwest National Laboratory [PNNL], 2000). As part of the initial response, a two to three ft thick, low-permeability clay cap was installed after the removal action to prevent leaching of the contaminants left at FTLE-46 and, in 1984, a perimeter fence was constructed around the capped area to restrict access to the site.

In 1990, an IAG (USEPA, 1990) between the Army, USEPA and Ecology was signed to address sites at the Fort Lewis Army Base that were suspected of having environmental contamination, including the Illicit PCB Dump site.

3.2.5 Basis For Taking Action

PCBs were left in place at FTLE-46 at concentrations above the Initial Response cleanup level of 50 mg/kg recommended by Ecology, forming the basis for taking action.

3.2.6 Remedial Action

3.2.6.1 Remedy Selection

The selected remedy for the Illicit PCB Dump site (FTLE-46) is documented in the following DDs:

- *Decision Document for the Storm Water Outfalls/Industrial Wastewater Treatment Plant, Pesticide Rinse Area, Old Fire Fighting Training Pit, Illicit PCB Dump Site, and the Battery Acid Pit. Fort Lewis, Washington,* published December 2000.
- *Decision Document for Selected Remedy, Illicit PCB Dump Site, Fort Lewis, Washington,* signed May 1, 2006a.

3.2.6.1.1 Remedial Action Objectives

The RAO stated in the 2006 DD is:

- Prevent unacceptable risks via direct contact with soil by future residents or excavation workers.

3.2.6.1.2 Remedial Goals

No RGs were established for the selected remedy.

3.2.6.1.3 Remedy Description

The following LUC objectives were identified as part of the remedy selected for FTLE-46 in the 2000 DD (PNNL) to prevent exposure to contaminants remaining in the soil:

- Prevent residential land use.
- Prevent unplanned excavation of contaminated soil.
- Prevent training access.
- Maintain boundary fence and signs.
- Maintain clay cap.

The LUC objectives are achieved through maintenance of the following LUCs described in further detail in Section 2.5.1 and conducting annual inspections of the sites and interviews with the staff responsible for maintaining the LUC overlays and filling out LUC checklists:

- Administrative LUCs Maintain and update as needed the following LUC mechanisms: LUC Data Layer in GIS; LUC Overlay for RPMP; LUC Overlay for ERP; LUC Overlay for DPA; LUC Inclusion in ORRs; Installation Access.
- Physical LUCs Maintain the site boundary fencing & warning signs; maintain the clay cap.

The 2006 DD (Fort Lewis, 2006a) was prepared to finalize the remedy selected in the 2000 DD because the remedy presented in 2000 was contingent upon additional groundwater monitoring data to confirm that the leaching to groundwater pathway was incomplete.

The selected remedy for FTLE-46 establishes protection of human health and the environment through the maintenance of the cap and fencing at the site and implementation of LUCs that prevent use of the site for residential purposes, unplanned excavation of contaminated soil, and access to the site for training purposes. The LUC boundaries for FTLE-46 are provided on Figure 3-9.

3.2.6.2 Remedy Implementation

LUC implementation at FTLE-46 began in December 2007 and is ongoing in accordance with the 2017 Comprehensive LUCs Plan (Sealaska, 2018a). The LUCs are to be implemented within the LUC boundary shown in Figure 3-9, as provided in the 2017 LUC Plan. LUCs are implemented through the mechanisms discussed in Section 2.5.1. LUC details presented in the 2017 LUC Plan are provided in Appendix E.

3.2.6.3 Operations and Maintenance

The 2017 through 2021 O&M activities required for FTLE-46 were conducted in accordance with the 2017 LUC Plan (Sealaska, 2018a). O&M activities include conducting annual LUC inspection to assess the condition of the site and identify needed maintenance or repairs.

LUC and Site Inspections

The FTLE-46 site and LUCs are monitored and inspected annually. Copies of the completed LUC inspection checklists are provided to the JBLM IRP Manager for submittal to the appropriate regulatory agencies, including Ecology and USEPA, as described in the LUC plan (Sealaska, 2018a). Copies of the LUC checklists completed during this FYR period are provided in Appendix E.

Annual inspections were performed at FTLE-46 during the 2017 to 2021 FYR review period to verify that prohibited land use has not occurred within the LUC boundary including residential development, excavation activities, or recent training activities. Inspection of the fencing and the clay cap is also required to document the condition of those remedy elements and determine maintenance needs. According to the 2019 Installation Action Plan (IAP), upkeep of the cap is performed by base personnel as part of normal roads and grounds maintenance (JBLM, 2019).

Documentation of the annual inspection activities was provided for review in the 2018, 2019, 2020, and 2021LUCs Checklists (EA, 2019f; 2020d; 2022c, 2022g). An annual inspection was reportedly performed in 2017 but no checklist was available for review. A monthly status report was provided stating that the

2017 inspections were conducted as part of the Environmental Remediation Program Services (Sealaska, 2017a).

Interviews are also conducted with installation personnel as part of the annual site/LUC inspections to confirm that LUC requirements are available in the JBLM GIS and RPMP systems for real-time reference during land use planning, environmental reviews, construction and maintenance activities, and as part of the JBLM NEPA implementation. The interview portion of the LUC checklists was reviewed for the 2018 through 2021 checklists and confirms that the LUC information necessary for real-time reference remains available and current.

No maintenance issues were identified at FTLE-46 in the 2018 and 2019 LUC monitoring checklists, confirming that land use within the LUC boundary conformed to the LUC requirements and no LUC deficiencies, violations, or inconsistencies existed at FTLE-46 in 2018 and 2019. However, in the 2020 and 2021 issues were identified on the checklist. In 2020, a note written in Section D: Comments stated that "Illicit PCB Dump cap needs brush clearing. Fence needs new signs." In 2021, the responses to questions in Section A: Field Inspection concerning the FTLE-46 boundary fence and/or signs noted that the clay cap required maintenance and that "deep rooted vegetation" was growing on the clay cap.

3.2.7 Progress Since the Last Five-Year Review

3.2.7.1 Protectiveness Statement From The Last Review

Protectiveness statements presented in the 2017 FYR were organized by OU rather than by individual sites. The protectiveness for OU01 was deferred in the 2017 FYR but was revised in a 2019 addendum. The original protectiveness statement along with the revised protectiveness statement are presented below

Protectiveness statement for OU01 as presented in the 2017 FYR

> *A protectiveness determination for the OU1 – Logistics Center Remedy cannot be made at this time until further information is obtained. Further information will be obtained by taking the following action: an investigation and evaluation of the presence of PFASs within the three pump and treat systems at the Logistics Center. It is expected that this action will take approximately three years to complete, at which time a protectiveness determination will be made.*
>
> *The following elements of the remedy have ensured that RAOs are being met. LUCs prevent exposure to groundwater by restricting installation of new drinking water wells within the areal extent of the TCE groundwater plume inside the JBLM boundary. Existing LUCs are preventing exposure to soil by maintaining a fence with signs around the perimeter of LF-2 and restricting training activities and unauthorized digging and construction within LF-2. LUCs are preventing exposure by preventing residential land use at LF-2 or within the 100 µg/L groundwater isoconcentration contour. The I-5 and SLA P&T systems prevent migration of contaminated groundwater within the Upper Vashon, Lower Vashon, and SLA.*
>
> *Additionally, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness: a thorough evaluation of whether the LF-2 system is providing complete capture of the plume in accordance with the RAOs through monitoring and*

capture zone analysis. If capture zone analysis shows lack of capture, pumping should be increased (through additional extraction well(s) and/or increased pumping).

At the Illicit PCB Dump Site, LUCs prevent exposure to contaminated soils by maintaining a fence with signs warning against unauthorized excavation and digging, restricting access, and ensuring the site is not used for training or residential land use. Maintenance of the cap also restricts exposure to contaminated soils.

At Landfill 1, LUCs are preventing exposure to groundwater and landfill wastes by restricting residential development, unplanned excavation, and installation of new drinking water wells within a 1,000 feet of the site boundary.

At the Battery Acid Pit, DRMO Yard, IWTP, and Pesticide Rinse Area, LUCs are preventing exposure to contaminated soils through maintenance of the asphalt cap and excavation and construction restrictions at the Battery Acid Pit and through prevention of residential land use at the Battery Acid Pit, DRMO Yard, IWTP, and the Pesticide Rinse Area.

Revised protectiveness statement for OU01 as presented in the 2019 Addendum

Based on new information and/or actions taken since the Five-Year Review completion date, the protectiveness statement for OU1 - Logistics Center Remedy is being revised to currently protective of human health and the environment because the sum of PFOS/PFOA was found to be below the current HAL of 70 ppt in the Landfill 2 source area wells and Landfill 2, I-5, and Sea Level Aquifer pump and treat system influent and effluent samples.

3.2.7.2 Status of Recommendations and Follow-Up Actions from Last Review

No issues were identified during the second installation-wide FYR that affect the protectiveness of the remedy for FTLE-46.

3.2.8 Five-Year Review Process

3.2.8.1 Data Review

There is no data collection requirement for the site.

3.2.8.2 Site Inspection

As discussed in Section 1.3.4, the Site Inspection for FTLE-46 was conducted on 9 November 2021. The site is located in a remote portion of the JBLM operation range training area. The FTLE-46 remedy was noted to require a perimeter fence, ICs, and maintenance of a clay cap to prevent direct human contact with contaminated soils. The site inspection confirmed the presence of a fence around the site, with signage noting “CAUTION – Contaminated Soil, KEEP OUT”. Fencing and signage appeared to be in good shape. Access to the site is through a locked gate and access through the gate was not provided during the inspection; however, the site could be viewed through the fence. The area within the fence is heavily vegetated and access would be difficult even if the gate was unlocked. The cap is not being maintained and during the inspection, Mr. Lambiotte noted no mowing or maintenance occurs within the fenced area. The

Annual LUC Inspections available at the time of the site inspection indicate no issues with the cap, but failed to note overgrown vegetation across the cap that includes the growth of small saplings that could disrupt the cap's structure and undermine its integrity. Appendix C provides the detailed Site Inspection Trip Report and includes the inspection participants, FYR Site Inspection Checklists, and photographic log.

3.2.8.3 Interviews

As discussed in Section 1.3.5, interviews were conducted by email with parties with knowledge or awareness of the site conditions including regulatory agencies involved in site activities. The USEPA RPM, Mr. Patrick Hickey, responded to the FYR interview questionnaire that included FTLE-46 but had no specific comments regarding the site. The complete interview records are included in Appendix D.

3.2.9 Technical Assessment

The technical assessment of the protectiveness of the remedy for FTLE-46 is based on the responses to these three questions:

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

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

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

3.2.9.1 Question A: Is The Remedy Functioning As Intended By The Decision Document?

No, the review of documents and site inspection data indicate that the remedy at FTLE-46 is not functioning as intended by the DD.

The site continues to be restricted to nonresidential use only and remains under government control. Maintenance inspections are conducted annually and documents available for review during this FYR review period report that no residential land use is occurring or planned and that excavation of contaminated soil or training activities have not occurred. However, the FYR site inspection found that maintenance of the clay cap, which is a component of the remedy, has not occurred in recent years and vegetation is overgrown across the cap with the potential to disrupt the cap's structure, undermine its integrity, and affect future protectiveness.

3.2.9.2 Question B: Are The Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used At the Time Of The Remedy Selection Still Valid?

Yes, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. Thus, no changes have occurred that call into question the protectiveness of the remedy. Although no COCs or RGs were identified in the DD, the chemicals and media of concern discussed in the DD are discussed in Question B to assess the protectiveness of the remedy (i.e., LUC) in meeting the RAO.

3.2.9.2.1 Changes in Standards and To Be Considereds (TBCs)

While the 2000 DD and the 2006 DD did not identify ARARs, To-Be-Considereds (TBCs) or cleanup levels, PCBs in soil were cleaned up to an Ecology requirement of 50 mg/kg during the initial response (see

Section 3.2.4), with the exception of two small areas where soils with PCB concentrations of 280 and 390 mg/kg were not removed. The entire spill area was covered with a low-permeability clay and topsoil cap to prevent direct contact and leaching of the contaminants that were left at FTLE-46. The December 2000 DD prescribed four additional groundwater monitoring events to provide further confirmation that the potential leaching to groundwater is incomplete. Analytical results for PCBs and trichlorobenzenes were non-detect, as presented in the 2006 DD. The risk evaluation was not available for review; however, updated standards for PCBs and trichlorobenzenes are unlikely to affect the protectiveness. The detection limits for PCBs presented in the 2006 DD ranged from 0.0053 µg/L to 0.53 µg/L are at or below the federal MCL (40 C.F.R. 141.61) of 0.5 µg/L for PCBs. The detection limits for 1,2,4-trichlorobenzene (5 µg/L to 25 µg/L) are below the federal MCL (40 CFR. 141.61) for 1,2,4-trichlorobenzene (70 µg/L). The MCLs have not changed since the remedy. The soil cleanup level for PCBs presented in the DD is less than the July 2021 MTCA Method C industrial cleanup level of 66 mg/kg. Thus, the site does not pose an unacceptable risk or hazard under a restricted (industrial) land use.

3.2.9.2.2 Changes in Exposure Pathways

There have been no changes in the exposure pathways at the site since the implementation of the remedy and LUCs are being utilized to maintain the ICs established in the remedy. Thus, the RAO (prevent direct contact with contaminated soils) at the time the remedy was selected is still valid. However, the potential for VI to indoor air was not considered previously and is therefore evaluated below.

Vapor Intrusion

The VI pathway was not evaluated, and PCBs are characterized by USEPA (Vapor Intrusion Screening Level [VISL] On-line Calculator; https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator; last updated May 19, 2021) as being sufficiently volatile and toxic to pose an inhalation risk via VI from a soil source. However, this exposure pathway is incomplete because the site is capped and there are no buildings present.

3.2.9.2.3 Changes in Toxicity and Other Contaminant Characteristics

No COCs or RGs were identified in the DD for the Illicit PCB Dump Site, therefore no changes in toxicity or other contaminant characteristics were identified for FTLE-46.

3.2.9.2.4 Changes in Risk Assessment Methods

No COCs or RGs were identified in the DD for the Illicit PCB Dump Site; therefore, no changes in risk assessment methods were identified for FTLE-46.

3.2.9.2.5 Expected Progress Toward Meeting RAOs

The RAO identified in the 2006 DD is being met. The RAO to prevent unacceptable risks via direct contract with soil at the site is accomplished through maintaining government control of the site and restricting use of the site to nonresidential, preventing excavation of contaminated soil or training activities, and annual inspection of the site's cap and fencing. However, the apparent lack of maintenance of the cap was identified as an issue that could affect future protectiveness.

3.2.9.3 *Question C: Has Any Other Information Come To Light That Could Call Into Question The Protectiveness of the Remedy?*

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

3.2.10 Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. Required maintenance of the clay cap is not occurring which could compromise the integrity of the cap and allow exposure to the contaminated soil.	N	Y

N = No Y = Yes

3.2.11 Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1.	Schedule and perform cap maintenance on a routine basis to ensure protection of human health and the environment.	U.S. Army	USEPA	2023	N	Y

N = no USEPA = United States Environmental Protection Agency Y = Yes

3.2.12 FTLE-46 Protectiveness Statement

The remedy at FTLE-46, Illicit PCB Dump Site currently protects human health and the environment. Potential exposure at the site has been addressed through LUCs that protect human health within the site boundary by preventing residential land use, unplanned excavation of contaminated soil, site access for training purposes, and by maintaining a boundary fence and signage. However, for the remedy to be protective in the long term, maintenance of the clay cap must be conducted on a routine basis to ensure the integrity of the cap which is necessary to prevent direct contact with contaminated soil.

3.3 FTLE–54 (LANDFILL 1)

3.3.1 Site Description

The LF-1 site (FTLE-54; HQAES Site ID 53465.1034) is a former landfill site encompassing approximately 15 acres in the southern part of the Cantonment Area (Figure 3-10). The site was reportedly used for disposal of solid waste between 1946 and the early 1970s. The main portion of the former landfill site is currently unused but has unpaved roadways crossing the grass- and tree-covered area. Three former open pit dumping areas that lie outside the main landfill area are currently covered by buildings or asphalt and/or concrete parking areas. The current and anticipated future land use designated in the JBLM RPMP for the area including and surrounding LF-1 is industrial/maintenance. According to the 2017 FYR report (USACE, 2017), future land use for the site may include development of recreational ball fields.

3.3.2 Site Chronology

The chronology of key events for FTLE–54 is provided in Table 3-9.

Table 3-9. Chronology of Site Events

Event	Date
SI – Monitoring Well Installation	1984-1995
RFA	1986
Inclusion in the FFA	1990
Limited SI and follow-on Limited SI with SLRA	1990, 1994
Installation of additional monitoring wells	1995
Draft DD	2004
Final GW Plan	2004
DD signed	2006
Implementation of LUCs	2008
PCOR (documents Operational and Functional)	2015
FYRs	2002, 2007, 2012, and 2017
Annual LUC Inspections	2011 – 2021
Comprehensive LUCs Plan	2018

DD = Decision Document
FFA = Federal Facilities Agreement
FYR = Five-Year Review
GW = Groundwater Monitoring
LUC = Land Use Control
PCOR = Preliminary Close Out Report
RCRA = Resource Conservation and Recovery Act
RFA = RCRA Facility Assessment
SI = Site Investigation
SLRA = Screening Level Risk Assessment

3.3.3 History of Contamination

FTLE-54 is the site of a former landfill (LF-1) used for solid waste disposal for approximately 24 years. Historical landfill operations within the main cell of the landfill reportedly consisted of trench cut-and-fill operations in the northern portion between 1946 and 1951 and overbank dumping and surface dumping of construction debris in the southern portion from 1951 until the early 1970s. Burn pit/open-pit dumping likely occurred between 1946 and 1951 within three small areas to the west of the main cell. The closed landfill was investigated beginning in 1984 with the installation of monitoring wells around the landfill perimeter. Groundwater sampling identified low concentrations of TCE, cis- and trans-1,2-DCE, TCA, 1,2-dichloropropane (1,2-DCP), PCE, carbon tetrachloride, and chloroform; however, TCE is the only COC detected at a concentration that exceeded an MCL.

3.3.4 Initial Response

In 1990, an IAG (USEPA, 1990) between the Army, USEPA and Ecology was signed to address sites at the Fort Lewis Army Base that were suspected of having environmental contamination, including LF-1. There is no record of other initial response actions having been conducted at LF-1 prior to completion of the 2007 DD.

3.3.5 Basis For Taking Action

TCE was identified at concentrations that exceed the MTCA Method A cleanup level (5 µg/L, also the MCL), which formed the basis for taking action.

3.3.6 Remedial Action

3.3.6.1 Remedy Selection

The selected remedy for the LF-1 site (FTLE-54) is documented in the following DD:

- *Decision Document for Selected Remedy, Landfill 1, Fort Lewis, Washington*, signed May 1, 2006 (Fort Lewis, 2006a)

3.3.6.1.1 Remedial Action Objectives

The RAOs stated in the 2006 DD are:

- Prevent inhalation and ingestion by human and ecological receptors of the VOCs in groundwater beneath and surrounding the landfill.
- Prevent direct exposure to landfill wastes.

3.3.6.1.2 Remedial Goals

The RG selected as a site-specific cleanup level at FTLE-54 is the MTCA Method A cleanup level (equivalent to MCLs).

Table 3-10 lists the cleanup level selected for the groundwater COCs at FTLE-54.

Table 3-10. Groundwater COC and Cleanup Level, FTLE-54

COCs	Cleanup Level (µg/L)[1]
Trichloroethene (TCE)	5

[1] The cleanup level is the Model Toxics Control Act (MTCA) Method A clean up level (equivalent to Federal Maximum Contaminant Level).
µg/L = micrograms per liter COC = Contaminant of Concern TCE = trichloroethene

3.3.6.1.3 Remedy Description

The following LUC objectives and LTM activities were identified as part of the remedy selected for FTLE-54 in the 2006 DD (Fort Lewis, 2006b) to prevent exposure to contaminants remaining in the soil and groundwater:

- Implement land use planning within the landfill boundary.
- Implement LUCs on groundwater use to prevent the installation of new water supply wells within 1,000 ft of the landfill boundary without USEPA-approved monitoring plans.
- Conduct annual groundwater LTM as described in the 2004 LF-1 groundwater monitoring plan, as amended.
- Sample a select number of wells during years in which a FYR is not occurring (i.e., 2004 through 2006, 2008 through 2011, 2013 through 2016, etc.) and sample all 14 existing monitoring wells during years in which the FYR is occurring (i.e., 2017, 2022, etc.) The few select monitoring wells sampled during non-FYR years are to be those wells with VOC cleanup level exceedances and those with VOC concentrations slightly below the cleanup levels. The monitoring wells to be sampled during non-FYR years are to be re-evaluated and adjusted as necessary following each comprehensive LTM event conducted during a FYR year. In all cases, groundwater samples are to be analyzed for VOCs. Annual LTM is to continue until 1) all VOC concentrations are below MCLs for three consecutive years, or 2) until the year 2017, as long as VOC concentrations are stable or declining. Conducting LTM until 2017 represents 30 years of post-closure monitoring (a RCRA requirement for permitted landfills) since groundwater monitoring first started at LF-1 in 1988. If contaminant concentrations increase significantly in the future, then additional LTM beyond 2017 will be considered.

The LUC objectives are achieved through maintenance of the following LUCs described in further detail in Section 2.5.1 and conducting annual inspections of the sites and interviews with the staff responsible for maintaining the LUC overlays and filling out LUC checklists:

- <u>Administrative LUCs</u> Maintain and update as needed the following LUC mechanisms: LUC Data Layer in GIS; LUC Overlay for RPMP; LUC Overlay for ERP; LUC Overlay for DPA; LUC Inclusion in WSPs; Installation Access.

3.3.6.2 <u>Remedy Implementation</u>

Implementation of the remedy for the LF-1 site included two major components, groundwater LTM and IC implementation. Groundwater was sampled annually at LF-1 in select wells since 2002 (Sealaska, 2017c), and LTM as part of the selected remedy for FTLE-54 was conducted from June 2006 until March 2018. As reported in the 2018 Annual Groundwater Monitoring Report, as of the March 2018 sampling event, requirements for cessation of groundwater monitoring at LF-1, as specified in the 2006 DD, were met at all monitoring wells.

Implementation of the LUCs at LF-1 began in December 2007. As provided in the 2017 LUC Plan, LUCs are implemented through the mechanisms discussed in Section 2.5.1. LUC details presented in the 2017 LUC Plan are provided in Appendix E.

LUCs are monitored and inspected annually. Copies of the completed LUC inspection checklists are provided to the JBLM IRP Manager for submittal to the appropriate regulatory agencies, including Ecology and USEPA, as described in the LUC plan (Sealaska, 2018a).

3.3.6.3 Operations and Maintenance

The 2017 through 2021 O&M activities required for FTLE-54 were conducted in accordance with the 2017 LUC plan (Sealaska, 2018a) and with the 2017 LF-1 groundwater monitoring plan (Sealaska, 2017c). O&M activities include conducting groundwater monitoring to determine concentration of COCs in groundwater beneath the site and annual LUC inspections to assess the condition of the site and compliance with LUC requirements.

3.3.6.3.1 LUC and Site Inspections

The FTLE-54 site and LUCs are monitored and inspected annually. Copies of the completed LUC inspection checklists are provided to the JBLM IRP Manager for submittal to the appropriate regulatory agencies, including Ecology and USEPA, as described in the LUC plan (Sealaska, 2018a). Copies of the LUC checklists completed during this FYR period are provided in Appendix E.

Annual inspections were performed at FTLE-54 during the 2017 to 2021 FYR review period to verify that prohibited land use has not occurred within the LUC boundary (Figure 3-11) including residential development or excavation activities , or if any groundwater supply wells were installed within the 1,000-ft buffer around the landfill.

Documentation of the annual inspection activities was provided for review in the 2018, 2019, 2020, and 2021 LUCs Checklists (EA, 2019f; 2020d; 2022c, 2022g). An annual inspection was reportedly performed in 2017, but no checklists were available for review. A monthly status report was provided stating that the 2017 inspections were conducted as part of the Environmental Remediation Program Services (Sealaska, 2017a).

Interviews are also conducted with installation personnel as part of the annual site/LUC inspections to confirm that LUC/IC requirements are available in the JBLM GIS and RPMP systems for real-time reference during land use planning, environmental reviews, construction and maintenance activities, and as part of the JBLM NEPA implementation. The interview portion of the LUC checklists was reviewed for the 2018 through 2021 checklists and confirms that the LUC information necessary for real-time reference remains available and current.

No issues were identified at FTLE-54 in the final LUC monitoring checklist for 2021.

The 2018 through 2021 LUC inspection checklists indicated that land use within the LUC boundary conforms to the LUC requirements and no LUC deficiencies, violations, or inconsistencies were noted. Interviews conducted as part of the annual inspections confirmed that the LUC information necessary for real-time reference remains available through the JBLM GIS and RPMP systems and as part of the JBLM NEPA implementation.

3.3.6.3.2 Groundwater Monitoring

The groundwater LTM program at LF-1 was conducted from 2006 until 2018. The LTM program was discontinued after the 2018 sampling event as results were evaluated as having met the requirements stated in the 2006 DD:

- Groundwater monitoring will continue until 1) all VOC concentrations are below MCLs for three consecutive years, or 2) until the year 2017, as long as VOC concentrations are stable or declining.

When groundwater LTM at LF-1 began, sampling was conducted at 14 monitoring wells installed at the site. Samples were analyzed for VOCs, with TCE considered the primary COC with concentrations consistently slightly above the RG of 5 µg/L . Through the years, program optimization removed the wells that continued to show TCE concentrations below the RG from the program with USEPA approval. The annual LTM conducted in 2017 and 2018 included sampling four wells that remained in the LF-1 long-term sampling program (Figure 3-12). Samples from the four wells were collected using passive diffusion bags (PDBs), which were deployed at the end of the previous year's annual sampling event. All samples, including appropriate quality control samples, were analyzed for VOCs. Analytical results for the sampling events reviewed for this FYR are discussed in more detail in Section 3.3.8.1.

3.3.7 Progress Since the Last Five-Year Review

3.3.7.1 Protectiveness Statement From The Last Review

Protectiveness statements presented in the 2017 FYR were organized by OU rather than by individual sites. The protectiveness for OU01 was deferred in the 2017 FYR but was revised in a 2019 addendum. The original protectiveness statement along with the revised protectiveness statement are presented below.

Protectiveness statement for OU01 as presented in the 2017 FYR

> *A protectiveness determination for the OU1 – Logistics Center Remedy cannot be made at this time until further information is obtained. Further information will be obtained by taking the following action: an investigation and evaluation of the presence of PFASs within the three pump and treat systems at the Logistics Center. It is expected that this action will take approximately three years to complete, at which time a protectiveness determination will be made.*
>
> *The following elements of the remedy have ensured that RAOs are being met. LUCs prevent exposure to groundwater by restricting installation of new drinking water wells within the areal extent of the TCE groundwater plume inside the JBLM boundary. Existing LUCs are preventing exposure to soil by maintaining a fence with signs around the perimeter of LF-2 and restricting training activities and unauthorized digging and construction within LF-2. LUCs are preventing exposure by preventing residential land use at LF-2 or within the 100 µg/L groundwater isoconcentration contour. The I-5 and SLA P&T systems prevent migration of contaminated groundwater within the Upper Vashon, Lower Vashon, and SLA.*
>
> *Additionally, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness: a thorough evaluation of whether the LF-2 system is providing complete capture of the plume in accordance with the RAOs through monitoring and capture zone analysis. If capture zone analysis shows lack of capture, pumping should be increased (through additional extraction well(s) and/or increased pumping).*
>
> *At the Illicit PCB Dump Site, LUCs prevent exposure to contaminated soils by maintaining a fence with signs warning against unauthorized excavation and digging, restricting access, and ensuring the site is not used for training or residential land use. Maintenance of the cap also restricts exposure to contaminated soils.*

At Landfill 1, LUCs are preventing exposure to groundwater and landfill wastes by restricting residential development, unplanned excavation, and installation of new drinking water wells within a 1,000 feet of the site boundary.

At the Battery Acid Pit, DRMO Yard, IWTP, and Pesticide Rinse Area, LUCs are preventing exposure to contaminated soils through maintenance of the asphalt cap and excavation and construction restrictions at the Battery Acid Pit and through prevention of residential land use at the Battery Acid Pit, DRMO Yard, IWTP, and the Pesticide Rinse Area.

Revised protectiveness statement for OU01 as presented in the 2019 Addendum

Based on new information and/or actions taken since the Five-Year Review completion date, the protectiveness statement for OU1 - Logistics Center Remedy is being revised to currently protective of human health and the environment because the sum of PFOS/PFOA was found to be below the current HAL of 70 ppt in the Landfill 2 source area wells and Landfill 2, I-5, and Sea Level Aquifer pump and treat system influent and effluent samples.

3.3.7.2 Status of Recommendations and Follow-Up Actions from Last Review

No issues were identified during the second installation-wide FYR that affect the protectiveness of the remedy at FTLE-54.

3.3.8 Five-Year Review Process

3.3.8.1 Data Review

The FYR process consists of a review and evaluation of data generated in relation to the remedy objectives.

The results of the data review indicate the RAO established in the ROD to prevent inhalation and ingestion by human and ecological receptors of the VOCs in groundwater beneath and surrounding the landfill by achieving the RG throughout the contaminated plume, as follows:

- The LTM program at LF-1 was completed with the March 2018 sampling event because groundwater results were evaluated as having met the requirements for discontinuing LTM as stated in the 2006 DD.
- In 2017 and 2018, LTM groundwater samples were collected from the four LF-1 monitoring wells that remain in the LTM monitoring program, and only TCE was detected slightly above its RG in one of the wells in the downgradient direction at the eastern site boundary.
- TCE is typically not detected in samples from other LF-1 monitoring wells.
- Concentrations of TCE in other wells and all other constituents detected in the 2017 and 2018 groundwater samples was below its respective RGs.
- Trend analyses of TCE concentration data collected during the review period (and in the last 10 years that are evaluated statistically) indicate a significant downward trend.
- Although groundwater data from one well located along the eastern LF-1 boundary indicate that TCE concentrations above the RG have migrated outside the LF-1 eastern boundary, trend analyses indicate a significant downward trend, which is interpreted to be the result of natural attenuation.

> Therefore, the small amount of TCE exceeding the RG observed outside of the landfill boundary is expected to continue to attenuate over time to concentrations below the RG.

The details of each sampling event are presented in Annual Groundwater Monitoring Reports which include an evaluation of the data based on the RGs presented in Section 3.3.6.1.2 and in the DD (Fort Lewis, 2006b).

The LF-1 LTM monitoring program generated 13 rounds of annual sampling event data, beginning in 2006 and ending in 2018, which included static water level measurements and groundwater analytical data. Appendix G provides the cumulative groundwater elevation and analytical data, as well as the contaminant trend analyses and associated graphs and charts as presented in the 2018 Annual Groundwater Monitoring Report (EA, 2019e).

Static water level measurements were collected from select LF-1 monitoring wells as part of the LTM program to monitor groundwater flow direction. The groundwater elevation data from March 2018 indicate that the groundwater flow direction is generally to the east-southeast, which is consistent with historical data. LF-1 data tables and figures included in Appendix G are from the 2018 Annual Groundwater Monitoring Report (EA, 2019e).

In 2017 and 2018, LTM groundwater samples were collected from the four LF-1 monitoring wells that remain in the LTM monitoring program, which include 84-CD-LF1-3, 84-CD-LF1-4, 95-LF1-10, and 95-LF1-11. Samples were analyzed for TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1,1-TCA, 1,2-DCP, PCE, carbon tetrachloride, and chloroform. Detected VOCs were screened against MCLs with TCE screened against the MTCA Method A cleanup level of 5 µg/L (equivalent to the Federal MCL). Analytical results are provided in Appendix G.

In 2017 and 2018, only TCE was detected above its RG of 5 µg/L. TCE was detected in the 2017 and 2018 samples from monitoring well 84-CD-LF1-4 at concentration of 8.3µg/L and 6.8 µg/L, respectively. TCE concentrations detected in 2018 are shown on Figure 3-12. 84-CD-LF1-4 is located in a downgradient direction at the eastern site boundary. Concentrations of TCE in other wells and all other constituents detected in the 2017 and 2018 groundwater samples were below the RG.

Beginning in 2012, TCE data have undergone statistical analysis to help support evaluation and interpretation of the TCE concentrations detected in groundwater at LF-1. Statistical analyses follow the guidelines agreed upon by JBLM and the USEPA for JBLM's Logistics Center RAM project. Analyses were performed on data from September 1988 through March 2018 from monitoring wells 84-CD-LF1-3, 84-CD-LF1-4, 95-LF1-10, and 95-LF1-11. TCE is typically not detected in samples from other LF-1 monitoring wells.

Two TCE concentration datasets were analyzed for the statistical analysis. Historical data includes TCE concentrations detected in samples collected in September 1988 and continuing through 2018. TCE concentration data collected in the last 10 years (April 2009 to present) was re-analyzed and new trend graphs were completed. These trends are considered current data trends. Trend analyses were performed using the Shapiro-Wilk test for normality, linear regression analysis, and the Mann-Kendall test for trends on non-parametric data. The statistical evaluation for LF-1, including data tables, histogram figures, and linear regression graphs are included in Appendix G.

Review of the evaluation results for historic and current data from four monitoring wells indicate a significant downward trend in TCE concentrations, which remain below the RG in three of the four wells (84-CD-LF1-3, 95-LF1-10, and 95-LF1-11). In the fourth well (84-CD-LF1-4), although historic data indicated a significant downward trend in TCE concentrations, current data showed a non-statistically upward trend.

Groundwater data from 84-CD-LF1-4, located along the eastern LF-1 boundary, confirm that TCE concentrations above the RG have migrated outside the LF-1 eastern boundary. Trend analysis of 84-CD-LF1-4 historical data indicates a non-statistically significant downward trend, which is interpreted to be the result of natural attenuation. However, the analysis of current data at 84-CD-LF1-4 (from 2009 to 2018) indicate a non-statistically significant upward trend. The 2018 Annual Groundwater Monitoring Report states that the small amount of TCE exceeding the RG observed outside of the landfill boundary is expected to attenuate over time. The review of the 2017 and 2018 data conducted as part of this FYR did not find evidence that would contradict that observation.

As recommended in the 2018 Annual Groundwater Monitoring Report, annual groundwater sampling at LF-1 was discontinued in accordance with provisions in the 2006 DD and with concurrence from USEPA. Requirements for cessation of groundwater monitoring specified in the DD were met at all monitoring wells. The cleanup strategy for FTLE-54 is continued maintenance of implemented LUCs.

3.3.8.2 Site Inspection

As discussed in Section 1.3.4, the Site Inspection for FTLE-54 was conducted on 9 November 2021. Installation personnel accompanying the inspection team noted that groundwater LTM at LF-1 was discontinued, with USEPA approval, in 2018. No changes in site conditions or land use were noted during the site inspection. Appendix C provides the detailed Site Inspection Trip Report and includes the inspection participants, FYR Site Inspection Checklists, and photographic log.

3.3.8.3 Interviews

As discussed in Section 1.3.5, interviews were conducted by email with parties knowledgeable of the site conditions, including regulatory agencies involved in site activities. The USEPA RPM, Mr. Patrick Hickey, responded to the FYR interview questionnaire that included FTLE-54 but had no specific comments regarding the site. The complete interview records are included in Appendix D.

3.3.9 Technical Assessment

The technical assessment of the protectiveness of the remedy for FTLE-54 is based on the responses to these three questions:

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

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

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

3.3.9.1 Question A: Is The Remedy Functioning As Intended By The Decision Document?

Yes, the review of RAOs, documents, and site inspection data indicate that the remedy at FTLE-54 is currently functioning as intended by the DD.

The site continues to be restricted to nonresidential use only and remains under government control. Maintenance inspections are conducted annually and documents available for review during this FYR review period report that no residential land use is occurring or planned, excavation of contaminated soil has not occurred, and drinking water wells have not been installed within 1,000 ft of the landfill boundary. In addition, the groundwater monitoring program met its objectives in 2018 and monitoring is no longer occurring.

3.3.9.2 Question B: Are The Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used At the Time Of The Remedy Selection Still Valid?

Yes. While there have been changes to exposure assumptions and toxicity data since the remedy, these do not call the protectiveness of the remedy into question. The RAOs of preventing human and ecological receptors exposure to groundwater and landfill wastes remain valid.

3.3.9.2.1 Changes in Standards and To Be Considereds (TBCs)

The RG for TCE is based on the MTCA Method A criteria of 5 µg/L, which is equivalent to the Federal MCL. These ARARs have not changed since the implementation of the remedy, as shown in Table 1 of Appendix H.

3.3.9.2.2 Changes in Exposure Pathways

There have been no changes in the exposure pathways since the implementation of the remedy and LUCs are utilized to implement the ICs in the remedy. The groundwater exposure pathway remains incomplete as a groundwater well cannot be placed within 1000 ft of the landfill boundary in accordance with WAC 173-160-171(3)(b)(vi); this regulation has not changed since the implementation of the remedy. The 2006 DD indicates that LF-1 meets an exclusion from a terrestrial ecological evaluation presented in WAC 173-340-749 and no further ecological evaluation is required since there are less than 1.5 acres of contiguous undeveloped land within 500 ft of the landfill boundary. This regulation has not changed since the implementation of the remedy, so the ecological evaluation remains unnecessary. Thus, the RAOs at the time of the remedy was selected are still valid. However, the potential for VI to indoor air was not considered previously and is therefore evaluated below.

Vapor Intrusion

As, the VI pathway was not evaluated previously, the potential for VI to indoor air was considered for buildings near monitoring wells with TCE present above 5 µg/L within the last five years. TCE was detected in groundwater from all four wells sampled annually at LF-1 in 2018; TCE above the RG was detected in only one well at 6.8 µg/L. Annual monitoring was discontinued because all concentrations in all wells were stable or declining. This concentration was input into USEPA’s online VI screening level calculator (May 2022 RSLs) under both a residential and commercial exposure scenario. For the residential scenario, the carcinogenic risk level was 5.7 x 10^{-6} and within the acceptable risk range (i.e., 10^{-4} to 10^{-6}). The non-carcinogenic hazard quotient was 1.3, numerically equivalent to the target HQ of 1. For the commercial scenario, the carcinogenic risk level was 9.2 x 10^{-7} and within the acceptable risk range (i.e., 10^{-4} to 10^{-6}).

The non-carcinogenic hazard quotient was 0.31, below the target HQ of 1. Therefore, the potential for VI does not affect current or future protectiveness because an IC is used for the landfill that prohibits residential development. As provided in the 2017 LUC Plan, LUCs are implemented through the mechanisms discussed in Section 2.5.1. LUC details presented in the 2017 plan are provided in Appendix E.

Emerging Chemicals

The likelihood of emerging contaminants has been considered for the LF-1. The presence of PFAS at or near the LF-1 was evaluated in 2020 due to the potential for disposal of PFAS containing waste. The previous FYR recommended sampling at JBLM because the presence of PFAS at or near the CERCLA sites included within this FYR has not been evaluated. The 2020 PA/SI indicated that PFOS and PFOA were not measured at concentrations greater than 40 ppt in any of the two groundwater samples associated with the Gray Army Airfield LF-1 (AOPI-21) and determined that further evaluation was not necessary. As shown on Table 3 in Appendix H, the USEPA tapwater RSL for PFOS (40 ppt), PFOA (40 ppt) and PFBS (40,000 ppt) applied in the 2020 PA/SI have been reduced to 4 ppt for PFOS, 6 ppt for PFOA, and 600 ppt for PFBS. The maximum concentrations of PFOS (1.4 ppt), PFOA (0.37 ppt) PFBS (0.8 ppt) in LF-1 does not exceed the current (May 2022) RSLs. In addition, the USEPA (May 2022) provided RSLs for two additional compounds (PFHxS and PFNA) that were analyzed for during the PA/SI. PFHxS was non-detect and the maximum concentration PFNA (1.7 ppt) does not exceed the RSL of 5.9 ppt for PFNA. Therefore, the presence of PFAS in groundwater at LF-1 does not call the protectiveness of the remedy into question.

3.3.9.2.3 Changes in Toxicity and Other Contaminant Characteristics

The toxicity data for TCE was updated in the USEPA IRIS on 28 September 2011. as discussed in Appendix H. USEPA has also concluded that TCE is carcinogenic by a mutagenic mode of action, and currently applies ADAFs when assessing risk associated with early-life exposure. However, these changes in risk assessment methods and toxicity data do not call the protectiveness of the remedy into question because the RG for TCE is based on an ARAR.

3.3.9.2.4 Changes in Risk Assessment Methods

Though the 1994 risk assessment was not available for review, a number of changes in risk assessment methods, exposure parameters, and toxicity data have taken place since the 1994 assessment for the LF-1 performed by Woodward and Clyde Consultants. The default exposure assumptions for residential and industrial land use have changed since the implementation of the remedy, as discussed in Appendix H. However, these changes in risk assessment methods do not call the protectiveness of the remedy into question because the RG for TCE is based on an ARAR. These ARARs have not changed since the implementation of the remedy, as shown in Table 1 of Appendix H.

3.3.9.2.5 Expected Progress Toward Meeting RAOs

The RAO to prevent the inhalation and ingestion by human and ecological receptors of the VOCs in groundwater beneath and surrounding the landfill has been achieved through LUCs that prevent residential land use and prevent new drinking water wells within 1,000 ft of the landfill boundary. The RAO to prevent direct exposure to landfill wastes has been achieved through a LUC that prevents unauthorized excavation of contaminated soil. In addition, the DD requirement for LTM has been achieved, with regulatory agency approval, as TCE concentrations remain below the RG or are stable.

3.3.9.3 *Question C: Has Any Other Information Come To Light That Could Call Into Question The Protectiveness of the Remedy?*

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

3.3.10 Issues, Recommendations and Follow-up Actions

There were no issues found affecting the protectiveness of the remedy.

3.3.11 Protectiveness Statement

The remedy at the FTLE-54, LF-1 site is protective of human health and the environment. LUCs prevent exposure to groundwater and landfill wastes by restricting residential land use, preventing unplanned excavation of contaminated soil, and preventing the installation of new drinking water wells within 1,000 ft of landfill boundary without a monitoring plan approved by USEPA.

3.4 FTLE–16 (BATTERY ACID PIT)

3.4.1 Site Description

The Battery Acid Pit site (FTLE-16; HQAES Site ID 53465.1009) is a small site (less than 1,500 square ft) located within the northwest portion of the Logistics Center, south of Building 9580 and adjacent to former Building 9589 (Figure 3-13). The current and anticipated future land use designated for the site in the JBLM RPMP is industrial. The site is no longer in use and is currently paved with an asphalt cover.

3.4.2 Site Chronology

The chronology of key events for FTLE–16 is provided in Table 3-11.

Table 3-11. Chronology of Site Events

Event	Date
Initial soil sampling	1986
Inclusion in the Logistics Center RI	1988
Site included in the Logistics Center ROD for sampling/characterization of lead concentrations in soil	1990
Included in Logistics Center investigations	1993, 1995
DD for several sites, including the Battery Acid Pit	2000
DD to obtain USEPA concurrence (Needed because USEPA did not comment on the 2000 DD)	2006
FYR	2007, 2012, and 2017
Implementation of LUCs	2008
Site was removed, with other sites within the Logistics Center's North Uses Area, as a potential source of TCE in groundwater through an ESD, separating the sites from the Logistics Center NPL site.	2010
PCOR (documents Operational and Functional)	2015
Annual LUC Inspections	2011-2021
Comprehensive LUCs Plan	2018

DD = Decision Document
ESD = Explanation of Significant Difference
FYR = Rive-Year Review
LUC = Land Use Control
NPL = National Priorities List
PCOR = Preliminary Close Out Report
RI = Remedial Investigation
ROD = Record of Decision
TCE = trichloroethene
USEPA = United States Environmental Protection Agency

3.4.3 History of Contamination

An approximately 5-ft by 8-ft by 10-ft deep pit was reportedly used from 1971 to 1976 to dispose of electrolytic solutions from used vehicle batteries. It is not known how many varieties of batteries were drained at the Battery Acid Pit; however, it is known that the majority were vehicle batteries containing a lead-acid electrolyte. Crushed limestone was placed in the pit to neutralize the acidic solutions.

The Battery Acid Pit site was initially investigated in 1986 with subsequent investigations indicating that elevated concentrations of total lead in soil and low soil pH were present at the site.

3.4.4 Initial Response

In 1990, an IAG (USEPA, 1990) between the Army, USEPA and Ecology was signed to address sites at the Fort Lewis Army Base that were suspected of having environmental contamination, including the Battery Acid Pit. There is no record of other initial response actions having been conducted at the Battery Acid Pit prior to issuing the 2000 DD.

3.4.5 Basis For Taking Action

Elevated concentrations of lead in soil that pose potential risk and hazards associated with direct contact by future residents or industrial workers forms the basis for taking action.

3.4.6 Remedial Action

3.4.6.1 Remedy Selection

The selected remedy for the Battery Acid Pit site (FTLE-16) is documented in the following DDs:

- *Decision Document for the Storm Water Outfalls/Industrial Wastewater Treatment Plant, Pesticide Rinse Area, Old Fire Fighting Training Pit, Illicit PCB Dump Site, and the Battery Acid Pit. Fort Lewis, Washington,* published December 2000.
- *Decision Document for Selected Remedy, Battery Acid Pit, Fort Lewis, Washington,* signed May 1, 2006 (Fort Lewis, 2006c).

3.4.6.1.1 Remedial Action Objectives

The RAO stated in the 2006 DD is:

- Prevent unacceptable risks via direct contact with soil by future residents or industrial workers.

3.4.6.1.2 Remedial Goals

No RGs were established for the selected remedial action at FTLE-16.

3.4.6.1.3 Remedy Description

The following LUC objectives were identified as part of the remedy selected in the 2000 DD (PNNL, 2000) to prevent exposure to contaminants remaining in the soil:

- Prevent residential land use.
- Prevent unplanned excavation of contaminated soil.
- Maintain asphalt cap.

The LUC objectives are achieved through maintenance of the following LUCs described in further detail in Section 2.5.1 and conducting annual inspections of the sites and interviews with the staff responsible for maintaining the LUC overlays and filling out LUC checklists:

- Administrative LUCs Maintain and update as needed the following LUC mechanisms: LUC Data Layer in GIS; LUC Overlay for RPMP; LUC Overlay for ERP; LUC Overlay for DPA; Installation Access.

- Physical LUCs Maintain the asphalt cap.

The 2006 DD (Fort Lewis, 2006c) was prepared to finalize the remedy selected in the 2000 DD because USEPA review of the multi-site 2000 DD omitted approval of the remedy for the Battery Acid Pit.

3.4.6.2 Remedy Implementation

LUC implementation at FTLE-16 began in 2007 and is ongoing in accordance with the 2017 Comprehensive LUCs Plan (Sealaska, 2018a). LUCs are implemented through the mechanisms discussed in Section 2.5.1. LUC details presented in the 2017 plan are provided in Appendix E.

3.4.6.3 Operations and Maintenance

The 2017 through 2021 O&M activities required for FTLE-16 were conducted in accordance with the 2017 LUC plan (Sealaska, 2018a). O&M activities include conducting annual LUC inspections to assess the condition of the site and identify needed maintenance or repairs.

LUC and Site Inspections

The FTLE-16 site and LUCs are monitored and inspected annually. Copies of the completed LUC inspection checklists are provided to the JBLM IRP Manager for submittal to the appropriate regulatory agencies, including Ecology and USEPA, as described in the LUC plan (Sealaska, 2018a). Copies of the LUC checklists completed during this FYR period are provided in Appendix E.

Annual inspections were performed at FTLE-16 during the 2017 to 2021 reporting period to verify that prohibited land use has not occurred within the LUC boundary (Figure 3-14) including residential development or excavation activities and to determine if the asphalt cap requires maintenance. Documentation of the annual inspection activities was provided for review in the 2018, 2019, 2020, and 2021 LUCs Checklists (EA, 2019f; 2020d; 2022c, 2022g). An annual inspection was reportedly performed in 2017, but no checklist was available for review. A monthly status report was provided stating that the 2017 inspections were conducted as part of the Environmental Remediation Program Services (Sealaska, 2017a).

Interviews are also conducted with installation personnel as part of the annual site/LUC inspections to confirm that LUC requirements are available in the JBLM GIS and RPMP systems for real-time reference during land use planning, environmental reviews, construction and maintenance activities, and as part of the JBLM NEPA implementation. The interview portion of the LUC checklists was reviewed for the 2018 through 2021 checklists and confirms that the LUC information necessary for real-time reference remains available and current.

No maintenance issues were identified at FTLE-16 in the reviewed LUC monitoring checklists. The reviewed annual checklists confirmed that restrictions within the LUC boundary concerning land use, unplanned excavation, and asphalt cap maintenance conform to the LUC requirements and no LUC deficiencies, violations, or inconsistencies were noted.

3.4.7 Progress Since the Last Five-Year Review

3.4.7.1 Protectiveness Statement From The Last Review

Protectiveness statements presented in the 2017 FYR were organized by OU rather than by individual sites. The protectiveness for OU01 was deferred in the 2017 FYR but was revised in a 2019 addendum. The original protectiveness statement along with the revised protectiveness statement are presented below.

Protectiveness statement for OU01 as presented in the 2017 FYR

> *A protectiveness determination for the OU1 – Logistics Center Remedy cannot be made at this time until further information is obtained. Further information will be obtained by taking the following action: an investigation and evaluation of the presence of PFASs within the three pump and treat systems at the Logistics Center. It is expected that this action will take approximately three years to complete, at which time a protectiveness determination will be made.*
>
> *The following elements of the remedy have ensured that RAOs are being met. LUCs prevent exposure to groundwater by restricting installation of new drinking water wells within the areal extent of the TCE groundwater plume inside the JBLM boundary. Existing LUCs are preventing exposure to soil by maintaining a fence with signs around the perimeter of LF-2 and restricting training activities and unauthorized digging and construction within LF-2. LUCs are preventing exposure by preventing residential land use at LF-2 or within the 100 µg/L groundwater isoconcentration contour. The I-5 and SLA P&T systems prevent migration of contaminated groundwater within the Upper Vashon, Lower Vashon, and SLA.*
>
> *Additionally, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness: a thorough evaluation of whether the LF-2 system is providing complete capture of the plume in accordance with the RAOs through monitoring and capture zone analysis. If capture zone analysis shows lack of capture, pumping should be increased (through additional extraction well(s) and/or increased pumping).*
>
> *At the Illicit PCB Dump Site, LUCs prevent exposure to contaminated soils by maintaining a fence with signs warning against unauthorized excavation and digging, restricting access, and ensuring the site is not used for training or residential land use. Maintenance of the cap also restricts exposure to contaminated soils.*
>
> *At Landfill 1, LUCs are preventing exposure to groundwater and landfill wastes by restricting residential development, unplanned excavation, and installation of new drinking water wells within a 1,000 feet of the site boundary.*
>
> *At the Battery Acid Pit, DRMO Yard, IWTP, and Pesticide Rinse Area, LUCs are preventing exposure to contaminated soils through maintenance of the asphalt cap and excavation and construction restrictions at the Battery Acid Pit and through prevention of residential land use at the Battery Acid Pit, DRMO Yard, IWTP, and the Pesticide Rinse Area.*

Revised protectiveness statement for OU01 as presented in the 2019 Addendum

> *Based on new information and/or actions taken since the Five-Year Review completion date, the protectiveness statement for OU1 - Logistics Center Remedy is being revised to currently protective of human health and the environment because the sum of PFOS/PFOA was found to be below the current HAL of 70 ppt in the Landfill 2 source area wells and Landfill 2, 1-5, and Sea Level Aquifer pump and treat system influent and effluent samples.*

3.4.7.2 Status of Recommendations and Follow-Up Actions from Last Review

No issues were identified during the second installation-wide FYR that affect the protectiveness of the remedy for FTLE-16.

3.4.8 Five-Year Review Process

3.4.8.1 Data Review

There is no data collection requirement for the site.

3.4.8.2 Site Inspection

As discussed in Section 1.3.4, the Site Inspection for FTLE-16 was conducted on 9 November 2021. The site is within an asphalt parking lot adjacent to an area used for maintenance located within the Logistics Center Readiness Area. The area is fenced with restricted access and access to the specific site area was not provided during the inspection. Although the asphalt cap could not be inspected, no issues were reported in the 2020 LUC inspection checklist. Appendix C provides the detailed Site Inspection Trip Report and includes the inspection participants, FYR Site Inspection Checklists, and photographic log.

3.4.8.3 Interviews

As discussed in Section 1.3.5, interviews were conducted by email with parties with knowledge or awareness of site conditions, including regulatory agencies involved in site activities. The USEPA RPM, Mr. Patrick Hickey, responded to the FYR interview questionnaire that included FTLE-16 but had no specific comments regarding the site. The complete interview records are included in Appendix D.

3.4.9 Technical Assessment

The technical assessment of the protectiveness of the remedy for FTLE-16 is based on the responses to these three questions:

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

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

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

3.4.9.1 Question A: Is The Remedy Functioning As Intended By The Decision Document?

Yes, the review of documents, and site inspection data indicate that the remedy at FTLE-16 is currently functioning as intended by the DD.

The site continues to be restricted to nonresidential use only and remains under government control. Maintenance inspections are conducted annually and documents available for review during this FYR review period report that no residential land use is occurring or planned, excavation of contaminated soil has not occurred, and the existing asphalt cap is adequately maintained.

3.4.9.2 Question B: Are The Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used At the Time Of The Remedy Selection Still Valid?

Yes. While there have been changes to exposure assumptions, toxicity data, and cleanup levels used at the time of remedy selection, no changes have occurred that call into question the protectiveness of the remedy.

3.4.9.2.1 Changes in Standards and To Be Considereds (TBCs)

While the 2000 Draft DD and the 2006 DD did not identify ARARS or cleanup levels, lead in soil was identified in soil at concentrations above the 400 mg/kg 1998 Office of Solid Waste and Emergency Response (OSWER) screening level for children (2000 DD). Lead concentrations in monitoring wells were compared to the USEPA MCL of 15 µg/L; the Logistic Center wells had lead concentrations between the detection limit and 12 µg/L, though these concentrations were not reproducible (2000 DD). The USEPA MCL for lead (which is actually an action level of 15 µg/L established in the Lead and Copper Rule [40 CFR Part 141 Subpart I]) has not changed since the implementation of the remedy. Currently, the USEPA (2021) has retained a residential RSL of 400 mg/kg, as soil lead levels less than 400 mg/kg are generally safe for residential use. The current USEPA (2022) RSL for lead in soil is 800 mg/kg for workers. The February 2021 MTCA Method A screening level for lead is 250 mg/kg for unrestricted use and 1000 mg/kg for industrial properties. Regardless, this area is currently covered with asphalt, which prevents exposure to contaminated soil. Thus, change in standards and TBCs do not change the protectiveness of the remedy.

3.4.9.2.2 Changes in Exposure Pathways

There have been no changes in the exposure pathways at the site since the implementation of the remedy and LUCs are utilized to implement the ICs in the remedy. The potential direct contact pathway continues to be incomplete because the sites is paved with asphalt. The asphalt cap has been maintained and the land use has been memorialized in the Fort Lewis IC Plan. Thus, the RAO (prevent direct contact with elevated lead concentrations in soil by future residents or industrial workers) at the time the remedy was selected is still valid.

3.4.9.2.3 Changes in Toxicity and Other Contaminant Characteristics

The USEPA's OSWER Directives 9200.4-27P (USEPA, 1998) identifies 10 µg/dL as the blood lead level of concern and is in contrast with the latest USEPA Office of Land and Emergency Management (OLEM) Directive (Directive 9200.2-167, issued December 22, 2016), which indicates that adverse health effects are associated with blood lead levels of 5 µg/dL, and possibly as low as 2 µg/dL, in young children. Regardless, this area is currently covered with asphalt, which prevents exposure to contaminated soil. Thus, change in toxicity does not change the protectiveness of the remedy.

3.4.9.2.4 Changes in Risk Assessment Methods

The health impact assessment (2000 DD) concluded that exposures of up to 2,300 mg/kg of lead did not pose unacceptable health risks to workers working directly at the site who might potentially be exposed through ingestion, dermal contact, and inhalation of airborne particulate material. Inhalation exposure of adult exposure 100 meters from the site was also evaluated. Blood lead levels were estimated for workers directly at the site and to offsite workers. The distribution of blood lead levels was 1.11 µg/dL at the 50th percentile to 2.51 µg/dL at the 99th percentile for the onsite worker and a blood lead level of 13E-06 µg/dL was estimated for the worker within 100m of the Battery Acid Pit site; the values were below the guideline of 10 µg/ dL and are also below the current USEPA OLEM (2016) guideline of 5 µg/dL. Since the preparation of the health impact assessment of the Battery Acid pit, the USEPA (2009) has developed an adult lead model (ALM) that considers ingestion exposure route to estimate blood lead concentrations in worker and its fetus, and the probability that the fetus blood lead levels exceed the blood lead target. The ALM applies an ingestion rate of 50 mg/kg, which is higher than the ingestion rate of 25 mg/kg used in the health impact assessment, and a biokinetic slope factor of 0.4 µg/dl per µg/day, which is higher than the intake conversion factor for transfer to blood for soil ingestion intake of 0.018 µg Pb/dl blood per µg/Pb per day. Thus, the blood lead levels modeled in the health impact assessment are expected to be underestimated in comparison to current risk assessment methods using the USEPA's ALM model.

Regardless, this area is currently covered with asphalt, which prevents direct contact of on-site workers with contaminated soil and for inhalation of contaminated particulates by a worker within 100m. Thus, changes in risk assessment methods do not change the protectiveness of the remedy .

3.4.9.2.5 Expected Progress Toward Meeting RAOs

The RAO identified in the 2006 DD is being met. Unacceptable risks through direct contact with soil is accomplished by maintaining the asphalt cap that covers the site and other LUCs including preventing residential land use and unplanned soil excavations.

3.4.9.3 Question C: Has Any Other Information Come To Light That Could Call Into Question The Protectiveness of the Remedy?

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

3.4.10 Issues, Recommendations and Follow-up Actions

There were no issues found affecting the protectiveness of the remedy.

3.4.11 Protectiveness Statement

The remedy at the FTLE-16, Battery Acid Pit site is protective of human health and the environment. LUCs prevent exposure to contaminated soil by restricting residential land use, preventing unplanned excavation of contaminated soil, and maintaining the asphalt covering the former pit.

3.5 FTLE–31 (DRMO YARD)

3.5.1 Site Description

The Defense Reutilization and Marketing Office (DRMO) Yard site (FTLE-31; HQAES Site ID 53465.1019) is an active 33-acre industrial laydown yard (Figure 3-15) within a fenced and secured portion of the Logistics Center complex (which has significantly stricter access restrictions than the installation at-large). The site, also referred to as the Defense Property Disposal Office Yard and Defense Logistics Agency Disposition Services (DLADS), is used for storing surplus materials to be recycled or reused. The DRMO Yard includes gravel-covered areas, paved areas, and grass-covered areas. The current and anticipated future land use designated for the site in the JBLM RPMP is industrial.

3.5.2 Site Chronology

The chronology of key events for FTLE–31 is provided in Table 3-20.

Table 3-12. Chronology of Site Events

Event	Date
PCB Spill / Initial Evaluation	1981
Initial Response Action - Soil Removal	1982
Interim Report, Groundwater Investigations	1986
Logistics Center RI	1988
Site included in the Logistics Center ROD as a potential groundwater contamination source (subsequently determined to not be a source)	1990
Limited Field Investigation Report (Woodward Clyde)	1995
Limited Field Investigation including a Human Health Screening Level Risk Assessment	2000
Field Report (Soil Removal Study)	2000
IRP SLRA	2005
DD, DRMO Yard	2006
Implementation of LUCs	2008
FYRs	2007, 2012, and 2017
ESDs issued that separated the DRMO Yard site from the Logistics Center NPL site. The ESD further confirmed the remedy selected for the DRMO Yard site was LUCs to prevent residential land use.	2010
PCOR (documents Operational and Functional)	2015
Annual LUC Inspections	2011-2021
Comprehensive LUCs Plan	2017

DD = Decision Document
FYR = Five-Year Review
NPL = National Priorities List
RI = Remedial Investigation
DRMO = Defense Reutilization Marketing Office
IRP = Installation Restoration Program
PCB = Polychlorinated Biphenyl
ROD = Record of Decision
ESD = Explanation of Significant Difference
LUC = Land Use Control
PCOR = Preliminary Close Out Report
SLRA = Screening Level Risk Assessment

3.5.3 History of Contamination

Materials stored at the DRMO have historically included equipment containing residual PCBs and drums containing waste TCE. The site was initially evaluated in 1986 because approximately 10 to 15 gallons of transformer fluid containing PCBs was spilled at the site in 1981. Soil in the area was sampled for PCBs and the site was recommended for no further action (NFA) based on the low PCB concentrations remaining in soil. However, further sampling in 1988 (Envirosphere, 1988) identified previously unreported areas of potential PCB soil contamination, and in 2000 areas were identified with concentrations of oil- and petroleum-range hydrocarbons, carcinogenic PAHs (cPAH), and metals within the upper five ft of soil.

3.5.4 Initial Response

In 1982, a limited soil removal of approximately 15 cubic yards was completed. Stockpiled soil was sampled and the soil was disposed of offsite. A second removal action was attempted in 2000; however, the stockpiled soil removed from the area was returned to the excavation rather than disposing offsite because samples indicated that contaminant concentrations were below the most conservative residential cleanup levels with the exception of PCB Aroclor 1242 in one sample

In 1990, an IAG (USEPA, 1990) between the Army, USEPA and Ecology was signed to address sites at the Fort Lewis Army Base that were suspected of having environmental contamination, including the DRMO Yard.

3.5.5 Basis For Taking Action

Contaminants remain in soil at concentrations above MTCA Method A criterion for unrestricted (residential) land uses, which forms the basis for taking action.

3.5.6 Remedial Action

3.5.6.1 <u>Remedy Selection</u>

The selected remedy for the DRMO Yard site (FTLE-31) is documented in the following DD:

- *Decision Document for Selected Remedy, DRMO Yard, Fort Lewis, Washington,* signed May 1, 2006 (Fort Lewis, 2006d).

3.5.6.1.1 Remedial Action Objectives

The RAO stated in the 2006 DD.

- Ensure that the nature and extent of the site is considered during all planning decisions and that potential impacts from the site are mitigated as necessary before any proposed residential use.

3.5.6.1.2 Remedial Goals

No RGs were established for the selected remedial action at FTLE-31.

3.5.6.1.3 Remedy Description

The following LUC objective was identified as part of the remedy selected for FTLE-31 in the 2006 DD (Fort Lewis, 2006d) to prevent exposure to contaminants remaining in the soil:

- Prevent residential land use.

The LUC objectives are achieved through maintenance of the following LUCs described in further detail in Section 2.5.1 and conducting annual inspections of the sites and interviews with the staff responsible for maintaining the LUC overlays and filling out LUC checklists:

- Administrative LUCs Maintain and update as needed the following LUC mechanisms: LUC Data Layer in GIS; LUC Overlay for RPMP; LUC Overlay for ERP; LUC Overlay for DPA; Installation Access.

3.5.6.2 Remedy Implementation

LUC implementation at FTLE-31 began in 2007 and is ongoing in accordance with the 2017 Comprehensive LUCs Plan (Sealaska, 2018a). LUCs are implemented through the mechanisms stated in Section 2.5.1. LUC details presented in the 2017 plan are provided in Appendix E.

3.5.6.3 Operations and Maintenance

The 2017 through 2021 O&M activities required for FTLE-31 were conducted in accordance with the 2017 LUC plan (Sealaska, 2018a). O&M activities include conducting annual LUC inspections to assess the condition of the site and identify needed maintenance or repairs.

LUC and Site Inspections

Annual inspections were performed at FTLE-31 during the 2017 to 2021 reporting period to verify that prohibited land use has not occurred within the LUC boundary (Figure 3-16). Documentation of the annual inspection activities was provided for review in the 2018, 2019, 2020, and 2021 LUCs Checklists (EA, 2019f; 2020d; 2022c, 2022g). An annual inspection was reportedly performed in 2017, but no checklist was available for review. A monthly status report was provided stating that the 2017 inspections were conducted as part of the Environmental Remediation Program Services (Sealaska, 2017a).

Interviews are also conducted with installation personnel as part of the annual site/LUC inspections to confirm that LUC requirements are available in the JBLM GIS and RPMP systems for real-time reference during land use planning, environmental reviews, construction and maintenance activities, and as part of the JBLM NEPA implementation. The interview portion of the LUC checklists was reviewed for the 2018 through 2021 checklists and confirms that the LUC information necessary for real-time reference remains available and current.

No changes from industrial land use were identified at FTLE-31 in the reviewed LUC monitoring checklists. The reviewed annual checklists confirmed that restrictions within the LUC boundary concerning land use conform to the LUC requirements and no LUC deficiencies, violations, or inconsistencies were noted.

3.5.7 Progress Since the Last Five-Year Review

3.5.7.1 Protectiveness Statement From The Last Review

Protectiveness statements presented in the 2017 FYR were organized by OU rather than by individual sites. The protectiveness for OU01 was deferred in the 2017 FYR but was revised in a 2019 addendum. The original protectiveness statement along with the revised protectiveness statement are presented below.

Protectiveness statement for OU01 as presented in the 2017 FYR

> *A protectiveness determination for the OU1 – Logistics Center Remedy cannot be made at this time until further information is obtained. Further information will be obtained by taking the*

following action: an investigation and evaluation of the presence of PFASs within the three pump and treat systems at the Logistics Center. It is expected that this action will take approximately three years to complete, at which time a protectiveness determination will be made.

The following elements of the remedy have ensured that RAOs are being met. LUCs prevent exposure to groundwater by restricting installation of new drinking water wells within the areal extent of the TCE groundwater plume inside the JBLM boundary. Existing LUCs are preventing exposure to soil by maintaining a fence with signs around the perimeter of LF-2 and restricting training activities and unauthorized digging and construction within LF-2. LUCs are preventing exposure by preventing residential land use at LF-2 or within the 100 µg/L groundwater isoconcentration contour. The I-5 and SLA P&T systems prevent migration of contaminated groundwater within the Upper Vashon, Lower Vashon, and SLA.

Additionally, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness: a thorough evaluation of whether the LF-2 system is providing complete capture of the plume in accordance with the RAOs through monitoring and capture zone analysis. If capture zone analysis shows lack of capture, pumping should be increased (through additional extraction well(s) and/or increased pumping).

At the Illicit PCB Dump Site, LUCs prevent exposure to contaminated soils by maintaining a fence with signs warning against unauthorized excavation and digging, restricting access, and ensuring the site is not used for training or residential land use. Maintenance of the cap also restricts exposure to contaminated soils.

At Landfill 1, LUCs are preventing exposure to groundwater and landfill wastes by restricting residential development, unplanned excavation, and installation of new drinking water wells within a 1,000 feet of the site boundary.

At the Battery Acid Pit, DRMO Yard, IWTP, and Pesticide Rinse Area, LUCs are preventing exposure to contaminated soils through maintenance of the asphalt cap and excavation and construction restrictions at the Battery Acid Pit and through prevention of residential land use at the Battery Acid Pit, DRMO Yard, IWTP, and the Pesticide Rinse Area.

Revised protectiveness statement for OU01 as presented in the 2019 Addendum

> *Based on new information and/or actions taken since the Five-Year Review completion date, the protectiveness statement for OU1 – Logistics Center Remedy is being revised to currently protective of human health and the environment because the sum of PFOS/PFOA was found to be below the current HAL of 70 ppt in the Landfill 2 source area wells and Landfill 2, 1-5, and Sea Level Aquifer pump and treat system influent and effluent samples.*

3.5.7.2 Status of Recommendations and Follow-Up Actions from Last Review

No issues were identified during the second installation-wide FYR that affect the protectiveness of the remedy for FTLE-31.

3.5.8 Five-Year Review Process

3.5.8.1 Data Review

There is no data collection requirement for the site.

3.5.8.2 Site Inspection

As discussed in Section 1.3.4, the Site Inspection for FTLE-31 was conducted on 9 November 2021. The site is within a fenced area used as an active industrial laydown yard. The fence is not part of the remedy but is used to prevent access to the material being stored in the laydown yard. No changes in site conditions or land use were noted during the inspection. Appendix C provides the detailed Site Inspection Trip Report and includes the inspection participants, FYR Site Inspection Checklists, and photographic log.

3.5.8.3 Interviews

As discussed in Section 1.3.5, interviews were conducted by email with parties with knowledge of site conditions, including regulatory agencies involved in site activities. The USEPA RPM, Mr. Patrick Hickey, responded to the FYR interview questionnaire that included FTLE-31 but had no specific comments regarding the site. The complete interview records are included in Appendix D.

3.5.9 Technical Assessment

The technical assessment of the protectiveness of the remedy for FTLE-31 is based on the responses to these three questions:

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

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

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

3.5.9.1 Question A: Is The Remedy Functioning As Intended By The Decision Document?

Yes, the review of RAOs, documents, and site inspection data indicate that the remedy at FTLE-31 is currently functioning as intended by the DD.

The site continues to be restricted to nonresidential use only and remains under government control. Maintenance inspections are conducted annually and documents available for review during this FYR review period report that no residential land use is occurring or planned.

3.5.9.2 Question B: Are The Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used At the Time Of The Remedy Selection Still Valid?

Yes, exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time the remedy was selected are still valid. No changes have occurred that call into question the protectiveness of the remedy. Although no COCs or RGs were identified in the DD, the chemicals and media of concern discussed in the DD are discussed in Question B to assess the protectiveness of the remedy (i.e., LUCs) in meeting the RAO.

3.5.9.2.1 Changes in Standards and To-Be-Considereds (TBCs)

No COCs, ARARs, TBCs, or cleanup standards were identified in the 2006 DD for the DRMO Yard. However, the DD indicates that Aroclor 1242 was detected at a concentration of 1.8 mg/kg in a single sample (PCB Aroclor 1242) from a stock pile of soil that returned to the excavations in 2000 as part of the initial response.

The soil concentration was evaluated in a January 2005 Screening Level Risk Assessment (SLRA) and was found to be above MTCA cleanup levels for unrestricted use. The Aroclor 1242 (PCB) concentration is above the current (February 2021) unrestricted use MTCA Method A cleanup level of 1 mg/kg PCBs but below the current industrial MTCA Method A cleanup level of 10 mg/kg PCBs.

The Toxic Substance Control Act requires a cap for soils containing more than 1 mg/kg PCBs to ≤ 10 mg/kg under unrestricted use and ICs for up to 25 mg/kg in low occupancy areas. The most recent USEPA (May 2022) soil RSL for high-risk PCBs addressing future residents is 0.23 mg/kg. Thus, future risks associated with the maximum detection of 1.8 mg/kg PCBs would be associated with a $8x10^{-6}$ cancer risk, which is within the "acceptable" risk range of 10^{-4} to 10^{-6}. The PCB soil RSL for workers is 0.94 mg/kg, indicating a cancer risk for workers of $2x10^{-6}$. Thus, the concentration remains above the MTCA unrestricted use value used to screen PCBs (1 mg/kg) but below values protective of commercial/industrial use. ICs are used to prevent residential land use within the site boundary.

3.5.9.2.2 Changes in Exposure Pathways

There have been no changes in the exposure pathways since the implementation of the remedy and LUCs are utilized to implement the ICs in the remedy. The site is currently used as an active industrial laydown yard for surplus material to be recycled. The site continues to be restricted to nonresidential use only and remains under government control. Maintenance inspections are conducted annually and documents available for review during this FYR report no residential land use is occurring or planned. Thus, the RAO at the time the remedy was selected is still valid. However, the potential for VI to indoor air was not considered previously and is therefore evaluated below.

Vapor Intrusion

The VI pathway was not discussed in the 2006 DD and PCBs are characterized by USEPA (VISL On-line Calculator; https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator; last updated May 19, 20202) as being sufficiently volatile and toxic to pose an inhalation risk via VI from a soil source. However, this exposure pathway is incomplete because there are no buildings present. Thus, based on a review of current land use, there have been no changes in exposure pathways. As provided in the 2017 LUC Plan, LUCs are implemented through the mechanisms discussed in Section 2.5.1. LUC details presented in the 2017 plan are provided in Appendix E.

3.5.9.2.3 Changes in Toxicity and Other Contaminant Characteristics

No COCs or RGs were identified in the DD for the DRMO Yard, therefore no changes in toxicity or other contaminant characteristics were identified for FTLE-31.

3.5.9.2.4 Changes in Risk Assessment Methods

No COCs or RGs were identified in the DD for the DRMO Yard; therefore, no changes in risk assessment methods were identified for FTLE-31.

3.5.9.2.5 Expected Progress Toward Meeting RAOs

The RAO identified in the 2006 DD is being met by maintaining governmental control of the site and restricting the site to nonresidential uses.

3.5.9.3 Question C: Has Any Other Information Come To Light That Could Call Into Question The Protectiveness of the Remedy?

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

3.5.10 Issues, Recommendations and Follow-up Actions

There were no issues found affecting the protectiveness of the remedy.

3.5.11 Protectiveness Statement

The remedy at the FTLE-31, DRMO Yard site is protective of human health and the environment. LUCs prevent exposure to contaminated soil by restricting residential land use and preventing unplanned excavation of contaminated soil.

3.6 FTLE–51 (Industrial Wastewater Treatment Plant)

3.6.1 Site Description

The IWTP site (FTLE-51; HQAES Site ID 53465.1032) consists of the soil in the settling basin downstream of the former IWTP Outfall 7 and the forested/grassy area affected by overflow from the settling basin. The approximately 1-acre site, also known as Stormwater Outfall #7/Settling Basin, is located within a fenced area in the north-central portion (North Use Area) of the Logistics Center complex (Figure 3-17). The components of FTLE-51 (Outfall 7 and associated settling basins) were replaced in 2002 and are currently used only for excess stormwater capacity during infrequent stormwater overflows associated with the replacement Outfall 7. The JBLM RPMP lists current and future land use at the FTLE-51 site as industrial.

3.6.2 Site Chronology

The chronology of key events for FTLE–51 is provided in Table 3-13.

Table 3-13. Chronology of Site Events

Event	Date
Limited SI of surface soils and Outfall #7 effluent	1986
Logistics Center RI	1988
Site included in the Logistics Center ROD as a potential groundwater contamination source (subsequently determined not to be a source)	1990
Limited Field Investigation of Fort Lewis stormwater outfalls	1993
DD for the Stormwater Outfalls/IWTP (and other sites)	2000
Soil removal associated with stormwater system improvements	2001/2002
SI for the IWTP	2007
Draft DD for Selected Remedy, IWTP	2007
Implementation of LUCs	2008
FYRs	2007, 2012, and 2017
Site was removed, with other sites within the Logistics Center's North Uses Area, as a potential source of TCE in groundwater through an ESD, separating the sites from the Logistics Center NPL site.	2010
PCOR (documents Operational and Functional)	2015
Annual LUC Inspections	2011-2021
Comprehensive LUCs Plan	2017

DD = Decision Document
IWTP = Industrial Wastewater Treatment Plant
PCOR = Preliminary Close Out Report
SI = Site Investigation
ESD = Explanation of Significant Difference
LUC = Land Use Control
RI = Remedial Investigation
TCE = trichloroethene
FYR = Five-Year Review
NPL = National Priorities List
ROD = Record of Decision

3.6.3 History of Contamination

The IWTP began operating in 1954 and predominantly received storm water runoff from nearby maintenance facilities. The IWTP reportedly received floor washings from machine shops, paint spray booths, and rinsate from metal refinishing dip tanks all located within the Logistics Center complex.

The IWTP site was initially investigated in 1986 and during subsequent investigations in 2001/2002 concentrations of Total Petroleum Hydrocarbons (TPH), cPAH, and lead that exceeded MTCA Method A unrestricted use thresholds but were below the MTCA Method C industrial thresholds were identified. Select TPH and cPAH concentrations were also above the MTCA threshold for potential leaching to groundwater.

3.6.4 Initial Response

In 1990, an IAG (USEPA, 1990) between the Army, USEPA and Ecology was signed to address sites at the Fort Lewis Army Base that were suspected of having environmental contamination, including the IWTP. A soil removal action was completed in 2002 that resulted in excavation and removal of approximately 80 cubic yards of petroleum-impacted soil from the northeast corner of the site. The removal action was completed during improvements to Outfall 7.

3.6.5 Basis For Taking Action

TPH, cPAH, and lead remain present in soil at concentrations above MTCA Method A criteria for residential use, which forms the basis for taking action.

3.6.6 Remedial Action

3.6.6.1 Remedy Selection

The selected remedy for the IWTP site (FTLE-51) is documented in the following DD:

- *Decision Document for Selected Remedy, Industrial Wastewater Treatment Plant, Fort Lewis, Washington* (Fort Lewis, 2007)

3.6.6.1.1 Remedial Action Objectives

The RAO stated in the 2007 DD.

- Ensure that the nature and extent of the site is considered during all planning decisions and that potential impacts from the site are mitigated as necessary before any proposed residential use.

3.6.6.1.2 Remedial Goals

No RGs were established for the selected remedial action at FTLE-51.

3.6.6.1.3 Remedy Description

The following LUC objective was identified as part of the remedy selected in the 2007 DD (Fort Lewis, 2007) to prevent exposure to contaminants remaining in the soil:

- Prevent residential land use.

The LUC objective is achieved through maintenance of the following LUCs described in further detail in Section 2.5.1 and conducting annual inspections of the sites and interviews with the staff responsible for maintaining the LUC overlays and filling out LUC checklists:

- Administrative LUCs Maintain and update as needed the following LUC mechanisms: LUC Data Layer in GIS; LUC Overlay for RPMP; LUC Overlay for ERP; LUC Overlay for DPA; Installation Access.

3.6.6.2 Remedy Implementation

LUC implementation at FTLE-51 began in 2007 and is ongoing in accordance with the 2017 Comprehensive LUCs Plan (Sealaska, 2018a). LUCs are implemented through the mechanisms discussed in Section 2.5.1. LUC details presented in the 2017 plan are provided in Appendix E.

3.6.6.3 Operations and Maintenance

The 2017 through 2021 O&M activities required for FTLE-51 were conducted in accordance with the 2017 LUC plan (Sealaska, 2018a). O&M activities include conducting annual LUC inspection to assess the condition of the site.

LUC and Site Inspections

The FTLE-51 site and LUCs are monitored and inspected annually. Copies of the completed LUC inspection checklists are provided to the JBLM IRP Manager for submittal to the appropriate regulatory agencies, including Ecology and USEPA, as described in the LUC plan (Sealaska, 2018a). Copies of the LUC checklists completed during this FYR period are provided in Appendix E.

Annual inspections were performed at FTLE-51 during the 2017 to 2021 reporting period to verify that prohibited land use (residential) has not occurred within the LUC boundary (Figure 3-18). Documentation of the annual inspection activities was provided for review in the 2018, 2019, 2020, and 2021 LUCs Checklists (EA, 2019f; 2020d; 2022c, 2022g). An annual inspection was reportedly performed in 2017 but no checklist was available for review. A monthly status report was provided stating that the 2017 inspections were conducted as part of the Environmental Remediation Program Services (Sealaska, 2017a).

Interviews are also conducted with installation personnel as part of the annual site/LUC inspections to confirm that LUC requirements are available in the JBLM GIS and RPMP systems for real-time reference during land use planning, environmental reviews, construction and maintenance activities, and as part of the JBLM NEPA implementation. The interview portion of the LUC checklists was reviewed for the 2018 through 2021 checklists and confirms that the LUC information necessary for real-time reference remains available and current.

No changes from industrial land use were identified at FTLE-51 in the reviewed LUC monitoring checklists. The reviewed annual checklists confirmed that restrictions within the LUC boundary concerning land use conform to the LUC requirements and no LUC deficiencies, violations, or inconsistencies were noted.

3.6.7 Progress Since the Last Five-Year Review

3.6.7.1 Protectiveness Statement From The Last Review

Protectiveness statements presented in the 2017 FYR were presented by OU rather than by individual sites. The protectiveness for OU01 was deferred in the 2017 FYR but was revised in a 2019 addendum. The original protectiveness statement along with the revised protectiveness statement are presented below

Protectiveness statement for OU01 presented in the 2017 FYR

> *A protectiveness determination for the OU1 – Logistics Center Remedy cannot be made at this time until further information is obtained. Further information will be obtained by taking the following action: an investigation and evaluation of the presence of PFASs within the three pump and treat systems at the Logistics Center. It is expected that this action will take approximately three years to complete, at which time a protectiveness determination will be made.*
>
> *The following elements of the remedy have ensured that RAOs are being met. LUCs prevent exposure to groundwater by restricting installation of new drinking water wells within the areal extent of the TCE groundwater plume inside the JBLM boundary. Existing LUCs are preventing exposure to soil by maintaining a fence with signs around the perimeter of LF-2 and restricting training activities and unauthorized digging and construction within LF-2. LUCs are preventing exposure by preventing residential land use at LF-2 or within the 100 µg/L groundwater isoconcentration contour. The I-5 and SLA P&T systems prevent migration of contaminated groundwater within the Upper Vashon, Lower Vashon, and SLA.*
>
> *Additionally, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness: a thorough evaluation of whether the LF-2 system is providing complete capture of the plume in accordance with the RAOs through monitoring and capture zone analysis. If capture zone analysis shows lack of capture, pumping should be increased (through additional extraction well(s) and/or increased pumping).*
>
> *At the Illicit PCB Dump Site, LUCs prevent exposure to contaminated soils by maintaining a fence with signs warning against unauthorized excavation and digging, restricting access, and ensuring the site is not used for training or residential land use. Maintenance of the cap also restricts exposure to contaminated soils.*
>
> *At Landfill 1, LUCs are preventing exposure to groundwater and landfill wastes by restricting residential development, unplanned excavation, and installation of new drinking water wells within a 1,000 feet of the site boundary.*
>
> *At the Battery Acid Pit, DRMO Yard, IWTP, and Pesticide Rinse Area, LUCs are preventing exposure to contaminated soils through maintenance of the asphalt cap and excavation and construction restrictions at the Battery Acid Pit and through prevention of residential land use at the Battery Acid Pit, DRMO Yard, IWTP, and the Pesticide Rinse Area.*

Revised protectiveness statement for OU01 as presented in the 2019 Addendum

> *Based on new information and/or actions taken since the Five-Year Review completion date, the protectiveness statement for OU1 - Logistics Center Remedy is being revised to currently protective of human health and the environment because the sum of PFOS/PFOA was found to be below the current HAL of 70 ppt in the Landfill 2 source area wells and Landfill 2, 1-5, and Sea Level Aquifer pump and treat system influent and effluent samples.*

3.6.7.2 Status of Recommendations and Follow-Up Actions from Last Review

No issues were identified during the second installation-wide FYR that affected the protectiveness of the remedy at FTLE-51.

3.6.8 Five-Year Review Process

3.6.8.1 Data Review

There is no data collection requirement for the site.

3.6.8.2 Site Inspection

As discussed in Section 1.3.4, the Site Inspection for FTLE-51 was conducted on 9 November 2021. The site is located within a fenced area to prevent access to portions of the wastewater treatment area; the fence is not part of the FTLE-51 remedy. No changes in site conditions or land use were noted during the inspection. Appendix C provides the detailed Site Inspection Trip Report and includes the inspection participants, FYR Site Inspection Checklists, and photographic log.

3.6.8.3 Interviews

As discussed in Section 1.3.5, interviews were conducted by email with parties knowledgeable of site conditions, including regulatory agencies involved in site activities. The USEPA RPM, Mr. Patrick Hickey, responded to the FYR interview questionnaire that included FTLE-51 but had no specific comments regarding the site. The complete interview records are included in Appendix D.

3.6.9 Technical Assessment

The technical assessment of the protectiveness of the remedy for FTLE-51 is based on the responses to these three questions:

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

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

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

3.6.9.1 Question A: Is The Remedy Functioning As Intended By The Decision Document?

Yes, the review of documents, and site inspection data indicate that the remedy at FTLE-51 is currently functioning as intended by the DD.

The site continues to be restricted to nonresidential use only and remains under government control. Maintenance inspections are conducted annually and documents available for review during this FYR review period report that no residential land use is occurring or planned.

3.6.9.2 Question B: Are The Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used At the Time Of The Remedy Selection Still Valid?

Yes, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. No changes have occurred that call the protectiveness of the remedy into question. Although no COC or RGs were identified in the DD, the chemicals and media of concern discussed in the DD are discussed in Question B to assess the protectiveness of the remedy (i.e., LUC) in meeting the RAO.

3.6.9.2.1 Changes in Standards and To-Be-Considereds (TBCs)

While the 2007 Draft DD did not identify COCs and associated ARARs, TBCs or cleanup levels, TPH, PAHs and metals concentrations were identified above residential risk-based screening criteria. The 2007 Draft DD was based on an analysis of the 2007 SI Report that demonstrated that petroleum and metal concentrations (TPH, cPAH, and lead) at the IWTP site do not pose an unacceptable risk or hazard for any potential exposure pathways under the industrial land use scenario but were above the MTCA Method A/Method B soil cleanup levels for the potential direct contact pathway in an unrestricted land use scenario. The current July 2021 Method C (industrial) soil cleanup level for lead (1000 mg/kg) is the same. The TPH and cPAH MTCA soil cleanup levels have increased, as discussed under “Changes in Toxicity and Other Chemical Characteristics”.

3.6.9.2.2 Changes in Exposure Pathways

There have been no changes in the exposure pathways at the site since the implementation of the remedy and LUCs are utilized at FTLE-51 to implement the ICs in the remedy. The industrial land use assumed in the 2007 screening level risk evaluation has not changed. Thus, the RAO (prevent residential use) at the time the remedy was selected is still valid.

3.6.9.2.3 Changes in Toxicity and Other Contaminant Characteristics

A modified Method C TPH-D and TPH-HO cleanup level of 80,000 mg/kg (based on sites-specific extractable petroleum hydrocarbon [EPH] concentrations) was used in the 2007 screening level risk evaluation.

The toxicity data and contaminant specific properties used to develop the TPH cleanup levels in the screening level risk evaluation were updated in July 2021. As done in the 2007 screening level risk evaluation, site-specific EPH data was input into the most recent version of the MTCA TPH 11.1 Excel workbook to calculate site-specific modified Method C direct contact cleanup level of 120,000 mg/kg, which has increased from the value used in the 2007 screening risk evaluation.

However, for industrial soils only benzo(a)pyrene exceeded the USEPA (1998) Region 9 Preliminary RGs (PRGs) industrial standard. The USEPA IRIS updated the toxicity data for benzo(a)pyrene in January 2017, which results in increased industrial PRGs (now called RSLs) for cPAHs. Based on this toxicity change, the Method C cleanup level for cPAH has increased from 18 mg/kg used in the 2007 screening risk evaluation to the July 2021 Method C cleanup level of 130 mg/kg.

Since the 2007 DD placed LUCs on the area to prevent future residential use and the site is in a fenced area used for collection of excess storm water, where even worker exposure will be minimized, changes to toxicity data and contaminant properties do not call the protectiveness of the remedy into question.

3.6.9.2.4 Changes in Risk Assessment Methods

A number of changes in risk assessment methods and exposure assumptions have taken place since the DD. These changes are summarized in Appendix H. These changes, along with changes in toxicity data, have been incorporated in the updated Method C cleanup levels and USEPA RSL, and have not been significant enough to call the protectiveness of the remedy into question. Since the 2007 DD placed LUCs on the area to prevent future residential use and the site is in a fenced area used for collection of excess storm water, where even worker exposure will be minimized, changes to risk assessment methodologies do not call the protectiveness of the remedy into question.

3.6.9.2.5 Expected Progress Toward Meeting RAOs

The RAO identified in the 2006 DD is being met by maintaining governmental control of the site and restricting the site to nonresidential uses.

3.6.9.3 Question C: Has Any Other Information Come To Light That Could Call Into Question The Protectiveness of the Remedy?

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

3.6.10 Issues, Recommendations and Follow-up Actions

There were no issues found affecting the protectiveness of the remedy.

3.6.10.1 Other Findings

The following recommendation not affecting protectiveness was identified during this FYR and is provided to improve implementation of the remedy.

- The annual LUCs Checklist reports should be completed in a timely manner to ensure that the required LUC inspections are documented and available for review.

3.6.11 Protectiveness Statement

The remedy at the FTLE-51, IWTP site is protective of human health and the environment. LUCs prevent exposure to contaminated soil by restricting residential land use.

3.7 FTLE–28 (PESTICIDE RINSE AREA – BUILDING 9586)

3.7.1 Site Description

The Pesticide Rinse Area site (FTLE-28; HQAES Site ID 53465.1016) consisted of an approximately 34 ft by 35 ft concrete pad located outside a pesticide storage area on the south side of Building 2054 (Figure 3-19). The FTLE-28 area is currently part of a parking area for adjacent buildings. The current and anticipated future land use designated for the Pesticide Rinse Area in the JBLM RPMP is administration.

3.7.2 Site Chronology

The chronology of key events for FTLE–28 is provided in Table 3-14.

Table 3-14. Chronology of Site Events

Event	Date
Investigations	1986-1994
DD	2000
Implementation of LUCs	2008
Final Draft Technical Memo (formal documentation of RI/FS)	2010
PCOR (documents Operational and Functional)	2015
FYR	2007, 2012, and 2017
Annual LUC Inspections	2011-2021
Comprehensive LUCs Plan	2017

DD = Decision Document FS = Feasibility Study FYR = Five-Year Review LUC = Land Use Control
PCOR = Preliminary Close Out Report RI = Remedial Investigation

3.7.3 History of Contamination

The pad was used for over 24 years as a rinsing area for pesticide application equipment and to rinse out empty chemical containers. The rinse pad had no berm or other type of secondary containment and was reported to have been dissected by many cracks, some of which extend to the base of the concrete slab. The initial investigation of FTLE-28 resulted in a detection of one low concentration of the pesticide dichlorodiphenyldichloroethylene (DDE) in surface soil. Additional soil and groundwater sampling were conducted under a 1993/1994 Limited SI which resulted in detecting chlordane beneath the concrete pad at a concentration exceeding the industrial screening criteria used at that time. Residential criteria were also exceeded in one sample for chlordane, dieldrin, and heptachlor. No contaminants were detected in groundwater.

3.7.4 Initial Response

In 1990, an IAG (USEPA, 1990) between the Army, USEPA and Ecology was signed to address sites at the Fort Lewis Army Base that were suspected of having environmental contamination, including the Pesticide Rinse Area). There is no record of other initial response actions having been conducted at the FTLE-28 site.

3.7.5 Basis For Taking Action

Pesticide contamination exceeding 1998 USEPA Region 9 Residential PRGs was left at FTLW-28, forming the basis for taking action at FTLE-28.

3.7.6 Remedial Action

3.7.6.1 Remedy Selection

The selected remedy for the Pesticide Rinse Area site (FTLE-28) is documented in the following DD:

- *Decision Document for the Storm Water Outfalls/Industrial Wastewater Treatment Plant, Pesticide Rinse Area, Old Fire Fighting Training Pit, Illicit PCB Dump Site, and the Battery Acid Pit. Fort Lewis, Washington,* published December 2000.

3.7.6.1.1 Remedial Action Objectives

The RAO stated in the 2000 DD is:

- Prevent direct contact of site soils under a residential exposure scenario.

3.7.6.1.2 Remedial Goals

No site-specific RGs were established for FTLE-28 in the 2000 DD.

3.7.6.1.3 Remedy Description

The following LUC objective was identified as part of the remedy selected for FTLE-28 in the 2000 DD (PNNL, 2000) to prevent exposure to contaminants remaining in the soil:

- Prevent residential land use.

The LUC objective is achieved through maintenance of the following LUCs described in further detail in Section 2.5.1 and conducting annual inspections of the sites and interviews with the staff responsible for maintaining the LUC overlays and filling out LUC checklists:

- Administrative LUCs Maintain and update as needed the following LUC mechanisms: LUC Data Layer in GIS; LUC Overlay for RPMP; LUC Overlay for ERP; LUC Overlay for DPA; Installation Access.

3.7.6.2 Remedy Implementation

LUC implementation at FTLE-28 began in 2008 and is ongoing in accordance with the 2017 Comprehensive LUCs Plan (Sealaska, 2018a). LUCs are implemented through the mechanisms stated in Section 2.5.1. LUC details presented in the 2017 plan are provided in Appendix E.

3.7.6.3 Operations and Maintenance

The 2017 through 2021 O&M activities required for FTLE-28 were conducted in accordance with the 2017 LUC plan (Sealaska, 2018a). O&M activities include conducting annual LUC inspections to assess the condition of the site.

LUC and Site Inspections

The FTLE-28 site and LUCs are monitored and inspected annually. Copies of the completed LUC inspection checklists are provided to the JBLM IRP Manager for submittal to the appropriate regulatory agencies, including Ecology and USEPA, as described in the LUC plan (Sealaska, 2018a). Copies of the LUC checklists completed during this FYR period are provided in Appendix E.

Annual inspections were performed at FTLE-28 during the 2017 to 2021 reporting period to verify that prohibited land use (residential) has not occurred withing the LUC boundary (Figure 3-20). Documentation of the annual inspection activities was provided for review in the 2018, 2019, 2020, and 2021 LUCs Checklists (EA, 2019f; 2020d; 2022c, 2022g). An annual inspection was reportedly performed in 2017 but no checklist was available for review. A monthly status report was provided stating that the 2017 inspections were conducted as part of the Environmental Remediation Program Services (Sealaska, 2017a).

Interviews are also conducted with installation personnel as part of the annual site/LUC inspections to confirm that LUC requirements are available in the JBLM GIS and RPMP systems for real-time reference during land use planning, environmental reviews, construction and maintenance activities, and as part of the JBLM NEPA implementation. The interview portion of the LUC checklists was reviewed for the 2018 through 2021 checklists and confirms that the LUC information necessary for real-time reference remains available and current.

No residential land use was identified at FTLE-28 in the reviewed LUC monitoring checklists. The reviewed annual checklists confirmed that restrictions within the LUC boundary concerning land use conform to the LUC requirements and no LUC deficiencies, violations, or inconsistencies were noted.

3.7.7 Progress Since the Last Five-Year Review

3.7.7.1 Protectiveness Statement From The Last Review

Protectiveness statements presented in the 2017 FYR were organized by OU rather than by individual sites. The protectiveness for OU01 was deferred in the 2017 FYR but was revised in a 2019 addendum. The original protectiveness statement along with the revised protectiveness statement are presented below.

Protectiveness statement for OU01 as presented in the 2017 FYR

> *A protectiveness determination for the OU1 – Logistics Center Remedy cannot be made at this time until further information is obtained. Further information will be obtained by taking the following action: an investigation and evaluation of the presence of PFASs within the three pump and treat systems at the Logistics Center. It is expected that this action will take approximately three years to complete, at which time a protectiveness determination will be made.*
>
> *The following elements of the remedy have ensured that RAOs are being met. LUCs prevent exposure to groundwater by restricting installation of new drinking water wells within the areal extent of the TCE groundwater plume inside the JBLM boundary. Existing LUCs are preventing exposure to soil by maintaining a fence with signs around the perimeter of LF-2 and restricting training activities and unauthorized digging and construction within LF-2. LUCs are preventing exposure by preventing residential land use at LF-2 or within the 100 µg/L groundwater*

isoconcentration contour. The I-5 and SLA P&T systems prevent migration of contaminated groundwater within the Upper Vashon, Lower Vashon, and SLA.

Additionally, in order for the remedy to be protective in the long-term, the following action needs to be taken to ensure protectiveness: a thorough evaluation of whether the LF-2 system is providing complete capture of the plume in accordance with the RAOs through monitoring and capture zone analysis. If capture zone analysis shows lack of capture, pumping should be increased (through additional extraction well(s) and/or increased pumping).

At the Illicit PCB Dump Site, LUCs prevent exposure to contaminated soils by maintaining a fence with signs warning against unauthorized excavation and digging, restricting access, and ensuring the site is not used for training or residential land use. Maintenance of the cap also restricts exposure to contaminated soils.

At Landfill 1, LUCs are preventing exposure to groundwater and landfill wastes by restricting residential development, unplanned excavation, and installation of new drinking water wells within a 1,000 feet of the site boundary.

At the Battery Acid Pit, DRMO Yard, IWTP, and Pesticide Rinse Area, LUCs are preventing exposure to contaminated soils through maintenance of the asphalt cap and excavation and construction restrictions at the Battery Acid Pit and through prevention of residential land use at the Battery Acid Pit, DRMO Yard, IWTP, and the Pesticide Rinse Area.

Revised protectiveness statement for OU01 as presented in the 2019 Addendum to the 2017 FYR

Based on new information and/or actions taken since the Five-Year Review completion date, the protectiveness statement for OU1 - Logistics Center Remedy is being revised to currently protective of human health and the environment because the sum of PFOS/PFOA was found to be below the current HAL of 70 ppt in the Landfill 2 source area wells and Landfill 2, 1-5, and Sea Level Aquifer pump and treat system influent and effluent samples.

3.7.7.2 Status of Recommendations and Follow-Up Actions from Last Review

No issues were identified during the second installation-wide FYR that affect the protectiveness of the remedy for FTLE-28.

3.7.8 Five-Year Review Process

3.7.8.1 Data Review

There is no data collection requirement for the site.

3.7.8.2 Site Inspection

As discussed in Section 1.3.4, the Site Inspection for FTLE-28 was conducted on 9 November 2021. The site is located near Building 2054 within a fenced area. No changes in site conditions or land use were noted during the inspection. Appendix C provides the detailed Site Inspection Trip Report and includes the inspection participants, FYR Site Inspection Checklists, and photographic log.

3.7.8.3 Interviews

As discussed in Section 1.3.5, interviews were conducted by email with parties knowledgeable of site conditions, including regulatory agencies involved in site activities. The USEPA RPM, Mr. Patrick Hickey, responded to the FYR interview questionnaire that included FTLE-28 but had no specific comments regarding the site. The complete interview records are included in Appendix D.

3.7.9 Technical Assessment

The technical assessment of the protectiveness of the remedy for FTLE-28 is based on the responses to these three questions:

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

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

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

3.7.9.1 Question A: Is The Remedy Functioning As Intended By The Decision Document?

Yes, the review of documents, and site inspection data indicate that the remedy at FTLE-28 is currently functioning as intended by the DD.

The site continues to be restricted to nonresidential use only and remains under government control. Maintenance inspections are conducted annually and documents available for review during this FYR review period report that no residential land use is occurring or planned.

3.7.9.2 Question B: Are The Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used At the Time Of The Remedy Selection Still Valid?

Yes, while there have been changes to exposure assumptions, toxicity data, cleanup levels, and RAOs at the time the remedy was selected, no changes have occurred that call the protectiveness of the remedy into question. Although no COCs or RGs were identified in the DD. The chemicals and media of concern discussed in DD are discussed in Question B to assess the protectiveness of the remedy (i.e., LUC) in meeting the RAO.

3.7.9.2.1 Changes in Standards, To-Be-Considereds (TBCs),

While the 2000 DD did not identify ARARs, TBCs or cleanup levels, the 2000 DD identified chlordane, dieldrin, and heptachlor as exceeding 1998 USEPA Region 9 PRGs for residential soils, but not for industrial soils. Since this area is under concrete, effectively preventing exposures and restricting leaching to groundwater, minor changes in the soil screening levels and contaminant characteristics (as described in the "Changes in Toxicity and Other Contaminant Characteristics" and "Changes in Risk Assessment Methods") do not affect the protectiveness of the remedy.

3.7.9.2.2 Changes in Exposure Pathways

There have been no changes in the exposure pathways at the site since the implementation of the remedy and LUCs are being utilized at FTLE-28 to implement the ICs in the remedy. Thus, the RAO (prevent direct contact of site soils under a residential exposure scenario) at the time the remedy was selected is still valid. However, the potential for VI was not considered previously and is therefore evaluated below.

Vapor Intrusion Pathway

The VI pathway was not discussed in the 2000 Draft DD and Heptachlor and chlordane are characterized by USEPA (VISL On-line Calculator; https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator; last updated May 19, 2022) as being sufficiently volatile and toxic to pose an inhalation risk via VI from a soil source. Soil concentrations of pesticides were detected at two ft beneath the concrete pad at concentrations above the industrial screening level applicable at the time. The DD indicated no pesticides or PCBs were detected in the groundwater sample. While the VI pathway and associated indoor inhalation risks were not evaluated for the Pesticide Release Area, the residual soil contaminants are beneath concrete, and no chemicals were detected in groundwater. Therefore, the VI exposure pathway has no effect on the protectiveness of the remedy.

3.7.9.2.3 Changes in Toxicity and Other Contaminant Characteristics

To evaluate changes in toxicity and contaminant characteristics, comparison of the 1998 PRGs, the 2021 RSLs, and the February 2021 MTCA Cancer Method B values is provided in Table 3-15, below:

Table 3-15. Comparison of Soil Screening Criteria, FTLE-28

COCs	1998 EPA Region 9 PRGs (mg/kg)		EPA May 2022 RSL (mg/kg)		February 2021 MTCA Method B / Method C (mg/kg)	
	Residential	Industrial	Residential	Industrial	Unrestricted	Industrial
Chlordane	1.6	12	1.7	7.7	2.9	380
Dieldrin	0.028	0.19	0.034	0.14	0.063	8.2
Heptachlor	0.099	0.67	0.13	0.63	0.22	29

mg/kg = milligrams per kilogram
COC = Contaminant of Concern
EPA = Environmental Protection Agency
PRG = Preliminary Remediation Goal
RSL = Regional Screening Level

An oral reference dose from the Agency for Toxic Substances and Disease Registry is used to develop the November 2021 RSL for heptachlor. While the RSLs and MTCA have changed since the remedy, the residential screening levels are higher than the 1998 residential PRGs. While the chlordane concentration beneath the pad (10 mg/kg) exceeds the May 20221 industrial RSLs (7.7 mg/kg), this chlordane concentration is within the risk management range (7.7 mg/kg at 10^{-6} risk to 770 mg/kg at 10^{-4} risk) and is below the noncancer industrial RSL of 450 mg/kg. The 2000 DD also evaluated the potential for chlordane to impact groundwater. Modeling results indicated that the chlordane will never reach the groundwater due to a combination of adsorption and degradation. The soil partition coefficient (Kd) used in the modeling was 28 mL/g. The May 2022 RSL table presents an organic carbon partition coefficient of 6.8E+04 L/kg, which is equivalent to a Kd of 136 mL/g at USEPA default soil organic carbon content of 0.002. Because the Kd is higher than used in the computer modeling in the DD, the modeling results are still protective when considering this updated chemical property of chlordane. Since this area is under concrete, effectively preventing exposures and restricting leaching to groundwater, these minor changes in the soil screening levels and contaminant characteristics do not affect the protectiveness of the remedy.

3.7.9.2.4 Changes in Risk Assessment Methods

The default exposure parameters for residential and industrial land use have changed since the implementation of the remedy. These changes have been incorporated in the screening criteria presented above in the "Changes in Toxicity and Other Contaminant Characteristics". Since this area is under concrete, effectively preventing exposures and restricting leaching to groundwater, these minor changes in the risk-based soil screening levels do not affect the protectiveness of the remedy.

3.7.9.2.5 Expected Progress Toward Meeting RAOs

The RAO identified in the 2000 DD is being met by maintaining governmental control of the site and restricting the site to nonresidential uses.

3.7.9.3 Question C: Has Any Other Information Come To Light That Could Call Into Question The Protectiveness of the Remedy?

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

3.7.10 Issues, Recommendations and Follow-up Actions

There were no issues found affecting the protectiveness of the remedy.

3.7.11 Protectiveness Statement

The remedy at the FTLE-28, Pesticide Rinse Area site is protective of human health and the environment. LUCs prevent exposure to contaminated soil by restricting residential land use.

3.8 OU01 Issues, Recommendations and Follow-up Actions

3.8.1 Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. At FTLE-33 (Logistics Center), the northwestern edge of the lower Vashon aquifer plume is not well-defined downgradient of the FTLE-33 I-5 P&T system. Currently, LC-237b (73 µg/L in 2020) is located on the edge of the monitoring network and had the highest TCE concentration of any lower Vashon aquifer monitoring well in 2020 and 2021.	N	Y
2. At FTLE-33 (Logistics Center), the northwestern edge of the lower Vashon aquifer plume is not well defined at FTLE-33 near LC-41b.	N	Y
3. At FTLE-33 (Logistics Center), groundwater contaminated with TCE at concentrations significantly exceeding the RG is bypassing the existing LF-2 treatment systems such that upgradient TCE concentrations continue to impact downgradient areas.	N	Y
4. At FTLE-46 (Illicit PCB Dump Site), the required maintenance of the clay cap is not occurring which could compromise the integrity of the cap and allow exposure to the contaminated soil.	N	Y

P&T = Point & Treat N = No PCB = Polychlorinated Biphenyl RG = Remedial Goal
TCE = trichloroethene Y = Yes

3.8.2 Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1.	For FTLE-33 (Logistics Center), install additional well or wells to the northwest or southeast of existing well LC-41b for the purpose of defining the northwestern edge of the lower Vashon aquifer plume.	U.S. Army	USEPA	28 September 2026	N	Y
2.	For FTLE-33 (Logistics Center), install additional well or wells in the lower Vashon aquifer to the northwest of existing well LC-237b to completely define the lower Vashon plume boundary in that area.	U.S. Army	USEPA	28 September 2026	N	Y
3.	For FTLE-33 (Logistics Center), complete a plume capture assessment to provide a comprehensive understanding of hydrogeologic conditions beneath the LF-2 area and, based on that understanding, optimize the LF-2 P&T system and associated monitoring network so that the contaminant plume beneath the LF-2 P&T system is completely contained.	U.S. Army	USEPA	28 September 2026	N	Y
4.	For FTLE-46 (Illicit PCB Dump Site), schedule and perform routine cap maintenance activities to ensure protection of human health and the environment.	U.S. Army	USEPA	28 September 2023	N	Y

N = No P&T = Pump and Treat PCB = Polychlorinated Biphenyl USEPA = United States Environmental Protection Agency Y = Yes

3.9 OU01 Protectiveness Statement

The remedies at sites within OU01, Logistics Center, currently protect human health and the environment because potential exposure to contamination has been addressed through implementation and/or O&M of remedial systems and LTM, and through implementation and maintenance of appropriate LUCs that achieve the following LUC objectives:

- **FTLE-33, Logistics Center.** Restrict access to known source areas at the site, restrict the site to industrial or administrative use, prevent unplanned excavation of contaminated soil, and prevent new drinking water wells without a USEPA-approved monitoring plan.
- **FTLE-46, Illicit PCB Dump Site.** Prevent residential land use, prevent unplanned excavation of contaminated soil, restrict site access for training purposes, and by maintaining a boundary fence and signage.
- **FTLE-54, LF-1.** Prevent residential land use, prevent unplanned excavation of contaminated soil, and prevent new drinking water wells within 1,000 ft of landfill boundary without a USEPA-approved monitoring plan.
- **FTLE-16, Battery Acid Pit.** Prevent residential land use, prevent unplanned excavation of contaminated soil, and ensure that the asphalt covering the former pit is maintained.
- **FTLE-31, DRMO Yard.** Prevent residential land use.
- **FTLE-51, IWTP.** Prevent residential land use.
- **FTLE-28, Pesticide Rinse Area.** Prevent residential land use.

However, for OU01 to be protective in the long term, the following actions should be taken to ensure protectiveness at two of the sites:

- **FTLE-33, Logistics Center.** Additional monitoring wells must be installed to define and monitor the full extent of the groundwater plume and additional plume optimization of the existing treatment systems must be accomplished to fully capture upgradient TCE concentrations in groundwater that significantly exceed the RG and continue to impact downgradient areas.
- **FTLE-46, Illicit PCB Dump.** Maintenance of the clay cap must be conducted on a routine basis to ensure the integrity of the cap which is necessary to prevent direct contact with contaminated soil.

4 OU02 – LANDFILL 4 AND SOLVENT REFINED COAL PILOT PLANT

OU02 is comprised of LF-4 (FTLE-57) and SCRPP (FTLE-32) that were identified in 1986 and added to the NPL in 1989 (with the Logistics Center) after investigations confirmed the presence of contamination. Each site has their own response actions, and Chapter 4 is structured to discuss and evaluate the sites individually, including individual protectiveness statements for each site; however, a combined set of issues and a single OU02 protectiveness statement is provided at the conclusion of Chapter 4.

4.1 FTLE–57 (LANDFILL 4)

4.1.1 Site Description

The LF-4 site (FTLE-57; HQAES Site ID 53465.1036) encompasses approximately 52 acres on JBLM-North (former North Fort Lewis), approximately 500 ft north of Sequalitchew Lake (Figure 4-1). This area was used as a gravel source as well as for equipment storage and maintenance activities dating back to the early 1940s, then as a solid waste disposal site from 1951 to 1967. No records of disposed materials were kept, but the majority of the waste materials likely consisted of domestic and light industrial solid waste (including domestic liquids and biosolids collected by septic tank pump trucks) and construction debris.

Aerial photographs from 1960 show several aboveground storage tanks and a potential liquid waste disposal pit located in the northeast area of the landfill. Additional photographs from 1966 show small buildings and a circular pit similar to that shown on the 1960 photographs located in the southern part of the landfill. When active disposal ended at LF-4, the landfill was covered with compacted native materials such as sand, gravel, and soil. However, landfill debris remained exposed in some portions of LF-4 where the surface cover was thin or not present. The landfill area is currently covered with trees and grass.

4.1.2 Site Chronology

The chronology of key events for LF-4 (FTLE–57) is provided in Table 4-1.

Table 4-1. Chronology of Site Events

Event	Date
Site Investigation – Monitoring Well Installation	1981
Site Investigation (SI)	1990
Remedial Investigation/Feasibility Study (RI/FS)	1993
Record of Decision (ROD) signed	1993
Remedy Implementation	1994
RA Operation: Air Sparge / SVE System Operation	1996-1999
GW and LUC Inspections	1994 – present
Preliminary Close Out Report (PCOR) (documents Operational and Functional)	2015
Site-Specific FYRs	2002, 2007, 2012
Installation-Wide FYR	2017
SI conducted to define extent of disposal cells, develop a soil management plan, and other tasks at LF-4; Final SI Report issued	June 2021

FS = Feasibility Study
FYR = Five-Year Review
GW = Groundwater Monitoring
LUC = Land Use Control
PCOR = Preliminary Close Out Report
RA = Remedial Action
RI = Remedial Investigation
ROD = Record of Decision
SI = Site Investigation
SVE = Soil Vapor Extraction

4.1.3 History of Contamination

Reports indicate that TCE and PCE could have been used in degreasing operations in the area and disposed of as landfill refuse (Applied Geotechnology, 1993). A 1988 investigation of LF-4 indicated that shallow groundwater around the landfill was contaminated by TCE and several other chlorinated hydrocarbons. The highest TCE concentration detected was in a monitoring well located between LF-4 and Sequalitchew Springs, a drinking water source for the area. Subsequent investigations in 1993 confirmed the presence of several VOCs in groundwater and identified VOCs in landfill and soil gas. The highest concentrations of VOCs in gas and groundwater were associated with TCE, cis-1,2-DCE, and VC. Chloroform was also detected in groundwater along with metals with manganese concentrations attributed to intrusion of landfill leachate into the upper groundwater

4.1.4 Initial Response

In 1990, an IAG (USEPA, 1990) between the Army, USEPA and Ecology was signed to address sites at the Fort Lewis Army Base that were suspected of having environmental contamination, including LF-4. There are no other reported initial response actions conducted at LF-4 before implementing the remedy selected in the ROD.

4.1.5 Basis For Taking Action

Groundwater in the upper Vashon aquifer beneath the site is contaminated with TCE and VC at concentrations that exceed their MCLs and could affect drinking water sources. The maximum concentrations of groundwater contaminants detected represent an excess cancer risk that exceeds both Federal and State allowable risk thresholds from groundwater exposure for any potential future residential population.

Although the upper groundwater was determined to be the primary medium requiring action, to reduce ongoing groundwater contamination, unsaturated soil within former disposal and degreasing activity areas was also determined to require action to minimize leaching of contaminants from soil to groundwater.

4.1.6 Remedial Action

4.1.6.1 Remedy Selection

The selected remedy for the LF-4 site (FTLE-57) is documented in the following ROD:

- *Record of Decision for Landfill 4 and the Solvent Refined Coal Pilot Plant, Fort Lewis Military Reservation, Washington* (USEPA, 1993), signed 24 September 1993.

4.1.6.1.1 Remedial Action Objectives

As provided in the 1993 ROD, the intent of the remedial actions conducted at LF-4 was to restore groundwater to its beneficial use, which is, at this site, a potential drinking water aquifer. RAOs formulated to protect human health and the environment from potential threats associated with site contaminants in the upper aquifer groundwater are:

- Prevent exposure to contaminated groundwater.

- Restore contaminated groundwater to its beneficial use, which is drinking water.
- Minimize movement of contaminants from soil to groundwater.
- Prevent exposure to landfill contents.

4.1.6.1.2 Remedial Goals

RGs for groundwater were established for COCs at LF-4 to meet State and Federal ARARs that will result in a cumulative risk not to exceed 1 x 10^{-5}. The Federal MCL was used to determine the cleanup level for TCE. The more conservative MTCA Method B (risk-based cleanup level) was used to determine the cleanup level for VC.

Table 4-2 lists the selected cleanup levels for the groundwater COCs at FTLE-57.

Table 4-2. Groundwater COCs and Cleanup Levels, FTLE-57

COCs	Basis for Cleanup Level	Groundwater Cleanup Level (µg/L)
Trichloroethene (TCE)	Federal MCL	5
Vinyl Chloride (VC)	MTCA Method B	1

µg/L = micrograms per liter
MCL = Maximum Contaminant Level
TCE = Trichloroethene
COC = Contaminant of Concern
MTCA = Model Toxics Control Act
VC = Vinyl Chloride

4.1.6.1.3 Remedy Description

Per the 1993 ROD, the selected remedy for addressing groundwater contamination beneath LF-4 is a combination of active soil vapor extraction (SVE) system, in situ groundwater treatment, groundwater monitoring, and LUCs with the LUC objectives to restrict access and development of the site. Major components of the remedy include the following:

- Installing an active SVE system in suspected groundwater contamination source areas. Vapors from the system will be treated in compliance with air quality regulations prior to discharge.
- Installing an in situ groundwater sparging system to remove volatile contaminants from groundwater. The sparging system will work in conjunction with the SVE.
- Monitoring upper aquifer groundwater to determine the effectiveness of the selected remedy.

  As part of the monitoring program, the localized area of elevated manganese along the western borders of South and Northwest LF4 will be monitored to determine any changes in manganese concentrations. If the monitoring indicates that manganese concentrations are not declining, the need for remediation of the localized are will then be reevaluated. This reevaluation may include supplemental sampling, or additional source characterization.
- Maintaining ICs restricting access to and development at the site (herein referred to as LUCs) as long as hazardous substances remain on site at levels that preclude unrestricted use, including preventing installation of drinking water wells within 1,000 ft of site boundaries without USEPA-approved monitoring plans.

The LUC objectives are achieved through maintenance of the following LUCs described in further detail in Section 2.5.1 and conducting annual inspections of the sites and interviews with the staff responsible for maintaining the LUC overlays and filling out LUC checklists:

- Administrative LUCs Maintain and update as needed the following LUC mechanisms: LUC Data Layer in GIS; LUC Overlay for RPMP; LUC Overlay for ERP; LUC Overlay for DPA; LUC Inclusion in ORRs; LUC Inclusion in WSPs; Installation Access.

4.1.6.2 Remedy Implementation

Implementation of the remedy for the FTLE-57 site included four major components: source reduction through SVE, groundwater treatment through air sparging, groundwater monitoring to determine the effectiveness of the remedy, and implementing and maintaining LUCs that prevent exposure to landfill contents.

Remedy implementation included installing six vapor extraction wells, four air sparging wells, four passive air injection wells, and three upper Vashon aquifer monitoring wells. The SVE and air sparging remedy components for LF-4 operated from 1996 until shutdown on 30 June 1999. The system was shut down in 1999 as the cost of continued system operation was considered significant in comparison to the quantity of TCE that the system was actually removing, as documented in the *LF-4 Air Sparging/Soil Vapor Extraction Remediation Report* (GSA, 2001).

System performance sampling was conducted during operation of the sparging/SVE system. Vapor samples were collected periodically and analyzed for volatiles using a fixed-base laboratory and for total organic hydrocarbons using a portable photoionization device. Groundwater monitoring to evaluate the effectiveness of the sparging/SVE system was also conducted and consisted of a baseline and quarterly sampling from 12 groundwater monitoring wells from 1996 to 1999.

The periodic LTM portion of the LF-4 remedy, implemented in 1994, is ongoing. The latest annual LTM events for which records are available for review were completed in March 2021 and reported in the Draft 2021 Annual Groundwater Monitoring Report, FTLE-57: Landfill 4 (EA, 2022b).

LUCs were to be implemented as part of the 1993 ROD and are intended to restrict access to and development at the site as long as hazardous substances remain onsite at levels that preclude unrestricted use but were not specifically defined. The LUCs necessary to protect human health and the environment during RA were formally implemented in the 2007 LUC Plan and carried forward in the most recent 2017 revision to the LUC Plan (Sealaska, 2018a). The LUCs, as stated in the 2017 plan, are defined as:

- Prevent residential land use (within site boundary).
- Prevent unplanned excavation of contaminated soil (within site boundary).
- Prevent digging, bivouacking, or off-road vehicle maneuvering during training (within site boundary).
- Prevent new drinking water wells without USEPA approved monitoring plan (within a 1,000 ft buffer around site boundary).

4.1.6.3 Operations and Maintenance

The 2017 through 2021 O&M activities required for FTLE-57 were conducted in accordance with the 2017 LUC plan (Sealaska, 2018a) and include annual LUC inspections and performing groundwater sampling activities and well inspection, maintenance and repairs, as needed.

4.1.6.3.1 LUC and Site Inspections

Annual inspections were performed at FTLE-57 during the 2017 to 2021 FYR review period to verify that prohibited land use has not occurred within the LUC boundary (Figure 4-2) including residential land use, unplanned excavation activities or digging, bivouacking, or off-road vehicle use during training, or to determine if any groundwater supply wells were installed within the 1,000-ft buffer surrounding the landfill.

Documentation of the annual inspection activities was provided for review in the 2018, 2019, 2020, and 2021 LUCs Checklists (EA, 2019f; 2020d; 2022c, 2022g). An annual inspection was reportedly performed in 2017 but no checklists were available for review. A monthly status report was provided stating that the 2017 inspections were conducted as part of the Environmental Remediation Program Services (Sealaska, 2017a).

Interviews are also conducted with installation personnel as part of the annual site/LUC inspections to confirm that LUC/IC requirements are available in the JBLM GIS and RPMP systems for real-time reference during land use planning, environmental reviews, construction and maintenance activities, and as part of the JBLM NEPA implementation. The interview portion of the LUC checklists was reviewed for the 2018 through 2021 checklists and confirmed that the LUC information necessary for real-time reference remains available and current.

One issue was identified at FTLE-57 in the reviewed LUC monitoring checklists for 2018, 2019, 2020, and 2021.Each of the reviewed checklists answered "Yes" to the question that asked, "Any obvious recent digging, bivouacking, or off-road maneuvering in landfill?". The LUC checklist for 2018 further noted that multiple areas of landfill trash were exposed; the 2019 checklist also added that the Director of Public Works was working with JBLM to mitigate the impact. Landfill cover repairs were conducted in August 2020 that covered the exposed landfill debris identified in 2018 with an additional 8 to 12 inches of soil. The soil was compacted and erosion controls (straw, netting) were installed to prevent erosion of the new cover soil.

This was the only noted LUC deficiency, violation, or inconsistency noted in the reviewed LUC Checklists. Interviews conducted as part of the annual inspections confirmed that the LUC information necessary for real-time reference remains available through the JBLM GIS and RPMP systems and as part of the JBLM NEPA implementation.

4.1.6.3.2 Groundwater Monitoring

Groundwater monitoring data have been collected at FTLE-57 since 1988. The groundwater LTM phase of the remedy began in 2004 after completing the source reduction and groundwater treatment remedy phases. Objectives of the LF-4 LTM program are to obtain data to characterize the presence and concentrations of VOCs and manganese; to identify whether COCs in groundwater are migrating toward drinking water sources, other potential receptors, or offsite; and to determine when groundwater cleanup goals have been met.

COCs identified in the 1993 ROD are TCE and VC. Two other VOC compounds, cis-1,2-DCE and trans-1,2-DCE, both degradation products of TCE, are also analyzed in LTM samples. TCE and VC results are screened against their respective RGs (5 µg/L for TCE and 1 µg/L for VC). The remaining analytes (cis-1,2-DCE and trans-1,2-DCE) were not assigned RGs in the ROD, but for completeness, results are also compared to their respective MCLs (70 µg/L and 100 µg/L, respectively).

LTM monitoring also included monitoring for manganese based on the requirements in the 1993 ROD. Although not identified as a COC and no RG was established, the ROD required groundwater monitoring to include manganese to confirm that the elevated concentrations would decline as remediation progressed. Manganese was screened against MTCA Method B cleanup level (2,240 µg/L).

Under the LF-4 LTM program, groundwater samples are collected annually and analyzed for VOCs and dissolved manganese.

To ensure that a comprehensive data set was available for evaluation in this FYR report, sampling of all Vashon aquifer monitoring wells except the five wells located significantly upgradient from the LF-4 site (LF4-MW1A, LF4-MW1B, LF4-MW2A, LF4-MW2B, and MW-DG2) was conducted in 2021. Annual sampling events not coincident with FYR reports include only those wells with TCE or VC concentrations above RGs, wells that can demonstrate changes in plume boundaries, and wells used to monitor potential migration toward Sequalitchew Springs.

Sampling events were conducted in accordance with the groundwater monitoring plan utilized at the time of the sampling event. Sampling at LF-4 was completed in 2017 and 2018 in accordance with the 2017 updates to the Groundwater Monitoring Plan for Landfill 4 (Sealaska, 2017e) and in 2019, 2020, and 2021 in accordance with the Site-Specific QAPP for Groundwater Monitoring at Landfill 4 (EA, 2019b). The 2020 and 2021 annual LF-4 long-term groundwater sampling events were documented in the Draft Final 2020 and Draft 2021 monitoring reports (EA, 2020h and 2022b).

After the March 2019 sampling event, recommended optimization changes were made based on the LF-4 Optimization Technical Memorandum (Sealaska, 2016b). Optimization changes included discontinuing LTM in seven wells, adding sampling of two downgradient monitoring wells and two monitoring wells to ensure protection of the Sequalitchew Springs production well. All sampling for dissolved manganese at LF-4 was discontinued beginning in 2019. The 2018 changes resulted in collecting samples in 2019 from nine LF-4 monitoring wells (seven Upper Vashon and two Lower Vashon aquifer wells) and from the Sequalitchew Springs sample tap. In 2017, 2018, and 2019, all samples were analyzed for VOCs using PDBs. Where manganese was also analyzed (2017 and 2018), low-flow sampling techniques with dedicated bladder pumps were used.

Groundwater elevation data are also collected annually from select LF-4 monitoring wells. In the years prior to the year in which a FYR is conducted (e.g., 2016, 2021, etc.), elevation data are collected from an additional seven LF-4 wells and groundwater samples are collected from an additional five wells. Data from each sampling event included in this FYR reporting period are provided in annual groundwater monitoring reports. Data reviewed for this FYR report include those collected in 2017 (Sealaska, 2018d), 2018 (EA, 2019e), 2019 (EA, 2020g), 2020 (EA, 2020h), and 2021 (EA, 2022b). The most recent analytical results available for review for this FYR are discussed in Section 4.1.8.1.

4.1.7 Progress Since the Last Five-Year Review

4.1.7.1 Protectiveness Statement From The Last Review

The final protectiveness statement from the last FYR is provided below.

> *The remedy at OU2 – LF-4 and SRCPP is currently protective of human health and the environment because:*
>
> - *At LF-4, LUCs prevent exposure to contaminated groundwater by preventing installation of new drinking water wells within 1,000 ft of the site boundary. LUCs prevent exposure to landfill contents and contaminated soil by preventing residential land use, unplanned excavations, and off-road maneuvering within the site boundary.*
> - *At SRCPP, LUCs prevent exposure to contaminated groundwater by restricting installation of new drinking water wells within the site boundary without an EPA approved monitoring plan. The site's non-residential land use has prevented exposure to contaminated soils.*
>
> *However, in order for the remedy to be protective in the long-term, the prevention of residential land use at SRCPP needs to be incorporated into the Final JBLM LUC Plan and annual inspection checklists to ensure protectiveness.*

4.1.7.2 Status of Recommendations and Follow-Up Actions from Last Review

The following issue was identified during the previous FYR that affects the long-term protectiveness of the remedy at FTLE-57:

- In order for the remedy to be protective in the long-term, the prevention of residential land use at SRCPP needs to be incorporated into the Final JBLM LUC Plan and annual inspection/LUC checklists to ensure protectiveness.

4.1.8 Five-Year Review Process

4.1.8.1 Data Review

Table 4-3 summarizes the current status of COCs in groundwater at FTLE-57 that is discussed in more detail below.

Table 4-3. FTLE-57 Current Status of Groundwater COCs

COCs	Current Status
TCE	During the 2017 through 2021 review period TCE was the only COC in groundwater detected at concentrations slightly exceeding the RG of 5 µg/L in two Upper Vashon aquifer monitoring wells (LF4-DG1 and -UG1) at concentrations of 5.3 and 7.5 µg/L, respectively, in the most recent March 2021 sampling event. Concentrations of TCE in all other monitoring wells are non-detect or below the RG and are trending downward.
VC	During the 2017 through 2021 review period VC was the only other COC in groundwater that was detected and concentrations are non-detect in all Upper Vashon aquifer wells.

µg/L = micrograms per liter COC = Contaminant of Concern RG = Remedial Goal
TCE = trichloroethene VC = Vinyl Chloride

The FYR process consists of a review and evaluation of data generated to evaluate the performance of the remedy. Data reviewed for this FYR report include those collected in 2017 (Sealaska, 2018d), 2018 (EA, 2019e), 2019 (EA, 2020g), 2020 (EA, 2020h), and 2021 (EA, 2022b). Appendix G provides a summary of the analytical data, historic contaminant concentration graphs, and statistical analyses from the most recent sampling event conducted in March 2021 presented in the Draft 2021 Annual Groundwater Monitoring Report, FTLE-57: Landfill 4 (EA, 2022b).

Based on the review of LTM data as described below, the RAO identified in the LF-4 ROD to monitor the upper aquifer groundwater to determine the effectiveness of the selected remedy has been achieved.

Summary of COC Concentrations

- From 2017 through 2021 only TCE was detected slightly above the RG in groundwater samples from two wells screened in the Upper Vashon aquifer considered to be source areas wells that are in close proximity to each other. However, concentrations in these wells have steadily decreased for approximately the last 10 years and statistical analysis indicates a statistically significant downward trend in TCE concentrations. Concentrations of TCE in all other wells detected from 2017 through 2021 groundwater samples were below the RG.
- From 2017 through 2021 concentrations of VC detected in groundwater samples from all wells screened in the Upper Vashon aquifer were non-detect and below the RG.
- TCE and its degradation products remain at concentrations that are below their respective MCLs in all cross- and down-gradient monitoring locations at LF-4.
- TCE was not detected in samples from the Sequalitchew Springs production well, a significant source for drinking water for JBLM located approximately 1,200 ft southeast of LF-4.

Summary of COC Concentration Trends

Review of the most recent March 2021 TCE data, linear regression trends, and Mann-Kendall trend analysis for LF-4/FTLE-57 provides the following information:

- Statistically significant downward trends were identified in Upper Vashon aquifer monitoring wells LF4-1 and LF4-MW5 and source area monitoring well MW-DG1.

- Non-statistically significant downward trends were identified in Upper Vashon aquifer monitoring wells LF4-11 and SW-MW1, source area monitoring well MW-UG1, and Lower Vashon aquifer monitoring well LF4-MW15B.
- Upward trends were not identified in any monitoring wells.

Summary of Groundwater Monitoring Program

The LF-4 LTM monitoring program has generated 18 rounds of annual sampling data from 2004 to 2021. An additional sampling event was conducted in August 2017, at the request of USEPA, to examine the effects of Sequalitchew Spring pumping during the dry season when water needs and pumping rates are the highest of the year. The details of each sampling event are presented in annual groundwater monitoring reports, which include an evaluation of the data based on the RGs presented in Section 4.1.6.1.2 and in the ROD (USEPA, 1993). During this reporting period, annual sampling, which included collection of static water level measurements in wells sampled, was conducted from 2017 through 2021. Groundwater flow beneath LF-4 is typically to the west and southwest. Groundwater levels and flow direction in 2021 were consistent with historical data.

Per the Site-Specific QAPP, 2022 is designated as a 5-year review for LF-4; as such, additional groundwater samples were collected from monitoring wells LF4-PNL5, LF4-MW6, LF4-MW7, LF4-MW9A, and LF4-MW13B. In total, 14 groundwater samples were collected from 10 monitoring wells screened in the Upper Vashon aquifer and 4 monitoring wells screened in the Lower Vashon aquifer. A sample was also collected from a spigot on the Sequalitchew Springs wellhead.

The ten Upper Vashon and four Lower Vashon aquifer wells and one surface water spring that were sampled at LF4 in 2021 include those listed in Table 4-4:

Table 4-4. LF-4 LTM Program Sampling Points, 2021

Monitoring Well	Aquifer
LF4-1	Upper Vashon
LF4-11	Upper Vashon
LF4-MW3A	Upper Vashon
LF4-MW3B	Lower Vashon
LF4-MW5	Upper Vashon
LF4-MW6	Upper Vashon
LF4-MW7	Upper Vashon
LF4-MW9A	Lower Vashon
LF4-MW13B	Lower Vashon
LF4-MW15B	Lower Vashon
LF4-PNL5	Upper Vashon
MW-DG1	Upper Vashon
MW-UG1	Upper Vashon
SW-MW-1	Upper Vashon
Sequalitchew Spring	NA

NA = Not applicable

Summary of Current Trend Analyses

Trend analyses of TCE data are performed on data collected since 2010 through the most recent data collection event conducted in March 2021. The data have undergone statistical analysis to help support evaluation and interpretation of the TCE concentrations detected in groundwater at LF-4. Statistical analyses follow the guidelines included in the Landfill 4 Site-Specific QAPP (EA, 2019b).

Trend analyses were performed on wells with at least four detected concentrations of TCE using the Shapiro-Wilk test for normality, linear regression analysis, and the Mann-Kendall test for trends. The statistical evaluation for LF-4, including data tables, histogram figures, and linear regression graphs are included in Appendix G.

Table 4-5 presents a summary of descriptive statistics of TCE concentration data for each monitoring well, the results of the Shapiro-Wilk test for normality, the result of linear regression trend analysis, and the results of the Mann-Kendall test for trend that was performed on nonparametric data. Of the remaining four wells in the Upper Vashon aquifer from which data were statistically analyzed in 2021, two exhibited statistically significant downward trends and two exhibited nonstatistically significant downward trends. Wells LF4-MW5 and LF4-1 exhibited statistically significant downward trends. Wells LF4-11 and SW-MW1 exhibited non-statistically significant downward trends. Data from one Lower Vashon aquifer well (LF4-MW15B) was statistically analyzed in 2021. Well LF4-MW15B exhibited a non-statistically significant downward trend.

Information from review of the linear regression trends and Mann-Kendall trend analysis for the LF-4 data is provided in Table 4-5.

Table 4-5. LF-4 Statistical Analysis Information

Monitoring Well	Trend	
Upper Vashon Aquifer		
LF4-1	Down (statistically significant)	Data not normally or log normally distributed
LF4-11	Down (non-statistically significant)	Data normally distributed
LF4-MW3A	—	Trend not analyzed; all results non-detect
LF4-MW5	Down (statistically significant)	Data normally distributed
SW-MW-1	Down (nonstatistically significant)	Data normally distributed
Source Area Wells		
MW-DG1	Down (statistically significant)	Data normally distributed
MW-UG1	Down (nonstatistically significant)	Data normally distributed
Lower Vashon Aquifer		
LF4- MW3B	—	Trend not analyzed; all results non-detect
LF4-MW15B	Down (nonstatistically significant)	Data normally distributed

— = Not applicable; analysis not performed. Statistical analysis not performed on datasets composed of greater than 50% non-detects

Conclusions

From 2017 through 2019 annual groundwater monitoring was conducted at seven monitoring wells and one production well. The 2019 Annual Groundwater Monitoring Report (EA, 2020g) recommended annual groundwater monitoring at six monitoring wells (reducing from seven wells sampled in the previous year) and one production well continue in accordance with the site-specific QAPP (EA, 2019b); these wells were sampled in 2020 and 2021. In 2021, four additional monitoring wells and surface water from the spring were sampled.

From 2017 through 2021 only TCE was detected slightly above the RG in groundwater samples from two wells screened in the Upper Vashon aquifer, concentrations in these wells have steadily decreased for approximately the last 10 years, and statistical analysis indicates a statistically significant downward trend in TCE concentrations.

Therefore, the 2021 Annual Groundwater Monitoring Report recommended the following based on the results of the recent and historical monitoring events:

- Discontinue annual groundwater monitoring at LF-4. Recent data indicate that TCE continues to be detected slightly above the 5 µg/L ROD cleanup level in two wells; however, the data indicate that concentrations in these monitoring wells with exceedances exhibit clear downward trends. Additionally, the data indicate that COCs in groundwater are localized to this one area, and are not migrating offsite, toward drinking water wells, or toward potential receptors.
- Continue to implement ICs on land and groundwater use.
- Continue annual sampling of Sequalitchew Springs under the JBLM Drinking Water Program.

The review of the 2017 through 2021 LTM data conducted as part of this FYR found no evidence that would contradict the conclusions or recommendations presented in the annual monitoring reports for LF-4.

4.1.8.2 Site Inspection

As discussed in Section 1.3.4, the Site Inspection for FTLE-57 was conducted on 9 November 2021. The LF-4 site is located off Vancouver Road, with one portion of the landfill located to the east of the road (where the air sparging and SVE treatment occurred) and the other portion located to the west of the road. The eastern portion was inspected first. The eastern area is fenced but the gate is not locked. During the site inspection, the JBLM contractor accompanying the inspection stated that the SVE and air sparging systems were decommissioned in 2000 and the remaining test wells (TW-1 through TW-6) and vadose zone piezometer (VZP-E-1) were abandoned in February 2021. Approximately 10 empty drums were observed in the area which were identified as being left after the decommissioning effort. The western portion of the site was then inspected. Access to the western part of LF-4 is not restricted and this area is used by JBLM for off-road vehicle maneuvering training. There is a gravel road transecting the site from east to west that leads to Sequalitchew Lake. Ruts from vehicle use were noted on the surface of the landfill. JBLM personnel noted that damage to the landfill cover has been observed/reported during annual inspections, with some areas described where landfill contents (trash) had been exposed. JBLM IRP coordinated with the 555 Engineering Brigade to construct 22 rock/gravel/earthen berms to block access to the landfill to deter off road driving across the landfill. This activity has had some success; however, the JBLM contractor noted that increased enforcement is needed to prevent vehicular use that could further damage the soil cap.

Cap repairs were initiated in 2020 to cover landfill contents exposed from off-road maneuvering. The JBLM contractor stated that additional access controls have been recommended. Appendix C provides the detailed Site Inspection Trip Report and includes the inspection participants, FYR Site Inspection Checklists, and photographic log.

4.1.8.3 Interviews

As discussed in Section 1.3.5, interviews were conducted by email with parties knowledgeable of site conditions including regulatory agencies involved in site activities. The USEPA RPM, Mr. Patrick Hickey, responded to the FYR interview questionnaire. In addition to the general responses concerning the JBLM environmental program presented in Section 1.3.5, Mr. Hickey provided the following responses specific to the FTLE-57, LF-4 site. Mr. Hickey indicated that monitoring data and trend analyses indicate a substantial lowering of contaminant levels. The complete interview records are included in Appendix D.

4.1.9 Technical Assessment

The technical assessment of the protectiveness of the remedy for FTLE-57/OU02 is based on the responses to these three questions:

> ***Question A:*** *Is the remedy functioning as intended by the decision documents?*
>
> ***Question B:*** *Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*
>
> ***Question C:*** *Has any other information come to light that could call into question the protectiveness of the remedy?*

4.1.9.1 Question A: Is The Remedy Functioning As Intended By The Decision Document?

No, the review of documents and site inspection data indicate that the remedy at FTLE-57 is not currently functioning as intended by the ROD.

The site continues to be restricted to nonresidential use only and remains under government control. Maintenance inspections are conducted annually and documents available for review during this FYR review period report that no residential land use is occurring or planned, and no drinking water wells have been or are planned to be installed within 1,000 ft of the landfill boundary. However, the 2018 through 2021 annual inspection reports note evidence of off-road vehicle use and/or bivouacking across the site with the 2018 inspection reporting that landfill contents were exposed in multiple areas. Although landfill repairs were conducted in 2020 and the exposed landfill contents were covered, access to the western part of LF-4 is not restricted. Discussions with during the FYR site inspection revealed that this area is used by JBLM for off-road vehicle maneuvering training that is causing damage to the cap that has the potential to expose landfill contents. These activities are in violation of the LF-4 LUCs that are intended to prevent exposure to the landfill contents thereby ensuring protection of human health and the environment from potential threats associated with site contaminants. Engineering controls to prevent site access have been attempted with limited success through the construction of 22 rock/gravel/earthen berms, but increased enforcement is needed to prevent vehicular use that is resulting in damage to the soil cap.

4.1.9.2 Question B: Are The Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used At the Time Of The Remedy Selection Still Valid?

Yes, the exposure assumptions, toxicity data, RAOs, and cleanup levels used at the time of remedy selection are still valid. No changes in exposure assumptions, toxicity data, and cleanup levels have occurred that call the protectiveness of the remedy into question. However, off-road vehicle maneuvering training has exposed landfill content, which is not protective of human health and the environment because of the potential threat associated with direct contact with site contaminants. Landfill repairs conducted in 2020 successfully covered the exposed landfill contents; however, access to the landfill cap by off-road vehicles, which caused the potential exposure issues, has only been partially restricted through construction of berms across several access points. Thus, the RAO to prevent exposure to landfill contents is still valid but is not being met.

4.1.9.2.1 Changes in Standards and To-Be-Considereds (TBCs)

In order to evaluate whether a change in standards and TBCs affects the remedy's protectiveness, the RGs were compared to updated ARARs and risk-based MTCA Method B cleanup levels in Table 1 of Appendix H. Upper aquifer groundwater is the primary medium requiring action at LF-4 Site. The groundwater COCs identified in the ROD are TCE and VC. The Federal MCL was used to determine the cleanup level for TCE at 5 µg/L; the MCL has not changed since the implementation of the remedy. The MTCA Method B cleanup level was used to determine the cleanup level for VC at 1 µg/L, which is the PQL for the contaminant. The current Method B cleanup level is 0.029 µg/L. Although the RG of 1 µg/L for VC is less stringent, it is within the USEPA target risk range of 10^{-4} to 10^{-6} therefore the RG remains protective.

Though not identified as COCs in the ROD, degradation products of TCE (i.e., cis and trans 1,2-DCE) were evaluated in the HHRA, discussed in the FS and ROD, and included in annual groundwater monitoring. These degradation products have consistently been reported at concentrations below their respective Federal MCLs of 70 and 100 µg/L, respectively). The maximum reported historical concentration presented in the 2019 Annual Groundwater Monitoring Report are below the MCL (i.e., 11 µg/L cis-1,2-DCE and 2.4 µg/L trans-1,2-DCE).

4.1.9.2.2 Changes in Exposure Pathways

Changes in exposure pathways have occurred at the site. The site remedy in the 1993 ROD is to prevent exposure to contaminated groundwater, restore contaminated groundwater to its beneficial use, minimize movement of contaminants from soil to groundwater, and prevent exposure to landfill contents. The landfill is located within the operational range area and is currently used for military training activities. LUCs prohibit residential development, unpermitted excavations (i.e., prevent digging, bivouacking, or off-road vehicle maneuvering), and prohibit groundwater use within 1,000 ft of the site boundary. Thus, the RAOs established to address the groundwater exposure pathways at the time the remedy was selected are still valid. However, off-road vehicle maneuvering training is causing damage to the LF-4 cap and exposing landfill content. These activities are in violation of the LF-4 LUCs that are intended to prevent exposure to the landfill contents thereby ensuring protection of human health and the environment from potential threats associated with site contaminants. As landfill contents have been exposed, which could result in a complete pathway for human and ecological receptor exposure to site contaminants, the RAO established to prevent exposure to the landfill contents is still valid but is not being completely achieved. Additionally, the potential for VI from groundwater to indoor air was not considered in the HHRA and is therefore evaluated below.

Vapor Intrusion

As presented in the 1993 ROD, the HHRA considered potential exposure to LF-4 contaminants in groundwater and air (i.e., exposure to VOCs in ambient air and indoor air from landfill gas emissions); however, VI from groundwater to indoor air exposure pathway was not evaluated. The two monitoring wells with TCE concentrations above the MCL over the last five years were MW-DG1 (8 µg/L) and MW-UG1 (6.3 µg/L). The potential VI pathway was evaluated using the USEPA VISL on-line calculator under a commercial land use scenario. Groundwater monitoring data over the last 5 years (April 2016 through March 2019 as presented in the 2019 Annual Groundwater Monitoring Report) was evaluated using the maximum concentrations of TCE (8 µg/L at MW-DG1 in February 2017), VC (0.73 µg/L at LF4-MW15B in August 2017), cis-1,2-DCE (2.4 µg/L at LF4-MW15B in March 2021) and trans-1,2-DCE (1.1 µg/L at LF-4-MW15B in March 2019). The total cancer risk was 1.37E-06 and the total noncancer hazard index was 0.373, both considered within acceptable risk ranges. Well LF4-PNL1 contains the highest concentration of VOCs (3.1 µg/L TCE in August 2017; 0.61 µg/L cis-1,2-DCE, and 0.32 µg/L trans-1,2-DCE) in groundwater within 100 ft of a building and outside the LF-4 site boundary. The cancer risk is 2.61E-06 and the noncancer hazard index is 0.60 under a residential use scenario and the cancer risk is 4.17E-07 and the noncancer hazard index is 0.143 under a commercial scenario, which are all considered within acceptable risk ranges. The June 2021 SI Report for Landfill 4 documents soil gas sampling at LF-4 that concluded soil gas/landfill gas is considered a potentially complete pathway although it does not currently pose a human health risk and that further investigation may be warranted to evaluate VI risks within areas of future development (ERRG, 2021). At the maximum TCE concentration (29 µg/m^3), the maximum PCE concentration (23 µg/m^3), and the maximum VC concentration (42 µg/m^3), the VISL calculator indicates a cancer risk of 7.58E-07 and a noncancer hazard index of 0.107 under a commercial scenario and a cancer risk of 9.40E-06 and a noncancer hazard index of 0.449 under a residential scenario, which are all considered within acceptable risk ranges. Therefore, the potential for VI does not affect the remedy's protectiveness. As provided in the 2017 LUC Plan, LUCs are implemented through the mechanisms discussed in Section 2.5.1. LUC detail presented in the 2017 plan are provided in Appendix E.

4.1.9.2.3 Changes in Toxicity, and Other Contaminant Characteristics

Several chemicals identified as COCs in the HHRA were excluded as COCs in the ROD, including manganese because localized concentrations were expected to decline due to implementation of the remedy. Though manganese was not identified as a COC and groundwater RG was not established for LF-4, manganese is a groundwater COC and a groundwater RG of 80 µg/L was established in the 1993 ROD for manganese at the nearby SRCPP (also within OU02).

The ROD specifies if the monitoring indicates that manganese concentrations are not declining, the need for remediation of the localized area will then be reevaluated. The ROD also indicates that the goal of the RA at LF-4 is to restore groundwater to its beneficial use, which is, at this site, a potential drinking water aquifer. The 2019 Annual Groundwater Monitoring Report indicates that groundwater sampling for manganese was discontinued in March 2018 due to statistically significant downward trends in groundwater concentrations of dissolved manganese and no dissolved manganese exceedances of the MTCA Method B cleanup level (2,240 µg/L) within the last 4 years. However, the maximum dissolved manganese concentration over the last five years (1900 µg/L in LF-4-PNL1 in August 2017) exceeds the revised (May 2022) Method B cleanup level of 750 µg/L, the Method C cleanup level of 1600 µg/L, and the USEPA November 2021 tapwater RSL of 430 µg/L. Thus, manganese concentrations may pose a risk to human health through groundwater consumption. However, LUCs prohibit groundwater use within 1,000 ft of the site boundary.

These changes in contaminant toxicity and characteristics have not been significant enough to call the protectiveness of the remedy into question.

Emerging Chemicals

The likelihood of emerging chemicals being present has been considered for the LF-4. The presence of PFAS at or near the LF-4 was evaluated in 2020 due to the potential for disposal of PFAS containing waste. The previous FYR recommended sampling at JBLM to evaluate the presence of PFAS at or near the CERCLA sites included within this FYR. The 2020 PA/SI indicated that PFOS and PFOA were not measured at concentrations greater than 40 ppt in any of the six groundwater samples associated with the Lewis North LF-4 (AOPI – 12) and indicated that further evaluation was not necessary. As shown on Table 3 in Appendix H, the USEPA (November 2021) tapwater RSL for PFOS (40 ppt) and PFOA (40 ppt) and PFBS (40,000 ppt) applied in the 2020 PA/SI have been reduced to 4 ppt for PFOS, 6 ppt for PFOA, and 600 ppt for PFBS. The maximum concentration of PFOS (20 ppt) and the maximum concentration of PFOA (25 ppt) in LF-4 exceed the current (May 2022) RSL. The maximum concentration of PFBS in LF-4 was 5.3 ppt and does not exceed the current RSL. In addition, the USEPA (May 2022) provided RSLs for two additional compounds (PFHxS and PFNA) that were analyzed for during the PA/SI. The maximum concentrations of PFHxS (11 ppt) and PFNA (2.4 ppt) do not exceed the RSLs of 39 ppt for PFHxS and 5.9 ppt for PFNA. The PFAS compounds exceeding RSLs were considered in the risk assessment process through the calculation of site specific noncancer hazard index (Table 3 in Appendix H). The individual chemical HQ for each PFAS compound and the total hazard index for the PFAS compounds do not exceed the threshold of one. Therefore, the presence of PFAS in groundwater at LF-4 does not call the protectiveness of the remedy into question.

4.1.9.2.4 Changes in Risk Assessment Methods

A number of changes in risk assessment methods and exposure assumptions have taken place since the 1993 ROD. These changes are summarized in Appendix H. These changes, along with changes in toxicity data, have been incorporated in the updated Method B cleanup levels, and have not been significant enough to call the protectiveness of the remedy into question.

4.1.9.2.5 Expected Progress Toward Meeting RAOs

The RAO to prevent exposure to contaminated groundwater is being met through maintaining governmental control of the site and implementing LUCs that include preventing new drinking water wells within 1,000 ft of the site boundary and monitoring current, nearby drinking water sources. Significant progress toward restoring groundwater to its beneficial, drinking water use and minimizing movement of contaminants from soil to water has been made through completing the source reduction and groundwater treatment remedy phases and continuing the LTM of groundwater remedy phase. The RAO of preventing exposure to landfill contents is not being completely achieved because site access is not completely restricted and the site continues to be used for military off-road vehicle training which generates ruts in the landfill cover and exposes landfill contents.

4.1.9.3 Question C: Has Any Other Information Come To Light That Could Call Into Question The Protectiveness of the Remedy?

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

4.1.10 Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. Off-road vehicle maneuvering training has the potential to cause potential damage to the LF-4 cap and expose landfill contents. These activities are in violation of the LF-4 LUCs that are intended to prevent exposure to the landfill contents thereby ensuring protection of human health and the environment from potential threats associated with site contaminants.	Y	Y

N = No Y = Yes

4.1.11 Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Overnight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1.	Enforce LUCs to include implementation of additional preventative measures that restrict access to the landfill cap to mitigate potential damage and prevent exposure to the landfill contents.	U.S. Army	USEPA	28 September 2023	Y	Y

LUC = Land Use Control N = No USEPA = United States Environmental Protection Agency Y = Yes

4.1.11.1 Other Findings

The following recommendation not affecting protectiveness was identified during this FYR and is provided to improve implementation of the remedy.

- The annual LUCs Checklist reports should be completed in a timely manner to ensure that the required LUC inspections are documented and available for review.
- Although sampling has demonstrated that concentrations of manganese have decreased and sampling has been eliminated in accordance with the ROD, manganese levels exceed the current MTCA cleanup level and monitoring should resume.
- The empty drums observed in the area should be removed.

4.1.12 Protectiveness Statement

The remedy at FTLE-57, LF-4, currently protects human health and the environment because LUCs were implemented to prevent: residential land use; unplanned excavation of contaminated soil; drinking water well installation within 1,000 ft of the site boundary; and digging, bivouacking, or off-road vehicle maneuvering training on the landfill, thereby ensuring protection of human health and the environment from potential threats associated with site contaminants. However, in order for FTLE-57, LF-4, to be protective in the long term, LUCs should be enforced to include implementation of additional preventative measures that restrict access to the landfill cap to mitigate potential damage and prevent exposure to the landfill contents.

4.2 FTLE–32 (Solvent Refined Coal Pilot Plant)

4.2.1 Site Description

The approximately 25-acre SRCPP site (FTLE-32; HQAES Site ID 53465.1020) began operation in 1974 as a production/research facility designed to develop a solvent extraction technology for deriving petroleum hydrocarbon-like products from coal. The SRCPP (Figure 4-3) was initially designed to convert coal into a low-sulfur, low-ash solid product by the solvent-refined coal process, but the process was later modified to distill the volatile fractions and produce liquids for blending into fuel oil (USACE, 1999).

The facility operated until its closure in 1981. In 1982 and 1983, the facility was partially demolished; however, some parts of the facility are still used today for other purposes. The main portion of the SRCPP lies just south of Sequalitchew Lake and north of Interstate 5.

4.2.2 Site Chronology

The chronology of key events for FTLE–32 is provided in Table 4-6.

Table 4-6. Chronology of Site Events

Event	Date
Spill of solvent refined coal liquid fuel	1979
Initial Response (spill excavation and soil/sludge excavation from lagoon)	1980-1982
Remedial Investigation / Feasibility Study (RI/FS)	1993
Record of Decision (ROD)	1993
Remedy Implementation – Low temperature thermal desorption	1996-1997
Remedy Implementation – Groundwater and surface water monitoring	1981-1999
PCOR (documents Operational and Functional)	2015
Site-Specific FYRs	2002, 2007, 2012
Annual LUC Inspections	2011-2019
Installation-Wide FYRs	2017, 2022

FS = Feasibility Study FYR = Five-Year Review LUC = Land Use Control PCOR = Preliminary Close Out Report
RI = Remedial Investigation ROD = Record of Decision

4.2.3 History of Contamination

Potential sources from activities conducted during operation of the SRCPP include air emissions of aromatics and VOCs from the SRCPP process, metals in soil derived from coal storage at the site, surface and subsurface leaks and spills of process fluids, and surge overflows of wastes from wastewater treatment process and storage lagoons. Primary contaminants at the site are carcinogenic and noncarcinogenic PAHs.

Documented releases include the 1979 spill of 2,000 gallons of solvent-refined coal liquid fuel. Subsequent investigations of both soil and groundwater indicated a likelihood that other sources of soil and groundwater contamination might exist at the SRCPP, prompting further investigation.

4.2.4 Initial Response

In 1990, an IAG (USEPA, 1990) between the Army, USEPA and Ecology was signed to address sites at the Fort Lewis Army Base that were suspected of having environmental contamination, including the Solvent Refined Coal Plant.

The following initial response activities were conducted a the SRCPP prior to implementing the remedy

- A removal action to clean up a spill in October 1980 resulted in excavation and disposal of 2,400 cubic yards of contaminated soil from the spill area (USACE, 1999). Groundwater was extracted from one well in the spill area (Well 30) beginning in June 1980 and treated in the plant's water treatment system. Records did not record the volume or duration of the 1980 P&T action. Additional P&T action was reported to have begun in June 1980. Groundwater was also extracted from a well identified as Well 46 at a rate of 30 gpm; no duration of the P&T action was reported and it is assumed the water extracted from Well 46 was also treated through the plant's water treatment system.
- A soil removal action was conducted at SRCPP's wastewater lagoon in 1981 and 1982. The action included excavation and off-site disposal of 410 tons of soil and sludge contaminated with PAHs (Applied Geotechnology, 1993b).

4.2.5 Basis For Taking Action

Soils at the SRCPP site are contaminated with cPAH at levels exceeding State regulatory requirements. The cPAH in soil have the potential, if site pavements are removed, to adversely impact groundwater. Predictive modeling indicates risks from impacted groundwater could exceed MTCA risk goals.

The seven cPAH identified as COCs in soil at the SRCPP are benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. These seven cPAH were also identified as COCs in groundwater along with manganese.

4.2.6 Remedial Action

4.2.6.1 Remedy Selection

The selected remedy for the SRCPP site (FTLE-32) is documented in the following ROD:

- *Record of Decision for Landfill 4 and the Solvent Refined Coal Pilot Plant, Fort Lewis Military Reservation, Washington* (USEPA, 1993), signed 24 September 1993.

4.2.6.1.1 Remedial Action Objectives

The 1993 ROD included the following RAOs:

- Prevent exposure to contaminated soils.
- Prevent movement of contaminants from soil to groundwater.
- Prevent exposure to contaminated upper aquifer groundwater beneath the former SRCPP.

4.2.6.1.2 Remedial Goals

RGs were established to meet State ARARs that will result in a cumulative risk not to exceed 1 x 10^{-5}. Table 4-7 lists the selected cleanup levels for the groundwater COCs at the SRCPP. The ROD RG for cPAH in groundwater is 0.1 µg/L, which assumes any combination of the seven cPAH up to a total of 0.1 µg/L.

Table 4-7. COCs and Cleanup Levels, SRCPP

COCs	Criteria	Cleanup Level
Soil (mg/kg)		
Carcinogenic Polyaromatic Hydrocarbons (cPAH)	MTCA Method B	1.0[1]
Groundwater (µg/L)		
Carcinogenic Polyaromatic Hydrocarbons (cPAH)	MTCA Method B	0.1[2]
Manganese	MTCA Method B	80
Total Petroleum Hydrocarbons	MTCA Method A	1,000

[1] A collective cPAH MTCA Method B cleanup level of 1 mg/kg for soil was set for benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene, based on not exceeding a total cancer risk of 10^{-5}.
[2] The MTCA Method B cleanup level for groundwater assumes any combination of the seven cPAH up to a total of 0.1 µg/L
µg/L = micrograms per liter
COC = Contaminant of Concern
cPAH = Carcinogenic Polyaromatic Hydrocarbon
mg/kg = milligrams per kilogram
MTCA = Model Toxics Control Act

4.2.6.1.3 Remedy Description

The selected remedy at SRCPP is a combination of soil excavation and treatment and groundwater LUCs with the LUC objectives to restrict access to and development of the site. Major components of the remedy include the following:

- Excavating and treating contaminated soils. Soils will be treated using either soil washing or thermal destruction to meet cleanup levels.
- Monitoring upper aquifer groundwater beneath and adjacent to the site to determine the effectiveness of soil treatment.
- Maintaining LUCs restricting access to and development at the site as long as hazardous substances remain on site at levels that preclude unrestricted use including preventing installation of drinking water wells within 1,000 ft of site boundaries without USEPA-approved monitoring plans.

The LUC objectives are achieved through maintenance of the following LUCs described in further detail in Section 2.5.1 and conducting annual inspections of the sites and interviews with the staff responsible for maintaining the LUC overlays and filling out LUC checklists:

- Administrative LUCs Maintain and update as needed the following LUC mechanisms: LUC Data Layer in GIS; LUC Overlay for RPMP; LUC Overlay for ERP; LUC Overlay for DPA; LUC Inclusion in WSPs; Installation Access.

4.2.6.2 Remedy Implementation

The selected remedy of low-temperature thermal desorption was implemented in 1996. This remedy component consisted of excavation of approximately 44,600 cubic yards of PAH-contaminated soil, treatment of excavated soil using thermal destruction to bring COC concentrations down to below the 1.0 mg/kg cleanup level, and backfilling the excavations with the treated soil. This remedy component was completed in July 1997 and met soil cleanup levels in all but six of the excavated areas. Confirmation sampling at completion of the soil treatment remedy established that PAH concentrations in soil exceeding the MTCA Method B RG remain at the SRCPP (USACE, 1999).

The groundwater monitoring remedy component was implemented for two years following the soil cleanup. Groundwater was monitored through June 1999, when it was discontinued with USEPA concurrence (USEPA, 2015) because the cleanup levels were achieved in groundwater at the point of compliance.

A LUC was implemented for the SRCPP as part of the 1993 ROD to address potential exposures to groundwater only. The LUC was incorporated into the 2007 LUC Plan, with implementation beginning in 2008. The LUC was carried forward in the most recent 2017 revision to the LUC Plan (Sealaska, 2018a) and is enforced through annual inspections and reporting. The 2017 LUC plan identified the following specific objective for the LUC at SRCPP:

- Prevent new drinking water wells without USEPA approved monitoring plan (within site boundary).

A Draft Final Comprehensive LUCs Plan for 2021 was issued in December 2021 and includes revisions to the LUC at SRCPP to prevent residential use of the site and unplanned excavation of contaminated soil.

4.2.6.3 Operations and Maintenance

The 2017 through 2021 O&M activities required for FTLE-32 were conducted in accordance with the 2017 LUC plan (Sealaska, 2018a). O&M activities include conducting annual LUC inspections to assess the condition of the site and identify needed maintenance or repairs.

LUC and Site Inspections

Annual inspections were performed at FTLE-32 during the 2017 to 2021 reporting period to assess site conditions and confirm that drinking water wells have not been installed within the LUC boundary (Figure 4-4). Documentation of the annual inspection activities was provided for review in the 2018, 2019, 2020, and 2021 LUCs Checklists (EA, 2019f; 2020d; 2022c, 2022g). An annual inspection was reportedly performed in 2017, but no checklist was available for review. A monthly status report was provided stating that the 2017 inspections were conducted as part of the Environmental Remediation Program Services (Sealaska, 2017a).

Interviews are also conducted with installation personnel as part of the annual site/LUC inspections to confirm that LUC requirements are available in the JBLM GIS and RPMP systems for real-time reference during land use planning, environmental reviews, construction and maintenance activities, and as part of the JBLM NEPA implementation. The interview portion of the LUC checklists was reviewed for the 2018 through 2021 checklists and confirms that the LUC information necessary for real-time reference remains available and current.

No evidence of drinking water well installation was noted at FTLE-32 in the reviewed LUC monitoring checklists. Review of the annual checklists confirmed that restrictions within the LUC boundary concerning drinking water well installation conform to the LUC requirements and no LUC deficiencies, violations, or inconsistencies were noted.

4.2.7 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

4.2.7.1 Protectiveness Statement From The Last Review

The final protectiveness statement from the last FYR is provided below.

The remedy at OU2 – LF-4 and SRCPP is currently protective of human health and the environment because:

- *At LF-4, LUCs prevent exposure to contaminated groundwater by preventing installation of new drinking water wells within 1,000 ft of the site boundary. LUCs prevent exposure to landfill contents and contaminated soil by preventing residential land use, unplanned excavations, and off-road maneuvering within the site boundary.*
- *At SRCPP, LUCs prevent exposure to contaminated groundwater by restricting installation of new drinking water wells within the site boundary without an EPA approved monitoring plan. The site's non-residential land use has prevented exposure to contaminated soils.*

However, in order for the remedy to be protective in the long-term, the prevention of residential land use at SRCPP needs to be incorporated into the Final JBLM LUC Plan and annual inspection checklists to ensure protectiveness.

4.2.7.2 Status of Recommendations and Follow-Up Actions from Last Review

Table 4-8 provides the issues identified in the previous FYR and summarizes the status of the recommendation and any follow-up action taken by the U.S. Army to address this issue.

Table 4-8. Actions Taken Since the Last Five-Year Review, OU02/FTLE-32

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Action Taken and Outcome	Date of Action
Issue Category: ICs Residual soil contamination does not allow residential land use at SRCPP. The Final 2017 LUC Plan does not restrict residential land use at SRCPP.	Incorporate prevention of residential land use for SRCPP into the JBLM LUC Plan and annual inspection/LUC checklists.	U.S. Army	A Draft Final Comprehensive LUCs Plan was issued in December 2021 and is anticipated to be updated in 2022. Revisions to the LUC Plan and LUC Checklists include LUCs preventing residential use of the site and preventing unplanned excavation of contaminated soil.	December 2021.

IC = Institutional Controls JBLM = Joint Base Lewis-McChord LUC = Land Use Control
SRCPP = Solvent Refined Coal Pilot Plant

4.2.8 Five-Year Review Process

4.2.8.1 Data Review

No new data has been collected at FTLE-32 since the previous FYR, and as of 1999 there is no longer a data collection requirement for the site.

4.2.8.2 Site Inspection

As discussed in Section 1.3.4, the Site Inspection for FTLE-32 was conducted on 9 November 2021. No activities related to drinking water well installation were noted. Likewise, no changes in site conditions or land use were noted during the site inspection. Installation personnel accompanying the inspection team were asked about the status of the issue noted in the 2017 FYR that a LUC restricting the SRCPP site to nonresidential land use is necessary. JBLM personnel indicated that, to date, this issue had not been formally addressed; however, the revised 2017 LUC Plan that was issued as a Draft Final in December 2021 (that is anticipated to be updated in 2022) includes the LUC preventing residential use of the site. Appendix C provides the detailed Site Inspection Trip Report and includes the inspection participants, FYR Site Inspection Checklists, and photographic log.

4.2.8.3 Interviews

As discussed in Section 1.3.5, interviews were conducted by email with parties knowledgeable of site conditions, including regulatory agencies involved in site activities The USEPA RPM, Mr. Patrick Hickey, responded to the FYR interview questionnaire that included FTLE-32 but had no specific comments regarding the site. The complete interview records are included in Appendix D.

4.2.9 Technical Assessment

The technical assessment of the protectiveness of the remedy for FTLE-32/OU02 is based on the responses to these three questions:

> ***Question A:*** *Is the remedy functioning as intended by the decision documents?*
>
> ***Question B:*** *Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*
>
> ***Question C:*** *Has any other information come to light that could call into question the protectiveness of the remedy?*

4.2.9.1 Question A: Is The Remedy Functioning As Intended By The Decision Document?

No, the review of documents and site inspection data indicate that the remedy at FTLE-32 is not currently functioning as intended by the 1993 ROD. Although the excavation and treatment of the soil protects the groundwater from future contamination and the site continues to be under governmental control to prevent drinking water wells from being installed within the site boundary, residual soil contamination exceeding the MTCA Method B (residential) cleanup RG for cPAHs remain and LUCs do not restrict residential land use at SRCPP.

4.2.9.2 *Question B: Are The Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used At the Time Of The Remedy Selection Still Valid?*

No, the exposure assumptions, toxicity data, and cleanup levels used at the time of remedy selection are not still valid. Changes in the exposure pathway have occurred that call the protectiveness of the remedy into question. Although the remedy for SRCPP currently protects human health and the environment because current land use is commercial, and the RPMP identifies the SRCPP's future land use as commercial, ICs have not been established to restrict residential development and residential land use.

4.2.9.2.1 Changes in Standards and To-Be-Considereds(TBCs)

In order to evaluate whether a change in standards and TBCs affects the remedy's protectiveness, the RGs were compared to updated ARARs and TBCs in Table 1 of Appendix H. Soil cleanup levels have been established to meet the State ARARs which will result in a cumulative risk not to exceed 1 x 10^{-5}. The risk-based MTCA Method B was used to set the SRCPP soil RG for total carcinogenic PAHs at 1.0 mg/kg. A number of changes have taken place since the 1993 ROD and are incorporated into the updated ARARs and TBCs as summarized on Table 1 in Appendix H. However, the changes have not been significant enough to call the protectiveness of the remedy into question.

4.2.9.2.2 Changes in Exposure Pathways

The site remedy in the 1993 ROD was to prevent exposure to contaminated soils, prevent movement of contaminants from soil to groundwater, and to prevent exposure to contaminated upper aquifer groundwater beneath the former SRCPP. While the 1999 Remedial Action Report indicated that soil concentrations above the 1 mg/kg total cPAH cleanup level (based on MTCA Method B residential cleanup level) remain in the subsurface (>2 ft below ground surface [bgs]), the area has been backfilled with clean fill and the highest residual concentrations are covered with asphalt. The 1999 Removal Action Report indicates that residual cPAH remain in subsurface soil at concentrations ranging from 1.2 mg/kg to 47.2 mg/kg total cPAH; these residual total cPAH concentrations do not exceed the current (February 2021) MTCA Method C industrial cleanup level of 130 mg/kg for benzo(a)pyrene. Because residual concentrations in subsurface soil could pose a threat under a residential land use, LUCs are required to restrict access to and development at the site since hazardous substances remain onsite at levels that preclude unrestricted use. Groundwater monitoring has been conducted to ensure there were no deleterious effects. There have been no changes in the physical condition of the site since the implementation of the remedy, and ICs prevent installation of drinking water wells, however LUCs do not restrict access to and prevent residential development. Thus, the RAOs established to address the exposure pathways of concern at the time the remedy was selected have not been achieved. Additionally, the potential for VI to indoor air was not considered previously and is therefore evaluated below.

Vapor Intrusion

The VI pathway was not discussed in the ROD. Of the cPAH, benzo(a)anthracene is characterized by USEPA (VISL On-line Calculator; https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-level-calculator; last updated May 19, 2022) as being sufficiently volatile and toxic to pose an inhalation risk via VI from a soil and groundwater source. Benzo(a)anthracene was not listed as being detected in the RI groundwater samples tabulated in the ROD. The 0.1 µg/L total cPAH groundwater cleanup standard is below the May 2022 USEPA VISL Residential Target Groundwater Concentration (TCR=1E-06 or

THQ=0.1) of 3.44E+01 µg/L for benzo(a)anthracene. Thus, the VI pathway is not considered to be of concern.

4.2.9.2.3 Changes in Toxicity and Other Contaminant Characteristics

In order to evaluate whether a change in contaminant toxicity affects the remedy's protectiveness, the risk-based RGs were compared to updated risk-based TBCs and USEPA RSLs as summarized in Table 2 of Appendix H.

The 1993 ROD RGs for soil and groundwater were established to meet regulatory requirements. MTCA Method B was used to set the soil cleanup level for cPAH at 1.0 mg/kg. A collective cPAH MTCA Method B level of 1 mg/kg was set for benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene, based on not exceeding a total cancer risk of 10^{-5}. The cleanup level for cPAH is based on a total of 7 cPAH each at 1 x 10^{-6} risk for an aggregate risk of 7 x 10^{-6}. Because this cleanup goal covers any combination of the seven cPAH up to a total 1 mg/kg, the current MTCA level cited is for benzo(a)pyrene, which is the chemical used as the basis for comparison of cancer potency of PAHs. Comparison of the past and current values indicates that soils with up to 1 mg/kg cPAH could pose a cancer risk of up to 7×10^{-6}, which is near the lower end of the acceptable risk range of 10^{-6} to 10^{-4}. The current Method B standard for benzo(a)pyrene is 0.19 mg/kg; summing 7 cPAH equals 1.33 mg/kg total cPAH (assuming same toxicity as benzo[a]pyrene) that would result in a 7×10^{-6} risk. Thus, the RG for cPAH is still protective under a residential land use.

The ROD RG for cPAH in groundwater is 0.1 µg/L, which assumes any combination of the seven cPAH up to a total of 0.1 µg/L. The current (July 2021) Method B value for benzo(a)pyrene in groundwater is 0.023 µg/L at 10^{-6} risk, which would be equal to 0.161µg/L for the seven cPAH (assuming same toxicity as benzo[a]pyrene). This sum is higher than the ROD RG, indicating that the RG remains protective.

The ROD RG for manganese in groundwater is 80 µg/L. The current (July 2021) Method B value for manganese in groundwater is 750 µg/L, indicating that the potential for adverse non-cancer health effects has decreased compared to the original RG.

The ROD also indicates that total petroleum hydrocarbons in groundwater would be evaluated against its State of WA groundwater cleanup standard of 1,000 µg/L because of the potential for process leaks or surface spills at the tank farm. The current (July 2021) Method A cleanup standard for TPH (gasoline range organics, no detectable benzene) remains at 1,000 µg/L.

In summary, there have been no changes in contaminant toxicity that affect the protectiveness of the remedy.

4.2.9.2.4 Changes in Risk Assessment Methods

A number of changes in risk assessment methods and exposure assumptions have taken place since the 1993 ROD. These changes are summarized in Appendix H. These changes, along with changes in toxicity data, have been incorporated in the updated TBCs and RSLs, and have not been significant enough to call the protectiveness of the remedy into question.

4.2.9.2.5 Expected Progress Toward Meeting RAOs

The RAO to prevent movement of contamination from soil to groundwater was accomplished by completing the soil excavation and treatment phase of the selected remedy and progress continues toward preventing exposure to contaminated groundwater by maintaining governmental control of the site and implementing a LUC to prevent new drinking water wells within 1,000 ft of the site boundary. However, the RAO to prevent exposure to contaminated soil has not been achieved as residual soil contamination remain above the MTCA Method B (residential) RG. Although residential exposure is currently not occurring, LUCs are required to restrict access to and prevent residential development at the site to ensure that the RAO is met.

4.2.9.3 Question C: Has Any Other Information Come To Light That Could Call Into Question The Protectiveness of the Remedy?

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

4.2.10 Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. Residual soil contamination remains at the site above the residential RG and LUCs do not restrict access to and prevent residential development.	N	Y

LUC = Land Use Control N = No RG = Remedial Goal Y = Yes

4.2.11 Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Overnight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1.	Implement LUCs to prevent residential land use of the site and unauthorized excavation of contaminated soil.	U.S. Army	USEPA	28 September 2022	N	Y

LUC = Land Use Control N = No USEPA = United States Environmental Agency Y = Yes

4.2.11.1 Other Findings

The following recommendation not affecting protectiveness was identified during this FYR and is provided to improve implementation of the remedy.

- The annual LUCs Checklist reports should be completed in a timely manner to ensure that the required LUC inspections are documented and available for review.

4.2.12 Protectiveness Statement

The remedy at FTLE-32, SRCPP currently protects human health and the environment because potential exposure to groundwater contamination at the site has been addressed through LUCs that prevent installation of drinking water wells within 1,000 ft of the site boundary without USEPA-approved monitoring plans and potential exposure to contaminated soil was addressed via excavation and treatment of soil by low-temperature desorption, although confirmation sampling at completion of the soil treatment established that cPAH concentrations in soil exceeding the residential RG remained. Residential exposure is currently not occurring. However, for the remedy to be protective in the long term, LUCs should be implemented to prevent residential land use of the site and unauthorized excavation of contaminated soil.

4.3 OU02 Issues, Recommendations and Follow-up Actions

4.3.1 Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. At FTLE-57 (Landfill 4), off-road vehicle maneuvering training is causing damage to the LF-4 cap and exposing landfill contents. These activities are in violation of the LF-4 LUCs that are intended to prevent exposure to the landfill contents thereby ensuring protection of human health and the environment from potential threats associated with site contaminants.	N	Y
2. At FTLE-32 (SRCPP), residual soil contamination remains at the site above the RG and LUCs do not restrict access to and prevent residential development.	N	Y

LUC = Land Use Control N = No RG = Remedial Goal SRCPP = Solvent Refined Coal Pilot Plant Y = Yes

4.3.2 Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Overnight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1.	For FTLE-57 (Landfill 4), implement additional preventative measures to restrict access to the landfill cap.	U.S. Army	USEPA	2022	N	Y
2.	For FTLE-32 (SRCPP), implement LUCs to prevent residential land use of the site and unauthorized excavation of contaminated soil.	U.S. Army	USEPA	2022	N	Y

LUC = Land Use Control N = No RG = Remedial Goal SRCPP = Solvent Refined Coal Pilot Plant
USEPA = United States Environmental Protection Agency Y = Yes

4.4 OU02 Protectiveness Statement

The remedies at OU02, LF-4 and SCRPP, currently protect human health and the environment. The remedy at FTLE-57, LF-4, currently protects human health and the environment because LUCs were implemented to prevent: residential land use; unplanned excavation of contaminated soil; drinking water well installation within 1,000 ft of the site boundary; and digging, bivouacking, or off-road vehicle maneuvering training, thereby ensuring protection of human health and the environment from potential threats associated with site contaminants. The remedy at FTLE-32, SCRPP currently protects human health and the environment because potential exposure to groundwater contamination at the site has been addressed through LUCs that prevent installation of drinking water wells within 1,000 ft of the site boundary without USEPA-approved monitoring plans and potential exposure to contaminated soil was addressed via excavation and treatment of soil although residual soil contamination remains above the residential RG.

However, for OU02 to be protective in the long term, the following actions should be taken to ensure protectiveness:

- **FTLE-57, LF-4**. Enforce LUCs to include implementation of additional preventative measures that restrict access to the landfill cap to mitigate potential damage and prevent exposure to the landfill contents.
- **FTLE-32, SRCPP**. Implement LUCs to prevent residential land use of the site and unauthorized excavation of contaminated soil.

5 OU03 - AMERICAN LAKE GARDEN TRACT

5.1 SITE DESCRIPTION

OU03, Area D / ALGT (MF-ALGT-LF-05; HQAES Site ID 53465.1077) is located in the northern part of JBLM (Figure 5-1) and includes the ALGT housing area and the former McChord AFB's Area D. The area is roughly bounded by I-5 to the northwest, Porter Hills and a former McChord AFB ammunition storage area to the north, Fairway Road to the east, Wescott Hills and Fort Lewis Logistic Center to the south, and the ALGT housing area to the southwest. Area D lies in the southwestern portion of the former McChord AFB and includes the Whispering Firs Golf Course, undeveloped wooded areas to the west/northwest, and administration, flight operations support functions for the former McChord AFB, and housing and recreation facilities to the east. Properties to the west of the site, both on- and off-base, are primarily residential, while properties to the north and south are primarily undeveloped wooded land within the JBLM boundary. Properties to the east are also within the base boundary and are primarily occupied by retail/service establishments. Properties surrounding the site are connected to the local public water supply.

Area D had several waste disposal sites in various stages of operation from the mid-1940s to the early 1970s. The Area D/ALGT site was listed on the NPL in October 1984 (USEPA, 1991). Chapter 5 is structured to discuss and evaluate the sites in combination, with MF-ALGT-LF-05 as the primary site at OU03, with one protectiveness statement for MF-ALGT-LF-05 and the OU03 protectiveness statement provided at the conclusion of Chapter 5.

5.2 SITE CHRONOLOGY

The chronology of key events for Area D/ALGT (MF-ALGT-LF-05) is provided in Table 5-1.

Table 5-1. Chronology of Site Events

Event	Date
Disposal activities at the site	1940s to early 1970s
DoD IRP initiated at McChord	1981
IRP Phase I - Records search	1982
IRP Phase II - SI	1983
Discovery/Preliminary Assessment	1983
Final listing on EPA NPL	1984
Interim remedial activities—bottled water provided to private residences located within the 5 μg/L contour of the TCE plume	1984 – 1986
RI/FS negotiations completed	1988
Federal Facilities Agreement between Air Force, EPA, and Ecology finalized	1989
HHRA finalized	1990
Ecological Risk Assessment finalized	1991
RI/FS finalized	1991

Event	Date
Proposed Plan identifying EPA's preferred remedy presented to public; start of public comment period	1991
ROD signed	1991
Remedial Design completed	1991
Began on-site construction of groundwater containment and treatment system	1993
Completed connection of residents in ALGT to the public water system	1993
Containment system startup	1994
O&M Plan approved by EPA	1994
Completed on-site construction of groundwater containment and treatment system	1994
Extraction well DX-1 shut down due to low concentrations in aquifer	1999
First FYR completed	2000
Extraction well DX-2 shut down due to low concentrations in aquifer	2003
Extraction well DX-2 pump replaced and returned to service due to resource protection well slightly above RG	2004
Second FYR completed	2005
Sampling for 1,4-dioxane completed	2005
Identification and evaluation of alternatives to reduce source term and enhance dissolved plume remediation	2010
Third FYR completed	2010
Bioenhancement Pilot Study Summary Report	2012
First Installation Wide (JBLM) FYR completed	2012
Well Installation and Source Zone Characterization Report	2013
Enhanced Amendment Delivery to Low-Permeability Zones for Chlorinated Solvent	2014
Technical Memorandum for Temporary Shutdown of the Area D/ALGT Groundwater P&T (system shut down in August 2016)	2016
GW Plan Addendum for Area D/ALGT; including evaluation of the effectiveness of MNA as a potential remedy	2016
Second Installation Wide (JBLM) FYR completed	2017
Technical Memorandum issued to document Army's closure of six Area D/ALGT sites determined to pose no risk to human health or the environment	September 2017
FFS Area D/ALGT	November 2020
Draft PP for Area D/ALGT to amend the selected remedy	June 2021
Draft Final ROD Amendment for Area D/ALGT to amend the selected remedy	December 2021

µg/L = micrograms per liter
Ecology = Washington State Department of Ecology
FS = Feasibility Study
HHRA = Human Health Risk Assessment
MNA = monitored natural attenuation
P&T = Pump & Treat
ROD = Record of Decision
ALGT = American Lake Garden Tract
EPA = Environmental Protection Agency
FYR = Five-Year Review
IRP = Installation Restoration Program
NPL = National Priorities List
PP = Proposed Plan
SI = Site Investigation
DoD = Department of Defense
FFS = Focused Feasibility Study
GW = Groundwater Monitoring
JBLM = Joint Base Lewis-McChord
O&M = Operations and Maintenance
RI = Remedial Investigation
TCE = trichloroethene

5.3 HISTORY OF CONTAMINATION

TCE and other solvents were reportedly disposed of at Area D; however, the quantity is unknown. Seven of Area D's former waste disposal sites, six of which lie within the area occupied by the Whispering Firs golf course, were identified as potential sources of contamination and investigated as part of an RI (Ebasco, 1991a). The seven waste sites are shown on Figure 5-1 and include:

- Landfill 4 (MF-LF-004)
- Landfill 5 (MF-ALGT-LF-005)
- Landfill 6 (MF-LF-006)
- Landfill 7 (MF-LF-007)
- Ordnance Disposal Burn Kettles (MF-OT-26)
- Radioactive Waste Disposal Well (MF-RW-035)
- Concrete Burn Trench (MF-OT-39)

MF-ALGT-LF-05 was ultimately identified as the source for groundwater impacts. The landfill was used for disposal of industrial, domestic, and construction waste, including waste oil, fuel, and possibly spent solvents. The RI (Ebasco, 1991a) and subsequent FS (Ebasco, 1991b) concluded that groundwater contamination associated with MF-ALGT-LF-05 exceeded health-based levels and/or federal MCLs and required remediation.

5.4 INITIAL RESPONSE

A Memorandum of Agreement was signed in September 1985 between the Air Force, USEPA, Ecology, WA Department of Social and Health Service, and the Tacoma-Pierce County Health Department that required the installation of a permanent alternative water supply for the ALGT. The Air Force subsequently provided bottled water to residents in the ALGT affected by well contamination. By mid-1986 the residents within the 5 µg/L isoconcentration contour of the TCE plume were connected to the public water system, replacing the need for bottled water. As a follow-on action in 1992, the Air Force offered free hookups to all property owners in the ALGT, and owners that accepted the offer were connected by June 1993.

In 1989, an FFA (USEPA, 1989) between the Air Force, USEPA, and Ecology was signed to address sites identified in the 1991 Consent Decree at the McChord AFB that were suspected of having environmental contamination, including Area D/ALGT now included under OU03.

5.5 BASIS FOR TAKING ACTION

The basis for taking action at OU03 was the unacceptable risks associated with groundwater ingestion and groundwater inhalation by on-base residents and off-base residents and groundwater ingestion by long-term workers based on maximum detected contaminant concentrations. Four groundwater COCs were identified for the MF-ALGT-LF-05 site:

- 1,1-Dichloroethene (1,1-DCE)
- cis-1,2-DCE
- TCE

- VC

The potential for exposure to groundwater contaminated with COC concentrations exceeding State and Federal MCLs provided the basis for taking action under CERCLA.

5.6 REMEDIAL ACTION

The selected remedy for the Area D/ALGT NPL Site (MF-ALGT-LF-05) is documented in the following ROD.

- *Record of Decision for the United States Air Force Area D/American Lake Garden Tract, McChord Air Force Base, Washington* (USEPA, 1993), signed September 19, 1991.

5.6.1 Remedial Action Objectives

The RAO provided in the 1991 Area D/ALGT ROD is:

- To restore groundwater to its beneficial use, a drinking water source. The groundwater will be restored to levels consistent with state and Federal ARARs. Remediation levels will be attained throughout the contaminated plume.

5.6.2 Remedial Goals

RGs selected in the ROD for contaminated groundwater at MF-ALGT-LF-05 are either MCLs or MTCA Method B values for TCE, cis-1,2-DCE, 1,1-DCE, and VC, as shown in Table 5-2.

Table 5-2. Groundwater COCs and Cleanup Levels, Area D/ALGT

COCs	Groundwater Cleanup Level (µg/L)	Basis for Cleanup Level
Trichloroethene (TCE)	5	MCL
cis-1,2-Dichloroethene (cis-1,2-DCE)	70	MCL
1,1-Dichloroethene (1,1-DCE)	0.07	MTCA Method B
Vinyl Chloride (VC)	0.04	MTCA Method B

µg/L = micrograms per liter
COC = Contaminant of Concern
MTCA - Model Toxics Control Act
ALGT = American Lake Garden Tract
DCE = dichloroethene
TCE = Trichloroethene
DCE = Dichloroethene
MCL = Maximum Contaminant Level
VC = Vinyl Chloride

5.6.3 Remedy Description

The major components of the remedy selected in the 1991 ROD for the Area D/ALGT NPL site included installation of a groundwater P&T system, groundwater monitoring, LUCs with the LUC objectives to prevent exposure to contaminants remaining in soil and groundwater, and connecting ALGT households to the public water supply, as necessary, as follows:

- Install groundwater extraction wells capable of capturing the groundwater contaminant plume in the unconfined aquifer. An estimated three extraction systems will be necessary to achieve this goal.

- Install one of the three groundwater extraction systems near areas of highest concentration of contaminants within the contaminant plume.
- Install on-site groundwater treatment facilities to remove contaminants from the extracted groundwater. The preferred treatment is carbon adsorption, with an estimated two treatment facilities necessary to achieve this goal.
- Monitor the groundwater contaminant plume and the extraction/treatment system during groundwater remediation activities to ensure that groundwater RGs are achieved and maintained throughout the contaminant plume.
- Implement administrative and ICs (herein referred to as LUCs) such as restrictive covenants and McChord AFB command directives, that supplement engineering controls and minimize exposure to releases of hazardous substances during remediation.

As described in Section 5.3, seven former waste sites at Area D/ALGT RI were originally suspected as potential sources of groundwater contamination in the RI: MF-LF-004, MF-ALGT-LF-05, MF-LF-006, MF-LF-007, MF-OT-026, MF-RW-035, and MF-OT-039. Only one of the seven sites, MF-ALGT-LF-05, was ultimately identified as the source for groundwater impacts. The remaining six waste sites addressed by the 1991 ROD were determined to pose no unacceptable risk to human health or the environment and in 1991 (USEPA et. al., 1991a). The Air Force prepared a DD for site close-out with NFA planned for these six sites concurrent with the ROD: U*.S. Air Force installation Restoration Program Decision Document, McChord AFB, WA, No Further Action Planned Site Close-Out* (USEPA et. al., 1991b). In 2017, a Technical Memorandum was issued that documented the Army's closure, with USEPA and Ecology approval, and the determination that the six NFA sites did not require CERCLA FYRs; therefore, these NFA sites are not discussed further or included in the evaluations conducted in this FYR (TetraTech, 2017a). It should be noted that the Technical Memorandum further states that LUCs are not required under CERCLA, but to comply with internal requirements, LUCs were retained on four of the sites (MF-LF-004, MF-LF-006, MF-LF-007, and MF-OT-39), but are not subject to CERCLA review in this FYR.

A Draft ROD amendment was prepared in 2021 to address a change in the remedy (USEPA, 2021), which includes the following proposed change to the 1991 remedy:

- Because the groundwater P&T system is not effectively removing TCE, monitored natural attenuation (MNA) is considered to be an effective alternative remedy that should replace groundwater extraction and treatment as the primary remedy.

The following LUC objectives were identified as part of the remedy selected for Area D/ALGT to prevent exposure to contaminants remaining in the soil at the former waste disposal site MF-ALGT-LF-05:

- Prevent residential land use.
- Prevent unplanned excavation of contaminated soil.

For the area encompassed by the Area D/ALGT groundwater contaminant plume, the following LUC objective was established:

- Prevent new drinking water wells until USEPA concurs that groundwater quality has been restored.

The LUC boundary is shown on Figure 5-2. The LUC objectives are achieved through maintenance of the following LUCs described in further detail in Section 2.5.1 and conducting annual inspections of the sites and interviews with the staff responsible for maintaining the LUC overlays and filling out LUC checklists:

- Administrative LUCs Maintain and update as needed the following LUC mechanisms: LUC Data Layer in GIS; LUC Overlay for RPMP; LUC Overlay for ERP; LUC Overlay for DPA; LUC Inclusion in WSPs; Installation Access.

5.6.4 Remedy Implementation

Implementation of the remedy selected in the 1991 ROD for the Area D/ALGT NPL site included three components:

- Extracting, treating, and reinjecting groundwater through a P&T system
- Implementing a groundwater monitoring plan to monitor the effectiveness of the P&T system
- Implementing LUCs that effectively prevent the use of the site for residential purposes, prevent unplanned excavation within the site boundary, and prevent drinking water well installation within 1,000 ft of the site boundary or within the footprint of the groundwater contaminant plume.

Pump and Treat System Operation

Implementation of the groundwater P&T system consisted of installing three groundwater extraction wells, a groundwater treatment plant that utilizes two 20,000-pound vessels of granular activated carbon (GAC) connected in series, and two recharge trenches that reinject the treated water into the aquifer upgradient of the contaminant plume. Construction of the P&T system was completed in September 1994 and operation of the remedy continued from 1994 until 2016. Pumping from one extraction well (DX-1, located near the northeast corner of ALGT) was discontinued in December 1999, as the Air Force and Ecology agreed that the discontinuation of pumping from this well would have no adverse impact on hydraulic control of the remaining TCE plume. Extraction from the remaining two extraction wells (DX-2 and DX-3) and treatment of Area D/ALGT groundwater through GAC was discontinued in 2016 based on the results of a SMIS to optimize the Area D/ALGT site (TetraTech 2017b). As a component of the SMIS, the Army recommended a short-term shutdown (e.g., 12 to 24 months) of the ALGT P&T system following the June 2016 quarterly sampling event with implementation of MNA sampling.

The system was shut down in August 2016 to evaluate contaminant rebound as well as to evaluate additional treatment options for the remaining residual groundwater contaminants at the site because it had not effectively driven the site towards closure in an expedient manner. The P&T system removed 108 pounds of TCE during 22 years of operation and was expensive to operate and maintain. The system shutdown became permanent when contaminant concentration data collected from a rebound test initiated in 2016 indicated that the plume is in a steady-state condition without the extraction system running (TetraTech, 2018).

Groundwater Monitoring

Groundwater sampling to monitor the P&T system was conducted annually, semi-annually, and quarterly in accordance with the Final RA Work Plan (USACE, 1994) and subsequent plan updates. Sample analysis was conducted for a specific subset of VOCs and included TCE, cis-1,2-DCE, 1,1-DCE, and VC There were typically five system sample locations that were monitored quarterly which included operating extraction wells, a resource protection well; the System Monitoring Point, and the system effluent. Nine other monitoring wells were monitored on an annual or semi-annual basis during operation of the P&T

system. After discontinuing operation of the P&T system in 2016, groundwater sampling entered the LTM phase which includes quarterly sampling and analysis for TCE, cis-1,2-DCE, 1,1-DCE, VC, and parameters necessary to assess the feasibility of MNA as an alternative remedy for the ALGT.

Focused Feasibility Study

After P&T system shutdown, a Focused Feasibility Study (FFS) was conducted to evaluate alternatives to the existing remedy and determine which of the alternative cleanup actions is warranted based on data from the current groundwater monitoring program and past RIs (EA, 2020). The FFS evaluated four alternatives: NFA/Natural Attenuation; MNA; Enhanced In-Situ Bioremediation with Organic Carbon Plus Activated Carbon and Zero-Valent Iron; and Enhanced In-Situ Bioremediation with Electron Donor Injection.

MNA was identified as the preferred alternative in the FFS because it has the lowest threshold for implementability, as well as the lowest cost and associated risk, and monitoring provides a means to continually evaluate the downward trend of concentrations for effectiveness, as well as potential contaminant migration. In addition:

- The current TCE plume is stable and shows no evidence of mobility
- Natural attenuation appears to be occurring at the site primarily via dispersion and dilution.
- Recent data indicates that TCE concentrations are generally stable or decreasing in site wells since termination of the P&T system.
- One monitoring well also exhibits reductive dechlorination conditions as a result of remaining product from a previous injection.

The FFS was approved by Ecology on September 15, 2020. The *Draft Final Record of Decision (ROD) Amendment For Area D/American Lake Garden Tract (ALGT)* (USEPA, 2021) documented the results of the FFS, and the final ROD Amendment will document MNA as the ALGT groundwater remedy to replace P&T.

LUC Implementation

LUC implementation at MF-ALGT-LF-05 began in 2011 and is ongoing in accordance with the most recent 2017 LUC Plan (Sealaska, 2018a). As provided in the 2017 LUC Plan, LUCs are implemented through the mechanisms discussed in Section 2.5.1. LUC details presented in the 2017 LUC plan are provided in Appendix E.

5.6.5 Operations and Maintenance

The 2017 through 2021 O&M activities required for OU03 (Area D/ALGT NPL site) were conducted in accordance with the 2017 LUC plan (Sealaska, 2018a) and with the 2016 Groundwater Monitoring Plan Addendum (TetraTech, 2016b). O&M activities include periodic groundwater sampling to monitor contaminant levels and MNA parameters. Annual LUC and site inspections are also conducted to assess site conditions and compliance with LUC requirements.

5.6.5.1 Groundwater Monitoring

The monitoring program at MF-ALGT-LF-05, conducted in accordance with the 2016 Groundwater Monitoring Plan (TetraTech, 2016b), consists of collecting static water elevation data and groundwater samples for VOC and MNA parameter analysis. The monitoring well network for Area D/ALGT (Figure 5-3) includes the following 25 monitoring wells, seven of which were installed after the June 2016 P&T system was shut down:

DA-7b	DA-9b	DA-11a	DA-11b	DA-13a	DA-21b	DA-28
DA-29	DA-30a	DA-30b	DA-31	DA-32	DA-43	DA-44
DA-45	DA-46	DA-47	DA-48	DB-6	DO-2	DO-3
DR-05	DT-1	DT-2	EPA-W-5			

Since 2017, VOC data have been collected quarterly. The 2018 Annual Groundwater Monitoring Report supported the SMIS conclusions that site conditions are generally stable and that reductive dechlorination is not occurring under ambient conditions at the site. Further, it was recommended that groundwater monitoring for MNA parameters be reduced to semiannual (first and third quarters). VOC monitoring was recommended to continue on a quarterly basis using PDBs in place of low-flow sampling. Recommendations were approved by Ecology and implemented beginning during the December 2019 sampling event.

MNA data were collected quarterly in 2018, but the frequency for MNA sampling was reduced to semiannually after 2018. LTM data are provided in Annual Groundwater Monitoring Reports. Reports made available for review in this FYR report include the final reports for 2018 (EA, 2019g) and 2019 (EA, 2020f), the draft final report for 2020 (EA, 2021e), and the draft report for 2021 (EA, 2022d). After the groundwater P&T system was shut off in early August 2016, the results of sampling conducted in 2017 were not presented in an Annual Groundwater Monitoring Report, but in the Final Logistics Center SMIS Report, (Sealaska, 2018b); the 2017 analytical results are also included in the 2018 through 2021 reports.

After the groundwater P&T system was shut off in early August 2016, a quarterly groundwater sampling program began. The goal of the quarterly sampling was to collect enough data to evaluate the effectiveness of natural attenuation in removing the remaining groundwater contamination within and adjacent to the Area D/ALGT contaminant plume. Groundwater is sampled quarterly for the analysis of VOCs and semi-annually for MNA parameters. In 2018, 2019, and 2020, the sampling events were conducted in March, June, September, and December. In 2021, the sampling events were conducted in March, June, September, and November.

Groundwater samples are analyzed for TCE and its degradation products, cis-1,2-DCE, 1,1-DCE, and VC, and for MNA parameters that include alkalinity, anions (nitrate, sulfate, and chloride), ferrous iron (Fe[II]), dissolved hydrocarbon gases (methane, ethane, and ethene), total organic carbon (TOC), and dissolved metals (iron and manganese).

Sampling was conducted in 2018 using low-flow sampling methods, but a recommendation was made in the 2018 annual report that future sampling for VOCs be conducted using PDBs; beginning in December 2019, sampling for VOCs was conducted using PDBs (low-flow techniques are still utilized for collecting samples for MNA parameter analysis). One well, DA-32, is sampled using a peristaltic pump. Emulsified vegetable oil used as part of a 2012 bioenhancement pilot study is present in DA-32 and prohibits low-flow sampling.

Analytical results are discussed in Section 5.8.1.

5.6.5.2 LUC and Site Inspections

Annual inspections were performed at MF-ALGT-LF-05 during the 2017 to 2021 FYR review period to document that land use within the LUC boundary (Figure 5-2) conforms to the LUC requirements and to identify any LUC deficiencies, violations, or inconsistencies. Documentation of the annual inspection activities was provided for review in the 2018, 2019, 2020, and 2021 LUCs Checklists (EA, 2019f; 2020d; 2022c, 2022g). An annual inspection was reportedly performed in 2017, but no checklist was available for review. A monthly status report was provided stating that the 2017 inspections were conducted as part of the Environmental Remediation Program Services (Sealaska, 2017a).

No LUC deficiencies, violations, or inconsistencies were noted in 2018, 2019, 2020, or 2021 concerning restrictions on residential land use, construction/excavation activities, or installation of drinking water wells within 1,000 ft of the former waste disposal site MF-ALGT-LF-005 or concerning installation of drinking water wells within the Area D/ALGT groundwater contaminant plume.

Interviews are also conducted with installation personnel as part of the annual site/LUC inspections to confirm that LUC requirements are available in the JBLM GIS and RPMP systems for real-time reference during land use planning, environmental reviews, construction and maintenance activities, and as part of the JBLM NEPA implementation. The interview portion of the LUC checklists was reviewed for the 2018 through 2021 checklists and confirms that the LUC information necessary for real-time reference remains available and current.

5.7 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

5.7.1 Protectiveness Statement From The Last Review

The protectiveness statement presented in the 2017 FYR for OU03 provided below was revised in a 2019 addendum to the FYR. The revised protectiveness statement presented in the 2019 FYR Addendum is also provided.

> *A protectiveness determination for the OU-3 – ALGT remedy cannot be made at this time until further information is obtained. Further information will be obtained by taking the following action: an investigation and evaluation of the presence of PFASs within the GPT system at the ALGT. It is expected that this action will take approximately three years to complete, at which time a protectiveness determination will be made.*

The revised protectiveness statement for OU03 presented in the 2019 Addendum to the 2017 FYR is provided below:

> *Based on new information and/or actions taken since the Five-Year Review completion date, the protectiveness statement for OU3 - ALGT is currently protective of human health and the environment because the sum of PFOS/PFOA was found to be below the current HAL of 70 ppt in samples collected from wells DA-21a, DA-7e, DO-2, and DO 5b, which are located within or* downgradient of Landfill 5.

5.7.2 Status of Recommendations and Follow-Up Actions from Last Review

Table 5-3 provides the issues identified in the previous FYR and summarizes the status of the recommendations and follow-up actions taken by the U.S. Army to address those issues.

Table 5-3. Actions Taken Since the Last FYR – Area D/ALGT

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Action Taken and Outcome	Date of Action
Groundwater extraction and treatment system (currently shutdown) has the potential to intercept groundwater containing PFAS. If present, reinjection may be redistributing PFAS.	Evaluate presence of PFAS at ALGT through collection of groundwater samples from three wells within the footprint of the groundwater plume including one near the infiltration trenches. If operation of the ALGT Groundwater P&T system is resumed, then samples from the influent and effluent should assessed for PFAS.	U.S. Army	An investigation was conducted to evaluate the presence of PFAS within the P&T system at the ALGT site. The resulting data demonstrate PFAS results are below the lifetime HA of 70 ppt for the sum of PFOS and PFOA. An addendum was issued for the 2017 Installation-Wide FYR Report to report the PFAS data and revise the OU01 protectiveness statement from "protectiveness deferred" to "currently protective."	June 2018. USEPA acknowledgement letter dated March 2019.

ALGT = American Lake Garden Tract; FYR = Five-Year Review; HA = Health Advisory
OU = Operable Unit; P&T = Pump & Treat; PFAS = per- and polyfluoroalkyl substances
PFOA = perfluorooctanoic acid; PFOS = perfluorooctane sulfonate; USEPA = United States Environmental Protection Agency

5.8 FIVE-YEAR REVIEW PROCESS

5.8.1 Data Review

Based on the data review, Table 5-4 summarizes the current status of COCs in groundwater at ALGT that is summarized in more detail below.

Table 5-4. ALGT Current Status of Groundwater COCs

COCs	Current Status
TCE	In 2021, TCE was detected during quarterly monitoring above the RG (5 µg/L) in samples collected from up to seven monitoring wells over the four quarters of monitoring with a maximum concentration of 20 µg/L in monitoring well DA-43 in the 4th quarter. During the 2017 through 2021 review period, concentrations of TCE in all other monitoring wells were non-detect or below the RG and are trending downward.
VC	In 2021, VC was detected during quarterly monitoring above the RG (0.04 µg/L) in samples collected from up to four monitoring wells with a maximum concentration of 9.9 µg/L in monitoring well DA-32 in the 4th quarter. During the 2017 through 2021 review period, concentrations of VC in all other monitoring wells were non-detect or below the RG and are trending downward.
Cis-DCE	In 2021, cis-DCE was not detected during quarterly monitoring above the RG (70 µg/L) in any sample. During the 2017 through 2021 review period, concentrations of cis-DCE in all other monitoring wells were non-detect or below the RG and are trending downward.
1,1-DCE	In 2021, 1,1-DCE was detected during quarterly monitoring above the RG (0.07 µg/L) in samples collected from one monitoring well with a maximum concentration of 0.16 µg/L in monitoring well DA-32 in the 2nd and 3rd quarters. During the 2017 through 2021 review period, concentrations of 1,1-DCE in all other monitoring wells were non-detect or below the RG and are trending downward.

µg/L = micrograms per liter ALGT = American Lake Garden Tract COC = Contaminant of Concern
DCE = dichloroethene RG = Remedial Goal TCE = trichloroethene VC = vinyl chloride

The FYR process consists of a review and evaluation of data generated to evaluate the performance of the remedy. Groundwater monitoring data reviewed for this FYR report include those collected in 2017 (TetraTech, 2017b), 2018 (TetraTech, 2019g), 2019 (TetraTech, 2020f), 2020 (TetraTech, 2021e), and 2021 (EA, 2022d). Data reviewed from other reports related to changes in the monitoring program, P&T system operation, and site improvement and FFSs are described in Section 5.5.3. Appendix G provides a summary of the analytical data, historic contaminant concentration graphs, and statistical analyses from the most recent sampling event conducted in November 2021 presented in the Draft 2021 Annual Groundwater Monitoring Report (EA, 2022d).

Based on the review of data as described below, the RAO identified in the ROD to restore the aquifer to its beneficial use is being achieved, as described below.

Summary of COC Concentrations

Review of the 2017 through most recent November 2021 groundwater sampling data provides the following information:

- The 2021 Annual Monitoring Report indicates TCE concentrations were detected above the cleanup level in samples from seven of eight wells during at least one sampling event (DA-7b, DA-9b, DA-21b, DA-29, DA-31, DA-43, and DO-3). The highest concentration of TCE in 2021 was detected in the sample from well DA-43 at 20 µg/L in November 2021.

- Trend analyses indicate statistically significant downward trends in TCE concentrations in samples from five (DA-7b, DA-9b, DA-21b, DA-29, and DA-31) of these eight wells. TCE datasets for the remaining three wells (DA-43, DB-6, and DO-3) exhibited non-statistically significant downward trends. In addition, TCE concentrations in groundwater continue to remain relatively consistent across the site. The contaminant plume is stable and does not appear to be expanding.
- In 2017 through 2021, groundwater from 25 monitoring wells were sampled; TCE and VC were detected above their RGs; cis-DCE was not detected above the RG, and 1,1-DCE was either detected below the RG or was detected above the RG in one well.
- TCE concentrations in groundwater continue to remain relatively consistent across the site. The contaminant plume is stable and does not appear to be expanding.
- Trend analysis of TCE concentrations indicate that five of the eight wells where TCE concentrations exceed the RG show statistically significant downward trends. TCE concentrations in all but two of the 25 LTM wells exhibit a statistically or non-statistically significant downward trend. The elevated VC concentrations are the result of ongoing reductive dechlorination.
- A Draft Final ROD Amendment (USEPA et.al., 2021) was prepared to recommend a change in the P&T remedy to MNA after discontinuing operation of the P&T system in 2016, and conducting groundwater sampling under the LTM phase of the remedy, which includes quarterly sampling and analysis for TCE, cis-1,2-DCE, 1,1-DCE, VC, and parameters necessary to assess the feasibility of MNA as an alternative remedy for the ALGT. The Draft Final ROD Amendment stated that the RAO will not be altered by the Amended Remedy, and the Amended Remedy will meet the requirements of the RAO and will prevent future human exposure to contaminants in the groundwater through the maintenance of existing ICs.

Summary of Groundwater Monitoring Program

Groundwater samples were collected from 25 monitoring wells on a quarterly basis (March, June, September, and November). Twenty-three monitoring wells were sampled for MNA parameters during the first and third quarter 2021 sampling events. The details of each sampling event are presented in annual groundwater monitoring reports, which include an evaluation of the data based on the RGs presented in Section 5.5.2 and in the ROD (USEPA, 1991). During this reporting period, annual sampling, which included collection of static water level measurements in wells sampled, was conducted from 2017 through 2021. Groundwater flow beneath ALGT is typically from the east to west. Groundwater levels and flow direction in 2021 were consistent with historical data.

LTM groundwater data was collected quarterly in 2018 through 2021. The details of each sampling event are presented in Annual Groundwater Monitoring Reports and include an evaluation of the data based on the RGs presented in the 1991 ROD (USEPA, 1991) and in Section 5.6.2.

Since discontinuing the P&T phase of remediation in 2016, the Area D/ALGT LTM monitoring program has generated data from 20 quarterly sampling events that include static water level measurements and groundwater analytical data. Appendix G provides the cumulative groundwater elevation and analytical data, as well as the contaminant trend analyses and associated graphs and charts as presented in the 2021

Draft Annual Groundwater Monitoring Report (EA, 2022d). TCE concentrations detected in the 4th quarter of 2021 are shown on Figure 5-3.

The 2017 through 2021 LTM groundwater samples were collected quarterly from each of the 25 monitoring wells across the Area D/ALGT site (Figure 5-3). Samples were analyzed for the COCs identified in the 1991 ROD, which are TCE, cis-1,2-DCE, 1,1-DCE and VC. The COC results are screened against their respective RGs. The RGs are based on the Federal MCL for TCE (5 µg/L) and cis-1,2-DCE (70 µg/L) and the MTCA Method B for 1,1-DCE (0.07 µg/L) and VC (0.04 µg/L). Analytical results are provided in Appendix G.

Summary of Current Trend Analyses

Trend analyses indicate statistically significant downward trends in TCE concentrations in samples from five (DA-7b, DA-9b, DA-21b, DA-29, and DA-31) of eight wells. TCE datasets for the remaining three wells (DA-43, DB-6, and DO-3) exhibited non-statistically significant downward trends.

TCE data collected since 2000 have undergone statistical analysis to help support evaluation and interpretation of the TCE concentrations detected in groundwater at Area D/ALGT. Trend analyses were not performed on wells where TCE was not detected in greater than 50 percent (%) of the dataset or where there were fewer than eight data points (excluding non-detects). Of the 20 LTM monitoring locations for which data were available and suitable for analysis, data from 12 locations exhibited statistically significant downward trends. Non-statistically significant downward trends were exhibited in data from six monitoring wells and non-statistically significant upward trends were seen in two datasets. A summary of the trends for Area D/ALGT monitoring wells are shown in Table 5-5.

Table 5-5. Area D/ALGT Statistical Analysis Information

Monitoring Well	Trend	Statistically Significant	Distribution
DA-7b	Down	Yes	Mann-Kendall analysis (data not normally or log-normally distributed)
DA-9b	Down	Yes	Linear regression analysis (data normally distributed)
DA-11a	Down	Yes	Linear regression analysis (data normally distributed)
DA-11b	Up	No	Linear regression analysis (data normally distributed)
DA-13a	Up	No	Mann-Kendall analysis (data not normally or log-normally distributed)
DA-21b	Down	Yes	Mann-Kendall analysis (data not normally or log-normally distributed)
DA-28	Down	Yes	Mann-Kendall analysis (data not normally or log-normally distributed)
DA-29	Down	Yes	Linear regression analysis (data log-normally distributed)
DA-30a	Down	Yes	Mann-Kendall analysis (data not normally or log-normally distributed)
DA-30b	Down	No	Mann-Kendall analysis (data not normally or log-normally distributed)
DA-31	Down	Yes	Linear regression analysis (data normally distributed)
DA-32	Down	No	Mann-Kendall analysis (data not normally or log-normally distributed)
DA-43	Down	No	Linear regression analysis (data normally distributed)
DA-44	Down	Yes	Linear regression analysis (data normally distributed)
DA-45	—	—	No analysis; results 100% non-detect

DA-46	—	—	No analysis; results 94% non-detect
DA-47	—	—	No analysis; results 82% non-detect
DA-48	—	—	No analysis; results 82% non-detect
DB-6	Down	No	Linear regression analysis (data normally distributed)
DO-2	Down	Yes	Mann-Kendall analysis (data not normally or log-normally distributed)
DO-3	Down	No	Mann-Kendall analysis (data not normally or log-normally distributed)
DR-05	Down	No	Mann-Kendall analysis (data not normally or log-normally distributed)
DT-1	Down	Yes	Linear regression analysis (data log-normally distributed)
DT-2	—		No analysis; results 88% non-detect
EPA-W-5	Down	Yes	Linear regression analysis (data log-normally distributed)

% = percent ALGT = American Lake Garden Tract

From the documents available for review for this FYR period, TCE concentrations in groundwater continue to remain relatively consistent across the site. The contaminant plume is stable and does not appear to be expanding. TCE concentrations exceeding the RG form a groundwater plume that originates at the MF-ALGT-LF-05 source area and extends with groundwater flow to the northwest, lying under part of the Whispering Firs Golf Course (Figure 5-3).

Trend analysis of TCE concentrations indicate that five of the eight wells where TCE concentrations exceed the RG show statistically significant downward trends. TCE concentrations in all but two of the 25 LTM wells exhibit a statistically or non-statistically significant downward trend. TCE degradation compound cis-1,2-DCE was not detected above the 70 µg/L RG in samples collected since 2017. 1,1-DCE exceeded the 0.07 µg/L RG in only three wells since 2017. Since 2017, VC (another TCE degradation compound) exceeded its 0.04 µg/L RG in five of the 25 sampled wells. VC concentrations are highest in monitoring well DA-32, located near the MF-ALGT-LF-05 source area. The elevated VC concentrations are the result of ongoing reductive dechlorination enhanced by a hydrogen source that was injected into the DA-32 well during a 2011 bioenhancement pilot study. MNA parameters collected across the site since 2016 when P&T operations ceased would indicate that reductive dechlorination is not occurring under ambient conditions. MNA results are discussed in further detail below.

MNA Parameters Evaluation

Twenty-three monitoring wells were sampled for MNA parameters during the first and third quarter 2021 sampling events.

To aid in evaluating the viability of MNA as a suitable alternative to the inefficient P&T system at Area D/ALGT, 23 monitoring wells have been sampled for MNA parameters beginning in 2016. MNA parameters and analytical results are provided in Appendix G. The following information was provided by the MNA evaluation results from the 23 wells sample. In general, conditions were determined to be unfavorable for anaerobic biodegradation, and natural attenuation processes are by dilution and dispersion.

TOC is considered of primary importance to anaerobic biodegradation as it reflects the presence of an electron donor required to drive the reductive dechlorination process. TOC concentrations above 20 milligrams per liter (mg/L) are generally considered necessary to support effective anaerobic dechlorination

(USEPA 1998). Of the over 300 results from quarterly sampling of 23 wells since 2016, only three readings exceed 20 mg/L.

Anaerobic conditions require dissolved oxygen levels that are less than 0.5 mg/L. Of the over 300 results, the dissolved oxygen levels exceed 0.5 mg/L in 233 samples; and exceed 1.0 mg/L in 193. Oxidation reduction potential levels should be between -100 millivolts (mV) and -300 mV. Results indicate 12 samples meet those criteria. Other criteria were reviewed as reported in the 2018, 2019, 2020, and 2021 Groundwater Monitoring Reports, but with similar results. Area D/ALGT groundwater is unfavorable for anaerobic biodegradation, and natural attenuation processes are by dilution and dispersion.

Conclusions

The Final FFS was approved by Ecology on September 15, 2020. The *Draft Final Record of Decision (ROD) Amendment For Area D/American Lake Garden Tract (ALGT)* (USEPA, 2021) documented the results of the FFS, and the final ROD Amendment will document MNA as the ALGT groundwater remedy to replace P&T for the following reasons:

- The plume appears to be stable, with approximate dimensions of 1,000 ft in length, 20 ft thick, & 500 ft in width (2019). This is a decrease from the initial plume dimension assessment of 3,500 ft in length, 40 ft thick & 500 ft in width (1991).
- Relatively low TCE concentrations, with a maximum concentration of 22 µg/L during the September 2019 sampling event.
- The depth of contaminants is reportedly between 50- to 70 ft bgs in a silty gravel layer. This unit serves as a continuous source, back-diffusing into the groundwater. Due to the depth of contamination, and exposure to volatile contaminants will be negated through vertical separation distances.
- The groundwater gradient is relatively flat, ranging from 1.7- to 6.8 ft per mile (EA, 2020).
- The Site is entirely within the boundary of the JBLM facility, and is improved/utilized as Whispering Springs Golf Course.
- Recent sampling events have exhibited the presence of a degradation daughter product cis-1,2 DCE. This suggests reductive dechlorination is occurring.

The 2021 Annual Groundwater Monitoring Report recommended monitoring at the 25 ALGT monitoring wells should continue in general accordance with the Monitoring Plan (TetraTech, 2016), as amended by the 2018 Groundwater Monitoring Report (EA, 2019).

The current LTM network remains protective of potential receptors and provides sufficient coverage to determine future contaminant migration.

The review of the 2017 through 2021 LTM data conducted as part of this FYR found no evidence that would contradict the conclusions or recommendations presented in the ALGT monitoring reports and supporting documents including the SMIS and FFS reports. Selection of the preferred alternative of MNA to replace the P&T system at ALGT as documented in the Draft Final ROD Amendment is supported by the data review performed for this FYR.

5.8.2 Site Inspection

As discussed in Section 1.3.4, the Site Inspection for MF-ALGT-LF-05 was conducted on 9 November 2021 and included inspection of the three P&T system wells at the site and the P&T system building. No changes in site conditions or land use were noted during the site inspection and no indications of drinking water well installation were noted within the LUC or plume boundaries. According to JBLM personnel, there are plans to decommission the treatment system to include the treatment building, vessels, piping, and select wells in 2023. Appendix C provides the detailed Site Inspection Trip Report and includes the inspection participants, FYR Site Inspection Checklists, and photographic log.

5.8.3 Interviews

As discussed in Section 1.3.5, interviews were attempted with parties knowledgeable of site conditions, including regulatory agencies involved in site activities. The USEPA RPM, Mr. Patrick Hickey, responded to the FYR interview questionnaire that included MF-ALGT-LF-05 but had no specific comments regarding the site. The Ecology representative for the ALGT site, Mr. Jason Cook, also responded to the FYR interview questionnaire. Mr. Cook noted that Ecology had recently concurred with the remedial alternative presented in the 2020 FFS. Mr. Cook further noted that the Area D/ALGT groundwater contaminant plume is stable, with areas where contaminant concentrations are decreasing in magnitude and extent. The complete interview records are included in Appendix D.

5.9 TECHNICAL ASSESSMENT

The technical assessment of the protectiveness of the remedy for Area D/ALGT is based on the responses to these three questions:

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

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

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

5.9.1 Question A: Is The Remedy Functioning As Intended By The Decision Document?

No, the review of documents and site inspection data indicate that the P&T component of the remedy at MF-ALGT-LF-05 ceased operation in 2016 and is not currently functioning to effectively to remove TCE and restore groundwater as a drinking water source, although the Area D/ALGT groundwater contaminant plume is stable, with areas where contaminant concentrations are decreasing in magnitude and extent. A Draft ROD Amendment (USEPA, 2021) proposed a change to the 1991 remedy of P&T identified in the ROD because the groundwater P&T system is no longer an effective remedy for treating groundwater contamination, MNA is considered to be an effective alternative remedy that should replace groundwater extraction and treatment as the primary remedy. Additionally, the site continues to be restricted to nonresidential use only and remains under government control. Maintenance inspections are conducted annually and documents available for review during this FYR review period report that no residential land use is occurring or planned, excavation of contaminated soil has not occurred, and drinking water wells have not been installed within 1,000 ft of the LUC boundaries.

5.9.2 Question B: Are The Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used At the Time Of The Remedy Selection Still Valid?

Yes. While there have been changes to exposure assumptions, toxicity data, and cleanup levels since the remedy, these do not call the protectiveness of the remedy into question. The RAO to restore drinking water to its beneficial use as a potential groundwater drinking source remains valid.

5.9.2.1 Changes in Standards and To-Be-Considereds (TBCs)

In order to evaluate whether a change in standards and TBCs affects the remedy's protectiveness, the RGs were compared to updated ARARs and risk-based MTCA cleanup levels in Table 1 of Appendix H. The RG for TCE (5 µg/L) and cis-1,2DCE (70 µg/L) are based on an the Federal MCL, which is equivalent to and the MTCA Method A criteria. These ARARs have not changed since the implementation of the remedy, as shown in Table 1 of Appendix H. Therefore, there are no changes in ARARs to call the protectiveness of the remedy into question.

5.9.2.2 Changes in Exposure Pathways

COCs remain in landfills and in groundwater at ALGT. There have been no changes in the exposure pathways since the implementation of the selected remedy and LUCs prohibit residential use, excavation, and training activities within the landfill. All private residences above and downgradient of the plume have been connected to public water supply. The historical and current boundaries of the plume are within the confines of JBLM property; no potable wells are utilized at the site and LUCs prohibit new water wells within 1000 ft of the landfill boundaries or plume extent. Thus, the RAO (restore groundwater to beneficial use) at the time the remedy was selected is still valid. However, the potential for VI to indoor air was not considered previously and is therefore evaluated below.

Vapor Intrusion

The HHRA in the 1991 ROD did not include potential for VI to indoor air as an exposure pathway. Groundwater data from previous five years (2016 through 2020) as presented in the 2021 Annual Groundwater Monitoring Report were reviewed to assess potential for VI. The highest detected concentrations of the COCs [(31 µg/L TCE in DA-21b in September 2017; 48 µg/L cis-1,2-DCE in DA-43 in April 2019; 0.19 µg/L DCE in DO-2 in April 2019; and 53 µg/L VC in DA-32 in April 2019) were input into USEPA's online VISL calculator (May 2022 RSLs) under both a residential and commercial exposure scenario. For the residential scenario, the total VI carcinogenic risk for indoor inhalation of vapors from the Vashon aquifer ($3.9E^{-04}$) exceeds the USEPA's acceptable target risk range for carcinogens (between 10^{-4} to 10^{-6}) and noncancer hazard index (6.7) exceeds that the target hazard index (HI) of 1 using these COC concentrations. For the commercial scenario, the total VI carcinogenic risk ($2.6E^{-05)}$ falls within the USEPA's acceptable target risk range and the noncancer hazard (1.6) slightly exceeds that the target hazard quotient of 1, with TCE and VC as primary risk drivers. These risk values are calculated using conservative standard exposure scenarios such as people living in a house for 26 years which may not be applicable for a military installation. The 2021 Annual Monitoring Report indicates TCE concentrations were detected above the cleanup level in samples from seven wells during at least one sampling event (DA-7b, DA-9b, DA-21b, DA-29, DA-31, DA-43, and DO-3). The highest concentration of TCE in 2021 was detected in the sample from well DA-43 at 20 µg/L in November 2021. Trend analyses indicate statistically significant downward trends in TCE concentrations in samples from five (DA-7b, DA-9b, DA-21b, DA-29, and DA-31) of these seven wells. TCE datasets for the two wells (DA-43, DB-6, and DO-3) exhibited non-statistically significant downward trends (DO-3) or trend analysis was not performed (DA-43).

Recalculating the USEPA VI risk based on where buildings and residences are located with respect to the plume yields a VI carcinogenic risk and non-carcinogenic risk within acceptable levels. Because these structures are outside the 5.0 µg/L isoconcentration contour by more than 100 ft, the RGs were input into the USEPA VISL calculator. The residential (cancer risk = $4.8E^{-06}$; HI = 0.97) and commercial (cancer risk = $6.9E^{-07}$; HI = 0.23) risk estimates at the RGs do not exceed acceptable thresholds. The golf course club house is over 400 ft from well DA-7b and approximately 250 ft from the 5.0 µg/L TCE isoconcentration contour. Concentrations decrease toward the club house building. The single-family residential housing area south of Lincoln Boulevard SW and Whispering Firs Golf Course is approximately 300 ft south of the current 5.0 ppb TCE contour line (as measured from the nearest house). The distances are based on the TCE isoconcentration contours in the 2021 Annual Groundwater Monitoring Report. Protectiveness is maintained as there are no structures above the TCE plume as defined by the 5.0 µg/L isoconcentration line. While there are LUCs restricting new construction over ALGT landfills, there are no environmental LUCs preventing construction over the ALGT TCE plume. The golf course, however, which encompasses the ALGT TCE plume, is within the range's safety fan for the north ammunition storage area where development is prohibited. Therefore, future protectiveness is still being achieved through the safety fan restrictions.

Emerging Chemicals

The likelihood of emerging chemicals being present at the site has been considered for the ALGT plume. The 2nd FYR indicates monitoring for 1,4-dioxane was conducted at ALGT in 2005 in response to a previous FYR recommendation. USEPA considers 1,4-dioxane as a likely contaminant at many sites contaminated with certain chlorinated solvents because of its widespread use as a stabilizer for chlorinated solvents. Results were below the PQL of 5 µg/L according to previous FYRs; however, the data were unavailable for this review. The July 2021 MTCA Method B limit is 0.44 µg/L, which is based on a 10^{-6} cancer risk. The corresponding risk of a detection at 5 µg/L was evaluated using the USEPA RSL on-line calculator for a residential tap water use scenario. The cancer risks from 1,4-dioxane occurring at the PQL is 1.1×10^{-5}, which falls well within the "acceptable" cancer risk range and the hazard quotient is 0.088, which is below the noncancer threshold of 1. Therefore, 1,4-dioxane if present below the PQL would not call the protectiveness of the remedy into question.

The presence of PFAS at or near the ALGT was evaluated in 2020 due to the potential for disposal of PFAS containing waste. The previous FYR recommended sampling because the treatment system is not configured to adequately treat PFAS prior to discharging, and thus, the protectiveness may be affected if PFAS is presented above the lifetime HAs. The 2020 PA/SI indicated that PFOS and PFOA were not measured at concentrations greater than 40 ppt in any of the six groundwater samples associated with the ALGT Landfill 005 (AOPI – 8) and determined that further evaluation was not warranted. As shown on Table 3 in Appendix H, the USEPA tapwater RSL for PFOS (40 ppt) and PFOA (40 ppt) and PFBS (40,000 ppt) applied in the 2020 PA/SI have been reduced to 4 ppt for PFOS, 6 ppt for PFOA, and 600 ppt for PFBS. The maximum concentration of PFOS (38 ppt) in ALGT Landfill 005 (AOPI – 8) exceeds the current (May 2022) RSL. The maximum concentrations of PFOA (5.6 ppt) and PFBS (4.1 ppt) in Landfill 005do not exceed the current RSLs. In addition, the USEPA (May 2022) provided RSLs for two additional compounds (PFHxS and PFNA) that were analyzed for during the PA/SI. The maximum concentrations of PFHxS (29 ppt) and PFNA (0.56 ppt) do not exceed the RSLs of 39 ppt for PFHxS and 5.9 ppt for PFNA. The PFAS compounds exceeding RSLs were considered in the risk assessment process through the calculation of site specific noncancer hazard index (Table 3 in Appendix H). The individual chemical HQ for each PFAS compound and the total hazard index for the PFAS compounds do not exceed the threshold of one. Therefore, the presence of PFAS in groundwater at the ALGT LF-5 does not call the protectiveness of the remedy into question.

5.9.2.3 <u>Changes in Toxicity and Other Contaminant Characteristics</u>

In order to evaluate whether a change in risk-based TBC, risk assessment methodologies, or contaminant toxicity affects the remedy's protectiveness, the RGs were compared to updated risk-based MTCA cleanup levels in Table 2 of Appendix H. The toxicity data for the COCs have been updated in the USEPA IRIS as discussed in Appendix H. USEPA has also concluded that TCE and vinyl chloride are carcinogenic by a mutagenic mode of action, and currently applies ADAFs when assessing risk associated with early-life exposure. The USEPA no longer recommends using inhalation toxicity values that are derived from oral data (i.e., no longer using SFi or RfDi. Inhalation toxicity values are currently presented as inhalation unit risk for cancer risks and reference concentrations for non-cancer hazards. The cancer toxicity data for 1,1-DCE has been withdrawn; the IRIS indicates data for 1,1-DCE are not sufficient evidence to assess human carcinogenic potential following inhalation exposure.

These changes in toxicity data do not call the protectiveness of the remedy into question because the RG for TCE (5 µg/L) and cis-1,2DCE (70 µg/L) are based on the Federal MCL, which is equivalent to the MTCA Method A criteria. These ARARs have not changed since the implementation of the remedy, as shown in Table 1 of Appendix H. The RG for VC (0.04 µg/L) and 1,1-DCE (0.07 µg/L) are risk-based cleanup levels based on MTCA Method B levels. The July 2021 MTCA Method B criteria for VC has decreased to 0.0292 µg/L for VC when children may be exposed, while the Method B criteria for 1,1-DCE has increased to 400 µg/L. While concentrations of TCE and VC above the MCL and MTCA Method B levels remain in select groundwater wells at AGLT, the remedy includes site restrictions that prevent installing new drinking water wells within 1000 ft of the landfill boundary and off-site homes have been hooked up to an alternative water supply, which restricts exposure. Thus, there is no change with respect to the protectiveness of the remedy.

5.9.2.4 <u>Changes in Risk Assessment Methods</u>

The default exposure parameters for residential and industrial land use have changed since the implementation of the remedy, as discussed in Appendix H. The USEPA (OSWER Directive 9200.1-120) provided supplemental guidance in 2014 that updated the standard default exposure factors for calculating risk. The remedy includes site restrictions that prevent installing new drinking water wells within 1000 ft of the landfill boundary and off-site homes have been hooked up to an alternative water supply, which restricts exposure. Therefore, changes in risk assessment methods have not been significant enough to call the protectiveness of the remedy into question.

5.9.2.5 Expected Progress Toward Meeting RAOs

Significant progress has been made toward meeting the RAO of restoring groundwater to its beneficial, drinking water use at Area D/ALGT. The P&T system operated at ALGT from 1994 to 2016 after which time it was shut down to evaluate contaminant rebound as well as to evaluate additional treatment options for the remaining residual groundwater contaminants at the site because it had not effectively driven the site towards closure in an expedient manner. The P&T system removed 108 pounds of TCE during 22 years of operation and was expensive to operate and maintain. The system shutdown became permanent when contaminant concentration data collected from a rebound test initiated in 2016 indicated that the plume is in a steady-state condition without the extraction system running (TetraTech, 2018).

An FFS was completed to evaluate the potential remedial options to replace the P&T system and was approved by Ecology in September 2020 (EA, 2020). The *Draft Final Record of Decision (ROD) Amendment For Area D/American Lake Garden Tract (ALGT)* (USEPA, 2021) documented the results of the FFS, and the final ROD Amendment will document MNA as the ALGT groundwater remedy to replace P&T for the following reasons:

- The plume appears to be stable, with approximate dimensions of 1,000 ft in length, 20 ft thick, & 500 ft in width (2019). This is a decrease from the initial plume dimension assessment of 3,500 ft in length, 40 ft thick & 500 ft in width (1991).
- Relatively low TCE concentrations, with a maximum concentration of 22 µg/L during the September 2019 sampling event.
- The depth of contaminants is reportedly between 50- to 70 ft bgs in a silty gravel layer. This unit serves as a continuous source, back-diffusing into the groundwater. Due to the depth of contamination, and exposure to volatile contaminants will be negated through vertical separation distances.
- The groundwater gradient is relatively flat, ranging from 1.7- to 6.8 ft per mile (EA, 2020).
- The Site is entirely within the boundary of the JBLM facility and is improved/utilized as Whispering Springs Golf Course.
- Recent sampling events have exhibited the presence of a degradation daughter product cis-1,2 DCE. This suggests reductive dechlorination is occurring.

The 2021 monitoring report concluded the current LTM network remains protective of potential receptors and provides sufficient coverage to determine future contaminant migration. In addition, LUCs have been implemented and are maintained to prevent exposure to contaminated groundwater by restricting the uses of shallow groundwater and prohibiting future development of landfills for human habitation and to provide for a LTM program for both on- and off-site wells to measure the effectiveness of the RA.

5.9.3 Question C: Has Any Other Information Come To Light That Could Call Into Question The Protectiveness of the Remedy?

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

5.10 ISSUES

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. The groundwater P&T system is no longer an effective remedy for treating groundwater contamination.	N	Y

N = No P&T = Pump & Treat Y = Yes

5.10.1 Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Overnight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1.	Finalize the ROD amendment as the DD that changes the remedy from P&T to MNA, which is considered to be an effective alternative remedy that should replace groundwater extraction and treatment as the primary remedy for groundwater contamination.	U.S. Army	USEPA	28 September 2023	N	Y

DD = Decision Document MNA = monitored natural attenuation N = No P&T = Pump & Treat
ROD = Record of Decision USEPA = United States Environmental Protection Agency Y = Yes

5.10.2 Other Findings

The following recommendation not affecting protectiveness was identified during this FYR and is provided to improve implementation of the remedy.

- The annual Groundwater Monitoring Reports and LUCs Checklist reports should be completed in a timely manner to ensure that the required LUC inspections are documented and available for review.

5.11 OU03 PROTECTIVENESS STATEMENT

The remedy at MF-ALGT-LF-05, Area D/ALGT, currently protects human health and the environment. Potential exposures have been addressed through groundwater extraction and treatment (i.e., P&T), and the implementation and maintenance of appropriate LUCs that prevent residential land use, unplanned excavation of contaminated soil, and installation of new drinking water wells within 1,000 ft of the LUC boundaries until USEPA concurs that groundwater quality has been restored. Ongoing groundwater LTM and reporting ensure that continuing progress towards achieving the RAO is being made by providing data that confirm the concentrations and extent of COCs and monitor the natural attenuation of contaminants in accordance with the current monitoring plan for the site. However, for the remedy to remain protective in the long term, the ROD amendment needs to be finalized as the DD that changes the remedy from P&T to MNA, which is considered to be an effective alternative remedy that should replace groundwater extraction and treatment as the primary remedy for groundwater contamination.

6 SITE-WIDE PROTECTIVENESS STATEMENT

The site-wide protectiveness determination for JBLM is based on the protectiveness determinations for the three OUs, as summarized in the following table:

Protectiveness Determination	Location
Short-Term Protective	**JBLM Site-Wide**
Short-Term Protective	*OU01*
Short-Term Protective	Logistics Center (FTLE-33)
Short-Term Protective	Illicit PCB Dump Site (FTLE-46)
Protective	LF-1 (FTLE-54)
Protective	Battery Acid Pit (FTLE-16)
Protective	DRMO Yard (FTLE-31)
Protective	IWTP (FTLE-51)
Protective	Pesticide Rinse Area (FTLE-28)
Short-Term Protective	*OU02*
Short-Term Protective	LF-4 (FTLE-57)
Short-Term Protective	SRCPP (FTLE-32)
Short-Term Protective	*OU03*
Short-Term Protective	ALGT (MF-ALGT-LF-05)

ALGT = American Lake Garden Tract
IWTP = Industrial Wastewater Treatment Plant
PCB = polychlorinated biphenyl
DRMO = Defense Reutilization Marketing Office
OU = Operable Unit
SRCPP = Solvent Refined Coal Pilot Plant

The remedial actions at OU01, OU2, and OU03 currently protect human health and the environment because potential exposures to contaminated media are controlled through site access, groundwater LTM, and maintenance of LUCs, including caps installed over waste areas, in accordance with the RODs and DDs.

To ensure future protectiveness at OU01:

- **FTLE-33 Logistics Center**. Install additional monitoring wells to define and monitor the full extent of the groundwater plume and conduct additional plume optimization of the existing treatment systems to fully capture upgradient TCE concentrations in groundwater that significantly exceed the RG and continue to impact downgradient areas.
- **FTLE-46, Illicit PCB Dump Site**. Maintenance of the clay cap must be conducted on a routine basis to ensure the integrity of the cap which is necessary to prevent direct contact with contaminated soil.

To ensure future protectiveness at OU02:

- **FTLE-57, LF-4.** Enforce LUCs to include implementation of additional preventative measures that restrict access to the landfill cap to mitigate potential damage and prevent exposure to the landfill contents.
- **FTLE-32, SRCPP**. Implement LUCs to prevent residential land use of the site and unauthorized excavation of contaminated soil.

To ensure future protectiveness at OU03:

- **MF-ALGT-LF-05, Area D/ALGT**. Finalize the ROD amendment to document a change in the remedy selected in the 1991 ROD to replace the groundwater P&T system remedy with MNA.

7 NEXT REVIEW

The next FYR for JBLM is due 28 September 2027.

FIGURES

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Legend

Joint Base Lewis-McChord Boundary

County Boundaries

U.S. Army Corps of Engineers

Aerostar Environmental and Construction

Aerostar Environment and Construction LLC
1006 Floyd Culler Court
Oak Ridge, TN 37830

FIGURE 1-1
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 12,500 25,000 Feet

N

Date modified: 12/07/2021	File: JBLM_WA_Location_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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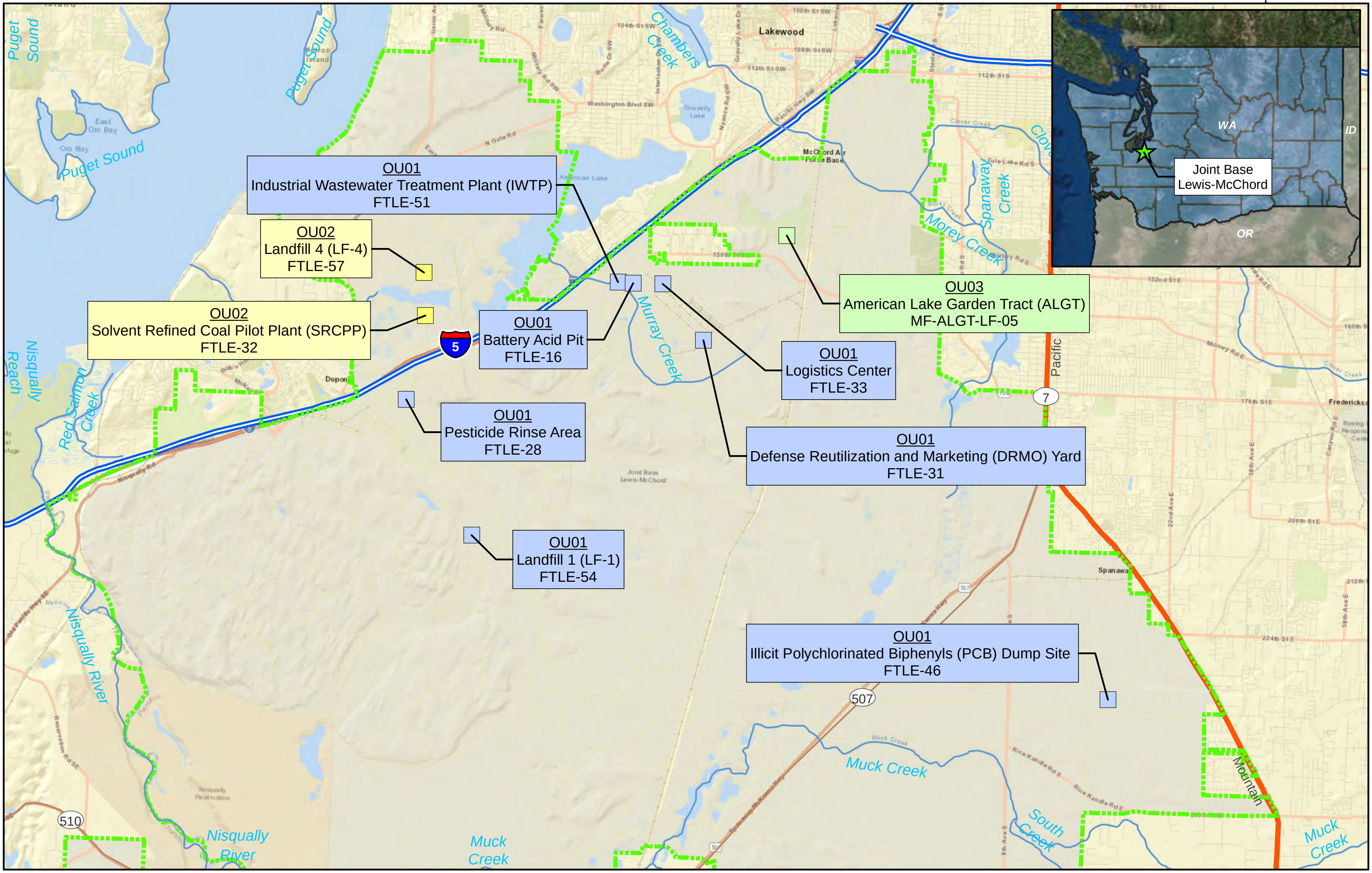

Legend

OU = Operable Unit
- OU01 Site Location
- OU02 Site Location
- OU03 Site Location
- Joint Base Lewis-McChord Boundary

U.S. Army Corps of Engineers

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FIGURE 1-2
Location Map, Operable Units and Five-Year Review Sites
Joint Base Lewis-McChord
Pierce and Thurston County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 4,500 9,000 Feet

N

Date modified: 04/07/2022	File: Fig_1_2_JBLM_Site_Location_5YR_PMP		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C. Wallace	Rev: 01

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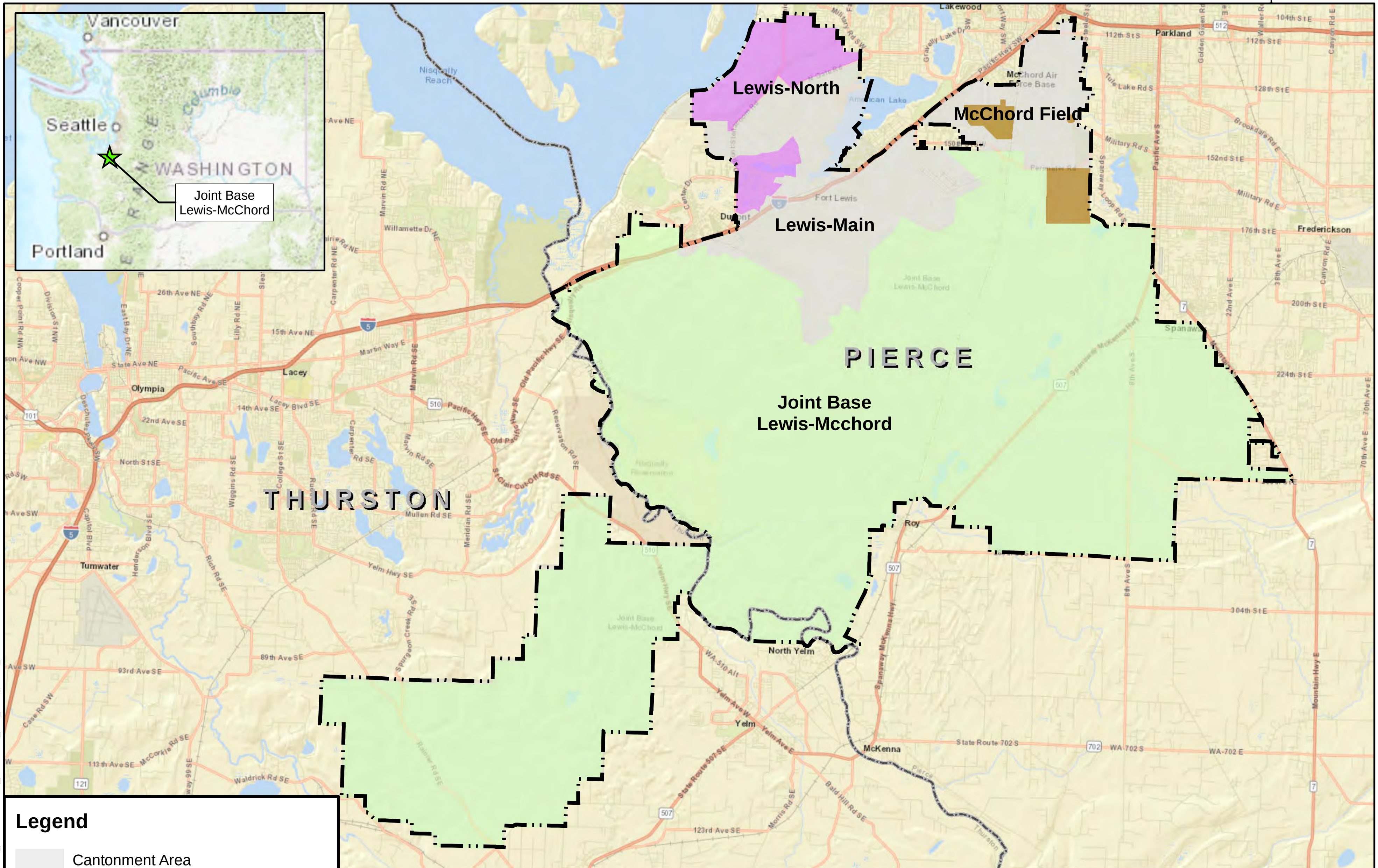

Legend

- Cantonment Area
- Lewis-Main Opertational Range
- Lewis-North Operational Range
- McChord Field Operational Range
- Joint Base Lewis-McChord Boundary
- County Boundaries

U.S. Army Corps of Engineers

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FIGURE 2-1
Joint Base Lewis-McChord Designated Areas
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 7,500 15,000 Feet

N

Date modified: 01/06/2022	File: JBLM_WA_Designated_Areas		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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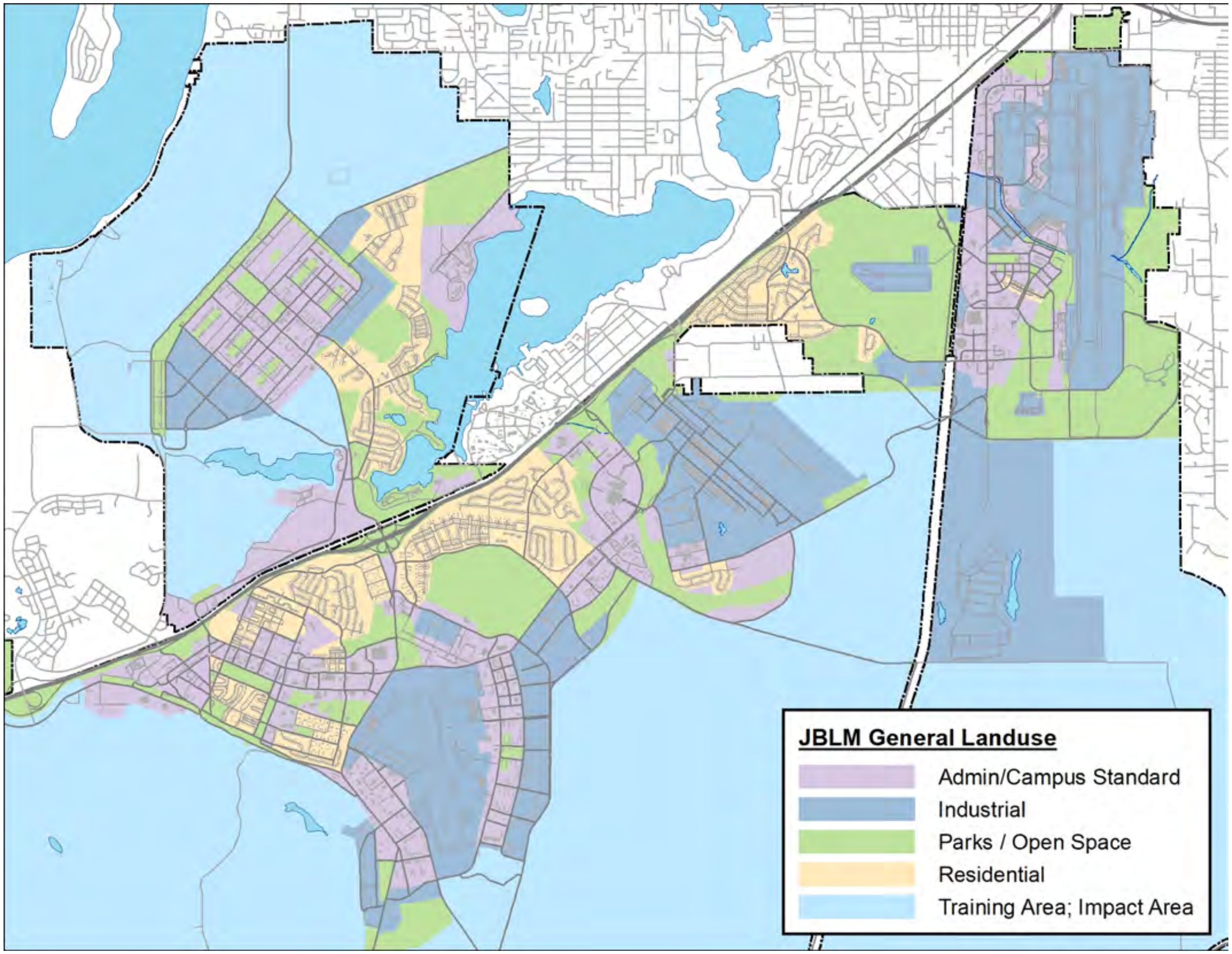

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FIGURE 2-2
Joint Base Lewis-McChord General Landuse
Pierce County, Washington

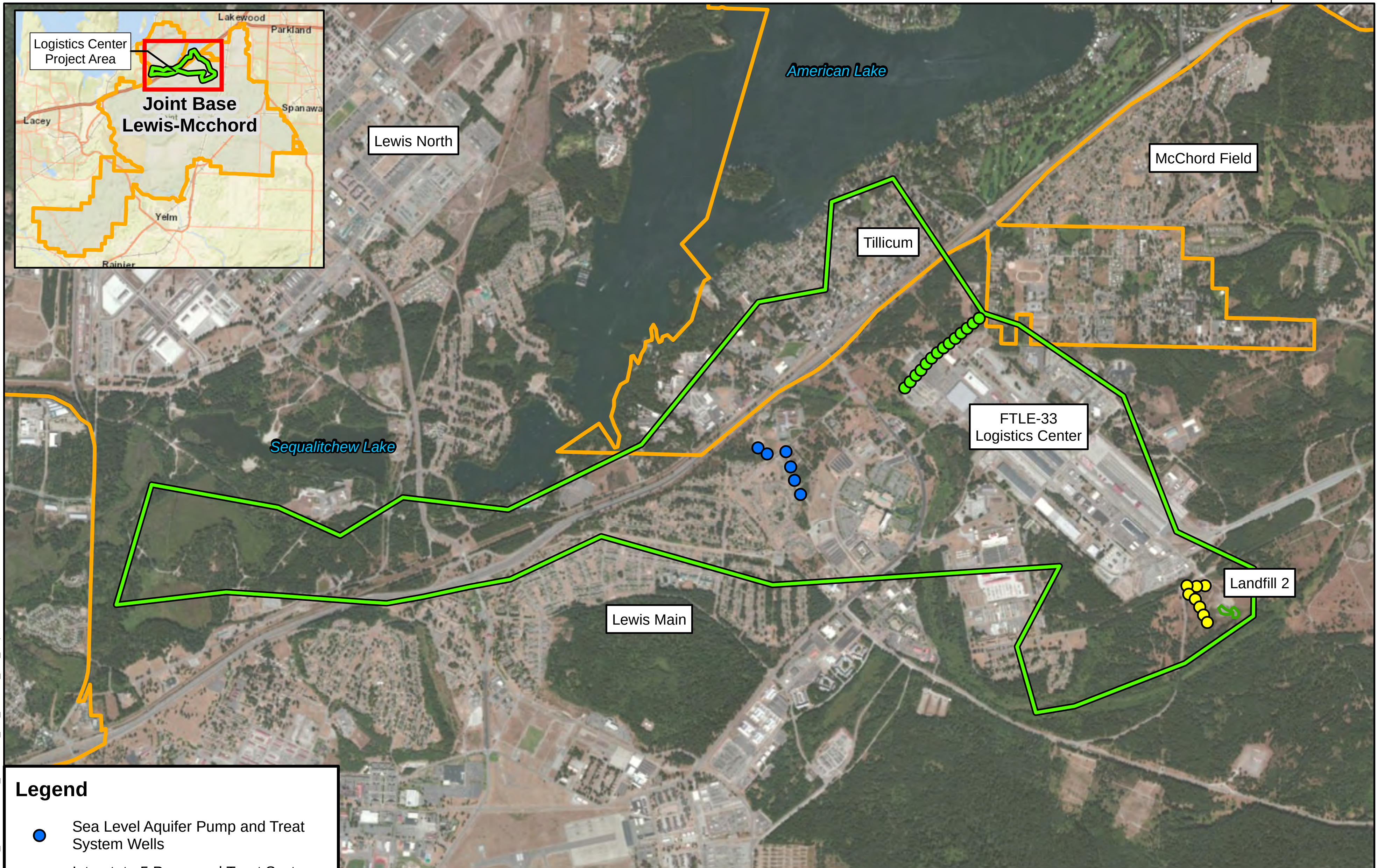
Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 7,500 15,000 Feet

N

Date modified: 01/06/2022	File: JBLM_WA_Landuse		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

Path: G:\1RC01.1023.0001.05_5_Year_Review_KC\MXD\JBLM_WA\JBLM_WA_Landuse.mxd



Legend

- Sea Level Aquifer Pump and Treat System Wells
- Interstate 5 Pump and Treat System Wells
- Landfill 2 Pump and Treat System Wells
- Project Area
- Landfill 2 NAPL Areas
- Joint Base Lewis-McChord Boundary

U.S. Army Corps of Engineers

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FIGURE 3-1
FTLE-33 (Logistics Center) Site Location Map
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 1,500 3,000 Feet

N

Date modified: 12/09/2021	File: JBLM_WA_FTLE33_Site_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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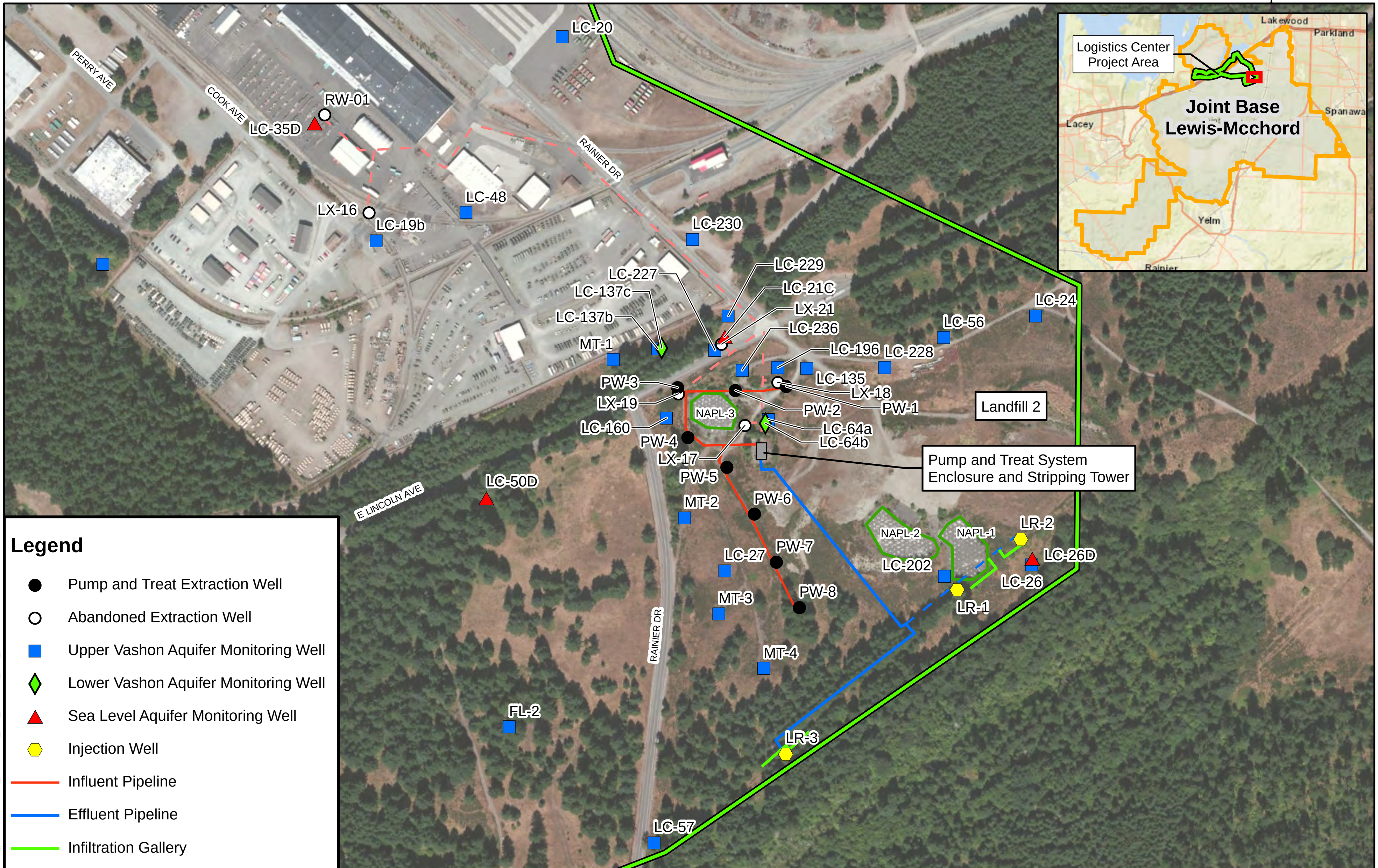

Legend

- Pump and Treat Extraction Well
- Abandoned Extraction Well
- Upper Vashon Aquifer Monitoring Well
- Lower Vashon Aquifer Monitoring Well
- Sea Level Aquifer Monitoring Well
- Injection Well
- Influent Pipeline
- Effluent Pipeline
- Infiltration Gallery
- Abandoned Influent Pipeline
- Abandoned Effluent Pipeline
- Project Area
- NAPL Area
- Joint Base Lewis-McChord Boundary

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FIGURE 3-2
FTLE-33 (Logistics Center) Landfill 2 Pump and Treat System Location
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 250 500 Feet

N

Date modified: 12/09/2021	File: JBLM_WA_FTLE33_LF2_PT		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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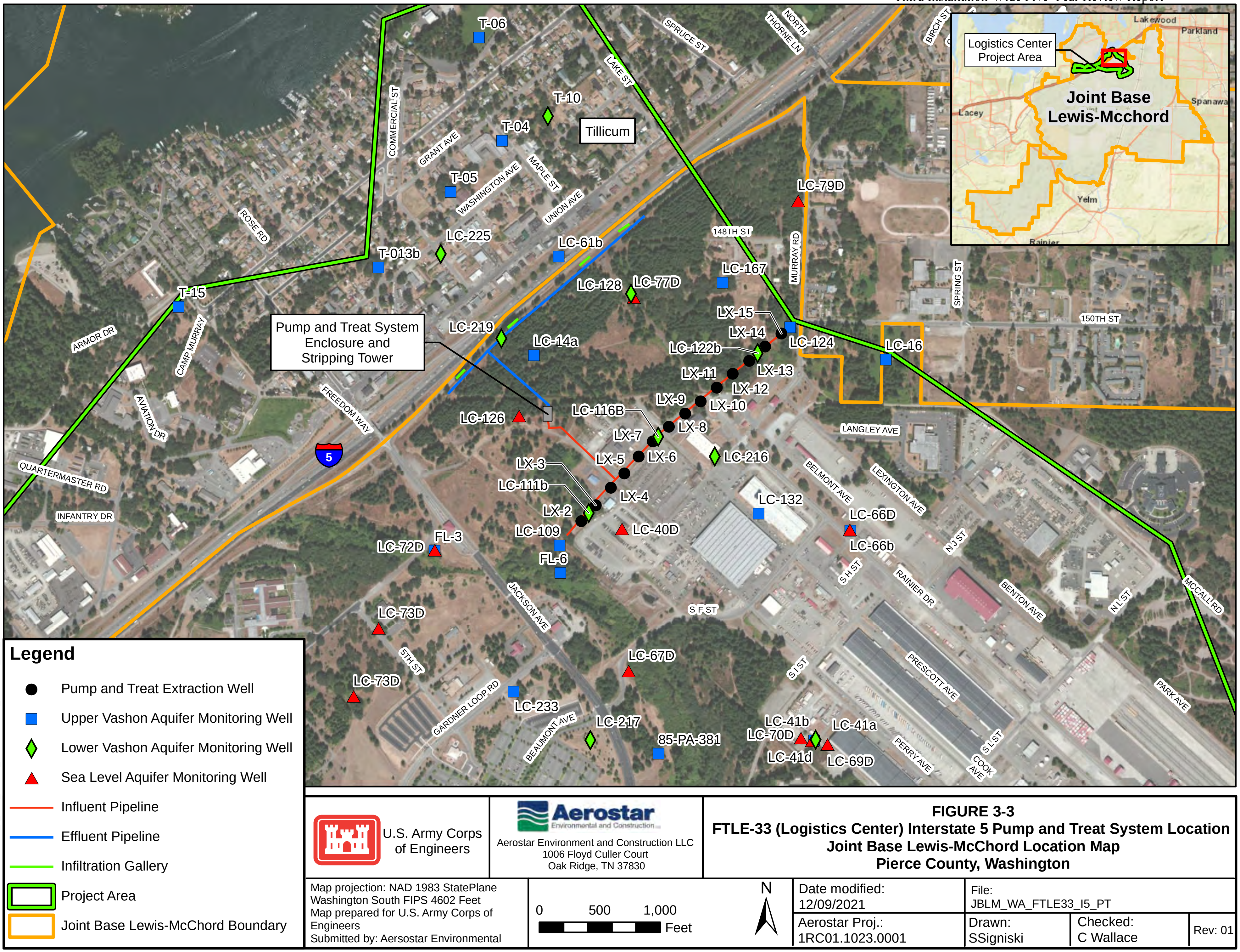

FIGURE 3-3
FTLE-33 (Logistics Center) Interstate 5 Pump and Treat System Location
Joint Base Lewis-McChord Location Map
Pierce County, Washington

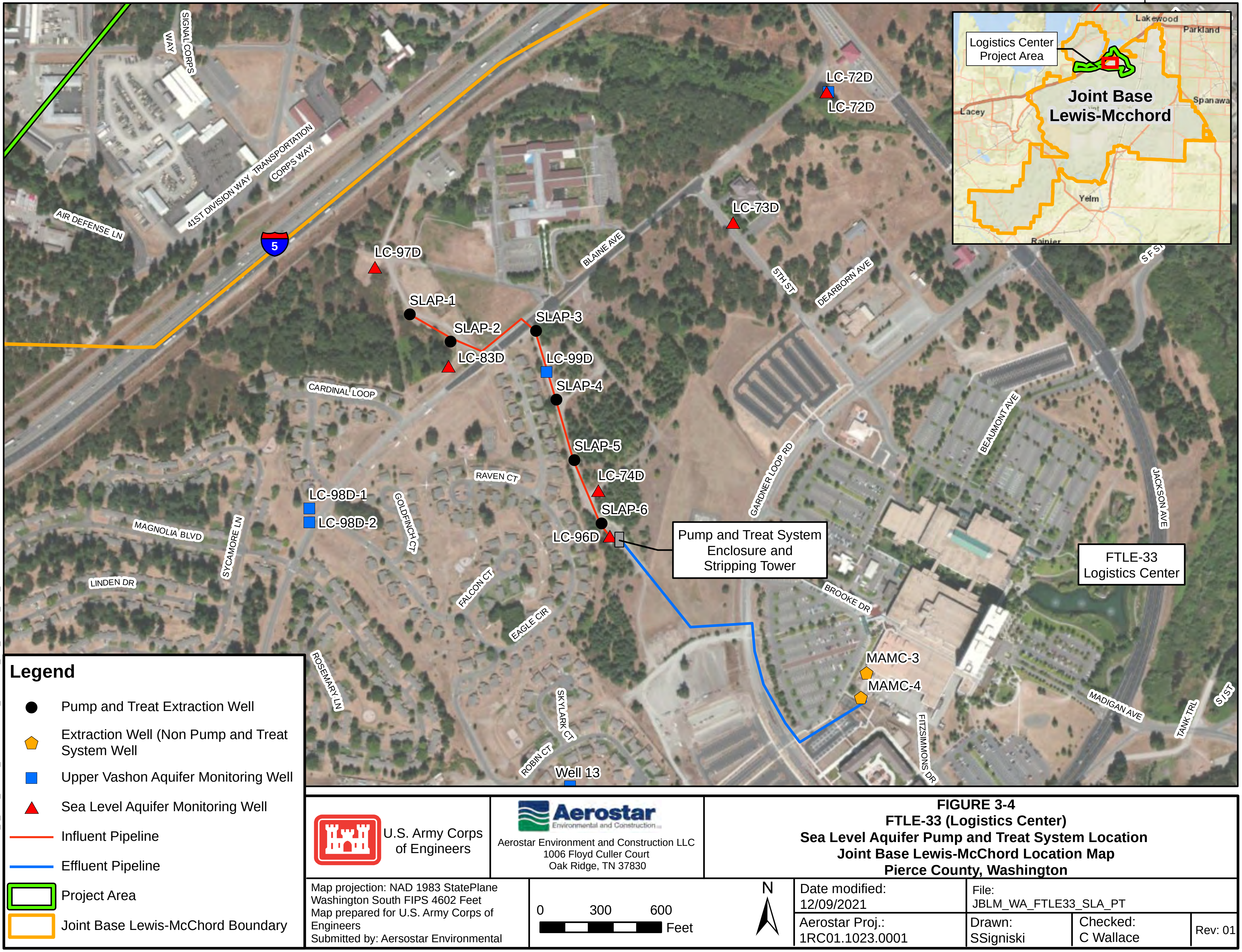

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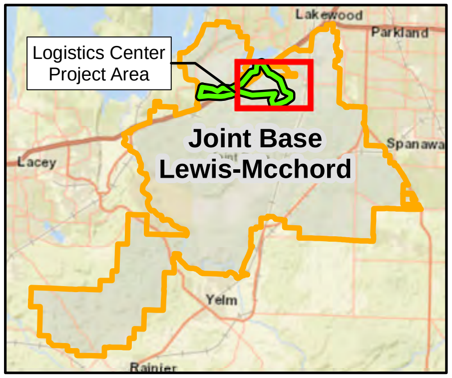
FIGURE 3-4
FTLE-33 (Logistics Center)
Sea Level Aquifer Pump and Treat System Location
Joint Base Lewis-McChord Location Map
Pierce County, Washington

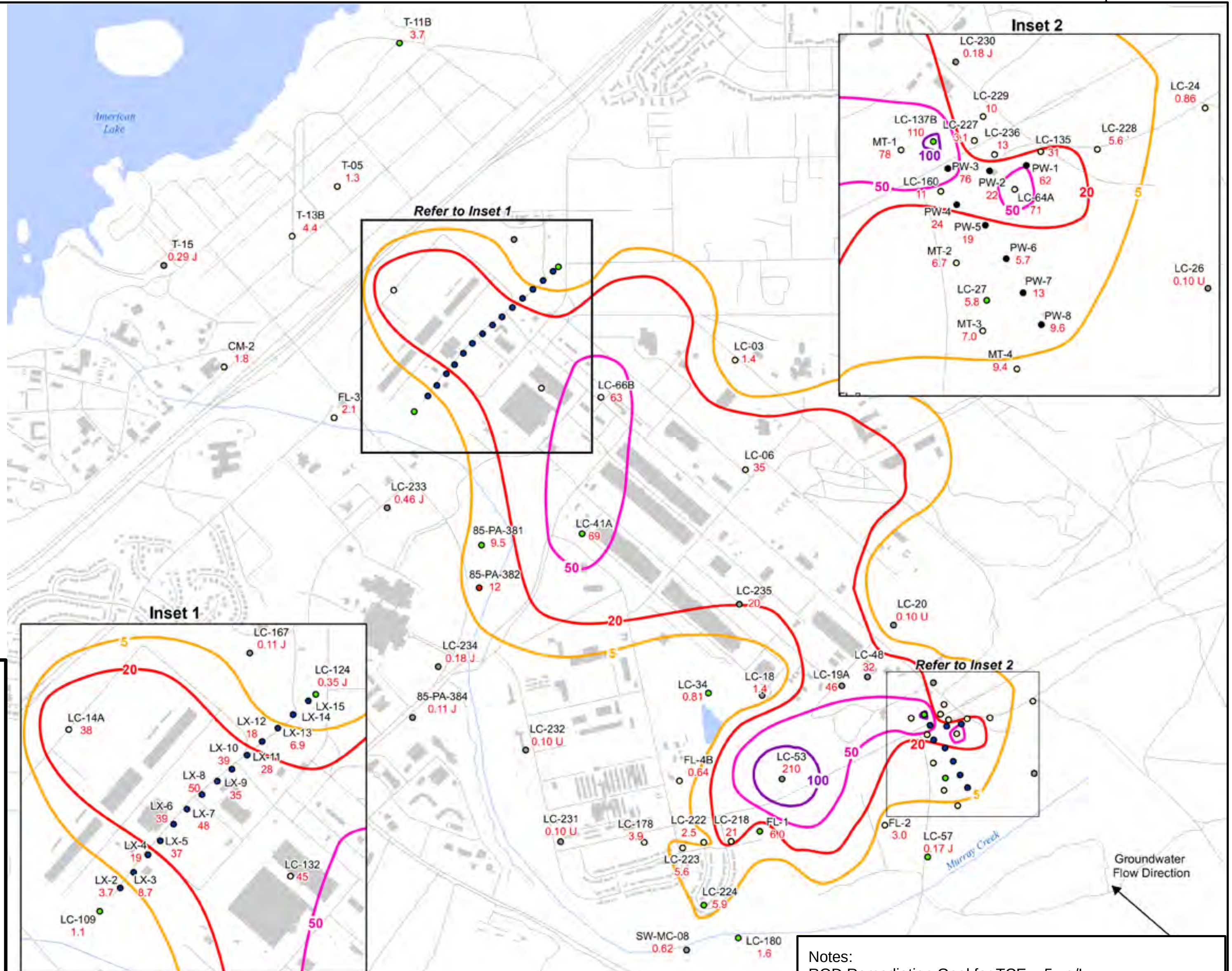
Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 300 600 Feet

N

Date modified: 12/09/2021	File: JBLM_WA_FTLE33_SLA_PT		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01





Notes:
ROD Remediation Goal for TCE = 5 µg/L
J = The report is an estimated value.
U = Analyte not detected above practical quantification limit.

Legend

- Pump and Treat Extraction Well
- Lower Vashon Aquifer Monitoring Well

Sea Level Aquifer Monitoring Well TCE Trend (2011 - 2021)

- Statistically Significant Upward Trend
- Statistically Significant Downward Trend
- No Trend
- Data Not Analyzed
- 17 Spring 2021 TCE Concentration (µg/L)

Estimated TCE Concentration

- 100 µg/L
- 50 µg/L
- 20 µg/L
- 5 µg/L

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FIGURE 3-5
FTLE-33 (Logistics Center)
TCE Plume, Upper Vashon Aquifer (Spring 2021)
Joint Base Lewis-McChord
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 1,000 2,000 Feet

N

Date modified: 04/13/2022	File: JBLM_WA_FTLE33_TCE_UVA_Spring2021_2		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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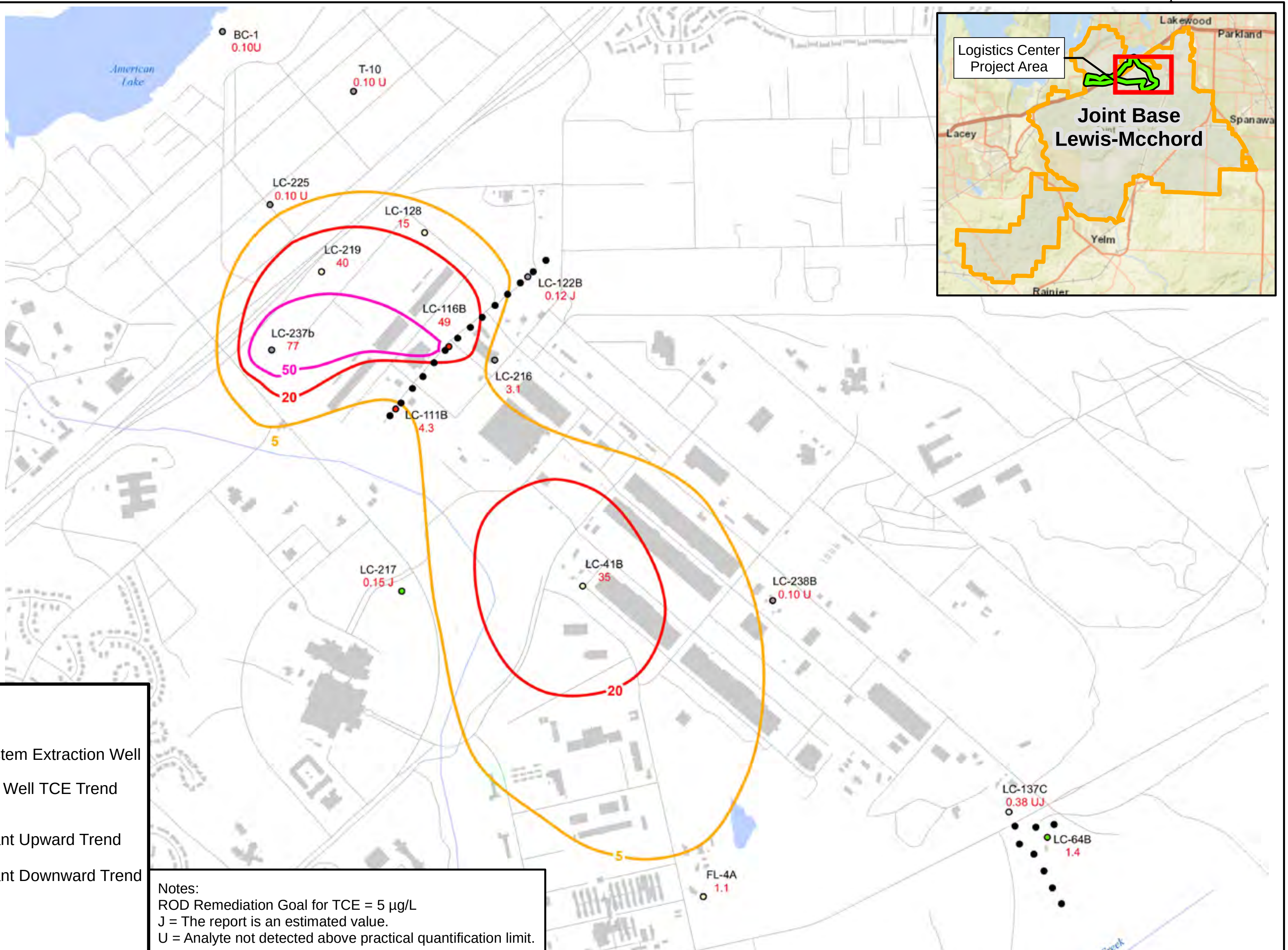

Legend

- ● Pump and Treat System Extraction Well

Sea Level Aquifer Monitoring Well TCE Trend (2011 - 2021)

- Statistically Significant Upward Trend
- Statistically Significant Downward Trend
- No Trend
- Data Not Analyzed
- 42 Spring 2021 TCE Concentration (µg/L)

Estimated TCE Concentration

- 50 µg/L
- 20 µg/L
- 5 µg/L

Notes:
ROD Remediation Goal for TCE = 5 µg/L
J = The report is an estimated value.
U = Analyte not detected above practical quantification limit.

