PACIFIC CREST ENVIRONMENTAL
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INTERIM ACTION WORKPLAN

FORMER PRIME CLEANERS
18001 BOTHELL EVERETT HIGHWAY
BOTHELL, WASHINGTON 98012
FACILITY/SITE ID: 19816
CLEANUP SITE ID NO.: 11775
VCP PROJECT NO.: NW2571

Submitted by:

Pacific Crest Environmental, LLC
1531 Bendigo Boulevard North
North Bend, Washington 98045

Pacific Crest PN: 223-002

For:

Mr. Nicholas Echelbarger
Mill Creek Crossing, LLC
31 NW Cherry Loop
Shoreline, Washington 98177

July 9, 2024

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1.0 INTRODUCTION

Pacific Crest Environmental, LLC (Pacific Crest) has prepared this Interim Action Work Plan (Work Plan) on behalf of Mill Creek Crossing, LLC (MCC) for the Former Prime Cleaners Site (the Site)[1], located at 18001 Bothell Everett Highway in Bothell, Washington (MCC Shopping Center Property) (Figure 1). This Work Plan has been prepared in accordance with the requirements for Sampling and Analysis Plans established in Section 820 of the Model Toxics Control Act (MTCA) regulations and presents a scope of work and methodology to implement groundwater treatment interim measures. The objective of the cleanup activities at the Site is to comply with the substantive requirements of the MTCA regulations and, ultimately, to obtain a No Further Action (NFA) Opinion Letter from the Washington State Department of Ecology (Ecology) for the Site.

1.1 BACKGROUND

The MCC Shopping Center Property is approximately 4.8 acres in size, located at 18001 Bothell Everett Highway in Bothell, Washington, near Latitude 47°50'0.91" N and Longitude 122°12'29.96" W. In 1983, MCC developed the property as a retail shopping center. Between 1984 and 2000, Prime Cleaners conducted retail dry-cleaning operations in a tenant suite on the southern portion of the MCC Shopping Center Property. In 2015, MCC sold the property to Lakha Properties – Mill Creek LLC (Lakha Properties). (Figure 2).

1.1.1 Regulatory Status

In 1999, tetrachloroethene (PCE) was detected in soil and groundwater below the former Prime Cleaners tenant suite. Between 1999 and 2014, environmental consultants working on behalf of MCC conducted subsurface investigation activities to assess the nature and extent of PCE-contaminated soil and groundwater. In 2012, the Site was entered into Ecology's Voluntary Cleanup Program (VCP) with MCC meeting the definition of Potentially Responsible Person (PRP) due to its ownership of the MCC Shopping Center Property at that time. In 2014, Zipper Geo Associates (ZGA) submitted a Remedial Investigation and Feasibility Study (RI/FS) and Cleanup Action Plan (CAP) to Ecology for review. The extent of PCE and trichloroethene (TCE) concentrations in soil that exceed the MTCA Method A cleanup level for unrestricted properties is defined within the boundaries of the MCC Shopping Center Property. The extent of PCE concentrations in groundwater that exceed the MTCA Method A cleanup level extends beyond the MCC Shopping Center Property boundary to the southwest. The RI/FS and CAP selected dual phase extraction (DPE) as the preferred cleanup alternative to remediate soil and groundwater and estimated a restoration timeframe of 1-year to achieve cleanup standards for both soil and groundwater. In 2017, ZGA installed the existing DPE system.

Between 2017 and 2021, ZGA operated the DPE system and conducted groundwater monitoring, but the DPE system developed mechanical problems related to equipment overheating and was shut-down in 2021. The most recent groundwater sampling results indicate that the DPE system has not been successful in achieving cleanup standards in groundwater after four years of operation. In an Opinion Letter dated September 29, 2021 (2021 Opinion Letter), Ecology stated that cleanup of the Site was insufficient and required either implementation of further cleanup action to remediate off-property contaminated groundwater or implementation of engineering and/or

[1] A Site is defined under MTCA as the area where a hazardous substance has come to be located.

institutional controls as cleanup measures to meet the substantive requirements of the MTCA regulations.

In April 2023, Pacific Crest, on behalf of MCC, collected groundwater samples from existing monitoring wells at the Site and a soil vapor sample from one existing vapor pin located inside the MCC Shopping Center building. Laboratory analysis of the groundwater samples detected PCE at concentrations ranging from 0.34 micrograms per liter (µg/L) to 21 µg/L. Laboratory analysis of the soil vapor sample detected PCE and TCE at concentrations of 458 micrograms per cubic meter (µg/m3) and 28.5 µg/m3. On the basis of the 2023 groundwater monitoring results and Ecology's 2021 Opinion Letter, Pacific Crest prepared an Amended CAP that requested a Property-Specific NFA and proposed a combination of restrictive covenants and monitored natural attenuation as the preferred cleanup action approach (Pacific Crest 2023). The Amended CAP, dated September 22, 2023, was submitted to Ecology for review. Ecology provided preliminary comments in an email dated October 3, 2023 and indicated that a Property-Specific NFA with a restrictive covenant would require a demonstration that groundwater with contaminant concentrations greater than site cleanup levels is confined to the property and is not flowing onto the adjoining property, but the recent monitoring data for wells MW-4, MW-8, and DPE-3 did not meet the criteria for an NFA.

1.2 PURPOSE

The purpose of the Work Plan is to specify procedures for completion of the scope of work described herein, including in-situ chemical reduction (ISCR) pilot test activities, sample collection, handling, and analysis.

1.3 OBJECTIVES

The objectives of the scope of work elements include:

- Assess the efficacy of ISCR as a remediation technology for cleanup of the Site by conducting a groundwater treatment pilot study using ISCR amendments using wells on the MCC Shopping Center Property.
- Monitor the progress of the pilot study by collecting groundwater samples from existing monitoring wells for laboratory analysis.
- Prepare progress reports to document the results of the pilot study and groundwater monitoring.

1.4 ISCR REMEDIATION TECHNOLOGY

ISCR is a permanent remedial technology that provides treatment of contaminants primarily by chemical reduction, or abiotic processes. Indirect contaminant reduction via biotic processes also plays a role in ISCR technology. Reducing agents include zero valent iron (ZVI), ferrous iron, sodium dithionite, sulfide salts, and hydrogen sulfide. These reductants can cause the rapid establishment of highly reducing conditions in the aquifer, resulting in degradation or destruction of organic chemicals. Reductants can be introduced to the subsurface through injection wells, direct push injection, trenching, soil mixing, and pneumatic fracturing. ISCR is a proven technology for remediating chlorinated solvents with a substantial history of success in a variety of applications.

1.5 PROJECT SCHEDULE

The project schedule is generally described below.

Work Scope Item	Description	Start	Duration
ISCR Pilot Test	- Prepare Workplan - Prepare and submit required permits - ISCR Injection - Post injection monitoring	Within one week following the receipt of written authorization to proceed.	45 - 60 days
Monitoring Event No. 1	- GW Monitoring and Sampling	Approximately 30-days following injection event.	2 days
Monitoring Event No. 2	- GW Monitoring and Sampling	Approximately 90 days following Monitoring Event No. 1.	2 days
Monitoring Event No. 3	- GW Monitoring and Sampling	Approximately 90 days following Monitoring Event No. 2.	2 days
Monitoring Event No. 4	- GW Monitoring and Sampling	Approximately 90 days following Monitoring Event No. 3.	2 days
Annual Report No. 1	- Prepare 2024 Annual Report	Approximately 60 days following Monitoring Event No. 2.	60 days
Annual Report No. 2	- Prepare 2025 Annual Report	Approximately 60 days following Monitoring Event No. 4.	60 days

1.6 ORGANIZATION AND RESPONSIBILITIES

Role	Organization	Responsibilities
Property Owner	Lakha Properties – Mill Creek 500 108th Avenue NE, Suite 2050 Bellevue, Washington	Access and tenant coordination
Environmental Consultant	Pacific Crest Environmental, LLC 1531 Bendigo Blvd North North Bend, Washington 98045	Field activities and reporting
Laboratory Subcontractor	OnSite Environmental, Inc. 14648 NE 95th St, Redmond, Washington 98052	Contract laboratory for analysis of groundwater samples

2.0 WORK SCOPE ACTIVITIES AND PROCEDURES

The scope of work consists of the following:

- Inject a solution of ISCR amendments into the subsurface through four existing wells in the area where PCE concentrations are highest.
- Conduct four post-pilot test groundwater monitoring events using select existing groundwater monitoring wells and analyze groundwater samples for the Site COCs.
- Prepare progress reports documenting the results of the pilot study and groundwater monitoring.

2.1 WORK SCOPE ACTIVITIES

2.1.1 Health & Safety Plan

A Site-specific Health & Safety Plan will be prepared in accordance with 29 CFR 1910.120. All personnel working at the Site shall have completed OSHA 40-hour Hazardous Worker Training and, if appropriate, 8-hour Annual Refresher Training.

2.1.2 ISCR Pilot Test

2.1.2.1 Permitting

The proposed injection points are considered Class V underground injection wells that are subject to the Underground Injection Control (UIC) Program, Washington Administrative Code (WAC) 173-218. Pacific Crest will prepare and submit to Ecology's UIC Program an application to register the wells as Class V injection wells for groundwater remediation purposes. Ecology's VCP Project Manager (Mr. Christopher Maurer) will be copied on the UIC Application submittal.

