ENGINEERING EVALUATION/COST ANALYSIS SAMPLING AND ANALYSIS PLAN

ROSS LAKE NATIONAL RECREATIONAL AREA

DIABLO DRY DOCK SITE

WHATCOM COUNTY, WA

EDL # 5PWR3360

Prepared by

Geosyntec consultants

engineers | scientists | innovators

4/20/2021

SAMPLING AND ANALYSIS PLAN
DIABLO DRY DOCK SITE
WHATCOM COUNTY, WA

Prepared for:

City of Seattle, City Light Department
700 5th Avenue
Seattle, WA 98104

For Submittal to:

National Park Service
U.S. Department of Interior
Environmental Compliance and Cleanup Division Park Facility Management Division

Prepared by:

Geosyntec Consultants, Inc.
520 Pike Street, Suite 260
Seattle, WA 98101

Joey Hickey, CHMM
Senior Scientist

Anne Fitzpatrick, LHG (WA)
Senior Principal

Project Number: PNG0913

20 April 2021

Signatories:

[Federal Government Lead]	[Signature]	[Date Signed]
[Cleanup Lead]	[Signature]	[Date Signed]
[Legal Lead]	[Signature]	[Date Signed]
[Regional Coordinator]	[Signature]	[Date Signed]
[Contaminated Sites Program]	[Signature]	[Date Signed]
By signing above, the signatories verify that they understand and concur with the information, procedures, and recommendations presented herein.		

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

95% UCL	95% upper confidence limit
AOC	Administrative Order on Consent
ARARs	Relevant and Appropriate Requirements
ASAOC	Administrative Settlement Agreement and Order on Consent
ASTM	American Society of Testing Materials
AVS/SEM	acid volatile sulfides/simultaneously extracted metals
blm	below mudline
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
CAL	cleanup action levels
cm	Centimeter
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIP	Community Involvement Plan
CLP	contract laboratory program
COCs	chemicals of concern
COIs	Constituents of Interest
COPCs	chemicals of potential concern
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
CRC	Cultural Resources Coordinator
CSL	cleanup screening level
CSM	conceptual site model
DAHP	Department of Archaeological and Historic Preservation
DGPS	differential global positioning system
DOI	Department of the Interior
DQIs	data quality indicators
DQOs	data quality objectives
EA	Environmental Assessment
EDD	electronic data deliverable
EE/CA	Engineering Evaluation/Cost Analysis
ELC	Environmental Learning Center
EPA	Environmental Protection Agency
ERCI	Equinox Research and Consulting International Inc.
ESV	ecological screening value

FSP	Field Sampling Plan
GPS	global positioning system
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HMW	high molecular weight
IDP	Inadvertent Discovery Protocol
IDQTF	Intergovernmental Data Quality Task Force
IDW	investigative-derived waste
LCS	laboratory control sample
LIMS	laboratory information management system
LMW	low molecular weight
LPM	Laboratory Project Manager
MDL	method detection limit
mg/kg	milligrams per kilogram
ml	Milliliter
MLLW	mean lower low water
MQOs	measurement quality objective
MS/MSD	matrix spike/matrix spike duplicate
MTCA	Model Toxics Control Act
NAGPRA	Native American Graves Protection and Repatriation Act
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOCA	North Cascades National Park Service Complex
NPS	National Park Service
NRA	National Recreation Area
NTCRA	non-time critical removal action
OnSite	OnSite Environmental laboratory
OHWM	ordinary high water mark
OSWER	Office of Solid Waste and Emergency Response
PAHs	polycyclic aromatic hydrocarbons
PARCCS	precision, accuracy, representativeness, completeness, comparability, and sensitivity
PE	performance evaluation
PID	photoionization detector
PIQ	principal investigation questions
PPE	personal protective equipment

PQL	practical quantification limit
PRG	preliminary remediation goals
PSEP	Puget Sound Estuary Protocols
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RCW	Revised Code of Washington
RI	Remedial Investigation
RL	reporting limit
SAP	Sampling and Analysis Plan
SCL	Seattle City Light
SCO	sediment cleanup objective
SCUM	Sediment Cleanup User's Manual
SCUMII	Sediment Cleanup User's Manual Version II
Settlement	Administrative Settlement and Order on Consent
Site	Diablo Dry Dock Site
SL	screening levels
SLERA	Screening Level Environmental Risk Assessment
SMS	Sediment Management Standard
SOPs	standard operating procedures
SWAC	spatially weighted average concentrations
TCLP	Toxicity Characteristic Leaching Procedures
TCP	Traditional Cultural Places
TEQ	toxic equivalents
TOC	total organic carbon
TPH	total petroleum hydrocarbons
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency's
USFWS	United States Fish and Wildlife Service
VOA	Volatile Organic Analysis
VOC	volatile organic compound
WISAARD	Washington Information System for Architectural and Archaeological Records Data
WPC	Washington State Plane Coordinate

1. INTRODUCTION

Geosyntec Consultants Inc. (Geosyntec) has prepared this Sampling and Analysis Plan (SAP) on behalf of Seattle City Light (SCL or City Light) to document the field procedures that will be used in the characterization of upland soils and sediments associated with the Diablo Dry Dock Site (Site) as part of the Engineering Evaluation/Cost Analysis process for the Site. This document is prepared pursuant to the July 16, 2019 Administrative Settlement Agreement and Order on Consent (ASAOC) for the Site. Per National Park Service (NPS) direction, this document satisfies requirements under Sections 20, 24 and 25a and 25b of the ASAOC (NPS 2019a). The Site is located on the north shore of Diablo Lake, Whatcom County, Washington, and immediately adjacent to the North Cascades Environmental Learning Center (Figure 1). The results generated during this investigation will be reported in the upcoming EE/CA.

Per National Park Service (NPS) direction, this Work Plan focuses primarily on field sampling and data quality. Its purpose is to define the:

- Historical data and regulatory framework
- Conceptual site model and data gaps (information inputs)
- Data Quality Objectives (DQOs) and the quality and types of data needed to accomplish the goals of this study
- Data collection methods

1.1 CERCLA and National Park Service Authority

SCL entered into an Administrative Settlement and Order on Consent (Settlement) with the United States Department of the Interior (DOI) and NPS for the performance of removal actions by SCL. The Settlement was issued under the authority vested in the President of the United States by Sections 104, 107, and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. §§ 9604, 9607 and 9622 (CERCLA).

NPS is authorized under CERCLA, 42 USC. Section 9601 et seq., to respond as the Lead Agency to a release or threatened release of hazardous substances and/or a release or threatened release of any pollutant or contaminant that may present an imminent and substantial danger to public health or welfare on NPS land.

CERCLA's implementing regulations, codified in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300 (1994), establishes the framework for responding to such releases and threatened releases. The NCP prescribes two similar processes for responding to releases: removal actions and remedial actions. (See NCP Sections 300.400 through 300.440.) An SAP is required under either process if environmental samples are to be collected (see NCP Sections 300.415 and 300.430).

In addition, NPS has many regulations that apply to the release of hazardous substances on NPS land (see NPS 2014a), including the NPS Organic Act of 1916 (16 USC Section 1, et seq., 36 CFR

Part 1), which requires that NPS manage parks in order to conserve the scenery, natural and historic objects, and wildlife and provide for their enjoyment by such means as will leave them unimpaired for the enjoyment of future generations. Therefore, in the event the Site poses risks to the interaction of organisms and the environment, it is especially relevant to NPS responsibility to protect park resources.

1.2 SAP Overview

Per NPS direction, the SAP comprise primarily two parts: Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP). The FSP describes the number, types, and locations of samples and the types of analyses that will be conducted on the samples. The QAPP describes the project's policy, organization, and functional activities and the data quality objectives (DQOs) and measures necessary to achieve the objectives of the study.

This SAP was generated in accordance with:

- Administrative Settlement Agreement and Order on Consent (ASAOC) for Removal Actions – Diablo Dry Dock (and this SAP satisfies the Work Plan requirements stated in this agreement)
- National Park Service Guidance on Developing an NPS Sampling and Analysis Plan
- United States Environmental Protection Agency's (USEPA) *Guidance on Systematic Planning Using the Data Quality Objectives Process* (USEPA 2006a)
- *Guidance for Quality Assurance Project Plans* (USEPA 2002a)
- *EPA Requirements for Quality Assurance Project Plans* (USEPA 2001)
- Intergovernmental Data Quality Task Force's (IDQTF) *Uniform Federal Policy for Quality Assurance Project Plans* (IDQTF 2005)
- Washington State *Model Toxics Control Act (MTCA)* (Ecology, 2020a and b) *and Sediment Management Standards (SMS)* (Ecology 2013)
- *Sediment Cleanup User's Manual* (SCUM) (Ecology 2019)
- *Puget Sound Estuary Protocols* (PSEP) (1997)
- *Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites* (USEPA 2008)

The remainder of this document is organized according to the following sections:

- **Section 2, Site Background and Conditions:** Presents an overview of the Site and reviews the chemical, physical, and biological settings.
- **Section 3, Conceptual Site Model:** Identifies chemicals of potential concern and potential exposures that may affect human health and ecological resources.

- **Section 4, Data Quality Objectives Planning Team and Stakeholders:** Details the project team, the primary decision makers, and stakeholders who may be interested in the project.
- **Section 5, Data Quality Objectives:** Presents the DQOs for the EE/CA.
- **Section 6, Field Sampling Plan:** Details the proposed field sampling efforts intended to satisfy the DQOs identified in Section 5.
- **Section 7, Documentation and Management:** Describes the processes that will be used to document and manage data during the field investigations.
- **Section 8, Quality Assurance and Quality Control:** Outlines measures that will be implemented to produce high-quality information during the investigation.
- **Section 9, Investigation Outputs and Reporting:** Lists the components of the EE/CA report that will be produced following the investigation.
- **Section 10, References:** Lists the references cited in this document.

Tables and figures are located at the end of the text, followed by Appendices A through E. Appendix E graphically presents a generalized schedule of activities and key milestones for the EE/CA process. Per the NPS direction, this schedule embodies the EE/CA Work Plan.

1.3 Purpose of Field Sampling

The purpose of the sampling events is to characterize the nature and extent of contaminants and provide data that will facilitate an evaluation of risk to human health and ecological receptors and, if needed, removal alternatives (as part of the pending EE/CA). SCL will use data collected during this field investigation to support potential response actions that may be undertaken by SCL, NPS, or other parties.

The sampling will be completed in phases, and the field work tasks include:

- Phase 1:
  - Physical surveys, including a bathymetry survey and soft sediment probing
  - Soil sampling to fill data gaps and determine the extent of contamination
  - Surface sediment sampling to fill data gaps and evaluate risks
- Phase 2:
  - Subsurface sediment coring to determine vertical extent of contamination
  - Site-specific background sampling

Sampling activities are expected to be conducted during the summer of 2021. Data generated from these sampling events will be used in accordance with the provisions outlined in the DQOs.

1.4 Site Location

The Site is located on the north shore of Diablo Lake, Whatcom County, Washington (Figure 2) and is located within North Cascades National Park. The dry dock is located in Deer Creek Cove of Diablo Lake on land managed by NPS. The North Cascades Environmental Learning Center is located immediately adjacent to the west and northwest (Figure 1). To the south is Diablo Lake, which serves as a reservoir for City Light's Diablo Dam. Diablo Lake is located along the Skagit River in the Ross Lake National Recreational Area.

The Global Positioning System (GPS) coordinates for the Dry Dock are 48.717694 degrees latitude by -121.117185 degrees longitude. The Washington State Plane Coordinate (WPC) system is zone 4601, 1571890.040 feet United States East, 626713.801 feet United States North. The Site is 125 miles from Seattle in township range section 4 T37N R13E.

2. SITE DESCRIPTION AND PREVIOUS INVESTIGTIONS

This section summarizes the known relevant environmental information and historical activities that have occurred at the Site. This information has been used to form a graphical conceptual site model (CSM) presented in Section 3 of this Work Plan. The development of a clear and thorough CSM is a critical component for ensuring that key site elements are considered before any samples are collected and for assisting the project team in making decisions in the field.

2.1 Key Site Features and Site Description

The Diablo Dry Dock Site and its surrounding lands are located on NPS lands within Ross Lake National Recreation Area. Specifically, the Site is located on the north shore of Diablo Lake, which is formed as a reservoir along the Skagit River by Diablo Dam and is approximately eight miles east of Newhalem and 3.5 miles east of Diablo, Whatcom County, Washington. The Site is accessible from Washington State Highway 20 via the Diablo Dam Road, an approximate one-mile long NPS road and a short road network within the campus of the North Cascades Environmental Learning Center (ELC).

Several SCL boat facilities are located along the access road off SR20, including a tour dock, ferry dock, boathouse, barge landing, and fuel dock, all of which are located on NPS land. The Diablo Dry Dock Site itself is located within Deer Creek Cove, immediately east of the ELC campus. The ELC cafeteria and associated facilities, as well as a short peninsula trail, are immediately adjacent to the Site. Figure 2 provides the Site layout.

2.1.1 Operational History

The SCL Diablo Marine Railway and Shelter (referred to as the Diablo Dry Dock) was built circa 1937 after Diablo Dam was completed and Diablo Lake filled in behind the dam in late 1929. This building was constructed to provide shelter for a marine railway used to build and maintain vessels operating on Diablo Lake, including the construction of the Alice Ross, SCL's first tour boat between 1936 and 1937. The railway and building have been used in this capacity since construction. The Dry Dock is listed in the National Register of Historical Places.

The shelter/Dry Dock building was constructed of corrugated sheet metal on a wood framework, supported by treated logs on concrete bases, and was built on native soils. It is open to the weather on two sides and is surrounded by a chain-link fence. A concrete and metal railway extend from the boathouse into the lake to transfer boats into and out of the reservoir.

Table 1 provides a summary of the history and timeline for the Site.

2.1.2 Waste Characteristics

Very little information is available on the materials and chemicals used or stored at the Dry Dock. Based on historical use of the facility for boat storage and maintenance, expected chemicals of potential concern (COPCs) include metals from potential sand blast grit for boat maintenance and coating systems, petroleum compounds from boat fueling activities, and polycyclic aromatic

hydrocarbons (PAHs), including carcinogenic polycyclic aromatic hydrocarbons (cPAHs) from petroleum and/or treated timber supports. Given that pesticide use to control pests around buildings is commonly performed, it is also possible that they were used and/or stored at the Dry Dock.

2.1.3 Regional and Site Geology and Hydrogeology

The Site is in the North Cascades National Park (NOCA) in the northern part of Washington State. The Park is situated in mountainous terrain just north of the Skagit River between Mount Shuksan on the West and Ross Lake on the east. The Park area occupies approximately 500 square miles of steep mountains and thickly forested valleys centered on the precipitous North Cascades mountain range called the Picket Range. Old metamorphic rocks and young volcanic and sedimentary rocks are intruded by large masses of granitic rocks that together form a diverse, complicated, but well-exposed geologic section (Geological Survey, 1973).

The bedrock geology around Diablo Lake is comprised of the Middle Eocene to Late Cretaceous-aged Skagit Gneiss Complex, which is locally presented as banded amphibole and biotite gneiss. The Skagit Gneiss Complex trends northwest to southeast. Upstream along the Skagit River, in the vicinity of Ross Lake, exposed rocks from the Ross Lake Fault Zone include surface outcrops from the Little Jack Terrane (phyllite and schist) and Hozomeen Terrane (greenstone, limestone, chert, and argillite.) The North Cascades also includes granodiorite batholiths, tonalitic plutons, and volcanic derived rocks (USGS, 2003.) Mineral resources available in the North Cascades include gold, silver, copper, lead, and zinc. The Slate Creek Mining District is between 7 and 15 miles east of Diablo Lake, along Ruby and Slate Creeks. Mining in the Slate Creek Mining District has occurred since the 1870s (DNR, 1969.)

Locally, the Diablo Lake shoreline near the Site is composed of bedrock and unconsolidated sedimentary deposits of alluvial, fluvial, and glacial material. These unconsolidated sedimentary deposits may be subject to erosion from wave action. The soils on the Site are generally made up of gravelly sandy silt or silty sand and organic material, such as rootlets.

On behalf of City Light, the consulting firm HWA Geosciences conducted a groundwater assessment for the ELC in September 2007 (HWA, 2007). During their assessment, three groundwater monitoring wells were installed to depths ranging from 40 to 45 feet below ground surface (bgs). HWA concluded that groundwater flowed toward Diablo Lake in a southerly direction, with groundwater depths ranging from 25 to 42 feet bgs.

2.1.4 Site Hydrology

Located in the Skagit watershed, Diablo Lake is a 4.8-mile-long reservoir formed by the Diablo Dam and is used for regulation of discharge from the upstream Ross Lake Dam. The full operating pool water elevation of the reservoir is 1,205 feet, and water level is seasonally drawn down by as much as 11 feet. Diablo Lake is an oligotrophic lake that drains a pristine drainage watershed. Thunder Creek is the major tributary to the Skagit River that enters Diablo Lake.

The Site is located on a shoreline in a bay located in the northwestern part of the lake. At low water level, the shoreline has been observed to be at least 150 feet from the dock building. Deer Creek,

which lies less than 200 feet west of the dock, is a minor tributary to the reservoir. The reservoir is fed mainly by Thunder Creek and the Upper Skagit River, which drains from protected mountainous terrain at higher elevations. Depending on the time of year, the water in the lake can have high turbidity due to glacial silt. The Diablo Dam drains the reservoir into Gorge Lake, which is the next reservoir downstream along the Skagit River formed by Gorge Dam.

Local water use is mainly for recreational activities in the months between May and October.

2.1.5 Local Climate

The Site experiences weather typical for the North Cascades; moderately warm and dry summers and cold winters with heavy snowfall. Summer temperatures are typically between 50 and 80 degrees Fahrenheit with less than 10 inches of rain. Winter temperatures range from 0 to 40 degrees Fahrenheit. Heavy snowfall typically closes the only access route to the Site (US-2) between late November and early June.

2.1.6 Upland Sensitive Environments

The upland portion of the Site is located within the North Pacific Maritime Dry-Mesic Douglas-Fir Western Hemlock Ecological System, as defined by the Washington Natural Heritage Program (Rocchio and Crawford 2009). The ecosystem, typical of interior western Washington lowlands (less than 2,000-foot elevation) is characterized by mild, moist maritime climate, with more precipitation occurring as rain than snow; fire is a major natural disturbance (Rocchio and Crawford 2009). Vegetation in the project area is dominated by mature Douglas-fir (*Pseudotsuga menziesii*) with western hemlock (*Tsuga heterophylla*) co-dominant or occasional in the canopy. The understory can be sparse due to the shallow soils. Vegetation near the Site consists of a mix of non-native and native species common to riparian and upland habitats in western Washington and characteristic of areas that have been previously cleared or disturbed. Vegetation is generally not diverse compared to other areas of Ross Lake National Recreation Area (NRA). No rare or sensitive plant species are known to occur within the project area. Past actions in the region, including clearing vegetation for logging, hydroelectric development and operations, roads, and Ross Lake NRA recreational developments, have all affected vegetation resources of the Site. The previous activities have also promoted the introduction and spread of invasive weeds in the vicinity, although the Site is relatively weed-free.

The terrestrial area within the immediate vicinity of the Dry Dock is partially developed for access to the Dry Dock and surrounding the ELC campus. These developments include numerous gravel roads, footpaths, buildings, and other infrastructure. Overall, the area is a mixture of anthropogenically disturbed areas and semi-natural brush and forest patches among the developments.

The western side of the building features an area of gravel road access to the Dry Dock. Approximately 30 feet from the edge of the Dry Dock to the west features an area of disturbed vegetation that appears to have been cleared within the past decades due to the lack of larger trees and abundance of small saplings, as shown in the inset photographs. This area is bordered to the west by a hill leading upslope to the north.

Photo of area adjacent to western side of the Dry Dock (looking north).

The northern side of the building cuts into a sloped area (sloping upwards to the north), is covered in dense underbrush, and features larger trees than in the disturbed areas to the west of the Dry Dock. The diameters of the trees are relatively small (12 to 24 inches or less) such that they are not likely to be representative of a primary forest. This area slopes upwards to a gravel road, approximately 100 feet from the northern edge of the Dry Dock.

Photo of area adjacent to northern side of the Dry Dock (looking east).

Approximately 20 feet from the Dry Dock to the east features an area of disturbed vegetation that appears to have been cleared within the past decades due to the lack of larger trees and abundance of small saplings, as shown in the adjacent inset photo. Farther to the east, the area slopes steeply downward to Diablo Lake. The open areas of the Dry Dock are bordered by a fence along this area (shown in the left of the inset photo).

Photo of area adjacent to eastern side of the Dry Dock (looking north)

Overall, the terrestrial habitats adjacent to the Dry Dock appear to be patches of forest and undergrowth typical of the areas between the

buildings, roads, and other infrastructure of the ELC campus. As noted above, the areas to the west and east of the Dry Dock appeared to have been cleared to facilitate Dry Dock activities. Sensitive species are not anticipated to occur in the areas that would be physically disturbed by the cleanup (if required), and if they did occur there, they would be transient occurrences and would only be temporarily displaced during project activities. As noted in an environmental assessment of the Dry Dock Site (NPS 2018a), no rare or sensitive plant species are known to occur within the project area, and "wildlife inhabiting or likely to use the project area are habitat generalists, including those species tolerant of relatively high levels of human activity or those that can use relatively small patches of disturbed habitat." Given the future use of the Dry Dock area in hosting infrastructure, these areas are likely to continue to be disturbed during future building construction activities, and vegetation may need to be actively managed as a part of future operations.

2.1.7 Aquatic Sensitive Environments

Fish species currently found in Diablo Lake include native bull trout, Dolly Varden, rainbow trout (O. *mykiss*), a nonnative char species: eastern brook trout (*Salvelinus fontinalis*) and non-native cutthroat trout (*Onchorynchus clarki*). The redside shiner (*Richardsonius baleatu*s), a minnow species native to the Lower Skagit River, is also found in Diablo Lake. Diablo Lake was designated as a critical habitat for bull trout by the United State Fish and Wildlife Service (USFWS) in the final rule published October 18, 2010 (50 CFR 17:63898-64068). Diablo Lake primarily provides foraging, migration, and overwintering habitat for subadult and adult bull trout (City Light 2012).

City Light fish biologists estimated a count of 370 bull trout in Diablo Lake (City Light 2012). USFWS suggested that the actual number of bull trout may be lower due to poor spawning habitat conditions in Thunder Creek because of naturally high turbidity from glacial runoff. Bull trout require certain stream and river conditions to spawn, so there is no spawning habitat in the vicinity of the project Site. As part of the food chain, benthic macroinvertebreates are likely present in the lake and lake sediments.

The potential for impacts to aquatic species would be dependent on the selected remedial alternative. Impacts could include stormwater runoff during upland work or impacts during dredging or capping work in Diablo Lake. Any disturbance should be temporary in nature.

2.2 Summary of Previous Investigations

In 2014 and 2015, SCL contracted Hart Crowser to conduct a limited upland soil and sediment investigation at the Site as an independent investigation under Model Toxics Control Act (MTCA), prior to NPS's designation of the Site under CERCLA. Two field sampling events were completed (September 16 and 17, 2014, and May 14 and 15, 2015[1]). Surface soil and sediment samples were collected around and within the Dry Dock building (by hand) and the marine railway (from a boat); sample locations were documented using a portable GPS unit. The purpose of this investigation

[1]Soil and Sediment Characterization. Seattle City Light Diablo Lake Dry Dock Building. Hart Crowser, September 15, 2016.

was to determine if metals, PAHs, or petroleum were released into the soil at concentrations greater than MTCA Method A and B screening levels and to determine if metals or petroleum were released to sediment at concentrations greater than the Washington State Sediment Management Standards (SMS) screening levels for fresh water.

2.2.1 Soil Data

In September 2014, initial sampling of the Site included six surface soil samples located within the building footprint, near the railway, and at the east and west exteriors of the building. Samples were analyzed for metals (including arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc), diesel- and lube oil-range petroleum hydrocarbons, and PAHs. Eight additional subsurface soil samples were collected in 2015 from four previous soil sample locations (DD-S1, DD-S4, DDS5, and DD-S7), and 15 additional surface soil samples (DD-S8 through DD-S22) were collected to further delineate the extent of soil that exceeded MTCA Method A/B screening criteria for arsenic, lead, and cPAHs. The upland soil sample locations are shown in Figure 3, analytical results are shown in Figures 4 and 5, and the data are summarized in Table 2a. Results compared to screening criteria are discussed in Section 3.2 (Chemicals of Potential Concern).

2.2.2 Sediment Data

Eight surface sediment samples (0 to 10 centimeters [cm]) were collected south and east of the Dry Dock building below the ordinary high-water mark (OHWM), and two samples were collected from the marine railway in 2014. Two of the samples were archived based on results nearer to shore, and the remaining eight samples were analyzed for total metals (including arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc); and diesel- and oil-range petroleum hydrocarbons. Two subsurface samples were collected from Station DD-S2 for PAH analysis (3- to 6-inch and 6- to 12-inch depth). The sediment sample locations are shown in Figure 3, the analytical results are shown in Figure 6, and the data are summarized in Table 2b. Sample results are compared to screening criteria in Section 3.2 (Chemicals of Potential Concern).

2.2.3 Data Quality/Usability of Previous Data

The historical soil and sediment data collected by Hart Crowser and analyzed by OnSite Environmental laboratory (OnSite) located in Redmond, Washington, are considered acceptable for use for EE/CA decision-making. OnSite is a Washington State accredited laboratory. Hart Crowser conducted a data quality review of the chemical data following EPA National Functional Guidelines for Inorganic and Organic Data Review (Hart Crowser 2016, Appendix A). In their report, they stated that data quality passed with no exceptions.

2.3 Preliminary Identification of Data Gaps

Based on a review of historical data, knowledge of historical site use, and site history, the following data gaps have been identified:

- The complete nature and extent (horizontal and vertical) of soil contamination for metals and PAHs
- The complete nature and extent of sediment contamination for metals and PAHs
- Confirmation of the absence of elevated concentrations of pesticides in soil and sediment at the Site

3. CONCEPTUAL SITE MODEL

The CSM identifies the potential sources, screening levels used to determine contaminants and media of potential concern, current and future property use scenarios, and potentially complete exposure pathways resulting in exposure to human health and ecological receptors (NPS 2014b). The preliminary graphical box-style CSM figures for human health and ecological receptors are presented in Figures 7a and 7b, respectively. These figures were used to develop the sampling scoped presented in this SAP. A revised pictorial-style CSM will be provided in the human health and ecological risk assessment and included in the EE/CA report, taking into consideration further data collection results.

3.1 Screening Levels

Screening levels were compiled for both soil and sediment (Tables 3a and 3b). Ecological soil and sediment screening levels include values from *NPS Protocol for the Selection and Use of Ecological Screening Values for Non-Radiological Analytes* (NPS 2018b). For soil, the MTCA Soil Cleanup Levels (Ecology 2020) for human health are provided. For sediment, the Washington State Sediment Management Standards SCO and CSL values for freshwater sediment-benthic (Ecology 2013, 2020) and Washington State regional background concentrations (Ecology 2020) are provided. The Washington State values were used for screening chemicals if they were more stringent that federal screening levels used by NPS. Screening levels are summarized in Tables 3a and 3b. Additional information on screening levels is provided in Section 5.5.2.

3.2 Chemicals of Potential Concern

The COPCs for the Site include those constituents that have been identified for each media based on site operational history (Section 2.1.1), historical data (Section 2.2), and screening levels. For both soil and sediments, the preliminary COPCs include metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc) and PAHs. Based on general site-use history, pesticides are also considered potential COPCs and will be analyzed for in future soil and sediment sampling. Total petroleum hydrocarbons (TPH) were not detected above screening levels in historical samples. Table 4 provides a summary of the preliminary COPCs,

Table 5 provides a summary of soil exceedances from historical data, and Table 6 provides a summary of sediment exceedances from historical data. The historical data are spatially well distributed spatially throughout the Site and include areas expected to have the highest concentrations. The data are adequately representative of the areas of interest and are adequate for identifying spatial data gaps and screening preliminary COPCs.

3.2.1 Soil

Soil screening levels from NPS (2018b), MTCA, and background studies are presented in Tables 3a and 3b. The most conservative screening level was selected for determining the preliminary COPCs for the Site. In summary:

- Four of the six samples (three in the building and one sample east of the building) in 2014 exceeded the MTCA Method A cleanup level for unrestricted use for arsenic and lead. Selenium and silver were non-detect, and the remaining metals were less than MTCA screening levels, but greater than the NPS COPEC selection screening levels.
- All 2014 samples were less than the diesel- and lube oil-range petroleum hydrocarbon MTCA Method A cleanup levels for unrestricted use. The 2015 samples were not analyzed for total petroleum hydrocarbons (TPH), and NPS does not have screening criteria for TPH.
- None of the samples exceed total low molecular weight (LMW) PAHs or high molecular weight (HMW) PAH ecological screening criteria. cPAH concentrations expressed in terms of benzo(a)pyrene toxic equivalents (TEQ) exceeded the MTCA Method A unrestricted soil cleanup level of 0.1 milligrams per kilogram (mg/kg) and the MTCA Method B cleanup level of 0.137 mg/kg in all five samples.
- None of the samples were analyzed for pesticides.

3.2.2 Sediment

Sediment screening Levels from the NPS and Ecology freshwater Sediment Cleanup User Manual (SCUM) Sediment Management Standard (SMS) Freshwater Sediment Cleanup Objective (SCO) guidance are presented in Table 3b. The most conservative screening level was selected for determining the preliminary COPCs for the Site. In summary:

- Arsenic was detected in one sample greater than the SCO criterion of 14 mg/kg; but was far less than the SMS Freshwater Cleanup Screening Level (CSL) criterion of 120 mg/kg, and greater than the SLERA COPEC Selection Ecological Screening Value (ESV) of 9.7 mg/kg. Additionally, for three samples (DD-S2, DD-SD2, and DD-SD3) arsenic was not detected at the method detection limit (MDL); however, the MDL was greater than screening levels.
- Cadmium, mercury, and selenium were not detected above laboratory reporting limits (RLs) in the samples, but RDLs were greater than SLERA ESV screening values. Chromium, copper, lead, and zinc were detected and less than the SMS Freshwater SCO, but greater than the SLERA ESV screening level. The one detected silver concentration was greater than the SMS Freshwater SCO and SLERA ESV screening levels. Nickel concentrations exceeded the screening levels in seven of the eight samples, but concentrations were less than Ecology's natural background sediment values.
- None of the samples exceeded the SMS Freshwater SCO for diesel- or lube oil-range organics.
- SD sample DD-S2 was less than the SMS Freshwater SCO for total PAHs. Samples were not screened for cPAHs. Two additional sediment samples were collected from DD-S2 in 2015 by hand-auger between the rails of the marine railway down to 12 inches and tested for PAHs. The two sediment samples were well below the SMS Freshwater SCO for total

PAHs. The three locations had concentrations greater than the SLERA ESV screening levels for LMW PAHs or HMW PAHs.

In summary, metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc) and PAHs are the preliminary COPCs in the soil and sediment at the Site. Pesticides have been retained as potential COPCs and will be included in the sample analytical testing program.

3.3 Media of Potential Concern

The Site includes a building constructed to provide shelter for a marine railway and used to build and maintain vessels operating on Diablo Lake. The Dry Dock building was built on native soils. A concrete and metal railway extends from the boathouse into the lake to haul boats out of the water. Based on information from the operational history and the previously collected data, soil and sediment are the media most likely to be impacted by Site activities and will be sampled under this SAP. Groundwater is not a media of potential concern because the building was built on native soils; however, the possibility of a soil-to-groundwater pathway will be assessed by evaluating concentrations of COPCs in soil versus depth during the EE/CA soil investigation. Surface water is not a media of potential concern and no surface water sampling is proposed.

The primary pathway that could contaminate Diablo Lake is surface run-off of soil particles. The source of contamination is upland in nature and consists of surface soil particulates depositing to sediment. In addition, the primary chemicals of concern (PAHs and metals) are not expected to dissolve into water in significant amounts from the contaminated soil. Evaluating sediments will serve as a conservative and protective method to assess aquatic risks.

3.4 Current and Future Property Use Scenarios

The Site is adjoined by lands used for environmental education by the ELC. The North Cascade Institute operates the ELC (on lands managed by NPS, within facilities owned by SCL) and provides educational programs, including overnight retreats (including lodging and food services) at the ELC for visitors of all ages. One of their most prominent programs is Mountain School, a three-day, two-night program for fifth graders from area schools. This program operates from approximately March to June and September to November every year.

SCL plans to retain ownership of the dry dock facility and will likely rebuild it, considering future water access and use. Existing above-grade structures are planned to be demolished, and a new facility will likely be designed/built in its place. The existing fence around the structure is planned to be replaced to limit site access. Specific future use plans for the existing marine railway have not been determined. City Light's expected reuse plan has four steps:

- Demolition of above-grade structures
- Depending on the results of the EECA, cleanup of sediment and soil contamination above cleanup levels, and supplemental removal of concrete footings (under the building and marine railway), if necessary

- Design and construction of a new facility after non-time critical removal action (NTCRA) completion

3.5 Potential Exposure Pathways and Receptors

3.5.1 Human Health

The human health exposure pathways for Diablo Dry Dock Site include exposure to upland soil as well as sediment, including direct contact with sediment present in shallow water depths that may be encountered during recreational activities (Figure 7a). The four human health receptor groups include: construction workers, recreational visitors, maintenance worker, and recreational/ subsistence fishers. For upland soil, the construction worker is the receptor likely to have the most significant exposure to soil, although this is expected to be only for a short duration. Direct contact through dermal and incidental ingestion are the primary routes of exposure for the construction worker, and the maintenance worker. For sediment in shallow water depths, a recreator is the most conservative receptor. Dermal and incidental ingestion are the most likely exposure routes for this receptor. recreational and tribal subsistence fishers will also be considered for the shallow water depths. Dermal exposure to sediment, as well as incidental sediment ingestion, are the likely exposure routes for this receptor group, as well as consumption of fish that may have bioaccumulated chemicals from sediment. Contingent on a screening level review of data, incidental ingestion, dermal contact, and fish consumption pathways may be quantitatively modeled using typical human health exposure and effects modeling approaches. Bioaccumulation through dietary fish consumption for the tribal/recreational receptor will use the default exposure factors in Washington State SCUMII Tables 9-5.

3.5.2 Ecological

Ecological receptors include terrestrial invertebrates, plants, avian and mammalian wildlife; benthic invertebrates and fish; and aquatic-dependent avian and mammalian wildlife, including representative herbivores, invertivores, and piscivores.

Ecologically relevant exposures for the terrestrial portion of the Site are limited, as the key areas potentially impacted by COPCs are located within the current and future building footprints or are located in adjacent areas that are likely to feature vegetation management to maintain building use (Figure 7b). As these terrestrial habitat areas are small relative to typical foraging areas or most terrestrial animals and will be impacted by ongoing facility use, chemical exposures to terrestrial ecological receptors (via ingestion and direct contact) are possible in this area, but are unlikely to represent a significant risk. Contingent on a screening level review of data, terrestrial risks may be evaluated on a semi-quantitative basis and/or a full exposure and an effects food web model may be conducted.

Sediments offshore of the facility in Diablo Lake may represent a risk to ecological receptors, including aquatic life (benthic invertebrates and fish) and wildlife that prey upon them. Benthic invertebrates will be assessed by evaluation against risk-based screening levels for sediment. Contingent on a screening level review of data, typical ecological exposure and effects modeling

approaches may be used to further evaluate risks. A food web analysis may be used to determine risk through direct exposure, as well as through dietary accumulation from ingestion for wildlife receptors.

3.6 Cultural Resources

NPS completed an Environmental Assessment (EA) for a proposed new tour dock that would be located within 400 feet of the dry dock, further down the shoreline and north of the Site (NPS 2018a). Within the EA, NPS provided a discussion of potential cultural resources for the nearby area. The following sections summarize their findings.

3.6.1 Traditional Cultural Places

To date, no Traditional Cultural Places (TCP) have been formally recorded, delineated, or registered with the Department of Archaeological and Historic Preservation (DAHP) for the Site. However, the broader Upper Skagit watershed is culturally significant to several indigenous groups.

At the time Europeans first traveled into the Diablo area, the Miskaiwhu band of Upper Skagit Indians had established several winter villages along the Upper Skagit river in the vicinity of Marblemount and Newhalem, based on ethnographic data (Collins 1974; Smith 1988; Suttles and Lane 1990) (e.g., Weiser 2015). Based upon an archival overview for both Diablo and Gorge Lakes and summary of ethnographic research, Lewarch and Larson (1990) identified the Upper Skagit and Nlaka'pamux Tribes as the primary ethnographically recorded groups to use the area; and to a lesser extent the Chilliwack and Chelan Tribes. The project area is situated upstream of winter villages of the Upper Skagit Tribe, the closest of these is about eight miles from the Site in Newhalem. The winter villages of the Nlaka'pamux Tribe, located along the Fraser River canyon in today's British Columbia, were situated about 60 miles upstream of the project area. The Nlaka'pamux Tribe would have been able to reduce travel time by canoe along the Skagit River for much of the trip, with portages in a few key places. Research by Blukus Onat (1990) also included connections to other groups such as the Sauk-Suiattle and Swinomish Tribes who were settled in other parts of the watershed (to the south and southeast) but had relationships with the Upper Skagit Tribe and engaged in hunting and gathering in or near the project area.

Like most of the surrounding terrain, the project area had a wealth of resources, both practical and spiritual, including food sources (e.g., deer, elk, bear, mountain goat, fish (including Dolly Varden), rainbow and bull trout, raw materials for tool making (e.g., bone, sinew, stone, wood, and other useful parts of many plant and animal resources) and medicinal plants for protecting and healing the body as well as spiritual practice and spiritual health. Colored earth was a desirable resource for spiritual practice and though no sources are known for the project area, they may be present in the broader vicinity. Lewarch and Larson (1990) proposed that due to its remoteness from village settlements, the local area may have been attractive for vision questing and acquisition of guardian spirits.

Today's Upper Skagit Tribe still identifies the Diablo vicinity as an area of traditional cultural value within a broad hunting region for goat, elk, deer, and bear (Smith 1988). Most TCPs are identified to protect cultural places or associations that are ephemeral on the landscape and typically do not leave archaeological signatures.

3.6.2 Archaeological Context

Archaeological evidence reflects over 5,000 years of indigenous use of the Upper Skagit River valley in the vicinity of the project area (i.e., the Newhalem area) and nearly 10,000 years of indigenous use in the broader region throughout the North Cascades (e.g., North Cascades National Park Records; Bush 2008, 2009).

In 1987, a cultural resource survey was conducted on foot to assess a pedestrian surface survey along a stretch of Diablo Lake shoreline that was exposed during a drawdown of the reservoir to 1,182 feet, 15 feet below normal full pool of that time (1,197 feet) (Mierendorf and Luxenberg 1987). No archaeological or historic sites were found during this survey, but the researchers noted that reservoir mud and sand (siltation) may have obscured archaeological evidence.

In 1990, Lewarch and Larson conducted a cultural resource reconnaissance of Diablo and Gorge Reservoirs, including a pedestrian survey and shovel scraping in the project area to clear away surface duff. Their observations were that the "peninsula southeast of Diablo Lake Resort" was used intensively by people from the Diablo Lake Resort, as evidenced by numerous trails, plastic, wood, and other refuse scattered along trails and across other surfaces. No historic or prehistoric artifacts were discovered, but the surveyors did not employ any subsurface survey at that location.

3.6.3 Archaeological Expectations

- Despite the lack of archaeological evidence for the project area, there is a potential for buried cultural resources. A number of human activities are reflected in the archaeological record for the broader vicinity, such as pre-contact hunting/resource gathering, post-contact trapping, homesteading, government administration, hydroelectric development, and tourism; yet, many of the early or pre-contact uses of the land, both practical and spiritual, would leave no archaeological signatures. Intact trail segments from the early indigenous trails are possible for the vicinity, though large portions of the routes are likely obscured or obliterated by modern roads and historic and modern trails. None are known for the project area. Lithic scatters, isolated artifacts that could withstand the test of time (typically stone), or hearth remnants that reflect overnight camps are possibilities for the project area.
- Prior to the inundation of Diablo Lake, the project area would have been a low rise and knob situated above the Skagit River near the edge of a sloping river terrace. Such an area may have been a desirable location to cook a meal and have an overnight rest, sharpen and repair tools, see and hunt game, or a place for reflection and solitude.
- To date, no archaeological sites have been recorded within a half mile of the project area, as per the DAHP digital database, the Washington Information System for Architectural

and Archaeological Records Data (WISAARD), as well as in-house cultural resource records of the Complex. However, given the topographic features, distance to water, and archaeological and ethnographic context of the broader area, there is presumed to be a moderate possibility for archaeological discovery.

3.7 Graphical Conceptual Site Model

The preliminary graphical box-style CSM figures for human health and ecological receptors are presented in Figures 7a and 7b, respectively. These figures were used to develop the sampling scoped presented in this SAP. A pictorial CSM figure will be developed after more data have been collected at the Site and presented in the EE/CA report.

4. DQO PLANNING TEAM AND STAKEHOLDERS

The following sections detail the project team, the primary decision makers, and stakeholders who may be interested in the project.

4.1 DQO Planning Team

The DQO Planning Team develops the project DQOs according to the DQO process. The DQO process is iterative, and team members may be added or changed to address technical issues that were not initially identified. The DQO Planning Team for this project, plus supporting staff, are summarized in Table 7.

4.2 Decision Makers

The decision makers have the ultimate authority for making final decisions based on the recommendations of the DQO Planning Team. The decision makers for this project include NPS regional and national personnel:[2]

- Travis Kraft, Project Manager, NOCA
- Steve Mitchell, Operations/Environmental Programs Branch Chief
- Patricia Billig, Environmental Protection Specialist, Pacific West Region Toxicologist

4.3 Stakeholders

Stakeholders are parties who may be affected by the results of the investigation and/or persons who may later use the data resulting from the DQO process. Stakeholder involvement must be considered within the context of the project.

NPS has developed a Community Involvement Plan (CIP) for use at three facilities located in the Ross Lake National Recreation Area[3] under the ASAOC. The Diablo Dry Dock is included in the CIP. The CIP was prepared in accordance with CERCLA and the NCP. The CIP serves as a guide for NPS to engage and inform community members, environmental groups, government officials, the media, and other interested parties in the environmental investigation and cleanup activities at the Sites. The CIP is a "living" document and will be updated or revised, as appropriate, as conditions change at one or more of the affected sites.

The CIP has two key objectives. The first key objective is to provide for the dissemination of information to the public in a timely, accurate, meaningful, and understandable manner. The second objective is to create opportunities—and ensure the community understands those

[2] Notes that decision authority for this project has been designed to the Regional Directors. The Regional Director will approve any remedy but may not be directly involved with the Site.
[3] Draft Community Involvement Plan. Newhalem Penstock, Ladder Creek Settling Tank and Diablo Dry Dock Sites. Ross Lake National Recreation Area, Pacific West Region. NPS. October 2017.

opportunities—for active public participation, enabling interested persons to provide valuable comments that can be used by the NPS project team for planning and decision-making.

The stakeholder(s) for this project are:

- Upper Skagit Tribe
- Sauk-Suiattle Tribe
- Swinomish Tribe
- Employees of the ELC
- Recreational users and visitors of Diablo Lake and the North Cascade Learning Center
- City Light staff from nearby facilities
- NPS staff

5. DATA QUALITY OBJECTIVES

The DQO process applies systematic planning to sampling design, in order to collect an appropriate dataset for determining the extent of contamination, assessing risks for humans and ecological receptors, and evaluating remedial alternatives. DQOs and Data Quality Indicators (DQIs) are performance and acceptance criteria developed to establish the quality of the data to be collected, and, as such, they represent the basis for designing sampling activities, ultimately needed to make remedial decisions. DQOs specify the data types, quality, and locations needed to achieve the project goals and to address the key EE/CA principal investigation questions (PIQs) within the approximate site boundary. This SAP specifies the data quality and validation standards required for soil and sediment media to provide a common baseline and a comparable dataset that will achieve the project objectives. Table 8 presents the DQOs.

The seven-step DQO process, as outlined in the 2006 guidance document (USEPA. 2006a), is a tool to determine the type, quantity, and quality of data necessary for any subject analysis. The seven steps are listed below:

1. State the Problem - what are the problems driving this study.
2. Identify the Goal of the Study - what data will be collected to fill the gaps and solve the study's problems.
3. Identify Information Inputs - what data will be used to guide or support choices to be made later.
4. Define the Boundaries of the Study - what are the spatial boundaries for each media to be investigated.
5. Develop the Analytic Approach - what accepted methods will guide how the data will be analyzed and used to draw conclusions from the study results; if-then statements may be appropriate and may be used to develop action levels.
6. Specify Performance or Acceptance Criteria - what are acceptable levels of uncertainty, typically describes sampling and measurement errors and controls.
7. Develop the Plan for Obtaining the Data - what is the appropriate sampling design to fulfill data gaps; what statistical/probability-based design or judgmental sampling techniques will be used.

The DQO process helps define what data are needed to achieve key study goals (Table 8). The data quality measurement indicators and performance goals are described in Section 8.

5.1 Step 1 - State the Problem

City Light has identified elevated levels of metals and PAHs in Site soil and sediment, but the extent of contamination and risks needs to be delineated and confirmed. The problem is to understand the nature and extent of metal and PAH contamination in soil and sediment and to assess whether potential risk to human and ecological receptors requires a removal action.

5.2 Step 2 - Identify the Goals of the Investigation

5.2.1 Principal Investigation Questions

The PIQs are as follows:

- PIQ 1: Do metals and PAH concentrations in soil and sediment pose an unacceptable risk to human and ecological receptors?
- PIQ 2: What is the horizontal and vertical extent of contamination greater than screening levels and preliminary cleanup levels (see SLs listed in Tables 3a and 3b)?
- PIQ 3: Do background concentrations affect the evaluation and selection of screening levels?
- PIQ 4: Confirm that the soil-to-groundwater pathway is not complete by review of soil metals and PAH data versus depth. Is there a potential soil-to-groundwater pathway?

5.2.2 Decision Criteria

The decision rules for each PIQ include:

PIQ 1: Areas where samples exceed the cleanup levels and objectives will be selected for removal or some other remedy alternative, if they pose unacceptable risks. A remedial action level may be applied such that a SWAC meet cleanup levels.

PIQ 2: Areas where surface and subsurface samples exceed the cleanup level will be targeted for cleanup. The starting interval of the deepest sample below cleanup levels will be designated as the bottom of contamination.

PIQ3: Sample results with detected results or MDL/RDLs above conservative NPS or Washington State screening levels may require comparison to background concentrations. If background concentrations are higher than the screening levels, then the cleanup level will be adjusted to the background concentration.

PIQ 4: If the 2- to 4-foot interval of soil borings is less than cleanup levels and no groundwater is encountered, then there is no risk pathway to groundwater. If results are detected greater than cleanup levels, then a data evaluation will be conducted to determine the potential risks.

5.3 Step 3 - Identify the Information Inputs

The historical soil and sediment data are of acceptable quality and usability as existing sources of information to help answer to the PIQs. Additional sampling will be conducted to fill spatial data gaps and gaps in the chemical testing suite. Surface and subsurface soil samples will be collected from various locations and depths and analyzed for COPCs. Surface and subsurface sediment samples will be collected from various locations and depths and analyzed for COPCs. An upland elevation survey has already been completed, but in-water bathymetry has not been mapped in the lake. A bathymetry survey and soft sediment probing survey at proposed locations to help understand substrate conditions will be collected during the field investigation.

5.4 Step 4 - Define the Boundaries of the Study

The area affected by historical site use appears to encompass a relatively small footprint of about 0.3 acres of upland soils and 0.5 acres of sediments around and including the Dry Dock structure and marine railway. In the upland area, the preliminary boundary extends about 30 to 50 feet in all directions around the structure. In the sediment area, the preliminary boundary is limited to the railway area, but sampling will extend further east, south, and west to confirm the project boundary. It is anticipated that soil and sediment samples will be collected during a singular mobilization, as such, temporal boundaries (such as seasonal lake level) are not expected. To the extent practical, sediment/soil samples will be collected within the same temporal boundaries. Elevations at the time of sampling will be recorded and post-collection elevation adjustments will be made, if needed. All field data, including the new data collected in 2021, will be collectively used to evaluate site risks and define cleanup areas.

5.5 Step 5 - Determine the Analytic Approach

The purpose of this section is to define the analytic or evaluation approach that will be used to answer the PIQs and what screening values or standards will be used.

All data collected within the last 10 years will be applied to the sample population for analysis. The 95% Upper Confidence Limits (95% UCL) of the data population will be compared to screening levels for the COPCs (metals and PAHs). In addition to the use of 95% UCLs, for human health fish consumption and wildlife exposures, spatially weighted average concentrations (SWAC) will also be considered to evaluate bioaccumulative chemicals and will be compared to appropriate criteria. The interpolation method has not been selected yet, but the inverse-distance weighting interpolation method will be considered. Summary statistics will be provided in the EE/CA report (# of detects, mean, median, 90th percentile, and 95% UCL).

5.5.1 Logic for Screening Levels and PRGs

An array of screening levels (SLs) will be considered, including the NPS ESVs for COPEC selection and for a refined SLERA; the MTCA Method A and B soil screening levels; and the SMS SCO and CSL screening levels for sediment. The lowest SL and the highest detected sample concentrations were used to determine preliminary COPCs in this document. Refined COPCs and chemicals of concern (COCs), along with numeric preliminary remediation goals (PRGs), will be determined after the screening level risk assessment has been completed. Chemicals that are detected in fewer than 5% of the samples will not be retained as COCs.

Results of the screening level risk assessment will indicate if remedial action is warranted to reduce unacceptable human health and ecological risks posed by COCs at the Site. Remediation goals (RGs) (also called maximum contaminant levels [MCLs] allowed to remain at a site in the NPS SAP template [NPS 2020] and cleanup levels in Washington State) will be developed for COCs that pose the majority of risk at this site. RGs are numeric, site-specific, and contaminant-specific concentrations that can trigger the need for active remediation. Selection of remediation goals will consider risk-based concentrations that protect a particular receptor, practical quantification limits

(PQLs), applicable or relevant and appropriate requirements (ARARs), and literature-based or site-specific background values. If a screening level is less than background, then the cleanup level may be adjusted upwards to the background concentration, and the background value will be used to assess site risks. The detection limits required to meet these concentration thresholds are discussed in the next section.

5.5.2 Action Levels

A hill-topping approach may be used to determine how many samples (and the area) need to be remediated to achieve site-wide risk goals and cleanup levels. Hill-topping refers to a method in which the concentrations of COCs are ranked from highest to lowest, the highest concentration is removed from the dataset (it has been remediated), and the SWAC, or some other statistic, is re-calculated. These steps are repeated until the cleanup level is reached. The lowest concentration requiring removal becomes the action level.

The residual risk remaining after construction will be evaluated for all COCs with cleanup levels.

5.5.3 Background Samples

Background samples are collected when naturally occurring or ambient concentrations of one or more contaminants may be present at the Site and are greater than SLs. Background samples may also be used to delineate the contribution of contaminants from the Site versus off-site sources or define the Site boundary. Background sampling reference location(s) should not be impacted by site activities and should have physical, chemical, and geological conditions that are similar to the Site being investigated. A similar background sampling approach was used at the nearby Newhalem Penstock Site.

The evaluation of contaminant background concentrations is of importance on park lands due to the non-impairment mandate in the Organic Act (NPS 2014a) and the classification of all NPS lands as “sensitive environments.” Background samples should facilitate the ambient characterization of the area so that suspected contamination attributed to historical site activities above acceptable risk levels can be remediated (USEPA 2002b, USEPA 2002c). The approach to soil and sediment background sampling is described below.

Upland Soil Background. If background testing is deemed necessary for evaluating Site risks or the Site boundary, the rationale for choosing appropriate background reference sample locations and sample collection protocols will be developed in collaboration with NPS staff. A reconnaissance survey of the terrain and Site access will be completed suggesting possible background sampling locations in the Deer Creek watershed area. A stepwise approach will be followed. Collected data will be compared to NPS ESVs and EPA RSLs. If detected concentrations are above these levels, then sample collection may be conducted after consultation with NPS and would likely be a separate mobilization.

Sediment Background. Background locations should be selected from similar depositional environment as the Site and spatially proximal such that sediments would be exposed to similar ambient inputs (unrelated to historical activities). For this project, background locations were

selected near the perimeter of the cove in a radiating step-out pattern from the source area. Ten surface sediment sampling locations were placed in less than 75 feet of water depth, before a steep slope towards deeper water. These samples will be collected during the initial field event using the same sampling techniques as described above and archived pending review of the primary samples. The grain size will be visually inspected prior to sampling and compared to the visual classification of primary samples to ensure similar depositional environment. Samples may be shifted closer to shore, if deemed necessary by the field crew.

5.6 Step 6 - Performance and Acceptance Criteria

This section describes the measures that will be implemented during the investigation to minimize variability, ensure data quality, and increase the accuracy and defensibility of collected data.

5.6.1 QAQC (Data Decision Rules)

The Quality Assurance/Quality Control (QA/QC) measures and data quality indicators (DQIs) that will be applied to field and laboratory data are described in the QAPP. The assurance that the sample design (including # of samples) will be effective for answering our study questions is discussed in Section 5.2.

Laboratory MDL and RDLs for metals and PAHs in soil and sediment must be less than the cleanup objective. MDLs and RDLs for this project are discussed below in the QAPP. Data will be considered acceptable if not qualified as rejected after verification and validation, as discussed in the QAPP. If sample results are estimated between the MDL and RDL they will be qualified as a J-flag. These samples are still acceptable for use in the EE/CA but represent lower confidence (higher variance) when applied to decision-making.

5.6.2 Decision Error Limits and Uncertainty Evaluation

These criteria are described below in the QAPP.

5.6.3 Data Validation and Usability

The data validation approach and usability goals are described in the QAPP section of this document. To provide an independent validation of the data reports generated during this EE/CA process, Geosyntec will review and validate the data presented in the final reports submitted by the analytical laboratories. Data validation will be performed following EPA Update III SW-846 (EPA, 1997b) methodologies. Detailed validation checklists and summary tables will be provided, including discussions of any data outliers and validation action taken.

Data validation reports and checklists will include assessments of data precision, accuracy, completeness, and method compliance. Sample results, case narratives, and analytical QC summary forms will be reviewed. All sample and QC results will be compared to the EDDs. Full analytical data documentation will be submitted to the Quality Control Manager electronically and will also be retained by the laboratory as detailed below.

Data validation qualifiers override any previously assigned laboratory flags. Qualifier definitions that describe data interpretation are provided in Section 8.8.1. According to the qualifier definitions, all data are considered usable, except for those data identified with an "R" for rejected data. Rejected data are maintained in the project database but are not used in assessment and decision-making.

Upon completion and/or approval of the independent data validation report by the Quality Control Manager, the Quality Control Manager will present a copy of this report to the Project Manager. In addition, the Project Manager designee assigned the task of reviewing the representativeness and comparability of the laboratory data, as well as the general quality of the field documentation associated with the same laboratory report, will present a copy of his/her completed validation report to the Project Manager. The Project Manager or designee will review these reports to ensure that the data package meets the project-specific objectives.

5.7 Step 7 - Plan for Obtaining the Data

Soil and sediment samples will be obtained using the field methods discussed in Section 6 of this Work Plan. The number of soil and sediment samples (sample design) needed to meet the DQOs is discussed below. Table 8 provides a brief description of the sampling program. Soil sampling methods will follow acceptable data collection methods. Sediment sampling will be conducted in compliance with the Puget Sound Estuary Protocols (PSEP) (Ecology 2015). Documentation requirements are discussed in Section 7, and analytical methods are discussed in Section 8 of this Work Plan.

5.7.1 Number of Samples Needed to Meet DQOs

To evaluate the soil and sediment sample sizes necessary to achieve DQOs, a Monte Carlo analysis was conducted to estimate the expected 95% UCLs one would calculate if additional samples are added to the existing data. 95% UCL values are expected to be used to understand exposures in soil and sediment and are likely to be compared to screening levels and potentially used in human health and/or ecological risk assessment.

For example, there were 16 surface soil samples analyzed for lead from the previous Hart Crowser (2016) investigation. Data collected in 2021 will be added to samples from this dataset and used to calculate a new 95% UCL. For example, the current 95% UCL for soil lead, based on nine soil sample results at locations outside the building footprint, is 288 mg/kg (based on logarithmic data distribution with a Log_{10} mean of 2.0 mg/kg, Log_{10} variance of 0.46, corresponding to a un-logged mean of 100 mg/kg and un-logged variance of 130 mg/kg). This 288 mg/kg value was calculated assuming a logarithmic data distribution and was evaluated with the nine Hart Crowser (2016) samples outside the existing building footprint[4]. Data from soils within the Dry Dock building

[4] Accurately characterizing and delineating the area adjacent to and surrounding the building footprint is a key focus of the SAP given future human and potential ecological exposures. DQOs associated with short-term construction worker risks inside the building footprint will be also evaluated in the risk assessment but are much less critical in terms of sample sizes since risks are not expected to drive overall conclusions.

footprint were excluded from this analysis since the focus of the additional sampling are in the areas outside of the building footprint, which generally indicate a different (lower) data distribution. If more samples are added to these data and they are of similar variability as the current dataset, the statistical power associated the 95% UCL will increase and the confidence limit will become more precise (i.e., narrow). Because of higher precision and confidence in the calculation of the confidence interval, this will result in a 95% UCL that is closer to the mean.

To evaluate the effects of additional samples on the 95% UCL, we used Monte Carlo simulation to randomly generate five additional values for concentrations of lead in soil that could be obtained from a future investigation. These five sample results were generated assuming a similar data distribution as the existing Hart Crowser (2016) soil lead data. Combining the five Monte Carlo-generated results with the nine sample results from Hart Crowser (2016) allows the recalculation of a projected 95% UCL were we to add five sampling locations. This process was repeated 5,000 times using Monte Carlo, with each Monte Carlo iteration involving the generation of five projected sample results. Using this process, 5,000 projected 95% UCL values were calculated. The median projected 95% UCL value was 222 mg/kg, indicating that the additional five soil samples would allow a more precise estimation of the confidence limit, resulting in a decrease of the 95% UCL with the nine original samples (288 mg/kg) to 222 mg/kg with a higher sample size of 13.

We repeated this process to generate 5,000 projected 95% UCL values, assuming we would add 10, 15, or 20 additional samples (to determine the appropriate sample size). The median-projected 95% UCL values are shown in Figure 8. As shown in Figure 8, adding 10 samples (instead of just five) to the existing data would further improve the precision of the 95% UCL, decreasing the projected 95% UCL to 198 mg/kg. Adding five more samples (i.e., 15 additional samples total) would slightly reduce the 95% UCL to 182 mg/kg. However, adding more samples (i.e., 20 additional samples total) does not result in decreasing the projected 95% UCL, indicating that maximum precision in deriving a 95% UCL is reached by adding approximately 15 samples (Figure 8).

This analysis was repeated for arsenic data in soil. As shown in Figure 9, the existing data indicate a 95% UCL of 33 mg/kg (based on logarithmic data distribution with a Log_{10} mean of 1.2 mg/kg, Log_{10} variance of 0.17, corresponding to a un-logged mean of 18 mg/kg and un-logged variance of 7.1 mg/kg). The curve plateaus when approximately 10 samples are added, indicating that adding more than 10 samples to the existing arsenic soil data will not greatly improve the precision for which a 95% UCL for soil arsenic can be calculated.

This analysis was also conducted for PAHs (sum of PAHs, ΣPAH) in sediment, although data are limited to only three Hart Crowser (2016) sample results. The existing data indicate a 95% UCL of 3.7 mg/kg (based on logarithmic data distribution with a Log_{10} mean of 0.40 mg/kg, Log_{10} variance of 0.024, corresponding to a un-logged mean of 2.5 mg/kg and un-logged variance of 0.14 mg/kg). As shown in Figure 10, the curve plateaus at approximately five samples, indicating that adding more than five samples to the existing data will not greatly improve the precision with which a 95% UCL for sediment PAHs can be calculated. Fewer sample sizes are needed for PAHs

in sediment because the variability of the total PAHs in sediment is much lower than that for soil lead and soil arsenic.

Given the above results, the addition of at least 15 soil samples and five sediment samples will provide sufficient statistical power to achieve optimal precision in calculating 95% UCLs for the purposes of evaluating risks. These sample quantities are also sufficient to allow a delineation of the nature and extent of chemicals at the Site, achieving an appropriate sampling density to facilitate future removal decision-making or guide additional supplemental sampling. Note: this SAP is proposing to collect more samples (see Section 6) than statistically needed to calculate a UCL with confidence.

6. FIELD SAMPLING PLAN

The FSP guides the collection of data. It describes the methods for collecting samples of acceptable quality and that are representative of the decision area and the media being sampled and characterized. The following sections detail each field activity element. Appendix A includes the standard operating procedures (SOPs) for the field activities, including bathymetry survey, soil sampling and, sediment sampling. Table 9 presents a summary of the sampling program. Table 10 presents a list of proposed sample locations, sample depths, and proposed coordinates. The historical upland and sediment sampling at the Site were conducted using discrete sampling methods. As such, discrete sampling methods will be used during the EE/CA.

6.1 Bathymetry Survey and Location Control

A bathymetry survey will be performed to map substrate elevations and water depths. These data will help confirm that the proposed sediment sampling vessel has sufficient water depth to access the sampling area, determine core tube lengths, and develop remedial alternatives if needed. The survey vessel will be equipped with multi-beam bathymetric sonar and real-time kinematic positioning and will target high-water conditions. A control survey with one or more locations near the survey area will be used as the basis for location control. Data from the bathymetry survey will be used to create a bathymetric contour elevation map. The contours will use mean lower low water (MLLW) or NAVD88 datum as the vertical datum.

Horizontal. Sample station horizontal positioning requires an accuracy of plus or minus three meters with a minimum completeness of 90 percent of all sampling stations, and measurements will be recorded to the nearest one 1 foot. Proposed coordinates will be determined from the geographic information systems (GIS) maps prior to field mobilization. The proposed location coordinates are listed in Table 10. The North American Datum of 1983, 2011 (NAD83[2011])) and the WPC system North Zone will be the horizontal datums. The units will be U.S. survey feet.

Vertical. The objective for vertical position accuracy is plus or minus 0.5 feet, and measurements will be recorded to the nearest 0.1 feet. To meet these requirements, the instrument calibration and quality control (QC) procedures described below will be followed. The vertical datum of NAVD88 will be used to record the upland sampling locations, but the mean lower low water (MLLW) vertical datum may be used during in-water sampling while navigating from a vessel. Vertical elevations will be recorded to the nearest tenth of a foot.

6.2 Soil and Bank Sampling

A hand-held electric, pneumatic, or gasoline powered roto hammer will be used to drive direct push rods to collect soil data at 23 locations in the upland portion of the Site around the Dry Dock Site to further define the vertical and horizontal extent of soil contamination. The upland soil sampling locations are shown in Figure 11.

The boring locations were placed for spatial coverage in approximately 30- to 50-foot spacing from historical locations with concentrations of constituents of interest (COIs) that exceeded

screening values. The borings were also chosen to provide vertical profiling of potential COIs from the OHWM to the assumed upland extent of contamination. A limited number of the proposed sampling locations shown on Figure 11 are less than the assumed OHWM; however, the actual OHWM has not been surveyed, and these proposed locations are within the upland bank area. Based on Geosyntec's Site reconnaissance, samples located within the bank area of the Site will be considered part of the soil investigation.

The investigation will be conducted as follows:

- Borings will be field located, utilities will be located, and drilling locations will be surveyed with a hand-held sub-meter accurate GPS unit.
- Drilling activities will be conducted by a State of Washington-licensed driller with direct oversight by Geosyntec field personnel, who will be supervised by a State of Washington-licensed Professional Geologist.
- Borings will be advanced to a depth of three feet.
- Soils will be logged using the Unified Soil Classification System (USCS) and field screened to identify evidence of contamination based on sheen, odor, staining, volatile organic compound (VOC) presence as measured with a photoionization detector (PID), and/or indications of non-soil materials.

Soil samples from each boring will be collected for the parameters and methods listed in Table 9 at the proposed locations listed in Table 10.

6.3 Sediment Sampling

Both surface and subsurface sediment samples will be collected. Figure 12 shows the proposed sediment sampling locations.

6.3.1 Surface Sediment Sampling

A total of 14 surface sediment samples (0 to 10 cm) will be collected using van Veen grab methods to fill spatial data gaps from the 2014 and 2015 Hart Crowser studies and refine the horizontal extent of COPCs. The scope also includes archiving the top surface interval (0 to 10 cm) of five sediment cores for PAH testing at the proposed coring locations (DD-2, DD-3, DD-4, DD-7, and DD-08). Co-located surface sediment grab samples (0 to 10 cm) have already been collected at these five coring locations but samples were only analyzed for metals and TPH.

Sediment sample locations are spaced approximately 50 feet from historical locations where COI concentrations exceeded screening levels. In addition, the five coring locations have been placed in areas where historical results showed elevated surface sediment contamination. Surface sediment samples will be collected using a stainless-steel grab sampler (van Veen, power grab, box core, or equivalent) deployed from a boat equipped with Differential Global Positioning System (DGPS) and adequate sample processing deck space. Multiple grab samples are not expected, but may be collected per station (within 25 feet of the proposed sample location) and composited into one sample to achieve adequate volume requirements, as needed. During surface

sediment sampling, the type and quantity of bottom debris (such as woody debris) and visual evidence of impacts (e.g., oil sheens) will be recorded. If penetration depth is less than 10 cm, then the best of three field attempts will be accepted and processed. Near-shore samples may be collected by hand at low water level using stainless-steel spoons and bowls. Sample acceptable criteria will follow PSEP (1997).

A soft sediment probing survey will be collected at each station prior to sample collection (in areas with less than 25 feet water depth) to help understand substrate conditions and core penetration depths. A stainless-steel rod (up to 25 feet long) will be hand-pushed into the sediment, and the penetration depth will be recorded. In general, soft, fine-grained sediment can be easily probed, but sand cannot.

An additional ten surface sediment grab samples will be collected as ambient sediment background samples from perimeter areas of the cove (Figure 13) and archived pending review of the primary samples. These samples will be collected after the primary samples. Grain size will be visually estimated in the field and compared to the primary samples to ensure similar grain sizes and depositional patterns. A target goal of less than 25% difference in percent fines (sum of clay and silt size fractions) will be used by the field team for acceptable sampling locations. If greater than 25% difference, then the sample locations may be moved closer to shore, in consultation with the Project Manager.

The total sample count for new surface samples is 29, but some of these will be archived.

6.3.2 Subsurface Sediment Sampling

Approximately five subsurface sediment cores will be advanced, using vibracore methods, to an approximate depth of ten feet below mudline or refusal. Core samples results will be used to determine the vertical extent of COPCs at the Site.

Sediment coring methodology employed may vary depending on field conditions, but will involve vibracoring, hand-drive slide-hammer coring, and/or similar methods. At most locations, the coring device will be deployed from a boat, but locations may be accessed on foot if lake levels are low during the scheduled time of sampling. Core sample acceptance criteria will follow PSEP protocols and target at least 80% recovery. If 80% recovery is not obtained after three attempts, then the best of three cores will be accepted and processed.

After collection and retrieval, core tubes will be cut open and sediment will be visually logged based on stratigraphy. If observed stratigraphy appears homogenous with depth, subsamples will be collected for the entire length of the core at 2-foot intervals. If major stratigraphic contacts are observed, then these contacts will be used to define the sample depth intervals. Grain size, color, odor, sheen, presence of biota, wood, debris, and any other visual observation related to the character and depositional history of the substrate will be used to describe and section the cores. Sectioning will focus on substrate with similar characteristics with 1-foot minimum intervals.

6.4 Field Measurements

At the time of sampling, field measurements will be collected and documented on field forms by field personnel according to SOPs. Field data may include:

- Soil and sediment coring logs
- Sampling forms (sediment; soil)
- Chain-of-custody forms
- Maps and photographs
- Meteorological data
- Field investigation daily reports and logbooks
- Visitors to the Site or decisions made in the field
- Field instrument readings and calibration logs
- Positional information

Field documentation is discussed in Section 7.

6.5 Analytical Methods

The following analytical methods will be used for soil samples:

- Total metals (arsenic, cadmium, chromium (III and VI), copper, lead, nickel, selenium and zinc) by EPA Methods 6010, 6020 and 7000 series methods
- Leachable metals by Toxicity Characteristic Leaching Procedures (TCLP)
- Mercury by method 7471
- PAHs by EPA Method 8270SIM
- Organochlorine pesticides by EPA Method 8081B
- Total Organic Carbon (TOC) by EPA Method 9060A
- Grain Size (American Society of Testing Materials [ASTM] Method D422, or updates)

The following analytical methods will be used for sediment samples:

- Total metals (arsenic, cadmium, chromium (III and VI), copper, lead, nickel, selenium and zinc) by EPA Methods 6010, 6020 and 7000 series methods
- Mercury by Method 7470
- PAHs by EPA Method 8270SIM
- Organochlorine pesticides by EPA Method 8081B
- Grain Size (PSEP Method)
- TOC by EPA Method 9060A (surface sediment only)
- Acid volatile sulfides/simultaneously extracted metals (AVS/SEM) for surface sediments only

Table 9 provides a summary of the proposed analytical testing for soil and sediment samples, respectively. Sample container, preservation, and holding times are summarized in Table 11.

6.6 Sample Handling

Below are the procedures and processes for the management of soil and sediment samples.

6.6.1 Sample Designation

Each sample will receive a unique designator. This identifier will be used throughout collection, analysis, and reporting activities. The sample identifier will be clearly shown on the chain-of-custody form and sample container labels. The sample identifier will be cross-referenced to the field identification of the sample point in the field notebook. The first two digits will be the media and sample type, the second two digits will be the unique sample location, followed by depth digits that provide the subsurface sample depth, if appropriate. The sample nomenclature includes:

- SB = soil boring
- SG = sediment grab
- SC = sediment core
- DB = Diablo Lake background sample
- UB = upland background sample
- RB = rinsate blank

Table 10 presents the proposed sample IDs. All sample jars will be labeled as “the sampling location – the project number – sampling date – sampler’s initials.”

6.6.2 Sample Labeling

All samples will have properly affixed labels prior to packing and shipment to the laboratory. Information will be legibly written in indelible ink and include, at a minimum, the following information:

- Project number
- Sample identification
- Sampler’s initials
- Preservatives (if used)
- Required analysis
- Date and time of collection
- Type of sample/media (e.g., sediment, rinsate water)

Prior to packaging, the field technician will check to ensure that both the laboratory sample identification and the field sample identification are recorded in the field notebook and that those numbers match on the sample label.

6.6.3 Sample Handling and Custody

The sample log and chain-of-custody form will be initiated at the time a sample is collected and will accompany the sample until its final disposal. The chain-of-custody form will contain the following information:

- Project information
- Project contact
- Sample number
- Collection date for each sample in the shipment
- Time the shipment was packed
- Number of containers of each sample
- Sample description (environmental matrix)
- Analyses required for each sample
- Shipment number
- Shipping address of the laboratory
- Date, time, and method of shipment
- Signatures as custody is transferred from one individual to another

6.6.4 Documentation and Records

Field activities, observations, measurements, and safety briefings will be documented by field personnel on daily field forms and sampling forms. Please refer to Section 7 of the Work Plan for details on field documentation.

6.7 Investigative-Derived Waste Handling

Except for used personal protective equipment (PPE), all investigative-derived waste (IDW), whether solid or liquid, will be temporarily placed in a labeled 55-gallon drum and stored in a designated waste storage area. The onsite location of the waste storage area will be determined prior to initiating field activities. The amount of soil and sediment generated will be minimized to the volume necessary for sampling and analysis, if possible.

During field operations for sediment, leftover material will be returned to the location (from the sampling vessel) it was generated from unless a significant sheen is observed. If significant sheen is observed, the soil/sediment will be placed in 55-gallon drums. Each drum will be labeled using a grease pencil or paint pen to indicate the date sealed, location, and contents. Each sealed drum will then be staged at a designated solid waste management unit location prior to composite sample collection and characterization. Sediment discarded at the time of core extrusion at the designated core processing area (on land) will be separated into a clean drum and a potentially hazardous drum, based on visual observation, for later disposal.

Investigation-derived PPE consists of gloves and one-time use equipment used during the field investigation. All used PPE will be containerized in plastic garbage bags and disposed of on Site for subsequent transport to the municipal landfill.

6.8 Health and Safety

Fieldwork will be performed in accordance with the Geosyntec's corporate Health and Safety standards and the project-specific HASP (Appendix B). The HASP will be updated as needed to address new Site conditions or tasks. The HASP contains current guidance for working safely during the time of COVID-19 and will be updated to reflect any changes that occur prior to the commencement of fieldwork.

6.9 Inadvertent Discovery Protocol

During the implementation of the field activities, it is possible that culturally significant artifacts may be encountered. In the event of a discovery, the Inadvertent Discovery Protocol (IDP), included in Appendix C will be referenced and implemented.

7. DOCUMENTATION AND DATA MANAGEMENT

Documentation and data management are critical steps in maintaining project quality. Documentation and data management begin with the development of appropriate field forms prior to field mobilization, continue with appropriate recordkeeping in the field, and conclude with thorough records management and database population after the work has been completed. The following sections describe these steps in greater detail.

7.1 Field Logbook and Forms

Field visits and sample collection programs are documented using a combination of field logbooks and specific field log forms. These two methods have their advantages and disadvantages, as follows:

- Field logbooks have the advantage of maintaining work chronology. Since all pages and lines are used in sequence without any skips, it is possible to reconstruct the sequence of work should any quality issues or other incidents arise. One logbook can be used to document several weeks' worth of work in sequence, depending upon the nature of the work. In addition, since logbooks lack structure, they provide flexibility, in that they can be used to document nearly any site work. However, the lack of structure in logbooks is a disadvantage for record-intensive work, such as groundwater sampling, because the lack of entry boxes for field parameters discourages consistent data collection.
- Conversely, field forms have the advantage of customization (e.g., a groundwater sampling form can be designed in detail to remind the field team member to record a list of specific readings). Field forms are valuable for large sampling events in which consistency in the method of recording observations is desired. They have the disadvantage of lacking any degree of chronological sequence. They are also not as portable or durable as logbooks.

A logbook or daily field form will be used to document each day of sampling. Media-specific field forms will used for each unique sample location. The logbook will be used to document a summary of the day's activities and non-repetitive tasks, including the following:

- Time of arrival and departure from the Site, including lunch breaks
- Names of field team members and any visitors
- Time of arrival and departure of subcontractors
- Nature of the daily health and safety tailgate meeting, with signatures of participants
- Instrument calibration
- Supply deliveries
- Weather
- Interaction with agency or client personnel
- Incident occurrence and management
- Other irregular or ad hoc activities

As such, the logbook(s) will provide a comprehensive overview of all site activities throughout the project; the level of detail of documentation within each logbook entry will depend upon the duration of an individual visit and the applicability of field forms to the tasks performed.

7.1.1 Field Logbooks

Pertinent data are recorded in the field logbook. Field logbooks document where, when, how, and from whom any vital project information was obtained. Logbook entries are complete and accurate enough to permit reconstruction of field activities. Logbook pages are numbered consecutively. Each page is dated, the time of entry noted, and entries are legible. Language is factual, objective, and free of personal opinions or other terminology that might prove inappropriate.

Sampling personnel will use either a bound field logbook with moisture-resistant pages or three-ring binders with daily log forms to record pertinent field information with waterproof ink. The logbook will identify the project name, project number, and geographic location of the Site. Daily field activities and sampling information will be entered in the logbook on sequentially numbered pages. Corrections will be made to entries with initialed and dated line-out deletions. A diagonal line will be drawn across the remaining blank space of the last page of each day's entry. Logbook lines will be used in sequence, and no blank lines shall remain at the end of the day. Observations will be recorded in sequence.

Multiple logbooks may be required over the course of the project. It is desirable to have a continuous sequence of logbooks throughout the course of the project period, with one logbook in use at any one time. Upon completion of a logbook, the timeframe covered will be clearly indicated on the front cover and spine by noting the date range of work and investigative phase name. In some cases, however, the presence of multiple field teams may require the use of two logbooks in parallel. In these cases, the Field Manager shall maintain the primary logbook. The secondary logbook shall be clearly identified as such and shall make reference to the primary logbook.

7.1.2 Field Sampling Forms

As discussed above, field forms shall be used for specific field sampling tasks of a routine and repetitive nature, such as soil/sediment sampling or sample processing. Field forms have the advantage of prompting the user for detailed data documentation in a consistent format.

Appendix A includes field form templates for the following tasks:

- Daily field log
- Soil boring field log
- Meter calibration form
- Surface sediment field form
- Sediment core collection and core processing form
- Visual classification key
- Chain of custody form

The protocol for form completion will be similar to those of logbooks:

- One form will be filled out per sample
- Corrections shall be made through single-line strikeout with initial and date
- Tables within forms (e.g., field parameters) shall be filled out with each line in sequence; no lines will be skipped, and unused lines at the end of sample collection shall be crossed out, initialed, and dated
- Forms must be signed and dated by the person making and recording the measurements

7.2 Laboratory Data

Laboratory data reports will be securely stored by the laboratory for a period of five years. It will be the responsibility of the lead laboratory to store data generated by subcontractors. Geosyntec and City Light will also store copies of laboratory reports, as well as the project database, for a period of ten years. Hard copies of pertinent project information will also be stored, including project reports, correspondence, and interpretations. The specific personnel responsible for data storage and retrieval and the physical location of the data storage are presented below. If data storage is not possible at the area designated below, off-site storage areas will be utilized.

7.3 Electronic Data Management

7.3.1 Data Recording

Upon receipt of both electronic and hard copy analytical data, internal checks will be performed to detect possible errors. The data check will be performed by the project data manager(s) with oversight provided by the Project Manager and QA Manager. General checks will include the following:

- Verification that data requested was received (check of data against Chains-of-Custody)
- Verification of completeness of data packages
- Verification of cross references between primary and duplicate samples
- Ten percent verifications of consistency between forms and electronic data

A data management system will be used to manage project analytical data and to perform additional verification tests on the data. The use of the data management system allows for upload of the electronic data deliverable (EDD) provided by the laboratory to the project management database, without manual manipulation of data. The additional data checks that will be completed and detected using automated routines provided with the data management system consist of the following and are performed prior to electronic import into the database:

- Unknown exploration or sampling point ID
- Misspelled chemical name
- Unknown chemical synonym

- New parameter
- Inappropriate sample type
- Invalid sample date/time
- Sample depth outside starting and ending depths
- Unknown target constituent list ID
- Non-matching data for primary and duplicate samples
- Duplicate record
- Inappropriate test date/time
- Dilution factor less than or equal to zero
- New (undefined) query codes
- Missing fields

For data generated in the field, the field crew will work together to maintain accuracy and integrity of the data. The Project Manager will review field forms and field notes to verify consistency with field observations and activities. Field information may include the sample ID, sample date, x/y sample location, sample depth, and rinseate blank record.

7.3.2 Data Transformations/Data Reduction

Data transformation and reduction procedures performed by the laboratory are outlined in the laboratory SOPs. Laboratory SOPs are available upon request. The remainder of this section outlines the data reduction procedures.

Anticipated data reduction and transformation activities consist of at least the following:

- Determining which laboratory analytical result to use when multiple extractions and/or dilutions are performed
- Setting up the electronic database to be reflective of any qualifications applied through data validation

Only the data to be used in making project decisions will be included in the electronic database. In cases where multiple analytical result sets are given for a particular sample, only one set of data (which may consist of portions of various result reports) will be included in the database. The Database Manager will work closely with the Project Manager and/or QA Manager to select the dataset, which is expected to be most representative of the sample.

After data validation has been completed (Section 8.6), it is anticipated that some results may differ from the original with the application of data qualifiers or elevated MDLs and/or RLs. The Database Manager will work closely with the data validation team to identify changes that need to be reflected in the database. Changes will be made by the Database Manager, with QA/QC checks performed by the Project Manager and/or QA Manager.

Data transformation and data reduction procedures will be clearly documented and placed in the project files. All data transformation and data reduction activities performed on the project data will be carefully monitored by both the Project Manager and/or QA Manager, to ensure that data integrity is maintained.

7.3.3 Data Transfer/Transmittal

Two types of electronic data transfer and transmittal computer systems will be used. The laboratory will utilize their laboratory information management system (LIMS) to transfer data internally and to ultimately generate the EDD that will be used to transfer data to Geosyntec. Geosyntec will then use its data management system, which consists of Microsoft Access, to maintain and store the data for the duration of the project. Any subsequent transfer of data and the creation of data tables will be performed using Geosyntec's data management system.

Data transfer activities will be completed using automated routines and will require minimal manual manipulation or handling of the data. Utilizing Geosyntec's data management system, data can be exported electronically to a number of electronic formats including Excel, ASCII or dbf files, or standard table reporting templates. The data managers, with oversight from the Project Manager and/or QA Manager, will be responsible for all data transfer activities and will implement procedures to run periodic checks on the data transfer to ensure accuracy.

Periodic checks will be performed on the data management system by the Database Manager to evaluate system performance. Approximately ten percent of the data exported from the database to tables and/or other electronic formats will be checked against the project database for accuracy. If errors are encountered, the Project Manager and/or QA Manager will be notified, and the use of the data management system will be terminated until the issue can be corrected. Resulting issues and their resultant solutions will be clearly documented and stored in the project files.

7.3.4 Data Analysis

Data analysis will be completed by the laboratory using its LIMS and by Geosyntec using its data management system. The use of the Access database will allow for the efficient management and storage of project analytical data and will reduce errors resulting from manual handling of information.

7.4 Data Tracking and Control

Data are tracked from generation to ultimate storage in project files. Internal procedures to track data generation at the laboratory have been previously described. At Geosyntec, data tracking will be performed by the Database Manager using a combination of automated routines and manual reviews. Automated routines consist of tracking each sample from the point of collection until the requested data are included in the electronic database. The automated routine checks will be verified by manual spot checks. Both automated and manual tracking procedures and outcomes will be documented and stored in the project files.

8. QUALITY ASSURANCE AND QUALITY CONTROL

This section details the QA/QC measures that will be implemented during the investigation to minimize variability, mitigate the potential for false positive and/or false negative error, and increase accuracy and defensibility in the collected data. QA/QC procedures apply to both the laboratory and field operations. Field and laboratory QA/QC samples are presented in Tables 12 and 13, respectively. The quality control criteria (method RLs, MDLs, etc.) for metals, PAHs, pesticides, and conventionals are summarized in Table 14.

8.1 Assessment and Corrective Actions

The QA Manager may conduct both performance and systems audits of both field and laboratory activities, as necessary. This section describes the measures that will be employed to ensure that this SAP/QAPP is implemented properly. Descriptions of the audits are presented below.

A systems audit is an evaluation of key components of the measurement systems to determine their proper selection and use. This audit includes a careful evaluation of both field and laboratory QC procedures. When required by USEPA or alternative regulatory authority, systems audits are performed prior to or shortly after systems are operational. After systems are operational and generating data, the Project Manager may request that a performance audit be conducted to determine the accuracy of the total measurement system(s) or component parts thereof.

When a problem situation arises, corrective action will be implemented to identify the problem and its source. Appropriate documentation of this action will be recorded in the project file. Personnel responsible for the initiation and approval of corrective action will be the laboratory QA Manager (for corrective action at the laboratory) and the project QA Manager (for corrective actions identified during field activities and/or during the data validation effort). Geosyntec's Project Manager and Data Manager, if appropriate, will be responsible for the approval of corrective action measures.

8.1.1 Field Audit and Corrective Actions

8.1.1.1 Field Systems Audit

An onsite audit focuses on data collection systems, using this Work Plan as well as the pertinent SOPs for reference. Specific activities vary with the scope of the audit, but can include a review of the following:

- Sample collection activities
- Equipment calibration techniques and records
- Decontamination and equipment cleaning
- Background and training of personnel
- Sample containers and preservation techniques
- Documentation practices
- Chain-of-custody procedures

It is anticipated that the Field Manager or the Quality Assurance Lead will be responsible for conducting the field system audits.

8.1.1.2 Field Performance Audits

Performance audits of field screening and sampling activities shall be conducted using the screening equipment vendor's field instrument calibration procedures and a review of laboratory sample receipt forms.

Proper measurement accuracy of field screening instruments is verified by daily and periodic instrument calibration procedures. This information is recorded in the field logbook and the instrument logbook. This information is reviewed by the QA Manager, who audits the calibration accuracy of a field screening instrument and consequent field screening accuracy.

An inspection for suitability of the samples for proper laboratory analysis serves as the performance audit of the sample collection procedures. Volatiles possessing free air (i.e., a bubble in an aqueous sample vial), insufficient sample volume for analysis, or improper preservation of samples will be noted by the analytical laboratory. A preponderance of such reports of unsuitable samples will indicate that the sampling procedures are poor or unacceptable. Analytical results will be reviewed by the Project Manager and/or the QA Manager to assess the performance and adequacy of sample collection procedures.

8.1.1.3 Field Measurement Corrective Action and Response

Project personnel will be responsible for reporting suspected technical or QA non-conformances or suspected deficiencies of any activity by reporting the situation to the Project Manager. Suspected problems will be discussed with the Project QA Manager to make a decision based on the potential for the situation to impact the quality of the data. If it is determined that the situation indicates a reportable nonconformance requiring corrective action, then a nonconformance report will be initiated by the Project Manager.

The Project Manager will be responsible for ensuring that corrective action for nonconformances is initiated by:

- Evaluating all reported nonconformances
- Controlling additional work on nonconforming items
- Determining disposition or action to be taken
- Maintaining a log of nonconformances
- Reviewing nonconformance reports and corrective actions taken
- Ensuring that nonconformance reports are included in the final site documentation in project files

If appropriate, the Project Manager or Field Manager will ensure that no additional work that is dependent on the nonconforming activity is performed until the corrective actions are completed.

Corrective actions for field measurements may include:

- Repeating measurements to check the error
- Checking for all proper adjustments for ambient conditions such as temperature
- Checking the batteries
- Recalibrating
- Checking the calibration
- Replacing the instrument measuring devices
- Stopping work (if necessary)

The Project Manager at times may be required to adjust the site programs to accommodate site-specific needs. When it becomes necessary to modify a program, the responsible person notifies the Project Manager of the anticipated change and implements the necessary changes after obtaining the approval of the Project Manager. Corrective actions will be implemented and documented in the field logbook. No staff member will initiate corrective action without prior communication of findings through the Project Manager.

8.1.2 Laboratory Audit and Corrective Actions

8.1.2.1 Laboratory Systems Audit

The laboratory systems audit is a review of laboratory operations to verify that the laboratory has the necessary facilities, equipment, staff, and procedures in place to generate acceptable data.

Specific activities vary with the scope of the audit, but can include a review of the following:

- Equipment suitability and maintenance/repair
- Background and training of personnel
- Laboratory control charts and support systems
- SOPs
- Documentation practices
- QC samples, including performance evaluation samples
- Chain-of-custody procedures
- Data logs, data transfer, data reduction, and validation

No systems audits are planned for this project. However, the Project Manager or Data Manager may conduct or request such audits at their discretion.

8.1.2.2 Laboratory Performance Audits

The project laboratories participate in a variety of federal and state programs that subject laboratories to stringent performance audits on a regular basis. Only laboratories with current state and federal certifications will be used. QA policies and procedures currently in place at the

laboratories and actions that will be included in sampling activities to ensure QA include the following:

- Both intra-laboratory and inter-laboratory check (if needed) samples may be conducted
- Periodic (at least annual) audits conducted by the Laboratory Project Manager (LPM) or his/her designee
- Laboratory control samples analyzed at a frequency equal to 1 in 20 samples analyzed
- Performance evaluation (PE) samples may be submitted to laboratories during major sampling events

8.1.2.3 Laboratory Corrective Action and Response

When the analysis of a sample indicates the system may be out of control, a QC check sample is analyzed. If the analysis of the check sample indicates a problem, the LPM is notified and corrective action is implemented. This corrective action includes, but is not limited to, the following:

- Removal of the instrument from service
- Isolation of the source of the problem
- Correction of the problem
- Re-analysis of the check sample

The instrument cannot be put back into service until the check sample meets QA specifications. Also, the laboratory group leader must sign the maintenance logbook and enter all the information related to the check sample.

To reduce the chances for an out-of-control situation to occur, the laboratory will be provided feedback on performance evaluations in a timely manner.

8.2 Quality Assurance Reporting

Presented below are the QA reporting procedures that will be implemented for this project.

8.2.1 Reporting Responsibility and Recordkeeping

Comprehensive records shall be maintained by the Project Manager to provide evidence of QA activities.

These records shall include the following documentation:

- Results of performance and systems audits (if any)
- Data validation summary reports
- Identified QA problems and proposed corrective action(s)
- Changes to this Work Plan

The proper maintenance of QA records is essential to provide support in any evidentiary proceedings. Access to working files will be restricted to project personnel. Upon termination of an individual task or work assignment, working files will be processed for storage.

8.2.2 Audit Reports

Should audits be requested, the corresponding audit reports will be distributed to the following project personnel, as appropriate:

- Project Manager
- Laboratory QA and Laboratory Project Manager

8.2.3 Periodic Progress Reports

Descriptions of completed tasks will be communicated to the Project Manager as part of monthly status updates, conference calls, and scheduled report deliverables specified in the Remedial Investigation (RI) Work Plan.

8.3 Field Quality Assurance/Quality Control

Field QA/QC procedures to be followed include completing all appropriate sample documentation; preservation, instrument calibration and inspection; and field duplicates and field blanks. Table 12 provides a summary of the field QC sample frequency.

During field activities, QA/QC samples designed to assess sampling techniques (duplicates) and decontamination procedures (blanks) will be collected and submitted to the laboratory with the soil and sediment. Field personnel on site and/or the Project or QA Manager will be in frequent communication with the laboratory to receive raw data so that, as issues or quality control problems arise with regard to sampling, decontamination, bottles, or transport, they can be identified and corrected early in the process. The data assessment process for each medium will be an on-going process implemented by the QA Project Manager, the Project Manager, and the laboratory subcontractor.

8.3.1 Field Quality Control Samples

Laboratory analysis of field duplicates and field blanks will assess the precision and accuracy of field sampling techniques. The ratio of duplicate samples to field samples is 1 duplicate sample to every 20 field samples collected of each matrix (i.e., 5 percent), or a minimum of one per sample matrix.

Field/equipment blanks will be collected at a minimum frequency of one per sampling event and/or type of sampling equipment. At a minimum, an equipment blank will be collected from each type of sampling equipment: (1) soil boring equipment and stainless-steel spoons and bowls; (2) sediment grab samplers; and (3) a core tube. Duplicates will be analyzed for the same chemical suite as original samples. Extra sample volume will be collected as needed for matrix spike/matrix spike duplicate (MS/MSD) analyses. Temperature blanks will be included in every shipment

cooler. QC samples will be collected in accordance with the applicable sampling procedures presented in the SAP, which are summarized in Table 12.

8.3.2 Instrument/Equipment Testing, Inspection, and Maintenance

All equipment and instruments used to generate data will be calibrated, adjusted, and maintained to operate within manufacturers' specifications and SOPs. Maintaining the necessary accuracy, precision, sensitivity, and traceability of the equipment ensures that reliable measurements and representative samples will be obtained. Methods and intervals of calibration and maintenance will be based on the type of equipment and stability characteristics: required accuracy; intended use; and environmental factors (e.g., temperature and humidity). Such an effort will be conducted by trained technicians using service manuals or through service agreements with a qualified maintenance contractor. In addition, procedures will ensure that equipment is properly used by trained personnel.

As appropriate, schedules and records of calibration and maintenance will be maintained for the equipment in the field notebook. Equipment that is out of calibration or is malfunctioning will be removed from operation until it is recalibrated or repaired.

8.3.3 Instrument/Equipment Calibration and Frequency

All field equipment and instruments will be calibrated per manufacturer's guidelines prior to each field event. Equipment that may be used during the fieldwork include a PID. Calibration will occur prior to each field event, according to the manufacturer's procedures.

The linearity of field instruments will be checked by using a two-point calibration with reference standards bracketing the expected measurement. All the calibration procedures performed will be documented on specified field forms and/or in the field notebook and will include the date/time of calibration, name of person performing the calibration, reference standard used, temperature at which readings were taken, and the readings. Multiple readings on one sample or standard, as well as readings on replicate samples, will likewise be documented.

8.3.4 Inspection/Acceptance of Supplies and Consumables

This section describes the requirements for the procurement of supplies and consumables. The procurement program is intended to ensure that the supplies purchased for this project meet the required quality criteria of this plan.

Field supplies include the following items:

- PPE
- Deionized or distilled water
- Solvents/detergent
- Decontamination reagents and supplies
- Sediment sampling equipment

- Soil sampling equipment
- Field equipment calibration standards

The Field Manager will be responsible for material procurement and control. The Field Manager will verify upon receipt that materials meet the required specifications and that, as applicable, material or standard certification documents are provided and maintained. The Field Manager will also verify that material storage is properly maintained, and contamination of materials is not allowed.

8.3.5 Special Training and Certification

All field personnel will have successfully completed a 40-hour HAZWOPER training course conducted by a qualified training provider before they engage in the work activities that may disturb soils or sediments. In addition, a HAZWOPER Supervisor must be on Site at all times.

8.4 Laboratory Quality Assurance/Quality Control

The laboratory DQOs will be met in the laboratory by using established instrument calibration and sample handling procedures, analysis according to standard analytical methods, and analysis of quality control samples. Laboratory quality control will consist of analysis of surrogate spikes, method blanks, duplicates, matrix spikes, and matrix spike duplicates and reporting of all data, including holding times.

8.4.1 Laboratory Quality Control Samples

Laboratory QC samples will be analyzed at a frequency of 5 percent (1 in 20) on a laboratory batch basis. Laboratory QC samples will consist of duplicates, method blanks, matrix spikes, and matrix spike duplicates (MS/MSD). In addition, each organic analysis will include the addition of surrogate compounds to the sample for surrogate spike analysis. Table 13 provides a summary of the lab QC sample frequency.

8.4.2 Laboratory Inspection of Consumables

Laboratories contracted for this project must have procedures that are documented and followed that cover the following:

- Checking purity standards, reagent grade water, and other chemicals as appropriate versus intended use
- Preparation and storage of chemicals
- Requirements for disposable glassware (grade and handling)

For this project, the Laboratory Project Manager or designee will be responsible for procuring and shipping the appropriate sample containers and preservatives to the sampling location. The containers will be pre-cleaned and certified by lot. Reagents provided will be of the appropriate grade for the analysis. Records of these certifications and grades of material will be maintained on file at the laboratory.

8.5 Data Quality Indicators and PARCC Parameters

Quality assurance objectives are formally measured through computation of performance measures (DQIs), which are in turn compared to pre-defined measurement quality objectives (MQOs) specific to the project objectives. For measurement data, these are expressed in terms of the precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) parameters. PARCCS include measurements of precision (reproducibility of data), accuracy (degree of difference and/or bias between measured values and the true value), representativeness (degree to which the data accurately and precisely describe the characteristics of the population), completeness (percent of the data that are valid), comparability (confidence of the dataset for comparisons to other data, use of established methods), and sensitivity (magnitude to which analytical methods can resolve quantitative differences among sample concentrations). The PARCC parameters for this project are summarized in Table 14. The data will be reviewed for compliance with these DQIs by the Geosyntec data validation team.

The field QA/QC program will be accomplished through the collection of field duplicates, equipment (rinsate) blanks, MS/MSD, and trip blanks, as applicable. The analytical QA/QC program will be assessed through the internal laboratory QC performed, including, but not limited to, method blanks, laboratory control sample (LCS) recoveries, surrogate recoveries, MS/MSD recoveries, and evaluation of MDLs. The PQL, sometimes referred to as the RL, is a quantifiable value and usually the lowest concentration standard used in the calibration curve. In practice, to allow for matrix interferences variability in instrument control, an RL of three to eight times the MDL is typically selected and reported by the laboratory. For this project, it is anticipated that both the MDL and RL will be reported and evaluated as needed. The following sections describe the DQIs in greater detail.

8.5.1 Precision

Field and laboratory duplicates have been incorporated into the program to assess the precision of the measurement system. If duplicate results indicate matrix heterogeneity greater than anticipated, qualifiers will be added to reported concentrations. Corrective action will be taken for future sampling events to provide thorough homogenization of the sample medium during sample collection and analysis. Imprecision may be due to extreme heterogeneity within the matrix; any re-sampling program will take this potential influence into consideration.

8.5.2 Accuracy

Accuracy is a measure of how a concentration is in agreement with a reference concentration. Calibrations, matrix spikes, surrogate spikes, internal standards, and laboratory control sample results will be used to assess accuracy. The Data Quality Assessment Report will identify non-compliant results and discuss the impact to reported results. Data qualifiers will be applied to sample concentrations based on a comparison of quality control results to laboratory or method-specified performance criteria.

8.5.3 Representativeness

Sample representativeness will be assessed through an analysis of the lab blank results, field duplicates, and sample variance. The concentrations and frequencies of target analytes detected in lab blanks will provide an indication of data representativeness. The RPD of replicates will also be evaluated. The Data Quality Assessment Report will describe issues concerning representativeness based on a review of these data. Soil and sediment sample results will be verified based on the QC data results. Qualifiers will be applied to data that do not meet the specified laboratory or method criteria of these measurement parameters.

8.5.4 Comparability

Comparability between datasets will be made qualitatively and quantitatively to determine the extent to which different measurements of the same quantity will yield valid conclusions. Comparability performance will be assessed on the basis of duplicate results from samples of the same media collected from the same location at the same time compared against measurement performance criteria.

Field parameters can provide another means of assessing the comparability of data points within a dataset. Parameters, including pH, turbidity, and specific conductivity, are generally similar among like samples, within certain limits. Should laboratory data appear anomalous, field parameters will be checked to assess the potential that a sample may not have been representative of general conditions for a particular location at a particular time.

8.5.5 Completeness

A dataset for a specific medium will be considered complete if at least 90 percent of the results have all associated quality control results and are accepted as valid data to meet the Quality Objectives provided in this QAPP. The Data Assessment Report will include a discussion of the results obtained from the completeness review and recommend corrective action(s), as appropriate.

8.6 Data Validation and Usability

All sample results, QC summaries, raw data, and EDDs will be reviewed for precision, accuracy, method compliance, and QAPP compliance by the laboratory prior to release of the data to the Quality Control Manager. The Quality Control Manager (or his/her appointee) will also check these data for precision, accuracy, completeness, method compliance, and QAPP compliance as an independent validator. These reviews, along with a review of data representativeness and comparability, will be used to decide the usability of the data collected during this project. Quality assurance review of inorganic, organic, and physical data will be performed using EPA Contract Laboratory Program (CLP) National Functional Guidelines, methods specified in this QAPP, and guidelines presented in PSEP guidance on Quality Assurance and Quality Control. Physical and chemical data will be validated by professionals with experience in validating data.

Datasets will be assessed according to the PARCCS parameters described above. The Data Quality Assessment Report will be used to describe and document observed data limitations based on the

qualitative and quantitative performance criteria. Based on validation results, data that do not meet performance criteria will be flagged with qualifiers and potentially be rejected or be limited in use for site decision-making.

8.6.1 Data Reduction, Review, Verification, and Validation

This section addresses the stages of data quality assessment by the laboratory and by Geosyntec chemists/validators after data have been generated and received (i.e., data reduction, review, verification, and validation). It also sets procedures for evaluating the usability of data with respect to the DQOs set forth in Section 4. EPA Region 9 outlines three tiers of data validation [EPA, 2001]. Each tier requires progressively more technical review. Data validation pertinent to this Site will be conducted using Tier 1A validation procedures, as described below.

8.6.1.1 Data Reduction

Raw analytical data generated in the laboratory are collected on printouts from the instruments and associated data system or are manually recorded into bound notebooks. Analysts review data as they are generated to determine that the instruments are performing within specifications. This review includes calibration checks, surrogate recoveries, blank checks, retention time reproducibility, and other QC checks as specified in the SOPs. If any problems are noted during the analytical run, corrective action is taken by the laboratory and documented.

Each analytical run is reviewed for completeness prior to interpretation and data reduction.

8.6.1.2 Data Review

Data review is an initial and relatively non-technical step of data assessment that primarily addresses issues of completeness and data handling integrity. In data review, the reviewer will ensure that all necessary reporting components have been included in laboratory reports, such as necessary fields (e.g., collection/analysis dates, units, etc.) as well as the presence of (but not implications of) QA/QC data components (e.g., LCS records, surrogate results, etc.).

8.6.1.3 Data Verification

Data verification is a more technical process than data review in that the core technical aspects of data quality (e.g., precision, accuracy, etc.) are evaluated through a review of the results of QA/QC measures, such as LCSs and surrogates.

Following interpretation and data reduction by an analyst, data are transferred to the laboratory sample management system either by direct data upload from the analytical data system or manually. The data are reviewed by the group leader or another analyst and marked on the sample management system as being verified. The person performing the verification reviews all data, including QC information prior to verifying the data. If data package deliverables have been requested, the laboratory will complete the appropriate forms summarizing the QC information and transfer copies of all raw data (e.g., instrument printouts, spectra, chromatograms, etc.) to the data packages group. This group will combine the information from the various analytical groups and the analytical reports from the laboratory sample management system into one package. This

package is reviewed by the LPM for conformance with SOPs and to ensure that all project QC goals have been met. Any analytical problems are discussed in the case narrative, which is also included with the data package deliverables.

8.6.1.4 Data Validation and Usability Determination

Following data verification by the laboratory, data validation will be conducted. Tier 1A data validation will be conducted on 100% of the laboratory data by an entity independent of the laboratory. This validation will be done on the hard copy (or electronic version) data with electronic data screening as a component of the validation. following EPA Update III SW-846 (EPA, 1997b) and ASTM (ASTM, 1992) methodologies

The following documents will be used as guidance in data validation:

- USEPA Region 9 Draft Superfund Data Evaluation/Validation Guidance, R9QA/006.1 (December 2001)
- USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review, EPA-540-R-201 7-001 (January 2017a)
- USEPA National Functional Guidelines for Organic Superfund Methods Data Review, EPA-540-R-2017-002 (January 2017b)

These guidance documents provide structured approaches for the assignment of data qualifiers based on observations made in the data verification process and will be used in conjunction with the specific USEPA method-specified criteria, as well as the QC criteria set forth in this QAPP.

While data verification is a technical process in which the data's adherence to core PARCCS elements is evaluated, it still does not answer the final question of the usability of the data and the implications of any departures from data expectations. The data validation process is designed to answer these questions through: (i) the assignment of data qualifiers based on the data verification results; and (ii) a case-by-case review of data quality issues with respect to QAPP objectives to render a final assessment of data usability.

The final step of data evaluation entails a comparison of data quality performance with the QAPP-specific DQOs.