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FIGURE 3-6
FTLE-33 (Logistics Center)
TCE Plume, Lower Vashon Aquifer (Spring 2021)
Joint Base Lewis-McChord
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 800 1,600
Feet

N

Date modified: 04/13/2022	File: JBLM_WA_FTLE33_TCE_LVA_Spring2021_2		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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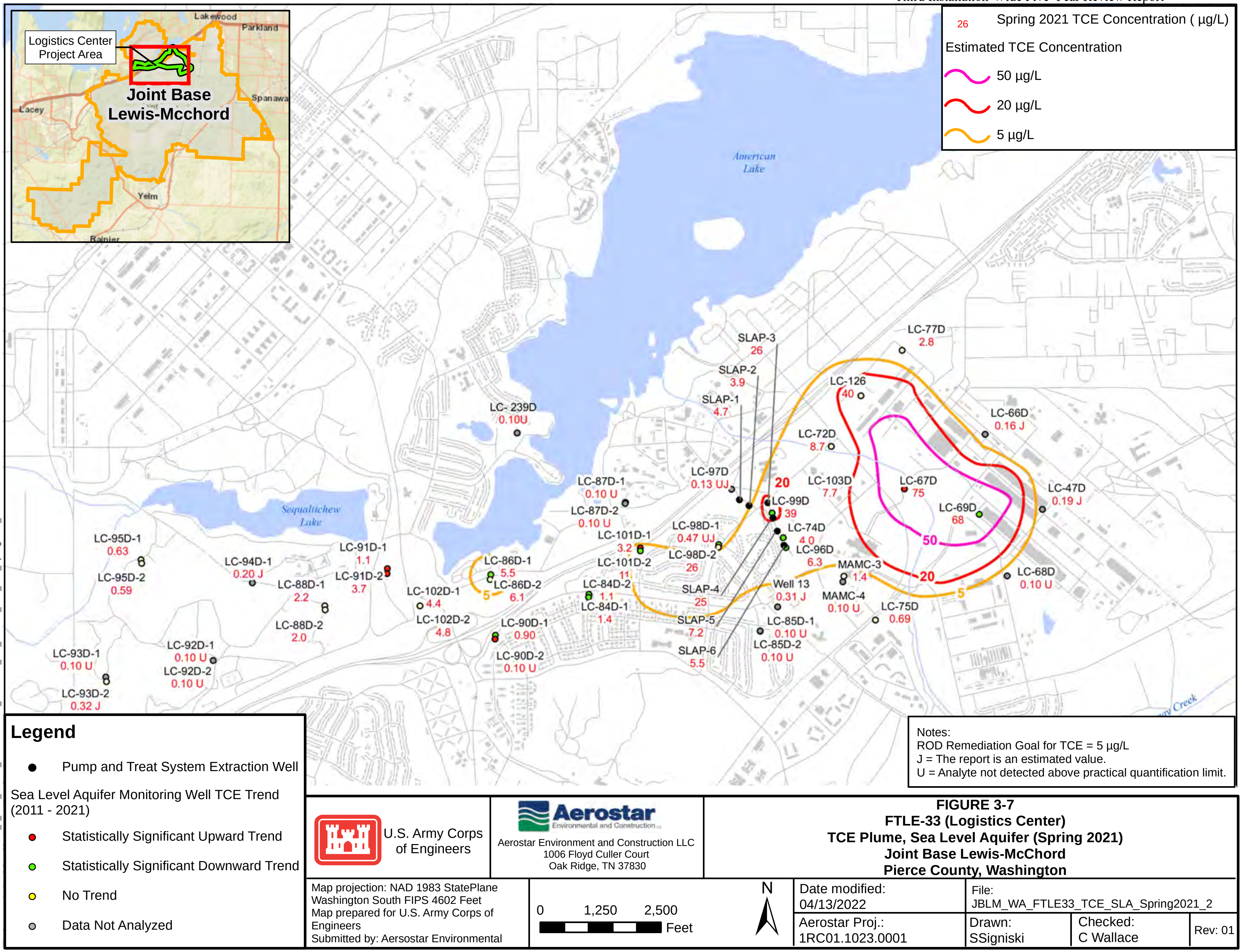

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Legend

Project Area

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FIGURE 3-8
FTLE-46 (Illicit PCB Dump Site) Site Location Map
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 100 200 Feet

N

Date modified: 12/17/2021	File: JBLM_WA_FTLE46_Site_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

Path: G:\1RC01.1023.0001.05_5_Year_Review_KC\MXD\JBLM_WA\JBLM_WA_FTLE46_Site_Map.mxd

Legend

LUC Boundary - To Prevent Residential Land Use, Prevent Unplanned Excavation of Contaminated Soil, Prevent Training Access, Maintain Boundary Fence with Signs, and Maintain Cap

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FIGURE 3-9
FTLE-46 (Illicit PCB Dump Site) LUC Boundary Locations
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 100 200 Feet

N

Date modified: 12/17/2021	File: JBLM_WA_FTLE46_LUC_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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Legend

Project Area

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FIGURE 3-10
FTLE-54 (Landfill 1) Site Location Map
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 250 500 Feet

N

Date modified: 12/17/2021	File: JBLM_WA_FTLE54_Site_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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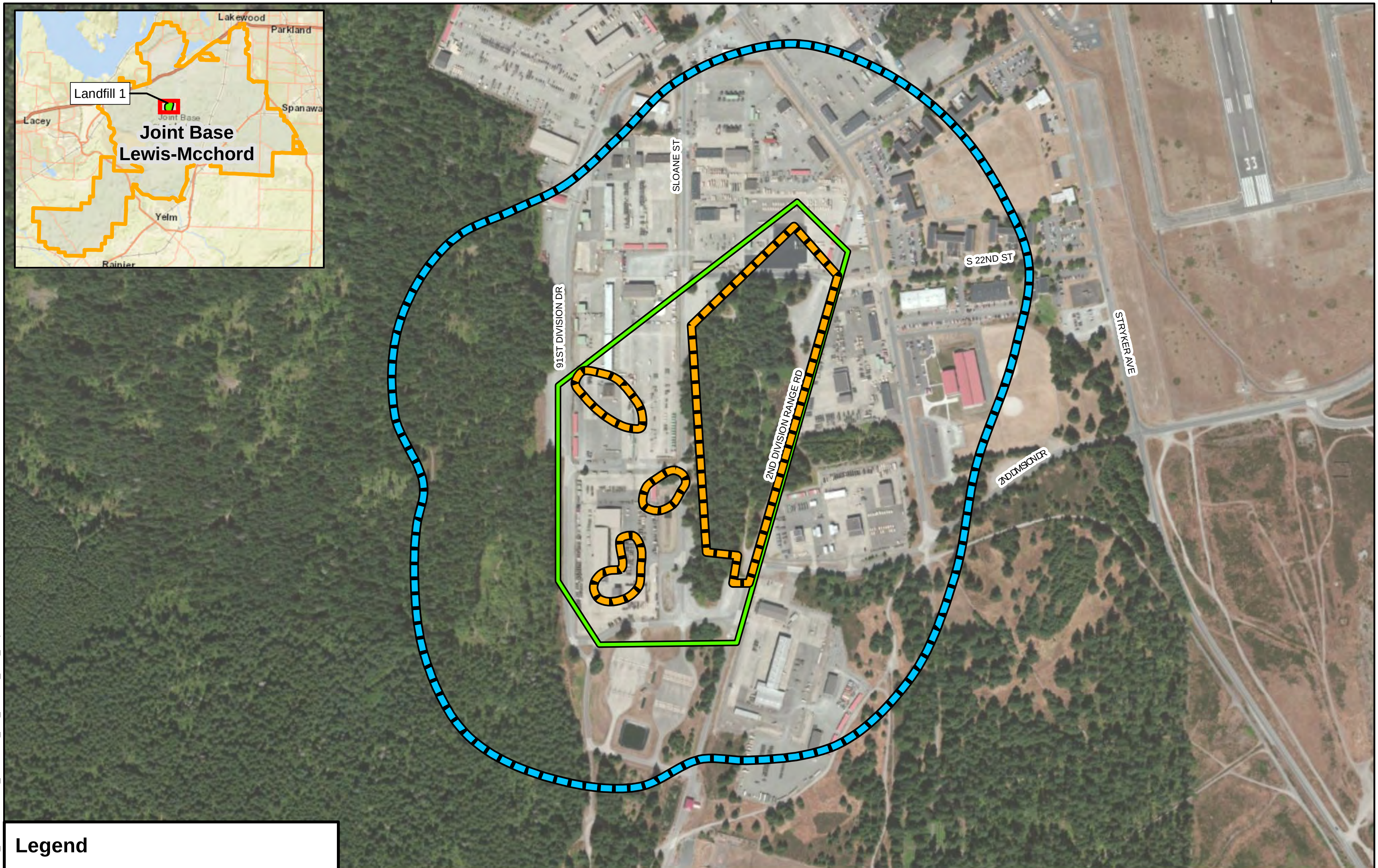

Legend

- Project Area
- LUC Boundary - To Prevent Residential Land Use and Prevent Unplanned Excavation of Contaminated Soil
- LUC Boundary - To Prevent New Drinking Water Wells without EPA Approved Monitoring Plan

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FIGURE 3-11
FTLE-54 (Landfill 1) LUC Boundary Locations
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 350 700 Feet

N

Date modified: 01/10/2022	File: JBLM_WA_FTLE54_LUC_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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Legend

- Groundwater Monitoring Well
- Project Area
- Joint Base Lewis-McChord Boundary

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FIGURE 3-12
FTLE-54 (Landfill 1) TCE Concentrations (2018)
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 250 500 Feet

N

Date modified: 01/10/2022	File: JBLM_WA_FTLE_54_TCE_2018		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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Legend

Project Area

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FIGURE 3-13
FTLE-16 (Battery Acid Pit) Site Location Map
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 50 100 Feet

N

Date modified: 01/10/2022	File: JBLM_WA_FTLE16_Site_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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Legend

LUC Boundary - To Prevent Residential Land Use, Prevent Unplanned Excavation of Contaminated Soil, and Maintain Cap

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FIGURE 3-14
FTLE-16 (Battery Acid Pit) LUC Boundary Locations
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 50 100 Feet

N

Date modified: 01/10/2022	File: JBLM_WA_FTLE16_LUC_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

Legend

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Oak Ridge, TN 37830

FIGURE 3-15
FTLE-31 (DRMO Yard) Site Location Map
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 200 400 Feet

N

Date modified: 01/10/2022	File: JBLM_WA_FTLE31_Site_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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Legend

LUC Boundary - To Prevent Residential Land Use

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FIGURE 3-16
FTLE-31 (DRMO Yard) LUC Boundary Locations
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 200 400 Feet

N

Date modified: 01/10/2022	File: JBLM_WA_FTLE31_LUC_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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Legend

Project Area

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FIGURE 3-17
FTLE-51 (Industrial Wastewater Treatment Plant) Site Location Map
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 100 200 Feet

N

Date modified: 01/10/2022	File: JBLM_WA_FTLE51_Site_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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Legend

LUC Boundary - To Prevent Residential Land Use

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FIGURE 3-18
FTLE-51 (Industrial Wastewater Treatment Plant)
LUC Boundary Locations
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 100 200 Feet

N

Date modified: 01/10/2022	File: JBLM_WA_FTLE51_LUC_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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Legend

Project Area

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FIGURE 3-19
FTLE-28 (Pesticide Rinse Area) Site Location Map
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 50 100 Feet

N

Date modified: 01/10/2022	File: JBLM_WA_FTLE28_Site_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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Legend

LUC Boundary - To Prevent Residential Land Use

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FIGURE 3-20
FTLE-28 (Pesticide Rinse Area) LUC Boundary Locations
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 50 100 Feet

N

Date modified: 01/10/2022	File: JBLM_WA_FTLE28_LUC_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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Legend

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FIGURE 4-1
FTLE-57 (Landfill 4) Site Location Map
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 500 1,000 Feet

N

Date modified: 12/17/2021	File: JBLM_WA_FTLE57_Site_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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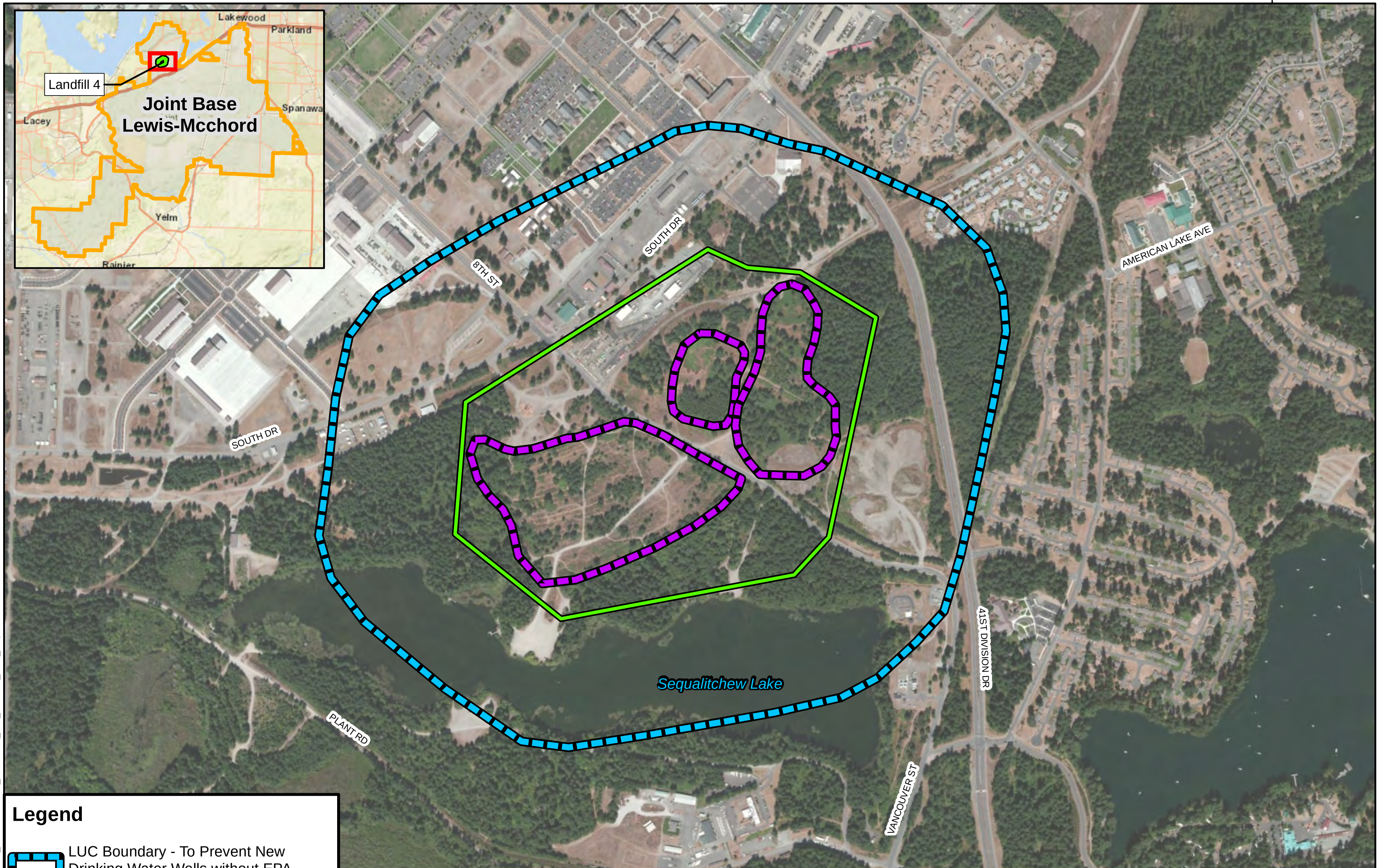

Legend

- LUC Boundary - To Prevent New Drinking Water Wells without EPA Approved Monitoring Plan
- LUC Boundary - To Prevent Residential Land Use, Prevent Unplanned Excavation of Contaminated Soil, and Prevent Digging, Bivouacking, or Off-Road Vehicle Maneuvering During Trainging
- Project Area

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FIGURE 4-2
FTLE-57 (Landfill 4) LUC Boundary Locations
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 500 1,000 Feet

N

Date modified: 12/17/2021	File: JBLM_WA_FTLE57_LUC_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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Legend

Project Area

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FIGURE 4-3
FTLE-32 (Solvent Refined Coal Pilot Plant) Site Location Map
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 150 300 Feet

N

Date modified: 12/20/2021	File: JBLM_WA_FTLE32_Site_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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Legend

LUC Boundary - To Prevent New Drinking Water Wells without EPA Approved Monitoring Plan

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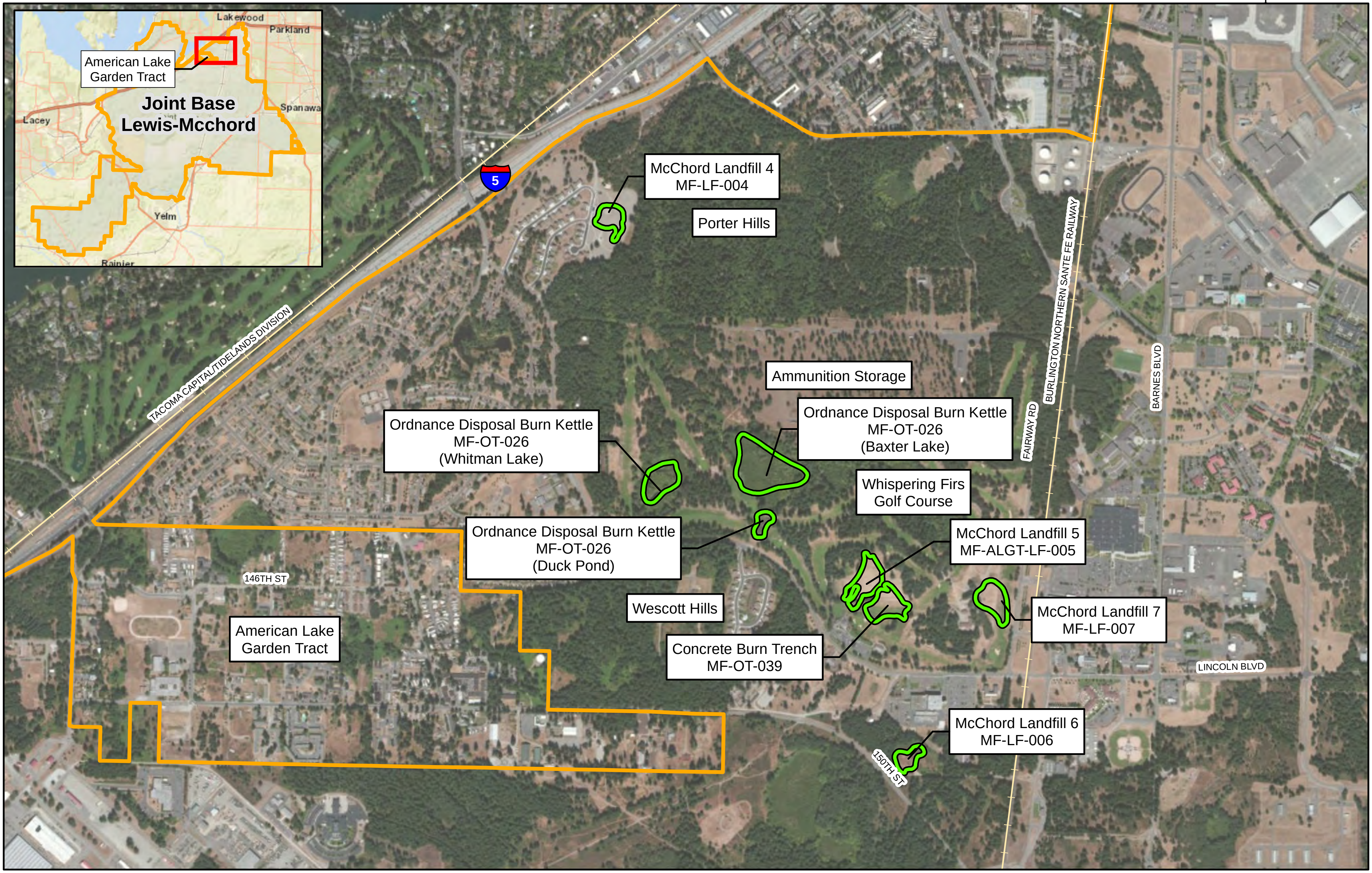
FIGURE 4-4
FTLE-32 (Solvent Refined Coal Pilot Plant) LUC Boundary Locations
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 150 300 Feet

N

Date modified: 12/20/2021	File: JBLM_WA_FTLE32_LUC_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01



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Legend

Project Area
Joint Base Lewis-McChord Boundary
Railroad

U.S. Army Corps of Engineers

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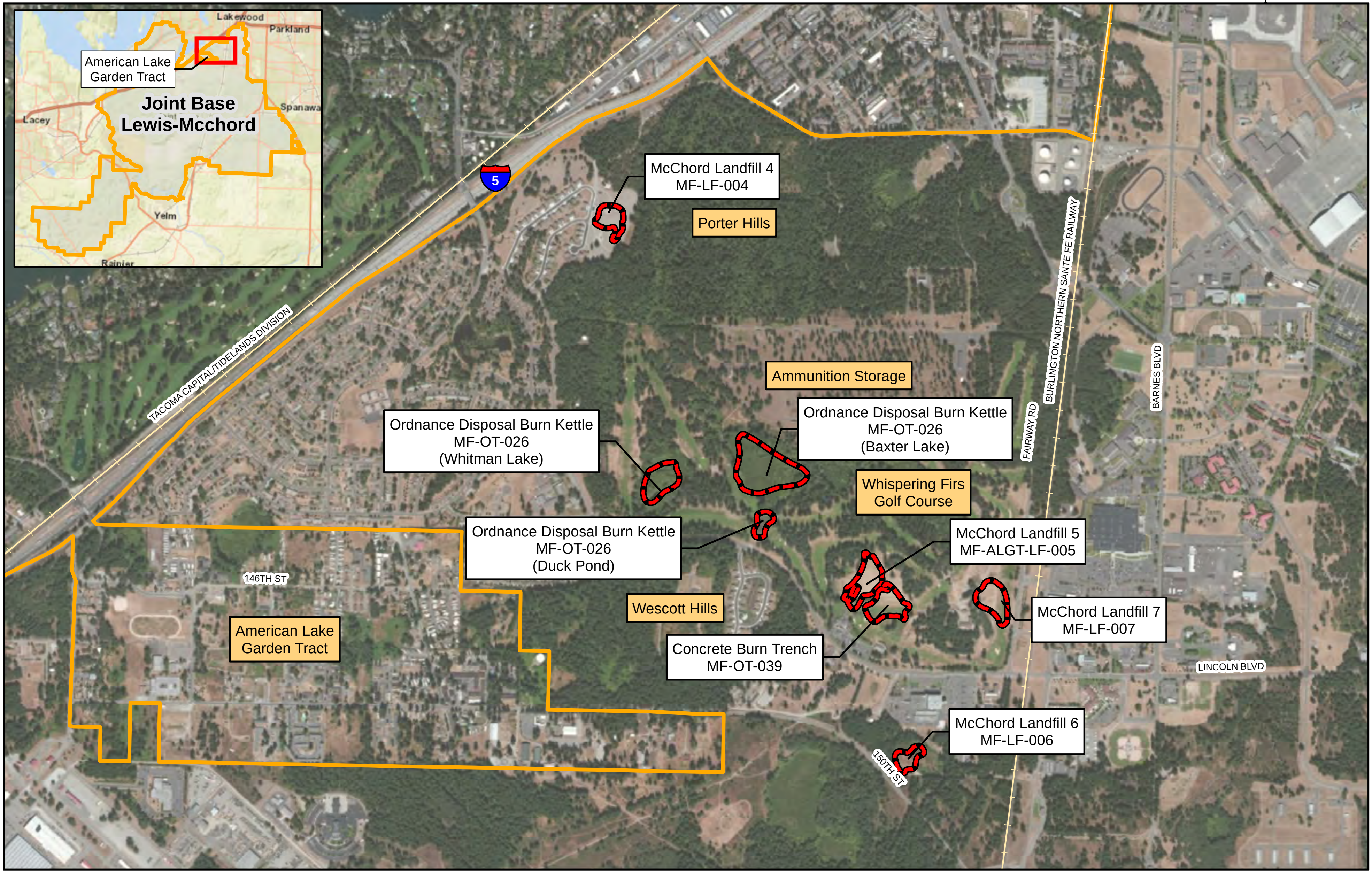
FIGURE 5-1
MF-ALGT-LF-005 (American Lake Garden Tract) Site Location Map
Joint Base Lewis-McChord Location Map
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 750 1,500 Feet

N

Date modified: 12/20/2021	File: JBLM_WA_ALGT_Site_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01



Path: G:\1RC01.1023.0001.05_5_Year_Review_KC\MXD\JBLM_WA\JBLM_WA_ALGT_LUC_Map.mxd

Legend
- LUC Boundary
- Joint Base Lewis-McChord Boundary
- Railroad

U.S. Army Corps of Engineers

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FIGURE 5-2
MF-ALGT-LF-005 (American Lake Garden Tract)
LUC Boundary Locations
Joint Base Lewis-McChord
Pierce County, Washington

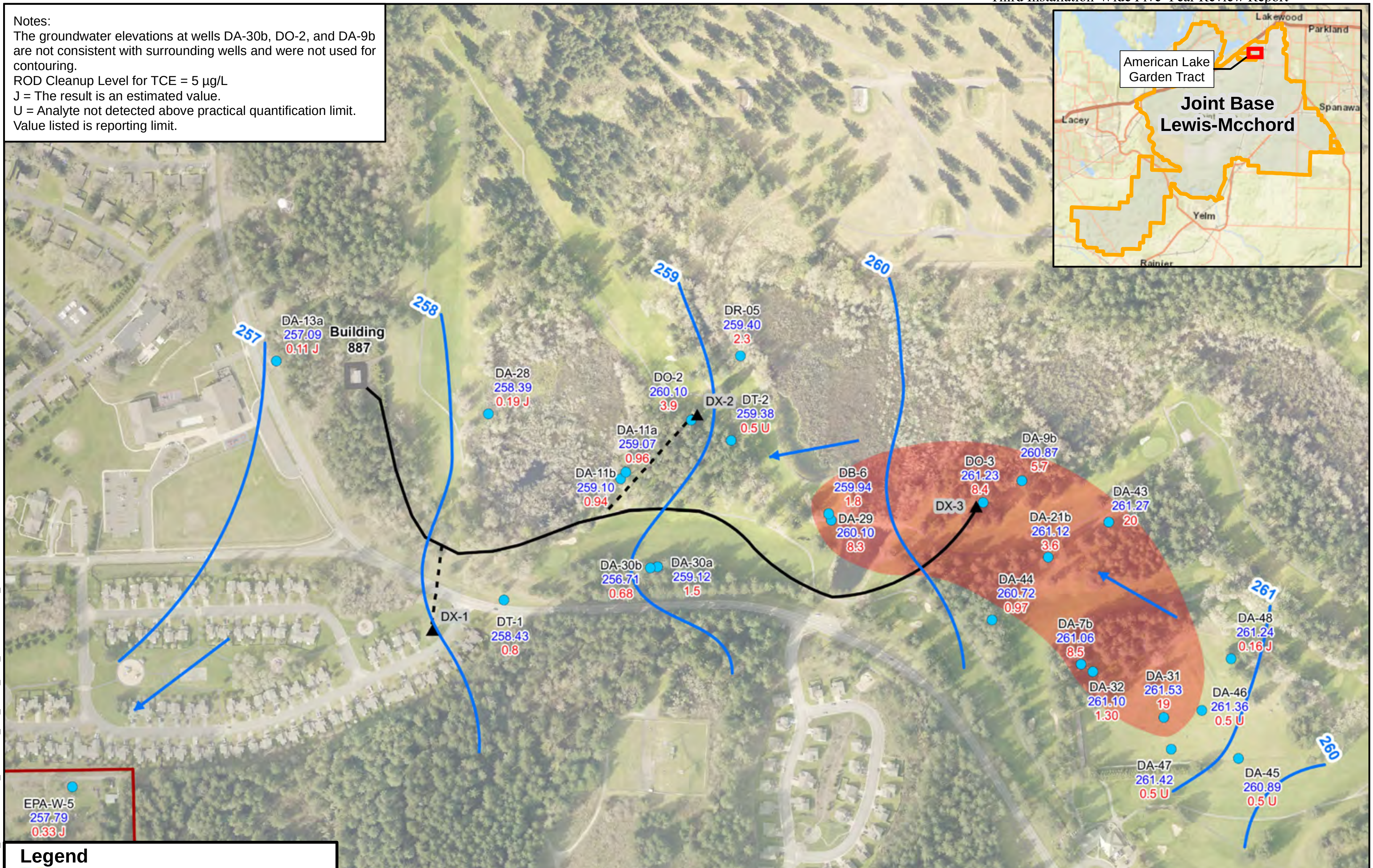
Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 750 1,500 Feet

N

Date modified: 04/13/2022	File: JBLM_WA_ALGT_LUC_Map		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

Notes:
The groundwater elevations at wells DA-30b, DO-2, and DA-9b are not consistent with surrounding wells and were not used for contouring.
ROD Cleanup Level for TCE = 5 µg/L
J = The result is an estimated value.
U = Analyte not detected above practical quantification limit. Value listed is reporting limit.



Legend

- Groundwater Monitoring Well
- Extraction Well
- GPT System 2" Pipe
- GPT System 6" Main Pipe
- Inferred Residual TCE Plume Above 5 µg/L
- Inferred Groundwater Elevation Contours
- JBLM Boundary
- Inferred Seasonal Groundwater Direction Flow
- 261.24 November 2021 Groundwater Elevation (ft AMSL)

U.S. Army Corps of Engineers

Aerostar Environmental and Construction

Aerostar Environment and Construction LLC
1006 Floyd Culler Court
Oak Ridge, TN 37830

FIGURE 5-3
MF-ALGT-LF-005 (American Lake Garden Tract)
TCE Concentrations (November 2021)
Joint Base Lewis-McChord
Pierce County, Washington

Map projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet
Map prepared for U.S. Army Corps of Engineers
Submitted by: Aersostar Environmental

0 250 500 Feet

N

Date modified: 04/13/2022	File: JBLM_WA_ALGT_TCE_November2021_2		
Aerostar Proj.: 1RC01.1023.0001	Drawn: SSigniski	Checked: C Wallace	Rev: 01

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APPENDICES

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Appendix A

Public Notice

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JOINT BASE LEWIS-MCCHORD

THE U.S. ARMY BEGINS FIVE YEAR REVIEW

The U.S. Army, in conjunction with the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology), is conducting the third Installation-Wide, five-year review (FYR) of the final remedies in place after cleanup actions were performed at 10 sites divided between three Operable Units (OUs) at Joint Base Lewis-McChord (JBLM), Washington including:

Operable Unit	Site / Site Group Name
OU-1	**Logistics Center**
	Logistics Center (FTLE-33)
	Illicit Polychlorinated Biphenyls (PCB) Dump Site (FTLE-46)
	Landfill 1 (FTLE-54)
	Battery Acid Pit (FTLE-16)
	Defense Reutilization and Marketing Office (DRMO) Yard (FTLE-31)
	Industrial Wastewater Treatment Plant (FTLE-51)
	Pesticide Rinse Area (FTLE-28)
OU-2	**Landfill 4 and Solvent Refined Coal Pilot Plant**
	Landfill 4 (FTLE-57)
	Solvent Refined Coal Pilot Plant (FTLE-32)
OU-3	**American Lake Garden Tract (MF-ALGT-LF-05)**

The purpose of the FYR is to determine whether the remedy remains protective of human health and the environment. Historical operations at the 10 sites resulted in unacceptable levels of contaminants of concern in soil and groundwater. The remedies, chosen in coordination with the EPA and Ecology, include land use controls, monitored natural attenuation, excavation and treatment of soil, and extraction and treatment of groundwater. The FYR is currently in progress and includes a review of current and historical data and information, and inspection of the site. The FYR Report, scheduled for completion in September 2022, will document the methods used for the review and present the findings and conclusions. In addition, the report will identify issues, if any, found during the review, and make recommendations to address them. When completed, a copy of the final report will be available on-post at the Grandstaff Library and at the Lakewood Pierce County Library, 6300 Wildaire Rd SW, Lakewood, WA. Members of the community are encouraged to ask questions, make comments, and/or report concerns about the site. For more information, contact:

Mr. Mark Mettler, JBLM Installation Restoration Program Manager
mark.a.mettler2.civ@mail.mil
253-966-8004

Mr. Jason Cook, Ecology
asco461@ecy.wa.gov
360-407-6834

Mr. Patrick Hickey, EPA Remedial Project Manager
hickey.patrick@epa.gov
206-553-6295

McCLATCHY

Beaufort Gazette
Belleville News-Democrat
Bellingham Herald
Bradenton Herald
Centre Daily Times
Charlotte Observer
Columbus Ledger-Enquirer
Fresno Bee
The Herald - Rock Hill
Herald Sun - Durham
Idaho Statesman
Island Packet
Kansas City Star
Lexington Herald-Leader
Merced Sun-Star
Miami Herald
el Nuevo Herald - Miami
Modesto Bee
Raleigh News & Observer
The Olympian
Sacramento Bee
Fort Worth Star-Telegram
The State - Columbia
Sun Herald - Biloxi
Sun News - Myrtle Beach
The News Tribune Tacoma
The Telegraph - Macon
San Luis Obispo Tribune
Tri-City Herald
Wichita Eagle

AFFIDAVIT OF PUBLICATION

	Order Number	Identification	Cols	Depth		
	187454	Print Legal Ad - IPL0052826	2	53 L		

Attention: Allison Bailey

Aerostar Environmental and Construction
1006 Floyd Culler Court
Oak Ridge, Tennessee 37830

JOINT BASE LEWIS-MCCHORD

THE U.S. ARMY BEGINS FIVE YEAR REVIEW

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Mr. Mark Mettler, JBLM Installation Restoration Program Manager
mark.a.mettler2.civ@mail.mil
253-966-8004
Mr. Jason Cook, Ecology
asco461@ecy.wa.gov
360-407-6834
Mr. Patrick Hickey, EPA Remedial Project Manager
hickey.patrick@epa.gov
206-553-6295
IPL0052826
Dec 14 2021

Calandra Daniels, being duly sworn, deposes and says: That he/she is the Principal Clerk of the publication; The News Tribune, printed and published in Tacoma, Pierce County, State of Washington, and having a general circulation therein, and which said newspaper(s) have been continuously and uninterruptedly published in said County during a period of six months prior to the first publication of the notice, a copy of which is attached hereto: that said notice was published in The News Tribune, as amended, for:

No. of Insertions: 1

Beginning Issue of: 12/14/2021

Ending Issue of: 12/14/2021

Principal Clerk

Sworn to and subscribed before me this 14th day of December in the year of 2021 before me, a Notary Public, personally appeared before me Calandra Daniels known or identified to me to be the person whose name subscribed to the within instrument, and being by first duly sworn, declared that the statements therein are true, and acknowledged to me that he/she executed the same.

Amanda Grisham

Notary Public in and for the state of Texas, residing in Dallas County

AMANDA DAWN GRISHAM
My Notary ID # 132031326
Expires May 30, 2023

**Extra charge for lost or duplicate affidavits.
Legal document please do not destroy!**

Appendix B

List of Documents Reviewed

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DOCUMENTS REVIEWED

Applied Geotechnology, Inc. (Applied Geotechnology). 1993a. *Final Feasibility Study Report, Landfill 4 and Solvent Refined Coal Pilot Plant, Fort Lewis, Washington*, for U.S. Army Corps of Engineers, Seattle District, Washington. May.

Department of Defense (DoD), 2022. *Memorandum: Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program*. July 6.

———. 1993b. *Final Remedial Investigation Report: Landfill 4 and SRCPP RI/FS,* for U.S. Army Corps of Engineers, Seattle District, Washington. January.

EA Engineering, Science, and Technology, Inc. PBC (EA). 2018a. *2017 Annual Groundwater Monitoring Report for FTLE-57: Landfill 4*. Prepared for Joint Base Lewis-McChord Public Works Environmental Division. January.

———. 2018b. *Site-Specific Quality Assurance Project Plan for Logistics Center Remedial Action Operations and Performance Monitoring Activities*. October.

———. 2019a. *Final 2018 Annual Logistics Center Remedial Action Monitoring Report*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. August.

———. 2019b. *Site Specific Quality Assurance Project Plan for Groundwater Monitoring at Landfill 4*. Prepared for Joint Base Lewis-McChord Environmental Division. Draft Final. May.

———. 2019c. *2018 Annual Groundwater Monitoring Report for FTLE-57: Landfill 4*. Prepared for Joint Base Lewis-McChord Public Works Environmental Division. March.

———. 2019d. *Final Logistics Center Groundwater Pump and Treat System Operations and Maintenance Manual.* Prepared for U.S. Army Corps of Engineers. July

———. 2019e. *Final 2018 Annual Groundwater Monitoring Report, FTLE-54: Landfill 1, Joint Base Lewis-McChord, Pierce County, Washington.* March.

———. 2019f. *Final Land Use Controls Checklists - 2018*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. May.

———. 2019g. *Final 2018 Annual Groundwater Monitoring Report, Area D/American Lake Garden Tract (ALGT), Joint Base Lewis-McChord, Pierce County, Washington.* October.

———. 2020a. *Final 2018 Operation and Maintenance Annual Report, Logistics Center Pump and Treat Systems*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. April.

———. 2020b. *Final 2019 Annual Logistics Center Remedial Action Monitoring Report*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. September.

———. 2020c. *Field Sampling Plan, Landfill 2 Source Area Investigation*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. December.

———. 2020d. *Final Land Use Controls Checklists - 2019*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. July.

———. 2020e. *Final 2019 Annual Groundwater Monitoring Report, FTLE-54: Landfill 1, Joint Base Lewis-McChord, Pierce County, Washington.* January.

———. 2020f. *Final 2019 Annual Groundwater Monitoring Report, Area D/American Lake Garden Tract (ALGT), Joint Base Lewis-McChord, Pierce County, Washington.* September.

———. 2020g. *Final 2019 Annual Groundwater Monitoring Report, FTLE-57: Landfill 4, Joint Base Lewis-McChord, Pierce County, Washington.* January.

———. 2020h. *Draft Final 2020 Annual Groundwater Monitoring Report, FTLE-57: Landfill 4*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. November.

———. 2021a. *Draft Final 2019 Operation and Maintenance Annual Report, Logistics Center Pump and Treat Systems*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. January.

———. 2021b. *Final Work Plan, Landfill 2 Aquifer Testing and Capture Zone Analysis*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. September.

———. 2021c. *Draft 2020 Operation and Maintenance Annual Report, Logistics Center Pump and Treat Systems*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. November.

———. 2021e. *Draft Final 2020 Annual Groundwater Monitoring Report, Area D/American Lake Garden Tract (ALGT), Joint Base Lewis-McChord, Pierce County, Washington.* October.

———. 2021f. *Draft Final 2020 Annual Logistics Center Remedial Action Monitoring Report, Joint Base Lewis-McChord, Pierce County, Washington.* September.

———. 2021g. *Draft Final 2021 Comprehensive Land Use Controls Plan, Joint Base Lewis-McChord, Pierce County, Washington.* December.

———. 2022a. *Draft Final 2020 Operation and Maintenance Annual Report, Logistics Center Pump and Treat Systems*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. January.

———. 2022b. *Draft 2021 Annual Groundwater Monitoring Report, FTLE-57: Landfill 4*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. January.

———. 2022c. *Final Land Use Controls Checklists - 2020*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. January.

———. 2022d. *Draft 2021 Annual Groundwater Monitoring Report, Area D/American Lake Garden Tract (ALGT), Joint Base Lewis-McChord, Pierce County, Washington.* January.

———. 2022e. *Draft 2021 Annual Logistics Center Remedial Action Monitoring Report*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. January.

———. 2022f. *Draft 2021 Operation and Maintenance Annual Report, Logistics Center Pump and Treat Systems*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. April.

———. 2022g. *Draft Land Use Controls Checklists - 2021*, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington. January.

Ebasco Environmental (Ebasco). 1990. *Final Endangerment Assessment Report*. Prepared for the Department of the Army, Seattle District, Corps of Engineers. February.

Ebasco in association with Shannon & Wilson, Inc. 1991a. *Final Remedial Investigation Report, McChord Air Force Base Area D/American Lake Garden Tract*. Prepared for Department of the Army, Seattle District, Corps of Engineers. March.

———. 1991b. *Final Feasibility Study Report, McChord Air Force Base Area D/American Lake Garden Tract*. Prepared for Department of the Army, Seattle District, Corps of Engineers. March.

Department of Ecology, State of Washington (Ecology), 2022. *Final PFAS Chemical Action Plan and Washington State Board of Health (WAC 246-290-315) State Action Levels and State Maximum Contaminant Levels (MCLs)*. January.

Engineering/Remediation Resources Group, Inc. (ERRG). 2021. *Site Investigation Report for Landfill 4 – 53465.1036, Joint Base Lewis-McChord, Pierce County, Washington.* June.

Envirosphere Company in association with Shannon & Wilson, Inc. (Envirosphere). 1988. *Fort Lewis Logistics Center Remedial Investigation Final Report*. November.

Fort Lewis. 2006a. *Decision Document for the Selected Remedy, Illicit PCB Dump Site, Fort Lewis, Washington.* April.

———. 2006b. *Decision Document for the Selected Remedy, Landfill 1, Fort Lewis, Washington.* April.

———. 2006c. *Decision Document for the Selected Remedy, Battery Acid Pit, Fort Lewis, Washington.* April.

———. 2006d. *Decision Document for the Selected Remedy, DRMO Yard, Fort Lewis, Washington.* April.

———. 2006e. *Decision Document, Direct Contact with Landfill 2 Soil, Fort Lewis, Washington.* May.

———. 2007. *Draft Decision Document for Selected Remedy, Industrial Wastewater Treatment Plant Site, Fort Lewis, Washington.* December.

Gerry Struthers Associates (GSA). 2001. *Chemical Data Report #4, Landfill 4 Air Sparging/Soil Vapor Extraction Remediation, Fort Lewis, Washington,* for U.S. Army Corps of Engineers, Seattle District. March.

Joint Base Lewis-McChord (JBLM). 2019. *Joint Base Lewis-McChord Army Cleanup Program, Installation Action Plan – Final*. March.

———. 2020. *Final Preliminary Assessment/Site Inspection Report. Joint Base Lewis-McChord, JBLM, Washington*. Prepared for JBLM Public Works, Environmental Department, IRP Program and US Army Corps of Engineers (USACE) Seattle District by AECOM. August.

Pacific Northwest National Laboratory (PNNL). 2000. *Decision Document for the Storm Water Outfalls/Industrial Wastewater Treatment Plant, Pesticide Rinse Area, Old Fire Fighting Training Pit, Illicit PCB Dump Site, and the Battery Acid Pit, Fort Lewis, Washington.* December

Prych, E.A. 1999. *A Tracer Test to Estimate Hydraulic Conductivities and Dispersivities of Sediments in the Shallow Aquifer at the East Gate Disposal Yard, Fort Lewis, Washington*, for U.S. Geological Survey, Water Resources Investigations Report 99-4244.

Sealaska Environmental Services, LLC (Sealaska). 2015. *Final Technical Memorandum: JBLM Logistics Center, Recommendations for Initial Phase of Groundwater Monitoring Optimization - Revised*. October.

———. 2016a. *Logistics Center Remedial Action Monitoring Program Compliance Monitoring Plan, Joint Base Lewis-McChord, Washington*. Prepared for Joint Base Lewis-McChord Public Works Environmental Division. July.

———. 2016b. *Final Technical Memorandum: JBLM Landfill 4, Recommendations for Groundwater Monitoring Program Optimization, Environmental Remediation Program Services, JBLM And Yakima Training Center Washington.* May.

———. 2017a. *Environmental Remediation Program Services, JBLM And Yakima Training Center Washington – February 2017 Monthly Status Report.* March.

———. 2017b. *Final Logistics Center Pump and Treat Systems Operation and Maintenance Manual, Joint Base Lewis-McChord, Pierce County, Washington.* May.

———. 2017c. *Final 2017 Groundwater Monitoring Plan, Landfill 1, Joint Base Lewis-McChord, Pierce County, Washington.* May.

———. 2017d. *Final 2017 Annual Groundwater Monitoring Report, FTLE-54: Landfill 1, Joint Base Lewis-McChord, Pierce County, Washington.* November.

———. 2017e. *Groundwater Monitoring Plan, Landfill 4, Joint Base Lewis-McChord, Washington.* Prepared for Joint Base Lewis-McChord Public Works Environmental Division. May.———. 2018a. *Final 2017 Comprehensive Land Use Controls Plan, Joint Base Lewis-McChord, Pierce County, Washington.* January.

———. 2018b. *Final Logistics Center Site Management Improvement Study Report, Joint Base Lewis-McChord, Pierce County, Washington.* February.

———. 2018c. *Draft Operation and Maintenance Annual Report, January 1 through December 31, 2017, Logistics Center Pump and Treat Systems, Joint Base Lewis-McChord, Pierce County, Washington.* January.

———. 2018d. *2017 Annual Groundwater Monitoring Report, FTLE-57: Landfill 4, Joint Base Lewis-McChord, Pierce County, Washington.* Prepared for Joint Base Lewis-McChord Public Works Environmental Division. January.

———. 2018e. *Final 2017 Logistics Center Remedial Action Monitoring Program Compliance Monitoring Plan, Joint Base Lewis-McChord, Washington*. Prepared for Joint Base Lewis-McChord Public Works Environmental Division. January.

Shannon and Wilson, Inc. (Shannon and Wilson), 1990. *Final Feasibility Study Report, Fort Lewis Logistics Center Remedial Investigation/Feasibility Study*, for the Seattle District, Corps of Engineers, Seattle, Washington. May.

Tetra Tech EC, Inc. (TetraTech). 2016a. *Technical Memorandum for Temporary Shutdown of The Area D/ALGT Groundwater Pump And Treatment System. Joint Base Lewis-McChord, McChord Field,* *Washington*. Prepared for U.S. Army Corps of Engineers, Seattle District and Public Works – Environmental Division, Joint Base Lewis McChord, Washington. May.

———. 2016b. *Groundwater Monitoring Plan Addendum. Area D/ALGT Groundwater Pump and Treat System. Joint Base Lewis-McChord, McChord Field, Washington.* Prepared for U.S. Army Corps of Engineers, Seattle District and Public Works – Environmental Division, Joint Base Lewis McChord, Washington. August.

———. 2017a. *Technical Memorandum for Site Closure, Sites MF-LF-004, MF-LF-006, MF-LF-007, MF-OT-026, MF-RW-035, and MF-OT-039, Area D/American Lake Garden Tract, JBLM McChord Field, Washington*. Prepared for U.S. Army – Joint Base Lewis McChord. September.

———. 2017b. *Site Management Improvement Study Report, Area D/American Lake Garden Tract Groundwater Pump And Treatment System. Joint Base Lewis-McChord, McChord Field, Washington*. Prepared for U.S. Army Corps of Engineers, Seattle District and Public Works – Environmental Division, Joint Base Lewis McChord, Washington. December.

———. 2020. *American Lake Garden Tract (ALGT) Focused Feasibility Study. Joint Base Lewis-McChord, Washington*. Prepared for Joint Base Lewis-McChord Public Works – Environmental Division, Joint Base Lewis McChord, Washington. November.

United States Army Corps of Engineers (USACE). Seattle District, 1986. *Interim Report for Completed Actions and Plan of Study for: Groundwater Contamination Investigations at Fort Lewis Logistics Center, Fort Lewis, Washington*. February.

———. Seattle District. 1994. *Final Remedial Action Work Plan, Area D/American Lake Garden Tract Groundwater Treatment, McChord Air Force Base, Washington*. September.

———. Seattle District. 1999. *Remedial Action Report for Solvent Refined Coal Pilot Plant Operable Unit, Fort Lewis, Washington*. July.

———. Seattle District. 2017. *Final Second Installation-Wide Five-Year Review Report, Joint Base Lewis-McChord, Pierce County, Washington*. November.

United States Department of Agriculture (USDA), 2021. The Sentinel Landscape Partnership, Joint Base Lewis-McChord, Retrieved from https://sentinellandscapes.org/landscapes/joint-base-lewis-mcchord/

URS Corporation (URS). 2002. *Final Risk Assessment Addendum, East Gate Disposal Yard and Logistics Center, Fort Lewis, Washington.* For U.S. Corps of Engineers, Seattle District. October.

U.S. Environmental Protection Agency (USEPA). 1989. *Human Health Risk Assessment, Fort Lewis Logistics Center*. May

———. 1989. *Federal Facilities Agreement, McChord Air Force Base*.

______. 1990. *Interagency Agreement for Superfund Sites at Fort Lewis Logistics Center*. January.

———. 2021. *Human Health Toxicity Values for PFBS and Related Compound PFBS.* April.

———. 2022. *Regional Screening Levels* . May.

______. 2022. *Technical Fact Sheet: Drinking Water Health Advisories for Four PFAS (PFOA, PFOS, GenX chemicals, and PFBS)* June.

USEPA and Fort Lewis. 1990. *Record of Decision for the Department of the Army, Logistics Center, Fort Lewis, Washington*. September.

———. 1993. *Record of Decision for the Department of the Army, Landfill 4 and the Solvent Refined Coal Pilot Plant, Fort Lewis Military Reservation, Pierce County, Washington*. EPA/ROD/R10-93/072. September.

———. 1998. *Explanation of Significant Difference for the Department of the Army, Logistics Center, Fort Lewis, Washington*. September.

———. 2007. *Explanation of Significant Difference (ESD) for the Logistics Center National Priority List Site, Fort Lewis, Washington*. February.

———. 2018. *Optimization Review, Joint Base Lewis-McChord, Washington*. December.

USEPA, et.al. 1991a. *Record of Decision, for the United States Air Force Area D/American Lake Garden Tract, McChord Air Force Base, Washington*. September.

———. 1991b, *U.S. Air Force Installation Restoration Program Decision Document, McChord AFB, WA, No Further Action Planned Site Close-Out.* September 25.

______. 2015. *Preliminary Close Out Report, Joint Base Lewis McChord, Logistics Center National Priority List Site, EPA ID: WA7210090067, Joint Base Lewis McChord, Pierce County, Washington*. September.

______. 2021. *Draft Final Record of Decision (ROD) Amendment For Area D/American Lake Garden Tract (ALGT), Joint Base Lewis McChord, Pierce County, Washington*. December.

Washington State Board of Health, 2021. Washington Administrative Code 246-290-010(170), as amended, Retrieved from https://doh.wa.gov/sites/default/files/2022-02/PFAS%20Rule%20Adoption%20Notice%20and%20Adopted%20Rule%20Language.pdf. November.

Appendix C

FYR Site Inspection Information

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Site Inspection Meeting Minutes
and Trip Report

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The Five-Year Review (FYR) site inspection for Joint Base Lewis-McChord (JBLM), Washington was conducted on 9 November 2021 to visually inspect and document the conditions of 10 sites for inclusion into the FYR Report. The site inspection included a teleconference with stakeholders including JBLM, United States Army Corps of Engineers (USACE), United States Environmental Protection Agency (USEPA), Washington Department of Ecology (Ecology) and Aerostar Environmental and Construction (Aerostar). Following the teleconference, representatives from JBLM, USACE, and Aerostar performed the site inspection. The meeting minutes for the teleconference are included in this appendix along with a site inspection Trip Report, the *FYR Site Inspection Checklist,* and photographs taken during the site visit. Interviews for the FYR were completed through Interview Record Questionnaires submitted via email, which are included as Appendix C.

JOINT BASE LEWIS-MCCHORD
FYR SITE INSPECTION
MEETING MINUTES

Date of Call: 9 November 2021
Time of Call: **0**830 CST
Call-In Number: 1-805-309-2350, 37354
Meeting Leader: Allison Bailey, Aerostar
Attendees:

Name	Present	Organization	Phone No.
Allison Bailey	✓	Aerostar	865-483-9280
Andrea Heinzenberger	✓	Aerostar	865-813-2755
Margaret Stemper	✓	Aerostar	865-469-1110
Corey Wallace	–	Aerostar	865-599-4216
Gary Richards	✓	USACE Kansas City	816-389-3760
Mark Mettler	✓	JBLM	253-966-8004
Jerome Lambiotte	✓	JBLM (AGEISS)	253-966-1802
Roger Walton	–	USAEC	210-466-1063
Patrick Hickey	✓	USEPA	206-553-6295
Ted Repasky	✓	USEPA	
Jason Cook	✓	Washington Department of Ecology	360-407-6834

Introductions

The meeting began by introducing attendees along with their roles on the JBLM FYR. Aerostar has been contracted by the USACE Kansas City District to perform the FYR for JBLM. Ms. Allison Bailey is the project manager (PM) for Aerostar. Ms. Andrea Heinzenberger and Ms. Margaret Stemper of Aerostar are providing technical support on the JBLM FYR. Mr. Mark Mettler of JBLM is the Installation Restoration Program (IRP) manager. Mr. Jerome Lambiotte of AGEISS is providing support to JBLM and is the technical lead for the IRP. Mr. Gary Richards is the PM for the USACE Kansas City District. Mr. Jason Cook is the point of contact (POC) for the Washington Department of Ecology (Ecology). Mr. Patrick Hickey is the POC from USEPA, and Mr. Ted Repasky is a hydrogeologist from USEPA providing technical support to the project. Ms. Bailey stated that the purpose of today's meeting is to discuss the site inspection/visit activities for the JBLM FYR. Ms. Bailey began the discussion by providing an overview of the meeting agenda followed by a discussion of the schedule and the sites included in the FYR.

Agenda Overview

- Project Team
- Schedule
- FYR – Current Status/Issues
- FYR Interviews/Questionnaires
- Public Notice
- Site Visit Activities

Schedule

Ms. Bailey noted that preparing the FYR is a relatively long process due to the various review cycles. Aerostar is currently preparing the QC copy (internal draft). The site inspection is a component of the FYR and at the completion of the site visit, the information gathered will be added to the FYR report. The QC copy will be completed and submitted in January 2022. The draft will be issued to the installation, and the Army environmental legal team in March. The Draft FYR will be submitted to the Regulators at the end of May 2022, with a 45-day review cycle. The final document is scheduled for completion on 28 September 2022.

FYR Sites – Current Status/Issues

Ms. Bailey asked if there were any specific issues that anyone wanted to address before she began the discussion. No specific issues were mentioned, and Ms. Bailey proceeded with an overview of the status and issues for each site.

<u>OU 001 – Logistics Center</u>

Logistics Center (FTLE-33) – NPL Site

The remedy consists of three groundwater pump and treat systems, Institutional Controls (ICs), and long-term groundwater monitoring. The systems include the LF-2 System, I-5 System, and the Sea Level Aquifer (SLA) System. Mr. Lambiotte noted there are several activities ongoing to collect additional data including a capture zone analysis and source zone investigation, as there are issues/concerns regarding plume capture. Ms. Bailey noted that Aerostar only has data reports and annual inspection records through 2019. Mr. Lambiotte noted that the contractor is behind on completing the associated reports and will work to get the reports to Aerostar as soon as they become available. Ms. Bailey asked if there were any issues noted with the systems. Mr. Lambiotte indicated that the systems are under a service contract with EA Engineering Science and Technology (EA). He was not aware of any specific issues with the systems and commented that routine maintenance and repair is performed. However, he noted that systems upgrades/enhancements were needed and some improvements to the systems are planned for the upcoming years. He stated that he was not aware of any time that the system has been shut off in the last few years for significant periods, although there are frequent power surges in the area which can knock out pumps, and seasonal variations in groundwater levels can have an effect. Capture Zone Analyses and other investigative reasons sometimes require the systems to be temporarily be turned off. Ms. Bailey noted that the 2017 FYR noted there were issues regarding a fence. Mr. Lambiotte stated that he believes that the fence has been repaired, although the crew is still fencing other sections. The repairs to the fencing will be documented in the 2022 land-use controls (LUC) inspection.

Illicit Polychlorinated Biphenyls (PCB) Dump Site (FTLE-46)
This site has LUCs and no samplings. It has a clay cap, which is subject to annual inspections.

Landfill 1 (FTLE-54)
The remedy for this site includes ICs and long-term groundwater monitoring. Sampling for this site was discontinued in 2018 because all volatile organic compound (VOC) concentrations were below cleanup levels (maximum contaminant level [MCL]) for the previous three years. Concurrence was received from the USEPA to discontinue the annual monitoring. LUCs are still in place.

Battery Acid Pit (FTLE-16), Defense Reutilization and Marketing Office (DRMO) Yard (FTLE-31), Industrial Wastewater Treatment Plant (FTLE-51), and Pesticide Rinse Area (FTLE-28)
The remedy for each of these sites include LUCs only. No associated data is collected.

<u>OU 002 – Landfill 4 and Solvent Refined Coal Pilot Plant</u>

These two sites were once National Priority List (NPL) sites included with Operable Unit 001 (OU 001) but were delisted and separated from OU 001.

Landfill 4 (FTLE-57)
The remedy included soil treatment by vapor extraction (SVE) and groundwater treatment by air sparging, ICs, and long-term groundwater monitoring. Mr. Lambiotte explained that the groundwater monitoring conducted here has concentrations barely over the MCLs, and that the monitoring is nearing its end. The treatment system was discontinued in 1999 with the system decommissioned in 2020. Mr. Lambiotte stated that he would provide the documentation concerning the decommissioning to Aerostar.

Solvent Refined Coal Pilot Plant (FTLE-32)
The remedy consists of soil excavation, LUCs and long-term groundwater monitoring. Soil excavation was performed. Groundwater monitoring was performed for two year and discontinued in 1999 as concentrations were below the cleanup levels. LUCs remain in place. The

decommissioning of wells has been completed at the site, but well abandonments across JBLM will be performed next year.

<u>OU 003 – American Lake Garden Tract (MF-ALGT-LF-05) – NPL Site</u>

The remedy consists of groundwater pump and treat, ICs, and long-term groundwater monitoring. The system was shut down in 2016 and has remained offline since then. Long-term groundwater monitoring is still being performed but there are no plans to restart the system as the data show that trichloroethene (TCE) rebound is not occurring and mass reduction is apparent. Recommendations have been made to continue with monitored natural attenuation (MNA), monitoring, and ICs. Concurrence has been received from the regulators for this change to the remedy. Plans are in the works to have the pump and treat system decommissioned.

General

Ms. Bailey asked if JBLM has a particular method of communication with the public. Mr. Lambiotte stated that this is usually done via public meetings, and one was planned for March 2020, but it was cancelled. Presently, there is nothing officially planned.

Mr. Hickey asked whether the upcoming per-and polyfluoroalkyl substances (PFAS) investigation is going to be addressed in this FYR. Ms. Bailey stated that if PFAS is not associated with the sites, it wouldn't be specifically addressed. Mr. Lambiotte stated that none of the sites being discussed under the FYR are potential source areas for PFAS. Ms. Bailey clarified that the addendum to the 2017 FYR addressed concerns with potential PFAS issues at OU1 and OU3 and that based on 2018 investigation efforts, the "*Protectiveness Deferred*" statements from the 2017 FYR were revised to "*Protective*". She noted that a discussion of the 2018 PFAS investigation and the FYR Addendum will be included in the 2022 FYR.

FYR Interviews/Questionnaires

Ms. Bailey noted that the FYR questionnaires had been sent out to Mr. Hickey, Mr. Cook, Mr. Mettler, and Mr. Lambiotte on 27 October with a requested completion/return date of 30 November. Mr. Mettler stated that Ms. Meseret Ghebresllassie (former JBLM IRP Manager) and Mr. Lambiotte would be assisting him with the completion of the questionnaire. Ms. Bailey asked if there were other individuals that should be sent the questionnaire. No other names were provided.

Public Notice

Ms. Bailey stated that a draft public notice was submitted for review to the Army. Mr. Mettler indicated that the notice is currently being review. Ms. Bailey asked who the POC should be for the USEPA, and Mr. Hickey confirmed that it is him. Mr. Cook noted that the only site he's currently involved with is OU 003.

Site Visit Activities

Ms. Bailey stated that following this meeting, the team will perform an inspection/evaluation of each site relative to remedy and condition, as well as a review of any issues noted from Annual LTM inspection/2017 FYR. A FYR Site Inspection Checklist will also be completed for each site as well as a photolog.

Final Questions or Comments

Ms. Bailey asked the team if there were any further questions or comments. No further questions or comments were made, and the meeting was adjourned at 0910.

JOINT BASE LEWIS-MCCHORD
FYR SITE INSPECTION
TRIP REPORT

Date of Visit: 9 November 2021
Meeting Time: 0830 (PT)
Location: JBLM, Bldg 2012

Team:
Gary Richards – USACE Kansas City District PM
Jerome Lambiotte – AGEISS, JBLM Department of Public Works, IRP Representative
Allison Bailey – Aerostar, PM
Andrea Heinzenberger – Aerostar, Technical Support

Summary:
The team assembled at Building 2012 at 0800 and after introductions, a teleconference was held from 0830 to 0910 with the USEPA and Ecology. The Team departed at 0930 to perform the site inspections in the following order:

1. **OU 003, American Lake Garden Tract (MF-ALGT-LF-05)**
2. **OU 001, Logistics Center (FTLE -33)**
3. **OU 001, Defense Reutilization and Marketing Office (DRMO) Yard (FTLE-31)**
4. **OU 001, Battery Acid Pit (FTLE-16)**
5. **OU 001, Industrial Wastewater Treatment Plant (IWTP) (FTLE-51)**
6. **OU 001, Pesticide Rinse Area (FTLE-28)**
7. **OU 001, Landfill 1 (FTLE-54)**
8. **OU 001, Illicit Polychlorinated Biphenyls (PCB) Dump Site (FTLE-46)**
9. **OU 002, Solvent Refined Coal Pilot Plant (SRCPP) (FTLE-32)**
10. **OU 002, Landfill 4 (FTLE-57)**

All sites have ICs/LUCs as part of the selected remedy. The Logistics Center, Landfill 1, Landfill 4, and ALGT also include groundwater monitoring as part of the remedy.

- **ALGT.** This site is located at the former McChord Air Force Base. The remedy consists of groundwater pump and treat, ICs, and long-term groundwater monitoring. The treatment system was temporarily shut down in 2016 and has remained offline since that time. Data show no TCE rebound and apparent mass reduction. The 2018 Groundwater Monitoring Report recommends MNA with continued monitoring and ICs. The Regulators agree with the shutdown of the three pump and treat systems. There are plans to decommission the treatment system including the building, vessels, piping, and select wells in 2023.
- **Logistic Center.** This site is located at the former Fort Lewis Army Base at the southern edge of the Logistics Center. The remedy consists of three groundwater pump and treat systems, ICs, and long-term groundwater monitoring. The systems include the LF-2 System, I-5 System, and SLA System and each location was inspected. Mr. Lambiotte

noted that the three systems are operating however each system requires upgrades/enhancements/repairs to ensure that they continue to function properly and prevent failure as the systems are 25+ years old. Recommendations/consideration have been given to perform systems upgrades (see the Draft Final O&M Annual report dated January 2021). Mr. Lambiotte also noted that repairs to the fencing around LF2 are in progress and that the completion of the activity will be documented in the 2022 LUC inspection. Mr. Lambiotte stated that system plume capture issues have been identified and that a capture zone analysis will be conducted in 2022/2023 (See Final Work Plan). He also noted that a Source Zone Investigation was initiated in in January 2021 (see work plan) along with a supplemental investigation conducted in September/October 2021 (See LF-2 Source Area Addendum Memo 26 Sept 2021). These activities were conducted following recommendations from the 2017 FYR and the Logistics Center Groundwater Monitoring program.

- **DRMO Yard.** This site is in a fenced area used as an active industrial laydown yard for storage of surplus material. The fence is not part of the remedy but is used to prevent access to the material being stored in the laydown yard. No data is collected as part of the remedy that only includes ICs. No changes in site conditions/land use were noted during the inspection.
- **Battery Acid Pit.** This small site is located in the Logistics Center Readiness Area, which is fenced with restricted access. The former pit is now covered by an asphalt parking lot located adjacent to a maintenance area. No data is collected as part of the remedy that only includes ICs. Access to the area was not provided during the inspection to view the asphalt cap, however no issues were reported in the 2020 LUC Inspection
- **IWTP.** The site is located in a fenced area which is in place to prevent access to portions of the wastewater treatment area. The fence is not part of the remedy. No data is collected, and the remedy only includes ICs. No changes in site conditions/land use were noted during the inspection.

The Team broke for lunch at 1140 and resumed the site inspections at 1230.

- **Pesticide Rinse Area.** This site consists of a 34-ft x 34-ft concrete pad outside a former pesticide storage area. The site is located near Building 2054 in the DMWR Supply/Warehouse facility, which is fenced. No data is collected as part of the remedy that only includes ICs. No changes in site conditions/land use were noted during the inspection.
- **Land Fill 1.** This site consists of approximately 15 acres and is located in an area designated for maintenance/industrial use. The remedy is a combination of ICs (land use planning) and long-term groundwater monitoring. There is no signage or fencing and it is not required by the remedy. As per the 2006 Decision Document, groundwater monitoring was discontinued as VOC concentrations were stable or declining, as reported in the 2018

Annual Groundwater Monitoring Report. Concurrence was received from the EPA to discontinue the annual monitoring and no groundwater samples have been collected since 2018. No changes in site conditions/land use were noted during the inspection.

- **Illicit PCB Dump Site.** This site is located in a remote portion JBLM. The current and anticipated future land use is restricted within the JBLM operation range training area. The remedy includes a perimeter fence, IC, and the maintenance of a clay cap to prevent direct human contact with contaminated soils. No data is collected as part of the remedy. The site inspection found a fence around the site along with signage noting "CAUTION – Contaminated Soil, KEEP OUT". Access to the area through the located gate was not provided during the inspection. However, the site could be viewed through the fence. The area within the fence is heavily vegetated and access would be difficult even if the gate was opened. The cap is not being maintained. Mr. Lambiotte noted no mowing or maintenance occurs within the fenced area. The Annual LUC Inspections do not list issues with the cap and should have noted the overgrown vegetations which includes the growth of small saplings.
- **SRCPP.** This is an approximately 25-acrea site located in an industrial portion of JBLM. The selected remedy included soil excavation, LUCs, and Long-Term groundwater monitoring. Soil excavation/treatment was performed and groundwater monitoring was discontinued in 1999, with concurrence received from the EPA. LUCs are required to prevent use of groundwater. The 2017 FYR noted that the prevention of residential land use for the SRCPP had not been incorporated into the JBLM Master Plan and stated that this was an issue affect protectiveness. Mr. Lambiotte stated that to date this has not been accomplished. During the inspection four granular activated carbon vessels were observed on the site. Mr. Lambiotte noted that the contents had been characterized and removed however, disposal of the vessels had not been accomplished as was recommended in the 2017 FYR. No changes in site conditions/land use were noted during the site inspection.
- **Landfill 4.** This is a 52-acre site. Solid waste was disposed in three cells in this trench and fill type landfill. The remedy included soil treatment by vapor extraction and groundwater treatment by sparging, ICs restricting access and site development, and groundwater monitoring. Active treatment was discontinued in 1999. Groundwater monitoring is conducted annually along with LUC inspections. The site is located off Vancouver Road, with one portion of the landfill located to the east of the road (where the active treatment occurred) and the other portion located to the west of the road. The eastern portion was inspected first. This area is fenced but the gate is not locked. During the site inspection, Mr. Lambiotte noted that the SVE and air sparge treatment systems were decommissioned in 2020. Select wells will be abandoned in 2022/2023. Approximately 10 empty drums were observed in the area. Mr. Lambiotte noted these were left over from the decommissioning effort. The western portion of the site was then inspected. This portion

of the site is located in an area used by JBLM for off-road vehicle maneuvering training. Access to this area is not restricted and there is a gravel road to Sequalitchew Lake that transects the site from east to west. Ruts were noted on the surface of the landfill and Mr. Lambiotte noted that damage to the landfill cover has been observed/reported within some areas where the landfill contents (trash) has been exposed. He indicated that he has worked with the JBLM Engineering Department to construct approximately 20 rock/grave/earthen berms to block access to the landfill, and to deter off-road driving across the landfill. This activity has had some success, however he noted that increased enforcement is needed to prevent ruts and damage to the soil cap and that controlled access is recommended.

The Team returned to Bldg. 2012 after the site inspection was completed with Aerostar and USAEC personnel departing JBLM at 1600.

FYR Site Inspection Checklists

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OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Logistics Center
(FTLE-33)

I. SITE INFORMATION	
Site name: **Joint Base Lewis-McChord (JBLM)** **OU1 – Logistics Center (FTLE-33)**	Date/Time of inspection: **November 9, 2021**
Location and region: **JBLM, Pierce County, Washington – EPA Region 10**	USEPA ID: **WA9214053465**
Agency, office or company leading the Five-Year Review: **US Army/JBLM**	Weather/temperature: **Sunny to partly cloudy, 46 degrees. Ground is wet with standing water from recent rain event.**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Land use controls
- ☒ Groundwater pump and treat
- ☐ Surface water collection and treatment
- ☐ Other
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster (below) ☐ Site map attached

- Gary Richards, USACE Kansas City District, Project Manager
- Jerome Lambiotte, AGEISS, Technical Lead/Representative for JBLM IRP Manager
- Allison Bailey, Aerostar, FYR Project Manager
- Andrea Heinzenberger, Aerostar, Project Support

II. INTERVIEWS (Check all that apply)

1. IRP site manager **Mark Mettler, JBLM Department of Public Works, IRP Manager** **11/09/2021**
Name Title Date
Interviewed ☐ at site ☒ at office/email ☐ by phone Phone no. **253-966-8004**
Problems, suggestions: ☒ Interview Record included as Appendix to the FYR Report

2. O&M staff - NA

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.
Agency: **Washington Department of Ecology (Ecology)**
Contact: **Jason Cook, Toxic Cleanup Program, Hydrogeologist** **11/09/2021** **360-407-6834**
Name Title Date Phone no.
Problems; suggestions; ☒ Interview Record included as Appendix to the FYR Report

4. Other interviews (optional) ☒ Interview Record included as Appendix to the FYR Report
Agency: **US EPA Region 10**
Contact: **Patrick Hickey, Superfund Remedial Project Manage** **11/09/2021** **206-553-6295**
Name Title Date Phone no.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Logistics Center
(FTLE-33)

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - O&M manual ☒ Readily available ☐ Up to date ☐ N /A
   - As-built drawings ☒ Readily available ☐ Up to date ☐ N/A
   - Maintenance logs ☒ Readily available ☐ Up to date ☐ N/A

   Remarks: **LUC Inspections are performed annually. The 2021 LUC inspection was conducted in December. The report is not currently available. Annual O&M Reports are also prepared. However, the Final versions of the 2020 and 2021 report are not yet available.**

2. **Site Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
   - Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A

   Remarks: **Plans are developed by contractors for any activities performed. AAPP was on-site for FYR site visit and signed by all attendees.**

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A

   Remarks:

4. **Permits and Service Agreements**
   - ☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Other permits____________ ☐ Readily available ☐ Up to date ☒ N/A

   Remarks: ______

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

   Remarks: ______

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

   Remarks: ______

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☐ N/A

   Remarks: **Data is collected as prescribed; however, all the reports are not currently up to date. The 2020 Groundwater Monitoring (GWM) Report has not been finalized and the 2021 GWM Report is not yet available.**

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

   Remarks: ______

9. **Discharge Compliance Records**
   - ☐ Air ☒ Readily available ☐ Up to date ☐ N/A
   - ☐ Water (effluent) ☒ Readily available ☐ Up to date ☐ N/A

   Remarks:

10. **Daily Access/Security Logs**
    ☐ Readily available ☐ Up to date ☒ N/A

Remarks:

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Logistics Center
(FTLE-33)

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house
   - ☐ PRP in-house
   - ☐ Federal Facility in-house
   - ☐ Other _
   - ☐ Contractor for State
   - ☐ Contractor for PRP
   - ☒ Contractor for Federal Facility

2. **O&M Cost Records**
   - ☐ Readily available ☐ Up to date
   - ☒ Funding mechanism/agreement in place

   Original O&M cost estimate **$** ☐ Breakdown attached
   Total annual cost by year for review period if available

   From ______________ To ______________ ______________ ☐ Breakdown attached
   (Date) (Date) (Total cost)

   From ______________ To ______________ ______________ ☐ Breakdown attached
   (Date) (Date) (Total cost)

   From ______________ To ______________ ______________ ☐ Breakdown attached
   (Date) (Date) (Total cost)

   From ______________ To ______________ ______________ ☐ Breakdown attached
   (Date) (Date) (Total cost)

   From ______________ To ______________ ______________ ☐ Breakdown attached
   (Date) (Date) (Total cost)

3. U**nanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: ______________

V. ACCESS AND LAND USE CONTROLS ☒ Applicable ☐ N/A

A. Fencing

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

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on map ☐ N/A
   Remarks: The Logistics Center remedy consists of three groundwater pump and treat systems located in three separate areas of the former Fort Lewis Army Base at the southern edge of the Logistics Center. Each system (Land Fill-2 [LF-2], Interstate-5 [I-5], Sea Level Aquifer [SLA]) is located in a fenced area with a locked gate.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Logistics Center
(FTLE-33)

C. Land Use Controls (LUCs)

1. **Implementation and Enforcement**

Site conditions imply LUCs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply LUCs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g*., self-reporting, drive by)
Responsible party/agency **Army/JBLM_____**
Contact: ____________________
Name Title Phone no.

Reporting is up-to-date ☐ Yes ☒ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Have there been violations ☐ Yes ☒ No ☐ N/A

Other problems or suggestions ☐ Report attached

Remarks: LUC Inspections are conducted annually. The 2021 LUC inspection was conducted in December. The report is not currently available.

2. **Adequacy** ☒ LUCs are adequate ☐ LUCs are inadequate ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks: ____________________

2. **Land use changes onsite** ☒ N/A
Remarks: ____________________

3. **Land use changes offsite** ☒ N/A
Remarks: ____________________

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads Adequate ☐ N/A
Remarks: ____________________

B. Other Site Conditions

Remarks: No changes in site conditions/land use were noted during the inspection.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Logistics Center
(FTLE-33)

VII. LANDFILL COVERS ☐ **Applicable** ☒ **N/A**

VIII. VERTICAL BARRIER WALLS ☐ **Applicable** ☒ **N/A**

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ **Applicable** ☐ **N/A**

A. Groundwater Extraction Wells, Pumps, and Pipelines
☒ **Applicable** ☐ **N/A**
Remarks: Three pump and treat systems are in place: LF-2, I-5 and SLAT. See O&M Annual Reports for operational issues and recommendations for future repairs, maintenance, and improvements. Each system required upgrades/enhancements/repairs to ensure they continue to function properly and prevent failure as the systems are 25+ years old. See O&M Annual Reports for operational issues and recommendations for future repairs, maintenance, and improvements.

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ □ All required wells properly operating ☒ Needs Maintenance ☐ □ N/A
Remarks____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☒ Needs Maintenance
Remarks____

3. **Spare Parts and Equipment**
☐ Readily available ☐ □ Good condition ☒ Requires upgrade ☐ Needs to be provided
Remarks____

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

C. Treatment System ☒**Applicable** ☐ **N/A**

1. **Treatment Train** (Check components that apply)
□ Metals removal □ Oil/water separation □ Bioremediation
☒ Air stripping □ Carbon adsorbers
□ Filters____
□ Additive (*e.g.*, chelation agent, flocculent)______________________________
□ Others____
□ Good condition ☒ Needs Maintenance
□ Sampling ports properly marked and functional
□ Sampling/maintenance log displayed and up to date
☒ Equipment properly identified
☒ Quantity of groundwater treated annually **– Documented in the O&M Annual Reports**
□ Quantity of surface water treated annually________________________
Remarks. See O&M Annual Reports for operational issues and recommendations for future repairs, maintenance, and improvements.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Logistics Center
(FTLE-33)

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks______________________________

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks______________________________

4. **Discharge Structure and Appurtenances**
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks______________________________

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

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

D. Monitored Natural Attenuation

1. Monitoring data
☒ **Is routinely submitted on time** ☒ **Is of acceptable quality**
Remarks: Data is collected as prescribed; however, all the reports are not currently up to date. The 2020 Groundwater Monitoring (GWM) Report has not been finalized and the 2021 GWM Report is not yet available.

2. Monitoring data suggest
☒ **Contaminant concentrations are declining** ☒ **Contaminant concentrations are increasing**
☐ **Groundwater plume is effectively contained** ☒ **Groundwater plume is not contained**
Remarks:

3. Monitoring Wells (natural attenuation remedy)
☐ **Properly secured/locked** ☐ **Functioning** ☐ **Routinely Sampled** ☐ **Good Condition**
☐ **All Required Wells Located** ☐ **Needs Maintenance**
Remarks: ______________________________.

X. OTHER REMEDIES

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

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Logistics Center
(FTLE-33)

XI. OVERALL OBSERVATIONS
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). **The remedy includes extraction/treatment of contaminated groundwater and implementing Institutional Controls to prevent residential land use within the site boundary and prevent new drinking water wells. The current remedy is not effective as plume capture issues were identified with the systems in 2017 during a Site Management Improvement Study. A source zone investigation was initiated in January 2021 and a capture zone analysis will be conducted in 2022/2023. A strategy for ensuring that the remedy is effective will be developed after these evaluations are completed.**
B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. **Upgrade/enhancements/repairs are needed to the system to ensure that they continue to function properly allowing the remedy to be protective in the long-term.**
C. Early Indicators of Potential Remedy Problems
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. **Unscheduled repairs are occurring on a regular basis on the three systems that are 25+ years old. Upgrade/enhancements/repairs are needed to ensure that they continue to function properly and prevent potential remedy problems in the future.**
D. Opportunities for Optimization
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. **An Optimization Review of the remediation system was completed in 2018. The conclusions of the review provide the basis for the implementation of the Aquifer Testing and Capture Zone Analysis program scheduled for 2022/2023. Optimization of the system/remedy will occur when the analysis is completed.**

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Illicit Polychlorinated Biphenyls (PCB) Dump Site (FTLE-46)

I. SITE INFORMATION

Site name: **Joint Base Lewis-McChord (JBLM) OU1 – Illicit Polychlorinated Biphenyls (PCB Dump Site (FTLE-46)**	Date/Time of inspection: **November 9, 2021**
Location and region: **JBLM, Pierce County, Washington – EPA Region 10**	USEPA ID: **WA9214053465**
Agency, office or company leading the Five-Year Review: **US Army/JBLM**	Weather/temperature: **Sunny to partly cloudy, 46 degrees. Ground is wet with standing water from recent rain event.**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Land use controls
- ☐ Groundwater pump and treat
- ☐ Surface water collection and treatment
- ☒ Other – Clay cap over excavated area – The site in not a landfill
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster (below) ☐ Site map attached

- Gary Richards, USACE Kansas City District, Project Manager
- Jerome Lambiotte, AGEISS, Technical Lead/Representative for JBLM IRP Manager
- Allison Bailey, Aerostar, FYR Project Manager
- Andrea Heinzenberger, Aerostar, Project Support

II. INTERVIEWS (Check all that apply)

1. IRP site manager **Mark Mettler, JBLM Department of Public Works, IRP Manager 11/09/2021**
Name / Title / Date
Interviewed ☐ at site ☒ at office/email ☐ by phone Phone no. **253-966-8004**
Problems, suggestions: ☒ Interview Record included as Appendix to the FYR Report

2. O&M staff - NA

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.
Agency: **Washington Department of Ecology (Ecology)**
Contact: **Jason Cook, Toxic Cleanup Program, Hydrogeologist 11/09/2021 360-407-6834**
Name / Title / Date / Phone no.
Problems; suggestions; ☒ Interview Record included as Appendix to the FYR Report

4. Other interviews (optional) ☒ Interview Record included as Appendix to the FYR Report
Agency: **US EPA Region 10**
Contact: **Patrick Hickey, Superfund Remedial Project Manage 11/09/2021 206-553-6295**
Name / Title / Date / Phone no.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Illicit Polychlorinated Biphenyls (PCB) Dump Site (FTLE-46)

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
O&M manual ☐ Readily available ☐ Up to date ☒ N /A
As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks: LUC Inspections are performed annually

2. **Site Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A
Remarks: Plans are developed by contractors for any activities performed. AAPP was on-site for FYR site visit and signed by all attendees.

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A
Remarks:

4. **Permits and Service Agreements**
☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits____________ ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: No data is not part of the remedy.

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☐ N/A
Remarks:

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

10. **Daily Access/Security Logs**
☐ Readily available ☐ Up to date ☒ N/A

Remarks: The site is located in a remote portion of JBLM within the operation range training area.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Illicit Polychlorinated Biphenyls (PCB) Dump Site (FTLE-46)

IV. O&M COSTS

1. O&M Organization

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other _

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☒ Funding mechanism/agreement in place
Original O&M cost estimate **$**
☐ Breakdown attached Total annual cost by year for review period if available

From________________To ______________ ____________________ ☐ Breakdown attached
Date Date Total cost
From________________To ______________ ____________________ ☐ Breakdown attached
Date Date Total cost
From________________To ______________ ____________________ ☐ Breakdown attached
Date Date Total cost
From________________To ______________ ____________________ ☐ Breakdown attached
Date Date Total cost
From________________To ______________ ____________________ ☐ Breakdown attached
Date Date Total cost

Note: **No data is collected for the remedy. Annual LUC inspections are performed.**

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

Describe costs and reasons: NA

V. ACCESS AND LAND USE CONTROLS ☐ Applicable ☒ N/A

A. Fencing

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

Remarks: No damage to the perimeter fence observed.

B. Other Access Restrictions

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

Remarks: The site is surrounded by a perimeter fence with a locked gate. The fence is in good condition. Signage noting "*CAUTION – Contaminated Soil, KEEP OUT*" is located at the gate and on the fence.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Illicit Polychlorinated Biphenyls (PCB) Dump Site (FTLE-46)

C. Land Use Controls (LUCs)

1. **Implementation and Enforcement**

Site conditions imply LUCs not properly implemented ☒ Yes ☐ No ☐ N/A
Site conditions imply LUCs not being fully enforced ☒ Yes ☐ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by)
Responsible party/agency **Army/JBLM IRP**
Contact: ______________________________
Name Title Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☒ No ☐ N/A
Have there been violations ☒ Yes ☐ No ☐ N/A

Other problems or suggestions ☐ Report attached

- **Remarks: LUCs are part of the remedy and include perimeter fencing and maintenance of the clay cap to prevent direct human contact with contaminated soils. Annual LUC inspections are conducted to verify the LUCs. During the site inspection, access to the area through the locked gate was not provided although the site could be viewed through the fence. The area within the fence is heavily vegetated and access would be difficult even if the gate was opened due to the tall grass, weeds, and saplings growing on the clay cap. The 2006 Decision Document requires inspection and maintenance of the clay cap. The cap is not being maintained and Mr. Lambiotte noted no mowing or maintenance occurs within the fenced area. LUC Inspections are conducted annually. The 2021 LUC inspection was conducted in December after this inspection and the report is not yet available. However, previous annual LUC Inspections do not list issues with the cap or that mowing/maintenance is not being conducted. The annual inspections should have noted the overgrown vegetations which includes the growth of small saplings on the cap.**

2. **Adequacy** ☒ LUCs are adequate ☐ LUCs are inadequate ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks: ______________________________

2. **Land use changes onsite** ☐ N/A
Remarks: **No change in the land use observed.**

3. **Land use changes offsite** ☐ N/A
Remarks: **No change in land use observed.**

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

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

B. Other Site Conditions ☒ N/A

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist Joint Base Lewis-McChord, Washington OU 001 – Illicit Polychlorinated Biphenyls (PCB) Dump Site (FTLE-46)

VII. LANDFILL COVERS ☐ **Applicable** ☒ **N/A – Site is not a landfill. A low permeability clay cap covers the area that was excavated to remove PCB contaminated soils.**

VIII. VERTICAL BARRIER WALLS ☐ **Applicable** ☒ **N/A**

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ **Applicable** ☒ **N/A**

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
The selected remedy for the Illicit PCB Dump Site includes long-term maintenance of the existing clay cap, perimeter fence, and institutional controls to prevent direct human contact to contaminated soils. The remedy is effective at preventing direct contact with the soils and is functioning as designed as the fence and clay cap are in place however maintenance of the clay cap is not occurring and is a necessary component of the remedy that ensures exposure does not occur.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
No evidence that maintenance of the clay cap is occurring. Maintenance is necessary to ensure long-term protectiveness of the remedy. Additionally, the annual inspections do not note the condition of clay cap or that mowing/maintenance is necessary.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.
Maintenance of the clay cap is necessary to ensure the remedy remains protective.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
None.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Landfill 1 (FTLE-54)

<table>
<tr><td colspan="2">I. SITE INFORMATION</td></tr>
<tr><td>Site name: Joint Base Lewis-McChord (JBLM) OU1 – Landfill 1 (FTLE-54)</td><td>Date/Time of inspection: November 9, 2021</td></tr>
<tr><td>Location and region: JBLM, Pierce County, Washington – EPA Region 10</td><td>USEPA ID: WA9214053465</td></tr>
<tr><td>Agency, office or company leading the Five-Year Review: US Army/JBLM</td><td>Weather/temperature:
Sunny to partly cloudy, 46 degrees. Ground is wet with standing water from recent rain event.</td></tr>
<tr><td colspan="2">Remedy Includes: (Check all that apply)
☒ Landfill cover/containment
☐ Access controls
☒ Land use controls
☐ Groundwater pump and treat
☐ Surface water collection and treatment
☐ Other
☒ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls</td></tr>
<tr><td colspan="2">Attachments: ☒ Inspection team roster (below) ☐ Site map attached
• Gary Richards, USACE Kansas City District, Project Manager
• Jerome Lambiotte, AGEISS, Technical Lead/Representative for JBLM IRP Manager
• Allison Bailey, Aerostar, FYR Project Manager
• Andrea Heinzenberger, Aerostar, Project Support</td></tr>
<tr><td colspan="2">II. INTERVIEWS (Check all that apply)</td></tr>
<tr><td colspan="2">1. IRP site manager <u>Mark Mettler</u> , <u>JBLM Department of Public Works, IRP Manager</u> <u>11/09/2021</u>
Name Title Date
Interviewed ☐ at site ☒ at office/email ☐ by phone Phone no. <u>253-966-8004</u>
Problems, suggestions: ☒ Interview Record included as Appendix to the FYR Report</td></tr>
<tr><td colspan="2">2. O&M staff - NA</td></tr>
<tr><td colspan="2">3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.
Agency: <u>Washington Department of Ecology (Ecology)</u>
Contact: <u>Jason Cook, Toxic Cleanup Program, Hydrogeologist</u> <u>11/09/2021</u> <u>360-407-6834</u>
Name Title Date Phone no.
Problems; suggestions; ☒ Interview Record included as Appendix to the FYR Report</td></tr>
<tr><td colspan="2">4. Other interviews (optional) ☒ Interview Record included as Appendix to the FYR Report
Agency: <u>US EPA Region 10</u>
Contact: <u>Patrick Hickey, Superfund Remedial Project Manage</u> <u>11/09/2021</u> <u>206-553-6295</u>
Name Title Date Phone no.</td></tr>
</table>

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Landfill 1 (FTLE-54)

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
O&M manual ☐ Readily available ☐ Up to date ☒ N /A
As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks: Groundwater monitoring discontinued in 2018 as VOC concentrations were determined to be stable and declining (in accordance with DD). Regulatory concurrence received. Institutional controls remain on land and groundwater use and LUC inspections are conducted annually.

2. **Site Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A
Remarks: Plans are developed by contractors for any activities performed. AAPP was on-site for FYR site visit and signed by all attendees.

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A
Remarks:

4. **Permits and Service Agreements**
☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits____________ ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

7. **Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A
Remarks: Reports are available through 2018. As per the 2006 Decision Document, groundwater monitoring was discontinued as VOC concentration were stable or declining, as reported in the 2018 Annual Groundwater Monitoring Report. Concurrence was received from the EPA to discontinue the annual monitoring and no groundwater samples have been collected since 2018.

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

10. **Daily Access/Security Logs**
☐ Readily available ☐ Up to date ☒ N/A

Remarks: No signs or fencing are required/used for the 15-acre site that is located in an area designated for maintenance in the Lewis-Main Master Plan. The current and anticipated future land use designated for LF 1 in the Lewis-Main Master Plan is industrial/maintenance.

Page 2 of 7

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Landfill 1 (FTLE-54)

IV. O&M COSTS

1. O&M Organization

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other _

2. O&M Cost Records

☐ Readily available ☐ Up to date
☒ Funding mechanism/agreement in place
Original O&M cost estimate $
☐ Breakdown attached Total annual cost by year for review period if available

From ______ (Date)	To ______ (Date)	______ (Total cost)	☐ Breakdown attached
From ______ (Date)	To ______ (Date)	______ (Total cost)	☐ Breakdown attached
From ______ (Date)	To ______ (Date)	______ (Total cost)	☐ Breakdown attached
From ______ (Date)	To ______ (Date)	______ (Total cost)	☐ Breakdown attached
From ______ (Date)	To ______ (Date)	______ (Total cost)	☐ Breakdown attached

Note: **Since 2018 data has not been collected as part of the remedy. Annual LUC inspections are performed.**

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: NA

V. ACCESS AND LAND USE CONTROLS ☐ Applicable ☒ N/A

A. Fencing

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

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on map ☒ N/A
Remarks:

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Landfill 1 (FTLE-54)

C. Land Use Controls (LUCs)

1. **Implementation and Enforcement**

Site conditions imply LUCs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply LUCs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by)
Responsible party/agency **Army/JBLM IRP**
Contact: ______ Name ______ Title ______ Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☒ No ☐ N/A
Have there been violations ☐ Yes ☒ No ☐ N/A

Other problems or suggestions ☐ Report attached
Remarks: LUC Inspections are conducted annually. The 2021 LUC inspection was conducted in December after the inspection and is not currently available.

2. **Adequacy** ☒ LUCs are adequate ☐ LUCs are inadequate ☐ N/A
Remarks:

D. General

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

2. **Land use changes onsite** ☐ N/A
Remarks: **No change in the land use observed.**

3. **Land use changes offsite** ☐ N/A
Remarks: **No change in land use observed.**

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads Adequate ☒ N/A
Remarks:

B. Other Site Conditions

Remarks: Main portions of the landfill have vegetation growing on the cap. Paved parking lots are constructed over former open pit dumping areas.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Landfill 1 (FTLE-54)

VII. LANDFILL COVERS ☒ **Applicable** ☐ **N/A**

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
   Areal extent______________ Depth____________
   Remarks____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
   Lengths____________ Widths___________ Depths__________
   Remarks____

3. **Erosion** ☐ Location shown on site map ☒Erosion not evident
   Areal extent______________ Depth____________
   Remarks____

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
   Areal extent______________ Depth____________
   Remarks____

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

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

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
   Areal extent______________ Height____________
   Remarks____

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Areal extent______________
   ☐ Ponding ☐ Location shown on site map Areal extent______________
   ☐ Seeps ☐ Location shown on site map Areal extent______________
   ☐ Soft subgrade ☐ Location shown on site map Areal extent______________
   Remarks____

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Landfill 1 (FTLE-54)

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent______________
Remarks____

B. Benches ☐ Applicable ☒ N/A

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

D. Cover Penetrations ☐ Applicable ☒ N/A

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

F. Cover Drainage Layer ☐ Applicable ☒ N/A

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

H. Retaining Walls ☐ Applicable ☒ N/A

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

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☐ N/A

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

A. Groundwater Extraction Wells, Pumps, and Pipelines
☐ Applicable ☒ N/A
Remarks:_

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

C. Treatment System ☐ Applicable ☒ N/A

D. Monitored Natural Attenuation ☒ Applicable ☒ N/A

1. Monitoring data
☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggest
☒ Contaminant concentrations are declining ☐ Contaminant concentrations are increasing
☒ Groundwater plume is effectively contained ☐ Groundwater plume is not contained
Remarks: VOC concentration were determined to be stable or declining, as reported in the 2018 Annual Groundwater Monitoring Report. Annual monitoring discontinued. No groundwater samples have been collected since 2018.

3. Monitoring Wells (natural attenuation remedy)
☒ Properly secured/locked ☐ Functioning ☐ Routinely Sampled ☐ Good Condition
☐ All Required Wells Located ☐ Needs Maintenance
Remarks: Groundwater monitoring discontinued in 2018. There are plans to abandon a select number of wells across JBLM in 2023.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Landfill 1 (FTLE-54)

X. OTHER REMEDIES
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). **The selected remedy for LF-1 is a combination of groundwater monitoring and Institutional Controls. The remedy is effective and functioning as designed. As stipulated in the 2006 Decision Document, annual groundwater monitoring will continue until 1) all VOC concentration are below MCLs for three years or 2) until the year 2017, as long as VOC concentration are stable or declining. As reported in the 2018 Annual Groundwater Monitoring Report, VOC concentration were determined to be stable or declining. As per the Decision Document, groundwater monitoring was discontinued as VOC concentration were stable or declining, Concurrence was received from the EPA to discontinue the annual monitoring and no groundwater samples have been collected since 2018.**
B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. **O&M procedures should be reviewed and modified as appropriate to reflect the change in the remedy from MNA to Institutional Controls only.**
C. Early Indicators of Potential Remedy Problems
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. **None. As the long-term groundwater monitoring is no longer required, the cost of the remedy, along with the scope of the O&M, has changed and been substantially reduced.**
D. Opportunities for Optimization
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. **The remedy was optimized by discontinuing the groundwater monitoring in 2018.**

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Battery Acid Pit (FTLE-16)

<table>
<tr><td colspan="2">I. SITE INFORMATION</td></tr>
<tr><td>Site name: Joint Base Lewis-McChord (JBLM)
OU1 – Battery Acid Pit (FTLE-16)</td><td>Date/Time of inspection: November 9, 2021</td></tr>
<tr><td>Location and region: JBLM, Pierce County, Washington – EPA Region 10</td><td>USEPA ID: WA9214053465</td></tr>
<tr><td>Agency, office or company leading the Five-Year Review: US Army/JBLM</td><td>Weather/temperature:
Sunny to partly cloudy, 46 degrees.</td></tr>
<tr><td colspan="2">Remedy Includes: (Check all that apply)
☐ Landfill cover/containment
☐ Access controls
☒ Land use controls
☐ Groundwater pump and treat
☐ Surface water collection and treatment
☐ Other
☐ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls</td></tr>
<tr><td colspan="2">Attachments: ☒ Inspection team roster (below) ☐ Site map attached

• Gary Richards, USACE Kansas City District, Project Manager
• Jerome Lambiotte, AGEISS, Technical Lead/Representative for JBLM IRP Manager
• Allison Bailey, Aerostar, FYR Project Manager
• Andrea Heinzenberger, Aerostar, Project Support</td></tr>
<tr><td colspan="2">II. INTERVIEWS (Check all that apply)</td></tr>
<tr><td colspan="2">1. IRP site manager Mark Mettler, JBLM Department of Public Works, IRP Manager 11/09/2021
Name Title Date
Interviewed ☐ at site ☒ at office/email ☐ by phone Phone no. 253-966-8004
Problems, suggestions: ☒ Interview Record included as Appendix to the FYR Report</td></tr>
<tr><td colspan="2">2. O&M staff - NA</td></tr>
<tr><td colspan="2">3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.
Agency: Washington Department of Ecology (Ecology)
Contact: Jason Cook, Toxic Cleanup Program, Hydrogeologist 11/09/2021 360-407-6834
Name Title Date Phone no.
Problems; suggestions; ☒ Interview Record included as Appendix to the FYR Report</td></tr>
<tr><td colspan="2">4. Other interviews (optional) ☒ Interview Record included as Appendix to the FYR Report
Agency: US EPA Region 10
Contact: Patrick Hickey, Superfund Remedial Project Manage 11/09/2021 206-553-6295
Name Title Date Phone no.</td></tr>
</table>

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Battery Acid Pit (FTLE-16)

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - O&M manual ☐ Readily available ☐ Up to date ☒ N /A
   - As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
   - Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
   - **Remarks: LUC Inspections are performed annually.**

2. **Site Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
   - Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A
   - **Remarks: Plans are developed by contractors for any activities performed. AAPP was on-site for FYR site visit and signed by all attendees.**

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A
   - **Remarks:**

4. **Permits and Service Agreements**
   - ☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Other permits__________ ☐ Readily available ☐ Up to date ☒ N/A
   - **Remarks:**

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   - Remarks:

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
   - Remarks:

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
   - **Remarks: No data is collected as part of the remedy**

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
   - Remarks:

9. **Discharge Compliance Records**
   - ☐ Air ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
   - Remarks:

10. **Daily Access/Security Logs**
    - ☐ Readily available ☐ Up to date ☒ N/A

Remarks:

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house ☐ Contractor for State
   - ☐ PRP in-house ☐ Contractor for PRP
   - ☐ Federal Facility in-house ☒ Contractor for Federal Facility
   - ☐ Other _

Page 2 of 5

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Battery Acid Pit (FTLE-16)

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☒ Funding mechanism/agreement in place
Original O&M cost estimate **$** ☐ Breakdown attached Total annual cost by year for review period if available

From ______	To ______	______	______	☐ Breakdown attached
	Date	Date	Total cost	
From ______	To ______	______	______	☐ Breakdown attached
	Date	Date	Total cost	
From ______	To ______	______	______	☐ Breakdown attached
	Date	Date	Total cost	
From ______	To ______	______	______	☐ Breakdown attached
	Date	Date	Total cost	
From ______	To ______	______	______	☐ Breakdown attached
	Date	Date	Total cost	

***Note:* No data is collected as part of the remedy. Annual LUC inspections are performed.**

3. U**nanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: NA

V. ACCESS AND LAND USE CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
Remarks: The Battery Acid Pit is located in the Logistics Center Readiness Area, which is fenced with restricted access. The former pit is now covered by an asphalt parking lot located adjacent to a maintenance area. The fence is not part of the remedy.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on map ☒ N/A
Remarks:

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Battery Acid Pit (FTLE-16)

C. Land Use Controls (LUCs)

1. **Implementation and Enforcement**

Site conditions imply LUCs not properly implemented	☐ Yes	☒ No	☐ N/A
Site conditions imply LUCs not being fully enforced	☐ Yes	☒ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by)
Responsible party/agency **Army/JBLM IRP**
Contact: ____
Name Title Phone no.

Reporting is up-to-date	☒ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☒ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☒ Yes	☐ No	☐ N/A
Have there been violations	☐ Yes	☒ No	☐ N/A

Other problems or suggestions ☐ Report attached
Remarks: LUC Inspections are conducted annually. The 2021 LUC inspection was conducted in December. The report is not currently available.

2. **Adequacy** ☒ LUCs are adequate ☐ LUCs are inadequate ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks: ____

2. **Land use changes onsite** ☒ N/A
Remarks: ____

3. **Land use changes offsite** ☒ N/A
Remarks: ____

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads Adequate ☒ N/A
Remarks: ____

B. Other Site Conditions

Remarks:
Access to the area was not provided during the inspection however no changes in site conditions/land use were observed during the inspection. No issues were reported with the asphalt cap in the 2020 LUC Inspection.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Battery Acid Pit (FTLE-16)

VII. LANDFILL COVERS ☐ **Applicable** ☒ **N/A**
VIII. VERTICAL BARRIER WALLS ☐ **Applicable** ☒ **N/A**
IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ **Applicable** ☒ **N/A**

X. OTHER REMEDIES
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). **<u>The remedy includes implementing Institutional Controls to prevent residential land use within the site boundary. The remedy is effective and functioning as designed.</u>**
B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. **<u>No Issues. O&M procedures are adequate. LUC inspection conducted annually.</u>**
C. Early Indicators of Potential Remedy Problems
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. **<u>No observations regarding changes in scope or cost of O&M identified.</u>**
<u>D. Opportunities for Optimization</u>
<u>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</u> **<u>No opportunities for optimization were identified.</u>**

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – DRMO Yard Site (FTLE-31)

I. SITE INFORMATION	
Site name: **Joint Base Lewis-McChord (JBLM) OU1 – DRMO Yard (FTLE-31)**	Date/Time of inspection: **November 9, 2021**
Location and region: **JBLM, Pierce County, Washington – EPA Region 10**	USEPA ID: **WA9214053465**
Agency, office or company leading the Five-Year Review: **US Army/JBLM**	Weather/temperature: **Sunny to partly cloudy, 46 degrees.**

Remedy Includes: (Check all that apply)
- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Land use controls
- ☐ Groundwater pump and treat
- ☐ Surface water collection and treatment
- ☐ Other
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster (below) ☐ Site map attached

- Gary Richards, USACE Kansas City District, Project Manager
- Jerome Lambiotte, AGEISS, Technical Lead/Representative for JBLM IRP Manager
- Allison Bailey, Aerostar, FYR Project Manager
- Andrea Heinzenberger, Aerostar, Project Support

II. INTERVIEWS (Check all that apply)

1. IRP site manager **Mark Mettler, JBLM Department of Public Works, IRP Manager 11/09/2021**
   Name / Title / Date
   Interviewed ☐ at site ☒ at office/email ☐ by phone Phone no. **253-966-8004**
   Problems, suggestions: ☒ Interview Record included as Appendix to the FYR Report

2. O&M staff - NA

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.
   Agency: **Washington Department of Ecology (Ecology)**
   Contact: **Jason Cook, Toxic Cleanup Program, Hydrogeologist 11/09/2021 360-407-6834**
   Name / Title / Date / Phone no.
   Problems; suggestions; ☒ Interview Record included as Appendix to the FYR Report

4. Other interviews (optional) ☒ Interview Record included as Appendix to the FYR Report
   Agency: **US EPA Region 10**
   Contact: **Patrick Hickey, Superfund Remedial Project Manage 11/09/2021 206-553-6295**
   Name / Title / Date / Phone no.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – DRMO Yard Site (FTLE-31)

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - O&M manual ☐ Readily available ☐ Up to date ☒ N /A
   - As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
   - Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
   - **Remarks: LUC Inspections are performed annually.**

2. **Site Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
   - Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A
   - **Remarks: Plans are developed by contractors for any activities performed. AAPP was on-site for FYR site visit and signed by all attendees.**

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A
   - **Remarks:**

4. **Permits and Service Agreements**
   - ☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Other permits________ ☐ Readily available ☐ Up to date ☒ N/A
   - **Remarks:**

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   - Remarks:

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
   - Remarks:

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
   - **Remarks: Groundwater monitoring is not part of the remedy.**

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
   - Remarks:

9. **Discharge Compliance Records**
   - ☐ Air ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
   - Remarks:

10. **Daily Access/Security Logs**
    - ☐ Readily available ☐ Up to date ☒ N/A

Remarks:

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – DRMO Yard Site (FTLE-31)

IV. O&M COSTS

1. O&M Organization

- ☐ State in-house
- ☐ PRP in-house
- ☐ Federal Facility in-house
- ☐ Other _
- ☐ Contractor for State
- ☐ Contractor for PRP
- ☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☒ Funding mechanism/agreement in place
Original O&M cost estimate ***$*** ☐ Breakdown attached Total annual cost by year for review period if available

From________________To ______________ ____________________ ☐ Breakdown attached
Date Date Total cost
From________________To ______________ ____________________ ☐ Breakdown attached
Date Date Total cost
From________________To ______________ ____________________ ☐ Breakdown attached
Date Date Total cost
From________________To ______________ ____________________ ☐ Breakdown attached
Date Date Total cost
From________________To ______________ ____________________ ☐ Breakdown attached
Date Date Total cost

Note: **No data is collected for the remedy. Annual LUC inspections are performed.**

3. U**nanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: NA

V. ACCESS AND LAND USE CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
Remarks: The DRMO Yard is located in a fenced area used as an active industrial laydown yard for storage of surplus material. The fence is not part of the remedy.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on map ☒ N/A
Remarks:

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – DRMO Yard Site (FTLE-31)

C. Land Use Controls (LUCs)

1. **Implementation and Enforcement**

Site conditions imply LUCs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply LUCs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by)
Responsible party/agency **Army/JBLM IRP**
Contact: ______
Name Title Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Have there been violations ☐ Yes ☒ No ☐ N/A

Other problems or suggestions ☐ Report attached
Remarks: LUC Inspections are conducted annually. The 2021 LUC inspection was conducted in December. The report is not yet available.

2. **Adequacy** ☒ LUCs are adequate ☐ LUCs are inadequate ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks: ______

2. **Land use changes onsite** ☒ N/A
Remarks: ______

3. **Land use changes offsite** ☒ N/A
Remarks: ______

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads Adequate ☒ N/A
Remarks: ______

B. Other Site Conditions

Remarks:
No changes in site conditions/land use were noted during the inspection.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – DRMO Yard Site (FTLE-31)

VII. LANDFILL COVERS ☐ **Applicable** ☒ **N/A**
VIII. VERTICAL BARRIER WALLS ☐ **Applicable** ☒ **N/A**
IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ **Applicable** ☒ **N/A**

X. OTHER REMEDIES
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). **<u>The remedy includes implementing Institutional Controls to prevent residential land use within the site boundary. The remedy is effective and functioning as designed.</u>**
B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. **<u>No Issues. O&M procedures are adequate. LUC inspection conducted annually.</u>**
C. Early Indicators of Potential Remedy Problems
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. **<u>No observations regarding changes in scope or cost of O&M identified.</u>**
<u>D. Opportunities for Optimization</u>
<u>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</u> **<u>No opportunities for optimization were identified.</u>**

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Industrial Wastewater Treatment Plant (IWTP) (FTLE-51)

I. SITE INFORMATION

Site name: **Joint Base Lewis-McChord (JBLM) OU1 – IWTP (FTLE-51)**	Date/Time of inspection: **November 9, 2021**
Location and region: **JBLM, Pierce County, Washington – EPA Region 10**	USEPA ID: **WA9214053465**
Agency, office or company leading the Five-Year Review: **US Army/JBLM**	Weather/temperature: **Sunny to partly cloudy, 46 degrees.**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Land use controls
- ☐ Groundwater pump and treat
- ☐ Surface water collection and treatment
- ☐ Other
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster (below) ☐ Site map attached

- Gary Richards, USACE Kansas City District, Project Manager
- Jerome Lambiotte, AGEISS, Technical Lead/Representative for JBLM IRP Manager
- Allison Bailey, Aerostar, FYR Project Manager
- Andrea Heinzenberger, Aerostar, Project Support

II. INTERVIEWS (Check all that apply)

1. IRP site manager **Mark Mettler, JBLM Department of Public Works, IRP Manager** **11/09/2021**
Name Title Date
Interviewed ☐ at site ☒ at office/email ☐ by phone Phone no. **253-966-8004**
Problems, suggestions: ☒ Interview Record included as Appendix to the FYR Report

2. O&M staff - NA

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.
Agency: **Washington Department of Ecology (Ecology)**
Contact: **Jason Cook, Toxic Cleanup Program, Hydrogeologist** **11/09/2021** **360-407-6834**
Name Title Date Phone no.
Problems; suggestions; ☒ Interview Record included as Appendix to the FYR Report

4. Other interviews (optional) ☒ Interview Record included as Appendix to the FYR Report
Agency: **US EPA Region 10**
Contact: **Patrick Hickey, Superfund Remedial Project Manage** **11/09/2021** **206-553-6295**
Name Title Date Phone no.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Industrial Wastewater Treatment Plant (IWTP) (FTLE-51)

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - O&M manual ☐ Readily available ☐ Up to date ☒ N /A
   - As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
   - Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
   - **Remarks: LUC Inspections are performed annually.**

2. **Site Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
   - Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A
   - **Remarks: Plans are developed by contractors for any activities performed. AAPP was on-site for FYR site visit and signed by all attendees.**

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A
   - **Remarks:**

4. **Permits and Service Agreements**
   - ☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Other permits________ ☐ Readily available ☐ Up to date ☒ N/A
   - **Remarks:**

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   - Remarks:

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
   - Remarks:

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
   - **Remarks: No data is collected as part of the remedy**

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
   - Remarks:

9. **Discharge Compliance Records**
   - ☐ Air ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
   - Remarks:

10. **Daily Access/Security Logs**
    - ☐ Readily available ☐ Up to date ☒ N/A

Remarks:

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Industrial Wastewater Treatment Plant (IWTP) (FTLE-51)

IV. O&M COSTS

1. **O&M Organization**
- ☐ State in-house
- ☐ Contractor for State
- ☐ PRP in-house
- ☐ Contractor for PRP
- ☐ Federal Facility in-house
- ☒ Contractor for Federal Facility
- ☐ Other _

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☒ Funding mechanism/agreement in place
Original O&M cost estimate **$** ☐ Breakdown attached Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

Note: **No data is collected as part of the remedy. Annual LUC inspections are performed.**

3. U**nanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: NA

V. ACCESS AND LAND USE CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
Remarks: The IWTP is located in a fenced area which is in place to prevent access to portions of the wastewater treatment area. The fence is not part of the remedy.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on map ☒ N/A
Remarks:

Page 3 of 5

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Industrial Wastewater Treatment Plant (IWTP) (FTLE-51)

C. Land Use Controls (LUCs)

1. **Implementation and Enforcement**

Site conditions imply LUCs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply LUCs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by)
Responsible party/agency **Army/JBLM IRP**
Contact: ____________________
Name Title Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Have there been violations ☐ Yes ☒ No ☐ N/A

Other problems or suggestions ☐ Report attached
Remarks: LUC Inspections are conducted annually. The 2021 LUC inspection was conducted in December. The report is not currently available.

2. **Adequacy** ☒ LUCs are adequate ☐ LUCs are inadequate ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks: ____________________

2. **Land use changes onsite** ☒ N/A
Remarks: ____________________

3. **Land use changes offsite** ☒ N/A
Remarks: ____________________

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads Adequate ☒ N/A
Remarks: ____________________

B. Other Site Conditions

Remarks:
No changes in site conditions/land use were observed during the inspection.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Industrial Wastewater Treatment Plant (IWTP) (FTLE-51)

VII. LANDFILL COVERS ☐ **Applicable** ☒ **N/A**

VIII. VERTICAL BARRIER WALLS ☐ **Applicable** ☒ **N/A**

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ **Applicable** ☒ **N/A**

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
The remedy includes implementing Institutional Controls to prevent residential land use within the site boundary. The remedy is effective and functioning as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
No Issues. O&M procedures are adequate. LUC inspection conducted annually.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.
No observations regarding changes in scope or cost of O&M identified.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
No opportunities for optimization were identified.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Pesticide Rinse Area (FTLE-28)

I. SITE INFORMATION

Site name: **Joint Base Lewis-McChord (JBLM) OU1 – Pesticide Rinse Area (FTLE-28)**	Date/Time of inspection: **November 9, 2021**
Location and region: **JBLM, Pierce County, Washington – EPA Region 10**	USEPA ID: **WA9214053465**
Agency, office or company leading the Five-Year Review: **US Army/JBLM**	Weather/temperature: **Sunny to partly cloudy, 46 degrees.**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Land use controls
- ☐ Groundwater pump and treat
- ☐ Surface water collection and treatment
- ☐ Other
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster (below) ☐ Site map attached

- Gary Richards, USACE Kansas City District, Project Manager
- Jerome Lambiotte, AGEISS, Technical Lead/Representative for JBLM IRP Manager
- Allison Bailey, Aerostar, FYR Project Manager
- Andrea Heinzenberger, Aerostar, Project Support

II. INTERVIEWS (Check all that apply)

1. IRP site manager **Mark Mettler**, **JBLM Department of Public Works, IRP Manager** **11/09/2021**
Name Title Date
Interviewed ☐ at site ☒ at office/email ☐ by phone Phone no. **253-966-8004**
Problems, suggestions: ☒ Interview Record included as Appendix to the FYR Report

2. O&M staff - NA

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.
Agency: **Washington Department of Ecology (Ecology)**
Contact: **Jason Cook, Toxic Cleanup Program, Hydrogeologist** **11/09/2021** **360-407-6834**
Name Title Date Phone no.
Problems; suggestions; ☒ Interview Record included as Appendix to the FYR Report

4. Other interviews (optional) ☒ Interview Record included as Appendix to the FYR Report
Agency: **US EPA Region 10**
Contact: **Patrick Hickey, Superfund Remedial Project Manage** **11/09/2021** **206-553-6295**
Name Title Date Phone no.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Pesticide Rinse Area (FTLE-28)

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
O&M manual ☐ Readily available ☐ Up to date ☒ N /A
As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks: LUC Inspections are performed annually.

2. **Site Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A
Remarks: Plans are developed by contractors for any activities performed. AAPP was on-site for FYR site visit and signed by all attendees.

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

4. **Permits and Service Agreements**
☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits__________ ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: No data is collected as part of the remedy

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

10. **Daily Access/Security Logs**
☐ Readily available ☐ Up to date ☒ N/A
Remarks:

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other _

Page 2 of 5

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Pesticide Rinse Area (FTLE-28)

2. **O&M Cost Records**
☐ Readily available ☐ Up to date
☒ Funding mechanism/agreement in place
Original O&M cost estimate **$** ☐ Breakdown attached Total annual cost by year for review period if available

From ______	To ______	______	☐ Breakdown attached
Date	Date	Total cost	
From ______	To ______	______	☐ Breakdown attached
Date	Date	Total cost	
From ______	To ______	______	☐ Breakdown attached
Date	Date	Total cost	
From ______	To ______	______	☐ Breakdown attached
Date	Date	Total cost	
From ______	To ______	______	☐ Breakdown attached
Date	Date	Total cost	

***Note:* No data is collected as part of the remedy. Annual LUC inspections are performed.**

3. U**nanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: NA

V. ACCESS AND LAND USE CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
Remarks: The Pesticide Rinse Area is located near Bldg 2054 in the DMWR Supply/Warehouse facility, which is fenced. The fence is not part of the remedy.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on map ☒ N/A
Remarks:

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Pesticide Rinse Area (FTLE-28)

C. Land Use Controls (LUCs)

1. **Implementation and Enforcement**

Site conditions imply LUCs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply LUCs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by)
Responsible party/agency **Army/JBLM IRP**
Contact: ____________________
Name Title Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Have there been violations ☐ Yes ☒ No ☐ N/A

Other problems or suggestions ☐ Report attached
Remarks: LUC Inspections are conducted annually. The 2021 LUC inspection was conducted in December. The report is not currently available.

2. **Adequacy** ☒ LUCs are adequate ☐ LUCs are inadequate ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks: ____________________

2. **Land use changes onsite** ☒ N/A
Remarks: ____________________

3. **Land use changes offsite** ☒ N/A
Remarks: ____________________

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads Adequate ☒ N/A
Remarks: ____________________

B. Other Site Conditions

Remarks:
No changes in site conditions/land use were noted during the inspection.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 001 – Pesticide Rinse Area (FTLE-28)

VII. LANDFILL COVERS ☐ **Applicable** ☒ **N/A**

VIII. VERTICAL BARRIER WALLS ☐ **Applicable** ☒ **N/A**

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ **Applicable** ☒ **N/A**

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
<u>**The remedy includes implementing Institutional Controls to prevent residential land use within the site boundary. The remedy is effective and functioning as designed.**</u>

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
<u>**No Issues. O&M procedures are adequate. LUC inspection conducted annually.**</u>

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.
<u>**No observations regarding changes in scope or cost of O&M identified.**</u>

<u>**D. Opportunities for Optimization**</u>

<u>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</u>
<u>**No opportunities for optimization were identified.**</u>

I. SITE INFORMATION	
Site name: **Joint Base Lewis-McChord (JBLM) OU1 – Landfill 4 (FTLE-57)**	Date/Time of inspection: **November 9, 2021**
Location and region: **JBLM, Pierce County, Washington – EPA Region 10**	USEPA ID: **WA9214053465**
Agency, office, or company leading the Five-Year Review: **US Army/JBLM**	Weather/temperature: **Sunny to partly cloudy, 46 degrees. Ground is wet with standing water from recent rain event.**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls
- ☒ Land use controls
- ☐ Groundwater pump and treat
- ☐ Surface water collection and treatment
- ☐ Other
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster (below) ☐ Site map attached

- Gary Richards, USACE Kansas City District, Project Manager
- Jerome Lambiotte, AGEISS, Technical Lead/Representative for JBLM IRP Manager
- Allison Bailey, Aerostar, FYR Project Manager
- Andrea Heinzenberger, Aerostar, Project Support

II. INTERVIEWS (Check all that apply)

1. IRP site manager **Mark Mettler**, **JBLM Department of Public Works, IRP Manager** **11/09/2021**
Name Title Date
Interviewed ☐ at site ☒ at office/email ☐ by phone Phone no. **253-966-8004**
Problems, suggestions: ☒ Interview Record included as Appendix to the FYR Report

2. O&M staff - NA

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.
Agency: **Washington Department of Ecology (Ecology)**
Contact: **Jason Cook, Toxic Cleanup Program, Hydrogeologist** **11/09/2021** **360-407-6834**
Name Title Date Phone no.
Problems; suggestions; ☒ Interview Record included as Appendix to the FYR Report

4. Other interviews (optional) ☒ Interview Record included as Appendix to the FYR Report
Agency: **US EPA Region 10**
Contact: **Patrick Hickey, Superfund Remedial Project Manage** **11/09/2021** **206-553-6295**
Name Title Date Phone no.

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - O&M manual ☐ Readily available ☒ Up to date ☐ N /A
   - As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
   - Maintenance logs ☒ Readily available ☐ Up to date ☐ N/A

   Remarks: LTM groundwater monitoring is conducted annually. Institutional controls remain on land use and LUC inspections are conducted annually. The 2021 LUC inspection was conducted in December. The report is not currently available.

2. **Site Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
   - Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A

   Remarks: Plans are developed by contractors for any activities performed. AAPP was on-site for FYR site visit and signed by all attendees.

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A

   Remarks:

4. **Permits and Service Agreements**
   - ☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Other permits________ ☐ Readily available ☐ Up to date ☒ N/A

   Remarks: ________

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

   Remarks: ________

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

   Remarks: ________

7. **Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A

   Remarks: Data is collected as prescribed; however, all the reports are not available/ up to date. The 2020 Groundwater Monitoring (GWM) Report has not been finalized and the 2021 GWM Report is not yet available.

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

   Remarks: ________

9. **Discharge Compliance Records**
   - ☐ Air ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A

   Remarks:

10. **Daily Access/Security Logs**
    - ☐ Readily available ☐ Up to date ☒ N/A

Remarks:

IV. O&M COSTS

1. O&M Organization

- ☐ State in-house
- ☐ PRP in-house
- ☐ Federal Facility in-house
- ☐ Other _
- ☐ Contractor for State
- ☐ Contractor for PRP
- ☒ Contractor for Federal Facility

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☒ Funding mechanism/agreement in place
Original O&M cost estimate **$**
☐ Breakdown attached Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

3. U**nanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: NA

V. ACCESS AND LAND USE CONTROLS ☒ Applicable ☐ N/A

A. Fencing

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

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on map ☒ N/A
Remarks: Fencing or signage are not a required element of the remedy for the 52-acre site that includes three cells in this former trench and fill type landfill. The area. The LF 4 site is located off Vancouver Road, with one portion of the landfill located to the east of the road. This is the area where active groundwater treatment (SVE/Air Sparge) occurred until 1999 and it is fenced but not locked. The other portion located to the west of the road has a gravel road transecting the site from east to west that leads to Sequalitchew Lake. There are no signs posted and access to the area is open.

C. Land Use Controls (LUCs)

1. **Implementation and Enforcement**

Site conditions imply LUCs not properly implemented ☒ Yes ☐ No ☐ N/A
Site conditions imply LUCs not being fully enforced ☒ Yes ☐ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by)
Responsible party/agency **Army/JBLM IRP**
Contact: ______ Name / Title / Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☒ No ☐ N/A
Have there been violations ☒ Yes ☐ No ☐ N/A

Other problems or suggestions ☒ Yes ☐ Report attached

Remarks: LUC Inspections are conducted annually. The 2021 LUC inspection was conducted in December after the inspection and is not currently available. LUCs restrict off-road vehicle maneuvering. Observations during this FYR site inspection indicate that off-road vehicle use is occurring in the western portion of the site. Annual LUC inspections note issues with off-road vehicle use in the area as well

2. **Adequacy** ☐ LUCs are adequate ☒ LUCs are inadequate ☐ N/A

Remarks: LUCs are in place to prevent residential land use, unplanned excavation of contaminated soil and prevent digging, bivouacking, or off-road vehicle maneuvering during training. Observations during the site inspection indicate that off-road vehicle use is occurring in the western portion of the site located in an area used by JBLM for off-road vehicle maneuvering training. Access to this area is not restricted Ruts were noted on the surface of the landfill. Mr. Lambiotte noted that damage to the landfill cover has been observed/reported with some areas where the landfill contents (trash) has been exposed. He indicated that the JBLM Engineering Department has construct approximately 20 rock/grave/earthen berms to block access to the landfill to deter off road driving across the landfill. This activity has had some success however he noted that increased enforcement is needed to prevent ruts and damage to the soil cap and that controlled access is recommended.

D. General

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

Remarks: **Off-road vehicle usage was observed on portions of the landfill**

2. **Land use changes onsite** ☒ Yes ☐ N/A

Remarks: **Off-road vehicle usage was observed on portions of the landfill.**

3. **Land use changes offsite** ☐ N/A

Remarks: **No change in land use observed.**

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

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

Remarks: __________

B. Other Site Conditions

Remarks: During the site inspection, Mr. Lambiotte noted that the SVE and air sparge treatment systems were decommissioned in 2020. Select wells will be abandoned in 2022/2023. Approximately 10 empty drums were observed in the area. Mr. Lambiotte noted these were left over from the decommissioning effort.

VII. LANDFILL COVERS ☒ **Applicable** ☐ **N/A**

A. Landfill Surface

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

Areal extent______ Depth______

Remarks **Low spots/ruts were observed during the inspection.**

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident

Lengths______ Widths______ Depths______

Remarks__________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident

Areal extent______ Depth______

Remarks **Off-road vehicle traffic has cause ruts to occur and damage to the landfill cover has been observed/reported with some areas where the landfill contents (trash) have been exposed**

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
Areal extent______________ Depth____________
Remarks: **<u>Off-road vehicle traffic has cause ruts to occur and damage to the landfill cover has been observed/reported with some areas where the landfill contents (trash) have been exposed</u>**

5. **Vegetative Cover** ☒ Grass ☐ Cover properly established ☐ No signs of stress
☒ Trees/Shrubs
Remarks______________________________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
Remarks: **<u>Gravel road transecting the site from east to west that leads to Sequalitchew Lake</u>**

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
Areal extent______________ Height____________
Remarks______________________________

8. **Wet Areas/Water Damage** ☒ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent______________
☐ Ponding ☐ Location shown on site map Areal extent______________
☐ Seeps ☐ Location shown on site map Areal extent______________
☐ Soft subgrade ☐ Location shown on site map Areal extent______________
Remarks______________________________

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability
Areal extent______________
Remarks______________________________

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

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

D. Cover Penetrations ☐ Applicable ☒ N/A

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

F. Cover Drainage Layer ☐ Applicable ☒ N/A

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

H. Retaining Walls ☐ Applicable ☒ N/A

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

VIII. VERTICAL BARRIER WALLS ☐ **Applicable** ☐ **N/A**

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ **Applicable** ☐ **N/A**

A. Groundwater Extraction Wells, Pumps, and Pipelines
☐ **Applicable** ☒ **N/A**
Remarks:

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

C. Treatment System ☐ **Applicable** ☒ **N/A – Treatment system shut down in 1999**

D. Monitored Natural Attenuation ☒ **Applicable** ☐ **N/A**

1. Monitoring data
☐ **Is routinely submitted on time** ☒ **Is of acceptable quality**
Remarks: Data is collected as prescribed; however, all the reports are not currently up to date. The 2020 Groundwater Monitoring (GWM) Report has not been finalized and the 2021 GWM Report is not yet available.

2. Monitoring data suggest
☒ **Contaminant concentrations are declining** ☐ **Contaminant concentrations are increasing**
☒ **Groundwater plume is effectively contained** ☐ **Groundwater plume is not contained**
Remarks: TCE in the source area slightly exceed the MCL and have statistically significant downward trends. TCE in cross-gradient and down-gradient wells are all below MCL.

3. Monitoring Wells (natural attenuation remedy)
☒ **Properly secured/locked** ☒ **Functioning** ☒ **Routinely Sampled** ☒ **Good Condition**
☐ **All Required Wells Located** ☐ **Needs Maintenance**
4. Remarks:

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
The selected remedy for LF-4 is a combination of groundwater treatment, monitoring and Institutional Controls. The remedy is effective as groundwater treatment (Air Sparge/Soil Vapor Extraction) reduced contamination. Groundwater monitoring indicates TCE only slightly exceeds the MCL and is decreasing. LUCs are in place to prevent exposure, residential use, installation of drinking water wells, and digging/off-road vehicle maneuvering. However, improved enforcement of the LUC preventing off-road maneuvering is required to ensure that the remedy is functioning as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
None.

C. Early Indicators of Potential Remedy Problems
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. **Access to the landfill is not restricted and off-road maneuvering is causing damage to the cap causing unscheduled repairs and changes in the scope of the O&M activities (construction of berms) suggesting the protectiveness of the remedy may be compromised in the future.**

D. Opportunities for Optimization
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. **The monitoring program was optimized in 2017; wells were removed from the program and the sampling frequency and change in chemical analysis (from 156 VOC analytes to 4 VOC target analytes). No additional opportunities for optimization were identified.**

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 002 – Solvent Refined Coal Pilot Plant (SRCPP) (FTLE-32)

<table>
<tr><th colspan="2">I. SITE INFORMATION</th></tr>
<tr><td>Site name: Joint Base Lewis-McChord (JBLM)
OU2 – Solvent Refined Coal Pilot Plant (SRCPP) (FTLE-32)</td><td>Date/Time of inspection: November 9, 2021</td></tr>
<tr><td>Location and region: JBLM, Pierce County, Washington – EPA Region 10</td><td>USEPA ID: WA9214053465</td></tr>
<tr><td>Agency, office or company leading the Five-Year Review: US Army/JBLM</td><td>Weather/temperature:
Sunny to partly cloudy, 46 degrees. Ground is wet with standing water from recent rain event.</td></tr>
<tr><td colspan="2">Remedy Includes: (Check all that apply)
☐ Landfill cover/containment
☐ Access controls
☒ Land use controls
☐ Groundwater pump and treat
☐ Surface water collection and treatment
☒ Other (Soil Excavation/Treatment)
☒ Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls</td></tr>
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• Jerome Lambiotte, AGEISS, Technical Lead/Representative for JBLM IRP Manager
• Allison Bailey, Aerostar, FYR Project Manager
• Andrea Heinzenberger, Aerostar, Project Support</td></tr>
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<tr><td colspan="2">1. IRP site manager <u>Mark Mettler, JBLM Department of Public Works, IRP Manager</u> <u>11/09/2021</u>
Name / Title / Date
Interviewed ☐ at site ☒ at office/email ☐ by phone Phone no. <u>253-966-8004</u>
Problems, suggestions: ☒ Interview Record included as Appendix to the FYR Report</td></tr>
<tr><td colspan="2">2. O&M staff - NA</td></tr>
<tr><td colspan="2">3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.
Agency: <u>Washington Department of Ecology (Ecology)</u>
Contact: <u>Jason Cook, Toxic Cleanup Program, Hydrogeologist</u> <u>11/09/2021</u> <u>360-407-6834</u>
Name / Title / Date / Phone no.
Problems; suggestions; ☒ Interview Record included as Appendix to the FYR Report</td></tr>
<tr><td colspan="2">4. Other interviews (optional) ☒ Interview Record included as Appendix to the FYR Report
Agency: <u>US EPA Region 10</u>
Contact: <u>Patrick Hickey, Superfund Remedial Project Manage</u> <u>11/09/2021</u> <u>206-553-6295</u>
Name / Title / Date / Phone no.</td></tr>
</table>

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 002 – Solvent Refined Coal Pilot Plant (SRCPP) (FTLE-32)

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
O&M manual ☒ Readily available ☐ Up to date ☐ N /A
As-built drawings ☐ Readily available ☐ Up to date ☐ N/A
Maintenance logs ☒ Readily available ☐ Up to date ☐ N/A
Remarks: Groundwater monitoring discontinued in 1999 after confirming effectiveness of soil treatment. LUC Inspections are performed annually. The 2021 LUC inspection was conducted in December. The report is not currently available.

2. **Site Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A
Remarks: Plans are developed by contractors for any activities performed. AAPP was on-site for FYR site visit and signed by all attendees.

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A
Remarks:

4. **Permits and Service Agreements**
☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits________ ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks: Groundwater monitoring discontinued in 1999

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

9. **Discharge Compliance Records**
☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks:

10. **Daily Access/Security Logs**
☐ Readily available ☐ Up to date ☒ N/A
Remarks:

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 002 – Solvent Refined Coal Pilot Plant (SRCPP) (FTLE-32)

IV. O&M COSTS

1. O&M Organization

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other _

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☒ Funding mechanism/agreement in place
Original O&M cost estimate **$** ☐ Breakdown attached Total annual cost by year for review period if available

From ______	To ______	______	☐ Breakdown attached
Date	Date	Total cost	
From ______	To ______	______	☐ Breakdown attached
Date	Date	Total cost	
From ______	To ______	______	☐ Breakdown attached
Date	Date	Total cost	
From ______	To ______	______	☐ Breakdown attached
Date	Date	Total cost	
From ______	To ______	______	☐ Breakdown attached
Date	Date	Total cost	

Note: Soil treatment was completed in 1997 and groundwater monitoring discontinued in 1999. LUC inspections are conducted annually

3. U**nanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: NAS

V. ACCESS AND LAND USE CONTROLS ☐ Applicable ☒ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A
Remarks:

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on map ☐ N/A
Remarks: This is an approximately 25-acre site located in an industrial portion of JBLM. Fencing was in place during excavation/soil treatment that was completed in 1997. Signs/fencing are not required as part of the remedy.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 002 – Solvent Refined Coal Pilot Plant (SRCPP) (FTLE-32)

C. Land Use Controls (LUCs)

1. **Implementation and Enforcement**

Site conditions imply LUCs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply LUCs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by)
Responsible party/agency **Army/JBLM**
Contact: ______________________
Name Title Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Have there been violations ☐ Yes ☒ No ☐ N/A

Other problems or suggestions ☒ Yes ☐ Report attached

Remarks: LUC Inspections are conducted annually to ensure no drinking water wells have been installed. The 2021 LUC inspection was conducted in December. The report is not yet available.

2. **Adequacy** ☒ LUCs are adequate ☒ LUCs are inadequate ☐ N/A

Remarks: LUCs are required to prevent use of groundwater and include preventing new drinking water wells without USEPA approval. However, residual soil contamination remains that does not allow residential land use. The 2017 LUC Plan does not restrict residential land use at SRCPP. Restriction of residential land use should be incorporated into the LUC Plan and LUC inspection checklist.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks: ______________________

2. **Land use changes onsite** ☒ N/A
Remarks: ______________________

3. **Land use changes offsite** ☒ N/A
Remarks: ______________________

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads Adequate ☐ N/A
Remarks: ______________________

B. Other Site Conditions

Remarks: Four granular activated carbon vessels were observed on the site. Mr. Lambiotte noted that the contents had been characterized and removed however, disposal of the vessels has not been accomplished as was recommended in the 2017 FYR.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 002 – Solvent Refined Coal Pilot Plant (SRCPP) (FTLE-32)

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

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

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

C. Treatment System ☐ Applicable ☒ N/A

D. Monitored Natural Attenuation ☒ N/A **Groundwater data was collected as prescribed to determine the effectiveness of the soil treatment. Monitoring was discontinued in June 1999 and is no longer required.**

1. Monitoring data
☐ Is routinely submitted on time ☐ Is of acceptable quality
Remarks:

2. Monitoring data suggest
☐ Contaminant concentrations are declining ☐ Contaminant concentrations are increasing
☐ Groundwater plume is effectively contained ☐ Groundwater plume is not contained
Remarks:

3. Monitoring Wells (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely Sampled ☐ Good Condition
☐ All Required Wells Located ☐ Needs Maintenance
Remarks: ______.

X. OTHER REMEDIES

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

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

The remedy includes excavation/treatment of contaminated soil, groundwater monitoring to ensure effectiveness of soil treatment, and implementing Institutional Controls to prevent installation of drinking water wells without USEPA approval. The remedy is functioning as designed and is effective at preventing future groundwater contamination however residual soil contamination remains and the remedy does not restrict residential land use. Recommend incorporating prevention of residential land use in the JBLM LUC Plan and to the annual inspection checklist.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 002 – Solvent Refined Coal Pilot Plant (SRCPP) (FTLE-32)

B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. **None.**
C. Early Indicators of Potential Remedy Problems
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. **None.**
D. Opportunities for Optimization
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. **None.**

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 003 – American Lake Garden Tract
(MF-ALGT-LF-05)

I. SITE INFORMATION	
Site name: **Joint Base Lewis-McChord (JBLM)** **OU3 – American Lake Garden Tract (MF-ALGT-LF-05)**	Date/Time of inspection: **November 9, 2021**
Location and region: **JBLM, Pierce County, Washington – EPA Region 10**	USEPA ID: **WA9214053465**
Agency, office or company leading the Five-Year Review: **US Army/JBLM**	Weather/temperature: **Sunny to partly cloudy, 46 degrees. Ground is wet with standing water from recent rain event.**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Land use controls
- ☒ Groundwater pump and treat
- ☐ Surface water collection and treatment
- ☐ Other
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster (below) ☐ Site map attached

- Gary Richards, USACE Kansas City District, Project Manager
- Jerome Lambiotte, AGEISS, Technical Lead/Representative for JBLM IRP Manager
- Allison Bailey, Aerostar, FYR Project Manager
- Andrea Heinzenberger, Aerostar, Project Support

II. INTERVIEWS (Check all that apply)

1. IRP site manager **Mark Mettler**, **JBLM Department of Public Works, IRP Manager** **11/09/2021**
Name Title Date
Interviewed ☐ at site ☒ at office/email ☐ by phone Phone no. **253-966-8004**
Problems, suggestions: ☒ Interview Record included as Appendix to the FYR Report

2. O&M staff - NA

3. Local regulatory authorities and response agencies (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.
Agency: **Washington Department of Ecology (Ecology)**
Contact: **Jason Cook, Toxic Cleanup Program, Hydrogeologist** **11/09/2021** **360-407-6834**
Name Title Date Phone no.
Problems; suggestions; ☒ Interview Record included as Appendix to the FYR Report

4. Other interviews (optional) ☒ Interview Record included as Appendix to the FYR Report
Agency: **US EPA Region 10**
Contact: **Patrick Hickey, Superfund Remedial Project Manage** **11/09/2021** **206-553-6295**
Name Title Date Phone no.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 003 – American Lake Garden Tract
(MF-ALGT-LF-05)

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - O&M manual ☒ Readily available ☐ Up to date ☐ N/A
   - As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
   - Maintenance logs ☒ Readily available ☐ Up to date ☐ N/A

   Remarks: **The groundwater pump and treat system was shut down in 2016 and has remained off-line. Groundwater monitoring/sampling has been conducted over a 22 year period and continues LUC Inspections are performed annually. The 2021 LUC inspection was conducted in December. The report is not currently available.**

2. **Site Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
   - Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A

   Remarks: **Plans are developed by contractors for any activities performed. AAPP was on-site for FYR site visit and signed by all attendees.**

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A

   Remarks:

4. **Permits and Service Agreements**
   - ☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
   - ☐ Other permits__________ ☐ Readily available ☐ Up to date ☒ N/A

   Remarks:

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

   Remarks:

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

   Remarks:

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☐ N/A

   Remarks: **Data is collected as prescribed; however, all the reports are not currently up to date. The 2020 Groundwater Monitoring (GWM) Report has not been finalized and the 2021 GWM Report is not yet available.**

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

   Remarks:

9. **Discharge Compliance Records**
   - ☐ Air ☐ Readily available ☐ Up to date ☐ N/A
   - ☐ Water (effluent) ☐ Readily available ☐ Up to date ☐ N/A

   Remarks:

10. **Daily Access/Security Logs**
    - ☐ Readily available ☐ Up to date ☒ N/A

    Remarks:

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 003 – American Lake Garden Tract
(MF-ALGT-LF-05)

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house ☐ Contractor for State
   - ☐ PRP in-house ☐ Contractor for PRP
   - ☐ Federal Facility in-house ☒ Contractor for Federal Facility
   - ☐ Other _

2. **O&M Cost Records**
   - ☐ Readily available ☐ Up to date
   - ☒ Funding mechanism/agreement in place

   Original O&M cost estimate **$** ☐ Breakdown attached Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
From ______	To ______	______	☐ Breakdown attached
From ______	To ______	______	☐ Breakdown attached
From ______	To ______	______	☐ Breakdown attached
From ______	To ______	______	☐ Breakdown attached
From ______	To ______	______	☐ Breakdown attached

Note:

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: NA

V. ACCESS AND LAND USE CONTROLS ☒ Applicable ☐ N/A

A. Fencing

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

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on map ☐ N/A
   Remarks: The pump and treat system is no longer operational. The treatment systems are housed in locked buildings.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 003 – American Lake Garden Tract
(MF-ALGT-LF-05)

C. Land Use Controls (LUCs)

1. **Implementation and Enforcement**

Site conditions imply LUCs not properly implemented	☐ Yes	☒ No	☐ N/A
Site conditions imply LUCs not being fully enforced	☐ Yes	☒ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by)
Responsible party/agency **Army/JBLM**
Contact: ______ Name ______ Title ______ Phone no.

Reporting is up-to-date	☐ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☐ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☒ Yes	☐ No	☐ N/A
Have there been violations	☐ Yes	☒ No	☐ N/A

Other problems or suggestions ☐ Report attached

Remarks: LUC Inspections are conducted annually. The 2021 LUC inspection was conducted in December. The report is not currently available.

2. **Adequacy** ☒ LUCs are adequate ☐ LUCs are inadequate ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks: ______

2. **Land use changes onsite** ☒ N/A
Remarks: **The pump and treat system is no longer operational**

3. **Land use changes offsite** ☒ N/A
Remarks: **No change in the land use observed**

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads Adequate ☐ N/A
Remarks: ______

B. Other Site Conditions

Remarks:

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 003 – American Lake Garden Tract
(MF-ALGT-LF-05)

VII. LANDFILL COVERS ☐ **Applicable** ☒ **N/A**

VIII. VERTICAL BARRIER WALLS ☐ **Applicable** ☒ **N/A**

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ **Applicable** ☐ **N/A**

A. Groundwater Extraction Wells, Pumps, and Pipelines
☒ **Applicable** ☐ **N/A**
Remarks: Groundwater extraction and treatment was ceased in 2016. There are no plans to restart the system.

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ ☐ All required wells properly operating ☐ Needs Maintenance ☒ ☐ N/A
Remarks____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks____

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

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

C. Treatment System ☐ **Applicable** ☒ **N/A**

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters____
☐ Additive (*e.g.*, chelation agent, flocculent)________________________
☐ Others____
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually________________________
☐ Quantity of surface water treated annually________________________
Remarks____

2. **Electrical Enclosures and Panels** (properly rated and functional)
☒ N/A ☐ Good condition ☐ Needs Maintenance
Remarks____

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 003 – American Lake Garden Tract
(MF-ALGT-LF-05)

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks______________________________

4. **Discharge Structure and Appurtenances**
☒ N/A ☐ Good condition ☐ Needs Maintenance
Remarks______________________________

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

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

D. Monitored Natural Attenuation

1. Monitoring data
☒ **Is routinely submitted on time** ☒ **Is of acceptable quality**
Remarks: <u>Data is collected as prescribed; however, all the reports are not currently up to date. The 2020 Groundwater Monitoring (GWM) Report has not been finalized and the 2021 GWM Report is not yet available.</u>

2. Monitoring data suggest
☒ **Contaminant concentrations are declining** ☐ **Contaminant concentrations are increasing**
☒ **Groundwater plume is effectively contained** ☐ **Groundwater plume is not contained**
Remarks: <u>Contaminant concentration data collected from a rebound test initiated in 2016 indicate that the plume is in a steady-state condition without the extraction system running. The data show no TCE rebound and an apparent mass reduction. The 2018 Groundwater Monitoring Report recommends MNA with continued monitoring and ICs. The Washington Department of Ecology concurs with the findings and recommendations presented in the Final Focused Feasibility Study, dated November 2020.</u>

3. Monitoring Wells (natural attenuation remedy)
☒ **Properly secured/locked** ☒ **Functioning** ☒ **Routinely Sampled** ☒ **Good Condition**
☐ **All Required Wells Located** ☐ **Needs Maintenance**
Remarks: ______________________________.

OSWER No. 9355.7-03B-P

Five-Year Review Site Inspection Checklist
Joint Base Lewis-McChord, Washington
OU 003 – American Lake Garden Tract
(MF-ALGT-LF-05)

X. OTHER REMEDIES
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS
A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). **The selected remedy for ALGT as listed in the 1991 specifies containment of the groundwater VOC plume (TCE, cis-1,2-DCE, 1,1-DCE, and VC) utilizing a groundwater pump and treat system (GPT). Operation of the ALGT GPT occurred from 1994 to 2016. The decision to cease operation of the GPT was approved following the submittal of a Technical Memorandum in 2015, which recommended conducting a Site Management Improvement Study in order to evaluate monitored natural attenuation (MNA) as a viable treatment technology to replace the GPT system. The study along with annual groundwater monitoring concluded that the plume is in a steady-state condition without the extraction system running and reductive dichlorination is occurring. A Focused Feasibility Study (FFS) completed in November 2020 indicated that while the system removed small amounts of contaminant annually, the rate of contaminant removal was not driving the site towards closure in an expedient manner and that the GPT is ineffective and costly to operate and maintain. The FFS recommended revising the remedy from GPT to MNA. A ROD Amendment has been drafted (August 2021) to change the remedy. The administrative and institutional control specified in the 1991 remedy will be maintained to minimize exposure to hazardous substances.**
B. Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. **The 2017 through 2021 O&M activities required for the Area D/ALGT NPL site were conducted in accordance with the 2017 LUC plan and with the 2016 Groundwater Monitoring Plan Addendum. O&M procedures should be reviewed and modified as appropriate to reflect the change in the remedy from GPT to MNA.**
C. Early Indicators of Potential Remedy Problems
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. **As the GPT is no longer operational, the cost of the remedy, along with the scope of the O&M, has changed and been substantially reduced. There will be additional changes to the cost/scope when the treatment system is decommissioned.**
D. Opportunities for Optimization
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. **Optimization of the remedy occurred in 2016 when the treatment system was shut down in 2016. Monitoring tasks were optimized in 2018 for MNA analysis. Additional opportunities for optimization of the monitoring tasks will be evaluated in 2023 when select wells are decommissioned along with the treatment system.**

FYR Site Photographic Log

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Five-Year Review Site Inspection
Logistics Center (FTLE-33)
Joint Base Lewis McChord, Washington

Photograph 1:	
Direction: SE	
Comments: View of the JBLM I-5 treatment system area.	

Five-Year Review Site Inspection
Logistics Center (FTLE-33)
Joint Base Lewis McChord, Washington

Photograph 2:

Direction: S

Comments:

View of the JBLM I-5 treatment system area, which is within a secured fence.

Five-Year Review Site Inspection
Logistics Center (FTLE-33)
Joint Base Lewis McChord, Washington

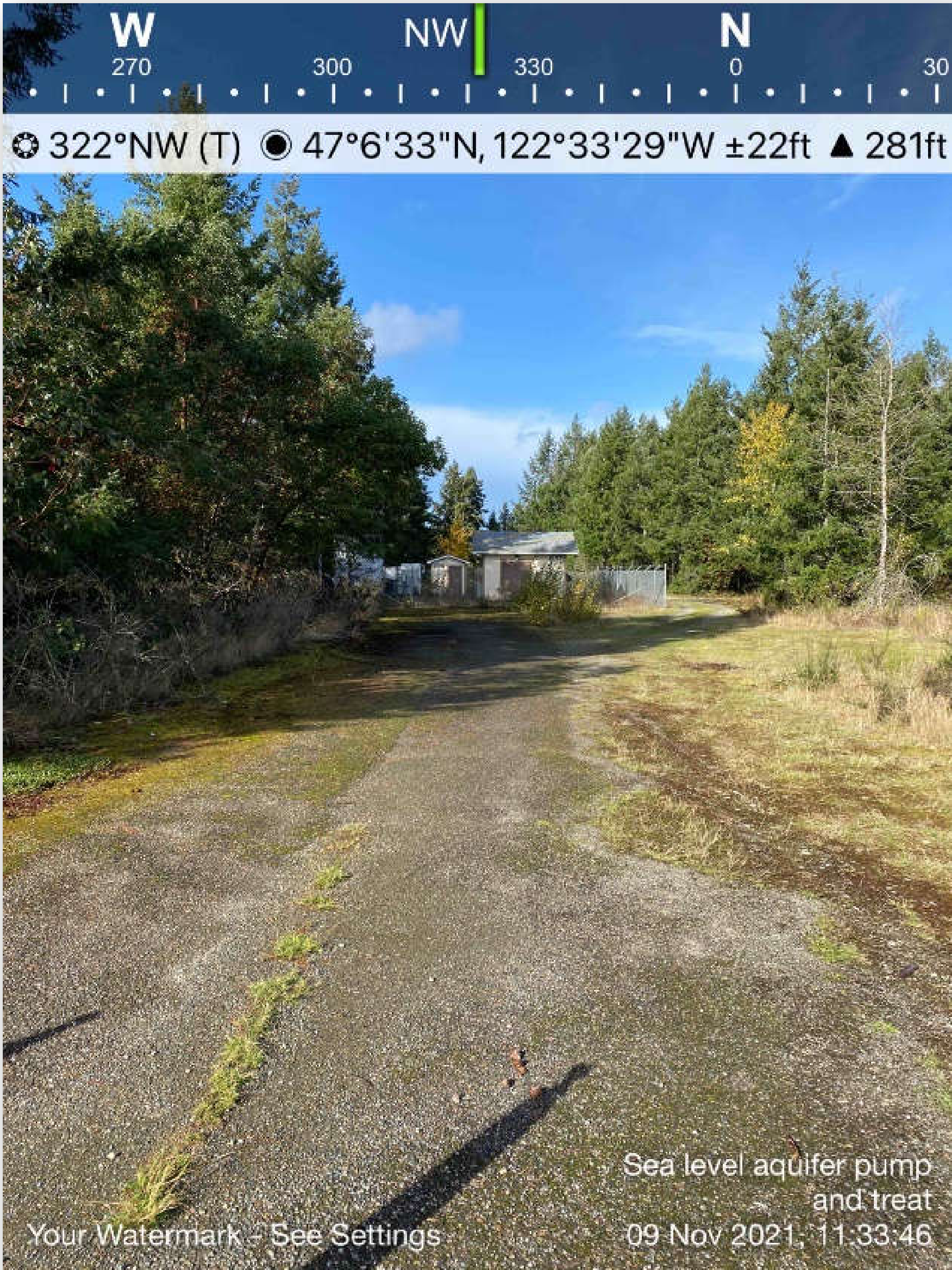
Photograph 3:

Direction: SSW

Comments:

View of the JBLM I-5 treatment system area.

Five-Year Review Site Inspection
Logistics Center (FTLE-33)
Joint Base Lewis McChord, Washington

Photograph 4:	
Direction: NW	
Comments: View of the Sea Level Aquifer (SLA) pump and treat system.	

Five-Year Review Site Inspection
Logistics Center (FTLE-33)
Joint Base Lewis McChord, Washington

Photograph 5:	
Direction: SW	
Comments: View of the SLA pump and treat system.	

Five-Year Review Site Inspection
Logistics Center (FTLE-33)
Joint Base Lewis McChord, Washington

Photograph 6:	
Direction: S	
Comments: View of LF-2 pump and treat system	

Five-Year Review Site Inspection
Logistics Center (FTLE-33)
Joint Base Lewis McChord, Washington

Photograph 7:

Direction: SE

Comments:

View of access road to the Landfill 2 (LF-2) pump and treat system

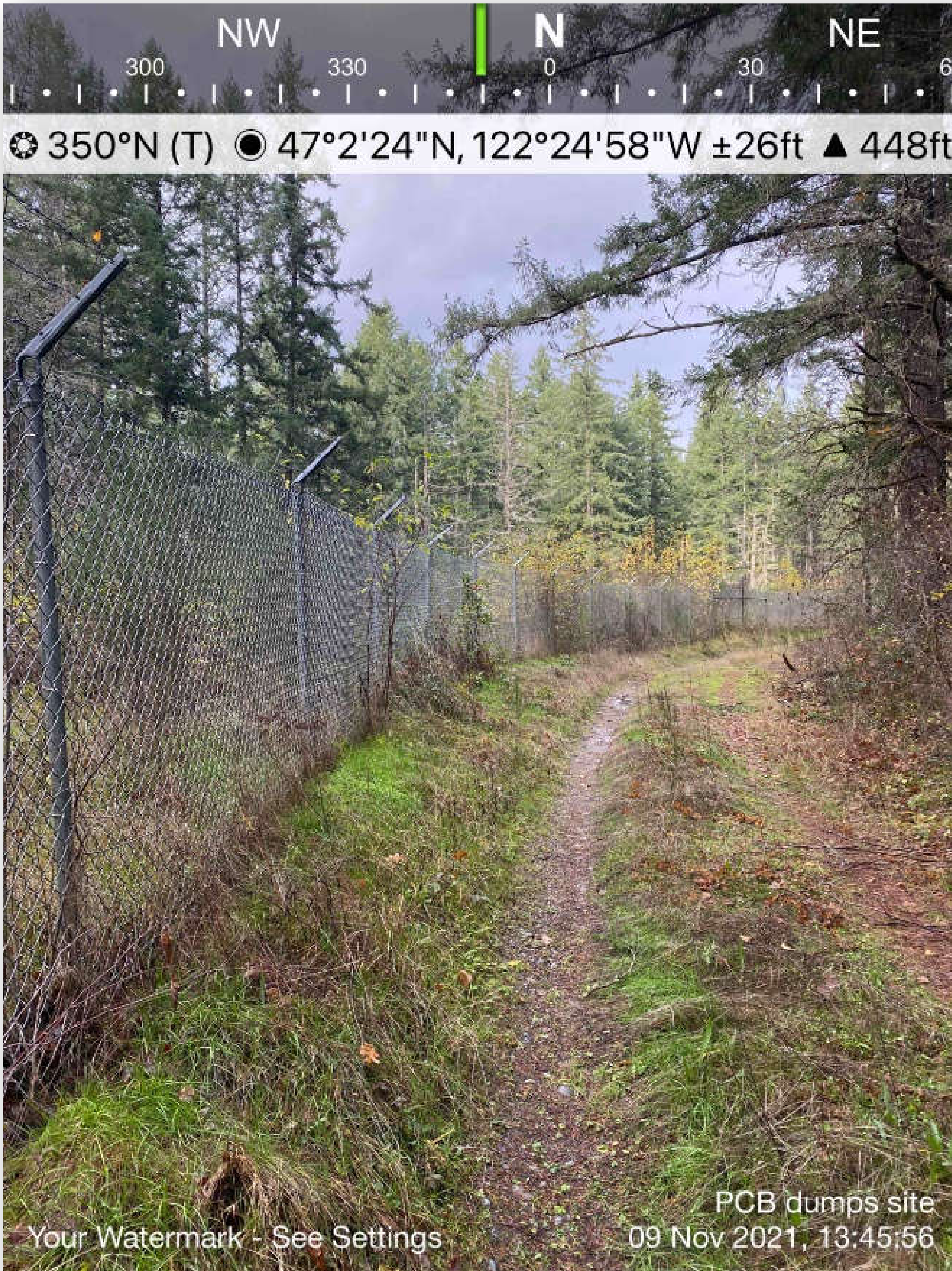
Five-Year Review Site Inspection
Logistics Center (FTLE-33)
Joint Base Lewis McChord, Washington

Photograph 8:	
Direction: NE	
Comments: View of a well associated with the LF-2 pump and treat system	

Five-Year Review Site Inspection
Illicit PBC Dump Site (FTLE-46)
Joint Base Lewis McChord, Washington

Photograph 1:	
Direction: NE	
Comments: View of the locked gate to the entrance of the Illicit PCB Dump Site facing northeast.	

Five-Year Review Site Inspection
Illicit PBC Dump Site (FTLE-46)
Joint Base Lewis McChord, Washington

<table>
<tr><td>Photograph 2:</td><td rowspan="3">
</td></tr>
<tr><td>Direction: N</td></tr>
<tr><td>Comments:
View of the eastern side of the Illicit PCB Dump Site (inside the fenced area) facing north.</td></tr>
</table>

Five-Year Review Site Inspection
Illicit PBC Dump Site (FTLE-46)
Joint Base Lewis McChord, Washington

Photograph 3:

Direction: W

Comments:

View of the Illicit PCB Dump Site facing west. Note the capped area within the fence is heavily vegetated.

Five-Year Review Site Inspection
Illicit PBC Dump Site (FTLE-46)
Joint Base Lewis McChord, Washington

Photograph 4:	
Direction: **SW**	
Comments: View of the Illicit PCB Dump Site facing southwest. Note the overgrown vegetation and growth of small saplings within the fenced area.	

Five-Year Review Site Inspection
Illicit PBC Dump Site (FTLE-46)
Joint Base Lewis McChord, Washington

Photograph 5:	
Direction: S	
Comments: View of the west side of the Illicit PCB Dump Site facing south.	

Five-Year Review Site Inspection
Illicit PBC Dump Site (FTLE-46)
Joint Base Lewis McChord, Washington

Photograph 6:

Direction: E

Comments:

View of the west side of the Illicit PCB Dump Site facing east.

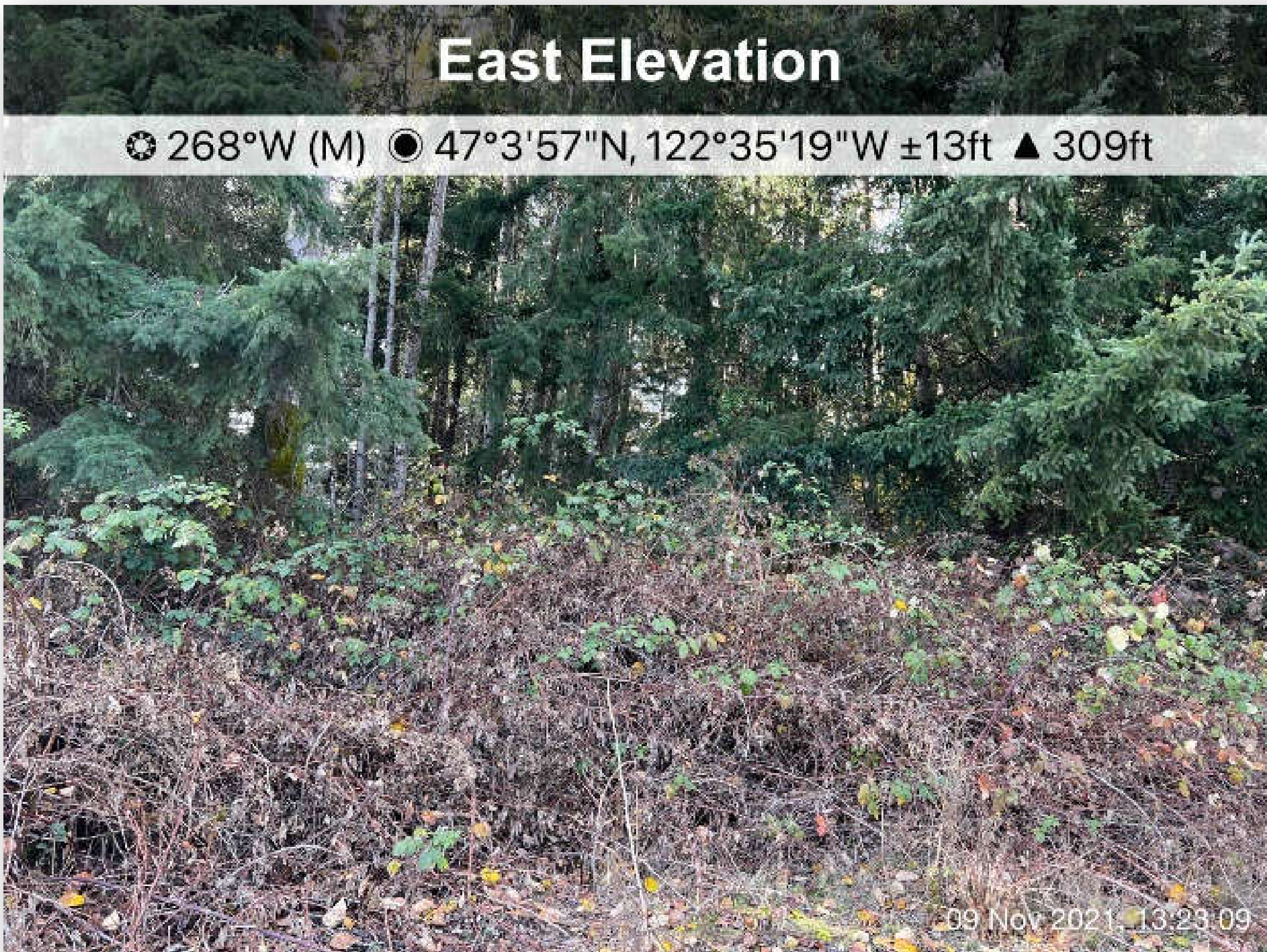
Five-Year Review Site Inspection
Landfill 1 (FTLE-54)
Joint Base Lewis McChord, Washington

Photograph 1:	
Direction: N	
Comments: View of the Landfill 1 area facing north.	

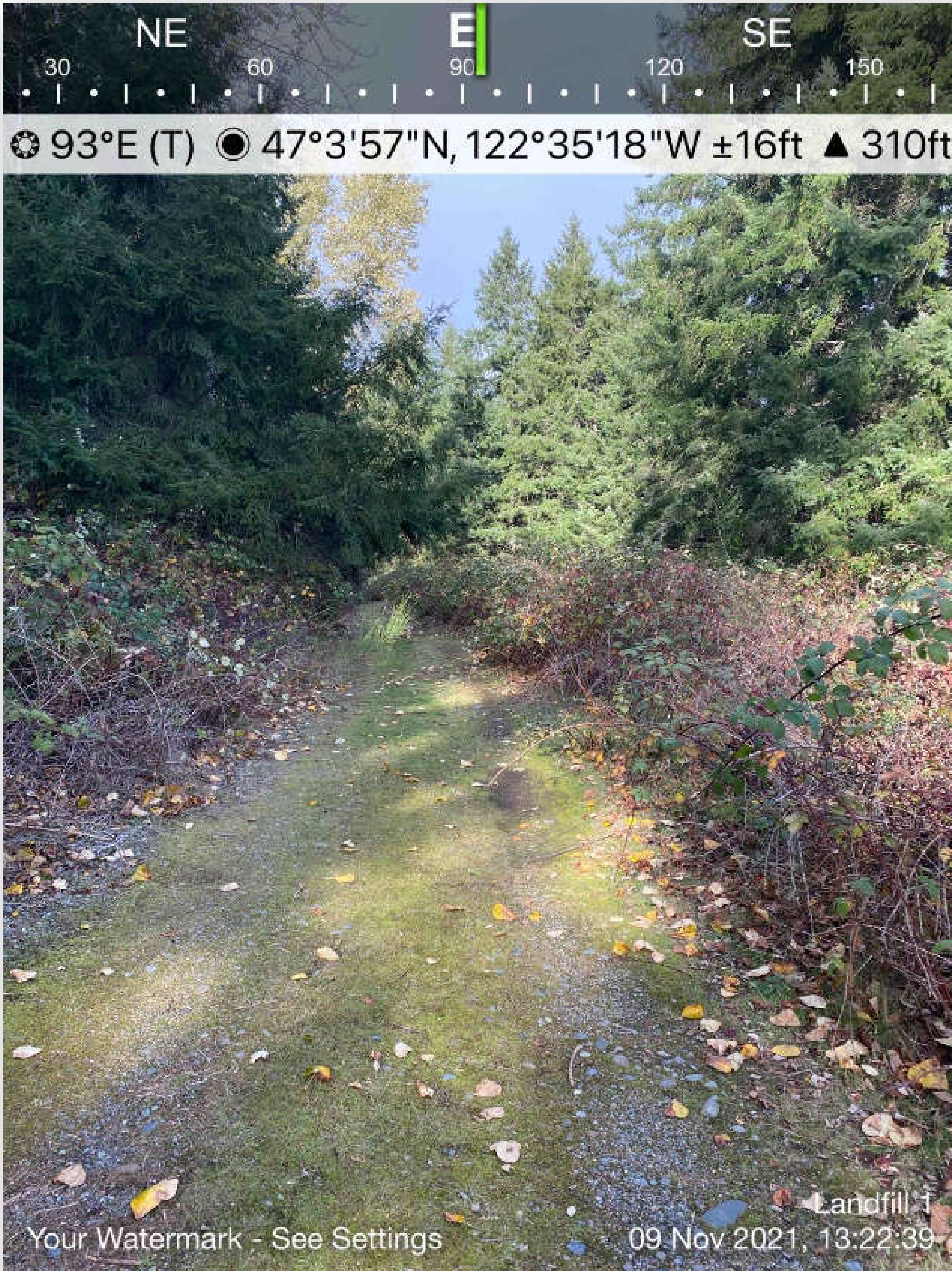
Five-Year Review Site Inspection
Landfill 1 (FTLE-54)
Joint Base Lewis McChord, Washington

<table>
<tr><td>Photograph 2:</td><td rowspan="3">
</td></tr>
<tr><td>Direction: NE</td></tr>
<tr><td>Comments:
View of the Landfill 1 area facing northeast. Note that the site is located in an area designated for maintenance/industrial use.</td></tr>
</table>

Five-Year Review Site Inspection
Landfill 1 (FTLE-54)
Joint Base Lewis McChord, Washington

Photograph 3:	
Direction: W	
Comments: View of the Landfill 1 area facing west. Note the thick vegetation surrounding the landfill area.	

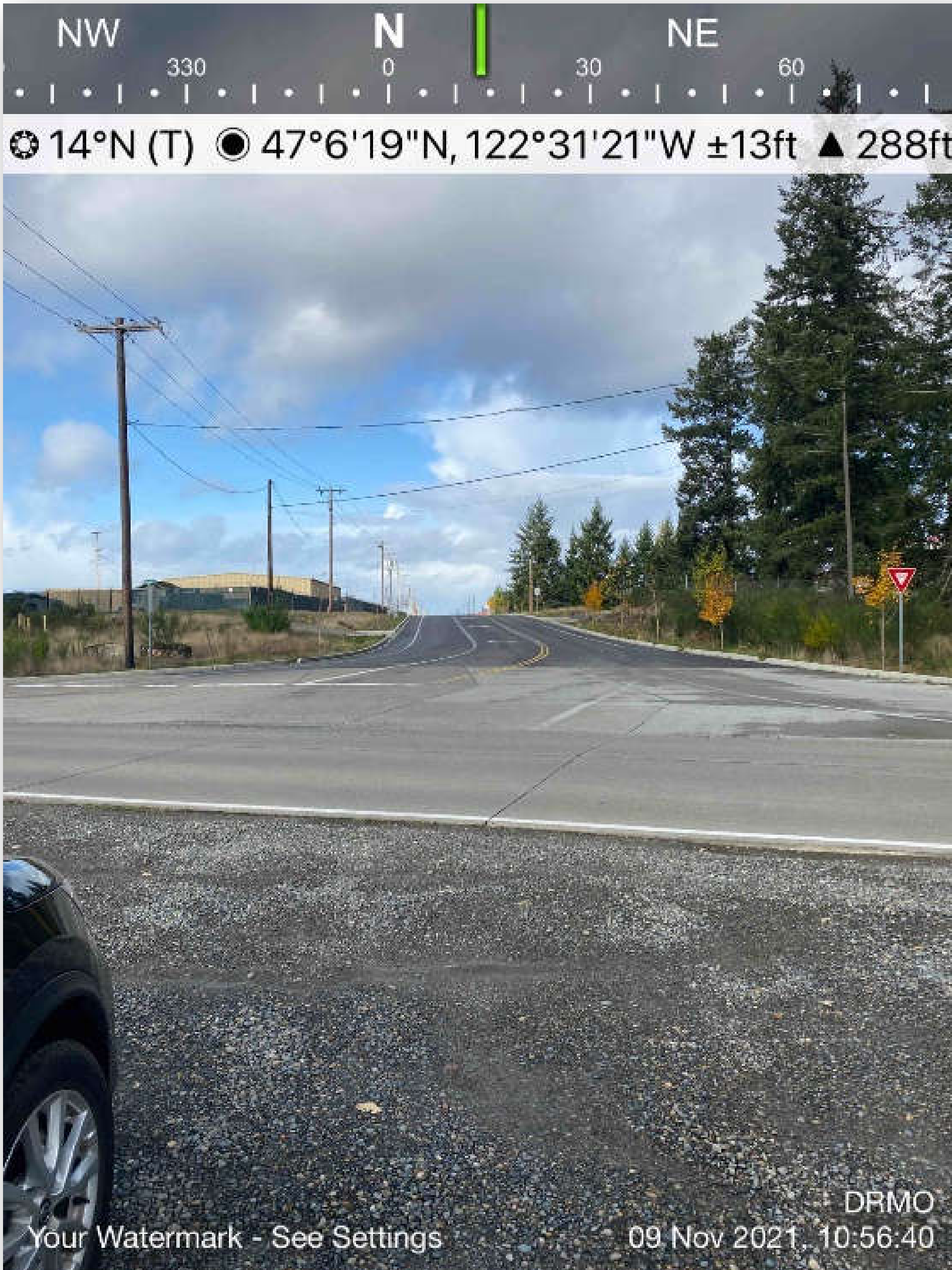
Five-Year Review Site Inspection
Landfill 1 (FTLE-54)
Joint Base Lewis McChord, Washington

Photograph 4:	
Direction: E	
Comments: View of the Landfill 1 area facing east.	

Five-Year Review Site Inspection
Battery Acid Pit (FTLE-16)
Joint Base Lewis McChord, Washington

Photograph 1:	
Direction: NE	
Comments: View of the battery acid pit facing northeast. The site is within a fenced area of the Logistics Center Readiness Area. .	

Five-Year Review Site Inspection
Defense Reutilization and Marketing Office Yard (FTLE-31)
Joint Base Lewis McChord, Washington

Photograph 1:	
Direction: N	
Comments: View of the Defense Reutilization and Marketing Office (DRMO) Yard facing north.	

Five-Year Review Site Inspection
Defense Reutilization and Marketing Office Yard (FTLE-31)
Joint Base Lewis McChord, Washington

Photograph 2:

Direction: **W**

Comments:

View of the DRMO facing west.

Five-Year Review Site Inspection
Defense Reutilization and Marketing Office Yard (FTLE-31)
Joint Base Lewis McChord, Washington

Photograph 3:

Direction: S

Comments:

View of the DRMO facing south.

Five-Year Review Site Inspection
Defense Reutilization and Marketing Office Yard (FTLE-31)
Joint Base Lewis McChord, Washington

Photograph 4:

Direction: NW

Comments:

View of the DRMO facing northwest.

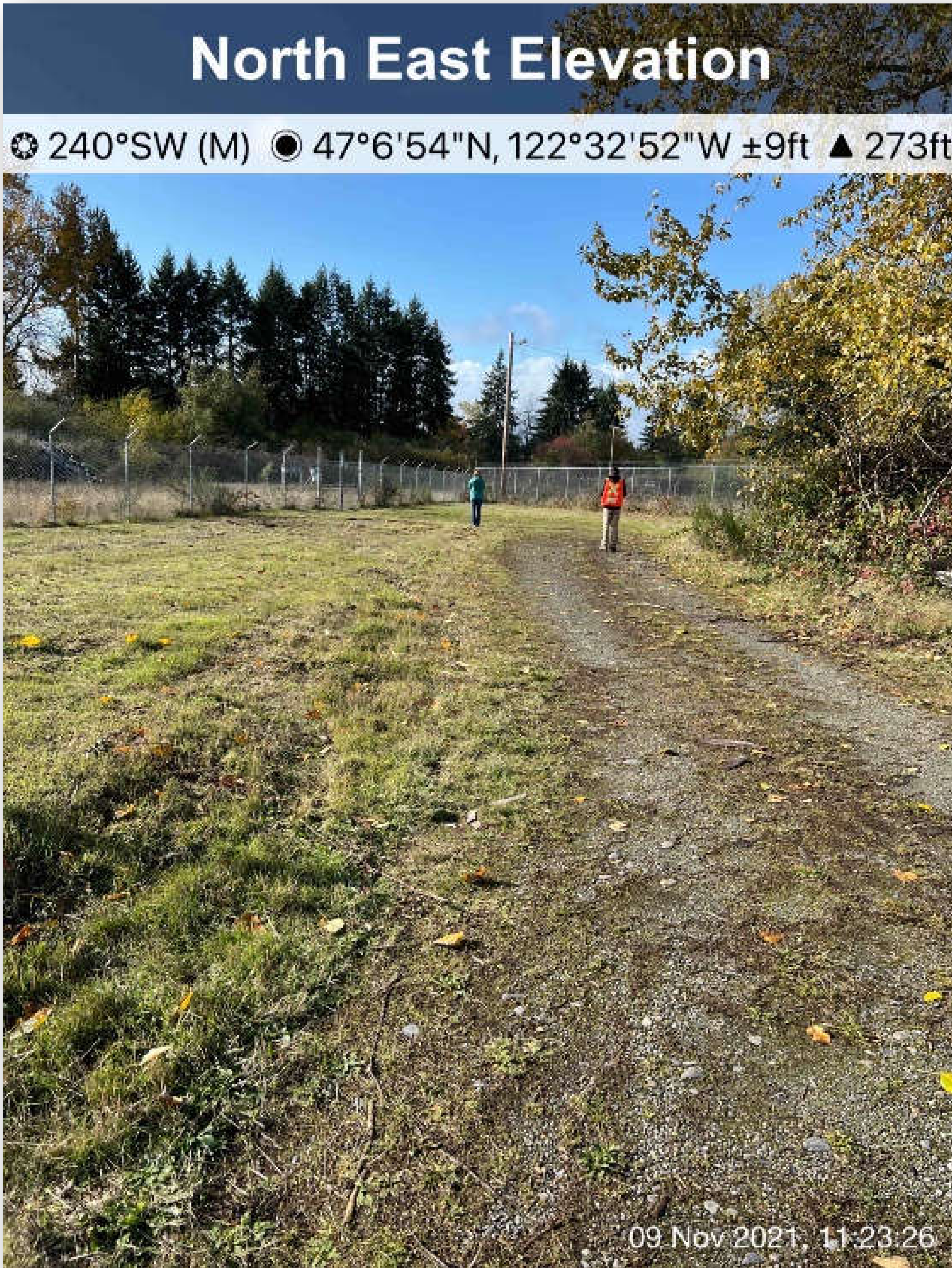
Five-Year Review Site Inspection
Industrial Wastewater Treatment Plant
Joint Base Lewis McChord, Washington

Photograph 1:

Direction: NE

Comments:

View of the Industrial Wastewater Treatment Plant (WWTP) area facing northeast. Note that the site is located in a fenced area which is in place to prevent access to portions of the waste-water treatment area. The fence is not part of the remedy.



Five-Year Review Site Inspection
Industrial Wastewater Treatment Plant
Joint Base Lewis McChord, Washington

Photograph 2:	
Direction: SW	
Comments: View of the Industrial WWTP area facing southwest.	

Five-Year Review Site Inspection
Industrial Wastewater Treatment Plant
Joint Base Lewis McChord, Washington

<table>
<tr><td>Photograph 3:</td><td rowspan="3">
</td></tr>
<tr><td>Direction: W</td></tr>
<tr><td>Comments:
View of the Industrial WWTP area facing west.</td></tr>
</table>

Five-Year Review Site Inspection
Industrial Wastewater Treatment Plant
Joint Base Lewis McChord, Washington

<table>
<tr><td>Photograph 4:</td><td rowspan="3">
</td></tr>
<tr><td>Direction: S</td></tr>
<tr><td>Comments:
View of the Industrial WWTP area facing south.</td></tr>
</table>

Five-Year Review Site Inspection
Pesticide Rinse Area (FTLE-28)
Joint Base Lewis McChord, Washington

Photograph 1:	
Direction: W	
Comments: View of the former pesticide rinse area facing west. The site is located outside a former pesticide storage area near Building 2054 in the DMWR Supply/Warehouse facility, which is fenced.	

Five-Year Review Site Inspection
Pesticide Rinse Area (FTLE-28)
Joint Base Lewis McChord, Washington

<table>
<tr><td>Photograph 2:</td><td rowspan="3">
</td></tr>
<tr><td>Direction: SW</td></tr>
<tr><td>Comments:
View of the former pesticide rinse area facing southwest.</td></tr>
</table>

Five-Year Review Site Inspection
Pesticide Rinse Area (FTLE-28)
Joint Base Lewis McChord, Washington

Photograph 3:	
Direction: W	
Comments: View of the former pesticide rinse area facing west.	

Five-Year Review Site Inspection
Pesticide Rinse Area (FTLE-28)
Joint Base Lewis McChord, Washington

Photograph 4:	
Direction: NW	
Comments: View of the former pesticide rinse area facing northwest.	

Five-Year Review Site Inspection
Landfill 4 (FTLE-57)
Joint Base Lewis McChord, Washington

Photograph 1:

Direction: W

Comments:

View of the entrance to the source area of Landfill 4 off of Vancouver Road. Active treatment occurred on this portion of the landfill.

Five-Year Review Site Inspection
Landfill 4 (FTLE-57)
Joint Base Lewis McChord, Washington

<table>
<tr><td>Photograph 2:</td><td rowspan="3">
</td></tr>
<tr><td>Direction: NW</td></tr>
<tr><td>Comments:
View of the Landfill 4 source area. Approximately 10 empty drums were observed in the area.</td></tr>
</table>

Five-Year Review Site Inspection
Landfill 4 (FTLE-57)
Joint Base Lewis McChord, Washington

Photograph 3:

Direction: NW

Comments:

View of the Landfill 4 source area. Note the exposed portion of the geomembrane.

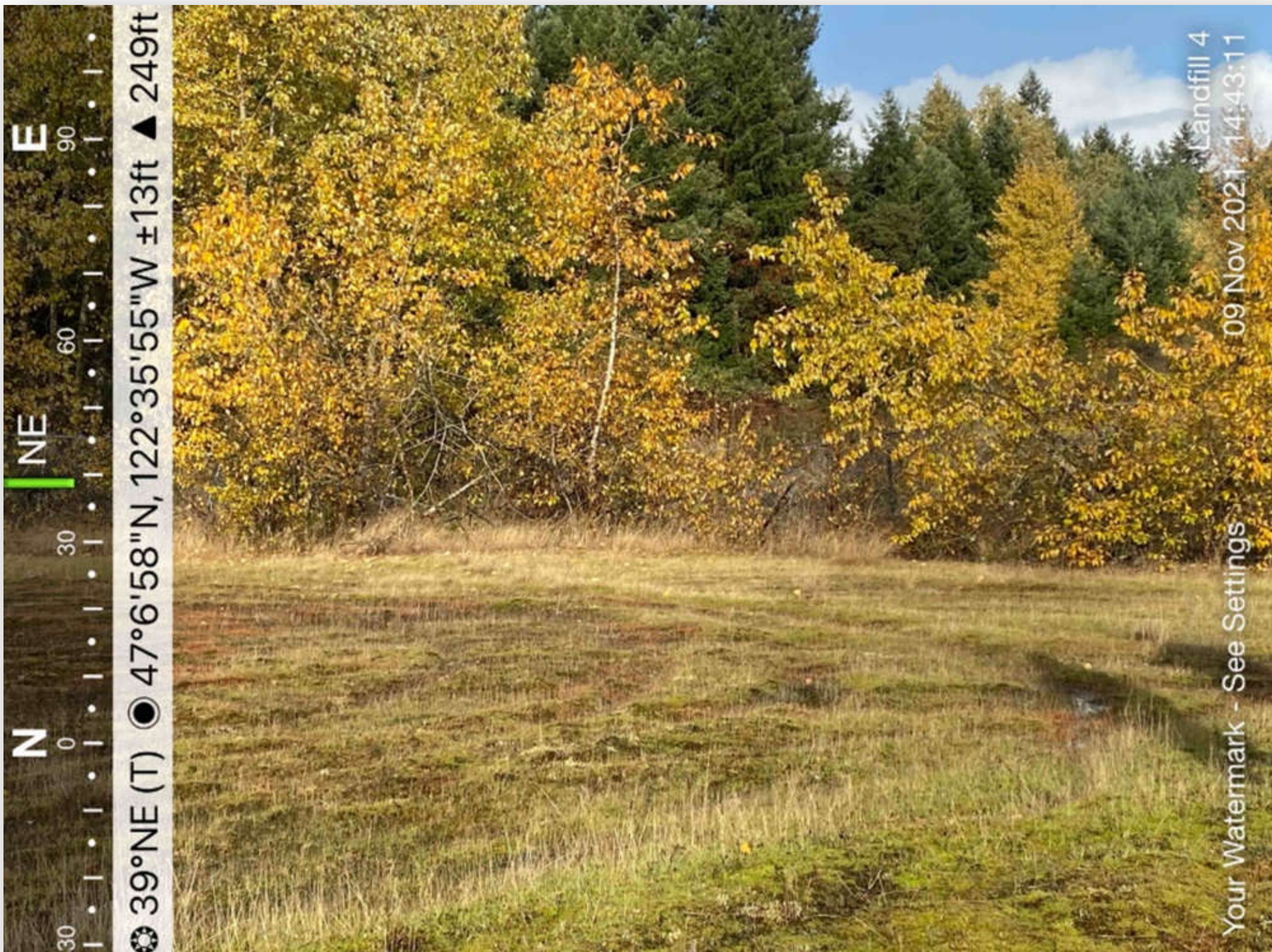
Five-Year Review Site Inspection
Landfill 4 (FTLE-57)
Joint Base Lewis McChord, Washington

Photograph 4:

Direction: NE

Comments:

View of Landfill 4 source area facing northeast



Five-Year Review Site Inspection
Landfill 4 (FTLE-57)
Joint Base Lewis McChord, Washington

Photograph 5:	
Direction: NE	
Comments: View of a monitoring well associated with Landfill 4.	

Five-Year Review Site Inspection
Landfill 4 (FTLE-57)
Joint Base Lewis McChord, Washington

<table>
<tr><td>Photograph 6:</td><td rowspan="3">
</td></tr>
<tr><td>Direction: NW</td></tr>
<tr><td>Comments:
View of Landfill 4 area berm created to prevent vehicles from disturbing the landfill cap.</td></tr>
</table>

Five-Year Review Site Inspection
Landfill 4 (FTLE-57)
Joint Base Lewis McChord, Washington

Photograph 7:	
Direction: NE	
Comments: View of gravel road to Sequalitchew Lake that transects the western portion of the landfill.	

Five-Year Review Site Inspection
Landfill 4 (FTLE-57)
Joint Base Lewis McChord, Washington

Photograph 8:	
Direction: W	
Comments: View of Landfill 4 area berm created to prevent vehicles from disturbing the landfill cap.	

Five-Year Review Site Inspection
Landfill 4 (FTLE-57)
Joint Base Lewis McChord, Washington

Photograph 9:	
Direction: NW	
Comments: View of ruts on the surface of the landfill from off-road vehicles	

Five-Year Review Site Inspection
Landfill 4 (FTLE-57)
Joint Base Lewis McChord, Washington

Photograph 10:

Direction: E

Comments:

View of ruts on the surface of the landfill from off-road vehicles

Five-Year Review Site Inspection
Solvent Refined Coal Pilot Plant (FTLE-32)
Joint Base Lewis McChord, Washington

Photograph 1:

Direction: **NNW**

Comments:

View of the Solvent Refined Coal Pilot Plant (SRCPP) area facing north-northwest.

Five-Year Review Site Inspection
Solvent Refined Coal Pilot Plant (FTLE-32)
Joint Base Lewis McChord, Washington

Photograph 2:

Direction: W

Comments:

View of the SRCPP area facing west.

Five-Year Review Site Inspection
Solvent Refined Coal Pilot Plant (FTLE-32)
Joint Base Lewis McChord, Washington

Photograph 3:

Direction: E

Comments:

View of the SRCPP area facing east. The site is located in an industrial portion of JBLM.

Five-Year Review Site Inspection
Solvent Refined Coal Pilot Plant (FTLE-32)
Joint Base Lewis McChord, Washington

Photograph 4:

Direction: S

Comments:

View of the SRCPP area facing south.

Five-Year Review Site Inspection
Solvent Refined Coal Pilot Plant (FTLE-32)
Joint Base Lewis McChord, Washington

Photograph 5:

Direction: **N**

Comments:

View of the SRCPP area facing north.

Five-Year Review Site Inspection
Solvent Refined Coal Pilot Plant (FTLE-32)
Joint Base Lewis McChord, Washington

Photograph 6:	
Direction: W	
Comments: View of the SRCPP area facing west. Note the carbon vessels located at the site. The contents have been removed however the vessels still remain onsite.	

Five-Year Review Site Inspection
ALGT (MF-ALGT-LF-05)
Joint Base Lewis McChord, Washington

Photograph 1:	
Direction: **SW**	
Comments: View of the ALGT Treatment System Building.	

Five-Year Review Site Inspection
ALGT (MF-ALGT-LF-05)
Joint Base Lewis McChord, Washington

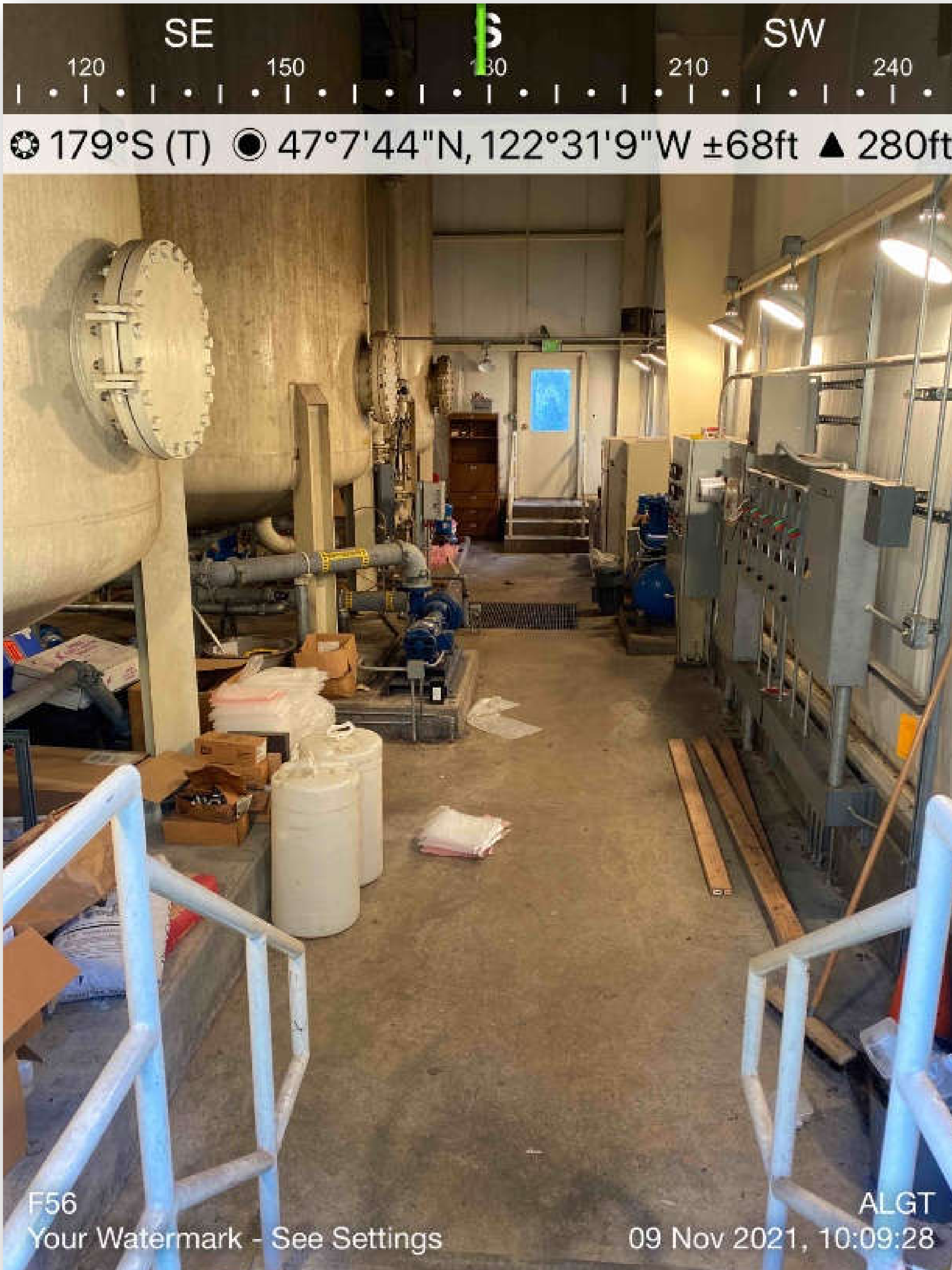
Photograph 2:

Direction: W

Comments:

View of ALGT treatment area near the golf course.

Five-Year Review Site Inspection
ALGT (MF-ALGT-LF-05)
Joint Base Lewis McChord, Washington

<table>
<tr><td>**Photograph 3:**</td><td rowspan="3">
</td></tr>
<tr><td>**Direction: S**</td></tr>
<tr><td>**Comments:**
View of the ALGT treatment system. Note that the system has been shut down since 2016.</td></tr>
</table>

Five-Year Review Site Inspection
ALGT (MF-ALGT-LF-05)
Joint Base Lewis McChord, Washington

<table>
<tr><td>Photograph 4:</td><td rowspan="3">
</td></tr>
<tr><td>Direction: N</td></tr>
<tr><td>Comments:
View of ALGT vaulted wells.</td></tr>
</table>

Five-Year Review Site Inspection
ALGT (MF-ALGT-LF-05)
Joint Base Lewis McChord, Washington

Photograph 5:

Direction: **S**

Comments:

View of the ALGT treatment system area near the golf course.

Five-Year Review Site Inspection
ALGT (MF-ALGT-LF-05)
Joint Base Lewis McChord, Washington

Photograph 6:	
Direction: W	
Comments: View of ALGT system building.	

Five-Year Review Site Inspection
ALGT (MF-ALGT-LF-05)
Joint Base Lewis McChord, Washington

<table>
<tr><td>Photograph 7:</td><td rowspan="3">
</td></tr>
<tr><td>Direction: N</td></tr>
<tr><td>Comments:
View of the ALGT area near a residential area.</td></tr>
</table>

Five-Year Review Site Inspection
ALGT (MF-ALGT-LF-05)
Joint Base Lewis McChord, Washington

Photograph 8:	
Direction: SE	
Comments: View of a monitoring well associated with the ALGT.	

Appendix D

Interview Records

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Five-Year Review Interview Record

Site: Joint Base Lewis-McChord, Washington	EPA ID No:	WA9214053465
• **FTLE-16 (Battery Acid Pit):** Maintain existing asphalt cap and Land Use Controls (LUCs). • **FTLE-28 (Pesticide Rinse Area):** LUCs to prevent residential land use within the site boundary. • **FTLE-31 (DRMO Yard):** LUCs to prevent residential land use within the site boundary. • **FTLE-33 (Logistics Center):** Extract and treat contaminated groundwater, long-term groundwater monitoring (LTM), and LUCs. • **FTLE-46 (Illicit PCB Dump Site):** Maintain existing clay cap and LUCs. • **FTLE-51 (Industrial Wastewater Treatment Plant):** LUCs to prevent residential land use within the site boundary. • **FTLE-54 (Landfill 1):** Groundwater LTM and LUCs. • **FTLE-57 (Landfill 4):** Air sparging with soil vapor extraction and LUCs. • **FTLE-32 (Solvent Refined Coal Pilot Plant):** Excavation and treatment of contaminated soils, groundwater monitoring during remediation, and LUCs. • **MF-ALGT-LF-05 (American Lake Garden Tract):** Extract and treat contaminated groundwater, LTM, and LUCs.		

Interview Type: Questionnaire via Email
Location of Visit: NA – ONLY applies to ALGT Site.
Date: 11/29/2021
Time: 10:00

Interviewers

Name	Title	Organization
NA	NA	**Aerostar Environmental and Construction LLC**

Interviewees

Name	Organization	Title	Telephone	Email
J.G. Cook	Ecology	HG3	360.763.2777	ASCO461@ecy.wa.gov

Summary of Questions

1. **How long and in what capacity have you been involved with JBLM and with the 10 sites included in this Five-Year Review?** *Only work with ALGT in the above list. Assigned this Site about two years ago.*

2. **Have there been routine communications or activities conducted by your office regarding the sites? If so, please give purpose and results.** *Review of documents and generation of responses.*

3. **How are contracts for monitoring and inspections for the sites managed?** *Not within scope*

4. **Is there a continuous Operations & Maintenance (O&M) presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.** *Quarterly GWM performed at the Site by JBLM consultants.*

5. **Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? Please describe changes and impacts.** *No, MNA of groundwater.*

6. What are the annual operating costs for your organization's involvement with each of the 10 sites? *Unknown.*
7. **Have there been unexpected O&M difficulties or costs associated with any of the sites in the last five years? If so, please give details.** *No.*
8. **Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.** *None identified. Quarterly monitoring and sampling of ALGT Site MWs.*
9. **Other than routine groundwater monitoring, are you aware of any other work completed at each of the 10 sites in the last five years? If so, please explain.** *A FFS was generated in 2020. State concurrence with selected method.*
10. Are you aware of any intrusive activities performed at any of the 10 sites? If so, please explain. *None recently.*
11. **Are you aware of any changes in land use at JBLM or in the area surrounding the 10 sites? If so, please explain.** *Not to my knowledge.*
12. Are you aware of any trespassing at any of the 10 sites? If so, please explain. *Not to my knowledge.*
13. Have you received any complaints, violations, or comments from the community or other stakeholders requiring a response by your office? If so, please explain. *No.*
14. Do you feel well informed about the sites' activities and progress? *Yes.*
15. **Is the remedy functioning as expected at each site? How well is the remedy performing at each site?** *Yes, MNA for ALGT Site.*
16. **What does the monitoring data show at each site? Are there any trends that show contaminant levels are changing?** *Plume stable/decreasing in magnitude and extent.*
17. Has any other information come to light that could call into question the protectiveness of the remedy at each site? *Not to my knowledge.*
18. **Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedies at each of the 10 sites?** *No.*
19. Do you have any comments, suggestions, or recommendations regarding the project? *Not at this time.*
Additional Site-Specific Questions
[If needed]

<table>
<tr><th colspan="5">Five-Year Review Interview Record</th></tr>
<tr><td colspan="3">Site: <u>Joint Base Lewis-McChord, Washingon</u>
FTLE-16 (Battery Acid Pit): Maintain existing asphalt cap and Land Use Controls (LUCs).
FTLE-28 (Pesticide Rinse Area): LUCs to prevent residential land use within the site boundary.
FTLE-31 (DRMO Yard): LUCs to prevent residential land use within the site boundary.
FTLE-33 (Logistics Center): Extract and treat contaminated groundwater, long-term groundwater monitoring (LTM), and LUCs.
FTLE-46 (Illicit PCB Dump Site): Maintain existing clay cap and LUCs.
FTLE-51 (Industrial Wastewater Treatment Plant): LUCs to prevent residential land use within the site boundary.
FTLE-54 (Landfill 1): Groundwater LTM and LUCs.
FTLE-57 (Landfill 4): Air sparging with soil vapor extraction and LUCs.
FTLE-32 (Solvent Refined Coal Pilot Plant): Excavation and treatment of contaminated soils, groundwater monitoring during remediation, and LUCs.
MF-ALGT-LF-05 (American Lake Garden Tract): Extract and treat contaminated groundwater, LTM, and LUCs.</td><td>EPA ID No:</td><td><u>WA9214053465</u></td></tr>
<tr><td colspan="5">Interview Type: Questionnaire via Email
Location of Visit: NA
Date:
Time:</td></tr>
<tr><th colspan="5">Interviewers</th></tr>
<tr><td colspan="3">Name</td><td>Title</td><td>Organization</td></tr>
<tr><td colspan="3">NA</td><td>NA</td><td>Aerostar Environmental and Construction LLC</td></tr>
<tr><th colspan="5">Interviewees</th></tr>
<tr><td>Name</td><td>Organization</td><td>Title</td><td>Telephone</td><td>Email</td></tr>
<tr><td>Patrick Hickey</td><td>EPA</td><td>Remedial Project Manager</td><td>206-553-6295</td><td>hickey.patrick@epa.gov</td></tr>
<tr><th colspan="5">Summary of Questions</th></tr>
<tr><td colspan="5">1. How long and in what capacity have you been involved with JBLM and with the 10 sites included in this Five-Year Review? I have been the EPA Remedial Project Manager assigned to the JBLM facilities since June 2021. I oversee cleanup operations on the facility and provide recommendations and or concurrence.</td></tr>
<tr><td colspan="5">2. Have there been routine communications or activities conducted by your office regarding the sites? If so, please give purpose and results. Yes. I have stayed in communication with the JBLM staff regarding ongoing clean up operations. This included an initial site visit for my spatial understanding and an overview of all cleanup operations ongoing at the site.</td></tr>
<tr><td colspan="5">3. How are contracts for monitoring and inspections for the sites managed? The JBLM facility staff develop and let contracts designed to for the monitoring and inspecting of the sites within the JBLM facility.</td></tr>
</table>

4.	**Is there a continuous Operations & Maintenance (O&M) presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.** Yes, there is a continuous O&M presence. Activities include operating pumping wells and documenting operating conditions, data is logged from the pumping systems, and equipment repairs and evaluations are performed through the year. Land use controls are inspected annually.
5.	**Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? Please describe changes and impacts.** No, I am not aware of any significant changes in O&M requirements, maintenance schedules, or sampling routines in the last five years.
6.	**What are the annual operating costs for your organization's involvement with each of the 10 sites?** The costs are comprised primarily of EPA hydrologist and my labor hours in regard to document reviews and travel costs and are varied depending on the document output by the facility.
7.	**Have there been unexpected O&M difficulties or costs associated with any of the sites in the last five years? If so, please give details.** I am not aware of any unexpected O&M difficulties and costs aside from fence repairs due to downed trees or signage replacement.
8.	**Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.**
9.	**Other than routine groundwater monitoring, are you aware of any other work completed at each of the 10 sites in the last five years? If so, please explain.** I am not aware of any other work completed at the sites in the past five years.
10.	**Are you aware of any intrusive activities performed at any of the 10 sites? If so, please explain.** I have not been made aware of any intrusive activities.
11.	**Are you aware of any changes in land use at JBLM or in the area surrounding the 10 sites? If so, please explain.** I have not been made aware of any land use changes at JBLM or at the 10 sites.
12.	**Are you aware of any trespassing at any of the 10 sites? If so, please explain.** I am not aware of any trespassing.
13.	**Have you received any complaints, violations, or comments from the community or other stakeholders requiring a response by your office? If so, please explain.** I have not received complaints or comments from the community or stakeholders, nor have I been made aware of any violations.
14.	**Do you feel well informed about the sites' activities and progress?** To date, I feel I have been kept apprised of key operations at the facility.
15.	**Is the remedy functioning as expected at each site? How well is the remedy performing at each site?** The remedies are functioning as expected at each site.
16.	**What does the monitoring data show at each site? Are there any trends that show contaminant levels are changing?** The monitoring data at Landfill 4 indicates substantial lowering of contaminant levels with downwards trends. The Logistics Center contaminant concentrations do not appear to be lowering.

17. Has any other information come to light that could call into question the protectiveness of the remedy at each site? I am not aware of any information that could directly call into question the protectiveness of the remedy at any of the sites. As a contaminant not directly linked to the NPL listed sites at JBLM, there is a current investigation for PFAS ongoing, which may have contaminants located within the 10 sites, as well as other areas, at JBLM.
18. **Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedies at each of the 10 sites?** While not directly related to the NPL listed sites at JBLM, the State of Washington is proceeding with establishing state action levels on PFOA (10 ppt)), PFOS (15 ppt), PFNA (9 ppt), PFHxS (65 ppt), and PFBS (345 ppt) in drinking water, with the new lower limit in parathesis.
19. Do you have any comments, suggestions, or recommendations regarding the project? Not at this time.
Additional Site-Specific Questions
[If needed]

Appendix E

Land Use Control Information

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2018, 2019, and 2020

Final Land Use Controls Checklists

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Excerpts From

2017 Comprehensive Land Use Controls Plan

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FINAL
25 JANUARY 2018

2017 Comprehensive Land Use Controls Plan

Joint Base Lewis-McChord
Pierce County, Washington

Joint Base Lewis-McChord Public Works – Environmental Division
IMLM-PWE
MS 17 Box 339500
Joint Base Lewis-McChord, Washington 98433

2 PLAN APPROACH AND ORGANIZATION

This Comprehensive LUC Plan incorporates several LUC Plans for sites currently under the JBLM LUC program including sites at JBLM and the YTC. For simplicity and ease of use, the main text of this plan only provides basic information on the LUC program. More details on the LUC process, nomenclature, and information of the different types of sites (CERCLA, Agreed Order, etc.) are included in Appendix A. Additional appendices provide supporting regulations, information, and checklists for LUC inspections. The appendices include:

- Appendix A, Land Use Controls Process Information and Background
- Appendix B, Real Property Master Plan Brochure
- Appendix C, Army Regulation 210-20
- Appendix D, Fort Lewis Regulatioin 200-1
- Appendix E, Land Use Deconflictation Process
- Appendix F, JBLM Public Works Project Review Procedures
- Appendix G, Fort Lewis Regulation 350-30
- Appendix H, Land Use Control Monitoring Checklists

2.1 CURRENT LUC SITES

All JBLM LUC program sites and associated requirements are summarized in Table 2-1. This table is also provided electronically as a Microsoft Excel spreadsheet on the disc that accompanies this plan. The spreadsheet is provided as a searchable database that can be sorted by Base or site name.

2.2 LUC SITE LOCATIONS

The locations of all current LUC sites are shown in the following figures.

- Figure 2-1 – LUCs at Fort Lewis (large foldout map)
- Figure 2-2 – McChord Field Land Use Controls
- Figure 2-3 – LUCs at Yakima Training Center

2.3 LUC INSPECTION CHECKLISTS

LUC inspections are completed annually. Checklists for completing these inspections are provided in Appendix H. Checklists to be used for the various inspections include:

- JBLM CERCLA LUC Monitoring Checklist
- JBLM Agreed Order LUC Monitoring Checklist
- JBLM Independent LUC Monitoring Checklist
- McChord Other Non-CERLA LUC Monitoring Checklist
- YTC LUC Monitoring Checklist

Additional information of the LUC inspections and associated reporting is provided in Appendix A, Section 3.

Table 2-1. Land Use Controls Summary for Fort Lewis, McChord Field, and Yakima Training Center

Base	Site Name	Applicable Area of Site	Document Requiring LUC	LUC Objective
Fort Lewis	Logistics Center	Lewis Landfill 2	April 2006 DD (Army 2006a)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
				Prevent training access.
				Maintain boundary fence and signs.
		Buffer (1,000 feet) around site boundary and within JBLM boundary	September 1990 ROD (Army and EPA 1990)	Prevent new drinking water wells without EPA approved monitoring plan.
		Off-post portion of Vashon Aquifer TCE plume above 5 µg/L		Remind Lakewood Water District annually that Logistics Center should remain listed as possible source of contamination in its Wellhead Protection Program.
		Upper Vashon Aquifer TCE 40 µg/L iso-concentration contour[1/]		Prevent residential land use.
Fort Lewis	Landfill 4	Landfill boundary	September 1993 ROD (Army and EPA 1993)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
				Prevent digging, bivouacking, or off-road vehicle maneuvering during training.
		Buffer (1,000 feet) around site boundary		Prevent new drinking water wells without EPA approved monitoring plan.
Fort Lewis	SRCPP	Site boundary	September 1993 ROD (Army and EPA 1993)	Prevent new drinking water wells without EPA approved monitoring plan.
Fort Lewis	Battery Acid Pit	Site boundary	April 2006 DD (Army 2006b)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
				Maintain asphalt cap.
Fort Lewis	DRMO Yard	Site boundary	April 2006 DD (Army 2006c)	Prevent residential land use.
Fort Lewis	Illicit PCB Dump Site	Site boundary	April 2006 DD (Army 2006d)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
				Prevent training access.
				Maintain boundary fence and signs .
				Maintain clay cap.
Fort Lewis	Industrial Wastewater Treatment Plant Site	Site boundary	Oct 2010 ESD (Kemron 2010a) and December 2007 DD (Army 2007a)	Prevent residential land use.
Fort Lewis	Landfill 1	Landfill boundary	April 2006 DD (Army 2006e)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
		Buffer (1,000 feet) around landfill boundary		Prevent new drinking water wells without EPA approved monitoring plan.
Fort Lewis	Pesticide Rinse Area	Site boundary	December 2000 DD (PNNL 2000)	Prevent residential land use.
Fort Lewis	Lewis-North B-Range	Residential and undeveloped areas outside cantonment area (Munitions Response Site 1)	Action Memorandum dated 1 Oct 2012 (USACE 2012) and B Range Land Use Control Plan (USAEC 2013)	No unauthorized excavations, dig permits required.
				UXO awareness training required for all excavations (UXO information on the JBLM website http://www.lewis-mcchord.army.mil/safety/Pages/All/UXO.aspx).
				Housing contractor annually notifies the B-Range family housing residents of the potential explosives and chemical agent hazards in the subsurface footprint of the property.
		Industrial and Troop area (former North Fort Lewis cantonment area; Munitions Response Site 2)		Prevent residential land use (i.e., residential dwelling construction).
				No unauthorized excavations; dig permits required.
				UXO avoidance training/construction support for excavations, if not evaluated by JBSO. (JBSO may authorize lower level of UXO safety measures, if warranted).
				Prepare and maintain emergency response plan within construction Site Safety and Health Plan, and brief construction employees.
Fort Lewis	Bldg. 4131 UST (AOC 8-2)	Area within 10 feet of the former tank location and 500 feet downgradient	WAC 173-340 (MTCA). FLAO Remedial Investigation (Versar 2008)	Prevent residential land use.
				Prevent groundwater use.
Fort Lewis	Bldg. 5101 UST (AOC 9-4) Military Motorpool	Area under former fueling island	WAC 173-340 (MTCA). FLAO Remedial Investigation (Versar 2008)	Prevent residential land use.
				Remove soil containing petroleum when building is removed.
Fort Lewis	Bldg. 5115 UST (AOC 8-3) Rainier Inn	Area within 10 feet of the former tank location	WAC 173-340 (MTCA). FLAO Remedial Investigation (Versar 2008)	Prevent residential land use.

Table 2-1. Land Use Controls Summary for Fort Lewis, McChord Field and Yakima Training Center (continued)

Base	Site Name	Applicable Area of Site	Document Requiring LUC	LUC Objective
Fort Lewis	Bldg. A0111 UST (AOC 8-4) Chemical Battalion	Area within 10 feet of the former tank location	WAC 173-340 (MTCA). FLAO Remedial Investigation (Versar 2008)	Prevent residential land use. Remove soil containing petroleum when building is removed.
Fort Lewis	Former Bldg. A1033 UST (AOC 9-2) Domino's/America's Credit Union Bank	Area within 10 feet of the former tank location	WAC 173-340 (MTCA). FLAO Remedial Investigation (Versar 2008)	Prevent residential land use. Remove soil containing petroleum when building is removed. Prevent groundwater use.
Fort Lewis	Gray Army Airfield (GAAF) Fuel Facility (AOC 10-8)	Site boundary	WAC 173-340 (MTCA). FLAO Remedial Investigation (Versar 2008)	Prevent residential land use.
Fort Lewis	Landfill 9 (SWMU-40)	Landfill boundary	WAC 173-340 (MTCA), 173-160. FLAO Remedial Investigation (Versar 2008)	Restrict access by the general public. Prevent residential land use. Prevent unplanned excavation of contaminated soil. Prevent digging, bivouacking, or off-road vehicle maneuvering during training. Prevent new drinking water wells within 1,000 feet of landfill boundary unless granted State variance.
Fort Lewis	Miller Hill (AOC 4-2.2)	Site boundary - Residential Buffer Zone	Interim Action Plan (Kemron 2010b)	Residential Buffer Zone: Prevent residential land use. Prevent unplanned excavation of contaminated soil. For planned excavations, require health and safety training and personal protective equipment. Excess excavated material to be handled as contaminated soil (unless testing indicates soil quality is below MTCA Method A Cleanup Level for Unrestricted Land Uses).
Fort Lewis	Miller Hill (AOC 4-2.2)	Site boundary - Steep Hillside	Interim Action Plan (Kemron 2010b)	Steep Hillside: Prevent residential land use. Limit access by installing and maintaining boundary fencing and warning signs. Prevent unplanned excavation of contaminated soil. For planned excavations, require health and safety training and personal protective equipment. Excess excavated material to be handled as contaminated soil (unless testing indicates soil quality is below MTCA Method A Cleanup Level for Unrestricted Land Uses).
Fort Lewis	Miller Hill (AOC 4-2.2)	Site boundary - Flatlands	Interim Action Plan (Kemron 2010b)	Flatlands: Prevent residential land use. Prevent unplanned excavation of contaminated soil. For planned excavations, require health and safety training and personal protective equipment. Excess excavated material to be handled as contaminated soil (unless testing indicates soil quality is below MTCA Method A Cleanup Level for Unrestricted Land Uses).
Fort Lewis	Lewis Landfills 3, 5, 7, 8, 11b, and Park Marsh Landfill	Landfill boundary	WAC 173-303, 173-60	Prevent residential land use. Prevent unplanned excavation of contaminated soil. Prevent digging, bivouacking, or off-road vehicle maneuvering during training. Prevent new drinking water wells within 1,000 feet of landfill boundary unless granted State variance.
Fort Lewis	Bldg. 2162	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. 2202	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. 2609	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. 2610	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. 03075	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. 3152	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. 3292	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.

Table 2-1. Land Use Controls Summary for Fort Lewis, McChord Field and Yakima Training Center (continued)

Base	Site Name	Applicable Area of Site	Document Requiring LUC	LUC Objective
Fort Lewis	Bldg. 03945	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. 4043	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. 4170	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. 6071	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. 9645	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. 9785	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. B0910	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. B0912	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. C0204	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. C0214	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. C1008	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0219	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0303	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0312	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0334	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0403	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0406	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0410	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0412	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0432	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0434	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0534	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0622	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0630	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.

Table 2-1. Land Use Controls Summary for Fort Lewis, McChord Field and Yakima Training Center (continued)

Base	Site Name	Applicable Area of Site	Document Requiring LUC	LUC Objective
Fort Lewis	Bldg. D0634	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0703	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0727	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0803	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0810	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0822	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0827	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0833	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0834	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0920	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0932	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0933	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D0951	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D1002	Site boundary	WAC 173-340 (MTCA) Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D1006	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D1102	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D1107	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D1108	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D1132	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D1135	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D1152	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. D1156	Site boundary	WAC 173-340 (MTCA). Initial Investigation Report (Kemron 2012)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. T6195	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.
Fort Lewis	Bldg. T6228	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use. Prevent unplanned excavation of contaminated soil.

Table 2-1. Land Use Controls Summary for Fort Lewis, McChord Field and Yakima Training Center (continued)

Base	Site Name	Applicable Area of Site	Document Requiring LUC	LUC Objective
McChord	Area D/ American Lake Garden Tract (ALGT)	Area D/ALGT Groundwater Plume	September 1991 ROD (EPA 1991)	Prevent new drinking water wells until EPA concurs that groundwater quality has been restored.
		McChord Field: Landfills 4, 5, 6, 7, OT-26, and OT-39		Prevent residential land use.
				Prevent new drinking water wells within 1,000 feet of landfill boundary unless granted State variance.
McChord	McChord Landfills 1, 2, 10, 13, 14, 19, 20, and 22	Landfill boundary	Washington Consent Decree (Ecology 1992)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
				Prevent new drinking water wells within 1,000 feet of landfill boundary unless granted State variance.
McChord	Spill Site 34 (SS-34)	Area immediately around the site and 500 feet downgradient	Washington Consent Decree (Ecology 1992)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
				Prevent groundwater use.
McChord	Spill Site 34N (SS-34N)	Spill area	Washington Consent Decree (Ecology 1992)	Prevent groundwater use.
McChord	Motor Pool Spill (SS-38)	Spill area	Washington Consent Decree (Ecology 1992)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
McChord	POL Spill/Disposal (SS-40)	Spill area	Washington Consent Decree (Ecology 1992)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
McChord	Waste Pit 44 (WP-44)	Spill area	Washington Consent Decree (Ecology 1992)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
McChord	Surface Spill Area (SS-55)	Spill area	Washington Consent Decree (Ecology 1992)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
McChord	Leach Pits at WTA (SD-54)	Groundwater plume area	WTA ROD (Air Force and EPA 1992)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
McChord	WTA Spill Area (DP-60)	Groundwater plume area	WTA ROD (Air Force and EPA 1992)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
McChord	Bldg. 841	Site boundary	WAC 173-340 (MTCA). Tank Investigation Report (Sealaska 2017)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
Yakima	Former Pesticide Handling Area (SWMU 5)	Site boundary	March 2007 DD (Army 2007b)	Prevent residential land use.
Yakima	Former ASP Burn Pits (SWMU 27)	Site boundary	March 2007 DD (Army 2007c)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil
Yakima	1969 – 1994 Landfill (SWMU 51)	Landfill boundary	Pending RCRA Corrective Action Completion Report (Versar 2013)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
Yakima	1954 – 1968 Landfill/Burn Pits (SWMU 57)	Landfill/burn pits boundary	March 2007 DD (Army 2007d)	Prevent residential land use.
				Prevent unplanned excavation of contaminated soil.
Yakima	Former Fire Training Pit (SWMU 59)	Site boundary	March 2007 DD (Army 2007e)	Prevent new drinking water wells without approved EPA monitoring plan.
Yakima	Building 218 (AOC 7)	Building 218	Pending RCRA Corrective Action Completion Report	Address potential discarded military munitions under building when building is removed.
Yakima	Building 301 Former UST Site (AOC 14)	Building 301	Pending RCRA Corrective Action Completion Report	Address potential discarded military munitions under building when building is removed.
Yakima	TVR/Old MATES	1,000 feet around site boundary	March 2007 DD (Army 2007f)	Prevent new drinking water wells without approved EPA monitoring plan.
		Building 843		Address potential discarded military munitions under building when building is removed.
Yakima	Centralized Fueling Point	Soil under concrete hard stand	January 2013 DD (JBLM 2013)	Prevent unplanned excavation of contaminated soil.
				Address potential contamination under hard stand when it is removed.

Table 2-1. Land Use Controls Summary for Fort Lewis, McChord Field and Yakima Training Center (continued)

Notes:
[1/] The 40 µg/L iso-concentration contour used as the criteria for the vapor intrusion LUC is based on the groundwater threshold concentration calculated in the draft 2016 Logistics Center Indoor Air Vapor Intrusion Study Report (Versar 2016). However, it should be noted that this LUC boundary is reasonable because the:
1) the assumptions used to calculate the 40 µg/L threshold were quite conservative and
2) the upper Vashon Aquifer TCE plume is expected to continue decreasing.

All tanks were unregulated tanks that contained heating oil.
TCE – trichloroethylene
WTA – washrack treatment area
JBSO – Joint Base Safety Office
UXO – unexploded ordnance
Green shading indicates the site can be found on the JBLM CERCLA LUC Monitoring Checklist.
Blue shading indicates the site can be found on the JBLM Agreed Order LUC Monitoring Checklist.
Yellow shading indicates the site can be found on the JBLM Independent LUC Monitoring Checklist.
Purple shading indicates the site can be found on the McChord Other Non-CERCLA LUC Monitoring Checklist.
Orange shading indicates the site can be found on the YTC LUC Monitoring Checklist.

Legend

- Prevent new drinking water wells without EPA or State approved monitoring plan, as applicable.
- Prevent residential land use and prevent unplanned excavation of contaminated soil.
- Prevent residential land use, prevent unplanned excavation of contaminated soil, and maintain cap.
- Prevent residential land use, prevent unplanned excavation of contaminated soil, and prevent digging, bivouacking, or off-road vehicle maneuvering during training.
- Prevent residential land use, prevent unplanned excavation of contaminated soil, prevent training access, and maintain boundary fence with signs.
- Prevent residential land use, prevent unplanned excavation of contaminated soil, prevent training access, maintain boundary fence with signs, and maintain cap.
- Prevent residential land use.
- Prevent residential land use, commercial use only, require personal protective equipment for construction workers and prevent unauthorized excavation of contaminated soil.
- Munitions Response Site 1
- Munitions Response Site 2
- RCRA corrective action sites, further investigation and/or action required.
- JBLM Boundary

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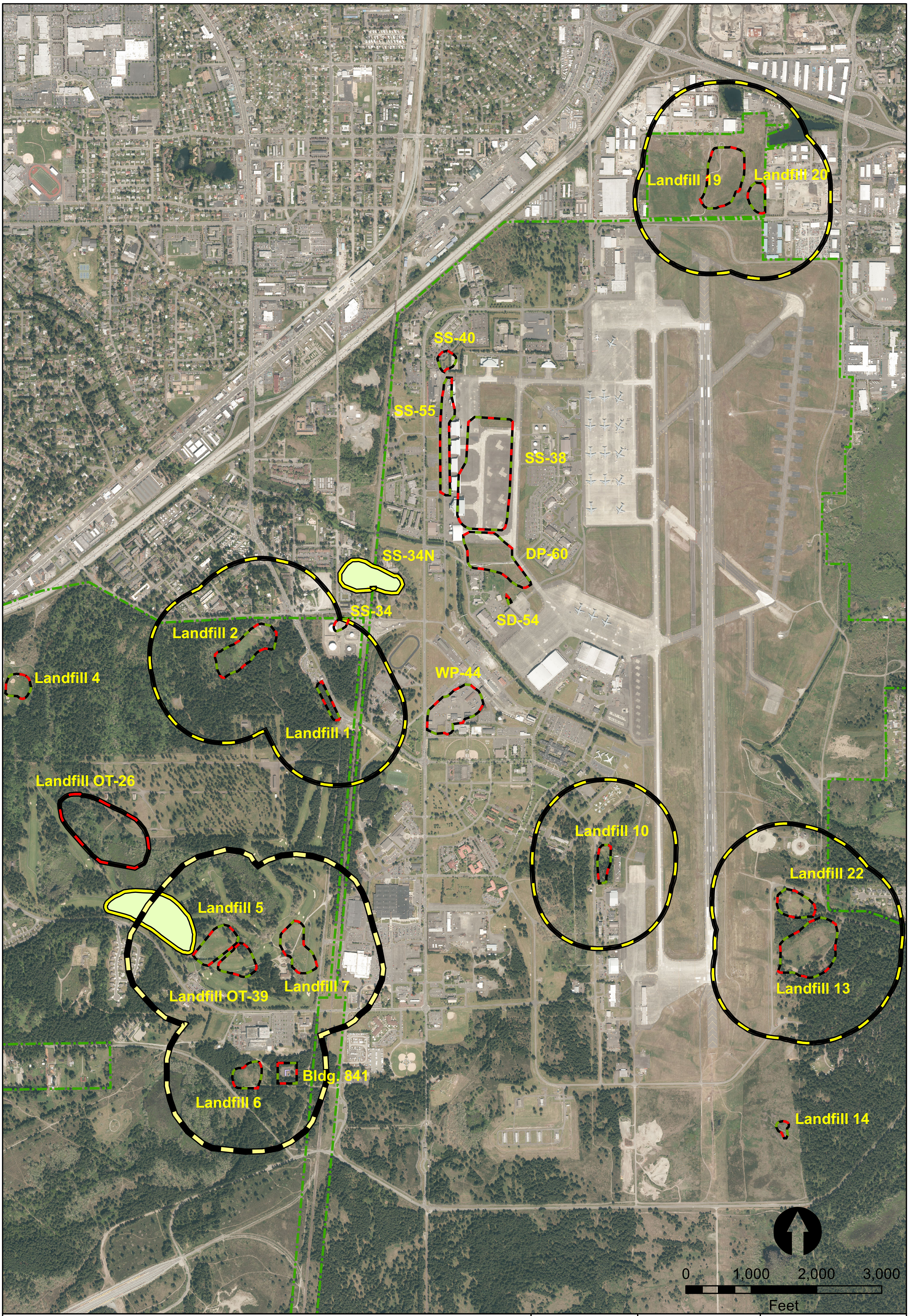
Date: 12/4/2017

USACE | SEALASKA

Figure 2-1
LUCs at Lewis



JBLM Boundary
Prevent new water supply wells within 1,000 ft w/o State approval.
Prevent groundwater use.
Prevent residential use.
Prevent residential use and unplanned excavation of contaminated soil.

USACE | **SEALASKA** | **Figure 2-2 McChord Field Land Use Controls**

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Date: 12/5/2017

APPENDIX A

LAND USE CONTROLS PROCESS INFORMATION AND BACKGROUND

CONTENTS

ATTACHMENTS

1 GENERAL LUC DESCRIPTION

1.1 INSTALLATION DESCRIPTION

Joint Base Lewis-McChord (JBLM) is a United States military facility located approximately 9 miles south-southwest of Tacoma, Washington under the jurisdiction of the United States Army Joint Base Garrison. The facility is an amalgamation of the United States Army (Army) Fort Lewis and the United States Air Force (Air Force) McChord Air Force Base, which merged on February 1, 2010 into a Joint Base because of Base Realignment and Closure Commission recommendations of 2005.

JBLM includes the former McChord Air Force Base (4,639 acres) and the former Fort Lewis (86,198 acres). JBLM became fully functional on October 1, 2010. JBLM has an Army joint base commander and an Air Force deputy commander. Base services are managed and provided by the Army. JBLM is divided into three distinct cantonment areas:

- Lewis-Main (Former Fort Lewis);
- McChord Field (Former McChord Air Force Base); and
- Lewis-North (Former North Fort Lewis).

The Yakima Training Center (YTC) is an active Army sub-installation of JBLM located approximately 5 miles northeast of the City of Yakima. YTC has been used for training military artillery, infantry, and engineering units since 1941. Expansion of YTC occurred in the early 1950s with the acquisition of additional land and permanent construction of the Cantonment area in the southwest portion of YTC. An expansion of YTC to the north occurred in the early 1990s. Currently the YTC is 327,231 acres.

1.2 OVERVIEW OF LUC MECHANISMS

The Land Use Control (LUC) mechanisms presented in this plan are a collection of LUC overlays on top of existing planning tools, procedures, permits, and regulations that ensure the LUC objectives are satisfied. The JBLM Installation Restoration Program (IRP) disseminates the LUC objectives to the Army staff in charge of making land use decisions, policies, and regulations so that Army staff can incorporate the information into their job responsibilities.

Typically, the LUCs for the JBLM environmental program perform the following:

- Prevent or restrict residential land use;
- Restrict construction of water supply wells without agency approval;
- Prevent unauthorized excavation; and
- Improve awareness/avoidance of possible encounters with munitions.

LUCs are implemented through the following measures which are described in subsequent sections:

- A data layer in the geographic information system (GIS);
- LUC overlay in the Master Plan;
- JBLM National Environmental Policy Act (NEPA) implementation;
- Project reviews (Digging Permits); and
- LUC overlay in Water System Plans.

2 LUC MECHANISMS

LUCs for Lewis and McChord are implemented using the mechanisms described in the following sections.

2.1 LUC DATA LAYER IN GIS

A GIS data layer created by JBLM IRP and the JBLM Public Works (PW) GIS Lab is a key LUC mechanism supporting LUC objectives. GIS is a critical tool for Army staff in a variety of disciplines and organizations because complex spatial data is quickly shared, accessed, and overlaid. JBLM staff members consistently use available GIS data layers for real-time reference during meetings regarding land use planning, environmental reviews, construction activities, and maintenance activities. The LUC data layer is also available for use by Army staff. The LUC data layer in GIS contains the specific LUC locations at JBLM and the specific LUC objectives for each location. The JBLM PW GIS Lab is responsible for long-term storage of the LUC data layer in GIS.

2.2 LUC OVERLAY FOR REAL PROPERTY MASTER PLAN

A LUC overlay on the JBLM Real Property Master Plan is an additional LUC mechanism designed to support all LUC objectives. The JBLM Real Property Master Plan delineates the major uses of real property and represents the formal decision process for the use of all land at JBLM. A copy of the Lewis-Main Real Property Master Plan Brochure is included in Appendix B. A copy of Army Regulation (AR) 210-20, which requires maintenance of the Real Property Master Plan and LUC overlay is included in Appendix C.

The JBLM Master Planner within the JBLM PW Planning Division is responsible for maintaining the Real Property Master Plan as well as a variety of other long-range land use planning activities. The JBLM IRP Manager has provided the JBLM Master Planner with a copy of this LUC Plan and access to the GIS LUC data layer to overlay with the Master Plan.

2.3 LUC OVERLAY FOR ENVIRONMENTAL REVIEW PROCEDURES

A LUC overlay on JBLM environmental review procedures is a third LUC mechanism designed to support all LUC objectives. NEPA procedures are described in Fort Lewis Regulation (FLR) 200-1 (Appendix D). The Land Use Deconfliction Process is included in Appendix E and the JBLM PW Environmental Division Project Review Procedures are included in Appendix F. These environmental review procedures are in place to ensure that all environmental considerations, including LUCs, are accounted for and adequately addressed during the preliminary project planning process.

The JBLM NEPA Program Manager within the JBLM PW Environmental Division is responsible for implementing the JBLM environmental review procedures described above. The JBLM IRP Manager has provided the JBLM NEPA Program Manager with a copy of this LUC Plan and access to the GIS LUC data layer to overlay with the environmental review procedures.

2.4 LUC OVERLAY FOR DIGGING PERMIT APPROVAL

A LUC overlay on the JBLM Dig Permit approval process is a fourth LUC mechanism designed to support all LUC objectives. Before any digging or excavation activities are undertaken at JBLM, a JBLM Digging Permit must be obtained in accordance with Appendix S of FLR 200-1. A copy of FLR 200-1 is included in Appendix D. The Digging Permit process may be initiated on the JBLM PW website: (http://www.lewis-mcchord.army.mil/publicworks/sites/services/digPermit.aspx).

LUC objectives will be considered (along with existing overlays such as utilities and culturally-sensitive locations) before a Digging Permit is issued.

The JBLM NEPA Program Manager and the JBLM Cultural Resources Program Manager within the JBLM PW Environmental Division are jointly responsible for reviewing and approving the environmental portion of the Digging Permit applications. The JBLM IRP Manager has provided the JBLM NEPA Program Manager and JBLM Cultural Resources Program Manager with a copy of this LUC Plan and access to the GIS LUC data layer to overlay with the Digging Permit approval process.

2.5 LUC INCLUSION IN OPERATIONAL RANGE REGULATIONS

Landfill 3, Landfill 5, Landfill 9, Illicit PCB Dump Site, and portions of the Logistics Center and Landfill 4 are located within the JBLM operational range, which by definition includes general training areas as well as specific numbered ranges and impact areas. LUC inclusion in operational range regulations is a LUC mechanism designed to ensure that the training related LUCs for the landfills (prevent digging, bivouacking, or off-road vehicle maneuvering), the Illicit PCB Dump Site (prevent training access), and the Logistics Center (prevent training access) are maintained.

Use of ranges and training areas at JBLM are regulated in accordance with FLR 350-30, which is included in Appendix G. The Range Division of the JBLM Directorate of Plans, Training, Mobilization, and Security is responsible for implementing this regulation. The JBLM Environmental Coordination Map is the primary tool used for implementing a wide variety of environmental LUCs under FLR 350-30. The JBLM Environmental Coordination Map, which is maintained by the JBLM NEPA Program Manager, includes the training-related LUCs for Landfills 3, 5, and 9. In addition, it should be noted that Landfill 2 and the Illicit PCB Dump Site (which both have LUCs to prevent training access) are explicitly shown as Hazardous Areas on the 2007 Fort Lewis 1:50,000 scale Military Installation Map.

2.6 LUC INCORPORATION IN WATER SYSTEM PLANS

Incorporating the LUC objectives into the next update of the JBLM Cantonment Area Water System Plan (WSP) is a LUC mechanism designed to ensure that a new drinking water well is not installed within the Solvent Refined Coal Pilot Plant (SRCPP) site boundary, within 1,000 feet of the Logistics Center, within 1,000 feet of the Landfill 4 site boundaries, or within 1,000 feet of the Landfill 1 boundary without obtaining a variance from Washington State Department of Ecology (Ecology) and/or an approved monitoring plan. These LUC boundaries are within the service area boundary of the JBLM Cantonment Area Water System. A WSP is the primary planning tool for all public water systems and is typically used to plan future construction, including installation of new drinking water wells. WSPs are required to be updated every six years in accordance with Washington Department of Health regulations in Washington Administrative Code (WAC) 246-290-100. The Washington Department of Health will not approve installation of a new drinking water well without adequate documentation of the need for a new well in the WSP as well as adequate incorporation of the proposed well in the Wellhead Protection Program portion of the WSP.

The JBLM Water Systems Manager within the JBLM PW Operation and Maintenance Division is responsible for maintaining the WSP as well as a variety of other planning, design, and operation tasks related to the JBLM Cantonment Area Water System. The JBLM IRP Manager will provide the JBLM Water Systems Manager with a copy of this LUC Plan and access to the GIS LUC data layer to incorporate the drinking water well related objectives in the WSP update, which is currently being prepared.

Although the off-post portion of the Vashon Aquifer trichloroethylene (TCE) plume is relatively small and is expected to continue shrinking, a LUC has been developed that is commensurate with the nature and extent of off-post TCE impacts and the difficulty in effectively implementing LUCs off-post. Lakewood Water District (LWD) is the primary water system serving the area impacted by the Vashon Aquifer TCE plume in the off-post community of Tillicum. LWD is well aware of the Logistics Center site and has included the site as a possible source of contamination in its Wellhead Protection Program. Thus, the LUC action is to periodically remind LWD to keep the site in its Wellhead Protection Program. The LUC will be implemented via monitoring as discussed in Section 3, Monitoring and Reporting.

2.7 INSTALLATION ACCESS

JBLM and YTC are controlled military installations that limit access to authorized personnel. Although these security measures are not a remedial LUC mechanism because the mechanisms have not been specifically modified to accommodate LUC data, the installation access restrictions do support the LUC objectives by keeping the general public and unauthorized personnel out of JBLM and YTC.

3 MONITORING AND REPORTING

Annual monitoring of the LUCs will be conducted as described in this plan. Responsibilities include, but are not limited to:

- Conducting routine monitoring, including interviewing Army staff and visually inspecting sites;
- Preparing LUC Monitoring Checklists to document routine monitoring;
- Notifying the JBLM IRP Manager immediately upon discovery of any land use activity that is inconsistent with the LUC objectives;
- Maintaining boundary fences at LUC sites;
- Maintaining signage;
- Maintaining landfill caps; and
- Updating the Land Use Control Plans as necessary. (Note: This task includes providing appropriate GIS data/information to JBLM for their use in installation geospatial databases.)

The LUC Monitoring Checklists in Appendix H will be used to conduct and document the routine monitoring. Please note that the sites which include questions related to the LUC "Prevent new drinking water wells without EPA approved monitoring plan" within Section A, Field Inspection, will be answered as part of the Section B, Interview under "new water well."

A copy of the completed checklists will be provided to JBLM IRP Manager for submittal to the appropriate regulatory agencies. Copies of the completed JBLM Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) LUC Monitoring Checklist will be submitted to United States Environmental Protection Agency (EPA). Copies of the completed JBLM Agreed Order Monitoring Checklist will be submitted to Ecology for review. Copies of the completed Independent LUC Monitoring Checklist and McChord Other Non-CERCLA LUC Monitoring Checklist will be submitted to JBLM and any regulatory agencies as needed. As the LUC remedy matures, the JBLM IRP Manager may reduce the routine monitoring frequency with the concurrence of EPA and/or Ecology.

JBLM IRP will conduct a review of the LUCs every five years during the JBLM CERCLA five-year review and the Non-CERCLA periodic reviews. JBLM IRP will review the annual monitoring reports and re-evaluate this plan to ensure the LUC mechanisms are working properly to satisfy the LUC objectives and that the remedy is still protective of human health and the environment. The five-year review will also be a time to update the LUC Plan(s) as necessary to document any minor changes to the LUC mechanisms over time.

In addition to the annual monitoring and five-year reviews, the JBLM IRP Manager will notify JBLM PW immediately upon discovery of any land use activity that is inconsistent with the LUC objectives. JBLM PW will determine a plan of action to rectify such a situation. It should be noted that a temporary failure in a single LUC mechanism is unlikely to compromise the protectiveness of the LUCs since:

- Another mechanism would likely detect and prevent the possible failure; and
- The maximum length of time of the failure would likely be one year (in the interim between annual monitoring events) compared to the much longer exposure durations assumed when calculating potential risks and hazards.

4 RECORDKEEPING

Recordkeeping provides the necessary durability to ensure the LUC program endures and outlasts personnel changes, government reorganizations, and LUC mechanism changes. This plan, all subsequent plan modifications, routine monitoring reports (checklists), and five-year reviews will be included in the JBLM IRP administrative record. In addition, the LUC remedy will be recorded in the Army Environmental Center’s Army Environmental Database for Restoration (AEDB-R) and Compliance-related Cleanup (AEDB-CC).

5 ENFORCEMENT

The JBLM IRP Manager is responsible for managing the LUC objectives for the Army. The JBLM IRP Manager will determine if an action is not consistent with the site remedy. Any LUC non-compliance that is out of the authority of the JBLM IRP Manager will be immediately communicated to EPA and/or Ecology through appropriate Army Command channels. If EPA or Ecology disagrees with Army actions, they can initiate formal dispute resolution to guarantee the long-term reliability and effectiveness of the LUC. However, it is expected that most, if not all, potential disputes can be resolved through early problem identification and informal communication.

6 FINANCIAL ASSURANCE

As Army and subcontractor staff are responsible for implementing, monitoring, and reporting on internal LUCs, financial assurance documentation for long-term maintenance of LUCs is not necessary for this federal facility.

7 FUTURE PROPERTY CONVEYANCE

Property conveyance includes leaseholds, easements, and land transfers. For CERCLA sites, the Army will consult with EPA prior to any property conveyance that affects the LUC objectives in accordance with 42 United States Code 9620(h). For Agreed Order sites or other non-CERCLA sites, the Army will consult with Ecology prior to any property conveyance that affects the LUC objectives. As necessary, JBLM IRP Manager will re-evaluate the appropriateness of the selected LUC remedies and will have the current LUC Plan revised as necessary. A transfer of JBLM land to private ownership or to a federal agency outside of the Department of Defense is highly unlikely given the importance of JBLM for Department of Defense training. In the unlikely event of a land transfer, the Army shall include all applicable LUC restrictions as part of a restrictive covenant or easement and will work with EPA or Ecology and the future landowner(s) to ensure that appropriate LUC objectives and mechanisms are also in place to ensure protection of human health and the environment.

8 TERMINATION AND MODIFICATION OF LUCS

The LUCs described in this Plan are intended to be in place until the concentrations of hazardous substances are reduced to levels that allow for unlimited use and unrestricted exposure. If the JBLM IRP Manager determines in the future that there are changes to hazardous substance concentrations or applicable cleanup levels, the JBLM IRP Manager will terminate or modify a LUC objective as appropriate. The JBLM IRP Manager will notify the Ecology Program Manager if LUCs are terminated or modified at a particular Site.

FINAL

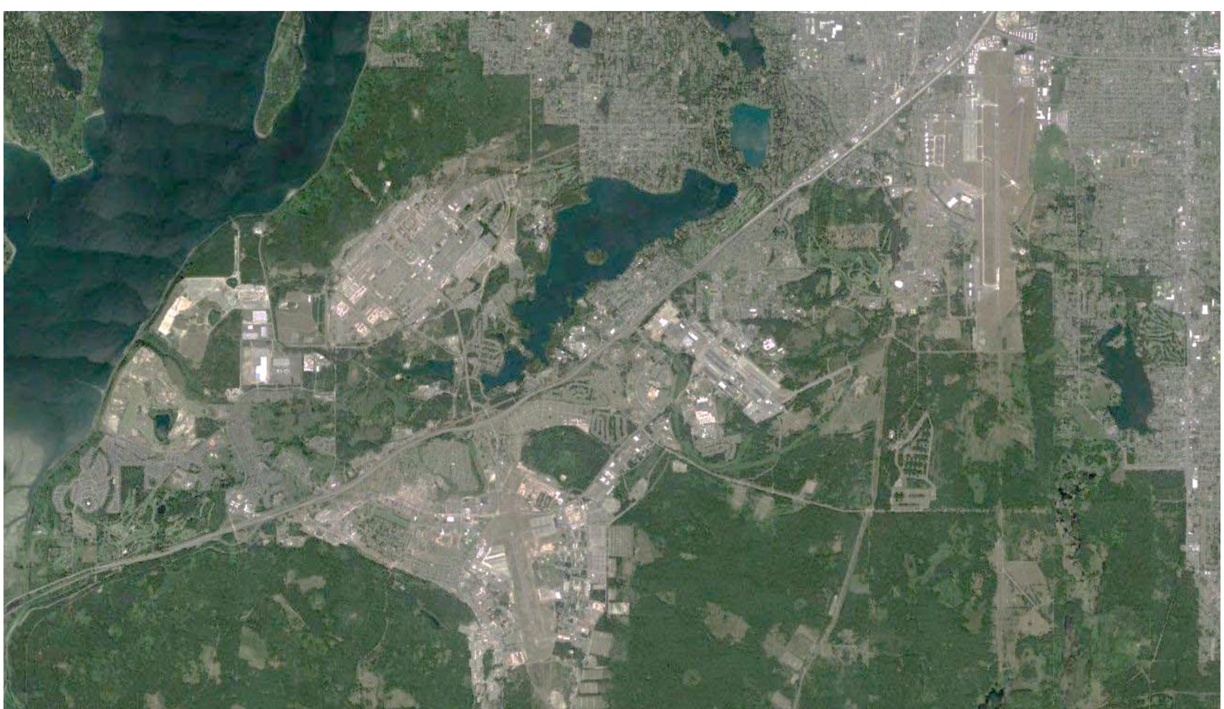
MAY 2019

LAND USE CONTROLS CHECKLIST - 2018

Joint Base Lewis-McChord

Pierce County, Washington

Joint Base Lewis-McChord Public Works – Environmental Division
IMLM-PWE
MS 17 Box 339500
Joint Base Lewis-McChord, Washington 98433



2018 Land Use Controls Checklist

Prepared for

Joint Base Lewis-McChord Public Works – Environmental Division
IMLM-PWE
MS 17 Box 339500
Joint Base Lewis-McChord, Washington 98433

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
2200 6th Avenue, Suite 707
Seattle, Washington 98121

5/10/19

Timothy McCormack, LHG — Date
Project Manager

5/10/19

James Costello, P.G. — Date
Program Manager

May 2019
Revision: 0
EA Project No. 63043.05

JBLM CERCLA
LUC MONITORING CHECKLIST

SECTION A: FIELD INSPECTION

Site	Inspection Date	Questions	Answer
Logistics Center	11/12/18	Any residential land use within Landfill 2 or within the 40 μg/L trichloroethylene groundwater contour?	Yes / No
		Any obvious recent construction/excavation within Landfill 2?	Yes / No
		Any obvious recent training activities within Landfill 2?	Yes / No
		Does the Landfill 2 boundary fence and/or signs need maintenance?	Yes / ~~No~~
		Any new drinking water wells planned at or within 1,000 feet of the site?	Yes / No
Landfill 4 (Lewis)	11/13/18	Any residential land use within landfill boundary?	Yes / No
		Any obvious recent construction/excavation within landfill boundary?	Yes / No
		Any obvious recent digging, bivouacking, or off-road maneuvering in landfill?	Yes / No
		Any new drinking water wells planned within 1,000 feet of the site?	Yes / No
SRCPP	11/14/18	Any new drinking water wells planned at or within 1,000 feet of the site?	Yes / No
Battery Acid Pit	11/14/18	Any residential land use within site boundary?	Yes / No
		Any obvious recent construction/excavation within site boundary?	Yes / No
		Does asphalt cap need maintenance?	Yes / No
DRMO Yard	11/12/18	Any residential land use within site boundary?	Yes / No
Illicit PCB Dump Site	11/14/18	Any residential land use within site boundary?	Yes / No
		Any obvious recent construction/excavation within site boundary?	Yes / No
		Any obvious recent training activities within site boundary?	Yes / No
		Does boundary fence and/or signs need maintenance?	Yes / No
		Does clay cap need maintenance?	Yes / No
IWTP Site	11/12/18	Any residential land use within site boundary?	Yes / No
Landfill 1 (Lewis)	11/14/18	Any residential land use within landfill boundary?	Yes / No
		Any obvious recent construction/excavation within landfill?	Yes / No
		Any new drinking water wells planned within 1,000 feet of the site?	Yes / No
Pesticide Rinse Area	11/14/18	Any residential land use within site boundary?	Yes / No
McChord Field: Landfills 4, 5, 6, and 7	11/15/18	Any residential land use within landfill boundary?	Yes / No
		Any obvious recent construction/excavation within landfill boundary?	Yes / No
		Any new drinking water wells planned within 1,000 feet of the site?	Yes / No
McChord Field: Landfills OT-26 and OT-39	11/15/18	Any residential land use within landfill boundary?	Yes / No
		Any obvious recent construction/excavation within landfill boundary?	Yes / No
		Any new drinking water wells planned within 1,000 feet of the site?	Yes / No
Area D/AGLT Groundwater Plume (west of McChord Landfill 5)	11/15/18	Any new drinking water wells planned within the plume boundary?	Yes / No
Site Summary		Any comments? (Comments are required for all **Yes** answers and any **No** answers requiring additional explanation.) If yes, detail in Section D, Comments.	Yes / No

JBLM CERCLA
LUC MONITORING CHECKLIST

SECTION B: INTERVIEWS

Position	Name	Date of Interview	Questions	Answer
PW GIS Lab	Teresa Hansen	12/12/18	Are you still storing the LUC data layer in GIS?	Yes / No
			Is the LUC data layer still available to GIS users?	Yes / No
Master Planner	Vince Bozick	2/13/19	Do you still have access to the LUC data when you need it?	Yes / No
			Are you still using the LUC data for a Master Plan overlay?	Yes / No
NEPA Program Manager	Chris Runner	12/12/18	Do you still have access to the LUC data when you need it?	Yes / No
			Are you still using the LUC data as an environmental review overlay?	Yes / No
			Are training LUCs still included on the Environmental Coordination Map?	Yes / No
			Are you still using the LUC data for a digging permit overlay?	Yes / No
Cultural Resources PM	Donna Turnpseed	2/19/19	Do you still have access to the LUC data when you need it?	Yes / No
			Are you still using the LUC data for a digging permit overlay?	Yes / No
Range Operations	Harold Nelson	1/9/19	Are you still using the Environmental Coordination Map as primary tool for implementing environmental LUCs under FLR 350-30?	Yes / No
Water Systems Manager	Lyle Fog	12/12/18	Do you still have access to the LUC data when you need it?	Yes / No
			Are WSP LUCs going to (be added/remain) in future WSP updates?	Yes / No
			Any plans for new drinking water wells in JBLM Cantonment Area Water System?	Yes / No
Lakewood Water Quality Dept.	Don Stanley	12/12/18	Any plans for new drinking water wells in JBLM Cantonment Area Water System?	Yes / No
			Any existing drinking water wells within Tillicum besides Well A-1?	Yes / No
			Any plans for new drinking water wells within Tillicum?	Yes / No
Additional Reporting			Any comments or additional reporting? (See instructions for required comments.) If yes, detail in Section D, Comments.	Yes / No
Changes to LUC Mechanisms			Any changes noted with how LUC mechanisms are executed? If yes, detail in Section D, Comments.	Yes / No

JBLM CERCLA
LUC MONITORING CHECKLIST

SECTION C: CERTIFICATION

Based on this monitoring, LUC mechanisms appear to be working and achieving LUC objectives.

Hannah Dennis 2/20/19

Signature Date

SECTION D: COMMENTS

* Fencing near LF2 entrance has been hit by a vehicle and needs repair
* Multiple signs of off-road vehicles being used at LF4.
  - Trash exposed in multiple areas
* Lyle Fog - remodeled WSP may result in ~~WSt~~ LUC revisions. New well recently installed near North Gate.

FINAL

JULY 2020

LAND USE CONTROLS CHECKLIST - 2019

Joint Base Lewis-McChord

Pierce County, Washington

Joint Base Lewis-McChord Public Works – Environmental Division
IMLM-PWE
MS 17 Box 339500
Joint Base Lewis-McChord, Washington 98433

Land Use Controls Checklist - 2019

Prepared for

Joint Base Lewis-McChord Public Works – Environmental Division
IMLM-PWE
MS 17 Box 339500
Joint Base Lewis-McChord, Washington 98433

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
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7/30/2021

Garrett Lee, P.E. — Date
Project Manager

7/30/2021

James Costello, P.G. — Date
Program Manager

July 2020
Revision: 0
EA Project No. 63043.05

JBLM CERCLA
LUC MONITORING CHECKLIST

SECTION A: FIELD INSPECTION

Site	Inspection Date	Questions	Answer
Logistics Center	11/21/19	Any residential land use within Landfill 2 or within the 40 μg/L trichloroethylene groundwater contour?	Yes / No
		Any obvious recent construction/excavation within Landfill 2?	Yes / No
		Any obvious recent training activities within Landfill 2?	Yes / No
		Does the Landfill 2 boundary fence and/or signs need maintenance?	Yes / No
		Any new drinking water wells planned at or within 1,000 feet of the site?	Yes / No
Landfill 4 (Lewis)		Any residential land use within landfill boundary?	Yes / No
		Any obvious recent construction/excavation within landfill boundary?	Yes / No
		Any obvious recent digging, bivouacking, or off-road maneuvering in landfill?	Yes / No
		Any new drinking water wells planned within 1,000 feet of the site?	Yes / No
SRCPP		Any new drinking water wells planned at or within 1,000 feet of the site?	Yes / No
Battery Acid Pit		Any residential land use within site boundary?	Yes / No
		Any obvious recent construction/excavation within site boundary?	Yes / No
		Does asphalt cap need maintenance?	Yes / No
DRMO Yard		Any residential land use within site boundary?	Yes / No
Illicit PCB Dump Site		Any residential land use within site boundary?	Yes / No
		Any obvious recent construction/excavation within site boundary?	Yes / No
		Any obvious recent training activities within site boundary?	Yes / No
		Does boundary fence and/or signs need maintenance?	Yes / No
		Does clay cap need maintenance?	Yes / No
IWTP Site		Any residential land use within site boundary?	Yes / No
Landfill 1 (Lewis)		Any residential land use within landfill boundary?	Yes / No
		Any obvious recent construction/excavation within landfill?	Yes / No
		Any new drinking water wells planned within 1,000 feet of the site?	Yes / No
Pesticide Rinse Area		Any residential land use within site boundary?	Yes / No
McChord Field: Landfills 4, 5, 6, and 7		Any residential land use within landfill boundary?	Yes / No
		Any obvious recent construction/excavation within landfill boundary?	Yes / No
		Any new drinking water wells planned within 1,000 feet of the site?	Yes / No
McChord Field: Landfills OT-26 and OT-39		Any residential land use within landfill boundary?	Yes / No
		Any obvious recent construction/excavation within landfill boundary?	Yes / No
		Any new drinking water wells planned within 1,000 feet of the site?	Yes / No
Area D/AGLT Groundwater Plume (west of McChord Landfill 5)		Any new drinking water wells planned within the plume boundary?	Yes / No
Site Summary		Any comments? (Comments are required for all **Yes** answers and any **No** answers requiring additional explanation.) If yes, detail in Section D, Comments.	Yes / No

3

JBLM CERCLA
-7 LUC MONITORING CHECKLIST

SECTION B: INTERVIEWS

Position	Name	Date of Interview	Questions	Answer
PW GIS Lab	Teresa Hansen	12/10/19	Are you still storing the LUC data layer in GIS?	Yes / No
			Is the LUC data layer still available to GIS users?	Yes / No
Master Planner	Vincent Bozick	11/22/19	Do you still have access to the LUC data when you need it?	Yes / No
			Are you still using the LUC data for a Master Plan overlay?	Yes / No
NEPA Program Manager	Chris Runner	12/23/19	Do you still have access to the LUC data when you need it?	Yes / No
			Are you still using the LUC data as an environmental review overlay?	Yes / No
			Are training LUCs still included on the Environmental Coordination Map?	Yes / No
			Are you still using the LUC data for a digging permit overlay?	Yes / No
Cultural Resources PM	Donna Turnipseed	1/16/20	Do you still have access to the LUC data when you need it?	Yes / No
			Are you still using the LUC data for a digging permit overlay?	Yes / No
Range Operations	Harold Nelson	12/4/19	Are you still using the Environmental Coordination Map as primary tool for implementing environmental LUCs under FLR 350-30?	Yes / No
Water Systems Manager	Yannick Rendu	1/3/20	Do you still have access to the LUC data when you need it?	Yes / No
			Are WSP LUCs going to (be added/remain) in future WSP updates?	Yes / No
			Any plans for new drinking water wells in JBLM Cantonment Area Water System?	Yes / No
Lakewood Water Quality Dept.	Dan Stanley	1/23/20	Any plans for new drinking water wells in JBLM Cantonment Area Water System?	Yes / No
			Any existing drinking water wells within Tillicum besides Well A-1?	Yes / No
			Any plans for new drinking water wells within Tillicum?	Yes / No
Additional Reporting			Any comments or additional reporting? (See instructions for required comments.) If yes, detail in Section D, Comments.	Yes / No
Changes to LUC Mechanisms			Any changes noted with how LUC mechanisms are executed? If yes, detail in Section D, Comments.	Yes / No

4

JBLM CERCLA
LUC MONITORING CHECKLIST

SECTION C: CERTIFICATION

Based on this monitoring, LUC mechanisms appear to be working and achieving LUC objectives.

[signature] 1/27/20

Signature Date

SECTION D: COMMENTS

*From field inspection:

- Tree fallen on southwest portion of LF2 fencing
- Signs of offroad vehicle use at LF4. DPW working with JBLM to mitigate impact.
- All buildings and associated USTs located in the "D Block" on Lewis North have been removed.

5

FINAL
JANUARY 2022

LAND USE CONTROLS CHECKLIST - 2020

Joint Base Lewis-McChord

Pierce County, Washington

Joint Base Lewis-McChord Public Works – Environmental Division
IMLM-PWE
MS 17 Box 339500
Joint Base Lewis-McChord, Washington 98433

Land Use Controls Checklist - 2020

Prepared for

Joint Base Lewis-McChord Public Works – Environmental Division
IMLM-PWE
MS 17 Box 339500
Joint Base Lewis-McChord, Washington 98433

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
2200 6th Avenue, Suite 707
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1/20/2022

Garrett Lee, P.E. — Date
Project Manager

1/20/2022

James Costello, P.G. — Date
Program Manager

January 2022
Revision: 0
EA Project No. 63043.05

JBLM CERCLA
LUC MONITORING CHECKLIST

SECTION A: FIELD INSPECTION

Site	Inspection Date	Questions	Answer
Logistics Center	12/1/2020	Any residential land use within Landfill 2 or within the 40 µg/L trichloroethylene groundwater contour?	No
		Any obvious recent construction/excavation within Landfill 2?	No
		Any obvious recent training activities within Landfill 2?	No
		Does the Landfill 2 boundary fence and/or signs need maintenance?	**Yes**
		Any new drinking water wells planned at or within 1,000 feet of the site?	No
Landfill 4 (Lewis)	12/3/2020	Any residential land use within landfill boundary?	No
		Any obvious recent construction/excavation within landfill boundary?	No
		Any obvious recent digging, bivouacking, or off-road maneuvering in landfill?	**Yes**
		Any new drinking water wells planned within 1,000 feet of the site?	No
SRCPP	12/3/2020	Any new drinking water wells planned at or within 1,000 feet of the site?	No
Battery Acid Pit	11/25/2020	Any residential land use within site boundary?	No
		Any obvious recent construction/excavation within site boundary?	No
		Does asphalt cap need maintenance?	No
DRMO Yard	12/1/2020	Any residential land use within site boundary?	No
Illicit PCB Dump Site	11/25/2020	Any residential land use within site boundary?	No
		Any obvious recent construction/excavation within site boundary?	No
		Any obvious recent training activities within site boundary?	No
		Does boundary fence and/or signs need maintenance?	No
		Does clay cap need maintenance?	No
IWTP Site	11/25/2020	Any residential land use within site boundary?	No
Landfill 1 (Lewis)	11/25/2020	Any residential land use within landfill boundary?	No
		Any obvious recent construction/excavation within landfill?	No
		Any new drinking water wells planned within 1,000 feet of the site?	No
Pesticide Rinse Area	12/8/2020	Any residential land use within site boundary?	No
McChord Field: Landfills 4, 5, 6, and 7	12/8/2020	Any residential land use within landfill boundary?	No
		Any obvious recent construction/excavation within landfill boundary?	No
		Any new drinking water wells planned within 1,000 feet of the site?	No
McChord Field: Landfills OT-26 and OT-39	12/8/2020	Any residential land use within landfill boundary?	No
		Any obvious recent construction/excavation within landfill boundary?	No
		Any new drinking water wells planned within 1,000 feet of the site?	No
Area D/AGLT Groundwater Plume (west of McChord Landfill 5)	12/8/2020	Any new drinking water wells planned within the plume boundary?	No
Site Summary		Any comments? (Comments are required for all **Yes** answers and any **No** answers requiring additional explanation.) If yes, detail in Section D, Comments.	**Yes**

JBLM CERCLA
LUC MONITORING CHECKLIST

SECTION B: INTERVIEWS

Position	Name	Date of Interview	Questions	Answer
PW GIS Lab	Teresa Hansen	12/3/2020	Are you still storing the LUC data layer in GIS?	Yes
			Is the LUC data layer still available to GIS users?	Yes
Master Planner	Vince Bozick	12/3/2020	Do you still have access to the LUC data when you need it?	Yes
			Are you still using the LUC data for a Master Plan overlay?	Yes
NEPA Program Manager	Chris Runner	12/11/2020	Do you still have access to the LUC data when you need it?	Yes
			Are you still using the LUC data as an environmental review overlay?	Yes
			Are training LUCs still included on the Environmental Coordination Map?	Yes
			Are you still using the LUC data for a digging permit overlay?	Yes
Cultural Resources PM	Donna Turnipseed	12/3/2020	Do you still have access to the LUC data when you need it?	Yes
			Are you still using the LUC data for a digging permit overlay?	Yes
Range Operations	Harold Nelson	12/4/2020	Are you still using the Environmental Coordination Map as primary tool for implementing environmental LUCs under FLR 350-30?	Yes
Water Systems Manager	Yannick Rendu	12/28/2020	Do you still have access to the LUC data when you need it?	Yes
			Are WSP LUCs going to (be added/remain) in future WSP updates?	Yes
			Any plans for new drinking water wells in JBLM Cantonment Area Water System?	No
Lakewood Water Quality Dept.	Don Stanley	12/3/2020	Any plans for new drinking water wells in JBLM Cantonment Area Water System?	No
			Any existing drinking water wells within Tillicum besides Well A-1?	No
			Any plans for new drinking water wells within Tillicum?	No
Additional Reporting			Any comments or additional reporting? (See instructions for required comments.) If yes, detail in Section D, Comments.	**Yes**
Changes to LUC Mechanisms			Any changes noted with how LUC mechanisms are executed? If yes, detail in Section D, Comments.	No

JBLM CERCLA
LUC MONITORING CHECKLIST

SECTION C: CERTIFICATION

Based on this monitoring, LUC mechanisms appear to be working and achieving LUC objectives.

12/30/2020

Signature Date

SECTION D: COMMENTS

Tree fallen on Rainier Drive Near Lincoln Road. Breached cantonment fence.

Permitted training occurred in 2020 to level grade northeast of NAPL-1 and NAPL-2.

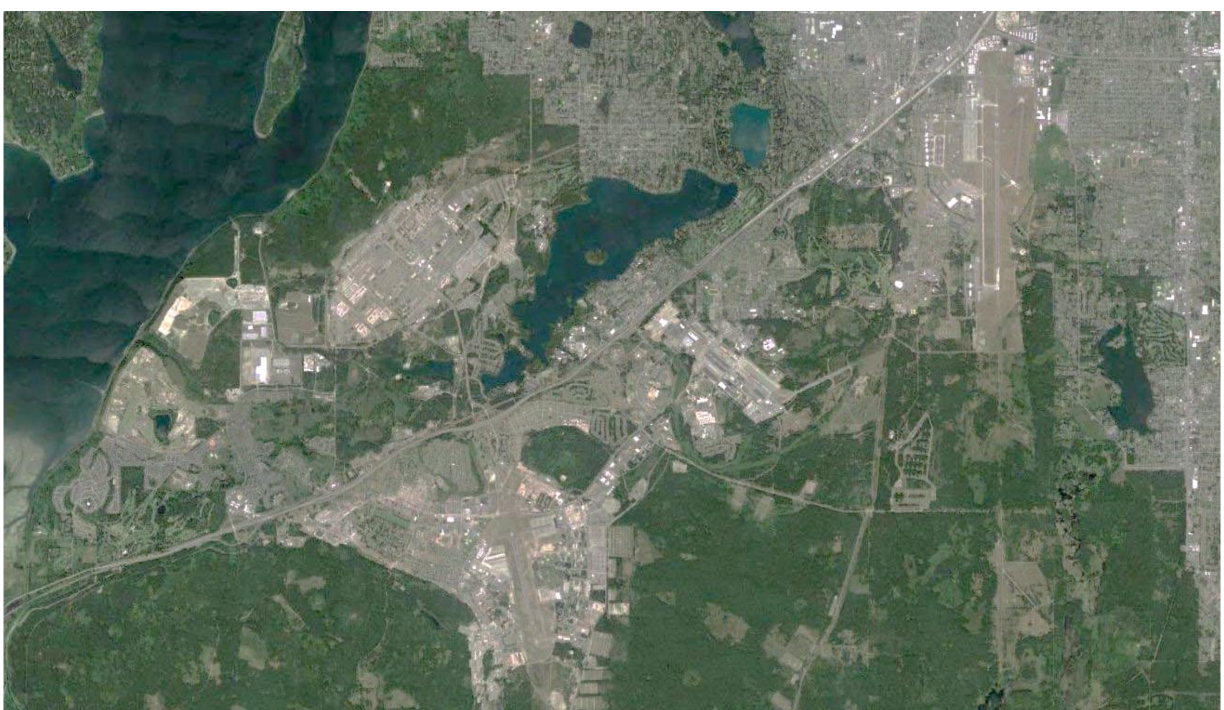
Illicit PCB Dump cap needs brush clearing. Fence needs new signs.

DRAFT
JANUARY 2022

LAND USE CONTROLS CHECKLIST - 2021

Joint Base Lewis-McChord
Pierce County, Washington

Joint Base Lewis-McChord Public Works – Environmental Division
IMLM-PWE
MS 17 Box 339500
Joint Base Lewis-McChord, Washington 98433



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Land Use Controls Checklist - 2021

Prepared for

Joint Base Lewis-McChord Public Works – Environmental Division
IMLM-PWE
MS 17 Box 339500
Joint Base Lewis-McChord, Washington 98433

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
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Garrett Lee, P.E. Project Manager	Date

James Costello, P.G. Program Manager	Date

January 2022
Revision: 0
EA Project No. 63043.05

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JBLM CERCLA
LUC MONITORING CHECKLIST

SECTION A: FIELD INSPECTION

Site	Inspection Date	Questions	Answer
Logistics Center	12/9/21	Any residential land use within Landfill 2 or within the 40 µg/L trichloroethylene groundwater contour?	Yes / No
		Any obvious recent construction/excavation within Landfill 2?	Yes / No
		Any obvious recent training activities within Landfill 2?	Yes / No
		Does the Landfill 2 boundary fence and/or signs need maintenance?	Yes / No
		Any new drinking water wells planned at or within 1,000 feet of the site?	Yes / No
Landfill 4 (Lewis)	11/22/21	Any residential land use within landfill boundary?	Yes / No
		Any obvious recent construction/excavation within landfill boundary?	Yes / No
		Any obvious recent digging, bivouacking, or off-road maneuvering in landfill?	Yes / No
		Any new drinking water wells planned within 1,000 feet of the site?	Yes / No
SRCPP	12/9/21	Any new drinking water wells planned at or within 1,000 feet of the site?	Yes / No
Battery Acid Pit	12/9/21	Any residential land use within site boundary?	Yes / No
		Any obvious recent construction/excavation within site boundary?	Yes / No
		Does asphalt cap need maintenance?	Yes / No
DRMO Yard	12/9/21	Any residential land use within site boundary?	Yes / No
Illicit PCB Dump Site	11/22/21	Any residential land use within site boundary?	Yes / No
		Any obvious recent construction/excavation within site boundary?	Yes / No
		Any obvious recent training activities within site boundary?	Yes / No
		Does boundary fence and/or signs need maintenance?	Yes / No
		Does clay cap need maintenance?	Yes / No
IWTP Site	11/22/21	Any residential land use within site boundary?	Yes / No
Landfill 1 (Lewis)	11/22/21	Any residential land use within landfill boundary?	Yes / No
		Any obvious recent construction/excavation within landfill?	Yes / No
		Any new drinking water wells planned within 1,000 feet of the site?	Yes / No
Pesticide Rinse Area	11/22/21	Any residential land use within site boundary?	Yes / No
McChord Field: Landfills 4, 5, 6, and 7	12/9/21	Any residential land use within landfill boundary?	Yes / No
		Any obvious recent construction/excavation within landfill boundary?	Yes / No
		Any new drinking water wells planned within 1,000 feet of the site?	Yes / No
McChord Field: Landfills OT-26 and OT-39	12/9/21	Any residential land use within landfill boundary?	Yes / No
		Any obvious recent construction/excavation within landfill boundary?	Yes / No
		Any new drinking water wells planned within 1,000 feet of the site?	Yes / No
Area D/AGLT Groundwater Plume (west of McChord Landfill 5)	12/9/21	Any new drinking water wells planned within the plume boundary?	Yes / No
Site Summary		Any comments? (Comments are required for all **Yes** answers and any **No** answers requiring additional explanation.) If yes, detail in Section D, Comments.	[redacted] No

JBLM CERCLA
LUC MONITORING CHECKLIST

SECTION B: INTERVIEWS

Position	Name	Date of Interview	Questions	Answer
PW GIS Lab	TERESA HANSEN	11/4/21	Are you still storing the LUC data layer in GIS?	Yes / No
			Is the LUC data layer still available to GIS users?	Yes / No
Master Planner	DARRYL ABE	12/9/21	Do you still have access to the LUC data when you need it?	Yes / No
			Are you still using the LUC data for a Master Plan overlay?	Yes / No
NEPA Program Manager	CHRIS RUNNER	11/4/21	Do you still have access to the LUC data when you need it?	Yes / No
			Are you still using the LUC data as an environmental review overlay?	Yes / No
			Are training LUCs still included on the Environmental Coordination Map?	Yes / No
			Are you still using the LUC data for a digging permit overlay?	Yes / No
Cultural Resources PM	CHRIS RUNNER	11/4/21	Do you still have access to the LUC data when you need it?	Yes / No
			Are you still using the LUC data for a digging permit overlay?	Yes / No
Range Operations	HAROLD NELSON	11/4/21	Are you still using the Environmental Coordination Map as primary tool for implementing environmental LUCs under FLR 350-30?	Yes / No
Water Systems Manager	DOUG STOTLER	11/19/21	Do you still have access to the LUC data when you need it?	Yes / No
			Are WSP LUCs going to (be added/remain) in future WSP updates?	Yes / No
			Any plans for new drinking water wells in JBLM Cantonment Area Water System?	Yes / No
Lakewood Water Quality Dept.	DON STANLEY	11/4/21	Any plans for new drinking water wells in JBLM Cantonment Area Water System?	Yes / No
			Any existing drinking water wells within Tillicum besides Well A-1?	Yes / No
			Any plans for new drinking water wells within Tillicum?	Yes / No
Additional Reporting			Any comments or additional reporting? (See instructions for required comments.) If yes, detail in Section D, Comments.	Yes / No
Changes to LUC Mechanisms			Any changes noted with how LUC mechanisms are executed? If yes, detail in Section D, Comments.	Yes / No

JBLM CERCLA
LUC MONITORING CHECKLIST

SECTION C: CERTIFICATION

Based on this monitoring, LUC mechanisms appear to be working and achieving LUC objectives.

[signature] 12/9/21

Signature Date

SECTION D: COMMENTS

11/22/21 LANDFILL 4- OBVIOUS SIGNS OF BIVOUACKING & OFFROAD MANEUVERING IN LANDFILL

11/22/21 ILLICIT PCB DUMP SITE - DEEP ROOTING VEGGETATION GROWING ON CAP

11/19/21 PLANS TO REPLACE CONTAMINATED AND RETIRED WELLS FOR JBLM CANTONMENT AREA DRINKING WATER WELLS ARE IN PLACE OR BEING INVESTIGATED

Appendix F
Logistics Center Pump & Treat Performance and Operation & Maintenance Information

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Groundwater Treatment System Shutdowns and O&M Activities, 2018 through 2021

Date	Operation & Maintenance Activity, 2018	Lost Production Volume (gallons)
	I-5 System	
1/18/2018	LX-14 tripped on low level alarm. Reduced flow from 13 to 11 gpm.	0
1/18/2018	Increased flow at LX-8 from 47 to 49 gpm.	0
2/2/2018	Transfer of control under new contract from Sealaska to EA Engineering. LX-13 tripped on low level alarm, reduced flow by 1-2 gpm.	1,500
2/26/2018	Evaluation of discharge pump P2 to determine why flow has been reduced. Possible seal leak due to increased silt/ sand production at wells LX-5,8,13,14 and 15.	0
3/7/2018	LX-5 shut down to change isolator in panel to transducer, alarm reset and well pumping normally again.	2,000
3/22/2018	Discharge pump P2 is shut down due to leaking seal. Pump P1 is put in lead and will stay in lead until leaking seal can be replaced on P2.	0
5/14/2018	I5 treatment system shut down to simulate a power outage to test backup boiler system at buildings using heat transfer system. System shut down at 1025 am and will be restarted tomorrow May 15 at 0800 am. Oil changed in discharge pump P1.	0
5/15/2018	I5 treatment system turned back on at 0836 after 22 hour shut down to simulate power failure. System back up and running normally.	0
5/22/2018	LX-13 tripped on low level alarm. Well running normally, reduced flow from 13 to 11 gpm.	0
5/23/2018	LX-11 slowed from 155 to 147 gpm.	
6/21/2018	LX-11 slowed from 147 to 140 gpm.	0
8/2/2018	LX-13 tripped on low level alarm. Well running normally, reduced flow to 6 gpm.	0
9/19/2018	Whitney Equipment Co. at I5 system to replace leaking seal on discharge pump P2. No system shutdown, just disconnecting of pump P2 for repairs. New coupling ordered for the pump and will be replaced when received.	0
10/15/2018	Power lost to both systems for approximately 2 hours. Power restored and system running normally again.	150,000
12/6/2018	Whitney Equipment Co. back at I5 system to finish repair of discharge pump P2 seal. Seal replaced and pump turned back on and running normally. System switched back to auto on pump P1 and P2.	0
12/17/2018	Oil changed in pump P2.	0
	I-5 Lost Production Total, 2018	**153,500**
	LF-2 System	
1/26/2018	Increased flow at PW-2 from 57 to 60 gpm, PW-4 from 42 to 45 gpm, PW-7 from 34 to 36 gpm, and PW-8 from 10 to 12 gpm.	0
2/2/2018	Transfer of control under new contract from Sealaska to EA Engineering.	0
2/13/2018	Adjusting calibration on PW-6 transducer.	0
3/2/2018	RP2 greased and running.	0
3/27/2018	Transferred 168 gallons of IDW water from sampling event into acid wash tank.	0
4/3/2018	Pumped 80 gallons of IDW water from sampling event into acid wash tank.	0
6/14/2018	Pumped 55 gallons of IDW water from sampling event into acid wash tank.	0
9/28/2018	PW-1 pumping rate has dropped to low level, pumping is sporadic and well is now running on flow set points between 3 and 8 gpm.	5,310
10/9/2018	RP1 greased and running.	0
10/15/2018	Power lost to both systems for approximately 2 hours. Power restored and system running normally again.	58,680
10/16/2018	Both discharge pump VFDs failed overnight. Pumps reset and both running normally, approximate shutdown time of 8 hours.	234,720
11/8/2018	PW-1 slowed from 45 Hz to 44 Hz due to lack of production.	0
11/19/2018	PW-2 tripped on low level alarm, reduced flow from 60 to 55 gpm.	0
12/27/2018	RP1 VFD alarm tripped on 12/25/2018. Alarm reset and pump reset immediately and pump returned to normal.	0
	LF-2 Lost Production Total, 2018	**298,710**
	SLAPT System	
11/20/2018	SLAPT system shut down to replace supply fan belts and filters on stripper tower. Estimate 7 hour down time	624,120
12/17/2018	Replaced stripper tower blower air filters. No interruption of operation.	0
	SLAPT Lost Production Total, 2018	**624,120**

Date	Operation & Maintenance Activity, 2019	Lost Production Volume (gallons)
	I-5 System	
2/9/2019	Loss of power to I-5 system at approximately 12:30am due to snow storm.	0
2/10/2019	Power restored to I-5 system after snow storm ended, system on at 10:15am.	2,381,437
2/14/2019	Tower float alarm tripped at 10:50am, system shut down to inspect tower float transducer.	0
2/15/2019	Tower float transducer fixed at 9:00am and system back on and running.	1,577,216
4/17/2019	Pump P2 oil change, no shutdown of system required.	0
6/22/2019	Loss of power to I-5 system at 5:17am, no alarms sent to operator.	0

Groundwater Treatment System Shutdowns and O&M Activities, 2018 through 2021

6/26/2019	Malfunctioning UPS system found to be cause of no alarms sent to operator. System restarted at 9:15am. Pump P1 oil changed.	6,931,246
6/27/2019	Loss of power to I-5 system at 4:00pm, no alarms sent to operator.	0
6/28/2019	System restarted at 9:00am.	1,178,312
7/18/2019	Loss of power to I-5 system at 4:45am. System restarted at 10:05am.	351,577
7/19/2019	LX-4 down due to transducer failure.	0
7/27/2019	Loss of power to I-5 system at 3:00pm, no alarms sent to operator.	0
7/29/2019	System restarted at 7:20am.	2,811,505
7/29/2019	LX-14 and LX-15 shut down to attempt well rehabilitation.	0
7/31/2019	LX-14 and LX-15 permanently shut down due to corrosion of well casing and the inability to rehabilitate either well. Associated pumps, motors, and piping removed from wells and stored on base.	0
7/31/2019	LX-4 transducer replaced. LX-4 remains down.	0
10/30/2019	LX-4 PLC card replaced. LX-4 remains down.	0
11/7/2019	Planned shutdown for 20 mins for DPW to check on transformer to install grounding in all extraction wells and treatment system building. US Electric recalibrated and reinstalled the transducer at LX-4. LX-4 running again.	21,209
12/11/2019	Pump P1 oil change, no shutdown of system required.	0
12/31/2019	Pump P2 oil change, no shutdown of system required.	0
	I-5 Lost Production Total, 2019	**15,252,501**
	LF-2 System	
2/9/2019	Loss of power to LF2 system at approximately 12:30am due to snow storm.	0
2/10/2019	Power restored to LF2 system after snow storm ended, system on at 10:30am.	1,010,856
4/12/2019	Both discharge pumps RP1 and RP2 greased, no shutdown of system needed.	0
6/27/2019	Loss of power to LF2 system at approximately 4:00 pm.	
6/28/2019	System started restarted at 10:30am. After startup, PW-7 was adjusted from running on set point of 36 gpm to running on speed of 38 hz to lessen variances in flow.	476,474
7/2/2019	PW-1 pumping rate has dropped to low level, pumping is sporadic and well is now running on flow set points between 3 and 8 gpm.	0
7/18/2019	Loss of power to LF2 system at 4:45am, no alarms sent to operator to notify of power loss. System started at 9:45am.	138,653
12/15/2019	Blower fault sent to both operators at 7:35am, attempt to restart system remotely failed. Blower flow switch found to be inoperable so system placed in Hand mode at 9:55am until switch can be replaced.	61,556
12/16/2019	PW-1 shut down due to alarm, check of VFD has fault labeled "load loss". Operators expect motor has failed.	0
12/18/2019	Replacement of blower flow switch and reset of tripped breaker associated with blower, system shut down for 45 mins. Placed back into Auto mode and running again as normal.	19,743
	LF-2 Lost Production Total, 2019	**1,707,282**
	SLAPT System	
5/17/2019	SLAP system shut down for 4 hours for annual belt and filter replacement on stripping tower fan.	341,250
11/23/2019	Black box communication relay failure at SLAP pump #5 caused a 4 hour shutdown of SLAP wells #1 through #5.	268,167
	SLAPT Lost Production Total, 2019	**609,417**

Date	Operation & Maintenance Activity, 2020	Lost Production Volume (gallons)
	I-5 System	
1/7/2020	LX-9 shut down to repair leak.	0
1/9/2020	LX-9 restarted following repair completion.	197,535
1/9/2020	I-5 system shut down by power outage.	0
1/9/2020	I-5 system restarted.	511,720
1/11/2020	I-5 system shut down by power outage.	0
1/13/2020	I-5 system restarted.	3,615,716
1/20/2020	I-5 system shut down to repair leak at LX-14.	0
1/20/2020	I-5 system restarted following repair at LX-14.	93,291
1/22/2020	I-5 system shut down to replace SCADA batteries.	0
1/22/2020	I-5 system restarted following SCADA battery replacement.	46,084
1/31/2020	I-5 system shut down for electrical grid repairs (distribution transformer replacement).	0
2/3/2020	I-5 system restarted following electrical grid repairs.	5,894,104
3/4/2020	I-5 system shut down for electrical work in well houses.	0
3/4/2020	I-5 system restarted following completion of electrical work.	701,848
3/12/2020	I-5 system emergency shutdown due to JBLM DPW electric shop breaking plumbing at LX-12.	0
3/13/2020	I-5 system restarted following emergency repairs. LX-12 left offline for repairs.	1,641,524
3/17/2020	I-5 system shut down for electrical work in well houses.	0
3/17/2020	I-5 system restarted following completion of electrical work.	630,336
4/3/2020	I-5 system shut down for repair of LX-12.	0
4/3/2020	I-5 system restarted following repair of LX-12.	39,671
4/3/2020	LX-12 restarted following repairs.	5,485,244
7/14/2020	I-5 system shut down by power outage.	0
7/14/2020	I-5 system restarted.	25,208
7/29/2020	I-5 system shut down by power outage. No alarm call was received.	0
8/3/2020	I-5 system restarted.	7,015,552
8/4/2020	I-5 system shut down by power outage. No alarm call was received.	0

Groundwater Treatment System Shutdowns and O&M Activities, 2018 through 2021

8/4/2020	I-5 system restarted.	779,506
8/19/2020	I-5 system shut down to repair leak at LX-9.	0
8/19/2020	I-5 system restarted following repair of LX-9.	73,236
9/8/2020	I-5 system shut down for blower maintenance.	0
9/8/2020	I-5 system restarted following completion of blower maintenance.	109,578
9/24/2020	LX-8, LX-9, and LX-11 shut down by power outage.	0
9/24/2020	LX-8, LX-9, and LX-11 restarted.	151,494
10/13/2020	I-5 system shut down by power outage (multiple outages).	0
10/13/2020	I-5 system restarted (multiple restarts).	70,794
10/29/2020	I-5 system shut down due to electrical issues	0
10/29/2020	I-5 system restarted following troubleshoot/repair of electrical issues.	170,039
11/2/2020	I-5 system shut down due to electrical issues	0
11/2/2020	I-5 system restarted following troubleshoot/repair of electrical issues.	19,229
12/21/2020	LX-9 shut down to repair leak.	0
12/24/2020	I-5 system shut down to repair leak at LX-9.	0
12/24/2020	I-5 system restarted following repair of LX-9. LX-9 left offline for adhesive to cure.	347,683
12/28/2020	LX-9 restarted following repairs.	999,060
	I-5 Lost Production Total, 2020	**28,618,451**
	LF-2 System	
1/9/2020	LF-2 system shut down by power outage.	0
1/9/2020	LF-2 system restarted.	290,172
1/9/2020	LF-2 system shut down by power outage.	0
1/13/2020	LF-2 system restarted.	2,155,728
1/14/2020	PW-7 failure. Left offline for repairs.	0
1/23/2020	Restart PW-01 (off since 2019) and PW-7 following repairs. Lost production for PW-1 is from 1/1/2020-1/23/2020.	729,368
1/23/2020	PW-7 failure. Left offline for repairs.	0
3/2/2020	LF-2 system shut down by unspecified fault.	0
3/2/2020	LF-2 system restarted.	50,145
3/3/2020	LF-2 system shut down due to blower failure.	0
3/3/2020	LF-2 system restarted following blower repair.	25,073
7/11/2020	PW-1 seasonal shutdown due to low water level. Lost production is from 8/10/2021 through 11/3/2021.	0
7/14/2020	LF-2 system shut down by power outage.	0
7/14/2020	LF-2 system restarted.	47,687
7/28/2020	PW-7 restarted following installation of replacement pump.	16,106,496
11/15/2020	PW-1 restarted following seasonal shutdown.	568,198
	LF-2 Lost Production Total, 2020	**19,972,867**
	SLAPT System	
7/29/2020	SLAP-1, SLAP-2, SLAP-3 shut down by communications error.	0
7/29/2020	SLAP-1, SLAP-2, SLAP-3 restarted.	45,300
12/2/2020	SLAPT system shut down to replace blower belts.	0
12/2/2020	SLAPT system restarted following replacement of blower belts.	319,560
12/16/2020	SLAPT system shut down to replace fire sprinkler system backflow valve.	0
12/16/2020	SLAPT system restarted following replacement of fire sprinkler system backflow valve.	798,900
	SLAPT Lost Production Total, 2020	**1,163,760**

Date	Operation & Maintenance Activity, 2021	Lost Production Volume (gallons)
	I-5 System	
1/12/2021	I-5 system shut down by power surge.	520,675
1/13/2021	I-5 system restarted.	0
2/18/2021	I-5 system shut down by power surge.	6,812,358
2/22/2021	I-5 system restarted.	0
2/27/2021	I-5 system shut down by grounding issue.	0
3/1/2021	I-5 system restarted.	0
3/30/2021	LX-6 motor failure. Lost production is from 3/30/2021 through 12/31/2021.	2,895,516
4/19/2021	LX-13 shut down for well inspection.	0
4/19/2021	LX-13 restarted.	0
4/20/2021	LX-11 and LX-12 shut down for well inspection.	96,527
4/20/2021	LX-11 and LX-12 restarted.	0
4/21/2021	LX-9 and LX-10 shut down for well inspection.	98,120
4/21/2021	LX-9 and LX-10 restarted.	0
4/22/2021	LX-4, LX-5, LX-7, and LX-8 shut down for well inspection.	102,033
4/23/2021	LX-4, LX-5, LX-7, and LX-8 restarted.	0
4/23/2021	LX-2 and LX-3 shut down for well inspection.	48,957
4/23/2021	LX-2 and LX-3 restarted.	0
4/23/2021	LX-4 motor failure. Lost production is from 4/23/2021 through 12/31/2021.	60,715,116
6/11/2021	LX-14R and LX-15R placed online.	0
6/15/2021	I-5 system shut down for maintenance.	79,116
6/15/2021	I-5 system restarted.	0
8/20/2021	I-5 system shut down for maintenance.	140,975
8/20/2021	I-5 system restarted.	0
9/6/2021	I-5 system shut down by power surge.	11,936
9/6/2021	I-5 system restarted.	0

Groundwater Treatment System Shutdowns and O&M Activities, 2018 through 2021

	I-5 Lost Production Total, 2021	**71,521,330**
	LF-2 System	
1/12/2021	PW-1 shut down by power surge.	384,776
1/20/2021	PW-1 restarted.	0
3/6/2021	PW-6 shut down by VFD overheat fault.	466,770
3/8/2021	PW-6 restarted.	0
3/8/2021	PW-6 motor failure. Lost production is from 3/8/2021 through 12/31/2021.	72,321,024
3/25/2021	PW-8 shut down due to power panel disconnection.	845,260
4/20/2021	PW-8 restarted.	0
4/20/2021	PW-7 motor failure. Lost production is from 4/20/2021 through 12/31/2021.	32,899,080
4/20/2021	PW-4 and PW-5 shut down for well inspection.	67,272
4/21/2021	PW-4 and PW-5 restarted.	0
4/21/2021	PW-1, PW-2, and PW-3 shut down for well inspection.	29,983
4/21/2021	PW-1, PW-2, and PW-3 restarted.	0
4/22/2021	PW-2 shut down for leak repair.	18,372
4/22/2021	PW-2 restarted.	0
6/15/2021	LF-2 system shut down for maintenance.	19,573
6/15/2021	LF-2 system restarted.	0
7/16/2021	LF-2 system shut down for repair of conveyance line leak.	2,259,080
7/21/2021	LF-2 system restarted.	0
8/10/2021	LF-2 system shut down for plumbing repair at PW-2.	26,772
8/10/2021	LF-2 system restarted.	0
8/10/2021	PW-1 seasonal shutdown due to low water level. Lost production is from 8/10/2021 through 11/3/2021.	361,930
8/16/2021	LF-2 system shut down for repair of conveyance line leak.	89,622
8/16/2021	LF-2 system restarted.	0
8/20/2021	LF-2 system shut down for maintenance.	70,969
8/20/2021	LF-2 system restarted.	0
9/8/2021	PW-5 shut down by power surge.	1,839,040
9/13/2021	PW-5 restarted.	0
9/17/2021	LF-2 system offline for aquifer pump test. PW-2 operated from 9/20/2021 to 9/23/2021 at 45 gpm.	3,962,404
9/27/2021	LF-2 system restarted.	0
10/1/2021	LF-2 system offline for aquifer pump test. PW-5 operated from 10/5/2021 to 10/8/2021 at 170 gpm.	3,912,358
10/12/2021	LF-2 system restarted.	0
11/3/2021	PW-1 restarted following seasonal shutdown.	0
	LF-2 Lost Production Total, 2021	**119,574,284**
	SLAPT System	
5/24/2021	SLAPT system off to replace belts on air stripping tower fan.	244,063
5/24/2021	SLAPT system restarted.	0
11/15/2021	SLAP-4 shut down by power surge.	235,000
11/15/2021	SLAP-4 restarted.	0
11/24/2021	SLAPT system off to replace belts and filters on air stripping tower fan.	315,417
11/24/2021	SLAPT system restarted.	0
	SLAPT Lost Production Total, 2021	**794,479**

Lost production volumes are estimated from records of duration of outage multiplied by nearest average flow rate, rounded to nearest 10 gallon.
gpm = gallons per minute
Hz = Hertz
IDW = Investigation-derived waste
VFD = Variable frequency drive

Appendix G

Groundwater Data

OU1/FTLE-33

Groundwater Data from

2021 Annual Logistics Center Remedial Action Monitoring Report, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington

January 2022

Table 5
Summary of Analytical Results for Contaminants of Concern
(TCE, cDCE, PCE, TCA, VC) - 2021
Logistics Center, Joint Base Lewis McChord, Washington

Location ID	Sample Collection Date	TCE (µg/L)	cDCE (µg/L)	PCE (µg/L)	TCA (µg/L)	VC (µg/L)
ROD Remediation Goal		**5.0**	**70**	**5.0**	**-**	**-**
MCL		5.0	70	5.0	**200**	**2.0**
Upper Vashon Aquifer						
85-PA-381	11-Mar-21	9.5	0.070 J	0.20 U	0.20 U	0.10 U
85-PA-382	11-Mar-21	12	**0.28 J**	0.20 U	0.20 U	0.10 U
85-PA-384	11-Mar-21	**0.11 J**	0.20 U	0.20 U	0.20 U	0.10 U
CM-2	10-Mar-21	**1.8**	0.20 U	0.20 U	0.20 U	0.10 U
FL-1	11-Mar-21	6.0	0.15 J	0.20 U	0.20 U	0.10 U
FL-2	10-Mar-21	**3.0**	0.16 J	0.20 U	0.20 U	0.10 U
Duplicate	10-Mar-21	**3.1**	0.18 J	0.20 U	0.20 U	0.10 U
FL-3	10-Mar-21	**2.1**	0.20 U	0.20 U	0.20 U	0.10 U
FL-4b	11-Mar-21	**0.64**	0.070 J	0.20 U	0.20 U	0.10 U
FL-6	March 2021 - Inaccessible (vegetation)					
LC-03	8-Mar-21	**1.4**	0.20 U	0.20 U	0.20 U	0.10 U
LC-06	8-Mar-21	35	**1.1**	0.14 J	0.20 U	0.10 U
LC-14a	11-Mar-21	38	**0.57 J**	0.11 J	0.20 U	0.10 U
LC-18	11-Mar-21	**1.4**	**6.3**	0.20 U	0.20 U	0.10 U
LC-19a	12-Mar-21	46	**0.73**	0.20 U	0.20 U	0.10 U
LC-20	10-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
LC-24	25-Mar-21	**0.86**	0.20 U	0.20 U	0.20 U	0.10 U
LC-26	10-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
LC-27	10-Mar-21	5.8	**0.44 J**	0.20 U	0.20 U	0.10 U
	1-Sep-21	8.5	**0.58**	0.20 U	0.20 U	0.15 U
LC-34	11-Mar-21	**0.81**	**0.93**	0.20 U	0.20 U	**0.25 J**
LC-41a	11-Mar-21	69	**0.72**	0.20 U	0.20 U	0.10 U
LC-48	12-Mar-21	32	**1.8**	0.18 J	0.20 U	0.10 U
LC-53	25-Mar-21	210	**3.6**	0.20 U	0.13 J	0.10 U
LC-57	10-Mar-21	**0.17 J**	0.20 U	0.20 U	0.20 U	0.10 U
LC-64a	11-Mar-21	71	**1.2**	0.20 U	0.20 U	0.10 U
LC-109	25-Mar-21	**1.1**	0.20 U	0.20 U	0.20 U	0.10 U
	1-Sep-21	**0.72**	0.20 U	0.20 U	0.20 U	0.10 U
Duplicate	1-Sep-21	**0.68**	0.20 U	0.20 U	0.20 U	0.10 U
LC-124	11-Mar-21	**0.35 J**	0.20 U	0.20 U	0.20 U	0.10 U
	1-Sep-21	**2.8**	0.20 U	0.20 U	0.20 U	0.15 U
LC-132	25-Mar-21	45	**0.44 J**	**0.40 J**	0.14 J	0.10 U
LC-135	11-Mar-21	31	**0.30 J**	0.20 U	0.20 U	0.10 U
	1-Sep-21	38	**0.36 J**	0.20 U	0.20 U	0.15 U
LC-137b	10-Mar-21	110	**1.1**	0.20 U	0.080 J	0.10 U
	1-Sep-21	110	**1.1**	0.20 U	0.12 J	0.15 U
LC-160	10-Mar-21	11	**0.21 J**	0.20 U	0.080 J	0.10 U
	1-Sep-21	16	**0.29 J**	0.20 U	0.20 U	0.15 U

Table 5
Summary of Analytical Results for Contaminants of Concern
(TCE, cDCE, PCE, TCA, VC) - 2021
Logistics Center, Joint Base Lewis McChord, Washington

Location ID	**Sample Collection Date**	**TCE (µg/L)**	**cDCE (µg/L)**	**PCE (µg/L)**	**TCA (µg/L)**	**VC (µg/L)**
ROD Remediation Goal		**5.0**	**70**	**5.0**	**-**	**-**
MCL		5.0	70	5.0	**200**	**2.0**
LC-167	11-Mar-21	**0.11 J**	0.20 U	0.20 U	0.20 U	0.10 U
Duplicate	11-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
LC-178	8-Mar-21	**3.9**	**0.10 J**	0.20 U	0.20 U	0.10 U
	31-Aug-21	**0.33 J**	0.20 U	0.20 U	0.20 U	0.15 U
LC-180	10-Mar-21	**1.6**	0.20 U	0.20 U	0.20 U	0.10 U
LC-192	March 2021 - Well Destroyed					
LC-202	March 2021 - Sample Not Received by Laboratory					
LC-218	11-Mar-21	21	**0.34 J**	0.20 U	0.20 U	0.10 U
LC-222	11-Mar-21	**2.5**	**0.96**	0.20 U	0.20 U	0.10 U
LC-223	11-Mar-21	5.6	0.15 J	0.20 U	0.20 U	0.10 U
	31-Aug-21	11	**0.34 J**	0.20 U	0.20 U	0.15 U
Duplicate	31-Aug-21	8.1	0.19 J	0.20 U	0.20 U	0.15 U
LC-224	11-Mar-21	5.9	0.11 J	0.20 U	0.20 U	0.10 U
	31-Aug-21	8.7	**0.22 J**	0.20 U	0.20 U	0.15 U
LC-227	10-Mar-21	**3.1**	0.20 U	0.20 U	0.20 U	0.10 U
Duplicate	10-Mar-21	**3.3**	0.20 U	0.20 U	0.20 U	0.10 U
	1-Sep-21	20	**0.25 J**	0.20 U	0.20 U	0.15 U
LC-228	10-Mar-21	5.6 `	0.080 J	0.20 U	0.20 U	0.10 U
	1-Sep-21	**4.3**	0.13 J	0.20 U	0.20 U	0.15 U
LC-229	10-Mar-21	10	0.14 J	0.20 U	0.20 U	0.10 U
	1-Sep-21	13	0.16 J	0.20 U	0.20 U	0.15 U
LC-230	11-Mar-21	0.18 J	0.20 U	0.20 U	0.20 U	0.10 U
LC-231	11-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
LC-232	11-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
LC-233	11-Mar-21	**0.46 J**	0.20 U	0.20 U	0.20 U	0.10 U
LC-234	11-Mar-21	**0.18 J**	0.20 U	0.20 U	0.20 U	0.10 U
LC-235	11-Mar-21	20	**0.27 J**	0.13 J	0.20 U	0.10 U
LC-236	11-Mar-21	13	0.13 J	0.20 U	0.20 U	0.10 U
	1-Sep-21	14	0.14 J	0.20 U	0.20 U	0.15 U
LX-02	11-Mar-21	**3.7**	0.10 J	0.20 U	0.20 U	0.10 U
	31-Aug-21	**3.3**	0.20 U	0.20 U	0.20 U	0.15 U
LX-03	11-Mar-21	8.7	**0.30 J**	0.20 U	0.20 U	0.10 U
	31-Aug-21	8.5	**0.28 J**	0.20 U	0.14 J	0.15 U
LX-04	11-Mar-21	19	**0.44 J**	0.20 U	**0.36 J**	0.10 U
Duplicate	11-Mar-21	18	**0.43 J**	0.20 U	**0.36 J**	0.10 U
	September 2021 -Well Offline					
LX-05	11-Mar-21	37	**0.89**	0.20 U	**0.33 J**	0.10 U
Duplicate	11-Mar-21	38	**0.87**	0.20 U	**0.34 J**	0.10 U
	2-Sep-21	35	**0.87**	0.20 U	**0.29 J**	0.15 U
LX-06	11-Mar-21	39	**0.89**	0.15 J	**0.56**	0.10 U
	September 2021 - Well Offline					
LX-07	11-Mar-21	48	**0.85**	**0.24 J**	**0.23 J**	0.10 U
Duplicate	11-Mar-21	48	**0.83**	0.18 J	**0.24 J**	0.10 U
	31-Aug-21	47	**0.83**	**0.20 J**	**0.27 J**	0.15 U
LX-08	11-Mar-21	50	**0.70**	**0.34 J**	0.090 J	0.10 U
	31-Aug-21	55	**0.73**	**0.36 J**	0.18 J	0.15 U
LX-09	11-Mar-21	35	**0.91**	0.15 J	0.10 J	0.10 U
	31-Aug-21	41	**0.81**	0.17 J	0.12 J	0.15 U
LX-10	11-Mar-21	39	**0.54**	0.18 J	0.20 U	0.10 U
	2-Sep-21	46	**0.63**	**0.22 J**	0.20 U	0.15 U
LX-11	11-Mar-21	28	**0.60**	0.20 U	0.080 J	0.10 U
Duplicate	11-Mar-21	28	**0.56**	0.20 U	0.20 U	0.10 U
	2-Sep-21	32	**0.63**	0.20 U	0.090 J	0.15 U
LX-12	11-Mar-21	18	**0.27 J**	0.20 U	0.20 U	0.10 U

Table 5
Summary of Analytical Results for Contaminants of Concern
(TCE, cDCE, PCE, TCA, VC) - 2021
Logistics Center, Joint Base Lewis McChord, Washington

Location ID	Sample Collection Date	TCE (µg/L)	cDCE (µg/L)	PCE (µg/L)	TCA (µg/L)	VC (µg/L)
ROD Remediation Goal		**5.0**	**70**	**5.0**	**-**	**-**
MCL		5.0	70	5.0	**200**	**2.0**
	31-Aug-21	23	**0.38 J**	0.20 U	0.090 J	0.15 U
LX-13	11-Mar-21	6.9	**0.32 J**	0.20 U	0.20 U	0.10 U
Duplicate	11-Mar-21	6.8	**0.32 J**	0.20 U	0.20 U	0.10 U
	31-Aug-21	7.8	**0.36 J**	0.20 U	0.20 U	0.10 U
LX-14	March 2021 - Well Offline					
	31-Aug-21	7.0	0.12 J	0.20 U	0.20 U	0.15 U
LX-15	March 2021 - Well Offline					
	31-Aug-21	**3.3**	0.20 U	0.20 U	0.20 U	0.15 U
MT-1	10-Mar-21	78	**0.90**	0.20 U	0.20 U	0.10 U
	1-Sep-21	70	**0.62**	0.20 U	0.20 U	0.15 U
MT-2	10-Mar-21	6.7	**0.35 J**	0.20 U	0.20 U	0.10 U
Duplicate	10-Mar-21	6.4	**0.32 J**	0.20 U	0.20 U	0.10 U
	1-Sep-21	7	**0.25 J**	0.20 U	0.20 U	0.15 U
MT-3	10-Mar-21	7.0	**0.86**	0.20 U	0.20 U	0.10 U
	1-Sep-21	9.5	**0.74**	0.20 U	0.20 U	0.15 U
MT-4	10-Mar-21	9.4	**0.32 J**	0.20 U	0.20 U	0.10 U
Duplicate	10-Mar-21	9.1	**0.25 J**	0.20 U	0.20 U	0.10 U
	1-Sep-21	**4.2**	0.15 J	0.20 U	0.20 U	0.15 U
PW-1	10-Mar-21	62	**8.3**	**0.31 J**	0.20 U	0.10 U
	September 2021 - Well Offline					
PW-2	10-Mar-21	22	**0.58**	0.20 U	0.20 U	0.10 U
	31-Aug-21	43	**1.7**	0.20 U	**0.44 J**	0.15 U
PW-3	10-Mar-21	76	**15**	0.20 U	0.20 U	0.10 U
	31-Aug-21	76	**0.82**	0.20 U	0.20 U	0.15 U
PW-4	10-Mar-21	24	**1.2**	0.20 U	**0.23 J**	0.10 U
	31-Aug-21	45	**3.6**	0.20 U	**1.2**	0.15 U
PW-5	10-Mar-21	19	**1.7**	0.20 U	**0.26 J**	0.10 U
	31-Aug-21	21	**1.0**	0.20 U	**0.26 J**	0.15 U
PW-6	10-Mar-21	5.7	**0.84**	0.20 U	0.20 U	0.10 U
	September 2021 - Well Offline					
PW-7	10-Mar-21	13	**0.46** J	0.20 U	0.20 U	0.10 U
	September 2021 - Well Offline					
PW-8	10-Mar-21	9.6	**2.0**	0.20 U	0.20 U	0.10 U
	31-Aug-21	11	**1.0**	0.20 U	0.20 U	0.15 U
SW-MC-08	10-Mar-21	**0.62**	0.20 U	0.20 U	0.20 U	0.10 U
T-04	March 2021 - Inaccessible (car covering well)					
	2-Sep-21	5.0	0.12 J	0.20 U	0.20 U	0.15 U
T-05	25-Mar-21	**1.3**	0.11 J	0.20 U	0.20 U	0.10 U
T-06	March 2021 - Insufficent Water in PDB for Sample					
T-11b	25-Mar-21	**3.7**	0.20 U	0.20 U	0.20 U	0.10 U
T-13b	25-Mar-21	**4.4**	**0.50**	0.11 J	**0.23 J**	0.10 U
T-15	10-Mar-21	**0.29** J	0.20 U	0.20 U	0.20 U	0.10 U
	1-Sep-21	**0.46 J**	0.20 U	0.20 U	0.12 J	0.15 U
Duplicate	1-Sep-21	**0.44 J**	0.20 U	0.20 U	0.12 J	0.15 U
Lower Vashon Aquifer						
BC-1	11-Mar-21	0.10 U	0.15 J	0.20 U	**0.61 J**	0.10 U
Duplicate	11-Mar-21	0.10 U	0.14 J	0.20 U	**0.59 J**	0.10 U
FL-4a	12-Mar-21	**1.1**	0.070 J	0.20 U	0.20 U	0.10 U
LC-41b	25-Mar-21	35	**0.36 J**	0.20 U	0.20 U	0.10 U
LC-64b	11-Mar-21	**1.4**	0.20 U	0.20 U	0.20 U	0.10 U
LC-111b	11-Mar-21	**4.3**	**0.78**	0.20 U	0.17 J	0.10 U
	1-Sep-21	11	**1.3**	0.20 U	**0.28 J**	0.15 U
LC-116b	11-Mar-21	49	**1.1**	0.20 U	0.20 U	0.10 U
	1-Sep-21	49	**1.1**	0.20 U	0.11 J	0.15 U

Table 5
Summary of Analytical Results for Contaminants of Concern
(TCE, cDCE, PCE, TCA, VC) - 2021
Logistics Center, Joint Base Lewis McChord, Washington

Location ID	Sample Collection Date	TCE (µg/L)	cDCE (µg/L)	PCE (µg/L)	TCA (µg/L)	VC (µg/L)
ROD Remediation Goal		**5.0**	**70**	**5.0**	**-**	**-**
MCL		5.0	70	5.0	**200**	**2.0**
Duplicate	1-Sep-21	48	**1.0**	0.20 U	0.10 J	0.15 U
LC-122b	11-Mar-21	**0.12 J**	0.20 U	0.20 U	0.20 U	0.10 U
	1-Sep-21	**0.37 J**	0.20 U	0.20 U	0.20 U	0.15 U
LC-124	11-Mar-21	**0.35 J**	0.20 U	0.20 U	0.20 U	0.10 U
LC-128	11-Mar-21	15	**0.35 J**	0.20 U	0.080 J	0.10 U
LC-137c	10-Mar-21	**0.38 UJ**	0.20 U	0.20 U	0.20 U	0.10 U
LC-216	11-Mar-21	**3.1**	**3.5**	0.20 U	**0.40 J**	0.10 U
LC-217	11-Mar-21	**0.15 J**	0.20 U	0.20 U	0.20 U	0.10 U
LC-219	11-Mar-21	40	**3.1**	0.20 U	**1.4**	0.10 U
LC-225	11-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
	September 2021 - Low Water Level					
LC-237b	11-Mar-21	77	**5.6**	**0.20 J**	**2.0**	0.10 U
	1-Sep-21	71	**5.8**	**0.23 J**	**2.0**	0.15 U
LC-238b	11-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
	1-Sep-21	0.10 U	0.20 U	0.20 U	0.20 U	0.15 U
Duplicate	1-Sep-21	**0.58**	0.20 U	0.20 U	0.20 U	0.15 U
MAMC-01	11-Mar-21	**1.7**	0.20 U	0.20 U	0.20 U	0.10 U
Duplicate	11-Mar-21	**1.5**	0.20 U	0.20 U	0.20 U	0.10 U
MAMC-06	11-Mar-21	**1.3**	0.20 U	0.20 U	0.20 U	0.10 U
T-10	25-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
Sea Level Aquifer						
LC-47D	11-Mar-21	**0.19 J**	0.20 U	0.20 U	0.20 U	0.10 U
LC-66B	11-Mar-21	63	**0.81**	**0.24 J**	0.20 U	0.10 U
LC-66D	11-Mar-21	**0.16 J**	0.20 U	0.20 U	0.20 U	0.10 U
LC-67D	11-Mar-21	75	**2.3**	0.20 U	**0.20 J**	0.10 U
LC-68D	12-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
LC-69D	11-Mar-21	68	**0.59**	0.20 U	0.080 J	0.10 U
LC-72D	10-Mar-21	8.7	0.18 J	0.20 U	0.20 U	0.10 U
LC-74D	10-Mar-21	**4.0**	0.10 J	0.20 U	0.20 U	0.10 U
	1-Sep-21	**4.5**	**0.090 J**	0.20 U	0.20 U	0.15 U
	1-Sep-21	**4.6**	**0.080 J**	0.20 U	0.20 U	0.15 U
LC-75D	11-Mar-21	**0.69**	0.10 J	0.20 U	0.20 U	0.10 U
LC-77D	11-Mar-21	**2.8**	0.20 U	0.20 U	0.20 U	0.10 U
LC-84D-1	9-Mar-21	**1.4**	0.070 J	0.20 U	0.20 U	0.10 U
LC-84D-2	9-Mar-21	**1.1**	0.20 U	0.20 U	0.20 U	0.10 U
LC-85D-1	10-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
LC-85D-2	10-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
LC-86D-1	9-Mar-21	5.5	**0.33 J**	0.20 U	0.20 U	0.10 U
LC-86D-2	9-Mar-21	6.1	**0.32 J**	0.20 U	0.20 U	0.10 U
LC-87D-1	10-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
LC-87D-2	10-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
LC-88D-1	9-Mar-21	**2.2**	0.15 J	0.20 U	0.20 U	0.10 U
LC-88D-2	9-Mar-21	**2.0**	0.15 J	0.20 U	0.20 U	0.10 U
LC-90D-1	9-Mar-21	**0.90**	0.15 J	0.20 U	0.20 U	0.10 U
LC-90D-2	9-Mar-21	0.10 U	0.15 J	0.20 U	0.20 U	0.10 U
LC-91D-1	9-Mar-21	**1.1**	0.17 J	0.20 U	0.20 U	0.10 U
LC-91D-2	9-Mar-21	**3.7**	0.20 U	0.20 U	0.20 U	0.10 U
LC-92D-1	9-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
LC-92D-2	9-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
LC-93D-1	25-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
LC-93D-2	10-Mar-21	**0.32 J**	0.20 U	0.20 U	0.20 U	0.10 U
LC-94D-1	25-Mar-21	**0.20 J**	0.20 U	0.20 U	0.20 U	0.10 U
LC-94D-2	March 2021 - Well Destroyed					
LC-95D-1	25-Mar-21	**0.63**	0.20 U	0.20 U	0.20 U	0.10 U

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(TCE, cDCE, PCE, TCA, VC) - 2021
Logistics Center, Joint Base Lewis McChord, Washington

Location ID	Sample Collection Date	TCE (µg/L)	cDCE (µg/L)	PCE (µg/L)	TCA (µg/L)	VC (µg/L)
ROD Remediation Goal		**5.0**	**70**	**5.0**	-	-
MCL		5.0	70	5.0	**200**	**2.0**
LC-95D-2	9-Mar-21	**0.59**	0.20 U	0.20 U	0.20 U	0.10 U
LC-96D	10-Mar-21	**6.3**	0.14 J	0.20 U	0.20 U	0.10 U
	1-Sep-21	**6.9**	0.13 J	0.20 U	0.20 U	0.15 U
LC-97D	10-Mar-21	0.13 UJ	0.20 U	0.20 U	0.20 U	0.10 U
LC-98D-1	10-Mar-21	0.47 UJ	0.20 U	0.20 U	0.20 U	0.10 U
	1-Sep-21	**0.54 J**	0.20 U	0.20 U	0.20 U	0.15 U
Duplicate	1-Sep-21	**0.74 J**	0.20 U	0.20 U	0.20 U	0.15 U
LC-98D-2	10-Mar-21	**26**	**0.48** J	0.20 U	0.080 J	0.10 U
	1-Sep-21	**32**	**0.93**	0.20 U	0.14 J	0.15 U
LC-99D	10-Mar-21	**39**	**1.0**	0.20 U	0.18 J	0.10 U
	1-Sep-21	**43**	**1.1**	0.20 U	**0.20 J**	0.15 U
LC-101D-1	10-Mar-21	**3.2**	**0.65**	0.20 U	0.20 U	0.10 U
LC-101D-2	10-Mar-21	**11**	**0.46 J**	0.20 U	0.20 U	0.10 U
LC-102D-1	9-Mar-21	**4.4**	0.10 J	0.20 U	0.20 U	0.10 U
LC-102D-2	9-Mar-21	**4.8**	**0.21 J**	0.20 U	0.20 U	0.10 U
LC-103D	10-Mar-21	**7.7**	0.10 J	0.20 U	0.20 U	0.10 U
	1-Sep-21	**5.5**	0.20 **U**	0.20 U	0.20 U	0.15 U
LC-126	11-Mar-21	**40**	**1.5**	0.20 U	0.15 J	0.10 U
LC-239D						
(196 ft bgs)	9-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
(217 ft bgs)	9-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
(196 ft bgs)	1-Sep-21	0.17 J	0.20 U	0.20 U	0.20 U	0.15 U
(217 ft bgs)	1-Sep-21	0.10 U	0.20 U	0.20 U	0.20 U	0.15 U
MAMC-03	11-Mar-21	**1.4**	0.20 U	0.20 U	0.20 U	0.10 U
Duplicate	11-Mar-21	**1.5**	0.20 U	0.20 U	0.20 U	0.10 U
MAMC-04	11-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
Duplicate	11-Mar-21	0.10 U	0.20 U	0.20 U	0.20 U	0.10 U
SRCMW-01b	March 2021 - Inaccessible					
SLAP-1	10-Mar-21	**4.7**	**0.56**	0.20 U	0.18 J	0.10 U
	31-Aug-21	**5.5**	**0.70**	0.20 U	**0.33 J**	0.15 U
SLAP-2	10-Mar-21	**3.9**	**0.27 J**	0.20 U	0.14 J	0.10 U
Duplicate	10-Mar-21	**4.3**	**0.37 J**	0.20 U	0.12 J	0.10 U
	31-Aug-21	**4.1**	**0.35 J**	0.20 U	0.17 J	0.15 U
SLAP-3	10-Mar-21	**26**	**0.73**	0.20 U	0.15 J	0.10 U
Duplicate	10-Mar-21	**26**	**0.65**	0.20 U	0.17 J	0.10 U
	September 2021 - Well Offline					
SLAP-4	10-Mar-21	**25**	**0.36** J	0.20 U	0.20 U	0.10 U
	31-Aug-21	**27**	**0.39 J**	0.20 U	0.090 J	0.15 U
SLAP-5	10-Mar-21	**7.2**	0.16 **J**	0.20 U	0.20 U	0.10 U
	31-Aug-21	**8.2**	**0.21 J**	0.20 U	0.20 U	0.15 U
SLAP-6	10-Mar-21	**5.5**	0.11 **J**	0.20 U	0.20 U	0.10 U
	31-Aug-21	**6.5**	**0.10 J**	0.20 U	0.20 U	0.15 U
Well 13	11-Mar-21	**0.31 J**	0.20 U	0.20 U	0.20 U	0.10 U

Notes:

TCE = Trichloroethene
cDCE = cis 1,2 Dichloroethylene
PCE = Tetrachloroethene
TCA = 1,1,1 Trichloroethane
VC = Vinyl Chloride
MTCA = Model Toxics Control Act
ROD = Record of Decision
µg/L = Micrograms per liter
BOLD = Analyte detected above practical quantification limit.
SHADED = Analyte detected above ROD Remediation Goal Value

Table 5
Summary of Analytical Results for Contaminants of Concern
(TCE, cDCE, PCE, TCA, VC) - 2021
Logistics Center, Joint Base Lewis McChord, Washington

Location ID	**Sample Collection Date**	**TCE (µg/L)**	**cDCE (µg/L)**	**PCE (µg/L)**	**TCA (µg/L)**	**VC (µg/L)**
ROD Remediation Goal		**5.0**	**70**	**5.0**	**-**	**-**
MCL		5.0	70	5.0	**200**	**2.0**

J = Result is above the method detection limit, but below the reporting limit.
U = Analyte not detected above practical quantification limit.
D = The reported result is from a dilution.
\- = Not Applicable, no data, not sampled
MCL = Maximum contaminant level

Table 6
Monitoring Well Descriptive Statistics (TCE Data, 2012-2021)
Logistics Center, Joint Base Lewis McChord, Washington

Well ID	First Sample Date	Last Sample Date	Number of ND's	Number of Samples	Sample Mean	Standard Deviation	Minimum TCE Conc.	Maximum TCE Conc.	Date*
Upper Vashon Aquifer (UVA) Unit									
85-PA-381	Mar-12	Sep-21	0	10	16.65	5.26	10	26	Mar-15
85-PA-382	Mar-12	Sep-21	0	20	8.82	2.47	4.9	14	Mar-16
85-PA-384	Mar-12	Sep-21	7	15	-	-	-	-	-
CM-2	Mar-12	Sep-21	0	7	-	-	-	-	-
FL-1	Mar-12	Sep-21	0	13	9.20	3.34	6.0	19	Aug-12
FL-2	Mar-12	Sep-21	0	10	4.40	1.66	2.3	6.9	Mar-12
FL-3	Mar-12	Sep-21	0	10	2.39	0.33	1.9	2.9	Mar-15
FL-4b	Mar-12	Sep-21	0	10	0.83	0.22	0.54	1.2	Mar-16
FL-6	Mar-12	Sep-21	0	9	1.21	0.31	0.82	1.8	Mar-12
LC-03	Mar-12	Sep-21	0	14	0.96	0.32	0.49	1.7	Sep-15
LC-06	Mar-12	Sep-21	0	11	42.09	13.74	14	60	Mar-12
LC-14a	Mar-12	Sep-21	0	10	41.40	5.70	33	52	Mar-16
LC-16	Mar-12	Sep-21	0	12	6.17	1.17	4.0	7.5	Mar-13
LC-18	Mar-12	Sep-21	0	5	-	-	-	-	-
LC-19a	Mar-12	Sep-21	0	6	-	-	-	-	-
LC-20	Mar-12	Sep-21	9	10	-	-	-	-	-
LC-24	Mar-12	Sep-21	0	10	0.76	0.35	0.30	1.3	Mar-17
LC-26	Mar-12	Sep-21	7	7	-	-	-	-	-
LC-27	Mar-12	Sep-21	0	16	7.71	2.28	4.1	12	Mar-13
LC-34	Mar-12	Sep-21	0	10	0.97	0.14	0.75	1.1	Mar-12
LC-41a	Mar-12	Sep-21	0	10	97.70	23.49	69	130	Mar-12
LC-48	Mar-12	Sep-21	0	5	-	-	-	-	-
LC-53	Mar-12	Sep-21	0	10	141.70	56.08	17	220	Mar-14
LC-57	Mar-12	Sep-21	0	10	0.51	0.37	0.17	1.3	Mar-12
LC-64a	Mar-12	Sep-21	0	10	79.10	23.44	43	120	Mar-18
LC-66b	Mar-12	Sep-21	0	10	70.10	9.65	56	87	Mar-15
LC-109	Mar-12	Sep-21	0	19	1.20	0.27	0.72	1.7	Mar-12
LC-124	Mar-12	Sep-21	0	20	2.68	1.54	0.35	6.3	Mar-16
LC-132	Mar-12	Sep-21	0	10	57.90	10.29	45	73	Mar-15
LC-135	Mar-12	Sep-21	0	27	41.04	9.13	17	54	Jun-15
LC-137b	Mar-12	Sep-21	0	16	165.63	50.59	100	290	Mar-12
LC-160	Mar-12	Sep-21	0	16	13.22	5.19	4.2	21	Mar-16
LC-178	Apr-12	Sep-21	2	20	3.81	1.75	0.20	6.1	Sep-15
LC-180	Apr-12	Sep-21	0	12	2.37	0.84	0.98	3.8	Mar-14
LC-202	Apr-12	Sep-21	0	5	-	-	-	-	-
LC-218	Apr-12	Sep-21	0	14	19.93	5.86	12	33	Sep-14
LC-222	Apr-12	Sep-21	0	10	10.59	6.99	1.8	19	Mar-16
LC-223	Apr-12	Sep-21	0	20	7.91	5.30	4.3	25	Sep-14

Table 6
Monitoring Well Descriptive Statistics (TCE Data, 2012-2021)
Logistics Center, Joint Base Lewis McChord, Washington

Well ID	First Sample Date	Last Sample Date	Number of ND's	Number of Samples	Sample Mean	Standard Deviation	Minimum TCE Conc.	Maximum TCE Conc.	Date*
LC-224	Apr-12	Sep-21	0	20	10.74	4.24	3.6	19	Sep-14
LC-227	Apr-12	Sep-21	0	8	9.29	6.97	3.1	20	Sep-21
LC-228	Apr-12	Sep-21	0	8	4.06	1.02	2.7	6	Mar-21
LC-229	Apr-12	Sep-21	0	8	10.86	1.86	8.4	13	Sep-18
LC-230	Apr-12	Sep-21	0	4	-	-	-	-	-
LC-231	Apr-12	Sep-21	4	4	-	-	-	-	-
LC-232	Apr-12	Sep-21	4	4	-	-	-	-	-
LC-233	Apr-12	Sep-21	0	4	-	-	-	-	-
LC-234	Apr-12	Sep-21	0	4	-	-	-	-	-
LC-235	Apr-12	Sep-21	0	4	-	-	-	-	-
LC-236	Apr-12	Sep-21	0	8	16.13	3.60	10	21	Sep-18
MT-1	Apr-12	Sep-21	0	28	62.66	29.54	7.0	110	Sep-20
MT-2	Apr-12	Sep-21	0	28	6.69	1.49	4.5	11	Sep-14
MT-3	Apr-12	Sep-21	0	28	7.40	3.10	2.8	12	Mar-14
MT-4	Apr-12	Sep-21	0	27	5.68	5.84	0.90	21	Mar-16
T-04	Apr-12	Sep-21	0	18	7.85	1.35	5.0	10	Mar-16
T-05	Apr-12	Sep-21	0	11	1.41	0.38	0.90	2.1	Mar-14
T-06	Apr-12	Sep-21	0	13	3.61	0.38	3.0	4.1	Mar-15
T-11b	Apr-12	Sep-21	0	14	3.89	0.48	3.2	4.5	Mar-15
T-13b	Apr-12	Sep-21	0	14	4.24	0.41	3.6	5.0	Mar-16
T-15	Mar-21	Sep-21	14	20	-	-	-	-	-
Lower Vashon Aquifer Unit									
BC-1	Mar-12	Mar-21	14	14	-	-	-	-	-
FL-4a	Mar-12	Mar-21	0	10	1.20	0.14	1.0	1.4	Mar-14
LC- 41b	Mar-12	Mar-21	0	10	74.80	23.72	35	130	Mar-12
LC- 64b	Mar-12	Mar-21	0	10	2.93	3.24	1.2	12	Mar-12
LC-111b	Mar-12	Sep-21	0	20	6.83	3.74	2.5	14	Sep-16
LC-116b	Mar-12	Sep-21	0	20	47.50	13.75	11	66	Mar-17
LC-122b	Mar-12	Sep-21	12	17	-	-	-	-	-
LC-128	Mar-12	Mar-21	0	10	17.01	4.76	8.1	25	Mar-17
LC-137c	Mar-12	Mar-21	0	10	0.47	0.69	0.16	2.4	Mar-12
LC-216	Mar-12	Mar-21	6	10	-	-	-	-	-
LC-217	Mar-12	Mar-21	2	10	1.09	2.25	0.1	7.4	Mar-12
LC-219	Mar-12	Mar-21	0	10	41.20	11.50	14	56	Mar-16
LC-225	Mar-12	Mar-21	6	19	-	-	-	-	-
LC-237b	Mar-12	Sep-21	0	4	-	-	-	-	-
LC-238b	Mar-12	Sep-21	4	4	-	-	-	-	-
MAMC-1	Mar-12	Mar-21	0	11	3.98	8.64	0.84	30	Sep-15
MAMC-6	Mar-12	Mar-21	0	12	3.80	9.52	0.61	34	Sep-15

Table 6
Monitoring Well Descriptive Statistics (TCE Data, 2012-2021)
Logistics Center, Joint Base Lewis McChord, Washington

Well ID	First Sample Date	Last Sample Date	Number of ND's	Number of Samples	Sample Mean	Standard Deviation	Minimum TCE Conc.	Maximum TCE Conc.	Date*
T-10	Mar-12	Mar-21	12	12	-	-	-	-	-
Sea Level Aquifer Unit									
LC-47D	Mar-12	Mar-21	8	9	-	-	-	-	-
LC-66D	Mar-12	Mar-21	5	9	-	-	-	-	-
LC-67D	Mar-12	Mar-21	0	10	66.00	8.31	49	75	Mar-20
LC-68D	Mar-12	Mar-21	1	4	-	-	-	-	-
LC-69D	Mar-12	Mar-21	0	10	100.60	19.30	68	120	Mar-12
LC-72D	Mar-12	Mar-21	0	10	13.23	6.01	8.7	27	Mar-15
LC-74D	Mar-12	Mar-21	0	24	117.00	0.52	4.0	5.7	Sep-14
LC-75D	Mar-12	Mar-21	0	10	0.52	0.07	0.43	0.69	Mar-21
LC-77D	Mar-12	Mar-21	0	10	2.63	0.60	1.5	3.4	Mar-17
LC-84D-1	Mar-12	Mar-21	0	10	2.10	0.46	1.4	2.7	Mar-12
LC-84D-2	Mar-12	Mar-21	0	10	1.56	0.30	1.1	2.1	Mar-12
LC-85D-1	Mar-12	Mar-21	1	6	-	-	-	-	-
LC-85D-2	Mar-12	Mar-21	1	6	-	-	-	-	-
LC-86D-1	Mar-12	Mar-21	0	14	6.60	0.72	5.5	7.5	Mar-12
LC-86D-2	Mar-12	Mar-21	0	14	6.59	0.58	5.5	7.7	Sep-14
LC-87D-1	Mar-12	Mar-21	1	6	-	-	-	-	-
LC-87D-2	Mar-12	Mar-21	1	6	-	-	-	-	-
LC-88D-1	Mar-12	Mar-21	0	14	2.72	0.29	2.2	3.2	Mar-15
LC-88D-2	Mar-12	Mar-21	0	14	1.56	0.56	0.10	2.0	Mar-18
LC-90D-1	Mar-12	Mar-21	0	10	1.18	0.26	0.83	1.7	Mar-12
LC-90D-2	Mar-12	Mar-21	8	9	-	-	-	-	-

Table 6
Monitoring Well Descriptive Statistics (TCE Data, 2012-2021)
Logistics Center, Joint Base Lewis McChord, Washington

Well ID	First Sample Date	Last Sample Date	Number of ND's	Number of Samples	Sample Mean	Standard Deviation	Minimum TCE Conc.	Maximum TCE Conc.	Date*
LC-91D-1	Mar-12	Mar-21	0	10	0.73	0.17	0.54	1.1	Mar-21
LC-91D-2	Mar-12	Mar-21	0	10	3.23	0.63	2.3	4.6	Mar-19
LC-92D-1	Mar-12	Mar-21	1	6	-	-	-	-	-
LC-92D-2	Mar-12	Mar-21	1	6	-	-	-	-	-
LC-93D-1	Mar-12	Mar-21	12	12	-	-	-	-	-
LC-93D-2	Mar-12	Mar-21	2	14	0.32	0.08	0.23	0.50	9-Mar-12
LC-94D-1	Mar-12	Mar-21	3	9	-	-	-	-	-
LC-95D-1	Mar-12	Mar-21	2	13	0.54	0.09	0.41	0.77	Mar-19
LC-95D-2	Mar-12	Mar-21	2	14	0.61	0.29	0.45	1.6	Sep-14
LC-96D	Mar-12	Sep-21	0	24	6.97	0.62	5.8	8.3	Sep-14
LC-97D	Mar-12	Mar-21	5	9	-	-	-	-	-
LC-98D-1	Mar-12	Sep-21	0	24	1.66	3.02	0.45	15	Sep-14
LC-98D-2	Mar-12	Sep-21	0	24	16.68	9.66	4.4	32	Sep-21
LC-99D	Mar-12	Sep-21	0	24	59.88	11.17	39	80	Mar-16
LC-101D-1	Mar-12	Mar-21	0	14	2.00	0.55	1.3	3.2	Mar-21
LC-101D-2	Mar-12	Mar-21	0	14	12.29	1.44	10	15	Mar-12
LC-102D-1	Mar-12	Mar-21	0	14	4.74	0.53	4.2	5.8	Sep-14
LC-102D-2	Mar-12	Mar-21	0	14	5.24	0.44	4.8	5.9	Mar-16
LC-103D	Mar-12	Sep-21	0	20	47.76	27.31	5.5	83	Sep-15
LC-126	Mar-12	Sep-21	0	10	37.20	20.97	8.0	79	Mar-12
LC-239D (196 ft bgs)	Mar-12	Sep-21	4	4	-	-	-	-	-
LC-239D (217 ft bgs)	Mar-12	Sep-21	4	4	-	-	-	-	-
MAMC-3	Mar-12	Mar-21	0	14	1.69	0.49	0.10	2.2	Sep-13
MAMC-4	Mar-12	Mar-21	12	12	-	-	-	-	-
Well 13	Mar-12	Mar-21	3	11	-	-	-	-	-

Notes

ND = Non-detect. TCE not detected above laboratory reporting limit.
TCE Conc. = Trichloroethene concentration in micrograms per liter
* = Date sample was collected from monitoring well with maximum concentration of TCE. If maximum concentration has been detected during
- = Not applicable; analysis not performed

Statistics were performed on and trend graphs were plotted on current data sets (March 2012 to September 2021).
Statistical analysis was not performed on monitoring wells in which TCE was not detected above the reporting limit in over 20 percent of the data points or in which there were fewer than eight data points.