2.1.2.2 ISCR Injection

After receipt of concurrence from Ecology's VCP and UIC Program, Pacific Crest will implement the pilot test scope of work as follows. Pacific Crest will inject a 2.5% solution of the zero valent iron (ZVI), manufactured by Tersus Environmental, and water into four (4) existing wells (DPE-1, DPE-3, DPE4, and VM-1), as illustrated on Figure 2. The injection area targets the highest residual concentrations of PCE in groundwater. The ISCR reagent will be applied via gravity flow into each well. For the purposes of this scope of work, the mZVI solution will be 15.9 gallons of mZVI mixed with 1,180 gallons of potable water (Table 1). For the purposes of the design, Pacific Crest has assumed a radius of influence around each well of approximately 8 feet. The ISCR material does not contain hazardous substances and is routinely used in groundwater remediation projects. A copy of the Safety Data Sheet for Tersus mZVI is provided in Appendix A.

2.1.3 Groundwater Monitoring and Sampling

Water level measurements will be collected in Site monitoring wells during four sampling events after the ISCR pilot test in accordance with Pacific Crest SOPs, following the procedures described below:

- The locking well cap will be removed from the monitoring well, and the groundwater level will be allowed to equilibrate to atmospheric pressure for at least 15 minutes.

- The depth to groundwater will be measured in all Site monitoring wells to the nearest 0.01 foot using an electronic water level meter. The total depth of the monitoring well will also be measured to evaluate silt buildup in the well. All reusable equipment will be decontaminated between uses at successive well locations with an Alconox wash, double rinsing with deionized water.

Groundwater samples will be collected and handled in accordance with the guidance document Low-Flow (Minimal Drawdown) Ground-water Sampling Procedures (EPA 1996) and Pacific Crest SOPs, following the procedures described below:

- Each monitoring well will be purged using a peristaltic pump and dedicated polyethylene tubing at a flow rate of approximately 200 milliliters per minute (0.05 gallons per minute).
- Groundwater geochemical parameters, including temperature, specific conductivity, pH, dissolved oxygen (DO), and oxidation/reduction potential (ORP) will be measured and recorded at approximately three-minute intervals using a YSI Pro Quatro multi-parameter water quality meter equipped with a flow-through cell.
- Groundwater samples will be field screened for ferrous iron using a Hach Ferrous Iron Color Disc Test Kit in accordance with the manufacturer's guidelines.
- Upon stabilization of geochemical parameters, groundwater samples will be collected directly into laboratory-prepared sample containers.
- The sample containers will be filled directly from the polyethylene, with care taken to minimize turbulence. Care will be taken not to handle the seal or lid of the container when decanting the sample into the containers. The containers will be filled completely to eliminate any headspace, and the seal/lid will be secured;
- The sample containers will be labeled with the date and time sampled, the well identification and number, the project number, and preservative(s), if any;
- The information will be documented on a chain-of-custody form and the sample placed in a chilled cooler at approximately 4 degrees Celsius for transport to the laboratory;
- Chain-of-custody protocols will be maintained during sample transport and submittal to the laboratory;
- All purge water will be placed in a labeled 55-gallon drum on the Site pending disposal; and
- The well cap and monument will be secured following sampling. Any damage or defect of the well cap or monument will be noted and scheduled for repair or replacement.

The groundwater samples will be submitted to OnSite under standard chain-of-custody protocol for analysis of PCE, TCE, c-DCE, t-DCE and VC by SW-846 Method 8260D.

2.2 GENERAL PROCEDURES

2.2.1 Analytical Method, Sample Containers, and Preservation

Sample containers are required for groundwater samples. The sample container and preservation requirements are presented below:

Matrix	Analytical Method	Sample Container	Preservative
Groundwater	SW-846 Method 8260D	(3) 40-ml VOA bottles	≤6º C, HCl
	Hach Ferrous Iron Color Disk Kit	25 ml graduated vial	Not applicable

Notes:
VOA: Volatile Organic Analysis
HCl: Hydrochloric acid

2.2.2 Sample Identification

Samples collected for laboratory analysis will be assigned a unique sample identifier as follows:

- The groundwater sample number will include a prefix of the RPW identification and the date. For example, the groundwater sample collected on August 10, 2024, from RPW MW-3, would be labeled MW3-081024.

2.2.3 Reporting Limits

Analyte	Soil (mg/kg)	Groundwater (µg/L)
Tetrachloroethene	Not applicable	0.20
Trichloroethene	Not applicable	0.20
Cis-1,2-Dichloroethene	Not applicable	0.20
Vinyl Chloride	Not applicable	0.20
Ferrous Iron	Not applicable	10

2.2.4 Decontamination

The decontamination procedures to be followed will be in accordance with Pacific Crest SOPs and generally approved industry procedures. Decontamination of sampling equipment must be conducted consistently to assure the quality of samples collected. All equipment that comes into contact with potentially contaminated groundwater will be decontaminated. Disposable equipment intended for one-time use will not be decontaminated but will be packaged for appropriate disposal. Decontamination will occur prior to and after each use of a piece of equipment.

2.2.5 Investigation Derived Waste

In the process of collecting samples, Pacific Crest will generate different types of potentially-contaminated investigation derived waste (IDW). The specific types of IDW and the disposal methods are summarized below:

- Decontamination fluids and purge water generated during sampling activities will be placed into Department of Transportation (DOT)-approved containers for temporary storage on site and disposed of in accordance with the DPE water discharge permit.
- Used personal protective equipment (PPE) and disposable equipment will be double bagged and placed in a municipal refuse dumpster. Those wastes are not considered hazardous and may be sent to a municipal landfill. Any PPE and disposable equipment that is to be disposed of which can still be reused will be rendered inoperable before disposal in a refuse dumpster.

2.2.6 Standard Operating Procedures

Applicable SOPs have been incorporated into the data collection activities for this investigation. To ensure environmental sample collection efforts are comparable, procedures found in sampling SOPs will be followed. The purpose of each sampling SOP is summarized below.

- **Water Level Measurements and Low Flow Groundwater Sampling SOP (SOP-Field-2007-12003)** – The purpose of this SOP is to provide field personnel with an outline of the information needed to measure water levels in monitoring wells and collect representative groundwater samples from monitoring wells using low flow sampling methodologies.
- **Equipment Decontamination SOP (SOP-Field-2007-12008)** – The purpose of this SOP is to provide field personnel with an outline of the specific procedures for the decontamination of field monitoring equipment for both organic and inorganic contaminants. Decontamination of equipment is performed as a quality assurance measure and as a safety precaution. Decontamination is intended to prevent cross-contamination between sampling and to maintain a clean, safe working environment.
- **Handling of Investigation Derived Wastes SOP (SOP-Field-2007-12007)** – The purpose of this SOP is to provide field personnel with an outline of the specific information needed for handling IDW.
- **Field Notes and Documentation SOP (SOP-Field-2014-12016)** – The purpose of this SOP is to provide field personnel with an outline of the specific information needed to document daily field activities.

Copies of the applicable SOPs are provided in Appendix B.

2.3 QA/QC

The data quality objectives (DQOs) for this project, as well as the data review and validation procedures, are described in Section 3.0. The QA/QC samples will be analyzed to provide for data validation and will include the following:

- Laboratory Method Blanks - The laboratory will run method blanks in accordance with the QA/QC procedures provided in the laboratory Quality Assurance Manuals. A summary of the laboratory QA/QC procedures is beyond the scope of this SAP
- Field Duplicates – Duplicate samples will be collected and analyzed with the other samples. The anticipated frequency for groundwater sampling will be one duplicate sample per groundwater monitoring event.

The QA/QC samples will be assigned a unique sample identifier. The field duplicate will be identified by a prefix of “DUP”. The sampler will document the relevant information regarding the time and location at which field duplicates are selected in their field notes for correlation.