8.7 Data Evaluation Roles and Responsibilities

The following components of data evaluation will be performed by certain entities as noted:

- Data reduction will be performed by the analytical laboratory
- Data review will be performed both by the laboratory and by Geosyntec
- Data verification will be performed both by the laboratory and by Geosyntec
- Data validation and usability determination will be performed by Geosyntec

8.8 Data Reporting

The laboratory data package receipt schedules will be based on the laboratory standard turnaround time. The laboratory will provide hard copy data packages that consist of several components, as well as an EDD for each set of samples (i.e., each work order). The data package deliverables from the laboratory will be specific to each type of data collected, but will likely consist of Level 2 data packages. The components of a Level 1 through Level 4 data packages are as follows:

- Level 1– Signed cover sheet, narrative, data results, and copy of the chain-of-custody
- Level 2 – Signed cover sheet, narrative, data results, QC sample results, copy of the chain-of-custody
- Level 3 – Signed cover sheet, narrative, data results, raw data result information, QC sample results, raw data QC information, calibration and continuing calibration information
- Level 4, Full, or CLP-like – All of the above plus all raw data and supporting information for the data results

8.8.1 Data Qualifiers

Based on validation results, qualifiers will be added to reported analytical results to indicate uncertainty or potential bias or interferences. Specific data qualifiers that will be applied to sample concentration include the following:

J: The results are considered estimated. The analyte was detected greater than the MDL, but the associated reported concentration is approximate and is considered estimated because it is less than the RL or because there was a QC issue identified and associated with the analytical result.

R: The reported analyte concentration was rejected due to a serious deficiency with the associated quality control result(s). The presence or absence of the analyte cannot be confirmed.

U: The analyte was not detected greater than the MDL or RL, as applicable.

UJ: The analyte was not detected greater than the MDL or RL, as applicable. However, due to quality control results that did not meet acceptance criteria, the quantitation limit is uncertain and may not accurately represent the actual limit.

8.8.2 Data Reporting

After data qualifiers have been applied (as applicable) to the dataset, the validated laboratory data will be entered into Geosyntec's database. Upon entry into this database, the data will be in a final format that is then available for use in achieving project objectives.

Information for each sample that will be entered into the database may include, but is not limited to, the following:

- Sample Identification Number
- Date Sampled
- Sample Numbers of Associated QA/QC Analyses (Duplicate, Trip, and Equipment Blanks)
- Analyte Name
- Reporting Units
- RL
- MDL
- Dilution Factors
- Re-analysis Flags (if necessary)
- Analytical Results
- Validation Qualifiers
- Any Required Footnotes or reason codes

Data that have been entered into the database can then be used for data analysis and decisions.

8.9 Reconciliation with DQOs and Data Usability

While data verification is a technical process in which the data's adherence to the measurement performance criteria for the PIQs (PARCCS elements) is evaluated, it still does not answer the final question of the usability of the data with respect to the PIQs and the implications of any departures from data expectations. The data validation process is designed to answer these questions through: 1) the assignment of data qualifiers based on the data verification results; and 2) a case-by-case review of data quality issues with respect to QAPP objectives to render a final assessment of data usability. Validation of the analytical data is the process of determining that the data support the task-specific DQOs.

The final step of data evaluation entails a comparison of data quality performance and usability with the project specific PIQs and the data's ability to help address the project decision rules and criteria regarding the nature and extent of contamination and risks at the Site. Previous sections describe the study questions and objectives, required data inputs, associated required quality metrics references, and corrective actions to address data deficiencies. If data meet the DQIs described above, then the data are considered acceptable for addressing the PIQs.

.

9. INVESTIGATION OUTPUTS AND REPORTING

The results of the field investigation will be documented in the EE/CA. It is anticipated that the field sampling results will be summarized in the EE/CA, and a full reporting of the investigation provided as an appendix. The EE/CA will include: 1) a summary of the field activities; 2) analytical results; 3) summary of risk screening results; and 4) conclusions.

The inset table below highlights the general timeline of activities and milestones for the project.

Project Schedule		
Activity	**Start Date**	**End Date**
EE/CA SAP	October 2020	May 2021
Field Investigation	June 2021	December 2021
Draft EE/CA Reporting	January 2022	December 2022
Public Review Draft of EE/CA Report	January 2023	March 2023

9.1 EE/CA Report

The EE/CA identifies the objectives of the removal action project and analyzes the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. The EE/CA will summarize the results of the investigation, assess human and ecological risk, identify ARARs, establish target risk levels, and develop cleanup goals. The EE/CA is intended to:

- Satisfy environmental review requirements for removal actions under CERCLA and the NCP
- Satisfy AOC requirements for documentation of removal action selection
- Serve as a technically accurate and understandable presentation of facts and recommendations on which the public can comment
- Provide a framework for NPS to evaluate and select an appropriate decision regarding a NTCRA at the Site

The EE/CA will be prepared using the NPS EE/CA template (NPS 2019b) and will include the following sections:

- *Executive Summary* - highlights the key information contained in the EE/CA report.
- *Introduction* - describes the framework for this EE/CA and states the objectives and scope.
- *Site Description, Investigation Results and Conceptual Site Model* - provides information on the extent of contamination and the physical characteristics of the Site and presents the CSM so that the location and fate and transport of contamination is understood. *Risk Assessment Summary* - describes the risks to human health and ecological receptors posed by contamination at the Site. Provides a summary of the Human Health and Ecological Screening Level Risk Assessments; describes development of risk-based cleanup levels

that are intended to provide adequate protection of human health, ecological receptors, and habitat; and presents a spatially explicit risk-based footprint evaluation

- *Identification and Analysis of Applicable or Relevant and Appropriate Requirements* – identify chemical-, location-, and action-specific ARARs for the Site.
- *Removal Action Objectives and Removal Goals* – present the RAOs and the numeric site-specific cleanup level concentrations needed to achieve the RAOs for the non-time-critical removal action.
- *Identification of Removal Action Alternatives* - describes general response actions that address RAOs, identifies and screens removal action technologies and process options, and introduces the identification and detailed screening of removal action alternatives; and provides a detailed discussion of the applicable alternatives and Remedial Action Levels.
- *Comparative Analysis of Removal Action Alternatives* - presents a detailed comparison and analysis of the potential removal actions remaining after the screening process; will include an evaluation for effectiveness, implementability, and cost.
- *Recommended Removal Action Alternative* - describes the recommended removal action alternative and a summary of the recommendations.
- *References* - provides a list of references used for preparation of this document.

9.2 Supporting Files

The supporting files to be included with EE/CA report include the project database in MS Excel format; GIS files of bathymetry, topography, sample concentration maps, site features, and sample locations; and aerial photos. Report appendices will include field forms, field logs, and documentation of any archaeological information, if encountered.

All finalized and validated data will be formatted and submitted to the Washington State Department of Ecology for entry into the Environmental Information Management (EIM) System. Geosyntec will manage the overall project database and will oversee data management to ensure that analytical data are incorporated into the project database with appropriate qualifiers following acceptance of the data validation.

10. REFERENCES

American Society for Testing and Materials (ASTM). 2001. *Standard Practice for Classification of Sediments for Engineering Purposes (Unified Sediment Classification System).* ASTM Book of Standards. D 2487-00. Vol. 04.08. American Society for Testing and Materials. Conshohocken, Pennsylvania.

CERCLA. Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. § 9601 et seq (2002).

Department of Natural Resources. 1969 Mines and Mineral Deposits of Whatcom County, Washington. Moen, Wayne S. Washington Department of Natural Resources, Division of Mines and Geology. Bulletin No. 57.

Ecology (Washington State Department of Ecology), 2020a. Cleanup Levels and Risk Calculation Data Tables. CLARC Master Data Table. Available at: https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC/Data-tables. Downloaded August 2020.

Ecology, 2020b. Model Toxics Control Action (MTCA). Remedial Investigation (RI) Checklist; Toxics Cleanup Program. Publication No. 16-09-006. June.

Ecology. 2019. Sediment Cleanup User's Manual (SCUM). *Guidance for Implementing the Cleanup Provisions of Sediment Management Standards, Chapter 173-204 WAC.* May 2019.

Ecology. 2015. Puget Sound Estuary Protocols. Publication Number 15-09-046. March.

Ecology. 2013. Sediment Management Standards. Chapter 173-204 WAC. Toxics Cleanup Program. Publication no. 13-09-055. September.

Ecology. 2008. Sediment Sampling and Analysis Plan Appendix Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards Chapter 173-204 WAC. February.

Geologic Survey. 1973. North Cascades National Park Washington. Reconnaissance geology of the 500-square-mile wilderness north of the Skagit River and the mineral survey that was made before it became a park. Geological Survey Bulletin 1359.

Hart Crowser. 2016. Soil and Sediment Characterization. Seattle City Light Diablo Lake Dry Dock Building. September.

HWA GeoSciences. 2007. Ground Water Assessment, North Cascade Institute Environmental Learning Center Diablo, Washington. September.

Intergovernmental Data Quality Task Force (IDQTF). 2005. Uniform Federal Policy for Quality Assurance Project Plans: Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs. EPA/505/B-04/900A; DoD DTIC ADA 427785.

United States Department of the Interior National Park Service (NPS). 2020. Sampling and Analysis Template. Provided by the National Park Service, Environmental Compliance and Cleanup Branch, Park Facility Management Division. Last modification date of May 30, 2019. Initially created on April 11, 2018.

NPS. 2019a. *Administrative Settlement Agreement and Order on Consent for Removal Actions*, City of Seattle, Seattle City Light Department and National Park Service, Environmental Compliance and Cleanup Branch.

NPS. 2019b. Engineering Evaluation/Cost Analysis (EE/CA) Report Template. Provided by the National Park Service, Environmental Compliance and Cleanup Branch, Park Facility Management Division. Last modification date July 2019.

NPS. 2018a. Diablo Lake New Tour Dock Project. Environmental Assessment. July.

NPS. 2018b. NPS Protocol for the Selection and Use of Ecological Screening Values for Non-Radiological Analytes. Revision 3. November.

NPS. No date. Natural Resource Management Reference Manual #77. http://www.nature.nps.gov/rm77/. Accessed February 2, 2014.

NPS. 2014a. NPS-Specific CERCLA ARARs and TBCs.

NPS. 2014b. NPS Conceptual Site Model Guidance.

Office of the Federal Register. 1994. NCP, 40 Code of Federal Regulations (CFR) Part 300. Code of Federal Regulations Title 40: "Protection of Environment, Chapter I, Subchapter J, Part 300 – National Oil and Hazardous Substances Pollution Contingency Plan." Available from epa.gov/docs/epacfr40/Chapt-I.info/subch-j.htm; Internet

Puget Sound Estuary Program (PSEP). 1997. Recommended Protocols for Measuring Conventional Sediment Variables in Puget Sound. Prepared for the Puget Sound Estuary Program, U.S. Environmental Protection Agency, Region 10, Office of Puget Sound, Seattle, Washington.

U.S. Environmental Protection Agency (USEPA). 2012. Guidance for Evaluating and Documenting the Quality of Existing Scientific and Technical Information. Addendum to A Summary of General Assessment Factors for Evaluating the Quality of Scientific and Technical Information. December.

USEPA. 2011. Environmental Cleanup Best Management Practices: Effective Use of the Project Life Cycle Conceptual Site Model. EPA/542/F-11/011. July.

USEPA. 2008. Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites. EPA/540/R-08/002. April.

USEPA. 2006a. Guidance on Systematic Planning Using the Data Quality Objectives Process. EPA/240/B-06/001. February.

USEPA. 2006b. Data Quality Assessment: Statistical Methods for Practitioners. EPA/240/B-06/003. February.

USEPA. 2006c. Data Quality Assessment: A Reviewer's Guide. EPA/240/B-02/002. February.

USEPA. 2003a. A Summary of General Assessment Factors for Evaluating the Quality of Scientific and Technical Information. EPA/100/B-03/001. June.

USEPA. 2003b. Guidance for Obtaining Representative Laboratory Analytical Subsamples from Particulate Laboratory Samples. EPA/600/R-03/027. November.

USEPA. 2002a. Guidance for Quality Assurance Project Plans. EPA/240/R-02/009. December.

USEPA. 2002b. Role of Background in the CERCLA Cleanup Program. Office of Solid Waste and Emergency Response (OSWER) 9285.6-07. April 26.

USEPA. 2002c. Guidance of Comparing Background and Chemical Concentrations in Soil for CERCLA Sites. EPA/540/R-01/003.

USEPA. 2002d. Guidance on Environmental Data Verification and Data Validation. EPA/240/R-02/004. November.

USEPA. 2002e. Guidance on Choosing a Sampling Design for Environmental Data Collection: for Use in Developing a Quality Assurance Project Plan. EPA/240/R-02/005. December.

USEPA. 2001. EPA Requirements for Quality Assurance Project Plans. EPA/240/B-01/003. March.

USEPA. 1993. Guidance for conducting non-time critical removal actions under CERCLA. EPA 540-R93-057. Office of Solid Waste and Emergency Response, Washington, DC.

USEPA. 1992. Guide to Management of Investigative-Derived Wastes. Publication: 9345.3-03FS. January.

USGS. 2003. Geologic Map of Mount Baker 30- by 60-Minute Quadrangle, Washington. Tabor, R.W., Haugerud, R.A., Hildreth, Wes, and Brown, E.H. Geologic Investigations Series I-2660. United Stated Department of the Interior, United States Geologic Survey.

TABLES

Table 1. Site History and Timeline
Diablo Dry Dock Site
EE/CA SAP

Year(s)	Activity at Diablo Dry Dock
1929	Diablo Dam construction completed.[a]
1930	Seattle City Light (SCL) Diablo Marine Railway and Shelter (Diablo Dry Dock) constructed.[a]
1936-1937	First tour boat, Alice Ross, constructed in Diablo Dry Dock.[a]
1950s	Cottages were built at the lake.
2006	Environmental Learning Center constructed.
2014	Initial field investigation conducted by SCL consisting of surface soil and sediment sample collection in and around the Dry Dock. [a]
2015	Additional sampling conducted by SCL to determine the extent of contamination.[a]
2019	National Park Service issues Administrative Settlement and Order on Consent for EE/CA Investigations and Removal Actions.[b]

Footnotes:

a. Hart Crowser, 2016. *Soil and Sediment Characterization Seattle City Light Diablo Lake Dry Dock Building, Diablo Washington*. Prepared for Seattle City Light. *17843-48*. September 15, 2016.

b. United States Department of the Interior National Park Service. Administrative Settlement and Order on Consent for EE/CA Investigations and Removal Actions.

Table 2a. Summary of Historical Soil Data
Diablo Dry Dock Site
EE/CA SAP

Constituent														
Sample Location:	**DD-S1**	**DD-S1-3-6"**	**DD-S1-6-12"**	**DD-S3**	**DD-S4**	**DD-S4-3-6"**	**DD-S4-6-12"**	**DD-S5**	**DD-S5-3-6"**	**DD-S5-6-12"**	**DD-S6**	**DD-S7**	**DD-S7-3-6"**	**DD-S7-6-12"**
Upper Sample Depth (inches below surface):	**0**	**3**	**6**	**0**	**0**	**3**	**6**	**0**	**3**	**6**	**0**	**0**	**3**	**6**
Lower Sample Depth (inches below surface):	**3**	**6**	**12**	**3**	**3**	**6**	**12**	**3**	**6**	**12**	**3**	**3**	**6**	**12**
Sample Date (year-month-day):	**2014-09-16**	**2015-05-14**	**2015-05-14**	**2014-09-16**	**2014-09-16**	**2015-05-14**	**2015-05-14**	**2014-09-16**	**2015-05-14**	**2015-05-14**	**2014-09-16**	**2014-09-16**	**2015-05-14**	**2015-05-14**
Metals (mg/kg)														
Arsenic	10 U	--	--	10 U	82	20	13 U	77	91	41	37	57	43	15
Cadmium	0.52 U	--	--	0.51 U	1.9	--	--	1.7	--	--	1.2	1.1	--	--
Chromium	43	--	--	62	44	--	--	34	--	--	44	45	--	--
Copper	59	--	--	140	850	--	--	780	--	--	380	480	--	--
Lead	46	--	--	7.4	1200	1100	49	1000	700	390	670	550	420	110
Mercury	0.26 U	--	--	0.26 U	1.2	--	--	0.92	--	--	0.3	0.5	--	--
Nickel	35	--	--	39	46	--	--	19	--	--	23	19	--	--
Selenium	10 U	--	--	10 U	10 U	--	--	10 U	--	--	10 U	10 U	--	--
Silver	1 U	--	--	1 U	1 U	--	--	1 U	--	--	1 U	1 U	--	--
Zinc	150	--	--	160	2000	--	--	1700	--	--	1200	1100	--	--
TCLP (mg/L)														
Lead	--	--	--	--	2	--	--	0.91	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (mg/kg)														
1-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	0.98	0.01	0.0083	0.0069 U	0.21	0.16	0.01	1.2	3.1	0.59	0.1	0.34	0.19	0.072
Benzo(a)pyrene	0.47	0.0085	0.0096	0.0069 U	0.27	0.21	0.011	1.4	3.1	0.6	0.13	0.47	0.22	0.083
Benzo(b)fluoranthene	0.52	0.011	0.02	0.0069 U	0.35	0.23	0.02	1.4	3.8	0.73	0.15	0.53	0.3	0.11
Benzo(ghi)perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(j,k)fluoranthene	0.37	0.0078 U	0.0073 U	0.0069 U	0.22	0.083	0.0084 U	1.2	1.3	0.27	0.089	0.35	0.1	0.032
Chrysene	1.1	0.0099	0.019	0.0069 U	0.33	0.16	0.015	1.5	2.8	0.54	0.12	0.39	0.17	0.064
Dibenzo(a,h)anthracene	0.096	0.0078 U	0.0073 U	0.0069 U	0.096	0.039	0.0084 U	0.31	0.51	0.1	0.036	0.15	0.041	0.015
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	0.19	0.0078 U	0.0073 U	0.0069 U	0.26	0.15	0.0086	0.79	1.9	0.37	0.093	0.36	0.15	0.056
Naphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total LMW PAHs[a]	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs[b]	3.63	0.0394	0.0569	ND	1.64	0.993	0.0646	7.49	16	3.1	0.682	2.44	1.13	0.417
Total cPAHs (calculated) - human health toxicity[c]	3.73	0.04	0.06	ND	1.74	1.03	0.06	7.80	16.51	3.20	0.72	2.59	1.17	0.43
Total cPAH TEQ (calculated) - human health toxicity[d]	**0.70**	0.01	0.01	0.01	**0.39**	**0.28**	0.02	**1.91**	**4.19**	**0.81**	**0.18**	**0.65**	**0.30**	**0.11**
Total PAHs (calculated)	3.73	0.04	0.06	ND	1.74	1.03	0.06	7.80	16.51	3.20	0.72	2.59	1.17	0.43
Petroleum Hydrocarbons (mg/kg)														
Lube Oil	120	--	--	57	260	--	--	240	--	--	230	100	--	--
Diesel Range Organics	28 U	--	--	26 U	56	--	--	29	--	--	33	26 U	--	--

Footnotes:

a. LMW PAHs include: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene. Fluoranthene treated as LPAH, following NPS guidelines for an NPS site. This differs from SCUM (2019) guidance, which treats fluoranthene as an HPAH.

b. HMW PAHs inclue: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Pyrene. Benzo(j,k)fluoranthene was treated as Benzo(k)fluoranthene for comparison purposes.

c. cPAHs include: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene.

d. Individual analyte TEQs are calculated by multiplying toxicity equivalency factor (TEF; SCUM, 2019) by the detected concentration. For non-detects, TEF is multiplied by half the reporting limit. All analyte TEQs are summed to produce the Total cPAH TEQ calculated value.

bold Analyte detected above the lowest or most restrictive screening level

Acronyms:

mg/kg	milligrams per kilogram	TEQ	Toxicity Equivalents
mg/L	milligrams per liter	ND	Compound non detected
LMW	Low molecular weight	TCLP	Toxicity characteristic leachating procedure
HMW	High molecular weight	U	Analytical result not detected at the listed reporting level
PAH	Polycyclic aromatic hydrocarbons	--	Sample not analyzed
cPAH	Carcinogenic polycyclic aromatic hydrocarbon	-	Screening Level not available

Table 2a. Summary of Historical Soil Data
Diablo Dry Dock Site
EE/CA SAP

Constituent										
Sample Location:	**DD-S8**	**DD-S9**	**DD-S10**	**DD-S11**	**DD-S12**	**DD-S13**	**DD-S16**	**DD-S20**	**DD-S21**	**DD-S22**
Upper Sample Depth (inches below surface):	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Lower Sample Depth (inches below surface):	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Sample Date (year-month-day):	**2015-05-14**	**2015-05-14**	**2015-05-14**	**2015-05-14**	**2015-05-14**	**2015-05-14**	**2015-05-14**	**2015-05-14**	**2015-05-14**	**2015-05-14**
Metals (mg/kg)										
Arsenic	13 U	21	11 U	--	--	--	--	160	33	39
Cadmium	--	--	--	--	--	--	--	--	--	--
Chromium	--	--	--	--	--	--	--	--	--	--
Copper	--	--	--	--	--	--	--	--	--	--
Lead	8.1	35	23	--	--	--	--	1600	410	460
Mercury	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--
Selenium	--	--	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--	--	--
Zinc	--	--	--	--	--	--	--	--	--	--
TCLP (mg/L)										
Lead	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (mg/kg)										
1-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	1.2	0.06	0.0071 U	0.0074 U	0.049	0.016	0.52	0.59	0.24	0.24
Benzo(a)pyrene	1.5	0.083	0.0071 U	0.0074 U	0.044	0.017	0.64	0.65	0.29	0.29
Benzo(b)fluoranthene	2.6	0.13	0.0077	0.0083	0.07	0.018	0.92	0.89	0.47	0.42
Benzo(ghi)perylene	--	--	--	--	--	--	--	--	--	--
Benzo(j,k)fluoranthene	0.66	0.046	0.0071 U	0.0074 U	0.021	0.015 U	0.31	0.25	0.13	0.15
Chrysene	1.3	0.083	0.0071 U	0.0074 U	0.076	0.015 U	0.69	0.6	0.36	0.31
Dibenzo(a,h)anthracene	0.4	0.021	0.0071 U	0.0074 U	0.0077 U	0.015 U	0.11	0.1	0.052	0.052
Fluoranthene	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	1.7	0.064	0.0071 U	0.0074 U	0.019	0.015 U	0.39	0.39	0.17	0.17
Naphthalene	--	--	--	--	--	--	--	--	--	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--
Pyrene	--	--	--	--	--	--	--	--	--	--
Total LMW PAHs[a]	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs[b]	8.96	0.466	0.0077	0.0083	0.279	0.051	3.47	3.37	1.66	1.58
Total cPAHs (calculated) - human health toxicity[c]	9.36	0.49	0.01	0.01	0.28	0.05	3.58	3.47	1.71	1.63
Total cPAH TEQ (calculated) - human health toxicity[d]	**2.17**	**0.12**	0.01	0.01	0.06	0.02	**0.87**	**0.88**	**0.40**	**0.40**
Total PAHs (calculated)	9.36	0.49	0.01	0.01	0.28	0.05	3.58	3.47	1.71	1.63
Petroleum Hydrocarbons (mg/kg)										
Lube Oil	--	--	--	--	--	--	--	--	--	--
Diesel Range Organics	--	--	--	--	--	--	--	--	--	--

Footnotes:

a. LMW PAHs include: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene. Fluoranthene treated as LPAH, following NPS guidelines for an NPS site. This differs from SCUM (2019) guidance, which treats fluoranthene as an HPAH.

b. HMW PAHs inclue: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Pyrene. Benzo(j,k)fluoranthene was treated as Benzo(k)fluoranthene for comparison purposes.

c. cPAHs include: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene.

d. Individual analyte TEQs are calculated by multiplying toxicity equivalency factor (TEF; SCUM, 2019) by the detected concentration. For non-detects, TEF is multiplied by half the reporting limit. All analyte TEQs are summed to produce the Total cPAH TEQ calculated value.

bold Analyte detected above the lowest or most restrictive screening level

Acronyms:

mg/kg	milligrams per kilogram	TEQ	Toxicity Equivalents
mg/L	milligrams per liter	ND	Compound non detected
LMW	Low molecular weight	TCLP	Toxicity characteristic leachating procedure
HMW	High molecular weight	U	Analytical result not detected at the listed reporting level
PAH	Polycyclic aromatic hydrocarbons	--	Sample not analyzed
cPAH	Carcinogenic polycyclic aromatic hydrocarbon	-	Screening Level not available

Geosyntec consultants

Table 2b. Summary of Historical Sediment Data
Diablo Dry Dock Site
EE/CA SAP

Constituent										
Sample Location:	**DD-S2**	**DD-S2-3-6"**	**DD-S2-6-12"**	**DD-SD1**	**DD-SD2**	**DD-SD3**	**DD-SD4**	**DD-SD5**	**DD-SD7**	**DD-SD8**
Sample Depth (inches below sediment surface):	**0**	**3**	**6**	**0**	**0**	**0**	**0**	**72**	**31**	**101**
Sample Depth (inches below sediment surface):	**4**	**6**	**12**	**4**	**4**	**4**	**4**	**(c)**	**(c)**	**(c)**
Sample Date (year-month-day):	**2014-09-16**	**2015-05-15**	**2015-05-15**	**2014-09-17**	**2014-09-17**	**2014-09-17**	**2014-09-17**	**2014-09-17**	**2014-09-17**	**2014-09-17**
Conventionals (mg/kg)										
Ammonia	--	--	--	--	--	--	--	--	--	--
Total Sulfides	--	--	--	--	--	--	--	--	--	--
Total Organic Carbon (%)	--	--	--	--	--	--	--	--	--	--
Metals (mg/kg)										
Arsenic	19 U	--	--	**26**	20 U	19 U	13 U	13 U	13 U	13 U
Cadmium	0.95 U	--	--	1.5 U	0.98 U	0.95 U	0.66 U	1.3 U	1.3 U	1.3 U
Chromium	**47**	--	--	**58**	**62**	**53**	23	**63**	**64**	**65**
Copper	**140**	--	--	**120**	**49**	**36**	17	**59**	**62**	**50**
Lead	**140**	--	--	**91**	11	9.5 U	6.6 U	13 U	15	13 U
Mercury	0.48 U	--	--	0.74 U	0.49 U	0.47 U	0.33 U	0.67 U	0.67 U	0.63 U
Nickel	**31**	--	--	**36**	**38**	**31**	15	**41**	**43**	**39**
Selenium	19 U	--	--	30 U	20 U	19 U	13 U	27 U	27 U	25 U
Silver	1.9 U	--	--	3 U	2 U	1.9 U	1.3 U	2.7 U	2.7 U	**6.4**
Zinc	**260**	--	--	**240**	**140**	**120**	56	**140**	**150**	**150**
Polycyclic Aromatic Hydrocarbons (mg/kg)										
1-Methylnaphthalene	--	0.0097 U	0.009 U	--	--	--	--	--	--	--
2-Methylnaphthalene	--	0.0097 U	0.009 U	--	--	--	--	--	--	--
Acenaphthene	--	0.0097 U	0.009 U	--	--	--	--	--	--	--
Acenaphthylene	--	0.033	0.016	--	--	--	--	--	--	--
Anthracene	--	**0.047**	**0.023**	--	--	--	--	--	--	--
Benzo(a)anthracene	**0.38**	**0.15**	**0.1**	--	--	--	--	--	--	--
Benzo(a)pyrene	**0.37**	**0.12**	**0.089**	--	--	--	--	--	--	--
Benzo(b)fluoranthene	**0.52**	**0.46**	**0.25**	--	--	--	--	--	--	--
Benzo(ghi)perylene	--	**0.074**	**0.05**	--	--	--	--	--	--	--
Benzo(j,k)fluoranthene	**0.29**	0.11	0.064	--	--	--	--	--	--	--
Chrysene	**0.67**	**0.49**	**0.26**	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	**0.09**	0.018	0.014	--	--	--	--	--	--	--
Fluoranthene	--	**0.91**	**0.38**	--	--	--	--	--	--	--
Fluorene	--	**0.011**	0.009 U	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	**0.2**	**0.072**	**0.047**	--	--	--	--	--	--	--
Naphthalene	--	0.0097 U	0.009 U	--	--	--	--	--	--	--
Phenanthrene	--	**0.21**	**0.078**	--	--	--	--	--	--	--
Pyrene	--	**0.82**	**0.36**	--	--	--	--	--	--	--
Total LMW PAHs[b]	--	**1.21**	**0.50**	--	--	--	--	--	--	--
Total HMW PAHs[c]	**2.43**	**2.296**	**1.22**	--	--	--	--	--	--	--
Total cPAHs (calculated) - human health toxicity[d]	2.52	1.42	0.824	--	--	--	--	--	--	--
Total cPAH TEQ (calculated) - human health toxicity[e]	0.52	0.41	0.28	--	--	--	--	--	--	--
Total PAHs (calculated)	2.52	3.53	1.73	--	--	--	--	--	--	--
Petroleum Hydrocarbons (mg/kg)										
TPH - Lube Oil	220	--	--	2200	130	280	66 U	470	390	490
TPH - Diesel Range Organics	48 U	--	--	120	49 U	53 U	33 U	67 U	67 U	63 U
TPH - Residual Range Organics	--	--	--	--	--	--	--	--	--	--

Footnotes:

a. Sample depth provided in Hart Crowser (2016) as depth below water surface. Bottom depth below water surface not provided.

b. LMW PAHs include: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene. Fluoranthene treated as LPAH, following NPS guidelines for an NPS site. This differs from SCUM (2019) guidance, which treats fluoranthene as an HPAH.

c. HMW PAHs inclue: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Pyrene. Benzo(j,k)fluoranthene was treated as Benzo(k)fluoranthene for comparison purposes.

d. cPAHs include: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene.

e. Individual analyte TEQs are calculated by multiplying toxicity equivalency factor (TEF; SCUM, 2019) by the detected concentration. For non-detects, TEF is multiplied by half the reporting limit. All analyte TEQs are summed to produce the Total cPAH TEQ calculated value.

Acronyms:

mg/kg	milligrams per kilogram
COPEC	Chemical of potential ecological concern
cPAH	Carcinogenic polycyclic aromatic hydrocarbon
ESV	Ecological screening value
HMW	High molecular weight
LMW	Low molecular weight
PAH	Polycyclic aromatic hydrocarbons
SLERA	Screening level ecological risk assessment
TPH	Total petroleum hydrocarbon
--	Sample not analyzed
TEQ	Toxicity Equivalents

Table 3a. Screening Levels for Soil
Diablo Dry Dock Site
EE/CA SAP

	National Park Service Guidance Document for Ecological ESVs[a]														LANL Plant geomean SLs	MTCA Soil Cleanup Levels[b]				Background			
	Terrestrial Plants				Soil Invertebrates				Selected NPS Screening Levels[a]														
Constituent of Potential Concern	Eco-SSL Plants (1)	ORNL Plants (2)	LANL Plants No Effect ESL (3)	EPA Region 5 ESL (4)	Eco SSL (5)	ORNL (6)	LANL No Effect ESL (3)	EPA Region 5 ESLs (4)	SLERA COPEC Selection ESVs	Source	Refined SLERA ESVs Terrestrial Plant	Source	Refined SLERA ESVs Soil Invertebrate	Source		Soil Method A Unrestricted Land Use	Soil Method B Noncancer	Soil Method B Cancer	Soil Protective of Groundwater Vadose (13 degrees C)	Natural Background Statewide mean[c]	Natural Background Whatcom County mean[c]	USGS Background Area D N. Cascades mean[d]	SCST Natural Background[e]
Metals (mg/kg)																							
Arsenic	18	10	18	--	--	60	6.8	--	6.8	(3)	18	(1)	60	(6)	40.47	20	24	0.67	2.9	3.82	3.49	3.9-13	9.6-18
Cadmium	32	4	32	--	140	20	140	--	4.0	(2)	32	(1)	140	(3)	71.55	2	80	-	0.69	0.63	--	<2	--
Chromium[f]	--	1	0.35	--	--	0.4	0.34	0.4	0.34	(3)	1	(2)	0.4	(6)	1.18	-	-	-	--	23.37	37.74	130-340	--
Copper	70	100	70	--	80	50	80	--	50	(6)	70	(1)	80	(5)	185.2	-	3200	-	280	20.46	21.24	13-68	--
Lead	120	50	120	--	1700	500	1700	--	50	(2)	120	(1)	1700	(3)	261.53	250	-	-	3000	10.05	5.63	7-11	6.9-18
Mercury	--	0.3	34	--	--	0.1	0.05	0.1	0.05	(3)	0.3	(2)	0.1	(6)	46.65	2	-	-	2.1	--	0.05	0.06-0.38	--
Nickel	38	30	38	--	280	200	280	--	30	(2)	38	(1)	280	(3)	101.29	-	1600	-	130	21.49	25.66	66-120	6.1-24
Selenium	0.52	1	0.52	--	4.1	70	4.1	--	0.52	(3)	0.52	(1)	4.1	(3)	1.25	-	400	-	5.2	--	--	0.1-0.7	--
Silver	560	2	560	--	--	--	--	--	2	(2)	560	(1)	-	--	1252.2	-	400	-	14	--	--	<2	--
Zinc	160	50	160	--	120	200	120	6.6	6.6	(4)	160	(1)	120	(3)	360	-	24000	-	6000	55.53	48.41	89-130	17-100
Polycyclic Aromatic Hydrocarbons (mg/kg)																							
1-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-	-	-	-	--	--	--	--
2-Methylnaphthalene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-	-	-	-	--	--	--	--
Acenaphthene	--	20	0.25	--	--	--	--	--	0.25	(3)	20	(2)	--	--	0.71	-	-	-	98	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-	-	-	-	--	--	--	--
Anthracene	--	--	6.8	--	--	--	--	--	6.8	(3)	6.8	(3)	--	--	7.82	-	-	-	-	--	--	--	--
Benzo(a)anthracene	--	--	18	--	--	--	--	--	18	(3)	18	(3)	--	--	56.92	-	-	-	-	--	--	--	--
Benzo(a)pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.1	24	0.19	3.9	--	--	--	--
Benzo(b)fluoranthene	--	--	18	--	--	--	--	--	18	(3)	18	(3)	--	--	56.92	-	-	-	-	--	--	--	--
Benzo(ghi)perylene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-	-	-	-	--	--	--	--
Benzo(j,k)fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-	-	-	-	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-	-	-	-	--	--	--	--
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-	-	-	-	--	--	--	--
Fluoranthene	--	--	--	--	--	--	10	--	10	(3)	--	--	10	(3)	--	-	-	-	630	--	--	--	--
Fluorene	--	--	--	--	--	30	3.7	--	3.7	(3)	--	--	30	(6)	--	-	-	-	100	--	--	--	--
Indeno(1,2,3-cd)pyrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-	-	-	-	--	--	--	--
Naphthalene	--	--	1	--	--	--	--	--	1	(3)	1	(3)	--	--	3.16	-	-	-	4.5	--	--	--	--
Phenanthrene	--	--	--	--	--	--	5.5	--	5.5	(3)	--	--	5.5	(3)	--	-	-	-	-	--	--	--	--
Pyrene	--	--	--	--	--	--	10	--	10	(3)	--	--	10	(3)	--	-	-	-	650	--	--	--	--
Total LMW PAHs[g]	--	--	--	--	29	--	--	--	29	(5)	--	--	29	(5)	--	-	-	-	-	--	--	--	--
Total HMW PAHs[h]	--	--	--	--	18	--	--	--	18	(5)	--	--	18	(5)	--	-	-	-	-	--	--	--	--
Total cPAHs[i]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.1	0.19	-	-	--	--	--	--
Petroleum Hydrocarbons (mg/kg)																							
TPH - Lube Oil	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-	-	-	-	--	--	--	--
TPH - Diesel Range Organics	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2000	-	-	2000	--	--	--	--
Pesticides (mg/kg)																							
1,2-Dibromo-3-chloropropane (DBCP)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	16	1.3	--	--	--	--	--
4,4´-DDD (Dichlorodiphenyldichloroethane)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.4	4.2	0.34	--	--	--	--
4,4´-DDE (Dichlorodiphenyldichloroethylene)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	24	2.9	0.45	--	--	--	--
4,4´-DDT (Dichlorodiphenyltrichloroethane)	--	--	4.1	--	--	--	--	--	4.1	(3)	4.1	(3)	--	--	4.96	3	40	2.9	3.5	--	--	--	--
Aldrin	--	--	--	0.0033	--	--	--	--	0.0033	(4)	--	--	--	--	--	--	2.4	0.059	0.0025	--	--	--	--
alpha-BHC (alpha-Hexachlorocyclohexane or alpha-HCH)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
beta-BHC (beta-Hexachlorocyclohexane or beta-HCH)	--	--	--	0.0040	--	--	--	--	0.0040	(4)	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlordane	--	--	--	0.22	--	--	--	--	0.22	(4)	--	--	--	--	--	--	40	2.9	2.1	--	--	--	--
Chlorobenzilate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1600	9.1	--	--	--	--	--
cis-Chlordane	--	--	2.2	--	--	--	--	--	2.2	(3)	2.2	(3)	--	--	6.96	--	--	--	--	--	--	--	--
delta-BHC (delta-Hexachlorocyclohexane or delta-HCH)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diallate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	16	--	--	--	--	--	--
Dieldrin	--	--	10	--	--	--	--	--	10	(3)	10	(3)	--	--	31.62	--	4	0.063	0.0028	--	--	--	--
Endosulfan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	480	--	4.3	--	--	--	--
Endosulfan I	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan II	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan sulfate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	480	--	--	--	--	--	--
Endrin	--	--	0.0034	--	--	--	--	--	0.0034	(3)	0.0034	(3)	--	--	0.01	--	24	--	0.44	--	--	--	--
Endrin aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
gamma-BHC (Lindane)	--	--	0.10	0.0050	--	--	--	--	0.005	(4)	0.1	(3)	--	--	0.32	--	--	--	--	--	--	--	--
Heptachlor	--	--	0.40	--	--	--	--	--	0.4	(3)	0.4	(3)	--	--	1.26	--	40	0.22	0.038	--	--	--	--
Heptachlor epoxide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	0.11	0.08	--	--	--	--
Isodrin	--	--	--	0.0033	--	--	--	--	0.0033	(4)	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	400	--	64	--	--	--	--
Toxaphene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.2	0.91	1.5	--	--	--	--
trans-Chlordane	--	--	2.2	--	--	--	--	--	2.2	(3)	2.2	(3)	--	--	6.96	--	--	--	--	--	--	--	--

Footnotes:

a. National Park Service (NPS; 2018) NPS Protocol for the Selection and Use of Ecological Screening Values for Non-radiological Analytes. Prepared by National Park Service Contaminants Cleanup Branch (CCB). November 2018.
b. Ecology (2020) CLARC Mater Data Table. Available at: https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC/Data-tables. Downloaded August 2020.
c. Ecology (1994) Natural Background Soil Metals Concentrations in Washington State, Ecology Publication No. 94-115, available at https://fortress.wa.gov/ecy/publications/summarypages/94115.html
d. Ames, K.C. and E.A. Prych (1995) Background Concentrations of Metals in Soils from Selected Regions in the State of Washington. U.S. Geological Survey, Water-Resources Investigations Report 95-4018.
e. SCL Newhalen (2018) Background Locations Soil XRF and Analytical Results
f. Cr(VI) values are reported for the LANL Plant geomean SLs (column Q)
g. LMW PAHs include: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene. Fluoranthene treated as LPAH, following NPS guidelines for an NPS site. This differs from SCUM (2019) guidance, which treats fluoranthene as an HPAH.
h. HMW PAHs inclue: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Pyrene. Benzo(j,k)fluoranthene was treated as Benzo(k)fluoranthene for comparison purposes.
i. cPAHs include: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene.

Sources:

(1) Soil ecological screening values for plants from USEPA Eco SSLs available at: https://www.epa.gov/chemical-research/ecological-soil-screening-level
(2) Efroymson et al. (1997) Toxicological Benchmarks for Screening Chemicals of Potential Concern for Effects on Terrestrial Plants: 1997 Revision
(3) LANL, September 2017. “ECORISK Database (Release 4.1),” LA-UR-17-26376, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2017, 602538)
(4) USEPA, Region 5, RCRA. 2003. Ecological Screening Levels. https://epa.gov/region5/waste/cars/pdfs/ecological-screening-levels-200308.pdf
(5) Soil ecological screening values for invertebrates from USEPA Eco SSLs available at: https://www.epa.gov/chemical-research/ecological-soil-screening-level
(6) Efroymson et al. (1997) Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision

Acronyms:

mg/kg	milligrams per kilogram	ESL	Ecological screening level	PAH	Polycyclic aromatic hydrocarbons
COPEC	Chemical of potential ecologica	ESV	Ecological screening value	cPAH	Carcinogenic polycyclic aromatic hydrocarbon
SLERA	Screening level ecological risk	MTCA	Model Toxins Control Act	SSL	Soil screening level
LANL	Los Alamos National Laborator	USGS	United States Geological Surv	SCST	Southern California soil and testing
ORNL	Oak Ridge National Laboratory	HMW	High molecular weight	TPH	Total petroleum hydrocarbon
EPA	Environmental Protection Ager	LMW	Low molecular weight	--	Screening Level not available

Table 3b. Screening Levels for Sediments
Diablo Dry Dock Site
EE/CA SAP

	Freshwater Sediment Ecological Screening Values from Approved Sources[a]							NPS Selected Screening Levels[a]						Freshwater Sediment SMS[b, c]		Washington State Regional Background[d]					
	Threshold Effect Based ESVs				Probable Effect Based ESVs																
Consituent of Potential Concern	Consensus TEC (mg/kg dw) (1)	Ingersoll TEL (mg/kg) (2)	No Effect ESL (3)	EqP (mg/kg) (4)	Consensus PEC (mg/kg dw) (5)	Ingersoll PEL (mg/kg) (6)	LANL Low Effect ESL (7)	SLERA ESV	Source	SLERA Threshold Effects ESV	Source	SLERA Probable Effects ESV	Source	SCO[d]	CSL[d]	Port Gardner Bay (marine)	North Olympic Peninsula (marine)	Port Angeles (marine)	Bellingham Bay (marine)	South Puget Sound (marine)	Lake Washington (freshwater)
Conventionals																					
Ammonia	--	--	--	--	--	--	--	--	--	--	--	--	--	230	300	--	--	--	--	--	--
Total Sulfides	--	--	--	--	--	--	--	--	--	--	--	--	--	39	61	--	--	--	--	--	--
Total Organic Carbon (%)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (mg/kg)																					
Arsenic	9.8	11	9.7	--	33	48	33	9.7	(3)	9.8	(1)	33	(5)	14	120	12	14	14	--	--	--
Cadmium	0.99	0.58	0.99	--	5	3.3	4.9	0.58	(2)	0.99	(3)	5	(5)	2.1	5.4	0.52	2.4	--	--	--	--
Chromium	43	36	43	--	111	119	110	36	(2)	43	(3)	111	(5)	72	88	--	--	--	--	--	--
Copper	32	28	31	--	149	101	140	28	(2)	32	(1)	149	(5)	400	1200	--	--	--	--	--	--
Lead	36	37	35	--	128	82	120	35	(3)	36	(1)	128	(5)	360	1300	--	--	--	16	--	--
Mercury	0.18	--	0.18	--	1.1	--	1	0.18	(1)	0.18	(1)	1.1	(5)	0.66	0.8	0.14	0.13	0.13	--	--	--
Nickel	23	20	22	--	49	33	48	20	(2)	23	(1)	49	(5)	26	110	--	--	--	--	--	--
Selenium	--	--	0.72	--	--	--	2.9	0.72	(3)	0.72	(3)	2.9	-3	11	20	--	--	--	--	--	--
Silver	--	--	0.5	--	--	--	5	0.5	(3)	0.5	(3)	5	-3	0.57	1.7	--	--	--	--	--	--
Zinc	121	98	120	--	459	543	450	98	(2)	121	(1)	459	(5)	3200	4200	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (mg/kg)																					
1-Methylnaphthalene	--	--	--	--	--	--	--	-	--	-	--	-		-	-	--	--	--	--	--	--
2-Methylnaphthalene	--	--	0.076	--	--	--	0.76	0.076	(3)	0.076	(3)	0.76	-3	-	-	--	--	--	--	--	--
Acenaphthene	--	--	0.076	--	--	--	0.76	0.076	(3)	0.076	(3)	0.76	-3	-	-	--	--	--	--	--	--
Acenaphthylene	--	--	0.076	--	--	--	0.76	0.076	(3)	0.076	(3)	0.76	-3	-	-	--	--	--	--	--	--
Anthracene	0.057	0.01	0.057	--	0.85	0.17	0.57	0.01	(1)	0.057	(1)	0.85	(5)	-	-	--	--	--	--	--	--
Benzo(a)anthracene	0.11	0.015	0.1	--	1.1	0.29	1	0.015	(2)	0.11	(1)	1.1	(5)	-	-	--	--	--	--	--	--
Benzo(a)pyrene	0.15	0.032	0.15	--	1.5	0.32	1.4	0.032	(2)	0.15	(1)	1.5	(5)	-	-	--	--	--	--	--	--
Benzo(b)fluoranthene	--	--	0.19	--	--	--	1.9	0.19	(3)	0.19	(3)	1.9	-3	-	-	--	--	--	--	--	--
Benzo(ghi)perylene	--	0.016	0.17	--	--	0.25	1.7	0.016	(2)	0.016	(2)	0.25	(6)	-	-	--	--	--	--	--	--
Benzo(j,k)fluoranthene	--	--	0.24	--	--	--	2.4	0.24	(3)	0.24	(3)	2.4	(3)	-	-	--	--	--	--	--	--
Chrysene	0.17	0.026	0.16	--	1.3	0.41	1.2	0.026	(2)	0.17	(1)	1.3	(5)	-	-	--	--	--	--	--	--
Dibenzo(a,h)anthracene	0.033	--	0.033	--	--	--	0.33	0.033	(1)	0.033	(1)	0.33	(3)	-	-	--	--	--	--	--	--
Fluoranthene	0.42	0.031	0.42	--	2.2	0.32	2.2	0.031	(2)	0.42	(1)	2.2	-3	-	-	--	--	--	--	--	--
Fluorene	0.077	0.01	0.077	--	0.54	0.15	0.53	0.01	(2)	0.077	(1)	0.54	(5)	-	-	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	--	0.017	0.2	--	--	0.24	2	0.017	(2)	0.017	(2)	0.24	(6)	-	-	--	--	--	--	--	--
Naphthalene	0.18	0.014	0.17	--	0.56	0.14	0.56	0.014	(2)	0.18	(1)	0.56	(5)	-	-	--	--	--	--	--	--
Phenanthrene	0.2	0.019	0.2	--	1.2	0.41	1.1	0.019	(2)	0.2	(1)	1.2	(5)	-	-	--	--	--	--	--	--
Pyrene	0.2	0.044	0.19	--	1.5	0.49	1.5	0.044	(2)	0.2	(1)	1.5	(5)	-	-	--	--	--	--	--	--
Total LMW PAHs[e]	--	0.076	--	--	--	1.2	--	0.076	(2)	0.076	(2)	1.2	(6)	-	-	--	--	--	--	--	--
Total HMW PAHs[f]	--	0.19	--	--	--	2.3	--	0.19	(2)	0.19	(2)	2.3	(6)	-	-	--	--	--	--	--	--
Total cPAHs[g]	--	--	--	--	--	--	--	-	-	-	-	-	-	-	-	--	--	--	--	--	--
Total cPAH TEQ (calculated)[h]	--	--	--	--	--	--	--	-	-	-	-	-	-	-	-	56	31	64	86	78	210
Petroleum Hydrocarbons (mg/kg)																					
TPH - Lube Oil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	--	--	--	--
TPH - Diesel Range Organics	-	-	-	-	-	-	-	-	-	-	-	-	-	340	510	--	--	--	--	--	--
TPH - Residual Range Organics	-	-	-	-	-	-	-	-	-	-	-	-	-	3600	4400	--	--	--	--	--	--
Pesticides (mg/kg)																					
1,2-Dibromo-3-chloropropane (DBCP)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4´-DDD (Dichlorodiphenyldichloroethane)	0.0049	--	--	--	0.028	--	--	0.0049	(1)	0.0049	(1)	0.028	(5)	0.31	0.86	--	--	--	--	--	--
4,4´-DDE (Dichlorodiphenyldichloroethylene)	0.0032	--	0.0031	--	0.031	--	0.031	0.0031	(3)	0.0032	(1)	0.031	(5)	0.021	0.033	--	--	--	--	--	--
4,4´-DDT (Dichlorodiphenyltrichloroethane)	0.0042	--	0.0041	--	0.063	--	0.041	0.0041	(3)	0.0042	(1)	0.063	(5)	0.1	8.1	--	--	--	--	--	--
Aldrin	--	--	--	7.4	--	--	--	7.4	(4)	7.4	(4)	--	--	--	--	--	--	--	--	--	--
alpha-BHC (alpha-Hexachlorocyclohexane or alpha-HC	--	--	--	0.027	--	--	--	0.027	(4)	0.027	(4)	--	--	--	--	--	--	--	--	--	--
beta-BHC (beta-Hexachlorocyclohexane or beta-HCH)	--	--	0.0050	0.028	--	--	0.050	0.0050	(3)	0.005	(3)	0.05	(3)	0.0072	0.011	--	--	--	--	--	--
Carbazole	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlordane	0.0032	--	--	--	0.018	--	--	0.0032	(1)	0.0032	(1)	0.018	(5)	--	--	--	--	--	--	--	--
Chlorobenzilate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-Chlordane	--	--	0.0032	--	--	--	0.017	0.0032	(3)	0.0032	(3)	0.017	(3)	--	--	--	--	--	--	--	--
delta-BHC (delta-Hexachlorocyclohexane or delta-HCH	--	--	--	0.14	--	--	--	0.14	(4)	0.14	(4)	--	--	--	--	--	--	--	--	--	--
Diallate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	0.0019	--	0.0019	--	0.062	--	0.019	0.0019	(1)	0.0019	(1)	0.062	(5)	0.0049	0.0093	--	--	--	--	--	--
Endosulfan I	--	--	--	0.0000064	--	--	--	0.0000064	(4)	0.0000064	(4)	--	--	--	--	--	--	--	--	--	--
Endosulfan II	--	--	--	0.0000064	--	--	--	0.0000064	(4)	0.0000064	(4)	--	--	--	--	--	--	--	--	--	--
Endosulfan sulfate	--	--	--	0.0000064	--	--	--	0.0000064	(4)	0.0000064	(4)	--	--	--	--	--	--	--	--	--	--
Endrin	0.0022	--	0.0022	--	0.21	--	0.022	0.0022	(1)	0.0022	(1)	0.21	(5)	--	--	--	--	--	--	--	--
Endrin aldehyde	--	--	--	0.0044	--	--	--	0.0044	(4)	0.0044	(4)	--	--	--	--	--	--	--	--	--	--
Endrin ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0085	--	--	--	--	--	--	--
gamma-BHC (Lindane)	0.0024	--	0.0023	--	0.0050	--	0.0049	0.0023	(3)	0.0024	(1)	0.0050	(5)	--	--	--	--	--	--	--	--
Heptachlor	--	--	0.0024	0.054	--	--	0.016	0.0024	(3)	0.0024	(3)	0.016	(3)	--	--	--	--	--	--	--	--
Heptachlor epoxide	0.0025	--	--	--	0.016	--	--	0.0025	(1)	0.0025	(1)	0.016	(5)	--	--	--	--	--	--	--	--
Isodrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methoxychlor	--	--	0.030	0.019	--	--	0.30	0.019	(4)	0.03	(3)	0.3	(3)	--	--	--	--	--	--	--	--
Toxaphene	--	--	0.00010	0.00051	--	--	0.0010	0.00010	(3)	0.00010	(3)	0.001	(3)	--	--	--	--	--	--	--	--
trans-Chlordane	--	--	0.0032	--	--	--	0.017	0.0032	(3)	0.0032	(3)	0.017	(3)	--	--	--	--	--	--	--	--

Footnotes:

a. National Park Service (NPS; 2018) NPS Protocol for the Selection and Use of Ecological Screening Values for Non-radiological Analytes. Prepared by National Park Service Contaminants Cleanup Branch (CCB). November 2018.
b. Ecology (2013) Sediment Management Standards. Chapter 173-204 WAC. Toxics Cleanup Program. Publication no. 13-09-055. September.
c. Ecology (2020) CLARC Mater Data Table. Available at: https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC/Data-tables. Downloaded August 2020.
d. Ecology (2019) Sediment Cleanup User's Manual. Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards, Chapter 173-204 WAC. Publication No. 12-09-057. December 2019
e. LMW PAHs include: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene. Fluoranthene treated as LPAH, following NPS guidelines for an NPS site. This differs from SCUM (2019) guidance, which treats fluoranthene as an HPAH.
f. HMW PAHs inclue: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Pyrene. Benzo(j,k)fluoranthene was treated as Benzo(k)fluoranthene for comparison purposes.
g. cPAHs include: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene.
h. Individual analyte TEQs are calculated by multiplying toxicity equivalency factor by the detected concentration[d]. For non-detects, TEF is multiplied by half the reporting limit. All analyte TEQs are summed to produce the Total cPAH TEQ calculated value.

Sources:

(1) MacDonald et al. (2000); consensus-based threshold effect concentration (TEC).
(2) Ingersoll, et al. (1996); Threshold Effect Level (TEL) for total extraction of sediment (BT) samples from *Hyalella azteca* 28-day (HA28) tests.
(3) LANL (Los Alamos National Laboratory), September 2017. "ECORISK Database (Release 4.1)," LA-UR-17-26376, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2017, 602538)
(4) National Park Service (2018) NPS Protocol for the Selection and Use of Ecological Screening Values for Non-radiological Analytes. Prepared by National Park Service Contaminants Cleanup Branch (CCB). November 2018. Section 2.3.1
(5) MacDonald et al. (2000); consensus-based probable effect concentration (PEC).
(6) Ingersoll, et al. (1996); Probable Effect Level (PEL) for total extraction of sediment (BT) samples from *Hyalella azteca* 28-day (HA28) tests.

Acronyms:

mg/kg	milligrams per kilogram	ESV	Ecological screening value	SCO	Sediment Cleanup Objective
ARCS	Assessment and Remediation of Contaminated Sediments	HMW	High molecular weight	SLERA	Screening level ecological risk assessment
CASRN	Chemical Abstracts Service Registry Number	LANL	Los Alamos National Laboratory	SMS	Sediment Management Standards
COPEC	Chemical of potential ecological concern	LMW	Low molecular weight	TEC	Threshold effect concentration
cPAH	Carcinogenic polycyclic aromatic hydrocarbon	NOAA	National Oceanic and Atmospheric Administration	TEL	Threshold effect level
CSL	Cleanup Screening Levels	NPS	National Park System	TEQ	Toxicity Equivalents
dw	Dry weight	PAH	Polycyclic aromatic hydrocarbons	TOC	Total organic carbon
EqP	Equilibrium partitioning	PEC	Probable effect concentration	TPH	Total petroleum hydrocarbon
ESL	Ecological screening level	PEL	Probable effect level	--	Screening Level not available

Table 4. Preliminary Chemicals of Potential Concern
Diablo Dry Dock Site
EE/CA SAP

Soil		
Category	***Chemical of Potential Concern***	***Basis***
Metals	Arsenic	Exceeds lowest SL
	Cadmium	Exceeds lowest SL
	Chromium	Exceeds lowest SL
	Copper	Exceeds lowest SL
	Lead	Exceeds lowest SL
	Mercury	Exceeds lowest SL
	Nickel	Exceeds lowest SL
	Zinc	Exceeds lowest SL
PAHs	Benzo(a)pyrene	Exceeds lowest SL
TPH	Lube oil	Site History
	Deisel range	Site History
Pesticides	TBD	Site History
Sediment		
Category	***Chemical of Potential Concern***	***Basis***
Metals	Arsenic	Exceeds lowest SL
	Chromium	Exceeds lowest SL
	Copper	Exceeds lowest SL
	Lead	Exceeds lowest SL
	Nickel	Exceeds lowest SL
	Silver	Exceeds lowest SL
	Zinc	Exceeds lowest SL
PAHs	Anthracene	Exceeds lowest SL
	Benzo(a)anthracene	Exceeds lowest SL
	Benzo(a)pyrene	Exceeds lowest SL
	Benzo(b)fluoranthene	Exceeds lowest SL
	Benzo(g,h,i)perylene	Exceeds lowest SL
	Benzo(j,k)fluoranthene	Exceeds lowest SL
	Chrysene	Exceeds lowest SL
	Dibenzo(a,h)anthracene	Exceeds lowest SL
	Fluoranthene	Exceeds lowest SL
	Fluorene	Exceeds lowest SL
	Indeno(1,2,3-cd)pyrene	Exceeds lowest SL
	Phenanthrene	Exceeds lowest SL
	Pyrene	Exceeds lowest SL
	Total HMW PAHs	Exceeds lowest SL
Pesticides	TBD	Site History

Acronyms:

SL Screening level
TBD To be determined
PAHs Polycyclic aromatic hydrocarbons
TPH Total petroleum hydrocarbon
HMW High molecular weight

Table 5a. Soil - Selected Screening Levels
Diablo Dry Dock Site
EE/CA SAP

Constituent	A. SLERA COPEC ESV[a]	B. SLERA ESVs Terrestrial Plant[a]	C. SLERA ESVs Soil Invertebrate[a]	D. Soil Method A Unrestricted Land Use[b]	E. Soil Method B Noncancer[b]	F. Soil Method B Cancer[b]	G. Soil Protective of Groundwater Vadose (13 degrees C)[b]	Selected SL
Metals (mg/kg)								
Arsenic	6.8	18	60	20	24	0.67	2.9	F
Cadmium	4.0	32	140	2	80	-	0.69	G
Chromium	0.34	1	0.4	-	-	-	-	A
Copper	50	70	80	-	3200	-	280	A
Lead	50	120	1700	250	-	-	3000	A
Mercury	0.05	0.3	0.1	2	-	-	2.1	A
Nickel	30	38	280	-	1600	-	130	A
Selenium	0.52	0.52	4.1	-	400	-	5.2	A; B
Silver	2	560	-	-	400	-	14	A
Zinc	6.6	160	120	-	24000	-	6000	A
TCLP (mg/L)								
Lead	-	-	-	-	-	-	-	
Polycyclic Aromatic Hydrocarbons (mg/kg)								
1-Methylnaphthalene	-	-	-	-	5600	34	-	F
2-Methylnaphthalene	-	-	-	-	320	-	-	E
Acenaphthene	0.25	20	-	-	4800	-	98	A
Acenaphthylene	-	-	-	-	-	-	-	-
Anthracene	6.8	6.8	-	-	24000	-	-	A; B
Benzo(a)anthracene	18	18	-	-	-	-	-	A; B
Benzo(a)pyrene	-	-	-	0.1	24	0.19	3.9	D
Benzo(b)fluoranthene	18	18	-	-	-	-	-	A; B
Benzo(ghi)perylene	-	-	-	-	-	-	-	-
Benzo(j,k)fluoranthene	-	-	-	-	-	-	-	-
Chrysene	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	-	-	-	-	-	-	-	-
Fluoranthene	10	-	10	-	3200	-	630	A; C
Fluorene	3.7	-	30	-	3200	-	100	A
Indeno(1,2,3-cd)pyrene	-	-	-	-	-	-	-	-
Naphthalene	1.0	1.0	-	5	1600	-	4.5	A;B
Phenanthrene	5.5	-	5.5	-	-	-	-	A; C
Pyrene	10	-	10	-	2400	-	650	A; C
Total LMW PAHs[c]	29	-	29	-	-	-	-	A; C
Total HMW PAHs[d]	18	-	18	-	-	-	-	A; C
Total cPAHs (calculated) - human health toxicity[e]	-	-	-	-	-	-	-	-
Total cPAH TEQ (calculated) - human health toxicity[f]	-	-	-	-	-	-	-	-
Total PAHs (calculated)	-	-	-	-	-	-	-	-
Petroleum Hydrocarbons (mg/kg)								
TPH - Lube Oil	-	-	-	-	-	-	-	-
TPH - Diesel Range Organics	-	-	-	2000	-	-	2000	D; G

Footnotes:

a. National Park Service (NPS; 2018) NPS Protocol for the Selection and Use of Ecological Screening Values for Non-radiological Analytes. Prepared by National Park Service Contaminants Cleanup Branch (CCB). November 2018.
b. Ecology (2020) CLARC Mater Data Table. Available at: https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC/Data-tables. Downloaded August 2020.
c. LMW PAHs include: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene. Fluoranthene treated as LPAH, following NPS guidelines for an NPS site. This differs from SCUM (2019), which treats fluoranthene as an HPAH.
d. HMW PAHs include: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Pyrene. Benzo(j,k)fluoranthene was treated as Benzo(k)fluoranthene for comparison purposes.
e. cPAHs include: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene.
f. Individual analyte TEQs are calculated by multiplying toxicity equivalency factor by the detected concentration. For non-detects, TEF is multiplied by half the reporting limit. All analyte TEQs are summed to produce the Total cPAH TEQ calculated value.

Acronyms:

mg/kg milligrams per kilogram
mg/L milligrams per liter
C Celsius
COPEC Chemical of potential ecological concern
cPAH Carcinogenic polycyclic aromatic hydrocarbon
ESV Ecological screening value
HMW High molecular weight
LMW Low molecular weight
PAH Polycyclic aromatic hydrocarbons
TCLP Toxicity characteristic leachating procedure
SL Screening level
SLERA Screening level ecological risk assessment
TEQ Toxicity Equivalents
TPH Total petroleum hydrocarbon
- Screening Level not available

Table 5b. Historical Soil Data Compared to Selected Screening Levels
Diablo Dry Dock Site
EE/CA SAP

Constituent	Selected SL Value[a, b]														
Sample Location:		DD-S1	DD-S1-3-6"	DD-S1-6-12"	DD-S3	DD-S4	DD-S4-3-6"	DD-S4-6-12"	DD-S5	DD-S5-3-6"	DD-S5-6-12"	DD-S6	DD-S7	DD-S7-3-6"	DD-S7-6-12"
Upper Sample Depth (inches below surface):		0	3	6	0	0	3	6	0	3	6	0	0	3	6
Lower Sample Depth (inches below surface):		3	6	12	3	3	6	12	3	6	12	3	3	6	12
Sample Date (year-month-day):		2014-09-16	2015-05-14	2015-05-14	2014-09-16	2014-09-16	2015-05-14	2015-05-14	2014-09-16	2015-05-14	2015-05-14	2014-09-16	2014-09-16	2015-05-14	2015-05-14
Metals (mg/kg)															
Arsenic	0.67	10 U	--	--	10 U	**82**	**20**	13 U	**77**	**91**	**41**	**37**	**57**	**43**	**15**
Cadmium	0.69	0.52 U	--	--	0.51 U	**1.9**	--	--	**1.7**	--	--	**1.2**	**1.1**	--	--
Chromium	0.34	**43**	--	--	**62**	**44**	--	--	**34**	--	--	**44**	**45**	--	--
Copper	50	**59**	--	--	**140**	**850**	--	--	**780**	--	--	**380**	**480**	--	--
Lead	50	46	--	--	7.4	**1200**	**1100**	49	**1000**	**700**	**390**	**670**	**550**	**420**	**110**
Mercury	0.05	0.26 U	--	--	0.26 U	**1.2**	--	--	**0.92**	--	--	**0.3**	**0.5**	--	--
Nickel	30	**35**	--	--	**39**	**46**	--	--	19	--	--	23	19	--	--
Selenium	0.52	10 U	--	--	10 U	10 U	--	--	10 U	--	--	10 U	10 U	--	--
Silver	2	1 U	--	--	1 U	1 U	--	--	1 U	--	--	1 U	1 U	--	--
Zinc	6.6	**150**	--	--	**160**	**2000**	--	--	**1700**	--	--	**1200**	**1100**	--	--
TCLP (mg/L)															
Lead		--	--	--	--	2	--	--	0.91	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (mg/kg)															
1-Methylnaphthalene	34	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	320	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	0.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	-	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	6.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	18	0.98	0.01	0.0083	0.0069 U	0.21	0.16	0.01	1.2	3.1	0.59	0.1	0.34	0.19	0.072
Benzo(a)pyrene	0.1	**0.47**	0.0085	0.0096	0.0069 U	**0.27**	**0.21**	0.011	**1.4**	**3.1**	**0.6**	**0.13**	**0.47**	**0.22**	0.083
Benzo(b)fluoranthene	18	0.52	0.011	0.02	0.0069 U	0.35	0.23	0.02	1.4	3.8	0.73	0.15	0.53	0.3	0.11
Benzo(ghi)perylene	-	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(j,k)fluoranthene	-	0.37	0.0078 U	0.0073 U	0.0069 U	0.22	0.083	0.0084 U	1.2	1.3	0.27	0.089	0.35	0.1	0.032
Chrysene	-	1.1	0.0099	0.019	0.0069 U	0.33	0.16	0.015	1.5	2.8	0.54	0.12	0.39	0.17	0.064
Dibenzo(a,h)anthracene	-	0.096	0.0078 U	0.0073 U	0.0069 U	0.096	0.039	0.0084 U	0.31	0.51	0.1	0.036	0.15	0.041	0.015
Fluoranthene	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	3.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	-	0.19	0.0078 U	0.0073 U	0.0069 U	0.26	0.15	0.0086	0.79	1.9	0.37	0.093	0.36	0.15	0.056
Naphthalene	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	5.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrene	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total LMW PAHs[c]	29	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs[d]	18	3.63	0.0394	0.0569	ND	1.64	0.993	0.0646	7.49	16	3.1	0.682	2.44	1.13	0.417
Total cPAHs (calculated) - human health toxicity[e]	-	3.73	0.04	0.06	ND	1.74	1.03	0.06	7.80	16.51	3.20	0.72	2.59	1.17	0.43
Total cPAH TEQ (calculated) - human health toxicity[f]	-	**0.70**	0.01	0.01	0.01	**0.39**	**0.28**	0.02	**1.91**	**4.19**	**0.81**	**0.18**	**0.65**	**0.30**	**0.11**
Total PAHs (calculated)		3.73	0.04	0.06	ND	1.74	1.03	0.06	7.80	16.51	3.20	0.72	2.59	1.17	0.43
Petroleum Hydrocarbons (mg/kg)															
TPH - Lube Oil	---	120	--	--	57	260	--	--	240	--	--	230	100	--	--
TPH - Diesel Range Organics	2000	28 U	--	--	26 U	56	--	--	29	--	--	33	26 U	--	--

Footnotes:

a. National Park Service (2018) Protocol for the Selection and Use of Ecological Screening Values for Non-radiological Analytes. Contaminants Cleanup Branch (CCB). November 2018.
b. Ecology (2020) CLARC Data Table. Available at: https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC/Data-tables. August 2020.
c. LMW PAHs include: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene. Fluoranthene treated as LPAH, following NPS guidelines for an NPS site. This differs from SCUM (2019) guidance, which treats fluoranthene as an HPAH.
d. HMW PAHs inclue: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Pyrene. Benzo(j,k)fluoranthene was treated as Benzo(k)fluoranthene for comparison purposes.
e. cPAHs include: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene.
f. Individual analyte TEQs are calculated by multiplying toxicity equivalency factor by the detected concentration. For non-detects, TEF is multiplied by half the reporting limit. All analyte TEQs are summed to produce the Total cPAH TEQ calculated value.

bold Analyte detected above the lowest or most restrictive screening level

Acronyms:

mg/kg	milligrams per kilogram	HMW	High molecular weight	TEQ	Toxicity Equivalents
mg/L	milligrams per liter	LMW	Low molecular weight	TPH	Total petroleum hydrocarbon
C	Celsius	PAH	Polycyclic aromatic hydrocarbons	U	Analyte not detected above reporting limit
COPEC	Chemical of potential ecological concern	TCLP	Toxicity characteristic leachating procedure	ND	Non-detect
cPAH	Carcinogenic polycyclic aromatic hydrocarbon	SL	Screening level	--	Sample not analyzed
ESV	Ecological screening value	SLERA	Screening level ecological risk assessment	-	Screening Level not available

Table 5b. Historical Soil Data Compared to Selected Scree
Diablo Dry Dock Site
EE/CA SAP

Constituent	Selected SL Value[a, b]	DD-S8	DD-S9	DD-S10	DD-S11	DD-S12	DD-S13	DD-S16	DD-S20	DD-S21	DD-S22
Sample Location:		DD-S8	DD-S9	DD-S10	DD-S11	DD-S12	DD-S13	DD-S16	DD-S20	DD-S21	DD-S22
Upper Sample Depth (inches below surface):		0	0	0	0	0	0	0	0	0	0
Lower Sample Depth (inches below surface):		3	3	3	3	3	3	3	3	3	3
Sample Date (year-month-day):		2015-05-14	2015-05-14	2015-05-14	2015-05-14	2015-05-14	2015-05-14	2015-05-14	2015-05-14	2015-05-14	2015-05-14
Metals (mg/kg)											
Arsenic	0.67	13 U	**21**	11 U	--	--	--	--	**160**	**33**	**39**
Cadmium	0.69	--	--	--	--	--	--	--	--	--	--
Chromium	0.34	--	--	--	--	--	--	--	--	--	--
Copper	50	--	--	--	--	--	--	--	--	--	--
Lead	50	8.1	35	23	--	--	--	--	**1600**	**410**	**460**
Mercury	0.05	--	--	--	--	--	--	--	--	--	--
Nickel	30	--	--	--	--	--	--	--	--	--	--
Selenium	0.52	--	--	--	--	--	--	--	--	--	--
Silver	2	--	--	--	--	--	--	--	--	--	--
Zinc	6.6	--	--	--	--	--	--	--	--	--	--
TCLP (mg/L)											
Lead		--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (mg/kg)											
1-Methylnaphthalene	34	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	320	--	--	--	--	--	--	--	--	--	--
Acenaphthene	0.25	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	-	--	--	--	--	--	--	--	--	--	--
Anthracene	6.8	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	18	1.2	0.06	0.0071 U	0.0074 U	0.049	0.016	0.52	0.59	0.24	0.24
Benzo(a)pyrene	0.1	**1.5**	0.083	0.0071 U	0.0074 U	0.044	0.017	**0.64**	**0.65**	**0.29**	**0.29**
Benzo(b)fluoranthene	18	2.6	0.13	0.0077	0.0083	0.07	0.018	0.92	0.89	0.47	0.42
Benzo(ghi)perylene	-	--	--	--	--	--	--	--	--	--	--
Benzo(j,k)fluoranthene	-	0.66	0.046	0.0071 U	0.0074 U	0.021	0.015 U	0.31	0.25	0.13	0.15
Chrysene	-	1.3	0.083	0.0071 U	0.0074 U	0.076	0.015 U	0.69	0.6	0.36	0.31
Dibenzo(a,h)anthracene	-	0.4	0.021	0.0071 U	0.0074 U	0.0077 U	0.015 U	0.11	0.1	0.052	0.052
Fluoranthene	10	--	--	--	--	--	--	--	--	--	--
Fluorene	3.7	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	-	1.7	0.064	0.0071 U	0.0074 U	0.019	0.015 U	0.39	0.39	0.17	0.17
Naphthalene	1	--	--	--	--	--	--	--	--	--	--
Phenanthrene	5.5	--	--	--	--	--	--	--	--	--	--
Pyrene	10	--	--	--	--	--	--	--	--	--	--
Total LMW PAHs[c]	29	--	--	--	--	--	--	--	--	--	--
Total HMW PAHs[d]	18	8.96	0.466	0.0077	0.0083	0.279	0.051	3.47	3.37	1.66	1.58
Total cPAHs (calculated) - human health toxicity[e]	-	9.36	0.49	0.01	0.01	0.28	0.05	3.58	3.47	1.71	1.63
Total cPAH TEQ (calculated) - human health toxicity[f]	-	**2.17**	**0.12**	0.01	0.01	0.06	0.02	**0.87**	**0.88**	**0.40**	**0.40**
Total PAHs (calculated)		9.36	0.49	0.01	0.01	0.28	0.05	3.58	3.47	1.71	1.63
Petroleum Hydrocarbons (mg/kg)											
TPH - Lube Oil	---	--	--	--	--	--	--	--	--	--	--
TPH - Diesel Range Organics	2000	--	--	--	--	--	--	--	--	--	--

Footnotes:

a. National Park Service (2018) Protocol for the Selection and Use of Ecological Screening Values for Non-radiological Analytes. Contaminants Cleanup Branch (CCB). November
b. Ecology (2020) CLARC Data Table. Available at: https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC/Data-tables. August 2020.
c. LMW PAHs include: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene. Fluoranthene treated as LPAH, following NPS guidelines for an NPS site. This differs from SCUM (2019) guidance, which treats fluoranthene as an HPAH.
d. HMW PAHs inclue: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Pyrene. Benzo(j,k)fluoranthene was treated as Benzo(k)fluoranthene for comparison purposes.
e. cPAHs include: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene.
f. Individual analyte TEQs are calculated by multiplying toxicity equivalency factor by the detected concentration. For non-detects, TEF is multiplied by half the reporting limit. All analyte TEQs are summed to produce the Total cPAH TEQ calculated value.

bold Analyte detected above the lowest or most restrictive screening level

Acronyms:

mg/kg	milligrams per kilogram	HMW	High molecular weight	TEQ	Toxicity Equivalents
mg/L	milligrams per liter	LMW	Low molecular weight	TPH	Total petroleum hydrocarbon
C	Celsius	PAH	Polycyclic aromatic hydrocarbons	U	Analyte not detected above reporting limit
COPEC	Chemical of potential ecological concern	TCLP	Toxicity characteristic leachating procedure	ND	Non-detect
cPAH	Carcinogenic polycyclic aromatic hydrocarbon	SL	Screening level	--	Sample not analyzed
ESV	Ecological screening value	SLERA	Screening level ecological risk assessment	-	Screening Level not available

Table 6. Historical Sediment Data Compared to Screening Levels
Diablo Dry Dock Site
EE/CA SAP

Constituent																
Sample Location:	A. SLERA COPEC ESV[a]	B. SLERA Threshold Effects ESV[a]	C. SLERA Probable Effects ESV[a]	D. SCUM SCO SMS Freshwater Sediment[b]	E. SCUM CSL SMS Freshwater Sediment[b]	Selected SL	DD-S2	DD-S2-3-6"	DD-S2-6-12"	DD-SD1	DD-SD2	DD-SD3	DD-SD4	DD-SD5	DD-SD7	DD-SD8
Sample Depth (inches below sediment surface):							0	3	6	0	0	0	0	72	31	101
Sample Depth (inches below sediment surface):							4	6	12	4	4	4	4	[c]	[c]	[c]
Sample Date (year-month-day):							2014-09-16	2015-05-15	2015-05-15	2014-09-17	2014-09-17	2014-09-17	2014-09-17	2014-09-17	2014-09-17	2014-09-17
Metals (mg/kg)																
Arsenic	9.7	9.8	33	14	120	A	19 U	--	--	**26**	20 U	19 U	13 U	13 U	13 U	13 U
Cadmium	0.58	0.99	5	2.1	5.4	A	0.95 U	--	--	1.5 U	0.98 U	0.95 U	0.66 U	1.3 U	1.3 U	1.3 U
Chromium	36	43	111	72	88	A	**47**	--	--	**58**	**62**	**53**	23	**63**	**64**	**65**
Copper	28	32	149	400	1200	A	**140**	--	--	**120**	**49**	**36**	17	**59**	**62**	**50**
Lead	35	36	128	360	1300	A	**140**	--	--	**91**	11	9.5 U	6.6 U	13 U	15	13 U
Mercury	0.18	0.18	1.1	0.66	0.8	A; B	0.48 U	--	--	0.74 U	0.49 U	0.47 U	0.33 U	0.67 U	0.67 U	0.63 U
Nickel	20	23	49	26	110	A	**31**	--	--	**36**	**38**	**31**	15	**41**	**43**	**39**
Selenium	0.72	0.72	2.9	11	20	A; B	19 U	--	--	30 U	20 U	19 U	13 U	27 U	27 U	25 U
Silver	0.5	0.5	5	0.57	1.7	A; B	1.9 U	--	--	3 U	2 U	1.9 U	1.3 U	2.7 U	2.7 U	**6.4**
Zinc	98	121	459	3200	4200	A	**260**	--	--	**240**	**140**	**120**	56	**140**	**150**	**150**
Polycyclic Aromatic Hydrocarbons (mg/kg)																
1-Methylnaphthalene	-	-	-	-	-	-	--	0.0097 U	0.009 U	--	--	--	--	--	--	--
2-Methylnaphthalene	0.076	0.076	0.76	-	-	A; B	--	0.0097 U	0.009 U	--	--	--	--	--	--	--
Acenaphthene	0.076	0.076	0.76	-	-	A; B	--	0.0097 U	0.009 U	--	--	--	--	--	--	--
Acenaphthylene	0.076	0.076	0.76	-	-	A; B	--	0.033	0.016	--	--	--	--	--	--	--
Anthracene	0.01	0.057	0.85	-	-	A	--	**0.047**	**0.023**	--	--	--	--	--	--	--
Benzo(a)anthracene	0.015	0.11	1.1	-	-	A	**0.38**	**0.15**	**0.1**	--	--	--	--	--	--	--
Benzo(a)pyrene	0.032	0.15	1.5	-	-	A	**0.37**	**0.12**	**0.089**	--	--	--	--	--	--	--
Benzo(b)fluoranthene	0.19	0.19	1.9	-	-	A; B	**0.52**	**0.46**	**0.25**	--	--	--	--	--	--	--
Benzo(ghi)perylene	0.016	0.016	0.25	-	-	A; B	--	**0.074**	**0.05**	--	--	--	--	--	--	--
Benzo(j,k)fluoranthene	0.24	0.24	2.4	-	-	A; B	**0.29**	0.11	0.064	--	--	--	--	--	--	--
Chrysene	0.026	0.17	1.3	-	-	A	**0.67**	**0.49**	**0.26**	--	--	--	--	--	--	--
Dibenzo(a,h)anthracene	0.033	0.033	0.33	-	-	A; B	**0.09**	0.018	0.014	--	--	--	--	--	--	--
Fluoranthene	0.031	0.42	2.2	-	-	A	--	**0.91**	**0.38**	--	--	--	--	--	--	--
Fluorene	0.01	0.077	0.54	-	-	A	--	**0.011**	0.009 U	--	--	--	--	--	--	--
Indeno(1,2,3-cd)pyrene	0.017	0.017	0.24	-	-	A; B	**0.2**	**0.072**	**0.047**	--	--	--	--	--	--	--
Naphthalene	0.014	0.18	0.56	-	-	A	--	0.0097 U	0.009 U	--	--	--	--	--	--	--
Phenanthrene	0.019	0.2	1.2	-	-	A	--	**0.21**	**0.078**	--	--	--	--	--	--	--
Pyrene	0.044	0.2	1.5	-	-	A	--	**0.82**	**0.36**	--	--	--	--	--	--	--
Total LMW PAHs[d]	0.076	0.076	1.2	-	-	A; B	--	**1.21**	**0.50**	--	--	--	--	--	--	--
Total HMW PAHs[e]	0.19	0.19	2.3	-	-	A; B	**2.43**	**2.296**	**1.22**	--	--	--	--	--	--	--
Total cPAHs (calculated) - human health toxicity[f]	-	-	-	-	-	-	2.52	1.42	0.824	--	--	--	--	--	--	--
Total cPAH TEQ (calculated) - human health toxicity[g]	-	-	-	-	-	-	0.52	0.41	0.28	--	--	--	--	--	--	--
Total PAHs (calculated)	-	-	-	17	30	D	2.52	3.53	1.73	--	--	--	--	--	--	--
Petroleum Hydrocarbons (mg/kg)																
TPH - Lube Oil	-	-	-	-	-	-	220	--	--	2200	130	280	66 U	470	390	490
TPH - Diesel Range Organics	-	-	-	340	510	D	48 U	--	--	120	49 U	53 U	33 U	67 U	67 U	63 U
TPH - Residual Range Organics	-	-	-	3600	4400	D	--	--	--	--	--	--	--	--	--	--

Footnotes:

a. National Park Service (NPS; 2018) NPS Protocol for the Selection and Use of Ecological Screening Values for Non-radiological Analytes. Prepared by National Park Service Contaminants Cleanup Branch (CCB). November 2018.

b. Ecology (2019) Sediment Cleanup User's Manual. Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards, Chapter 173-204 WAC. Publication No. 12-09-057. December 2019

c. Sample depth provided in Hart Crowser (2016) as depth below water surface. Bottom depth below water surface not provided.

d. LMW PAHs include: 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene. Fluoranthene treated as LPAH, following NPS guidelines for an NPS site. This differs from SCUM (2019) guidance, which treats fluoranthene as an HPAH.

e. HMW PAHs inclue: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Pyrene. Benzo(j,k)fluoranthene was treated as Benzo(k)fluoranthene for comparison purposes.

f. cPAHs include: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(j,k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene.

g. Individual analyte TEQs are calculated by multiplying toxicity equivalency factor by the detected concentration. For non-detects, TEF is multiplied by half the reporting limit. All analyte TEQs are summed to produce the Total cPAH TEQ calculated value.

bold Analyte detected above the lowest or most restrictive screening level

Acronyms:

mg/kg	milligrams per kilogram	ESV	Ecological screening value	SCO	Sediment cleanup objective	TEQ	Toxicity Equivalents
CSL	Cleanup screening level	HMW	High molecular weight	SMS	Sediment management standards	TPH	Total petroleum hydrocarbon
COPEC	Chemical of potential ecological concern	LMW	Low molecular weight	SL	Screening level	--	Sample not analyzed
cPAH	Carcinogenic polycyclic aromatic hydrocarbon	PAH	Polycyclic aromatic hydrocarbons	SLERA	Screening level ecological risk assessment	-	Screening Level not available

Table 7. DQO Project Team and Contact Information
Diablo Dry Dock Site
EE/CA SAP

Role[a]	Name	Firm	Address	Phone	Email
City Project Manager	Tom Meyer	City of Seattle	700 5th Avenue #4112 Seattle, WA 98104	(206) 665-5750	tom.meyer@seattle.gov
NPS Lead	Travis Kraft	National Park Services	810 State Route 20 Sedro-Woolley, WA 98284	(360) 854-7264	travis_kraft@nps.gov
Operations/Environmental Programs Branch Chief	Steve Mitchell	National Park Service	333 Bush St, San Francisco, CA 94104	415 623 2286	steve_mitchell@nps.gov
Environmental Protection Specialist/NPS Toxicologist	Patricia Billig	National Park Service	333 Bush St, San Francisco, CA 94104	303-868-4007	pat_billing@nps.gov
Primary Project Consultant (Project Coordinator)	Anne Fitzpatrick, LHG	Geosyntec Consultants, Inc.	520 Pike Street, Suite 2600 Seattle, WA 98101	(206) 496-1461	afitzpatrick@geosyntec.com
Engineering and Cost Estimator Lead	Brent Miller, PE	Geosyntec Consultants, Inc.	520 Pike Street, Suite 2600 Seattle, WA 98101	(206) 496-1445	BMiller@Geosyntec.com
Technical Lead	Joey Hickey, CHMM	Geosyntec Consultants, Inc.	920 SW Sixth Avenue, Suite 600 Portland, Oregon 97204	(971) 271-5897	JHickey@Geosyntec.com
Risk Assessment Lead	Jason Conder, PhD	Geosyntec Consultants, Inc.	2100 Main Street, Suite 150, Huntington Beach, CA 92648	(714) 465-1226	JConder@Geosyntec.com
Data Manager Lead	Jamey Rosen	Geosyntec Consultants, Inc.	130 Stone Road W, Guelph, ON N1G 3Z2 Canada	(519) 515-0871	JRosen@Geosyntec.com
Quality Assurance/Data Validation Lead	Julia Caprio	Geosyntec Consultants, Inc.	180A Market Pl Blvd, Knoxville, TN 37922	(865) 291-4696	JKlensCaprio@Geosyntec.com
Subcontractors					
Cultrual Resources	Kelly Bush	Equinox Research and Consulting International Inc. (ERCI)	1229 Cleveland Avenue Mount Vernon, WA 98273	(360) 661-0356	kelrbush@equinoxerci.com
Bathymetry	tbd				
Field Staff Support	tbd				
Laboratory and Analytical Services	tbd				
Drilling Operators	tbd				
Vessel Operators	tbd				

Footnotes:
a. Team member roles are described in detail in Section 1.3.

Acronyms:
tbd to be determined

Table 8. Data Quality Objectives
Diablo Dry Dock Site
EE/CA SAP

DQO Step:	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
DQO Decision	***State the Problem***	***Identify the Goals of the Study***	***Identify the Information Inputs***	***Define the Boundaries of the Study***	***Determine the Analytic Approach***	***Specify Performace or Acceptance Criteria***	***Describe the Plan for Obtaining the Data***
Upland Soil	Understand the nature and extent of metal and PAH contamination in soil	PIQ 1. Do metals and PAH concentrations pose an unacceptable risk to human and ecological receptors? PIQ 3: Do background concentrations affect the evaluation of screening levels? PIQ 4: Is there a potential soil-to-groundwater pathway?	The 2014-2015 soil data help evaluate maximum concentrations and spatial extent; collect additional samples to fill data gaps and help refine the horizontal and vertical extent and collect additional COPC data.	Within the area of the Dry Dock; background sampling local will be reconnaissanced up Deer Creek drainage area.	The extent and distribution of contamination will be delineated by comparing environmental data to screening levels for metals and PAHs. Individual detected sample concentrations will determine the location of COPC exceedances. Data will be interpolated between locations to estimate extents. All data (historical and current data) will be considered. Statistics (such as 95% UCL) will be used to refine the COCs.	Aceptance criteria includes: i) validation of field sampling methods using field sampling quality standard (field duplicates, blanks etc.): ii) validation of lab results adequate to indicated quality standard (as reported in the QAPP).	**Soil:** - 23 soil boring locations to 3 feet. - Analyze 0-1 ft., 1-2 ft, and 2-3 ft bgs
Sediment	Understand the nature and extent of metal and PAH contamination in sediment	PIQ 1. Do metals and PAH concentrations pose an unacceptable risk to human and ecological receptors? PIQ 3: Do background concentrations affect the evaluation of screening levels?	The 2014-2015 sediment data help evaluate maximum concentrations and spatial extent; collect additional samples to fill data gaps and refine the horizontal and vertical extent and collect additional COPC data; conduct a bathymetry survey to understand substrate conditions/elevations.	Within the nearshore area of the Dry Dock; background sample locations near the perimeter of the cove.	Compare environmental data to site-specific screening levels and determine the extent and distribution of COPC exceedances. All data (historical and current data) will be considered. Statistics (such as 95% UCL) will be used to refine the COCs.	Aceptance criteria includes: i) validation of field sampling methods using field sampling quality standard (field duplicates, blanks etc.): ii) validation of lab results adequate to indicated quality standard (as reported in the QAPP).	**Sediment:** - 14 surface sediment grabs (0 to 10 cm) - 5 cores to bound depth of COPCs (up to 10 ft) - 10 archived perimeter surface sediment samples for background
Risks	Assess whether potential risk to human and ecological receptors requres a removal action	PIQ 2: What are the risks, and are they greater than screening levels and preliminary cleanup levels?	Pojnt-based concentrations at the point of compliance, SWACs, grain size, TOC, review of receptors, and site-specific background may help build site-specific risk assessment model.	Within Dry Dock area; plus close locations for background soil or sediment determinations.	Site risks will be evaluated by: i) human health and benthic risk analysis ii) comparison of 95% UCL to screening levels iii) comparison of SWACs to screening levels and/or background levels iv) chemicals detected in less than 5% of samples will not be retained as COCs. confirmation of exposure pathways and receptors.	Adequate spatial coverage to estimate exposure point concentrations with confidence such that data are adequate to perform the risk assessment.	Will be evaluated during the EE/CA Report based on the soil and sediment data described above

Acronyms:

DQO	Data Wuality Objective
PIQ	Principal Investigation Questions
PAH	Polyciclyc aromatic hydrocarbons
COPC	Chemical of potential concern
UCL	Upper control limit
COC	Chemical of concern
QAPP	Quality assurance project plan
ft	feet
bgs	below ground surface
SWACs	Spatially weighted average concentrations
TOC	Total organic carbon
EE/CA	Engineering evaluation/Cost analysis
%	percent

Table 9. Summary of Sampling Media, Sample Counts, and Analyses
Diablo Dry Dock Site
EE/CA SAP

Media	# of Locations	Sample Depth	Analytes						Archive
			Metals[a b]	PAHs	Pesticides	AVS/SEM	TOC	Grain Size	
Upland Soil Samples	23	0 to 1 ft	X	X	X		X	X	
	23	1 to 2 ft	X	X	X				
	23	2 to 3 ft	X[c]	X[c]	X[c]				
	if needed	3 to 4 ft							X[d]
Surface Sediment Samples	14	0 to 10 cm	X	X	X	X	X	X	
Surface Sediment Background Samples	10	0 to 10 cm				X			X[d]
Sediment Coring	5	0 to 10 ft or refusal[e]	X	X	X		X	X	

Footnotes:

a. Sample with highest metal concentration will also be analyzed for leachable metas using TCLP methods.
b. Up to 10 soil and 5 surface sediment samples with the highest total chromium concentrations will also be analzyed for hexavalent chromium.
c. Analyte will only be analyzed if concentration in the 1-2 ft interval exceed screening levels.
d. Archive pending review of primary sediment samples and shallow soil samples.
e. Assumes cores will be sampled at surface and in 2-ft intervals. Six samples per core

Acronyms:

ft feet
cm centimeters
PAHs Polyciclyc aromatic hydrocarbons
TOC Total organic carbon
AVS/SEM Simultaneously extracted metals/Acid-volatile sulfide

Table 10. Sample Designations and Proposed Coordinates
Diabo Dry Dock Site
EE/CA SAP

Location	Proposed Coordinates		Sampling Scheme and Depth Interval						
	SPC Northing (ft)	SPC Easting (ft)	Unit	Interval 1	Interval 2	Interval 3	Interval 4	Interval 5	Sample ID[a]
Upland Soil Sampling									
SB-1	tbd	tbd	ft bgs	0-1	1-2	2-3			SB-1-X-X
SB-2			ft bgs	0-1	1-2	2-3			SB-2-X-X
SB-3			ft bgs	0-1	1-2	2-3			SB-3-X-X
SB-4			ft bgs	0-1	1-2	2-3			SB-4-X-X
SB-5			ft bgs	0-1	1-2	2-3			SB-5-X-X
SB-6			ft bgs	0-1	1-2	2-3			SB-6-X-X
SB-7			ft bgs	0-1	1-2	2-3			SB-7-X-X
SB-8			ft bgs	0-1	1-2	2-3			SB-8-X-X
SB-9			ft bgs	0-1	1-2	2-3			SB-9-X-X
SB-10			ft bgs	0-1	1-2	2-3			SB-10-X-X
SB-11			ft bgs	0-1	1-2	2-3			SB-11-X-X
SB-12			ft bgs	0-1	1-2	2-3			SB-12-X-X
SB-13			ft bgs	0-1	1-2	2-3			SB-13-X-X
SB-14			ft bgs	0-1	1-2	2-3			SB-14-X-X
SB-15			ft bgs	0-1	1-2	2-3			SB-15-X-X
SB-16			ft bgs	0-1	1-2	2-3			SB-16-X-X
SB-17			ft bgs	0-1	1-2	2-3			SB-17-X-X
SB-18			ft bgs	0-1	1-2	2-3			SB-18-X-X
SB-19			ft bgs	0-1	1-2	2-3			SB-19-X-X
SB-20			ft bgs	0-1	1-2	2-3			SB-20-X-X
SB-21			ft bgs	0-1	1-2	2-3			SB-21-X-X
SB-22			ft bgs	0-1	1-2	2-3			SB-22-X-X
SB-23			ft bgs	0-1	1-2	2-3			SB-23-X-X
Surface Sediment Sampling									
SG-01	tbd	tbd	cm blm	0-10					SG-01
SG-02			cm blm	0-10					SG-02
SG-03			cm blm	0-10					SG-03
SG-04			cm blm	0-10					SG-04
SG-05			cm blm	0-10					SG-05
SG-06			cm blm	0-10					SG-06
SG-07			cm blm	0-10					SG-07
SG-08			cm blm	0-10					SG-08
SG-09			cm blm	0-10					SG-09
SG-10			cm blm	0-10					SG-10
SG-11			cm blm	0-10					SG-11
SG-12			cm blm	0-10					SG-12
SG-13			cm blm	0-10					SG-13
SG-14			cm blm	0-10					SG-14
Surface Sediment Background									
DB-01	tbd	tbd	cm blm	0-10					DB-01
DB-02			cm blm	0-10					DB-02
DB-03			cm blm	0-10					DB-03
DB-04			cm blm	0-10					DB-04
DB-05			cm blm	0-10					DB-05
DB-06			cm blm	0-10					DB-06
DB-07			cm blm	0-10					DB-07
DB-08			cm blm	0-10					DB-08
DB-09			cm blm	0-10					DB-09
DB-10			cm blm	0-10					DB-10

Table 10. Sample Designations and Proposed Coordinates
Diabo Dry Dock Site
EE/CA SAP

Location	Proposed Coordinates		Sampling Scheme and Depth Interval						
	SPC Northing (ft)	SPC Easting (ft)	Unit	Interval 1	Interval 2	Interval 3	Interval 4	Interval 5	Sample ID[a]
Sediment Cores									
SC-01	tbd	tbd	ft blm	0 to 10 cm (archive) PAHs only	0 to 2	2 to 4	4 to 6	6 to 8	SC-01-X-X
SC-02			ft blm						SC-02-X-X
SC-03			ft blm						SC-03-X-X
SC-04			ft blm						SC-04-X-X
SC-05			ft blm						SC-05-X-X

Footnotes:

a. X-X indicates the depth interval (still to be determined).

Acronyms:

blm	below mudline	SB	Soil Boring
bgs	below ground surface	SG	Sediment Grab
cm	centimeters	DB	Diablo Background (sediment)
ft	feet	SC	Sediment Core
tbd	to be determined		

Table 11. Sample Containers, Methods, Sample Preservation, and Holding Times
Diablo Dry Dock Site
EE/CA SAP

Matrix	Parameter	Method	Sample Container	Preservation	Archive Preservation (up to 1 year)	Holding Time
Soil / Sediment	Metals[a]	EPA Method 6020B	1x 8-ounce glass jar with Teflon®-lined lid	Cool to 0-6°C	Freeze to <-10°C	180 days from collection to analysis
	Mercury	EPA Method 7471A	1x 4-ounce glass jar with Teflon®-lined lid	Cool to 0-6°C	NA	30 days from collection to extraction; 168 hours from extraction to analysis
	Hexavalent chromium	EPA Method 7196A	1x 8-ounce glass jar with Teflon®-lined lid	Cool to 0-6°C	Freeze to <-10°C	28 days from collection to analysis
	PAHs	EPA 8270D SIM	1x 8-ounce glass jar	Cool to 0-6°C	Freeze to <-10°C	14 days from collection to preparation; 40 days from extraction to analysis
	Chlorinated Pesticides	EPA GC/MS/MS1699M	1x 8-ounce glass jar	Cool to 0-6°C	Freeze to <-10°C	14 days from collection to preparation; 40 days from extraction to analysis
	Total Organic Carbon	EPA Method 9060	1x 4-ounce glass jar	Cool to 0-6°C	NA	28 days from collection to analysis; 6 months if frozen
	Grain Size (soil)	ASTM D7928 and D6913 (replaced ASTM D422)	1x 16-ounce glass or plastic jar	NA	NA	None
	Grain Size (Sediment)	PSEP	1x 16-ounce glass or plastic jar	Cool to 0-6°C	NA	6 months
	AVS/SEM (sediment)	EPA-OW/OST 376.3 (EPA-821-R91-100) (EPA 1991)	1x 4-ounce glass jar	Zero headspace 0-6 degree C	NA	14 days from collection to analysis' 6 months if frozen
	Total Solids	EPA 160.3 Modified	1x 4-ounce glass jar	Cool to 0-6°C	NA	7 days from collection to analysis

Footnotes:

a. TCLP testing will be completed from the same container as total metals.

Acronyms:

EPA Environmental Protection Agency
ASTM American Society of Testing and Materials
PSEP Puget Sound Estuary Protocols
AVS/SEM Acid-volatile sulfide/Simultaneously extracted metals
PAHs Polyciclyc aromatic hydrocarbons
NA Not applicable
C Centigrade

Table 12. Field Quality Control Sample Frequency
Diablo Dry Dock Site
EE/CA SAP

Matrix	Parameter	Method	Trip Blanks	MS/MSD[a]	Equipment Rinsate Blanks[b]	Field Duplicate Samples
Soil/ Sediments	Chlorinated Pesticides	EPA GC/MS/MS 1699M	NA	NA	1 per 20 samples	1 per 20 samples
	Grain Size	EPA ASTM D422 (soil) PSEP (sediment)		NA	NA	1 per 20 samples
	Mercury	EPA 7471A		1 set/20 samples	1 per 20 samples	1 per 20 samples
	Metals	EPA 6020B		1 set/20 samples	1 per 20 samples	1 per 20 samples
	Hexavalent Chromium	EPA 7196A		1 set/20 samples	1 per 20 samples	1 per 20 samples
	PAHs	EPA 8270D-SIM		1 set/20 samples	1 per 20 samples	1 per 20 samples
	Total Organic Carbon	EPA 9060		1 set/20 samples	1 per 20 samples	1 per 20 samples

Footnotes:

a. Field personnel must collect triple volume to account for MS/MSD samples where needed. Analyses performed by 1600 series methods will not require MS/MSD.

b. No equipment blanks are required for disposable or dedicated field sampling equipment. Equipment blanks will target about one per week, one per event, or one per piece of equipment for overall project average of 1 per 20 samples.

Acronyms:

MS/MSD Matrix Spike/Matrix Spike Duplicate
NA Not applicable
PAHs Polycyclic aromatic hydrocarbons
EPA Environmental Protection Agency
ASTM American Society of Testing and Materials

Table 13. Laboratory Quality Control Sample Frequency
Diablo Dry Dock Site
EE/CA SAP

Matrix	Parameter	Method	Method Blanks	MS/MSD	LCS/LCSD	Laboratory Duplicate	Surrogate Recovery
Soil/ Sediments	Chlorinated Pesticides	EPA GC/MS/MS 1699M or MLA-028/EPA 1699	1 per extraction batch	NA	Per method	1 per 20 samples	Per method
	PAHs	EPA 8270D-SIM or MLA-021/EPA 8270D/1625M	1 per extraction batch	1 per 20 samples[a]	1 per extraction batch[a]	1 per 20 samples	Per method
	Metals	EPA 6020B/6010C	1 per digestion batch	1 per 20 samples	1 per digestion batch	1 per 10 samples	NA
	Hexavaent chromium	EPA 7196A	1 per digestion batch	1 per 20 samples	1 per digestion batch	1 per 10 samples	NA
	Mercury	EPA 7471A	1 per digestion batch	1 per 20 samples	1 per digestion batch	1 per 10 samples	NA
	AVS/SEM (sediment)	EPA-OW/OST 376.3 (EPA-821-R91-100) (EPA 1991)	TBD	TBD	TBD	TBD	TBD
	Total Organic Carbom	EPA 9060 (or SM5310B)	1 per extraction batch	1 per 20 samples	1 per extraction batch	NA	Per method
	Grain Size	ASTM D422 / PSEP	NA	NA	NA	Triplicate analysis per 20 samples	NA

Footnotes:

a. Frequency noted is for samples analyzed by EPA 8270D-SIM. An MS/MSD is not required for method EPA 8270D/1625M. An LCS will be performed per method requirements.