Table 7
Statistical Analysis of TCE Data, 2012-2021
Logistics Center, Joint Base Lewis McChord, Washington

	Distribution of Data				Trend Analysis (Linear Regression)				Trend Analysis (Mann-Kendall Test for Trend)			
Well ID	**P Value**	**Normally Distributed?**	**Log P Value**	**Log Normally Distributed?**	**P Value**	**Slope**	**Trend**	**Statistically?**	**P Value**	**Tau Statistic**	**Trend**	**Statistically?**
Upper Vashon Aquifer Unit												
85-PA-381	0.6177	Yes	-	-	0.0487	-0.003030	Down	Yes	-	-	-	-
85-PA-382	0.7510	Yes	-	-	0.0161	0.001445	Up	Yes	-	-	-	-
FL-1	0.0023	No	0.1024	Yes	0.0014	-0.000227	Down	Yes	-	-	-	-
FL-2	0.3393	Yes	-	-	0.2791	-0.000574	Down	No	-	-	-	-
FL-3	0.8741	Yes	-	-	0.1431	-0.000148	Down	No	-	-	-	-
FL-4b	0.6582	Yes	-	-	0.3055	-0.000072	Down	No	-	-	-	-
FL-6	0.5480	Yes	-	-	0.0025	-0.000269	Down	Yes	-	-	-	-
LC-03	0.3892	Yes	-	-	0.3235	0.0000874	Up	No	-	-	-	-
LC-06	0.6258	Yes	-	-	0.5253	-0.002814	Down	No	-	-	-	-
LC-14a	0.8946	Yes	-	-	0.8409	-0.000378	Down	No	-	-	-	-
LC-16	0.2201	Yes	-	-	0.3265	-0.000402	Down	No	-	-	-	-
LC-24	0.5719	Yes	-	-	0.9369	0.000009	Up	No	-	-	-	-
LC-27	0.4519	Yes	-	-	0.0078	-0.001396	Down	Yes	-	-	-	-
LC-34	0.0439	No	0.0392	No	-	-	-	-	0.001063	-0.8578	Down	Yes
LC-41a	0.2354	Yes	-	-	0.0004	-0.019173	Down	Yes	-	-	-	-
LC-53	0.1983	Yes	-	-	0.5227	-0.011707	Down	No	-	-	-	-
LC-57	0.0710	Yes	-	-	0.0052	-0.000269	Down	Yes	-	-	-	-
LC-64a	0.9866	Yes	-	-	0.4760	0.005441	Up	No	-	-	-	-
LC-66b	0.9545	Yes	-	-	0.4307	-0.002467	Down	No	-	-	-	-
LC-109	0.4325	Yes	-	-	<0.0001	-0.000231	Down	Yes	-	-	-	-
LC-124	0.3588	Yes	-	-	0.0472	-0.000637	Down	Yes	-	-	-	-
LC-132	0.4204	Yes	-	-	0.1784	-0.004278	Down	No	-	-	-	-
LC-135	0.2142	Yes	-	-	0.0314	-0.003567	Down	No	-	-	-	-
LC-137b	0.2847	Yes	-	-	<0.0001	-0.044862	Down	Yes	-	-	-	-
LC-160	0.3697	Yes	-	-	0.5506	-0.000802	Down	No	-	-	-	-
LC-178	0.0189	No	<0.0001	No	-	-	-	-	0.948208	0.0106	Up	No
LC-180	0.9980	Yes	-	-	0.0046	-0.000600	Down	Yes	-	-	-	-
LC-218	0.2691	Yes	-	-	0.4654	-0.001170	Down	No	-	-	-	-
LC-222	0.0986	Yes	-	-	0.0749	-0.003620	Down	No	-	-	-	-
LC-223	<0.0001	No	0.0019	No	-	-	-	-	0.625097	-0.0804	Down	No
LC-224	0.8921	Yes	-	-	0.0270	-0.001943	Down	Yes	-	-	-	-
LC-227	0.0429	No	0.0640	Yes	0.3350	0.000718	Up	No	-	-	-	-
LC-228	0.8937	Yes	-	-	0.8088	0.000238	Up	No	-	-	-	-
LC-229	0.2199	Yes	-	-	0.5134	0.001154	Up	No	-	-	-	-
LC-236	0.8604	Yes	-	-	0.0959	-0.005151	Up	No	-	-	-	-
MT-1	0.0625	Yes	-	-	0.0739	0.009722	Up	No	-	-	-	-
MT-2	0.0628	Yes	-	-	0.8637	0.000048	Up	No	-	-	-	-
MT-3	0.0490	No	0.0141	No	-	-	-	-	0.736497	-0.0454	Down	No
MT-4	<0.0001	No	0.0778	Yes	0.4123	0.000158	Up	No	-	-	-	-
T-04	0.5655	Yes	-	-	0.0043	-0.000841	Down	Yes	-	-	-	-
T-05	0.0534	Yes	-	-	0.1005	-0.000195	Down	No	-	-	-	-
T-06	0.1534	Yes	-	-	0.0283	-0.000246	Down	Yes	-	-	-	-
T-11b	0.0790	Yes	-	-	0.0032	-0.000334	Down	Yes	-	-	-	-
T-13b	0.8797	Yes	-	-	0.7768	0.000033	Up	No	-	-	-	-
Lower Vashon Aquifer Unit												
FL-4a	0.2578	Yes	-	-	0.7254	-0.000016	Down	No	-	-	-	-
LC-41b	0.0479	No	0.08	No	0.0087	-0.0002	Down	Yes	-	-	-	-
LC-64b	<0.0001	No	0.0082	No	-	-	-	-	0.001600	-0.7957	Down	Yes
LC-111b	0.0239	No	0.0239	No	-	-	-	-	0.021044	0.3767	Up	Yes
LC-116b	0.1981	Yes	-	-	0.6157	0.001525	Up	No	-	-	-	-
LC-128	0.9504	Yes	-	-	0.6987	0.000607	Up	No	-	-	-	-
LC-137c	<0.0001	No	0.0054	No	-	-	-	-	0.417077	-0.2046	Down	No
LC-217	<0.0001	No	0.0669	Yes	0.0008	-0.0010	Down	Yes	-	-	-	-
LC-219	0.0369	No	0.0007	No	-	-	-	-	1.000000	0.0000	None	No
MAMC-1	<0.0001	No	<0.0001	No	-	-	-	-	0.937053	-0.0189	Down	No

Table 7
Statistical Analysis of TCE Data, 2012-2021
Logistics Center, Joint Base Lewis McChord, Washington

	Distribution of Data				Trend Analysis (Linear Regression)				Trend Analysis (Mann-Kendall Test for Trend)			
Well ID	P Value	Normally Distributed?	Log P Value	Log Normally Distributed?	P Value	Slope	Trend	Statistically?	P Value	Tau Statistic	Trend	Statistically?
MAMC-6	<0.0001	No	<0.0001	No	-	-	-	-	0.191569	0.2901	Up	No
Sea Level Aquifer Unit												
LC-67D	0.1060	Yes	-	-	0.0035	0.006544	Up	Yes	-	-	-	-
LC-69D	0.1301	Yes	-	-	0.0031	-0.014475	Down	Yes	-	-	-	-
LC-72D	0.0014	No	0.0104	No	-	-	-	-	0.121206	-0.3958	Down	No
LC-74D	0.1041	Yes	-	-	0.0011	-0.000292	Down	Yes	-	-	-	-
LC-75D	0.2610	Yes	-	-	0.7955	0.000006	Down	No	-	-	-	-
LC-77D	0.4708	Yes	-	-	0.4972	0.000133	Up	No	-	-	-	-
LC-84D-1	0.3084	Yes	-	-	0.0002	-0.000386	Down	Yes	-	-	-	-
LC-84D-2	0.9533	Yes	-	-	<0.0001	-0.000260	Down	Yes	-	-	-	-
LC-86D-1	0.1412	Yes	-	-	0.0015	-0.000528	Down	Yes	-	-	-	-
LC-86D-2	0.9934	Yes	-	-	0.0345	-0.000315	Down	No	-	-	-	-
LC-88D-1	0.7595	Yes	-	-	0.3800	-0.000072	Down	No	-	-	-	-
LC-88D-2	0.0002	No	<0.0001	No	-	-	-	-	0.068314	0.3985	Up	No
LC-90D-1	0.7245	Yes	-	-	0.0006	-0.000210	Down	Yes	-	-	-	-
LC-91D-1	0.2034	Yes	-	-	0.0044	0.000125	Up	Yes	-	-	-	-
LC-91D-2	0.5447	Yes	-	-	0.0270	0.000396	Up	Yes	-	-	-	-
LC-93D-2	0.0011	No	0.0108	No	-	-	-	-	0.375044	-0.1830	Down	No
LC-95D-1	0.0366	No	0.1705	Yes	0.0577	0.000079	Up	No				
LC-95D-2	<0.0001	No	<0.0001	No	-	-	-	-	0.619763	0.1011	Up	No
LC-96D	0.5992	Yes	-	-	0.1300	-0.000177	Down	Yes	-	-	-	-
LC-98D-1	<0.0001	No	<0.0001	No	-	-	-	-	0.005439	-0.4073	Down	Yes
LC-98D-2	0.0117	No	0.0520	Yes	0.4256	0.000100	Up	No	-	-	-	-
LC-99D	0.8935	Yes	-	-	0.0075	-0.005316	Down	Yes	-	-	-	-
LC-101D-1	0.4040	Yes	-	-	<0.0001	0.000477	Up	Yes	-	-	-	-
LC-101D-2	0.4958	Yes	-	-	0.0031	-0.001007	Down	Yes	-	-	-	-
LC-102D-1	0.0977	No	0.1082	Yes	0.1186	-0.000047	Down	No	-	-	-	-
LC-102D-2	0.0114	No	0.0105	No	-	-	-	-	0.499642	-0.1406	Down	No
LC-103D	0.0409	No	0.0049	No	-	-	-	-	0.000206	-0.6097	Down	Yes
LC-126	0.7237	Yes	-	-	0.2496	-0.007440	Down	No	-	-	-	-
MAMC-3	<0.0001	No	<0.0001	No	-	-	-	-	0.140943	-0.3155	Down	No

Notes

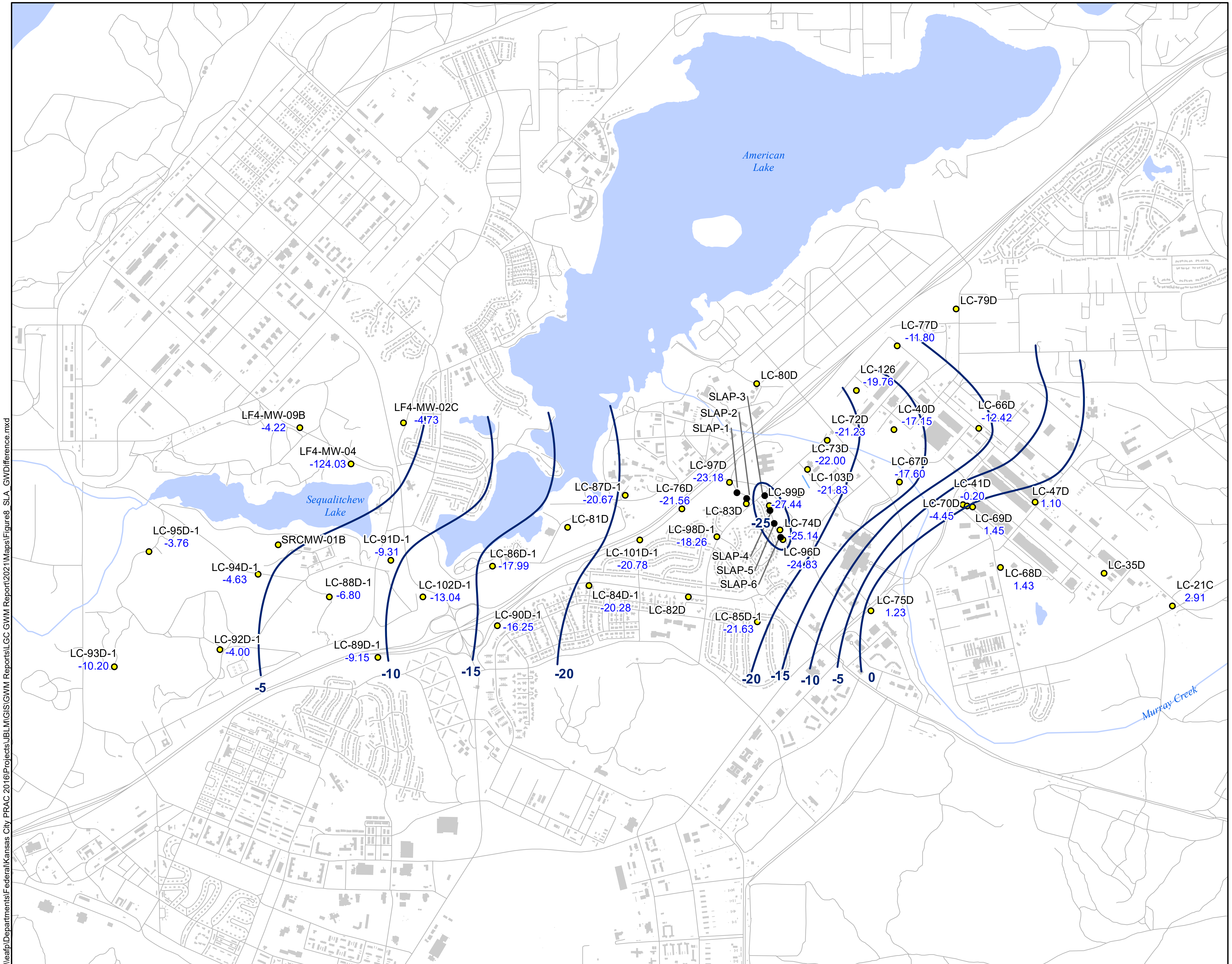
\- Not applicable; analysis not performed. Statistical analysis not performed on datasets composed of greater than 20% non-detects.

Distribution of Data - Data was tested for normal distribution using the Shapiro-Wilk test for normality. P values were generated by the Shapiro-Wilk test; P values equal to or less than 0.05 were not considered normally distributed. Logarithmic transformation was performed on datasets not considered normally distributed and again tested for normality using the Shapiro-Wilk test.

Trend Analysis (Linear Regression) - Performed on datasets considered normally or log-normally distributed. Trends with a P Value of less than 0.05 were considered statistically significant.

Trend Analysis (Mann-Kendall Test for Trend) - Performed on datasets not considered normally or log-normally distributed (non-parametric data). Trends with a Two-Tailed P Value of less than 0.05 or greater than 0.95 were considered statistically significant.

Additional discussion of statistical approach is included in Appendix F.



Legend

Sea Level Aquifer Monitoring Well

Pump and Treat System Extraction Well

Surface Water Course Centerline

Groundwater Elevation Difference Contours (2009 to 2020) (ft)

-11.98 Groundwater Elevation Difference (Spring 2021 minus Spring 2009) (ft)

Note:
Groundwater elevation difference contour intervals are 5 ft.

Groundwater elevations measured at LF4-MW-04, LC-93D-1, and LC-98D-1 are not consistent with nearby wells and are excluded from contouring.

N

0 1,750 3,500
Feet
1 inch = 2,195 feet

Map Date: 1/13/2022
Coordinate System: UTM Zone 10
Horizontal Datum: WGS 84

FIGURE 8
DIFFERENCES IN WET SEASON
SEA LEVEL AQUIFER GROUNDWATER
ELEVATION CONTOURS
(SPRING 2009 TO 2021)

2021 ANNUAL GROUNDWATER MONITORING AND REPORTING

\\earfs\Departments\Federal\Kansas City PRAC 2016\Projects\JBLM\GIS\GWM Reports\LGC GWM Report\2021\Maps\Figure8_SLA_GWDifference.mxd

APPENDIX

HISTORICAL DEPTH TO WATER MEASUREMENTS

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APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
Vashon Aquifer			
85-PA-381	4/23/1997	262.20	Vashon
85-PA-381	7/16/1997	254.45	Vashon
85-PA-381	10/16/1997	254.31	Vashon
85-PA-381	1/30/1998	258.86	Vashon
85-PA-381	4/2/1998	256.66	Vashon
85-PA-381	7/7/1998	254.75	Vashon
85-PA-381	9/22/1998	251.51	Vashon
85-PA-381	12/1/1998	262.14	Vashon
85-PA-381	3/1/1999	259.64	Vashon
85-PA-381	6/1/1999	259.27	Vashon
85-PA-381	9/1/1999	252.49	Vashon
85-PA-381	12/1/1999	259.86	Vashon
85-PA-381	3/1/2000	261.14	Vashon
85-PA-381	6/1/2000	258.03	Vashon
85-PA-381	9/1/2000	251.94	Vashon
85-PA-381	12/1/2000	251.72	Vashon
85-PA-381	3/1/2001	251.64	Vashon
85-PA-381	6/1/2001	252.49	Vashon
85-PA-381	9/1/2001	249.27	Vashon
85-PA-381	12/1/2001	260.07	Vashon
85-PA-381	4/1/2002	259.99	Vashon
85-PA-381	6/1/2002	258.71	Vashon
85-PA-381	9/1/2002	255.91	Vashon
85-PA-381	2/3/2003	259.59	Vashon
85-PA-381	3/3/2003	258.09	Vashon
85-PA-381	7/1/2003	254.65	Vashon
85-PA-381	10/4/2004	250.03	Vashon
85-PA-381	4/15/2005	254.30	Vashon
85-PA-381	7/29/2005	252.35	Vashon
85-PA-381	9/6/2005	251.04	Vashon
85-PA-381	3/20/2006	258.46	Vashon
85-PA-381	9/20/2006	253.08	Vashon
85-PA-381	3/21/2007	259.61	Vashon
85-PA-381	9/28/2007	254.41	Vashon
85-PA-381	3/25/2008	256.96	Vashon
85-PA-381	10/8/2008	251.25	Vashon
85-PA-381	2/5/2009	257.20	Vashon
85-PA-381	8/4/2009	255.82	Vashon
85-PA-381	2/10/2010	258.30	Vashon
85-PA-381	8/10/2010	257.33	Vashon
85-PA-381	2/16/2011	259.13	Vashon
85-PA-381	8/8/2011	256.68	Vashon
85-PA-381	3/1/2012	257.19	Vashon
85-PA-381	7/31/2012	256.85	Vashon
85-PA-381	2/6/2013	257.96	Vashon
85-PA-381	8/7/2013	255.42	Vashon
85-PA-381	2/14/2014	257.22	Vashon
85-PA-381	9/9/2014	256.44	Vashon
85-PA-381	2/19/2015	258.88	Vashon
85-PA-381	9/8/2015	254.56	Vashon
85-PA-381	2/16/2016	261.85	Vashon
85-PA-381	8/17/2016	256.48	Vashon
85-PA-381	2/10/2017	259.77	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
85-PA-381	3/29/2018	258.36	Vashon
85-PA-381	3/14/2019	258.10	Vashon
85-PA-381	3/13/2020	258.78	Vashon
85-PA-381	11-Mar-21	263.22	Vashon
85-PA-382	8/7/2012	254.2	Vashon
85-PA-382	2/6/2013	254.83	Vashon
85-PA-382	8/7/2013	252.18	Vashon
85-PA-382	2/13/2014	253.9	Vashon
85-PA-382	9/3/2014	253.25	Vashon
85-PA-382	2/19/2015	255.79	Vashon
85-PA-382	9/8/2015	251.4	Vashon
85-PA-382	2/16/2016	258.68	Vashon
85-PA-382	8/17/2016	253.27	Vashon
85-PA-382	2/10/2017	256.64	Vashon
85-PA-382	3/29/2018	255.09	Vashon
85-PA-382	3/14/2019	254.82	Vashon
85-PA-382	3/13/2020	255.49	Vashon
85-PA-382	11-Mar-21	256.98	Vashon
85-PA-383	10/16/1997	253.75	Vashon
85-PA-383	1/30/1998	258.45	Vashon
85-PA-383	4/2/1998	256.35	Vashon
85-PA-383	7/7/1998	253.98	Vashon
85-PA-383	9/22/1998	250.79	Vashon
85-PA-383	12/1/1998	261.81	Vashon
85-PA-383	3/1/1999	259.12	Vashon
85-PA-383	6/1/1999	258.50	Vashon
85-PA-383	9/1/1999	251.81	Vashon
85-PA-383	12/1/1999	259.16	Vashon
85-PA-383	3/1/2000	260.32	Vashon
85-PA-383	6/1/2000	257.10	Vashon
85-PA-383	9/1/2000	251.51	Vashon
85-PA-383	12/1/2000	251.34	Vashon
85-PA-383	3/1/2001	251.16	Vashon
85-PA-383	6/1/2001	251.78	Vashon
85-PA-383	9/1/2001	248.98	Vashon
85-PA-383	12/1/2001	259.71	Vashon
85-PA-383	4/1/2002	259.24	Vashon
85-PA-383	6/1/2002	257.66	Vashon
85-PA-383	9/1/2002	255.43	Vashon
85-PA-383	2/3/2003	258.93	Vashon
85-PA-383	3/3/2003	257.45	Vashon
85-PA-383	7/1/2003	254.01	Vashon
85-PA-383	10/4/2004	251.75	Vashon
85-PA-383	4/15/2005	254.00	Vashon
85-PA-383	8/30/2005	250.87	Vashon
85-PA-383	3/20/2006	258.06	Vashon
85-PA-384	6/1/1999	268.95	Vashon
85-PA-384	9/1/1999	247.53	Vashon
85-PA-384	12/1/1999	255.77	Vashon
85-PA-384	3/1/2000	256.32	Vashon
85-PA-384	6/1/2000	248.55	Vashon
85-PA-384	9/1/2000	240.85	Vashon
85-PA-384	12/1/2000	248.62	Vashon
85-PA-384	3/1/2001	247.81	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
85-PA-384	12/1/2001	253.56	Vashon
85-PA-384	4/1/2002	256.25	Vashon
85-PA-384	6/1/2002	252.41	Vashon
85-PA-384	9/1/2002	244.06	Vashon
85-PA-384	2/3/2003	255.19	Vashon
85-PA-384	3/3/2003	249.64	Vashon
85-PA-384	7/1/2003	249.04	Vashon
85-PA-384	2/12/2013	256.15	Vashon
85-PA-384	8/7/2013	249.72	Vashon
85-PA-384	2/13/2014	254.50	Vashon
85-PA-384	9/3/2014	251.81	Vashon
85-PA-384	2/19/2015	257.74	Vashon
85-PA-384	9/8/2015	249.09	Vashon
85-PA-384	2/17/2016	260.97	Vashon
85-PA-384	8/17/2016	251.98	Vashon
85-PA-384	2/10/2017	258.50	Vashon
85-PA-384	3/29/2018	253.61	Vashon
85-PA-384	3/14/2019	256.36	Vashon
85-PA-384	3/13/2020	251.80	Vashon
85-PA-384	3/11/2021	257.40	Vashon
9700-MW1	6/1/1999	253.81	Vashon
9700-MW1	9/1/1999	266.13	Vashon
9700-MW1	12/1/1999	267.58	Vashon
9700-MW1	3/1/2000	268.06	Vashon
9700-MW1	6/1/2000	267.16	Vashon
9700-MW1	9/1/2000	266.28	Vashon
9700-MW1	12/1/2000	266.22	Vashon
9700-MW1	3/1/2001	266.53	Vashon
9700-MW1	12/1/2001	268.17	Vashon
9700-MW1	4/1/2002	268.53	Vashon
9700-MW1	6/1/2002	267.25	Vashon
9700-MW1	9/1/2002	266.86	Vashon
9700-MW1	2/3/2003	267.70	Vashon
9700-MW1	3/3/2003	267.62	Vashon
CM-2	10/4/2004	239.32	Vashon
CM-2	3/25/2008	242.51	Vashon
CM-2	10/8/2008	238.44	Vashon
CM-2	2/6/2009	243.19	Vashon
CM-2	8/6/2009	241.14	Vashon
CM-2	2/9/2010	244.62	Vashon
CM-2	8/13/2010	242.24	Vashon
CM-2	2/15/2011	244.57	Vashon
CM-2	8/9/2011	242.27	Vashon
CM-2	3/1/2012	243.62	Vashon
CM-2	8/7/2012	242.22	Vashon
CM-2	2/12/2013	242.49	Vashon
CM-2	8/6/2013	240.87	Vashon
CM-2	2/12/2014	241.92	Vashon
CM-2	9/9/2014	241.37	Vashon
CM-2	2/20/2015	244.60	Vashon
CM-2	9/8/2015	239.77	Vashon
CM-2	2/18/2016	246.12	Vashon
CM-2	8/16/2016	241.22	Vashon
CM-2	2/14/2017	244.75	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
CM-2	3/30/2018	243.67	Vashon
CM-2	3/12/2019	243.21	Vashon
CM-2	3/11/2020	243.54	Vashon
CM-2	3/10/2021	244.78	Vashon
FL-1	4/6/2005	267.48	Vashon
FL-1	7/21/2005	267.00	Vashon
FL-1	3/20/2006	268.86	Vashon
FL-1	9/20/2006	266.85	Vashon
FL-1	3/21/2007	269.28	Vashon
FL-1	9/28/2007	267.06	Vashon
FL-1	10/8/2008	266.60	Vashon
FL-1	2/3/2009	267.90	Vashon
FL-1	8/4/2009	266.92	Vashon
FL-1	2/11/2010	268.37	Vashon
FL-1	8/10/2010	267.98	Vashon
FL-1	2/16/2011	268.87	Vashon
FL-1	8/10/2011	268.12	Vashon
FL-1	2/22/2012	268.70	Vashon
FL-1	7/31/2012	267.91	Vashon
FL-1	2/6/2013	268.32	Vashon
FL-1	8/8/2013	267.52	Vashon
FL-1	2/12/2014	267.92	Vashon
FL-1	9/3/2014	267.69	Vashon
FL-1	2/19/2015	268.49	Vashon
FL-1	9/9/2015	267.14	Vashon
FL-1	2/16/2016	269.76	Vashon
FL-1	8/17/2016	267.67	Vashon
FL-1	2/10/2017	269.34	Vashon
FL-1	3/27/2018	268.49	Vashon
FL-1	3/12/2019	267.91	Vashon
FL-1	3/12/2020	268.06	Vashon
FL-1	3/11/2021	268.39	Vashon
FL-2	2/3/2003	268.96	Vashon
FL-2	3/3/2003	268.31	Vashon
FL-2	7/1/2003	268.04	Vashon
FL-2	10/4/2004	267.41	Vashon
FL-2	4/6/2005	271.48	Vashon
FL-2	7/29/2005	270.83	Vashon
FL-2	9/21/2005	270.22	Vashon
FL-2	3/17/2006	273.22	Vashon
FL-2	9/20/2006	270.63	Vashon
FL-2	3/19/2007	273.72	Vashon
FL-2	9/28/2007	270.94	Vashon
FL-2	3/25/2008	272.59	Vashon
FL-2	10/8/2008	270.39	Vashon
FL-2	2/3/2009	271.99	Vashon
FL-2	8/3/2009	270.86	Vashon
FL-2	2/11/2010	272.79	Vashon
FL-2	8/9/2010	271.98	Vashon
FL-2	2/16/2011	273.19	Vashon
FL-2	8/10/2011	272.07	Vashon
FL-2	2/22/2012	272.74	Vashon
FL-2	7/31/2012	271.94	Vashon
FL-2	2/5/2013	272.45	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
FL-2	8/7/2013	271.49	Vashon
FL-2	2/14/2014	271.89	Vashon
FL-2	9/8/2014	271.58	Vashon
FL-2	2/18/2015	272.69	Vashon
FL-2	9/10/2015	270.96	Vashon
FL-2	2/19/2016	270.65	Vashon
FL-2	8/17/2016	268.26	Vashon
FL-2	2/15/2017	269.72	Vashon
FL-2	3/28/2018	269.25	Vashon
FL-2	3/11/2019	268.59	Vashon
FL-2	3/10/2020	268.86	Vashon
FL-2	3/10/2021	269.27	Vashon
FL-3	12/1/2001	254.29	Vashon
FL-3	4/1/2002	253.89	Vashon
FL-3	6/1/2002	252.49	Vashon
FL-3	9/1/2002	250.86	Vashon
FL-3	2/3/2003	253.84	Vashon
FL-3	7/1/2003	249.95	Vashon
FL-3	10/4/2004	248.13	Vashon
FL-3	4/15/2005	249.89	Vashon
FL-3	7/29/2005	248.31	Vashon
FL-3	9/26/2005	247.11	Vashon
FL-3	3/20/2006	253.86	Vashon
FL-3	9/21/2006	248.29	Vashon
FL-3	3/21/2007	254.75	Vashon
FL-3	9/27/2007	249.96	Vashon
FL-3	3/25/2008	251.93	Vashon
FL-3	2/5/2009	252.66	Vashon
FL-3	8/6/2009	250.61	Vashon
FL-3	2/9/2010	253.94	Vashon
FL-3	8/13/2010	251.61	Vashon
FL-3	2/17/2011	253.96	Vashon
FL-3	8/8/2011	251.53	Vashon
FL-3	3/2/2012	252.56	Vashon
FL-3	7/31/2012	251.72	Vashon
FL-3	2/5/2013	252.45	Vashon
FL-3	8/6/2013	250.06	Vashon
FL-3	2/13/2014	251.21	Vashon
FL-3	9/9/2014	250.71	Vashon
FL-3	2/19/2015	253.37	Vashon
FL-3	9/10/2015	249.05	Vashon
FL-3	2/17/2016	256.40	Vashon
FL-3	8/17/2016	250.58	Vashon
FL-3	2/10/2017	254.19	Vashon
FL-3	3/29/2018	253.15	Vashon
FL-3	3/12/2019	252.73	Vashon
FL-3	3/13/2020	253.06	Vashon
FL-3	3/10/2021	254.80	Vashon
FL-4a	12/1/2001	267.41	Vashon
FL-4a	4/1/2002	268.49	Vashon
FL-4a	6/1/2002	267.47	Vashon
FL-4a	9/1/2002	265.93	Vashon
FL-4a	2/3/2003	267.97	Vashon
FL-4a	3/3/2003	266.72	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
FL-4a	7/1/2003	266.64	Vashon
FL-4a	10/4/2004	265.26	Vashon
FL-4a	4/15/2005	265.57	Vashon
FL-4a	7/21/2005	265.60	Vashon
FL-4a	9/19/2005	265.07	Vashon
FL-4a	3/17/2006	268.91	Vashon
FL-4a	9/20/2006	265.99	Vashon
FL-4a	3/21/2007	269.08	Vashon
FL-4a	9/28/2007	266.30	Vashon
FL-4a	3/25/2008	267.72	Vashon
FL-4a	10/8/2008	265.35	Vashon
FL-4a	2/3/2009	267.14	Vashon
FL-4a	8/3/2009	266.04	Vashon
FL-4a	3/12/2021	268.50	Vashon
FL-4b	12/1/2001	267.31	Vashon
FL-4b	4/1/2002	268.22	Vashon
FL-4b	6/1/2002	268.28	Vashon
FL-4b	9/1/2002	265.92	Vashon
FL-4b	2/3/2003	268.50	Vashon
FL-4b	3/3/2003	266.65	Vashon
FL-4b	7/1/2003	266.68	Vashon
FL-4b	10/4/2004	265.74	Vashon
FL-4b	4/15/2005	266.48	Vashon
FL-4b	7/19/2005	262.52	Vashon
FL-4b	9/19/2005	266.13	Vashon
FL-4b	3/17/2006	268.57	Vashon
FL-4b	9/20/2006	265.99	Vashon
FL-4b	3/21/2007	268.68	Vashon
FL-4b	9/28/2007	266.26	Vashon
FL-4b	3/25/2008	267.49	Vashon
FL-4b	10/8/2008	265.43	Vashon
FL-4b	2/3/2009	267.03	Vashon
FL-4b	8/3/2009	266.07	Vashon
FL-4b	2/11/2010	267.48	Vashon
FL-4b	8/13/2010	267.28	Vashon
FL-4b	2/16/2011	268.17	Vashon
FL-4b	8/10/2011	267.78	Vashon
FL-4b	2/23/2012	267.72	Vashon
FL-4b	8/2/2012	267.24	Vashon
FL-4b	2/6/2013	267.68	Vashon
FL-4b	8/8/2013	266.68	Vashon
FL-4b	2/13/2014	267.08	Vashon
FL-4b	9/8/2014	267.11	Vashon
FL-4b	2/18/2015	268.27	Vashon
FL-4b	9/9/2015	266.37	Vashon
FL-4b	2/16/2016	269.69	Vashon
FL-4b	8/17/2016	267.18	Vashon
FL-4b	2/10/2017	268.34	Vashon
FL-4b	3/27/2018	268.10	Vashon
FL-4b	3/12/2019	267.08	Vashon
FL-4b	3/12/2020	267.25	Vashon
FL-4b	3/12/2021	267.76	Vashon
FL-6	12/1/2001	257.05	Vashon
FL-6	4/1/2002	256.90	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
FL-6	6/1/2002	255.62	Vashon
FL-6	9/1/2002	252.23	Vashon
FL-6	2/3/2003	256.48	Vashon
FL-6	3/3/2003	255.09	Vashon
FL-6	7/1/2003	252.45	Vashon
FL-6	10/4/2004	250.09	Vashon
FL-6	4/14/2005	252.12	Vashon
FL-6	7/29/2005	251.48	Vashon
FL-6	9/26/2005	249.46	Vashon
FL-6	3/17/2006	256.17	Vashon
FL-6	9/25/2006	251.11	Vashon
FL-6	3/22/2007	257.25	Vashon
FL-6	10/19/2007	252.34	Vashon
FL-6	3/25/2008	254.63	Vashon
FL-6	10/8/2008	249.61	Vashon
FL-6	2/5/2009	255.25	Vashon
FL-6	8/5/2009	254.03	Vashon
FL-6	2/10/2010	256.43	Vashon
FL-6	8/11/2010	254.77	Vashon
FL-6	2/16/2011	256.68	Vashon
FL-6	8/9/2011	254.36	Vashon
FL-6	2/29/2012	254.87	Vashon
FL-6	8/3/2012	254.73	Vashon
FL-6	2/12/2013	254.75	Vashon
FL-6	8/9/2013	252.03	Vashon
FL-6	2/19/2014	256.83	Vashon
FL-6	9/5/2014	253.91	Vashon
FL-6	2/19/2015	255.96	Vashon
FL-6	9/15/2015	251.79	Vashon
FL-6	2/17/2016	258.85	Vashon
FL-6	8/16/2016	253.63	Vashon
FL-6	2/14/2017	256.98	Vashon
FL-6	4/5/2018	255.55	Vashon
FL-6	3/13/2019	255.76	Vashon
FL-6	3/12/2020	255.90	Vashon
LC-01	12/1/1998	263.88	Vashon
LC-01	3/1/1999	262.09	Vashon
LC-01	6/1/1999	259.84	Vashon
LC-01	9/1/1999	257.06	Vashon
LC-01	12/1/1999	261.05	Vashon
LC-01	3/1/2000	261.48	Vashon
LC-01	6/1/2000	259.24	Vashon
LC-01	9/1/2000	257.02	Vashon
LC-01	12/1/2000	258.27	Vashon
LC-01	3/1/2001	257.69	Vashon
LC-01	6/1/2001	256.87	Vashon
LC-01	9/1/2001	254.34	Vashon
LC-01	12/1/2001	259.71	Vashon
LC-01	4/1/2002	261.48	Vashon
LC-01	6/1/2002	258.85	Vashon
LC-01	9/1/2002	257.31	Vashon
LC-01	2/3/2003	258.91	Vashon
LC-01	3/3/2003	260.00	Vashon
LC-01	7/1/2003	258.18	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-01	10/4/2004	256.27	Vashon
LC-01	2/10/2010	261.05	Vashon
LC-01	6/3/2010	260.16	Vashon
LC-01	8/10/2010	258.70	Vashon
LC-01	2/16/2011	261.15	Vashon
LC-01	8/10/2011	259.15	Vashon
LC-01	2/23/2012	260.92	Vashon
LC-01	7/31/2012	259.07	Vashon
LC-01	2/6/2013	260.48	Vashon
LC-01	8/7/2013	258.1	Vashon
LC-01	2/18/2014	261.25	Vashon
LC-01	9/4/2014	258.54	Vashon
LC-01	2/18/2015	261.25	Vashon
LC-01	9/9/2015	257.24	Vashon
LC-01	2/22/2016	263.18	Vashon
LC-01	8/17/2016	258.17	Vashon
LC-01	4/6/2018	260.66	Vashon
LC- 01	3/13/2019	260.48	Vashon
LC- 01	3/13/2020	260.59	Vashon
LC-03	4/23/1997	262.81	Vashon
LC-03	7/16/1997	256.84	Vashon
LC-03	10/16/1997	256.77	Vashon
LC-03	1/30/1998	260.61	Vashon
LC-03	4/2/1998	259.42	Vashon
LC-03	7/7/1998	255.37	Vashon
LC-03	9/22/1998	253.97	Vashon
LC-03	12/1/1998	261.47	Vashon
LC-03	3/1/1999	259.72	Vashon
LC-03	6/1/1999	257.37	Vashon
LC-03	9/1/1999	254.21	Vashon
LC-03	12/1/1999	260.13	Vashon
LC-03	3/1/2000	259.21	Vashon
LC-03	6/1/2000	256.78	Vashon
LC-03	3/1/2001	254.75	Vashon
LC-03	6/1/2001	253.63	Vashon
LC-03	9/1/2001	251.01	Vashon
LC-03	12/1/2001	257.32	Vashon
LC-03	4/1/2002	259.19	Vashon
LC-03	6/1/2002	257.39	Vashon
LC-03	9/1/2002	254.36	Vashon
LC-03	2/3/2003	258.25	Vashon
LC-03	3/3/2003	257.92	Vashon
LC-03	7/1/2003	255.52	Vashon
LC-03	10/4/2004	253.67	Vashon
LC-03	4/6/2005	256.37	Vashon
LC-03	7/29/2005	254.80	Vashon
LC-03	8/29/2005	253.98	Vashon
LC-03	3/17/2006	259.24	Vashon
LC-03	9/19/2006	254.52	Vashon
LC-03	3/20/2007	259.74	Vashon
LC-03	10/4/2007	255.19	Vashon
LC-03	3/25/2008	257.67	Vashon
LC-03	10/8/2008	253.70	Vashon
LC-03	2/5/2009	258.31	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-03	8/4/2009	255.32	Vashon
LC-03	2/10/2010	258.80	Vashon
LC-03	8/10/2010	256.25	Vashon
LC-03	2/16/2011	258.85	Vashon
LC-03	8/10/2011	256.65	Vashon
LC-03	2/23/2012	258.51	Vashon
LC-03	7/31/2012	257.49	Vashon
LC-03	2/6/2013	258.15	Vashon
LC-03	8/7/2013	255.45	Vashon
LC-03	2/18/2014	258.40	Vashon
LC-03	9/8/2014	255.82	Vashon
LC-03	2/18/2015	258.97	Vashon
LC-03	9/9/2015	254.45	Vashon
LC-03	2/22/2016	260.91	Vashon
LC-03	8/17/2016	255.47	Vashon
LC-03	2/13/2017	259.30	Vashon
LC-03	3/29/2018	259.30	Vashon
LC-03	3/7/2019	258.18	Vashon
LC-03	3/9/2020	258.44	Vashon
LC-03	3/8/2021	259.19	Vashon
LC-05	10/7/1996	249.90	Vashon
LC-05	1/24/1997	257.69	Vashon
LC-05	4/23/1997	257.99	Vashon
LC-05	7/16/1997	251.81	Vashon
LC-05	10/16/1997	251.64	Vashon
LC-05	1/30/1998	255.79	Vashon
LC-05	4/2/1998	254.25	Vashon
LC-05	7/7/1998	250.59	Vashon
LC-05	9/22/1998	248.34	Vashon
LC-05	12/1/1998	257.59	Vashon
LC-05	3/1/1999	255.45	Vashon
LC-05	6/1/1999	253.58	Vashon
LC-05	9/1/1999	248.72	Vashon
LC-05	12/1/1999	254.66	Vashon
LC-05	3/1/2000	255.35	Vashon
LC-05	6/1/2000	252.82	Vashon
LC-05	9/1/2000	249.00	Vashon
LC-05	12/1/2000	249.59	Vashon
LC-05	3/1/2001	249.31	Vashon
LC-05	6/1/2001	248.88	Vashon
LC-05	9/1/2001	247.05	Vashon
LC-05	12/1/2001	254.07	Vashon
LC-05	4/1/2002	255.26	Vashon
LC-05	6/1/2002	253.27	Vashon
LC-05	9/1/2002	251.39	Vashon
LC-05	2/3/2003	254.27	Vashon
LC-05	3/3/2003	253.65	Vashon
LC-05	7/1/2003	251.16	Vashon
LC-05	10/4/2004	248.76	Vashon
LC-05	4/8/2005	251.31	Vashon
LC-05	7/20/2005	250.39	Vashon
LC-05	3/14/2006	255.14	Vashon
LC-05	9/20/2006	249.91	Vashon
LC-05	3/21/2007	255.73	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-05	9/28/2007	250.92	Vashon
LC-05	3/25/2008	253.48	Vashon
LC-05	10/8/2008	248.36	Vashon
LC-05	2/5/2009	254.41	Vashon
LC-05	8/4/2009	251.17	Vashon
LC-05	2/10/2010	255.38	Vashon
LC-05	8/11/2010	252.68	Vashon
LC-05	2/16/2011	254.93	Vashon
LC-05	8/9/2011	252.58	Vashon
LC-05	2/29/2012	253.96	Vashon
LC-05	7/31/2012	252.63	Vashon
LC-05	2/6/2013	253.77	Vashon
LC-05	8/7/2013	250.98	Vashon
LC-05	2/18/2014	253.78	Vashon
LC-05	9/8/2014	251.79	Vashon
LC-05	2/20/2015	254.55	Vashon
LC-05	9/10/2015	249.69	Vashon
LC-06	4/23/1997	265.25	Vashon
LC-06	7/16/1997	260.29	Vashon
LC-06	10/16/1997	260.46	Vashon
LC-06	1/30/1998	263.95	Vashon
LC-06	4/2/1998	262.61	Vashon
LC-06	7/7/1998	260.22	Vashon
LC-06	9/22/1998	259.39	Vashon
LC-06	12/1/1998	266.31	Vashon
LC-06	3/1/1999	263.23	Vashon
LC-06	6/1/1999	260.68	Vashon
LC-06	9/1/1999	258.55	Vashon
LC-06	12/1/1999	263.18	Vashon
LC-06	3/1/2000	263.65	Vashon
LC-06	6/1/2000	261.21	Vashon
LC-06	9/1/2000	258.66	Vashon
LC-06	12/1/2000	259.85	Vashon
LC-06	3/1/2001	260.15	Vashon
LC-06	6/1/2001	259.14	Vashon
LC-06	9/1/2001	256.45	Vashon
LC-06	12/1/2001	264.69	Vashon
LC-06	4/1/2002	263.69	Vashon
LC-06	6/1/2002	264.05	Vashon
LC-06	9/1/2002	259.68	Vashon
LC-06	2/3/2003	264.41	Vashon
LC-06	3/3/2003	261.86	Vashon
LC-06	7/1/2003	260.45	Vashon
LC-06	10/4/2004	258.96	Vashon
LC-06	4/14/2005	261.47	Vashon
LC-06	7/29/2005	259.84	Vashon
LC-06	9/6/2005	259.21	Vashon
LC-06	3/17/2006	263.66	Vashon
LC-06	9/19/2006	259.85	Vashon
LC-06	3/20/2007	264.43	Vashon
LC-06	9/28/2007	260.26	Vashon
LC-06	3/25/2008	262.04	Vashon
LC-06	10/8/2008	259.16	Vashon
LC-06	2/5/2009	262.66	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-06	8/4/2009	260.29	Vashon
LC-06	2/10/2010	263.04	Vashon
LC-06	8/10/2010	260.84	Vashon
LC-06	2/16/2011	263.19	Vashon
LC-06	8/10/2011	261.25	Vashon
LC-06	2/23/2012	262.95	Vashon
LC-06	7/31/2012	261.11	Vashon
LC-06	2/6/2013	262.44	Vashon
LC-06	8/7/2013	260.44	Vashon
LC-06	2/18/2014	262.84	Vashon
LC-06	9/8/2014	260.70	Vashon
LC-06	2/18/2015	263.36	Vashon
LC-06	9/9/2015	259.87	Vashon
LC-06	2/22/2016	265.40	Vashon
LC-06	8/17/2016	260.47	Vashon
LC-06	2/13/2017	263.67	Vashon
LC-06	3/29/2018	262.71	Vashon
LC-06	3/7/2019	262.52	Vashon
LC-06	3/9/2020	262.74	Vashon
LC-06	3/8/2021	263.49	
LC-08	10/4/2004	226.27	Vashon
LC-10	4/6/2005	262.80	Vashon
LC-10	7/29/2005	260.96	Vashon
LC-10	3/17/2006	265.13	Vashon
LC-10	9/26/2006	261.12	Vashon
LC-10	3/23/2007	266.87	Vashon
LC-10	9/28/2007	261.62	Vashon
LC-10	3/25/2008	263.45	Vashon
LC-10	10/8/2008	260.67	Vashon
LC-10	2/5/2009	263.89	Vashon
LC-10	8/4/2009	261.67	Vashon
LC-10	2/10/2010	264.49	Vashon
LC-10	8/10/2010	262.27	Vashon
LC-10	2/16/2011	264.53	Vashon
LC-10	8/8/2011	262.84	Vashon
LC-10	2/29/2012	264.21	Vashon
LC-10	7/31/2012	262.49	Vashon
LC-10	2/6/2013	263.77	Vashon
LC-10	8/8/2013	261.69	Vashon
LC-10	2/13/2014	262.99	Vashon
LC-10	9/8/2014	262.05	Vashon
LC-10	2/18/2015	264.75	Vashon
LC-10	9/10/2015	261.13	Vashon
LC-101	10/7/1996	248.46	Vashon
LC-101	1/24/1997	256.14	Vashon
LC-101	4/23/1997	254.06	Vashon
LC-101	7/16/1997	250.40	Vashon
LC-101	10/16/1997	250.14	Vashon
LC-101	1/30/1998	254.31	Vashon
LC-101	4/2/1998	252.96	Vashon
LC-101	7/7/1998	249.70	Vashon
LC-101	9/22/1998	247.33	Vashon
LC-101	12/1/1998	256.58	Vashon
LC-101	3/1/1999	254.48	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-101	6/1/1999	252.54	Vashon
LC-101	9/1/1999	247.73	Vashon
LC-101	12/1/1999	253.87	Vashon
LC-101	3/1/2000	254.47	Vashon
LC-101	6/1/2000	252.04	Vashon
LC-101	9/1/2000	248.02	Vashon
LC-101	12/1/2000	247.84	Vashon
LC-101	3/1/2001	248.48	Vashon
LC-101	6/1/2001	248.73	Vashon
LC-101	9/1/2001	246.11	Vashon
LC-101	12/1/2001	254.14	Vashon
LC-101	4/1/2002	254.13	Vashon
LC-101	6/1/2002	253.45	Vashon
LC-101	9/1/2002	250.99	Vashon
LC-101	2/3/2003	253.26	Vashon
LC-101	3/3/2003	252.69	Vashon
LC-101	7/1/2003	250.18	Vashon
LC-101	10/4/2004	247.68	Vashon
LC-103	10/7/1996	260.92	Vashon
LC-103	1/24/1997	267.62	Vashon
LC-103	4/23/1997	266.07	Vashon
LC-103	7/16/1997	261.85	Vashon
LC-103	10/16/1997	262.06	Vashon
LC-103	1/30/1998	265.82	Vashon
LC-103	4/2/1998	264.43	Vashon
LC-103	7/7/1998	261.82	Vashon
LC-103	9/22/1998	261.30	Vashon
LC-103	12/1/1998	268.37	Vashon
LC-108	10/7/1996	264.75	Vashon
LC-108	1/24/1997	270.74	Vashon
LC-108	4/23/1997	270.13	Vashon
LC-108	7/16/1997	266.29	Vashon
LC-108	10/16/1997	265.00	Vashon
LC-108	1/30/1998	269.45	Vashon
LC-108	4/2/1998	268.86	Vashon
LC-108	7/7/1998	265.34	Vashon
LC-108	9/22/1998	262.56	Vashon
LC-108	12/1/1998	270.99	Vashon
LC-108	3/1/1999	269.50	Vashon
LC-108	6/1/1999	266.52	Vashon
LC-108	9/1/1999	262.35	Vashon
LC-108	12/1/1999	268.47	Vashon
LC-108	3/1/2000	269.42	Vashon
LC-108	6/1/2000	266.61	Vashon
LC-108	9/1/2000	263.32	Vashon
LC-108	12/1/2000	263.08	Vashon
LC-108	3/1/2001	263.13	Vashon
LC-108	6/1/2001	263.75	Vashon
LC-108	9/1/2001	262.40	Vashon
LC-108	9/25/2006	266.34	Vashon
LC-108	3/22/2007	271.00	Vashon
LC-108	4/3/2008	267.73	Vashon
LC-108	10/8/2008	263.31	Vashon
LC-108	2/3/2009	267.43	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-108	8/3/2009	267.84	Vashon
LC-108	2/11/2010	268.52	Vashon
LC-108	8/10/2010	265.90	Vashon
LC-108	2/14/2011	268.52	Vashon
LC-108	8/10/2011	268.42	Vashon
LC-108	2/22/2012	268.04	Vashon
LC-108	7/31/2012	266.24	Vashon
LC-108	2/7/2013	267.73	Vashon
LC-108	8/7/2013	265.54	Vashon
LC-108	2/18/2014	269.67	Vashon
LC-108	9/3/2014	266.72	Vashon
LC-108	2/18/2015	268.91	Vashon
LC-108	9/9/2015	264.40	Vashon
LC-109	1/24/1997	256.85	Vashon
LC-109	4/23/1997	254.13	Vashon
LC-109	2/19/2015	254.74	Vashon
LC-109	9/9/2015	250.67	Vashon
LC-109	2/17/2016	257.45	Vashon
LC-109	8/16/2016	252.23	Vashon
LC-109	2/14/2017	255.60	Vashon
LC-109	8/7/2017	252.88	Vashon
LC-109	4/5/2018	254.26	Vashon
LC-109	9/14/2018	250.84	Vashon
LC-109	3/13/2019	254.40	Vashon
LC-109	9/5/2019	250.65	Vashon
LC-109	3/12/2020	254.79	Vashon
LC-109	8/28/2020	249.96	Vashon
LC-109	3/25/2021	255.66	Vashon
LC-109	9/1/2021	252.09	Vashon
LC-11	7/16/1997	262.62	Vashon
LC-11	1/30/1998	266.68	Vashon
LC-11	4/2/1998	265.22	Vashon
LC-11	7/7/1998	261.39	Vashon
LC-11	9/22/1998	260.39	Vashon
LC-11	12/1/1998	268.24	Vashon
LC-11	3/1/1999	265.87	Vashon
LC-11	6/1/1999	262.97	Vashon
LC-11	9/1/1999	260.54	Vashon
LC-11	12/1/1999	264.46	Vashon
LC-11	3/1/2000	264.95	Vashon
LC-11	6/1/2000	262.38	Vashon
LC-11	9/1/2000	261.73	Vashon
LC-11	12/1/2000	262.01	Vashon
LC-11	3/1/2001	261.14	Vashon
LC-11	6/1/2001	259.91	Vashon
LC-11	9/1/2001	257.90	Vashon
LC-11	12/1/2001	265.00	Vashon
LC-11	4/1/2002	264.99	Vashon
LC-11	6/1/2002	264.72	Vashon
LC-11	9/1/2002	261.13	Vashon
LC-11	2/3/2003	264.85	Vashon
LC-11	3/3/2003	262.98	Vashon
LC-11	7/1/2003	261.50	Vashon
LC-110	10/7/1996	247.83	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-110	1/24/1997	255.65	Vashon
LC-110	4/23/1997	252.82	Vashon
LC-110	7/16/1997	249.67	Vashon
LC-110	10/16/1997	249.59	Vashon
LC-110	1/30/1998	253.43	Vashon
LC-110	4/2/1998	251.48	Vashon
LC-110	7/7/1998	249.21	Vashon
LC-110	9/22/1998	247.11	Vashon
LC-110	12/1/1998	256.38	Vashon
LC-110	3/1/1999	253.67	Vashon
LC-110	6/1/1999	252.03	Vashon
LC-110	9/1/1999	247.01	Vashon
LC-110	12/1/1999	253.25	Vashon
LC-110	3/1/2000	254.17	Vashon
LC-110	6/1/2000	251.70	Vashon
LC-110	9/1/2000	247.44	Vashon
LC-110	12/1/2000	247.23	Vashon
LC-110	3/1/2001	247.47	Vashon
LC-110	6/1/2001	248.12	Vashon
LC-110	9/1/2001	246.00	Vashon
LC-110	12/1/2001	253.96	Vashon
LC-110	4/1/2002	253.62	Vashon
LC-110	6/1/2002	253.33	Vashon
LC-110	9/1/2002	251.26	Vashon
LC-110	2/3/2003	252.35	Vashon
LC-110	3/3/2003	251.87	Vashon
LC-110	7/1/2003	248.95	Vashon
LC-110	10/4/2004	247.25	Vashon
LC-110	4/14/2005	239.87	Vashon
LC-110	7/19/2005	248.44	Vashon
LC-110	11/4/2005	246.95	Vashon
LC-110	3/14/2006	253.25	Vashon
LC-110	9/21/2006	248.12	Vashon
LC-110	3/23/2007	255.08	Vashon
LC-110	9/28/2007	251.06	Vashon
LC-110	3/25/2008	252.47	Vashon
LC-110	10/8/2008	247.55	Vashon
LC-110	2/5/2009	253.35	Vashon
LC-110	8/5/2009	251.15	Vashon
LC-110	2/10/2010	254.97	Vashon
LC-110	8/12/2010	251.94	Vashon
LC-110	2/16/2011	254.29	Vashon
LC-110	8/9/2011	252.04	Vashon
LC-110	3/1/2012	253.09	Vashon
LC-110	8/2/2012	252.27	Vashon
LC-110	2/7/2013	252.59	Vashon
LC-110	9/10/2014	251.19	Vashon
LC-110	2/20/2015	253.69	Vashon
LC-110	9/11/2015	249.39	Vashon
LC-110	2/22/2016	256.35	Vashon
LC-110	8/17/2016	250.90	Vashon
LC-110	2/13/2017	254.22	Vashon
LC-110	4/6/2018	252.64	Vashon
LC-110	3/13/2019	253.11	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-110	3/11/2020	252.67	Vashon
LC-111	10/7/1996	247.69	Vashon
LC-111	1/24/1997	255.65	Vashon
LC-111	4/23/1997	258.83	Vashon
LC-111	7/16/1997	249.59	Vashon
LC-111	10/16/1997	249.56	Vashon
LC-111	1/30/1998	253.53	Vashon
LC-111	4/2/1998	251.56	Vashon
LC-111	7/7/1998	249.14	Vashon
LC-111	9/22/1998	247.14	Vashon
LC-111	12/1/1998	256.51	Vashon
LC-111	3/1/1999	253.96	Vashon
LC-111	6/1/1999	252.20	Vashon
LC-111	9/1/1999	247.11	Vashon
LC-111	12/1/1999	253.23	Vashon
LC-111	3/1/2000	254.11	Vashon
LC-111	6/1/2000	251.60	Vashon
LC-111	9/1/2000	247.33	Vashon
LC-111	12/1/2000	247.14	Vashon
LC-111	3/1/2001	247.38	Vashon
LC-111	6/1/2001	247.98	Vashon
LC-111	9/1/2001	245.83	Vashon
LC-111	12/1/2001	253.88	Vashon
LC-111	4/1/2002	253.69	Vashon
LC-111	6/1/2002	253.19	Vashon
LC-111	9/1/2002	251.50	Vashon
LC-111	2/3/2003	252.83	Vashon
LC-111	3/3/2003	251.88	Vashon
LC-111	7/1/2003	249.44	Vashon
LC-111a	10/4/2004	247.16	Vashon
LC-111a	4/8/2005	249.35	Vashon
LC-111a	7/19/2005	248.40	Vashon
LC-111a	11/4/2005	246.96	Vashon
LC-111a	3/14/2006	253.32	Vashon
LC-111a	9/21/2006	248.23	Vashon
LC-111a	3/23/2007	254.85	Vashon
LC-111a	9/28/2007	250.79	Vashon
LC-111a	3/25/2008	252.20	Vashon
LC-111a	10/8/2008	247.04	Vashon
LC-111a	2/5/2009	250.34	Vashon
LC-111a	8/5/2009	250.64	Vashon
LC-111a	2/10/2010	254.96	Vashon
LC-111a	8/12/2010	251.43	Vashon
LC-111a	2/16/2011	254.04	Vashon
LC-111a	8/9/2011	251.73	Vashon
LC-111a	3/1/2012	252.84	Vashon
LC-111a	8/2/2012	251.96	Vashon
LC-111a	2/7/2013	252.23	Vashon
LC-111a	8/7/2013	249.66	Vashon
LC-111a	2/18/2014	253.16	Vashon
LC-111a	9/9/2014	250.76	Vashon
LC-111a	2/20/2015	253.38	Vashon
LC-111a	9/11/2015	248.89	Vashon
LC-111a	2/22/2016	255.92	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-111a	8/17/2016	250.41	Vashon
LC-111a	2/13/2017	254.04	Vashon
LC-111a	4/6/2018	252.82	Vashon
LC-111a	3/13/2019	252.72	Vashon
LC-111a	3/11/2020	252.85	Vashon
LC-111a	3/12/2021	23.34	Vashon
LC-111b	7/7/1998	241.80	Vashon
LC-111b	9/22/1998	240.55	Vashon
LC-111b	12/1/1998	249.77	Vashon
LC-111b	3/1/1999	247.03	Vashon
LC-111b	6/1/1999	244.93	Vashon
LC-111b	9/1/1999	240.54	Vashon
LC-111b	12/1/1999	245.78	Vashon
LC-111b	3/1/2000	246.55	Vashon
LC-111b	6/1/2000	244.24	Vashon
LC-111b	3/1/2001	241.55	Vashon
LC-111b	6/1/2001	241.57	Vashon
LC-111b	9/1/2001	239.91	Vashon
LC-111b	12/1/2001	246.78	Vashon
LC-111b	4/1/2002	246.75	Vashon
LC-111b	6/1/2002	246.04	Vashon
LC-111b	9/1/2002	243.83	Vashon
LC-111b	2/3/2003	245.85	Vashon
LC-111b	3/3/2003	245.16	Vashon
LC-111b	7/1/2003	243.03	Vashon
LC-111b	10/4/2004	241.16	Vashon
LC-111b	4/8/2005	242.32	Vashon
LC-111b	7/19/2005	241.83	Vashon
LC-111b	9/7/2005	240.13	Vashon
LC-111b	3/14/2006	247.21	Vashon
LC-111b	9/21/2006	244.32	Vashon
LC-111b	3/23/2007	250.77	Vashon
LC-111b	9/19/2007	244.92	Vashon
LC-111b	3/25/2008	247.60	Vashon
LC-111b	10/8/2008	243.13	Vashon
LC-111b	2/3/2009	253.35	Vashon
LC-111b	8/5/2009	244.95	Vashon
LC-111b	3/11/2021	246.93	Vashon
LC-112	4/23/1997	252.69	Vashon
LC-112	7/16/1997	249.37	Vashon
LC-112	10/16/1997	249.35	Vashon
LC-112	1/30/1998	253.43	Vashon
LC-112	4/2/1998	251.64	Vashon
LC-112	7/7/1998	249.00	Vashon
LC-112	6/1/1999	251.47	Vashon
LC-112	12/1/1999	253.02	Vashon
LC-112	3/1/2000	253.50	Vashon
LC-112	6/1/2000	251.34	Vashon
LC-112	9/1/2000	247.10	Vashon
LC-112	12/1/2000	246.90	Vashon
LC-112	3/1/2001	247.25	Vashon
LC-112	6/1/2001	247.83	Vashon
LC-112	9/1/2001	245.71	Vashon
LC-112	12/1/2001	253.71	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-112	4/1/2002	253.63	Vashon
LC-112	6/1/2002	252.66	Vashon
LC-112	9/1/2002	250.73	Vashon
LC-112	2/3/2003	252.17	Vashon
LC-112	3/3/2003	251.79	Vashon
LC-112	7/1/2003	249.75	Vashon
LC-112	10/4/2004	246.98	Vashon
LC-112	4/8/2005	249.28	Vashon
LC-112	9/22/2006	248.22	Vashon
LC-112	10/19/2007	250.44	Vashon
LC-112	10/8/2008	246.69	Vashon
LC-112	2/5/2009	253.07	Vashon
LC-112	8/5/2009	250.11	Vashon
LC-112	2/10/2010	254.58	Vashon
LC-112	8/12/2010	251.08	Vashon
LC-112	2/16/2011	253.81	Vashon
LC-112	8/9/2011	251.53	Vashon
LC-112	2/29/2012	252.15	Vashon
LC-112	8/2/2012	251.10	Vashon
LC-112	2/7/2013	251.45	Vashon
LC-112	8/7/2013	249.33	Vashon
LC-112	2/18/2014	252.58	Vashon
LC-112	9/10/2014	250.23	Vashon
LC-112	2/20/2015	253.06	Vashon
LC-112	9/11/2015	248.36	Vashon
LC-112	2/23/2016	255.54	Vashon
LC-112	8/17/2016	249.93	Vashon
LC-112	2/15/2017	253.78	Vashon
LC-112	4/6/2018	252.50	Vashon
LC-112	3/14/2019	252.48	Vashon
LC-112	3/11/2020	252.72	Vashon
LC-113	10/7/1996	247.28	Vashon
LC-113	4/8/2005	249.72	Vashon
LC-113	7/19/2005	248.83	Vashon
LC-113	11/4/2005	246.97	Vashon
LC-113	3/14/2006	253.68	Vashon
LC-113	9/21/2006	248.43	Vashon
LC-113	3/23/2007	254.17	Vashon
LC-113	9/28/2007	249.71	Vashon
LC-113	3/25/2008	252.03	Vashon
LC-113	10/8/2008	246.97	Vashon
LC-113	2/5/2009	253.00	Vashon
LC-113	8/5/2009	250.10	Vashon
LC-113	2/10/2010	254.29	Vashon
LC-113	8/12/2010	251.09	Vashon
LC-113	2/16/2011	253.52	Vashon
LC-113	8/9/2011	251.24	Vashon
LC-113	3/1/2012	252.37	Vashon
LC-113	8/2/2012	251.23	Vashon
LC-113	2/7/2013	252.29	Vashon
LC-113	8/7/2013	249.59	Vashon
LC-113	2/18/2014	252.59	Vashon
LC-113	9/8/2014	250.44	Vashon
LC-113	2/20/2015	253.23	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-113	9/11/2015	248.44	Vashon
LC-113	2/22/2016	255.67	Vashon
LC-113	8/17/2016	250.01	Vashon
LC-113	2/13/2017	253.79	Vashon
LC-113	4/6/2018	252.55	Vashon
LC-113	3/13/2019	254.64	Vashon
LC-113	3/11/2020	253.84	Vashon
LC-113	3/12/2021	254.13	Vashon
LC-114	10/7/1996	247.99	Vashon
LC-114	1/24/1997	255.72	Vashon
LC-114	4/23/1997	253.25	Vashon
LC-114	7/16/1997	249.92	Vashon
LC-114	10/16/1997	249.89	Vashon
LC-114	1/30/1998	253.82	Vashon
LC-114	4/2/1998	252.06	Vashon
LC-114	9/22/1998	247.73	Vashon
LC-114	12/1/1998	256.66	Vashon
LC-114	3/1/1999	253.95	Vashon
LC-114	6/1/1999	251.87	Vashon
LC-114	9/1/1999	247.28	Vashon
LC-114	12/1/1999	253.44	Vashon
LC-114	3/1/2000	254.12	Vashon
LC-114	6/1/2000	251.70	Vashon
LC-114	9/1/2000	247.98	Vashon
LC-114	12/1/2000	247.83	Vashon
LC-114	3/1/2001	248.22	Vashon
LC-114	6/1/2001	248.69	Vashon
LC-114	9/1/2001	246.19	Vashon
LC-114	12/1/2001	254.26	Vashon
LC-114	4/1/2002	253.95	Vashon
LC-114	6/1/2002	254.28	Vashon
LC-114	9/1/2002	251.13	Vashon
LC-114	2/3/2003	252.74	Vashon
LC-114	3/3/2003	252.03	Vashon
LC-114	7/1/2003	249.72	Vashon
LC-114	10/4/2004	247.42	Vashon
LC-114	4/8/2005	249.83	Vashon
LC-114	7/19/2005	248.98	Vashon
LC-114	11/4/2005	247.30	Vashon
LC-114	3/14/2006	253.69	Vashon
LC-114	9/21/2006	248.50	Vashon
LC-114	3/23/2007	254.21	Vashon
LC-114	9/28/2007	249.43	Vashon
LC-114	3/25/2008	251.77	Vashon
LC-114	10/8/2008	246.88	Vashon
LC-114	2/5/2009	253.18	Vashon
LC-114	8/5/2009	249.87	Vashon
LC-114	2/10/2010	254.30	Vashon
LC-114	8/12/2010	251.37	Vashon
LC-114	2/16/2011	253.18	Vashon
LC-114	8/9/2011	250.90	Vashon
LC-114	3/1/2012	252.14	Vashon
LC-114	8/2/2012	250.99	Vashon
LC-114	2/7/2013	252.69	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-114	8/9/2013	249.4	Vashon
LC-114	9/8/2014	250.35	Vashon
LC-114	2/20/2015	253.14	Vashon
LC-114	9/11/2015	248.33	Vashon
LC-114	2/22/2016	255.56	Vashon
LC-114	8/17/2016	249.95	Vashon
LC-114	2/13/2017	253.75	Vashon
LC-114	4/6/2018	252.61	Vashon
LC-114	3/13/2019	252.59	Vashon
LC-114	3/11/2020	252.82	Vashon
LC-114	3/12/2021	254.13	Vashon
LC-115	10/7/1996	248.36	Vashon
LC-115	1/24/1997	256.14	Vashon
LC-115	4/23/1997	253.83	Vashon
LC-115	7/16/1997	250.25	Vashon
LC-115	10/16/1997	250.18	Vashon
LC-115	1/30/1998	254.27	Vashon
LC-115	4/2/1998	252.73	Vashon
LC-115	7/7/1998	249.90	Vashon
LC-115	9/22/1998	247.76	Vashon
LC-115	12/1/1998	256.77	Vashon
LC-115	3/1/1999	253.93	Vashon
LC-115	6/1/1999	251.99	Vashon
LC-115	9/1/1999	247.53	Vashon
LC-115	12/1/1999	253.88	Vashon
LC-115	3/1/2000	254.54	Vashon
LC-115	6/1/2000	252.09	Vashon
LC-115	9/1/2000	248.37	Vashon
LC-115	12/1/2000	248.18	Vashon
LC-115	3/1/2001	248.65	Vashon
LC-115	6/1/2001	249.04	Vashon
LC-115	9/1/2001	246.92	Vashon
LC-115	12/1/2001	254.94	Vashon
LC-115	4/1/2002	254.46	Vashon
LC-115	6/1/2002	254.00	Vashon
LC-115	9/1/2002	251.89	Vashon
LC-115	2/3/2003	253.39	Vashon
LC-115	3/3/2003	252.74	Vashon
LC-115	7/1/2003	250.36	Vashon
LC-115	10/4/2004	248.04	Vashon
LC-115	4/8/2005	250.59	Vashon
LC-115	7/19/2005	249.76	Vashon
LC-115	11/4/2005	247.85	Vashon
LC-115	3/14/2006	254.36	Vashon
LC-115	9/21/2006	249.17	Vashon
LC-115	3/23/2007	254.91	Vashon
LC-115	9/28/2007	249.76	Vashon
LC-115	3/25/2008	252.59	Vashon
LC-115	10/8/2008	247.64	Vashon
LC-115	2/5/2009	253.90	Vashon
LC-115	8/5/2009	250.38	Vashon
LC-115	2/10/2010	254.81	Vashon
LC-115	8/12/2010	251.96	Vashon
LC-115	2/16/2011	253.98	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-115	8/9/2011	251.56	Vashon
LC-115	3/1/2012	253.11	Vashon
LC-115	8/2/2012	251.76	Vashon
LC-115	2/7/2013	252.93	Vashon
LC-115	8/7/2013	250.26	Vashon
LC-115	2/18/2014	253.01	Vashon
LC-115	9/8/2014	251.09	Vashon
LC-115	2/20/2015	253.83	Vashon
LC-115	9/11/2015	248.89	Vashon
LC-115	2/22/2016	255.99	Vashon
LC-115	8/17/2016	250.51	Vashon
LC-115	2/13/2017	254.43	Vashon
LC-115	4/6/2018	253.39	Vashon
LC-115	3/13/2019	253.35	Vashon
LC-115	3/11/2020	253.45	Vashon
LC-115	3/12/2021	254.48	Vashon
LC-116	10/7/1996	248.18	Vashon
LC-116	1/24/1997	255.89	Vashon
LC-116	4/23/1997	253.72	Vashon
LC-116	7/16/1997	250.04	Vashon
LC-116	10/16/1997	249.91	Vashon
LC-116	1/30/1998	254.05	Vashon
LC-116	4/2/1998	252.59	Vashon
LC-116	7/7/1998	249.67	Vashon
LC-116	9/22/1998	247.49	Vashon
LC-116	12/1/1998	256.45	Vashon
LC-116	3/1/1999	253.71	Vashon
LC-116	6/1/1999	251.77	Vashon
LC-116	9/1/1999	247.34	Vashon
LC-116	12/1/1999	253.76	Vashon
LC-116	3/1/2000	254.34	Vashon
LC-116	6/1/2000	251.93	Vashon
LC-116	9/1/2000	248.53	Vashon
LC-116	12/1/2000	248.12	Vashon
LC-116	3/1/2001	248.58	Vashon
LC-116	6/1/2001	248.98	Vashon
LC-116	9/1/2001	246.46	Vashon
LC-116	12/1/2001	254.51	Vashon
LC-116	4/1/2002	254.37	Vashon
LC-116	6/1/2002	253.77	Vashon
LC-116	9/1/2002	251.47	Vashon
LC-116	2/3/2003	253.26	Vashon
LC-116	3/3/2003	252.79	Vashon
LC-116	7/1/2003	250.44	Vashon
LC-116	10/4/2004	248.10	Vashon
LC-116	4/8/2005	250.79	Vashon
LC-116	7/19/2005	249.92	Vashon
LC-116	11/4/2005	247.84	Vashon
LC-116	3/14/2006	254.43	Vashon
LC-116	9/21/2006	249.35	Vashon
LC-116	3/23/2007	254.98	Vashon
LC-116	9/28/2007	249.60	Vashon
LC-116	3/25/2008	252.84	Vashon
LC-116	10/8/2008	247.65	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-116	2/5/2009	254.03	Vashon
LC-116	8/5/2009	250.30	Vashon
LC-116	2/10/2010	254.92	Vashon
LC-116	8/12/2010	251.90	Vashon
LC-116	2/16/2011	254.25	Vashon
LC-116	8/9/2011	251.45	Vashon
LC-116	3/1/2012	253.30	Vashon
LC-116	8/2/2012	251.94	Vashon
LC-116	2/7/2013	253.42	Vashon
LC-116	8/7/2013	250.4	Vashon
LC-116	2/18/2014	253.15	Vashon
LC-116	9/3/2014	251.47	Vashon
LC-116	2/20/2015	253.82	Vashon
LC-116	9/11/2015	247.84	Vashon
LC-116	2/22/2016	255.89	Vashon
LC-116	8/17/2016	250.51	Vashon
LC-116	2/13/2017	254.50	Vashon
LC-116	4/6/2018	253.45	Vashon
LC-116	3/13/2019	253.52	Vashon
LC-116	3/11/2020	253.46	Vashon
LC-116	3/12/2021	254.32	Vashon
LC-116b	7/7/1998	243.56	Vashon
LC-116b	12/1/1998	250.74	Vashon
LC-116b	3/1/1999	248.54	Vashon
LC-116b	6/1/1999	246.29	Vashon
LC-116b	9/1/1999	242.21	Vashon
LC-116b	12/1/1999	246.98	Vashon
LC-116b	3/1/2000	247.45	Vashon
LC-116b	6/1/2000	245.08	Vashon
LC-116b	9/1/2000	242.63	Vashon
LC-116b	12/1/2000	242.72	Vashon
LC-116b	3/1/2001	243.22	Vashon
LC-116b	6/1/2001	242.83	Vashon
LC-116b	9/1/2001	241.03	Vashon
LC-116b	12/1/2001	247.83	Vashon
LC-116b	4/1/2002	248.37	Vashon
LC-116b	6/1/2002	247.31	Vashon
LC-116b	9/1/2002	245.19	Vashon
LC-116b	2/3/2003	246.94	Vashon
LC-116b	3/3/2003	246.52	Vashon
LC-116b	7/1/2003	244.59	Vashon
LC-116b	10/4/2004	242.61	Vashon
LC-116b	4/8/2005	244.15	Vashon
LC-116b	7/20/2005	243.62	Vashon
LC-116b	9/8/2005	242.03	Vashon
LC-116b	3/14/2006	248.57	Vashon
LC-116b	9/21/2006	243.13	Vashon
LC-116b	3/23/2007	247.32	Vashon
LC-116b	3/25/2008	244.43	Vashon
LC-116b	10/8/2008	246.02	Vashon
LC-116b	2/5/2009	252.41	Vashon
LC-116b	8/5/2009	244.05	Vashon
LC-116b	3/11/2021	245.35	Vashon
LC-117	10/7/1996	248.07	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-117	1/24/1997	255.84	Vashon
LC-117	4/23/1997	253.68	Vashon
LC-117	7/16/1997	249.91	Vashon
LC-117	10/16/1997	249.76	Vashon
LC-117	1/30/1998	254.00	Vashon
LC-117	4/2/1998	252.51	Vashon
LC-117	7/7/1998	249.55	Vashon
LC-117	9/22/1998	247.39	Vashon
LC-117	12/1/1998	256.54	Vashon
LC-117	3/1/1999	254.08	Vashon
LC-117	6/1/1999	252.12	Vashon
LC-117	9/1/1999	247.71	Vashon
LC-117	12/1/1999	253.83	Vashon
LC-117	3/1/2000	254.41	Vashon
LC-117	6/1/2000	251.91	Vashon
LC-117	9/1/2000	248.60	Vashon
LC-117	12/1/2000	248.04	Vashon
LC-117	3/1/2001	248.51	Vashon
LC-117	6/1/2001	248.98	Vashon
LC-117	9/1/2001	246.86	Vashon
LC-117	12/1/2001	254.90	Vashon
LC-117	4/1/2002	254.39	Vashon
LC-117	6/1/2002	253.84	Vashon
LC-117	9/1/2002	251.75	Vashon
LC-117	2/3/2003	253.36	Vashon
LC-117	3/3/2003	252.91	Vashon
LC-117	7/1/2003	250.44	Vashon
LC-117	10/4/2004	248.13	Vashon
LC-117	4/8/2005	250.85	Vashon
LC-117	7/19/2005	249.99	Vashon
LC-117	11/4/2005	247.75	Vashon
LC-117	3/14/2006	254.53	Vashon
LC-117	9/21/2006	249.43	Vashon
LC-117	3/23/2007	255.08	Vashon
LC-117	10/8/2008	247.17	Vashon
LC-117	2/5/2009	253.80	Vashon
LC-117	8/12/2010	251.48	Vashon
LC-117	3/1/2012	253.05	Vashon
LC-117	8/2/2012	252.43	Vashon
LC-117	2/7/2013	253.3	Vashon
LC-117	9/8/2014	251.15	Vashon
LC-117	2/20/2015	253.49	Vashon
LC-117	4/6/2018	253.15	Vashon
LC-117	3/13/2019	253.18	Vashon
LC-118	10/7/1996	249.11	Vashon
LC-118	1/24/1997	256.58	Vashon
LC-118	4/23/1997	254.51	Vashon
LC-118	7/16/1997	250.85	Vashon
LC-118	10/16/1997	250.68	Vashon
LC-118	1/30/1998	254.76	Vashon
LC-118	4/2/1998	253.35	Vashon
LC-118	7/7/1998	250.41	Vashon
LC-118	9/22/1998	248.07	Vashon
LC-118	12/1/1998	256.97	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-118	3/1/1999	254.61	Vashon
LC-118	6/1/1999	252.65	Vashon
LC-118	9/1/1999	248.31	Vashon
LC-118	12/1/1999	254.31	Vashon
LC-118	3/1/2000	254.84	Vashon
LC-118	6/1/2000	252.43	Vashon
LC-118	9/1/2000	248.80	Vashon
LC-118	12/1/2000	247.62	Vashon
LC-118	3/1/2001	246.43	Vashon
LC-118	6/1/2001	249.01	Vashon
LC-118	9/1/2001	246.90	Vashon
LC-118	12/1/2001	254.95	Vashon
LC-118	4/1/2002	254.69	Vashon
LC-118	6/1/2002	254.07	Vashon
LC-118	9/1/2002	251.85	Vashon
LC-118	2/3/2003	253.42	Vashon
LC-118	3/3/2003	253.25	Vashon
LC-118	7/1/2003	250.93	Vashon
LC-118	10/4/2004	248.64	Vashon
LC-118	4/8/2005	244.76	Vashon
LC-118	7/20/2005	250.52	Vashon
LC-118	11/4/2005	243.68	Vashon
LC-118	3/14/2006	244.05	Vashon
LC-118	9/21/2006	249.89	Vashon
LC-118	3/23/2007	255.39	Vashon
LC-118	9/28/2007	250.34	Vashon
LC-118	3/25/2008	253.31	Vashon
LC-118	10/8/2008	248.26	Vashon
LC-118	2/5/2009	254.15	Vashon
LC-118	8/5/2009	250.96	Vashon
LC-118	2/10/2010	255.06	Vashon
LC-118	8/12/2010	252.20	Vashon
LC-118	2/16/2011	254.68	Vashon
LC-118	8/9/2011	252.25	Vashon
LC-118	3/1/2012	253.86	Vashon
LC-118	8/2/2012	251.51	Vashon
LC-118	2/7/2013	252.89	Vashon
LC-118	8/7/2013	250.91	Vashon
LC-118	2/18/2014	253.56	Vashon
LC-118	9/3/2014	251.81	Vashon
LC-118	2/20/2015	254.33	Vashon
LC-118	9/11/2015	249.37	Vashon
LC-118	2/22/2016	256.29	Vashon
LC-118	8/17/2016	250.91	Vashon
LC-118	2/13/2017	254.76	Vashon
LC-118	4/6/2018	253.70	Vashon
LC-118	3/13/2019	253.67	Vashon
LC-118	3/11/2020	253.88	Vashon
LC-118	3/12/2021	254.67	Vashon
LC-119	10/7/1996	249.59	Vashon
LC-119	1/24/1997	256.82	Vashon
LC-119	4/23/1997	254.77	Vashon
LC-119	7/16/1997	251.23	Vashon
LC-119	10/16/1997	251.05	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-119	1/30/1998	254.99	Vashon
LC-119	4/2/1998	253.61	Vashon
LC-119	7/7/1998	250.76	Vashon
LC-119	9/22/1998	248.43	Vashon
LC-119	12/1/1998	257.15	Vashon
LC-119	3/1/1999	254.74	Vashon
LC-119	6/1/1999	252.80	Vashon
LC-119	9/1/1999	248.55	Vashon
LC-119	12/1/1999	254.49	Vashon
LC-119	3/1/2000	255.01	Vashon
LC-119	6/1/2000	252.63	Vashon
LC-119	9/1/2000	249.05	Vashon
LC-119	12/1/2000	248.99	Vashon
LC-119	3/1/2001	249.64	Vashon
LC-119	6/1/2001	249.81	Vashon
LC-119	9/1/2001	247.69	Vashon
LC-119	12/1/2001	255.72	Vashon
LC-119	4/1/2002	254.83	Vashon
LC-119	6/1/2002	255.06	Vashon
LC-119	9/1/2002	252.57	Vashon
LC-119	2/3/2003	254.18	Vashon
LC-119	3/3/2003	253.34	Vashon
LC-119	7/1/2003	251.12	Vashon
LC-119	10/4/2004	248.92	Vashon
LC-119	4/18/2005	251.65	Vashon
LC-119	7/21/2005	250.73	Vashon
LC-119	10/8/2008	248.54	Vashon
LC-119	2/5/2009	254.11	Vashon
LC-119	8/5/2009	251.13	Vashon
LC-119	2/10/2010	254.96	Vashon
LC-119	8/12/2010	252.27	Vashon
LC-119	2/16/2011	254.61	Vashon
LC-119	8/9/2011	252.46	Vashon
LC-119	2/24/2012	254.02	Vashon
LC-119	8/2/2012	252.28	Vashon
LC-119	2/7/2013	253.82	Vashon
LC-119	8/7/2013	251.16	Vashon
LC-119	2/18/2014	253.66	Vashon
LC-119	9/3/2014	251.92	Vashon
LC-119	2/24/2015	254.23	Vashon
LC-119	4/6/2018	253.86	Vashon
LC-119	3/13/2019	253.78	Vashon
LC-119	3/11/2020	254.03	Vashon
LC-119	3/12/2021	254.79	Vashon
LC-12	10/7/1996	250.19	Vashon
LC-12	1/24/1997	256.04	Vashon
LC-12	4/23/1997	254.24	Vashon
LC-12	7/16/1997	251.29	Vashon
LC-12	10/16/1997	251.18	Vashon
LC-12	1/30/1998	254.54	Vashon
LC-12	4/2/1998	253.24	Vashon
LC-12	7/7/1998	249.99	Vashon
LC-12	9/22/1998	248.34	Vashon
LC-12	12/1/1998	256.39	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-12	3/1/1999	253.69	Vashon
LC-12	6/1/1999	251.99	Vashon
LC-12	9/1/1999	248.74	Vashon
LC-12	12/1/1999	254.12	Vashon
LC-12	3/1/2000	253.67	Vashon
LC-12	6/1/2000	252.32	Vashon
LC-12	9/1/2000	249.48	Vashon
LC-12	12/1/2000	249.55	Vashon
LC-12	3/1/2001	249.96	Vashon
LC-12	6/1/2001	250.14	Vashon
LC-12	9/1/2001	247.56	Vashon
LC-12	12/1/2001	253.14	Vashon
LC-12	4/1/2002	254.14	Vashon
LC-12	6/1/2002	252.36	Vashon
LC-12	9/1/2002	250.17	Vashon
LC-12	2/3/2003	253.21	Vashon
LC-12	3/3/2003	252.79	Vashon
LC-12	7/1/2003	250.95	Vashon
LC-12	10/4/2004	249.41	Vashon
LC-120	10/7/1996	249.75	Vashon
LC-120	1/24/1997	256.90	Vashon
LC-120	4/23/1997	254.84	Vashon
LC-120	7/16/1997	251.33	Vashon
LC-120	10/16/1997	251.17	Vashon
LC-120	1/30/1998	255.06	Vashon
LC-120	4/2/1998	253.64	Vashon
LC-120	7/7/1998	250.89	Vashon
LC-120	9/22/1998	248.61	Vashon
LC-120	12/1/1998	257.20	Vashon
LC-120	3/1/1999	254.71	Vashon
LC-120	6/1/1999	252.76	Vashon
LC-120	9/1/1999	248.56	Vashon
LC-120	12/1/1999	254.58	Vashon
LC-120	3/1/2000	255.07	Vashon
LC-120	6/1/2000	252.71	Vashon
LC-120	9/1/2000	249.16	Vashon
LC-120	12/1/2000	249.17	Vashon
LC-120	3/1/2001	249.78	Vashon
LC-120	6/1/2001	249.88	Vashon
LC-120	9/1/2001	248.26	Vashon
LC-120	12/1/2001	256.25	Vashon
LC-120	4/1/2002	254.95	Vashon
LC-120	6/1/2002	255.56	Vashon
LC-120	9/1/2002	251.10	Vashon
LC-120	2/3/2003	253.82	Vashon
LC-120	3/3/2003	252.42	Vashon
LC-120	7/1/2003	251.17	Vashon
LC-120	10/4/2004	249.11	Vashon
LC-120	4/14/2005	251.92	Vashon
LC-120	7/21/2005	250.82	Vashon
LC-120	11/4/2005	248.73	Vashon
LC-120	3/14/2006	255.08	Vashon
LC-120	9/25/2006	249.97	Vashon
LC-120	3/23/2007	255.35	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-120	9/28/2007	250.49	Vashon
LC-120	3/25/2008	253.28	Vashon
LC-120	10/8/2008	248.65	Vashon
LC-120	2/5/2009	254.07	Vashon
LC-120	8/5/2009	251.19	Vashon
LC-120	2/9/2010	255.00	Vashon
LC-120	8/12/2010	252.35	Vashon
LC-120	2/17/2011	254.62	Vashon
LC-120	8/9/2011	252.50	Vashon
LC-120	3/1/2012	254.02	Vashon
LC-120	8/1/2012	252.58	Vashon
LC-120	2/7/2013	253.77	Vashon
LC-120	3/11/2020	254.18	Vashon
LC-120	3/12/2021	254.88	Vashon
LC-121	10/7/1996	248.95	Vashon
LC-121	1/24/1997	257.04	Vashon
LC-121	4/23/1997	255.01	Vashon
LC-121	7/16/1997	251.52	Vashon
LC-121	10/16/1997	250.34	Vashon
LC-121	1/30/1998	255.21	Vashon
LC-121	4/2/1998	253.81	Vashon
LC-121	6/1/1999	252.99	Vashon
LC-121	9/1/1999	248.87	Vashon
LC-121	12/1/1999	254.71	Vashon
LC-121	3/1/2000	255.22	Vashon
LC-121	6/1/2000	252.85	Vashon
LC-121	9/1/2000	249.42	Vashon
LC-121	12/1/2000	249.41	Vashon
LC-121	3/1/2001	250.07	Vashon
LC-121	6/1/2001	250.19	Vashon
LC-121	9/1/2001	247.55	Vashon
LC-121	12/1/2001	255.58	Vashon
LC-121	4/1/2002	255.15	Vashon
LC-121	6/1/2002	255.10	Vashon
LC-121	9/1/2002	252.95	Vashon
LC-121	2/3/2003	254.06	Vashon
LC-121	3/3/2003	253.67	Vashon
LC-121	7/1/2003	251.44	Vashon
LC-121	10/4/2004	249.36	Vashon
LC-121	4/14/2005	252.15	Vashon
LC-121	7/21/2005	251.02	Vashon
LC-121	11/4/2005	248.97	Vashon
LC-121	3/14/2006	255.26	Vashon
LC-121	9/25/2006	250.15	Vashon
LC-121	3/23/2007	255.59	Vashon
LC-121	9/28/2007	250.76	Vashon
LC-121	3/25/2008	253.54	Vashon
LC-121	2/5/2009	254.27	Vashon
LC-121	8/5/2009	251.47	Vashon
LC-121	2/9/2010	254.47	Vashon
LC-121	8/12/2010	251.32	Vashon
LC-121	2/17/2011	254.85	Vashon
LC-121	8/9/2011	252.72	Vashon
LC-121	3/1/2012	254.24	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-121	8/1/2012	252.77	Vashon
LC-121	2/7/2013	253.56	Vashon
LC-121	8/8/2013	251.42	Vashon
LC-121	2/18/2014	253.97	Vashon
LC-121	9/4/2014	251.12	Vashon
LC-121	2/20/2015	254.81	Vashon
LC-121	9/11/2015	250.16	Vashon
LC-121	2/22/2016	256.71	Vashon
LC-121	8/17/2016	251.48	Vashon
LC-121	2/13/2017	255.24	Vashon
LC-121	4/6/2018	254.17	Vashon
LC-121	3/13/2019	254.05	Vashon
LC-121	3/11/2020	254.41	Vashon
LC-121	3/12/2021	254.22	Vashon
LC-122	10/7/1996	250.02	Vashon
LC-122	1/24/1997	257.09	Vashon
LC-122	4/23/1997	255.06	Vashon
LC-122	7/16/1997	251.56	Vashon
LC-122	10/16/1997	251.41	Vashon
LC-122	1/30/1998	255.28	Vashon
LC-122	4/2/1998	253.89	Vashon
LC-122	7/7/1998	251.12	Vashon
LC-122	9/22/1998	248.95	Vashon
LC-122	12/1/1998	257.41	Vashon
LC-122	3/1/1999	254.72	Vashon
LC-122	6/1/1999	253.33	Vashon
LC-122	9/1/1999	249.25	Vashon
LC-122	12/1/1999	254.77	Vashon
LC-122	3/1/2000	255.31	Vashon
LC-122	6/1/2000	252.90	Vashon
LC-122	9/1/2000	248.43	Vashon
LC-122	12/1/2000	248.42	Vashon
LC-122	3/1/2001	250.07	Vashon
LC-122	6/1/2001	250.17	Vashon
LC-122	9/1/2001	246.55	Vashon
LC-122	12/1/2001	254.61	Vashon
LC-122	4/1/2002	255.12	Vashon
LC-122	6/1/2002	253.60	Vashon
LC-122	9/1/2002	252.23	Vashon
LC-122	2/3/2003	254.07	Vashon
LC-122	3/3/2003	253.65	Vashon
LC-122	7/1/2003	251.43	Vashon
LC-122	10/4/2004	249.38	Vashon
LC-122	4/14/2005	252.15	Vashon
LC-122	11/4/2005	248.99	Vashon
LC-122	9/25/2006	246.17	Vashon
LC-122	3/23/2007	255.57	Vashon
LC-122	9/28/2007	250.75	Vashon
LC-122	10/8/2008	248.87	Vashon
LC-122	2/22/2016	256.71	Vashon
LC-122	2/13/2017	255.22	Vashon
LC-122	4/6/2018	254.21	Vashon
LC-122	3/13/2019	254.07	Vashon
LC-122	3/11/2020	254.39	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-122	3/12/2021	255.10	Vashon
LC-122b	7/7/1998	245.21	Vashon
LC-122b	9/22/1998	243.03	Vashon
LC-122b	12/1/1998	251.63	Vashon
LC-122b	3/1/1999	249.79	Vashon
LC-122b	6/1/1999	249.66	Vashon
LC-122b	9/1/1999	245.68	Vashon
LC-122b	12/1/1999	251.00	Vashon
LC-122b	3/1/2000	251.49	Vashon
LC-122b	6/1/2000	249.10	Vashon
LC-122b	3/1/2001	244.89	Vashon
LC-122b	6/1/2001	244.60	Vashon
LC-122b	9/1/2001	241.98	Vashon
LC-122b	12/1/2001	248.73	Vashon
LC-122b	4/1/2002	251.85	Vashon
LC-122b	6/1/2002	248.02	Vashon
LC-122b	9/1/2002	247.25	Vashon
LC-122b	2/3/2003	249.08	Vashon
LC-122b	3/3/2003	248.83	Vashon
LC-122b	7/1/2003	246.87	Vashon
LC-122b	10/4/2004	244.63	Vashon
LC-122b	4/14/2005	247.76	Vashon
LC-122b	9/8/2005	245.41	Vashon
LC-122b	3/14/2006	251.61	Vashon
LC-122b	9/25/2006	246.76	Vashon
LC-122b	3/23/2007	251.01	Vashon
LC-122b	9/28/2007	246.01	Vashon
LC-122b	3/25/2008	248.71	Vashon
LC-122b	10/8/2008	245.70	Vashon
LC-122b	2/11/2009	250.13	Vashon
LC-122b	8/5/2009	248.18	Vashon
LC-123	10/7/1996	250.02	Vashon
LC-123	1/24/1997	257.11	Vashon
LC-123	4/23/1997	255.08	Vashon
LC-123	6/1/1999	242.86	Vashon
LC-123	9/1/1999	248.71	Vashon
LC-123	12/1/1999	254.80	Vashon
LC-123	3/1/2000	255.28	Vashon
LC-123	6/1/2000	252.94	Vashon
LC-123	9/1/2000	249.45	Vashon
LC-123	12/1/2000	249.44	Vashon
LC-123	3/1/2001	250.10	Vashon
LC-123	6/1/2001	250.20	Vashon
LC-123	9/1/2001	249.58	Vashon
LC-123	12/1/2001	257.58	Vashon
LC-123	4/1/2002	255.15	Vashon
LC-123	6/1/2002	256.89	Vashon
LC-123	9/1/2002	253.95	Vashon
LC-123	2/3/2003	256.02	Vashon
LC-123	3/3/2003	253.69	Vashon
LC-123	7/1/2003	251.43	Vashon
LC-123	10/4/2004	249.38	Vashon
LC-123	4/14/2005	252.17	Vashon
LC-123	7/21/2005	251.05	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-123	11/4/2005	248.99	Vashon
LC-123	3/14/2006	255.25	Vashon
LC-123	9/25/2006	250.15	Vashon
LC-123	3/23/2007	255.59	Vashon
LC-123	9/28/2007	250.76	Vashon
LC-123	3/25/2008	259.71	Vashon
LC-123	10/8/2008	248.88	Vashon
LC-123	2/5/2009	254.33	Vashon
LC-123	8/5/2009	251.48	Vashon
LC-123	2/9/2010	255.11	Vashon
LC-123	8/12/2010	252.51	Vashon
LC-123	2/17/2011	254.81	Vashon
LC-123	8/9/2011	252.76	Vashon
LC-123	3/1/2012	254.24	Vashon
LC-123	8/1/2012	252.76	Vashon
LC-123	2/7/2013	254.85	Vashon
LC-123	9/4/2014	252.09	Vashon
LC-123	2/23/2015	254.69	Vashon
LC-123	9/10/2015	250.13	Vashon
LC-123	2/22/2016	256.73	Vashon
LC-123	8/17/2016	251.49	Vashon
LC-123	2/13/2017	255.27	Vashon
LC-123	4/6/2018	254.22	Vashon
LC-123	3/13/2019	254.12	Vashon
LC-123	3/11/2021	255.41	Vashon
LC-124	10/7/1996	250.05	Vashon
LC-124	1/24/1997	257.18	Vashon
LC-124	4/23/1997	255.15	Vashon
LC-124	7/16/1997	251.62	Vashon
LC-124	10/16/1997	251.46	Vashon
LC-124	1/30/1998	255.35	Vashon
LC-124	4/2/1998	253.96	Vashon
LC-124	7/7/1998	251.19	Vashon
LC-124	9/22/1998	248.97	Vashon
LC-124	12/1/1998	257.49	Vashon
LC-124	3/1/1999	255.13	Vashon
LC-124	6/1/1999	253.12	Vashon
LC-124	9/1/1999	249.02	Vashon
LC-124	12/1/1999	254.84	Vashon
LC-124	3/1/2000	255.33	Vashon
LC-124	6/1/2000	253.27	Vashon
LC-124	9/1/2000	249.43	Vashon
LC-124	12/1/2000	249.43	Vashon
LC-124	3/1/2001	250.10	Vashon
LC-124	6/1/2001	250.19	Vashon
LC-124	9/1/2001	247.68	Vashon
LC-124	12/1/2001	255.63	Vashon
LC-124	4/1/2002	255.16	Vashon
LC-124	6/1/2002	255.06	Vashon
LC-124	9/1/2002	252.66	Vashon
LC-124	2/3/2003	254.09	Vashon
LC-124	3/3/2003	253.69	Vashon
LC-124	7/1/2003	251.45	Vashon
LC-124	10/4/2004	249.31	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-124	9/28/2007	250.76	Vashon
LC-124	3/25/2008	253.51	Vashon
LC-124	10/8/2008	248.88	Vashon
LC-124	2/5/2009	254.29	Vashon
LC-124	8/5/2009	251.47	Vashon
LC-124	2/9/2010	255.08	Vashon
LC-124	8/12/2010	252.53	Vashon
LC-124	2/17/2011	254.78	Vashon
LC-124	8/9/2011	252.81	Vashon
LC-124	3/1/2012	254.27	Vashon
LC-124	8/1/2012	252.78	Vashon
LC-124	2/7/2013	254.14	Vashon
LC-124	8/8/2013	250.68	Vashon
LC-124	2/19/2014	254.38	Vashon
LC-124	9/4/2014	252.10	Vashon
LC-124	2/23/2015	254.68	Vashon
LC-124	9/9/2015	250.15	Vashon
LC-124	2/19/2016	256.73	Vashon
LC-124	8/15/2016	251.56	Vashon
LC-124	2/13/2017	255.28	Vashon
LC-124	8/7/2017	252.64	Vashon
LC-124	4/5/2018	254.20	Vashon
LC-124	9/12/2018	250.03	Vashon
LC-124	3/13/2019	254.12	Vashon
LC-124	9/5/2019	249.75	Vashon
LC-124	3/11/2020	254.43	Vashon
LC-124	9/3/2020	250.46	Vashon
LC-124	3/11/2021	255.23	Vashon
LC-124	9/1/2021	250.21	Vashon
LC-125	10/7/1996	248.99	Vashon
LC-125	1/24/1997	255.72	Vashon
LC-125	4/23/1997	253.47	Vashon
LC-125	7/16/1997	250.28	Vashon
LC-125	10/16/1997	250.31	Vashon
LC-125	1/30/1998	253.71	Vashon
LC-125	4/2/1998	251.94	Vashon
LC-125	7/7/1998	249.78	Vashon
LC-125	9/22/1998	247.89	Vashon
LC-125	12/1/1998	256.32	Vashon
LC-125	3/1/1999	253.72	Vashon
LC-125	6/1/1999	252.11	Vashon
LC-125	9/1/1999	247.60	Vashon
LC-125	12/1/1999	253.42	Vashon
LC-125	3/1/2000	254.28	Vashon
LC-125	6/1/2000	252.01	Vashon
LC-125	9/1/2000	248.40	Vashon
LC-125	12/1/2000	248.28	Vashon
LC-125	3/1/2001	248.45	Vashon
LC-125	6/1/2001	249.05	Vashon
LC-125	9/1/2001	246.83	Vashon
LC-125	12/1/2001	250.78	Vashon
LC-125	4/1/2002	253.76	Vashon
LC-125	6/1/2002	250.15	Vashon
LC-125	9/1/2002	249.50	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-125	2/3/2003	253.17	Vashon
LC-125	3/3/2003	252.11	Vashon
LC-125	7/1/2003	249.94	Vashon
LC-125	10/4/2004	239.45	Vashon
LC-125	4/8/2005	249.80	Vashon
LC-125	7/19/2005	248.90	Vashon
LC-125	3/17/2006	253.51	Vashon
LC-125	3/23/2007	254.53	Vashon
LC-125	3/25/2008	251.98	Vashon
LC-125	10/8/2008	247.45	Vashon
LC-125	2/5/2009	252.77	Vashon
LC-125	8/5/2009	250.79	Vashon
LC-125	2/10/2010	253.82	Vashon
LC-125	8/11/2010	251.64	Vashon
LC-125	2/16/2011	253.77	Vashon
LC-125	8/9/2011	251.60	Vashon
LC-125	2/28/2012	252.59	Vashon
LC-125	8/1/2012	251.68	Vashon
LC-125	2/12/2013	252.15	Vashon
LC-125	8/9/2013	250.12	Vashon
LC-127	10/7/1996	248.96	Vashon
LC-127	1/24/1997	255.54	Vashon
LC-127	4/23/1997	253.48	Vashon
LC-127	7/16/1997	250.34	Vashon
LC-127	10/16/1997	250.24	Vashon
LC-127	1/30/1998	253.78	Vashon
LC-127	4/2/1998	252.41	Vashon
LC-127	7/7/1998	249.87	Vashon
LC-127	9/22/1998	247.96	Vashon
LC-127	12/1/1998	255.97	Vashon
LC-127	3/1/1999	253.44	Vashon
LC-127	6/1/1999	251.67	Vashon
LC-127	9/1/1999	247.77	Vashon
LC-127	12/1/1999	253.33	Vashon
LC-127	3/1/2000	253.90	Vashon
LC-127	6/1/2000	251.65	Vashon
LC-127	9/1/2000	248.42	Vashon
LC-127	12/1/2000	248.36	Vashon
LC-127	3/1/2001	248.88	Vashon
LC-127	6/1/2001	249.06	Vashon
LC-127	9/1/2001	247.44	Vashon
LC-127	12/1/2001	249.93	Vashon
LC-127	4/1/2002	253.62	Vashon
LC-127	6/1/2002	249.53	Vashon
LC-127	9/1/2002	248.54	Vashon
LC-127	2/3/2003	252.66	Vashon
LC-127	3/3/2003	252.19	Vashon
LC-127	7/1/2003	250.06	Vashon
LC-127	10/4/2004	247.99	Vashon
LC-128	1/24/1997	252.87	Vashon
LC-128	4/23/1997	250.95	Vashon
LC-128	7/16/1997	247.43	Vashon
LC-128	10/16/1997	247.44	Vashon
LC-128	1/30/1998	251.05	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-128	4/2/1998	249.79	Vashon
LC-128	7/7/1998	247.02	Vashon
LC-128	9/22/1998	244.75	Vashon
LC-128	12/1/1998	253.63	Vashon
LC-128	3/1/1999	250.36	Vashon
LC-128	6/1/1999	248.46	Vashon
LC-128	9/1/1999	244.30	Vashon
LC-128	12/1/1999	250.45	Vashon
LC-128	3/1/2000	251.10	Vashon
LC-128	6/1/2000	248.76	Vashon
LC-128	9/1/2000	245.39	Vashon
LC-128	12/1/2000	245.32	Vashon
LC-128	3/1/2001	245.98	Vashon
LC-128	6/1/2001	246.07	Vashon
LC-128	9/1/2001	242.96	Vashon
LC-128	12/1/2001	248.08	Vashon
LC-128	4/1/2002	251.02	Vashon
LC-128	6/1/2002	247.93	Vashon
LC-128	9/1/2002	247.03	Vashon
LC-128	2/3/2003	249.75	Vashon
LC-128	3/3/2003	249.42	Vashon
LC-128	7/1/2003	247.21	Vashon
LC-128	10/4/2004	245.29	Vashon
LC-128	4/14/2005	247.77	Vashon
LC-128	7/21/2005	246.66	Vashon
LC-128	9/6/2005	245.00	Vashon
LC-128	3/28/2006	250.79	Vashon
LC-128	9/25/2006	246.32	Vashon
LC-128	3/22/2007	251.23	Vashon
LC-128	9/28/2007	246.67	Vashon
LC-128	3/25/2008	249.80	Vashon
LC-128	10/8/2008	245.95	Vashon
LC-128	2/5/2009	251.57	Vashon
LC-128	8/5/2009	247.37	Vashon
LC-129	10/7/1996	253.21	Vashon
LC-129	1/24/1997	257.28	Vashon
LC-129	4/23/1997	255.48	Vashon
LC-129	7/16/1997	253.41	Vashon
LC-129	10/16/1997	253.30	Vashon
LC-129	1/30/1998	255.63	Vashon
LC-129	4/2/1998	254.63	Vashon
LC-129	7/7/1998	253.12	Vashon
LC-129	9/22/1998	252.10	Vashon
LC-129	12/1/1998	257.53	Vashon
LC-129	3/1/1999	254.95	Vashon
LC-129	6/1/1999	253.52	Vashon
LC-129	9/1/1999	251.77	Vashon
LC-129	12/1/1999	255.14	Vashon
LC-129	3/1/2000	255.58	Vashon
LC-129	6/1/2000	253.83	Vashon
LC-129	9/1/2000	252.29	Vashon
LC-129	12/1/2000	252.31	Vashon
LC-129	3/1/2001	252.72	Vashon
LC-129	6/1/2001	252.58	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-129	9/1/2001	249.96	Vashon
LC-129	12/1/2001	254.26	Vashon
LC-129	4/1/2002	255.32	Vashon
LC-129	6/1/2002	253.67	Vashon
LC-129	9/1/2002	251.27	Vashon
LC-129	2/3/2003	254.59	Vashon
LC-129	3/3/2003	254.28	Vashon
LC-129	7/1/2003	253.24	Vashon
LC-129	10/4/2004	252.69	Vashon
LC-13	10/7/1996	250.66	Vashon
LC-13	1/24/1997	257.45	Vashon
LC-13	4/23/1997	255.48	Vashon
LC-13	7/16/1997	252.07	Vashon
LC-13	10/16/1997	251.93	Vashon
LC-13	1/30/1998	255.62	Vashon
LC-13	4/2/1998	254.33	Vashon
LC-13	7/7/1998	250.58	Vashon
LC-13	12/1/1998	257.74	Vashon
LC-13	3/1/1999	254.68	Vashon
LC-13	6/1/1999	252.76	Vashon
LC-13	9/1/1999	249.00	Vashon
LC-13	12/1/1999	255.15	Vashon
LC-13	3/1/2000	254.47	Vashon
LC-13	6/1/2000	253.31	Vashon
LC-13	9/1/2000	250.07	Vashon
LC-13	12/1/2000	250.10	Vashon
LC-13	3/1/2001	250.77	Vashon
LC-13	6/1/2001	250.81	Vashon
LC-13	9/1/2001	248.66	Vashon
LC-13	12/1/2001	254.18	Vashon
LC-13	4/1/2002	255.45	Vashon
LC-13	6/1/2002	253.95	Vashon
LC-13	9/1/2002	251.45	Vashon
LC-13	2/3/2003	254.08	Vashon
LC-13	3/3/2003	254.10	Vashon
LC-13	7/1/2003	251.94	Vashon
LC-13	10/4/2004	249.91	Vashon
LC-130	10/7/1996	250.11	Vashon
LC-130	1/24/1997	257.15	Vashon
LC-130	4/23/1997	255.15	Vashon
LC-130	7/16/1997	251.64	Vashon
LC-130	10/16/1997	251.49	Vashon
LC-130	1/30/1998	255.34	Vashon
LC-130	4/2/1998	254.02	Vashon
LC-130	7/7/1998	251.19	Vashon
LC-130	9/22/1998	250.01	Vashon
LC-130	12/1/1998	257.47	Vashon
LC-130	3/1/1999	254.98	Vashon
LC-130	6/1/1999	253.04	Vashon
LC-130	9/1/1999	248.93	Vashon
LC-130	12/1/1999	254.89	Vashon
LC-130	3/1/2000	255.37	Vashon
LC-130	6/1/2000	252.99	Vashon
LC-130	9/1/2000	249.85	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-130	12/1/2000	249.86	Vashon
LC-130	3/1/2001	250.51	Vashon
LC-130	6/1/2001	250.60	Vashon
LC-130	9/1/2001	248.98	Vashon
LC-130	12/1/2001	253.39	Vashon
LC-130	4/1/2002	255.53	Vashon
LC-130	6/1/2002	252.70	Vashon
LC-130	9/1/2002	251.16	Vashon
LC-130	2/3/2003	254.49	Vashon
LC-130	3/3/2003	254.13	Vashon
LC-130	7/1/2003	251.85	Vashon
LC-130	10/4/2004	249.78	Vashon
LC-131	10/7/1996	251.19	Vashon
LC-131	1/24/1997	259.06	Vashon
LC-131	4/23/1997	255.43	Vashon
LC-131	7/16/1997	252.90	Vashon
LC-131	10/16/1997	252.75	Vashon
LC-131	1/30/1998	257.15	Vashon
LC-131	4/2/1998	255.04	Vashon
LC-131	7/7/1998	252.77	Vashon
LC-131	9/22/1998	250.13	Vashon
LC-131	12/1/1998	260.31	Vashon
LC-131	3/1/1999	257.75	Vashon
LC-131	6/1/1999	256.59	Vashon
LC-131	9/1/1999	250.45	Vashon
LC-131	12/1/1999	257.53	Vashon
LC-131	3/1/2000	258.60	Vashon
LC-131	6/1/2000	255.70	Vashon
LC-131	9/1/2000	251.59	Vashon
LC-131	12/1/2000	250.39	Vashon
LC-131	3/1/2001	250.43	Vashon
LC-131	6/1/2001	251.16	Vashon
LC-131	9/1/2001	248.39	Vashon
LC-131	12/1/2001	246.99	Vashon
LC-131	4/1/2002	258.21	Vashon
LC-131	6/1/2002	246.29	Vashon
LC-131	9/1/2002	245.94	Vashon
LC-131	2/3/2003	257.32	Vashon
LC-131	3/3/2003	256.15	Vashon
LC-131	7/1/2003	253.04	Vashon
LC-131	10/4/2004	250.61	Vashon
LC-132	10/7/1996	250.37	Vashon
LC-132	1/24/1997	257.97	Vashon
LC-132	4/23/1997	255.63	Vashon
LC-132	7/16/1997	252.13	Vashon
LC-132	10/16/1997	252.02	Vashon
LC-132	1/30/1998	256.03	Vashon
LC-132	4/2/1998	254.59	Vashon
LC-132	7/7/1998	251.71	Vashon
LC-132	9/22/1998	249.41	Vashon
LC-132	12/1/1998	258.43	Vashon
LC-132	3/1/1999	255.87	Vashon
LC-132	6/1/1999	254.07	Vashon
LC-132	9/1/1999	249.30	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-132	12/1/1999	255.73	Vashon
LC-132	3/1/2000	256.30	Vashon
LC-132	6/1/2000	253.86	Vashon
LC-132	9/1/2000	249.87	Vashon
LC-132	12/1/2000	249.80	Vashon
LC-132	3/1/2001	250.33	Vashon
LC-132	6/1/2001	250.54	Vashon
LC-132	9/1/2001	249.71	Vashon
LC-132	3/3/2003	254.60	Vashon
LC-132	7/1/2003	252.07	Vashon
LC-132	10/4/2004	249.71	Vashon
LC-132	4/8/2005	252.30	Vashon
LC-132	7/20/2005	251.35	Vashon
LC-132	9/9/2005	252.36	Vashon
LC-132	3/17/2006	255.93	Vashon
LC-132	9/20/2006	250.82	Vashon
LC-132	3/21/2007	256.57	Vashon
LC-132	9/25/2007	251.94	Vashon
LC-132	3/25/2008	254.40	Vashon
LC-132	10/8/2008	249.32	Vashon
LC-132	2/5/2009	255.12	Vashon
LC-132	8/4/2009	252.45	Vashon
LC-132	2/10/2010	255.97	Vashon
LC-132	8/11/2010	253.47	Vashon
LC-132	2/16/2011	255.82	Vashon
LC-132	8/9/2011	253.54	Vashon
LC-132	2/29/2012	254.94	Vashon
LC-132	7/31/2012	253.67	Vashon
LC-132	2/6/2013	254.89	Vashon
LC-132	8/7/2013	252.12	Vashon
LC-132	2/18/2014	254.67	Vashon
LC-132	9/8/2014	252.79	Vashon
LC-132	2/20/2015	255.57	Vashon
LC-132	9/9/2015	250.85	Vashon
LC-132	2/19/2016	257.67	Vashon
LC-132	8/17/2016	252.36	Vashon
LC-132	2/13/2017	256.06	Vashon
LC-132	4/5/2018	254.92	Vashon
LC-132	3/13/2019	254.85	Vashon
LC-132	3/11/2020	255.25	Vashon
LC-132	3/25/2021	255.47	Vashon
LC-133	10/7/1996	266.72	Vashon
LC-133	1/24/1997	270.71	Vashon
LC-133	4/23/1997	270.13	Vashon
LC-133	7/16/1997	267.58	Vashon
LC-133	10/16/1997	267.35	Vashon
LC-133	1/30/1998	269.50	Vashon
LC-133	4/2/1998	268.97	Vashon
LC-133	7/7/1998	267.48	Vashon
LC-133	9/22/1998	265.65	Vashon
LC-133	12/1/1998	270.90	Vashon
LC-133	3/1/1999	269.58	Vashon
LC-133	6/1/1999	267.81	Vashon
LC-133	9/1/1999	265.67	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-133	12/1/1999	268.65	Vashon
LC-133	3/1/2000	269.27	Vashon
LC-133	6/1/2000	267.98	Vashon
LC-133	9/1/2000	266.03	Vashon
LC-133	12/1/2000	265.47	Vashon
LC-133	3/1/2001	265.73	Vashon
LC-133	6/1/2001	266.50	Vashon
LC-133	9/1/2001	264.90	Vashon
LC-133	12/1/2001	268.30	Vashon
LC-133	4/1/2002	269.71	Vashon
LC-133	6/1/2002	267.78	Vashon
LC-133	9/1/2002	266.89	Vashon
LC-133	2/3/2003	268.99	Vashon
LC-133	3/3/2003	268.05	Vashon
LC-133	7/1/2003	267.89	Vashon
LC-133	10/4/2004	265.36	Vashon
LC-134	4/23/1997	271.65	Vashon
LC-134	7/16/1997	268.22	Vashon
LC-134	10/16/1997	268.00	Vashon
LC-134	1/30/1998	270.83	Vashon
LC-134	4/2/1998	269.97	Vashon
LC-134	7/7/1998	268.24	Vashon
LC-134	9/22/1998	266.72	Vashon
LC-134	12/1/1998	271.97	Vashon
LC-134	3/1/1999	270.32	Vashon
LC-134	6/1/1999	268.29	Vashon
LC-134	9/1/1999	266.26	Vashon
LC-134	12/1/1999	269.42	Vashon
LC-134	3/1/2000	270.10	Vashon
LC-134	6/1/2000	268.66	Vashon
LC-134	9/1/2000	266.91	Vashon
LC-135	10/7/1996	268.55	Vashon
LC-135	1/24/1997	272.93	Vashon
LC-135	4/23/1997	272.33	Vashon
LC-135	7/16/1997	269.24	Vashon
LC-135	10/16/1997	269.00	Vashon
LC-135	1/30/1998	271.48	Vashon
LC-135	4/2/1998	270.97	Vashon
LC-135	7/7/1998	269.13	Vashon
LC-135	9/22/1998	267.62	Vashon
LC-135	12/1/1998	272.99	Vashon
LC-135	3/1/1999	271.72	Vashon
LC-135	6/1/1999	269.47	Vashon
LC-135	9/1/1999	267.32	Vashon
LC-135	12/1/1999	270.35	Vashon
LC-135	3/1/2000	271.03	Vashon
LC-135	6/1/2000	269.46	Vashon
LC-135	9/1/2000	267.64	Vashon
LC-135	12/1/2000	267.12	Vashon
LC-135	3/1/2001	267.40	Vashon
LC-135	6/1/2001	267.98	Vashon
LC-135	9/1/2001	266.61	Vashon
LC-135	12/1/2001	270.32	Vashon
LC-135	4/1/2002	271.54	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-135	6/1/2002	269.46	Vashon
LC-135	9/1/2002	267.54	Vashon
LC-135	2/3/2003	269.83	Vashon
LC-135	3/3/2003	269.44	Vashon
LC-135	7/1/2003	268.82	Vashon
LC-135	10/4/2004	266.44	Vashon
LC-135	8/30/2011	268.68	Vashon
LC-135	2/22/2012	269.52	Vashon
LC-135	7/31/2012	269.23	Vashon
LC-135	2/7/2013	269.45	Vashon
LC-135	8/7/2013	267.93	Vashon
LC-135	2/18/2014	270.53	Vashon
LC-135	9/3/2014	268.33	Vashon
LC-135	2/18/2015	270.31	Vashon
LC-135	9/9/2015	267.12	Vashon
LC-135	2/16/2016	272.22	Vashon
LC-135	8/15/2016	268.25	Vashon
LC-135	2/10/2017	270.65	Vashon
LC-135	8/8/2017	268.87	Vashon
LC-135	3/27/2018	270.26	Vashon
LC-135	9/12/2018	267.87	Vashon
LC-135	3/11/2019	269.41	Vashon
LC-135	9/5/2019	266.51	Vashon
LC-135	3/10/2020	269.62	Vashon
LC-135	9/3/2020	267.05	Vashon
LC-135	3/11/2021	270.23	Vashon
LC-135	9/1/2021	267.36	Vashon
LC-136a	4/23/1997	267.64	Vashon
LC-136a	7/16/1997	263.67	Vashon
LC-136a	10/16/1997	263.57	Vashon
LC-136a	1/30/1998	266.13	Vashon
LC-136a	4/2/1998	265.52	Vashon
LC-136a	7/7/1998	263.70	Vashon
LC-136a	9/22/1998	262.14	Vashon
LC-136a	12/1/1998	267.67	Vashon
LC-136a	3/1/1999	265.85	Vashon
LC-136a	6/1/1999	264.04	Vashon
LC-136a	9/1/1999	261.95	Vashon
LC-136a	12/1/1999	265.19	Vashon
LC-136a	3/1/2000	265.78	Vashon
LC-136a	6/1/2000	264.52	Vashon
LC-136a	9/1/2000	262.78	Vashon
LC-136a	12/1/2000	262.49	Vashon
LC-136a	3/1/2001	262.53	Vashon
LC-136a	6/1/2001	263.24	Vashon
LC-136a	9/1/2001	261.50	Vashon
LC-136a	12/1/2001	265.19	Vashon
LC-136a	4/1/2002	267.45	Vashon
LC-136a	6/1/2002	265.36	Vashon
LC-136a	9/1/2002	263.78	Vashon
LC-136a	2/3/2003	265.77	Vashon
LC-136a	3/3/2003	264.81	Vashon
LC-136a	7/1/2003	265.70	Vashon
LC-136a	10/4/2004	262.44	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-136a	8/17/2005	267.25	Vashon
LC-136b	12/1/1998	267.39	Vashon
LC-136b	3/1/1999	265.42	Vashon
LC-136b	6/1/1999	263.76	Vashon
LC-136b	9/1/1999	261.99	Vashon
LC-136b	12/1/1999	264.90	Vashon
LC-136b	3/1/2000	265.50	Vashon
LC-136b	6/1/2000	264.09	Vashon
LC-136b	9/1/2000	262.67	Vashon
LC-136b	12/1/2000	262.44	Vashon
LC-136b	3/1/2001	262.94	Vashon
LC-136b	6/1/2001	262.38	Vashon
LC-136b	9/1/2001	262.30	Vashon
LC-136b	12/1/2001	265.20	Vashon
LC-136b	4/1/2002	266.36	Vashon
LC-136b	6/1/2002	264.32	Vashon
LC-136b	9/1/2002	263.72	Vashon
LC-136b	2/3/2003	265.80	Vashon
LC-136b	3/3/2003	264.78	Vashon
LC-136b	7/1/2003	266.18	Vashon
LC-136b	10/4/2004	262.93	Vashon
LC-136b	8/17/2005	267.03	Vashon
LC-137a	4/23/1997	267.60	Vashon
LC-137a	7/16/1997	263.78	Vashon
LC-137a	10/16/1997	263.85	Vashon
LC-137a	1/30/1998	266.39	Vashon
LC-137a	4/2/1998	265.45	Vashon
LC-137a	7/7/1998	263.73	Vashon
LC-137a	9/22/1998	262.60	Vashon
LC-137a	12/1/1998	268.46	Vashon
LC-137a	3/1/1999	266.16	Vashon
LC-137a	6/1/1999	264.32	Vashon
LC-137a	9/1/1999	262.58	Vashon
LC-137a	12/1/1999	265.39	Vashon
LC-137a	3/1/2000	266.09	Vashon
LC-137a	6/1/2000	264.46	Vashon
LC-137a	9/1/2000	263.03	Vashon
LC-137a	12/1/2000	263.22	Vashon
LC-137a	3/1/2001	263.20	Vashon
LC-137a	6/1/2001	263.48	Vashon
LC-137a	9/1/2001	261.94	Vashon
LC-137b	12/1/1998	268.32	Vashon
LC-137b	3/1/1999	264.61	Vashon
LC-137b	6/1/1999	263.71	Vashon
LC-137b	9/1/1999	261.91	Vashon
LC-137b	12/1/1999	265.21	Vashon
LC-137b	3/1/2000	265.92	Vashon
LC-137b	6/1/2000	264.31	Vashon
LC-137b	9/1/2000	262.81	Vashon
LC-137b	12/1/2000	262.96	Vashon
LC-137b	3/1/2001	262.95	Vashon
LC-137b	6/1/2001	263.27	Vashon
LC-137b	9/1/2001	261.74	Vashon
LC-137b	12/1/2001	266.20	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-137b	4/1/2002	266.04	Vashon
LC-137b	6/1/2002	264.71	Vashon
LC-137b	9/1/2002	263.24	Vashon
LC-137b	2/3/2003	264.76	Vashon
LC-137b	3/3/2003	264.43	Vashon
LC-137b	7/1/2003	265.36	Vashon
LC-137b	10/4/2004	262.37	Vashon
LC-137b	4/1/2005	267.54	Vashon
LC-137b	7/21/2005	265.89	Vashon
LC-137b	8/29/2005	265.47	Vashon
LC-137b	3/20/2006	268.17	Vashon
LC-137b	9/20/2006	265.65	Vashon
LC-137b	3/20/2007	268.67	Vashon
LC-137b	3/25/2008	265.65	Vashon
LC-137b	10/8/2008	263.08	Vashon
LC-137b	2/3/2009	265.61	Vashon
LC-137b	8/3/2009	265.11	Vashon
LC-137b	2/11/2010	266.18	Vashon
LC-137b	8/9/2010	264.78	Vashon
LC-137b	2/14/2011	266.38	Vashon
LC-137b	8/10/2011	265.91	Vashon
LC-137b	2/22/2012	266.28	Vashon
LC-137b	7/31/2012	264.97	Vashon
LC-137b	2/6/2013	265.81	Vashon
LC-137b	8/8/2013	264.51	Vashon
LC-137b	2/14/2014	266.06	Vashon
LC-137b	9/8/2014	265.15	Vashon
LC-137b	2/18/2015	266.54	Vashon
LC-137b	9/9/2015	263.83	Vashon
LC-137b	2/16/2016	268.27	Vashon
LC-137b	8/15/2016	264.99	Vashon
LC-137b	2/13/2017	267.48	Vashon
LC-137b	8/7/2017	265.60	Vashon
LC-137b	3/28/2018	266.73	Vashon
LC-137b	9/12/2018	264.92	Vashon
LC-137b	3/11/2019	266.01	Vashon
LC-137b	9/5/2019	263.91	Vashon
LC-137b	3/10/2020	266.08	Vashon
LC-137b	9/1/2020	263.11	Vashon
LC-137b	3/6/2021	266.69	Vashon
LC-137b	9/1/2021	264.50	Vashon
LC-137c	12/1/1998	267.55	Vashon
LC-137c	3/1/1999	265.28	Vashon
LC-137c	6/1/1999	263.48	Vashon
LC-137c	9/1/1999	261.75	Vashon
LC-137c	12/1/1999	264.80	Vashon
LC-137c	3/1/2000	265.45	Vashon
LC-137c	6/1/2000	264.00	Vashon
LC-137c	9/1/2000	262.65	Vashon
LC-137c	12/1/2000	262.57	Vashon
LC-137c	3/1/2001	262.65	Vashon
LC-137c	6/1/2001	262.94	Vashon
LC-137c	9/1/2001	261.79	Vashon
LC-137c	12/1/2001	265.70	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-137c	4/1/2002	265.87	Vashon
LC-137c	6/1/2002	264.80	Vashon
LC-137c	9/1/2002	263.03	Vashon
LC-137c	2/3/2003	265.10	Vashon
LC-137c	3/3/2003	264.30	Vashon
LC-137c	7/1/2003	265.78	Vashon
LC-137c	10/4/2004	262.37	Vashon
LC-137c	4/1/2005	267.10	Vashon
LC-137c	7/21/2005	266.90	Vashon
LC-137c	8/29/2005	266.33	Vashon
LC-137c	3/20/2006	269.53	Vashon
LC-137c	9/20/2006	266.65	Vashon
LC-137c	3/20/2007	269.85	Vashon
LC-137c	3/25/2008	266.53	Vashon
LC-137c	10/8/2008	263.55	Vashon
LC-137c	2/3/2009	266.45	Vashon
LC-137c	8/3/2009	265.62	Vashon
LC-137c	3/10/2021	268.01	Vashon
LC-139	10/7/1996	268.09	Vashon
LC-139	1/24/1997	272.21	Vashon
LC-139	4/23/1997	271.62	Vashon
LC-139	7/16/1997	268.83	Vashon
LC-139	10/16/1997	268.60	Vashon
LC-139	1/30/1998	270.86	Vashon
LC-139	4/2/1998	270.34	Vashon
LC-139	7/7/1998	268.72	Vashon
LC-139	9/22/1998	267.25	Vashon
LC-139	12/1/1998	272.40	Vashon
LC-139	3/1/1999	270.95	Vashon
LC-139	6/1/1999	268.84	Vashon
LC-139	9/1/1999	266.90	Vashon
LC-139	12/1/1999	269.76	Vashon
LC-139	3/1/2000	270.46	Vashon
LC-139	6/1/2000	269.02	Vashon
LC-139	9/1/2000	267.27	Vashon
LC-139	12/1/2000	266.76	Vashon
LC-139	3/1/2001	267.07	Vashon
LC-139	6/1/2001	267.68	Vashon
LC-139	9/1/2001	266.21	Vashon
LC-139	12/1/2001	268.57	Vashon
LC-139	4/1/2002	271.02	Vashon
LC-139	6/1/2002	267.77	Vashon
LC-139	9/1/2002	267.08	Vashon
LC-139	2/3/2003	269.86	Vashon
LC-139	3/3/2003	268.99	Vashon
LC-139	7/1/2003	268.49	Vashon
LC-139	10/4/2004	266.03	Vashon
LC-140	12/1/1998	267.79	Vashon
LC-140	3/1/1999	264.73	Vashon
LC-140	6/1/1999	262.58	Vashon
LC-140	9/1/1999	261.01	Vashon
LC-140	12/1/1999	264.81	Vashon
LC-140	3/1/2000	265.36	Vashon
LC-140	6/1/2000	263.15	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-140	9/1/2000	261.98	Vashon
LC-140	12/1/2000	262.21	Vashon
LC-140	3/1/2001	262.30	Vashon
LC-140	6/1/2001	261.66	Vashon
LC-140	9/1/2001	260.04	Vashon
LC-140	12/1/2001	265.39	Vashon
LC-140	4/1/2002	264.69	Vashon
LC-140	6/1/2002	264.79	Vashon
LC-140	9/1/2002	262.39	Vashon
LC-140	2/3/2003	265.50	Vashon
LC-140	3/3/2003	263.01	Vashon
LC-140	7/1/2003	262.54	Vashon
LC-140	10/4/2004	260.68	Vashon
LC-141	1/24/1997	265.66	Vashon
LC-141	4/23/1997	264.35	Vashon
LC-141	7/16/1997	260.08	Vashon
LC-141	10/16/1997	260.68	Vashon
LC-141	1/30/1998	264.49	Vashon
LC-141	4/2/1998	263.10	Vashon
LC-141	7/7/1998	260.84	Vashon
LC-141	9/22/1998	261.60	Vashon
LC-141	12/1/1998	267.99	Vashon
LC-141	3/1/1999	265.42	Vashon
LC-141	6/1/1999	263.17	Vashon
LC-141	9/1/1999	261.24	Vashon
LC-141	12/1/1999	264.89	Vashon
LC-141	3/1/2000	265.66	Vashon
LC-141	6/1/2000	263.17	Vashon
LC-141	9/1/2000	261.82	Vashon
LC-141	12/1/2000	262.08	Vashon
LC-141	3/1/2001	262.19	Vashon
LC-141	6/1/2001	260.73	Vashon
LC-141	9/1/2001	258.23	Vashon
LC-141	12/1/2001	262.66	Vashon
LC-141	4/1/2002	263.80	Vashon
LC-141	6/1/2002	262.11	Vashon
LC-141	9/1/2002	260.66	Vashon
LC-141	2/3/2003	263.10	Vashon
LC-141	3/3/2003	261.97	Vashon
LC-141	7/1/2003	262.42	Vashon
LC-141	10/4/2004	259.42	Vashon
LC-142	12/1/1998	268.00	Vashon
LC-142	3/1/1999	265.51	Vashon
LC-142	6/1/1999	263.14	Vashon
LC-142	9/1/1999	261.02	Vashon
LC-142	12/1/1999	264.78	Vashon
LC-142	3/1/2000	265.46	Vashon
LC-142	6/1/2000	263.00	Vashon
LC-142	9/1/2000	261.34	Vashon
LC-142	12/1/2000	261.58	Vashon
LC-142	3/1/2001	261.79	Vashon
LC-142	6/1/2001	261.16	Vashon
LC-142	9/1/2001	259.20	Vashon
LC-142	12/1/2001	264.77	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-142	4/1/2002	264.79	Vashon
LC-142	6/1/2002	264.75	Vashon
LC-142	9/1/2002	262.32	Vashon
LC-142	2/3/2003	264.03	Vashon
LC-142	3/3/2003	262.90	Vashon
LC-142	7/1/2003	262.11	Vashon
LC-142	10/4/2004	260.01	Vashon
LC-143	1/24/1997	267.03	Vashon
LC-143	4/23/1997	265.58	Vashon
LC-143	7/16/1997	261.55	Vashon
LC-143	10/16/1997	262.03	Vashon
LC-143	1/30/1998	265.33	Vashon
LC-143	4/2/1998	263.99	Vashon
LC-143	7/7/1998	261.71	Vashon
LC-143	9/22/1998	261.51	Vashon
LC-143	12/1/1998	267.92	Vashon
LC-143	3/1/1999	265.45	Vashon
LC-143	6/1/1999	263.19	Vashon
LC-143	9/1/1999	261.31	Vashon
LC-143	12/1/1999	264.84	Vashon
LC-143	3/1/2000	265.51	Vashon
LC-143	6/1/2000	263.11	Vashon
LC-143	9/1/2000	261.62	Vashon
LC-143	12/1/2000	262.01	Vashon
LC-143	3/1/2001	262.13	Vashon
LC-143	6/1/2001	261.51	Vashon
LC-143	9/1/2001	259.42	Vashon
LC-143	12/1/2001	264.92	Vashon
LC-143	4/1/2002	264.64	Vashon
LC-143	6/1/2002	264.41	Vashon
LC-143	9/1/2002	262.62	Vashon
LC-143	2/3/2003	263.98	Vashon
LC-143	3/3/2003	262.92	Vashon
LC-143	7/1/2003	262.24	Vashon
LC-143	10/4/2004	260.24	Vashon
LC-144a	4/23/1997	266.54	Vashon
LC-144a	7/16/1997	262.39	Vashon
LC-144a	10/16/1997	262.54	Vashon
LC-144a	4/2/1998	264.29	Vashon
LC-144a	7/7/1998	262.37	Vashon
LC-144a	9/22/1998	262.39	Vashon
LC-144a	12/1/1998	268.04	Vashon
LC-144a	3/1/1999	265.60	Vashon
LC-144a	6/1/1999	263.59	Vashon
LC-144a	9/1/1999	262.15	Vashon
LC-144a	12/1/1999	265.14	Vashon
LC-144a	3/1/2000	265.68	Vashon
LC-144a	6/1/2000	263.70	Vashon
LC-144a	9/1/2000	262.52	Vashon
LC-144a	12/1/2000	262.74	Vashon
LC-144a	3/1/2001	262.76	Vashon
LC-144a	6/1/2001	262.14	Vashon
LC-144a	9/1/2001	260.68	Vashon
LC-144a	12/1/2001	265.95	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-144a	4/1/2002	264.84	Vashon
LC-144a	6/1/2002	264.82	Vashon
LC-144a	9/1/2002	262.49	Vashon
LC-144a	2/3/2003	264.38	Vashon
LC-144a	3/3/2003	263.30	Vashon
LC-144a	7/1/2003	263.30	Vashon
LC-144a	10/4/2004	261.35	Vashon
LC-144b	12/1/1998	268.02	Vashon
LC-145	10/7/1996	270.11	Vashon
LC-145	1/24/1997	273.24	Vashon
LC-145	4/23/1997	272.71	Vashon
LC-145	7/16/1997	270.48	Vashon
LC-145	10/16/1997	270.29	Vashon
LC-145	1/30/1998	272.01	Vashon
LC-145	4/2/1998	271.65	Vashon
LC-145	7/7/1998	270.32	Vashon
LC-145	9/22/1998	269.23	Vashon
LC-145	12/1/1998	273.07	Vashon
LC-145	3/1/1999	271.92	Vashon
LC-145	6/1/1999	270.17	Vashon
LC-145	9/1/1999	268.77	Vashon
LC-145	12/1/1999	270.89	Vashon
LC-145	3/1/2000	271.44	Vashon
LC-145	6/1/2000	270.31	Vashon
LC-145	9/1/2000	269.21	Vashon
LC-145	12/1/2000	268.87	Vashon
LC-145	3/1/2001	268.99	Vashon
LC-145	6/1/2001	269.51	Vashon
LC-145	9/1/2001	268.79	Vashon
LC-145	12/1/2001	272.82	Vashon
LC-145	4/1/2002	271.93	Vashon
LC-145	6/1/2002	272.12	Vashon
LC-145	9/1/2002	270.39	Vashon
LC-145	2/3/2003	271.09	Vashon
LC-145	3/3/2003	270.48	Vashon
LC-145	7/1/2003	269.59	Vashon
LC-146	10/7/1996	271.03	Vashon
LC-146	1/24/1997	273.97	Vashon
LC-146	4/23/1997	273.45	Vashon
LC-146	7/16/1997	271.26	Vashon
LC-146	10/16/1997	271.11	Vashon
LC-146	1/30/1998	272.59	Vashon
LC-146	4/2/1998	272.26	Vashon
LC-146	7/7/1998	271.10	Vashon
LC-146	9/22/1998	270.13	Vashon
LC-146	12/1/1998	273.65	Vashon
LC-146	3/1/1999	272.71	Vashon
LC-146	6/1/1999	270.96	Vashon
LC-146	9/1/1999	269.81	Vashon
LC-146	12/1/1999	271.52	Vashon
LC-146	3/1/2000	272.06	Vashon
LC-146	6/1/2000	271.05	Vashon
LC-146	9/1/2000	270.15	Vashon
LC-146	12/1/2000	269.81	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-147	10/7/1996	271.03	Vashon
LC-147	1/24/1997	274.32	Vashon
LC-147	4/23/1997	273.79	Vashon
LC-147	7/16/1997	271.35	Vashon
LC-147	10/16/1997	271.19	Vashon
LC-147	1/30/1998	272.74	Vashon
LC-147	4/2/1998	272.43	Vashon
LC-147	7/7/1998	271.17	Vashon
LC-147	9/22/1998	270.03	Vashon
LC-147	12/1/1998	273.95	Vashon
LC-147	3/1/1999	273.08	Vashon
LC-147	6/1/1999	271.14	Vashon
LC-147	9/1/1999	269.79	Vashon
LC-147	12/1/1999	271.60	Vashon
LC-147	3/1/2000	272.24	Vashon
LC-147	6/1/2000	271.12	Vashon
LC-147	9/1/2000	269.99	Vashon
LC-147	12/1/2000	269.63	Vashon
LC-147	3/1/2001	269.77	Vashon
LC-147	6/1/2001	270.39	Vashon
LC-147	9/1/2001	269.66	Vashon
LC-147	12/1/2001	271.60	Vashon
LC-147	4/1/2002	272.82	Vashon
LC-147	6/1/2002	271.22	Vashon
LC-147	9/1/2002	269.40	Vashon
LC-147	2/3/2003	271.75	Vashon
LC-147	3/3/2003	271.23	Vashon
LC-147	7/1/2003	270.51	Vashon
LC-147	10/4/2004	268.52	Vashon
LC-149a	1/24/1997	276.26	Vashon
LC-149a	4/23/1997	276.09	Vashon
LC-149a	7/16/1997	272.45	Vashon
LC-149a	10/16/1997	272.27	Vashon
LC-149a	1/30/1998	274.14	Vashon
LC-149a	4/2/1998	273.70	Vashon
LC-149a	7/7/1998	272.34	Vashon
LC-149a	9/22/1998	271.49	Vashon
LC-149a	12/1/1998	275.47	Vashon
LC-149a	3/1/1999	275.49	Vashon
LC-149a	6/1/1999	272.38	Vashon
LC-149a	9/1/1999	271.09	Vashon
LC-149a	12/1/1999	272.83	Vashon
LC-149a	3/1/2000	273.55	Vashon
LC-149a	6/1/2000	272.63	Vashon
LC-149a	9/1/2000	271.57	Vashon
LC-149a	12/1/2000	270.99	Vashon
LC-149a	3/1/2001	271.26	Vashon
LC-149a	6/1/2001	271.59	Vashon
LC-149a	9/1/2001	270.77	Vashon
LC-149c	4/23/1997	277.14	Vashon
LC-149c	7/16/1997	272.48	Vashon
LC-149c	1/30/1998	274.13	Vashon
LC-149c	4/2/1998	273.75	Vashon
LC-149c	7/7/1998	272.37	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-149c	9/22/1998	271.52	Vashon
LC-149c	12/1/1998	275.49	Vashon
LC-149c	3/1/1999	274.48	Vashon
LC-149c	6/1/1999	272.45	Vashon
LC-149c	9/1/1999	271.67	Vashon
LC-149c	12/1/1999	272.81	Vashon
LC-149c	3/1/2000	273.54	Vashon
LC-149c	6/1/2000	272.62	Vashon
LC-149c	9/1/2000	271.59	Vashon
LC-149c	12/1/2000	271.00	Vashon
LC-149c	3/1/2001	271.26	Vashon
LC-149c	6/1/2001	271.59	Vashon
LC-149c	9/1/2001	270.78	Vashon
LC-149c	12/1/2001	275.47	Vashon
LC-149c	4/1/2002	274.27	Vashon
LC-149c	6/1/2002	273.98	Vashon
LC-149c	9/1/2002	272.04	Vashon
LC-149c	2/3/2003	274.26	Vashon
LC-149c	3/3/2003	272.31	Vashon
LC-149c	7/1/2003	272.30	Vashon
LC-149c	10/4/2004	270.70	Vashon
LC-149d	7/7/1998	272.57	Vashon
LC-149d	12/1/1998	275.61	Vashon
LC-149d	3/1/1999	275.36	Vashon
LC-149d	6/1/1999	272.40	Vashon
LC-149d	9/1/1999	270.89	Vashon
LC-149d	12/1/1999	272.89	Vashon
LC-149d	3/1/2000	273.77	Vashon
LC-149d	6/1/2000	272.85	Vashon
LC-149d	9/1/2000	271.68	Vashon
LC-149d	12/1/2000	271.02	Vashon
LC-149d	3/1/2001	271.26	Vashon
LC-149d	6/1/2001	271.66	Vashon
LC-149d	9/1/2001	270.79	Vashon
LC-14a	4/23/1997	255.54	Vashon
LC-14a	7/16/1997	250.33	Vashon
LC-14a	10/16/1997	250.23	Vashon
LC-14a	1/30/1998	253.70	Vashon
LC-14a	4/2/1998	252.31	Vashon
LC-14a	7/7/1998	249.90	Vashon
LC-14a	9/22/1998	247.97	Vashon
LC-14a	12/1/1998	255.85	Vashon
LC-14a	3/1/1999	253.80	Vashon
LC-14a	6/1/1999	252.14	Vashon
LC-14a	9/1/1999	248.27	Vashon
LC-14a	12/1/1999	253.42	Vashon
LC-14a	3/1/2000	253.96	Vashon
LC-14a	6/1/2000	251.75	Vashon
LC-14a	9/1/2000	248.42	Vashon
LC-14a	12/1/2000	248.38	Vashon
LC-14a	3/1/2001	248.88	Vashon
LC-14a	6/1/2001	249.06	Vashon
LC-14a	9/1/2001	246.33	Vashon
LC-14a	12/1/2001	250.40	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-14a	4/1/2002	253.47	Vashon
LC-14a	6/1/2002	249.99	Vashon
LC-14a	2/3/2003	252.55	Vashon
LC-14a	3/3/2003	252.06	Vashon
LC-14a	7/1/2003	249.96	Vashon
LC-14a	10/4/2004	248.03	Vashon
LC-14a	4/14/2005	250.44	Vashon
LC-14a	7/21/2005	249.37	Vashon
LC-14a	9/6/2005	247.77	Vashon
LC-14a	3/20/2006	253.22	Vashon
LC-14a	9/25/2006	248.64	Vashon
LC-14a	3/22/2007	253.89	Vashon
LC-14a	9/28/2007	249.44	Vashon
LC-14a	10/8/2008	247.48	Vashon
LC-14a	2/5/2009	252.55	Vashon
LC-14a	8/5/2009	250.10	Vashon
LC-14a	2/9/2010	253.27	Vashon
LC-14a	8/12/2010	251.07	Vashon
LC-14a	2/17/2011	253.20	Vashon
LC-14a	8/9/2011	251.07	Vashon
LC-14a	3/1/2012	252.42	Vashon
LC-14a	8/1/2012	251.22	Vashon
LC-14a	2/7/2013	252.13	Vashon
LC-14a	8/8/2013	249.87	Vashon
LC- 14a	2/19/2014	252.67	Vashon
LC- 14a	9/11/2014	250.38	Vashon
LC- 14a	2/23/2015	252.90	Vashon
LC- 14a	9/10/2015	248.74	Vashon
LC- 14a	2/19/2016	255.32	Vashon
LC- 14a	8/17/2016	250.36	Vashon
LC- 14a	2/13/2017	253.59	Vashon
LC- 14a	4/5/2018	252.22	Vashon
LC- 14a	3/13/2019	252.40	Vashon
LC- 14a	3/12/2020	252.66	Vashon
LC-150	10/7/1996	261.90	Vashon
LC-150	1/24/1997	265.93	Vashon
LC-150	4/23/1997	265.09	Vashon
LC-150	7/16/1997	261.89	Vashon
LC-150	10/16/1997	261.53	Vashon
LC-150	1/30/1998	265.73	Vashon
LC-150	4/2/1998	263.62	Vashon
LC-150	7/7/1998	261.33	Vashon
LC-150	9/22/1998	259.56	Vashon
LC-150	12/1/1998	265.33	Vashon
LC-150	3/1/1999	263.21	Vashon
LC-150	6/1/1999	261.39	Vashon
LC-150	9/1/1999	258.70	Vashon
LC-150	12/1/1999	261.87	Vashon
LC-150	3/1/2000	261.93	Vashon
LC-150	6/1/2000	252.81	Vashon
LC-150	9/1/2000	258.71	Vashon
LC-150	12/1/2000	258.72	Vashon
LC-150	3/1/2001	258.60	Vashon
LC-150	6/1/2001	259.67	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-150	9/1/2001	258.28	Vashon
LC-150	12/1/2001	262.10	Vashon
LC-150	4/1/2002	269.59	Vashon
LC-150	6/1/2002	261.07	Vashon
LC-150	9/1/2002	259.67	Vashon
LC-150	2/3/2003	262.65	Vashon
LC-150	3/3/2003	262.95	Vashon
LC-150	7/1/2003	262.13	Vashon
LC-150	10/4/2004	262.09	Vashon
LC-151	10/7/1996	260.71	Vashon
LC-151	1/24/1997	266.24	Vashon
LC-151	4/23/1997	265.94	Vashon
LC-151	7/16/1997	261.40	Vashon
LC-151	10/16/1997	261.61	Vashon
LC-151	1/30/1998	264.66	Vashon
LC-151	4/2/1998	263.40	Vashon
LC-151	7/7/1998	261.36	Vashon
LC-151	9/22/1998	262.18	Vashon
LC-151	12/1/1998	267.99	Vashon
LC-151	3/1/1999	265.32	Vashon
LC-151	6/1/1999	263.29	Vashon
LC-151	9/1/1999	261.69	Vashon
LC-151	12/1/1999	265.03	Vashon
LC-151	3/1/2000	265.61	Vashon
LC-151	6/1/2000	263.52	Vashon
LC-151	9/1/2000	262.35	Vashon
LC-151	12/1/2000	262.54	Vashon
LC-151	3/1/2001	262.60	Vashon
LC-151	6/1/2001	261.16	Vashon
LC-151	9/1/2001	260.16	Vashon
LC-151	12/1/2001	264.16	Vashon
LC-151	4/1/2002	264.02	Vashon
LC-151	6/1/2002	263.34	Vashon
LC-151	9/1/2002	260.30	Vashon
LC-151	2/3/2003	263.51	Vashon
LC-151	3/3/2003	262.39	Vashon
LC-151	7/1/2003	262.98	Vashon
LC-151	10/4/2004	260.24	Vashon
LC-152	10/7/1996	260.75	Vashon
LC-152	1/24/1997	266.82	Vashon
LC-152	4/23/1997	265.58	Vashon
LC-152	7/16/1997	261.49	Vashon
LC-152	10/16/1997	261.83	Vashon
LC-152	1/30/1998	265.20	Vashon
LC-152	4/2/1998	263.89	Vashon
LC-152	7/7/1998	261.69	Vashon
LC-152	9/22/1998	261.74	Vashon
LC-152	12/1/1998	267.91	Vashon
LC-152	3/1/1999	265.10	Vashon
LC-152	6/1/1999	262.92	Vashon
LC-152	9/1/1999	261.14	Vashon
LC-152	12/1/1999	264.91	Vashon
LC-152	3/1/2000	265.59	Vashon
LC-152	6/1/2000	263.23	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-152	9/1/2000	261.92	Vashon
LC-152	12/1/2000	262.11	Vashon
LC-152	3/1/2001	262.22	Vashon
LC-152	6/1/2001	261.35	Vashon
LC-152	9/1/2001	259.46	Vashon
LC-152	12/1/2001	264.40	Vashon
LC-152	4/1/2002	264.50	Vashon
LC-152	6/1/2002	263.26	Vashon
LC-152	9/1/2002	260.44	Vashon
LC-152	2/3/2003	263.93	Vashon
LC-152	3/3/2003	262.80	Vashon
LC-152	7/1/2003	262.51	Vashon
LC-152	10/4/2004	260.38	Vashon
LC-153	10/7/1996	261.89	Vashon
LC-153	1/24/1997	265.86	Vashon
LC-153	4/23/1997	265.02	Vashon
LC-153	7/16/1997	261.84	Vashon
LC-153	10/16/1997	261.43	Vashon
LC-153	1/30/1998	265.76	Vashon
LC-153	4/2/1998	263.53	Vashon
LC-153	7/7/1998	261.22	Vashon
LC-153	9/22/1998	259.41	Vashon
LC-153	12/1/1998	265.15	Vashon
LC-153	3/1/1999	263.29	Vashon
LC-153	6/1/1999	261.56	Vashon
LC-153	9/1/1999	258.67	Vashon
LC-153	12/1/1999	261.58	Vashon
LC-153	3/1/2000	261.77	Vashon
LC-153	6/1/2000	260.58	Vashon
LC-153	9/1/2000	258.60	Vashon
LC-153	12/1/2000	258.50	Vashon
LC-153	3/1/2001	258.32	Vashon
LC-153	6/1/2001	259.45	Vashon
LC-153	9/1/2001	258.01	Vashon
LC-153	12/1/2001	262.77	Vashon
LC-153	4/1/2002	269.68	Vashon
LC-153	6/1/2002	261.87	Vashon
LC-153	9/1/2002	259.51	Vashon
LC-153	2/3/2003	263.27	Vashon
LC-153	3/3/2003	263.97	Vashon
LC-153	7/1/2003	262.84	Vashon
LC-153	10/4/2004	262.50	Vashon
LC-154	10/16/1997	262.02	Vashon
LC-154	1/30/1998	265.34	Vashon
LC-154	4/2/1998	264.05	Vashon
LC-154	7/7/1998	261.74	Vashon
LC-154	9/22/1998	261.93	Vashon
LC-154	12/1/1998	267.94	Vashon
LC-154	3/1/1999	265.04	Vashon
LC-154	6/1/1999	262.94	Vashon
LC-154	9/1/1999	261.28	Vashon
LC-154	12/1/1999	264.91	Vashon
LC-154	3/1/2000	265.48	Vashon
LC-154	6/1/2000	263.29	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-154	9/1/2000	262.05	Vashon
LC-154	12/1/2000	262.24	Vashon
LC-154	3/1/2001	262.33	Vashon
LC-154	6/1/2001	261.45	Vashon
LC-154	9/1/2001	257.94	Vashon
LC-154	12/1/2001	263.44	Vashon
LC-154	4/1/2002	264.70	Vashon
LC-154	6/1/2002	262.63	Vashon
LC-154	9/1/2002	261.31	Vashon
LC-154	2/3/2003	264.14	Vashon
LC-154	3/3/2003	262.97	Vashon
LC-154	7/1/2003	262.73	Vashon
LC-154	10/4/2004	260.32	Vashon
LC-155	10/7/1996	259.09	Vashon
LC-155	1/24/1997	264.45	Vashon
LC-155	4/23/1997	264.19	Vashon
LC-155	7/16/1997	261.82	Vashon
LC-155	10/16/1997	262.03	Vashon
LC-155	1/30/1998	264.80	Vashon
LC-155	4/2/1998	264.98	Vashon
LC-155	7/7/1998	263.11	Vashon
LC-155	9/22/1998	261.91	Vashon
LC-155	12/1/1998	267.33	Vashon
LC-155	3/1/1999	265.65	Vashon
LC-155	6/1/1999	263.49	Vashon
LC-155	9/1/1999	261.60	Vashon
LC-155	12/1/1999	264.89	Vashon
LC-155	3/1/2000	265.49	Vashon
LC-155	6/1/2000	264.40	Vashon
LC-155	9/1/2000	262.66	Vashon
LC-155	12/1/2000	262.26	Vashon
LC-155	3/1/2001	262.41	Vashon
LC-155	6/1/2001	263.09	Vashon
LC-155	9/1/2001	261.42	Vashon
LC-155	12/1/2001	264.96	Vashon
LC-155	4/1/2002	267.52	Vashon
LC-155	6/1/2002	264.26	Vashon
LC-155	9/1/2002	263.32	Vashon
LC-155	2/3/2003	265.67	Vashon
LC-155	3/3/2003	264.76	Vashon
LC-155	7/1/2003	265.60	Vashon
LC-155	10/4/2004	262.44	Vashon
LC-156	10/7/1996	265.55	Vashon
LC-156	1/24/1997	270.92	Vashon
LC-156	4/23/1997	269.36	Vashon
LC-156	7/16/1997	266.58	Vashon
LC-156	10/16/1997	266.49	Vashon
LC-156	1/30/1998	268.68	Vashon
LC-156	4/2/1998	268.28	Vashon
LC-156	7/7/1998	266.59	Vashon
LC-156	9/22/1998	264.52	Vashon
LC-156	12/1/1998	270.22	Vashon
LC-156	3/1/1999	269.13	Vashon
LC-156	6/1/1999	267.39	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-156	9/1/1999	265.21	Vashon
LC-156	12/1/1999	268.22	Vashon
LC-156	3/1/2000	268.88	Vashon
LC-156	6/1/2000	267.52	Vashon
LC-156	9/1/2000	265.23	Vashon
LC-156	12/1/2000	264.52	Vashon
LC-156	3/1/2001	264.81	Vashon
LC-156	6/1/2001	265.75	Vashon
LC-156	9/1/2001	263.13	Vashon
LC-156	12/1/2001	266.08	Vashon
LC-156	4/1/2002	269.36	Vashon
LC-156	6/1/2002	265.29	Vashon
LC-156	9/1/2002	264.29	Vashon
LC-156	2/3/2003	267.22	Vashon
LC-156	3/3/2003	267.30	Vashon
LC-156	7/1/2003	267.40	Vashon
LC-156	10/4/2004	264.14	Vashon
LC-157	1/24/1997	266.90	Vashon
LC-157	4/23/1997	265.87	Vashon
LC-157	7/16/1997	261.56	Vashon
LC-157	10/16/1997	261.79	Vashon
LC-157	1/30/1998	265.24	Vashon
LC-157	4/2/1998	263.93	Vashon
LC-157	7/7/1998	261.58	Vashon
LC-157	9/22/1998	261.75	Vashon
LC-157	12/1/1998	268.02	Vashon
LC-157	3/1/1999	265.36	Vashon
LC-157	6/1/1999	263.16	Vashon
LC-157	9/1/1999	261.35	Vashon
LC-157	12/1/1999	264.95	Vashon
LC-157	3/1/2000	265.54	Vashon
LC-157	6/1/2000	263.25	Vashon
LC-157	9/1/2000	261.83	Vashon
LC-157	12/1/2000	262.04	Vashon
LC-157	3/1/2001	262.21	Vashon
LC-157	6/1/2001	261.26	Vashon
LC-157	9/1/2001	274.85	Vashon
LC-157	12/1/2001	264.72	Vashon
LC-157	4/1/2002	264.56	Vashon
LC-157	6/1/2002	263.76	Vashon
LC-157	9/1/2002	261.18	Vashon
LC-157	2/3/2003	263.94	Vashon
LC-157	3/3/2003	262.78	Vashon
LC-157	7/1/2003	262.55	Vashon
LC-157	10/4/2004	260.27	Vashon
LC-158	10/7/1996	267.64	Vashon
LC-158	1/24/1997	271.78	Vashon
LC-158	4/23/1997	271.18	Vashon
LC-158	7/16/1997	268.55	Vashon
LC-158	10/16/1997	268.33	Vashon
LC-158	1/30/1998	270.56	Vashon
LC-158	4/2/1998	269.99	Vashon
LC-158	7/7/1998	268.45	Vashon
LC-158	9/22/1998	266.88	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-158	12/1/1998	272.04	Vashon
LC-158	3/1/1999	270.69	Vashon
LC-158	6/1/1999	268.68	Vashon
LC-158	9/1/1999	266.77	Vashon
LC-158	12/1/1999	269.58	Vashon
LC-158	3/1/2000	270.21	Vashon
LC-158	6/1/2000	268.83	Vashon
LC-158	9/1/2000	267.03	Vashon
LC-158	12/1/2000	266.44	Vashon
LC-158	3/1/2001	266.85	Vashon
LC-158	6/1/2001	267.53	Vashon
LC-158	9/1/2001	265.06	Vashon
LC-158	12/1/2001	267.46	Vashon
LC-158	4/1/2002	270.74	Vashon
LC-158	6/1/2002	267.36	Vashon
LC-158	9/1/2002	266.44	Vashon
LC-158	2/3/2003	269.71	Vashon
LC-158	3/3/2003	268.88	Vashon
LC-158	7/1/2003	268.41	Vashon
LC-158	10/4/2004	264.87	Vashon
LC-159	10/16/1997	263.00	Vashon
LC-159	1/30/1998	265.32	Vashon
LC-159	4/2/1998	264.67	Vashon
LC-159	7/7/1998	263.01	Vashon
LC-159	9/22/1998	261.77	Vashon
LC-159	12/1/1998	266.96	Vashon
LC-159	3/1/1999	264.67	Vashon
LC-159	6/1/1999	262.92	Vashon
LC-159	9/1/1999	261.12	Vashon
LC-159	12/1/1999	264.35	Vashon
LC-159	3/1/2000	263.91	Vashon
LC-159	6/1/2000	263.65	Vashon
LC-159	9/1/2000	262.77	Vashon
LC-159	12/1/2000	262.63	Vashon
LC-159	3/1/2001	261.67	Vashon
LC-159	6/1/2001	260.94	Vashon
LC-159	9/1/2001	260.96	Vashon
LC-159	12/1/2001	263.81	Vashon
LC-159	4/1/2002	264.95	Vashon
LC-159	6/1/2002	263.13	Vashon
LC-159	9/1/2002	262.02	Vashon
LC-159	2/3/2003	264.44	Vashon
LC-159	3/3/2003	263.46	Vashon
LC-159	7/1/2003	264.84	Vashon
LC-159	10/4/2004	261.21	Vashon
LC-16	12/1/2001	255.99	Vashon
LC-16	4/1/2002	255.67	Vashon
LC-16	6/1/2002	253.83	Vashon
LC-16	9/1/2002	251.35	Vashon
LC-16	2/3/2003	254.84	Vashon
LC-16	3/3/2003	253.27	Vashon
LC-16	7/1/2003	252.01	Vashon
LC-16	10/4/2004	249.92	Vashon
LC-16	3/17/2005	251.34	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-16	7/21/2005	251.59	Vashon
LC-16	10/26/2005	249.18	Vashon
LC-16	3/30/2006	255.40	Vashon
LC-16	9/25/2006	250.60	Vashon
LC-16	3/22/2007	256.45	Vashon
LC-16	10/5/2007	251.40	Vashon
LC-16	3/25/2008	254.19	Vashon
LC-16	10/8/2008	249.50	Vashon
LC-16	2/5/2009	254.88	Vashon
LC-16	8/5/2009	251.98	Vashon
LC-16	2/9/2010	255.35	Vashon
LC-16	8/10/2010	253.02	Vashon
LC-16	2/17/2011	255.48	Vashon
LC-16	8/9/2011	253.03	Vashon
LC-16	2/29/2012	254.90	Vashon
LC-16	8/1/2012	253.31	Vashon
LC-16	2/13/2013	255.86	Vashon
LC-16	8/7/2013	253.45	Vashon
LC-16	2/19/2014	256.48	Vashon
LC-16	9/5/2014	254.06	Vashon
LC-16	2/20/2015	256.92	Vashon
LC-16	9/9/2015	252.16	Vashon
LC-16	2/19/2016	258.90	Vashon
LC-16	8/17/2016	253.49	Vashon
LC-16	2/14/2017	257.39	Vashon
LC-16	3/27/2018	256.49	Vashon
LC-16	3/13/2019	256.18	Vashon
LC-16	3/11/2020	256.48	Vashon
LC-160	3/1/1999	266.06	Vashon
LC-160	6/1/1999	264.36	Vashon
LC-160	9/1/1999	262.67	Vashon
LC-160	12/1/1999	265.72	Vashon
LC-160	3/1/2000	265.43	Vashon
LC-160	6/1/2000	265.02	Vashon
LC-160	9/1/2000	263.64	Vashon
LC-160	12/1/2000	263.48	Vashon
LC-160	3/1/2001	263.34	Vashon
LC-160	6/1/2001	262.77	Vashon
LC-160	9/1/2001	262.64	Vashon
LC-160	12/1/2001	266.08	Vashon
LC-160	4/1/2002	266.61	Vashon
LC-160	6/1/2002	265.08	Vashon
LC-160	9/1/2002	262.78	Vashon
LC-160	2/3/2003	266.05	Vashon
LC-160	3/3/2003	265.08	Vashon
LC-160	7/1/2003	266.15	Vashon
LC-160	10/4/2004	263.21	Vashon
LC-160	9/25/2006	266.30	Vashon
LC-160	3/22/2007	270.14	Vashon
LC-160	10/19/2007	264.85	Vashon
LC-160	4/3/2008	266.52	Vashon
LC-160	10/8/2008	263.22	Vashon
LC-160	2/3/2009	266.27	Vashon
LC-160	8/3/2009	267.36	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-160	2/11/2010	266.94	Vashon
LC-160	8/10/2010	265.39	Vashon
LC-160	2/14/2011	267.24	Vashon
LC-160	8/10/2011	266.71	Vashon
LC-160	2/22/2012	266.89	Vashon
LC-160	7/31/2012	265.72	Vashon
LC-160	2/7/2013	266.7	Vashon
LC-160	8/7/2013	265.19	Vashon
LC-160	2/18/2014	269.14	Vashon
LC-160	9/8/2014	266.42	Vashon
LC-160	2/18/2015	267.35	Vashon
LC-160	9/9/2015	264.14	Vashon
LC-160	2/16/2016	269.17	Vashon
LC-160	8/15/2016	266.00	Vashon
LC-160	2/10/2017	268.74	Vashon
LC-160	8/8/2017	266.93	Vashon
LC-160	3/27/2018	268.16	Vashon
LC-160	9/12/2018	265.93	Vashon
LC-160	3/11/2019	267.16	Vashon
LC-160	9/5/2019	264.65	Vashon
LC-160	3/10/2020	267.22	Vashon
LC-160	8/31/2020	265.12	Vashon
LC-160	3/10/2021	268.04	Vashon
LC-160	9/1/2021	265.72	Vashon
LC-161	10/7/1996	269.51	Vashon
LC-161	1/24/1997	274.87	Vashon
LC-161	4/23/1997	273.26	Vashon
LC-161	7/16/1997	270.07	Vashon
LC-161	10/16/1997	269.80	Vashon
LC-161	1/30/1998	272.26	Vashon
LC-161	4/2/1998	271.80	Vashon
LC-161	7/7/1998	269.94	Vashon
LC-161	9/22/1998	268.52	Vashon
LC-161	12/1/1998	273.82	Vashon
LC-161	3/1/1999	273.13	Vashon
LC-161	6/1/1999	269.74	Vashon
LC-161	9/1/1999	267.84	Vashon
LC-161	12/1/1999	271.03	Vashon
LC-161	3/1/2000	271.77	Vashon
LC-161	6/1/2000	270.20	Vashon
LC-161	9/1/2000	268.50	Vashon
LC-161	12/1/2000	267.97	Vashon
LC-162	10/7/1996	268.98	Vashon
LC-162	1/24/1997	273.28	Vashon
LC-162	4/23/1997	272.69	Vashon
LC-162	7/16/1997	269.66	Vashon
LC-162	10/16/1997	269.37	Vashon
LC-162	1/30/1998	271.79	Vashon
LC-162	4/2/1998	271.31	Vashon
LC-162	7/7/1998	269.53	Vashon
LC-162	9/22/1998	268.11	Vashon
LC-162	12/1/1998	273.33	Vashon
LC-162	3/1/1999	271.65	Vashon
LC-162	6/1/1999	269.40	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-162	9/1/1999	267.38	Vashon
LC-162	12/1/1999	270.63	Vashon
LC-162	3/1/2000	271.33	Vashon
LC-162	6/1/2000	269.81	Vashon
LC-162	9/1/2000	268.11	Vashon
LC-162	12/1/2000	267.60	Vashon
LC-163	10/7/1996	251.06	Vashon
LC-163	1/24/1997	258.58	Vashon
LC-163	4/23/1997	255.25	Vashon
LC-163	7/16/1997	252.88	Vashon
LC-163	10/16/1997	252.71	Vashon
LC-163	1/30/1998	256.73	Vashon
LC-163	4/2/1998	254.69	Vashon
LC-163	7/7/1998	252.78	Vashon
LC-163	9/22/1998	250.06	Vashon
LC-163	12/1/1998	259.61	Vashon
LC-163	3/1/1999	257.35	Vashon
LC-163	6/1/1999	256.18	Vashon
LC-163	9/1/1999	250.37	Vashon
LC-163	12/1/1999	256.69	Vashon
LC-163	3/1/2000	257.99	Vashon
LC-163	6/1/2000	255.40	Vashon
LC-163	9/1/2000	250.21	Vashon
LC-163	12/1/2000	249.94	Vashon
LC-163	3/1/2001	249.97	Vashon
LC-163	6/1/2001	250.81	Vashon
LC-163	9/1/2001	248.14	Vashon
LC-163	12/1/2001	257.16	Vashon
LC-163	4/1/2002	257.23	Vashon
LC-163	6/1/2002	255.74	Vashon
LC-163	9/1/2002	254.78	Vashon
LC-163	2/3/2003	256.26	Vashon
LC-163	3/3/2003	255.32	Vashon
LC-163	7/1/2003	252.57	Vashon
LC-163	10/4/2004	250.13	Vashon
LC-165	10/7/1996	247.74	Vashon
LC-165	1/24/1997	254.49	Vashon
LC-165	4/23/1997	252.69	Vashon
LC-165	7/16/1997	249.30	Vashon
LC-165	10/16/1997	249.16	Vashon
LC-165	1/30/1998	252.72	Vashon
LC-165	4/2/1998	251.89	Vashon
LC-165	7/7/1998	248.97	Vashon
LC-165	9/22/1998	246.61	Vashon
LC-165	12/1/1998	254.72	Vashon
LC-165	3/1/1999	252.57	Vashon
LC-165	6/1/1999	250.72	Vashon
LC-165	9/1/1999	246.82	Vashon
LC-165	12/1/1999	252.24	Vashon
LC-165	3/1/2000	252.69	Vashon
LC-165	6/1/2000	250.46	Vashon
LC-165	9/1/2000	246.67	Vashon
LC-165	12/1/2000	246.88	Vashon
LC-165	3/1/2001	247.56	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-165	6/1/2001	247.63	Vashon
LC-165	9/1/2001	245.20	Vashon
LC-165	12/1/2001	249.88	Vashon
LC-165	4/1/2002	252.28	Vashon
LC-165	6/1/2002	249.24	Vashon
LC-165	9/1/2002	248.28	Vashon
LC-165	2/3/2003	251.25	Vashon
LC-165	3/3/2003	250.90	Vashon
LC-165	7/1/2003	248.67	Vashon
LC-165	10/4/2004	248.84	Vashon
LC-167	10/7/1996	250.72	Vashon
LC-167	1/24/1997	257.10	Vashon
LC-167	4/23/1997	255.11	Vashon
LC-167	7/16/1997	252.18	Vashon
LC-167	10/16/1997	251.77	Vashon
LC-167	1/30/1998	255.33	Vashon
LC-167	4/2/1998	254.03	Vashon
LC-167	7/7/1998	251.53	Vashon
LC-167	9/22/1998	249.87	Vashon
LC-167	12/1/1998	257.41	Vashon
LC-167	3/1/1999	254.56	Vashon
LC-167	6/1/1999	252.66	Vashon
LC-167	9/1/1999	249.36	Vashon
LC-167	12/1/1999	254.83	Vashon
LC-167	3/1/2000	255.33	Vashon
LC-167	6/1/2000	253.06	Vashon
LC-167	9/1/2000	250.16	Vashon
LC-167	12/1/2000	250.18	Vashon
LC-167	3/1/2001	250.66	Vashon
LC-167	6/1/2001	250.72	Vashon
LC-167	9/1/2001	249.10	Vashon
LC-167	12/1/2001	254.29	Vashon
LC-167	4/1/2002	255.11	Vashon
LC-167	6/1/2002	253.32	Vashon
LC-167	9/1/2002	241.78	Vashon
LC-167	2/3/2003	254.11	Vashon
LC-167	3/3/2003	253.76	Vashon
LC-167	7/1/2003	251.71	Vashon
LC-167	10/4/2004	250.14	Vashon
LC-167	7/21/2005	251.39	Vashon
LC-167	9/26/2005	250.70	Vashon
LC-167	3/20/2006	254.12	Vashon
LC-167	9/25/2006	250.60	Vashon
LC-167	3/22/2007	255.54	Vashon
LC-167	9/28/2007	251.14	Vashon
LC-167	3/25/2008	253.57	Vashon
LC-167	10/8/2008	249.64	Vashon
LC-167	2/5/2009	254.21	Vashon
LC-167	8/5/2009	251.79	Vashon
LC-167	2/9/2010	254.99	Vashon
LC-167	8/12/2010	252.59	Vashon
LC-167	2/17/2011	254.87	Vashon
LC-167	8/9/2011	252.87	Vashon
LC-167	2/28/2012	254.29	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-167	8/1/2012	252.87	Vashon
LC-167	2/7/2013	252.65	Vashon
LC-167	8/8/2013	251.69	Vashon
LC-167	2/19/2014	254.39	Vashon
LC-167	9/11/2014	252.08	Vashon
LC-167	2/20/2015	254.81	Vashon
LC-167	9/9/2015	250.70	Vashon
LC-167	2/19/2016	256.65	Vashon
LC-167	8/17/2016	251.73	Vashon
LC-167	2/13/2017	255.21	Vashon
LC-167	4/6/2018	253.84	Vashon
LC-167	3/13/2019	254.09	Vashon
LC-167	3/11/2020	254.38	Vashon
LC-167	3/11/2021	255.16	Vashon
LC-168	1/24/1997	257.32	Vashon
LC-168	4/23/1997	255.29	Vashon
LC-168	7/16/1997	251.73	Vashon
LC-168	10/16/1997	251.57	Vashon
LC-168	1/30/1998	255.47	Vashon
LC-168	4/2/1998	255.29	Vashon
LC-168	7/7/1998	251.29	Vashon
LC-168	9/22/1998	249.10	Vashon
LC-168	12/1/1998	257.66	Vashon
LC-168	3/1/1999	255.57	Vashon
LC-168	6/1/1999	253.59	Vashon
LC-168	9/1/1999	249.52	Vashon
LC-168	12/1/1999	255.07	Vashon
LC-168	3/1/2000	255.53	Vashon
LC-168	6/1/2000	253.12	Vashon
LC-168	9/1/2000	249.55	Vashon
LC-168	12/1/2000	249.58	Vashon
LC-168	3/1/2001	250.24	Vashon
LC-168	6/1/2001	250.34	Vashon
LC-168	9/1/2001	248.72	Vashon
LC-168	12/1/2001	257.81	Vashon
LC-168	4/1/2002	255.34	Vashon
LC-168	6/1/2002	256.72	Vashon
LC-168	9/1/2002	253.22	Vashon
LC-168	2/3/2003	254.58	Vashon
LC-168	3/3/2003	253.91	Vashon
LC-168	7/1/2003	251.59	Vashon
LC-168	10/4/2004	249.44	Vashon
LC-168	4/14/2005	252.34	Vashon
LC-168	7/20/2005	251.13	Vashon
LC-168	3/17/2006	255.34	Vashon
LC-168	9/20/2006	250.45	Vashon
LC-168	3/20/2007	255.84	Vashon
LC-168	9/28/2007	250.94	Vashon
LC-168	3/25/2008	253.78	Vashon
LC-168	10/8/2008	249.03	Vashon
LC-168	2/5/2009	254.46	Vashon
LC-168	9/8/2009	251.68	Vashon
LC-168	2/10/2010	255.26	Vashon
LC-168	8/10/2010	252.65	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-168	2/16/2011	255.01	Vashon
LC-168	8/10/2011	252.89	Vashon
LC-168	2/28/2012	254.47	Vashon
LC-168	7/31/2012	252.98	Vashon
LC-168	2/5/2013	254.36	Vashon
LC-168	8/7/2013	251.56	Vashon
LC-168	2/18/2014	254.01	Vashon
LC-168	9/8/2014	252.12	Vashon
LC-168	2/18/2015	255.07	Vashon
LC-168	9/10/2015	250.25	Vashon
LC-169	3/3/2003	268.44	Vashon
LC-169	7/1/2003	268.13	Vashon
LC-169	10/4/2004	266.39	Vashon
LC-170	3/3/2003	268.13	Vashon
LC-170	7/1/2003	267.88	Vashon
LC-170	10/4/2004	267.28	Vashon
LC-170	4/6/2005	267.94	Vashon
LC-170	7/29/2005	267.27	Vashon
LC-170	3/17/2006	266.63	Vashon
LC-170	9/20/2006	264.09	Vashon
LC-170	3/21/2007	267.10	Vashon
LC-170	9/28/2007	264.47	Vashon
LC-170	3/25/2008	265.95	Vashon
LC-170	10/8/2008	263.94	Vashon
LC-170	2/3/2009	264.46	Vashon
LC-170	9/8/2009	264.32	Vashon
LC-170	2/11/2010	265.97	Vashon
LC-170	8/9/2010	265.51	Vashon
LC-170	2/16/2011	266.37	Vashon
LC-170	8/10/2011	265.42	Vashon
LC-170	2/22/2012	266.23	Vashon
LC-170	8/1/2012	265.44	Vashon
LC-170	2/6/2013	265.92	Vashon
LC-170	8/7/2013	264.97	Vashon
LC-170	2/14/2014	265.67	Vashon
LC-170	9/8/2014	261.53	Vashon
LC-170	2/18/2015	266.11	Vashon
LC-170	9/10/2015	264.48	Vashon
LC-170	2/22/2016	267.75	Vashon
LC-170	8/17/2016	265.08	Vashon
LC-170	2/15/2017	266.48	Vashon
LC-170	4/6/2018	265.97	Vashon
LC-170	3/11/2019	265.35	Vashon
LC-170	3/10/2020	265.62	Vashon
LC-170	3/9/2021	265.82	Vashon
LC-172	3/3/2003	268.35	Vashon
LC-172	7/1/2003	268.11	Vashon
LC-172	10/4/2004	267.62	Vashon
LC-173	3/3/2003	268.59	Vashon
LC-173	7/1/2003	268.28	Vashon
LC-173	10/4/2004	267.71	Vashon
LC-174	3/3/2003	270.03	Vashon
LC-174	7/1/2003	269.25	Vashon
LC-174	10/4/2004	268.21	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-175	3/3/2003	269.19	Vashon
LC-175	10/4/2004	267.23	Vashon
LC-176	3/3/2003	270.23	Vashon
LC-176	10/4/2004	267.23	Vashon
LC-177	3/3/2003	271.34	Vashon
LC-177	10/4/2004	269.45	Vashon
LC-177	4/1/2005	275.71	Vashon
LC-177	10/8/2008	269.35	Vashon
LC-177	2/3/2009	271.63	Vashon
LC-177	9/8/2009	270.49	Vashon
LC-177	2/11/2010	271.88	Vashon
LC-177	8/9/2010	270.93	Vashon
LC-177	2/14/2011	272.00	Vashon
LC-177	8/8/2011	271.31	Vashon
LC-177	2/22/2012	269.58	Vashon
LC-177	7/31/2012	270.97	Vashon
LC-177	2/7/2013	271.64	Vashon
LC-177	8/7/2013	270.63	Vashon
LC-177	2/14/2014	271.18	Vashon
LC-177	9/5/2014	270.86	Vashon
LC-177	2/18/2015	272.29	Vashon
LC-177	9/11/2015	270.02	Vashon
LC-177	2/22/2016	270.20	Vashon
LC-177	8/18/2016	270.62	Vashon
LC-177	2/15/2017	270.18	Vashon
LC-177	4/6/2018	272.12	Vashon
LC-177	3/11/2019	270.21	Vashon
LC-177	3/11/2020	271.81	Vashon
LC-177	3/10/2021	272.33	Vashon
LC-178	3/3/2003	267.09	Vashon
LC-178	7/1/2003	267.11	Vashon
LC-178	10/4/2004	265.25	Vashon
LC-178	4/6/2005	265.68	Vashon
LC-178	7/29/2005	265.33	Vashon
LC-178	3/14/2006	267.30	Vashon
LC-178	9/25/2006	265.60	Vashon
LC-178	3/21/2007	267.27	Vashon
LC-178	9/26/2007	265.70	Vashon
LC-178	3/25/2008	263.82	Vashon
LC-178	10/8/2008	265.82	Vashon
LC-178	2/6/2009	266.55	Vashon
LC-178	9/8/2009	266.06	Vashon
LC-178	2/11/2010	267.27	Vashon
LC-178	8/10/2010	267.50	Vashon
LC-178	2/16/2011	267.97	Vashon
LC-178	8/10/2011	267.82	Vashon
LC-178	2/23/2012	267.40	Vashon
LC-178	8/3/2012	267.24	Vashon
LC-178	2/6/2013	267.24	Vashon
LC-178	8/8/2013	266.82	Vashon
LC-178	2/13/2014	263.77	Vashon
LC-178	9/8/2014	267.27	Vashon
LC-178	2/19/2015	267.91	Vashon
LC-178	9/9/2015	266.75	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-178	2/16/2016	269.21	Vashon
LC-178	8/17/2016	267.39	Vashon
LC-178	2/10/2017	263.00	Vashon
LC-178	8/8/2017	267.59	Vashon
LC-178	3/29/2018	268.02	Vashon
LC-178	9/11/2018	266.97	Vashon
LC-178	3/7/2019	263.34	Vashon
LC-178	9/4/2019	266.17	Vashon
LC-178	3/10/2020	267.51	Vashon
LC-178	8/27/2020	267.47	Vashon
LC-178	3/8/2021	267.88	Vashon
LC-178	8/31/2021	266.55	Vashon
LC-18	12/1/1998	266.84	Vashon
LC-18	3/1/1999	264.84	Vashon
LC-18	6/1/1999	263.22	Vashon
LC-18	9/1/1999	261.84	Vashon
LC-18	12/1/1999	264.21	Vashon
LC-18	3/1/2000	264.75	Vashon
LC-18	6/1/2000	263.02	Vashon
LC-18	9/1/2000	261.77	Vashon
LC-18	12/1/2000	262.43	Vashon
LC-18	3/1/2001	262.15	Vashon
LC-18	6/1/2001	261.79	Vashon
LC-18	9/1/2001	260.61	Vashon
LC-18	12/1/2001	250.44	Vashon
LC-18	4/1/2002	264.44	Vashon
LC-18	6/1/2002	249.90	Vashon
LC-18	9/1/2002	260.88	Vashon
LC-18	2/3/2003	250.20	Vashon
LC-18	3/3/2003	263.19	Vashon
LC-18	7/1/2003	262.50	Vashon
LC-18	10/4/2004	261.35	Vashon
LC-18	4/6/2005	263.14	Vashon
LC-18	3/14/2006	264.68	Vashon
LC-18	3/20/2007	265.37	Vashon
LC-18	9/28/2007	262.59	Vashon
LC-18	3/25/2008	263.68	Vashon
LC-18	10/8/2008	261.69	Vashon
LC-18	2/5/2009	263.72	Vashon
LC-18	8/4/2009	262.34	Vashon
LC-18	2/10/2010	264.24	Vashon
LC-18	8/10/2010	263.04	Vashon
LC-18	2/16/2011	264.57	Vashon
LC-18	8/8/2011	263.42	Vashon
LC-18	2/23/2012	264.47	Vashon
LC-18	7/31/2012	263.24	Vashon
LC-18	2/7/2013	263.94	Vashon
LC-18	8/8/2013	262.72	Vashon
LC-18	2/18/2014	264.39	Vashon
LC-18	9/8/2014	262.97	Vashon
LC-18	2/18/2015	264.66	Vashon
LC-18	9/11/2015	262.44	Vashon
LC-18	2/17/2016	266.11	Vashon
LC-18	8/17/2016	262.99	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-18	2/14/2017	265.17	Vashon
LC-18	4/5/2018	264.06	Vashon
LC-18	3/12/2019	263.87	Vashon
LC-18	3/12/2020	264.92	Vashon
LC-18	3/12/2021	265.48	Vashon
LC-180	3/3/2003	266.65	Vashon
LC-180	10/4/2004	266.47	Vashon
LC-180	7/29/2005	266.14	Vashon
LC-180	10/27/2005	265.97	Vashon
LC-180	9/29/2006	266.27	Vashon
LC-180	3/28/2007	267.43	Vashon
LC-180	10/4/2007	270.64	Vashon
LC-180	3/25/2008	267.08	Vashon
LC-180	10/8/2008	266.12	Vashon
LC-180	2/3/2009	266.64	Vashon
LC-180	9/8/2009	266.04	Vashon
LC-180	2/11/2010	267.09	Vashon
LC-180	8/9/2010	267.34	Vashon
LC-180	2/16/2011	267.84	Vashon
LC-180	8/10/2011	267.35	Vashon
LC-180	2/23/2012	267.40	Vashon
LC-180	8/1/2012	266.82	Vashon
LC-180	2/6/2013	267.12	Vashon
LC-180	8/7/2013	266.56	Vashon
LC-180	2/14/2014	266.74	Vashon
LC-180	9/8/2014	266.65	Vashon
LC-180	2/18/2015	266.84	Vashon
LC-180	9/10/2015	266.44	Vashon
LC-180	2/22/2016	267.73	Vashon
LC-180	8/18/2016	266.79	Vashon
LC-180	2/15/2017	267.11	Vashon
LC-180	3/7/2019	266.62	Vashon
LC-180	3/9/2020	266.65	Vashon
LC-180	3/10/2021	266.78	Vashon
LC-181	3/3/2003	268.03	Vashon
LC-181	10/4/2004	267.27	Vashon
LC-182	3/3/2003	267.24	Vashon
LC-182	7/1/2003	267.24	Vashon
LC-182	10/4/2004	266.55	Vashon
LC-182	2/3/2009	267.46	Vashon
LC-182	8/4/2009	266.16	Vashon
LC-182	2/11/2010	267.64	Vashon
LC-182	8/9/2010	267.62	Vashon
LC-182	2/16/2011	268.12	Vashon
LC-182	8/10/2011	267.52	Vashon
LC-182	2/23/2012	267.54	Vashon
LC-182	8/1/2012	267.24	Vashon
LC-182	2/6/2013	267.57	Vashon
LC-182	8/7/2013	267.04	Vashon
LC-182	2/14/2014	267.34	Vashon
LC-182	9/8/2014	267.23	Vashon
LC-182	2/18/2015	267.68	Vashon
LC-182	9/10/2015	266.74	Vashon
LC-182	2/22/2016	268.77	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-182	8/18/2016	267.2	Vashon
LC-183	3/3/2003	270.30	Vashon
LC-183	7/1/2003	270.19	Vashon
LC-183	10/4/2004	268.68	Vashon
LC-187-1	7/1/2003	268.75	Vashon
LC-187-1	10/4/2004	266.79	Vashon
LC-187-2	7/1/2003	268.75	Vashon
LC-187-2	10/4/2004	266.90	Vashon
LC-187-3	7/1/2003	269.04	Vashon
LC-187-3	10/4/2004	267.02	Vashon
LC-187-4	7/1/2003	269.07	Vashon
LC-187-4	10/4/2004	268.30	Vashon
LC-191-3	7/1/2003	268.65	Vashon
LC-191-3	10/4/2004	267.15	Vashon
LC-191-4	7/1/2003	268.69	Vashon
LC-191-4	10/4/2004	267.16	Vashon
LC-191-5	7/1/2003	269.08	Vashon
LC-191-5	10/4/2004	267.20	Vashon
LC-191-6	7/1/2003	268.95	Vashon
LC-191-6	10/4/2004	266.96	Vashon
LC-193-1	7/1/2003	268.88	Vashon
LC-193-1	10/4/2004	267.68	Vashon
LC-193-3	7/1/2003	269.06	Vashon
LC-193-3	10/4/2004	267.81	Vashon
LC-193-5	7/1/2003	271.42	Vashon
LC-193-5	10/4/2004	268.19	Vashon
LC-19a	12/1/1998	267.53	Vashon
LC-19a	3/1/1999	265.58	Vashon
LC-19a	6/1/1999	263.59	Vashon
LC-19a	9/1/1999	262.13	Vashon
LC-19a	12/1/1999	264.96	Vashon
LC-19a	3/1/2000	265.22	Vashon
LC-19a	6/1/2000	263.51	Vashon
LC-19a	9/1/2000	262.47	Vashon
LC-19a	12/1/2000	262.97	Vashon
LC-19a	3/1/2001	262.71	Vashon
LC-19a	6/1/2001	261.65	Vashon
LC-19a	9/1/2001	260.45	Vashon
LC-19a	12/1/2001	265.20	Vashon
LC-19a	4/1/2002	264.64	Vashon
LC-19a	6/1/2002	263.01	Vashon
LC-19a	9/1/2002	261.65	Vashon
LC-19a	2/3/2003	264.18	Vashon
LC-19a	3/3/2003	263.13	Vashon
LC-19a	7/1/2003	263.20	Vashon
LC-19a	3/16/2006	267.67	Vashon
LC-19a	9/25/2006	265.39	Vashon
LC-19a	3/23/2007	268.30	Vashon
LC-19a	9/28/2007	265.29	Vashon
LC-19a	10/8/2008	264.46	Vashon
LC-19a	2/5/2009	266.57	Vashon
LC-19a	8/4/2009	265.20	Vashon
LC-19a	2/10/2010	267.01	Vashon
LC-19a	8/10/2010	265.55	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-19a	2/16/2011	267.26	Vashon
LC-19a	2/29/2012	266.99	Vashon
LC-19a	8/2/2012	265.69	Vashon
LC-19a	2/7/2013	266.56	Vashon
LC-19a	8/8/2013	265.21	Vashon
LC-19a	2/13/2014	266.26	Vashon
LC-19a	9/10/2014	265.48	Vashon
LC-19a	2/14/2017	268.05	Vashon
LC-19a	3/12/2019	290.61	Vashon
LC-19a	3/12/2020	266.65	Vashon
LC-19a	3/12/2021	267.14	Vashon
LC-19b	12/1/1998	267.80	Vashon
LC-19b	3/1/1999	265.75	Vashon
LC-19b	6/1/1999	263.65	Vashon
LC-19b	9/1/1999	262.28	Vashon
LC-19b	12/1/1999	264.83	Vashon
LC-19b	3/1/2000	265.38	Vashon
LC-19b	6/1/2000	263.62	Vashon
LC-19b	9/1/2000	262.28	Vashon
LC-19b	12/1/2000	262.83	Vashon
LC-19b	3/1/2001	262.51	Vashon
LC-19b	6/1/2001	261.85	Vashon
LC-19b	9/1/2001	260.71	Vashon
LC-19b	2/18/2015	267.37	Vashon
LC-19b	9/11/2015	264.84	Vashon
LC-19b	2/16/2016	269.01	Vashon
LC-19b	8/17/2016	265.36	Vashon
LC-19b	2/14/2017	267.86	Vashon
LC-19b	3/27/2018	264.06	Vashon
LC-19b	3/12/2019	265.83	Vashon
LC-19b	3/11/2020	264.60	Vashon
LC-19b	3/12/2021	267.14	Vashon
LC-19c	12/1/1998	267.68	Vashon
LC-19c	3/1/1999	265.77	Vashon
LC-19c	6/1/1999	263.78	Vashon
LC-19c	9/1/1999	262.37	Vashon
LC-19c	12/1/1999	264.85	Vashon
LC-19c	3/1/2000	265.41	Vashon
LC-19c	6/1/2000	263.68	Vashon
LC-19c	9/1/2000	262.50	Vashon
LC-19c	12/1/2000	262.96	Vashon
LC-19c	3/1/2001	262.75	Vashon
LC-19c	6/1/2001	261.71	Vashon
LC-19c	9/1/2001	260.49	Vashon
LC-20	7/16/1997	263.49	Vashon
LC-20	10/16/1997	263.59	Vashon
LC-20	1/30/1998	267.11	Vashon
LC-20	4/2/1998	265.90	Vashon
LC-20	7/7/1998	263.28	Vashon
LC-20	9/22/1998	261.76	Vashon
LC-20	12/1/1998	269.22	Vashon
LC-20	3/1/1999	267.14	Vashon
LC-20	6/1/1999	264.77	Vashon
LC-20	9/1/1999	262.06	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-20	12/1/1999	265.92	Vashon
LC-20	3/1/2000	266.52	Vashon
LC-20	6/1/2000	264.38	Vashon
LC-20	9/1/2000	261.89	Vashon
LC-20	12/1/2000	262.26	Vashon
LC-20	3/1/2001	262.60	Vashon
LC-20	6/1/2001	262.15	Vashon
LC-20	9/1/2001	259.53	Vashon
LC-20	12/1/2001	266.36	Vashon
LC-20	4/1/2002	266.24	Vashon
LC-20	6/1/2002	264.38	Vashon
LC-20	9/1/2002	261.96	Vashon
LC-20	2/3/2003	264.85	Vashon
LC-20	3/3/2003	264.14	Vashon
LC-20	7/1/2003	262.99	Vashon
LC-20	4/6/2005	264.58	Vashon
LC-20	7/29/2005	262.60	Vashon
LC-20	9/27/2005	261.65	Vashon
LC-20	3/17/2006	266.83	Vashon
LC-20	9/21/2006	262.60	Vashon
LC-20	3/22/2007	267.41	Vashon
LC-20	9/25/2007	262.48	Vashon
LC-20	3/25/2008	265.21	Vashon
LC-20	10/8/2008	261.74	Vashon
LC-20	2/5/2009	265.52	Vashon
LC-20	8/4/2009	263.23	Vashon
LC-20	2/10/2010	265.88	Vashon
LC-20	8/10/2010	263.83	Vashon
LC-20	2/16/2011	266.07	Vashon
LC-20	8/8/2011	264.56	Vashon
LC-20	2/23/2012	265.92	Vashon
LC-20	7/31/2012	264.14	Vashon
LC-20	2/6/2013	265.38	Vashon
LC-20	8/8/2013	263.23	Vashon
LC-20	2/13/2014	264.73	Vashon
LC-20	9/8/2014	263.65	Vashon
LC-20	2/18/2015	266.41	Vashon
LC-20	9/11/2015	262.43	Vashon
LC-20	2/13/2014	264.73	Vashon
LC-20	9/8/2014	263.65	Vashon
LC-20	2/16/2016	268.20	Vashon
LC-20	8/22/2016	263.24	Vashon
LC-20	2/13/2017	266.84	Vashon
LC-20	3/27/2018	264.06	Vashon
LC-20	3/12/2019	265.37	Vashon
LC-20	3/12/2020	265.48	Vashon
LC-20	3/12/2021	266.19	Vashon
LC-202	8/30/2011	268.30	Vashon
LC-202	2/19/2016	272.47	Vashon
LC-202	3/27/2018	270.72	Vashon
LC-202	3/11/2019	270.02	Vashon
LC-202	3/11/2020	270.59	Vashon
LC-202	3/10/2021	270.82	Vashon
LC-21	10/7/1996	260.82	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-21	4/23/1997	271.24	Vashon
LC-21	7/16/1997	258.06	Vashon
LC-21	10/16/1997	261.58	Vashon
LC-21	1/30/1998	270.44	Vashon
LC-21	4/2/1998	269.73	Vashon
LC-21	7/7/1998	262.11	Vashon
LC-21	9/22/1998	260.52	Vashon
LC-21	12/1/1998	271.79	Vashon
LC-21	3/1/1999	271.27	Vashon
LC-21	6/1/1999	267.66	Vashon
LC-21	9/1/1999	260.92	Vashon
LC-21	12/1/1999	268.39	Vashon
LC-21	3/1/2000	270.17	Vashon
LC-21	6/1/2000	264.75	Vashon
LC-21	9/1/2000	259.66	Vashon
LC-21	12/1/2000	259.58	Vashon
LC-21	3/1/2001	259.46	Vashon
LC-21	6/1/2001	259.89	Vashon
LC-21	9/1/2001	258.85	Vashon
LC-21	2/3/2003	262.39	Vashon
LC-21	3/3/2003	261.51	Vashon
LC-21	7/1/2003	265.99	Vashon
LC-21	10/4/2004	259.43	Vashon
LC-216	10/4/2004	244.71	Vashon
LC-216	11/1/2004	244.54	Vashon
LC-216	2/15/2005	246.76	Vashon
LC-216	6/15/2005	247.35	Vashon
LC-216	9/14/2005	244.76	Vashon
LC-216	12/29/2005	247.57	Vashon
LC-216	3/13/2006	251.16	Vashon
LC-216	9/20/2006	245.96	Vashon
LC-216	3/21/2007	250.17	Vashon
LC-216	9/28/2007	246.23	Vashon
LC-216	3/25/2008	248.08	Vashon
LC-216	10/8/2008	247.01	Vashon
LC-216	2/5/2009	252.99	Vashon
LC-216	8/3/2009	246.65	Vashon
LC-217	10/4/2004	251.54	Vashon
LC-217	11/1/2004	250.05	Vashon
LC-217	2/15/2005	251.94	Vashon
LC-217	6/17/2005	253.17	Vashon
LC-217	9/19/2005	250.24	Vashon
LC-217	12/29/2005	253.96	Vashon
LC-217	3/21/2006	257.29	Vashon
LC-217	9/21/2006	252.03	Vashon
LC-217	3/21/2007	258.81	Vashon
LC-217	9/27/2007	253.72	Vashon
LC-217	3/25/2008	255.82	Vashon
LC-217	10/8/2008	250.32	Vashon
LC-217	2/5/2009	256.24	Vashon
LC-217	8/6/2009	254.71	Vashon
LC-218	10/4/2004	266.74	Vashon
LC-218	11/1/2004	266.59	Vashon
LC-218	2/15/2005	267.11	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-218	6/16/2005	267.03	Vashon
LC-218	9/14/2005	266.46	Vashon
LC-218	12/21/2005	266.70	Vashon
LC-218	3/7/2006	268.77	Vashon
LC-218	9/20/2006	266.89	Vashon
LC-218	3/21/2007	274.16	Vashon
LC-218	9/28/2007	267.06	Vashon
LC-218	3/25/2008	268.29	Vashon
LC-218	10/8/2008	266.62	Vashon
LC-218	2/3/2009	267.84	Vashon
LC-218	8/4/2009	266.93	Vashon
LC-218	2/11/2010	268.29	Vashon
LC-218	8/10/2010	267.99	Vashon
LC-218	2/16/2011	268.84	Vashon
LC-218	8/10/2011	268.19	Vashon
LC-218	2/22/2012	268.64	Vashon
LC-218	8/2/2012	267.92	Vashon
LC-218	2/6/2013	268.34	Vashon
LC-218	8/8/2013	267.52	Vashon
LC-218	2/13/2014	267.94	Vashon
LC-218	9/3/2014	267.72	Vashon
LC-218	2/19/2015	268.49	Vashon
LC-218	9/9/2015	267.18	Vashon
LC-218	2/16/2016	269.76	Vashon
LC-218	8/17/2016	267.73	Vashon
LC-218	2/10/2017	269.33	Vashon
LC-218	3/27/2018	268.51	Vashon
LC-218	3/11/2019	267.77	Vashon
LC-218	3/12/2020	268.00	Vashon
LC-218	3/11/2021	268.33	Vashon
LC-219	10/4/2004	243.63	Vashon
LC-219	11/1/2004	243.18	Vashon
LC-219	2/15/2005	244.52	Vashon
LC-219	6/15/2005	245.21	Vashon
LC-219	9/19/2005	242.35	Vashon
LC-219	12/30/2005	245.93	Vashon
LC-219	3/8/2006	250.09	Vashon
LC-219	9/25/2006	244.16	Vashon
LC-219	3/22/2007	249.38	Vashon
LC-219	9/28/2007	245.84	Vashon
LC-219	3/25/2008	247.95	Vashon
LC-219	10/8/2008	243.73	Vashon
LC-219	2/5/2009	249.07	Vashon
LC-219	8/5/2009	245.71	Vashon
LC-21b	9/1/2000	262.30	Vashon
LC-21b	12/1/2000	262.21	Vashon
LC-21b	3/1/2001	262.24	Vashon
LC-21b	6/1/2001	262.59	Vashon
LC-21b	9/1/2001	261.48	Vashon
LC-222	3/25/2008	267.64	Vashon
LC-222	10/8/2008	266.49	Vashon
LC-222	2/3/2009	267.71	Vashon
LC-222	8/4/2009	266.85	Vashon
LC-222	2/11/2010	268.13	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-222	8/10/2010	267.95	Vashon
LC-222	2/16/2011	268.73	Vashon
LC-222	8/10/2011	268.20	Vashon
LC-222	2/23/2012	268.49	Vashon
LC-222	8/2/2012	267.88	Vashon
LC-222	2/6/2013	267.39	Vashon
LC-222	8/8/2013	267.43	Vashon
LC-222	2/13/2014	267.83	Vashon
LC-222	9/8/2014	266.77	Vashon
LC-222	2/19/2015	268.38	Vashon
LC-222	9/9/2015	266.23	Vashon
LC-222	2/16/2016	269.71	Vashon
LC-222	8/17/2016	267.73	Vashon
LC-222	2/10/2017	269.19	Vashon
LC-222	3/27/2018	268.44	Vashon
LC-222	3/12/2019	267.77	Vashon
LC-222	3/12/2020	267.86	Vashon
LC-222	3/11/2021	268.23	Vashon
LC-223	3/25/2008	267.35	Vashon
LC-223	10/8/2008	265.76	Vashon
LC-223	2/3/2009	266.93	Vashon
LC-223	8/4/2009	266.13	Vashon
LC-223	2/11/2010	267.35	Vashon
LC-223	8/10/2010	267.21	Vashon
LC-223	2/16/2011	267.93	Vashon
LC-223	8/10/2011	267.50	Vashon
LC-223	2/23/2012	267.70	Vashon
LC-223	8/2/2012	267.14	Vashon
LC-223	2/6/2013	268.42	Vashon
LC-223	8/8/2013	266.7	Vashon
LC-223	2/13/2014	267.05	Vashon
LC-223	9/3/2014	267.87	Vashon
LC-223	2/19/2015	267.65	Vashon
LC-223	9/9/2015	267.30	Vashon
LC-223	2/16/2016	268.95	Vashon
LC-223	8/15/2016	267.05	Vashon
LC-223	2/10/2017	268.32	Vashon
LC-223	3/27/2018	267.73	Vashon
LC-223	9/12/2018	266.01	Vashon
LC-223	3/12/2019	267.01	Vashon
LC-223	9/5/2019	265.78	Vashon
LC-223	3/12/2020	267.13	Vashon
LC-223	8/27/2020	266.10	Vashon
LC-223	3/11/2021	267.46	Vashon
LC-223	8/31/2021	266.33	Vashon
LC-224	3/3/2003	267.43	Vashon
LC-224	10/4/2004	267.26	Vashon
LC-224	3/25/2008	267.73	Vashon
LC-224	10/8/2008	266.23	Vashon
LC-224	2/3/2009	267.28	Vashon
LC-224	8/4/2009	266.48	Vashon
LC-224	2/11/2010	267.73	Vashon
LC-224	8/10/2010	267.65	Vashon
LC-224	2/16/2011	268.38	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-224	8/10/2011	267.86	Vashon
LC-224	2/23/2012	268.06	Vashon
LC-224	8/2/2012	267.49	Vashon
LC-224	2/6/2013	267.86	Vashon
LC-224	8/8/2013	267.05	Vashon
LC-224	2/13/2014	267.43	Vashon
LC-224	9/3/2014	267.31	Vashon
LC-224	2/19/2015	267.86	Vashon
LC-224	9/9/2015	266.80	Vashon
LC-224	2/16/2016	269.10	Vashon
LC-224	8/15/2016	267.39	Vashon
LC-224	2/10/2017	268.50	Vashon
LC-224	8/8/2017	267.60	Vashon
LC-224	3/27/2018	267.95	Vashon
LC-224	9/12/2018	267.04	Vashon
LC-224	3/12/2019	267.37	Vashon
LC-224	9/5/2019	266.25	Vashon
LC-224	3/12/2020	267.42	Vashon
LC-224	8/27/2020	266.53	Vashon
LC-224	3/11/2021	267.72	Vashon
LC-224	8/31/2021	266.54	Vashon
LC-225	3/25/2008	237.88	Vashon
LC-225	10/8/2008	234.24	Vashon
LC-225	2/6/2009	237.29	Vashon
LC-225	8/6/2009	242.91	Vashon
LC-225	3/11/2021	237.36	Vashon
LC-225	9/1/2021	232.30	Vashon
LC-226	3/25/2008	238.37	Vashon
LC-226	10/8/2008	234.57	Vashon
LC-226	2/6/2009	238.08	Vashon
LC-226	8/6/2009	228.60	Vashon
LC-24	10/7/1996	269.54	Vashon
LC-24	1/24/1997	274.52	Vashon
LC-24	4/23/1997	273.93	Vashon
LC-24	7/16/1997	270.27	Vashon
LC-24	10/16/1997	269.92	Vashon
LC-24	1/30/1998	272.63	Vashon
LC-24	4/2/1998	272.14	Vashon
LC-24	12/1/1998	274.17	Vashon
LC-24	3/1/1999	273.57	Vashon
LC-24	6/1/1999	270.70	Vashon
LC-24	9/1/1999	268.54	Vashon
LC-24	12/1/1999	271.04	Vashon
LC-24	3/1/2000	271.52	Vashon
LC-24	6/1/2000	270.42	Vashon
LC-24	9/1/2000	268.71	Vashon
LC-24	12/1/2000	268.11	Vashon
LC-24	3/1/2001	268.19	Vashon
LC-24	6/1/2001	268.54	Vashon
LC-24	9/1/2001	267.57	Vashon
LC-24	12/1/2001	270.86	Vashon
LC-24	4/1/2002	272.63	Vashon
LC-24	6/1/2002	270.71	Vashon
LC-24	9/1/2002	269.05	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-24	2/3/2003	271.00	Vashon
LC-24	3/3/2003	270.24	Vashon
LC-24	7/1/2003	269.68	Vashon
LC-24	10/4/2004	267.22	Vashon
LC-24	4/1/2005	267.72	Vashon
LC-24	7/29/2005	267.01	Vashon
LC-24	10/27/2005	265.47	Vashon
LC-24	3/14/2006	271.25	Vashon
LC-24	9/20/2006	266.92	Vashon
LC-24	3/22/2007	271.46	Vashon
LC-24	10/19/2007	266.49	Vashon
LC-24	4/3/2008	269.05	Vashon
LC-24	10/8/2008	265.52	Vashon
LC-24	2/3/2009	269.13	Vashon
LC-24	8/3/2009	267.48	Vashon
LC-24	2/11/2010	269.50	Vashon
LC-24	8/9/2010	268.08	Vashon
LC-24	2/14/2011	269.60	Vashon
LC-24	8/8/2011	268.80	Vashon
LC-24	2/22/2012	269.16	Vashon
LC-24	7/31/2012	268.30	Vashon
LC-24	2/7/2013	269.12	Vashon
LC-24	8/7/2013	267.52	Vashon
LC-24	2/18/2014	269.70	Vashon
LC-24	9/5/2014	267.90	Vashon
LC-24	2/18/2015	270.07	Vashon
LC-24	9/9/2015	266.57	Vashon
LC-24	2/16/2016	272.27	Vashon
LC-24	8/18/2016	267.66	Vashon
LC-24	2/15/2017	270.36	Vashon
LC-24	3/27/2018	269.84	Vashon
LC-24	3/11/2019	268.81	Vashon
LC-24	3/10/2020	269.21	Vashon
LC-24	3/25/2021	269.59	Vashon
LC-25	4/1/2005	266.66	Vashon
LC-26	4/23/1997	274.65	Vashon
LC-26	7/16/1997	271.46	Vashon
LC-26	10/16/1997	271.29	Vashon
LC-26	1/30/1998	272.76	Vashon
LC-26	4/2/1998	272.50	Vashon
LC-26	7/7/1998	271.01	Vashon
LC-26	9/22/1998	270.07	Vashon
LC-26	12/1/1998	274.31	Vashon
LC-26	3/1/1999	273.88	Vashon
LC-26	6/1/1999	272.16	Vashon
LC-26	9/1/1999	270.96	Vashon
LC-26	12/1/1999	272.24	Vashon
LC-26	3/1/2000	272.75	Vashon
LC-26	6/1/2000	272.35	Vashon
LC-26	9/1/2000	267.79	Vashon
LC-26	12/1/2000	270.47	Vashon
LC-26	3/1/2001	270.05	Vashon
LC-26	6/1/2001	270.03	Vashon
LC-26	9/1/2001	269.97	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-26	12/1/2001	272.04	Vashon
LC-26	4/1/2002	272.75	Vashon
LC-26	6/1/2002	270.27	Vashon
LC-26	9/1/2002	269.68	Vashon
LC-26	2/3/2003	271.83	Vashon
LC-26	3/3/2003	271.34	Vashon
LC-26	7/1/2003	270.48	Vashon
LC-26	10/4/2004	268.77	Vashon
LC-26	7/29/2005	266.25	Vashon
LC-26	3/16/2006	272.52	Vashon
LC-26	9/20/2006	269.54	Vashon
LC-26	3/22/2007	272.62	Vashon
LC-26	4/3/2008	271.04	Vashon
LC-26	10/8/2008	268.63	Vashon
LC-26	2/3/2009	270.90	Vashon
LC-26	8/3/2009	269.91	Vashon
LC-26	2/11/2010	271.22	Vashon
LC-26	8/10/2010	270.37	Vashon
LC-26	2/14/2011	271.40	Vashon
LC-26	8/8/2011	270.77	Vashon
LC-26	2/22/2012	271.02	Vashon
LC-26	7/31/2012	270.46	Vashon
LC-26	2/7/2013	270.99	Vashon
LC-26	8/7/2013	270.02	Vashon
LC-26	2/15/2014	270.62	Vashon
LC-26	9/5/2014	270.26	Vashon
LC-26	2/18/2015	271.51	Vashon
LC-26	9/11/2015	269.37	Vashon
LC-26	2/16/2016	273.15	Vashon
LC-26	8/18/2016	270.10	Vashon
LC-26	2/15/2017	271.73	Vashon
LC-26	4/6/2018	271.37	Vashon
LC-26	3/11/2019	270.73	Vashon
LC-26	3/11/2020	271.05	Vashon
LC-26	3/10/2021	271.50	Vashon
LC-27	12/1/1998	271.19	Vashon
LC-27	3/1/1999	270.39	Vashon
LC-27	6/1/1999	268.82	Vashon
LC-27	9/1/1999	267.25	Vashon
LC-27	12/1/1999	269.06	Vashon
LC-27	3/1/2000	269.61	Vashon
LC-27	6/1/2000	268.86	Vashon
LC-27	9/1/2000	267.67	Vashon
LC-27	12/1/2000	267.42	Vashon
LC-27	3/1/2001	267.10	Vashon
LC-27	6/1/2001	267.11	Vashon
LC-27	9/1/2001	266.57	Vashon
LC-27	12/1/2001	270.37	Vashon
LC-27	4/1/2002	270.22	Vashon
LC-27	6/1/2002	269.47	Vashon
LC-27	9/1/2002	267.55	Vashon
LC-27	2/3/2003	269.66	Vashon
LC-27	3/3/2003	268.54	Vashon
LC-27	7/1/2003	268.55	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-27	10/4/2004	266.99	Vashon
LC-27	9/25/2006	267.49	Vashon
LC-27	3/22/2007	270.64	Vashon
LC-27	4/3/2008	268.75	Vashon
LC-27	10/8/2008	265.87	Vashon
LC-27	2/3/2009	268.67	Vashon
LC-27	8/3/2009	268.10	Vashon
LC-27	2/11/2010	269.15	Vashon
LC-27	8/10/2010	267.95	Vashon
LC-27	2/14/2011	269.25	Vashon
LC-27	8/10/2011	268.75	Vashon
LC-27	2/22/2012	269.09	Vashon
LC-27	7/31/2012	268.15	Vashon
LC-27	2/7/2013	268.94	Vashon
LC-27	8/7/2013	267.6	Vashon
LC-27	2/18/2014	270.25	Vashon
LC-27	9/5/2014	267.99	Vashon
LC-27	2/18/2015	269.46	Vashon
LC-27	9/9/2015	266.80	Vashon
LC-27	2/16/2016	270.95	Vashon
LC-27	8/15/2016	267.91	Vashon
LC-27	2/15/2017	269.94	Vashon
LC-27	8/8/2017	268.52	Vashon
LC-27	3/24/2018	269.45	Vashon
LC-27	9/12/2018	266.88	Vashon
LC-27	3/11/2019	268.63	Vashon
LC-27	9/5/2019	266.26	Vashon
LC-27	3/10/2020	268.95	Vashon
LC-27	8/31/2020	266.67	Vashon
LC-27	3/10/2021	269.64	Vashon
LC-27	9/1/2021	267.32	Vashon
LC-29	1/24/1997	263.51	Vashon
LC-29	4/23/1997	256.96	Vashon
LC-29	1/30/1998	257.06	Vashon
LC-29	4/2/1998	255.03	Vashon
LC-29	12/1/2001	257.99	Vashon
LC-29	4/1/2002	258.09	Vashon
LC-29	6/1/2002	257.51	Vashon
LC-29	9/1/2002	256.02	Vashon
LC-29	2/3/2003	257.42	Vashon
LC-29	3/3/2003	255.97	Vashon
LC-29	7/1/2003	253.32	Vashon
LC-29	10/4/2004	250.63	Vashon
LC-30	12/1/1998	258.73	Vashon
LC-30	3/1/1999	257.91	Vashon
LC-30	6/1/1999	256.08	Vashon
LC-30	9/1/1999	254.33	Vashon
LC-30	12/1/1999	256.47	Vashon
LC-30	3/1/2000	257.08	Vashon
LC-30	6/1/2000	255.76	Vashon
LC-30	9/1/2000	254.25	Vashon
LC-30	12/1/2000	253.85	Vashon
LC-30	3/1/2001	254.00	Vashon
LC-30	6/1/2001	254.46	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-30	9/1/2001	253.48	Vashon
LC-32	7/7/1998	252.36	Vashon
LC-32	9/22/1998	249.78	Vashon
LC-32	12/1/1998	259.02	Vashon
LC-32	3/1/1999	256.85	Vashon
LC-32	6/1/2000	254.86	Vashon
LC-32	9/1/2000	250.25	Vashon
LC-32	12/1/2000	250.03	Vashon
LC-32	3/1/2001	250.07	Vashon
LC-32	6/1/2001	251.18	Vashon
LC-32	9/1/2001	249.17	Vashon
LC-32	12/1/2001	253.84	Vashon
LC-32	4/1/2002	256.46	Vashon
LC-32	6/1/2002	253.31	Vashon
LC-32	9/1/2002	252.55	Vashon
LC-32	2/3/2003	256.04	Vashon
LC-32	3/3/2003	254.74	Vashon
LC-32	7/1/2003	252.37	Vashon
LC-32	10/4/2004	252.08	Vashon
LC-34	12/1/2001	264.72	Vashon
LC-34	4/1/2002	264.34	Vashon
LC-34	6/1/2002	262.78	Vashon
LC-34	9/1/2002	261.28	Vashon
LC-34	2/3/2003	264.28	Vashon
LC-34	3/3/2003	263.18	Vashon
LC-34	7/1/2003	262.05	Vashon
LC-34	10/4/2004	261.00	Vashon
LC-34	10/26/2005	259.43	Vashon
LC-34	10/9/2007	260.20	Vashon
LC-34	10/8/2008	259.50	Vashon
LC-34	2/3/2009	262.07	Vashon
LC-34	8/3/2009	260.33	Vashon
LC-34	2/11/2010	262.38	Vashon
LC-34	8/9/2010	261.06	Vashon
LC-34	2/14/2011	262.68	Vashon
LC-34	8/10/2011	261.30	Vashon
LC-34	2/29/2012	270.22	Vashon
LC-34	8/3/2012	261.88	Vashon
LC-34	2/6/2013	262.04	Vashon
LC-34	8/8/2013	260.66	Vashon
LC-34	2/14/2014	261.48	Vashon
LC-34	9/8/2014	260.89	Vashon
LC-34	2/19/2015	262.71	Vashon
LC-34	9/9/2015	260.32	Vashon
LC-34	2/19/2016	264.16	Vashon
LC-34	8/17/2016	260.90	Vashon
LC-34	2/14/2017	263.29	Vashon
LC-34	4/5/2018	262.09	Vashon
LC-34	3/12/2019	261.98	Vashon
LC-34	3/12/2020	262.12	Vashon
LC-34	3/11/2021	262.68	Vashon
LC-37	10/7/1996	250.23	Vashon
LC-37	1/24/1997	255.47	Vashon
LC-37	4/23/1997	253.76	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-37	7/16/1997	251.20	Vashon
LC-37	10/16/1997	251.09	Vashon
LC-37	1/30/1998	254.08	Vashon
LC-37	4/2/1998	252.92	Vashon
LC-37	7/7/1998	250.81	Vashon
LC-37	9/22/1998	249.23	Vashon
LC-37	12/1/1998	255.68	Vashon
LC-37	3/1/1999	253.58	Vashon
LC-37	6/1/1999	252.20	Vashon
LC-37	9/1/1999	249.21	Vashon
LC-37	12/1/1999	253.65	Vashon
LC-37	3/1/2000	254.04	Vashon
LC-37	6/1/2000	252.13	Vashon
LC-37	9/1/2000	249.50	Vashon
LC-37	12/1/2000	249.58	Vashon
LC-37	3/1/2001	250.01	Vashon
LC-37	6/1/2001	250.08	Vashon
LC-37	9/1/2001	247.57	Vashon
LC-37	12/1/2001	253.37	Vashon
LC-37	4/1/2002	253.71	Vashon
LC-37	6/1/2002	252.67	Vashon
LC-37	9/1/2002	250.22	Vashon
LC-37	2/3/2003	252.96	Vashon
LC-37	3/3/2003	252.65	Vashon
LC-37	7/1/2003	250.95	Vashon
LC-37	10/4/2004	249.50	Vashon
LC-38	1/24/1997	252.89	Vashon
LC-38	4/23/1997	251.30	Vashon
LC-38	7/16/1997	247.20	Vashon
LC-38	1/30/1998	250.80	Vashon
LC-38	4/2/1998	249.39	Vashon
LC-38	7/7/1998	246.53	Vashon
LC-38	9/22/1998	244.56	Vashon
LC-38	12/1/1998	253.56	Vashon
LC-38	3/1/1999	251.50	Vashon
LC-38	6/1/1999	249.05	Vashon
LC-38	9/1/1999	244.81	Vashon
LC-38	12/1/1999	251.14	Vashon
LC-38	3/1/2000	250.80	Vashon
LC-38	6/1/2000	248.59	Vashon
LC-38	9/1/2000	247.37	Vashon
LC-38	12/1/2000	246.79	Vashon
LC-38	3/1/2001	247.17	Vashon
LC-38	6/1/2001	247.48	Vashon
LC-38	9/1/2001	244.86	Vashon
LC-38	12/1/2001	252.72	Vashon
LC-38	4/1/2002	252.48	Vashon
LC-38	6/1/2002	252.40	Vashon
LC-38	9/1/2002	250.78	Vashon
LC-38	2/3/2003	251.09	Vashon
LC-38	3/3/2003	250.65	Vashon
LC-38	7/1/2003	248.56	Vashon
LC-38	10/4/2004	246.61	Vashon
LC-38a	10/7/1996	248.99	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-38a	1/24/1997	256.50	Vashon
LC-38a	4/23/1997	254.44	Vashon
LC-38a	7/16/1997	250.73	Vashon
LC-38a	10/16/1997	250.56	Vashon
LC-38a	1/30/1998	254.67	Vashon
LC-38a	4/2/1998	253.33	Vashon
LC-38a	7/7/1998	250.21	Vashon
LC-38a	9/22/1998	247.82	Vashon
LC-38a	12/1/1998	256.88	Vashon
LC-38a	3/1/1999	254.86	Vashon
LC-38a	6/1/1999	252.99	Vashon
LC-38a	9/1/1999	248.36	Vashon
LC-38a	12/1/1999	254.69	Vashon
LC-38a	3/1/2000	254.78	Vashon
LC-38a	6/1/2000	252.38	Vashon
LC-38a	9/1/2000	249.11	Vashon
LC-38a	12/1/2000	248.98	Vashon
LC-38a	3/1/2001	249.60	Vashon
LC-38a	6/1/2001	249.84	Vashon
LC-38a	9/1/2001	247.22	Vashon
LC-38a	12/1/2001	255.13	Vashon
LC-38a	4/1/2002	255.09	Vashon
LC-38a	6/1/2002	254.76	Vashon
LC-38a	9/1/2002	253.06	Vashon
LC-38a	2/3/2003	254.24	Vashon
LC-38a	3/3/2003	253.68	Vashon
LC-38a	7/1/2003	251.15	Vashon
LC-38a	10/4/2004	246.41	Vashon
LC-39	10/7/1996	248.46	Vashon
LC-39	1/24/1997	254.15	Vashon
LC-39	4/23/1997	252.20	Vashon
LC-39	7/16/1997	249.52	Vashon
LC-39	10/16/1997	249.53	Vashon
LC-39	1/30/1998	252.36	Vashon
LC-39	4/2/1998	250.82	Vashon
LC-39	7/7/1998	248.80	Vashon
LC-39	9/22/1998	247.30	Vashon
LC-39	12/1/1998	254.57	Vashon
LC-39	3/1/1999	252.70	Vashon
LC-39	6/1/1999	251.14	Vashon
LC-39	9/1/1999	247.55	Vashon
LC-39	12/1/1999	251.94	Vashon
LC-39	3/1/2000	252.68	Vashon
LC-39	6/1/2000	250.67	Vashon
LC-39	9/1/2000	248.91	Vashon
LC-39	9/1/2000	243.78	Vashon
LC-39	12/1/2000	248.89	Vashon
LC-39	12/1/2000	244.24	Vashon
LC-39	3/1/2001	249.07	Vashon
LC-39	6/1/2001	249.45	Vashon
LC-39	9/1/2001	248.18	Vashon
LC-39	12/1/2001	252.24	Vashon
LC-39	4/1/2002	252.21	Vashon
LC-39	6/1/2002	251.77	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-39	9/1/2002	250.11	Vashon
LC-39	2/3/2003	251.84	Vashon
LC-39	3/3/2003	250.75	Vashon
LC-39	7/1/2003	248.97	Vashon
LC-39	10/4/2004	247.29	Vashon
LC-39	4/6/2005	248.79	Vashon
LC-39	3/31/2006	251.71	Vashon
LC-39	9/21/2006	247.50	Vashon
LC-39	3/23/2007	252.79	Vashon
LC-39	9/24/2007	248.90	Vashon
LC-39	4/3/2008	250.47	Vashon
LC-39	10/8/2008	246.62	Vashon
LC-39	2/5/2009	251.18	Vashon
LC-39	8/5/2009	249.72	Vashon
LC-39	2/9/2010	251.97	Vashon
LC-39	8/12/2010	250.67	Vashon
LC-39	2/17/2011	252.17	Vashon
LC-39	8/9/2011	250.19	Vashon
LC-39	2/28/2012	251.31	Vashon
LC-39	8/1/2012	250.37	Vashon
LC-39	2/12/2013	250.87	Vashon
LC-39	8/8/2013	248.97	Vashon
LC-39	2/19/2014	251.97	Vashon
LC-39	9/10/2014	249.48	Vashon
LC-39	2/23/2015	251.68	Vashon
LC-39	9/10/2015	247.99	Vashon
LC-39	2/22/2016	254.15	Vashon
LC-39	8/18/2016	249.26	Vashon
LC-39	2/13/2017	252.56	Vashon
LC-39	4/6/2018	251.42	Vashon
LC-39	3/14/2019	251.52	Vashon
LC-39	3/11/2020	251.65	Vashon
LC-40	4/14/2005	252.09	Vashon
LC-40	7/20/2005	250.61	Vashon
LC-40	3/17/2006	254.48	Vashon
LC-40	9/20/2006	249.29	Vashon
LC-40	3/23/2007	255.88	Vashon
LC-40	10/19/2007	251.19	Vashon
LC-40	10/8/2008	247.89	Vashon
LC-40	2/5/2009	254.05	Vashon
LC-40	8/4/2009	251.63	Vashon
LC-40	2/10/2010	255.49	Vashon
LC-40	8/11/2010	252.44	Vashon
LC-40	2/16/2011	254.89	Vashon
LC-40	8/9/2011	253.19	Vashon
LC-40	2/28/2012	254.39	Vashon
LC-40	7/31/2012	252.57	Vashon
LC-40	2/6/2013	244.46	Vashon
LC-40	8/7/2013	250.64	Vashon
LC-40	2/18/2014	253.94	Vashon
LC-40	9/10/2014	251.51	Vashon
LC-40	2/20/2015	254.22	Vashon
LC-40	9/10/2015	250.54	Vashon
LC-40	2/22/2016	256.81	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-40	8/17/2016	251.23	Vashon
LC-40	2/13/2017	254.93	Vashon
LC-40	4/6/2018	253.65	Vashon
LC- 40	3/13/2019	253.67	Vashon
LC- 40	3/11/2020	253.85	Vashon
LC- 40	3/11/2021	253.28	Vashon
LC-41a	4/23/1997	261.49	Vashon
LC-41a	7/16/1997	254.62	Vashon
LC-41a	10/16/1997	254.88	Vashon
LC-41a	1/30/1998	255.29	Vashon
LC-41a	4/2/1998	257.30	Vashon
LC-41a	7/7/1998	254.50	Vashon
LC-41a	3/1/1999	258.84	Vashon
LC-41a	6/1/1999	257.75	Vashon
LC-41a	9/1/1999	251.29	Vashon
LC-41a	12/1/1999	259.75	Vashon
LC-41a	3/1/2000	260.77	Vashon
LC-41a	6/1/2000	257.63	Vashon
LC-41a	9/1/2000	252.08	Vashon
LC-41a	12/1/2000	252.66	Vashon
LC-41a	3/1/2001	252.37	Vashon
LC-41a	6/1/2001	252.83	Vashon
LC-41a	9/1/2001	249.57	Vashon
LC-41a	12/1/2001	252.67	Vashon
LC-41a	4/1/2002	260.18	Vashon
LC-41a	6/1/2002	251.92	Vashon
LC-41a	9/1/2002	249.66	Vashon
LC-41a	2/3/2003	259.55	Vashon
LC-41a	3/3/2003	258.31	Vashon
LC-41a	7/1/2003	254.84	Vashon
LC-41a	10/4/2004	252.11	Vashon
LC-41a	4/6/2005	254.58	Vashon
LC-41a	9/7/2005	251.03	Vashon
LC-41a	3/17/2006	259.04	Vashon
LC-41a	9/21/2006	253.06	Vashon
LC-41a	9/28/2007	254.88	Vashon
LC-41a	4/3/2008	257.46	Vashon
LC-41a	10/8/2008	251.48	Vashon
LC-41a	2/5/2009	257.76	Vashon
LC-41a	8/4/2009	255.63	Vashon
LC-41a	2/10/2010	258.98	Vashon
LC-41a	8/10/2010	257.19	Vashon
LC-41a	2/16/2011	259.41	Vashon
LC-41a	8/10/2011	256.66	Vashon
LC-41a	2/29/2012	257.87	Vashon
LC-41a	7/31/2012	256.99	Vashon
LC-41a	2/6/2013	257.89	Vashon
LC-41a	8/8/2013	255.13	Vashon
LC-41a	2/13/2014	256.93	Vashon
LC-41a	9/10/2014	256.08	Vashon
LC-41a	2/19/2015	258.92	Vashon
LC-41a	9/11/2015	254.07	Vashon
LC-41a	2/16/2016	261.73	Vashon
LC-41a	8/17/2016	256.08	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-41a	2/14/2017	259.80	Vashon
LC-41a	3/29/2018	258.23	Vashon
LC-41a	3/12/2019	258.09	Vashon
LC-41a	3/13/2020	258.54	Vashon
LC-41a	3/11/2021	259.80	Vashon
LC-41b	12/1/2001	259.85	Vashon
LC-41b	4/1/2002	259.83	Vashon
LC-41b	6/1/2002	259.41	Vashon
LC-41b	9/1/2002	253.50	Vashon
LC-41b	2/3/2003	259.18	Vashon
LC-41b	3/3/2003	257.96	Vashon
LC-41b	7/1/2003	254.52	Vashon
LC-41b	10/4/2004	251.87	Vashon
LC-41b	10/25/2005	249.14	Vashon
LC-41b	3/16/2006	258.81	Vashon
LC-41b	9/21/2006	252.70	Vashon
LC-41b	3/22/2007	259.68	Vashon
LC-41b	9/28/2007	254.53	Vashon
LC-41b	4/3/2008	251.43	Vashon
LC-41b	10/8/2008	244.70	Vashon
LC-41b	2/5/2009	257.51	Vashon
LC-41b	3/25/2021	258.76	Vashon
LC-44a	4/23/1997	263.31	Vashon
LC-44a	7/16/1997	254.96	Vashon
LC-44a	10/16/1997	254.99	Vashon
LC-44a	1/30/1998	259.93	Vashon
LC-44a	4/2/1998	258.26	Vashon
LC-44a	7/7/1998	254.65	Vashon
LC-44a	9/22/1998	253.04	Vashon
LC-44a	12/1/1998	262.36	Vashon
LC-44a	3/1/1999	260.16	Vashon
LC-44a	6/1/1999	257.31	Vashon
LC-44a	9/1/1999	253.33	Vashon
LC-44a	12/1/1999	259.48	Vashon
LC-44a	3/1/2000	259.94	Vashon
LC-44a	6/1/2000	256.75	Vashon
LC-44a	9/1/2000	253.41	Vashon
LC-44a	12/1/2000	253.79	Vashon
LC-44a	3/1/2001	254.24	Vashon
LC-44a	6/1/2001	254.24	Vashon
LC-44a	9/1/2001	250.65	Vashon
LC-47	4/6/2005	260.57	Vashon
LC-47	3/17/2006	263.33	Vashon
LC-47	9/20/2006	259.41	Vashon
LC-47a	9/28/2007	258.21	Vashon
LC-47a	3/25/2008	259.93	Vashon
LC-47a	10/8/2008	256.74	Vashon
LC-47a	10/8/2008	256.74	Vashon
LC-47a	2/11/2009	257.85	Vashon
LC-47a	8/4/2009	255.73	Vashon
LC-47a	2/10/2010	256.23	Vashon
LC-47a	8/10/2010	256.83	Vashon
LC-47a	2/16/2011	259.48	Vashon
LC-47a	8/8/2011	256.86	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-47a	2/23/2012	258.57	Vashon
LC-47a	7/31/2012	259.02	Vashon
LC-47a	2/8/2013	260.29	Vashon
LC-47a	8/8/2013	255.73	Vashon
LC-47a	2/13/2014	259.33	Vashon
LC-47a	9/8/2014	258.57	Vashon
LC-47a	2/18/2015	261.42	Vashon
LC-47a	9/10/2015	258.27	Vashon
LC-48	2/17/2016	266.92	Vashon
LC-48	2/14/2017	265.58	Vashon
LC-48	3/27/2018	264.49	Vashon
LC- 48	3/12/2019	264.15	Vashon
LC- 48	3/12/2020	264.21	Vashon
LC- 48	3/12/2021	264.89	Vashon
LC-49	4/23/1997	265.02	Vashon
LC-49	7/16/1997	260.91	Vashon
LC-49	10/16/1997	261.07	Vashon
LC-49	1/30/1998	263.74	Vashon
LC-49	4/2/1998	262.47	Vashon
LC-49	7/7/1998	260.83	Vashon
LC-49	9/22/1998	260.57	Vashon
LC-49	12/1/1998	266.15	Vashon
LC-49	3/1/1999	262.59	Vashon
LC-49	6/1/1999	260.96	Vashon
LC-49	9/1/1999	259.61	Vashon
LC-49	12/1/1999	263.30	Vashon
LC-49	3/1/2000	263.72	Vashon
LC-49	6/1/2000	261.59	Vashon
LC-49	9/1/2000	260.84	Vashon
LC-49	12/1/2000	261.05	Vashon
LC-49	3/1/2001	261.12	Vashon
LC-49	6/1/2001	261.07	Vashon
LC-49	9/1/2001	258.20	Vashon
LC-49	12/1/2001	263.43	Vashon
LC-49	4/1/2002	263.48	Vashon
LC-49	6/1/2002	263.22	Vashon
LC-49	9/1/2002	254.48	Vashon
LC-49	2/3/2003	263.70	Vashon
LC-49	3/3/2003	262.31	Vashon
LC-49	7/1/2003	260.28	Vashon
LC-49	10/4/2004	260.58	Vashon
LC-49	4/15/2005	261.95	Vashon
LC-49	7/21/2005	260.84	Vashon
LC-49	8/18/2005	260.77	Vashon
LC-49	3/17/2006	263.46	Vashon
LC-49	9/20/2006	261.11	Vashon
LC-49	3/20/2007	263.36	Vashon
LC-49	9/28/2007	262.32	Vashon
LC-49	3/25/2008	262.56	Vashon
LC-49	10/8/2008	260.99	Vashon
LC-49	2/5/2009	262.79	Vashon
LC-49	8/4/2009	261.25	Vashon
LC-49	2/10/2010	263.31	Vashon
LC-49	8/10/2010	261.77	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-49	2/16/2011	263.51	Vashon
LC-49	8/8/2011	262.06	Vashon
LC-49	2/23/2012	263.29	Vashon
LC-49	7/31/2012	261.56	Vashon
LC-49	2/8/2013	262.84	Vashon
LC-49a	3/3/2003	262.46	Vashon
LC-49a	7/1/2003	261.57	Vashon
LC-49a	10/4/2004	260.93	Vashon
LC-50	12/1/1998	268.48	Vashon
LC-50	6/1/1999	265.38	Vashon
LC-50	9/1/1999	263.77	Vashon
LC-50	12/1/1999	266.10	Vashon
LC-50	3/1/2000	266.52	Vashon
LC-50	6/1/2000	265.46	Vashon
LC-50	9/1/2000	264.75	Vashon
LC-50	12/1/2000	264.84	Vashon
LC-50	3/1/2001	264.88	Vashon
LC-50	6/1/2001	265.01	Vashon
LC-50	9/1/2001	264.15	Vashon
LC-50	12/1/2001	266.24	Vashon
LC-50	4/1/2002	266.46	Vashon
LC-50	6/1/2002	265.66	Vashon
LC-50	9/1/2002	265.45	Vashon
LC-50	2/3/2003	265.74	Vashon
LC-50	3/3/2003	265.64	Vashon
LC-50	7/1/2003	265.50	Vashon
LC-50	10/4/2004	264.72	Vashon
LC-50	4/1/2005	266.04	Vashon
LC-50	7/21/2005	265.35	Vashon
LC-50	3/14/2006	267.82	Vashon
LC-50	9/25/2006	262.17	Vashon
LC-50	9/28/2007	265.01	Vashon
LC-50	4/3/2008	266.15	Vashon
LC-50	10/8/2008	265.46	Vashon
LC-50	2/5/2009	262.99	Vashon
LC-50	2/11/2010	266.34	Vashon
LC-50	8/10/2010	265.61	Vashon
LC-50	2/16/2011	266.51	Vashon
LC-50	8/10/2011	265.84	Vashon
LC-50	2/22/2012	266.52	Vashon
LC-50	7/31/2012	265.66	Vashon
LC-50	2/6/2013	266.09	Vashon
LC-50	8/8/2013	265.44	Vashon
LC-50	2/14/2014	266.04	Vashon
LC-50	9/8/2014	265.52	Vashon
LC-50	2/19/2015	266.44	Vashon
LC-50	9/10/2015	265.09	Vashon
LC-50	2/22/2016	267.77	Vashon
LC-50	8/17/2016	265.47	Vashon
LC-50	2/15/2017	267.00	Vashon
LC-50	4/6/2018	266.24	Vashon
LC-50	3/11/2019	265.94	Vashon
LC-50	3/10/2020	266.06	Vashon
LC-50	3/9/2021	266.44	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-51	4/23/1997	270.37	Vashon
LC-51	7/16/1997	267.84	Vashon
LC-51	10/16/1997	267.75	Vashon
LC-51	1/30/1998	269.38	Vashon
LC-51	4/2/1998	268.95	Vashon
LC-51	7/7/1998	267.42	Vashon
LC-51	9/22/1998	266.42	Vashon
LC-51	12/1/1998	270.27	Vashon
LC-51	3/1/1999	269.37	Vashon
LC-51	6/1/1999	267.97	Vashon
LC-51	9/1/1999	266.74	Vashon
LC-51	12/1/1999	268.54	Vashon
LC-51	3/1/2000	268.70	Vashon
LC-51	6/1/2000	267.96	Vashon
LC-51	9/1/2000	266.89	Vashon
LC-51	12/1/2000	266.78	Vashon
LC-51	3/1/2001	266.50	Vashon
LC-51	6/1/2001	266.41	Vashon
LC-51	9/1/2001	265.98	Vashon
LC-51	12/1/2001	267.58	Vashon
LC-51	4/1/2002	268.99	Vashon
LC-51	6/1/2002	267.05	Vashon
LC-51	9/1/2002	266.92	Vashon
LC-51	2/3/2003	268.62	Vashon
LC-51	3/3/2003	267.89	Vashon
LC-51	7/1/2003	269.62	Vashon
LC-51	10/4/2004	266.87	Vashon
LC-52	12/1/2001	268.95	Vashon
LC-52	4/1/2002	269.42	Vashon
LC-52	6/1/2002	268.33	Vashon
LC-52	9/1/2002	267.60	Vashon
LC-52	2/3/2003	268.97	Vashon
LC-52	3/3/2003	268.45	Vashon
LC-52	7/1/2003	268.26	Vashon
LC-52	10/4/2004	267.58	Vashon
LC-53	4/23/1997	269.10	Vashon
LC-53	7/16/1997	266.45	Vashon
LC-53	10/16/1997	266.45	Vashon
LC-53	1/30/1998	268.14	Vashon
LC-53	4/2/1998	267.48	Vashon
LC-53	7/7/1998	266.11	Vashon
LC-53	9/22/1998	265.55	Vashon
LC-53	12/1/1998	269.25	Vashon
LC-53	3/1/1999	267.96	Vashon
LC-53	6/1/1999	266.70	Vashon
LC-53	9/1/1999	265.71	Vashon
LC-53	12/1/1999	267.09	Vashon
LC-53	3/1/2000	267.53	Vashon
LC-53	6/1/2000	266.76	Vashon
LC-53	9/1/2000	266.34	Vashon
LC-53	12/1/2000	266.06	Vashon
LC-53	3/1/2001	265.59	Vashon
LC-53	6/1/2001	265.33	Vashon
LC-53	9/1/2001	264.88	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-53	12/1/2001	268.46	Vashon
LC-53	4/1/2002	267.58	Vashon
LC-53	6/1/2002	267.96	Vashon
LC-53	9/1/2002	266.28	Vashon
LC-53	2/3/2003	268.37	Vashon
LC-53	3/3/2003	266.60	Vashon
LC-53	7/1/2003	266.37	Vashon
LC-53	10/4/2004	265.55	Vashon
LC-53	4/11/2005	266.85	Vashon
LC-53	10/31/2005	265.48	Vashon
LC-53	3/16/2006	267.93	Vashon
LC-53	9/20/2006	265.90	Vashon
LC-53	3/20/2007	268.46	Vashon
LC-53	3/25/2008	267.37	Vashon
LC-53	10/8/2008	265.61	Vashon
LC-53	2/3/2009	266.98	Vashon
LC-53	8/3/2009	266.01	Vashon
LC-53	2/11/2010	267.43	Vashon
LC-53	8/9/2010	266.86	Vashon
LC-53	2/14/2011	267.73	Vashon
LC-53	8/10/2011	267.01	Vashon
LC-53	2/22/2012	267.75	Vashon
LC-53	8/3/2012	266.79	Vashon
LC-53	2/6/2013	267.3	Vashon
LC-53	8/8/2013	266.43	Vashon
LC-53	2/14/2014	267.03	Vashon
LC-53	9/5/2014	266.59	Vashon
LC-53	2/18/2015	267.71	Vashon
LC-53	9/10/2015	266.08	Vashon
LC-53	2/16/2016	268.97	Vashon
LC-53	8/17/2016	266.98	Vashon
LC-53	2/14/2017	268.26	Vashon
LC-53	3/30/2018	267.47	Vashon
LC- 53	3/12/2019	266.96	Vashon
LC- 53	3/12/2020	267.10	Vashon
LC- 53	3/12/2021	267.19	Vashon
LC-57	12/1/2001	269.02	Vashon
LC-57	4/1/2002	269.52	Vashon
LC-57	6/1/2002	268.49	Vashon
LC-57	9/1/2002	267.54	Vashon
LC-57	2/3/2003	267.52	Vashon
LC-57	3/3/2003	268.42	Vashon
LC-57	7/1/2003	268.22	Vashon
LC-57	10/4/2004	267.61	Vashon
LC-57	4/1/2005	268.32	Vashon
LC-57	7/29/2005	267.57	Vashon
LC-57	9/21/2005	266.95	Vashon
LC-57	3/14/2006	269.91	Vashon
LC-57	9/20/2006	267.34	Vashon
LC-57	3/22/2007	270.46	Vashon
LC-57	10/19/2007	267.49	Vashon
LC-57	4/3/2008	269.49	Vashon
LC-57	10/8/2008	267.23	Vashon
LC-57	2/3/2009	268.81	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-57	8/3/2009	267.55	Vashon
LC-57	2/11/2010	269.34	Vashon
LC-57	8/10/2010	268.82	Vashon
LC-57	2/14/2011	269.69	Vashon
LC-57	8/10/2011	268.84	Vashon
LC-57	2/22/2012	269.55	Vashon
LC-57	8/1/2012	268.82	Vashon
LC-57	2/7/2013	269.25	Vashon
LC-57	8/7/2013	268.29	Vashon
LC-57	2/18/2014	270.14	Vashon
LC-57	9/5/2014	268.43	Vashon
LC-57	2/18/2015	270.36	Vashon
LC-57	9/11/2015	267.78	Vashon
LC-57	2/16/2016	270.73	Vashon
LC-57	8/18/2016	268.37	Vashon
LC-57	2/14/2017	269.82	Vashon
LC-57	3/27/2018	269.34	Vashon
LC-57	3/11/2019	268.69	Vashon
LC-57	3/11/2020	268.98	Vashon
LC-57	3/11/2021	269.34	Vashon
LC-60a	10/7/1996	249.03	Vashon
LC-60a	1/24/1997	254.98	Vashon
LC-60a	4/23/1997	253.04	Vashon
LC-60a	7/16/1997	250.24	Vashon
LC-60a	10/16/1997	250.16	Vashon
LC-60a	1/30/1998	253.41	Vashon
LC-60a	4/2/1998	252.07	Vashon
LC-60a	7/7/1998	249.80	Vashon
LC-60a	9/22/1998	248.08	Vashon
LC-60a	12/1/1998	255.48	Vashon
LC-60a	3/1/1999	253.28	Vashon
LC-60a	6/1/1999	251.65	Vashon
LC-60a	9/1/1999	248.18	Vashon
LC-60a	12/1/1999	252.93	Vashon
LC-60a	3/1/2000	253.47	Vashon
LC-60a	6/1/2000	251.38	Vashon
LC-60a	9/1/2000	248.38	Vashon
LC-60a	12/1/2000	248.37	Vashon
LC-60a	3/1/2001	248.79	Vashon
LC-60a	6/1/2001	248.95	Vashon
LC-60a	9/1/2001	246.33	Vashon
LC-60a	12/1/2001	251.33	Vashon
LC-60a	4/1/2002	253.04	Vashon
LC-60a	6/1/2002	250.59	Vashon
LC-60a	9/1/2002	248.50	Vashon
LC-60a	2/3/2003	252.20	Vashon
LC-60a	3/3/2003	251.78	Vashon
LC-60a	7/1/2003	249.73	Vashon
LC-60a	10/4/2004	247.95	Vashon
LC-61b	12/1/2001	253.81	Vashon
LC-61b	4/1/2002	253.45	Vashon
LC-61b	6/1/2002	251.84	Vashon
LC-61b	9/1/2002	249.87	Vashon
LC-61b	2/3/2003	244.52	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-61b	3/3/2003	252.27	Vashon
LC-61b	7/1/2003	250.48	Vashon
LC-61b	10/4/2004	248.86	Vashon
LC-61b	2/11/2005	250.48	Vashon
LC-61b	3/27/2006	253.64	Vashon
LC-61b	9/25/2006	249.71	Vashon
LC-61b	3/23/2007	254.68	Vashon
LC-61b	10/5/2007	250.59	Vashon
LC-61b	3/25/2008	252.59	Vashon
LC-61b	10/8/2008	249.10	Vashon
LC-61b	2/6/2009	252.97	Vashon
LC-61b	8/6/2009	251.05	Vashon
LC-61b	2/9/2010	253.64	Vashon
LC-61b	8/13/2010	251.81	Vashon
LC-61b	2/15/2011	253.84	Vashon
LC-61b	8/9/2011	252.01	Vashon
LC-61b	2/29/2012	253.29	Vashon
LC-61b	8/1/2012	252.14	Vashon
LC-61b	2/12/2013	253.01	Vashon
LC-61b	8/8/2013	250.99	Vashon
LC-61b	2/12/2014	252.09	Vashon
LC-61b	9/9/2014	251.37	Vashon
LC-61b	2/23/2015	253.64	Vashon
LC-61b	9/9/2015	249.98	Vashon
LC-61b	2/18/2016	255.51	Vashon
LC-61b	8/18/2016	251.02	Vashon
LC-61b	2/14/2017	254.22	Vashon
LC-61b	3/30/2018	253.31	Vashon
LC- 61b	3/13/2019	253.24	Vashon
LC-62a	10/7/1996	248.27	Vashon
LC-62a	1/24/1997	253.34	Vashon
LC-62a	4/23/1997	251.58	Vashon
LC-62a	7/16/1997	249.16	Vashon
LC-62a	10/16/1997	249.20	Vashon
LC-62a	1/30/1998	251.53	Vashon
LC-62a	4/2/1998	250.47	Vashon
LC-62a	7/7/1998	248.56	Vashon
LC-62a	9/22/1998	247.23	Vashon
LC-62a	12/1/1998	253.83	Vashon
LC-62a	3/1/1999	251.78	Vashon
LC-62a	6/1/1999	250.38	Vashon
LC-62a	9/1/1999	247.28	Vashon
LC-62a	12/1/1999	251.38	Vashon
LC-62a	3/1/2000	251.93	Vashon
LC-62a	6/1/2000	250.15	Vashon
LC-62a	9/1/2000	247.63	Vashon
LC-62a	12/1/2000	247.54	Vashon
LC-62a	3/1/2001	247.86	Vashon
LC-62a	6/1/2001	248.13	Vashon
LC-62a	9/1/2001	245.98	Vashon
LC-62a	12/1/2001	250.36	Vashon
LC-62a	4/1/2002	251.47	Vashon
LC-62a	6/1/2002	249.92	Vashon
LC-62a	9/1/2002	248.78	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-62a	2/3/2003	250.89	Vashon
LC-62a	3/3/2003	250.28	Vashon
LC-62a	7/1/2003	248.61	Vashon
LC-62a	10/4/2004	247.11	Vashon
LC-64a	10/7/1996	267.50	Vashon
LC-64a	1/24/1997	271.70	Vashon
LC-64a	4/23/1997	271.13	Vashon
LC-64a	7/16/1997	269.25	Vashon
LC-64a	1/30/1998	270.55	Vashon
LC-64a	4/2/1998	269.94	Vashon
LC-64a	7/7/1998	268.34	Vashon
LC-64a	9/22/1998	266.85	Vashon
LC-64a	12/1/1998	272.01	Vashon
LC-64a	3/1/1999	270.77	Vashon
LC-64a	6/1/1999	268.72	Vashon
LC-64a	9/1/1999	266.77	Vashon
LC-64a	12/1/1999	269.43	Vashon
LC-64a	3/1/2000	270.07	Vashon
LC-64a	6/1/2000	268.68	Vashon
LC-64a	9/1/2000	267.00	Vashon
LC-64a	12/1/2000	266.48	Vashon
LC-64a	3/1/2001	266.77	Vashon
LC-64a	6/1/2001	267.39	Vashon
LC-64a	9/1/2001	265.19	Vashon
LC-64a	12/1/2001	270.56	Vashon
LC-64a	4/1/2002	270.77	Vashon
LC-64a	6/1/2002	269.18	Vashon
LC-64a	9/1/2002	267.88	Vashon
LC-64a	2/3/2003	269.58	Vashon
LC-64a	3/3/2003	268.72	Vashon
LC-64a	7/1/2003	268.29	Vashon
LC-64a	10/4/2004	265.79	Vashon
LC-64a	8/17/2005	267.70	Vashon
LC-64a	3/20/2006	271.39	Vashon
LC-64a	9/20/2006	267.75	Vashon
LC-64a	3/22/2007	271.32	Vashon
LC-64a	9/19/2007	265.86	Vashon
LC-64a	10/8/2008	263.25	Vashon
LC-64a	2/3/2009	266.87	Vashon
LC-64a	8/3/2009	268.33	Vashon
LC-64a	2/11/2010	268.90	Vashon
LC-64a	8/10/2010	266.97	Vashon
LC-64a	2/14/2011	268.75	Vashon
LC-64a	8/10/2011	268.87	Vashon
LC-64a	2/22/2012	268.35	Vashon
LC-64a	8/1/2012	267.16	Vashon
LC-64a	2/7/2013	268.13	Vashon
LC-64a	8/7/2013	266.55	Vashon
LC-64a	2/18/2014	269.75	Vashon
LC-64a	9/8/2014	266.86	Vashon
LC-64a	2/18/2015	268.99	Vashon
LC-64a	9/11/2015	265.45	Vashon
LC-64a	2/16/2016	271.00	Vashon
LC-64a	8/18/2016	266.80	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-64a	2/10/2017	269.74	Vashon
LC-64a	3/27/2018	269.11	Vashon
LC-64a	3/11/2019	268.02	Vashon
LC-64a	3/13/2020	268.04	Vashon
LC-64a	3/11/2021	268.83	Vashon
LC-64b	12/1/1998	268.76	Vashon
LC-64b	3/1/1999	267.19	Vashon
LC-64b	6/1/1999	265.49	Vashon
LC-64b	9/1/1999	263.86	Vashon
LC-64b	12/1/1999	266.48	Vashon
LC-64b	3/1/2000	267.09	Vashon
LC-64b	6/1/2000	265.86	Vashon
LC-64b	9/1/2000	264.55	Vashon
LC-64b	12/1/2000	264.29	Vashon
LC-64b	3/1/2001	264.32	Vashon
LC-64b	6/1/2001	264.69	Vashon
LC-64b	9/1/2001	263.71	Vashon
LC-64b	12/1/2001	265.88	Vashon
LC-64b	4/1/2002	267.58	Vashon
LC-64b	6/1/2002	264.80	Vashon
LC-64b	9/1/2002	263.54	Vashon
LC-64b	2/3/2003	266.97	Vashon
LC-64b	3/3/2003	266.03	Vashon
LC-64b	7/1/2003	266.92	Vashon
LC-64b	10/4/2004	264.17	Vashon
LC-64b	8/17/2005	267.32	Vashon
LC-64b	3/20/2006	270.34	Vashon
LC-64b	9/20/2006	267.39	Vashon
LC-64b	3/22/2007	270.42	Vashon
LC-64b	9/19/2007	263.95	Vashon
LC-64b	4/3/2008	266.85	Vashon
LC-64b	10/8/2008	263.31	Vashon
LC-64b	2/3/2009	267.94	Vashon
LC-64b	8/3/2009	267.83	Vashon
LC-66a	4/23/1997	257.64	Vashon
LC-66a	7/16/1997	252.34	Vashon
LC-66a	10/16/1997	252.23	Vashon
LC-66a	1/30/1998	256.10	Vashon
LC-66a	4/2/1998	254.79	Vashon
LC-66a	7/7/1998	251.92	Vashon
LC-66a	9/22/1998	249.74	Vashon
LC-66a	12/1/1998	258.43	Vashon
LC-66a	3/1/1999	256.00	Vashon
LC-66a	6/1/1999	254.17	Vashon
LC-66a	9/1/1999	249.76	Vashon
LC-66a	12/1/1999	255.73	Vashon
LC-66a	3/1/2000	256.23	Vashon
LC-66a	6/1/2000	253.84	Vashon
LC-66a	9/1/2000	250.20	Vashon
LC-66a	12/1/2000	250.22	Vashon
LC-66a	3/1/2001	250.77	Vashon
LC-66a	6/1/2001	250.89	Vashon
LC-66a	9/1/2001	250.03	Vashon
LC-66b	12/1/1998	258.58	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-66b	3/1/1999	256.16	Vashon
LC-66b	6/1/1999	254.25	Vashon
LC-66b	9/1/1999	249.77	Vashon
LC-66b	12/1/1999	255.84	Vashon
LC-66b	3/1/2000	256.36	Vashon
LC-66b	6/1/2000	253.93	Vashon
LC-66b	9/1/2000	250.20	Vashon
LC-66b	12/1/2000	250.24	Vashon
LC-66b	3/1/2001	250.77	Vashon
LC-66b	6/1/2001	250.92	Vashon
LC-66b	9/1/2001	248.17	Vashon
LC-66b	12/1/2001	256.54	Vashon
LC-66b	4/1/2002	256.29	Vashon
LC-66b	6/1/2002	255.60	Vashon
LC-66b	9/1/2002	254.20	Vashon
LC-66b	2/3/2003	256.21	Vashon
LC-66b	3/3/2003	254.76	Vashon
LC-66b	7/1/2003	252.27	Vashon
LC-66b	10/4/2004	250.09	Vashon
LC-66b	4/15/2005	252.96	Vashon
LC-66b	7/20/2005	251.70	Vashon
LC-66b	9/7/2005	249.77	Vashon
LC-66b	3/17/2006	256.15	Vashon
LC-66b	9/20/2006	251.09	Vashon
LC-66b	3/20/2007	256.75	Vashon
LC-66b	9/28/2007	251.91	Vashon
LC-66b	4/3/2008	254.54	Vashon
LC-66b	10/8/2008	249.65	Vashon
LC-66b	2/5/2009	255.28	Vashon
LC-66b	8/4/2009	252.57	Vashon
LC-66b	2/10/2010	256.12	Vashon
LC-66b	8/13/2010	253.50	Vashon
LC-66b	2/16/2011	257.92	Vashon
LC-66b	8/9/2011	253.67	Vashon
LC-66b	2/29/2012	255.18	Vashon
LC-66b	7/31/2012	253.79	Vashon
LC-66b	2/6/2013	255.03	Vashon
LC-66b	8/7/2013	252.32	Vashon
LC-66b	2/18/2014	254.82	Vashon
LC-66b	9/8/2014	252.92	Vashon
LC-66b	2/20/2015	255.73	Vashon
LC-66b	9/9/2015	251.07	Vashon
LC-66b	2/16/2016	257.81	Vashon
LC-66b	8/17/2016	252.52	Vashon
LC-66b	2/13/2017	256.18	Vashon
LC-66b	4/5/2018	255.06	Vashon
LC-66b	3/13/2019	255.01	Vashon
LC-66b	3/11/2020	255.36	Vashon
LC-66b	3/11/2021	256.22	Vashon
LC-73a	4/23/1997	257.73	Vashon
LC-73a	7/16/1997	250.75	Vashon
LC-73a	10/16/1997	250.88	Vashon
LC-73a	1/30/1998	254.40	Vashon
LC-73a	4/2/1998	252.26	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-73a	7/7/1998	249.93	Vashon
LC-73a	9/22/1998	248.40	Vashon
LC-73a	12/1/1998	257.44	Vashon
LC-73a	3/1/1999	254.86	Vashon
LC-73a	6/1/1999	252.89	Vashon
LC-73a	9/1/1999	248.27	Vashon
LC-73a	12/1/1999	254.04	Vashon
LC-73a	3/1/2000	255.24	Vashon
LC-73a	6/1/2000	252.33	Vashon
LC-73a	9/1/2000	248.79	Vashon
LC-73a	12/1/2000	249.03	Vashon
LC-73a	3/1/2001	249.06	Vashon
LC-73a	6/1/2001	249.65	Vashon
LC-73a	9/1/2001	246.74	Vashon
LC-73a	12/1/2001	254.56	Vashon
LC-73a	4/1/2002	254.07	Vashon
LC-73a	6/1/2002	253.70	Vashon
LC-73a	9/1/2002	250.82	Vashon
LC-73a	2/3/2003	253.92	Vashon
LC-73a	3/3/2003	252.16	Vashon
LC-73a	7/1/2003	249.97	Vashon
LC-73a	10/4/2004	248.26	Vashon
LR-1	10/7/1996	274.16	Vashon
LR-1	1/24/1997	277.29	Vashon
LR-1	4/23/1997	276.66	Vashon
LR-1	7/16/1997	275.62	Vashon
LR-1	10/16/1997	275.67	Vashon
LR-1	1/30/1998	277.54	Vashon
LR-1	4/2/1998	279.78	Vashon
LR-1	7/7/1998	279.48	Vashon
LR-1	9/22/1998	279.37	Vashon
LR-1	12/1/1998	279.28	Vashon
LR-1	3/1/1999	279.23	Vashon
LR-1	6/1/1999	273.88	Vashon
LR-1	9/1/1999	279.03	Vashon
LR-1	12/1/1999	279.03	Vashon
LR-1	3/1/2000	279.18	Vashon
LR-1	6/1/2000	279.45	Vashon
LR-1	9/1/2000	270.35	Vashon
LR-1	12/1/2000	268.39	Vashon
LR-1	3/1/2001	269.78	Vashon
LR-1	6/1/2001	274.21	Vashon
LR-1	9/1/2001	273.35	Vashon
LR-1	12/1/2001	277.70	Vashon
LR-1	4/1/2002	275.09	Vashon
LR-1	6/1/2002	274.45	Vashon
LR-1	9/1/2002	272.94	Vashon
LR-1	2/3/2003	275.15	Vashon
LR-1	3/3/2003	274.02	Vashon
LR-1	7/1/2003	276.33	Vashon
LR-2	10/7/1996	273.09	Vashon
LR-2	1/24/1997	278.53	Vashon
LR-2	4/23/1997	277.05	Vashon
LR-2	7/16/1997	275.00	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LR-2	10/16/1997	274.13	Vashon
LR-2	4/2/1998	273.65	Vashon
LR-2	7/7/1998	276.28	Vashon
LR-2	9/22/1998	276.13	Vashon
LR-2	12/1/1998	276.33	Vashon
LR-2	3/1/1999	276.68	Vashon
LR-2	6/1/1999	274.03	Vashon
LR-2	9/1/1999	275.88	Vashon
LR-2	12/1/1999	275.98	Vashon
LR-2	3/1/2000	275.92	Vashon
LR-2	6/1/2000	276.13	Vashon
LR-2	9/1/2000	271.22	Vashon
LR-2	12/1/2000	271.29	Vashon
LR-2	3/1/2001	271.73	Vashon
LR-2	6/1/2001	274.02	Vashon
LR-2	9/1/2001	273.21	Vashon
LR-2	12/1/2001	277.48	Vashon
LR-2	4/1/2002	275.32	Vashon
LR-2	6/1/2002	273.90	Vashon
LR-2	9/1/2002	272.14	Vashon
LR-2	2/3/2003	274.28	Vashon
LR-2	3/3/2003	273.57	Vashon
LR-2	7/1/2003	274.41	Vashon
LX-01	10/7/1996	237.03	Vashon
LX-01	1/24/1997	244.83	Vashon
LX-01	4/23/1997	241.43	Vashon
LX-01	7/16/1997	237.37	Vashon
LX-01	10/16/1997	236.61	Vashon
LX-01	1/30/1998	240.03	Vashon
LX-01	4/2/1998	238.51	Vashon
LX-01	7/7/1998	236.54	Vashon
LX-01	9/22/1998	234.16	Vashon
LX-01	12/1/1998	243.48	Vashon
LX-01	3/1/1999	240.91	Vashon
LX-01	9/1/1999	234.94	Vashon
LX-01	12/1/1999	239.88	Vashon
LX-01	3/1/2000	241.18	Vashon
LX-01	6/1/2000	238.93	Vashon
LX-01	9/1/2000	234.56	Vashon
LX-01	12/1/2000	234.76	Vashon
LX-01	3/1/2001	235.93	Vashon
LX-01	6/1/2001	236.33	Vashon
LX-01	9/1/2001	207.53	Vashon
LX-01	12/1/2001	239.76	Vashon
LX-01	4/1/2002	239.76	Vashon
LX-01	6/1/2002	238.76	Vashon
LX-01	9/1/2002	234.66	Vashon
LX-01	2/3/2003	238.86	Vashon
LX-01	3/3/2003	237.64	Vashon
LX-01	7/1/2003	236.11	Vashon
LX-01	10/4/2004	235.86	Vashon
LX-01	2/24/2005	237.16	Vashon
LX-01	9/21/2005	220.46	Vashon
LX-01	3/14/2006	238.71	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LX-02	10/7/1996	226.69	Vashon
LX-02	1/24/1997	236.49	Vashon
LX-02	4/23/1997	231.69	Vashon
LX-02	7/16/1997	229.33	Vashon
LX-02	10/16/1997	228.52	Vashon
LX-02	1/30/1998	229.50	Vashon
LX-02	4/2/1998	229.09	Vashon
LX-02	7/7/1998	226.46	Vashon
LX-02	9/22/1998	222.50	Vashon
LX-02	12/1/1998	235.14	Vashon
LX-02	3/1/1999	232.55	Vashon
LX-02	6/1/1999	230.13	Vashon
LX-02	9/1/1999	222.50	Vashon
LX-02	12/1/1999	229.62	Vashon
LX-02	3/1/2000	229.79	Vashon
LX-02	6/1/2000	228.79	Vashon
LX-02	9/1/2000	222.58	Vashon
LX-02	12/1/2000	220.92	Vashon
LX-02	3/1/2001	222.69	Vashon
LX-02	6/1/2001	222.49	Vashon
LX-02	9/1/2001	220.79	Vashon
LX-02	12/1/2001	227.55	Vashon
LX-02	4/1/2002	227.27	Vashon
LX-02	6/1/2002	225.88	Vashon
LX-02	9/1/2002	223.08	Vashon
LX-02	2/3/2003	223.98	Vashon
LX-02	3/3/2003	222.97	Vashon
LX-02	7/1/2003	221.81	Vashon
LX-02	10/4/2004	220.68	Vashon
LX-02	2/24/2005	222.08	Vashon
LX-02	9/21/2005	244.98	Vashon
LX-02	3/14/2006	228.52	Vashon
LX-02	9/29/2006	223.05	Vashon
LX-03	10/7/1996	228.44	Vashon
LX-03	1/24/1997	237.34	Vashon
LX-03	4/23/1997	234.54	Vashon
LX-03	7/16/1997	227.90	Vashon
LX-03	10/16/1997	226.95	Vashon
LX-03	1/30/1998	229.71	Vashon
LX-03	4/2/1998	228.77	Vashon
LX-03	7/7/1998	225.76	Vashon
LX-03	9/22/1998	223.69	Vashon
LX-03	12/1/1998	234.94	Vashon
LX-03	3/1/1999	231.29	Vashon
LX-03	6/1/1999	227.99	Vashon
LX-03	9/1/1999	223.71	Vashon
LX-03	12/1/1999	227.82	Vashon
LX-03	3/1/2000	229.72	Vashon
LX-03	6/1/2000	227.74	Vashon
LX-03	9/1/2000	223.26	Vashon
LX-03	12/1/2000	223.46	Vashon
LX-03	3/1/2001	225.64	Vashon
LX-03	6/1/2001	224.84	Vashon
LX-03	9/1/2001	221.94	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LX-03	12/1/2001	228.41	Vashon
LX-03	4/1/2002	227.35	Vashon
LX-03	6/1/2002	226.96	Vashon
LX-03	9/1/2002	223.86	Vashon
LX-03	2/3/2003	227.26	Vashon
LX-03	3/3/2003	223.79	Vashon
LX-03	7/1/2003	224.71	Vashon
LX-03	10/4/2004	221.78	Vashon
LX-03	2/24/2005	225.36	Vashon
LX-03	9/21/2005	223.76	Vashon
LX-03	3/14/2006	230.80	Vashon
LX-03	9/29/2006	239.69	Vashon
LX-04	10/7/1996	241.15	Vashon
LX-04	1/24/1997	247.95	Vashon
LX-04	4/23/1997	245.15	Vashon
LX-04	7/16/1997	241.03	Vashon
LX-04	10/16/1997	240.64	Vashon
LX-04	1/30/1998	243.48	Vashon
LX-04	4/2/1998	219.15	Vashon
LX-04	7/7/1998	238.05	Vashon
LX-04	9/22/1998	247.08	Vashon
LX-04	12/1/1998	245.98	Vashon
LX-04	3/1/1999	244.85	Vashon
LX-04	9/1/1999	233.97	Vashon
LX-04	12/1/1999	239.57	Vashon
LX-04	3/1/2000	238.26	Vashon
LX-04	6/1/2000	235.95	Vashon
LX-04	9/1/2000	230.96	Vashon
LX-04	12/1/2000	232.16	Vashon
LX-04	3/1/2001	234.45	Vashon
LX-04	6/1/2001	232.95	Vashon
LX-04	9/1/2001	229.05	Vashon
LX-04	12/1/2001	235.06	Vashon
LX-04	4/1/2002	233.76	Vashon
LX-04	6/1/2002	233.16	Vashon
LX-04	9/1/2002	229.36	Vashon
LX-04	2/3/2003	233.26	Vashon
LX-04	10/4/2004	224.56	Vashon
LX-04	2/24/2005	233.06	Vashon
LX-04	9/21/2005	231.46	Vashon
LX-04	3/14/2006	242.47	Vashon
LX-04	9/29/2006	234.61	Vashon
LX-05	10/7/1996	241.40	Vashon
LX-05	1/24/1997	248.60	Vashon
LX-05	4/23/1997	243.20	Vashon
LX-05	7/16/1997	229.30	Vashon
LX-05	10/16/1997	228.73	Vashon
LX-05	1/30/1998	229.45	Vashon
LX-05	4/2/1998	226.70	Vashon
LX-05	7/7/1998	226.75	Vashon
LX-05	9/22/1998	224.98	Vashon
LX-05	12/1/1998	255.69	Vashon
LX-05	3/1/1999	251.02	Vashon
LX-05	9/1/1999	232.40	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LX-05	12/1/1999	232.90	Vashon
LX-05	3/1/2000	229.29	Vashon
LX-05	6/1/2000	230.20	Vashon
LX-05	9/1/2000	226.69	Vashon
LX-05	12/1/2000	226.49	Vashon
LX-05	3/1/2001	228.00	Vashon
LX-05	6/1/2001	226.80	Vashon
LX-05	9/1/2001	226.80	Vashon
LX-05	12/1/2001	226.99	Vashon
LX-05	4/1/2002	226.56	Vashon
LX-05	6/1/2002	226.79	Vashon
LX-05	9/1/2002	227.09	Vashon
LX-05	2/3/2003	226.99	Vashon
LX-05	7/1/2003	250.90	Vashon
LX-05	10/4/2004	231.09	Vashon
LX-05	2/24/2005	230.59	Vashon
LX-05	9/21/2005	231.49	Vashon
LX-05	3/14/2006	253.57	Vashon
LX-05	9/29/2006	248.21	Vashon
LX-06	10/7/1996	240.63	Vashon
LX-06	1/24/1997	248.43	Vashon
LX-06	4/23/1997	245.73	Vashon
LX-06	7/16/1997	241.73	Vashon
LX-06	10/16/1997	241.20	Vashon
LX-06	1/30/1998	244.31	Vashon
LX-06	4/2/1998	219.13	Vashon
LX-06	7/7/1998	240.75	Vashon
LX-06	9/22/1998	238.89	Vashon
LX-06	12/1/1998	247.93	Vashon
LX-06	3/1/1999	245.71	Vashon
LX-06	6/1/1999	243.23	Vashon
LX-06	9/1/1999	239.03	Vashon
LX-06	12/1/1999	243.21	Vashon
LX-06	3/1/2000	243.32	Vashon
LX-06	6/1/2000	241.43	Vashon
LX-06	9/1/2000	237.77	Vashon
LX-06	12/1/2000	231.43	Vashon
LX-06	12/1/2000	237.26	Vashon
LX-06	3/1/2001	239.93	Vashon
LX-06	6/1/2001	239.83	Vashon
LX-06	9/1/2001	237.13	Vashon
LX-06	12/1/2001	248.68	Vashon
LX-06	6/1/2002	250.97	Vashon
LX-06	9/1/2002	247.77	Vashon
LX-06	2/3/2003	251.07	Vashon
LX-06	3/3/2003	247.98	Vashon
LX-06	7/1/2003	246.76	Vashon
LX-06	10/4/2004	244.07	Vashon
LX-06	2/24/2005	245.67	Vashon
LX-06	9/21/2005	243.87	Vashon
LX-06	3/14/2006	250.87	Vashon
LX-06	9/29/2006	245.75	Vashon
LX-07	10/7/1996	236.54	Vashon
LX-07	1/24/1997	244.24	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LX-07	4/23/1997	241.34	Vashon
LX-07	7/16/1997	237.09	Vashon
LX-07	10/16/1997	236.15	Vashon
LX-07	1/30/1998	238.71	Vashon
LX-07	4/2/1998	230.07	Vashon
LX-07	7/7/1998	233.32	Vashon
LX-07	9/22/1998	232.60	Vashon
LX-07	12/1/1998	240.89	Vashon
LX-07	3/1/1999	238.29	Vashon
LX-07	6/1/1999	235.24	Vashon
LX-07	9/1/1999	232.62	Vashon
LX-07	12/1/1999	234.50	Vashon
LX-07	3/1/2000	234.10	Vashon
LX-07	6/1/2000	232.44	Vashon
LX-07	9/1/2000	231.53	Vashon
LX-07	3/1/2001	231.94	Vashon
LX-07	6/1/2001	232.04	Vashon
LX-07	9/1/2001	231.54	Vashon
LX-07	12/1/2001	234.02	Vashon
LX-07	4/1/2002	233.54	Vashon
LX-07	6/1/2002	232.33	Vashon
LX-07	9/1/2002	231.83	Vashon
LX-07	2/3/2003	232.43	Vashon
LX-07	3/3/2003	230.41	Vashon
LX-07	7/1/2003	232.07	Vashon
LX-07	10/4/2004	230.73	Vashon
LX-07	2/24/2005	232.03	Vashon
LX-07	9/21/2005	231.53	Vashon
LX-07	3/14/2006	235.54	Vashon
LX-07	9/29/2006	230.93	Vashon
LX-08	10/7/1996	235.56	Vashon
LX-08	1/24/1997	241.56	Vashon
LX-08	4/23/1997	238.06	Vashon
LX-08	7/16/1997	232.65	Vashon
LX-08	10/16/1997	230.76	Vashon
LX-08	1/30/1998	232.81	Vashon
LX-08	4/2/1998	226.21	Vashon
LX-08	7/7/1998	228.40	Vashon
LX-08	9/22/1998	226.79	Vashon
LX-08	12/1/1998	233.34	Vashon
LX-08	3/1/1999	230.89	Vashon
LX-08	6/1/1999	227.24	Vashon
LX-08	9/1/1999	222.70	Vashon
LX-08	12/1/1999	224.21	Vashon
LX-08	3/1/2000	226.87	Vashon
LX-08	6/1/2000	226.96	Vashon
LX-08	9/1/2000	248.81	Vashon
LX-08	12/1/2000	226.11	Vashon
LX-08	3/1/2001	227.26	Vashon
LX-08	6/1/2001	226.46	Vashon
LX-08	9/1/2001	225.36	Vashon
LX-08	12/1/2001	224.52	Vashon
LX-08	4/1/2002	224.61	Vashon
LX-08	6/1/2002	224.61	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LX-08	9/1/2002	224.61	Vashon
LX-08	2/3/2003	224.61	Vashon
LX-08	3/3/2003	229.73	Vashon
LX-08	7/1/2003	228.31	Vashon
LX-08	2/24/2005	229.11	Vashon
LX-08	9/21/2005	228.21	Vashon
LX-08	3/14/2006	238.55	Vashon
LX-09	10/7/1996	238.34	Vashon
LX-09	1/24/1997	245.84	Vashon
LX-09	4/23/1997	243.74	Vashon
LX-09	7/16/1997	239.87	Vashon
LX-09	10/16/1997	239.39	Vashon
LX-09	1/30/1998	242.02	Vashon
LX-09	4/2/1998	228.34	Vashon
LX-09	7/7/1998	237.64	Vashon
LX-09	9/22/1998	234.82	Vashon
LX-09	12/1/1998	244.09	Vashon
LX-09	3/1/1999	241.79	Vashon
LX-09	6/1/1999	239.46	Vashon
LX-09	9/1/1999	235.00	Vashon
LX-09	12/1/1999	238.84	Vashon
LX-09	3/1/2000	238.94	Vashon
LX-09	6/1/2000	237.14	Vashon
LX-09	9/1/2000	232.14	Vashon
LX-09	12/1/2000	232.24	Vashon
LX-09	3/1/2001	235.44	Vashon
LX-09	6/1/2001	234.64	Vashon
LX-09	9/1/2001	232.04	Vashon
LX-09	12/1/2001	237.69	Vashon
LX-09	4/1/2002	237.52	Vashon
LX-09	6/1/2002	236.24	Vashon
LX-09	9/1/2002	233.34	Vashon
LX-09	2/3/2003	236.14	Vashon
LX-09	3/3/2003	236.14	Vashon
LX-09	7/1/2003	234.40	Vashon
LX-09	10/4/2004	233.99	Vashon
LX-09	2/24/2005	233.64	Vashon
LX-09	9/21/2005	230.84	Vashon
LX-09	3/14/2006	235.80	Vashon
LX-09	9/29/2006	230.44	Vashon
LX-10	10/7/1996	245.34	Vashon
LX-10	1/24/1997	253.04	Vashon
LX-10	4/23/1997	250.24	Vashon
LX-10	7/16/1997	247.28	Vashon
LX-10	10/16/1997	247.05	Vashon
LX-10	1/30/1998	250.54	Vashon
LX-10	4/2/1998	224.88	Vashon
LX-10	7/7/1998	246.51	Vashon
LX-10	9/22/1998	243.75	Vashon
LX-10	12/1/1998	252.92	Vashon
LX-10	3/1/1999	250.53	Vashon
LX-10	6/1/1999	248.44	Vashon
LX-10	9/1/1999	243.46	Vashon
LX-10	12/1/1999	248.14	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LX-10	3/1/2000	246.43	Vashon
LX-10	6/1/2000	244.24	Vashon
LX-10	9/1/2000	240.55	Vashon
LX-10	12/1/2000	239.55	Vashon
LX-10	3/1/2001	242.74	Vashon
LX-10	6/1/2001	240.64	Vashon
LX-10	9/1/2001	237.14	Vashon
LX-10	12/1/2001	244.53	Vashon
LX-10	4/1/2002	243.85	Vashon
LX-10	6/1/2002	241.05	Vashon
LX-10	9/1/2002	238.15	Vashon
LX-10	2/3/2003	242.75	Vashon
LX-10	3/3/2003	242.07	Vashon
LX-10	7/1/2003	241.01	Vashon
LX-10	10/4/2004	237.75	Vashon
LX-10	2/24/2005	240.55	Vashon
LX-10	9/21/2005	237.65	Vashon
LX-10	3/14/2006	252.75	Vashon
LX-10	9/29/2006	246.60	Vashon
LX-11	10/7/1996	235.41	Vashon
LX-11	1/24/1997	243.11	Vashon
LX-11	4/23/1997	238.81	Vashon
LX-11	7/16/1997	235.81	Vashon
LX-11	10/16/1997	235.43	Vashon
LX-11	1/30/1998	238.32	Vashon
LX-11	4/2/1998	237.03	Vashon
LX-11	7/7/1998	233.39	Vashon
LX-11	12/1/1998	238.71	Vashon
LX-11	3/1/1999	235.83	Vashon
LX-11	6/1/1999	233.55	Vashon
LX-11	9/1/1999	230.00	Vashon
LX-11	12/1/1999	233.61	Vashon
LX-11	3/1/2000	232.42	Vashon
LX-11	6/1/2000	230.41	Vashon
LX-11	9/1/2000	226.00	Vashon
LX-11	12/1/2000	226.80	Vashon
LX-11	3/1/2001	230.71	Vashon
LX-11	6/1/2001	229.11	Vashon
LX-11	9/1/2001	225.81	Vashon
LX-11	12/1/2001	230.17	Vashon
LX-11	4/1/2002	228.89	Vashon
LX-11	6/1/2002	228.10	Vashon
LX-11	9/1/2002	224.70	Vashon
LX-11	2/3/2003	226.30	Vashon
LX-11	3/3/2003	226.23	Vashon
LX-11	7/1/2003	225.30	Vashon
LX-11	10/4/2004	222.38	Vashon
LX-11	2/24/2005	250.50	Vashon
LX-11	9/21/2005	248.20	Vashon
LX-11	3/14/2006	254.50	Vashon
LX-11	9/29/2006	249.25	Vashon
LX-12	10/7/1996	244.92	Vashon
LX-12	1/24/1997	251.82	Vashon
LX-12	4/23/1997	249.72	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LX-12	7/16/1997	246.20	Vashon
LX-12	10/16/1997	245.95	Vashon
LX-12	1/30/1998	249.80	Vashon
LX-12	4/2/1998	248.44	Vashon
LX-12	7/7/1998	245.75	Vashon
LX-12	9/22/1998	243.44	Vashon
LX-12	12/1/1998	252.20	Vashon
LX-12	3/1/1999	249.96	Vashon
LX-12	6/1/1999	247.96	Vashon
LX-12	9/1/1999	243.87	Vashon
LX-12	12/1/1999	249.06	Vashon
LX-12	3/1/2000	249.31	Vashon
LX-12	6/1/2000	246.82	Vashon
LX-12	9/1/2000	242.97	Vashon
LX-12	12/1/2000	242.97	Vashon
LX-12	3/1/2001	244.62	Vashon
LX-12	6/1/2001	244.42	Vashon
LX-12	9/1/2001	241.62	Vashon
LX-12	12/1/2001	247.33	Vashon
LX-12	4/1/2002	247.07	Vashon
LX-12	6/1/2002	245.27	Vashon
LX-12	9/1/2002	243.57	Vashon
LX-12	2/3/2003	245.97	Vashon
LX-12	3/3/2003	243.31	Vashon
LX-12	7/1/2003	241.41	Vashon
LX-12	10/4/2004	247.94	Vashon
LX-12	2/24/2005	240.47	Vashon
LX-12	9/21/2005	238.17	Vashon
LX-12	3/14/2006	244.91	Vashon
LX-12	9/29/2006	239.02	Vashon
LX-13	10/7/1996	224.25	Vashon
LX-13	1/24/1997	234.15	Vashon
LX-13	4/23/1997	235.75	Vashon
LX-13	7/16/1997	240.05	Vashon
LX-13	10/16/1997	250.01	Vashon
LX-13	4/2/1998	252.07	Vashon
LX-13	7/7/1998	214.25	Vashon
LX-13	9/22/1998	213.27	Vashon
LX-13	12/1/1998	225.23	Vashon
LX-13	3/1/1999	224.00	Vashon
LX-13	6/1/1999	252.31	Vashon
LX-13	9/1/1999	248.00	Vashon
LX-13	12/1/1999	253.83	Vashon
LX-13	6/1/2000	203.25	Vashon
LX-13	9/1/2000	240.76	Vashon
LX-13	9/1/2000	204.61	Vashon
LX-13	12/1/2000	214.92	Vashon
LX-13	12/1/2000	241.25	Vashon
LX-13	3/1/2001	206.75	Vashon
LX-13	6/1/2001	206.85	Vashon
LX-13	9/1/2001	207.25	Vashon
LX-13	12/1/2001	228.29	Vashon
LX-13	6/1/2002	206.01	Vashon
LX-13	9/1/2002	207.11	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LX-13	2/3/2003	211.01	Vashon
LX-13	3/3/2003	218.08	Vashon
LX-13	7/1/2003	222.77	Vashon
LX-13	10/4/2004	212.11	Vashon
LX-13	2/24/2005	214.61	Vashon
LX-13	9/21/2005	215.71	Vashon
LX-13	3/14/2006	220.66	Vashon
LX-14	10/7/1996	241.02	Vashon
LX-14	1/24/1997	246.72	Vashon
LX-14	4/23/1997	244.22	Vashon
LX-14	7/16/1997	240.35	Vashon
LX-14	10/16/1997	239.36	Vashon
LX-14	1/30/1998	239.99	Vashon
LX-14	4/2/1998	236.42	Vashon
LX-14	7/7/1998	229.10	Vashon
LX-14	6/1/1999	228.08	Vashon
LX-14	9/1/1999	227.30	Vashon
LX-14	12/1/1999	232.78	Vashon
LX-14	3/1/2000	232.62	Vashon
LX-14	6/1/2000	230.72	Vashon
LX-14	9/1/2000	228.26	Vashon
LX-14	12/1/2000	229.36	Vashon
LX-14	3/1/2001	230.22	Vashon
LX-14	6/1/2001	227.52	Vashon
LX-14	9/1/2001	226.22	Vashon
LX-14	12/1/2001	230.94	Vashon
LX-14	4/1/2002	226.27	Vashon
LX-14	6/1/2002	227.06	Vashon
LX-14	9/1/2002	225.36	Vashon
LX-14	2/3/2003	239.86	Vashon
LX-14	3/3/2003	236.34	Vashon
LX-14	7/1/2003	227.46	Vashon
LX-14	10/4/2004	230.66	Vashon
LX-14	2/24/2005	255.06	Vashon
LX-14	9/21/2005	249.16	Vashon
LX-14	3/14/2006	255.06	Vashon
LX-14	9/29/2006	249.86	Vashon
LX-15	10/7/1996	246.83	Vashon
LX-15	1/24/1997	253.63	Vashon
LX-15	4/23/1997	251.43	Vashon
LX-15	7/16/1997	247.63	Vashon
LX-15	10/16/1997	247.35	Vashon
LX-15	1/30/1998	251.17	Vashon
LX-15	4/2/1998	249.86	Vashon
LX-15	7/7/1998	247.01	Vashon
LX-15	9/22/1998	244.65	Vashon
LX-15	12/1/1998	253.03	Vashon
LX-15	3/1/1999	251.03	Vashon
LX-15	6/1/1999	248.81	Vashon
LX-15	9/1/1999	244.76	Vashon
LX-15	12/1/1999	249.55	Vashon
LX-15	3/1/2000	249.61	Vashon
LX-15	6/1/2000	246.73	Vashon
LX-15	9/1/2000	241.48	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LX-15	12/1/2000	241.48	Vashon
LX-15	3/1/2001	243.33	Vashon
LX-15	6/1/2001	243.03	Vashon
LX-15	9/1/2001	240.03	Vashon
LX-15	12/1/2001	246.25	Vashon
LX-15	4/1/2002	243.25	Vashon
LX-15	6/1/2002	243.08	Vashon
LX-15	9/1/2002	236.98	Vashon
LX-15	2/3/2003	223.48	Vashon
LX-15	3/3/2003	241.88	Vashon
LX-15	7/1/2003	236.09	Vashon
LX-15	10/4/2004	222.79	Vashon
LX-15	2/24/2005	226.48	Vashon
LX-15	9/21/2005	227.78	Vashon
LX-15	9/29/2006	222.63	Vashon
LX-16	10/7/1996	272.48	Vashon
LX-16	1/24/1997	277.38	Vashon
LX-16	4/23/1997	277.28	Vashon
LX-16	7/16/1997	262.19	Vashon
LX-16	10/16/1997	262.35	Vashon
LX-16	1/30/1998	265.53	Vashon
LX-16	4/2/1998	256.46	Vashon
LX-16	7/7/1998	262.20	Vashon
LX-16	9/22/1998	263.65	Vashon
LX-16	12/1/1998	269.45	Vashon
LX-16	3/1/1999	267.38	Vashon
LX-16	6/1/1999	265.38	Vashon
LX-16	9/1/1999	263.80	Vashon
LX-16	12/1/1999	269.38	Vashon
LX-16	3/1/2000	266.00	Vashon
LX-16	6/1/2000	267.48	Vashon
LX-16	9/1/2000	264.18	Vashon
LX-16	12/1/2000	265.33	Vashon
LX-16	3/1/2001	266.68	Vashon
LX-16	6/1/2001	264.58	Vashon
LX-16	9/1/2001	262.58	Vashon
LX-16	12/1/2001	265.21	Vashon
LX-16	4/1/2002	263.23	Vashon
LX-16	6/1/2002	263.43	Vashon
LX-16	9/1/2002	262.53	Vashon
LX-16	2/3/2003	265.23	Vashon
LX-16	3/3/2003	261.32	Vashon
LX-16	7/1/2003	262.92	Vashon
LX-16	10/4/2004	259.06	Vashon
LX-16	4/1/2005	263.90	Vashon
LX-16	9/21/2005	260.43	Vashon
LX-17	10/7/1996	250.64	Vashon
LX-17	1/24/1997	253.44	Vashon
LX-17	4/23/1997	252.34	Vashon
LX-17	7/16/1997	250.90	Vashon
LX-17	10/16/1997	250.59	Vashon
LX-17	1/30/1998	250.97	Vashon
LX-17	4/2/1998	248.35	Vashon
LX-17	12/1/1998	251.04	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LX-17	3/1/1999	250.86	Vashon
LX-17	6/1/1999	250.58	Vashon
LX-17	9/1/1999	250.11	Vashon
LX-17	12/1/1999	250.38	Vashon
LX-17	3/1/2000	250.37	Vashon
LX-17	6/1/2000	249.24	Vashon
LX-17	9/1/2000	248.52	Vashon
LX-17	12/1/2000	248.45	Vashon
LX-17	3/1/2001	249.14	Vashon
LX-17	6/1/2001	249.54	Vashon
LX-17	9/1/2001	249.34	Vashon
LX-17	12/1/2001	249.25	Vashon
LX-17	4/1/2002	249.85	Vashon
LX-17	6/1/2002	249.25	Vashon
LX-17	9/1/2002	248.75	Vashon
LX-17	2/3/2003	249.15	Vashon
LX-17	7/1/2003	253.58	Vashon
LX-17	10/4/2004	249.75	Vashon
LX-17	4/1/2005	268.43	Vashon
LX-17	9/21/2005	266.55	Vashon
LX-18	10/7/1996	261.21	Vashon
LX-18	1/24/1997	265.31	Vashon
LX-18	4/23/1997	264.51	Vashon
LX-18	7/16/1997	262.34	Vashon
LX-18	10/16/1997	261.90	Vashon
LX-18	1/30/1998	264.81	Vashon
LX-18	4/2/1998	255.35	Vashon
LX-18	7/7/1998	261.79	Vashon
LX-18	9/22/1998	259.96	Vashon
LX-18	12/1/1998	265.71	Vashon
LX-18	3/1/1999	264.68	Vashon
LX-18	6/1/1999	262.88	Vashon
LX-18	9/1/1999	260.09	Vashon
LX-18	12/1/1999	262.11	Vashon
LX-18	3/1/2000	262.27	Vashon
LX-18	6/1/2000	260.21	Vashon
LX-18	9/1/2000	257.28	Vashon
LX-18	12/1/2000	257.28	Vashon
LX-18	3/1/2001	258.21	Vashon
LX-18	6/1/2001	259.51	Vashon
LX-18	9/1/2001	257.91	Vashon
LX-18	12/1/2001	260.36	Vashon
LX-18	6/1/2002	261.98	Vashon
LX-18	9/1/2002	260.58	Vashon
LX-18	2/3/2003	261.38	Vashon
LX-18	3/3/2003	262.45	Vashon
LX-18	7/1/2003	261.71	Vashon
LX-18	4/1/2005	268.87	Vashon
LX-18	9/21/2005	267.08	Vashon
LX-19	10/7/1996	250.12	Vashon
LX-19	1/24/1997	254.52	Vashon
LX-19	4/23/1997	253.82	Vashon
LX-19	7/16/1997	259.72	Vashon
LX-19	10/16/1997	259.54	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LX-19	1/30/1998	261.76	Vashon
LX-19	4/2/1998	236.68	Vashon
LX-19	7/7/1998	259.20	Vashon
LX-19	9/22/1998	257.75	Vashon
LX-19	12/1/1998	262.92	Vashon
LX-19	3/1/1999	261.48	Vashon
LX-19	6/1/1999	259.95	Vashon
LX-19	9/1/1999	257.87	Vashon
LX-19	12/1/1999	259.86	Vashon
LX-19	3/1/2000	260.57	Vashon
LX-19	6/1/2000	260.32	Vashon
LX-19	9/1/2000	257.81	Vashon
LX-19	12/1/2000	260.36	Vashon
LX-19	3/1/2001	262.52	Vashon
LX-19	6/1/2001	262.82	Vashon
LX-19	9/1/2001	261.72	Vashon
LX-19	12/1/2001	263.82	Vashon
LX-19	4/1/2002	260.19	Vashon
LX-19	6/1/2002	262.96	Vashon
LX-19	9/1/2002	261.76	Vashon
LX-19	2/3/2003	263.56	Vashon
LX-19	3/3/2003	258.64	Vashon
LX-19	7/1/2003	259.72	Vashon
LX-19	10/4/2004	256.78	Vashon
LX-19	4/1/2005	267.95	Vashon
LX-19	9/21/2005	266.36	Vashon
LX-21	10/7/1996	246.83	Vashon
LX-21	1/24/1997	252.73	Vashon
LX-21	4/23/1997	251.03	Vashon
LX-21	7/16/1997	249.74	Vashon
LX-21	10/16/1997	248.97	Vashon
LX-21	1/30/1998	252.42	Vashon
LX-21	4/2/1998	238.37	Vashon
LX-21	7/7/1998	245.89	Vashon
LX-21	9/22/1998	242.98	Vashon
LX-21	12/1/1998	251.06	Vashon
LX-21	3/1/1999	247.32	Vashon
LX-21	6/1/1999	246.74	Vashon
LX-21	9/1/1999	239.78	Vashon
LX-21	12/1/1999	243.53	Vashon
LX-21	3/1/2000	243.99	Vashon
LX-21	6/1/2000	240.53	Vashon
LX-21	9/1/2000	235.99	Vashon
LX-21	12/1/2000	236.00	Vashon
LX-21	3/1/2001	240.83	Vashon
LX-21	6/1/2001	241.63	Vashon
LX-21	9/1/2001	240.23	Vashon
LX-21	12/1/2001	240.28	Vashon
LX-21	4/1/2002	241.92	Vashon
LX-21	6/1/2002	238.90	Vashon
LX-21	9/1/2002	236.20	Vashon
LX-21	2/3/2003	240.70	Vashon
LX-21	3/3/2003	242.46	Vashon
LX-21	7/1/2003	266.33	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LX-21	10/4/2004	240.56	Vashon
LX-21	4/1/2005	268.03	Vashon
LX-21	9/21/2005	268.20	Vashon
MAMC-1	4/1/2002	235.59	Vashon
MAMC-1	6/1/2002	237.59	Vashon
MAMC-1	2/3/2003	236.59	Vashon
MAMC-1	3/3/2003	231.59	Vashon
MAMC-1	7/1/2003	215.59	Vashon
MAMC-1	10/4/2004	222.59	Vashon
MAMC-7	4/1/2002	248.49	Vashon
MAMC-7	6/1/2002	251.49	Vashon
MAMC-7	9/1/2002	252.49	Vashon
MAMC-7	2/3/2003	252.49	Vashon
MAMC-7	3/3/2003	256.49	Vashon
MAMC-7	10/4/2004	244.49	Vashon
MT-1	4/2/2006	267.61	Vashon
MT-1	9/20/2006	265.23	Vashon
MT-1	3/20/2007	267.50	Vashon
MT-1	9/28/2007	263.80	Vashon
MT-1	3/25/2008	265.76	Vashon
MT-1	10/8/2008	263.47	Vashon
MT-1	2/3/2009	265.61	Vashon
MT-1	8/3/2009	265.35	Vashon
MT-1	2/11/2010	265.86	Vashon
MT-1	6/3/2010	265.81	Vashon
MT-1	8/9/2010	265.02	Vashon
MT-1	2/14/2011	266.01	Vashon
MT-1	8/10/2011	265.78	Vashon
MT-1	2/22/2012	266.09	Vashon
MT-1	7/31/2012	265.19	Vashon
MT-1	2/6/2013	265.685	Vashon
MT-1	8/8/2013	264.705	Vashon
MT-1	2/14/2014	265.86	Vashon
MT-1	9/3/2014	265.37	Vashon
MT-1	2/18/2015	266.06	Vashon
MT-1	9/9/2015	264.14	Vashon
MT-1	2/16/2016	267.85	Vashon
MT-1	8/15/2016	265.04	Vashon
MT-1	2/13/2017	266.81	Vashon
MT-1	8/7/2017	265.43	Vashon
MT-1	3/28/2018	266.06	Vashon
MT-1	9/12/2018	264.94	Vashon
MT-1	3/11/2019	265.71	Vashon
MT-1	9/5/2019	264.07	Vashon
MT-1	3/10/2020	265.78	Vashon
MT-1	9/1/2020	264.35	Vashon
MT-1	3/10/2021	266.06	Vashon
MT-1	9/1/2021	264.64	Vashon
MT-2	4/2/2006	270.71	Vashon
MT-2	9/20/2006	267.61	Vashon
MT-2	3/21/2007	270.61	Vashon
MT-2	9/28/2007	265.39	Vashon
MT-2	3/25/2008	268.37	Vashon
MT-2	10/8/2008	264.82	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
MT-2	2/3/2009	268.11	Vashon
MT-2	8/3/2009	267.85	Vashon
MT-2	2/11/2010	268.74	Vashon
MT-2	6/3/2010	268.73	Vashon
MT-2	8/9/2010	267.52	Vashon
MT-2	2/16/2011	269.11	Vashon
MT-2	8/10/2011	268.67	Vashon
MT-2	2/22/2012	268.84	Vashon
MT-2	7/31/2012	267.70	Vashon
MT-2	2/5/2013	268.555	Vashon
MT-2	8/7/2013	267.035	Vashon
MT-2	2/18/2014	270.14	Vashon
MT-2	9/3/2014	267.66	Vashon
MT-2	2/18/2015	269.29	Vashon
MT-2	9/9/2015	265.98	Vashon
MT-2	2/19/2016	270.69	Vashon
MT-2	8/15/2016	267.47	Vashon
MT-2	2/15/2017	269.71	Vashon
MT-2	8/7/2017	268.18	Vashon
MT-2	3/27/2018	269.16	Vashon
MT-2	9/12/2018	267.09	Vashon
MT-2	3/11/2019	268.34	Vashon
MT-2	9/5/2019	265.62	Vashon
MT-2	3/10/2020	268.54	Vashon
MT-2	8/31/2020	266.02	Vashon
MT-2	3/10/2021	269.42	Vashon
MT-2	9/1/2021	266.96	Vashon
MT-3	4/2/2006	270.94	Vashon
MT-3	9/20/2006	267.77	Vashon
MT-3	3/22/2007	270.84	Vashon
MT-3	9/28/2007	267.29	Vashon
MT-3	4/3/2008	269.44	Vashon
MT-3	10/8/2008	266.81	Vashon
MT-3	2/3/2009	269.06	Vashon
MT-3	8/3/2009	268.14	Vashon
MT-3	2/11/2010	269.59	Vashon
MT-3	6/3/2010	269.58	Vashon
MT-3	8/10/2010	268.64	Vashon
MT-3	2/14/2011	269.74	Vashon
MT-3	8/10/2011	269.14	Vashon
MT-3	2/22/2012	269.64	Vashon
MT-3	7/31/2012	268.74	Vashon
MT-3	2/7/2013	269.358	Vashon
MT-3	8/7/2013	268.218	Vashon
MT-3	2/18/2014	270.54	Vashon
MT-3	9/3/2014	268.43	Vashon
MT-3	2/18/2015	269.79	Vashon
MT-3	9/9/2015	267.54	Vashon
MT-3	2/16/2016	271.20	Vashon
MT-3	8/15/2016	268.40	Vashon
MT-3	2/14/2017	270.23	Vashon
MT-3	8/8/2017	268.93	Vashon
MT-3	3/27/2018	269.71	Vashon
MT-3	9/12/2018	267.39	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
MT-3	3/11/2019	268.96	Vashon
MT-3	9/5/2019	266.94	Vashon
MT-3	3/10/2020	269.27	Vashon
MT-3	8/31/2020	267.32	Vashon
MT-3	3/10/2021	269.79	Vashon
MT-3	9/1/2021	267.62	Vashon
MT-4	4/2/2006	270.90	Vashon
MT-4	9/20/2006	267.55	Vashon
MT-4	3/22/2007	270.78	Vashon
MT-4	9/28/2007	267.98	Vashon
MT-4	4/3/2008	269.73	Vashon
MT-4	10/8/2008	267.42	Vashon
MT-4	2/3/2009	269.07	Vashon
MT-4	8/3/2009	267.79	Vashon
MT-4	2/11/2010	269.62	Vashon
MT-4	6/3/2010	269.81	Vashon
MT-4	8/10/2010	269.01	Vashon
MT-4	2/14/2011	269.92	Vashon
MT-4	8/10/2011	269.10	Vashon
MT-4	2/22/2012	269.82	Vashon
MT-4	7/31/2012	269.02	Vashon
MT-4	2/7/2013	269.528	Vashon
MT-4	8/7/2013	268.548	Vashon
MT-4	2/18/2014	270.37	Vashon
MT-4	9/3/2014	268.67	Vashon
MT-4	2/18/2015	269.80	Vashon
MT-4	9/9/2015	268.01	Vashon
MT-4	2/16/2016	271.14	Vashon
MT-4	8/15/2016	268.62	Vashon
MT-4	2/14/2017	270.16	Vashon
MT-4	8/8/2017	269.05	Vashon
MT-4	3/27/2018	269.66	Vashon
MT-4	9/12/2018	267.67	Vashon
MT-4	3/11/2019	268.97	Vashon
MT-4	9/5/2019	267.41	Vashon
MT-4	3/10/2020	269.24	Vashon
MT-4	8/31/2020	267.73	Vashon
MT-4	3/10/2021	269.65	Vashon
MT-4	9/1/2021	267.70	Vashon
MT-5	4/2/2006	270.71	Vashon
MT-5	9/20/2006	267.57	Vashon
MT-5	3/22/2007	270.59	Vashon
MT-5	9/28/2007	263.51	Vashon
MT-5	4/3/2008	267.61	Vashon
MT-5	2/3/2009	267.07	Vashon
MT-5	8/3/2009	267.46	Vashon
MT-5	2/11/2010	267.86	Vashon
MT-5	8/10/2010	266.17	Vashon
MT-5	2/14/2011	268.16	Vashon
MT-5	8/10/2011	268.21	Vashon
MT-5	2/22/2012	267.88	Vashon
MT-5	7/31/2012	266.57	Vashon
MT-5	2/7/2013	267.618	Vashon
MT-5	8/7/2013	265.658	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
MT-5	2/18/2014	269.71	Vashon
MT-5	9/5/2014	266.70	Vashon
MT-5	2/18/2015	268.31	Vashon
MT-5	9/11/2015	263.96	Vashon
MT-6	4/2/2006	270.80	Vashon
MT-6	9/20/2006	267.89	Vashon
MT-6	3/22/2007	270.67	Vashon
MT-6	9/28/2007	266.08	Vashon
MT-6	4/3/2008	268.62	Vashon
MT-6	2/3/2009	268.82	Vashon
MT-6	2/11/2010	269.34	Vashon
MT-6	8/10/2010	267.78	Vashon
MT-6	2/14/2011	269.09	Vashon
MT-6	8/10/2011	268.62	Vashon
MT-6	2/22/2012	268.95	Vashon
MT-6	7/31/2012	267.96	Vashon
MT-6	2/7/2013	268.768	Vashon
MT-6	8/7/2013	267.608	Vashon
MT-6	2/18/2014	270.44	Vashon
MT-6	9/5/2014	267.94	Vashon
MT-6	2/18/2015	269.53	Vashon
MT-6	9/11/2015	266.83	Vashon
NAPL1-E07	8/30/2011	269.12	Vashon
NAPL1-L07	8/30/2011	269.07	Vashon
NAPL2-F12	8/30/2011	269.78	Vashon
NAPL2-G15	8/30/2011	269.61	Vashon
NAPL2-L15	8/30/2011	270.06	Vashon
RW-1	1/24/1997	277.05	Vashon
RW-1	4/23/1997	277.05	Vashon
RW-1	7/16/1997	252.27	Vashon
RW-1	10/16/1997	254.73	Vashon
RW-1	1/30/1998	259.40	Vashon
RW-1	4/2/1998	250.63	Vashon
RW-1	7/7/1998	256.98	Vashon
RW-1	9/22/1998	261.78	Vashon
RW-1	12/1/1998	268.21	Vashon
RW-1	3/1/1999	266.10	Vashon
RW-1	6/1/1999	263.80	Vashon
RW-1	9/1/1999	261.98	Vashon
RW-1	12/1/1999	265.13	Vashon
RW-1	3/1/2000	265.83	Vashon
RW-1	6/1/2000	263.35	Vashon
RW-1	9/1/2000	262.49	Vashon
RW-1	12/1/2000	250.46	Vashon
RW-1	3/1/2001	262.95	Vashon
RW-1	6/1/2001	256.95	Vashon
RW-1	9/1/2001	255.85	Vashon
RW-1	12/1/2001	257.22	Vashon
RW-1	4/1/2002	256.23	Vashon
RW-1	6/1/2002	255.53	Vashon
RW-1	9/1/2002	255.53	Vashon
RW-1	2/3/2003	255.53	Vashon
RW-1	3/3/2003	253.85	Vashon
RW-1	7/1/2003	262.42	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
RW-1	10/4/2004	250.73	Vashon
RW-1	4/1/2005	263.44	Vashon
RW-1	9/21/2005	252.83	Vashon
SRCMW-02	2/28/2006	215.37	Vashon
SRCMW-02	2/4/2009	213.97	Vashon
SRCMW-02	8/6/2009	212.15	Vashon
SRCMW-02	2/8/2010	214.67	Vashon
SRCMW-02	8/17/2010	212.74	Vashon
SRCMW-02	2/15/2011	215.22	Vashon
SRCMW-02	8/4/2011	213.30	Vashon
SRCMW-02	8/1/2012	214.25	Vashon
SW-MC-1	2/3/2003	266.75	Vashon
SW-MC-1	3/3/2003	266.83	Vashon
SW-MC-1	7/1/2003	266.94	Vashon
SW-MC-1	10/4/2004	267.11	Vashon
SW-MC-1	9/27/2005	268.76	Vashon
SW-MC-4	2/3/2003	262.41	Vashon
SW-MC-4	3/3/2003	261.77	Vashon
SW-MC-4	7/1/2003	261.76	Vashon
SW-MC-4	10/4/2004	262.12	Vashon
SW-MC-4	4/15/2005	263.28	Vashon
SW-MC-4	9/27/2005	262.84	Vashon
SW-MC-6	2/3/2003	266.44	Vashon
SW-MC-6	3/3/2003	266.52	Vashon
SW-MC-6	7/1/2003	266.81	Vashon
SW-MC-6	10/4/2004	266.95	Vashon
SW-MC-6	7/29/2005	265.82	Vashon
SW-MC-6	9/27/2005	266.11	Vashon
T-01	4/23/1997	249.51	Vashon
T-01	7/16/1997	245.83	Vashon
T-01	10/16/1997	245.80	Vashon
T-01	1/30/1998	248.81	Vashon
T-01	4/2/1998	247.53	Vashon
T-01	7/7/1998	245.24	Vashon
T-01	9/22/1998	244.20	Vashon
T-01	12/1/1998	250.39	Vashon
T-01	3/1/1999	248.30	Vashon
T-01	6/1/1999	246.85	Vashon
T-04	4/23/1997	250.19	Vashon
T-04	7/16/1997	246.86	Vashon
T-04	10/16/1997	246.87	Vashon
T-04	1/30/1998	249.52	Vashon
T-04	4/2/1998	248.68	Vashon
T-04	7/7/1998	246.34	Vashon
T-04	9/22/1998	245.38	Vashon
T-04	6/1/1999	248.00	Vashon
T-04	9/1/1999	244.94	Vashon
T-04	12/1/1999	249.00	Vashon
T-04	3/1/2000	249.48	Vashon
T-04	6/1/2000	247.12	Vashon
T-04	9/1/2000	244.28	Vashon
T-04	9/1/2000	254.19	Vashon
T-04	12/1/2000	255.57	Vashon
T-04	12/1/2000	244.20	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
T-04	3/1/2001	245.66	Vashon
T-04	6/1/2001	245.92	Vashon
T-04	9/1/2001	243.30	Vashon
T-04	12/1/2001	246.33	Vashon
T-04	4/1/2002	249.21	Vashon
T-04	6/1/2002	245.16	Vashon
T-04	9/1/2002	244.98	Vashon
T-04	2/3/2003	245.30	Vashon
T-04	7/1/2003	246.46	Vashon
T-04	10/4/2004	244.82	Vashon
T-04	2/11/2005	246.22	Vashon
T-04	7/15/2005	245.93	Vashon
T-04	9/9/2005	244.36	Vashon
T-04	3/21/2006	248.86	Vashon
T-04	9/22/2006	244.98	Vashon
T-04	3/22/2007	249.78	Vashon
T-04	10/4/2007	250.71	Vashon
T-04	3/25/2008	247.82	Vashon
T-04	2/6/2009	248.15	Vashon
T-04	8/6/2009	246.51	Vashon
T-04	2/9/2010	248.63	Vashon
T-04	8/13/2010	247.18	Vashon
T-04	2/16/2011	248.98	Vashon
T-04	8/9/2011	247.33	Vashon
T-04	3/2/2012	248.47	Vashon
T-04	8/3/2012	247.39	Vashon
T-04	2/12/2013	247.4	Vashon
T-04	8/6/2013	246.43	Vashon
T-04	2/13/2014	247.38	Vashon
T-04	9/4/2014	246.89	Vashon
T-04	2/23/2015	248.84	Vashon
T-04	9/8/2015	245.38	Vashon
T-04	2/18/2016	250.52	Vashon
T-04	8/15/2016	246.51	Vashon
T-04	2/14/2017	249.45	Vashon
T-04	8/7/2017	247.22	Vashon
T-04	4/5/2018	248.41	Vashon
T-04	9/12/2018	245.02	Vashon
T-04	3/12/2019	248.26	Vashon
T-04	9/5/2019	245.09	Vashon
T-04	3/10/2020	248.56	Vashon
T-04	9/3/2020	245.63	Vashon
T-04	9/1/2021	245.71	Vashon
T-05	10/4/2004	245.72	Vashon
T-05	2/11/2005	247.03	Vashon
T-05	7/15/2005	246.70	Vashon
T-05	9/28/2005	244.87	Vashon
T-05	3/21/2006	249.68	Vashon
T-05	9/22/2006	245.81	Vashon
T-05	3/22/2007	250.54	Vashon
T-05	3/25/2008	248.62	Vashon
T-05	10/8/2008	245.04	Vashon
T-05	2/6/2009	248.97	Vashon
T-05	8/6/2009	247.39	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
T-05	2/9/2010	249.24	Vashon
T-05	8/13/2010	248.07	Vashon
T-05	2/15/2011	249.84	Vashon
T-05	8/9/2011	248.15	Vashon
T-05	2/20/2014	249.94	Vashon
T-05	9/4/2014	247.72	Vashon
T-05	2/23/2015	249.62	Vashon
T-05	9/8/2015	246.24	Vashon
T-05	2/18/2016	251.32	Vashon
T-05	8/16/2016	247.28	Vashon
T-05	2/14/2017	250.18	Vashon
T-05	3/30/2018	249.27	Vashon
T-05	3/12/2019	248.06	Vashon
T-05	3/11/2020	249.36	Vashon
T-05	3/25/2021	250.35	Vashon
T-06	12/1/2001	246.69	Vashon
T-06	4/1/2002	246.57	Vashon
T-06	6/1/2002	245.23	Vashon
T-06	9/1/2002	243.61	Vashon
T-06	2/3/2003	245.90	Vashon
T-06	3/3/2003	245.37	Vashon
T-06	7/1/2003	243.88	Vashon
T-06	10/4/2004	242.23	Vashon
T-06	2/11/2005	243.55	Vashon
T-06	7/15/2005	243.29	Vashon
T-06	9/28/2005	241.36	Vashon
T-06	3/21/2006	246.26	Vashon
T-06	9/22/2006	242.33	Vashon
T-06	3/22/2007	247.06	Vashon
T-06	10/5/2007	243.49	Vashon
T-06	3/25/2008	245.28	Vashon
T-06	10/8/2008	241.57	Vashon
T-06	2/6/2009	245.50	Vashon
T-06	8/6/2009	243.77	Vashon
T-06	2/9/2010	246.05	Vashon
T-06	8/13/2010	244.53	Vashon
T-06	2/15/2011	246.42	Vashon
T-06	8/9/2011	244.75	Vashon
T-06	8/3/2012	244.80	Vashon
T-06	2/12/2013	245.55	Vashon
T-06	8/6/2013	243.75	Vashon
T-06	2/12/2014	244.75	Vashon
T-06	9/4/2014	244.25	Vashon
T-06	2/23/2015	246.19	Vashon
T-06	9/8/2015	242.69	Vashon
T-06	2/18/2016	247.68	Vashon
T-06	8/16/2016	243.84	Vashon
T-06	2/14/2017	246.74	Vashon
T-06	3/30/2018	245.89	Vashon
T-06	3/12/2019	245.51	Vashon
T-06	3/11/2020	245.86	Vashon
T-06	3/25/2021	245.79	Vashon
T-08	7/16/1997	239.39	Vashon
T-08	10/16/1997	239.49	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
T-08	1/30/1998	241.81	Vashon
T-08	4/2/1998	240.34	Vashon
T-08	7/7/1998	238.44	Vashon
T-08	9/22/1998	237.33	Vashon
T-08	12/1/1998	243.38	Vashon
T-08	3/1/1999	241.60	Vashon
T-08	6/1/1999	240.37	Vashon
T-08	9/1/1999	237.33	Vashon
T-08	12/1/1999	241.06	Vashon
T-08	3/1/2000	241.52	Vashon
T-08	6/1/2000	239.12	Vashon
T-08	9/1/2000	237.87	Vashon
T-08	12/1/2000	237.94	Vashon
T-08	3/1/2001	237.85	Vashon
T-08	6/1/2001	237.86	Vashon
T-08	9/1/2001	235.65	Vashon
T-08	12/1/2001	240.38	Vashon
T-08	4/1/2002	241.28	Vashon
T-08	6/1/2002	239.28	Vashon
T-08	9/1/2002	238.63	Vashon
T-08	2/3/2003	240.90	Vashon
T-08	3/3/2003	239.98	Vashon
T-08	7/1/2003	238.48	Vashon
T-08	10/4/2004	236.95	Vashon
T-08	2/10/2005	238.21	Vashon
T-08	7/15/2005	237.72	Vashon
T-08	9/9/2005	236.19	Vashon
T-08	3/16/2006	241.23	Vashon
T-08	9/22/2006	236.76	Vashon
T-08	3/22/2007	241.90	Vashon
T-08	10/5/2007	238.51	Vashon
T-08	3/25/2008	239.87	Vashon
T-08	10/8/2008	236.26	Vashon
T-08	2/6/2009	240.29	Vashon
T-08	8/6/2009	238.37	Vashon
T-08	2/9/2010	241.38	Vashon
T-08	8/13/2010	239.40	Vashon
T-08	2/15/2011	241.28	Vashon
T-08	8/9/2011	239.51	Vashon
T-10	4/1/2002	238.61	Vashon
T-10	6/1/2002	237.33	Vashon
T-10	9/1/2002	235.14	Vashon
T-10	2/3/2003	237.10	Vashon
T-10	3/3/2003	235.92	Vashon
T-10	7/1/2003	235.76	Vashon
T-10	10/4/2004	234.22	Vashon
T-10	2/11/2005	235.42	Vashon
T-10	7/15/2005	235.35	Vashon
T-10	9/28/2005	233.36	Vashon
T-10	3/21/2006	238.69	Vashon
T-10	9/22/2006	234.72	Vashon
T-10	3/22/2007	239.50	Vashon
T-10	10/5/2007	235.71	Vashon
T-10	3/25/2008	237.92	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
T-10	10/8/2008	234.14	Vashon
T-10	2/6/2009	237.58	Vashon
T-10	8/6/2009	235.75	Vashon
T-10	3/25/2021	237.31	Vashon
T-11b	4/1/2002	243.72	Vashon
T-11b	6/1/2002	242.58	Vashon
T-11b	9/1/2002	240.88	Vashon
T-11b	2/3/2003	242.69	Vashon
T-11b	3/3/2003	242.71	Vashon
T-11b	7/1/2003	241.35	Vashon
T-11b	10/4/2004	239.81	Vashon
T-11b	2/11/2005	241.07	Vashon
T-11b	7/15/2005	240.89	Vashon
T-11b	9/28/2005	239.09	Vashon
T-11b	3/21/2006	243.52	Vashon
T-11b	3/22/2007	244.19	Vashon
T-11b	10/5/2007	240.93	Vashon
T-11b	3/25/2008	242.71	Vashon
T-11b	10/8/2008	239.28	Vashon
T-11b	2/6/2009	242.91	Vashon
T-11b	8/6/2009	241.27	Vashon
T-11b	2/11/2010	243.30	Vashon
T-11b	8/7/2012	242.10	Vashon
T-11b	2/12/2013	242.5	Vashon
T-11b	8/6/2013	241.2	Vashon
T-11b	2/12/2014	242.15	Vashon
T-11b	9/4/2014	241.65	Vashon
T-11b	2/23/2015	243.48	Vashon
T-11b	9/8/2015	240.22	Vashon
T-11b	2/18/2016	244.61	Vashon
T-11b	8/16/2016	241.27	Vashon
T-11b	2/14/2017	243.91	Vashon
T-11b	3/30/2018	242.23	Vashon
T-11b	3/12/2019	242.95	Vashon
T-11b	3/11/2020	243.24	Vashon
T-11b	3/25/2021	243.77	Vashon
T-12b	12/1/1999	249.16	Vashon
T-12b	3/1/2000	249.69	Vashon
T-12b	6/1/2000	248.15	Vashon
T-12b	9/1/2000	244.51	Vashon
T-12b	12/1/2000	244.66	Vashon
T-12b	3/1/2001	245.75	Vashon
T-12b	6/1/2001	246.18	Vashon
T-12b	9/1/2001	243.75	Vashon
T-12b	12/1/2001	248.93	Vashon
T-12b	4/1/2002	250.24	Vashon
T-12b	6/1/2002	248.54	Vashon
T-12b	9/1/2002	246.46	Vashon
T-12b	2/3/2003	249.88	Vashon
T-12b	3/3/2003	248.90	Vashon
T-12b	7/1/2003	246.96	Vashon
T-12b	10/4/2004	245.08	Vashon
T-13b	4/23/1997	240.72	Vashon
T-13b	7/16/1997	237.35	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
T-13b	10/16/1997	234.38	Vashon
T-13b	1/30/1998	239.63	Vashon
T-13b	4/2/1998	238.95	Vashon
T-13b	7/7/1998	237.35	Vashon
T-13b	9/22/1998	236.65	Vashon
T-13b	12/1/1998	240.58	Vashon
T-13b	3/1/1999	238.43	Vashon
T-13b	6/1/1999	237.11	Vashon
T-13b	9/1/1999	234.43	Vashon
T-13b	12/1/1999	238.30	Vashon
T-13b	3/1/2000	239.51	Vashon
T-13b	6/1/2000	237.73	Vashon
T-13b	9/1/2000	235.65	Vashon
T-13b	12/1/2000	235.47	Vashon
T-13b	3/1/2001	235.86	Vashon
T-13b	6/1/2001	235.83	Vashon
T-13b	9/1/2001	240.46	Vashon
T-13b	12/1/2001	245.91	Vashon
T-13b	4/1/2002	238.94	Vashon
T-13b	6/1/2002	245.00	Vashon
T-13b	9/1/2002	235.84	Vashon
T-13b	2/3/2003	237.33	Vashon
T-13b	3/3/2003	237.12	Vashon
T-13b	7/1/2003	236.37	Vashon
T-13b	10/4/2004	234.71	Vashon
T-13b	2/10/2005	235.64	Vashon
T-13b	7/15/2005	235.74	Vashon
T-13b	9/9/2005	234.21	Vashon
T-13b	3/21/2006	238.94	Vashon
T-13b	9/22/2006	235.28	Vashon
T-13b	3/22/2007	239.84	Vashon
T-13b	10/4/2007	236.51	Vashon
T-13b	3/25/2008	238.56	Vashon
T-13b	10/8/2008	234.86	Vashon
T-13b	2/6/2009	237.84	Vashon
T-13b	8/6/2009	236.47	Vashon
T-13b	2/9/2010	238.44	Vashon
T-13b	8/13/2010	237.26	Vashon
T-13b	2/15/2011	238.84	Vashon
T-13b	8/9/2011	237.62	Vashon
T-13b	8/3/2012	237.59	Vashon
T-13b	2/12/2013	238.14	Vashon
T-13b	8/6/2013	236.64	Vashon
T-13b	2/12/2014	237.59	Vashon
T-13b	9/4/2014	237.16	Vashon
T-13b	2/20/2015	238.82	Vashon
T-13b	9/8/2015	235.53	Vashon
T-13b	2/18/2016	239.79	Vashon
T-13b	8/16/2016	236.69	Vashon
T-13b	2/14/2017	239.09	Vashon
T-13b	3/30/2018	238.46	Vashon
T-13b	3/12/2019	237.91	Vashon
T-13b	3/11/2020	237.46	Vashon
T-13b	3/25/2021	238.43	Vashon