2.4 FIELD DOCUMENTATION

Documentation of field activities will be included on Field Report forms, Log of Well forms, Well Purging and Sampling Data forms, Waste Inventory forms, Chain-of-Custody forms, and sample and waste labels (Appendix C). Documentation generated during the field program will be retained in the project file and included in reports generated, as appropriate. Field documentation forms are described below:

- **Field Report Form** – Field personnel will be required to keep a daily field log on the Field Report form. Field notes will be as descriptive and as inclusive as possible, allowing independent parties to reconstruct the sampling situation from the recorded information. Language will be objective, factual, and free of inappropriate terminology. A summary of each day's events will be completed on a Pacific Crest Field Report form. At a minimum, field documentation will include the date, job number, project identification and location, weather conditions, sample collection data, personnel present and responsibilities, field equipment used, a general description of activities performed, and specific descriptions of activities performed in a manner other than that specified in this Work Plan. In addition, if other forms are completed or used (e.g., Chain-of-Custody form, maps) they will be referred to, and attached to, the Field Report form. Field personnel will sign the Field Report form.
- **Well Purging and Sampling Data Form** - A Pacific Crest Low Flow Well Purging and Sampling Data form will be used to record the depth to groundwater, well purging information, and other pertinent hydrologic measurements and supplementary information collected during groundwater performance and confirmation sampling at each monitoring well. The field personnel will complete the form at the time of sample collection. A copy of a Low Flow Well Purging and Sampling Data form is included in Attachment C.
- **Waste Inventory Form** – A Pacific Crest Waste Inventory form will be used to document and track wastes generated during the compliance monitoring activities. The form will include information on the waste container, the origin of the waste, the type of waste, the date generated, the date removed from the Site, the transporter, and disposal location.
- **Sample Labels** – Sample labels will be filled out and affixed to appropriate containers immediately prior to sample collection. The label will be filled out in indelible ink, and will include the following information: date, time sampled, sample identification and number, project number, and preservative(s), if any.
- **Waste Material Label** – The waste material labels will be filled out and affixed to the appropriate waste container immediately upon the addition of waste to the container. The label will be filled out in indelible ink and will include the following information: job number and name, address where waste was generated, contents of the container, operation, date, consultant’s name and phone number, and sampler’s initials.
- **Chain of Custody** – The Chain-of-Custody form includes the following information: site name, Pacific Crest project number, sample identification number (assigned by the sampler in the field), sample date, and type of analysis required (if any). Whenever the sample is transferred from one party to another, both parties sign the Chain-of-Custody form and record the date and time of the transfer. In this manner, the sample integrity is ensured from collection through analysis. This written record, the Chain-of-Custody form, will be filled out by the field sampling team at the time the sample is obtained. All samples submitted to the laboratory will be accompanied by the Chain-of-Custody form, which will be checked for accuracy and completeness, and then signed and dated by the laboratory sample custodian accepting the sample.

3.0 DATA QUALITY OBJECTIVES

The scope of work includes collecting groundwater data for the purpose of comparison to applicable cleanup levels. The term “data quality” refers to the level of certainty associated with a particular data set. Data quality associated with measurement of environmental criteria is a function of the following: sampling plan rationale; sampling procedures; monitoring and analytical methods; and monitoring and analysis instruments. One of the primary goals of this Work Plan is to document the methods and standards used to ensure that the data collected are of known and documented quality, and useful for the purposes for which they are intended.

DQOs are statistical tools that can be quantified and measured to assess the level of uncertainty present in analytical results. The DQOs establish numeric limits for comparison to the analytical results to ensure that the data collected are of sufficient quality and quantity for data user applications. Quality objectives are categorized into decision quality objectives and measurement quality objectives. Decision quality objectives include:

Decision Quality Objective	Description	Project Specific Goal
Representativeness	The degree to which data accurately and precisely typify a characteristic of a population, a natural variation at a sampling point, or an environmental condition.	Ensuring that a sufficient number of samples are collected, and collected samples are handled and analyzed in a consistent manner.
Comparability	A qualitative characteristic that expresses the confidence that one data set can be compared to another data set.	Standardized field sampling techniques, laboratory analytical methods, measurement time periods, and units are used to achieve comparability between data sets.
Completeness	The percentage of measurements judged to be valid.	Results will be considered valid if they are not rejected during data validation. The target completeness goal for this work will be 95%.

Measurement quality objectives include:

Measurement Quality Objective	Description	Investigation Specific Goal
Precision	Measures the reproducibility of measurements under a given set of conditions. Precision is calculated as the relative percent difference (RPD) from results of duplicate sample analyses.	Duplicate samples will be collected during groundwater sampling. In general, when determining field precision, the acceptable level of variability in these results will be no greater than 30 percent RPD.

Accuracy	A measure of the closeness (bias) of the measured value to the true value. The accuracy of chemical analytical results is assessed by "spiking" samples in the laboratory with known standards (surrogates or matrix spikes of known concentration) and determining the percent recovery.	In general, the recovery of the surrogate should be between 50% and 150%.
Sensitivity	Relates the rate at which the analytical response changes in response to the concentration of the parameter being measured or the lowest concentration of a parameter that can be detected	For this investigation, the PQLs must be equal to or below the applicable cleanup levels (CULs) for the Site.

DATA REVIEW AND VALIDATION

Data review, verification, and validation will be conducted to establish the quality and usability of the data sets. The purpose of the verification and validation procedures is to assess whether the data conform to established project requirements and to identify any limitations when data do not conform to the project requirements, DQOs, data quality indicators (DQIs), and/or method-specific requirements.

Verification of sampling information and chemical data occurs at several levels throughout the course of sample collection and analysis. Data verification is the process of determining whether data have been collected or generated according to the Work Plan and the respective SOPs or method descriptions. Data verification consists of the following categories: 1) verifying compliance with SOPs, Work Plan, and contractual agreements; 2) verifying correctness to determine that the data collection plans and protocols were followed; and 3) verifying completeness of the data sets and supporting documentation to establish that all data necessary to meet project objectives have been collected.

Analytical data are validated after the field activities are completed, the results reported by the laboratory are available, and all data have been verified. Data validation requirements are completed prior to use of the data for interpretive activities. Data validation is the process of evaluating the technical usability of the verified data with respect to the planned objectives of the project. Data validation consists of the following objectives: 1) verifying that measurements (field and laboratory) meet the user's needs, 2) providing information to the data user regarding data quality by assignment of individual data qualifiers based on the associated degree of variability, and 3) determining whether DQIs and DQOs were met.

Data validation procedures include evaluating the sample results and applicable quality control measurement results reported by the laboratories. All data will undergo two levels of QA/QC evaluation: one by the laboratory for all analytical data and one by Pacific Crest for both analytical data and field data. As specified in the laboratory Quality Assurance Manual, the laboratory will perform initial data reduction, evaluation, and reporting. The analytical data will then be validated by Pacific Crest. The following types of quality control information will be reviewed, as appropriate:

- Method deviations;

- Sample extraction and holding times;
- Method reporting limits;
- Duplicate samples;
- Surrogate recoveries;
- Percent completeness; and
- RPD (precision).

Pacific Crest will review field records and results of field observations and measurements to ensure that procedures were properly followed and documented. The review of field procedures will include:

- Verification of completeness and legibility of field reports and sampling forms;
- Collection and preparation of field quality control samples;
- Equipment calibration and maintenance; and
- Completion of chain-of-custody forms.

4.0 REPORTING

At the end of each calendar year, an annual progress report will be prepared for submittal to Ecology documenting the activities, results, and findings. The Progress Report will include:

- A Site background summary;
- A narrative summary of the field activities and sample collection methods and techniques;
- A discussion of the pilot test and monitoring results,
- Data tables summarizing analytical data, as well as hydrogeologic data;
- Figures, to scale, including potentiometric surface maps;
- Laboratory analytical reports;
- An evaluation of regulatory requirements applicable to the cleanup action; and
- Recommendation of remediation activities on the basis of the pilot testing data.

5.0 REFERENCES

Ecology (Washington State Department of Ecology). 2021. *Further Action at Mill Creek Crossing – Prime Cleaners*. September 29.

EPA (Environmental Protection Agency). Low-Flow (Minimal Drawdown) Ground-water Sampling Procedures. April.

Pacific Crest Environmental, LLC (Pacific Crest). 2023. *Draft for Ecology Review Amended Cleanup Action Plan – Former Prime Cleaners Site, 18001 Bothell Everett Highway, Bothell, Washington.* August 17.

Zipper Geo Associates (ZGA). 2014a. *RI/FS and Pilot Study, Marketplace Retail Center, Bothell, Washington*. June 24.