Acronyms:

EPA Environmental Protection Agency
ASTM American Society of Testing and Materials
PSEP Puget Sound Estuary Protocols
GC/MS/MS Gas Chromatography/Tandem Mass Spectrometry
MS/MSD Matrix Spike/Matrix Spike Duplicate
LCS Laboratory control sample
LCSD Laboratory control sample duplicate
NA Not applicable
PAHs Polycyclic aromatic hydrocarbons
TBD To Be Determined

Table 14. PARCCS Quality Control Criteria (Measurement Indicators)
Diablo Dry Dock Site
EE/CA SAP

Matrix	Category	Analyte	Comparability			Completeness	Sensitivity				Accuracy and Precision										
											MS/MSD				LCS/LCSD				Surrogate		
			CAS Number	Laboratory	Test Method[a]	Usable Data (%)	Maximum Reporting Levels	Project Quantitation Limits	Achievable Laboratory MDLs	Units	% Recovery			RPD (%)	% Recovery			RPD (%)	% Recovery		
Soil	Conventionals	Total Organic Carbon	7440-44-0	TBD	9060A	90	2000	2000	96.7	mg/kg	68	-	149	32	40	-	180	32			
Soil		Percent Solids	STL00234		Not Applicable	90	0.100	0.100	0.100	%				20	80	-	120				
Soil	Total Metals	Arsenic	7440-38-2	TBD	6010D	90	3.00	3.00	0.248	mg/kg	80	-	120	20	80	-	120	20			
Soil		Barium	7440-39-3		6010D	90	0.500	0.500	0.0790	mg/kg	80	-	120	20	80	-	120	20			
Soil		Cadmium	7440-43-9		6010D	90	1.00	1.00	0.0490	mg/kg	80	-	120	20	80	-	120	20			
Soil		Chromium	7440-47-3		6010D	90	1.30	1.30	0.216	mg/kg	80	-	120	20	80	-	120	20			
Soil		Copper	7440-50-8		6010D	90	0.50	0.50	0.34	mg/kg	80	-	120	20	80	-	120	20			
Soil		Lead	7439-92-1		6010D	90	1.50	1.50	0.222	mg/kg	80	-	120	20	80	-	120	20			
Soil		Nickel	7440-02-0		6010D	90	0.50	0.50	0.05	mg/kg	80	-	120	20	80	-	120	20			
Soil		Selenium	7782-49-2		6010D	90	5.00	5.00	0.396	mg/kg	80	-	120	20	80	-	120	20			
Soil		Silver	7440-22-4		6010D	90	2.50	2.50	0.560	mg/kg	80	-	120	20	80	-	120	20			
Soil		Zinc	7440-66-6		6010D	90	4.00	4.00	0.82	mg/kg	80	-	120	20	80	-	120	20			
Soil		Hexavalent chromium	18540-29-9		7196A	90	0.42	0.42	0.14	mg/kg	85	-	115	20	85	-	115	20			
Soil		Mercury	7439-97-6		7471A	90	0.0300	0.0300	0.00900	mg/kg	80	-	120	20	80	-	120	20			
Soil	PAHs	1-Methylnaphthalene	90-12-0	TBD	8270DSIM	90	3	3	0.5	ug/kg	69	-	120	24	69	-	120	24			
Soil		2-Methylnaphthalene	91-57-6		8270DSIM	90	5	5	0.88	ug/kg	70	-	120	21	70	-	120	21			
Soil		Acenaphthene	83-32-9		8270DSIM	90	4	4	0.46	ug/kg	64	-	120	19	64	-	120	19			
Soil		Acenaphthylene	208-96-8		8270DSIM	90	2.5	2.5	0.5	ug/kg	63	-	120	18	63	-	120	18			
Soil		Anthracene	120-12-7		8270DSIM	90	6	6	1.6	ug/kg	67	-	131	28	67	-	131	28			
Soil		Benzo[a]anthracene	56-55-3		8270DSIM	90	4	4	1.1	ug/kg	60	-	135	21	60	-	135	21			
Soil		Benzo[a]pyrene	50-32-8		8270DSIM	90	6	6	1.3	ug/kg	62	-	129	27	62	-	129	27			
Soil		Benzo[b]fluoranthene	205-99-2		8270DSIM	90	4	4	1	ug/kg	58	-	136	25	58	-	136	25			
Soil		Benzo[g,h,i]perylene	191-24-2		8270DSIM	90	6	6	1.8	ug/kg	64	-	146	26	64	-	146	26			
Soil		Benzo[k]fluoranthene	207-08-9		8270DSIM	90	6	6	1.4	ug/kg	68	-	123	18	68	-	123	18			
Soil		Chrysene	218-01-9		8270DSIM	90	6	6	1.3	ug/kg	69	-	127	27	69	-	127	27			
Soil		Dibenz(a,h)anthracene	53-70-3		8270DSIM	90	5	5	1.2	ug/kg	59	-	139	29	59	-	139	29			
Soil		Fluoranthene	206-44-0		8270DSIM	90	4	4	1.2	ug/kg	69	-	133	21	69	-	133	21			
Soil		Fluorene	86-73-7		8270DSIM	90	2.5	2.5	0.5	ug/kg	68	-	121	17	68	-	121	17			
Soil		Indeno[1,2,3-cd]pyrene	193-39-5		8270DSIM	90	4	4	1.2	ug/kg	52	-	146	30	52	-	146	30			
Soil		Naphthalene	91-20-3		8270DSIM	90	2.5	2.5	0.5	ug/kg	68	-	120	15	68	-	120	15			
Soil		Phenanthrene	85-01-8		8270DSIM	90	6	6	0.58	ug/kg	68	-	126	27	68	-	126	27			
Soil		Pyrene	129-00-0		8270DSIM	90	6	6	1.3	ug/kg	68	-	141	24	68	-	141	24			
Soil		2,4,6-Tribromophenol (Surr)	118-79-6		8270DSIM	90	200		44.2	ug/kg									52	-	115
Soil		2-Fluorobiphenyl (Surr)	321-60-8		8270DSIM	90	100		32.3	ug/kg									57	-	120
Soil		2-Fluorophenol (Surr)	367-12-4		8270DSIM	90	200		44.2	ug/kg									47	-	119
Soil		Nitrobenzene-d5 (Surr)	4165-60-0		8270DSIM	90	100		29.4	ug/kg									54	-	120
Soil		Phenol-d5 (Surr)	4165-62-2		8270DSIM	90	200		19.8	ug/kg									59	-	120
Soil		Terphenyl-d14 (Surr)	1718-51-0		8270DSIM	90	100		61.2	ug/kg									73	-	125
Soil	Organochlorine Pesticides	4,4'-DDD	72-54-8	TBD	8081B	90	2.00	2.00	0.230	ug/kg	61	-	132	33	61	-	132	33			
Soil		4,4'-DDE	72-55-9		8081B	90	2.00	2.00	0.370	ug/kg	59	-	124	37	59	-	124	37			
Soil		4,4'-DDT	50-29-3		8081B	90	2.00	2.00	0.370	ug/kg	57	-	124	32	57	-	124	32			
Soil		Aldrin	309-00-2		8081B	90	3.00	3.00	0.380	ug/kg	56	-	121	37	56	-	121	37			
Soil		alpha-BHC	319-84-6		8081B	90	2.00	2.00	0.160	ug/kg	62	-	120	35	62	-	120	35			
Soil		beta-BHC	319-85-7		8081B	90	5.00	5.00	0.250	ug/kg	53	-	138	29	53	-	138	29			
Soil		cis-Chlordane	5103-71-9		8081B	90	2.00	2.00	0.750	ug/kg	62	-	125	39	62	-	125	39			
Soil		delta-BHC	319-86-8		8081B	90	3.00	3.00	0.280	ug/kg	60	-	124	37	60	-	124	37			
Soil		Dieldrin	60-57-1		8081B	90	2.00	2.00	0.350	ug/kg	61	-	121	35	61	-	121	35			
Soil		Endosulfan I	959-98-8		8081B	90	2.00	2.00	0.340	ug/kg	57	-	121	40	57	-	121	40			
Soil		Endosulfan II	33213-65-9		8081B	90	2.00	2.00	0.260	ug/kg	47	-	125	37	47	-	125	37			
Soil		Endosulfan sulfate	1031-07-8		8081B	90	2.00	2.00	0.280	ug/kg	50	-	132	40	50	-	132	40			
Soil		Endrin	72-20-8		8081B	90	2.00	2.00	0.470	ug/kg	56	-	131	38	56	-	131	38			
Soil		Endrin aldehyde	7421-93-4		8081B	90	20.0	20.0	4.80	ug/kg	45	-	136	36	45	-	136	36			
Soil		Endrin ketone	53494-70-5		8081B	90	2.00	2.00	0.420	ug/kg	56	-	128	27	56	-	128	27			
Soil		gamma-BHC (Lindane)	58-89-9		8081B	90	2.00	2.00	0.750	ug/kg	55	-	120	31	55	-	120	31			
Soil		Heptachlor	76-44-8		8081B	90	3.00	3.00	0.190	ug/kg	57	-	124	34	57	-	124	34			
Soil		Heptachlor epoxide	1024-57-3		8081B	90	3.00	3.00	0.300	ug/kg	62	-	120	34	62	-	120	34			
Soil		Methoxychlor	72-43-5		8081B	90	10.0	10.0	0.370	ug/kg	51	-	133	40	51	-	133	40			
Soil		Toxaphene	8001-35-2		8081B	90	100	100	25.0	ug/kg	38	-	150	40	38	-	150	40			

Table 14. PARCCS Quality Control Criteria (Measurement Indicators)
Diablo Dry Dock Site
EE/CA SAP

Matrix	Category	Analyte	Comparability			Completeness	Sensitivity				Accuracy and Precision										
											MS/MSD				LCS/LCSD				Surrogate		
			CAS Number	Laboratory	Test Method[a]	Usable Data (%)	Maximum Reporting Levels	Project Quantitation Limits	Achievable Laboratory MDLs	Units	% Recovery			RPD (%)	% Recovery			RPD (%)	% Recovery		
Soil	Organochlorine Pesticides	trans-Chlordane	5103-74-2	TBD	8081B	90	3.00	3.00	0.320	ug/kg	60	-	120	35	60	-	120	35			
Soil		DCB Decachlorobiphenyl (Surr)	2051-24-3		8081B	90	3.00	3.00	0.690	ug/kg									36	-	123
Soil		Tetrachloro-m-xylene (Surr)	877-09-8		8081B	90	3.00	3.00	0.280	ug/kg									38	-	123
Sediment	Conventionals	Total Organic Carbon	7440-44-0	TBD	9060A	90	2000	2000	96.7	mg/kg	68	-	149	32	40	-	180	32			
Sediment		Percent Solids	STL00234		Not Applicable	90	0.100	0.100	0.100	%				20	80	-	120				
Sediment	Sulfide, Acid Soluble and Insoluble (Titrimetric)	Acid Volatile Sulfides (AVS)	18496-25-8	TBD	9034_Calc_AVS	90	30.0	30.0	10.0	mg/kg	75	-	125	20	85	-	115	20			
Sediment	Metals, Simultaneously Extracted Metals (SEM)	SEM/AVS Ratio	STL00343	TBD	SEM	90	0.00100	0.00100	0.001	unitless											
Sediment	Metals, AVS/SEM	Cadmium SEM	7440-43-9	TBD	6010C	90	0.125	0.125	0.00698	mg/kg	75	-	125	20	80	-	120	20			
Sediment		Copper SEM	7440-50-8		6010C	90	0.625	0.625	0.0548	mg/kg	75	-	125	20	80	-	120	20			
Sediment		Lead SEM	7439-92-1		6010C	90	0.250	0.250	0.0713	mg/kg	75	-	125	20	80	-	120	20			
Sediment		Nickel SEM	7440-02-0		6010C	90	1.00	1.00	0.0380	mg/kg	75	-	125	20	80	-	120	20			
Sediment		Zinc SEM	7440-66-6		6010C	90	2.50	2.50	0.149	mg/kg	75	-	125	20	80	-	120	20			
Sediment		Mercury SEM	7440-02-0		6010C	90	0.00500	0.00500	0.00253	mg/kg	75	-	125	20	80	-	120	20			
Sediment	Grain Size	Gravel	STL00581	TBD	PSEP	90	0.01	0.01	NA	%											
Sediment		Sand, Coarse	STL00583		PSEP	90	0.01	0.01		%											
Sediment		Sand, Medium	STL00584		PSEP	90	0.01	0.01		%											
Sediment		Sand, Fine	STL00585		PSEP	90	0.01	0.01		%											
Sediment		Silt	STL00586		PSEP	90	0.01	0.01		%											
Sediment		Clay	STL00587		PSEP	90	0.01	0.01		%											
Sediment	Total Metals	Arsenic	7440-38-2	TBD	6010D	90	3.00	3.00	0.248	mg/kg	80	-	120	20	80	-	120	20			
Sediment		Barium	7440-39-3		6010D	90	0.500	0.500	0.0790	mg/kg	80	-	120	20	80	-	120	20			
Sediment		Cadmium	7440-43-9		6010D	90	1.00	1.00	0.0490	mg/kg	80	-	120	20	80	-	120	20			
Sediment		Chromium	7440-47-3		6010D	90	1.30	1.30	0.216	mg/kg	80	-	120	20	80	-	120	20			
Sediment		Copper	7440-50-8		6010D	90	0.5	0.5	0.34	mg/kg	80	-	120	20	80	-	120	20			
Sediment		Lead	7439-92-1		6010D	90	1.50	1.50	0.222	mg/kg	80	-	120	20	80	-	120	20			
Sediment		Nickel	7440-02-0		6010D	90	0.5	0.5	0.05	mg/kg	80	-	120	20	80	-	120	20			
Sediment		Selenium	7782-49-2		6010D	90	5.00	5.00	0.396	mg/kg	80	-	120	20	80	-	120	20			
Sediment		Silver	7440-22-4		6010D	90	2.50	2.50	0.560	mg/kg	80	-	120	20	80	-	120	20			
Sediment		Zinc	7440-66-6		6010D	90	4	4	0.82	mg/kg	80	-	120	20	80	-	120	20			
		Hexavalent chromium	18540-29-9		7196A	90	0.42	0.42	0.14	mg/kg	85	-	120	20	80	-	120	20			
Sediment		Mercury	7439-97-6		7471A	90	0.0300	0.0300	0.00900	mg/kg	80	-	115	20	85	-	115	20			
Sediment	PAHs	1-Methylnaphthalene	90-12-0	TBD	8270E	90	3	3	0.5	ug/kg	69	-	120	24	69	-	120	24			
Sediment		2-Methylnaphthalene	91-57-6		8270E	90	5	5	0.88	ug/kg	70	-	120	21	70	-	120	21			
Sediment		Acenaphthene	83-32-9		8270E	90	4	4	0.46	ug/kg	64	-	120	19	64	-	120	19			
Sediment		Acenaphthylene	208-96-8		8270E	90	2.5	2.5	0.5	ug/kg	63	-	120	18	63	-	120	18			
Sediment		Anthracene	120-12-7		8270E	90	6	6	1.6	ug/kg	67	-	131	28	67	-	131	28			
Sediment		Benzo[a]anthracene	56-55-3		8270E	90	4	4	1.1	ug/kg	60	-	135	21	60	-	135	21			
Sediment		Benzo[a]pyrene	50-32-8		8270E	90	6	6	1.3	ug/kg	62	-	129	27	62	-	129	27			
Sediment		Benzo[b]fluoranthene	205-99-2		8270E	90	4	4	1	ug/kg	58	-	136	25	58	-	136	25			
Sediment		Benzo[g,h,i]perylene	191-24-2		8270E	90	6	6	1.8	ug/kg	64	-	146	26	64	-	146	26			
Sediment		Benzo[k]fluoranthene	207-08-9		8270E	90	6	6	1.4	ug/kg	68	-	123	18	68	-	123	18			
Sediment		Chrysene	218-01-9		8270E	90	6	6	1.3	ug/kg	69	-	127	27	69	-	127	27			
Sediment		Dibenz(a,h)anthracene	53-70-3		8270E	90	5	5	1.2	ug/kg	59	-	139	29	59	-	139	29			
Sediment		Fluoranthene	206-44-0		8270E	90	4	4	1.2	ug/kg	69	-	133	21	69	-	133	21			
Sediment		Fluorene	86-73-7		8270E	90	2.5	2.5	0.5	ug/kg	68	-	121	17	68	-	121	17			
Sediment		Indeno[1,2,3-cd]pyrene	193-39-5		8270E	90	4	4	1.2	ug/kg	52	-	146	30	52	-	146	30			
Sediment		Naphthalene	91-20-3		8270E	90	2.5	2.5	0.5	ug/kg	68	-	120	15	68	-	120	15			
Sediment		Phenanthrene	85-01-8		8270E	90	6	6	0.58	ug/kg	68	-	126	27	68	-	126	27			
Sediment		Pyrene	129-00-0		8270E	90	6	6	1.3	ug/kg	68	-	141	24	68	-	141	24			
Sediment		2,4,6-Tribromophenol (Surr)	118-79-6		8270E	90	200	200	44.2	ug/kg									52	-	115
Sediment		2-Fluorobiphenyl (Surr)	321-60-8		8270E	90	100	100	32.3	ug/kg									57	-	120

Table 14. PARCCS Quality Control Criteria (Measurement Indicators)
Diablo Dry Dock Site
EE/CA SAP

Matrix	Category	Analyte	Comparability			Completeness	Sensitivity				Accuracy and Precision										
											MS/MSD				LCS/LCSD				Surrogate		
			CAS Number	Laboratory	Test Method[a]	Usable Data (%)	Maximum Reporting Levels	Project Quantitation Limits	Achievable Laboratory MDLs	Units	% Recovery			RPD (%)	% Recovery			RPD (%)	% Recovery		
Sediment	PAHs	2-Fluorophenol (Surr)	367-12-4	TBD	8270E	90	200	200	44.2	ug/kg									47	-	119
Sediment		Nitrobenzene-d5 (Surr)	4165-60-0		8270E	90	100	100	29.4	ug/kg									54	-	120
Sediment		Phenol-d5 (Surr)	4165-62-2		8270E	90	200	200	19.8	ug/kg									59	-	120
Sediment		Terphenyl-d14 (Surr)	1718-51-0		8270E	90	100	100	61.2	ug/kg									73	-	125
Sediment	Organochlorine Pesticides	4,4'-DDD	72-54-8	TBD	8081B	90	0.2	0.2	0.023	ug/kg	61	-	132	33	61	-	132	33			
Sediment		4,4'-DDE	72-55-9		8081B	90	0.2	0.2	0.037	ug/kg	59	-	124	37	59	-	124	37			
Sediment		4,4'-DDT	50-29-3		8081B	90	0.2	0.2	0.037	ug/kg	57	-	124	32	57	-	124	32			
Sediment		Aldrin	309-00-2		8081B	90	0.3	0.3	0.038	ug/kg	56	-	121	37	56	-	121	37			
Sediment		alpha-BHC	319-84-6		8081B	90	0.2	0.2	0.016	ug/kg	62	-	120	35	62	-	120	35			
Sediment		beta-BHC	319-85-7		8081B	90	0.5	0.5	0.025	ug/kg	53	-	138	29	53	-	138	29			
Sediment		cis-Chlordane	5103-71-9		8081B	90	0.2	0.2	0.075	ug/kg	62	-	125	39	62	-	125	39			
Sediment		delta-BHC	319-86-8		8081B	90	0.3	0.3	0.028	ug/kg	60	-	124	37	60	-	124	37			
Sediment		Dieldrin	60-57-1		8081B	90	0.2	0.2	0.035	ug/kg	61	-	121	35	61	-	121	35			
Sediment		Endosulfan I	959-98-8		8081B	90	0.2	0.2	0.034	ug/kg	57	-	121	40	57	-	121	40			
Sediment		Endosulfan II	33213-65-9		8081B	90	0.2	0.2	0.026	ug/kg	47	-	125	37	47	-	125	37			
Sediment		Endosulfan sulfate	1031-07-8		8081B	90	0.2	0.2	0.028	ug/kg	50	-	132	40	50	-	132	40			
Sediment		Endrin	72-20-8		8081B	90	0.2	0.2	0.047	ug/kg	56	-	131	38	56	-	131	38			
Sediment		Endrin aldehyde	7421-93-4		8081B	90	2	2	0.48	ug/kg	45	-	136	36	45	-	136	36			
Sediment		Endrin ketone	53494-70-5		8081B	90	0.2	0.2	0.042	ug/kg	56	-	128	27	56	-	128	27			
Sediment		gamma-BHC (Lindane)	58-89-9		8081B	90	0.2	0.2	0.075	ug/kg	55	-	120	31	55	-	120	31			
Sediment		Heptachlor	76-44-8		8081B	90	0.3	0.3	0.019	ug/kg	57	-	124	34	57	-	124	34			
Sediment		Heptachlor epoxide	1024-57-3		8081B	90	0.3	0.3	0.03	ug/kg	62	-	120	34	62	-	120	34			
Sediment		Methoxychlor	72-43-5		8081B	90	1	1	0.037	ug/kg	51	-	133	40	51	-	133	40			
Sediment		Toxaphene	8001-35-2		8081B	90	10	10	2.5	ug/kg	38	-	150	40	38	-	150	40			
Sediment		trans-Chlordane	5103-74-2		8081B	90	0.3	0.3	0.032	ug/kg	60	-	120	35	60	-	120	35			
Sediment		DCB Decachlorobiphenyl (Surr)	2051-24-3		8081B	90	0.3	0.3	0.069	ug/kg									36	-	123
Sediment		Tetrachloro-m-xylene (Surr)	877-09-8		8081B	90	0.3	0.3	0.028	ug/kg									38	-	123

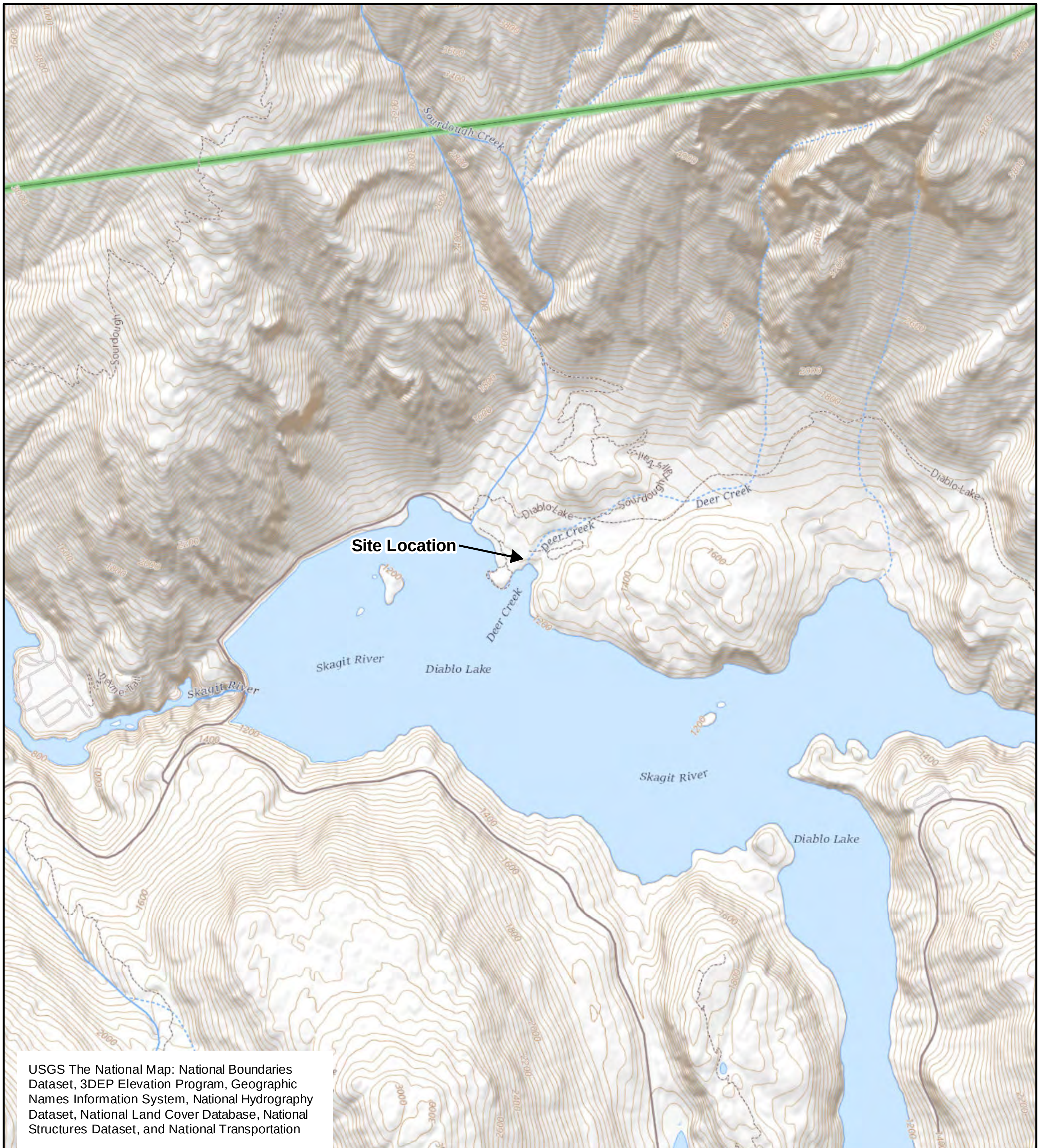
Footnotes:

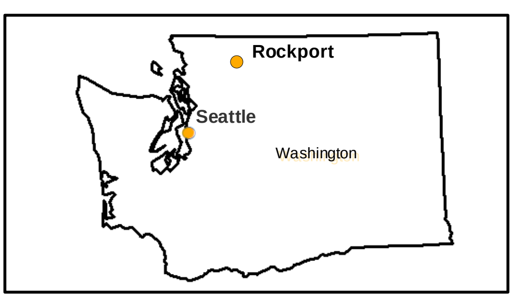
a. Actual method may differ depending on standard laboratory methods.

Acronyms:

%	percent	RPD	Relative percent difference
mg/kg	milligrams per kilograms	Surr	surrogate
ug/L	micrograms per liter	TBD	To be determined
MS	matrix spike	CAS	Chemical abstract service
MSD	matrix spike duplicate	PAHs	Polycyclic aromatic hydrocarbons
MDL	Method detection limit	AVS	Acid-volatile sulfide
LCS	Laboratory control sample	SEM	Simultaneously extracted metals
LCSD	Laboratory control sample duplicate		

FIGURES





Legend

- Road
- Stream
- Trail

N

0 — 1,680 Feet

Site Vicinity Map

Diablo Dry Dock
Diablo Lake, Washington

Geosyntec consultants

PNG0913	February 2021	Figure 1

Legend

- Trails (NPS)
- Streams (NHD)
- Road

Notes:
NPS = National Park Service
NHD = National Hydrography Dataset

N

0 100 Feet

Site Layout Map
Diablo Dry Dock
Diablo Lake, Washington

Geosyntec consultants

PNG0913 | February 2021

Figure 2

P:\Projects\Seattle_City_of\PNG0913_Diablo Drydock\900 GIS and CAD\GIS\MXDs\Figure 2 Site Layout.mxd 12/3/2020 4:34:18 AM

Legend

- Surface Sediment Sample Location
- Soil Sample Location
- Approximate Ordinary High Water Mark

Notes:
Sample locations based on coordinates found in 2016 Final SCL Diablo Drydock Report (Hart Crowser).
Approximate Ordinary High Water Mark digitized based on Figure 2 from 2016 Final SCL Diablo Drydock Report (Hart Crowser).

N

0 40 Feet

Historical Sampling Locations
Diablo Dry Dock
Diablo Lake, Washington

Geosyntec consultants

PNG0913 | February 2021

Figure 3

P:\Projects\Seattle_City_of\PNG0913_Diablo Drydock\900 GIS and CAD\GIS\MXDs\Figure 3 Historical Sampling Locations.mxd 2/9/2021 6:30:02 AM

Legend

- Historical Soil Sample Location
- Approximate Ordinary High Water Mark

Notes:
1. Detected concentrations that exceed MTCA Method A levels or ecological screening values are shaded.
2. U = Not detected at the reporting limit indicated.
3. Samples shown with no data were sampled, but were not analyzed for metals.
4. Chemical data from Soil and Sediment Characterization Seattle City Light Diablo Lake Dry Dock Building (Hart Crowser, 2016).
5. NA - Not Analyzed

N

0 20 Feet

Historical Upland Soil Sample Analytical Results – Select Metals

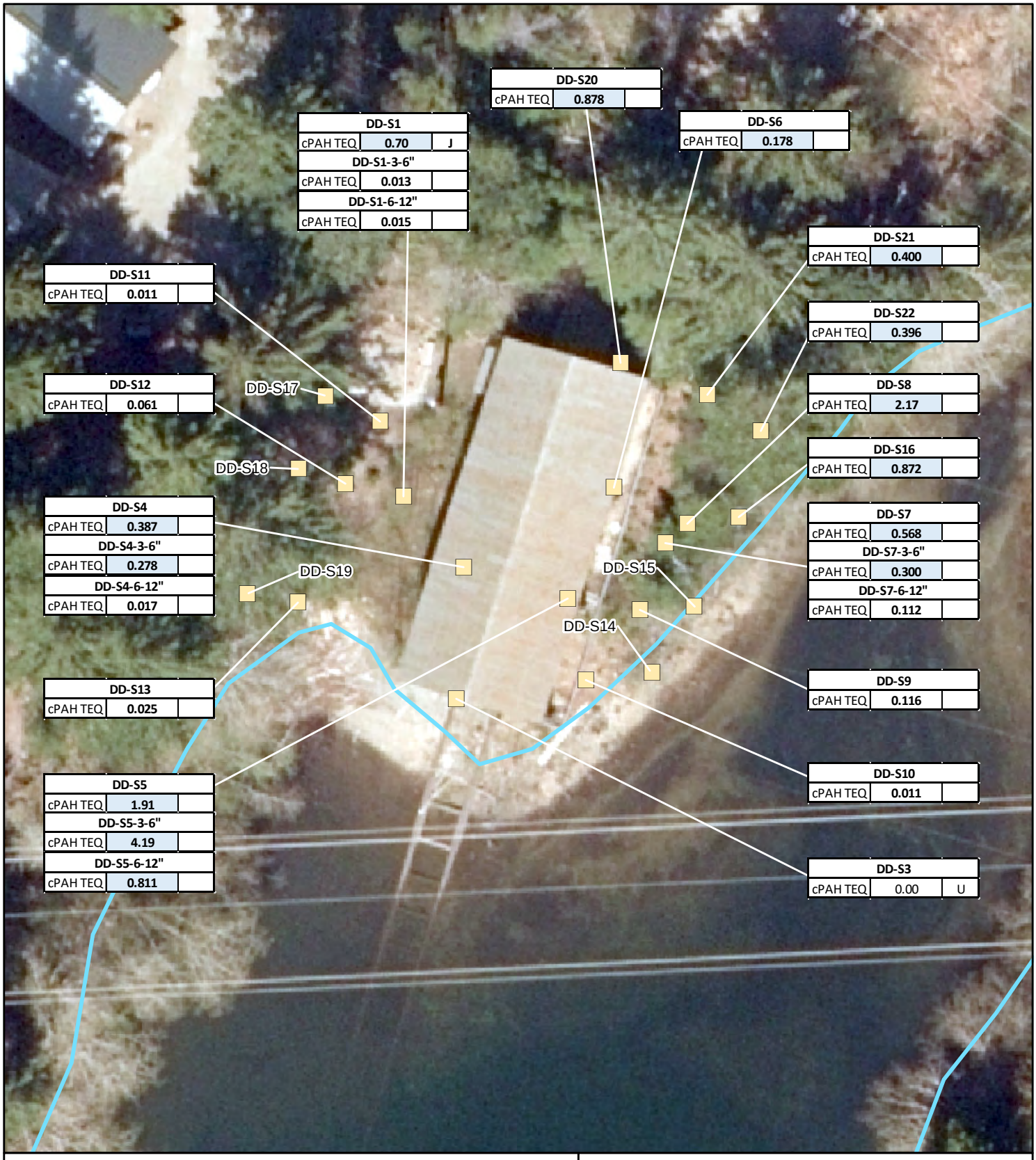
Diablo Dry Dock
Diablo Lake, Washington

Geosyntec consultants

PNG0913 | February 2021

Figure 4

P:\Projects\Seattle_City_of\PNG0913_Diablo Drydock\900 GIS and CAD\GIS\MXDs\Figure 4 Historical Upland Metals.mxd 2/9/2021 6:32:54 AM



Legend

- Soil Sample Location
- Approximate Ordinary High Water Mark

N

0 20 Feet

Notes:
1. Concentrations that exceed MTCA Method A levels are shaded.
2. U = Not detected at the reporting limit indicated.
3. Samples shown with no data were sampled, but were not analyzed for metals.
4. Total cPAH TEQs are calculated by multiplying toxicity equivalency factor (SCUM, 2019) by the detected concentration; non detected are multiplied by half the reporting limit.
5. Total cPAH TEQs calculated using WAC 173-340-708(8) in the historical dataset.

Historical Upland Soil Sample Analytical Results – cPAHs

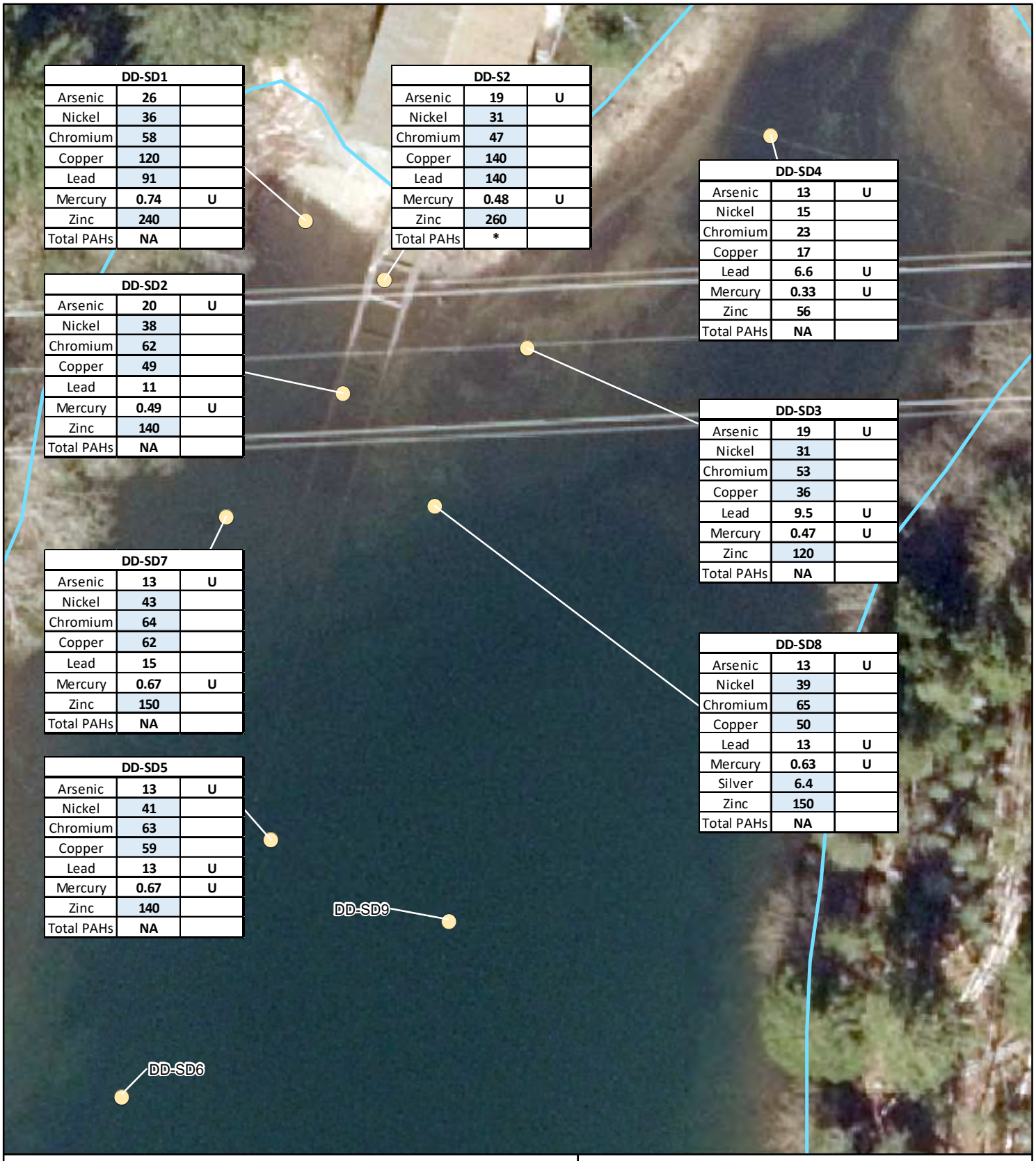
Diablo Dry Dock
Diablo Lake, Washington

Geosyntec consultants

PNG0913	February 2021

Figure 5

P:\Projects\Seattle_City_of\PNG0913_Diablo Drydock\900 GIS and CAD\GIS\MXDs\Figure 5 Historical Upland cPAHs.mxd 2/12/2021 12:23:28 PM



Legend

- Historical Surface Sediment Sample
- Approximate Ordinary High Water Mark

Notes:
1. Concentrations that exceed ecological screening values shaded.
2. Chemical data from Soil and Sediment Characterization Seattle City Light Diablo Lake Dry Dock Building (Hart Crowser, 2016).
3. NA - Not Analyzed
4. DD-SD6 and DD-SD9 were archived (not tested).
*DD-S2, DD-S2-3-6" and DD-S2-6-12" contained PAH concentrations above ecological screening values.

N

0 20 Feet

Historical Sediment Sample Analytical Results - Select Metals and total PAHs

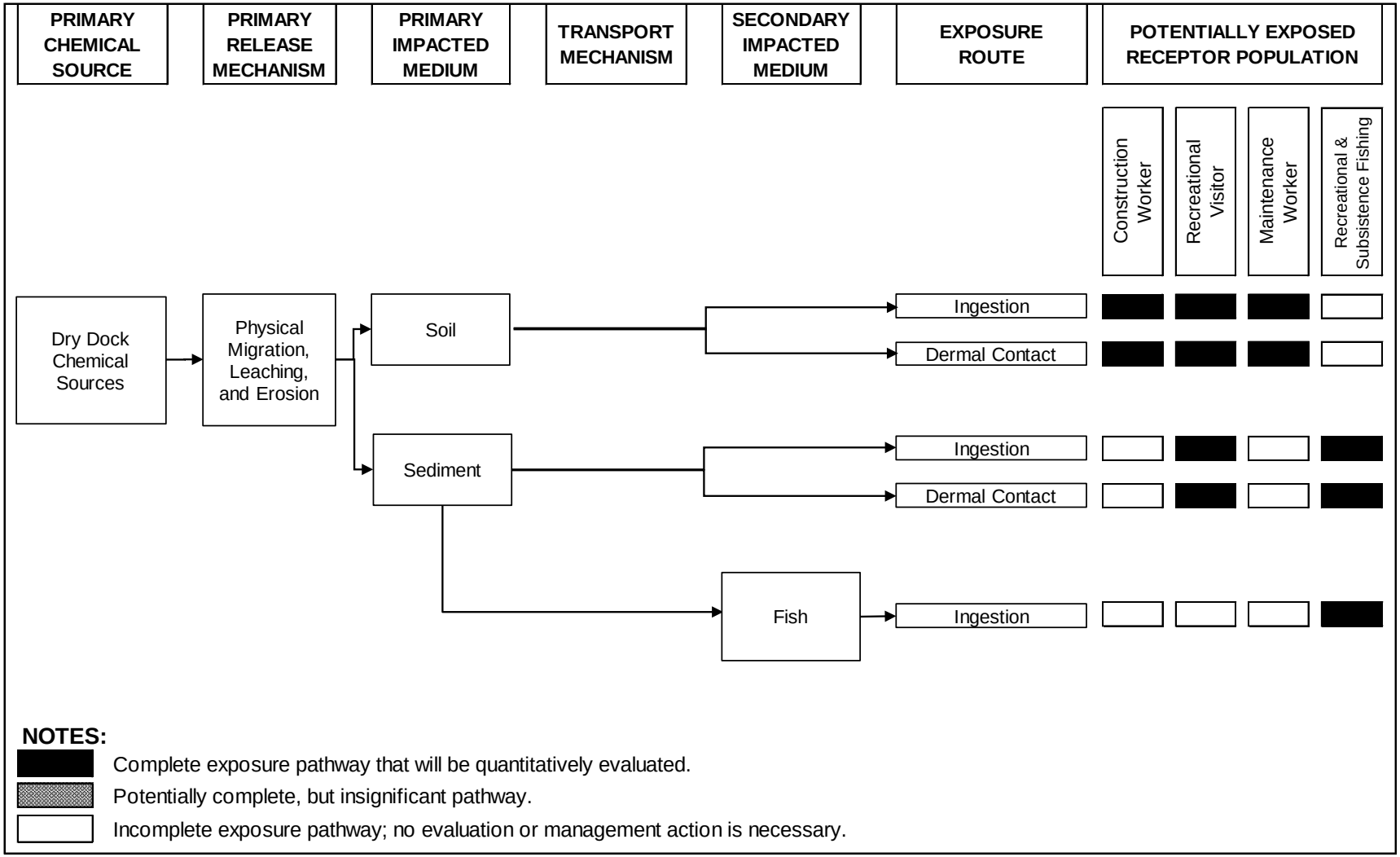
Diablo Dry Dock
Diablo Lake, Washington

Geosyntec consultants

PNG0913 | February 2021

Figure 6

P:\Projects\Seattle_City_of\PNG0913_Diablo Drydock\900 GIS and CAD\GIS\MXDs\Figure 6 Historical Sediment Sample Analytical Results.mxd 2/9/2021 6:36:50 AM



Conceptual Site Model – Human Health

Diablo Lake Drydock
Diablo Lake, Washington

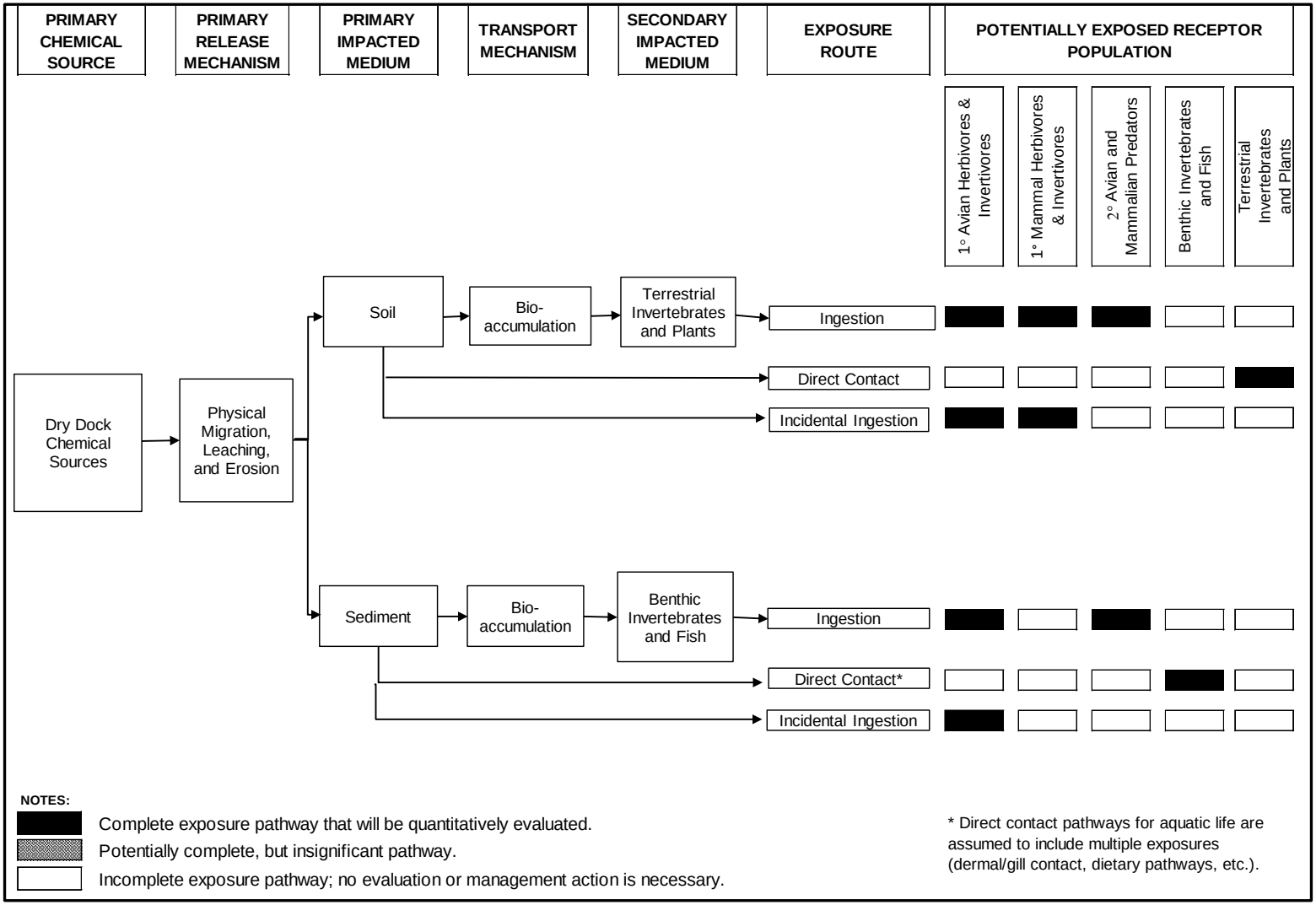
Geosyntec consultants

PNG0913

Figure **7a**

February 2021

internal info: path, date revised, author



Conceptual Site Model – Ecological

Diablo Lake Drydock
Diablo Lake, Washington

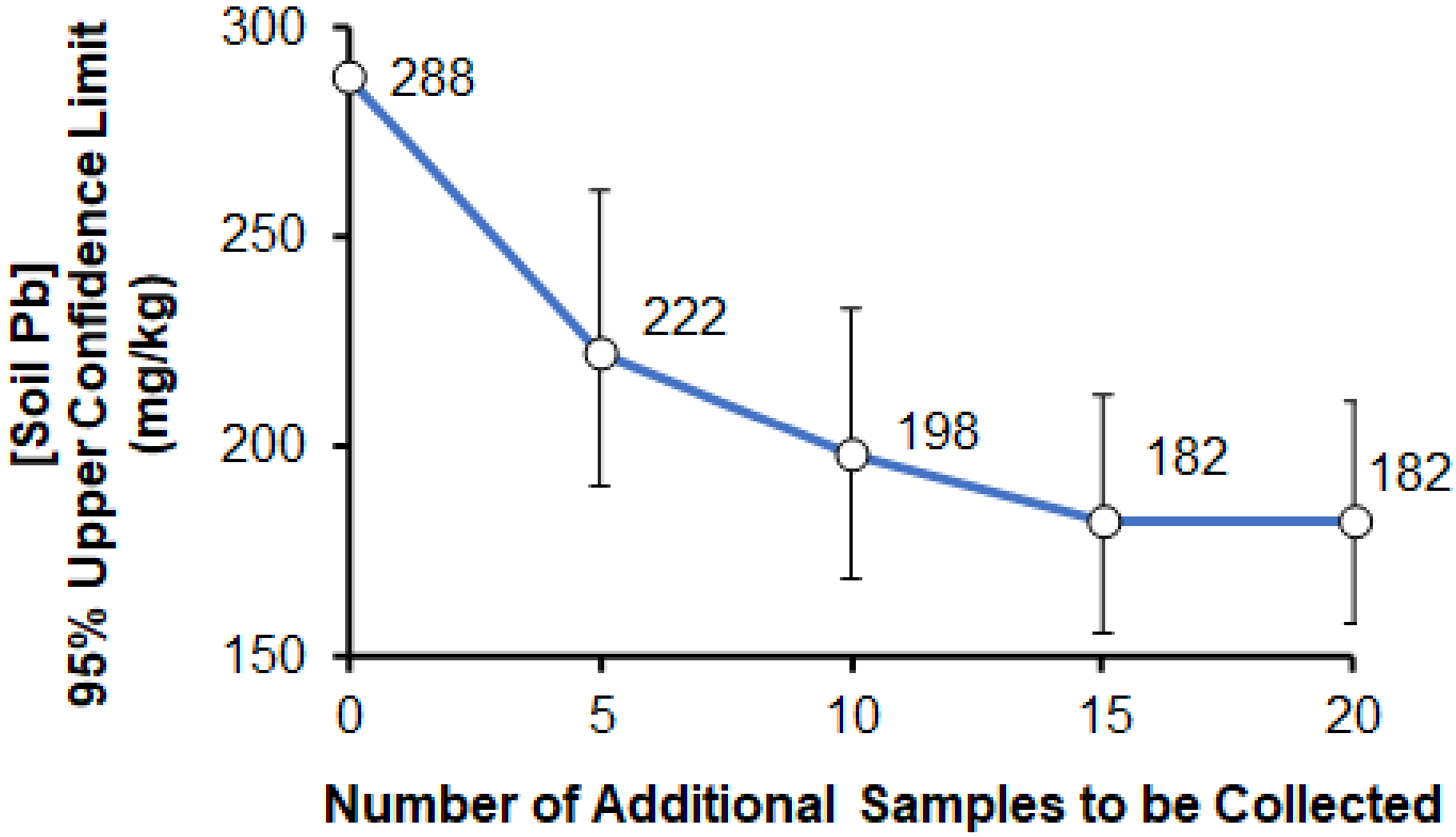
Geosyntec consultants

PNG0913

Figure **7b**

16-10-2020

internal info: path, date revised, author



Notes:
Median (+/- interquartile range) projected 95% Upper Confidence Limits (95 UCLs) for the concentration of lead in soil assuming 5, 10, 15, or 20 samples are added to the existing Hart Crowser (2016) samples and used to calculate 95 UCLs.
UCL – upper confidence limit
Mg/kg – milligrams per kilogram
Pb - lead

Sample Count versus 95% UCL Graph For Soil Lead

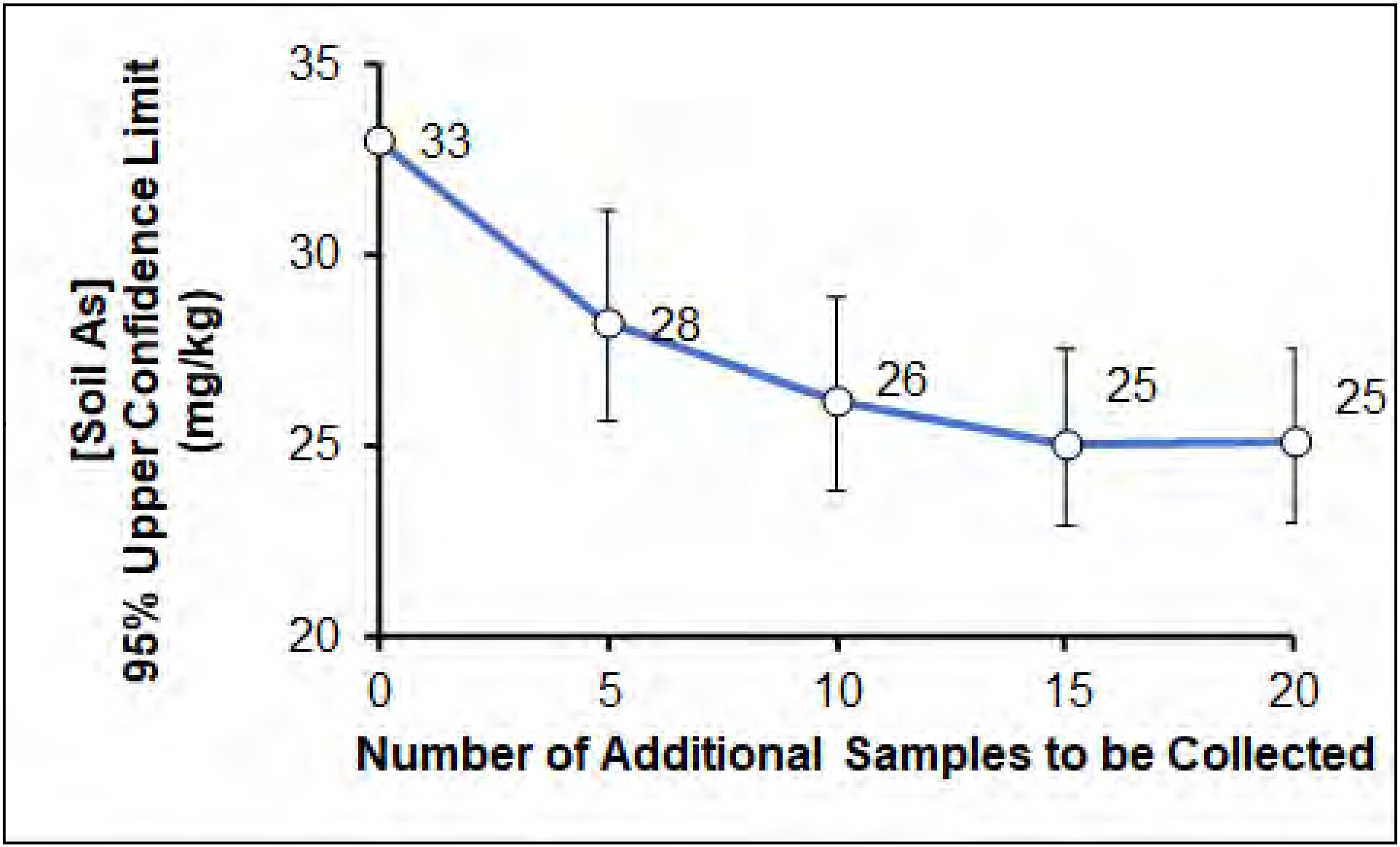
Diablo Dry Dock
Diablo Lake, Washington

Geosyntec consultants

PNG0913	February 2021

Figure 8

P:\Projects\Seattle_City_of\PNG0913_Diablo Drydock\900 GIS and CAD\GIS\MXDs\Figure 8 95% UCL Graph For Soil Lead.mxd 12/3/2020 4:43:14 AM



Notes
Median (+/- interquartile range) projected 95% Upper Confidence Limits (95 UCLs) for the concentration of arsenic in soil assuming 5, 10, 15, or 20 samples are added to the existing Hart Crowser (2016) samples and used to calculate 95 UCLs.
UCL – upper confidence limit
Mg/kg – milligrams per kilogram
As – arsenic

Sample Count versus 95% UCL Graph For Soil Arsenic

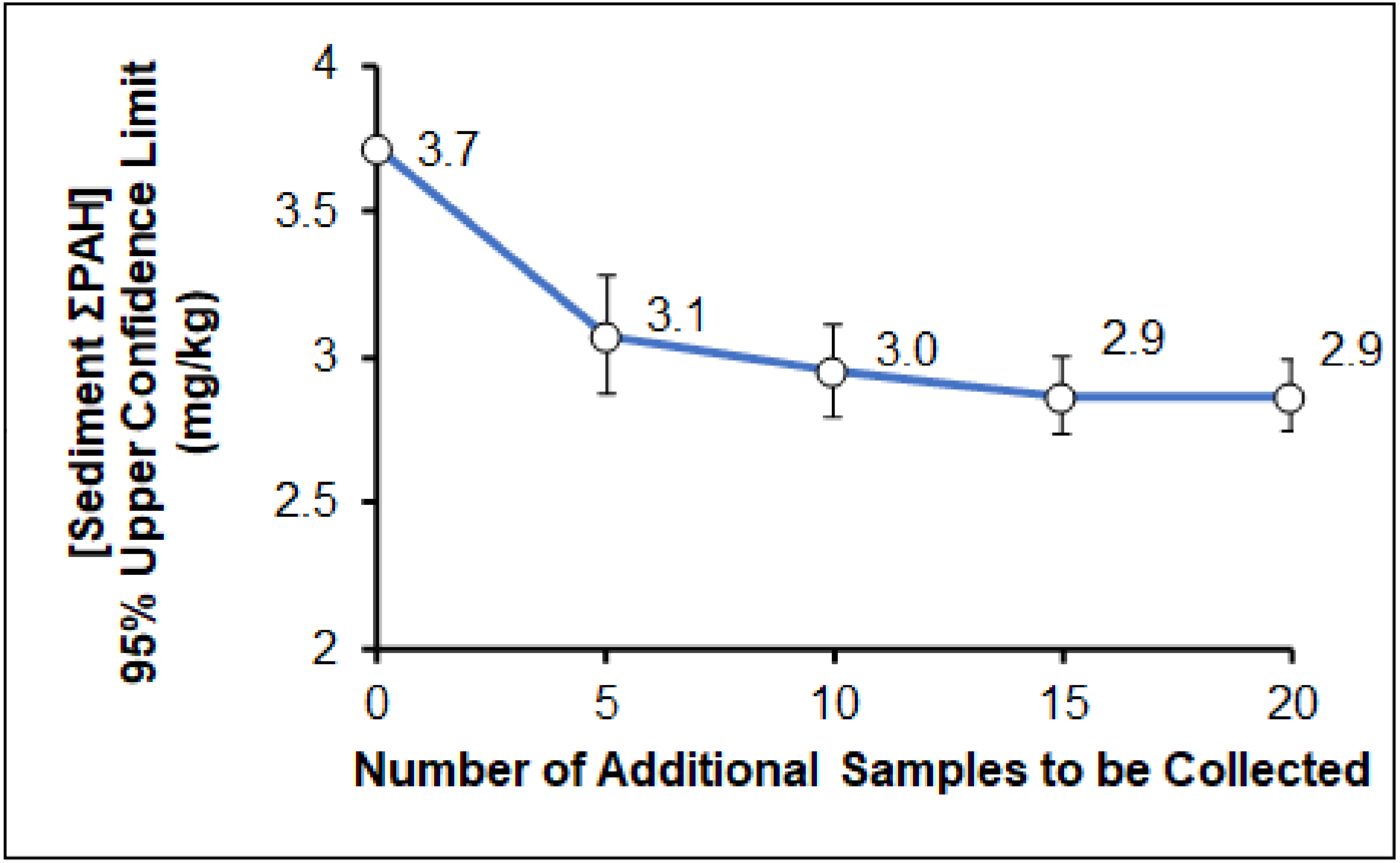
Diablo Dry Dock
Diablo Lake, Washington

Geosyntec consultants

PNG0913	February 2021

Figure 9

P:\Projects\Seattle_City_of\PNG0913_Diablo Drydock\900 GIS and CAD\GIS\MXDs\Figure 9 95% UCL Graph For Soil Arsenic.mxd 12/3/2020 4:43:51 AM



Notes
Median (+/- interquartile range) projected 95% Upper Confidence Limits (95 UCLs) for the concentration of the sum of PAHs in sediment assuming 5, 10, 15, or 20 samples are added to the existing Hart Crowser (2016) samples and used to calculate 95 UCLs.
UCL – upper confidence limit
Mg/kg – milligrams per kilogram
PAH - Polycyclic Aromatic Hydrocarbon

Sample Count versus 95% UCL Graph For Soil Total PAHs

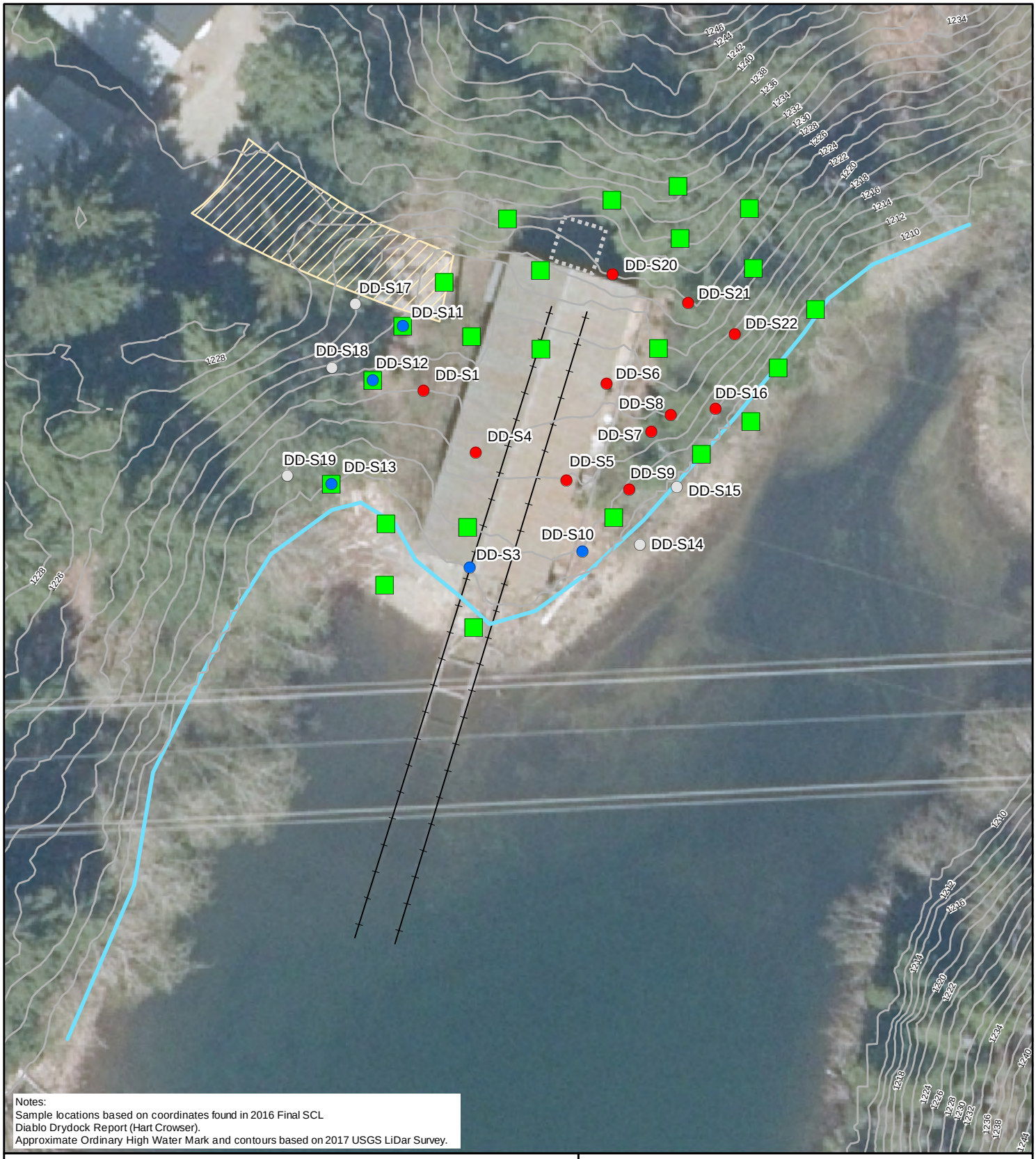
Diablo Dry Dock
Diablo Lake, Washington

Geosyntec consultants

PNG0913	February 2021

Figure 10

P:\Projects\Seattle_City_of\PNG0913_Diablo Drydock\900 GIS and CAD\GIS\MXDs\Figure 10 95% UCL Graph For Soil PAHs.mxd 12/3/2020 4:45:17 AM



Notes:
Sample locations based on coordinates found in 2016 Final SCL
Diablo Drydock Report (Hart Crowser).
Approximate Ordinary High Water Mark and contours based on 2017 USGS LiDar Survey.

Legend

- Proposed Soil

Historical Upland Soil Exceedance Level

- Not Analyzed
- Concentrations Below MTCA Method A/B Criteria
- Concentrations Above MTCA Method A/B Criteria
- Contour (2 Ft NAVD88)
- Approximate Ordinary High Water Mark
- Rail Line
- Shed
- Gravel Road

N

0 20 Feet

Proposed Upland Soil and Bank Sampling Locations

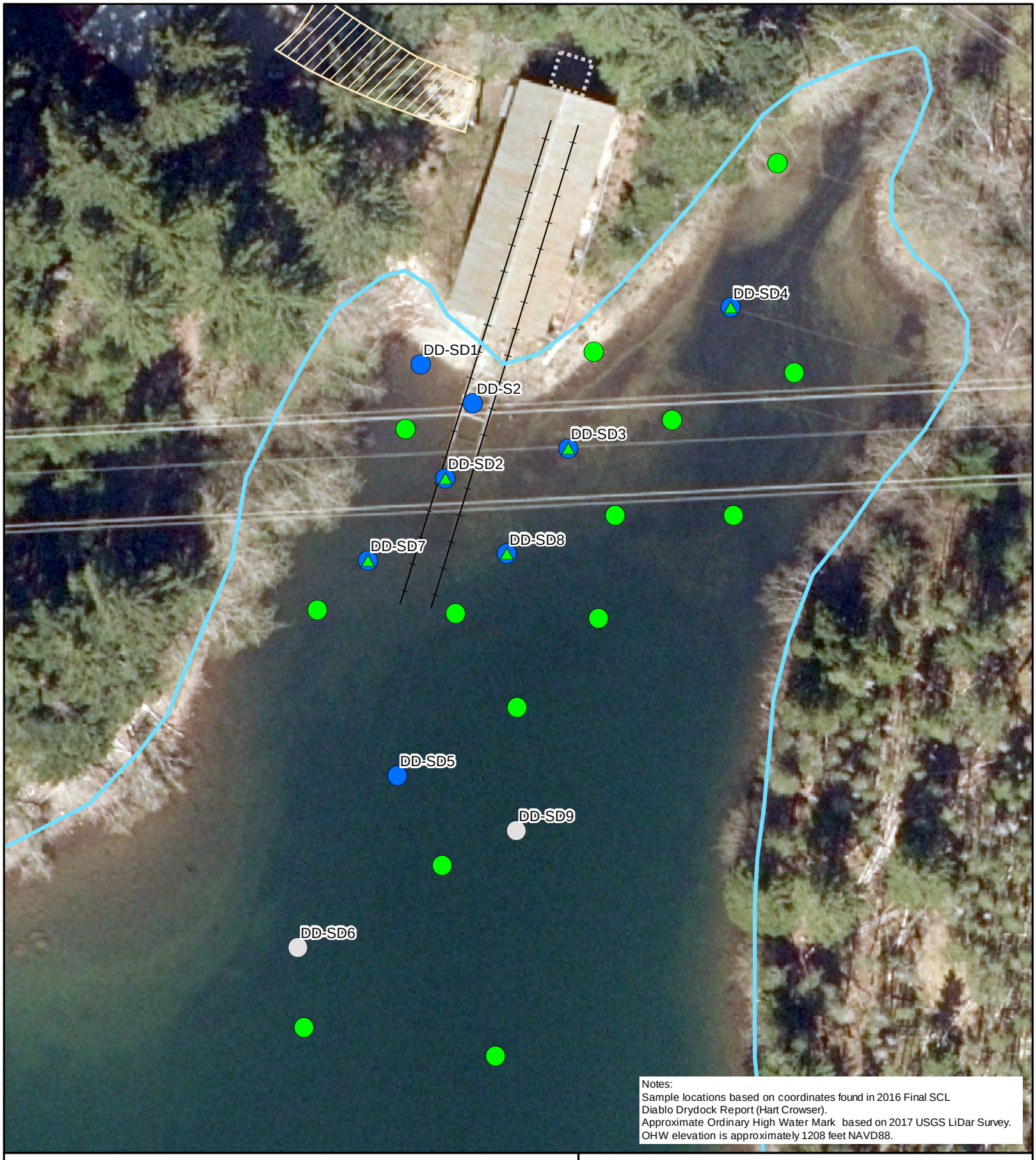
Diablo Dry Dock
Diablo Lake, Washington

Geosyntec consultants

PNG0913	February 2021

Figure 11

P:\Projects\Seattle_City_of\PNG0913_Diablo Drydock\900 GIS and CAD\GIS\MXDs\Figure 11 Proposed Upland Soil Sampling Locations.mxd 2/9/2021 5:59:15 AM



Legend

- Proposed Sediment Sample Location
- Proposed Core Location
- Historical Sediment Sampling Location: Not Analyzed
- Historical Sediment Sampling Location
- Approximate Ordinary High Water Mark
- Rail Line
- Shed
- Gravel Road

N

0 50 Feet

Proposed Sediment Sampling Locations

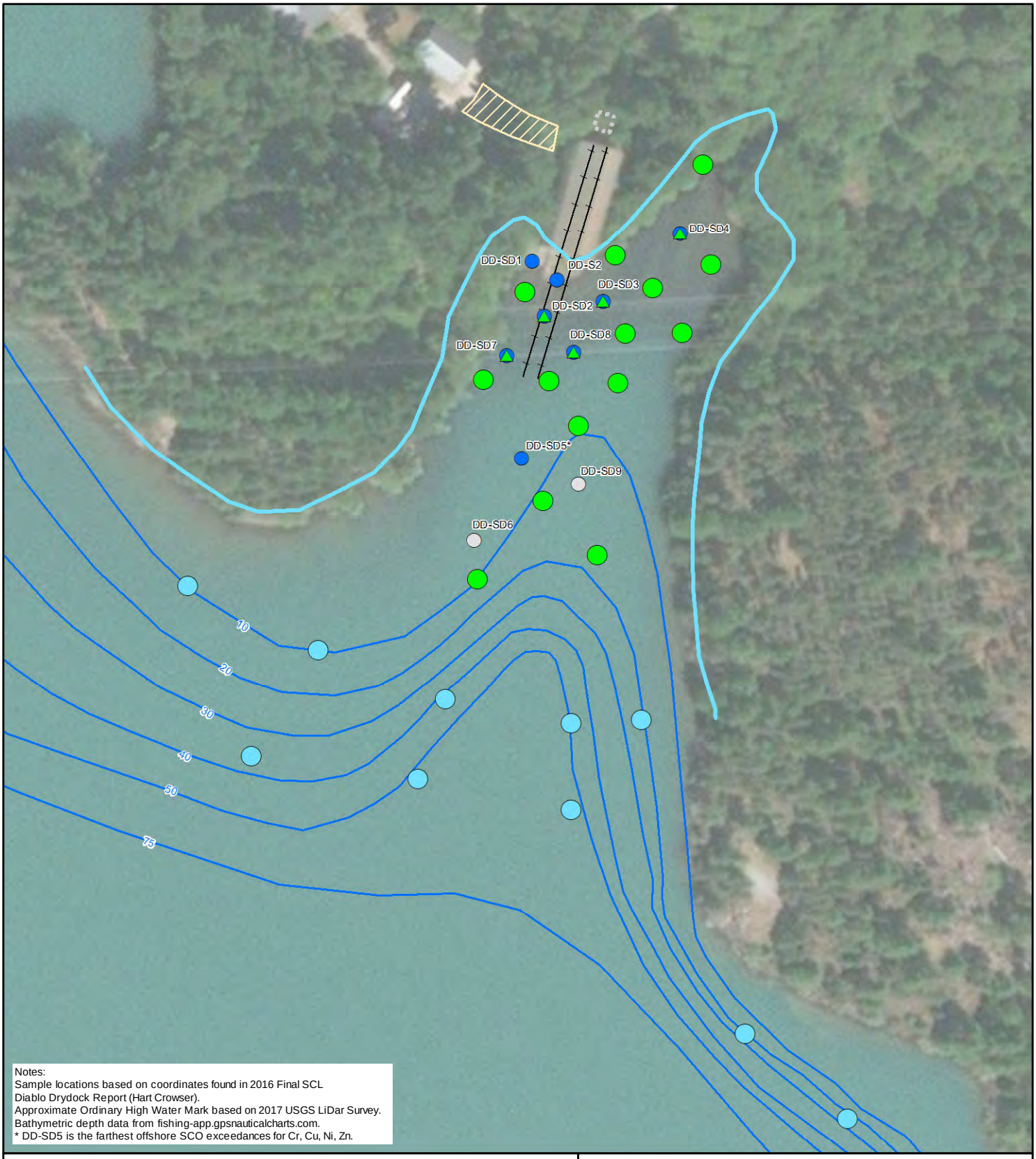
Diablo Dry Dock
Diablo Lake, Washington

Geosyntec consultants

PNG0913 | February 2021

Figure 12

P:\Projects\Seattle_City_of\PNG0913_Diablo Drydock\900 GIS and CAD\GIS\MXDs\Figure 12 Proposed Sediment Soil Sampling Locations.mxd 2/9/2021 6:18:51 AM



Notes:
Sample locations based on coordinates found in 2016 Final SCL Diablo Drydock Report (Hart Crowser).
Approximate Ordinary High Water Mark based on 2017 USGS LiDar Survey.
Bathymetric depth data from fishing-app.gpsnauticalcharts.com.
* DD-SD5 is the farthest offshore SCO exceedances for Cr, Cu, Ni, Zn.

Legend

- Proposed Sediment Sample Location
- Proposed Core Location
- Proposed Background Sediment Sample Location
- Historical Sediment Sampling Location: Not Analyzed
- Historical Sediment Sampling Location
- Approximate Ordinary High Water Mark
- Rail Line
- Approximate Depth Contour
- Shed
- Gravel Road

N

0 150 Feet

Proposed Sediment Background Sampling Locations

Diablo Dry Dock
Diablo Lake, Washington

Geosyntec consultants

PNG0913	February 2021	Figure 13

P:\Projects\Seattle_City_of\PNG0913_Diablo Drydock\900 GIS and CAD\GIS\MXDs\Figure 13 Proposed Sediment Background Sampling Locations.mxd 2/9/2021 12:29:08 PM

APPENDIX A
Standard Operating Procedures and Field Forms

- SOPs:
  - SOP 100 GPS Survey
  - SOP 101 Field Documentation
  - SOP 103 Equipment Decontamination
  - SOP 104 Management of IDW
  - SOP 107 Core Collection
  - SOP 108 Hand Auger
- Field Forms:
  - Daily Field Log
  - Soil Boring Field Log
  - Meter Calibration Form
  - Surface Sediment Field Form
  - Sediment Core Collection and Core Processing Form
  - Visual Classification Key
  - Chain of Custody Form

STANDARD OPERATING PROCEDURE NO. 100
RECORDING SAMPLE LOCATIONS WITH A GPS

SECTION 1 INTRODUCTION

1.1 Objective

The objective of this standard operating procedure (SOP) is to establish standard procedures for recording sample location with a global positioning system (GPS). Recording the location of field acquired data is essential to understanding contaminant distribution and necessary if returning to the location of collection is necessary during future sampling activities. GPS positioning will be used to confirm accurate positioning of vessels and sample locations during sample collection activities. This SOP includes: 1) methodology overview; 2) project geodetic parameters; 3) survey accuracy, precision, and control; 4) primary equipment; 5) portable GPS operation; 6) vessel navigation and equipment operation; and 7) data processing and quality assurance/quality control (QA/QC) procedures.

1.2 Referenced Documents and SOPs

- Health and Safety Plan (HASP)
- Quality Assurance Project Plan (QAPP)
- SOP 101 Field Documentation, Sample Designation, Custody and Handling Procedures

1.3 Task-Specific Equipment and Supplies

- Trimble® SPS 461 GPS with dual antennas (vessel GPS), or similar;
- Airmar ss510 survey sonar, (vessel sonar) or similar for bathymetry;
- A-frame assembly, sampling winch (vessel boom) for bathymetry;
- Eos Arrow® (portable GPS) receiver and antenna, tethered to Bluetooth® capable smartphone or tablet, ESRI Collector software with Eos® GNSS Status middleware, or similar device;
- Range pole;
- GPS owner's manuals;
- Field notebook;
- Spare batteries and/or battery charger;
- Weighted tape measure; and
- Writing tools (pens, Sharpie®).

SECTION 2 METHODOLOGY OVERVIEW

2.1 Horizontal (Map) Data Collection - Upland

Portable GPS receivers will be used to mobilize to sampling locations and to collect map location coordinates for those sampling locations. Portable GPS receivers will be procured through a reputable vendor. Coordinates will be recorded in decimal degree format using North American Datum 1983 (NAD83) or World Geodetic System 1984 (WGS84) as the datum. The pre-planned sampling locations in a Geographic Information System (GIS) file, which will be pre-loaded into the field tablet device.

Prior to each field effort, portable GPS will be verified and deemed to be sufficient to meet position and accuracy requirements for the project, by the equipment vendor, per manufacturers specification. The portable GPS devices will have the pre-loaded basemap on a field tablet device depicting planned sampling locations and other relevant features.

The sample location target will be recorded when the sampling device is in position (e.g., direct-push rig or hand-held equipment). The specific Location identification (ID) associated with the sample will also be recorded in the GPS device. Field personnel will be required to write that same Location ID on their field data collection forms at the same time as a backup, if for some reason there is an equipment or data failure. The data from the portable GPS devices will be wirelessly synchronized to a "cloud" web service in near real-time; the data from the "cloud" will also downloaded and saved to project servers daily.

2.2 Horizontal (Map) Data Collection - Inwater

A combination of vessel-mounted and portable GPS receivers will be used to navigate to sampling locations and to collect map location coordinates for those sampling locations. Coordinates will be recorded in decimal degree format using NAD83 or WGS84 State Plane Coordinates as the datum. The vessel-mounted GPS receivers will be the primary tool used for navigation to the pre-planned sampling locations in a GIS file, which will be pre-loaded into the vessel navigational system.

The portable GPS devices will be used as a backup only if there are problems with the vessel GPS navigation system or if there is no specific vessel navigation system (i.e., smaller boats). Prior to field work, vessel GPS will be verified and deemed to be sufficient to meet position and accuracy requirements for the project.

The vessel GPS will operate in two modes, collecting both a separate continuous data stream of positional information (line file) and recording GPS soundings (target file) when a sample is specifically collected. The sample location target file will be recorded when the sampling device is in position for the core (e.g., when sampler is on the lake bottom). The specific Location ID associated with the sample will also be recorded in the GPS device log. Field personnel will be

required to write that same Location ID on their field data collection forms at the same time. Both the continuous and episodic dataset will be timestamped to allow comparison of the two types of data. This data will be recorded and maintained on the vessel and will also be exported from the vessel navigation system and submitted to the project data manager and field lead(s) and on a daily basis for archival on project servers.

The portable GPS devices will be operated independently of the vessel's systems and will be used to record a location sounding wherever a sample is collected only for studies unable to use the vessel GPS navigation system. The sample location sounding will be recorded approximately at the same time as when the vessel GPS measurement would be collected (e.g., when sampler is in position). The specific Location ID associated with the sample will also be recorded on the GPS device. Field personnel will write this Location ID on the field forms only if the vessel measurement described earlier cannot be collected for some reason (e.g., equipment failure). These measurements will also be timestamped. The data from the portable GPS devices will be wirelessly synchronized to a "cloud" web service in near real-time; the data from the "cloud" will also be downloaded and saved to project servers daily.

2.3 Vertical Data Collection

Vertical (elevation) data can be recorded by the portable GPS device; however, accuracy will be contingent on the satellite signal and may not be a reliable representation of ground elevation. The vertical elevation of each upland station may be surveyed by a licensed surveyor and reported in the North American Vertical Datum 1988 (NAVD 88). Each sampling location will be marked appropriately as field activities take place and as allowed by operational activities at the time of sampling. Sample depths will be recorded relative to ground surface or mudline surface to the nearest tenth of a foot.

For in-water activities, vertical (elevation) data is also required for water levels, sample collection depth below surface water, and bottom (mudline) depth location for some types of sample locations. For depth measurements (e.g., water levels, depth to samples below water surface), the onboard vessel sonar will be used to record depth and then subsequently calculate elevation. Depth measurements will be verified using a weighted measuring tape ("lead line"). All depths will be recorded relative to the water surface and time tagged to correct with time tagged gauge data for obtaining lakebed elevations. The elevation will be calculated to NAVD88 vertical datum. To correct elevations, gauge data from the United States Army Corps of Engineers or City of Seattle website for Ross Lake will be downloaded. This water level gauge does not report NAVD88 elevations but rather reports a value that is 3.25 feet above NAVD88. The correction to NAVD88 would be to subtract 3.25 from the gauge reading. The City of Seattle gauge records data approximately every hour on the hour.

2.4 Location Position Recording in Project Database

When samples are collected, the Location ID and the location coordinates will be recorded on the GPS device(s) and the field data collection form(s).

Location coordinates will be based on the portable GPS and loaded to the project database. After the field event is completed, the recorded coordinates will be compared to the target coordinates. If analysis reveals precision or accuracy issues, the field recorded coordinates may be updated and edited with a better value derived from observations and notes recorded in the field notebook. These updated coordinates will be loaded to the project database only if there is a significant problem with the GPS (e.g., equipment failure).

For in-water locations, sample coordinates will be based on the vessel GPS measurements. The target and actual location measurement at the time of samples will be reviewed as a coordinate pair. The final and actual location will be loaded into the project database. After the field event is completed, the target measurement will be compared to the line file (vessel continuous GPS measurement) to confirm that the coordinate pair loaded to the project database is appropriate. If analysis reveals precision or accuracy issues, the loaded location coordinate pair in the project database may be updated and edited with a better value derived from the line file. In general, the hand-held GPS data will only be used as a backup and confirmation of vessel position only if there are problems with the vessel GPS navigation system or an independent navigation system is not available on the vessel. These coordinates will be loaded to the project database only if there is a significant problem with the vessel GPS (e.g., equipment failure) or if there is no vessel GPS.

If multiple grab samples are collected at a location to collect adequate sample volume, the first x/y coordinate of the first acceptable grab will be the primary coordinate for the sample.

2.5 Project Geodetic Parameters

The geodetic parameters to be used for the field studies will be as follows:

- Horizontal Datum: NAD83 or WGS84
- Projection: Unprojected
- Vertical Datum: NAVD88 Geoid12b
- Units: United States Survey Feet

2.6 Survey Accuracy, Precision, and Control

The anticipated horizontal accuracy of environmental sampling associated with vessel and portable GPS devices is a range of up to one meter. This is consistent with best practices as outlined in the 2008 US Environmental Protection Agency National Geospatial Data Policy.

The anticipated vertical accuracy of final elevation calculations derived from vessel sonar systems and lead-line measurements is anticipated to be one half foot.

SECTION 3 EQUIPMENT OPERATION

3.1 Portable GPS Operation

For ease of use, the project team will utilize a field tablet or similar device tethered to a GPS connection. The typical procedures to be followed when recording the location of field acquired data are summarized below.

- Turn GPS on outside in an open area. Wait for antenna to receive satellite signals. Continue to wait until a minimum number of satellites are acquired to achieve an appropriate horizontal accuracy (e.g., as shown in Eos Tools Pro software).
- Move the GPS to the location of the sample. Try to remain still or if on a boat ensure that the boat is stationary Press the appropriate keystrokes to mark the location (see Owner's Manual).
- Record the location name and coordinates in the field notebook, as a backup.
- If the GPS cannot be placed on the location of the sample record the distance and direction to the location as an "offset". This information should be recorded in the field notebook and used to correct the position at a later time.
- At the end of each day, if equipped, the data file should be downloaded to a personal computer from ESRI ArcMap or similar mapping tool and saved on the project server.
- If the coordinates are recorded by hand in the field notebook, they should be entered into a spreadsheet with the sample location name and submitted to the project data manager for archiving on the project server.

3.2 Vessel Navigation and Equipment Operation

Vessel positioning will be conducted through the marine navigation and hydrographic software package HYPACK. This software package allows the visualization of the vessel over navigable charts, the processing of satellite corrections, stored hardware, and vessel parameters, as well as the storing of physical target locations during sampling activities. HYPACK version 2017 will be used for this project.

Vessel position is measured using a Trimble SPS 461 GPS dual antenna receiver, or similar. The dual antennas provide precise vessel positioning via both satellite and differential radio corrections along with heading correction to 0.09 degree. GPS data is output through a serial connection into a computer running the HYPACK software, for vessel positioning and target collection.

At each sampling location, depth to mudline will be measured using an onboard fathometer (with lead line as confirmation as needed) immediately prior to or during the sampling, if available. Water depths are confirmed with a lead line with reference to water surface. Vertical measurements using a lead line will be recorded to the nearest 0.1 foot. Water depths will be converted to elevations in NAVD88 based on the lake stage at the time of sampling as recorded at the closest available water level gage.

STANDARD OPERATING PROCEDURE NO. 101
FIELD DOCUMENTATION, SAMPLE DESIGNATION, CUSTODY AND HANDLING PROCEDURES

SECTION 1 INTRODUCTION

1.1 Objective

The objective of this standard operating procedure (SOP) is to provide procedures for proper record keeping in the field. All information relevant to field operations must be properly documented to ensure that activities are accounted for and can be reconstructed from written records. Several types of field notes will be used for this purpose and should be used consistently by field crews (e.g., field notebooks, field data sheets). This document describes the procedures to be followed for field documentation, sample designation, handling, and custody.

1.2 Referenced Documents and SOPs

- Health and Safety Plan (HASP),
- Quality Assurance Project Plan (QAPP)
- SOP 102 Procedure to Prepare Environmental Samples for Shipment

SECTION 2 FIELD DOCUMENTATION

2.1 Field Documentation

During field sampling events, field notebook and field data sheets are used to record all daily field activities. The purpose of the field notebook is to document events that occur, and record data measured in the field that are not recorded on field forms.

Data entry will be made in a waterproof field notebook with consecutively numbered pages using indelible ink for each sampling event; all entries will be signed and dated, and no erasures will be made. All corrections should consist of a single line-out deletion, followed by the sampler's initials and the date. The sampler will sign and date the last page at the end of each day, and a line will be drawn through the remainder of the page.

The project name, site name and location, and dates of sampling activity should be written on the cover of the field notebook. If more than one notebook is used during a single sampling event, then the upper right-hand corner of the notebook will be annotated (e.g., 1 of 2, 2 of 2) to indicate the number of notebooks used during the field event. Alternatively, multiple notebooks could be used for different sampling activities (e.g., one notebook for sampling onshore at operable unit (OU) 1 and one for sampling offshore at OU2). When multiple notebooks are used for a single sampling activity (e.g., 2 or more sampling teams operating simultaneously during a single sampling event) notebooks should be annotated alphabetically to indicate which of those

notebooks is the primary, secondary, etc. notebook for that sampling activity, followed by the number of the notebook. For example, if soil sampling requires three teams and each have a notebook to record daily activity over the sampling event then the primary book will be labeled "Notebook A-1" and the others as "B-1" and "C-1." When only one team is on site, they will use the primary (A) notebook. Field notebooks will be stored in a secure manner when not in use in the field.

In addition to the field notebook, supplementary field data forms may be used during a field sampling event to record the relevant information (e.g., field calibration forms, groundwater monitoring form). At a minimum, the sampler will record the following information daily in the field notebook or on a field sampling form, as applicable:

- Project name, project location, project number and daily objective;
- Project start date and end date;
- Date and time of entry (24-hour clock);
- Time and duration of daily sampling activities;
- Weather conditions at the beginning of the field work and any changes that occur throughout the day, including the approximate time of the change;
- Name of person making entries and other field personnel, including the times that they are present;
- Onsite visitors, if any, including the times that they are present;
- The name, agency, and telephone number of any field contacts;
- The sample number and analysis code for each sample to be submitted for laboratory analysis;
- All field measurements made, including the time that the measurement was collected;
- The sampling location name, date, gear, water depth (if applicable), and sampling location coordinates;
- Type of sample gear used (e.g., pump type or model, size of core barrel);
- The location and description of the work area, including sketches and map references, if appropriate;
- Specific information on each type of sampling activity;
- The sample type (i.e., groundwater, dense non-aqueous phase liquid (DNAPL), soil, sediment), and sample number;
- Cross-references of numbers for duplicate samples;
- A description of the sample (source and appearance, such as soil or sediment type, color, and odor);
- Log of photographs (number taken, brief description of photo) taken at the sampling location, if any;

- Variations, if any, from specified sampling protocols and reasons for deviation;
- References to other notebooks used to record information (e.g., field data sheets, health and safety log); and
- The signature of the person making the entry.

Monitoring or sampling equipment information, including installation information, any maintenance performed on each piece of equipment, calibration information, and other observations relating to the operation or condition of the equipment, will be recorded on field forms, in field notebooks, and/or in a separate field notebook maintained for a specific type of monitoring or sampling equipment. Upon completion of the field sampling event, the field team leader will be responsible for scanning copies of the field notebooks and field data forms, uploading electronic copies to the project server, and submitting all field notebooks and field data forms to the project manager. Hard copy and an electronic copy shall be maintained in the project files.

SECTION 3 SAMPLE DESIGNATION AND HANDLING

3.1 Sample Labels

A self-adhesive, non-removable label will be affixed to each sample container and completed with an indelible marker prior to sample collection. Sample labels will contain the following information:

- Site name;
- Project number;
- A unique sample identification number (see QAPP for correct sample designation nomenclature);
- Initials of sample collector(s);
- Time and date collected;
- Analysis required; and
- Sample preservative (if applicable).

If samples are likely to contain high concentrations of non-aqueous phase liquids (NAPL) or other analytes, the samples will be identified on the chain-of custody forms. Locations where field quality control (QC) samples (e.g., field duplicate, matrix spike, and matrix spike duplicate) are collected will be documented in the field records.

3.2 Sample Handling

Each sample set will be sealed in a separate plastic bag following collection. Samples will then be stored in an insulated cooler containing ice packs or ice sealed in a plastic bag. Samples selected for laboratory analysis will be transferred to insulated coolers for overnight shipment to the

laboratory or to be picked up by a laboratory provided courier. All samples sent to the laboratory will be carefully checked against the chain-of-custody form (discussed below). Each cooler will be packed in a manner that will prevent damage to sample containers during shipment.

3.3 Sample Custody and Documentation

Chain-of-custody forms will be used to trace the possession and handling of all samples, from their collection, through analysis, until their final disposition. These forms will document the names of the relinquishing and receiving parties, the time and date of the transfer of custody, and the reason for the transfer of custody. Field personnel will complete the following information on each chain-of-custody form:

- Project number
- Client or project name
- Project location
- Sample identification number
- Date and time of sample collection
- Sample matrix
- Preservative
- Analyses requested
- Sampler's signature
- Signature of person relinquishing sample custody to the laboratory courier or FedEx
- Date and time relinquished
- Sampler remarks

One chain-of-custody form will accompany each set of coolers sent to the laboratory. The chain-of-custody form will be placed in a sealed plastic bag inside the cooler. A custody seal will be placed on each cooler after packing and prior to shipment. For multiple cooler shipments, the cooler number designation (e.g., cooler 1 of 2, cooler 2 of 2) will be written on the custody seal. Shipping of samples to the laboratory will be accomplished by Federal Express (FedEx) or equivalent overnight service. Samples will remain in the custody of the sampling team until custody is relinquished to FedEx or a laboratory courier. Each sample shipment will be tracked via the FedEx tracking number to ensure that prompt delivery of the shipment to the laboratory has occurred. A copy of the chain-of-custody form will then be transmitted to the project data manager and uploaded to the project file.

STANDARD OPERATING PROCEDURE NO. 103
DECONTAMINATION PROCEDURE FOR FIELD EQUIPMENT

SECTION 1 INTRODUCTION

This Standard Operating Procedure (SOP) was prepared to direct field personnel in the methods for decontamination of field equipment used in the investigation of sites with chemicals.

1.1 Objective

The objective of equipment decontamination is to remove potential contaminants from a sampling device or item of field equipment prior to, between, and after collection of samples for laboratory analysis and limit personnel exposure to residual contamination that may be present on used field equipment.

1.2 Referenced Documents and SOPs

- Health and Safety Plan (HASP)
- Quality Assurance Project Plan (QAPP)
- SOP 104 Management and Disposal of Investigative Derived Waste

1.3 Task-Specific Equipment and Supplies

The following equipment may be utilized when decontaminating equipment. Site-specific conditions may warrant the use or deletion of items from this list.

- Alconox®, Liquinox® or other non-phosphate concentrated laboratory grade detergent;
- Citrol®;
- Potable water;
- Distilled/deionized water from the analytical laboratory;
- Pump sprayers;
- 5-gallon buckets;
- Coarse scrub brushes;
- Small wire brushes;
- Paper towels;
- Aluminum foil;
- Polyethylene sheeting; and
- Personal protective equipment (PPE) as required by HASP

SECTION 2 PROCEDURES

2.1 General

The following procedures should be used for decontaminating field equipment. Procedures will vary with equipment used and potential contaminants present at the Site.

2.2 Procedure for Soil/Sediment Sampling Equipment

Soil and sediment sampling equipment, such as trowels, spoons, bowls, vanVeen grab samplers, hand augers, and spatulas will be cleaned using the following procedure.

1. Three 5-gallon buckets will be prepared with decontamination solutions at the recommended concentration.
    a. One bucket will contain potable water for the removal of solids from the device.
    b. One bucket will contain a solution of Citrol® and potable water for the removal of non-aqueous phase liquid (NAPL), such as creosote or coal tar, if present on the device.
    c. One bucket will contain a solution of detergent, such as Alconox®, and distilled water for decontaminating devices.
2. Physically remove adhered soil or other solids from the device to the extent practical using paper towels, scraping, or potable water.
3. Remove NAPL, if needed, from the device by washing in the Citrol® solution using a brush. The device will be rinsed with distilled water from a pump sprayer. Collect rinsate in a 5-gallon bucket for disposal per SOP 104.
4. Wash the device in the detergent solution using a brush. The device will be rinsed with distilled water from a pump sprayer. Collect rinsate in a 5-gallon bucket for disposal per SOP 104.
5. Reassemble equipment, if necessary, and wrap completely in clean, unused aluminum foil, shiny side out for transport. Only immediate re-use of equipment on the same day without wrapping in foil is acceptable.
6. Spent cleaning solutions shall be drummed for disposal along with any other contaminated fluids generated during the field investigation for disposal per SOP 104.
7. Record the decontamination procedure in the field logbook or on appropriate field form.

Note that if temperature or humidity conditions preclude air drying equipment, sufficient spares should be available so that no item of sampling equipment need be used more than once before drying. Alternatively, the inability to air dry equipment completely prior to reuse should be noted in the field logbook or applicable field form. In this case, additional rinses with distilled/deionized water should be used and recorded.

If NAPL cannot be fully removed from equipment, the device will be disposed. A spare will be used to replace the equipment.

2.3 Procedure for Groundwater Sampling Equipment

Groundwater will be sampled using disposable equipment. Bailers and low-density polyethylene (LDPE) tubing will be placed down the monitoring wells to collect groundwater samples. Pumps used with tubing will remain at the surface. Disposable equipment will be used once and disposed per SOP 104. Pumps will be decontaminated by spraying with a detergent and potable water solution and wiped clean with a paper towel.

2.4 Procedure for Groundwater Measuring Equipment

Measuring equipment, such as water level indicators or optical sensors, will be cleaned using the following procedure.

1. Remove NAPL, if needed, from the device by washing in the Citrol® solution using a brush. The device will be rinsed with distilled water from a pump sprayer. Collect rinsate in a 5-gallon bucket for disposal per SOP 104.
2. Spray probe and tape, or sensor, that was inserted into well with a detergent and potable water solution and wipe clean with a paper towel

2.5 Procedure for Large Heavy Equipment

Because heavy equipment pieces (e.g., drill rigs and support vehicles) are much larger than sampling equipment and generally come in less direct contact with sampling aliquots, a modified decontamination procedure is appropriate. Dry decontamination, which includes physical removal of solids by brushing, will be performed on large equipment tires or tracks to remove potentially contaminated solids that originate from Site surfaces.

Large equipment that come in contact with potential downhole contamination (e.g., core barrels), both as part of subsurface equipment advancement and above-ground contact with extracted soils or groundwater will be decontaminated prior to and after use. Decontamination of large equipment will be performed by:

- A high-pressure steam cleaner to clean the inside and outside of drilling equipment. Liquid and solid material produced from this operation will be collected on a decontamination pad and managed as described in the SOP 104.

  OR

- Following procedures outlined in Section 2.2. If 5-gallon buckets are not adequately sized for the larger equipment, a wash pad will be utilized. The wash pad may consist of a bermed area lined with plastic sheeting with a sump at one corner. The liquids from the wash pad may be left to evaporate during the field day; however, a sump pump should be used to

remove water from the sump and transfer it to a drum at the end of each day, at a minimum. Decontamination water will be collected for disposal per SOP 104.

New, unused core liners should be rinsed with site water at the sample location prior to deployment.

STANDARD OPERATING PROCEDURE NO. 104
MANAGEMENT AND DISPOSAL OF INVESTIGATION DERIVED WASTE

SECTION 1 INTRODUCTION

This Standard Operating Procedure (SOP) establishes protocols for testing, storage, and disposal of Investigative Derived Waste (IDW). Disposal of laboratory test equipment and supplies will be handled in accordance with the laboratory Quality Assurance Project Plan (QAPP).

1.1 Objective

IDW generated during this investigation may include:

- Sediment and soil
- Groundwater
- Non-aqueous phase liquid (NAPL)
- Site debris
- Personal Protective Equipment (PPE)
- Disposable sampling equipment
- Disposable field supplies (paper towels, plastic sheeting, etc.)
- Spent decontamination liquids

The management of these IDW will be conducted to limit exposure of site personnel to hazardous materials and to prevent introduction of contaminated materials to uncontaminated environmental media at the site.

1.2 Referenced Documents and SOPs

- Health and Safety Plan (HASP)
- QAPP
- United States Environmental Protection Agency (EPA) Office of Solid Waste and Emergency Response (OSWER) Guide to Management of Investigation-Derived Wastes (1992)

SECTION 2 GENERAL

This SOP discusses factors to consider as part of an IDW management program. These factors include protectiveness of human health and the environment, land disposal restrictions, storage requirements, recordkeeping and manifesting, and handling of non- Resource Conservation and Recovery Act (RCRA) hazardous wastes. The IDW management program described in this section incorporates these factors in the program.

IDW identified as potentially contaminated with hazardous materials will be stored in a designated and clearly marked IDW management area located at the site. The volume of waste will be minimized, to the extent possible, whenever applicable. Containers used to store IDW will be clean and Department of Transportation (DOT) approved, such as 55-gallon drums with bolt-secure open-top lids, or other acceptable containers. Containers/drums will also be clearly labeled to indicate the generator name and address, site name and location, material type (e.g., soil, sediment, groundwater, NAPL, decontamination liquid), date sealed, location, and origins (e.g., well identification [ID], soil/sediment boring location ID). Containers that are used for temporary storage to containerize media overnight should be clearly marked as "Temporary" and include the above information. Drums will be moved to a protected drum storage area in Operable Unit (OU) 1 for future management.

IDW from multiple locations may be consolidated in the same container provided that consolidated locations are grouped to the extent practicable based on 1) the perceived level of impact and 2) the area of the site they were generated. In addition, IDW generated from within the former footprint of the North Sump or South Sump will be segregated separately as they would potentially be characterized as RCRA-listed wastes.

The IDW storage area will be inspected daily and documented on field forms to ensure that storage procedures are adequate to keep the IDW isolated and contained. Storage procedures checked during inspections include but are not limited to the following:

- Labels properly filled out;
- Container covers and bungs kept closed;
- Containers compatible with contents;
- Incompatible waste separated;
- Containers stored to prevent spills; and
- No leaks or puddles on drum heads.

Any violations of these procedures will be documented and remedied as quickly as possible. The containers or drums will be kept on-site until the IDW has been analyzed for hazardous materials and characterized for waste disposal. At which time, the IDW will be transferred to and disposed of at a permitted landfill.

SECTION 3 MEDIA SPECIFIC IDW MANAGEMENT

Soils

Waste soils from direct push borings or hand augers may be generated during sampling activities. The required testing and handling of this IDW will depend on its origin and characteristics. Visual observations and photoionization detector (PID) readings will be used to determine if the soils contain potentially elevated levels of hazardous materials.

IDW will consist mainly of drill cuttings, purge and decontamination water, and solid waste. IDW will be placed in 55-gallon drums, labeled with the project name, exploration number, general contents, and date. The drummed IDW will be stored on-site pending analysis and off-site disposal.

Sediments

Waste sediments will be generated from drilling operations and excess sample material. The required testing and handling of this IDW will depend on its origin and characteristics. Visual observations and PID readings collected during air knifing, core collection (SOP 107) will be used to determine if the soils contain potentially elevated levels of hazardous materials.

The amount of sediment generated will be minimized to the volume necessary for sampling and analysis, if possible. During offshore field operations, leftover sediment material will be returned to the location it was generated from unless a significant sheen or NAPL is observed. If significant sheen or NAPL is observed, sediment on the vessel or core processing area will be temporally stored in 5-gallon buckets with lids, then transferred to 55-gallon drums in the IDW management area.

Personal Protective Equipment

PPE consists of gloves, protective clothing, and other one-time use equipment used during the field investigation. Used PPE will be containerized in plastic garbage bags and disposed in a municipal landfill.

Decontamination Fluids

Decontamination fluids containing soap solution or isopropyl alcohol will be stored in 5-gallon buckets with lids, then transferred to 55-gallon drums in the IDW management area. Isopropyl alcohol solutions will not be mixed with other decontamination fluids in the drums and will be managed separately to prevent incidental chemical reactions and for ease of disposal. Decontamination fluids will be contained separately from groundwater, and decontamination fluid used for NAPL removal will be stored separate from other decontamination fluid.

Other Materials

Trash and refuse generated during field activities, such as plastic sheeting, sampling containers, paper towels, plastic bags, tarps covering non-contaminated soils, caution tape, potable water containers, disposable PPE, and other disposable equipment that is free from hazardous materials will be containerized in plastic garbage bags and stored on-site for subsequent transport to the municipal landfill.

Materials that have visible NAPL, such as soiled buckets and NAPL-contaminated polyvinyl chloride (PVC) sampling sleeves, will be drummed and stored in the IDW management area.

Non-disposable or bulky materials may be decontaminated and re-used or disposed as solid waste.

SECTION 4 TESTING AND DISPOSAL

Drummed materials will be chemically analyzed to determine the proper disposal method. Composite samples will be collected from each drum for analysis. Composite samples will be collected such that reasonable likelihood exists that the entire volume of material in a drum is represented in the sample.

Composite samples will be tested for the parameters identified in the QAPP. Modifications of this analyte list may be made based on specific knowledge of the origin and likely contaminants in the materials.

Composite sample results will be used to characterize the IDW for disposal. IDW contaminated above hazardous waste criteria will be shipped to a licensed disposal facility following any further required waste characterization or stabilization. Disposal of IDW will be completed within 90 days of completing waste characterization after the completion of field activities.

STANDARD OPERATING PROCEDURE NO. 107
SOIL AND SEDIMENT CORE AND SAMPLE COLLECTION

SECTION 1 INTRODUCTION

This Standard Operating Procedure (SOP) was prepared to direct field personnel in conducting soil and sediment core collection.

1.1 Objective

The objective core collection is to obtain representative samples of soil and sediment for laboratory analysis at discrete locations in the subsurface. This objective requires that the samples meet the target depth specified in the Work Plan and be of sufficient quantity and quality for analysis of the selected test method. Multiple core collection methods are provided in this SOP to account for varying sample locations and conditions.

1.2 Referenced Documents and SOPs

- Health and Safety Plan (HASP)
- Quality Assurance Project Plan (QAPP)
- SOP 100 Recording Sample Locations with a Global Positioning System (GPS)
- SOP 101 Field Documentation, Sample Designation, Custody and Handling Procedures
- SOP 103 Decontamination Procedure for Field Equipment
- SOP 104 Management and Disposal of Investigation Derived Waste (IDW)

1.3 Documentation, Equipment and Supplies

1.3.1 Documentation

- Field forms (e.g., sampling forms, tailgate safety, core logs) and field notebook;
- Relevant site documentation from past investigations;
- Laboratory container labels;
- Equipment manuals; and
- Analysis and sample container summary.

1.3.2 Health and Safety Equipment

- Personal protective equipment (PPE), including hard hats and personal flotation devices (PFDs), as required by HASP;
- Rain gear (i.e., boots, ponchos); and
- Flashlights (preferably head flashlight) or work-place lights.

1.3.3 Task Specific Equipment and Supplies

The following materials will be available, as required, during the subsurface soil and sediment sampling:

Consumable supplies:

- Writing tools (pens, Sharpie®, etc.);
- Clipboards;
- Wet ice;
- Cable ties;
- Aluminum foil;
- Paper towels;
- Zip top bags;
- 5-gallon buckets;
- Decontamination detergents or chemicals (as per SOP 103);
- Trash bags (separate bags for IDW and general trash); and
- Plastic sheeting.

Other supplies and equipment:

- Sample containers and preservatives;
- Stainless-steel mixing bowls, spoons or trowels;
- Coolers;
- Portable table;
- Hand tools (Allen wrench set, hammer, screwdrivers, pliers, knife, wire strippers, measuring tape);
- Weighted tape measure;
- Digital camera and photograph placard;
- Mapping-grade GPS, as described in SOP 100, for recording sample locations or navigating to pre-determined locations;
- Photoionization Detector (PID) or Flame Ionization Detector (FID) and moisture traps;
- Direct-push drill rig;
- Core box to hold cores in the vertical position;
- Decontamination equipment; and
- Bentonite chips or grout.

Additional equipment for offshore work:

- Hand siphon, tubing or dedicated plastic cups for water removal from sediment core;
- Pneumatic, electric, or mechanically-driven vibratory core head or direct-push drill rig;
- Marine vessel equipped with A-frame or tripod and hydraulic winch;
- Marine barge capable of supporting a direct-push rig; and
- Marine acceptable cement grout (if applicable).

SECTION 2 PROCEDURES

2.1 Pre-Mobilization Activities

- Obtain the depth, material, and map for locations to be sampled.
- Obtain a listing of the parameters that will be measured in the field or laboratory as part of this sampling program including the required analytical method, analytical lab, sample volume, nomenclature, preservatives, sample containers and holding time for each parameter from the QAPP.
- Obtain a listing of the frequency of duplicate, matrix spike/matrix spike duplicate (MS/MSD), field blank, equipment blank and trip blank sampling as per the QAPP.
- Verify that all equipment on order is being shipped to the determined destination.

2.2 Pre-Sampling Procedures

Several steps are required before sampling. These steps ensure that supplies and instruments are procured as needed, and instruments are functioning properly, for efficient and accurate sampling.

2.2.1 Sample Container Preparation

- Sample container procurement should be arranged with the various analytical laboratories several weeks prior to the event.
- Upon receipt of the cleaned sample containers from the laboratories, containers should be inventoried to verify that the laboratory has provided the correct number of containers of the proper size and containing the correct preservative if required.
- To the extent possible, pre-label/tag and bundle sample containers for each location to avoid confusion during sample collection. Powder-free nitrile gloves should be worn whenever handling clean containers.
- Containers shall be placed in clean coolers for transport to the field.

2.2.2 Equipment and Supply Inventory

- Field equipment that must be cleaned and provided by the analytical laboratory or other supplier should be ordered several weeks prior to the event.
- Verify that the correct equipment has been received and that it is clean (decontaminated) and calibrated.
- Verify that the appropriate PPE and ancillary supplies (e.g., paper towels, decontamination solution) and the appropriate protective equipment, as specified in the HASP, have been brought to the field site.

2.2.3 Mobilization

Field personnel shall mobilize to the site and meet at the designated rendezvous location (e.g., entrance gate or boat ramp). Field staff will prepare for the sampling activities and mobilize to the target sampling locations. The following steps comprise the mobilization procedure:

- Assemble field equipment.
- Don appropriate PPE, including hard hats and PFDs on marine vessels.
- Carefully maneuver the marine vessel or drill rig to the sample station.
- Evaluate the area around the sampling location for safety concerns, hazards, adequate lighting conditions, and accessibility. Use workplace lighting as needed.
- Note any irregularities at the sampling location in the field notebook or the applicable field form, including modifications to sample locations or depths based upon field observations.