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
T-15	2/18/2016	242.26	Vashon
T-15	8/15/2016	239.29	Vashon
T-15	2/14/2017	241.38	Vashon
T-15	8/8/2017	239.70	Vashon
T-15	3/30/2018	240.82	Vashon
T-15	9/12/2018	237.70	Vashon
T-15	3/12/2019	240.27	Vashon
T-15	9/5/2019	237.51	Vashon
T-15	3/11/2020	240.15	Vashon
T-15	9/3/2020	237.61	Vashon
T-15	3/10/2021	240.80	Vashon
T-15	9/1/2021	237.83	Vashon
Sea Level			
88-LS-SS	2/3/2003	82.33	Sea Level
88-LS-SS	3/3/2003	82.55	Sea Level
88-LS-SS	7/1/2003	80.41	Sea Level
88-LS-SS	10/4/2004	80.69	Sea Level
88-LS-SS	3/2/2012	80.79	Sea Level
88-LS-SS	8/1/2012	78.91	Sea Level
88-LS-SS	2/12/2013	80.47	Sea Level
LC-100D	4/3/2008	213.57	Sea Level
LC-100D	10/8/2008	195.85	Sea Level
LC-100D	2/6/2009	209.96	Sea Level
LC-100D	8/17/2009	201.25	Sea Level
LC-100D	10/4/2011	190.53	Sea Level
LC-101D-1	4/3/2008	168.67	Sea Level
LC-101D-1	10/8/2008	164.25	Sea Level
LC-101D-1	2/6/2009	169.81	Sea Level
LC-101D-1	8/17/2009	164.54	Sea Level
LC-101D-1	2/9/2010	164.40	Sea Level
LC-101D-1	8/13/2010	142.95	Sea Level
LC-101D-1	2/17/2011	147.72	Sea Level
LC-101D-1	8/8/2011	146.35	Sea Level
LC-101D-1	2/27/2012	148.92	Sea Level
LC-101D-1	8/2/2012	146.72	Sea Level
LC-101D-1	2/5/2013	149.37	Sea Level
LC-101D-1	8/6/2013	144.97	Sea Level
LC-101D-1	2/12/2014	148.57	Sea Level
LC-101D-1	9/3/2014	148.15	Sea Level
LC-101D-1	2/24/2015	150.46	Sea Level
LC-101D-1	9/8/2015	146.52	Sea Level
LC-101D-1	2/17/2016	152.60	Sea Level
LC-101D-1	8/16/2016	147.30	Sea Level
LC-101D-1	2/9/2017	149.80	Sea Level
LC-101D-1	4/5/2018	150.70	Sea Level
LC-101D-1	3/11/2019	148.34	Sea Level
LC-101D-1	3/12/2020	148.55	Sea Level
LC-101D-1	3/10/2021	149.03	Sea Level
LC-101D-2	4/3/2008	168.73	Sea Level
LC-101D-2	10/8/2008	164.35	Sea Level
LC-101D-2	2/6/2009	169.93	Sea Level
LC-101D-2	4/5/2018	150.73	Sea Level
LC-101D-2	3/11/2019	148.33	Sea Level
LC-101D-2	3/12/2020	148.55	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-101D-2	3/10/2021	149.22	Sea Level
LC-102D-1	4/3/2008	138.78	Sea Level
LC-102D-1	10/8/2008	135.02	Sea Level
LC-102D-1	2/4/2009	139.46	Sea Level
LC-102D-1	8/6/2009	134.17	Sea Level
LC-102D-1	2/8/2010	134.12	Sea Level
LC-102D-1	8/16/2010	121.45	Sea Level
LC-102D-1	2/15/2011	126.32	Sea Level
LC-102D-1	8/4/2011	124.89	Sea Level
LC-102D-1	3/2/2012	126.65	Sea Level
LC-102D-1	8/1/2012	124.72	Sea Level
LC-102D-1	2/4/2013	127.1	Sea Level
LC-102D-1	8/5/2013	123.57	Sea Level
LC-102D-1	2/11/2014	126.47	Sea Level
LC-102D-1	9/2/2014	125.37	Sea Level
LC-102D-1	2/23/2015	127.89	Sea Level
LC-102D-1	9/8/2015	124.10	Sea Level
LC-102D-1	2/18/2016	129.42	Sea Level
LC-102D-1	8/16/2016	124.96	Sea Level
LC-102D-1	2/9/2017	127.70	Sea Level
LC-102D-1	3/30/2018	127.71	Sea Level
LC-102D-1	3/11/2019	126.07	Sea Level
LC-102D-1	3/12/2020	125.90	Sea Level
LC-102D-1	3/9/2021	126.19	Sea Level
LC-102D-2	4/3/2008	128.49	Sea Level
LC-102D-2	10/8/2008	134.79	Sea Level
LC-102D-2	2/4/2009	139.22	Sea Level
LC-102D-2	3/30/2018	127.49	Sea Level
LC-102D-2	3/11/2019	125.87	Sea Level
LC-102D-2	3/12/2020	125.67	Sea Level
LC-102D-2	3/9/2021	126.19	Sea Level
LC-103D	4/3/2008	174.88	Sea Level
LC-103D	10/8/2008	169.95	Sea Level
LC-103D	2/6/2009	176.38	Sea Level
LC-103D	8/17/2009	170.83	Sea Level
LC-103D	12/7/2009	157.15	Sea Level
LC-103D	1/21/2010	148.38	Sea Level
LC-103D	2/18/2010	175.75	Sea Level
LC-103D	3/18/2010	175.75	Sea Level
LC-103D	4/2/2010	172.03	Sea Level
LC-103D	4/21/2010	147.68	Sea Level
LC-103D	5/11/2010	147.15	Sea Level
LC-103D	6/3/2010	146.58	Sea Level
LC-103D	8/13/2010	144.85	Sea Level
LC-103D	2/17/2011	149.77	Sea Level
LC-103D	8/8/2011	148.35	Sea Level
LC-103D	10/4/2011	147.85	Sea Level
LC-103D	2/27/2012	151.09	Sea Level
LC-103D	8/2/2012	148.81	Sea Level
LC-103D	2/4/2013	151.47	Sea Level
LC-103D	8/6/2013	146.9	Sea Level
LC-103D	2/14/2014	150.90	Sea Level
LC-103D	9/3/2014	150.72	Sea Level
LC-103D	2/19/2015	153.35	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-103D	9/9/2015	142.95	Sea Level
LC-103D	2/17/2016	154.93	Sea Level
LC-103D	8/17/2016	152.67	Sea Level
LC-103D	2/10/2017	155.22	Sea Level
LC-103D	8/8/2017	153.98	Sea Level
LC-103D	3/29/2018	155.55	Sea Level
LC-103D	9/13/2018	132.03	Sea Level
LC-103D	3/12/2019	145.53	Sea Level
LC-103D	3/10/2020	154.07	Sea Level
LC-103D	8/28/2020	151.91	Sea Level
LC-103D	3/10/2021	154.55	Sea Level
LC-103D	9/1/2021	153.66	Sea Level
LC-104D	2/11/2014	81.57	Sea Level
LC-104D	9/9/2014	79.61	Sea Level
LC-104D	2/23/2015	82.20	Sea Level
LC-104D	9/15/2015	79.36	Sea Level
LC-104D	2/22/2016	82.56	Sea Level
LC-104D	8/16/2016	79.65	Sea Level
LC-104D	2/9/2017	82.85	Sea Level
LC-104D	4/6/2018	82.98	Sea Level
LC-104D	3/11/2019	81.58	Sea Level
LC-126	12/1/1998	185.41	Sea Level
LC-126	3/1/1999	185.41	Sea Level
LC-126	6/1/1999	183.30	Sea Level
LC-126	9/1/1999	177.83	Sea Level
LC-126	12/1/1999	182.77	Sea Level
LC-126	3/1/2000	184.79	Sea Level
LC-126	6/1/2000	182.93	Sea Level
LC-126	9/1/2000	178.37	Sea Level
LC-126	12/1/2000	180.24	Sea Level
LC-126	3/1/2001	179.97	Sea Level
LC-126	6/1/2001	179.26	Sea Level
LC-126	9/1/2001	175.93	Sea Level
LC-126	12/1/2001	181.83	Sea Level
LC-126	4/1/2002	184.23	Sea Level
LC-126	6/1/2002	181.03	Sea Level
LC-126	9/1/2002	177.18	Sea Level
LC-126	2/3/2003	181.55	Sea Level
LC-126	3/3/2003	181.84	Sea Level
LC-126	7/1/2003	176.77	Sea Level
LC-126	10/4/2004	177.56	Sea Level
LC-126	4/6/2005	178.09	Sea Level
LC-126	7/19/2005	175.87	Sea Level
LC-126	8/30/2005	173.92	Sea Level
LC-126	3/16/2006	183.47	Sea Level
LC-126	9/21/2006	175.77	Sea Level
LC-126	3/23/2007	184.18	Sea Level
LC-126	10/19/2007	177.21	Sea Level
LC-126	4/3/2008	180.77	Sea Level
LC-126	10/8/2008	175.84	Sea Level
LC-126	2/5/2009	181.54	Sea Level
LC-126	8/5/2009	175.72	Sea Level
LC-126	2/9/2010	176.29	Sea Level
LC-126	8/12/2010	156.39	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-126	2/17/2011	160.19	Sea Level
LC-126	8/9/2011	158.39	Sea Level
LC-126	2/28/2012	161.37	Sea Level
LC-126	8/1/2012	158.64	Sea Level
LC-126	2/7/2013	162.09	Sea Level
LC-126	8/8/2013	157.94	Sea Level
LC-126	2/19/2014	161.59	Sea Level
LC-126	2/24/2015	163.16	Sea Level
LC-126	9/11/2015	158.91	Sea Level
LC-126	2/19/2016	164.74	Sea Level
LC-126	8/22/2016	159.72	Sea Level
LC-126	2/13/2017	162.52	Sea Level
LC-126	4/5/2018	163.53	Sea Level
LC-126	3/13/2019	161.23	Sea Level
LC-126	3/11/2020	161.44	Sea Level
LC-126	3/11/2021	161.78	Sea Level
LC-166D	10/7/1996	213.03	Sea Level
LC-166D	1/24/1997	217.31	Sea Level
LC-166D	4/23/1997	216.45	Sea Level
LC-166D	10/16/1997	214.17	Sea Level
LC-166D	1/30/1998	215.50	Sea Level
LC-166D	4/2/1998	215.13	Sea Level
LC-166D	7/7/1998	213.65	Sea Level
LC-166D	9/22/1998	210.87	Sea Level
LC-166D	9/1/1999	211.28	Sea Level
LC-166D	12/1/1999	213.22	Sea Level
LC-166D	3/1/2000	215.40	Sea Level
LC-166D	6/1/2000	214.47	Sea Level
LC-166D	9/1/2000	211.00	Sea Level
LC-166D	12/1/2000	209.70	Sea Level
LC-166D	3/1/2001	209.04	Sea Level
LC-166D	6/1/2001	211.70	Sea Level
LC-166D	9/1/2001	207.53	Sea Level
LC-166D	12/1/2001	212.83	Sea Level
LC-166D	4/1/2002	214.01	Sea Level
LC-166D	6/1/2002	212.52	Sea Level
LC-166D	9/1/2002	210.56	Sea Level
LC-166D	2/3/2003	210.39	Sea Level
LC-166D	3/3/2003	210.59	Sea Level
LC-166D	7/1/2003	210.78	Sea Level
LC-166D	10/4/2004	208.98	Sea Level
LC-166D	7/29/2005	209.57	Sea Level
LC-166D	3/17/2006	214.47	Sea Level
LC-166D	9/21/2006	210.11	Sea Level
LC-166D	3/20/2007	214.53	Sea Level
LC-166D	9/27/2007	210.59	Sea Level
LC-166D	4/3/2008	213.05	Sea Level
LC-166D	10/8/2008	209.24	Sea Level
LC-166D	2/6/2009	211.79	Sea Level
LC-166D	8/17/2009	210.11	Sea Level
LC-166D	2/8/2010	211.04	Sea Level
LC-166D	8/10/2010	209.37	Sea Level
LC-166D	2/15/2011	211.39	Sea Level
LC-166D	8/4/2011	210.16	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-166D	3/1/2012	210.96	Sea Level
LC-166D	8/1/2012	210.29	Sea Level
LC-166D	2/5/2013	211.47	Sea Level
LC-166D	8/6/2013	209.47	Sea Level
LC-166D	2/11/2014	209.49	Sea Level
LC-166D	9/9/2014	209.19	Sea Level
LC-166D	2/23/2015	211.74	Sea Level
LC-166D	9/10/2015	208.39	Sea Level
LC-166D	2/22/2016	213.07	Sea Level
LC-166D	8/16/2016	209.67	Sea Level
LC-166D	2/9/2017	211.18	Sea Level
LC-166D	4/6/2018	211.35	Sea Level
LC-166D	3/11/2019	209.97	Sea Level
LC-21c	3/1/2000	268.18	Sea Level
LC-21c	6/1/2000	266.61	Sea Level
LC-21c	9/1/2000	264.61	Sea Level
LC-21c	12/1/2000	264.55	Sea Level
LC-21c	3/1/2001	265.00	Sea Level
LC-21c	6/1/2001	265.18	Sea Level
LC-21c	9/1/2001	263.91	Sea Level
LC-21c	12/1/2001	269.41	Sea Level
LC-21c	4/1/2002	268.68	Sea Level
LC-21c	6/1/2002	269.08	Sea Level
LC-21c	9/1/2002	264.72	Sea Level
LC-21c	2/3/2003	269.66	Sea Level
LC-21c	3/3/2003	266.74	Sea Level
LC-21c	7/1/2003	266.28	Sea Level
LC-21c	10/4/2004	263.89	Sea Level
LC-21c	3/16/2006	269.45	Sea Level
LC-21c	9/20/2006	265.24	Sea Level
LC-21c	3/21/2007	269.92	Sea Level
LC-21c	9/28/2007	265.21	Sea Level
LC-21c	3/25/2008	267.69	Sea Level
LC-21c	10/8/2008	264.49	Sea Level
LC-21c	2/3/2009	267.61	Sea Level
LC-21c	8/3/2009	265.85	Sea Level
LC-21c	2/11/2010	268.01	Sea Level
LC-21c	8/10/2010	266.53	Sea Level
LC-21c	2/14/2011	268.48	Sea Level
LC-21c	8/10/2011	267.39	Sea Level
LC-21c	2/22/2012	267.90	Sea Level
LC-21c	7/31/2012	266.86	Sea Level
LC-21c	2/6/2013	267.76	Sea Level
LC-21c	8/8/2013	265.96	Sea Level
LC-21c	2/14/2014	267.31	Sea Level
LC-21c	9/8/2014	266.51	Sea Level
LC-21c	2/18/2015	268.52	Sea Level
LC-21c	9/9/2015	265.12	Sea Level
LC-21c	2/22/2016	270.52	Sea Level
LC-21c	8/17/2016	266.31	Sea Level
LC-21c	2/15/2017	268.90	Sea Level
LC-21c	4/6/2018	266.91	Sea Level
LC-21c	3/11/2019	267.50	Sea Level
LC-21c	3/10/2020	267.85	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-21c	3/10/2021	270.52	Sea Level
LC-239D	3/12/2020	154.10	Sea Level
LC-239D	8/28/2020	147.39	Sea Level
LC-239D	3/9/2021	154.06	Sea Level
LC-239D	9/1/2021	115.69	Sea Level
LC-26D	10/7/1996	267.96	Sea Level
LC-26D	1/24/1997	269.73	Sea Level
LC-26D	4/23/1997	273.58	Sea Level
LC-26D	10/16/1997	268.58	Sea Level
LC-26D	1/30/1998	270.66	Sea Level
LC-26D	4/2/1998	270.39	Sea Level
LC-26D	7/7/1998	268.33	Sea Level
LC-26D	9/22/1998	266.78	Sea Level
LC-26D	12/1/1998	272.33	Sea Level
LC-26D	3/1/1999	272.08	Sea Level
LC-26D	6/1/1999	268.57	Sea Level
LC-26D	9/1/1999	266.40	Sea Level
LC-26D	12/1/1999	269.31	Sea Level
LC-26D	3/1/2000	270.42	Sea Level
LC-26D	6/1/2000	268.94	Sea Level
LC-26D	9/1/2000	266.89	Sea Level
LC-26D	12/1/2000	266.59	Sea Level
LC-26D	3/1/2001	267.21	Sea Level
LC-26D	6/1/2001	267.37	Sea Level
LC-26D	9/1/2001	266.14	Sea Level
LC-26D	12/1/2001	269.04	Sea Level
LC-26D	4/1/2002	270.98	Sea Level
LC-26D	6/1/2002	269.08	Sea Level
LC-26D	9/1/2002	266.38	Sea Level
LC-26D	2/3/2003	269.08	Sea Level
LC-26D	3/3/2003	268.75	Sea Level
LC-26D	7/1/2003	268.30	Sea Level
LC-26D	10/4/2004	266.20	Sea Level
LC-26D	3/16/2006	271.47	Sea Level
LC-26D	9/20/2006	267.21	Sea Level
LC-26D	3/22/2007	271.69	Sea Level
LC-26D	3/25/2008	269.54	Sea Level
LC-26D	10/8/2008	266.34	Sea Level
LC-26D	2/3/2009	269.44	Sea Level
LC-26D	8/6/2009	267.37	Sea Level
LC-26D	2/11/2010	269.94	Sea Level
LC-26D	8/9/2010	268.51	Sea Level
LC-26D	2/14/2011	270.34	Sea Level
LC-26D	8/8/2011	269.29	Sea Level
LC-26D	2/22/2012	269.63	Sea Level
LC-26D	7/31/2012	268.81	Sea Level
LC-26D	2/7/2013	269.71	Sea Level
LC-26D	8/7/2013	267.94	Sea Level
LC-26D	2/14/2014	269.04	Sea Level
LC-26D	9/5/2014	268.40	Sea Level
LC-26D	2/18/2015	270.38	Sea Level
LC-26D	9/9/2015	266.98	Sea Level
LC-35D	10/7/1996	260.45	Sea Level
LC-35D	1/24/1997	266.11	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-35D	4/23/1997	265.17	Sea Level
LC-35D	1/30/1998	264.15	Sea Level
LC-35D	4/2/1998	263.40	Sea Level
LC-35D	7/7/1998	260.98	Sea Level
LC-35D	9/22/1998	259.76	Sea Level
LC-35D	12/1/1998	266.38	Sea Level
LC-35D	3/1/1999	265.15	Sea Level
LC-35D	6/1/1999	262.03	Sea Level
LC-35D	9/1/1999	259.41	Sea Level
LC-35D	12/1/1999	263.50	Sea Level
LC-35D	3/1/2000	264.32	Sea Level
LC-35D	6/1/2000	262.30	Sea Level
LC-35D	9/1/2000	259.93	Sea Level
LC-35D	12/1/2000	260.30	Sea Level
LC-35D	3/1/2001	259.84	Sea Level
LC-35D	6/1/2001	259.76	Sea Level
LC-35D	9/1/2001	258.33	Sea Level
LC-35D	12/1/2001	263.74	Sea Level
LC-35D	4/1/2002	263.94	Sea Level
LC-35D	6/1/2002	262.04	Sea Level
LC-35D	9/1/2002	259.34	Sea Level
LC-35D	2/3/2003	262.79	Sea Level
LC-35D	3/3/2003	262.12	Sea Level
LC-35D	7/1/2003	260.89	Sea Level
LC-35D	10/4/2004	260.87	Sea Level
LC-35D	3/16/2006	264.33	Sea Level
LC-35D	9/26/2006	259.60	Sea Level
LC-35D	3/23/2007	265.15	Sea Level
LC-35D	9/28/2007	261.26	Sea Level
LC-35D	10/8/2008	259.89	Sea Level
LC-35D	2/5/2009	262.29	Sea Level
LC-35D	8/6/2009	260.84	Sea Level
LC-35D	2/10/2010	263.74	Sea Level
LC-35D	8/10/2010	262.17	Sea Level
LC-35D	2/16/2011	264.29	Sea Level
LC-35D	8/8/2011	262.79	Sea Level
LC-35D	2/29/2012	263.89	Sea Level
LC-35D	8/2/2012	262.44	Sea Level
LC-35D	2/6/2013	263.61	Sea Level
LC-35D	2/18/2014	263.99	Sea Level
LC-35D	9/8/2014	261.97	Sea Level
LC-35D	2/18/2015	264.24	Sea Level
LC-35D	9/11/2015	260.84	Sea Level
LC-35D	2/22/2016	266.28	Sea Level
LC-35D	8/17/2016	261.96	Sea Level
LC-35D	2/14/2017	264.76	Sea Level
LC-35D	4/6/2018	263.98	Sea Level
LC- 35D	3/12/2019	263.36	Sea Level
LC-35D	3/13/2020	263.61	Sea Level
LC-40D	10/7/1996	170.26	Sea Level
LC-40D	1/24/1997	182.89	Sea Level
LC-40D	4/23/1997	187.96	Sea Level
LC-40D	10/16/1997	177.81	Sea Level
LC-40D	1/30/1998	185.12	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-40D	4/2/1998	185.46	Sea Level
LC-40D	7/7/1998	181.99	Sea Level
LC-40D	9/22/1998	165.94	Sea Level
LC-40D	12/1/1998	186.73	Sea Level
LC-40D	3/1/1999	187.14	Sea Level
LC-40D	6/1/1999	184.55	Sea Level
LC-40D	9/1/1999	179.10	Sea Level
LC-40D	12/1/1999	184.14	Sea Level
LC-40D	3/1/2000	186.10	Sea Level
LC-40D	6/1/2000	184.32	Sea Level
LC-40D	9/1/2000	179.45	Sea Level
LC-40D	12/1/2000	181.31	Sea Level
LC-40D	3/1/2001	181.08	Sea Level
LC-40D	6/1/2001	180.30	Sea Level
LC-40D	9/1/2001	178.47	Sea Level
LC-40D	12/1/2001	183.55	Sea Level
LC-40D	4/1/2002	185.39	Sea Level
LC-40D	6/1/2002	183.51	Sea Level
LC-40D	9/1/2002	182.54	Sea Level
LC-40D	2/3/2003	182.68	Sea Level
LC-40D	3/3/2003	182.99	Sea Level
LC-40D	7/1/2003	177.78	Sea Level
LC-40D	10/4/2004	178.59	Sea Level
LC-40D	4/14/2005	179.35	Sea Level
LC-40D	7/20/2005	176.71	Sea Level
LC-40D	3/16/2006	184.58	Sea Level
LC-40D	9/20/2006	176.81	Sea Level
LC-40D	3/23/2007	185.36	Sea Level
LC-40D	10/19/2007	178.15	Sea Level
LC-40D	10/8/2008	176.76	Sea Level
LC-40D	2/5/2009	182.51	Sea Level
LC-40D	8/6/2009	176.53	Sea Level
LC-40D	2/10/2010	179.56	Sea Level
LC-40D	8/11/2010	157.51	Sea Level
LC-40D	2/16/2011	161.46	Sea Level
LC-40D	8/9/2011	159.61	Sea Level
LC-40D	2/28/2012	162.29	Sea Level
LC-40D	7/31/2012	160.06	Sea Level
LC-40D	2/6/2013	162.58	Sea Level
LC-40D	8/7/2013	157.96	Sea Level
LC-40D	2/18/2014	162.06	Sea Level
LC-40D	9/10/2014	161.68	Sea Level
LC-40D	2/20/2015	164.06	Sea Level
LC-40D	9/10/2015	159.40	Sea Level
LC-40D	2/22/2016	165.01	Sea Level
LC-40D	8/17/2016	160.22	Sea Level
LC-40D	2/13/2017	163.02	Sea Level
LC-40D	4/6/2018	163.56	Sea Level
LC-40D	3/13/2019	161.73	Sea Level
LC-40D	3/13/2020	165.28	Sea Level
LC-40D	3/11/2021	228.86	Sea Level
LC-41D	10/7/1996	229.54	Sea Level
LC-41D	1/24/1997	241.74	Sea Level
LC-41D	4/23/1997	241.75	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-41D	10/16/1997	231.93	Sea Level
LC-41D	4/2/1998	237.92	Sea Level
LC-41D	7/7/1998	233.96	Sea Level
LC-41D	12/1/1998	232.92	Sea Level
LC-41D	3/1/1999	241.33	Sea Level
LC-41D	6/1/1999	238.10	Sea Level
LC-41D	9/1/1999	232.70	Sea Level
LC-41D	12/1/1999	238.79	Sea Level
LC-41D	3/1/2000	239.87	Sea Level
LC-41D	6/1/2000	237.53	Sea Level
LC-41D	9/1/2000	235.37	Sea Level
LC-41D	12/1/2000	235.71	Sea Level
LC-41D	3/1/2001	240.27	Sea Level
LC-41D	6/1/2001	240.82	Sea Level
LC-41D	9/1/2001	237.76	Sea Level
LC-41D	12/1/2001	243.23	Sea Level
LC-41D	4/1/2002	249.57	Sea Level
LC-41D	6/1/2002	243.75	Sea Level
LC-41D	9/1/2002	240.66	Sea Level
LC-41D	2/3/2003	249.59	Sea Level
LC-41D	3/3/2003	249.11	Sea Level
LC-41D	7/1/2003	245.24	Sea Level
LC-41D	10/4/2004	243.38	Sea Level
LC-41D	3/17/2006	252.08	Sea Level
LC-41D	9/21/2006	239.65	Sea Level
LC-41D	9/28/2007	246.05	Sea Level
LC-41D	2/5/2009	250.37	Sea Level
LC-41D	8/6/2009	241.63	Sea Level
LC-41D	8/10/2010	247.07	Sea Level
LC-41D	2/16/2011	250.17	Sea Level
LC-41D	8/10/2011	247.39	Sea Level
LC-41D	2/29/2012	249.22	Sea Level
LC-41D	7/31/2012	244.05	Sea Level
LC-41D	2/6/2013	244.24	Sea Level
LC-41D	8/8/2013	244.07	Sea Level
LC-41D	2/13/2014	256.27	Sea Level
LC-41D	9/11/2014	246.22	Sea Level
LC-41D	2/19/2015	249.34	Sea Level
LC-41D	9/11/2015	244.62	Sea Level
LC-41D	2/22/2016	252.08	Sea Level
LC-41D	8/17/2016	246.32	Sea Level
LC-41D	2/14/2017	250.25	Sea Level
LC-41D	4/5/2018	248.96	Sea Level
LC-41D	3/12/2019	248.59	Sea Level
LC-41D	3/13/2020	248.91	Sea Level
LC-41D	3/11/2021	250.17	Sea Level
LC-41e	3/17/2006	238.33	Sea Level
LC-41e	9/21/2006	217.50	Sea Level
LC-41e	9/28/2007	232.16	Sea Level
LC-41e	3/25/2008	236.71	Sea Level
LC-41e	10/8/2008	230.74	Sea Level
LC-41e	2/5/2009	236.86	Sea Level
LC-41e	8/6/2009	221.11	Sea Level
LC-47D	12/1/1998	260.62	Sea Level

APPENDIX C - HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-47D	3/1/1999	258.86	Sea Level
LC-47D	6/1/1999	255.67	Sea Level
LC-47D	9/1/1999	250.84	Sea Level
LC-47D	12/1/1999	257.51	Sea Level
LC-47D	3/1/2000	258.47	Sea Level
LC-47D	6/1/2000	255.61	Sea Level
LC-47D	9/1/2000	251.13	Sea Level
LC-47D	12/1/2000	252.76	Sea Level
LC-47D	3/1/2001	251.35	Sea Level
LC-47D	6/1/2001	251.16	Sea Level
LC-47D	9/1/2001	248.41	Sea Level
LC-47D	12/1/2001	253.55	Sea Level
LC-47D	4/1/2002	257.58	Sea Level
LC-47D	6/1/2002	255.21	Sea Level
LC-47D	9/1/2002	250.54	Sea Level
LC-47D	2/3/2003	255.55	Sea Level
LC-47D	3/3/2003	255.31	Sea Level
LC-47D	7/1/2003	252.20	Sea Level
LC-47D	10/4/2004	250.21	Sea Level
LC-47D	4/6/2005	252.10	Sea Level
LC-47D	7/21/2005	251.24	Sea Level
LC-47D	8/29/2005	238.73	Sea Level
LC-47D	3/16/2006	257.09	Sea Level
LC-47D	9/20/2006	250.28	Sea Level
LC-47D	3/20/2007	257.81	Sea Level
LC-47D	9/28/2007	252.54	Sea Level
LC-47D	3/25/2008	255.59	Sea Level
LC-47D	10/8/2008	250.24	Sea Level
LC-47D	2/5/2009	255.76	Sea Level
LC-47D	8/6/2009	251.61	Sea Level
LC-47D	2/10/2010	255.81	Sea Level
LC-47D	8/10/2010	253.98	Sea Level
LC-47D	2/16/2011	256.76	Sea Level
LC-47D	8/8/2011	254.20	Sea Level
LC-47D	2/23/2012	255.79	Sea Level
LC-47D	7/31/2012	254.24	Sea Level
LC-47D	2/8/2013	255.68	Sea Level
LC-47D	8/8/2013	252.36	Sea Level
LC-47D	2/13/2014	254.66	Sea Level
LC-47D	9/8/2014	253.33	Sea Level
LC-47D	2/18/2015	256.76	Sea Level
LC-47D	9/10/2015	251.63	Sea Level
LC-47D	2/16/2016	259.21	Sea Level
LC-47D	8/17/2016	258.26	Sea Level
LC-47D	2/13/2017	257.25	Sea Level
LC-47D	4/5/2018	255.86	Sea Level
LC-47D	3/12/2019	255.61	Sea Level
LC-47D	3/13/2020	255.95	Sea Level
LC- 47D	3/13/2021	256.86	Sea Level
LC-50D	12/1/1998	268.25	Sea Level
LC-50D	3/1/1999	267.43	Sea Level
LC-50D	6/1/1999	264.72	Sea Level
LC-50D	9/1/1999	262.03	Sea Level
LC-50D	12/1/1999	265.60	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-50D	3/1/2000	266.85	Sea Level
LC-50D	6/1/2000	265.18	Sea Level
LC-50D	9/1/2000	263.06	Sea Level
LC-50D	12/1/2000	263.19	Sea Level
LC-50D	3/1/2001	263.53	Sea Level
LC-50D	6/1/2001	263.65	Sea Level
LC-50D	9/1/2001	262.21	Sea Level
LC-50D	12/1/2001	263.79	Sea Level
LC-50D	4/1/2002	267.54	Sea Level
LC-50D	6/1/2002	265.62	Sea Level
LC-50D	9/1/2002	262.94	Sea Level
LC-50D	3/3/2003	265.38	Sea Level
LC-50D	7/1/2003	264.47	Sea Level
LC-50D	10/4/2004	262.40	Sea Level
LC-50D	3/16/2006	268.04	Sea Level
LC-50D	9/25/2006	262.45	Sea Level
LC-50D	3/21/2007	268.45	Sea Level
LC-50D	9/28/2007	263.65	Sea Level
LC-50D	3/25/2008	266.66	Sea Level
LC-50D	10/8/2008	262.82	Sea Level
LC-50D	2/3/2009	266.64	Sea Level
LC-50D	8/3/2009	263.92	Sea Level
LC-50D	2/11/2010	266.92	Sea Level
LC-50D	8/10/2010	265.36	Sea Level
LC-50D	2/16/2011	267.49	Sea Level
LC-50D	8/10/2011	266.07	Sea Level
LC-50D	2/22/2012	266.75	Sea Level
LC-50D	8/3/2012	265.12	Sea Level
LC-50D	2/6/2013	266.77	Sea Level
LC-50D	8/8/2013	264.42	Sea Level
LC-50D	2/14/2014	265.97	Sea Level
LC-50D	9/8/2014	265.07	Sea Level
LC-50D	2/19/2015	267.52	Sea Level
LC-50D	9/10/2015	263.70	Sea Level
LC-50D	8/17/2016	265.02	Sea Level
LC-55D	12/1/1998	268.18	Sea Level
LC-55D	3/1/1999	267.32	Sea Level
LC-55D	6/1/1999	263.78	Sea Level
LC-55D	9/1/1999	260.50	Sea Level
LC-55D	12/1/1999	264.43	Sea Level
LC-55D	3/1/2000	266.02	Sea Level
LC-55D	6/1/2000	263.90	Sea Level
LC-55D	9/1/2000	261.27	Sea Level
LC-55D	12/1/2000	261.64	Sea Level
LC-55D	3/1/2001	262.63	Sea Level
LC-55D	6/1/2001	262.51	Sea Level
LC-55D	9/1/2001	259.93	Sea Level
LC-55D	12/1/2001	265.31	Sea Level
LC-55D	4/1/2002	267.16	Sea Level
LC-55D	6/1/2002	265.46	Sea Level
LC-55D	9/1/2002	264.10	Sea Level
LC-55D	2/3/2003	265.69	Sea Level
LC-55D	3/3/2003	264.68	Sea Level
LC-55D	7/1/2003	262.83	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-55D	10/4/2004	260.56	Sea Level
LC-66D	10/7/1996	196.27	Sea Level
LC-66D	1/24/1997	206.72	Sea Level
LC-66D	4/23/1997	212.39	Sea Level
LC-66D	10/16/1997	198.11	Sea Level
LC-66D	1/30/1998	208.04	Sea Level
LC-66D	4/2/1998	208.17	Sea Level
LC-66D	7/7/1998	204.66	Sea Level
LC-66D	9/22/1998	193.79	Sea Level
LC-66D	12/1/1998	210.51	Sea Level
LC-66D	3/1/1999	210.18	Sea Level
LC-66D	6/1/1999	206.72	Sea Level
LC-66D	9/1/1999	201.27	Sea Level
LC-66D	12/1/1999	207.66	Sea Level
LC-66D	3/1/2000	209.18	Sea Level
LC-66D	6/1/2000	206.90	Sea Level
LC-66D	9/1/2000	202.18	Sea Level
LC-66D	12/1/2000	203.66	Sea Level
LC-66D	3/1/2001	206.58	Sea Level
LC-66D	6/1/2001	206.12	Sea Level
LC-66D	9/1/2001	203.72	Sea Level
LC-66D	4/1/2002	210.41	Sea Level
LC-66D	9/1/2002	201.33	Sea Level
LC-66D	2/3/2003	208.93	Sea Level
LC-66D	3/3/2003	207.28	Sea Level
LC-66D	7/1/2003	202.61	Sea Level
LC-66D	10/4/2004	201.86	Sea Level
LC-66D	4/15/2005	202.42	Sea Level
LC-66D	7/20/2005	201.08	Sea Level
LC-66D	3/16/2006	208.08	Sea Level
LC-66D	9/20/2006	199.88	Sea Level
LC-66D	3/22/2007	208.62	Sea Level
LC-66D	9/28/2007	201.50	Sea Level
LC-66D	3/25/2008	205.59	Sea Level
LC-66D	10/8/2008	200.39	Sea Level
LC-66D	2/5/2009	206.40	Sea Level
LC-66D	8/4/2009	199.33	Sea Level
LC-66D	2/10/2010	203.23	Sea Level
LC-66D	8/13/2010	190.68	Sea Level
LC-66D	2/16/2011	194.73	Sea Level
LC-66D	8/9/2011	191.93	Sea Level
LC-66D	2/28/2012	194.31	Sea Level
LC-66D	7/31/2012	192.03	Sea Level
LC-66D	2/6/2013	194.29	Sea Level
LC-66D	8/7/2013	189.28	Sea Level
LC-66D	2/18/2014	193.58	Sea Level
LC-66D	9/8/2014	192.24	Sea Level
LC-66D	2/20/2015	195.41	Sea Level
LC-66D	9/9/2015	190.14	Sea Level
LC-66D	2/16/2016	197.32	Sea Level
LC-66D	8/17/2016	192.16	Sea Level
LC-66D	2/13/2017	194.52	Sea Level
LC-66D	4/5/2018	194.45	Sea Level
LC-66D	3/13/2019	193.19	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-66D	3/11/2020	193.31	Sea Level
LC-66D	3/11/2021	193.98	Sea Level
LC-67D	10/7/1996	180.16	Sea Level
LC-67D	1/24/1997	193.61	Sea Level
LC-67D	4/23/1997	198.68	Sea Level
LC-67D	10/16/1997	187.49	Sea Level
LC-67D	1/30/1998	195.43	Sea Level
LC-67D	4/2/1998	195.57	Sea Level
LC-67D	7/7/1998	192.19	Sea Level
LC-67D	9/22/1998	177.88	Sea Level
LC-67D	12/1/1998	197.49	Sea Level
LC-67D	3/1/1999	197.53	Sea Level
LC-67D	6/1/1999	194.50	Sea Level
LC-67D	9/1/1999	188.93	Sea Level
LC-67D	12/1/1999	194.73	Sea Level
LC-67D	3/1/2000	196.48	Sea Level
LC-67D	6/1/2000	194.44	Sea Level
LC-67D	9/1/2000	189.32	Sea Level
LC-67D	12/1/2000	190.97	Sea Level
LC-67D	3/1/2001	191.01	Sea Level
LC-67D	6/1/2001	190.28	Sea Level
LC-67D	9/1/2001	188.08	Sea Level
LC-67D	12/1/2001	193.56	Sea Level
LC-67D	4/1/2002	195.69	Sea Level
LC-67D	6/1/2002	193.64	Sea Level
LC-67D	9/1/2002	191.26	Sea Level
LC-67D	2/3/2003	193.09	Sea Level
LC-67D	3/3/2003	193.20	Sea Level
LC-67D	7/1/2003	187.95	Sea Level
LC-67D	10/4/2004	188.10	Sea Level
LC-67D	4/15/2005	188.72	Sea Level
LC-67D	7/29/2005	186.04	Sea Level
LC-67D	9/7/2005	184.37	Sea Level
LC-67D	3/16/2006	194.46	Sea Level
LC-67D	9/2/2006	186.08	Sea Level
LC-67D	3/21/2007	195.11	Sea Level
LC-67D	9/27/2007	187.29	Sea Level
LC-67D	3/25/2008	191.43	Sea Level
LC-67D	10/8/2008	186.36	Sea Level
LC-67D	2/5/2009	192.00	Sea Level
LC-67D	8/4/2009	185.63	Sea Level
LC-67D	2/10/2010	188.63	Sea Level
LC-67D	8/10/2010	170.20	Sea Level
LC-67D	2/16/2011	174.13	Sea Level
LC-67D	8/8/2011	171.98	Sea Level
LC-67D	2/23/2012	175.05	Sea Level
LC-67D	7/31/2012	172.35	Sea Level
LC-67D	2/6/2013	174.58	Sea Level
LC-67D	8/7/2013	169.48	Sea Level
LC-67D	2/13/2014	173.43	Sea Level
LC-67D	9/9/2014	173.42	Sea Level
LC-67D	2/19/2015	175.96	Sea Level
LC-67D	9/8/2015	171.28	Sea Level
LC-67D	2/16/2016	176.14	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-67D	8/17/2016	172.14	Sea Level
LC-67D	2/10/2017	174.83	Sea Level
LC-67D	4/5/2018	175.60	Sea Level
LC-67D	3/12/2019	173.73	Sea Level
LC-67D	3/13/2020	173.81	Sea Level
LC-67D	3/11/2021	174.40	Sea Level
LC-68D	12/1/1998	259.63	Sea Level
LC-68D	3/1/1999	257.40	Sea Level
LC-68D	6/1/1999	254.11	Sea Level
LC-68D	9/1/1999	249.95	Sea Level
LC-68D	12/1/1999	256.55	Sea Level
LC-68D	3/1/2000	258.04	Sea Level
LC-68D	6/1/2000	254.24	Sea Level
LC-68D	9/1/2000	247.77	Sea Level
LC-68D	12/1/2000	247.82	Sea Level
LC-68D	3/1/2001	247.88	Sea Level
LC-68D	7/29/2005	249.61	Sea Level
LC-68D	3/16/2006	256.46	Sea Level
LC-68D	9/25/2006	248.03	Sea Level
LC-68D	3/20/2007	257.16	Sea Level
LC-68D	9/28/2007	252.34	Sea Level
LC-68D	3/25/2008	255.38	Sea Level
LC-68D	10/8/2008	253.50	Sea Level
LC-68D	2/5/2009	254.93	Sea Level
LC-68D	8/5/2009	250.33	Sea Level
LC-68D	2/10/2010	254.83	Sea Level
LC-68D	8/10/2010	254.03	Sea Level
LC-68D	2/16/2011	256.58	Sea Level
LC-68D	8/10/2011	253.93	Sea Level
LC-68D	2/29/2012	255.53	Sea Level
LC-68D	7/31/2012	253.73	Sea Level
LC-68D	2/7/2013	255.33	Sea Level
LC-68D	8/8/2013	251.73	Sea Level
LC-68D	2/13/2014	254.28	Sea Level
LC-68D	9/10/2014	253.14	Sea Level
LC-68D	2/20/2015	256.31	Sea Level
LC-68D	9/9/2015	251.82	Sea Level
LC-68D	2/17/2016	258.95	Sea Level
LC-68D	8/17/2016	253.06	Sea Level
LC-68D	2/13/2017	256.81	Sea Level
LC-68D	4/5/2018	255.21	Sea Level
LC-68D	3/12/2019	255.20	Sea Level
LC-68D	3/12/2020	255.39	Sea Level
LC-68D	3/12/2021	256.36	Sea Level
LC-69D	12/1/1998	259.12	Sea Level
LC-69D	3/1/1999	257.07	Sea Level
LC-69D	6/1/1999	254.85	Sea Level
LC-69D	9/1/1999	248.88	Sea Level
LC-69D	12/1/1999	256.34	Sea Level
LC-69D	3/1/2000	257.36	Sea Level
LC-69D	6/1/2000	254.37	Sea Level
LC-69D	9/1/2000	249.09	Sea Level
LC-69D	12/1/2000	249.62	Sea Level
LC-69D	3/1/2001	249.86	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-69D	6/1/2001	249.97	Sea Level
LC-69D	9/1/2001	247.98	Sea Level
LC-69D	12/1/2001	253.37	Sea Level
LC-69D	4/1/2002	257.04	Sea Level
LC-69D	6/1/2002	255.40	Sea Level
LC-69D	9/1/2002	249.63	Sea Level
LC-69D	2/3/2003	255.94	Sea Level
LC-69D	3/3/2003	254.95	Sea Level
LC-69D	7/1/2003	251.47	Sea Level
LC-69D	10/4/2004	249.23	Sea Level
LC-69D	4/6/2005	250.91	Sea Level
LC-69D	7/21/2005	249.96	Sea Level
LC-69D	9/26/2005	249.09	Sea Level
LC-69D	3/16/2006	256.15	Sea Level
LC-69D	9/21/2006	249.28	Sea Level
LC-69D	3/22/2007	256.92	Sea Level
LC-69D	9/28/2007	251.71	Sea Level
LC-69D	3/25/2008	254.57	Sea Level
LC-69D	10/8/2008	248.66	Sea Level
LC-69D	2/5/2009	254.70	Sea Level
LC-69D	8/4/2009	251.31	Sea Level
LC-69D	2/10/2010	255.13	Sea Level
LC-69D	8/10/2010	253.18	Sea Level
LC-69D	2/16/2011	255.70	Sea Level
LC-69D	8/10/2011	253.03	Sea Level
LC-69D	2/23/2012	254.48	Sea Level
LC-69D	7/31/2012	253.18	Sea Level
LC-69D	2/6/2013	254.46	Sea Level
LC-69D	8/8/2013	251.18	Sea Level
LC-69D	2/13/2014	252.88	Sea Level
LC-69D	9/10/2014	252.37	Sea Level
LC-69D	2/19/2015	255.46	Sea Level
LC-69D	9/11/2015	250.98	Sea Level
LC-69D	2/16/2016	258.91	Sea Level
LC-69D	8/17/2016	252.29	Sea Level
LC-69D	2/10/2017	255.80	Sea Level
LC-69D	3/29/2018	255.58	Sea Level
LC-69D	3/12/2019	254.43	Sea Level
LC-69D	3/13/2020	254.82	Sea Level
LC-69D	3/11/2021	256.15	Sea Level
LC-70D	6/1/1999	227.08	Sea Level
LC-70D	9/1/1999	229.01	Sea Level
LC-70D	12/1/1999	236.20	Sea Level
LC-70D	3/1/2000	237.70	Sea Level
LC-70D	6/1/2000	234.71	Sea Level
LC-70D	9/1/2000	229.54	Sea Level
LC-70D	12/1/2000	231.61	Sea Level
LC-70D	3/1/2001	231.74	Sea Level
LC-70D	6/1/2001	230.85	Sea Level
LC-70D	9/1/2001	230.46	Sea Level
LC-70D	12/1/2001	235.55	Sea Level
LC-70D	4/1/2002	237.84	Sea Level
LC-70D	6/1/2002	236.44	Sea Level
LC-70D	9/1/2002	214.24	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-70D	2/3/2003	235.56	Sea Level
LC-70D	3/3/2003	235.61	Sea Level
LC-70D	7/1/2003	230.28	Sea Level
LC-70D	10/4/2004	229.32	Sea Level
LC-70D	3/16/2006	237.31	Sea Level
LC-70D	9/21/2006	215.49	Sea Level
LC-70D	3/22/2007	237.46	Sea Level
LC-70D	3/25/2008	235.08	Sea Level
LC-70D	2/11/2009	235.31	Sea Level
LC-70D	8/6/2009	219.08	Sea Level
LC-70D	2/10/2010	224.01	Sea Level
LC-70D	8/10/2010	227.21	Sea Level
LC-70D	2/16/2011	231.66	Sea Level
LC-70D	8/10/2011	228.06	Sea Level
LC-70D	2/29/2012	230.86	Sea Level
LC-70D	7/31/2012	228.43	Sea Level
LC-70D	2/7/2013	229.75	Sea Level
LC-70D	8/8/2013	223.56	Sea Level
LC-70D	2/13/2014	229.41	Sea Level
LC-70D	9/10/2014	227.06	Sea Level
LC-70D	2/19/2015	231.60	Sea Level
LC-70D	9/11/2015	226.26	Sea Level
LC-70D	2/22/2016	233.65	Sea Level
LC-70D	8/17/2016	227.36	Sea Level
LC-70D	2/10/2017	231.09	Sea Level
LC-70D	4/5/2018	230.98	Sea Level
LC-70D	3/12/2019	224.19	Sea Level
LC-70D	3/13/2020	176.93	Sea Level
LC-70D	3/11/2021	230.86	Sea Level
LC-71D	10/7/1996	167.02	Sea Level
LC-71D	1/24/1997	180.71	Sea Level
LC-71D	4/23/1997	185.87	Sea Level
LC-71D	10/16/1997	174.13	Sea Level
LC-71D	1/30/1998	182.44	Sea Level
LC-71D	4/2/1998	183.36	Sea Level
LC-71D	7/7/1998	179.33	Sea Level
LC-71D	9/22/1998	163.55	Sea Level
LC-71D	12/1/1998	184.45	Sea Level
LC-71D	3/1/1999	185.20	Sea Level
LC-71D	6/1/1999	181.94	Sea Level
LC-71D	9/1/1999	175.83	Sea Level
LC-71D	12/1/1999	181.70	Sea Level
LC-71D	3/1/2000	183.97	Sea Level
LC-71D	6/1/2000	182.03	Sea Level
LC-71D	9/1/2000	176.98	Sea Level
LC-71D	12/1/2000	179.45	Sea Level
LC-71D	3/1/2001	178.75	Sea Level
LC-71D	6/1/2001	177.88	Sea Level
LC-71D	9/1/2001	175.66	Sea Level
LC-71D	12/1/2001	181.17	Sea Level
LC-71D	4/1/2002	183.30	Sea Level
LC-71D	6/1/2002	181.48	Sea Level
LC-71D	9/1/2002	175.36	Sea Level
LC-71D	2/3/2003	180.52	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-71D	3/3/2003	180.99	Sea Level
LC-71D	7/1/2003	175.23	Sea Level
LC-71D	10/4/2004	176.12	Sea Level
LC-71D	2/10/2005	177.63	Sea Level
LC-71D	7/19/2005	174.58	Sea Level
LC-71D	8/29/2005	167.24	Sea Level
LC-71D	3/16/2006	182.36	Sea Level
LC-71D	9/21/2006	173.85	Sea Level
LC-71D	3/23/2007	183.20	Sea Level
LC-71D	10/19/2007	176.08	Sea Level
LC-71D	3/25/2008	180.05	Sea Level
LC-71D	2/5/2009	181.06	Sea Level
LC-71D	8/6/2009	173.50	Sea Level
LC-72D	10/7/1996	164.61	Sea Level
LC-72D	1/24/1997	179.89	Sea Level
LC-72D	4/23/1997	185.03	Sea Level
LC-72D	10/16/1997	174.91	Sea Level
LC-72D	1/30/1998	182.07	Sea Level
LC-72D	4/2/1998	182.60	Sea Level
LC-72D	7/7/1998	179.15	Sea Level
LC-72D	9/22/1998	162.55	Sea Level
LC-72D	12/1/1998	183.72	Sea Level
LC-72D	3/1/1999	184.18	Sea Level
LC-72D	6/1/1999	181.31	Sea Level
LC-72D	9/1/1999	175.98	Sea Level
LC-72D	12/1/1999	181.30	Sea Level
LC-72D	3/1/2000	183.28	Sea Level
LC-72D	6/1/2000	181.53	Sea Level
LC-72D	9/1/2000	176.76	Sea Level
LC-72D	12/1/2000	178.66	Sea Level
LC-72D	3/1/2001	178.26	Sea Level
LC-72D	6/1/2001	177.33	Sea Level
LC-72D	9/1/2001	174.36	Sea Level
LC-72D	12/1/2001	180.27	Sea Level
LC-72D	4/1/2002	182.63	Sea Level
LC-72D	6/1/2002	180.45	Sea Level
LC-72D	9/1/2002	178.43	Sea Level
LC-72D	2/3/2003	179.74	Sea Level
LC-72D	3/3/2003	180.18	Sea Level
LC-72D	7/1/2003	174.88	Sea Level
LC-72D	10/4/2004	175.73	Sea Level
LC-72D	4/15/2005	176.73	Sea Level
LC-72D	7/29/2005	172.35	Sea Level
LC-72D	8/30/2005	172.19	Sea Level
LC-72D	3/16/2006	181.73	Sea Level
LC-72D	9/21/2006	174.16	Sea Level
LC-72D	3/21/2007	182.53	Sea Level
LC-72D	9/27/2007	174.60	Sea Level
LC-72D	3/25/2008	179.06	Sea Level
LC-72D	10/8/2008	174.25	Sea Level
LC-72D	2/5/2009	179.83	Sea Level
LC-72D	8/6/2009	174.46	Sea Level
LC-72D	2/9/2010	174.88	Sea Level
LC-72D	8/13/2010	152.78	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-72D	2/17/2011	157.48	Sea Level
LC-72D	8/8/2011	155.68	Sea Level
LC-72D	3/2/2012	158.43	Sea Level
LC-72D	7/31/2012	156.29	Sea Level
LC-72D	2/5/2013	158.82	Sea Level
LC-72D	8/6/2013	154.18	Sea Level
LC-72D	2/13/2014	157.83	Sea Level
LC-72D	9/9/2014	158.03	Sea Level
LC-72D	2/19/2015	160.45	Sea Level
LC-72D	9/10/2015	155.77	Sea Level
LC-72D	2/17/2016	162.06	Sea Level
LC-72D	8/17/2016	156.52	Sea Level
LC-72D	2/10/2017	159.13	Sea Level
LC-72D	3/29/2018	159.53	Sea Level
LC-72D	3/12/2019	157.52	Sea Level
LC-72D	3/13/2020	158.15	Sea Level
LC-72D	3/10/2021	158.60	Sea Level
LC-73D	10/7/1996	166.95	Sea Level
LC-73D	1/24/1997	179.27	Sea Level
LC-73D	4/23/1997	184.24	Sea Level
LC-73D	10/16/1997	175.14	Sea Level
LC-73D	1/30/1998	181.36	Sea Level
LC-73D	4/2/1998	181.85	Sea Level
LC-73D	7/7/1998	181.43	Sea Level
LC-73D	9/22/1998	161.25	Sea Level
LC-73D	12/1/1998	182.96	Sea Level
LC-73D	3/1/1999	183.53	Sea Level
LC-73D	6/1/1999	180.03	Sea Level
LC-73D	9/1/1999	174.53	Sea Level
LC-73D	12/1/1999	180.38	Sea Level
LC-73D	3/1/2000	182.38	Sea Level
LC-73D	6/1/2000	180.66	Sea Level
LC-73D	9/1/2000	175.84	Sea Level
LC-73D	12/1/2000	177.74	Sea Level
LC-73D	3/1/2001	177.26	Sea Level
LC-73D	6/1/2001	176.45	Sea Level
LC-73D	9/1/2001	174.36	Sea Level
LC-73D	12/1/2001	180.97	Sea Level
LC-73D	4/1/2002	181.70	Sea Level
LC-73D	6/1/2002	181.33	Sea Level
LC-73D	9/1/2002	180.31	Sea Level
LC-73D	2/3/2003	178.81	Sea Level
LC-73D	3/3/2003	179.24	Sea Level
LC-73D	7/1/2003	173.97	Sea Level
LC-73D	10/4/2004	174.87	Sea Level
LC-73D	4/15/2005	175.86	Sea Level
LC-73D	7/29/2005	170.96	Sea Level
LC-73D	9/8/2005	171.59	Sea Level
LC-73D	3/16/2006	180.91	Sea Level
LC-73D	9/21/2006	173.26	Sea Level
LC-73D	3/21/2007	181.62	Sea Level
LC-73D	9/27/2007	173.60	Sea Level
LC-73D	3/25/2008	178.08	Sea Level
LC-73D	10/8/2008	173.30	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-73D	2/5/2009	178.90	Sea Level
LC-73D	8/6/2009	173.63	Sea Level
LC-73D	2/9/2010	173.93	Sea Level
LC-73D	8/13/2010	150.91	Sea Level
LC-73D	2/17/2011	155.66	Sea Level
LC-73D	8/8/2011	154.03	Sea Level
LC-73D	10/4/2011	153.48	Sea Level
LC-73D	3/2/2012	156.66	Sea Level
LC-73D	7/31/2012	154.64	Sea Level
LC-73D	2/7/2013	157.02	Sea Level
LC-73D	8/6/2013	152.48	Sea Level
LC-73D	2/13/2014	156.18	Sea Level
LC-73D	9/9/2014	156.41	Sea Level
LC-73D	2/19/2015	158.70	Sea Level
LC-73D	9/10/2015	154.12	Sea Level
LC-73D	2/22/2016	159.39	Sea Level
LC-73D	8/17/2016	154.89	Sea Level
LC-73D	2/10/2017	157.45	Sea Level
LC-73D	4/6/2018	159.23	Sea Level
LC-73D	3/12/2019	156.23	Sea Level
LC-73D	3/13/2020	156.41	Sea Level
LC-73D	3/10/2021	156.90	Sea Level
LC-74D	10/7/1996	158.38	Sea Level
LC-74D	1/24/1997	179.83	Sea Level
LC-74D	4/23/1997	181.96	Sea Level
LC-74D	10/16/1997	175.74	Sea Level
LC-74D	1/30/1998	178.74	Sea Level
LC-74D	4/2/1998	179.39	Sea Level
LC-74D	7/7/1998	177.05	Sea Level
LC-74D	9/22/1998	156.20	Sea Level
LC-74D	12/1/1998	180.39	Sea Level
LC-74D	3/1/1999	180.47	Sea Level
LC-74D	6/1/1999	178.37	Sea Level
LC-74D	9/1/1999	172.74	Sea Level
LC-74D	12/1/1999	177.64	Sea Level
LC-74D	3/1/2000	179.66	Sea Level
LC-74D	6/1/2000	177.96	Sea Level
LC-74D	9/1/2000	172.74	Sea Level
LC-74D	12/1/2000	174.65	Sea Level
LC-74D	3/1/2001	173.98	Sea Level
LC-74D	6/1/2001	173.18	Sea Level
LC-74D	9/1/2001	170.88	Sea Level
LC-74D	12/1/2001	176.98	Sea Level
LC-74D	4/1/2002	178.50	Sea Level
LC-74D	6/1/2002	176.89	Sea Level
LC-74D	9/1/2002	174.93	Sea Level
LC-74D	2/3/2003	175.58	Sea Level
LC-74D	3/3/2003	176.02	Sea Level
LC-74D	7/1/2003	170.50	Sea Level
LC-74D	10/4/2004	171.84	Sea Level
LC-74D	4/15/2005	172.71	Sea Level
LC-74D	7/29/2005	164.93	Sea Level
LC-74D	9/8/2005	168.63	Sea Level
LC-74D	3/16/2006	177.85	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-74D	9/21/2006	170.01	Sea Level
LC-74D	3/21/2007	178.49	Sea Level
LC-74D	10/17/2007	171.29	Sea Level
LC-74D	3/25/2008	174.13	Sea Level
LC-74D	10/8/2008	169.54	Sea Level
LC-74D	2/6/2009	175.88	Sea Level
LC-74D	8/17/2009	166.93	Sea Level
LC-74D	10/13/2009	170.50	Sea Level
LC-74D	11/16/2009	167.75	Sea Level
LC-74D	12/7/2009	156.84	Sea Level
LC-74D	12/18/2009	159.67	Sea Level
LC-74D	1/21/2010	148.09	Sea Level
LC-74D	2/18/2010	175.23	Sea Level
LC-74D	3/18/2010	175.23	Sea Level
LC-74D	4/2/2010	171.64	Sea Level
LC-74D	4/21/2010	147.19	Sea Level
LC-74D	5/11/2010	146.72	Sea Level
LC-74D	6/3/2010	146.18	Sea Level
LC-74D	8/13/2010	144.30	Sea Level
LC-74D	2/17/2011	149.25	Sea Level
LC-74D	8/8/2011	147.90	Sea Level
LC-74D	10/4/2011	147.35	Sea Level
LC-74D	2/27/2012	150.60	Sea Level
LC-74D	8/2/2012	148.43	Sea Level
LC-74D	2/5/2013	151.12	Sea Level
LC-74D	8/6/2013	146.02	Sea Level
LC-74D	2/13/2014	150.10	Sea Level
LC-74D	9/3/2014	149.90	Sea Level
LC-74D	2/19/2015	152.68	Sea Level
LC-74D	9/8/2015	148.45	Sea Level
LC-74D	2/17/2016	154.50	Sea Level
LC-74D	8/16/2016	149.19	Sea Level
LC-74D	2/10/2017	151.55	Sea Level
LC-74D	8/8/2017	150.42	Sea Level
LC-74D	3/29/2018	151.90	Sea Level
LC-74D	9/13/2018	149.65	Sea Level
LC-74D	3/12/2019	150.20	Sea Level
LC-74D	3/10/2020	150.36	Sea Level
LC-74D	8/28/2020	149.13	Sea Level
LC-74D	3/10/2021	150.74	Sea Level
LC-74D	9/1/2021	154.85	Sea Level
LC-75D	9/1/2000	232.73	Sea Level
LC-75D	12/1/2000	237.31	Sea Level
LC-75D	3/1/2001	236.55	Sea Level
LC-75D	6/1/2001	232.64	Sea Level
LC-75D	9/1/2001	231.36	Sea Level
LC-75D	12/1/2001	236.88	Sea Level
LC-75D	4/1/2002	243.92	Sea Level
LC-75D	6/1/2002	239.66	Sea Level
LC-75D	9/1/2002	232.95	Sea Level
LC-75D	2/3/2003	240.34	Sea Level
LC-75D	3/3/2003	239.14	Sea Level
LC-75D	7/1/2003	234.44	Sea Level
LC-75D	10/4/2004	234.64	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-75D	4/15/2005	237.65	Sea Level
LC-75D	7/29/2005	232.61	Sea Level
LC-75D	9/9/2005	232.16	Sea Level
LC-75D	3/16/2006	241.97	Sea Level
LC-75D	9/20/2006	234.72	Sea Level
LC-75D	3/21/2007	246.00	Sea Level
LC-75D	9/28/2007	236.90	Sea Level
LC-75D	3/25/2008	241.32	Sea Level
LC-75D	10/8/2008	233.82	Sea Level
LC-75D	2/5/2009	238.78	Sea Level
LC-75D	8/4/2009	232.43	Sea Level
LC-75D	2/10/2010	239.03	Sea Level
LC-75D	8/10/2010	237.51	Sea Level
LC-75D	2/16/2011	240.38	Sea Level
LC-75D	8/8/2011	237.48	Sea Level
LC-75D	2/29/2012	239.68	Sea Level
LC-75D	8/2/2012	234.49	Sea Level
LC-75D	2/6/2013	239.53	Sea Level
LC-75D	8/7/2013	231.18	Sea Level
LC-75D	2/13/2014	237.93	Sea Level
LC-75D	9/9/2014	237.72	Sea Level
LC-75D	2/19/2015	240.58	Sea Level
LC-75D	9/8/2015	233.88	Sea Level
LC-75D	2/17/2016	243.57	Sea Level
LC-75D	8/17/2016	236.32	Sea Level
LC-75D	2/10/2017	240.86	Sea Level
LC-75D	3/29/2018	237.88	Sea Level
LC-75D	3/12/2019	238.94	Sea Level
LC-75D	3/13/2020	237.37	Sea Level
LC-75D	3/11/2021	240.01	Sea Level
LC-76D	9/1/2000	168.38	Sea Level
LC-76D	12/1/2000	170.24	Sea Level
LC-76D	3/1/2001	169.64	Sea Level
LC-76D	6/1/2001	168.87	Sea Level
LC-76D	9/1/2001	166.14	Sea Level
LC-76D	12/1/2001	171.94	Sea Level
LC-76D	4/1/2002	173.94	Sea Level
LC-76D	6/1/2002	172.16	Sea Level
LC-76D	9/1/2002	166.18	Sea Level
LC-76D	2/3/2003	171.04	Sea Level
LC-76D	3/3/2003	171.46	Sea Level
LC-76D	7/1/2003	166.46	Sea Level
LC-76D	10/4/2004	167.41	Sea Level
LC-76D	3/16/2006	173.28	Sea Level
LC-76D	9/26/2006	165.73	Sea Level
LC-76D	3/21/2007	173.83	Sea Level
LC-76D	10/18/2007	166.83	Sea Level
LC-76D	3/25/2008	170.36	Sea Level
LC-76D	10/8/2008	165.76	Sea Level
LC-76D	2/6/2009	171.59	Sea Level
LC-76D	8/4/2009	166.28	Sea Level
LC-76D	2/9/2010	166.11	Sea Level
LC-76D	8/13/2010	143.78	Sea Level
LC-76D	2/17/2011	148.60	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-76D	8/8/2011	147.24	Sea Level
LC-76D	2/27/2012	149.78	Sea Level
LC-76D	8/1/2012	147.58	Sea Level
LC-76D	2/5/2013	150.24	Sea Level
LC-76D	8/6/2013	145.86	Sea Level
LC-76D	2/12/2014	149.46	Sea Level
LC-76D	9/10/2014	149.74	Sea Level
LC-76D	2/19/2015	151.97	Sea Level
LC-76D	9/8/2015	147.45	Sea Level
LC-76D	2/22/2016	152.51	Sea Level
LC-76D	8/16/2016	148.20	Sea Level
LC-76D	2/9/2017	150.65	Sea Level
LC-76D	4/6/2018	151.34	Sea Level
LC-76D	3/11/2019	149.28	Sea Level
LC-76D	3/12/2020	150.49	Sea Level
LC-76D	3/10/2021	150.03	Sea Level
LC-77D	9/1/2000	183.08	Sea Level
LC-77D	12/1/2000	184.90	Sea Level
LC-77D	3/1/2001	184.71	Sea Level
LC-77D	6/1/2001	183.92	Sea Level
LC-77D	9/1/2001	181.66	Sea Level
LC-77D	12/1/2001	187.07	Sea Level
LC-77D	4/1/2002	188.96	Sea Level
LC-77D	6/1/2002	187.20	Sea Level
LC-77D	9/1/2002	181.38	Sea Level
LC-77D	2/3/2003	186.06	Sea Level
LC-77D	3/3/2003	186.61	Sea Level
LC-77D	7/1/2003	181.81	Sea Level
LC-77D	10/4/2004	182.16	Sea Level
LC-77D	4/14/2005	183.29	Sea Level
LC-77D	7/21/2005	180.75	Sea Level
LC-77D	9/6/2005	179.15	Sea Level
LC-77D	3/16/2006	188.11	Sea Level
LC-77D	9/25/2006	180.80	Sea Level
LC-77D	3/22/2007	188.70	Sea Level
LC-77D	9/28/2007	181.40	Sea Level
LC-77D	3/25/2008	185.63	Sea Level
LC-77D	10/8/2008	180.87	Sea Level
LC-77D	2/6/2009	186.48	Sea Level
LC-77D	8/5/2009	180.46	Sea Level
LC-77D	2/9/2010	181.10	Sea Level
LC-77D	8/12/2010	163.65	Sea Level
LC-77D	2/17/2011	167.45	Sea Level
LC-77D	8/9/2011	165.43	Sea Level
LC-77D	2/28/2012	168.28	Sea Level
LC-77D	8/1/2012	171.61	Sea Level
LC-77D	2/7/2013	174.98	Sea Level
LC-77D	8/8/2013	170.85	Sea Level
LC-77D	2/19/2014	174.55	Sea Level
LC-77D	9/11/2014	173.95	Sea Level
LC-77D	2/23/2015	176.14	Sea Level
LC-77D	9/10/2015	171.62	Sea Level
LC-77D	2/19/2016	177.57	Sea Level
LC-77D	8/17/2016	172.44	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-77D	2/13/2017	175.36	Sea Level
LC-77D	4/5/2018	175.97	Sea Level
LC-77D	3/13/2019	174.19	Sea Level
LC-77D	3/11/2020	174.22	Sea Level
LC-77D	3/11/2021	174.68	Sea Level
LC-79D	2/3/2003	202.72	Sea Level
LC-79D	3/3/2003	203.82	Sea Level
LC-79D	7/1/2003	198.98	Sea Level
LC-79D	10/4/2004	199.16	Sea Level
LC-79D	4/14/2005	201.29	Sea Level
LC-79D	7/21/2005	199.01	Sea Level
LC-79D	3/16/2006	207.24	Sea Level
LC-79D	9/25/2006	198.44	Sea Level
LC-79D	3/22/2007	207.49	Sea Level
LC-79D	10/19/2007	200.94	Sea Level
LC-79D	3/25/2008	205.34	Sea Level
LC-79D	10/8/2008	199.84	Sea Level
LC-79D	2/11/2009	205.99	Sea Level
LC-79D	8/5/2009	198.94	Sea Level
LC-79D	2/9/2010	198.44	Sea Level
LC-79D	2/17/2011	192.94	Sea Level
LC-79D	8/9/2011	190.20	Sea Level
LC-79D	3/1/2012	193.44	Sea Level
LC-79D	8/2/2012	190.78	Sea Level
LC-79D	2/7/2013	193.71	Sea Level
LC-79D	8/9/2013	188.94	Sea Level
LC-79D	2/18/2014	193.24	Sea Level
LC-79D	9/10/2014	192.36	Sea Level
LC-79D	2/23/2015	166.80	Sea Level
LC-79D	2/22/2016	196.14	Sea Level
LC-79D	8/18/2016	190.42	Sea Level
LC-79D	2/14/2017	194.50	Sea Level
LC-79D	4/10/2018	194.86	Sea Level
LC-79D	3/14/2019	196.46	Sea Level
LC-79D	3/20/2020	194.01	Sea Level
LC-79D-2	2/3/2003	203.93	Sea Level
LC-79D-2	3/3/2003	204.70	Sea Level
LC-79D-2	7/1/2003	199.75	Sea Level
LC-79D-2	10/4/2004	199.55	Sea Level
LC-79D-3	2/3/2003	204.90	Sea Level
LC-79D-3	3/3/2003	205.75	Sea Level
LC-79D-3	7/1/2003	199.61	Sea Level
LC-79D-3	10/4/2004	199.58	Sea Level
LC-79D-4	2/3/2003	204.97	Sea Level
LC-79D-4	3/3/2003	205.75	Sea Level
LC-79D-4	7/1/2003	199.59	Sea Level
LC-79D-4	10/4/2004	199.95	Sea Level
LC-80D	2/3/2003	174.01	Sea Level
LC-80D	7/1/2003	171.48	Sea Level
LC-80D	10/4/2004	172.14	Sea Level
LC-80D	4/12/2005	173.02	Sea Level
LC-80D	7/29/2005	169.79	Sea Level
LC-80D	10/4/2005	169.01	Sea Level
LC-80D	3/16/2006	178.22	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-80D	9/25/2006	170.27	Sea Level
LC-80D	10/5/2007	171.32	Sea Level
LC-80D	10/8/2008	170.77	Sea Level
LC-80D	2/6/2009	176.84	Sea Level
LC-80D	8/6/2009	170.62	Sea Level
LC-80D	2/9/2010	170.42	Sea Level
LC-80D	2/15/2011	153.50	Sea Level
LC-80D	8/9/2011	151.82	Sea Level
LC-80D	3/1/2012	154.64	Sea Level
LC-80D	8/3/2012	152.13	Sea Level
LC-80D	2/7/2013	155.02	Sea Level
LC-80D	8/6/2013	150.54	Sea Level
LC-80D	2/12/2014	154.37	Sea Level
LC-80D	9/9/2014	154.49	Sea Level
LC-80D	2/20/2015	156.80	Sea Level
LC-80D	2/22/2016	157.17	Sea Level
LC-80D	8/16/2016	152.72	Sea Level
LC-80D	2/14/2017	155.56	Sea Level
LC-80D	4/10/2018	155.98	Sea Level
LC-80D	3/14/2019	154.12	Sea Level
LC-80D	3/20/2020	154.29	Sea Level
LC-80D-2	2/3/2003	173.98	Sea Level
LC-80D-2	7/1/2003	171.45	Sea Level
LC-80D-2	10/4/2004	172.18	Sea Level
LC-80D-3	2/3/2003	173.96	Sea Level
LC-80D-3	3/3/2003	174.44	Sea Level
LC-80D-3	7/1/2003	171.44	Sea Level
LC-80D-3	10/4/2004	172.22	Sea Level
LC-80D-4	2/3/2003	173.90	Sea Level
LC-80D-4	7/1/2003	171.40	Sea Level
LC-81D	2/3/2003	165.55	Sea Level
LC-81D	3/3/2003	166.05	Sea Level
LC-81D	7/1/2003	161.32	Sea Level
LC-81D	10/4/2004	162.11	Sea Level
LC-81D	4/15/2005	163.03	Sea Level
LC-81D	7/29/2005	160.20	Sea Level
LC-81D	10/18/2005	159.27	Sea Level
LC-81D	3/16/2006	167.87	Sea Level
LC-81D	9/26/2006	160.35	Sea Level
LC-81D	3/20/2007	168.25	Sea Level
LC-81D	10/19/2007	161.25	Sea Level
LC-81D	4/3/2008	165.05	Sea Level
LC-81D	10/8/2008	160.75	Sea Level
LC-81D	2/6/2009	165.90	Sea Level
LC-81D	8/6/2009	160.55	Sea Level
LC-81D	2/8/2010	158.95	Sea Level
LC-81D	2/16/2011	145.60	Sea Level
LC-81D	8/9/2011	144.23	Sea Level
LC-81D	3/1/2012	146.59	Sea Level
LC-81D	8/2/2012	144.36	Sea Level
LC-81D	2/5/2013	146.88	Sea Level
LC-81D	8/6/2013	142.85	Sea Level
LC-81D	2/11/2014	145.25	Sea Level
LC-81D	9/9/2014	146.40	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-81D	2/23/2015	148.14	Sea Level
LC-81D	2/22/2016	149.15	Sea Level
LC-81D	8/16/2016	145.03	Sea Level
LC-81D	2/15/2017	147.38	Sea Level
LC-81D	4/10/2018	147.95	Sea Level
LC-81D	3/14/2019	145.95	Sea Level
LC-81D-2	2/3/2003	165.53	Sea Level
LC-81D-2	3/3/2003	166.08	Sea Level
LC-81D-2	7/1/2003	161.32	Sea Level
LC-81D-2	10/4/2004	162.13	Sea Level
LC-81D-3	2/3/2003	166.00	Sea Level
LC-81D-3	3/3/2003	166.50	Sea Level
LC-81D-3	7/1/2003	161.75	Sea Level
LC-81D-3	10/4/2004	162.60	Sea Level
LC-81D-4	2/3/2003	166.90	Sea Level
LC-81D-4	3/3/2003	167.51	Sea Level
LC-81D-4	7/1/2003	162.67	Sea Level
LC-81D-4	10/4/2004	163.50	Sea Level
LC-82D	2/3/2003	172.63	Sea Level
LC-82D	3/3/2003	173.07	Sea Level
LC-82D	7/1/2003	167.79	Sea Level
LC-82D	10/4/2004	168.15	Sea Level
LC-82D	4/15/2005	170.17	Sea Level
LC-82D	7/29/2005	163.00	Sea Level
LC-82D	10/21/2005	166.95	Sea Level
LC-82D	3/17/2006	174.04	Sea Level
LC-82D	9/25/2006	167.12	Sea Level
LC-82D	3/20/2007	174.02	Sea Level
LC-82D	10/19/2007	168.22	Sea Level
LC-82D	10/8/2008	166.87	Sea Level
LC-82D	2/6/2009	173.27	Sea Level
LC-82D	8/7/2009	167.67	Sea Level
LC-82D	2/9/2010	167.67	Sea Level
LC-82D	2/17/2011	149.72	Sea Level
LC-82D	8/9/2011	148.29	Sea Level
LC-82D	3/1/2012	158.67	Sea Level
LC-82D	8/2/2012	148.78	Sea Level
LC-82D	2/5/2013	151.42	Sea Level
LC-82D	8/6/2013	146.87	Sea Level
LC-82D	2/12/2014	150.42	Sea Level
LC-82D	9/9/2014	150.74	Sea Level
LC-82D	2/20/2015	152.90	Sea Level
LC-82D	2/22/2016	153.89	Sea Level
LC-82D	8/16/2016	149.27	Sea Level
LC-82D	2/9/2017	151.70	Sea Level
LC-82D	4/10/2018	152.19	Sea Level
LC-82D	3/14/2019	149.98	Sea Level
LC-82D	3/20/2020	150.07	Sea Level
LC-82D-2	2/3/2003	171.52	Sea Level
LC-82D-2	3/3/2003	172.04	Sea Level
LC-82D-2	7/1/2003	166.91	Sea Level
LC-82D-2	10/4/2004	168.15	Sea Level
LC-82D-3	2/3/2003	171.78	Sea Level
LC-82D-3	3/3/2003	172.25	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-82D-3	7/1/2003	167.04	Sea Level
LC-82D-3	10/4/2004	168.95	Sea Level
LC-82D-4	2/3/2003	171.82	Sea Level
LC-82D-4	3/3/2003	172.25	Sea Level
LC-82D-4	7/1/2003	167.05	Sea Level
LC-82D-4	10/4/2004	168.05	Sea Level
LC-83D	2/3/2003	174.68	Sea Level
LC-83D	3/3/2003	175.13	Sea Level
LC-83D	7/1/2003	169.78	Sea Level
LC-83D	10/4/2004	170.49	Sea Level
LC-83D	4/15/2005	171.41	Sea Level
LC-83D	7/29/2005	167.61	Sea Level
LC-83D	10/4/2005	167.37	Sea Level
LC-83D	3/16/2006	176.45	Sea Level
LC-83D	9/25/2006	168.61	Sea Level
LC-83D	3/21/2007	177.01	Sea Level
LC-83D	10/18/2007	169.89	Sea Level
LC-83D	4/3/2008	173.61	Sea Level
LC-83D	10/8/2008	169.21	Sea Level
LC-83D	2/6/2009	174.66	Sea Level
LC-83D	8/17/2009	169.71	Sea Level
LC-83D	2/18/2010	174.36	Sea Level
LC-83D	4/21/2010	146.36	Sea Level
LC-83D	5/11/2010	145.71	Sea Level
LC-83D	2/17/2011	144.51	Sea Level
LC-83D	8/9/2011	147.04	Sea Level
LC-83D	2/28/2012	149.86	Sea Level
LC-83D	8/2/2012	147.47	Sea Level
LC-83D	2/5/2013	150.29	Sea Level
LC-83D	8/6/2013	145.71	Sea Level
LC-83D	2/12/2014	149.41	Sea Level
LC-83D	9/9/2014	150.08	Sea Level
LC-83D	2/20/2015	151.88	Sea Level
LC-83D	2/22/2016	154.06	Sea Level
LC-83D	8/16/2016	148.20	Sea Level
LC-83D	2/9/2017	150.73	Sea Level
LC-83D	4/10/2018	151.10	Sea Level
LC-83D	3/14/2019	149.17	Sea Level
LC-83D	3/20/2020	147.71	Sea Level
LC-83D-2	2/3/2003	174.27	Sea Level
LC-83D-2	3/3/2003	174.71	Sea Level
LC-83D-2	7/1/2003	169.49	Sea Level
LC-83D-2	10/4/2004	170.50	Sea Level
LC-83D-3	2/3/2003	174.33	Sea Level
LC-83D-3	3/3/2003	174.76	Sea Level
LC-83D-3	7/1/2003	169.52	Sea Level
LC-83D-3	10/4/2004	170.73	Sea Level
LC-83D-4	2/3/2003	174.60	Sea Level
LC-83D-4	3/3/2003	175.08	Sea Level
LC-83D-4	7/1/2003	169.83	Sea Level
LC-83D-4	10/4/2004	170.91	Sea Level
LC-84D-1	10/4/2004	161.39	Sea Level
LC-84D-1	11/1/2004	163.96	Sea Level
LC-84D-1	2/23/2005	166.00	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-84D-1	6/21/2005	164.19	Sea Level
LC-84D-1	9/29/2005	160.08	Sea Level
LC-84D-1	12/28/2005	165.06	Sea Level
LC-84D-1	3/16/2006	169.38	Sea Level
LC-84D-1	9/26/2006	162.98	Sea Level
LC-84D-1	3/19/2007	170.80	Sea Level
LC-84D-1	10/19/2007	164.06	Sea Level
LC-84D-1	4/3/2008	167.40	Sea Level
LC-84D-1	10/8/2008	162.93	Sea Level
LC-84D-1	2/6/2009	168.57	Sea Level
LC-84D-1	8/7/2009	163.39	Sea Level
LC-84D-1	2/9/2010	163.34	Sea Level
LC-84D-1	8/13/2010	143.01	Sea Level
LC-84D-1	2/17/2011	147.74	Sea Level
LC-84D-1	8/4/2011	146.27	Sea Level
LC-84D-1	3/1/2012	148.67	Sea Level
LC-84D-1	8/2/2012	146.69	Sea Level
LC-84D-1	2/5/2013	149.22	Sea Level
LC-84D-1	8/6/2013	144.94	Sea Level
LC-84D-1	2/12/2014	148.39	Sea Level
LC-84D-1	9/10/2014	149.52	Sea Level
LC-84D-1	2/24/2015	150.27	Sea Level
LC-84D-1	9/8/2015	146.31	Sea Level
LC-84D-1	2/17/2016	151.75	Sea Level
LC-84D-1	8/16/2016	146.51	Sea Level
LC-84D-1	2/9/2017	149.06	Sea Level
LC-84D-1	4/5/2018	149.91	Sea Level
LC-84D-1	3/11/2019	147.57	Sea Level
LC-84D-1	3/12/2020	147.72	Sea Level
LC-84D-1	3/9/2021	148.29	Sea Level
LC-84D-2	10/4/2004	161.79	Sea Level
LC-84D-2	11/1/2004	164.44	Sea Level
LC-84D-2	2/23/2005	165.87	Sea Level
LC-84D-2	6/21/2005	164.69	Sea Level
LC-84D-2	9/29/2005	160.54	Sea Level
LC-84D-2	12/28/2005	158.40	Sea Level
LC-84D-2	3/16/2006	169.86	Sea Level
LC-84D-2	9/26/2006	162.92	Sea Level
LC-84D-2	3/29/2007	171.00	Sea Level
LC-84D-2	10/19/2007	164.19	Sea Level
LC-84D-2	4/3/2008	167.56	Sea Level
LC-84D-2	10/8/2008	163.05	Sea Level
LC-84D-2	2/6/2009	168.74	Sea Level
LC-84D-2	4/5/2018	156.86	Sea Level
LC-84D-2	3/11/2019	147.78	Sea Level
LC-84D-2	3/12/2020	147.96	Sea Level
LC- 84D-2	3/9/2021	148.48	Sea Level
LC-85D-1	10/4/2004	170.24	Sea Level
LC-85D-1	11/1/2004	172.91	Sea Level
LC-85D-1	2/23/2005	174.62	Sea Level
LC-85D-1	6/23/2005	172.05	Sea Level
LC-85D-1	10/25/2005	171.68	Sea Level
LC-85D-1	12/28/2005	174.26	Sea Level
LC-85D-1	3/16/2006	178.84	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-85D-1	9/25/2006	170.80	Sea Level
LC-85D-1	3/20/2007	179.43	Sea Level
LC-85D-1	9/21/2007	169.65	Sea Level
LC-85D-1	4/3/2008	175.16	Sea Level
LC-85D-1	10/8/2008	170.47	Sea Level
LC-85D-1	2/6/2009	176.90	Sea Level
LC-85D-1	8/12/2009	171.60	Sea Level
LC-85D-1	2/9/2010	171.67	Sea Level
LC-85D-1	8/13/2010	148.63	Sea Level
LC-85D-1	2/17/2011	153.80	Sea Level
LC-85D-1	8/4/2011	151.55	Sea Level
LC-85D-1	3/1/2012	154.85	Sea Level
LC-85D-1	8/2/2012	152.85	Sea Level
LC-85D-1	2/5/2013	155.07	Sea Level
LC-85D-1	8/6/2013	150.55	Sea Level
LC-85D-1	2/12/2014	154.6	Sea Level
LC-85D-1	9/10/2014	152.85	Sea Level
LC-85D-1	2/19/2015	157.15	Sea Level
LC-85D-1	9/8/2015	152.62	Sea Level
LC-85D-1	2/17/2016	158.85	Sea Level
LC-85D-1	8/16/2016	153.43	Sea Level
LC-85D-1	2/10/2017	155.83	Sea Level
LC-85D-1	4/5/2018	156.86	Sea Level
LC-85D-1	3/12/2019	154.50	Sea Level
LC-85D-1	3/13/2020	154.73	Sea Level
LC-85D-1	3/10/2021	155.27	Sea Level
LC-85D-2	10/4/2004	168.14	Sea Level
LC-85D-2	11/1/2004	171.92	Sea Level
LC-85D-2	2/23/2005	173.50	Sea Level
LC-85D-2	6/23/2005	171.18	Sea Level
LC-85D-2	10/25/2005	170.60	Sea Level
LC-85D-2	12/28/2005	173.11	Sea Level
LC-85D-2	3/16/2006	177.76	Sea Level
LC-85D-2	9/25/2006	169.82	Sea Level
LC-85D-2	3/20/2007	178.32	Sea Level
LC-85D-2	9/21/2007	168.66	Sea Level
LC-85D-2	4/3/2008	174.34	Sea Level
LC-85D-2	10/8/2008	169.47	Sea Level
LC-85D-2	2/6/2009	175.92	Sea Level
LC-85D-2	3/10/2021	154.27	Sea Level
LC-86D-1	10/4/2004	157.66	Sea Level
LC-86D-1	11/1/2004	158.14	Sea Level
LC-86D-1	2/17/2005	159.78	Sea Level
LC-86D-1	6/17/2005	159.91	Sea Level
LC-86D-1	9/13/2005	155.41	Sea Level
LC-86D-1	12/21/2005	159.06	Sea Level
LC-86D-1	3/16/2006	163.73	Sea Level
LC-86D-1	9/22/2006	156.53	Sea Level
LC-86D-1	3/20/2007	164.16	Sea Level
LC-86D-1	9/27/2007	156.84	Sea Level
LC-86D-1	4/3/2008	160.92	Sea Level
LC-86D-1	10/8/2008	156.65	Sea Level
LC-86D-1	2/6/2009	161.99	Sea Level
LC-86D-1	8/6/2009	156.60	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-86D-1	2/8/2010	155.21	Sea Level
LC-86D-1	8/16/2010	137.75	Sea Level
LC-86D-1	2/16/2011	142.86	Sea Level
LC-86D-1	8/9/2011	141.36	Sea Level
LC-86D-1	3/1/2012	143.71	Sea Level
LC-86D-1	8/2/2012	141.74	Sea Level
LC-86D-1	2/4/2013	144.23	Sea Level
LC-86D-1	8/6/2013	140.09	Sea Level
LC-86D-1	2/11/2014	143.46	Sea Level
LC-86D-1	9/2/2014	142.72	Sea Level
LC-86D-1	2/23/2015	145.33	Sea Level
LC-86D-1	9/8/2015	141.25	Sea Level
LC-86D-1	2/18/2016	147.02	Sea Level
LC-86D-1	8/16/2016	142.16	Sea Level
LC-86D-1	2/9/2017	144.69	Sea Level
LC-86D-1	3/30/2018	144.92	Sea Level
LC-86D-1	3/11/2019	143.14	Sea Level
LC-86D-1	3/12/2020	143.24	Sea Level
LC-86D-1	3/9/2021	144.00	Sea Level
LC-86D-2	10/4/2004	149.72	Sea Level
LC-86D-2	11/1/2004	150.81	Sea Level
LC-86D-2	2/17/2005	152.31	Sea Level
LC-86D-2	6/17/2005	152.36	Sea Level
LC-86D-2	9/13/2005	148.19	Sea Level
LC-86D-2	12/21/2005	151.67	Sea Level
LC-86D-2	3/16/2006	156.04	Sea Level
LC-86D-2	9/22/2006	149.25	Sea Level
LC-86D-2	3/20/2007	156.48	Sea Level
LC-86D-2	9/27/2007	149.48	Sea Level
LC-86D-2	4/3/2008	153.53	Sea Level
LC-86D-2	10/8/2008	149.38	Sea Level
LC-86D-2	2/6/2009	154.42	Sea Level
LC-86D-2	3/30/2018	139.29	Sea Level
LC- 86D-2	3/11/2019	137.53	Sea Level
LC- 86D-2	3/12/2020	137.51	Sea Level
LC- 86D-2	3/12/2021	138.04	Sea Level
LC-87D-1	10/4/2004	164.34	Sea Level
LC-87D-1	11/1/2004	166.38	Sea Level
LC-87D-1	3/17/2005	167.75	Sea Level
LC-87D-1	6/17/2005	168.19	Sea Level
LC-87D-1	9/22/2005	162.99	Sea Level
LC-87D-1	12/28/2005	167.75	Sea Level
LC-87D-1	3/16/2006	172.09	Sea Level
LC-87D-1	9/22/2006	164.55	Sea Level
LC-87D-1	3/20/2007	172.64	Sea Level
LC-87D-1	9/27/2007	164.87	Sea Level
LC-87D-1	4/3/2008	169.34	Sea Level
LC-87D-1	10/8/2008	164.59	Sea Level
LC-87D-1	2/6/2009	170.34	Sea Level
LC-87D-1	8/6/2009	164.82	Sea Level
LC-87D-1	2/8/2010	163.14	Sea Level
LC-87D-1	8/16/2010	142.90	Sea Level
LC-87D-1	2/16/2011	148.39	Sea Level
LC-87D-1	8/9/2011	146.89	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-87D-1	3/1/2012	149.37	Sea Level
LC-87D-1	8/2/2012	147.13	Sea Level
LC-87D-1	2/4/2013	149.88	Sea Level
LC-87D-1	8/6/2013	145.59	Sea Level
LC-87D-1	2/11/2014	148.99	Sea Level
LC-87D-1	9/9/2014	149.34	Sea Level
LC-87D-1	2/23/2015	151.19	Sea Level
LC-87D-1	9/8/2015	147.13	Sea Level
LC-87D-1	2/18/2016	152.93	Sea Level
LC-87D-1	8/16/2016	147.61	Sea Level
LC-87D-1	2/9/2017	150.40	Sea Level
LC-87D-1	4/6/2018	150.98	Sea Level
LC-87D-1	3/13/2019	148.82	Sea Level
LC-87D-1	3/13/2020	149.25	Sea Level
LC-87D-1	3/10/2021	149.67	Sea Level
LC-87D-2	10/4/2004	165.14	Sea Level
LC-87D-2	11/1/2004	167.42	Sea Level
LC-87D-2	3/17/2005	168.54	Sea Level
LC-87D-2	6/17/2005	168.01	Sea Level
LC-87D-2	9/22/2005	163.72	Sea Level
LC-87D-2	12/28/2005	168.50	Sea Level
LC-87D-2	3/16/2006	172.92	Sea Level
LC-87D-2	9/22/2006	165.35	Sea Level
LC-87D-2	3/20/2007	173.41	Sea Level
LC-87D-2	9/27/2007	165.62	Sea Level
LC-87D-2	4/3/2008	170.02	Sea Level
LC-87D-2	10/8/2008	164.84	Sea Level
LC-87D-2	2/6/2009	171.41	Sea Level
LC-87D-2	3/10/2021	150.63	Sea Level
LC-88D-1	10/1/2004	109.10	Sea Level
LC-88D-1	10/4/2004	105.13	Sea Level
LC-88D-1	11/1/2004	109.10	Sea Level
LC-88D-1	2/24/2005	107.41	Sea Level
LC-88D-1	6/20/2005	106.40	Sea Level
LC-88D-1	9/13/2005	103.90	Sea Level
LC-88D-1	12/20/2005	106.18	Sea Level
LC-88D-1	3/16/2006	109.42	Sea Level
LC-88D-1	9/22/2006	104.64	Sea Level
LC-88D-1	3/20/2007	109.66	Sea Level
LC-88D-1	9/27/2007	105.09	Sea Level
LC-88D-1	4/3/2008	108.40	Sea Level
LC-88D-1	10/8/2008	105.10	Sea Level
LC-88D-1	2/4/2009	108.89	Sea Level
LC-88D-1	8/6/2009	103.53	Sea Level
LC-88D-1	2/8/2010	105.47	Sea Level
LC-88D-1	8/17/2010	97.92	Sea Level
LC-88D-1	2/15/2011	102.35	Sea Level
LC-88D-1	8/4/2011	100.52	Sea Level
LC-88D-1	3/2/2012	102.31	Sea Level
LC-88D-1	8/1/2012	100.33	Sea Level
LC-88D-1	2/4/2013	102.52	Sea Level
LC-88D-1	8/5/2013	99.37	Sea Level
LC-88D-1	2/11/2014	102.12	Sea Level
LC-88D-1	9/2/2014	100.45	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-88D-1	2/24/2015	103.05	Sea Level
LC-88D-1	9/8/2015	99.46	Sea Level
LC-88D-1	2/18/2016	104.08	Sea Level
LC-88D-1	8/16/2016	100.23	Sea Level
LC-88D-1	2/9/2017	103.36	Sea Level
LC-88D-1	3/30/2018	103.02	Sea Level
LC-88D-1	3/11/2019	101.61	Sea Level
LC-88D-1	3/12/2020	101.20	Sea Level
LC-88D-1	3/9/2021	102.09	Sea Level
LC-88D-2	10/4/2004	101.81	Sea Level
LC-88D-2	11/1/2004	106.41	Sea Level
LC-88D-2	2/24/2005	104.72	Sea Level
LC-88D-2	6/20/2005	103.52	Sea Level
LC-88D-2	9/12/2005	100.97	Sea Level
LC-88D-2	12/20/2005	103.64	Sea Level
LC-88D-2	3/16/2006	106.37	Sea Level
LC-88D-2	9/22/2006	101.81	Sea Level
LC-88D-2	3/20/2007	106.55	Sea Level
LC-88D-2	9/27/2007	102.09	Sea Level
LC-88D-2	4/3/2008	105.29	Sea Level
LC-88D-2	10/8/2008	102.49	Sea Level
LC-88D-2	2/4/2009	105.72	Sea Level
LC-88D-2	3/30/2018	100.56	Sea Level
LC-88D-2	3/11/2019	99.16	Sea Level
LC-88D-2	3/12/2020	98.69	Sea Level
LC-88D-2	3/9/2021	99.40	Sea Level
LC-89D-1	10/4/2004	125.31	Sea Level
LC-89D-1	11/1/2004	126.72	Sea Level
LC-89D-1	2/23/2005	128.17	Sea Level
LC-89D-1	6/21/2005	127.41	Sea Level
LC-89D-1	9/13/2005	124.69	Sea Level
LC-89D-1	12/27/2005	127.90	Sea Level
LC-89D-1	3/16/2006	130.80	Sea Level
LC-89D-1	9/26/2006	125.64	Sea Level
LC-89D-1	3/20/2007	131.24	Sea Level
LC-89D-1	9/21/2007	125.49	Sea Level
LC-89D-1	4/3/2008	129.43	Sea Level
LC-89D-1	10/8/2008	126.01	Sea Level
LC-89D-1	2/4/2009	129.78	Sea Level
LC-89D-1	8/7/2009	125.13	Sea Level
LC-89D-1	2/9/2010	126.31	Sea Level
LC-89D-1	8/13/2010	116.68	Sea Level
LC-89D-1	2/17/2011	120.61	Sea Level
LC-89D-1	8/4/2011	119.10	Sea Level
LC-89D-1	3/1/2012	120.86	Sea Level
LC-89D-1	8/1/2012	119.16	Sea Level
LC-89D-1	2/4/2013	121.26	Sea Level
LC-89D-1	8/6/2013	117.96	Sea Level
LC-89D-1	2/11/2014	120.71	Sea Level
LC-89D-1	2/24/2015	122.02	Sea Level
LC-89D-1	9/8/2015	118.35	Sea Level
LC-89D-1	2/22/2016	122.66	Sea Level
LC-89D-1	8/16/2016	119.24	Sea Level
LC-89D-1	2/9/2017	121.97	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-89D-1	4/6/2018	122.30	Sea Level
LC-89D-1	3/12/2019	121.59	Sea Level
LC-89D-1	3/12/2020	120.16	Sea Level
LC-89D-1	3/9/2021	120.63	Sea Level
LC-89D-2	10/4/2004	122.20	Sea Level
LC-89D-2	11/1/2004	123.58	Sea Level
LC-89D-2	2/23/2005	127.02	Sea Level
LC-89D-2	6/21/2005	124.38	Sea Level
LC-89D-2	9/13/2005	121.41	Sea Level
LC-89D-2	12/27/2005	123.95	Sea Level
LC-89D-2	3/16/2006	126.05	Sea Level
LC-89D-2	9/26/2006	122.00	Sea Level
LC-89D-2	3/20/2007	127.45	Sea Level
LC-89D-2	9/21/2007	121.16	Sea Level
LC-89D-2	4/3/2008	125.88	Sea Level
LC-89D-2	10/8/2008	122.30	Sea Level
LC-89D-2	2/4/2009	126.19	Sea Level
LC-90D-1	10/4/2004	151.15	Sea Level
LC-90D-1	11/1/2004	153.21	Sea Level
LC-90D-1	3/17/2005	154.39	Sea Level
LC-90D-1	6/20/2005	154.59	Sea Level
LC-90D-1	9/29/2005	149.92	Sea Level
LC-90D-1	12/27/2005	154.44	Sea Level
LC-90D-1	3/16/2006	158.55	Sea Level
LC-90D-1	9/26/2006	151.80	Sea Level
LC-90D-1	3/19/2007	159.00	Sea Level
LC-90D-1	9/21/2007	151.10	Sea Level
LC-90D-1	4/3/2008	156.00	Sea Level
LC-90D-1	10/8/2008	151.90	Sea Level
LC-90D-1	2/4/2009	156.73	Sea Level
LC-90D-1	8/7/2009	151.93	Sea Level
LC-90D-1	2/9/2010	152.20	Sea Level
LC-90D-1	8/13/2010	135.25	Sea Level
LC-90D-1	2/17/2011	139.79	Sea Level
LC-90D-1	8/4/2011	138.50	Sea Level
LC-90D-1	3/1/2012	140.43	Sea Level
LC-90D-1	8/2/2012	138.55	Sea Level
LC-90D-1	2/5/2013	141.04	Sea Level
LC-90D-1	8/6/2013	136.93	Sea Level
LC-90D-1	2/12/2014	140.35	Sea Level
LC-90D-1	9/10/2014	140.02	Sea Level
LC-90D-1	2/24/2015	141.94	Sea Level
LC-90D-1	9/8/2015	137.98	Sea Level
LC-90D-1	2/17/2016	143.85	Sea Level
LC-90D-1	8/16/2016	138.88	Sea Level
LC-90D-1	2/9/2017	141.44	Sea Level
LC-90D-1	4/5/2018	142.10	Sea Level
LC-90D-1	3/11/2019	139.91	Sea Level
LC-90D-1	3/12/2020	139.90	Sea Level
LC-90D-1	3/9/2021	140.48	Sea Level
LC-90D-2	10/4/2004	150.90	Sea Level
LC-90D-2	11/1/2004	153.01	Sea Level
LC-90D-2	3/17/2005	154.21	Sea Level
LC-90D-2	6/20/2005	154.34	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-90D-2	9/29/2005	149.70	Sea Level
LC-90D-2	12/27/2005	154.16	Sea Level
LC-90D-2	3/16/2006	158.33	Sea Level
LC-90D-2	9/26/2006	151.53	Sea Level
LC-90D-2	3/19/2007	158.70	Sea Level
LC-90D-2	9/21/2007	150.82	Sea Level
LC-90D-2	10/8/2008	151.62	Sea Level
LC-90D-2	2/4/2009	156.43	Sea Level
LC-90D-2	3/11/2019	139.58	Sea Level
LC-90D-2	3/12/2020	139.61	Sea Level
LC-90D-2	3/9/2021	140.19	Sea Level
LC-91D-1	11/1/2004	120.45	Sea Level
LC-91D-1	2/17/2005	118.55	Sea Level
LC-91D-1	6/16/2005	118.31	Sea Level
LC-91D-1	9/12/2005	114.78	Sea Level
LC-91D-1	12/20/2005	117.81	Sea Level
LC-91D-1	3/16/2006	120.03	Sea Level
LC-91D-1	9/22/2006	115.90	Sea Level
LC-91D-1	3/20/2007	121.24	Sea Level
LC-91D-1	9/27/2007	116.22	Sea Level
LC-91D-1	4/3/2008	119.58	Sea Level
LC-91D-1	10/8/2008	116.39	Sea Level
LC-91D-1	2/4/2009	120.21	Sea Level
LC-91D-1	8/6/2009	114.85	Sea Level
LC-91D-1	2/8/2010	116.01	Sea Level
LC-91D-1	8/16/2010	106.31	Sea Level
LC-91D-1	2/15/2011	111.33	Sea Level
LC-91D-1	8/4/2011	109.66	Sea Level
LC-91D-1	3/2/2012	111.39	Sea Level
LC-91D-1	8/1/2012	108.45	Sea Level
LC-91D-1	2/4/2013	111.63	Sea Level
LC-91D-1	8/5/2013	108.41	Sea Level
LC-91D-1	2/11/2014	111.16	Sea Level
LC-91D-1	9/9/2014	110.08	Sea Level
LC-91D-1	2/23/2015	112.36	Sea Level
LC-91D-1	9/8/2015	108.8	Sea Level
LC-91D-1	2/18/2016	113.79	Sea Level
LC-91D-1	8/16/2016	109.61	Sea Level
LC-91D-1	2/9/2017	112.50	Sea Level
LC-91D-1	4/5/2018	112.37	Sea Level
LC-91D-1	3/11/2019	110.91	Sea Level
LC-91D-1	3/12/2020	110.54	Sea Level
LC-91D-1	3/9/2021	110.90	Sea Level
LC-91D-2	10/4/2004	116.08	Sea Level
LC-91D-2	11/1/2004	120.42	Sea Level
LC-91D-2	2/17/2005	118.59	Sea Level
LC-91D-2	6/16/2005	118.29	Sea Level
LC-91D-2	9/12/2005	114.94	Sea Level
LC-91D-2	12/20/2005	117.83	Sea Level
LC-91D-2	3/16/2006	121.44	Sea Level
LC-91D-2	9/22/2006	116.43	Sea Level
LC-91D-2	3/20/2007	121.87	Sea Level
LC-91D-2	9/27/2007	116.81	Sea Level
LC-91D-2	4/3/2008	120.18	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-91D-2	10/8/2008	117.00	Sea Level
LC-91D-2	2/4/2009	120.77	Sea Level
LC-91D-2	4/5/2018	112.94	Sea Level
LC-91D-2	3/11/2019	111.41	Sea Level
LC-91D-2	3/12/2020	111.09	Sea Level
LC- 91D-2	3/9/2021	111.45	Sea Level
LC-92D-1	10/4/2004	116.21	Sea Level
LC-92D-1	3/16/2006	86.73	Sea Level
LC-92D-1	9/22/2006	82.70	Sea Level
LC-92D-1	3/20/2007	86.77	Sea Level
LC-92D-1	9/27/2007	83.17	Sea Level
LC-92D-1	4/3/2008	86.19	Sea Level
LC-92D-1	10/8/2008	83.57	Sea Level
LC-92D-1	2/4/2009	86.45	Sea Level
LC-92D-1	8/6/2009	80.49	Sea Level
LC-92D-1	2/8/2010	84.07	Sea Level
LC-92D-1	8/17/2010	79.52	Sea Level
LC-92D-1	2/15/2011	83.93	Sea Level
LC-92D-1	8/4/2011	81.82	Sea Level
LC-92D-1	3/2/2012	83.59	Sea Level
LC-92D-1	8/1/2012	81.72	Sea Level
LC-92D-1	2/4/2013	83.79	Sea Level
LC-92D-1	8/5/2013	80.82	Sea Level
LC-92D-1	2/18/2014	84.17	Sea Level
LC-92D-1	9/9/2014	81.43	Sea Level
LC-92D-1	2/23/2015	83.87	Sea Level
LC-92D-1	9/8/2015	80.76	Sea Level
LC-92D-1	2/18/2016	84.67	Sea Level
LC-92D-1	8/16/2016	81.5	Sea Level
LC-92D-1	2/9/2017	84.84	Sea Level
LC-92D-1	3/30/2018	84.42	Sea Level
LC-92D-1	3/11/2019	82.33	Sea Level
LC-92D-1	3/11/2020	82.37	Sea Level
LC-92D-1	3/9/2021	82.45	Sea Level
LC-92D-2	3/16/2006	87.31	Sea Level
LC-92D-2	9/22/2006	83.37	Sea Level
LC-92D-2	3/20/2007	87.33	Sea Level
LC-92D-2	9/27/2007	83.73	Sea Level
LC-92D-2	4/3/2008	86.74	Sea Level
LC-92D-2	10/8/2008	84.33	Sea Level
LC-92D-2	2/4/2009	87.03	Sea Level
LC-93D-1	3/16/2006	80.13	Sea Level
LC-93D-1	9/22/2006	76.40	Sea Level
LC-93D-1	3/20/2007	80.15	Sea Level
LC-93D-1	9/27/2007	76.54	Sea Level
LC-93D-1	4/3/2008	79.72	Sea Level
LC-93D-1	10/8/2008	77.42	Sea Level
LC-93D-1	2/4/2009	80.02	Sea Level
LC-93D-1	8/6/2009	72.77	Sea Level
LC-93D-1	2/8/2010	78.02	Sea Level
LC-93D-1	8/17/2010	72.97	Sea Level
LC-93D-1	2/15/2011	78.52	Sea Level
LC-93D-1	8/4/2011	76.27	Sea Level
LC-93D-1	3/2/2012	78.16	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-93D-1	8/1/2012	76.00	Sea Level
LC-93D-1	2/4/2013	78.4	Sea Level
LC-93D-1	8/5/2013	74.92	Sea Level
LC-93D-1	2/11/2014	78.32	Sea Level
LC-93D-1	9/2/2014	75.68	Sea Level
LC-93D-1	2/23/2015	78.15	Sea Level
LC-93D-1	9/8/2015	75.16	Sea Level
LC-93D-1	2/18/2016	78.79	Sea Level
LC-93D-1	8/16/2016	75.88	Sea Level
LC-93D-1	2/9/2017	79.45	Sea Level
LC-93D-1	3/30/2018	78.62	Sea Level
LC-93D-1	3/11/2019	76.85	Sea Level
LC-93D-1	3/11/2020	76.55	Sea Level
LC-93D-1	3/25/2021	69.82	Sea Level
LC-93D-2	3/16/2006	79.62	Sea Level
LC-93D-2	9/22/2006	75.94	Sea Level
LC-93D-2	3/20/2007	79.72	Sea Level
LC-93D-2	9/27/2007	76.02	Sea Level
LC-93D-2	4/3/2008	79.32	Sea Level
LC-93D-2	10/8/2008	76.89	Sea Level
LC-93D-2	2/4/2009	79.57	Sea Level
LC-93D-2	3/30/2018	77.44	Sea Level
LC-93D-2	3/11/2019	75.31	Sea Level
LC-93D-2	3/11/2020	76.29	Sea Level
LC-93D-2	3/9/2021	76.36	Sea Level
LC-94D-1	3/16/2006	91.45	Sea Level
LC-94D-1	9/22/2006	87.14	Sea Level
LC-94D-1	3/20/2007	91.36	Sea Level
LC-94D-1	9/27/2007	87.58	Sea Level
LC-94D-1	4/3/2008	90.50	Sea Level
LC-94D-1	10/8/2008	88.10	Sea Level
LC-94D-1	2/4/2009	90.93	Sea Level
LC-94D-1	8/6/2009	85.35	Sea Level
LC-94D-1	2/8/2010	88.27	Sea Level
LC-94D-1	8/17/2010	82.27	Sea Level
LC-94D-1	2/15/2011	87.42	Sea Level
LC-94D-1	8/4/2011	85.38	Sea Level
LC-94D-1	3/2/2012	87.17	Sea Level
LC-94D-1	8/1/2012	85.24	Sea Level
LC-94D-1	2/4/2013	87.33	Sea Level
LC-94D-1	8/5/2013	84.37	Sea Level
LC-94D-1	2/11/2014	87.07	Sea Level
LC-94D-1	9/9/2014	85.13	Sea Level
LC-94D-1	2/24/2015	87.8	Sea Level
LC-94D-1	9/8/2015	84.25	Sea Level
LC-94D-1	2/18/2016	88.48	Sea Level
LC-94D-1	8/16/2016	85.05	Sea Level
LC-94D-1	2/9/2017	88.25	Sea Level
LC-94D-1	3/30/2018	87.92	Sea Level
LC-94D-1	3/11/2019	86.64	Sea Level
LC-94D-1	3/11/2020	85.87	Sea Level
LC-94D-1	3/25/2021	86.30	Sea Level
LC-94D-2	3/16/2006	91.54	Sea Level
LC-94D-2	9/22/2006	87.66	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-94D-2	3/20/2007	91.82	Sea Level
LC-94D-2	9/27/2007	88.06	Sea Level
LC-94D-2	4/3/2008	90.99	Sea Level
LC-94D-2	10/8/2008	89.56	Sea Level
LC-94D-2	2/4/2009	91.38	Sea Level
LC-95D-1	3/16/2006	85.11	Sea Level
LC-95D-1	9/22/2006	81.24	Sea Level
LC-95D-1	3/20/2007	85.25	Sea Level
LC-95D-1	9/27/2007	81.62	Sea Level
LC-95D-1	4/3/2008	84.51	Sea Level
LC-95D-1	10/8/2008	82.27	Sea Level
LC-95D-1	2/4/2009	84.92	Sea Level
LC-95D-1	8/6/2009	79.17	Sea Level
LC-95D-1	2/8/2010	82.77	Sea Level
LC-95D-1	8/17/2010	77.12	Sea Level
LC-95D-1	2/15/2011	82.55	Sea Level
LC-95D-1	8/4/2011	83.45	Sea Level
LC-95D-1	3/2/2012	82.26	Sea Level
LC-95D-1	8/1/2012	80.28	Sea Level
LC-95D-1	2/4/2013	82.52	Sea Level
LC-95D-1	8/5/2013	79.37	Sea Level
LC-95D-1	2/11/2014	82.17	Sea Level
LC-95D-1	9/2/2014	80.22	Sea Level
LC-95D-1	2/23/2015	82.37	Sea Level
LC-95D-1	9/8/2015	79.18	Sea Level
LC-95D-1	2/18/2016	83.23	Sea Level
LC-95D-1	8/16/2016	79.98	Sea Level
LC-95D-1	2/9/2017	83.33	Sea Level
LC-95D-1	3/30/2018	82.92	Sea Level
LC-95D-1	3/11/2019	81.52	Sea Level
LC-95D-1	3/11/2020	80.76	Sea Level
LC-95D-1	3/9/2021	81.16	Sea Level
LC-95D-2	3/16/2006	85.05	Sea Level
LC-95D-2	9/22/2006	83.27	Sea Level
LC-95D-2	3/20/2007	87.25	Sea Level
LC-95D-2	9/27/2007	83.72	Sea Level
LC-95D-2	4/3/2008	86.52	Sea Level
LC-95D-2	10/8/2008	84.51	Sea Level
LC-95D-2	2/4/2009	86.98	Sea Level
LC-95D-2	3/30/2018	84.61	Sea Level
LC-95D-2	3/11/2019	83.52	Sea Level
LC-95D-2	3/11/2020	82.88	Sea Level
LC-95D-2	3/9/2021	83.11	Sea Level
LC-96D	4/3/2008	174.13	Sea Level
LC-96D	10/8/2008	169.54	Sea Level
LC-96D	2/6/2009	175.91	Sea Level
LC-96D	12/7/2009	156.89	Sea Level
LC-96D	12/18/2009	159.93	Sea Level
LC-96D	2/18/2010	175.34	Sea Level
LC-96D	3/18/2010	175.34	Sea Level
LC-96D	4/21/2010	147.47	Sea Level
LC-96D	5/11/2010	146.95	Sea Level
LC-96D	6/3/2010	146.30	Sea Level
LC-96D	8/13/2010	144.42	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-96D	2/17/2011	149.44	Sea Level
LC-96D	8/8/2011	148.09	Sea Level
LC-96D	2/27/2012	150.74	Sea Level
LC-96D	8/2/2012	148.66	Sea Level
LC-96D	2/5/2013	151.27	Sea Level
LC-96D	8/6/2013	146.14	Sea Level
LC-96D	2/13/2014	150.29	Sea Level
LC-96D	9/4/2014	150.18	Sea Level
LC-96D	2/19/2015	152.89	Sea Level
LC-96D	9/8/2015	148.60	Sea Level
LC-96D	2/17/2016	155.45	Sea Level
LC-96D	8/16/2016	149.38	Sea Level
LC-96D	2/10/2017	151.68	Sea Level
LC-96D	8/8/2017	150.56	Sea Level
LC-96D	3/30/2018	152.04	Sea Level
LC-96D	9/13/2018	149.81	Sea Level
LC-96D	3/12/2019	84.49*	Sea Level
LC-96D	3/10/2020	150.51	Sea Level
LC-96D	8/28/2020	137.82	Sea Level
LC-96D	3/10/2021	151.08	Sea Level
LC-96D	9/1/2021	149.97	Sea Level
LC-97D	4/3/2008	176.93	Sea Level
LC-97D	10/8/2008	172.52	Sea Level
LC-97D	2/6/2009	178.16	Sea Level
LC-97D	8/17/2009	172.67	Sea Level
LC-97D	10/13/2009	173.18	Sea Level
LC-97D	11/16/2009	169.86	Sea Level
LC-97D	12/7/2009	163.53	Sea Level
LC-97D	1/21/2010	152.75	Sea Level
LC-97D	2/9/2010	172.43	Sea Level
LC-97D	4/21/2010	152.13	Sea Level
LC-97D	5/11/2010	151.25	Sea Level
LC-97D	6/3/2010	150.69	Sea Level
LC-97D	8/13/2010	149.07	Sea Level
LC-97D	2/17/2011	152.70	Sea Level
LC-97D	8/10/2011	151.78	Sea Level
LC-97D	2/27/2012	154.65	Sea Level
LC-97D	8/2/2012	152.35	Sea Level
LC-97D	2/5/2013	155.47	Sea Level
LC-97D	8/6/2013	151.05	Sea Level
LC-97D	2/13/2014	154.50	Sea Level
LC-97D	9/10/2014	152.97	Sea Level
LC-97D	2/19/2015	156.85	Sea Level
LC-97D	9/8/2015	152.47	Sea Level
LC-97D	2/17/2016	158.54	Sea Level
LC-97D	8/16/2016	153.15	Sea Level
LC-97D	2/9/2017	155.64	Sea Level
LC-97D	3/29/2018	156.00	Sea Level
LC-97D	3/12/2019	154.04	Sea Level
LC-97D	3/10/2020	154.47	Sea Level
LC-97D	3/10/2021	154.98	Sea Level
LC-98D-1	4/3/2008	172.66	Sea Level
LC-98D-1	10/8/2008	168.42	Sea Level
LC-98D-1	2/6/2009	174.18	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-98D-1	8/17/2009	168.84	Sea Level
LC-98D-1	11/16/2009	166.21	Sea Level
LC-98D-1	12/7/2009	159.06	Sea Level
LC-98D-1	2/18/2010	173.49	Sea Level
LC-98D-1	3/18/2010	173.49	Sea Level
LC-98D-1	4/2/2010	169.84	Sea Level
LC-98D-1	4/23/2010	146.93	Sea Level
LC-98D-1	5/11/2010	146.92	Sea Level
LC-98D-1	6/3/2010	146.36	Sea Level
LC-98D-1	8/13/2010	144.59	Sea Level
LC-98D-1	2/17/2011	149.44	Sea Level
LC-98D-1	8/8/2011	148.04	Sea Level
LC-98D-1	3/2/2012	152.45	Sea Level
LC-98D-1	8/2/2012	148.50	Sea Level
LC-98D-1	2/5/2013	151.01	Sea Level
LC-98D-1	8/6/2013	146.59	Sea Level
LC-98D-1	2/12/2014	150.34	Sea Level
LC-98D-1	9/3/2014	150.08	Sea Level
LC-98D-1	2/19/2015	152.39	Sea Level
LC-98D-1	9/8/2015	148.44	Sea Level
LC-98D-1	2/17/2016	154.53	Sea Level
LC-98D-1	8/16/2016	149.15	Sea Level
LC-98D-1	2/9/2017	144.85	Sea Level
LC-98D-1	8/8/2017	150.34	Sea Level
LC-98D-1	3/29/2018	151.99	Sea Level
LC-98D-1	9/13/2018	126.74	Sea Level
LC-98D-1	3/11/2019	149.44	Sea Level
LC-98D-1	3/13/2020	150.33	Sea Level
LC-98D-1	8/28/2020	149.02	Sea Level
LC-98D-1	3/10/2021	155.92	Sea Level
LC-98D-1	9/1/2021	149.72	Sea Level
LC-98D-2	4/3/2008	171.98	Sea Level
LC-98D-2	10/8/2008	167.67	Sea Level
LC-98D-2	2/6/2009	173.42	Sea Level
LC-98D-2	12/18/2009	156.11	Sea Level
LC-98D-2	3/29/2018	151.77	Sea Level
LC-98D-2	9/13/2018	149.45	Sea Level
LC-98D-2	3/11/2019	148.97	Sea Level
LC-98D-2	3/13/2020	150.28	Sea Level
LC-98D-2	8/28/2020	144.51	Sea Level
LC-98D-2	3/10/2021	150.81	Sea Level
LC-98D-2	9/1/2021	149.46	Sea Level
LC-99D	4/3/2008	174.23	Sea Level
LC-99D	10/8/2008	170.36	Sea Level
LC-99D	2/6/2009	175.85	Sea Level
LC-99D	8/17/2009	170.38	Sea Level
LC-99D	10/13/2009	171.19	Sea Level
LC-99D	11/16/2009	167.80	Sea Level
LC-99D	12/7/2009	155.81	Sea Level
LC-99D	12/18/2009	160.03	Sea Level
LC-99D	1/21/2010	146.33	Sea Level
LC-99D	2/18/2010	175.23	Sea Level
LC-99D	3/18/2010	171.23	Sea Level
LC-99D	4/2/2010	171.50	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LC-99D	4/21/2010	145.52	Sea Level
LC-99D	5/11/2010	145.02	Sea Level
LC-99D	6/3/2010	144.47	Sea Level
LC-99D	8/13/2010	142.73	Sea Level
LC-99D	2/17/2011	147.58	Sea Level
LC-99D	8/8/2011	146.13	Sea Level
LC-99D	10/4/2011	145.60	Sea Level
LC-99D	2/27/2012	148.83	Sea Level
LC-99D	8/2/2012	146.52	Sea Level
LC-99D	2/5/2013	149.29	Sea Level
LC-99D	8/6/2013	144.28	Sea Level
LC-99D	2/13/2014	148.23	Sea Level
LC-99D	9/3/2014	148.03	Sea Level
LC-99D	2/19/2015	150.90	Sea Level
LC-99D	9/8/2015	146.62	Sea Level
LC-99D	2/17/2016	152.55	Sea Level
LC-99D	8/16/2016	147.22	Sea Level
LC-99D	2/10/2017	149.62	Sea Level
LC-99D	8/8/2017	148.55	Sea Level
LC-99D	3/29/2018	149.83	Sea Level
LC-99D	9/13/2018	147.73	Sea Level
LC-99D	3/12/2019	148.12	Sea Level
LC-99D	3/10/2020	148.23	Sea Level
LC-99D	8/28/2020	146.66	Sea Level
LC-99D	3/10/2021	148.41	Sea Level
LC-99D	9/1/2021	147.97	Sea Level
LF4-MW-02c	2/3/2003	113.16	Sea Level
LF4-MW-02c	3/3/2003	113.47	Sea Level
LF4-MW-02c	7/1/2003	110.74	Sea Level
LF4-MW-02c	10/4/2004	110.92	Sea Level
LF4-MW-02c	4/20/2005	112.09	Sea Level
LF4-MW-02c	7/26/2005	109.84	Sea Level
LF4-MW-02c	3/16/2006	114.37	Sea Level
LF4-MW-02c	9/26/2006	109.89	Sea Level
LF4-MW-02c	3/20/2007	114.59	Sea Level
LF4-MW-02c	10/8/2008	110.32	Sea Level
LF4-MW-02c	2/4/2009	113.74	Sea Level
LF4-MW-02c	8/6/2009	108.72	Sea Level
LF4-MW-02c	2/8/2010	109.89	Sea Level
LF4-MW-02c	8/16/2010	103.14	Sea Level
LF4-MW-02c	2/15/2011	107.19	Sea Level
LF4-MW-02c	8/4/2011	105.64	Sea Level
LF4-MW-02c	3/1/2012	107.26	Sea Level
LF4-MW-02c	8/3/2012	105.50	Sea Level
LF4-MW-02c	2/4/2013	107.41	Sea Level
LF4-MW-02c	8/5/2013	104.59	Sea Level
LF4-MW-02c	2/11/2014	107.04	Sea Level
LF4-MW-02c	9/9/2014	105.64	Sea Level
LF4-MW-02c	2/23/2015	108.16	Sea Level
LF4-MW-02c	9/10/2015	104.56	Sea Level
LF4-MW-02c	2/22/2016	108.57	Sea Level
LF4-MW-02c	8/16/2016	105.46	Sea Level
LF4-MW-02c	2/9/2017	108.17	Sea Level
LF4-MW-02c	4/6/2018	107.43	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LF4-MW-02c	3/11/2019	106.73	Sea Level
LF4-MW-02c	3/11/2020	106.33	Sea Level
LF4-MW-02c	3/10/2021	92.42	Sea Level
LF4-MW-04	4/20/2005	100.29	Sea Level
LF4-MW-04	7/26/2005	98.10	Sea Level
LF4-MW-04	3/16/2006	102.12	Sea Level
LF4-MW-04	9/26/2006	97.98	Sea Level
LF4-MW-04	3/20/2007	102.33	Sea Level
LF4-MW-04	9/27/2007	98.37	Sea Level
LF4-MW-04	4/3/2008	101.42	Sea Level
LF4-MW-04	10/8/2008	98.66	Sea Level
LF4-MW-04	2/4/2009	101.69	Sea Level
LF4-MW-04	8/6/2009	96.64	Sea Level
LF4-MW-04	2/8/2010	98.61	Sea Level
LF4-MW-04	8/16/2010	91.94	Sea Level
LF4-MW-04	2/15/2011	97.04	Sea Level
LF4-MW-04	8/3/2011	95.24	Sea Level
LF4-MW-04	3/2/2012	96.84	Sea Level
LF4-MW-04	8/3/2012	95.19	Sea Level
LF4-MW-04	2/4/2013	97.14	Sea Level
LF4-MW-04	8/5/2013	94.09	Sea Level
LF4-MW-04	2/11/2014	96.74	Sea Level
LF4-MW-04	9/9/2014	95.01	Sea Level
LF4-MW-04	2/23/2015	97.52	Sea Level
LF4-MW-04	9/10/2015	94.13	Sea Level
LF4-MW-04	2/22/2016	97.94	Sea Level
LF4-MW-04	8/16/2016	94.84	Sea Level
LF4-MW-04	2/9/2017	97.89	Sea Level
LF4-MW-04	4/6/2018	98.03	Sea Level
LF4-MW-04	3/11/2019	96.36	Sea Level
LF4-MW-04	3/11/2020	95.84	Sea Level
LF4-MW-04	3/10/2021	224.72	Sea Level
LF4-MW-09b	2/3/2003	90.76	Sea Level
LF4-MW-09b	3/3/2003	91.01	Sea Level
LF4-MW-09b	7/1/2003	88.72	Sea Level
LF4-MW-09b	10/4/2004	88.89	Sea Level
LF4-MW-09b	4/20/2005	99.44	Sea Level
LF4-MW-09b	7/26/2005	97.31	Sea Level
LF4-MW-09b	3/16/2006	91.02	Sea Level
LF4-MW-09b	3/20/2007	82.76	Sea Level
LF4-MW-09b	9/27/2007	79.22	Sea Level
LF4-MW-09b	4/3/2008	82.12	Sea Level
LF4-MW-09b	10/8/2008	79.58	Sea Level
LF4-MW-09b	2/4/2009	82.38	Sea Level
LF4-MW-09b	8/6/2009	77.38	Sea Level
LF4-MW-09b	2/8/2010	79.78	Sea Level
LF4-MW-09b	8/16/2010	75.37	Sea Level
LF4-MW-09b	2/15/2011	79.37	Sea Level
LF4-MW-09b	8/3/2011	77.41	Sea Level
LF4-MW-09b	3/2/2012	79.13	Sea Level
LF4-MW-09b	8/3/2012	77.54	Sea Level
LF4-MW-09b	2/4/2013	79.23	Sea Level
LF4-MW-09b	8/5/2013	76.43	Sea Level
LF4-MW-09b	2/11/2014	78.88	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LF4-MW-09b	9/9/2014	77.03	Sea Level
LF4-MW-09b	2/23/2015	79.58	Sea Level
LF4-MW-09b	9/10/2015	76.25	Sea Level
LF4-MW-09b	2/22/2016	79.95	Sea Level
LF4-MW-09b	8/16/2016	76.95	Sea Level
LF4-MW-09b	2/9/2017	80.10	Sea Level
LF4-MW-09b	4/6/2018	80.20	Sea Level
LF4-MW-09b	3/11/2019	78.59	Sea Level
LF4-MW-09b	3/11/2020	77.97	Sea Level
LF4-MW-09b	3/10/2021	78.16	Sea Level
LF4-MW-12b	2/3/2003	94.51	Sea Level
LF4-MW-12b	3/3/2003	94.80	Sea Level
LF4-MW-12b	7/1/2003	92.59	Sea Level
LF4-MW-12b	10/4/2004	92.59	Sea Level
LF4-MW-12b	4/20/2005	93.84	Sea Level
LF4-MW-12b	7/26/2005	91.81	Sea Level
LF4-MW-12b	3/16/2006	94.61	Sea Level
LF4-MW-12b	9/26/2006	90.79	Sea Level
LF4-MW-12b	9/27/2007	92.03	Sea Level
LF4-MW-12b	4/3/2008	94.88	Sea Level
LF4-MW-12b	10/8/2008	92.36	Sea Level
LF4-MW-12b	2/4/2009	95.08	Sea Level
LF4-MW-12b	8/6/2009	90.33	Sea Level
LF4-MW-12b	2/8/2010	92.41	Sea Level
LF4-MW-12b	8/16/2010	88.14	Sea Level
LF4-MW-12b	2/15/2011	91.98	Sea Level
LF4-MW-12b	8/3/2011	90.23	Sea Level
LF4-MW-12b	3/2/2012	91.82	Sea Level
LF4-MW-12b	8/3/2012	89.50	Sea Level
LF4-MW-12b	2/4/2013	91.86	Sea Level
LF4-MW-12b	8/5/2013	89.23	Sea Level
LF4-MW-12b	2/11/2014	91.53	Sea Level
LF4-MW-12b	9/9/2014	89.76	Sea Level
LF4-MW-12b	2/23/2015	92.39	Sea Level
LF4-MW-12b	9/10/2015	88.94	Sea Level
LF4-MW-12b	2/22/2016	92.69	Sea Level
LF4-MW-12b	8/16/2016	89.67	Sea Level
LF4-MW-14	4/20/2005	91.30	Sea Level
LF4-MW-14	7/26/2005	89.18	Sea Level
LF4-MW-14	3/16/2006	95.32	Sea Level
LF4-MW-14	9/26/2006	91.50	Sea Level
LF4-MW-14	3/20/2007	92.98	Sea Level
LF4-MW-14	9/27/2007	89.44	Sea Level
LF4-MW-14	4/3/2008	92.36	Sea Level
LF4-MW-14	10/8/2008	89.81	Sea Level
LF4-MW-14	2/4/2009	92.58	Sea Level
LF4-MW-14	8/6/2009	87.66	Sea Level
LF4-MW-14	2/8/2010	89.95	Sea Level
LF4-MW-14	8/16/2010	85.60	Sea Level
LF4-MW-14	2/15/2011	89.53	Sea Level
LF4-MW-14	8/3/2011	87.68	Sea Level
LF4-MW-14	3/2/2012	89.28	Sea Level
LF4-MW-14	8/3/2012	88.57	Sea Level
LF4-MW-14	2/4/2013	89.44	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
LF4-MW-14	8/5/2013	86.63	Sea Level
LF4-MW-14	2/11/2014	89.13	Sea Level
LF4-MW-14	9/9/2014	87.27	Sea Level
LF4-MW-14	2/23/2015	89.82	Sea Level
LF4-MW-14	9/10/2015	86.46	Sea Level
LF4-MW-16b	2/3/2003	86.79	Sea Level
LF4-MW-16b	3/3/2003	87.00	Sea Level
LF4-MW-16b	7/1/2003	84.81	Sea Level
LF4-MW-16b	10/4/2004	85.04	Sea Level
MAMC-3	4/1/2002	190.98	Sea Level
MAMC-3	6/1/2002	190.98	Sea Level
MAMC-3	9/1/2002	194.98	Sea Level
MAMC-3	2/3/2003	196.98	Sea Level
MAMC-3	3/3/2003	200.98	Sea Level
MAMC-3	7/1/2003	173.98	Sea Level
MAMC-3	10/4/2004	195.98	Sea Level
MAMC-4	4/1/2002	226.62	Sea Level
MAMC-4	6/1/2002	221.62	Sea Level
MAMC-4	9/1/2002	191.62	Sea Level
MAMC-4	2/3/2003	221.62	Sea Level
MAMC-4	3/3/2003	221.62	Sea Level
MAMC-4	10/4/2004	221.62	Sea Level
SLAP-1	10/8/2008	169.51	Sea Level
SLAP-1	2/6/2009	175.13	Sea Level
SLAP-1	6/16/2009	173.77	Sea Level
SLAP-1	8/17/2009	171.30	Sea Level
SLAP-1	10/13/2009	173.71	Sea Level
SLAP-1	12/7/2009	149.86	Sea Level
SLAP-1	12/11/2009	140.10	Sea Level
SLAP-1	12/18/2009	160.85	Sea Level
SLAP-1	1/8/2010	141.33	Sea Level
SLAP-1	1/21/2010	139.08	Sea Level
SLAP-1	4/21/2010	132.53	Sea Level
SLAP-1	5/11/2010	133.19	Sea Level
SLAP-1	6/3/2010	131.79	Sea Level
SLAP-1	8/13/2010	131.21	Sea Level
SLAP-1	8/20/2010	131.46	Sea Level
SLAP-1	10/22/2010	133.65	Sea Level
SLAP-1	11/24/2010	137.28	Sea Level
SLAP-1	12/13/2010	132.58	Sea Level
SLAP-1	1/19/2011	133.47	Sea Level
SLAP-1	2/25/2011	133.61	Sea Level
SLAP-1	3/28/2011	134.78	Sea Level
SLAP-1	4/26/2011	134.45	Sea Level
SLAP-1	5/25/2011	134.38	Sea Level
SLAP-1	7/27/2011	130.88	Sea Level
SLAP-1	8/24/2011	129.47	Sea Level
SLAP-1	9/26/2011	128.52	Sea Level
SLAP-1	10/27/2011	129.08	Sea Level
SLAP-1	11/21/2011	128.83	Sea Level
SLAP-1	12/22/2011	128.18	Sea Level
SLAP-1	1/25/2012	132.53	Sea Level
SLAP-1	2/27/2012	129.03	Sea Level
SLAP-1	4/25/2012	127.08	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
SLAP-1	5/31/2012	123.88	Sea Level
SLAP-1	6/28/2012	124.45	Sea Level
SLAP-1	7/25/2012	118.51	Sea Level
SLAP-1	8/22/2012	118.92	Sea Level
SLAP-1	9/12/2012	120.33	Sea Level
SLAP-1	10/18/2012	118.83	Sea Level
SLAP-1	11/28/2012	119.98	Sea Level
SLAP-1	12/28/2012	120.46	Sea Level
SLAP-1	1/24/2013	120.43	Sea Level
SLAP-1	2/25/2013	118.79	Sea Level
SLAP-1	3/26/2013	120.29	Sea Level
SLAP-1	4/24/2013	119.20	Sea Level
SLAP-1	5/14/2013	118.46	Sea Level
SLAP-1	6/19/2013	119.10	Sea Level
SLAP-1	8/29/2013	117.78	Sea Level
SLAP-1	1/30/2014	127.58	Sea Level
SLAP-1	3/10/2021	122.43	Sea Level
SLAP-1	8/31/2021	122.38	Sea Level
SLAP-2	10/8/2008	169.58	Sea Level
SLAP-2	2/6/2009	175.14	Sea Level
SLAP-2	6/6/2009	173.89	Sea Level
SLAP-2	8/17/2009	171.11	Sea Level
SLAP-2	10/13/2009	173.56	Sea Level
SLAP-2	12/7/2009	157.24	Sea Level
SLAP-2	12/11/2009	146.68	Sea Level
SLAP-2	12/18/2009	160.73	Sea Level
SLAP-2	1/8/2010	146.44	Sea Level
SLAP-2	1/21/2010	143.94	Sea Level
SLAP-2	4/21/2010	144.12	Sea Level
SLAP-2	5/11/2010	143.65	Sea Level
SLAP-2	6/3/2010	143.02	Sea Level
SLAP-2	8/13/2010	141.26	Sea Level
SLAP-2	8/20/2010	140.86	Sea Level
SLAP-2	10/22/2010	144.39	Sea Level
SLAP-2	11/24/2010	148.49	Sea Level
SLAP-2	12/13/2010	144.25	Sea Level
SLAP-2	1/19/2011	145.50	Sea Level
SLAP-2	2/25/2011	145.74	Sea Level
SLAP-2	3/28/2011	146.71	Sea Level
SLAP-2	4/26/2011	146.93	Sea Level
SLAP-2	5/25/2011	147.14	Sea Level
SLAP-2	7/27/2011	144.26	Sea Level
SLAP-2	8/24/2011	143.16	Sea Level
SLAP-2	9/26/2011	142.52	Sea Level
SLAP-2	10/27/2011	143.41	Sea Level
SLAP-2	11/21/2011	143.66	Sea Level
SLAP-2	12/22/2011	143.72	Sea Level
SLAP-2	1/25/2012	148.09	Sea Level
SLAP-2	2/27/2012	145.45	Sea Level
SLAP-2	4/25/2012	145.81	Sea Level
SLAP-2	5/31/2012	145.31	Sea Level
SLAP-2	6/28/2012	144.71	Sea Level
SLAP-2	7/25/2012	143.81	Sea Level
SLAP-2	8/22/2012	142.30	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
SLAP-2	9/12/2012	142.49	Sea Level
SLAP-2	10/18/2012	143.07	Sea Level
SLAP-2	11/28/2012	145.65	Sea Level
SLAP-2	12/28/2012	146.98	Sea Level
SLAP-2	1/24/2013	147.14	Sea Level
SLAP-2	2/25/2013	145.89	Sea Level
SLAP-2	3/26/2013	147.07	Sea Level
SLAP-2	4/24/2013	146.90	Sea Level
SLAP-2	5/14/2013	144.72	Sea Level
SLAP-2	6/19/2013	144.71	Sea Level
SLAP-2	8/29/2013	141.76	Sea Level
SLAP-2	1/30/2014	146.11	Sea Level
SLAP-2	3/10/2021	144.23	Sea Level
SLAP-2	8/31/2021	144.31	Sea Level
SLAP-3	10/8/2008	170.34	Sea Level
SLAP-3	2/6/2009	175.94	Sea Level
SLAP-3	6/16/2009	174.79	Sea Level
SLAP-3	8/17/2009	172.14	Sea Level
SLAP-3	10/13/2009	174.63	Sea Level
SLAP-3	12/7/2009	154.78	Sea Level
SLAP-3	12/11/2009	146.53	Sea Level
SLAP-3	12/18/2009	161.77	Sea Level
SLAP-3	1/8/2010	144.32	Sea Level
SLAP-3	1/21/2010	141.84	Sea Level
SLAP-3	4/21/2010	142.01	Sea Level
SLAP-3	5/11/2010	142.18	Sea Level
SLAP-3	6/3/2010	141.58	Sea Level
SLAP-3	8/13/2010	140.14	Sea Level
SLAP-3	8/20/2010	140.80	Sea Level
SLAP-3	10/22/2010	140.46	Sea Level
SLAP-3	11/24/2010	143.44	Sea Level
SLAP-3	12/13/2010	141.62	Sea Level
SLAP-3	1/19/2011	141.59	Sea Level
SLAP-3	2/25/2011	140.82	Sea Level
SLAP-3	3/28/2011	141.84	Sea Level
SLAP-3	4/26/2011	141.82	Sea Level
SLAP-3	5/25/2011	141.65	Sea Level
SLAP-3	7/27/2011	140.58	Sea Level
SLAP-3	8/24/2011	136.04	Sea Level
SLAP-3	9/26/2011	139.34	Sea Level
SLAP-3	10/27/2011	140.84	Sea Level
SLAP-3	11/21/2011	140.99	Sea Level
SLAP-3	12/22/2011	141.42	Sea Level
SLAP-3	1/25/2012	147.04	Sea Level
SLAP-3	2/27/2012	144.61	Sea Level
SLAP-3	4/25/2012	144.74	Sea Level
SLAP-3	5/31/2012	144.24	Sea Level
SLAP-3	6/28/2012	143.64	Sea Level
SLAP-3	7/25/2012	142.37	Sea Level
SLAP-3	8/22/2012	140.66	Sea Level
SLAP-3	9/12/2012	141.00	Sea Level
SLAP-3	10/18/2012	140.94	Sea Level
SLAP-3	11/28/2012	143.04	Sea Level
SLAP-3	12/28/2012	144.28	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
SLAP-3	1/24/2013	145.32	Sea Level
SLAP-3	2/25/2013	146.42	Sea Level
SLAP-3	3/26/2013	144.01	Sea Level
SLAP-3	4/24/2013	143.38	Sea Level
SLAP-3	5/14/2013	142.64	Sea Level
SLAP-3	6/19/2013	141.59	Sea Level
SLAP-3	8/29/2013	138.99	Sea Level
SLAP-3	8/29/2013	142.94	Sea Level
SLAP-3	1/30/2014	142.94	Sea Level
SLAP-3	3/10/2021	130.62	Sea Level
SLAP-3	8/31/2021	130.34	Sea Level
SLAP-4	10/8/2008	170.32	Sea Level
SLAP-4	2/6/2009	175.84	Sea Level
SLAP-4	6/16/2009	174.50	Sea Level
SLAP-4	8/17/2009	172.01	Sea Level
SLAP-4	10/13/2009	174.48	Sea Level
SLAP-4	12/7/2009	156.41	Sea Level
SLAP-4	12/11/2009	148.90	Sea Level
SLAP-4	12/18/2009	161.69	Sea Level
SLAP-4	1/8/2010	149.58	Sea Level
SLAP-4	1/21/2010	147.16	Sea Level
SLAP-4	4/21/2010	146.32	Sea Level
SLAP-4	5/11/2010	145.82	Sea Level
SLAP-4	6/3/2010	145.26	Sea Level
SLAP-4	8/13/2010	143.51	Sea Level
SLAP-4	8/20/2010	144.40	Sea Level
SLAP-4	10/22/2010	146.59	Sea Level
SLAP-4	11/24/2010	150.63	Sea Level
SLAP-4	12/13/2010	146.53	Sea Level
SLAP-4	1/19/2011	147.77	Sea Level
SLAP-4	2/25/2011	148.16	Sea Level
SLAP-4	3/28/2011	149.21	Sea Level
SLAP-4	4/26/2011	149.55	Sea Level
SLAP-4	5/25/2011	149.88	Sea Level
SLAP-4	7/27/2011	147.24	Sea Level
SLAP-4	8/24/2011	146.22	Sea Level
SLAP-4	9/26/2011	145.70	Sea Level
SLAP-4	10/27/2011	146.61	Sea Level
SLAP-4	11/21/2011	146.91	Sea Level
SLAP-4	12/22/2011	147.18	Sea Level
SLAP-4	1/25/2012	152.55	Sea Level
SLAP-4	2/27/2012	143.37	Sea Level
SLAP-4	4/25/2012	149.46	Sea Level
SLAP-4	5/31/2012	149.21	Sea Level
SLAP-4	6/28/2012	148.73	Sea Level
SLAP-4	7/25/2012	147.52	Sea Level
SLAP-4	8/22/2012	145.85	Sea Level
SLAP-4	9/12/2012	146.05	Sea Level
SLAP-4	10/18/2012	146.58	Sea Level
SLAP-4	11/28/2012	149.26	Sea Level
SLAP-4	12/28/2012	150.48	Sea Level
SLAP-4	1/24/2013	150.58	Sea Level
SLAP-4	2/25/2013	149.03	Sea Level
SLAP-4	3/26/2013	150.04	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
SLAP-4	4/24/2013	149.48	Sea Level
SLAP-4	5/14/2013	147.89	Sea Level
SLAP-4	6/19/2013	147.31	Sea Level
SLAP-4	8/29/2013	144.11	Sea Level
SLAP-4	1/30/2014	148.71	Sea Level
SLAP-4	3/10/2021	148.42	Sea Level
SLAP-4	8/31/2021	148.46	Sea Level
SLAP-5	10/8/2008	169.09	Sea Level
SLAP-5	2/6/2009	175.72	Sea Level
SLAP-5	6/16/2009	173.14	Sea Level
SLAP-5	8/17/2009	170.70	Sea Level
SLAP-5	10/13/2009	173.08	Sea Level
SLAP-5	12/7/2009	154.82	Sea Level
SLAP-5	12/11/2009	147.40	Sea Level
SLAP-5	12/18/2009	160.23	Sea Level
SLAP-5	1/8/2010	148.22	Sea Level
SLAP-5	1/21/2010	145.80	Sea Level
SLAP-5	4/21/2010	144.17	Sea Level
SLAP-5	5/11/2010	144.07	Sea Level
SLAP-5	6/3/2010	143.44	Sea Level
SLAP-5	8/13/2010	142.40	Sea Level
SLAP-5	8/20/2010	143.04	Sea Level
SLAP-5	10/22/2010	145.10	Sea Level
SLAP-5	11/24/2010	149.08	Sea Level
SLAP-5	12/13/2010	144.96	Sea Level
SLAP-5	1/19/2011	146.26	Sea Level
SLAP-5	2/25/2011	146.60	Sea Level
SLAP-5	3/28/2011	147.60	Sea Level
SLAP-5	4/26/2011	147.98	Sea Level
SLAP-5	5/25/2011	148.23	Sea Level
SLAP-5	7/27/2011	145.65	Sea Level
SLAP-5	8/24/2011	144.55	Sea Level
SLAP-5	9/26/2011	144.00	Sea Level
SLAP-5	10/27/2011	144.90	Sea Level
SLAP-5	11/21/2011	145.20	Sea Level
SLAP-5	12/22/2011	145.31	Sea Level
SLAP-5	1/25/2012	153.77	Sea Level
SLAP-5	2/27/2012	147.40	Sea Level
SLAP-5	4/25/2012	147.30	Sea Level
SLAP-5	5/31/2012	147.00	Sea Level
SLAP-5	6/28/2012	146.61	Sea Level
SLAP-5	7/25/2012	145.20	Sea Level
SLAP-5	8/22/2012	143.71	Sea Level
SLAP-5	9/12/2012	144.05	Sea Level
SLAP-5	10/18/2012	144.27	Sea Level
SLAP-5	11/28/2012	146.56	Sea Level
SLAP-5	12/28/2012	147.93	Sea Level
SLAP-5	1/24/2013	147.19	Sea Level
SLAP-5	2/25/2013	152.42	Sea Level
SLAP-5	3/26/2013	147.45	Sea Level
SLAP-5	4/24/2013	146.50	Sea Level
SLAP-5	5/14/2013	144.99	Sea Level
SLAP-5	6/19/2013	144.69	Sea Level
SLAP-5	8/29/2013	142.23	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
SLAP-5	1/30/2014	146.00	Sea Level
SLAP-5	3/10/2021	142.94	Sea Level
SLAP-5	8/31/2021	143.05	Sea Level
SLAP-6	10/8/2008	169.12	Sea Level
SLAP-6	2/6/2009	176.79	Sea Level
SLAP-6	6/16/2009	175.33	Sea Level
SLAP-6	8/17/2009	172.21	Sea Level
SLAP-6	10/13/2009	174.62	Sea Level
SLAP-6	12/7/2009	156.13	Sea Level
SLAP-6	12/11/2009	149.07	Sea Level
SLAP-6	12/18/2009	161.73	Sea Level
SLAP-6	1/8/2010	149.94	Sea Level
SLAP-6	1/21/2010	147.59	Sea Level
SLAP-6	4/21/2010	146.84	Sea Level
SLAP-6	5/11/2010	146.22	Sea Level
SLAP-6	6/3/2010	145.60	Sea Level
SLAP-6	8/13/2010	143.42	Sea Level
SLAP-6	8/20/2010	144.46	Sea Level
SLAP-6	10/22/2010	146.59	Sea Level
SLAP-6	11/24/2010	150.49	Sea Level
SLAP-6	12/13/2010	146.34	Sea Level
SLAP-6	1/19/2011	147.59	Sea Level
SLAP-6	2/25/2011	147.84	Sea Level
SLAP-6	3/28/2011	148.96	Sea Level
SLAP-6	4/26/2011	149.37	Sea Level
SLAP-6	5/25/2011	149.62	Sea Level
SLAP-6	7/27/2011	147.02	Sea Level
SLAP-6	8/24/2011	145.90	Sea Level
SLAP-6	9/26/2011	145.32	Sea Level
SLAP-6	10/27/2011	146.19	Sea Level
SLAP-6	11/21/2011	146.49	Sea Level
SLAP-6	12/22/2011	146.64	Sea Level
SLAP-6	1/25/2012	152.12	Sea Level
SLAP-6	2/27/2012	149.05	Sea Level
SLAP-6	4/25/2012	148.49	Sea Level
SLAP-6	5/31/2012	148.59	Sea Level
SLAP-6	6/28/2012	148.10	Sea Level
SLAP-6	7/25/2012	148.59	Sea Level
SLAP-6	8/22/2012	144.79	Sea Level
SLAP-6	9/12/2012	145.50	Sea Level
SLAP-6	10/18/2012	145.91	Sea Level
SLAP-6	11/28/2012	148.51	Sea Level
SLAP-6	12/28/2012	149.81	Sea Level
SLAP-6	1/24/2013	150.10	Sea Level
SLAP-6	2/25/2013	148.64	Sea Level
SLAP-6	3/26/2013	149.33	Sea Level
SLAP-6	4/24/2013	148.85	Sea Level
SLAP-6	5/14/2013	147.42	Sea Level
SLAP-6	6/19/2013	147.35	Sea Level
SLAP-6	8/29/2013	143.47	Sea Level
SLAP-6	1/30/2014	148.29	Sea Level
SLAP-6	3/10/2021	145.03	Sea Level
SLAP-6	8/31/2021	143.91	Sea Level
SRCMW-01b	2/3/2003	91.97	Sea Level

APPENDIX C -
HISTORICAL WATER LEVELS

Well ID	Date	SWL Elev. (ft AMSL)	Aquifer
SRCMW-01b	3/3/2003	92.11	Sea Level
SRCMW-01b	7/1/2003	89.55	Sea Level
SRCMW-01b	10/4/2004	90.00	Sea Level
SRCMW-01b	4/12/2005	91.04	Sea Level
SRCMW-01b	7/29/2005	88.14	Sea Level
SRCMW-01b	3/16/2006	92.79	Sea Level
SRCMW-01b	9/22/2006	88.84	Sea Level
SRCMW-01b	3/23/2007	92.96	Sea Level
SRCMW-01b	9/27/2007	89.29	Sea Level
SRCMW-01b	4/3/2008	92.20	Sea Level
SRCMW-01b	10/8/2008	89.74	Sea Level
SRCMW-01b	2/4/2009	92.49	Sea Level
SRCMW-01b	8/6/2009	87.10	Sea Level
SRCMW-01b	2/8/2010	89.99	Sea Level
SRCMW-01b	8/17/2010	85.12	Sea Level
SRCMW-01b	2/15/2011	89.23	Sea Level
SRCMW-01b	8/9/2011	87.22	Sea Level
SRCMW-01b	3/2/2012	88.99	Sea Level
SRCMW-01b	8/1/2012	87.27	Sea Level
SRCMW-01b	2/4/2013	89.14	Sea Level
SRCMW-01b	8/5/2013	86.34	Sea Level
SRCMW-01b	2/19/2014	89.09	Sea Level
SRCMW-01b	9/9/2014	86.96	Sea Level
SRCMW-01b	2/23/2015	89.33	Sea Level
SRCMW-01b	9/10/2015	86.27	Sea Level
SRCMW-01b	2/22/2016	89.79	Sea Level
WELL-13	4/1/2002	178.56	Sea Level
WELL-13	6/1/2002	178.24	Sea Level
WELL-13	9/1/2002	177.24	Sea Level
WELL-13	2/3/2003	176.24	Sea Level
WELL-13	3/3/2003	178.24	Sea Level
WELL-13	7/1/2003	177.24	Sea Level
WELL-13	10/4/2004	176.24	Sea Level

Notes:

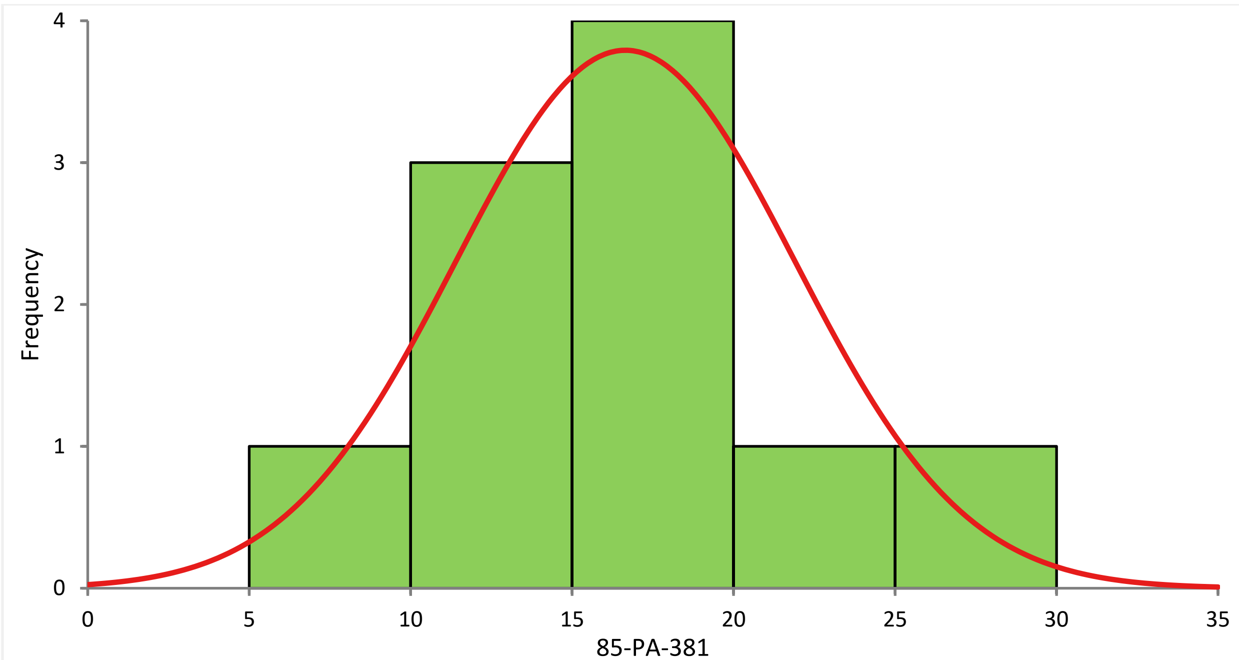
Vertical Datum = National Geodetic Vertical Datum - 1929 (NGVD-29)
SWL Elev (ft) = Static water level groundwater elevation in ft above mean sea level
* = SWL Elev (ft) erroneous due to field error.

Appendix E - Log RAM Statistics, 2012-2021

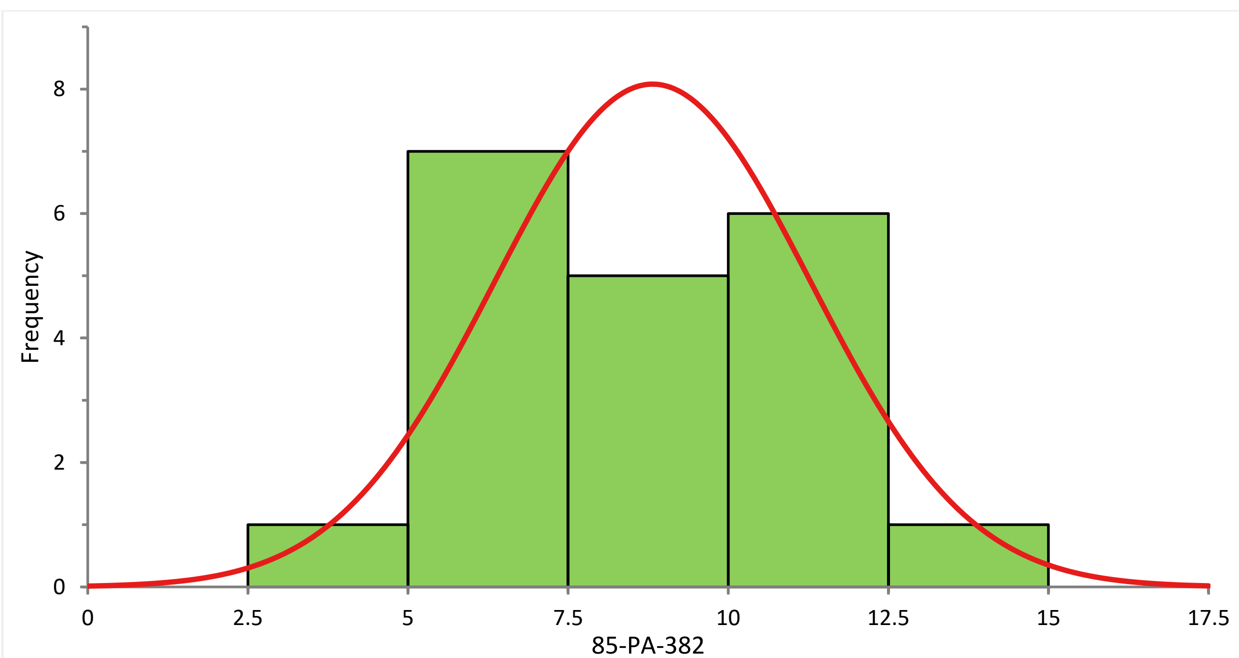
Histograms – Upper Vashon Aquifer TCE Data

Logistics Center, Joint Base Lewis McChord, Washington 98433

85-PA-381

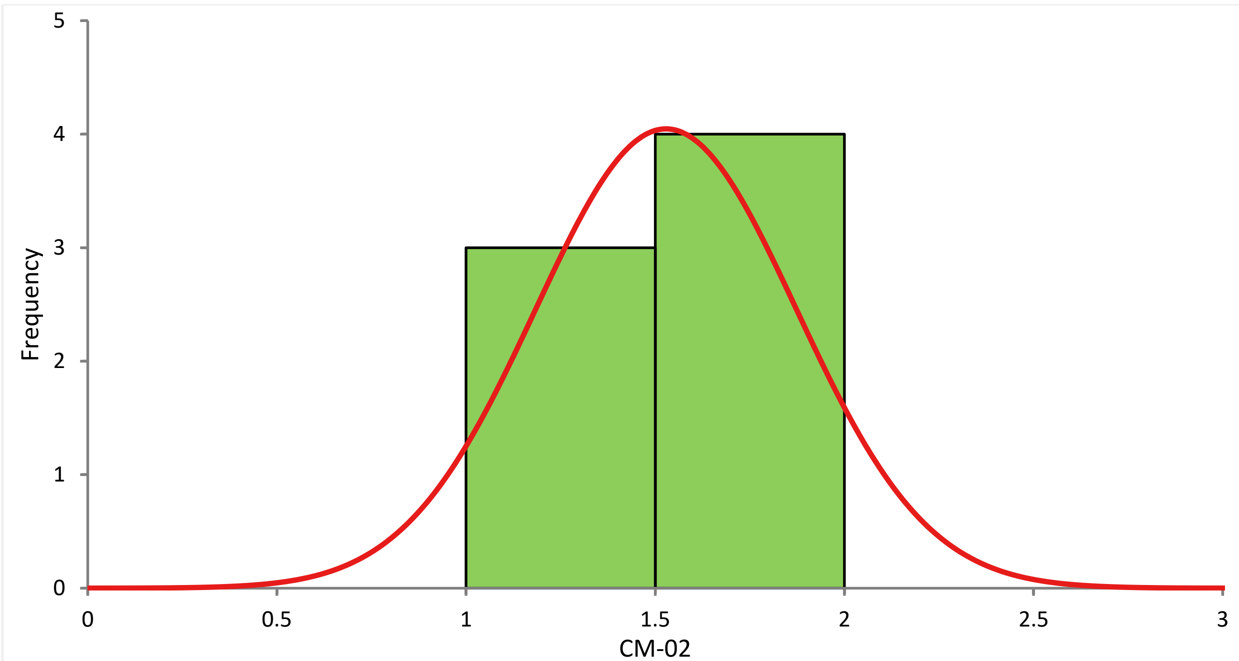


85-PA-382

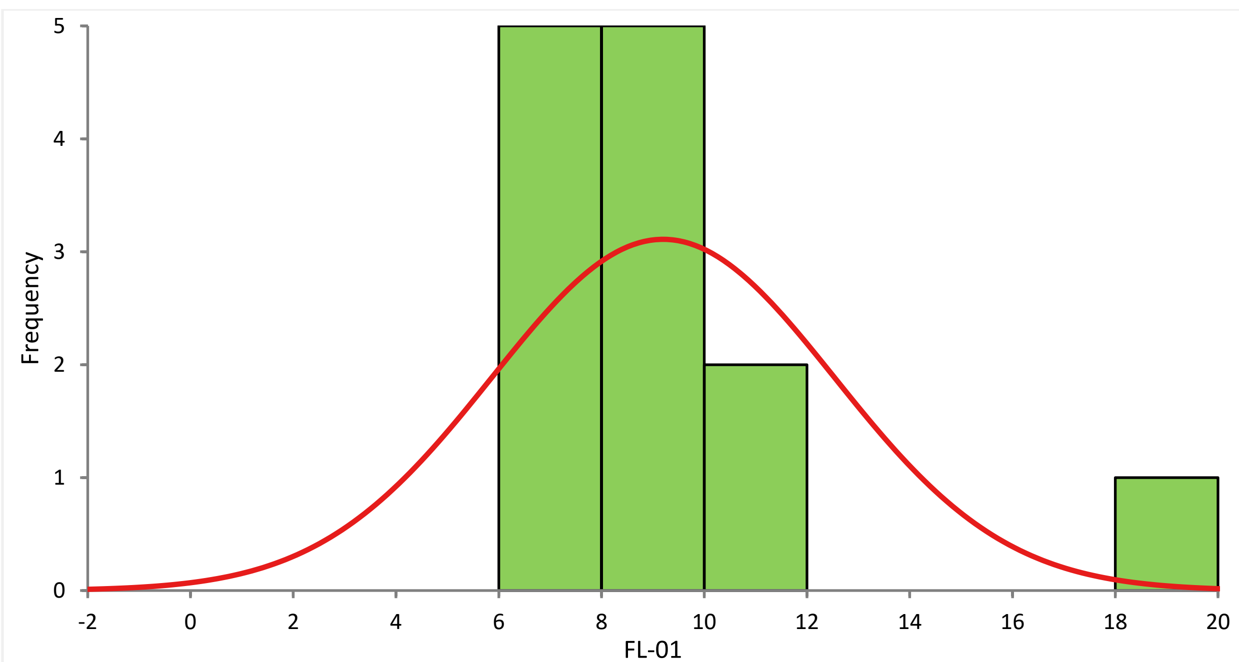


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

CM-02

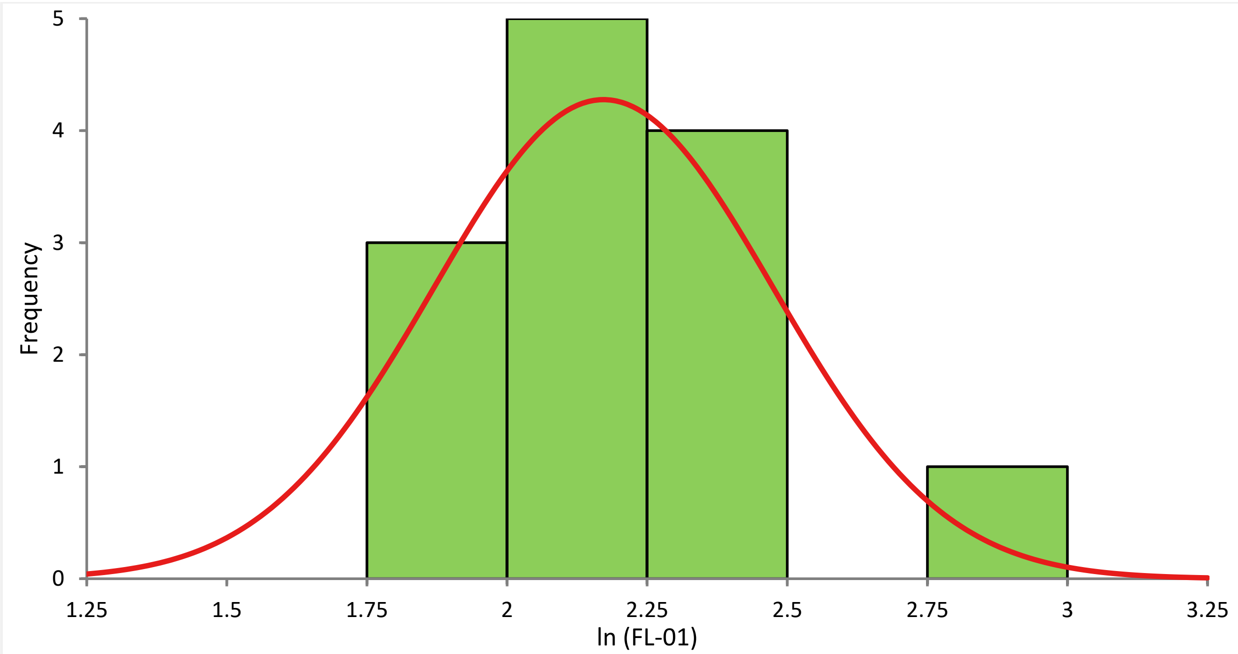


FL-01

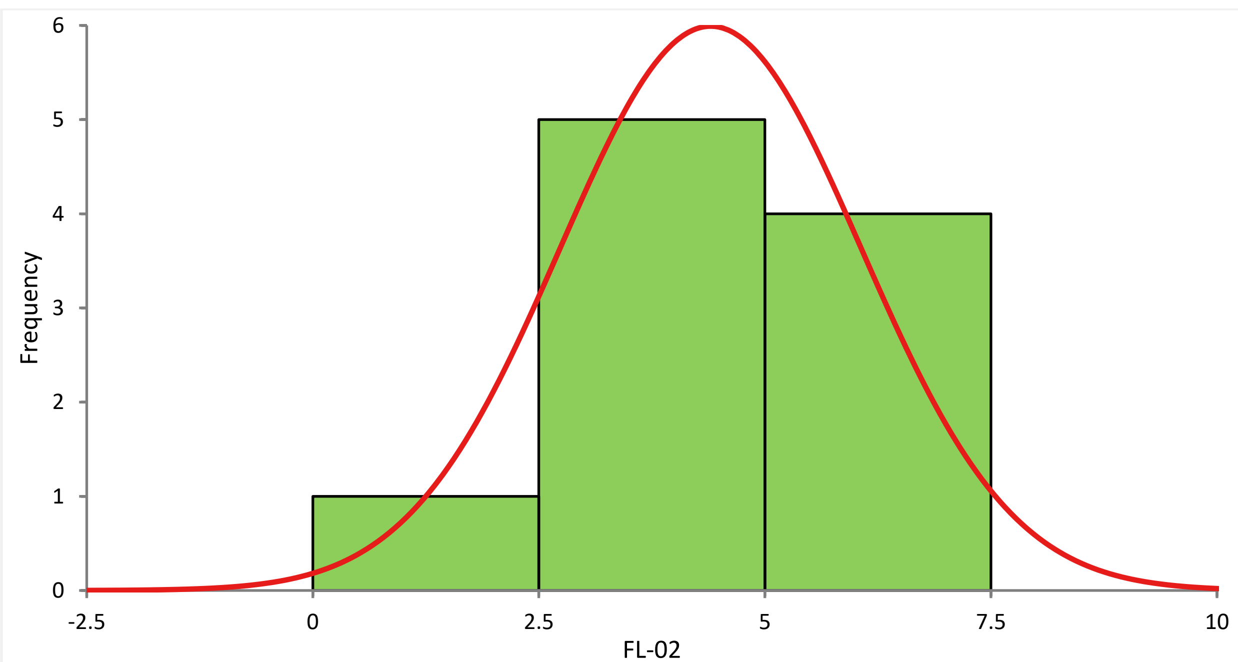


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(FL-01)

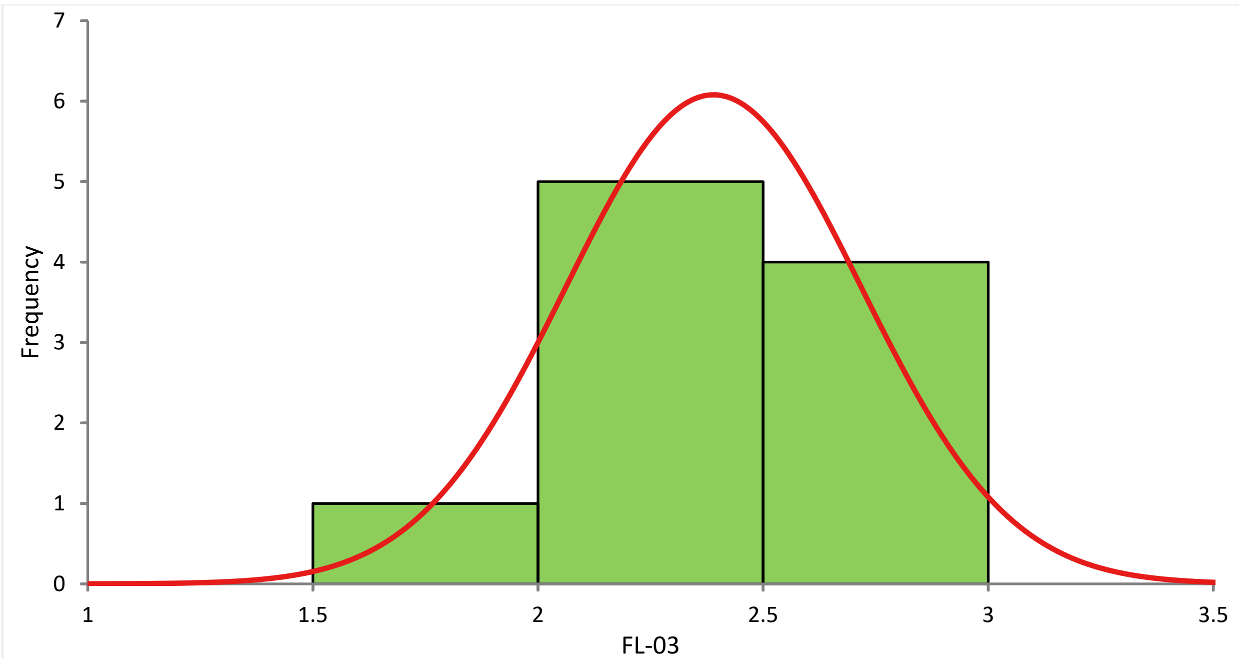


FL-02

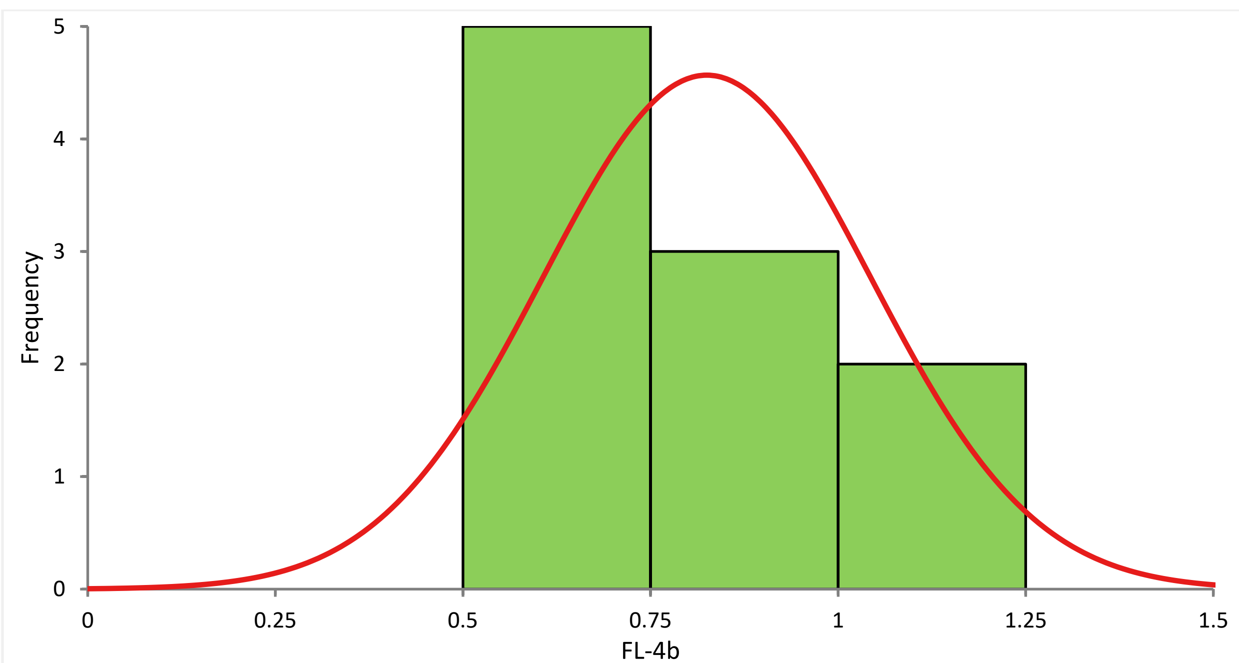


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

FL-03

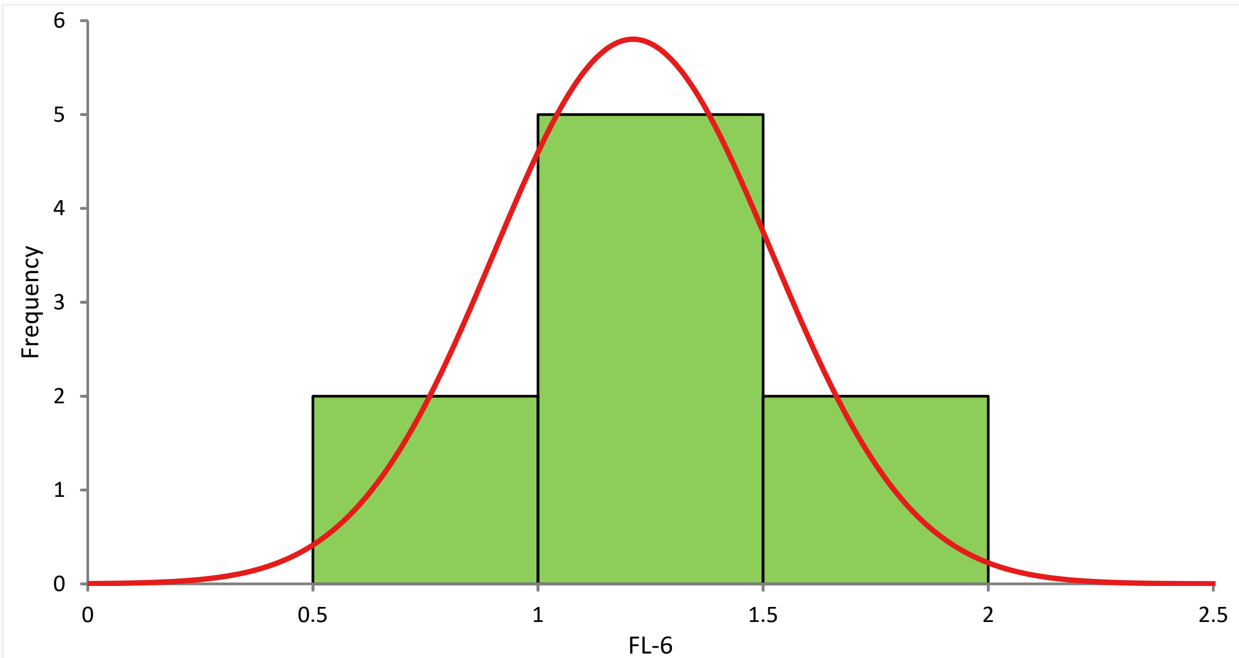


FL-4b

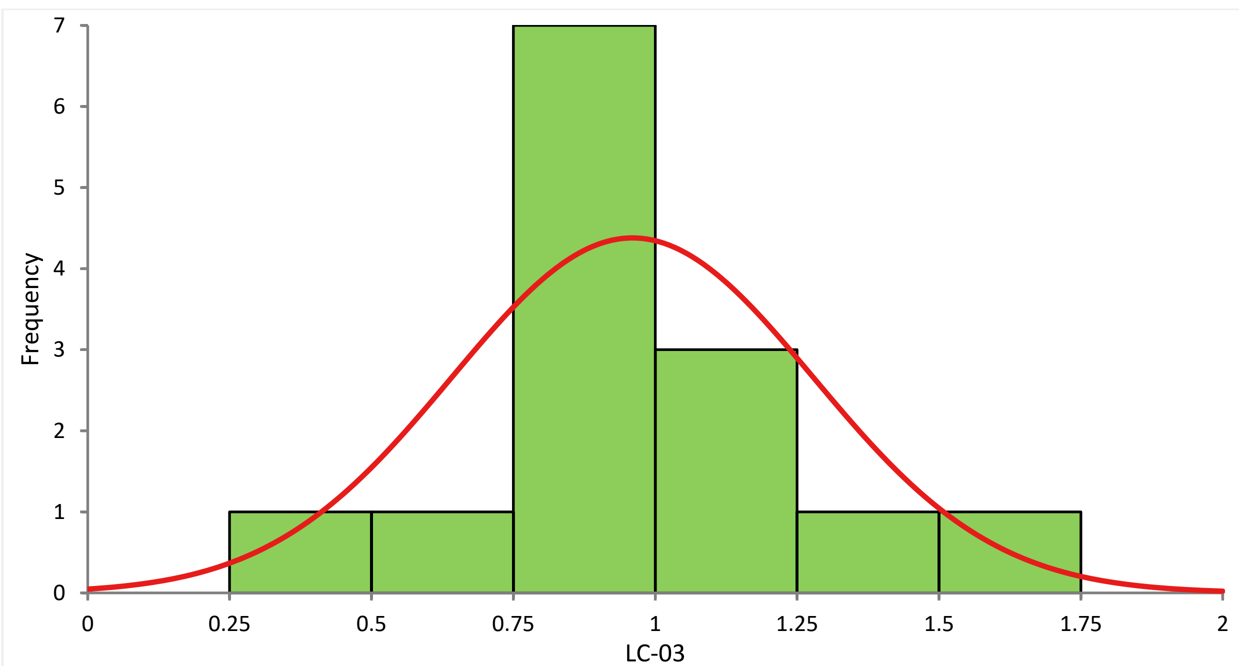


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

FL-6

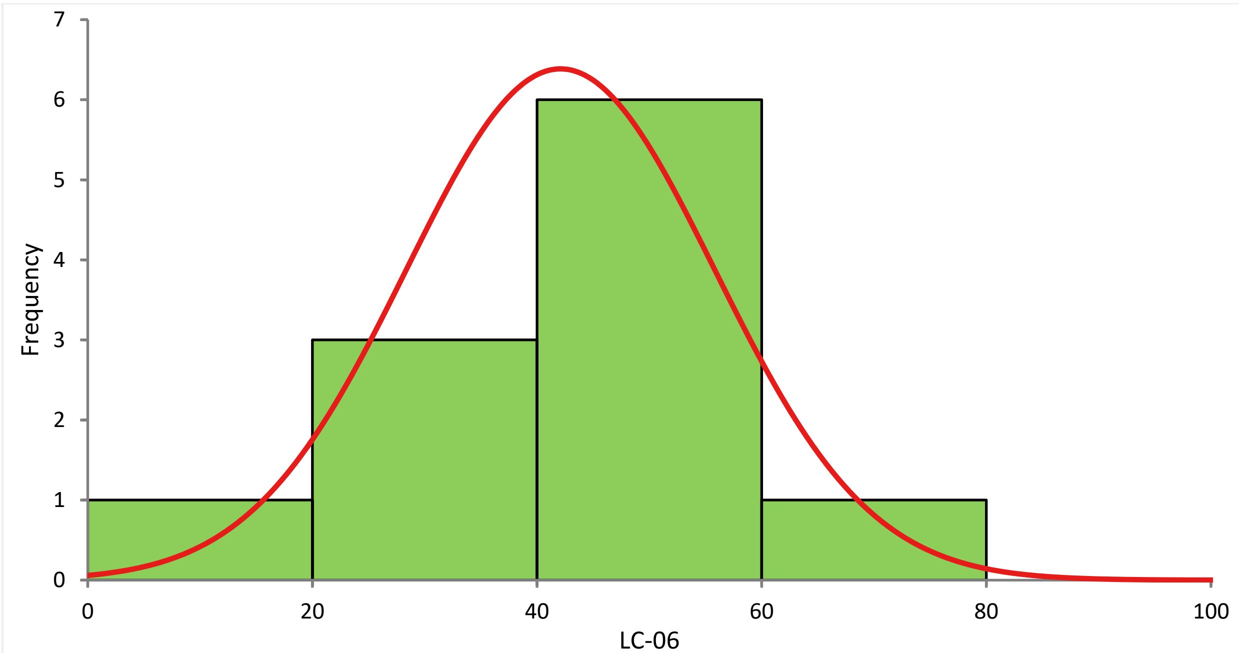


LC-03



Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-06



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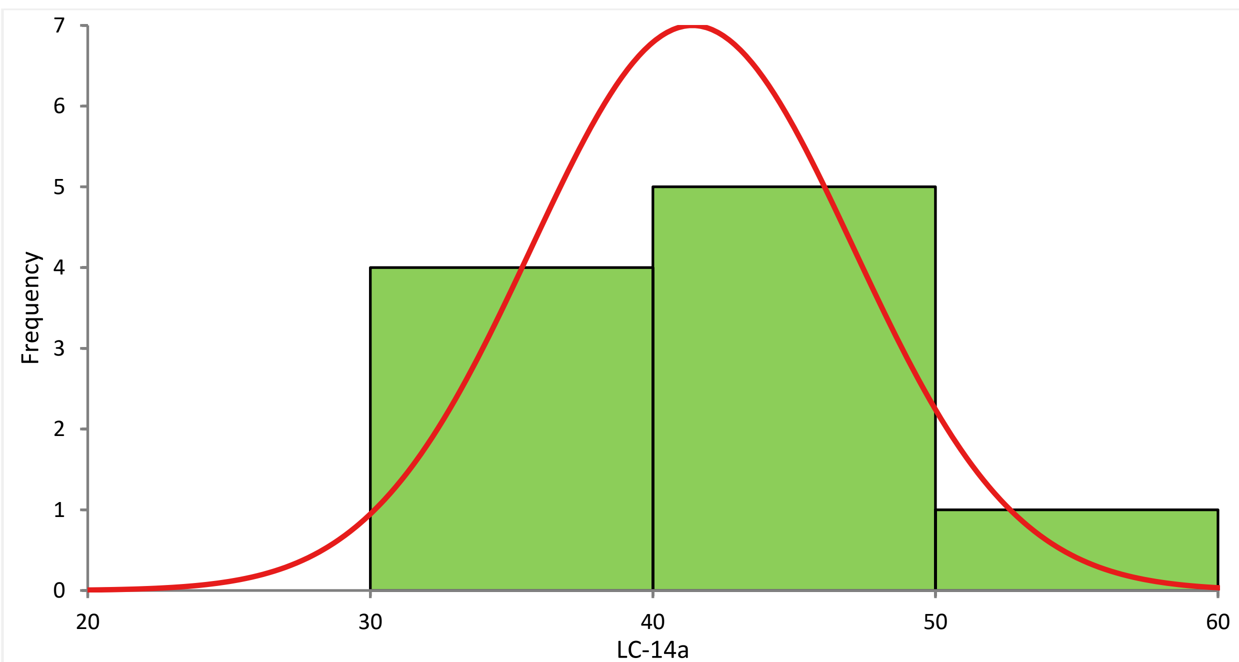
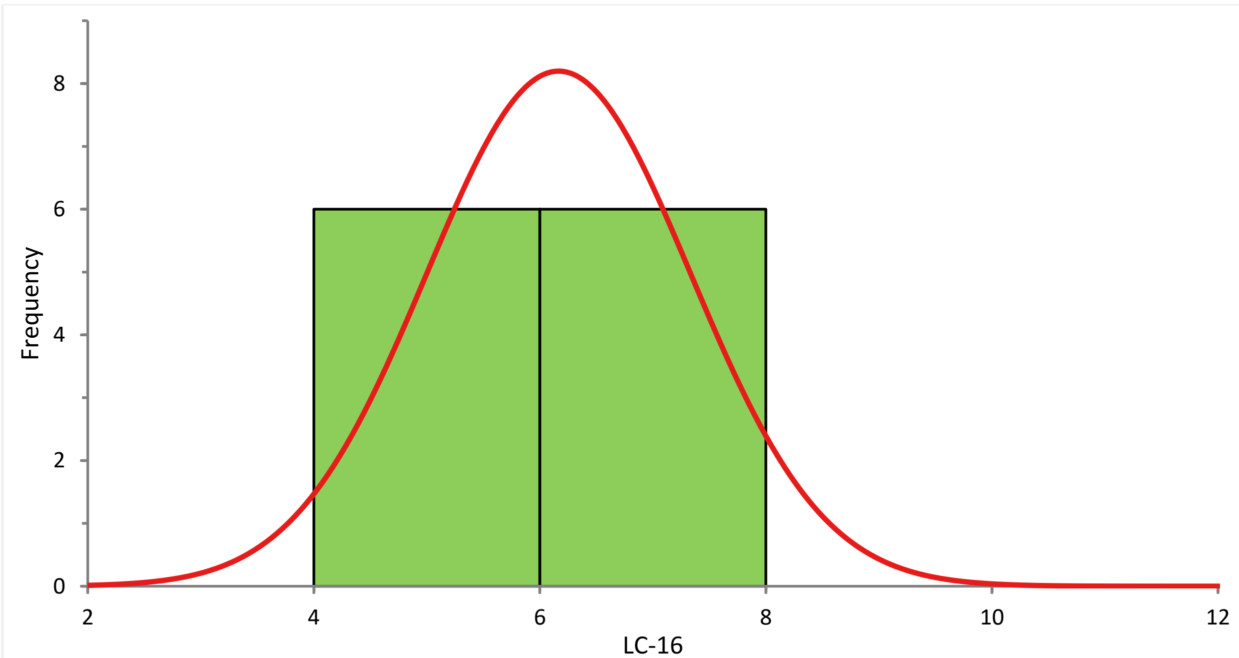


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-16



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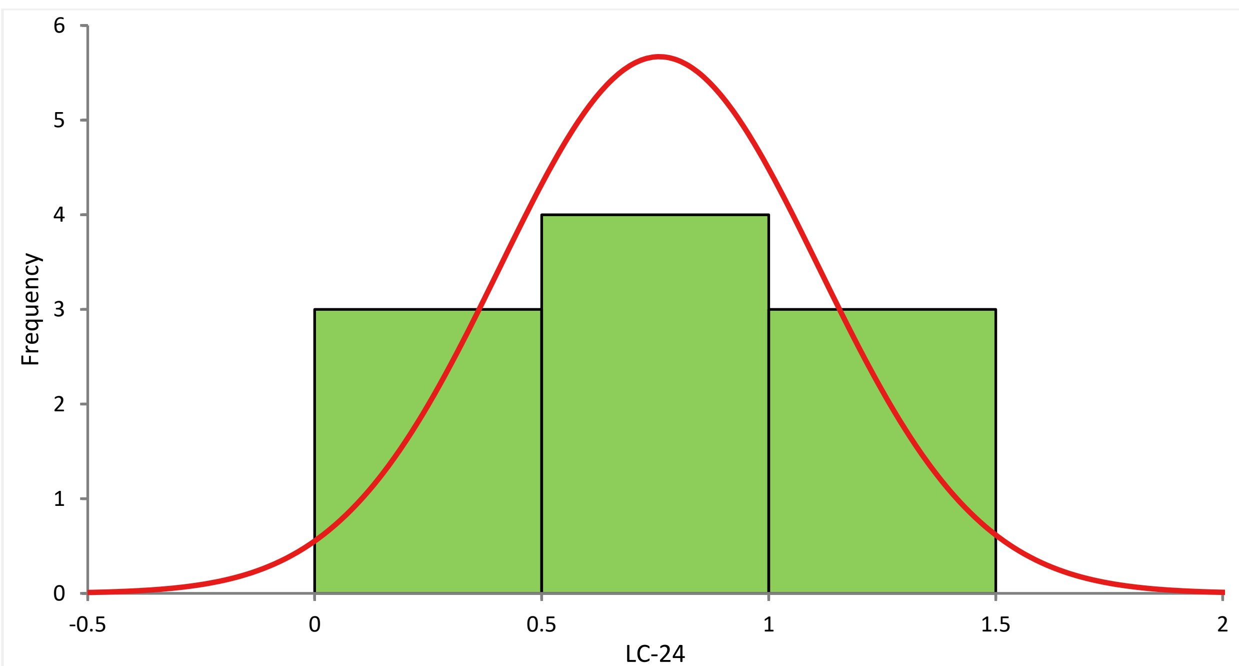
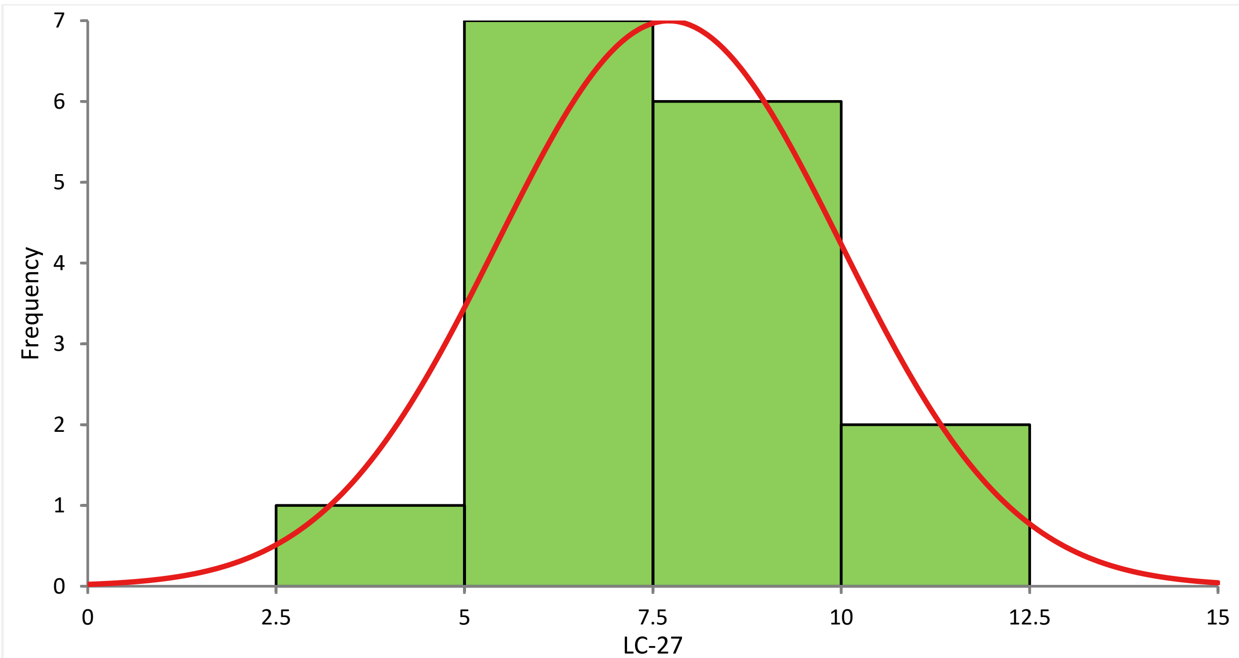
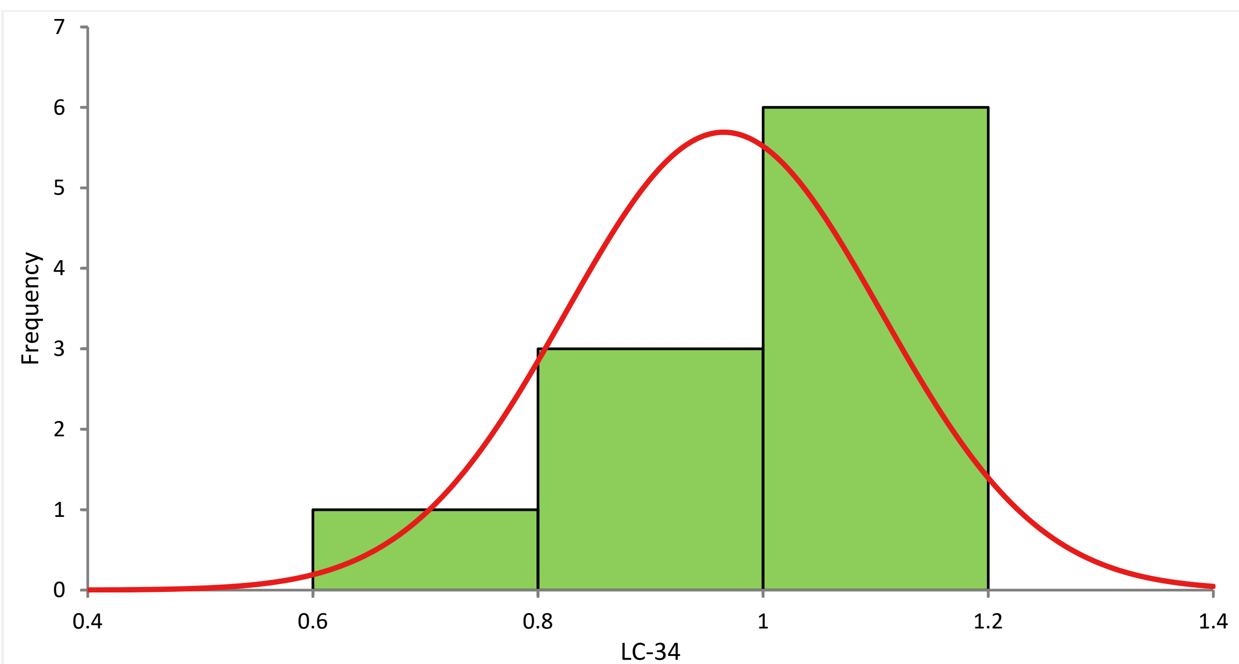


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-27

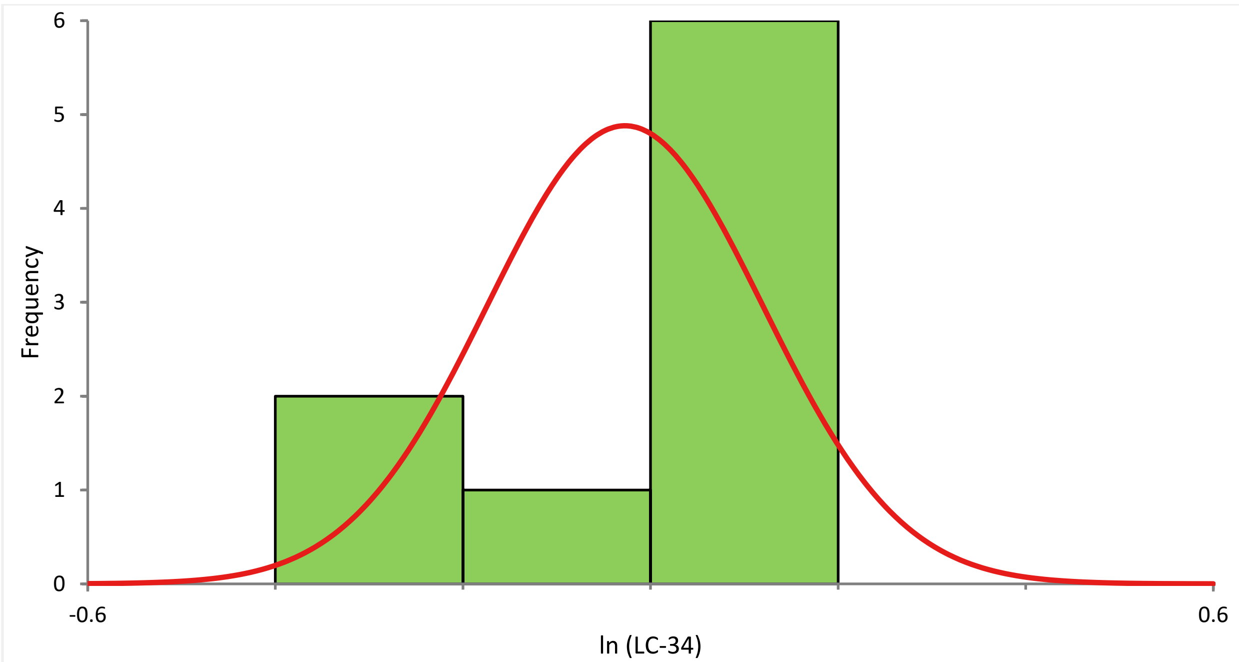


LC-34

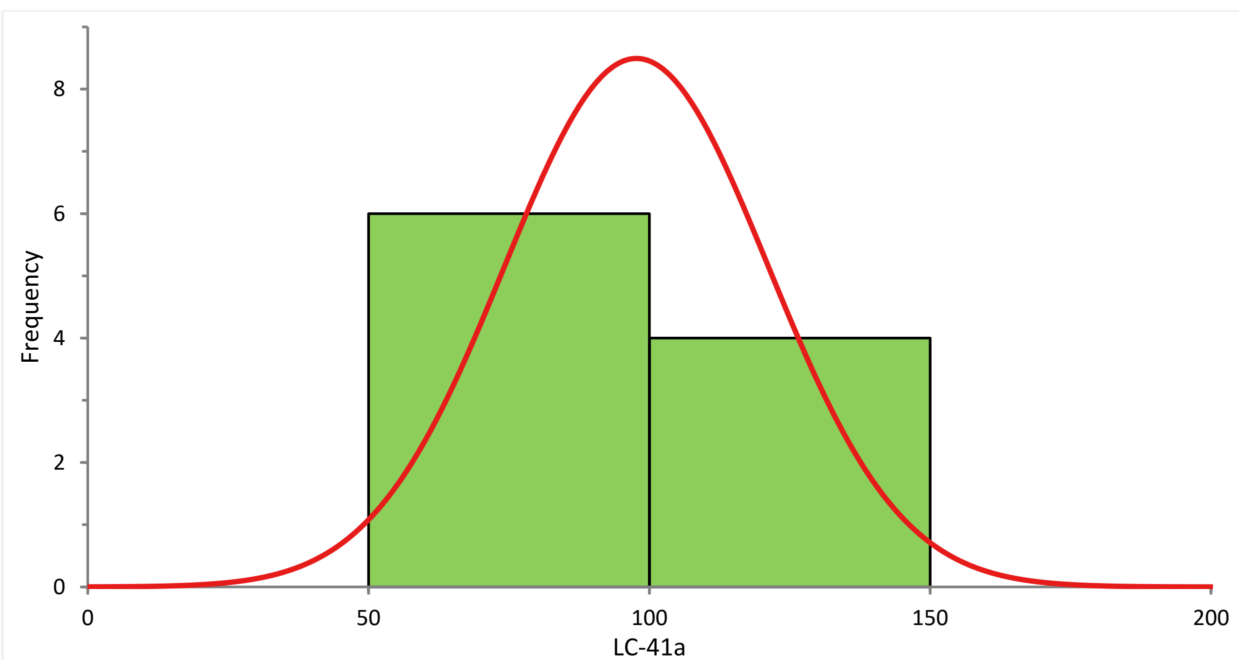


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(LC-34)

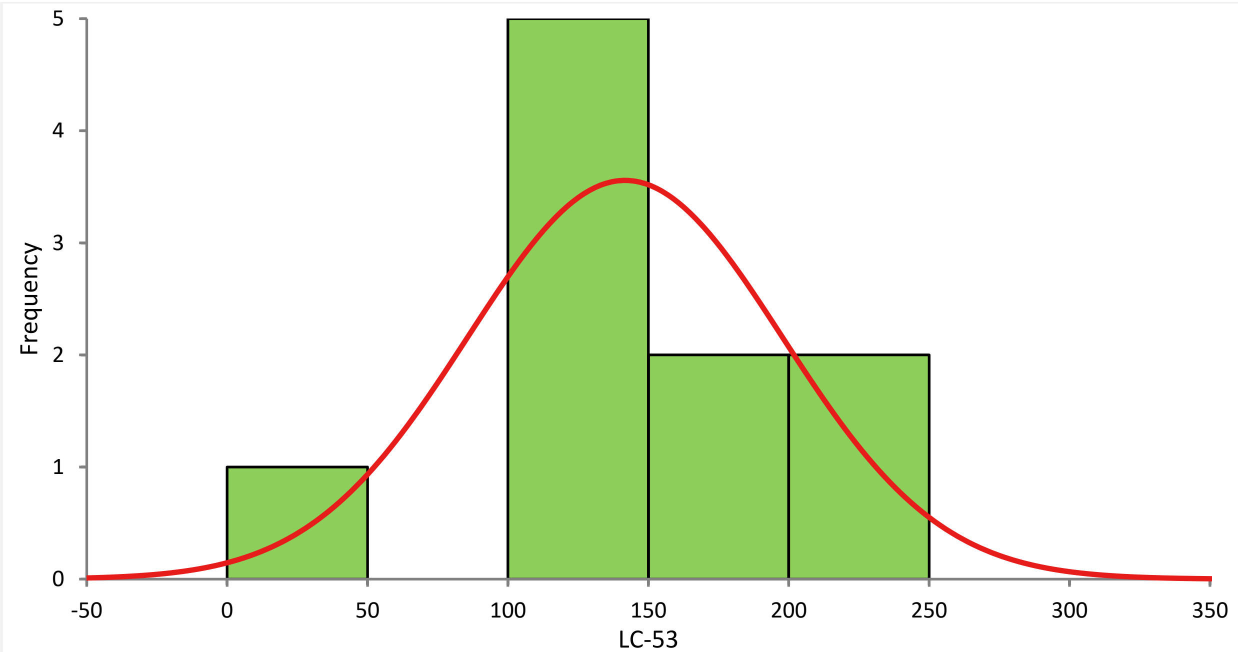


LC-41a



Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-53



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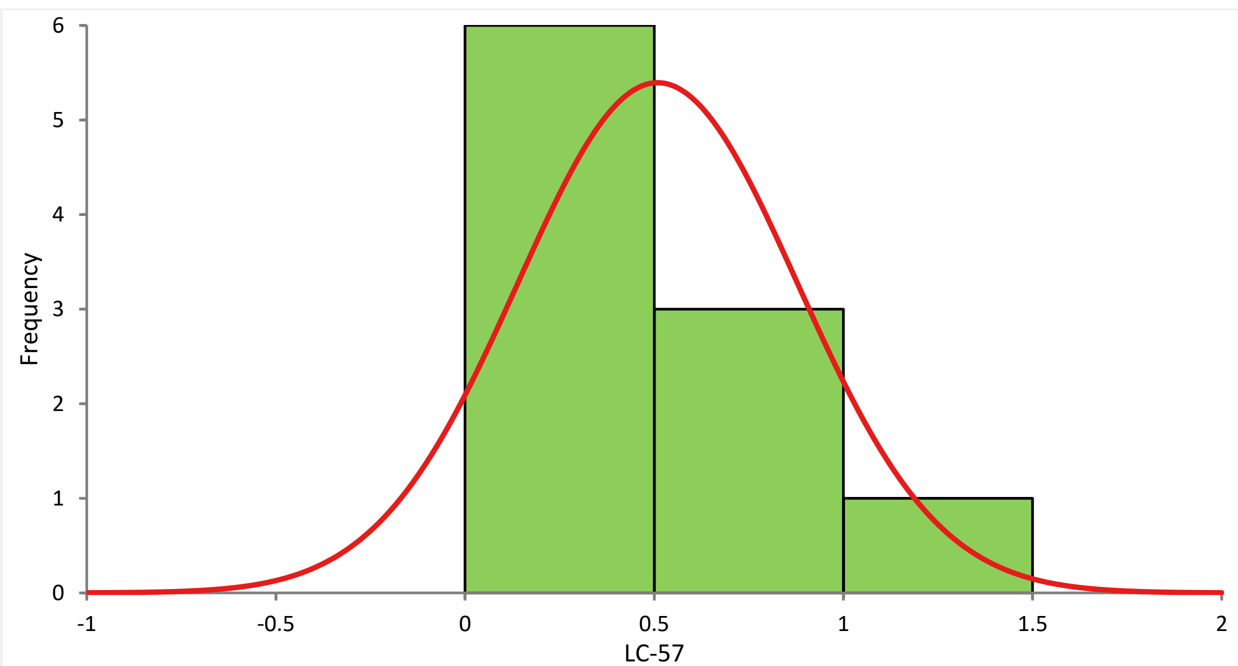
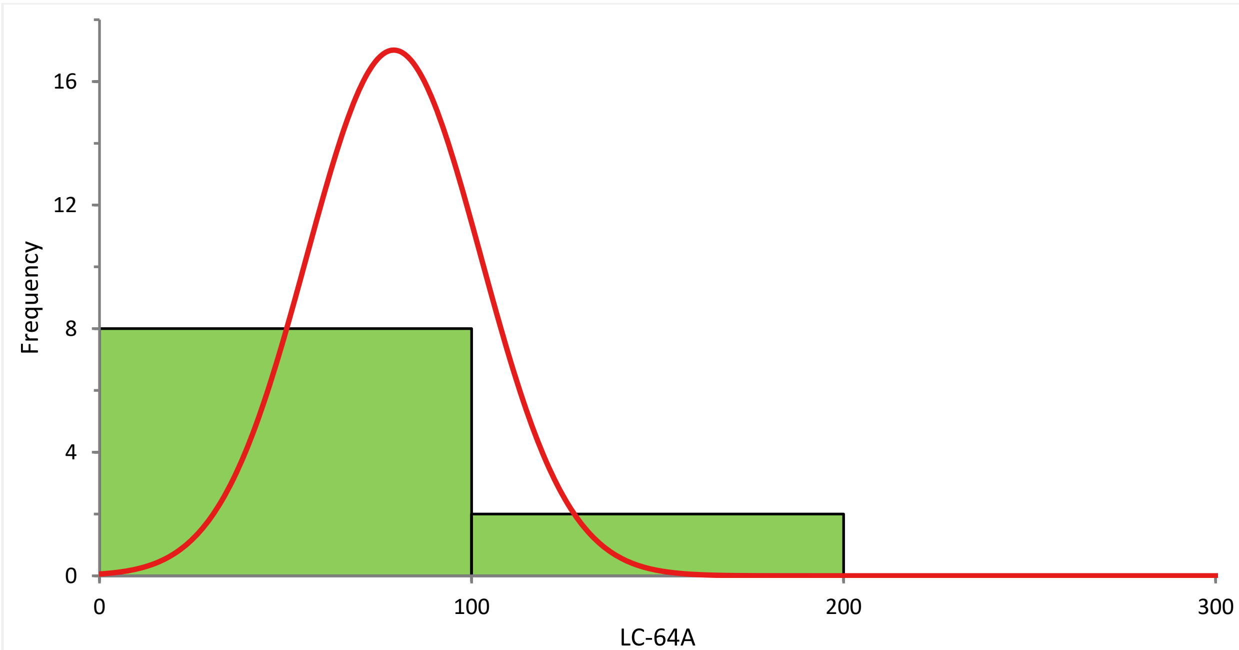
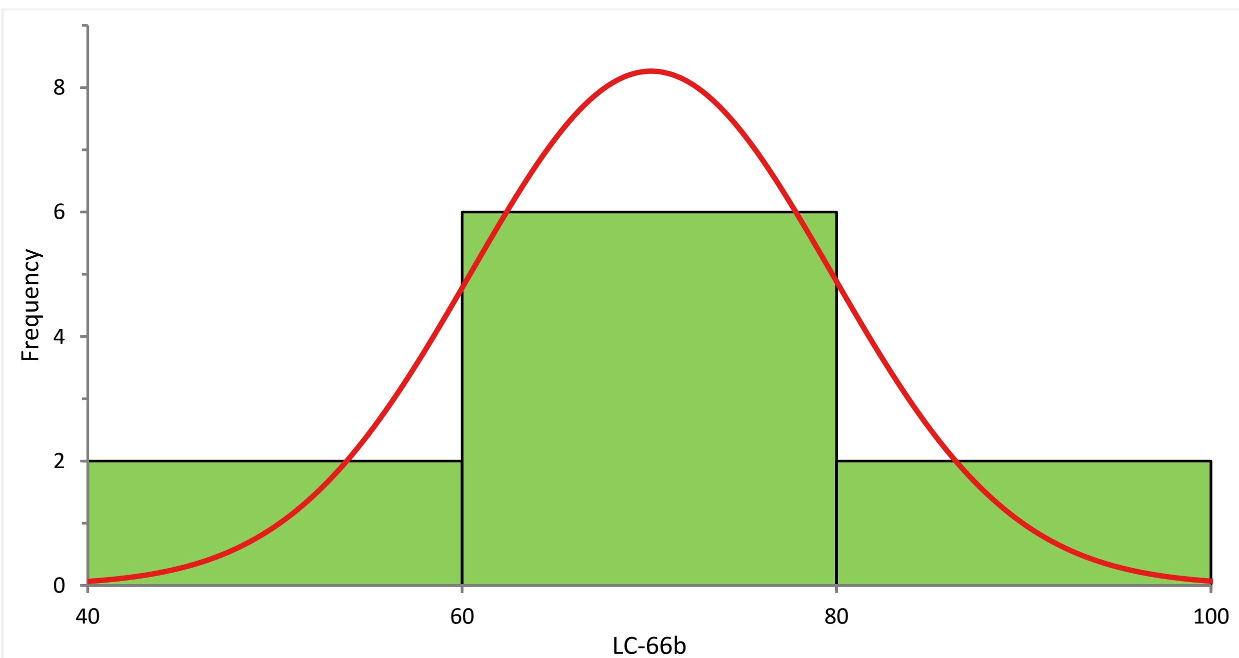


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-64A



LC-66b

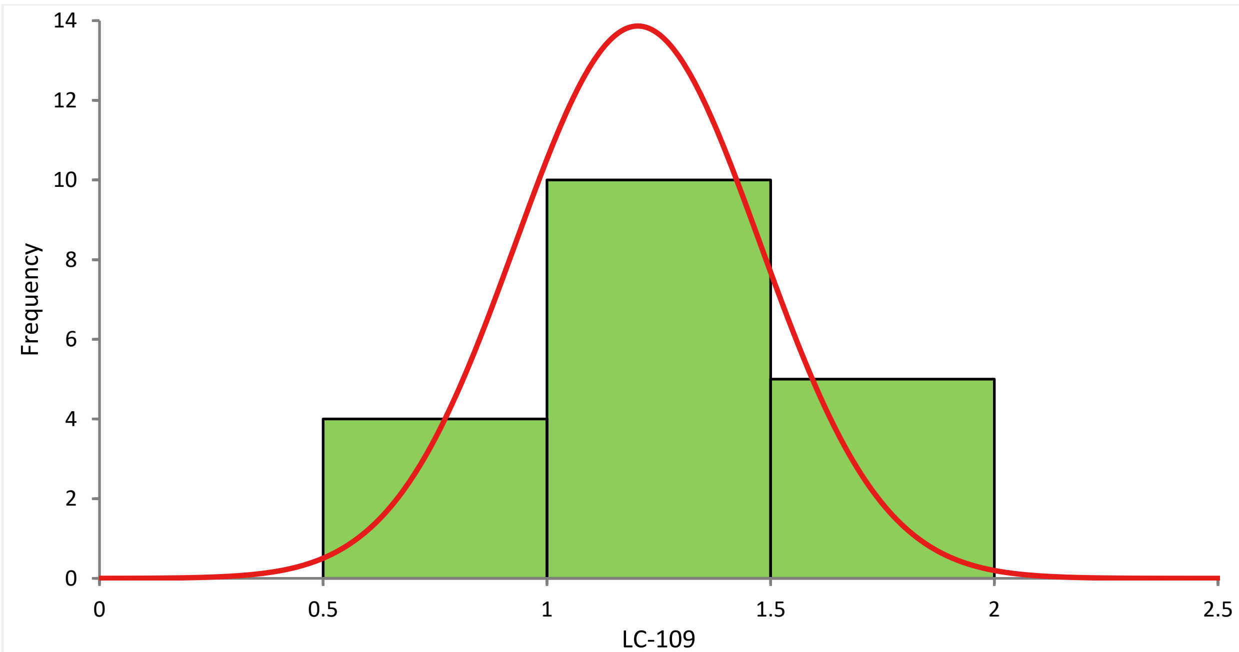


Appendix E - Log RAM Statistics, 2012-2021

Histograms – Upper Vashon Aquifer TCE Data

Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-109



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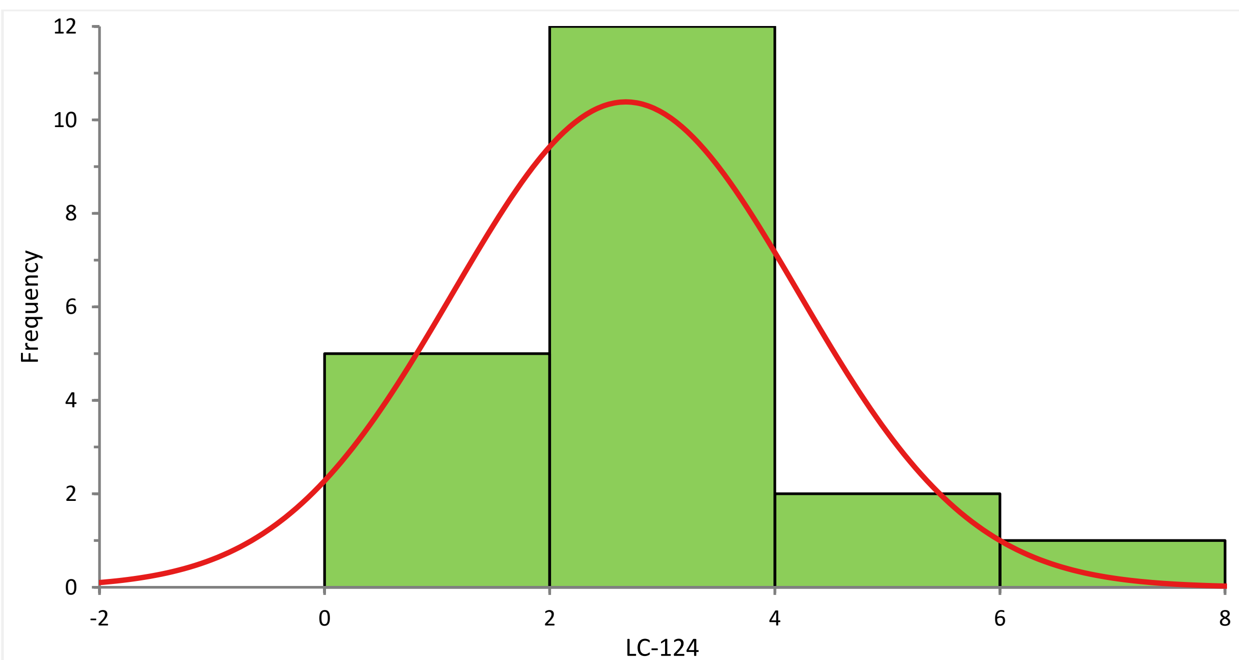
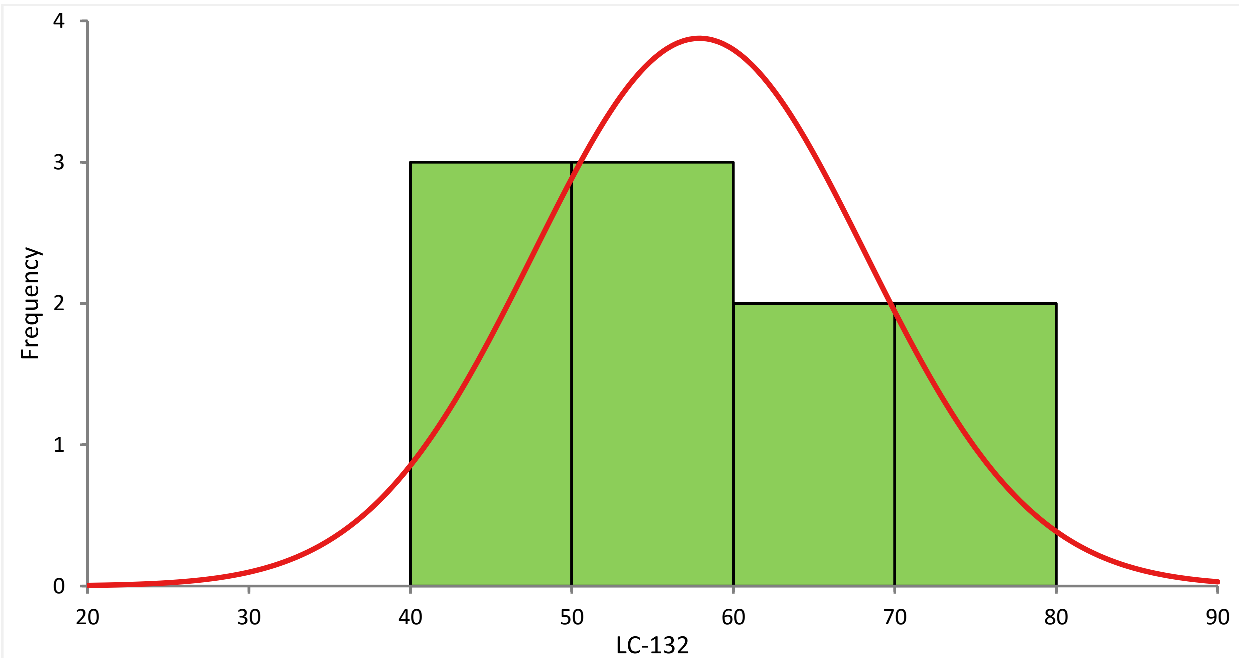
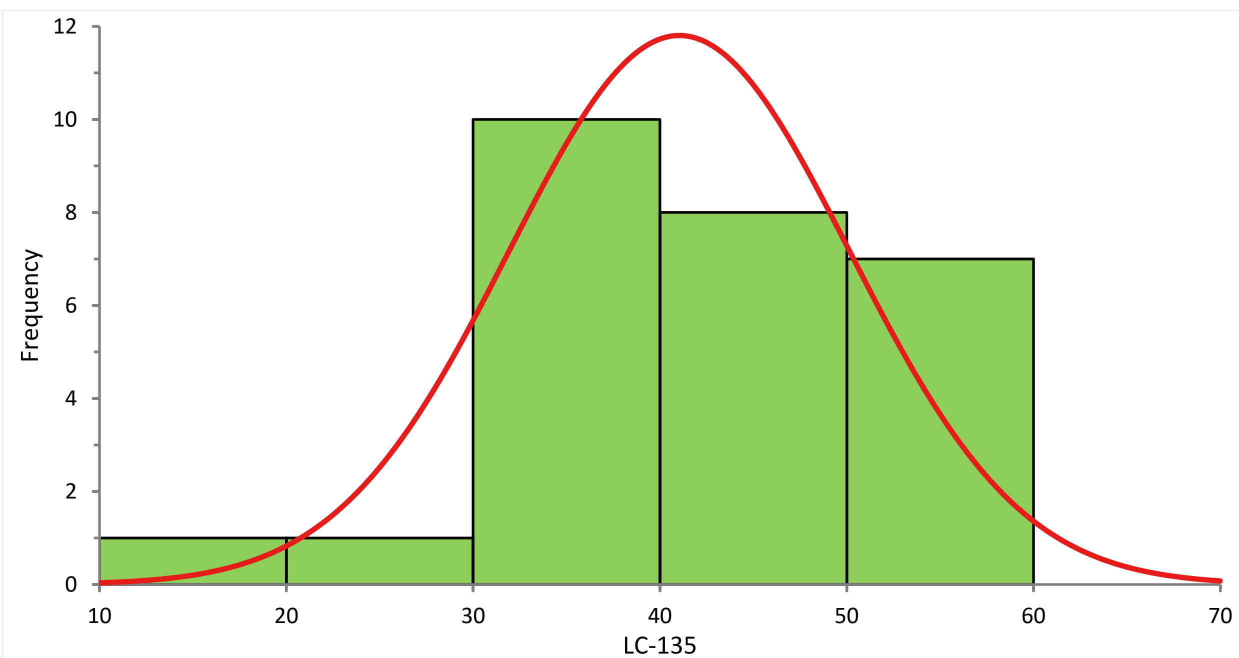


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-132

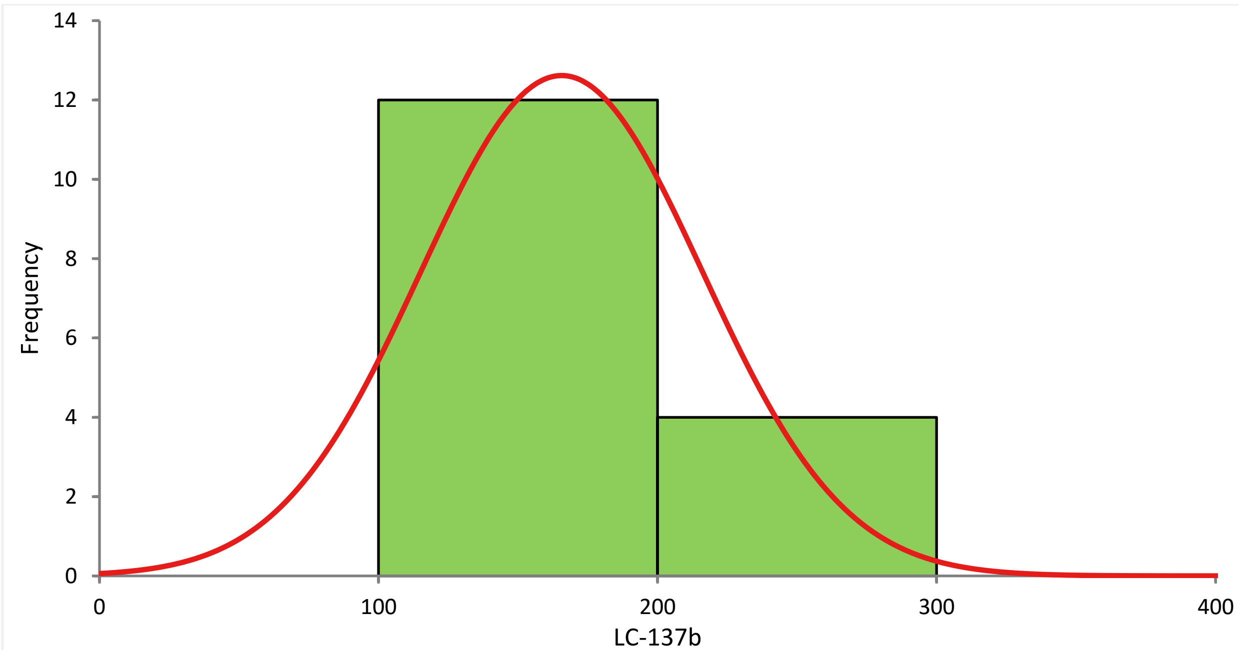


LC-135



Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-137b



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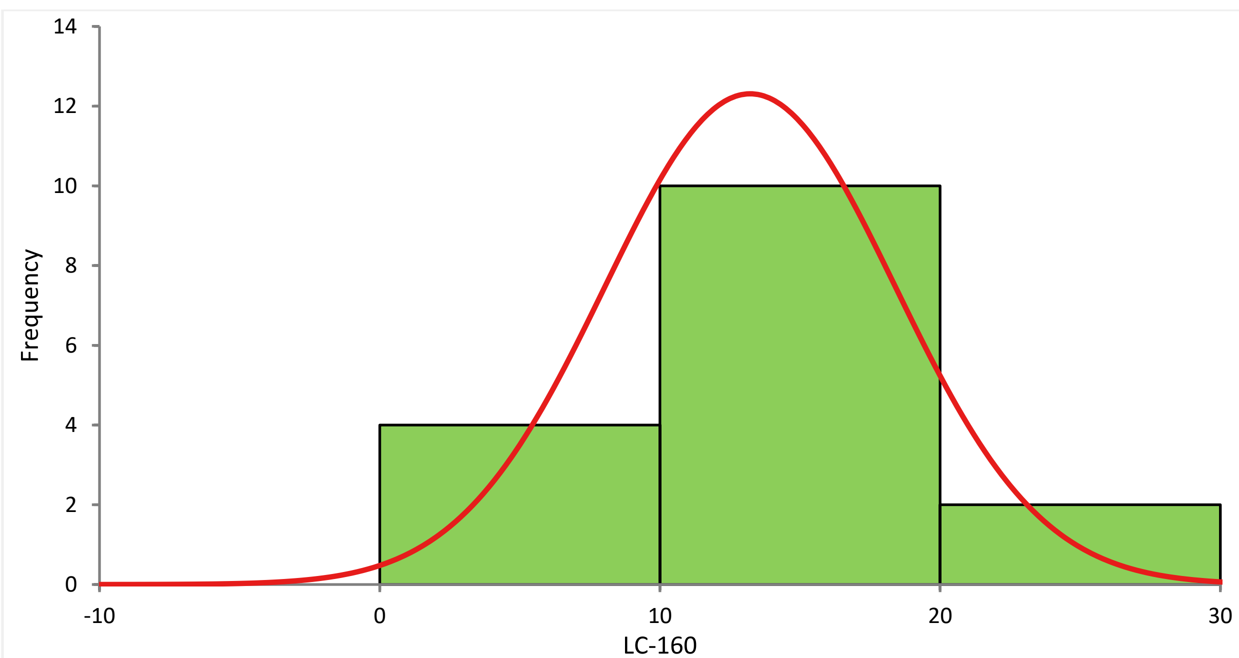
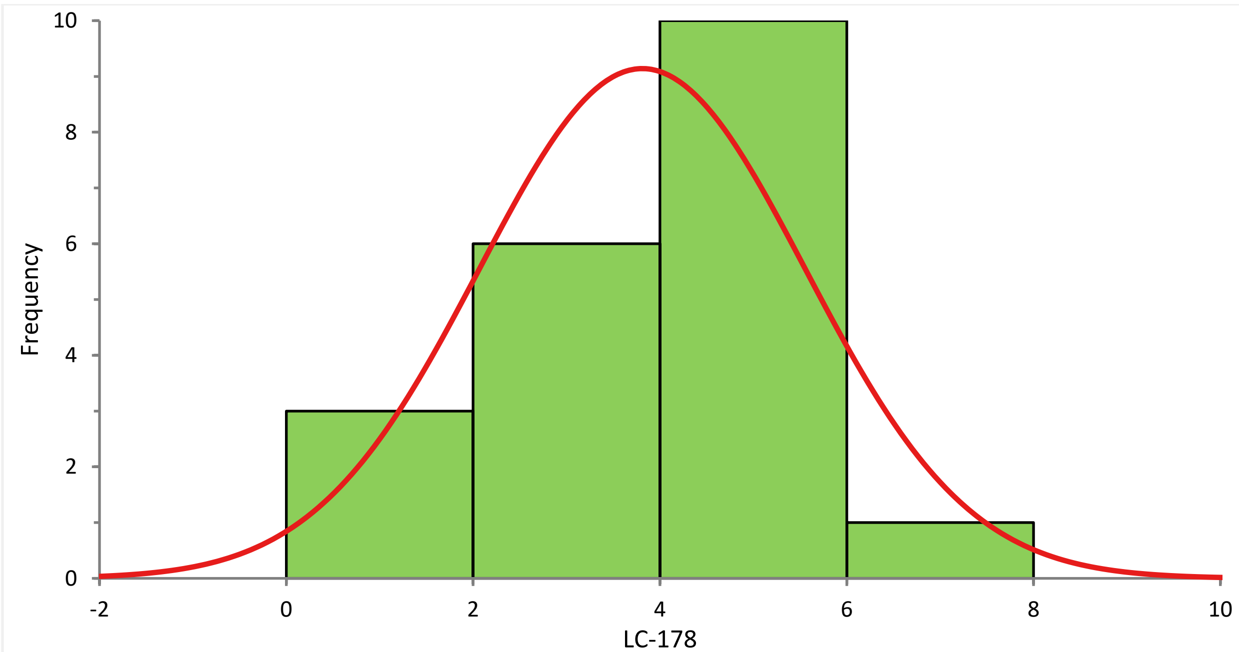


Appendix E - Log RAM Statistics, 2012-2021

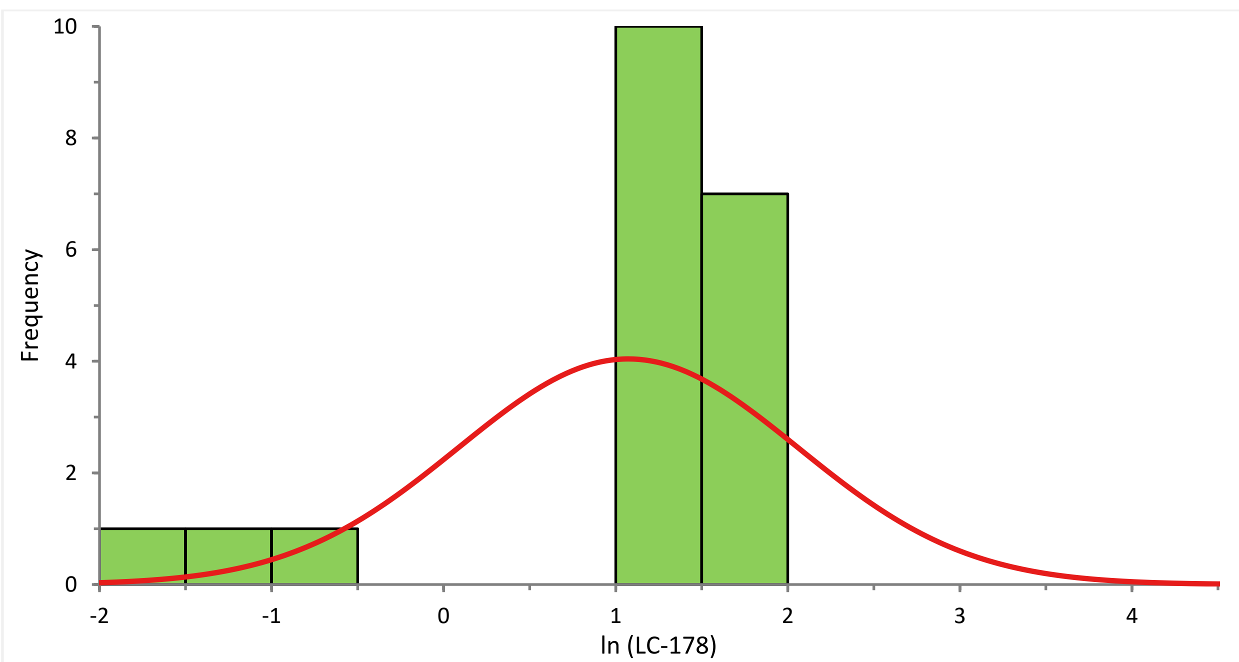
Histograms – Upper Vashon Aquifer TCE Data

Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-178

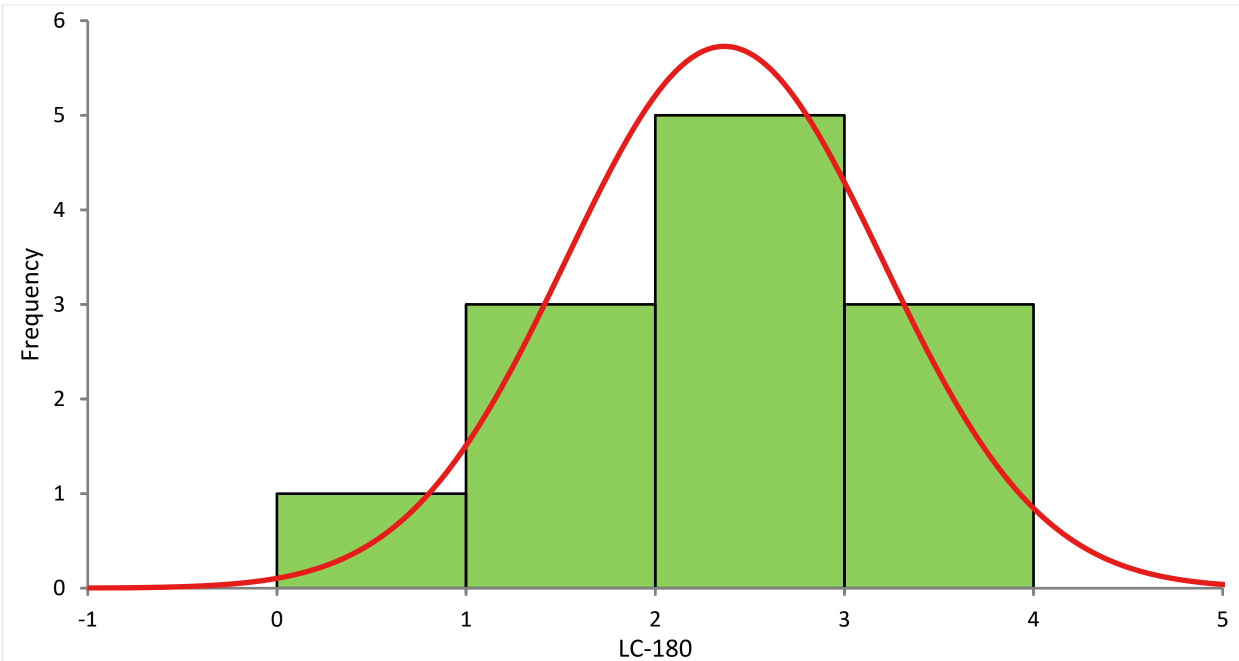


ln(LC-178)

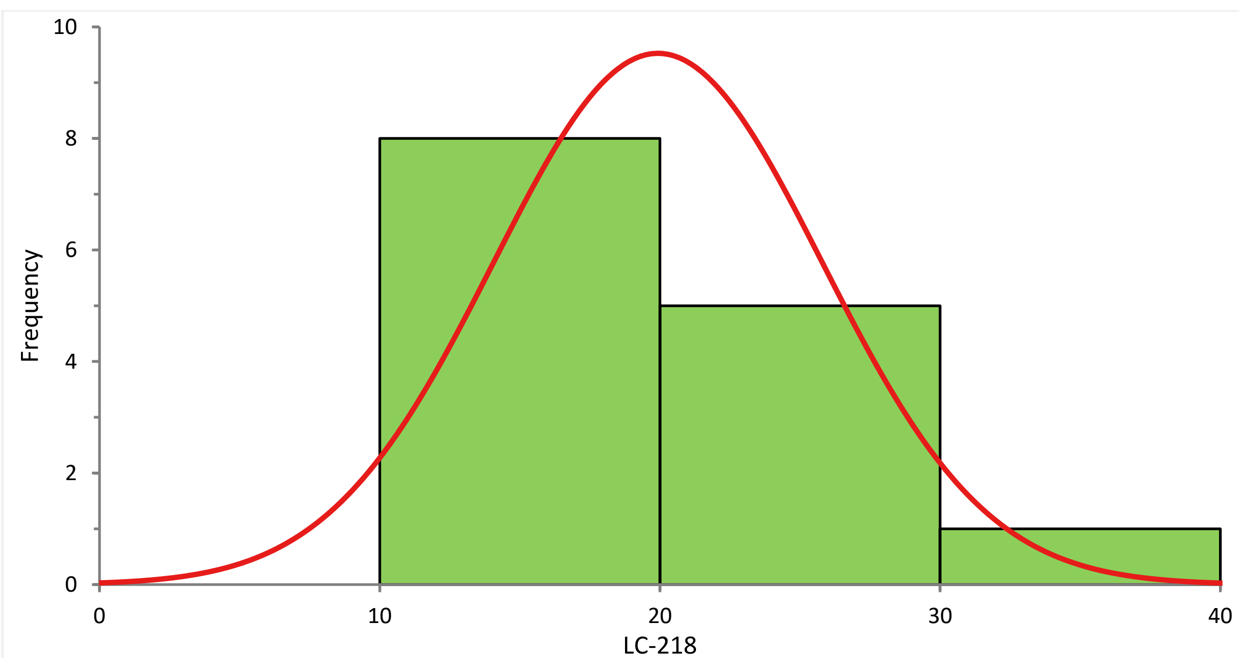


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-180

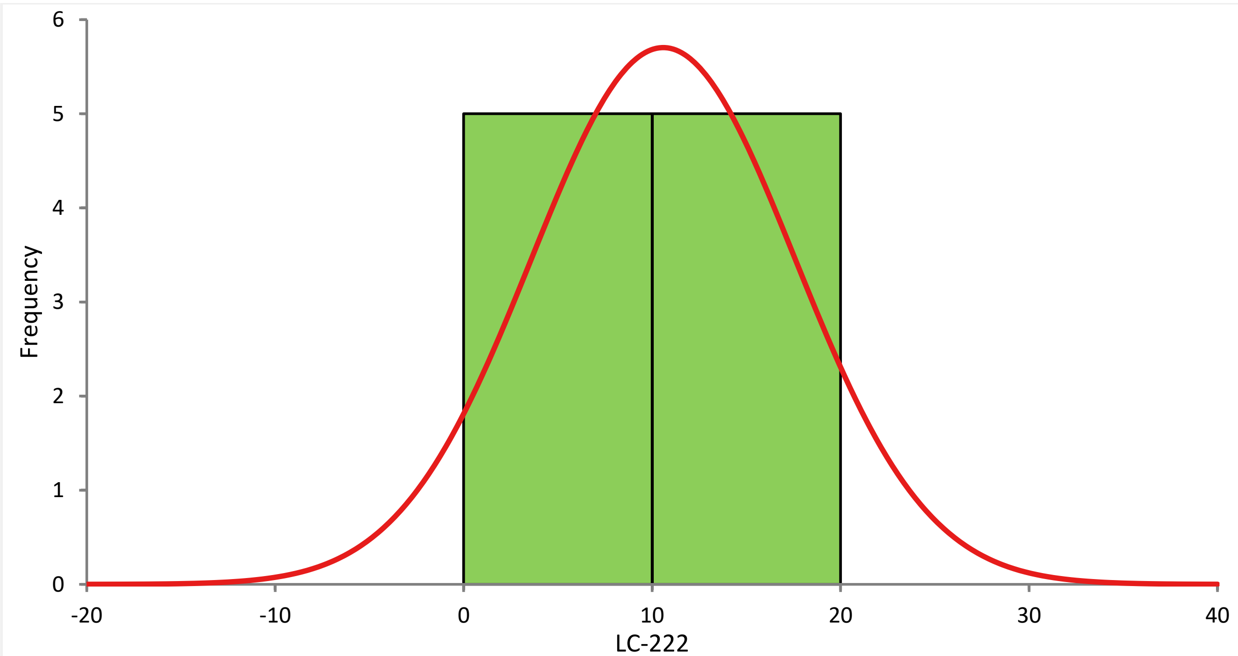


LC-218

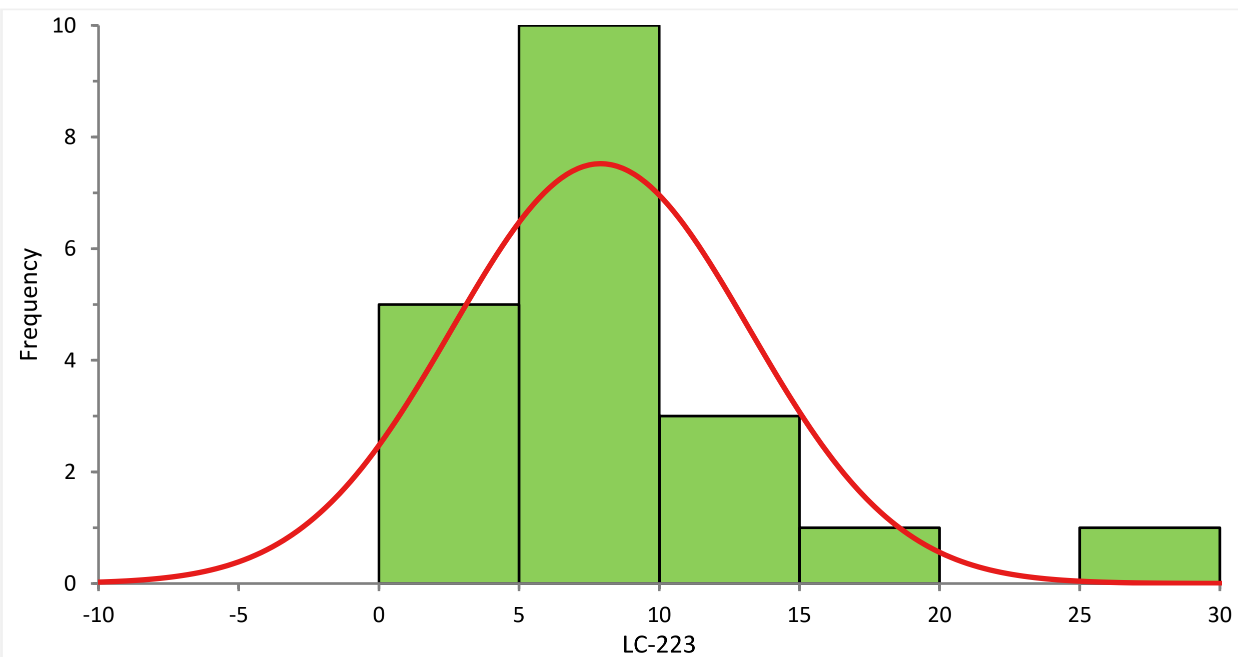


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-222

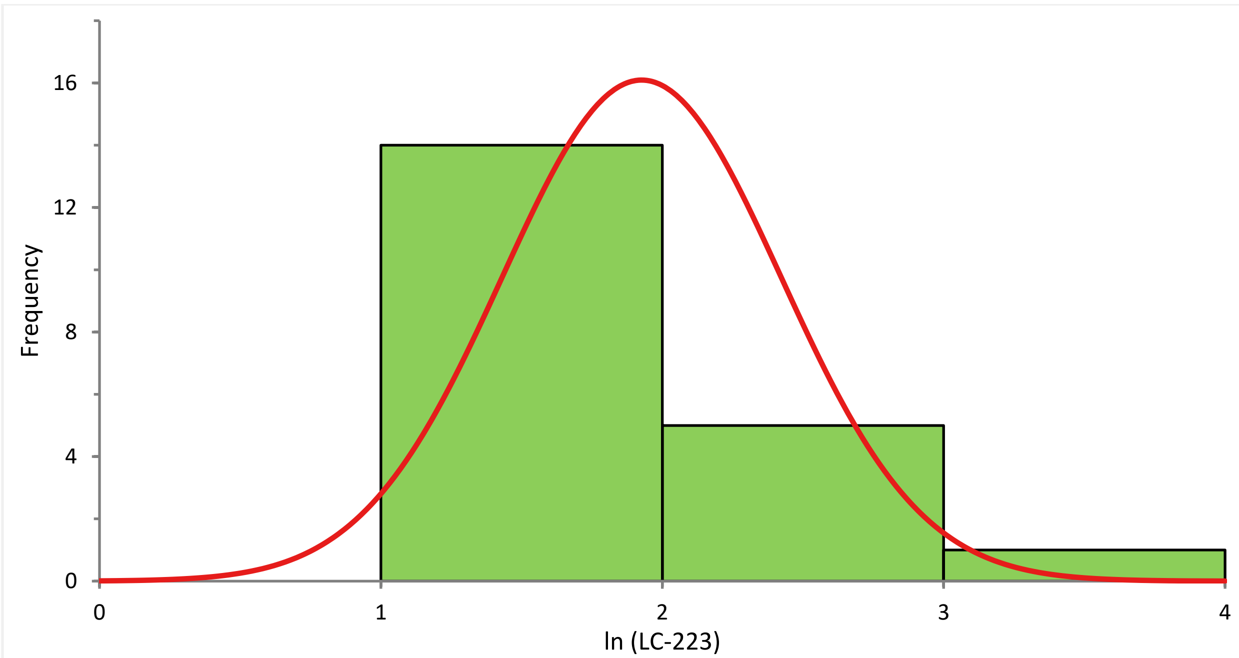


LC-223

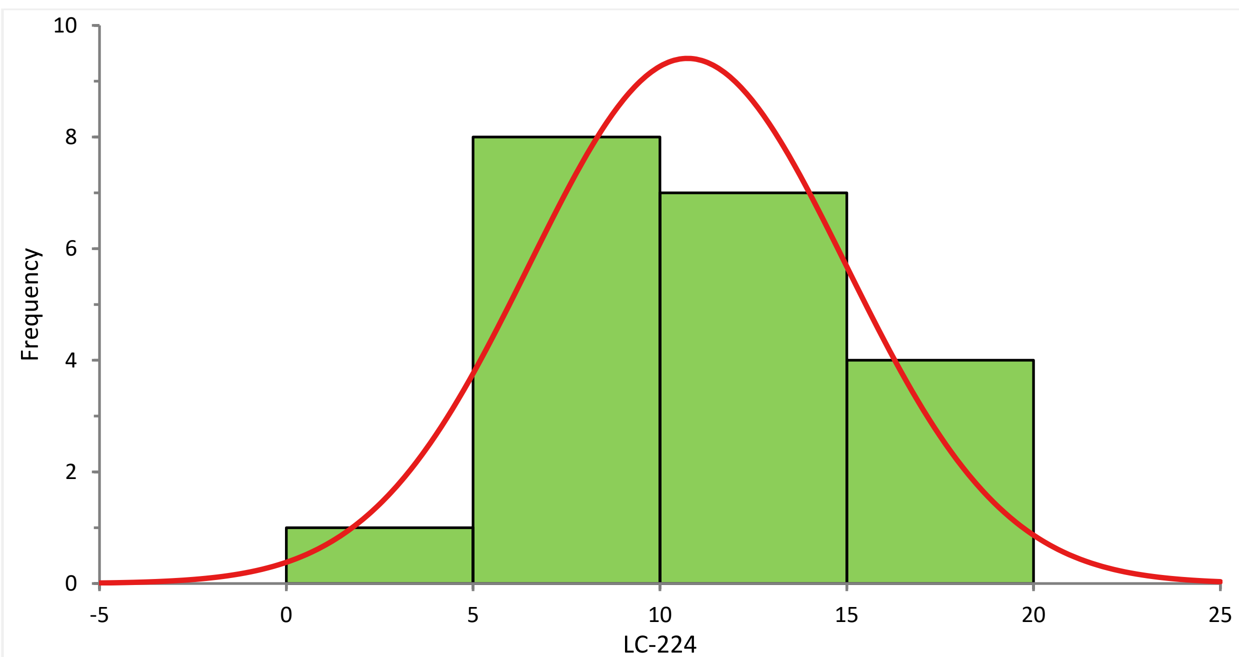


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(LC-223)