_____. 2014b. *Cleanup Action Plan, Marketplace Retail Center, Bothell, Washington*. June 24.

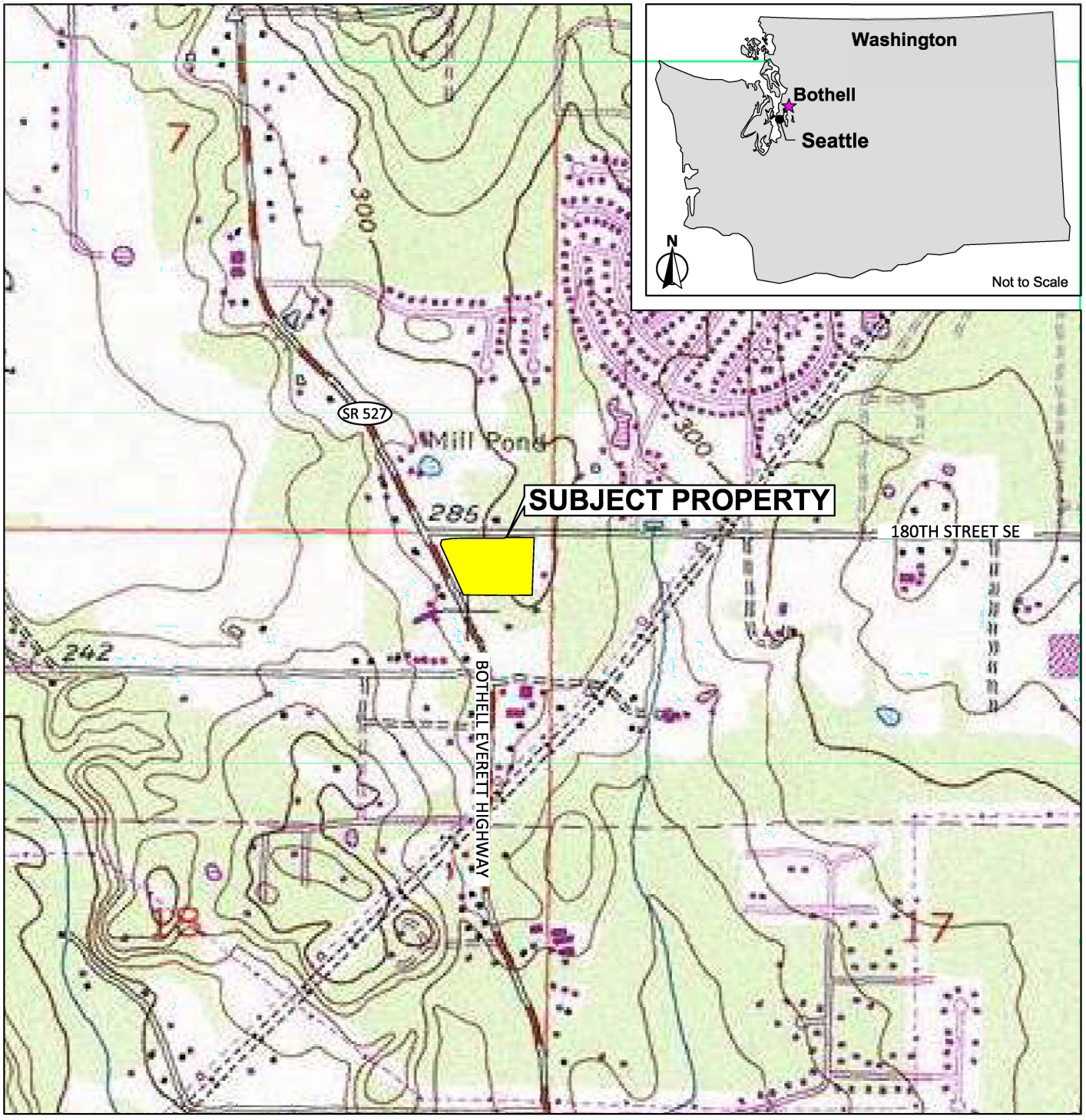
_____.2022. *Tech Memo - Former Prime Cleaners, Marketplace Retail Center, Bothell, Washington*. June 17.

FIGURES

INTERIM ACTION WORKPLAN

FORMER PRIME CLEANERS
18001 BOTHELL EVERETT HIGHWAY
BOTHELL, WASHINGTON

Pacific Crest PN: 223-002



N

0 1,000

Approximate Scale in Feet

Source: MyTopo

PACIFIC CREST ENVIRONMENTAL
WWW.PCENV.COM 425-888-4990

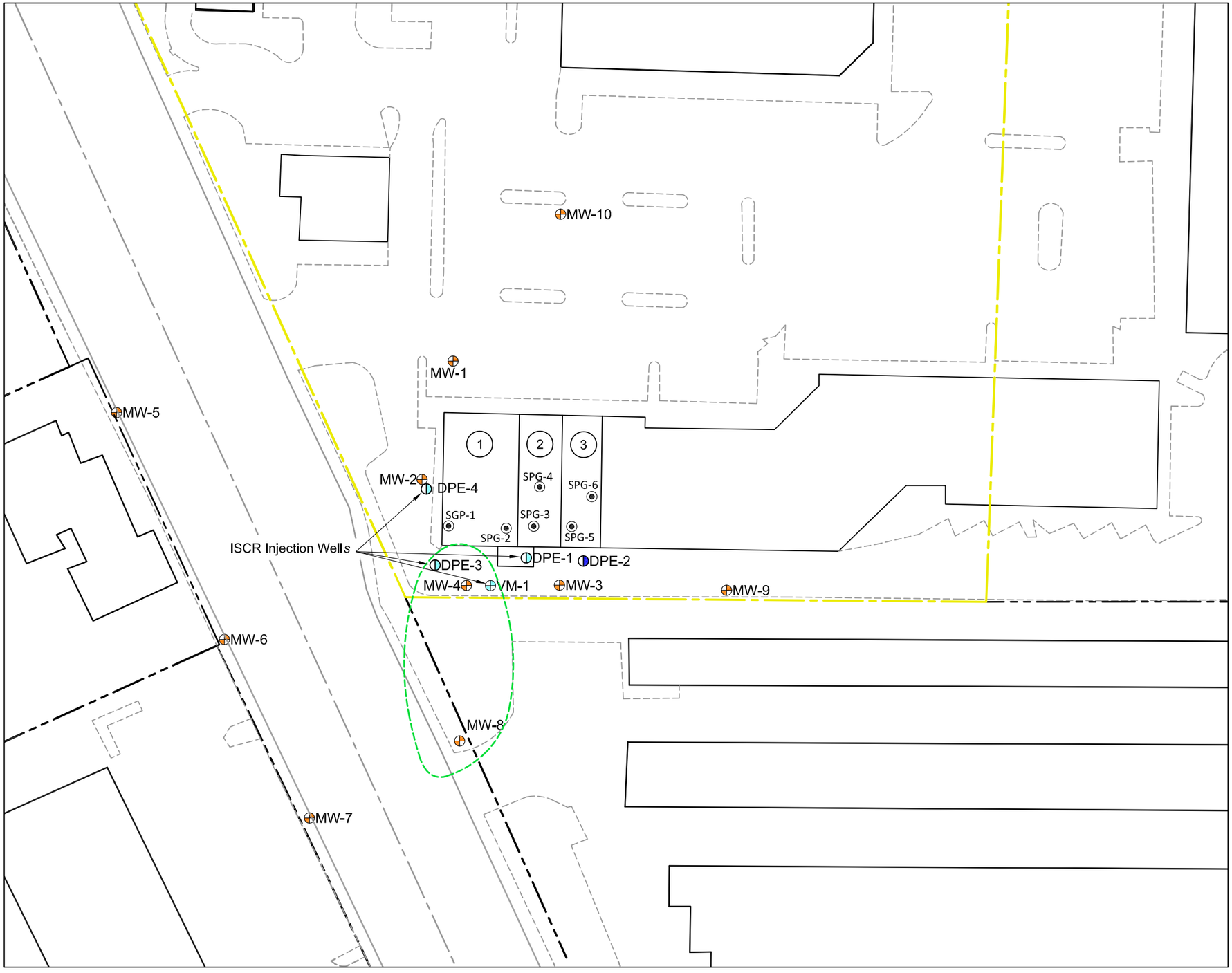
Former Prime Cleaners
18001 Bothell Everett Highway
Bothell, Washington

PN: 223-002

Figure 1

Site Location Map

9/14/2016 223-002-001.dwg FIG 1 Site Location



Legend

VM-1 ⊕ DPE-1◐	Proposed ISCR Injection Well
SGP-1◉	Soil Vapor Probe
MW-1⊕	Monitoring Well
DPE-2◐	Dual Phase Extraction Well
	Subject Property
	Parcel Boundary
	Road Centerline
	Road
	Curb
	Post-DPE PCE Plume
DPE	Dual Phase Extraction
PCE	Tetrachloroethene
ISCR	In Situ Chemical Reduction

1 Fusion India (Prime Cleaners 1984-2000)

2 Fusion India (Prime Cleaners 2000-2014)

3 Osaka Grill Teriyaki

Notes:

Source: Snohomish County Assessor

N

0 50

Approximate Scale in Feet

PACIFIC CREST ENVIRONMENTAL
WWW.PCENV.COM 425-888-4990

Former Prime Cleaners
18001 Bothell Everett Highway
Bothell, Washington

PN: 223-002

Figure 2

Site Plan with Proposed Injection Wells

4/18/2024 223-002-009.dwg Fig 2 Injection Wells

TABLES

INTERIM ACTION WORKPLAN

FORMER PRIME CLEANERS
18001 BOTHELL EVERETT HIGHWAY
BOTHELL, WASHINGTON

Pacific Crest PN: 223-002

Table 1
ISCR Injection Calculations
Former Prime Cleaners Site
18001 Bothell Everett Highway
Bothell, Washington
Pacific Crest Project No. : 223-002

Site Geometry												ISCR Solution						
	Pore Volume Calculations								Injection volume									
	Input Variables								Input	Output		Input Variables			Injection Solution (total)		Injection Solution @ each point	
Well Location	Injection Points	ROI (ft)	Vertical Treatment (ft)	Mobile Porosity (%)	Treatment Volume	Units	Pore Volume	Units	Pore Replacement (%)	Total Injection Volume	Units	Dilution %	ISCR Solution Components	Density (lbs/gal)	lbs	gal	lbs	gal
VM-1	1	7.8	10	15%	1911	ft^3	286.7	ft^3	10%	29	ft^3	2.50%	mZVI	14	40.1	2.9	40.1	2.9
					70.8	yd^3	2145	gal		214	gal		Water	7.48	1604	214.5	1604	214.5
DPE-1, DPE-3, DPE-4	3	7.8	15	15%	8601	ft^3	1290.2	ft^3	10%	129	ft^3	2.50%	mZVI	14	180.5	12.9	60.2	4.3
					318.6	yd^3	9650	gal		965	gal		Water	7.48	7218	965.0	2406	321.7

= Default value based on soil type
=Site specific variables

Total	mZVI	220.6	15.8
	Water	8823	1179.5
	Combined	9043	1195.2

Standard Ratios (Field Rules - 2.5% for wells and 10% for borings)	Standard Dilution %	mZVI	Water
		gal	
	2.5%	1	75
	5%		37.5
	10%		18.75

APPENDIX A
SAFETY DATA SHEETS

INTERIM ACTION WORKPLAN

FORMER PRIME CLEANERS
18001 BOTHELL EVERETT HIGHWAY
BOTHELL, WASHINGTON

Pacific Crest PN: 223-002

Safety Data Sheet

mZVI Suspension

SDS Revision Date: **04/27/2018**

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

1.1. Product identifier

Product Identity	mZVI Suspension
Alternate Names	mZVI Suspension

1.2. Relevant identified uses of the substance or mixture and uses advised against

Intended use	See Technical Data Sheet.
Application Method	See Technical Data Sheet.