2.3 Core Collection Methods

2.3.1 Direct-Push Drilling

A direct-push drilling rig (GeoProbe® or similar) will be used to collect subsurface soil and sediment to obtain depth-discrete sample intervals.

The direct-push rig may be operated using a dual tube methodology which allows the collection of subsurface samples through an outer casing that is set to maintain the integrity of the boring. Using the direct-push rig, borings are advanced by simultaneously driving an outer casing and inner tube into the ground. Upon reaching the desired penetration depth, the inner tube is extracted to collect the discrete subsurface samples, leaving the outer casing in place. To sample the next interval, a new length of tubing is then inserted into the outer casing (already in the place) attached to a length of drive pipe, and another length of outer casing is attached to the top of the outer casing that is already in the subsurface.

2.3.2 Vibratory Core Head (Vibracore)

A vibratory coring device (i.e., vibracore) may be used for sampling both coarse, consolidated sediment and fine-grained, cohesive sediment up to depths of tens of feet. The vibracore uses a hydraulic head that vibrates and drives a core tube into the sediment. A continuous sediment sample is retained within the core tube with the aid of a core catcher. Coring can continue until the total sample length is reached in one drive.

2.4 Sampling Procedures

2.4.1 Soil Cores (Upland)

The following procedures will be employed to collect subsurface soil samples:

1. Identify sample locations from the Work Plan based on pre-surveyed stake-out as per SOP 100 and note the locations in field notebook or the applicable field form by obtaining ties to physical features.
2. Verify field personnel and contractors are wearing appropriate PPE as specified in the HASP.
3. Assemble the sampling apparatus or similar direct push tool such as a dual tube or macro-core soil sampler.
4. Drive the sampling tools to the appropriate sampling depth.
5. When the desired depth for the collection of a subsurface soil sample is reached, retrieve the core and segregate the soil sample, as needed. Transport the core to the core processing area for field screening and sample collection (section 2.4.3).
6. Upon completion of the soil boring, backfill the boring with bentonite grout or chips to ground surface.
7. Record all other appropriate information in the field notebook or the applicable field form.
8. Identify the next sequential boring location, mobilize to that location and return to step 2.

2.4.2 Sediment Cores (In-Water)

The following procedures will be employed to collect subsurface sediment samples:

1. The marine vessel or barge will depart from the designated boat ramp off-site. The marine vessel will be equipped with a vibracore or marine barge will have the direct-push rig onboard.
2. Verify field personnel and contractors are wearing appropriate PPE as specified in the HASP, including PFDs.

3. Identify sample locations from the Work Plan as per SOP 100 and note location observations in field notebook or the applicable field form by obtaining ties to physical features. The marine vessel or barge will mobilize, with field personnel, to the site in water.
4. The vessel will be maneuvered over the approximate sample location by the vessel operator. Cores co-located with other samples will be offset by 2 to 5 feet. Positioning of the barge mounted drilling rig for each drilling location will be sited with a GPS device per SOP 100. The vessel will be secured with spuds, anchors, or be designed to allow for anchorless position stabilization.
5. The sampling vessel is maneuvered over the approximate position for the core by the vessel operator, and the water depth determined.
6. Depth ranges necessary for core collection will be confirmed.
7. Cores will be collected with either vibracore or direct-push methods.
    a. Vibracore
        i. Vibracore samples will be collected by installing a new high-density polyethylene (HDPE) core tube liner inside the core tube. Care will be taken so that there are no kinks or folds in the liner material. Approximately 2 to 3 inches of the liner will be folded around the outside of the bottom of the core tube and a pre-cleaned core catcher assembly will be inserted and secured into the end of the core tube.
        ii. The coring apparatus will be carefully suspended from the vessel's A-frame (or tripod) to the vertical position, and then lowered until the core cutter comes in contact with the sediment. After successful deployment, the vibratory head will be activated to induce the vibratory motion through the core barrel to the cutter tip. The core tube will be advanced to the proposed sample depth plus additional depth, so the sample passes the core catcher (be careful to avoid over-penetration).
        iii. Use the winch to recover the corer assembly. Maintain the sample in a vertical (upright) position, if possible, during subsequent handling to the extent practicable.
        iv. Record core penetration depth and inspect the core for acceptability.
    b. Direct-push
        i. Assemble the sampling apparatus or similar direct push tool such as a dual tube or macro core soil sampler.
        ii. Core collection will begin from the sediment surface and continue to the core collection depth range of interest. Drill rod(s) will be added to the drill string in order to advance the core barrel beyond the casing as

necessary. The core barrel will be advanced and then override casing will be advanced to the same depth as the core barrel to case the borehole.

iii. When the desired depth for the collection of a subsurface soil sample is reached, retrieve the core while maintaining the sample in a vertical (upright) position and if possible, during subsequent handling to the extent practicable.

iv. Record core penetration depth inspect the core for acceptability.

8. The following acceptability criteria should be satisfied:
    a. The sampler is not overfilled with sample to the point that the sediment surface is extruded through the top of the sampler.
    b. Overlying water is present (indicates minimal leakage).
    c. The overlying water is not excessively turbid (indicates minimal disturbance or winnowing).
    d. The core sampler was not inserted at an angle or tilted upon retrieval.
    e. The desired penetration depth, as indicated in the Work Plan, is achieved.
9. Store the core for on-shore processing (section 2.4.3).
10. Prior to processing, overlying water, if present, will be slowly removed to minimize loss of the shallowest sediments.
11. Record all other appropriate information in the field notebook or applicable field forms.
12. Identify the next sequential boring location, move to that location and return to step 2.

2.4.3 Core Processing and Sample Collection (Soil and Sediment)

1. To process, remove the core from the core tube and segregate the core, as needed. Record the soil type, color, odor, amount of recovery, in the appropriate field forms or field notebook.
2. Evaluate the core for the presence of visible NAPL and determine whether deeper coring is appropriate at the current location. Document samples interpreted to contain visible NAPL with video and/or photograph, and record observations in field notebook or applicable field form.
3. Based on core characteristics and field screening results, sample interval(s)/depth(s) will be determined, and soil/sediment sample(s) collected and placed in laboratory provided containers for laboratory analysis per the QAPP. Note that many sample containers contain preservatives; hence it is necessary to fill each container carefully to avoid spilling, underfilling or overfilling to maintain acceptable levels of preservative.

a. Samples for volatile organic compound (VOC) analysis will be collected first as discrete samples from the selected soil/sediment core sample interval to prevent losses due to volatilization.

b. The remaining material in the selected soil/sediment core sample interval will be homogenized by mixing with a decontaminated stainless-steel bowl and spoon. Mixing will continue until the soil/sediment sample material is homogeneous in color and texture. The homogenized sample will be placed into appropriate sample containers for the task specific analytical program per the QAPP (i.e., polycyclic aromatic hydrocarbons [PAHs], gasoline range organics [GRO], diesel range organics [DRO], residual range organics [RRO], total organic carbon, grain size, percent moisture, bulk density, and dense non-aqueous phase liquid (DNAPL) saturation). Materials more than 0.5-inch in diameter and debris will be omitted from the sample.

c. If insufficient core material is available to fill containers required for the planned analyses, the Field Lead will consult with the Project Manager to determine which analyses to prioritize.

2.5 Sample Disposition

Samples will be labeled, maintained in custody, and handled in accordance with SOP 101. Samples shall be prepared for shipment.

2.6 Documentation

Activities conducted as part of this SOP shall be documented in accordance with SOP 101. Documentation shall include a record of daily conditions and activities, calibration activities, sampling activities, and all other information required to be recorded per SOP 101.

2.7 Decontamination Procedures

Equipment will be decontaminated between sample locations. Decontamination shall be performed as per SOP 103. Personnel and PPE decontamination shall be performed in accordance with the HASP.

2.8 Investigative Derived Waste

IDW, including decontamination fluids, used PPE, and other IDWs generated during activities associated with this SOP shall be handled and disposed of according to SOP 104.

STANDARD OPERATING PROCEDURE NO. 108
SOIL SAMPLE COLLECTION BY HAND AUGER

SECTION 1 INTRODUCTION

This Standard Operating Procedure (SOP) was prepared to direct field personnel in the methods soil sample collection by hang auger

1.1 Objective

The objective of hand augering is to collect soil samples.

1.2 Referenced Documents and SOPs

- SOP 104 Management and Disposal of Investigative Derived Waste

1.3 Task-Specific Equipment and Supplies

The following equipment may be utilized when collecting soil samples with a hand auger. Site-specific conditions may warrant the use or deletion of items from this list.

- Site maps/plot plan
- Safety equipment, as specified in the site-specific Health and Safety Plan (HASP)
- Traditional survey equipment or global positioning system (GPS)
- Tape measure
- Survey stakes or flags
- Camera and image collection media
- Stainless steel, plastic[1], or other appropriate homogenization bucket, bowl or pan
- Plastic[1] or stainless steel spoons
- Appropriate size sample containers
- Ziplock plastic bags
- Site logbook
- Labels
- Chain of Custody records and custody seals
- Field data sheets and sample labels

1 Not used when sampling for semivolatile compounds.

- Cooler(s)
- Ice
- Vermiculite
- Decontamination supplies/equipment as per SOP 103
- Plastic sheeting
- Spade or shovel
- Spatula(s)
- Scoop(s)
- Trowel(s)
- Continuous flight (screw) auger
- Bucket auger
- Post hole auger
- Extension rods
- T-handle
- Sampling trier
- Thin wall tube sampler
- Split spoon sampler
- Soil core sampler
- Tubes, points, drive head, drop hammer, puller jack and grip
- Photoionization detector (PID), Flame ionization detector (FID) and/or Respirable Aerosol Monitor (RAM)
- Backhoe (as required)
- En Core® samplers

SECTION 2 PROCEDURES

2.1 General

The following procedures should be used for collecting soil samples with a hand auger. Procedures will vary with equipment used and potential contaminants present at the Site.

2.2 Procedure for Hand Auger Soil Sample Collection

Soil samples will be collected using a hand auger, shovel or trowel. At each sample location, a shovel will be used to remove surface material (i.e. grass, gravel paving, etc.), if present. The hand auger (or shovel/trowel) will then be used to sample to the target depth. Soil characteristics and sampling depths will be noted on field boring logs. Soil samples will be collected using a clean/decontaminated stainless-steel spoon, and the soil will be placed directly into laboratory provided containers. Composite soil samples will be collected using a stainless-steel spoon and transferred to a stainless-steel bowl. The samples will be mixed in the bowl to make a single homogenized sample prior to placement into the sample container. If analyzing for volatile or semivolatile compounds, care will be taken to minimize the time of exposure for each subsample.

The hand auger system consists of a series of extensions, and a "T" handle. The auger is used to bore a hole to a desired sampling depth and is then withdrawn. The sample is collected directly from the auger. The hand auger sampling procedure is as follows:

1. Attach the auger bit to a drill rod extension and attach the "T" handle to the drill rod.

2. Clear the area to be sampled of any surface debris (e.g., twigs, rocks, and litter). It may be advisable to remove the first 3 to 6 inches of surface soil from an area approximately 6 inches in radius around the drilling location.

3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet near the hole. This prevents accidental brushing of loose material back down the borehole when removing the auger or adding drill rods. It also facilitates refilling the hole and avoids possible contamination of the surrounding area.

4. After reaching the desired depth, slowly and carefully remove the auger from the hole. When sampling directly from the auger, collect the sample after the auger is removed from the hole.

5. Place the sample into a stainless-steel bowl and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, place the sample into appropriate, labeled containers and secure the caps tightly; If another sample is to be collected in the same hole, but at a greater depth, reattach the auger bit to the drill and assembly, and follow the steps above.

6. If required, ensure that a Teflon liner is present in the cap. Secure the cap tightly onto the sample container. Place the sample bottle in a plastic bag and put on ice to keep the sample at 4°Celsius.

7. Use the chain-of-custody form to document the types and numbers of soil samples collected and logged. Verify that the chain-of-custody form is correctly and completely filled out.

1. Record the time and date of sample collection, as well as a description of the sample, in the field logbook and coring log.

2. Each hand auger boring will be abandoned by backfilling each with the removed soil material.

3. After collecting samples, all equipment will be decontaminated (see SOP 103) prior to sampling at another location.

Geosyntec consultants

Daily Field Log

520 Pike Street, Suite 2600
Seattle, WA 98101
206-496-1471

Project Name: **Project Number:** **Page** **of**

Date: **Location:** **Logged By:**

Weather Conditions:

Tailgate Safety Meeting Time: **Contractor:**

Personnel: Name	Company	Time In	Time Out

Time	Activities

Copy to: Total Hrs.: Signature:

Geosyntec consultants

Daily Field Log

520 Pike Street, Suite 2600
Seattle, WA 98101
206-496-1471

Project Name: **Project Number:** **Page** **of**

Date: ______________ **Location:** ______________ **Logged By:** ______________

Time	Activities

Geosyntec consultants
520 Pike Street, Suite 2600
Seattle, Washington 98101
PH: 206.496.1471
www.geosyntec.com

LOG OF BORING _____

Page ___ of ___

Location:	Project Name:	Project Number:
Start Date and Time:	Finish Date and Time:	Total Depth Drilled (ft bgs):
Drilling Method:	Drilling Contractor:	Total Depth Cored (ft bgs):
Drill Rig:	Hammer Type:	Boring Diameter (in):
Sampling Method:	Hammer Weight/Drop:	Borehole Backfill:
Depth to Water (ft bgs):	Ground Surface Elevation (ft MSL):	Coordinates (X,Y):
Comments:		Logger: / Reviewer:

Depth (ft bgs)	Sample Interval	Sample ID and Type	Blow Per 6 Inches	Sample Recovery (%)	MATERIAL DESCRIPTION SOIL NAME (USCS SYMBOL): Color, Moisture, Grain Size and Percentage, Plasticity, Consistency/Density, Other (Odor, Dry Strength, Mineral Content)	PID Reading (ppm)	Time (00:00)	COMMENTS

Geosyntec consultants
520 Pike Street, Suite 2600
Seattle, Washington 98101
PH: 206.496.1471
www.geosyntec.com

LOG OF BORING _____

Page ___ of ___

Location:	**Project Name:**	**Project Number:**
Comments:	Logger:	Reviewer:

Depth (ft bgs)	Sample Interval	Sample ID and Type	Blow Per 6 Inches	Sample Recovery (%)	**MATERIAL DESCRIPTION** SOIL NAME (USCS SYMBOL): Color, Moisture, Grain Size and Percentage, Plasticity, Consistency/Density, Other (Odor, Dry Strength, Mineral Content)	PID Reading (ppm)	Time (00:00)	**COMMENTS**

METER CALIBRATION FORM

Geosyntec Consultants
520 Pike Street, Suite 2600
Seattle, WA 98101
Phone: 206-496-1450

Project Name: _____ Date: _____ Page ____ of ____

Project Number: _____ Primary Activities: _____

Field Personnel: _____ _____

_____ _____

Recorded By: _____ _____

Weather: _____

Initial Calibration Completed at: _____ (time)

Final Calibration Check Completed at: _____ (time)

pH calibration		buffer solution		
		pH 4.0	pH 7.0	pH 10.0
initial	temp. (°C)			
	instrument reading			
	should read/calibrated to			
final	temp. (°C)			
	instrument reading			

specific conductance calibration		standard (µS / cm)	
initial	instrument reading		
	should read/calibrated to		
final	instrument reading		

ORP calibration		Zobell solution (+231 mv Zobell reads)
initial	instrument reading	
final	instrument reading	

dissolved oxygen calibration		100%	0%
initial	temp. (°C)		
	instrument reading		
	should read/calibrated to		
final	temp. (°C)		
	instrument reading		

turbidity		
initial	instrument reading	
final	instrument reading	

Meter Summary
pH Meter / Probe: Model:
DO Meter / Probe: Model:
ORP Meter / Probe: Model:
Conductivity Meter / Probe: Model:
Turbidity

Comments: (rental, condition, problems)

Surface Sediment Field Log

Job: _____ Core Location: _____

Job No: _____ Date: _____ Time: _____

Field Reps: _____ Sample Method: _____

Contractor: _____ Proposed Coordinates: _____

Water Height

DTS Boat: DTS Lead Line:

Mudline Elevation (datum): _____

Tide Measurements

Time/Height: _____

Time/Height: _____

Sample Acceptability Criteria:

1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: _____

Grab #	Time	Confirmed Coordinates (datum)		Sample Accept (Y/N)	Recovery Depth	Comments: (i.e.winnowing, jaws close, biota, overfill, good seal, sample depth)
		Northing	Easting			

Sediment Sample Description: surface cover, (density), moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota)

Composite sample: _____

Sample Containers: _____

Analyses: _____

Sediment Core Processing Log

Job: Core Location/Sample Number:

Job Number: Date/ Time:

No. of Sections: Sample Logged by:

Sample Length (from log): Type/Diameter of Sample:

Avg. % Compaction: Sample Quality: good fair poor disturbed

Notes:

Recovered Length (ft)	% Compaction	Color	Size % - G	Size % - S	Size % - F	PID	Description (grain size, color, moisture, sheen/odor, biota, wood, other debris)	Insitu Actual Depth (ft)	Sample Depth	Subsample No.	Summary Sketch

Key for Acceptance and Physical Description of Sediment Samples

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D-2488 were used as an identification guide.

Density/Consistency

Soil density/consistency is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL	Standard Penetration Resistance (N) in Blows/Foot	Visual Description	SILT or CLAY	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF	Visual Description
Density			***Consistency***			
Very loose	0–4	freefall	Very soft	0–2	<0.125	ooze, no shape
Loose	4–10	easy penetration	Soft	2–4	0.125–0.25	saggy shape
Medium dense	10–30		Medium stiff	4–8	0.25–0.5	holds shape
Dense	30–50	low penetration	Stiff	8–15	0.5–1.0	holds shape
Very dense	>50	refusal	Very stiff	15–30	1.0–2.0	low penetration
			Hard	>30	>2.0	refusal

Moisture	
Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum; subcategories include soupy and flocculant for increasing moisture content

Minor Constituents	***Percentage (by weight)***
Not identified in description	0–5
Slightly (clayey, silty, etc.)	5–12
Clayey, silty, sandy, gravelly	12–30
Very (clayey, silty, etc.)	30–50
MAJOR CONSTITUENTS	Majority or >50

Surface Sediment Sample Acceptability Criteria (PSEP)

1. Overlying water is present.
2. Water has low turbidity.
3. Sampler is not overfilled.
4. Surface is flat.
5. Penetration depth is acceptable.

Color descriptions

Light Brown	Greenish Gray	Light Gray
Yellowish Orange	Olive Gray	Dark Gray

Estimated Percentage of Other Minor Constituents

(i.e., shells, wood, organics, plastic, metal brick, refuse)

	Estimated Percentage (by volume)
Dusting	Trace on Surface
Trace	0–5
Occasional	5–10
Moderate	10–30
Substantial	30–50

Chain of Custody Record

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact: Anne Fitzpatrick	**Project Manager: Anne Fitzpatrick**	**Site Contact:**	**Date:**
Geosyntec Consultants	**Tel/Fax: 206-496-1447**	**Lab Contact:**	**Carrier:**
520 Pike Street Suite 2600	**Analysis Turnaround Time**		
Seattle, WA 98101	☐ CALENDAR DAYS ☐ WORKING DAYS		
(206) 496-1447	TAT if different from Below ___STD___		
	☑ 2 weeks		
Report to:			
Project Name: Diablo Dry Dock - PNG0913	☐ 1 week		
Site: Diablo Dry Dock	☐ 2 days		
P O # PNG0913	☐ 1 day		

COC No: 1 of 1 COCs

Sampler:

For Lab Use Only:
Walk-in Client:
Lab Sampling:

Job / SDG No.:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	TOTAL METALS (6010,6020, 7471)	PESTICIDES (8081B)	PCBs (8082)	PAHs (8270SIM)	TOTAL ORGANIC CARBON (9060A)	BACK C ARBON (9060a										Sample Specific Notes:
				Preservation:																			

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ Therm ID No.:_____

Relinquished by:	Company: **GEOSYNTEC CONSULTANTS**	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

APPENDIX B
Health and Safety Plan

HEALTH AND SAFETY PLAN

DIABLO DRYDOCK SITE

Adjacent to the North Cascades Environmental Learning Center

1940 Diablo Dam Road
Diablo, Washington 98283

Prepared for:

City of Seattle
City Hall
600 Fourth Avenue
Seattle, Washington 98104

Prepared by:

Geosyntec consultants

engineers | scientists | innovators

520 Pike Street, Suite 2600
Seattle, Washington 98101

Project Number: PNG0913

April 2021

Geosyntec consultants

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ATTACHMENTS

H&S Incident Response Procedures

Figure 1. Health and Safety Injury Response Procedure Flow Chart.

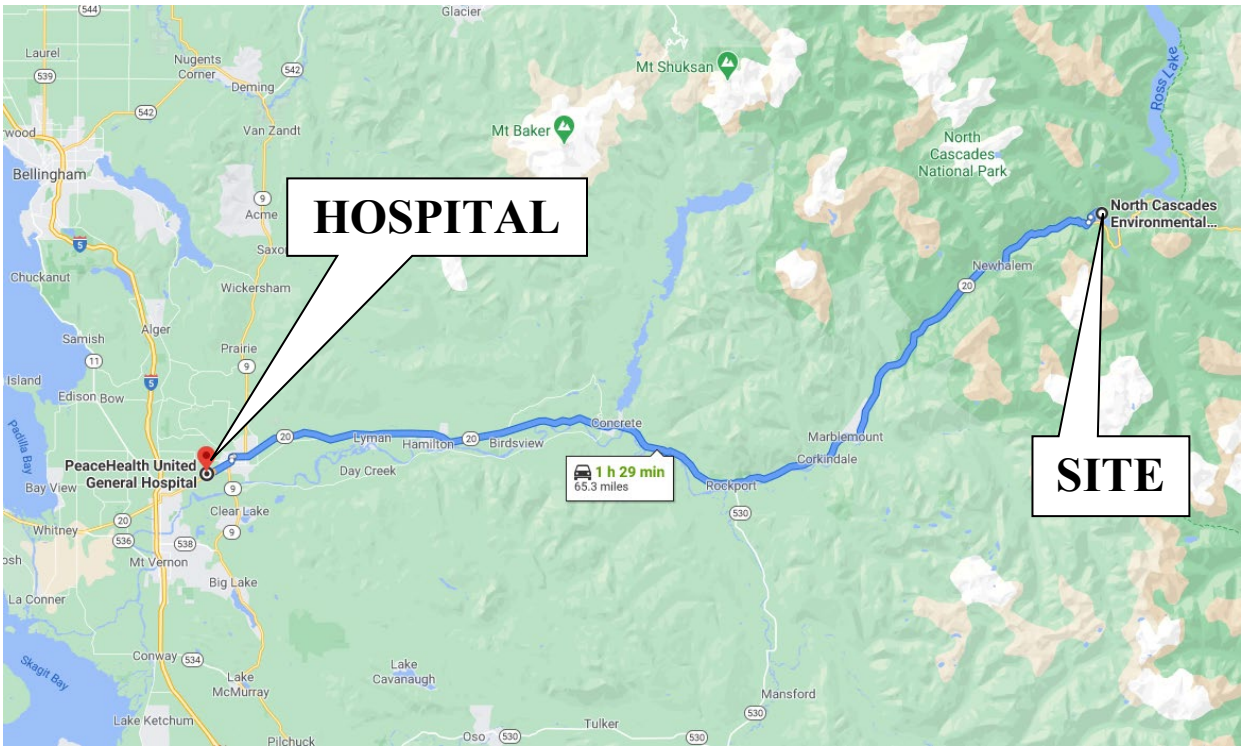


Figure 2. Route to the Hospital and Urgent Care from the Site.

HOSPITAL INFORMATION:

PeaceHealth United General Hospital
360-856-6021
2000 Hospital Drive
Sedro-Woolley, Washington 98284

DIRECTIONS TO HOSPITAL FROM SITE

- Start: North Cascades Environmental Learning Center, 1940 Diablo Dam Rd, Rockport, WA 98283
    - Head north on Diablo Dam Rd (0.8 miles)
    - Turn left to stay on Diablo Dam Rd (0.5 miles)
    - Turn right onto WA-20 W (61.8 miles)
    - At the traffic circle, continue straight onto W Moore St (0.1 miles)
    - Continue onto Bingham St/Borseth St (0.2 miles)
    - At the traffic circle, continue straight onto WA-20 W/Borseth St (1.7 miles)
    - Turn right onto Hospital Dr (0.1 miles)
    - Turn left to stay on Hospital Dr, destination on the right (302 feet)
- End: PeaceHealth United General Hospital, 2000 Hospital Dr, Sedro-Woolley, WA 98284

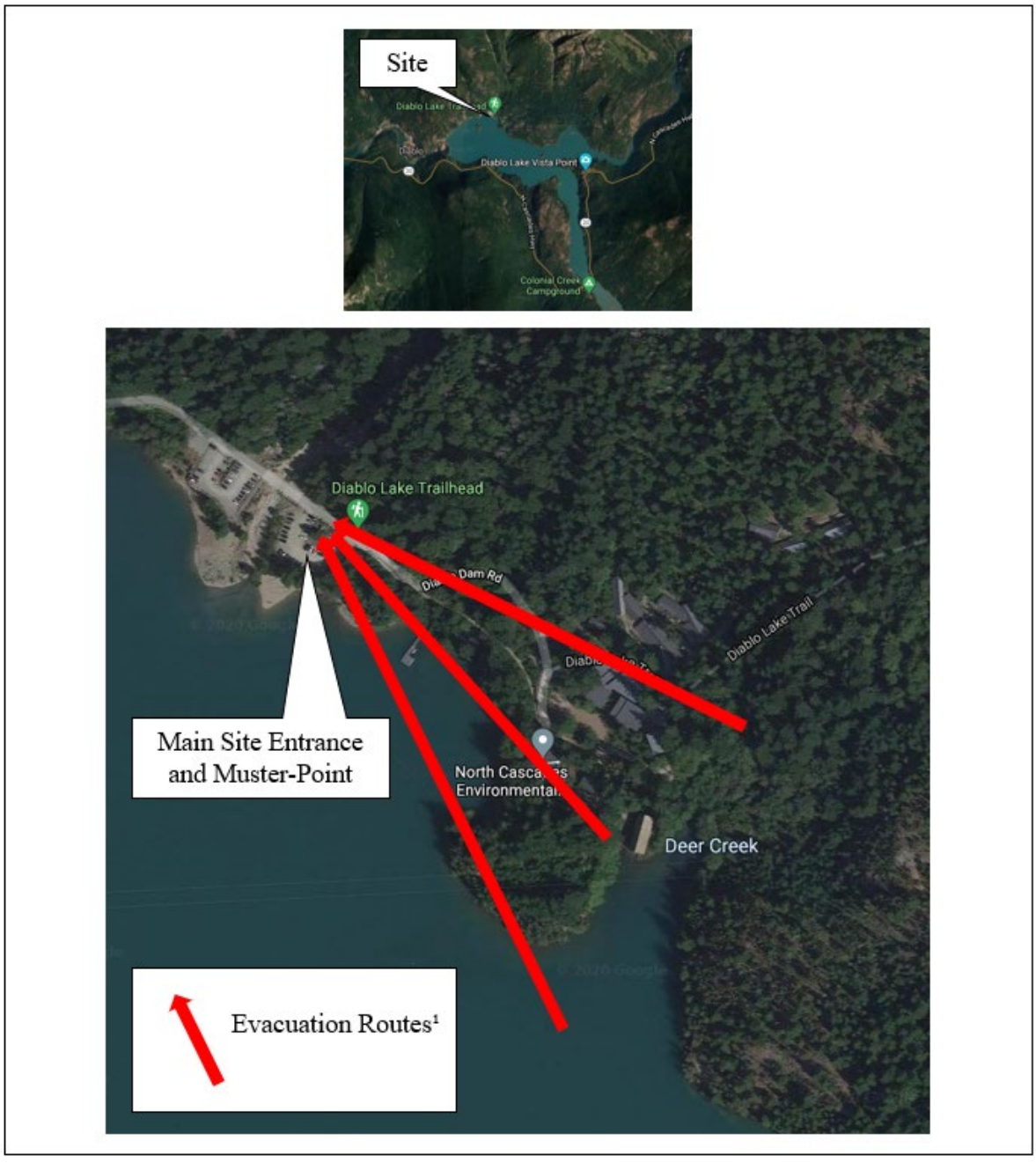


Figure 3. Site Map and Evacuation Routes.

[1]The muster point for upland and over water work will be the parking area for the North Cascades Environmental Learning Center. If it is safe, boats should beach on the north shore of Diablo Lake, and the field crew should follow the evacuation routes to the muster point. If evacuation is necessary while transiting to the Site from the boat ramp, the evacuation procedure will be to either continue transiting to the Site or to evacuate from the boat ramp, whichever is closer.

1. INTRODUCTION

This site-specific Health and Safety Plan (HASP) was prepared to address project-specific hazards known or suspected to be present associated with the existing conditions and work to be performed at the work site(s). This HASP was prepared to meet the requirements specified in Occupational Safety and Health (OSHA) Hazardous Waste Operations Emergency and Response (HAZWOPER) program, Geosyntec Consultants, Inc. (Geosyntec)'s Corporate Health and Safety (H&S or HS) Procedure HS 301, and the H&S requirements of the client (Written Hazard Communication Program, 29 C.F.R. § 1910.120(b)(1), Safety and Health Program, 29 C.F.R. § 1926.65(b)(1))

2. SIGNATURES

2.1 HASP Reviewers

This HASP must be maintained onsite when field work is being performed. The Site Health and Safety Officer (SHSO) can change or amend this document, in agreement with the Health and Safety Coordinator (HSC) or Project Manager (PM). Amendments (e.g., changes in personal protective equipment, addition of tasks, etc.) must be documented in Attachment A. This HASP must be reviewed and amended on an annual basis for projects lasting more than one year.

Prepared by:	Joey Hickey	April 13, 2021
		Date
Approved by:	Anne Fitzpatrick	April 13, 2021
	Project Manager	Date

This HASP has been given to the following H&S approved subcontractor(s).

Subcontractor	Representative	Date
Subcontractor	Representative	Date
Subcontractor	Representative	Date
Subcontractor	Representative	Date
Subcontractor	Representative	Date
Subcontractor	Representative	Date
Subcontractor	Representative	Date
Subcontractor	Representative	Date
Subcontractor	Representative	Date

2.2 Site Workers

This HASP must be reviewed by personnel prior to Site work. Workers not in attendance at the initial meeting must be trained by the SHSO on the information covered in the pre-entry briefing. After reading the HASP and attending a pre-entry briefing, Geosyntec employees and other parties covered under this HASP must sign the following acknowledgment statement.

"I have read, understand, and will perform my work in accordance with the information set forth in this HASP."

Signature	Printed Name	Date

3. EMERGENCY CONTACT INFORMATION

Table 1. Emergency Contact Information

Contact	Telephone Numbers	
	Office	Alternate (Type)
Fire Department	911	
Police Department	911	
Hospital – PeaceHealth United General Hospital	(360) 856-6021	
Director of H&S – Bob Poll	(813) 379-4420	(813) 240-9231 (Cell)
H&S Regional Manager – Joe Esseichick	(720) 509-8906	(734) 417-0909 (Cell)
Project Manager – Anne Fitzpatrick	(206) 496-1461	(206) 963-8199 (Cell)
Site Health & Safety Officer – Luke Smith	(206) 496-1452	(319) 400-2447
H&S Coordinator – Erin Dunbar &/or Coleman Hoyt	(971) 271-5916	(360) 901-6175 (Cell)
Principal-in-Charge – Anne Fitzpatrick	(206) 496-1461	(206) 963-8199 (Cell)
Utility Emergencies	811	
EthicsPoint	(844) 231-3371	
WorkCare	(888) 449-7787	(714) 978-7488
Client Contact – Tom Meyer		(206) 665-5750
Subcontractor –		
Subcontractor -		
Subcontractor –		

4. APPLICABILITY OF THIS HASP

This HASP was prepared in accordance with Geosyntec's H&S Procedures for use by Geosyntec project staff and subcontractors. Subcontractors, at a minimum, shall ensure that their employees, and those of its lower tier subcontractors, comply with these procedures and other health, safety and security provisions in the Subcontract. Compliance with this HASP shall represent the minimum requirements to be met by subcontractors, who shall be responsible for examining the requirements and determining whether additional or more stringent health, safety and security provisions are appropriate for their portion of the work and implementing them accordingly. Therefore, for firms executing all or any portion of the work, this document and its contents should not be used without a thorough peer review by their H&S managers. Prior to commencing work, such firms are responsible for reviewing and supplementing the HASP to add appropriate procedures specific to their portion of the work.

5. TASK HAZARD ASSESSMENT

5.1 Site Background

The following is a brief description of the Site, including information as to the location, approximate size, previous usage, and current usage. A description of the tasks to be performed is also presented.

Site Location:	Adjacent to the southeast corner of the North Cascades Environmental Learning Center located at: 1940 Diablo Dam Road Diablo, Washington 98283
Approximate Size of Site:	3.3 Acres
Previous Site Usage:	Drydock operations
Current Site Usage:	Recreation area

Description of Surrounding Property/Population:

North:	Science Education Center and Ross Lake National Recreation Area Lands, and North Cascades National Parklands	**East:**	Ross Lake National Recreation Area Lands
South:	Diablo Lake (Reservoir)	**West:**	Science Education Center

Summary of Previous Site Investigations:

The Site contains a drydock that has been owned and operated by the Seattle City Light (SCL) since the 1930s. SCL is interested in removing the drydock and associated infrastructure. Shallow surface soil samples (0 to 12 inches) and surface sediment samples (0 to 4 inches) were collected around the Drydock by SCL in 2014 and 2015. Contaminants of potential concern (COPCs) detected above Washington Department of Ecology (Ecology) Model Toxics Control Act (MTCA) criteria include metals (arsenic, lead, and nickel) and polycyclic aromatic hydrocarbons (PAHs). However, exceedances are reported to be less than 10 times their respective screening levels, and screening comparisons to date have been for discrete samples (no composites or area-wide averaging). In addition, total petroleum hydrocarbons (TPH) were also detected, but at concentrations below MTCA Method A limits for unrestricted land use. A review of the data indicates that detected concentrations were higher in upland soils, compared to sediments.

5.2 Task Descriptions

Geosyntec will complete a soil and sediment investigation at the Site that will include upland and in-water work. Individual tasks that will be completed during the Site investigation are summarized below.

Task 1: Site Visits

Geosyntec personnel will conduct periodic Site visits to assess Site conditions and operations. Driving to/from the Site may include hazards, such as: driving in remote areas; driving in unfamiliar areas; collision with objects; driving in adverse weather conditions; fatigue; and distracted drivers. Once on the Site, hazards will include slips-trips-falls, pinch points, contaminant exposure, insects, working near water, and environmental hazards. See the associated Task Hazard Analysis (THA) in Attachment B for details on the hazards involved.

Task 2: Physical Surveys

A bathymetry survey of the in-water portion of the Site will be performed by a subcontractor, using the subcontractor's research vessel. Geosyntec will provide on-board staff to provide oversight and document the surveying process.

General task-specific safety considerations include slips, trips, and falls during vessel boarding and operations, operational equipment and pinch points, heat and cold stress, adverse weather, working on or over water (e.g., person overboard, drowning), and collision with submerged objects. See the attached THA in Attachment B for details on the hazards involved and associated hazard controls.

Task 3: Soil Sampling

This work will take place on upland portions of the Site and will utilize hand tools and drilling equipment. Surface soil samples will be collected, by Geosyntec, using hand-held equipment such as a hand-auger. Subsurface soil samples will be collected with subcontractor-operated drilling rigs. For drilling, Geosyntec will provide onsite staff to provide oversight and document the sampling process.

General task-specific safety considerations include, contaminant exposure, slips, trips, and falls, moving equipment and pinch points, heat and cold stress, adverse weather, working around power equipment, chemical exposure in soil or sediment, and loud operating equipment. See the attached THA in Attachment B for details on the hazards involved and associated hazard controls.

Task 4: Surface Sediment Sampling and Sediment Coring

Surface sediment and sediment cores will be collected from in-water portions of the Site with subcontractor operated equipment (such as vibracores, hand augers, van Veen grab samplers, or power grab samplers) deployed from a research vessel. Geosyntec will provide on-board staff to provide oversight and document the sampling process.

General task-specific safety considerations include, contaminant exposure, slips, trips, and falls during vessel boarding and operations, overhead hazards (from sampling equipment), moving equipment and pinch points, heat and cold stress, adverse weather, working on or over water (e.g., person overboard, drowning), collision with submerged objects, and loud operating equipment. See the attached THA in Attachment B for details on the hazards involved and associated hazard controls.

5.3 Chemical Hazards

The classes of COPCs that are known or suspected to be present at the Site include the metals (arsenic, nickel, and lead) and PAHs.

Controls for these hazards are presented in the THAs included in Attachment B. A summary of these chemical hazards is presented in Attachment C.

5.4 Physical Hazards

The following physical hazards have been identified associated with the work to be performed and the Site conditions.

- Working on and over water (e.g., falling overboard)
- Heat and cold stress
- Drilling (e.g., pinch points, loud noise, moving equipment)
- Drum and container handling (e.g., pinch points)
- Eye injury
- Hand/Foot injury
- Knives/Blades (e.g., contact with, cut by)
- Strain/Overexertion (e.g., lifting heavy loads, repetition, bending, twisting)
- Loud noise/Vibration (hearing damage)
- Portable power/Hand tools (e.g., cuts from sharp parts, powered equipment injuries)
- Falls (slip/trip, fall to same level, fall from height)
- Thoroughfares/Traffic/Travel to/from Site

Controls for these hazards are presented in the THAs included in Attachment B.

5.5 Biological Hazards

The following biological hazards have been identified associated with the work to be performed and the Site conditions.

- Allergic reaction to poisonous plants
- Biting/mauling animals in the North Cascades of Washington include dogs, wild animals. including coyotes, black bears, cougars, bats, opossums, raccoons, and others.
- Biting/stinging insects
- Lyme disease (transmitted from insect bites)
- Rats/vermin
- COVID-19 Pathogen

Controls for these hazards are presented in the THAs included in Attachment B.

5.6 Potential Exposure Pathways

Exposure to chemical hazards at the Site could occur by three pathways: inhalation; skin contact; and ingestion.

Inhalation

Constituents that could potentially pose a concern to workers through the inhalation exposure pathway include volatile constituents included in the PAH analyte category or PAHs and metals contained in dust particles. Inhalation by workers could potentially happen during the following Tasks associated with this project:

- Task 3: Soil Sampling
- Task 4: Surface Sediment Sampling and Sediment Coring

PAH and metals exposure through inhalation is expected to be limited through the use of dust suppression techniques (as appropriate) and the proper use of PPE will adequately protect personnel.

Skin Contact

Constituents that could potentially pose a concern to workers through the dermal contact exposure pathway include PAHs and metals. Dermal contact with potentially contaminated soil or sediment could occur during the tasks associated with this project. However, dermal exposure is expected to be limited by the use of proper PPE designed to limit skin contact with sediment or soil.

Ingestion

Constituents that could potentially pose a concern to workers through the inhalation exposure pathway include PAHs and metals. Ingestion of potentially contaminated soil or sediment could occur during the tasks associated with this project. Exposure is expected to be minimal with the use of proper PPE and hygiene practices such as washing hands before eating.

5.7 COVID-19

COVID-19-related H&S measures will be taken during each task of this project. The COVID-19 pathogen can be transmitted from infected individuals, resulting in potentially life-threatening symptoms, including difficulty breathing. As of September 2020, there is no vaccine available, and best-practices to minimize transmission are changing often. As updates are made to Geosyntec COVID-19 policies and local, state, and federal policies, this HASP and its associated THAs will be updated. Each task-specific THA will address COVID-19 by assessing potential COVID-19-related hazards and risks and will describe ways to minimize those risks. See the Field Work COVID-19 General Prevention Measures guideline in Attachment F for COVID-19 prevention measures.

5.8 Geosyntec Health and Safety Procedures

Geosyntec has developed HS procedures for many of the tasks being performed during this project. These procedures must be followed during all aspects of this project. Attachment G contains relevant Geosyntec HS procedures for this project and includes:

- HS-105 Driver and Vehicle Safety
- HS-111 Air Monitoring Program
- HS-113 Personal Protective Equipment
- HS-115 GHS Hazard Communication System
- HS-202 Safety Meetings
- HS-203 Stop Work Authority
- HS-306 Working on or Near the Water
- HS-312 Water Transportation Safety
- HS-403 Drilling
- HS-502 Manual Hand Tools
- HS-503 Powered Hand Tools

6. GENERAL SAFE WORK PRACTICES

The following general safe work practices must be adhered to while performing Site work:

- Basic PPE (see section 14) shall be worn, including hard hats, safety glasses, hard-toed boots, high-visibility vests, personal floatation device (PFD) (when on vessels), and hearing protection (when around loud equipment). If conditions allow, the requirement for hard hats may be reduced with approval of the SHSO and PM.
- Minimize contact with impacted materials. Do not place equipment on the ground. Do not sit or kneel on potentially contaminated surfaces.
- Smoking, eating, or drinking after entering the work zone and before personal decontamination is not allowed. Employees who are suspected of being under the influence of illegal drugs or alcohol will be removed from the Site. Workers, including subcontractors, taking prescribed medication that may cause drowsiness shall not operate heavy equipment and are prohibited from performing tasks where Level C or B PPE is required.
- Practice good housekeeping.
- The following conditions must be observed when operating a motor vehicle:
  - Wearing of seat belts is mandatory.
  - The use of headlights is mandatory during periods of rain, fog, or other adverse weather or low-light conditions.

  - Posted traffic signs and directions from traffic controllers must be observed.
  - Equipment and/or samples transported in vehicles must be secured from movement.
  - Vehicles acquired by Geosyntec may not be operated by non-Geosyntec personnel.
- In an unknown situation, always assume the worst reasonable conditions.
- Be observant of your immediate surroundings and the surroundings of others. It is a team effort to notice and warn of dangerous situations. Withdrawal from a hazardous situation to reassess procedures is the preferred course of action.
- Conflicting situations may arise concerning safety requirements and working conditions. These must be addressed and resolved rapidly by the SHSO and PM to relieve motivations or pressures to circumvent established safety policies.
- Unauthorized breaches of specified safety protocol are not allowed. Workers unwilling or unable to comply with established procedures will be asked to leave the work Site.

7. EMERGENCY RESPONSE

This section discusses emergency response procedures and response equipment to be maintained onsite. A table presenting a list of contacts and telephone numbers for the applicable local and off-site emergency responders is provided inside the front cover of this HASP (Section 3).

7.1 Injury and Emergency Response Procedures

In the event of an injury to an employee, the instructions for injury response and reporting, located in the front of this HASP, must be implemented immediately. In the event that an emergency develops, the following procedures are to be implemented:

- The SHSO, or designated alternate, should be immediately notified via the onsite communication system. The SHSO assumes control of the emergency response.
- If applicable, the SHSO must immediately notify off-site emergency responders (e.g., fire department, hospital, police department, etc.) and must inform the response team of the nature and location of the emergency onsite.
- If applicable, the SHSO may call for evacuation of the Site. Site workers should move to their respective refuge stations using the evacuation routes provided on the Site Map.
- For small fires, flames should be extinguished using the appropriate type of fire extinguisher. Large fires should be handled by the local fire department.
- If a worker is injured, the procedures presented in "H&S Incident Response Procedures," located in the front of this HASP, must be implemented immediately.
- After an incident has stabilized, the procedures presented in "H&S Incident Response Procedures," located in the front of this HASP, must be followed.

7.2 Emergency Response Equipment

Emergency response equipment will be maintained in the work area as necessary for this project. Examples of emergency response equipment include first aid kits, fire extinguishers (Type ABC), and eyewash bottles.

8. KEY PERSONNEL AND HEALTH AND SAFETY RESPONSIBILITIES

Project personnel and their responsibilities in regard to H&S concerns on this project are as follows:

PM: Anne Fitzpatrick

- Approve this HASP and amendments, if any
- Monitor the field logbooks for H&S work practices employed
- Coordinate with SHSO so that emergency response procedures are implemented
- Check that corrective actions are implemented
- Check and document that qualified personnel receive this HASP and are aware of its provisions and potential hazards associated with Site operations, and that they are instructed in safe work practices and familiar with emergency response procedures
- Provide for appropriate monitoring, PPE, and decontamination materials

SHSO: Luke Smith

- Prepare and implement project HASP and amendments, if any, and report to the PM for action if deviations from the anticipated conditions exist and authorize the cessation of work if necessary
- Check that Site personnel meet the training and medical requirements
- Conduct pre-entry briefing and daily tailgate safety meetings
- Check that monitoring equipment and PPE are operating correctly according to manufacturer's instructions and such equipment is utilized by onsite personnel. Calibrate or check calibration of monitoring equipment and record results
- Check that decontamination procedures are being implemented
- Implement Site emergency response and follow-up procedures
- Notify the HSC in the event an emergency occurs
- Perform and document weekly inspections

HSC: Erin Dunbar &/or Coleman Hoyt

- Review and audit HASP and amendments
- Notify Director of H&S when an emergency occurs
- Assist with the implementation of the corporate H&S program
- Consult with staff on H&S issues

Site Workers:

- Provide verification of required H&S training and medical surveillance prior to arriving at the Site
- Notify supervisors of workplace accommodation requirements as the result of physical limitations or medical conditions
- Attend pre-entry briefings and daily tailgate safety meetings
- Immediately report accidents and/or unsafe conditions to the SHSO
- Be familiar with and abide by the HASP
- Be ultimately responsible for his or her own safety

9. WORKER TRAINING AND MEDICAL SURVEILLANCE

Personnel involved in field activities subject to OSHA HAZWOPER 29 Code of Federal Regulations (CFR) 1910.120 will be required to participate in both an H&S training program that complies with criteria primarily set forth by the OSHA HAZWOPER in 29 CFR 1910.120(e) and a medical surveillance program covered under 29 CFR 1910.120(f), or equivalent regulations based on the jurisdiction in which the project is performed.

9.1 Pre-Assignment and Annual Refresher Training

Prior to arrival onsite, the PM will be responsible for monitoring that their staff meet the requirements of pre-assignment training (40/24 hours per Procedure HS 301). In addition, personnel must be able to document dates of attendance at an annual 8-hour refresher and three days of fieldwork under a qualified supervisor. Failure to provide this documentation will prohibit entry to the active work area(s) (i.e., Exclusion Zone).

9.2 Site Supervisor Training

Consistent with OSHA 29 CFR 1910.120 (e)(4), prior to arrival onsite, individuals designated as Site supervisors require an additional eight hours of specialized training. The SHSO will be the Site supervisor for this project.

9.3 Initial Site Safety Orientation and HASP Review

In addition to complying with 29 CFR 1910(e), site personnel will attend an initial safety orientation during which the HASP and applicable THAs will be reviewed prior to initiating field activities. This review will include the following:

- Understanding the lines of authority regarding H&S and Site personnel roles and responsibilities.
- Discussing the information of specific hazard agents related to the Site and Site operations, such as health hazards of Site chemicals and specific safety hazards of processes, tools, and equipment.
- Training in the proper use, maintenance, and decon protocol of PPE and Level(s) of Protection.
- Reviewing appropriate work practices and engineering controls to reduce/eliminate exposures to Site hazards.
- Informing personnel of means for normal Site and emergency communication(s).
- Discussion of air monitoring strategies, to include the frequency/types, action levels, sampling techniques, pre/post calibration techniques.
- Consideration of unique/Site specific medical surveillance requirements based on Site contaminants.
- Understanding Site control measures, work zones, and proper decontamination procedures for personnel/tools/vehicles, etc. to reduce the potential for both on-/off-site contamination.
- Training personnel to respond quickly and properly in the event of an emergency.
- Specialized training in the appropriate techniques to employ prior to commencing these operations for personnel involved in specific hazardous activities, such as confined space entry, drum handling, sampling unknowns, etc.

9.4 Baseline Medical Surveillance Exam

The baseline medical examination is used to identify physical capabilities and certain medical limitations that may have an impact on the candidate's ability to perform in the position and/or job activity for which he/she is being considered, as well as to establish certain baseline medical parameters. The initial test results can then be compared against future periodic or project-specific monitoring results.

9.5 Periodic/Annual/Biennial Medical Exam

The periodic medical examination is used to evaluate an employee's continued fitness for duty and to assess possible impact(s) occupational exposures may have had on their health status. The periodic examination includes an update to the medical and work history, results of previous occupational exposure assessments, and a detailed medical exam tailored to the job description.

The Medical Director from WorkCare determines the frequency of the periodic medical exams based on regulatory requirements, the position/work activities of the employee, and the level of exposure to physical, chemical, and biological agents.

9.6 Exposure/Activity/Project-Specific Medical Testing

Exposure-specific medical tests and/or evaluation of biological indices may be conducted to establish a baseline for certain project-specific parameters, to monitor the effectiveness of hazard controls, and/or to assess the impact of occupational exposures associated with a particular work activity or project. The Medical Director, in coordination with the H&S Department, will require or recommend an exposure-specific exam when deemed appropriate based on knowledge of project hazards, occurrence of employee health symptoms, or an unexpected exposure event. Requests for exposure-specific examinations will be forwarded to the H&S Department, who will process the requests in collaboration with the Medical Director. The Medical Director will determine the type and frequency of the exposure-specific medical exams for employees designated to participate based on sound medical practice, latest toxicology information, and current regulatory requirements.

Cardiopulmonary Resuscitation (CPR) and First Aid Trained Personnel who will be onsite will be identified in the HASP appendums or THAs for each study.

9.7 Exit Exam

An exit medical examination is offered when an employee leaves the medical surveillance program, either because of termination of employment with Geosyntec or because of reassignment to a position not designated or identified to participate in the medical surveillance program. This optional exit examination may be used to assess potential changes in medical status that have occurred during the course of employees' previous work activities and establish a medical baseline at the time of departure.

10. MAPS AND SITE CONTROL

10.1 Routes to Hospital and Urgent Care Facility

A hospital near the Site has been identified. Maps to the hospital and urgent care are included in Figure 2. This figure also includes the facility name and phone number.

10.2 Site Map

A Site map (Figure 3) is located on Page ix of the pre-text of this HASP. The Site map is intended to provide onsite orientation and delineate evacuation routes and muster points. Changes may be made to the Site map by the SHSO based on changing Site conditions. The Site map should be accessible in the work area.

10.3 Buddy System

The buddy system is required when work is performed at the Site. The buddy system includes maintaining regular contact with one or more onsite Geosyntec personnel, clients, and/or contractors to periodically check on the condition of Site workers such that each employee in the work group is observed by (or in verbal contact with) at least one other employee in the work group. For field visits with only one employee onsite, the buddy system shall be implemented via periodic telephone contact with off-site Geosyntec personnel. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

10.4 Controlled Work Zones

APPLIES TO TASK: ☐① ☐② ☒③ ☒④

Three controlled work zones, including an Exclusion Zone, a Contaminant Reduction Zone, and a Support Zone, are required for the task(s) indicated above in the check-boxes.

The Exclusion Zone is defined as the area onsite where contamination is suspected and tasks are to be performed. The Contaminant Reduction Zone is defined as the area where equipment and workers are to be decontaminated as they leave the Exclusion Zone. The Support Zone is defined as the command area and may serve as a staging and storage area for supplies. The location and extent of the work zones may be modified as necessary as Site investigation information becomes available. For sites that do not require the three controlled work zones, the area(s) where work is to be performed shall be called the Work Zone. Geosyntec employees must not be allowed into the Contaminant Reduction Zone or Exclusion Zone or the Work Zone until they have received the proper PPE and they have read, understand, and meet the requirements outlined in this HASP.

Visitors to the Site may need to be continually escorted for safety purposes. Visitors under Geosyntec's direction need to check in with the SHSO upon visiting the Site.

For the tasks identified above, the boundaries of the Exclusion Zone, Contaminant Reduction Zone, and Support Zone, or the Work Zone, shall be marked using appropriate methods, including but not limited to warning tape, signs, traffic cones, fencing, or other appropriate means.

When working on vessels, the Exclusion Zone, Contaminant Reduction Zone, and Support Zone is illustrated in Figure 4 (below).

To enter the Exclusion Zone, workers must check in with support staff and don required PPE. Workers must then enter the Contaminant Reduction Zone before entering the Exclusion Zone.

To leave the Exclusion Zone, workers must directly enter the Contaminant Reduction Zone. In this zone, workers must remove contaminated PPE, such as dirty nitrile gloves, and practice proper hygiene such as washing hands and cleaning residue off boots. Once decontaminated, the worker

can enter the Support Zone where they can check-out with support staff if leaving the vessel is necessary.

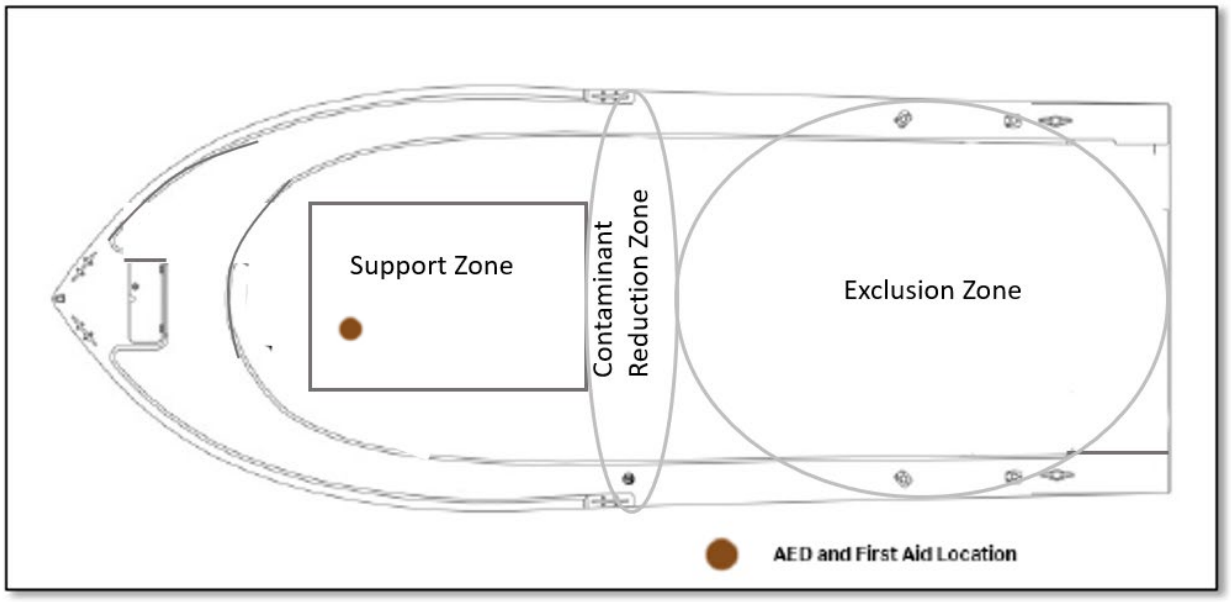


Figure 4. Exclusion, Contaminant Reduction, and Support Zones when working on Vessel.

10.5 Site Access and Muster Location

Certain sites require controlled access to the work area. Examples of access controls include sign in/sign out logs, checking in with guards, and donning identification badges. Geosyntec personnel will adhere to the site-specific access requirements and monitor that subcontractors and other Geosyntec visitors abide by site-specific access control requirements. Evacuation routes and muster locations are shown on Figure 3 (Page vi).

10.6 Inspections

☒ APPLICABLE ☐ NOT APPLICABLE

Based on the hazards identified for the project, periodic H&S inspections may be performed. The H&S Inspection Checklist records should be kept on file at the project Site. The frequency for periodic inspections is:

☐ Weekly

☐ Monthly

☒ Other: On an as-needed basis, determined by the HSC or PM.

11. TAILGATE MEETINGS

In accordance with the Company's Procedure HS 202 – Safety Meetings, tailgate meetings must be held daily prior to starting work to discuss important H&S issues concerning tasks to be performed during that shift. Non-Geosyntec Site workers should also communicate H&S concerns associated with the tasks they will be performing. Topics discussed in the tailgate meetings must be documented.

12. STOP WORK AUTHORITY

In accordance with the Company's Procedure HS 203 – Stop Work Authority, Geosyntec personnel and subcontractor personnel have the authority and responsibility to issue a Stop Work Order if unsafe actions and/or conditions are identified. The Stop Work Authority process involves a stop, notify, correct, and resume approach for resolving observed unsafe work actions or conditions. The person issuing the work stoppage will first notify workers engaged in or affected by the unsafe activity or condition and require that associated work be stopped. After this Stop Work Order is issued, the Geosyntec project manager and the supervisors for affected or concerned contractors will also be notified. The Geosyntec project manager will document the issuance of the Stop Work Order on the form provided in Procedure HS 203. Work will not resume until the issues and concerns of the Stop Work Order have been adequately addressed.

13. AIR MONITORING

APPLIES TO TASK: ☐① ☐② ☐③ ☐④

Air monitoring will be not be performed. The COPCs, (PAHs and metals) are not expected to pose a risk to breathing air.

14. PERSONAL PROTECTIVE EQUIPMENT

The levels of PPE required for each task are presented in Attachment D. Required equipment and types of protective clothing materials, as well as an indication of the initial level of protection to be utilized, are listed. The level of protection may be upgraded or downgraded by the SHSO according to controls requirements in Attachment D.

In general, Geosyntec requires the following PPE during Site field efforts: hardhats; safety glasses; safety-toe shoes; sleeved work shirts; full-length trousers; and high-visibility vests. A preliminary hazard assessment associated with the development of this HASP has identified additional Modified Level D PPE requirements for some of the planned tasks, including hearing protection, outer work gloves, surgical or cloth masks for COVID-19, and PFDs (when working over water). More information on PPE is given in Attachment D and Attachment G (HS-113).

15. DECONTAMINATION

The SHSO and PM will determine the type and level of decontamination procedures for both personnel and equipment based on evaluation of specific work activities in the controlled work zones. Medical treatment will take precedence over decontamination in the event of a life threatening and/or serious injury/illness. Personnel will perform decontamination in designated and identified areas upon leaving "hot zones" where the potential exists for exposure to hazardous chemical, biological, or environmental conditions.

Decontamination of personnel in Level D (modified) will consist of proper containerization and disposal of coveralls, disposable boots, and gloves (if applicable) and washing of non-disposable PPE (such as rain gear) suspected of being contaminated using a soap solution followed by a water rinse.

Decontamination of personnel in Level C, if applicable, will consist, at a minimum, of:

- Removal and cleaning/disposal of boot covers, coveralls, and outer gloves
- Removal, cleaning, and storage of respiratory protection
- Washing of non-disposable PPE suspected of being contaminated using a soap solution followed by a water rinse
- Removal and disposal of inner gloves

Hand tools and sampling equipment shall be decontaminated as needed by washing in decontamination basins with appropriate solutions, or, if possible, by dry decontamination. Wash solutions and PPE may require disposal at a licensed waste facility.

16. SPILL PREVENTION AND CONTAINMENT

The task(s) for this project may involve the handling of drums and/or containers that contain stored chemicals, hazardous materials, and/or investigation derived wastes. The drums and/or containers may have been spilled/dislodged during Site activities due to compromised construction of the drum/container, transportation accidents, improper packaging practices, and improper handling of hazardous materials during on/off loading. Containers shall be inspected and their integrity assured prior to being moved and/or handled. If the integrity of the container is in question, the container shall be over packed or its contents transferred. Operations shall be organized and coordinated to minimize movement of such containers. Where spills, leaks, or ruptures may potentially occur, a supply of sorbents shall be located in the immediate area.

Geosyntec will verify that subcontractors have either a spill plan or spill procedure prior to deploying equipment or launching vessels.

Additional preventative measures include:

- All hazardous materials will be stored in appropriate containers and labeled.
- Tops/lids will be placed over containers after use.
- When using 55-gallon drums:
    - United Nations (UN)-approved 55-gallon drums, bins, totes, and/or tanks will be inspected for visible defects upon delivery to the Site.
    - UN-approved 55-gallon drums will also be inspected to ensure that each drum includes a resealable lid with a small resealable sampling port near the top, or on the side of the drum and that the enclosure is not deformed and/or distorted.
    - Drums will not be completely filled to allow for possible expansion of liquid and will be set on wooden pallets to facilitate transport by forklift.
- The storage area will be inspected to check for leaks weekly while the containers are being filled and immediately after a relocation to a temporary onsite storage area.
- Flat areas will be selected for temporary storage away from high-traffic work areas/zones and storm/sewer drains.

In the event of an unplanned release or spill of unknown or hazardous substances, the PM will designate personnel who will support the spill containment, control, and/or clean-up procedures. The team will request additional off-site emergency response assistance if necessary, based on the type of spill, volume, potential toxicity, etc.

The spill area will be isolated and restricted to only authorized personnel designated to assist with the containment, control, or clean-up activity. Authorized personnel will be trained to contain and clean spills from typical materials and quantities used at the project location. Physical barriers will be set up to warn unauthorized personnel to stay clear and evacuate the affected area. The spill,

leak, or incident will be assessed by the team and characterized to determine the appropriate course(s) of action(s) to consider:

- Small spills may be remediated using absorbent materials by designated personnel.
- Large spills and/or spills of highly toxic materials may require assistance by off-site hazardous materials (HAZMAT) teams.
- Attempts shall be made to identify and stop the source(s) of spillage immediately while donning proper PPE (based on action levels and the air monitoring program) and performing air monitoring.
- If the spill has the potential to impact the water, the SHSO shall notify the PM and H&S Department, immediately.
- The SHSO will direct spill-response operations and stay at the spill area until it has been cleaned, inspected, and cleared for re-entry.
- The SHSO will prepare a spill incident and clean-up report and will communicate findings to the PM, Principal-in-Charge, and H&S Department.

17. CONFINEDSPACE ENTRY

☐ APPLICABLE ☒ NOT APPLICABLE

The task(s) for this project do not involve confined-space entry.

18. GLOBALLY-HARMONIZED SYSTEM (GHS) FOR HAZARD COMMUNICATION

☒ APPLICABLE ☐ NOT APPLICABLE

The following procedures must be followed for chemicals brought onto the Site by Geosyntec personnel or by subcontractors (i.e., decontamination solution, sampling preservatives, etc.) while performing the tasks of this project:

- Labels on primary chemical containers must not be defaced.
- Chemicals must be stored in appropriate storage containers.
- Secondary containers and storage cabinets must be correctly and clearly labeled.
- Chemicals incompatible with each other must not be stored together.
- Workers must receive training on the chemical hazards.
- Safety Data Sheets (SDSs) must be added to Attachment E.

When chemicals are used onsite, workers must abide by Geosyntec's GHS Hazard Communication Program (Procedure HS 115).

Geosyntec consultants

Attachment A: HASP Amendments

Over the course of this project, it is possible that the project-specific hazards and working conditions will change. This HASP may be reviewed and amended as necessary to effectively describe the changing working conditions and measures to mitigate the potential H&S issues that may arise during the project. Amendments to the HASP should be briefly described in the following spaces provided. The full text of the amendments should be provided in Attachment A and/or additional THAs should be added to Attachment B.

AMENDMENT 1:

Date: _____ Project Manager: _____ HSC: _____

Brief Description of Amendment:

_____

_____

_____

_____

AMENDMENT 2:

Date: _____ Project Manager: _____ HSC: _____

Brief Description of Amendment:

_____

_____

_____

_____

AMENDMENT 3:

Date: _____ Project Manager: _____ HSC: _____

Brief Description of Amendment:

_____

_____

_____

_____

Discuss details of amendments to this HASP here. Include amendment number, date, and details of amendments.

Attachment B: Task Hazard Analyses

TASKS	
①	Site Visits
②	Physical Surveys
③	Soil Sampling
④	Surface Sediment Sampling and Sediment Coring

THAs for these tasks are presented in the following pages.

Geosyntec consultants

TASK HAZARD ANALYSIS (Ver. 2, June 2015)

Geosyntec HS Procedures referenced herein are available on Geosyntec's H&S SharePoint site and should be consulted, as appropriate, per project-specific needs. This THA prepared per HS-106-Accident Prevention Program, HS-204-Task Hazard Analysis, and meets the requirements for a "Site-Specific Health and Safety Plan" per regulations and Geosyntec HS Procedures referenced herein (see Section B.14.).

PART A – SITE SAFETY PLAN

A.1. PROJECT/TASK INFORMATION

TASK:	Bathymetry surveys		
Project Name:	Engineering Evaluation/Cost Analysis Field Work	**Project Number/Org:**	PNG0913/3010
Project Address:	Adjacent to the North Cascades Environmental Learning Center 1940 Diablo Dam Road Diablo, Washington 98283		
Description of Task & Worksite:	The bathymetry surveys will map substrate elevations and water depths to help plan sediment sampling. This data will help design the sampling program and will consider site access, core tube lengths, and boat access. The surveys will be performed by a subcontractor, using subcontractor research vessels and equipment. Geosyntec will provide on-board staff for over-water work to provide oversight and document the survey process.		

Geosyntec Personnel	**Name**	**Desktop Office Phone**	**Cell Phone**
Site Lead/H&S Officer	Luke Smith	206-496-1452	319-400-2447
Project Manager	Joey Hickey	971-271-5897	503-730-6608
Project Director	Anne Fitzpatrick	206-496-1461	206-963-8199
H&S Coordinator	Erin Dunbar	971-271-5916	360-901-6175
Regional H&S Mngr.	Joe Esseichick	720-509-8906	734-417-0909
Corp. H&S Director	Bob Poll	813-379-4420	813-240-9231
Client Contact(s):	Tom Meyer		206-665-5750
Subcontractor(s):	☐ Not Applicable ☒ Applicable, provide contact information below:		
ETHICS POINT HOTLINE	US & Canada: 844-231-3371 UK: 800-89-0011 or 800-89-0011	Australia: 800-551-155 or 800.811.011 Ireland: 800-222-55288 or 800-500-000	

A.2. EMERGENCY RESPONSE Based on analysis of worksite factors, client/regulatory requirements, availability of emergency services.

Consider all Relevant Risk Factors & Response Procedures *(fire/explosion, medical, chemicals/spills, security, site factors, weather, communications)*.
EXPLANATORY NOTES, CLARIFICATIONS:
The field team will meet the subcontractor at the Diablo Lake boat ramp to load gear and supplies. In case of emergency the on-water field team can transit to one of two locations, the boat ramp or the Site. The closest emergency services to these muster points is provided.

Available Means of Jobsite Emergency Communication/Alerting	☒ Verbal ☒ Cell Phone ☐ Land Line ☐ 2-Way Radio ☐ On-site alarm/signal system ☐ Other:
To Summon Emergency Services Police, Fire, Ambulance	☒ **DIAL 911**, for external responders ☐ **Other**:
Other Emergency Contacts, as needed *(such as security, spill responder, utility):*	Spills-National Response Center: 800-424-8802 Report the spill immediately to BOTH: 1-800-258-5990 (Washington Emergency Management Division) 1-800-424-8802 (National Response Center)
Nearest Emergency Medical Services and Urgent Care	Hospital Name: PeaceHealth United General Hospital Address: 2000 Hospital Drive Sedro-Woolley, Washington 98284 Phone #: 360-856-6021 ☒ See Attached Directions
For **Non-Emergency Urgent Care**	☒ Contact WorkCare, 24/7 at: 888-449-7787 ☐ Other:
Job-site **Evacuation** Procedure, Rally Point, Place of refuge:	Field work will be located on water adjacent to the north shore of Diablo Lake adjacent to the North Cascades Environmental Learning Center. If there is an emergency on the water involving the vessel or a medical emergency, the field team will head to the Shoreline, or boat ramp. The research vessel used for the survey will launch at the boat ramp and transit to the Site.

Special Emergency Equipment/Procedures	For COVID 19 safety measures, follow "Field Work COVID 19 General Prevention Measures" guideline Attachment G of the Health and Safety Plan for this project. Core safety measures include: Maintain social distancing (where possible); Wear mask or cloth face covering, where social distancing cannot be maintained; Wash hands frequently for minimum 20 sec with soap and water; Use hand sanitizer and hand wipes periodically if hand-washing capability is not readily available; Avoid touching surfaces if not necessary; Use sanitary wipes to wipe handles of field tools and equipment prior to start of work Social distancing on the vessel will not be practical. To minimize the risk of transmission, only one Geosyntec Employee will oversee the survey work.

IMPORTANT: After initial emergency response actions and incident stabilization, contact appropriate project personnel listed in Part A.1.

A.3. SUMMARY OF WORK STEPS, HAZARDS, CONTROLS

Based on **PART B, "HAZARD ANALYSIS,"** and worksite/client/project factors.

Summary/outline of work steps/hazards/controls, with references to applicable Sections in Parts B and C, as applicable:

WORK STEPS	HAZARDS	CONTROLS
All steps	*Catching or spreading COVID-19 through contact with surfaces or being in close proximity to other people.*	*Maintain a 6-foot distance from others, when possible, and take other social distancing measures when able. Take separate vehicles to/from the field site.* *Ask those showing COVID-19 symptoms to dismiss yourself from work and self-isolate. Do not arrive to the work area with flu-like symptoms, including cough, fever, or respiratory illness. (See COVID-19 Supplemental Attachment).* *Maintain personal hygiene (cough into elbow or tissue, and wash hands frequently).* ***Every worker has Stop Work Authority if they deem risks are unacceptable***
Driving to/from site	*Driving* *Driving at and walking at boat ramp*	*Follow driving laws and familiarize yourself with unfamiliar vehicles before operating. Review prior to departure and utilize a map/GPS for directions to the site.* *Follow on-site parking and driving rules. Yield to equipment, trucks, and other on-site operations.*
General Site Safety	*Cold Exposure* *Heat Illness and Sun Exposure* *Slips and Falls* *Loading/Unloading Gear* *Strains/sprains* *Pinch points*	*Wear multiple layers underneath a water-resistant outer layer. Bring extra warming layers for replacement of wet clothes. Avoid fabrics that do not insulate when wet, such as cotton. Stay hydrated and be sure to eat frequent, but small snacks. Be prepared for cold, but above freezing temperatures with rain possible.* *Wear multiple layers including long-sleeve garments. Bring a hat and sunscreen. Bring at least a days-worth of drinking water.* *Use caution walking on roads and paths. Wear steel toe boots with good traction to avoid slipping on dock surfaces. Wear steel-toe boots with good traction for slippery paths, docks, and boat surfaces. Try to maintain three points of contact when moving.* *Use proper lifting techniques and use a lifting tool such as a dolly for heavy objects (>49 pounds) (but try not to have multiple people lifting objects in order to maintain safe distances from others). Be cautious of potential pinch-points such as the area between stationary docks and moving vessels.*
Field Survey	*Working near water* *Working outside of daylight hours* *Overhead/Surveying equipment* *Eye injury* *Hearing injury*	*Be aware of your surroundings and proximity to water bodies, wear a personal flotation device on or near water, man overboard training with captain and crew; daily float plan and communication with project management team; check in/out at the beginning and end of each day. Perform daily safety checks to make sure vessel and equipment are in working order. Follow directions as given by the vessel captain.* *Make available a functioning flashlight for each team member. Vessel has working lights inside cabin and outside.* *Maintain a safe distance from overhead equipment and wear a hard hat whenever outside vessel cabin.* *Wear safety-glasses at all times on the vessel.* *Have ear protection available for each team member, such as foam ear plugs or safety ear-muffs.*

Working on or near water	*On-Reservoir Traffic* *Drowning, cold water, fire onboard*	*Follow marine navigation regulations and display proper navigation lights. Ensure vessel horn works and is used to inform others of location if necessary.* *Wear personal floatation device at all times when working near or on water.* *Use the "buddy system".* *Practice man-over-board procedures, watch fellow employees and boat crew, keep eyes on, and point toward anyone overboard, follow emergency response procedures as directed by captain.* *Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations.* *Take special care on slippery rocks and surfaces near water. Always look ahead at the ground when walking around the water's edge.* *Be aware of overhead hazards, especially when navigating decks on vessels.*

A.4. H&S EQUIPMENT LIST List worksite equipment for worker protection; provide details in Explanatory Notes, Clarifications.

EXPLANATORY NOTES, CLARIFICATIONS: Wear high visibility clothing at all times. Wear safety glasses when operating any equipment to prevent eye injuries. Will bring portable first aid kit. Extra hand sanitizer and disinfecting chemicals will be on-Site for use in disinfecting frequently touched surfaces in order to minimize the risk of COVID-19 transmission (See COVID-19 Supplemental Attachment). Will bring supplies to construct field handwashing station.

☒	**ROUTINE PPE**	☒ Standard work clothes appropriate for task ☒ Hard-toed boots/shoes ☒ Hardhat ☒ Safety glasses	☒ Work gloves appropriate for task ☒ Noise/hearing protection ☒ High visibility/reflective vest ☐ Ice creepers (boot attachments)
		☐ Basic PPE for protection from low-hazard chemical contact & dust (nitrile gloves, Tyvek suit, dust mask, boot covers).	
☒	**ROUTINE H&S EQUIPMENT/GEAR**	☒ First Aid Kit ☒ Fire extinguisher ☐ Emergency eyewash bottle(s) ☒ Insect repellant ☐ Wasp spray ☐ Caution tape	☒ Sunscreen ☐ Project-supplied drinking water and/or hygiene facilities ☐ Poison ivy skin wash (Technu or similar) ☒ Vehicle emergency kit (flares, lights, reflective device) ☐ Traffic control warning devices (cones, or similar) ☐ Shade canopy (for sun protection)
		☐ Other:	
☒	**NON-ROUTINE PERSONAL PROTECTIVE EQUIPMENT (PPE)** (Indicate specific types of PPE in Explanatory Notes, Clarifications)	☐ Goggles ☐ Face shield ☐ Chemical protective gloves ☐ Coveralls (Tyvek, or other) ☐ Outer boots, boot covers	☐ Disposable n-95 dust mask ☐ Half-face air-purifying respirator ☐ Full-face air-purifying respirator ☐ Respirator cartridges ☐ SCBA/airline respirator	☐ Personal flotation device ☐ Personal fall apparatus ☐ Fire retardant clothing ☐ Arc Flash Protection ☐ Electrical-Hazard-rated boots, gloves
		☒ Other: Face masks or cloth face coverings must be used by staff to limit transmission of SARS-CoV-2 virus. PFD must be worn when working on or near water.		
☐	**SPECIAL HAZARD CONTROLS**	☐ Portable GFCI ☐ Eyewash - 15 min. flow	☐ Lockout/tagout equipment ☐ Emergency deluge shower	☐ Ventilation equipment (fan, blower) ☐ Air horn, alarm
		☐ Other:		
☒	**DECON, PPE DISPOSAL**	☒ Receptacle for disposable PPE	☒ Hand washing provisions	☐ Decon solution, related supplies
		☐ Other:		
☐	**AIR MONITORING EQUIPMENT, OTHER EQUIPMENT FOR WORKER EXPOSURE TESTING**	List equipment/devices to be brought to worksite; Use in accordance with procedures in Part C:		

PART B – HAZARD ANALYSIS *Complete Section B.1., then subsequent sections as applicable to the task(s).*

B.1. ROUTINE HAZARD PREPAREDNESS **This section required for all tasks.**

Explanatory Notes, Clarifications: Work will be scheduled for daylight hours, but gear loading/unloading may take place during twilight/dusk hours and lighting should be provided (e.g. headlamps/flashlights). Care will need to be taken regarding COVID-19 transmission. Maintain as much distance as is practical between people. Ask that people who develop the symptoms of COVID-19 leave the work site (See COVID-19 Supplemental Attachment). Take precautions when meeting at the boat ramp, don't leave your vehicle alone and use the buddy system. No work will be completed alone either on or near the water.

General Safety, Wellness, Preparedness – **Workers are encouraged to engage in workplace and lifestyle behaviors that facilitate wellness and safety; delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.**

☒ **General premises** hazards - housekeeping, rough terrain, trip hazards, steep slope, remote location.

☒ **Weather/climate-related hazards** – heat stress/cold stress measures, sunscreen, severe weather shelter/refuge, "30/30 rule" for lightning

☒ **Plant/Insect/Animal Hazards** - Precautions: poison ivy wash; insect repellant; check for ticks; hornet nest spray; animal precautions.

☒ **Worksite traffic hazards** – Implement measures to protect personnel (high visibility/reflective clothing, on-person lighting, traffic control measures).

☒ **Illumination hazards/night work** - Illuminate work areas and/or access routes, use reflective/hi-visibility clothing or on-person lighting, as appropriate.
☒ **Manual hand tools** - Use hand tools in accordance with "HS-502-Manual Hand Tools." USE OF OPEN-BLADED UTILITY/FOLDING/COLLAPSIBLE/FIXED BLADE KNIVES IS PROHIBITED. Cutting tools with appropriate safety features (automatically- retracting blades, enclosed/guarded blades) are permitted
☒ **General machine, equipment hazards** – keep safe distances, heed warning signs, stay out of "line of fire," use PPE (such as eye/hearing protection).
☒ **Lifting, manual material handling** – use proper lifting procedures, seek help for >49 lbs.
☒ **Non-routine wellness provisions** – special procedures for hydration, food, hygiene, general wellness.
☐ **Non-routine emergency procedures** - special procedures for reliable system of emergency communication, response, or transport.

Geosyntec Procedures: *HS-124-Heat Stress, HS-125-Cold Stress, HS-127-Ticks, HS-208-Housekeeping, HS-210-Walking and Working Surfaces, HS-401-Back Injury Prevention, HS-502-Manual Hand Tools, HS 517 Traffic Safety*

Routine Personal Protection – Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.

☒ **Overhead Hazards** - Wear hardhat or "bump cap" as appropriate for hazard.
☒ **Hand injury hazards** - Wear protective work gloves appropriate for the hazard and work tasks.
☒ **Eye injury hazards** - Wear safety glasses (with side shield or wrap around, either clear or shaded for sun protection), or other appropriate eye protection.
☒ **Foot hazards, rough terrain** - Wear work boots/shoes with hard toes, ankle support, puncture resistance, traction, as appropriate for conditions.
☐ **Noise** – use hearing protection, (earplugs, earmuffs, or both) as appropriate for conditions, at a minimum where noise levels exceed 85dBA.
☒ **Dust, unsanitary conditions** – For general protection against minimal non-specific hazards, use protective clothing and/or disposable dust mask, as needed.

Geosyntec Procedures: *HS-109-Hearing Conservation, HS 112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-207-Working Alone, HS-105-Driver and Vehicle Safety*

Security – Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.

☐ **High crime, urban** – Use appropriate measures for personal security (such as buddy system, security service, work scheduling, other measures)
☐ **Working alone** - Establish "check in" procedure with supervisor/project manager.

Geosyntec Procedures: *HS-207-Working Alone*

Routine Driving Hazards – Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.

☒ **Routine work travel** - Use routine safe/defensive driving practices (seat belts, safe speeds, eyes ahead, no tailgating, limit distractions, safe cell phone use, no texting, clear windows, account for weather/road conditions, adequate sleep, other measures as appropriate).
☒ **Unfamiliar location** - Plan travel route before driving (assemble maps, enter destination in GPS).
☒ **Long Distance or During Sleep Hours** – Minimize fatigue: rest breaks, light snacks (avoid heavy meals), stay hydrated, fresh air, no loud music, clean windshield.
☒ **Unfamiliar vehicle** – Become familiar with vehicle operational controls and handling characteristics before operating vehicle.

Geosyntec Procedures: *HS-105-Driver and Vehicle Safety*

B.2. SPECIAL DRIVING/TRAFFIC/TRANSPORTATION HAZARDS ☒Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Staff will drive on highways, urban roadways, and at boat ramps. Field team will need to watch for car and boat trailer traffic. Workers will travel to the Site separately to minimize the chances of exchanging COVID-19 *(See COVID-19 Supplemental Attachment).*

☐	**SPECIAL DRIVING HAZARDS** Off-Road Driving or use of non-typical vehicle, heavy vehicle, van, golf/utility cart, ATV Hazards: Worker injury due to vehicle collision, rollover	☐ For off road driving, do not exceed capability of vehicle, beware of wet conditions, speed low, avoid unsafe orientation on slopes. ☐ Follow ATV specific procedures for training, safety equipment, operation, manufacturer's instructions. ☐ Special Skills Required for Vehicle type - For vehicles requiring special skills (such as windowless van, heavy work vehicle, utility vehicle, similar) ensure operator is provided training and/or has appropriate operator skills through experience. ***Geosyntec Procedure(s):*** *HS-510-All Terrain Vehicles*
☐	**TRANSPORTING MATERIALS, TOWING/HAULING LOADS** Hazards: Vehicle accident, occupant injury from shifting load, unsafe equipment.	☐ Ensure load is firmly secured (rope, straps, load configuration) to prevent shifting during travel. ☐ Slings, chains, strap, rope and related equipment used for towing, hauling, load-securing shall be appropriate for use and used in a manner as to prevent an unsafe condition. ☐ For trailer use, verify signal/braking lights operational, rear-view mirrors effective, hitch/safety chains secure.
☒	**WORKSITE TRAFFIC HAZARDS** Where the project worksite is located in/near vehicle thoroughfare. Hazards: Worker injury from being struck by vehicle traveling in thoroughfare.	☒ Wear reflective vests where exposed to traffic hazards. ☐ Where possible, park vehicles as protective shield from oncoming traffic. ☐ Configure work area and support vehicles to minimize worker exposure to traffic hazards. ☐ Use DOT signal devices to re-route vehicles around work area, site entrances/exits. ☐ Use DOT-trained flaggers or police detail where appropriate or required. ***Geosyntec Procedure(s):*** *HS-517-Traffic Safety*
☐	**RAILROAD HAZARD** Hazard: Worker injury from being struck by train in R.R. right-of-way	☐ Coordinate with rail company and implement required safety and security measures. ☐ Site workers to receive safety training for railroad work. **Geosyntec Procedure(s):** HS-305-Rail Operations
☒	**WATER TRANSPORTATION**	☒ Follow HS 312 "Water Transportation Safety," and Section B.3., "Water/Boating Hazards." **Geosyntec Procedure(s):** HS-312-Water Transportation Safety

☐	**AIRPORT, AIRCRAFT** Worker injury when working on/near airport runway, or use of helicopter, light aircraft	☐ Coordinate safety requirements with Airport personnel and implement required safety measures. ☐ Site workers to receive safety training for railroad/airport work. ☐ Follow provisions of applicable Geosyntec HS Procedures, below: ***Geosyntec Procedure(s):*** *HS-310-Helicopter Safety, HS 311-General Aviation (Small Aircraft) Safety*
☐	**TRAFFIC/VEHICLE HAZARDS REALATED TO HEAVY EQUIPMENT, CONSTRUCTION SITE ACTIVITIES**	☐ See Section B.7., "Construction, Heavy Equipment, Lift Equipment"

B.3. WATER/BOATING HAZARDS ☒ Applicable ☐ Not Applicable or Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Survey work will take place on a reservoir with variable water surface elevations. Care must be taken to avoid grounding the vessel. Flash flooding is not expected to be a concern on Diablo Reservoir, there is a large volume of water that will dampen the effects of rain/stream input on water surface elevation. In the event of a dam emergency (e.g. earthquake or dam equipment failure), all over-water work will stop and the evacuation procedure will be enacted.

☒	**OPERATOR OF WATER CRAFT OR PASSENGER/WORKER ON WATER CRAFT OR PLATFORM** Hazards: Drowning, hypothermia, collision, motor/fuel hazards, navigation	☒ Wear regulatory-approved personal flotation device (PFD) or buoyant work vest. ☒ Bring emergency rescue equipment (ring buoy, reaching device, flares). Use "reach, throw, row, go" strategy. ☒ Use fuel safety practices, fire extinguisher present in boat. ☒ Have lifesaving skiff/boat available. ☒ Monitor weather, develop float plan, ensure navigation/communication equipment operable. ☒ For tidal, flash flood, dam release hazards, plan/locate work accordingly, other precautions as appropriate.
☒	**WORK NEAR WATER HAZARDS OR ENTERING WATER** Hazards: drowning, hypothermia from water immersion, related injuries. ☐ Wading, wetland, mud/silt ☒ Dam release, flash flood, tide ☐ Diving ☐ Ice on/near water body	☐ Where ice/slip hazards are present adjacent to water body, and for working directly on ice over water, wear ice creepers, sand work area, or take other appropriate measures to address slip hazard. ☐ For high-hazard work over very cold water, have immersion survival suit available, as appropriate. ☒ For electrical hazards associated with water/wet locations, see Section B.8., "Electrical Hazards." ***Geosyntec Procedure(s):*** *HS-306-Working on/near Water and Ice, HS-312-Water Transportation Safety*

B.4. FALL HAZARDS ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Fall hazards from dock or vessels are possible.

☒	**WORKING AT HEIGHTS (GENERAL)** Hazards: Falls, overhead hazards, impalement hazard (such as from falling onto unprotected rebar and similar)	*General fall protection requirement thresholds: required @ ≥4' (industry), ≥6' (construction), ≥10' (scaffolds)* ☐ Ensure guardrails present ☐ Use personal fall apparatus (PFA) ☐ Use tether or positioning device ☐ Restrict access to hazard (barriers, tape, sign) ☐ Ensure covers in place over holes ☒ Use designated "watch person" ☐ Use fall protection net ☐ Restrict access beneath work to protect other site personnel from overhead hazards ☒ Ensure safe access to elevated work location (ladder, stair,) ☐ Install caps on protruding rebar ***Geosyntec Procedure(s):*** *HS-120-Fall Protection, HS-210-Walking and Working Surfaces*
☒	**LADDERS / STAIRS** ☐ Extension/straight ladders ☐ Step ladders ☐ Fixed ladders ☒ Stairs Hazards: Falls, overhead hazards	☒ Follow safe work practices: • Use ladders according to safe practices and manufacturer's instructions. • Maintain 3 points of contact at all times on ladder; keep center of gravity within side rails. • Do not use metal (conductive) ladder near electrical hazard. • Extension/straight ladders shall be properly footed, secured, angled, extend above upper work surface. • Stepladders are set on level ground or properly shimmed, spreaders locked; do not climb/stand on top step, top cap, or rear non-climbing side; use step ladder of sufficient length for work. • Equip stairs with stair-rails where more than 4 steps, and for stairway height 4' or more. ***Geosyntec Procedure(s):*** *HS-501-Ladders*
☐	**SCAFFOLD** ☐ Supported scaffold ☐ Suspended scaffold ☐ Free-standing/mobile scaffold Hazards: Falls, overhead hazards, equipment collapse.	☐ Follow safe work practices: • Identify/coordinate operations with subcontractor's competent person. • Supported scaffold level, stable, proper attachments, tiebacks, planking, • Suspended scaffolds anchored properly. • Guardrails or personal fall apparatus required above 10 feet. • Proper means of accessing scaffold (proper ladders, stair tower). • Total height of free-standing scaffold not to exceed four times the minimum base dimension. • Do not exceed load limits; store/stage materials in quantities sufficient for immediate use. ***Geosyntec Procedure(s):*** *HS-507-Scaffolds*
☐	**AERIAL LIFT** Hazards: Falls, overhead hazards, struck-by, run-over, caught between (pinch points), tip over, fluid leaks.	☐ Follow safe work practices: • Operators to be sufficiently trained, experienced and qualified. • Equipment is inspected after mobilization and is in good condition. • Harness & lanyard worn whenever operating the lift (possible exception for scissor lifts). • Overhead and surface obstructions to be reviewed with operators prior to use. ***Geosyntec Procedure(s):*** *HS-509-Aerial Lifts*

☐	**IMPORTANT!** This work may/will include close proximity to overhead electric utility lines.	☐ Follow safe work practices per Section B.9., "Utility Related Hazards"

B.5. POWERED TOOLS, EQUIPMENT, MACHINERY ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Survey equipment and powered ancillary equipment will be operated by the contracted survey company. If work is performed near equipment that the subcontractor is operating, the Powered Hand tool Safety Procedures will be followed.

☒	**POWERED HAND TOOLS** ☒ Electric-powered ☒ Fuel-powered ☐ Pneumatic ☐ Powder-actuated Hazards: Eye/hand/body injury, fuel-related hazards, Inhalation hazards, noise, sparks, heat, fire hazard, electrical hazards	☒ For all power tools: • Inspect tools to ensure safe operating condition before each use. • Use tool in accordance with manufacturer's specifications. • Ensure guards are in place and no hazardous equipment modifications. • Use PPE or other safety practices, as appropriate, for eye/hearing/hand/head/body protection (such as use of Kevlar chaps and jacket for chainsaw use). • Provide training or verify operator qualification for use of power tool. • Stay clear of hazard zone, "line of fire," when working near where power tools are used. • For spark/heat generating tool, control fire hazards, segregate combustible/flammable materials. ☐ Use respirators, ventilation, wet methods, other appropriate means to control inhalation hazard. ☐ See fuel-safety practices in Section B.13., "Commercial Chemical Products." ☐ For electrical hazards, see Section B.8., "Electrical Hazards". ***Geosyntec Procedure(s):*** *HS-109-Hearing Conservation, HS-113-Personal Protective Equipment, HS-121-Electrical Safety, HS-503-Powered Hand Tools, Others as applicable*
☒	**OPERATION OF EQUIPMENT/MACHINERY** ☐ Point-of-operation hazards ☒ Pinch points, moving parts ☒ 'Struck-by,' 'caught between' ☐ Hot surfaces, heat ☐ Extension cords, flexible wire ☐ Fuel related (gas or liquid) ☐ Hydraulic pressure ☐ Pneumatic pressure ☐ Kinetic, stored energy ☒ Noise ☐ Emissions, discharge gases ☐ Working at heights, falls ☐ Lifting, repetitive motion ☐ Illumination ☒ Electrical	☒ <u>General safety requirements for equipment, machinery:</u> • Arrange worksite for safe access to equipment/machinery. • Use equipment/machinery in accordance with manufacturer's use and safety instructions. • Ensure point-of-operation, mechanical power transmission, other moving parts are guarded with protective devices; do not override interlocks, guards, protective devices. • Secure long hair/loose clothing/hanging jewelry near moving/rotating parts. • Heed warning signs/labels, keep safe distance; avoid locations of "struck by" and "caught between" hazards. • Implement lockout/tagout for repairs/adjustments/tooling changes. ☐ Use safe lifting practices for movement of heavy portable equipment ☐ Implement safe work practices for compressed air, pressurized systems (pneumatic/hydraulic), stored energy. ☐ For climbing/fall hazards associated with large equipment, see Section B.4., "Fall Hazards." ☐ For electrical hazards, see Section B.8., "Electrical Hazards." ☐ Operate fuel-powered equipment in well ventilated location. ☐ Use safe practices for fuels, see Section B.13., "Commercial Chemical Products." ***Geosyntec Procedure(s):*** *HS-109-Hearing Conservation, HS-113-Personal Protective Equipment, HS-119-Lockout/Tagout, HS-121-Electrical Safety, HS-503-Powered Hand Tools, Others as applicable*
☐	**LOCKOUT/TAGOUT OF HAZARDOUS ENERGY**	☐ Implement control-of-hazardous-energy practices (lockout/tagout), provide lockout/tagout locks and devices, training workers, designate "authorized" personnel, notify "affected" personnel. ***Geosyntec Procedure(s):*** *HS-119-Lockout Tagout*
☐	**WELDING, CUTTING, HOT WORK (GAS OR ARC)** UV/IR light-eye/skin burns, hot-work hazards, toxic welding fumes, compressed gases, electrical shock	☐ <u>General safe work practices:</u> • Hot work permit system to be implemented. • Operator properly protected (eye protection, clothing, apron, etc.). • Fire hazard controls (watcher, fire extinguisher, water, isolate combustibles). • Protect nearby personnel from hazardous UV, IR light (shielding, curtain). ☐ For gas welding/cutting, use gas cylinder safe practices (secured, upright, caps on when not in use, prevent Damage; never secure gas cylinders to metal bench used for arc welding). ☐ For arc welding, follow electrical safe work practices. See Section B.8., "Electrical Hazards." ☐ See Section B.13., "Commercial Chemical Products," for hazards of welding rods (toxic metals), welding gases. ***Geosyntec Procedure(s):*** *HS-511-Welding, Cutting and Other Hot Work*
☐	**COMPRESSED AIR, COMPRESSOR** (for compressed gases, see Section B.13., "Compressed Gases")	☐ Never direct nozzle toward body; do not use compressed air for cleaning clothes. ☐ If compressed air is used for cleaning, restrict pressure to 30 psi or below, equip nozzle with chip guard. ☐ Use eye protection. ☐ Ensure air tank, hoses, fittings are in good repair using factory fittings.

☐	**PORTABLE GENERATOR** Hazards: Electrical shock, carbon monoxide in exhaust, fuel-related fire, injury from mechanical hazards, lifting	☐ Follow general safety practices for Operation of Equipment/Machinery (above), and as follows: • Use in accordance with manufacturer's instructions. • Keep generator and work area dry. • Never use indoors, or near building air intake vents due to carbon monoxide hazard. • Provide for ventilation and/or air monitoring where hazardous accumulation of exhaust emissions is possible. • Use hearing protection in close proximity to operating generator, as needed. • Use power cords/extension cords specified by instructions. • Use ground-fault circuit interrupters (GFCIs) in accordance with manufacturer's instructions. • See Section B.8., "Electrical Hazards." • Shut down equipment before refueling. See safe practices for flammable/combustible liquids in Section B.13., "Commercial Chemical Products." ***Geosyntec Procedures:*** *HS-109-Hearing Conservation, HS-111-Air Monitoring, HS-115-Hazard Communication (for fuel), HS-121-Electrical Safety, Others as applicable*
☐	**PORTABLE HEATERS** **(electric or fuel powered)** Hazards: Electric-powered: Electrical shock, fires from hot surfaces. Fuel powered: Carbon monoxide in exhaust, fires from hot surfaces, fuel-related fires	☐ Follow general safety practices for Operation of Equipment/Machinery (above), and as follows: • Keep heater dry, and locate heater on level surface away from high traffic areas. • Never use fuel-powered heaters indoors, or near air intake vents, due to carbon monoxide hazard. • Provide for ventilation and/or air monitoring where hazardous accumulation of exhaust emissions is possible. • Keep combustible materials at least 3 feet from hot surfaces. • Do not use an extension cord or power strip to power an electric heater. • For electric heaters, See Section B.8., "Electrical Hazards." • Shut down fuel-powered equipment before refueling. See safe practices for flammable/combustible liquids and/or compressed gases in Section B.13., "Commercial Chemical Products." ***Geosyntec Procedures:*** *HS-111-Air Monitoring, HS-115-Hazard Communication (for fuel, HS-121-Electrical Safety, Others as applicable*

B.6. DRILLING ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**DRILLING** Hazards: Struck-by, run-over, caught between (pinch points), manual lifting, roll over, fluid leaks, fuel hazards, suspended equipment	☐ Follow safe work practices, as applicable: • Non-essential personnel to stay clear of drilling work zone when drill rig in operation. • Equipment inspected daily upon mobilization; maintained in good repair, backup alarms. • Leaks or defective safety equipment should be repaired before use. • Establish eye contact with operator and use hand signals prior to approaching near equipment. • PPE used near operating rig (eye/head/hearing/hand/foot protection, high visibility vests or equivalent). • Contractor inspects drill rig daily before use, verify daily that emergency stop is functional. • Drill rig to be equipped with operational emergency stop, equipment in good repair, machine guards in place, whip checks on high pressure lines. • Park personal/support vehicles in a location as to not obstruct travel lanes or other site operations. • Operators/helpers maintain safe distance from moving parts; secure loose hair, loose clothing, equipment. • Drill rigs will only be moved with masts lowered. • Max. safe slope for rig will be followed, drill rig leveled, appropriate blocking/cribbing as needed. • Use safety practices for refueling, fuel handling/storage/transport. • Spill equipment is available for fuel and hydraulic fluid leaks. • Verify mechanical lift/rigging equipment (cables, sheaves, boom, attachments) is in proper working order. • Ventilate and conduct air monitoring, as appropriate, when drilling indoors. ***Geosyntec Procedure(s):*** *HS-403-Drilling, Others as applicable*
☐	**IMPORTANT!** This work may/will include close proximity to overhead electric utility lines.	☐ Follow safe work practices per Section B.9., "Utility Related Hazards"

B.7. CONSTRUCTION, HEAVY EQUIPMENT, LIFT EQUIPMENT ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Survey equipment may be supported by an A-frame. Other gear might be loaded with a crane or hoist. There are no powerlines overhead at the Site.

☐	**HEAVY EQUIPMENT** Hazards: Struck-by, run-over, caught between (pinch points), roll over, fluid leaks, overhead hazards	☐ Follow general safe work practices for heavy equipment: • Trained/qualified persons operate all heavy equipment. • Do not get into a potential crush situation below or between equipment, or in an excavation. • No passengers on moving/operating equipment except where passenger seat/restraint is present. • Equipment inspected daily upon mobilization; maintained in good repair, backup alarms. • Leaks or defective safety equipment should be repaired before use. • Operators required to use seatbelts. • Maintain eye contact with operator and use hand signals prior to approaching near equipment. • High visibility vests for all personnel in construction vehicle work area, on-site roadways and travel lanes. • Maximum safe slope for each vehicle will be followed. • Personnel to stay clear of, or restrict access to, swing radius and travel path of equipment. • Spill equipment available for fuel and hydraulic fluid leaks.

		• Equipment locked, secured, brakes set, buckets/forks lowered, when not in use. • Park personal/support vehicles in a location as to not obstruct travel lanes or other site operations. • Mark temporary roadways clearly, provide berms/stop logs where needed. ***Geosyntec Procedure(s):*** *HS-504-Heavy Equipment, HS-132-Competent Persons*
☒	**CRANES** Hazards: - electrocution by overhead utility - injury in swing radius - injury from falling load - crane tipping over due to overbalancing, high winds, unstable ground, unsafe slope, bad placement of outriggers - injury from mechanical hazards	☒ In addition to general safety practices for heavy equipment (above), as applicable: • Only qualified persons operate cranes (certificate required). • Critical Lift Plan & Checklist prepared/executed (HS 506) prior to mobilization. • Equipment to be inspected prior to mobilization and daily by crane operator. • Crane operator will remain at the controls at all times during operation. • Crane operation must be performed under the direction of an appointed signal person at all times. • Communication between crane operator and signal person will be maintained through standard hand signals or voice communication equipment. • Keep area beneath suspended loads clear of personnel. • Rigging procedures – see Mechanical Lifting, Rigging, below. ***Geosyntec Procedure(s):*** *HS-506-Cranes, HS-132-Competent Persons*
☒	**MECHANICAL LIFTING, RIGGING** Applies to lifting by crane, truck-mounted boom rig (e.g. drill rig), mechanical/electrical hoist, similar equipment. Hazards: falling loads, personnel under suspended loads.	☒ In addition to general safety practices for heavy equipment and cranes (above), as applicable: • Coordinate lifting operations with competent person. • Do not exceed loading limits of lifting equipment; perform work in accordance with equipment load chart. • Slings, chains, rope, wire rope and related equipment used for lifting shall be maintained in good condition, and used in a manner as to protect from damage. • Rigging, wire rope and hoisting equipment will be inspected and maintained on a weekly basis. • Hooks will be equipped with safety latches. • Ensure anchor points for winch or other lift device (such as davit arm) are engineered for intended use. ***Geosyntec Procedure(s):*** *HS-506-Cranes*
☐	**FORKLIFT** Hazards: Struck-by, run-over, overhead hazards, caught between (pinch points), roll over, fluid leaks.	☐ In addition to general safety practices for heavy equipment (above), as applicable: • Qualified operator, per established forklift training (certificate is required). • Equipment inspected daily and documented on Forklift Preoperational Inspection Checklist. • Do not exceed lifting load limits. • Forklift shall not be moved/driven with empty forks in raised position. • When not in use, forks lowered, brake set, controls in neutral, key removed. ***Geosyntec Procedure(s):*** *HS-505-Safe Operation of Forklifts, HS-132-Competent Persons*
☐	**AERIAL LIFTS**	☐ See Section B.4., "Fall Hazards" *Geosyntec Procedure(s): HS-509-Aerial Lifts*
☐	**TRENCHING/EXCAVATION** Hazards: Cave-in, hazardous atmosphere, structures & foundations, falls into excavations	☐ Safe work practices when personnel will enter trenches/excavations: • Activities under supervision/oversight of competent person, daily inspection. • Excavated materials placed at least 2' from trench sidewall. • Prevent water accumulation in trench. • Sloping & shoring for excavations ≥20' must be approved by a professional engineer. • Sloping/shoring/trench box for excavations ≥5' when persons enter trench/excavation. • Sloping/shoring/trench box for shallow (<5') excavations with cave-in hazard . • Workers in trenches to be within 25 feet of ladder or sloped entryway. • Excavations to be protected by perimeter fencing (not barricade tape), if potential for personnel to fall into. • If potential for atmospheric hazard, see Section B.10, "Confined Space Entry, Hazardous Enclosed Spaces" ***Geosyntec Procedure(s):*** *HS-402-Excavation and Trenching, HS-132-Competent Persons*
☐	**IMPORTANT!** This work may/will include close proximity to overhead and/or underground utility lines.	☒ Follow safe work practices per Section B.9., "Utility Related Hazards"
☐	**DEMOLITION**	☐ Develop/implement demolition safety plan. ***Geosyntec Procedure(s):*** *HS-132-Competent Persons*
☐	**BLASTING**	☐ Develop/implement blasting safety plan. ***Geosyntec Procedure(s):*** *HS-307-Blasting and Use of Explosives, HS-132-Competent Persons*
☐	**PUBLIC AT RISK, SITE SECURITY**	☐ During site operations protect public (overhead protection, barriers, warning signs). ☐ During off hours, protect public with barriers, warning signs/lights, other measures as appropriate. ☐ Lock/secure hazardous materials and/or equipment.
B.8. ELECTRICAL HAZARDS		☒ Applicable ☐ Not Applicable, Not Anticipated
EXPLANATORY NOTES, CLARIFICATIONS: Survey vessels operate using onboard electrical supply. Care will be taken to make sure electrical components, cords, etc. are not in standing water or near wet surfaces.		

☒	**BASIC ELECTRICAL HAZARDS TO SKILLED NON ELECTRICAL WORKERS** Equipment/tool use/operation, use of extension cords, working near electrical equipment. Hazards: Electrical shock, secondary hazards (falls, other injuries).	☒ Follow safe work practices: • Control water-related/wet-location hazards in a manner appropriate for the job tasks/equipment/tool. • Never touch electrical equipment if you are wet, or standing in water or on wet surfaces. • Use extension cords/power cords properly, prevent damage, take out of service if damaged. • Inspect tool/equipment/extension cords/power cords/welding cables before each use; do not use if damaged. • Use GFCI-protected outlet or portable GFCI in wet locations, outdoors, basements, concrete floors. • Ensure live parts are guarded, enclosures secure. • Enclosures, circuits properly labeled. ***Geosyntec Procedure(s):*** *HS-121-Electrical Safety*
☐	**HANDS-ON ELECTRICAL WORK BY ELECTRICAL WORKER/TECHNICIAN:** ☐ Voltage < 50 v ☐ Voltage 50-600v ☐ Voltage > 600v ☐ AC ☐ DC ☐ 3-phase ☐ Battery and/or solar power ☐ Capacitor/transformer	☐ Implement electrical safe work practices pertaining to: • Worker training/qualification (Level 1, Level 2, Level 3) • General electrical safe work practices, grounding, use of GFCIs • Safe work practices during diagnostics/troubleshooting, maintenance, repair • Safe design features for electrical equipment • Arc flash protection ***Geosyntec Procedure(s):*** *HS-121-Electrical Safety, HS-129-High Voltage Electricity Safety*
☒	**LOCKOUT/TAGOUT OF ELECTRICAL ENERGY**	☐ Implement control-of-hazardous-energy practices (lockout/tagout), provide lockout/tagout locks and devices, training workers, designate "authorized" personnel, notify "affected" personnel. ***Geosyntec Procedure(s):*** *HS-119-Lockout Tagout, HS-121-Electrical Safety*
☐	**IMPORTANT!** This work may/will include close proximity to electric utility lines.	☐ Follow safe work practices per Section B.9., "Utility Related Hazards"

B.9. UTILITY RELATED HAZARDS ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: There are overhead powerlines at the Site.