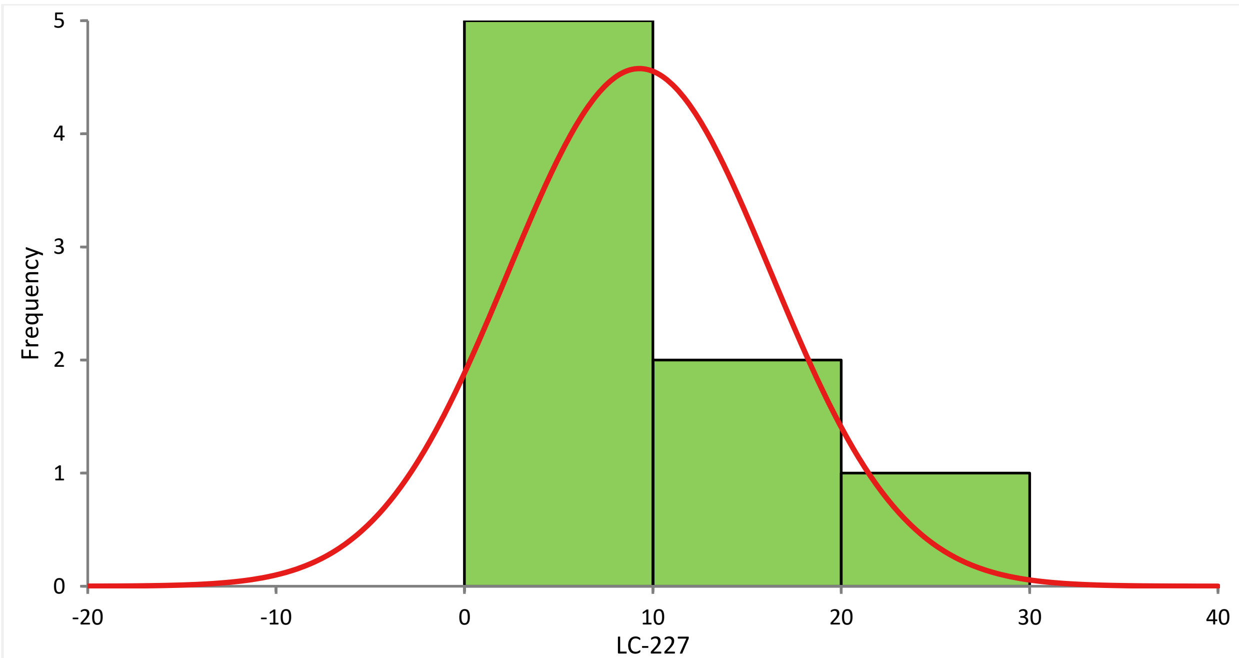


LC-224

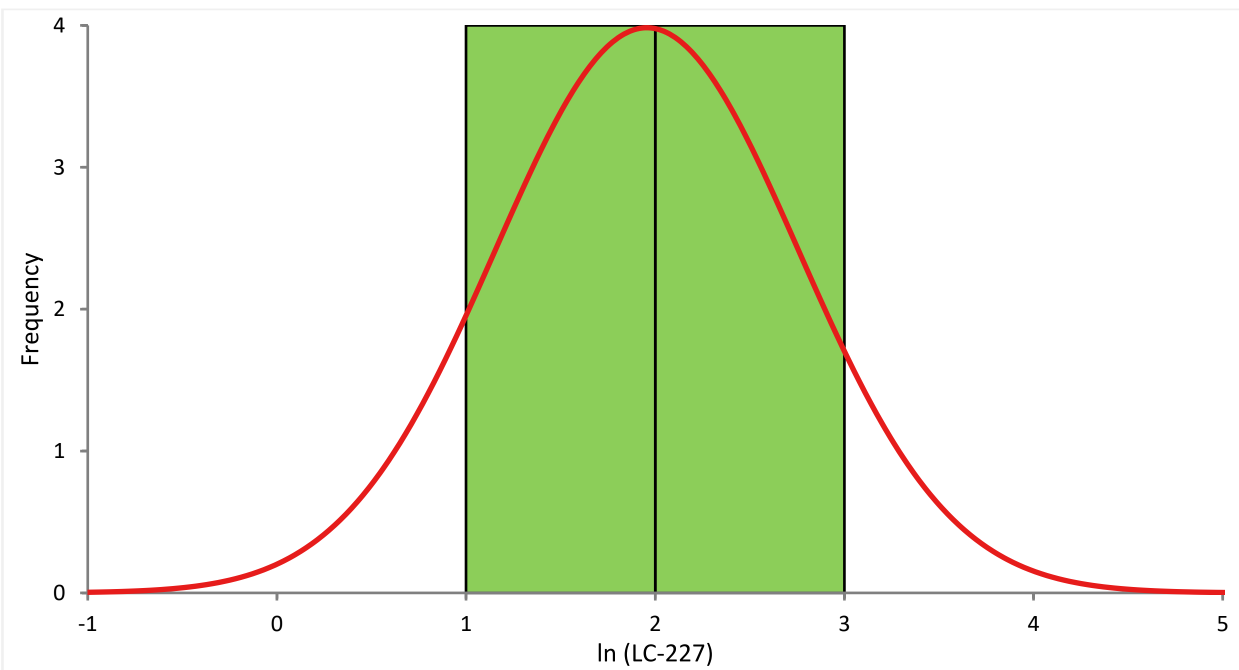


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-227

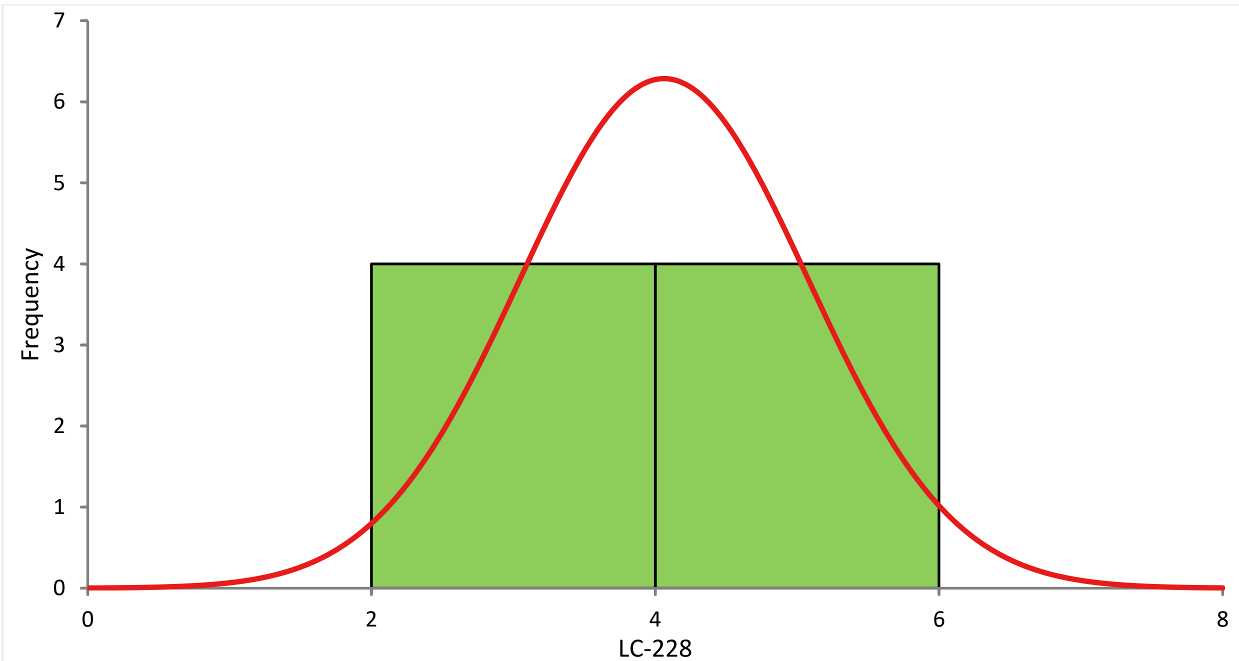


ln(LC-227)

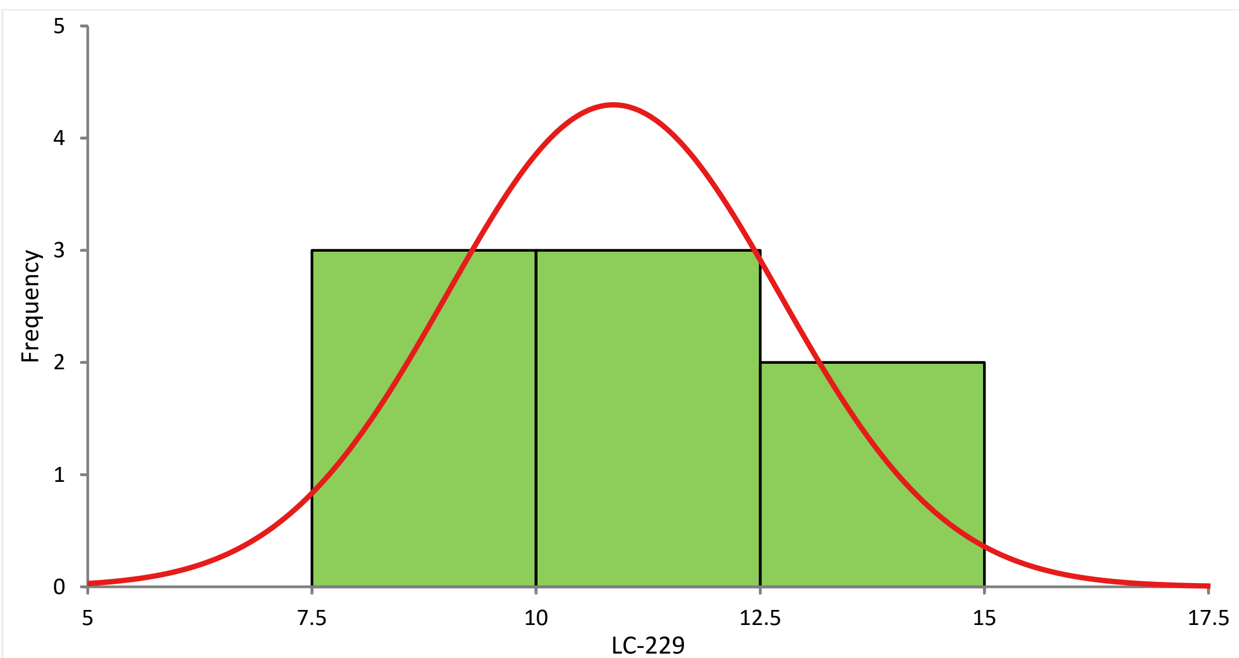


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-228

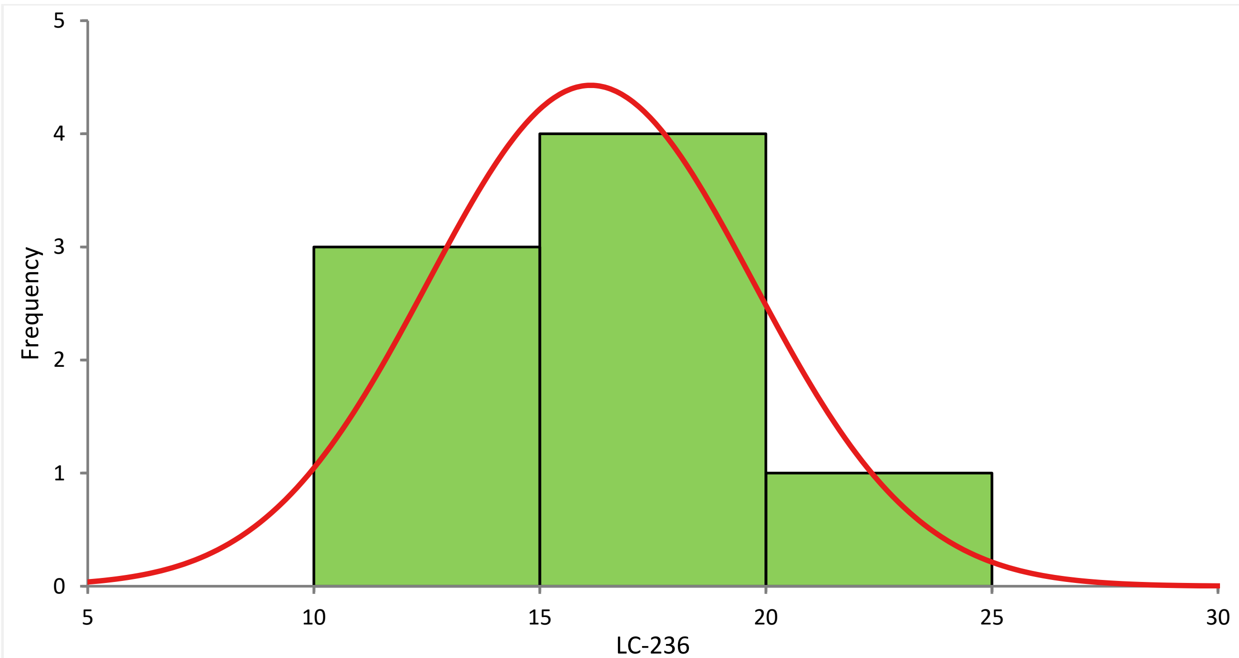


LC-229

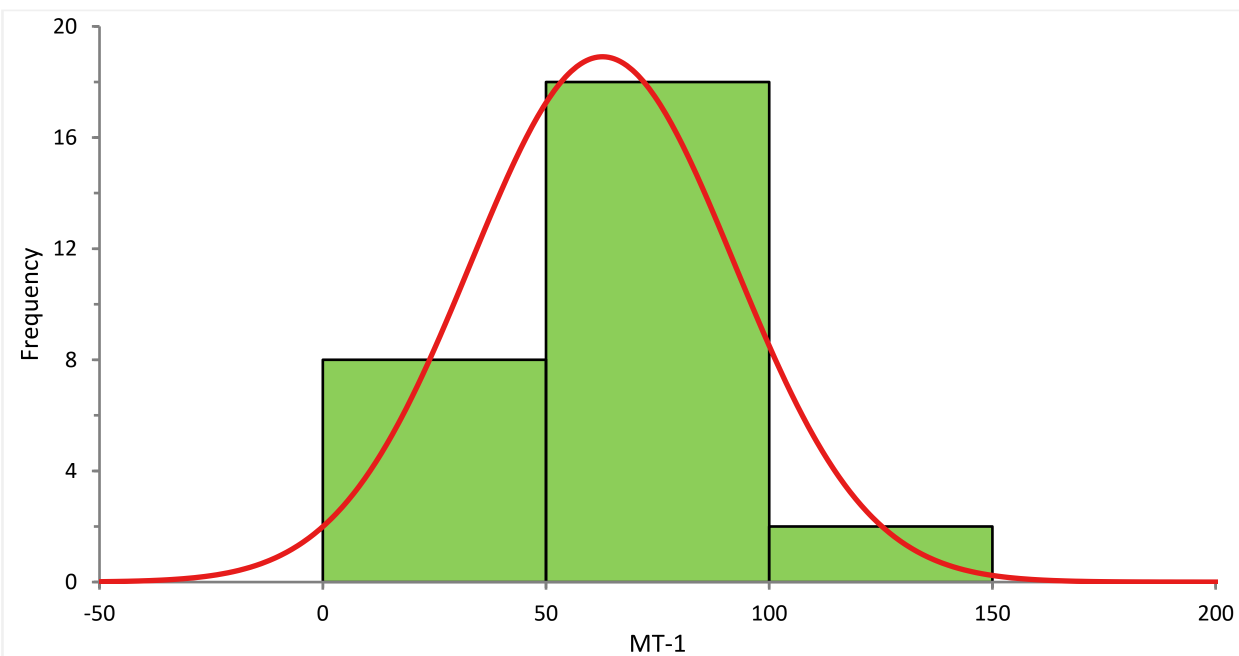


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-236

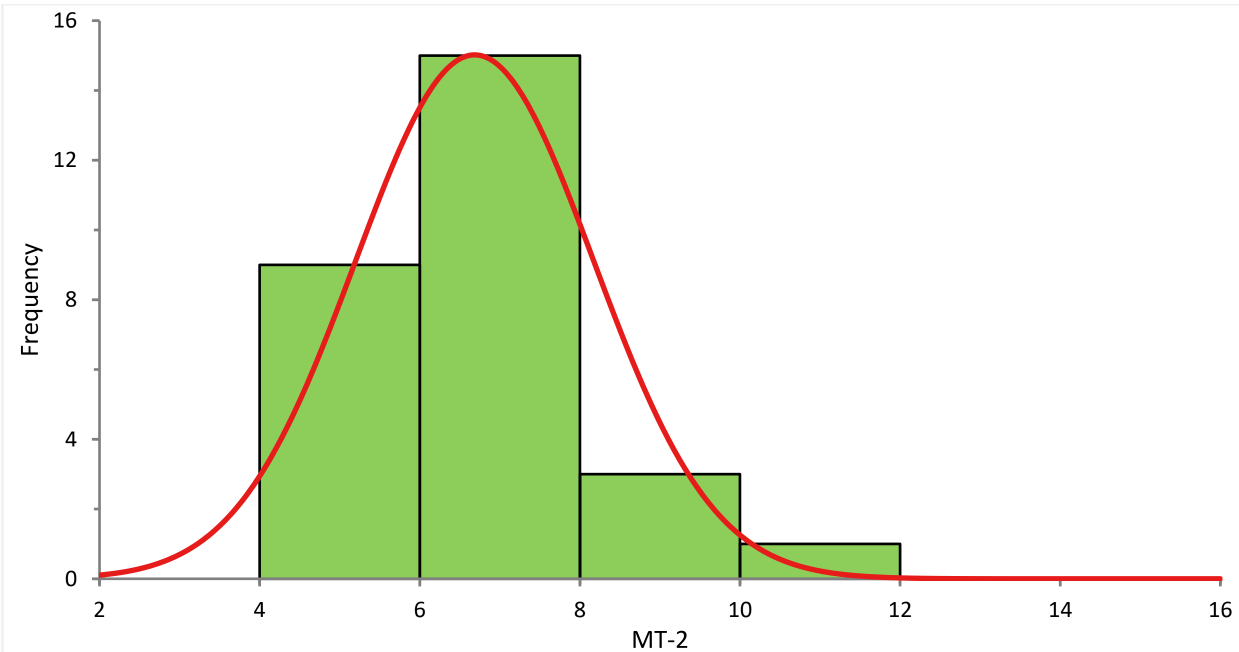


MT-1

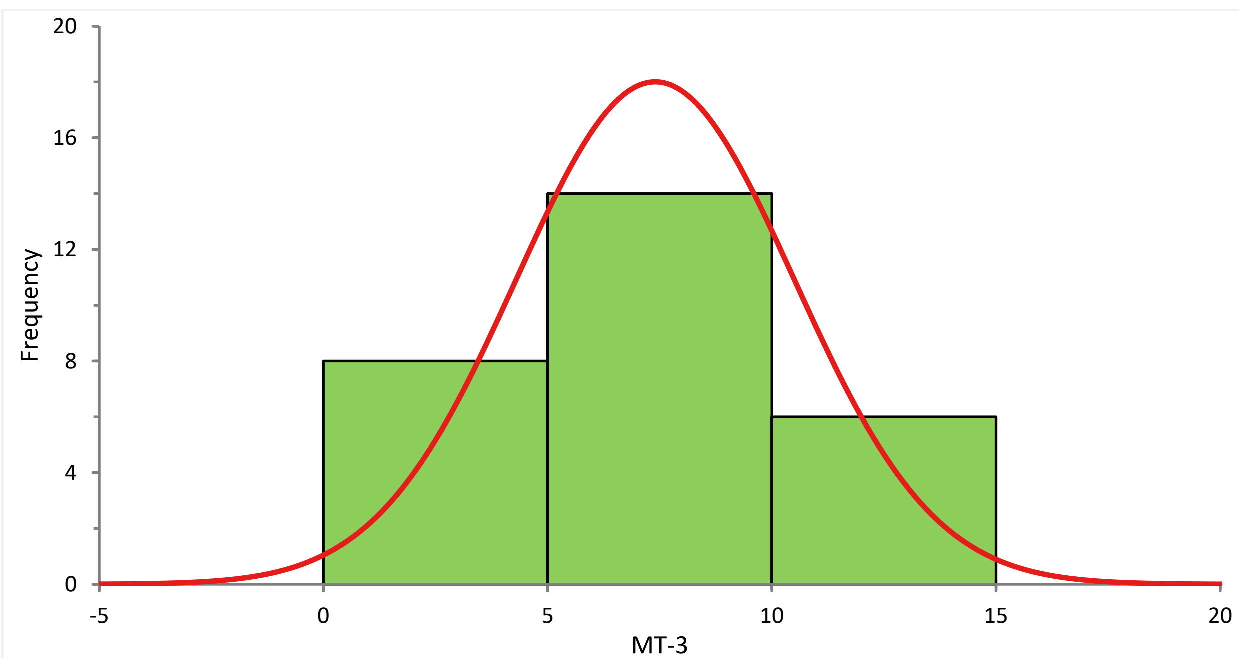


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

MT-2

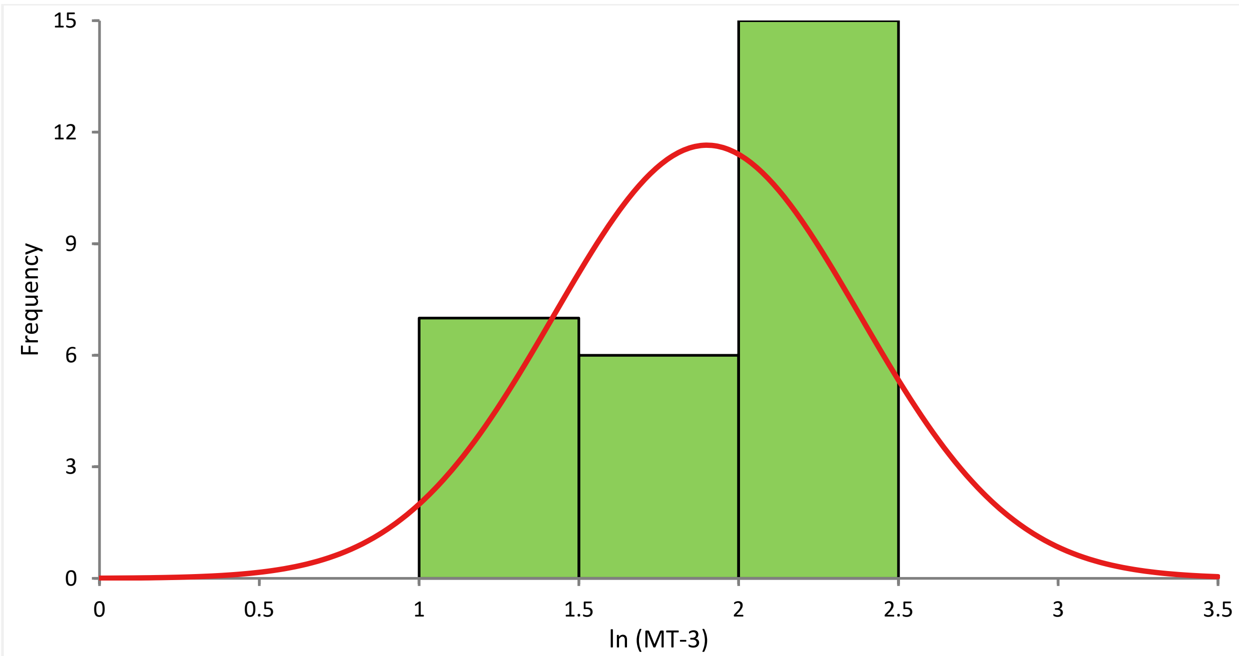


MT-3

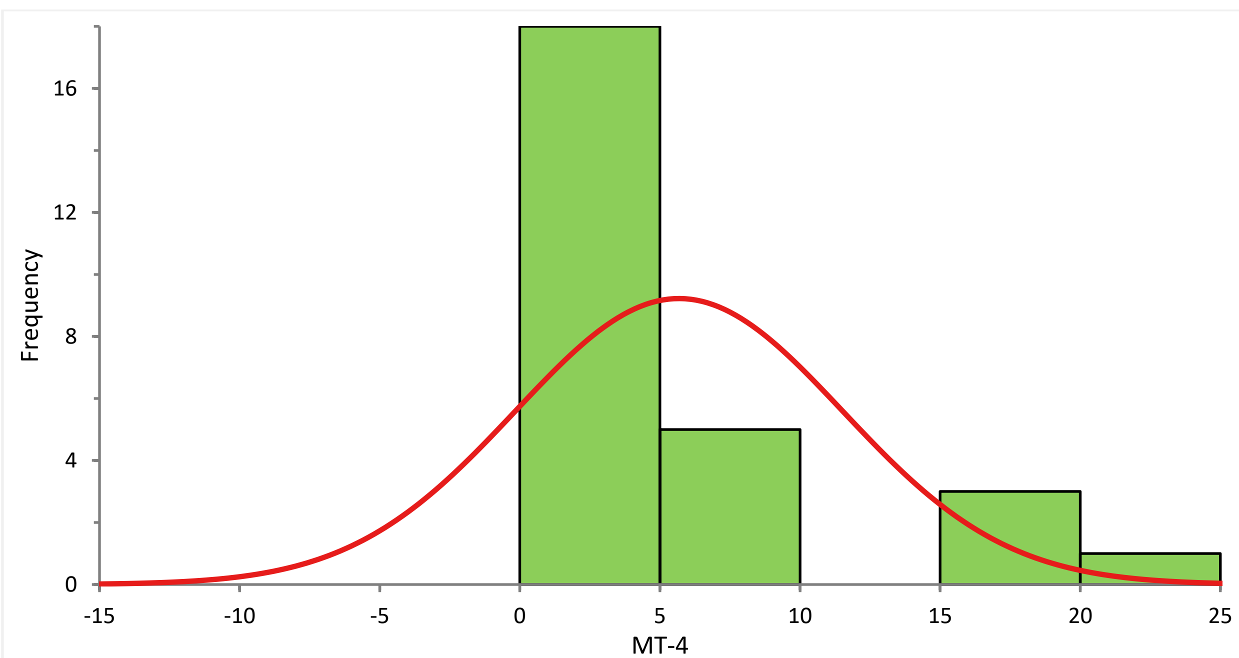


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(MT-3)

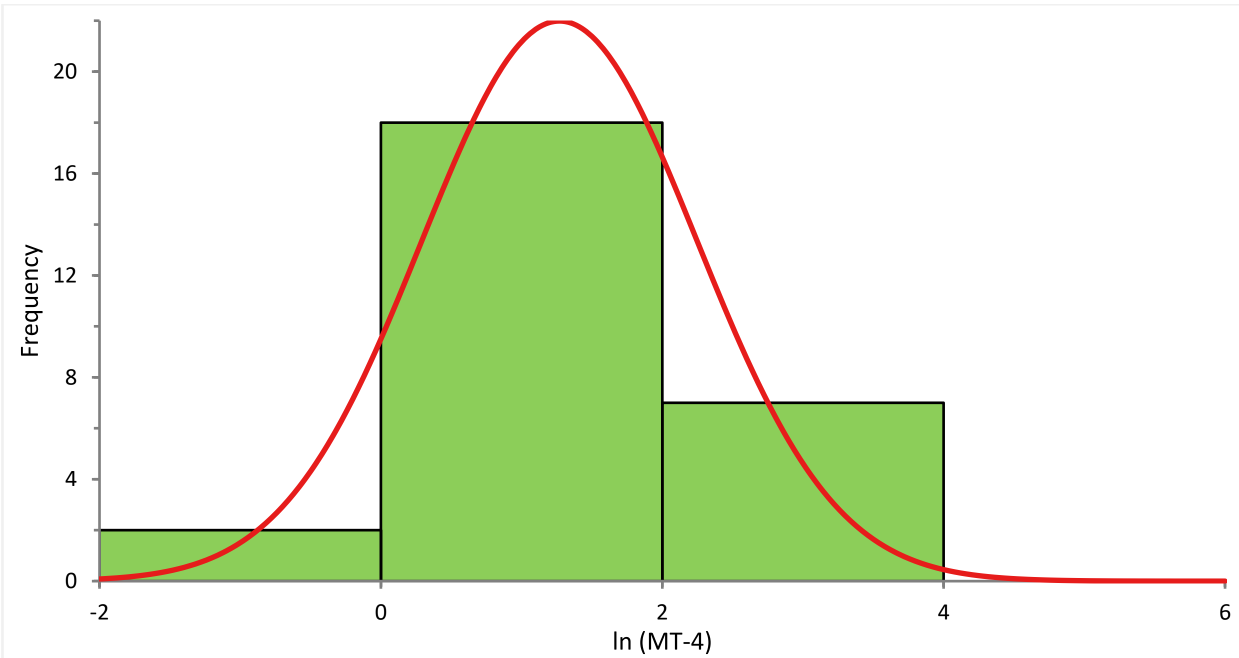


MT-4

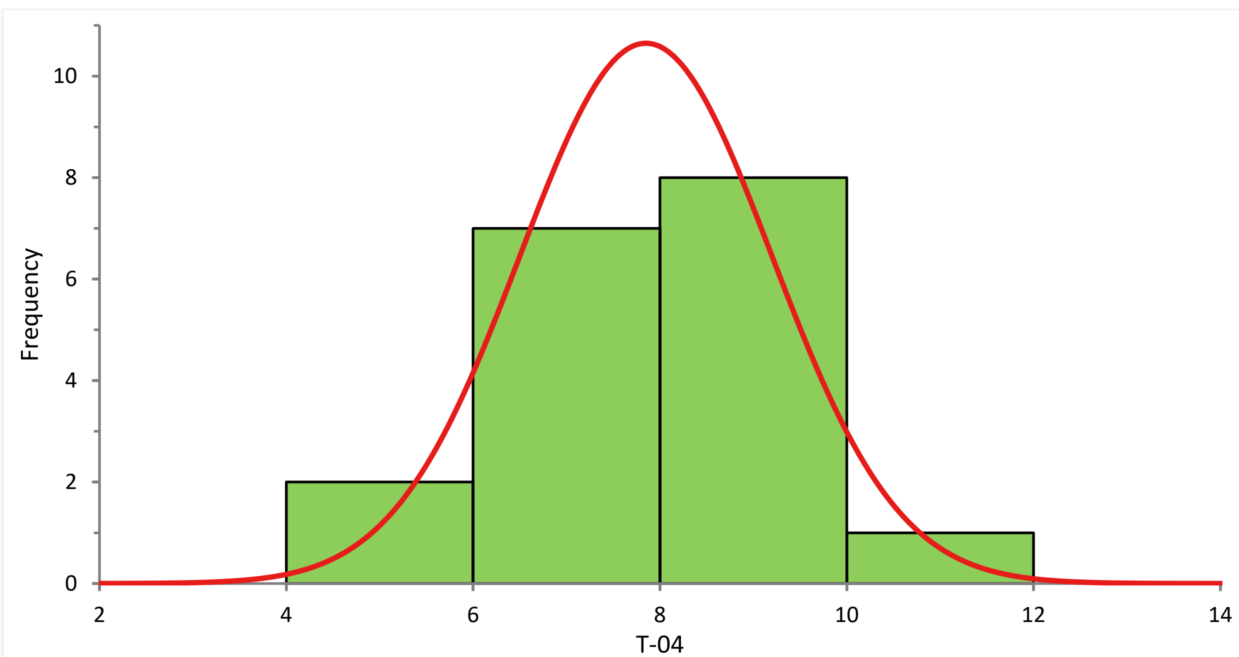


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(MT-4)

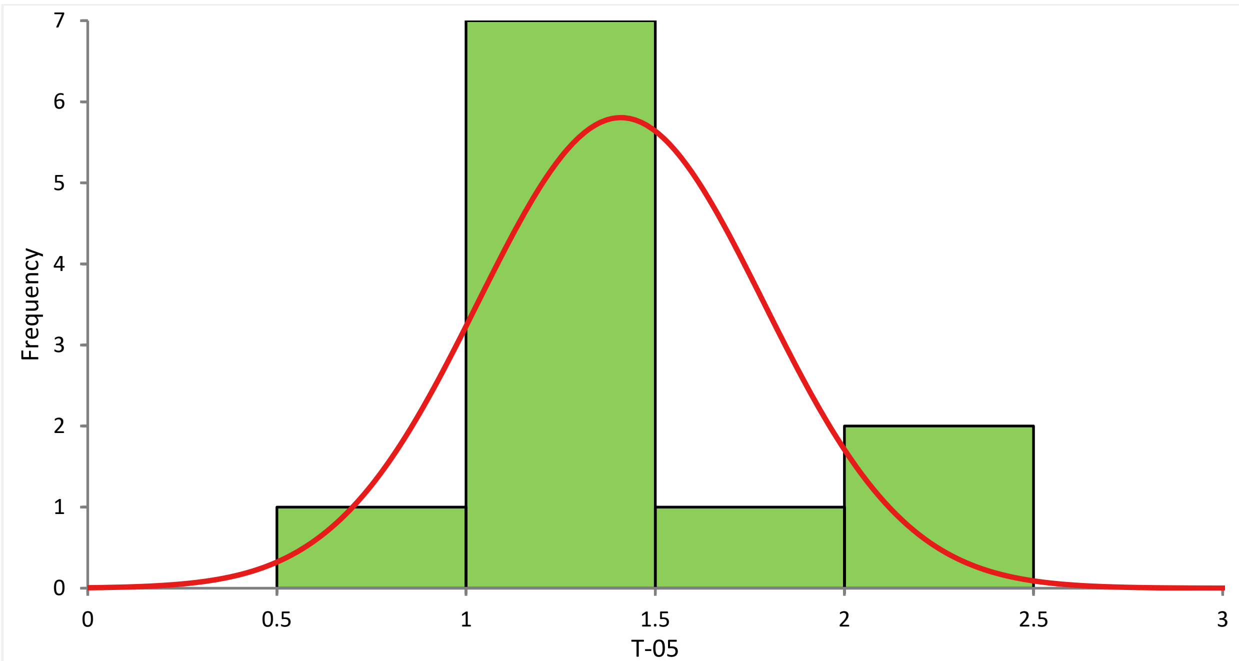


T-04

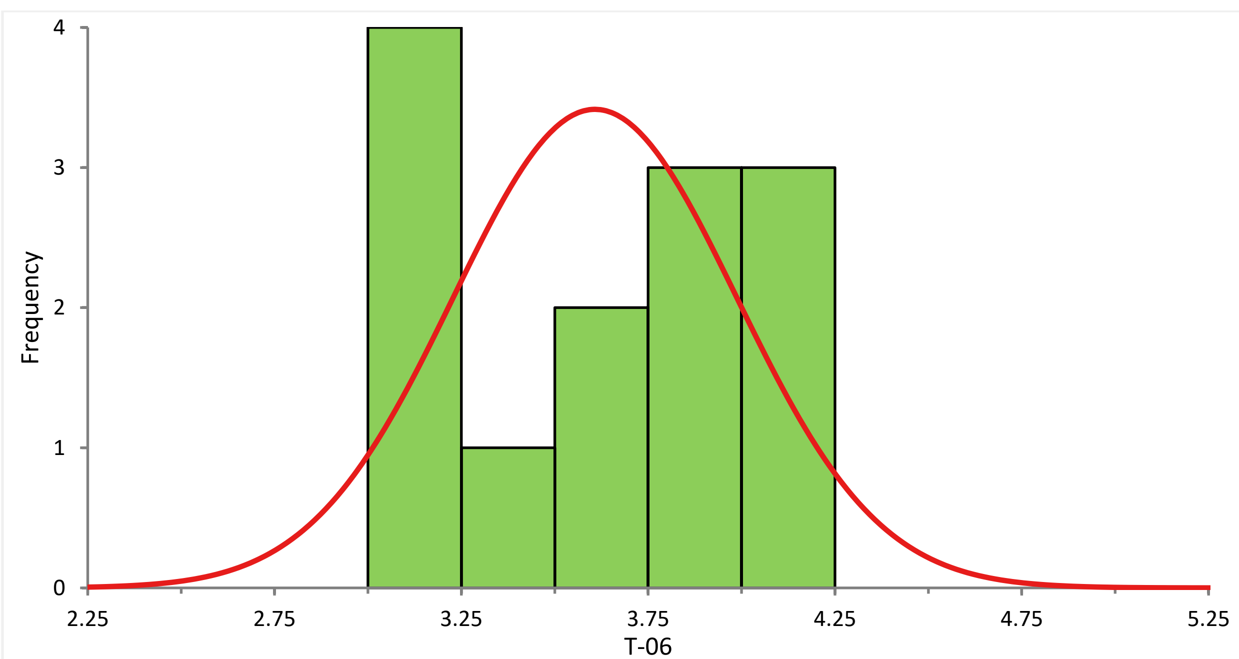


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

T-05

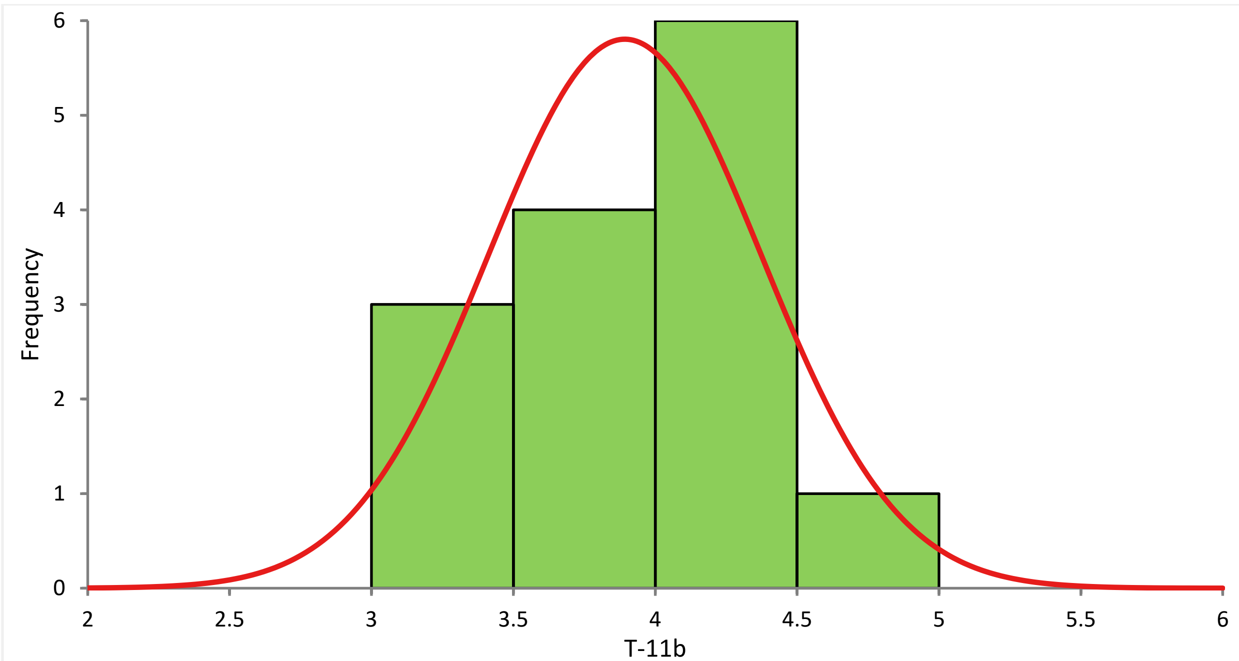


T-06

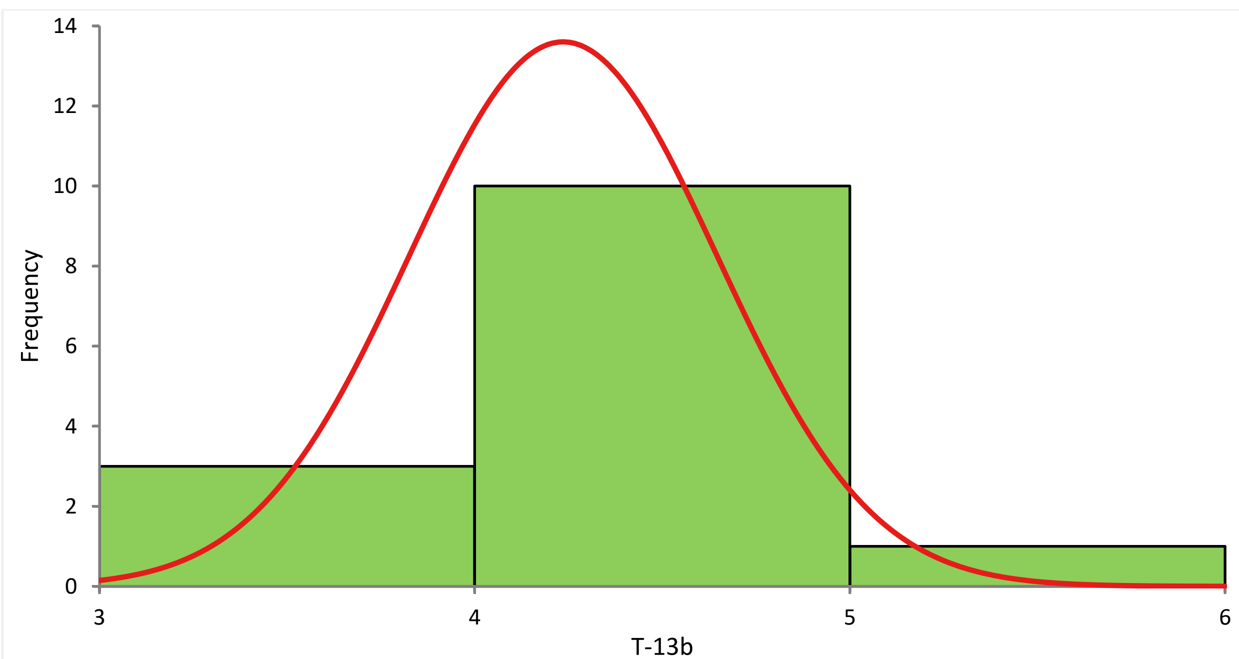


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

T-11b

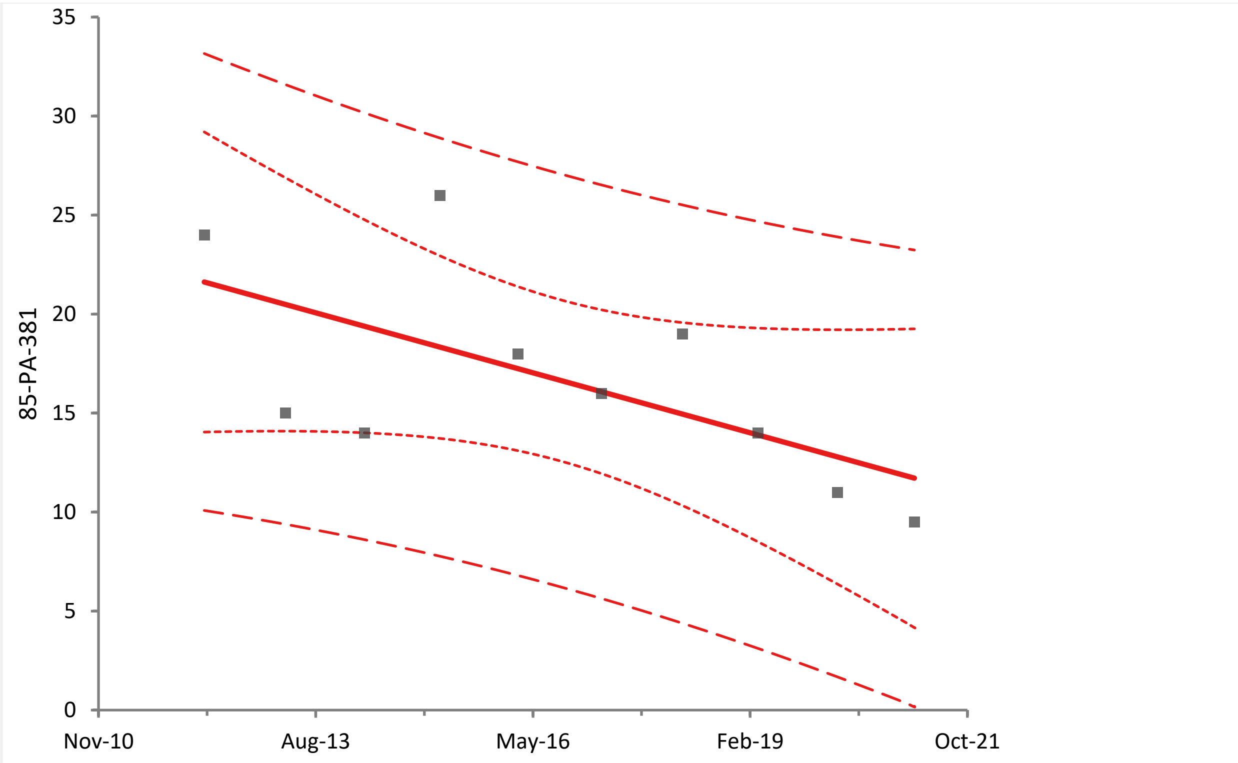


T-13b

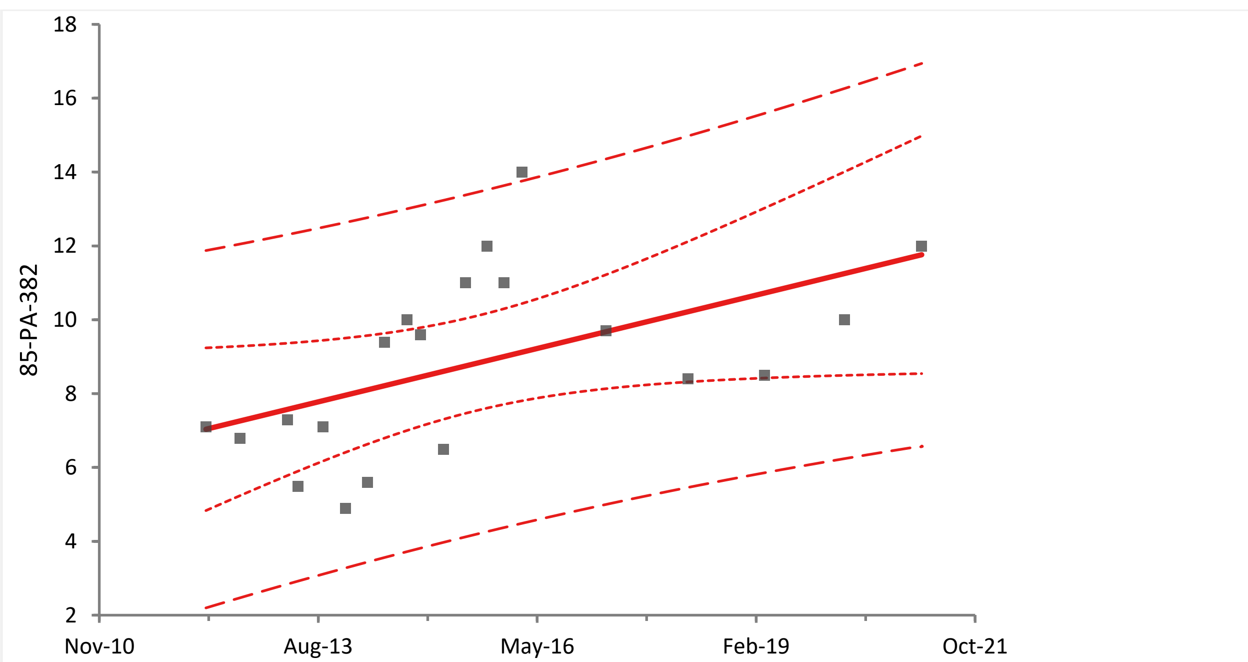


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

85-PA-381

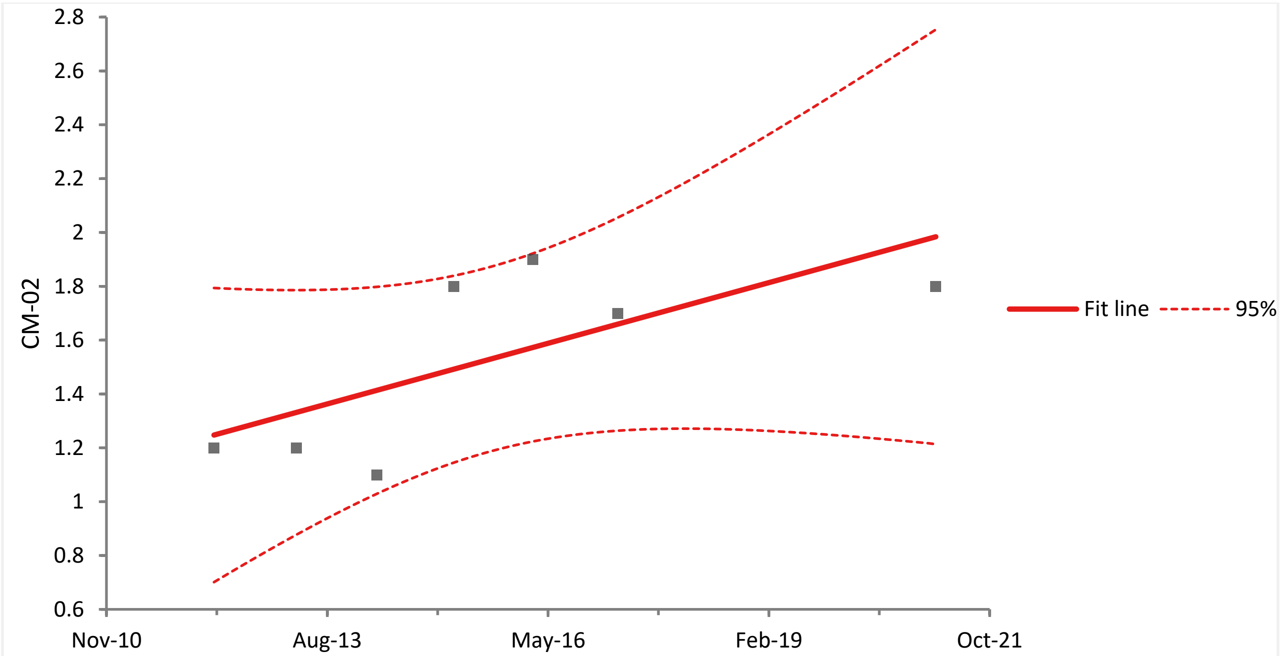


85-PA-382

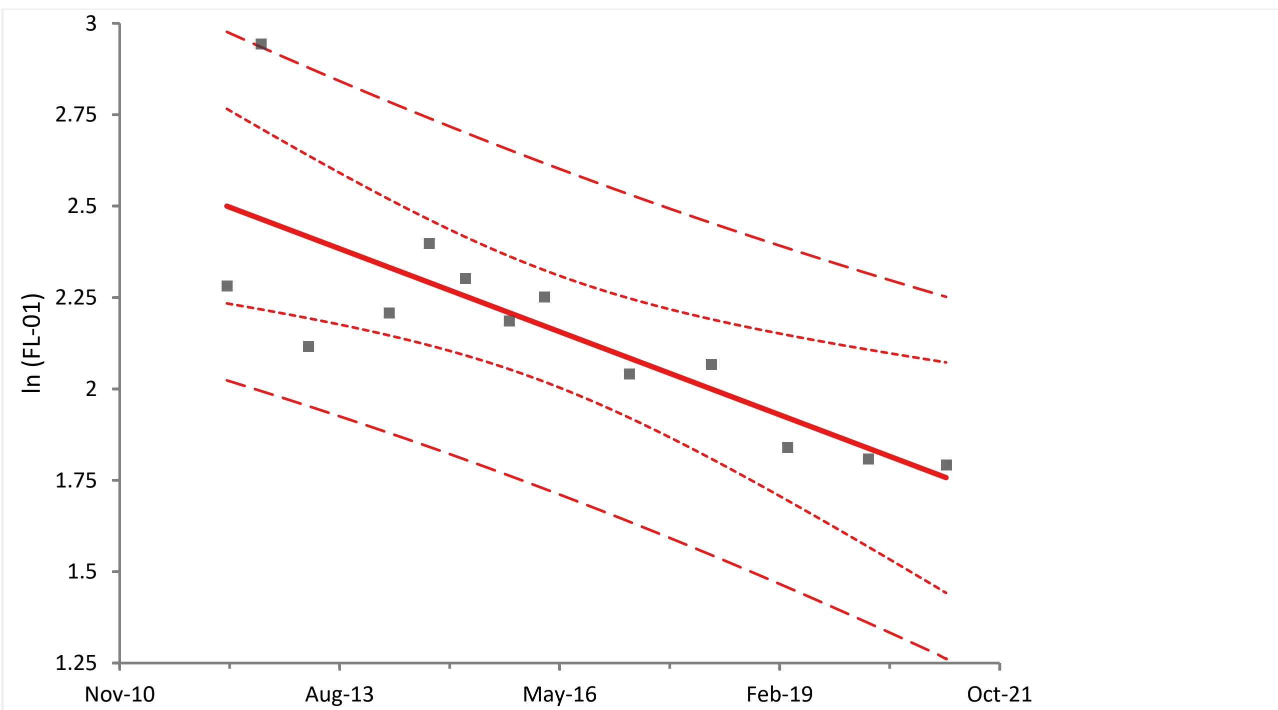


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

CM-02

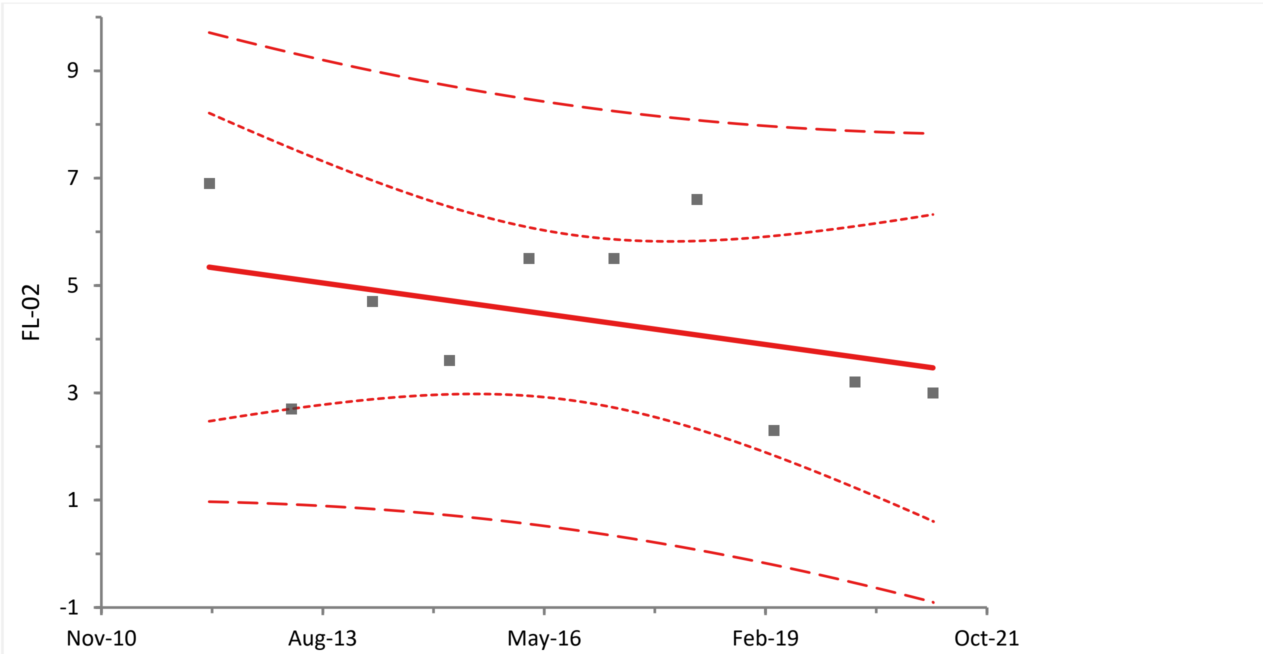


ln(FL-01)

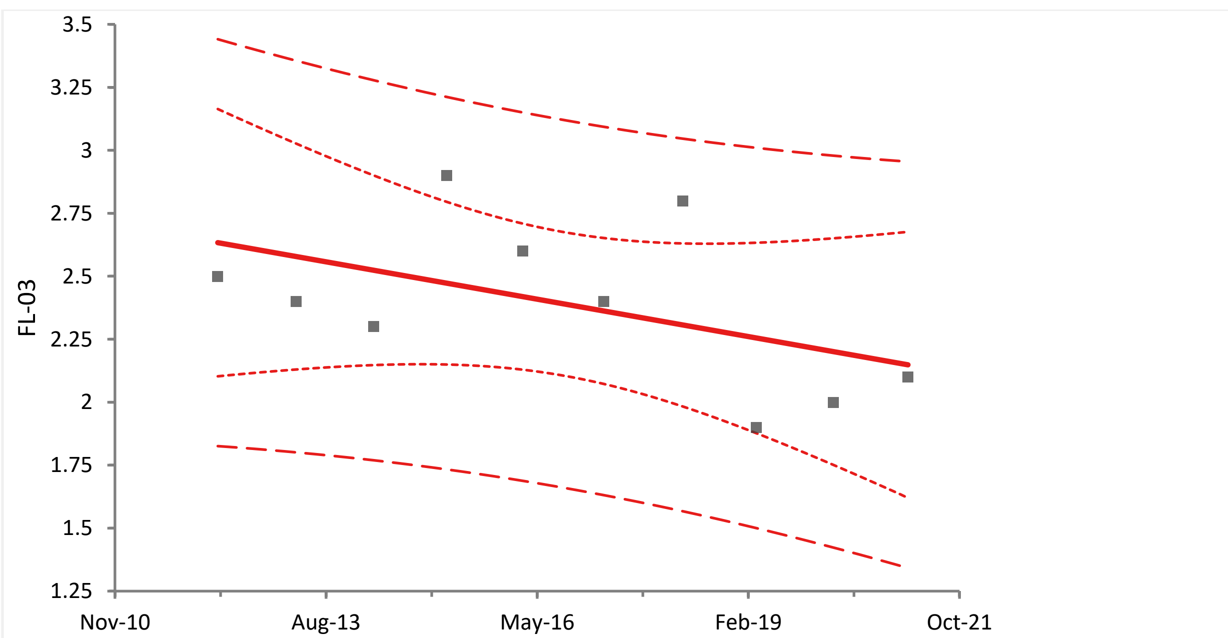


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

FL-02

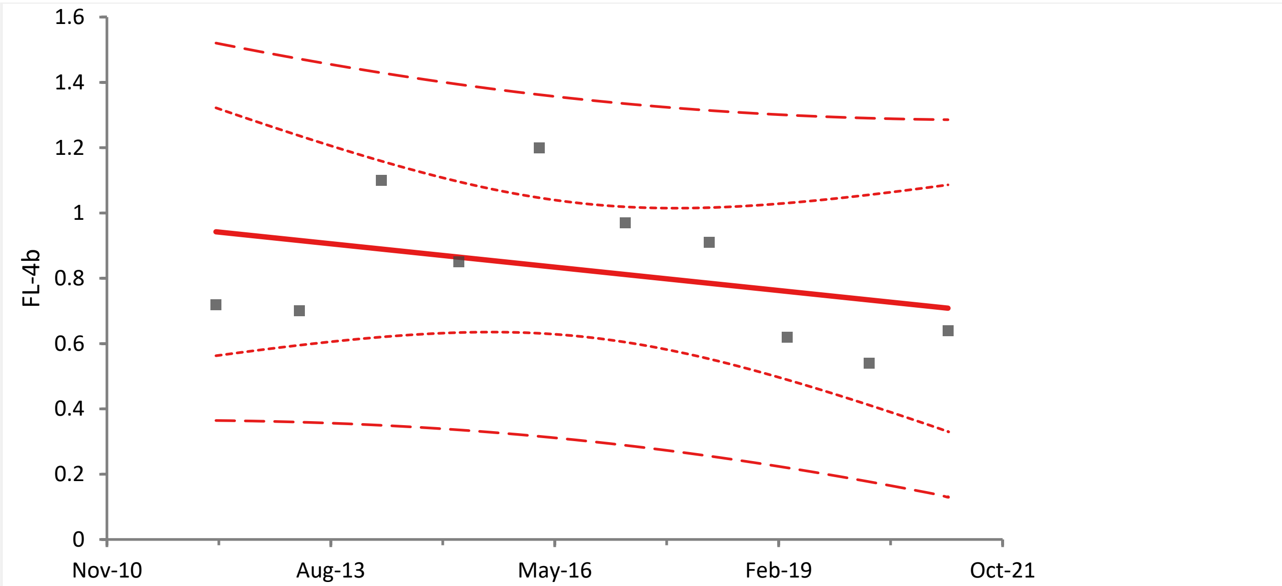


FL-03

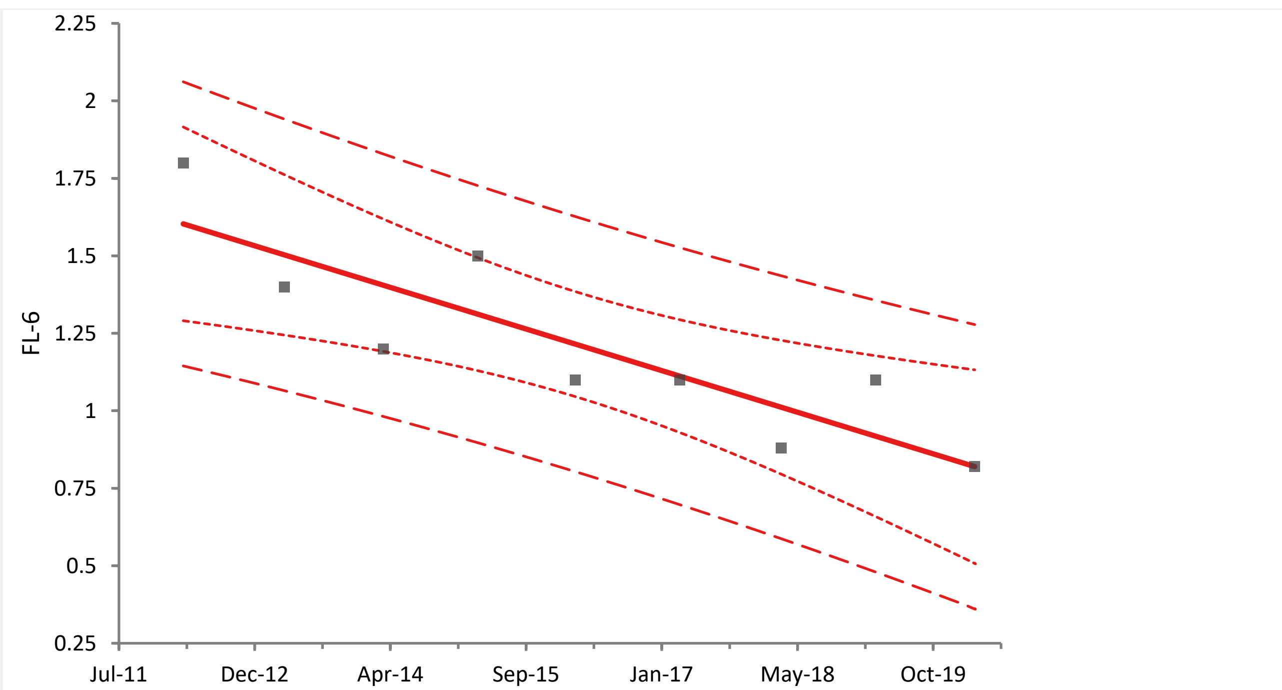


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

FL-4b

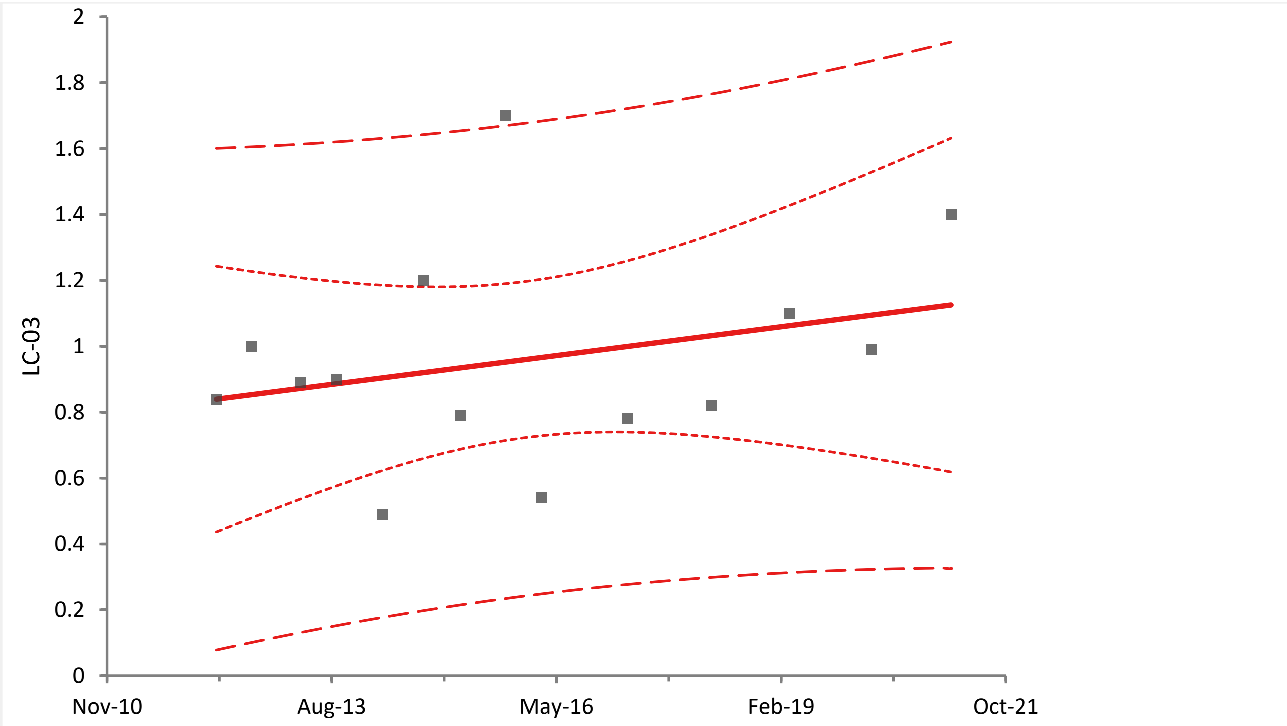


FL-6

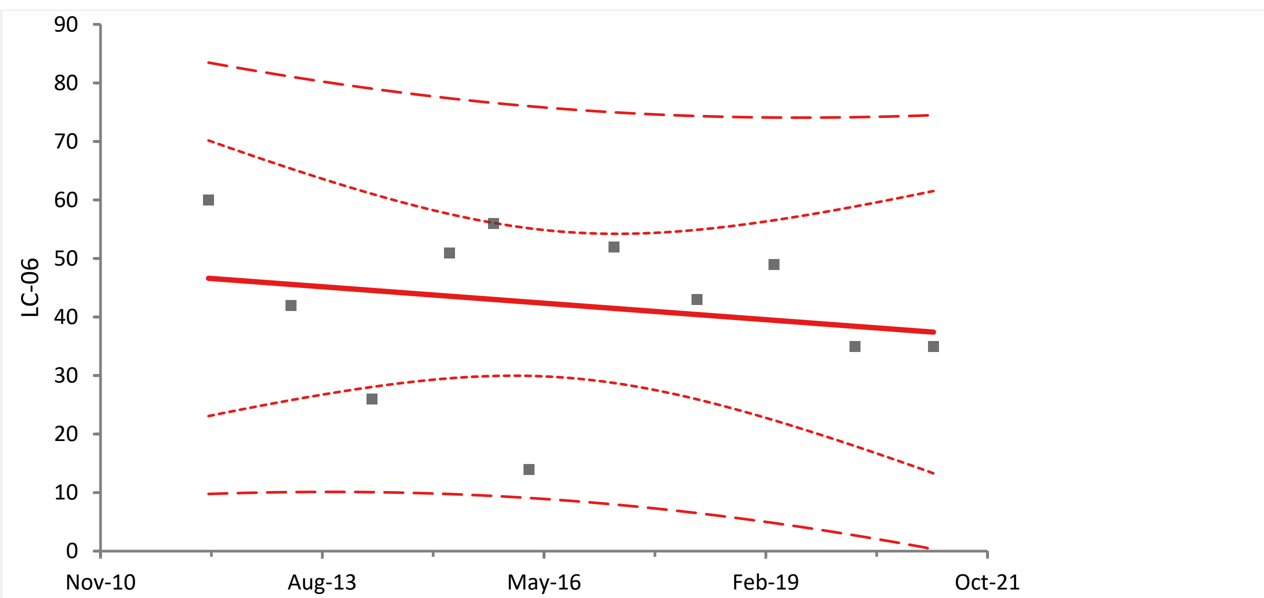


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-03

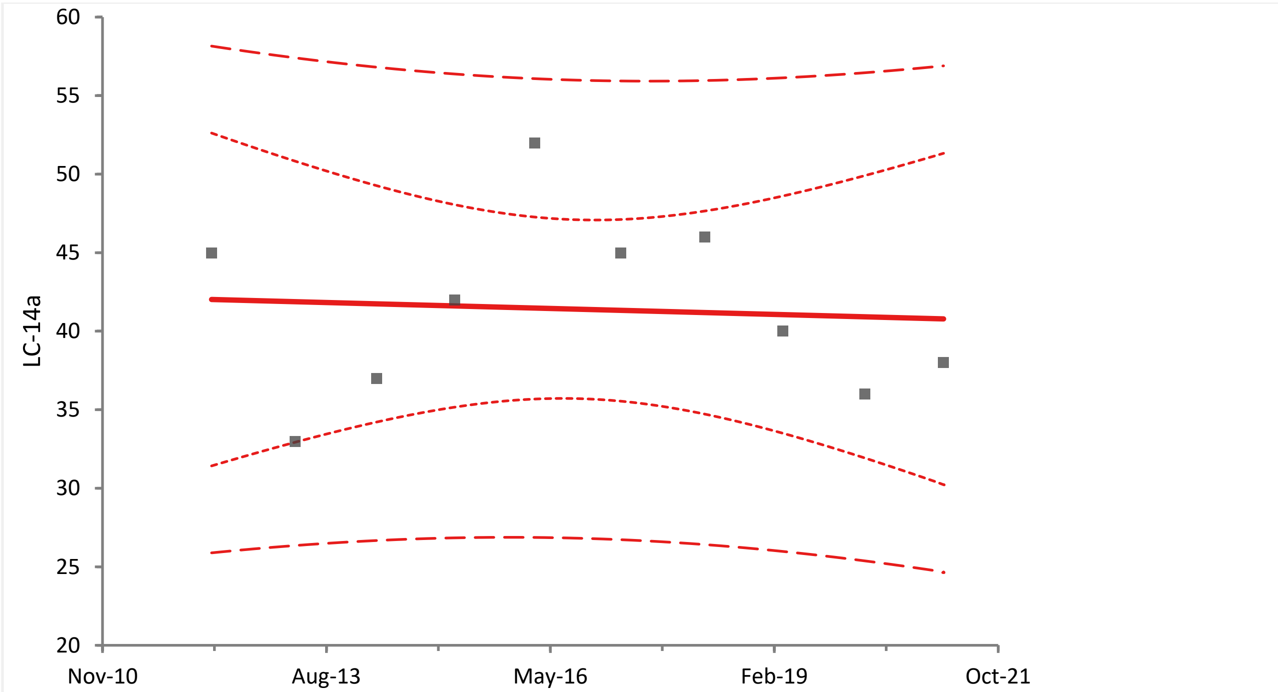


LC-06



Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-14a



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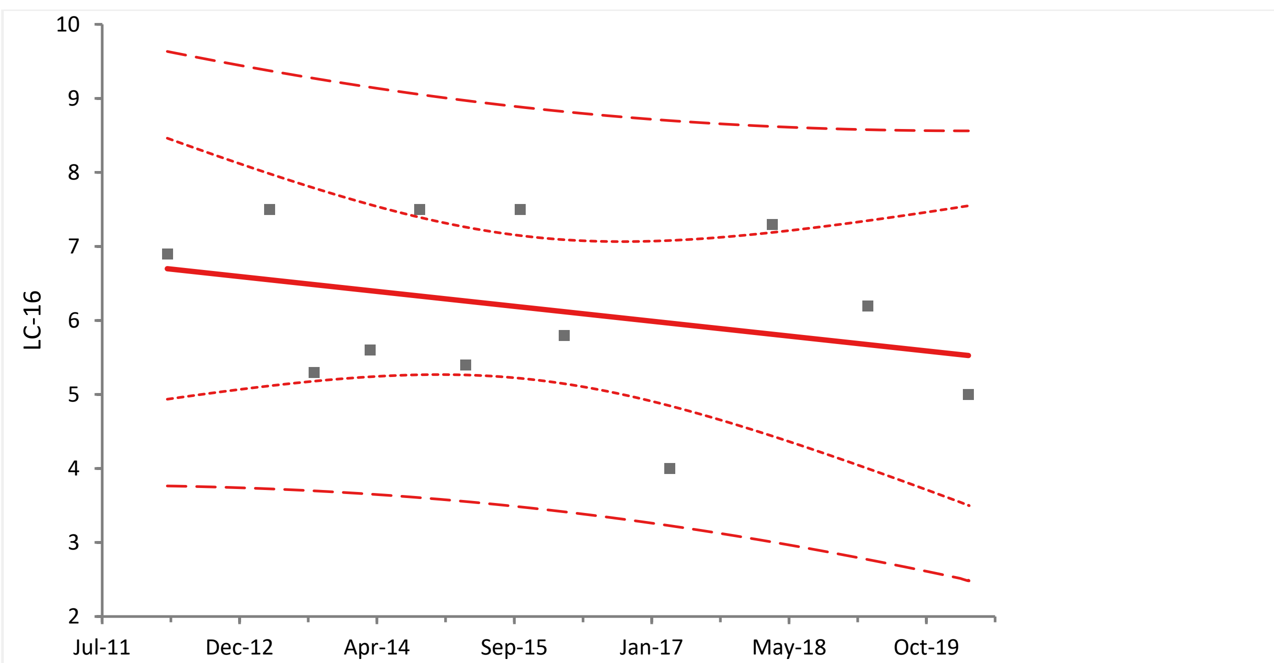
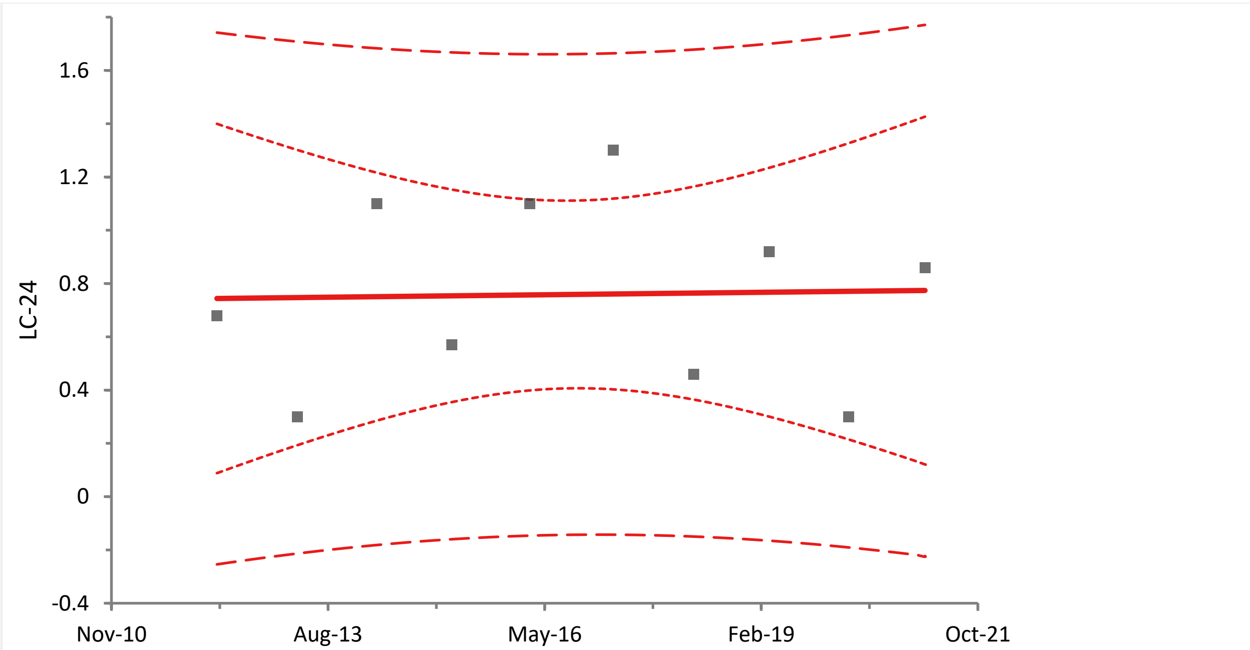


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-24



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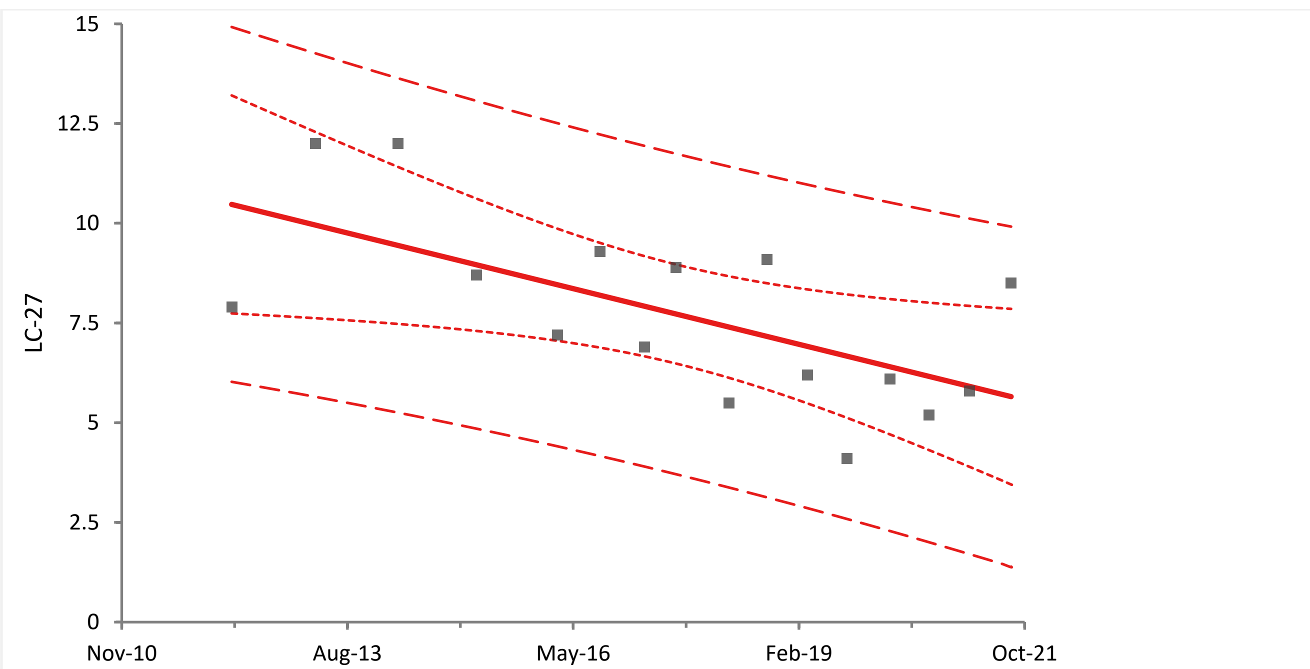
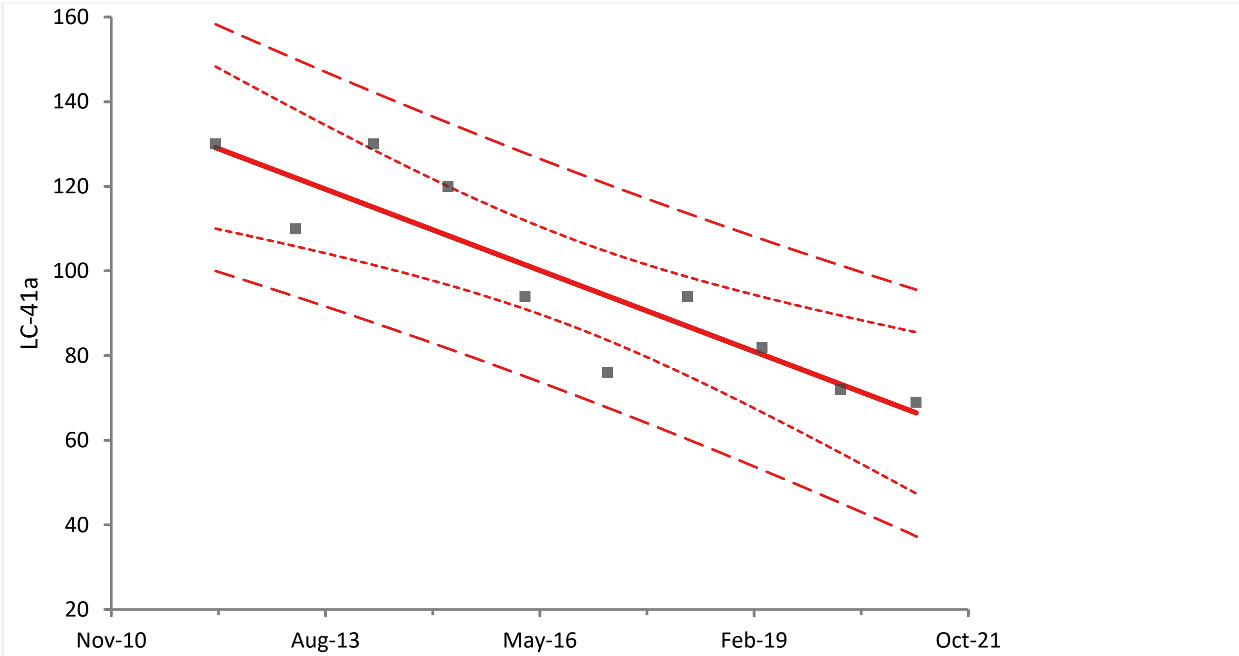


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-41a



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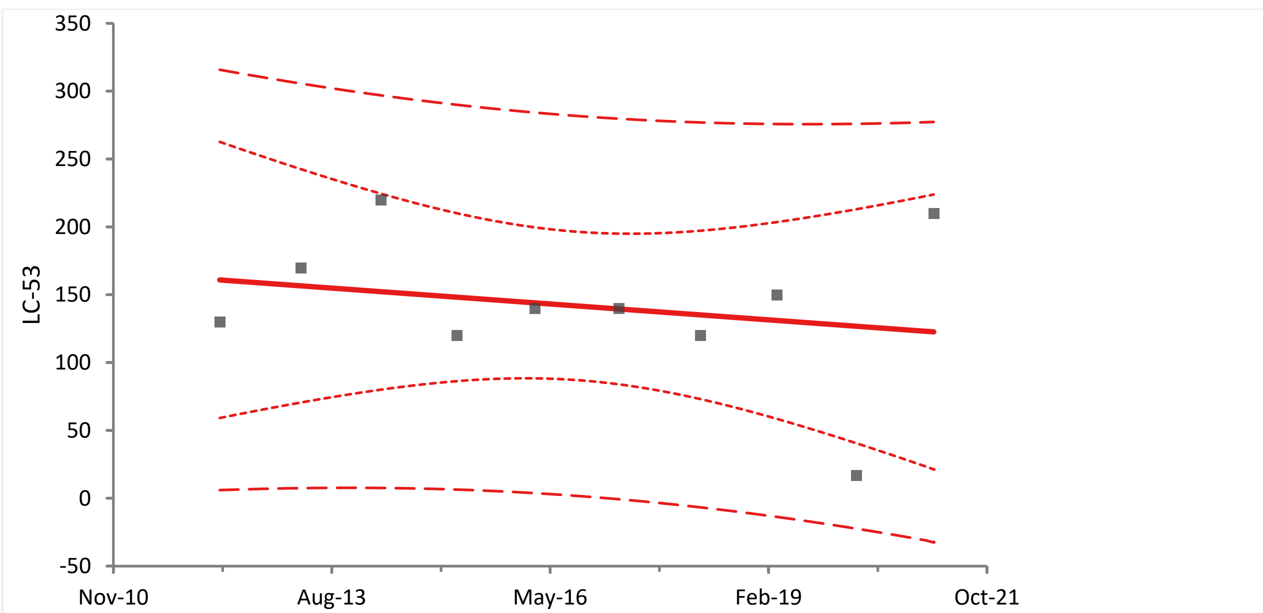
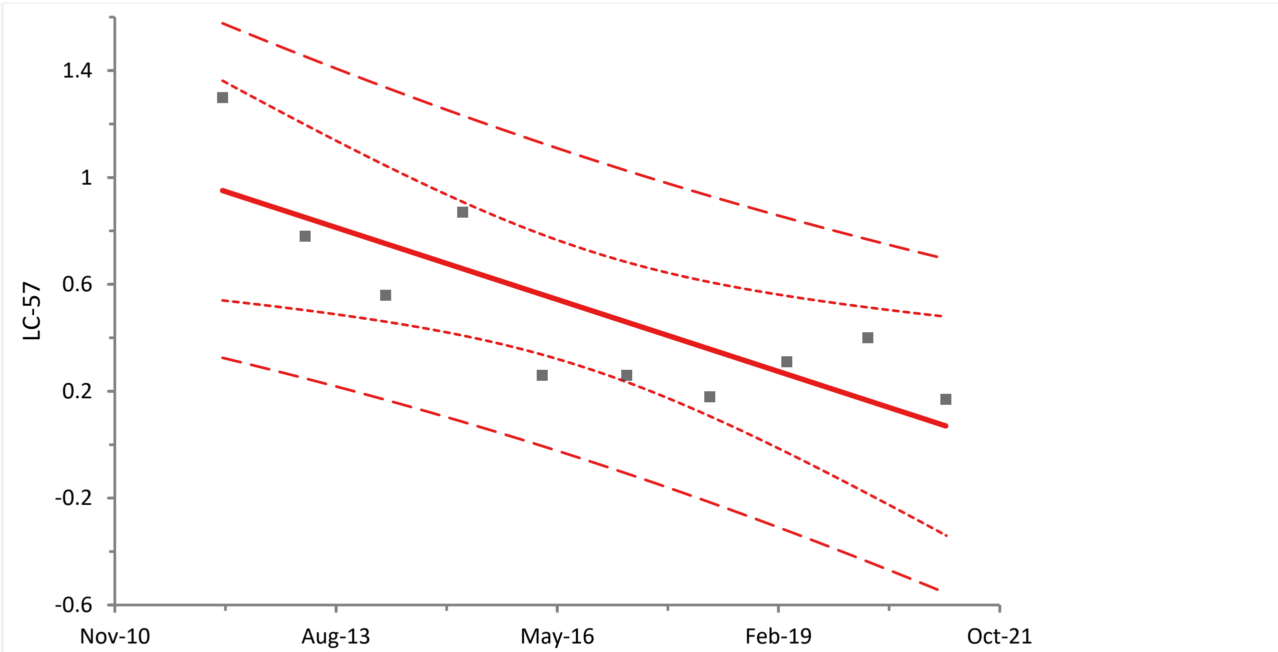


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-57



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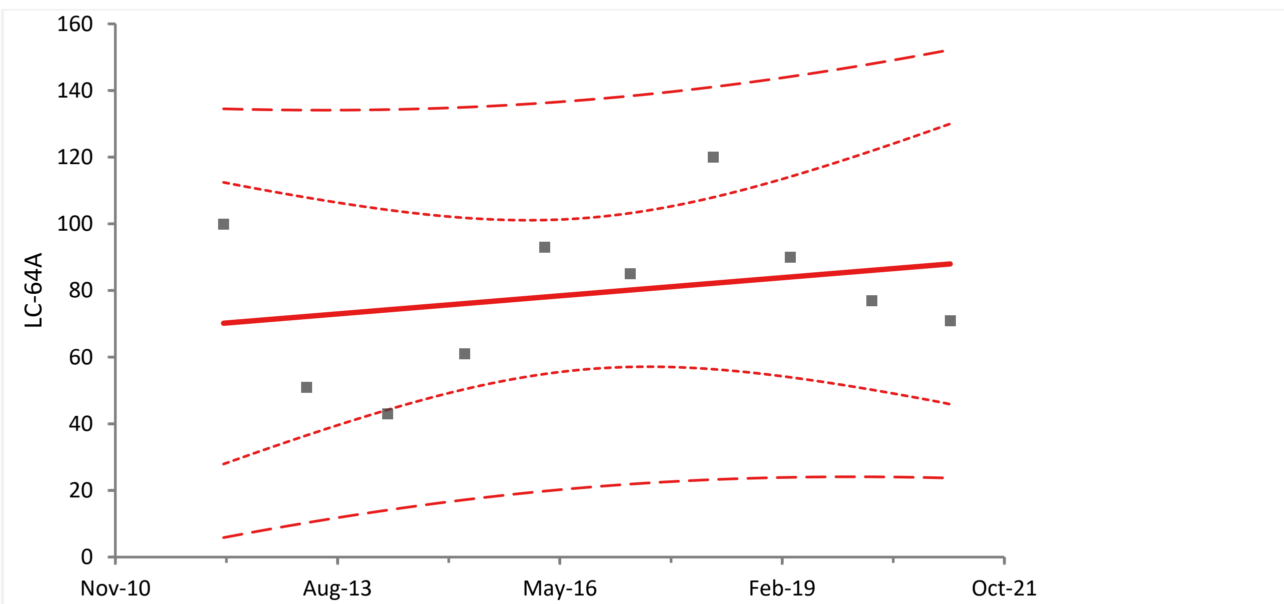
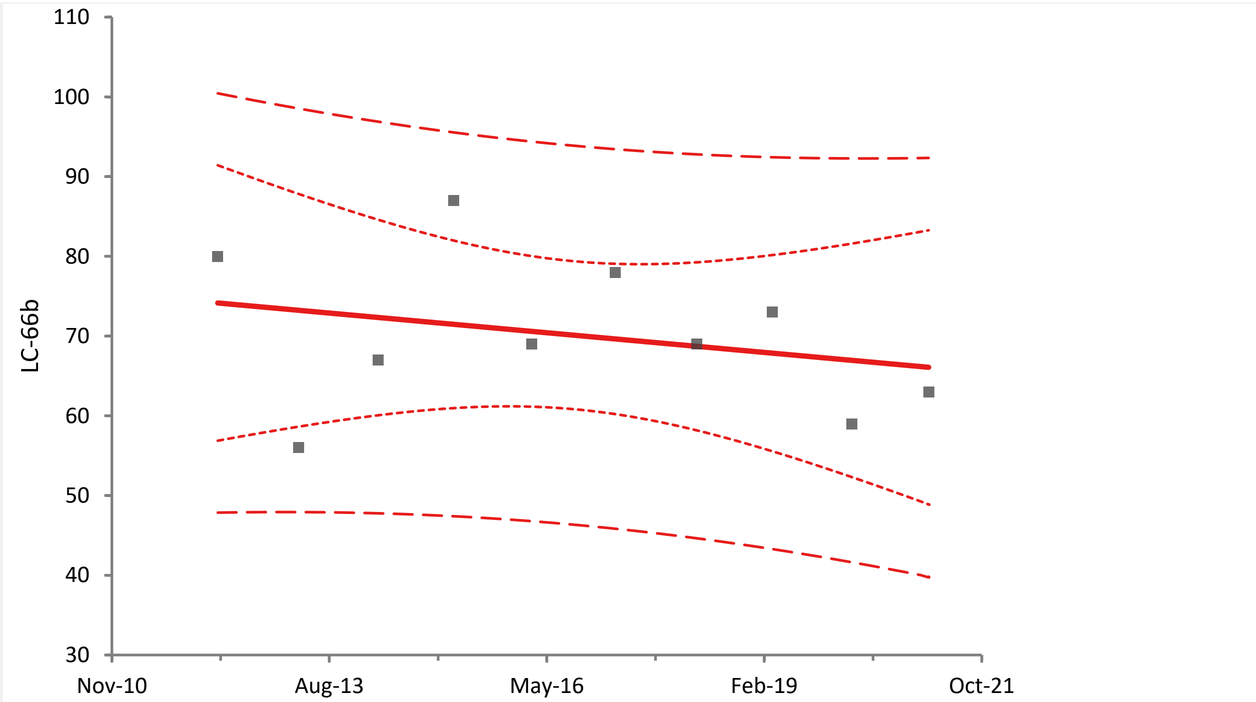


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-66b



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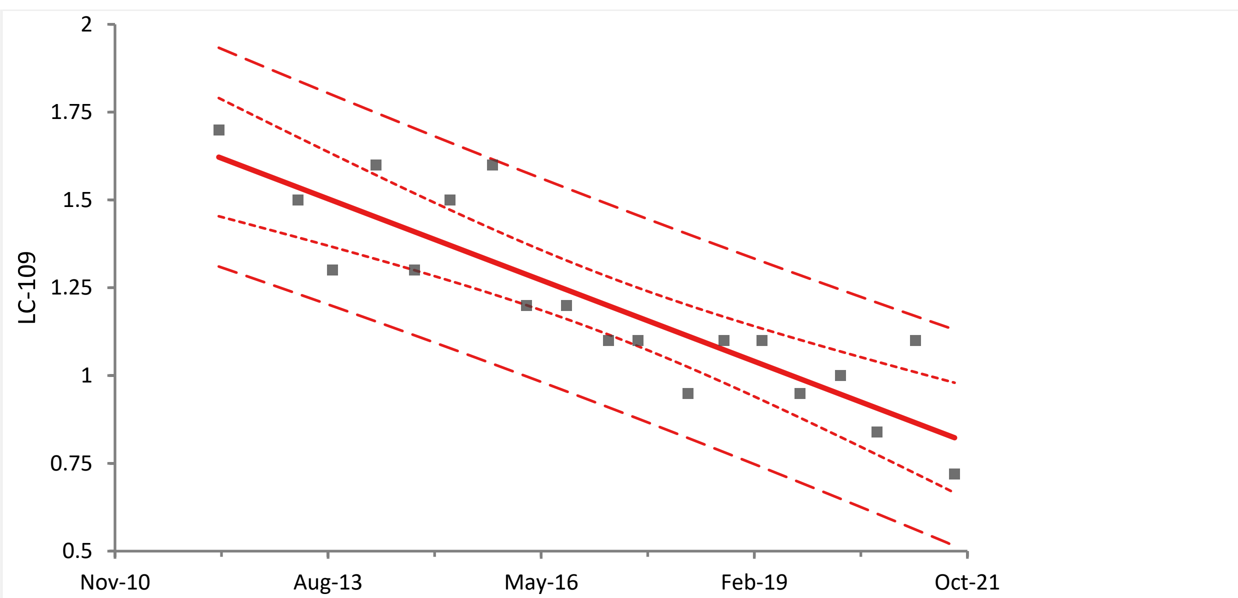
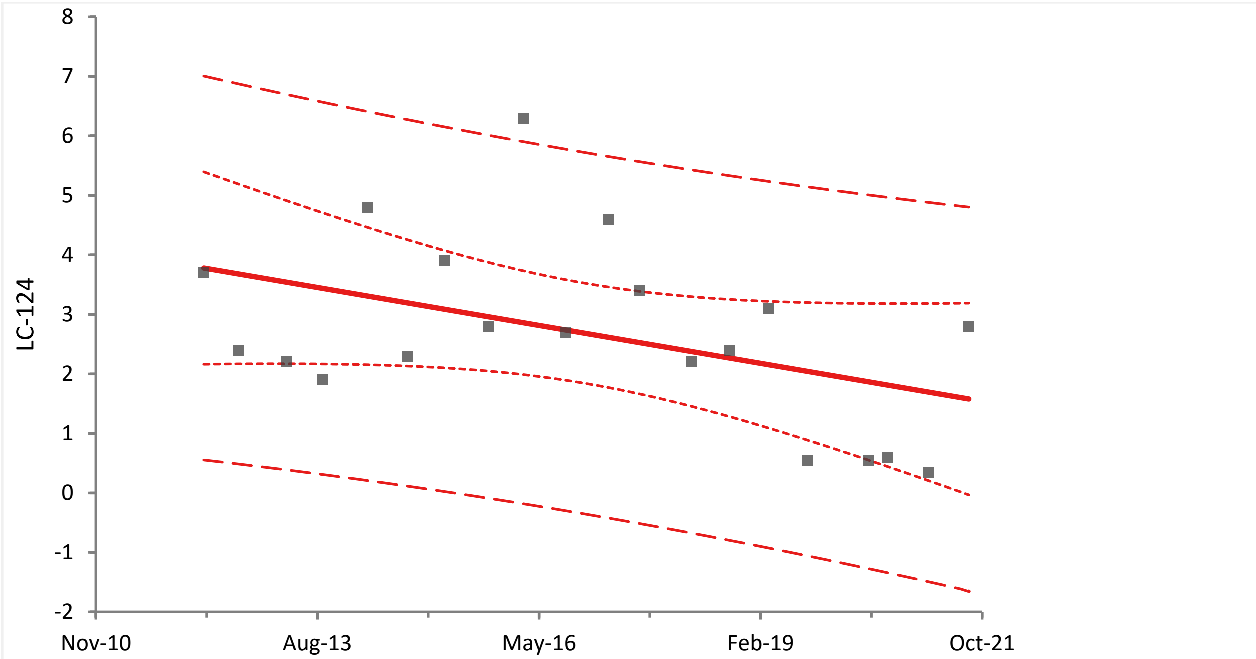


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-124



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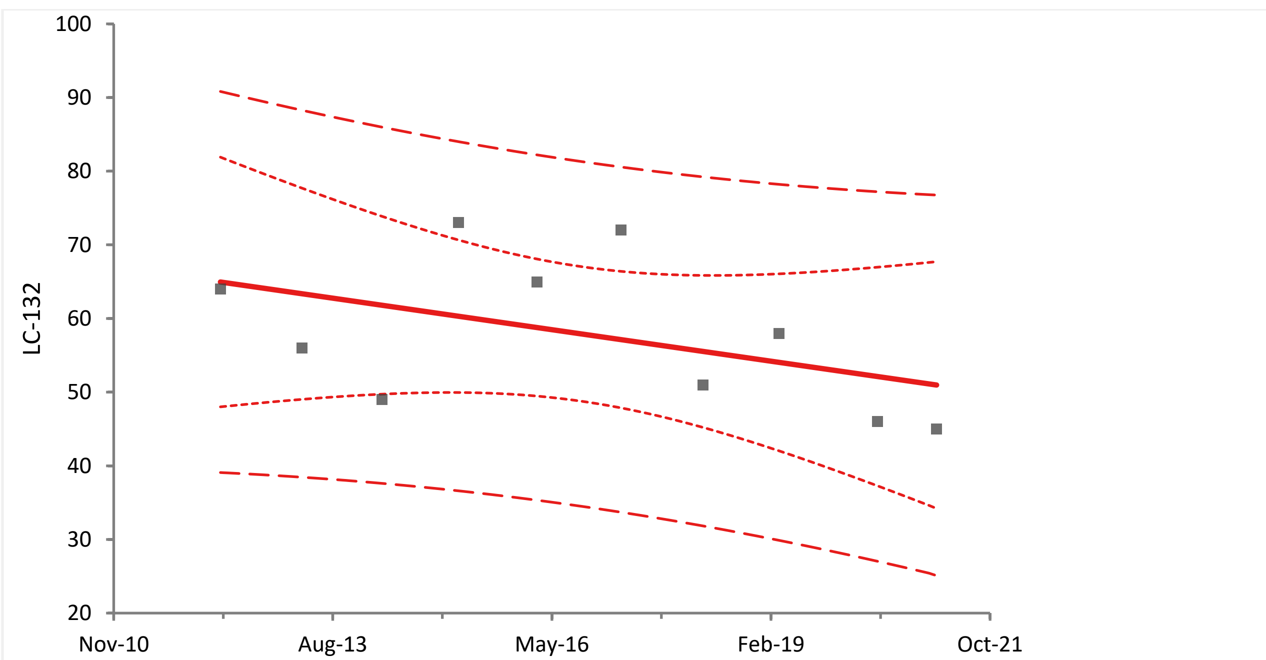
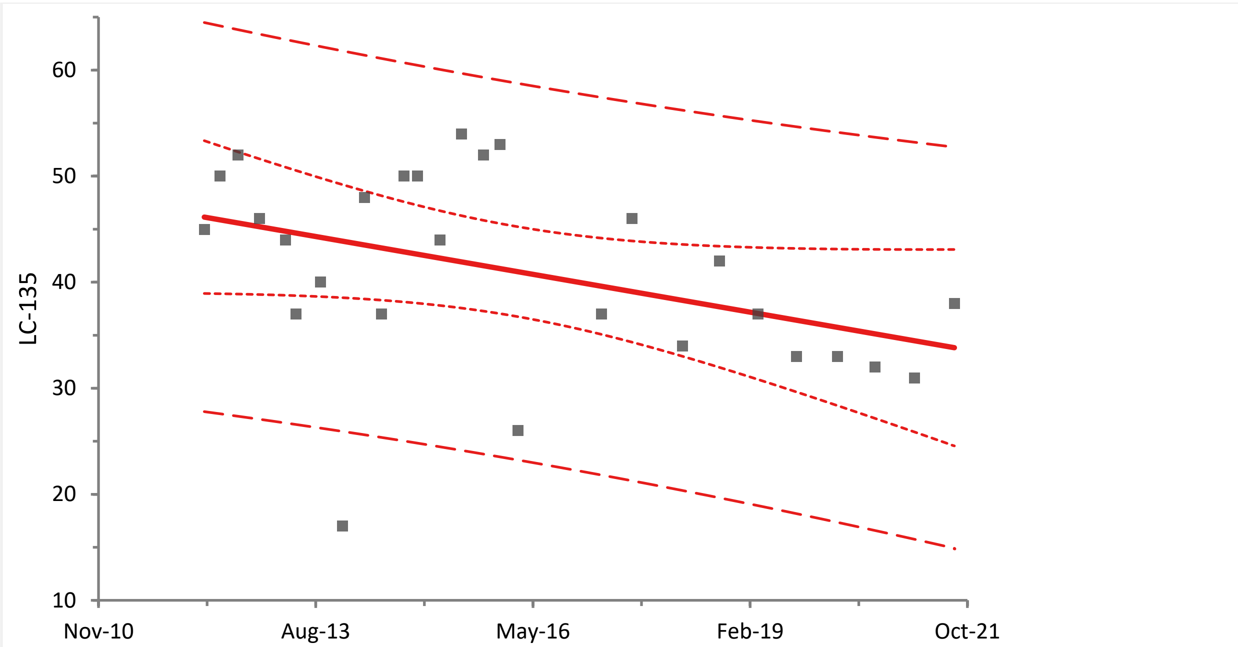


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-135



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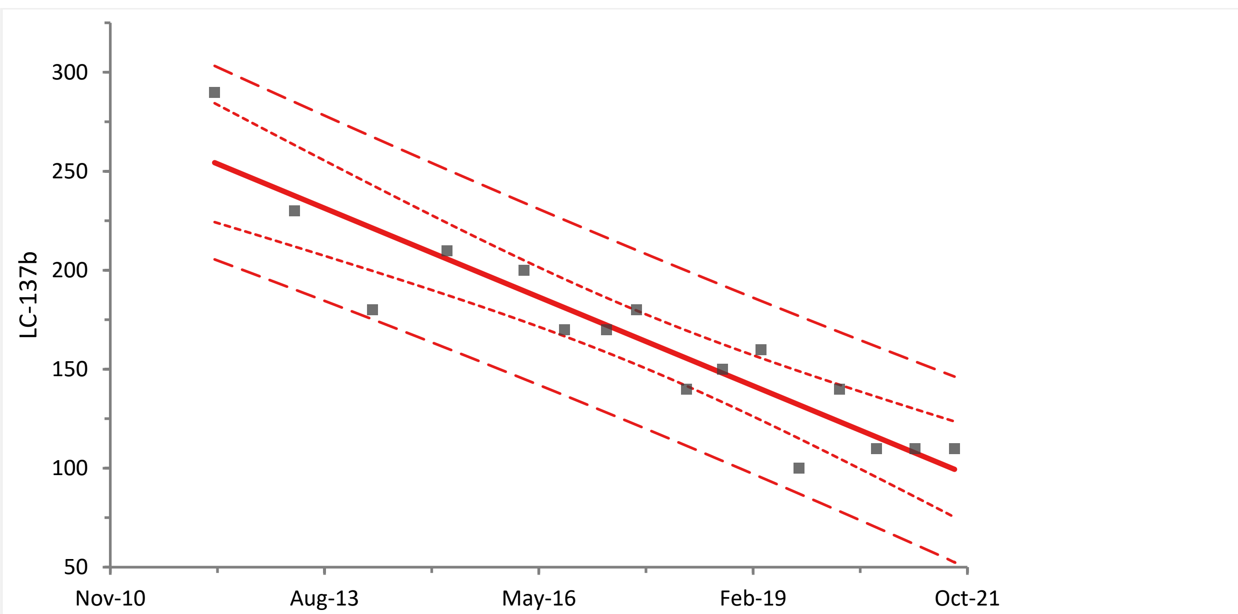
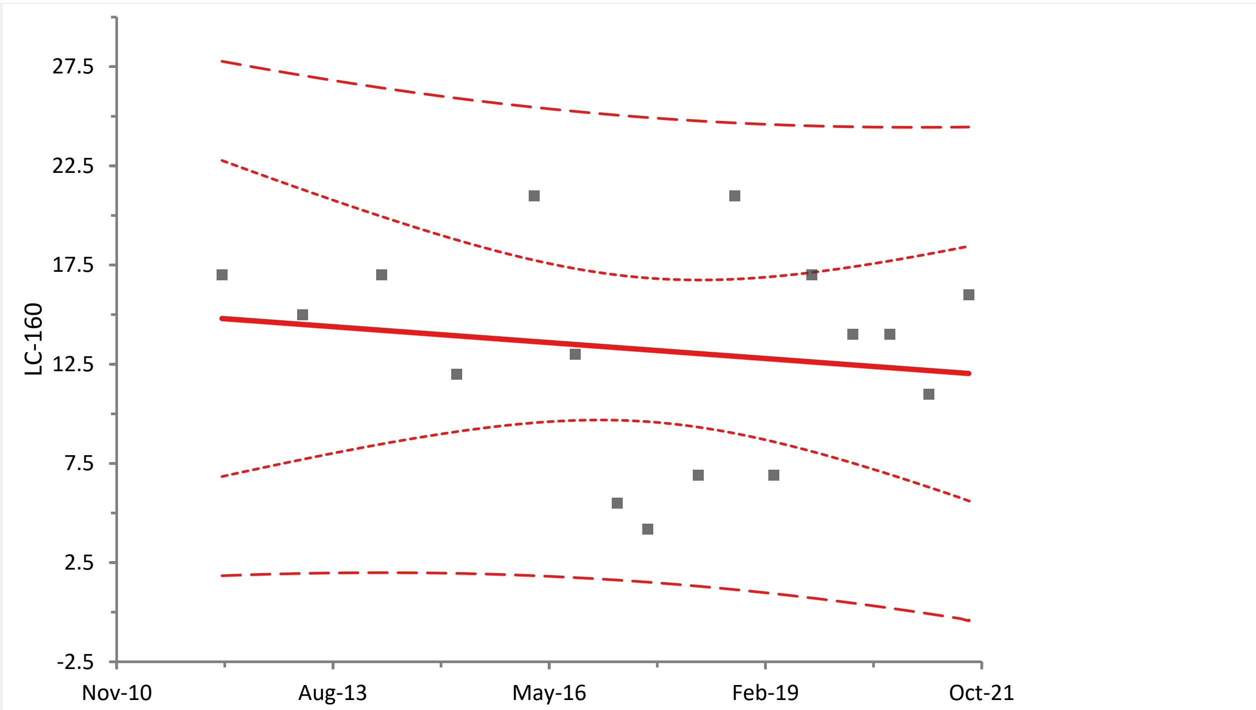


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-160



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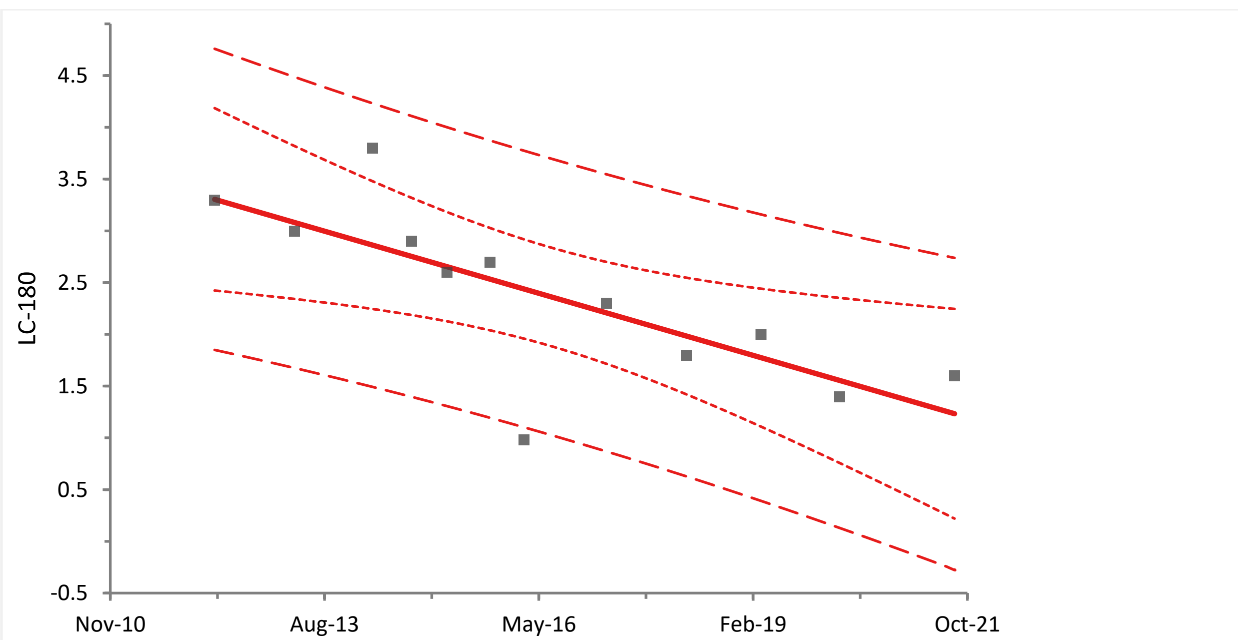
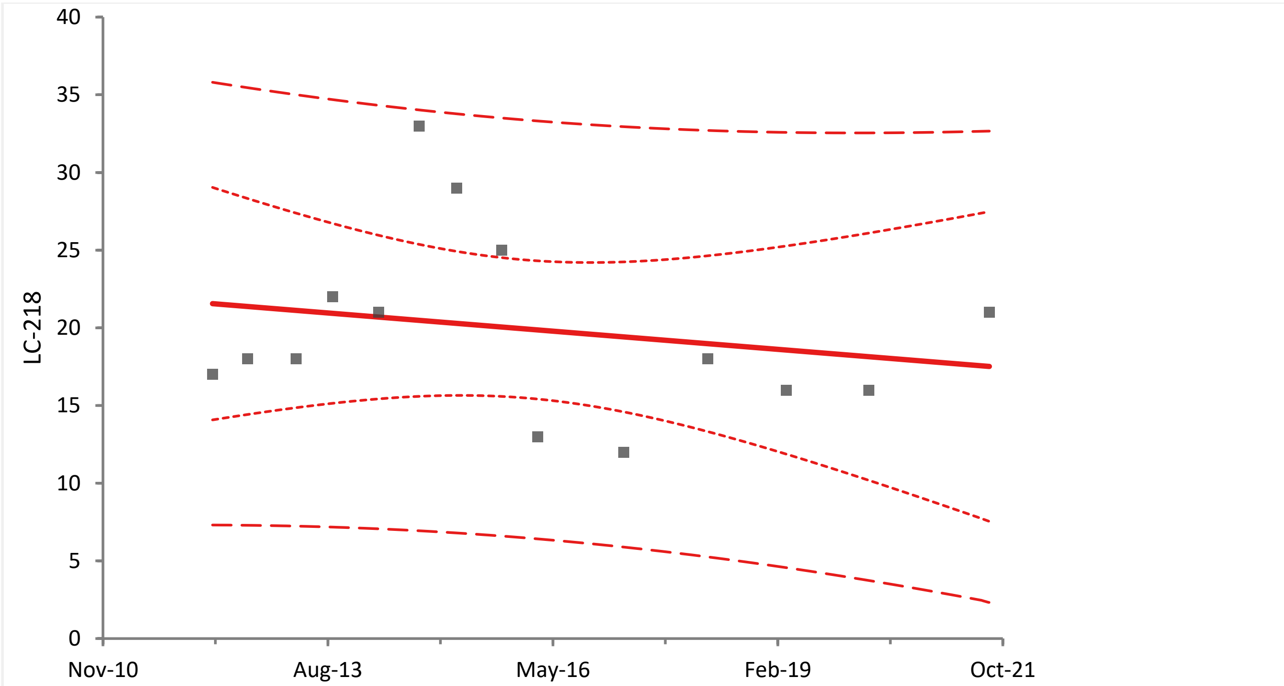


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-218



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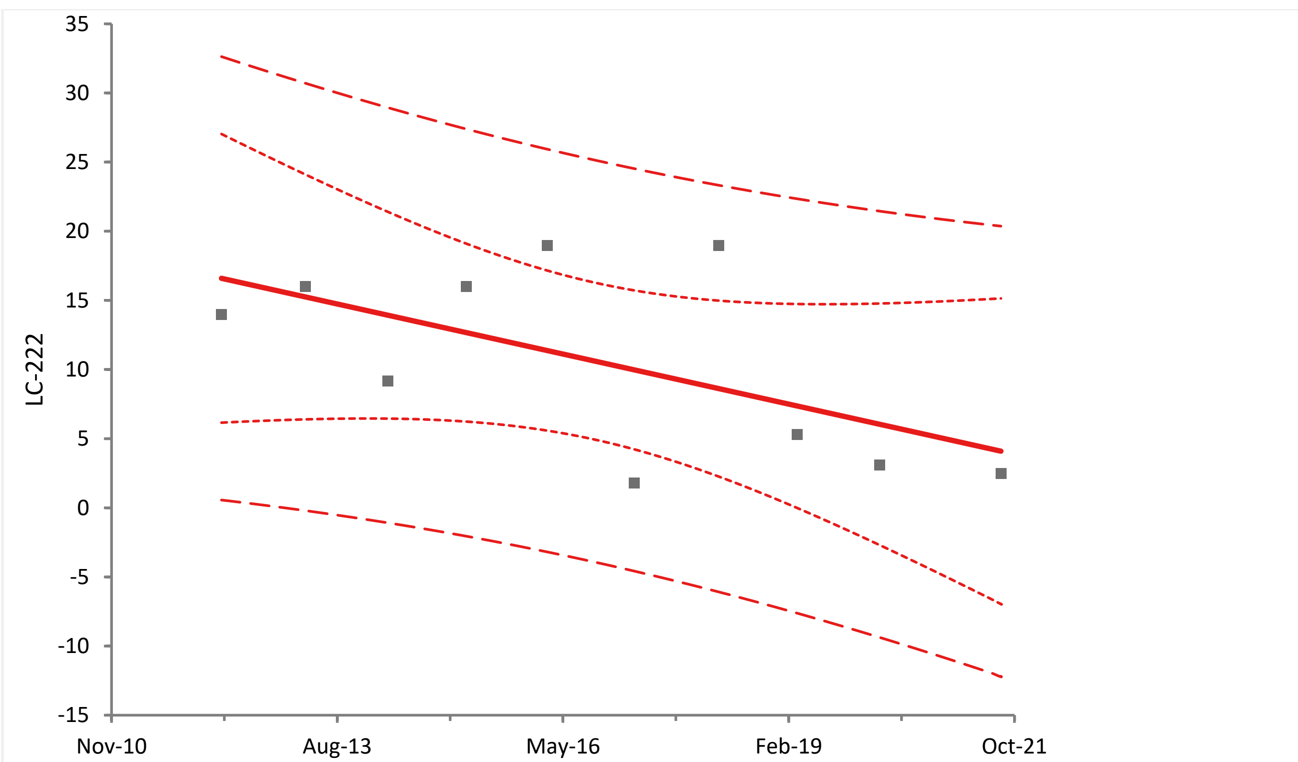
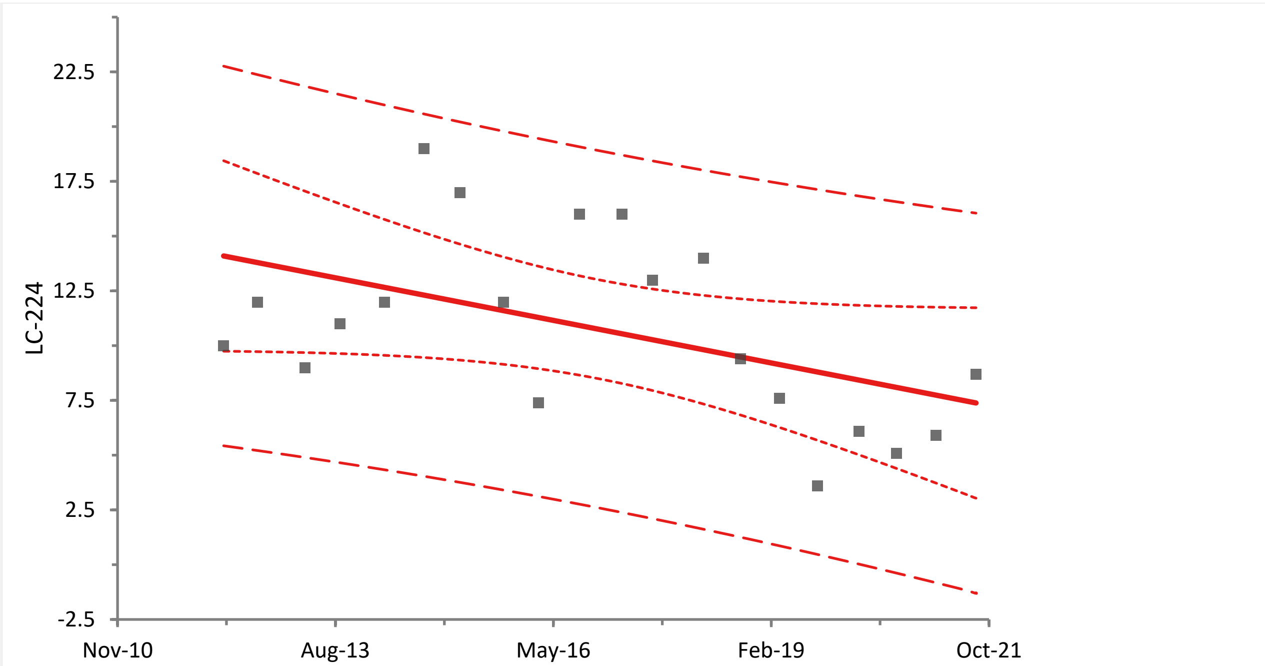


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-224



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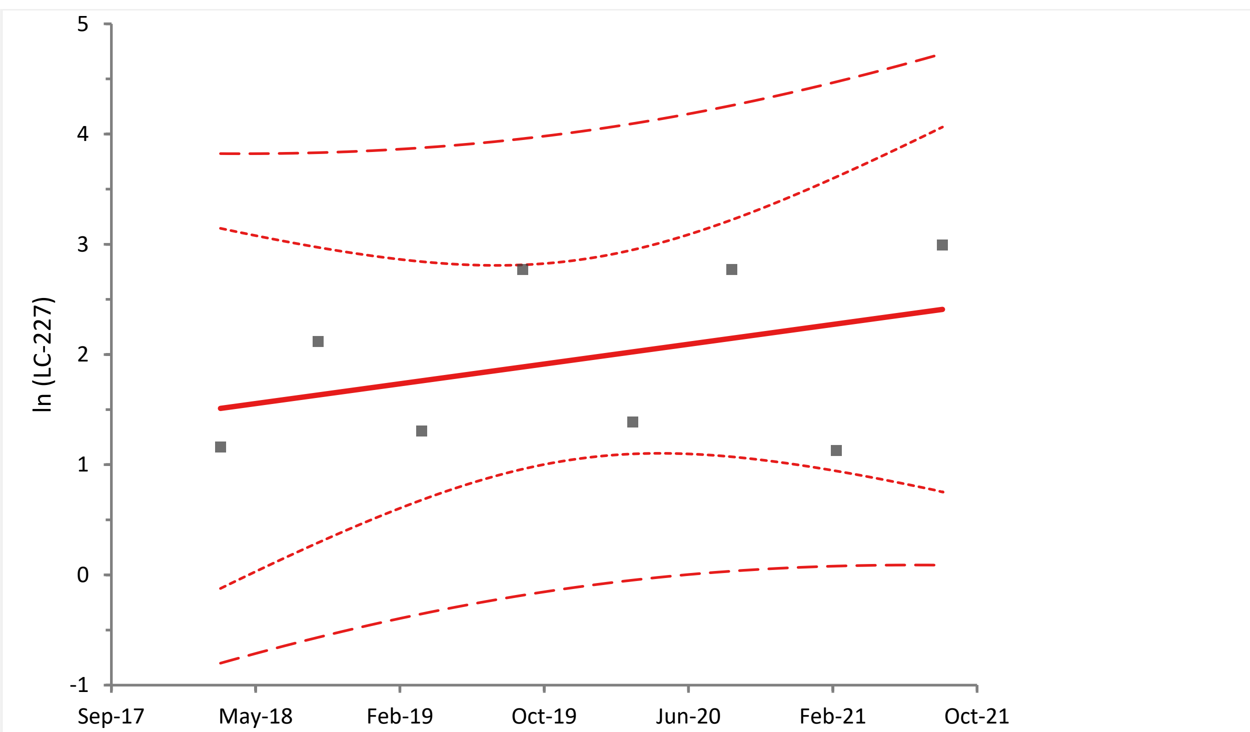
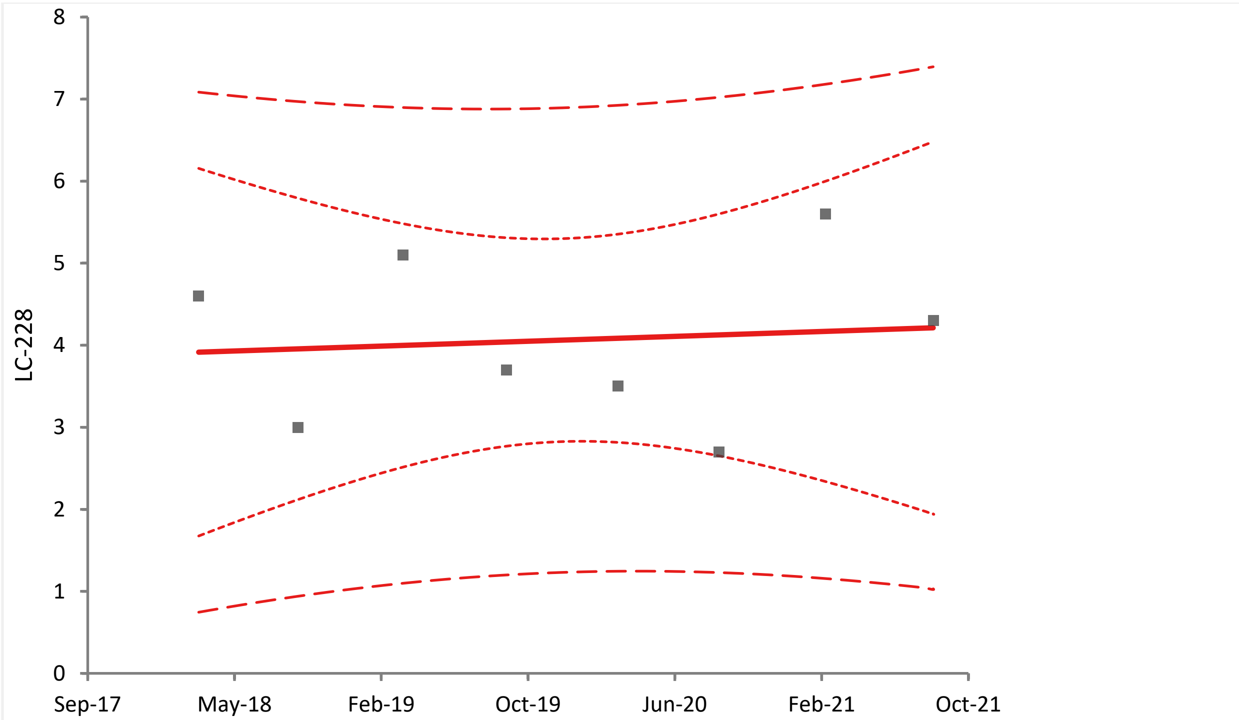


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-228



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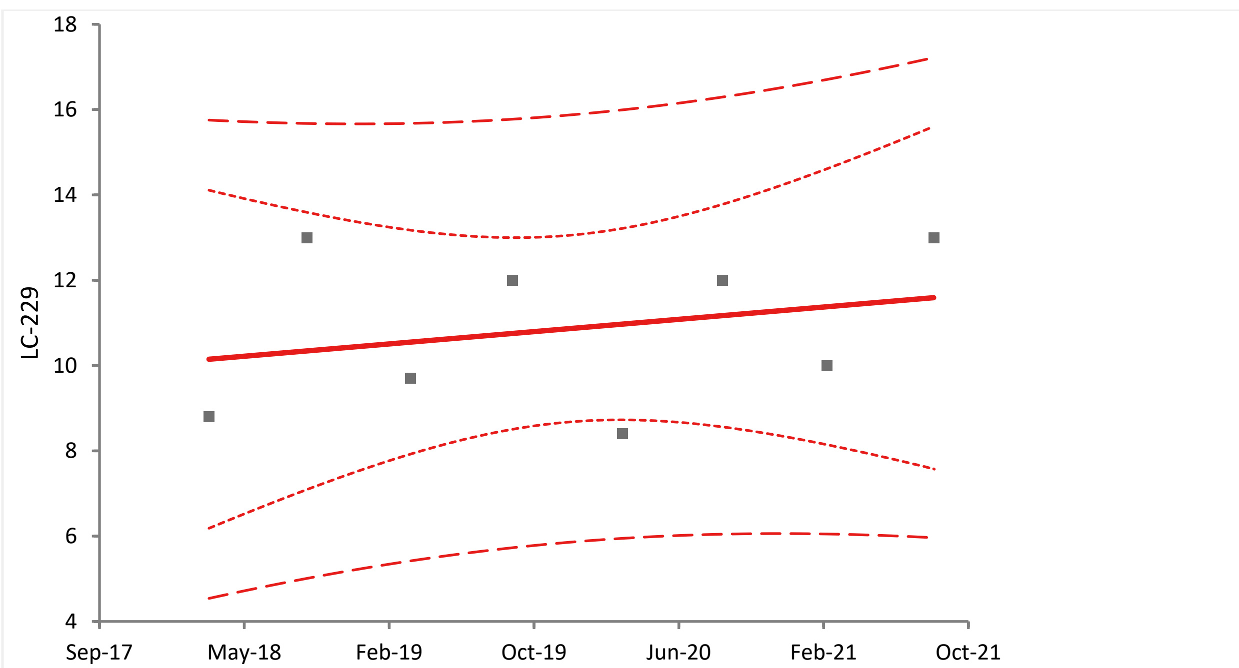
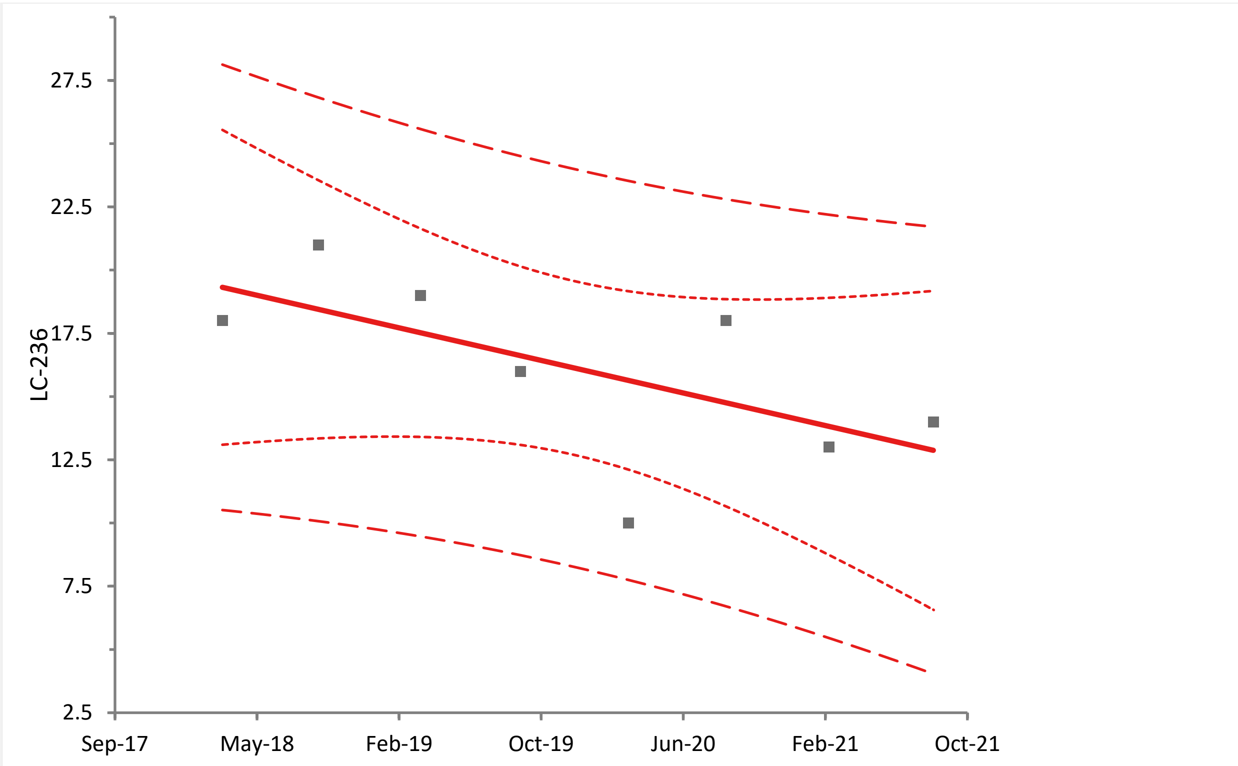
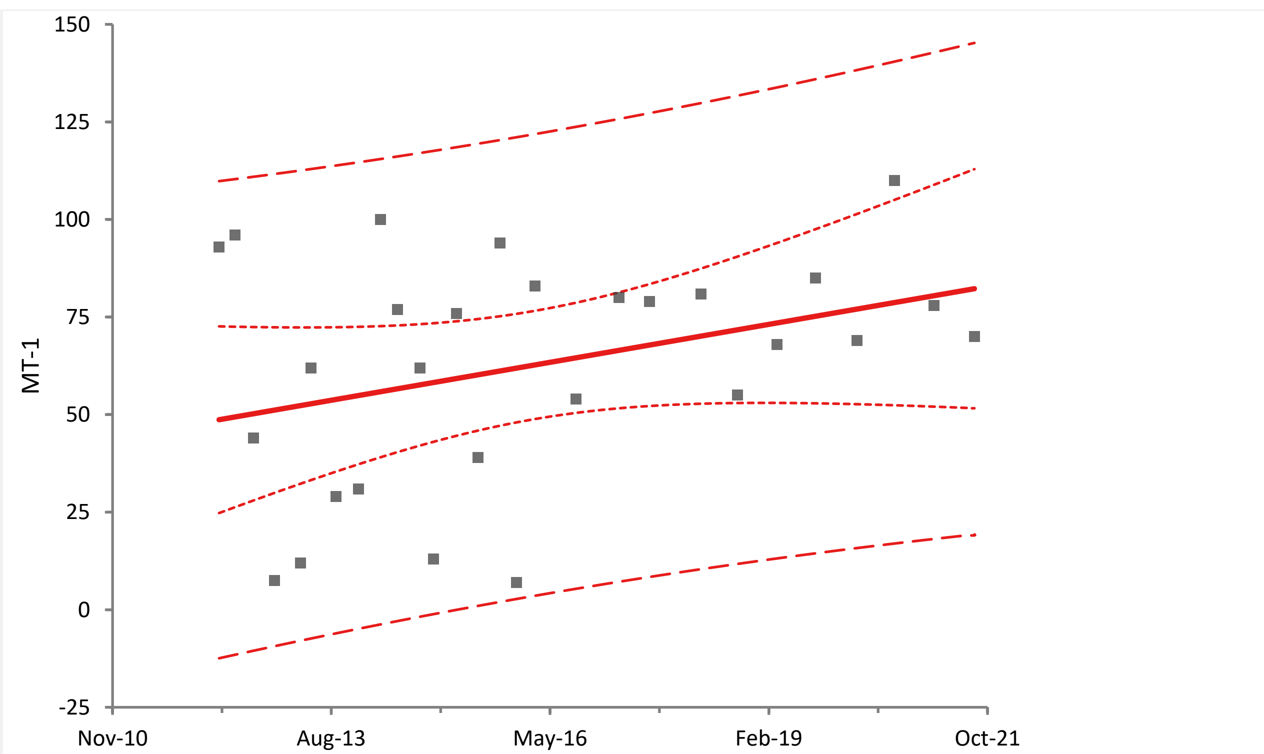


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-236

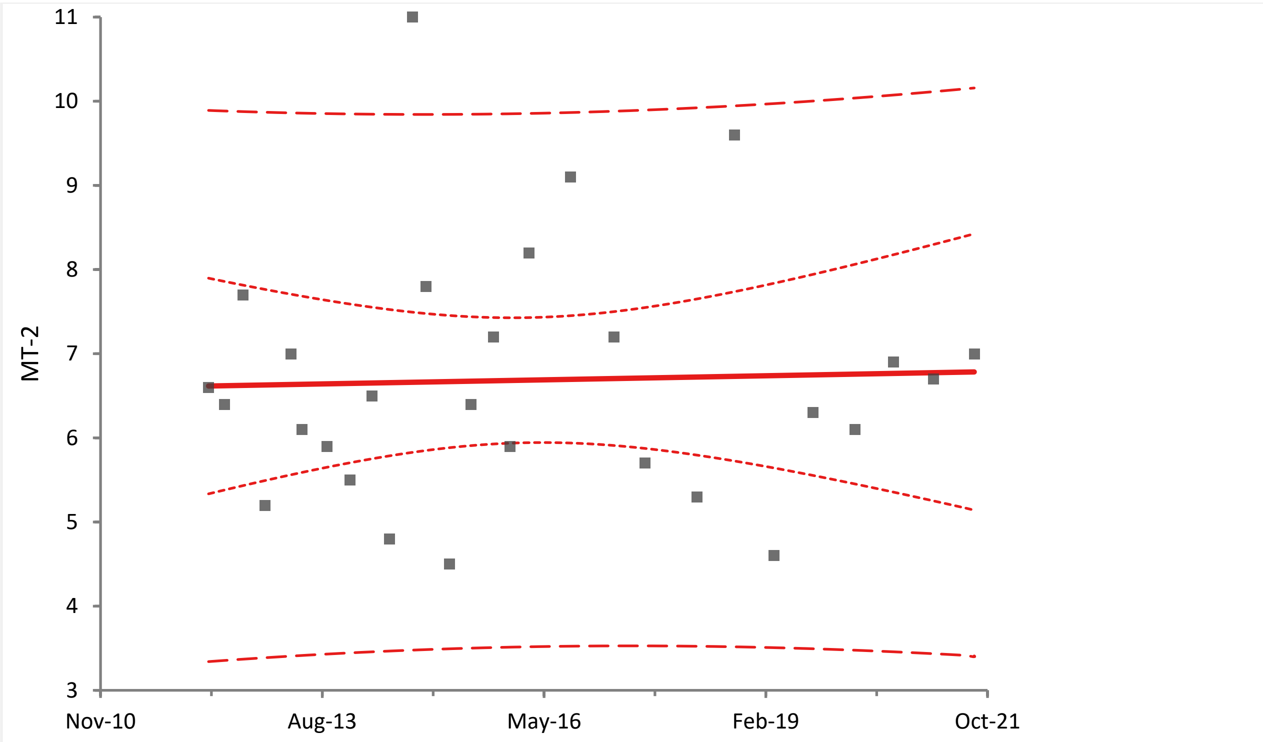


MT-1



Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

MT-2



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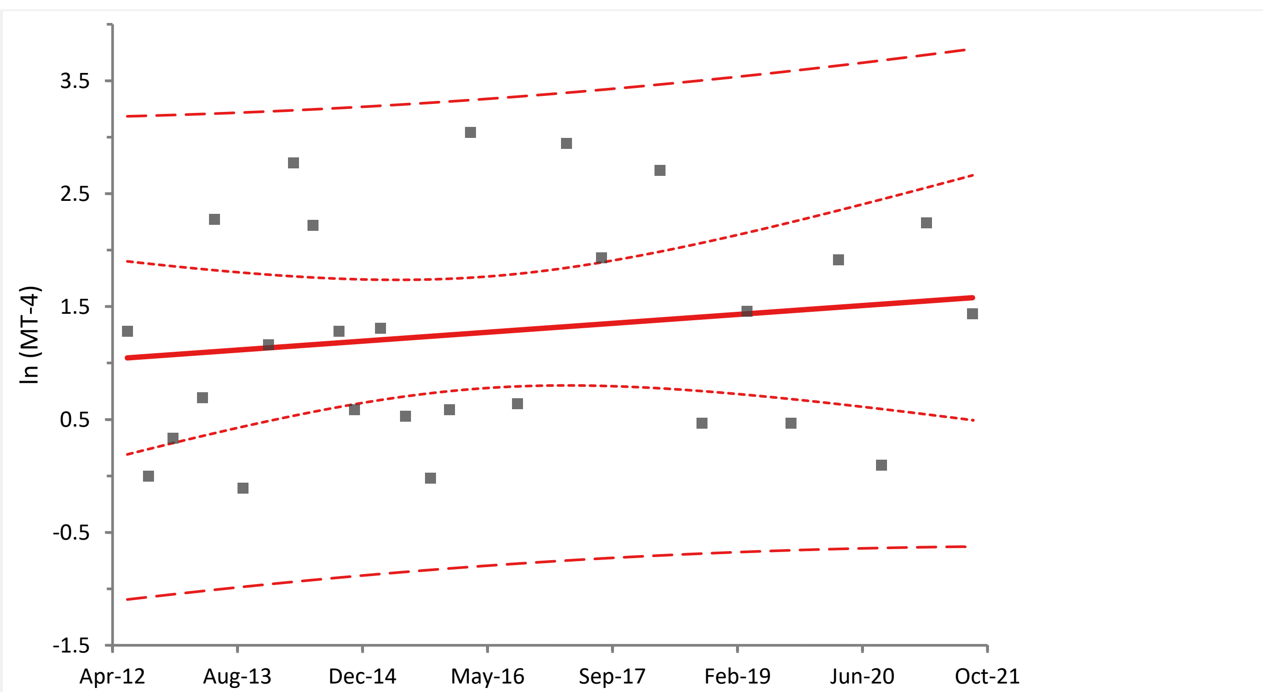
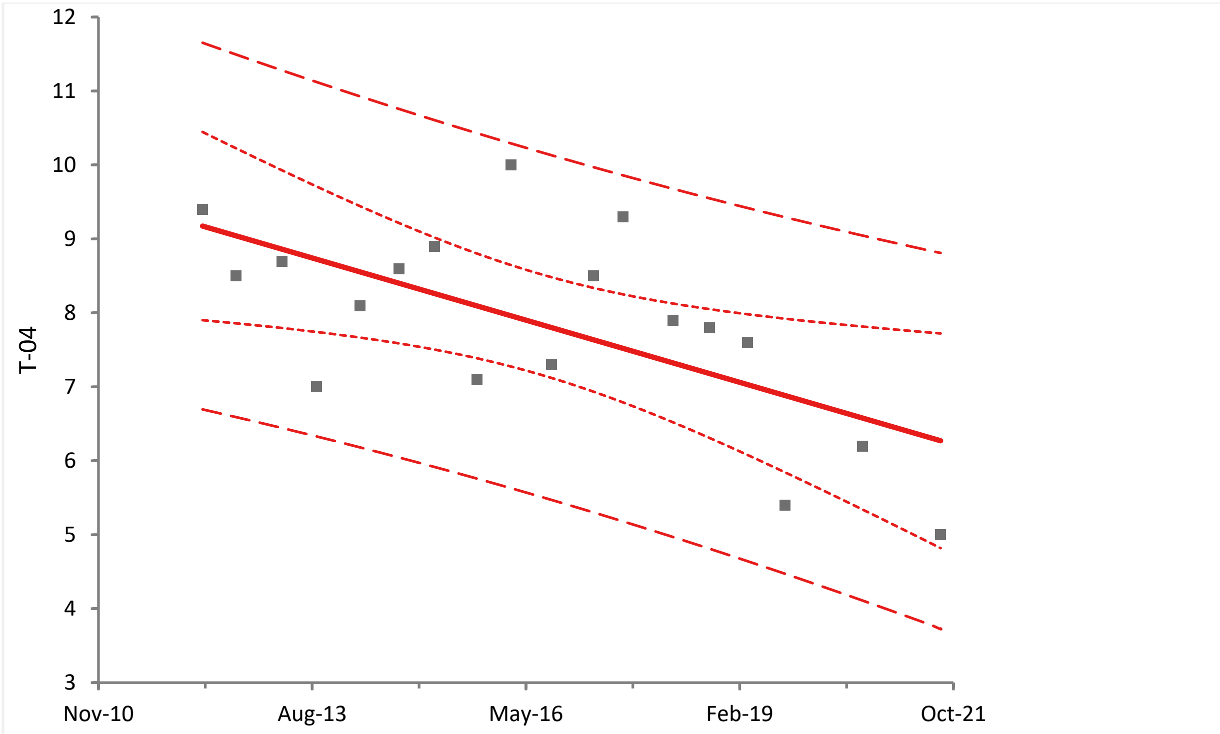
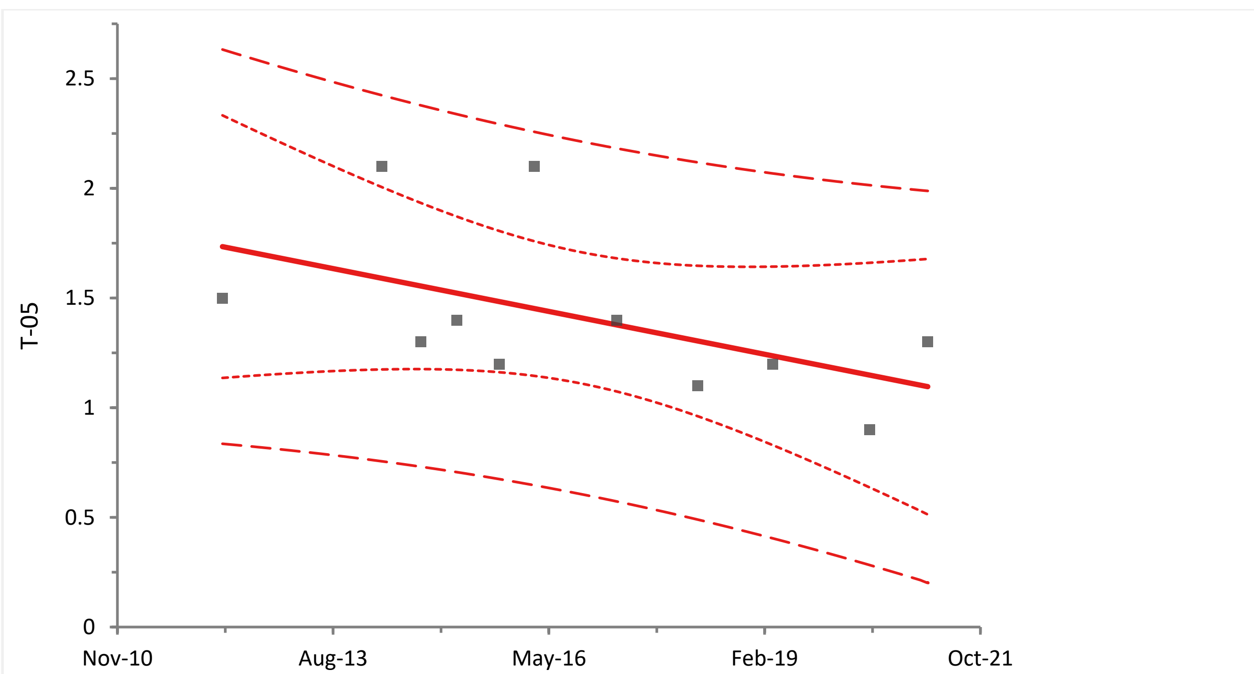


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

T-04

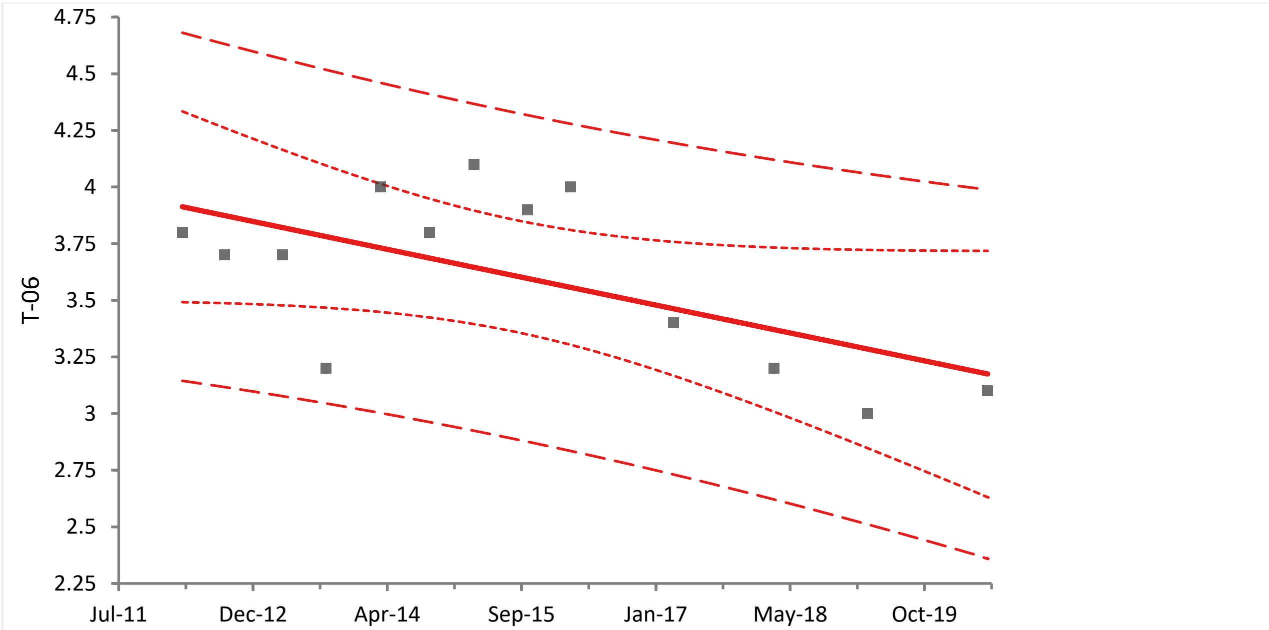


T-05

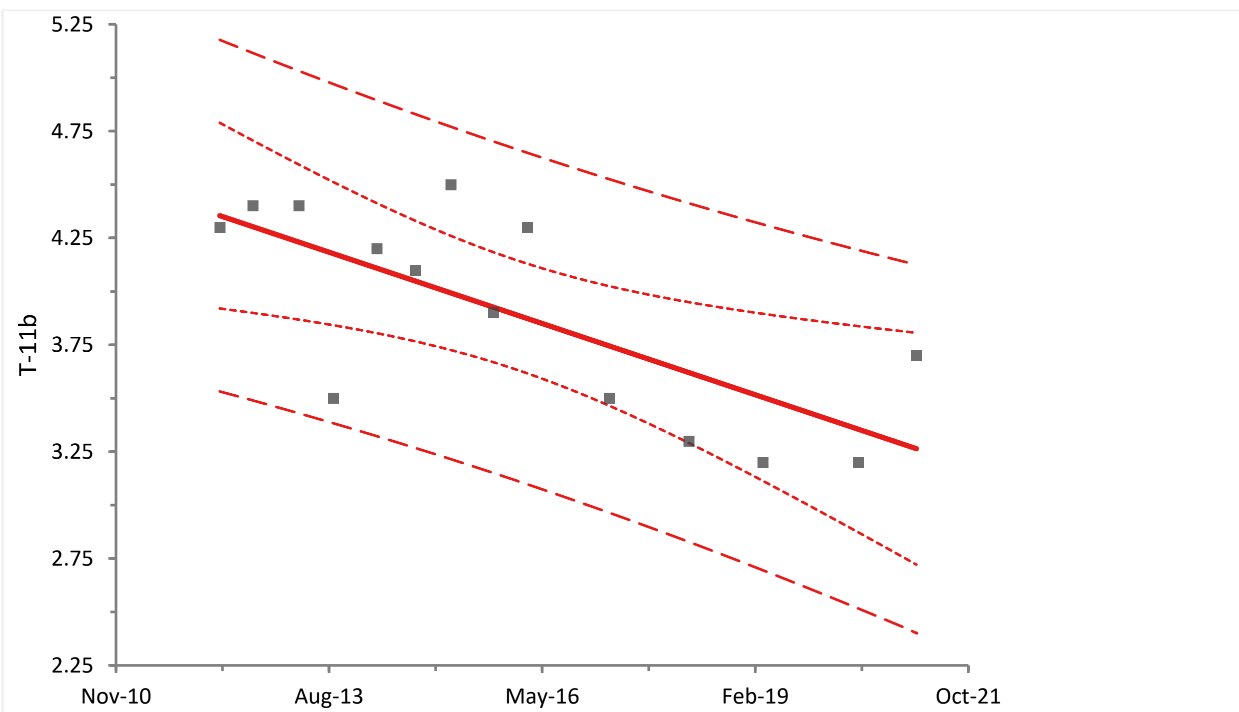


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

T-06

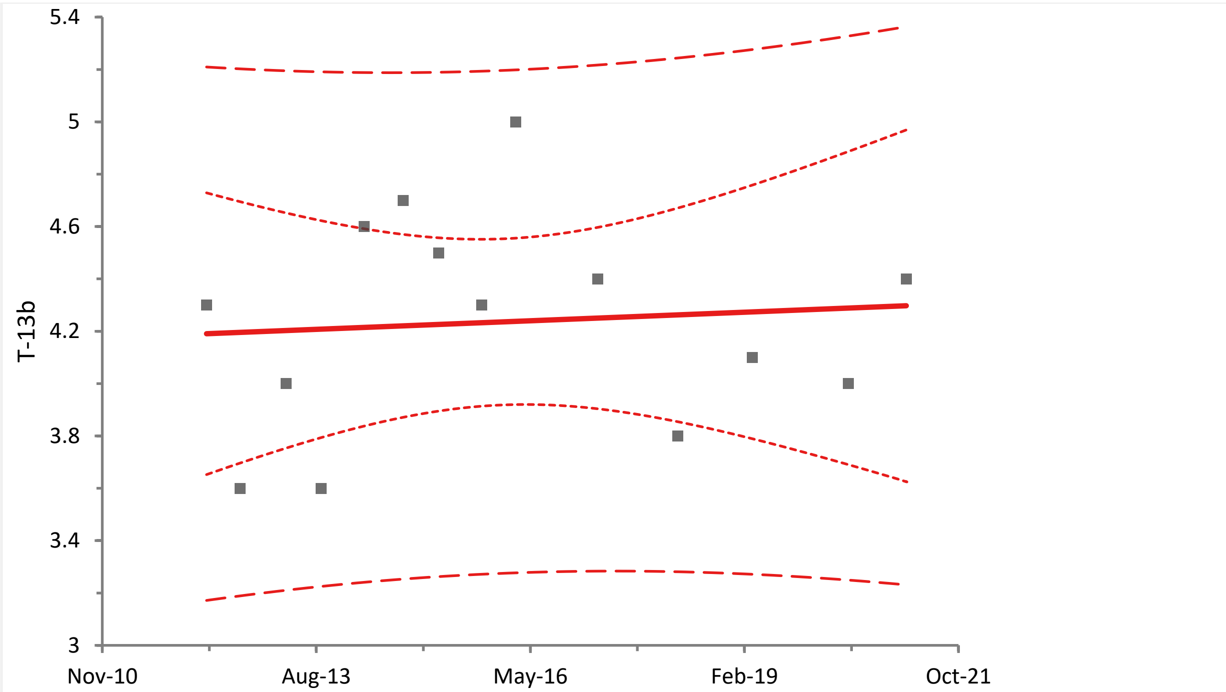


T-11b



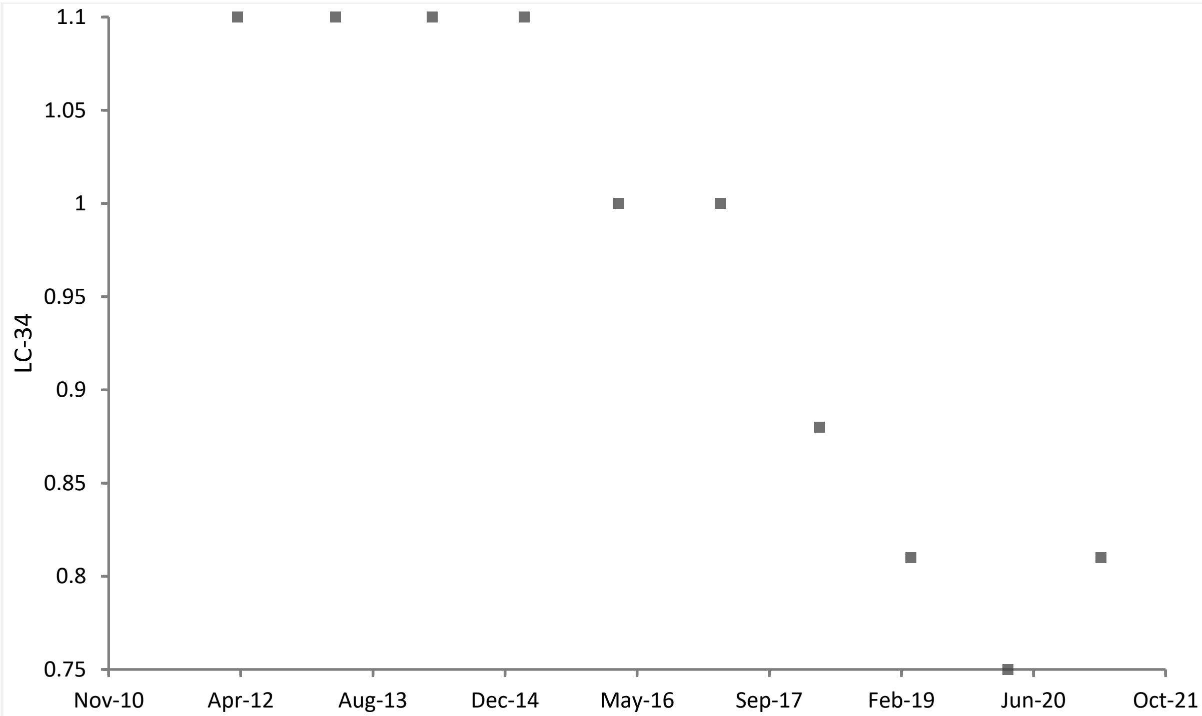
Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

T-13b

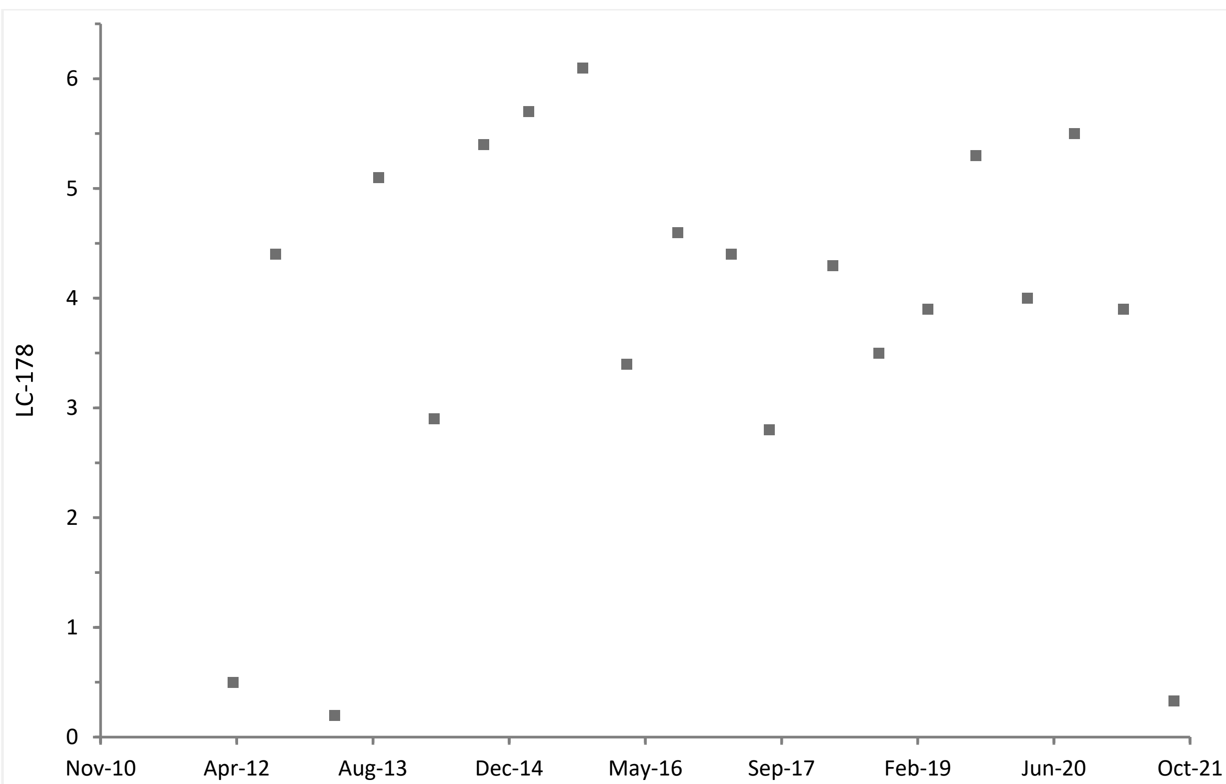


Appendix E - Log RAM Statistics, 2012-2021
Mann-Kendall Scatter Plots – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-34

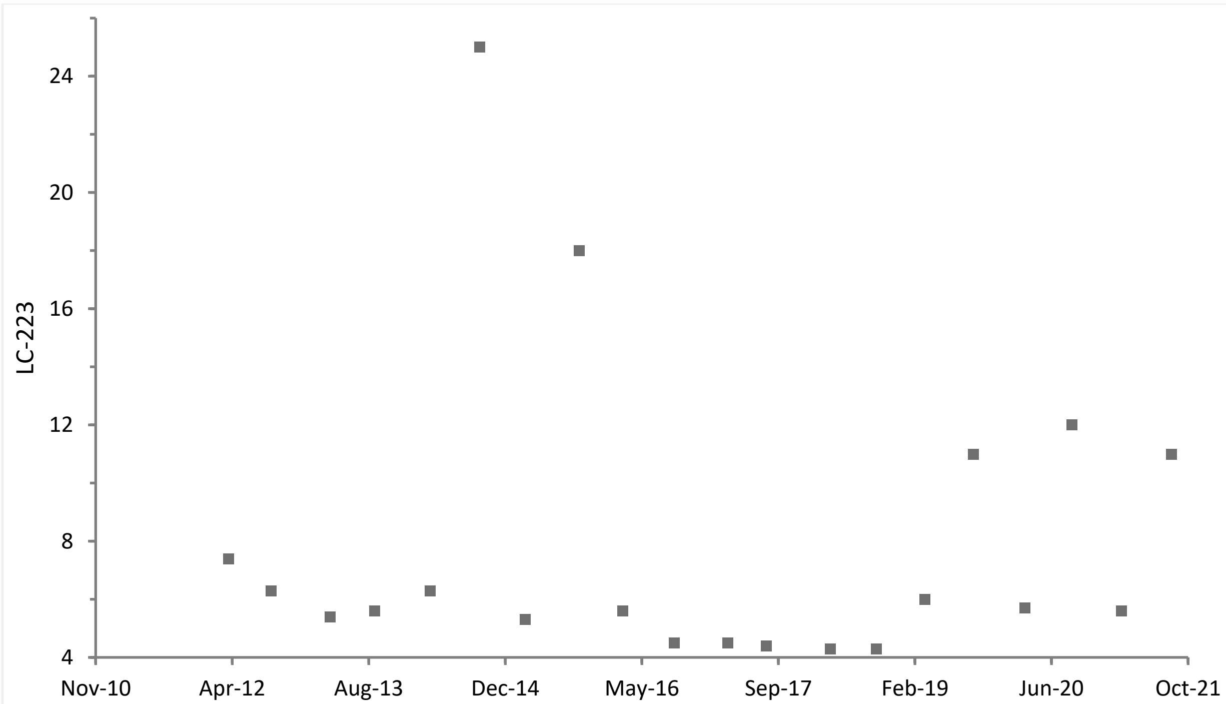


LC-178



Appendix E - Log RAM Statistics, 2012-2021
Mann-Kendall Scatter Plots – Upper Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-223



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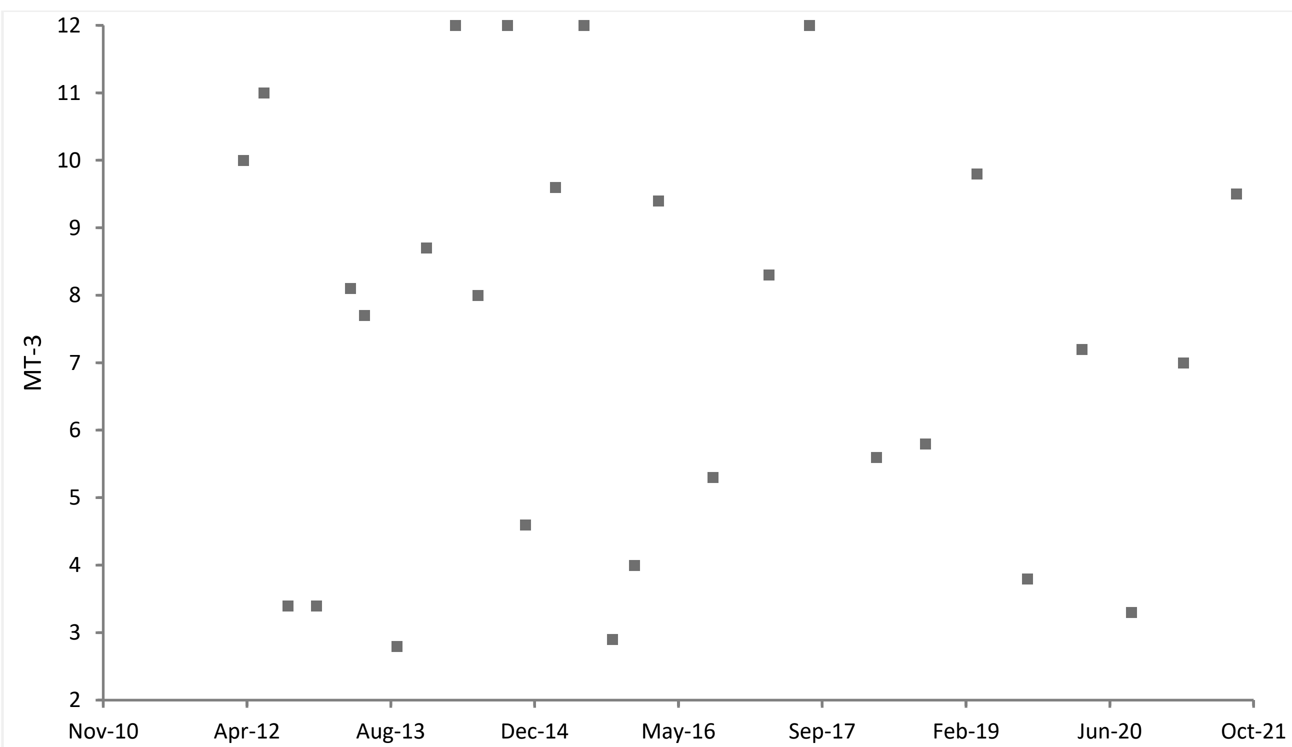
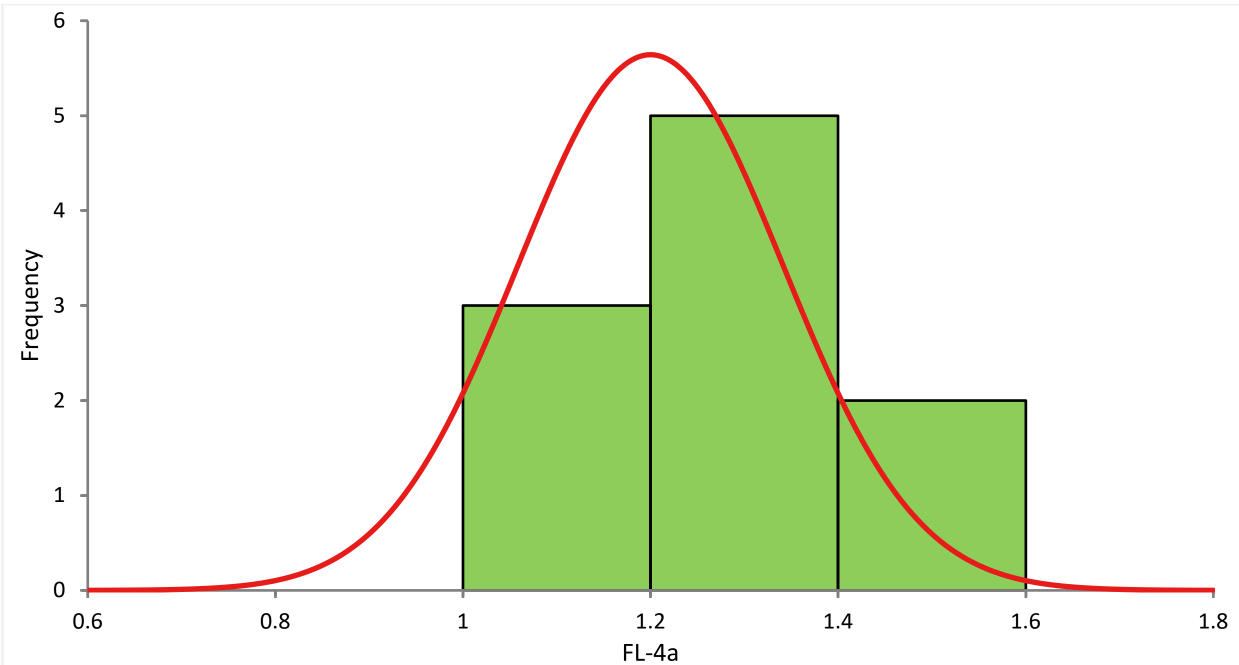
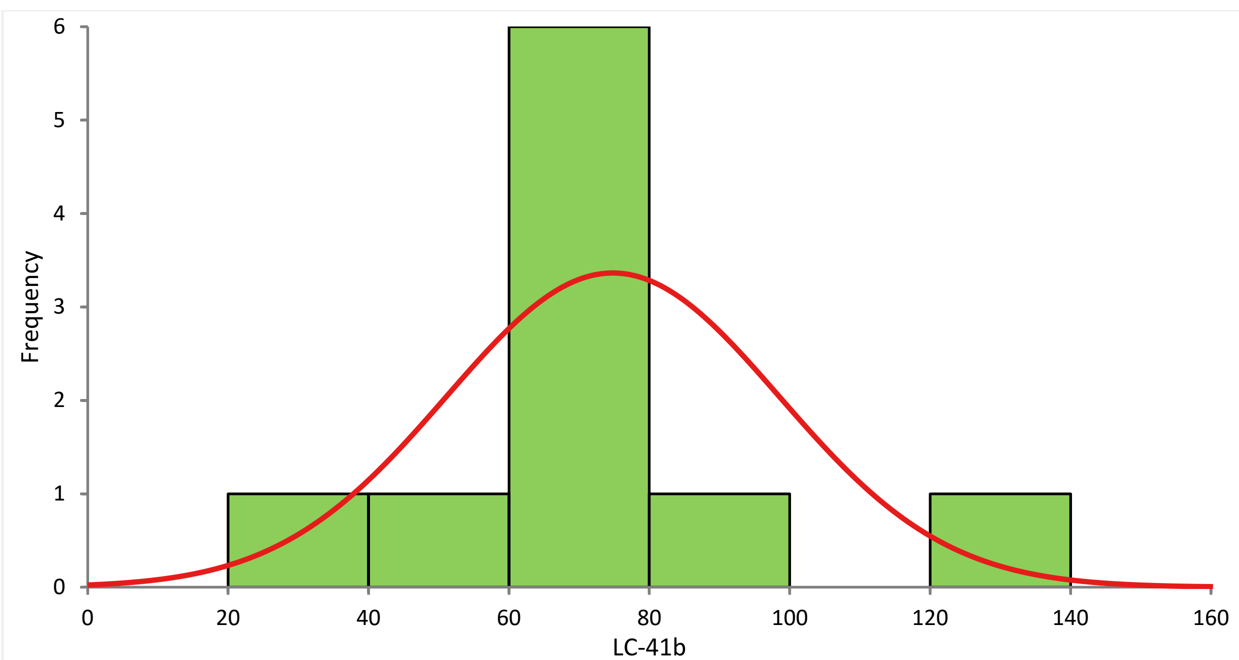


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

FL-4a

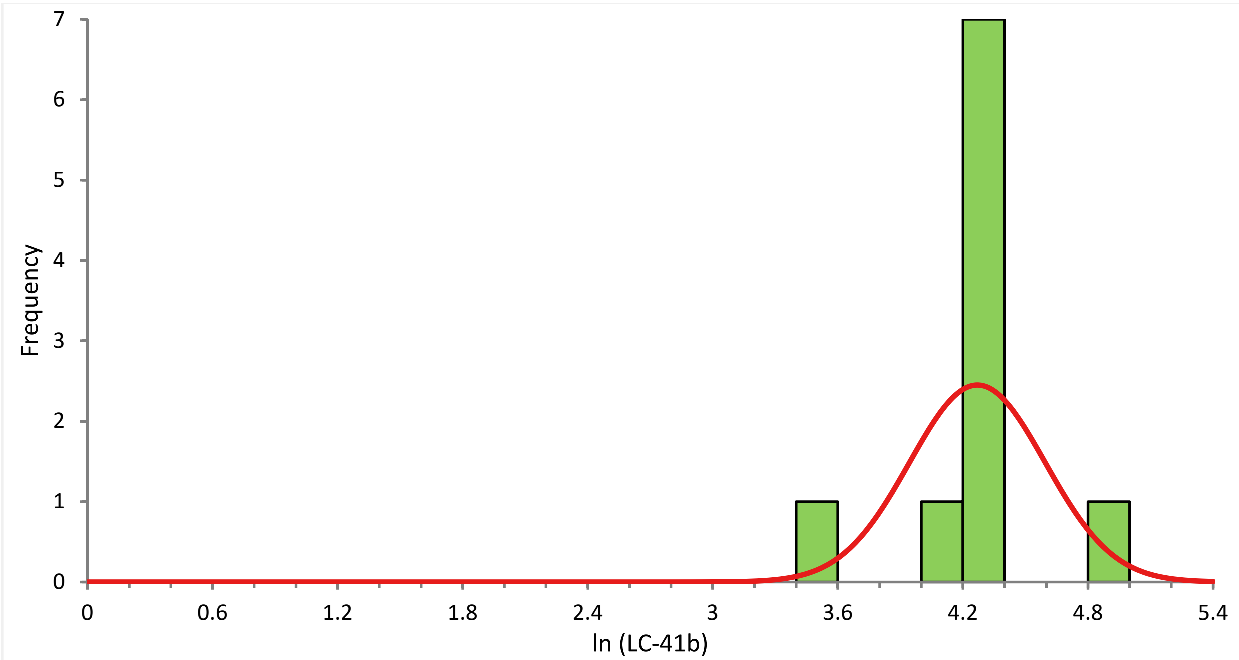


LC-41b

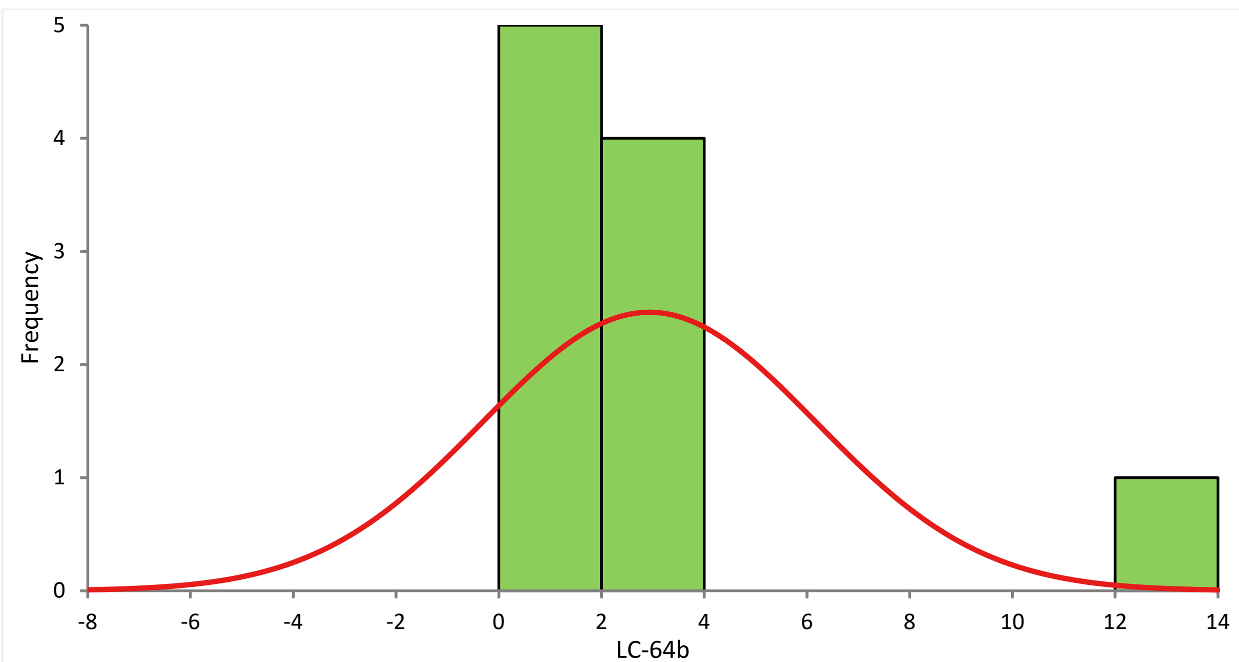


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(LC-41b)

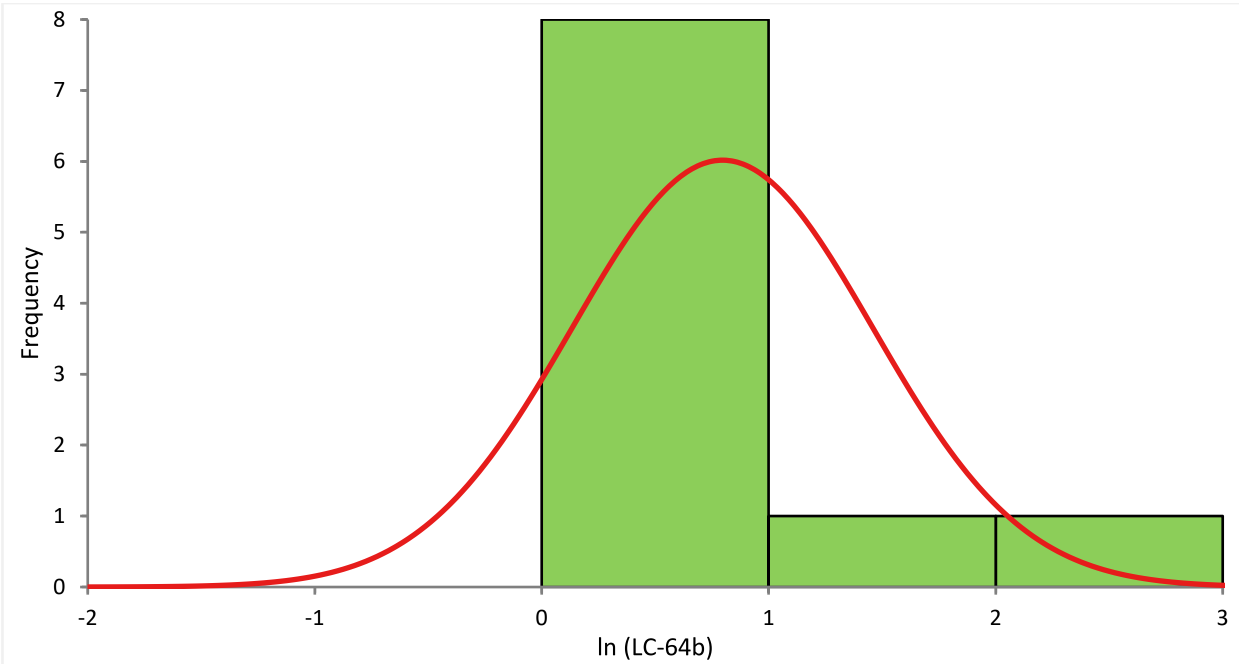


LC-64b

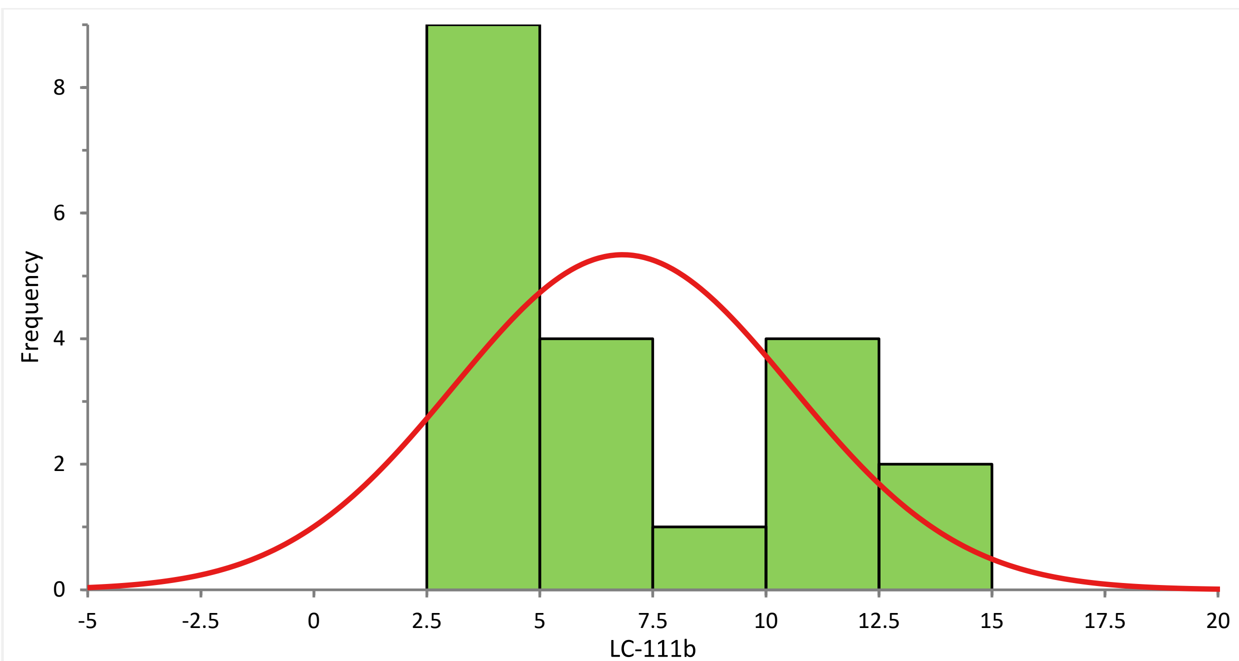


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(LC-64b)

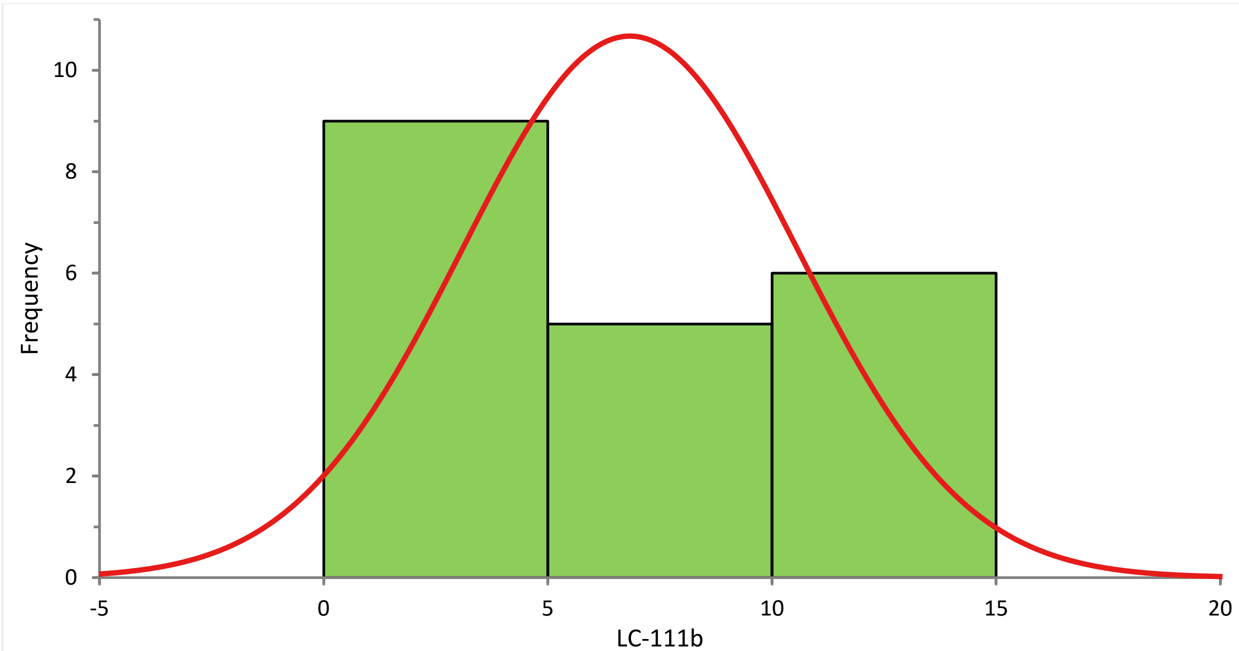


LC-111b



Appendix E - Log RAM Statistics, 2012-2021
Histograms – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(LC-111b)



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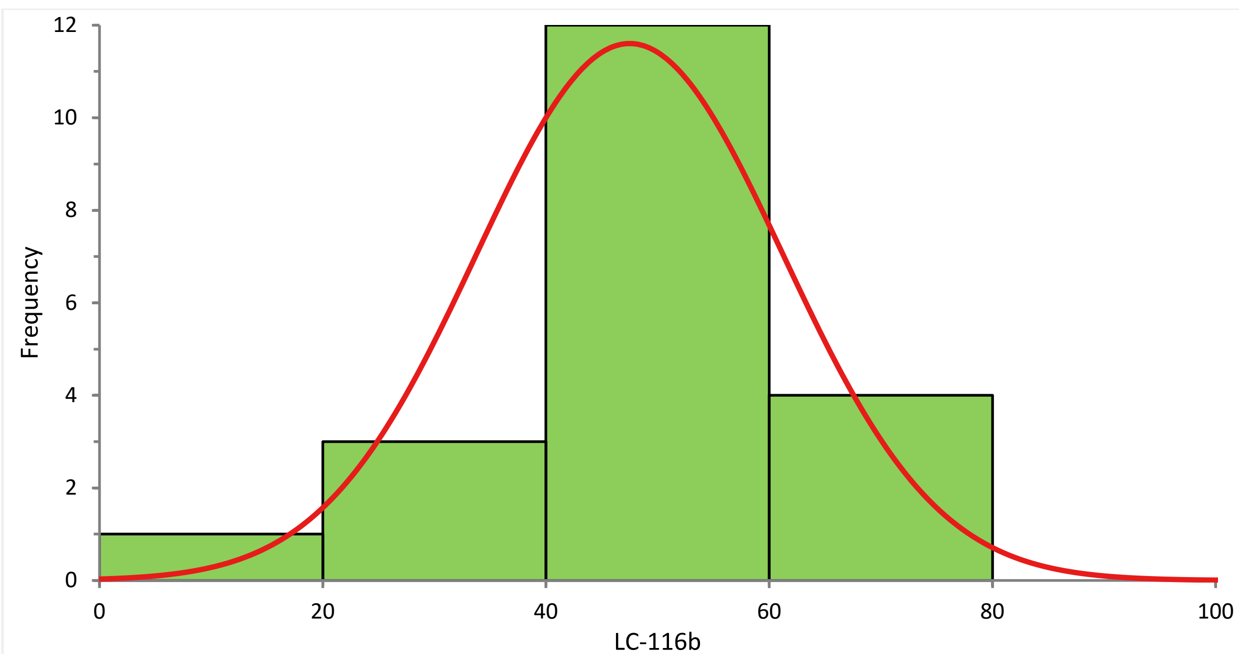
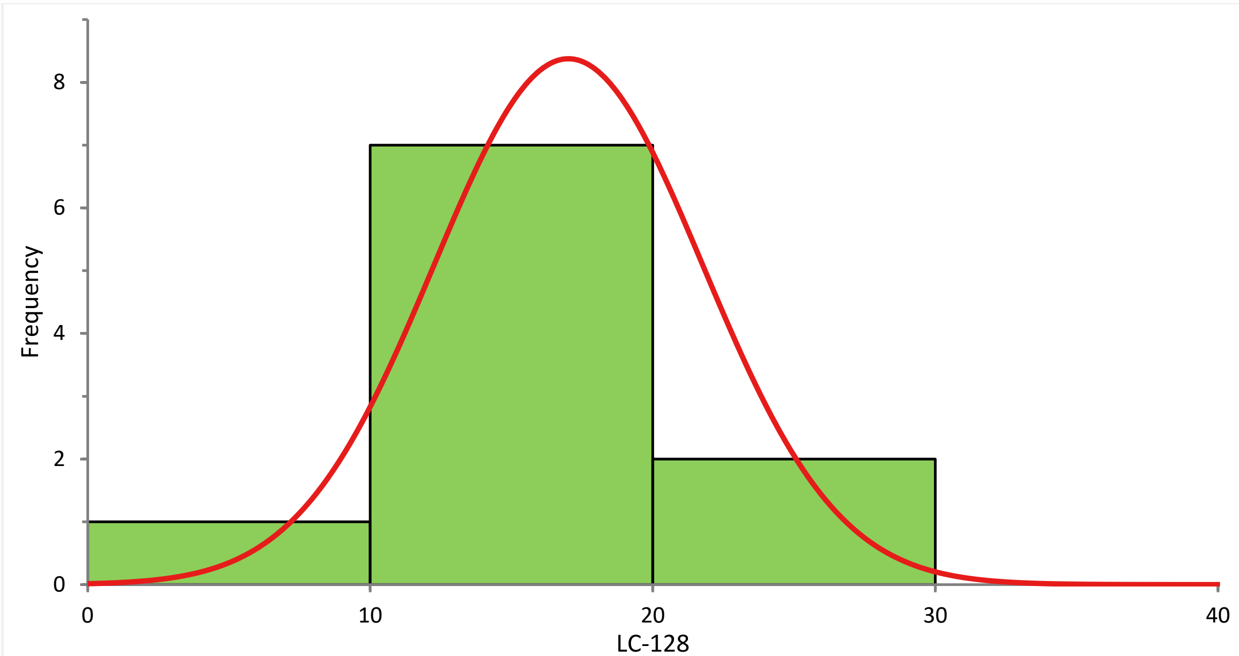


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-128



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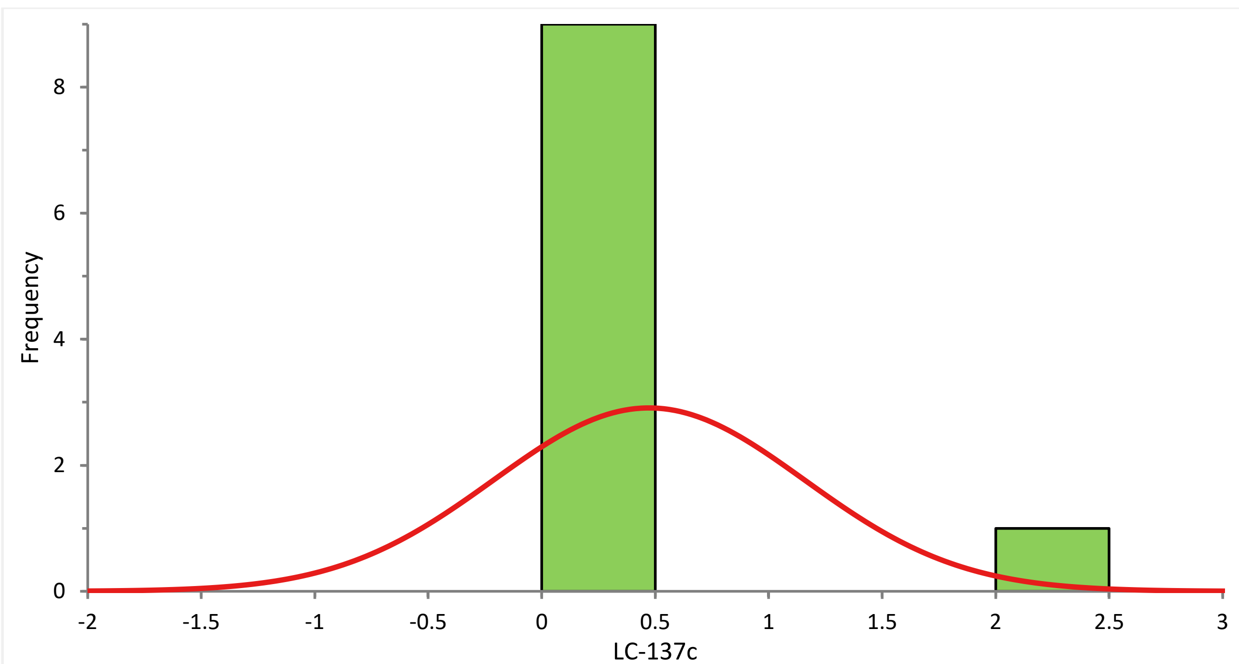
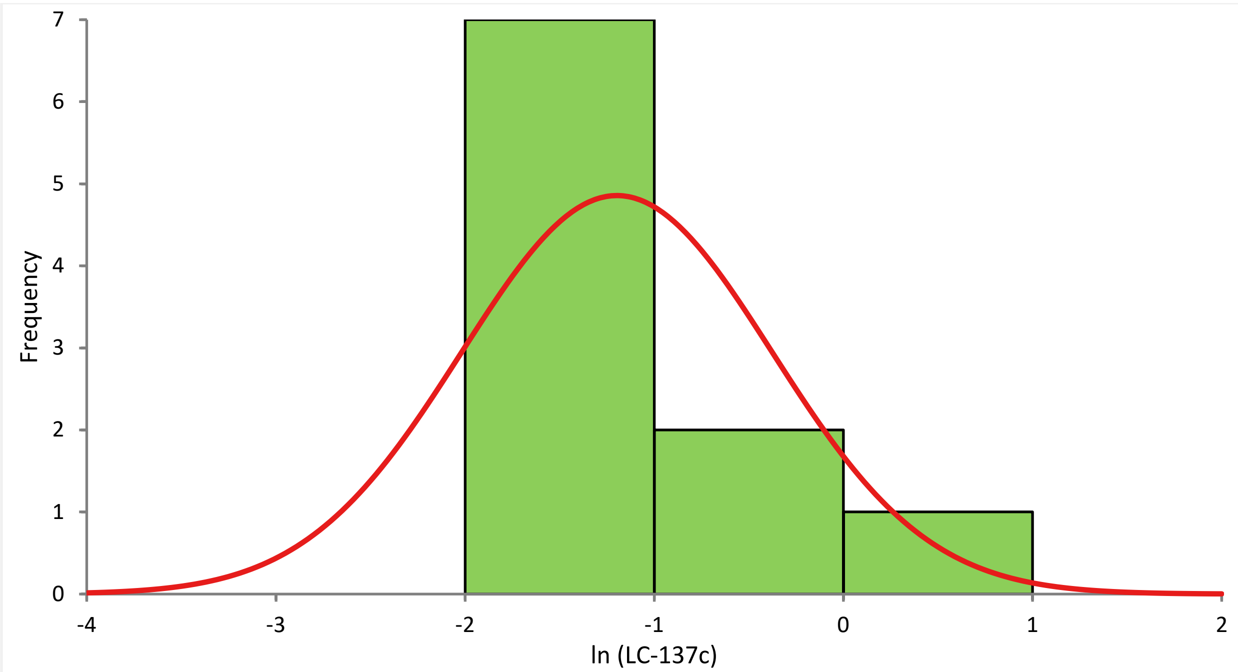
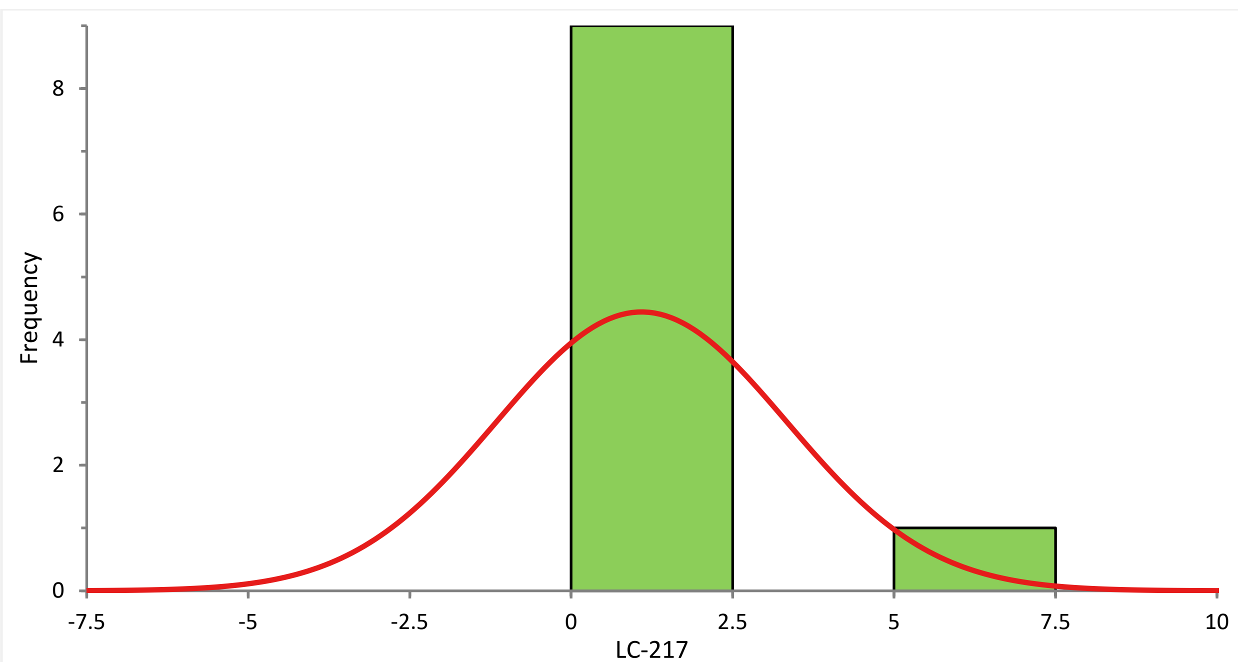


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(LC-137c)

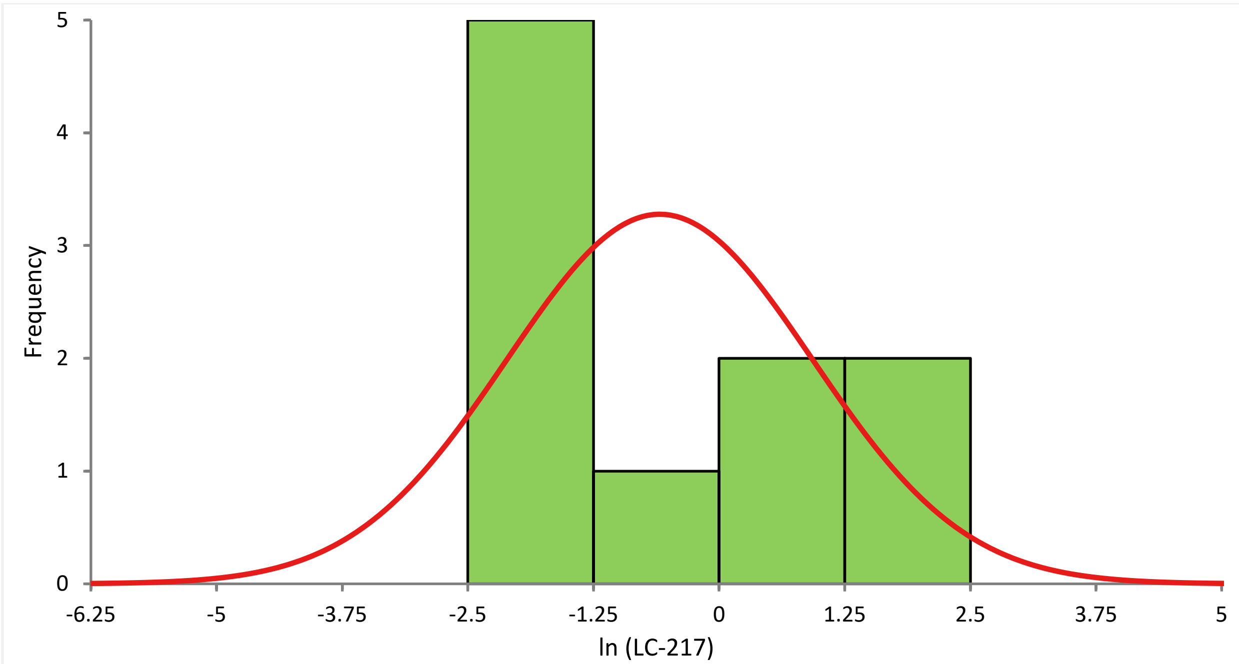


LC-217

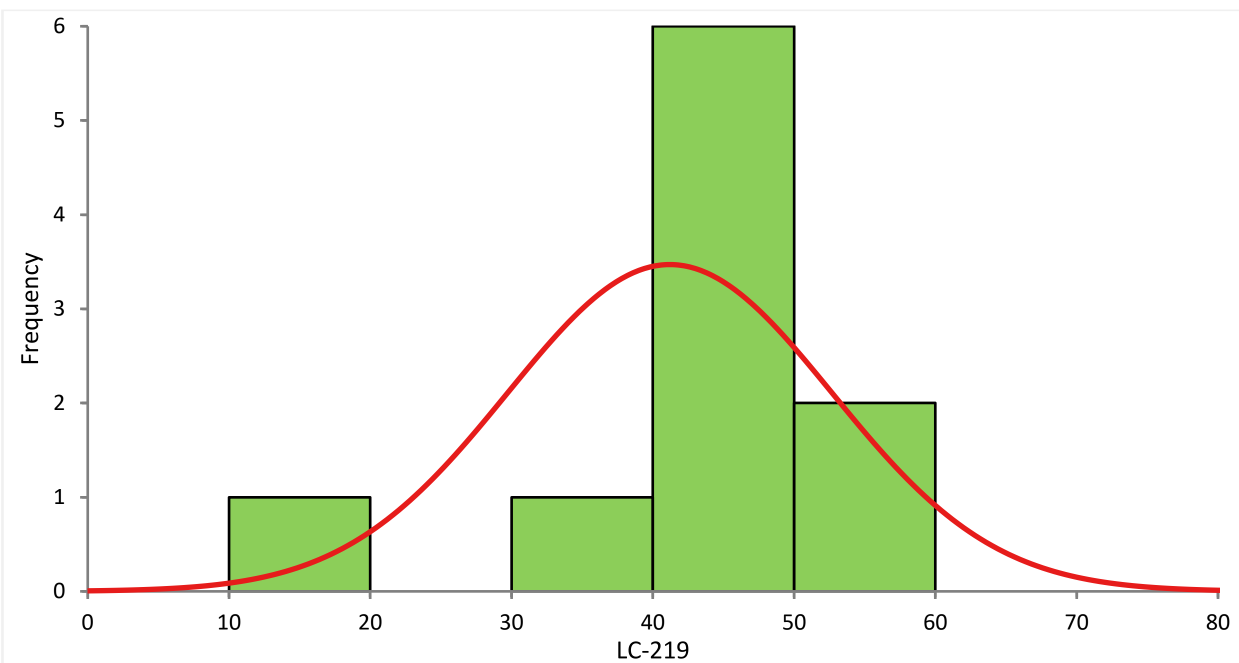


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(LC-217)

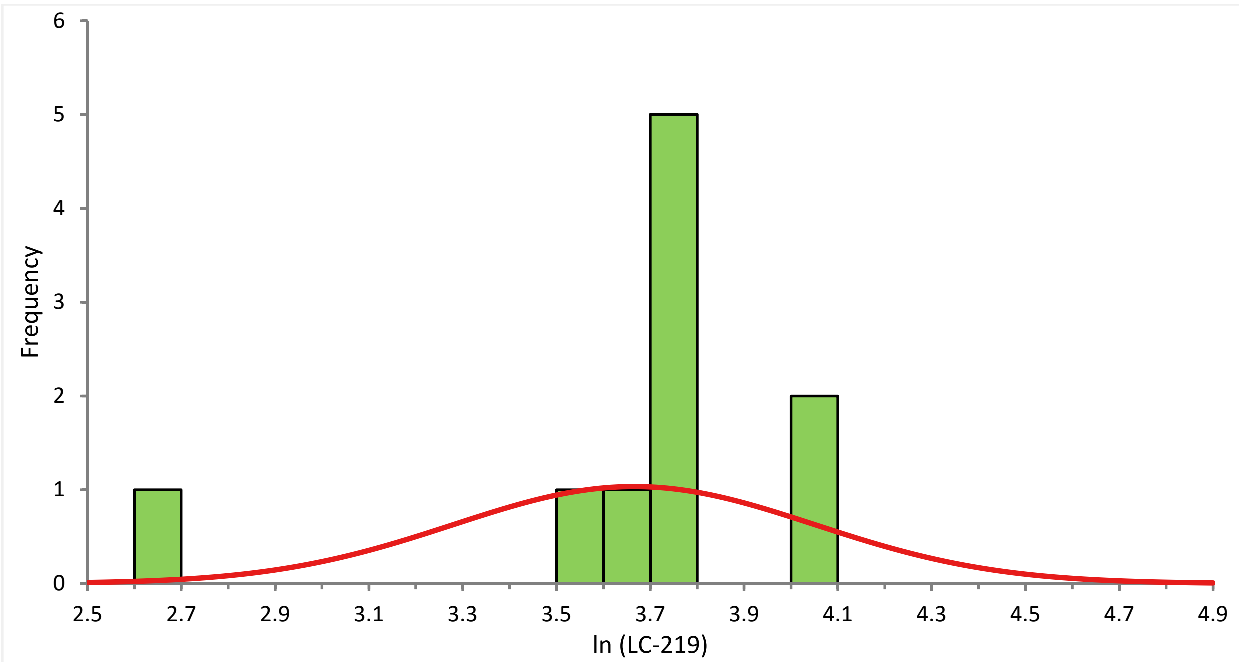


LC-219

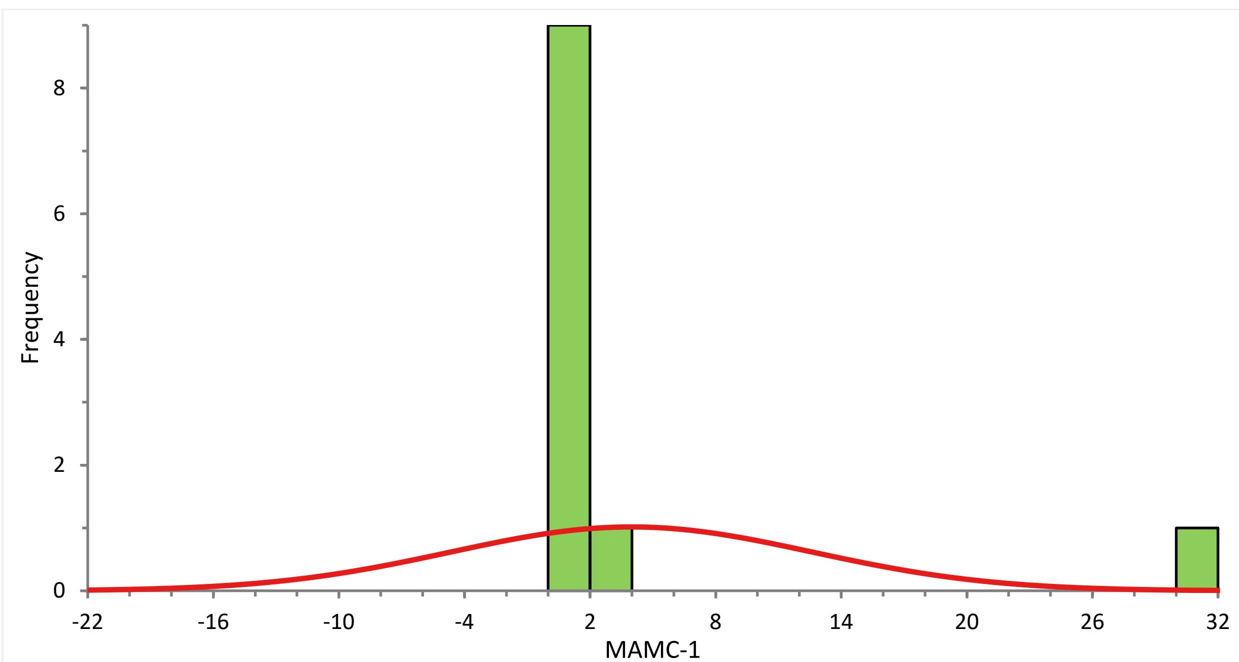


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(LC-219)

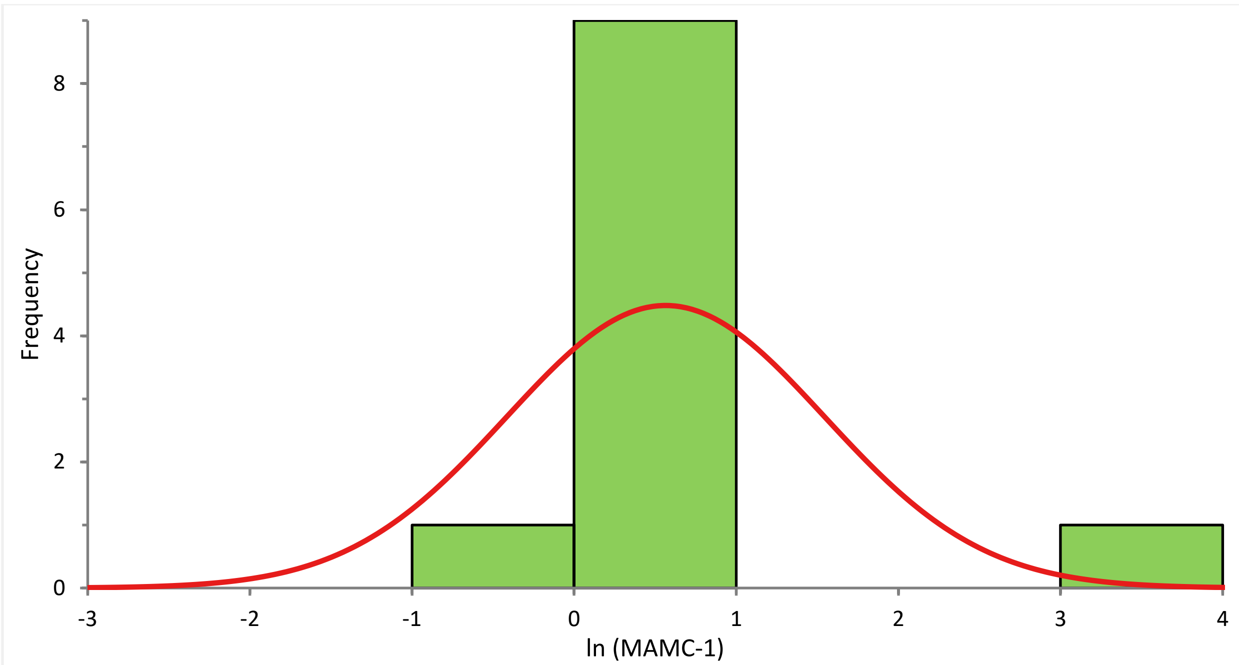


MAMC-1



Appendix E - Log RAM Statistics, 2012-2021
Histograms – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(MAMC-1)



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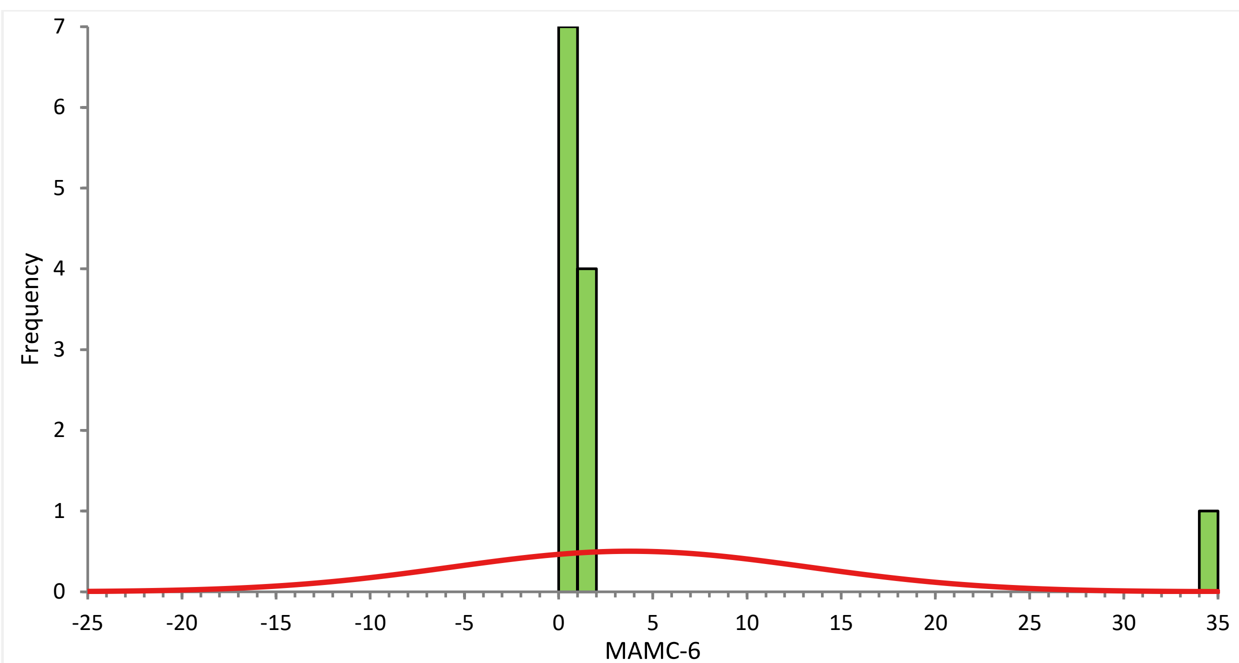
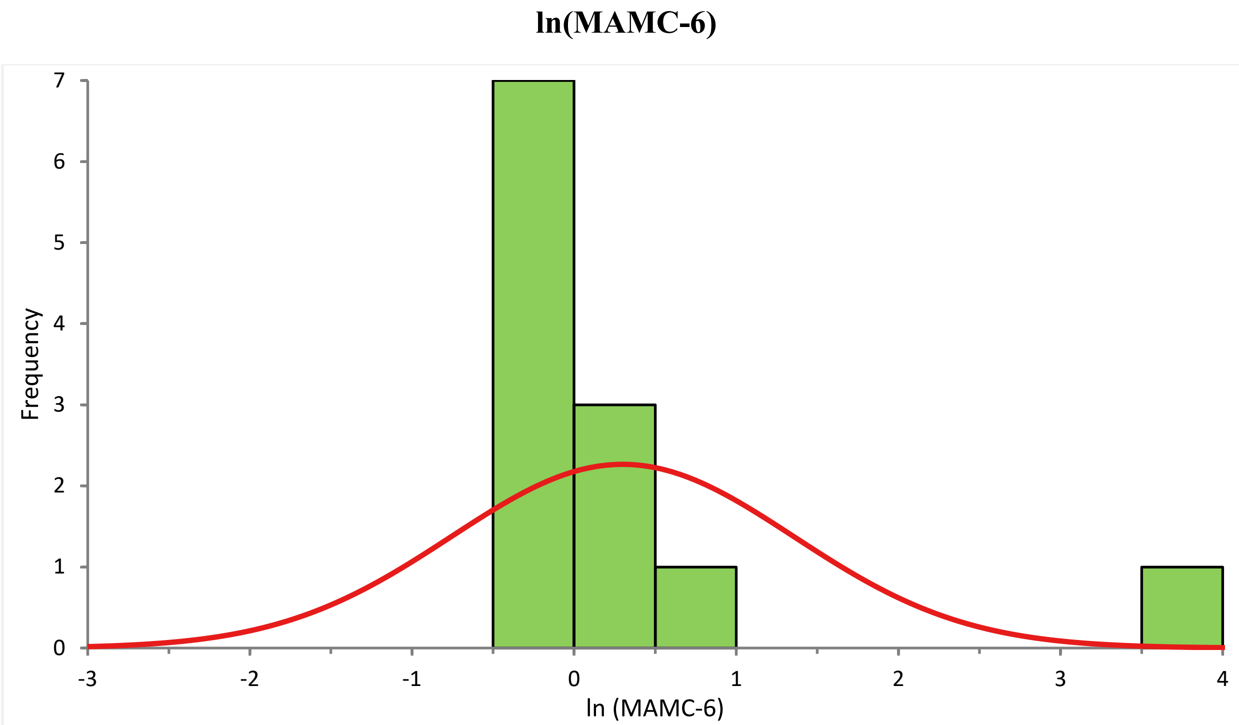
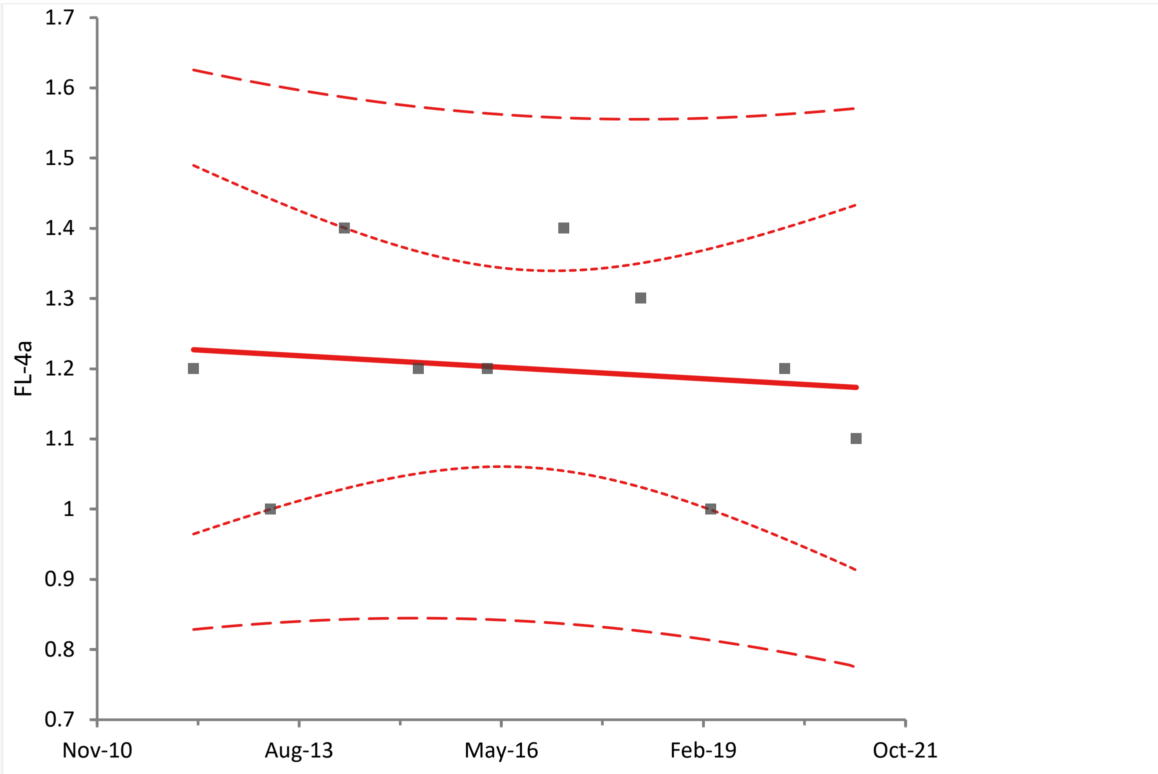


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

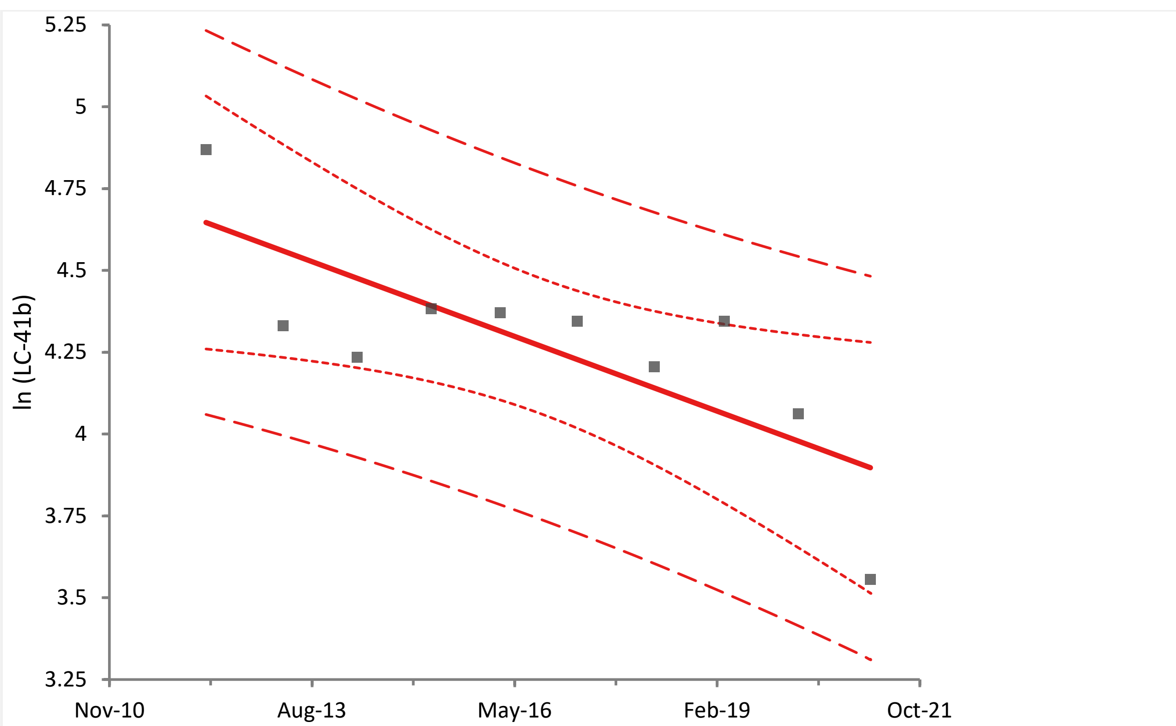


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

FL-4a

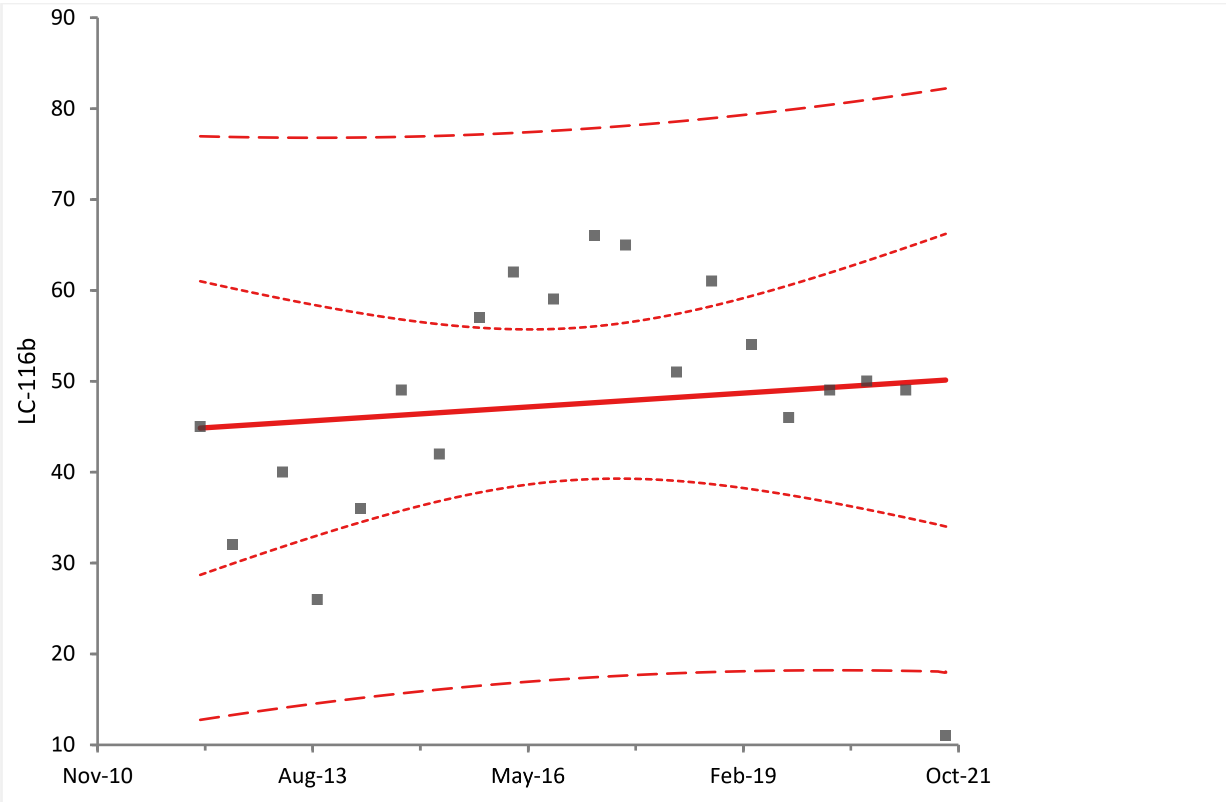


ln(-41b)

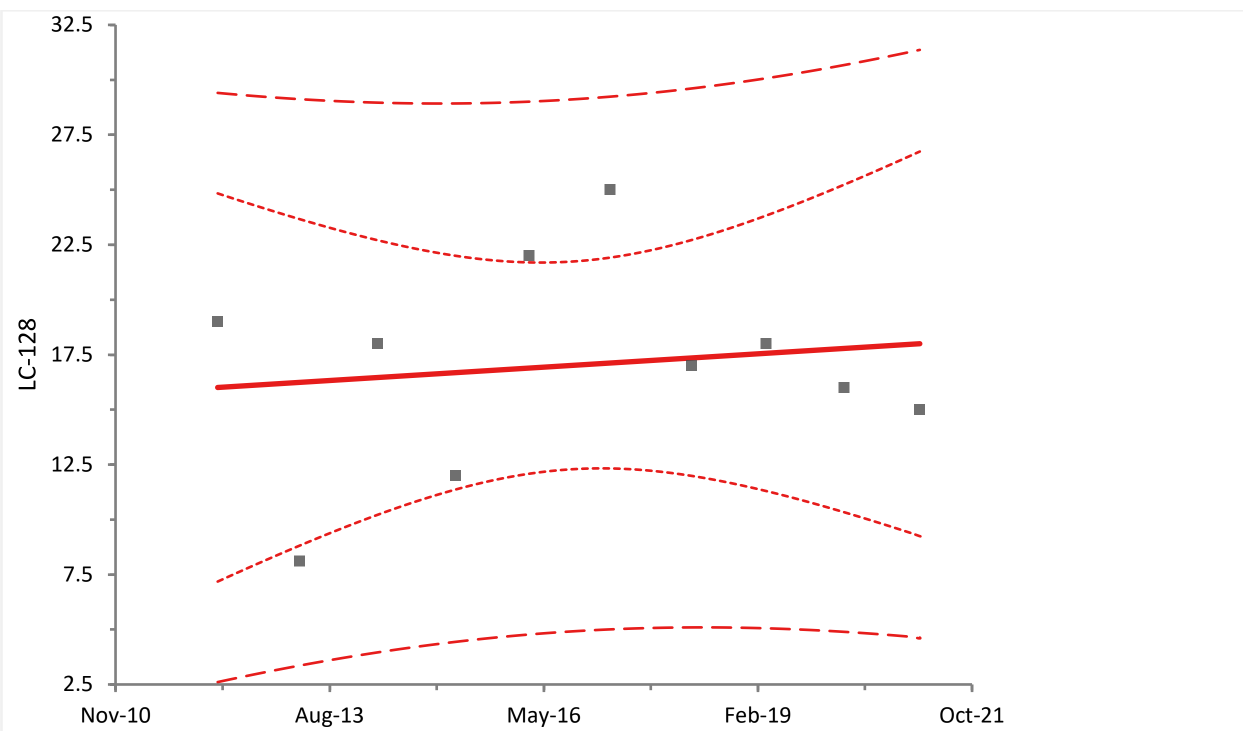


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-116b

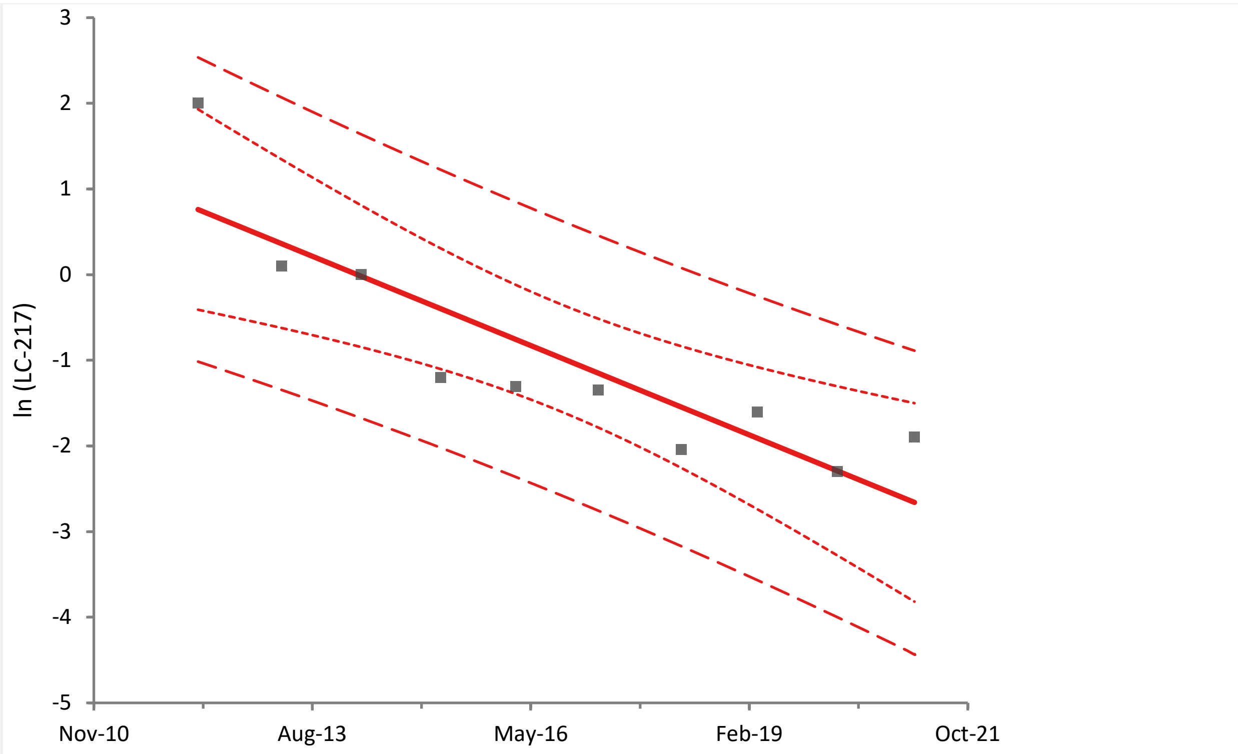


LC-128



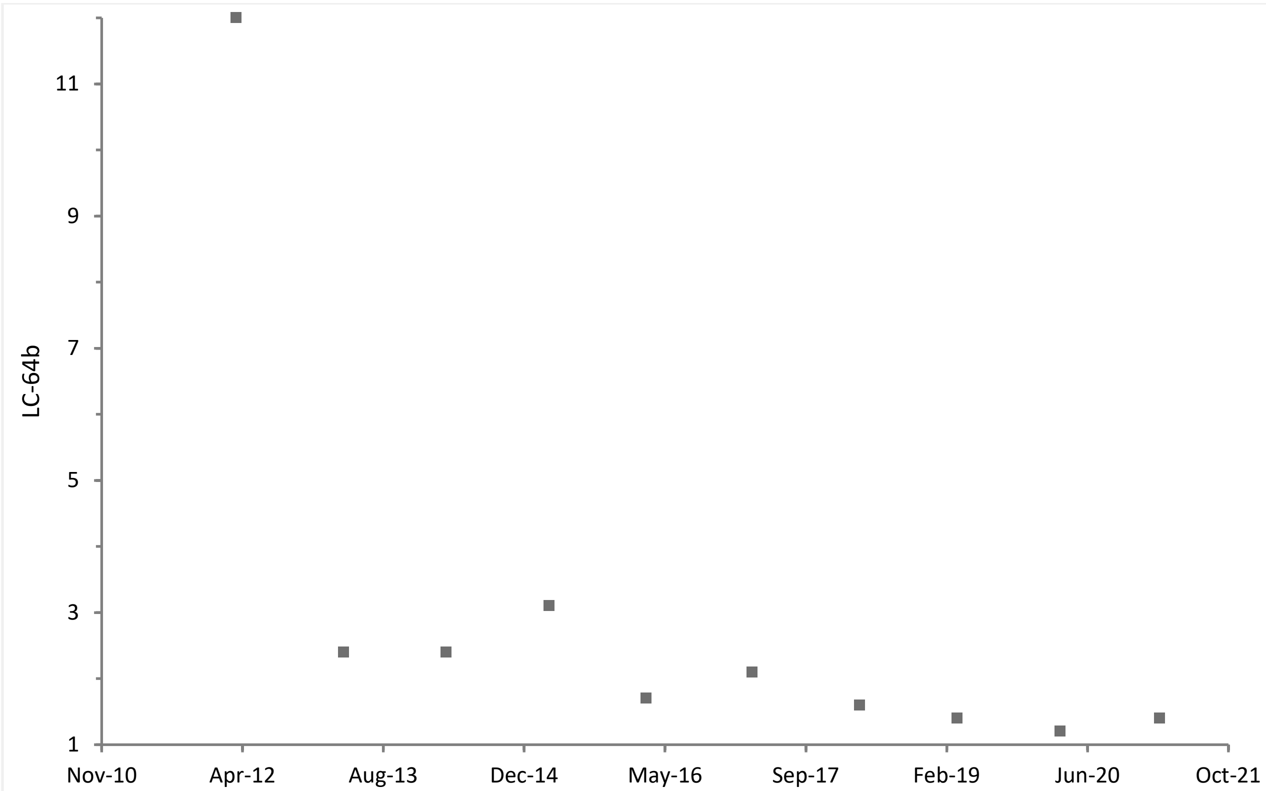
Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(LC-217)

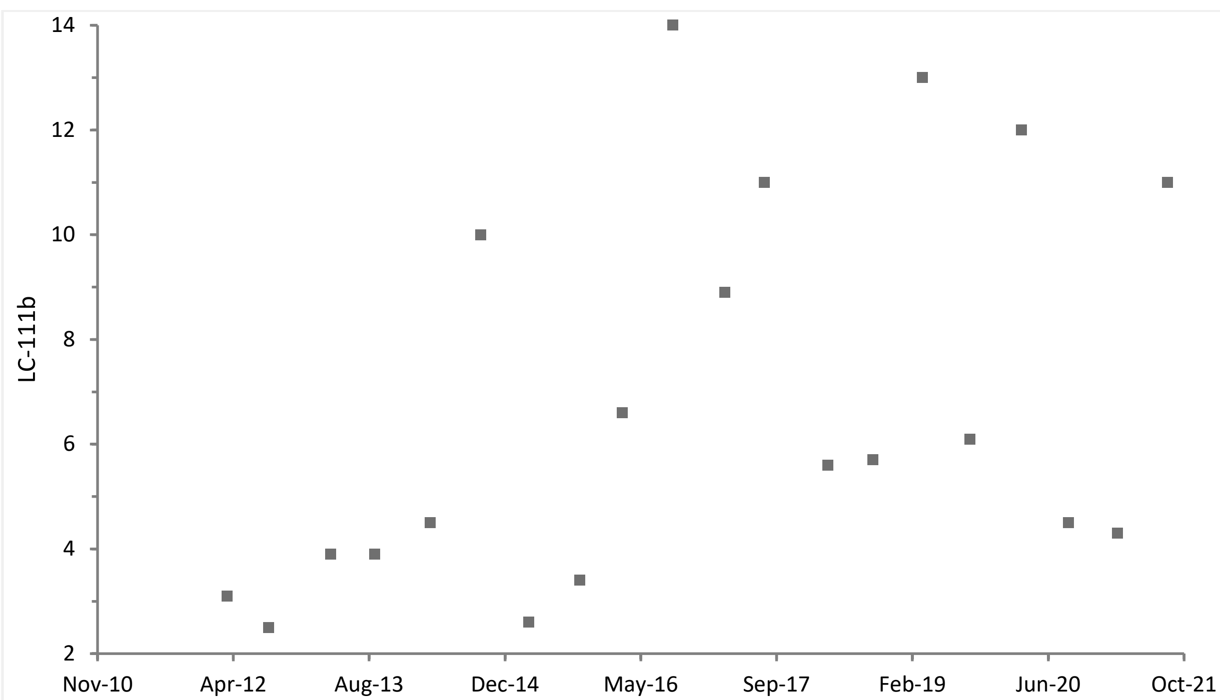


Appendix E - Log RAM Statistics, 2012-2021
Mann-Kendall Scatter Plots – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-64b

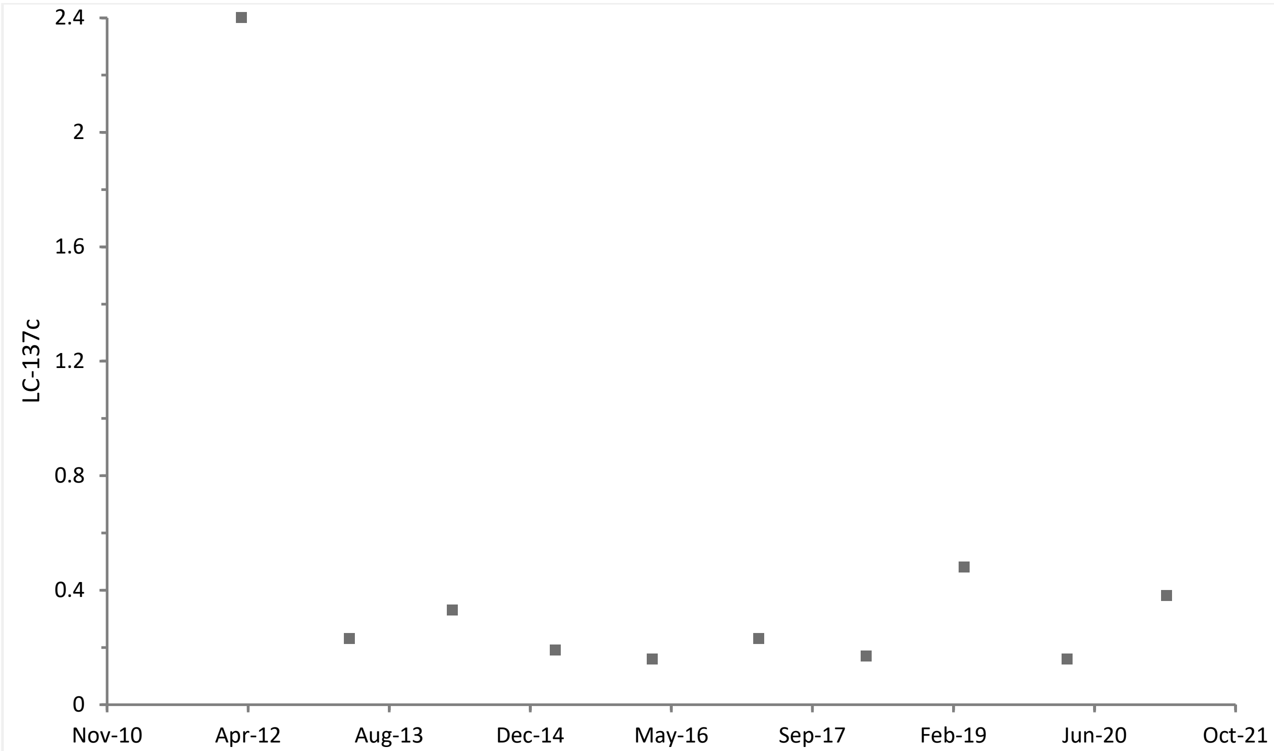


LC-111b

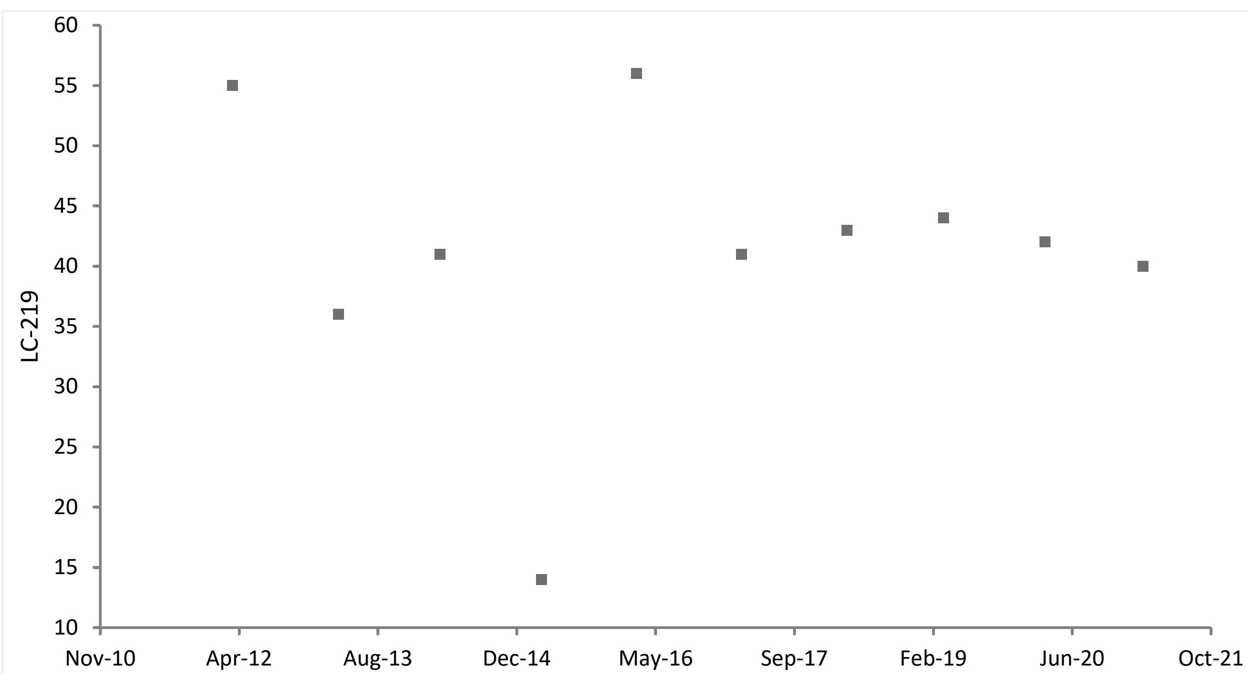


Appendix E - Log RAM Statistics, 2012-2021
Mann-Kendall Scatter Plots – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-137c

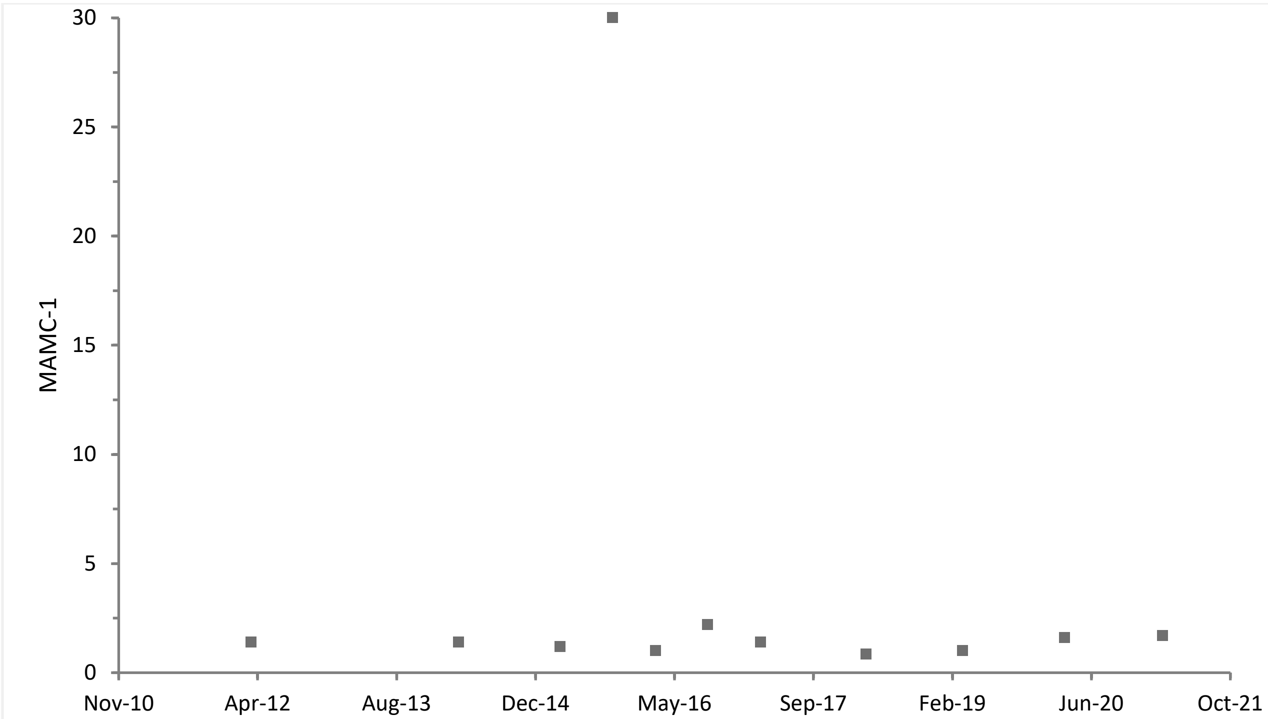


LC-219

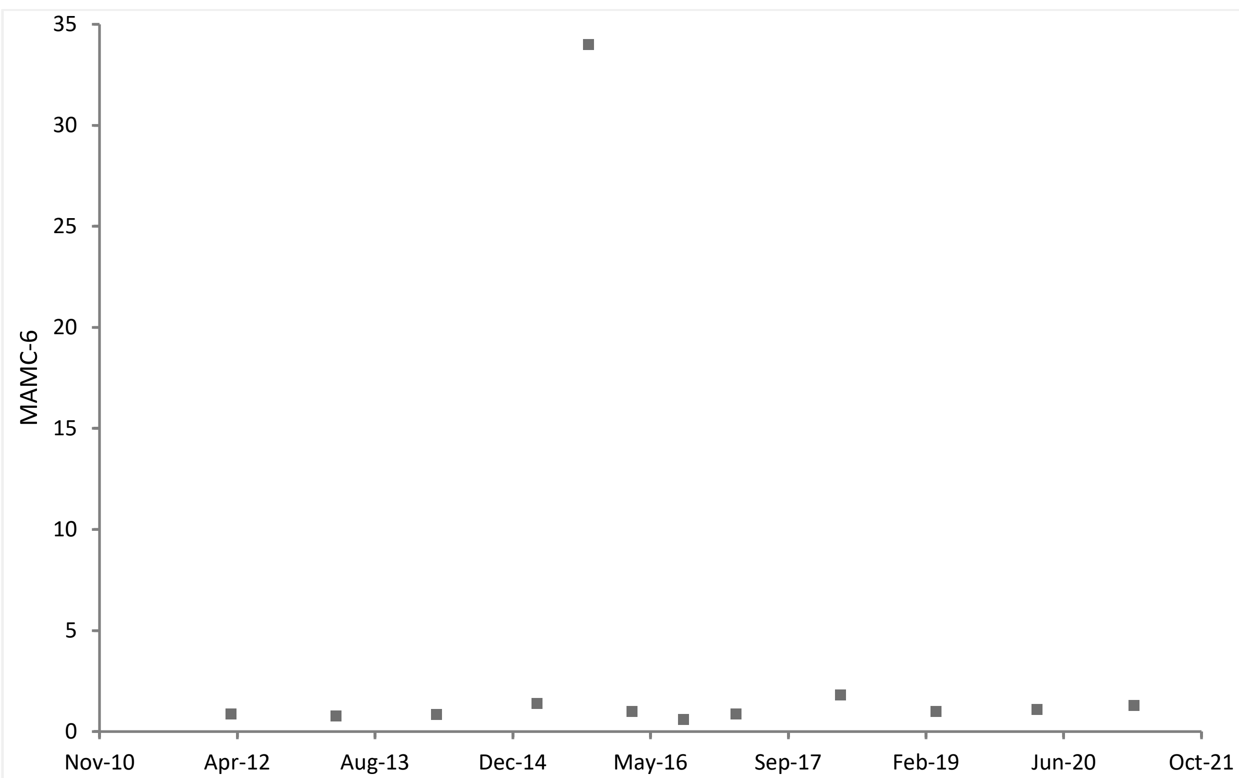


Appendix E - Log RAM Statistics, 2012-2021
Mann-Kendall Scatter Plots – Lower Vashon Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

MAMC-1

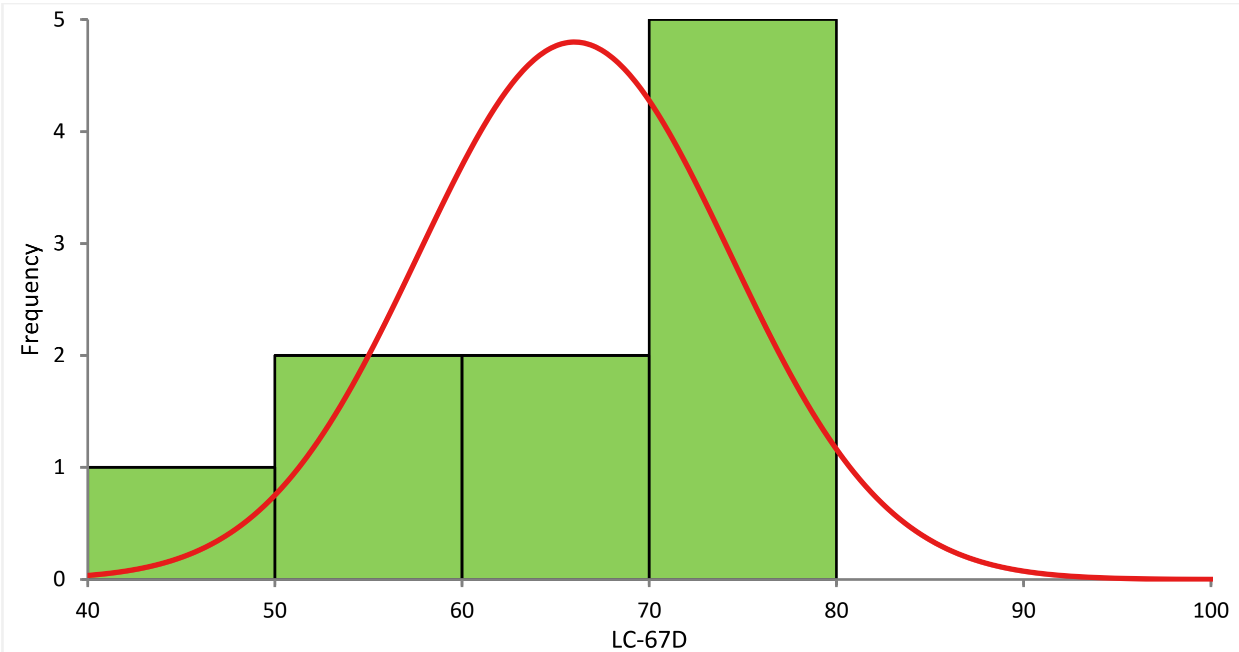


MAMC-6



Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-67D



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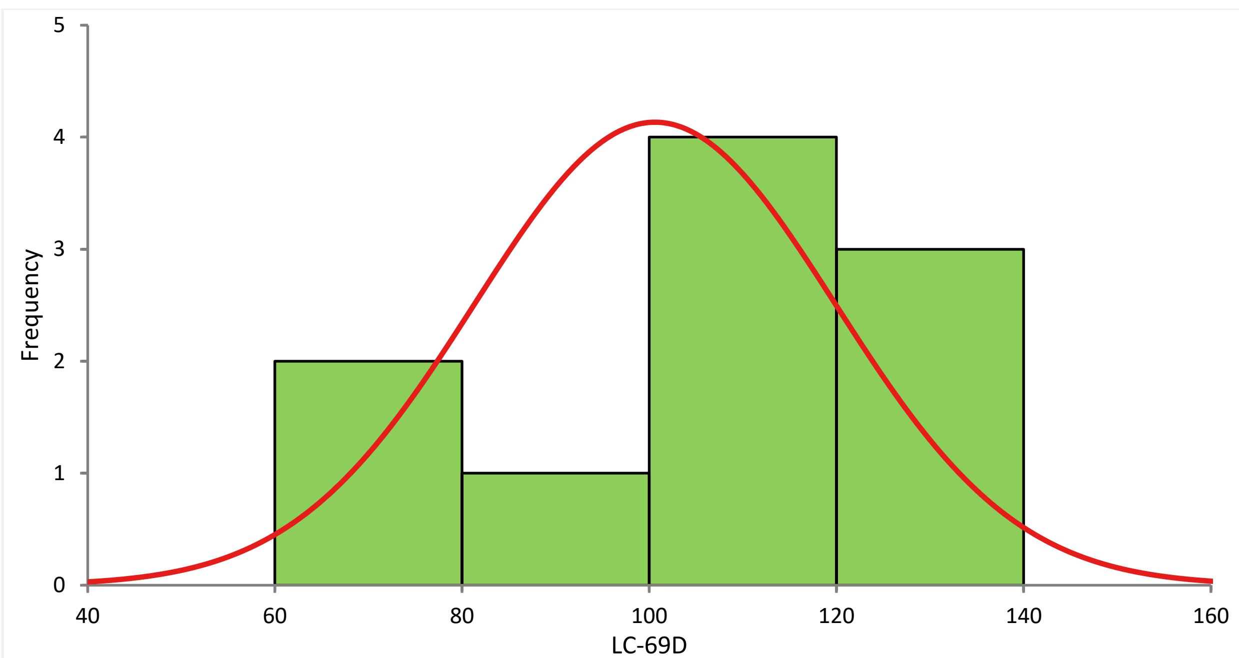
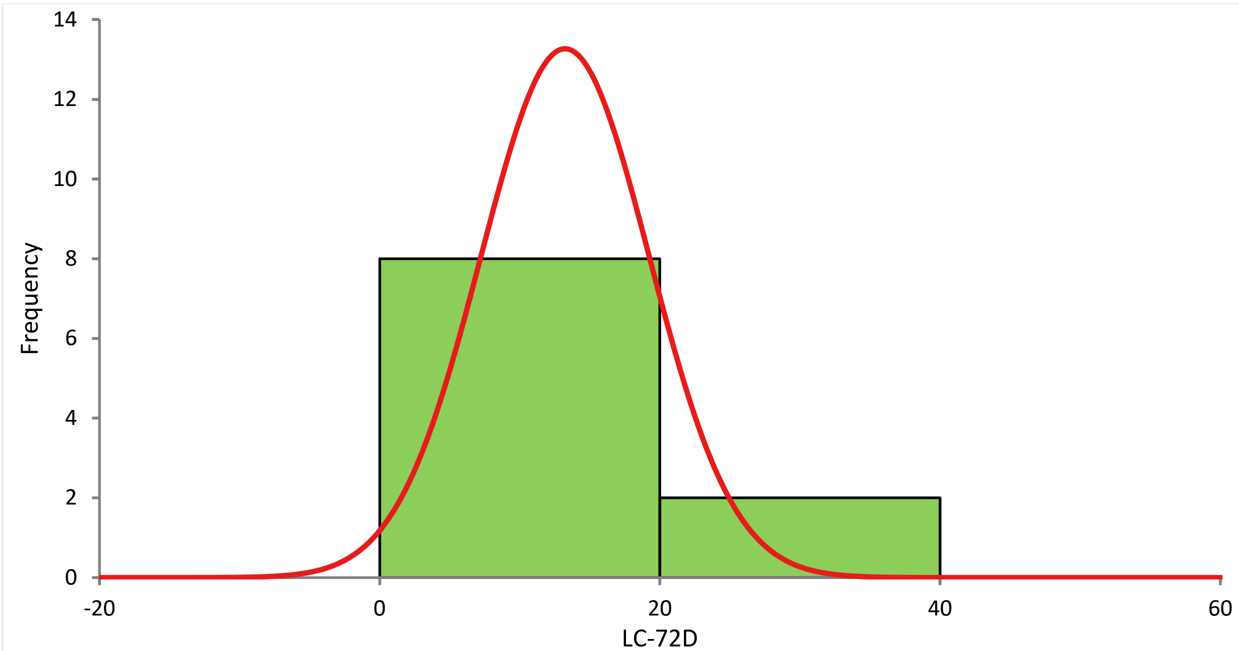
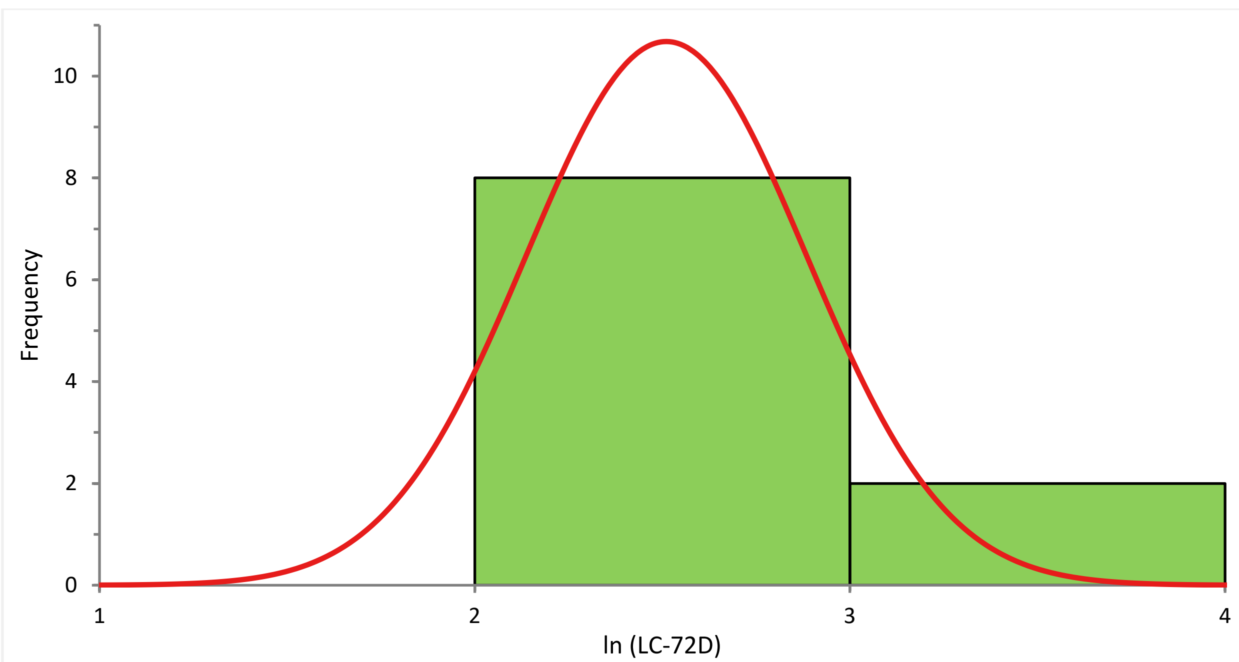


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-72D

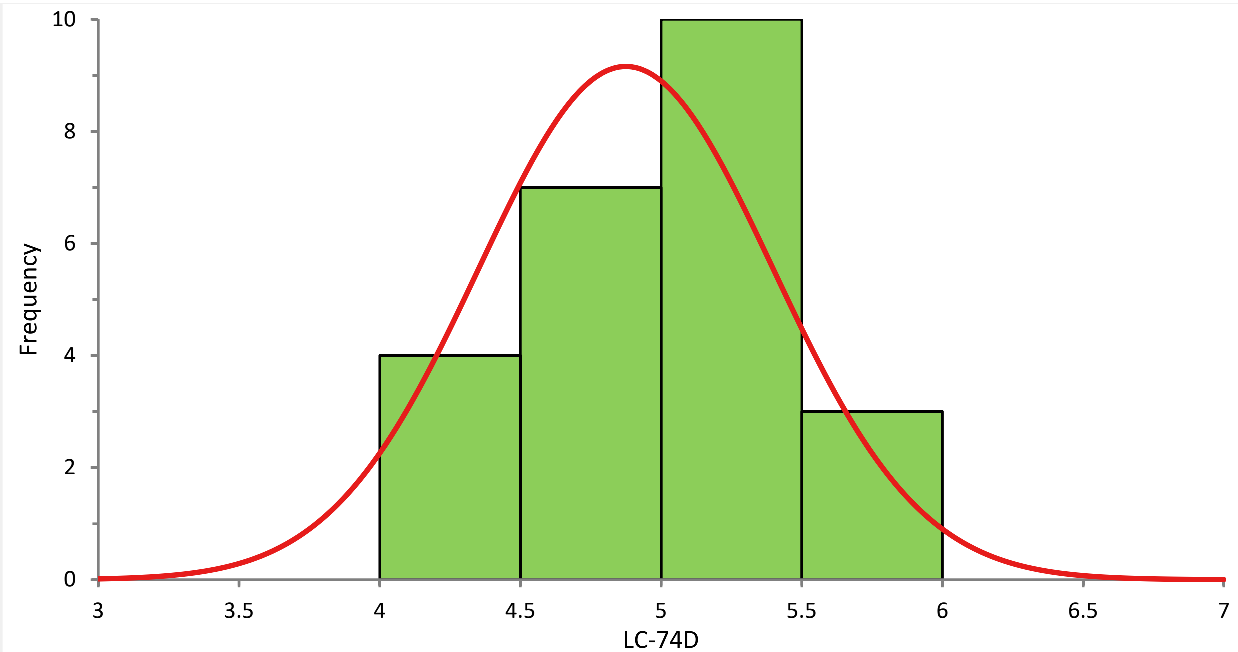


ln(LC-72D)

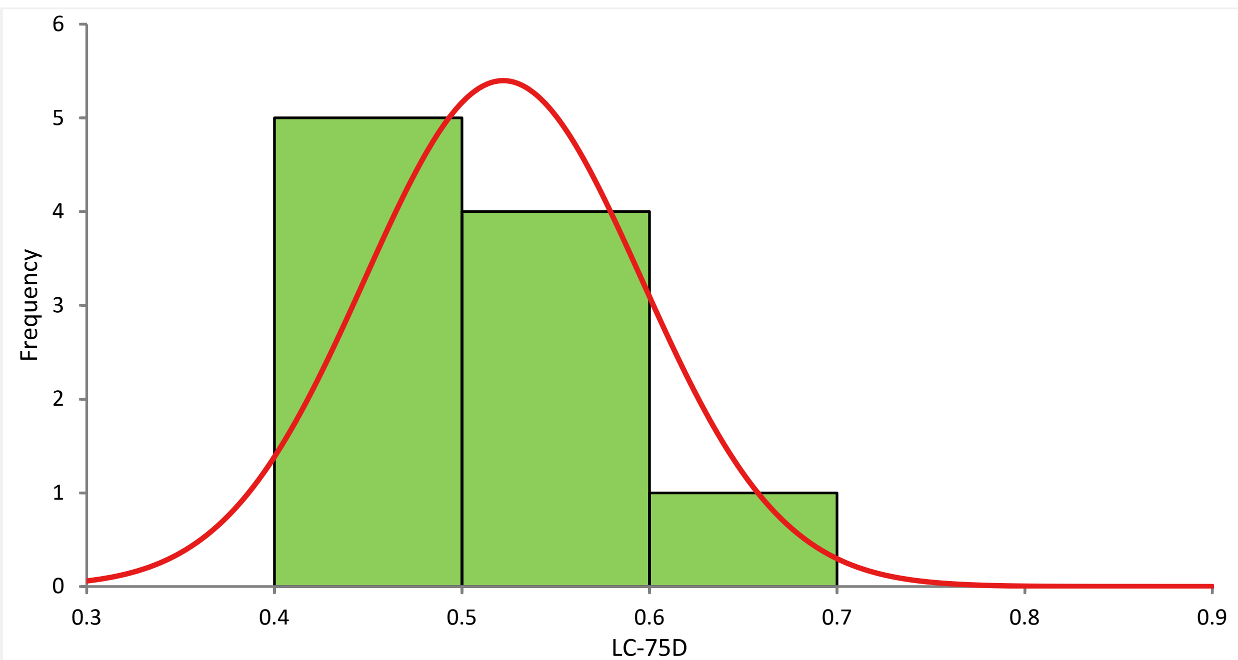


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-74D

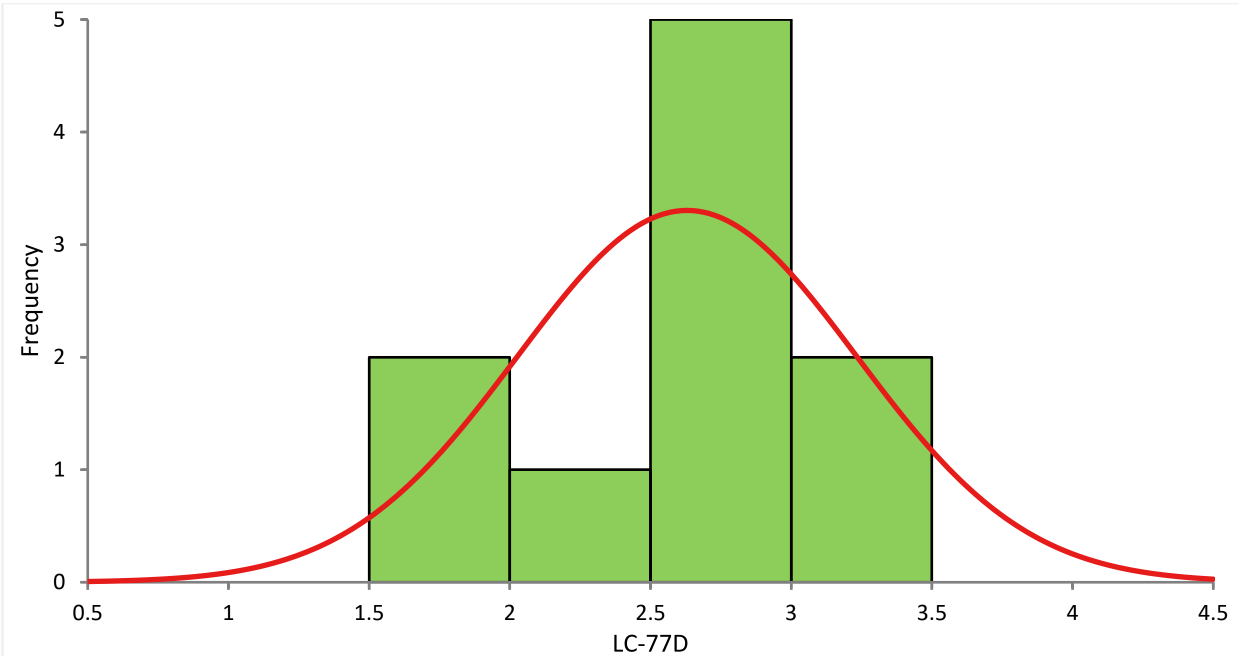


LC-75D

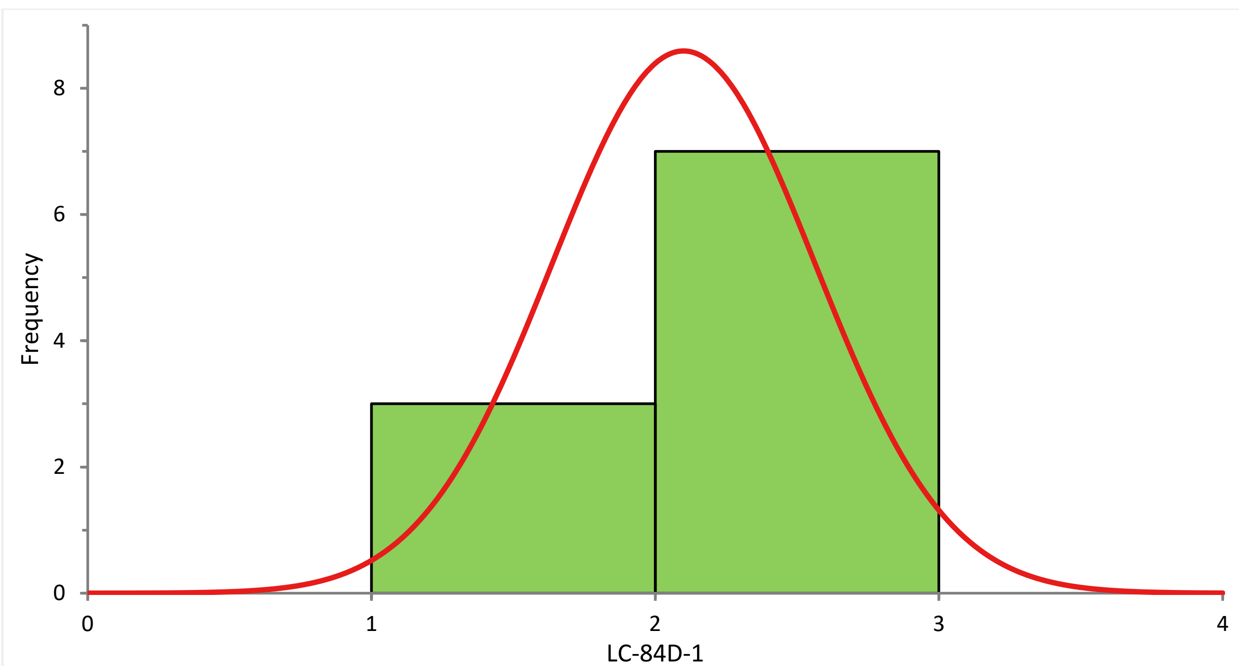


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-77D

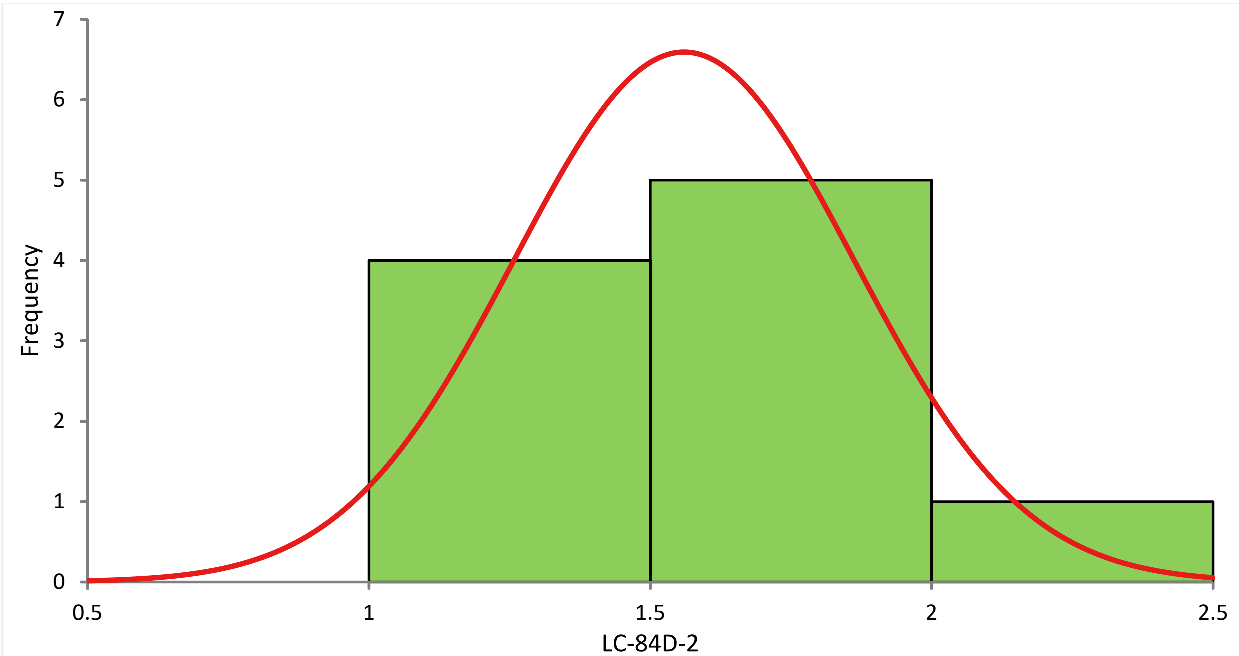


LC-84D-1



Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-84D-2



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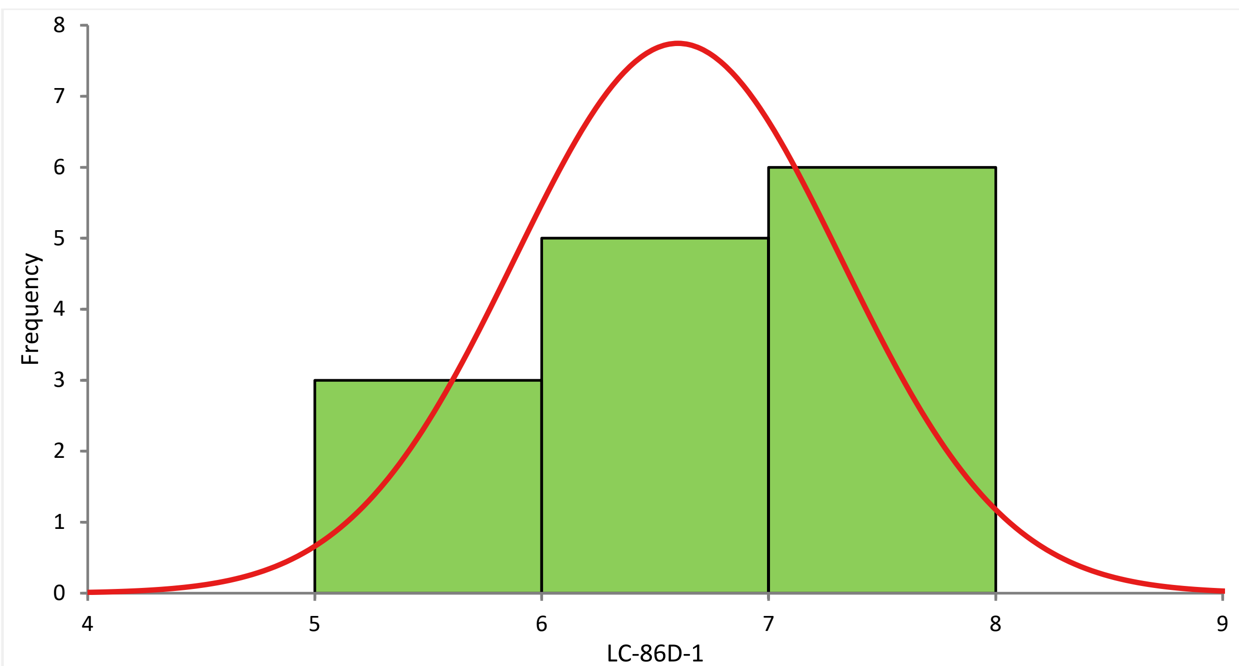
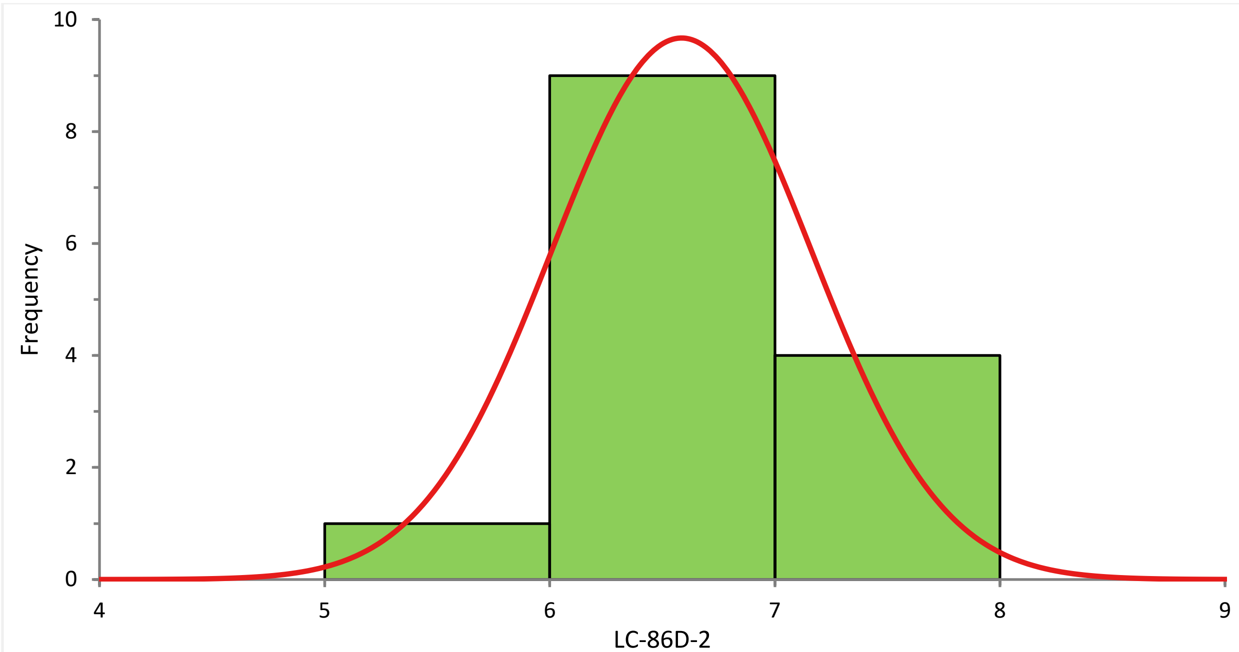


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-86D-2



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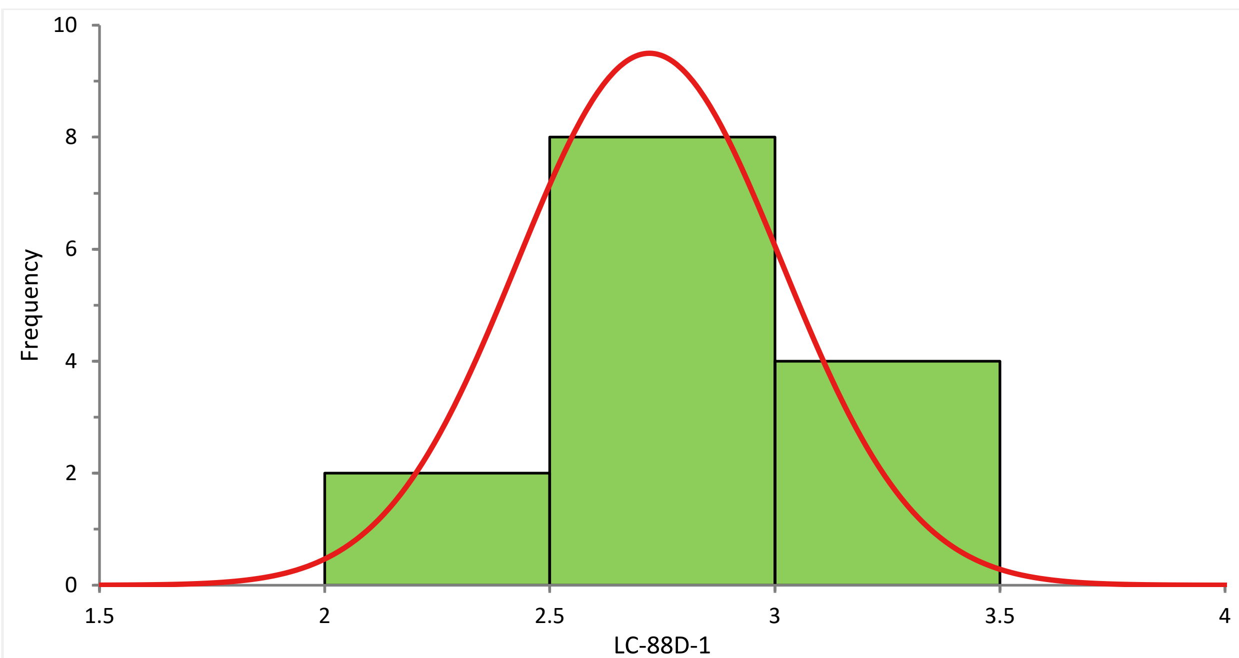
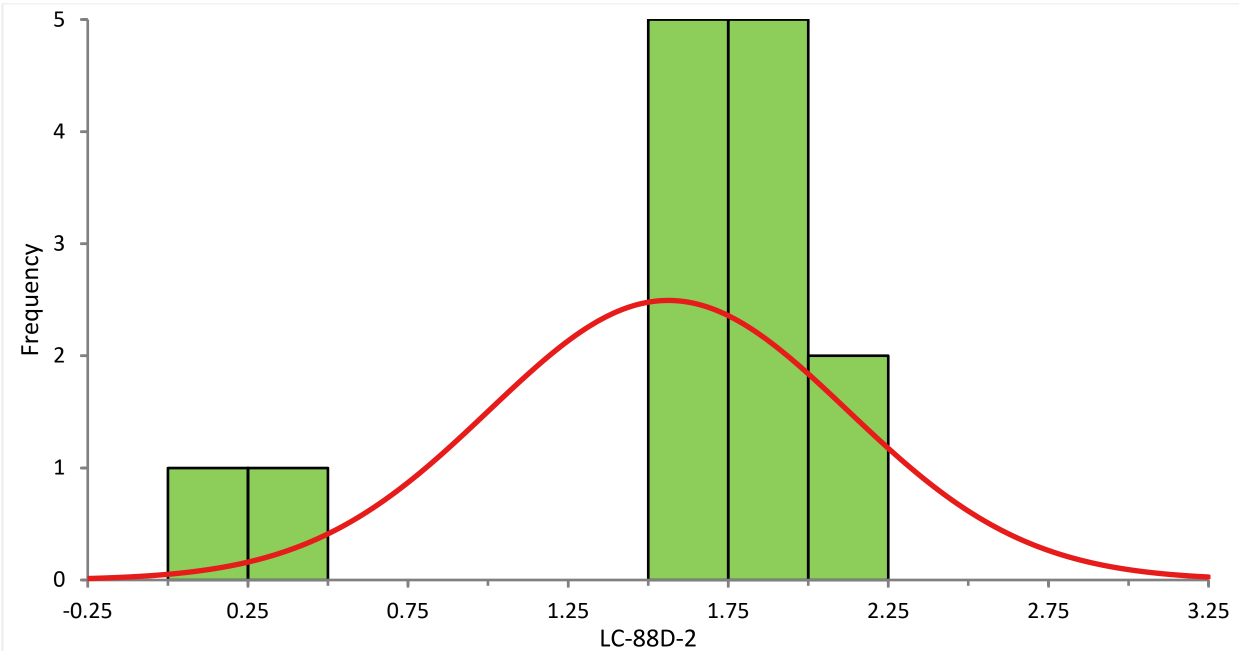