1.3. Details of the supplier of the safety data sheet

Company Name	Tersus Environmental, LLC 1116 Colonial Club Rd. Wake Forest, NC 27587
Emergency	
CHEMTREC (USA)	(800) 424-9300
24 hour Emergency Telephone No.	1-703-527-3887
Customer Service: Tersus Environmental, LLC	(919) 453-5577 info@tersusenv.com

SECTION 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

ROUTES OF ENTRY:

ABSORBTION (SKIN) (EYES): YES

INGESTION: YES

INJECTION: NO

INHALATION: NO

ACUTE HEALTH HAZARDS: None Known – Not believed to have harmful health effects

INGESTION/SWALLOWED: (Unknown)

- Accidental ingestion of the material may be damaging to the health of the individual.
- No harmful effects expected in amounts likely to be ingested by accident.
- Overexposure is unlikely in this form.
- Nonionic surfactants may produce localized irritation of the oral or gastrointestinal lining and induce vomiting and mild diarrhea.

EYE: (Unknown)

- Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals.
- Prolonged eye contact may cause inflammation characterized by a temporary redness of the conjunctiva (similar to windburn).
- Non-ionic surfactants can cause numbing of the cornea, which masks discomfort normally caused by other agents and leads to corneal injury. Irritation varies depending on the duration of contact, the nature and concentration of the surfactant.

SKIN: (Unknown)

- The material may cause moderate inflammation of the skin either following direct contact or after a delay of some time. Repeated exposure can cause contact dermatitis which is characterized by redness, swelling and blistering.
- Prolonged contact may cause dryness of the skin.
- Skin contact is not thought to have harmful health effects, however the material may still produce health damage following entry through wounds, lesions or abrasions.
- Repeated exposure may cause skin cracking, flaking or drying following normal handling and use.
- Open cuts, abraded or irritated skin should not be exposed to this material.
- Entry into the blood-stream through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects.
- Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALATION: (Unknown)

- The material is not thought to produce either adverse health effects or irritation of the respiratory tract following inhalation (as classified using animal models). Nevertheless, adverse effects have been produced following exposure of animals by at least one other route and good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.
- In high concentrations, vapors may be irritating to the respiratory system.

CHRONIC HEALTH HAZARDS: None Known – Not believed to have harmful chronic health effects

- Long-term exposure to the product is not thought to produce chronic effects adverse to the health (as classified using animal models); nevertheless, exposure by all routes should be minimized as a matter of course. Prolonged or repeated skin contact may cause degreasing with drying, cracking and dermatitis following.

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

OSHA Regulatory Status: Some ingredients of this product are hazardous according to OSHA 29CFR 1910.1200.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: None Known

CARCINOGENICITY

OSHA:	ACGIH:	NTP:	IARC:	OTHER:
NA	NA	NA	NA	NA

SECTION 2 NOTES:

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

PRODUCT NAME: mZVI – Electron Donor Suspension
CASE NO.: None Known
SYNONYMS: None Known
PRODUCT CODES: None Known

INGREDIENT:	CAS NO.	% WT	% VOL	SARA 313 REPORTABLE
Zero Valent Iron	7439-89-6	10 - 40	NA	NA
Glycerol	8001-22-7	40 - 80	NA	NA
Calcium carbonate	471-34-1	<10%	NA	NA

mZVI	ppm	mg/m3
OSHA PEL-TWA:	NA	NA
OSHA PEL STEL :	NA	NA
OSHA PEL CEILING:	NA	NA
ACGIH TLV-TWA:	NA	NA
ACGIH TLV STEL:	NA	NA
ACGIH TLV CEILING:	NA	NA

IMPURITIES: NONE

STABILIZING ADDITIVES: NONE

SECTION 3 NOTES:

SECTION 4: FIRST AID MEASURES

EYES:

- In case of eye contact, rinse opened eye for 15 minutes then consult a doctor.

SKIN:

- Remove contaminated clothing. Wash contaminated clothing before reuse.
- In case of skin contact, immediately wash with water and soap, then rinse thoroughly.
- Seek medical assistance if redness, itching or a burning sensation develops.

INGESTION:

- In case of ingestion, after swallowing seek immediate medical advice.
- Make doctor aware that the following symptoms may occur: nausea, cramps, gastric or intestinal disorders.
- Drink 2 to 3 glasses of whole milk.

INHALATION:

- Move individual to fresh air. Not an expected route of exposure.
- If cough or other respiratory symptoms develop, consult medical personnel.

SECTION 4 NOTES:

SECTION 5: FIRE-FIGHTING MEASURES

FLAMMABLE LIMITS IN AIR, UPPER: NA
(% BY VOLUME) LOWER: NA

FLASH POINT:
F: >482°F
C: >250°C

METHOD USED: Closed Cup

AUTOIGNITION TEMPERATURE:
F: >760°F
C: >404°C

NFPA HAZARD CLASSIFICATION *SCALE: 4-extreme, 3-High, 2-Moderate, 1-Low, 0- Insignificant

HEALTH: 1 FLAMMABILITY: 2 REACTIVITY: 1
OTHER: None

HMIS HAZARD CLASSIFICATION

HEALTH: 1 FLAMMABILITY: 2 REACTIVITY: 1
PROTECTION:

EXTINGUISHING MEDIA: Extinguishing Powder – Class D Fire Extinguisher

SPECIAL FIRE FIGHTING PROCEDURES: Do NOT use water, carbon dioxide, or halogenated extinguishers.

UNUSUAL FIRE AND EXPLOSION HAZARDS: NA

HAZARDOUS DECOMPOSITION PRODUCTS: NA

SECTION 5 NOTES:

SECTION 6: ACCIDENTAL RELEASE MEASURES

ACCIDENTAL RELEASE MEASURES:
Person Related Safety Measures: Wear protective equipment, keep unprotected persons away, ensure adequate ventilation
Environmental Safety Measures: NA
Measures for cleaning/collecting: Dispose of contaminated material as waste according to section 7

SECTION 6 NOTES:

SECTION 7: HANDLING AND STORAGE

HANDLING AND STORAGE:

- Contain spilled material and recover into drums. Plastic drums are recommended.
- All drums should be placed out of direct sunlight.
- Ensure good ventilation at the workplace.
- Keep ignition sources away.
- Do not store together with oxidizing and acidic materials.
- Store away from halogens.

SECTION 7 NOTES:

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Block off area from unprotected persons

VENTILATION : Ensure adequate ventilation

RESPIRATORY PROTECTION: NA

EYE PROTECTION: Safety Goggles

PROTECTIVE GLOVES: Rubberized gloves (neoprene or pvc)

PROTECTIVE FOOTWEAR: Slip resistant footwear

SKIN PROTECTION: Outer clothing to minimize dermal contact.

WORK HYGIENIC PRACTICES: Surfaces covered with EZVI are very slick. Exercise care in handling or clean up to avoid injury due to falls.

SECTION 8 NOTES:

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Grey to black, viscous liquid

ODOR: Soybean Oil (cooking oil) odor

PHYSICAL STATE: Liquid

pH AS SUPPLIED:

pH (Other):

BOILING POINT:

F: >572 ^{o}F

C: >300 ^{o}C

MELTING POINT:
F: -4 °F
C: -20 °C
FREEZING POINT:
F: NA
C: NA
VAPOR PRESSURE (mmHg):
@
F: NA
C: NA
VAPOR DENSITY (AIR = 1):
@
F: NA
C: NA
SPECIFIC GRAVITY (H2O = 1):
@
1.05 – 1.10 g/cm^3
EVAPORATION RATE (Butyl Acetate = 1): NA

SOLUBILITY IN WATER: Insoluble

PERCENT SOLIDS BY WEIGHT: 10 – 17%

PERCENT VOLATILE:
BY WT/ BY VOL @
F: NA
C: NA
VOLATILE ORGANIC COMPOUNDS (VOC):

WITH WATER: NA LBS/GAL
WITHOUT WATER: NA LBS/GAL

MOLECULAR WEIGHT: NA

SECTION 9 NOTES:

SECTION 10: STABILITY AND REACTIVITY

	STABLE	UNSTABLE
STABILITY:	X	

CONDITIONS TO AVOID (STABILITY): Avoid improper handling and storage conditions.