☒	**OVERHEAD, ABOVE-GROUND UTILITIES**	☒ Maintain proper clearance, employ other appropriate precautions for the conditions. ***Geosyntec Procedure(s):*** *HS-304-Overhead Electrical Lines*
☐	**UNDERGROUND UTILITIES**	☐ Confirm appropriate underground utility clearance procedures have been completed prior to ground penetrations, and employ other utility clearance/locator practices, as appropriate for conditions. ☐ Hand digging or vacuum post-holing within 3' of utility locations or other high risk condition.

B.10. CONFINED SPACE ENTRY, HAZARDOUS ENCLOSED SPACES ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**CONFINED SPACE(S)** Potential/actual hazards: ☐ Atmospheric hazards: ☐ Flammable/explosive ☐ Oxygen deficiency ☐ Hydrogen sulfide ☐ Other toxic ☐ Combustible dust ☐ Electrical ☐ Mechanical, engulfment, entrapment, stored energy	☐ Develop effective site-specific entry procedure **per applicable regulatory requirements**: • Personnel to be trained/qualified. • Hazards properly characterized • Use equipment necessary for safe entry (for access, retrieval, PPE, air monitoring, ventilation) • Develop measures for emergency rescue, as applicable. • IMPORTANT: - Describe site-specific safety measures above in Explanatory Notes, Clarifications - Modify this THA or attach separate confined space safety plan/permit, as appropriate ☐ Protect non-entry personnel working near confined spaces through control measures to prevent unauthorized entry (such as safety orientation, labeling, delineation, barriers) ***Geosyntec Procedure(s):*** *HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-118-Confined Space Entry, Others as applicable*
☐	**HAZARDOUS ENCLOSED OR INDOOR SPACE(S)** ☐ Indoors (occupied or vacant) ☐ Machine/equipment pit/vault ☐ Basement/crawl space ☐ Tunnel, shaft, gallery ☐ Trench, excavation ☐ Hazardous exhaust or emissions ☐ Building-related hazards	☐ Use personal protective clothing to protect from chemical, physical, biological hazards. ☐ Use respiratory protection, if necessary/appropriate. ☐ Duct equipment exhaust to outdoors using passive duct or active exhaust ventilation. ☐ Use fans, blowers or other effective means of ventilation to introduce fresh air/dissipate atmospheric hazards. ☐ Conduct air monitoring, as appropriate for conditions and hazards (see Part C, "Air Monitoring"). ☐ For a trench/excavation, also see subsection entitled "Trenching/Excavation" in Section B.7. "Construction, Heavy Equipment, Lift Equipment." ☐ If space classified/regulated as a "confined space," follow confined space entry requirements (above). ***Geosyntec Procedures****: HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, Others as applicable*

B.11. STORAGE OF BULK MATERIALS ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**STORAGE OF BULK MATERIALS** (for Storage of Hazardous Materials, See Section B.13.)	☐ Store materials in stable manner (stacked, racked, blocked, interlocked, tied, wrapped, or otherwise secured) to prevent tipping, sliding, rolling, falling or collapse. ☐ Do not exceed load limits of racks, platform, scaffold; ensure racks are stable, robust, secure. ☐ Ensure stored materials do not block aisles, passageways.

B.12. INFECTIOUS / ALLERGENIC BIOHAZARDS ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: For COVID 19 safety measures, follow "Field Work COVID 19 General Prevention Measures" guideline attached. Core safety measures include: Maintain social distancing; Wear mask or cloth face covering, where social distancing cannot be maintained; Wash hands frequently for minimum 20 sec with soap and water; Use hand sanitizer and hand wipes periodically if hand-washing capability is not readily available; Avoid touching surfaces if not necessary; Use sanitary wipes to wipe handles of field tools and equipment prior to start of work.

☒	☐ Wastewater, sewer ☐ Bird Guano ☐ Mold, fungi, Valley Fever ☐ Bloodborne pathogens ☒ Other (describe above)	☐ Low hazard - use basic hygiene practices, protective gloves, provide for hand washing. ☒ More severe hazard - facial covering/cloth mask, frequent hand washing. ☐ For human pathogens use "Universal Precautions" per Bloodborne Pathogen Program. ***Geosyntec Procedure(s):*** *HS-133-Bloodborne Pathogens*

B.13. COMMERCIAL CHEMICAL PRODUCTS ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**PRODUCTS REGULATED BY HAZARD COMMUNICATION STANDARD**	☐ Safety Data Sheets available, either on site or readily available within same work shift, containers labelled properly, workers trained/oriented on hazards ☐ For subcontractor use of chemical products, coordinate/discuss during safety meetings. ☐ Conduct air monitoring, as appropriate (see Part C, "Air Monitoring, Worker Exposure Monitoring").
☐	**COMPRESSED GAS (flammable or nonflammable)**	☐ Secure cylinders upright, caps on when not in use, handle with care, prevent damage. ☐ Propane cylinders not in use must be stored outdoors in cage or similar secure enclosure. ☐ Ensure acetylene cylinders NOT secured to steel arc welding bench. ☐ Store/use in a manner to prevent asphyxiation hazard. ☐ Segregate oxygen and fuel gases by distance (20') or barrier. ☐ Control ignition sources. ☐ "No smoking" signage at cylinder storage area for flammable gases. ☐ Use/store in a manner to control inhalation exposure hazards, PPE, air monitoring.
☐	**FLAMMABLE/COMBUSTIBLE LIQUIDS**	☐ Proper storage (flam. storage cabinets, other storage precautions). ☐ Use proper fuel safety can (metal fuel can preferred). ☐ Control ignition sources. ☐ Grounding and bonding where appropriate.
☐	**ACIDS, CAUSTICS, OTHER CORROSIVES**	☐ Handle with care, use appropriate eye/face/skin protection. ☐ Eyewash, deluge shower, drench hose, hand washing (with water), as appropriate.
☐	**TOXIC**	☐ For toxic substances, use/store in a manner to control exposure hazards (inhalation, ingestion, skin contact, skin absorption); use PPE as appropriate, conduct air monitoring as appropriate.
☐	**EMISSIONS FROM FUEL COMBUSTION, INDUSTRIAL PROCESSES** ☐ Gasoline ☐ Diesel ☐ Propane/Natural Gas ☐ Welding/cutting/hot work ☐ Vehicle/equipment exhaust ☐ Other	☐ Position outdoor personnel upwind of exhaust source. ☐ Use blowers, fans to provide fresh air to work area and dissipate atmospheric hazards. ☐ Use respiratory protection for high levels of smoke, exhaust particulates, soot. ☐ Conduct air monitoring as appropriate (see Part C, "Air Monitoring").
☐	**OTHER HAZARDS**	☐ Describe other hazardous substances and safety measures under "Explanatory Notes, Clarifications," above.
☐	**CHEMICAL/HAZMAT STORAGE** Check this when jobsite requirements include special provisions for chemical storage.	☐ Chemical storage cabinet, cage, storage room, or similar. ☐ Ensure incompatible chemicals are segregated. ☐ Provide secondary containment. ☐ Locate special safety equipment near chemical storage

Geosyntec Procedures: *HS-115-Hazard Communication, HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, Others as applicable*

B.14. SITE CONTAMINANTS, CHEMICAL WASTES ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Survey equipment will come into contact with sediment, but will not result in worker exposure to potentially contaminated environmental media.

CHECK ALL THAT APPLY. Provide explanatory notes above.

☐ Soil/groundwater contaminants (historical release)	☐ Oxygen deficiency	☐ Corrosive, acids/caustics, strong irritants
☐ Recent release, known high concentrations	☐ Chlorinated volatile organic compounds (VOCs)	☐ Sulfides, hydrogen sulfide (H_2S)
☐ Former chemical disposal site, landfill	☐ BTEX, petroleum derived VOCs	☐ Cyanides, hydrogen cyanide (HCN)
☐ Urban fill, residual contaminants	☐ Fuel oils, petroleum, waste oil, lubricants	☐ Asbestos
☐ Containerized waste (drums, process equipment)	☒ Metals, metal compounds, metal dusts	☐ Lead paint
☐ Buried drums (known or potential)	☐ Elemental mercury	☐ Pesticides, herbicides, fungicides
☐ Large containers, potential for spills	☒ Polyaromatic hydrocarbons (PAHs)	☐ Sensitizers
☐ Contaminated building surfaces	☐ Polychlorinated biphenyls (PCBs)	☐ Radioactive contaminants
☐ Unexploded ordnance	☐ Potential for flammable vapors	☐ Other (see Explanatory Notes, above)
☐ Explosive dust	☐ Potential for flammable gas (methane)	

☐ **FOR WORK CONSISTING OF CLEANUP OPERATIONS, CORRECTIVE ACTIONS, PRELIMINARY INVESTIGATIONS at an "UNCONTROLLED HAZ. WASTE SITE" (per HAZWOPER, 29 CFR 1910.120), implement the following as applicable to the work:**

- Implement site control plan via Exclusion Zone(s), Contaminant Reduction Zone(s) and Support Zone (aka EZ, CRZ, SZ)
- Workers to be aware of and trained on hazards per OSHA Hazard Communication Standard.
- Include site map/figure depicting work locations and other relevant site-specific information.
- Site workers in EZ or CRZ to have OSHA 40-hour training, current 8-hour refresher, 3 days supervised field experience.
- Site supervisor(s) required to have 8-hr. Supervisor training.
- Site workers in EZ or CRZ to participate in Medical Monitoring program, as applicable.
- Implement site-specific procedures for worker protection via engineering controls, work practices, personal protective equipment (PPE), air monitoring, decontamination procedures, spill containment, emergency preparedness and response.
- Conduct air monitoring, as appropriate (see Part C, "Air Monitoring, Worker Exposure Monitoring").

IMPORTANT: Provide supplemental information to sufficiently detail site-specific procedures for the above elements, as appropriate for the work.

Geosyntec Procedures: *HS-301-HAZWOPER, HS-108-Medical Monitoring Surveillance, HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, HS-115-Hazard Communication, HS-405-Drum Sampling, Others as applicable*

☒ **FOR SITE WITH CHEMICAL CONTAMINANTS OR WASTE BUT NOT REGULATED BY HAZWOPER**

- Workers to be knowledgeable/aware of chemical hazards through safety training/orientation and availability of hazard information
- Implement controls to minimize worker exposure through engineering controls, work practices, PPE, as appropriate.
- Conduct air monitoring/sampling to monitor/evaluate worker exposure, as applicable.

Geosyntec Procedures: *HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, HS-115-Hazard Communication, Others as applicable*

☐	**OFF-SITE MIGRATION OF CONTAMINANTS**	☐ Implement controls to minimize hazard migration (dust suppression, covers, foam, etc.) ☐ Community/perimeter air monitoring to be conducted per perimeter air monitoring plan.
☐	**SPILL CONTAINMENT, CONTAINERS**	☐ Describe above any site-specific procedures for spill containment, container handling, as applicable. ***Geosyntec Procedures****: HS-406-Unknown Hazardous Waste Drum Handling*

B.15. RADIATION HAZARDS (Other than Sunlight) ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**IONIZING RADIATION**	Describe hazards & safety measures above in Explanatory Notes, Clarifications. Conduct exposure monitoring, as appropriate (see Part C, "Air Monitoring, Worker Exposure Monitoring"). ***Geosyntec Procedures:*** *HS-126-Radiation Safety Program, HS-128-Ionizing and Non-Ionizing Radiation*
☐	**NON-IONIZING RADIATION**	Describe hazards & safety measures above in Explanatory Notes, Clarifications. Conduct exposure monitoring, as appropriate (see Part C, "Air Monitoring, Worker Exposure Monitoring"). ***Geosyntec Procedures:*** *HS-128-Ionizing and Non-Ionizing Radiation*

B.16. HAZMAT/DANGEROUS GOODS SHIPPING/TRANSPORTATION ☐ Applicable ☒ Not Applicable, Not Anticipated

MODE(S) OF TRANSPORT:	☐ Road	☐ Rail	☐ Air	☐ Sea	☐ Inland Waterway	☐ International

IMPORTANT: Ensure that each individual who will be involved in shipping/transportation of hazardous material is current with required training (awareness, function-specific, safety, security) in accordance with applicable regulatory authority (DOT, FAA, IATA, TDG), and ensure adherence to applicable regulations.

Geosyntec Procedures: *HS-135-Hazardous Materials Procedures*

EXPLANATORY NOTES, CLARIFICATIONS:

PART C – AIR MONITORING, WORKER EXPOSURE MONITORING

C.1. AIR MONITORING (Direct-Reading Instruments) ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**AIR-TESTING PARAMETERS**	☐ VOCs, GASES ☐ PID, Lamp energy: __ eV ☐ FID ☐ Carbon monoxide ☐ Hydrogen sulfide ☐ Oxygen (O_2)	☐ Flammable gas (LEL) ☐ Particulate (dust) ☐ Calibration kit for each parameter ☐ Other:

☐	**ACTION LEVELS FOR O2/LEL**	☐ Oxygen	≤19.5% - ventilate to raise O_2 to acceptable levels, or use Level B. ≥23.0% - ventilate to lower O_2 to acceptable levels, or use Level B and control fire hazards & ignition sources.
		☐ LEL	Confirm at least 12% oxygen is present to ensure accuracy of LEL readings. At <10% LEL - Continue working, continue to monitor LEL levels At ≥10% LEL- Immediately withdraw from area. Resume work ONLY after LEL readings reduced to <10%.

☐	**ACTION LEVELS FOR TOXICS** (sustained breathing zone concentrations)	**Parameters**	**Level D, Modified D***	**Use levels C or B*, as indicated below, OR take action to reduce breathing zone level to concentration acceptable for Level D*.**
		☐ VOCs	< __ ppm	__ ppm to __ ppm: Level C (air purifying respirator) > __ ppm: Level B (air-supplied respirator)
		☐ Carbon Monoxide	< 35 ppm	≥35 ppm - Level B (air-supplied respirator)
		☐ Hydrogen Sulfide	< 10 ppm	≥10 ppm - Level B (air-supplied respirator)
		☐ Total Dust	< __ mg/m^3	>__ mg/m^3 - Level C (air-purifying respirator)
		☐		
		☐		

*** Levels of Protection:**
Level D (standard work clothes, basic personal protective wear, no chemical protective clothing, no respiratory protection)
Modified Level D (chemical protective clothing in addition to standard work clothes, no respiratory protection)
Level C (air purifying respirator or dust mask, in addition to chemical protective clothing)
Level B or A (air supplied respirator, chemical protective suit; fully-encapsulating suit for Level A)

Geosyntec Procedures: *HS-111-Air Monitoring*

C.2. OTHER WORKER EXPOSURE MONITORING ☐ Applicable ☒ Not Applicable, Not Anticipated

☐ Air Sampling *(sample collection, passive dosimeter)*	☐ Ionizing or Non-ionizing Radiation Testing	☐ Heat Stress Testing
☐ Wipe/Bulk Sampling *(to evaluate worker exposure)*	☐ Noise Testing	☐ Other

EXPLANATORY NOTES, CLARIFICATIONS:

Geosyntec Procedures: *HS-109-Hearing Protection, HS-111-Air Monitoring, HS-124-Heat Stress Prevention, HS-126-Radiation Safety Program, HS-128-Ionizing and Non-ionizing Radiation, HS-601-Asbestos, HS-602-Lead*

PART D – APPROVALS, ACKNOWLEDGEMENTS

D.1. THA PREPARATION, REVIEW/APPROVAL SIGNATURES THA typically prepared by project staff, reviewed/approved by Project Manager, Supervisor, qualified/knowledgeable designee, with support of HS personnel as deemed appropriate by the Project Manager.			
THA PREPARED BY: (minimum one person)	*Printed Name*	*Signature*	*Date*
	Jon Laurance		
THA REVIEWED/ APPROVED BY: (minimum one person)	*Printed Name*	*Signature*	*Date*
	Joey Hickey		

D.2. FIELD CREW ACKNOWLEDGEMENTS

GEOSYNTEC FIELD CREW

Please sign below to acknowledge you reviewed and understand this THA, participated in project safety briefing and had an opportunity to ask questions about the information herein.

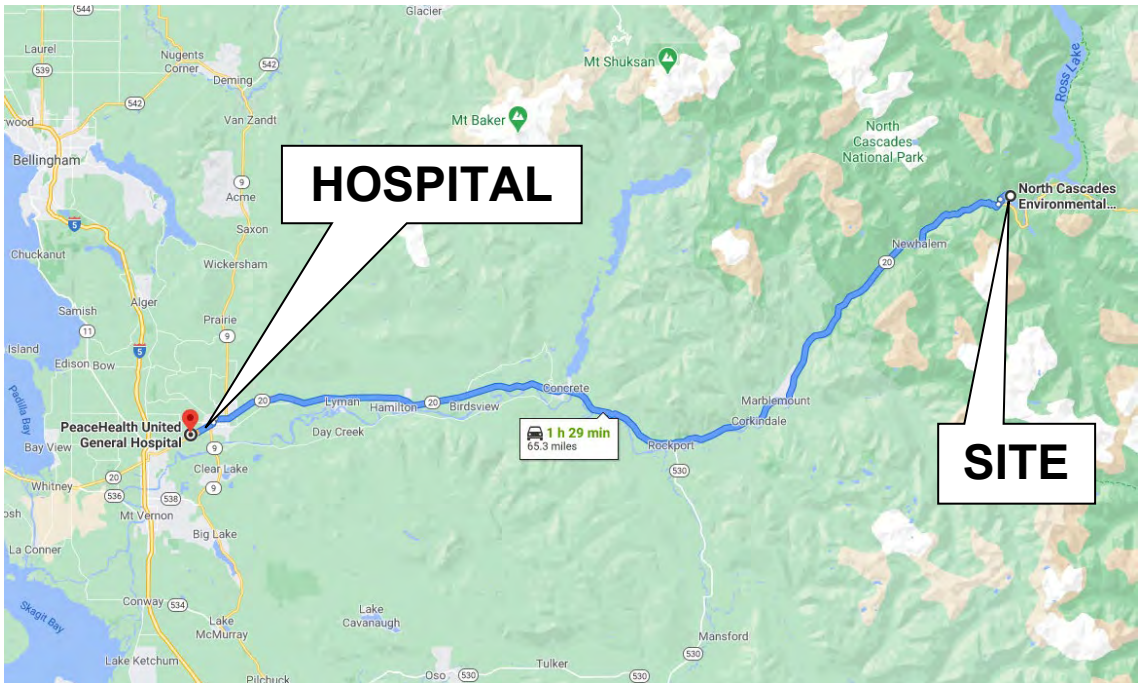
Printed Name	Signature	Employee No.	Date

SUBCONTRACTOR'S FIELD CREW

Please sign below to acknowledge that this THA was made available to you, and you had an opportunity to ask questions about the information herein.

Printed Name	Signature	Company Name	Date

ROUTE FROM DIABLO DRYDOCK SITE TO URGENT CARE AND EMERGENCY FACILITIES



HOSPITAL INFORMATION:

PeaceHealth United General Hospital
360-856-6021
2000 Hospital Drive
Sedro-Woolley, Washington 98284

DIRECTIONS TO HOSPITAL FROM SITE

- Start: North Cascades Environmental Learning Center, 1940 Diablo Dam Rd, Rockport, WA 98283
  - Head north on Diablo Dam Rd (0.8 miles)
  - Turn left to stay on Diablo Dam Rd (0.5 miles)
  - Turn right onto WA-20 W (61.8 miles)
  - At the traffic circle, continue straight onto W Moore St (0.1 miles)
  - Continue onto Bingham St/Borseth St (0.2 miles)
  - At the traffic circle, continue straight onto WA-20 W/Borseth St (1.7 miles)
  - Turn right onto Hospital Dr (0.1 miles)
  - Turn left to stay on Hospital Dr, destination on the right (302 feet)
- End: PeaceHealth United General Hospital, 2000 Hospital Dr, Sedro-Woolley, WA 98284

Attachment C: Summary of Chemical Hazards

Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs are produced during combustion events due to inadequate oxidation of fuel. PAHs in the pure state are yellowish crystalline solids. They are found in coal tar and in products of incomplete combustion. These chemicals have varying degrees of potency for causing cancer, with benzo(a)pyrene being among the most potent. The PAHs are evaluated collectively as COAL TAR PITCH VOLATILES. Coal tar pitch volatiles may cause photosensitization and a rash where sunlight strikes the skin. Exposure may also cause cancer of lungs, skin, bladder or kidneys. Benzo(b)fluoranthene, benzo(j)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, and indeno(1,2,3,c,d)pyrene have been identified as carcinogenic.

This information on PAH compounds is presented for Site contaminant awareness. While the potential for Site personnel sustaining inhalation exposures to volatilized PAH compounds during the Site activities of this project is minimal, there is the potential for inhalation of PAH-contaminated dust, and handling of contaminated soils presents skin exposure hazards. Use of dust suppression techniques (as appropriate) and the proper use of the PPE will adequately protect personnel. Some PAH compounds include:

- Anthracene
- Benzo(a)pyrene Benzo(a)anthracene
- Chrysene Benzo(b)fluoranthene
- Fluoranthene Benzo(k)fluoranthene
- Fluorene Benzo(g,h,i)perylene
- Indeno(1,2,3,c,d)pyrene Benzo(d,e,f)phenanthrene
- Phenanthrene

OSHA permissible exposure limit (PEL) for coal tar pitch volatiles is 0.2 mg/m^3 and National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) is 0.1 milligrams per cubic meter (mg/m^3), American Conference of Governmental Industrial Hygienists threshold limit value (ACGIH TLV) 0.2 mg/m^3 is for 8-hour time weighted average (TWA).

Resource Conservation and Recovery Act (RCRA) Metals

These metals include arsenic, barium, cadmium, chrome, mercury, selenium, and silver. Heavy metals are known to cause neurologic effects (lead, mercury), kidney damage (cadmium), and respiratory damage (arsenic, cadmium). Oral and respiratory exposures should be minimized. The table below summarizes exposure limits.

Chemical Name	PEL[1]	TLV[2]
Arsenic	0.01	0.01
Lead	0.05	0.05
Mercury	0.01	0.25

[1] OSHA PEL in parts per million
[2] ACGIH TLV in parts per million

Geosyntec consultants

Attachment D: Personal Protective Equipment

	Task ①	Task ②	Task ③	Task ④
Potential PPE Level per Task:	☒ D ☐ C	☒ D ☐ C	☒ D ☐ C	☒ D ☐ C

Modified Level D		***Level C***	
Equipment	***Material/Type***	***Equipment***	***Material/Type***
☒ Safety glasses		☐ Full-face air-purifying respirator	Cartridge Type:
☒ Hard-toed boots		☐ Half-mask air-purifying respirator	Cartridge Type:
☒ Protective clothing		☐ Safety glasses	
☒ Hard hat*		☐ Hard-toed boots	
☒ Hearing protection*		☐ Protective clothing	
☒ High-visibility vest*		☐ Hard hat	
☐ Outer boots*		☐ Hearing protection*	
☒ Outer gloves*		☐ High-visibility vest*	
☒ Other:		☐ Outer boots*	
☒ Surgical type masks or cloth face covers	Cloth	☐ Outer gloves*	
☒ Personal Floatation Device		☐ Inner gloves*	
		☐ Other:	

* PPE items may be downgraded (only with concurrence of SHSO and PM).

Attachment E: Safety Data Sheets

Included in this HASP	Chemical
☒	Alconox
☒	Bentonite
☒	Hexane
☒	Isobutylene Calibration Gas
☐	Other: _____
☐	Other: _____
☐	Other: _____
☐	Other: _____

Note: SDSs are for chemicals that used to perform project work, not Site contaminants.

Geosyntec consultants

TASK HAZARD ANALYSIS (Ver. 2, June 2015)

Geosyntec HS Procedures referenced herein are available on Geosyntec's H&S SharePoint site and should be consulted, as appropriate, per project-specific needs. This THA prepared per HS-106-Accident Prevention Program, HS-204-Task Hazard Analysis, and meets the requirements for a "Site-Specific Health and Safety Plan" per regulations and Geosyntec HS Procedures referenced herein (see Section B.14.).

PART A – SITE SAFETY PLAN

A.1. PROJECT/TASK INFORMATION

TASK:	Surface and Core Sediment Sample Collection		
Project Name:	Engineering Evaluation/Cost Analysis Field Work	**Project Number/Org:**	PNG0913/3010
Project Address:	Adjacent to the North Cascades Environmental Learning Center 1940 Diablo Dam Road Diablo, Washington 98283		
Description of Task & Worksite:	Sediment samples will be collected within 1,000 feet of shore. Sampling could potentially be completed on foot, from small vessels (row/pontoon boats), and from larger research vessels. Approximately 5 Cores and 20 surface sediment samples could potentially be collected over multiple days. For samples collected from open water, cores will be collected via vibracore methods and surface sediment samples will be collected by grab sample methods. This work will be completed by a subcontractor using subcontractor equipment. Geosyntec will provide on-board staff to provide oversight and document the sampling process. Near-shore samples will be collected by either Geosyntec staff, or subcontractors using hand coring/grab sample equipment. If access allows, cores will be collected by subcontractors using powered equipment. Sediment samples will be processed by either a shore crew, or directly on the sampling vessel.		

Geosyntec Personnel	**Name**	**Desktop Office Phone**	**Cell Phone**
Site Lead/H&S Officer	Luke Smith	206-496-1452	319-400-2447
Project Manager	Joey Hickey	971-271-5897	503-730-6608
Project Director	Anne Fitzpatrick	206-496-1461	206-963-8199
H&S Coordinator	Erin Dunbar	971-271-5916	360-901-6175
Regional H&S Mngr.	Joe Esseichick	720-509-8906	734-417-0909
Corp. H&S Director	Bob Poll	813-379-4420	813-240-9231
Client Contact(s):	Tom Meyer		Tom 206-665-5750
Subcontractor(s):	☐ Not Applicable ☒ Applicable, provide contact information below:		
ETHICS POINT HOTLINE	US & Canada: 844-231-3371 UK: 800-89-0011 or 800-89-0011	Australia: 800-551-155 or 800.811.011 Ireland: 800-222-55288 or 800-500-000	

A.2. EMERGENCY RESPONSE Based on analysis of worksite factors, client/regulatory requirements, availability of emergency services.

Consider all Relevant Risk Factors & Response Procedures *(fire/explosion, medical, chemicals/spills, security, site factors, weather, communications).*
EXPLANATORY NOTES, CLARIFICATIONS:
The field team will meet the subcontractor at the Diablo Lake boat ramp to load gear and supplies. In case of emergency the on-water field team can transit to one of two locations, the boat ramp or the Site. The closest emergency services to these muster points is provided.

Available Means of Jobsite Emergency Communication/Alerting	☒ Verbal ☒ Cell Phone ☐ Land Line ☐ 2-Way Radio ☐ On-site alarm/signal system ☐ Other:
To Summon Emergency Services Police, Fire, Ambulance	☒ **DIAL 911**, for external responders ☐ **Other**:
Other Emergency Contacts, as needed *(such as security, spill responder, utility):*	Spills-National Response Center: 800-424-8802 Report the spill immediately to BOTH: 1-800-258-5990 (Washington Emergency Management Division) 1-800-424-8802 (National Response Center)
Nearest Emergency Medical Services and Urgent Care	Hospital Name: PeaceHealth United General Hospital Address: 2000 Hospital Drive Sedro-Woolley, Washington 98284 Phone #: 360-856-6021 ☒ See Attached Directions
For **Non-Emergency Urgent Care**	☒ Contact WorkCare, 24/7 at: 888-449-7787 ☐ Other:
Job-site **Evacuation** Procedure, Rally Point, Place of refuge:	Field work will be located on water adjacent to the north shore of Diablo Lake adjacent to the North Cascades Environmental Learning Center. If there is an emergency on the water involving the vessel or a medical emergency, the field team will head to the Shoreline, or boat ramp. The research vessel used for the survey will launch at the boat ramp and transit to the Site.

Special Emergency Equipment/Procedures	For COVID 19 safety measures, follow "Field Work COVID 19 General Prevention Measures" guideline Attachment G of the Health and Safety Plan for this project. Core safety measures include: Maintain social distancing (where possible); Wear mask or cloth face covering, where social distancing cannot be maintained; Wash hands frequently for minimum 20 sec with soap and water; Use hand sanitizer and hand wipes periodically if hand-washing capability is not readily available; Avoid touching surfaces if not necessary; Use sanitary wipes to wipe handles of field tools and equipment prior to start of work Social distancing on the vessel will not be practical. To minimize the risk of transmission, only one Geosyntec Employee will oversee the survey work.

IMPORTANT: After initial emergency response actions and incident stabilization, contact appropriate project personnel listed in Part A.1.

A.3. SUMMARY OF WORK STEPS, HAZARDS, CONTROLS

Based on **PART B, "HAZARD ANALYSIS,"** and worksite/client/project factors.

Summary/outline of work steps/hazards/controls, with references to applicable Sections in Parts B and C, as applicable:

WORK STEPS	HAZARDS	CONTROLS
All steps	*Catching or spreading COVID-19 through contact with surfaces or being in close proximity to other people.*	*Maintain a 6-foot distance from others, when possible, and take other social distancing measures when able. Take separate vehicles to/from the field site.* *Ask those showing COVID-19 symptoms to dismiss yourself from work and self-isolate. Do not arrive to the work area with flu-like symptoms, including cough, fever, or respiratory illness.* *Maintain personal hygiene (cough into elbow or tissue, and wash hands frequently).* ***Every worker has Stop Work Authority if they deem risks are unacceptable*** *(See COVID-19 Supplemental Attachment).*
Driving to/from site	*City Driving* *Driving at and walking at boat ramp*	*Follow driving laws and familiarize yourself with unfamiliar vehicles before operating. Review prior to departure and utilize a map/GPS for directions to the site.* *Follow on-site parking and driving rules. Yield to equipment, trucks, and other on-site operations. Use caution walking on roads and paths. Wear steel toe boots with good traction to avoid slipping on dock surfaces.*
General Site Safety	*Cold Exposure* *Heat and Sun Exposure* *Slips and Falls* *Loading/Unloading Gear* *On-River Traffic*	*Wear multiple layers underneath a water-resistant outer layer. Bring extra warming layers for replacement of wet clothes. Avoid fabrics that do not insulate when wet, such as cotton. Stay hydrated and be sure to eat frequent, but small snacks. Be prepared for cold, but above freezing temperatures with rain possible.* *Wear multiple layers including long-sleeve garments. Bring a hat and sunscreen. Bring at least a days-worth of drinking water.* *Wear steel-toe boots with good traction for slippery paths, docks, and boat surfaces. Try to maintain three points of contact when moving.* *Use proper lifting techniques and use a lifting tool such as a dolly for heavy objects (try not to have multiple people lifting objects in order to maintain safe distances from others). Be cautious of potential pinch-points such as the area between stationary docks and moving vessels.* *Follow marine navigation regulations and display proper navigation lights. Ensure vessel horn works and is used to inform others of location if necessary.*

Sediment Sampling	*Working near water*	*Be aware of your surroundings and proximity to water bodies, know the location of personal flotation devices, man overboard training with captain and crew; daily float plan and communication with project management team; check in/out at the beginning and end of each day. Perform daily safety checks to make sure vessel and equipment are in working order. Follow directions as given by the vessel captain.*
	Working outside of daylight hours	*Make available a functioning flashlight for each team member. Vessel has working lights inside cabin and outside.*
	Overhead/Sampling equipment	*Maintain a safe distance from overhead equipment and wear a hard hat whenever outside vessel cabin.*
	Eye injury	*Wear safety-glasses at all times on the vessel.*
	Hearing injury	*Have ear protection available for each team member, such as foam ear plugs or safety earmuffs.*
	Hand-Sampling	*Follow the proper procedures to collect the sample. Be aware of pinch points for hand-driven core sampling. Use the buddy system.*
	Work from small vessels (row boats)	*When operating row boats, know your abilities and consult weather reports before launching. Have a support vessel in case of capsizing or another emergency. Wear a personal floatation device at all times. Consult the boat documentation to determine safe carrying capacity and do not overload the boat. Carry all Federal and State required equipment (e.g. signaling devices, Boater Education Cards, registration, floatation devices). Follow all State and Federal boating regulations.*
	Contaminant Exposure	*Follow the controlled work zones procedures for working on vessels as outlined in the Health and Safety Plan (HASP) for this project. Only enter the Exclusion Zone via the Contaminant Reduction Zone. Follow proper procedures when leaving the Exclusion Zone and practice proper hygiene techniques before entering the Support Zone. Follow the Air Monitoring Plan as discussed in the HASP.*
Working on water	*Drowning, cold water, fire onboard*	*Wear personal floatation device at all times; practice man-over-board procedures, watch fellow employees and boat crew, keep eyes on, and point toward anyone overboard, follow emergency response procedures as directed by captain.*

A.4. H&S EQUIPMENT LIST List worksite equipment for worker protection; provide details in Explanatory Notes, Clarifications.

EXPLANATORY NOTES, CLARIFICATIONS: Wear high visibility clothing at all times. Wear safety glasses when operating any equipment to prevent eye injuries. Will bring portable first aid kit. Extra hand sanitizer and disinfecting chemicals will be on-Site for use in disinfecting frequently touched surfaces in order to minimize the risk of COVID-19 transmission (See COVID-19 Supplemental Attachment). Will bring supplies to construct field handwashing station.

☒	**ROUTINE PPE**	☒ Standard work clothes appropriate for task ☒ Hard-toed boots/shoes ☒ Hardhat ☒ Safety glasses	☒ Work gloves appropriate for task ☒ Noise/hearing protection ☒ High visibility/reflective vest ☐ Ice creepers (boot attachments)	
		☐ Basic PPE for protection from low-hazard chemical contact & dust (nitrile gloves, Tyvek suit, dust mask, boot covers).		
☒	**ROUTINE H&S EQUIPMENT/GEAR**	☒ First Aid Kit ☒ Fire extinguisher ☐ Emergency eyewash bottle(s) ☐ Insect repellant ☒ Wasp spray ☐ Caution tape	☒ Sunscreen ☐ Project-supplied drinking water and/or hygiene facilities ☐ Poison ivy skin wash (Technu or similar) ☒ Vehicle emergency kit (flares, lights, reflective device) ☐ Traffic control warning devices (cones, or similar) ☐ Shade canopy (for sun protection)	
		☐ Other:		
☒	**NON-ROUTINE PERSONAL PROTECTIVE EQUIPMENT (PPE)** (Indicate specific types of PPE in Explanatory Notes, Clarifications)	☐ Goggles ☐ Face shield ☐ Chemical protective gloves ☐ Coveralls (Tyvek, or other) ☐ Outer boots, boot covers	☐ Disposable n-95 dust mask ☐ Half-face air-purifying respirator ☐ Full-face air-purifying respirator ☐ Respirator cartridges ☐ SCBA/airline respirator	☐ Personal flotation device ☐ Personal fall apparatus ☐ Fire retardant clothing ☐ Arc Flash Protection ☐ Electrical-Hazard-rated boots, gloves
		☒ Other: Face masks must be used by staff to limit transmission of SARS-CoV-2 virus. PFD must be worn when working on or near water.		
☐	**SPECIAL HAZARD CONTROLS**	☐ Portable GFCI ☐ Eyewash - 15 min. flow	☐ Lockout/tagout equipment ☐ Emergency deluge shower	☐ Ventilation equipment (fan, blower) ☐ Air horn, alarm
		☐ Other:		
☒	**DECON, PPE DISPOSAL**	☒ Receptacle for disposable PPE ☐ Other:	☒ Hand washing provisions	☐ Decon solution, related supplies
☐	**AIR MONITORING EQUIPMENT, OTHER EQUIPMENT FOR WORKER EXPOSURE TESTING**	List equipment/devices to be brought to worksite; Use in accordance with procedures in Part C:		

B.1. ROUTINE HAZARD PREPAREDNESS **This section required for all tasks.**

Explanatory Notes, Clarifications: Work will be scheduled for daylight hours, but gear loading/unloading may take place during twilight/dusk hours and lighting should be provided (e.g. headlamps/flashlights). Care will need to be taken regarding COVID-19 transmission. Maintain as much distance as is practical between people. Ask that people who develop the symptoms of COVID-19 leave the work site (See COVID-19 Supplemental Attachment). Take precautions when meeting at the boat ramp, don't leave your vehicle alone and use the buddy system. No work will be completed alone either on or near the water.

General Safety, Wellness, Preparedness – Workers are encouraged to engage in workplace and lifestyle behaviors that facilitate wellness and safety; delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.

☒ **General premises** hazards - housekeeping, rough terrain, trip hazards, steep slope, remote location.
☒ **Weather/climate-related hazards** – heat stress/cold stress measures, sunscreen, severe weather shelter/refuge, "30/30 rule" for lightning
☐ **Plant/Insect/Animal Hazards** - Precautions: poison ivy wash; insect repellant; check for ticks; hornet nest spray; animal precautions.
☒ **Worksite traffic hazards** – Implement measures to protect personnel (high visibility/reflective clothing, on-person lighting, traffic control measures).
☒ **Illumination hazards/night work** - Illuminate work areas and/or access routes, use reflective/hi-visibility clothing or on-person lighting, as appropriate.
☒ **Manual hand tools** - Use hand tools in accordance with "HS-502-Manual Hand Tools." USE OF OPEN-BLADED UTILITY/FOLDING/COLLAPSIBLE/FIXED BLADE KNIVES IS PROHIBITED. Cutting tools with appropriate safety features (automatically- retracting blades, enclosed/guarded blades) are permitted
☒ **General machine, equipment hazards** – keep safe distances, heed warning signs, stay out of "line of fire," use PPE (such as eye/hearing protection).
☒ **Lifting, manual material handling** – use proper lifting procedures, seek help for >50 lbs.
☒ **Non-routine wellness provisions** – special procedures for hydration, food, hygiene, general wellness.
☐ **Non-routine emergency procedures** - special procedures for reliable system of emergency communication, response, or transport.

Geosyntec Procedures: *HS-124-Heat Stress, HS-125-Cold Stress, HS-127-Ticks, HS-208-Housekeeping, HS-210-Walking and Working Surfaces, HS-401-Back Injury Prevention, HS-502-Manual Hand Tools, HS 517 Traffic Safety*

Routine Personal Protection – Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.

☒ **Overhead Hazards** - Wear hardhat or "bump cap" as appropriate for hazard.
☒ **Hand injury hazards** - Wear protective work gloves appropriate for the hazard and work tasks.
☒ **Eye injury hazards** - Wear safety glasses (with side shield or wrap around, either clear or shaded for sun protection), or other appropriate eye protection.
☒ **Foot hazards, rough terrain** - Wear work boots/shoes with hard toes, ankle support, puncture resistance, traction, as appropriate for conditions.
☐ **Noise** – use hearing protection, (earplugs, earmuffs, or both) as appropriate for conditions, at a minimum where noise levels exceed 85dBA.
☒ **Dust, unsanitary conditions** – For general protection against minimal non-specific hazards, use protective clothing and/or disposable dust mask, as needed.

Geosyntec Procedures: *HS-109-Hearing Conservation, HS 112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-207-Working Alone, HS-105-Driver and Vehicle Safety*

Security– Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.

☐ **High crime, urban** – Use appropriate measures for personal security (such as buddy system, security service, work scheduling, other measures)
☐ **Working alone** - Establish "check in" procedure with supervisor/project manager.

Geosyntec Procedures: *HS-207-Working Alone*

Routine Driving Hazards – Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.

☒ **Routine work travel** - Use routine safe/defensive driving practices (seat belts, safe speeds, eyes ahead, no tailgating, limit distractions, safe cell phone use, no texting, clear windows, account for weather/road conditions, adequate sleep, other measures as appropriate).
☒ **Unfamiliar location** - Plan travel route before driving (assemble maps, enter destination in GPS).
☐ **Long Distance or During Sleep Hours** – Minimize fatigue: rest breaks, light snacks (avoid heavy meals), stay hydrated, fresh air, no loud music, clean windshield.
☒ **Unfamiliar vehicle** – Become familiar with vehicle operational controls and handling characteristics before operating vehicle.

Geosyntec Procedures: *HS-105-Driver and Vehicle Safety*

B.2. SPECIAL DRIVING/TRAFFIC/TRANSPORTATION HAZARDS ☒Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Staff will drive on highways, urban roadways, and at boat ramps. Field team will need to watch for car and boat trailer traffic. Workers will travel to the Site separately to minimize the chances of exchanging COVID-19 *(See COVID-19 Supplemental Attachment).*

☐	**SPECIAL DRIVING HAZARDS** Off-Road Driving or use of non-typical vehicle, heavy vehicle, van, golf/utility cart, ATV Hazards: Worker injury due to vehicle collision, rollover	☐ For off road driving, do not exceed capability of vehicle, beware of wet conditions, speed low, avoid unsafe orientation on slopes. ☐ Follow ATV specific procedures for training, safety equipment, operation, manufacturer's instructions. ☐ Special Skills Required for Vehicle type - For vehicles requiring special skills (such as windowless van, heavy work vehicle, utility vehicle, similar) ensure operator is provided training and/or has appropriate operator skills through experience. ***Geosyntec Procedure(s):*** *HS-510-All Terrain Vehicles*

☐	**TRANSPORTING MATERIALS, TOWING/HAULING LOADS** Hazards: Vehicle accident, occupant injury from shifting load, unsafe equipment.	☐ Ensure load is firmly secured (rope, straps, load configuration) to prevent shifting during travel. ☐ Slings, chains, strap, rope and related equipment used for towing, hauling, load-securing shall be appropriate for use and used in a manner as to prevent an unsafe condition. ☐ For trailer use, verify signal/braking lights operational, rear-view mirrors effective, hitch/safety chains secure.
☒	**WORKSITE TRAFFIC HAZARDS** Where the project worksite is located in/near vehicle thoroughfare. Hazards: Worker injury from being struck by vehicle traveling in thoroughfare.	☒ Wear reflective vests where exposed to traffic hazards. ☐ Where possible, park vehicles as protective shield from oncoming traffic. ☐ Configure work area and support vehicles to minimize worker exposure to traffic hazards. ☐ Use DOT signal devices to re-route vehicles around work area, site entrances/exits. ☐ Use DOT-trained flaggers or police detail where appropriate or required. ***Geosyntec Procedure(s):*** *HS-517-Traffic Safety*
☐	**RAILROAD HAZARD** Hazard: Worker injury from being struck by train in R.R. right-of-way	☐ Coordinate with rail company and implement required safety and security measures. ☐ Site workers to receive safety training for railroad work. **Geosyntec Procedure(s):** HS-305-Rail Operations
☒	**WATER TRANSPORTATION**	☒ Follow HS 312 "Water Transportation Safety," and Section B.3., "Water/Boating Hazards." **Geosyntec Procedure(s):** HS-312-Water Transportation Safety
☐	**AIRPORT, AIRCRAFT** Worker injury when working on/near airport runway, or use of helicopter, light aircraft	☐ Coordinate safety requirements with Airport personnel and implement required safety measures. ☐ Site workers to receive safety training for railroad/airport work. ☐ Follow provisions of applicable Geosyntec HS Procedures, below: ***Geosyntec Procedure(s):*** *HS-310-Helicopter Safety, HS 311-General Aviation (Small Aircraft) Safety*
☐	**TRAFFIC/VEHICLE HAZARDS REALATED TO HEAVY EQUIPMENT, CONSTRUCTION SITE ACTIVITIES**	☐ See Section B.7., "Construction, Heavy Equipment, Lift Equipment"

B.3. WATER/BOATING HAZARDS ☒ Applicable ☐ Not Applicable or Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Sediment sampling work will take place over water. Flash flooding is not expected to be a concern on Diablo Reservoir, there is a large volume of water that will dampen the effects of rain/stream input on water surface elevation. In the event of a dam emergency (e.g. earthquake or dam equipment failure), all over-water work will stop and the evacuation procedure will be enacted.

☒	**OPERATOR OF WATER CRAFT OR PASSENGER/WORKER ON WATER CRAFT OR PLATFORM** Hazards: Drowning, hypothermia, collision, motor/fuel hazards, navigation	☒ Wear regulatory-approved personal flotation device (PFD) or buoyant work vest. ☒ Bring emergency rescue equipment (ring buoy, reaching device, flares). Use "reach, throw, row, go" strategy. ☒ Use fuel safety practices, fire extinguisher present in boat. ☒ Have lifesaving skiff/boat available. ☒ Monitor weather, develop float plan, ensure navigation/communication equipment operable. ☒ For tidal, flash flood, dam release hazards, plan/locate work accordingly, other precautions as appropriate.
☐	**WORK NEAR WATER HAZARDS OR ENTERING WATER** Hazards: drowning, hypothermia from water immersion, related injuries. ☒ Wading, wetland, mud/silt ☒ Dam release, flash flood, tide ☐ Diving ☐ Ice on/near water body	☐ Where ice/slip hazards are present adjacent to water body, and for working directly on ice over water, wear ice creepers, sand work area, or take other appropriate measures to address slip hazard. ☐ For high-hazard work over very cold water, have immersion survival suit available, as appropriate. ☒ For electrical hazards associated with water/wet locations, see Section B.8., "Electrical Hazards." ***Geosyntec Procedure(s):*** *HS-306-Working on/near Water and Ice, HS-312-Water Transportation Safety*

B.4. FALL HAZARDS ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Fall hazards from dock or vessels are possible.

☒	**WORKING AT HEIGHTS (GENERAL)** Hazards: Falls, overhead hazards, impalement hazard (such as from falling onto unprotected rebar and similar)	*General fall protection requirement thresholds: required @ ≥4' (industry), ≥6' (construction), ≥10' (scaffolds)* ☐ Ensure guardrails present ☐ Use personal fall apparatus (PFA) ☐ Use tether or positioning device ☐ Restrict access to hazard (barriers, tape, sign) ☐ Ensure covers in place over holes ☒ Use designated "watch person" ☐ Use fall protection net ☐ Restrict access beneath work to protect other site personnel from overhead hazards ☒ Ensure safe access to elevated work location (ladder, stair,) ☐ Install caps on protruding rebar ***Geosyntec Procedure(s):*** *HS-120-Fall Protection, HS-210-Walking and Working Surfaces*
☒	**LADDERS / STAIRS** ☐ Extension/straight ladders ☐ Step ladders ☐ Fixed ladders ☒ Stairs Hazards: Falls, overhead hazards	☒ Follow safe work practices: • Use ladders according to safe practices and manufacturer's instructions. • Maintain 3 points of contact at all times on ladder; keep center of gravity within side rails. • Do not use metal (conductive) ladder near electrical hazard. • Extension/straight ladders shall be properly footed, secured, angled, extend above upper work surface. • Stepladders are set on level ground or properly shimmed, spreaders locked; do not climb/stand on top step, top cap, or rear non-climbing side; use step ladder of sufficient length for work. • Equip stairs with stair-rails where more than 4 steps, and for stairway height 4' or more. ***Geosyntec Procedure(s):*** *HS-501-Ladders*

☐	**SCAFFOLD** ☐ Supported scaffold ☐ Suspended scaffold ☐ Free-standing/mobile scaffold Hazards: Falls, overhead hazards, equipment collapse.	☐ Follow safe work practices: • Identify/coordinate operations with subcontractor's competent person. • Supported scaffold level, stable, proper attachments, tiebacks, planking, • Suspended scaffolds anchored properly. • Guardrails or personal fall apparatus required above 10 feet. • Proper means of accessing scaffold (proper ladders, stair tower). • Total height of free-standing scaffold not to exceed four times the minimum base dimension. • Do not exceed load limits; store/stage materials in quantities sufficient for immediate use. ***Geosyntec Procedure(s):*** *HS-507-Scaffolds*
☐	**AERIAL LIFT** Hazards: Falls, overhead hazards, struck-by, run-over, caught between (pinch points), tip over, fluid leaks.	☐ Follow safe work practices: • Operators to be sufficiently trained, experienced and qualified. • Equipment is inspected after mobilization and is in good condition. • Harness & lanyard worn whenever operating the lift (possible exception for scissor lifts). • Overhead and surface obstructions to be reviewed with operators prior to use. ***Geosyntec Procedure(s):*** *HS-509-Aerial Lifts*
☐	**IMPORTANT!** This work may/will include close proximity to overhead electric utility lines.	☐ Follow safe work practices per Section B.9., "Utility Related Hazards"

B.5. POWERED TOOLS, EQUIPMENT, MACHINERY ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Core tubes might need to be cut to expose the sample. The preparation of core tubes might include the use of electric punches or drills.

☒	**POWERED HAND TOOLS** ☒ Electric-powered ☒ Fuel-powered ☐ Pneumatic ☐ Powder-actuated Hazards: Eye/hand/body injury, fuel-related hazards, Inhalation hazards, noise, sparks, heat, fire hazard, electrical hazards	☒ For all power tools: • Inspect tools to ensure safe operating condition before each use. • Use tool in accordance with manufacturer's specifications. • Ensure guards are in place and no hazardous equipment modifications. • Use PPE or other safety practices, as appropriate, for eye/hearing/hand/head/body protection (such as use of Kevlar chaps and jacket for chainsaw use). • Provide training or verify operator qualification for use of power tool. • Stay clear of hazard zone, "line of fire," when working near where power tools are used. • For spark/heat generating tool, control fire hazards, segregate combustible/flammable materials. ☐ Use respirators, ventilation, wet methods, other appropriate means to control inhalation hazard. ☐ See fuel-safety practices in Section B.13., "Commercial Chemical Products." ☐ For electrical hazards, see Section B.8., "Electrical Hazards". ***Geosyntec Procedure(s):*** *HS-109-Hearing Conservation, HS-113-Personal Protective Equipment, HS-121-Electrical Safety, HS-503-Powered Hand Tools, Others as applicable*
☒	**OPERATION OF EQUIPMENT/MACHINERY** ☒ Point-of-operation hazards ☒ Pinch points, moving parts ☒ 'Struck-by,' 'caught between' ☐ Hot surfaces, heat ☐ Extension cords, flexible wire ☐ Fuel related (gas or liquid) ☐ Hydraulic pressure ☐ Pneumatic pressure ☐ Kinetic, stored energy ☐ Noise ☐ Emissions, discharge gases ☐ Working at heights, falls ☐ Lifting, repetitive motion ☐ Illumination ☐ Electrical	☒ General safety requirements for equipment, machinery: • Arrange worksite for safe access to equipment/machinery. • Use equipment/machinery in accordance with manufacturer's use and safety instructions. • Ensure point-of-operation, mechanical power transmission, other moving parts are guarded with protective devices; do not override interlocks, guards, protective devices. • Secure long hair/loose clothing/hanging jewelry near moving/rotating parts. • Heed warning signs/labels, keep safe distance; avoid locations of "struck by" and "caught between" hazards. • Implement lockout/tagout for repairs/adjustments/tooling changes. ☐ Use safe lifting practices for movement of heavy portable equipment ☒ Implement safe work practices for compressed air, pressurized systems (pneumatic/hydraulic), stored energy. ☐ For climbing/fall hazards associated with large equipment, see Section B.4., "Fall Hazards." ☐ For electrical hazards, see Section B.8., "Electrical Hazards." ☒ Operate fuel-powered equipment in well ventilated location. ☒ Use safe practices for fuels, see Section B.13., "Commercial Chemical Products." ***Geosyntec Procedure(s):*** *HS-109-Hearing Conservation, HS-113-Personal Protective Equipment, HS-119-Lockout/Tagout, HS-121-Electrical Safety, HS-503-Powered Hand Tools, Others as applicable*
☐	**LOCKOUT/TAGOUT OF HAZARDOUS ENERGY**	☐ Implement control-of-hazardous-energy practices (lockout/tagout), provide lockout/tagout locks and devices, training workers, designate "authorized" personnel, notify "affected" personnel. ***Geosyntec Procedure(s):*** *HS-119-Lockout Tagout*

☐	**WELDING, CUTTING, HOT WORK (GAS OR ARC)** UV/IR light-eye/skin burns, hot-work hazards, toxic welding fumes, compressed gases, electrical shock	☐ General safe work practices: • Hot work permit system to be implemented. • Operator properly protected (eye protection, clothing, apron, etc.). • Fire hazard controls (watcher, fire extinguisher, water, isolate combustibles). • Protect nearby personnel from hazardous UV, IR light (shielding, curtain). ☐ For gas welding/cutting, use gas cylinder safe practices (secured, upright, caps on when not in use, prevent Damage; never secure gas cylinders to metal bench used for arc welding). ☐ For arc welding, follow electrical safe work practices. See Section B.8., "Electrical Hazards." ☐ See Section B.13., "Commercial Chemical Products," for hazards of welding rods (toxic metals), welding gases. ***Geosyntec Procedure(s):*** *HS-511-Welding, Cutting and Other Hot Work*
☐	**COMPRESSED AIR, COMPRESSOR** (for compressed gases, see Section B.13., "Compressed Gases")	☐ Never direct nozzle toward body; do not use compressed air for cleaning clothes. ☐ If compressed air is used for cleaning, restrict pressure to 30 psi or below, equip nozzle with chip guard. ☐ Use eye protection. ☐ Ensure air tank, hoses, fittings are in good repair using factory fittings.
☒	**PORTABLE GENERATOR** Hazards: Electrical shock, carbon monoxide in exhaust, fuel-related fire, injury from mechanical hazards, lifting	☒ Follow general safety practices for Operation of Equipment/Machinery (above), and as follows: • Use in accordance with manufacturer's instructions. • Keep generator and work area dry. • Never use indoors, or near building air intake vents due to carbon monoxide hazard. • Provide for ventilation and/or air monitoring where hazardous accumulation of exhaust emissions is possible. • Use hearing protection in close proximity to operating generator, as needed. • Use power cords/extension cords specified by instructions. • Use ground-fault circuit interrupters (GFCIs) in accordance with manufacturer's instructions. • See Section B.8., "Electrical Hazards." • Shut down equipment before refueling. See safe practices for flammable/combustible liquids in Section B.13., "Commercial Chemical Products." ***Geosyntec Procedures:*** *HS-109-Hearing Conservation, HS-111-Air Monitoring, HS-115-Hazard Communication (for fuel), HS-121-Electrical Safety, Others as applicable*
☐	**PORTABLE HEATERS (electric or fuel powered)** Hazards: Electric-powered: Electrical shock, fires from hot surfaces. Fuel powered: Carbon monoxide in exhaust, fires from hot surfaces, fuel-related fires	☐ Follow general safety practices for Operation of Equipment/Machinery (above), and as follows: • Keep heater dry, and locate heater on level surface away from high traffic areas. • Never use fuel-powered heaters indoors, or near air intake vents, due to carbon monoxide hazard. • Provide for ventilation and/or air monitoring where hazardous accumulation of exhaust emissions is possible. • Keep combustible materials at least 3 feet from hot surfaces. • Do not use an extension cord or power strip to power an electric heater. • For electric heaters, See Section B.8., "Electrical Hazards." • Shut down fuel-powered equipment before refueling. See safe practices for flammable/combustible liquids and/or compressed gases in Section B.13., "Commercial Chemical Products." ***Geosyntec Procedures:*** *HS-111-Air Monitoring, HS-115-Hazard Communication (for fuel, HS-121-Electrical Safety, Others as applicable*

B.6. DRILLING ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Sediment cores will be collected using vibracore equipment. Hand-coring equipment might also be used in near-water locations.

☒	**DRILLING** Hazards: Struck-by, run-over, caught between (pinch points), manual lifting, roll over, fluid leaks, fuel hazards, suspended equipment	☒ Follow safe work practices, as applicable: • Non-essential personnel to stay clear of drilling work zone when drill rig in operation. • Equipment inspected daily upon mobilization; maintained in good repair, backup alarms. • Leaks or defective safety equipment should be repaired before use. • Establish eye contact with operator and use hand signals prior to approaching near equipment. • PPE used near operating rig (eye/head/hearing/hand/foot protection, high visibility vests or equivalent). • Contractor inspects drill rig daily before use, verify daily that emergency stop is functional. • Drill rig to be equipped with operational emergency stop, equipment in good repair, machine guards in place, whip checks on high pressure lines. • Park personal/support vehicles in a location as to not obstruct travel lanes or other site operations. • Operators/helpers maintain safe distance from moving parts; secure loose hair, loose clothing, equipment. • Drill rigs will only be moved with masts lowered. • Max. safe slope for rig will be followed, drill rig leveled, appropriate blocking/cribbing as needed. • Use safety practices for refueling, fuel handling/storage/transport. • Spill equipment is available for fuel and hydraulic fluid leaks. • Verify mechanical lift/rigging equipment (cables, sheaves, boom, attachments) is in proper working order. • Ventilate and conduct air monitoring, as appropriate, when drilling indoors. ***Geosyntec Procedure(s):*** *HS-403-Drilling, Others as applicable*
☐	**IMPORTANT!** This work may/will include close proximity to overhead electric utility lines.	☐ Follow safe work practices per Section B.9., "Utility Related Hazards"

B.7. CONSTRUCTION, HEAVY EQUIPMENT, LIFT EQUIPMENT ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Survey equipment may be operated from a crane or A-frame. Other gear might be loaded with a crane or hoist. There are overhead powerlines at the Site.

☐	**HEAVY EQUIPMENT** Hazards: Struck-by, run-over, caught between (pinch points), roll over, fluid leaks, overhead hazards	☐ Follow general safe work practices for heavy equipment: • Trained/qualified persons operate all heavy equipment. • Do not get into a potential crush situation below or between equipment, or in an excavation. • No passengers on moving/operating equipment except where passenger seat/restraint is present. • Equipment inspected daily upon mobilization; maintained in good repair, backup alarms. • Leaks or defective safety equipment should be repaired before use. • Operators required to use seatbelts. • Maintain eye contact with operator and use hand signals prior to approaching near equipment. • High visibility vests for all personnel in construction vehicle work area, on-site roadways and travel lanes. • Maximum safe slope for each vehicle will be followed. • Personnel to stay clear of, or restrict access to, swing radius and travel path of equipment. • Spill equipment available for fuel and hydraulic fluid leaks. • Equipment locked, secured, brakes set, buckets/forks lowered, when not in use. • Park personal/support vehicles in a location as to not obstruct travel lanes or other site operations. • Mark temporary roadways clearly, provide berms/stop logs where needed. ***Geosyntec Procedure(s):*** *HS-504-Heavy Equipment, HS-132-Competent Persons*
☒	**CRANES** Hazards: - electrocution by overhead utility - injury in swing radius - injury from falling load - crane tipping over due to overbalancing, high winds, unstable ground, unsafe slope, bad placement of outriggers - injury from mechanical hazards	☒ In addition to general safety practices for heavy equipment (above), as applicable: • Only qualified persons operate cranes (certificate required). • Critical Lift Plan & Checklist prepared/executed (HS 506) prior to mobilization. • Equipment to be inspected prior to mobilization and daily by crane operator. • Crane operator will remain at the controls at all times during operation. • Crane operation must be performed under the direction of an appointed signal person at all times. • Communication between crane operator and signal person will be maintained through standard hand signals or voice communication equipment. • Keep area beneath suspended loads clear of personnel. • Rigging procedures – see Mechanical Lifting, Rigging, below. ***Geosyntec Procedure(s):*** *HS-506-Cranes, HS-132-Competent Persons*
☒	**MECHANICAL LIFTING, RIGGING** Applies to lifting by crane, truck-mounted boom rig (e.g. drill rig), mechanical/electrical hoist, similar equipment. Hazards: falling loads, personnel under suspended loads.	☒ In addition to general safety practices for heavy equipment and cranes (above), as applicable: • Coordinate lifting operations with competent person. • Do not exceed loading limits of lifting equipment; perform work in accordance with equipment load chart. • Slings, chains, rope, wire rope and related equipment used for lifting shall be maintained in good condition, and used in a manner as to protect from damage. • Rigging, wire rope and hoisting equipment will be inspected and maintained on a weekly basis. • Hooks will be equipped with safety latches. • Ensure anchor points for winch or other lift device (such as davit arm) are engineered for intended use. ***Geosyntec Procedure(s):*** *HS-506-Cranes*
☐	**FORKLIFT** Hazards: Struck-by, run-over, overhead hazards, caught between (pinch points), roll over, fluid leaks.	☐ In addition to general safety practices for heavy equipment (above), as applicable: • Qualified operator, per established forklift training (certificate is required). • Equipment inspected daily and documented on Forklift Preoperational Inspection Checklist. • Do not exceed lifting load limits. • Forklift shall not be moved/driven with empty forks in raised position. • When not in use, forks lowered, brake set, controls in neutral, key removed. ***Geosyntec Procedure(s):*** *HS-505-Safe Operation of Forklifts, HS-132-Competent Persons*
☐	**AERIAL LIFTS**	☐ See Section B.4., "Fall Hazards" *Geosyntec Procedure(s): HS-509-Aerial Lifts*
☐	**TRENCHING/EXCAVATION** Hazards: Cave-in, hazardous atmosphere, structures & foundations, falls into excavations	☐ Safe work practices when personnel will enter trenches/excavations: • Activities under supervision/oversight of competent person, daily inspection. • Excavated materials placed at least 2' from trench sidewall. • Prevent water accumulation in trench. • Sloping & shoring for excavations ≥20' must be approved by a professional engineer. • Sloping/shoring/trench box for excavations ≥5' when persons enter trench/excavation. • Sloping/shoring/trench box for shallow (<5') excavations with cave-in hazard . • Workers in trenches to be within 25 feet of ladder or sloped entryway. • Excavations to be protected by perimeter fencing (not barricade tape), if potential for personnel to fall into. • If potential for atmospheric hazard, see Section B.10, "Confined Space Entry, Hazardous Enclosed Spaces" ***Geosyntec Procedure(s):*** *HS-402-Excavation and Trenching, HS-132-Competent Persons*

☒	**IMPORTANT!** This work may/will include close proximity to overhead and/or underground utility lines.	☒ Follow safe work practices per Section B.9., "Utility Related Hazards"
☐	**DEMOLITION**	☐ Develop/implement demolition safety plan. ***Geosyntec Procedure(s):*** *HS-132-Competent Persons*
☐	**BLASTING**	☐ Develop/implement blasting safety plan. ***Geosyntec Procedure(s):*** *HS-307-Blasting and Use of Explosives, HS-132-Competent Persons*
☐	**PUBLIC AT RISK, SITE SECURITY**	☐ During site operations protect public (overhead protection, barriers, warning signs). ☐ During off hours, protect public with barriers, warning signs/lights, other measures as appropriate. ☐ Lock/secure hazardous materials and/or equipment.

B.8. ELECTRICAL HAZARDS ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Survey vessels operate using onboard electrical supply. Care will be taken to make sure electrical components, cords, etc. are not in standing water or near wet surfaces.

☒	**BASIC ELECTRICAL HAZARDS TO SKILLED NON ELECTRICAL WORKERS** Equipment/tool use/operation, use of extension cords, working near electrical equipment. Hazards: Electrical shock, secondary hazards (falls, other injuries).	☒ Follow safe work practices: • Control water-related/wet-location hazards in a manner appropriate for the job tasks/equipment/tool. • Never touch electrical equipment if you are wet, or standing in water or on wet surfaces. • Use extension cords/power cords properly, prevent damage, take out of service if damaged. • Inspect tool/equipment/extension cords/power cords/welding cables before each use; do not use if damaged. • Use GFCI-protected outlet or portable GFCI in wet locations, outdoors, basements, concrete floors. • Ensure live parts are guarded, enclosures secure. • Enclosures, circuits properly labeled. ***Geosyntec Procedure(s):*** *HS-121-Electrical Safety*
☐	**HANDS-ON ELECTRICAL WORK BY ELECTRICAL WORKER/TECHNICIAN:** ☐ Voltage < 50 v ☐ Voltage 50-600v ☐ Voltage > 600v ☐ AC ☐ DC ☐ 3-phase ☐ Battery and/or solar power ☐ Capacitor/transformer	☐ Implement electrical safe work practices pertaining to: • Worker training/qualification (Level 1, Level 2, Level 3) • General electrical safe work practices, grounding, use of GFCIs • Safe work practices during diagnostics/troubleshooting, maintenance, repair • Safe design features for electrical equipment • Arc flash protection ***Geosyntec Procedure(s):*** *HS-121-Electrical Safety, HS-129-High Voltage Electricity Safety*
☐	**LOCKOUT/TAGOUT OF ELECTRICAL ENERGY**	☐ Implement control-of-hazardous-energy practices (lockout/tagout), provide lockout/tagout locks and devices, training workers, designate "authorized" personnel, notify "affected" personnel. ***Geosyntec Procedure(s):*** *HS-119-Lockout Tagout, HS-121-Electrical Safety*
☒	**IMPORTANT!** This work may/will include close proximity to electric utility lines.	☒ Follow safe work practices per Section B.9., "Utility Related Hazards"

B.9. UTILITY RELATED HAZARDS ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: There are overhead powerlines at the Site.

☒	**OVERHEAD, ABOVE-GROUND UTILITIES**	☒ Maintain proper clearance, employ other appropriate precautions for the conditions. ***Geosyntec Procedure(s):*** *HS-304-Overhead Electrical Lines*
☐	**UNDERGROUND UTILITIES**	☐ Confirm appropriate underground utility clearance procedures have been completed prior to ground penetrations, and employ other utility clearance/locator practices, as appropriate for conditions. ☐ Hand digging or vacuum post-holing within 3' of utility locations or other high risk condition.

B.10. CONFINED SPACE ENTRY, HAZARDOUS ENCLOSED SPACES ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**CONFINED SPACE(S)** Potential/actual hazards: ☐ Atmospheric hazards: ☐ Flammable/explosive ☐ Oxygen deficiency ☐ Hydrogen sulfide ☐ Other toxic ☐ Combustible dust ☐ Electrical ☐ Mechanical, engulfment, entrapment, stored energy	☐ Develop effective site-specific entry procedure **per applicable regulatory requirements**: • Personnel to be trained/qualified. • Hazards properly characterized • Use equipment necessary for safe entry (for access, retrieval, PPE, air monitoring, ventilation) • Develop measures for emergency rescue, as applicable. • IMPORTANT: - Describe site-specific safety measures above in Explanatory Notes, Clarifications - Modify this THA or attach separate confined space safety plan/permit, as appropriate ☐ Protect non-entry personnel working near confined spaces through control measures to prevent unauthorized entry (such as safety orientation, labeling, delineation, barriers) ***Geosyntec Procedure(s):*** *HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-118-Confined Space Entry, Others as applicable*

☐	**HAZARDOUS ENCLOSED OR INDOOR SPACE(S)** ☐ Indoors (occupied or vacant) ☐ Machine/equipment pit/vault ☐ Basement/crawl space ☐ Tunnel, shaft, gallery ☐ Trench, excavation ☐ Hazardous exhaust or emissions ☐ Building-related hazards	☐ Use personal protective clothing to protect from chemical, physical, biological hazards. ☐ Use respiratory protection, if necessary/appropriate. ☐ Duct equipment exhaust to outdoors using passive duct or active exhaust ventilation. ☐ Use fans, blowers or other effective means of ventilation to introduce fresh air/dissipate atmospheric hazards. ☐ Conduct air monitoring, as appropriate for conditions and hazards (see Part C, "Air Monitoring"). ☐ For a trench/excavation, also see subsection entitled "Trenching/Excavation" in Section B.7. "Construction, Heavy Equipment, Lift Equipment." ☐ If space classified/regulated as a "confined space," follow confined space entry requirements (above). ***Geosyntec Procedures**: HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, Others as applicable*

B.11. STORAGE OF BULK MATERIALS ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Cores will be up to 10 feet long. During vessel transit, the cores must be secured to prevent them from shifting, falling, or rolling.

☒	**STORAGE OF BULK MATERIALS** (for Storage of Hazardous Materials, See Section B.13.)	☒ Store materials in stable manner (stacked, racked, blocked, interlocked, tied, wrapped, or otherwise secured) to prevent tipping, sliding, rolling, falling or collapse. ☒ Do not exceed load limits of racks, platform, scaffold; ensure racks are stable, robust, secure. ☒ Ensure stored materials do not block aisles, passageways.

B.12. INFECTIOUS / ALLERGENIC BIOHAZARDS ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: For COVID 19 safety measures, follow "Field Work COVID 19 General Prevention Measures" guideline attached. Core safety measures include: Maintain social distancing; Wear mask or cloth face covering, where social distancing cannot be maintained; Wash hands frequently for minimum 20 sec with soap and water; Use hand sanitizer and hand wipes periodically if hand-washing capability is not readily available; Avoid touching surfaces if not necessary; Use sanitary wipes to wipe handles of field tools and equipment prior to start of work.

☒	☐ Wastewater, sewer ☐ Bird Guano ☐ Mold, fungi, Valley Fever ☐ Bloodborne pathogens ☒ Other (describe above)	☐ Low hazard - use basic hygiene practices, protective gloves, provide for hand washing. ☒ More severe hazard - facial covering/cloth mask, frequent hand washing. ☐ For human pathogens use "Universal Precautions" per Bloodborne Pathogen Program. ***Geosyntec Procedure(s):** HS-133-Bloodborne Pathogens*

B.13. COMMERCIAL CHEMICAL PRODUCTS ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Isobutylene will be used to calibrate the PID, Alconox/Liquinox will be used for decontamination procedures.

☐	**PRODUCTS REGULATED BY HAZARD COMMUNICATION STANDARD**	☐ Safety Data Sheets available, either on site or readily available within same work shift, containers labelled properly, workers trained/oriented on hazards ☐ For subcontractor use of chemical products, coordinate/discuss during safety meetings. ☐ Conduct air monitoring, as appropriate (see Part C, "Air Monitoring, Worker Exposure Monitoring").
☐	**COMPRESSED GAS (flammable or nonflammable)**	☐ Secure cylinders upright, caps on when not in use, handle with care, prevent damage. ☐ Propane cylinders not in use must be stored outdoors in cage or similar secure enclosure. ☐ Ensure acetylene cylinders NOT secured to steel arc welding bench. ☐ Store/use in a manner to prevent asphyxiation hazard. ☐ Segregate oxygen and fuel gases by distance (20') or barrier. ☐ Control ignition sources. ☐ "No smoking" signage at cylinder storage area for flammable gases. ☐ Use/store in a manner to control inhalation exposure hazards, PPE, air monitoring.
☐	**FLAMMABLE/COMBUSTIBLE LIQUIDS**	☐ Proper storage (flam. storage cabinets, other storage precautions). ☐ Use proper fuel safety can (metal fuel can preferred). ☐ Control ignition sources. ☐ Grounding and bonding where appropriate.
☐	**ACIDS, CAUSTICS, OTHER CORROSIVES**	☐ Handle with care, use appropriate eye/face/skin protection. ☐ Eyewash, deluge shower, drench hose, hand washing (with water), as appropriate.
☐	**TOXIC**	☐ For toxic substances, use/store in a manner to control exposure hazards (inhalation, ingestion, skin contact, skin absorption); use PPE as appropriate, conduct air monitoring as appropriate.
☐	**EMISSIONS FROM FUEL COMBUSTION, INDUSTRIAL PROCESSES** ☐ Gasoline ☐ Diesel ☐ Propane/Natural Gas ☐ Welding/cutting/hot work ☐ Vehicle/equipment exhaust	☐ Position outdoor personnel upwind of exhaust source. ☐ Use blowers, fans to provide fresh air to work area and dissipate atmospheric hazards. ☐ Use respiratory protection for high levels of smoke, exhaust particulates, soot. ☐ Conduct air monitoring as appropriate (see Part C, "Air Monitoring").

	☐ Other	
☒	**OTHER HAZARDS**	☒ Describe other hazardous substances and safety measures under "Explanatory Notes, Clarifications," above.
☐	**CHEMICAL/HAZMAT STORAGE** Check this when jobsite requirements include special provisions for chemical storage.	☐ Chemical storage cabinet, cage, storage room, or similar. ☐ Ensure incompatible chemicals are segregated. ☐ Provide secondary containment. ☐ Locate special safety equipment near chemical storage

Geosyntec Procedures: *HS-115-Hazard Communication, HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, Others as applicable*

B.14. SITE CONTAMINANTS, CHEMICAL WASTES ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: The current location of the Diablo Drydock was used for drydock operations since the 1930s . Drydock operations resulted in soil and sediment contamination by metals and polycyclic aromatic hydrocarbons (PAHs). Two sampling and analysis investigations have taken place at the Site in the last 6 years. The results of sediment data along with historical information indicate that sediment contaminants of potential interest (COPIs) should include metals and PAHs.

CHECK ALL THAT APPLY. Provide explanatory notes above.

☒ Soil/groundwater contaminants (historical release)	☐ Oxygen deficiency	☐ Corrosive, acids/caustics, strong irritants
☐ Recent release, known high concentrations	☐ Chlorinated volatile organic compounds (VOCs)	☐ Sulfides, hydrogen sulfide (H_2S)
☐ Former chemical disposal site, landfill	☐ BTEX, petroleum derived VOCs	☐ Cyanides, hydrogen cyanide (HCN)
☐ Urban fill, residual contaminants	☐ Fuel oils, petroleum, waste oil, lubricants	☐ Asbestos
☐ Containerized waste (drums, process equipment)	☒ Metals, metal compounds, metal dusts	☐ Lead paint
☐ Buried drums (known or potential)	☐ Elemental mercury	☐ Pesticides, herbicides, fungicides
☐ Large containers, potential for spills	☒ Polyaromatic hydrocarbons (PAHs)	☐ Sensitizers
☐ Contaminated building surfaces	☐ Polychlorinated biphenyls (PCBs)	☐ Radioactive contaminants
☐ Unexploded ordnance	☐ Potential for flammable vapors	☐ Other (see Explanatory Notes, above)
☐ Explosive dust	☐ Potential for flammable gas (methane)	

☐	**FOR WORK CONSISTING OF CLEANUP OPERATIONS, CORRECTIVE ACTIONS, PRELIMINARY INVESTIGATIONS at an "UNCONTROLLED HAZ. WASTE SITE" (per HAZWOPER, 29 CFR 1910.120), implement the following as applicable to the work:** - Implement site control plan via Exclusion Zone(s), Contaminant Reduction Zone(s) and Support Zone (aka EZ, CRZ, SZ) - Workers to be aware of and trained on hazards per OSHA Hazard Communication Standard. - Include site map/figure depicting work locations and other relevant site-specific information. - Site workers in EZ or CRZ to have OSHA 40-hour training, current 8-hour refresher, 3 days supervised field experience. - Site supervisor(s) required to have 8-hr. Supervisor training. - Site workers in EZ or CRZ to participate in Medical Monitoring program, as applicable. - Implement site-specific procedures for worker protection via engineering controls, work practices, personal protective equipment (PPE), air monitoring, decontamination procedures, spill containment, emergency preparedness and response. - Conduct air monitoring, as appropriate (see Part C, "Air Monitoring, Worker Exposure Monitoring"). **IMPORTANT:** Provide supplemental information to sufficiently detail site-specific procedures for the above elements, as appropriate for the work. ***Geosyntec Procedures:*** *HS-301-HAZWOPER, HS-108-Medical Monitoring Surveillance, HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, HS-115-Hazard Communication, HS-405-Drum Sampling, Others as applicable*
☒	**FOR SITE WITH CHEMICAL CONTAMINANTS OR WASTE BUT NOT REGULATED BY HAZWOPER** - Workers to be knowledgeable/aware of chemical hazards through safety training/orientation and availability of hazard information - Implement controls to minimize worker exposure through engineering controls, work practices, PPE, as appropriate. - Conduct air monitoring/sampling to monitor/evaluate worker exposure, as applicable. ***Geosyntec Procedures:*** *HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, HS-115-Hazard Communication, Others as applicable*

☐	**OFF-SITE MIGRATION OF CONTAMINANTS**	☐ Implement controls to minimize hazard migration (dust suppression, covers, foam, etc.) ☐ Community/perimeter air monitoring to be conducted per perimeter air monitoring plan.
☐	**SPILL CONTAINMENT, CONTAINERS**	☐ Describe above any site-specific procedures for spill containment, container handling, as applicable. ***Geosyntec Procedures****: HS-406-Unknown Hazardous Waste Drum Handling*

B.15. RADIATION HAZARDS (Other than Sunlight) ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**IONIZING RADIATION**	Describe hazards & safety measures above in Explanatory Notes, Clarifications. Conduct exposure monitoring, as appropriate (see Part C, "Air Monitoring, Worker Exposure Monitoring"). ***Geosyntec Procedures:*** *HS-126-Radiation Safety Program, HS-128-Ionizing and Non-Ionizing Radiation*

☐	**NON-IONIZING RADIATION**	Describe hazards & safety measures above in Explanatory Notes, Clarifications. Conduct exposure monitoring, as appropriate (see Part C, "Air Monitoring, Worker Exposure Monitoring"). ***Geosyntec Procedures:*** *HS-128-Ionizing and Non-Ionizing Radiation*

B.16. HAZMAT/DANGEROUS GOODS SHIPPING/TRANSPORTATION ☐ Applicable ☒ Not Applicable, Not Anticipated

MODE(S) OF TRANSPORT:	☐ Road	☐ Rail	☐ Air	☐ Sea	☐ Inland Waterway	☐ International

IMPORTANT: Ensure that each individual who will be involved in shipping/transportation of hazardous material is current with required training (awareness, function-specific, safety, security) in accordance with applicable regulatory authority (DOT, FAA, IATA, TDG), and ensure adherence to applicable regulations.

Geosyntec Procedures: *HS-135-Hazardous Materials Procedures*

EXPLANATORY NOTES, CLARIFICATIONS:

PART C – AIR MONITORING, WORKER EXPOSURE MONITORING

C.1. AIR MONITORING (Direct-Reading Instruments) ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

Air monitoring will take place during the sediment sampling tasks. Data will be collected using a handheld Photoionization Detector (PID), capable of measuring volatile organic compounds including volatile PAHs at a concentration of 5 parts per million on a molar basis (e.g. 5 micromoles of VOC per mole of air). The PID will be calibrated following the manufactures procedures and at a minimum, one calibration will be made weekly, and one bump test will be performed weekly. An audible alarm will be set at the Site action level. Air monitoring will be performed according to Geosyntec Health and HS-111 (see Attachment H) and action levels and PID instrument information is given in Attachment D. Air monitoring data will be recorded using the Real Time Air Monitoring Form in HS-111.

An air monitoring action level is an instrument measured concentration at which increased protection is required through either donning of more protective PPE or implementation of either engineering controls or physical controls. The action level for Tasks 3 and 4 this project is 5 ppm when measured by a PID. When a measurement of 5 ppm or greater is encountered, all work will cease, and workers will exit the work area. The Health and Safety officer and Project Manager will both be notified. A plan will be developed in the field to safely investigate the source of the PID alarm. Then either PPE requirements will be upgraded, physical controls such as increasing ventilation will be implemented, or engineering controls such as installing a fan will be implemented.

☐	**AIR-TESTING PARAMETERS**	☐ VOCs, GASES ☐ PID, Lamp energy: 9.8 eV ☐ FID ☐ Carbon monoxide ☐ Hydrogen sulfide ☐ Oxygen (O_2)	☐ Flammable gas (LEL) ☐ Particulate (dust) ☐ Calibration kit for each parameter ☐ Other:

☐	**ACTION LEVELS FOR O2/LEL**	☐ Oxygen	≤19.5% - ventilate to raise O_2 to acceptable levels, or use Level B. ≥23.0% - ventilate to lower O_2 to acceptable levels or use Level B and control fire hazards & ignition sources.
		☐ LEL	Confirm at least 12% oxygen is present to ensure accuracy of LEL readings. At <10% LEL - Continue working, continue to monitor LEL levels At ≥10% LEL- Immediately withdraw from area. Resume work ONLY after LEL readings reduced to <10%.

☐	**ACTION LEVELS FOR TOXICS** (sustained breathing zone concentrations)	**Parameters**	**Level D, Modified D***	**Use levels C or B*, as indicated below, OR take action to reduce breathing zone level to concentration acceptable for Level D*.**
		☐ VOCs	< 5 ppm	___ ppm to ___ ppm: Level C (air purifying respirator) > ___ ppm: Level B (air-supplied respirator)
		☐ Carbon Monoxide	< 35 ppm	≥35 ppm - Level B (air-supplied respirator)
		☐ Hydrogen Sulfide	< 10 ppm	≥10 ppm - Level B (air-supplied respirator)
		☐ Total Dust	< ___ mg/m³	>___ mg/m³ - Level C (air-purifying respirator)
		☐		
		☐		

*** Levels of Protection:**
Level D (standard work clothes, basic personal protective wear, no chemical protective clothing, no respiratory protection)
Modified Level D (chemical protective clothing in addition to standard work clothes, no respiratory protection)
Level C (air purifying respirator or dust mask, in addition to chemical protective clothing)
Level B or A (air supplied respirator, chemical protective suit; fully encapsulating suit for Level A)

Geosyntec Procedures: *HS-111-Air Monitoring*

C.2. OTHER WORKER EXPOSURE MONITORING ☐ Applicable ☒ Not Applicable, Not Anticipated

☐ Air Sampling *(sample collection, passive dosimeter)*	☐ Ionizing or Non-ionizing Radiation Testing	☐ Heat Stress Testing
☐ Wipe/Bulk Sampling *(to evaluate worker exposure)*	☐ Noise Testing	☐ Other

EXPLANATORY NOTES, CLARIFICATIONS:

Geosyntec Procedures: *HS-109-Hearing Protection, HS-111-Air Monitoring, HS-124-Heat Stress Prevention, HS-126-Radiation Safety Program, HS-128-Ionizing and Non-ionizing Radiation, HS-601-Asbestos, HS-602-Lead*

PART D – APPROVALS, ACKNOWLEDGEMENTS

D.1. THA PREPARATION, REVIEW/APPROVAL SIGNATURES THA typically prepared by project staff, reviewed/approved by Project Manager, Supervisor, qualified/knowledgeable designee, with support of HS personnel as deemed appropriate by the Project Manager.			
THA PREPARED BY: (minimum one person)	*Printed Name*	*Signature*	*Date*
	Jon Laurance		
THA REVIEWED/ APPROVED BY: (minimum one person)	*Printed Name*	*Signature*	*Date*
	Joey Hickey		

D.2. FIELD CREW ACKNOWLEDGEMENTS

GEOSYNTEC FIELD CREW

Please sign below to acknowledge you reviewed and understand this THA, participated in project safety briefing and had an opportunity to ask questions about the information herein.

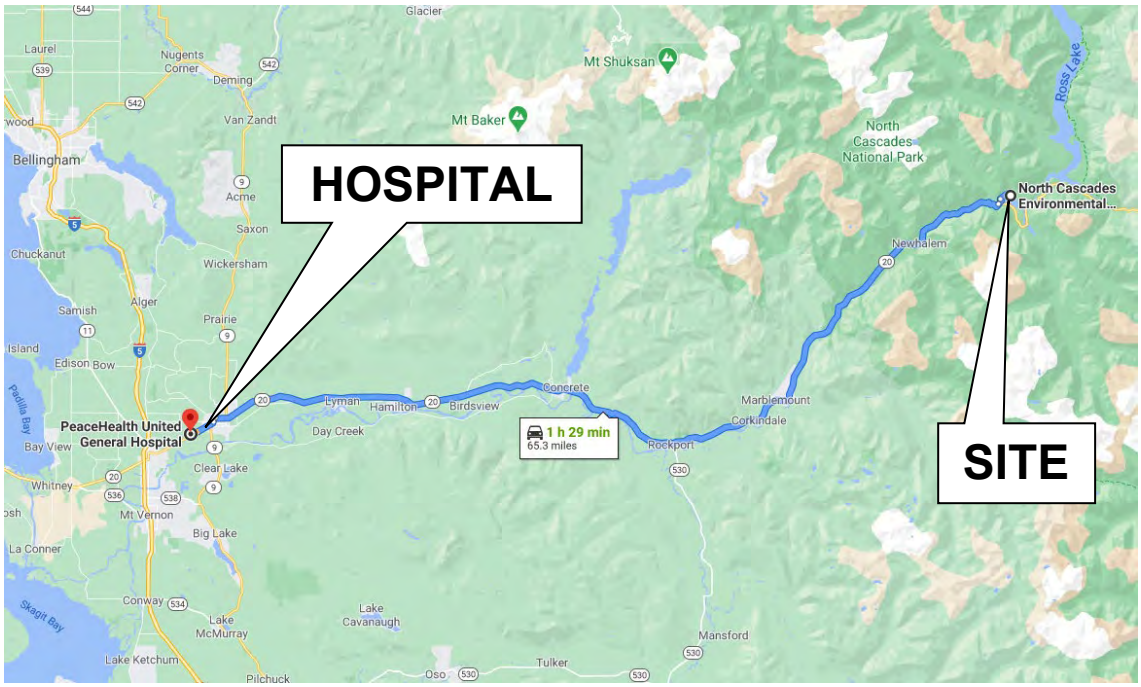
Printed Name	Signature	Employee No.	Date

SUBCONTRACTOR'S FIELD CREW

Please sign below to acknowledge that this THA was made available to you, and you had an opportunity to ask questions about the information herein.

Printed Name	Signature	Company Name	Date

ROUTE FROM DIABLO DRYDOCK SITE TO URGENT CARE AND EMERGENCY FACILITIES



HOSPITAL INFORMATION:

PeaceHealth United General Hospital
360-856-6021
2000 Hospital Drive
Sedro-Woolley, Washington 98284

DIRECTIONS TO HOSPITAL FROM SITE

- Start: North Cascades Environmental Learning Center, 1940 Diablo Dam Rd, Rockport, WA 98283
  - Head north on Diablo Dam Rd (0.8 miles)
  - Turn left to stay on Diablo Dam Rd (0.5 miles)
  - Turn right onto WA-20 W (61.8 miles)
  - At the traffic circle, continue straight onto W Moore St (0.1 miles)
  - Continue onto Bingham St/Borseth St (0.2 miles)
  - At the traffic circle, continue straight onto WA-20 W/Borseth St (1.7 miles)
  - Turn right onto Hospital Dr (0.1 miles)
  - Turn left to stay on Hospital Dr, destination on the right (302 feet)
- End: PeaceHealth United General Hospital, 2000 Hospital Dr, Sedro-Woolley, WA 98284

TASK HAZARD ANALYSIS (Ver. 2, June 2015)

Geosyntec HS Procedures referenced herein are available on Geosyntec's H&S SharePoint site and should be consulted, as appropriate, per project-specific needs. This THA prepared per HS-106-Accident Prevention Program, HS-204-Task Hazard Analysis, and meets the requirements for a "Site-Specific Health and Safety Plan" per regulations and Geosyntec HS Procedures referenced herein (see Section B.14.).

PART A – SITE SAFETY PLAN

A.1. PROJECT/TASK INFORMATION

TASK:	Diablo Reservoir Drydock Upland Site Visit		
Project Name:	Diablo Dry Dock Engineering Evaluation/Cost Analysis	**Project Number/Org:**	PNG0913/3010
Project Address:	Adjacent to the North Cascades Environmental Learning Center 1940 Diablo Dam Road Diablo, Washington 98283		
Description of Task & Worksite:	A Site visit will be performed by Geosyntec Employees who currently live in Washington State. The Site visit is being performed for future field-work planning purposes.		

Geosyntec Personnel	Name	Desktop Office Phone	Cell Phone
Site Lead/H&S Officer	Anne Fitzpatrick	206-496-1461	206-963-8199
Project Manager	Anne Fitzpatrick	206-496-1461	206-963-8199
Project Director	Sean Ragain	206.496.1463	281.229.1335
H&S Coordinator	Erin Dunbar	971.271.5907	503-702.0205
Regional H&S Mngr.	Joe Esseichick	971.251.5916	360.901.6175
Corp. H&S Director	Bob Poll	813-379-4420	813-240-9231
Client Contact(s):	Tom Meyer	206 665-5750	
Subcontractor(s):	☒ Not Applicable ☐ Applicable, provide contact information below:		
ETHICS POINT HOTLINE	US & Canada: 844-231-3371		

A.2. EMERGENCY RESPONSE

Based on analysis of worksite factors, client/regulatory requirements, availability of emergency services.

Consider all Relevant Risk Factors & Response Procedures *(fire/explosion, medical, chemicals/spills, security, site factors, weather, communications)*.
EXPLANATORY NOTES, CLARIFICATIONS: Geosyntec employees will check in at the National Park Service Administrative Building in the Washington State town of Newhalem. Temperatures will be taken and recorded, following National Park Service COVID 19 policies. If Geosyntec employee temperature fall within the acceptable range, they will transit to the Site, which is located on the shore of Diablo Reservoir. Covid-19 tests are not required by Washington State residents prior to visiting the site, as long as team members do not have signs of symptoms nor have been recently been in contact with persons who have testing positive. Residents outside of Washington State require a Covid-19 test before entering private City property. Relevant Washington State, National Park service, and Geosyntec COVID 19 precautions, laws, and procedures will be followed at all times (See Attachments 3, and 5).

In the event of an emergency, field-personnel will evacuate to the Environmental Learning Center Parking lot, following the routes presented in Attachment 2 to this THA.

Anne Fitzpatrick will be the Geosyntec COVID-19 Site Supervisor for construction work at the Site (See Attachment 5). All COVID 19 health monitoring of Geosyntec employees will be performed and enforced by A. Fitzpatrick.

Available Means of Jobsite Emergency Communication/Alerting	☒ Verbal ☒ Cell Phone ☐ Land Line ☐ 2-Way Radio ☐ On-site alarm/signal system ☐ Other:
To Summon Emergency Services Police, Fire, Ambulance	☒ **DIAL 911**, for external responders ☐ **Other**:
Other Emergency Contacts, as needed *(such as security, spill responder, utility):*	
Nearest Emergency Medical Services	Hospital Name: PeaceHealth United General Hospital Address: 2000 Hospital Drive Sedro-Woolley, Washington 98284 Phone #: 360-856-6021 ☒ See Attached Directions
For **Non-Emergency Urgent Care**	☒ Contact WorkCare, 24/7 at: 888-449-7787 ☐ Other:
Job-site **Evacuation** Procedure, Rally Point, Place of refuge:	The Site is located adjacent to the north shore of Diablo Lake (adjacent to the North Cascades Environmental Learning Center). See Attachment 2 for a Site Evacuation Map (Figure 3 from the project Health and Safety Plan).

Special Emergency Equipment/Procedures	For COVID 19 safety measures, follow "Field Work COVID 19 General Prevention Measures" guideline (Attachment 3) and the Washington State Construction COVID Procedure Document (Attachment 5). Core safety measures include: Maintain social distancing (where possible); Wear mask or cloth face covering, where social distancing cannot be maintained; Wash hands frequently for minimum 20 sec with soap and water; Use hand sanitizer and hand wipes periodically if hand-washing capability is not readily available; Avoid touching surfaces if not necessary; Use sanitary wipes to wipe handles of field tools and equipment prior to start of work. Anne Fitzpatrick will be the Geosyntec COVID-19 Site Supervisor for construction work in Washington State (See Attachment 5).

IMPORTANT: After initial emergency response actions and incident stabilization, contact appropriate project personnel listed in Part A.1.

A.3. SUMMARY OF WORK STEPS, HAZARDS, CONTROLS

Based on **PART B, "HAZARD ANALYSIS,"** and worksite/client/project factors.

Summary/outline of work steps/hazards/controls, with references to applicable Sections in Parts B and C, as applicable: The main hazards associated with the Site visit include, driving to/from the Site, exposure to the COVID 19 virus, and use of hand tools.

WORK STEPS	HAZARDS	CONTROLS
All steps	*Catching or spreading COVID-19 through contact with surfaces or being in close proximity to other people.*	*Maintain a 6-foot distance from others, when possible, and take other social distancing measures when able. Take separate vehicles to/from the field site.* *Ask those showing COVID-19 symptoms to dismiss yourself from work and self-isolate. Do not arrive to the work area with flu-like symptoms, including cough, fever, or respiratory illness. (See COVID-19 Supplemental Attachment 3). Also, see Attachment 5: Washington State Construction COVID Requirements.* *Maintain personal hygiene (cough into elbow or tissue, and wash hands frequently).* ***Every worker has Stop Work Authority if they deem risks are unacceptable***
Mobilization and Demobilization	*Driving*	*Drive Defensively* *Don't use cell phones while driving* *Follow federal and state traffic laws* *Follow HS-105 Driver and Vehicle Safety (Attachment 4)*
Pre-work set-up: Conduct tailgate safety meeting;	*Slip/trip/fall with uneven ground.* *Weather related hazards such as sun exposure and/or potential for extreme temperatures.*	*Wear hardhat in locations as required.* *Dress for weather conditions, apply sunscreen as needed.* *Follow guidance in HS-202 Safety Meetings (Attachment 4)*
Site Tour	*Heat stress and cold stress* *Exposure to animals, insects, and plants* *Use of hand tools (machete)*	*Keep hydrated and use sunscreen as well as a hat. Wear eye protection and work gloves when using hand tools. Maintain a safe distance from people using hand tools such as machetes. Be aware of surroundings, and stay clear of hazardous animals, insects, and plants.* *Follow HS113- Personal Protective Equipment and Follow HS-502 Manual Hand Tools, both in Attachment 4.*

A.4. H&S EQUIPMENT LIST

List worksite equipment for worker protection; provide details in Explanatory Notes, Clarifications.

EXPLANATORY NOTES, CLARIFICATIONS: Aside from required PPE (hardhats, safety glasses, safety-toe shoes, sleeved work shirt, full length trousers, and high visibility clothing), work gloves will be needed when using hand tools (HS-113 and HS-502). Geosyntec will bring a field first aid kit and fire extinguisher. Individuals are responsible for sunscreen and drinking water. Extra personal hygiene chemicals will need to be available such as soap and hand sanitizer to minimize the transmission of the virus.

☒	**ROUTINE PPE**	☒ Standard work clothes appropriate for task ☒ Hard-toed boots/shoes ☐ Hardhat ☒ Safety glasses	☒ Work gloves appropriate for task ☒ High visibility/reflective vest
☒	**ROUTINE H&S EQUIPMENT/GEAR**	☒ First Aid Kit	

PART B – HAZARD ANALYSIS *Complete Section B.1., then subsequent sections as applicable to the task(s).*

B.1. ROUTINE HAZARD PREPAREDNESS **This section required for all tasks.**

Explanatory Notes, Clarifications: Care will need to be taken regarding COVID-19 transmission. Maintain as much distance as is practical between people. Ask that people who develop the symptoms of COVID-19 leave the work site (See COVID-19 Supplemental Attachments 3 and 5). Take precautions when meeting at the parking areas, don't leave your vehicle alone and use the buddy system. No work will be completed alone. Follow the proper precautions when using manual hand tools.

General Safety, Wellness, Preparedness – **Workers are encouraged to engage in workplace and lifestyle behaviors that facilitate wellness and safety; delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.**

☒ **General premises** hazards - housekeeping, rough terrain, trip hazards, steep slope, remote location.

☒ **Weather/climate-related hazards** – heat stress/cold stress measures, sun screen, severe weather shelter/refuge, "30/30 rule" for lightning

☒ **Plant/Insect/Animal Hazards** - Precautions: poison ivy wash; insect repellant; check for ticks; hornet nest spray; animal precautions.

☐ **Worksite traffic hazards** – Implement measures to protect personnel (high visibility/reflective clothing, on-person lighting, traffic control measures).

☒ **Manual hand tools** - Use hand tools in accordance with "HS-502-Manual Hand Tools." USE OF OPEN-BLADED UTILITY/FOLDING/COLLAPSIBLE/FIXED BLADE KNIVES IS PROHIBITED. Cutting tools with appropriate safety features (automatically- retracting blades, enclosed/guarded blades) are permitted

Geosyntec Procedures: *HS-502-Manual Hand Tools*

Routine Personal Protection – **Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.**

☐ **Overhead Hazards** - Wear hardhat or "bump cap" as appropriate for hazard.

☒ **Hand injury hazards** - Wear protective work gloves appropriate for the hazard and work tasks.

☒ **Eye injury hazards** - Wear safety glasses (with side shield or wrap around, either clear or shaded for sun protection), or other appropriate eye protection.

☒ **Foot hazards, rough terrain** - Wear work boots/shoes with hard toes, ankle support, puncture resistance, traction, as appropriate for conditions.

Geosyntec Procedures

HS-113-Personal Protective Equipment, HS-105-Driver and Vehicle Safety

Routine Driving Hazards – **Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.**

☒ **Routine work travel** - Use routine safe/defensive driving practices (seat belts, safe speeds, eyes ahead, no tailgating, limit distractions, safe cell phone use, no texting, clear windows, account for weather/road conditions, adequate sleep, other measures as appropriate).

☒ **Unfamiliar location** - Plan travel route before driving (assemble maps, enter destination in GPS).

☒ **Long Distance or During Sleep Hours** – Minimize fatigue: rest breaks, light snacks (avoid heavy meals), stay hydrated, fresh air, no loud music, clean windshield.

☐ **Unfamiliar vehicle** – Become familiar with vehicle operational controls and handling characteristics before operating vehicle.

Geosyntec Procedures: *HS-105-Driver and Vehicle Safety*

B.2. SPECIAL DRIVING/TRAFFIC/TRANSPORTATION HAZARDS	☐ Applicable	☒ Not Applicable, Not Anticipated
B.3. WATER/BOATING HAZARDS	☐ Applicable	☒ Not Applicable or Not Anticipated
B.5. POWERED TOOLS, EQUIPMENT, MACHINERY	☐ Applicable	☒ Not Applicable, Not Anticipated
B.6. DRILLING	☐ Applicable	☒ Not Applicable, Not Anticipated
B.7. CONSTRUCTION, HEAVY EQUIPMENT, LIFT EQUIPMENT	☐ Applicable	☒ Not Applicable, Not Anticipated
B.8. ELECTRICAL HAZARDS	☐ Applicable	☒ Not Applicable, Not Anticipated
B.9. UTILITY RELATED HAZARDS	☐ Applicable	☒ Not Applicable, Not Anticipated
B.11. STORAGE OF BULK MATERIALS	☐ Applicable	☒ Not Applicable, Not Anticipated
B.12. INFECTIOUS / ALLERGENIC BIOHAZARDS	☒ Applicable	☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: For COVID 19 safety measures, follow "Field Work COVID 19 General Prevention Measures" guideline attached. Core safety measures include: Maintain social distancing; Wear mask or cloth face covering, where social distancing cannot be maintained; Wash hands frequently for minimum 20 sec with soap and water; Use hand sanitizer and hand wipes periodically if hand-washing capability is not readily available; Avoid touching surfaces if not necessary; Use sanitary wipes to wipe handles of field tools and equipment prior to start of work. Also, the work will take place in Washington State, so the rules presented in Attachment 5 (COVID Job Site Requirements) must be followed. A. Fitzpatrick will be the COVID 19 Supervisor for Geosyntec.

☒	☒ Other (describe above)	☒ More severe hazard - add protective clothing, respirator/dust mask, decon, as appropriate.

B.13. COMMERCIAL CHEMICAL PRODUCTS	☐ Applicable	☒ Not Applicable, Not Anticipated
B.14. SITE CONTAMINANTS, CHEMICAL WASTES	☒ Applicable	☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Soil at the Site could potentially contain metals and/or polyaromatic hydrocarbons. Exposure is not anticipated because there will be no sample collection and contact with the soil is not anticipated. Proper hygiene practices will be followed such as washing hands before eating.

CHECK ALL THAT APPLY. Provide explanatory notes above.

☒ Soil/groundwater contaminants (historical release)	☒ Metals, metal compounds, metal dusts ☒ Polyaromatic hydrocarbons (PAHs)	

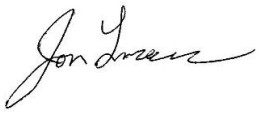
☒	**FOR WORK CONSISTING OF CLEANUP OPERATIONS, CORRECTIVE ACTIONS, PRELIMINARY INVESTIGATIONS at an "UNCONTROLLED HAZ. WASTE SITE" (per HAZWOPER, 29 CFR 1910.120), implement the following as applicable to the work:** - Implement site control plan via Exclusion Zone(s), Contaminant Reduction Zone(s) and Support Zone (aka EZ, CRZ, SZ) - Workers to be aware of and trained on hazards per OSHA Hazard Communication Standard. - Include site map/figure depicting work locations and other relevant site-specific information. - Site workers in EZ or CRZ to have OSHA 40-hour training, current 8-hour refresher, 3 days supervised field experience. - Site supervisor(s) required to have 8-hr. Supervisor training. - Site workers in EZ or CRZ to participate in Medical Monitoring program, as applicable. - Implement site-specific procedures for worker protection via engineering controls, work practices, personal protective equipment (PPE), air monitoring, decontamination procedures, spill containment, emergency preparedness and response. - Conduct air monitoring, as appropriate (see Part C, "Air Monitoring, Worker Exposure Monitoring"). **IMPORTANT:** Provide supplemental information to sufficiently detail site-specific procedures for the above elements, as appropriate for the work. ***Geosyntec Procedures:*** *HS-301-HAZWOPER, HS-108-Medical Monitoring Surveillance, HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, HS-115-Hazard Communication, HS-405-Drum Sampling, Others as applicable*
B.15. RADIATION HAZARDS (Other than Sunlight)	☐ Applicable ☒ Not Applicable, Not Anticipated
B.16. HAZMAT/DANGEROUS GOODS SHIPPING/TRANSPORTATION	☐ Applicable ☒ Not Applicable, Not Anticipated

PART C – AIR MONITORING, WORKER EXPOSURE MONITORING

C.1. AIR MONITORING (Direct-Reading Instruments)	☐ Applicable ☒ Not Applicable, Not Anticipated

PART D – APPROVALS, ACKNOWLEDGEMENTS

D.1. THA PREPARATION, REVIEW/APPROVAL SIGNATURES - THA typically prepared by project staff, reviewed/approved by Project Manager, Supervisor, qualified/knowledgeable designee, with support of HS personnel as deemed appropriate by the Project Manager.

	Printed Name	*Signature*	*Date*
THA PREPARED BY: (minimum one person)	J. Laurance		09/29/2020
THA REVIEWED/ APPROVED BY: (minimum one person)	J. Hickey		09/29/2020

D.2. FIELD CREW ACKNOWLEDGEMENTS

GEOSYNTEC FIELD CREW
Please sign below to acknowledge you reviewed and understand this THA, participated in project safety briefing and had an opportunity to ask questions about the information herein.

Printed Name	Signature	Employee No.	Date
Anne Fitzpatrick			
Brent Miller			

Geosyntec consultants

TASK HAZARD ANALYSIS (Ver. 2, June 2015)

Geosyntec HS Procedures referenced herein are available on Geosyntec's H&S SharePoint site and should be consulted, as appropriate, per project-specific needs. This THA prepared per HS-106-Accident Prevention Program, HS-204-Task Hazard Analysis, and meets the requirements for a "Site-Specific Health and Safety Plan" per Geosyntec HS Procedures and regulations referenced herein (see Section B.14.).