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-88D-2



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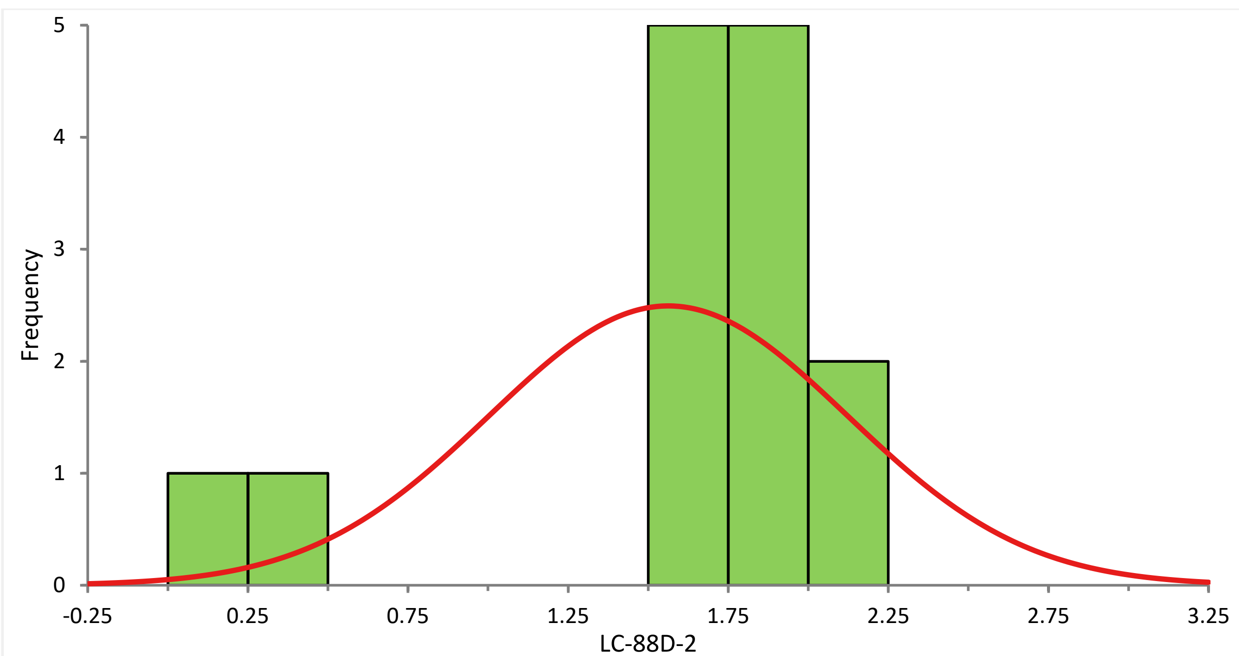
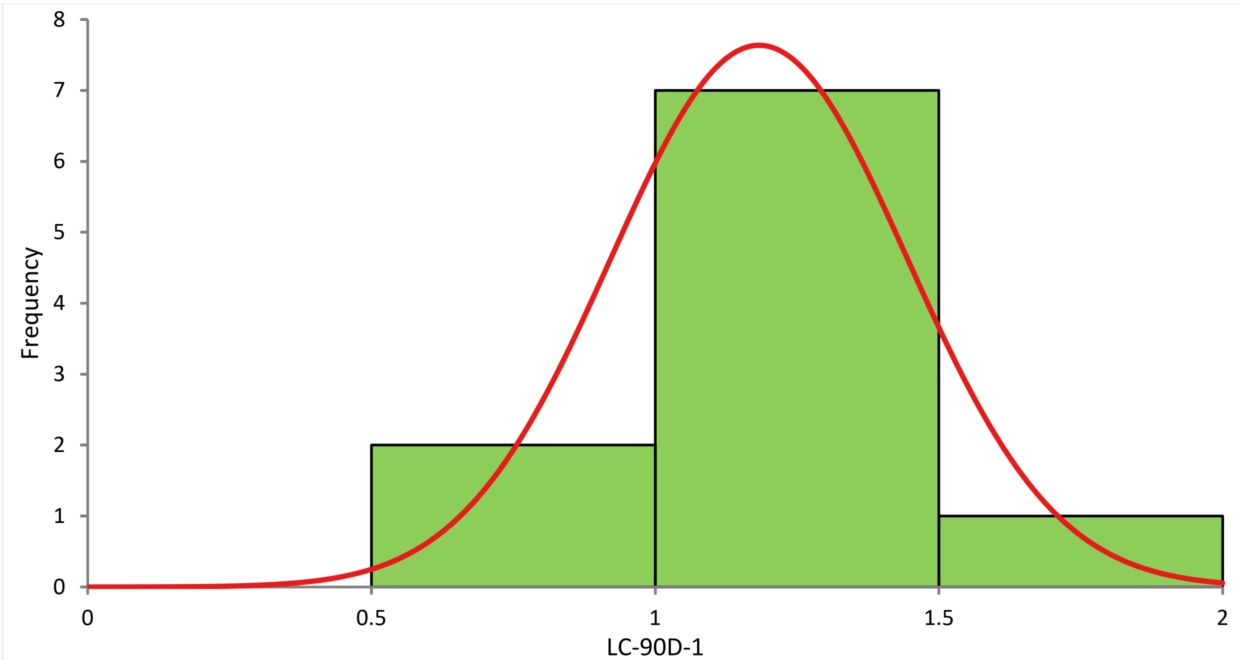


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-90D-1



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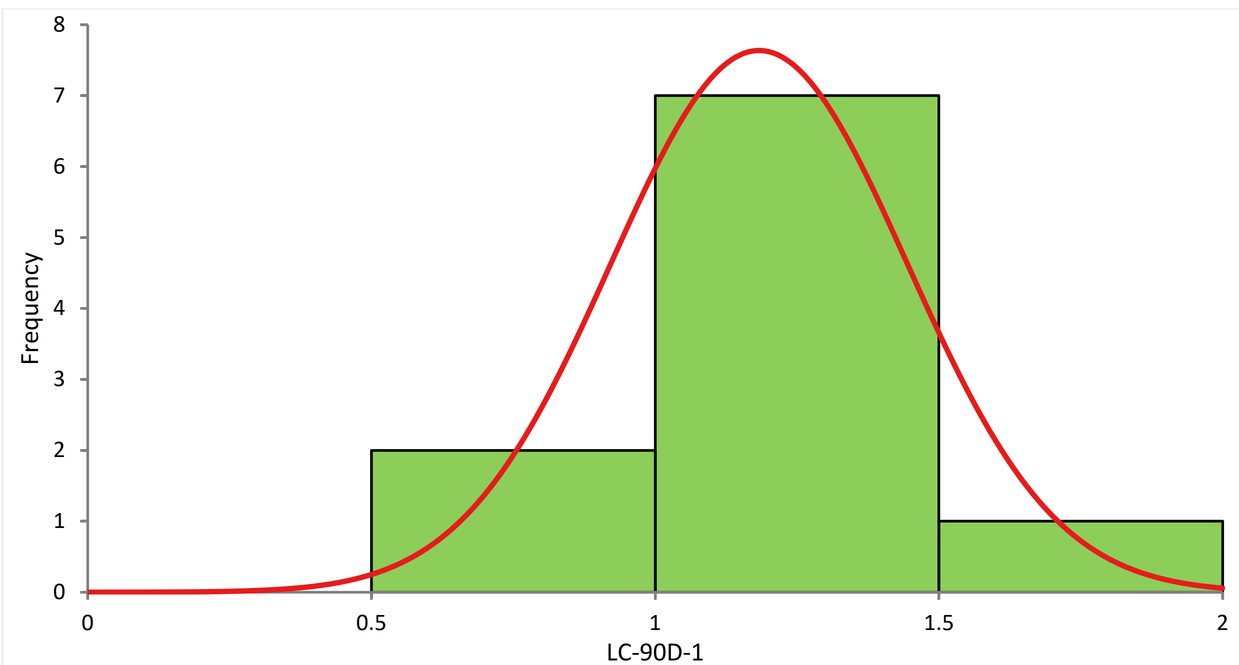
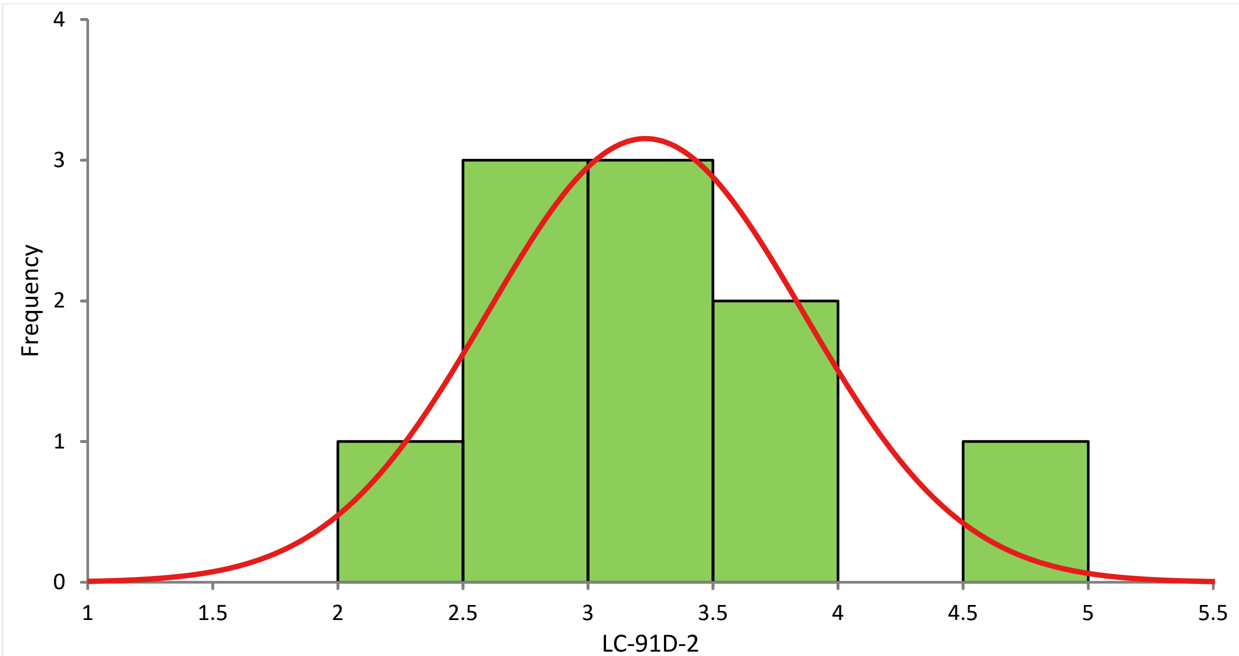


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-91D-2



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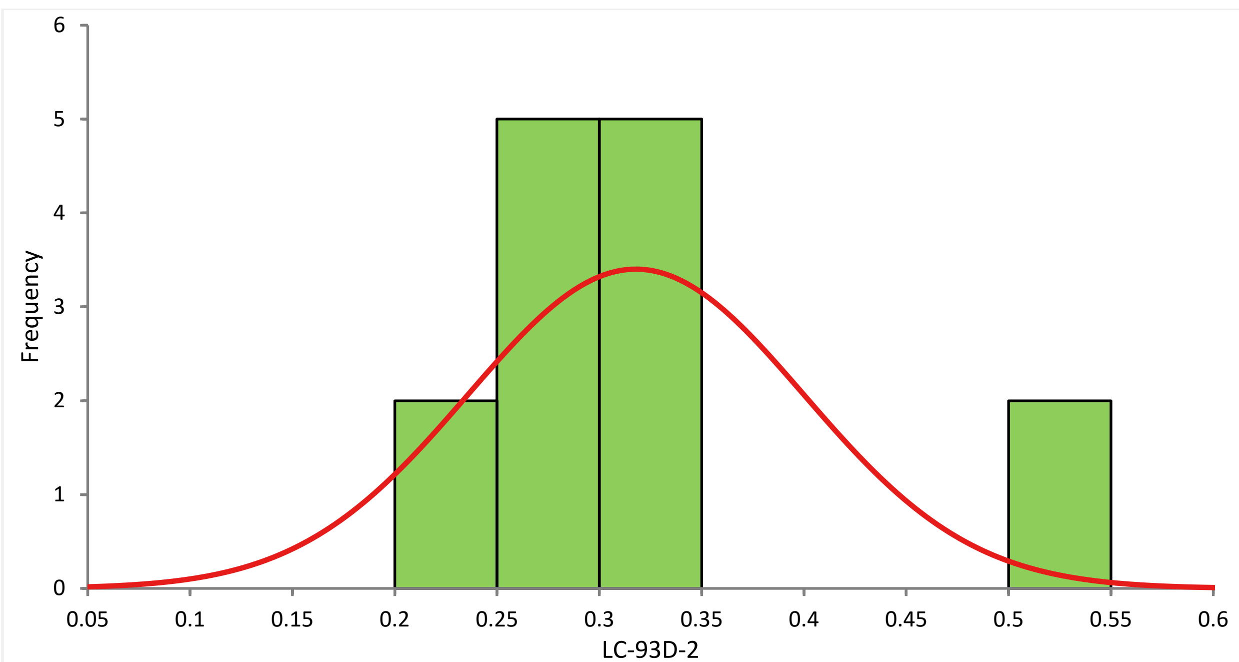
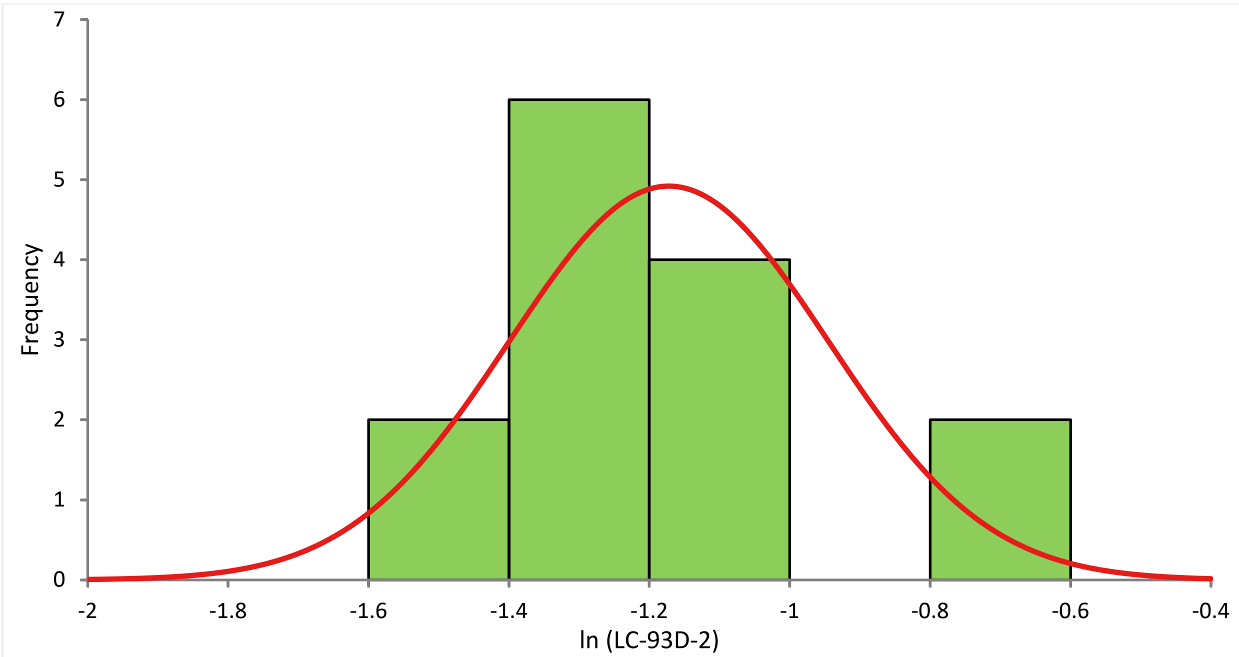


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(LC-93D-2)



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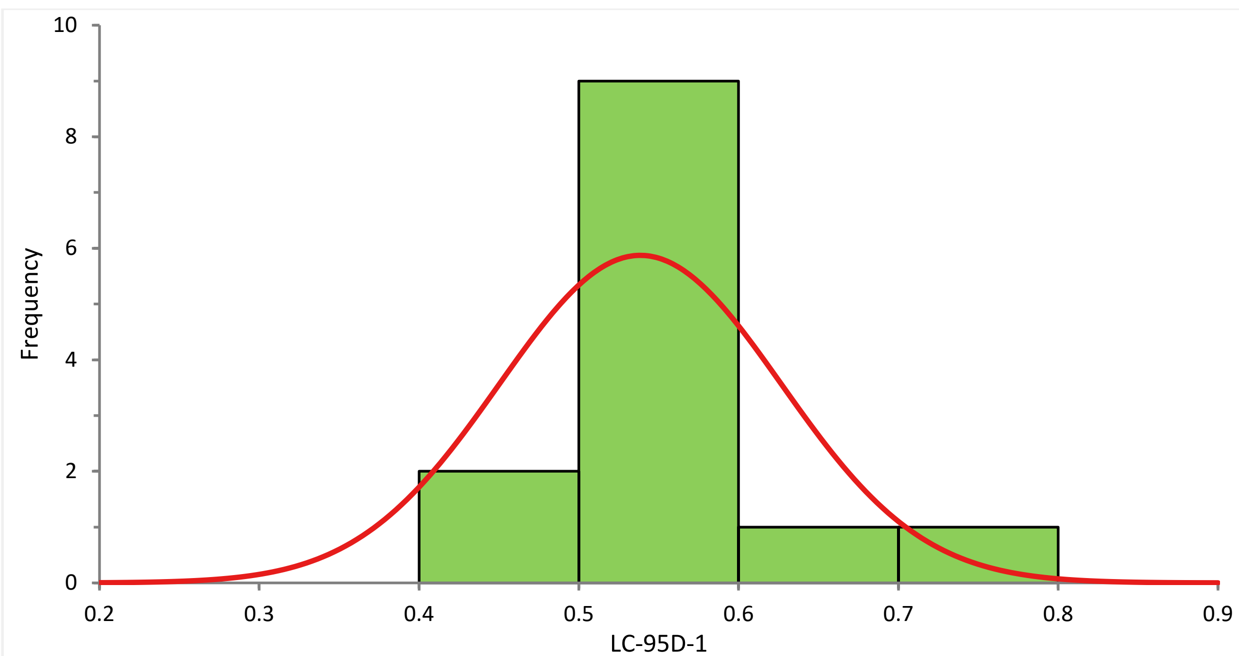
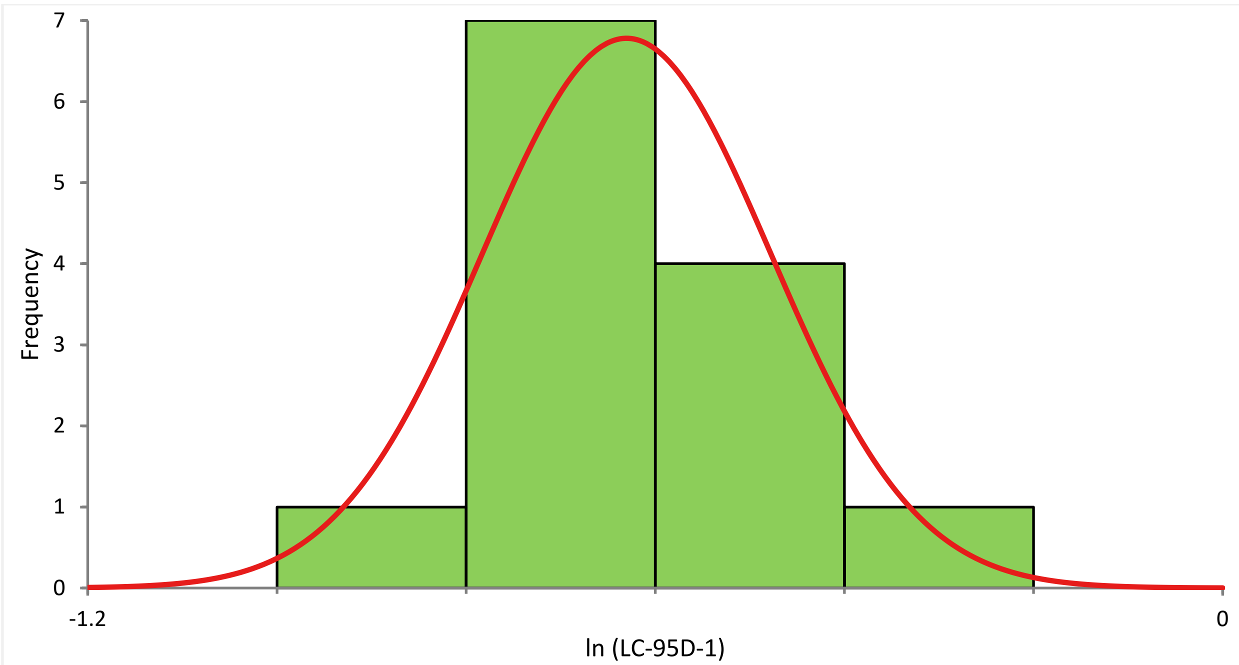


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(LC-95D-1)



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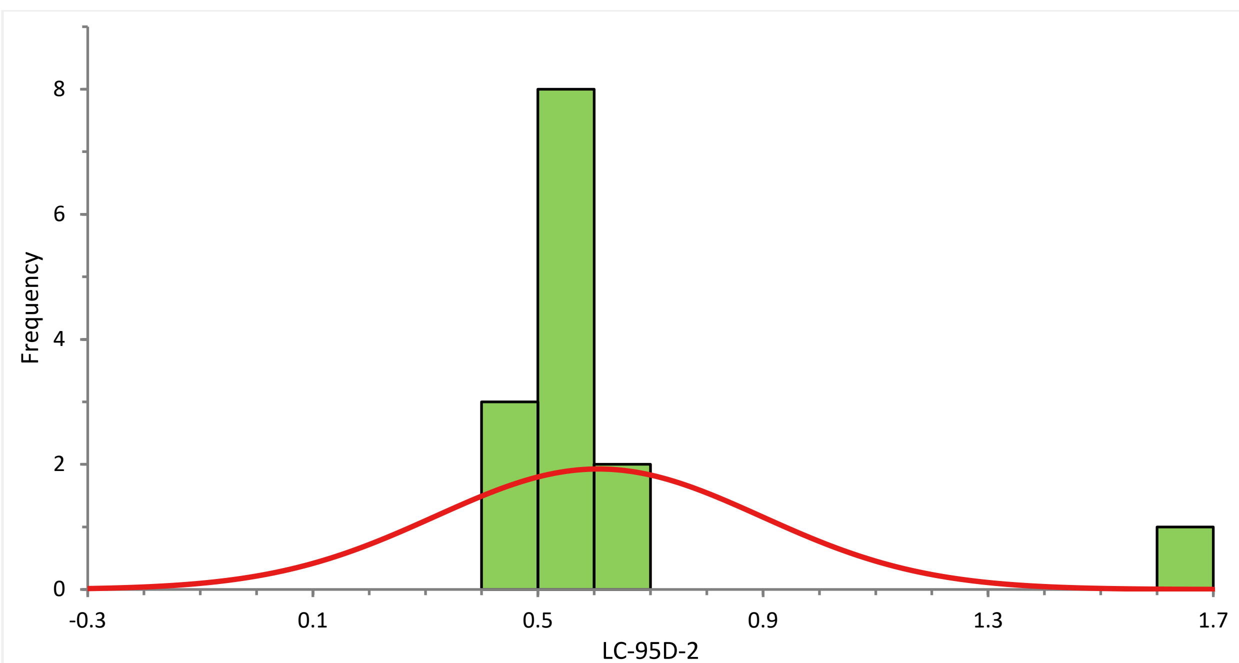

Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

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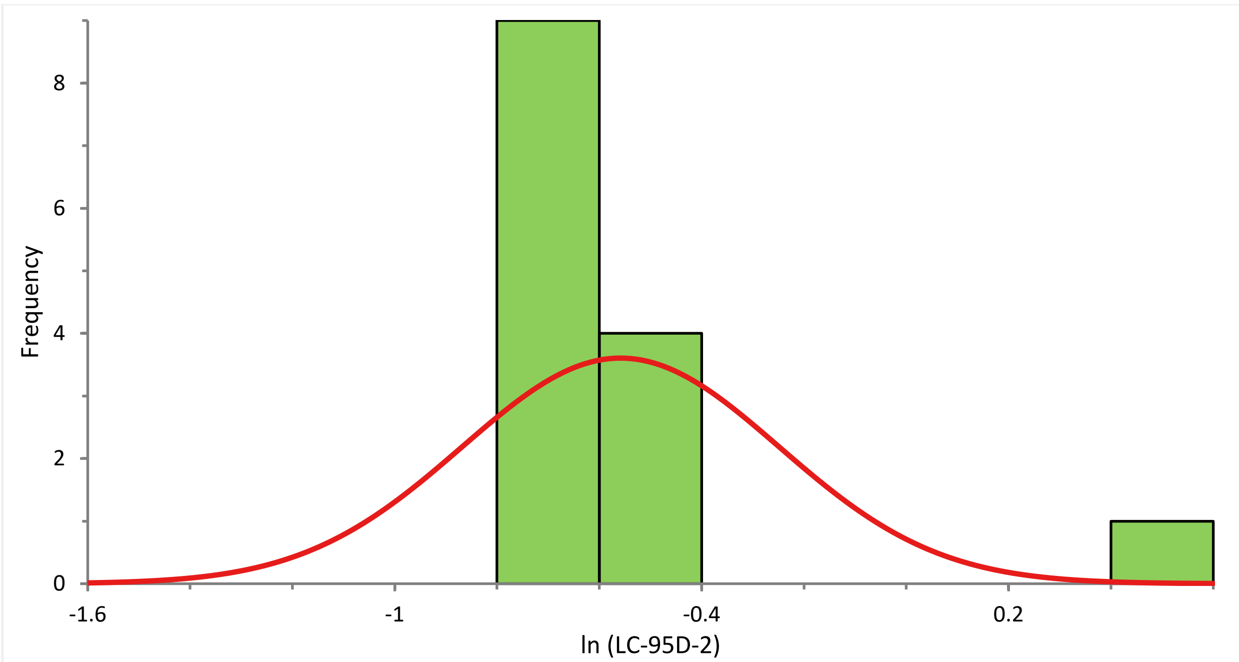

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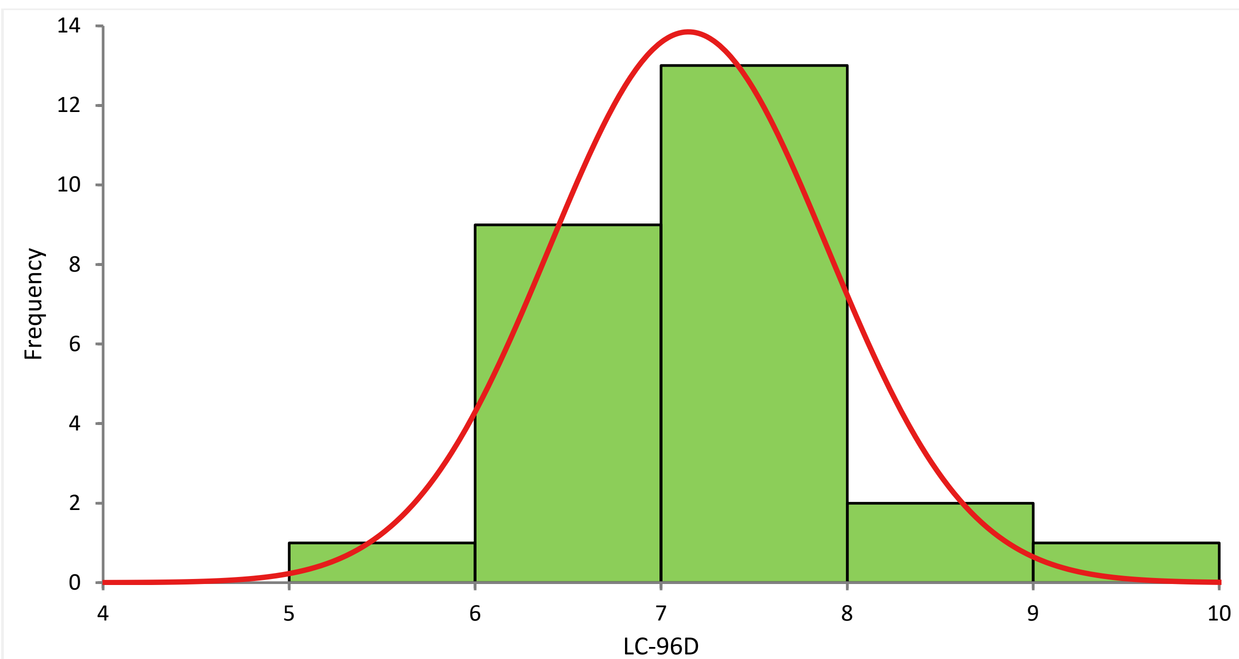
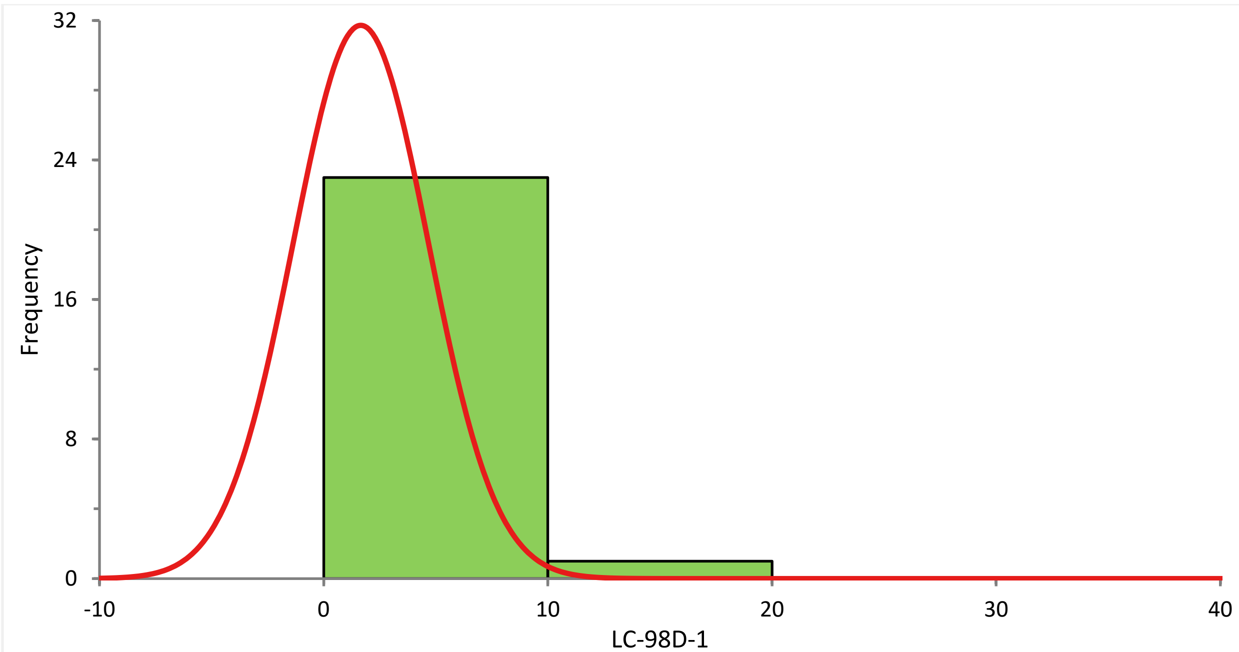


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-98D-1



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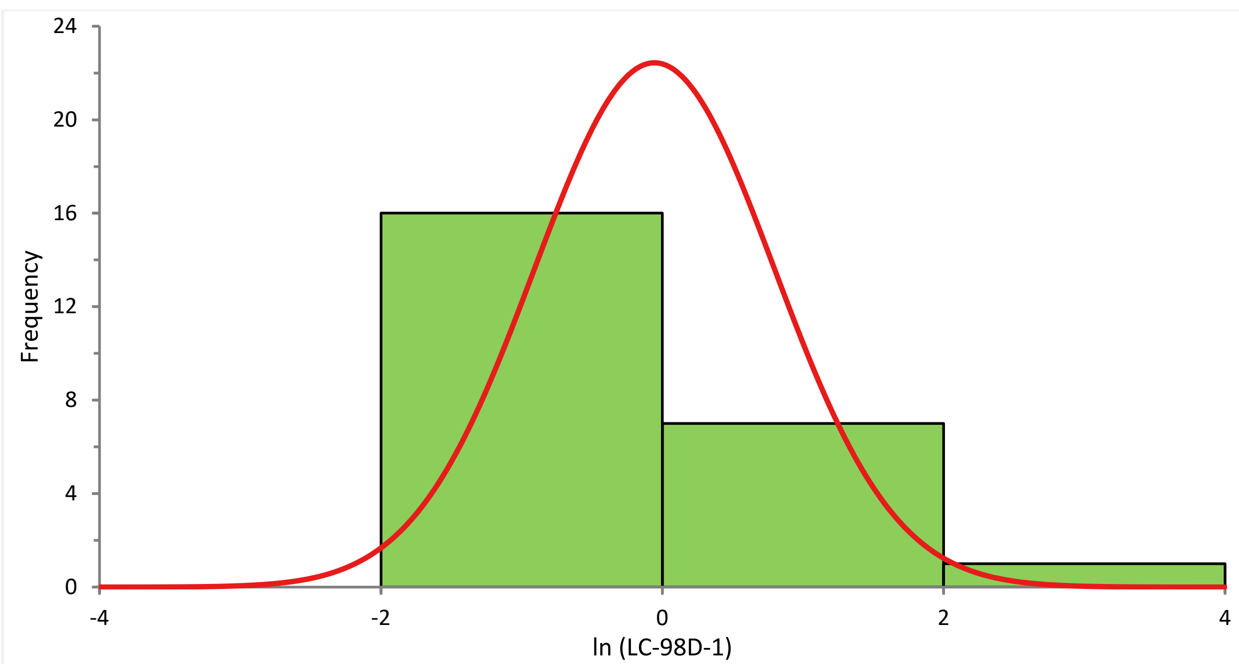
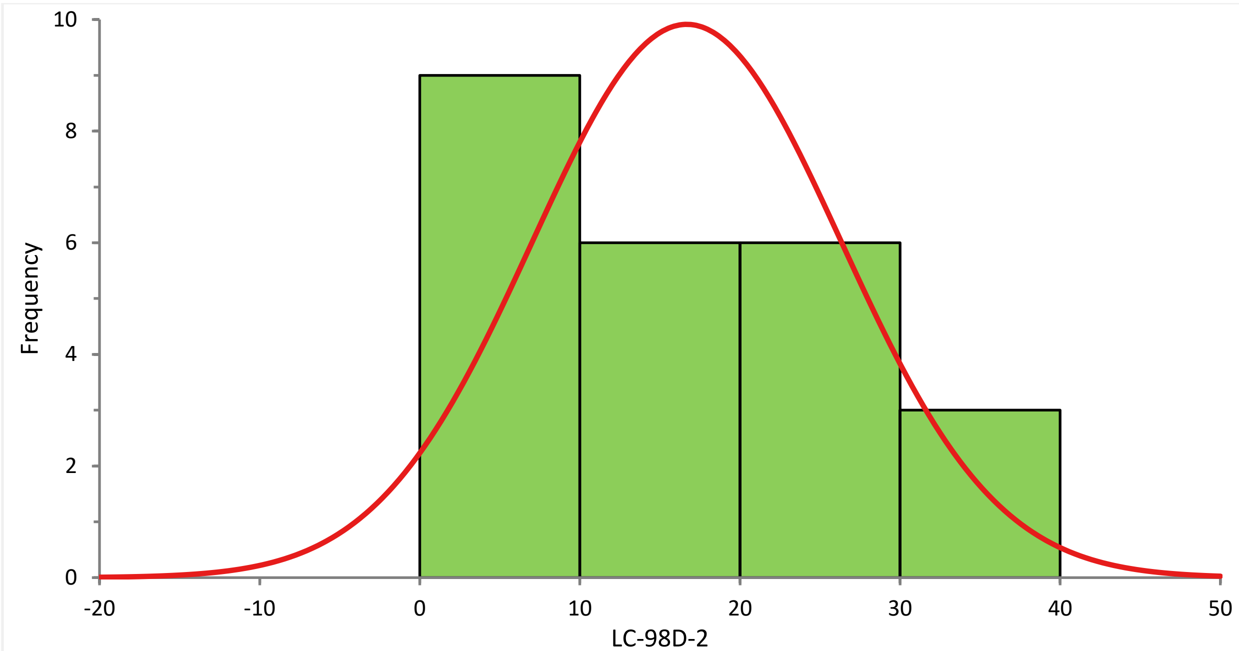


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-98D-2



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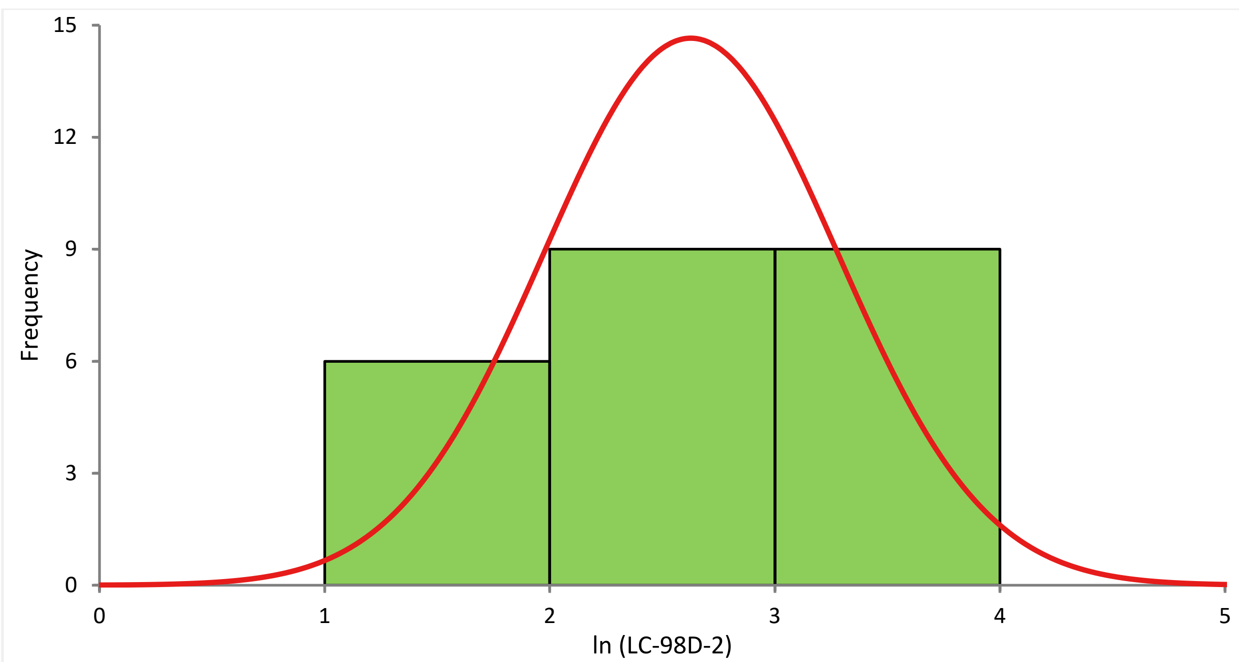
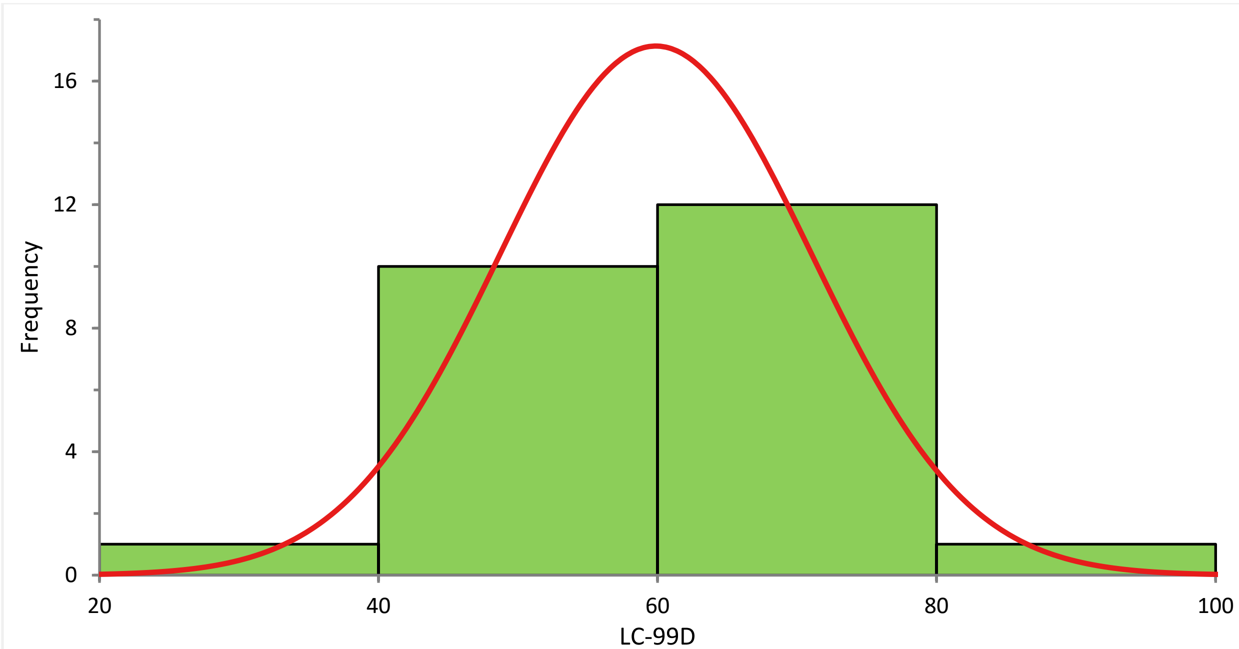


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-99D



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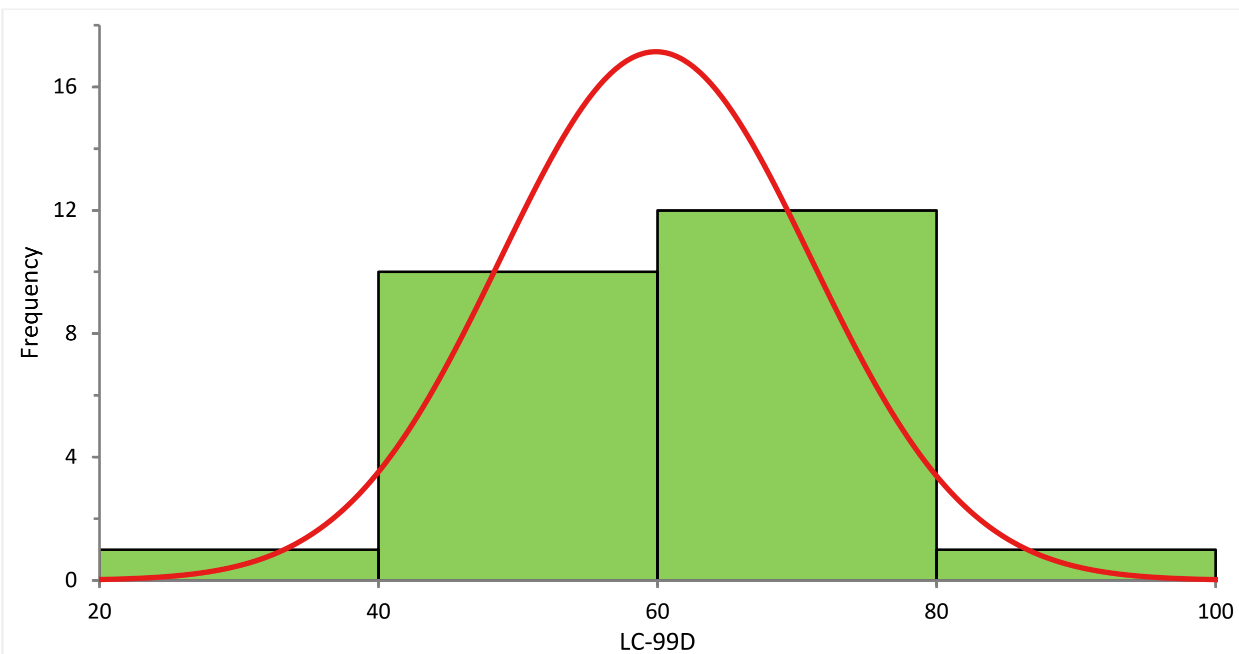
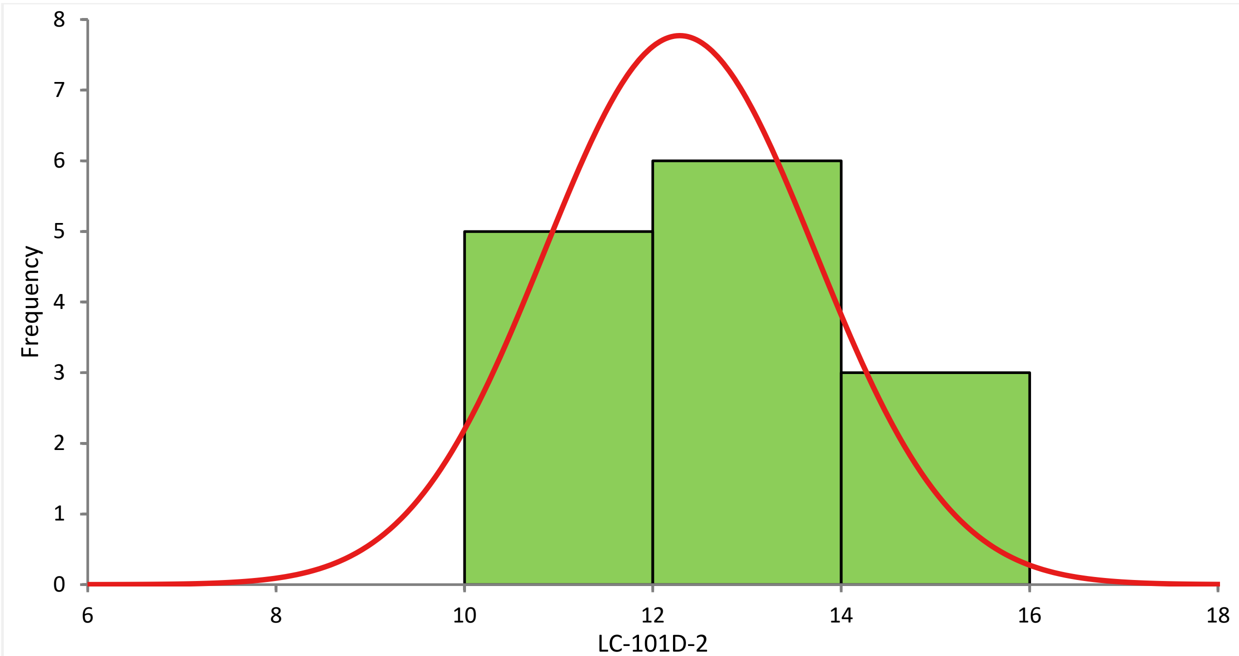
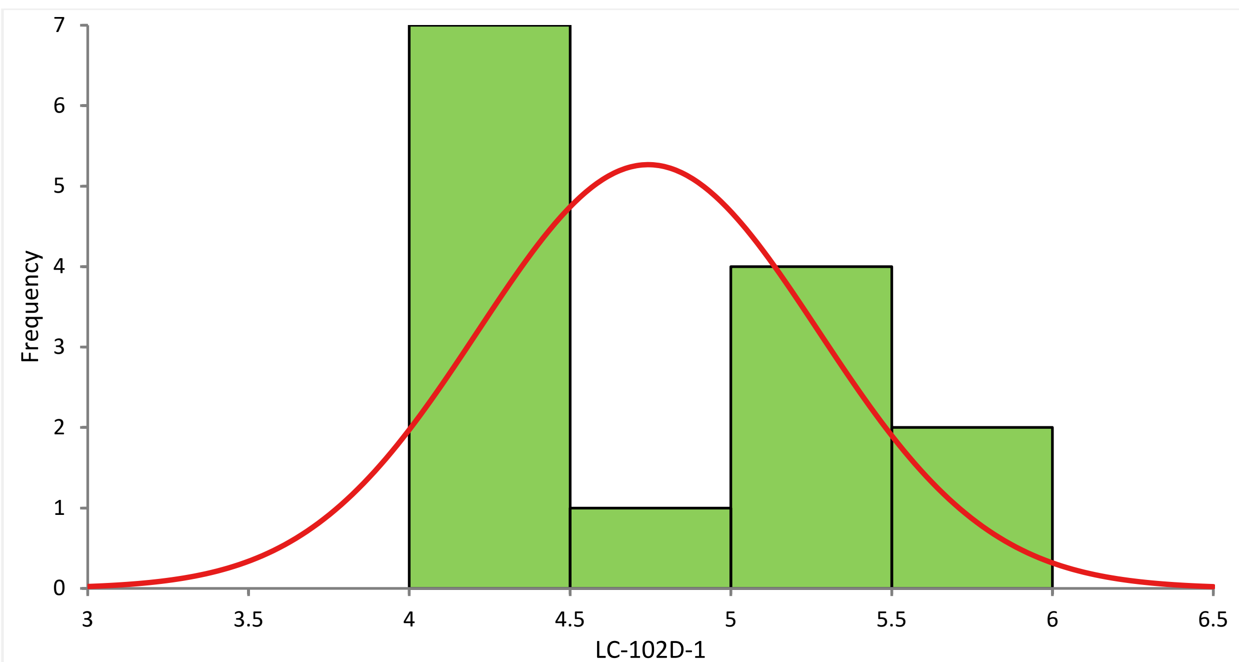


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-101D-2

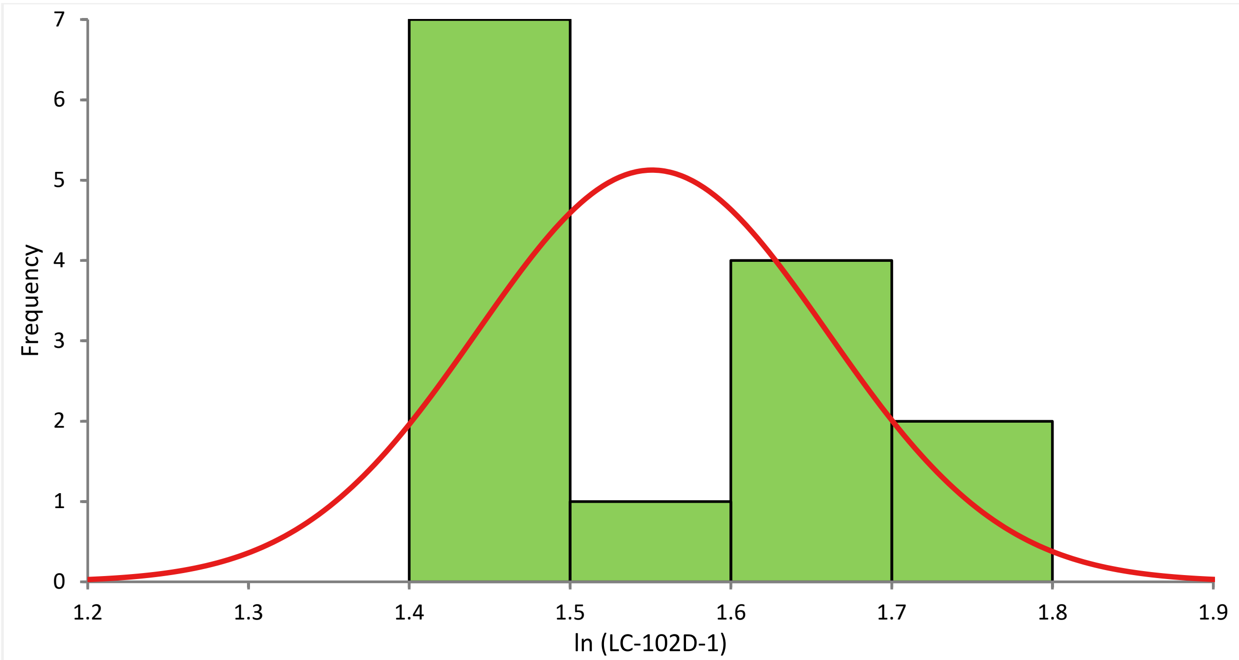


LC-102D-1



Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(LC-102D-1)



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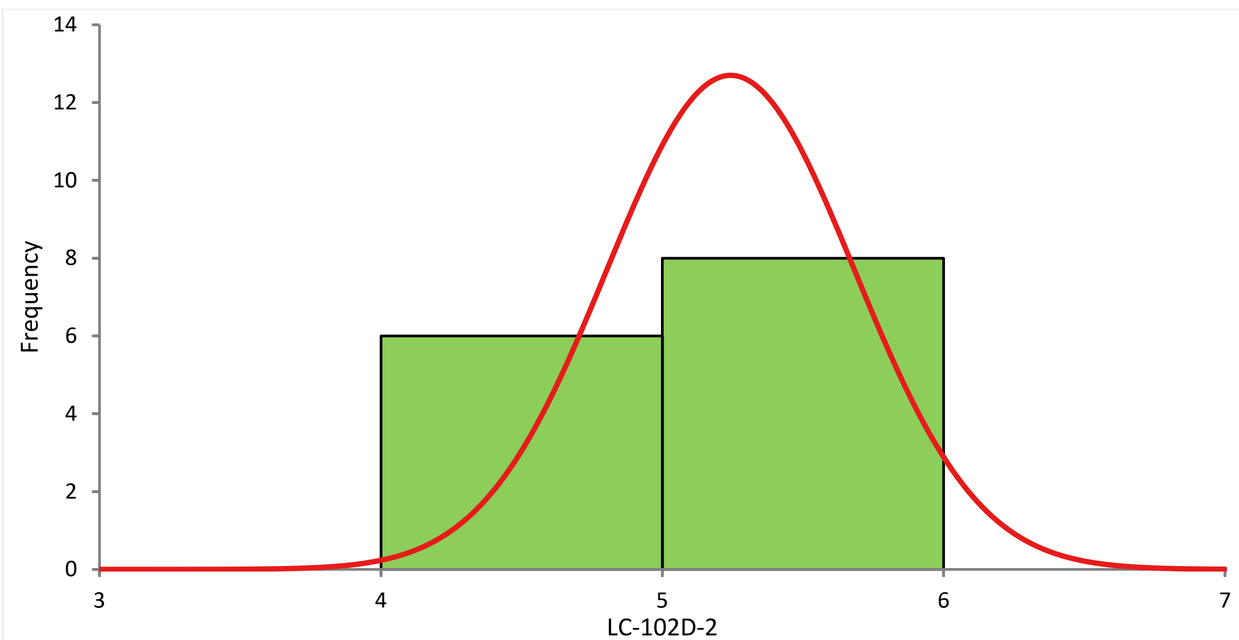
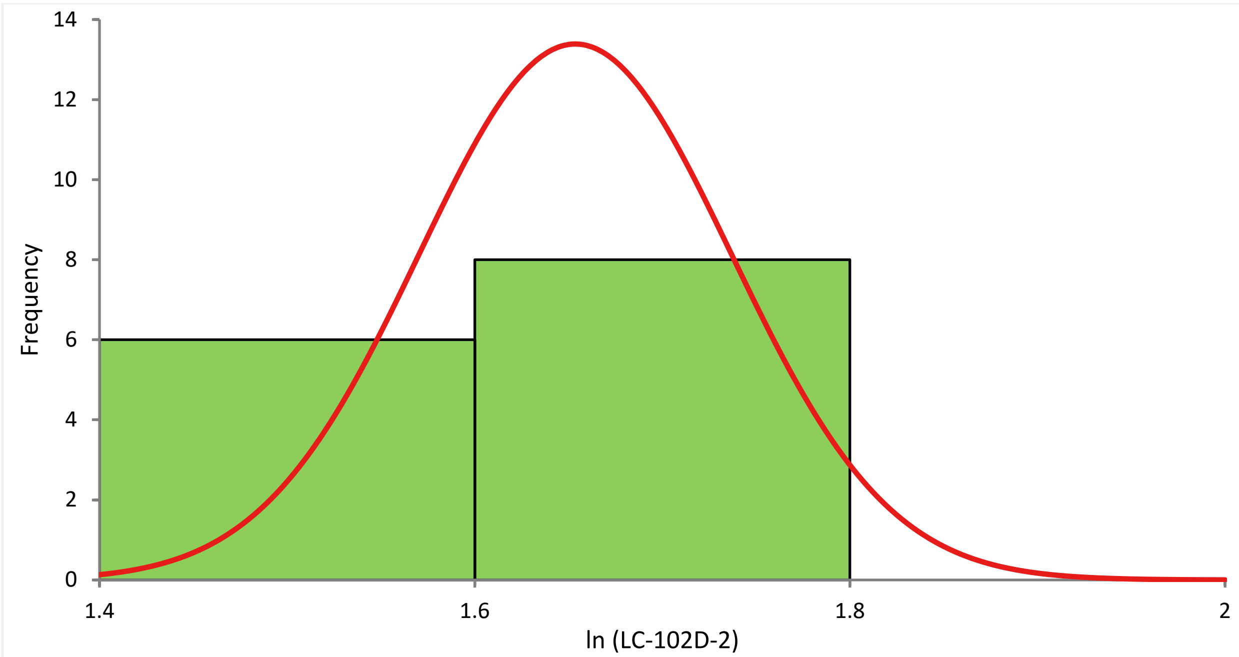
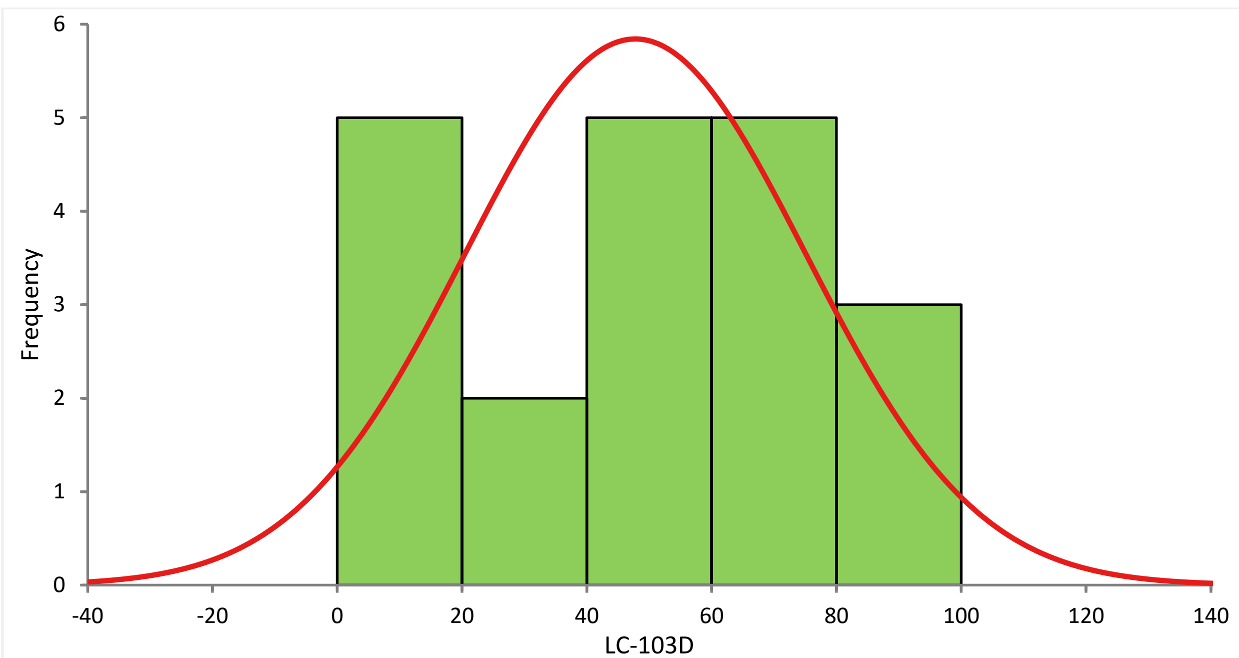


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(LC-102D-2)

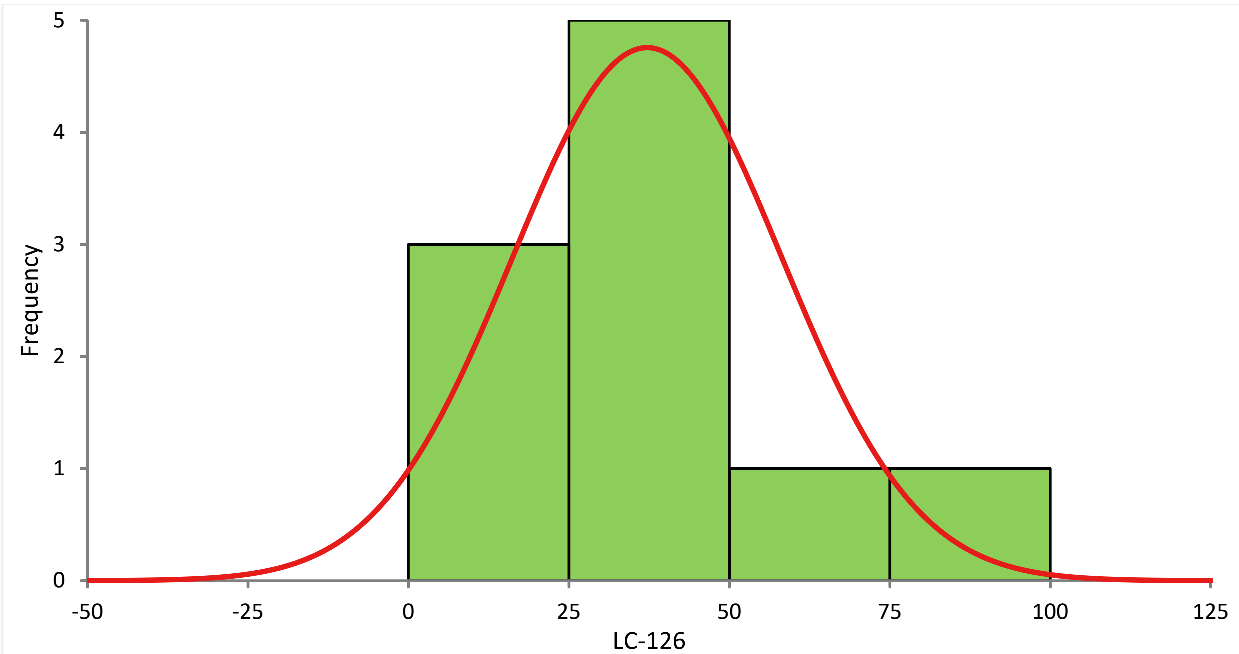


LC-103D

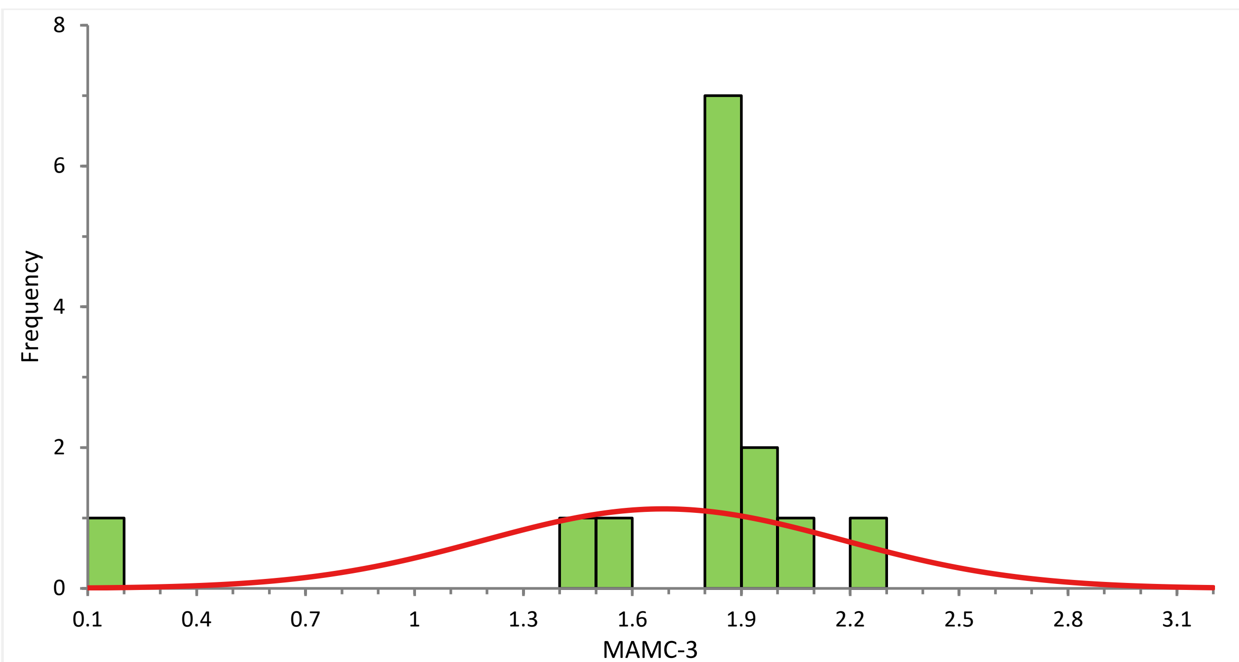


Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-126

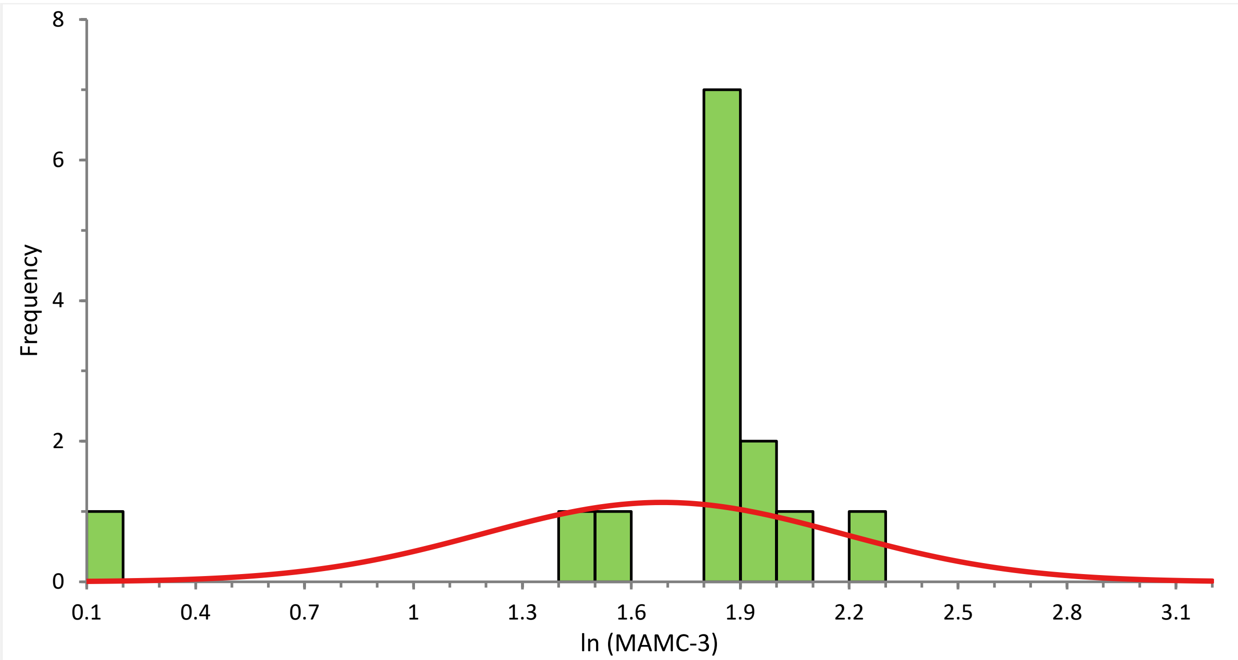


MAMC-3



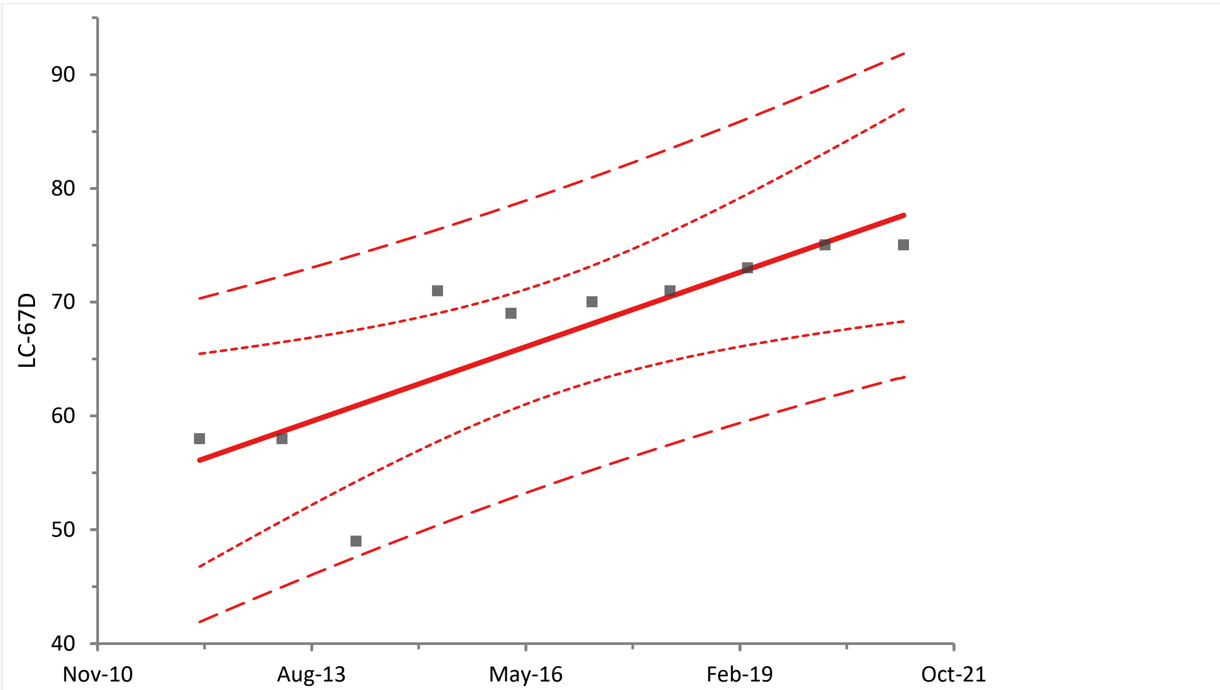
Appendix E - Log RAM Statistics, 2012-2021
Histograms – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

ln(MAMC-3)



Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-67D



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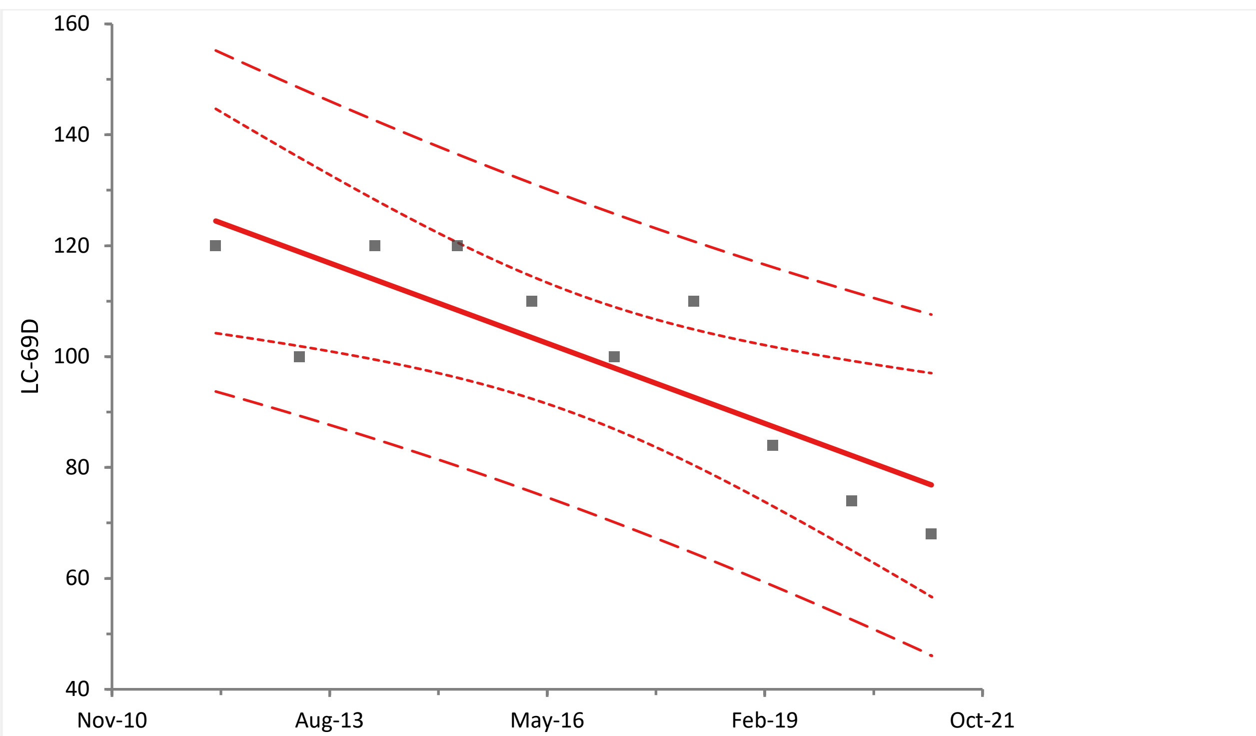
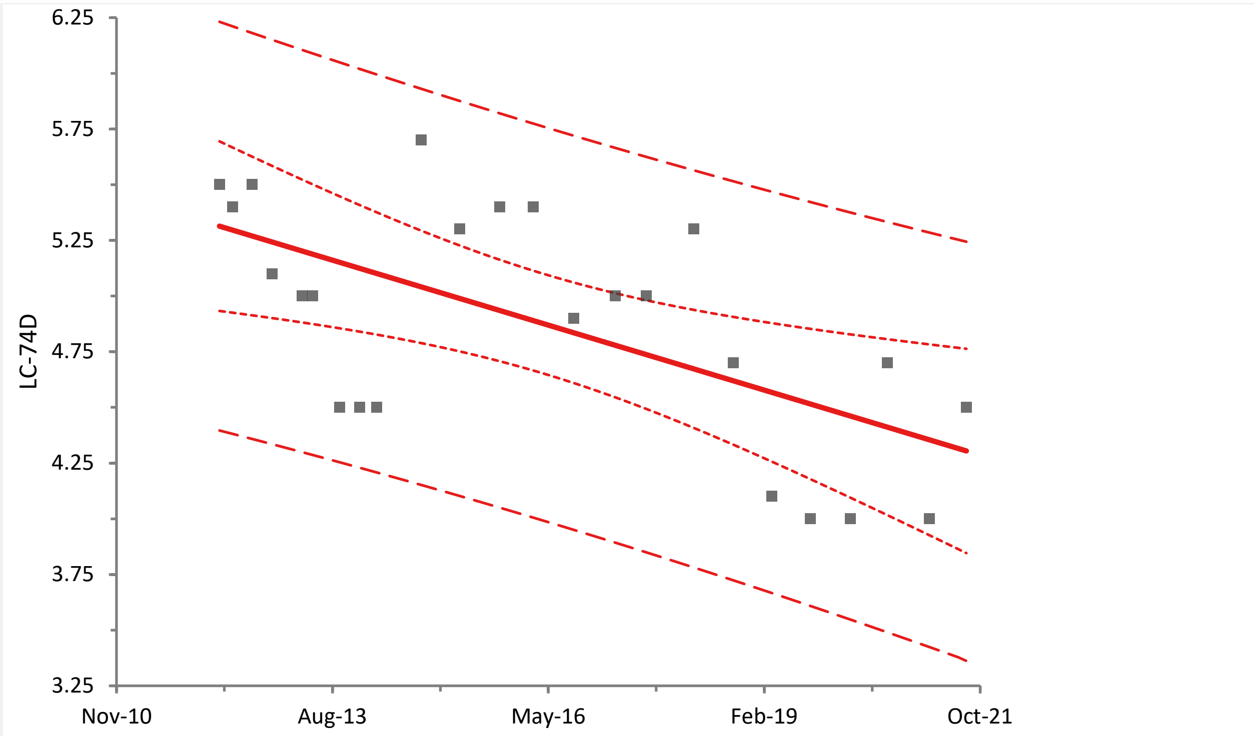


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-74D



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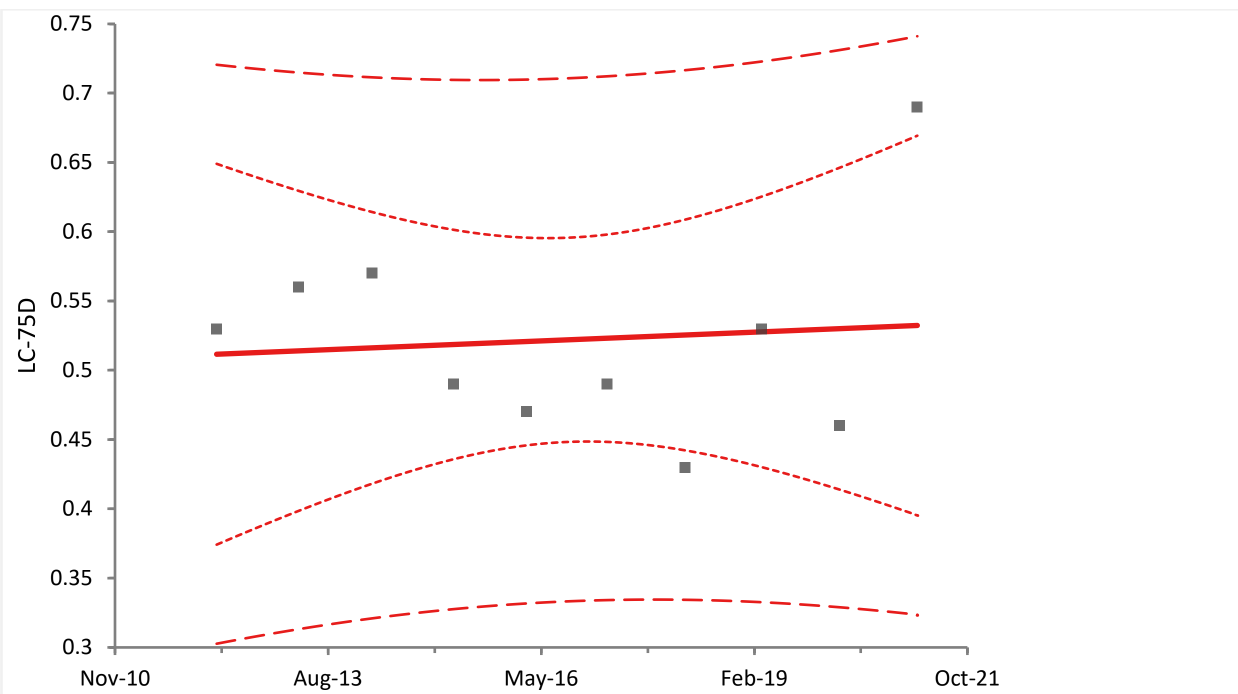
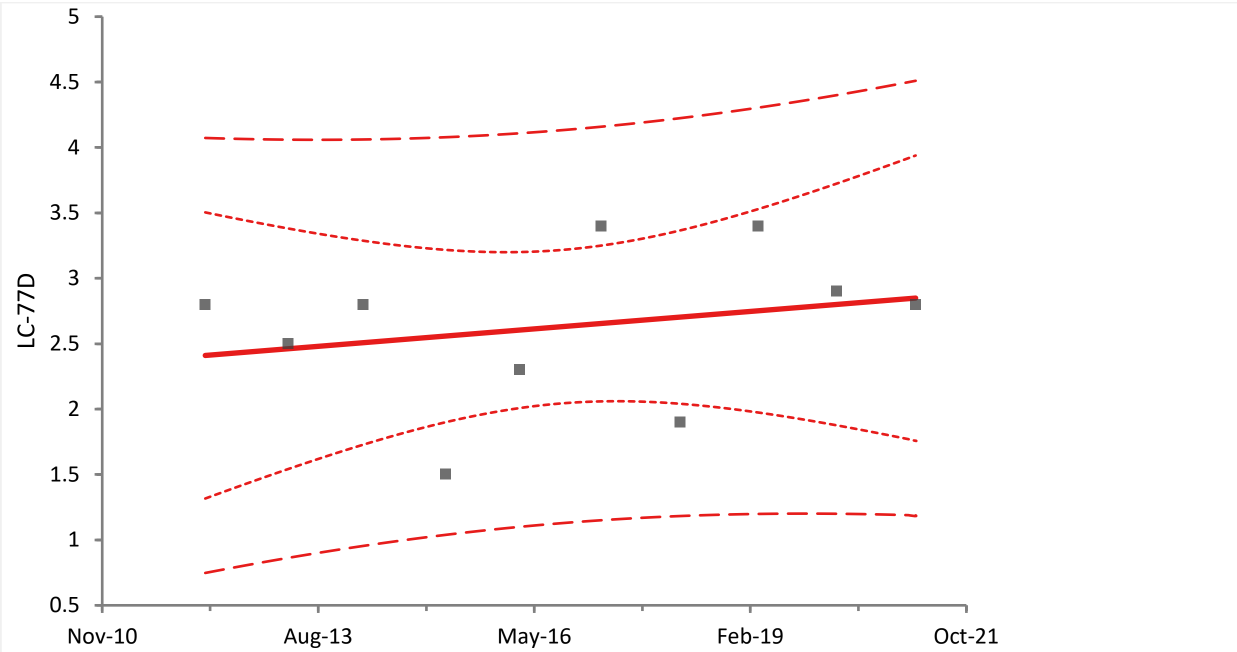
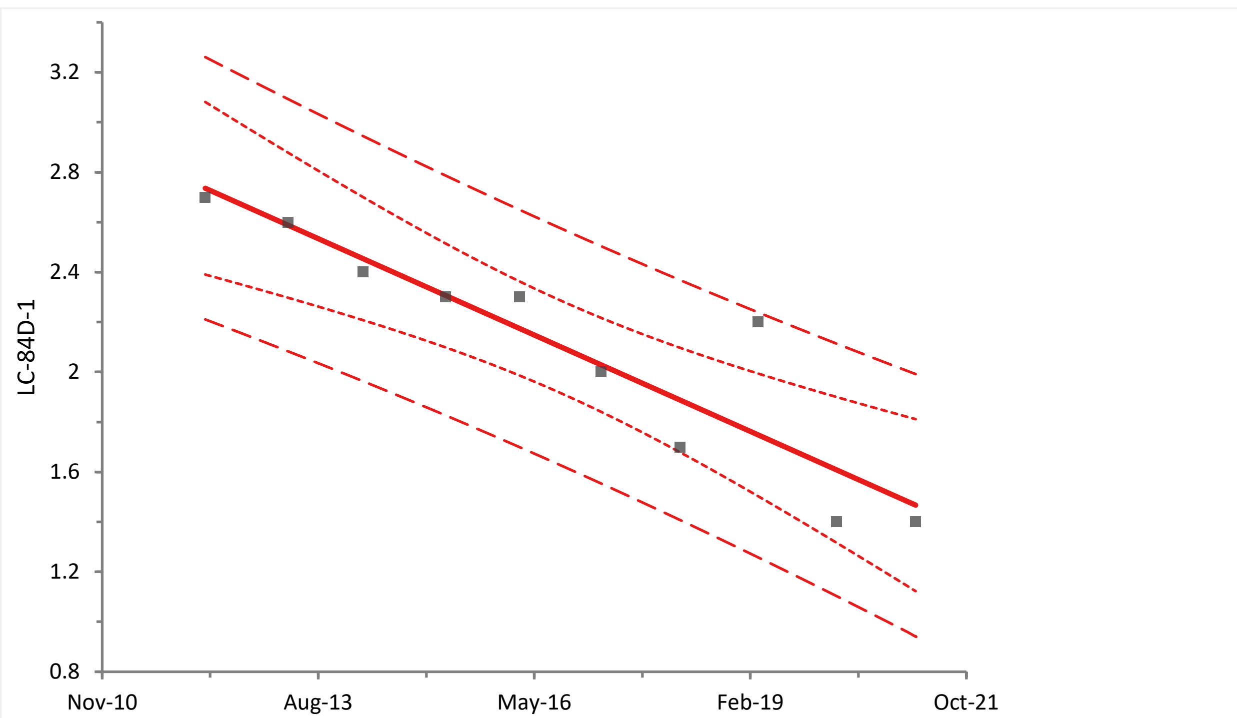


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-77D

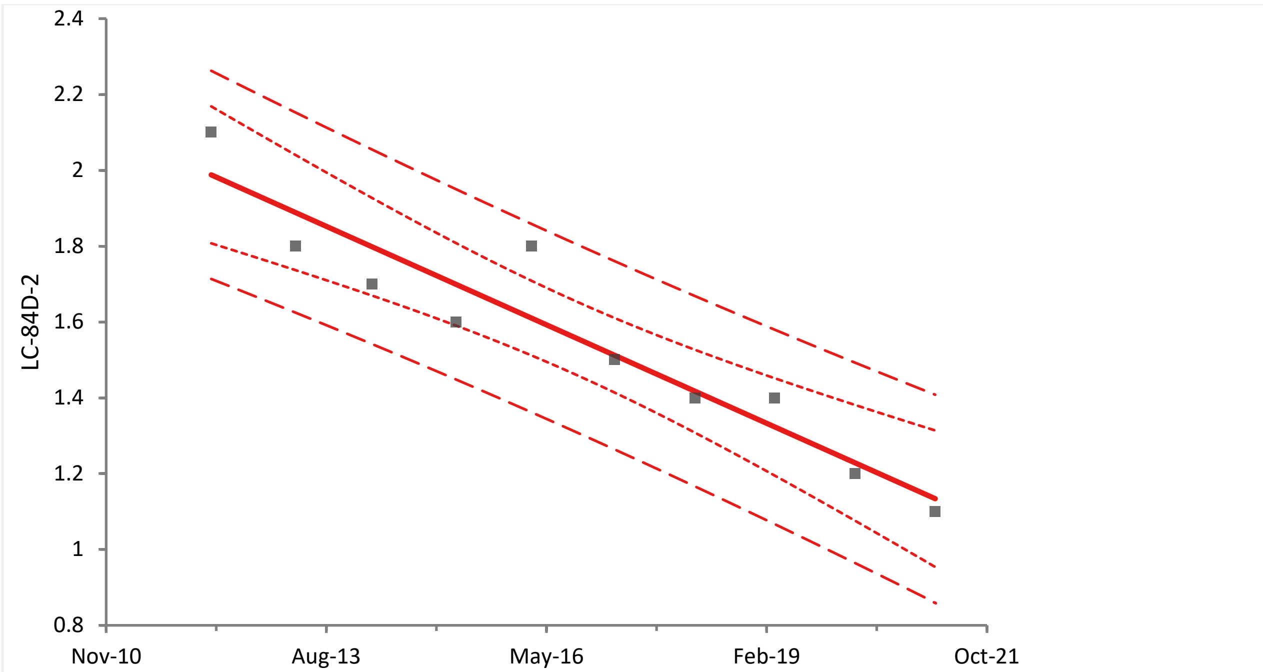


LC-84D-1



Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-84D-2



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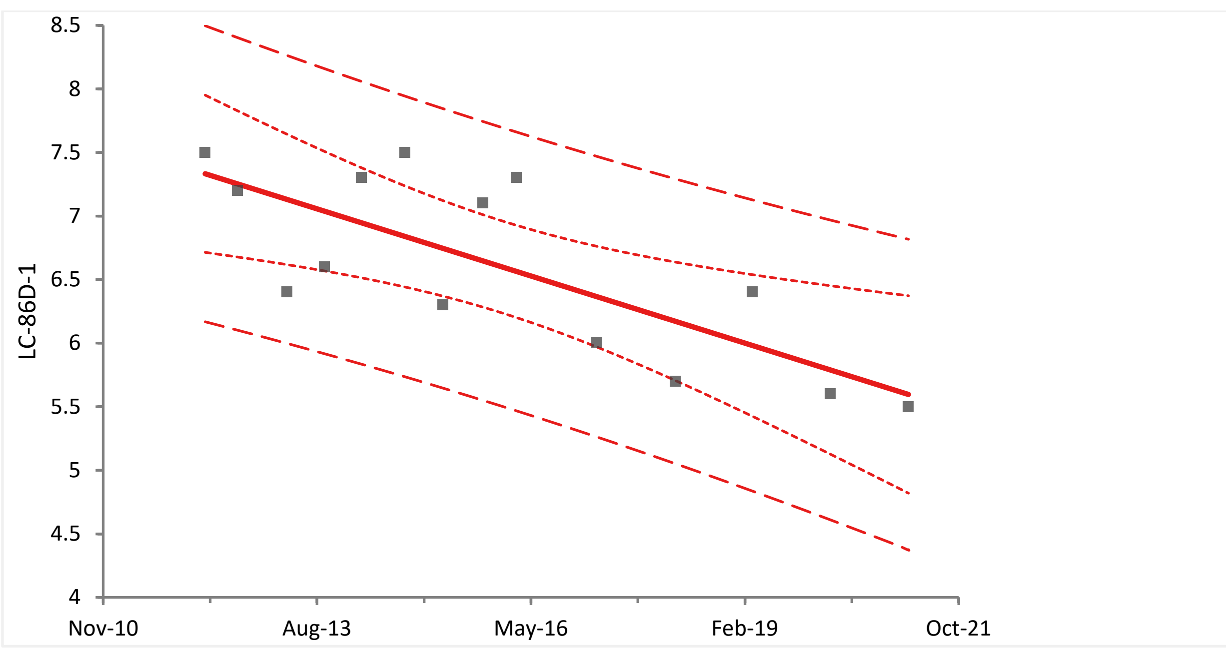
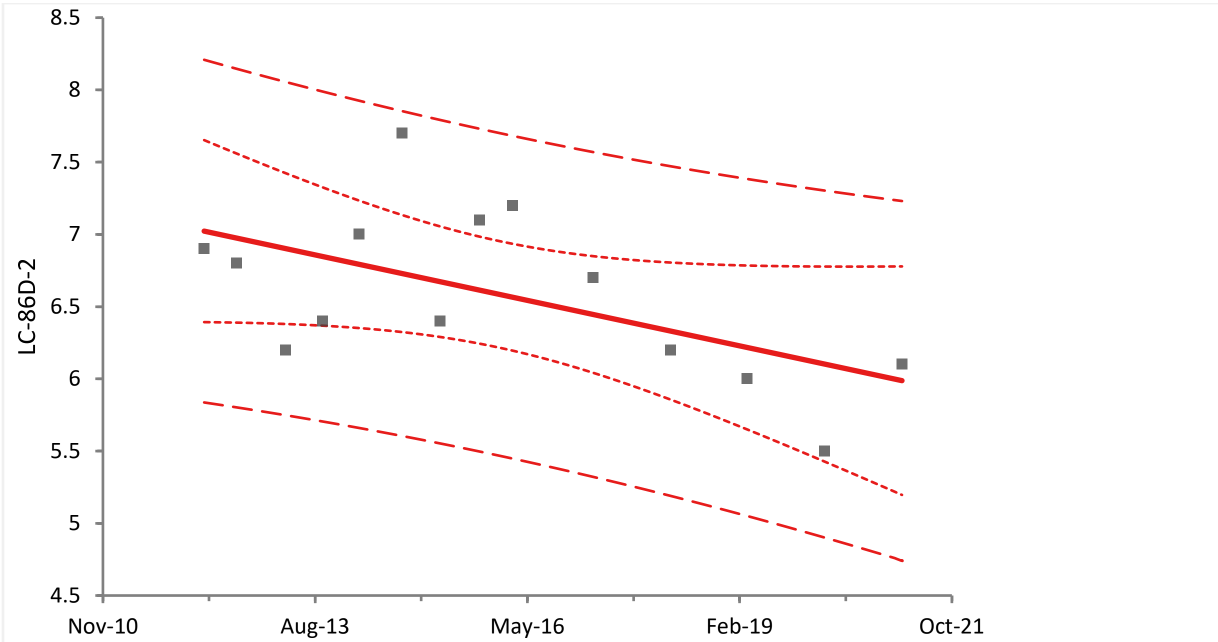
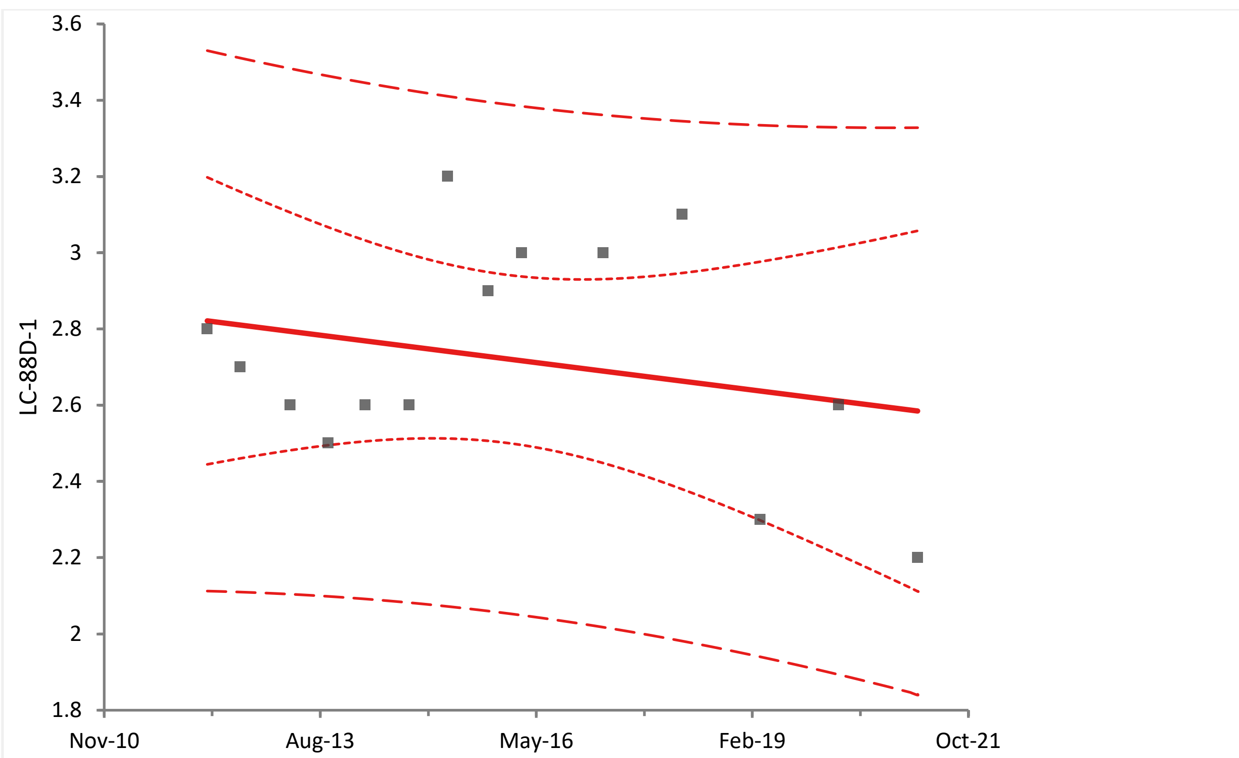


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-86D-2

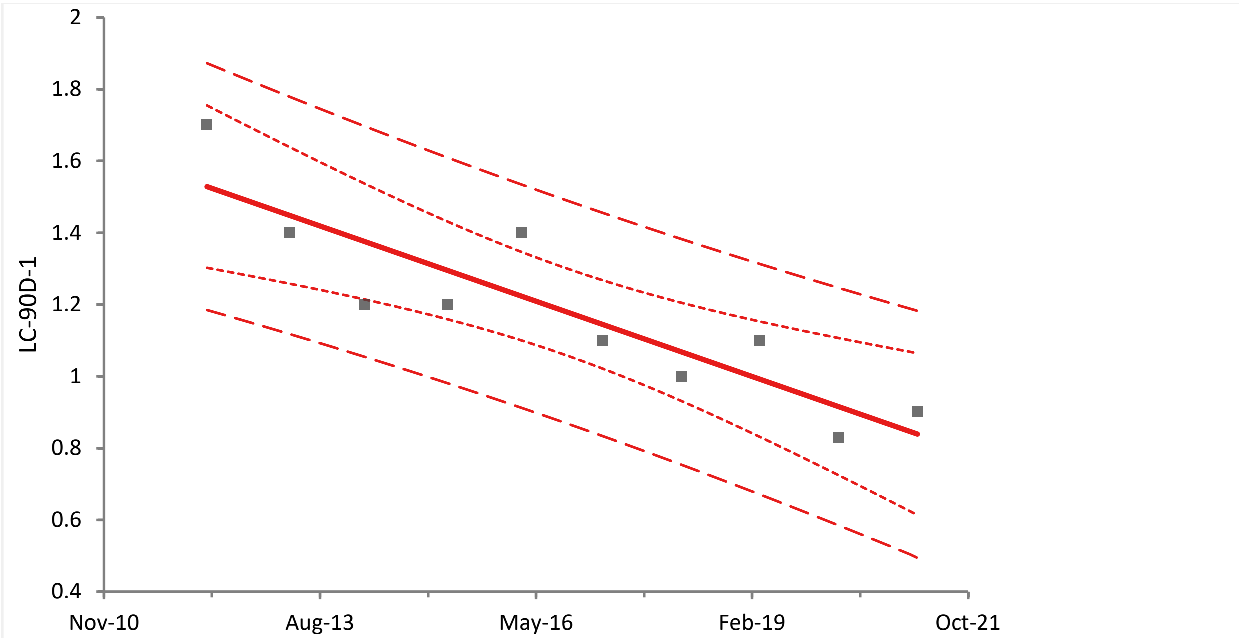


LC-88D-1



Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-90D-1



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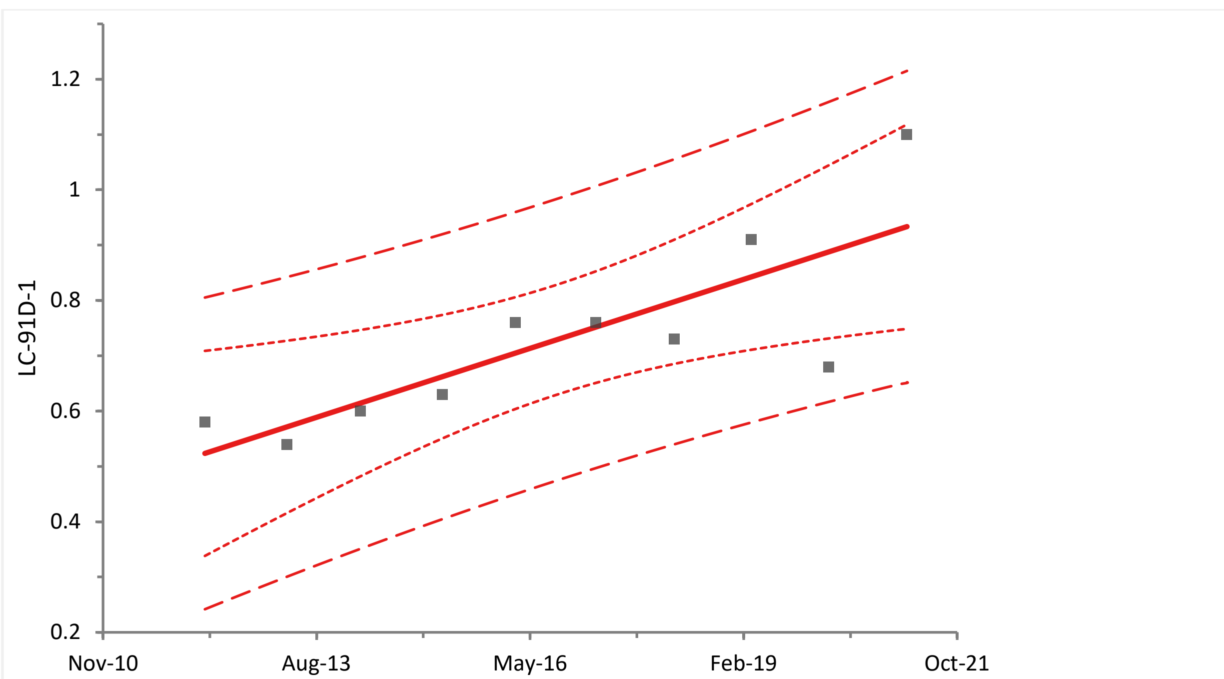
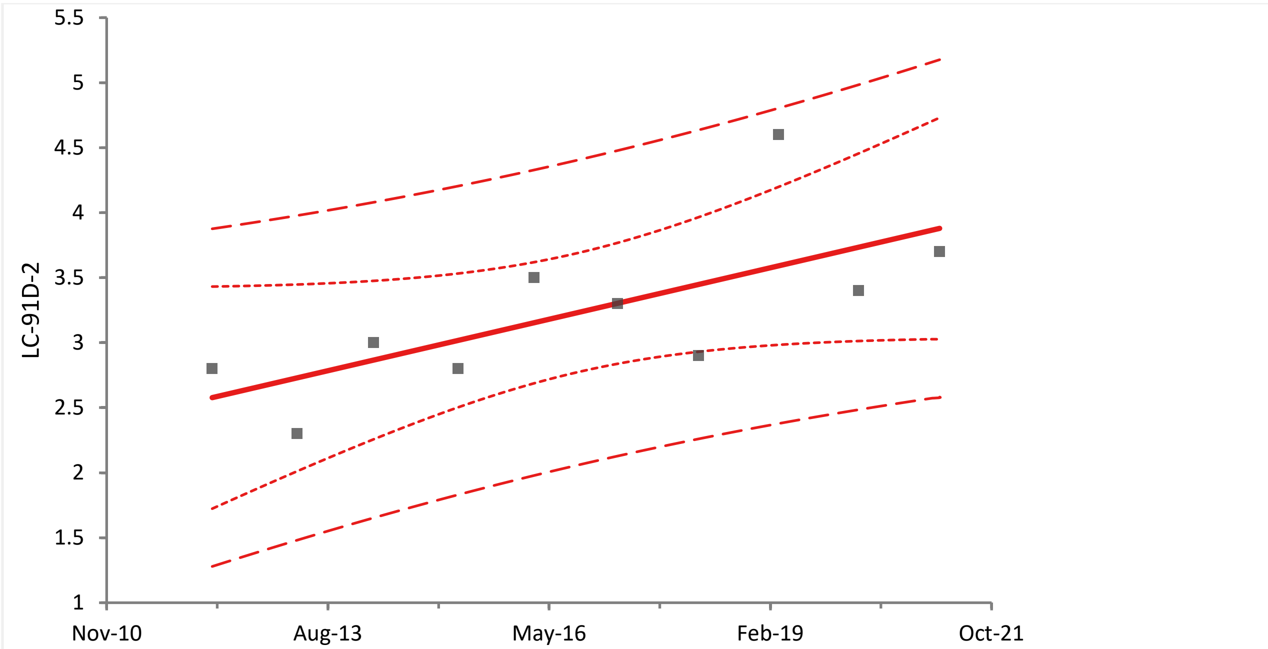


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-91D-2



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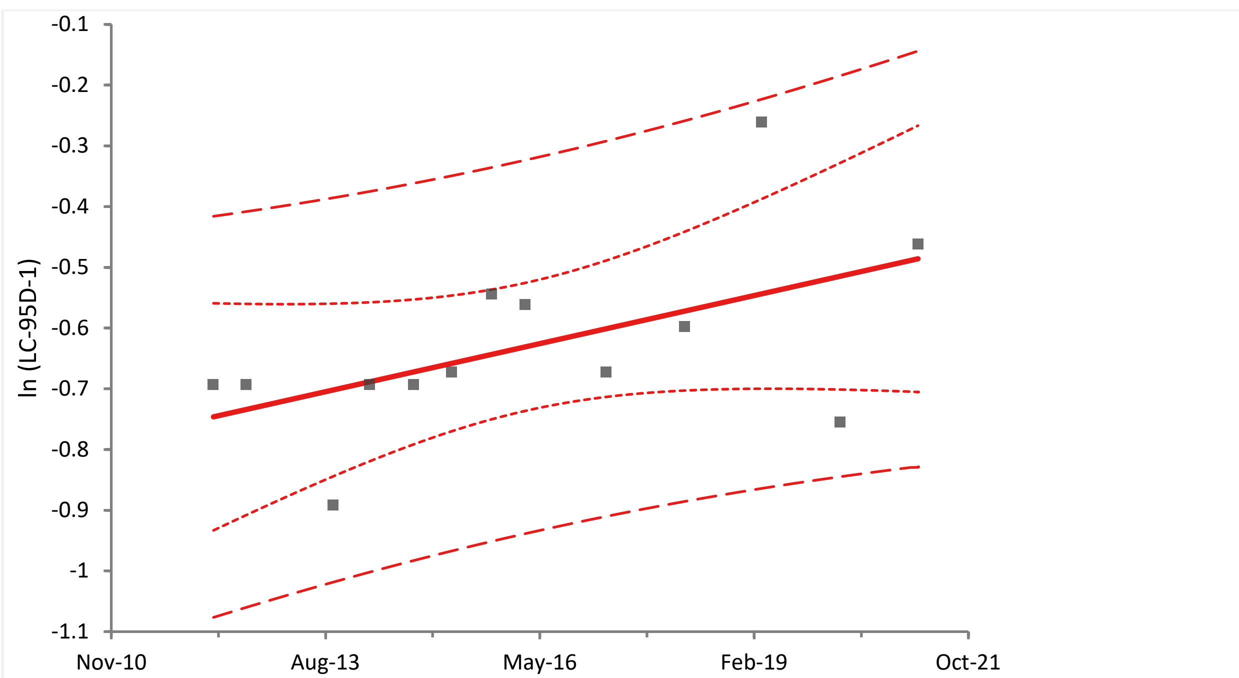
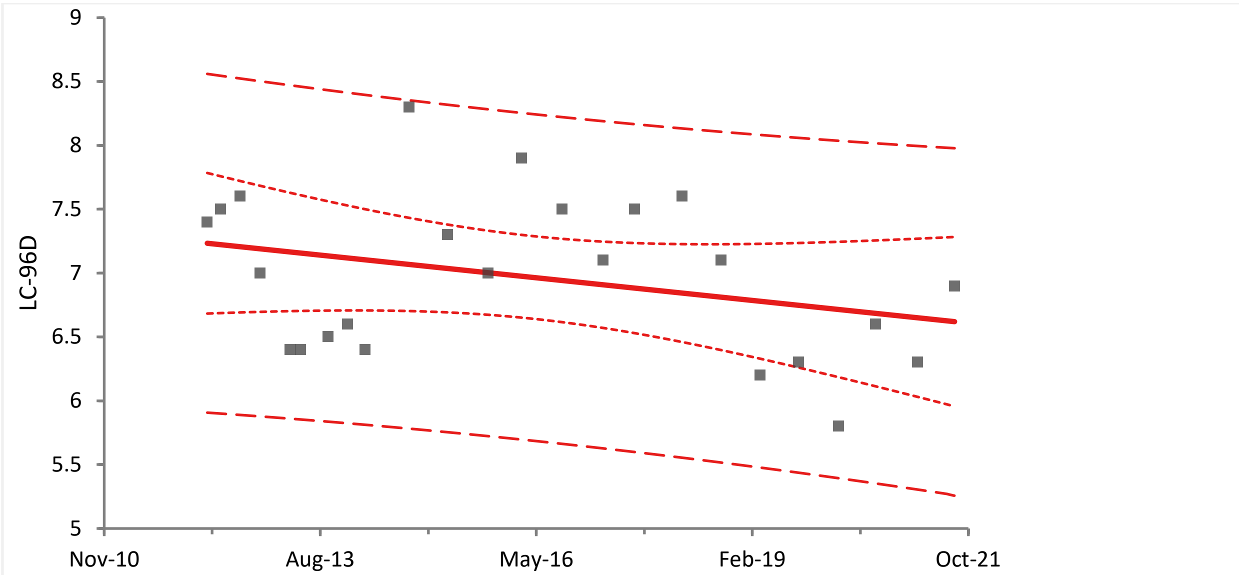


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-96D



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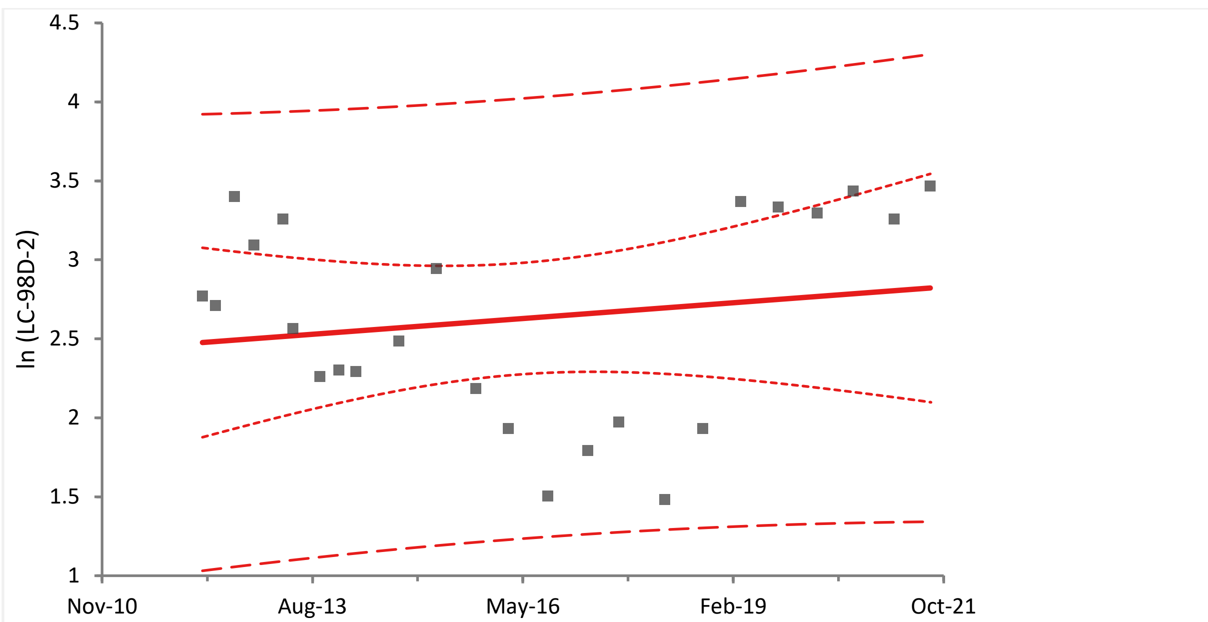
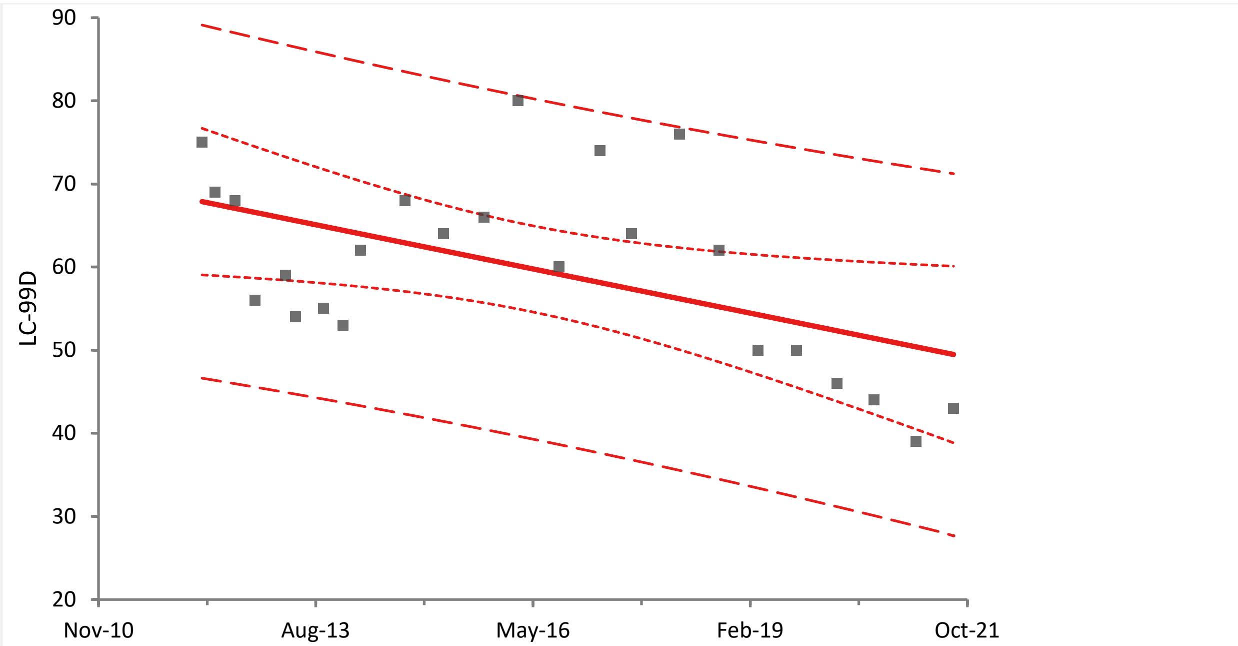
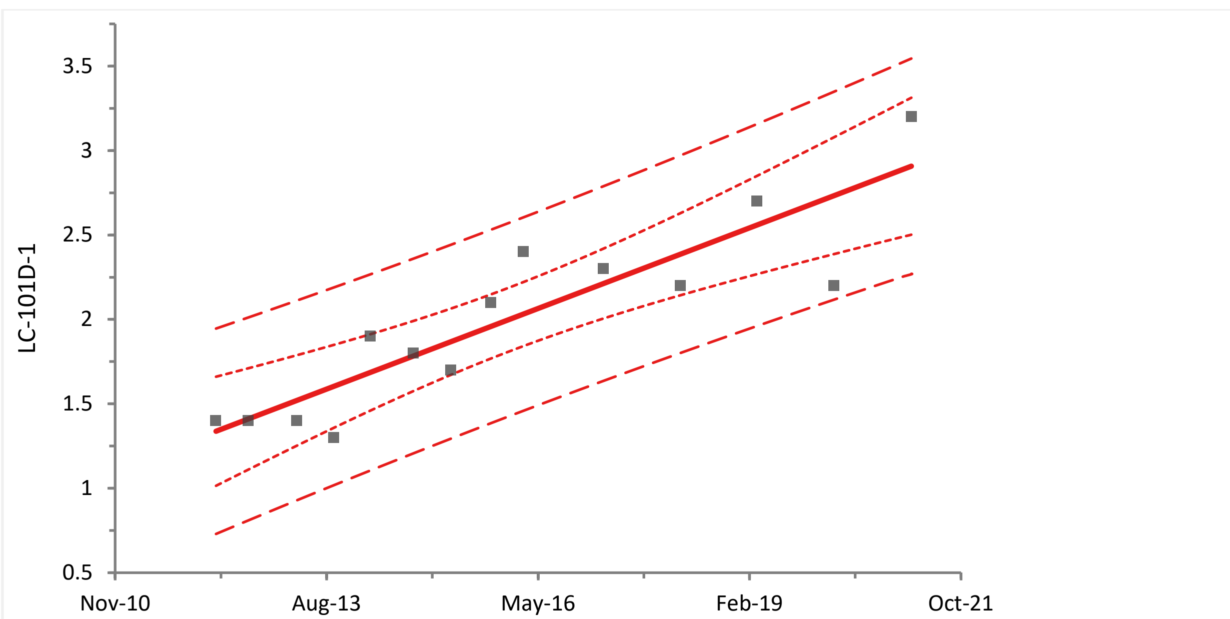


Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-99D

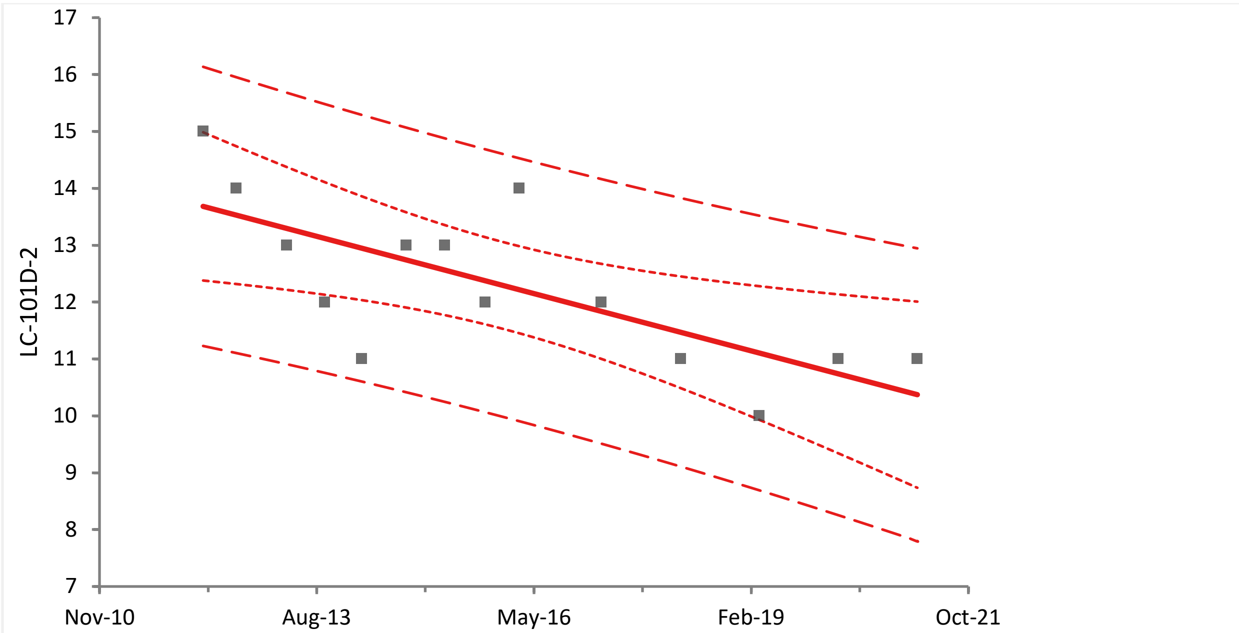


LC-101D-1



Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-101D-2



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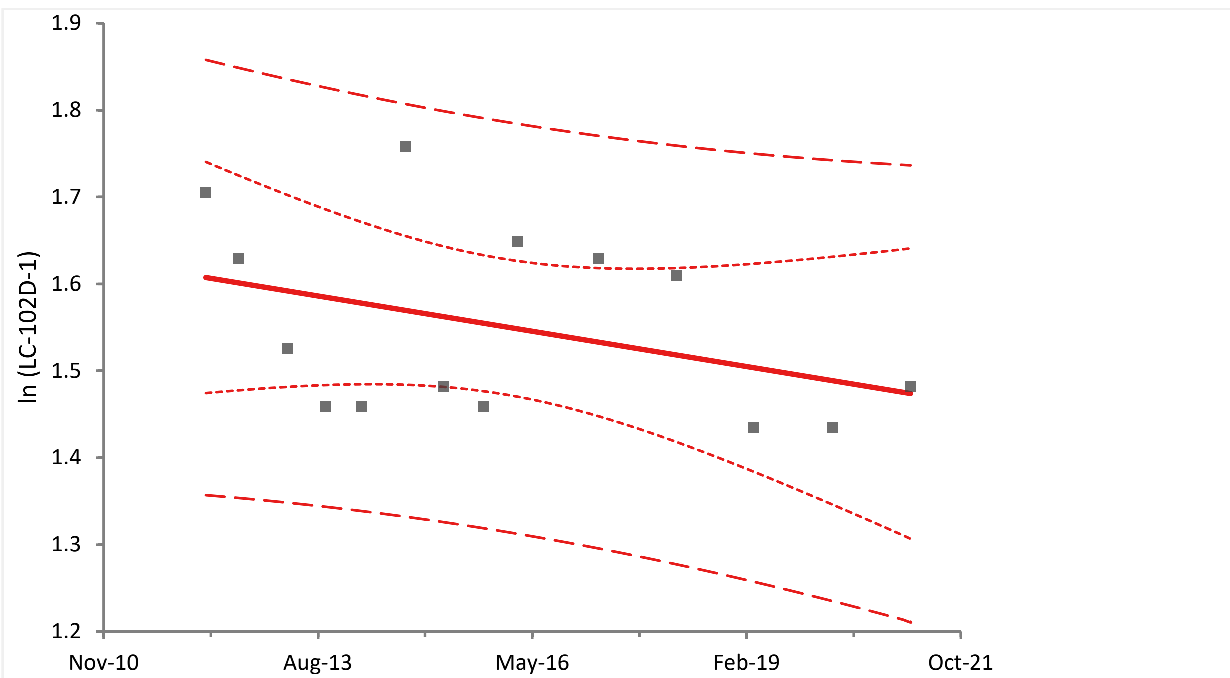
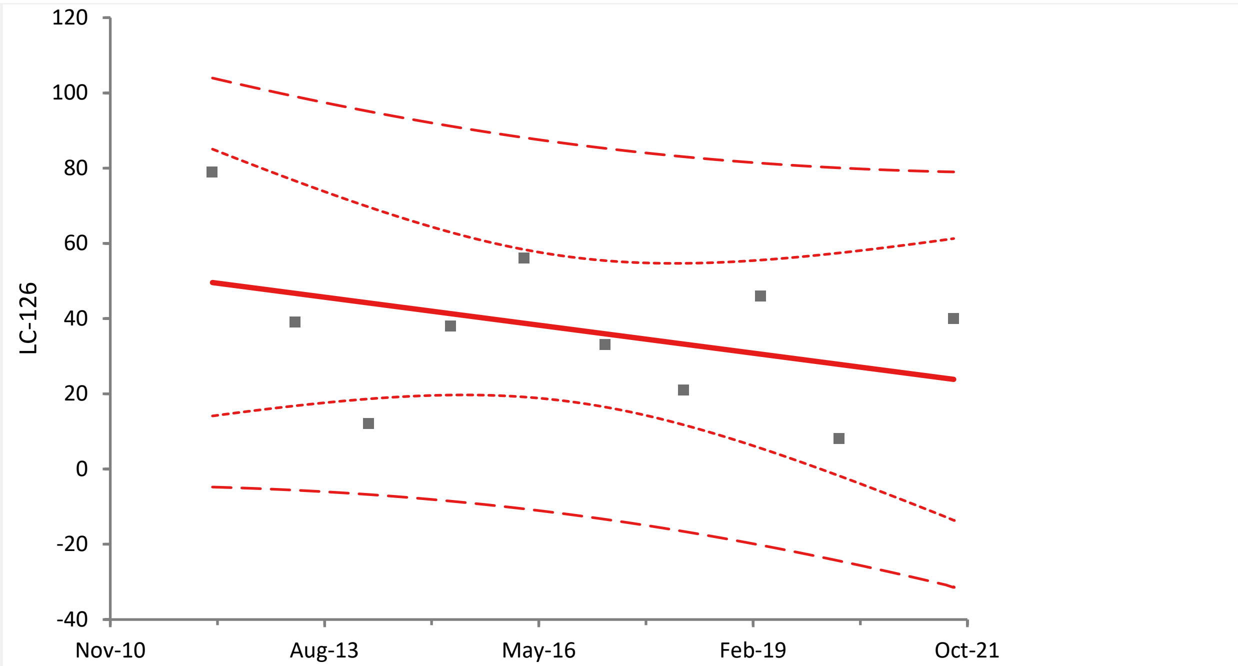


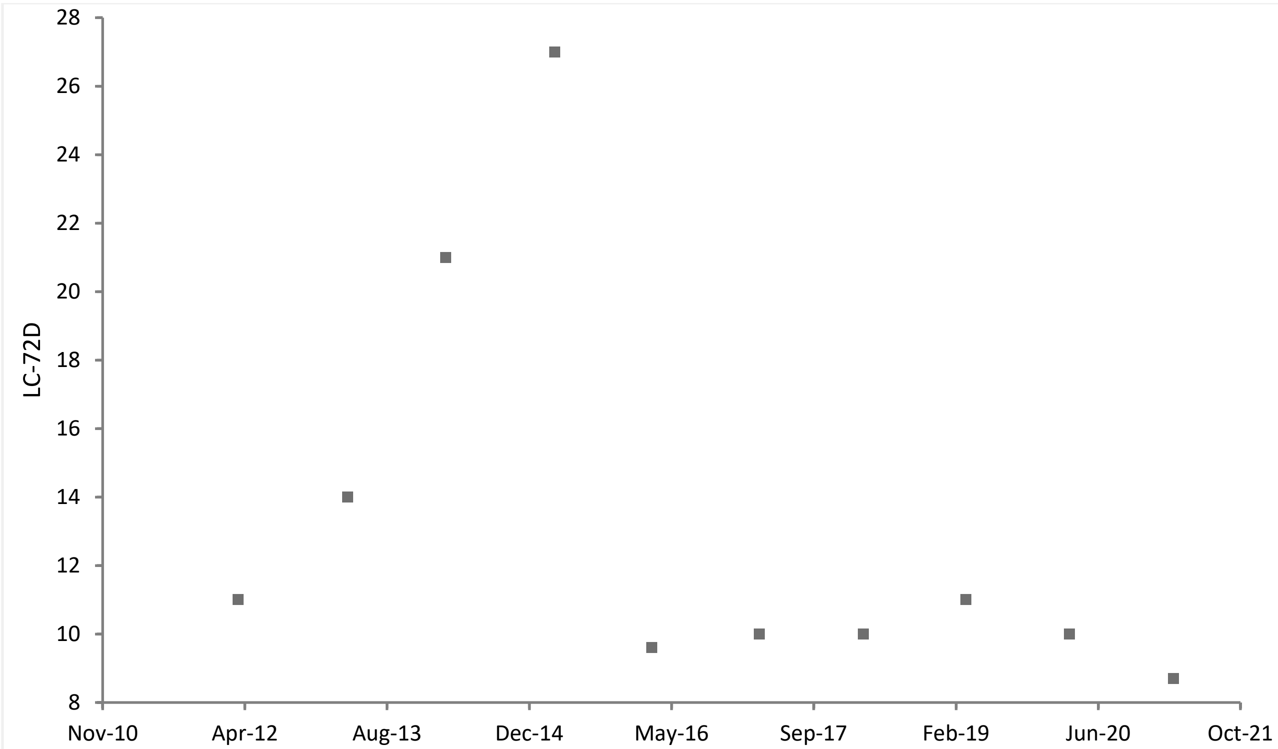
Appendix E - Log RAM Statistics, 2012-2021
Linear Regression Graphs – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-126



Appendix E - Log RAM Statistics, 2012-2021
Mann-Kendall Scatter Plots – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-72D



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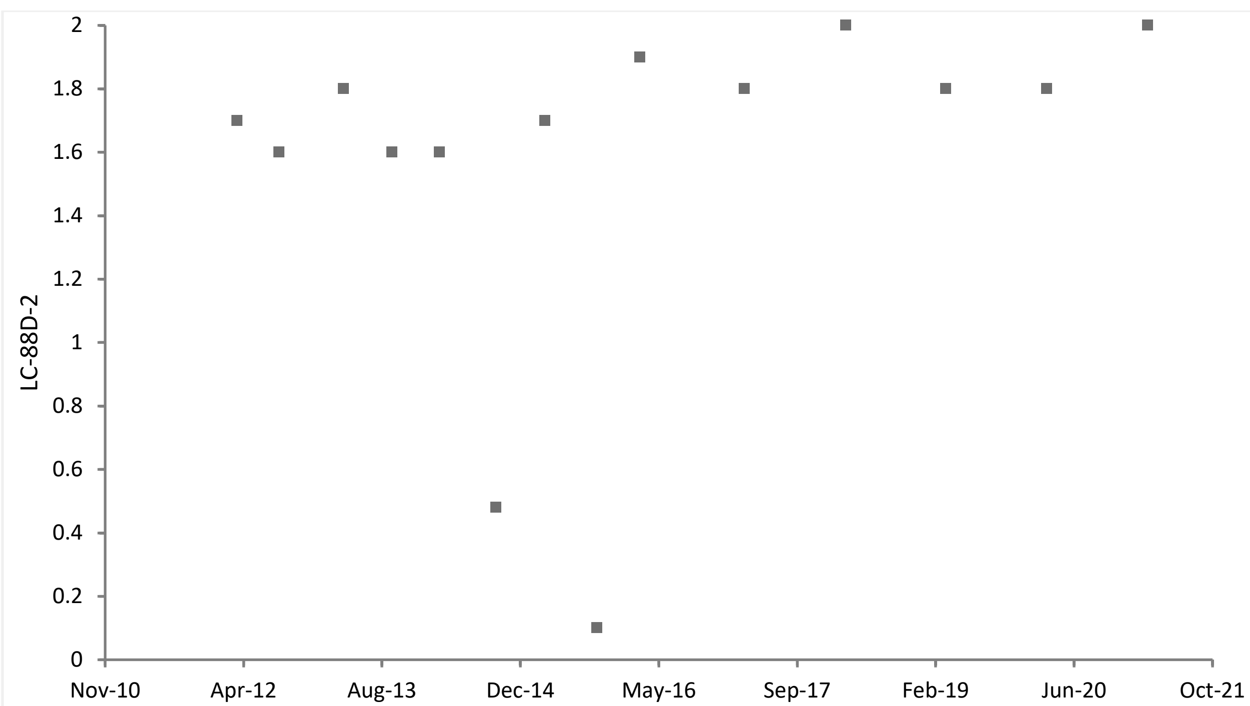
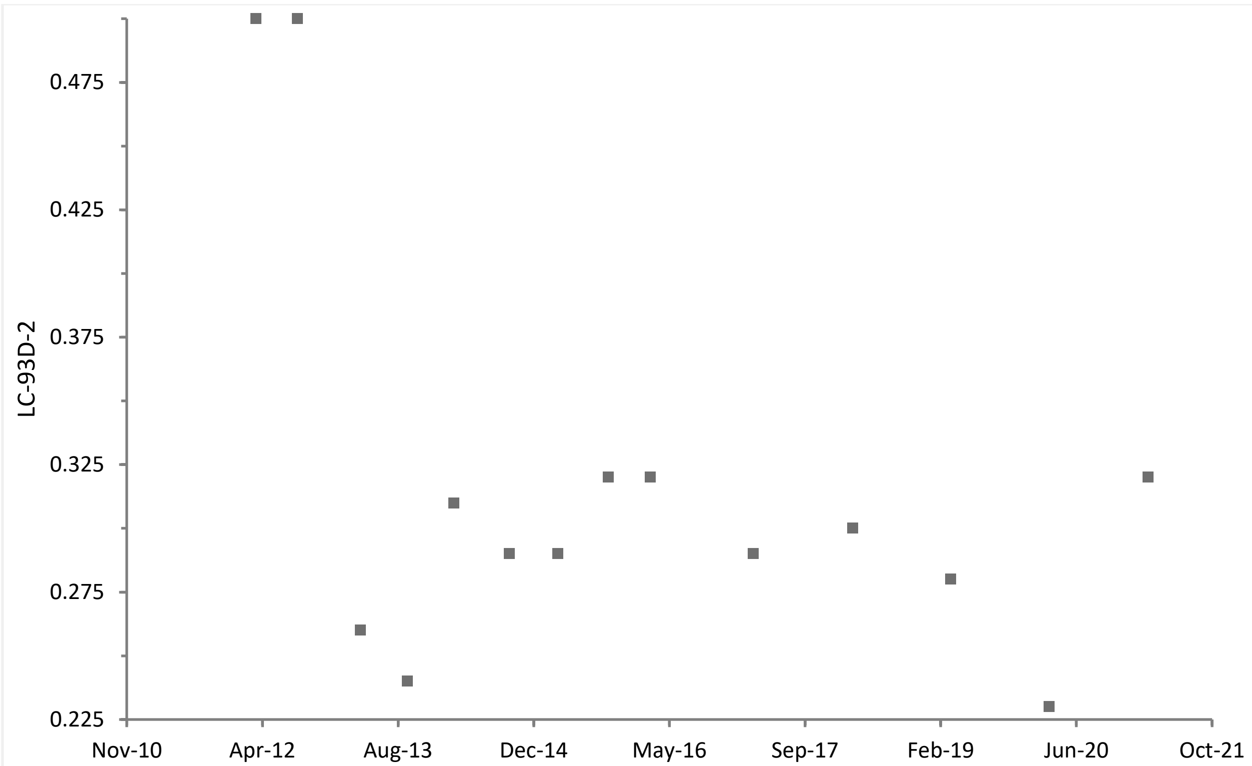


Appendix E - Log RAM Statistics, 2012-2021

Mann-Kendall Scatter Plots – Sea Level Aquifer TCE Data

Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-93D-2



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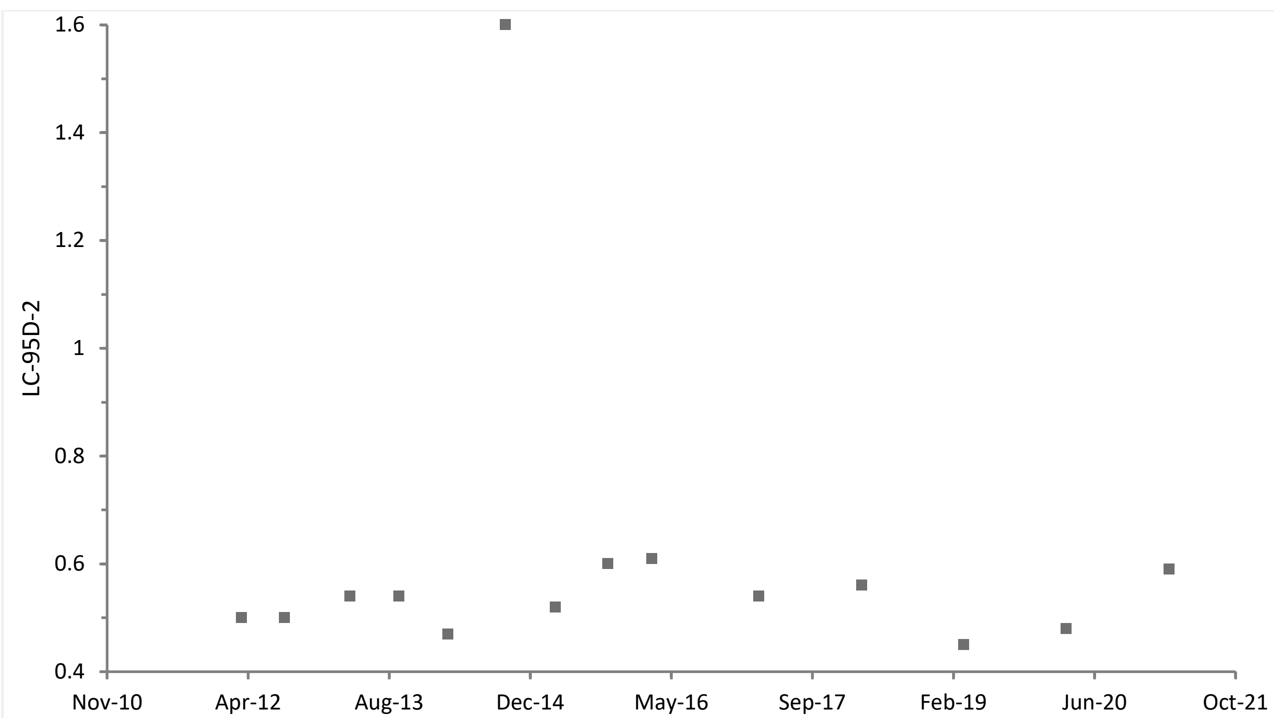
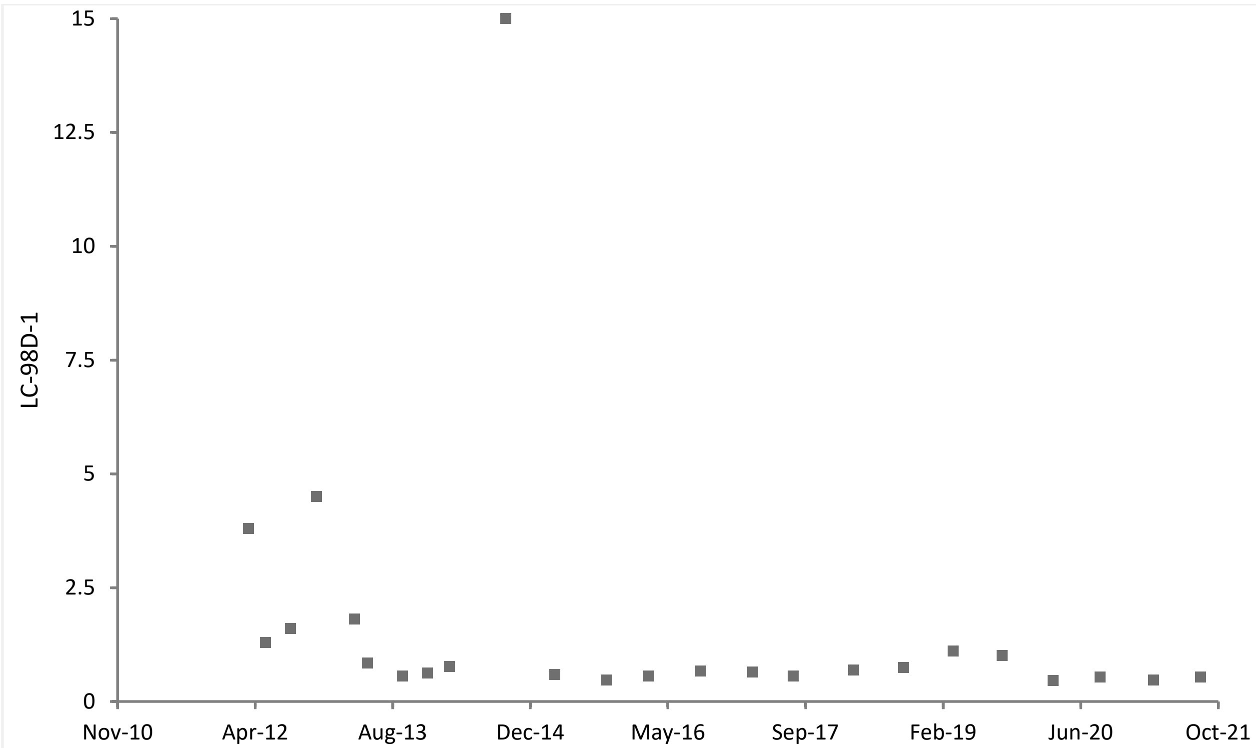


Appendix E - Log RAM Statistics, 2012-2021
Mann-Kendall Scatter Plots – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-98D-1



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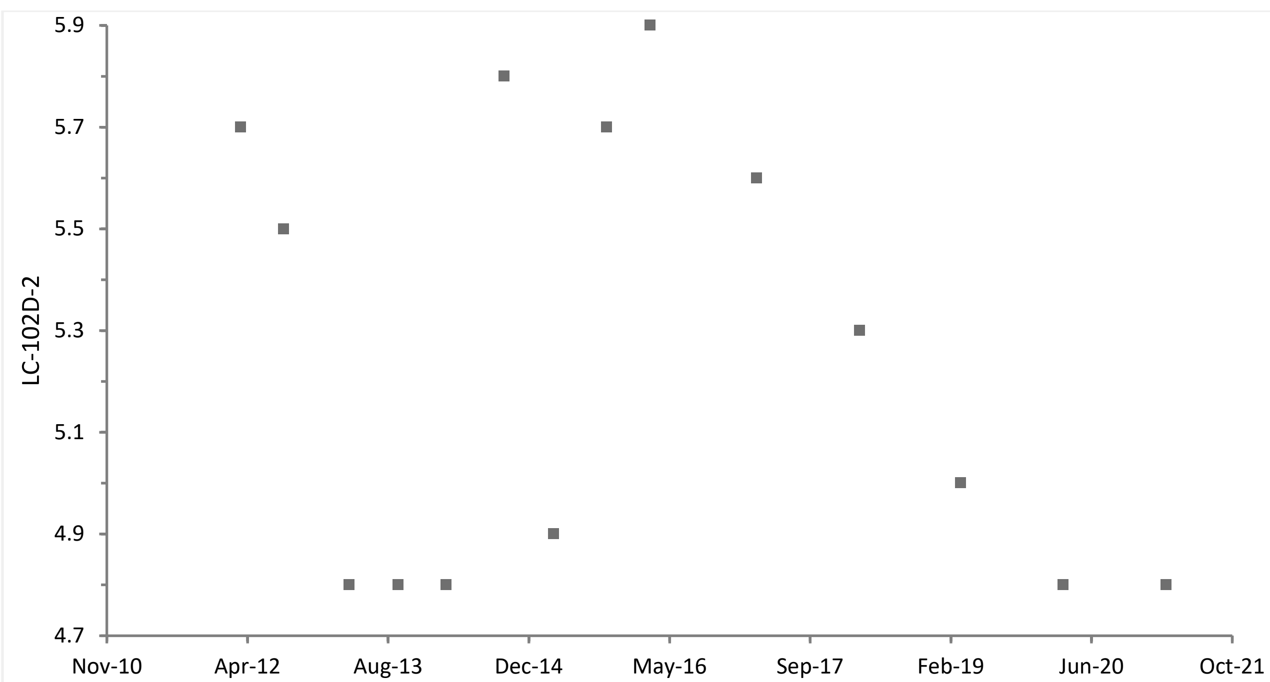
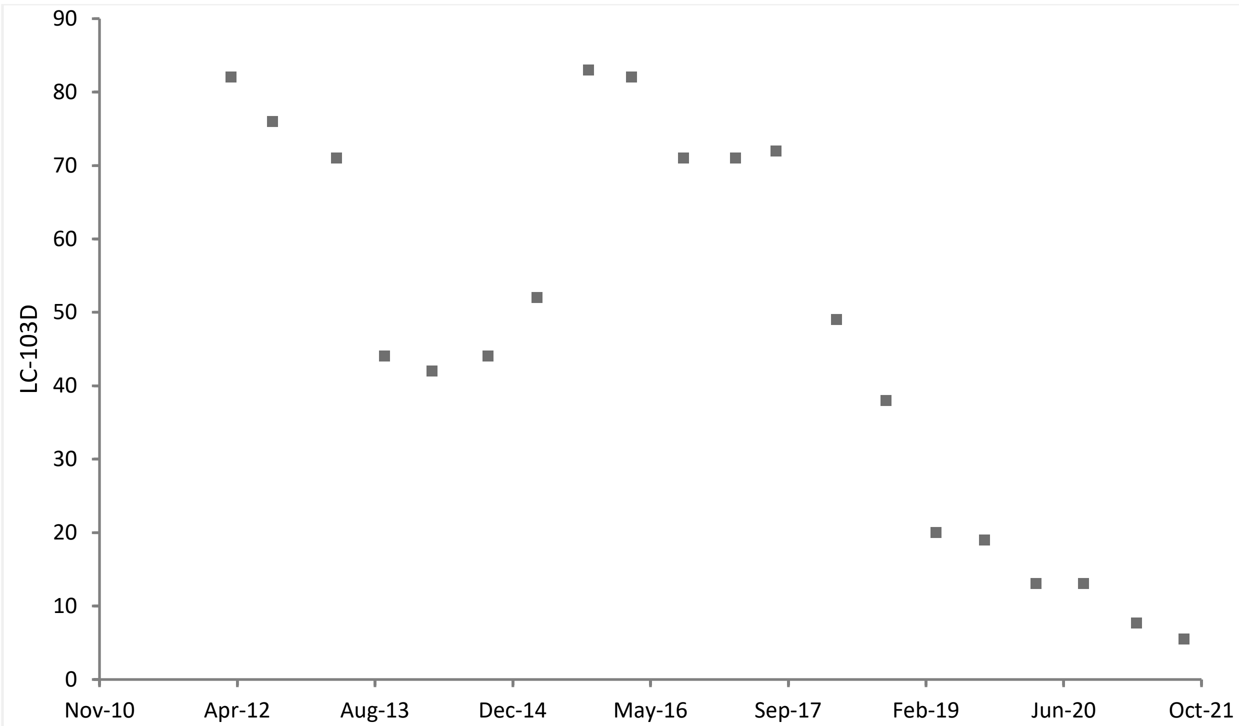
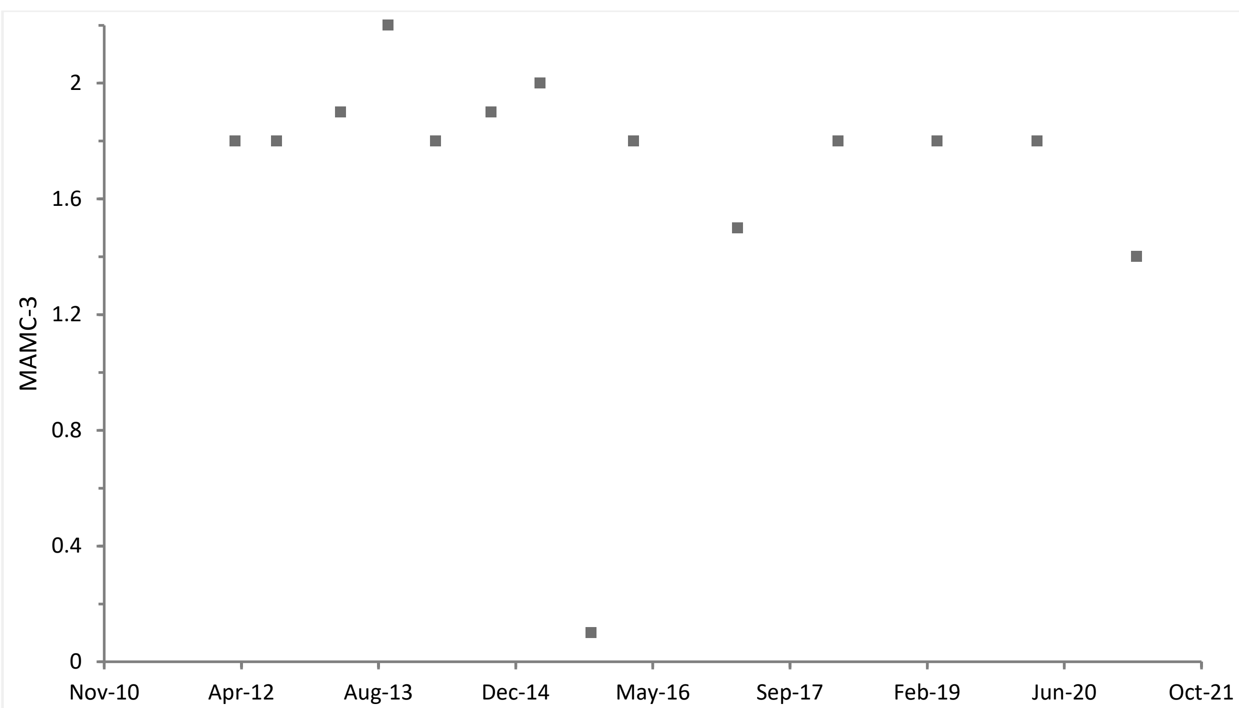


Appendix E - Log RAM Statistics, 2012-2021
Mann-Kendall Scatter Plots – Sea Level Aquifer TCE Data
Logistics Center, Joint Base Lewis McChord, Washington 98433

LC-103D



MAMC-3



OU1/FTLE-33

System Performance Data from

2021 Operation and Maintenance Annual Report, Logistics Center Pump and Treat Systems, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington

April 2022

Table 3-9. TCE Concentrations in Treatment System Influent and Effluent - 2021

Location ID	Sample Collection Date	TCE (µg/L)	cDCE (µg/L)	PCE (µg/L)	TCA (µg/L)	VC (µg/L)	2021 Volume (Mgal)	2021 TCE Mass (lbs)
Cleanup Levels		5	70	5	20	1		
Landfill 2 Pump and Treat System Influent Results								
LF-2 influent	19-Jan-21	23	1.5	0.20 U	0.13 J	0.10 U		
LF-2 influent	18-Feb-21	22	1.7	0.20 U	0.12 J	0.10 U		
LF-2 influent	10-Mar-21	21	2.1	0.20 U	0.15 J	0.10 U		
LF-2 influent	27-Apr-21	25	1.6	0.20 U	0.19 J	0.10 U		
LF-2 influent	24-May-21	26	1.6	0.20 U	0.25 J	0.15 U		
LF-2 influent	14-Jun-21	29	2.1	0.20 U	0.32 J	0.15 U		
LF-2 influent	26-Jul-21	26	2.6	0.20 U	0.31 J	0.15 U		
LF-2 influent	31-Aug-21	30	1.5	0.20 U	0.43 J	0.15 U		
LF-2 influent	15-Sep-21	28	1.6	0.20 U	0.36 J	0.15 U		
LF-2 influent	11-Oct-21	33	1.2	0.20 U	0.45 J	0.15 U		
LF-2 influent	3-Nov-21	35	1.4	0.20 U	0.41 J	0.15 U		
LF-2 influent	3-Dec-21	33	2.3	0.20 U	0.37 J	0.15 U		
Average		28	1.8	0.20 U	0.29	0.13 U		
Landfill 2 Pump and Treat System Effluent Results								
LF-2 effluent	19-Jan-21	0.17 J	0.20 U	0.20 U	0.20 U	0.10 U		
LF-2 effluent	18-Feb-21	0.34 J	0.20 U	0.20 U	0.20 U	0.10 U		
LF-2 effluent	10-Mar-21	0.10 J	0.20 U	0.20 U	0.20 U	0.10 U		
LF-2 effluent	27-Apr-21	0.30 J	0.20 U	0.20 U	0.20 U	0.10 U		
LF-2 effluent	24-May-21	0.21 J	0.20 U	0.20 U	0.20 U	0.15 U		
LF-2 effluent	14-Jun-21	0.20 U	0.20 U	0.20 U	0.20 U	0.15 U		
LF-2 effluent	26-Jul-21	0.20 U	0.20 U	0.20 U	0.20 U	0.15 U		
LF-2 effluent	31-Aug-21	0.12 J	0.20 U	0.20 U	0.20 U	0.15 U		
LF-2 effluent	15-Sep-21	0.50 U	0.20 U	0.20 U	0.20 U	0.15 U		
LF-2 effluent	11-Oct-21	0.26 J	0.20 U	0.20 U	0.20 U	0.15 U		
LF-2 effluent	3-Nov-21	0.21 J	0.20 U	0.20 U	0.20 U	0.15 U		
LF-2 effluent	03-Dec-21	0.50 U	0.20 U	0.20 U	0.20 U	0.15 U		
Average		0.26	0.20 U	0.20 U	0.20 U	0.13 U		
Landfill 2 Pump and Treat TCE Removed							198	45

Table 3-9. TCE Concentrations in Treatment System Influent and Effluent - 2021

Location ID	Sample Collection Date	TCE (µg/L)	cDCE (µg/L)	PCE (µg/L)	TCA (µg/L)	VC (µg/L)	2021 Volume (Mgal)	2021 TCE Mass (lbs)
Cleanup Levels		5	70	5	20	1		
I-5 Pump and Treat System Influent Results								
I-5 influent	19-Jan-21	27	0.48 J	0.13 J	0.17 J	0.10 U		
I-5 influent	18-Feb-21	30	0.56	0.13 J	0.17 J	0.10 U		
I-5 influent	11-Mar-21	30	0.60	0.11 J	0.18 J	0.10 U		
I-5 influent	27-Apr-21	31	0.58	0.14 J	0.080 J	0.10 U		
I-5 influent	24-May-21	29	0.58	0.12 J	0.11 J	0.15 U		
I-5 influent	14-Jun-21	25	0.55	0.20 U	0.12 J	0.15 U		
I-5 influent	26-Jul-21	24	0.44 J	0.20 U	0.20 U	0.15 U		
I-5 influent	31-Aug-21	25	0.43 J	0.12 J	0.12 J	0.15 U		
I-5 influent	15-Sep-21	25	0.41 J	0.20 U	0.11 J	0.15 U		
I-5 influent	12-Oct-21	26	0.43 J	0.20 U	0.10 J	0.15 U		
I-5 influent	3-Nov-21	25	0.46 J	0.20 U	0.10 J	0.15 U		
I-5 influent	3-Dec-21	27	0.49 J	0.10 J	0.12 J	0.15 U		
Average		27	0.50	0.15	0.13	0.13 U		
I-5 Pump and Treat System Effluent Results								
I-5 effluent	19-Jan-21	0.39 J	0.20 U	0.20 U	0.20 U	0.10 U		
I-5 effluent	18-Feb-21	0.52	0.20 U	0.20 U	0.20 U	0.10 U		
I-5 effluent	11-Mar-21	0.27 J	0.20 U	0.20 U	0.20 U	0.10 U		
I-5 effluent	27-Apr-21	0.39 J	0.20 U	0.20 U	0.20 U	0.10 U		
I-5 effluent	24-May-21	0.30 J	0.20 U	0.20 U	0.20 U	0.15 U		
I-5 effluent	14-Jun-21	0.37 J	0.20 U	0.20 U	0.20 U	0.15 U		
I-5 effluent	26-Jul-21	0.38 J	0.20 U	0.20 U	0.20 U	0.15 U		
I-5 effluent	31-Aug-21	0.28 J	0.20 U	0.20 U	0.20 U	0.15 U		
I-5 effluent	15-Sep-21	0.17 J	0.20 U	0.20 U	0.20 U	0.15 U		
I-5 effluent	12-Oct-21	0.35 J	0.20 U	0.20 U	0.20 U	0.15 U		
I-5 effluent	3-Nov-21	0.26 J	0.20 U	0.20 U	0.20 U	0.15 U		
I-5 effluent	3-Dec-21	0.21 J	0.20 U	0.20 U	0.20 U	0.15 U		
Average		0.32	0.20 U	0.20 U	0.20 U	0.13 U		
I-5 Pump and Treat TCE Removed							**643**	**142**

Table 3-9. TCE Concentrations in Treatment System Influent and Effluent - 2021

Location ID	Sample Collection Date	TCE (µg/L)	cDCE (µg/L)	PCE (µg/L)	TCA (µg/L)	VC (µg/L)	2021 Volume (Mgal)	2021 TCE Mass (lbs)
Cleanup Levels		5	70	5	20	1		
SLA Pump and Treat System Influent Results								
SLAPT influent	19-Jan-21	13	0.20 U	0.20 U	0.080 J	0.10 U		
SLAPT influent	18-Feb-21	15	0.35 J	0.20 U	0.090 J	0.10 U		
SLAPT influent	10-Mar-21	14	0.32 J	0.20 U	0.10 J	0.10 U		
SLAPT influent	27-Apr-21	14	0.33 J	0.20 U	0.20 U	0.10 U		
SLAPT influent	24-May-21	14	0.36 J	0.20 U	0.10 J	0.15 U		
SLAPT influent	14-Jun-21	16	0.47 J	0.20 U	0.10 J	0.15 U		
SLAPT influent	26-Jul-21	15	0.37 J	0.20 U	0.10 J	0.15 U		
SLAPT influent	31-Aug-21	15	0.42 J	0.20 U	0.20 U	0.15 U		
SLAPT influent	15-Sep-21	15	0.33 J	0.20 U	0.090 J	0.15 U		
SLAPT influent	12-Oct-21	15	0.42 J	0.20 U	0.11 J	0.15 U		
SLAPT influent	3-Nov-21	14	0.37 J	0.20 U	0.080 J	0.15 U		
SLAPT influent	3-Dec-21	15	0.35 J	0.20 U	0.12 J	0.15 U		
Average		15	0.36	0.20 U	0.11	0.13 U		
SLA Pump and Treat System Effluent Results								
SLAPT effluent	19-Jan-21	0.68	0.20 U	0.20 U	0.20 U	0.10 U		
SLAPT effluent	18-Feb-21	0.74	0.20 U	0.20 U	0.20 U	0.10 U		
SLAPT effluent	10-Mar-21	0.56	0.20 U	0.20 U	0.20 U	0.10 U		
SLAPT effluent	27-Apr-21	0.76	0.20 U	0.20 U	0.20 U	0.10 U		
SLAPT effluent	24-May-21	0.60	0.20 U	0.20 U	0.20 U	0.15 U		
SLAPT effluent	14-Jun-21	0.58	0.20 U	0.20 U	0.20 U	0.15 U		
SLAPT effluent	26-Jul-21	0.52 U	0.20 U	0.20 U	0.20 U	0.15 U		
SLAPT effluent	31-Aug-21	0.57	0.20 U	0.20 U	0.20 U	0.15 U		
SLAPT effluent	15-Sep-21	0.42 J	0.20 U	0.20 U	0.20 U	0.15 U		
SLAPT effluent	12-Oct-21	0.56	0.20 U	0.20 U	0.20 U	0.15 U		
SLAPT effluent	3-Nov-21	0.56	0.20 U	0.20 U	0.20 U	0.15 U		
SLAPT effluent	3-Dec-21	0.56	0.20 U	0.20 U	0.20 U	0.15 U		
Average		0.59	0.20 U	0.20 U	0.20 U	0.13 U		
SLA Pump and Treat TCE Removed							**700**	**81**
Total Volume and Mass Removed by All Systems							**1541**	**269**

Table 3-9. TCE Concentrations in Treatment System Influent and Effluent - 2021

Location ID	Sample Collection Date	TCE (µg/L)	cDCE (µg/L)	PCE (µg/L)	TCA (µg/L)	VC (µg/L)	2021 Volume (Mgal)	2021 TCE Mass (lbs)
Cleanup Levels		5	70	5	20	1		

Notes

Cleanup Levels from Record of Decision for JBLM Logistics Center

TCE = Trichloroethene
cDCE = cis 1,2 Dichloroethylene
PCE = Perchloroethylene
TCA = 1,1,1 Trichloroethane
VC = Vinyl Chloride
µg/L = Micrograms per liter
SHADED = Analyte detected above ROD Remediation Goal Value
U = Analyte not detected above practical quantification limit

J = Result is an estimate
Mgal= million gallons

Table 3-10. Systems Performance and Emissions - 2021

System	Performance				Emissions			
	Volume Treated of Water in 2021 (Mgal)	Volume of Water Treated Since 1995 (Mgal)	TCE Removed in 2021 (lbs)	TCE Removed Since 1995 (lbs)	Average Effluent TCE Concentration (µg/L)	TCE Removed (lbs/month)	TCE Removed (lbs/year)	PSCAA Limit (lbs/year)
Landfill 2	198	7,513	45	8,003	0.26	3.7	45	1,000
I-5	643	18,100	142	6,281	0.32	11.9	142	1,000
SLAPT	700	9,069	81	1103	0.59	6.8	81	1,000
TOTAL	1,541	34,682	269	15,388	-	22.4	269	-

Notes:

PSCAA limit is for total toxic constituents emissions, but is used to represent TCE since other VOCs are minimal.

TCE Removed in 2021 is calculated using averages of monthly influent & effluent samples and annual volumes. See Table 3-9.

I-5 = I-5 pump and treat system
SLA = Sea Level aquifer pump and treat system
TCE = Trichloroethene
Mgal = Million gallons
lbs = Pounds
PSCAA = Puget Sound Clean Air Agency
\- = Not applicable

OU1/FTLE-54

Groundwater Data from

Final 2018 Annual Groundwater Monitoring Report, FTLE-54: Landfill 1, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington

March, 2019

Figure 4. TCE Concentrations Over Time

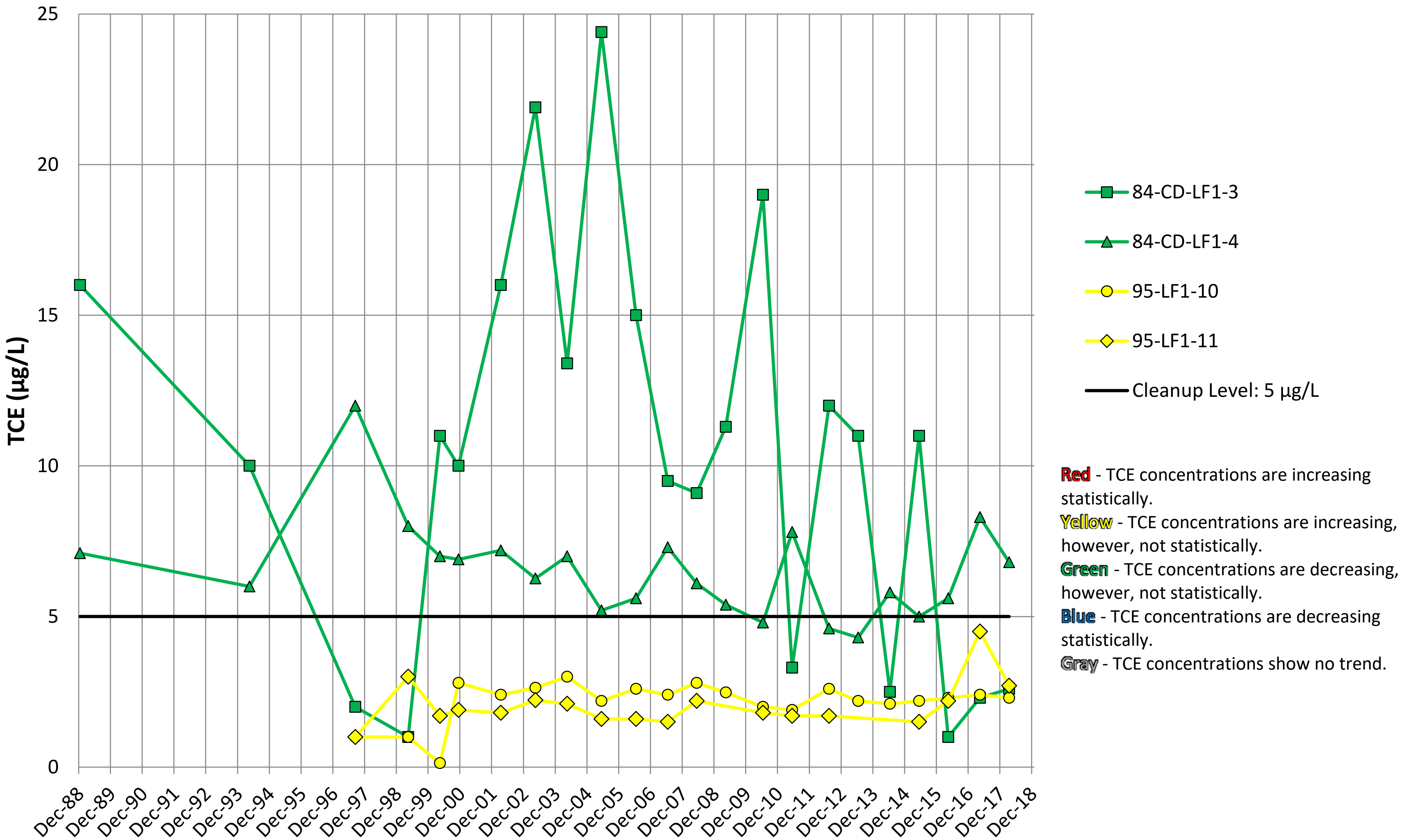


Table 4. Monitoring Well Descriptive Statistics

Well ID	Dataset	First Sample Date	Last Sample Date	Number of Samples	Number of ND's	Sample Mean	Standard Deviation	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)	Date*
84-CD-LF1-1	Historic	1-Sep-88	17-Jul-12	10	10	-	-	-	-	-
84-CD-LF1-2	Historic	1-Sep-88	17-Jul-12	9	9	-	-	-	-	-
84-CD-LF1-3	Historic	1-Dec-88	19-Mar-18	23	0	10.2	6.7	1.0	24.4	24-May-05
	Recent	22-Apr-09	19-Mar-18	10	0	7.6	6.0	1.0	19.0	4-Jun-10
84-CD-LF1-4	Historic	1-Dec-88	19-Mar-18	23	0	6.5	1.6	4.3	12.0	1-Aug-97
	Recent	22-Apr-09	19-Mar-18	10	0	5.8	1.4	4.3	8.3	11-Apr-17
95-LF1-5	Historic	1-Aug-97	17-Jul-12	6	5	-	-	-	0.6	1-Apr-03
95-LF1-9	Historic	1-Aug-97	17-Jul-12	7	7	-	-	-	-	-
95-LF1-10	Historic	1-Aug-97	19-Mar-18	21	1	2.2	0.7	0.1	3.0	28-Apr-04
	Recent	22-Apr-09	19-Mar-18	10	0	2.2	0.2	1.9	2.6	17-Jul-12
95-LF1-11	Historic	1-Aug-97	19-Mar-18	18	0	2.0	0.8	1.0	4.5	11-Apr-17
	Recent	22-Apr-09	19-Mar-18	7	0	2.3	1.1	1.5	4.5	11-Apr-17
LF1-PNL1	Historic	1-Sep-88	17-Jul-12	11	10	-	-	-	2.6	1-Apr-03
LF1-PNL2	Historic	1-Sep-88	17-Jul-12	7	7	-	-	-	-	-
LF1-PNL3	Historic	1-Sept-88	17-Jul-12	9	9	-	-	-	-	-
LF1-PNL4	Historic	1-Sept-88	17-Jul-12	10	9	-	-	-	0.7	1-Apr-94

Notes:

ND = Non detect - TCE not detected above practical quantification limit. If TCE was detected at less than 0.2 µg/L it was counted as a non-detect.
µg/L = Micrograms per liter
* = Date sample was collected from monitoring well with maximum concentration of TCE.
\- = Not applicable; analysis not performed.
Historic datasets include all available data since 1988. Recent datasets include data from the last 10 years.
Linear concentration graphs were not plotted for monitoring wells if non-detects are more than half of the data set.
Trend graphs are presented in Appendix C.

Table 5. Test for Normality and Linear Regression Results for Historical and Current TCE Data in Select Wells

Well ID	Dataset	P Value	Normally Distributed?	Log P Value	Log Normally Distributed?	Linear Regression P Value	Slope	Trend	Statistically?
84-CD-LF1-3	Historical	0.133	Yes	-	-	0.1543	-0.00073	Down	No
	Recent	0.070	Yes	-	-	0.0377	-0.00366	Down	Yes
84-CD-LF1-4	Historical	0.008	No	0.427	Yes	0.0714	-0.00022	Down	No
	Recent	0.213	Yes	-	-	0.2829	0.00047	Up	No
95-LF1-10	Historical	0.001	No	<0.0001	No	-	-	-	-
	Recent	0.990	Yes	-	-	0.6575	-0.00003	Down	No
95-LF1-11	Historical	0.001	No	0.165	Yes	0.1220	0.00012	Up	No
	Recent	0.016	No	0.131	Yes	0.1409	0.00058	Up	No

Notes:

- = Not applicable; analysis not performed. Logarithmic transformation was not performed on datasets considered normally distributed. Linear regression trend analysis was not performed on datasets not considered normally or log-normally distributed (non-parametric data). See Appendix C for additional information.

Historic datasets include all available data since 1988. Recent datasets include data from the last 10 years.

Table 6. Kendall Correlation Results for Historical and Recent TCE Data in Select Wells

Well ID	Dataset	Tau Statistic	Two Tailed P Value	Trend	Statistically?
95-LF1-10	Historical	0.010	0.9516	Up	No

Notes:

- = Not applicable; analysis not performed.

Historic datasets include all available data since 1988. Recent datasets include data from the last 10 years.

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Appendix B - Groundwater Elevations and Selected VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	trans-DCE (µg/L)	1,1,1-TCA (µg/L)	1,2-DCP (µg/L)	PCE (µg/L)	CT (µg/L)	CF (µg/L)
Maximum Contaminant Level (MCL)			-	5	70	100	200	5	5	5	8
84-CD-LF1-1	1-Sep-88	-	271.65	-	-	-	-	-	-	-	-
303.64	1-Dec-88	-	273.14	0.03U	0.2U	0.5U	-	-	-	0.01U	-
	1-Apr-94	-	273.30	0.5U	0.2U	-	0.2U	0.5U	0.5U	0.2U	0.2U
	1-Aug-97	25.78	277.86	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-99	21.25	282.39	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-00	26.05	277.59	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
	1-Nov-00	31.81	271.83	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
	1-Mar-02	27.59	276.05	-	-	-	-	-	-	-	-
	1-Apr-03	29.50	274.14	0.02U	1.0U	1.0U	1.0U	1.0U	0.05U	0.05U	1.0U
	15-Jun-07	26.20	277.44	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	22-Apr-09	30.07	273.57	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	10-May-10	29.16	274.48	-	-	-	-	-	-	-	-
	26-Apr-11	24.37	279.27	-	-	-	-	-	-	-	-
	17-Jul-12	27.65	275.99	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	10-Jun-13	28.85	274.79	-	-	-	-	-	-	-	-
	20-May-14	23.70	279.94	-	-	-	-	-	-	-	-
	5-May-15	26.37	277.27	-	-	-	-	-	-	-	-
	26-Apr-16	22.54	281.10	-	-	-	-	-	-	-	-
	11-Apr-17	22.03	281.61	-	-	-	-	-	-	-	-
	19-Mar-18	24.80	278.84	-	-	-	-	-	-	-	-
84-CD-LF1-2	1-Sep-88	-	277.51	-	-	-	-	-	-	-	-
303.48	1-Dec-88	-	277.82	**0.3**	0.2U	0.5U	-	-	-	0.01U	-
	1-Apr-94	-	277.70	0.5U	0.2U	-	0.2U	0.5U	0.5U	0.2U	0.2U
	1-Aug-97	26.17	277.31	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-99	21.77	281.71	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-00	20.98	282.50	0.081J	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
	1-Nov-00	27.66	275.82	0.044J	0.4U	0.4U	0.018J	0.4U	0.4U	0.025J	0.4U
	1-Mar-02	25.00	278.48	-	-	-	-	-	-	-	-
	1-Apr-03	25.18	278.30	**0.1**	1.0U	1.0U	1.0U	1.0U	0.05U	0.05U	1.0U
	15-Jun-07	26.32	277.16	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	17-Jul-12	26.41	277.07	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	10-Jun-13	26.27	277.21	-	-	-	-	-	-	-	-
	20-May-14	24.03	279.45	-	-	-	-	-	-	-	-
	5-May-15	25.92	277.56	-	-	-	-	-	-	-	-
	26-Apr-16	23.05	280.43	-	-	-	-	-	-	-	-
	11-Apr-17	22.37	281.11	-	-	-	-	-	-	-	-
	19-Mar-18	25.06	278.42	-	-	-	-	-	-	-	-
84-CD-LF1-3	1-Sep-88	-	274.02	-	-	-	-	-	-	-	-
297.69	1-Dec-88	-	275.13	**16.0**	**12.0**	0.5U	-	-	-	**0.05**	-
	1-Apr-94	-	273.02	**10.0**	**3.0**	-	0.2U	0.5U	0.5U	0.2U	0.2U
	1-Aug-97	21.84	275.85	**2.0**	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-99	18.38	279.31	**1.0**	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-00	21.96	275.73	**11.0**	**0.5**	0.4U	0.4U	0.4U	0.06J	0.4U	0.33J
	1-Nov-00	25.01	272.68	**10.0**	**1.6**	0.056J	0.4U	0.4U	0.033J	0.4U	0.12J
	1-Mar-02	23.25	274.44	**16.0**	**0.6**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
	1-Apr-03	21.95	275.74	**21.9**	**1.0U**	1.0U	1.0U	1.0U	0.1	0.1	1.0U
	28-Apr-04	24.81	272.88	**13.4**	**1.3**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	24-May-05	22.97	274.72	**24.4**	**0.6**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	13-Jun-06	23.69	274.00	**15.0**	**0.7**	0.5U	0.5U	0.5U	0.5U	**0.5**	0.5U
	15-Jun-07	23.27	274.42	**9.5**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	27-May-08	24.84	272.85	**9.1**	**0.7**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	22-Apr-09	24.45	273.24	**11.3**	**0.7**	0.5U	0.5U	0.5U	0.5U	0.5U	-
	4-Jun-10	24.31	273.38	**19.0**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	26-May-11	20.88	276.81	**3.3**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	17-Jul-12	23.81	273.88	**12.0**	**0.8**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	25-Jun-13	24.08	273.61	**11.0**	**0.61**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Duplicate	25-Jun-13	24.08	273.61	**11.0**	**0.59**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U

Appendix B - Groundwater Elevations and Selected VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	trans-DCE (µg/L)	1,1,1-TCA (µg/L)	1,2-DCP (µg/L)	PCE (µg/L)	CT (µg/L)	CF (µg/L)
Maximum Contaminant Level (MCL)			-	5	70	100	200	5	5	5	8
84-CD-LF1-3 (cont.)	11-Jun-14	20.43	277.26	**2.5**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
Duplicate	11-Jun-14	20.43	277.26	**2.4**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
	5-May-15	24.61	273.08	11.0	0.8	0.2U	0.2U	0.2U	0.2U	0.2U	0.23J
	26-Apr-16	19.41	278.28	**1.0**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.1J
Duplicate	26-Apr-16	19.41	278.28	**1.0**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.09J
	11-Apr-17	19.04	278.65	**2.3**	0.07J	0.2U	0.2U	0.2U	0.2U	0.2U	0.14J
	19-Mar-18	21.36	276.33	**2.5**	0.070J	0.2U	0.2U	0.2U	0.2U	0.2U	0.14J
Duplicate	19-Mar-18	21.36	276.33	**2.6**	0.080J	0.2U	0.2U	0.2U	0.2U	0.2U	0.12J
84-CD-LF1-4	1-Sep-88	-	270.80	-	-	-	-	-	-	-	-
312.59	1-Dec-88	-	271.28	7.1	**17.0**	0.5U	-	-	-	**0.02**	-
	1-Apr-94	-	270.86	6.0	**13.0**	-	0.2U	**2.0**	0.5U	0.2U	0.3U
	1-Aug-97	34.96	277.63	12.0	**7.0**	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-99	30.59	282.00	8.0	**6.0**	1.0U	1.0U	**1.0**	1.0U	1.0U	1.0U
	1-Apr-00	35.51	277.08	7.0	**9.9**	0.15J	0.4U	**1.4**	0.4U	0.4U	0.27J
	1-Nov-00	41.74	270.85	6.9	**11.0**	0.21J	0.4U	**1.5**	0.4U	0.4U	0.22J
	1-Mar-02	37.14	275.45	7.2	**11.0**	**0.2**	0.2U	**1.6**	0.2U	0.2U	0.2U
	1-Apr-03	40.17	272.42	6.3	**11.8**	1.0U	1.0U	**1.6**	0.05U	0.05U	1.0U
	28-Apr-04	40.23	272.36	7.0	**9.9**	0.5U	0.5U	**1.5**	0.5U	0.5U	0.5U
	24-May-05	41.46	271.13	5.2	**8.7**	0.5U	0.5U	**1.3**	0.5U	0.5U	0.5U
	13-Jun-06	36.78	275.81	5.6	**9.8**	0.5U	0.5U	**1.6**	0.5U	0.5U	0.5U
	15-Jun-07	35.46	277.13	7.3	**3.3**	0.5U	0.5U	**0.6**	0.5U	0.5U	0.5U
	27-May-08	39.65	272.94	6.1	**7.0**	0.5U	0.5U	**1.2**	0.5U	0.5U	0.5U
	22-Apr-09	39.30	273.29	5.4	**10.0**	0.5U	0.5U	**1.5**	0.5U	0.5U	0.5U
	4-Jun-10	38.77	273.82	**4.8**	**8.9**	0.5U	0.5U	**1.4**	0.5U	0.5U	0.5U
	26-May-11	33.72	278.87	7.8	**4.0**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	17-Jul-12	37.00	275.59	**4.6**	**9.5**	0.5U	0.5U	**1.2**	0.5U	0.5U	0.5U
	25-Jun-13	38.09	274.50	**4.3**	**7.8**	0.2U	0.2U	**1.2**	0.2U	0.2U	**0.21**
	11-Jun-14	32.95	279.64	5.8	**3.1**	0.2U	0.2U	**0.44**	0.2U	0.2U	0.2U
	5-May-15	35.62	276.97	**5**	**7.4**	0.15J	0.2U	**1.1**	0.2U	0.2U	0.24J
	26-Apr-16	31.80	280.79	5.6	**4.7**	0.2U	0.2U	**0.66**	0.17J	0.2U	0.24J
	11-Apr-17	31.37	281.22	8.3	**4.5**	0.1J	0.2U	**0.65**	0.12J	0.2U	0.21J
Duplicate	11-Apr-17	31.37	281.22	8.3	**4.5**	0.1J	0.2U	**0.63**	0.2U	0.2U	0.2J
	19-Mar-18	34.09	278.50	6.8	**5.3**	0.11J	0.2U	**0.82**	0.2U	0.2U	0.25J
95-LF1-5	1-Aug-97	37.38	277.55	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
314.93	1-Apr-99	32.87	282.06	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-00	37.95	276.98	0.24J	0.038J	0.4U	0.4U	0.4U	0.057J	0.11J	0.11J
	1-Nov-00	dry	-	-	-	-	-	-	-	-	-
	1-Mar-02	39.63	275.30	-	-	-	-	-	-	-	-
	1-Apr-03	43.15	271.78	**0.6**	1.0U	1.0U	1.0U	1.0U	**0.1**	0.05U	1.0U
	15-Jun-07	37.79	277.14	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	17-Jul-12	39.35	275.58	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	10-Jun-13	40.58	274.35	-	-	-	-	-	-	-	-
	20-May-14	No Access									
	5-May-15	37.98	276.95	-	-	-	-	-	-	-	-
	26-Apr-16	34.06	280.87	-	-	-	-	-	-	-	-
	11-Apr-17	33.65	281.28	-	-	-	-	-	-	-	-
	19-Mar-18	36.43	278.50	-	-	-	-	-	-	-	-
95-LF1-7	1-Aug-97	20.91	276.22	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
297.13	1-Apr-99	17.92	279.21	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-00	20.64	276.49	0.18J	0.038J	0.4U	0.4U	0.4U	0.4U	0.4U	0.37J
	1-Nov-00	20.87	276.26	0.19J	-	0.4U	0.4U	-	0.023J	0.4U	0.13J
	1-Mar-02	20.61	276.52	-	-	-	-	-	-	-	-
	1-Apr-03	20.10	277.03	**0.1**	1.0U	1.0U	1.0U	1.0U	0.05U	0.05U	1.0U
	15-Jun-07	20.99	276.14	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	17-Jul-12	20.93	276.20	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
95-LF1-8	1-Aug-97	19.87	276.04	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
295.91	1-Apr-99	16.77	279.14	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U

Appendix B - Groundwater Elevations and Selected VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	trans-DCE (µg/L)	1,1,1-TCA (µg/L)	1,2-DCP (µg/L)	PCE (µg/L)	CT (µg/L)	CF (µg/L)
Maximum Contaminant Level (MCL)			-	5	70	100	200	5	5	5	8
95-LF1-8 (cont.)	1-Apr-00	19.61	276.30	0.18J	0.4U	0.4U	0.4U	0.4U	0.069J	0.4U	0.081J
	1-Nov-00	20.04	275.87	0.19J	0.4U	0.4U	0.4U	0.4U	0.17J	0.4U	0.12J
	1-Mar-02	19.55	276.36	-	-	-	-	-	-	-	-
	1-Apr-03	19.22	276.69	**0.1**	1.0U	1.0U	1.0U	1.0U	0.12U	0.05U	1.0U
	15-Jun-07	20.15	275.76	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	17-Jul-12	Could Not Locate									
95-LF1-9 299.80	1-Aug-97	13.57	286.23	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-99	11.06	288.74	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-00	12.12	287.68	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
	1-Nov-00	13.99	285.81	0.4U	0.11J	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
	1-Mar-02	11.67	288.13	-	-	-	-	-	-	-	-
	1-Apr-03	12.09	287.71	0.02U	1.0U	1.0U	1.0U	1.0U	0.05U	0.05U	1.0U
	15-Jun-07	13.32	286.48	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	17-Jul-12	12.89	286.91	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	19-Mar-18	12.17	287.63	-	-	-	-	-	-	-	-
95-LF1-10 302.76	1-Aug-97	25.21	277.55	**1.0**	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-99	21.80	280.96	**1.0**	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-00	25.25	277.51	0.13J	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
	1-Nov-00	26.97	275.79	**2.8**	0.047J	0.4U	0.4U	0.051J	0.11J	0.024J	0.093J
	1-Mar-02	24.85	277.91	**2.4**	0.2U	0.2U	0.2U	0.2U	**0.3**	0.2U	0.2U
	1-Apr-03	24.92	277.84	**2.6**	1.0U	1.0U	1.0U	1.0U	**0.3**	0.05U	1.0U
	28-Apr-04	26.28	276.48	**3.0**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	24-May-05	25.57	277.19	**2.2**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	13-Jun-06	25.51	277.25	**2.6**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	15-Jun-07	25.63	277.13	**2.4**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	27-May-08	26.60	276.16	**2.8**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	22-Apr-09	25.68	277.08	**2.5**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Duplicate	22-Apr-09	25.68	277.08	**2.5**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	4-Jun-10	25.71	277.05	**2.0**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	26-May-11	24.22	278.54	**1.9**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	17-Jul-12	25.75	277.01	**2.6**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	25-Jun-13	25.92	276.84	**2.2**	0.2U	0.2U	0.2U	0.2U	**0.22**	0.2U	0.2U
	11-Jun-14	23.87	278.89	**2.1**	0.2U	0.2U	0.2U	0.2U	**0.29**	0.2U	0.2U
Duplicate	5-May-15	25.34	277.42	**2.2**	0.2U	0.2U	0.2U	0.2U	0.13J	0.2U	0.09J
	5-May-15	25.34	277.42	**2.2**	0.2U	0.2U	0.2U	0.2U	0.12J	0.2U	0.09J
	26-Apr-16	23.00	279.76	**2.3**	0.2U	0.2U	0.2U	0.2U	**0.58**	0.2U	0.2U
	11-Apr-17	22.72	280.04	**2.4**	0.2U	0.2U	0.2U	0.2U	**0.56**	0.2U	0.08J
	19-Mar-18	24.75	278.01	**2.3**	0.2U	0.2U	0.2U	0.2U	0.37J	0.2U	0.2U
95-LF1-11 307.85	1-Aug-97	31.35	276.50	**1.0**	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-99	26.69	281.16	**3.0**	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-00	31.34	276.51	**1.7**	0.047J	0.4U	0.4U	0.4U	0.4U	0.052J	0.09J
	1-Nov-00	33.23	274.62	**1.9**	0.076J	0.4U	0.4U	0.4U	0.021J	0.4U	0.11J
	1-Mar-02	32.75	275.10	**1.8**	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
	1-Apr-03	32.22	275.63	**2.2**	1.0U	1.0U	1.0U	1.0U	0.05U	**0.2**	1.0U
	28-Apr-04	32.66	275.19	**2.1**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	24-May-05	32.06	275.79	**1.6**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	13-Jun-06	31.87	275.98	**1.6**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	15-Jun-07	31.75	276.10	**1.5**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	27-May-08	32.98	274.87	**2.2**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	4-Jun-10	32.43	275.42	**1.8**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	26-May-11	40.60	267.25	**1.7**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Duplicate	26-May-11	40.60	267.25	**1.8**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	17-Jul-12	32.10	275.75	**1.7**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	25-Jun-13	Storage Container on Top of Well - No Access									
	20-May-14										
	5-May-15	31.52	276.33	**1.5**	0.2U	0.2U	0.2U	0.2U	0.2U	0.12J	0.09J
	26-Apr-16	27.75	280.10	**2.2**	0.2U	0.2U	0.2U	0.2U	0.2J	0.2U	0.19J

Appendix B - Groundwater Elevations and Selected VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	trans-DCE (µg/L)	1,1,1-TCA (µg/L)	1,2-DCP (µg/L)	PCE (µg/L)	CT (µg/L)	CF (µg/L)
Maximum Contaminant Level (MCL)			**-**	**5**	**70**	**100**	**200**	**5**	**5**	**5**	**8**
95-LF1-11 (cont.)	11-Apr-17	27.37	280.48	**4.5**	0.08J	0.2U	0.2U	0.2U	0.15J	0.13J	0.13J
	20-Mar-18	30.65	277.20	**2.7**	0.2U	0.2U	0.2U	0.2U	0.2U	0.10J	0.12J
LF1-PNL1	1-Sep-88	-	267.81	0.6U	-	0.6U	0.6U	0.6U	0.6U	0.6U	**1.4**
308.66	1-Dec-88	-	269.04	**0.1**	0.2U	0.5U	-	-	-	0.01U	-
	1-Apr-94	-	268.41	0.5U	**0.4**	-	**0.3**	0.5U	0.5U	**0.2**	0.5U
	1-Aug-97	31.12	277.54	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-99	26.64	282.02	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-00	31.69	276.97	0.4U	0.4U	0.4U	0.4U	0.4U	0.098J	0.15J	0.097J
	1-Nov-00	39.23	269.43	0.032J	0.027J	0.4U	0.031J	0.4U	0.026J	0.062J	0.11J
	1-Mar-02	33.41	275.25	-	-	-	-	-	-	-	-
	1-Apr-03	36.94	271.72	**2.6**	1.0U	1.0U	1.0U	1.0U	**0.3**	0.05U	1.0U
	15-Jun-07	31.54	277.12	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	22-Apr-09	37.03	271.63	-	-	-	-	-	-	-	-
	10-May-10	35.10	273.56	-	-	-	-	-	-	-	-
	26-Apr-11	29.76	278.90	-	-	-	-	-	-	-	-
	17-Jul-12	33.10	275.56	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Duplicate	17-Jul-12	33.10	275.56	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	10-Jun-13	34.34	274.32	-	-	-	-	-	-	-	-
	20-May-14	29.00	279.66	-	-	-	-	-	-	-	-
	5-May-15	31.73	276.93	-	-	-	-	-	-	-	-
	26-Apr-16	27.82	280.84	-	-	-	-	-	-	-	-
	11-Apr-17	27.39	281.27	-	-	-	-	-	-	-	-
	19-Mar-18	30.17	278.49	-	-	-	-	-	-	-	-
LF1-PNL2	1-Sep-88	-	275.95	2U	-	2U	2U	2U	2U	2U	2U
298.37	1-Dec-88	-	277.35	**0.2**	0.2U	0.5U	-	-	-	**0.01**	-
	1-Apr-94	-	277.31	-	-	-	-	-	-	-	-
	1-Aug-97	21.12	277.25	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-99	19.33	279.04	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-00	20.98	277.39	0.088J	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
	1-Nov-00	22.46	275.91	0.092J	0.021J	0.4U	0.4U	0.4U	0.022J	0.4U	0.4U
	1-Mar-02	21.01	277.36	-	-	-	-	-	-	-	-
	1-Apr-03	20.95	277.42	**0.044**	1.0U	1.0U	1.0U	1.0U	0.05U	0.05U	1.0U
	15-Jun-07	21.20	277.17	-	-	-	-	-	-	-	-
	22-Apr-09	21.12	277.25	-	-	-	-	-	-	-	-
	10-May-10	21.29	277.08	-	-	-	-	-	-	-	-
	26-Apr-11	20.86	277.51	-	-	-	-	-	-	-	-
	17-Jul-12	21.30	277.07	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	10-Jun-13	21.44	276.93	-	-	-	-	-	-	-	-
	20-May-14	20.86	277.51	-	-	-	-	-	-	-	-
	5-May-15	21.09	277.28	-	-	-	-	-	-	-	-
	26-Apr-16	20.35	278.02	-	-	-	-	-	-	-	-
	11-Apr-17	19.96	278.41								
	19-Mar-18	20.98	277.39	-	-	-	-	-	-	-	-
LF1-PNL3	1-Sep-88	-	278.34	2U	-	2U	2U	2U	2U	2U	2U
307.74	1-Dec-88	-	280.48	0.03U	0.2U	0.5U	-	-	-	0.01U	-
	1-Apr-94	-	281.34	-	-	-	-	-	-	-	-
	1-Aug-97	26.58	281.16	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-99	23.83	283.91	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-00	25.71	282.03	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
	1-Nov-00	29.21	278.53	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U	0.4U
	1-Mar-02	No Access									
	1-Apr-03	25.29	282.45	0.02U	1.0U	1.0U	1.0U	1.0U	0.05U	0.05U	1.0U
	15-Jun-07	26.72	281.02	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	17-Jul-12	27.09	280.65	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	19-Mar-18	21.76	285.98	-	-	-	-	-	-	-	-
LF1-PNL4	1-Sep-88	-	267.82	2U	-	2U	2U	2U	2U	2U	2U
305.00	1-Dec-88	-	269.03	**0.1**	0.2U	0.5U	-	-	-	0.01U	-

Appendix B - Groundwater Elevations and Selected VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	trans-DCE (µg/L)	1,1,1-TCA (µg/L)	1,2-DCP (µg/L)	PCE (µg/L)	CT (µg/L)	CF (µg/L)
Maximum Contaminant Level (MCL)			-	5	70	100	200	5	5	5	8
LF1-PNL4 (cont.)	1-Apr-94	-	268.41	**0.7**	0.4	-	0.2U	0.5U	0.5U	0.2U	0.2U
	1-Aug-97	27.46	277.54	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-99	23.04	281.96	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	1-Apr-00	28.00	277.00	0.29J	0.076J	0.4U	0.4U	0.4U	0.4U	0.4U	0.074J
	1-Nov-00	35.55	269.45	0.4U	0.021J	0.4U	0.4U	0.4U	0.4U	0.4U	0.047J
	1-Mar-02	29.76	275.24	-	-	-	-	-	-	-	-
	1-Apr-03	33.26	271.74	0.044U	1.0U	1.0U	1.0U	1.0U	0.05U	0.05U	1.0U
	15-Jun-07	27.87	277.13	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	17-Jul-12	29.37	275.63	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
	19-Mar-18	26.51	278.49	-	-	-	-	-	-	-	-

Notes:

TOC = Top of casing
DTW (ft bgs) = Depth to water feet below ground surface
GWELEV (ft AMSL) = Groundwater elevation feet above mean sea level
TCE = Trichloroethene
cis-DCE = cis-1,2-dichloroethylene
trans-DCE = trans-1,2-dichloroethylene
1,1,1-TCA = 1,1,1-trichloroethane
1,2-DCP = 1,2-dichloropropane
PCE = Tetrachloroethylene
CT = Carbon tetrachloride
CF = Chloroform
µg/L = Micrograms per liter
BOLD = Analyte detected at or above laboratory practical quantification limit
BOLD = Analyte detected at or above MTCA Method A cleanup level
J = Value estimated
U = Analyte not detected above laboratory practical quantification limit reported
- = No data, not applicable
TOC Elevation was measured on 10 June 2013

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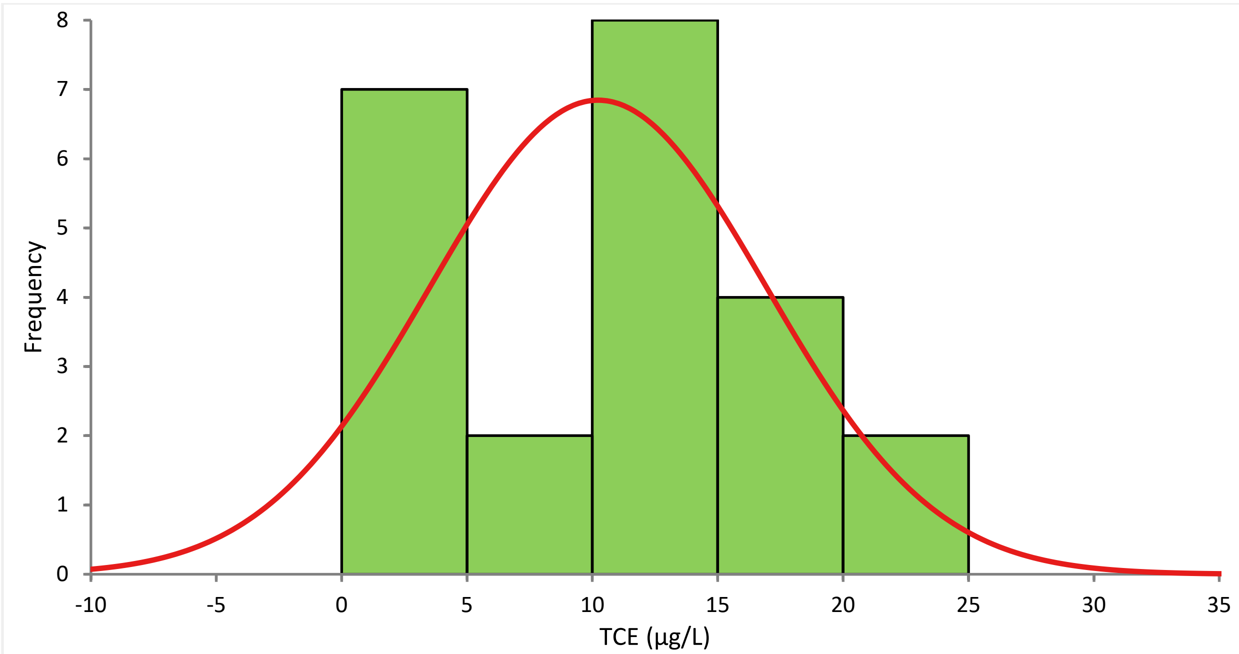
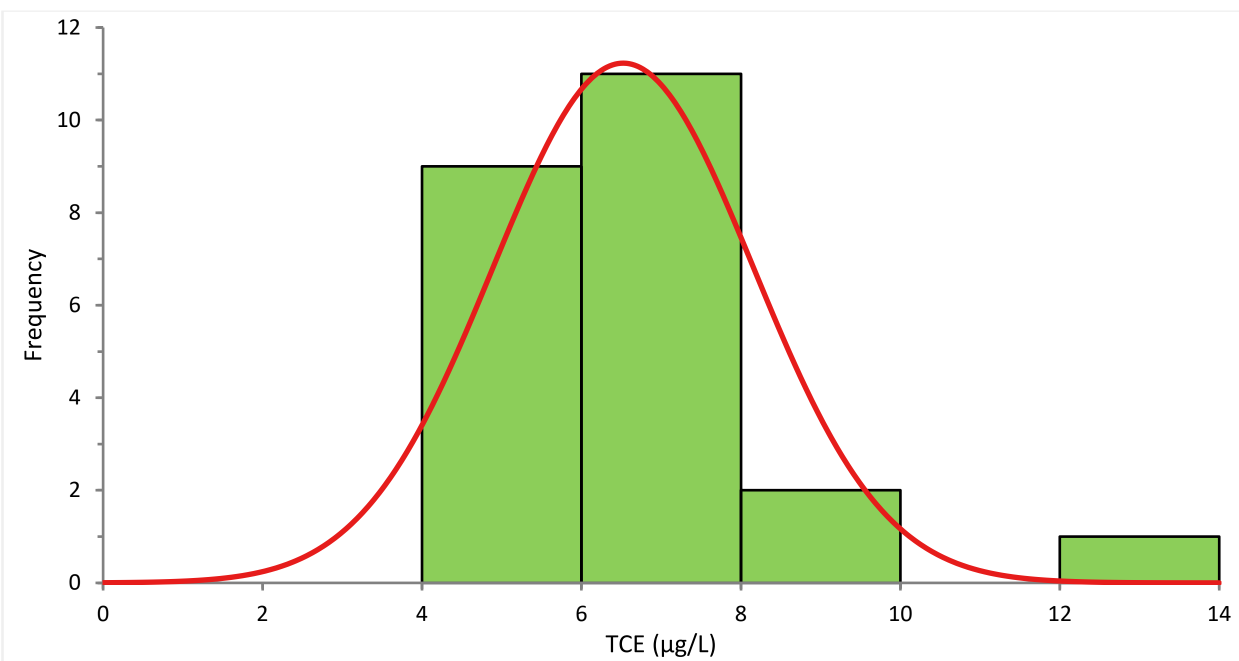
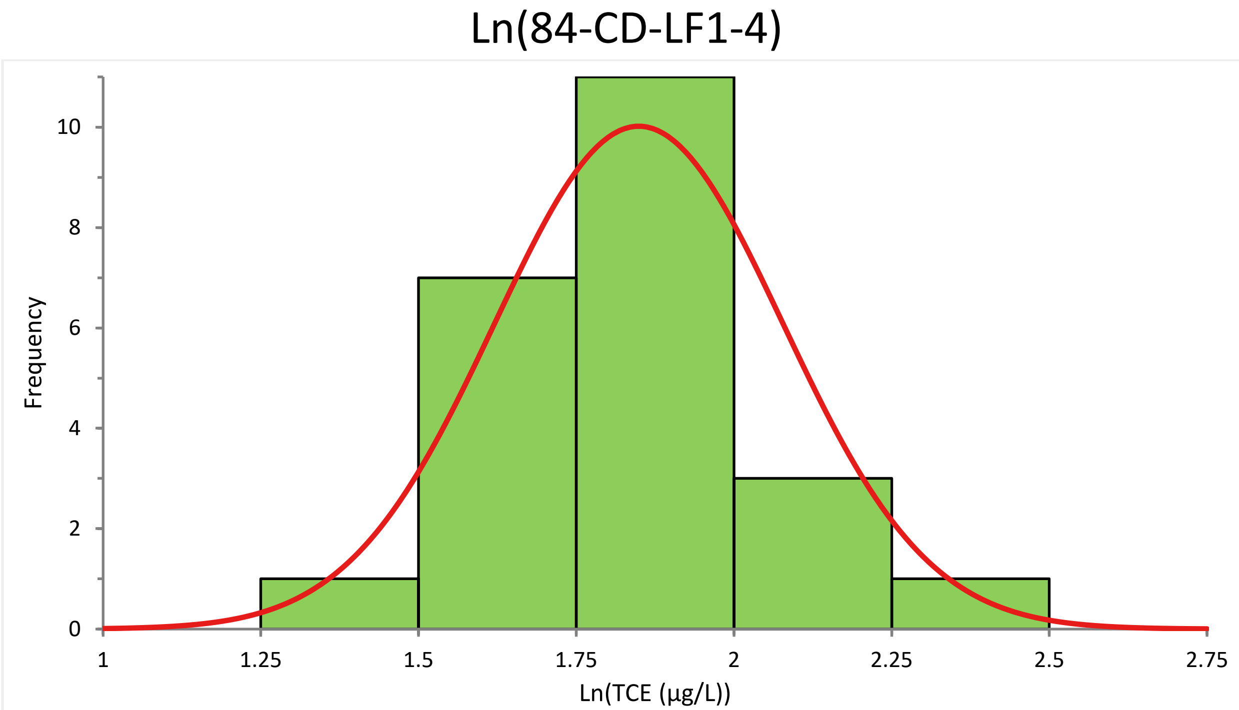
84-CD-LF1-3

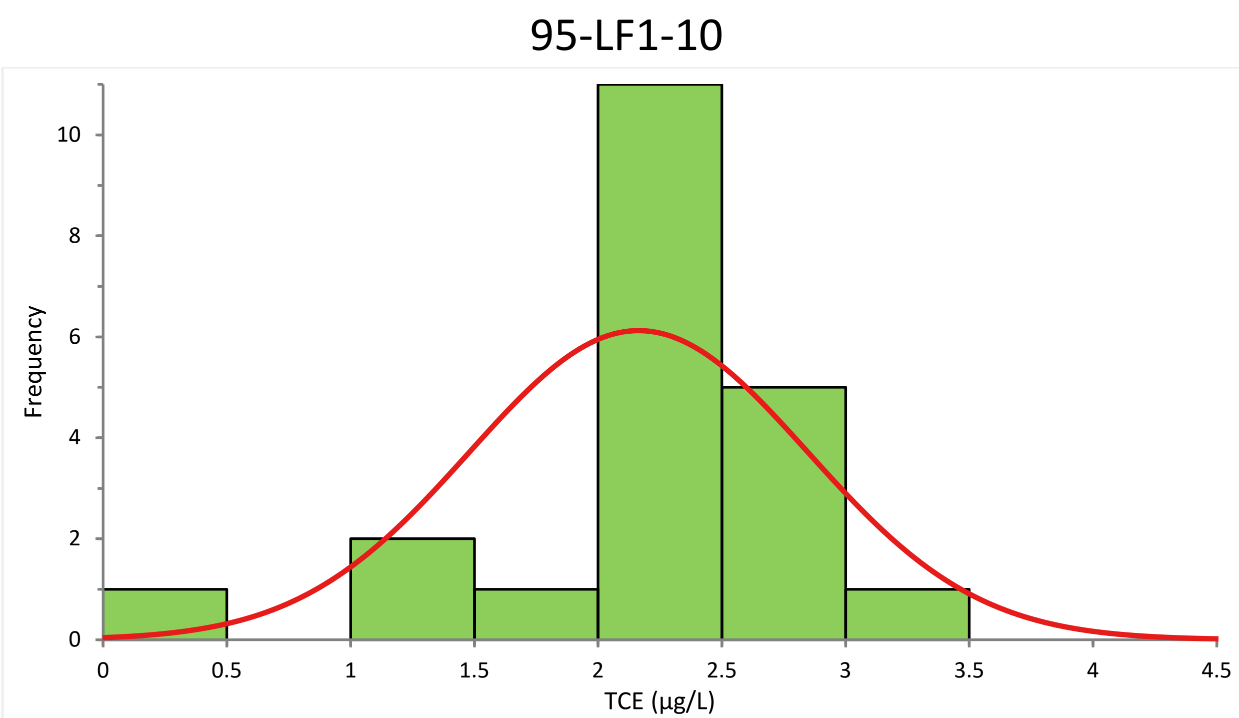


84-CD-LF1-4

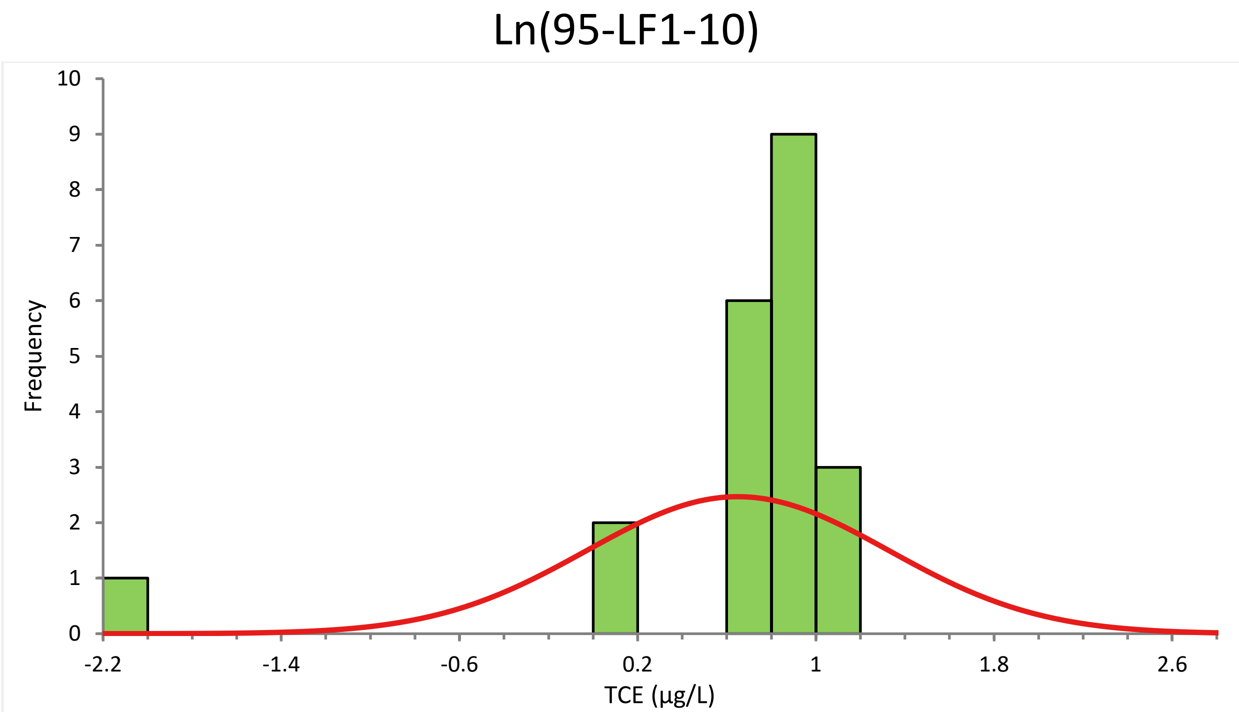


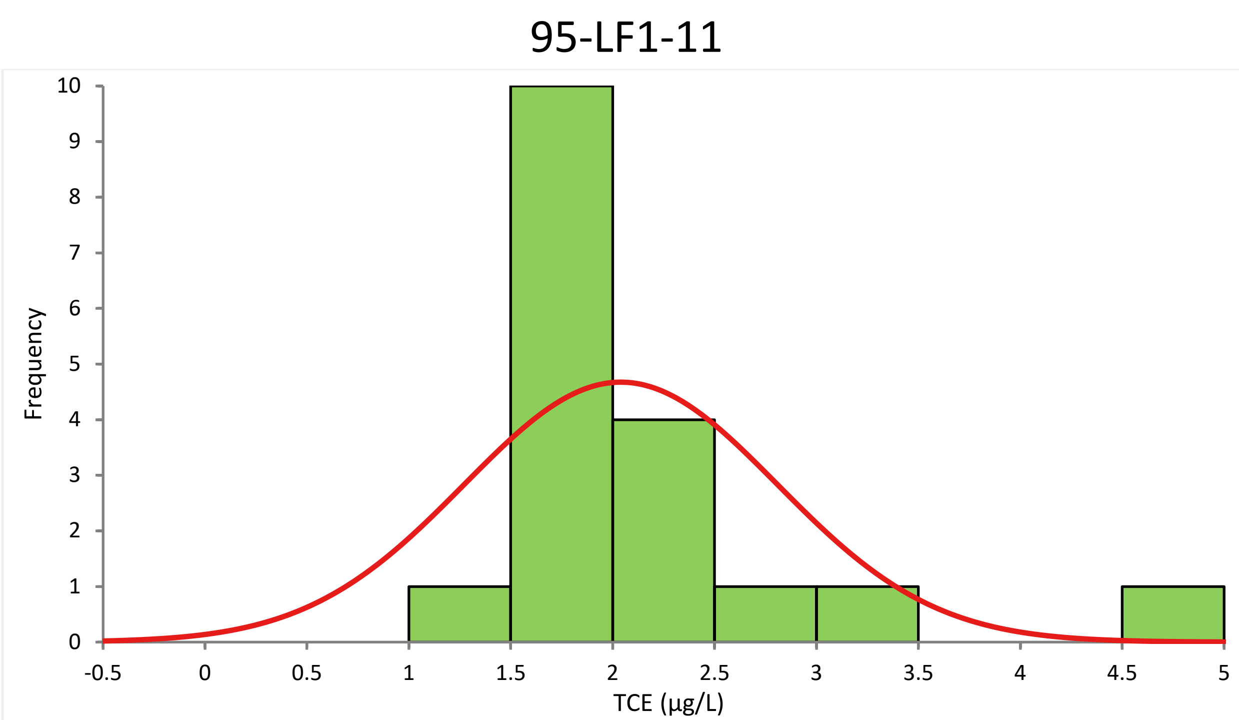


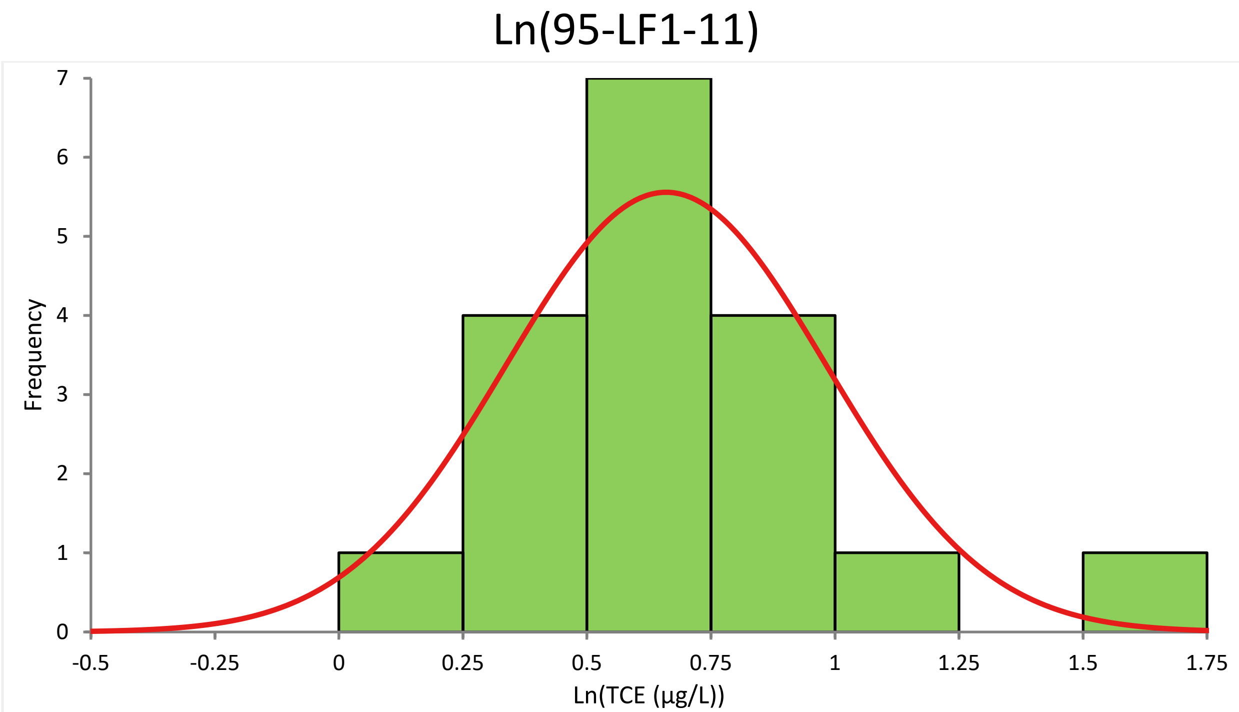
Ln(84-CD-LF1-4)
Frequency
0
2
4
6
8
10
1
1.25
1.5
1.75
2
2.25
2.5
2.75
Ln(TCE (µg/L))

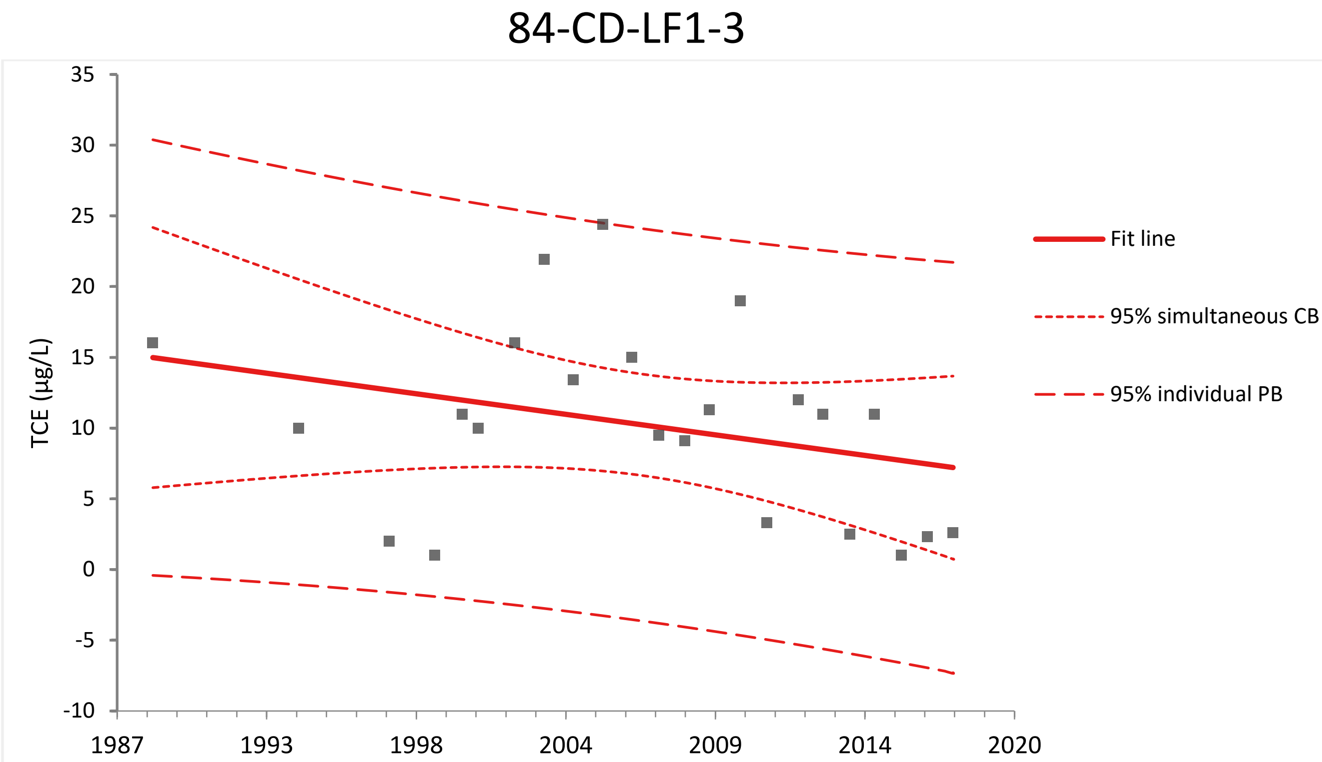


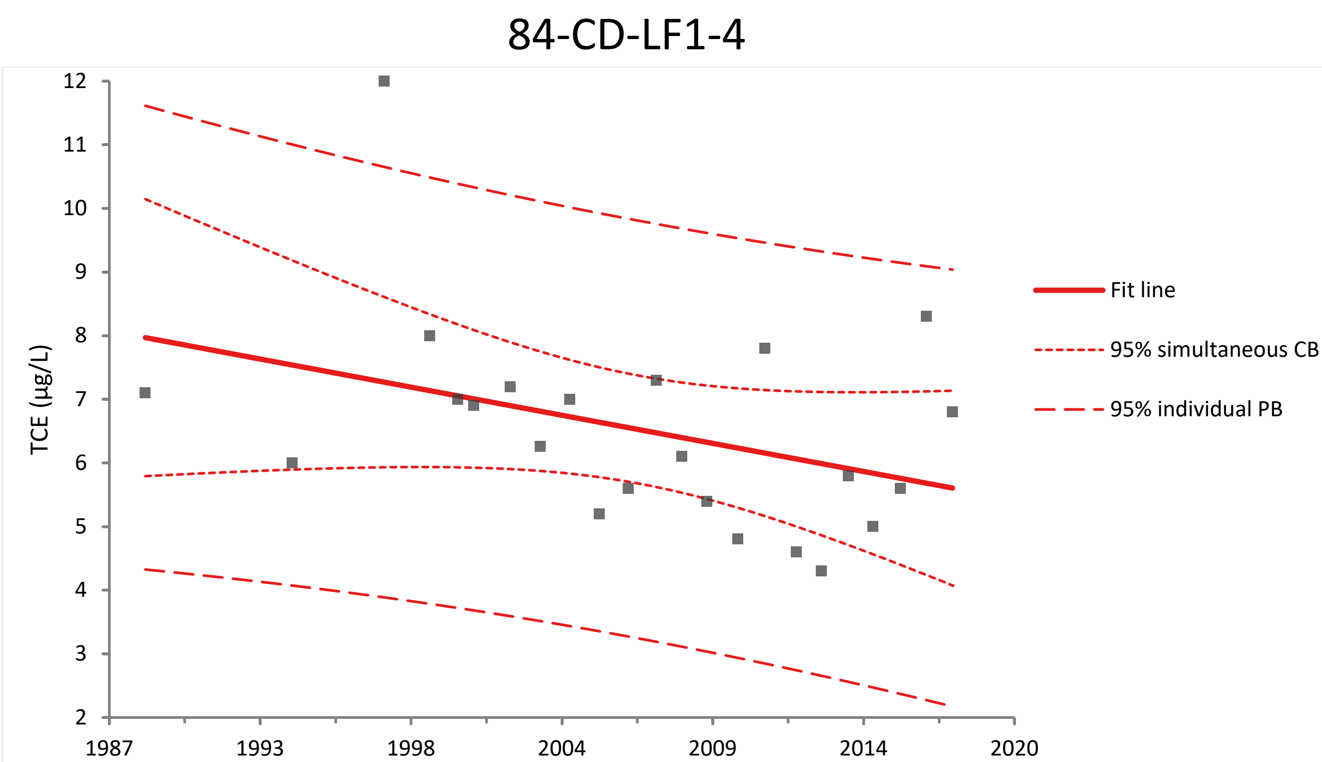
95-LF1-10
Frequency
0
2
4
6
8
10
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
TCE (µg/L)

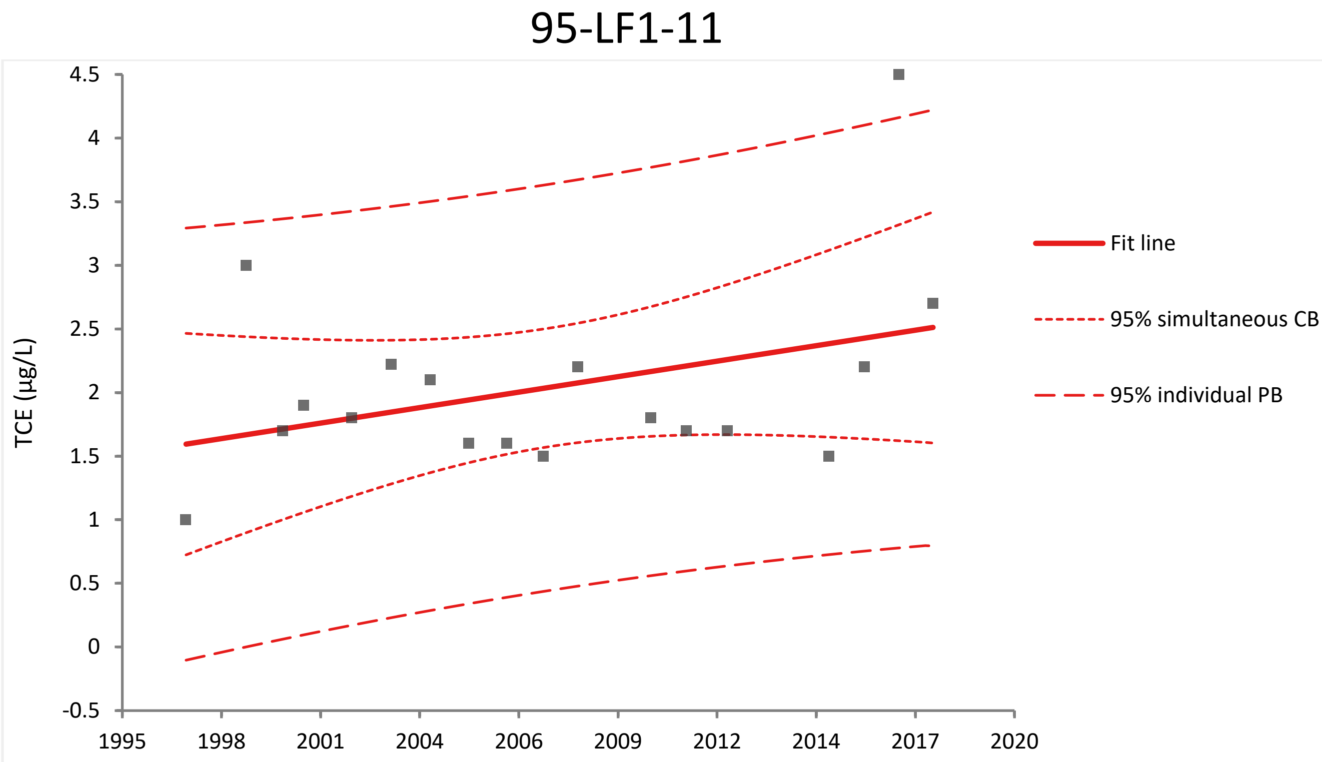

Ln(95-LF1-10)
Frequency
10
9
8
7
6
5
4
3
2
1
0
-2.2
-1.4
-0.6
0.2
1
1.8
2.6
TCE (µg/L)

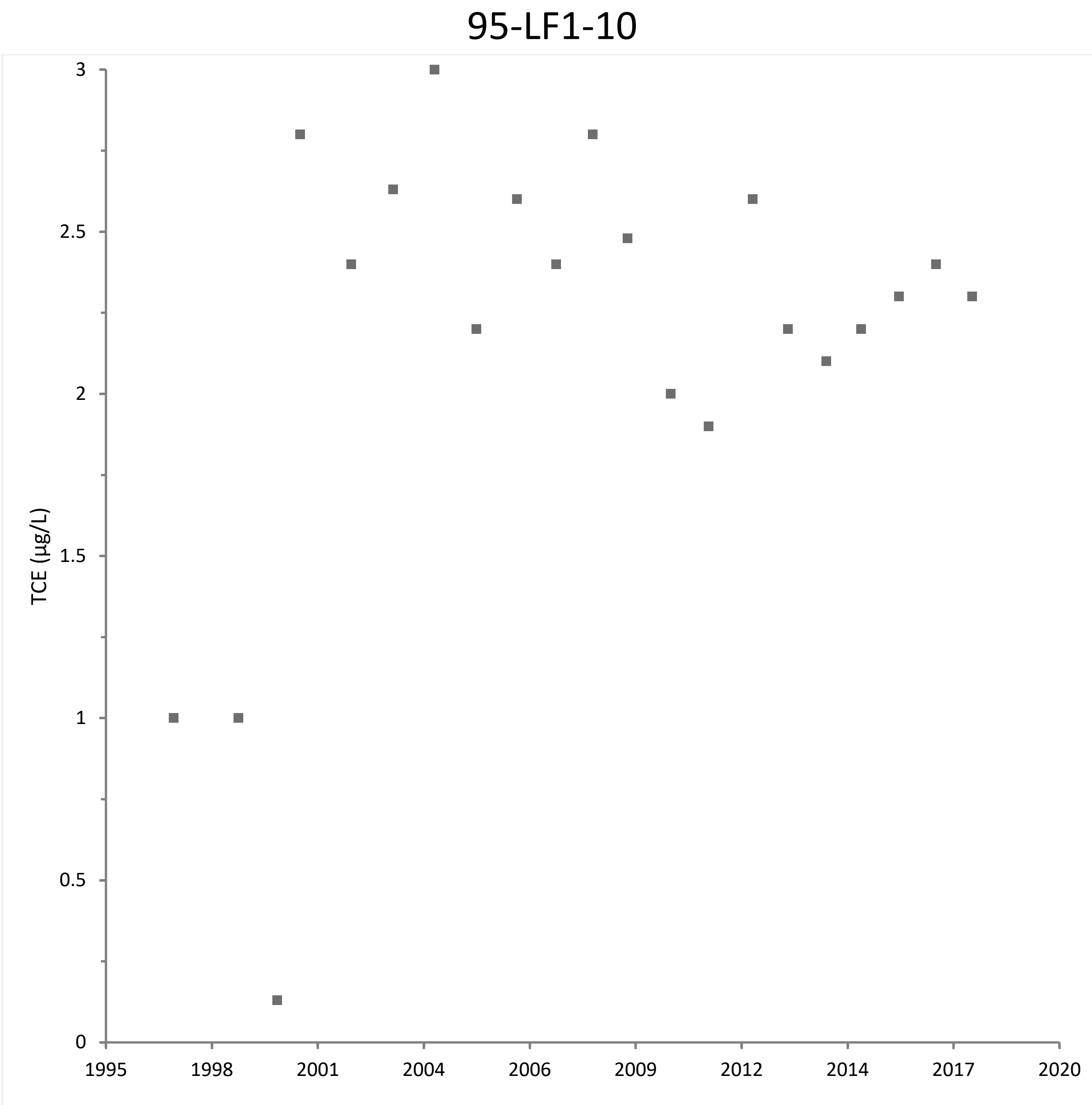

95-LF1-11
Frequency
10
9
8
7
6
5
4
3
2
1
0
-0.5
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
TCE (µg/L)

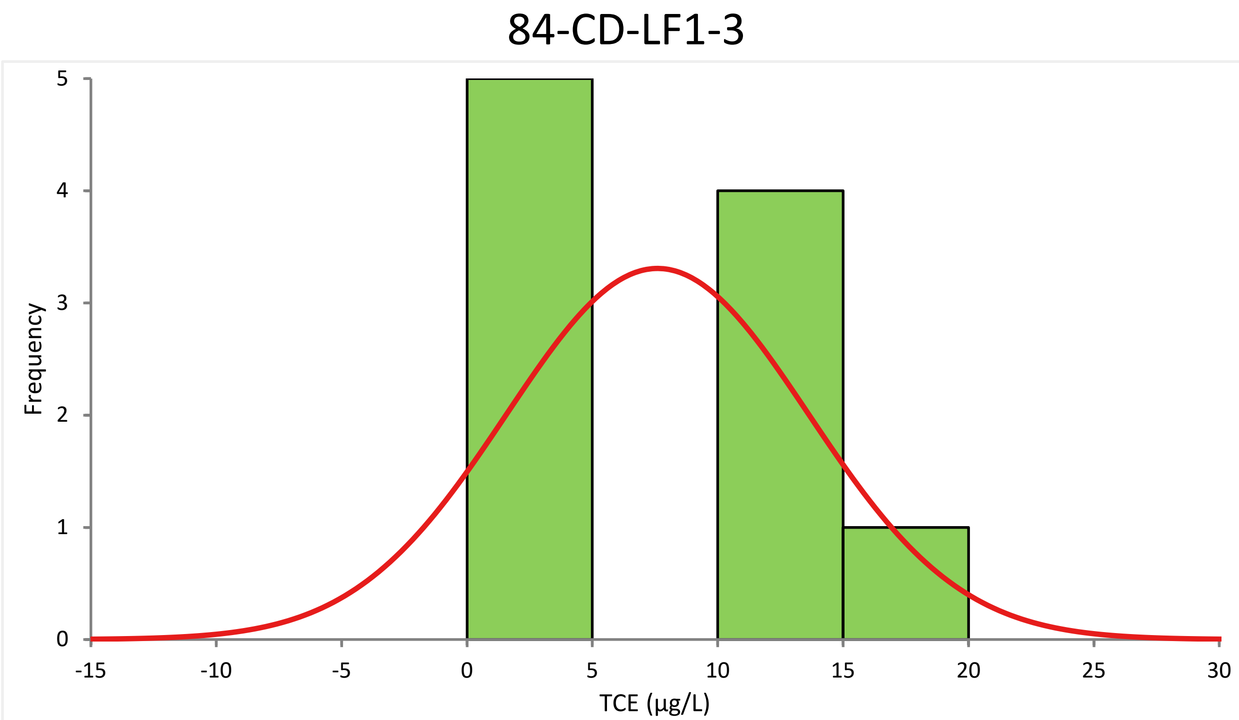

Ln(95-LF1-11)
Frequency
0
1
2
3
4
5
6
7
-0.5
-0.25
0
0.25
0.5
0.75
1
1.25
1.5
1.75
Ln(TCE (µg/L))

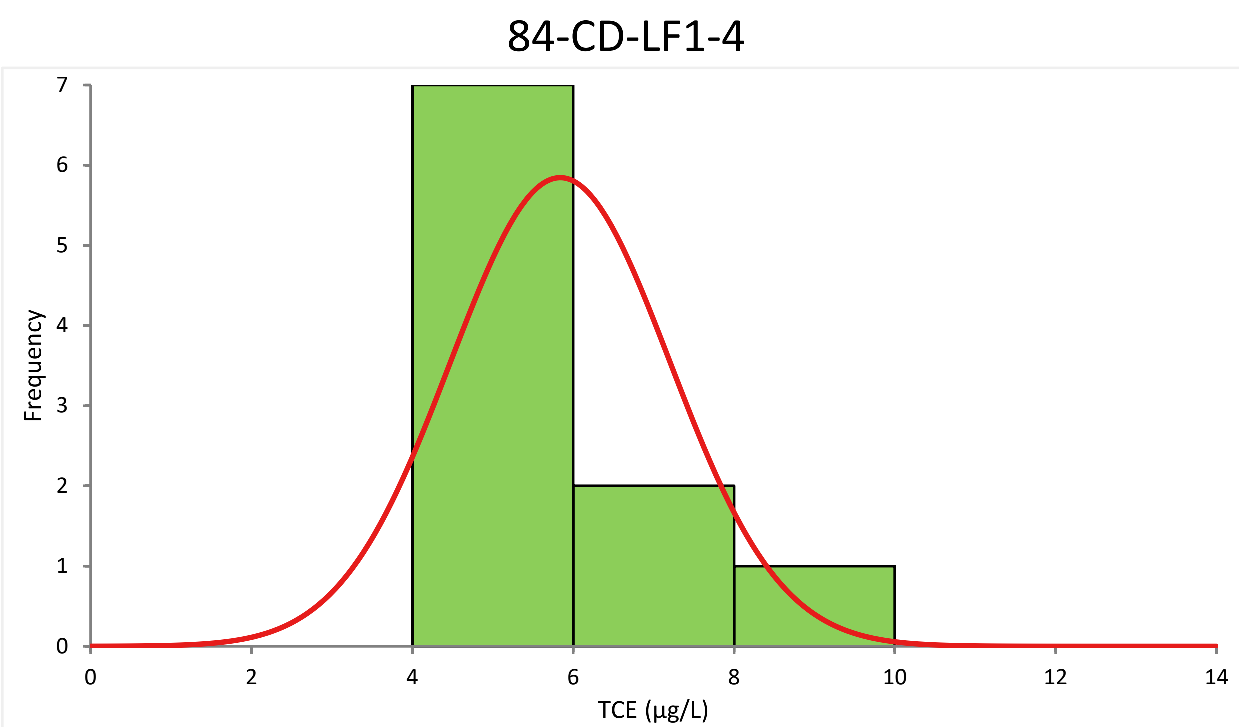

84-CD-LF1-3
TCE (µg/L)
Fit line
95% simultaneous CB
95% individual PB
35
30
25
20
15
10
5
0
-5
-10
1987
1993
1998
2004
2009
2014
2020


84-CD-LF1-4
TCE (µg/L)
Fit line
95% simultaneous CB
95% individual PB
12
11
10
9
8
7
6
5
4
3
2
1987
1993
1998
2004
2009
2014
2020

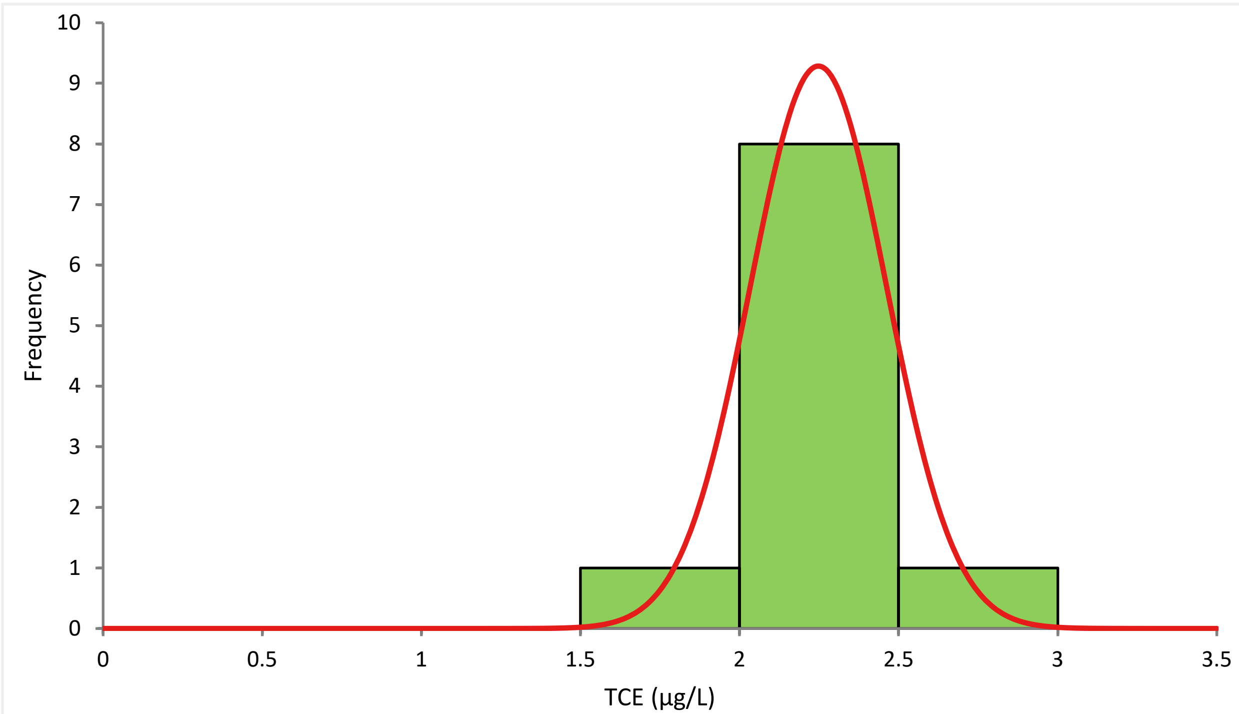

95-LF1-11
TCE (µg/L)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
1995
1998
2001
2004
2006
2009
2012
2014
2017
2020
Fit line
95% simultaneous CB
95% individual PB


95-LF1-10
TCE (µg/L)
3
2.5
2
1.5
1
0.5
0
1995
1998
2001
2004
2006
2009
2012
2014
2017
2020

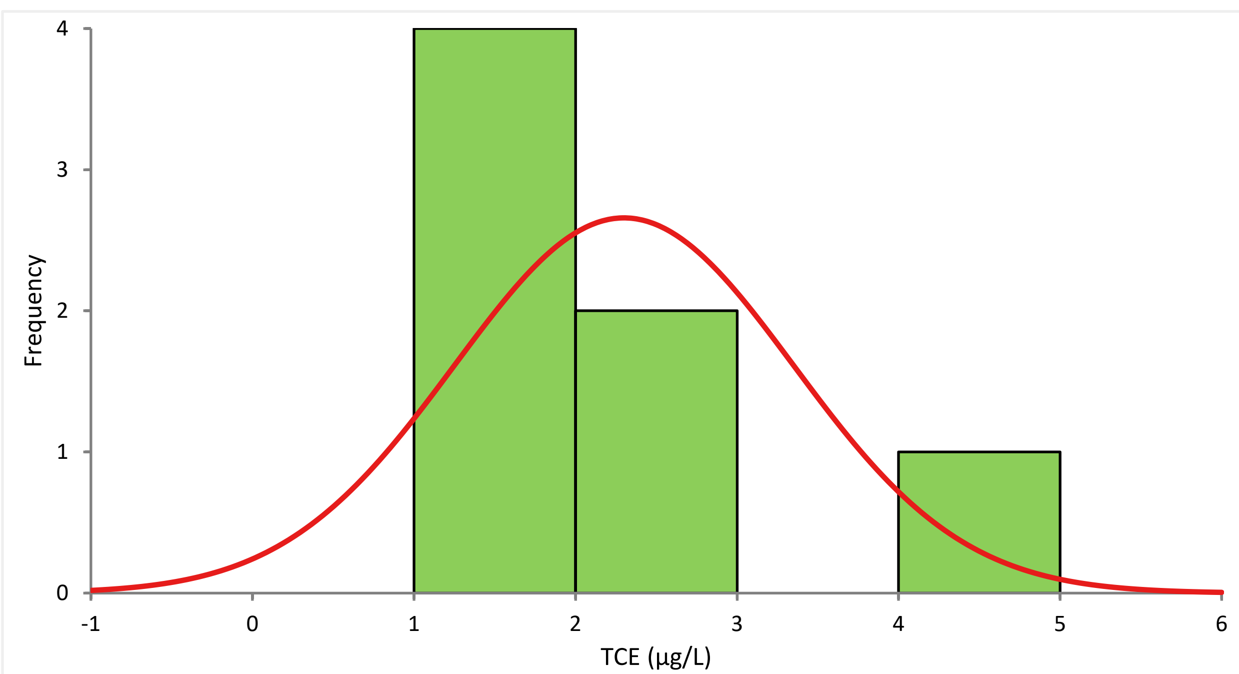

84-CD-LF1-3
Frequency
TCE (µg/L)
0
1
2
3
4
5
-15
-10
-5
0
5
10
15
20
25
30

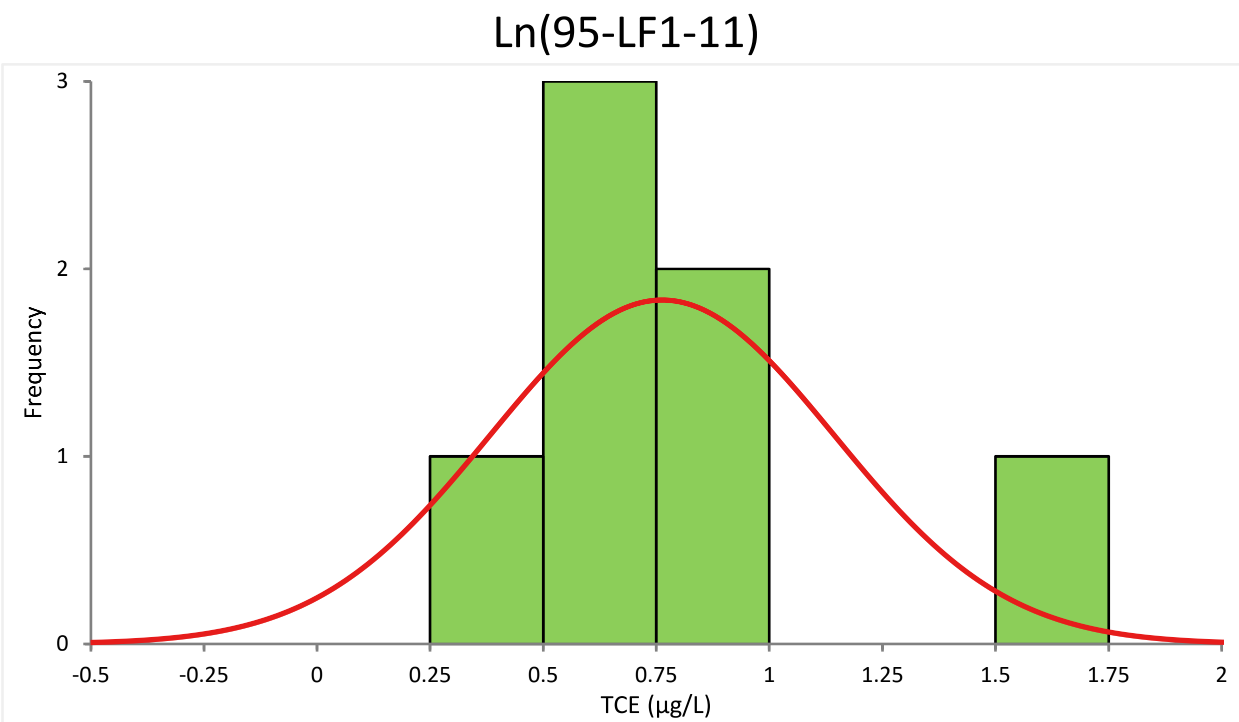

84-CD-LF1-4
Frequency
TCE (µg/L)
0
1
2
3
4
5
6
7
0
2
4
6
8
10
12
14

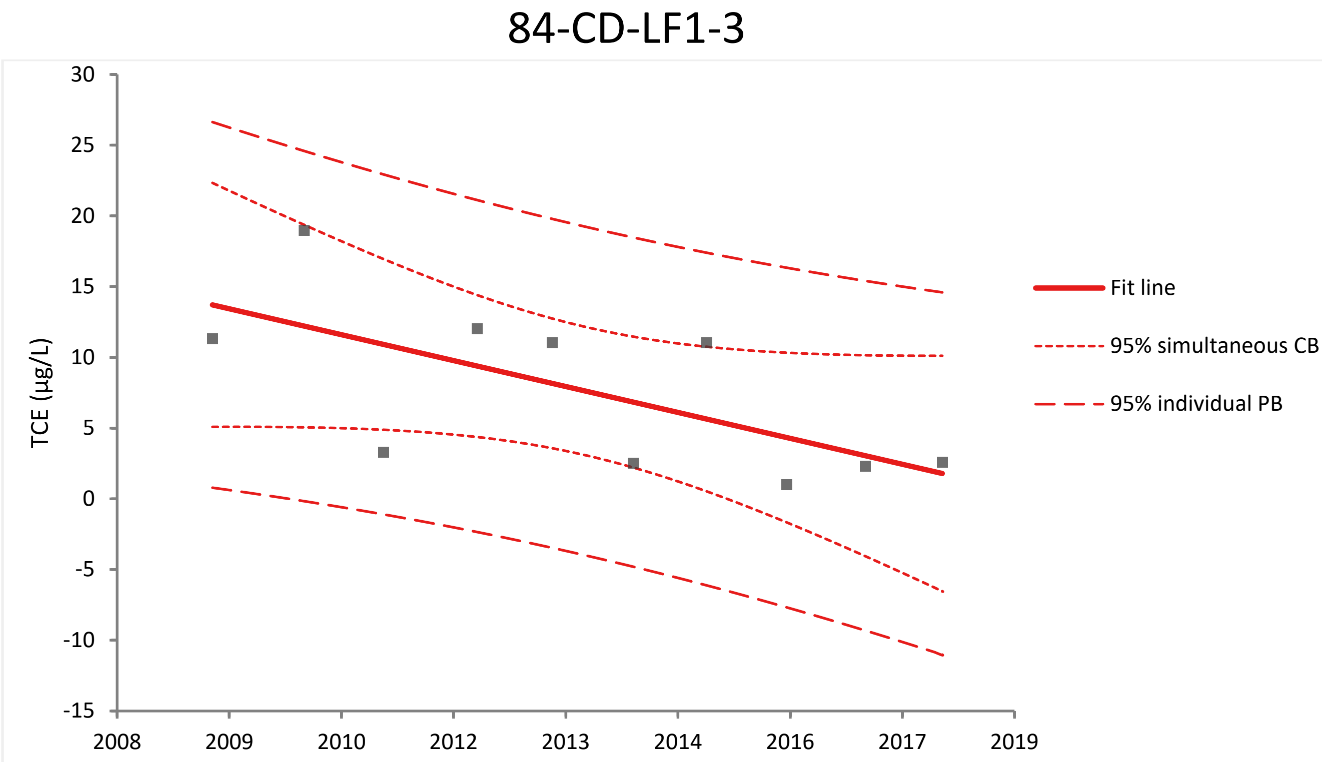
95-LF1-10

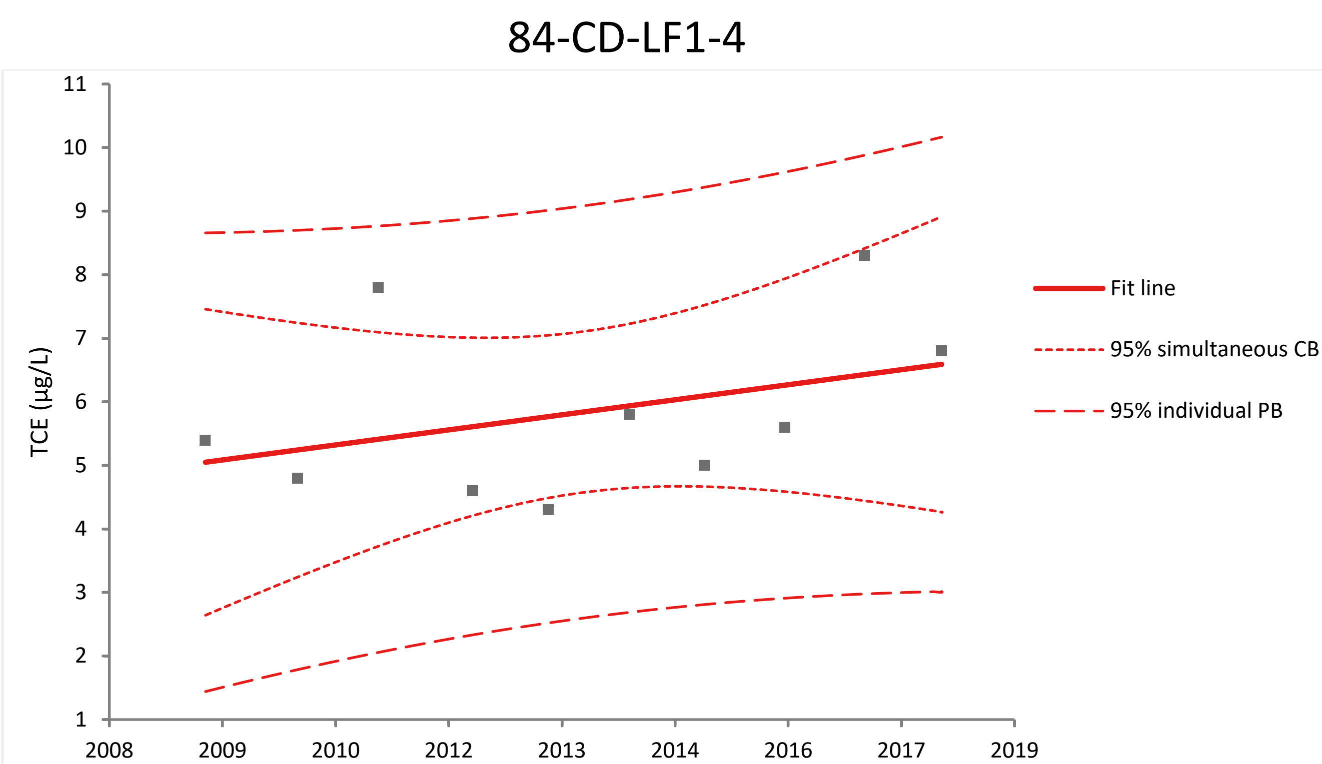


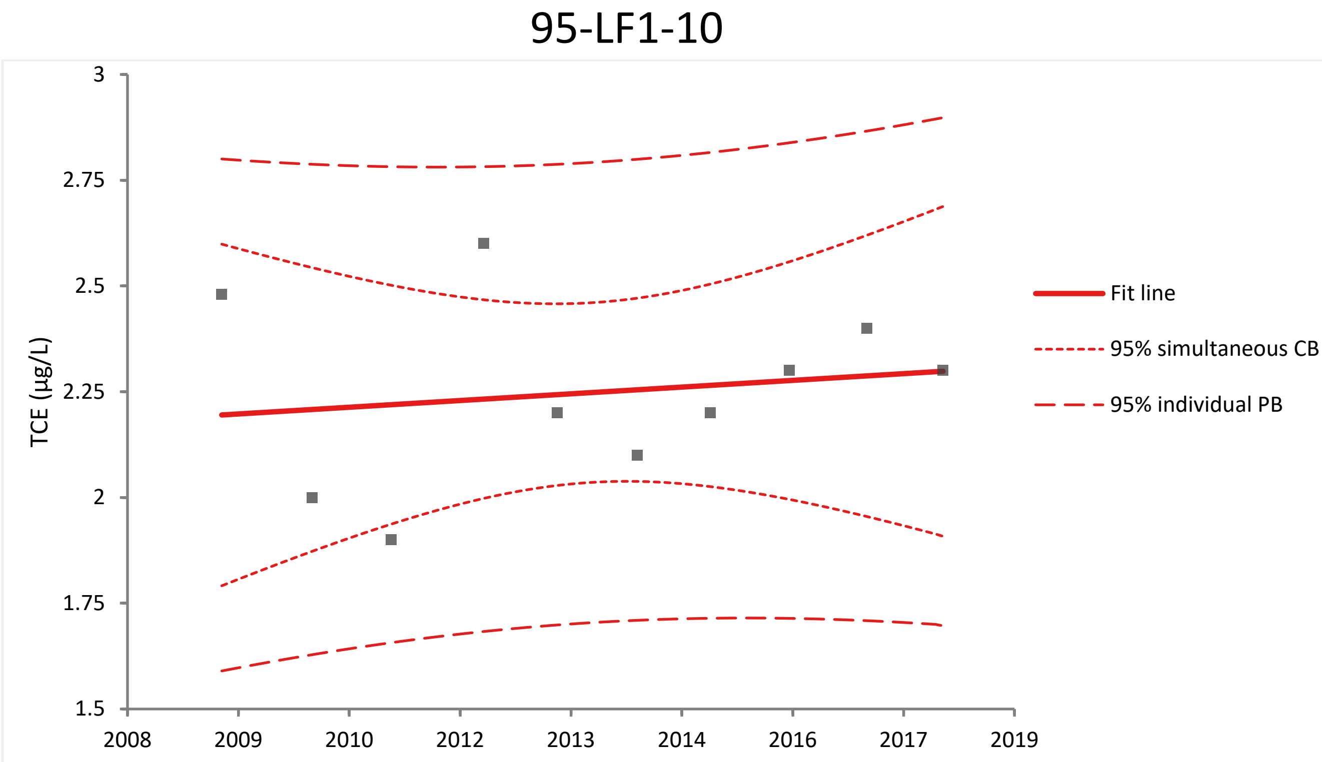
95-LF1-11

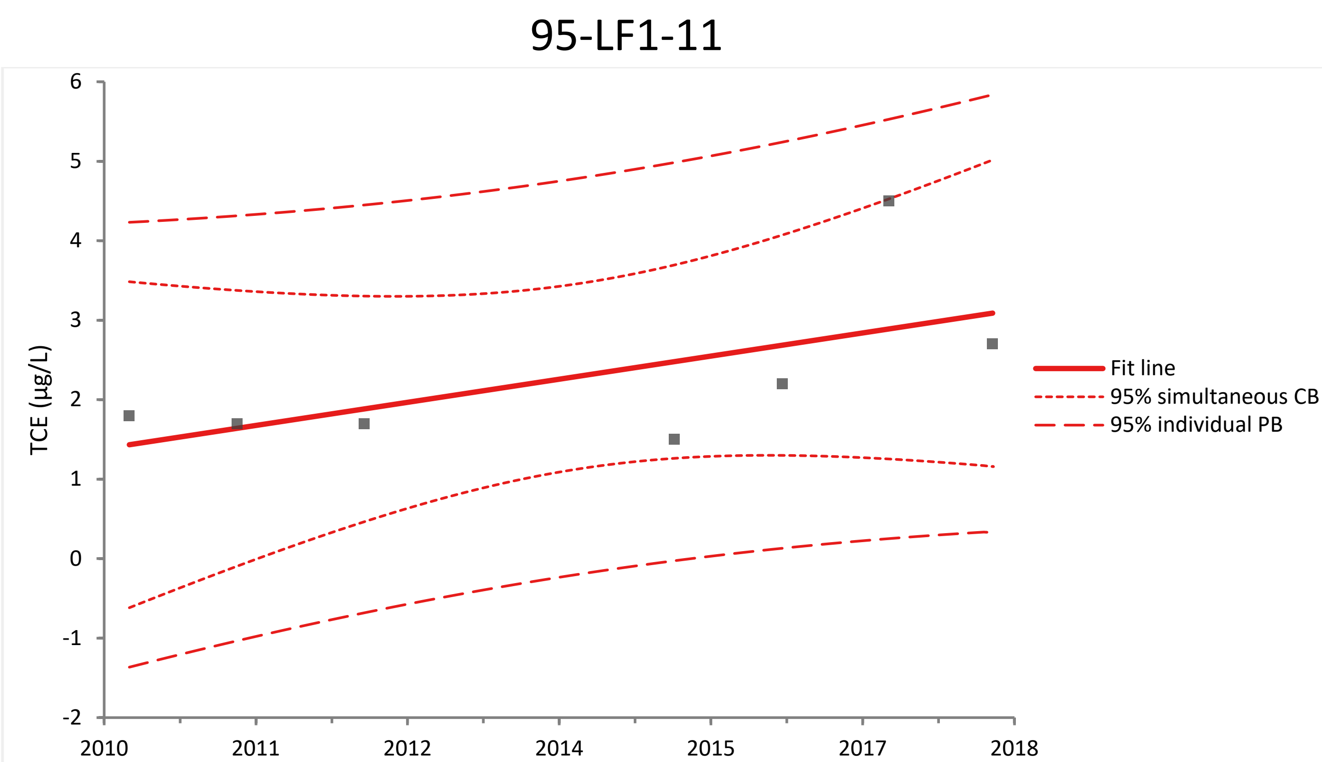



Ln(95-LF1-11)
Frequency
0
1
2
3
-0.5
-0.25
0
0.25
0.5
0.75
1
1.25
1.5
1.75
2
TCE (µg/L)


84-CD-LF1-3
TCE (µg/L)
30
25
20
15
10
5
0
-5
-10
-15
2008
2009
2010
2012
2013
2014
2016
2017
2019
Fit line
95% simultaneous CB
95% individual PB


84-CD-LF1-4
TCE (µg/L)
11
10
9
8
7
6
5
4
3
2
1
2008
2009
2010
2012
2013
2014
2016
2017
2019
Fit line
95% simultaneous CB
95% individual PB


95-LF1-10
TCE (µg/L)
3
2.75
2.5
2.25
2
1.75
1.5
2008
2009
2010
2012
2013
2014
2016
2017
2019
Fit line
95% simultaneous CB
95% individual PB


95-LF1-11
TCE (µg/L)
6
5
4
3
2
1
0
-1
-2
2010
2011
2012
2014
2015
2017
2018
Fit line
95% simultaneous CB
95% individual PB

OU2/FTLE-57

Groundwater Data from

Draft 2021 Annual Groundwater Monitoring Report, FTLE-57: Landfill 4, for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington

January, 2022

TABLE 3. LANDFILL 4 STATISTICS - TCE DATA

	Upper Vashon Aquifer					Source Area Monitoring Wells		Lower Vashon Aquifer		Production Well
Well ID	LF4-1	LF4-11	LF4-MW3A	LF4-MW5	SW-MW1	MW-DG1	MW-UG1	LF4-MW3B	LF4-MW15B	Sequalitchew Springs
Descriptive Statistics										
First Sample Date	22-Aug-11	22-Aug-11	22-Aug-11	22-Aug-11	22-Aug-11	22-Aug-11	22-Aug-11	22-Aug-11	22-Aug-11	22-Aug-11
Last Sample Date	9-Mar-21	9-Mar-21	9-Mar-21	9-Mar-21	9-Mar-21	9-Mar-21	9-Mar-21	9-Mar-21	9-Mar-21	9-Mar-21
Number of Samples	12	11	9	9	12	12	12	9	12	12
Number of ND's	0	0	9	0	0	0	0	9	0	12
Sample Mean	2.82	2.17	-	2.17	1.65	8.33	6.20	-	3.95	-
Standard Deviation	2.17	0.57	-	0.72	0.49	2.32	1.89	-	0.64	-
Minimum Concentration (µg/L)	1.3	1.1	-	1.4	1.1	5.3	2.8	-	2.7	-
Maximum Concentration (µg/L)	6.5	3.3	-	3.6	2.8	13	9.2	-	4.7	-
Date of Maximum Concentration	24-Jul-13	18-Jul-12	-	22-Aug-11	15-Mar-19	22-Aug-11	18-Jul-12	-	15-Mar-19	-
Distribution of Data										
P Value	0.0002	0.8758	-	0.2511	0.2335	0.7381	0.9787	-	0.2512	-
Normally Distributed	No	Yes	-	Yes	Yes	Yes	Yes	-	Yes	-
Log P Value	0.0010	-	-	-	-	-	-	-	-	-
Log-Normally Distributed	No	-	-	-	-	-	-	-	-	-
Trend Analysis (Linear Regression)										
Linear Regression P Value	-	0.3436	-	0.0032	0.3051	<0.0001	0.0907	-	0.9948	-
Slope	-	-0.00016	-	-0.00049	-0.00014	-0.00203	-0.00871	-	-<0.0001	-
Trend	-	Down	-	Down	Down	Down	Down	-	Down	-
Statistically Significant	-	No	-	Yes	No	Yes	No	-	No	-
Trend Analysis (Mann-Kendall Test for Trend)										
Tau Statistic	-0.835	-	-	-	-	-	-	-	-	-
Two Tailed P Value	0.0002	-	-	-	-	-	-	-	-	-
Trend	Down	-	-	-	-	-	-	-	-	-
Statistically Significant	Yes	-	-	-	-	-	-	-	-	-

Notes:

ND = Non-detect. TCE not detected above practical quantification limit.
TCE = trichloroethylene
(µg/L) = Micrograms per liter
\- = Not applicable; analysis not performed. Statistical analysis not performed on datasets composed of greater than 50% non-detects.

Distribution of Data - Data was tested for normal distribution using the Shapiro-Wilk test for normality. P values were generated by the Shapiro-Wilk test; P values equal to or less than 0.05 were not considered normally distributed. Logarithmic transformation was performed on datasets not considered normally distributed and again tested for normality using the Shapiro-Wilk test.

Trend Analysis (Linear Regression) - Performed on datasets considered normally or log-normally distributed. Trends with a P Value of less than 0.05 were considered statistically significant.

Trend Analysis (Mann-Kendall Test for Trend) - Performed on datasets not considered normally or log-normally distributed (non-parametric data). Trends with a Two-Tailed P Value of less than 0.05 or greater than 0.95 were considered statistically significant.

Additional discussion of statistical approach is included in Appendix D.