INCOMPATIBILITY (MATERIAL TO AVOID): Acids, oxidizing agents, halogens

HAZARDOUS DECOMPOSITION OR BY-PRODUCTS: If combined with halogens will produce hydrogen gas.

HAZARDOUS POLYMERIZATION: NA

CONDITIONS TO AVOID (POLYMERIZATION): None

SECTION 10 NOTES:

SECTION 11: TOXICOLOGICAL INFORMATION

TOXICOLOGICAL INFORMATION: NA

IRON Toxicity to Animals: Acute oral toxicity (LD50): 30000 mg/kg [Rat].

Routes of Entry: Eye contact, inhalation, ingestion, and absorption.

LD50: Not available.
LC50: Not available.

Possible Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Chronic Effects on Humans: Not available.
Special Remarks on other Toxic Effects on Humans: Not available.

SECTION 11 NOTES:

SECTION 12: ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: NA

SECTION 12 NOTES:

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: Store waste materials int appropriately labeled drums out of direct sunlight. Moist conditions are preferred. Waste materials should be doused with water while in drums.

RCRA HAZARD CLASS: NA

SECTION 13 NOTES:

SECTION 14: TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION
- PROPER SHIPPING NAME: Emulsified Zero Valent Iron
- HAZARD CLASS: NA
- ID NUMBER: NA
- PACKING GROUP: None
- LABEL STATEMENT:

WATER TRANSPORTATION
- PROPER SHIPPING NAME: Emulsified Zero Valent Iron
- HAZARD CLASS: NA
- ID NUMBER: NA
- PACKING GROUP: None

LABEL STATEMENTS:

AIR TRANSPORTATION
PROPER SHIPPING NAME: Emulsified Zero Valent Iron
HAZARD CLASS: NA
ID NUMBER: NA
PACKING GROUP: None
LABEL STATEMENTS:

OTHER AGENCIES:

SECTION 14 NOTES:

SECTION 15: REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS (No known regulations are in place for this product)
TSCA (TOXIC SUBSTANCE CONTROL ACT): NA

CERCLA (COMPREHENSIVE RESPONSE COMPENSATION, AND LIABILITY ACT): NA

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT): NA

311/312 HAZARD CATEGORIES: NA

313 REPORTABLE INGREDIENTS: NA

STATE REGULATIONS: NA

INTERNATIONAL REGULATIONS: NA

OSHA Regulatory Status: Some ingredients of this product are hazardous according to OSHA 29CFR 1910.1200. These specific ingredients are in lower amounts than the OSHA Permissible Exposure Limits and ACGIH Time Weighted Average.

IMPORTANT: The information contained herein relates only to the specific material identified. RemQuest believes that such information is accurate and reliable as of the date of this material safety data sheet, but no representation, guarantee or warranty, express or implied, is made as to the accuracy, reliability, or completeness of the information. RemQuest urges persons receiving this information to make their own determination as to the information's suitability and completeness for their particular application.

SECTION 16: OTHER INFORMATION

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful effects which may be caused by exposure to our products. Customers/users of this product must comply with all applicable health and safety laws, regulations, and orders.

The full text of the phrases appearing in section 3 is: Not applicable

SDS Revision Date: **04/27/2018**

This is the first version in the GHS SDS format. Listings of changes from previous versions in other formats are not applicable.

We suggest that containers be either professionally reconditioned for re-use by certified firms or properly disposed of by certified firms to help reduce the possibility of an accident. Disposal of containers should be in accordance with applicable federal, state and local laws and regulations. "Empty" drums should not be given to individuals.

The conditions of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product.

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Tersus Environmental be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Tersus Environmental has been advised of the possibility of such damages.

End of Document

APPENDIX B
STANDARD OPERATING PROCEDURES

INTERIM ACTION WORKPLAN

FORMER PRIME CLEANERS
18001 BOTHELL EVERETT HIGHWAY
BOTHELL, WASHINGTON

Pacific Crest PN: 223-002

Standard Operating Procedure (SOP-Field-2007-12003)
Water Level Measurements and Low Flow Groundwater Sampling

Purpose
The purpose of this Standard Operating Procedure (SOP) is to document the methodology for measuring water levels in monitoring wells and collecting representative groundwater samples from monitoring wells using low flow sampling methodologies.

Sampling Equipment and Materials
The sampling equipment and materials for measuring water levels in monitoring wells and collecting representative groundwater samples from monitoring wells using low flow sampling methodologies include the following:

- Electronic water level indicator;
- Laboratory provided sample containers;
- Peristaltic pump, small diameter bladder pump or small diameter bailer
- Accurate stopwatch, calculator and camera;
- Personal protective equipment (PPE) in accordance with the Site-specific Health and Safety Plan (HASP);
- Field tool kit;
- Project Field Sampling Plan (FSP); and,
- Equipment decontamination kit and materials.

Sampling Procedure
Groundwater samples for compliance monitoring will be collected and handled in accordance with EPA guidance document Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures dated April 1996 (EPA Groundwater Issue EPA/540/S-95/504). A step-by-step procedure for collecting representative groundwater samples from monitoring wells is presented below:

1. Remove the locking well cap from the well and allow the groundwater level to equilibrate to atmospheric pressure for a minimum of 15 minutes;
2. Measure the depth-to-groundwater in all groundwater monitoring wells at the to an accuracy of 0.01 foot relative to a surveyed notch on the top of the polyvinyl chloride (PVC) casing using an decontaminated electronic water level meter. Collect groundwater monitoring data at all wells in as short a time period as practical, not to exceed 2 hours. Measure the depth to the bottom of each monitoring well to evaluate the accumulation of silt in each well. Decontaminate all reusable equipment between use at successive well locations.
3. Purge the monitoring wells at a low-flow rate (i.e., 100 to 300 milliliters per minute) using a peristaltic or Micropurge (bladder) pump (or equivalent) and dedicated polyethylene tubing. Place the pump intake at the approximate center of the submerged screened interval. Monitor drawdown in the well and attempt to maintain a drawdown of less than 0.3 feet. Monitor temperature, pH, and conductivity using a YSI600XL water quality meter (or equivalent) equipped with a flow-through cell during purging. Conduct purging until the water quality data indicate that these parameters have stabilized as follows:

Parameter	Stabilization Criteria
pH	Max – Min <0.1 units
Temperature	Max – Min <
Specific Conductivity	RPD <3%

4. Measure dissolved oxygen and oxidation-reduction potential (ORP) using an YSI600XL water quality meter (or equivalent) as a component of the monitored natural attenuation evaluation.
5. Collect groundwater samples directly from the polyethylene tubing outlet following stabilization of water quality parameters. If a monitoring well is completely dewatered during purging, collect samples when the groundwater in the well has recovered at least 80 percent of the pre-purge casing volume. If low-flow sampling methods are not practical, allow the monitoring well to recharge for no longer than 2 hours from cessation of purging, and sample the well using a new disposable, polyethylene, double-check valve bailer and sampling cord.
6. Fill the sample containers directly from the polyethylene tubing if pumped, or transfer the water samples from the bailer directly into laboratory-supplied sample containers, with care taken to minimize turbulence. Take care also not to handle the seal or lid of the container when decanting the sample into the containers. Completely fill the containers to eliminate any headspace, the secure the seal/lid; and check the containers for air bubbles.
    a. For samples to be analyzed for volatile organic compounds (VOCs), total petroleum hydrocarbon as gasoline (TPH-G), and benzene, toluene, ethylbenzene and total xylenes (BTEX), fill 40-ml VOA vials to top with a positive meniscus (no headspace) being careful not to overfill and seal VOA vials with a Teflon-lined septum lid.
    b. For samples to be analyzes for semi-volatile organic compounds (SVOCs), fill 1-liter amber glass bottles to top being careful not to overfill and seal with a Teflon-lined septum lid.
    c. For samples to be analyzed for TPH as diesel and heavy oil (TPH-D and TPH-O), fill 500 ml amber glass bottle to top and seal with a Teflon-lined septum lid.
    d. For other analytes, follow guidelines for the appropriate sample container provided by the project laboratory or the applicable laboratory method.
7. Label the sample containers with the following: date and time sampled; the well identification and number; the project number; and, preservative(s).
8. Document the information on a Field Report Form and the Chain-of-Custody form and place the sample in a chilled cooler approximately 4 degrees Celsius for transport to the laboratory.
9. Maintain chain-of-custody protocols during sample transport and submittal to the laboratory.
10. Place all purge water in a labeled 55-gallon drum pending receipt of waste profiling results.
11. Secure the well cap and monument following sampling. Note any damage or defect of the well cap or monument and scheduled for repair or replacement.

Laboratory Analysis

The analytical method for laboratory analysis of the reconnaissance groundwater samples will be specified in the Work Plan. Typical analytical methods include: SW-846 Method 8260 for VOCs; SW-846 Method 8270 for SVOCs; common cations and anions; and, TPH-G, TPH-D and TPH-O.

Documentation

All field activities and sample criteria will be recorded in the Field Notes by Pacific Crest personnel in accordance with the applicable SOPs and the Sampling Procedure requirements. Upon completion of the field activities the Field Notes will be provided to the Pacific Crest Project Manager for review.