PART A – SITE SAFETY PLAN

A.1. PROJECT/TASK INFORMATION

TASK:	Soil Sampling		
Project Name:	Engineering Evaluation/Cost Analysis Field Work	**Project Number/Org:**	PNG0913/3010
Project Address:	Adjacent to the North Cascades Environmental Learning Center 1940 Diablo Dam Road Diablo, Washington 98283		
Description of Task & Worksite:	Soil samples will be collected on site from shallow borings using a small direct-push drill rig (such as a GeoProbe 540NT), test-pits utilizing excavation equipmen, and/or hand boring methods. There will be approximately 13 boring/test-pit locations. The soil sample collection will take approximately two to three days. The direct-push rig will also be used to collect the nearshore, intertidal "sediment samples," if possible.		

Geosyntec Personnel	**Name**	**Desktop Office Phone**	**Cell Phone**
Site Lead/HS Officer	Luke Smith	206-496-1452	319-400-2447
Project Manager	Joey Hickey	971-271-5897	503-730-6608
Project Director	Anne Fitzpatrick	206-496-1461	206-963-8199
HS Coordinator	Erin Dunbar	971-271-5916	360-901-6175
Regional HS Mngr.	Joe Esseichick	720-509-8906	734-417-0909
Corp. HS Director	Bob Poll	813-379-4420	813-240-9231
Client Contact(s):	Tom Meyer		206-665-5750
Subcontractor(s):	☐ Not Applicable ☒ Applicable, provide contact information below:		

A.2. EMERGENCY RESPONSE

Based on analysis of worksite factors, client/regulatory requirements, availability of emergency services.

Consider all Relevant Risk Factors & Response Procedures *(fire/explosion, medical, chemicals/spills, security, site factors, weather, communications)*.
EXPLANATORY NOTES, CLARIFICATIONS: When utilizing drilling equipment, the field team will meet the drilling subcontractor at the Site entrance, which is defined in the Health and Safety Plan (HASP) for this project. Geosyntec staff will escort subcontractors when working on Site.

Available Means of Jobsite Emergency Communication/Alerting	☒ Verbal ☒ Cell Phone ☐ Land Line ☐ 2-Way Radio ☐ On-site alarm/signal system ☐ Other:
To Summon Emergency Services Police, Fire, Ambulance	☒ **DIAL 911**, for external responders ☐ **Other**:
Other Emergency Contacts, as needed *(such as security, spill responder, utility):*	Spills-National Response Center: 800-424-8802 Report the spill immediately to BOTH: 1-800-258-5990 (Washington Emergency Management Division) 1-800-424-8802 (National Response Center)
Nearest Emergency Medical Services	Hospital Name: PeaceHealth United General Hospital Address: 2000 Hospital Drive Sedro-Woolley, Washington 98284 Phone #: 360-856-6021 Phone #: 360-856-6021
For **Non-Emergency Urgent Care**	☒ Contact WorkCare, 24/7 at: 888-449-7787 ☐ Other:
Job-site **Evacuation** Procedure, Rally Point, Place of refuge:	Field work will be located on upland portions of the Site which is adjacent to the north shore of Diablo Lake (adjacent to the North Cascades Environmental Learning Center). If there is an emergency, the field team will head to the Parking Area Muster Point which is defined in the HASP.

Special Emergency Equipment/Procedures	For COVID 19 safety measures, follow "Field Work COVID 19 General Prevention Measures" guideline Attachment G of the Health and Safety Plan for this project. Core safety measures include: Maintain social distancing (where possible); Wear mask or cloth face covering, where social distancing cannot be maintained; Wash hands frequently for minimum 20 sec with soap and water; Use hand sanitizer and hand wipes periodically if hand-washing capability is not readily available; Avoid touching surfaces if not necessary; Use sanitary wipes to wipe handles of field tools and equipment prior to start of work Social distancing on the vessel will not be practical. To minimize the risk of transmission, only one Geosyntec Employee will oversee the survey work.

IMPORTANT: After initial emergency response actions and incident stabilization, contact appropriate project personnel listed in Part A.1.

A.3. SUMMARY OF WORK STEPS, HAZARDS, CONTROLS

Based on **PART B, "HAZARD ANALYSIS,"** and worksite/client/project factors.

Summary/outline of work steps/hazards/controls, with references to applicable Sections in Parts B and C, as applicable: Driving to/from site includes hazard of potential collision with objects, can be potentially controlled by following traffic rules, wearing seatbelt ,and keeping two hands on the wheel. Conducting soil sampling events includes hazards of potential slips, trips, falls, exposure to contaminants of concern, and weather hazards (cold/heat/rain). These hazards can be potentially controlled by wearing the appropriate PPE including, but not limited to: sturdy boots/footwear, having proper foot placement, wearing proper clothing for cold/heat/rain elements, and having OSHA 40-hour training.

WORK STEPS	HAZARDS	CONTROLS
All steps	*Catching or spreading COVID-19 through contact with surfaces or being in close proximity to other people.*	*Maintain a 6-foot distance from others, when possible, and take other social distancing measures when able. Take separate vehicles to/from the field site.* *Ask those showing COVID-19 symptoms to dismiss yourself from work and self-isolate. Do not arrive to the work area with flu-like symptoms, including cough, fever, or respiratory illness. (See COVID-19 Supplemental Attachment).* *Maintain personal hygiene (cough into elbow or tissue, and wash hands frequently).* ***Every worker has Stop Work Authority if they deem risks are unacceptable***
Mobilization and Demobilization	*Driving*	*Drive Defensively* *Don't use cell phones while driving*
Pre-work set-up: Conduct tailgate safety meeting; establish work areas and set-up decon area;	*Slip/trip/fall with uneven ground.* *Weather related hazards such as sun exposure and/or potential for extreme temperatures.*	*Wear hard hat in locations as required.* *Dress for weather conditions (including modified level D PPE for this task – see below). Apply sunscreen as needed.* *Follow established hazard work zone protocals.*
Conduct soil sampling	*Contaminant exposure from soils and vapors; Sharp edges on tools; slips, trips, and falls.*	*Use of personal protective clothing: nitrile gloves, safety glasses, half face mask, safety glasses, Tyvek suit, and boot covers (if warranted). Conduct periodic screening in work zone with detector. Take time and work carefully while collecting samples and working with hand augers.*
Screen soils	*Contaminant exposure from recovered soils.*	*Use of personal protective clothing: nitrile gloves, safety glasses, half face mask, safety glasses, Tyvek suit, and boot covers (if warranted). Conduct periodic screening in work zone with detector.*
Equipment decontamination	*Slip/trip/fall; dermal exposure to chemicals in wastewater.*	*Pay close attention to foot placement; slow deliberate movement – do not hurry. Be sure adequate PPE is being used – especially nitrile gloves and safety glasses*
Outdoor Work	*Heat stress and cold stress* *Animals, bugs, and individuals.*	*Keep hydrated and use sunscreen as well as a hat. Wear eye protection, and appropriate PPE. Be cautious of hostile individuals and do not confront.*

A.4. H&S EQUIPMENT LIST

List worksite equipment for worker protection; provide details in Explanatory Notes, Clarifications.

EXPLANATORY NOTES, CLARIFICATIONS: Wear high visibility clothing at all times. Wear safety glasses when operating any equipment to prevent eye injuries. Will bring portable first aid kit. Extra hand sanitizer and disinfecting chemicals will be on-Site for use in disinfecting frequently touched surfaces in order to minimize the risk of COVID-19 transmission (See COVID-19 Supplemental Attachment). Will bring supplies to construct field handwashing station.				
☒	**ROUTINE PPE**	☒ Standard work clothes appropr task ☒ Hard-toed boots/shoes ☒ Hardhat ☒ Safety glasses	☒ Work gloves appropriate for task ☒ Noise/hearing protection ☐ High-visibility/reflective vest ☐ Ice creepers (boot attachments)	
		☐ Basic PPE for protection from low-hazard chemical contact & dust (nitrile gloves).		
☒	**ROUTINE H&S EQUIPMENT/GEAR**	☒ First Aid Kit ☐ Fire extinguisher ☐ Emergency eyewash bottle(s) ☐ Insect control (repellant, wasp spray, other) ☒ Caution tape	☒ Sun protection (sunscreen, shade canopy, other) ☒ Project-supplied drinking water and/or hygiene facilities ☐ Poison ivy skin wash (Technu or similar) ☐ Vehicle emergency kit (flares, lights, reflective device) ☐ Traffic control warning devices (cones, or similar)	
		☐ Other:		
☐	**NON-ROUTINE PERSONAL PROTECTIVE EQUIPMENT (PPE)** (Indicate specific types of PPE in Explanatory Notes, Clarifications)	☐ Goggles and/or face shield ☐ Chemical protective gloves ☐ Coveralls (Tyvek, or other) ☐ Outer boots, boot covers	☐ Disposable n-95 dust mask ☐ Half-face respirator (APR), cartridges ☐ Full-face respirator (APR), cartridges ☐ Personal flotation device	☐ Fire retardant clothing ☐ Arc Flash Protection ☐ Electrical-Hazard-rated boots, gloves ☐ Personal fall apparatus
		☐ Other:		
☐	**SPECIAL HAZARD CONTROLS**	☐ Portable GFCI	☐ Lockout/tagout equipment	☐ Ventilation equipment (fan, blower)
		☐ Eyewash - 15 min. flow	☐ Emergency deluge shower	☐ Air horn, alarm
		☐ Other:		
☐	**DECON, PPE DISPOSAL**	☐ Receptacle for disposable PPE	☐ Hand washing provisions	☐ Decon solution, related supplies
		☐ Other:		
☐	**AIR MONITORING EQUIPMENT, OTHER EQUIPMENT FOR WORKER EXPOSURE TESTING**	List equipment/devices to be brought to worksite; Use in accordance with procedures in Part C:		

PART B – HAZARD ANALYSIS and CONTROLS *Complete Section B.1., then subsequent sections as applicable to the task(s).*

B.1. ROUTINE HAZARD PREPAREDNESS **This section required for all tasks.**

Explanatory Notes, Clarifications: : Work will be scheduled for daylight hours, but gear loading/unloading may take place during twilight/dusk hours and lighting should be provided (e.g. headlamps/flashlights). Care will need to be taken regarding COVID-19 transmission. Maintain as much distance as is practical between people. Ask that people who develop the symptoms of COVID-19 leave the work site (See COVID-19 Supplemental Attachment). Take precautions when meeting at the parking areas, don't leave your vehicle alone and use the buddy system. No work will be completed alone.

General Safety, Wellness, Preparedness – **Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.**

☒ **General premises** hazards - housekeeping, rough terrain, trip hazards, steep slope, remote location.
☒ **Weather/climate-related hazards** – heat stress/cold stress measures, sun screen, severe weather shelter/refuge, "30/30 rule" for lightning
☒ **Plant/Insect/Animal Hazards** - Precautions: poison ivy wash; insect repellant; check for ticks; hornet nest spray; animal precautions.
☐ **Worksite traffic hazards** – Implement measures to protect personnel (high visibility/reflective clothing, on-person lighting, traffic control measures).
☐ **Illumination hazards/night work** - Illuminate work areas and/or access routes, use reflective/hi-visibility clothing or on-person lighting, as appropriate.
☒ **Lifting, manual material handling** – use proper lifting procedures, seek help for >50 lbs.

Geosyntec Procedures: *HS-124-Heat Stress, HS-125-Cold Stress, HS-127-Ticks, HS-208-Housekeeping, HS-210-Walking and Working Surfaces, HS-401-Back Injury Prevention, HS 517 Traffic Safety*

Routine Personal Protection – **Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.**

☒ **Head protection from overhead hazards** - Wear hardhat or "bump cap" as appropriate for hazard.
☒ **Hand protection** - Wear protective work gloves appropriate for the hazard and work tasks.
☒ **Eye protection** - Wear safety glasses (with side shield or wrap around, either clear or shaded for sun protection), or other appropriate eye protection.
☒ **Foot protection, rough terrain** - Wear work boots/shoes with hard toes, ankle support, puncture resistance, traction, as appropriate for conditions.
☒ **Hearing protection** – use earplugs, earmuffs (or both) as appropriate for conditions; at a minimum where noise levels exceed 85dBA.

☒ **Dust, unsanitary conditions** – For general protection against minimal non-specific hazards, use protective clothing and/or disposable dust mask, as needed.

Geosyntec Procedures: *HS-109-Hearing Conservation, HS 112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-207-Working Alone, HS-105-Driver and Vehicle Safety*

Tools, Equipment, Machinery – **Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.**

☒ **Manual hand tools -** proper tool for the job, maintain in good condition, use vise/clamp to hold work piece, proper follow through, stay clear of "line of fire."

☒ **Knives, cutting tools -** Utility/folding/collapsible knives and fixed open-bladed knives/cutting tools are *not* permitted, unless specifically authorized. Cutting tools with automatically-retracting blades, or with enclosed/guarded blades are permitted. See HS-502-*Manual Hand Tools* for additional Information.

☒ ***Working near*** **powered tools/equipment/machinery** – safe distance, heed warning signs, stay out of "line of fire," use PPE (for eye/hearing/dust protection).

☒ ***Operation/use of*** **powered tools/equipment/machinery – See Section B.5.**

HS-502-Manual Hand Tools

Security– **Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.**

☐ **High crime, urban** – Use appropriate measures for personal security (such as buddy system, security service, work scheduling, other measures)

☐ **Working alone** - Establish "check in" procedure with supervisor/project manager.

Geosyntec Procedures: *HS-207-Working Alone*

Routine Driving Hazards – **Delineate site-specific HS aspects, as appropriate, in "Explanatory Notes, Clarifications," above.**

☒ **Routine work travel** - Use routine safe/defensive driving practices (seat belts, safe speeds, eyes ahead, no tailgating, limit distractions, safe cell phone use, no texting, clear windows, account for weather/road conditions, adequate sleep, other measures as appropriate).

☒ **Unfamiliar location** - Plan travel route before driving (assemble maps, enter destination in GPS).

☐ **Long Distance or During Sleep Hours** – Minimize fatigue: rest breaks, light snacks (avoid heavy meals), stay hydrated, fresh air, no loud music, clean windshield.

☐ **Unfamiliar vehicle** – Become familiar with vehicle operational controls and handling characteristics before operating vehicle.

Geosyntec Procedures: *HS-105-Driver and Vehicle Safety*

B.2. SPECIAL DRIVING/TRAFFIC/TRANSPORTATION HAZARDS ☒Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: : Staff will drive on highways, urban roadways, and at boat ramps. Field team will need to watch for car and boat trailer traffic. Workers will travel to the Site separately to minimize the chances of exchanging COVID-19 (See COVID-19 Supplemental Attachment).

☐	**SPECIAL DRIVING HAZARDS** Off-Road Driving or use of non-typical vehicle, heavy vehicle, van, golf/utility cart, ATV Hazards: Worker injury due to vehicle collision, rollover	☐ For off road driving, do not exceed capability of vehicle, beware of wet conditions, speed low, avoid unsafe orientation on slopes. ☐ Follow ATV specific procedures for training, safety equipment, operation, manufacturer's instructions. ☐ Special Skills Required for Vehicle type - For vehicles requiring special skills (such as windowless van, heavy work vehicle, utility vehicle, similar) ensure operator is provided training and/or has appropriate operator skills through experience. ***Geosyntec Procedure(s):*** *HS-510-All Terrain Vehicles*
☒	**TRANSPORTING MATERIALS, TOWING/HAULING LOADS** Hazards: Vehicle accident, occupant injury from shifting load, unsafe equipment.	☒ Ensure load is firmly secured (rope, straps, load configuration) to prevent shifting during travel. ☐ Slings, chains, strap, rope and related equipment used for towing, hauling, load-securing shall be appropriate for use, and used in a manner as to prevent an unsafe condition. ☐ For trailer use, verify signal/braking lights operational, rear-view mirrors effective, hitch/safety chains secure.
☐	**WORKSITE TRAFFIC HAZARDS** Where the project worksite is located in/near vehicle thoroughfare. Hazards: Worker injury from being struck by vehicle traveling in thoroughfare.	☐ Wear reflective vests where exposed to traffic hazards. ☐ Where possible, park vehicles as protective shield from oncoming traffic. ☐ Configure work area and support vehicles to minimize worker exposure to traffic hazards. ☐ Use DOT signal devices to re-route vehicles around work area, site entrances/exits. ☐ Use DOT-trained flaggers or police detail where appropriate or required. ***Geosyntec Procedure(s):*** *HS-517-Traffic Safety*
☐	**RAILROAD HAZARD** Hazard: Worker injury from being struck by train in R.R. right-of-way	☐ Coordinate with rail company and implement required safety and security measures. ☐ Site workers to receive safety training for railroad work. **Geosyntec Procedure(s):** HS-305-Rail Operations
☐	**WATER TRANSPORTATION**	☐ Follow HS 312 "Water Transportation Safety," and Section B.3., "Water/Boating Hazards." **Geosyntec Procedure(s):** HS-312-Water Transportation Safety

☐	**AIRPORT, AIRCRAFT** Worker injury when working on/near airport runway, or use of helicopter, light aircraft	☐ Coordinate safety requirements with Airport personnel and implement required safety measures. ☐ Site workers to receive safety training for railroad/airport work. ☐ Follow provisions of applicable Geosyntec HS Procedures, below: ***Geosyntec Procedure(s):*** *HS-310-Helicopter Safety, HS 311-General Aviation (Small Aircraft) Safety*
☐	**TRAFFIC/VEHICLE HAZARDS REALATED TO HEAVY EQUIPMENT, CONSTRUCTION SITE ACTIVITIES**	☐ See Section B.7., "Construction, Heavy Equipment, Lift Equipment"

B.3. WATER/BOATING HAZARDS ☐ Applicable ☒ Not Applicable or Not Anticipated

B.4. FALL HAZARDS ☐ Applicable ☒ Not Applicable, Not Anticipated

B.5. POWERED TOOLS, EQUIPMENT, MACHINERY ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Subcontractors will be operating powered drilling equipment and powered ancillary equipment. Care will be taken when around operating machinery.

☒	**POWERED HAND TOOLS** ☒ Battery-operated ☐ Electric-powered, 120v/240v ☐ Fuel-powered ☐ Pneumatic ☐ Powder-actuated Hazards: Eye/hand/body injury, fuel-related hazards, Inhalation hazards, noise, sparks, heat, fire hazard, electrical hazards	☒ For all power tools: • Inspect tools to ensure safe operating condition before each use. • Use tool in accordance with manufacturer's specifications. • Ensure guards are in place and no hazardous equipment modifications. • Use PPE or other safety practices, as appropriate, for eye/hearing/hand/head/body protection. • Provide training or verify operator competency for use of power tool. • Stay clear of hazard zone, "line of fire," when working near where power tools are used. • For spark/heat generating tool, control fire hazards, segregate combustible/flammable materials. • Use vise/clamp/work bench or other appropriate means to hold/secure the work piece. ☐ Use respirators, ventilation, wet methods, other appropriate means to control inhalation hazard. ☐ See fuel-safety practices in Section B.13., "Commercial Chemical Products." ☐ For electrical hazards, see Section B.8., "Electrical Hazards". ***Geosyntec Procedure(s):*** *HS-109-Hearing Conservation, HS-113-Personal Protective Equipment, HS-121-Electrical Safety, HS-503-Powered Hand Tools, Others as applicable*
☐	**OPERATION OF EQUIPMENT/MACHINERY** ☐ Point-of-operation hazards ☐ Pinch points, moving parts ☐ 'Struck-by,' 'caught between' ☐ Hot surfaces, heat ☐ Extension cords, flexible wire ☐ Fuel related (gas or liquid) ☐ Hydraulic pressure ☐ Pneumatic pressure ☐ Kinetic, stored energy ☐ Noise ☐ Emissions, discharge gases ☐ Working at heights, falls ☐ Lifting, repetitive motion ☐ Illumination ☐ Electrical	☐ <u>General safety requirements for equipment, machinery:</u> • Arrange worksite for safe access to equipment/machinery. • Use equipment/machinery in accordance with manufacturer's use and safety instructions. • Ensure point-of-operation, mechanical power transmission, other moving parts are guarded with protective devices; do not override interlocks, guards, protective devices. • Secure long hair/loose clothing/hanging jewelry near moving/rotating parts. • Heed warning signs/labels, keep safe distance; avoid locations of "struck by" and "caught between" hazards. • Implement lockout/tagout for repairs/adjustments/tooling changes. ☐ Use safe lifting practices for movement of heavy portable equipment ☐ Implement safe work practices for compressed air, pressurized systems (pneumatic/hydraulic), stored energy. ☐ For climbing/fall hazards associated with large equipment, see Section B.4., "Fall Hazards." ☐ For electrical hazards, see Section B.8., "Electrical Hazards." ☐ Operate fuel-powered equipment in well ventilated location. ☐ Use safe practices for fuels, see Section B.13., "Commercial Chemical Products." ***Geosyntec Procedure(s):*** *HS-109-Hearing Conservation, HS-113-Personal Protective Equipment, HS-119-Lockout/Tagout, HS-121-Electrical Safety, HS-503-Powered Hand Tools, Others as applicable*
☐	**LOCKOUT/TAGOUT OF HAZARDOUS ENERGY**	☐ Implement control-of-hazardous-energy practices (lockout/tagout), provide lockout/tagout locks and devices, training workers, designate "authorized" personnel, notify "affected" personnel. ***Geosyntec Procedure(s):*** *HS-119-Lockout Tagout*

☐	**WELDING, CUTTING, HOT WORK (GAS OR ARC)** UV/IR light-eye/skin burns, hot-work hazards, toxic welding fumes, compressed gases, electrical shock	☐ General safe work practices: • Hot work permit system to be implemented. • Operator properly protected (eye protection, clothing, apron, etc.). • Fire hazard controls (watcher, fire extinguisher, water, isolate combustibles). • Protect nearby personnel from hazardous UV, IR light (shielding, curtain). ☐ For gas welding/cutting, use gas cylinder safe practices (secured, upright, caps on when not in use, prevent Damage; never secure gas cylinders to metal bench used for arc welding). ☐ For arc welding, follow electrical safe work practices. See Section B.8., "Electrical Hazards." ☐ See Section B.13., "Commercial Chemical Products," for hazards of welding rods (toxic metals), welding gases. ***Geosyntec Procedure(s):*** *HS-511-Welding, Cutting and Other Hot Work*
☐	**COMPRESSED AIR, COMPRESSOR** (for compressed gases, see Section B.13., "Compressed Gases")	☐ Never direct nozzle toward body; do not use compressed air for cleaning clothes. ☐ If compressed air is used for cleaning, restrict pressure to 30 psi or below, equip nozzle with chip guard. ☐ Use eye protection. ☐ Ensure air tank, hoses, fittings are in good repair using factory fittings.
☐	**PORTABLE GENERATOR** Hazards: Electrical shock, carbon monoxide in exhaust, fuel-related fire, injury from mechanical hazards, lifting	☐ Follow general safety practices for Operation of Equipment/Machinery (above), and as follows: • Use in accordance with manufacturer's instructions. • Keep generator and work area dry. • Never use indoors, or near building air intake vents due to carbon monoxide hazard. • Provide for ventilation and/or air monitoring where hazardous accumulation of exhaust emissions is possible. • Use hearing protection in close proximity to operating generator, as needed. • Use power cords/extension cords specified by instructions. • Use ground-fault circuit interrupters (GFCIs) in accordance with manufacturer's instructions. • See Section B.8., "Electrical Hazards." • Shut down equipment before refueling. See safe practices for flammable/combustible liquids in Section B.13., "Commercial Chemical Products." ***Geosyntec Procedures:*** *HS-109-Hearing Conservation, HS-111-Air Monitoring, HS-115-Hazard Communication (for fuel), HS-121-Electrical Safety, Others as applicable*
☐	**PORTABLE HEATERS (electric or fuel powered)** Hazards: Electric-powered: Electrical shock, fires from hot surfaces. Fuel powered: Carbon monoxide in exhaust, fires from hot surfaces, fuel-related fires	☐ Follow general safety practices for Operation of Equipment/Machinery (above), and as follows: • Keep heater dry, and locate heater on level surface away from high traffic areas. • Never use fuel-powered heaters indoors, or near air intake vents, due to carbon monoxide hazard. • Provide for ventilation and/or air monitoring where hazardous accumulation of exhaust emissions is possible. • Keep combustible materials at least 3 feet from hot surfaces. • Do not use an extension cord or power strip to power an electric heater. • For electric heaters, See Section B.8., "Electrical Hazards." • Shut down fuel-powered equipment before refueling. See safe practices for flammable/combustible liquids and/or compressed gases in Section B.13., "Commercial Chemical Products." ***Geosyntec Procedures:*** *HS-111-Air Monitoring, HS-115-Hazard Communication (for fuel, HS-121-Electrical Safety, Others as applicable*

B.6. DRILLING ☒ Applicable ☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS: Subcontractors will be operating powered drilling equipment. Care will be taken when around operating machinery.

☒	**DRILLING** Hazards: Struck-by, run-over, caught between (pinch points), manual lifting, roll over, fluid leaks, fuel hazards, suspended equipment	☒ Follow safe work practices, as applicable: • Non-essential personnel to stay clear of drilling work zone when drill rig in operation. • Equipment inspected daily upon mobilization; maintained in good repair, backup alarms. • Leaks or defective safety equipment should be repaired before use. • Establish eye contact with operator and use hand signals prior to approaching near equipment. • PPE used near operating rig (eye/head/hearing/hand/foot protection, high visibility vests or equivalent). • Contractor inspects drill rig daily before use, verify daily that emergency stop is functional. • Drill rig to be equipped with operational emergency stop, equipment in good repair, machine guards in place, whip checks on high pressure lines. • Park personal/support vehicles in a location as to not obstruct travel lanes or other site operations. • Operators/helpers maintain safe distance from moving parts; secure loose hair, loose clothing, equipment. • Drill rigs will only be moved with masts lowered. • Max. safe slope for rig will be followed, drill rig leveled, appropriate blocking/cribbing as needed. • Use safety practices for refueling, fuel handling/storage/transport. • Spill equipment is available for fuel and hydraulic fluid leaks. • Verify mechanical lift/rigging equipment (cables, sheaves, boom, attachments) is in proper working order. • Ventilate and conduct air monitoring, as appropriate, when drilling indoors. ***Geosyntec Procedure(s):*** *HS-403-Drilling, Others as applicable*
☐	**IMPORTANT!** This work may/will include close proximity to overhead electric utility lines.	☐ Follow safe work practices per Section B.9., "Utility Related Hazards"

B.7. CONSTRUCTION, HEAVY EQUIPMENT, LIFT EQUIPMENT	☐ Applicable	☒ Not Applicable, Not Anticipated
B.8. ELECTRICAL HAZARDS	☐ Applicable	☒ Not Applicable, Not Anticipated
B.9. UTILITY RELATED HAZARDS	☐ Applicable	☒ Not Applicable, Not Anticipated
B.10. CONFINED SPACE ENTRY, HAZARDOUS ENCLOSED SPACES	☐ Applicable	☒ Not Applicable, Not Anticipated
B.11. STORAGE OF BULK MATERIALS	☐ Applicable	☒ Not Applicable, Not Anticipated
B.12. INFECTIOUS / ALLERGENIC BIOHAZARDS	☒ Applicable	☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:
For COVID 19 safety measures, follow "Field Work COVID 19 General Prevention Measures" guideline attached. Core safety measures include: Maintain social distancing; Wear mask or cloth face covering, where social distancing cannot be maintained; Wash hands frequently for minimum 20 sec with soap and water; Use hand sanitizer and hand wipes periodically if hand-washing capability is not readily available; Avoid touching surfaces if not necessary; Use sanitary wipes to wipe handles of field tools and equipment prior to start of work.

☒	☐ Wastewater, sewer ☐ Bird Guano ☐ Mold, fungi, Valley Fever ☐ Bloodborne pathogens ☒ Other (describe above)	☒ Low hazard - use basic hygiene practices, protective gloves, provide for hand washing. ☐ More severe hazard - add protective clothing, respirator/dust mask, decon, as appropriate. ☐ For human pathogens use "Universal Precautions" per Bloodborne Pathogen Program. ***Geosyntec Procedure(s):*** *HS-133-Bloodborne Pathogens*

B.13. COMMERCIAL CHEMICAL PRODUCTS	☐ Applicable	☒ Not Applicable, Not Anticipated
B.14. SITE CONTAMINANTS, CHEMICAL WASTES	☒ Applicable	☐ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:
The current location of the Diablo Drydock was used for drydpcl operations since the 1930s . Drydock operations resulted in soil and sediment contamination by metals and polycyclic aromatic hydrocarbons (PAHs). Two sampling and analysis investigations have taken place at the Site in the last 6 years. The results of sediment data along with historical information indicate that sediment contaminants of potential interest (COPIs) should include metals and PAHs.

CHECK ALL THAT APPLY. Provide explanatory notes above.

☒ Soil/groundwater contaminants (historical release)	☐ Oxygen deficiency	☐ Corrosive, acids/caustics, strong irritants
☐ Recent release, known high concentrations	☐ Chlorinated volatile organic compounds (VOCs)	☐ Sulfides, hydrogen sulfide (H_2S)
☐ Former chemical disposal site, landfill	☐ BTEX, petroleum derived VOCs	☐ Cyanides, hydrogen cyanide (HCN)
☐ Urban fill, residual contaminants	☐ Fuel oils, petroleum, waste oil, lubricants	☐ Asbestos
☐ Containerized waste (drums, process equipment)	☒ Metals, metal compounds, metal dusts	☐ Lead paint
☐ Buried drums (known or potential)	☐ Elemental mercury	☐ Pesticides, herbicides, fungicides

☐ Large containers, potential for spills ☐ Contaminated building surfaces ☐ Unexploded ordnance ☐ Explosive dust	☒ Polyaromatic hydrocarbons (PAHs) ☐ Polychlorinated biphenyls (PCBs) ☐ Potential for flammable vapors ☐ Potential for flammable gas (methane)	☐ Sensitizers ☐ Radioactive contaminants ☐ Other (see Explanatory Notes, above)

☐	**FOR WORK CONSISTING OF CLEANUP OPERATIONS, CORRECTIVE ACTIONS, PRELIMINARY INVESTIGATIONS at an "UNCONTROLLED HAZ. WASTE SITE" (per HAZWOPER, 29 CFR 1910.120), implement the following as applicable to the work:** - Implement site control plan via Exclusion Zone(s), Contaminant Reduction Zone(s) and Support Zone (aka EZ, CRZ, SZ) - Workers to be aware of and trained on hazards per OSHA Hazard Communication Standard. - Include site map/figure depicting work locations and other relevant site-specific information. - Site workers in EZ or CRZ to have OSHA 40-hour training, current 8-hour refresher, 3 days supervised field experience. - Site supervisor(s) required to have 8-hr. Supervisor training. - Site workers in EZ or CRZ to participate in Medical Monitoring program, as applicable. - Implement site-specific procedures for worker protection via engineering controls, work practices, personal protective equipment (PPE), air monitoring, decontamination procedures, spill containment, emergency preparedness and response. - Conduct air monitoring, as appropriate (see Part C, "Air Monitoring, Worker Exposure Monitoring"). **IMPORTANT:** Provide supplemental information to sufficiently detail site-specific procedures for the above elements, as appropriate for the work. ***Geosyntec Procedures:*** *HS-301-HAZWOPER, HS-108-Medical Monitoring Surveillance, HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, HS-115-Hazard Communication, HS-405-Drum Sampling, Others as applicable*
☒	**FOR SITE WITH CHEMICAL CONTAMINANTS OR WASTE BUT NOT REGULATED BY HAZWOPER** - Workers to be knowledgeable/aware of chemical hazards thru safety training/orientation and availability of hazard information - Implement controls to minimize worker exposure through engineering controls, work practices, PPE, as appropriate. - Conduct air monitoring/sampling to monitor/evaluate worker exposure, as applicable. ***Geosyntec Procedures:*** *HS-111-Air Monitoring, HS-112-Respiratory Protection, HS-113-Personal Protective Equipment, HS-114-Safety Training Programs, HS-115-Hazard Communication, Others as applicable*
☐	**OFF-SITE MIGRATION OF CONTAMINANTS** ☐ Implement controls to minimize hazard migration (dust suppression, covers, foam, etc.) ☐ Community/perimeter air monitoring to be conducted per perimeter air monitoring plan.
☐	**SPILL CONTAINMENT, CONTAINERS** ☐ Describe above any site-specific procedures for spill containment, container handling, as applicable. ***Geosyntec Procedures****: HS-406-Unknown Hazardous Waste Drum Handling*

B.15. RADIATION HAZARDS (Other than Sunlight) ☐ Applicable ☒ Not Applicable, Not Anticipated

B.16. HAZMAT/DANGEROUS GOODS SHIPPING/TRANSPORTATION ☐ Applicable ☒ Not Applicable, Not Anticipated

PART C – AIR MONITORING, WORKER EXPOSURE MONITORING

C.1. AIR MONITORING (Direct-Reading Instruments) ☐ Applicable ☒ Not Applicable, Not Anticipated

EXPLANATORY NOTES, CLARIFICATIONS:

☐	**AIR-TESTING PARAMETERS**	☐ VOCs, GASES ☐ PID, Lamp energy: 9.8 eV ☐ FID ☐ Carbon monoxide ☐ Hydrogen sulfide ☐ Oxygen (O_2)		☐ Flammable gas (LEL) ☐ Particulate (dust) ☐ Calibration kit for each parameter ☐ Other:
☐	**ACTION LEVELS FOR O2/LEL**	☐ Oxygen	≤19.5% - ventilate to raise O_2 to acceptable levels, or use Level B. ≥23.0% - ventilate to lower O_2 to acceptable levels, or use Level B and control fire hazards & ignition sources.	
		☐ LEL	Confirm at least 12% oxygen is present to ensure accuracy of LEL readings. At <10% LEL - Continue working, continue to monitor LEL levels At ≥10% LEL- Immediately withdraw from area. Resume work ONLY after LEL readings reduced to <10%.	
☐	**ACTION LEVELS FOR TOXICS**	**Parameters**	**Level D, Modified D***	**Use levels C or B*, as indicated below, OR take action to reduce breathing zone level to concentration acceptable for Level D*.**
		☐ VOCs	< 5 ppm	__ ppm to __ ppm: Level C (air purifying respirator) > __ ppm: Level B (air-supplied respirator)

	(sustained breathing zone concentrations)	☐ Carbon Monoxide	< 35 ppm	≥35 ppm - Level B (air-supplied respirator)
		☐ Hydrogen Sulfide	< 10 ppm	≥10 ppm - Level B (air-supplied respirator)
		☐ Total Dust	< ___ mg/m³	>___ mg/m³ - Level C (air-purifying respirator)
		☐		
		☐		

*** Levels of Protection:**
Level D (standard work clothes, basic personal protective wear, no chemical protective clothing, no respiratory protection)
Modified Level D (chemical protective clothing in addition to standard work clothes, no respiratory protection)
Level C (air purifying respirator or dust mask, in addition to chemical protective clothing)
Level B or A (air supplied respirator, chemical protective suit; fully-encapsulating suit for Level A)

Geosyntec Procedures: *HS-111-Air Monitoring*

C.2. OTHER WORKER EXPOSURE MONITORING ☐ Applicable ☒ Not Applicable, Not Anticipated

☐ Air Sampling *(sample collection, passive dosimeter)*	☐ Ionizing or Non-ionizing Radiation Testing	☐ Heat Stress Testing
☐ Wipe/Bulk Sampling *(to evaluate worker exposure)*	☐ Noise Testing	☐ Other

EXPLANATORY NOTES, CLARIFICATIONS:

Geosyntec Procedures: *HS-109-Hearing Protection, HS-111-Air Monitoring, HS-124-Heat Stress Prevention, HS-126-Radiation Safety Program, HS-128-Ionizing and Non-ionizing Radiation, HS-601-Asbestos, HS-602-Lead*

PART D – APPROVALS, ACKNOWLEDGEMENTS

D.1. THA PREPARATION, REVIEW/APPROVAL SIGNATURES THA typically prepared by project staff, reviewed/approved by Project Manager, Supervisor, qualified/knowledgeable designee, with support of HS personnel as deemed appropriate by the Project Manager.			
THA PREPARED BY: (minimum one person)	*Printed Name*	*Signature*	*Date*
	Jon Laurance		
THA REVIEWED/ APPROVED BY: (minimum one person)	*Printed Name*	*Signature*	*Date*
	Joey Hickey		

D.2. FIELD CREW ACKNOWLEDGEMENTS

GEOSYNTEC FIELD CREW

Please sign below to acknowledge you reviewed and understand this THA, participated in project safety briefing and had an opportunity to ask questions about the information herein.

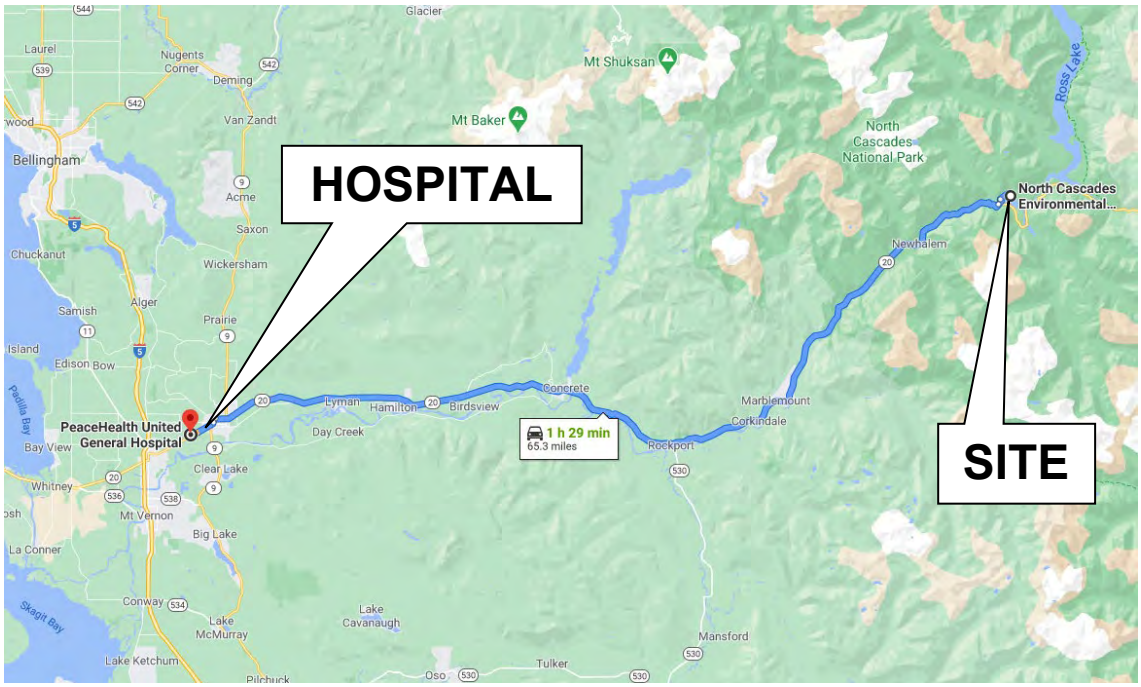
Printed Name	Signature	Employee No.	Date

SUBCONTRACTOR'S FIELD CREW

Please sign below to acknowledge that this THA was made available to you, and you had an opportunity to ask questions about the information herein.

Printed Name	Signature	Company Name	Date

ROUTE FROM DIABLO DRYDOCK SITE TO URGENT CARE AND EMERGENCY FACILITIES



HOSPITAL INFORMATION:

PeaceHealth United General Hospital
360-856-6021
2000 Hospital Drive
Sedro-Woolley, Washington 98284

DIRECTIONS TO HOSPITAL FROM SITE

- Start: North Cascades Environmental Learning Center, 1940 Diablo Dam Rd, Rockport, WA 98283
  - Head north on Diablo Dam Rd (0.8 miles)
  - Turn left to stay on Diablo Dam Rd (0.5 miles)
  - Turn right onto WA-20 W (61.8 miles)
  - At the traffic circle, continue straight onto W Moore St (0.1 miles)
  - Continue onto Bingham St/Borseth St (0.2 miles)
  - At the traffic circle, continue straight onto WA-20 W/Borseth St (1.7 miles)
  - Turn right onto Hospital Dr (0.1 miles)
  - Turn left to stay on Hospital Dr, destination on the right (302 feet)
- End: PeaceHealth United General Hospital, 2000 Hospital Dr, Sedro-Woolley, WA 98284

Safety Data Sheets (SDSs)

Safety Data Sheet (SDS)

OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Issue date 06/11/2015 Reviewed on 06/11/2015

* 1 Identification

· **Product identifier**

· **Trade name: Precision Calibration Gas Mixture**
· **Product number:** G-4415
· **Relevant identified uses of the substance or mixture and uses advised against**
Used for calibration of gas measuring devices. Not suitable for human consumption.
· **Product description** Calibration gas mixture consisting of Isobutylene, Oxygen and Nitrogen.

· **Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Gasco Affiliates, LLC
320 Scarlett Blvd.
Oldsmar, Fl 34677

TELEPHONE NUMBER: (800) 910-0051
FAX NUMBER: (866) 755-8920
E-MAIL: info@gascogas.com
· **Emergency telephone number:**
Inside the US: 1-800-424-9300 (CHEMTREC, 24 hours)
Outside the US: 1-703-527-3887 (CHEMTREC, 24 hours)

* 2 Hazard(s) identification

· **Classification of the substance or mixture**


GHS04 Gas cylinder

Press. Gas H280 Contains gas under pressure; may explode if heated.

· **Label elements**
· **GHS label elements**
The product is classified and labeled according to the Globally Harmonized System (GHS).
· **Hazard pictograms**


GHS04

· **Signal word** Warning

· **Hazard-determining components of labeling:**
Nitrogen
Isobutylene
· **Hazard statements**
Contains gas under pressure; may explode if heated.
· **Precautionary statements**
Protect from sunlight. Store in a well-ventilated place.
· **Unknown acute toxicity:**
99 percent of the mixture consists of ingredient(s) of unknown toxicity.

(Contd. on page 2)

Safety Data Sheet (SDS)

OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Issue date 06/11/2015 Reviewed on 06/11/2015

Trade name: Precision Calibration Gas Mixture

· **Classification system:**
· **NFPA ratings (scale 0 - 4)**

Health = 2
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = 2
Fire = 0
Reactivity = 0

· **Hazard(s) not otherwise classified (HNOC):** None known

* 3 Composition/information on ingredients

· **Chemical characterization: Mixtures**
· **Description:** Mixture of substances listed below with nonhazardous additions.

· **Dangerous Components:**

CAS: 7727-37-9 RTECS: QW 9700000	Nitrogen Press. Gas, H280; Simple Asphyxiant	78 - 81.99995%
CAS: 7782-44-7	Oxygen Oxid. Gas 1, H270; Press. Gas, H280	18 - 21%
CAS: 115-11-7 RTECS: UD 0890000	Isobutylene Flam. Gas 1, H220; Flam. Liq. 1, H224; Press. Gas, H280	0.00005 - 1%

* 4 First-aid measures

· **Description of first aid measures**
· **After inhalation:**
Generally the product does not irritate with inhalation.
Supply fresh air. If required, provide artificial respiration. Consult doctor if symptoms persist.
In case of unconsciousness, place patient securely on side position for transportation.
· **After skin contact:**
Generally the product does not irritate the skin.
In cases of contact with liquified material, frostbite may occur. Immerse frostbite in cool-warm water and seek medical attention.
· **After eye contact:**
Not anticipated under normal use.
If irritation occurs thoroughly wash the exposed area and discontinue use. Seek medical attention if any adverse effect occurs.
· **After swallowing:** Not a normal route of entry.
· **Information for doctor:**
· **Most important symptoms and effects, both acute and delayed:** No further relevant information available.
· **Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

* 5 Fire-fighting measures

· **Extinguishing media**
· **Suitable extinguishing agents:**
Use fire fighting measures that suit the environment.
Use water spray to cool fire-exposed containers.

(Contd. on page 3)

Safety Data Sheet (SDS)

OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Issue date 06/11/2015 Reviewed on 06/11/2015

Trade name: Precision Calibration Gas Mixture

· ***Special hazards arising from the substance or mixture***
Closed containers may explode when exposed to extreme heat.
If incinerated, product will release the following toxic fumes: Oxides of Carbon and Nitrogen (NOx).
· ***Advice for firefighters***
This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire.
· ***Protective equipment:***
As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.

* 6 Accidental release measures

· ***Personal precautions, protective equipment and emergency procedures***
Treat any fumes as toxic.
In a confined area, NIOSH approved respiratory protection may be required.
· ***Environmental precautions:*** Inform authorities in case of gas release.
· ***Methods and material for containment and cleaning up:***
Dispose contaminated material as waste according to section 13.
Ensure adequate ventilation.
Dispose of the collected material according to regulations.
· ***Reference to other sections***
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

* 7 Handling and storage

· ***Handling:***
· ***Precautions for safe handling***
Ensure good ventilation/exhaustion at the workplace.
Open and handle receptacle with care.
Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms due to the potential for oxygen deficiency (simple asphyxiation). Do not attempt to adjust, repair or in any other way modify the cylinders containing this gas mixture. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.
· ***Information about protection against explosions and fires:***
Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50 °C, i.e. electric lights. Do not pierce or burn, even after use.
Keep protective respiratory device available.
Do not cut, grind or weld on container that contains or contained product.
Do not spray on a naked flame or any incandescent material.

· ***Conditions for safe storage, including any incompatibilities***
Store away from strong acids, strong oxidizing agents, phosphorous, organic materials, halogens and powdered metals.
· ***Storage:***
· ***Requirements to be met by storerooms and receptacles:***
Store in a cool location.
Cylinders should be firmly secured to prevent falling or being knocked over. Cylinders must be protected from the environment, and preferably kept at room temperature. Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage. Full and empty cylinders should be segregated. Use a "first-on, first-out" inventory system to prevent full containers from being stored for long periods of time.

(Contd. on page 4)

Safety Data Sheet (SDS)

OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Issue date 06/11/2015 Reviewed on 06/11/2015

Trade name: Precision Calibration Gas Mixture

· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** Store in cool, dry conditions in well sealed receptacles.
· **Specific end use(s)** No further relevant information available.

*
8 Exposure controls/personal protection

· **Additional information about design of technical systems:** No further data; see section 7.

· **Control parameters**
All ventilation should be designed in accordance with OSHA standard (29 CFR 1910.94). Use mechanical (general) ventilation for storage areas. Use appropriate ventilation as required to keep Exposure Limits in Air below TLV & PEL limits.

· **Components with occupational exposure limits:**	
7727-37-9 Nitrogen	
TLV	withdrawn TLV, see App. F; simple asphyxiant
115-11-7 Isobutylene	
TLV	Long-term value: 574 mg/m³, 250 ppm

· **Additional information:** The lists that were valid during the creation of this SDS were used as basis.

· **Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Wash hands before breaks and at the end of work.
· **Breathing equipment:**
Not necessary if room is well-ventilated.
In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure, use respiratory protective device that is independent of circulating air.
· **Protection of hands:** Not required.
· **Eye protection:** Not necessary under normal conditions.

*
9 Physical and chemical properties

· **Information on basic physical and chemical properties**
· **General Information**
· **Appearance:**
Form: Gaseous
Color: Clear, colorless
· **Odor:** Odorless
· **Odor threshold:** Not determined.

· **pH-value:** Not determined.

· **Change in condition**
Melting point/Melting range: Not determined.
Boiling point/Boiling range: Not determined.

· **Flash point:** Not applicable.

· **Flammability (solid, gaseous):** Not determined.

· **Ignition temperature:**

Decomposition temperature: Not determined.

· **Auto igniting:** Product is not self-igniting.

(Contd. on page 5)

Safety Data Sheet (SDS)

OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Issue date 06/11/2015 Reviewed on 06/11/2015

Trade name: Precision Calibration Gas Mixture

· **Danger of explosion:**	Not determined.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapor pressure:**	Not determined.
· **Density:**	
Relative density	Not determined.
Vapor density	Not determined.
Evaporation rate	Not applicable.
· **Solubility in / Miscibility with**	
Water:	Not miscible or difficult to mix.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not determined.
Kinematic:	Not determined.
· **Solvent content:**	
Organic solvents:	0.0 %
· **Other information**	No further relevant information available.

* 10 Stability and reactivity

· **Reactivity** No further relevant information available.
· **Chemical stability** Stable under normal conditions.
· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **Possibility of hazardous reactions** No dangerous reactions known.
· **Conditions to avoid** No further relevant information available.
· **Incompatible materials:**
Strong acids, strong oxidizing agents, phosphorous, organic materials, halogens and powdered metals.
· **Hazardous decomposition products:** Carbon Oxides and Nitrogen Oxides (NOx).

* 11 Toxicological information

· **Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:**		
115-11-7 Isobutylene		
Inhalative	LC50/4 h	620 mg/l (rat)

· **Primary irritant effect:**
· **on the skin:** No irritating effect.
· **on the eye:** No irritating effect.
· **Additional toxicological information:**
The product shows the following dangers according to internally approved calculation methods for preparations:
Harmful

· **Carcinogenic categories**
· **IARC (International Agency for Research on Cancer)**
Group 1 - Carcinogenic to humans
Group 2A - Probably carcinogenic to humans
Group 2B - Possibly carcinogenic to humans

(Contd. on page 6)

Safety Data Sheet (SDS)

OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Issue date 06/11/2015 Reviewed on 06/11/2015

Trade name: Precision Calibration Gas Mixture

Group 3 - Not classifiable as to its carcinogenicity to humans
Group 4 - Probably not carcinogenic to humans

None of the ingredients are listed.

· **NTP (National Toxicology Program)**

None of the ingredients are listed.

· **OSHA-Ca (Occupational Safety & Health Administration)**

None of the ingredients are listed.

* 12 Ecological information

· **Toxicity** The hazards for the aquatic environment are unknown.
· **Aquatic toxicity:** No further relevant information available.
· **Persistence and degradability** No further relevant information available.
· **Behavior in environmental systems:**
· **Bioaccumulative potential** No further relevant information available.
· **Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:** Generally not hazardous for water.
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.
· **Other adverse effects** No further relevant information available.

* 13 Disposal considerations

· **Waste treatment methods**
· **Recommendation:**
Release all residual gas pressure in a well ventilated area. Verify the cylinder is completely empty (0 PSIG).
Remove or cover any hazard labels. Return empty cylinder for recycling.
NOTE: Check with the local easte authority before placing any gas cylinder into waste container for pickup.
GASCO encourages the consumer to return all cylinders.
· **Waste disposal key:**
The U.S. EPA has not published waste disposal numbers for this product's components.

· **Uncleaned packagings:**
· **Recommendation:** Return cylinder and unused product to supplier.

* 14 Transport information

· **UN-Number**
· **DOT, ADR, IMDG, IATA** UN1956
· **UN proper shipping name**
· **DOT** Compressed gas, n.o.s.
· **ADR** UN1956 Compressed gas, n.o.s.
· **IMDG, IATA** COMPRESSED GAS, N.O.S.
· **Transport hazard class(es)**

· **DOT**

· **Class** Non-Regulated Material

(Contd. on page 7)

Safety Data Sheet (SDS)

OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Issue date 06/11/2015 Reviewed on 06/11/2015

Trade name: Precision Calibration Gas Mixture

· **Label**	2.2
· **ADR**	
	
· **Class**	2.2 1A
· **Label**	2.2
· **IMDG, IATA**	
	
· **Class**	2.2
· **Label**	2.2
· **Packing group**	
· **DOT, ADR, IMDG, IATA**	Non-Regulated Material
· **Environmental hazards:**	Not applicable.
· **Special precautions for user**	Not applicable.
· **Danger code (Kemler):**	20
· **EMS Number:**	F-C,S-V
· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **Transport/Additional information:**	
· **DOT**	
· **Quantity limitations**	On passenger aircraft/rail: 75 kg On cargo aircraft only: 150 kg
· **ADR**	
· **Excepted quantities (EQ)**	Code: E1 Maximum net quantity per inner packaging: 30 ml Maximum net quantity per outer packaging: 1000 ml
· **IMDG**	
· **Limited quantities (LQ)**	120 ml
· **Excepted quantities (EQ)**	Code: E1 Maximum net quantity per inner packaging: 30 ml Maximum net quantity per outer packaging: 1000 ml
· **UN "Model Regulation":**	UN1956, Compressed gas, n.o.s., 2.2

* 15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **Sara**

· **Section 355 (extremely hazardous substances):**
None of the ingredients are listed.

· **Section 313 (Specific toxic chemical listings):**
None of the ingredients are listed.

(Contd. on page 8)

Safety Data Sheet (SDS)

OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Issue date 06/11/2015 Reviewed on 06/11/2015

Trade name: Precision Calibration Gas Mixture

· **TSCA (Toxic Substances Control Act):**
All ingredients are listed.

· **California Proposition 65**

· **Chemicals known to cause cancer:**
None of the ingredients are listed.

· **Chemicals known to cause reproductive toxicity for females:**
None of the ingredients are listed.

· **Chemicals known to cause reproductive toxicity for males:**
None of the ingredients are listed.

· **Chemicals known to cause developmental toxicity:**
None of the ingredients are listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**
None of the ingredients are listed.

· **TLV (Threshold Limit Value established by ACGIH)**
None of the ingredients are listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
None of the ingredients are listed.

· **GHS label elements**
The product is classified and labeled according to the Globally Harmonized System (GHS).

· **Hazard pictograms**

GHS04

· **Signal word** Warning

· **Hazard-determining components of labeling:**
Nitrogen
Isobutylene

· **Hazard statements**
Contains gas under pressure; may explode if heated.

· **Precautionary statements**
Protect from sunlight. Store in a well-ventilated place.

· **National regulations:**
The product is subject to be classified according with the latest version of the regulations on hazardous substances.

· **State Right to Know**

CAS: 7727-37-9 RTECS: QW 9700000	Nitrogen Press. Gas, H280; Simple Asphyxiant	79 - 81.99995%
CAS: 7782-44-7	Oxygen Oxid. Gas 1, H270; Press. Gas, H280	18 - 21%
CAS: 115-11-7 RTECS: UD 0890000	Isobutylene Flam. Gas 1, H220; Flam. Liq. 1, H224; Press. Gas, H280	0.00005 - 1%

(Contd. on page 9)

Safety Data Sheet (SDS)

OSHA HazCom Standard 29 CFR 1910.1200(g) and GHS Rev 03.

Issue date 06/11/2015 Reviewed on 06/11/2015

Trade name: Precision Calibration Gas Mixture

All ingredients are listed.

· ***Chemical safety assessment:*** A Chemical Safety Assessment has not been carried out.

* 16 Other information

· ***Relevant phrases***
Gasco Affiliates, LLC, makes not express or implied warranties, guarantees or representations regarding the product of the information herein, including but not limited to any implied warranty or merchantability or fitness for use. Gasco Affilitates, LLC shall not be liable for any personal injury, property or other damages of any nature, whether compensatory, consequential, exemplary, or otherwise, resulting from any publication, use of reliance upon the information herein.

· ***Date of preparation / last revision*** 06/11/2015 / -

· ***Abbreviations and acronyms:***
ADR: The European Agreement concerning the International Carriage of Dangerous Goods by Road
ADN: The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
ELINCS: European List of Notified Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
Flam. Gas 1: Flammable gases, Hazard Category 1
Oxid. Gas 1: Oxidising Gases, Hazard Category 1
Press. Gas: Gases under pressure: Compressed gas
Flam. Liq. 1: Flammable liquids, Hazard Category 1

· **** Data compared to the previous version altered.***
SDS created by MSDS Authoring Services www.msdsauthoring.com +1-877-204-9106

ISO9001:2000 Certified

Material Safety Data Sheet
Hexane

Section 1 - Chemical Product and Company Identification

MSDS Name:
Hexane
Catalog Numbers:
LC14920
Synonyms:
Hexyl hydride, dipropyl.
Company Identification:
LabChem, Inc.
200 William Pitt Way
Pittsburgh, PA 15238
Company Phone Number:
(412) 826-5230
Emergency Phone Number:
(800) 424-9300
CHEMTREC Phone Number:
(800) 424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name:	Percent
110-54-3	Hexane	100

Section 3 - Hazards Identification

Emergency Overview

Appearance: *clear, colorless liquid*

Danger! Extremely flammable liquid and vapor. Vapor may cause flash fire. Breathing vapors may cause drowsiness and dizziness. Causes eye, skin, and respiratory tract irritation. May be harmful if absorbed through the skin. Aspiration hazard if swallowed. Can enter lungs and cause damage. Long-term exposure may cause damage to the nervous system of the extremities. Possible risk of impaired fertility. Dangerous for the environment.

Target Organs: Central nervous system, respiratory system, eyes, skin, peripheral nervous system, testes.

Potential Health Effects

Eye:
Causes mild eye irritation.

Skin:
Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. Causes irritation with burning pain, itching, and redness. Absorbed through the skin. There have been no reports of skin sensitization in people occupationally exposed to n-hexane. Skin sensitization was not observed in a maximization test using 25 volunteers.

Ingestion:

May cause irritation to the digestive tract with nausea, vomiting, and diarrhea. Aspiration of material into the lungs may cause chemical pneumonitis, which may lead to death. May cause central nervous system depression.

Inhalation:

Causes irritation to the respiratory tract. Exposure produces central nervous system depression. Vapors may cause dizziness or suffocation. Hexane vapor concentration can become so high that oxygen is displaced, especially in confined spaces.

Chronic:

Prolonged or repeated skin contact may cause defatting and dermatitis. Prolonged or repeated exposure may cause adverse reproductive effects. Chronic exposure may cause visual disturbances. Laboratory experiments have resulted in mutagenic effects. Peripheral neuropathy symptoms include: muscular weakness, paresthesia, numbing of the hands, feet, legs, and arms, unsteadiness, and difficulty in walking and standing. Repeated exposure may cause nervous system abnormalities with muscle weakness and damage, motor incoordination, and sensation disturbances. Chronic exposure produces peripheral neuropathy.

Section 4 - First Aid Measures

Eyes:

Flush eyes with plenty of water for 15 minutes, occasionally lifting upper and lower eyelids. Get medical aid at once.

Skin:

Flush skin with plenty of water for 15 minutes. Remove contaminated clothing. Get medical aid at once.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Hexane may be aspirated. If vomiting occurs naturally, have victim lean forward. If victim is conscious, give 2-4 glasses of water. Get medical aid at once.

Inhalation:

Remove from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Get medical aid at once.

Notes to Physician:

Treat symptomatically and supportively. For ingestion, the stomach should be intubated, aspirated, and lavaged with a slurry of activated charcoal. Protect the airway from aspiration of gastric contents. Monitor arterial blood gases in cases of severe aspiration.

Section 5 - Fire Fighting Measures

General Information:

Wear self-contained breathing apparatus and full protective gear. Use water spray to keep fire-exposed containers cool. May accumulate static electrical charges, and may cause ignition of its own vapors. Extremely flammable liquid and vapors. Vapor may cause flash fire. Vapors are heavier than air and may travel to source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire.

Extinguishing Media:
carbon dioxide, dry chemical, or appropriate foam. Water may be ineffective because it will not cool material below its flash point.

Autoignition Temperature:
225°C (437 F)

Flash Point:
-7.6°C to –15°C

NFPA Rating:
H-1, F-3, R-0

Explosion Limits:
Lower: 1.2 Upper:

Section 6 - Accidental Release Measures

General Information:
Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:
Absorb spill with inert material (vermiculite, sand, earth) and place in suitable container for disposal. Clean up spills immediately. Remove sources of ignition and heat. Avoid runoff into sewers and ditches. Provide ventilation and use non-sparking tools and equipment. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling:
Wash thoroughly after handling. Remove contaminated clothing. Ground and bond containers when dispensing. Keep container tightly closed. Keep away from heat and flames. Avoid breathing vapors. Use with adequate ventilation. Empty containers retain product residue and can be dangerous.

Storage:
Store in cool, dry, well ventilated area away from incompatible materials. Keep away from sources of ignition and oxidizing materials.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls:
Use with adequate general ventilation or local explosion-proof ventilation to keep airborne levels within acceptable limits. An eye wash fountain and safety shower should be in the immediate work area.

Exposure Limits:

Chemical Name:	ACGIH	NIOSH	OSHA
Hexane	50 ppm TWA; Skin-potential significant contribution to overall exposure by the cutaneous route	50 ppm TWA; 180 mg/m3 TWA 1100 ppm IDLH	500 ppm TWA 1800 mg/m3 TWA
Other Hexanes, various	none listed	none listed	none listed

OSHA Vacated PELs:

Hexane: 50 ppm TWA, 180 mg/m3 TWA
Other hexanes: None listed.

Personal Protective Equipment

Eyes:

Wear chemical splash goggles

Skin:

Wear appropriate gloves to protect hands.

Clothing:

Wear proper clothing and safety shoes to protect skin.

Respirators:

Follow OSHA respirator regulations found in 29 CFR 1910.134. Use NIOSH/MSHA approved respirator whenever workplace conditions are exceeded.

Section 9 - Physical and Chemical Properties

Physical State:	Liquid
Color:	Colorless
Odor:	Gasoline-like
pH:	Not available.
Vapor Pressure:	151 mm Hg @ 25°C
Vapor Density:	2.97 (air=1)
Evaporation Rate:	Not available.
Viscosity:	0.31 mPas at 20°C
Boiling Point:	62-69°C at 760 mm Hg
Freezing/Melting Point:	-95°C
Decomposition Temperature:	Not available.
Solubility in water:	Insoluble
Specific Gravity/Density:	0.678
Molecular Formula:	C6H14
Molecular Weight:	86.18

Section 10 - Stability and Reactivity

Chemical Stability:

Stable under normal temperatures and pressures.

Conditions to Avoid:
Ignition sources, excess heat, electrical sparks, confined spaces.
Incompatibilities with Other Materials:
Strong oxidizing agents.
Hazardous Decomposition Products:
Carbon dioxide, carbon monoxide.
Hazardous Polymerization:
Not known to occur.

Section 11 - Toxicological Information

RTECS:
CAS # 110-54-3: MN9275000
LD50/LC50:
CAS # 110-54-3:
Draize test, rabbit, eye: 10 mg mild
Inhalation, mouse: LC50 = 150000 mg/m3/2H
Inhalation, rat: LC50 = 48000 ppm/4H
Inhalation, rat: LC50 = 627000 mg/m3/3M
Oral, rat: LD50 = 25 g/kg
Carcinogenicity:
CAS # 110-54-3: Not listed by IARC, NTP, ACGIH, or CA Prop 65
Epidemiology:
Occupational polyneuropathy has resulted from hexane exposures as low as 500 ppm, but the minimum levels of n-hexane that are neurotoxic in humans have not been established. Nearly continuous exposure of animals at 250 ppm has caused neurotoxic effects.
Teratogenicity:
No evidence of teratogenicity or embryotoxicity in animal studies with hexane has been found. Fetotoxicity has been observed in the presence of maternal toxicity.
Reproductive:
Severe testicular damage has been observed in rats exposed to hexane at concentrations that have produced other significant toxicity. Although subneurotoxic doses of its principal toxic metabolite, 2,5-hexanedione, can induce progressive testicular toxicity in rats, there have been no reports of human sterility or other reproductive toxicity associated with n-hexane exposures.
Mutagenicity:
Positive results (chromosomal damage in the bone marrow cells) obtained for rats exposed by inhalation to n-hexane.
Neurotoxicity:
n-Hexane is a mild irritant and CNS depressant in acute exposure, but its principal effects are damage to the sensory and motor peripheral nerves, particularly in chronic exposure.

Section 12 - Ecological Information

Ecotoxicity:
No data available. Estimated BCF values = 2.24 and 2.89. These values suggest that hexane will shoe low bioconcentration in aquatic organisms. Estimate Koc value = 4.11. This product will show slight soil mobility and is expected to rapidly volatilize from moist surface soils.

Environmental:

Terrestrial: Volatilization and adsorption are expected to be the most important fate processes. Aquatic: Photolysis or hydrolysis is not expected to be important. Atmospheric fate: Expected to exist entirely in the vapor phase in ambient air. Expected half-life: 2.8 days. Expected to biodegrade but not to bioconcentrate.

Physical:

No information available.

Section 13 - Disposal Considerations

Dispose of in accordance with Federal, State, and local regulations.

Section 14 - Transport Information

US DOT

Shipping Name: Hexanes
Hazard Class: 3
UN Number: UN1208
Packing Group: PG II

Section 15 - Regulatory Information

US Federal

TSCA:

CAS # 110-54-3 is listed on the TSCA inventory. It does not have a Significant New Use Rule.

CERCLA Reportable Quantities (RQ):

CAS # 110-54-3: 5000 lb. final RQ; 2270 Kg final RQ

CERCLA/SARA Section 313:

CAS # 110-54-3 is subject to the reporting requirements.

OSHA - Highly Hazardous:

Not considered to be highly hazardous by OSHA.

US State

State Right to Know:

CAS # 110-54-3 is found on the following state right to know lists: New Jersey, Pennsylvania, Minnesota, Massachusetts

California Regulations:

Not listed.

Material Safety Data Sheet
Hexane

Section 16 - Other Information

MSDS Creation Date: July 26, 2006
Revision Date: None

Information in this MSDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc. assumes no liability resulting from the use of this MSDS. The user must determine suitability of this information for his application.

"n/a" means unknown or non-applicable.

Safety Data Sheet

Effective date: 11 May 2020 **Revision**: 11 May 2020
Trade Name: Alconox®

1 Identification of the substance/mixture and of the supplier

1.1 GHS Product identifier

Trade Name: Alconox®
Product number: 1101, 1103, 1104, 1104-1, 1112, 1112-1, 1125, 1150

1.2 Application of the substance / the mixture: Cleaning material/Detergent

1.2.1 Recommended dilution ratio: 1 – 2% in water

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer:
Alconox Inc.
30 Glenn St
White Plains, NY 10603
(914) 948-4040

Supplier:

Emergency telephone number:
ChemTel Inc
North America: 1-888-255-3924
International: +1 813-248-0573

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272, 29CFR1910/1200 and GHS requirements.

Hazard-determining components of labeling:
Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:

Eye damage, category 1.

Skin irritation, category 2.

Product at recommended dilution:
Eye irritation, category 2B

Hazard pictograms:

Signal word: Danger

Hazard statements:
H315 Causes skin irritation.
H318 Causes serious eye damage.

Precautionary statements:
P264 Wash skin thoroughly after handling.

Effective date: 11 May 2020 **Revision**: 11 May 2020
Trade Name: Alconox®

P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Hazardous Elements at Use Dilution:

Hazard Pictograms:

Signal Word: Warning
Hazard Statements:
H320 Causes eye irritation

Precautionary statements:
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P501 Dispose of contents and container as instructed in Section 13

Additional information: None.

Hazard description
Hazards Not Otherwise Classified (HNOC): May cause surfaces to become slippery if wet. Use caution in areas of foot traffic if on floors.

Information concerning particular hazards for humans and environment:
The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:
The classification is according to EC regulation No. 1272, 29CFR1910/1200 and GHS Requirements, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization: Not determined or not available.

3.2 Description: None
3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2 or 68411-30-3	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2; H315 Eye Dam. 1; H318	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2; H315 Eye Irrit. 2; H319	2-16

Effective date: 11 May 2020 **Revision**: 11 May 2020
Trade Name: Alconox®

Hazardous components at use dilution (percentages by weight):

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Eye Irrit. 2; H319	0.12 - 0.28
CAS number: 68081-81-2 or 68411-30-3	Sodium Alkylbenzene Sulfonate	Eye Irrit. 2; H319	0.08 – 0.22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Eye Irrit. 2; H319	0.02 – 0.16

3.4 Additional Information: None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.
Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.
Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.
Seek medical attention if irritation, discomfort, or vomiting persists.

4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

First aid measure at recommended dilution:

General information: None.

After inhalation:

Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.

After swallowing:

Rinse mouth thoroughly. Seek medical attention if irritation, discomfort, or vomiting develops.

5 Firefighting measures

Safety Data Sheet

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents: None

5.2 Special hazards arising from the substance or mixture:

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information:

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions:

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up:

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections: None

7 Handling and storage

7.1 Precautions for safe handling:

No expected hazards under normal use condition.

Avoid breathing mist or vapor if aerosolized.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities:

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

Safety Data Sheet

Effective date: 11 May 2020 **Revision**: 11 May 2020
Trade Name: Alconox®

8 Exposure controls/personal protection

8.1 Control parameters:

a) 7722-88-5, Tetrasodium Pyrophosphate, ACGIH TWA 10 mg/m3
b) 7758-29-4, Sodium Tripolyphosphate, ACGIH TWA 10 mg/m3
c) Dusts, non-specific OEL, Irish Code of Practice
   (i) Total inhalable 10 mg/m3 (8hr)
   (ii) Respirable 4 mg/m3 (8hr)
   (iii) Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3, (8hr)

8.2 Exposure controls

Appropriate engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal use conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection. Recommended to comply with ANSI Z87.1 and/or EN 166.

General hygienic measures:

Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

Exposure Control and Personal Protective Equipment at recommended dilution:

Under normal use and operational conditions, no special personal protective equipment or engineering controls will be necessary. Handle with care.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	**Explosion limit lower**: **Explosion limit upper**:	Not determined or notavailable. Not determined or notavailable.
Odor:	Not determined or not available.	**Vapor pressure at 20°C**:	Not determined or notavailable.
Odor threshold:	Not determined or not available.	**Vapor density**:	Not determined or notavailable.
pH-value:	9.5 (1% aqueous solution)	**Relative density**:	Not determined or notavailable.

Safety Data Sheet

Effective date: 11 May 2020 **Revision**: 11 May 2020
Trade Name: Alconox®

Melting/Freezing point:	Not determined or not available.	**Solubilities**:	Not determined or notavailable.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water)**:	Not determined or notavailable.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature**:	Not determined or notavailable.
Evaporation rate:	Not determined or not available.	**Decomposition temperature**:	Not determined or notavailable.

Flammability (solid, gaseous):	Not determined or not available.	**Viscosity**:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

10.1 Reactivity: Not determined or not available.
10.2 Chemical stability: Not determined or not available.
10.3 Possibility hazardous reactions: Not determined or not available.
10.4 Conditions to avoid: Not determined or not available.
10.5 Incompatible materials: Not determined or not available.
10.6 Hazardous decomposition products: Not determined or not available.

11 Toxicological information

11.1 Information on toxicological effects:

Acute Toxicity:

Oral:

: LD50 > 5000 mg/kg oral rat - Product.

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation.

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye damage.

Tetrasodium Pyrophosphate: Risk of serious damage to eyes.

Product information at recommended dilution:

Eye irritation may occur upon direct contact with eyes. No specific hazards for skin contact, inhalation, or chronic exposure are expected within normal use parameters.

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.9 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: ADR, ADN, DOT, IMDG, IATA		None
14.2 UN Proper shipping name: ADR, ADN, DOT, IMDG, IATA		None
14.3 Transport hazard classes: ADR, ADN, DOT, IMDG, IATA	**Class:** **Label:** **LTD. QTY:**	None None None

US DOT
Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Non Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Safety Data Sheet

Effective date: 11 May 2020 **Revision**: 11 May 2020
Trade Name: Alconox®

Comments: None	**Comments:** None
14.4 Packing group: ADR, ADN, DOT, IMDG, IATA	None
14.5 Environmental hazards:	None
14.6 Special precautions for user:	None
Danger code (Kemler):	None
EMS number:	None
Segregation groups:	None

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code: Not applicable.

14.8 Transport/Additional information:

Transport category:	None
Tunnel restriction code:	None
UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable

Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed as active.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Germany MAK: Not classified.
EC 648/2004 – This is an industrial detergent. Contains >30% phosphate, 15-30% anionic surfactant, <5% EDTA salts
EC 551/2009 – This is not a laundry or dishwasher detergent
EC 907/2006 – Contains no enzymes, optical brighteners, perfumes, allergenic fragrances, or preservative agents

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:
H315 Causes skin irritation.
H318 Causes serious eye damage.

NFPA: 1-0-0
HMIS: 1-0-0

At recommended dilution:
NFPA: 1-0-0
HMIS: 1-0-0

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SAFETY DATA SHEET

1. Identification

Product identifier **PUREGOLD® MEDIUM CHIPS**

Other means of identification

CAS number 1302-78-9

Synonyms SMECTITE * BENTONITE * MONTMORILLONITE

Recommended use Bentonite has a variety of uses. It can be used as a rheology modifier, binding agent, adsorbent, hydraulic-barrier, and filler.

Recommended restrictions Workers (and your customers or users in the case of resale) should be informed of the potential presence of respirable dust and respirable crystalline silica as well as their potential hazards. Appropriate training in the proper use and handling of this material should be provided as required under applicable regulations.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Company name CETCO, an MTI Company

Address 2870 Forbs Avenue
Hoffman Estates, IL 60192
United States

Telephone General Information 800 527-9948

Website http://www.cetco.com/

E-mail safetydata@mineralstech.com

Emergency phone number Emergency 1.866.519.4752/1 760 476 3962

Americas 1.866.519.4752 (US, Canada, Mexico) 1 760 476 3962

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards

Carcinogenicity	Category 1A
Specific target organ toxicity, repeated exposure	Category 1

Environmental hazards Not classified.

OSHA defined hazards Not classified.

Label elements

Signal word Danger

Hazard statement May cause cancer. Causes damage to organs through prolonged or repeated exposure.

Precautionary statement

Prevention Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing/eye protection/face protection.

Response If exposed or concerned: Get medical advice/attention.

Storage Store locked up.

Disposal Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information None.

3. Composition/information on ingredients

Substances

Chemical name	Common name and synonyms	CAS number	%
Bentonite	SMECTITE BENTONITE MONTMORILLONITE	1302-78-9	100

Constituents

Chemical name	Common name and synonyms	CAS number	%
QUARTZ (SIO2)		14808-60-7	<= 8
CRISTOBALITE		14464-46-1	<= 2

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

Composition comments Occupational Exposure Limits for constituents are listed in Section 8. Bentonite is composed mainly of smectite group minerals but the composition is varied, as expected for a UVCB substance, and other mineral constituents will be present in small and varying amounts. These minor constituents are not relevant for classification and labelling. The purity of the product is 100% w/w. Impurities are not applicable for a UVCB substance.

4. First-aid measures

Inhalation Move to fresh air. Call a physician if symptoms develop or persist. No specific first aid measures noted.

Skin contact Get medical attention if irritation develops and persists. No specific first aid measures noted.

Eye contact No specific first aid measures noted. Do not rub eyes. Rinse with water. Get medical attention if irritation develops and persists.

Ingestion No specific first aid measures noted.

Most important symptoms/effects, acute and delayed Dust in the eyes will cause irritation. Dusts may irritate the respiratory tract, skin and eyes. Prolonged exposure may cause chronic effects.

Indication of immediate medical attention and special treatment needed Provide general supportive measures and treat symptomatically. Keep victim under observation. Symptoms may be delayed.

General information IF exposed or concerned: Get medical advice/attention. If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. No hazards which require special first aid measures. Provide general supportive measures and treat symptomatically.

5. Fire-fighting measures

Suitable extinguishing media Use any media suitable for the surrounding fires.

Unsuitable extinguishing media Not applicable, non-combustible.

Specific hazards arising from the chemical None known. The product itself does not burn.

Special protective equipment and precautions for firefighters Material can be slippery when wet.

Fire fighting equipment/instructions Use water spray to cool unopened containers.

Specific methods Use standard firefighting procedures and consider the hazards of other involved materials.

General fire hazards No unusual fire or explosion hazards noted. This material will not burn.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Material can be slippery when wet. Wear appropriate protective equipment and clothing during clean-up. Do not breathe dust. Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS. No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.

Methods and materials for containment and cleaning up

Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Collect dust using a vacuum cleaner equipped with HEPA filter. Stop the flow of material, if this is without risk.

Large Spills: Wet down with water and dike for later disposal. Shovel the material into waste container. Following product recovery, flush area with water.

Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal.

Never return spills to original containers for re-use. Put material in suitable, covered, labeled containers. For waste disposal, see section 13 of the SDS. Collect powder using special dust vacuum cleaner with particle filter or carefully sweep into closed container.

Environmental precautions

Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Minimize dust generation and accumulation. Provide appropriate exhaust ventilation at places where dust is formed. Do not breathe dust. When using, do not eat, drink or smoke. Should be handled in closed systems, if possible. In case of insufficient ventilation, wear suitable respiratory equipment. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Store locked up. No special restrictions on storage with other products. Store in a dry area. Keep the container dry. Store in tightly closed container. Store in a well-ventilated place. Keep out of the reach of children. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Constituents	Type	Value	Form
CRISTOBALITE (CAS 14464-46-1)	PEL	0.05 mg/m3	Respirable dust.
QUARTZ (SIO2) (CAS 14808-60-7)	PEL	0.05 mg/m3	Respirable dust.

US. OSHA Table Z-3 (29 CFR 1910.1000)

Constituents	Type	Value	Form
INERT OR NUISANCE DUSTS	TWA	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.
		50 mppcf	Total dust.
		15 mppcf	Respirable fraction.
CRISTOBALITE (CAS 14464-46-1)	TWA	0.05 mg/m3	Respirable.
		1.2 mppcf	Respirable.
QUARTZ (SIO2) (CAS 14808-60-7)	TWA	0.1 mg/m3	Respirable.
		2.4 mppcf	Respirable.

US. ACGIH Threshold Limit Values

Constituents	Type	Value	Form
CRISTOBALITE (CAS 14464-46-1)	TWA	0.025 mg/m3	Respirable fraction.
QUARTZ (SIO2) (CAS 14808-60-7)	TWA	0.025 mg/m3	Respirable fraction.

US. NIOSH: Pocket Guide to Chemical Hazards

Constituents	Type	Value	Form
CRISTOBALITE (CAS 14464-46-1)	TWA	0.05 mg/m3	Respirable dust.
QUARTZ (SIO2) (CAS 14808-60-7)	TWA	0.05 mg/m3	Respirable dust.

Biological limit values

No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls	If engineering measures are not sufficient to maintain concentrations of dust particulates below the OEL, suitable respiratory protection must be worn. Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. If material is ground, cut, or used in any operation which may generate dusts, use appropriate local exhaust ventilation to keep exposures below the recommended exposure limits.

Individual protection measures, such as personal protective equipment

Eye/face protection	Chemical respirator with organic vapor cartridge, full facepiece, dust and mist filter. Applicable for industrial settings only. Wear dust-resistant safety goggles where there is danger of eye contact.
Skin protection	
Hand protection	Wear appropriate chemical resistant gloves. Applicable for industrial settings only. No protection is ordinarily required under normal conditions of use.
Other	Use of an impervious apron is recommended. Normal work clothing (long sleeved shirts and long pants) is recommended. Applicable for industrial settings only.
Respiratory protection	Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits. Chemical respirator with organic vapor cartridge, full facepiece, dust and mist filter. Applicable for industrial settings only.
Thermal hazards	Not applicable.
General hygiene considerations	Observe any medical surveillance requirements. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Use good industrial hygiene practices in handling this material.

9. Physical and chemical properties

Appearance	Tablet. Pellets.
Physical state	Solid.
Form	Solid. Tablet.
Color	Various.
Odor	None.
Odor threshold	Not applicable.
pH	8.5 - 11
Melting point/freezing point	> 842 °F (> 450 °C) / Not applicable.
Initial boiling point and boiling range	Not applicable.
Flash point	Not applicable.
Evaporation rate	Not available.
Flammability (solid, gas)	This product is not flammable.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not applicable.
Flammability limit - upper (%)	Not applicable.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	Not applicable.
Vapor density	Not applicable.
Relative density	2.6 g/cm³
Solubility(ies)	
Solubility (water)	< 0.9 mg/l
Partition coefficient (n-octanol/water)	Not applicable. Not applicable.
Auto-ignition temperature	Not applicable.
Decomposition temperature	> 932 °F (> 500 °C)

Viscosity	Not applicable.
Viscosity temperature	Not applicable.
Other information	
Bulk density	0.9 - 1.4 g/cm³
Explosive limit	Not applicable.
Explosive properties	Not explosive. Not explosive
Explosivity	Not applicable.
Flame extension	Not applicable.
Flammability	Not applicable.
Flammability (flash back)	Not applicable.
Flammability (Heat of combustion)	Not applicable.
Flammability (Train fire)	Not applicable.
Flammability class	Not applicable.
Flash point class	Not flammable
Molecular formula	UVCB Substance
Molecular weight	Not applicable.
Oxidizing properties	Not oxidizing. None.
Percent volatile	0 %
pH in aqueous solution	8.5 - 11
Specific gravity	Not applicable.
VOC	CARB 0 %

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Stable at normal conditions.
Possibility of hazardous reactions	Will not occur.
Conditions to avoid	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. Moisture. Avoid temperatures exceeding the decomposition temperature. Contact with incompatible materials.
Incompatible materials	None known.
Hazardous decomposition products	None.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Dust may irritate respiratory system.
Skin contact	Dust or powder may irritate the skin.
Eye contact	Dust in the eyes will cause irritation.
Ingestion	Not classified.
Symptoms related to the physical, chemical and toxicological characteristics	Dusts may irritate the respiratory tract, skin and eyes. None known.

Information on toxicological effects

Acute toxicity Not classified. Not known.

Product	Species	Test Results
Bentonite (CAS 1302-78-9)		
Acute		
Inhalation		
Dust		
LC50	Rat	> 5.27 mg/l, 4 hr OECD 436

Product	Species	Test Results
Oral		
Dust		
LD50	Rat	> 2000 mg/kg OECD 425

Constituents	Species	Test Results
CRISTOBALITE (CAS 14464-46-1)		
Acute		
Oral		
LD50	Rat	> 22500 mg/kg

Skin corrosion/irritation Not classified.

Serious eye damage/eye irritation Not classified. Mild irritant to eyes (according to the modified Kay & Calandra criteria)

Respiratory or skin sensitization

Respiratory sensitization Not classified.

Skin sensitization Not classified.

Germ cell mutagenicity Not classified.

Carcinogenicity In June 2003, SCOEL (the EU Scientific Committee on Occupational Exposure Limits) concluded that the main effect in humans of the inhalation of respirable crystalline silica dust is silicosis. "There is sufficient information to conclude that the relative risk of lung cancer is increased in persons with silicosis (and, apparently, not in employees without silicosis exposed to silica dust in quarries and in the ceramic industry). Therefore, preventing the onset of silicosis will also reduce the cancer risk..." (SCOEL SUM Doc 94-final, June 2003) According to the current state of the art, worker protection against silicosis can be consistently assured by respecting the existing regulatory occupational exposure limits. May cause cancer. Occupational exposure to respirable dust and respirable crystalline silica should be monitored and controlled. This product contains <10% total crystalline silica. The respirable crystalline silica as determined by the SWeRF method is <1% w/w.

IARC Monographs. Overall Evaluation of Carcinogenicity

CRISTOBALITE (CAS 14464-46-1)	1 Carcinogenic to humans.
QUARTZ (SIO2) (CAS 14808-60-7)	1 Carcinogenic to humans.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1052)

CRISTOBALITE (CAS 14464-46-1)	Cancer
QUARTZ (SIO2) (CAS 14808-60-7)	Cancer

US. National Toxicology Program (NTP) Report on Carcinogens

CRISTOBALITE (CAS 14464-46-1)	Known To Be Human Carcinogen. Reasonably Anticipated to be a Human Carcinogen.
QUARTZ (SIO2) (CAS 14808-60-7)	Known To Be Human Carcinogen.

Reproductive toxicity Not classified.

Specific target organ toxicity - single exposure Not classified.

Specific target organ toxicity - repeated exposure Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard Not an aspiration hazard.

Chronic effects Causes damage to organs through prolonged or repeated exposure.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Product		Species	Test Results
Bentonite (CAS 1302-78-9)			
Aquatic			
Algae	EC50	Freshwater algae	> 100 mg/l, 72 hours
Crustacea	EC50	Coon stripe shrimp (Pandalus danae)	24.8 mg/l, 96 hours
		Daphnia	> 100 mg/l, 48 hours
		Dungeness or edible crab (Cancer magister)	81.6 mg/l, 96 hours

Product		Species	Test Results
Fish	LC50	Freshwater fish	16000 mg/l, 96 hours
		Marine water fish	2800 - 3200 mg/l, 24 hours

Persistence and degradability Not relevant for inorganic substances

Bioaccumulative potential Will not bio-accumulate.

Mobility in soil Bentonite is almost insoluble and thus presents a low mobility in most soils.

Mobility in general The product has poor water-solubility.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal. Store containers and offer for recycling of material when in accordance with the local regulations.

14. Transport information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1052)

CRISTOBALITE (CAS 14464-46-1)	Cancer
QUARTZ (SIO2) (CAS 14808-60-7)	Cancer
CRISTOBALITE (CAS 14464-46-1)	lung effects
QUARTZ (SIO2) (CAS 14808-60-7)	lung effects
CRISTOBALITE (CAS 14464-46-1)	immune system effects
QUARTZ (SIO2) (CAS 14808-60-7)	immune system effects
CRISTOBALITE (CAS 14464-46-1)	kidney effects
QUARTZ (SIO2) (CAS 14808-60-7)	kidney effects

Superfund Amendments and Reauthorization Act of 1986 (SARA)

SARA 302 Extremely hazardous substance

Not listed.

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA)	Not regulated.
Food and Drug Administration (FDA)	Total food additive Direct food additive GRAS food additive

US state regulations

California Proposition 65

WARNING: This product can expose you to QUARTZ (SIO2), which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

California Proposition 65 - CRT: Listed date/Carcinogenic substance

QUARTZ (SIO2) (CAS 14808-60-7) Listed: October 1, 1988

US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))

CRISTOBALITE (CAS 14464-46-1)
QUARTZ (SIO2) (CAS 14808-60-7)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
Taiwan	Taiwan Chemical Substance Inventory (TCSI)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date	12-September-2014
Revision date	26-September-2018
Version #	20
Further information	UVCB = a substance of Unknown or Variable composition, Complex reaction products or Biological materials SWERF = Size Weighted Respirable Fraction methodology is a scientific method developed to quantify the content of respirable particles within a bulk product. All details about the SWERF method are available at www.crystallinesilica.eu.
HMIS® ratings	Health: 3* Flammability: 0 Physical hazard: 0
NFPA ratings	Health: 2 Flammability: 0 Instability: 0

List of abbreviations	SWERF = Size-Weighted Relevant Fine Fraction methodology is a scientific method developed to quantify the content of respirable particles within a bulk product. All details about the SWERF method are available at www.crystallinesilica.eu. UVCB = a substance of Unknown or Variable composition, Complex reaction products or Biological materials
References	For any information on literature references or toxicity/ecotoxicity studies, please contact the supplier.
Disclaimer	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The manufacturer expressly does not make any representations, warranties, or guarantees as to its accuracy, reliability or completeness nor assumes any liability, for its use. It is the user's responsibility to verify the suitability and completeness of such information for each particular use. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. CETCO, an MTI Company cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.
Revision information	This document has undergone significant changes and should be reviewed in its entirety.

Attachment F: Fieldwork COVID-19 General Prevention Measures

Geosyntec consultants | family of companies

Date: June 16, 2020
Revision: 4.1

Health and Safety

Fieldwork COVID-19 General Prevention Measures

Note: Major updates to the previous version (Rev. 3, April 3, 2020) are presented herein in green text.

Scope of this Document

To facilitate the safety and well-being of our employees while executing field operations as various government agencies begin to lift COVID-19 workplace restrictions in many sectors, the Corporate H&S Department has prepared this guideline to help employees minimize the risk of spreading or contracting COVID-19 during ***fieldwork operations***. This information complements Geosyntec's "COVID-19 Considerations & Mitigations for Ongoing Business Operations," and other guidelines and communications distributed via Geosyntec's COVID-19 SharePoint Portal.

We invite all staff to share their questions and ideas with Managers and Supervisors, Health and Safety Coordinators and Corporate Health and Safety Department. All Corporate Health and Safety staff are available to assist you with COVID-19 safety solutions on your projects, and we will continue to update and improve these guidelines as we learn more and receive your feedback.

Risk Analysis

The COVID-19 pathogen can be transmitted from infected individuals who *may* or *may not* be experiencing symptoms. So, all project/worksite locations and surrounding communities, and all coworkers and community members, represent a potential source of exposure for Geosyntec personnel. The virus is spread primarily by airborne respiratory droplets and aerosols containing the virus, which are emitted by infectious persons and can settle in the moth or nose of nearby people or be inhaled directly into the lungs. A secondary mode of infection is through *direct contact* between hands and contaminated surfaces (where droplets can also settle), and subsequent transfer to the mouth, nose, or eyes through touching. Our risk-reduction guidelines focus on avoidance or mitigation of elevated-risk situations through the core safety practices of ***physical distancing, use of face covers, personal hygiene, workspace sanitation***, and in certain situations, use of ***engineering controls*** and/or ***personal protective equipment***.

Situation-Based Protection Strategies

For each fieldwork deployment by Geosyntec staff, a site-/project-specific "COVID-19 prevention strategy" shall be developed through evaluation of work tasks and associated COVID-19 exposure risks, and engagement with field team members, client representatives, and other onsite stakeholders (owners, clients, subcontractors, suppliers, contractors), as appropriate for the work. The core focus of such a strategy will always be on three fundamental objectives:

- **Minimize the Magnitude of Possible Virus Contact/Exposure** - Minimize the *intensity* and the *duration* of potential exposure to the virus.
- **Minimize the Number of Interpersonal Contacts** – Limit the number of *direct person-to-person contacts*, as well as *indirect contacts* via shared *work surfaces* and *air spaces.*[1]
- **Maximize Mitigation Measures** - Utilize COVID-19 protections applicable to work tasks, utilizing *redundant* protections to the extent feasible.

Geosyntec employees engaged in the management and execution of fieldwork must apply the prevention/mitigation strategies delineated herein as appropriate and feasible for their work, and as

[1] Limit both the number of contacts, and more important, limit the number of persons with whom contact is made.

needed to adhere to applicable government mandates and client requirements, to minimize the risks of transmitting or contracting COVID-19.

1. Project Planning, Communication, Health and Safety Coordination[2]

- Information updates – Employees engaged in the management and execution of fieldwork projects are encouraged to stay up to date with the latest information and updates to Company operating procedures and due diligence/best practice norms regarding COVID-19; include this information at all safety meetings and incorporate related safe work practices into written safety plans (HASPs/THAs).

- Client requirements - For job sites under the control of another organization, obtain a copy of any relevant COVID-19 exposure control requirements and ensure we can fully comply; H&S can assist in evaluating such plans as needed. Understand contract requirements for Geosyntec to staff projects, anticipate disruptions of our ability to serve the project that are out of our control, and develop contingency plans for such situations.

- Government rules/restrictions – All project teams shall adhere to government mandates and restrictions relevant in the jurisdiction of your fieldwork. Information on such requirements may be obtained from Corp. H&S, Geosyntec personnel familiar with your work location, client contacts, or on-line resources made available on municipal, state and federal COVID-19 websites.

- Project management, planning, budgets – We anticipate that the COVID-19 pandemic, and associated protections needed during execution of fieldwork, will result in changes in how we plan for and budget fieldwork projects. Many aspects of fieldwork may be impacted, including pre-mobilization planning, field equipment and supplies, travel costs, accommodations, coordination with clients and subcontractors. Review of the Project Manager Checklist for H&S Compliance with COVID-19 planning in mind, particularly *Sections A and B--"Proposal and Pre-Contract Activity*" and *"Project Planning"*-- may be helpful in this regard.

- Prework coordination, HSCs, HASP/THA – Prior to the start of fieldwork on each project, conduct a pre-work safety orientation or "kickoff meeting" that includes each member of the project/field team (as well as with clients, subcontractors, other contractors, as applicable) to determine the scope of prevention measures for COVID-19 and other site hazards. Delineate key COVID-19 safety elements in the Written Safety Plan (HASP/THA) and monitor/implement these measures daily throughout the performance of field activities. Health and Safety Coordinators (HSCs) and Regional Safety Managers can assist.

- Designate an on-site "COVID Lead" – Designate an individual to oversee (observe and enforce) the COVID 19 preventative measures to be implemented by personnel on site. On short-duration projects, this role is most typically assigned to the individual designated as the on-site safety lead or field supervisor; for long-duration large projects, the role may preferably be rotated among onsite personnel to fully engage the entire field team, as well as share the responsibility.

- Work task innovations – All employees are encouraged to consider innovative ways of conducting their work to reduce the risks of contracting or transmitting COVID-19. Learn new communication capabilities through available technologies (WebEx, Skype, MS Teams, Office 365) and develop safety innovations for on-site field work. Modify your work tasks and use non-typical field practices to maintain physical distancing, personal hygiene, and work area sanitation.

[2] *This section repositioned from Section 10 in the previous edition of this document to the current Section1*

2. Assess Risks, Avoid/Mitigate Elevated-Risk Work Situations, 'Stop Work' Authority[3]

- Risk assessment – Per criteria established by OSHA's COVID 19 risk classifications (https://www.osha.gov/SLTC/covid-19/hazardrecognition.html#risk_classification), Geosyntec fieldwork is generally classified as ranging from "Lower Exposure Risk" to "Medium Exposure Risk." Geosyntec fieldwork does not include "High Exposure Risk" or "Very High Exposure Risk" in this classification as our work does not require close proximity of employees to confirmed or presumed COVID-19 patients – potential exceptions to this must be coordinated directly with the Regional H&S Manager on a case-by-case basis.

- Medium exposure risks - Where Geosyntec fieldwork involves entry into "Medium Exposure Risk" workplace environments, such as occupied residences, active/occupied health care facilities, extended-care/rehab/elder-care facilities, schools, correctional facilities, crowded public transportation areas, high-volume retail settings and similar high population density work environments, such work shall either be 1) eliminated or significantly curtailed (preferred), or 2) a strategy of "maximum mitigation" through focused and redundant protections (to the extent feasible) shall be implemented to minimize the potential intensity of exposure to the virus, and minimize the number of interpersonal contacts, both direct and indirect.

- Low exposure risks - In all low-risk situations, vigilance shall be maintained with regard to physical distancing, sanitation/hygiene, use of face covers, and other applicable controls in order to minimize the risk of COVID-19 disease transmission among workers.

- Personnel convergence points[4], movement of personnel and materials – For each project site, consider process flows of both materials and personnel, and make specific arrangements to minimize interpersonal contact and maximize physical distancing. Eliminate convergence points by such measures as: separate entrances and exits; "circular" routing of personnel footpaths; designate pick up/drop of points for materials and equipment; stagger personnel approaches.

- Hierarchy of controls – Geosyntec employees shall consider the typical "hierarchy of controls" for eliminating/mitigating COVID-19 hazards, as summarized below, with examples:
    - *Hazard Elimination* – Modify the scope of work to eliminate an elevated risk element, such as entry into a hospital with known COVID-19 patients.
    - *Hazard Substitution* – Deploy an on-site portable toilet as a substitute for using a rest room in a high-population-density facility (site facility or nearby travel stop).
    - *Engineering controls* – Use of Plexiglas barriers, or fans for ventilation, at points of personnel convergence.
    - *Administrative controls, safe work practices* – Maintain physical distancing; assign specific tasks to each on-site staff member (minimize multi-tasking) to limit interpersonal encounters; frequent disinfection of high-touch surfaces.
    - *Face Covers, PPE* – Use of face covers as barriers to minimize airborne release of respiratory droplets; use of disposable gloves; use of N95 respirator for "high-" and "very high-" exposure risks (per OSHA classification).

---

[3] *This section repositioned from Section 7 in the previous edition of this document to the current Section 2*

[4] Wherever persons come together and engage in *direct* person-to-person interactions, or when individuals contact each other *indirectly* via shared work surfaces and air spaces. Such points of convergence represent opportunities for transmission of the COVID-19 virus, should an infected person be encountered.

- Vigilance, redundant controls – Because the presence or absence of the COVID-19 virus in any workplace situation cannot be confirmed "real time" during fieldwork, vigilance in the application of controls, and a "default strategy" of using of redundant controls[5] where feasible, will afford the greatest levels of risk reduction and worker protection.

- Stop-work authority - Inform staff and coworkers that they have the authority to stop work if they suspect an unacceptable risk to the health or safety of participants. All employees are encouraged and expected to report elevated hazards to their supervisor/project manager, and seek assistance from the H&S Department in evaluating the risk and recommending safe work practices.

3. Be On-the-Lookout for Symptoms

- Symptoms – COVID-19 symptoms include:
    - Fever of 100.4 deg. F (38 deg. C) or higher
    - Fatigue (extreme, non-typical)
    - Persistent cough
    - Sore throat
    - Shortness of breath
    - Headache
    - Chills
    - Shaking/shivering with chills
    - Muscle aches/pains
    - Gastrointestinal distress (diarrhea, nausea, vomiting)
    - Loss of taste or smell (new, recent)
    - In severe cases, *emergency warning signs requiring immediate medical attention* may include trouble breathing, persistent pain or pressure in the chest, confusion, inability to arouse, and bluish lips or face.

- Self-monitor for symptoms – Geosyntec has implemented a Health Status Self-Check Process for our employees, detailed in Section 5.2.2 Geosyntec's "COVID-19 Considerations & Mitigations for Ongoing Business Operations." Using this process as our main tool, we will practice self-notification and self-quarantine as our primary method for excluding ill or potentially-ill workers who may be infectious from being present on our jobsites. Where local regulatory requirements or client requirements require more stringent on-site health check measures we will comply.
  Based on self-check/on-site check results, personnel with possible COVID-19 symptoms will respond as follows:
    - On site - If you are on site and begin to experience symptoms, wear a face covering, immediately isolate yourself from all other site personnel and notify your supervisor and the project manager (who will inform HR and the Branch Manager). Leave the site as soon as possible and follow Geosyntec guidance for self-quarantine. The company also recommends you seek medical care from your personal doctor or health care provider.
    - Off Site/Work – If you begin experiencing symptoms while away from work DO NOT GO TO THE JOB SITE. Contact your supervisor and the project manager and follow Geosyntec company guidance for self-quarantine. The company also recommends you seek medical care from your own personal doctor or health care provider.

[5] Use of two or more control measures simultaneously, such as wearing face covers, maintaining physical distancing, and using fans for fresh air ventilation, all at the same time in a given workplace setting.

For either of the above cases the Geosyntec HR & H&S Departments, in coordination with the project manager, will recommend appropriate follow-up measures (contact tracing, quarantine) regarding other project personnel. Project managers will need to arrange for replacement personnel if anyone is required to leave the site for an extended period of time.

- Coworker with symptoms – If a Geosyntec coworker, subcontractor, client or client contractor exhibits symptoms, or has presumptive or confirmed COVID-19, avoid close contact and implement safe work practices (delineated herein) as applicable. Contact the project manager, who will inform HR, H&S and the Branch Manager; the HR/H&S team, together with the project team, will evaluate risks and recommend appropriate response.

- Daily tailgate safety meetings – On a daily basis: communicate with on-site coworkers to reinforce COVID-19 prevention measures in general and those specific to the work, re-discuss symptoms to be on the lookout for, and confirm with each individual on the project team that they are not experiencing any possible COVID-19 symptoms.

- Field screening/documentation of worker symptoms – Formal procedures for onsite screening of symptoms may be required for certain projects (due to client requirements and/or government regulation), or as viable best practice (large workforce, multiple subcontractors, transient labor). Screening questions may focus on a range of specific symptoms, include questions about personal contacts and recent travel, and may include individual temperature checks. For additional information, or if Geosyntec is required to implement such a program, contact the Corp. H&S Department for assistance/guidance. As appropriate for the work, a requirement for formal COVID-19 screening of subcontractor personnel, or of other on-site stakeholder personnel, may be included in contractual subcontract agreements or site access agreements. Onsite project-specific forms can be readily developed as stand-alone forms, or as a component of related procedures/documents, such as worker/visitor entry/exit logs, safety dash cards, visitor orientation forms, etc. Contact Corp. H&S for assistance.

4. Integrate Physical Distancing Strategies into all Fieldwork Activities and Meetings

- Interpersonal physical distancing – Physical distancing is a fundamental strategy (in conjunction with use of face covers and other control measures) for controlling person-to-person transmission of the COVID-19 virus. For all work activities, maintain a *minimum* distance of 2 meters/6 feet from all other field staff, visitors and general public when possible. Where physical distancing objectives are not workable, face covers shall be worn, and other protective strategies delineated herein, as applicable to the situation, should be deployed (such as Plexiglas barriers, fans/ventilation, more frequent hand washing, more frequent work area sanitization,).

- Meetings - Eliminate in-person meetings where possible. Video meetings and conference calls are preferable. Practice physical distancing when conducting onsite daily tailgate safety meetings, pre-work assessments, progress meetings and oversight observations of the work. Where in-person meetings are necessary, limit the meeting to key individuals who absolutely need to attend--all attendees shall practice physical distancing with a minimum of 2 m/6 ft between individuals.

- Indoor/enclosed spaces - Minimize or eliminate time spent in a field trailer, and in similar indoor/enclosed work areas, particularly areas frequented by other individuals (coworkers, on-site personnel, general public). Where possible, conduct work tasks and in-person meetings out-of-doors to reduce transmission of airborne disease agents.

- Social greetings - Avoid hand shaking, fist bumps, and other social greetings with direct contact or proximity to individuals within the physical distancing limits. Greet coworkers at a distance and don't exchange business cards.

- Onsite paperwork, office supplies - Develop procedures to minimize person-to-person contact through exchange of logs, forms, field documentation, and other paperwork. Don't share miscellaneous office supplies (pens, pencils, etc.) and periodically wipe/disinfect commonly used items (staplers, printers, etc.).

- Schedules, staff assignments - Adjust staff schedules and work assignments to facilitate physical distancing and minimize contact with high-touch surfaces. Such measures may include (but are not limited to):
    - Stagger schedules/shifts;
    - Perform only critical tasks;
    - Cross-train individuals for greater flexibility in staff assignments;
    - Limiting field teams to only essential personnel can help minimize personal interactions;
    - Increasing the size of field teams may:
        - Enable assigning a specific onsite role to each team member, thereby minimizing close encounters with coworkers;
        - Shorten the workday and limit overnight hotel stays.

- Site visitors – For ***transient visitors*** (such as site deliveries) make arrangements to minimize interpersonal contact by maintaining physical distancing and completing visits outside of site trailers and site facilities. Prevent package handling by multiple individuals, wear disposable gloves when receiving packages, dispose of packaging/wrapping promptly, disinfect exterior of items, and wash hands thoroughly after receipt. For more extended visits by ***service providers*** or ***business visitors***, use appropriate controls as appropriate for the visit, including physical distancing, face covers, limit meetings to minimum essential personnel, limit the duration of the meetings, include visitor in a health status self-check process or document symptom screening.

5. Maintain Personal Hygiene

- Regular hand-washing – Conduct regular and thorough handwashing (at least 20 seconds) with soap and water throughout the day. Where a water supply for hand washing is not readily available, set up a 'field handwashing station' were feasible/appropriate, and label water container "for handwashing only."

- Hand sanitizer - Where water for handwashing is not available, utilize hand sanitizer (with at least 60% alcohol) frequently, then wash hands with soap and water as soon as possible. After applying alcohol-based hand sanitizer, allow it to dry completely before bringing hands into close proximity to potential ignition sources, such as arcing electrical equipment, surfaces that could cause static discharge, and most importantly – SMOKING!

- Skin moisturizers – Frequent handwashing, and use of alcohol-based hand cleaners, or contact with chemical irritants in disinfectant cleaners, can result in dry/cracked skin. Periodic use of moisturizing creams can counteract that effect.

- Facial tissues - Carry a supply of facial tissues and use as much as possible for coughs/sneezes and dispose of used tissue in regular trash. "Covering your cough" is acceptable; use and disposal of tissues is more sanitary and therefore preferred.