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	**-**	**-**
MTCA Method B Cleanup Levels				**-**	**-**	**-**	**1.0**	**2,240**
Upper Vashon Aquifer								
LF4-1 225.37	1-Dec-1988	-	210.27	**2.4**	0.2U	0.5U	-	-
	1-Mar-1992	-	212	10	0.6	0.2U	1U	10U
	1-Jun-1992	-	211.09	11	0.2U	0.2U	1U	10U
	1-Mar-1996	-	-	7.5	**1.2**	0.1U	0.1U	-
	1-Oct-1996	-	-	0.5U	0.5U	0.5U	0.5U	-
	1-Apr-1997	-	-	5.2	**1.9**	0.4J	1.8	-
	1-Oct-1997	-	-	10	**0.9**	0.5U	0.5U	-
	1-Jan-1998	-	211.8	**2**	0.2J	0.5U	0.5U	-
	1-Apr-1998	-	211.56	6.1	**0.8**	0.5U	0.4J	-
	1-Jul-1998	-	210.86	23	**0.8**	0.5U	0.5U	-
	1-Oct-1998	-	211.11	17	**0.6**	0.5U	0.5U	-
	1-Jan-1999	-	211.55	**4.1**	0.2J	0.5U	0.5U	-
	1-Apr-1999	-	211.74	-	-	-	-	-
	1-Aug-1999	-	211.28	-	-	-	-	-
	1-Oct-1999	-	211.18	-	-	-	-	-
	1-Sep-2004	14.1	211.27	**4.7**	0.5U	0.5U	0.5U	1U
	1-Sep-2005	15.48	209.89	-	-	-	-	-
	16-Aug-2006	13.57	211.80	-	-	-	-	-
	21-Jun-2007	13.88	211.49	**4.5**	0.5U	0.5U	0.5U	**2**
	22-Aug-2008	13.7	211.67	**0.77**	0.5U	0.5U	0.5U	-
	19-Aug-2009	14.1	211.27	**1.34**	0.5U	0.5U	0.5U	-
	19-Jul-2010	13.93	211.44	5.2	0.5U	0.5U	0.5U	-
	22-Aug-2011	14.05	211.32	6.5	0.5U	0.5U	0.5U	-
	18-Jul-2012	14.02	211.35	6.2	0.5U	0.5U	0.5U	-
	24-Jul-2013	13.92	211.45	6.5	0.2U	0.2U	0.2U	-
	18-Jun-2014	13.63	211.74	**1.7**	0.2U	0.2U	0.2U	-
	21-Apr-2015	13.76	211.61	**1.9**	0.2J	0.2U	0.1U	-
	26-Apr-2016	13.61	211.76	**1.7**	0.25J	0.2U	0.1U	-
	1-Feb-2017	14.47	210.90	**1.9**	0.21J	0.2U	0.1U	-
	9-Aug-2017	14.78	210.59	**1.7**	0.2U	0.2U	0.2U	-
	20-Mar-2018	14.34	211.03	**1.5**	0.34J	0.090J	0.1U	-
Duplicate	20-Mar-2018	14.34	211.03	**1.6**	0.31J	0.10J	0.1U	-
	15-Mar-2019	14.66	210.71	**1.5**	0.32J	0.2U	0.1U	-
	10-Mar-2020	14.53	210.84	**1.4**	0.28J	0.2U	0.1U	-
	9-Mar-2021	14.43	210.94	**1.3**	0.26J	0.2U	0.1U	-
Duplicate	9-Mar-2021	14.43	210.94	**1.2**	0.26J	0.90J	0.1U	-
LF4-2 218.27	1-Dec-1988	-	210.24	**0.32**	**0.9**	0.5U	-	**450**
	1-Mar-1992	-	211.93	0.2 U	**1.2**	0.2U	3.3	2,600
	1-Jun-1992	-	211.02	0.2 U	**1.4**	0.2U	4.8	3,000
	1-Feb-1994	6.65	211.62	0.2U	**0.9**	0.2U	4.7	2,600
	1-Aug-1994	10.4	207.87	0.2U	**0.7**	0.2U	1.5	**2,100**
	1-Feb-1995	6.21	212.06	0.2U	**0.9**	0.2U	2.8	2,700
	1-Aug-1995	6.64	211.63	0.2U	**1.6**	**0.23**	5.6	3,700
	1-Mar-1996	-	-	0.1J	**1.6**	0.3J	4.6	4,570
	1-Oct-1996	-	-	0.5U	**2.1**	0.4J	6.1	4,290
	1-Apr-1997	-	-	0.5U	**2.1**	0.4J	6.4	5,380
	1-Oct-1997	-	-	0.1J	**1.7**	**0.5**	5.9	-
	1-Jan-1998	-	211.77	0.1J	**1.7**	0.3J	6.1	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	**-**	**-**
MTCA Method B Cleanup Levels				**-**	**-**	**-**	**1.0**	**2,240**
LF4-2 (cont)	1-Apr-1998	-	211.49	0.2J	**1.7**	**0.5**	6.9	-
	1-Jul-1998	-	210.79	0.5U	**1.1**	0.4J	4.8	-
	1-Oct-1998	-	211	0.5U	**1.1**	0.5J	4.7	-
	1-Jan-1999	-	211.5	0.5U	**1.4**	0.4J	5.1	-
	1-Apr-1999	-	211.69	-	-	-	-	-
	1-Aug-1999	-	211.18	-	-	-	-	-
	1-Oct-1999	-	211.09	-	-	-	-	-
	1-Sep-2004	7.01	211.26	0.5U	**1**	0.5U	3.6	3,800
	1-Sep-2005	8.46	209.81	**0.6**	**1.1**	0.5U	2.6	2,950
	16-Aug-2006	6.62	211.65	0.5U	**1.1**	0.5U	1.9	3,910
	21-Jun-2007	6.68	211.59	0.5U	**0.8**	0.5U	1.8	4,890
	22-Aug-2008	6.73	211.54	0.5U	**1.0**	0.5U	1.9	3,900
	19-Aug-2009	7.1	211.17	0.5U	**1.23**	0.5U	2.04	3,570
	22-Jul-2010	6.86	211.41	0.5U	**0.94**	0.5U	1.1	3,100
	22-Aug-2011	7.05	211.22	0.5U	**0.92**	0.5U	1.1	4,000
	18-Jul-2012	7.18	211.09	0.5U	**1.1**	0.5U	1.2	3,800
	24-Jul-2013	6.95	211.32	0.2U	**0.8**	**0.28**	1	3,970
	18-Jun-2014	6.62	211.65	**0.47**	**0.62**	0.2U	**0.28**	**2,130**
Duplicate	21-Apr-2015	6.72	211.55	0.42J	**0.79**	0.16J	0.38J	**1,930**
	21-Apr-2015	6.72	211.55	0.38J	**0.74**	0.13J	0.34J	**1,920**
	28-Apr-2016	6.57	211.70	0.36J	0.48J	0.2U	0.09J	**1,300**
	2-Feb-2017	7.49	210.78	0.29J	0.23J	0.2U	0.1U	**537**
	10-Aug-2017	7.77	210.50	**0.5**	0.48J	0.2U	0.13J	**1,450**
	20-Mar-2018	7.26	211.01	0.31J	0.24J	0.2U	0.1U	**436**
	5-Mar-2019	7.91	210.36	-	-	-	-	-
	9-Mar-2020	6.51	211.76	-	-	-	-	-
	9-Mar-2021	7.36	210.91	-	-	-	-	-
LF4-4 235.41	1-Dec-1988	-	210.68	0.03U	0.2U	0.5U	ND	-
	1-Mar-1992	-	213.37	0.2 U	0.2U	0.2U	1U	10U
	1-Jun-1992	-	212.19	0.2 U	0.2U	0.2U	1U	**14**
	1-Oct-1996	-	212.62	0.05U	0.2U	0.08U	0.08U	-
	1-Jan-1997	-	214.99	0.05U	0.1U	0.2U	0.08U	-
	1-Apr-1997	-	214.27	0.05U	0.2U	0.2U	0.08U	-
	1-Jul-1997	-	213.48	0.05U	0.2U	0.2U	0.08U	-
	1-Oct-1997	-	213.14	0.05U	0.2U	0.2U	0.08U	-
	1-Jan-1998	-	213.98	0.05U	0.2U	0.2U	0.08U	-
	1-Apr-1998	-	213.3	0.05U	0.2U	0.2U	0.08U	-
	1-Jul-1998	-	212.16	0.3U	0.3U	0.2U	0.3U	-
	1-Oct-1998	-	211.86	0.3U	0.3U	0.2U	0.3U	-
	1-Jan-1999	-	213.28	0.3U	0.3U	0.2U	0.3U	-
	1-Apr-1999	-	213.83	0.3U	0.3U	0.2U	0.3U	-
	1-Aug-1999	-	212.67	0.3U	0.3U	0.2U	0.3U	-
	1-Oct-1999	-	212.06	0.3U	0.3U	0.2U	0.3U	-
	1-Sep-2004	23.4	212.01	0.5U	0.5U	0.5U	0.5U	1U
	1-Sep-2005	24.81	210.60	-	-	-	-	-
	16-Aug-2006	22.56	212.85	-	-	-	-	-
	21-Jun-2007	22.21	213.20	0.5U	0.5U	0.5U	0.5U	1U
	22-Aug-2008	22.92	212.49	-	-	-	-	-
	19-Aug-2009	23.1	212.31	-	-	-	-	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	**-**	**-**
MTCA Method B Cleanup Levels				-	-	-	**1.0**	**2,240**
LF4-4	29-Jun-2010	22.42	212.99	-	-	-	-	-
(cont)	3-Aug-2011	22.82	212.59	-	-	-	-	-
	18-Jul-2012	22.73	212.68	0.5U	0.5U	0.5U	0.5U	-
	7-Jun-2013	22.5	212.91	-	-	-	-	-
	27-May-2014	21.72	213.69	-	-	-	-	-
	21-Apr-2015	22.18	213.23	-	-	-	-	-
	27-Apr-2016	21.83	213.58	-	-	-	-	-
	1-Feb-2017	22.92	212.49	-	-	-	-	-
	9-Aug-2017	23.3	212.11	-	-	-	-	-
	20-Mar-2018	22.42	212.99	-	-	-	-	-
	5-Mar-2019	23.04	212.37	-	-	-	-	-
	10-Mar-2020	22.98	212.43	-	-	-	-	-
	9-Mar-2021	22.55	212.86	-	-	-	-	-
LF4-11	1-Dec-1988	-	210.27	19	**6.8**	-	ND	-
234.05	1-Mar-1992	-	212.03	**1.4**	**0.5**	-	1U	**700**
	1-Jun-1992	-	211.1	**1.5**	0.2U	-	1U	**900**
	1-Apr-1998	-	211.56	-	-	-	-	-
	1-Oct-1998	-	211.07	-	-	-	-	-
	1-Jan-1999	-	211.58	-	-	-	-	-
	1-Apr-1999	-	211.77	-	-	-	-	-
	1-Aug-1999	-	211.28	-	-	-	-	-
	1-Sep-2004	22.76	211.29	5.2	0.5U	-	0.5U	**33**
	1-Sep-2005	24.18	209.87	**2.4**	0.5U	-	0.5U	**24**
	16-Aug-2006	22.27	211.78	**1.3**	0.5U	-	0.5U	**99**
	21-Jun-2007	23.67	210.38	**2.2**	0.5U	-	0.5U	**174**
	22-Aug-2008	22.35	211.7	**1.08**	0.5U	-	0.5U	-
	19-Aug-2009	22.8	211.25	**1.35**	0.5U	-	0.5U	-
	19-Jul-2010	22.59	211.46	**2.5**	0.5U	-	0.5U	-
	22-Aug-2011	22.75	211.3	**2.3**	0.5U	-	0.5U	-
	18-Jul-2012	22.68	211.37	**3.1**	0.5U	-	0.5U	-
Duplicate	18-Jul-2012	22.68	211.37	**3.3**	0.5U	-	0.5U	-
	24-Jul-2013	22.61	211.44	**1.1**	0.2U	-	0.2U	-
	18-Jun-2014	22.25	211.8	**2.2**	**0.23**	-	0.2U	-
	21-Apr-2015	22.41	211.64	**2.3**	0.26J	-	0.1U	-
	26-Apr-2016	22.24	211.81	**2.6**	0.46J	-	0.1U	-
	1-Feb-2017	23.14	210.91	**2**	0.41J	-	0.1U	-
	9-Aug-2017	23.47	210.58	**2.6**	0.37J	-	0.1U	-
	3-Apr-2019	23.31	210.74	**1.9**	**0.53**	0.2U	0.1U	-
Duplicate	3-Apr-2019	23.31	210.74	**1.9**	**0.57**	0.2U	0.1U	-
	10-Mar-2020	23.17	210.88	**1.7**	0.070J	0.2U	0.1U	-
	9-Mar-2021	23.01	211.04	**1.9**	**0.12J**	**0.13J**	0.1U	-
LF4-MW1A	1-Mar-1992	-	212.79	0.2U	0.2U	-	1U	10U
256.85	1-Jun-1992	-	211.22	0.2U	0.2U	-	1U	10U
	1-Sep-2004	45.03	211.82	-	-	-	-	-
	1-Sep-2005	46.48	210.37	-	-	-	-	-
	16-Aug-2006	44.22	212.63	-	-	-	-	-
	21-Jun-2007	44.31	212.54	-	-	-	-	-
	22-Aug-2008	44.72	212.13	-	-	-	-	-
	19-Aug-2009	45.4	211.45	-	-	-	-	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	**-**	**-**
MTCA Method B Cleanup Levels				**-**	**-**	**-**	**1.0**	**2,240**
LF4-MW1A (cont)	29-Jun-2010	44.58	212.27	-	-	-	-	-
	3-Aug-2011	45.05	211.8	-	-	-	-	-
	18-Jul-2012	44.7	212.15	-	-	-	-	-
	7-Jun-2013	44.79	212.06	-	-	-	-	-
	27-May-2014	43.95	212.9	-	-	-	-	-
	21-Apr-2015	44.47	212.38	-	-	-	-	-
	27-Apr-2016	43.89	212.96	-	-	-	-	-
	1-Feb-2017	44.48	212.37	-	-	-	-	-
	9-Aug-2017	45.34	211.51	-	-	-	-	-
	20-Mar-2018	44.31	212.54	-	-	-	-	-
	5-Mar-2019	45.11	211.74	-	-	-	-	-
	10-Mar-2020	44.63	212.22	-	-	-	-	-
	9-Mar-2021	44.00	212.85	-	-	-	-	-
LF4-MW2A 229.95	1-Mar-1992	-	213.2	0.2U	0.2U	-	1U	10U
	1-Jun-1992	-	211.86	0.2U	0.2U	-	1U	10U
	1-Feb-1994	17.43	212.52	0.2U	0.2U	-	1U	-
	1-Aug-1994	20.83	209.12	0.2U	0.2U	-	1U	-
	1-Feb-1995	16.84	213.11	0.2U	0.2U	-	1U	-
	1-Aug-1995	17.45	212.50	0.2U	0.2U	-	1U	-
	1-Sep-2004	17.75	212.20	-	-	-	-	-
	1-Sep-2005	19.17	210.78	-	-	-	-	-
	16-Aug-2006	16.9	213.05	-	-	-	-	-
	21-Jun-2007	16.82	213.13	-	-	-	-	-
	19-Aug-2009	17.9	212.05	-	-	-	-	-
	29-Jun-2010	17.11	212.84	-	-	-	-	-
	4-Aug-2011	17.49	212.46	-	-	-	-	-
	18-Jul-2012	17.4	212.55	-	-	-	-	-
	7-Jun-2013	17.22	212.73	-	-	-	-	-
	27-May-2014	16.43	213.52	-	-	-	-	-
	21-Apr-2015	16.93	213.02	-	-	-	-	-
	27-Apr-2016	16.46	213.49	-	-	-	-	-
	1-Feb-2017	17.2	212.75	-	-	-	-	-
	9-Aug-2017	17.74	212.21	-	-	-	-	-
	20-Mar-2018	16.88	213.07	-	-	-	-	-
	5-Mar-2019	17.66	212.29	-	-	-	-	-
	10-Mar-2020	17.28	212.67	-	-	-	-	-
	9-Mar-2021	16.71	213.24	-	-	-	-	-
LF4-MW3A 243.13	1-Mar-1992	-	212.03	0.2U	0.2U	-	1U	10U
	1-Jun-1992	-	210.93	0.2U	0.2U	-	1U	10U
	1-Feb-1994	31.46	211.67	0.2U	0.2U	-	1U	-
	1-Aug-1994	35.38	207.75	0.2U	0.2U	-	1U	-
	1-Feb-1995	31.12	212.01	0.2U	0.2U	-	1U	-
	1-Aug-1995	31.34	211.79	0.2U	0.2U	-	1U	-
	1-Apr-1998	-	211.62	-	-	-	-	-
	1-Jul-1998	-	210.86	-	-	-	-	-
	1-Oct-1998	-	211.15	0.3U	0.3U	-	0.3U	-
	1-Jan-1999	-	211.62	0.3U	0.3U	-	0.3U	-
	1-Apr-1999	-	211.85	0.3U	0.3U	-	0.3U	-
	1-Aug-1999	-	211.31	0.3U	0.3U	-	0.3U	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	**-**	**-**
MTCA Method B Cleanup Levels				-	-	-	**1.0**	**2,240**
LF4-MW3A (cont)	1-Oct-1999	-	211.23	0.3U	0.3U	-	0.3U	-
	1-Nov-2000	-	-	0.2U	0.2U	-	0.3U	-
	1-Dec-2001	-	-	0.5U	0.5U	-	0.5U	-
	1-Jun-2003	-	-	0.5U	0.5U	-	0.5U	-
	1-Sep-2004	31.72	211.41	0.5U	0.5U	-	0.5U	1U
	1-Sep-2005	33.23	209.90	0.5U	0.5U	-	0.5U	1U
	16-Aug-2006	31.24	211.89	0.5U	0.5U	-	0.5U	1U
	21-Jun-2007	32.11	211.02	0.5U	0.5U	-	0.5U	1U
	22-Aug-2008	31.4	211.73	0.5U	0.5U	-	0.5U	-
	19-Aug-2009	31.85	211.28	0.5U	0.5U	-	0.5U	-
	19-Jul-2010	31.69	211.44	0.5U	0.5U	-	0.5U	-
	22-Aug-2011	31.38	211.75	0.5U	0.5U	-	0.5U	-
	18-Jul-2012	31.75	211.38	0.5U	0.5U	-	0.5U	-
	24-Jul-2013	31.2	211.93	0.2U	0.2U	-	0.2U	-
	18-Jun-2014	31.3	211.83	0.2U	0.2U	-	0.2U	-
	21-Apr-2015	31.51	211.62	0.1U	0.2U	-	0.1U	-
	27-Apr-2016	31.33	211.8	0.1U	0.2U	-	0.1U	-
	3-Apr-2019	31.74	211.39	0.2U	0.2U	0.2U	0.1U	-
	10-Mar-2020	32.23	210.9	0.1U	0.2U	0.2U	0.1U	-
	9-Mar-2021	32.12	211.01	0.1U	0.2U	0.2U	0.1U	-
LF4-MW5 219.43	1-Mar-1992	-	212	11	**1.7**	-	1U	**310**
	1-Jun-1992	-	211.1	19	**2.1**	-	1U	**230**
	1-Feb-1994	7.7	211.73	6.2	0.2U	-	1U	-
	1-Aug-1994	11.55	207.88	6.7	**1.1**	-	1U	-
	1-Dec-1994	-	-	6.2	ND	-	0.7J	**68**
	1-Feb-1995	7.28	212.15	11	**1.1**	-	1U	-
	1-Aug-1995	7.69	211.74	7.1	**0.38**	-	1U	-
	1-Oct-1996	-	211.47	16	**1.8**	-	0.08U	**182**
	1-Jan-1997	-	212.48	14	**1.8**	-	**0.6**	**171**
	1-Apr-1997	-	212.16	10	**1.1**	-	0.08U	**194**
	1-Jul-1997	-	212	9.6	**1**	-	0.08U	-
	1-Oct-1997	-	211.84	9.6	**0.6**	-	0.08U	-
	1-Jan-1998	-	211.79	10	**1.1**	-	0.08U	-
	1-Apr-1998	-	211.52	9.7	0.2U	-	0.08U	-
	1-Jul-1998	-	210.84	9.8	**0.6**	-	0.3U	-
	1-Oct-1998	-	211.07	9.6	0.4J	-	0.3U	-
	1-Jan-1999	-	211.53	6.5	**1.2**	-	**0.8**	-
	1-Apr-1999	-	211.74	7.1	0.3U	-	0.3U	-
	1-Aug-1999	-	211.25	6.9	**0.6**	-	0.3U	-
	1-Oct-1999	-	211.17	6.3	**0.8**	-	0.3U	-
	1-Sep-2004	8.18	211.25	5.9	**0.8**	-	0.5U	**65**
	1-Sep-2005	9.56	209.87	-	-	-	-	-
	16-Aug-2006	7.62	211.81	-	-	-	-	-
	21-Jun-2007	8.03	211.40	**4.2**	0.5U	-	0.5U	**142**
	22-Aug-2008	7.82	211.61	**4.68**	0.5U	-	0.5U	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	-	-
MTCA Method B Cleanup Levels				-	-	-	**1.0**	**2,240**
LF4-MW5	19-Aug-2009	8.2	211.23	**4.65**	0.5U	-	0.5U	-
(cont)	20-Jul-2010	8	211.43	**3.4**	0.5U	-	0.5U	-
Duplicate	20-Jul-2010	8	211.43	**3.4**	0.5U	-	0.5U	-
	22-Aug-2011	8.15	211.28	**3.4**	0.5U	-	0.5U	-
Duplicate	22-Aug-2011	8.15	211.28	**3.6**	0.5U	-	0.5U	-
	18-Jul-2012	8.05	211.38	**2.8**	0.5U	-	0.5U	-
Duplicate	18-Jul-2012	8.05	211.38	**2.8**	0.5U	-	0.5U	-
	24-Jul-2013	8	211.43	**2.6**	0.2U	-	0.2U	-
Duplicate	24-Jul-2013	8	211.43	**2.6**	0.2U	-	0.2U	-
	18-Jun-2014	7.68	211.75	**1.9**	0.2U	-	0.2U	-
	21-Apr-2015	7.82	211.61	**2.3**	0.14J	-	0.1U	-
	27-Apr-2016	7.69	211.74	**1.6**	0.11J	-	0.1U	-
	3-Apr-2019	8.74	210.69	**1.7**	0.23J	0.2U	0.1U	-
	10-Mar-2020	8.63	210.80	**1.4**	0.13J	0.2U	0.1U	-
	9-Mar-2021	8.48	210.95	**1.6**	**0.15J**	0.2U	0.1U	-
LF4-MW6	1-Mar-1992	-	212	0.2U	0.2U	-	1U	**59**
225.15	1-Jun-1992	-	211.08	0.2U	0.2U	-	1U	**48**
	1-Apr-1998	-	211.55	-	-	-	-	-
	1-Jul-1998	-	210.85	-	-	-	-	-
	1-Jan-1999	-	211.54	-	-	-	-	-
	1-Apr-1999	-	211.73	-	-	-	-	-
	1-Aug-1999	-	211.28	-	-	-	-	-
	1-Oct-1999	-	211.17	-	-	-	-	-
	1-Sep-2004	13.76	211.39	0.5U	0.5U	-	0.5U	**738**
	1-Sep-2005	15.3	209.85	-	-	-	-	-
	16-Aug-2006	13.38	211.77	-	-	-	-	-
	21-Jun-2007	13.79	211.36	0.5U	0.5U	-	0.5U	**817**
	22-Aug-2008	13.55	211.6	-	-	-	-	-
	19-Aug-2009	13.9	211.25	-	-	-	-	-
	29-Jun-2010	13.75	211.4	-	-	-	-	-
	3-Aug-2011	13.87	211.28	-	-	-	-	-
	18-Jul-2012	13.89	211.26	0.5U	0.5U	-	0.5U	-
	7-Jun-2013	13.77	211.38	-	-	-	-	-
	27-May-2014	13.43	211.72	-	-	-	-	-
	21-Apr-2015	13.59	211.56	-	-	-	-	-
	26-Apr-2016	13.45	211.7	-	-	-	-	-
	2-Feb-2017	14.32	210.83	0.2U	0.2U	-	0.1U	-
	9-Aug-2017	14.61	210.54	0.2U	0.2U	-	0.1U	-
	9-Mar-2021	14.15	211	0.1U	0.2U	0.2U	0.1U	-
LF4-MW7	1-Mar-1992	-	211.98	0.2U	0.2U	-	1U	**83**
226.23	1-Jun-1992	-	211.06	0.2U	0.2U	-	1U	10U
	1-Feb-1994	14.51	211.72	0.2U	0.2U	-	1U	10U
	1-Aug-1994	18.35	207.88	0.2U	0.2U	-	1U	10U
	1-Feb-1995	14.2	212.03	0.2U	0.2U	-	1U	10U
	1-Aug-1995	14.54	211.69	0.2U	0.2U	-	1U	10U
	1-Sep-2004	14.82	211.41	0.5U	0.5U	-	0.5U	**2**
	1-Sep-2005	16.36	209.87	-	-	-	-	-
	16-Aug-2006	14.47	211.76	-	-	-	-	-
	21-Jun-2007	14.89	211.34	0.5U	0.5U	-	0.5U	**1**

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				5.0	70	100	-	-
MTCA Method B Cleanup Levels				-	-	-	1.0	2,240
LF4-MW7 (cont)	19-Aug-2009	15	211.23	0.5U	0.5U	-	0.5U	-
	3-Aug-2011	14.97	211.26	-	-	-	-	-
	18-Jul-2012	15	211.23	0.5U	0.5U	-	0.5U	-
	7-Jun-2013	14.85	211.38	-	-	-	-	-
	2-Feb-2017	15.39	210.84	0.2U	0.2U	-	0.1U	-
	9-Aug-2017	15.7	210.53	0.2U	0.2U	-	0.1U	-
	9-Mar-2021	15.35	210.88	0.1U	0.2U	0.2U	0.1U	-
LF4-MW8A 242.41	1-Mar-1992	-	211.97	79	5	0.2U	1U	18
	1-Jun-1992	-	211.06	37	4.1	0.2U	1U	10U
	1-Feb-1994	30.7	211.71	150	12	0.2U	1U	220
	1-Aug-1994	34.65	207.76	10	2.5	0.2U	1U	10U
	1-Dec-1994	-	-	190	1.5J	1.5	ND	7
	1-Feb-1995	30.41	212.00	160	8.7	0.2U	1U	10U
	1-Aug-1995	30.68	211.73	110	3.9	0.2U	1U	10U
	1-Oct-1996	-	211.48	48	2.8	0.08U	0.08U	1J
	1-Jan-1997	-	21.53	9.8	0.4J	0.2U	0.08U	1U
	1-Apr-1997	-	212.19	6.6	0.2U	0.2U	0.08U	1U
	1-Jul-1997	-	211.99	12	0.4J	0.2U	0.08U	-
	1-Oct-1997	-	211.84	4.2	0.2U	0.2U	0.08U	-
	1-Jan-1998	-	211.83	10	0.4J	0.2U	0.08U	-
	1-Apr-1998	-	211.56	3.8	0.2U	0.2U	0.08U	-
	1-Jul-1998	-	210.85	6.6	0.3U	0.2U	0.3U	-
	1-Oct-1998	-	211.08	19	0.4J	0.2U	0.3U	-
	1-Jan-1999	-	211.53	8.1	0.4J	0.2U	0.3U	-
	1-Apr-1999	-	211.76	3.9	0.3U	0.2U	0.3U	-
	1-Aug-1999	-	211.55	5.8	0.3U	0.2U	0.3U	-
	1-Oct-1999	-	211.2	27	0.5J	0.2U	0.3U	-
	1-Sep-2004	31.06	211.35	6.9	0.5U	0.5U	0.5U	1U
	1-Sep-2005	32.59	209.82	5.6	0.5U	0.5U	0.5U	16
	16-Aug-2006	30.61	211.80	3.5	0.5U	0.5U	0.5U	2
	21-Jun-2007	31.07	211.34	1.7	0.5U	0.5U	0.5U	3
	22-Aug-2008	32.82	209.59	2.39	0.5U	0.5U	0.5U	-
	19-Aug-2009	31.15	211.26	2.21	0.5U	0.5U	0.5U	-
	19-Jul-2010	30.98	211.43	1.1	0.5U	0.5U	0.5U	-
	22-Aug-2011	31.06	211.35	1.4	0.5U	0.5U	0.5U	-
Duplicate	22-Aug-2011	31.06	211.35	1.3	0.5U	0.5U	0.5U	-
	18-Jul-2012	31.19	211.22	0.69	0.5U	0.5U	0.5U	-
	24-Jul-2013	31	211.41	0.7	0.2U	0.2U	0.2U	-
	18-Jun-2014	30.63	211.78	0.83	0.2U	0.2U	0.2U	-
	21-Apr-2015	30.79	211.62	1.1	0.2U	0.2U	0.1U	-
	27-Apr-2016	30.66	211.75	0.55	0.2U	0.2U	0.1U	-
LF4-MW10 240.93	1-Mar-1992	-	212.02	1.2	0.3	0.2U	1U	750
	1-Jun-1992	-	211.06	0.6	0.2U	0.2U	1U	770
	1-Dec-1994	-	-	2.1	ND	ND	ND	440
	1-Oct-1996	-	211.38	1.3	0.4	0.3	0.08U	-
	1-Jan-1997	-	212.54	1.9	0.2J	0.2U	0.08U	-
	1-Apr-1997	-	212.16	1.9	0.7	0.2U	0.1J	-
	1-Jul-1997	-	211.9	1.2	0.6	0.2J	0.08U	-
	1-Oct-1997	-	211.76	1.1	0.3J	0.2U	0.08U	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	-	-
MTCA Method B Cleanup Levels				-	-	-	**1.0**	**2,240**
LF4-MW10 (cont)	1-Jan-1998	-	211.81	**2**	0.3J	0.2U	0.08U	-
	1-Apr-1998	-	211.51	**1.3**	0.5J	0.3J	0.08U	-
	1-Jul-1998	-	210.75	**1**	0.3J	0.2J	0.3U	-
	1-Oct-1998	-	210.94	**1.3**	0.3J	0.2J	0.3U	-
	1-Jan-1999	-	211.52	**1.6**	0.3U	0.2J	0.3U	-
	1-Apr-1999	-	211.74	**1.1J**	**0.9**	0.2UJ	0.3J	-
	1-Aug-1999	-	211.18	**1**	0.4J	0.2U	0.3U	-
	1-Oct-1999	-	211.02	**1.2**	0.4J	0.2U	0.3U	-
	1-Sep-2004	29.65	211.28	**1.1**	0.5U	0.5U	0.5U	**6**
	1-Sep-2005	31.12	209.81	-	-	-	-	-
	16-Aug-2006	29.2	211.73	-	-	-	-	-
	21-Jun-2007	29.11	211.82	**0.7**	0.5U	0.5U	0.5U	**2**
	22-Aug-2008	29.4	211.53	**1.04**	0.5U	0.5U	0.5U	-
	19-Aug-2009	29.72	211.21	**1.03**	0.5U	0.5U	0.5U	-
	19-Jul-2010	29.48	211.45	**1.2**	**0.53**	0.5U	0.5U	-
	22-Aug-2011	29.65	211.28	**1**	0.5U	0.5U	0.5U	-
	18-Jul-2012	29.59	211.34	**1**	0.5U	0.5U	0.5U	-
	24-Jul-2013	29.5	211.43	**0.92**	0.2U	**0.2**	0.2U	-
	18-Jun-2014	29.12	211.81	**1.2**	0.2U	0.2U	0.2U	-
Duplicate	18-Jun-2014	29.12	211.81	**1.1**	0.2U	0.2U	0.2U	-
	21-Apr-2015	29.31	211.62	**1.4**	0.22J	0.15J	0.1U	-
	26-Apr-2016	29.12	211.81	**1.7**	0.35J	0.16J	0.1U	-
	1-Feb-2017	29.97	210.96	**1.6**	0.28J	0.16J	0.1U	-
	10-Aug-2017	30.39	210.54	**1.6**	0.15J	0.10J	0.1U	-
	20-Mar-2018	29.87	211.06	**1.6**	0.24J	0.15J	0.1U	-
	15-Mar-2019	30.22	210.71	-	-	-	-	-
	10-Mar-2020	30.05	210.88	-	-	-	-	-
	9-Mar-2021	-	-	-	-	-	-	-
LF4-MW12A 238.25	1-Mar-1992	-	212.06	**1.9**	**3.1**	**0.7**	1U	**2,500**
	1-Jun-1992	-	210.55	**1**	**2.7**	**0.5**	1U	**2,700**
	1-Feb-1994	27.45	210.80	**1.3**	**1.6**	**0.4**	1U	**2,600**
	1-Aug-1994	31.32	206.93	**1.1**	**2.2**	**0.7**	1U	**3,700**
	1-Feb-1995	24.51	213.74	**0.6**	**0.5**	**0.5**	1U	**1,600**
	1-Aug-1995	28.09	210.16	**1.3**	**1.7**	**0.57**	1U	**3,200**
	1-Mar-1996	-	-	**1.3**	**1.7**	**0.7**	0.1U	**1,940**
	1-Oct-1996	-	-	**2**	**3**	**1**	**0.6**	**2,310**
	1-Apr-1997	-	-	**3.7**	**5.8**	**1.7**	**0.8**	**2,020**
	1-Oct-1997	-	-	**1.7**	**2.7**	**0.8**	0.4J	-
	1-Jan-1998	-	212.75	**1.4**	**2**	**0.6**	0.5U	-
	1-Apr-1998	-	211.74	**1.8**	**2.2**	**0.9**	0.2J	-
	1-Jul-1998	-	210.24	**1.9**	**2.6**	**0.8**	0.4J	-
	1-Oct-1998	-	209.86	**1.7**	**2.2**	**0.8**	0.4J	-
	1-Jan-1999	-	212.39	**1.6**	**2**	**0.6**	0.5U	-
	1-Apr-1999	-	212.37	-	-	-	-	-
	1-Aug-1999	-	210.91	-	-	-	-	-
	1-Oct-1999	-	210.19	-	-	-	-	-
	1-Sep-2004	28.4	209.85	**1.8**	**2**	**0.9**	0.5U	**2,180**
	1-Sep-2005	29.68	208.57	**1.4**	**1.5**	**0.6**	0.5U	**2,400**
	16-Aug-2006	27.7	210.55	**1.3**	**1.5**	**0.5**	0.5U	**1,890**

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	-	-
MTCA Method B Cleanup Levels				-	-	-	**1.0**	**2,240**
LF4-MW12A (cont)	21-Jun-2007	27.05	211.20	**1**	**1.1**	**0.5**	0.5U	**1,770**
	22-Aug-2008	27.88	210.37	**1.85**	**1.72**	**0.78**	0.5U	2,210
	19-Aug-2009	28	210.25	**1.75**	**1.68**	**0.79**	0.5U	**1,880**
	22-Jul-2010	26.91	211.34	**1.4**	**1.2**	**0.59**	0.5U	**1,600**
	22-Aug-2011	27.45	210.8	**1.4**	**1.2**	**0.57**	0.5U	**1,500**
	18-Jul-2012	27.34	210.91	**1**	**0.84**	0.5U	0.5U	**1,300**
	24-Jul-2013	27.04	211.21	**1**	**0.67**	**0.4**	0.2U	**1,170**
	18-Jun-2014	26.1	212.15	**0.47**	**0.38**	**0.21**	0.2U	**922**
	21-Apr-2015	26.51	211.74	1.1J	**0.74**	0.4J	0.1U	**1,040**
	27-Apr-2016	25.96	212.29	**0.95**	**0.66**	0.36J	0.1U	**1,110**
	2-Feb-2017	26.91	211.34	**0.91**	**0.51**	0.3J	0.1U	**776**
	10-Aug-2017	28.04	210.21	**0.79**	**0.43J**	0.26J	0.1U	**772**
	21-Mar-2018	26.68	211.57	**0.87**	**0.57**	0.33J	0.1U	**777**
	5-Mar-2019	27.01	211.24	-	-	-	-	-
	10-Mar-2020	27.14	211.11	-	-	-	-	-
	9-Mar-2021	26.5	211.75	-	-	-	-	-
LF4-MW13A 238.89	1-Mar-1992	-	212.06	**2.1**	**1**	0.2U	1U	**1,200**
	1-Jun-1992	-	210.67	**3.5**	**2.6**	**0.4**	1U	**1,600**
	1-Sep-2004	28.65	210.24	**2.6**	**1.3**	**0.7**	0.5U	**1,270**
	1-Sep-2005	29.98	208.91	**2.6**	**0.9**	0.5U	0.5U	**1,340**
	16-Aug-2006	28.02	210.87	**2.1**	**0.9**	0.5U	0.5U	**1,050**
	21-Jun-2007	27.8	211.09	**1.3**	**0.6**	0.5U	0.5U	**274**
	22-Aug-2008	28.22	210.67	**1.88**	**0.78**	0.5U	0.5U	-
	19-Aug-2009	28.4	210.49	**1.88**	**0.79**	0.5U	0.5U	-
	20-Jul-2010	27.57	211.32	**1.1**	**0.54**	0.5U	0.5U	-
	22-Aug-2011	27.95	210.94	**1.2**	**0.59**	0.5U	0.5U	-
	18-Jul-2012	27.9	210.99	**1.2**	**0.59**	0.5U	0.5U	-
	24-Jul-2013	27.66	211.23	**1.2**	**0.49**	**0.25M**	0.2U	-
	18-Jun-2014	26.8	212.09	**0.62**	**0.27**	0.2U	0.2U	-
	21-Apr-2015	27.22	211.67	**0.68**	0.26J	0.15J	0.1U	-
	26-Apr-2016	26.78	212.11	**0.99**	0.43J	0.18J	0.1U	-
LF4-MW15A 237.31	1-Mar-1992	-	211.96	8.4	**1**	0.2U	1U	**350**
	1-Jun-1992	-	211.05	6.7	**0.9**	0.2U	1U	**250**
	1-Feb-1994	25.61	211.70	**1.9**	0.2U	0.2U	1U	-
	1-Aug-1994	29.5	207.81	**3.5**	**0.7**	0.2U	1U	-
	1-Feb-1995	25.09	212.22	**1**	0.2U	0.2U	1U	-
	1-Aug-1995	25.68	211.63	6.7	**1.1**	**0.51**	1U	-
	1-Mar-1996	-	-	**4.6**	0.4J	0.2J	0.1U	-
	1-Oct-1996	-	-	9	**1**	**0.6**	0.2J	-
	1-Apr-1997	-	-	**4.4**	**0.4J**	0.5U	0.5U	-
	1-Oct-1997	-	-	7.4	**1.3**	0.4J	0.5U	-
	1-Jan-1998	-	211.83	**2.2**	0.5U	0.5U	0.5U	-
	1-Apr-1998	-	211.56	5.3	0.4J	0.2J	0.5U	-
	1-Jul-1998	-	210.83	7.1	**1.1**	**0.5**	0.5U	-
	1-Oct-1998	-	211.05	8.1	**1.5**	**0.6**	0.4J	-
	1-Jan-1999	-	211.55	**0.6**	0.5U	0.5U	0.5U	-
	1-Apr-1999	-	211.76	-	-	-	-	-
	1-Aug-1999	-	211.25	-	-	-	-	-
	1-Oct-1999	-	211.14	-	-	-	-	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	**-**	**-**
MTCA Method B Cleanup Levels				-	-	-	**1.0**	**2,240**
LF4-MW15A (cont)	1-Sep-2004	26.07	211.24	**3.1**	0.5U	0.5U	0.5U	**65**
	1-Sep-2005	27.49	209.82	**2.9**	0.5U	0.5U	0.5U	**215**
	16-Aug-2006	25.58	211.73	**3.3**	0.5U	0.5U	0.5U	**451**
	21-Jun-2007	26.82	210.49	**3.6**	0.5U	0.5U	0.5U	**151**
	22-Aug-2008	25.75	211.56	**0.9**	0.5U	0.5U	0.5U	-
	19-Aug-2009	26.1	211.21	**3**	0.5U	0.5U	0.5U	-
	20-Jul-2010	26.9	210.41	**3.4**	0.5U	0.5U	0.5U	-
	22-Aug-2011	26.05	211.26	**3.7**	0.5U	0.5U	0.5U	-
	18-Jul-2012	25.99	211.32	**3.6**	0.5U	0.5U	0.5U	-
	24-Jul-2013	25.95	211.36	**3.2**	**0.48**	0.3	0.2U	-
	18-Jun-2014	25.57	211.74	**2.4**	**0.22**	0.2U	0.2U	-
	21-Apr-2015	25.72	211.59	**3.6**	0.33J	0.24J	0.1U	-
	26-Apr-2016	25.57	211.74	**2.3**	0.13J	0.1J	0.1U	-
	1-Feb-2017	26.40	210.91	**2.5**	0.26J	0.18J	0.1U	-
	9-Aug-2017	26.78	210.53	**3.8**	0.44J	0.26J	0.1U	-
	20-Mar-2018	26.31	211.00	**2.4**	0.15J	0.11J	0.1U	-
	15-Mar-2019	26.63	210.68	-	-	-	-	-
	10-Mar-2020	26.52	210.79	-	-	-	-	-
	9-Mar-2021	26.38	210.93	-	-	-	-	-
LF4-MW16A 233.58	1-Mar-1992	-	211.85	**5**	**2.1**	**0.3**	1U	**2,000**
	1-Jun-1992	-	210.97	**4.3**	**1**	0.2U	1U	**1,300**
	1-Feb-1994	21.94	211.64	**0.8**	0.2U	0.2U	1U	**740**
	1-Aug-1994	25.72	207.86	**0.4**	**0.3**	0.2U	1U	**810**
	1-Feb-1995	21.39	212.19	**0.5**	0.2U	0.2U	1U	**120**
	1-Aug-1995	22.02	211.56	**1.5**	**0.65**	0.2U	1U	**1,200**
	1-Mar-1996	-	-	**5**	**1.5**	**0.6**	**0.6**	**2,120**
	1-Oct-1996	-	-	**3.8**	**1.1**	0.2J	0.5U	**2,030**
	1-Apr-1997	-	-	**6.5**	**1.4**	0.4J	**0.5**	**1,910**
	1-Oct-1997	-	-	0.5U	0.5U	0.5U	0.5U	-
	1-Jan-1998	-	211.7	**3.2**	**0.7**	0.2J	0.5U	-
	1-Apr-1998	-	211.44	**3.9**	**0.9**	0.4J	0.5U	-
	1-Jul-1998	-	210.71	**3.4**	**0.8**	0.3J	0.5U	-
	1-Oct-1998	-	210.91	**3**	**0.7**	0.3J	0.5U	-
	1-Jan-1999	-	211.45	**4.2**	**0.9**	0.3J	0.5U	-
	1-Apr-1999	-	211.62	-	-	-	-	-
	1-Aug-1999	-	211.11	-	-	-	-	-
	1-Oct-1999	-	211	-	-	-	-	-
	1-Sep-2004	22.42	211.16	**0.8**	0.5U	0.5U	0.5U	**1,290**
	1-Sep-2005	23.82	209.76	**0.6**	**0.5**	0.5U	**0.6**	**667**
	16-Aug-2006	21.97	211.61	**1.1**	**0.7**	0.5U	0.5U	**1,590**
	21-Jun-2007	22.29	211.29	**1.4**	0.5U	0.5U	0.5U	**1,200**
	22-Aug-2008	22.14	211.44	0.5U	0.5U	0.5U	0.5U	-
	19-Aug-2009	23.34	210.24	**1.09**	**0.66**	0.5U	0.5U	-
	20-Jul-2010	22.26	211.32	**1**	0.5U	0.5U	0.5U	-
	22-Aug-2011	22.4	211.18	**1.4**	0.5U	0.5U	0.5U	-
	18-Jul-2012	22.35	211.23	**1.2**	0.5U	0.5U	0.5U	-
	24-Jul-2013	22.25	211.33	**0.97**	**0.3**	0.2U	0.2U	-
	18-Jun-2014	21.88	211.70	**1.4**	**0.4**	0.2U	0.2U	-
	21-Apr-2015	22.07	211.51	**1.6**	0.42J	0.21J	0.1U	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	**-**	**-**
MTCA Method B Cleanup Levels				**-**	**-**	**-**	**1.0**	**2,240**
LF4-MW16A (cont)	26-Apr-2016	21.89	211.69	**2.1**	0.3J	0.16J	0.1U	-
	1-Feb-2017	22.74	210.84	**1.5**	0.16J	0.1J	0.1U	-
	9-Aug-2017	23.12	210.46	**1.4**	0.2U	0.2U	0.1U	-
	30-Mar-2018	22.6	210.98	**1.6**	0.14J	0.11J	0.1U	-
	15-Mar-2019	22.91	210.67	-	-	-	-	-
	10-Mar-2020	22.81	210.77	-	-	-	-	-
	9-Mar-2021	22.69	210.89	-	-	-	-	-
LF4-PNL1 237.82	1-Dec-1988	-	210.33	20	**11**	**2.4**	ND	-
	1-Mar-1992	-	211.97	6.3	**2.3**	**0.3**	1U	2,900
	1-Jun-1992	-	211.18	7.2	**2.6**	**0.6**	1U	2,500
	1-Mar-1996	-	-	5.9	**1.4**	**0.7**	0.1U	2,480
	1-Oct-1996	-	-	6	**3**	**1**	**0.9**	3,650
	1-Apr-1997	-	-	7	**1.8**	**0.6**	**0.7**	-
	1-Oct-1997	-	-	5.6	**3.1**	1.0U	1	3,600
	1-Jan-1998	-	211.81	5.3	**2.6**	**0.7**	**0.7**	-
	1-Apr-1998	-	211.54	6.2	**2.5**	**0.9**	**0.7**	-
	1-Jul-1998	-	210.8	5.2	**2.4**	**0.8**	**0.6**	-
	1-Oct-1998	-	211.02	**4.3**	**2.2**	**0.9**	**0.8**	-
	1-Jan-1999	-	211.54	**4**	**1.2**	**0.5**	0.5U	-
	1-Apr-1999	-	211.73	-	-	-	-	-
	1-Aug-1999	-	211.22	-	-	-	-	-
	1-Oct-1999	-	211.1	-	-	-	-	-
	1-Sep-2004	26.58	211.24	**1.7**	**1.3**	**0.6**	1.1	3,170
	1-Sep-2005	28.02	209.80	**2.1**	**1**	0.5U	**0.9**	3,420
	16-Aug-2006	26.1	211.72	**2.5**	**0.8**	0.5U	0.5U	2,730
	21-Jun-2007	27.61	210.21	**2.2**	0.5U	0.5U	0.5U	3,160
	22-Aug-2008	26.28	211.54	**2.04**	**0.7**	0.5U	0.5U	2,700
	19-Aug-2009	27.6	210.22	**1.96**	**0.79**	0.5U	0.5U	2,850
	22-Jul-2010	26.45	211.37	**2.6**	**0.5**	0.5U	0.5U	2,200
	22-Aug-2011	26.6	211.22	**2.9**	**0.82**	0.5U	0.5U	2,600
	18-Jul-2012	26.56	211.26	**2.9**	**0.63**	0.5U	0.5U	2,400
	24-Jul-2013	26.46	211.36	**2.5**	**0.48**	**0.32**	0.2U	2,230
	18-Jun-2014	26.1	211.72	**2.8**	**0.54**	**0.31**	0.2U	2,460
Duplicate	18-Jun-2014	26.1	211.72	**2.7**	**0.43**	**0.29**	0.2U	-
	21-Apr-2015	26.29	211.53	**3.2**	**0.65**	0.4J	0.1U	**2,110**
Duplicate	21-Apr-2015	26.29	211.53	**3.2**	**0.65**	0.4J	0.1U	**2,090**
	28-Apr-2016	26.06	211.76	**3**	0.4J	0.25J	0.1U	**1,490**
Duplicate	28-Apr-2016	26.06	211.76	**3**	0.39J	0.26J	0.1U	**1,490**
	2-Feb-2017	26.97	210.85	**2.8**	0.38J	0.28J	0.1U	**1,890**
	10-Aug-2017	27.31	210.51	**3.1**	**0.61**	0.32J	0.1U	**1,900**
	21-Mar-2018	26.82	211.00	**2.4**	0.44J	0.22J	0.1U	**1,570**
	5-Mar-2019	27.14	210.68	-	-	-	-	-
	10-Mar-2020	27.06	210.76	-	-	-	-	-
	9-Mar-2021	26.9	210.92	-	-	-	-	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	-	-
MTCA Method B Cleanup Levels				-	-	-	**1.0**	**2,240**
LF4-PNL2 240.48	1-Dec-1988	-	208.88	**0.25**	0.2U	0.5U	ND	-
	1-Mar-1992	-	212.01	0.2U	0.2U	0.2U	1U	**95**
	1-Jun-1992	-	210.32	**0.4**	**0.4**	**0.3**	1U	**28**
	1-Sep-2004	31.15	209.33	**1.3**	**1**	**0.5**	0.5U	**2**
	1-Sep-2005	32.26	208.22	**1.6**	**1.1**	0.5U	0.5U	**2**
	16-Aug-2006	30.35	210.13	**0.8**	**0.5**	0.5U	0.5U	**9**
	21-Jun-2007	30.82	209.66	**0.6**	0.5U	0.5U	0.5U	**21**
	18-Jul-2012	29.82	210.66	0.5U	0.5U	0.5U	0.5U	-
LF4-PNL3 246.59	1-Dec-1988	-	210.05	**2.7**	**2.7**	0.5U	ND	**20**
	1-Mar-1992	-	211.91	6	0.2U	0.2U	1U	10U
	1-Jun-1992	-	210.97	7.1	0.2U	0.2U	1U	10U
	1-Feb-1994	24.97	221.62	9.5	0.2U	0.2U	1U	-
	1-Aug-1994	38.92	207.67	5.2	0.2U	0.2U	1U	-
	1-Dec-1994	-	-	7.9	ND	ND	ND	**8**
	1-Feb-1995	34.58	212.01	13	**0.5**	0.2U	1U	-
	1-Aug-1995	24.92	221.67	14	**0.52**	0.2U	1U	-
	1-Oct-1996	-	211.44	32	**1.1**	0.08U	0.08U	1J
	1-Jan-1997	-	212.48	14	0.3J	0.2U	0.08U	1U
	1-Apr-1997	-	212.12	7.9	0.2U	0.2U	0.08U	2U
	1-Jul-1997	-	211.96	5.4	0.2U	0.2U	0.08U	-
	1-Oct-1997	-	211.78	7.2	0.2U	0.2U	0.08U	-
	1-Jan-1998	-	211.76	5.5	0.2U	0.2U	0.08U	-
	1-Apr-1998	-	211.49	**4.7**	0.2U	0.2U	0.08U	-
	1-Jul-1998	-	210.78	**4.5**	0.3U	0.2U	0.3U	-
	1-Oct-1998	-	211.02	5.6	0.3U	0.2U	0.3U	-
	1-Jan-1999	-	211.48	**2.6**	0.3U	0.2U	0.3U	-
	1-Apr-1999	-	211.71	**3.1**	0.3U	0.2U	0.3U	-
	1-Aug-1999	-	211.19	**2.5**	0.3U	0.2U	0.3U	-
	1-Oct-1999	-	211.16	**2.9**	0.3U	0.2U	0.3U	-
	1-Sep-2004	35.39	211.20	**2.1**	0.5U	0.5U	0.5U	**7**
	1-Sep-2005	36.82	209.77	**1.5**	0.5U	0.5U	0.5U	**60**
	16-Aug-2006	34.83	211.76	**2.2**	0.5U	0.5U	0.5U	**2**
	21-Jun-2007	35.24	211.35	**1.8**	0.5U	0.5U	0.5U	**1**
	22-Aug-2008	34.95	211.64	**1.01**	0.5U	0.5U	0.5U	-
	19-Aug-2009	35.4	211.19	**0.61**	0.5U	0.5U	0.5U	-
Duplicate	19-Aug-2009	35.4	211.19	**0.6**	0.5U	0.5U	0.5U	-
	19-Jul-2010	35.21	211.38	**1.5**	0.5U	0.5U	0.5U	-
	22-Aug-2011	35.37	211.22	**1.5**	0.5U	0.5U	0.5U	-
	18-Jul-2012	35.28	211.31	**1.2**	0.5U	0.5U	0.5U	-
	24-Jul-2013	35.24	211.35	**0.43**	0.2U	0.2U	0.2U	-
	18-Jun-2014	34.92	211.67	**0.9**	0.2U	0.2U	0.2U	-
	21-Apr-2015	35.1	211.49	0.32J	0.2U	0.2U	0.1U	-
	27-Apr-2016	34.91	211.68	0.43J	0.2U	0.2U	0.1U	-
	1-Feb-2017	35.77	210.82	0.46J	0.2U	0.2U	0.1U	-
	9-Aug-2017	36.1	210.49	**1.1**	0.2U	0.2U	0.1U	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	**-**	**-**
MTCA Method B Cleanup Levels				-	-	-	**1.0**	**2,240**
LF4-PNL4 235.72	1-Dec-1988	-	208.43	5.3	**5.3**	**1.5**	ND	-
	1-Mar-1992	-	211.72	7.2	**1**	0.2U	1U	10U
	1-Jun-1992	-	210.09	15	**1.9**	**0.3**	1U	10U
	1-Mar-1996	-	-	5.6	**1.7**	0.4J	0.1J	-
	1-Oct-1996	-	-	0.5U	**0.7**	0.5U	0.5U	-
	1-Apr-1997	-	-	**2.9**	0.4J	0.5U	0.5U	**3J**
	1-Oct-1997	-	-	5.5	0.7	0.5U	0.5U	-
	1-Jan-1998	-	212.64	**3.8**	0.5J	0.5U	0.5U	-
	1-Apr-1998	-	211.46	**4.2**	**0.8**	0.5U	0.5U	-
	1-Jul-1998	-	209.74	7.3	0.5J	0.5U	0.5U	-
	1-Oct-1998	-	209.19	8.8	**0.8**	0.5U	0.5U	-
	1-Jan-1999	-	212.3	**4.7**	**0.5**	0.5U	0.5U	-
	1-Apr-1999	-	212.15	-	-	-	-	-
	1-Aug-1999	-	210.48	-	-	-	-	-
	1-Oct-1999	-	209.57	-	-	-	-	-
	1-Sep-2004	26.61	209.11	6.1	**0.5**	0.5U	0.5U	**1**
	1-Sep-2005	27.9	207.82	5.3	0.5U	0.5U	0.5U	**2**
	16-Aug-2006	25.87	209.85	5.2	0.5U	0.5U	0.5U	1U
	21-Jun-2007	25.03	210.69	**2.7**	0.5U	0.5U	0.5U	1U
	22-Aug-2008	26	209.72	**4.63**	0.5U	0.5U	0.5U	-
	19-Aug-2009	26	209.72	**4.66**	0.5U	0.5U	0.5U	-
	20-Jul-2010	24.8	210.92	**3.2**	0.5U	0.5U	0.5U	-
	22-Aug-2011	25.28	210.44	**3.2**	0.5U	0.5U	0.5U	-
	18-Jul-2012	25.23	210.49	**3.4**	0.5U	0.5U	0.5U	-
	24-Jul-2013	24.92	210.80	**3.5**	**0.22**	0.2U	0.2U	-
	18-Jun-2014	23.87	211.85	**2.2**	0.2U	0.2U	0.2U	-
	21-Apr-2015	24.34	211.38	**2.2**	0.14J	0.11J	0.1U	-
	27-Apr-2016	23.72	212.00	**1.9**	0.32J	0.2U	0.1U	-
	1-Feb-2017	24.72	211.00	**2.2**	0.26J	0.16J	0.1U	-
	9-Aug-2017	25.88	209.84	**2.4**	0.2U	0.2U	0.1U	-
	20-Mar-2018	24.40	211.32	**1.7**	0.26J	0.090J	0.1U	-
Duplicate	20-Mar-2018	24.40	211.32	**1.9**	0.28J	0.090J	0.1U	-
	15-Mar-2019	25.12	210.60	-	-	-	-	-
	10-Mar-2020	24.77	210.95	-	-	-	-	-
	9-Mar-2021	24.12	211.60	-	-	-	-	-
LF4-PNL5 237.46	1-Dec-1988	-	210.22	0.2U	0.2U	0.5U	ND	-
	1-Mar-1992	-	211.88	0.2U	0.2U	0.2U	1U	10U
	1-Jun-1992	-	210.99	0.2U	0.2U	0.2U	1U	10U
	1-Sep-2004	26.21	211.25	**0.5**	0.5U	0.5U	0.5U	1U
	1-Sep-2005	27.68	209.78	0.5U	0.5U	0.5U	0.5U	1U
	16-Aug-2006	25.85	211.61	0.5U	0.5U	0.5U	0.5U	**6**
	21-Jun-2007	25.83	211.63	0.5U	0.5U	0.5U	0.5U	**3**
	18-Jul-2012	26.25	211.21	0.5U	0.5U	0.5U	0.5U	-
	2-Feb-2017	26.57	210.89	0.2U	0.2U	0.2U	0.1U	-
	9-Aug-2017	26.98	210.48	0.2U	0.2U	0.2U	0.1U	-
	9-Mar-2021	26.48	210.98	0.1U	0.2U	0.2U	0.1U	-
Duplicate	9-Mar-2021	26.48	210.98	0.1U	0.2U	0.2U	0.1U	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	-	-
MTCA Method B Cleanup Levels				-	-	-	**1.0**	**2,240**
MW-DG1	1-Oct-1996	-	211.49	81	**4.6**	0.08U	0.08U	**2J**
244.96	1-Jan-1997	-	212.56	13	**0.5**	0.2U	0.08U	1U
	1-Apr-1997	-	212.34	7.6	0.2U	0.2U	0.08U	2U
	1-Jul-1997	-	212.04	14	0.5J	0.2U	0.08U	-
	1-Oct-1997	-	211.86	**1.3**	0.2U	0.2U	0.08U	-
	1-Jan-1998	-	211.86	**4.1**	0.2J	0.2U	0.08U	-
	1-Apr-1998	-	211.58	**1.8**	0.2U	0.2U	0.08U	-
	1-Jul-1998	-	210.88	7	0.3U	0.2U	0.3U	-
	1-Oct-1998	-	211.1	15	0.3U	0.2U	0.3U	-
	1-Jan-1999	-	211.57	8	0.5J	0.2U	0.3U	-
	1-Apr-1999	-	211.77	**3.8**	0.3U	0.2U	0.3U	-
	1-Aug-1999	-	211.27	7	0.3U	0.2U	0.3U	-
	1-Oct-1999	-	211.17	42J	**0.8**	0.2U	0.3U	-
	1-Sep-2004	33.57	211.39	26	**0.9**	0.5U	0.5U	**2**
	21-Jun-2007	33.51	211.45	7.6	0.5U	0.5U	0.5U	**1**
	22-Aug-2008	33.29	211.67	12.1	0.5U	0.5U	0.5U	-
	19-Aug-2009	33.65	211.31	15.7	0.5U	0.5U	0.5U	-
Duplicate	19-Aug-2009	33.65	211.31	15	0.5U	0.5U	0.5U	-
	19-Jul-2010	33.46	211.50	13	0.5U	0.5U	0.5U	-
Duplicate	19-Jul-2010	33.46	211.50	16	0.5U	0.5U	0.5U	-
	22-Aug-2011	33.56	211.40	13	0.5U	0.5U	0.5U	-
	18-Jul-2012	33.57	211.39	11	0.5U	0.5U	0.5U	-
	24-Jul-2013	33.48	211.48	9.8	0.2U	0.2U	0.2U	-
	18-Jun-2014	33.12	211.84	9.3	0.2U	0.2U	0.2U	-
	21-Apr-2015	33.3	211.66	9.8	0.16J	0.2U	0.1U	-
	27-Apr-2016	33.15	211.81	7.8	0.12J	0.2U	0.1U	-
	1-Feb-2017	34.00	210.96	7.9	0.13J	0.2U	0.1U	-
Duplicate	1-Feb-2017	34.00	210.96	8	0.13J	0.2U	0.1U	-
	10-Aug-2017	34.38	210.58	7.5	0.10J	0.2U	0.1U	-
Duplicate	10-Aug-2017	34.38	210.58	7.5	0.10J	0.2U	0.1U	-
	20-Mar-2018	33.89	211.07	6.2	0.09J	0.2U	0.1U	-
	15-Mar-2019	34.27	210.69	6.7	0.13J	0.2U	0.1U	-
	10-Mar-2020	34.10	210.86	5.6	0.2U	0.2U	0.1U	-
	9-Mar-2021	33.97	210.99	5.3	0.11J	0.2U	0.1U	-
MW-DG2	1-Oct-1996	-	211.46	80J	4J	1UJ	0.4UJ	2J
244.98	1-Jan-1997	-	212.52	12	**0.5**	0.2U	0.08U	2U
	1-Apr-1997	-	212.05	9.5	0.3J	0.2U	0.08U	2U
	1-Jul-1997	-	212	14	0.4J	0.2U	0.08U	-
	1-Oct-1997	-	211.83	**2.1**	0.2U	0.2U	0.08U	-
	1-Jan-1998	-	211.82	6.2	0.3J	0.2U	0.08U	-
	1-Apr-1998	-	211.54	**1.6**	0.2U	0.2U	0.08U	-
	1-Jul-1998	-	210.84	7.1	0.3U	0.2U	0.3U	-
	1-Oct-1998	-	211.06	-	-	-	-	-
	1-Jan-1999	-	211.53	-	-	-	-	-
	1-Apr-1999	-	211.74	-	-	-	-	-
	1-Aug-1999	-	211.23	-	-	-	-	-
	1-Oct-1999	-	211.14	-	-	-	-	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	**-**	**-**
MTCA Method B Cleanup Levels				**-**	**-**	**-**	**1.0**	**2,240**
MW-UG1	1-Oct-1996	-	211.51	70	**4.1**	0.08U	0.08U	4J
244.43	1-Jan-1997	-	212.57	21	**0.8**	0.2U	0.08U	2U
	1-Apr-1997	-	212.23	19	**0.6**	0.2U	0.08U	2U
	1-Jul-1997	-	212.05	18	**0.7**	0.2U	0.08U	-
	1-Oct-1997	-	211.89	18	0.5J	0.2U	0.08U	-
	1-Jan-1998	-	211.89	17	**0.6**	0.2U	0.08U	-
	1-Apr-1998	-	211.6	18	0.2U	0.2U	0.08U	-
	1-Jul-1998	-	211.89	16	0.4J	0.2U	0.3U	-
	1-Oct-1998	-	211.11	20	0.4J	0.2U	0.3U	-
	1-Jan-1999	-	211.59	18	0.5J	0.2U	0.3U	-
	1-Apr-1999	-	211.8	8.8	0.3U	0.2U	0.3U	-
	1-Aug-1999	-	211.29	12	0.3J	0.2U	0.3U	-
	1-Oct-1999	-	211.19	16	0.5J	0.2U	0.3U	-
	1-Sep-2004	33.22	211.21	31	**1.1**	0.5U	0.5U	**3**
	1-Sep-2005	34.75	209.68	43	**1.3**	0.5U	0.5U	**3**
	16-Aug-2006	32.76	211.67	21.5	**0.5**	0.5U	0.5U	**6**
	21-Jun-2007	33.19	211.24	11	0.5U	0.5U	0.5U	**3**
	22-Aug-2008	32.93	211.5	14.3	0.5U	0.5U	0.5U	-
Duplicate	22-Aug-2008	32.93	211.5	15.8	0.5U	0.5U	0.5U	-
	19-Aug-2009	33.3	211.13	16.8	0.5U	0.5U	0.5U	-
	19-Jul-2010	33.13	211.3	12	0.5U	0.5U	0.5U	-
	22-Aug-2011	33.21	211.22	8.5	0.5U	0.5U	0.5U	-
	18-Jul-2012	33.28	211.15	9.2	0.5U	0.5U	0.5U	-
	24-Jul-2013	33.15	211.28	7.6	**0.2**	0.2U	0.2U	-
Duplicate	24-Jul-2013	33.15	211.28	7.7	**0.21**	0.2U	0.2U	-
	18-Jun-2014	32.78	211.65	**4.8**	0.2U	0.2U	0.2U	-
	21-Apr-2015	32.95	211.48	7	0.12J	0.2U	0.1U	-
	27-Apr-2016	32.82	211.61	**4.4**	0.07J	0.2U	0.1U	-
	1-Feb-2017	33.69	210.74	6.3	0.14J	0.2U	0.1U	-
Duplicate	1-Feb-2017	33.69	210.74	6.3	0.14J	0.2U	0.1U	-
	10-Aug-2017	34.00	210.43	5.5	0.10J	0.2U	0.1U	-
Duplicate	10-Aug-2017	34.00	210.43	5.4	0.11J	0.2U	0.1U	-
	20-Mar-2018	33.55	210.88	**2.8**	0.2U	0.2U	0.1U	-
	15-Mar-2019	32.60	211.83	6.3	0.2J	0.2U	0.1U	-
	10-Mar-2020	33.77	210.66	**4.4**	0.2U	0.2U	0.1U	-
	9-Mar-2021	33.03	211.40	7.5	**0.21J**	0.2U	0.1U	-
NW-MW-2	1-Dec-1994	-	-	ND	ND	ND	ND	2,700
243.90	1-Oct-1996	-	211.42	0.05U	0.2U	0.08U	0.08U	4U
	1-Jan-1997	-	212.53	0.1 J	0.2U	0.2U	0.08U	**61**
	1-Apr-1997	-	212.16	0.1 J	0.2U	0.2U	0.08U	2U
	1-Jul-1997	-	211.93	0.09J	0.2U	0.2U	0.08U	-
	1-Oct-1997	-	211.78	0.05U	0.2U	0.2U	0.08U	-
	1-Jan-1998	-	211.83	0.06J	0.2U	0.2U	0.08U	-
	1-Apr-1998	-	211.53	0.07J	0.2U	0.2U	0.08U	-
	1-Jul-1998	-	210.78	0.3U	0.3U	0.2U	0.3U	-
	1-Oct-1998	-	211.01	0.3U	0.3U	0.2U	0.3U	-
	1-Jan-1999	-	211.53	0.3U	0.3U	0.2U	0.3U	-
	1-Apr-1999	-	211.76	0.3U	0.3U	0.2U	0.3U	-
	1-Aug-1999	-	211.19	0.3U	0.3U	0.2U	0.3U	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	-	-
MTCA Method B Cleanup Levels				-	-	-	**1.0**	**2,240**
NW-MW-2 (cont)	1-Oct-1999	-	211.03	0.3U	0.3U	0.2U	0.3U	-
	1-Sep-2004	31.59	212.31	0.5U	0.5U	0.5U	0.5U	**1**
	19-Aug-2009	32.68	211.22	-	-	-	-	-
	18-Jul-2012	31.56	212.34	0.5U	0.5U	0.5U	0.5U	-
SW-MW-1 236.50	1-Oct-1996	-	211.47	**11**	**0.5**	0.08U	0.08U	5U
	1-Jan-1997	-	212.48	**17**	0.3J	0.2U	0.08U	2U
	1-Apr-1997	-	212.15	**16**	0.3J	0.2U	0.08U	2U
	1-Jul-1997	-	211.94	**16**	0.2J	0.2U	0.08U	-
	1-Oct-1997	-	211.82	**20**	0.3J	0.2U	0.08U	-
	1-Jan-1998	-	211.79	**46**	0.4J	0.2U	0.08U	-
	1-Apr-1998	-	211.53	**33**	0.2U	0.2U	0.08U	-
	1-Jul-1998	-	210.82	**23**	0.3U	0.2U	0.3U	-
	1-Oct-1998	-	211.05	**16**	0.3U	0.2U	0.3U	-
	1-Jan-1999	-	211.52	**1.4**	0.3U	0.2U	0.3U	-
	1-Apr-1999	-	210.74	**12**	0.3U	0.2U	0.3U	-
	1-Aug-1999	-	211.24	**4.3**	0.3U	0.2U	0.3U	-
	1-Oct-1999	-	211.13	**5.1**	0.3U	0.2U	0.3U	-
	1-Sep-2004	24.79	211.71	**6.1**	0.5U	0.5U	0.5U	**6**
	1-Sep-2005	26.19	210.31	**7.3**	0.5U	0.5U	0.5U	**8**
	16-Aug-2006	24.26	212.24	**6.5**	**0.5**	0.5U	0.5U	**2**
	21-Jun-2007	24.61	211.89	**3.1**	0.5U	0.5U	0.5U	1U
	22-Aug-2008	24.35	212.15	**4.65**	0.5U	0.5U	0.5U	-
	19-Aug-2009	24.8	211.7	**4.81**	0.5U	0.5U	0.5U	-
	20-Jul-2010	24.69	211.81	**2.6**	0.5U	0.5U	0.5U	-
	22-Aug-2011	24.75	211.75	**2.5**	0.5U	0.5U	0.5U	-
	18-Jul-2012	24.69	211.81	**1.9**	0.5U	0.5U	0.5U	-
Duplicate	18-Jul-2012	24.69	211.81	**1.9**	0.5U	0.5U	0.5U	-
	24-Jul-2013	24.62	211.88	1.7	0.2U	0.2U	0.2U	-
	18-Jun-2014	24.28	212.22	**1.6**	0.2U	0.2U	0.2U	-
	21-Apr-2015	24.42	212.08	**2**	0.2U	0.2U	0.1U	-
	27-Apr-2016	24.29	212.21	**1.5**	0.2U	0.2U	0.1U	-
	1-Feb-2017	25.13	211.37	**1.7**	0.2U	0.2U	0.1U	-
	10-Aug-2017	25.47	211.03	**1.1**	0.2U	0.2U	0.1U	-
	20-Mar-2018	25.02	211.48	**1.3**	0.2U	0.2U	0.1U	-
	15-Mar-2019	25.33	211.17	**2.8**	0.2U	0.2U	0.1U	-
	10-Mar-2020	25.22	211.28	**1.5**	0.2U	0.2U	0.1U	-
Duplicate	10-Mar-2020	25.22	211.28	**1.4**	0.2U	0.2U	0.1U	-
	9-Mar-2021	25.11	211.39	**1.4**	0.2U	0.2U	0.1U	-
Lower Vashon Aquifer								
LF4-MW1B 257.06	1-Mar-1992	-	212.61	0.2 U	0.2U	0.2U	1U	**300**
	1-Jun-1992	-	211.41	**0.5**	0.2U	0.2U	1U	**270**
	1-Sep-2004	45.12	211.94	-	-	-	-	-
	21-Jun-2007	44.53	212.53	-	-	-	-	-
	22-Aug-2008	42.72	214.34	-	-	-	-	-
	18-Jul-2012	44.88	212.18	-	-	-	-	-
	1-Feb-2017	45.06	212.00	-	-	-	-	-
	9-Aug-2017	45.6	211.46	-	-	-	-	-
	9-Mar-2021	44.75	212.31	-	-	-	-	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	**-**	**-**
MTCA Method B Cleanup Levels				-	-	-	**1.0**	**2,240**
LF4-MW2B 229.32	1-Mar-1992	-	217.65	0.2 U	0.2U	0.2U	1U	**190**
	1-Jun-1992	-	216.92	0.2 U	0.2U	0.2U	1U	**170**
	1-Feb-1994	13.7	215.62	0.2U	0.2U	0.2U	1U	-
	1-Aug-1994	15.72	213.60	0.2U	0.2U	0.2U	1U	-
	1-Feb-1995	11.43	217.89	0.2U	0.2U	0.2U	1U	-
	1-Aug-1995	17.53	211.79	0.2U	0.2U	0.2U	1U	-
	1-Sep-2004	13.03	216.29	-	-	-	-	-
	21-Jun-2007	11.1	218.22	-	-	-	-	-
	18-Jul-2012	11.7	217.62	-	-	-	-	-
	1-Feb-2017	11.75	217.57	-	-	-	-	-
	9-Aug-2017	11.82	217.50	-	-	-	-	-
	9-Mar-2021	11.11	218.21	-	-	-	-	-
LF4-MW3B 242.85	1-Mar-1992	-	212.32	0.2 U	0.2U	0.2U	1U	**460**
	1-Jun-1992	-	211.04	0.2 U	0.2U	0.2U	1U	**360**
	1-Feb-1994	-	-	-	-	-	-	-
	1-Aug-1994	-	-	-	-	-	-	-
	1-Dec-1994	-	-	ND	ND	ND	ND	**6**
	1-Feb-1995	-	-	-	-	-	-	-
	1-Aug-1995	-	-	-	-	-	-	-
	1-Mar-1996	-	-	-	-	-	-	-
	1-Oct-1996	-	211.89	0.05U	0.2U	0.08U	0.08U	-
	1-Jan-1997	-	213.31	0.05U	0.2U	0.2U	0.08U	-
	1-Apr-1997	-	212.78	0.05U	0.2U	0.2U	0.08U	-
	1-Jul-1997	-	212.3	0.05U	0.2U	0.2U	0.08U	-
	1-Oct-1997	-	212.23	0.05U	0.2U	0.2U	0.08U	-
	1-Jan-1998	-	212.2	0.05U	0.2U	0.2U	0.08U	-
	1-Apr-1998	-	211.86	0.05U	0.2U	0.2U	0.08U	-
	1-Jul-1998	-	211.08	0.3U	0.3U	0.2U	0.3U	-
	1-Oct-1998	-	211.26	0.3U	0.3U	0.2U	0.3U	-
	1-Jan-1999	-	211.9	0.3U	0.3U	0.2U	0.3U	-
	1-Apr-1999	-	212.23	0.3U	0.3U	0.2U	0.3U	-
	1-Aug-1999	-	211.58	0.3U	0.3U	0.2U	0.3U	-
	1-Oct-1999	-	211.41	0.3U	0.3U	0.2U	0.3U	-
	1-Nov-2000	-	-	0.2U	0.2U	0.2U	0.3U	-
	1-Dec-2001	-	-	0.5U	0.5U	0.5U	0.5U	-
	1-Jun-2003	-	-	0.5U	0.5U	0.5U	0.5U	-
	1-Sep-2004	31.28	211.57	0.5U	0.5U	0.5U	0.5U	**34**
	1-Sep-2005	32.77	210.08	0.5U	0.5U	0.5U	0.5U	**13**
	16-Aug-2006	30.98	211.87	0.5U	0.5U	0.5U	0.5U	**2**
	21-Jun-2007	30.8	212.05	0.5U	0.5U	0.5U	0.5U	**3**
	22-Aug-2008	31	211.85	0.5U	0.5U	0.5U	0.5U	-
	19-Aug-2009	31.5	211.35	0.5U	0.5U	0.5U	0.5U	-
	19-Jul-2010	-	-	0.5U	0.5U	0.5U	0.5U	-
	22-Aug-2011	31.35	211.50	0.5U	0.5U	0.5U	0.5U	-
	18-Jul-2012	31.19	211.66	0.5U	0.5U	0.5U	0.5U	-
	24-Jul-2013	31.71	211.14	0.2U	0.2U	0.2U	0.2U	-
	18-Jun-2014	30.64	212.21	0.2U	0.2U	0.2U	0.2U	-
	21-Apr-2015	30.94	211.91	0.1U	0.2U	0.2U	0.1U	-
	27-Apr-2016	30.64	212.21	0.1U	0.2U	0.2U	0.1U	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	**-**	**-**
MTCA Method B Cleanup Levels				-	-	-	**1.0**	**2,240**
LF4-MW3B (cont)	3-Apr-2019	32.42	210.43	0.2U	0.2U	0.2U	0.1U	-
	10-Mar-2020	31.51	211.34	0.1U	0.2U	0.2U	0.1U	-
	9-Mar-2021	31.16	211.69	0.1U	0.2U	0.2U	0.1U	-
LF4-MW8B 242.16	1-Mar-1992	-	212.05	0.2 U	0.2U	0.2U	1U	**25**
	1-Jun-1992	-	211.09	0.2 U	0.2U	0.2U	1U	**12**
	1-Dec-1994	-	-	ND	ND	ND	ND	**11**
	1-Oct-1996	-	211.55	0.05U	0.2U	0.08U	0.08U	-
	1-Jan-1997	-	212.68	0.05U	0.2U	0.2U	0.08U	-
	1-Apr-1997	-	212.32	0.05U	0.2U	0.2U	0.08U	-
	1-Jul-1997	-	212.09	0.05U	0.2U	0.2U	0.08U	-
	1-Oct-1997	-	211.91	0.05U	0.2U	0.2U	0.08U	-
	1-Jan-1998	-	211.94	0.05U	0.2U	0.2U	0.08U	-
	1-Apr-1998	-	211.66	0.05U	0.2U	0.2U	0.08U	-
	1-Jul-1998	-	210.92	0.3U	0.3U	0.2U	0.3U	-
	1-Oct-1998	-	211.12	0.3U	0.3U	0.3U	0.3U	-
	1-Jan-1999	-	211.65	0.3U	0.3U	0.2U	0.3U	-
	1-Apr-1999	-	211.88	0.3U	0.3U	0.2U	0.3U	-
	1-Aug-1999	-	211.32	0.3U	0.3U	0.2U	0.3U	-
	1-Oct-1999	-	211.2	0.3U	0.3U	0.2U	0.3U	-
	1-Sep-2004	30.76	211.40	0.5U	0.5U	0.5U	0.5U	1U
	21-Jun-2007	30.4	211.76	0.5U	0.5U	0.5U	0.5U	**3**
	18-Jul-2012	30.87	211.29	0.5U	0.5U	0.5U	0.5U	-
	2-Feb-2017	31.17	210.99	0.2U	0.2U	0.2U	0.1U	-
	10-Aug-2017	31.52	210.64	0.2U	0.2U	0.2U	0.1U	-
LF4-MW9A 233.95	1-Mar-1992	-	210.21	0.2 U	**1.5**	**1.9**	**2.6**	**1,600**
	1-Jun-1992	-	209.29	0.2 U	**1.6**	**1.2**	1U	**590**
	1-Sep-2004	23.9	210.05	0.5U	**0.5**	**0.6**	0.5U	**12**
	1-Sep-2005	-	-	-	-	-	-	-
	16-Aug-2006	-	-	-	-	-	-	-
	21-Jun-2007	23.56	210.39	0.5U	0.5U	**0.6**	0.5U	**25**
	18-Jul-2012	23.65	210.30	0.5U	0.5U	0.5U	0.5U	-
	1-Feb-2017	23.92	210.03	0.2U	0.39J	**0.64**	0.1U	-
	9-Aug-2017	24.38	209.57	0.2U	**0.72**	**0.94**	0.1U	-
	9-Mar-2021	23.77	210.18	0.1U	**0.48J**	**0.82**	0.1U	-
LF4-MW13B 238.21	1-Dec-1988	-	-	-	-	-	-	-
	1-Mar-1992	-	209.38	0.2 U	0.2U	0.2U	1U	**520**
	1-Jun-1992	-	208.21	0.2 U	0.2U	0.2U	1U	**200**
	1-Sep-2004	29.95	208.26	0.5U	0.5U	0.5U	0.5U	**13**
	21-Jun-2007	29.05	209.16	0.5U	0.5U	0.5U	0.5U	**205**
	18-Jul-2012	29.17	209.04	0.5U	0.5U	0.5U	0.5U	-
	2-Feb-2017	29.16	209.05	0.2U	0.2U	0.2U	0.1U	-
	9-Aug-2017	29.82	208.39	0.2U	0.2U	0.2U	0.1U	-
	9-Mar-2021	28.88	209.33	0.1U	0.2U	0.2U	0.1U	-
LF4-MW15B 237.62	1-Mar-1992	-	208.83	0.2 U	0.2U	0.2U	**3.3**	**480**
	1-Jun-1992	-	207.96	0.2 U	0.2U	0.2U	**7.8**	**230**
	1-Mar-1996	-	-	**2.6**	**1.4**	**0.5**	**4**	-
	1-Oct-1996	-	-	0.4J	0.3J	0.5U	**8**	-
	1-Apr-1997	-	-	**0.9**	**0.7**	0.2J	**9.9**	-
	1-Oct-1997	-	-	0.4J	0.3J	0.5U	**9.2**	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	-	-
MTCA Method B Cleanup Levels				-	-	-	**1.0**	**2,240**
LF4-MW15B (cont)	1-Jan-1998	-	210.42	**0.5**	0.4J	0.5U	9.7	-
	1-Apr-1998	-	209.92	**0.5**	0.5U	0.5U	8.5	-
	1-Jul-1998	-	209	0.4J	0.5U	0.5U	11	-
	1-Oct-1998	-	209.07	0.3J	0.5U	0.5U	7.5	-
	1-Jan-1999	-	210.12	**0.5**	0.3J	0.5U	7.1	-
	1-Apr-1999	-	210.42	-	-	-	-	-
	1-Aug-1999	-	209.59	-	-	-	-	-
	1-Oct-1999	-	209.34	-	-	-	-	-
	1-Sep-2004	28.48	209.14	**0.5**	0.5U	0.5U	6.3	**52**
	1-Sep-2005	29.7	207.92	**1.2**	0.5U	0.5U	5.7	**148**
	16-Aug-2006	27.79	209.83	**2.1**	0.5U	0.5U	**0.8**	**41**
	21-Jun-2007	27.88	209.74	**0.6**	0.5U	0.5U	3.2	**84**
	22-Aug-2008	27.92	209.7	**3.98**	**1.69**	**0.92**	1.49	-
Duplicate	22-Aug-2008	27.92	209.7	**4.03**	**1.71**	**0.88**	1.46	-
	19-Aug-2009	28.2	209.42	**4.3**	**1.66**	**0.99**	**0.98**	-
	20-Jul-2010	-	-	**3.9**	**1.7**	**0.97**	**0.78**	-
	22-Aug-2011	28.05	209.57	**4.2**	**1.8**	**1.1**	**0.75**	-
	18-Jul-2012	28	209.62	**3.6**	**1.6**	**0.83**	**0.54**	-
	24-Jul-2013	27.93	209.69	**3.3**	**1.3**	**0.75**	**0.53**	-
	18-Jun-2014	27.38	210.24	**3.2**	**1.3**	**0.6**	**0.43**	-
	21-Apr-2015	27.65	209.97	**4.2**	**1.9**	**1.1**	**0.76**	-
	26-Apr-2016	27.31	210.31	**4.6**	**1.8**	**1**	**0.56**	-
Duplicate	26-Apr-2016	27.31	210.31	**4.2**	**1.8**	**0.91**	**0.53**	-
	1-Feb-2017	28.36	209.26	**4.3**	**1.7**	**0.97**	0.46J	-
Duplicate	1-Feb-2017	28.36	209.26	**4.6**	**1.7**	**1**	**0.54**	-
	9-Aug-2017	28.86	208.76	**4.6**	**2.1**	**1.1**	**0.7**	-
Duplicate	9-Aug-2017	28.86	208.76	**4.2**	**2.2**	**1.1**	**0.73**	-
	20-Mar-2018	28.11	209.51	**4.3**	**1.9**	**0.97**	**0.50**	-
	15-Mar-2019	28.50	209.12	**4.7**	**2.2**	**1.1**	**0.54**	-
	10-Mar-2020	28.41	209.21	**3.7**	**1.9**	**0.86**	**0.60**	-
	9-Mar-2021	28.13	209.49	**2.7**	**2.4**	**0.84**	**0.61**	-
Production Well								
Sequalitchew Spring	1-Mar-1992	-	-	0.2U	0.2U	0.2U	1U	10U
	1-Jun-1992	-	-	0.2U	0.2U	0.2U	1U	10U
	1-Aug-1994	-	-	0.5U	0.5U	0.5U	0.5U	**15**
	1-Jan-1998	-	-	0.5U	0.5U	0.5U	0.5U	-
	1-Aug-1999	-	-	0.5U	0.5U	0.5U	0.5U	-
	1-Nov-2000	-	-	0.5U	0.5U	0.5U	0.5U	10U
	1-Dec-2001	-	-	0.5U	0.5U	0.5U	0.5U	-
	1-Jun-2003	-	-	0.5U	0.5U	0.5U	0.5U	-
	1-Sep-2004	-	-	0.5U	0.5U	0.5U	0.5U	1U
	1-Sep-2005	-	-	0.5U	0.5U	0.5U	0.5U	1U
	16-Aug-2006	-	-	0.5U	0.5U	0.5U	0.5U	1U
	22-Aug-2008	-	-	0.5U	0.5U	0.5U	0.5U	-
	19-Aug-2009	-	-	0.5U	0.5U	0.5U	0.5U	-
	19-Jul-2010	-	-	0.5U	0.5U	0.5U	0.5U	-
	22-Aug-2011	-	-	0.5U	0.5U	0.5U	0.5U	-
	18-Jul-2012	-	-	0.5U	0.5U	0.5U	0.5U	-
	24-Jul-2013	-	-	0.2U	0.2U	0.2U	0.2U	-

Appendix B - Groundwater Elevations and Selected VOC and Manganese Concentrations

Well ID TOC	Date	DTW ft bgs	GWELEV ft AMSL	TCE µg/L	cDCE µg/L	tDCE µg/L	VC µg/L	Mn µg/L
Federal MCLs				**5.0**	**70**	**100**	-	-
MTCA Method B Cleanup Levels				-	-	-	**1.0**	**2,240**
Sequalitchew Spring (cont)	23-Jun-2014	-	-	0.2U	0.2U	0.2U	0.2U	-
	6-May-2015	-	-	0.1U	0.2U	0.2U	0.1U	-
	27-Apr-2016	-	-	0.1U	0.2U	0.2U	0.1U	-
	1-Feb-2017	-	-	0.2U	0.2U	0.2U	0.1U	-
	9-Aug-2017	-	-	0.2U	0.2U	0.2U	0.1U	-
	22-Mar-2018	-	-	0.2U	0.2U	0.2U	0.1U	-
	5-Mar-2019	-	-	0.2U	0.2U	0.2U	0.1U	-
	10-Mar-2020	-	-	0.1U	0.2U	0.2U	0.1U	-
	9-Mar-2021	-	-	0.1U	0.2U	0.2U	0.1U	-

Notes:

DTW ft bgs = Depth to water in feet below ground surface
WELEV ft AMSL = Groundwater elevation in feet above mean sea level
TCE = Trichloroethene
cDCE = cis 1,2 Dichloroethene
tDCE = trans 1,2 Dichloroethene
VC = Vinyl chloride
Mn = Dissolved manganese
µg/L = Microgram(s) per liter
QC EB = Quality control equipment blank
U = Analyte not detected above practical quantitation limit or limit of detection
BOLD = Analyte detected above practical quantitation limit
BOLD = Analyte detected above MCL or MTCA B cleanup level values
\- = Not Applicable, no data
ND = Non-detect
cont = Continued from previous page

APPENDIX C

HISTORICAL CONCENTRATION GRAPHS

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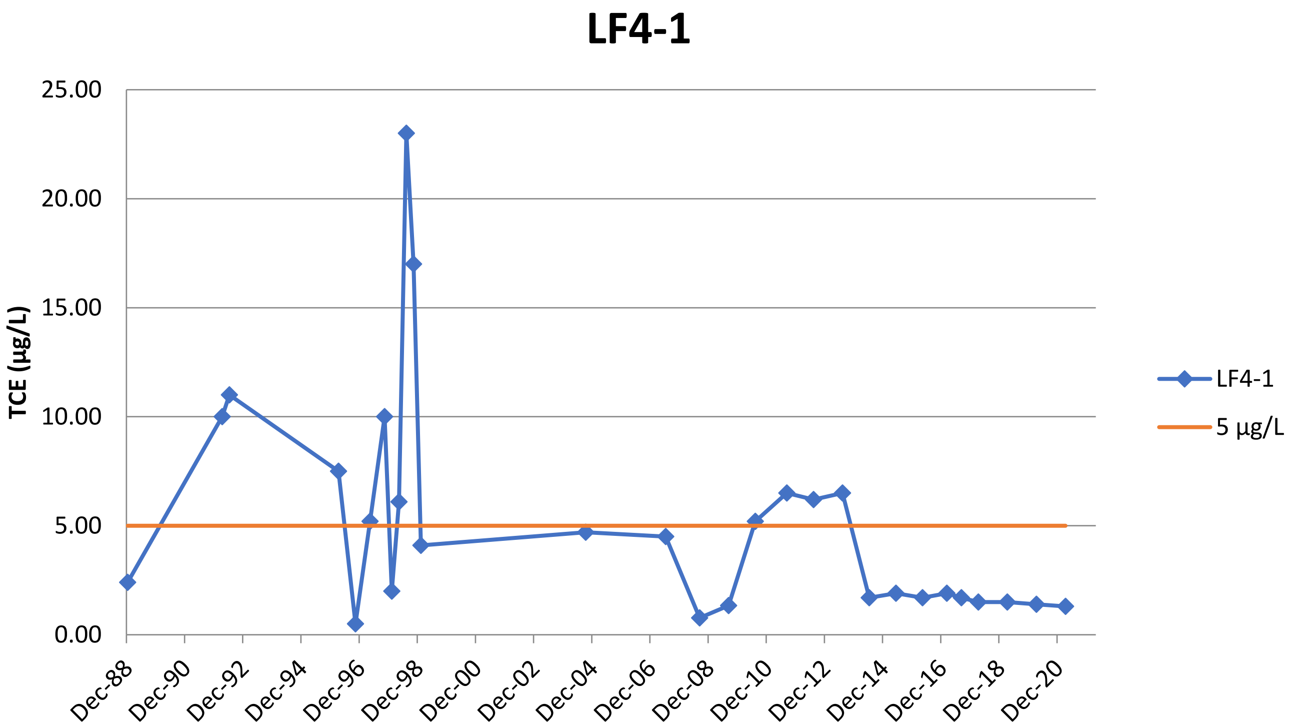
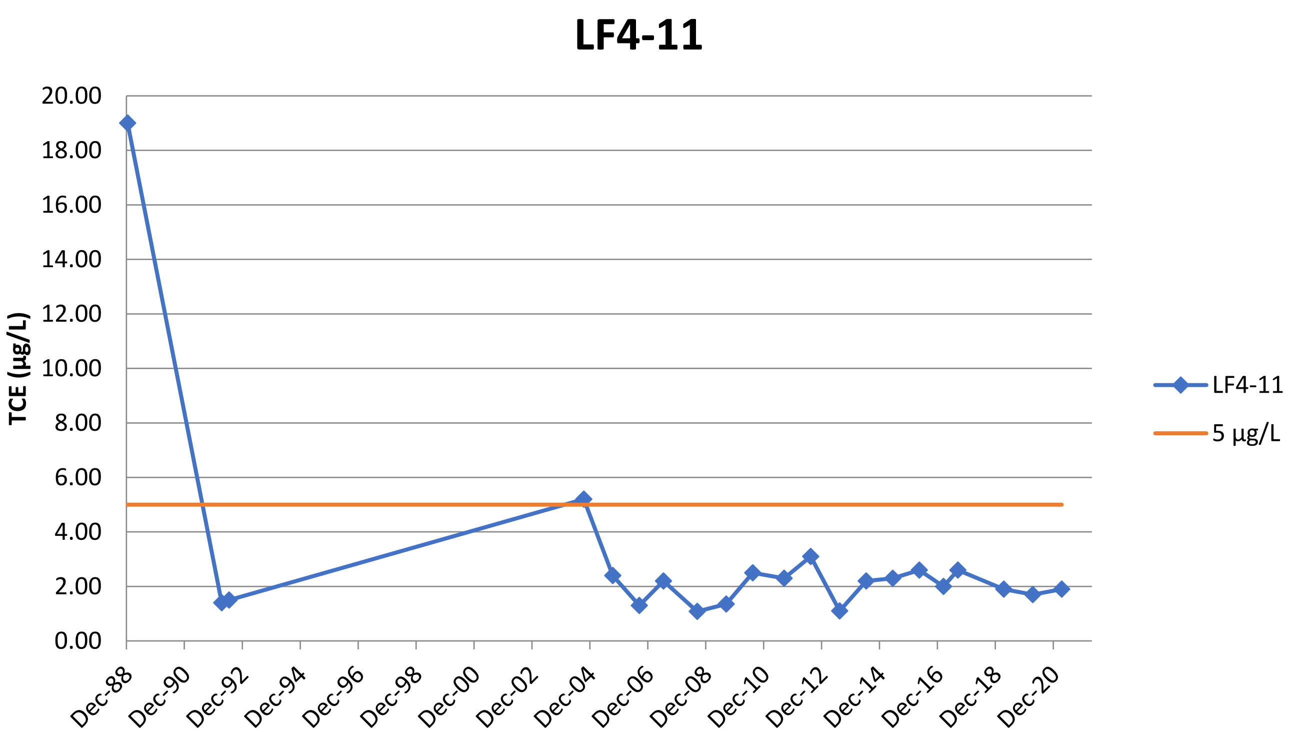
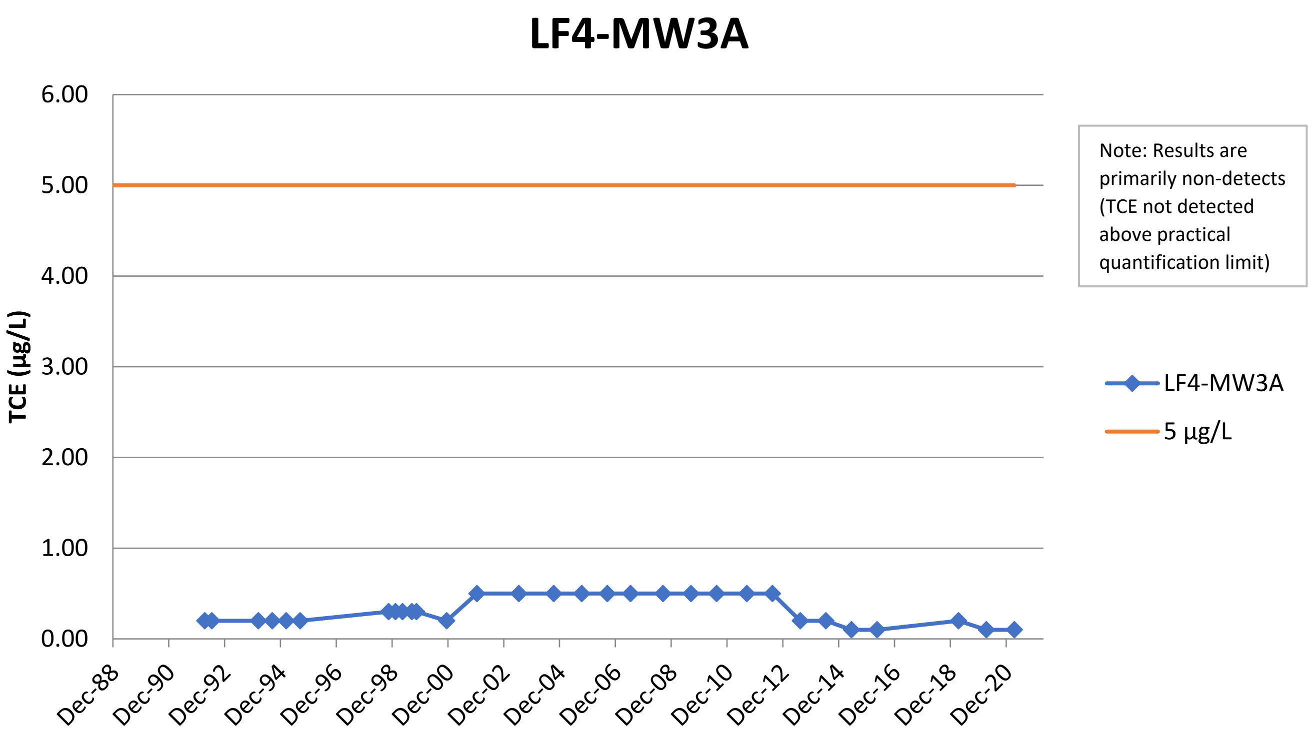
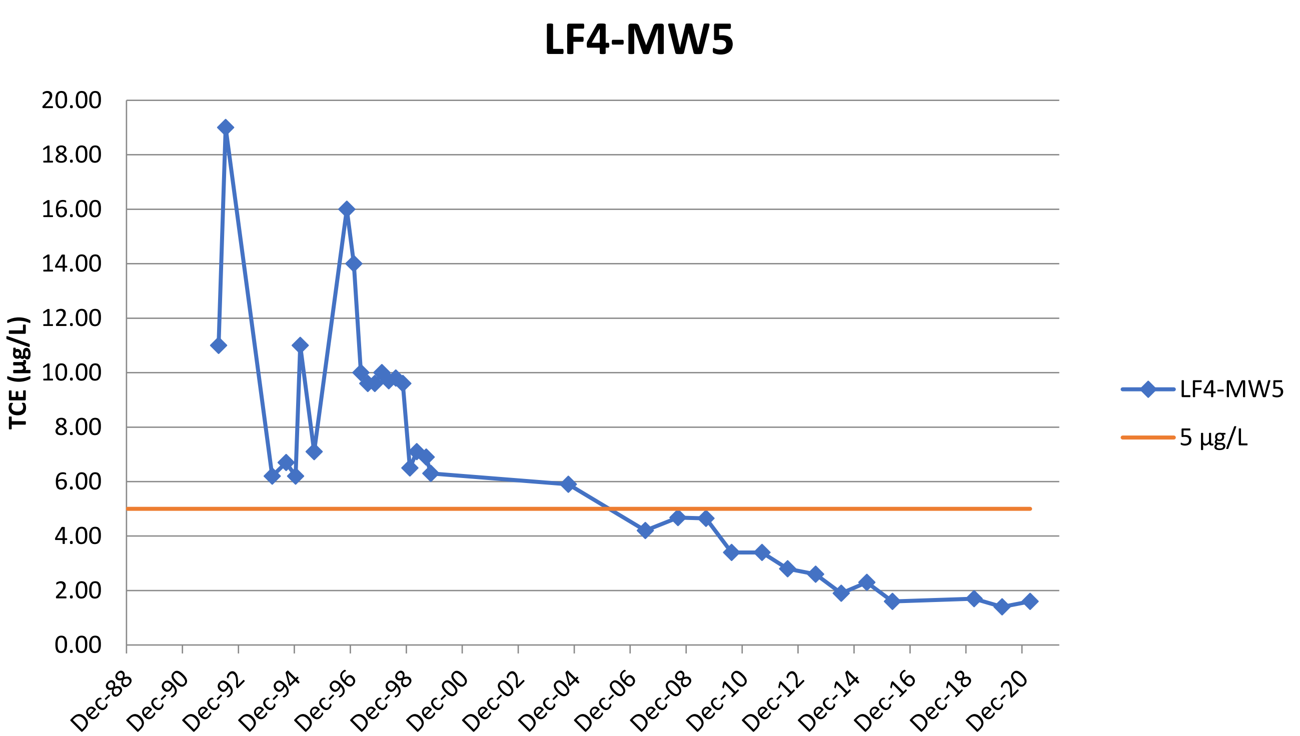
Historical Concentration Graphs - TCE



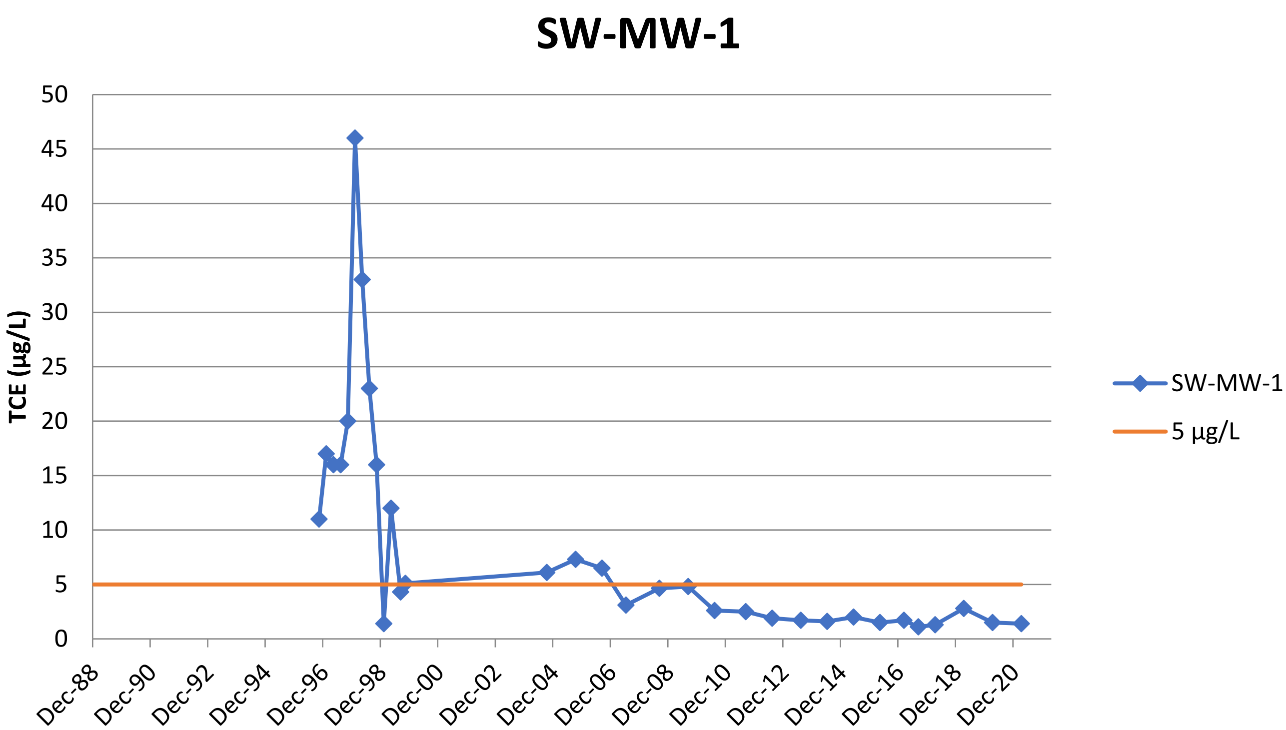


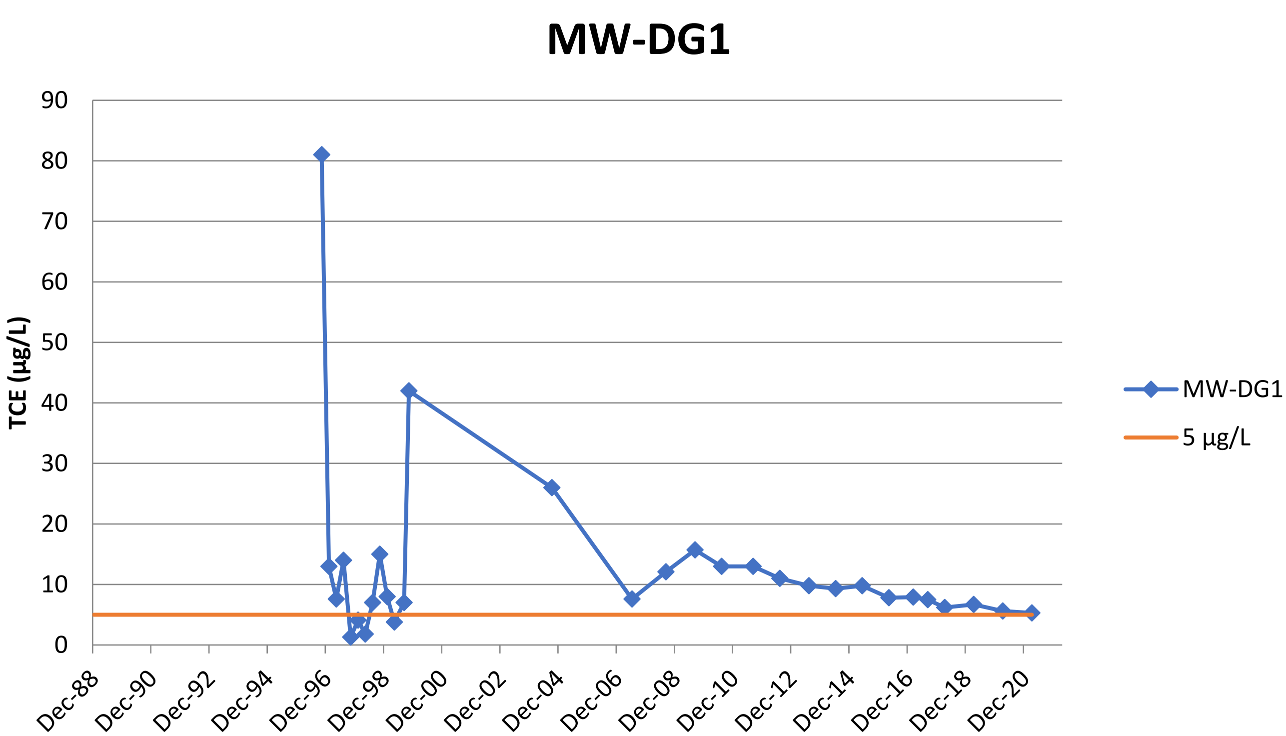
Historical Concentration Graphs - TCE



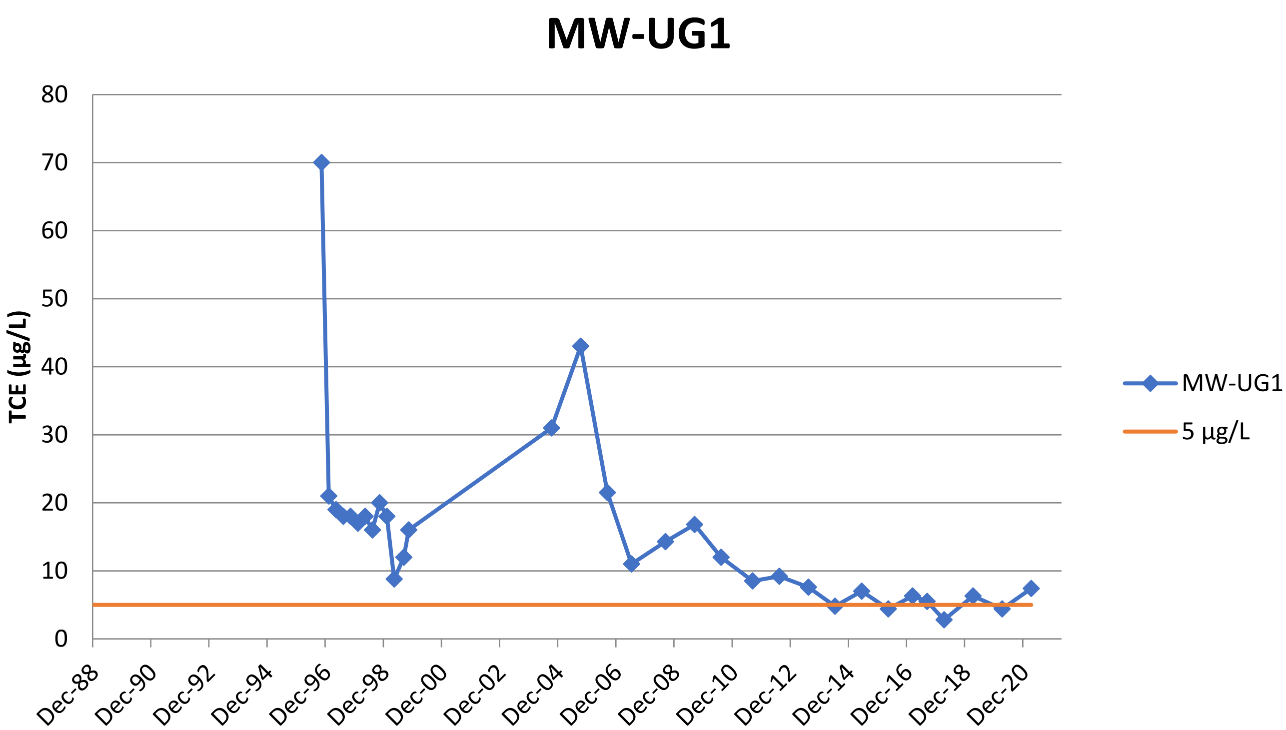


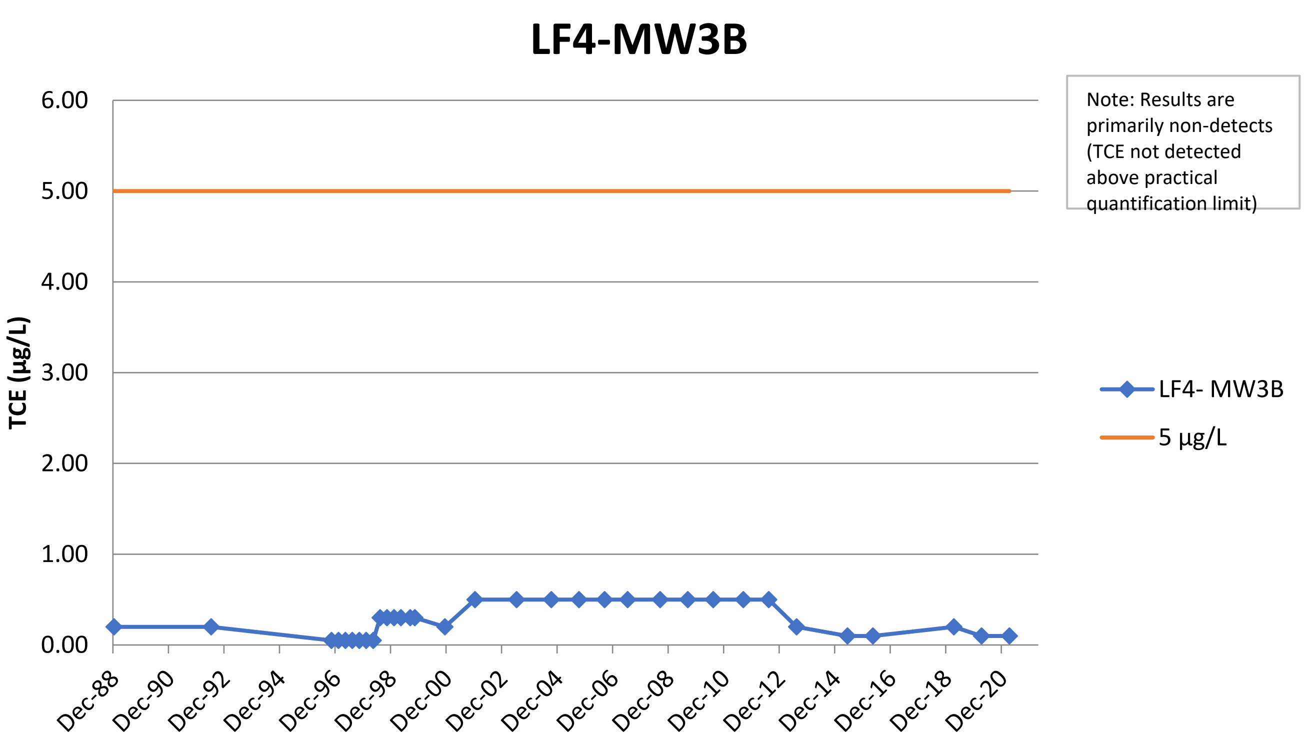
Historical Concentration Graphs - TCE



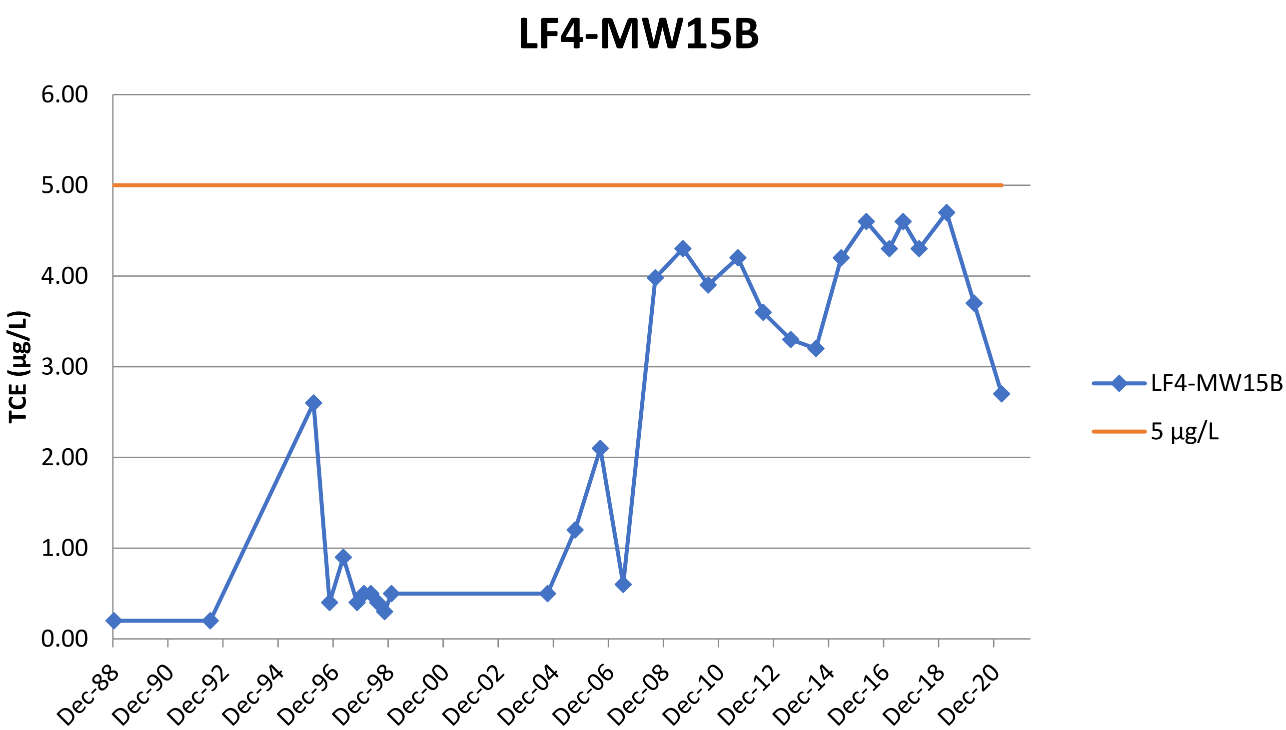


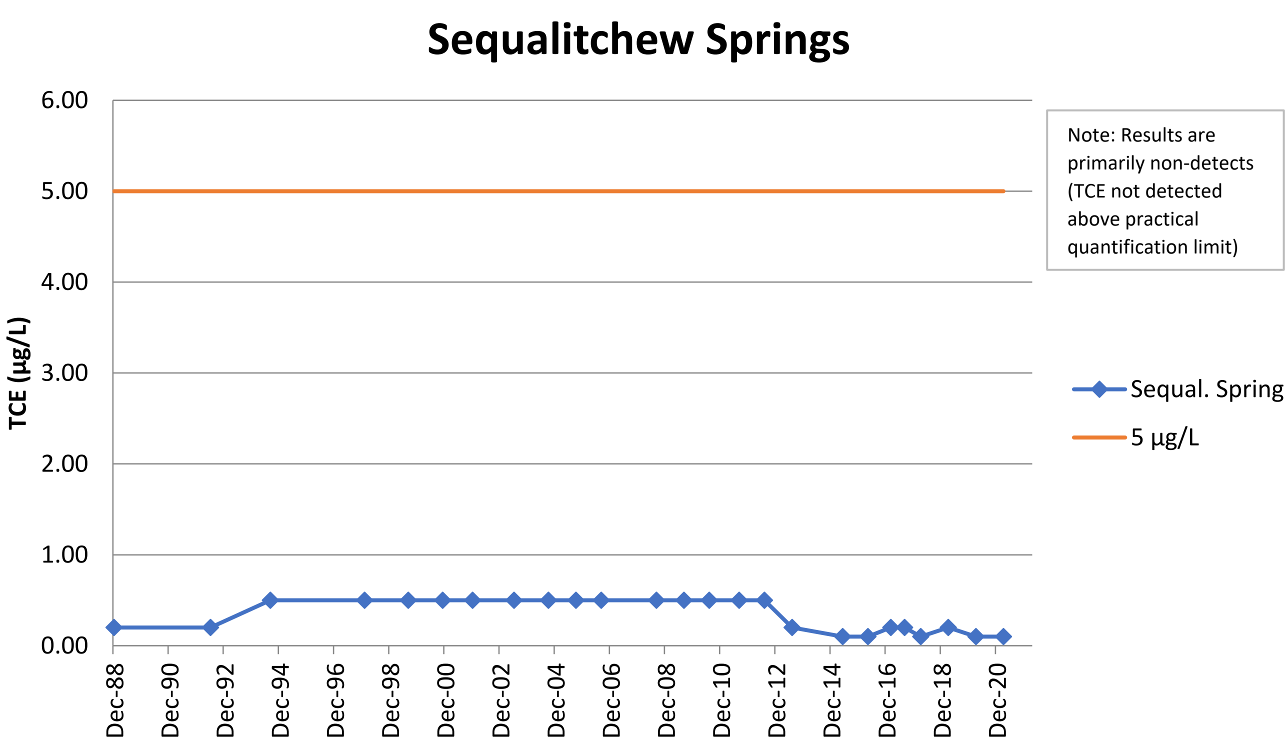
Historical Concentration Graphs - TCE





Historical Concentration Graphs - TCE





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APPENDIX D

LANDFILL 4 STATISTICS

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ANALYSIS OF DATA

Analysis of trichloroethylene (TCE) data collected over the last 10 years (2011-2021) was performed to help support interpretation and evaluation of TCE concentrations detected in groundwater. Statistical analysis of Landfill 4 data followed the guidelines agreed upon by Joint Base Lewis-McChord (JBLM) and the United States Environmental Protection Agency (EPA) for JBLM's Logistics Center Remedial Action Monitoring (Log RAM) project. Guidelines can be found in the updated Log RAM Compliance Monitoring Plan (Sealaska Environmental Services, LLC 2016).

Statistical analysis was performed on TCE from monitoring wells with a minimum of eight data points. Statistical analysis was not performed if over 50 percent of the dataset was composed of non-detects (TCE not detected above the laboratory practical quantification limit). Only current data from samples collected within the last 10 years (2011 to 2020) was statistically analyzed. The Shapiro-Wilk test for normality, linear regression analysis, and Mann-Kendall test for trend were performed on both TCE datasets using Analyse-It® for Microsoft Excel version 5.01. The Mann-Kendall test was performed only on non-parametric TCE data.

All concentration measurements not known to be in error were considered valid. Suspect "outliers" were not removed from the data set and were included in the graphs. Non-detect data, which represent concentration measurements below the analytical reporting limits, were evaluated at the reporting limit value.

A. SUMMARY STATISTICS

Summary statistics were performed on data from monitoring wells with a minimum of eight data points. Summary statistics were calculated using Microsoft Excel's Descriptive Statistics tool.

B. SHAPIRO-WILK TEST FOR NORMALITY

Prior to analyzing TCE concentration data for trends, the data was tested for normal distribution. A significance level, or alpha level, of 0.05 was used when determining whether current data from monitoring wells was normally distributed. P values, generated using the Shapiro-Wilk test for normality, were then compared to the alpha level. The alpha level is the "cutoff" point for the test statistic in making a decision whether the data was normally distributed or not. P values show the strength of the test in determining whether the data was normally distributed or not. P values range from 0 to 1; the closer a P value is to 1, the closer the dataset is to a normally distribution. P values equal to or below 0.05 (alpha level) were not considered normally distributed.

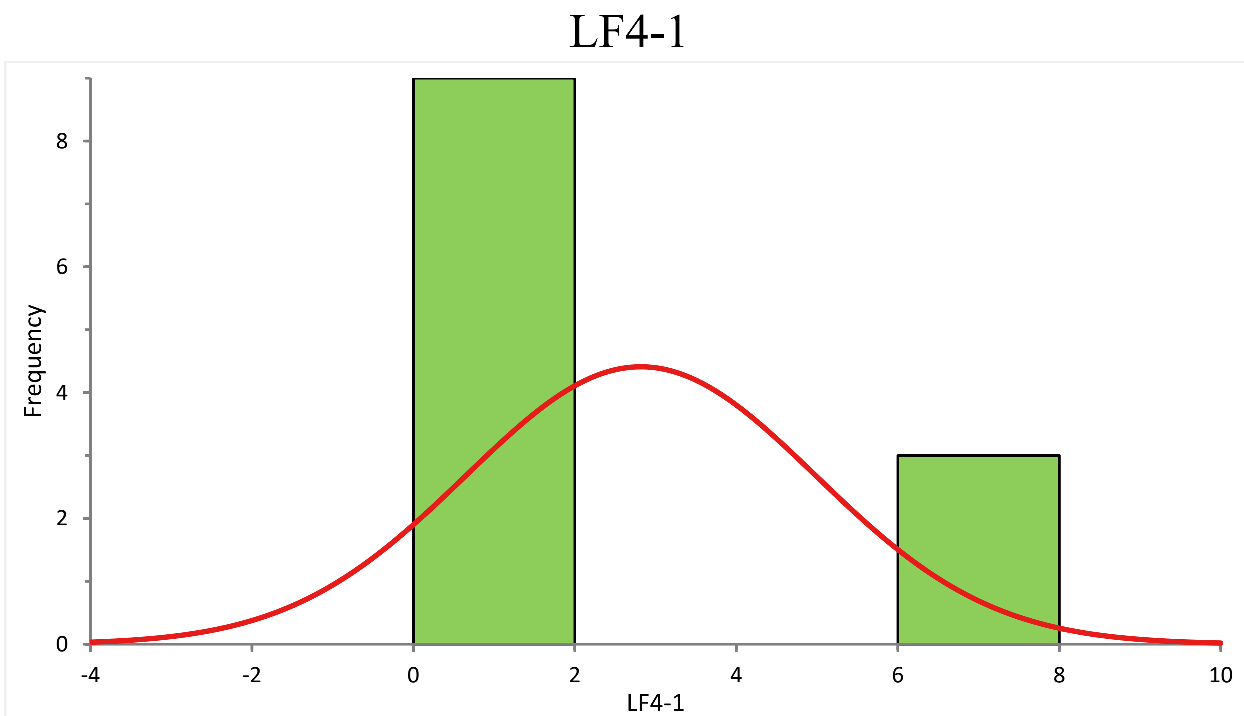
Datasets that were not considered normally distributed were then transformed by taking the natural logarithm of the original values. The Shapiro-Wilk test for normality was run on the transformed data with the same criteria as the datasets above. Histograms are included in following this discussion.

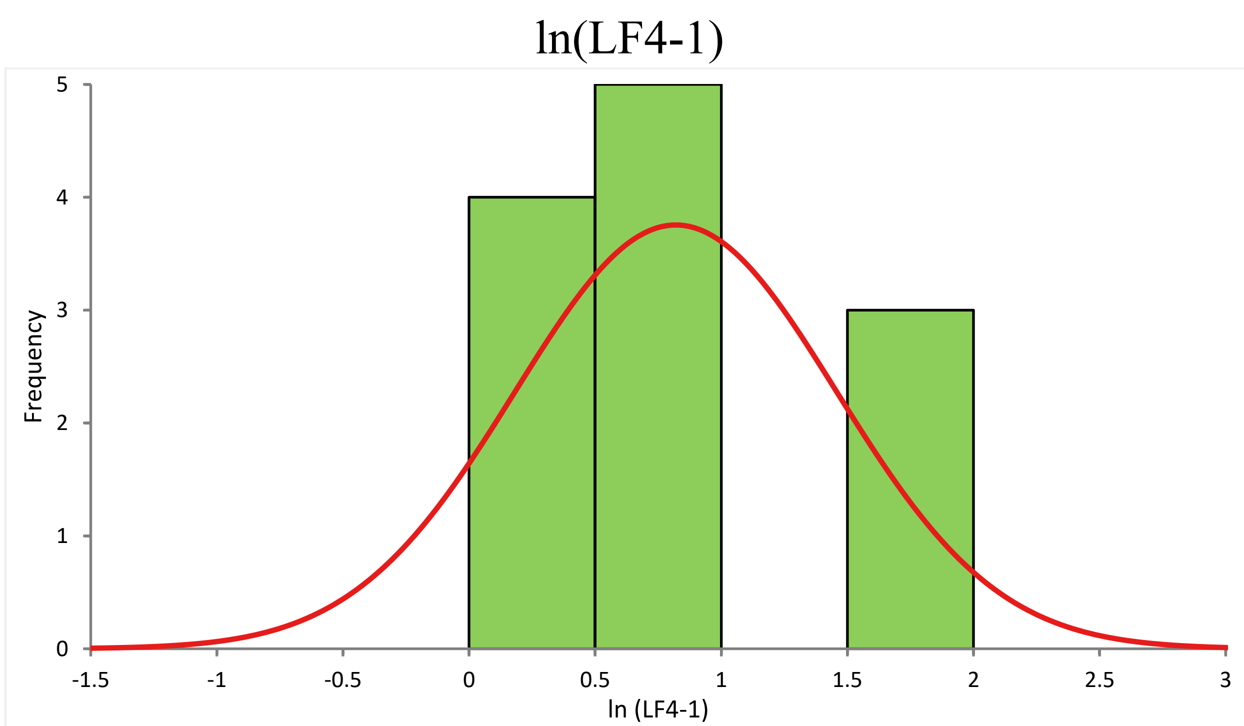
C. LINEAR REGRESSION AND MANN-KENDALL TREND ANALYSES

Linear regression trend analyses were conducted on TCE concentration data that was found to be normally or log-normally distributed. The alpha level for the linear regression analysis was set at 0.05. P values generated by the analysis were then compared to the alpha level. P values less than the alpha value suggested a trend in the data. Linear regression graphs are presented following this discussion.

The Mann-Kendall test for trend was performed on data that was not normally or log-normally distributed (non-parametric data). No assumptions need to be made about the distribution of the data in order to perform the Mann-Kendall test (Helsel and Hirsch 2002). The alpha level was kept at 0.05, although the Mann-Kendall test computes a P value for a two-tailed prediction interval, and as such the null hypothesis was rejected for P values smaller than 0.05 or larger than 0.95. Mann-Kendall scatter plots are presented following this discussion.

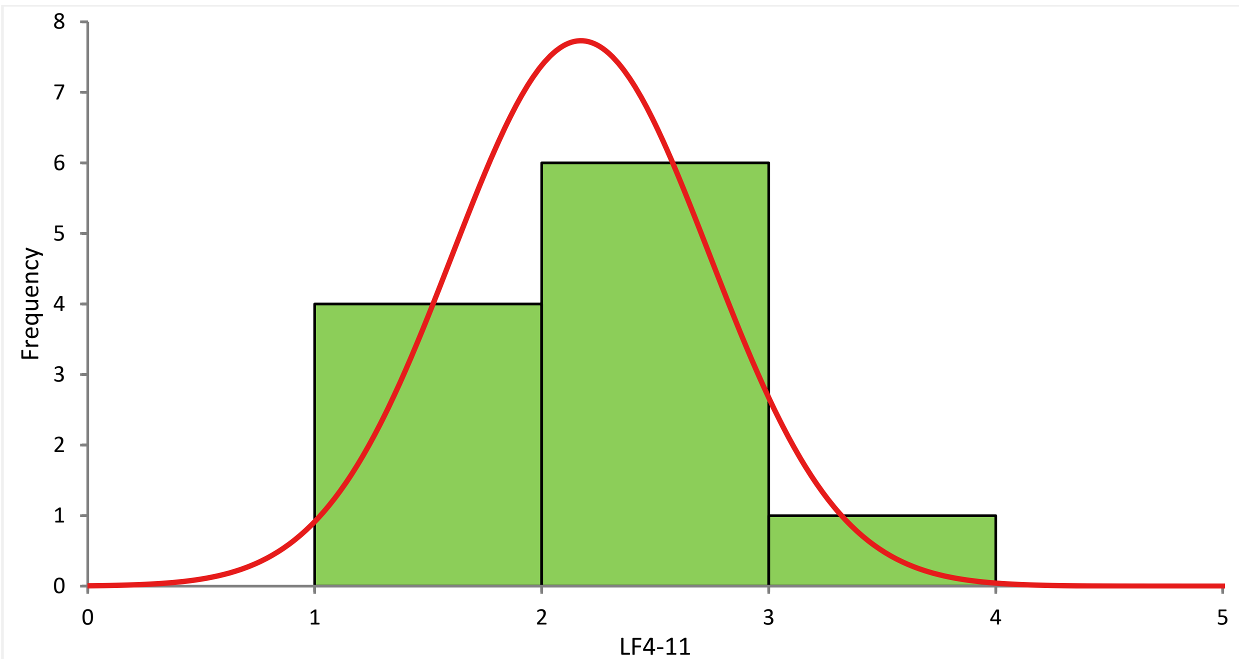
Histograms – TCE Data (2011-2021)



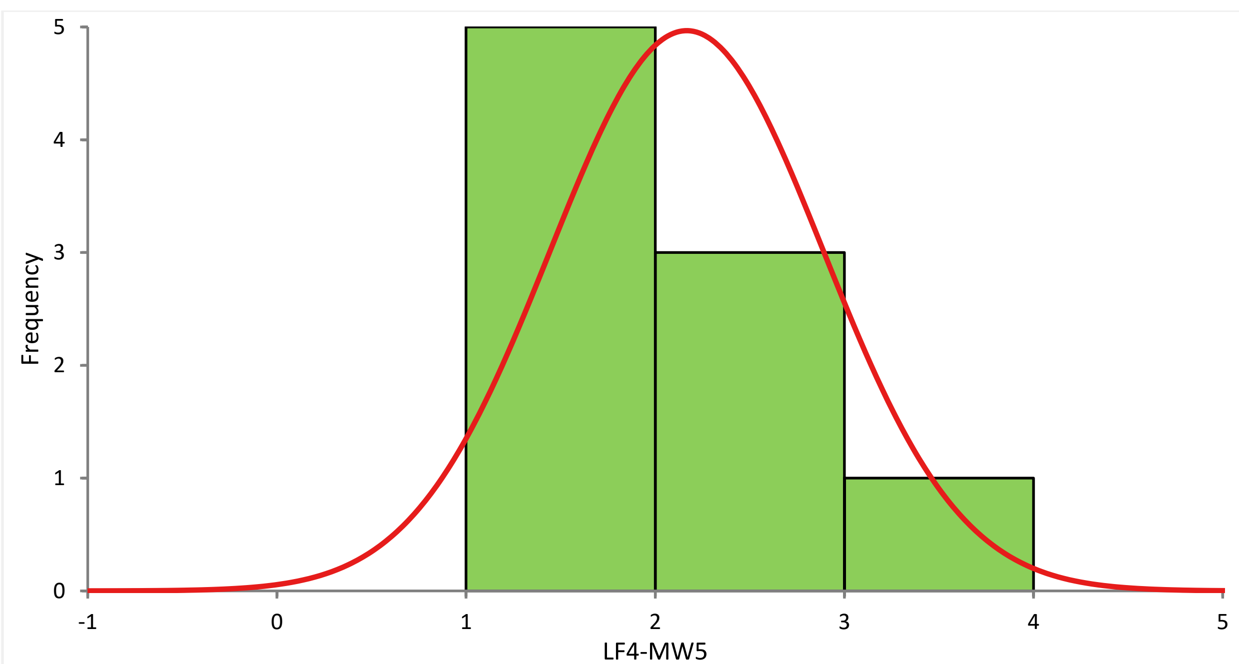


Histograms – TCE Data (2011-2021)

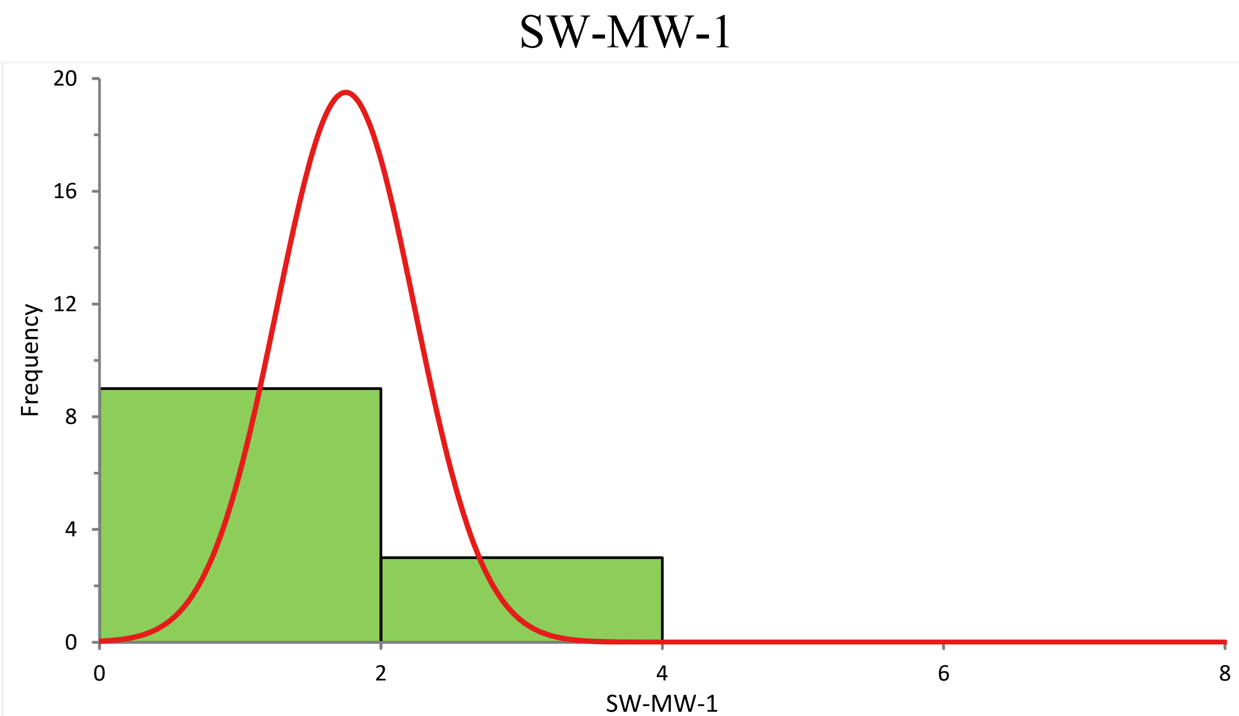
LF4-11

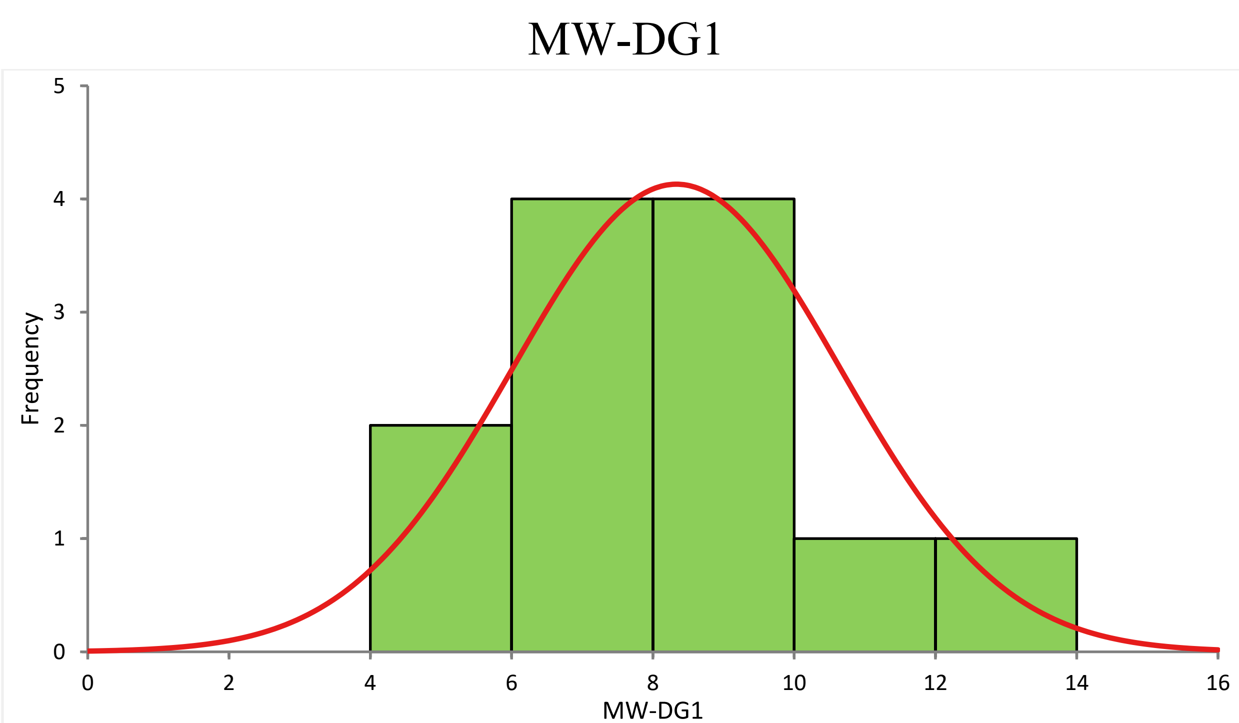


LF4-MW5



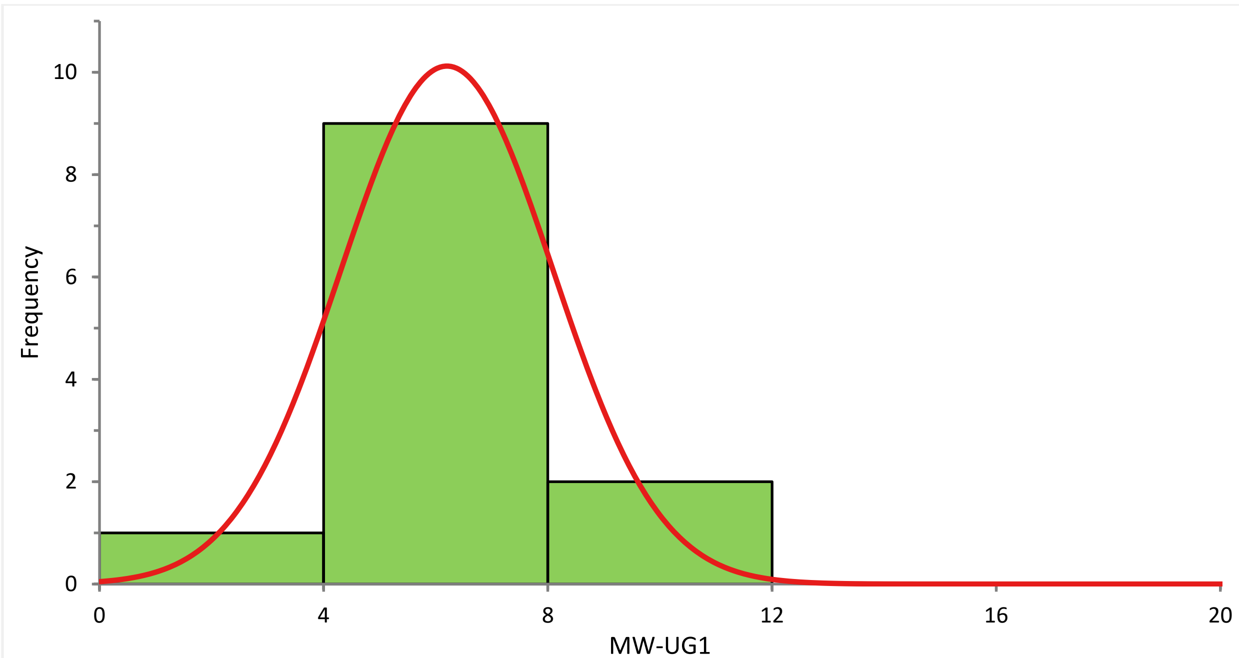
Histograms – TCE Data (2011-2021)



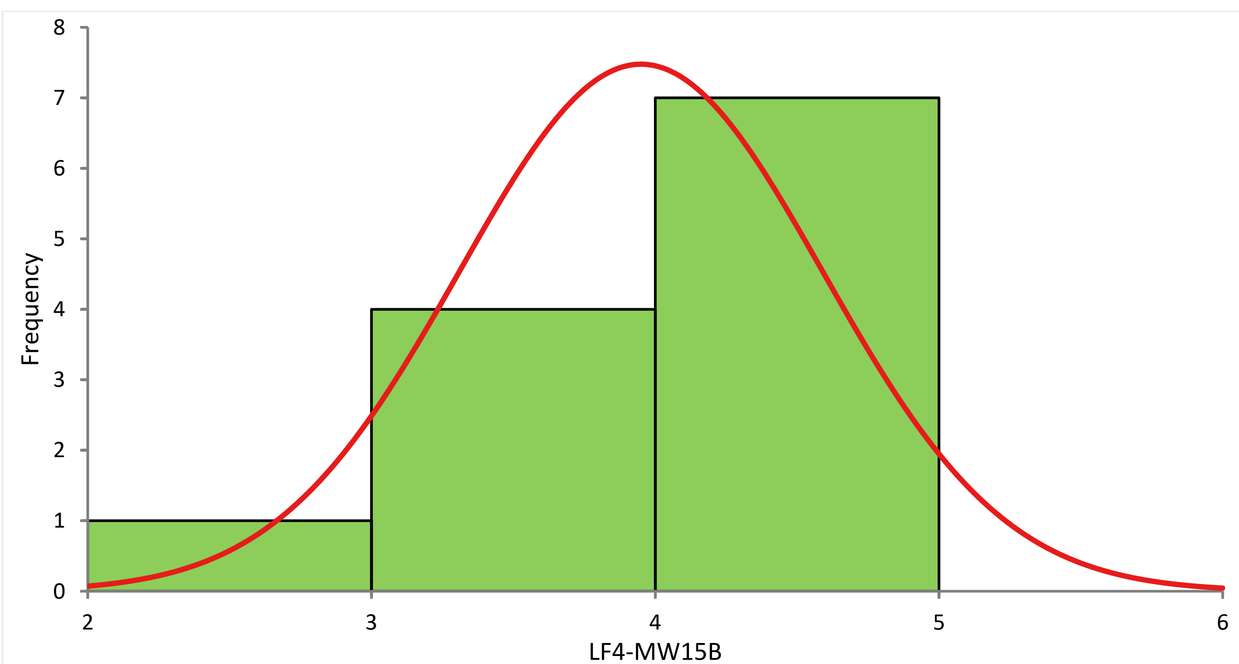


Histograms – TCE Data (2011-2021)

MW-UG1

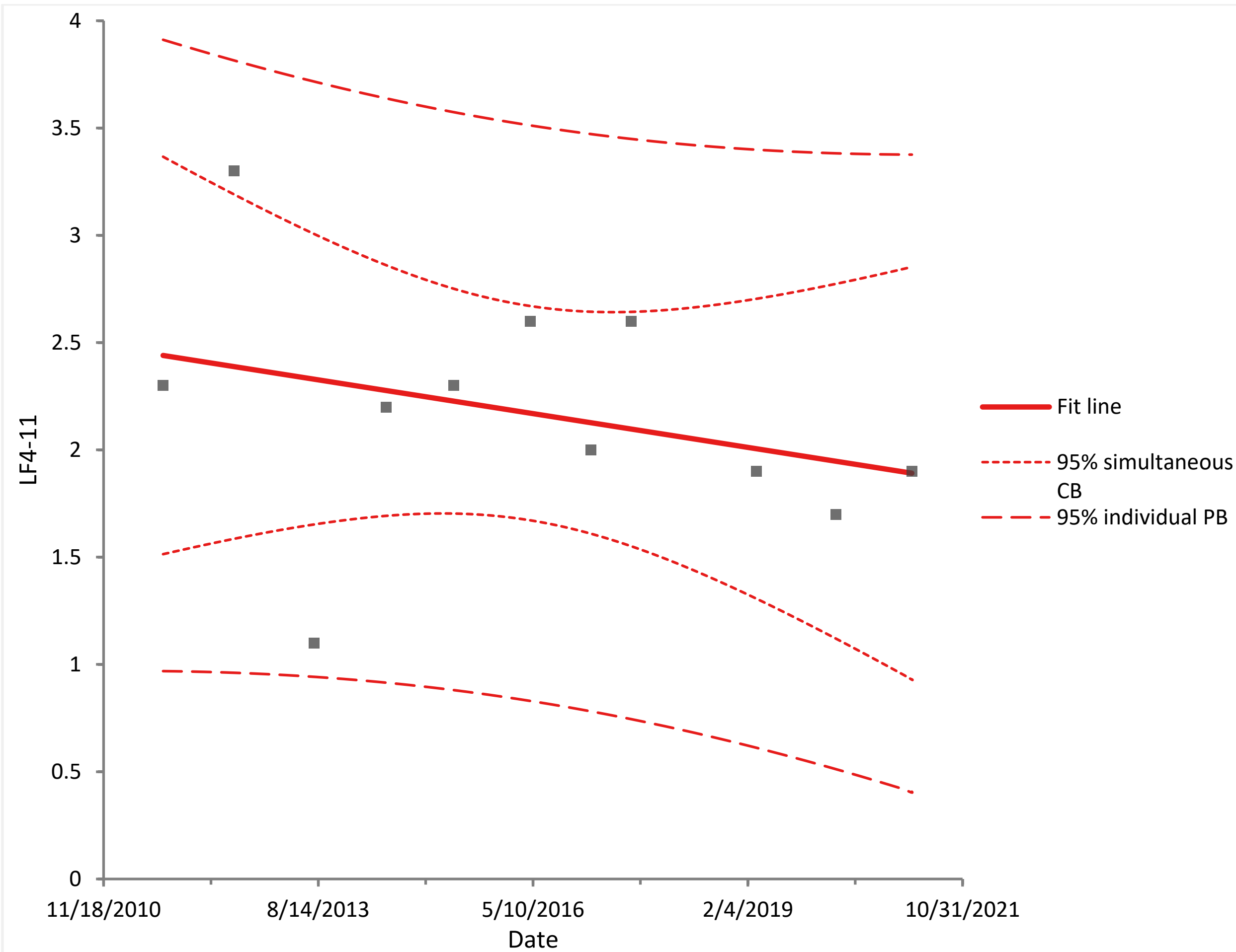


LF4-MW15B

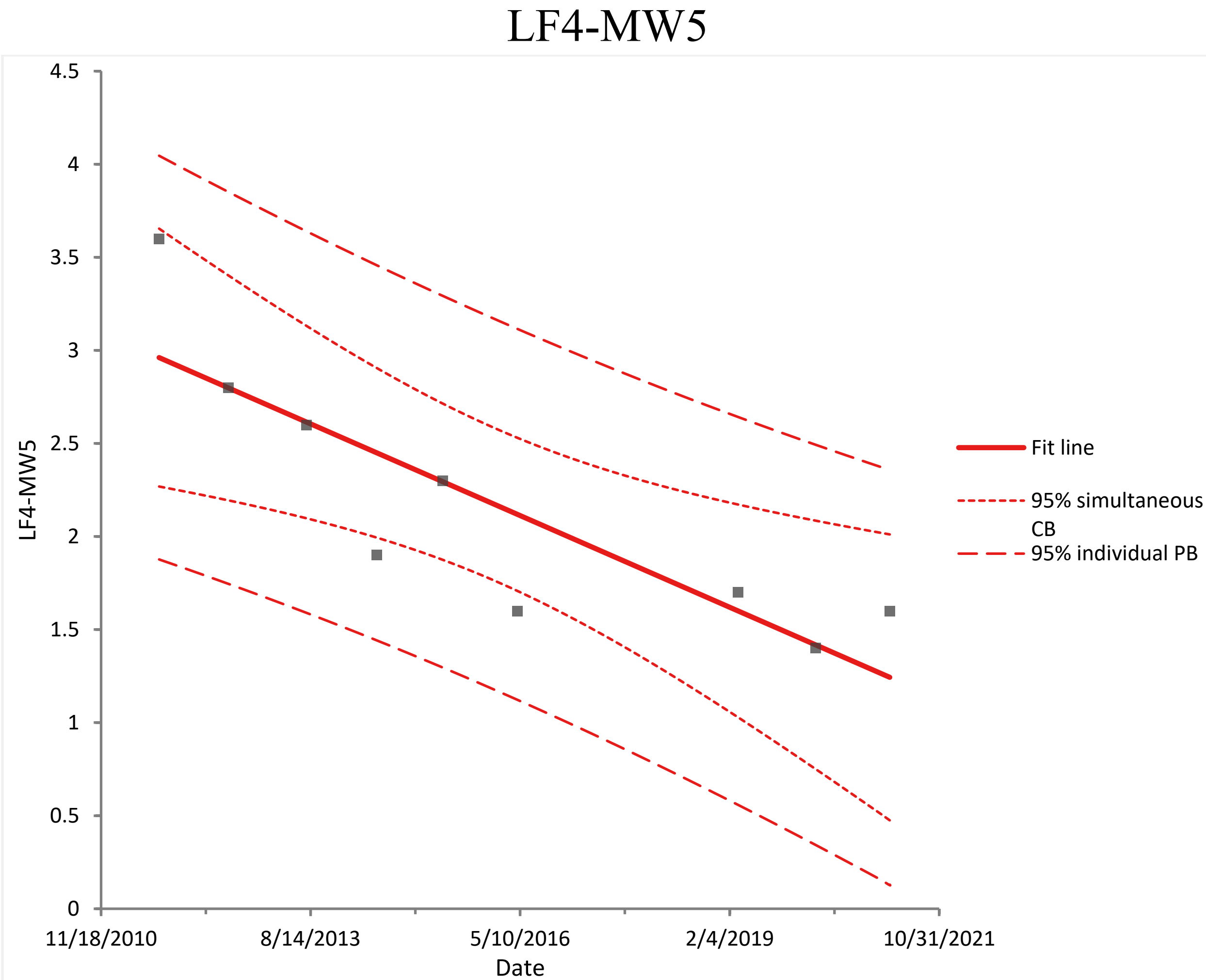


Linear Regressions – TCE Data (2011-2021)

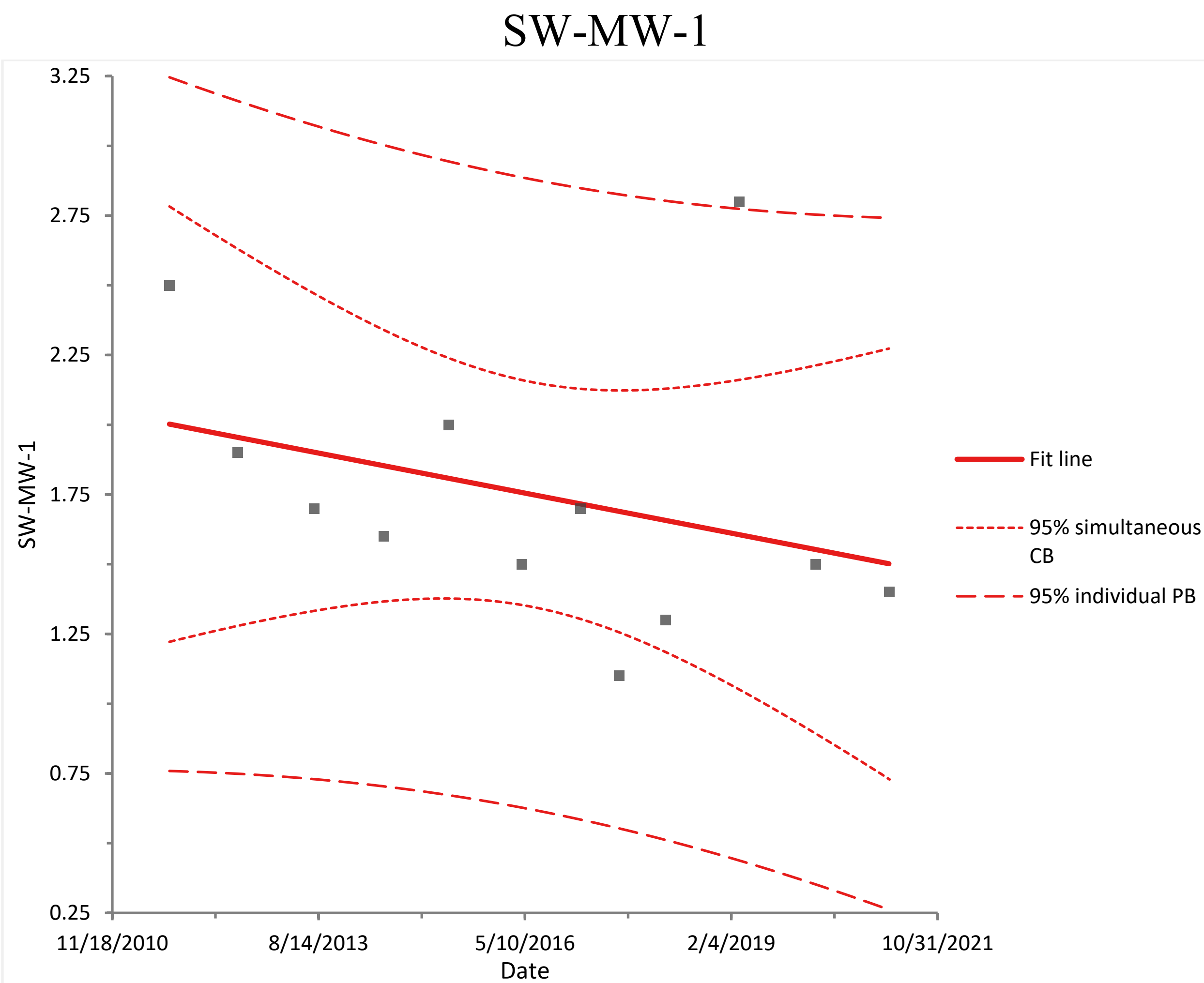
LF4-11



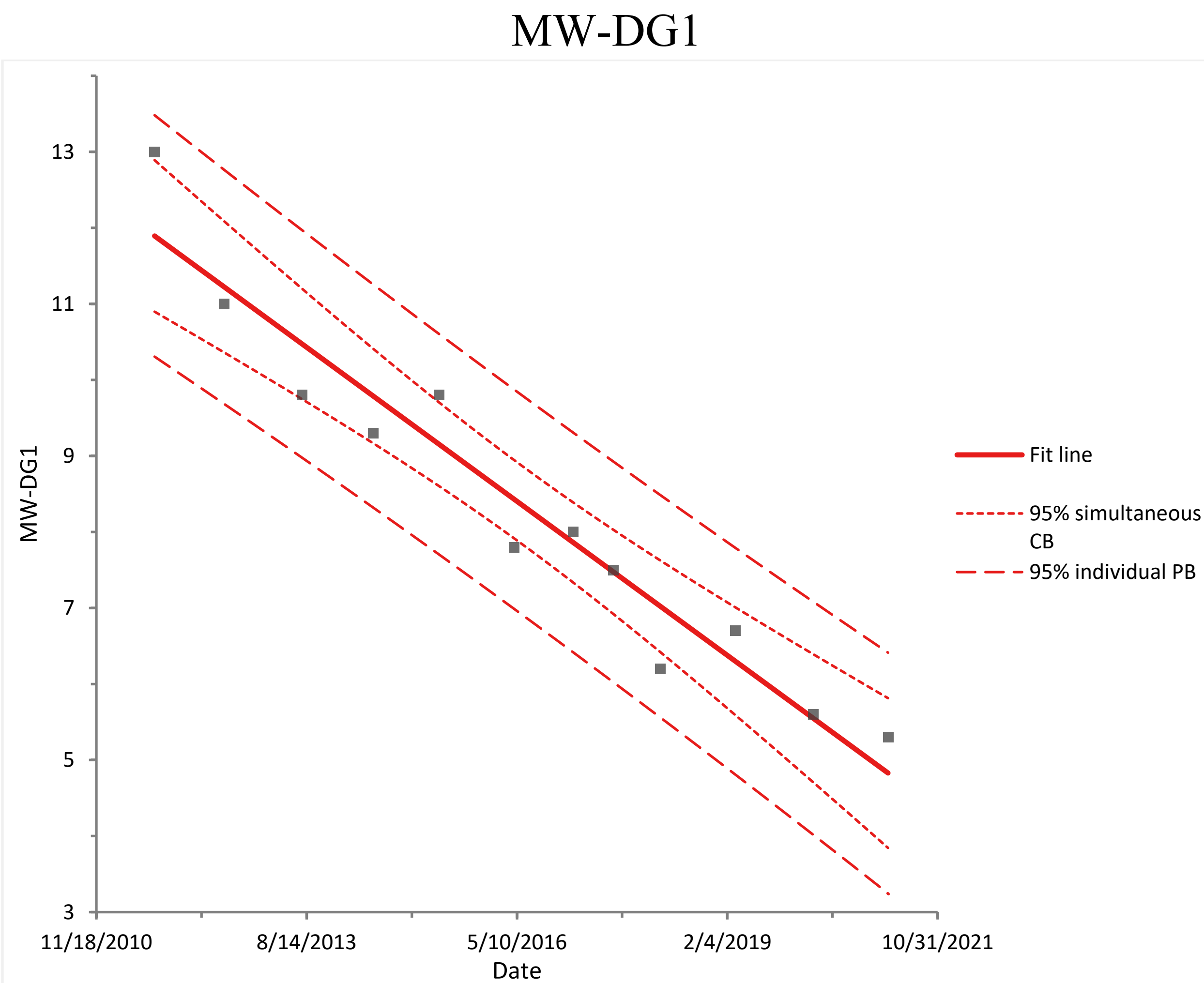
Linear Regressions – TCE Data (2011-2021)



Linear Regressions – TCE Data (2011-2021)

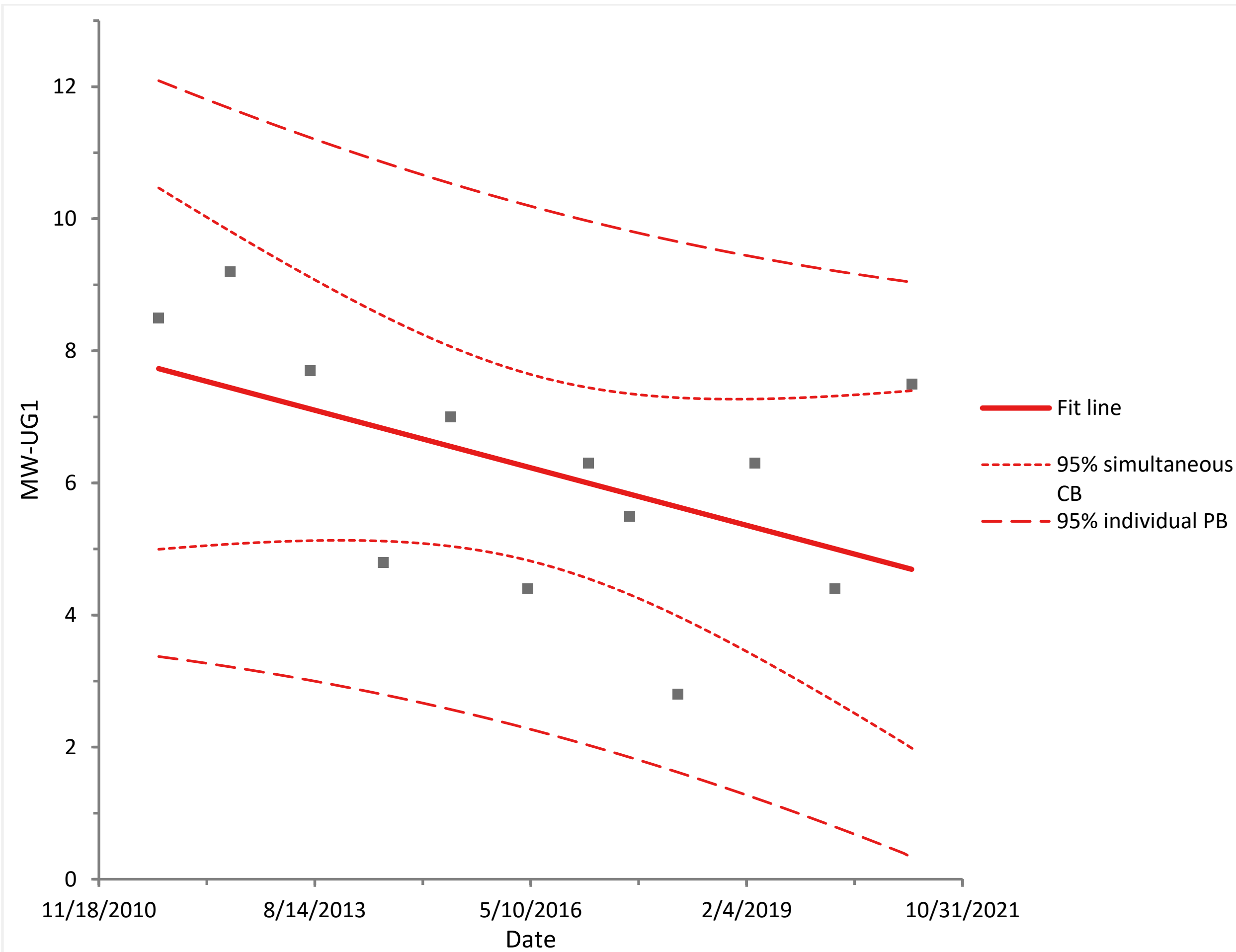


Linear Regressions – TCE Data (2011-2021)

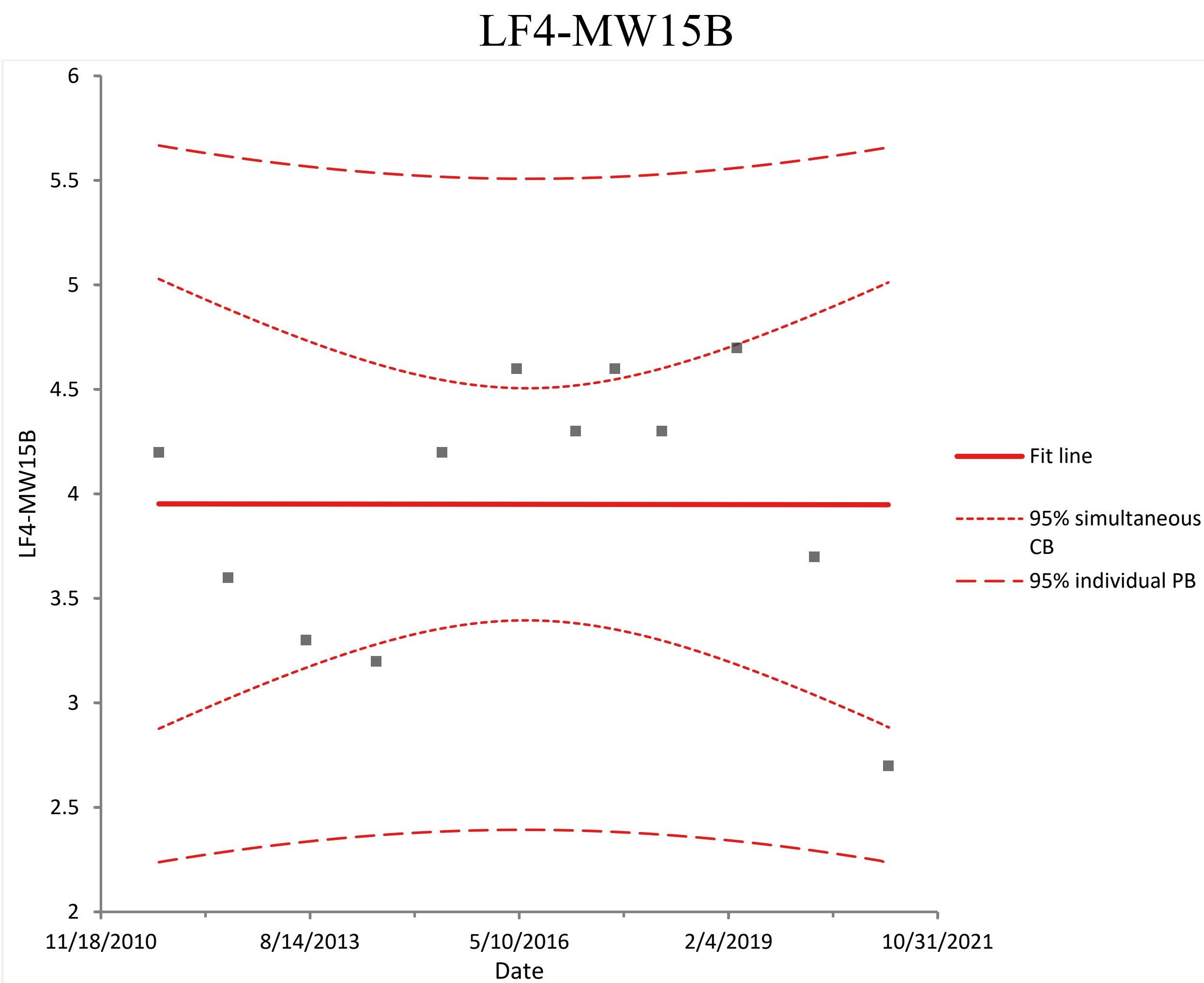


Linear Regressions – TCE Data (2011-2021)

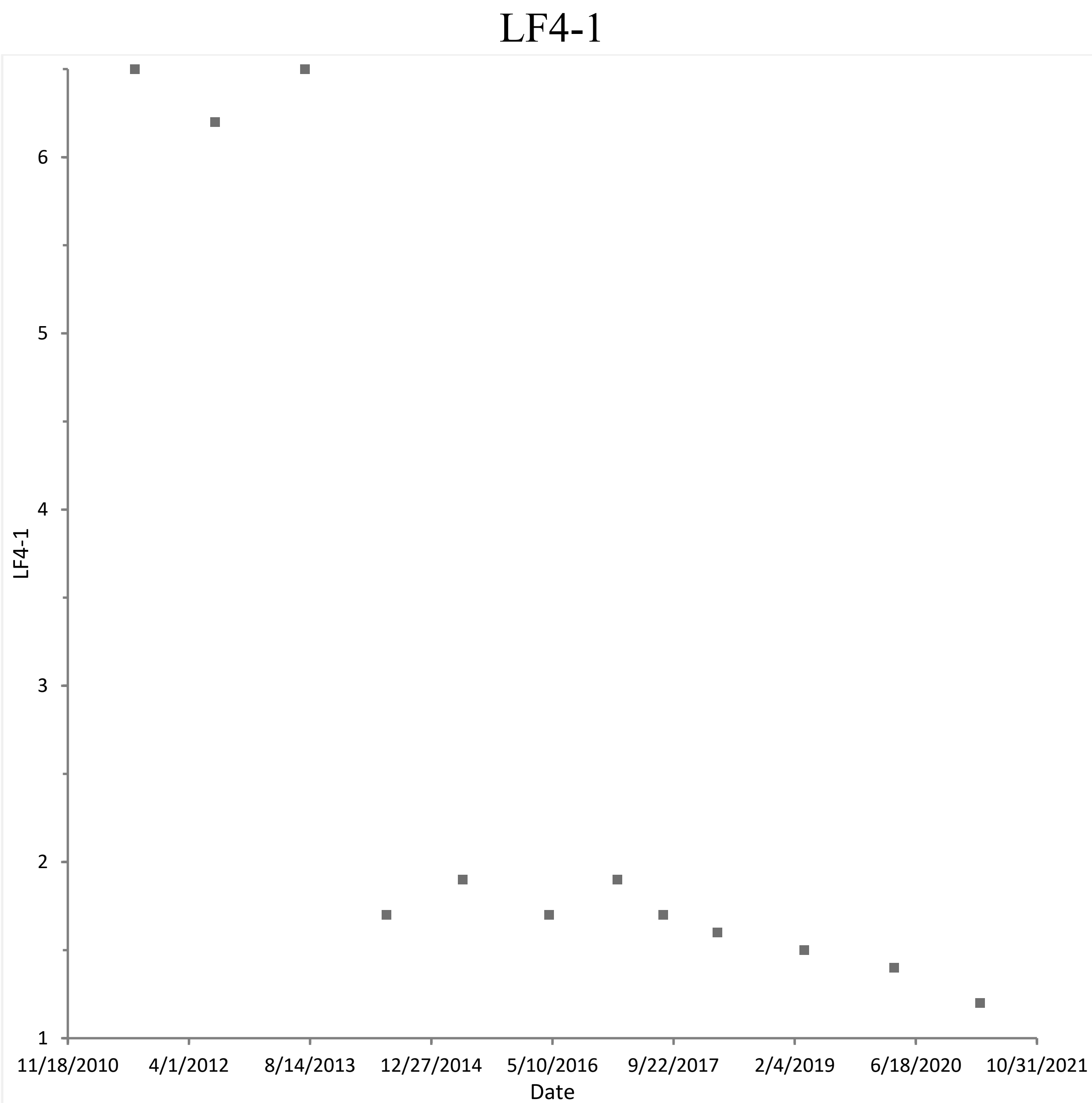
MW-UG1



Linear Regressions – TCE Data (2011-2021)



Mann-Kendall Scatter Plot – TCE Data (2011-2021)



OU3/ALGT

Groundwater Data from

Draft 2021 Annual Groundwater Monitoring Report, Area D/American Lake Garden Tract (ALGT), for Joint Base Lewis-McChord Public Works – Environmental Division, Pierce County, Washington

January, 2022

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
DA-7b	17-Mar-00	-	-	91	210.0	<0.24	<0.2
Duplicate	17-Mar-00	-	-	90	210.0	<0.24	<0.2
281.34	15-Sep-00	-	-	81 E	190 E	<0.5	<0.5
Duplicate	15-Sep-00	-	-	82 D	190 D	<5	<5
	13-Mar-01	-	-	53	150 E	<0.5	<0.5
Duplicate	13-Mar-01	-	-	56 D	140 D	<5	<5
	17-Sep-01	-	-	77 E	200 E	<1	<1
Duplicate	17-Sep-01	-	-	75 D	210 D	<10	<10
	7-Mar-02	-	-	84	210 E	<0.5	<0.5
Duplicate	7-Mar-02	-	-	63 D	160 D	<2.5	<2.5
	17-Sep-02	-	-	75	210 D	<0.5	<0.5
Duplicate	17-Sep-02	-	-	69 D	190 D	<2.5	<2.5
	11-Mar-03	-	-	82	220 E	<0.5	<0.5
Duplicate	11-Mar-03	-	-	72 D	220 D	<1	<1
	4-Sep-03	-	-	79	190.0	<0.5	<0.5
	16-Mar-04	-	-	61	110.0	<0.5	<0.5
	13-Sep-04	-	-	63	140	<0.5	<0.5
	7-Mar-05	-	-	64	150	<0.5	<0.5
	6-Sep-05	-	-	69	140	<0.5	<0.5
	7-Mar-06	-	-	50	88	<0.5	<0.5
	15-Sep-06	-	-	38	**58**	<0.5	<0.5
	5-Mar-07	-	-	42	**55**	<0.5	<0.5
	21-Sep-07	-	-	18	**9.5**	<0.5	<0.5
	10-Mar-08	-	-	39	**31**	<0.5	<0.5
	8-Sep-08	-	-	53	81	<0.5	<0.5
	24-Mar-09	-	-	38	**34**	<0.5	<0.5
	8-Sep-09	-	-	56 B	100	0.12 J	<0.5
	22-Mar-10	-	-	30	**16**	<0.5	<0.5
	28-Apr-10	-	-	62	99 D	<0.5	<0.5
	9-Sep-10	-	-	47	**49**	<0.5	<0.5
	1-Dec-10	-	-	22	**7.8**	<0.5	<0.5
	21-Mar-11	-	-	46	**38**	<0.5	<0.5
	28-Jun-11	-	-	23	**7**	<0.5	<0.5
	6-Sep-11	-	-	16	**5.8**	<0.5	<0.5
	21-Mar-12	16.43	264.91	5.9	**3.8**	<0.5	<0.5
	8-Mar-13	17.6	263.74	9.4	**3.7**	<0.2	<0.2
	29-May-13	18.38	262.96	-	-	-	-
	28-Aug-13	21.38	259.96	25	**19**	<0.2	<0.2
	17-Feb-14	16.6	264.74	16	**5**	<0.2	<0.2
	16-Sep-14	21.7	259.64	18	**5.3**	<0.5	<0.5
	2-Dec-14	18.9	262.44	-	-	-	-
	10-Mar-15	16.39	264.95	24	**9.2**	<0.5	<0.5
	23-Jun-15	19.97	261.37	-	-	-	-

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
DA-7b (cont.)	16-Sep-15	22.67	258.67	17	**4.6**	<0.5	<0.5
	9-Dec-15	17.73	263.61	-	-	-	-
	11-Aug-16	20.84	260.50	9.3	**3.2**	<0.5	<0.5
Duplicate	11-Aug-16	20.84	260.50	9.1	**3.1**	<0.5	<0.5
	5-Dec-16	17.44	263.90	11	**3.9**	<0.5	<0.5
Duplicate	5-Dec-16	17.44	263.90	11	**3.7**	<0.5	<0.5
	21-Mar-17	12.88	268.46	9	**3.2**	<0.5	<0.1
Duplicate	21-Mar-17	12.88	268.46	9.4	**3.3**	<0.5	<0.1
	26-Jun-17	16.85	264.49	8.3	**3.4**	<0.5	<0.1
Duplicate	26-Jun-17	16.85	264.49	9.3	**3.7**	<0.5	<0.1
	6-Sep-17	20.60	260.74	10	**4.2**	<0.5	<0.5
Duplicate	6-Sep-17	20.60	260.74	11	**4.2**	<0.5	<0.5
	10-Nov-17	20.89	260.45	9.7	**4.1**	<0.1	<0.02
Duplicate	10-Nov-17	20.89	260.45	9.8	**4.2**	<0.1	<0.02
	2-Apr-18	16.18	265.16	10	**3.5**	0.5 U	0.5 U
	13-Jun-18	18.02	263.32	9.3	**3.4**	0.5 U	0.5 U
	5-Sep-18	21.50	259.84	9.1	**3.0**	0.5 U	0.5 U
	4-Dec-18	21.06	260.28	9.14	**3.35**	0.5 U	0.5 U
	2-Apr-19	17.65	263.69	14	**4.8**	0.5 U	0.5 U
	4-Jun-19	19.47	261.87	12	**3.6**	0.5 U	0.5 U
	10-Sep-19	22.11	259.23	12	**4.2**	0.5 U	0.5 U
	3-Dec-19	22.02	259.32	7.5	**3.6**	0.5 U	0.5 U
	3-Mar-20	15.59	265.75	7.4	**3.5**	0.5 U	0.5 U
	1-Jun-20	19.05	262.29	8.2	**4.0**	0.5 U	0.5 U
	1-Sep-20	22.05	259.29	9	**3.9**	0.5 U	0.5 U
	16-Dec-20	21.25	260.09	9	**3.9**	0.5 U	0.5 U
	3-Mar-21	15.27	266.07	8.3	**4.3**	0.5 U	0.5 U
	10-Jun-21	19.47	261.87	9	**4.2**	0.5 U	0.5 U
	14-Sep-21	22.82	258.52	8.6	**3.9**	0.5 U	0.5 U
	16-Nov-21	20.28	261.06	8.5	**3.8**	0.5 U	**0.10 J**
DA-9b 285.92	17-Mar-00	-	-	8.0	**4.5**	<0.24	<0.2
	31-Mar-01	-	-	7.5	**5.3**	<0.5	<0.5
	7-Mar-02	-	-	6.8	**3.7**	<0.5	<0.5
	12-Mar-03	-	-	7.5	**4.5**	<0.5	<0.5
Duplicate	12-Mar-03	-	-	7.4	**4.6**	<0.5	<0.5
	16-Mar-04	-	-	7.6	**4.3**	<0.5	<0.5
	4-Mar-05	-	-	6.1	**3.2**	<0.5	<0.5
	7-Mar-06	-	-	6.4	**3.5**	<0.5	<0.5
	5-Mar-07	-	-	4.8	**2.0**	<0.5	<0.5
	24-Mar-09	-	-	5.9	**2.6**	<0.5	<0.5
	22-Mar-10	-	-	7.2	**3.2**	<0.5	<0.5
	21-Mar-11	-	-	6.0	**2.4**	<0.5	<0.5
	21-Mar-12	21.29	264.63	**4.7**	**1.7**	<0.5	<0.5

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		-	-	**5.0**	**70.0**	**0.07**	**0.04**
DA-9b (cont.)	5-Mar-13	22.15	263.77	**4.8**	**2.1**	<0.2	<0.2
Duplicate	5-Mar-13	22.15	263.77	**5.0**	**2.1**	<0.2	<0.2
	29-May-13	22.37	263.55	-	-	-	-
	28-Aug-13	26.85	259.07	-	-	-	-
	27-Feb-14	21.40	264.52	**4.9**	**2.1**	<0.2	<0.2
	16-Sep-14	26.50	259.42	-	-	-	-
	10-Mar-15	21.04	264.88	**4.7**	**2.0**	<0.5	<0.5
	16-Sep-15	27.42	258.50	-	-	-	-
	9-Dec-15	22.60	263.32	-	-	-	-
	5-Dec-16	22.44	263.48	**5.6**	**2**	<0.5	<0.5
	21-Mar-17	17.56	268.36	**4.8**	**1.5**	<0.5	<0.1
	22-Jun-17	21.31	264.61	**6.1**	**2.5**	<0.5	<0.1
	7-Sep-17	25.38	260.54	**6**	**2.5**	<0.2	<0.1
	9-Nov-17	25.66	260.26	**5**	**2.3**	<0.1	<0.02
	3-Apr-18	20.94	264.98	**5.5**	**2.5**	0.5 U	0.5 U
	12-Jun-18	22.68	263.24	**5.9**	**2.4**	0.5 U	0.5 U
	6-Sep-18	28.26	257.66	**5.6**	**2.3**	0.5 U	0.5 U
	4-Dec-18	25.79	260.13	**4.91**	**2.31**	0.5 U	0.5 U
	2-Apr-19	22.35	263.57	**6.7**	**3.1**	0.5 U	0.5 U
	4-Jun-19	24.14	261.78	**5.5**	**2.6**	0.5 U	0.5 U
	10-Sep-19	26.78	259.14	**5.8**	**2.6**	0.5 U	0.5 U
	3-Dec-19	26.71	259.21	**4.4**	**2.1**	0.5 U	0.5 U
	4-Mar-20	20.32	265.60	**4.4**	**1.9**	0.5 U	0.5 U
	1-Jun-20	23.75	262.17	**4.6**	**2.1**	0.5 U	0.5 U
	1-Sep-20	26.74	259.18	**5.3**	**2.8**	0.5 U	0.5 U
	16-Dec-20	25.97	259.95	**5.0**	**2.4**	0.5 U	0.5 U
	2-Mar-21	20.10	265.82	**5.2**	**2.2**	0.5 U	0.5 U
	10-Jun-21	24.18	261.74	**4.9**	**2.3**	0.5 U	0.5 U
	14-Sep-21	27.60	258.32	**5.3**	**2.6**	0.5 U	0.5 U
	16-Nov-21	25.05	260.87	**5.7**	**2.9**	0.5 U	0.5 U
DA-11a	11-Mar-03	-	-	**1**	**11**	<0.5	<0.5
272.79	9-Jun-03	-	-	**1.2**	**11**	<0.5	<0.5
	4-Sep-03	-	-	**1.1**	**12**	<0.5	<0.5
Duplicate	4-Sep-03	-	-	**1.1**	**12**	<0.5	<0.5
	4-Dec-03	-	-	**1**	**11**	<0.5	<0.5
	20-Mar-12	9.84	262.95	-	-	-	-
	28-Aug-13	15.30	257.49	-	-	-	-
	27-Feb-14	10.20	262.59	-	-	-	-
	16-Sep-14	14.89	257.90	-	-	-	-
	2-Dec-14	12.65	260.14	-	-	-	-
	10-Mar-15	9.62	263.17	-	-	-	-
	23-Jun-15	13.06	259.73	-	-	-	-
	16-Sep-15	16.00	256.79	-	-	-	-

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		-	-	**5.0**	**70.0**	**0.07**	**0.04**
DA-11a (cont.)	9-Dec-15	10.75	262.04	-	-	-	-
	10-Aug-16	13.95	258.84	**1.2**	**9**	<0.5	<0.5
	1-Dec-16	11.28	261.51	**1.1**	**6.7**	<0.5	<0.5
	21-Mar-17	6.50	266.29	**1**	**6.4**	<0.5	<0.1
	21-Jun-17	10.00	262.79	**1.1**	**7.3**	<0.5	<0.1
	6-Sep-17	13.96	258.83	**1.1**	**8**	<0.5	<0.5
	9-Nov-17	14.26	258.53	**0.8**	**7**	<0.1	<0.02
	2-Apr-18	9.59	263.20	**1.0**	**7.5**	0.5 U	0.5 U
	11-Jun-18	11.25	261.54	**0.93**	**7**	0.5 U	**0.040 J**
	4-Sep-18	14.85	257.94	**0.9**	**7**	0.5 U	0.5 U
	3-Dec-18	14.32	258.47	**0.86**	**5.95**	0.2 U	0.2 U
	2-Apr-19	10.91	261.88	**1.1**	**8.0**	0.5 U	0.5 U
	3-Jun-19	12.72	260.07	**0.79 UJ**	**6.3**	0.5 UJ	0.5 U
	9-Sep-19	15.44	257.35	**0.77**	**6.1**	0.5 U	0.5 U
	3-Dec-19	15.32	257.47	**0.79**	**6.8**	0.5 U	0.5 U
	2-Mar-20	9.02	263.77	**0.83**	**5.6**	0.5 U	0.5 U
	1-Jun-20	12.40	260.39	**0.80**	**5.7**	0.5 U	0.5 U
	31-Aug-20	15.43	257.36	**0.93**	**6.7**	0.5 U	0.5 U
	16-Dec-20	14.59	258.20	**0.92**	**6.3**	0.5 U	0.5 U
	1-Mar-21	8.73	264.06	**0.83**	**7.0**	0.5 U	0.5 U
	10-Jun-21	12.78	260.01	**0.87**	**7.0**	0.5 U	**0.090J**
	13-Sep-21	16.42	256.37	**0.92**	**7.2**	0.5 U	0.5 U
	16-Nov-21	13.72	259.07	**0.96**	**7.2**	0.5 U	0.5 U
DA-11b 272.99	20-Mar-12	10.13	262.86	-	-	-	-
	10-Aug-16	14.22	258.77	**0.62**	**9.1**	<0.50	<0.50
	1-Dec-16	11.37	261.62	**0.76**	**10**	**0.090 J**	<0.50
	21-Mar-17	6.45	266.54	**0.87**	**9.8**	<0.5	<0.1
	21-Jun-17	10.06	262.93	**0.97**	**13**	<0.5	<0.1
	6-Sep-17	14.05	258.94	**0.94**	**14**	<0.5	<0.5
	9-Nov-17	14.35	258.64	**0.72**	**12**	<0.1	<0.02
	3-Apr-18	9.63	263.36	**0.95**	**12**	0.5 U	0.5 U
	11-Jun-18	11.40	261.59	**0.83**	**12**	**0.050 J**	**0.040 J**
	4-Sep-18	14.99	258.00	**0.82**	**12**	0.5 U	0.5 U
	3-Dec-18	14.49	258.50	**0.86**	**10.6**	0.5 U	0.5 U
	1-Apr-19	11.01	261.98	**1.0**	**15**	0.5 U	0.5 U
	3-Jun-19	12.77	260.22	**0.93 J**	**11**	**0.13 J**	**0.080 J**
	9-Sep-19	15.53	257.46	**0.91**	**12**	0.5 U	**0.080 J**
	3-Dec-19	15.48	257.51	**0.88**	**12**	0.5 U	0.5 U
	2-Mar-20	9.02	263.97	**0.94**	**12**	0.5 U	0.5 U
	1-Jun-20	12.47	260.52	**0.68**	**9**	0.5 U	0.5 U
	31-Aug-20	15.55	257.44	**0.79**	**11**	0.5 U	0.5 U
	16-Dec-20	14.96	258.03	**0.91**	**12**	0.5 U	0.5 U
	1-Mar-21	8.73	264.26	**0.97**	**13**	0.5 U	**0.080 J**

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
DA-11b (cont.)	10-Jun-21	12.82	260.17	**1.20**	**14**	0.5 U	**0.090J**
	13-Sep-21	16.56	256.43	**0.89**	**13**	0.5 U	**0.080 J**
	16-Nov-21	13.89	259.10	**0.94**	**13**	0.5 U	**0.080 J**
DA-13a 273.65	11-Aug-16	15.51	258.14	**0.19 J**	**0.61**	<0.5	<0.5
	6-Dec-16	13.10	260.55	**0.22 J**	**24**	<0.5	<0.5
	23-Mar-17	8.94	264.71	**0.16**	<0.2	<0.2	<0.1
	22-Jun-17	12.30	261.35	**0.17 J**	<0.2	<0.2	<0.1
	7-Sep-17	15.60	258.05	**0.15 J**	<0.2	<0.2	<0.1
	8-Nov-17	15.90	257.75	**0.12 J**	<0.2	<0.1	<0.02
	3-Apr-18	11.90	261.75	**0.15 J**	0.5 U	0.5 U	0.5 U
	11-Jun-18	13.35	260.30	**0.17 J**	0.5 U	0.5 U	0.5 U
	4-Sep-18	17.02	256.63	**0.14 J**	0.5 U	0.5 U	0.5 U
	3-Dec-18	15.94	257.71	**0.12 J**	0.5 U	0.5 U	0.5 U
	1-Apr-19	13.05	260.60	**0.26 J**	0.5 U	0.5 U	0.5 U
	3-Jun-19	14.49	259.16	**0.17 J**	0.5 U	0.5 UJ	0.5 U
	9-Sep-19	16.97	256.68	**0.15 J**	0.5 U	0.5 U	0.5 U
	3-Dec-19	16.90	256.75	**0.19 J**	0.5 U	0.5 U	0.5 U
	2-Mar-20	11.28	262.37	0.5 U	0.5 U	0.5 U	0.5 U
	1-Jun-20	14.26	259.39	**0.17 J**	0.5 U	0.5 U	0.5 U
	31-Aug-20	16.91	256.74	**0.26 J**	0.5 U	0.5 U	0.5 U
	16-Dec-20	16.22	257.43	**0.18 J**	0.5 U	0.5 U	0.5 U
	1-Mar-21	11.04	262.61	**0.14J**	0.5 U	0.5 U	0.5 U
	10-Jun-21	14.58	259.07	**0.17J**	0.5 U	0.5 U	0.5 U
	13-Sep-21	17.94	255.71	**0.13 J**	0.5 U	0.5 U	0.5 U
	16-Nov-21	16.56	257.09	**0.11J**	0.5 U	0.5 U	0.5 U
DA-21b 283.24	17-Mar-00	-	-	48	**58**	<0.24	<0.2
	15-Sep-00	-	-	44	**56**	<0.5	<0.5
	13-Mar-01	-	-	35	**51**	<0.5	<0.5
	11-Sep-01	-	-	48	**61 E**	<0.5	<0.5
	11-Sep-01	-	-	46 D	**59 D**	<2.5	<2.5
	7-Mar-02	-	-	43	**56**	<0.5	<0.5
	17-Sep-02	-	-	37	**50**	<0.5	<0.5
	12-Mar-03	-	-	41	**54**	<0.5	<0.5
	4-Sep-03	-	-	41	**53**	<0.5	<0.5
	16-Mar-04	-	-	42	**54**	<0.5	<0.5
	13-Sep-04	-	-	32	**43**	<0.5	<0.5
	7-Mar-05	-	-	28	**32**	<0.5	<0.5
	6-Sep-05	-	-	39	**44**	<0.5	<0.5
	7-Mar-06	-	-	35	**45**	<0.5	<0.5
	15-Sep-06	-	-	28	**38**	<0.5	<0.5
	5-Mar-07	-	-	25	**30**	<0.5	<0.5
	21-Sep-07	-	-	34	**42**	<0.5	<0.5
	10-Mar-08	-	-	37	**41**	<0.5	<0.5

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
DA-21b (cont.)	8-Sep-08	-	-	36	**41**	<0.5	<0.5
	24-Mar-09	-	-	30	**31**	<0.5	<0.5
	8-Sep-09	-	-	30 B	**32**	<0.5	<0.5
	22-Mar-10	-	-	39	**38**	<0.5	<0.5
	28-Apr-10	-	-	38	**38**	<0.5	<0.5
	9-Sep-10	-	-	31	**30**	<0.5	<0.5
	21-Mar-11	-	-	33	**31**	<0.5	<0.5
	6-Sep-11	-	-	**3.2**	**1.6**	<0.5	<0.5
	21-Mar-12	18.45	264.79	31	**30**	<0.5	<0.5
	5-Mar-13	19.38	263.86	26	**25**	<0.2	<0.2
	29-May-13	20.28	262.96	-	-	-	-
	28-Aug-13	23.30	259.94	26	**25**	<0.2	<0.2
Duplicate	28-Aug-13	23.30	259.94	27	**25**	<0.2	<0.2
	27-Feb-14	18.50	264.74	26	**24**	<0.2	<0.2
	16-Sep-14	23.67	259.57	29	**25**	<0.5	<0.5
	2-Dec-14	20.99	262.25	-	-	-	-
	10-Mar-15	18.33	264.91	28	**26**	<0.5	<0.5
	23-Jun-15	21.83	261.41	-	-	-	-
	16-Sep-15	24.62	258.62	32	**27**	<0.5	<0.5
	9-Dec-15	19.80	263.44	-	-	-	-
	11-Aug-16	22.84	260.40	28	**24**	<0.5	<0.5
	5-Dec-16	19.55	263.69	28	**22**	<0.5	<0.5
Duplicate	5-Dec-16	19.55	263.69	29	**22**	<0.5	<0.5
	23-Mar-17	14.70	268.54	27	**23**	<0.2	<0.1
Duplicate	23-Mar-17	14.70	268.54	29	**24**	<0.2	<0.1
	22-Jun-17	18.45	264.79	21	**18**	<0.2	<0.1
Duplicate	22-Jun-17	18.45	264.79	23	**20**	<0.2	<0.1
	7-Sep-17	22.46	260.78	31	**27**	<0.2	<0.1
Duplicate	7-Sep-17	22.46	260.78	31	**27**	<0.2	<0.1
	8-Nov-17	22.79	260.45	21	**20**	<0.1	<0.02
Duplicate	8-Nov-17	22.79	260.45	22	**21**	<0.1	<0.02
	2-Apr-18	17.99	265.25	24 J	**21 J**	0.5 U	0.5 U
	12-Jun-18	19.82	263.42	30	**26**	0.5 U	0.5 U
	5-Sep-18	23.33	259.91	26	**23**	0.5 U	0.5 U
Duplicate	5-Sep-18	23.33	259.91	24	**22**	0.5 U	0.5 U
	4-Dec-18	22.87	260.37	18.2	**15.8**	0.2 U	0.2 U
	2-Apr-19	19.52	263.72	26	**26**	0.5 U	0.5 U
	4-Jun-19	21.28	261.96	22	**20**	0.5 U	0.5 U
	10-Sep-19	23.91	259.33	22	**20**	0.5 U	0.5 U
	3-Dec-19	23.82	259.42	**1.6**	**0.38 J**	0.5 U	0.5 U
	3-Mar-20	17.40	265.84	**4.0**	**1.6**	0.5 U	0.5 U
	1-Jun-20	20.87	262.37	**2.3**	**0.90**	0.5 U	0.5 U
	1-Sep-20	23.85	259.39	5.2	**2.4**	0.5 U	0.5 U

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
DA-21b (cont.)	16-Dec-20	23.08	260.16	**1.5**	**0.20 J**	0.5 U	0.5 U
	2-Mar-21	17.09	266.15	8.3	**5.2**	0.5 U	0.5 U
	10-Jun-21	21.28	261.96	**3.5**	**1.3**	0.5 U	0.5 U
	14-Sep-21	24.68	258.56	**2.2**	**0.8**	0.5 U	0.5 U
	16-Nov-21	22.12	261.12	**3.6**	**1.2**	0.5 U	0.5 U
DA-28 266.19	16-Mar-00	-	-	<0.2	<0.2	<0.24	<0.2
	12-Sep-00	-	-	**0.55**	<0.5	<0.5	<0.5
	12-Mar-01	-	-	**0.86**	<0.5	<0.5	<0.5
	7-Mar-02	-	-	<0.5	<0.5	<0.5	<0.5
	10-Mar-03	-	-	<0.5	<0.5	<0.5	<0.5
	9-Jun-03	-	-	**0.5**	<0.5	<0.5	<0.5
	4-Sep-03	-	-	<0.5	<0.5	<0.5	<0.5
	4-Dec-03	-	-	**0.5**	<0.5	<0.5	<0.5
	15-Mar-04	-	-	<0.5	<0.5	<0.5	<0.5
	7-Mar-05	-	-	**0.5**	<0.5	<0.5	<0.5
	17-Jun-07	-	-	**0.36 J**	<0.5	<0.5	<0.5
	10-Mar-08	-	-	**0.33 J**	<0.5	<0.5	<0.5
	23-Mar-09	-	-	**0.32 J**	<0.5	<0.5	<0.5
	22-Mar-10	-	-	**0.27 J**	<0.5	<0.5	<0.5
	28-Jun-11	-	-	**0.22 J**	<0.5	<0.5	<0.5
	21-Mar-12	3.84	262.35	<0.5	<0.5	<0.5	<0.5
	5-Mar-13	4.70	261.49	**0.52**	<0.2	<0.2	<0.2
	29-May-13	5.61	260.58	-	-	-	-
	28-Aug-13	8.40	257.79	-	-	-	-
	27-Feb-14	4.30	261.89	**0.53**	<0.2	<0.2	<0.2
	16-Sep-14	8.61	257.58	-	-	-	-
	2-Dec-14	6.09	260.10	-	-	-	-
	10-Mar-15	18.33	247.86	-	-	-	-
	23-Jun-15	21.83	244.36	-	-	-	-
	16-Sep-15	24.62	241.57	-	-	-	-
	7-Dec-15	5.88	260.31	**0.21 J**	<0.5	<0.5	<0.5
	10-Aug-16	7.52	258.67	**0.31 J**	<0.5	<0.5	<0.5
	30-Nov-16	5.34	260.85	**0.24 J**	<0.5	<0.5	<0.5
	21-Jun-17	4.25	261.94	**0.20 J**	<0.5	<0.5	<0.5
	5-Sep-17	7.80	258.39	**0.17 J**	<0.2	<0.2	<0.1
	9-Nov-17	8.15	258.04	**0.12 J**	<0.2	<0.1	<0.02
	4-Apr-18	3.90	262.29	**0.12 J**	0.5 U	0.5 U	0.5 U
	11-Jun-18	5.41	260.78	**0.15 J**	0.5 U	0.5 U	0.5 U
	4-Sep-18	8.69	257.50	**0.14 J**	0.5 U	0.5 U	0.5 U
	3-Dec-18	8.20	257.99	**0.14 J**	0.2 U	0.2 U	0.2 U
	1-Apr-19	5.07	261.12	**0.17 J**	0.5 U	0.5 U	0.5 U
	3-Jun-19	6.69	259.50	**0.18 J**	0.5 U	0.5 UJ	0.5 U
	3-Jun-19	6.69	259.50	**0.17 J**	0.5 U	0.5 UJ	0.5 U

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
DA-28 (cont.)	9-Sep-19	9.21	256.98	**0.14 J**	0.5 U	0.5 U	0.5 U
	3-Dec-19	9.18	257.01	**0.17 J**	0.5 U	0.5 U	0.5 U
	2-Mar-20	3.22	262.97	**0.13 J**	0.5 U	0.5 U	0.5 U
	1-Jun-20	6.40	259.79	**0.13 J**	0.5 U	0.5 U	0.5 U
	31-Aug-20	10.24	255.95	**0.20 J**	**0.19 J**	0.5 U	0.5 U
Duplicate	31-Aug-20	10.24	255.95	0.5 U	0.5 U	0.5 U	0.5 U
	16-Dec-20	8.46	257.73	**0.19 J**	0.5 U	0.5 U	0.5 U
Duplicate	16-Dec-20	8.46	257.73	**0.14 J**	0.5 U	0.5 U	0.5 U
	1-Mar-21	3.02	263.17	**0.13J**	0.5 U	0.5 U	0.5 U
	1-Mar-21	3.02	263.17	**0.15J**	0.5 U	0.5 U	0.5 U
	10-Jun-21	6.72	259.47	**0.15J**	0.5 U	0.5 U	0.5 U
	13-Sep-21	10.26	255.93	0.5 U	0.5 U	0.5 U	0.5 U
	16-Nov-21	7.80	258.39	**0.19 J**	0.5 U	0.5 U	0.5 U
DA-29	17-Mar-00	-	-	12	**15.0**	<0.24	<0.2
268.63	10-Sep-01	-	-	14	**19.0**	<0.5	<0.5
	7-Mar-02	-	-	9.6	**11.0**	<0.5	<0.5
	4-Sep-03	-	-	12	**14.0**	<0.5	<0.5
	13-Sep-04	-	-	12	**14.0**	<0.5	<0.5
	6-Sep-05	-	-	11	**10.0**	<0.5	<0.5
	15-Sep-06	-	-	8	**8.1**	<0.5	<0.5
	20-Sep-07	-	-	8.9	**7.0**	<0.5	<0.5
	8-Sep-08	-	-	8.8	**6.5**	<0.5	<0.5
	8-Sep-09	-	-	9.9 B	**7.7**	<0.5	<0.5
	8-Sep-10	-	-	11	**7.2**	<0.5	<0.5
	8-Sep-11	-	-	11	**6.4**	<0.5	<0.5
	21-Mar-12	4.81	263.82	-	-	-	-
	29-Aug-13	9.75	258.88	8	**4.7**	<0.2	<0.2
	16-Sep-14	10.05	258.58	9.1	**4.5**	<0.5	<0.5
	2-Dec-14	7.28	261.35	-	-	-	-
	10-Mar-15	4.55	264.08	-	-	-	-
	23-Jun-15	8.25	260.38	-	-	-	-
	16-Sep-15	11.10	257.53	9.0	**4.5**	<0.5	<0.5
	9-Dec-15	5.90	262.73	-	-	-	-
	9-Aug-16	9.08	259.55	9.3	**4.4**	<0.5	<0.5
	1-Dec-16	6.39	262.24	8.5	**3.5**	<0.5	<0.5
	20-Mar-17	0.92	267.71	7.9	**3.6**	<0.2	<0.1
	21-Jun-17	4.91	263.72	8.7	**5.4**	<0.2	<0.1
	5-Sep-17	8.97	259.66	8.8	**4.4**	<0.2	<0.1
	7-Nov-17	27.38	259.25	7.1	**3.5**	<0.1	<0.02
	2-Apr-18	4.48	264.15	8.4	**4.5**	0.5 U	0.5 U
	12-Jun-18	6.33	262.30	8.3	**4.8**	0.5 U	0.5 U
	5-Sep-18	9.97	258.66	7.2	**3.2**	0.5 U	0.5 U
	4-Dec-18	9.34	259.29	7.42	**3.16**	0.2 U	0.2 U

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		-	-	**5.0**	**70.0**	**0.07**	**0.04**
DA-29 (cont.)	2-Apr-19	6.00	262.63	9.1	**5.0**	0.5 U	0.5 U
	4-Jun-19	7.77	260.86	6.8	**3.6**	0.5 U	0.5 U
	9-Sep-19	11.61	257.02	7.5	**3.5**	0.5 U	0.5 U
	3-Dec-19	10.42	258.21	7.8	**3.6**	0.5 U	0.5 U
	2-Mar-20	3.66	264.97	7.1	**3.5**	0.5 U	0.5 U
	1-Jun-20	7.45	261.18	6.9	**3.3**	0.5 U	0.5 U
	31-Aug-20	10.46	258.17	7.7	**3.7**	0.5 U	0.5 U
	16-Dec-20	9.66	258.97	8.1	**3.7**	0.5 U	0.5 U
	2-Mar-21	3.51	265.12	7.8	**4.3**	0.5 U	0.5 U
	10-Jun-21	7.86	260.77	8.5	**4.3**	0.5 U	0.5 U
	13-Sep-21	11.41	257.22	7.3	**4.1**	0.5 U	0.5 U
	13-Sep-21	11.41	257.22	7.3	**3.9**	0.5 U	0.5 U
	16-Nov-21	8.53	260.10	8.3	**4.2**	0.5 U	0.5 U
DA-30a 270.63	16-Mar-00	-	-	**2.2**	**2.2**	<0.24	<0.2
	10-Sep-01	-	-	**1.6**	**15**	<0.5	<0.5
	17-Sep-02	-	-	**1.1**	**8.2**	<0.5	<0.5
	4-Sep-03	-	-	**1.4**	**14**	<0.5	<0.5
	13-Sep-04	-	-	**1.6**	**14**	<0.5	<0.5
	6-Sep-05	-	-	**1.3**	**12**	<0.5	<0.5
	15-Sep-06	-	-	**0.9**	**8**	<0.5	<0.5
	20-Sep-07	-	-	**0.9**	**6.3**	<0.5	<0.5
	8-Sep-08	-	-	**1.2**	**8.6**	<0.5	<0.5
	8-Sep-09	-	-	**1.3 B**	**8.8**	<0.5	<0.5
	8-Sep-10	-	-	**1.3**	**8.2**	<0.5	<0.5
	6-Sep-11	-	-	**1.2**	**6.5**	<0.5	<0.5
	21-Mar-12	7.52	263.11	-	-	-	-
	28-Aug-13	12.38	258.25	**1.1**	**5.2**	<0.2	<0.2
	16-Sep-14	12.65	257.98	**1.3**	**5**	<0.5	<0.5
	2-Dec-14	9.95	260.68	-	-	-	-
	10-Mar-15	7.40	263.23	-	-	-	-
	23-Jun-15	10.90	259.73	-	-	-	-
	16-Sep-15	13.80	256.83	**1.1**	**4.6**	<0.5	<0.5
	9-Dec-15	8.40	262.23	-	-	-	-
	9-Aug-16	11.72	258.91	**1.1**	**3.4**	<0.5	<0.5
	30-Nov-16	9.01	261.62	**1.1**	**3.9**	<0.5	<0.5
	20-Mar-17	4.15	266.48	**0.93**	**0.15**	<0.2	<0.1
	21-Jun-17	7.75	262.88	**0.93**	**0.48 J**	<0.2	<0.1
	5-Sep-17	11.70	258.93	**1.2**	**3.6**	<0.2	<0.1
	7-Nov-17	12.10	258.53	**0.97**	**3.3**	<0.1	<0.02
	2-Apr-18	7.33	263.30	**0.87**	**0.14 J**	0.5 U	0.5 U
	12-Jun-18	9.10	261.53	**1.1**	**1.6**	0.5 U	0.5 U
	4-Sep-18	12.65	257.98	**0.96**	**2.4**	0.5 U	0.5 U
	3-Dec-18	12.01	258.62	**0.92**	**2.38**	0.5 U	0.5 U

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
Duplicate DA-30a (cont.)	3-Dec-18	12.01	258.62	**1.0**	**2.3**	0.5 U	0.5 U
	1-Apr-19	8.75	261.88	**1.2**	**2.6**	0.5 U	0.5 U
	3-Jun-19	10.50	260.13	**1.1 J**	**2.7**	0.5 UJ	0.5 U
	9-Sep-19	13.30	257.33	**1.0**	**3.1**	0.5 U	0.5 U
	3-Dec-19	13.17	257.46	**1.0**	**2.8**	0.5 U	0.5 U
	2-Mar-20	6.64	263.99	**0.94**	0.5 U	0.5 U	0.5 U
	1-Jun-20	10.18	260.45	**0.9**	**2.3**	0.5 U	0.5 U
	31-Aug-20	13.18	257.45	**1.1**	**2.1**	0.5 U	0.5 U
	16-Dec-20	12.37	258.26	**0.8**	**2.8**	0.5 U	0.5 U
	2-Mar-21	6.47	264.16	**1.1**	**0.28J**	0.5 U	0.5 U
Duplicate	2-Mar-21	6.47	264.16	**1.0**	0.5U	0.5 U	0.5 U
	10-Jun-21	10.54	260.09	**1.7**	**0.59**	0.5 U	0.5 U
	13-Sep-21	14.20	256.43	**1.2**	**1.5**	0.5 U	0.5 U
	16-Nov-21	11.51	259.12	**1.5**	**1.3**	0.5 U	0.5 U
DA-30b 270.36	12-Sep-00	-	-	**0.64**	**3.2**	<0.5	<0.5
	21-Mar-01	-	-	**0.71**	**4.2**	<0.5	<0.5
Duplicate	21-Mar-01	-	-	**0.71**	**4.4**	<0.5	<0.5
	7-Mar-02	-	-	**0.6**	**3.2**	<0.5	<0.5
	11-Mar-03	-	-	**0.7**	**3.6**	<0.5	<0.5
	15-Mar-04	-	-	**0.8**	**4.3**	<0.5	<0.5
	7-Mar-05	-	-	**0.7**	**2.9**	<0.5	<0.5
	7-Mar-06	-	-	**0.8**	**4.2**	<0.5	<0.5
	5-Mar-07	-	-	**0.63**	**3**	<0.5	<0.5
	10-Mar-08	-	-	**0.75**	**2.9**	<0.5	<0.5
	23-Mar-09	-	-	**0.7**	**3.5**	<0.5	<0.5
	22-Mar-10	-	-	**0.78**	**3**	<0.5	<0.5
	21-Mar-11	-	-	**0.7**	**2.3**	<0.5	<0.5
	21-Mar-12	9.45	260.91	**0.58**	**2.4**	<0.5	<0.5
	5-Mar-13	8.26	262.10	**1.1**	**3.3**	<0.2	<0.2
	29-May-13	10.96	259.40	**0.32**	<0.2	<0.2	<0.2
	28-Aug-13	13.75	256.61	-	-	-	-
	27-Feb-14	9.20	261.16	**0.55**	**1.8**	<0.2	<0.2
	16-Sep-14	14.10	256.26	-	-	-	-
	2-Dec-14	11.15	259.21	-	-	-	-
	10-Mar-15	10.01	260.35	**0.73**	**2.3**	<0.5	<0.5
Duplicate	10-Mar-15	10.01	260.35	**0.75**	**2.2**	<0.5	<0.5
	23-Jun-15	13.60	256.76	-	-	-	-
	16-Sep-15	16.32	254.04	-	-	-	-
	9-Dec-15	10.82	259.54	-	-	-	-
	9-Aug-16	12.81	257.55	**0.62**	**2.5**	<0.5	<0.5
	30-Nov-16	10.30	260.06	**0.7**	**2.3**	<0.5	<0.5
	20-Mar-17	5.95	264.41	**0.63**	**2.1**	<0.2	<0.1
	21-Jun-17	9.30	261.06	**0.69**	**2.6**	<0.2	<0.1

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		-	-	**5.0**	**70.0**	**0.07**	**0.04**
DA-30b (cont.)	5-Sep-17	12.95	257.41	**0.66**	<0.2	<0.2	<0.1
	7-Nov-17	13.09	257.27	**0.55**	**2.1**	<0.1	<0.02
	2-Apr-18	8.97	261.39	**0.69**	**2.2**	0.5 U	0.5 U
	12-Jun-18	10.66	259.70	**0.64**	**2.2**	0.5 U	0.5 U
	4-Sep-18	13.58	256.78	**0.57**	**1.9**	0.5 U	0.5 U
	3-Dec-18	13.24	257.12	**0.58**	**1.69**	0.5 U	0.5 U
	1-Apr-19	10.17	260.19	**0.72**	**2.5**	0.5 U	0.5 U
	3-Jun-19	11.90	258.46	**0.60 J**	**2.0**	0.5 UJ	0.5 U
Duplicate	3-Jun-19	11.90	258.46	**0.64 J**	**2.0**	0.5 UJ	0.5 U
	9-Sep-19	14.95	255.41	**0.68**	**2.2**	0.5 U	0.5 U
	3-Dec-19	14.88	255.48	**0.77**	**2.5**	0.5 U	0.5 U
	2-Mar-20	8.91	261.45	**0.65**	**2.0**	0.5 U	0.5 U
	1-Jun-20	12.28	258.08	**0.64**	**2.2**	0.5 U	0.5 U
	31-Aug-20	15.00	255.36	**0.77**	**2.4**	0.5 U	0.5 U
	16-Dec-20	13.54	256.82	**0.76**	**2.7**	0.5 U	0.5 U
	2-Mar-21	7.21	263.15	**0.62**	**2.6**	0.5 U	0.5 U
	10-Jun-21	11.97	258.39	**0.81**	**2.7**	0.5 U	0.5 U
	13-Sep-21	15.38	254.98	**0.67**	**2.6**	0.5 U	0.5 U
	16-Nov-21	13.65	256.71	**0.68**	**2.5**	0.5 U	0.5 U
DA-31 277.64	28-Apr-10	-	-	32	**5**	<0.5	**0.63 J**
	9-Sep-10	-	-	25	**3.9**	<0.5	<0.5
	21-Mar-12	12.25	265.39	-	-	-	-
	28-Aug-13	17.00	260.64	-	-	-	-
	27-Feb-14	12.40	265.24	-	-	-	-
	10-Mar-15	12.34	265.30	-	-	-	-
	17-Aug-16	16.60	261.04	22	**0.56**	<0.5	<0.5
	1-Dec-16	13.62	264.02	24	**0.59**	<0.5	<0.5
	23-Mar-17	8.88	268.76	18	**0.24**	<0.2	<0.1
	26-Jun-17	12.65	264.99	14	**0.12 J**	<0.2	<0.1
	8-Sep-17	16.41	261.23	21	**0.46 J**	<0.2	<0.1
	8-Nov-17	16.73	260.91	18	**0.3**	<0.1	<0.02
	2-Apr-18	12.03	265.61	22	**0.38 J**	0.5 U	0.5 U
	13-Jun-18	13.81	263.83	23	**0.44 J**	0.5 U	0.5 U
	6-Sep-18	17.82	259.82	20	**0.37 J**	0.5 U	0.5 U
	5-Dec-18	16.88	260.76	17	**0.30**	0.5 U	0.5 U
	3-Apr-19	13.58	264.06	24	**0.54**	0.5 UJ	0.5 U
	5-Jun-19	15.24	262.40	20 J	**0.42 J**	0.5 R	0.5 U
	11-Sep-19	17.80	259.84	18	**0.34 J**	0.5 U	0.5 U
Duplicate	11-Sep-19	17.80	259.84	19	**0.30 J**	0.5 U	0.5 U
	3-Dec-19	17.71	259.93	13	**0.36 J**	0.5 U	0.15 J
	3-Mar-20	11.46	266.18	15	**0.23 J**	0.5 U	0.5 U
	1-Jun-20	14.81	262.83	17	**0.20 J**	0.5 U	0.5 U
	2-Sep-20	17.77	259.87	16	**0.20 J**	0.5 U	0.5 U

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
DA-31 (cont.)	16-Dec-20	17.02	260.62	**3.7**	**5.90**	0.5 U	0.5 U
	2-Mar-21	11.16	266.48	**18.0**	**0.38J**	0.5 U	0.5 U
	10-Jun-21	15.23	262.41	**19.0**	**0.29J**	0.5 U	0.5 U
Duplicate	10-Jun-21	15.23	262.41	**19.0**	**0.29J**	0.5 U	0.5 U
	14-Sep-21	18.48	259.16	**17.0**	**0.42J**	0.5 U	0.5 U
	16-Nov-21	16.11	261.53	**19.0**	**0.26J**	0.5 U	0.5 U
DA-32 282.20	28-Apr-10	-	-	**77**	**150 D**	**0.31 J**	**0.11 J**
	9-Sep-10	-	-	**140**	**5.3**	**0.24 J**	**0.42 J**
	21-Mar-12	13.50	268.70	-	-	-	-
	2-Dec-14	7.98	274.22	-	-	-	-
	10-Mar-15	15.12	267.08	-	-	-	-
	17-Aug-16	21.83	260.37	**1.9**	**31**	**0.15 J**	**30**
	6-Dec-16	18.11	264.09	**1**	**23**	**0.11 J**	**5.8**
	23-Mar-17	13.65	268.55	**0.12 J**	**31**	**0.08 J**	**12**
	26-Jun-17	17.63	264.57	**0.17 J**	**31**	**0.09 J**	**26**
	11-Sep-17	20.89	261.31	**0.21 J**	**33**	**0.10 J**	**30**
	10-Nov-17	21.83	260.37	**0.3**	**27**	<0.1	**35**
	2-Apr-18	17.05	265.15	**0.13 J**	**3.5**	0.5 U	**35**
Duplicate	2-Apr-18	17.05	265.15	**0.5 U**	**4.5**	0.5 U	**35**
	13-Jun-18	18.90	263.30	**0.16 J**	**22**	**0.070 J**	**30**
	6-Sep-18	22.49	259.71	-	-	-	-
	4-Dec-18	21.89	260.31	**0.10**	**16**	0.5 U	**30.3**
	2-Apr-19	18.58	263.62	**0.18 J**	**19**	0.5 U	**53**
	4-Jun-19	20.30	261.90	**0.12 J**	**12**	0.5 U	**41**
	9-Sep-19	22.96	259.24	**0.25 J**	**16**	0.5 U	**46**
	3-Dec-19	22.81	259.39	**0.28 J**	**22**	0.5 U	**38**
	4-Mar-20	16.45	265.75	**0.52**	**12**	0.5 U	**22**
	1-Jun-20	19.90	262.30	**3.70**	**14**	0.5 U	**10**
	1-Sep-20	22.81	259.39	**0.65**	**17**	**0.090 J**	**12**
	16-Dec-20	21.99	260.21	**1.80**	**15**	**0.12 J**	**5.8**
	2-Mar-21	15.95	266.25	**0.94**	**19**	**0.10J**	**9.3**
	10-Jun-21	20.23	261.97	**1.90**	**21**	**0.16J**	**7.6**
	14-Sep-21	23.62	258.58	**2.00**	**16**	0.5 U	**5.4**
	16-Nov-21	21.10	261.10	**1.30**	**16**	0.5 U	**9.9**
DA-43 279.71	5-Dec-16	16.19	263.52	**18**	**40**	<0.5	<0.5
	21-Mar-17	11.19	268.52	**18**	**37**	<0.5	<0.1
	22-Jun-17	-	-	**20**	**43**	<0.5	<0.1
	6-Sep-17	18.72	260.99	**21**	**47**	<0.5	<0.5
	10-Nov-17	19.02	260.69	**17**	**42**	<0.1	<0.02
	3-Apr-18	14.61	265.10	**20**	**42**	0.5 U	0.5 U
	12-Jun-18	16.13	263.58	**20**	**43**	0.5 U	0.5 U
	5-Sep-18	19.59	260.12	**19**	**40**	0.5 U	0.5 U
	4-Dec-18	19.20	260.51	**16**	**32.8**	0.5 U	0.5 U

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
DA-43 (cont.)	2-Apr-19	15.77	263.94	22	**48 J-**	0.5 U	0.5 U
	4-Jun-19	17.61	262.10	17	**35**	0.5 U	0.5 U
	9-Sep-19	20.96	258.75	19	**38**	0.5 U	0.5 U
	3-Dec-19	20.05	259.66	19	**43**	0.5 U	0.5 U
	3-Mar-20	13.81	265.90	17	**36**	0.5 U	0.5 U
	1-Jun-20	17.17	262.54	18	**38**	0.5 U	0.5 U
Duplicate	1-Jun-20	17.17	262.54	18	**41**	0.5 U	0.5 U
	1-Sep-20	20.10	259.61	18	**34**	0.5 U	0.5 U
	16-Dec-20	19.37	260.34	19	**39**	0.5 U	0.5U
	2-Mar-21	13.49	266.22	17	**42**	0.5 U	0.5U
	10-Jun-21	17.78	261.93	14	**25**	0.5 U	0.5 U
	14-Sep-21	20.90	258.81	17	**33**	0.5 U	0.5 U
	16-Nov-21	18.44	261.27	20	**40**	0.5 U	0.5 U
DA-44 283.20	5-Dec-16	19.60	263.60	**1.8**	**0.45 J**	<0.5	<0.5
	22-Mar-17	14.70	268.50	**1.6**	**0.29**	<0.2	<0.1
	22-Jun-17	18.53	264.67	**1.9**	**0.41 J**	<0.2	<0.1
	6-Sep-17	22.83	260.37	**1.9**	**0.36 J**	<0.5	<0.5
	9-Nov-17	23.18	260.02	**1.3**	**0.26**	<0.1	<0.02
	3-Apr-18	18.42	264.78	**1.6**	**0.25 J**	0.5 U	0.5 U
	13-Jun-18	22.25	260.95	**1.6**	**0.23 J**	0.5 U	0.5 U
	5-Sep-18	23.73	259.47	**1.4**	**0.19 J**	0.5 U	0.5 U
	4-Dec-18	23.25	259.95	**1.26**	**0.15 J**	0.2 U	0.2 U
	2-Apr-19	19.92	263.28	**1.1**	**0.11 J**	0.5 U	0.5 U
	4-Jun-19	21.65	261.55	**1.0**	0.5 U	0.5 U	0.5 U
	10-Sep-19	24.32	258.88	**0.64**	**0.28 J**	0.5 U	0.5 U
	3-Dec-19	24.21	258.99	**0.24 J**	0.5 U	0.5 U	0.5 U
	4-Mar-20	17.85	265.35	**0.98**	**0.11 J**	0.5 U	0.5 U
	1-Jun-20	21.29	261.91	**0.40 J**	0.5 U	0.5 U	0.5 U
	1-Sep-20	24.29	258.91	**1.1**	**0.40 J**	0.5 U	0.12 J
	16-Dec-20	23.48	259.72	**0.88**	**0.13 J**	0.5 U	0.5 U
	2-Mar-21	17.48	265.72	**1.00**	**0.12J**	0.5 U	0.5 U
	10-Jun-21	21.68	261.52	**0.98**	**0.10J**	0.5 U	0.5 U
	14-Sep-21	25.07	258.13	**0.88**	0.5 U	0.5 U	0.5 U
	16-Nov-21	22.48	260.72	**0.97**	0.5 U	0.5 U	0.5 U
DA-45 281.00	1-Dec-16	16.74	264.26	<0.5	<0.5	<0.5	<0.5
	22-Mar-17	11.59	269.41	<0.2	<0.2	<0.2	<0.1
	26-Jun-17	15.79	265.21	<0.2	<0.2	<0.2	<0.1
	6-Sep-17	19.45	261.55	<0.5	<0.5	<0.5	<0.5
	8-Nov-17	20.18	260.82	<0.2	<0.2	<0.1	<0.02
	4-Apr-18	15.50	265.50	0.5 U	0.5 U	0.5 U	0.5 U
	13-Jun-18	18.10	262.90	0.5 U	0.5 U	0.5 U	0.5 U
Duplicate	13-Jun-18	18.10	262.90	0.5 U	0.5 U	0.5 U	0.5 U
	6-Sep-18	20.51	260.49	0.5 U	0.5 U	0.5 U	0.5 U

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
DA-45 (cont.)	5-Dec-18	20.31	260.69	0.5 U	0.5 U	0.5 U	0.5 U
	3-Apr-19	17.11	263.89	0.5 U	0.5 U	0.5 UJ	0.5 U
	5-Jun-19	18.51	262.49	0.5 R	0.5 R	0.5 R	0.5 U
	11-Sep-19	21.22	259.78	0.5 U	0.5 U	0.5 U	0.5 U
	3-Dec-19	21.10	259.90	0.5 U	0.5 U	0.5 U	0.5 U
	3-Mar-20	15.97	265.03	0.5 U	0.5 U	0.5 U	0.5 U
	1-Jun-20	18.03	262.97	0.5 U	0.5 U	0.5 U	0.5 U
	2-Sep-20	20.91	260.09	0.5 U	0.5 U	0.5 U	0.5 U
	16-Dec-20	20.65	260.35	0.5 U	0.5 U	0.5 U	0.5 U
	3-Mar-21	14.61	266.39	0.5 U	0.5 U	0.5 U	0.5 U
	10-Jun-21	18.53	262.47	0.5 U	0.5 U	0.5 U	0.5 U
	14-Sep-21	21.84	259.16	0.5 U	0.5 U	0.5 U	0.5 U
	16-Nov-21	20.11	260.89	0.5 U	0.5 U	0.5 U	0.5 U
DA-46 280.22	1-Dec-16	16.04	264.18	**0.35 J**	<0.5	<0.5	<0.5
	22-Mar-17	-	-	<0.2	<0.2	<0.2	<0.1
	26-Jun-17	15.09	265.13	<0.2	<0.2	<0.2	<0.1
	6-Sep-17	19.05	261.17	<0.5	<0.5	<0.5	<0.5
	8-Nov-17	19.46	260.76	<0.2	<0.2	<0.1	<0.02
	4-Apr-18	14.48	265.74	0.5 U	0.5 U	0.5 U	0.5 U
	13-Jun-18	16.56	263.66	0.5 U	0.5 U	0.5 U	0.5 U
	6-Sep-18	19.96	260.26	0.5 U	0.5 U	0.5 U	0.5 U
	5-Dec-18	19.60	260.62	0.5 U	0.5 U	0.5 U	0.5 U
	3-Apr-19	16.78	263.44	0.5 U	0.5 U	0.5 UJ	0.5 U
	5-Jun-19	17.97	262.25	0.5 R	0.5 R	0.5 R	0.5 U
	11-Sep-19	20.53	259.69	0.5 U	**0.19 J**	0.5 U	0.5 U
	3-Dec-19	20.45	259.77	0.5 U	0.5 U	0.5 U	0.5 U
	3-Mar-20	14.23	265.99	0.5 U	0.5 U	0.5 U	0.5 U
	1-Jun-20	17.53	262.69	0.5 U	0.5 U	0.5 U	0.5 U
	2-Sep-20	20.46	259.76	0.5 U	0.5 U	0.5 U	0.5 U
	16-Dec-20	19.74	260.48	0.5 U	0.5 U	0.5 U	0.5 U
	3-Mar-21	13.88	266.34	0.5 U	0.5 U	0.5 U	0.5 U
	10-Jun-21	17.90	262.32	0.5 U	0.5 U	0.5 U	0.5 U
	14-Sep-21	21.18	259.04	0.5 U	0.5 U	0.5 U	0.5 U
	16-Nov-21	18.86	261.36	0.5 U	0.5 U	0.5 U	0.5 U
DA-47 277.59	1-Dec-16	13.37	264.22	**0.31 J**	0.51	<0.5	<0.5
	22-Mar-17	8.55	269.04	<0.2	<0.2	<0.2	<0.1
	26-Jun-17	12.25	265.34	<0.2	<0.2	<0.2	<0.1
	6-Sep-17	16.15	261.44	<0.5	<0.5	<0.5	<0.5
	8-Nov-17	16.77	260.82	<0.2	<0.2	<0.1	<0.02
	3-Apr-18	12.11	265.48	0.5 U	0.5 U	0.5 U	0.5 U
	13-Jun-18	13.80	263.79	**0.080 J**	**0.040 J**	0.5 U	0.5 U
	6-Sep-18	17.89	259.70	0.5 U	0.5 U	0.5 U	0.5 U
	5-Dec-18	16.94	260.65	0.5 U	0.5 U	0.5 U	0.5 U

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		-	-	**5.0**	**70.0**	**0.07**	**0.04**
DA-47 (cont.)	3-Apr-19	13.59	264.00	0.5 U	0.5 U	0.5 UJ	0.5 U
	5-Jun-19	15.28	262.31	0.5 R	0.5 R	0.5 R	0.5 U
	11-Sep-19	17.82	259.77	0.5 U	0.5 U	0.5 U	0.5 U
Duplicate	11-Sep-19	17.82	259.77	0.5 U	0.5 U	0.5 U	0.5 U
	3-Dec-19	17.77	259.82	**0.13 J**	0.5 U	0.5 U	0.5 U
	3-Mar-20	11.51	266.08	0.5 U	0.5 U	0.5 U	0.5 U
Duplicate	3-Mar-20	11.51	266.08	0.5 U	0.5 U	0.5 U	0.5 U
	1-Jun-20	14.70	262.89	0.5 U	0.5 U	0.5 U	0.5 U
	2-Sep-20	17.76	259.83	0.5 U	0.5 U	0.5 U	0.5 U
	16-Dec-20	17.07	260.52	0.5 U	**0.070 J**	0.5 U	0.5 U
	3-Mar-21	11.23	266.36	0.5 U	0.5 U	0.5 U	0.5 U
	10-Jun-21	15.25	262.34	0.5 U	0.5 U	0.5 U	0.5 U
	14-Sep-21	18.52	259.07	0.5 U	0.5 U	0.5 U	0.5 U
	16-Nov-21	16.17	261.42	0.5 U	0.5 U	0.5 U	0.5 U
DA-48 277.07	6-Dec-16	12.71	264.36	**0.13 J**	**0.28 J**	<0.5	<0.5
	22-Mar-17	8.18	268.89	<0.2	**0.09 J**	<0.2	<0.1
	26-Jun-17	11.91	265.16	<0.2	**0.15 J**	<0.2	<0.1
	6-Sep-17	15.88	261.19	**0.12 J**	**0.15 J**	<0.5	<0.5
	8-Nov-17	16.35	260.72	<0.2	**0.11 J**	<0.1	<0.02
	3-Apr-18	11.68	265.39	0.5 U	**0.14 J**	0.5 U	0.5 U
	13-Jun-18	13.45	263.62	**0.060 J**	**0.14 J**	0.5 U	0.5 U
	6-Sep-18	17.51	259.56	0.5 U	**0.090 J**	0.5 U	0.5 U
	4-Dec-18	16.49	260.58	0.5 U	**0.11 J**	0.5 U	0.5 U
	2-Apr-19	13.17	263.90	0.5 U	**0.17 J**	0.5 U	0.5 U
	4-Jun-19	14.82	262.25	0.5 U	**0.17 J**	0.5 U	0.5 U
	10-Sep-19	17.40	259.67	0.5 U	**0.13 J**	0.5 U	0.5 U
	3-Dec-19	17.31	259.76	0.5 U	0.5 U	0.5 U	0.5 U
Duplicate	3-Dec-19	17.31	259.76	0.5 U	**0.10 J**	0.5 U	0.5 U
	3-Mar-20	11.13	265.94	0.5 U	0.5 U	0.5 U	0.5 U
	1-Jun-20	14.43	262.64	0.5 U	0.5 U	0.5 U	0.5 U
	1-Sep-20	17.25	259.82	0.5 U	**0.16 J**	0.5 U	0.5 U
Duplicate	1-Sep-20	17.25	259.82	0.5 U	**0.12 J**	0.5 U	0.5 U
	16-Dec-20	16.63	260.44	0.5 U	0.5 U	0.5 U	0.5 U
	3-Mar-21	10.80	266.27	0.5 U	0.5 U	0.5 U	0.5 U
	10-Jun-21	14.92	262.15	0.5 U	**0.090J**	0.5 U	0.5 U
Duplicate	10-Jun-21	14.92	262.15	0.5 U	**0.12J**	0.5 U	0.5 U
	14-Sep-21	18.07	259.00	0.5 U	0.5 U	0.5 U	0.5 U
	16-Nov-21	15.83	261.24	**0.16 J**	**0.11 J**	0.5 U	0.5 U
DB-6 269.29	12-Sep-00	-	-	**7.3**	**4.3**	<0.5	<0.5
	13-Mar-01	-	-	**9.2**	**5.4**	<0.5	<0.5
	17-Sep-02	-	-	**6.8**	**2.6**	<0.5	<0.5
	11-Mar-03	-	-	**8.3**	**3**	<0.5	<0.5
	16-Mar-04	-	-	**3.4**	**1.2**	<0.5	<0.5

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		-	-	**5.0**	**70.0**	**0.07**	**0.04**
DB-6 (cont.)	7-Mar-05	-	-	7.7	**2.3**	<0.5	<0.5
	7-Mar-06	-	-	**1.3**	<0.5	<0.5	<0.5
	5-Mar-07	-	-	**1**	<0.5	<0.5	<0.5
	10-Mar-08	-	-	**3.7**	**1.2**	<0.5	<0.5
	23-Mar-09	-	-	**2.8**	**0.66**	<0.5	<0.5
	22-Mar-10	-	-	**3.1**	**0.79**	<0.5	<0.5
	21-Mar-11	-	-	**2.4**	**0.73**	<0.5	<0.5
	21-Mar-12	5.57	263.72	**2.5**	<0.5	<0.5	<0.5
	6-Mar-13	6.45	262.84	**2.2**	**0.63**	<0.2	<0.2
	29-May-13	7.33	261.96	-	-	-	-
	28-Aug-13	10.48	258.81	-	-	-	-
	27-Feb-14	5.95	263.34	5.3	**1.2**	<0.2	<0.2
	16-Sep-14	10.82	258.47	-	-	-	-
	2-Dec-14	7.98	261.31	-	-	-	-
	10-Mar-15	5.29	264.00	**1.5**	**0.47 J**	<0.5	<0.5
	23-Jun-15	8.96	260.33	-	-	-	-
	16-Sep-15	11.81	257.48	-	-	-	-
	9-Dec-15	6.58	262.71	-	-	-	-
	9-Aug-16	9.83	259.46	**3.4**	**0.94**	<0.5	<0.5
	1-Dec-16	7.09	262.20	5.6	**1**	<0.5	<0.5
	20-Mar-17	1.70	267.59	**1.3**	**0.23**	<0.2	<0.1
	21-Jun-17	5.66	263.63	**2.7**	**0.94**	<0.2	<0.1
	5-Sep-17	9.70	259.59	5.6	**1.1**	<0.2	<0.1
	7-Nov-17	10.04	259.25	**4.4**	**0.8**	<0.1	<0.02
	2-Apr-18	5.23	264.06	**2.1**	**0.56**	0.5 U	0.5 U
	12-Jun-18	7.07	262.22	**3.3**	**1.1**	0.5 U	0.5 U
	5-Sep-18	10.70	258.59	5.8	**1.1**	0.5 U	0.5 U
	4-Dec-18	10.02	259.27	**4.64**	**0.78**	0.5 U	0.5 U
	2-Apr-19	6.73	262.56	**4.1**	**1.2**	0.5 U	0.5 U
Duplicate	2-Apr-19	6.73	262.56	**3.9**	**1.3**	0.5 U	0.5 U
	4-Jun-19	8.53	260.76	**4.9**	**1.1**	0.5 U	0.5 U
	9-Sep-19	12.30	256.99	6.3	**1.4**	0.5 UJ	0.5 U
	3-Dec-19	11.31	257.98	5.0	**1.2**	0.5 U	0.5 U
	2-Mar-20	4.42	264.87	**1.4**	**0.35 J**	0.5 U	0.5 U
	1-Jun-20	8.18	261.11	**4.4**	**1.0**	0.5 U	0.5 U
Duplicate	1-Jun-20	8.18	261.11	**4.3**	**0.99**	0.5 U	0.5 U
	31-Aug-20	11.19	258.10	6.0	**1.7**	0.5 U	0.5 U
	16-Dec-20	10.37	258.92	**3.4**	**0.83**	0.5 U	0.5 U
	2-Mar-21	4.27	265.02	**1.5**	**0.35J**	0.5 U	0.5 U
	10-Jun-21	8.58	260.71	**4.6**	**1.2**	0.5 U	0.5 U
	13-Sep-21	12.11	257.18	**3.5**	**0.93**	0.5 U	0.5 U
	16-Nov-21	9.35	259.94	**1.8**	**0.37 J**	0.5 U	0.5 U
DO-2	18-Dec-97	-	-	**4.9**	**5.9**	<0.2	<0.2

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
Duplicate	18-Dec-97	-	-	5.3	**5.8**	<0.2	<0.2
Duplicate	9-Mar-98	-	-	**3.9**	**23**	<0.2	<0.2
274.1	16-Sep-99	-	-	5.4	**9**	<0.2	<1
	11-Mar-03	-	-	6.1	**16**	<0.5	<0.5
	9-Jun-03	-	-	6.7	**18**	<0.5	<0.5
Duplicate	9-Jun-03	-	-	7	**19**	<0.5	<0.5
	4-Sep-03	-	-	6.5	**16**	<0.5	<0.5
	4-Dec-03	-	-	**2.3**	**9.8**	<0.5	<0.5
Duplicate	4-Dec-03	-	-	6.9	**17**	<0.5	<0.5
	4-Dec-03	-	-	5.8	**14**	<0.5	<0.5
Duplicate	4-Dec-03	-	-	5.5	**14**	<0.5	<0.5
	16-Mar-04	-	-	6.6	**25**	<0.5	<0.5
Duplicate	16-Mar-04	-	-	6.7	**26**	<0.5	<0.5
	10-Jun-04	-	-	6.6	**10**	<0.5	<0.5
Duplicate	10-Jun-04	-	-	6.4	**10**	<0.5	<0.5
	20-Mar-12	10.74	263.36	-	-	-	-
	12-Sep-13	14.85	259.25	**4**	**1.7**	<0.2	<0.2
	27-Feb-14	11.50	262.60	-	-	-	-
	16-Sep-14	15.85	258.25	-	-	-	-
	2-Dec-14	13.00	261.10	-	-	-	-
	10-Mar-15	10.43	263.67	-	-	-	-
	23-Jun-15	13.81	260.29	-	-	-	-
	16-Sep-15	16.88	257.22	-	-	-	-
	9-Dec-15	11.70	262.40	-	-	-	-
	10-Aug-16	14.77	259.33	**3.1**	**2.2**	<0.5	<0.5
	30-Nov-16	11.42	262.68	**4.1**	**11**	0.090 J	<0.5
	21-Mar-17	6.30	267.80	**3.8**	**15**	<0.5	<0.1
	21-Jun-17	-	-	**4.1**	**22**	0.11 J	<0.1
	6-Sep-17	14.04	260.06	**4.2**	**16**	0.10 J	<0.5
	9-Nov-17	14.50	259.60	**3.4**	**15**	<0.1	0.046
	3-Apr-18	9.65	264.45	**3.4**	**16**	0.080 J	0.5 U
	12-Jun-18	11.37	262.73	**3.7**	**17**	0.090 J	0.5 U
	4-Sep-18	15.08	259.02	**3.4**	**14**	0.5 U	0.080 J
	3-Dec-18	14.51	259.59	**3.45**	**13.1**	0.5 U	0.5 U
	1-Apr-19	11.00	263.10	**4.2**	**14**	0.18 J	0.11 J
	1-Apr-19	11.00	263.10	**4.3**	**14**	0.19 J	0.13 J
	3-Jun-19	12.81	261.29	**3.3**	**10**	0.080 J	0.11 J
	9-Sep-19	15.65	258.45	**3.6**	**8.8**	0.5 U	0.5 U
	3-Dec-19	15.59	258.51	**3.8**	**10**	0.5 U	0.15 J
	2-Mar-20	9.00	265.10	**3.3**	**9.8**	0.5 U	0.12 J
	1-Jun-20	12.49	261.61	**3.5**	**8.4**	0.5 U	0.15 J
	31-Aug-20	16.73	257.37	**3.6**	**8.3**	0.5 U	0.17 J
	16-Dec-20	14.80	259.30	**3.9**	**10**	0.5 U	0.22 J

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		-	-	**5.0**	**70.0**	**0.07**	**0.04**
DO-2 (cont.)	1-Mar-21	8.72	265.38	**3.4**	**11**	0.5 U	**0.22 J**
	10-Jun-21	12.89	261.21	**3.8**	**10**	**0.10J**	**0.13 J**
	13-Sep-21	16.69	257.41	**3.9**	**10**	0.5 U	**0.22 J**
Duplicate	13-Sep-21	16.69	257.41	**3.2**	**8.6**	0.5 U	**0.20 J**
	16-Nov-21	14.00	260.10	**3.9**	**13**	0.5 U	**0.25 J**
DO-3 282.2	20-Mar-12	18.38	263.82	-	-	-	-
	28-Aug-13	22.70	259.50	-	-	-	-
	27-Feb-14	17.40	264.80	-	-	-	-
	16-Sep-14	23.38	258.82	-	-	-	-
	2-Dec-14	20.53	261.67	-	-	-	-
	10-Mar-15	17.79	264.41	-	-	-	-
	23-Jun-15	21.48	260.72	-	-	-	-
	16-Sep-15	24.35	257.85	-	-	-	-
	9-Dec-15	19.70	262.50	-	-	-	-
	10-Aug-16	22.59	259.61	**9**	**3.9**	<0.5	<0.5
	5-Dec-16	18.40	263.80	**8.3**	**4.1**	<0.5	<0.5
	21-Mar-17	13.41	268.79	**8.9**	**5.4**	<0.5	<0.1
	22-Jun-17	-	-	**6.4**	**2.8**	<0.5	<0.1
	7-Sep-17	21.34	260.86	**8.1**	**3.7**	<0.2	<0.1
	9-Nov-17	21.60	260.60	**6.9**	**4.2**	<0.1	<0.02
	4-Apr-18	16.90	265.30	**8.3**	**3.8**	0.5 U	0.5 U
	12-Jun-18	18.60	263.60	**8.7**	**4.1**	0.5 U	0.5 U
	6-Sep-18	22.04	260.16	0.5 U	**4.0**	0.5 U	0.5 U
	4-Dec-18	21.75	260.45	**8.48**	**4.85**	0.2 U	0.2 U
	2-Apr-19	18.30	263.90	**9.3**	**4.9**	0.5 U	0.5 U
	4-Jun-19	20.12	262.08	**8.1**	**4.1**	0.5 U	0.5 U
	10-Sep-19	23.90	258.30	**8.4**	**4.4**	0.5 U	0.5 U
	3-Dec-19	22.71	259.49	**8.0**	**4.2**	0.5 U	0.5 U
	4-Mar-20	16.24	265.96	**7.4**	**4.2**	0.5 U	0.5 U
	1-Jun-20	19.70	262.50	**8.3**	**4.1**	0.5 U	0.5 U
	1-Sep-20	22.74	259.46	**7.7**	**3.9**	0.5 U	0.5 U
	16-Dec-20	21.94	260.26	**8.6**	**4.5**	0.5 U	0.5 U
	2-Mar-21	15.88	266.32	**14.0**	**13.0**	0.5 U	0.5 U
	10-Jun-21	20.13	262.07	**8.7**	**5.0**	0.5 U	0.5 U
	13-Sep-21	23.58	258.62	**9.8**	**6.1**	0.5 U	0.5 U
	16-Nov-21	20.97	261.23	**8.4**	**7.8**	0.5 U	0.5 U
DR-05 270.77	16-Mar-00	-	-	**0.74**	**0.22**	<0.24	<0.2
	10-Sep-01	-	-	**3.3**	**1.3**	<0.5	<0.5
	17-Sep-02	-	-	**2.1**	**1**	<0.5	<0.5
	11-Mar-03	-	-	**0.6**	<0.5	<0.5	<0.5
	9-Jun-03	-	-	**0.5**	<0.5	<0.5	<0.5
	4-Sep-03	-	-	**3**	**1.3**	<0.5	<0.5
	4-Dec-03	-	-	**2.4**	**1.4**	<0.5	<0.5

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
DR-05 (cont.)	16-Mar-04	-	-	<0.5	<0.5	<0.5	<0.5
	7-Mar-05	-	-	**1.4**	**0.6**	<0.5	<0.5
	7-Mar-06	-	-	<0.5	<0.5	<0.5	<0.5
	5-Mar-07	-	-	**0.61**	**0.32 J**	<0.5	<0.5
	8-Sep-08	-	-	**2.9**	**1.5**	<0.5	<0.5
	8-Sep-09	-	-	**0.80 B**	**0.56**	<0.5	<0.5
Duplicate	8-Sep-09	-	-	**0.88 B**	**0.44 J**	<0.5	<0.5
	8-Sep-10	-	-	**2.6**	**1.3**	<0.5	<0.5
	6-Sep-11	-	-	**2.4**	**1.2**	<0.5	<0.5
	20-Mar-12	7.04	263.73	-	-	-	-
	29-Aug-13	12.20	258.57	**1.8**	**0.8**	<0.2	<0.2
	1-Feb-14	7.50	263.27	-	-	-	-
	16-Sep-14	12.46	258.31	**1.8**	**0.79**	<0.5	<0.5
	2-Dec-14	9.58	261.19	-	-	-	-
	10-Mar-15	6.86	263.91	-	-	-	-
	23-Jun-15	10.42	260.35	-	-	-	-
	16-Sep-15	13.62	257.15	**1.6**	**0.64**	<0.5	<0.5
	9-Dec-15	8.30	262.47	-	-	-	-
	10-Aug-16	11.51	259.26	**1.5**	**0.7**	<0.5	<0.5
	30-Nov-16	8.69	262.08	**2.2**	**0.92**	<0.5	<0.5
	21-Mar-17	3.34	267.43	**0.16**	**0.09 J**	<0.5	<0.1
	21-Jun-17	5.23	265.54	**0.69**	**0.40 J**	<0.5	<0.1
	5-Sep-17	11.40	259.37	**1.6**	**0.83**	<0.2	<0.1
	9-Nov-17	11.90	258.87	**1.5**	**0.83**	<0.1	<0.02
	3-Apr-18	6.85	263.92	**0.38 J**	**0.22 J**	0.5 U	0.5 U
	12-Jun-18	8.54	262.23	**0.38 J**	**0.20 J**	0.5 U	0.5 U
	5-Sep-18	12.49	258.28	**1.3**	**0.59**	0.5 U	0.5 U
Duplicate	5-Sep-18	12.49	258.28	**1.4**	**0.57**	0.5 U	0.5 U
	4-Dec-18	11.90	258.87	**1.55**	**0.64**	0.5 U	0.5 U
Duplicate	4-Dec-18	11.90	258.87	**1.58**	**0.75**	0.5 U	0.5 U
	1-Apr-19	8.22	262.55	0.5 U	0.5 U	0.5 U	0.5 U
	3-Jun-19	10.11	260.66	**0.51 J**	**0.40 J**	0.5 U	0.5 U
	10-Sep-19	12.99	257.78	**1.4**	**0.76**	0.5 U	0.5 U
	3-Dec-19	12.91	257.86	**1.7**	**1.0**	0.5 U	0.5 U
Duplicate	3-Dec-19	12.91	257.86	**1.8**	**1.0**	0.5 U	0.5 U
	4-Mar-20	6.24	264.53	**0.20 J**	**0.20 J**	0.5 U	0.5 U
Duplicate	4-Mar-20	6.24	264.53	**0.24 J**	**0.22 J**	0.5 U	0.5 U
	1-Jun-20	9.75	261.02	**0.21 J**	**0.14 J**	0.5 U	0.5 U
	1-Sep-20	13.67	257.10	**1.7**	**0.7**	0.5 U	0.5 U
	16-Dec-20	12.15	258.62	**3.0**	**1.8**	0.5 U	0.5 U
Duplicate	16-Dec-20	12.15	258.62	**3.1**	**1.7**	0.5 U	0.5 U
	2-Mar-21	5.90	264.87	**0.23J**	**0.22J**	0.5 U	0.5 U
	10-Jun-21	10.66	260.11	**0.46J**	**0.34J**	0.5 U	0.5 U

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
DR-05 (cont.)	13-Sep-21	14.13	256.64	**2.2**	**1.2**	0.5 U	0.5 U
	10-Nov-21	11.37	259.40	**2.1**	**1.9**	0.5 U	0.5 U
	10-Nov-21	11.37	259.40	**2.3**	**2.1**	0.5 U	0.5 U
DT-1	8-Sep-98	-	-	**3.9**	**2.7**	<0.2	<0.2
271.77	16-Mar-00	-	-	**3.5**	**1.2**	<0.24	<0.24
Duplicate	16-Mar-00	-	-	**3.5**	**1.2**	<0.24	<0.2
	12-Sep-00	-	-	**2.9**	**1**	<0.5	<0.5
Duplicate	12-Sep-00	-	-	**3**	**1**	<0.5	<0.5
	12-Mar-01	-	-	**3**	**1.1**	<0.5	<0.5
	11-Jun-01	-	-	**3.2**	**1.2**	<0.5	<0.5
Duplicate	11-Jun-01	-	-	**3.2**	**1.2**	<0.5	<0.5
	10-Sep-01	-	-	**4.2**	**1.2**	<0.5	<0.5
Duplicate	10-Sep-01	-	-	**4.3**	**1.2**	<0.5	<0.5
	3-Dec-01	-	-	**4.2**	**1.3**	<0.5	<0.5
Duplicate	3-Dec-01	-	-	**4.2**	**1.3**	<0.5	<0.5
	7-Mar-02	-	-	**2.8**	**0.8**	<0.5	<0.5
Duplicate	7-Mar-02	-	-	**2.9**	**0.8**	<0.5	<0.5
	21-Jun-02	-	-	**2.3**	<0.5	<0.5	<0.5
Duplicate	21-Jun-02	-	-	**2.3**	**0.7**	<0.5	<0.5
	17-Sep-02	-	-	**2.3**	**0.7**	<0.5	<0.5
Duplicate	17-Sep-02	-	-	**2.2**	**0.6**	<0.5	<0.5
	19-Dec-02	-	-	**3.9**	**1.2**	<0.5	<0.5
Duplicate	19-Dec-02	-	-	**3.8**	**1.1**	<0.5	<0.5
	10-Mar-03	-	-	**2.9**	**0.8**	<0.5	<0.5
	9-Jun-03	-	-	**3.5**	**0.9**	<0.5	<0.5
	4-Sep-03	-	-	**3.4**	**0.9**	<0.5	<0.5
	4-Dec-03	-	-	**3.4**	**0.9**	<0.5	<0.5
	15-Mar-04	-	-	**3.2**	**0.8**	<0.5	<0.5
	10-Jun-04	-	-	**2.4**	<0.5	<0.5	<0.5
	13-Sep-04	-	-	**3.1**	**0.8**	<0.5	<0.5
	15-Dec-04	-	-	**3.1**	**0.7**	<0.5	<0.5
	4-Mar-05	-	-	**2.5**	**0.5**	<0.5	<0.5
	6-Jun-05	-	-	**2.7**	**0.6**	<0.5	<0.5
Duplicate	6-Jun-05	-	-	**2.9**	**0.7**	<0.5	<0.5
	6-Sep-05	-	-	**3**	**0.6**	<0.5	<0.5
	5-Dec-05	-	-	**3.1**	**0.6**	<0.5	<0.5
	7-Mar-06	-	-	**1.9**	<0.5	<0.5	<0.5
	6-Jun-06	-	-	**2.2**	<0.5	<0.5	<0.5
Duplicate	6-Jun-06	-	-	**2**	<0.5	<0.5	<0.5
	15-Sep-06	-	-	**1.9**	<0.5	<0.5	<0.5
Duplicate	15-Sep-06	-	-	**1.8**	<0.5	<0.5	<0.5
	11-Dec-06	-	-	**2.3**	**0.4 J**	<0.5	<0.5
	5-Mar-07	-	-	**2.2**	**0.41 J**	<0.5	<0.5

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
DT-1 (cont.)	19-Jun-07	-	-	**2**	**0.43 J**	<0.5	<0.5
	20-Sep-07	-	-	**1.7**	**0.30 J**	<0.5	<0.5
	10-Dec-07	-	-	**2.3**	**0.41 J**	<0.5	<0.5
	10-Mar-08	-	-	**2.4**	**0.48 J**	<0.5	<0.5
	7-May-08	-	-	**2.6**	**0.42 J**	<0.5	<0.5
	8-Sep-08	-	-	**2.4**	**0.47 J**	<0.5	<0.5
	15-Dec-08	-	-	**2.1**	**0.33 J**	<0.5	<0.5
	23-Mar-09	-	-	**2.1**	**0.39 J**	<0.5	<0.5
	18-Jun-09	-	-	**1.9**	**0.38 J**	<0.5	<0.5
	8-Sep-09	-	-	**2.1 B**	**0.39 J**	<0.5	<0.5
	1-Feb-10	-	-	**2.3**	**0.40 J**	<0.5	<0.5
	22-Mar-10	-	-	**2.3**	**0.41 J**	<0.5	<0.5
Duplicate	22-Mar-10	-	-	**2.4**	**0.40 J**	<0.5	<0.5
	14-Jun-10	-	-	**2.2**	**0.40 J**	<0.5	<0.5
Duplicate	14-Jun-10	-	-	**2.2**	**0.37 J**	<0.5	<0.5
	8-Sep-10	-	-	**2.1**	**0.32 J**	<0.5	<0.5
	1-Dec-10	-	-	**1.9**	**0.28 J**	<0.5	<0.5
	21-Mar-11	-	-	**2.6**	**0.54**	<0.5	<0.5
Duplicate	21-Mar-11	-	-	**2.6**	**0.5**	<0.5	<0.5
	28-Jun-11	-	-	**2.1**	**0.38 J**	<0.5	<0.5
Duplicate	28-Jun-11	-	-	**2.1**	**0.39 J**	<0.5	<0.5
	6-Sep-11	-	-	**1.8**	**0.32 J**	<0.5	<0.5
	30-Nov-11	-	-	**1.6**	**0.24 J**	<0.5	<0.5
	21-Mar-12	9.99	261.78	**1.8**	<0.5	<0.5	<0.5
Duplicate	21-Mar-12	9.99	261.78	**1.7**	<0.5	<0.5	<0.5
	12-Jun-12	-	-	**1.7**	<0.5	<0.5	<0.5
	5-Mar-13	10.56	261.21	**1.5**	**0.25**	<0.2	<0.2
	29-May-13	-	-	**0.84**	<0.2	<0.2	<0.2
	28-Aug-13	14.10	257.67	**1.4**	<0.2	<0.2	<0.2
	27-Feb-14	10.00	261.77	**2**	**0.31**	<0.2	<0.2
	16-Sep-14	14.59	257.18	**1.8**	**0.25 J**	<0.5	<0.5
	2-Dec-14	18.74	253.03	**1.6**	**0.21 J**	<0.5	<0.5
	10-Mar-15	9.69	262.08	**1.6**	**0.20 J**	<0.5	<0.5
	23-Jun-15	12.67	259.10	**1.6**	**0.18 J**	<0.5	<0.5
	16-Sep-15	15.34	256.43	**1.3**	**0.14 J**	<0.5	<0.5
	7-Dec-15	27.44	244.33	**1.4**	**0.19 J**	<0.5	<0.5
	10-Aug-16	13.48	258.29	**1.5**	**0.24 J**	<0.5	<0.5
	30-Nov-16	11.15	260.62	**1.4**	**0.25 J**	<0.5	<0.5
	20-Mar-17	8.60	263.17	**1.7**	**0.21**	<0.2	<0.1
	21-Jun-17	10.07	261.70	**1.5**	**0.22 J**	<0.2	<0.1
	5-Sep-17	13.49	258.28	**1.4**	<0.2	<0.2	<0.1
	7-Nov-17	13.82	257.95	**1.2**	**0.16 J**	<0.1	<0.02
	4-Apr-18	9.78	261.99	**1.3**	**0.19 J**	0.5 U	0.5 U

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
Duplicate	4-Apr-18	9.78	261.99	**1.2**	**0.16 J**	0.5 U	0.5 U
DT-1 (cont.)	11-Jun-18	11.27	260.50	**1.4**	**0.16 J**	0.5 U	0.5 U
Duplicate	11-Jun-18	11.27	260.50	**1.4**	**0.17 J**	0.5 U	0.5 U
	4-Sep-18	14.36	257.41	**1.3**	**0.12 J**	0.5 U	0.5 U
	3-Dec-18	13.80	257.97	**0.9**	**0.09 J**	0.5 U	0.5 U
	1-Apr-19	10.94	260.83	**1.7**	**0.24 J**	0.5 U	0.5 U
	3-Jun-19	12.45	259.32	**1.4 J**	**0.15 J**	0.5 UJ	0.5 U
	9-Sep-19	14.95	256.82	**1.0**	0.5 U	0.5 U	0.5 U
	3-Dec-19	14.88	256.89	**1.0**	**0.14 J**	0.5 U	0.5 U
	2-Mar-20	9.11	262.66	**1.1**	0.5 U	0.5 U	0.5 U
	1-Jun-20	12.21	259.56	**0.8**	**0.080 J**	0.5 U	0.5 U
	31-Aug-20	14.83	256.94	**1.3**	**0.090 J**	0.5 U	0.5 U
	16-Dec-20	14.12	257.65	**1.1**	0.5 U	0.5 U	0.5 U
	2-Mar-21	8.99	262.78	**1.4**	**0.13J**	0.5 U	0.5 U
	10-Jun-21	12.51	259.26	**1.8**	**0.22J**	0.5 U	0.5 U
	13-Sep-21	15.80	255.97	**1.2**	**0.090 J**	0.5 U	0.5 U
	16-Nov-21	13.34	258.43	**0.8**	**0.070 J**	0.5 U	0.5 U
DT-2	9-Sep-98	-	-	<0.2	<0.2	<0.2	<0.2
274.37	20-Oct-98	-	-	<0.2	**0.71**	<0.2	<0.2
	19-Nov-98	-	-	<0.2	**0.67**	<0.2	<0.2
	11-Mar-03	-	-	<0.5	**0.7**	<0.5	<0.5
	9-Jun-03	-	-	<0.5	**0.8**	<0.5	<0.5
	4-Sep-03	-	-	<0.5	**0.7**	<0.5	<0.5
	4-Dec-03	-	-	<0.5	**0.7**	<0.5	<0.5
	21-Mar-12	11.14	263.23	-	-	-	-
	28-Aug-13	15.80	258.57	-	-	-	-
	16-Sep-14	16.20	258.17	-	-	-	-
	2-Feb-14	13.80	260.57	-	-	-	-
	10-Mar-15	10.91	263.46	-	-	-	-
	17-Aug-16	15.50	258.87	**0.13 J**	**2.5**	<0.5	<0.5
	30-Nov-16	11.65	262.72	<0.5	**1.6**	<0.5	<0.5
	21-Mar-17	6.20	268.17	<0.2	**2.5**	<0.5	<0.1
	21-Jun-17	10.25	264.12	<0.2	**2.7**	<0.5	<0.1
	6-Sep-17	15.15	259.22	<0.5	**2.3**	<0.5	<0.5
	9-Nov-17	15.60	258.77	**0.035 J**	**2.1**	<0.1	<0.02
	3-Apr-18	10.64	263.73	0.5 U	**2.2**	0.5 U	0.5 U
	12-Jun-18	12.80	261.57	**0.060 J**	**2.7**	0.5 U	0.5 U
	4-Sep-18	15.96	258.41	0.5 U	**2.1**	0.5 U	0.5 U
	3-Dec-18	15.55	258.82	0.5 U	**1.72**	0.5 U	0.5 U
	1-Apr-19	12.13	262.24	0.5 U	**3.1**	0.5 U	0.5 U
	3-Jun-19	13.52	260.85	0.5 U	**1.6**	0.5 U	0.5 U
	9-Sep-19	16.71	257.66	0.5 U	**2.4**	0.5 U	0.5 U
	3-Dec-19	16.60	257.77	0.5 U	**4.4**	0.5 U	0.5 U

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**
DT-2 (cont.)	3-Mar-20	10.07	264.30	0.5 U	**4.5**	0.5 U	0.5 U
	1-Jun-20	13.60	260.77	0.5 U	**3.8**	0.5 U	0.5 U
	31-Aug-20	21.32	253.05	0.5 U	**4.5**	0.5 U	0.5 U
	16-Dec-20	15.86	258.51	0.5 U	**4.0**	0.5 U	0.5 U
	1-Mar-21	9.78	264.59	0.5 U	**2.5**	0.5 U	0.5 U
	10-Jun-21	13.67	260.70	0.5 U	**4.5**	0.5 U	0.5 U
	13-Sep-21	17.70	256.67	0.5 U	**5.3**	0.5 U	0.5 U
	16-Nov-21	14.99	259.38	0.5 U	**4.9**	0.5 U	**0.080 J**
EPA-W-5 266.84	16-Mar-00	-	-	<0.2	**3.1**	<0.24	<0.2
	12-Sep-00	-	-	**0.71**	**0.66**	<0.5	<0.5
	21-Mar-01	-	-	<0.5	**1.6**	<0.5	<0.5
	10-Sep-01	-	-	**1**	**1.1**	<0.5	<0.5
	7-Mar-02	-	-	<0.5	**2.6**	<0.5	<0.5
	29-Aug-13	11.25	255.59	-	-	-	-
	16-Sep-14	11.61	255.23	-	-	-	-
	2-Dec-14	9.55	257.29	-	-	-	-
	10-Mar-15	8.30	258.54	-	-	-	-
	23-Jun-15	10.44	256.40	-	-	-	-
	16-Sep-15	12.23	254.61	-	-	-	-
	7-Dec-15	9.46	257.38	-	-	-	-
	9-Aug-16	10.83	256.01	**0.31 J**	**0.51**	<0.5	<0.5
	30-Nov-16	9.00	257.84	**0.25 J**	**0.64**	<0.5	<0.5
	22-Mar-17	5.60	261.24	<0.1	**2.7**	<0.2	<0.1
	22-Jun-17	8.55	258.29	**0.22 J**	**0.64**	<0.2	<0.1
	7-Sep-17	11.03	255.81	**0.41 J**	**0.71**	<0.2	<0.1
	7-Nov-17	11.10	255.74	**0.27**	**0.21**	<0.1	<0.02
	4-Apr-18	7.51	259.33	**0.12 J**	**2.2**	0.5 U	0.5 U
	11-Jun-18	8.60	258.24	**0.14 J**	**0.75**	0.5 U	0.5 U
	4-Sep-18	10.79	256.05	**0.27 J**	**0.32 J**	0.5 U	0.5 U
	3-Dec-18	10.45	256.39	**0.29**	**0.22**	0.5 U	0.5 U
	1-Apr-19	8.85	257.99	**0.11 J**	**2.0**	0.5 U	0.5 U
	3-Jun-19	9.57	257.27	**0.23 J**	**0.63**	0.5 UJ	0.5 U
	9-Sep-19	11.39	255.45	**0.30 J**	**0.37 J**	0.5 U	0.5 U
	3-Dec-19	11.20	255.64	**0.26 J**	**0.17 J**	0.5 U	0.5 U
	2-Mar-20	7.17	259.67	**0.25 J**	**1.1**	0.5 U	0.5 U
	1-Jun-20	9.36	257.48	**0.27 J**	**0.25 J**	0.5 U	0.5 U
	31-Aug-20	11.16	255.68	**0.34 J**	**0.21 J**	0.5 U	0.5 U
	16-Dec-20	10.44	256.40	**0.32 J**	**0.080 J**	0.5 U	0.5 U
	1-Mar-21	6.69	260.15	**0.22J**	**1.20**	0.5 U	0.5 U
	10-Jun-21	9.47	257.37	**0.30J**	**0.24J**	0.5 U	0.5 U
	13-Sep-21	11.87	254.97	**0.28 J**	0.5 U	0.5 U	0.5 U
	16-Nov-21	9.05	257.79	**0.33 J**	**0.12 J**	0.5 U	0.5 U
Duplicate	16-Nov-21	9.05	257.79	**0.31 J**	**0.14 J**	0.5 U	0.5 U

Table B-1. Groundwater Elevations and VOC Concentrations

Well ID TOC Elevation	Sample Date	DTW (ft bgs)	GWELEV (ft AMSL)	TCE (µg/L)	cis-DCE (µg/L)	1,1-DCE (µg/L)	VC (µg/L)
ROD Remediation Goal		**-**	**-**	**5.0**	**70.0**	**0.07**	**0.04**

Notes:

TOC = Top of casing
DTW (ft bgs) = Depth to water feet below ground surface
GWELEV (ft AMSL) = Groundwater elevation feet above mean sea level
TCE = Trichloroethene
cis-DCE = cis-1,2-dichloroethylene
1,1-DCE = 1,1-dichloroethylene
VC = Vinyl Chloride
µg/L = Micrograms per liter
BOLD = Analyte detected at or above laboratory practical quantification limit
BOLD = Analyte detected above the applicable cleanup level
B = The analyte was found in the associated method blank at a level that is significant relative to
D = The reported result is from a dilution
E = The result is an estimated value
R = Rejected
J = The result is an estimated value
U = Analyte not detected above laboratory practical quantification limit reported
- = No data, not applicable

APPENDIX C
TCE CONCENTRATION TREND GRAPHS

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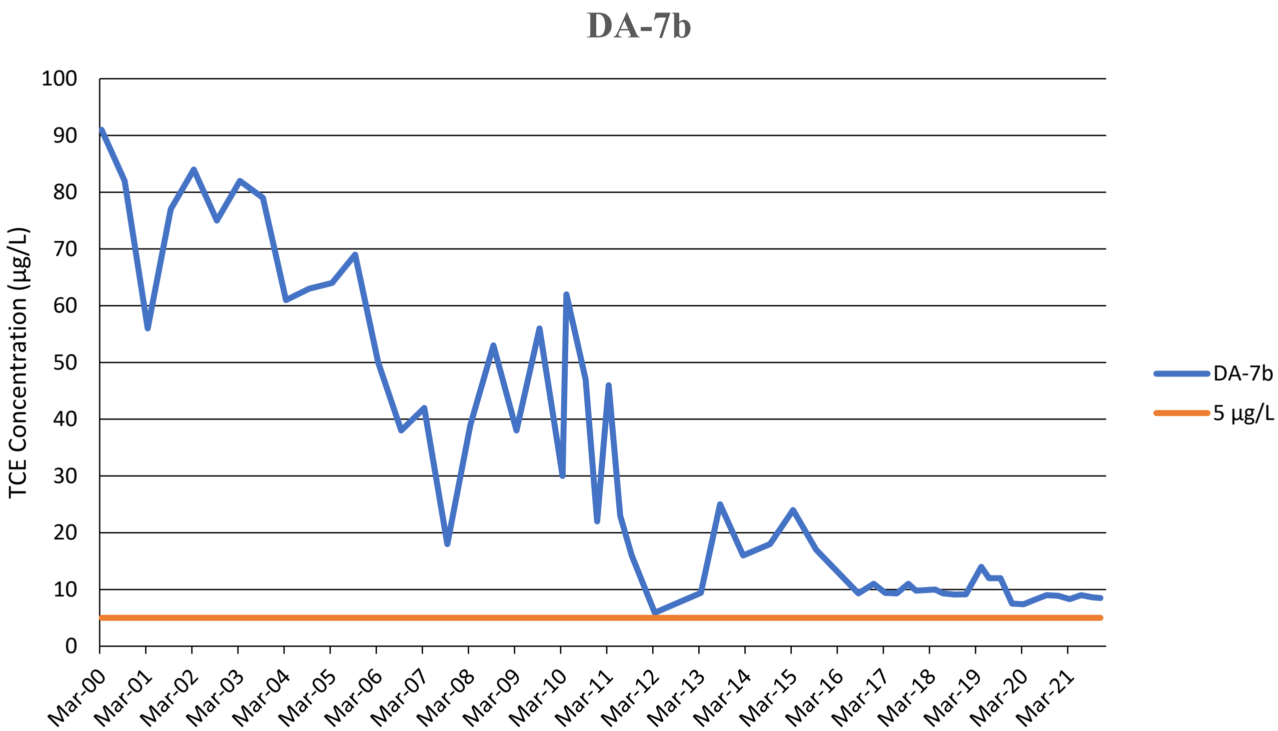
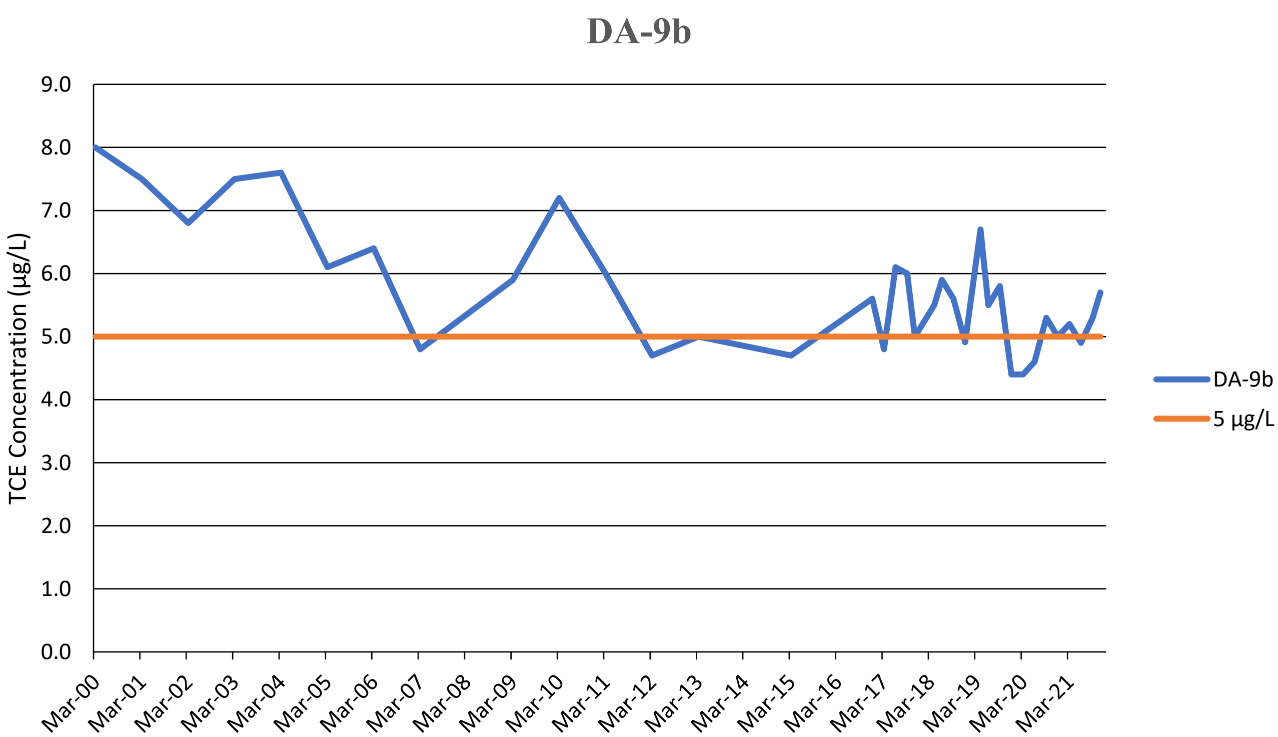
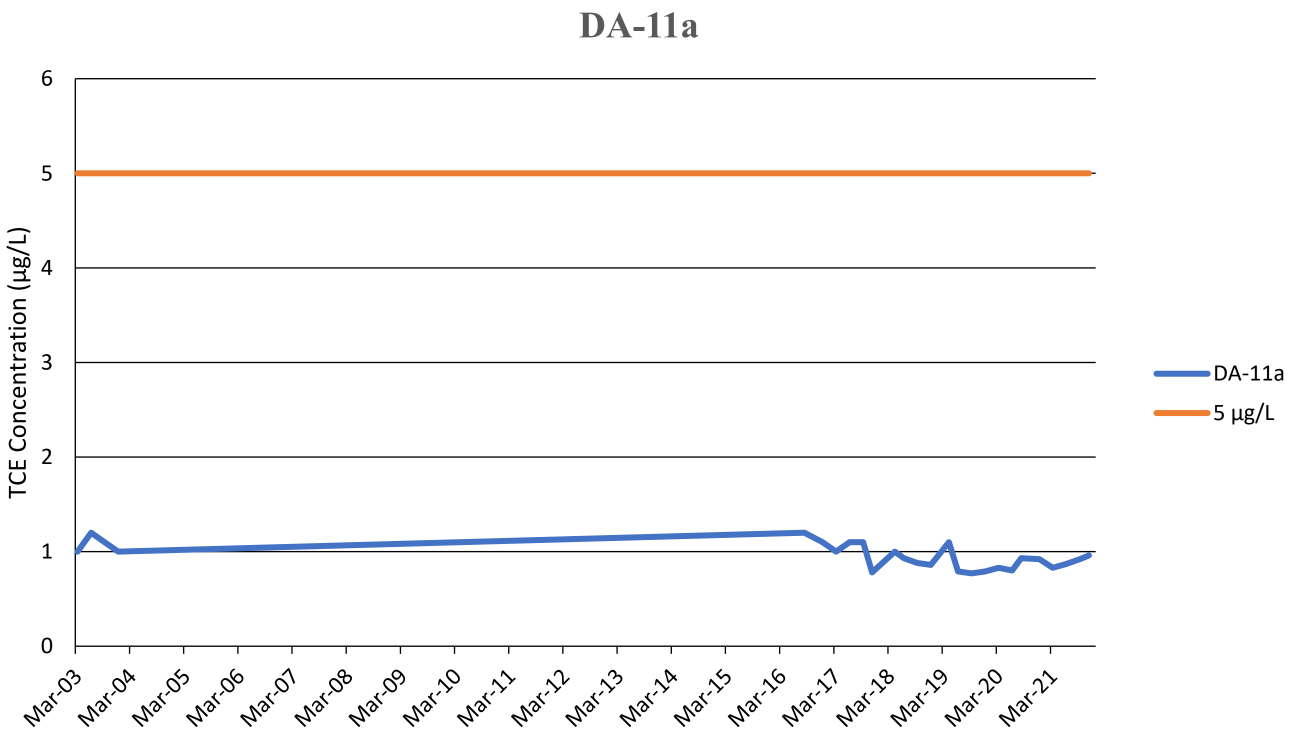
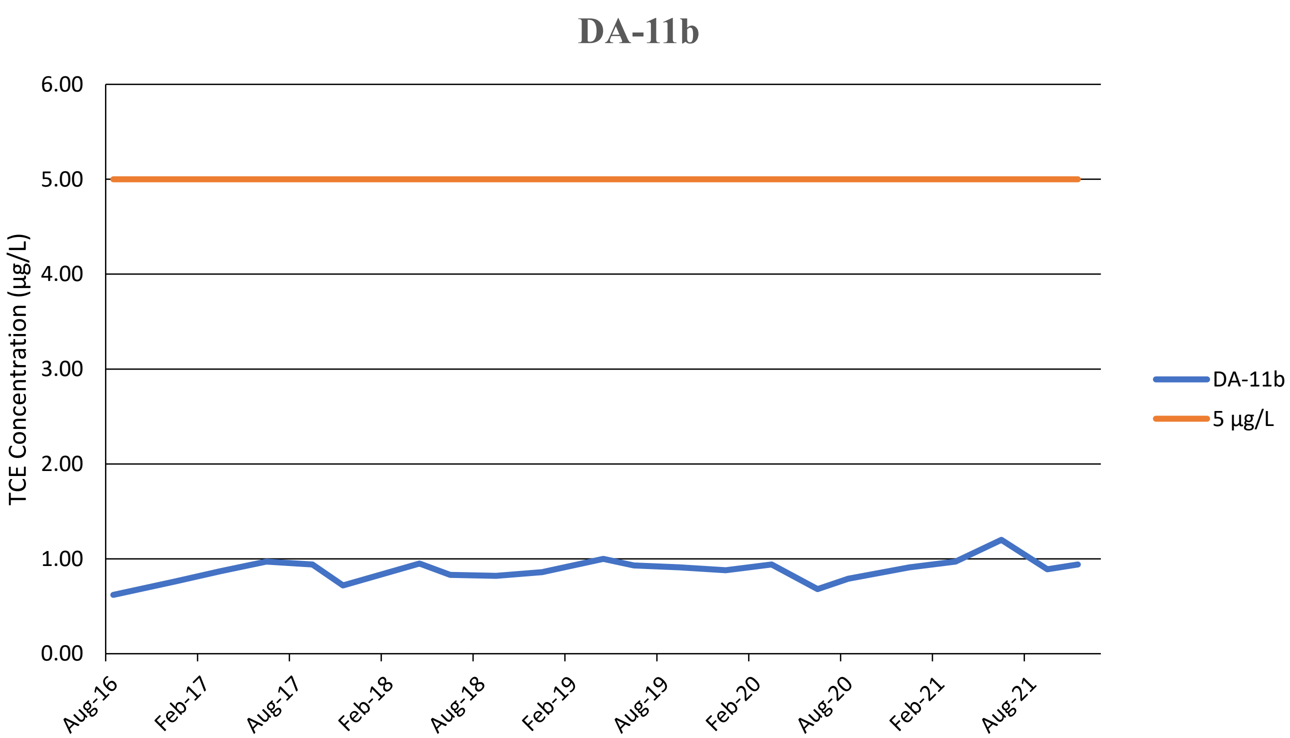
Historical Concentration Graphs - TCE



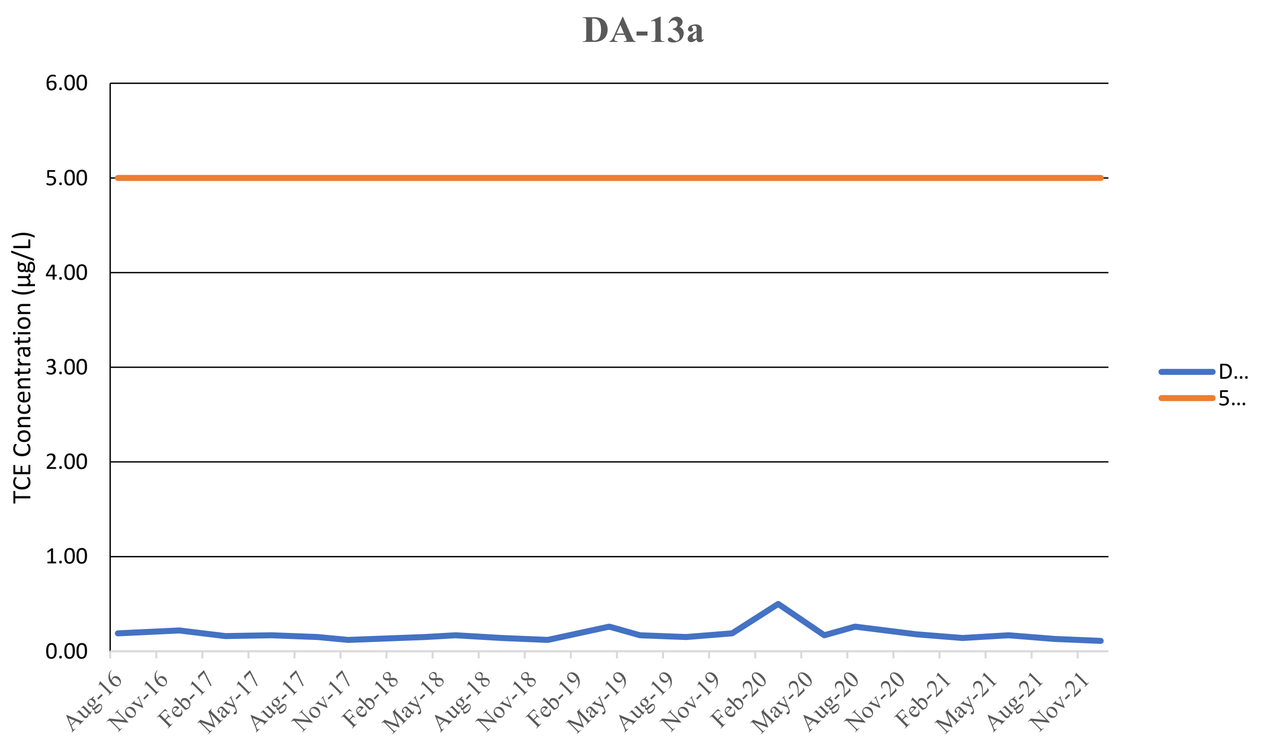


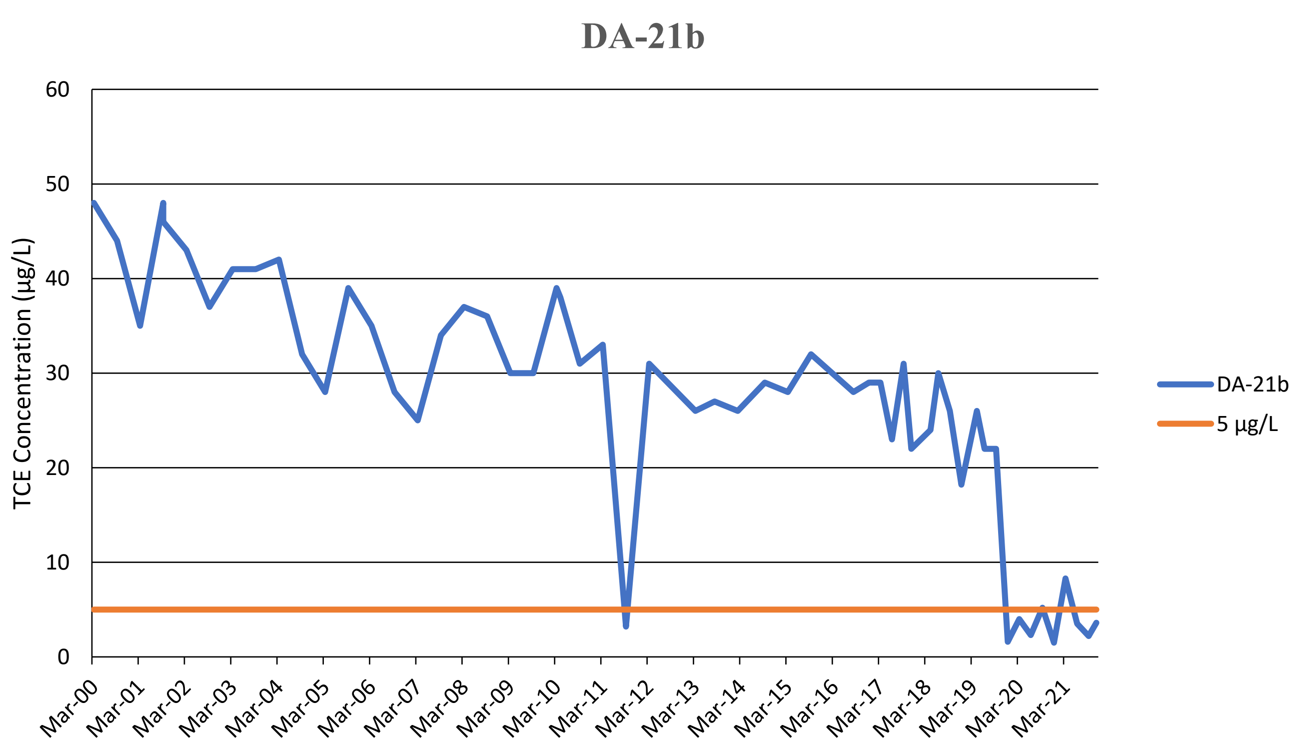
Historical Concentration Graphs - TCE



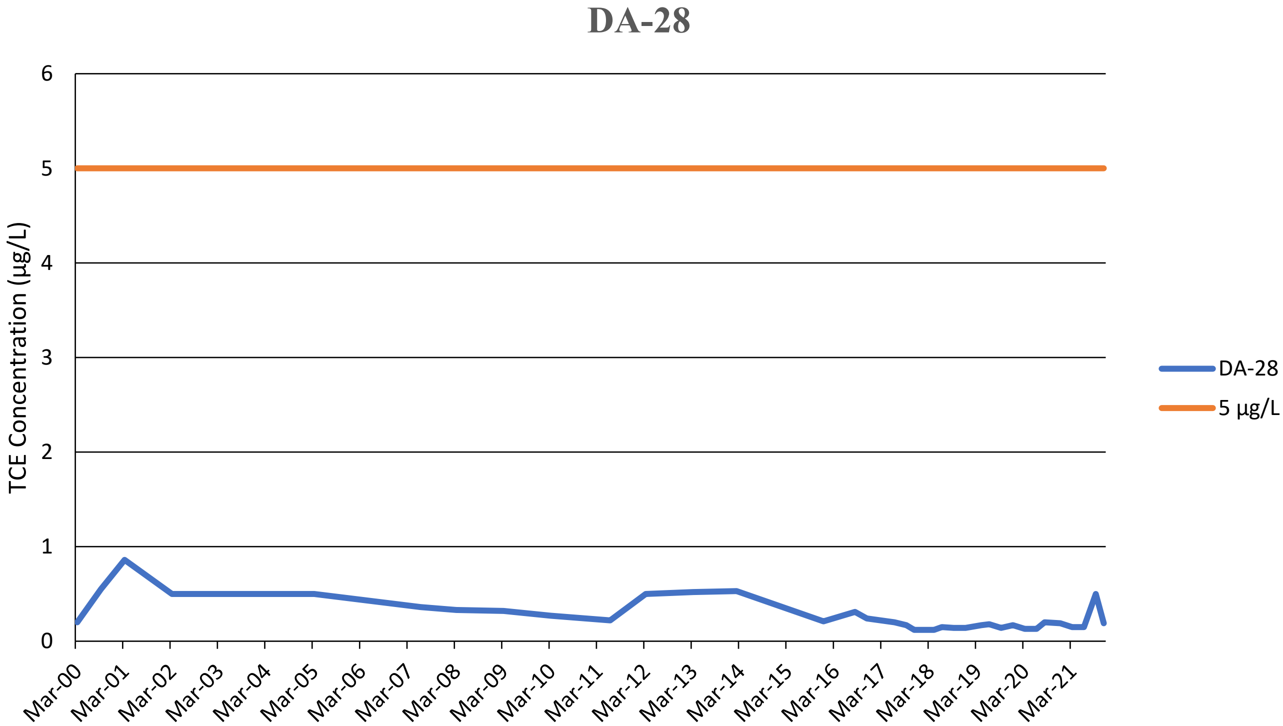


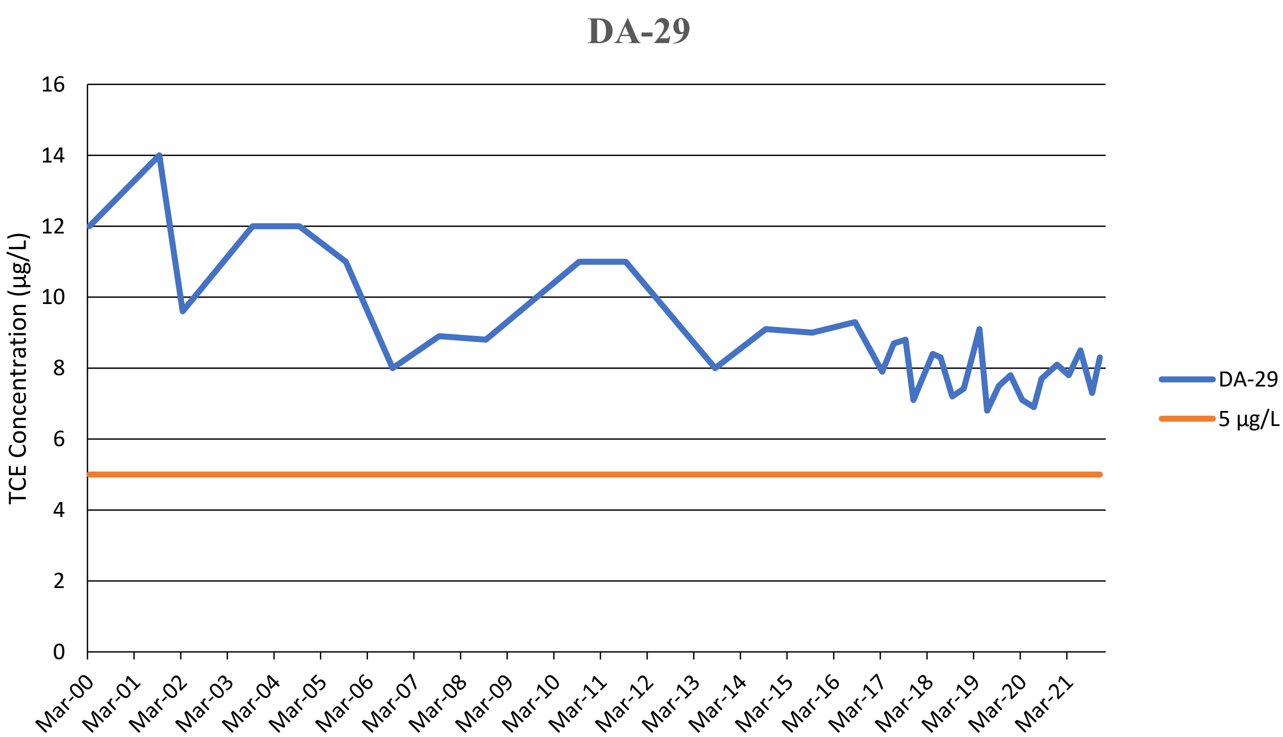
Historical Concentration Graphs - TCE



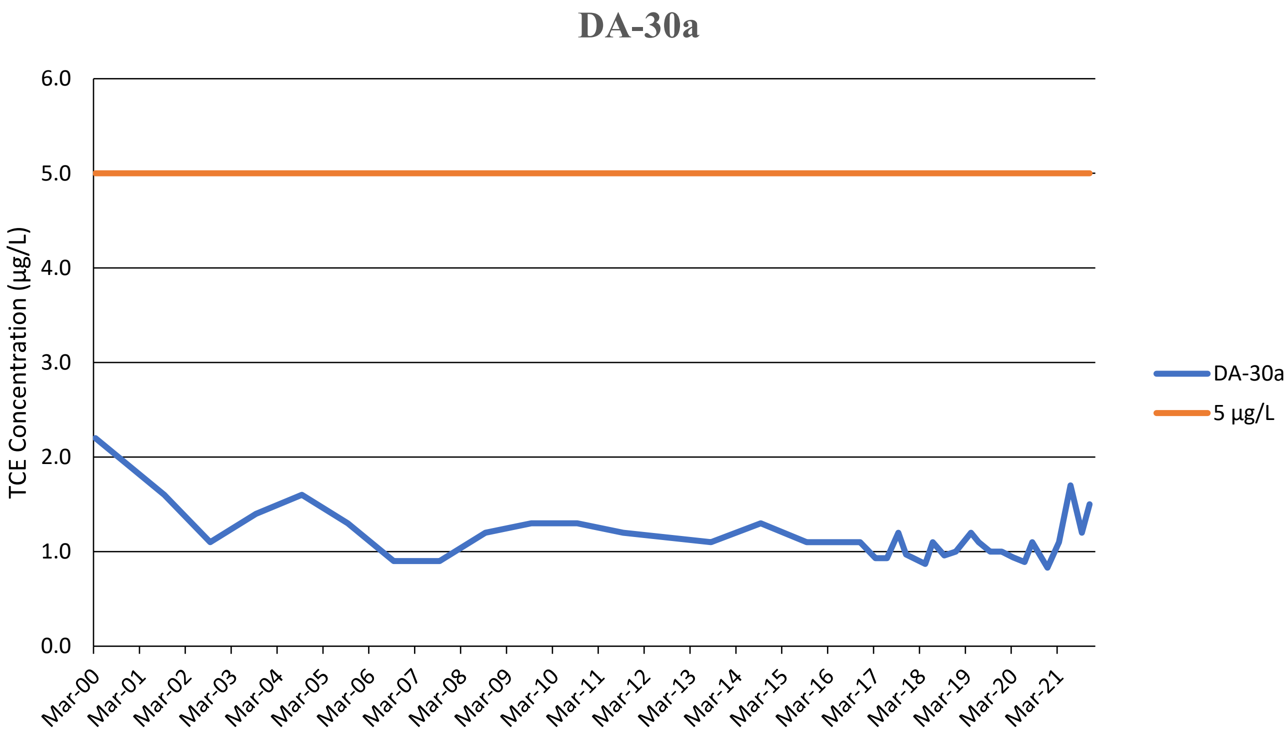


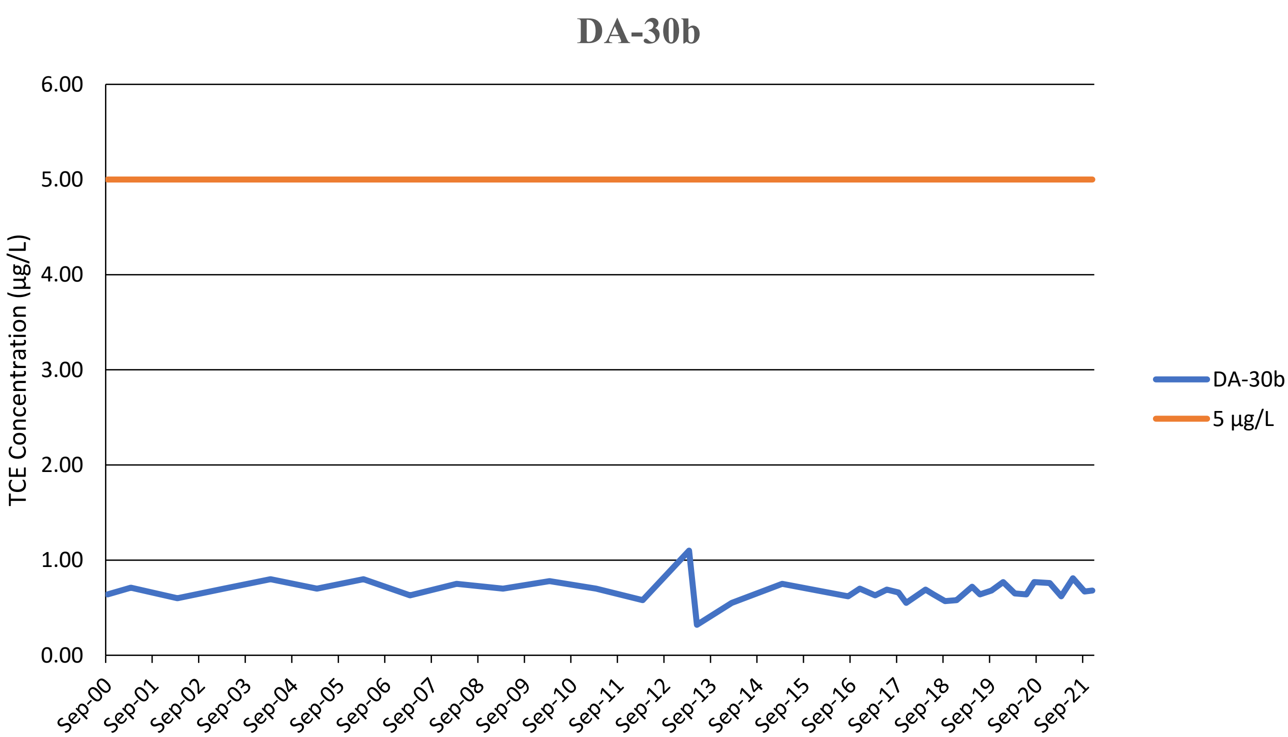
Historical Concentration Graphs - TCE



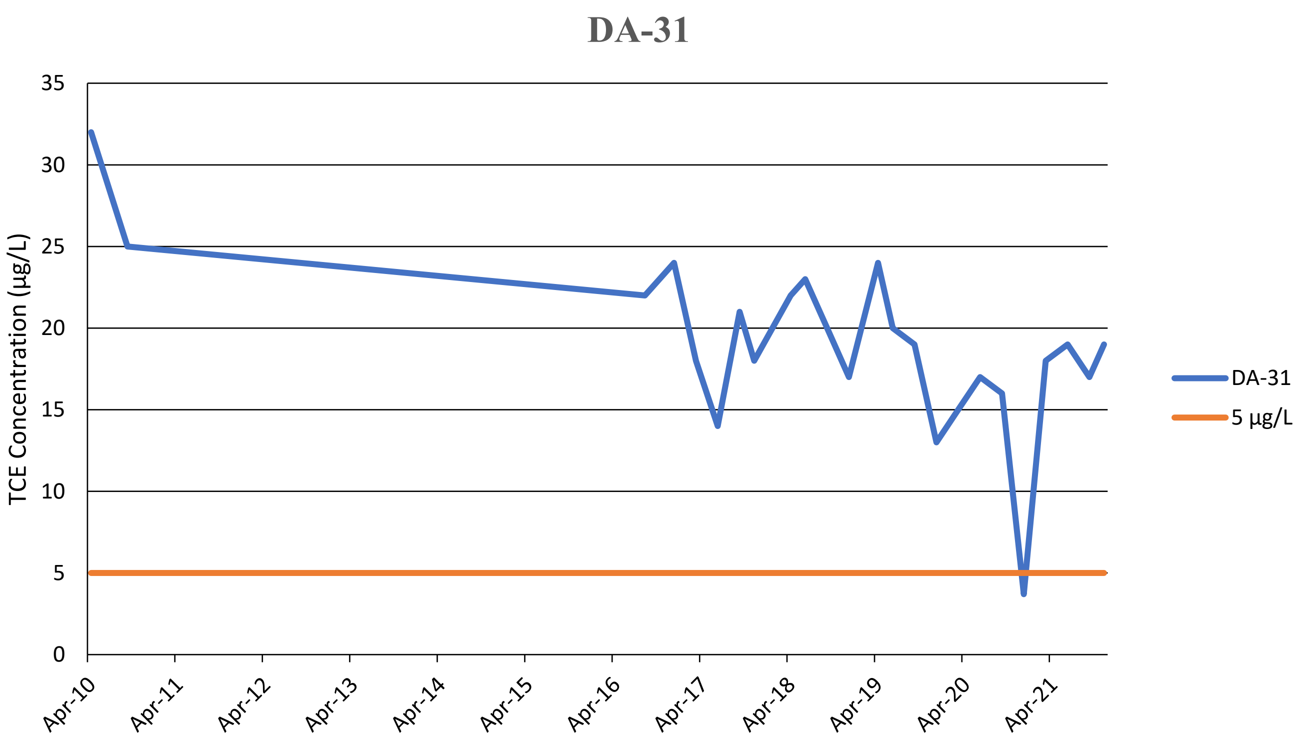


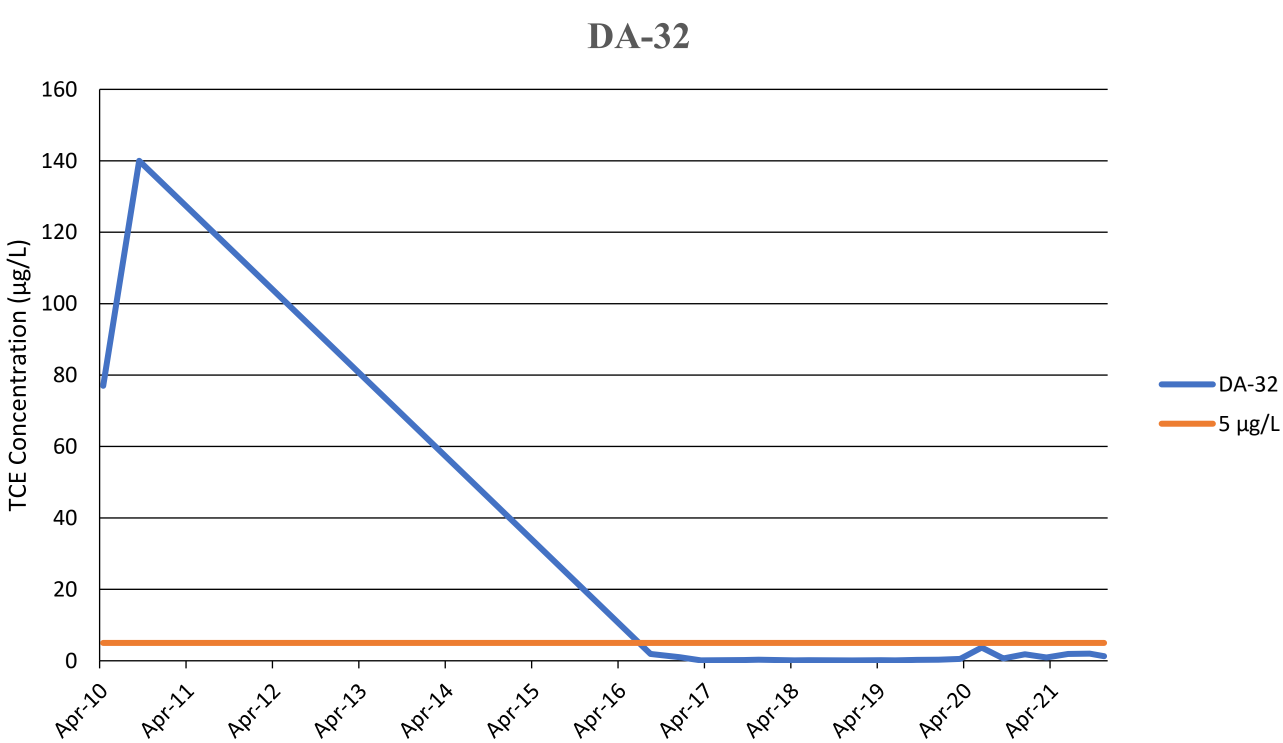
Historical Concentration Graphs - TCE



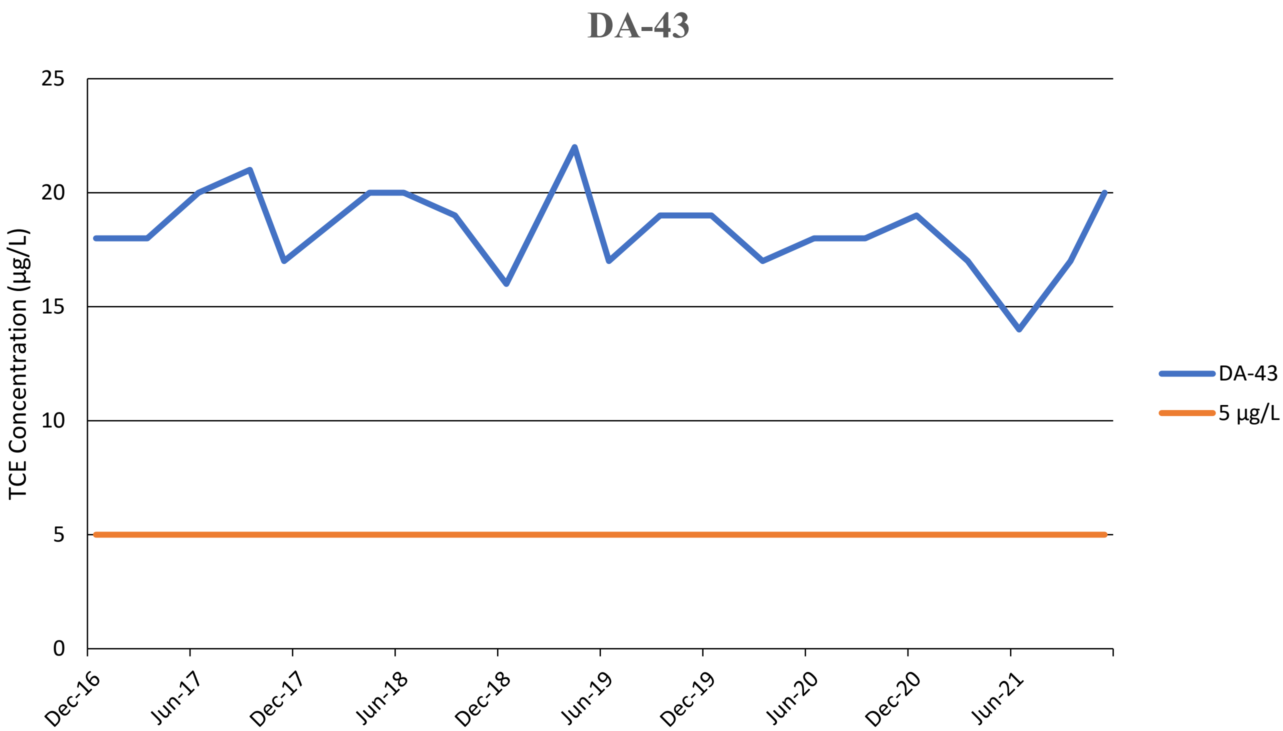


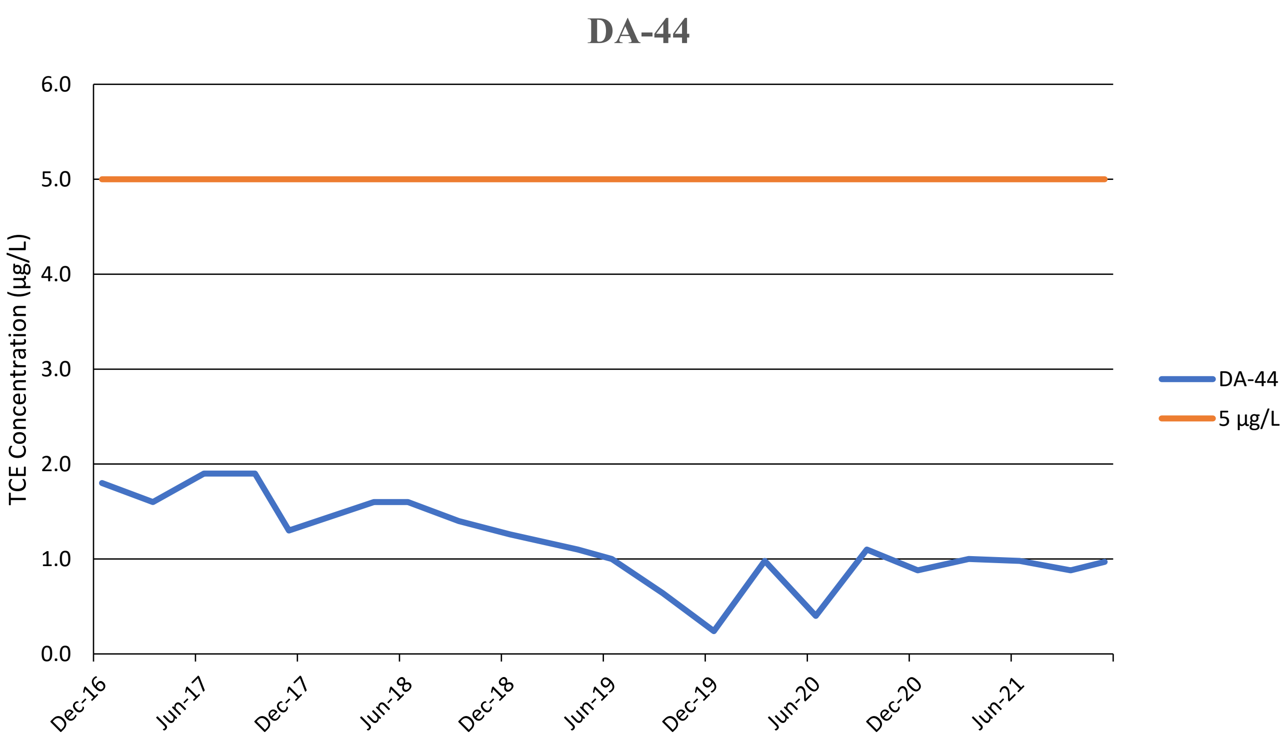
Historical Concentration Graphs - TCE



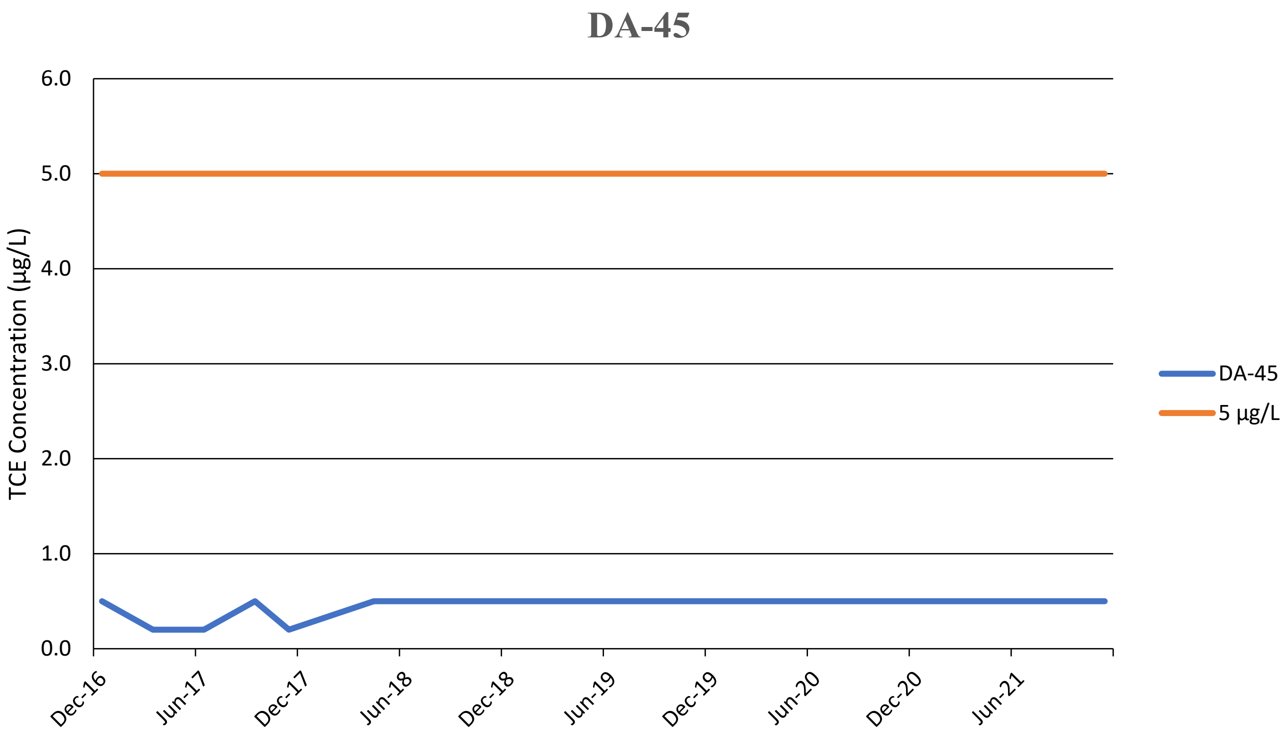


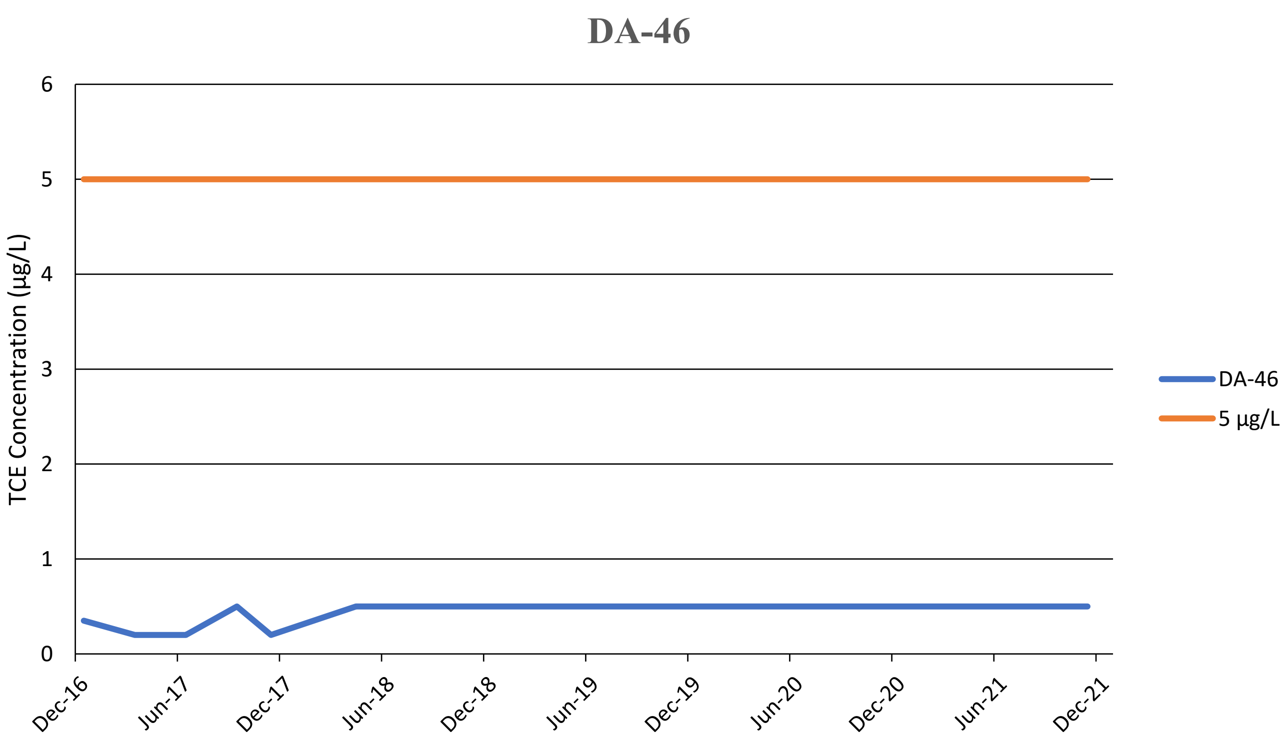
Historical Concentration Graphs - TCE



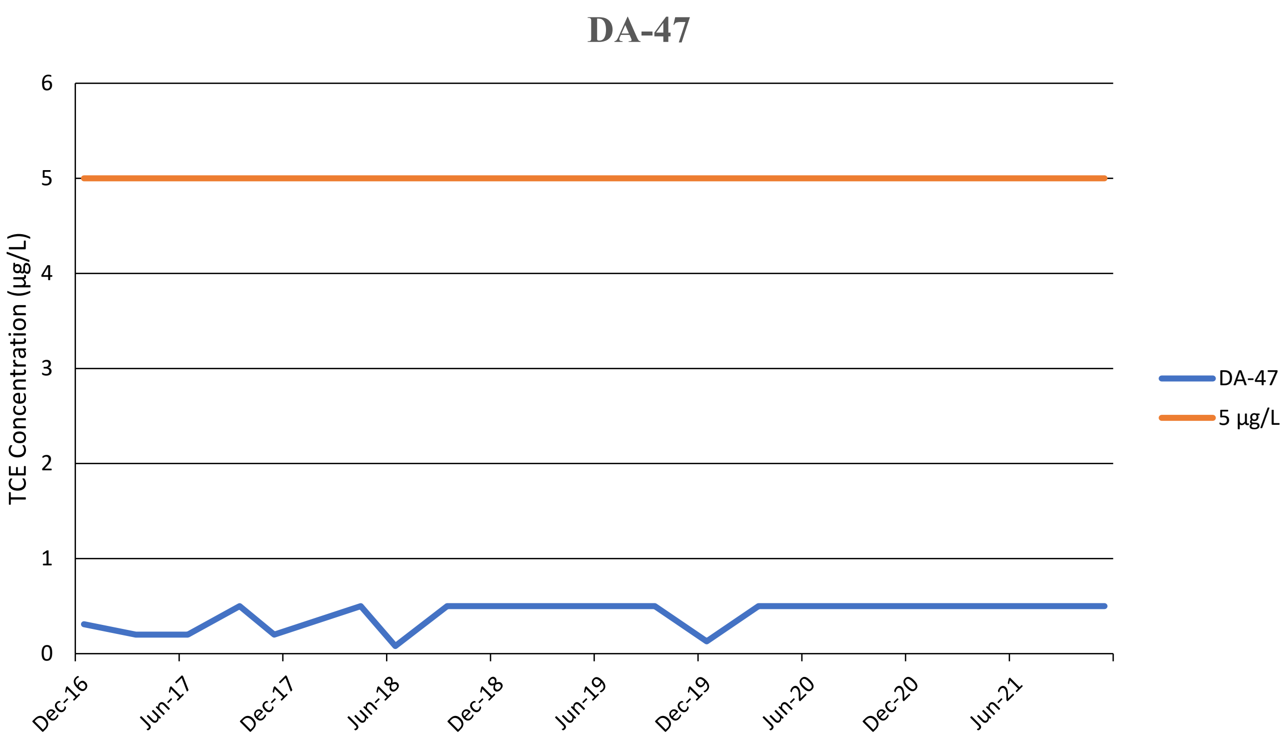


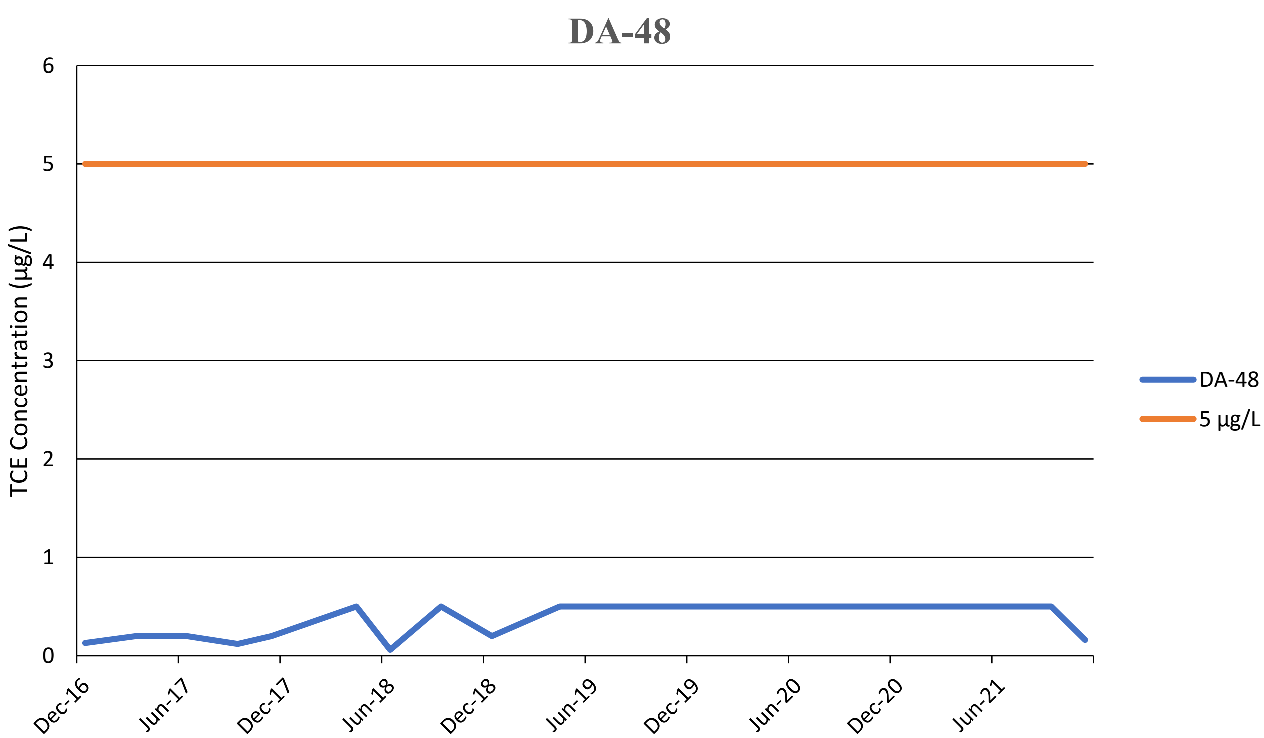
Historical Concentration Graphs - TCE



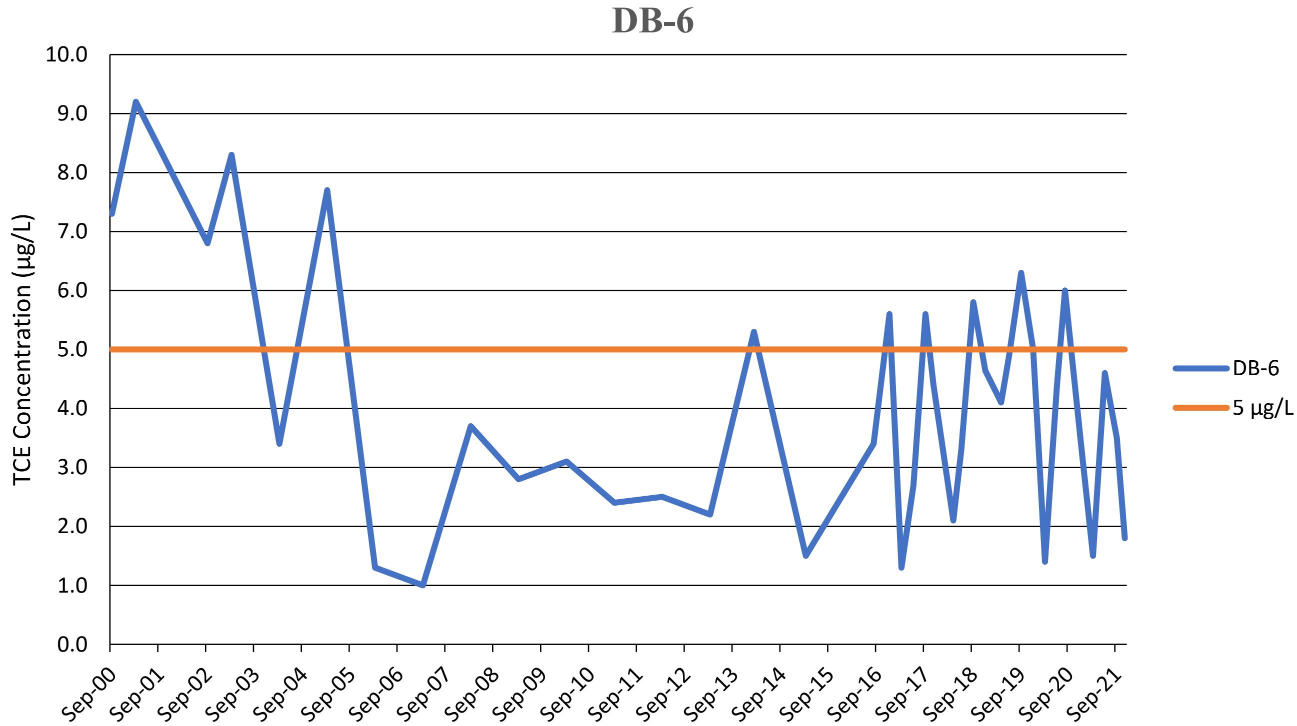


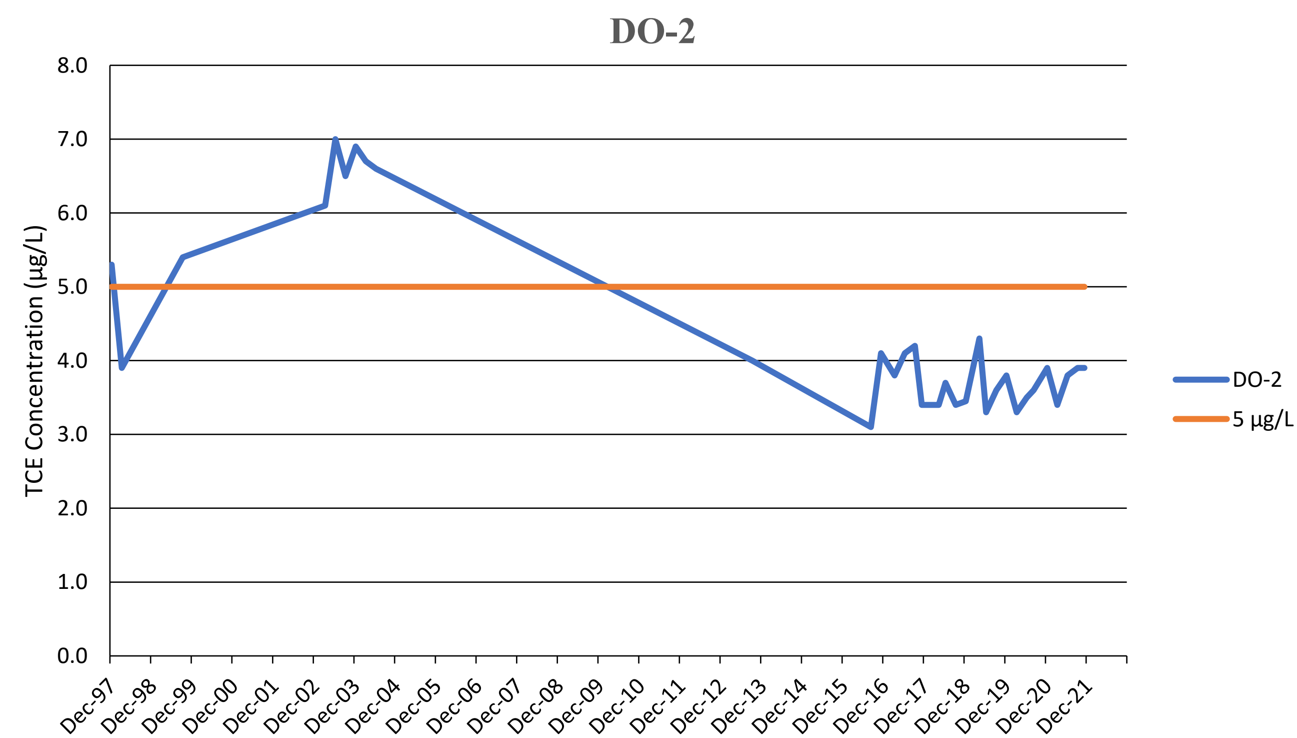
Historical Concentration Graphs - TCE



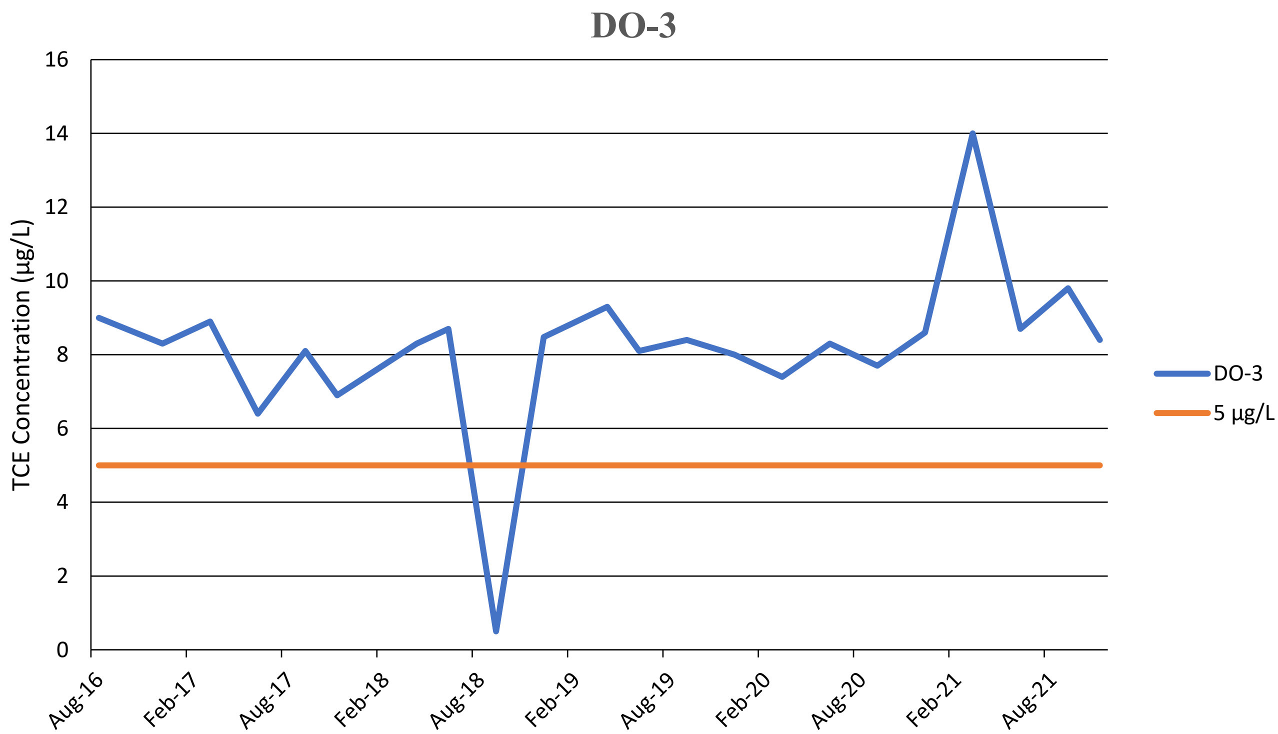


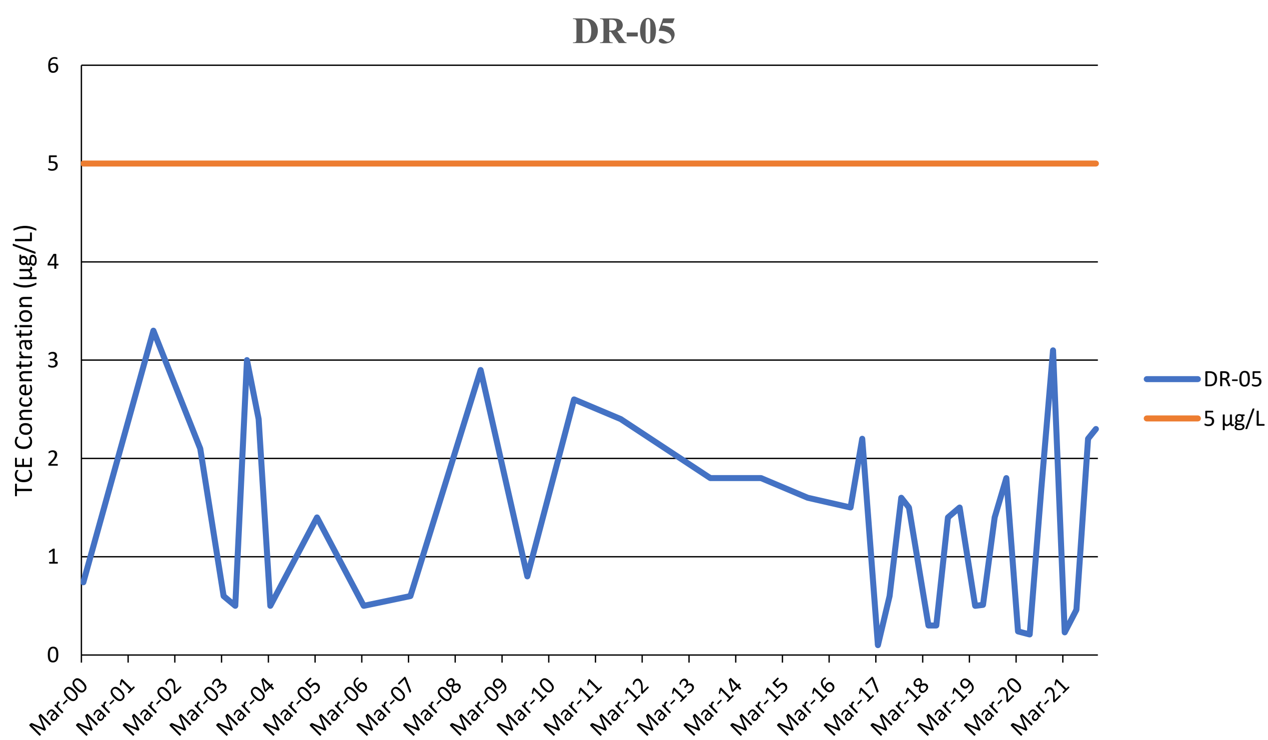
Historical Concentration Graphs - TCE



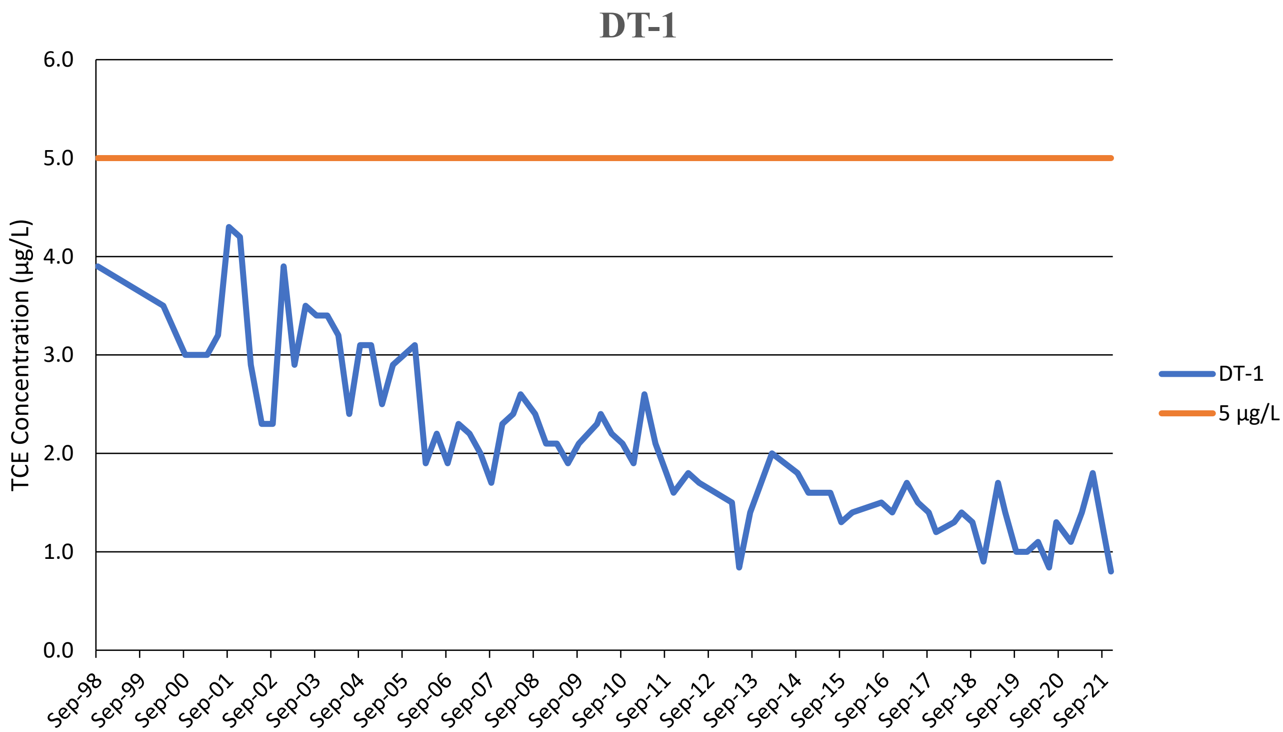


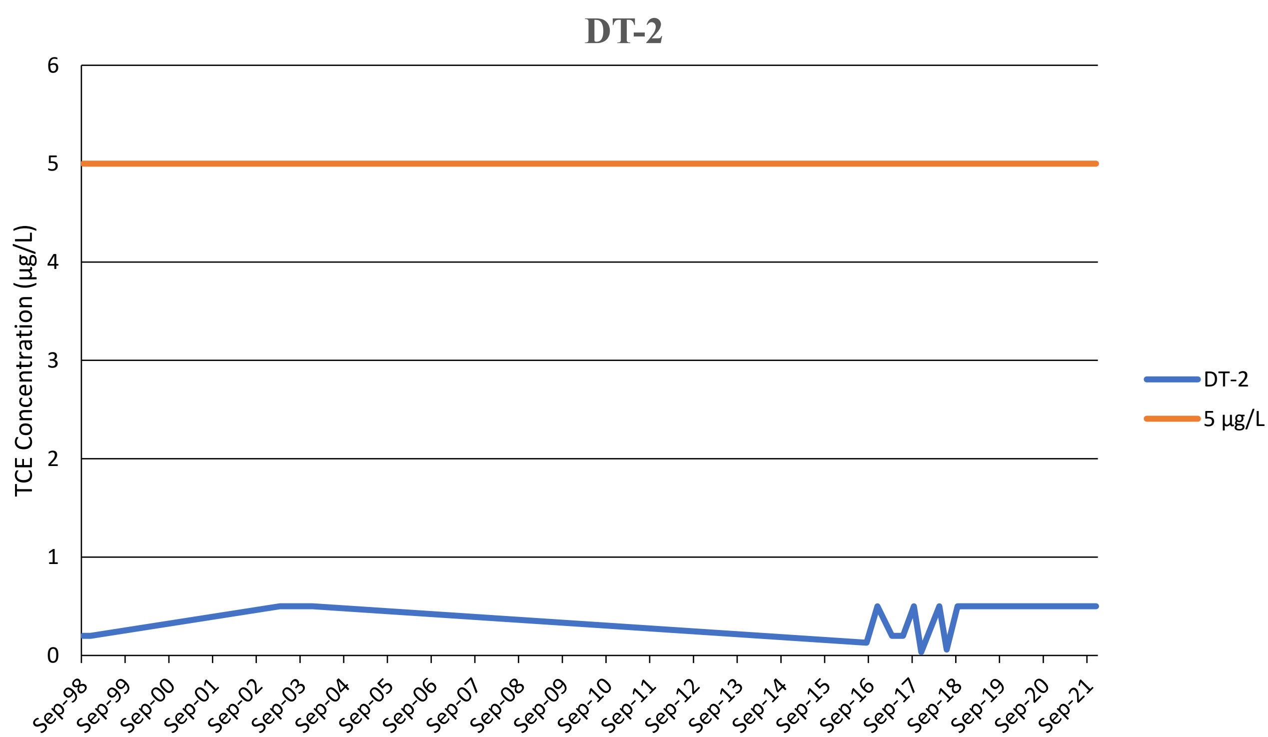
Historical Concentration Graphs - TCE



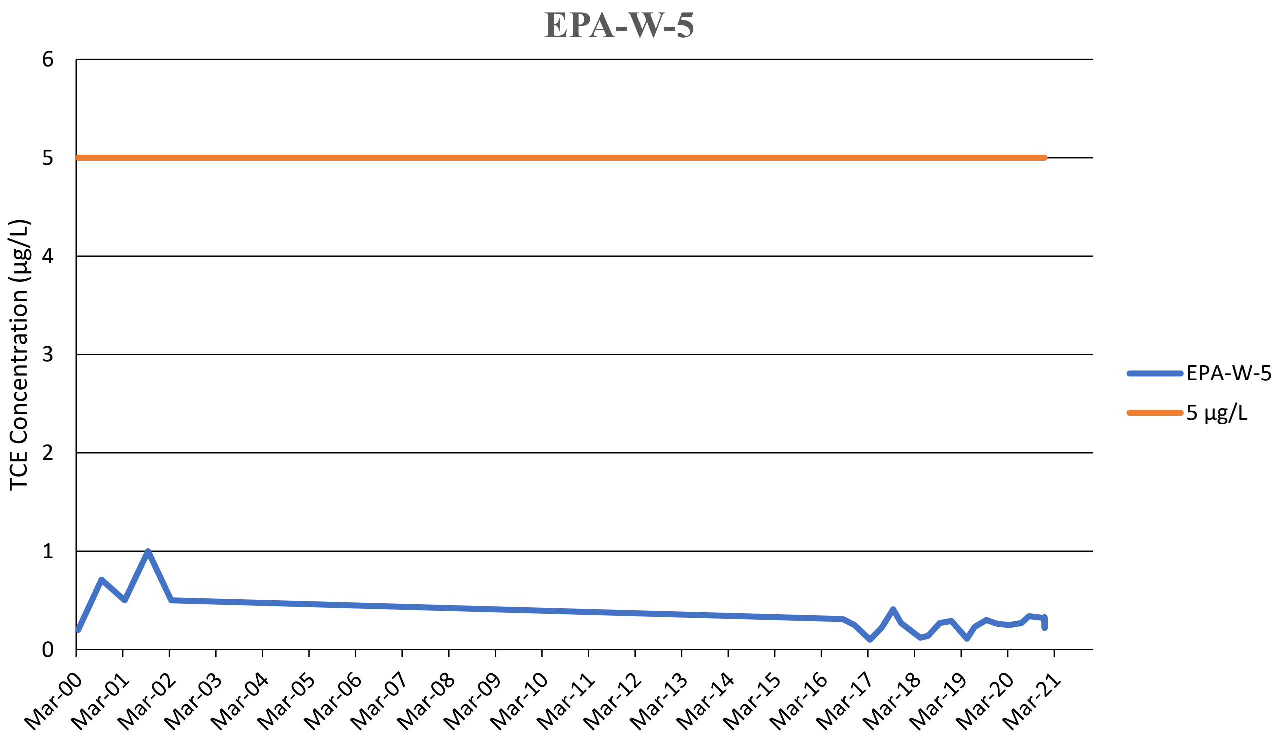


Historical Concentration Graphs - TCE





Historical Concentration Graphs - TCE



Historical Concentration Graphs - TCE

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APPENDIX D

MNA PARAMETER CONCENTRATIONS

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Table D-1. MNA Parameter Concentrations