Investigation Derived Waste

The field activities typically generate minimal quantities of investigation derived waste (IDW) including purge water, decontamination fluids, used PPE and tubing. The PPE and tubing may in some cases be disposed of as waste in a municipal landfill. The purge water and decontamination fluids should be containerized on site in sealed 55-gallon capacity drums for proper disposal in accordance with the regulations.

References

EPA Groundwater Issue EPA/540/S-95/504

Puls, R.W. and M.J. Barcelona, 1996, Low-Flow (Minimal Drawdown) Ground-water Sampling Procedures, EPA/540/S-95/504.

U.S. EPA, 1993, RCRA Ground-Water Monitoring: Draft Technical Guidance, EPA/530-R-93-001.

U.S. EPA Region II, 1989, CERCLA Quality Assurance Manual.

Standard Operating Procedure (SOP-Field-2007-12007)
Handling of Investigation Derived Wastes

Purpose
The purpose of this SOP is to provide field personnel with an outline of the specific information needed for handling investigation derived waste (IDW).

Equipment and Materials
The equipment and materials for handling IDW include the following:

- Project specific decontamination equipment may include: dedicated power source; steam cleaner; secondary containment; transfer pumps; overspray containment; and, clean water supply source.
- Project specific IDW containment may include: 55-gallon drums; poly-tanks (250 or 500-gallon); Baker Tanks (4,000-gallon).
- All required documentation including drum labels, waste report forms, and waste manifests.
- Personal protective equipment (PPE) as described in the Site Health and Safety Plan.

Waste Handling Procedure
A step-by-step procedure for handling IDW including soil, wastewater, sediment, and PPE is presented below:

1. Upon arrival at each boring site, the following procedures shall be followed:
    a. Suit up in appropriate PPE as described in the Site Health and Safety Plan.
    b. Set-up an area for temporary storage of IDW. The size and site specific considerations in the design and location of the storage area will depend on the nature of the activities.
2. IDW handling procedures for soil, wastewater, and sediment are described below.
    a. Transfer all waste soil, wastewater, sediment and construction materials (e.g., sand filter pack, bentonite and grout) directly to 55-gallon drums or appropriate waste disposal container. To the extent practical, segregate waste streams on the basis of the waste type and potential for contamination.
    b. Record the volume and type of waste (soil, wastewater, sediment, etc.) generated from each boring/well installation on IDW Inventory forms and in the field notes.
    c. Label the drums with the following information: boring/well name, project name and number, drum identification, date generated, contents, percent filled, and contact number.
    d. Complete an IDW Inventory form will be completed with the following information: site name, project name and number, date and time of inventory, drum identification, date generated, contents, drum capacity, percent filled, label information (non-hazardous or hazardous), date removed, transporter, disposal location, as appropriate.
    e. Upon completion of the field activities, one or more discrete samples may be collected from the container(s) for laboratory analysis. The waste

disposal analytical requirements will be site-specific and specified in the Sampling and Analysis Plan.

3. IDW handling procedures for disposable PPE (e.g., Tyvek suits, rubber gloves, boot covers) and disposable sampling devices (e.g., plastic scoops and bailers) are described below.
    a. Clean all PPE and disposable sampling devices and place the material in plastic garbage bags for disposal as non-hazardous waste.
    b. Remove residual contamination visible on disposable sampling devices or disposable clothing prior to disposal. Dispose of PPE that cannot be cleaned as in accordance with the applicable regulations.

Laboratory Analysis

The analytical method for laboratory analysis of the IDW will be specified in the Work Plan.

Transportation and Disposal

Provide waste profiles to the applicable TSD facility or appropriate landfill facility. Forward all waste profiles and manifests to the generator for approval prior to transporting the materials off site. All waste will be removed by a licensed transporter in labeled, EPA-approved containers. No waste will remain on the property for greater than 90 days following generation.

Documentation

All field activities and sample criteria will be recorded in the Field Notes by Pacific Crest personnel in accordance with the applicable SOP. Upon completion of the field activities the Field Notes will be provided to the Pacific Crest Project Manager for review.

References

Title 40, Code of Federal Regulations Part 262.

EPA, 1996, Understanding Hazardous Waste Rules: A Handbook for Small Businesses-1996 Update

Standard Operating Procedure (SOP-Field-2007-12008)
Equipment Decontamination

Purpose
The purpose of this SOP is to provide field personnel with an outline of the specific procedures for the decontamination of field monitoring equipment. Decontamination of equipment is performed as a quality assurance measure and as a safety precaution. Decontamination is intended to prevent cross-contamination between sampling and to maintain a clean, safe working environment.

Equipment and Materials
The equipment and materials for equipment decontamination include the following:

- Project specific decontamination equipment may include: dedicated power source; steam cleaner; secondary containment; transfer pumps; overspray containment; and, clean water supply source;
- Project specific IDW containment may include: 55-gallon drums; poly-tanks (250 or 500-gallon); 5-gallon buckets;
- Alconox and paper towels;
- Clean plastic bristle brushes;
- De-ionized water,
- Laboratory grade methanol or laboratory grade hexane in a spray bottle;
- Laboratory grade nitric acid;
- A clean hose and tap water source;
- A labeled 55-gallon drum for wastewater and a bucket to use for smaller volume prior to containing in drum; and,
- Personal protective equipment (PPE) as described in the Site Health and Safety Plan.

Decontamination Procedure
A step-by-step procedure for small field equipment[1] decontamination is presented below:

1. On a daily basis for each project or field activity, designate a decontamination area consisting of at least a 3-ft by 5-ft piece of visqueen plastic sheeting on the ground in a controlled area. The staging area should be designed to allow easy access for moving equipment in and out and to contain decontamination investigation derived waste (IDW). Conduct decontamination in the designated area only.
2. Set up a minimum of four 5-gallon buckets (Bucket #1, Bucket #2, Bucket #3 and, Bucket #4) for use in the decontamination process.
3. Add approximately 2.5 gallons of clean tap water to Bucket #1 and to Bucket #2.
4. Add 2-tablespoons of non-phosphate detergent to Bucket #2.
5. Add approximately 2.5 gallons of de-ionized water to Bucket #3.
6. Remove the gross contamination from the equipment by washing in Bucket #1.
7. Remove the residual contamination from the equipment by washing in Bucket #2 with non-phosphate detergent.
8. Rinse the detergent from the equipment in de-ionized water in Bucket #3.

[1] Decontamination of large field equipment is beyond the scope of this SOP and typically requires an equipment-specific decontamination plan.

9. Optional for organic contaminants – Rinse by spraying with laboratory grade hexane or methanol.
10. Optional for inorganic contaminants – Rinse with diluted nitric acid solution.
11. Final rinse with de-ionized water.
12. Allow the equipment to air dry in a dust free environment.
13. Handle field cleaned equipment in a manner that prevents recontamination.
14. Upon completion of the field activities containerize the IDW generated during decontamination activities in accordance with the applicable SOP.

Laboratory Analysis
The analytical methods for laboratory analysis of the samples collected from the IDW generated during decontamination (equipment blanks, etc.) will be specified in the Work Plan.

Documentation
All field activities will be recorded in the Field Notes by Pacific Crest personnel in accordance with the applicable SOP. Upon completion of the field activities the Field Notes will be provided to the Pacific Crest Project Manager for review.

References

ASTM D 5088-90. 1990. Standard Practice for Decontamination of Field Equipment Used at Nonradioactive Waste Sites. West Conshohocken, PA. http://www.astm.org

USEPA. 1994. "Sampling Equipment Decontamination." Environmental Response Team SOP #2006, Revision #0.0. Edison, NJ. http://www.ert.org

USEPA. 1996. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. http://www.epa.gov/region04/sesd/eisopqam/eisopqam.html. Region 4, Science and Ecosystem Support Division. Athens, GA.

USEPA. 1992. RCRA Ground-Water Monitoring: Draft Technical Guidance. EPA/530/R-93/001. Office of Solid Waste. Washington, DC.

Standard Operating Procedure (SOP-Field-2014-12016)
Field Notes and Documentation

Purpose

The purpose of this SOP is to provide Pacific Crest Environmental personnel with an outline of the specific information needed to document daily field activities. Field notes are used to provide a record of conditions of a site; to record activities at a site; and to document a site visit, among other uses.

Equipment and Materials

The equipment and materials for compiling field notes include the following:

- General Field forms or bound field logbooks (use waterproof pages as necessary)
- Specialized field forms (such as form used for low flow groundwater sampling)
- Blue or Black waterproof and/or indelible ink pens

Procedure

Field notes should be comprehensive enough to enable recreation of project field activities without reliance on memory. They should be completed in chronological order and recorded in blue or black ink. Included in the notes should be: field data observations, any deviations from project plans (and the reasoning behind deviation), and problems encountered.

There should be no blank lines on a page. If only part of a page is used, the unused remainder of the page should have an "X" drawn across and should be initialed and dated.

If an error is made, a single line should be drawn through the error, the correct information should be entered, and the change should be initialed and dated. If necessary, a brief reason for the correction should be recorded.