- "Cover your cough" – When facial tissue is not ready at hand, cover your cough or sneeze by coughing/sneezing into the crook of your elbow--not into your hands. If you need to cough/sneeze into your hands, wash hands immediately.
- Personal hygiene supplies – In Geosyntec-controlled site trailers and other regularly-visited worksites, personal hygiene supplies including hand sanitizer, wipes, soap, and paper goods shall be maintained in adequate supply, as available for purchase.
- Minimize hand-contact with work surfaces and your face – Develop changes in your typical work practices and personal habits to eliminate or minimize the frequency of hand contact with surfaces in your work environment (e.g., avoid unnecessary contact with work surfaces, open doors with minimal hand/finger contact, grip handrails with fingers or at intermittent junctures rather than sliding your hand the full length; etc.). Limit habitual hand contact with your face. Contact your face only after thorough hand washing. If it's necessary to contact your face, use the back of your hand or knuckles rather than your palm or fingertips.

6. Work Area Cleaning, Sanitation, Protection, Modifications

- On-site trailers and similar indoor workspaces – On-site trailers/facilities at Geosyntec-controlled sites should be cleaned by custodial services at least once per day. Disinfect "high-touch" surfaces regularly during each workday. Cleaning and sanitation supplies shall be maintained in adequate supply and used regularly to clean/sanitize work surfaces.
- Clean "high-touch" work surfaces – Wipe high-touch work surfaces with sanitizing cleaners (preferred), detergents or soap & water at the start and end of each work shift and periodically throughout the day. High-touch items include cell phones, personal water bottles, desktops, computer keyboards, touch screens, tools, field equipment, coolers, doorknobs, railings, refrigerators, microwaves, light switches, thermostats, faucet/toilet handles, latches on portable bathrooms, and similar items. Items being used/shared by more than 1 person should be cleaned before transferring.
- Cleaners/sanitizers - Cleaning/disinfecting supplies may include commercial cleaners containing common EPA-registered household disinfectants, alcohol solutions containing at least 60% alcohol, or diluted household bleach solution[6] applied with commercial wipes or paper towels. See COVID cleaning and disinfection guidelines for more detail and full disinfection steps. Discard all used wipes/paper towels in regular trash.
- Chemical hazards of cleaners/disinfectants – Commercial disinfectant products shall be used in accordance with product labels, safety data sheets and manufacturer specifications, and appropriate PPE--typically nitrile or vinyl gloves--used as recommended. Safety Data Sheets (SDSs) for commonly used cleaners and disinfectants are provided for use by workers on our COVID-19 SharePoint site HERE. Note that many alcohol-containing products are flammable and should be used well away from ignition sources. Many disinfectants contain chemical irritants that can cause skin dryness/cracking/irritation. Wearing chemical protective gloves when sanitizing surfaces and/or periodic use of skin moisturizers can counteract these effects.
- Housekeeping – Proper housekeeping shall be maintained in all work areas. Minimize/eliminate clutter and accumulations of trash and debris, particularly trash items that have received human

[6] Per the CDC, a solution can be prepared by mixing: 5 tablespoons (1/3rd cup) bleach per gallon of water, or for smaller amounts 4 teaspoons bleach per quart of water.

contact (food wrappers, disposable cups, paper towels/tissues, etc.). Minimizing clutter will facilitate regular cleaning of high-touch surfaces. Empty trash receptacles daily.

- Protect frequently-used workspaces – In workspaces frequently accessed by on-site personnel, such as supply storage areas, treatment system control stations, toilet facilities, and hand washing stations, require that all personnel who enter these workspaces wear face covers to minimize the presence of respiratory droplets in the air or settled on surfaces.
- Work area modifications – Physical modifications of the work area should be considered as a means of limiting the intensity and/or frequency of possible exposure to the virus (should infected personnel be present), such as:
    - Use of physical barriers or caution tape to delineate travel pathways as a means of limiting interpersonal contacts and maintaining physical distancing;
    - Opening doors and windows to enhance fresh air ventilation;
    - Erecting canopies for outdoor tailgate meetings during inclement weather;
    - Erecting Plexiglas barriers at specific points of personnel convergence

7. Minimize Travel-Related Risks

Geosyntec has developed specific business travel protocols in Section 6.0 of our "COVID-19 Considerations & Mitigations for Ongoing Business Operations" procedure (referred to as "the Procedure," below). In addition, personnel performing fieldwork-related travel should also consider the following:

- Vehicle travel – See Section 6.1 of the Procedure; in addition: Regularly clean/disinfect high-touch surfaces (steering wheel, shift lever, door handles, tailgate, etc.) in personal vehicles, company field vehicles and rental vehicles. Try to travel one person per vehicle, but no more than two. If traveling with others in the same vehicle, exercise physical distancing as possible within the vehicle and wear face masks/covers.
- Fatigue management – Limit total travel and work time to no more than 14 hours per day. Additional provisions are provided in *HS 211 Fatigue Management Plan*.
- Minimize stops - Make as few stops as possible during travels to limit exposure to public spaces. Adhere to Journey Management Plan requirements (where applicable).
- Fuel/food/supply stops - When traveling by vehicle, and when stopping for fuel or other supplies is necessary, either clean/sanitize your hands upon completion of food/fuel stop, or wear gloves during the stop, then discard gloves and wash hands. Utilize physical distancing (6 ft/2 m) and wear a face mask/cover during the stop.
- Public restrooms/washrooms – Minimize or eliminate the use of public restrooms/washrooms, particularly in high-population-density locations (such as travel stops, occupied site facilities), as elevated-risk factors may include: recent use by many individuals; poor ventilation; small enclosed air-space; repeated use of high-air-velocity hand driers (which increase levels of airborne particulates). On-site portable toilets, with doors propped open between use for ventilation, represent lower exposure risk, particularly if used by limited number of on-site personnel.
- Minimize/eliminate cash transactions – To minimize interpersonal contact, and to maintain appropriate physical distancing, use credit-card transactions where possible. Avoid passing credit cards to vendors is possible (prefer swipe/chip reader situations). If you must pass the credit card to someone, wipe it with sanitizer upon receiving it back.
- Air travel - See Section 6.2 of the Procedure; in addition: To the extent possible, minimize/curtail air travel. Branch Manager approval is required for air travel. Adhere to existing restrictions on

domestic and international travel. Maintain physical distancing and use a face cover while at any airport. Have disinfectant wipes with you and wipe high-touch surfaces (head rest, tray, arm rest, lavatory latch). Wear protective gloves and a face mask or cover at all times while on airplane.

- Public transportation – See Section 6.4 of the Procedure; in addition: Avoid travel on trains, subways, buses, and other public transportation (i.e., ride share) where possible, especially in metropolitan areas with elevated levels of community transmission. If such travel is necessary, practice physical distancing, disinfect high-touch surfaces (seat, headrest, arm rest, hand-hold, etc.). Wear protective gloves and a face mask or cloth face cover during travel, and wash hands thoroughly upon completion of travel.

- Safe accommodations - See Section 6.3 of the Procedure; in addition: Book accommodations only at reputable hotel chains and verify with the hotel that appropriate protocols are in place to limit the potential exposure and spread of the virus by thorough cleaning and disinfection. Motels/hotels with direct access to each room, or house/apartment rentals (such as through Airbnb) may be preferable to minimize the number of contacts, direct or indirect, with other people. Added safety measures include:
    - Sanitize high-touch surfaces in your room with your own sanitizing cleaner (doorknobs, light switches, TV controller, desktops, etc.);
    - Avoid public areas/common spaces to the greatest degree possible;
    - Use hotel entrances closest to your room; avoid lobby, elevators, and other public spaces as much as possible;
    - Eliminate daily housekeeping room service;
    - Select hotels/motels with direct outside access to your room.

- Critically assess the need for travel – Coordinate with clients and colleagues about the need for travel and the potential for alternatives to face-to-face meetings and travel away from home, such as schedule changes and virtual meetings.

8. Utilize Safe Practices for Food & Beverage Provisions

- "BYOFB" – Each individual should bring his/her own food and beverages to all work sites to avoid stopping at a store or restaurant. When shopping for food, obtain food for several days in advance to minimize the number of trips to the grocery store.

- Suspend providing food in common areas – Refrain from delivering commonly shared foods—bagels, muffins, buffet lunch, coffee service areas etc. If any food is to be provided for a group, it must be individually packed and served (e.g. box lunches), and physical distancing must be practiced by all while food is consumed.

- Personal cooler – Use your own personal lunch pack or cooler with ice packs refrozen daily for safe food storage during each workday and avoid use of "community" refrigerators.

- Physical distancing during meals - Food should be eaten alone or at a minimum physical distance of 2 m/6 ft between persons. Dine in your vehicle or outside alone and avoid using the project trailer or common spaces in site facilities.

- Drinking water/beverage dispensers – Restrict drinking water sources onsite to individual bottled water only. Refrain from using shared water dispensers and coffee service. Have workers take measures, such as labeling bottles, to avoid drinking out of someone else's bottle.

9. Face Covers, Personal Protective Equipment (PPE)

- Face masks/covers used as emission barriers – Use of a nose/mouth face covering—dust masks, surgical masks, cloth face covers—is considered a fundamental protective measure for COVID-19. Face masks and covers capture potentially infectious respiratory droplets/aerosols produced by the wearer (i.e., from coughs, sneezes, speaking, etc.), thereby limiting exposure risks to coworkers by limiting airborne levels of droplets and settling of droplets onto surfaces. Therefore, use of acceptable nose/mouth face coverings[7] is authorized for unrestricted use by Geosyntec personnel for cases where the coverings are strictly used *as an emission barrier only* for COVID-19 exposure risk reduction, particularly where preferred physical distancing measures and other controls are impractical. See COVID-19 Considerations & Mitigations for Ongoing Business Operations, Attachment 2, "Facial Coverings," for information on proper usage, video instructions, and additional resources.

- A few additional pointers about face covers – Light-weight loose fitting paper masks may tend to blow around a bit on a windy day—a heavier weight and/or form-fitting cloth cover may be preferable. Masks that do not fit tightly over the nose are more likely to cause fogging of eyewear, particularly in cool weather. Wash cloth masks frequently, and when not in use, place in a zip-loc bag or similar container to keep it clean. When wearing a face cover, individuals may be inclined drink less fluids due to apprehension to lift the mask—remember, it is still essential that you drink sufficient fluids to prevent heat related illness.

- Use of NIOSH-approved N95 respirators for wearer inhalation protection - In situations where workers require inhalation protection from a confirmed source of airborne COVID-19 hazard (e.g., entry into a high-exposure-risk locations such as a COVID-19 patient room in a hospital – see Section 2), respirator use MUST be coordinated directly with your H&S manager to ensure that a proper risk assessment and device selection is conducted and that all elements of a respiratory protection program are implemented.

- Disposable gloves – Where contact with potentially contaminated surfaces may occur the prevention of "hand-to-face" transfer of material is important to mitigate exposure risk, and requires frequent hand washing and disinfection. Surgical-type gloves made of nitrile or vinyl[8] provide a means of simplifying this decontamination and is especially preferable in elevated-risk circumstances where proper washing/disinfection could become excessive or where access to cleaning stations is not readily available. Gloves must be removed and disposed of after a specific task, and upon removal wearers must wash hands (for a minimum of 20 seconds) or apply hand sanitizer (>60% alcohol) immediately.

[7] Acceptable nose/mouth face coverings for use as emission barriers (only) include: Loose-fitting masks (commonly termed "surgical masks"), tight-fitting masks where the device body is the filtering material and the design does NOT incorporate an exhalation valve of any kind (irrespective of protection rating, such as N95, P99, KN95, etc.), or even home-made or make-shift face covers (e.g., home-made masks, bandanas, balaclavas, etc.). In accordance with the CDC, an acceptable cloth face cover should: fit snugly but comfortably against the side of the face; be secured with ties or ear loops; include multiple layers of fabric; allow for breathing without restriction; and be able to be laundered and machine-dried without damage or change to shape. Note: Any negative pressure elastomeric respirator devices utilizing filter cartridges (e.g., ½-face or full-face respirators) are strictly prohibited for use as emission barriers - use of such devices is for wearer inhalation protection only and requires prior concurrence from the H&S manager.

[8] Latex gloves are also effective and acceptable for protection against COVID-19 but come with a risk of severe allergic reaction to latex from sensitized individuals.

- Other PPE – Face shields used in conjunction with cloth masks, of use of Tyvek-suits, may have useful applicability in some situations to minimize exposure risk, or may be required by regulation or the client.

10. Ventilation, Fresh Air, Air Circulation

In some fieldwork environments both indoors (such as site trailers, treatment system facilities, host facilities) as well as outdoors (staff congregation points), a possible viable infection-risk-reduction measure—used in conjunction with physical distancing and face covers--may be to optimize the amount of air movement and/or fresh air ventilation in both the breathing zone and general work areas. The ultimate purpose is to mitigate localized areas of elevated inhalation risk, particularly at points of personnel convergence where site restrictions or the specific nature of the work may compromise physical distancing or use of face covers. Suggestions/examples are listed below:

- Facilitate passive cross ventilation – Where multiple personnel may temporarily congregate (sampling hand-off points, outdoor tailgate meetings, under canopies set up outdoors for rain/sun protection) consider strategies that facilitate "comfortable cross ventilation:"
  - Place canopies in an open location (not shielded by buildings, vegetation) to maximize passive air currents;
  - Set up indoor and outdoor workstations in locations with natural ventilation—avoid areas with limited air movement, "stagnant air."
  - Keep doors of portable toilets open at all times between use.
- Maximize fresh air – In site trailers, and inside on-site/client facilities, keep doors and windows open at all times (as practical), limit the use of air conditioners--eliminate "cocooned air-conditioned environments" with limited fresh air. Where work is conducted in an indoor environment, locate congregation points near open windows, open doors, or "high-bay" areas with open vents and natural air movement.
- Active cross ventilation – Under ambient conditions of little or no existing air movement, use fans or blowers to increase air movement across the breathing zone at elevated-risk congregation points, such as:
  - In site trailers with doors/windows open;
  - During outdoor tailgate meetings near site trailer under canopy during rain;
  - Working in "close quarters" on boats/barges;
  - Louvered exhaust fan in an enclosed/indoor treatment system facility;
  - For some work tasks, such as indoor drilling with fuel-powered equipment, use of blowers/fans is standard procedure for mitigating airborne combustion emissions, and will have the added benefit of reducing the airborne levels (local accumulations) of COVID 19.

IMPORTANT NOTE: Where Geosyntec personnel may see increased use of electrical fans and blowers, increased reliance on fresh air and the outdoors for hygienic purposes, and decrease reliance on "cocooned air-conditioned environments," we must be more cognizant of measures to mitigate electrical hazards (take precautions in wet locations, use GFCI-protected power sources), and heat stress hazards (drink fluids, more frequent breaks, shaded break locations, cooling personnel by air-movement, personal wellness).

11. Maintain Healthy Lifestyle, Facilitate "Wellness"

- Personal wellness – Spend extra effort to stay well (e.g., eat healthy, get enough rest) to maintain a strong immune system; develop strategies to maintain emotional wellness.

- Exercise, stretching – Make time for solitary physical exercise, stretching, yoga or similar activities; avoid group activities where possible; maintain physical distancing; use only your own personal exercise equipment and accessories.
- Ergonomics – As employees are adjusting to new work strategies, which may entail working from home in a non-office environment, all employees are encouraged to consider strategies for maintaining appropriate work-station ergonomics.

Here are some additional resources to provide to employees and post in field office locations

- COVID-19 Factsheet
- Geosyntec COVID Procedure: "COVID-19 Considerations & Mitigation for On-Going Business Operations"
- Keep Calm and Wash Your Hands
- Wash Your Hands!
- Make a Field Hand Washing Station
- Making Hand Washing Solution from Liquid Bleach
- Know the facts about Coronavirus Disease 2019 and help stop the spread of rumors

Attachment G: Geosyntec Health and Safety Procedures

Geosyntec consultants | family of companies

US Health & Safety Procedures

Procedure: HS 105 US
Date: June 2015
Revised: December 2019

Driver and Vehicle Safety

1. PURPOSE

This procedure is designed to promote driver and vehicle safety and to establish the minimum requirements for the safe operation of motor vehicles while driving on company business by employees of our U.S. operations.

2. SCOPE

The procedure applies to the operation of motorized vehicles intended for ground transportation while on company business, including personally owned vehicles (POVs) when being used on company business and vehicles that are owned, rented, and or/leased by Geosyntec (the Company) or otherwise provided to an employee for business use.

3. COMMONLY USED TERMS

Term	Description
Accident	Any incident in which the vehicle comes in contact with another vehicle, person, object, or animal which results in death, personal injury, or property damage, regardless of whom was injured, what was damaged or to what extent, where or when it occurred, or who was responsible.
Accident, At-Fault	An accident in which evidence has indicated that a driver's actions were the primary cause of the accident.
Accident, No-Fault	An accident in which there was not enough evidence to determine which, if any, driver's actions were the primary cause of an accident.
Authorized Driver	Any company employee or contracted hire: (i) who may operate a company-owned, leased, or rented vehicle, (i.e. a Company-Provided Vehicle) and/or a Personally Owned Vehicle (POV); and (ii) who has submitted the appropriate motor vehicle report consent forms and been approved by Human Resources (HR).
Authorized Passenger	Company employee, client, vendor, or other person(s) associated with company business traveling with an authorized driver for a business purpose.
Company-Provided Vehicle (CPV)	Any vehicle owned, leased, or rented by Geosyntec or its personnel for the purpose of conducting company business. Please refer to Vehicle

Term	Description
	Rental Policy for additional guidance on driver eligibility, insurance, and use restrictions.
Health and Safety (H&S) Department	The Geosyntec corporate department responsible for administering all H&S policies and procedures including this one.
Personally Owned Vehicle (POV)	Any type of motorized vehicle, other than a CPV, that is being used by an Authorized Driver on company business.

4. PROCEDURE

4.1 Authorized Drivers

4.1.1 Only HR can approve an employee's Authorized Driver status after the required consent forms have been submitted, and a satisfactory motor vehicle record (MVR) has been confirmed.

4.1.2 Only Authorized Drivers are permitted to operate motor vehicles on company business.

4.1.3 Authorized Drivers are responsible for reporting any conviction (work-related and not work-related) resulting in license limitation, suspension, or revocation, or involving driving under the influence of drugs and/or alcohol to the Geosyntec HR Director immediately upon receipt of such a finding.

4.1.4 Authorized Drivers should notify HR promptly if there is a change to their driver's license number or state of issue.

4.2 Training

4.2.1 New employees who may drive for work purposes as an Authorized Driver must complete the Company's on-line Driver Safety (DD1) course, or an alternative course, approved by the Health and Safety (H&S) Director, prior to operating a CPV or a POV on company business.

4.2.2 Current employees who may drive for work purposes as Authorized Drivers must complete the company's on-line Driver Safety (DD1) course, or an alternative course, approved by the H&S Director, if they have not done so within the past two (2) years, in order to maintain their Authorized Driver status and thereby retain access to CPVs and POVs for company business.

4.2.3 At the discretion of the H&S Director, HR, and the Risk Management Committee (RMC), employees involved in accidents while driving for work purposes (At Fault or No-Fault) may be required to participate in supplemental training (i.e., Defensive Driving DD2) and/or an equivalent.

4.2.4 Retraining is required every two (2) years. Training records and refresher due dates are maintained by the Corporate Training Department or designee.

4.3 Motor Vehicle Records Review

4.3.1 Geosyntec will contract with an authorized background consumer reporting vendor to review employee motor vehicle records (MVR) as reported through our national system of State Department of Motor Vehicles. The intent of the procedure is to identify employees that may

pose an increased risk for the operation of vehicles for use on company business and provide an opportunity for enhanced driver safety education, as warranted.

4.3.2 Geosyntec will direct employees to sign electronic consent forms in accordance with state and federal laws and will obtain driving records for employees who may drive for work purposes - Authorized Drivers as defined in Section 3 above. An employee who does not submit the required consent forms is not considered an Authorized Driver and is not authorized to operate any vehicle for company business or to submit driving-related expenses. Review of employee MVRs will take place upon acceptance of an employment offer and prior to the start of employment for new employees, and every two (2) years for all Authorized Drivers. Employees cannot operate a vehicle for Company business until HR has approved the MVR record. The Company may also obtain and review MVRs for any employee who incurs an "at-fault" accident on company business or at the discretion of the supervisor and/or H&S Department as warranted for business-necessity reasons.

4.3.3 A new employee who may drive for work purposes will have his/her MVR reviewed and approved by HR as a condition of driving for company business and for authorization to submit driving-related expenses for reimbursements. Each state provides MVR records in line with specific state reporting requirements, which are not controlled by the Company or the authorized background consumer reporting vendor and may report MVR history beyond a two-year period. However, the Company will only consider the MVRs of hires and employees for the two-year period preceding the date of the records search for the purpose of this policy.

4.3.4 The Company contracts with an authorized background consumer reporting vendor to obtain state MVRs in compliance with state and federal laws. Representatives from the Company's HR department will review driver violations to determine if the record contains any Type A or Type B violations in the preceding two-year period, as further described below.

4.3.5 Type A violations include, but may not be limited to the following:

- Driving under the influence of alcohol or drugs or refusing to take a substance test.
- Driving with an open container of alcohol.
- Reckless/careless driving and/or hit and run.
- Fleeing, evading police or a roadblock, or racing/speeding incident.
- Driving on an expired, suspended, or revoked license.
- Vehicular assault.
- Restrictions to a driver's license which the Company is unable or unwilling to accommodate for safety or liability risk reasons, or because it creates an undue hardship for the Company to do so.

4.3.6 Type B violations include, but may not be limited to the following:

- Moving violations such as, texting and driving, speeding, improper lane change, failure to yield, and failure to obey a traffic signal or sign; and
- At-fault accidents as confirmed by a police report/investigation.

4.3.7 Because the MVRs are a type of background/consumer report under the **Fair Credit and Reporting Act (FCRA)**, HR administers the FCRA aspect of the program. If the Company receives a non-compliant MVR, HR will inform the employee and will provide the employee with a statement of his/her rights, a copy of the MVR report, and the right to dispute potentially inaccurate information within state and federal guidelines. Employees will have at least five (5) business days or as otherwise noted in the applicable law of the employees' home state, to dispute the information. If the information is not disputed within the provided timeframe or, if

disputed, found by the authorized background consumer reporting vendor to be accurate, HR may share a summary of the report with representatives of our H&S Department and/or the employee's supervisor as deemed appropriate. In cases where consideration is being given to decline approval or provide a conditional approval, HR may also share the details of the MVR with the Company's H&S Director.

4.3.8 Employees with one (1) or more Type A driving violations within the prior two (2) years may be placed on probationary driving status or suspended from driving a CPV or POV on company business until such time as the Company has determined otherwise, depending on the violation(s). The employee affected will receive a copy of the MVR in question and will be given an opportunity to discuss the pertinent circumstances of the violation(s) with a member of the HR department. Depending on, but not limited to, the nature and frequency of the violation(s), at a minimum, the employee may be required to successfully complete a driver safety education program selected by the H&S Department within one (1) month of being placed on probation or being suspended. The H&S Department will develop a plan for the affected employee, which may include, but not be limited to, the length of probation or suspension, the driver safety education program(s) the employee may be required to take, the frequency of future MVR screenings, and the discipline that may be enforced should additional violations occur during or after the probationary or suspension period. In addition, other actions including rescinding an employment offer or termination of employment may be considered by the Company.

4.3.9 Employees with two (2) or more Type B moving violations or one (1) or more at-fault driving accident(s) during the applicable review period may be placed on probationary driving status. Employees placed on probation may be allowed to operate a vehicle for company business purposes provided he/she satisfactorily completes a driver safety program selected by the H&S Department within the timeframe established by the H&S Department. Based on the circumstances and severity of violations, the H&S Department may develop a plan for the affected employee, which may include the duration of probation, the frequency of future MVR record review, and the discipline that may be enforced should additional violations occur during the probationary period. Discipline for subsequent violations during or after the probationary period may include suspension from driving a personal, company or rental vehicle for business purposes, or termination of employment.

4.4 General Requirements

4.4.1 CPVs are for official company business only. Personal use is not permitted unless approved in advance by the employee's Department Manager or Branch Manager. Road travel will be limited to all extent possible and during daylight hours. The weather, environmental conditions, client expectations, etc. also need to be considered prior to driving. If bad weather conditions are forecasted, driving should be avoided/delayed when practical.

4.4.2 Authorized Drivers shall comply with all governmental traffic and other laws and regulations relating to vehicle operation, all client requirements, and project policies concerning vehicle operation.

4.4.3 Authorized Drivers who use a POV on company business are responsible for the POV's operating condition and for the personal safety of themselves and their passengers. They must also maintain appropriate insurance coverage on the POV, including coverage for liability, uninsured motorist, collision, and property loss.

A note about insurance:

It is your responsibility to maintain appropriate insurance coverage on your POV, including coverage for liability, uninsured motorist, collision, and property loss. If you use your POV for company business extensively, please consult your carrier's representative to ensure that your coverage extends to "business" uses. All Authorized Drivers should have in their possession a Geosyntec Accident Reporting Card.

4.4.4 Any vehicles used for company business must have the appropriate registration and insurance required by the jurisdiction in which the vehicle is registered.

4.4.5 All vehicles used on company business that have seat belts as original equipment must retain them. In vehicles with seat belts, all occupants must use them. In vehicles with seat belts, the number of occupants shall not exceed the number of seat belts.

4.4.6 No employee shall drive on company business when:

- They have a suspended, expired, or revoked license.
- They are under the influence of alcohol or drugs.
- They are specifically restricted by a medical provider (in writing) due to health issues, taking prescription medication(s) that have a stated adverse effect (i.e., drowsiness, blurred vision, dizziness, vertigo, etc.).
- They have injuries or illnesses that could prevent the safe operation.
- They are experiencing a temporary personal condition (e.g., excessive fatigue, extreme emotional distress) that could prevent safe operation.
- For extended driving periods, staff will take appropriate rest breaks to limit fatigue. Pursuant to HS201, employees are limited to no more than a 14 hour work day, which includes any driving for business that may be required.

4.4.7 Unless specifically approved by a client representative or a Geosyntec Department or Branch Manager, vehicle motors/engines shall not be left running when the vehicle is unattended.

4.4.8 Unless specifically required by the site health and safety plan or the client's site management regulations, the vehicle ignition key shall not be left in an unattended vehicle.

4.4.9 Geosyntec employees shall not use all-terrain vehicles (ATVs) and/or other motorized vehicles not specifically designed for over-the-road use unless specifically approved in the project/site health and safety plan.

4.4.10 Any samples or glass items shall be transported in vehicles in accordance with applicable governmental regulations.

4.4.11 Geosyntec employees are prohibited from riding in pickup truck cargo beds. Geosyntec employees are prohibited from transporting any passengers in pickup truck cargo beds.

4.4.12 Report missing or defective safety equipment to the appropriate manager and obtain replacement equipment before driving in or riding in a CPV. Confirm with both your direct supervisor and the office manager of your destination(s) and trip itinerary.

4.4.13 Maintain CPVs in a clean and orderly condition and obtain driving directions prior to traveling in unfamiliar locations and/or site facilities.

4.4.14 Ensure CPVs do not exceed weight or towing capacity.

4.4.15 Smoking is not permitted in CPVs.

4.4.16 While operating a CPV or POV on company business, employees are specifically prohibited from:

- Disabling any safety device including seat belts and air bags.
- Transporting anyone other than Authorized Passengers.
- Allowing unauthorized personnel to operate a CPV.
- Using portable computers or similar devices while the vehicle is in motion.
- Smoking or using a cell phone while refueling.
- Violating cell phone laws or restrictions (see 4.7 below).
- Violating applicable driving laws regarding alcohol levels and open containers of alcohol.

4.5 Site Vehicles and Equipment

4.5.1 Operation of materials-handling equipment such as, but not limited to, forklifts, winch trucks, front-end loaders, tractors, etc. by Authorized Drivers is not permitted without prior training, licensure, and written authorization from the Geosyntec's H&S Director.

4.5.2 Drivers and passengers shall ride with all portions of their bodies inside the vehicle body or frame.

4.5.3 Drivers and passengers shall be in the seated position, with the seat belts fastened before the vehicle is set in motion.

4.5.4 Riding on any vehicle's bumper or tailgate is prohibited.

4.5.5 Tailgates will be closed before the vehicle is set in motion unless carrying an extended load that is properly secured and flagged.

4.5.6 If a vehicle is not designed to transport passengers, it must not be used for that purpose.

4.5.7 When driving on private property or project sites, drivers shall comply with the posted or specified speed limits and traffic rules established for the project or site.

4.5.8 Drivers operating a vehicle with a gross vehicular weight of more than 20,000 pounds will use chocks when parking on steep slopes or grades.

4.6 In Case of a Vehicle Accident

In case of any accident involving a CPV at any time or a POV when being used on company business, whether there is any injury or damage whatsoever, or not, the Authorized Driver shall:

- Stop.
- Call for medical assistance in case of bodily injury and clear the road as required by local jurisdiction.
- Call for local police assistance to report the accident.
- Provide your name, address, driver's license number, and vehicle insurance information.
- Obtain the following:

    - Name, address, telephone number, driver's license number, state of issue, and insurance information of the other drivers involved.
    - Name and contact information from passengers in other vehicles if any.
    - Year, make, and model of any vehicles involved.
    - Name and contact information of any witnesses.
    - Police report, when available.
- Promptly notify your supervisor.
- If you are in the United States or Canada, please notify the Legal Department to obtain help on insurance coverage with company owned vehicles. Please contact the Accounting Department if the incident involves rental vehicles. If you are outside of the United States or Canada, please contact the nearest Geosyntec office.
- Complete the form "What to do in case of a Vehicle Accident" (Attachment 1) and submit to your supervisor as soon as possible.
- Within 24 hours, or as soon as situationally possible, file an online Preliminary Incident Report and contact **WorkCare at 888-449-7787** to confirm injuries or lack thereof.

4.7 Cellular Phones/Wireless Communications

While operating a vehicle on company business, employees shall refrain from using wireless communications devices where specifically prohibited by law or regulation. Where no laws or regulations apply to the use of wireless communication devices, Authorized Drivers shall not use such devices while the vehicle is in motion unless the device is in a hands-free mode.

4.8 Safety Inspections

Authorized Drivers are responsible for verifying that vehicles they operate on company business are in safe operating condition. Authorized Drivers are not allowed to use vehicles that do not have current state and/or local inspections and registrations (new vehicles waiting for tags are exempt). Authorized Drivers should observe that the following safety items/systems are in good working order prior to vehicle operation:

- Seat belts.
- Doors and door locks.
- Headlights and tail lights.
- Rear view mirrors and side mirrors.
- Turn signals.
- Backup lights.
- Horn.
- Backup alarms, if applicable.
- Parking brake.
- Speedometer.
- Steering system.

- Windows (operate correctly, clean and, free of damage that might interfere with the driver's vision).
- Windshield wipers and washer fluid.
- Windshield defrosters and defoggers.
- Tire pressure and tread wear (at a minimum by visual inspection).

A vehicle inspection checklist is provided in Attachment 2 and, except for rented vehicles, should be completed prior to operation or at the direction of the CPV's owning Department Manager to identify problems related to safe operation. The completed checklists shall be submitted to the CPV's owning Department Manager and maintained on file. Any items identified on the checklist as deficient must be reported to the CPV's owning Department Manager. If any condition prevents an item from working properly, or if the Authorized Driver deems the vehicle unsafe, the vehicle must be repaired before it is used for company business. Where the condition is such that the Authorized Driver believes the vehicle may be operated safely, the vehicle may be driven to a service facility for repairs. With respect to POV's, drivers should observe that the safety/operational systems are in good working order on a weekly basis. Vehicles will be equipped with roadside emergency kits.

5. SECURITY

Vehicles must be secured in a safe place and locked whenever unattended and the keys removed except as noted in Section 4.3.8. Authorized Drivers should not leave sensitive materials or anything of value (company or personal) in the vehicle. When circumstances make it impractical to remove items, they should be placed in the trunk, kept out of site, or covered. In the advent of an emergency, the driver needs to confirm they have access to reliable communications (i.e., cell phone, CB radio, etc.)

6. ATTACHMENTS

- Attachment 1 – "What to do in case of a Vehicle Accident Form"
- Attachment 2 – Vehicle inspection checklist

Driver's Report of Accident

Do not argue at the scene of the accident. Be courteous.

Your Vehicle

Name of Driver _____

Odometer Reading _____

Vehicle I.D. No. _____

License Plate No. _____ State ____

Place of Accident _____

_____

City/State/Province _____

Direction of Travel _____

Speed _____

Other Vehicle

Name of Driver _____

Address _____

_____

Phone No. _____

Vehicle I.D. No. _____

Year/Model _____

License Plate No. _____ State ____

Owner of Vehicle _____

Address of Owner _____

_____

_____

Insured by _____

Direction of Travel _____

Approximate Speed _____

Diagram of Accident

Using the grid below, show exact relationship of roadways and vehicles at the time of the accident. (Indicate North) Show measurements if possible (Identify your vehicle as #1, other vehicles as #2, #3, etc.)

Geosyntec consultants

engineers | scientists | innovators

What to do in case of a Vehicle Accident

Here is what to do

1. Take precautions necessary to protect the scene of the accident from further accidents.
2. Call police immediately, if someone is injured, request medical assistance. In case of fire, request fire department.
3. If there are any injuries, follow the requirements of the injury, illness, near miss procedure
4. Be courteous. Answer police questions. Give identifying information to the other party involved, but do not admit fault. Check the glove box for insurance information on your rental car.
5. Complete this **FORM**. You will need this information later for state and insurance reports.
6. Report the accident to your immediate supervisor and H&S Manager as soon as possible. The supervisor will send the completed form to David George in the Oakland Office: phone (510) 836-3034. David will contact the insurance carrier. If a rental vehicle is involved in the accident, contact Robin Quinones in the Boca Raton office. Phone: (561) 922-1115. The supervisor will notify appropriate personnel within their department.
7. Take photographs of the damage if it is safe to do so.
8. Do not leave the scene of the accident, until police have arrived or you're being transported by rescue.

H&S Contacts:

Dale Prokopchak: 804-349-8067

Joe Esseichick 734-417-0909

Jason Ford 226-220-3401

Mark Malchik: 781-392-5440

Ersin Yalcin: 404-435-4722

Description of Accident

Date_____ Time_____ ☐ am ☐ pm

Road Condition _____

Illumination ☐ Daylight ☐ Dawn/Dusk ☐ Dark

Weather Condition ☐ Foggy ☐ Cloudy ☐ Clear

Road Surface ☐ Wet ☐ Damp ☐ Dry

Description _____

Driver's Signature _____

Employer (check one)

☐ Geosyntec Consultants ☐ MMI

Branch Location _____

Branch Phone No. _____

Witnesses

1. Name _____

Address _____

_____

Phone _____

2. Name _____

Address _____

_____

Phone _____

Police Investigation

Name of Officer _____

Report Number _____

Name of Police Agency_____

Was Summons Issued? ☐ Yes ☐ No

Injured Persons

1. Name _____ DOB:_____

Address _____

_____

Nature of Injury _____

2. Name _____ DOB:_____

Address _____

_____

Nature of Injury _____

Damage to Property

1. Owner _____

Address _____

_____

Description _____

of Damage _____

_____

_____

2. Owner _____

Address _____

_____

Description _____

of Damage _____

_____

_____

Attachment 2 - Vehicle Inspection Checklist

Vehicle _____ **Month** _____

Description	Date	Mileage	Initials
Windshield (chips, cracks)			
Fluids (oil, fuel, windshield washer, brake, steering)			
Brakes			
Tires (tread, pressure)			
Appearance (scratches, dents)			
Lights (driving, parking)			
Interior (obstructions)			
Exterior (signage, bed, tie downs)			
Weight of Cargo (not exceeding maximum allowable)			
Trailers (connections, lights, weight)			
Safety (locks, door closure, seat belts, windows, chocks)			
Documentation (Registration, insurance, accident forms)			
Emergency Kit (triangle, jumper cables, first aid kit, fire extinguisher etc.)			
Free Release (oil or other fluid leaks)			
Distraction avoidance (Mobile phone hands free kit or headset, GPS or clear directions for unfamiliar areas, emails and texts muted or ignored)			

Discrepancies Noted	Date	Initials	Reported To

US Health & Safety Procedures

Air Monitoring Program

1.0 PURPOSE

This procedure applies to all U.S.-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved, in writing, by the H&S Department.

2.0 SCOPE

During work activities where employees, subcontractors and/or clients may be exposed to airborne hazards, Geosyntec will implement an air monitoring program.

3.0 DEFINITIONS

ACGIH: American Conference of Governmental Industrial Hygienists.

AIHA: American Industrial Hygiene Association.

Employee Exposure Record: A record containing any of the following kinds of information: environmental (workplace) monitoring or measuring of a toxic substance, including personal, area, grab, wipe, or other form of sampling, as well as related collection and analytical methodologies, calculations, and other background data relevant to interpretation of the results obtained.

Exposure: Occurs when an employee is exposed to a toxic substance, chemical entity, or biological hazard in the course of employment through any route of entry (e.g., inhalation, ingestion, skin contact, or absorption). This includes past exposure and potential (e.g., accidental or possible) exposure, but does not include those situations where the employer can demonstrate that the toxic substance or harmful physical agent is not used, handled, stored, generated, or present in the workplace in any manner different from non-occupational situations.

Medical Director: The Medical Director is a physician, board-certified in occupational medicine, employed by Geosyntec. The Medical Director manages the services provided by any clinic, hospital, etc. and provides Geosyntec with guidance on medical matters and potential occupational exposures.

NIOSH: National Institute of Occupational Safety and Health.

OEL: Occupational Exposure Limit, a generic guideline for assessing employee exposures.

OSHA: The Occupational Safety and Health Administration in the U.S. Department of Labor.

PEL: Permissible Exposure Limit, the regulatory maximum exposure to an airborne contaminant established by OSHA or state agency.

REL: Recommended Exposure Limit, an exposure guideline recommended by NIOSH.

TLV: Threshold Limit Value, an exposure guideline recommended by ACGIH, and a registered trademark of the ACGIH.

4.0 PROCEDURE

The potential exists for Geosyntec employees to be exposed to airborne contaminants during projects. As part of project safety and health planning, potential employee exposures will be evaluated, and where the possibility exists for airborne exposure to toxic substances, resources will be identified and allocated to quantify the exposure(s). The H&S Department and project health and safety representatives will evaluate the potential for the development of an air monitoring plan as part of the site-specific health and safety plan (HASP) and/or project program oversight. Also, the H&S Department may recommend personal exposure monitoring based on specific regulatory requirements (e.g., asbestos/lead projects) or anticipated elevated airborne contaminant levels (e.g., benzene at refinery projects). Such sampling can be conducted by project personnel under the direction and supervision of the H&S Department.

4.1 Strategies

If applicable, the HASP and/or health and safety planning document will include a section dedicated to air monitoring or a specific reference that identifies the location within another site document where the following information is provided:

- Frequency and type of environmental monitoring needed for the specific operations.
- Monitoring techniques and instrumentation used to conduct these monitoring operations. Copies of specific manufacturer's requirements and documentation will be available onsite and/or discussed with the H&S Department.
- Method of pre/post-calibration, air monitoring forms, documentation, etc.
- Action levels to determine appropriate engineering/administrative/PPE controls will be identified in the site specific HASP and/or other relevant document.

4.2 Training

Geosyntec personnel who are assigned to conduct initial and/or periodic air monitoring tasks will be trained and qualified to conduct those tasks in accordance with guidelines set forth by the H&S Department. Training information will include, but will not be limited to, the following:

- Instrument inspection.
- Calibration frequency/protocol.
- Sampling procedures.
- Instrument limitation(s) (e.g., humidity, interferences, etc.).
- Maintenance.
- Storage.
- Shipping instrument(s) back to the vendor.

4.3 Equipment Calibration

- All field portable monitoring instruments will be calibrated daily according to the manufacturer's instructions.
- If a project is of longer duration and/or visited periodically throughout the year, the Geosyntec personnel responsible for air monitoring needs to ensure the instrument is sent back to the vendor at least on an annual basis for maintenance, inspection, changing of sensors, etc.
- A record of calibration results will be documented on the applicable data sheet identified in the project HASP and/or health and safety planning document.
- Records of all on-site calibration activities will remain on site with Geosyntec project files.

4.4 Exposure Evaluation and Interpretation

Often, airborne contaminants and/or classes of contaminants (e.g., organic volatiles) have no published or established exposure levels or there may be differences among the various agencies. In those cases, the Geosyntec H&S Department will establish an OEL based on the best available toxicological information. Based on monitoring results, the site health and safety officer, with consultation with the H&S Department, will recommend any additional actions to be taken to protect the employee (e.g., engineering controls, PPE, medical surveillance, improved work practices).

4.5 Recordkeeping

Results of air monitoring assessments will be discussed with the affected employees and maintained in the project file.

In the event that personal exposure monitoring is required based on the direct reading results, employee exposure records will be maintained in the employee's medical records by the Medical Director's Company. Individual employee exposure records are maintained and available for 30 years.

5.0 ATTACHMENTS

Attachment 1 – Real Time Air Monitoring Log

ATTACHMENT 1- REAL TIME AIR MONITORING LOG

Geosyntec consultants	Date	Calibration/Bump Test Date:	Operational Period:	Monitored by:
Site Name/Location	Chemical(s) of Concern	Action Levels		Weather Temperature: Precip.: Wind: Relative Humidity: Cloud Cover:
Instrument, ID Number	Location/Activity	Results (ppm, mg/m^3)	Time	Interferences and Comments

US Health & Safety Procedures

Personal Protective Equipment

This procedure applies to all of the subsidiaries, affiliates, and operating units of the Geosyntec family of companies (hereinafter referred to as "Geosyntec" or the "Company". Any exceptions to this procedure must be approved, in writing, by the Health and Safety (H&S) Director.

1.0 PURPOSE

Personal protective equipment (PPE) is specifically designed to protect select parts of the body from chemical, physical and biological hazards. Types of PPE include, but are not limited to, hard hats, safety glasses, safety shoes, and treated coveralls. This written program, along with site-specific hazard analyses, will provide the requirements for the selection, use and maintenance of personal protective equipment to comply with the provisions of the following to include but not be limited to: OSHA 29 CFR 1910, Subpart I., the American National Standards Institute (ANSI), the American Society of Testing and Materials (ASTM), and international agencies such as the Canadian Standards Association (CSA), British Standards (BS), and Malaysian Standards (MS).

2.0 SCOPE

A hazard assessment must be conducted for each task being performed for the purpose of identifying the potential hazards and selecting appropriate personal protective equipment based on the identified hazards. A written certification must be in place verifying that the hazard assessment has been performed**. Attachment 1** of this procedure contains a PPE Hazard Analysis template that can be used to document this requirement. Other formats, such as formal project-specific Health and Safety Plans (HASPs) and Task Hazard Analyses (THAs), can also be used when approved by the Corporate H&S Manager. All PPE Hazard Analysis must be reviewed annually (at a minimum) to ensure proper PPE has been identified, selected, and issued according to the identified hazards.

3.0 PROCEDURE

3.1 Hierarchy of Controls

Engineering controls are used to eliminate, stop, contain, or capture a hazard at the source or intercept it along its path to the worker. When feasible, these controls are preferred to administrative controls or the use of PPE. Administrative controls are measures to limit the duration of exposure to the hazard. With the exception of administrative controls to prevent heat-, cold-, or radiation- related exposures, the use of administrative controls requires the approval of the H&S Department.

3.2 General Requirements

1. Geosyntec will provide suitable PPE as required for the nature of the job being performed, such as, but not limited to, steel-toe (or tech-toe if approved by H&S Manager) boots, chemical protective clothing, respirators, eye and face protection, hardhats, and gloves.
2. Employees will use all required PPE as outlined in project-specific HASPs, THAs and/or PPE Hazard Assessments, or business unit PPE policy.
3. All PPE will meet all applicable current OSHA, MSHA, ANSI, NIOSH and regulatory agencies noted in Section 1.0 for the particular equipment.

3.3 Minimum PPE Requirements

The following minimum requirements are mandatory as a condition of working at Geosyntec-controlled field projects, construction projects, and operating facilities unless the activity is being conducted within a field trailer or facility control room and the project has established these locations as "office-like" areas. Minimum PPE requirements include:

1. Hardhats.
2. Safety glasses (ANSI Z-87 and other applicable agencies noted in Section 1.0) w/sideshields
3. Safety-toe boots or shoes.
4. A sleeved work shirt is required to cover the upper torso, if required by the client or hazard
5. Full-length trousers (shorts are prohibited).
6. High-visibility vests – when working around heavy/mobile equipment, moving vehicles, or as required by the client. See Section 3.12 for additional information.

3.4 Hazard Assessment

1. A PPE hazard assessment of the workplace will be conducted to identify the need and type(s) of PPE to be utilized. This hazard assessment will be performed as part of the initial development of project and site health and safety plans.
2. The workplace hazard assessment must be in written form and discussed with affected staff.

3.5 PPE Training

1. Employees will receive training on the proper use, inspection, and maintenance of PPE prior to being required to utilize any assigned equipment. The training will include:

    a. Discussion of when and what PPE is required.
    b. How to properly don, doff, adjust, and wear PPE.
    c. Limitations of the PPE.
    d. Decontamination procedures.
    e. Proper care, maintenance, useful life, and disposal of the PPE.

2. Employee training must be verified by a written certification. The certification must include the names of the employees trained, signature of instructor and participants, and the date of training. It must also be identified as a certification of training on the use of PPE.
3. Training documentation may include completion of Tailgate Safety Briefings with specific emphasis on PPE use and selection requirements.
4. Training will be repeated whenever the workplace hazards change, specified PPE changes, or when incorrect or incomplete use of PPE is observed, or as required by the re-training frequency.

3.6 Eye and Face Protection

3.6.1 Basic Eye Protection

Eye and face protection prevents injuries due to particulates, splashing, flying objects and certain forms of ultraviolet radiation. Forms of eye protection include safety glasses, coverall goggles (both chipping and chemical splash), face shields, welding goggles and welding shields. Contact lenses do not meet the requirements of eye protection.
All non-prescription safety glasses, goggles, and face shields shall be provided at no cost to the employee. Prescription safety glasses are provided at no charge (up to a predetermined amount) through the Geosyntec prescription safety glasses program (See Intranet).

The following are the general use requirements for eye and face protection:

1. Employees who wear prescription lenses shall either obtain prescription safety glasses with side shields or goggles that completely cover the employees' prescription lenses without disturbing the spectacle adjustment.
2. Face and eye protection shall be comfortable and of the proper size to fit the employee.
3. All equipment shall be kept clean and in good repair by the employee. If the equipment cannot be cleaned (i.e. dried paint), or is damaged, it must be properly discarded and new equipment shall be obtained.
4. Equipment (except prescription glasses) can be used by different employees, as long as the equipment has been cleaned and disinfected between uses by each person.
5. Safety glasses shall be worn under welding shields.
6. Prescription safety glasses shall be replaced as necessary (i.e. damaged, change in prescription, lost). The employee will discuss replacement of safety glasses with his/her supervisor.

3.6.2 Contact Lenses

Wearing contact lenses is prohibited at worksites where the possibility of particles and chemicals getting behind the contact lens exist. Contact lenses do not provide eye protection; contact lens wearers must use the same additional eye protection as non-lens wearers.

3.6.3 Chemical (Splash-Proof) Goggles

Chemical goggles will be used as follows:

1. Approved chemical mono-goggles will be provided to ensure protection from the hazards associated with handling or dispensing liquid chemicals.
2. The appropriate Material Safety Data Sheets (MSDS) and/or Safety Data Sheets (SDS) will provide specific information for the use of chemical goggles. The MSDSs can be obtained in accordance with HS 115 Hazard Communications/Globally Harmonized System Program.
3. Basic eye protection and chemical goggles (with the exception of prescriptions glasses) will not be worn at the same time, but a face shield may be worn in conjunction with chemical goggles and may be required for certain operations.

3.6.4 Face Shield

1. An approved full-face shield will be worn to provide protection from flying particles, splashes, or mist, where required.
2. A face shield only provides protection to the face from direct impact objects, and does not provide acceptable eye protection. Additional standard eye protection or goggles must be worn in conjunction with a face shield.

3.6.5 Burning Goggles

Approved burning goggles will be worn to provide employee protection from optical radiation. Burning goggles will be worn whenever an oxy-gas torch is used for cutting or burning.

3.6.6 Welding Hood

A welding hood with either a filtered lens of number 10 shade or darker, or an auto-darkening lens providing the same shade number or darker (see applicable shading requirements), will be used to provide protection from the optical radiation produced during electric arc welding. Approved safety glasses with side shields will be worn in conjunction with the welding hood to ensure protection from popping hot slag when the hood is raised. Welding hoods will meet ANSI and/or standards noted in Section 1.0.

3.7 Head Protection

3. 7.1 Basic Head Protection

1. Approved hardhats will include only plastic or fiberglass hats that meet ANSI Z89.1 and Section 1.0 agencies.
2. Metal hardhats or bump caps are not considered approved head protection and will not be used on Geosyntec projects.
3. Approved hardhats will be worn by all employees exposed to hazards that could cause injury to the head (moving equipment, falling objects, protruding objects, etc.).
4. Compliance with state and/or local requirements is mandatory (e.g., chinstrap accessory, etc.).

3.7.2 Issuance of Head Protection

An approved hardhat will be issued to all employees exposed to overhead hazards. The decision to charge a fee for replacement hardhats will depend on the requirements of the individual project and will be determined by the Project Manager.

3.7.3 Color Coding

Color coding of hardhats will be at the discretion of the Site Project Manager for each individual project.

3.7.4 General Maintenance Requirements

It will be forbidden for employees to:

1. Drill holes in the shell of the hardhat.
2. Alter the shape of the hardhat or bill.
3. Remove the suspension straps or cut/alter them in any way.
4. Paint the hat or cover in non-approved decals.
5. Wear hardhats with the brim to the rear; or
6. Alter hardhat in any other manner that may compromise its integrity e.g. pasting stickers other than standard Geosyntec logo.

3.8 Hearing Protection

1. Employees will not be exposed to noise in excess of the Permissible Exposure Limits (PELs), occupational exposure levels, and/or other exposure levels established by applicable regulatory agency guidelines and industry best practices. Geosyntec has established an action level where hearing protection is mandatory at project sites where equipment, machinery, etc. generates noise levels in excess of applicable regulatory provisions and guidelines.

2. The two types of recognized hearing protection available for use in effectively reducing noise exposure are earplugs and earmuffs.
3. In most instances, universal-fit earplugs (expandable foam) will be acceptable hearing protection. Cotton plugs are not acceptable.
4. When using earmuffs for hearing protection, special care will be taken to ensure that the muffs are disinfected before being issued to another employee.
5. The H&S Department will indicate whether both earplugs and earmuffs must be worn to provide adequate hearing protection.

3.9 Hand Protection

Hand protection serves two purposes:

- Control of physical hazards
- Control of skin contact with hazardous materials

3.9.1 General Purpose Gloves

Where workers are exposed to physical hazards, the use of standard leather or cloth work gloves will be employed. These selected gloves should:

- Be of sturdy construction.
- Be suitable to protect against the particular hazard(s) associated with the job (e.g., insulated gloves for hot work).
- Properly fit the worker's hands.

3.9.2 Special Purpose Gloves

Gloves intended to provide chemical protection must be rated by the manufacturer as effective against the substance(s) expected to be encountered. Specific selection will be made on a task-by-task basis and approved by the H&S Department. Special purpose gloves may at times be required when employees are performing certain tasks as indicated below:

- Working with solvents or fuels (thinners, degreasers, gasoline, safety solvents, etc.).
- Handling pesticides, herbicides, or any poison.
- Working with insulating materials.
- Assisting welders or handling hot materials.

Special purpose gloves include:

- "Hot" gloves for electrical work.
- Cut-resistant gloves.
- Chemical-resistant gloves.
- Standard rubber gloves.
- Heat-resistant gloves.

Hydrocarbon-resistant rubber gloves will be worn to protect the hands when using petroleum-based cleaning agents.

Barrier creams/moisturizing lotions can provide additional protection from minor exposure to some irritants and will be used as specified:

- Barrier creams will be evaluated to ensure the proper protection is provided for the specific task to be performed. Barrier creams are NOT a substitute for gloves.
- Moisturizing lotion/creams will be utilized to restore the natural oils to the skin removed through frequent hand washing.

3.10 Foot Protection

3.10.1 Basic Foot Protection

Safety footwear will meet the following requirements:

1. Comply with applicable Standards noted in Section 1.0
2. Minimum height of 6 inches.
3. Safety-toed footwear will be worn at all job sites unless a variance is obtained from the H&S Department.
4. Sneakers, sandals, tennis shoes, high heels, and leather-soled street or dress shoes will not be considered approved industrial or construction footwear.
5. Safety shoes are provided at no charge (up to a predetermined amount) to the employee.

3.10.2 Special Purpose Footwear

Special footwear may be required to provide maximum protection to the employee.

1. Whenever employees may be exposed to corrosives or irritant chemicals (e.g., pouring concrete, applying form oils), they will wear the appropriate special purpose footwear.
2. Special purpose footwear may include PVC or neoprene boots, preferably with steel shanks.

3.10.3 Foot Protectors

Employees performing tasks that potentially expose them to extreme foot injury hazards (e.g., operating a ground tamper or chipping concrete with jackhammer) will wear metal foot protectors and/or metatarsal protection.

3.11 General Clothing Requirements

1. Clothing will be in good condition. Frayed or tattered clothing can be a hazard to the employee.
2. Pants will fit properly and not have large cuffs or belled or frayed bottoms.
3. Tank tops or sleeveless shirts (less than 4 inches below shoulder) will not be worn.
4. If dictated by the client or the hazards, long-sleeve shirts will be required.
5. Shirts will be worn tucked in at all times. Employees flame cutting or welding must have clothing suitable for that operation (i.e., prevent slag from being caught in cuffs, waist, or pocket openings).
6. Neckties, gauntlet-type gloves, and baggy, loose, or ragged clothing will not be worn when working near or with moving machinery.
7. Jewelry such as rings, watchbands, necklaces, earrings, or the like can cause or contribute to accidents. Loose, dangling jewelry will not be allowed.
8. In situations where an employee may be exposed to hazardous materials, such as corrosives, fire, toxins, irritants, heat, or sensitizers, the task will be evaluated and the employee will wear the appropriate clothing for the hazard identified.

9. All employees or contractors working on site controlled by Geosyntec with a potential to use respiratory protection (for normal as well as emergency escape purposes) must be shaved and shall not have facial hair (long mustache, long side burns, beard) that can affect sealing of respiratory protection equipment.

3.12 High-Visibility Vests – Communication

1. Fluorescent safety vests, or other approved high-visibility clothing made with reflecting orange, white, or yellow materials meeting ANSI and/or other regulatory agency specifications, are mandatory when working around heavy equipment and vehicular traffic. The reflecting material must be visible from all angles (360 degrees).

2. High-visibility vests are also required while working in and near traffic areas and in remote areas (e.g., working near and/or adjacent to hunting grounds).

Exception: Workers may be exempt from wearing high-visibility safety vests if a hazard assessment prepared for a specific task determines that wearing such gear may introduce additional hazards (e.g., loose clothing/polyester materials). Examples of these tasks may include, but are not limited to, work involving rotating tools/equipment and open flame or spark-producing activities such as welding, cutting, or grinding.

3.13 Safety Equipment for Respiratory Protection, Elevated Work, Confined Space Entry, Electrical Safety, Work Over Water, Etc.

Please refer to the respective H&S SOP(s) to review the PPE requirements.

4.0 STORAGE AND MAINTENANCE

4.1 Personal Items

The following PPE items will be obtained by the individual users, with costs reimbursed based on the condition and safe operating use of PPE. The employee's supervisor will approve new purchases of required PPE by the employee to include:

- Safety-toed boots.
- Prescription Safety Glasses.

Employees are expected to maintain this equipment in a clean, ready-to-use condition, and to perform periodic inspections to ensure that equipment is undamaged and fully functional. Any equipment which becomes unserviceable shall be replaced by the employee, subject to reimbursement in accordance with Geosyntec's PPE Allowance criteria.

4.2 Individually Issued Items

The following PPE items will be issued individually to each worker, or will be obtained by each worker at Geosyntec expense for their personal use:

- Hard hat.
- Non-Prescription Safety Glasses.
- Safety-toed boots (rubber).
- Respiratory Protection.
- Ear Muffs/ear plugs.

- Cold weather gear (NOTE: All items must be approved for purchase through the employee's Branch or Department Manager prior to purchase).

Employees are expected to maintain this equipment in a clean, ready-to-use condition, and to perform periodic inspections to ensure that equipment is undamaged and fully functional. Any problems should be identified to the site safety officer immediately so that replacements can be arranged.

Except for personal issue items, all other PPE will be stored onsite and issued to workers as required for use. This includes:

- Work coveralls.
- Chemically-protective outer coveralls.
- Leather and chemically-protective gloves.
- Face shields.
- Fall protection equipment.
- Specialized safety equipment.

All central issue equipment will be maintained in a clean, dry condition.

4.3 Inspection

Prior to use of any safety equipment (individual issue or centrally stored) personnel must inspect each piece to ensure that it is in good working order. Equipment exhibiting any signs of wear or damage will be immediately placed out of service and repaired/replaced.

5.0 REFERENCES

HS 109 US – Hearing Conservation Program
HS 112 US – Respiratory Protection Program
HS 115 US – Hazard Communication/Globally Harmonized System Program

6.0 ATTACHMENTS

Attachment 1 – PPE Hazard Hazard Analysis

ATTACHMENT 1- PERSONAL PROTECTIVE EQUIPMENT HAZARD ANALYSIS

1. **Job Title(s):** This hazard analysis describes the tasks and required personal protective equipment for the following job titles:
   - ■
   - ■
   - ■
   - ■
   - ■

2. **Description of Tasks:** The tasks performed by personal in the above job titles include:
   - ■
   - ■
   - ■
   - ■
   - ■

3. **Potential Hazards and PPE Selection. (See List of Potential Hazards for assistance)**

TASK	POTENTIAL HAZARDS (1)	PPE SELECTION

(1) Refer to attached list for a list of potential hazards to consider.

Signature of certifying Project Manager those tasks are accurately described.

_____

Signature Date

Print Name: _____

LISTS OF POTENTIAL HAZARDS

	POTENTIAL HAZARDS
HEAD	**Falling overhead objects**
	Spark contact
	Chemical contamination
	Cold/heat
	Electrical (>600 volts)
HANDS	**Cut, puncture, abrasions**
	Burns
	Dermatitis
	Chemical absorption
	Cold
FEET	**Falling or rolling objects**
	Chemical absorption
	Dermatitis
	Burns
	Cold
	Slips, trips
FACE	**Burns (chemical, spark, UV radiation)**
	Chemical splashing
	Flying particulates
	Abrasions, cuts
EYES	**Burns (gas, liquid, spark)**
	Abrasions-flying particulates
	Absorption
	Retinal/corneal damage (UV/IR radiation)
EARS	**Noise**
	Cold/Heat/Liquids
FULL BODY	**Chemical splashing**
	Burns (chemical, UV radiation)
	Absorption
	Spark contact
	cuts/abrasions/punctures
	Heat/cold stress
MISCELLANEOUS	**Insects (ticks, spiders, mosquitoes, bees/wasps)**
	Animals (dogs, bears, wild boars, raccoons)
	Reptiles (snakes)
	Poisonous plants (poison ivy, sumac, poison oak)
	Biological (fungus, bacteria, fungus, viral)

Geosyntec consultants **Health, and Safety Procedure**	PROCEDURE NO. HS 202 DATE January 2020 PREVIOUS February 2014
Safety Meetings	

1.0 PURPOSE/SCOPE

This procedure will provide general guidelines on the type, content, and information to be communicated to employees during safety meetings and site safety training. This procedure applies to all of the subsidiaries, affiliates, and operating units of the Geosyntec family of companies (hereinafter referred to as "Geosyntec" or the "Company" unless the use of an alternate procedure prepared specifically for/by a subsidiary has been endorsed by the Director of H&S.

2.0 PROJECT INITIATION/KICK-OFF

Where specified in the project-specific HS documentation, a kick-off safety meeting will be conducted prior to the start of field operations, and will involve representatives of all organizations working on the job site. Topics for this meeting will include:

- Communication of all on site H&S responsibilities and authority.
- Communication of organizational H&S performance expectations.
- Identification of significant project H&S issues/hazards and solutions.

3.0 ON-SITE MEETINGS

Safety meetings will be conducted at all job sites for the following operational milestones:

1. Project Start-up: On the first day of field operations for a new project or a new phase of work.
2. Periodic: On a regular, recurring frequency of not less than once per week (daily meetings are required for HAZWOPER activities per 29CFR1910.120 and H&S Procedure 301).
3. Significant Personnel Turn-over: The start of any workday where a new organization begins work on site or more than 25 percent of the day's work force is new to the site.
4. Accident Recovery: The start of the work day following any accident which results in more than $1000 dollars in property damage, an environmental release and/or issue, or where an injury to one or more personnel requires medical treatment (discuss the accident, its causes and preventive measures).

The meetings will be documented on the *Tailgate Safety Meeting Sign-In Log* (Attachment 1).

4.0 SUPPLEMENTAL SAFETY TRAINING

The Project Manager (PM), Site Supervisor (SS) or Site Safety Officer (SSO) will implement worker training on general safety topics as part of routine on-site training activities. Where such training is conducted it will be documented on the *Safety Training Log* (Attachment 2).

US Health & Safety Procedures

The Globally Harmonized System for Hazard Communication

This procedure applies to all U.S-based personnel, projects, offices, business units and activities. Any exceptions to this procedure must be approved in writing, by the HS Director.

1.0 PURPOSE

The purpose of this program is to ensure that the potential hazards posed by all hazardous substances in the workplace are communicated to Geosyntec employees and subcontractors. Additionally, this program will aid in complying with the Hazard Communication Standard as it now exists. The Globally Harmonized System (GHS) for Hazard Communication was designed to replace all the diverse classification systems and present one universal standard which all countries should follow. The system provides the infrastructure for participating countries to implement a hazard classification and communication system.

2.0 SCOPE

The requirements defined in this program apply to all Geosyntec facilities, projects, employees, and subcontractors which receive, use, handle, store, transport, or distribute hazardous substances. This program does not apply to the following:

- Any hazardous waste as defined by the Solid Waste Disposal Act, as amended by RCRA, when subject to regulations issued by the USEPA.
- Tobacco or tobacco products.
- Wood or wood products.
- Articles.
- Food, drugs, cosmetics, or alcoholic beverages packaged for sale to customers.
- Food, drugs, or cosmetics intended for personal use.
- Any consumer product or hazardous substance as defined by the Consumer Product Safety Act and Federal Hazardous Substance Act when used in the workplace in the same manner as normal consumer use.
- Any drug, as defined by the Federal Food, Drug, and Cosmetic Act, when sold in final form for patient use.

The labeling requirements defined in this program do not apply to the following when regulated by Federal requirements other than 29 CFR 1910.1200 (OSHA GHS for Hazard Communication Standard).

- Pesticides as defined by the Federal Insecticide, Fungicide, and Rodenticide Act.
- Food, drugs, cosmetics, or veterinary devices as defined by the Federal Food, Drug, and Cosmetic Act.
- Alcoholic beverages as defined by the Federal Alcohol Administration Act.
- Consumer products or hazardous substances defined by the Consumer Product Safety Act and Federal Hazardous Substance Act.

3.0 DEFINITIONS

"**Article**" means a manufactured item: (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which does not release, or otherwise result in exposure to a hazardous substance under normal conditions of use.

"Classification" means to identify the relevant data regarding the hazards of a chemical; review those data to ascertain the hazards associated with the chemical; and decide whether the chemical will be classified as hazardous, and the degree of hazard where appropriate, by comparing the data with the criteria for health and physical hazards.

"Consumer Product" means any product intended for sale/use to the general public that is used in the same manner and frequency as a consumer. For example, motor oil purchased in quart containers used to service an Geosyntec vehicle will be considered a consumer product as long as it is used in the frequency (approx. once every 2-3 months) and manner (to change/add oil to a motor vehicle) as intended for consumer use. However, if the project/facility employee's a mechanic that uses the motor oil on a more frequent basis (i.e. as part of her/his normal job) then the motor oil will NOT be considered a consumer product.

"**Container**" means any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous substance. For purposes of this procedure, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers.

"**Exposure**" or "exposed" means that an employee is subjected to a hazardous substance in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.) and includes potential (e.g., accidental or possible) exposure.

"**Foreseeable Emergency**" means any potential occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which could result in an uncontrolled release of a hazardous substance into the workplace.

"**Hazardous Substance**" means any substance, not excluded by section 2.0 of this procedure, which is a physical hazard or a health hazard.

"Hazard Category" means the division of criteria within each hazard class, e.g., oral acute toxicity and flammable liquids include 4 hazard categories. These categories compare hazard severity within a hazard class and should not be taken as a comparison of hazard categories more generally.

"Hazard Class" means the nature of the physical or health hazards, e.g., flammable solid, carcinogen, oral acute toxicity.

"Hazard Statement" means a statement assigned to a hazard class and category that describes the nature of the hazard(s) of a chemical, including, where appropriate, the degree of hazard.

"Hazardous Chemical" means any chemical which is classified as a physical hazard or a health hazard, or an unclassified hazard as defined in this section.

"Health Hazard" means a chemical which is classified as posing one of the following hazardous effects: acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); or aspiration hazard. The criteria for determining whether a chemical is classified as a health hazard are detailed in **Appendix A** to §1910.1200 -- Health Hazard Criteria.

"**Immediate Use**" means that the hazardous substance will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

“**Label**” means an appropriate group of written, printed or graphic information elements concerning a hazardous product, selected as relevant to the target sector(s) that is affixed to, printed on, or attached to the immediate container of a hazardous product, or to the outside packaging of a hazardous product.

“Label Element” means one type of information that has been harmonized for use in a label, e.g., pictogram, signal word.

“Mixture” means a mixture or a solution composed of two or more substances in which they do not react.

"**Physical Hazard**" means a substance for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water reactive.

“Pictogram” means a graphical composition that may include a symbol plus other graphic elements, such as a border, background pattern or color that is intended to convey specific information.

“Precautionary Statement” means a phrase (and/or pictogram) that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product.

“Product Identifier” means the name or number used for a hazardous product on a label or in the SDS. It provides a unique means by which the product user can identify the substance or mixture within the particular use setting (e.g. transport, consumer or workplace).

"**Safety Data Sheets (SDS**)" means any technical data sheets which contain chemical identities, physical and chemical characteristics, physical hazards, health hazards, primary routes of entry, OSHA permissible exposure limits (whether chemical is listed as a carcinogen), precautions for safe handling and use, applicable control measures, emergency and first aid procedures, date of SDS preparation, and name, address, and telephone number of manufacturer or importer. If no relevant information is found for any given section on the SDS, that section shall not be left blank. It should be marked to indicate that it is not applicable or that no information was found.

“Signal Words” means the words “Danger" or "Warning" will be used to emphasize hazards and indicate the relative level of severity of the hazard, assigned to a GHS hazard class and category. Some lower level hazard categories do not use signal words. Only one signal word corresponding to the class of the most severe hazard should be used on a label.

“**Symbols”** means (GHS hazard pictograms): that convey health, physical and environmental hazard information, assigned to a GHS hazard class and category. Pictograms include the harmonized hazard symbols plus other graphic elements, such as borders, background patterns or covers and substances which have target organ toxicity. Also, harmful chemicals and irritants are marked with an exclamation mark, replacing the European saltire. Pictograms will have a black symbol on a white background with a red diamond frame. For transport, pictograms will have the background, symbol and colors currently used in the UN Recommendations on the Transport of Dangerous Goods. Where a transport pictogram appears, the GHS pictogram for the same hazard should not appear.

"**Work Area**" means a room or defined space in a workplace where hazardous substances are produced or used, and where employees are present.

"**Workplace**" means an establishment, job site, or project, at one geographical location containing one or more work areas.

4.0 PROCEDURE

4.1 Designation of a Responsible Person

Each Geosyntec office and project will have an identified *Responsible Person* who will implement the requirements of the GHS for Hazard Communication Program.

- For each office, the Section Manager will appoint the Responsible Person, in writing.
- For each project, the Project Manager (or designated subordinate) will be assigned the duties for the Responsible Person.

4.2 Hazardous Substance Inventory (HSI)

All hazardous substances found in a particular workplace shall be listed on a Hazardous Substance Inventory (HSI). The HSI will be reviewed at least annually. New hazardous substances entering a workplace (e.g., project-specific materials) shall be added to the HSI upon receiving and reviewing the SDS. The HSI includes the following information:

- Product name.
- Chemical name (if different from product name).
- Manufacturer's name.
- Approximate typical quantity.
- Location of substance (i.e., work area).
- Description of use.

An example HSI format is provided as **Attachment 1**. A copy of the most current HSI, along with the corresponding SDS and a copy of this program (or site-specific program), will be available for review by all employees. The name of the material (product or chemical) on the HSI must be consistent with the SDS for that material.

4.3 Safety Data Sheets

The GHS for Hazard Communication Standard (HCS) requires chemical manufacturers, distributors, or importers to provide Safety Data Sheets (SDSs) (formerly known as Material Safety Data Sheets or MSDSs) to communicate the hazards of hazardous chemical products. As of June 1, 2015, OSHA will require new SDSs to be in a uniform format, and include the section numbers, the headings, and associated information under the headings below:

Section 1, Identification includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.

Section 2, Hazard(s) Identification includes all hazards regarding the chemical; required label elements.

Section 3, Composition/Information on Ingredients includes information on chemical ingredients; trade secret claims.

Section 4, First Aid Measures includes important symptoms/ effects, acute, delayed; required treatment.

Section 5, Fire-Fighting Measures lists suitable extinguishing techniques, equipment; chemical hazards from fire.

Section 6, Accidental Release Measures lists emergency procedures; protective equipment; proper methods of containment and cleanup.

Section 7, Handling and Storage lists precautions for safe handling and storage, including incompatibilities.

Section 8, Exposure Controls/Personal Protection lists OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE).

Section 9, Physical and Chemical Properties lists the chemical's characteristics.

Section 10, Stability and Reactivity lists chemical stability and possibility of hazardous reactions.

Section 11, Toxicological Information includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.

Section 12, Ecological Information*

Section 13, Disposal Considerations*

Section 14, Transport Information*

Section 15, Regulatory Information*

Section 16, Other Information, includes the date of preparation or last revision.

*Note: Since other Agencies regulate this information, OSHA will not be enforcing Sections 12 through 15(29 CFR 1910.1200(g)(2)).

Geosyntec does not manufacture, package or distribute hazardous commodities. However, as an end user, Geosyntec must maintain hazard documentation for each hazardous substance used on each job site. This documentation will take the form of a listing of all onsite hazardous substances, and copies of manufacturer-developed Materials Safety Data Sheets (SDSs) for each listed item.

A SDS shall be available for every hazardous substance used or stored on each job site (this does not include SDSs for known or suspected environmental contaminants, the hazards of which are addressed on project-specific HS documentation). Copies of all SDSs will be maintained onsite in either a dedicated folder/binder, or as part of the project-specific HS documentation. All site personnel will be briefed as to the location of the SDSs, and will have immediate access to examine any SDS at any time during their work shift.

SDSs received for consumer products, articles and other materials not covered by this procedure will be maintained and made available to employees.

For on-going projects, each SDS associated with a material no longer in use will be marked as obsolete and the date it was obsolete. At the completion of any project the accumulated SDSs will be maintained as part of the project records. **NO SDS ASSOCIATED WITH ANY PROJECT WILL BE DESTROYED**.

Employees are required to report any hazardous substance found at the project site that is not on the list of hazardous substances. The report is to be made to the project/site manager.

If no SDS accompanies a hazardous substance, the manufacturer, distributor, or importer will be immediately notified and requested to provide one as soon as possible. The request will be documented in a letter or telephone log. If this request is not honored, the H&S Department will be notified.

Employers must ensure that SDSs are readily accessible to employees.

For more information: www.osha.gov when purchasing hazardous substances, the verbal or written purchase order will request an SDS be sent with the shipment. For each facility and/or project, the SDS will be kept in a location that is readily accessible to all employees at all times during their work periods. Additionally, the SDSs and HSI will be available to employees for review in such a way so that the assistance of a supervisor is not necessary.

4.3.1 New Information

Whenever a new or revised SDS is received, such information shall be provided to employees on a timely basis not to exceed 30 days after receipt.

4.4 Training

4.4.1 GHS-GHS for Hazard Communication Course Content – General Training

Due to the nature of our business, the information and training provided to Geosyntec employees with regard to GHS for Hazard Communication will take two forms: general and specific. General training and information will include the following:

- The elements and requirements of the OSHA GHS for Hazard Communication standard (29 CFR 1910.1200).
- Tasks and operations where hazardous substances are present.
- The location and availability of the written GHS for Hazard Communication Program, including the list(s) of hazardous substances and SDSs.
- The methods and observations that may be used to detect the presence or release of a hazardous substance, such as personal and area monitoring, continuous monitoring devices, visual appearance or odor of hazardous substances when being released, etc.
- The physical and health hazards of the substances in the work area, and the measures they can take to protect themselves from these hazards, including specific procedures implemented for the project or shop to protect employees from exposure to hazardous substances, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.
- The project- or shop-specific details of the GHS for Hazard Communication Program, including an explanation of the labeling system and the SDSs, and how employees can obtain and use the appropriate hazard information.
- Information regarding hazardous substances to which employees may be exposed, according to the provisions of the OSHA GHS for Hazard Communication standard.
- Information for their physician to receive regarding hazardous substances to which the employee may be exposed according to provisions of this section.
- Freedom from discharge or other discrimination due to the employee's exercise of the rights afforded pursuant to the provisions of the Hazardous Substances Information and Training Act.

4.4.2 Facility-Specific GHS for Hazard Communication Training

Specific information regarding safe handling and use of hazardous materials found on the HSI will be presented during site specific training programs. This training may be for specific hazardous materials or for groups of hazardous substances, including flammable/combustible liquids, compressed gases, organic solvents, corrosives, and toxic metals. Additional specific training will be provided to the affected employees any time a new hazardous substance is introduced into the workplace (e.g., project specific substances) and/or when an employee is reassigned. All training conducted will be documented and copies of the documentation included in the permanent project files.

4.4.3 Training Records

The minimum required information required to be maintained at the job site or project is as follows:

- Training agenda.
- Name of attendees.
- Signature of attendees.
- Date and duration of training.
- List of any audio visual aids used.
- Name & Signature of instructor.
- Project or facility (specific training only).
- Copies of any tests and/or quizzes.

4.5 GHS Labels

4.5.1 General

All hazardous substances received from outside suppliers will conform to legal requirements and display on each container, as a minimum, the following:

GHS safety labels have six standardized elements:

1. Product Identifier – Must match product identifier on safety data sheet.
2. Manufacturer Contact Information – Including name, phone number, and address.
3. Hazard Pictograms – New label elements that may require color printers.
4. Signal Word – Either DANGER or WARNING depending upon hazard severity.
5. Hazard Statements – Standardized sentences that describes the level of the hazards.
6. Precautionary Statements – Steps employees can take to protect themselves.

Stationary process containers may have signs, placards, process sheets, batch tickets, operating procedures, or other written material in lieu of fixed labels on the containers, as long as the alternative method conveys hazard information. The written materials will be readily accessible to the employees in the work area.

- Containers of hazardous substances transferred from labeled containers and not intended for the immediate use of the employee performing the transfer must be labeled in accordance with a hazardous materials identification system or an equivalent commercial system.
- Labels on incoming containers will not be removed or defaced.
- Labels or other forms of warning will be legible, in English, and prominently displayed on the containers, or readily available throughout each work shift.
- Container size is not the determining factor in deciding if a label is required; ALL containers of hazardous chemicals must be labeled.

4.5.2 GHS Label Elements

One of the new symbols implemented by the GHS

The standardized label elements included in the GHS are:

"Symbols" means (GHS hazard pictograms): that convey health, physical and environmental hazard information, assigned to a GHS hazard class and category. Pictograms include the harmonized hazard symbols plus other graphic elements, such as borders, background patterns or covers and substances which have target organ toxicity. Also, harmful chemicals and irritants are marked with an exclamation mark, replacing the European saltire. Pictograms will have a black symbol on a white background with a red diamond frame. For transport, pictograms will have the background, symbol and colors currently used in the *UN Recommendations on the Transport of Dangerous Goods*. Where a transport pictogram appears, the GHS pictogram for the same hazard should not appear.

"Signal Words" means "Danger" or "Warning" will be used to emphasize hazards and indicate the relative level of severity of the hazard, assigned to a GHS hazard class and category. Some lower level hazard categories do not use signal words. Only one signal word corresponding to the class of the most severe hazard should be used on a label.

"Hazard Statements" means standard phrases assigned to a hazard class and category that describe the nature of the hazard. An appropriate statement for each GHS hazard should be included on the label for products possessing more than one hazard.

Additional label elements in the GHS are:

"Precautionary Statements" means measures to minimize or prevent adverse effects. There are four types of precautionary statements covering: prevention, response in cases of accidental spillage or exposure, storage, and disposal. The precautionary statements are linked to each GHS hazard statement and type of hazard.

"Product Identifier" means (ingredient disclosure): Name or number used for a hazardous product on a label or in the SDS. The GHS label for a substance should include the chemical identity of the substance. For mixtures, the label should include the chemical identities of all ingredients that contribute to acute toxicity, skin corrosion or serious eye damage, germ cell mutagenicity, carcinogenicity, reproductive toxicity, skin or respiratory sensitization, or Target Organ Systemic Toxicity (TOST), when these hazards appear on the label.

Supplier identification: The name, address and telephone number should be provided on the label.

Supplemental information: Non-harmonized information on the container of a hazardous product that is not required or specified under the GHS. Supplemental information may be used to provide further detail that does not contradict or cast doubt on the validity of the standardized hazard information.

4.5.3 GHS Label Format

The GHS includes directions for application of the GHS for Hazard Communication elements on the label. In particular, it specifies for each hazard, and for each class within the hazard, what signal word, pictogram, and hazard statement should be used. The GHS hazard pictograms signal words and hazard statements should be located together on the label.

4.5.4 Pipes / Vessel Labeling

All pipes or piping systems in a treatment system, and all process vessels containing hazardous substances, must be labeled or color coded using facility specific color coding for which all affected

employees have been trained. The Project Manager (PM) is responsible for ensuring that this is accomplished at each project site.

4.5.5 User

Each user shall ensure that each container of hazardous substances in the workplace is labeled, tagged, or marked with the following information:

- Identity of the hazardous substance(s) contained therein, and
- Appropriate hazard warnings.

4.5.6 Receiving

Employees receiving shipments of hazardous substances shall not accept the shipment, but return it to the shipper, if the containers are not properly labeled with the following information:

- Identity of the hazardous substance(s);
- Appropriate hazard warnings; and
- Name and address of the manufacturer, importer, or other responsible party.

4.6 Trade Secrets

4.6.1 Non-Emergency Access to Trade Secret Information

Each Responsible Person who obtains an SDS that claims trade secret information shall forward a copy of that SDS to the H&S Director. The HS Director will submit a written request to the supplier explaining that the information is needed for one or more of the following reasons, as applicable:

- To classify the hazards of the substances to which employees may be exposed.
- To guide appropriate sampling of the workplace atmosphere to determine employee exposure levels.
- To conduct pre-assignment or periodic medical surveillance of exposed employees;
- To provide medical treatment to exposed employees.
- To guide the selection of appropriate personal protective equipment for exposed employees;
- To guide the development of appropriate engineering controls or other protective measures for exposed employees; and
- To conduct studies to determine the health effects of exposure.

The request includes an agreement to protect the confidentiality of the disclosed information with assurance that the trade secret information will not be used for any purpose other than classifying health hazards.

The H&S Director will provide such information as necessary to coordinate an industrial hygiene evaluation of employee exposures. If this involves releasing trade secret information, the HS Director will sign a nondisclosure agreement before receiving such information.

Employees working with materials protected by a trade secret have access to the SDS, which does not have protected information.

4.6.2 Emergency Access to Trade Secret Information

Emergency access to trade secret information is provided through the H&S Director and Geosyntec's Occupational Physician. Where a physician or nurse determines that a medical emergency exists and the specific chemical identity of a hazardous substance is necessary for emergency or first-aid treatment, the H&S Director shall request that the manufacturer, importer, or other supplier

immediately disclose the specific chemical identity of a trade secret substance, regardless of the existence of a written statement of need or a confidentiality agreement. The manufacturer, importer, or other supplier may require a written statement of need and confidentiality agreement, in accordance with the provisions of OSHA's GHS for Hazard Communication standard, as soon as circumstances permit.

4.7 Visitors

4.7.1 Escorted Visitors

Visitors to the work area who have not received a GHS for Hazard Communication briefing on the substances present in the work area must be escorted the entire time they are in the work area to ensure that they do not contact and are not harmed by the hazardous substances.

4.7.2 Unescorted Visitors

The supervisor must ensure all visitors who enter the work area unescorted receive a GHS for Hazard Communication briefing before encountering any of the hazardous substances in the work area.

4.7.3 Subcontractors

All Geosyntec subcontractors will be required to provide a copy of their written GHS for Hazard Communication program and documentation of training to the Geosyntec project manager. This information will be maintained in the permanent project file. In the event that a subcontractor does not have a written program and/or the employees do not have the appropriate training, the situation must be rectified prior to allowing subcontractor employees to perform work activities in a work area containing a hazardous substance.

4.7.4 Multi-Employer Worksites

In order to inform contractors of the hazardous substances that their employee's may be exposed to which are under the control of Geosyntec, a copy of the HSI and applicable SDSs will be made available to them. This may be accomplished by providing the contractor with direct access to the existing Geosyntec file or by providing them with copies of the necessary information. Additionally, the Geosyntec Project Manager will request a list of hazardous substances, with their location, and SDSs for those items which Geosyntec employees may be exposed. This request will be made from the client, any Geosyntec subcontractors, and any other client contractors which may impact Geosyntec operations. The response to this request shall be covered in the project specific training and maintained along with the Geosyntec HSI and SDSs.

4.8 Written Program

4.8.1 GHS for Hazard Communication in Health and Safety Plans

All Health and Safety Plans or equivalent documents written for projects will contain all the elements of the GHS for Hazard Communication Program. SDSs for hazardous substances at the project site will also be included.

4.8.2 Location-Specific GHS for Hazard Communication Programs

Each Geosyntec location where hazardous substances are present shall develop a GHS for Hazard Communication Program in accordance with OSHA's GHS for Hazard Communication regulation, this procedure, and location-specific work rules. The location-specific GHS for Hazard Communication Program must address all elements outlined in **Attachment 2** of this procedure and be in writing. In addition, certain state regulatory provisions require additional information to be included in a GHS for

Hazard Communication program. These state-specific requirements must be identified by the project/office manager and included in the final program.

Attachment 2 is a template that can be used in developing facility specific GHS for Hazard Communication Programs. While the template is not mandatory, all elements addressed in Attachment 2 must be included in all final programs.

5.0 PROCUREMENT

No hazardous substance may be purchased for use on a Geosyntec-managed job site unless it:

- Is accompanied by a copy of the item's SDS (unless already on file on the job site)
- Is packaged with proper hazardous commodity hazard warning labels affixed to each container.

All hazardous substances, even those purchased at local stores, must be accompanied with a SDS. If a vendor cannot provide a SDS at the time of procurement, the material should not be purchased.

ATTACHMENTS

Attachment 1 – Hazardous Material Inventory Template
Attachment 2 – GHS for Hazard Communication Program Template

Attachment 1: Hazardous Material Inventory

Product Name	Chemical Name	Manufacturer	Quantity	Location	Usage[1]
OVM/HNu Calibration Gas (Isobutylene in Air)	100 ppm isobutylene in air	Varies (MSA, Scott Specialty Products, others)	$\leq$300 ft^3	Varies (usually stored in site trailer or with other compressed gases)	D, B
LEL/O_2 Calibration Gas (Pentane and Oxygen in Nitrogen)	0.75% pentane and 15% oxygen in balance nitrogen	Varies (MSA, Scott Specialty Products, others)	$\leq$300 ft^3	Varies (usually stored in site trailer or with other compressed gases)	D, B
OVA Calibration Gas (Methane in Air)	100 ppm methane in air	Varies (MSA, Scott Specialty Products, others)	$\leq$300 ft^3	Varies (usually stored in site trailer or with other compressed gases)	D, B
Hydrogen Gas	99.9999% hydrogen gas	Varies (check with Site Manager or HSSO)	$\leq$300 ft^3	Varies (usually stored outside of site trailer with other compressed gas cylinders)	O, B

[1] Usage Legend

D = Daily	F = Field; I = In-House; B= Both; S = Storage
O =Occasionally	

Attachment 2: GHS for Hazard Communication Program Template

Site Name: _____

Location: _____

1. The individual with overall responsibility for the implementation of this GHS for Hazard Communication Program at this site is: _____

   Responsibilities of key staff and employees with regards to GHS for Hazard Communication program at this will be as follows:

   a. Project Manager is responsible for:

   b. Operations Manager/Area Supervisors are responsible for:

   c. Individual employees are responsible for:

2. Inventory of hazardous substances is attached and also located:
   _____

3. Safety Data Sheets (SDSs) for all hazardous substances are located at:
   _____

4. Employees may review SDSs and the standard by following this procedure:
   _____
   _____

   SDSs not on hand that are requested by employees will be requested of suppliers within 7 days by letter.

5. The SDS file is updated with new information and new hazards identified by: _____, every _____weeks.

   Out of date or missing SDS are obtained and maintained in the files by: _____ within _____ days of the review.

6. Any new hazards will be reported immediately to: _____
   _____ and affected employees notified within 30 days.

7 Containers of hazardous materials entering the site will be checked by _____
   _____ to assure that they are properly labeled with the chemical name of the contents, the appropriate hazard warning, and the name and address of the supplier or manufacturer.

8. Onsite containers of hazardous materials will be labeled with the chemical name and hazard warning. Exceptions must be approved by _____
   _____

   The following exceptions have been approved

   -
   -

9. Non-routine tasks at this location involving hazardous materials may include the following:

Attachment 2: GHS for Hazard Communication Program Template

Procedures for complying with the GHS for Hazard Communication Standard for these jobs are the following:

-
-
-

10. Employee training is provided initially to all employees and for all new employees. This training covers the following areas:
    a. The basic requirements of the GHS for Hazard Communication Standard and their right to information on chemical hazards.
    b. Our company's program to comply with the standards and procedures to follow to see the standard, company program, and SDSs.
    c. How to interpret and use the labels on containers of hazardous materials.
    d. The potential physical hazards and health effects of the hazardous substances and how to use SDSs for more information.
    e. How to handle the hazardous substances safely and other protective measures in place.
    f. What to do in an emergency, release, or over-exposure to the chemicals.
    g. How the presence of hazardous chemicals can be detected in the work area.
11. This training is documented in the following manner: _____

    _____

    Records are maintained at the following location: _____

    _____
12. Training concerning new hazards (new chemicals or new information on SDSs) will be provided within 30 days and documented.
13. Periodic refresher training will be provided and documented as follows:

    -
    -

14. Outside employees (subcontractors and visitors) will be advised of chemical hazards at our site in the following manner: _____

    _____

    Contractors will be required to provide information on any chemicals used at this site as a condition of their contract.
15. An internal review or audit of GHS for Hazard Communication program is conducted by _____ every _____ months and results of audit are maintained at _____ for review.

Our company relies on the information contained in SDSs as permitted by the OSHA GHS for Hazard Communication Standard and does not perform independent hazard determinations.

Reviewed and approved:

_____ _____
H&S Department Date

_____ _____
Project Manager Date

5.0 SITE ORIENTATIONS

1. All project employees will receive a safety orientation and training prior to the start of any project and/or task.
2. The PM, SS or SSO will perform the orientation and training. The level of training and method for providing orientation and training will consist of the mandatory items listed in Project HASP or the H&S Planning Document and a site-specific orientation that will be based on the project specifics, location of the project, and client requirements. The HS Department can provide examples of previous orientation material for reference.
3. The depth/level of training will be commensurate with the job function(s) to be performed. Site visitors will receive general orientation and task-specific training.
4. At a minimum, initial employee orientation and training will consist of the items listed below:

   * Identification of hazards associated with the individual's job function and responsibilities.

   * Specific safety procedural instruction needed to perform his or her required job function or task.

   *Content of the HASP, Job Safety Analysis (JSA), Task Hazard Analysis (THA), Journey Management Plan (JMP), etc.

   * Additional training for specific job functions will be conducted on an “as-needed” basis.

6.0 SAFETY MEETINGS

A safety/kick-off meeting will occur prior to the start of field activities. Safety meetings will be conducted by the PM or SS and supplemented by the supervisors of various crafts (labour, equipment operation, foreman, safety).

1. The purpose of these meetings is to allow the project employees an opportunity to maintain a high degree of safety awareness through timely safety education. This training will be used to discuss specific safety topics and obtain employee feedback.
2. The PM and SSO will monitor safety meetings to ensure that subject matter is properly presented.
3. Topics to be discussed will include safety hazards noted during the week and explanation of job safety procedures unique to the project.
4. Other items open for discussion may include, but are not limited to:
   - Use of employee personal protective equipment and decontamination protocol
   - Project safety rules, safe work practices, and control measures
   - Employee accidents and incident reviews
   - Review of applicable SOPs to job specific activities
5. Safety Briefings will be developed by the PM, SS, or SSO. Meetings will be conducted by the PM, SS, or foreman with support from the HS Department. Subjects may be obtained from the HS Dept.
6. Records of attendance at all employee safety orientation and training provided as part of this procedure will be documented on the Tailgate Safety Briefing Form (attached).

7.0 ATTACHMENTS

Attachment 1 – Tailgate Safety Meeting Sign-In Log

Attachment 2 – Safety Training Log

Geosyntec Tailgate Safety Meeting Sign-In Log

Briefing Lead By:	Signature:	Date:	Time:

Project name:	Project Number:	Project Contact:

Muster Point:	Nearest Hospital:	First Aid Provider:

This sign-in log documents the topics of the tailgate safety briefing and individual attendance at the briefing. Personnel who perform work operations onsite are required to attend each safety briefing and acknowledge receipt of such briefings daily. **Please provide a brief narrative of the following topics as applicable to the project:**

Scope of Work/Tasks:	
Hazards:	
Engineering/ Administrative Controls:	
PPE:	
Other:	

Personnel Sign-in List (Geosyntec + Subcontractors)

Printed Name and Company	Signature	Printed Name and Company	Signature
1.		5.	
2.		6.	
3.		7.	
4.		8.	

End of Day - Tailgate Meeting:

1. Any hazards found today that were not identified as part of the scope or morning tailgate?
2. Were any Incidents or Good Catches observed today and were they reported?
3. Any additional hazard controls, equipment, or PPE needed for tomorrow to complete the tasks?

Geosyntec
family of companies

Geosyntec
Safety Training Log

Training Conducted By:	Signature:	Date:
Project name:	Project Number:	Time:

This sign-in log documents the safety training conducted in accordance with Geosyntec requirements as well as other applicable regulatory requirements. Personnel who perform work activities in field/facility environments are required to attend each safety training session and acknowledge receipt of such training prior to a change in site/facility-specific operations or conditions. Additional training topics and/or regulations can be added to address ongoing site/facility operations. The assigned Manager (i.e., project, construction, response, facility, etc.) is instructed to maintain the completed documents at the facility for review for the duration of the project.

Describe the elements of the training topic below. Use a separate for separate training. This form should be used for specific training (PPE training, Respiratory Protection training, HAZCOM/GHS, etc.)

Personnel Sign-in List

Printed Name	Signature	Printed Name	Signature
1.		7.	
2.		8.	
3.		9.	
4.		10.	
5.		11.	
6.		12.	

Geosyntec consultants | family of companies

Health & Safety Procedures

Procedure: HS 203 US CA

Date: November 17, 2017

Revisions:
November, 2017
March, 2014
December, 2010

Stop Work Authority

1.0 PURPOSE

To recognize the right of all workers on Geosyntec project sites and in Geosyntec workplaces to stop work ("refusal to work"), without reprimand, if they believe, based on reasonable and practicable grounds, that an imminent H&S hazard or risk as defined herein, is likely to endanger them self, a co-worker, a subcontractor employee, a Client representative or visitor, or member of the general public. This Procedure also establishes administrative procedures associated with processing and closure of a formal Stop Work Order.

2.0 SCOPE/APPLICABILITY

This procedure applies to all of the subsidiaries, affiliates, and operating units of the Geosyntec family of companies (hereinafter referred to as "Geosyntec" or the "Company"). Any exceptions to this procedure must be approved, in writing, by the Health and Safety (H&S) Director and Risk Management Committee (RMC).

This Procedure is not intended to require a formal work stoppage in place of normal and typical discourse among Geosyntec staff and subcontractors to discuss workplace hazards and develop appropriate safe work practices and hazard control measures, or to preclude other avenues for submitting a written request for corrective action; it is intended to ensure that workers are not exposed to "imminent" or "undue" hazards, and provide recourse to workers when normal/typical means of resolution through collaboration are not effective or available.

Circumstances for which a valid Stop Work Order may be submitted, include, but are not limited to the following:

- An individual is exposed to an imminent or undue work-related danger or risk, including an employee, subcontractor, client, visitor or member of the general public
- An imminent or undue threat to the environment, facilities, or property.
- Continuing work or equipment usage will result in exposure of other individuals to an imminent hazard, or significant damage, rework, or removal from the project.
- A project, or any segment of the project, is executed improperly or is substantively and critically out of compliance with contract specifications, or where a work area or work practices are not managed or maintained in a safe and healthy manner according to H&S submittals reviewed and accepted by Geosyntec.

Geosyntec's stop-work authority applies to all work locations, employees and subcontractors. All personnel are authorized to stop work if there is an identified unsafe condition with an imminent hazard to which a worker will be exposed.

The regulatory basis for workers' right to refuse work that represents an imminent hazard in North America includes, but may not be limited to:

- Alberta Occupational Health and Safety Act, Section 2, No. 35 "Existence of Imminent Danger", and No. 36 "Where Disciplinary Action Prohibited"

- British Columbia Occupational Health and Safety Regulation, Part 3 “Refusal of Unsafe Work,” Sections 3.12, 3.13, and 3.23 (2) (b)
- Ontario Occupational Health and Safety Act, Part V “Right to Refuse or to Stop Work Where Health or Safety in Danger,” Section 43
- U.S. OSHAct, Part 11(c), and regulation 29 CFR Part 1977.12 “Exercise of any Right Afforded by the [OSH]Act, Section (b)(2)

A Stop Work Order issued by a worker under this H&S Procedure will be without prejudice to any other legal or contractual rights of Geosyntec. Geosyntec reserves right to “stop work” where Geosyntec is responsible for enforcing terms of our contracts, negotiating with Client and/or Subcontractors, and other normal activities associated with execution of work.

Informal stop work interventions to correct minor conditions (e.g., to remind workers to put on their hard hats, safety glasses, parking of Company vehicles, etc.) do not require formal notification, and do not constitute grounds for a formal Stop Work Order, per this Procedure.

3.0 DEFINITIONS

Imminent Danger: Also termed an “imminent risk” or “imminent hazard;” or “undue risk or hazard;” a danger that is not “normal, or typical” for a work task. An impending or threatening hazard related to a condition, practice, piece of equipment, tool, which represents, if left uncorrected, a likelihood of worker exposure to an undue risk or hazard, with the potential for serious injury to any person, or critical/catastrophic environmental impact or property damage.

Stop Work Order: A formal action, documented in **Attachment 1 “Stop Work Order,”** initiated by a worker in which he/she refuses to perform work that represents an imminent or undue hazard or risk, and places the worker or others in danger of harm. A stop-work order may be issued for a specific task, practice, tool or piece of equipment, area within a work area or an entire work area or project site, to the extent necessary to protect affected workers from exposure to an imminent or undue hazard or risk.

4.0 PROCEDURES

This section delineates procedures for issuance and processing of a Stop Worker, including documentation of pertinent actions on the written **Stop Work Order**, provided in **Attachment 1**, including actions corresponding to the following Sections of the written Stop Work Order:

- Section 1 - Issuance of a Stop Work Order
- Section 2 - Review for Merit
- Section 3 – Abating the Hazard, Resumption of Work

4.1 Issuance of a Stop Work Order

To submit or issue a Stop Work Order, a worker shall first/immediately notifying the worker’s Supervisor/Project Manager of the work stoppage and the reason(s) for the action, followed as soon as possible by filling out **Section 1 “Submittal of a Stop Work Order”** of the written **“Stop Work Order.”** Submit the Stop Work Order, by hard copy or electronically, to the worker’s supervisor/manager, whose subsequent actions shall include:

- Immediately notify senior management directly associated with the organization/project team responsible for the work subject to the stop work order, including, at a minimum, the Project Manager and Branch Manager, and forward copies of the Stop Work Order.
- Immediately notify the Corporate HS, HR and Legal Departments, of the issuance of the Stop Work Order, and forward copies of the written Stop Work Order.
- As considered appropriate for the specific circumstance, investigate and take action, in coordination with operational Managers, HS, HR, and Legal Departments, to mitigate the hazard and/or prevent other workers from performing the work tasks that are the subject of the work stoppage and/or seeking additional information about the circumstance of the Stop Work Order.

- Follow procedures stated herein for documenting and resolving the work stoppage.

Where a subcontractor exercises his/her right to "Stop/Refuse to Work, he/she shall do so by notifying his/her manager/supervisor/employer, who will notify their primary Geosyntec contact(s) for the work. Subsequent activities will be generally in accordance with the principals outlined in this Procedure, with engagement/notification of Corp. HS, HR, Legal, or Contracts Departments, as appropriate for the circumstance.

4.2 Review of Stop Work Order for Merit/Justification

A formal "Stop Work Order" may be reviewed for merit by senior managers associated with the work. All decisions shall be in coordination/collaboration with the Corporate HS, HR and Legal Departments. It is the responsibility of the review team to ensure that:

- The employee's right to a safe workplace, and right to refuse work of undue or imminent hazard, are protected under the occupational health and safety regulations and laws applicable in the jurisdiction where with work is located;
- Make a determination as to the merit of the Stop Work Order, or lack thereof, based on current standards of care and due diligence, and in accordance with laws and regulations applicable in the jurisdiction where the work is located.

Findings of the review team shall be documented in Section 2 "Review for Merit," of the Stop Work Order, with information including substantive findings, corrective measures to eliminate/control the subject hazard(s) of the Stop Work Order, names of reviewers, relevant dates, and next steps.

Where the review team has determined that the Stop Work Order has merit and is validated, subsequent actions will be in accordance with the following Section 4.3 "Abating the Hazard and Resumption of Work." Where the review team contests/refutes the validity of the Stop Work Order, subsequent actions will either be resolved by impartial senior managers not directly associated with the project or work, to include Corp. HS HR and Legal Departments, or handled as a formal labor dispute, under direct supervision of Corp Legal and HR departments.

No action by the review team or Geosyntec will interfere with the employee's rights to any subsequent valid/legal course of action, taken in response to the findings of the reviewer team.

4.3 Abating the Hazard and Resumption of Work

Actions taken to abate the subject hazard(s) addressed in Sections 1 and 2 of the Stop Work Order, and for the resumption of work after hazard abatement, shall be documented in **Section 3** of the Stop Work Order, **"Resolution of Stop Work Order and Resumption of Work."**

In response to a valid Stop Work Order, in accordance with HS-202-Safety Meetings, work-site personnel affected by the stop work order will be instructed on the corrective actions and preventative measures to be taken in a timely manner. Additional requirements associated with corrective action(s) addressed in HS-104-Inspections, Audits, and Corrective Actions, will also be complied with and discussed with affected personnel.

The stop work order will remain in effect until the responsible organization resolves the problem(s), implements corrective measures, and brings the work area(s) to satisfactory conformance with established H&S requirements and eliminates worker exposures to imminent or undue hazards or risk.

Temporary stabilizing or halting of an imminent danger condition or practice is acceptable, as deemed acceptable to be left unattended/unresolved, and ensuring that no other person is exposed to the imminent or undue hazard. Work associated with the affected area or operation will not resume unless all corrective actions identified in the applicable Stop Work Order have been completed and closed.

If the responsible organization fails to provide resolution or if at any time their acts, or failure to act, cause substantial harm or imminent danger to the health and safety of project employees or the public or the environment, the organization and responsible individuals will be considered in violation of this Procedure.

5.0 DOCUMENTATION/RECORDS

Documentation of stop work actions, to include fully executed Stop Work Order, Attachment 1, and other relevant information/documentation generated during execution and closure of the Order, will be maintained by the Corporate HR and HS Departments, and by other Corporate Departments as deemed necessary or appropriate. Copies of the executed/closed written Stop Work Order will be provided to the individual(s) initiating the work stoppage as well as other members of the affected organization(s), including, as appropriate, the Project Manager, Department Manager, Branch Manager, Site Supervisor.

The HS Department will utilize general information associated with the Stop Work Order to communicate any resultant lessons learned or changes in Geosyntec's practices or procedures.

6.0 PROTECTION FROM REPRISALS, DISCIPLINARY ACTIONS

Geosyntec prohibits, and will not tolerate, any form of reprisal, reprimand, retribution, or intimidation, or other form of discipline directed at any individual, for exercising their right to refuse unsafe work, subject to the provisions delineated in this Procedure. Individuals failing to follow the directive of a "stop work order," or who reprimand a person, in any way, for exercising his/her right to refuse hazardous work, will be subject to disciplinary action.

7.0 TRAINING

Geosyntec employees will be provided training on the right to refuse unsafe work (work stoppage), and on the procedures for refusing unsafe work as part of New Employee Safety Orientation, and in accordance with HS 114 Safety Training Programs. Training on this topic will also be provided periodically during other appropriate worker training/learning/communication opportunities, such as:

- Periodic health and safety training programs
- "Safety Moments" and "Safety Alerts"
- Project specific safety orientations and daily tailgate meetings
- Shared/published "lessons learned" resulting from incident reports and investigations (per HS 101 Incident Reporting, and HS 102 Incident Investigation), or Stop Work Orders issued per this Procedure.

8.0 ATTACHMENTS

Attachment 1 – Stop Work Order

9.0 REFERENCES

HS 101 US CA- Incident Reporting
HS 102 US CA- Incident Investigation
HS 104 US– Inspections, Audits, and Corrective Actions
HS 114 US CA-Safety Training Programs
HS 202 US– Safety Meetings

STOP WORK ORDER

Section 1 – Issuance of a Stop Work Order		
Project Name:	Project No:	Date:
Project Manager:	Time:	
Submitted/Reported By:		
Summary of Hazardous Conditions, Relevant Factors:		

Section 2 – Review for Merit		
Findings; Next Steps:		
Signatures of Review Team :		

Section 3 – Resolution of Stop Work Order, Resumption of Work			
Actions Taken:			
Signatures Confirming Closure of Stop Work Order:			
Title:	**Print Name:**	**Signature:**	**Date:**
Project Manager			
Party Issuing Stop Work Order:			
Subcontractor Supervisor: (if applicable)			
Others:			

US Health & Safety Procedures

Working on or Near Water and Ice

1.0 PURPOSE

To establish the minimum safety requirements for personnel assigned to Geosyntec projects performing sampling, investigations, and support while working on or near water or ice. This procedure applies to all of the subsidiaries, affiliates, and operating units of the Geosyntec family of companies (hereinafter referred to as "Geosyntec" or the "Company"). Any exceptions to this procedure must be approved, in writing, by the Health and Safety (H&S) Director.