Well ID	Sample Date	Alkalinity (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fe(II) (mg/L)	Methane (ug/L)	Ethene (ug/L)	Ethane (ug/L)	TOC (mg/L)	Fe (ug/L)	Mn (ug/L)	Temp-Hydro (^oC)	Conductance (uS/cm)	DO-Hydro (mg/L)	pH (units)	Redox (E_H) (mV)	Turbidity (NTUs)
DA-7b	11-Aug-16	54	0.96	6.7	2.41	<0.20	3.1	<0.22	<0.24	0.45 J	96	8.9	13.2	182	5.8	6.73	73	14
Duplicate	11-Aug-16	78	0.95	6.7	2.42	<0.20	4.1	<0.22	<0.24	0.28 J	84	7.6	--	--	--	--	--	--
	5-Dec-16	81	0.96	7.03	2.36	<0.20	1.7	<0.22	<0.24	0.32 J	426	14.4	12.3	186	4.5	6.00	179	0
Duplicate	5-Dec-16	81	0.96	7	2.36	<0.20	1.2	<0.22	<0.24	0.40 J	86.6	3.69	--	--	--	--	--	--
	21-Mar-17	79	0.93	6.61	2.2	<0.2	1.1 J	<0.22	<0.24	0.47 J	96	4.1	12.4	169	5.9	6.80	180	40
Duplicate	21-Mar-17	80	0.93	6.45	2.33	<0.2	0.48 J	<0.22	<0.24	0.42 J	60	2.8	--	--	--	--	--	--
	26-Jun-17	55	1.22	5.42	2.46	<0.2	2.2	<0.22	<0.23	0.7	368	30.7	12.5	172	6	6.9	142	0.50
Duplicate	26-Jun-17	78	0.97	5.89	2.62	<0.2	4.3	<0.22	<0.23	0.54	59	4.9	--	--	--	--	--	--
	6-Sep-17	77	0.97	6.83	2.58	<0.2	3.2	<1	<0.6	0.07 J	36	3	12.5	174	5	6.8	94	0.40
Duplicate	6-Sep-17	79	0.97	6.78	2.58	<0.2	2.3	<1	<0.6	<0.5	16 J	1.4	--	--	--	--	--	--
	10-Nov-17	75	1	6.5	2.6	<0.2 HF	0.42 J	<5	<5	0.61 J	<0.5	0.0018 J	12.4	143	4.4	6.10	238	1
Duplicate	10-Nov-17	76	1	6.5	2.6	<0.2 HF	0.51 J	<5	<5	0.9 J	<0.5	0.0017 J	--	--	--	--	--	--
	2-Apr-18	77	1.00	6.25	2.53	0.2 U	6.9	1.0 U	0.60 U	0.51	777	31.0	13.3	340	5.92	6.45	104.6	5.1
	13-Jun-18	77	0.94	5.93	2.30	0.2 U	6.0	1.0 U	0.60 U	0.36 J	76.9	6.99	12.9	151	6.17	6.63	151.2	3.0
	5-Sep-18	78	0.88	6.36	2.46	0.2 U	5.3	1.0 U	0.60 U	0.19 J	70.3	5.18	14.3	174	5.6	5.88	75	8.1
	4-Dec-18	81	0.94	7.04	2.52	0.2 U	5.3	1.0 U	0.60 U	0.12 J	53.3	6.22	12.2	175	4.20	6.77	108.3	0.0
	2-Apr-19	79	0.87	6.64	2.55	0.2 U	2.5	1.0 U	0.60 U	0.39 J	75.2	11.2	13.5	173.2	3.74	6.61	114.2	16.99
	6-Jun-19	79	0.85	7.16	2.43	0.2 U	0.72	1.0 U	0.60 U	0.50 U	18.9	2.44	14.3	187.0	4.07	6.66	143.2	2.45
	10-Sep-19	80	0.89	7.15	2.52	0.2 U	0.89	1.0 U	0.60 U	0.50 U	27.8	2.82	13.9	169	4.43	6.53	113.3	1.82
	3-Mar-20	80	0.90	6.61	2.54	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	42.8	4.10	12.12	166.7	4.46	6.44	129.5	4.48
	1-Sep-20	81	0.83	7.05	2.42	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	40.1	4.10	14.1	251.7	4.32	6.68	150.6	2.00
	3-Mar-21	81	0.9	7.33	2.73	0.2 U	1.0 U	0.55 U	0.47 U	0.26 J	103	10.30	12.6	166.6	4.80	6.49	101.8	0.10
	14-Sep-21	85	0.83	6.89	2.68	0.2 U	1.0 U	1.0 U	2.0 U	0.31 J	113	16.40	14.0	186.3	3.70	6.56	115.9	2.61
DA-9b	5-Dec-16	58	0.95	10.3	2.83	<0.20	<0.63	<0.22	<0.24	0.40 J	244	148	11.8	153	6.1	5.80	311	7
	21-Mar-17	55	0.87	9.44	2.77	<0.2	<0.63	<0.22	<0.24	0.56	252	72.7	11.8	128	4.2	6.30	219	2
	22-Jun-17	56	0..99	8.67	2.79	<0.2	<0.63	<0.22	<0.23	0.40 J	86	24.3	12.3	112	7	6.1	124	10.00
	7-Sep-17	56	1.18	9.06	2.86	<0.2	<1.3	<1	<0.6	0.18 J	63	23.8	12.8	144	7	6.3	193	1.50
	9-Nov-17	55	1.2	8.4	2.9	<0.2 HF	<5	<5	<5	0.68 J	<0.5	0.036	11.9	115	6.2	6.10	313	9
	3-Apr-18	56	1.15	8.16	2.78	0.2 U	1.3 U	1.0 U	0.60 U	0.69	115	66.1	12.2	130.2	6.73	6.08	220.3	4.7
	12-Jun-18	58	1.13	8.88	2.69	0.2 U	1.3 U	1.0 U	0.60 U	0.37 J	75.7	45.4	13.1	204.1	7.30	6.04	144.9	21.3
	6-Sep-18	58	0.96	7.98	2.41	0.2 U	1.3 U	1.0 U	0.60 U	0.18 J	203	130	14.8	146.3	6.71	6.18	158	7.4
	4-Dec-18	59	1.00	8.36	2.32	0.2 U	1.3 U	1.0 U	0.60 U	0.16 J	130	78.9	12.5	142	5.44	6.45	111.1	0.0
	2-Apr-19	62	0.86	8.20	2.39	0.2 U	1.3 U	1.0 U	0.60 U	0.29 J	56.5	33.1	13.1	145.4	6.36	6.30	166.4	1.31
	4-Jun-19	62	0.84	8.65	2.29	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	73.7	30.7	13.3	158.4	7.15	6.33	158.9	3.25
	10-Sep-19	63	0.85	8.16	2.43	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	101	26.9	13.7	143	7.17	6.19	140	2.46
	4-Mar-20	63	0.69	8.81	2.51	0.2 U	1.3 U	1.0 U	0.60 U	0.28 J	53.6	35.9	12.6	146.2	6.16	6.12	108.1	2.30
	1-Sep-20	65	0.85	8.95	2.65	0.2 U	1.3 U	1.0 U	0.60 U	0.44 J	108	56.8	13.8	223.9	7.32	6.04	165.3	3.05
	2-Mar-21	68	0.82	10.1	3.06	0.2 U	1.0 U	0.55 U	0.47 U	0.39 J	92.6	52.7	12.3	149.0	6.71	6.28	162.2	1.53
	14-Sep-21	68	0.92	9.38	3.03	0.2 U	1.0 U	1.0 U	2.0 U	0.36 J	89.4	50.9	13.7	162.8	6.78	6.24	167.8	7.72
DA-11a	10-Aug-16	95	<0.10	8.13	2.78	<0.20	11	<0.22	<0.24	0.91	366	717	12.0	208	0.3	6.75	73	6
	1-Dec-16	97	<0.10	8.17	2.79	<0.20	12	<0.22	<0.24	1.03	182	443	11.4	206	<0.5	6.48	129	21
	21-Mar-17	99	<0.1	8.29	2.61	<0.2	13	<0.22	<0.24	1.08	482	474	10.8	211	<0.5	7.00	50	6
	21-Jun-17	98	<0.1	7.95	2.78	<0.2	12	<0.22	<0.23	1.26	382	468	11.5	215	0	6.7	53	2.70
	6-Sep-17	98	0.13	9.34	2.82	<0.2	15	<1	<0.6	0.84	1290	808	11.9	211	NA	7.0	37	13.00
	9-Nov-17	97	<0.2	8.6	2.9	<0.2 HF	46	<5	<5	1.1	3.2	2.2	11.6	168	3.8	6.60	120	7
	3-Apr-18	98	0.10 U	8.55	2.85	0.2 U	24	1.0 U	0.60 U	1.25	897	818	12.4	188.7	1.10	6.58	81.8	5.2

Table D-1. MNA Parameter Concentrations

Well ID	Sample Date	Alkalinity (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fe(II) (mg/L)	Methane (ug/L)	Ethene (ug/L)	Ethane (ug/L)	TOC (mg/L)	Fe (ug/L)	Mn (ug/L)	Temp-Hydro (°C)	Conductance (uS/cm)	DO-Hydro (mg/L)	pH (units)	Redox (E_H) (mV)	Turbidity (NTUs)
DA-11a (cont.)	11-Jun-18	100	0.10 U	8.27	2.65	0.2 U	26	1.0 U	0.60 U	0.91	152	522	11.9	187.7	0.73	6.63	69.8	1.9
	4-Sep-18	103	0.10 U	8.94	2.84	0.2 U	30	1.0 U	0.60 U	0.83	274	486	13.7	--	0.86	7.50	27.3	44.8
	3-Dec-18	99	0.10 U	9.15	2.87	0.2 U	38	1.0 U	0.60 U	0.67	149	600	12.3	214	0.68	6.81	91.6	0.02
	1-Apr-19	103	0.05 J	8.96	2.73	0.2 U	14	1.0 U	0.60 U	0.86	90.4	465	12.3	202.0	0.20	6.83	85.4	2.42
	3-Jun-19	104	0.10 U	9.21	2.78	0.2 U	21	1.0 U	0.60 U	0.59	451	689	14.4	224.6	0.41	6.81	59.6	27.25
	9-Sep-19	102	0.10 U	9.29	2.88	0.2 U	12	1.0 U	0.60 U	0.66	721	600	15.4	15.5	1.35	6.80	33.5	6.46
	2-Mar-20	101	0.10 U	9.01	2.78	0.2 U	8.7	1.0 U	0.60 U	0.73	302	651	11.5	193.1	0.75	6.77	89.7	2.09
	31-Aug-20	103	0.10 U	8.98	2.63	0.2 U	16	1.0 U	0.60 U	2.02	1590	1050	12.9	299	1.70	6.33	82.6	8.91
	1-Mar-21	105	0.10 U	8.81	2.75	0.2 U	9.1	0.55 U	0.47 U	1.00	593	900	12.6	192	1.45	6.80	91.5	2.88
	13-Sep-21	106	0.10 U	8.51	2.75	0.2 U	31	1.0 U	2.0 U	1.00	425	570	14.1	198	2.83	6.62	106.0	8.01
DA-11b	10-Aug-16	110	<0.10	10.4	2.89	<0.20	6.1	<0.22	<0.24	0.49 J	283	551	11.7	242	0.2	7.13	37	6
	1-Dec-16	102	<0.10	8.53	2.74	<0.20	16	<0.22	<0.24	1.25	496	573	10.8	218	<0.5	6.60	103	5
	21-Mar-17	99	<0.1	8.34	2.67	<0.2	27	<0.22	<0.24	1.18	135	507	10..8	212	<0.5	7.00	76	2
	21-Jun-17	98	<0.1	7.97	2.72	<0.2	17	<0.22	<0.23	1.65	191	511	11.2	213	0	6.6	82	39.00
	6-Sep-17	99	0.12	9.19	2.8	0.45	16	<1	<0.6	0.82	3760	663	11.4	210	NA	6.9	23	34.00
	9-Nov-17	87	<0.2	8.1	2.9	<0.2 HF	78	<5	<5	1.2	0.74	0.53	11.2	165	0.0	6.70	117	8
	3-Apr-18	97	0.10 U	8.67	2.87	0.2 U	46	1.0 U	0.60 U	1.35	232	484	10.6	183.7	0.42	6.54	64.2	2.5
	11-Jun-18	99	0.10 U	8.2	2.63	0.2 U	31	1.0 U	0.60 U	1.01	194	556	11.4	187.1	8.70	6.71	48.6	0.6
	4-Sep-18	100	0.10 U	8.92	2.90	0.2 U	35	1.0 U	0.60 U	0.88	133	489	12.1	--	0.54	7.57	3.1	0.2
	3-Dec-18	99	0.10 U	9.28	2.96	0.2 U	58	1.0 U	0.60 U	0.77	124	560	11.2	211	1.49	6.77	58.3	0.0
	1-Apr-19	98	0.03 J	8.79	2.83	0.2 U	21	1.0 U	0.60 U	0.90	180	552	11.7	195.6	0.60	6.82	63.5	8.7
	3-Jun-19	98	0.10 U	8.99	2.86	0.2 U	36	1.0 U	0.60 U	0.58	147	591	12.6	215.3	0.25	6.78	35.6	2.1
	9-Sep-19	98	0.10 U	9.10	2.89	0.2 U	24	1.0 U	0.60 U	0.62	175	528	12.4	204	1.07	6.77	39.7	2.14
	2-Mar-20	96	0.10 U	9.13	2.89	0.2 U	26	1.0 U	0.60 U	0.73	130	538	10.6	183.8	0.87	6.74	69.1	0.90
	31-Aug-20	99	0.10 U	8.95	2.65	0.5	14	1.0 U	0.60 U	1.21	142	557	12.0	288.7	2.35	6.38	74.3	1.72
	1-Mar-21	99	0.10 U	8.95	2.84	0.5	24	0.55 U	0.47 U	0.9	189	540	10.5	183.0	0.65	6.77	84.2	2.55
	13-Sep-21	100	0.10 U	8.74	2.80	0.2 U	24	1.0 U	2.0 U	1.00	172	612	12.4	190.2	2.67	6.59	96.5	2.17
DA-13a	7-Sep-17	41	1.05	5.3	2.51	<0.2	0.35 T	<1	<0.6	0.09 J	58	3.2	12.9	104	8	6.5	174	1.40
	8-Nov-17	35	1.2	4.8	2.5	<0.2 HF	0.32 J	<5	<5	0.61 J	<0.5	0.0038 J	11.8	83	8.2	6.00	352	4
DA-21b	11-Aug-16	73	0.97	9.08	2.66	<0.20	0.40 J	<0.22	<0.24	0.49 J	564	19	12.5	166	6.9	6.20	169	8
	5-Dec-16	75	0.98	9.35	2.69	<0.20	<0.63	<0.22	<0.24	0.32 J	6.6 J	0.62 J	12.7	129	8	6.1	152	1.00
Duplicate	5-Dec-16	74	0.97	9.49	2.69	<0.20	<0.63	<0.22	<0.24	0.28 J	25.4	1.17	--	--	--	--	--	--
	23-Mar-17	73	0.95	8.33	2.76	<0.2	<0.63	<0.22	<0.24	0.34 J	19	1.8	12.4	173	5	6.5	180	0.50
Duplicate	23-Mar-17	74	0.94	8.42	2.7	<0.2	<0.63	<0.22	<0.24	0.19 J	17	1.4	--	--	--	--	--	--
	22-Jun-17	69	0.98	8.07	2.73	<0.2	0.31 J	<0.22	<0.23	0.55	22	4.4	11.6	127	7.5	6.30	368	8
Duplicate	22-Jun-17	69	0.97	7.99	2.73	<0.2	<0.63	<0.22	<0.23	0.7	22	3.4	--	--	--	--	--	--
	7-Sep-17	74	0.99	9.77	2.75	<0.2	<1.3	<1	<0.6	<0.5	17 J	0.7 J	13.4	186	4.9	6.53	316	9
Duplicate	7-Sep-17	75	0.98	9.77	2.74	<0.2	0.31 T	<1	<0.6	<0.5	16 J	0.7 J	--	--	--	--	--	--
	8-Nov-17	71	1.1	8.8	2.7	<0.2 HF	<5	<5	<5	0.37 J	<0.5	0.0052 J	12.0	181	5.0	6.50	223	5
Duplicate	8-Nov-17	69	1.1	8.9	2.7	<0.2 HF	<5	<5	<5	0.40 J	0.15 J	0.012 J	--	--	--	--	--	--
	2-Apr-18	72	1.14	8.37	2.77	0.2 U	1.3 U	1.0 U	0.60 U	0.66	75.0	3.68	12.7	333.0	6.04	6.33	153.4	2.2
	12-Jun-18	73	1.12	9.17	2.84	0.2 U	1.3 U	1.0 U	0.60 U	0.34 J	17.9	0.97	13.1	269.1	5.71	6.37	102	5.8
	5-Sep-18	73	1.01	8.56	2.64	0.2 U	1.3 U	1.0 U	0.60 U	0.20 J	22.0	0.65	14.0	172.1	5.47	5.81	101	8.7
Duplicate	5-Sep-18	72	1.02	8.65	2.64	0.2 U	1.3 U	1.0 U	0.60 U	0.16 J	8.6	0.52	--	--	--	--	--	--
	4-Dec-18	67	1.06	8.07	2.51	0.2 U	1.3 U	1.0 U	0.60 U	0.51	84.9	2.92	12.3	156	5.35	6.38	128.7	1.22
	2-Apr-19	73	1.01	8.05	2.52	0.2 U	1.3 U	1.0 U	0.60 U	0.36 J	22.9	1.21	13.6	162.4	6.01	6.46	174.7	1.89

Table D-1. MNA Parameter Concentrations

Well ID	Sample Date	Alkalinity (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fe(II) (mg/L)	Methane (ug/L)	Ethene (ug/L)	Ethane (ug/L)	TOC (mg/L)	Fe (ug/L)	Mn (ug/L)	Temp-Hydro (°C)	Conductance (uS/cm)	DO-Hydro (mg/L)	pH (units)	Redox (E_H) (mV)	Turbidity (NTUs)
DA-21b (cont.)	4-Jun-19	72	0.98	8.14	2.42	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	19.5	0.95	14.2	177.1	6.05	6.52	169.4	2.8
	10-Sep-19	73	0.96	8.18	2.30	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	25.5	1.25	14.1	158	6.30	6.45	144.8	1.90
	3-Mar-20	72	0.90	7.83	2.49	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	25.7	1.35	12.7	154.5	6.48	6.29	140.8	1.61
	1-Sep-20	73	0.86	7.89	2.45	0.2 U	1.3 U	1.0 U	0.60 U	0.69	83.6	5.88	14.5	235.6	6.70	6.35	148.4	4.24
	2-Mar-21	76	0.95	8.29	2.81	0.2 U	1.0 U	0.55 U	0.47 U	0.45 J	76.2	3.94	12.3	155.5	6.66	6.45	164.7	2.53
	14-Sep-21	82	0.94	8.17	2.83	0.2 U	1.0 U	1.0 U	2.0 U	0.30 J	54.4	2.58	14.6	170.3	7.01	6.33	159.8	2.45
DA-28	10-Aug-16	50	0.65	4.98	2.76	<0.20	0.38 J	<0.22	<0.24	0.6	436	79.2	12.5	126	162.0	6.31	240	8
	30-Nov-16	50	0.72	8.51	2.75	<0.20	<0.63	<0.22	<0.24	1.13	1600	224	11.6	134	1.7	6.10	226	19
	21-Jun-17	54	0.19	3.13	2.47	0.21	20	<0.22	<0.23	1.59	163	68.7	10.9	119	1	6.1	134	0.70
	5-Sep-17	52	0.54	4.81	2.67	<0.2	<1.3	<1	<0.6	0.78	148	58.5	11.9	119	1	6.6	110	10.00
	9-Nov-17	50	0.62	5.4	2.6	<0.2 HF	<5	<5	<5	0.94 J	0.35 J	0.15	12.0	96	1.0	5.50	243	4
	4-Apr-18	47	0.24	4.61	2.47	0.2 U	1.3 U	1.0 U	0.60 U	1.58	96.0	95.9	9.5	185.8	1.34	5.87	208.5	2.6
	11-Jun-18	53	0.20	3.39	2.21	0.2 U	57	1.0 U	0.60 U	1.04	71.4	35.1	12.9	284.2	1.16	6.07	123	2.6
	4-Sep-18	54	0.48	4.7	2.49	0.2 U	1.3 U	1.0 U	0.60 U	0.67	63.3	74.0	13.1	--	1.59	6.66	87.1	6.2
	3-Dec-18	53	0.56	6.35	2.50	0.2 U	0.75 J	1.0 U	0.60 U	0.41 J	59.7	52.0	11.5	127	1.41	6.32	201.1	0.42
	1-Apr-19	48	0.41	5.55	2.23	0.2 U	1.3 U	1.0 U	0.60 U	0.88	67.9	45.4	10.9	107.7	2.38	6.29	168.5	2.08
	3-Jun-19	55	0.43	5.18	2.31	0.2 U	1.3 U	1.0 U	0.60 U	0.62	44.5 UJ	13.7	12.4	125.8	1.99	6.22	188.9	2.44
Duplicate	3-Jun-19	54	0.44	5.24	2.31	0.2 U	1.3 U	1.0 U	0.60 U	0.55	47.0 UJ	15.6	--	--	--	--	--	--
	9-Sep-19	55	0.61	5.97	2.42	0.2 U	1.3 U	1.0 U	0.60 U	0.30 J	56.8 UJ	28.1	13.2	125	2.27	6.18	118.2	2.12
	2-Mar-20	49	0.41	6.00	2.24	0.2 U	1.3 U	1.0 U	0.60 U	0.91	71.1	30.9	9.8	104.8	3.05	6.24	161.0	1.92
	31-Aug-20	57	0.56	5.38	2.51	0.2 U	1.3 U	1.0 U	0.60 U	0.96	103	67.8	12.1	186.1	2.39	5.14	187.3	2.22
Duplicate	31-Aug-20	58	0.53	5.38	2.56	0.2 U	1.3 U	1.0 U	0.60 U	0.92	227	134	--	--	--	--	--	--
	1-Mar-21	53	0.42	6.07	2.42	0.2 U	1.0 U	0.55 U	0.47 U	1.00	200	234	9.1	110	3.6	6.26	98.2	4.72
Duplicate	1-Mar-21	54	0.43	6.00	2.46	0.2 U	1.0 U	0.55 U	0.47 U	1.00	161	150	--	--	--	--	--	--
	13-Sep-21	61	0.44	5.10	2.83	0.2 U	1.0 U	1.0 U	2.0 U	0.8	189	228	12.9	124.9	2.48	5.79	183.5	4.53
DA-29	9-Aug-16	85	1.04	7.98	2.81	<0.20	<0.63	<0.22	<0.24	0.37 J	336	10.8	12.5	126	162.0	6.31	240	8
	1-Dec-16	82	1.09	7.96	2.8	<0.20	0.37	<0.22	<0.24	0.39 J	234	6.26	11.6	134	1.7	6.10	226	19
	20-Mar-17	82	0.96	7.51	2.66	<0.2	<0.63	<0.22	<0.24	0.43 J	121	3.6	10.9	119	1	6.1	134	0.70
	21-Jun-17	89	0.68	6.5	2.84	<0.2	<0.63	<0.22	<0.23	0.75	87	8.9	11.9	119	1	6.6	110	10.00
	5-Sep-17	88	1.04	7.75	2.84	<0.2	0.44 T	<1	<0.6	0.24 J	37	5.9	12.0	96	1.0	5.50	243	4
	7-Nov-17	77	1.2	7.3	3	<0.2 HF	1.1 J	<5	<5	0.69 J	0.28 J	0.0095 J	9.5	185.8	1.34	5.87	208.5	2.6
	2-Apr-18	88	0.89	6.45	2.55	0.2 U	1.3 U	1.0 U	0.60 U	1.00	583	11.7	12.9	284.2	1.16	6.07	123	2.6
	12-Jun-18	87	0.81	6.42	3.44	0.5	1.3 U	1.0 U	0.60 U	0.66	464	21.8	12.3	303.6	3.89	6.86	-54	5.3
	5-Sep-18	86	0.94	6.91	3.12	0.2 U	1.3 U	1.0 U	0.60 U	0.58	290	2.75	12.8	191.4	6.47	6.13	40	2.9
	4-Dec-18	80	1.02	7.34	2.84	0.2 U	1.3 U	1.0 U	0.60 U	0.86	137	5.18	12.4	176	5.02	6.75	98.7	1.28
	2-Apr-19	82	0.90	6.32	2.52	0.2 U	1.3 U	1.0 U	0.60 U	0.40 J	275	6.17	12.6	177.0	5.27	6.78	138.1	5.60
	4-Jun-19	88	0.98	6.62	2.47	0.2 U	1.3 U	1.0 U	0.60 U	0.11 J	225	7.45	11.9	201.3	5.33	6.86	161	45.5
	9-Sep-19	83	0.96	7.11	2.39	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	283	7.45	13.3	182	6.73	6.73	88.5	4.60
	2-Mar-20	79	0.89	6.35	2.41	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	243	7.03	11.6	151.2	5.23	6.63	105.2	3.95
	31-Aug-20	88	0.89	6.85	2.51	0.2 U	1.3 U	1.0 U	0.60 U	0.83	549	19.1	13.2	242.5	6.20	6.81	108.6	7.41
	2-Mar-21	78	0.87	6.06	2.43	0.2 U	1.0 U	0.55 U	0.47 U	0.60	1080	18.4	11.0	159.0	5.73	6.70	101.4	28.15
	13-Sep-21	87	0.76	6.12	2.98	0.2 U	2.20	1.0 U	2.0 U	1.30	529	13.2	13.0	181.7	5.04	6.68	97.1	19.83
Duplicate	13-Sep-21	86	0.70	5.78	3.2	0.2 U	1.70	1.0 U	2.0 U	1.40	1080	25.0	--	--	--	--	--	--
DA-30a	9-Aug-16	49	0.23	7.61	2.81	<0.20	<0.63	<0.22	<0.24	0.64	974	28.9	12.5	127	0.4	6.27	316	14
	30-Nov-16	51	0.37	7.4	2.84	<0.20	<0.63	<0.22	<0.24	0.71	544	27.7	12.6	130	<0.5	5.90	253	18
	20-Mar-17	48	0.45	7.79	2.78	<0.2	<0.63	<0.22	<0.24	1.13	492	46.3	10.6	125	2.1	6.70	171	21

Table D-1. MNA Parameter Concentrations

Well ID	Sample Date	Alkalinity (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fe(II) (mg/L)	Methane (ug/L)	Ethene (ug/L)	Ethane (ug/L)	TOC (mg/L)	Fe (ug/L)	Mn (ug/L)	Temp-Hydro (°C)	Conductance (uS/cm)	DO-Hydro (mg/L)	pH (units)	Redox (E_H) (mV)	Turbidity (NTUs)
DA-30a (cont.)	21-Jun-17	51	<0.10	4.95	2.67	<0.2	2.5	<0.22	<0.23	1.46	316	41.2	10.7	120	0	6.0	172	2.00
	5-Sep-17	52	0.24	7.47	2.75	<0.2	<1.3	<1	<0.6	0.86	19200	670	12.9	122	0	6.4	75	89.00
	7-Nov-17	50	0.36	7.2	2.7	<0.2 HF	0.45 J	<5	<5	0.63 J	<0.5	0.01 J	13.2	100	1.7	6.00	445	3
	2-Apr-18	49	0.23	6.79	2.63	0.2 U	0.60 J	1.0 U	0.60 U	1.25	532	26.3	11.1	209.5	0.62	6.07	169.6	18.3
	12-Jun-18	53	0.29	7.24	2.75	0.2 U	1.3 U	1.0 U	0.60 U	0.65	66.3	9.41	11.6	194.1	0.32	6.07	116	1.8
	4-Sep-18	54	0.36	7.42	2.66	0.2 U	1.3 U	1.0 U	0.60 U	0.46 J	64.7	14.0	14.4	2000	0.68	6.27	87	5.0
	3-Dec-18	53	0.44	7.64	2.78	0.2 U	1.3 U	1.0 U	0.60 U	0.55	59.0	14.5	14.4	128	0.45	6.19	126.7	1.57
Duplicate	3-Dec-18	53	0.46	7.63	2.81	0.2 U	1.3 U	1.0 U	0.60 U	0.74	64.5	17.0	--	--	--	--	--	--
	1-Apr-19	55	0.55	7.50	2.52	0.2 U	1.3 U	1.0 U	0.60 U	0.37 J	53.9	11.8	12.5	122.5	0.95	6.23	173.2	2.72
	3-Jun-19	55	0.55	7.25	2.65	0.2 U	1.3 U	1.0 U	0.60 U	0.13 J	58.9	5.63	12.7	133.5	0.77	6.24	159.6	2.9
	9-Sep-19	55	0.64	7.61	2.68	0.2 U	1.3 U	1.0 U	0.60 U	0.16 J	39.2	4.40	13.7	130	0.46	6.06	134.5	1.74
	2-Mar-20	53	0.61	8.29	2.59	0.2 U	1.3 U	1.0 U	0.60 U	0.64	27.9	7.12	11.9	116.5	2.59	6.08	160.0	1.68
	31-Aug-20	56	0.62	7.77	2.47	0.2 U	1.3 U	1.0 U	0.60 U	0.56	40.7	34.4	14.1	173.1	0.98	6.19	163.3	2.13
	2-Mar-21	54	0.52	7.56	2.78	0.2 U	1.0 U	0.55 U	0.47 U	1.00	72.4	18.8	10.9	123.0	2.32	6.15	109.5	2.25
Duplicate	2-Mar-21	54	0.52	7.62	2.77	0.2 U	1.0 U	0.55 U	0.47 U	1.00	63.4	14.1	--	--	--	--	--	--
	13-Sep-21	58	0.54	6.95	2.75	0.2 U	2.20	1.0 U	2.0 U	0.60	229	62.0	13.5	137.8	0.61	6.12	145.2	2.24
DA-30b	9-Aug-16	88	0.53	9.85	3.58	<0.20	0.42 J	<0.22	<0.24	0.37 J	441	15.3	11.9	207	1.5	6.55	176	12
	30-Nov-16	89	0.59	9.72	3.44	<0.20	<0.63	<0.22	<0.24	0.24 J	150	3.48	11.1	213	1.2	6.20	245	1
	20-Mar-17	85	0.61	9.81	3.45	<0.2	<0.63	<0.22	<0.24	0.65	386	12.2	11.0	204	1.5	7.00	147	10
	21-Jun-17	88	0.52	8.65	3.28	<0.2	<0.63	<0.22	<0.23	0.89	295	141	11.3	201	1	6.4	138	1.10
	5-Sep-17	90	0.6	10.1	3.5	<0.2	<1.3	<1	<0.6	0.48 J	172	7.2	11.7	210	1	6.6	99	3.60
	7-Nov-17	88	0.7	9.5	3.4	<0.2 HF	<5	<5	<5	0.48 J	0.36 J	0.019 J	11.7	161	1.4	6.20	460	31
	2-Apr-18	87	0.63	9.22	3.31	0.2 U	1.3 U	1.0 U	0.60 U	0.71	192	6.63	11.6	381.6	12.9	6.33	143.2	6.0
	12-Jun-18	88	0.64	9.64	3.38	0.2 U	1.3 U	1.0 U	0.60 U	0.30 J	157	10.7	11.6	310.5	1.53	6.33	90	3.5
	4-Sep-18	90	0.77	9.61	3.33	0.2 U	1.3 U	1.0 U	0.60 U	0.28 J	107	5.66	13.0	3201	1.70	6.60	73.0	2.3
	3-Dec-18	89	0.71	9.73	3.54	0.2 U	1.3 U	1.0 U	0.60 U	0.51	148	5.71	12.3	203	1.14	6.50	87.0	7.8
	1-Apr-19	88	0.72	9.28	3.11	0.2 U	1.3 U	1.0 U	0.60 U	0.23 J	85.3	3.92	11.5	185.8	1.93	6.49	148.4	3.91
	3-Jun-19	87	0.68	9.52	3.28	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	68.8	2.61	12.4	201	1.57	6.47	144.7	3.2
Duplicate	3-Jun-19	87	0.68	9.43	3.22	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	92.3	2.88	--	--	--	--	--	--
	9-Sep-19	84	0.66	9.26	3.20	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	51.3	1.80	12.6	185	1.08	6.31	119.3	2.57
	2-Mar-20	79	0.68	8.89	3.06	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	48.1	3.35	11.7	162.9	1.37	6.33	141.9	1.72
	31-Aug-20	86	0.66	7.13	2.48	0.2 U	1.3 U	1.0 U	0.60 U	0.44 J	169	5.81	12.6	245.0	1.38	6.44	14.8	5.92
	2-Mar-21	85	0.72	9.02	3.18	0.2 U	1.0 U	0.55 U	0.47 U	0.50 U	100	5	10.3	181.0	2.39	6.42	103.9	0.64
	13-Sep-21	90	0.73	8.61	3.15	0.2 U	9.2	1.0 U	2.0 U	0.34 J	105	4.78	12.2	197.8	1.18	6.34	143.6	1.62
DA-31	17-Aug-16	79	0.73	7.54	2.34	<0.20	<0.63	<0.22	<0.24	0.6	1150	80.5	12.9	188	3.9	5.88	123	5 (est)
	1-Dec-16	81	0.72	7.42	2.33	<0.20	0.41	<0.22	<0.24	0.37 J	236	40.4	11.8	181	2.7	6.40	182	2
	23-Mar-17	76	0.81	6.31	2.33	<0.2	<0.63	<0.22	<0.24	0.2 J	739	27.4	11.6	172	3.6	7.10	128	2
	26-Jun-17	72	0.7	5.36	2.27	<0.2	0.42 J	<0.22	<0.23	0.63	341	14.4	12.8	162	6	6.7	187	5.00
	8-Sep-17	80	0.77	7.58	2.38	<0.2	0.35 T	<1	<0.6	<0.5	1490	66.8	12.2	174	3	6.9	110	25.00
	8-Nov-17	71	0.82	7.1	2.4	<0.2 HF	<5	<5	<5	0.43 J	0.34 J	0.029	12.0	136	3.0	6.20	297	14
	2-Apr-18	77	0.81	6.69	2.36	0.2 U	1.3 U	1.0 U	0.60 U	0.69	687	60.0	12.1	308.7	3.52	6.40	178.8	19.2
	13-Jun-18	76	0.8	6.68	2.20	0.2 U	1.3 U	1.0 U	0.60 U	0.26 J	1040	77.0	12.5	254.9	3.84	6.44	90.9	9.4
	6-Sep-18	77	0.76	7.02	2.42	0.2 U	1.3 U	1.0 U	0.60 U	0.12 J	1390	65.8	13.8	187.2	3.38	5.15	37.9	31.6
	5-Dec-18	76	0.83	7.08	2.43	0.2 U	1.3 U	1.0 U	0.60 U	0.30 J	257	35.6	13.2	171	2.16	6.63	112.4	8.5
	3-Apr-19	77	0.78	6.42	2.43	0.2 U	1.3 U	1.0 U	0.60 U	0.09 J	660	48.9	12.8	162.4	3.50	6.60	123.9	13.99
	5-Jun-19	74	0.79	7.03	2.43	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	2950	98.7	13.2	178.7	3.62	6.57	119.4	12.6

Table D-1. MNA Parameter Concentrations

Well ID	Sample Date	Alkalinity (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fe(II) (mg/L)	Methane (ug/L)	Ethene (ug/L)	Ethane (ug/L)	TOC (mg/L)	Fe (ug/L)	Mn (ug/L)	Temp-Hydro (°C)	Conductance (uS/cm)	DO-Hydro (mg/L)	pH (units)	Redox (E_H) (mV)	Turbidity (NTUs)
DA-31 (cont.)	11-Sep-19	75	0.75	7.11	2.46	0.2 U	0.52 J	1.0 U	0.60 U	0.50 U	1660	91.2	14.7	168	3.51	6.57	71.2	20.30
Duplicate	11-Sep-19	75	0.76	7.07	2.45	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	1490	80.9	--	--	--	--	--	--
	3-Mar-20	74	0.75	6.59	2.46	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	520	34.2	12.5	158.3	3.56	6.46	108.2	8.45
	2-Sep-20	78	0.73	6.81	2.50	0.2 U	1.3 U	1.0 U	0.60 U	0.54	1200	78.4	13.8	237	3.65	6.65	121.0	14.09
	3-Mar-21	79	0.71	6.71	2.74	0.2 U	1.0 U	0.55 U	0.47 U	0.60	1240	125	12.4	158	3.08	6.47	96.4	10.16
	14-Sep-21	80	0.70	6.40	2.66	0.2 U	1.8	1.0 U	2.0 U	0.60	714	56.5	13.4	174	3.22	6.53	22.1	12.60
DA-32	17-Aug-16	469	<0.10	0.6	2.77	25.7	4100	0.56 J	0.15 J	136	32100	14200	12.6	100	0.5	5.95	-90	--
	6-Dec-16	163	<0.10	0.10 J	2.44	19.6	5100	0.54	0.15	76.6	22,300	3,390	11.2	355	--	6.40	67	44
	23-Mar-17	209	0.04	0.16	2.4	12.9	3200	<0.22	<0.24	50	18000	3710	11.3	432	5.1	6.50	-9	70
	26-Jun-17	326	<0.1	0.11 J	2.66	12.9	9000	0.28 J	0.23 J	16.7	22000	5740	13.4	615	0	6.3	20	74.00
	11-Sep-17	335	0.61	0.34	2.64	17.7	9000	<1	<0.6	15.7	19600	6010	13.0	622	0	6.3	-26	301.00
	10-Nov-17	270	<0.2	0.71 J	2.8	<0.2 HF	40000	<90	<90	13	19	5.2	9.7	364	4.2	6.10	121	--
	2-Apr-18	363	0.10 U	0.18 J	2.67	4.5	22000	0.87 J	0.68	9.1	19400	6040	12.4	1192	0.04	5.96	7.8	102.7
Duplicate	2-Apr-18	360	0.10 U	0.09 J	2.68	4.5	21000	0.83 J	0.71	9.1	21100	6470	--	--	--	--	--	--
	13-Jun-18	345	0.10 U	0.21	2.52	4.5	19000	0.66 J	0.54 J	15.7	19400	6420	14.7	5515	1.00	6.07	-46.9	186.0
	6-Sep-18	395	0.65	0.16 J	2.65	0.2 U	4900	0.30 J	0.60 U	7.3	22300	6760	13.8	792	0.42	4.52	-59.5	46.5
	4-Dec-18	451	0.10 U	0.38	2.71	5.0	10000	0.48 J	0.32 J	8.7	20600	8670	11.6	80	0.04	6.23	-13.8	10.4
	2-Apr-19	497	0.53	0.65	2.69	4.0	4100	1.0 U	0.60 U	11.6	21400	9060	12.0	879	-0.03	6.22	-30.6	76.89
	4-Jun-19	502	0.10 U	0.47	2.70	2.2	8700	0.48 J	0.35 J	12.7	23600	9720	12.3	977	0.00	6.28	-52.9	19.84
	10-Sep-19	497	0.10 U	0.50	2.80	2.0	7500	0.48	0.24 J	9.07 J	25000	8500	12.7	823	0.03	6.15	-42.4	19.20
	4-Mar-20	323	0.24	0.51	2.73	2.0	6400	1.0 U	0.60 U	6.37	21800	6160	11.5	587.0	0.00	5.97	-50.8	114.08
	1-Sep-20	195	0.10 U	1.16	2.46	0.2 U	12000	1.0 U	0.60 U	3.34	9870	2870	13.5	509	0.18	6.57	-110.3	67.05
	2-Mar-21	169	0.10 U	1.12	2.72	0.2 U	21000	0.34	0.25	2.20	7450	2660	11.5	242	0.30	6.37	45.0	158.24
	14-Sep-21	161	0.10 U	2.5	2.74	0.2 U	1.0 U	1.8	2.0 U	1.70	5070	2710	12.9	295	0.12	6.39	-140.0	18.58
DA-43	5-Dec-16	111	0.27	8.65	2.39	<0.20	0.99	0.3	0.38	0.49 J	6230	541	11.8	238	0.5	6.30	114	68
	21-Mar-17	100	0.53	8.21	2.27	<0.2	<0.63	<0.22	<0.24	0.53	58	228	11.6	219	1.6	7.10	118	0
	22-Jun-17	96	0.62	7.72	2.39	<0.2	0.34	<0.22	<0.23	0.69	37	41.5	11.8	214	3	6.6	53	6.00
	6-Sep-17	93	0.74	9.37	2.47	<0.2	0.38 J	<1	<0.6	0.15 J	1720	59.4	11.9	208	3	7.1	88	41.00
	10-Nov-17	88	0.84	8.7	2.5	<0.2 HF	0.85 J	<5	<5	0.57 J	<0.5	0.014 J	12.0	158	2.5	6.00	211	4
	3-Apr-18	90	0.92	9.09	2.55	0.2 U	0.67 J	1.0 U	0.60 U	0.58	324	19.4	12.1	3.3	6.51	6.51	193.2	10.8
	12-Jun-18	90	0.97	9.65	2.63	0.2 U	1.3 U	1.0 U	0.60 U	0.28 J	1420	55.0	12.6	322.6	3.71	6.61	56	32.7
	5-Sep-18	92	0.89	9.23	2.46	0.2 U	1.3 U	1.0 U	0.60 U	0.24 J	1210	30.5	13.8	205.4	3.41	5.99	45	34.0
	4-Dec-18	90	0.97	9.66	2.54	0.2 U	1.3 U	1.0 U	0.60 U	0.21 J	287	13.8	12.2	199	3.15	6.81	107.4	4.41
	2-Apr-19	90	0.91	8.90	2.53	0.2 U	1.3 U	1.0 U	0.60 U	0.21 J	193	7.85	12.6	199.4	3.74	6.71	128.6	3.86
	4-Jun-19	90	0.90	9.19	2.45	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	854	36.1	12.0	214.1	4.64	6.75	106.1	23.34
	10-Sep-19	90	0.91	9.26	2.60	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	386	12.1	13.4	192	3.54	6.59	95.4	9.23
	3-Mar-20	89	0.87	9.02	2.47	0.2 U	1.3 U	1.0 U	0.60 U	0.13 J	86.2	5.43	12.4	186.7	3.42	6.50	120.8	4.23
	1-Sep-20	90	0.83	8.77	2.25	0.2 U	1.3 U	1.0 U	0.60 U	0.32 J	263	11.1	13.3	281	4.48	6.66	127.1	9.31
	2-Mar-21	92	0.87	8.75	2.46	0.2 U	1.0 U	0.55 U	0.47 U	0.36 J	213	8.33	12.4	182	3.45	6.71	155.3	7.32
	14-Sep-21	96	0.79	8.55	2.56	0.2 U	1.0 U	1.0 U	2.0 U	0.37 J	387	22.3	13.3	204	3.41	6.66	107.9	11.72
DA-44	5-Dec-16	58	0.94	6.7	2.42	1.03	0.47	<0.22	0.14	0.38 J	13,200	462	11.6	142	5.8	5.70	206	109
	22-Mar-17	54	1.01	5.65	2.38	<0.2	0.42 JB	<0.22	<0.24	0.4 J	4270	85.8	11.8	132	7.6	7.40	159	2
	22-Jun-17	54	1.08	5.67	2.6	<0.2	<0.63	<0.22	<0.23	0.7	36900	601	12.2	131	8	6.1	120	2.40
	6-Sep-17	49	1.21	6.87	2.91	<0.2	<1.3	<1	<0.6	0.13 J	3890	72.8	12.3	129	8	6.5	160	90.00
	9-Nov-17	48	1.2	6.3	2.8	<0.2 HF	<5	<5	<5	0.5 J	1.1	0.025	11.4	92	8.2	5.40	338	246
	3-Apr-18	52	1.10	5.91	2.62	0.2 U	1.2 J	1.0 U	0.60 U	0.56	1920	43.6	12.3	115.1	7.81	6.09	185.0	21.5

Table D-1. MNA Parameter Concentrations

Well ID	Sample Date	Alkalinity (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fe(II) (mg/L)	Methane (ug/L)	Ethene (ug/L)	Ethane (ug/L)	TOC (mg/L)	Fe (ug/L)	Mn (ug/L)	Temp-Hydro (°C)	Conductance (uS/cm)	DO-Hydro (mg/L)	pH (units)	Redox (E_H) (mV)	Turbidity (NTUs)
DA-44 (cont.)	13-Jun-18	52	1.02	5.99	2.36	0.2 U	1.0 J	1.0 U	0.60 U	0.21 J	1850	47.7	12.7	189.3	8.18	5.99	147.7	22.1
	5-Sep-18	50	0.94	6.36	2.42	0.2 U	1.3 U	1.0 U	0.60 U	0.29 J	892	16.7	13.5	124.9	8.17	5.66	87	31.3
	4-Dec-18	51	0.93	6.36	2.31	0.2 U	1.3 U	1.0 U	0.60 U	0.45 J	1490	36.5	13.3	121	5.93	6.29	124.0	30.6
	2-Apr-19	55	0.87	5.76	2.36	0.2 U	1.3 U	1.0 U	0.60 U	0.16 J	1220	30.1	13.7	124.7	7.43	6.30	170.7	24.02
	4-Jun-19	55	0.79	5.79	2.33	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	974	23.7	13.5	133.9	7.76	6.28	171.6	18.3
	10-Sep-19	54	0.73	6.13	2.60	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	1090	24.3	13.9	120	7.92	6.24	156.8	22.94
	4-Mar-20	55	0.75	5.49	2.73	0.2 U	1.3 U	1.0 U	0.60 U	0.1 J	741	14.9	12.3	124.8	7.91	6.18	184.5	13.29
	1-Sep-20	56	0.72	6.02	2.48	0.2 U	1.3 U	1.0 U	0.60 U	0.72	1110	22.6	13.7	186.4	7.83	6.35	168.0	25.15
	2-Mar-21	58	0.85	5.66	2.82	0.2 U	1.0 U	0.55 U	0.47 U	0.30 J	358	7.33	11.9	130.0	7.68	6.27	121.4	5.44
	14-Sep-21	58	0.77	5.85	2.80	0.2 U	1.0 U	1.0 U	2.0 U	0.30 J	561	13.3	14.1	129.8	8.64	6.16	158.8	10.75
DA-45	1-Dec-16	47	<0.10	5.38	4.72	<0.20	3.8	1.2	20	0.87	2590	135	11.8	117	<0.5	8.20	-632	60
	22-Mar-17	59	<0.1	1.88	4.23	<0.2	2.9 B	1	1.2	0.8 J	967	76.1	12.1	146	0.5	10.00	-8	21
	26-Jun-17	52	<0.1	2.15	4.55	<0.2	3.4	1.1	1.4	0.78	433	87.6	12.1	127	0	9.1	-4	3.00
	6-Sep-17	46	0.14	2.55	4.65	<0.2	3.5	0.69 J	1	0.31 J	2670	168	12.6	110	0	8.5	-89	42.00
	8-Nov-17	43	0.025 J	3	4.5	<0.2 HF	4.4 J	0.72 J	1.7 J	1.4	0.17 J	0.11	12.0	87	0.2	7.40	194	4
	4-Apr-18	41	0.02 J	3.36	4.60	0.2 U	5.7	1.0 U	0.47 J	0.53	1470	137	13.1	171.9	0.36	8.02	-116.0	18.4
	13-Jun-18	43	0.10 U	2.70	4.20	0.2 U	14	1.0 U	0.47 J	0.17 J	508	107	12.6	155.3	1.09	7.47	-49.8	10.4
Duplicate	13-Jun-18	42	0.10 U	2.88	4.24	0.2 U	13	1.0 U	0.42 J	0.19 J	386	114	--	--	--	--	--	--
	6-Sep-18	41	0.10 U	3.56	4.46	0.2 U	15	1.0 U	0.33 J	0.10 U	184	99.7	14.3	102.9	0.37	7.94	-193	4.5
	5-Dec-18	41	0.10 U	3.48	4.47	0.2 U	52	1.0 U	0.37 J	0.56	315	111	13.5	102	0.27	7.95	-124.1	2.51
	3-Apr-19	6 J	0.06 J	2.27 UJ	4.40	0.2 U	83	0.36 J	0.30 J	0.13 J	355	110	13.2	99.1	1.20	7.96	-114.8	7.75
	5-Jun-19	41	0.10 U	3.55	4.36	0.2 U	79	1.0 U	0.60 U	0.50 U	349	110	13.7	102.2	0.34	7.97	-136.6	7.29
	11-Sep-19	40	0.10 U	3.64	4.40	0.2 U	33	1.0 U	0.60 U	0.50 U	213	99.3	13.3	99	0.14	7.89	-132.6	4.60
	3-Mar-20	40	0.10 U	3.60	4.22	0.2 U	23	1.0 U	0.60 U	0.50 U	322	108	12.4	92.4	1.72	7.74	35.6	6.20
	2-Sep-20	40	0.10 U	3.59	3.93	0.2 U	20	1.0 U	0.60 U	0.54	200	102	13.9	132.4	1.62	7.57	-30.2	4.89
	3-Mar-21	40	0.10 U	3.83	4.13	0.2 U	41	0.55 U	0.47 U	0.22 J	227	110	12.0	199.0	0.30	7.47	11.6	2.72
	14-Sep-21	41	0.03 J	3.37	3.28	0.2 U	54	1.0 U	1.0 U	0.27 J	905	111	14.9	92.4	2.26	7.42	53.3	9.21
DA-46	1-Dec-16	74	<0.10	5.5	3.37	<0.20	5.6	0.98	1.7	1.45	2940	241	11.7	165	<0.5	7.90	-231	40
	22-Mar-17	80	0.21	4.76	3	<0.2	0.4 JB	0.18 J	<0.24	0.31 J	112	115	11.6	174	0.9	8.20	47	16
	26-Jun-17	79	0.42	5	3.02	<0.2	0.33 J	0.12 J	<0.23	0.41 J	645	91.1	12.4	172	1	7.1	55	10.00
	6-Sep-17	80	0.48	5.76	3.02	<0.2	1.3	<1	<0.6	<0.5	4870	188	12.3	176	1	7.9	-13	62.00
	8-Nov-17	77	0.59	5.4	3	<0.2 HF	0.26 J	<5	<5	0.31 J	0.12 J	0.012 J	12.0	139	2.9	7.40	246	19
	4-Apr-18	81	0.57	5.44	3.06	0.2 U	1.3 U	1.0 U	0.60 U	0.51	519	26.5	12.0	305.5	3.03	7.48	181.8	19.6
	13-Jun-18	82	0.55	5.45	2.84	0.2 U	1.1 J	1.0 U	0.60 U	0.13 J	496	20.5	12.7	1588	2.72	7.63	85.5	14.6
	6-Sep-18	85	0.48	5.82	2.97	0.2 U	1.9 B	1.0 U	0.60 U	0.50 U	147	6.98	14.1	186.2	1.91	5.4	-17	5.3
	5-Dec-18	81	0.59	5.78	3.04	0.2 U	1.1 J	1.0 U	0.60 U	0.16 J	1460	51.3	12.4	180	1.75	7.70	59.4	29.29
	3-Apr-19	83	0.59	5.34	3.04	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	381	16.6	12.8	172.4	2.93	7.66	108.6	14.21
	5-Jun-19	84	0.56	5.94	3.00	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	246	10.6	14.4	191.3	2.05	7.63	57.6	6.6
	11-Sep-19	83	0.58	5.91	2.99	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	731	21.6	15.1	181	2.72	7.66	-16.9	18.40
	3-Mar-20	82	0.60	5.65	2.89	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	203	5.63	12.4	169.5	3.20	7.36	123.0	4.07
	1-Sep-20	82	0.59	5.52	2.72	0.2 U	1.3 U	1.0 U	0.60 U	0.38 J	267	9.13	14.2	244.7	3.30	7.80	81.2	8.17
	3-Mar-21	88	0.67	5.79	2.93	0.2 U	1.0 U	0.55 U	0.47 U	0.12 J	270	11.5	11.9	375.0	2.78	7.57	24.2	2.96
	14-Sep-21	88	0.73	5.47	2.80	0.2 U	1.0 U	1.0 U	2.0 U	0.12 J	448	19.1	13.9	177.2	4.10	7.51	111.3	11.80
DA-47	1-Dec-16	80	0.11	5.5	2.4	<0.20	6.6	1.2	2.6	1.95	174	136	11.6	168	<0.5	7.70	-511	1
	22-Mar-17	80	0.07 J	4.09	2.21	<0.2	1.8 B	0.38 J	0.51 J	0.64	128	114	11.6	162	<0.5	8.50	-111	2
	26-Jun-17	82	0.22	4.21	2.21	<0.2	2.5	0.27 J	0.33 J	0.51	45	88.8	11.8	167	0	8.0	-41	6.00

Table D-1. MNA Parameter Concentrations

Well ID	Sample Date	Alkalinity (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fe(II) (mg/L)	Methane (ug/L)	Ethene (ug/L)	Ethane (ug/L)	TOC (mg/L)	Fe (ug/L)	Mn (ug/L)	Temp-Hydro (°C)	Conductance (uS/cm)	DO-Hydro (mg/L)	pH (units)	Redox (E_H) (mV)	Turbidity (NTUs)
DA-47 (cont.)	6-Sep-17	80	0.16	4.45	2.24	<0.2	3.9	0.12 J	0.11 J	<0.5	436	85.2	11.9	167	0	7.9	-54	13.00
	8-Nov-17	76	0.25	4.8	2.3	<0.2 HF	1.3 J	<5	<5	0.31 J	<0.5	0.046	11.5	130	0.6	5.90	168	19
	3-Apr-18	85	0.32	4.90	2.28	0.2 U	1.5	1.0 U	0.60 U	0.46 J	319	28.7	11.5	159.2	1.82	7.61	193.2	13.5
	13-Jun-18	84	0.30	5.10	2.12	0.2 U	7.6	1.0 U	0.60 U	0.13 J	147	20.0	12.6	263.5	1.18	7.60	20.5	3.6
	6-Sep-18	83	0.30	5.40	2.27	0.2 U	21 B	1.0 U	0.60 U	0.50 U	117	21.3	13.4	192.3	1.33	6.20	-22.3	1.9
	5-Dec-18	85	0.34	5.37	2.28	0.2 U	58	1.0 U	0.60 U	0.11 J	69.9	25.2	12.1	177	0.79	7.61	92.3	0.1
	3-Apr-19	84	0.35	5.29	2.25	0.2 U	43	1.0 U	0.60 U	0.50 U	102 J	28.9	12.4	172.7	1.33	7.66	26.4	3.84
	5-Jun-19	83	0.33	5.65	2.30	0.2 U	43	1.0 U	0.60 U	0.50 U	85.1 J	25.1	12.8	180.4	0.99	7.65	124.6	3.26
	11-Sep-19	83	0.32	5.65	2.08	0.2 U	12	1.0 U	0.60 U	0.50 U	88.3	18.6	13.5	176	1.14	7.46	63.0	3.10
Duplicate	11-Sep-19	84	0.34	5.69	2.09	0.2 U	13	1.0 U	0.60 U	0.50 U	87.8	17.9	--	--	--	--	--	--
	3-Mar-20	87	0.38	5.88	2.23	0.2 U	3.8	1.0 U	0.60 U	0.50 U	31.8	10.9	12.1	109.6	1.12	7.40	99.5	1.69
Duplicate	3-Mar-20	86	0.37	5.88	2.28	0.2 U	4.1	1.0 U	0.60 U	0.50 U	34.4	11.0	--	--	--	--	--	--
	1-Sep-20	83	0.42	5.60	2.12	0.2 U	1.8	1.0 U	0.60 U	0.32 J	126	16.8	14.1	233	2.64	7.11	126.5	3.19
	3-Mar-21	86	0.65	5.78	2.22	0.2 U	2.3	0.55 U	0.47 U	0.36 J	352	34.7	11.7	165	1.93	7.40	109.8	4.31
	14-Sep-21	87	0.54	5.92	2.22	0.2 U	1.3	1.0 U	2.0 U	0.25 J	132	12.2	12.8	185	1.41	7.45	118.8	4.35
DA-48	6-Dec-16	72	<0.10	7.54	2.81	<0.20	2.1	0.33	0.56	0.47 J	12,000	631	11.7	161	<0.5	8.40	180	290
	22-Mar-17	75	<0.1	5.53	2.69	<0.2	2 B	0.36 J	0.59 J	0.2 J	5870	563	11.6	165	<0.5	8.70	-83	60
	26-Jun-17	67	<0.1	6.29	2.72	0.21	2.3	0.36 J	0.53 J	0.48 J	422	267	12.0	155	0	8.4	-59	18.00
	6-Sep-17	65	0.11	7.16	2.73	<0.2	1.8	0.28 J	0.38 J	<0.5	1060	303	11.9	155	0	8.2	-84	43.00
	8-Nov-17	69	0.027 J	7.5	2.7	<0.2 HF	6	0.86 J	1.4 J	0.47 J	0.74	0.27	11.6	124	0.2	8.00	202	14
	3-Apr-18	69	0.02 J	6.50	2.75	0.2 U	2.3	1.0 U	0.33 J	0.44 J	708	247	11.8	135.1	0.21	7.95	54.7	20.4
	13-Jun-18	70	0.02 J	6.32	2.56	0.2 U	2.8	1.0 U	0.40 J	0.50 U	375	253	12.3	1342	0.21	8.14	-59.6	18.6
	6-Sep-18	70	0.10 U	6.52	2.72	0.2 U	1.8	1.0 U	0.23 J	0.50 U	693	243	13.7	165.1	0.39	6.91	-126.4	31.6
	4-Dec-18	69	0.10 U	6.64	2.74	0.2 U	3.6	1.0 U	0.40 J	0.70 J	225	255	12.0	149	0.26	8.06	-102.4	5.13
	2-Apr-19	68	0.10 U	5.95	2.68	0.2 U	1.1 J	1.0 U	0.60 U	0.10 J	407	219	12.9	144.9	0.76	7.91	-72.9	12.65
	4-Jun-19	66	0.05 J	6.13	2.62	0.2 U	2.6	1.0 U	0.25 J	0.50 U	340	232	14.1	155.5	0.69	7.89	-73.0	10.7
	10-Sep-19	65	0.05	6.15	2.44	0.2 U	1.1	1.0 U	0.60 U	0.50 U	688	214	14.3	136	0.89	7.85	-78.7	20.97
	3-Mar-20	65	0.11	6.04	2.74	0.2 U	0.75	1.0 U	0.60 U	0.50 U	331	220	11.8	135.9	0.61	7.79	34.8	22.25
	1-Sep-20	66	0.11	5.86	2.57	0.2 U	0.95 J	1.0 U	0.60 U	0.76	184	195	13.9	202.8	2.04	7.79	40.8	9.30
Duplicate	1-Sep-20	67	0.11	5.82	2.53	0.2 U	0.85 J	1.0 U	0.60 U	0.86	193	198	--	--	--	--	--	--
	3-Mar-21	70	0.06 J	5.93	2.80	0.2 U	1.1	0.55 U	0.47 U	0.15 J	213	196	11.5	297	0.07	7.78	-5	6.49
	14-Sep-21	75	0.10	5.54	2.60	0.2 U	1.4	1.0 U	2.0 U	0.33 J	463	191	13.8	139.7	1.7	7.6	14.4	12.02
DB-6	9-Aug-16	64	<0.10	7.36	3.25	<0.20	34	<0.22	<0.24	4.68	567	119	13.8	155	0.3	6.27	85	1
	1-Dec-16	56	0.64	11.1	2.91	<0.20	<0.63	<0.22	<0.24	1.83	25.9	38	11.8	148	<0.5	6.16	255	2
	20-Mar-17	45	<0.1	5.6	2.72	<0.2	39	<0.22	<0.24	3.19	59	72.5	7.8	111	<0.5	6.70	125	0
	21-Jun-17	59	<0.1	4.14	2.86	<0.2	200	<0.22	<0.23	4	196	91.9	12.9	135	0	6.1	92	6.00
	5-Sep-17	57	0.11	7.47	3.22	<0.2	6.8	<1	<0.6	2.25	212	94.4	13.4	136	0	6.4	85	0.40
	7-Nov-17	52	0.4	8.5	3.1	<0.2 HF	140	<5	<5	2.7	0.17 J	0.048	12.9	112	0.1	5.80	447	2
	2-Apr-18	48	0.10 U	6.14	2.67	0.2 U	57	1.0 U	0.60 U	3.33	258	84.2	9.1	205	0.01	6.09	138.0	2.4
	12-Jun-18	62	0.10 U	4.96	2.76	0.5	210	1.0 U	0.60 U	3.59	487	99.7	13.2	211.4	0.21	6.08	37	0.9
	5-Sep-18	56	0.41	7.55	2.65	0.2 U	1.3 U	1.0 U	0.60 U	0.92	279	42.9	13.6	133.7	0.37	5.62	63	1.1
	4-Dec-18	59	0.66	8.86	2.91	0.2 U	6.7	1.0 U	0.60 U	1.72	57.7	17.2	14	136	0.15	6.29	124.7	0.47
	2-Apr-19	53	0.10 U	8.07	2.56	0.2 U	18	1.0 U	0.60 U	3.45	83.2	67.8	13.3	121.1	0.22	6.17	114.7	1.69
Duplicate	2-Apr-19	52	0.10 U	8.09	2.56	0.2 U	19	1.0 U	0.60 U	3.27	96.4	67.9	--	--	--	--	--	--
	4-Jun-19	57	0.07 J	6.89	2.32	0.2 U	17	1.0 U	0.60 U	2.29	73.3	81.5	14.5	138.8	0.18	6.19	-31.9	57.3
	9-Sep-19	57	0.61	7.72	2.52	0.2 U	1.3 U	1.0 U	0.60 U	0.55	352	15.9	14.3	134	0.12	6.14	115.0	2.39

Table D-1. MNA Parameter Concentrations

Well ID	Sample Date	Alkalinity (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fe(II) (mg/L)	Methane (ug/L)	Ethene (ug/L)	Ethane (ug/L)	TOC (mg/L)	Fe (ug/L)	Mn (ug/L)	Temp-Hydro (°C)	Conductance (uS/cm)	DO-Hydro (mg/L)	pH (units)	Redox (E_H) (mV)	Turbidity (NTUs)
DB-6 (cont.)	2-Mar-20	47	0.10 U	5.85	2.57	0.2 U	7.2	1.0 U	0.60 U	3.77	301	32.8	10.4	99.0	0.17	6.09	144.5	1.67
	31-Aug-20	61	0.65	6.89	2.50	0.2 U	0.62 J	1.0 U	0.60 U	2.14	209	15.7	18.0	184.3	0.50	6.23	121.5	1.53
	2-Mar-21	48	0.10 U	5.17	2.78	0.2 U	23	0.55 U	0.47 U	3.70	357	35.5	8.6	106.0	0.03	6.12	97.1	1.77
	13-Sep-21	67	0.76	6.54	2.80	0.2 U	1.1	1.0 U	2.0 U	1.00	148	4.92	14.3	152.0	1.21	6.19	142.2	0.12
DO-2	10-Aug-16	60	<0.10	4.87	2.29	0.31	18	<0.22	<0.24	2.42	6040	156	11.7	137	0.2	6.60	25	15
	30-Nov-16	65	<0.10	18.3	3.13	0.35	31	<0.22	<0.24	1.92	1580	313	11.1	177	<0.5	6.00	102	3
	21-Mar-17	80	<0.1	8.96	2.78	0.49	16	<0.22	<0.24	1.77	1430	333	10.9	179	<0.5	6.90	39	4
	21-Jun-17	79	<0.1	8.5	3.01	<0.2	11	<0.22	<0.23	1.75	633	340	11.8	180	1	6.3	79	0.90
	6-Sep-17	79	0.09 J	8.22	2.97	0.37	41	<1	<0.6	4.44	10700	352	11.3	174	0	7.0	9	90.00
	9-Nov-17	75	<0.2	8	3.1	<0.2 HF	130	<5	<5	2.2	3.1	0.33	11.5	136	0.2	6.00	219	7
	2-Apr-18	77	0.10 U	9.25	3.11	0.20	22	1.0 U	0.60 U	1.44	1780	313	11.9	157.5	0.29	6.38	61.3	7.5
	12-Jun-18	81	0.10 U	8.90	3.23	0.2 U	25	1.0 U	0.60 U	1.45	3950	337	12.7	251.2	2.11	6.32	29.4	8.8
	4-Sep-18	82	0.10 U	8.16	3.08	0.2 U	65	1.0 U	0.60 U	1.39	3600	318	12.7	--	0.46	7.10	7.9	6.3
	3-Dec-18	78	0.10 U	8.42	3.31	0.50	69	1.0 U	0.60 U	1.55	1870	328	11.3	175	0.12	6.65	35.8	5.97
	1-Apr-19	80	0.10 U	8.40	3.06	0.2 U	22	1.0 U	0.60 U	1.47	1300	312	12.6	166.3	1.45	6.63	64.1	5.09
Duplicate	1-Apr-19	80	0.10 U	8.43	3.12	0.2 U	20	1.0 U	0.60 U	1.51	1300	312	--	--	--	--	--	--
	3-Jun-19	81	0.10 U	8.59	3.16	0.50	36	1.0 U	0.60 U	0.99	1360	328	13.4	183.6	0.66	6.62	40.6	7.9
	9-Sep-19	79	0.10 U	8.62	3.01	0.50	19	1.0 U	0.60 U	1.44	2260	311	13.8	169	0.37	6.55	37.8	19.74
	2-Mar-20	78	0.10 U	8.68	3.05	0.2 U	1.3 U	1.0 U	0.60 U	1.08	1040	325	11.3	156.3	0.86	6.58	55.7	2.99
	31-Aug-20	80	0.03 J	8.21	2.67	0.70	15	1.0 U	0.60 U	2.24	1960	329	12.5	241.2	3.39	6.39	42.8	13.00
	1-Mar-21	82	0.10 U	8.22	3.11	1.00	23	0.55 U	0.47 U	1.60	3140	319	11.5	159.0	0.75	6.62	86.2	13.43
	13-Sep-21	85	0.10 U	7.84	3.00	0.2 U	45	1.0 U	2.0 U	1.70	1800	328	12.9	165.2	2.14	6.50	64.5	9.72
Duplicate	13-Sep-21	85	0.10 U	7.79	2.99	0.2 U	51	1.0 U	2.0 U	1.70	1810	328	--	--	--	--	--	--
DO-3	10-Aug-16	64	1.03	10.1	2.81	<0.20	0.36 J	<0.22	<0.24	0.32 J	33	2.1	12.2	166	6.6	6.45	191	3
	5-Dec-16	63	1.02	9.08	2.72	--	<0.63	<0.22	<0.24	0.38 J	4,730	110	11.8	158	6.1	6.50	250	40
	21-Mar-17	70	0.88	7.92	2.66	<0.2	<0.63	<0.22	<0.24	0.45 J	89	2.7	12.0	135	7.0	7.10	166	0
	22-Jun-17	55	1.01	6.79	2.66	<0.2	<0.63	<0.22	<0.23	0.55	28	1.9	12.3	97	8	6.9	113	0.60
	7-Sep-17	57	1.12	8.98	2.87	<0.2	<1.3	<1	<0.6	0.26 J	11 J	1.1	12.4	145	7	6.4	194	0.50
	9-Nov-17	61	1.1	8.1	2.8	<0.2 HF	<5	<5	<5	0.51 J	0.59	0.013 J	11.6	117	6.4	6.00	298	58
	4-Apr-18	57	1.12	7.81	2.67	0.2 U	1.3 U	1.0 U	0.60 U	0.78	458	13.8	10.4	242.8	62.8	7.01	172.9	11.6
	12-Jun-18	58	1.06	8.80	2.71	0.2 U	1.3 U	1.0 U	0.60 U	0.32 J	1240	41.7	12.4	205.7	7.74	5.99	164.0	4.0
	6-Sep-18	60	0.97	8.39	2.50	0.2 U	1.3 U	1.0 U	0.60 U	0.18 J	270	10.5	14.9	159.1	6.79	4.86	69.5	2.8
	4-Dec-18	63	0.99	8.28	2.47	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	124	7.7	11	145	5.22	6.46	97.8	0.22
	2-Apr-19	63	0.93	7.56	2.55	0.2 U	1.3 U	1.0 U	0.60 U	0.19 J	594	19.3	11.4	145.5	7.20	6.34	167.5	10.92
	4-Jun-19	62	0.84	7.72	2.32	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	168	6.67	12.4	158.0	6.82	6.34	192.3	6.04
	10-Sep-19	63	0.85	8.32	2.56	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	42.4	1.63	12.2	142	6.64	6.18	165.1	2.43
	4-Mar-20	63	0.83	7.63	2.60	0.2 U	1.3 U	1.0 U	0.60 U	0.50 U	108	3.45	11.2	143.7	6.82	6.09	130.5	3.26
	1-Sep-20	65	0.86	8.48	2.60	0.2 U	1.3 U	1.0 U	0.60 U	0.41 J	116	3.54	12.5	218.6	7.13	5.78	173.2	4.05
	2-Mar-21	71	0.82	8.17	2.70	0.2 U	1.0 U	0.55 U	0.47 U	0.33 J	658	20.6	11.6	148.8	5.15	6.45	147.5	6.24
	13-Sep-21	67	0.91	8.62	2.87	0.2 U	1.1	1.0 U	2.0 U	0.33 J	1300	41.3	12.1	161.0	5.84	6.22	159.9	18.91
DR-05	10-Aug-16	63	<0.10	4.86	2.95	1.03	31	<0.22	<0.24	4.36	2080	54.5	12.0	149	0.2	6.29	25	2
	30-Nov-16	59	<0.10	9.51	2.85	0.28	15	<0.22	<0.24	4.3	1120	45.6	11.6	151	<0.5	5.90	136	0
	21-Mar-17	38	<0.1	4.29	2.31	<0.2	37	<0.22	<0.24	5.47	1300	50.5	7.6	86	<0.5	6.50	59	12
	21-Jun-17	57	<0.1	1.59	2.66	0.33	230	<0.22	<0.23	7.03	1750	77.5	13.1	128	0	6.0	34	6.70
	5-Sep-17	62	0.07 J	4.61	2.81	1.86	97	<1	<0.6	4.38	1970	54.5	12.2	141	0	6.4	19	2.70
	9-Nov-17	62	<0.2	5.6	2.9	0.059 J HF	250	<5	<5	4.7	2.1	0.051	12.2	115	0.2	6.00	241	1

Table D-1. MNA Parameter Concentrations

Well ID	Sample Date	Alkalinity (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fe(II) (mg/L)	Methane (ug/L)	Ethene (ug/L)	Ethane (ug/L)	TOC (mg/L)	Fe (ug/L)	Mn (ug/L)	Temp-Hydro (°C)	Conductance (uS/cm)	DO-Hydro (mg/L)	pH (units)	Redox (E_H) (mV)	Turbidity (NTUs)
DR-05 (cont.)	3-Apr-18	44	0.10 U	4.34	2.55	0.8	130	1.0 U	0.60 U	6.07	1150	59.5	9.1	93.7	0.15	5.98	59.3	6.86
	12-Jun-18	64	0.10 U	1.37	2.76	2.0	710	1.0 U	0.60 U	7.57	2110	96.4	13.6	191.4	0.58	5.89	-16.6	0.9
	5-Sep-18	63	0.10 U	5.55	2.52	1.0	65	1.0 U	0.60 U	3.46	1750	42.8	12.5	132.9	0.38	6.27	8.8	0.0
Duplicate	5-Sep-18	62	0.10 U	5.55	2.51	1.0	77	1.0 U	0.60 U	3.48	1700	43.4	--	--	--	--	--	--
	4-Dec-18	60	0.10 U	7.34	2.59	1.6	50	1.0 U	0.60 U	3.34	1540	43.1	11.0	138	0.17	6.34	27.0	0.0
Duplicate	4-Dec-18	61	0.10 U	7.37	2.6	1.6	50	1.0 U	0.60 U	3.64	1570	43.1	--	--	--	--	--	--
	1-Apr-19	41	0.10 U	4.92	2.31	0.2 U	0.70 J	1.0 U	0.60 U	8.38	557	28.1	9.3	93.4	0.63	6.18	149.4	5.23
	3-Jun-19	56	0.10 U	4.02	2.46	0.2 U	130	1.0 U	0.60 U	10.7	1430	84.5	12.0	128.0	0.08	6.17	59.1	2.22
	10-Sep-19	61	0.10 U	8.67	2.53	0.2 U	10	1.0 U	0.60 U	3.18	1650	45.5	12.2	135	0.29	6.18	20.7	1.1
	4-Mar-20	38	0.10 U	6.10	2.45	1.0	8.7	1.0 U	0.60 U	9.33	3490	50.4	7.8	90.2	0.43	5.92	160.5	24.83
Duplicate	4-Mar-20	38	0.10 U	6.13	2.44	1.0	9.5	1.0 U	0.60 U	8.77	4110	51.7	--	--	--	--	--	--
	1-Sep-20	63	0.10 U	7.77	2.56	1.5	4.0	1.0 U	0.60 U	4.43	1630	47.1	11.8	202.2	0.30	6.24	10.1	2.09
	2-Mar-21	39	0.10 U	6.65	2.81	0.2 U	9.9	0.55 U	0.47 U	7.80	1560	36.4	7.9	89.0	0.37	6.07	107.6	18.10
	13-Sep-21	63	0.10 U	8.99	3.00	1.25	10.0	1.0 U	2.0 U	3.60	1520	45.0	13.1	136.8	1.64	6.12	54.3	1.80
DT-1	10-Aug-16	52	0.11	5.78	2.98	<0.20	1.7	<0.22	<0.24	0.69	957	35.3	12.6	125	0.5	6.28	84	13
	30-Nov-16	38	0.78	21.4	3.13	<0.20	<0.63	<0.22	<0.24	0.72	236	7.23	12.2	137	2.0	6.30	227	2
	20-Mar-17	47	1.03	8.02	2.87	<0.2	1.9	<0.22	<0.24	0.89	958	28	10.9	132	6.4	6.80	138	39
	21-Jun-17	9	0.15	5.43	2.56	1.55	<0.63	<0.22	<0.23	1.19	279	24.4		119	3	6.2	240	2.20
	5-Sep-17	56	0.34	5.92	3.89	<0.2	<1.3	<1	<0.6	11.3	933	52.9	14.1	132	4	6.4	139	8.70
	7-Nov-17	52	0.52	6.2	3	<0.2 HF	<5	<5	<5	0.73 J	0.21 J	0.0052 J	13.2	99	2.1	6.00	450	17
	4-Apr-18	48	0.41	7.14	2.56	0.2 U	3.8	1.0 U	0.60 U	1.05	220	6.51	11.6	204.7	4.64	5.86	188.8	12.3
Duplicate	4-Apr-18	48	0.41	7.26	2.59	0.2 U	4	1.0 U	0.60 U	1.07	253	7.39	--	--	--	--	--	--
	11-Jun-18	49	0.20	6.05	2.42	0.2 U	1.9	1.0 U	0.60 U	1.17	276	9.22	12.4	285.7	1.43	6.08	93	6.3
Duplicate	11-Jun-18	49	0.20	5.89	2.38	0.2 U	2.5	1.0 U	0.60 U	1.28	255	8.96	--	--	--	--	--	--
	4-Sep-18	55	0.36	6.39	2.69	0.2 U	1.4	1.0 U	0.60 U	0.53	793	22.7	15.7	2040	1.15	6.24	80	14.38
	3-Dec-18	54	0.68	7.07	2.74	0.2 U	1.4	1.0 U	0.60 U	0.77	77.9	3.65	14	130	1.91	6.17	145.6	1.13
	1-Apr-19	55	0.77	8.72	2.48	0.2 U	1.3 U	1.0 U	0.60 U	0.52	228	8.85	12.4	128.9	2.3	6.19	139.3	4.63
	3-Jun-19	55	0.54	8.14	2.56	0.2 U	1.3 U	1.0 U	0.60 U	0.25 J	141	5.51	13.7	136.3	1.36	6.19	163.6	3.7
	9-Sep-19	56	0.10 U	8.14	2.36	0.2 U	0.62 J	1.0 U	0.60 U	0.43 J	70.1	4.14	13.8	132	2.46	5.99	142.3	2.83
	2-Mar-20	53	0.90	7.29	2.55	0.2 U	1.1 J	1.0 U	0.60 U	0.49 J	105	5.82	12.0	116.4	4.46	6.06	168.5	32.44
	31-Aug-20	57	0.47	6.69	2.47	0.2 U	0.75 J	1.0 U	0.60 U	0.76	175	10.7	13.7	171.2	1.61	6.17	155.2	5.44
	2-Mar-21	56	0.83	7.29	2.91	0.2 U	12	0.55 U	0.47 U	1.30	5820	139	10.5	130.0	5.16	6.18	100.3	3.65
	13-Sep-21	59	0.48	6.48	2.83	0.2 U	7	1.0 U	2.0 U	0.80	135	5.26	13.0	138.5	1.54	6.04	158.3	1.94
DT-2	17-Aug-16	135	<0.10	11	2.75	<0.20	3.1	<0.22		0.94	20200	474	11.6	273	1.0	6.86	120	NA
	30-Nov-16	125	0.35	11.2	2.68	<0.20	0.97	<0.22	<0.24	1.35	19600	522	11.4	281	<0.5	7.30	-53	90
	21-Mar-17	133	<0.1	11.2	2.67	<0.2	20	<0.22	<0.24	2.47	36100	737	10.8	274	<0.5	7.90	-80	208
	21-Jun-17	131	<0.1	10.3	2.72	<0.2	3.9	<0.22	<0.23	1.06	3000	240	11.7	277	0	7.3	-32	119.00
	6-Sep-17	129	0.12	11.4	2.99	0.32	29	<1	<0.6	1.27	16200	457	12.5	271	0	7.5	-115	132.00
	9-Nov-17	120	0.036 J	11	3	<0.2 HF	64	<5	<5	1.6	7.2	0.33	11.7	211	0.2	7.50	39	180
	3-Apr-18	129	0.10 U	10.8	2.95	0.2 U	8.9	1.0 U	0.60 U	0.79	1610	201	11.9	238.3	0.23	7.54	99.9	19.0
	12-Jun-18	128	0.10 U	11.4	2.94	0.2 U	9.9	1.0 U	0.60 U	0.53	2270	269	12.8	377.0	0.38	7.62	-95.4	43.7
	4-Sep-18	130	0.10 U	11.2	2.89	0.2 U	8.9	1.0 U	0.60 U	0.36 J	595	178	13.4	4251	0.55	8.04	-90	16.35
	3-Dec-18	128	0.10 U	11.5	2.98	0.2 U	4.1	1.0 U	0.60 U	0.39 J	1380	195	13.2	258	0.17	7.69	-74.4	26.3
	1-Apr-19	128	0.10 U	11.1	2.48	0.2 U	2.5	1.0 U	0.60 U	0.21 J	1400	188	13.3	250.4	1.18	7.68	44.3	35.69
	3-Jun-19	129	0.10 U	11.3	2.96	0.2 U	2.3	1.0 U	0.60 U	0.50 U	566	203	12.9	274.5	0.24	7.69	16.2	16.7
	9-Sep-19	127	0.04 J	11.2	3.04	0.2 U	12	1.0 U	0.60 U	0.50 U	1060	211	14.6	258	0.69	7.71	-98.4	20.05

Table D-1. MNA Parameter Concentrations

Well ID	Sample Date	Alkalinity (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fe(II) (mg/L)	Methane (ug/L)	Ethene (ug/L)	Ethane (ug/L)	TOC (mg/L)	Fe (ug/L)	Mn (ug/L)	Temp-Hydro (°C)	Conductance (uS/cm)	DO-Hydro (mg/L)	pH (units)	Redox (E_H) (mV)	Turbidity (NTUs)
DT-2 (cont.)	3-Mar-20	123	0.10 U	11.0	2.9	0.2 U	7.0	1.0 U	0.60 U	0.40 J	1330	197	11.9	242.9	0.70	7.59	-40.3	12.14
	30-Aug-20	126	0.10 U	11.1	2.8	0.2 U	9	1.0 U	0.60 U	0.77	2620	215	12.7	363.9	11.28	7.65	-81.9	51.28
	1-Mar-21	121	0.10 U	10.4	3.06	0.5	15	0.55 U	0.47 U	1.00	2550	208	12.1	225.0	0.70	7.72	35.5	43.81
	13-Sep-21	130	0.23	10.3	3.86	0.2 U	14	1.0 U	2.0 U	1.50	2200	200	13.9	239.8	1.77	7.54	6.0	30.04

Notes:

°C = Degrees celsius
µg/L = Micrograms per liter
µS/cm = Microsiemens per centimeter
B = The analyte was found in the associated method blank at a level that is is significant relative to the sample result as defined by the DOD or NELAC standards
DO = Dissolved oxygen
Fe = Iron
Fe(II) = Ferrous iron
J = The result is an estimated value
mg/L = Milligrams per liter
Mn = Manganese
mV = Millivolt
NTU = Nephelometric turbidity unit
TOC = Total organic carbon
U = Analyte not detected above laboratory practical quantification limit reported
\- = No data, not applicable

Table 4. Statistical Analysis

Site	ALGT																								
Well ID	DA-7b	DA-9b	DA-11a	DA-11b	DA-13a	DA-21b	DA-28	DA-29	DA-30a	DA-30b	DA-31	DA-32	DA-43	DA-44	DA-45	DA-46	DA-47	DA-48	DB-6	DO-2	DO-3	DR-05	DT-1	DT-2	EPA-W-5
Compound	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE	TCE
	Descriptive Statistics																								
First Sample Date	17-Mar-00	17-Mar-00	11-Mar-03	10-Aug-16	11-Aug-16	17-Mar-00	16-Mar-00	17-Mar-00	16-Mar-00	12-Sep-00	28-Apr-10	28-Apr-10	5-Dec-16	5-Dec-16	1-Dec-16	1-Dec-16	1-Dec-16	6-Dec-16	12-Sep-00	18-Dec-97	10-Aug-16	16-Mar-00	8-Sep-98	9-Sep-98	16-Mar-00
Last Sample Date	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21	16-Dec-21
Number of Samples*	56	35	26	22	22	55	40	37	37	39	24	23	21	21	21	21	21	21	38	32	22	40	81	29	27
Number of Non-Detects	0	0	0	0	1	0	7	0	0	0	0	0	0	0	21	20	18	17	0	0	1	3	0	26	4
Sample Mean	31.95	5.73	0.95	0.88	0.18	26.99	0.31	9.00	1.17	0.68	19.03	10.21	18.38	1.17	0.4571	0.45	0.41	0.37	4.06	4.35	8.19	1.38	2.11	0.40	0.31
Standard Deviation	26.51	0.98	0.13	0.12	0.08	13.03	0.18	1.69	0.28	0.11	5.23	32.45	1.83	0.46	0.11	0.12	0.15	0.17	2.11	1.22	2.23	0.93	0.83	0.16	0.19
Minimum Concentration	5.9	4.4	0.77	0.62	0.11	1.50	0.12	6.8	0.83	0.32	3.7	0.10	14	0.24	-	0.35	0.08	0.06	1.0	3.1	6.4	0.1	0.84	0.035	0.11
Maximum Concentration	91	8.0	1.2	1.20	0.26	48	0.86	14	2.2	1.1	32	140	22	1.9	-	0.35	0.31	0.16	9.2	7.0	14.0	3.3	4.3	0.13	1.0
Date**	17-Mar-00	17-Mar-00	10-Aug-16	10-Jun-21	1-Apr-19	17-Mar-00	12-Mar-01	10-Sep-01	16-Mar-00	5-Mar-13	28-Apr-10	9-Sep-10	2-Apr-19	6-Sep-17	-	1-Dec-16	1-Dec-16	16-Nov-21	13-Mar-01	9-Jun-03	2-Mar-21	10-Sep-01	10-Sep-01	17-Aug-16	10-Sep-01
	Distribution of Data																								
P Value	<0.0001	0.0220	0.0925	0.2821	<0.0001	0.0004	<0.0001	0.0011	0.0001	0.0006	0.1085	<0.0001	0.6191	0.4650	-	-	-	-	0.1544	<0.0001	<0.0001	0.0117	0.0053	-	<0.0001
Normally Distributed?	No	No	Yes	Yes	No	No	No	No	No	No	Yes	No	Yes	Yes	-	-	-	-	Yes	No	No	No	No	-	No
Log P Value	<0.0001	0.1317	-	-	0.0051	<0.0001	0.0014	0.0228	0.0215	<0.0001	-	0.0014	-	-	-	-	-	-	-	0.0001	<0.0001	0.0065	0.4034	-	0.1485
Log Normally Distributed?	No	Yes	-	-	No	No	No	No	No	No	-	No	-	-	-	-	-	-	-	No	No	No	Yes	-	Yes
	Trend Analysis (Linear Regression)																								
Linear Regression P Value	-	<0.0001	0.0075	0.0578	-	-	-	-	-	-	0.0005	-	0.1582	0.0001	-	-	-	-	0.0329	-	-	-	<0.0001	-	0.0044
Slope	-	-0.00028	-0.000003	0.000009	-	-	-	-	-	-	-0.00320	-	-0.00104	-0.00006	-	-	-	-	-0.00003	-	-	-	-0.00015	-	-0.00010
Trend***	-	Down	Down	Up	-	-	-	-	-	-	Down	-	Down	Down	-	-	-	-	Down	-	-	-	Down	-	Down
Statistically Significant?	-	Yes	Yes	No	-	-	-	-	-	-	Yes	-	No	Yes	-	-	-	-	Yes	-	-	-	Yes	-	Yes
	Trend Analysis (Mann-Kendall Test for Trend)																								
Two Tailed P Value	<0.0001	-	-	-	0.6083	<0.0001	<0.0001	<0.0002	0.0132	0.7525	-	0.2785	-	-	-	-	-	-	-	0.0057	0.3508	0.1684	-	-	-
Tau Statistic	-0.754	-	-	-	-0.081	-0.691	-0.526	-0.553	-0.299	-0.036	-	0.163	-	-	-	-	-	-	-	-0.349	0.145	-0.153	-	-	-
Trend***	Down	-	-	-	Down	Down	Down	Down	Down	Down	-	Up	-	-	-	-	-	-	-	Down	Up	Down	-	-	-
Statistically Significant?	Yes	-	-	-	No	Yes	Yes	Yes	Yes	No	-	No	-	-	-	-	-	-	-	Yes	No	No	-	-	-

Notes:

* = Total number of samples collected since first sample date (excludes duplicate samples).

** = Date sample with highest concentration of TCE was collected from monitoring well

*** = Trend for entire dataset not taking discontinuities into consideration

\- = Not applicable; analysis not performed. Statistical analysis not performed on datasets composed of greater than 50% non-detects or had fewer than 8 data points (excluding non-detects).
Distribution of Data - Data was tested for normal distribution using the Shapiro-Wilk test for normality. P values were generated by the Shapiro-Wilk test; P values equal to or less than 0.05 were not considered normally distributed. Logarithmic transformation was performed on datasets not considered normally distributed and again tested for normality using the Shapiro-Wilk test.
Trend Analysis (Linear Regression) - Performed on datasets considered normally or log-normally distributed. Trends with a P Value of less than 0.05 were considered statistically significant.
Trend Analysis (Mann-Kendall Test for Trend) - Performed on datasets not considered normally or log-normally distributed (non-parametric data). Trends with a Two-Tailed P Value of less than 0.05 or greater than 0.95 were considered statistically significant.
Additional discussion of statistical approach is included in Appendix E.

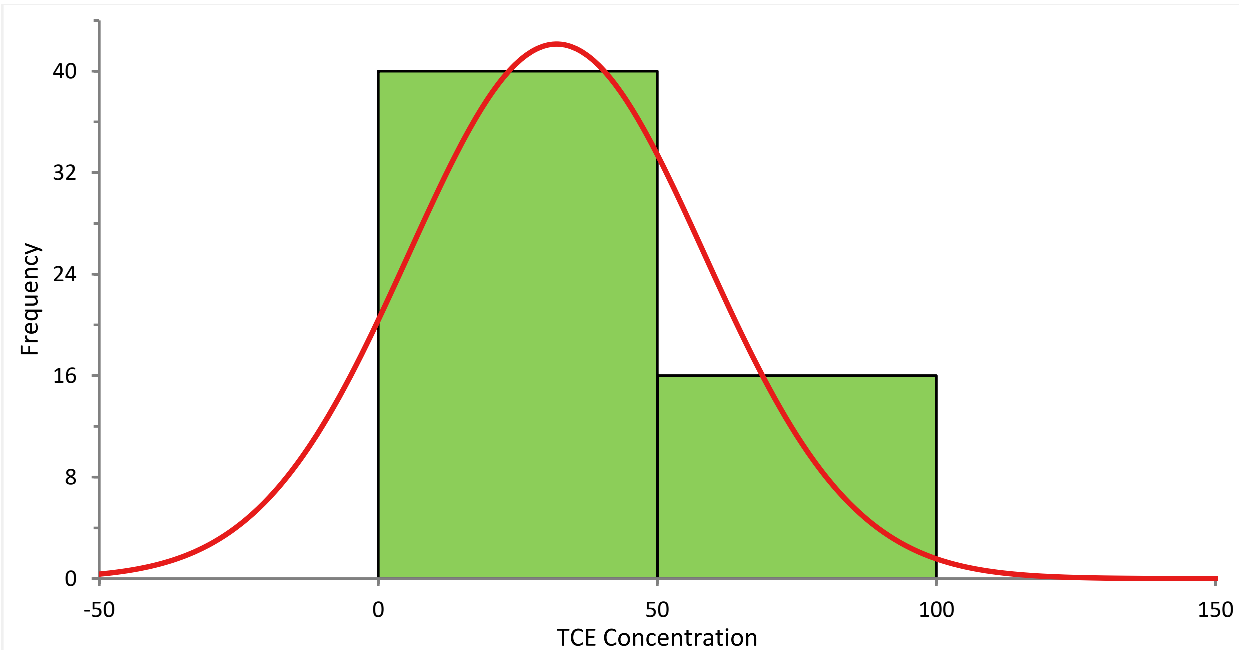
Abbreviations and Acronyms:

ID = Identification

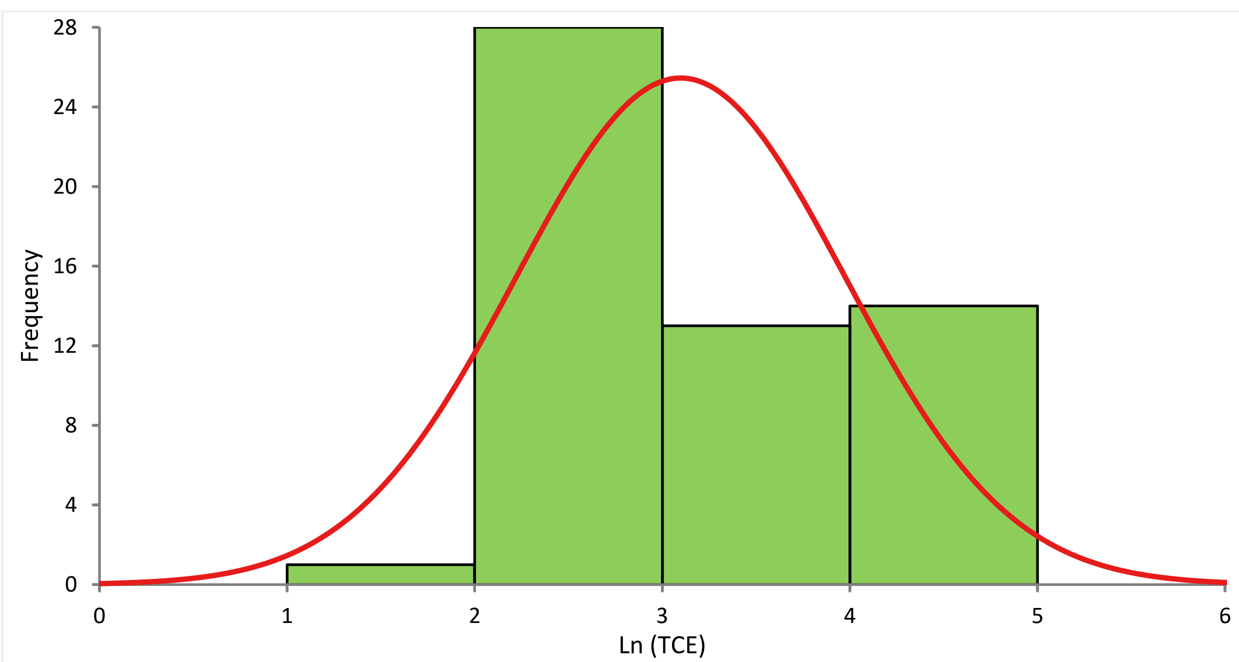
TCE = trichloroethylene in micrograms per liter

Histograms

DA-7b

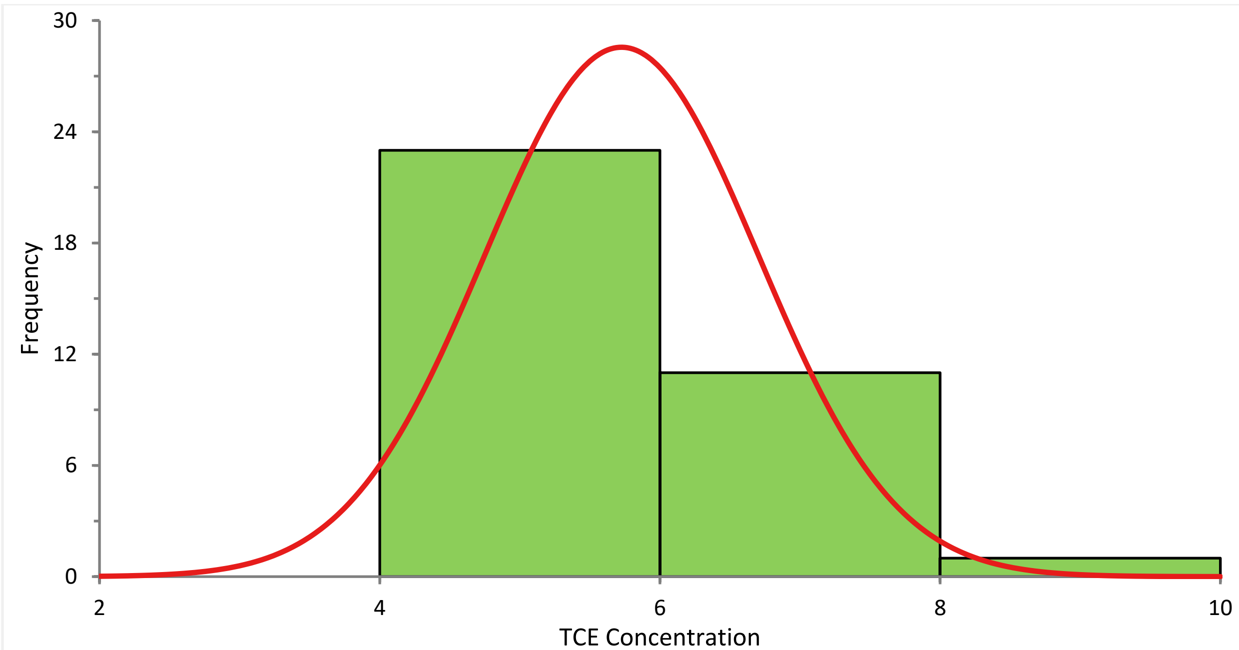


Ln(DA-7b)



Histograms

DA-9b



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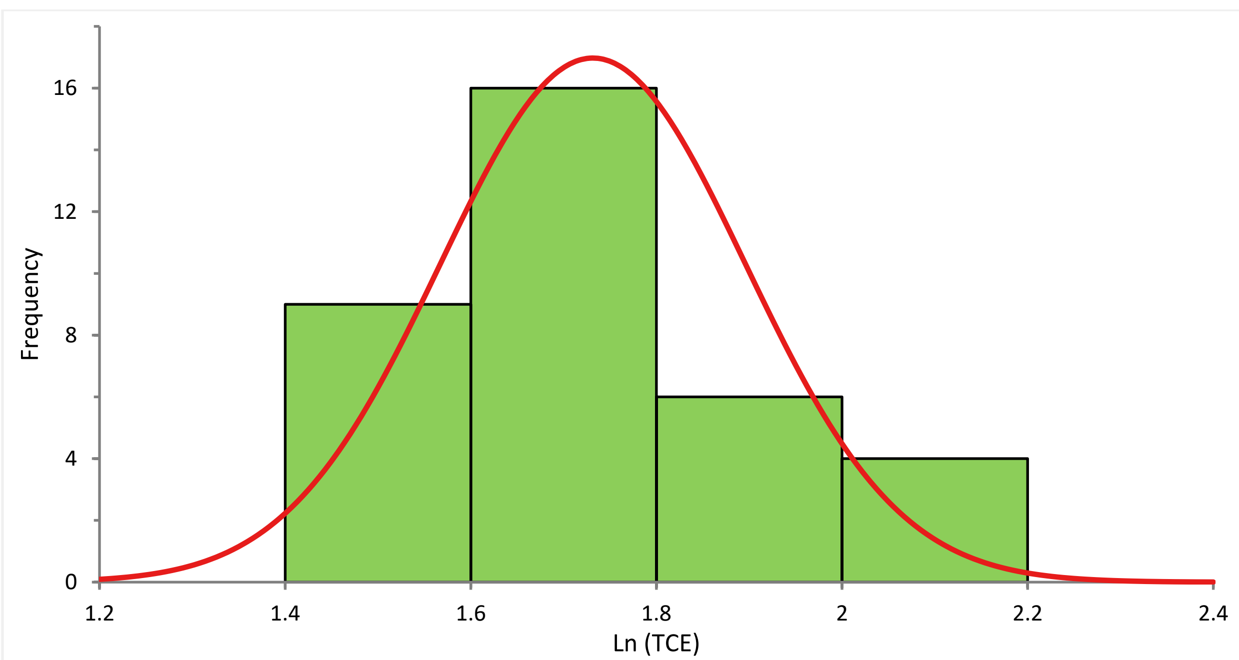
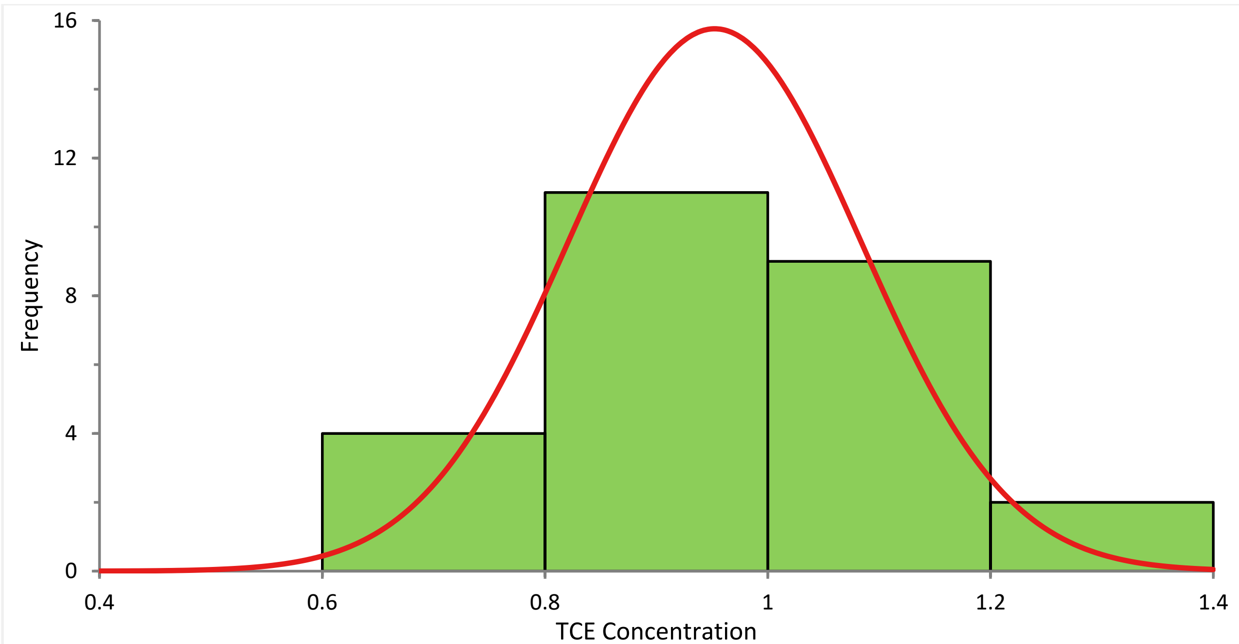
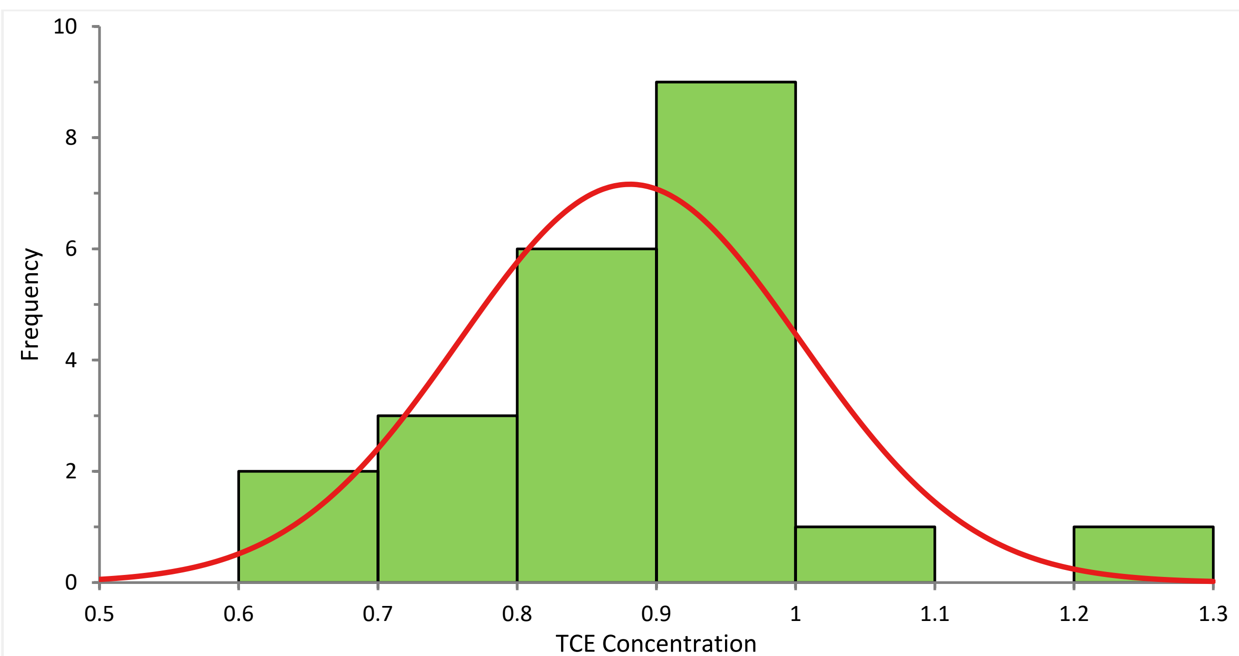


Histograms

DA-11a

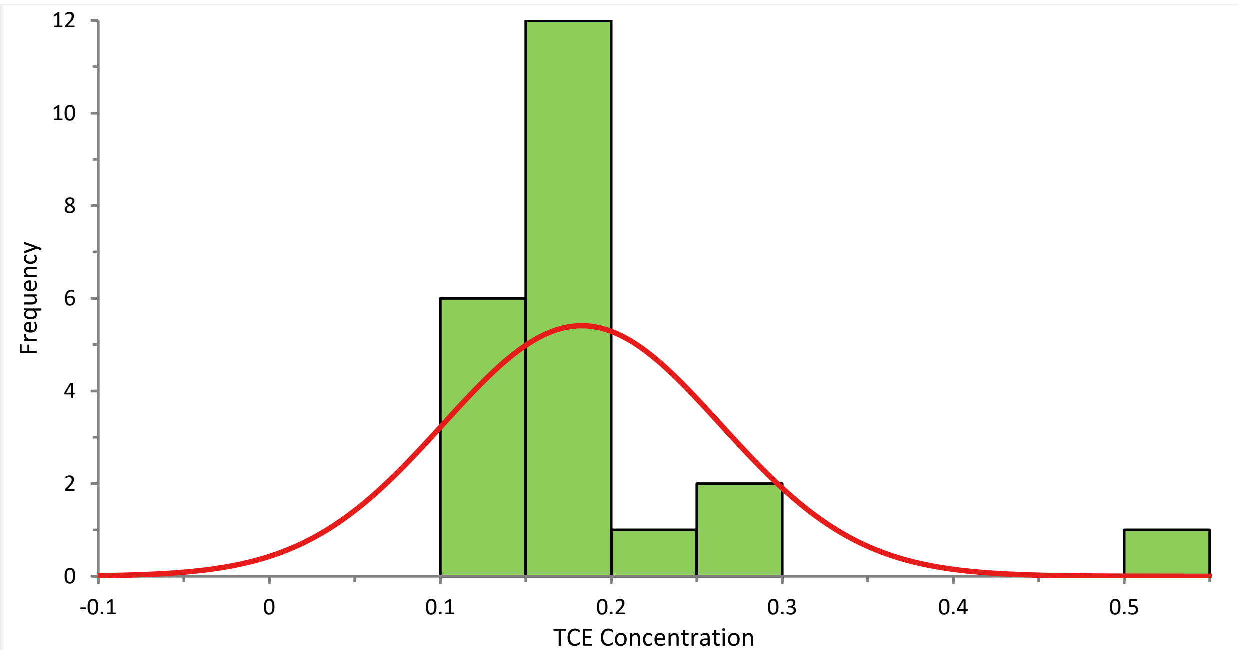


DA-11b



Histograms

DA-13a



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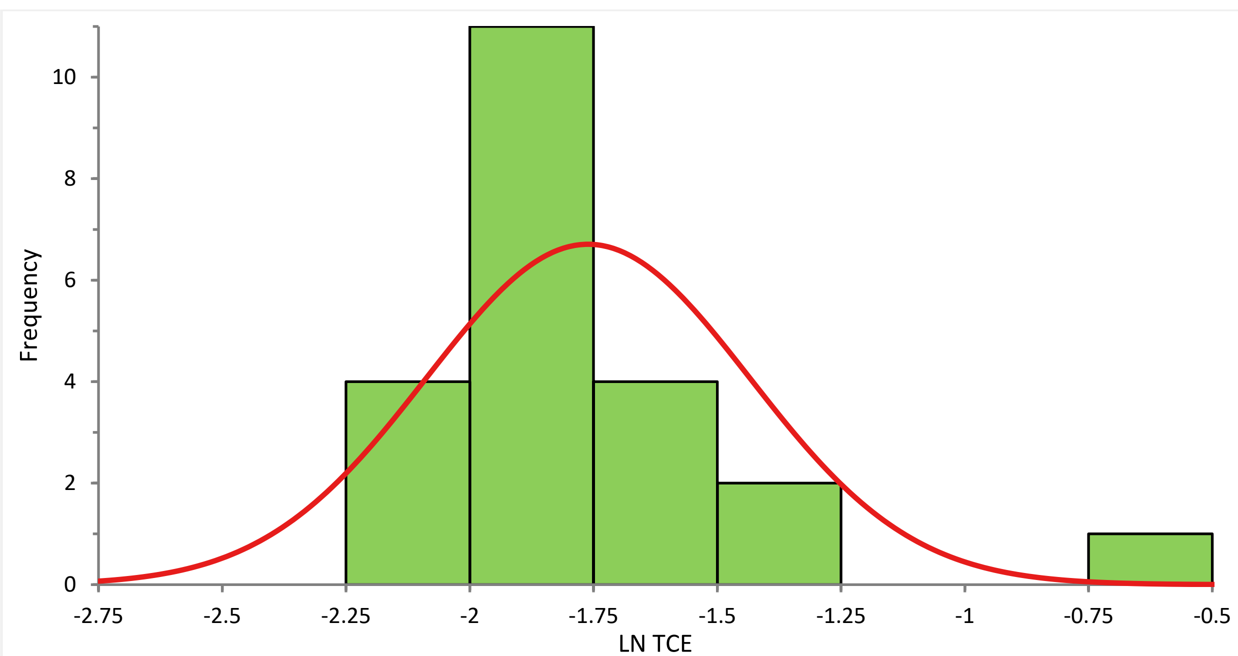
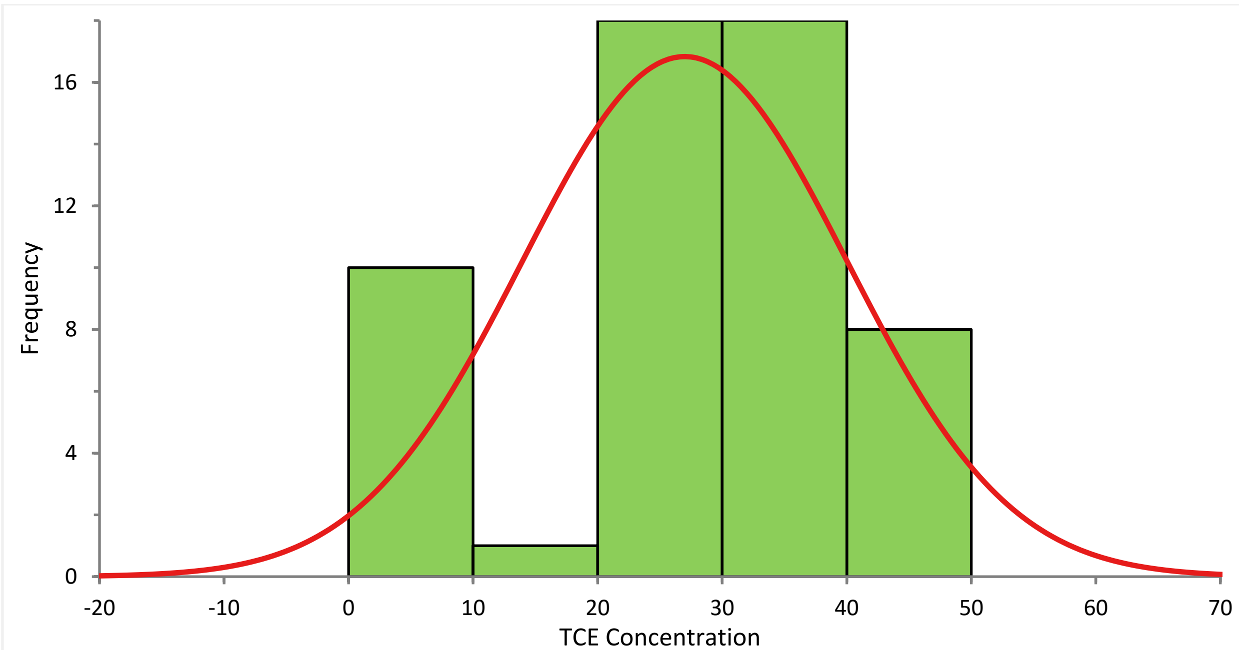


Histograms

DA-21b



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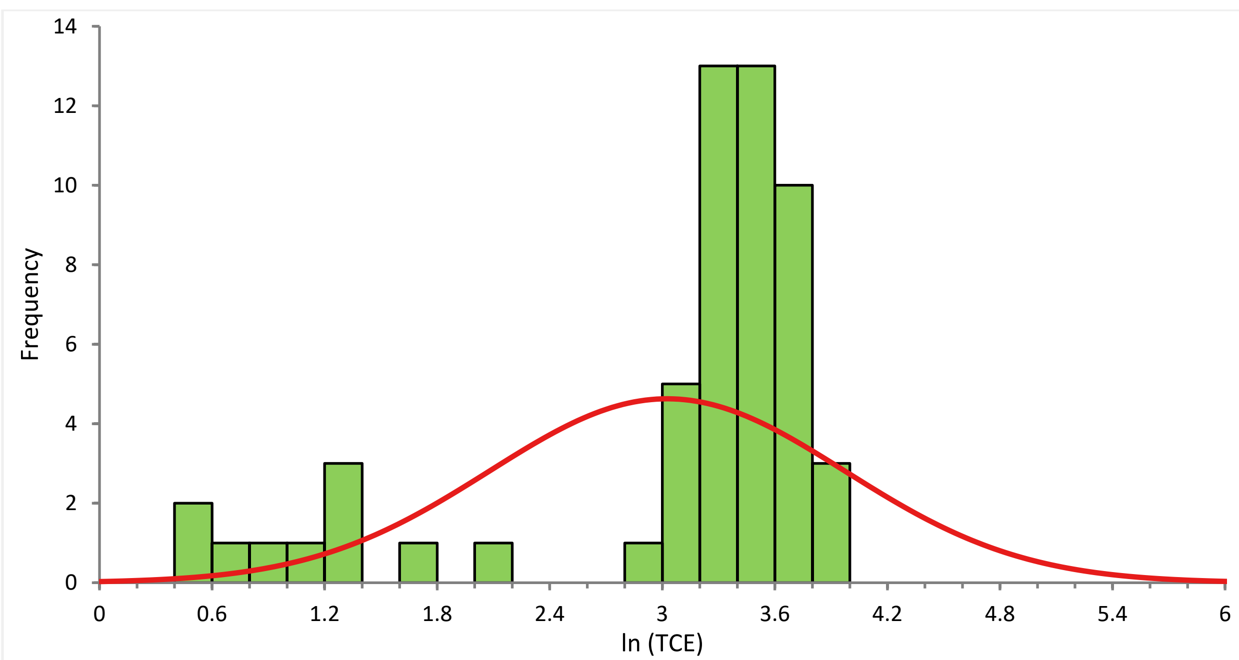
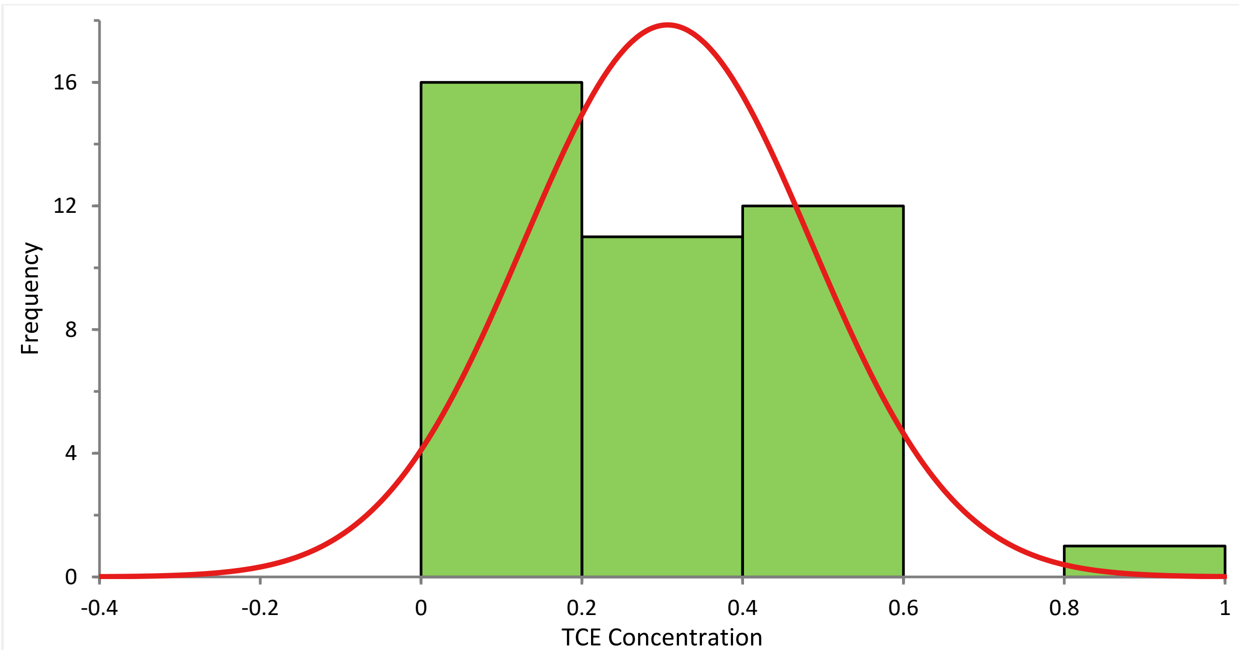


Histograms

DA-28



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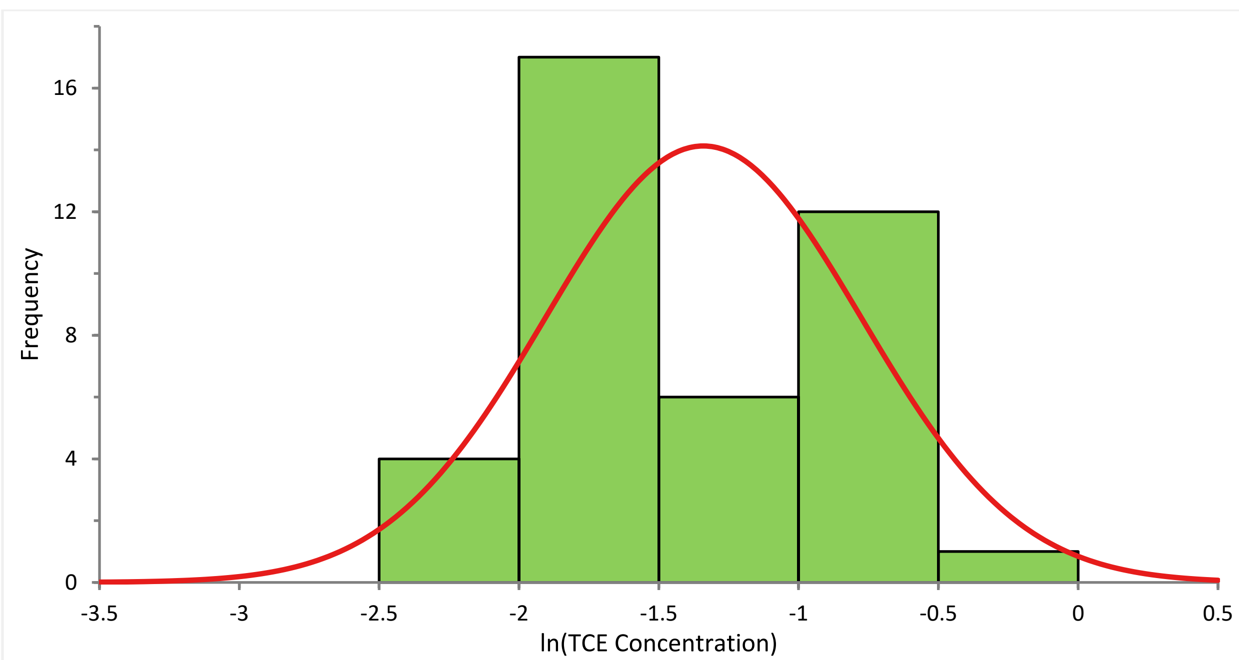
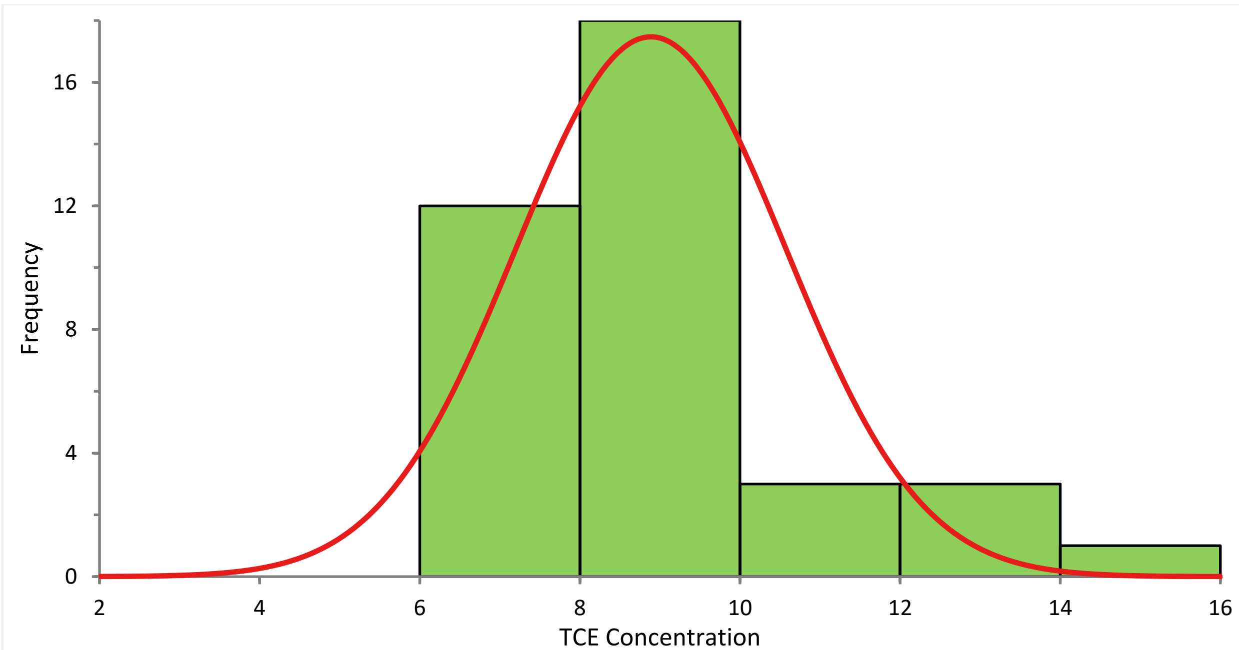
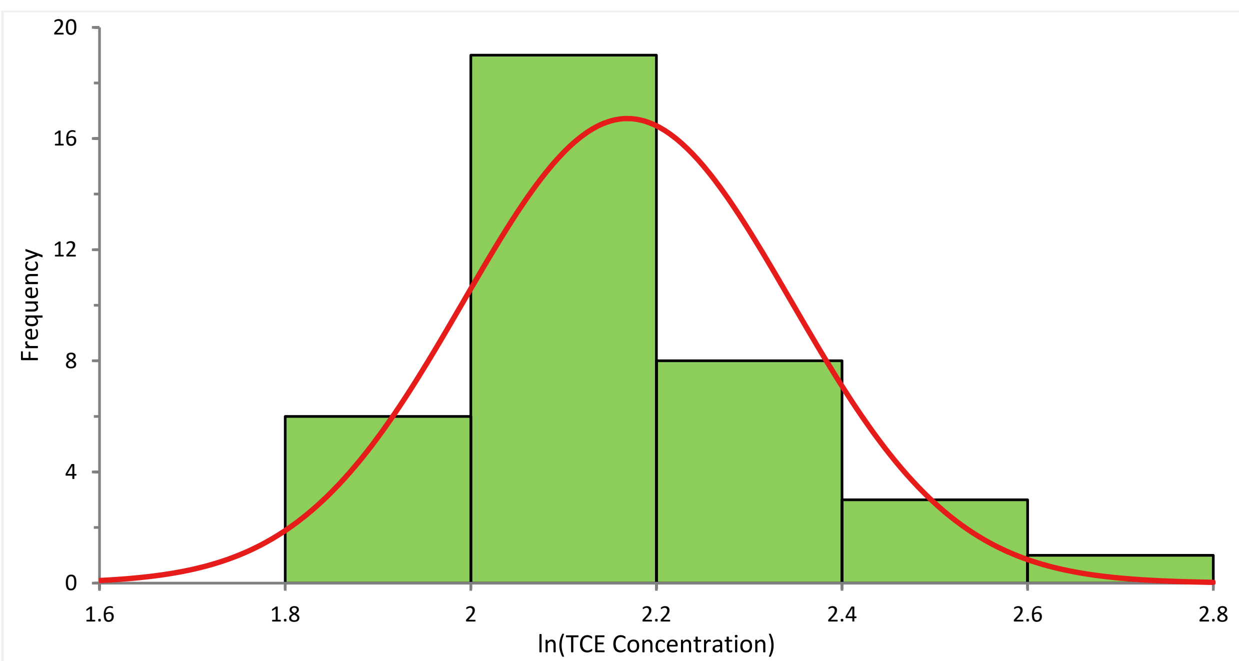


Histograms

DA-29

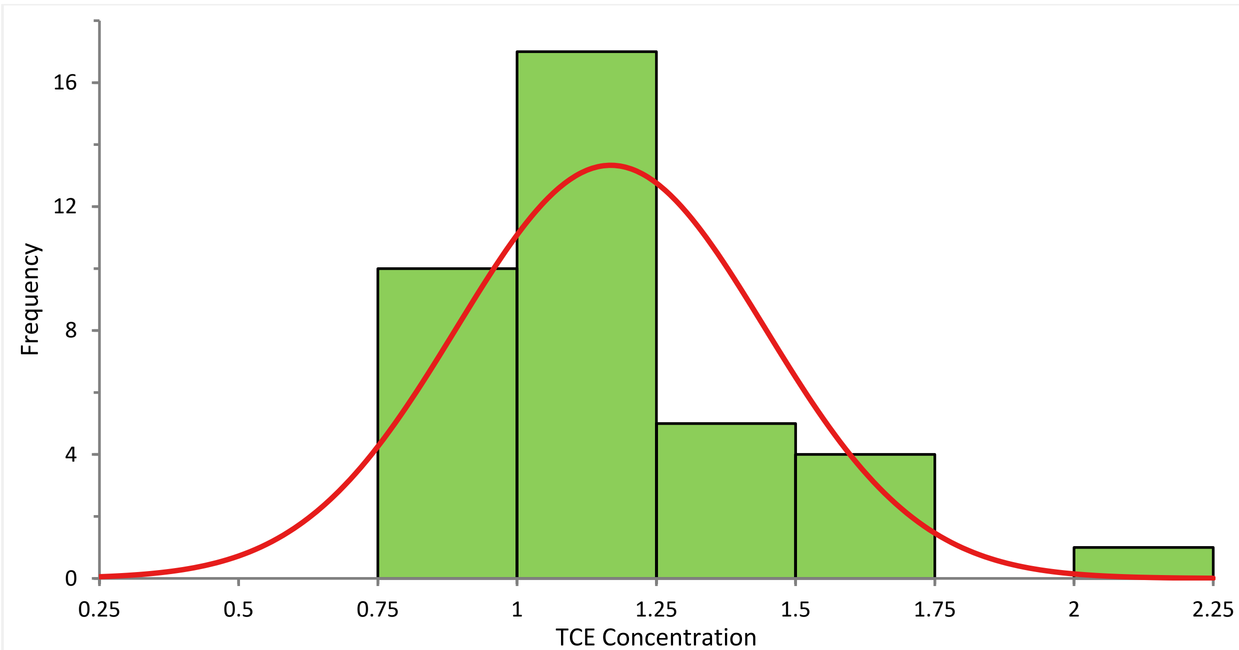


Ln(DA-29)

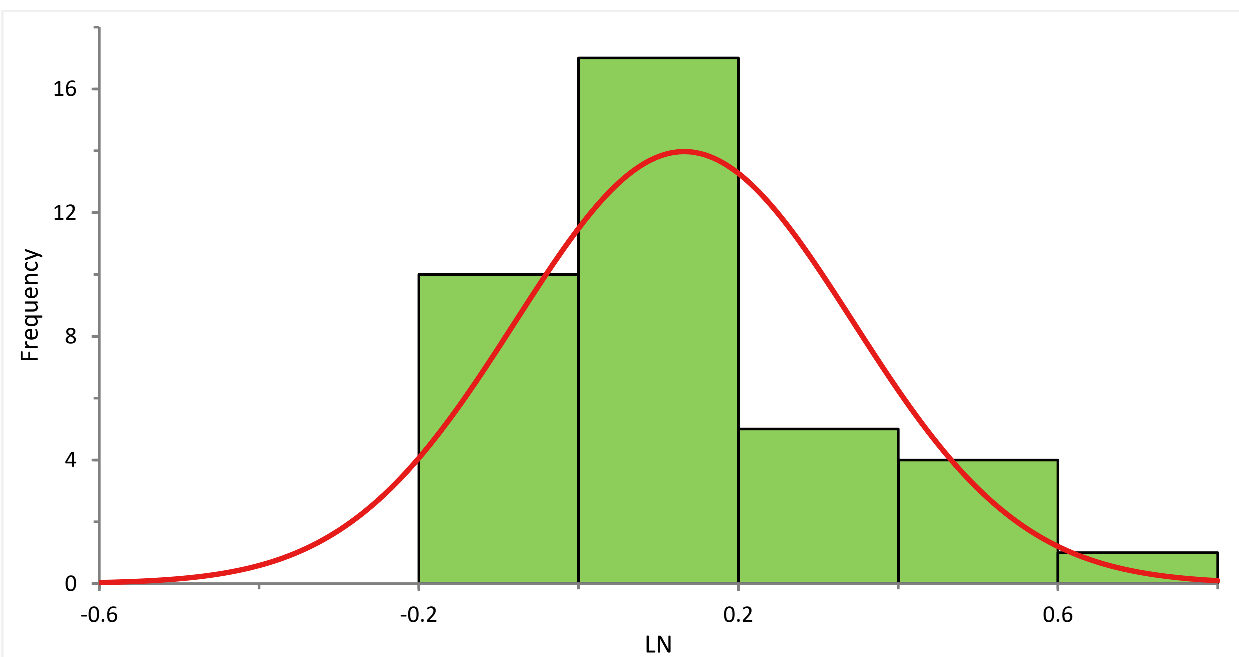


Histograms

DA-30a

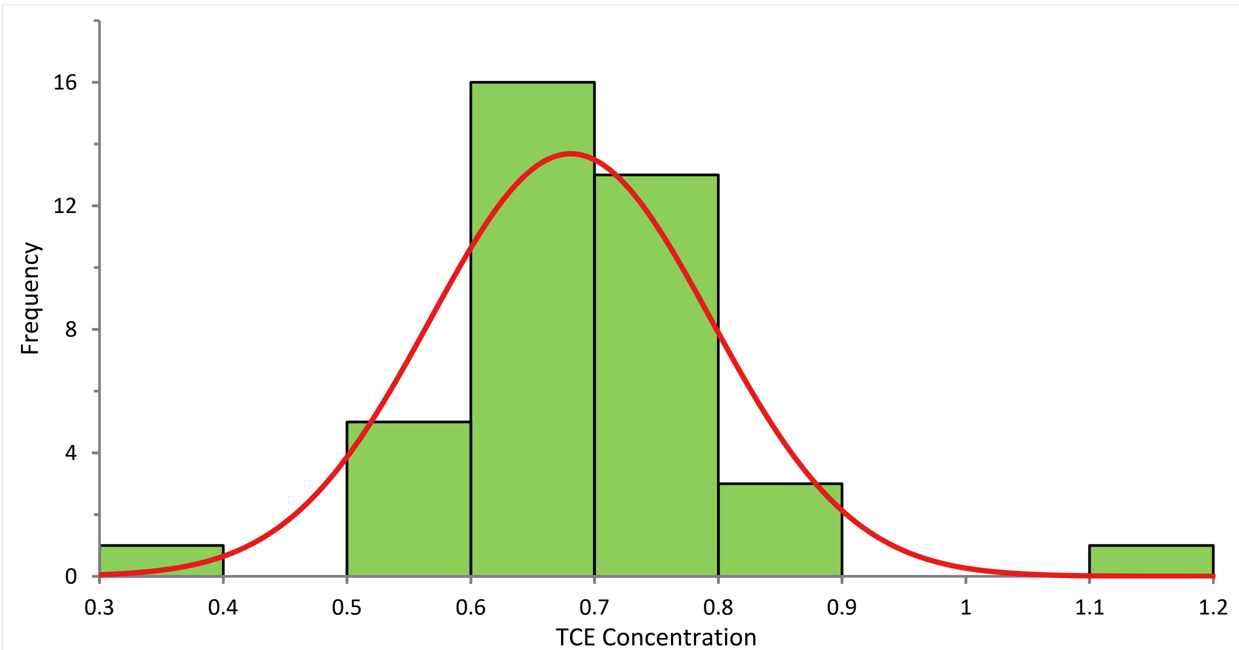


Ln(DA-30)

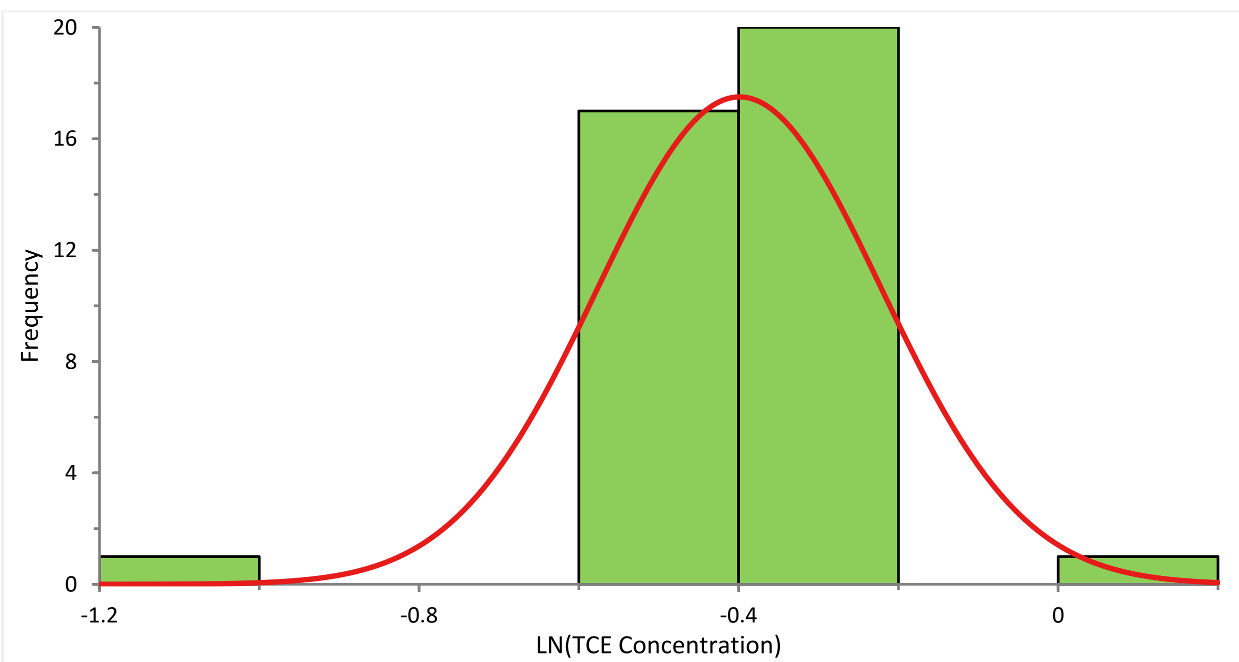


Histograms

DA-30b

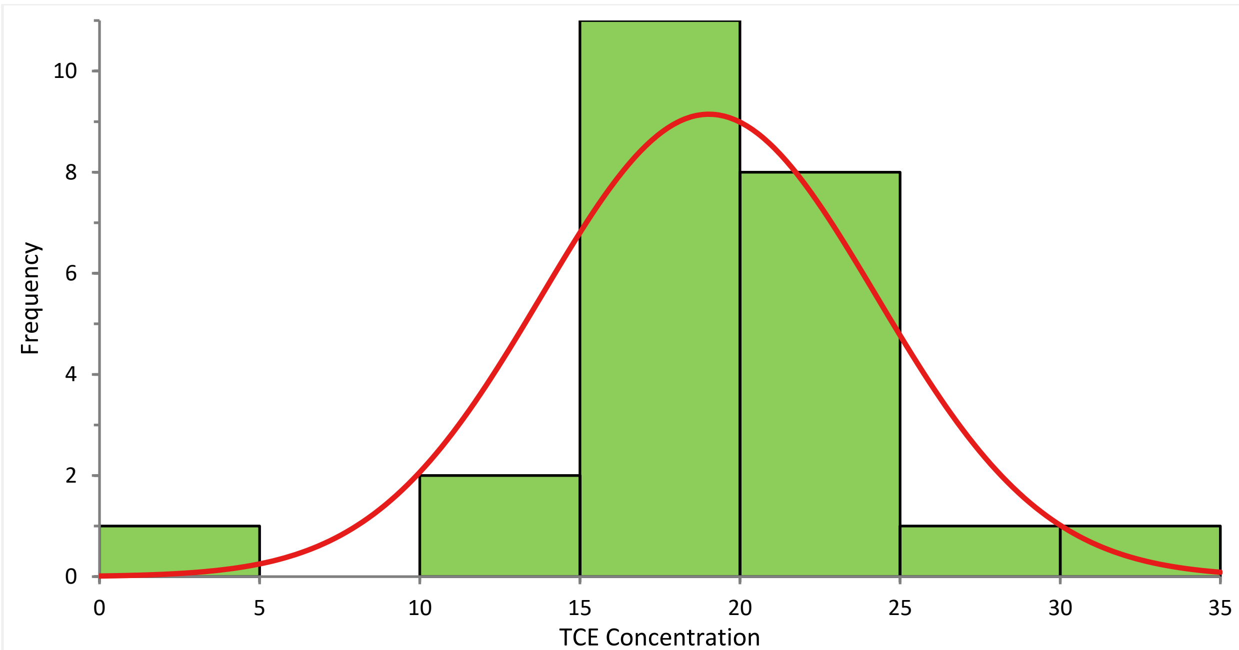


Ln(DA-30b)

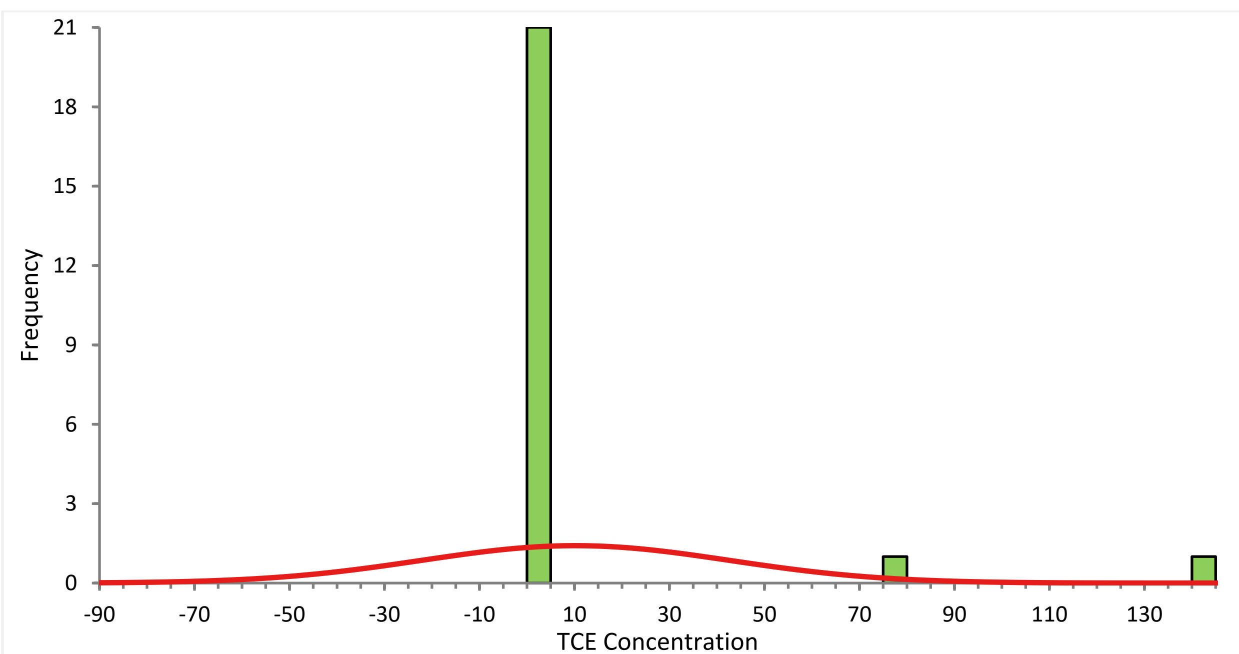


Histograms

DA-31

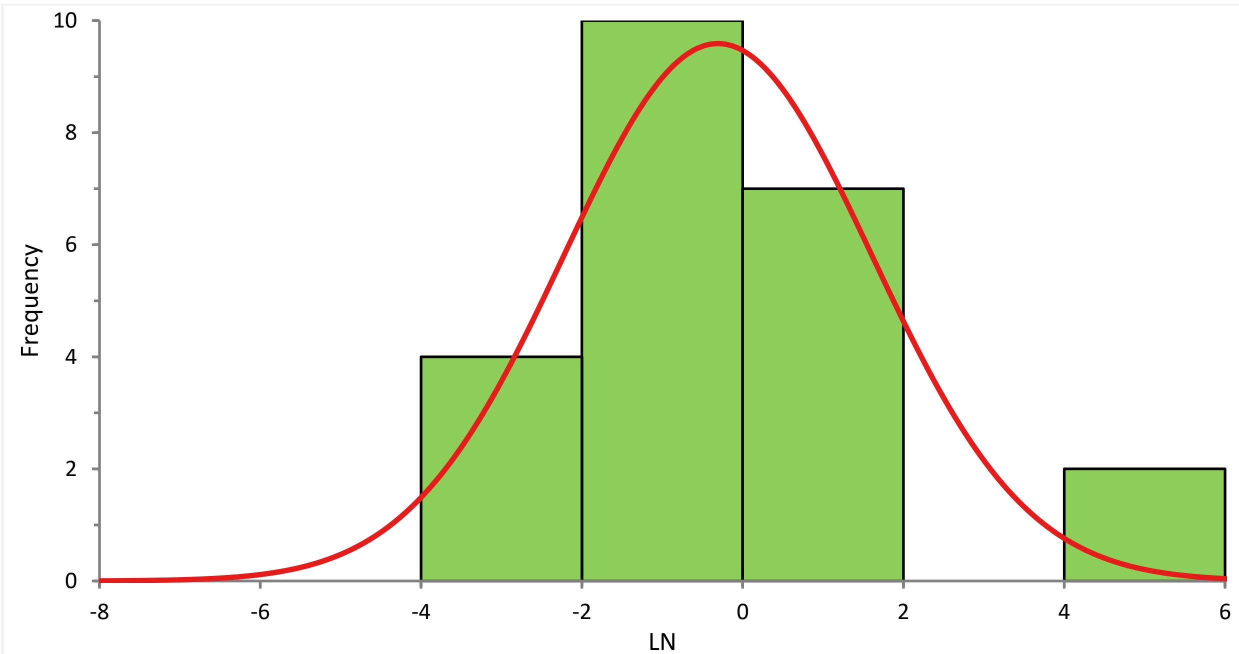


DA-32

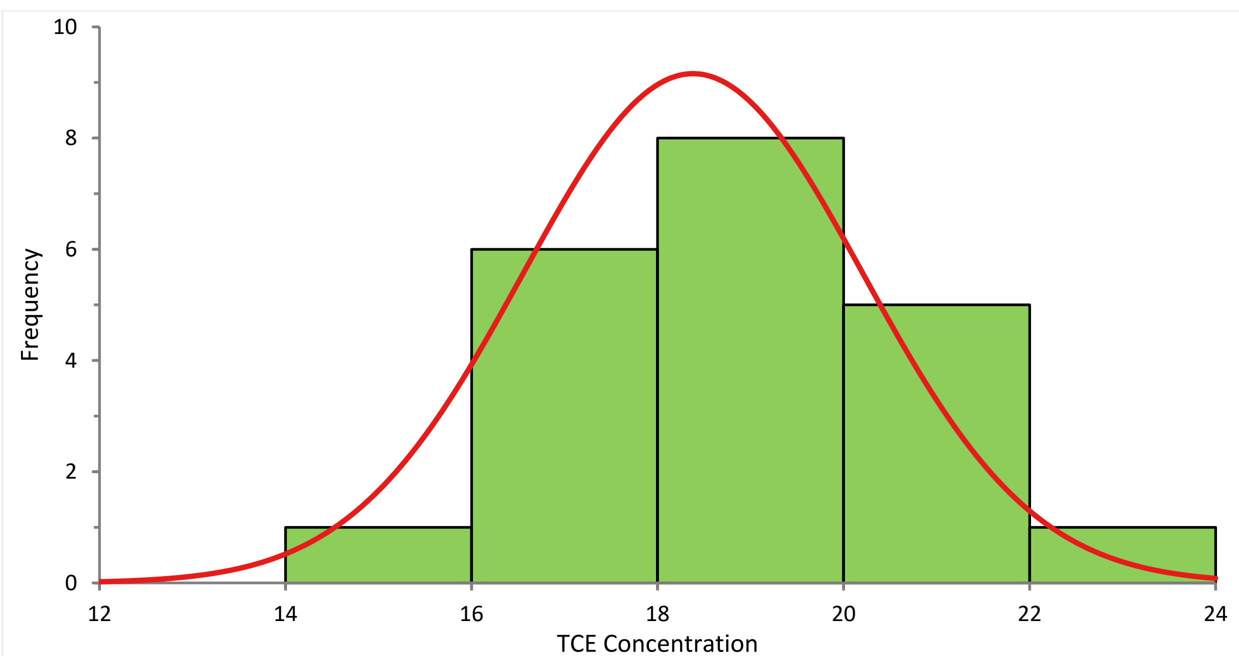


Histograms

Ln(DA-32)

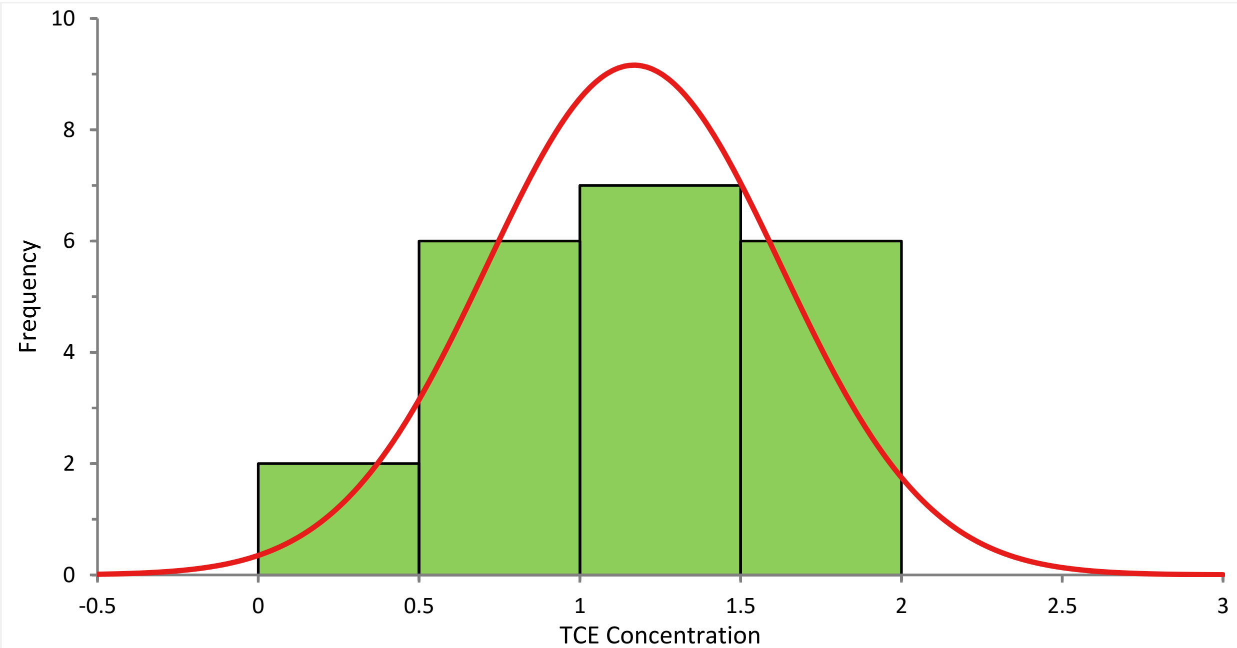


DA-43

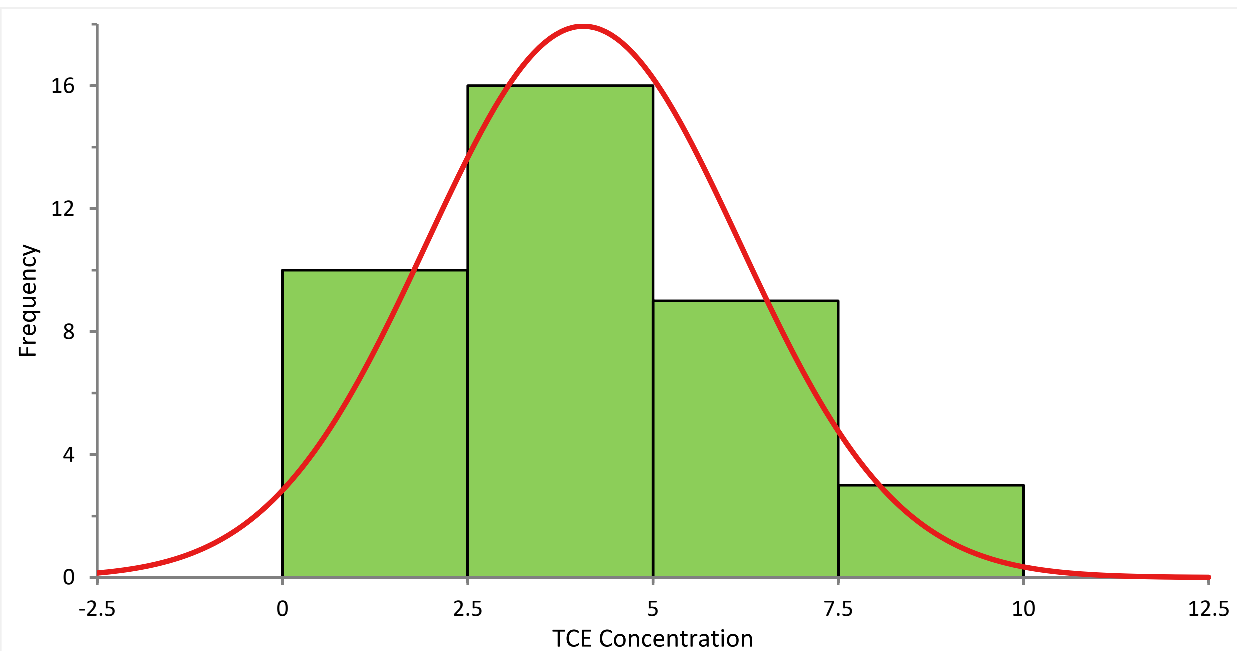


Histograms

DA-44

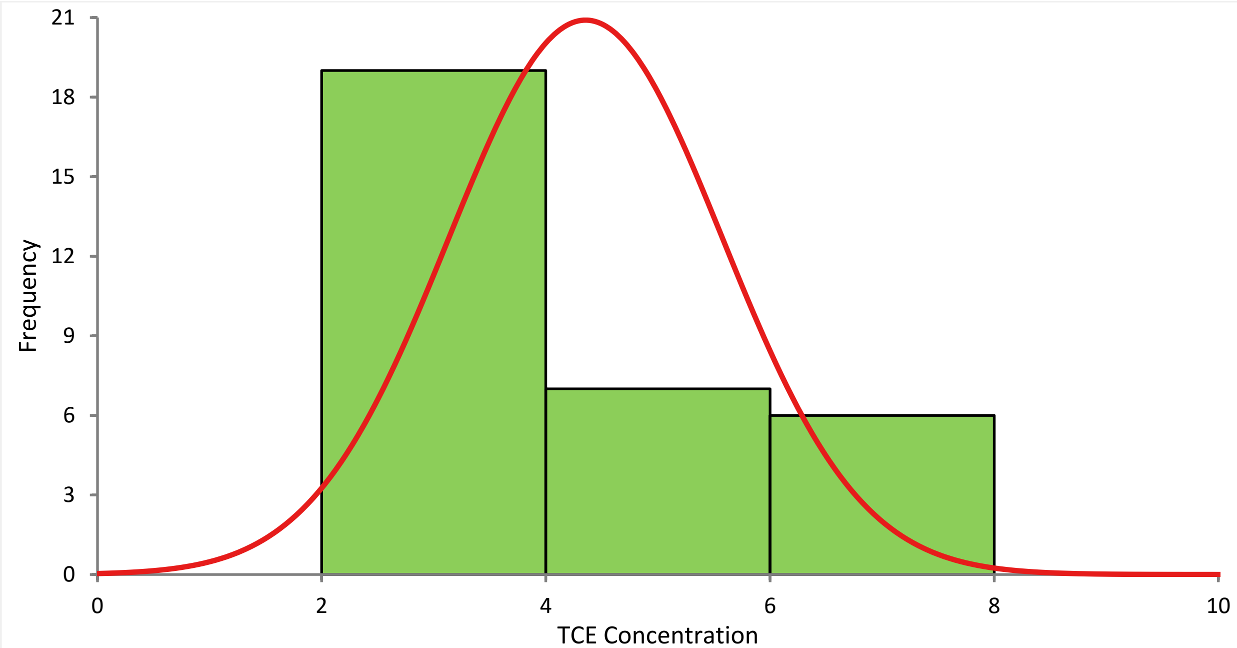


DB-6



Histograms

DO-2



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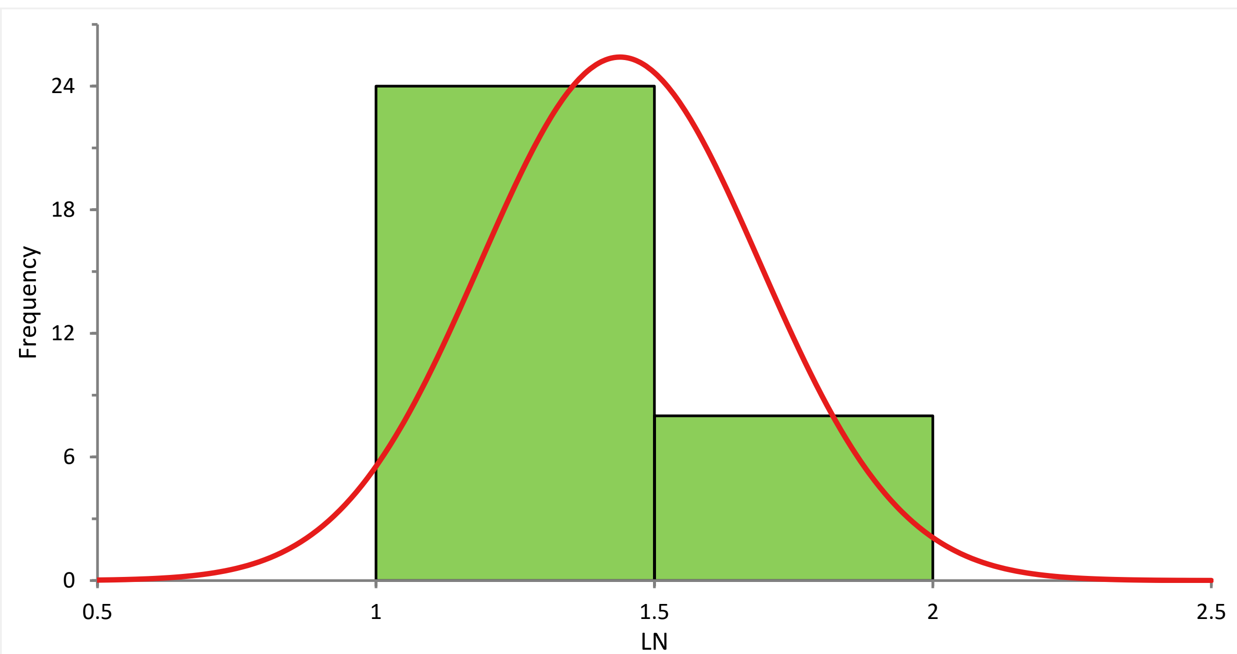
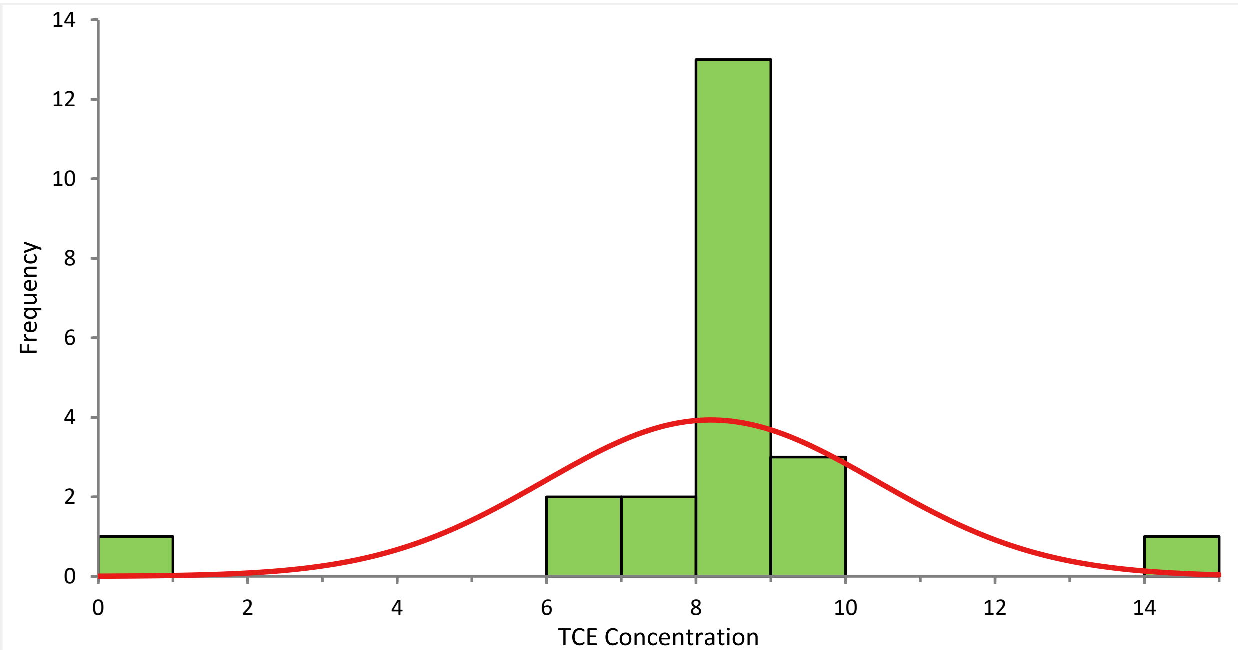


Histograms

DO-3



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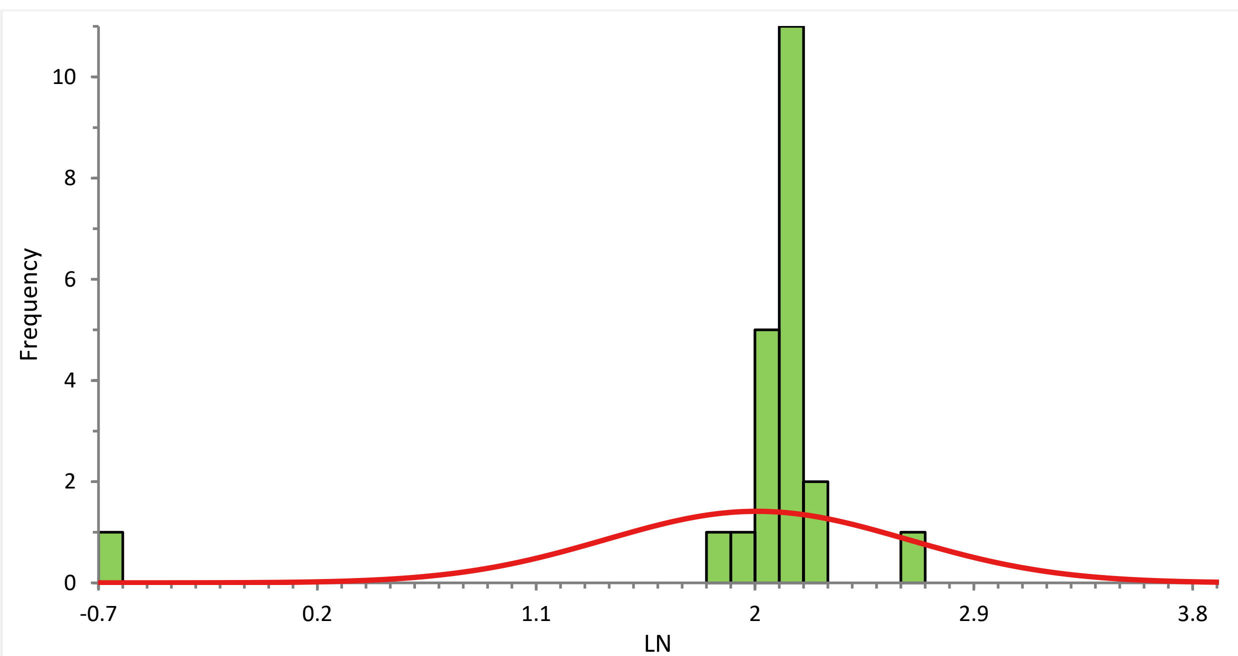
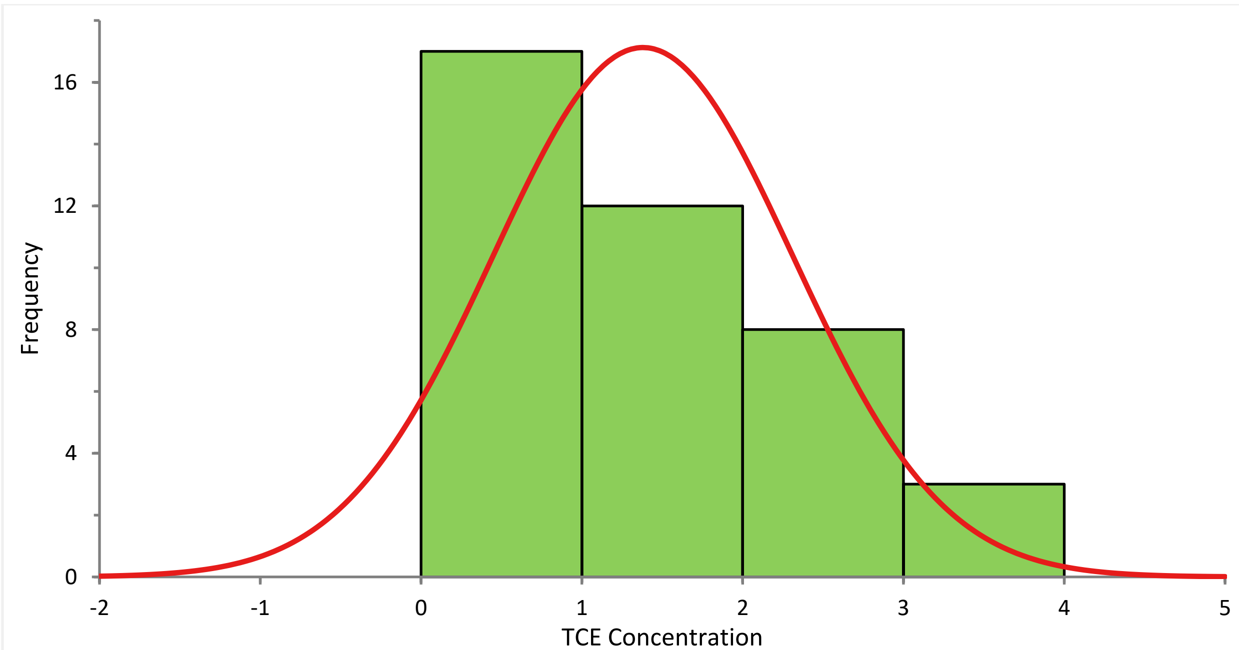
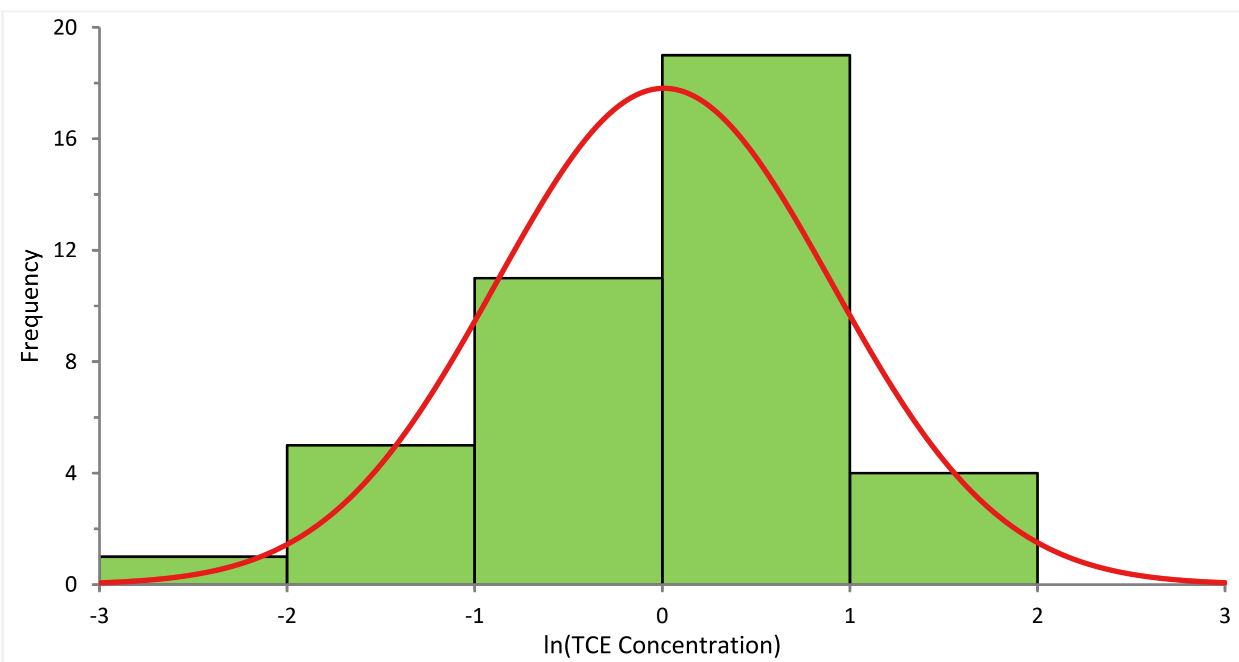


Histograms

DR-05

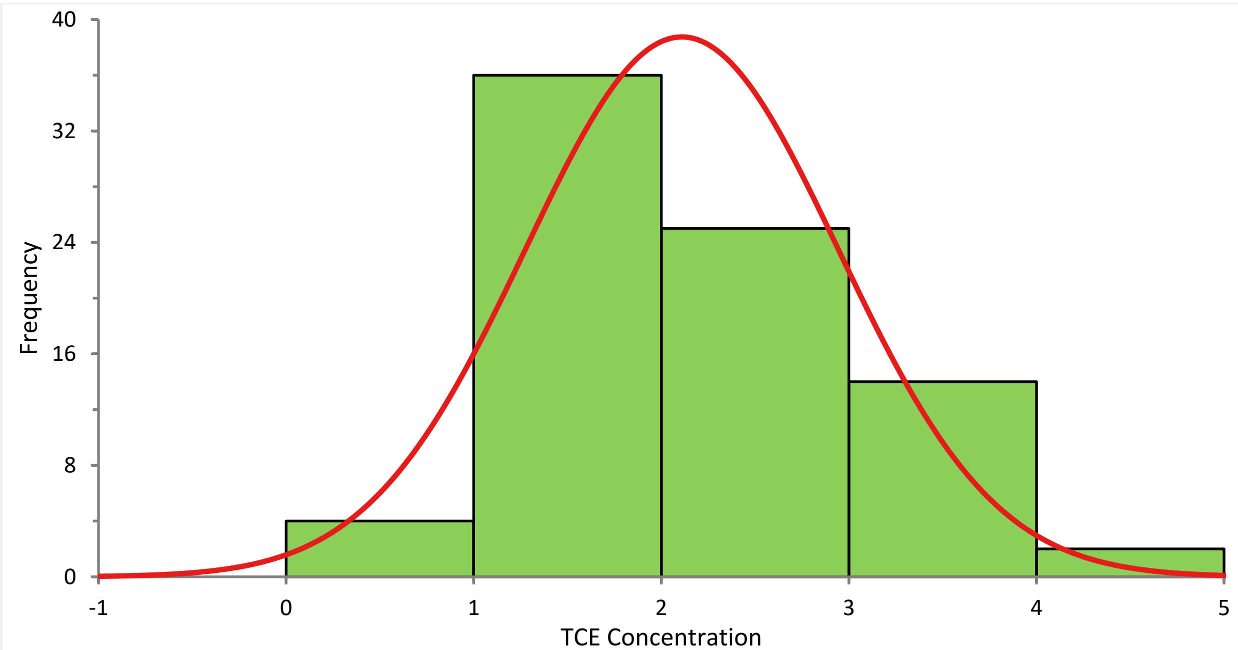


Ln(DR-05)

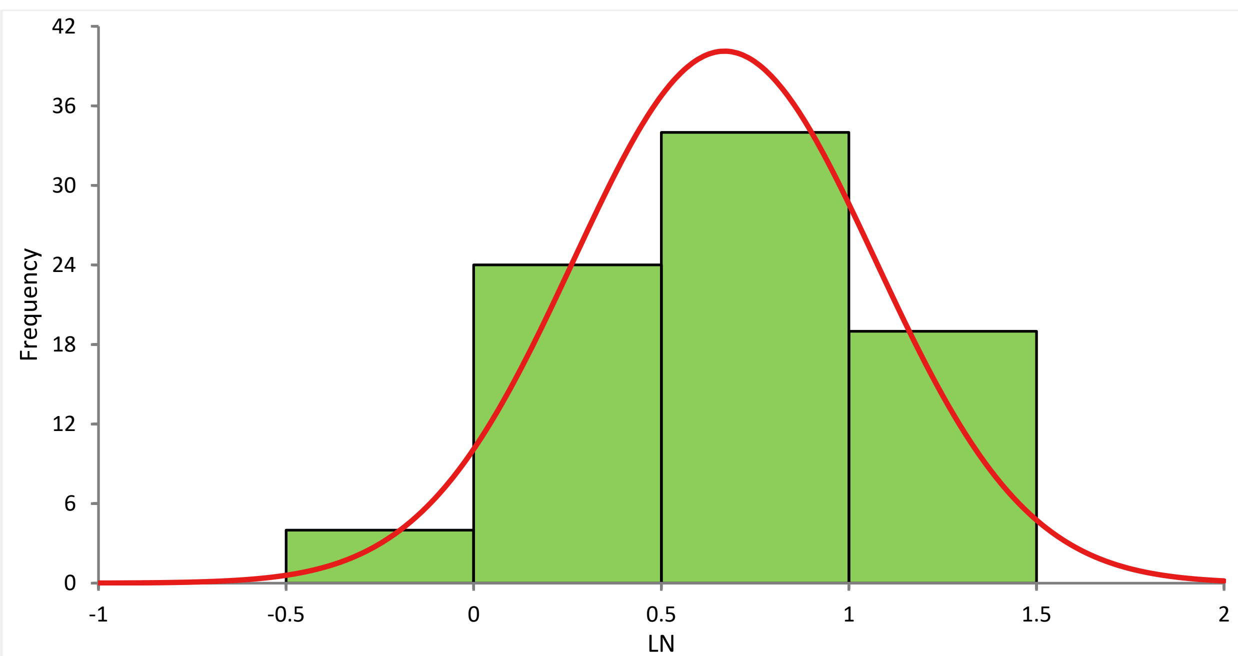


Histograms

DT-1

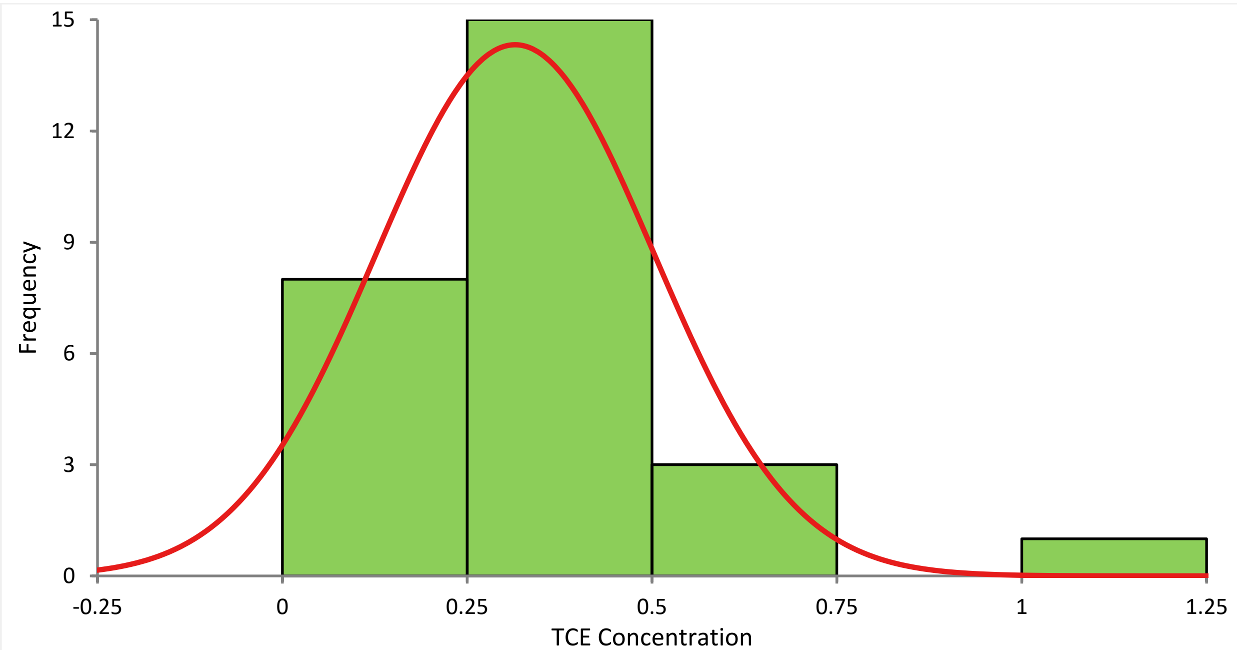


Ln(DT-1)

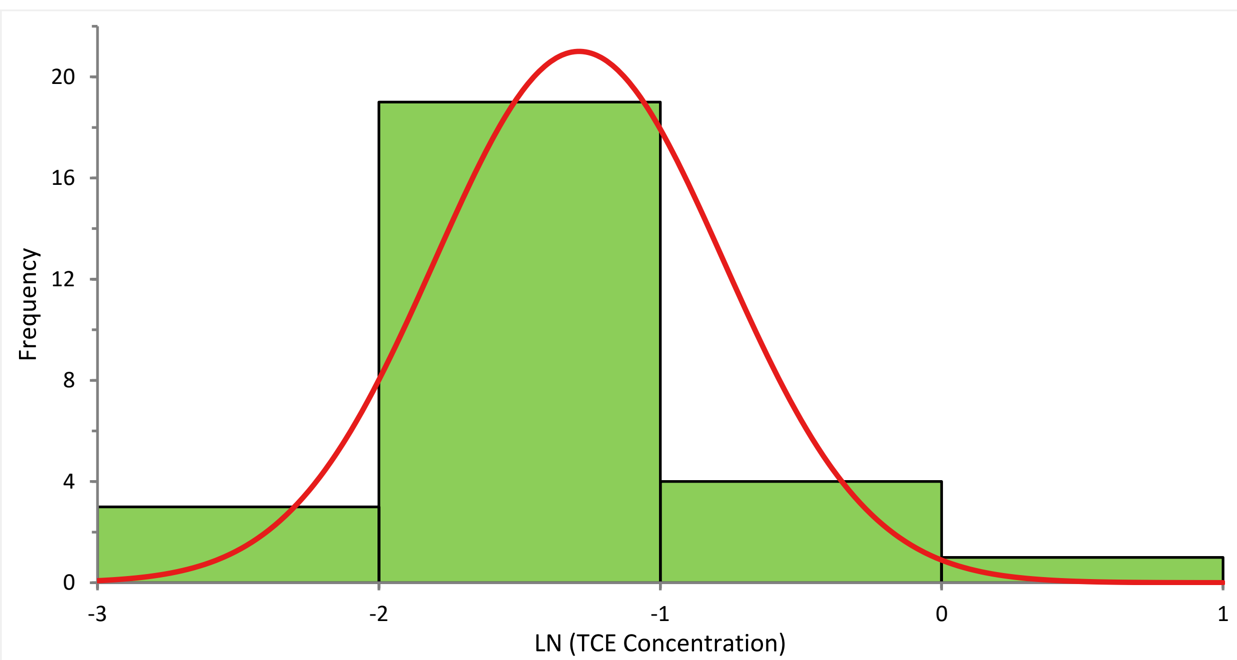


Histograms

EPA-W-5

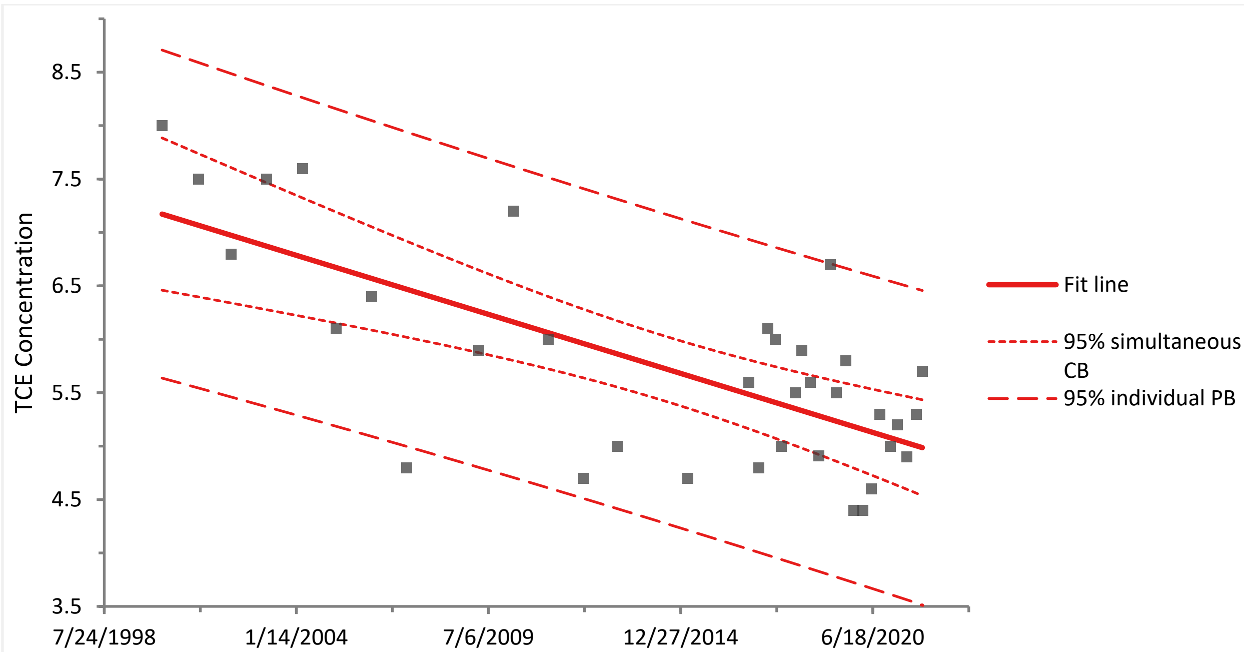


Ln(EPA-W-5)

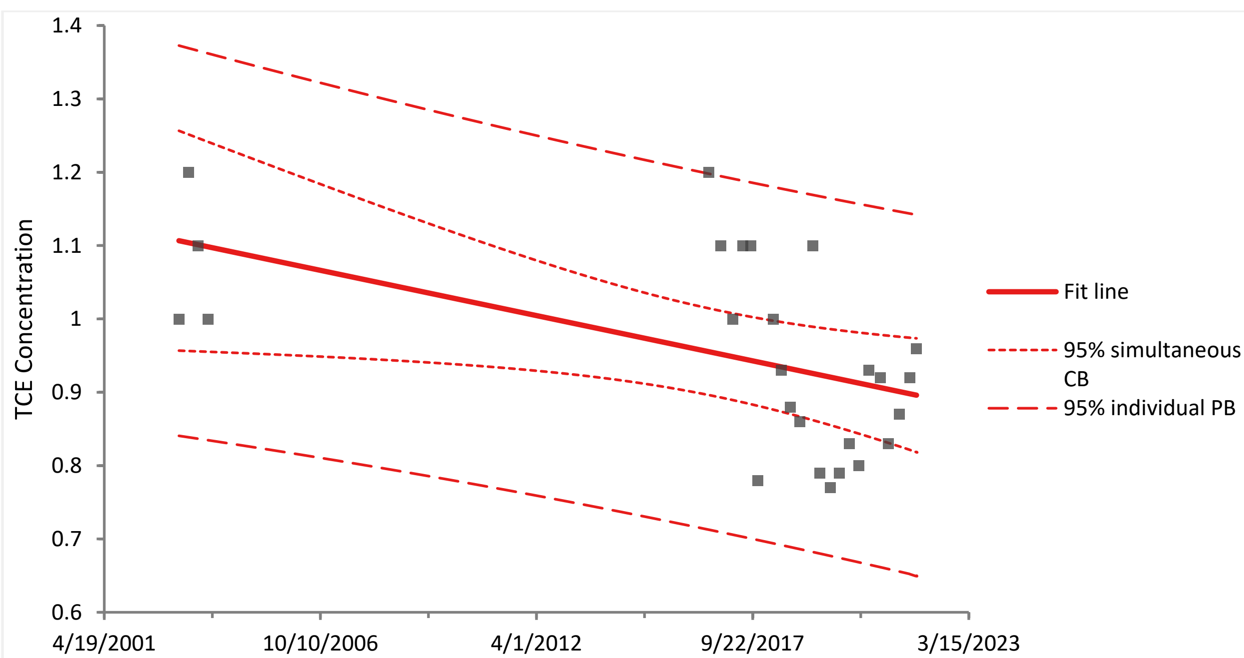


Linear Regression Graphs

DA-9b

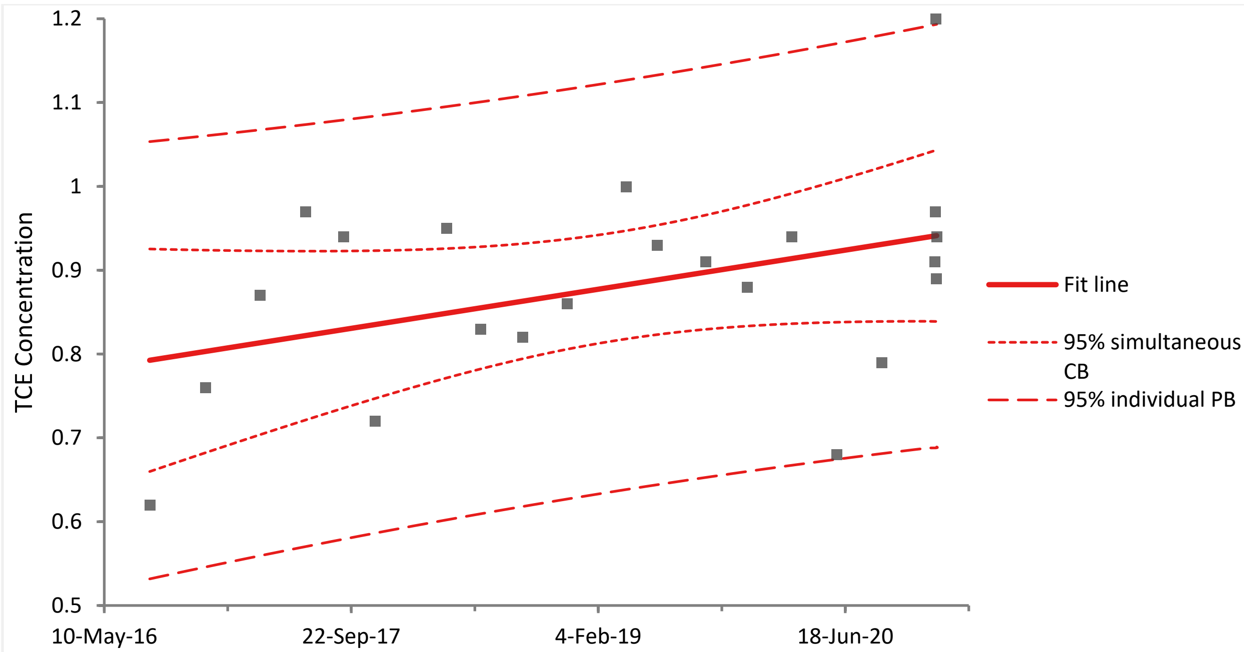


DA-11a

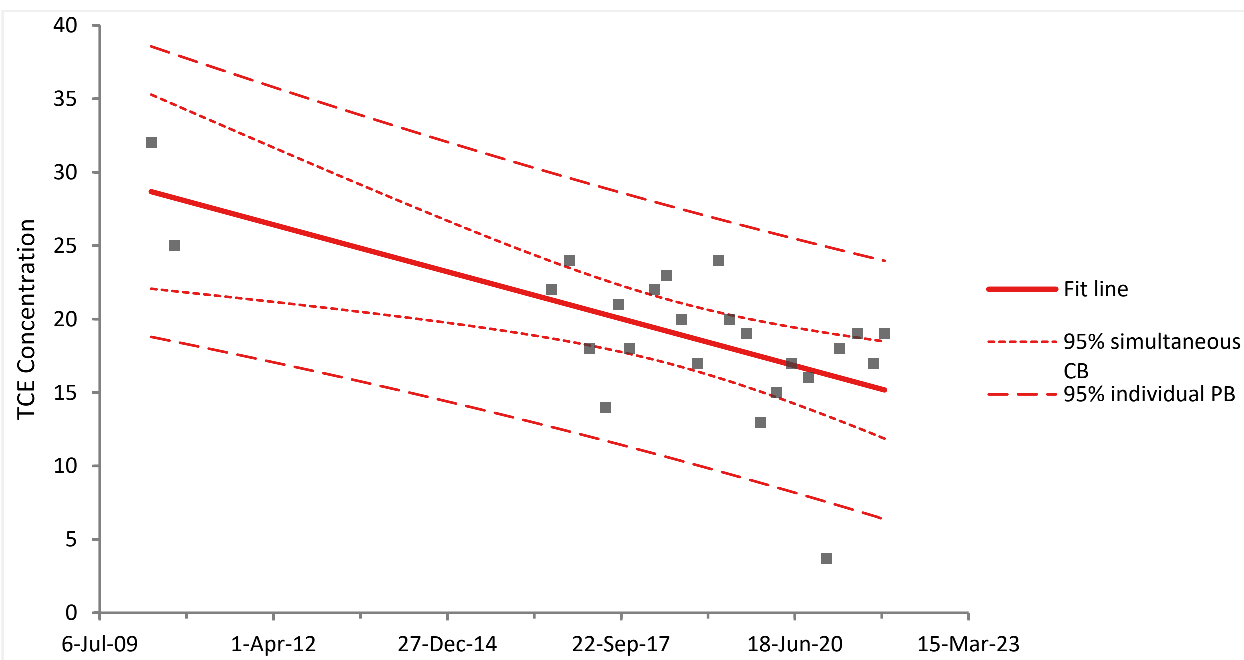


Linear Regression Graphs

DA-11b

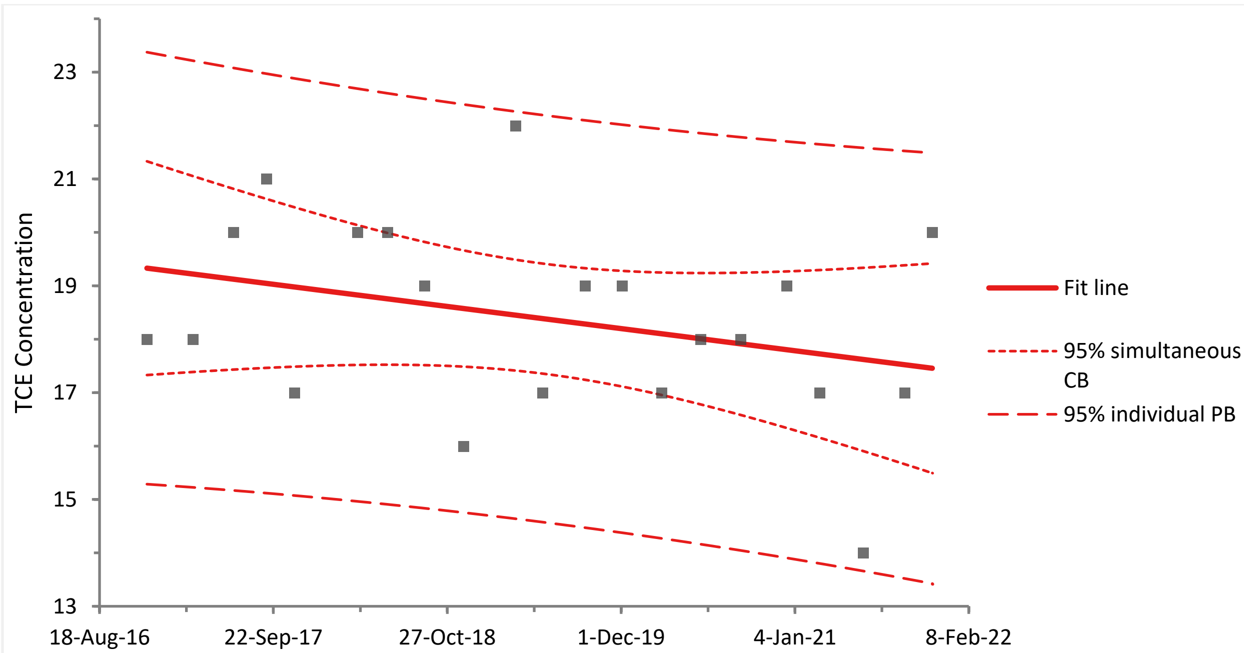


DA-31

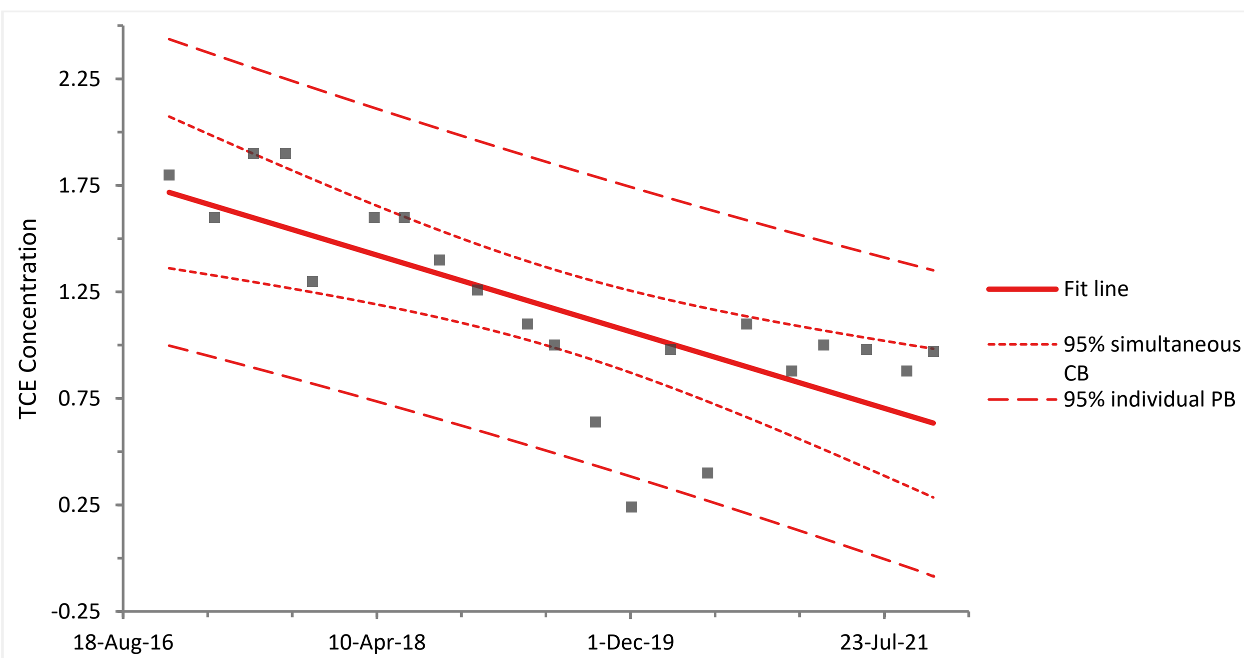


Linear Regression Graphs

DA-43

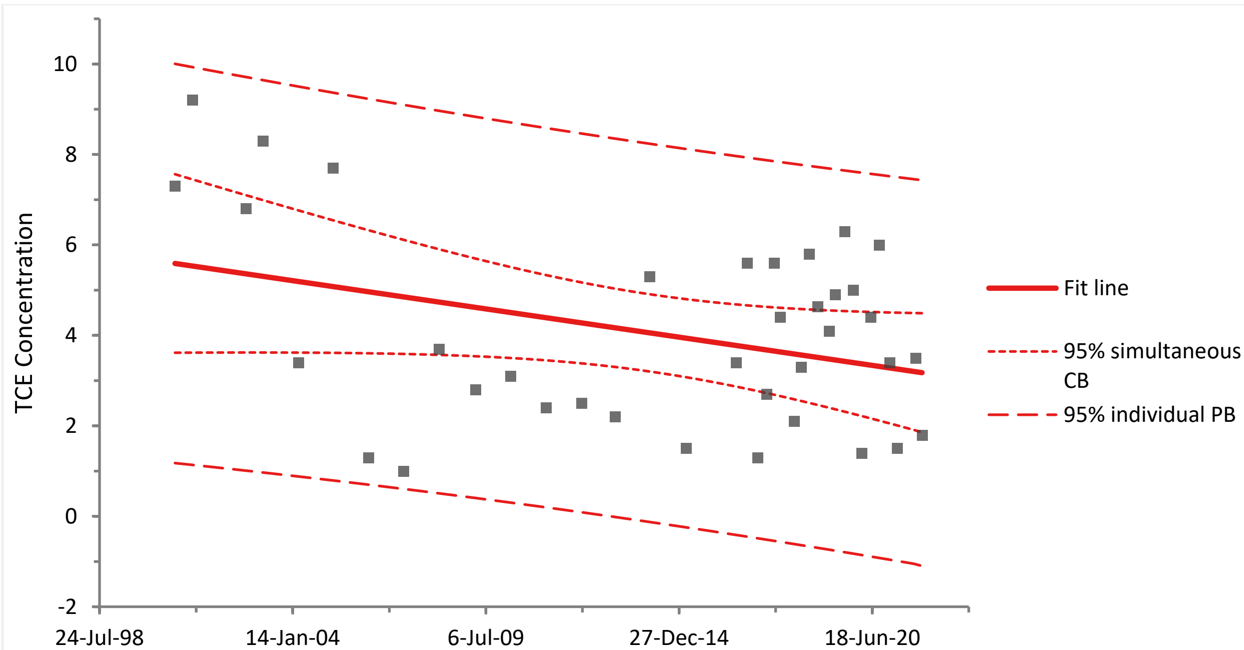


DA-44

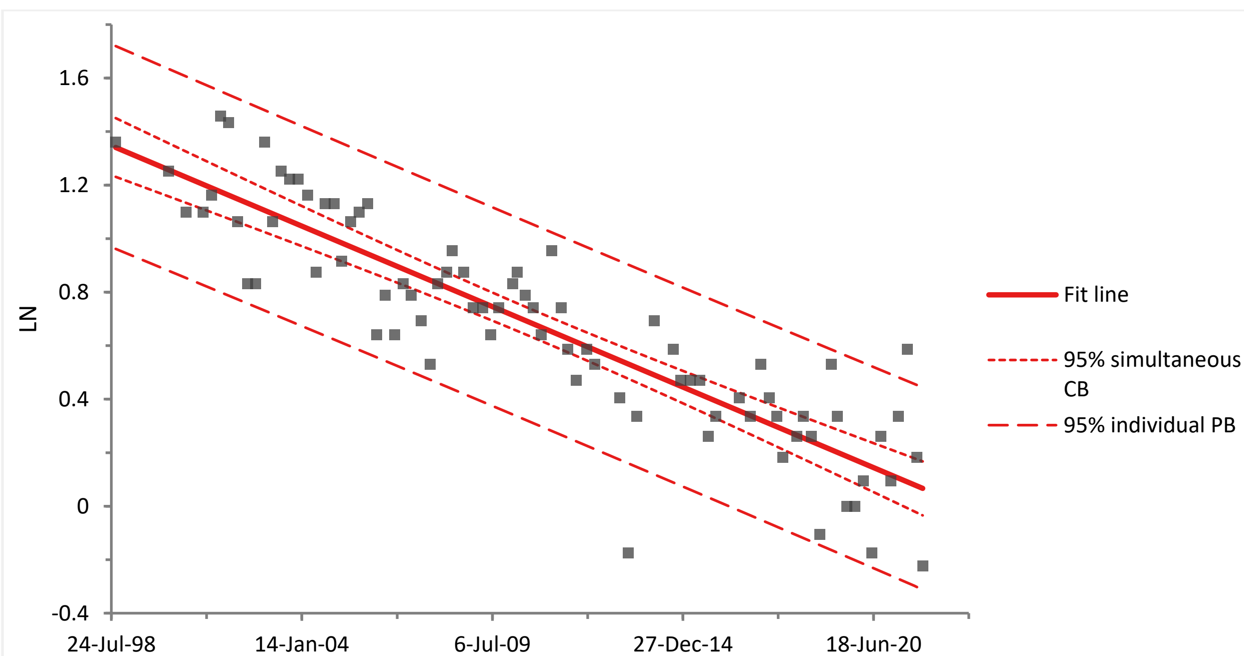


Linear Regression Graphs

DB-6

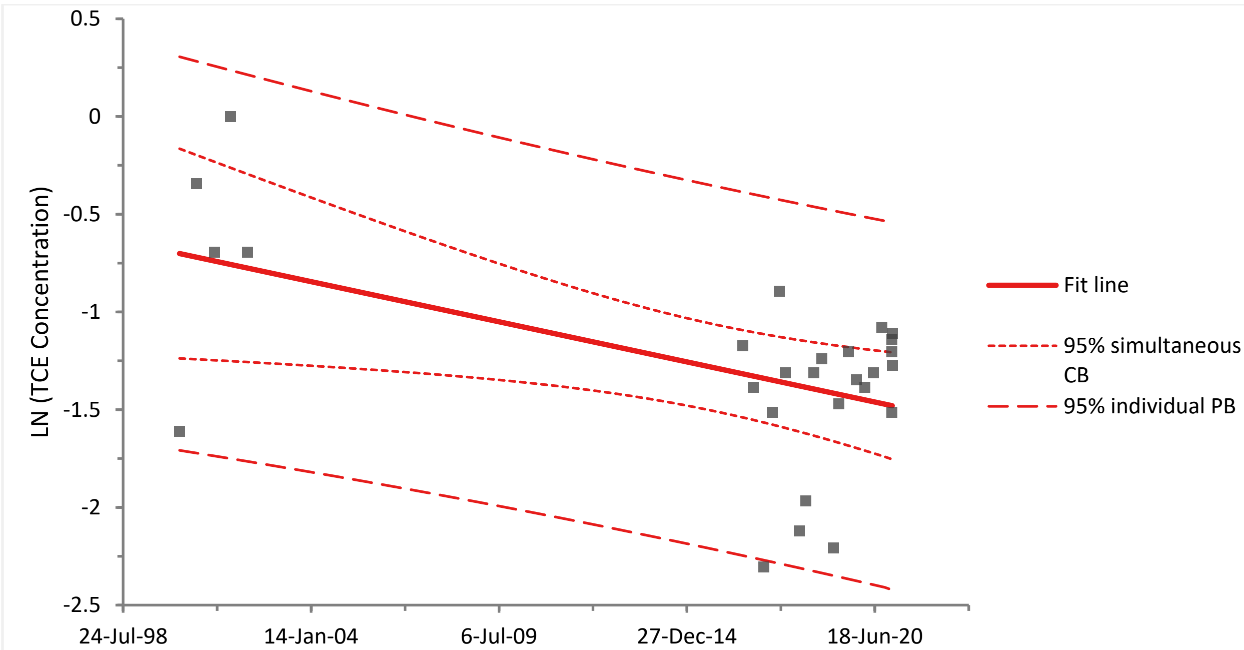


DT-1



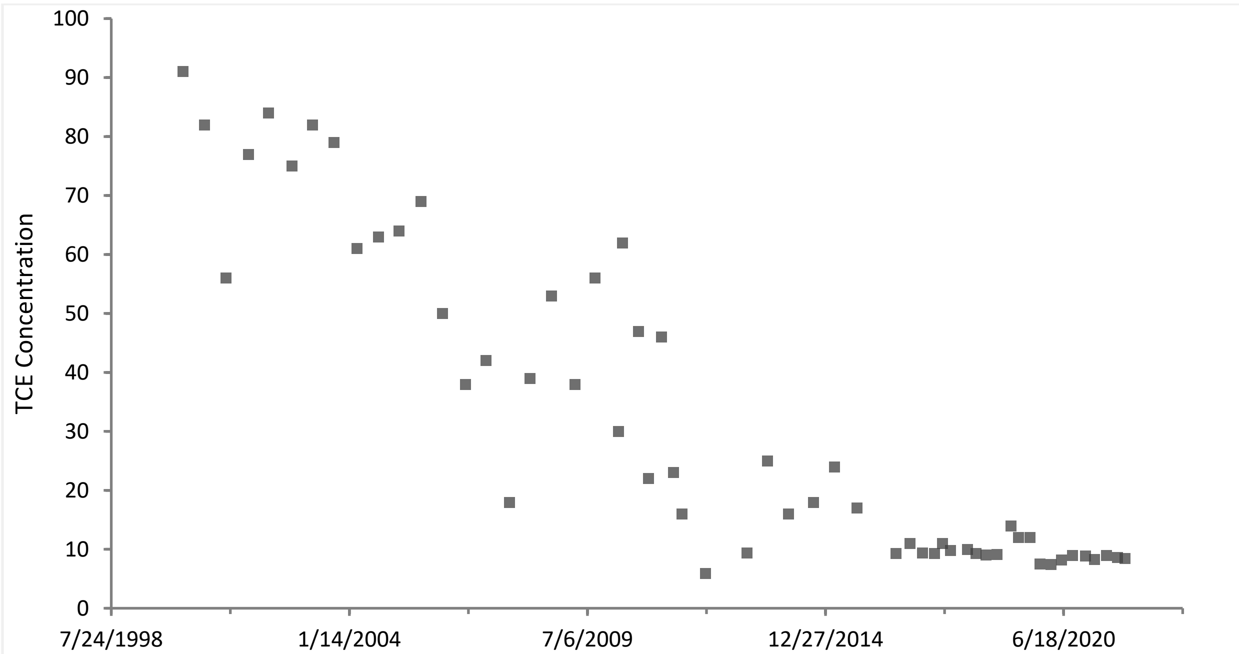
Linear Regression Graphs

EPA-W-5

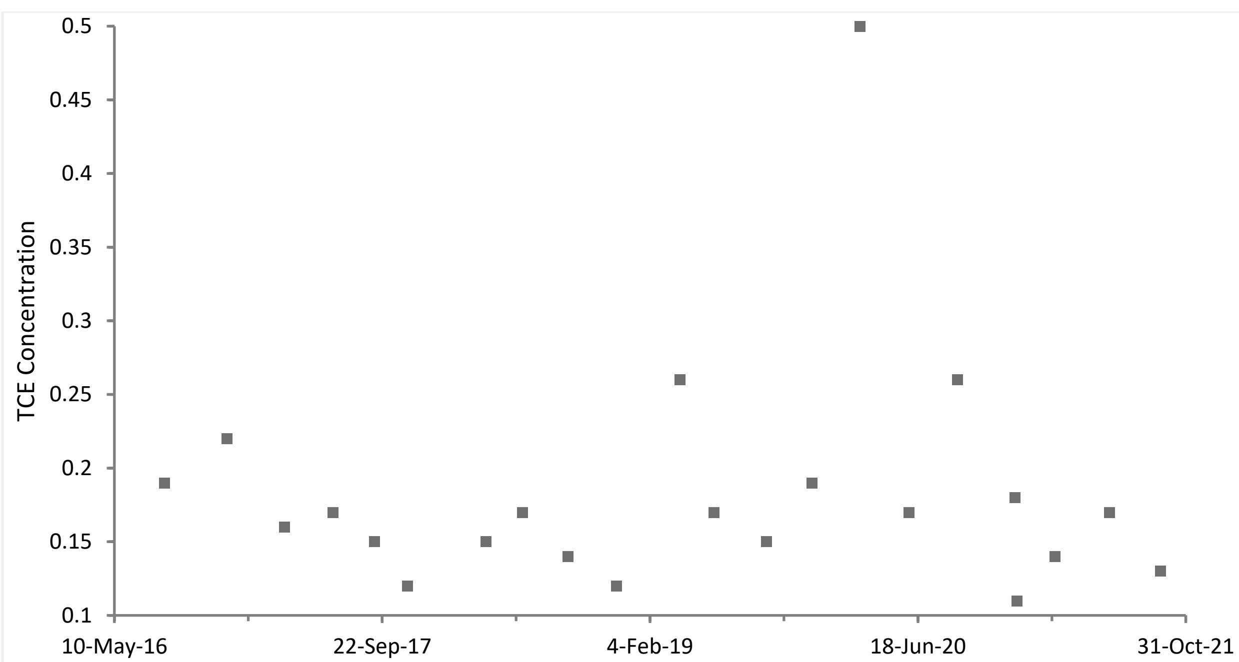


Mann-Kendall Scatter Plots

DA-7b



DA-13a



Mann-Kendall Scatter Plots

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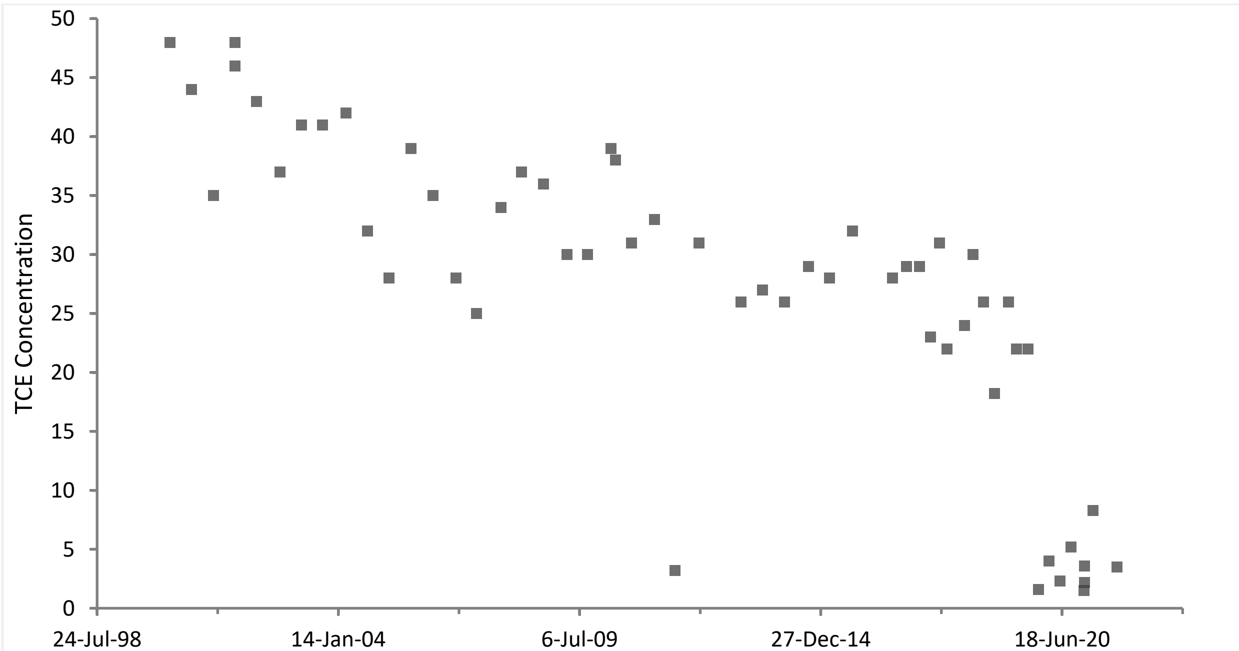

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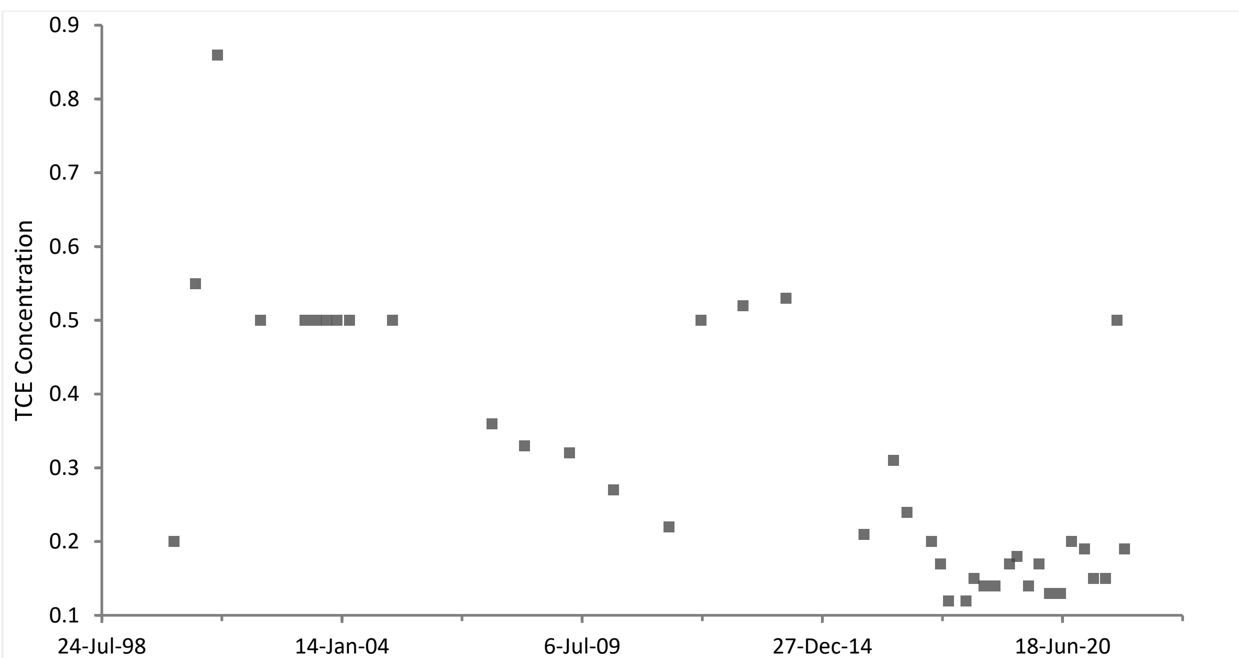

Mann-Kendall Scatter Plots

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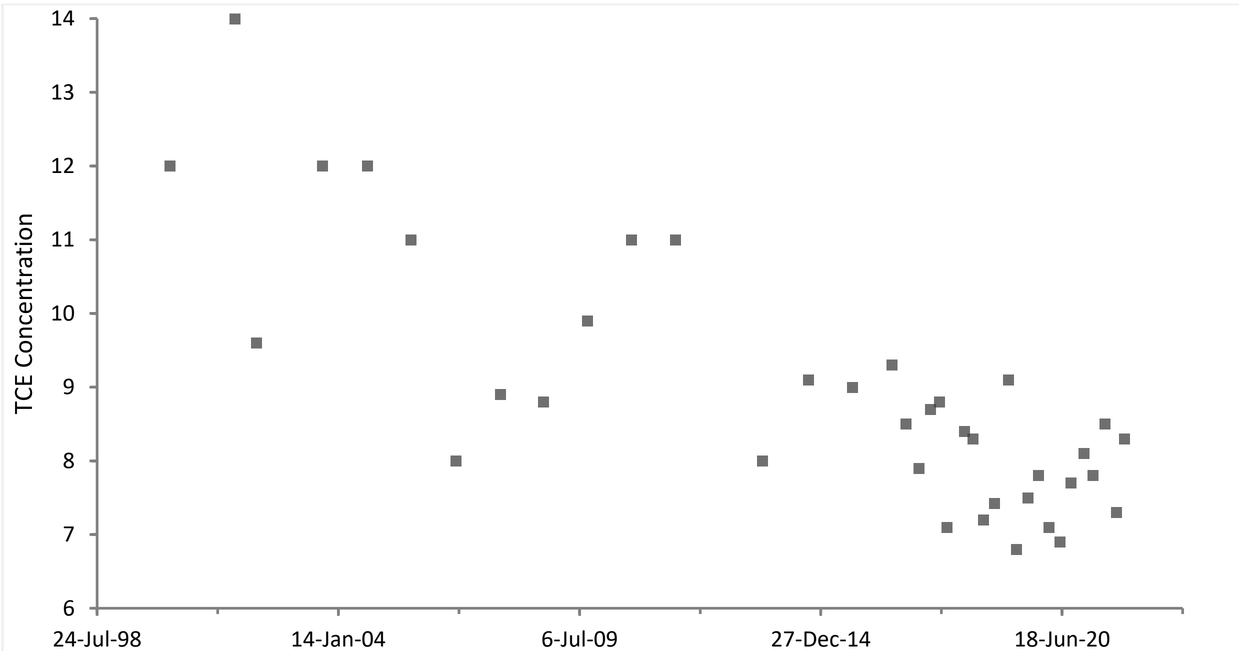

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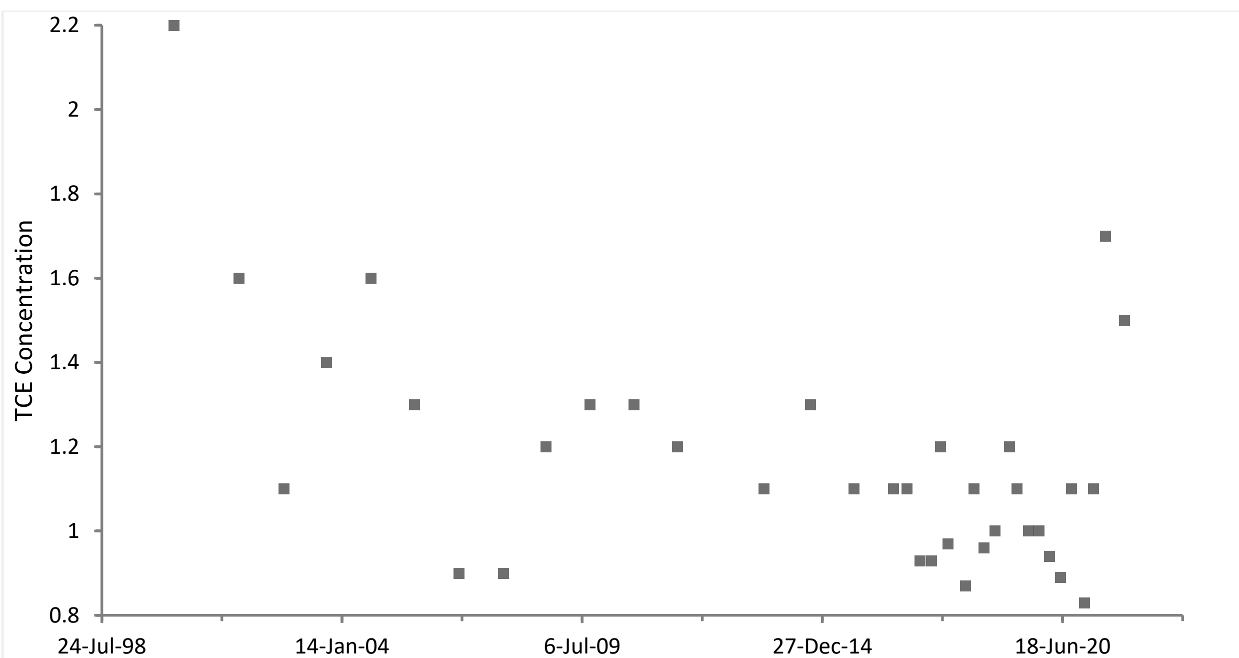

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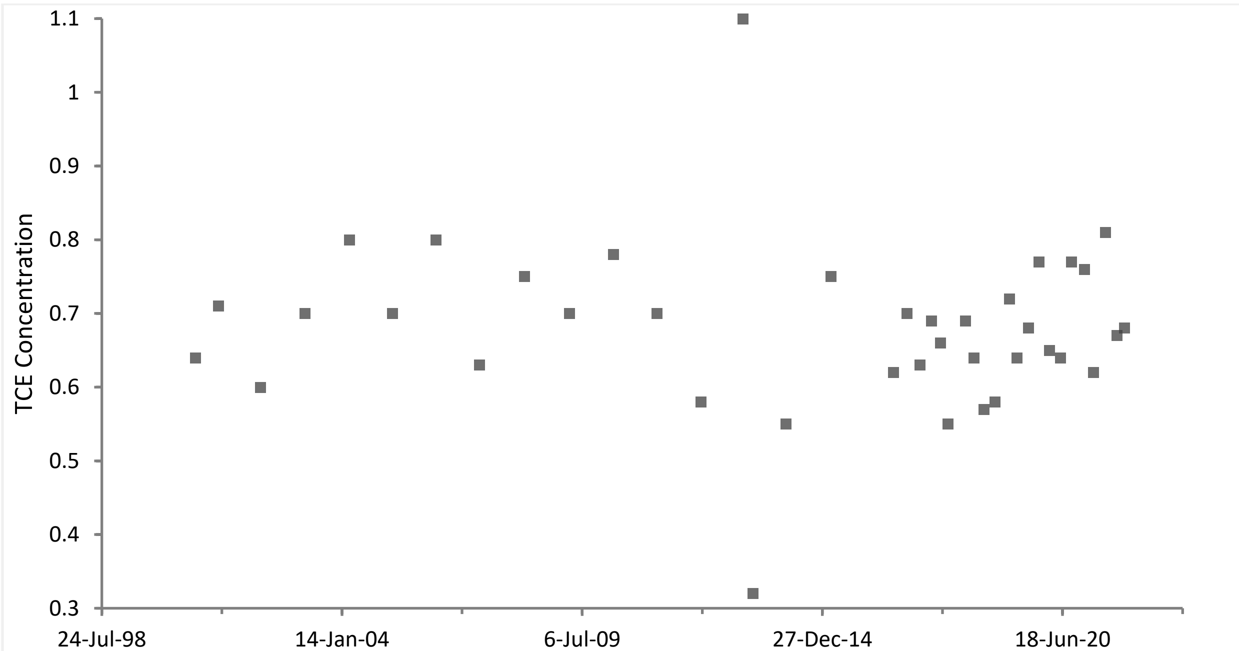

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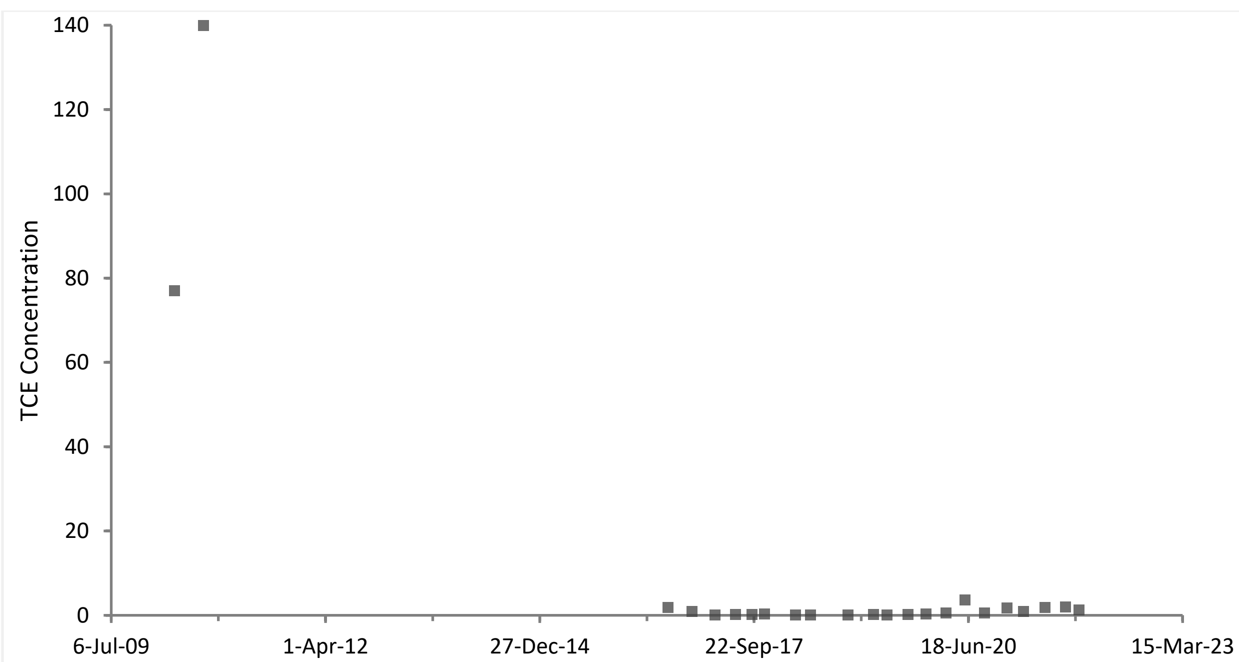
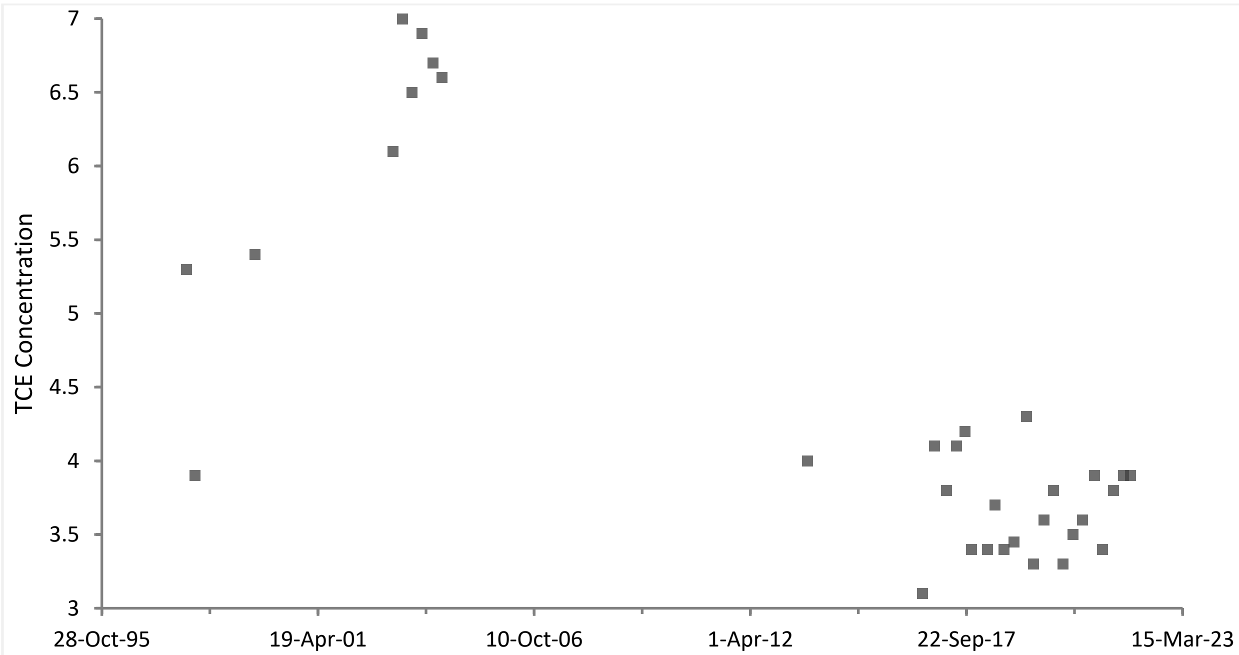


Mann-Kendall Scatter Plots

DO-2



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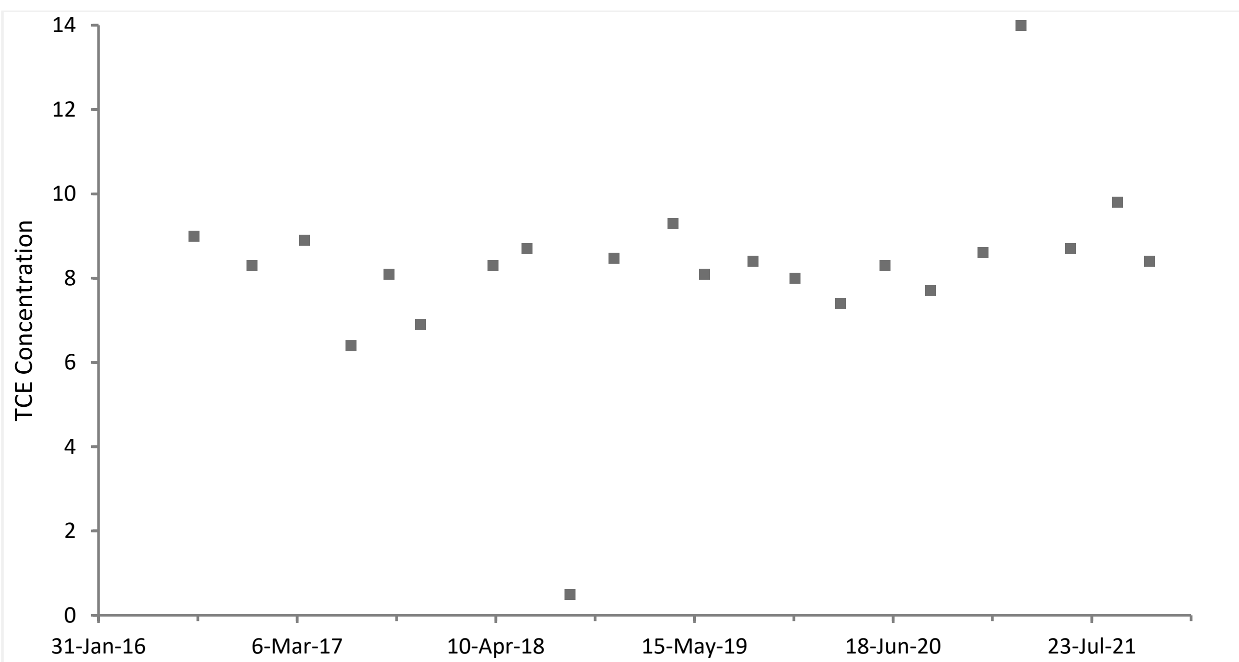
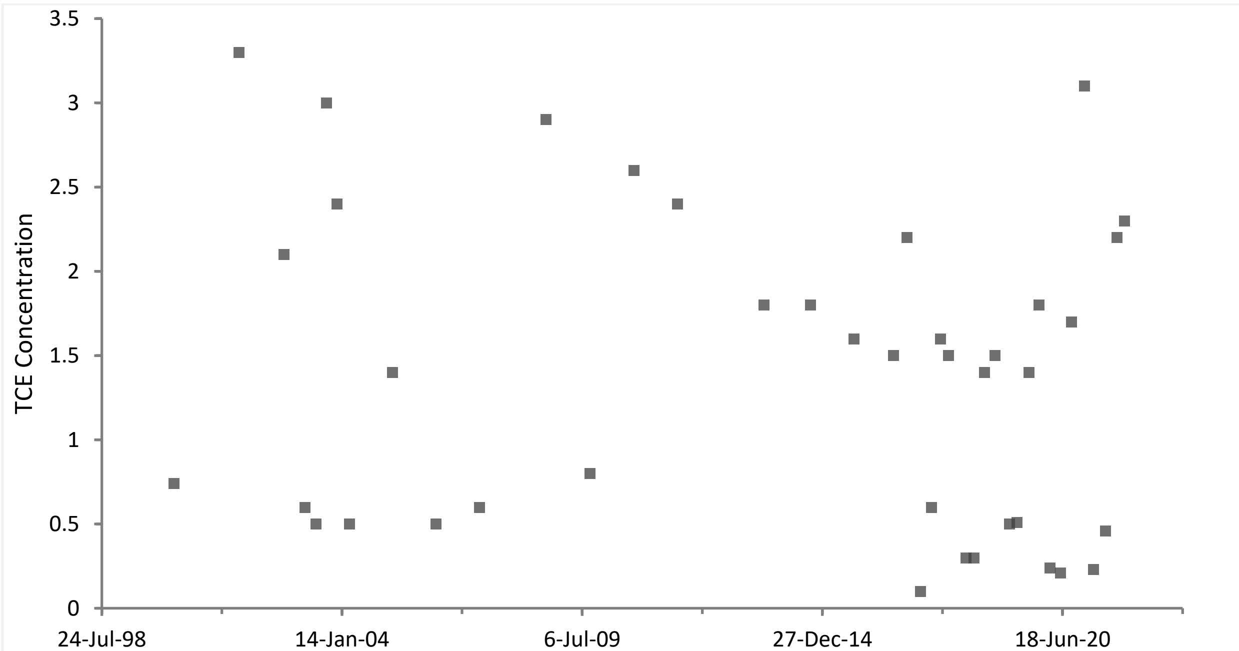


Mann-Kendall Scatter Plots

DR-05



Appendix H

Question B Appendix

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Question B Evaluation Supporting Information

This appendix was prepared to provide additional information used to address Question B of the Five-Year Review (FYR), which asks "*Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) used at the Time of the Remedy Selection Still Valid?"* For each of the 10 Joint Base Lewis McChord (JBLM) sites, a determination of whether the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid is provided in each subsection. This appendix summarizes the information that is considered in answering Question B to ensure that all relevant issues are considered when determining the protectiveness of the remedy and the process is described herein to avoid repetition.

Table 1 compiles the Remediation Goals (RGs) for the JBLM sites and provides a comparison of RGs to updated Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds. Table 2 provides comparison of risk-based RGs with current risk-based Washington Model Toxics Control Act (MTCA) Method B cleanup levels and United States Environmental Protection Agency (USEPA) risk-based Regional Screening Levels (RSLs), along with a comparison of previous toxicity presented in the Record of Decision (ROD) and current toxicity data. Table 3 provides changes in toxicity data and risk-based screening levels for evaluating the emerging chemicals per- and polyfluoroalkyl substances (PFAS).

Changes in Standards, Newly Promulgated Standards, and To Be Considereds (TBCs)

Changes in standards identified as ARARs in the ROD, newly promulgated standards, and/or changes in TBCs identified in the ROD are evaluated to determine whether the changes could call into question the protectiveness of the remedy.

For groundwater in Operable Unit (OU) 1, OU2, and OU3, the federal maximum contaminant levels (MCL) and State of Washington Department of Ecology Cleanup Levels And Risk Calculations (CLARC) established as part of the Washington MTCA. Under MTCA, clean up levels may be established for unrestricted or industrial land used and may use one of three Methods (A, B, or C). Method A, Method B and C cleanup levels were identified as ARARs/TBCs and are based on values in place at the time of the RODs.

- Method A criteria are based on routine site conditions with relatively few hazardous substances and either residential or industrial land use, as well as a comparison with the criteria for protection of groundwater exposure due to soil leaching.
- Method B criteria are based on the reasonable maximum exposure under residential land use, using either the "Standard" set of equations and exposure assumptions or using "Modified" site-specific or chemical-specific data. Method B criteria are established to limit sitewide impacts to an excess cancer risk of 1×10^{-5} and a hazard index of 1, with criteria adjusted downward to achieve these objectives. A terrestrial ecological evaluation for terrestrial receptors (plants and animals) are also included in establishing Method B criteria.

- Method C criteria are based on the reasonable maximum exposure under the industrial land use scenario and requires that appropriate institutional controls (including property covenants) be implemented to limit future property use to industrial applications. Additionally, Method C criteria are calculated using a target risk of 1 x 10^{-5} and less stringent default exposure assumptions than Method B. Criteria developed under Method C may be based on "Standard" equations/parameters or "Modified" site/chemical specific values.

The ARAR-based RGs are compared to the current federal and state MCLs in Table 1. These values have not changed and are the same as the RGs. The groundwater RGs based on MTCA cleanup levels are also compared to current MTCA cleanup levels in Table 1. The risk-based groundwater MTCA Method B cleanup levels have been updated since the time of the ROD. The State and federal surface water standards for Trichloroethene (TCE) have been updated since the time of the ROD. The RG is compared to current surface water standard in Table 1. For soil, risk-based MTCA Method B cleanup levels and USEPA Region 9 Preliminary Remedial Goals (PRGs) have been used to evaluate risk. The MTCA Method B cleanup level was used to establish the cleanup level for carcinogenic polycyclic aromatic hydrocarbons (cPAH). MTCA Method B cleanup levels have been updated since the time of the ROD. The soil RGs are compared to current MTCA Method B cleanup levels and USEPA RSLs (merger of the EPA Region 3 risk-based concentration [RBC] table, Region 6 Human Health Medium-Specific Screening Levels [HHMSSL] table, and the Region 9 PRG table) in Table 2. Risk-based groundwater RGs are also compared to RSLs in Table 2. Changes in RGs and risk-based cleanup levels on the protectiveness of the remedies for the JBLM sites are discussed in the subsection for each of the sites.

For five of the seven areas within OU1 (Illicit PCB Dump Site, Industrial Wastewater Treatment Plant, Battery Acid Pit, DRMO Yard, and Pesticide Rinse Area), no cleanup standards, or cleanup ARARs, or cleanup TBCs were identified in the Decision Documents (DD). The COCs listed in the DD as exceeding residential cleanup levels in soil, and thus requiring a land use control (LUC), are listed in Table 1. These COCs are discussed in the subsection for each of these sites. Changes in risk-based levels used to establish LUCs to prevent unacceptable risk via direct contact with soil on the protectiveness of the remedies are discussed in the subsection for each of the sites. Changes in toxicity data and risk-based screening levels for evaluating the emerging chemicals (PFAS) are presented in Table 3. In May 2022, the USEPA updated the RSLs for perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) based on changes to toxicity data for these compounds as well as included toxicity data and RSLs for more PFAS compounds. In June 2022, USEPA issued interim updated lifetime health advisories (HAs) of 0.004 parts per trillion (ppt) for PFOA and 0.02 ppt for PFOS, and final lifetime HAs of 2,000 ppt for perfluorobutane sulfonic acid (PFBS) and 10 ppt for hexafluoropropylene oxide dimer acid (HFPO-DA, or GenX) (USEPA, 2022). In July 2022, the Department of Defense (DoD) provided technical guidance on incorporating the updated USEPA RSLs for PFOS, PFOA, PFBS, PFNA, perfluorohexane sulfonate (PFHxS), and HPFO-DA when investigating PFAS within the DOD Cleanup Program(DoD, 2022). In January 2022, the Washington State Board of Health (WAC 246-290-315) established state action levels (SALs) for five PFAS compounds: PFOA (10 nanograms/liter [ng/L] or 10 parts per trillion [ppt]); PFOS (15 ppt); PFBS (345 ppt);

Perfluorohexane sulfonate (PFHxS) (65 ppt); and Perfluorononanoic acid (PFNA) (9 ppt) (Ecology, 2022). The DoD has not provided guidance on SALs for DoD installations in the state of Washington, and the SALs are not promulgated standards. Therefore, the SALs are currently not appliable to investigation of PFAS in groundwater at JBLM or protectiveness determinations.

Changes in Exposure Pathways

Changes in physical site conditions, changes in land use, and new human health or ecological exposure pathways or receptors are evaluated to determine whether changes in exposure pathways that could result in increased exposure, and whether the remedy can mitigate any unacceptable risk or whether additional actions may need to be taken.

During the site visit, each of the ten sites were inspected to determine if the land use was consistent with the selected remedy and the LUC objectives identified in the JBLM LUC Plan, and if there were any visually apparent issues that may affect the remedy's protectiveness. No changes in physical site conditions or land use were noted during the FYR site inspections. The remedy for all 10 sites included restrictions on land use.

Many of the sites include a LUC objective to restrict installation of new drinking water wells without an EPA approved monitoring plan. The Final 2017 JBLM LUC Plan states that incorporating the LUC objectives into the next update of the JBLM Cantonment Area Water System Plan (WSP) will be a LUC mechanism to ensure that a new drinking water well is not installed within 1,000 feet of the landfill boundaries without obtaining a variance from Ecology.

The likelihood of the emerging chemicals (i.e., PFAS) being present at the sites has been considered for JBLM. As a recommendation of the 2nd FYR, JBLM performed a Preliminary Assessment/Site Inspection (PA/SI) to collect and analyze water samples for PFASs at Areas of Potential Interest (AOPI) including the Logistics Center Landfill 2 (LF-2) (AOPI 11), American Lake Garden Tract (ALGT) LF-5 (AOPI 8), LF 1 (AOPI 21), and LF 4 (AOPI 12) as there is a reasonable basis for suspecting PFAS within the footprint of the existing site remedy. PFAS exposure was not included in the risk assessment. A discussion of PFAS results presented in the Final PA/SI is provided for each landfill to determine if PFAS was detected at concentrations that would pose unacceptable risk through the groundwater exposure pathway. The groundwater screening levels presented in the PA/SI are compared to current (May 2022) USEPA tap water RSLs in Table 3, and concentrations of PFAS for each landfill are compared to the updated RSLs (based on a target cancer risk of 1E-06 and target hazard quotient of 0.1) within each subsection to determine if the presence of PFAS in groundwater could impact the protectiveness of the remedy. In addition, the USEPA provided RSLs for two additional compounds (perfluorohexanesulfonic acid [PFHxS] and perfluorononanoic acid [PFNA]) that were analyzed for during the PA/SI. In July 2022, the DoD incorporated use of these screening values when investigating PFAS within the DoD Cleanup Program through a Memorandum (DoD, 2022). Concentrations of PFBS, PFHxS, and PFNA in groundwater samples from Logistics Center LF-2, ALGT LF-5, LF-1 and LF-4 did not exceed the updated RSLs. Concentrations of PFOS in groundwater samples from Logistics Center LF-2, ALGT LF-5, and LF-4 and

PFOA in groundwater samples from Logistics Center LF-2 and LF-4 exceeded the updated RSLs. The PFAS compounds exceeding RSLs were considered in the risk assessment process through the calculation of site specific noncancer hazard index for these landfills (Table 3). The individual chemical HQ for each PFAS compound and the total hazard index for the PFAS compounds at each landfill do not exceed the threshold of one.

The potential for vapor intrusion (VI) to indoor air as an exposure pathway was not evaluated in the Human Health Risk Assessment (HHRA) for ALGT, LF1, LF4, and SRCPP. In 2002, USEPA released the Draft Subsurface Vapor Intrusion Guidance. This guidance was updated in June 2015 as Office of Solid Waste and Emergency Response (OSWER) Publication 9200.2-154. In 2012, the USEPA released the Vapor Intrusion Screening Level (VISL) Calculator as a spreadsheet tool and in 2018 released VISL Calculator replacing previous versions in MS-Excel workbooks as an online calculator. The VISL online calculator (updated December 2021) was used to evaluate the vapor intrusion risk associated with volatile organic compound (VOCs) in groundwater samples (collected within the last 5 years) for the ALGT, LF-1, LF-4 and Solvent Refined Coal Plant (SRCPP). The VI pathway at the Logistics Center/LF2 was addressed through a 2007 Indoor Air Study (residential) and a 2016 Indoor Air Vapor Intrusion Study (industrial). Based on current site conditions, these sites were not found to have unacceptable risks associated VI. The VI pathway is discussed in the subsection for each of these sites.

Changes in Risk Assessment Methods Toxicity and Other Contaminant Characteristics

An evaluation of risk-based RGs is performed to determine if the RGs are protective of residential and non-residential land use. If the remedy is intended to meet a site-specific, risk-based cleanup level, the risk assessment methods and the toxicity or other contaminant characteristics used to determine the original cleanup level should be examined to determine if they have changed and whether new estimated risk is acceptable. This determination is based on whether the risk is within or below the generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and the hazard index is below 1 for non-carcinogenic effects changed. A number of changes in risk assessment methods and toxicity have taken place since the original risk assessments were prepared for the JBLM sites. The following changes in risk assessment methods were noted:

- In 1993, USEPA published Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (EPA/600/R-93/089, July 1993), which recommends that a relative potency factor (RPF) be used to convert concentrations of carcinogenic polycyclic aromatic hydrocarbons (cPAHs) to an equivalent concentration of benzo(a)pyrene when assessing the cancer risks posed by these substances from oral exposures.
- In 2003, USEPA published the OSWER Directive 9285-7.53 Human Toxicity Values in Superfund Risk Assessments. This memorandum revised the hierarchy of the sources of toxicity values and presents other sources including USEPA provisional peer reviewed toxicity values, and values from the Agency for Toxic Substances and Disease Registry (ATSDR) and state regulatory agencies.

- In 2005, USEPA published Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, which provided methodology for Cancer Potency Adjustment for Early-Life Exposure Adjustments to Mutagenic Carcinogens. TCE, vinyl chloride (VC), and benzo(a)pyrene are COCs at JBMDL that are considered to be carcinogenic by mutagenic mode of action. TCE requires the use of different toxicity values for cancer and mutagens. For VC, an uncertainty factor of 2 is applied to the cancer toxicity values if the exposure includes a portion of time when increased rates of cell mitosis are expected (i.e., if exposure begins early in life).
- In 2009, USEPA published Risk Assessment Guidance for Superfund (RAGS) – Part E, Supplemental Guidance for Dermal Risk Assessment, which updated dermal exposure equations and parameters (some of these have been further updated in the USEPA RSL tables).
- In 2009, USEPA published RAGS Part F – Supplemental Guidance for Inhalation Risk Assessment, which updated the methodology for calculation of both cancer risks and non-cancer HQs from the air concentrations to which receptors were exposed.
- In 2014, the USEPA OSWER Directive 9200.1-120) provided supplemental guidance that updated the standard default exposure factors (some of these values have been further updated in the USEPA RSL tables).
- In July 2021, Washington Model Toxics Control Act (MTCA) Cleanup Levels and Risk Calculation (CLARC) Table was updated, which incorporate changes in risk assessment methods, exposure parameters, and toxicity data.
- On 19 May 2022, USEPA updated RSL and VISL tables, which incorporate changes in risk assessment methods, exposure parameters, and toxicity data.
- On 6 July 2022, the DoD provided technical guidance on incorporating the updated USEPA RSLs for PFOS, PFOA, PFBS, PFNA, PFHxS, and HPFO-DA when investigating PFAS.

As changes in risk assessment methods, exposure parameters, and toxicity data have been incorporated into the updated risk-based values, a comparison of risk-based RGs to updated risk-based values is provided in Table 2. A comparison of toxicity data for COCs with risk-based RGs used in the site-specific RODs with current toxicity data is also provided in Table 2. An evaluation of whether these changes result in an unacceptable risk was made by comparing risk-based RGs to the USEPA November 2021 Regional Screening Level and to MTCA Method B/C cleanup levels, which uses current equations, exposure factors, and toxicity values recommended by USEPA and Ecology. While risk-based screening levels have changed due to changes in risk assessment methods and toxicity data, the ARARs-based RGs (i.e., MCLs for groundwater) have not changed since the ROD. Following USEPA FYR guidance, since the promulgated standard has not changed, changes in risk assessment methods and toxicity data do not change the protectiveness of the ARAR-based RGs. Changes in risk-based cleanup levels on the protectiveness of the remedies for the JBLM sites are discussed in the subsection for each of the sites.

Expected Progress Toward Meeting RAOs

An evaluation of the RAOs stated in the ROD is conducted to determine whether the remedy is meeting or will meet RAOs. Depending on the outcome of the evaluation, it may be necessary to modify the RAOs, modify the remedy, or conduct further response actions. The primary RAOs for the 10 JBLM sites are preventing exposure of human and ecological receptors to contaminated soil and groundwater and restoring all aquifers to drinking water status. The selected remedies for the sites prevent exposure to groundwater contaminants by human and ecological receptors and minimizes migration of contamination. Current LUCs prevent contact with contaminated soil and landfill wastes. Current drinking water well installation restrictions eliminate exposure and groundwater monitoring helps ensures the remedy remains protective of human health and the environment until the contaminated groundwater is restored to its designated use.

Table 1
Remedial Goals Based on Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)

Operable Unit	COC	Media	ROD / DD Remediation Goal		ROD / DD Remediation Goal Basis	Federal MCL[1]		Applicable WA Standard[2]		WA ARAR/TBC Basis	Implications for RGs Associated with ARARs and TBCs
	FTLE-33, Logistics Center (NPL)[5]										
	cis-1,2-dichloroethene	GW	70	ug/L	Federal MCL	70	ug/L	70	ug/L	2021 WA MCL	None
	tetrachloroethene	GW	5	ug/L	Federal MCL	5	ug/L	5	ug/L	2021 WA MCL	None
	trichloroethene	GW	5	ug/L	Federal MCL	5	ug/L	5	ug/L	2021 WA MCL	None
	1,1,1-trichloroethane[3]	GW	--			200	ug/L	200	ug/L	2021 WA MCL	--
	vinyl chloride[3]	GW	--			2	ug/L	0.2	ug/L	2021 MTCA Method A (2021 WA MCL: 2.0)	--
	cis-1,2-dichloroethene[3]	SW	--			--		--			--
	trichloroethene	SW	80	ug/L	CWA §304 Human health AWQC aquatic organisms only	7 (CWA §304 Human Health for the consumption of Organism Only; based on carcinogenicity of 10^{-6} risk; updated June 2015 (30 ug/L for noncancer toxicitiy)	ug/L	0.86	ug/L	2021 WA Fresh Water Human Health Criteria for Consumption of Organisms Only (WAC 173-201A-240; certified on 1/23/2020; calculated based on an additional lifetime cancer risk of 1 x 10^{-6} risk level)	RG is less stringent; new value wtihin target risk range but exceeds noncancer value
OU1	**FTLE-54, Landfill 1** (Non-NPL)[5]										
	trichloroethene	GW	5	ug/L	MTCA Method A, equivalent to Federal MCL	5	ug/L	5	ug/L	2021 WA MCL	None
	FTLLE-46, Illicit PCB Dump Site (Non-NPL)[5]										
	PCB/trichlorobenzene [3,4]	Soil	--			--		--			
	FTLE-16, Battery Acid Pit (Non-NPL)[5]										
	Lead [3,4]	Soil	--			--		--			
	FTLE-31, DRMO Yard (Non-NPL)[5]										
	PCB [3,4]	Soil	--			--		--			
	FTLE-51, IWTP (Non-NPL)[5]										
	TPH/lead/cPAH [3,4]	Soil	--			--		--			
	FTLE-28, Pesticide Rinse Area (non-NPL)[5]										
	chlordane, dieldrin, heptachlor [3,4]	Soil	--			--		--			
	FTLE-57, Landfill 4 (NPL)[5]										
	trichloroethene	GW	5	ug/L	Federal MCL	5	ug/L	5	ug/L	2021 WA MCL	None
	vinyl chloride	GW	1	ug/L	MTCA Method B PQL	2	ug/L	0.029	ug/L	2021 MTCA Method B cancer (2021 WA MCL: 2.0; 2021 MTCA Method A: 0.2)	RG is less stringent but within target risk range and less than MCL
	FTLE-32, SRCPP (NPL)[5]										
	cPAHs	Soil	1	mg/kg	MTCA Method B	--	--	0.19	mg/kg	2021 MTCA Method B cancer for benzo(a)pyrene (2021 MTCA Method A (industrial): 2 for benzo(a)pyrene)	RG is less stringent but within target risk range and less than Method A.
OU2	cPAHs	GW	0.1	ug/L	MTCA Method A	0.2	ug/L	0.2	ug/L	2021 WA MCL for benzo(a)pyrene (2021 MTCA Method A for benzo(a)pyrene: 0.1; 2021 MTCA Method B cancer for benzo(a)pyrene: 0.023)	RG is more stringent
	manganese	GW	80	ug/L	unknown	--	ug/L	750	ug/L	2021 MTCA Method B noncancer	RG is more stringent
	TPH	GW	1000	ug/L	MTCA Method A	--		1,000	ug/L	2021 MTCA Method A (1000 ug/L TPH: gasoline range organics, no detectable benzene)	TPH petroleum product not provided in ROD; benzene was non-detect in 2019 groundwater samples.
	MF-ALGT-LF-05, American Lakes Garden Tract (NPL) [5]										
	trichloroethene	GW	5	ug/L	Federal MCL	5	ug/L	5	ug/L	2021 WA MCL	None
	cis-1,2-dichloroethene	GW	70	ug/L	Federal MCL	70	ug/L	70	ug/L	2021 WA MCL	None
OU3	vinyl chloride	GW	0.04	ug/L	MTCA Method B detection limit (EPA Method 524.2)	2	ug/L	0.029	ug/L	2021 MTCA Method B cancer (2021 MTCA Method A: 0.2; 2021 WA MCL: 2)	RG is less stringent but within target risk range and less than MCL
	1,1-dichloroethene	GW	0.07	ug/L	MTCA Method B	7	ug/L	400	ug/L	2021 MTCA Method B noncancer (2021 WA MCL: 7)	RG is more stringent

Notes:

1 Federal MCLs obtained from https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables. Water quality criteria obtained from https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table (last updated August 30, 2021)

2 Washington Model Toxics Control Act (MTCA) Cleanup Levels and Risk Calculation (CLARC) Table - July 2021 obtained from https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC/Data-tables

3 An RG was not included in the ROD. No AWQC for cis-1,2-dichloroethene in the ROD and no current values available. ROD required monitoring for 1,1,1-TCA and vinyl chloride in groundwater at the Logistics Center but no RG was established.

4 Illicit PCB Dump Site, Battery Acid Pit, IWTP, DRMO Yard, and Pesticide Rinse Area - No COCs or remediation goals, cleanup standards, or cleanup ARARs were identified in the DDs. Chemicals and media of concern discussed in DD are listed.

5 The remedy prevents exposure through groundwater use restrictions and/or residential land use controls.

ug/L = microgram per liter
cPAH = carcinogenic PAH
MCL = Maximum Contaminant Level
PCB = Polychlorinated Biphenyl
SW = surface water
ARAR = applicable or relevant and appropriate requirements
DD = Decision Document
mg/kg = milligram per kilogram
PQL = practical quantitation limit
TBC = to be considered
AWQC = Ambient Water Quality Criteria
DRMO = Defense Reutilization and Marketing Office
MTCA = Model Toxics Control Act
RG = Remediation Goal
TPH = total petroleum hydrocabon
CLARC = Cleanup Levels and Risk Calculation
EPA = Environmental Protection Agency
NPL = National Priorities List
ROD = Record of Decision
WA = Washington
COC = Constituent of Concern
GW = Groundwater
PAH = polycyclic aromatic hydrocarbon
SRCPP = Solvent Refined Coal Pilot Plant

Table 2
Changes in Toxicity Data for Remedial Goals based on Risk-Based Concentrations

Operable Unit	COC	Media	ROD / DD Remediation Goal		ROD / DD Remediation Goal Basis	Applicable WA Standard[2]		WA ARAR/TBC Basis	Toxicity Data				Implications for Risk Associated with Changes in Toxicity Data	November 2021 Federal Tapwater RSL / Industrial Soil RSL[1]		
									Reference Dose (mg/kg-day)	Reference Concentration (mg/m^3)	Oral Slope Factor (mg/kg-day)[1]	Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$ / Inhalation Unit Risk $(ug/m^3)^1$		Cancer (TR=1E-06 to 1E-04)	Noncancer (THQ=1)	Unit
									Previous/Current[1]	Previous/Current[1]	Previous/Current[1]	Previous/Current[1]				
OU2	**FTLE-57, Landfill 4** (NPL)															
	vinyl chloride	GW	1	ug/L	MTCA Method B	0.029	ug/L	2021 MTCA Method B cancer	None / 3E-03	None / 8E-02	1.9E+00 / 7.2E-01	3E-01 / 4.4E-06	new RfD/RFC; less stringent SF/IUR	0.019 - 1.9	42	ug/L
	FTLE-32, SRCPP (NPL)															
	cPAHs	Soil	1	mg/kg	MTCA Method B	0.19	mg/kg	2021 MTCA Method B cancer for benzo(a)pyrene	None/ 3E-04	None / 2E-06	7.3E+00 / 1.0E+00	6.1E+00 / 6.0E-04	new RfD/RFC; less stringent SF/IUR	0.11 -11 RES (2.1 - 2100 IND)	18 RES (220 IND)	mg/kg
	manganese	GW	80	ug/L	unknown	750	ug/L	2021 MTCA Method B noncancer	3.3E-02 / 2.4E-02	NA	NC	NA	more stringent RfD	NC	430	ug/L
OU3	**MF-ALGT-LF-05, American Lakes Garden Tract** (NPL)															
	vinyl chloride	GW	0.04	ug/L	MTCA Method B detection limit (EPA Method 524.2)	0.029	ug/L	2021 MTCA Method B cancer	None / 3E-03	None / 8E-02	2.3E+00 / 7.2E-01	1.48E-01 / 4.4E-06	new RfD/RFC; less stringent SF/IUR	0.019 - 1.9	42	ug/L
	1,1-dichloroethene	GW	0.07	ug/L	MTCA Method B	400	ug/L	2021 MTCA Method B noncancer	9.0E-03 / 5.0E-02	None / 2E-01	6.0E-01 / NC	1.8E-01 / NC	less stringent RfD/new RfC; no longer carcinogenic	NC	280	ug/L

Notes:

1 USEPA May 2022 Regional Screening Levels and current toxicity data obtained from https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables. Previous toxicity data from ROD

2 Washington Model Toxics Control Act (MTCA) Cleanup Levels and Risk Calculation (CLARC) Table - July 2021 obtained from https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC/Data-tables

ug/L = microgram per liter
ug/m^3 = microgram per cubic meter
ARAR = applicable or relevant and appropriate requirements
CLARC = Cleanup Levels and Risk Calculation
COC = Constituent of Concern
cPAH = carcinogenic PAH
DD = Decision Document
GW = Groundwater
IND = industrial
IUR = inhalation unit risk
mg/kg = milligram per kilogram
mg/m^3 = milligram per cubic meter
MTCA = Model Toxics Control Act
NA = not applicable
NC = not carcinogenic
NPL = National Priorities List
RES = residential
RFC = inhalation reference concentration
RfD = oral reference dose
RG = Remediation Goal
ROD = Record of Decision
RSL = USEPA Regional Screening Level
SF = slope factor
SRCPP = Solvent Refined Coal Pilot Plant
TBC = to be considered
TQH = target hazard quotient
TR = target cancer risk based on lifetime excess cancer risk

Table 3
Evaluation of Screening Levels and Toxicity Data for Per- and Polyfluoroalkyl Substances (PFAS) presented in PA/SI [1]

PFAS Compound	PA/SI Groundwater Screening Level (ng/L)[1]	SL Basis	Toxicity Data		Implications for Risk Associated with Changes in Toxicity Data	May 2022 Federal Tapwater RSL (ng/L)[2,3]		Noncancer Hazard Index [5]							
			Reference Dose (mg/kg-day)	Oral Slope Factor (mg/kg-day)[1]		Cancer (TR=1E-06 to 1E-04)	Noncancer (THQ=0.1)	OU3, ALGT (Landfill #5)		OU1, Logistic Center (Landfill #2)		OU1, Landfill #1		OU2, Landfill #4	
			Previous/Current[1]	Previous/Current[1]				Maximum Concentration (ng/L)	HQ	Maximum Concentration (ng/L)	HQ	Maximum Concentration (ng/L)	HQ	Maximum Concentration (ng/L)	HQ
PFOS	70 * / 40	*USEPA lifetime health advisory for PFOS + PFOA combined / OSD SL; THQ = 0.1	2E-05 / 2E-06	NC	no change	NC	4	38	0.950	31	0.775	1.4	0.035	20	0.500
PFOA	70* / 40	*USEPA lifetime health advisory for PFOS + PFOA combined / OSD SL; THQ = 0.1	2E-05 / 3E-06	7E-02 / 7E-02	no change	1,100-11,000	6	5.6	0.093	10	0.167	0.37	0.006	25	0.417
PFBS	40,000	2017 USEPA RSL (OSD SL); THQ = 0.1	2.0E-02 / 3E-04	NC	more stringent RfD	NC	600	4.1	0.001	3	0.001	0.8	0.0001	5.3	0.001
PFNA [4]	None	None	-- / 3E-06	NC	new RfD	NC	5.9	0.56	0.009	3	0.051	1.0 U	-	2.4	0.041
PFHxS [4]	None	None	-- / 2E-05	NC	new RfD	NC	39	29	0.074	20	0.051	1.7	0.004	11	0.028
							Hazard Index		1		1		0.05		1

Notes:

1 Perfluorinated Alkyl Substances (PFAS) PA/SI study conducted in 2020 at for Joint Base Lewis-McChord. The results for Areas of Potential Concern (AOPI) associated with this FYR (AOPI 11 [LF-2], AOPI 21 [LF-1], AOPI 12 [LF-4], and AOPI 8 [ALGT LF-05]) were provided in the Addendum to 2017 FYR.

2 USEPA May 2022 Regional Screening Levels and current toxicity data obtained from https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

3 OSD Investigating Per- and Polyfluoroalkyl Substances within the Department of Defense Cleanup Program, 6 July 2022.

4 Analyzed during the PA/SI study, but no screening level provided; USEPA May 2022 RSL available.

5 Total hazard index (HI) = sum of individual hazard quotient (HQ), where HQ = maximum concentration / noncancer RSL adjusted to THQ of 1. Total HI is presented as one significant figure per USEPA Risk Assessmetnt Guidance for Superfund.

mg/kg-day = milligram per kilogram per day
mg/m^3 = milligram per cubic meter
NC = not carcinogenic
ng/L = nanogram per liter (equivalent to parts per trillion)
OSD-SL = Office of the Secretary of Defense Screening Level, dated 15 October 2019
PA = preliminary assessment
PFAS = Per- and Polyfluoroalkyl Substances
PFBS = Perfluorobutane sulfonate
PFHxS =Perfluorohexanesulfonic acid
PFNA = Perfluorononanoic acid
PFOA = Perfluorooctanoic acid
PFOS = Perfluorooctane sulfonic acid
RfD = Reference Dose
RSL = Regional Screening Level
SI = Site Inspection
SL = screening level
THQ = target hazard quotient
USEPA = United States Environmental Protection Agency