A step-by-step procedure for recording field notes is presented below:

1. Upon arrival at each site, the following procedures shall be followed:
    a. Fill out field report form. Include personnel/subcontractor arrival time; weather & temperature; project name, number, & task number; date; project manager; and the name of the personnel preparing the field notes.
    b. Identify any contractors or site visitors present, and document the time of arrival and departure.
    c. Additional information for documentation includes, but is not limited to:
        i. Sampling methodology and information;
        ii. Sample locations (helpful to use sketches)
        iii. A chronological description of field observations and events
        iv. Waste generated, containment units, and storage location;
        v. The manufacturer, model, and serial number of field instruments;
        vi. Additional materials used on-site

vii. Conditions that could affect the sample results;
viii. Decontamination procedures;
ix. Daily summary.

Chain of Custody Record (COC)

COC procedures are used to document the possession and handling of individual samples from field collection through laboratory analysis. A COC should list each individual that had possession of the sample. Information on a COC should include:

- Time and date of sample collection
- Sample ID and sample matrix
- Analysis Requested
- Number of Containers
- Sampler's signature and date

The COC is completed on carbon paper. The sampler should keep the carbon copy (the undersheet) to be filed with the field notes.

Documentation

Upon return to Pacific Crest, the field notes should be scanned and uploaded to the appropriate project file under "Field Forms". The originals should then be filed to the applicable project file.

Upon completion of the field activities the Field Notes will be provided to the Project Manager for review.

References

United States Environmental Protection Agency, Region 9. 2006. SOP-03 Field Notes and Documentation. Yerington Mine Site Standard Operating Procedure.

APPENDIX C
FIELD FORMS

INTERIM ACTION WORKPLAN

FORMER PRIME CLEANERS
18001 BOTHELL EVERETT HIGHWAY
BOTHELL, WASHINGTON

Pacific Crest PN: 223-002

PACIFIC CREST ENVIRONMENTAL
WWW.PCENV.COM 425-888-4990

FIELD REPORT

Page ___ of ___

Date:_____ **Project #:**_____ **Task#:**_____

Project:_____ **Location:**_____

Client:_____ **Contractor:**_____

Weather:_____ **Temperature:**_____

Equipment Used:_____

Prepared By:_____ **Project Manager:**_____

Notes:

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FIELD REPORT

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Date:_____ **Project #:**_____ **Task#:**_____

Notes:

Pacific Crest Environmental
1531 Bendigo Boulevard North, North Bend, Washington 98045
425.888.4990

LOW FLOW WELL PURGING AND SAMPLING DATA

		WELL ID:
DATE:	PROJECT NAME:	PROJECT NO.
WEATHER CONDITIONS:		
WELL DIAMETER (IN.) ☐ 1 ☐ 2 ☐ 4 ☐ 6 ☐ OTHER: _____		
SAMPLE TYPE: ☐ GROUNDWATER ☐ SURFACE WATER ☐ OTHER		
WELL DEPTH (TOC) FT.	DEPTH TO WATER BEFORE PURGING (TOC) FT.	
LENGTH OF WATER FT.	CALCULATED ONE WELL VOLUME[1] GAL.	
DEPTH OF SAMPLE POINT FT.	ESTIMATED VOLUME PURGED GAL.	
EQUIPMENT DECON.: ☐ ALCONOX WASH ☐ DIST./DEION. 1 RINSE ☐ DIST./DEION. 2 RINSE ☐ OTHER		
CONTAINER PRESERVATION: ☐ LAB PRESERVED ☐ FIELD PRESERVED		
WATER QUALITY METER:	PUMP TYPE:	TUBING:

TIME	FLOW RATE (ml/min) 100-500 ml/min	DEPTH TO WATER (feet)	TEMP ☐°F ☐°C	SPECIFIC CONDUCT. ☐ ms/cm ☐ µs/cm ±3%	pH ± 0.1	DISS. OXYGEN (mg/L) ± 10%	ORP (mV) ± 10mV	TURBIDITY (NTUs) ± 10%	COMMENTS (ODOR, COLOR, PID)
	INITIAL		--	--	--	--	--	--	

DEPTH TO WATER AFTER PURGING (TOC) FT.	SAMPLE FILTERED ☐ YES ☐ NO SIZE _____
NOTES:	SAMPLE TIME: ID#
	DUPLICATE ☐ TIME: ID#
	EQUIP. BLANK ☐ TIME: ID#
	PREPARED BY:

[1]A 1-FOOT LENGTH OF WATER = 0.05 GAL IN 1" DIA. PIPE, 0.17 GAL IN 2" DIA PIPE, 0.65 GAL IN 4" DIA PIPE, 1.5 GAL IN 6" DIA PIPE

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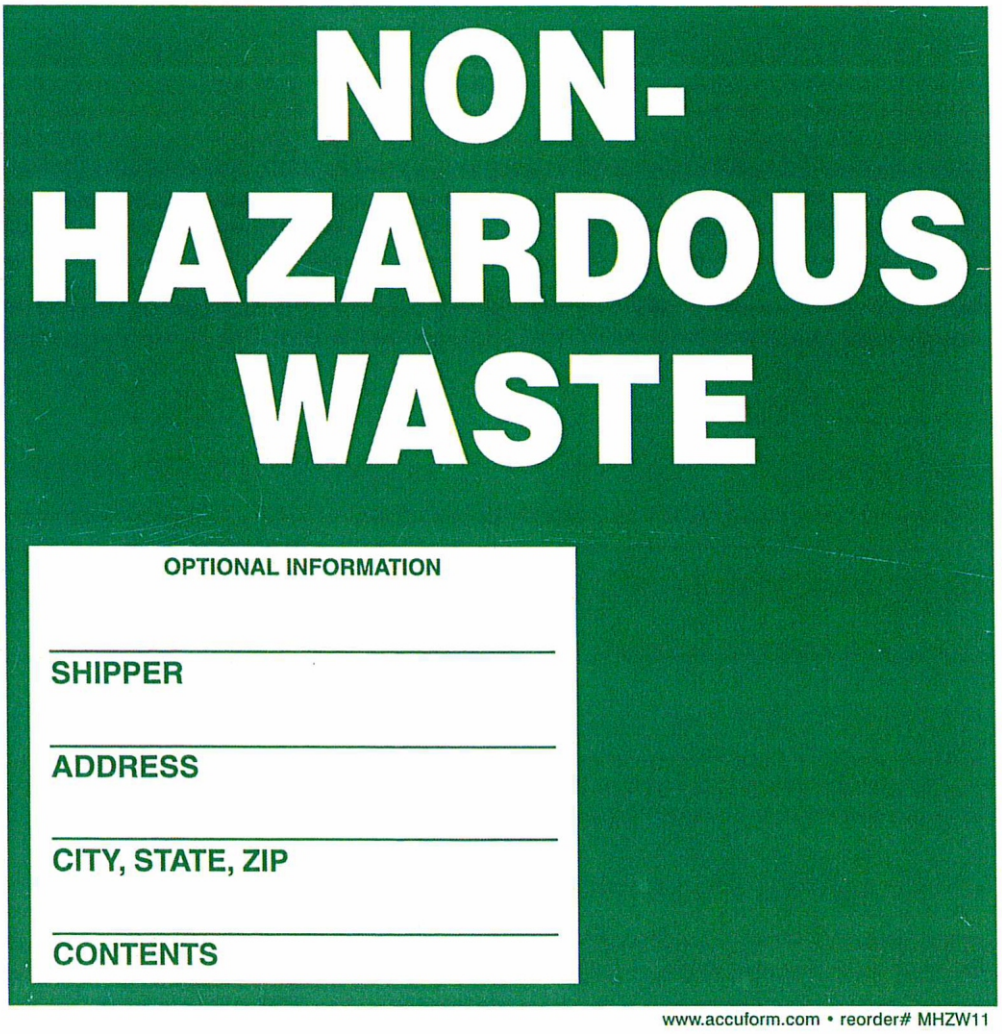
Waste Inventory Form

Date: _____

Site Name/Location: _____ **Pacific Crest PN:**_____ **Personnel:** _____

# of Drums	Drum Contents	% Full	Date(s) Accumulated	Labled (Y/N)	Sampled (Y/N)	Comments

Location of Drums (sketch or describe):	PM Use Only	Date Removed:
	Waste Transporter:	
	Disposal/Treatment Location:	



OnSite Environmental Inc.
14648 NE 95th Street
Redmond, WA 98052
(425) 883-3881

Client _____

Project _____

Sample ID _____

Date _____ Time _____

Analysis _____ Preservative _____

OnSite Environmental Inc.

Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Chain of Custody

Page _____ of _____

Company:

Project Number:

Project Name:

Project Manager:

Sampled by:

Turnaround Request (in working days)

(Check One)

☐ Same Day ☐ 1 Day

☐ 2 Days ☐ 3 Days

☐ Standard (7 Days)

☐ _____ (other)

Laboratory Number:

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (☐ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A					% Moisture

ATTORNEY WORK PRODUCT - DRAFT FOR REVIEW

	Signature	Company	Date	Time	Comments/Special Instructions
Relinquished					
Received					
Relinquished					
Received					
Relinquished					
Received					Data Package: Standard ☐ Level III ☐ Level IV ☐
Reviewed/Date		Reviewed/Date			Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