2.0 SCOPE

The following guidelines shall be implemented during all work activities that require personnel to work on, near or over water and/or ice (e.g., rivers, lakes, ponds, retention basins, unguarded clarifiers, containment systems, etc.). These guidelines must be communicated to all employees performing operations where the potential for drowning or exposure/immersion in water exists.

3.0 PROCEDURE

3.1 General Requirements

3.1.1 Training

- Certification Requirements: All boat operators are required to complete a boating safety course and have experience operating a motorized vessel within the past two years.
- Boat safety training and education may be obtained through a recognized outside source such as the United States Coast Guard Auxiliary , Transport Canada---Office of Boating Safety, UK—Boat Safety Scheme (BSS), etc. and/or through local boating safety agencies in Geosyntec respective international location(s).
- Proof of course completion from one of these outside sources must be kept on record. Furthermore, the user may be required to demonstrate boat handling skills.
- Before departure, each passenger not holding certification must be briefed by the certified operator or captain as to the safety equipment and procedures on board the vessel.

3.1.2 Personal Protective Equipment

Operations on/near water may require some or all of the following:

- Coast Guard (US),CE/ISO (UK), 4758(AS) Australia Standard, Safety of Life at Sea (SOLAS) in Malaysia, etc. approved Personal Flotation Device (PFD), sized and adjusted to the wearer, shall be worn by all when danger of drowning exists. To be immediately effective in an overboard situation, the straps must be buckled. Vests shall be reflectorized with a rescue light during night/low light/heavy weather conditions.
- Foul weather gear will be available for use during wet conditions as necessary.
- Gloves of appropriate material.

- Waders (only in shallow waters).
- Rescue line.
- Ring buoys.

3.1.3 Transfer Between Boats

Transferring between boats and barges can be dangerous, particularly in rough weather. Be extremely cautious each and every time you make a transfer. NEVER become complacent about this. Getting caught between vessels, even in calm seas, can be deadly.

3.1.4 Deck Hazards

Deck hazards are everywhere on vessels/barges. Rigging, wire, fittings, welding, lead, and stored materials are just some of the many trip and snagging hazards. Also watch for slippery decks particularly when muddy, wet, layered with ice or near fuel and lubricant spills. This is especially hazardous during rolling deck conditions.

3.1.5 Overhead Hazards

- Overhead hazards are always a threat. NEVER stand under a hanging load, empty bucket hook, or crane boom.
- Crane operators are not allowed to swing loads over other personnel.
- Stand clear of tag lines and other rigging suspended from above.

3.1.6 Hazardous Noise

High noise areas should be avoided. Ear plugs and/or muffs will be worn in high noise areas that must be entered or where engineering controls are unable to reduce exposure.

3.2 Diving

No Geosyntec employee shall be allowed to “wet dive” or “one atmosphere dive” in any vehicle, bell or suit without being authorized by the H&S Department. This includes self-contained underwater breathing apparatus (SCUBA) and hard hat diving.

3.2.1 Weather

- Full account will be given to existing weather conditions and forecast during planning for specific project operations.
- Boat handling will cease when winds reach sustained speed of 20 knots. Launching, recovering, or otherwise handling a boat is unsafe when wind speed reaches 20 knots.

4.0 WORKING NEAR WATER/ICE

If work must be performed on, near or over water, the following requirements must be followed:

- Work must be performed in accordance with the “Buddy System.”

- Employees working over or near water, where the danger of drowning exists, shall be provided with an approved PFD (See Section 3.1.2). Type of PFD should be selected by the water conditions present. Prior to and after each use, the PFDs shall be inspected for defects, which would alter their strength or buoyancy. Defective units shall not be used and must be replaced.
- Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.
- At least one lifesaving skiff/boat shall be immediately available at locations where employees are working over or adjacent to water.
- Whenever possible, minimize the risk to employees avoiding the use of watercraft and instead performing work from the shore/bank. For situations where ice exists, reschedule work to periods of warmer temperatures, when ice is not an issue.
- Avoid wearing waders or hip boots, in deeper waters. They are cumbersome and may encourage workers to go deeper into water than is safe. Only use this apparel in shallow waters (i.e., creek beds).
- If workers have the potential to get stuck in mud or sediment, air injection equipment designed to free workers feet/legs may need to be available onsite. If a worker does get stuck, do not struggle as this causes deeper sinking. Workers should not be permitted to access areas where this hazard exists, especially in locations containing tidal water flow.
- Use a pole to probe ahead to assess water depths and/or stability of shoreline terrain.
- Take special care on slippery rocks around lakeshores, riverbanks and creeks. Always look ahead at the ground when walking around the water's edge.
- If sampling near or in flowing water environments, be aware of slippery or steep banks and fast currents. If the current is fast or the water looks deeper than knee height, do not enter the water. If you must enter the water, a restraining system must be worn and secured to the bank for retrieval.

If work must be performed on ice, the following requirements must be followed:

- Work must be performed in accordance with the "Buddy System" with rescue communications available.
- Do not walk or work on ice unless there is no other way of performing work.
- Whenever possible, use alternate methods. Have personnel use a flat-bottomed boat with ropes (or equivalent) tied to each end and handled by workers on the berm, bank, or shore.
- Only walk on ice that is fully frozen, not cracked or brittle, that will support the necessary weight of workers and associated equipment.
- PFDs shall be inspected and worn in accordance with the requirements listed above.
- Workers must wear a restraining system (a lifeline attached to the front of a full-body harness) and stay close enough to the edge to make it possible for the attendant to pull the individual back on the ice.
- Workers must have available (on their person) equipment that can be used to partially penetrate the ice to help pull them out of the water and back up on the ice (equipment is available with capped ends that can be worn safely until needed).

Gauging the strength of ice is very difficult. There is no such thing as 100% safe ice.

- Never walk or drive on cloudy ice.

- Only go on clear, thick ice.
- Spring ice is **NEVER** safe.
- The thickness of ice is never consistent - it will be flat on top, but not on the bottom.
- Snow on ice acts as an insulator - it makes ice warmer and weaker.
- Extreme cold snaps will weaken the ice.
- Ice formed over running water (rivers & streams) is more dangerous. than ice formed over standing water (lakes & ponds).

General ice thickness guidelines from the various resources outline the following (new, clear ice only):

- Less than 2 inches - **STAY OFF!**
- 4" and thicker - probably safe for walking and ice fishing on foot
- 5" and thicker - probably safe for ATV or snowmobiling
- 8-12" and thicker - probably safe for small cars or light pickups
- 12-15" and thicker - probably safe for medium trucks

4.1 Water and Ice Safety Equipment

The safety equipment required to support work on, over or near water and/or ice includes:

- Cell phones (or equivalent) capable of contacting emergency services.
- Approved PFD.
- Ring buoys with at least 90 feet of line.
- Full-body harness with restraining line.
- Lifesaving skiff/boat (as needed) - contact the H&S Department for guidance.
- Air injection equipment designed to free workers feet/legs (if necessary).
- Poles to probe for assessment purposes.
- Capped ice picks, spikes, etc.

5.0 ATTACHMENTS

Attachment 1 – Boat Loading and Launching Checklist
Attachment 2 – Daily Float Plan

ATTACHMENT 1

BOAT LAUNCHING & LOADING CHECKLIST

Purpose: The checklist covers loading and unloading boats.
The checklist includes vehicle to trailer hook-up and operating boats safely

Date:	Employee's Name:

Title: SAFE BOAT UNLOADING, OPERATING and LOADING

Subject 1: PERSONAL PROTECTIVE EQUIPMENT REQUIRED	THA Followed (check) YES	NO
A. Safety Glasses		
B. Safety Toe Boots		
C. Hard Hats(Required for work, but not necessary while driving or riding boat(s) to and from work site.)		
D. Personal Flotation Devices		

Subject 2: VEHICLE TO TRAILER HOOK-UP

PRE-JOB TASKS:

A. Boat may be equipped with a transom drain plug. Make sure this plug is in place and tight.		
B. Inspect the bottom of the boat and make note of all fittings below the waterline. Ensure none are loose or broken.		
C. Check boat, motor and trailer for vegetation and remove before launching boat into water.		
D. Check gas/oil tank(s) and lines for leaks, frays, cracks and breaks.		

PROCEDURE:

A. Check behind the vehicle to make sure that no one or any obstacles are between vehicle and trailer.		
B. Back vehicle toward trailer using approximate center of vehicle to align trailer hitch on vehicle with tongue of trailer. Put vehicle in park and set park brakes, and then check for vehicle ball and trailer hitch alignment. Adjust vehicle to desired distance. Put vehicle in park, set parking brake, and shut off engine. (Assistant can help align if available)		
C. (1) Check vehicle tube receiver making sure pin and cotter pin are installed through receiver tube.		
(2) Check ball on receiver for tightness.		
(3) Check ball size (normally stamped on trailer hitch).		
(4) Match ball size on vehicle receiver with trailer hitch.		
Failure to use correct ball size can cause trailer to come unhitched from vehicle.		
D. Remove safety pin from latch on trailer hitch. Latch must be in up position. Slowly lower trailer hitch toward ball, by turning jack handle to lower trailer tongue while aligning ball and hitch. When trailer hitch has bottomed on the ball, push latch down; install the safety pin through the latch.		
NOTE: Jack can be used to raise and lower tongue to get the latch to lock.		

Subject 2: VEHICLE TO TRAILER HOOK-UP (Procedure Continued)

E. Attach hooks on safety chains from trailer to vehicle hitch where holes are provided, or to vehicle frame. Chains should be crossed (XpedX) from trailer tongue to vehicle frame.

F. Plug trailer lights to vehicle. Ensure all lights are working properly.

G. Attach brake cable (if unit is equipped).

H. Pull pin on jack frame and pivot jack to tow position letting pin return into hole on frame to lock jack.

I. Check that trailer coupler is secure and latched.

J. Check that a safety pin or a lock is in place.

K. Check boat and trailer.

L. Complete Trailer inspection. Ensure that all equipment is present, in good condition and safe to operate.

M. Remove wheel chocks before moving boat trailer.

Title: SAFE UNLOADING, OPERATING and BOAT LOADING

Subject 3: BOAT LAUNCHING

A. Complete launch preparations while boat is in staging area.

1) Remove safety tie downs from boat to trailer.

2) Drop motor into vertical position. Remove support, if equipped.

3) Install transom drain plug.

4) Unhook trailer wires.

5) Be sure a bow line is fastened to boat.

B. Be sure all required equipment and safety devices are aboard.

1) If there are two people, launch boat with one person on boat (life jacket must be worn). Driver will slowly back the boat trailer down the ramp until the boat can easily float off the trailer. When backing onto the ramp; back to the left if possible. This gives the driver better launching visibility. Driver will place vehicle in park; put on parking brake; and keep one foot on brake pedal. When boat is floating in the water; remove vehicle/trailer from launch ramp and park in the parking area. Set parking brake before leaving vehicle.

2) If one person is launching, after boat is in water place vehicle in park, set parking brake and shut off engine. Place chocks under wheels of towing vehicle. Enter boat (life jacket must be worn) remove from trailer; dock at pier or on shoreline and tie off boat. Remove truck from launch ramp to parking area.

C. When boat is in the water, immediately inspect the motor for leakage. If an oil or gas leak is detected attempt to contain the release if possible, without risking bodily harm. Return the boat to the trailer and contact the area supervisor or the project sponsor. If there is immediate danger; evacuate the area.

Title: SAFE BOAT UNLOADING, OPERATING and LOADING

Subject 3: BOAT LAUNCHING (Continued)

D. Check the boat for any through-the-hull fittings for sign of leakage into the boat. If any leaks are noted, the boat should be removed from the water immediately for repair.		

Subject 4: BOAT RULES and REGULATIONS

BOATING and WATER SAFETY RULES	**YES**	**NO**
1. Each occupant (employees, contractors and visitors) aboard any water craft while on water, including boats and barges with standard handrails, must wear an approved personal flotation device.		
A. Prior to and after each use, the Personal Floatation Device shall be inspected for defects that might alter their strength or buoyancy. Defective units shall not be used.		
2. Each boat, including pontoon boats, shall have on board the following items:		
A. A minimum of one Type IV life jacket (or equivalent)		
B. One Life Ring Buoy with 90 feet of line (rope attached)		
C. A sound device for alerting or alarm, whistle or horn .		
D. A minimum of one paddle.		
E. One site radio if applicable. (Tested to be sure radio is working properly.)		
F. Minimum of one approved fire extinguisher.		
Fire extinguisher(s) has current (monthly) inspection.		
3. Approved hardhats, safety shoes and eye protection are required while working aboard any craft, not necessary when traveling aboard a boat.		

BOATING and WATER SAFETY RULES –MISC. Information

ATTACHMENT 2

DAILY FLOAT PLAN

				Expected Weather Conditions:	
Name	**Role**	**Phone No.**	**Signature**	**Description:**	
				Air Temp:	
				Water Temp:	
				High Tide:	
				Low Tide:	
Shore Support Personnel				**Sunrise:**	
Name	**Role**	**Phone No.**	**Signature**	**Sunset:**	
				Boat Information	
				Model:	
				Registration:	
				Captain:	
				Model:	
				Registration:	
				Captain:	

Trip Itinerary	**Work Areas:**

Health and safety meeting prior to starting work.
Topics:

General Timeline			
Specialized Equipment Required			

Safety Equipment

_x_ As specified in HASP

US Health & Safety Procedures

Water Transportation Safety

1.0 PURPOSE

The purpose of this program is to provide guidance and information that is aimed at performing work over water in a safe and controlled manner and ensure that the potential hazards posed by Water Transportation Operations are communicated to staff of the subsidiaries, affiliates, and operating units of the Geosyntec family of companies (hereinafter referred to as "Geosyntec") unless the use of an alternate procedure prepared specifically for/by a subsidiary has been endorsed by the Director of Health & Safety (H&S).

The following governmental organizations are responsible for regulating Water Transportation Safety in their respective jurisdictions:

- United States – United States Coast Guard (USCG) under the U.S. Department of Homeland Security.
- Canada - Transport Canada under the direction of the federal government's Minister of Transport.
- United Kingdom - Her Majesty's Coastguard (HMCG), The Maritime and Coastguard Agency (MCA), a UK executive agency.
- Australia - Australian Maritime Safety Authority, a self-funded government agency.
- Malaysia – The Marine Department of Malaysia is a government department under the purview of the Ministry of Transport.

2.0 SCOPE

Water transportation includes supply ships, tugboats, ferries, barges, and other watercraft operating on oceans, lakes, rivers, canals, and harbors that Geosyntec may engage in the performance of project-related activities. Activities and work practices normally associated with water transportation or performing work over water are within the scope of this procedure and also noted in HS 306 US Working On or Near Water and Ice (i.e., Safety considerations, personal protective equipment (PPE), deck hazards, etc.

3.0 DEFINITIONS

Commercial Boat: Any boat used as a common carrier of passengers or property; operating on a regular schedule; any vessel propelled by electric or mechanical power carrying passengers for hire.

Capacity Plate: A metal plaque located near the operator's position and/or near the transom of the vessel indicating the maximum weight capacity and/or the maximum number of people that vessel can safely carry. On outboard powerboats the capacity plate will also state the maximum horsepower rating for that vessel.

Cowl: A hooded opening used for ventilation

Flame arrestor: A safety device that prevents an exhaust backfire from causing an explosion.

Master: person trained in and responsible for the navigation of a vessel

Maximum Capacity: The maximum number of people or pounds designated by the United States Coast Guard on the vessel's capacity plate.

The Offshore Vessel Inspection Database (OVID): Developed in response to a request from its members to provide a database of offshore inspections broadly following the format of SIRE.

Personal Floatation Device (PFD): Official terminology for life preserver.

Ship Inspection Report (SIRE) - Reports are generated for OCIMF members on an annual or call out basis. These reports are entered into an online database which is accessible by all OCIMF members to view reports.

4.0 PROCEDURE

4.1 Working over Water Guidance

Prior to the commencement of work, the Project Manager, Field Supervisor, Platform Foreman or Lead Operator, and Boat Crew (to include Geosyntec staff, hereinafter called the boat staff) will conduct a pre-job safety analysis (JSA) with those individuals noted on the Permit to Work and all workers designated to work over water.

1. When applicable, the boat staff should discuss where the rescue boat is to be located. The preferred location is the immediate facility. A secondary option is an adjacent facility that can provide an adequate rescue response. An adequate response evaluation will be conducted as part of the rescue. The rescue drill will consist of a ring buoy deployment from the facility where the over water work is to be performed and a successful retrieval from the facility performing the rescue activities.

2. The intent of the work, work duration, and communications procedures will be discussed as well as other safety issues with the boat staff. All safety issues will be resolved to the satisfaction of the boat staff prior to initiating any over-water work.

3. The boat staff will be required to make notification to the destination locations and adjacent facilities each day that over-water work will occur and the scheduled duration. When over-water work ceases, previously notified parties will be contacted.

4. A Lead Supervisor must be designated prior to the initiation of the Permit to Work. This person shall also act as the communications person.

5. Employees shall not work alone in situations where a drowning hazard exists.

6. Employees shall wear a Coast Guard Approved PFD and will maintain 100% tie-off at all times while outside the confines of standard handrail areas or outside the confines of certified scaffolding.

4.1.1 Drills and General Requirements

1. <u>Man Overboard Drill</u>
   (a) Will be conducted and the rescue boat run, launched, and retrieved prior to commencement of work, where the permit named rescue boat operator or the boat crane operator has not performed a rescue drill within the last 30 days.
   (b) When conditions are less than perfect to conduct a rescue drill, then boat staff shall lower the boat till the prop is in the water, start and briefly run the motor and simulate releasing the boat before returning the boat on deck. Drills should not be undertaken where this presents an unacceptable risk to the rescue crew.

2. Abandon Ship and Man Overboard Drills and Training

(a) The master shall conduct sufficient drills and give sufficient instructions to make sure that all crew members are familiar with their duties during emergencies that necessitate abandoning ship or the recovery of persons who have fallen overboard.
(b) Each abandon ship drill must include:
    (1) Summoning the crew to report to assigned stations and prepare for assigned duties;
    (2) Summoning passengers on a vessel on an overnight voyage to muster stations or embarkation stations and ensuring that they are made aware of how the order to abandon ship will be given;
    (3) Checking that life jackets are correctly donned.
    (4) Operation of any davits used for launching life rafts; and
(c) Each abandon ship drill must, as far as practicable, be conducted as if there were an actual emergency.
(d) Each rescue boat required in accordance with § 180.210 of this chapter must be launched with its assigned crew aboard and maneuvered in the water as if during an actual man overboard situation:
    (1) Once each month, if reasonable and practicable; but
    (2) At least once within a 3 month period before the vessel gets underway with passengers.
(e) Onboard training in the use of davit launched life rafts must take place at intervals of not more than 3 months on a vessel with a davit launched life raft.
(f) Abandon ship and man overboard drills and training shall be logged or otherwise documented for review by the Coast Guard upon request. The drill entry shall include the following information:
    (1) Date of the drill and training; and
    (2) General description of the drill scenario and training topics.

3. Rescue of a Worker Suspended in a Safety Harness

May be required as part of the JSA and/or Permit to Work procedures.

(a) The rescue of a worker who has fallen and is being suspended in his/her safety harness needs to be undertaken as quickly as possible.

(b) If no Elevating Work Platform is available for rescue, the general rescue procedures should cover at a minimum:

    (1) If worker is not conscious or cannot reliably help with his/her own rescue, at least 2 rescuers may be needed.

    (2) If worker is suspended from a lifeline, where possible, move the suspended victim to an area that can be safely reached by the ladder(s).

    (3) If victim is suspended directly from his/her lanyard or from a lifeline, securely attach a separate lowering line to the victim’s harness.

    (4) Other rescuers should lower the victim while he/she is being guided by the rescuer on the ladder.

    (5) Once the victim has been brought to a safe location, administer First Aid and treat the person for Suspension Trauma and any other injuries.

    (6) Arrange for transport to nearest hospital.

4. Working Over Water Shall Not Occur

(a) When weather conditions deteriorate to a point that the rescue boat cannot respond or there are express concerns over wave height, sea state or poor visibility. Working over water will occur only during daylight hours.

(b) When winter ice is located in the immediate vicinity of the facility.

(c) If the regular helicopter is not available for medical transfer.

(1) To ensure availability of Medevac or Coast Guard helicopters when regular helicopters are not available, coordination must be made.

(2) This coordination includes making contact with Medevac or Coast Guard helicopters and documenting the contact time, names and phone numbers of individuals to call in case of emergency.

(3) Once alternative helicopter coverage for medical transfer has been confirmed (Medevac or Coast Guard), over-water work may resume.

5. Rescue Boat Requirements

(a) A rescue boat must be available prior to the commencement of over-water work. The boat may be in the water or it may be situated on the deck, ready for launch by crane or davit/winch device. An evacuation capsule may not be used as the primary rescue boat.

(b) Prior to beginning any work over water and prior to the requisite Man Overboard Drill, the crane operator and rescue boat operator will confer and stage the rescue boat in an advantageous location to perform the most timely rescue.

(c) The crane does not have to be attached to the rescue boat concurrent to the over-water work, but the rescue boat as well as the crane shall have appropriate rigging attached. The crane being utilized will be dedicated to no other job concurrent with the over water work.

(1) The crane operator and the rescue boat captain shall monitor wind, weather, and sea conditions routinely throughout the duration of the job and shut down work activities accordingly.

(2) The crane operator shall stage the Personnel Transfer Basket as appropriate if a contracted vessel is in the water and is utilized as the rescue boat.

(3) The crane operator shall have a radio at hand while all over-water work is underway.

(4) Upon being notified via radio by the man watch/attendant that an individual has fallen overboard, he shall immediately sound a General Alarm and make a “Man Overboard” notification to all platform/facility personnel via the facility PA system.

(d) The rescue boat crew will include a boat operator and one or two assistants depending on the size of boat.

(e) In conjunction with rescue boat staging, the rescue boat crew will ensure that the fuel tank is at least 75% full, stage emergency response/rescue equipment and a hand-held radio at/in the rescue boat as appropriate. Personal floatation suits or exposure suits will be staged aboard for the rescue boat crew.

6. Man Watch/Attendant and Man Overboard Requirements

(a) Duties for individuals performing man watch/attendant:

(1) In all cases of over-water work, a person shall be posted at the job site in order to handle emergencies.

(2) This person will be in visual and/or verbal communication with all harnessed/ tethered personnel at all times.

(3) The man watch/attendant shall not leave this location for any reason while over-water work is in progress.

(4) If the man watch/attendant must leave, the tied-off personnel shall return to the confines of grating/handrail areas or within the confines of certified scaffolding, fully erected with standard handrails, until the man watch returns.

(5) The man watch/attendant shall be equipped with a radio and a ring buoy with a minimum of 90 feet of lanyard.

(6) In the event of a “Man Overboard,” this individual will summon assistance via radio from the crane operator and he shall also throw a life ring in close proximity to the man overboard.

(7) The man watch/attendant shall not lose sight of the man overboard and will direct rescue personnel via radio to the location of the fall victim.

(8) The man watch/attendant shall know the location of the nearest facility intercom.

(9) The man watch/attendant shall not be assigned any duties that interfere with the intended responsibilities nor participate in over-water work.”

(b) The designated Lead Supervisor shall maintain radio communications with the man watch/attendant while all over-water work is underway. Prior to beginning work over water, the designated Lead Supervisor will apprise him/herself of the following telephone numbers:

(1) Departure Location.
(2) Destination/Rig Supply Vessel and/or of adjacent facilities.

(c) Upon hearing announcement of a "Man Overboard" the designated Lead Supervisor shall immediately notify "911" as well as the other noted locations in an effort to seek assistance. She/he shall remain cognizant of tidal current direction throughout the day. Tidal current direction shall be conveyed to the potential responders.

(d) In the event of a "Man Overboard," all over-water work shall cease and all tied-off personnel shall return to the confines of a handrail area or within the confines of approved scaffolding.

7. Vessel Requirements

(a) All commercial boats must be commercially registered and inspected with a certified/licensed operator.

(b) The bow numbers issued to every vessel shall be displayed on the forward half of the hull and meet specific numbering requirements regarding size, color and placement.

(d) The licensing examination consists of a written test and, if the vessel involved is 34 feet or greater, an on the water examination of the applicant's piloting skills will also be administered.

(e) It is the responsibility of the commercial operator to ensure that all safety requirements are met prior to operation.

(f) The operator is required to obey the boating laws and rules regarding navigation, operation and safety equipment, while underway.

(g) The operator or owner of a commercial vessel shall report all boating accidents involving $2000 or more in total damage; personal injury or death, immediately to the regulating agency.

(h) The operator of a commercial vessel must have his/her commercial operator's license in his/her possession at all times when operating a commercial vessel.

8. Safety Equipment (Refer to HS 306 US) - must be in good condition and inspected prior to use.

9. Personal Flotation Devices.

Every commercial vessel shall carry a US Coast Guard Approved Type I personal flotation device that is in serviceable condition for each person on board. The device must be of an appropriate size for the intended wearer; and the device must be readily accessible. Children 12 years of age or younger must wear a PFD at all times unless the vessel meets special requirements for exemption from this rule. Additionally, unless the vessel never carries children, the vessel shall be equipped with a number of such approved devices suitable for children, equal to at least 10 percent of the total number of persons carried. A US Coast Guard Approved Type IV device must also be provided on vessels that are 16 feet or greater in length.

10. Sound Producing Devices (SPD)

Powerboats must have a horn or whistle that meets SPD requirements. Vessels 26 feet or greater in length must also have a bell. When boats are running in the fog, mist, etc., and cannot see each other, the operators shall sound on blast of a whistle or horn at intervals not exceeding two minutes.

11. Fire Extinguishers

(a) A fire extinguisher is required on all power boats. Fire extinguishers must be approved by the United States Coast Guard and/or Underwriters Laboratory.

(b) Powerboats less than 26 feet in length must have at least a B1 extinguisher.

(c) Powerboats 26 to less than 40 feet in length must have at least a size B-2 extinguisher or two B-1 extinguishers.

(d) Powerboats 40 feet or greater in length must have a B-2 extinguisher and a B-1 extinguisher or three B-1 fire extinguishers.

(e) All B-I and B-II extinguishers should be securely mounted in brackets in locations where they are readily accessible.

12. Navigation Lights

Navigation lights are to be displayed between sunset and sunrise. All boats are to show at the forward part of the boat a red light to port and a green light to starboard. Each colored light must show from dead ahead to two points towards the stern of the beam or 112.5 degrees of an arc. In addition to the forward colored running lights, an all-around 360 degree white light must be aft and higher than the colored running lights. Boats 26 feet and greater in length may mount the running lights on the sides of the super structure and must display a white masthead light showing in the direction of the red and green lights combined. Colored lights must be visible for one mile on a clear night and white lights must be visible for two miles on a clear night.

13. Flame Arrestors

The carburetor(s) of every engine installed on motorboats which use gasoline as a fuel, except outboard motors, shall be fitted with a device which has demonstrated its ability to arrest backfires, and which has been accepted and approved by the U.S. Coast Guard.

14. Ventilation

All boats, with an enclosed engine compartment, which use gasoline or other flammable fuel shall be provided with at least two cowls or their equivalent for the purpose of properly and efficiently ventilating the bilge, engine and fuel tank compartments.

All commercial vessels powered by gasoline or other flammable fuel in which the motors or fuel tanks are enclosed shall have a forced draft blower for ventilating the bilge, engine and fuel tank compartments in order to remove flammable or explosive gases.

15. Paddles

All commercial vessels less than 26 feet in length must be equipped with two paddles in case of engine failure.

16. Fuel Shut Off

All commercial vessels equipped with fuel tanks having a capacity of 6 gallons or more shall be equipped with a functional shut-off valve having a securely attached handle that is readily accessible for use.

17. Drugs and Alcohol

No person may operate a vessel while under the influence of intoxicating liquor or drugs or any combination thereof. Additionally, no person may operate a vessel while knowingly having in his possession, or in any part of the vessel, a controlled drug.

18. Operation

The following information is a selection of boating rules and regulations. This information is to aid the commercial boat license applicant in understanding many of the rules and laws which he/she is required to abide by. Operators of passenger boats, while underway, shall not allow unauthorized persons to interfere with the navigation of such boats.

All boat staff of a power boat must be completely inside the boat and are not allowed to be seated on the gunwales or transom or to straddle the bow.

While going greater than headway speed all boats must keep at least 150 feet from other boats, rafts, swim areas, docks or shore. Headway speed is defined as the slowest speed at which it is still possible to maintain steering or six miles per hour.

Boats meeting each other head on or bow to bow should turn to the right, a port to port passage, unless a starboard to starboard passage is obviously safe and understood by both operators and the courses of both boats are not meeting head on.

When two or more boats come together in a crossing situation, the boat to the right showing its port side or red light has the right of way.

Sailboats, canoes and rowboats should always be given the right of way with respect to powerboats.

19. Navigation

One category is regulatory markers which indicate general information and dangerous and restricted areas. Regulatory markers are easily identified by their color. They are white with black lettering and have orange bands. The second category is comprised of the aids to navigation. These buoys and markers direct the boater to a direction towards a cardinal point (North, South, East or West) of a compass.

It is unlawful to tie a boat to a buoy, marker or other aid to navigation, as doing so may pull the marker off its designated location and direct traffic into a navigational hazard.

20. Personal Protective Equipment

Operating on water, Geosyntec is exposed to the sun, wind, and weather. In addition to the PFD, wear layers of clothing to regulate temperature and sun exposure. Provide adequate supplies of sunscreen and bottled water. Sturdy work boots protect your feet from getting crushed by heavy gear. A slip resistant sole helps you stay on your feet while working on a wet and moving surface. Consider a heel on the boot to assist with climbing ladders. Heavy/durable waterproof canvas gloves will provide support during handling of equipment and machinery.

21. Slips, Trips and Falls

Slips, trips and falls can be serious on a boat. Besides a scrape, sprain, or fracture from a fall, you could end up overboard. Keep work areas clear of standing water. Maintain slip resistant surfaces with special marine coatings and

good housekeeping practices. When you work near the sides of the boat, stay behind the rail or clip into a sturdy, rated anchor point on the boat using a lifeline or fall protection.

22. Weather

Follow safe boating practices and monitor weather conditions before and during your trip. Know what type of weather conditions and extremes your vessel (and its cargo) can handle.

23. Navigation

Keep updated charts and know the operating and navigational rules of the waters you work. Know the boat and its capacity and load rating, load and store materials in a compliant and safe manner.

24. Maintenance

Boat staff should perform equipment inspections and maintenance on schedule so you don't break down. Carry adequate fuel, tools, and spare parts onboard in case of a breakdown or emergency.

25. Communications

Geosyntec should develop a "float plan" so someone onshore knows where you will be and when you are expected back. A float plan can be found in HS 306 US Working On or Near Water and Ice; **Attachment 2**: Daily Float Plan.

26. Emergency Equipment

Provide the correct number of life vests, immersion suits, rafts, etc. onboard. Keep them accessible and in good working order. Carry enough food, water and first aid supplies to sustain all of the passengers in an emergency. Geosyntec should know the emergency procedures and the location of emergency supplies. Learn about hypothermia and how to maximize your water survival and rescue.

27. Vessel Safety Check Program (VSC)

The VSC decal attests to the fact that the boat is in compliance with federal and state requirements. Operations in potentially challenging waters or hazardous conditions may justify knowledge, skills, and additional safety equipment that far exceed these minimum legal requirements.

5.0 REFERENCES

This Working Over Water guidance meets the requirements of OSHA CFR 29, 1926.106(a), 1926.106(b), 1926.106(b), 1926106(d) and covers work performed by Geosyntec.

Reference is made to the Code of Federal Regulations Title 46 Shipping 46 CFR 185.520 - ABANDON SHIP AND MAN OVERBOARD DRILLS AND TRAINING.

6.0 SUPPORTING DOCUMENTS

Note that in addition to the minimum federal requirements stated here, the owner/operator may be required to comply with other regulations and/or laws specific to the state in which their recreational vessel is registered or operated. To ensure compliance with state boating laws, boaters should contact the appropriate boating agency in their area for additional information.

US Health & Safety Procedures

Drilling

1.0 PURPOSE

All drilling operations must conform to the procedures outlined below. Drilling operations include, but are not limited to, rotary, hollow-stem, and direct-push drilling. This procedure applies to all of the subsidiaries, affiliates, and operating units of the Geosyntec family of companies in the US (hereinafter referred to as "Geosyntec" or the "Company"). Any exceptions to this procedure must be approved, in writing, by the Health and Safety (H&S) Director.

2.0 GENERAL SAFETY GUIDELINES

- Conduct a survey, prior to bringing drilling equipment to the job site, to identify overhead electrical hazards, potential subsurface hazards, and terrain hazard. Once on site, before drilling equipment is moved, the travel route shall again be visually surveyed for overhead and terrain hazards. Document possible hazards and communicate them to the drilling crew.
- Use required personal protective equipment (PPE); do not wear loose-fitting clothing or jewelry. Keep hair tied back and tucked into hardhat.
- Do not touch or go near moving parts.
- Be aware of the location of "Emergency Shut Off" switches. Shut off switches should be tested at the beginning of each day.
- Be aware of potential contaminants. Always wear required PPE and follow appropriate decontamination procedures.
- In the event of an accident, allow properly equipped and protected personnel to respond. Immediately leave the area.
- Do not smoke or use spark-producing equipment around drilling operations.
- No food will be consumed or stored in the work area.
- Do not work around a drill rig during a thunderstorm or rain.
- Maintain orderly housekeeping on and around the drill rig. Store tools, materials, and supplies to allow safe handling by drill crewmembers. Proper storage on racks or sills will prevent spreading, rolling, or sliding. Avoid storage or transportation of tools, materials, or supplies within or on the drill rig derrick.
- Maintain working surfaces free of obstructions or potentially hazardous substances.
- Store gasoline only in containers specifically designed or approved for such use.
- Firefighting equipment should not be tampered with and should not be removed for other than the intended firefighting purposes or for servicing.
- The departing driller should inform the oncoming driller of any special hazards or ongoing work that may affect the safety of the crew.
- Rigging material equipment for material handling should be checked prior to use on each shift and as often as necessary to ensure it is safe. Defective rigging should be removed from service.

- Work areas and walkways should not be obstructed. The area around the derrick ladder should be kept clear to provide unimpeded access to the ladder. The rotary table of the rig floor shall be kept free of obstructions and free of undue accumulation of oil, water, ice, or circulating fluids.
- Passengers shall only be allowed in vehicles designed for passenger use. Do not ride on the outside of drill rigs, trailers, or other equipment.

3.0 PRE-OPERATIONAL PROCEDURES

3.1 Utility Clearance

Geosyntec and/or its subcontractors will determine the location of all underground/overhead utilities before drilling operations take place. Project management shall contact the One-Call Center for the state in which drilling is to be performed to obtain written clearance. For drilling operations outside of the United States, contact the local utility companies for clearance. For areas that are not covered by One-Call Centers or local utility companies (i.e., client specific utilities), clearance must be obtained from the client. In addition to obtaining utility clearances, the appropriate party will make a utility survey of each drilling point. The utility survey shall include both magnetometer and ground-penetrating radar survey. Documentation that nearby utilities have been marked on the ground and that the drill site has been cleared shall be kept in the project trailer/support vehicle and communicated to the drilling subcontractor. All utilities shall be identified on a job hazard analysis and communicated to all drilling and drill support personnel. See Location Marking Form (**Attachment 2**).

3.2 Drill Rig Inspection

Prior to the start of site work each day, the drilling subcontractor will inspect all drilling equipment. The inspection will be documented in the field records, and the records will be maintained at the site. If the drill rig owner or operator does not have a company-specific inspection form, use or reference the attached "Drill Rig Safety Inspection Checklist" form (**Attachment 1**). The drilling equipment inspection must be repeated on a daily basis. Defective equipment shall be repaired prior to use.

3.3 Maintenance

The following are minimum specifications for performing maintenance on drilling equipment:

- Safety glasses shall be worn, at a minimum, when performing maintenance on a drill rig or on the drilling tools.
- Follow all manufacturers' recommendations for maintenance on drilling equipment.
- The drill rig engine shall be shut down before making repairs or adjustments to a drill rig or lubricating fittings (except repairs or adjustments that can only be made with the engine running). The operator shall remove keys and tag out the ignition. All systems (i.e., drill rotor, engine, pressurized lines, etc.) shall be at a "zero energy state" before performing maintenance.
- The leveling jacks shall be lowered, the wheels chocked, and the hand/parking brakes set before working under a drill rig.

4.0 OPERATING PROCEDURES

4.1 Moving Drilling Equipment

- Lower drilling mast before moving rig.
- Secure all loads to rig prior to off-road mobilization.
- Inspect the route of travel prior to moving the drill rig off-road. Be aware of holes, rocks, trees, erosion, and uneven surfaces.

- Remove all passengers from the cab before moving drill rig onto rough or sloped terrain.
- Engage multiple drive power trains (when available) on rig vehicle when mobilizing off-road.
- Travel directly up or down grade on slopes when feasible. Avoid off-camber traverse approaches to drill sites.
- Approach changes in grade squarely to avoid shifting loads or unexpected unweighting.
- Use a spotter (person at grade) to provide guidance when vertical and lateral clearance is questionable.
- Use parking brake and chock wheels when grades are steep.

4.2 Raising the Derrick (Mast)

- Locate visually, overhead utilities prior to raising the mast.
- Treat overhead electrical lines as if they were energized and maintain at least a 50-foot clearance.
- Geosyntec will contact appropriate utilities agency to manipulate and deactivate overhead service in areas that interfere with drilling operations. Do not attempt to handle utilities.
- Stabilize and level each work site prior to drill rig setup. Do not drill on slopes near power lines, including drainage ditches, trenches, excavations, and other holes. Drill rig could tip over, resulting in contact with power lines.
- The derrick must not be raised until the rig has been blocked, leveled (leveling jacks down), and chocked.
- Secure and lock mast according to manufacturer's recommendations prior to drilling.
- If required to perform work on the mast at heights above six feet, a full body safety harness and lanyard shall be worn accordingly.
- Note wind speed and direction to prevent overhead utility lines from contacting rig derrick. Allow at least a 40-foot clearance between rig mast and utility lines, unless authorized by the H&S Department to operate at a shorter clearance distance.

4.3 Drilling

- If Geosyntec personnel perform drilling (i.e., direct push, Geoprobe®), follow the manufacturer's operational or field manual's safety guidelines/specifications.
- Only authorized and trained drill rig operators shall operate a drill rig. Drill rigs shall be setup and operated according to manufacturer's specifications.
- Set up and delineate appropriate work zones. This may include an exclusion zone, contamination-reduction zone, and a support zone. When feasible, work zones shall be cleared of obstructions and leveled to provide a safe working area.
- Establish a communication system between driller, helpers, and other field support personnel for responsibilities during drilling operations.
- All personnel shall be instructed to "stand clear" prior to and during startup. Personnel shall stay as far away as possible from operating equipment; especially if rig is located on unstable terrain (drilling operations shall not proceed on unstable ground).
- Begin auger borings slowly with the drive engine operating at low speed.
- Keep hands and feet clear of rotating augers and direct push equipment.
- Prevent placing hands or feet under auger sections during hoisting over hard surfaces.
- Avoid the removal of spoil cuttings with hands or feet.

- Assure drill rig is in neutral and the augers are not rotating before cleaning augers.
- Wear hearing protection as required.

4.4 Indoor Drilling

- Conduct a survey, prior to bringing drilling equipment to the job site, to identify ceiling height, overhead hazards, potential subsurface hazards, terrain hazard, and building stability particularly during drilling activities. Identify sources of ventilation (including open doorways for cross ventilation and fans to assist in air flow). Once onsite, before drilling equipment is moved, the travel route shall again be visually surveyed for overhead and terrain hazards and avenues of ventilation will be opened or turned on.
- Notify and/or evacuate all building occupants prior to start of drilling activities.
- All drilling rig exhaust will be redirected outdoors by tubing. The perimeter of the outdoor exhaust area shall be roped off a suitable distance to allow proper ventilation of exhaust.
- Monitor ambient oxygen percentage and carbon monoxide concentrations in the work zone, as well as entire indoor area, to prevent low oxygen or high carbon monoxide environments. Operations shall cease and the building will be evacuated if levels become dangerous.

4.5 Subcontractor Guidelines

Only qualified subcontractors that meet minimum health and safety standards should be contracted for work on such projects. Subcontractors shall discuss company-specific standard operating procedures (SOPs) for health and safety with Geosyntec field supervisors prior to the start of drilling operations. Subcontractor SOPs may include procedures in basic drilling procedures with additional information on hoisting operations, cat line operations, pipe handling, derrick operations, making and breaking joints, etc.

5.0 ATTACHMENT

Attachment 1 - Drill Rig Safety Inspection Checklist
Attachment 2 - Location Marking Form

6.0 REFERENCES

H&S 112 US – Respiratory Protection Program

H&S 113 US – Personal Protective Equipment

H&S 206 US -- Subcontractor H&S Requirements

H&S 301 US – Hazardous Waste Operations (HAZWOPER)

H&S 304 US – Overhead Electrical Lines

Drill Rig Safety Inspection Checklist

ATTACHMENT 1

Date:	Equipment Model/Type:
Project Name:	Serial or License #
Project #	Location Owner/Operator:
Project Manager:	Inspector:

Place a (✓) in the "Yes" column if the requirement has been met. If a "No" is encountered, equipment must be removed from operation until the deficiency has been corrected. Describe deficiencies on page two of this form. Use the comment column to note any additional information needed to certify the equipment. If a checklist item is found to be "Not Applicable," check "NA" and provide a comment in the appropriate box.

Item Name	Requirement	Yes	No	NA	Comment
Hydraulic systems controls and levers	No leak fittings or connections. Levers are in good operating condition. Fluid levels are full.				
Fuel, oil, water, and coolant lines	No leaks.				
Hoses	No leaks in hoses or connections. No signs of excessive wear, kinked or bent hoses.				
Gauges	Operational and visible to operator.				
Emergency kill switch and life line	Operational and accessible to operator.				
Shear pins	In place.				
Drive chains	No signs of excessive wear, broken or defective links.				
Parking brakes	Set and operational.				
Outriggers	No leaks. Set on pads (as necessary to avoid damage).				
Windshield wipers	Operational.				
Lights (head, tail and running lights)	Operational and without cracked lenses.				
Back-up alarm	Operational, spotter used.				
Cables and ropes	No fraying, birdnesting, flattening, stretching. Must be braided or properly clamped at connections.				
Pulleys, drums and spools	No excessive wear or cracking.				
Derrick/Mast	Locked in position. Frame is not cracked or bent.				
Hoists	Properly spooled cable, rated to lift loads.				

Item Name	Requirement	Yes	No	NA	Comment
Safety equipment	Safety harness, fire extinguisher, flares, safety reflectors, first aid kit, grounding wire for fueling, and spill response equipment (for fueling and repairs).				
Guards	Power take-offs (PTOs) and all rotating parts designed with guards. Guards must have warning labels.				
Miscellaneous (as applicable)	Diverter systems; auger and head seals; cyclones; grout plant guards; etc. (list): • • •				

DEFICIENCIES (Explain all negative response and list corrective actions; all deficiencies must be corrected before the rig is entered into service):

1.
2.
3.
4.
5.

Other Repairs, Routine Maintenance and/or Comments:

Inspection Conducted and Certified By:

	Print Name:	Signature:	Date:
Owner/Operator			

Checklist Reviewed By:

	Print Name:	Signature:	Date:
Geosyntec PM			

ATTACHMENT 2

Location Marking Form

Project name:_____ **Project number:**_____

Site Location/Address:_____

Type of work being performed:_____

1. Are utility plans or maps available onsite for review? If possible, photocopy pertinent sections. ☐ Yes ☐ No

2. List onsite contact person and location or contact information (if required to gain access).

   Is location in a building? ☐ Yes ☐ No If yes, skip to Section 2. If no, complete Section 1.

Section 1: Outdoor Locations

3. Describe and sketch any irregular access, including difficult terrain, narrow roads/bridges, steep access roads, tight spaces (e.g. between buildings), water crossings, soft ground, etc.

4. Describe grade and slope of drilling/digging location (e.g. Level, gently sloping to the south):

5. Is location within 20 feet of any building or structure? ☐ Yes ☐ No (describe/sketch location)

6. Any locked gates (give combination or key location)? ☐ Yes ☐ No

7. Is location in a roadway, parking lot, or other public/paved area? (describe and use sketch box)

8. Are there any manhole covers, water valve covers, concrete christy boxes, or other flush-mounted monuments denoting electrical or other utilities in the vicinity? ☐ Yes ☐ No (if yes, describe including size, shape, any lettering or numbering, and use sketch box)

9. Any fire hydrants, transformers, propane tanks, streetlights, sprinkler systems, backflow prevention devices, or other surface features proximal to the location that may be connected to underground lines? ☐ Yes ☐ No (describe/sketch)

10. Any visible surveyor's flags denoting buried natural gas or other pipelines? ☐ Yes ☐ No (describe/sketch location)

11. Any old paint on paved surfaces denoting utilities, or any old USA markings in the vicinity? ☐ Yes ☐ No (describe color, orientation, sketch)

12. Any visible repaved asphalt or concrete patches, trenches, or other road cuts? If location is in an unpaved area, any displaced grass or dirt, or evidence of recent digging? ☐ Yes ☐ No (describe/sketch)

13. Look up. Any overhead power lines, tree limbs, building eaves or overhangs or other obstructions within 20 feet of the location or access route that may impair access or the ability to raise the mast or cause safety concerns? ☐ Yes ☐ No (describe/sketch and estimate height)

Section 2: Indoor Locations

1. Describe size and type of access point(s) (e.g. standard doorway, metal roll-up door 10 feet wide by 12 feet high, etc. Sketch location(s) of access points.

2. Are access points elevated? Are ramps or other special equipment necessary to move equipment into building?

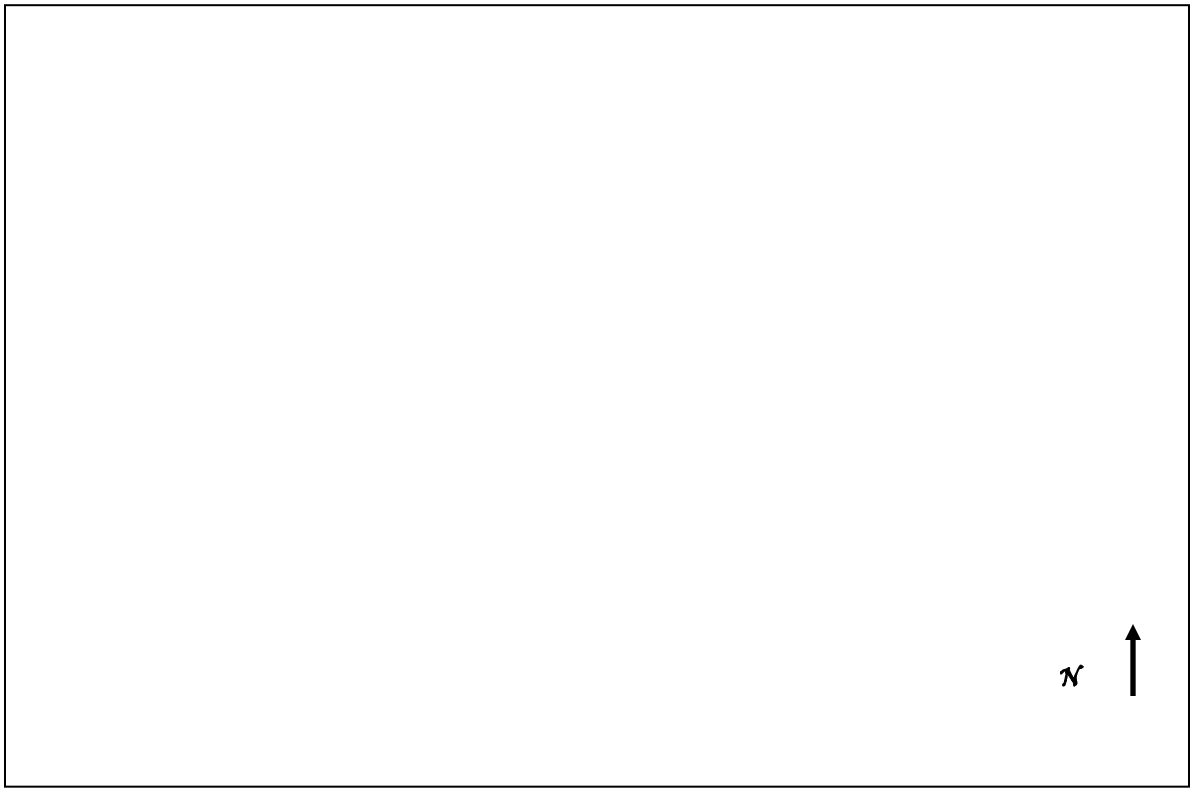
3. Minimum height of ceiling along access route?

4. Height of ceiling above sampling point(s)?

5. If drilling indoors, describe nearest ventilation location and estimate length of ventilation line(s) required.

Additional access information, access requirements, or miscellaneous information:

Sketch location(s) and other site features below.



Manual Hand Tools

1.0 PURPOSE

All manually operated hand tools and equipment shall be used, handled, and stored in accordance with the following requirements. This procedure applies to all the subsidiaries, affiliates, and operating units of the Geosyntec family of companies (hereinafter referred to as "Geosyntec" or the "Company"). Any exceptions to this procedure must be approved, in writing, by the Health and Safety (H&S) Director.

2.0 GENERAL REQUIREMENTS

- Use each tool only for the job it was designed to do.
- Discard damaged or abused tools promptly.
- Buy several versions or sizes of the same tool.
- Inspect for distortion, cracks, chips, wear or mushrooming.
- Keep all tools clean and in working order.
- Be sure handles are fixed firmly to a tool's working end.
- Be sure tools and work mate properly to avoid slippage.
- Handles are made for the tool; never use extensions.
- Confine impact forces to striking and struck tools.
- Hold work in a clamp or vise, not in your hand.
- Start off slowly when engaging the tool and the work.
- Shut current off before using a tool near electricity.
- Make sure the handle sits securely in your hand.
- Keep moving parts lightly lubed; avoid lube leakage.
- Wear approved safety goggles when using hand tools.
- Keep hands away from sharp edges.
- Pull, don't push, a wrench handle for more leverage.
- Position your body securely while working with the tool.
- Keep jaw teeth, cutters and blades sharp for better results.
- Keep tool's moving parts properly cleaned and tightened
- Use steady pressure on jaws and cutters; don't rock the tool.
- Use pads in the jaws to protect soft or crushable work.
- Use a tool close to the vise or clamp.

- Hold work in a clamp or vise with sufficient pressure.
- Keep clamped assemblies away from vibration and bumping.
- Discard a tool instead of repairing it by welding or brazing.
- Keep tools from excessive heat.
- For continuous work, use comfort grips or gloves.
- Follow instructions on the tool and/or package.

3.0 TOOL-SPECIFIC REQUIREMENTS

3.1 Cutting Tools

- Wear safety glasses and protective gloves when using cutters.
- Choose the proper cutter for the job. Cutters are designed for a specific type, hardness, and size of material.
- Cut materials straight across - keep the material being cut at right angles to the cutting edges of jaws.
- Prevent injury from flying metal by wrapping a burlap bag, cloth or rag around the cutting jaws.
- Warn those in the area to take precautionary measures to avoid possible injury from flying metal pieces.
- Keep cutting tools in good repair.
- Adjust and lubricate cutter and moving parts daily if heavily used.
- Sharpen jaws according to manufacturers' instructions.
- Do not use a cutting tool until you are trained in its proper and safe use.
- Do not use cushion grip handles for jobs requiring electrically-insulated handles. Cushion grips are for comfort primarily and do not protect against electric shock.
- Do not use cutters which are cracked, broken or loose.
- Do not exceed the recommended capacity of a tool.
- Do not cut diagonally.
- Do not rock cutters from side to side when cutting wire.
- Do not pry or twist with tool when cutting.
- Do not hammer on cutting tools or extend the handle length to achieve greater cutting power.
- Do not expose cutters to excessive heat.

3.2 Hammers

- Hammers are designed according to the intended purpose. Select a hammer that is comfortable for you and that is the proper size and weight for the job. Misuse can cause the striking face to chip, possibly causing a serious injury.
- Choose a hammer with a striking face diameter approximately ½ inch larger than the face of the tool being struck (e.g., chisels, punches, wedges, etc.).

- Ensure that the head of the hammer is firmly attached to the handle.
- Replace loose, cracked or splintered handles.
- Discard any hammer with mushroomed or chipped face or with cracks in the claw or eye sections.
- Strike a hammer blow squarely with the striking face parallel to the surface being struck. Always avoid glancing blows and over and under strikes. (Hammers with beveled faces are less likely to chip or spall).
- Look behind and above you before swinging the hammer.
- Watch and focus on the object you are hitting.
- Hold the hammer with your wrist straight and your hand firmly wrapped around the handle.
- Do not use a hammer with a loose or damaged handle.
- Do not use handles that are rough, cracked, broken, splintered, sharp-edged or loosely attached to the head.
- Do not use any hammer head with dents, cracks, chips, mushrooming, or excessive wear.
- Do not use a hammer for any purpose for which it was not designed or intended.
- Do not use one hammer to strike another hammer, other hard metal objects, stones or concrete.
- Do not redress, grind, weld or reheat-treat a hammer head.
- Do not strike with the side or cheek of the hammer.

3.3 Saws

- Saws are made in various shapes and sizes and for many uses. Use the correct saw for the job.
- Wear safety glasses.
- Select a saw of proper shape and size for stock being used.
- Choose a saw handle that keeps your wrist in a natural position in the horizontal plane.
- Choose a saw with a handle opening of at least 5 inches long and 2.5 inches wide and slanted at a 15° angle.
- Check the stock being cut for nails, knots, and other objects that may damage or buckle the saw.
- Start the cut by placing your hand beside the cut mark with your thumb upright and pressing against blade. Start the cut carefully and slowly to prevent blade from jumping. Pull upward until blade bites. Start with a partial cut, and then set the saw at the proper angle.
- Apply pressure on downstroke only.
- Hold stock being cut firmly in place.
- Use a helper, a supporting bench or vise to support long stock if required.
- Keep teeth and blades properly set.
- Protect teeth of saw when not in use.

- Keep saw blades clean.
- Hacksaws:
    - Select correct blade for material being cut.
    - Secure blade with the teeth pointing forward.
    - Keep blade rigid, and frame properly aligned.
    - Cut using strong, steady strokes, directed away from you.
    - Use entire length of blade in each cutting stroke.
    - Use light machine oil on the blade to keep it from overheating and breaking.
    - Cut harder materials more slowly than soft materials.
    - Clamp thin, flat pieces requiring edge cutting.

3.4 Pipe Tools (Wrenches, Cutters, Reamers, and Threaders)

- Pipe tools are made in various shapes and sizes and for many uses. Always use the correct tool for the job.
- Select a pipe wrench with sufficient capacity and leverage to do the job.
- Use a pipe wrench to turn or hold a pipe. Never use a pipe wrench to bend, raise or lift a pipe.
- Adjust the pipe wrench grip to maintain a gap between the back of the hook jaw and the pipe. This concentrates the pressure at the jaw teeth, producing the maximum gripping force. It also aids the ratcheting action.
- Inspect pipe wrenches periodically for worn or unsafe parts and replace them (e.g., check for worn threads on the adjustment ring and movable jaw).
- Keep pipe wrench teeth clean and sharp.
- Face a pipe wrench forward. Turn wrench so pressure is against heel jaw.
- Pull, rather than push on the pipe wrench handle. Maintain a proper stance with feet firmly placed to hold your balance.
- Do not use a pipe wrench as a hammer, or strike a pipe wrench with a hammer.
- Do not use pipe wrenches on nuts and bolts.
- Do not use a pipe extender for extra leverage. Get a larger pipe wrench.
- Replace pipe cutter wheels which are nicked or otherwise damaged.
- Use a 3- or 4-wheeled cutter, if there is not enough space to swing the single wheel pipe cutter completely around the pipe.
- Choose a cutting wheel suitable for cutting the type of pipe material required:
    - Thin wheel for cutting ordinary steel pipe.
    - Stout wheel for cutting cast iron.
    - Other wheels for cutting stainless steel, plastic and other materials.
- Select the proper hole diameter and correct tap size to tap a hole. The hole should be sized so that the thread cut by the tap will be about 75% as deep as the thread on the tap.
- Use a proper tap wrench (with a "T" handle) for turning a tap.
- Use lubricant or machine cutting fluid with metals other than cast iron.

- Do not permit chips to clog flutes (groves in the tap that allow metal chips to escape from the hole). The chips may prevent the tap from turning - this may result in the tap breaking if you continue to apply pressure.
- Do not use a conventional adjustable wrench for turning a tap - it will cause uneven pressure on the tap that may cause it to break.
- Do not attempt to thread hardened steel. This can chip or damage the die.
- Do not thread any rod or other cylindrical object that is larger in diameter than the major diameter of the die thread.
- Do not use a spiral reamer on a rotating pipe. The reamer may snag and cause serious injury.

3.5 Pliers and Wire Cutters

- Pliers are made in various shapes and sizes and for many uses. Use the correct pliers or wire cutters for the job.
- Choose pliers or wire cutters that have a grip span of 2½ - 3½ inches to prevent your palm or fingers from being pinched when the tools are closed.
- Use adjustable pliers that allow you to grip the workpiece firmly while maintaining a comfortable handgrip (i.e., hand grasp is not too wide).
- Use tools only if they are in good condition.
- Make sure that the cutting edges are sharp. Dull and worn-down cutting edges require many times more force for cutting.
- Make sure that the toothed jaws are clean and sharp. Greasy or worn-down jaws can result in compromised safety. Such tools also require increased force to hold the workpiece which, in turn, increases the risk of muscular fatigue and repetitive strain injuries.
- Oil pliers and wire cutters regularly. A drop of oil on the hinge will make the tools easier to use.
- Pull on the pliers; do not push away from you when applying pressure. If the tool slips unexpectedly, you may lose your balance or injure your hand.
- Cut at right angles. Never rock the cutting tool from side to side or bend wire back and forth against the cutting edges.
- Do not cut hardened wire unless the pliers or wire cutters are specifically manufactured for this purpose.
- Do not expose pliers or wire cutters to excessive heat.
- Do not bend stiff wire with light pliers. Needle-nose pliers can be damaged by using the tips to bend large wire. Use a sturdier tool.
- Do not use pliers as a hammer.
- Do not hammer on pliers or wire cutters to cut wires or bolts.
- Do not extend the length of handles to gain greater leverage. Use a larger pair of pliers for gripping or a bolt cutter for cutting.
- Do not use cushion grip handles for jobs requiring tools with electrically insulated handles. Cushion grips are for comfort primarily and do not protect against electric shock.
- Do not use pliers on nuts and bolts; use a wrench.

3.6 Screwdrivers

- Screwdrivers are made in various shapes and sizes and for many uses. Use the correct screwdriver for the job.
- Choose contoured handles that fit the shank tightly, with a flange to keep the hand from slipping off the tool.
- Use a slot screwdriver with a blade tip width that is the same as the width of the slotted screw head.
- For cross-head screws, use the correct size and type of screwdriver: a Phillips screwdriver may slip out of a screw head designed for use with the slightly flatter-tipped Pozidriv screwdriver.
- Use a vise or clamp to hold the stock if the piece is small or moves easily.
- Keep the screwdriver handle clean. A greasy handle could cause an injury or damage from unexpected slippage.
- If work must be carried out on "live" electrical equipment, use screwdrivers that have insulated handles designed for electrical work and a non-conducting shaft. Remember, most plastic handles are designed for grip and comfort.
- Use non-magnetic tools when working near strong magnets (e.g., in some laboratories).
- Use a screw-holding screwdriver (with screw-holding clips or magnetic blades) to get screws started in awkward, hard-to-reach areas. Square-tipped screwdrivers (e.g., Robertson) that hold screws with recessed square holes are also useful in such situations.
- Use an offset screwdriver in close quarters where a conventional screwdriver cannot be used.
- Use a screwdriver that incorporates the following features when continuous work is needed:
    - A pistol grip to provide for a straighter wrist and better leverage.
    - A "Yankee drill" mechanism (spiral ratchet screwdriver or push screwdriver) which rotates the blade when the tool is pushed forward.
    - A ratchet device to drive hard-to-move screws efficiently, or use a powered screwdriver.
- File a rounded tip square making sure the edges are straight. A dull or rounded tip can slip out of the slot and cause hand injury or damage to materials.
- Store screwdrivers in a rack or partitioned pouch so that the proper screwdriver can be selected quickly.
- Do not lean or push on a screwdriver with any more force than necessary to keep contact with the screw. A screw properly piloted and fitted will draw itself into the right position when turned. Keep the shank directly over the screw being driven.
- Do not hold the stock in one hand while using the screwdriver with the other. If the screwdriver slips out of the slot, you may cut your hand.
- Do not hammer screws that cannot be turned.
- Do not grind the tip to fit another size screw head.

- Do not try to use screwdrivers on screw heads for which they are not designed (e.g., straight blade screwdrivers on Phillips, clutch head, Torx or multi-fluted spline screw heads).
- Do not use defective screwdrivers (e.g., ones with rounded or damaged edges or tips; split or broken handles; or bent shafts).
- Do not use a screwdriver for prying, punching, chiseling, scoring, scraping or stirring paint.
- Do not use pliers on the handle of a screwdriver for extra turning power. A wrench should be used only on the square screwdriver shank designed for that purpose.
- Do not expose a screwdriver blade to excessive heat. Heat can affect the temper of the metal and weaken the tool.
- Do not use a screwdriver to check if an electrical circuit is live. Use a suitable meter or other circuit testing device.
- Do not carry screwdrivers in your pockets.

3.7 Snips

- Wear safety glasses and protective gloves when working with snips. Small pieces of metal may go flying in the air and cut edges of metal are sharp.
- Snips are made in various shapes and sizes for various tasks. The handle can be like those on scissors with finger and thumb holes or like pliers handles. Models are available for cutting in straight lines and in curves to the left or right.
- Universal snips can cut in both straight and wide curves.
- Straight snips and duckbill snips (flat blade, "perpendicular" to the handle, with pointed tips) are generally designed to cut in straight lines; some duckbill snips are designed for cutting curved lines.
- Hawk's bill snips (with crescent-shaped jaws) are used for cutting tight circles.
- Aviation snips have compound leverage that reduces the effort required for cutting.
- Offset snips have jaws that are set at an angle from the handle.
- Select the right size and type of snips for the job; check the manufacturer's specifications about the intended use of the snips (e.g., type of cut - straight, wide curve, tight curve, right or left, and maximum thickness and kind of metal or other material that can be cut).
- Use only snips that are sharp and in good condition.
- Use snips for cutting soft metal only. Hard or hardened metal should be cut with tools designed for that purpose.
- Use ordinary hand pressure for cutting. If extra force is needed, use a larger tool.
- Cut so that the waste is on the right if you are right-handed or on the left if you are left-handed.
- Avoid springing the blades- this results from trying to cut metal that is too thick or heavy for the snips you are using.
- Keep the nut and the pivot bolt properly adjusted at all times.
- Oil the pivot bolt on the snips occasionally.
- Do not try to cut sharp curves with straight cut snips.

- Do not cut sheet metal thicker than the manufacturer's recommended upper limit (e.g., cuts up to 16-gauge cold, rolled steel or 18-gauge stainless steel). Do not extend the length of handles to gain greater leverage.
- Do not hammer or use your foot to exert extra pressure on the cutting edges.
- Do not use cushion grip handles for tasks requiring insulated handles. They are for comfort primarily and not for protection against electric shocks.
- Do not attempt to resharpen snips in a sharpening device designed for scissors, garden tools, or cutlery.

3.8 Wood Chisels

- Wear safety glasses.
- Wood chisels are made in various shapes and sizes and for many uses. Use the correct chisel for the job.
- Use the right size of chisel for the job.
- Choose smooth, rectangular handles that have no sharp edges and are attached firmly to the chisel.
- Ensure that the cutting edge is sharp. Dull chisels can be difficult to control and require more effort to do the job.
- Check stock thoroughly for knots, staples, nails, screws, or other foreign objects before chiseling.
- Clamp stock so it cannot move.
- Adjust your stance so that you do not lose your balance if the tool slips.
- Chip or cut away from yourself.
- Keep your hands and body behind the cutting edge.
- Use a wooden or plastic mallet with a large striking face on all chisels. Only heavy-duty or framing chisels are made of a solid or molded handle that can be struck with a steel hammer.
- Make finishing or paring cuts with hand pressure alone.
- Place chisels safely within the plastic protective caps to cover cutting edges when not in use.
- Replace any chisel that is bent or shows dents, cracks, chips, or excessive wear.
- Store chisels in a "storage roll," a cloth or plastic bag with slots for each chisel, and keep them in a drawer or tray.
- Replace broken or splintered handles.
- Sharpen cutting edges as often as necessary.
- Do not use a wood chisel as a pry or a wedge.
- Do not use a wood chisel on metal.
- Do not use an all-steel chisel with a mushroomed face or a chipped edge. Redress with a file or whetstone.
- Do not use a grinder to redress heat-treated tools. Use a whetstone.
- Do not use a dull chisel.

3.9 Wrenches

- Use the correct wrench for the job - pipe wrenches for pipes and plumbing fittings, and general-use wrenches for nuts and bolts.
- Discard any damaged wrenches (e.g., open-ended wrenches with spread jaws or box wrenches with broken or damaged points).
- Select the correct jaw size to avoid slippage.
- Position your body in a way that will prevent you from losing balance and hurting yourself if the wrench slips or something (e.g., a bolt) suddenly breaks.
- Use a box or socket wrench with a straight handle, rather than an off-set handle, when possible.
- Ensure that the jaw of an open-ended wrench is in full contact (fully seated, "flat," not tilted) with the nut or bolt before applying pressure.
- Face an adjustable wrench "forward," adjust tightly, and turn the wrench so pressure is against the permanent or fixed jaw.
- Ensure that the teeth of a pipe wrench are sharp and free of oil and debris and that the pipe or fitting is clean to prevent unexpected slippage and possible injuries.
- Apply a small amount of pressure to a ratchet wrench initially to ensure that the ratchet wheel (or gear) is engaged with the pawl (a catch fitting in the gear) for the direction you are applying pressure.
- Support the head of the ratchet wrench when socket extensions are used.
- Pull on a wrench using a slow, steady pull; do not use fast, jerky movements.
- Stand aside when work is done with wrenches overhead.
- Make sure adjustable wrenches do not "slide" open during use.
- Keep tools well maintained (cleaned and oiled).
- Clean and place tools and wrenches in a tool box, rack or tool belt after use.
- Do not push on a wrench - losing your balance is more likely if the wrench slips.
- Do not use a wrench that is bent or damaged.
- Do not pull on an adjustable wrench that is loosely adjusted.
- Do not use pipe wrenches on nuts or bolts.
- Do not use pipe wrenches for lifting or bending pipes.
- Do not use a wrench on moving machinery.
- Do not use the wrong tools for the job. For example, never use pliers instead of a wrench or a wrench as a hammer.
- Do not use a makeshift wrench.
- Do not insert a shim in a wrench for better fit.
- Do not strike a wrench with a hammer or similar object to gain more force.
- Do not increase the leverage by adding sleeved additions (e.g., a pipe) to increase tool handle length.

- Do not expose a wrench to excessive heat (like from a blow torch) that could affect the temper of the metal and ruin the tool.

3.10 Chisels

- Personnel will not use a chisel that has a dull cutting edge or ones that have "mushroomed" striking heads.
- Hold a chisel by using a tool holder if possible.
- Clamp small workpieces in the vise and chip towards the stationary jaw when working with a chisel.

3.11 Vises

- When clamping a long workpiece in a vise, support the far end of the workpiece by using an adjustable pipe stand, saw horse or box.
- Position the workpiece in the vise so that the entire face of the jaw supports the workpiece.
- Personnel will not use a vise that has worn or broken jaw inserts, or has cracks or fractures in the body of the vise.
- Personnel will not slip a pipe over the handle of a vise to gain extra leverage.

3.12 Clamps

- Personnel will not use the C-clamp for hoisting materials.
- Personnel will not use the C-clamp as a permanent fastening device.

3.13 Jacks

- Personnel will not exceed the jack's rated lifting capacity as noted on the label of the jack.
- Clear all tools, equipment and any other obstructions from under the vehicle before lowering the jack.

3.14 Tool Boxes/Chests/Cabinets

- Use the handle when opening and closing a drawer or door of a tool box, chest, or cabinet.
- Tape over or file off sharp edges on toolboxes, chests or cabinets.
- Personnel will not stand on toolboxes, chests or cabinets to gain extra height.
- Lock the wheels on large toolboxes, chests or cabinets to prevent them from rolling.
- Push large chests, cabinets and toolboxes rather that pulling them.
- Personnel will not open more than one drawer of a toolbox at a time.
- Close and lock all drawers and doors before moving the tool chest to a new location.
- Personnel will not move a toolbox, chest or cabinet if it has loose tools or parts on the top.

US Health & Safety Procedures

Powered Hand Tools

1.0 PURPOSE

All power-operated hand tools and equipment shall be used, handled and stored in accordance with the following requirements. This procedure applies to all of the subsidiaries, affiliates, and operating units of the Geosyntec family of companies (hereinafter referred to as "Geosyntec" or the "Company"). Any exceptions to this procedure must be approved, in writing, by the Health & Safety (H&S) Director.

2.0 GENERAL REQUIREMENTS

2.1 Selection and Use

- Select tools that can be used without bending the wrist. Hand tools should allow the operator to grasp, hold, and use the tool with the wrist held straight.
- Select the tool with the workplace layout and job design in mind. Sometimes a tool is correct for one operation and incorrect for another.
- Use the right tool for the job. Ensure it is the right size and has sufficient power to do the job safely. When there is a choice, select a tool of a low weight.
- Select low-vibrating tools, or choose tools with vibration-absorbing handles, like those covered with cork, rubber, plastic or plastic bonded to steel, to reduce hand-arm vibration.
- Choose hand tools that have the center of gravity within or close to the handle.
- Select tools with rounded and smooth handles that you can grip easily.
- If they are available, choose hand tools with double handles to permit easier holding and better manipulation of the tool.
- Select tools with a trigger strip, rather than a trigger button. This strip will allow you to exert more force over a greater area of the hand that, in turn, will reduce muscle fatigue.
- Ensure that the trigger works easily to reduce the effort needed to operate it.
- Ensure that your tool is well maintained and in good repair.
- Frequently used tools that weigh more than 1 pound should be counter-balanced.
- Hold the tool close to the body. Do not overreach.
- Keep good balance and proper footing at all times. This will help operators to control the tool better, especially in response to unexpected situations.
- Rest your hands by putting the tool down when you are not using it.
- Reduce power to the lowest setting that can complete the job safely. This action reduces tool vibration at the source.
- Ensure that cutting tools, drill bits, etc., are kept sharp, clean, and well maintained.

- Do not wear gloves, loose clothing or jewelry while using revolving power tools. Tie back long hair or wear appropriate hair protection to prevent hair from getting caught in moving parts of equipment.
- Do not use a tool unless you have been trained to use it safely and know its limitations and hazards.

2.2 Storage and Handling

- All tools shall be stored in a manner to prevent damage and injury. Store tools in a dry, secure location when they are not being used.
- Tools shall be properly put away after use.
- Sharp or pointed tools shall be handled only if the sharp/pointed edge is covered, carried in a tool box or other device designed for that purpose, or the sharp/pointed edge is pointed downward, away from the body.

3.0 ELECTRIC TOOLS

3.1 Inspection

- Inspect tools for any damage prior to each use.
- Ensure that the power tool has the correct guard, shield or other attachment that the manufacturer recommends.
- Ensure that the tools are properly grounded using a three-prong plug, are double-insulated (and are labeled as such), or are powered by a low-voltage isolation transformer: this will protect users from an electrical shock.
- Check electric tools to ensure that a tool with a 3-prong plug has an approved 3-wire cord and is grounded. The three-prong plug should be plugged in a properly grounded 3-pole outlet. If an adapter must be used to accommodate a two-hole receptacle, the adapter wire must be attached to a known, functioning ground. Never remove the third, grounding prong from a plug.
- Check the handle and body casing of the tool for cracks or other damage.
- If the tool has auxiliary or double handles, check to see that they installed securely.
- Inspect cords for defects: check the power cord for cracking, fraying, and other signs of wear or faults in the cord insulation.
- Check for damaged switches and ones with faulty trigger locks.
- Inspect the plug for cracks and for missing, loose or faulty prongs.
- If a tool is defective, remove it from service, and tag it clearly "Out of service for repair". Replace damaged equipment immediately - do not use defective tools "temporarily". DO NOT ATTEMPT FIELD REPAIRS.

3.2 Battery Powered Tools

- Use the type of battery that the tool manufacturer specifies for the battery-powered tool that you are using.
- Recharge a battery-powered tool only with a charger that is specifically intended for the battery in that tool.

- Remove the battery from the tool or ensure that the tool is switched off or locked off before changing accessories, making adjustments, or storing the tool.
- Store a battery pack safely so that no metal parts, nails, screws, wrenches and so on can come in contact with the battery terminals; this could result in shorting the battery and possibly cause sparks, fires or burns.

3.3 Using Electric Tools

- Switch off the tools before connecting them to a power supply.
- If a power cord feels more than comfortably warm or if a tool is sparking excessively, have it checked by an electrician or other qualified person.
- Disconnect the power supply before making adjustments or changing accessories.
- Remove any wrenches and adjusting tools before turning on a tool.
- Inspect the cord for fraying or damage before each use. Tag defective tools clearly with an "Out of service" tag and replace immediately with a tool in good running order.
- During use, keep power cords clear of tools and the path that the tool will take.
- Use clamps, a vice or other devices to hold and support the piece being worked on, when practical to do so. This will allow you to use both hands for better control of the tool and will help prevent injuries if a tool jams or binds in a work piece.
- Use only approved extension cords that have the proper wire size for the length of cord and power requirements of the electric tool that you are using. This will prevent the cord from overheating.
- For outdoor work, use outdoor extension cords marked "W-A" or "W."
- Suspend power cords over aisles or work areas to eliminate stumbling or tripping hazards.
- Eliminate octopus connections: if more than one receptacle plug is needed, use a power bar or power distribution strip that has an integral power cord and a built-in overcurrent protection.
- Pull the plug, not the cord when unplugging a tool. Pulling the cord causes wear and may adversely affect the wiring to the plug and electrical shock to the operator may result.
- Keep power cords away from heat, water, oil, sharp edges and moving parts. They can damage the insulation and cause a shock.
- Avoid accidental starting by ensuring the tool is turned off before you plug it in. Also do not walk around with a plugged-in tool with your finger touching the switch.
- Do not bypass the ON/OFF switch and operate the tools by connecting and disconnecting the power cord.
- Do not disconnect the power supply of the tool by pulling or jerking the cord from the outlet.
- Do not leave a running tool unattended. Do not leave it until it has been turned off, has stopped running completely, and has been unplugged.
- Do not use electric tools in wet conditions or damp locations unless tool is connected to a ground fault circuit interrupter (GFCI).
- Do not expose electric power tools to rain or wet conditions; wet tools increase the likelihood for getting an electric shock.

- Avoid body contact with grounded surfaces like refrigerators, pipes and radiators when using electric powered tools; this will reduce the likelihood of shock if the operator's body is grounded.
- Do not plug several power cords into one outlet by using single-to-multiple outlet adapters or converters ("cube taps").
- Do not use light duty power cords.
- Do not connect or splice extension cords together to make a longer connection: the resulting extension cord may not be able to provide sufficient current or power safely.
- Do not carry electrical tools by the power cord.
- Do not tie power cords in knots. Knots can cause short circuits and shocks. Loop the cords or use a twist lock plug.
- Never break off the third prong on a plug: replace broken 3-prong plugs and make sure the third prong is properly grounded.
- Never use extension cords as permanent wiring- use extension cords only as a temporary power supply to an area that does not have a power outlet.
- Do not walk on or allow vehicles or other moving equipment to pass over unprotected power cords. Cords should be put in conduits or protected by placing planks on each side of them.
- Do not brush away sawdust, shavings or turnings while the tool is running. Never use compressed air for cleaning surfaces or removing sawdust, metal turnings, etc.
- Do not operate tools in an area containing explosive vapors or gases.
- Do not clean tools with flammable or toxic solvents.
- Do not surprise or touch anyone who is operating a tool. Startling a tool operator could end up causing an accident or injury.

3.3.1 Belt Sanders

- Wear safety glasses.
- Make sure the sander is switched "OFF" before connecting the power supply.
- Disconnect power supply before changing a sanding belt, making adjustments, or emptying dust collector.
- Inspect sanding belts before using them. Replace those belts that are worn or frayed.
- Install sanding belts that are the same widths as the pulley drum.
- Adjust sanding belt tension to keep the belt running true and at the same speed as pulley drum.
- Secure the sanding belt in the direction shown on the belt and the machine.
- Keep hands away from a sanding belt.
- Use two hands to operate sanders - one on a trigger switch and the other on a front handle knob.
- Keep all cords clear of sanding area during use.
- Clean dust from a motor and vents at regular intervals.

- Do not use a sander without an exhaust system or a dust collector present that is in good working order. Empty the collector when 1/4 full. The dust created when sanding can be a fire and explosion hazard. Proper ventilation is essential.
- Do not exert excessive pressure on a moving sander. The weight of the sander supplies adequate pressure for the job.
- Do not work on unsecured stock unless it is heavy enough to stay in place. Clamp the stock into place or use a "stop block" to prevent movement.
- Do not overreach. Always keep proper footing and balance.
- Do not cover the air vents of the sander.

3.3.2 Drills

- Wear safety glasses.
- Keep drill air vents clear to maintain adequate ventilation.
- Keep drill bits sharp always.
- Keep all cords clear of the cutting area during use. Inspect for frays or damage before each use.
- Disconnect power supply before changing or adjusting bit or attachments.
- Tighten the chuck securely. Remove chuck key before starting drill.
- Secure workpiece being drilled to prevent movement.
- Slow the rate of feed just before breaking through the surface.
- Drill a small "pilot" hole before drilling large holes.
- For small pieces, clamp stock so work will not twist or spin. Do not drill with one hand while holding the material with the other.
- Do not use a bent drill bit.
- Do not exceed the manufacturer's recommended maximum drilling capacities.
- Do not use a hole saw cutter without the pilot drill.
- Do not use high speed steel (HSS) bits without cooling or using lubrication.
- Do not attempt to free a jammed bit by starting and stopping the drill. Unplug the drill and then remove the bit from the workpiece.
- Do not reach under or around stock being drilled.
- Do not overreach. Always keep proper footing and balance.
- Do not raise or lower the drill by its power cord.

3.3.3 Planers

- Wear safety glasses.
- Disconnect the planer from the power supply before making any adjustments to the cutter head or blades.
- Use blades of the same weight and set at the same height.
- Ensure that the blade-locking screws are tight.
- Remove adjusting keys and wrenches before turning on power.

- Support the material (stock) in a comfortable position that will allow the job to be done safely and accurately.
- Check stock thoroughly for staples, nails, screws, or other foreign objects before using a planer.
- Start a cut with the infeed table (front shoe) resting firmly on the stock and with the cutter head slightly behind the edge of the stock.
- Use two hands to operate a planer - one hand on the trigger switch and the other on a front handle.
- Do not put your finger or any object in a deflector to clean out chips while a planer is running.
- Disconnect the power supply when stopping to dump out chips.
- Do not set a planer down until blades have stopped turning.
- Keep all cords clear of cutting area.

3.3.4 Routers

- Wear safety glasses.
- Disconnect the power supply before making any adjustments or changing bits.
- Ensure that the bit is securely mounted in the chuck and the base is tight.
- Put the base of the router on the work, template or guide. Make sure that the bit can rotate freely before switching on the motor.
- Secure stock. Never rely on yourself or a second person to support or hold the material. Sudden torque or kickback from the router can cause damage and injury.
- Before using a router, check stock thoroughly for staples, nails, screws or other foreign objects.
- Keep all cords clear of cutting area.
- Hold both hands on router handles always, until a motor has stopped. Do not set the router down until the exposed router bit has stopped turning.
- Do not overreach. Keep proper footing and balance.
- When inside routing, start the motor with the bit above the stock. When the router reaches full power, lower the bit to two times the required depth.
- When routing outside edges, guide the router counter clockwise around the work.
- When routing bevels, moldings and other edge work, make sure the router bit is in contact with the stock to the left of a starting point and is pointed in the correct cutting direction.
- Feed the router bit into the material at a firm, controlled speed.
- With softwood, you can sometimes move the router as fast as it can go. With hardwood, knotty and twisted wood, or with larger bits, cutting may be very slow.
- The sound of the motor can indicate safe cutting speeds. When the router is fed into the material too slowly, the motor makes a high-pitched whine. When the router is pushed too hard, the motor makes a low growling noise.
- When the type of wood or size of the bit requires going slowly, make two or more passes to prevent the router from burning out or kicking back.

- To decide the depth of cut and how many passes to make, test the router on scrap lumber similar to the work.

3.3.5 Circular Saws

- Wear safety glasses and hearing protection.
- Check the retracting lower blade guard to make certain it works freely.
- Ensure that the blade that you have selected is sharp enough to do the job. Sharp blades work better and are safer.
- Check the saw for proper blade rotation.
- Set the depth of the blade, while the saw is unplugged, and lock it at a depth so that the lowest tooth does not extend more than about 1/8 inch beneath the wood.
- Keep all cords clear of cutting area.
- Circular saws are designed for right-hand operation; left-handed operation will demand more care to operate safely.
- Check the retracting lower blade guard frequently to make certain it works freely. It should enclose the teeth as completely as possible, and cover the unused portion of the blade when cutting.
- Check that the retracting lower blade guard has returned to its starting position before laying down the saw.
- Keep upper and retracting lower blade guard clean and free of sawdust.
- Disconnect power supply before adjusting or changing the blade.
- Allow the saw to reach full power before starting to cut.
- Use two hands to operate saws - one on a trigger switch and the other on a front knob handle.
- Keep the motor free from accumulation of dust and chips.
- Select the correct blade for stock being cut and allow it to cut steadily. Do not force it.
- Secure work being cut to avoid movement.
- Do not hold or force the retracting lower guard in the open position.
- Do not place your hand under the shoe or guard of the saw.
- Do not over-tighten the blade-locking nut.
- Do not twist the saw to change, cut or check alignment.
- Do not use a saw that vibrates or appears unsafe in any way.
- Do not force the saw during cutting.
- Do not cut materials without first checking for obstructions or other objects such as nails and screws.
- Do not carry the saw with a finger on the trigger switch.
- Do not overreach. Keep proper footing and balance.
- Do not rip stock without using a wedge or guide clamped or nailed to the stock.

3.3.6 Other Saws

- Wear safety glasses.

- Disconnect power supply before changing or adjusting blades.
- Use lubricants when cutting metals.
- Keep all cords clear of cutting area.
- Position the saw beside the material before cutting and avoid entering the cut with a moving blade.
- Make sure guards, if present, are installed and are working properly.
- Remember sabre saws cut on the upstroke.
- Secure and support stock as close as possible to the cutting line to avoid vibration.
- Keep the base or shoe of the saw in firm contact with the stock being cut.
- Select the correct blade for the material being cut and allow it to cut steadily. Do not force it. Clean and sharp blades operate best.
- Set the blade to go no further than 1/8 to 1/4 inch deeper than the material being cut.
- Do not start cutting until the saw reaches its full power.
- Do not force a saw along or around a curve. Allow the machine to turn with ease.
- Do not insert a blade into or withdraw a blade from a cut or lead hole while the blade is moving.
- Do not put down a saw until the motor has stopped.
- Do not reach under or around the stock being cut.
- Maintain control of the saw always. Avoid cutting above shoulder height.
- External Cuts:
  - Make sure that the blade is not in contact with the material or the saw will stall when the motor starts.
  - Hold the saw firmly down against the material and switch the saw on.
  - Feed the blade slowly into the stock, maintaining an even forward pressure.
- Internal Cuts:
  - Drill a lead hole slightly larger than the saw blade. With the saw switched off, insert the blade in the hole until the shoe rests firmly on the stock.
  - Do not let the blade touch the stock until the saw has been switched on.

4.0 PNEUMATIC TOOLS

4.1 General Requirements

- Wear safety glasses.
- Ensure that the compressed air supplied to the tool is clean and dry. Dust, moisture, and corrosive fumes can damage a tool. An in-line regulator filter and lubricator increases tool life.
- Keep tools clean and lubricated, and maintain them according to the manufacturers' instructions.
- Use only the attachments that the manufacturer recommends for the tools you are using.

- Be careful to prevent hands, feet, or body from injury in case the machine slips or the tool breaks.
- Reduce physical fatigue by supporting heavy tools with a counter-balance wherever possible.
- Use the proper hose and fittings of the correct diameter.
- Use hoses specifically designed to resist abrasion, cutting, crushing and failure from continuous flexing.
- Choose air-supply hoses that have a minimum working pressure rating of 150 psig or 150% of the maximum pressure produced in the system, whichever is higher.
- Check hoses regularly for cuts, bulges and abrasions. Tag and replace, if defective.
- Blow out the air line before connecting a tool. Hold hose firmly and blow away from yourself and others.
- Make sure that hose connections fit properly and are equipped with a mechanical means of securing the connection (e.g., chain, wire, or positive locking device).
- Install quick disconnects of a pressure-release type rather than a disengagement type. Attach the male end of the connector to the tool, NOT the hose.
- Do not operate the tool at a pressure above the manufacturer's rating.
- Turn off the air pressure to the hose when not in use or when changing power tools.
- Do not carry a pneumatic tool by its hose.
- Avoid creating trip hazards caused by hoses laid across walkways or curled underfoot.
- Do not use compressed air to blow debris or to clean dirt from clothes.

4.2 Pneumatic Nailing and Stapling Tools

- Permit only experienced and trained persons to operate pneumatic nailing and stapling tools.
- Wear safety glasses or a face shield and, where necessary, use hearing protection.
- Inspect a tool before connecting it to air supply:
- Check tool safety mechanisms if applicable.
- Tighten securely all screws and cylinder caps.
- Check correct air supply and pressure before connecting a tool.
- Check that the tool is correctly and securely connected to the air supply hose and that it is in good working order, with the safety mechanism operative, before using.
- Always handle a tool as if it is loaded with fasteners (nails, staples, etc.).
- Equip tools with a work-contacting element that limits the contact area to one that is as small as practical.
- Make sure that the mechanical linkage between the work-contacting element and trigger is enclosed.
- Disconnect a tool from the air supply when the tool is unattended and during cleaning or adjustment. Before clearing a blockage, be sure that depressing the trigger exhausts all air from the tool.

- Use only fasteners recommended by the manufacturer.
- Permit only properly trained people to carry out tool maintenance.
- Do not operate at a pressure above the manufacturer's rating.
- Do not depress the trigger unless the nosepiece of tool is directed onto a safe work surface.
- Do not carry a tool with the trigger depressed.
- Do not load a tool with fasteners while the trigger is depressed.
- Do not overreach. Keep proper footing and balance.
- Do not use compressed air to blow debris or to clean dirt from clothes.

APPENDIX C
Inadvertent Discovery Protocol

APPENDIX C
Inadvertent Discovery Protocol

INADVERTENT DISCOVERY PROTOCOL

PROTOCOL FOR ARCHAEOLOGICAL AND CULTURAL RESOURCES

DIABLO DRY DOCK SITE
ROSS LAKE NATIONAL RECREATION AREA
CITY OF SEATTLE, CITY LIGHT DEPARTMENT
WHATCOM COUNTY, WASHINGTON

Prepared by: Equinox Research and Consulting International Inc.
Prepared for: Geosyntec Consultants, Inc.

1. INTRODUCTION

Geosyntec Consultants (Geosyntec), at the direction of the National Park Service (NPS), will be conducting an Engineering Evaluation and Cost Analysis (EE/CA) on behalf of the Seattle City Light (SCL or City Light) at the Diablo Dry Dock Site located in Whatcom County. SCL entered into an Administrative Settlement and Order on Consent (Settlement) with the United States Department of the Interior (DOI) and National Park Service (NPS) for the performance of removal actions by SCL. This Inadvertent Discovery Protocol (IDP) covers the work at the Diablo Dry Dock Site. It is standard procedure for SCL to conduct archaeological investigations for its investigations that have the potential to affect cultural resources. The purpose of this Inadvertent Discovery Protocol (IDP) is to support the implementation of the EE/CA.

Previous archaeological and historic property assessments in the local area have documented several sites and buildings that are eligible for listing in the National Register of Historic Places. While many activities involve only disturbance of already disturbed areas, projects do occasionally involve excavation below the previously disturbed areas or in other locations that do not already have structures. Therefore, there is a potential that archaeological resources or human remains could be discovered during the project. This IDP describes procedures by which City Light and their consultants will address inadvertent discovery of human remains, artifacts, or cultural resource sites during the course of project activities. The Plan is intended to provide guidance to personnel of City Light and their consultants and subconsultants to:

- Comply with applicable laws and regulations, including:
  - Title 27 Revised Code of Washington (RCW), including Chapter 27.44, Indian Graves and Records, and Chapter 27.53 Archaeological Sites and Resources
  - Native American Graves Protection and Repatriation Act (NAGPRA) 25 U.S.C 3001 et seq. [Nov.16, 1990] as regulated by 43 Code of Federal Regulations (CFR) 10
- Describe to agencies and Tribes the procedure City Light will follow to deal with unanticipated discoveries.
- Provide proper procedures to project personnel to be followed should an unanticipated discovery occur.

1.1 Inadvertent Discovery Protocol

The IDP serves as the plan for responding to any unanticipated discoveries of describe protocols to be followed for discovery of: (1) human remains; and (2) other cultural resources, including artifacts that are encountered during field investigations. Protocols to be followed and contact information are provided below. Personnel are required to follow these protocols when carrying out ground-disturbing field investigations. Table 1 provides contact information.

1.1.1 Human Remains Discovery Protocol

There is a very low potential for displaced human remains to be encountered. However, in the event that human remains are discovered in the Project Area during ground-disturbing activities, the following protocol will be followed:

- Stop **immediately** all ground disturbing activity within 50 feet of the discovery.
- Secure the site **immediately** from any possible disturbance. The remains will be **immediately covered and not removed from the ground**.
- Ensure **at all times** that any discovered human remains and artifacts are treated with dignity and respect.
- The Field Lead or Project Archaeologist (if present) will contact the City Light Project Manager, Geosyntec Project Manager, or their designated authority immediately. They will be responsible for assuring that the necessary protocols are followed.
- Geosyntec or City Light Project Manager will immediately contact City Light's Cultural Resources Coordinator (CRC) (Andrea Weiser or Amber Earley) who will follow the Department of Archaeology and Historic Preservation (DAHP)'s protocol.
- The finding of human skeletal remains, because the Site is on federal land, will also be reported to North Cascades National Park Service Complex (NOCA) law enforcement and the NOCA Archaeologist. NOCA representatives may work with DAHP Physical Anthropologist for first, the determination of forensic or not, and then second, on the determination of Native American or not. The NOCA Archaeologist is responsible for making sure that the NAGPRA process is carried out, including consultation and notification with regard to all human remains encountered on federal land.
- The finding of human skeletal remains will also be reported to the county medical examiner/coroner and local law enforcement in the most expeditious manner possible. The county medical examiner/coroner will assume jurisdiction over the human skeletal remains and make a determination of whether those remains are forensic or non-forensic. If the county medical examiner/coroner determines the remains are non-forensic, then they will report that finding to the DAHP who will then take jurisdiction over the remains. The DAHP will notify any appropriate cemeteries and all affected tribes of the find. The State Physical Anthropologist will make a determination of whether the remains are Native American or non-Native American and report that finding to any appropriate cemeteries and the affected tribes. The DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains.

- If the remains are determined to be non-Native American by DAHP, City Light will treat the remains in accordance with applicable laws and regulations.
- Work can resume upon clearance from City Light's CRC and the NOCA archaeologist.

1.1.2 Cultural Resources Discovery Protocol

A cultural resource discovery could be from the prehistoric or historic period and consist of, but not be limited to, the following:

- An area of charcoal or charcoal-stained soil in association with historic-period or prehistoric remains such as stone tools or chips
- An arrowhead, stone tool, or stone chips
- A historic bottle, old glass fragments, square nails, "hole in top" lead-soldered cans, etc.
- A cluster of animal bones or burned rocks in association with stone tools or chips
- A cluster of tin cans or bottles, utensils, or industrial equipment older than 50 years

If potential archaeological artifacts or historical materials that appear to be older than 50 years of age are encountered by City Light staff or contractors during ground-disturbing field activities, the following protocol will be implemented, no matter how insignificant the items may seem:

- If any member of a construction, maintenance, or other field crew believes that he or she has made a cultural resource discovery, they will **leave the object in place** and flag for later location. Collecting artifacts is illegal and a violation of federal and state laws.
- Personnel will immediately **stop work** adjacent to the discovery and notify the Project Manager, who will immediately contact the City Light CRC (Andrea Weiser, Amber Earley).
- The field manager will take appropriate steps to protect the discovery site. At a minimum, the immediate area of the discovery site will be secured. Vehicles, equipment, and unauthorized personnel will not be permitted to traverse the site.
- An area of work restriction will be established in consultation with the CRC and will be sufficient to provide for the security and protection of the cultural materials. City Light will enforce appropriate security measures.
- City Light has retained Equinox Research and Consulting International Inc. (ERCI) as the qualified project archaeologist contractor for this project to inspect the site and determine whether the discovery is a historic or prehistoric/precontact resource. If prehistoric/ precontact, then all resources of this age are protected under state statute and require a permit. If historic, it should be noted the DAHP has previously-determined resources that are eligible for the National Register of Historic Places and therefore require a permit. The CRC will immediately contact the DAHP, the appropriate jurisdiction, and the land management agency to seek consultation regarding appropriate treatment. Treatment measures may include mapping, photography, limited probing, sample collection, protection of the site to avoid further impact, or other activity and will be implemented following federal (if applicable) and state regulations.

- The CRC, or its designated representative, will prepare a report that documents the methods and results of the treatment measures within four months of completion of the measures. City Light will provide a review copy of the draft report to the DAHP, the land management agency, and affected Tribes. After a 30-day review period, City Light will make revisions that address review comments and provide a copy of the final report to each of these parties.
- If the discovery is a significant historic or cultural resource in the project area, it should be included in a Cultural Resource Management Plan for the Project for long-term management.
- If it is necessary to continue the project activities that led to the discovery, City Light will consult with the parties (landowner, DAHP, affected Tribes, etc.) to determine appropriate protection and treatment.

Work can resume upon clearance from City Lights CRC and the NOCA archaeologist.

Table 1. Parties to Contact in Event of Human Remains Discovery or Cultural Resource Discovery

Name	Affiliation	Telephone	Email
Andrea Weiser	Sr. Archaeologist Seattle City Light	(206) 233-1644 (206) 858-1287 (cell)	andrea.weiser@seattle.gov
Amber Earley	Sr. Archaeologist Seattle City Light	(206) 402-2143 (cell)	amber.earley@seattle.gov
Tom Meyer	Project Manager Seattle City Light	(206) 665-5750	tom.meyer@seattle.gov
Anne Fitzpatrick	Project Manager for the EECA, Geosyntec Consultants	(206) 496-1461	afitzpatrick@geosyntec.com
Travis Kraft	National Park Service	(360) 854-7264	travis_kraft@nps.gov
Kim DiCenzo	Archaeologist North Cascades National Park Service Complex	(360) 854-7341	kim_dicenzo@nps.gov
Sheriff	Whatcom County	(360) 676-6911 or (206) 386-4476	
Dr. Robert G. Whitlam	DAHP, State Archaeologist	(360) 586-3080	Rob.Whitlam@dahp.wa.gov
Dr. Guy Tasa	DAHP, State Physical Anthropologist	(360) 586-3534; (360) 790-1633	Guy.Tasa@dahp.wa.gov
Holly Borth	DAHP, Preservation Design Reviewer	(360)586-3533	Holly.borth@dahp.wa.gov
Kevin Joseph	Cultural Resource Department Sauk–Suiattle Indian Tribe	(360) 722-0287	kjoseph@sauk-suiattle.com
Josephine Jefferson	Tribal Historic Preservation Lead Swinomish Tribal Community	(360) 466-7352 (360) 488-3860 (cell)	jjefferson@swinomish.nsn.us
Scott Schuyler	Cultural Resource Department Upper Skagit Indian Tribe	(360) 854-7090 (360) 982-8218	ScottS@upperskagit.com
	Nlaka'pamux Nation	(250) 455-2711	
Kurt Powers	Federal Energy Regulatory Commission	(202) 502-8949	Kurt.powers@ferc.gov

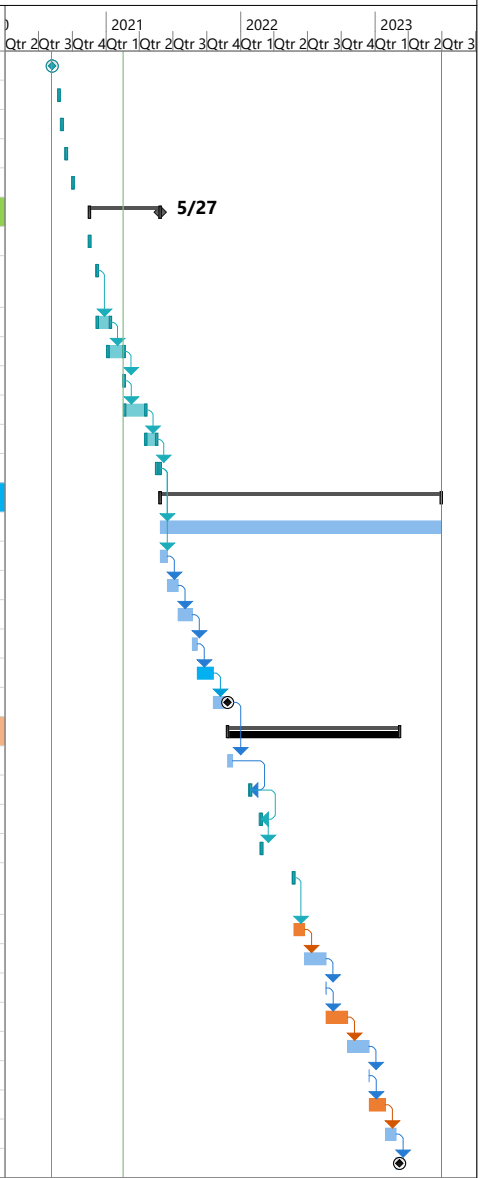
APPENDIX D
Laboratory SOPs
(available upon request)

APPENDIX E
EE/CA Work Plan (Schedule)

APPENDIX E
EE/CA Work Plan (Schedule)

Diablo Dry Dock EE/CA Schedule

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		**Contract with City of Seattle Signed**	1 day	Thu 8/6/20	Thu 8/6/20	
2		Internal Kickoff Call	1 day	Tue 8/25/20	Tue 8/25/20	
3		Initial Virtual Meeting with NPS	1 day	Wed 9/2/20	Wed 9/2/20	
4		DQO Scoping Meeting with NPS	1 day	Mon 9/14/20	Mon 9/14/20	
5		**Conduct Site Visit**	1 day	Fri 10/2/20	Fri 10/2/20	
6		**EE/CA SAP (Including HASP, QAPP, and Work Plan)**	**199 days**	**Mon 11/16/20**	**Thu 5/27/21**	
7		Meeting with NPS (check-in scope elements)	1 day	Mon 11/16/20	Tue 11/17/20	
8		Submittal of Pre-Draft EE/CA SAP to local NPS (due 120 days after contract, includes SAP and HASP)	1 day	Mon 12/7/20	Mon 12/7/20	
9		Local NPS review	37 days	Mon 12/7/20	Tue 1/12/21	8
10		Revise per local NPS comments (AOC allowed 60 days)	45 days	Tue 1/5/21	Wed 2/17/21	9
11		Submittal of Draft EE/CA SAP to National NPS	1 day	Thu 2/18/21	Thu 2/18/21	10
12		National ECCD and NPS review (AOC allowed 60 days)	60 days	Sat 2/20/21	Sun 4/18/21	11
13		Revise per National NPS review	30 days	Sun 4/18/21	Mon 5/17/21	12
14		Submittal of Final EE/CA SAP to NPS (and NPS Approval)	10 days	Mon 5/17/21	Thu 5/27/21	13
15		**EE/CA Investigation**	**790 days**	Thu 5/27/21	Thu 6/29/23	
16		Quarterly Progress Report to NPS (begin after SAP approval)	790 days	Thu 5/27/21	Thu 6/29/23	14
17		Procure subcontractors; field prep	20 days	Thu 5/27/21	Tue 6/15/21	14
18		Phase 1 sampling (upland, surface sediment)	30 days	Tue 6/15/21	Wed 7/14/21	17
19		Lab Analysis, review preliminary results from Phase 1	40 days	Wed 7/14/21	Sun 8/22/21	18
20		Phase 2 sampling (sed cores, soil background)	14 days	Sun 8/22/21	Sat 9/4/21	19
21		Receipt of final lab packet (Phase 1 and 2)	45 days	Sat 9/4/21	Mon 10/18/21	20
22		Validate and review lab data (completion of investigation)	40 days	Mon 10/18/21	Thu 11/25/21	21
23		**EE/CA Reporting**	484 days	Fri 11/26/21	Wed 3/8/23	
24		Database	14 days	Fri 11/26/21	Thu 12/9/21	22
25		Meeting with NPS - check-in data review	2 days	Tue 1/25/22	Thu 1/27/22	24FF+45 days
26		Meeting with NPS - check-in CSM review	2 days	Wed 2/23/22	Fri 2/25/22	25FF+30 days
27		Meeting with NPS, discuss SLERA and remedy	2 days	Fri 2/25/22	Sun 2/27/22	26
28		Submittal of Pre-Draft EE/CA Report to local NPS (due 180 days after completion of work, assume after validation of data, due May 2022)	1 day	Tue 5/24/22	Tue 5/24/22	
29		Local NPS review	30 days	Wed 5/25/22	Wed 6/22/22	28
30		Revise per local NPS comments(AOC allowed 60 days)	60 days	Thu 6/23/22	Fri 8/19/22	29
31		Submittal of Draft EE/AA Report to National NPS	1 day	Sat 8/20/22	Sat 8/20/22	30
32		National NPS review and Selection of Remedy by Superintendent (assume 60 days)	60 days	Sat 8/20/22	Mon 10/17/22	31
33		Revise per National NPS review (assume 60 days)	60 days	Mon 10/17/22	Wed 12/14/22	32
34		Submittal of Draft Final/Public Review Draft of EE/CA Report to NPS	1 day	Wed 12/14/22	Thu 12/15/22	33
35		Public Review of Draft Final Report	45 days	Thu 12/15/22	Sat 1/28/23	34
36		Finalize the EE/CA Report	30 days	Sat 1/28/23	Sun 2/26/23	35
37		NPS Approval of Final EE/CA Report, post final PDF	10 days	Sun 2/26/23	Tue 3/7/23	36



Project: Diablo Project Schedul
Date: Tue 2/16/21
Schedule is Calendar Days

Task	Project Summary	Manual Task	Start-only	Deadline	
Split	Inactive Task	Duration-only	Finish-only	Progress	
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress	
Summary	Inactive Summary	Manual Summary	External Milestone		