Gold Hill Cement Power Plant (Former) Targeted Brownfields Assessment

Gold Hill, Oregon

Technical Direction Document: 15-01-0009

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Prepared for:
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List of Abbreviations and Acronyms

Acronym	Definition
2,3,7,8-TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
bgs	Below Ground Surface
CLP	Contract Laboratory Program
CSM	Conceptual Site Model
E & E	Ecology and Environment, Inc.
EPA	United States Environmental Protection Agency
ERA	Environmental Risk Assessment
GPS	Global Positioning System
IDW	Investigation-Derived Waste
NOAA	National Oceanic and Atmospheric Administration
ODEQ	Oregon Department of Environmental Quality
PCB	Polychlorinated Biphenyls
PEL	Probable Effects Levels
QA	Quality Assurance
QC	Quality Control
RBC	Risk-based Concentrations
REC	Recognized Environmental Condition
RSL	Regional Screening Levels
SHPO	Oregon State Historic Preservation Officer
SOW	Statement of Work
SQAP	Sampling and Quality Assurance Plan
SQuiRT	Screening Quick Reference Tables
START	Superfund Technical Assessment and Response Team
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TBA	Targeted Brownfields Assessment
TEF	Toxic Equivalence Factor
TEL	Threshold Effects Levels
TEQ	Toxic Equivalent
TM	Task Monitor
TPH-Dx	Diesel Range Total Petroleum Hydrocarbons
TPH-Gx	Gasoline Range Total Petroleum Hydrocarbons
VOC	Volatile Organic Compound

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1 Introduction

Pursuant to the United States Environmental Protection Agency (EPA) Region 10 Superfund Technical Assessment and Response Team (START) Contract EP-S7-13-07 and Technical Direction Document Number 15-01-0009 Ecology and Environment, Inc. (E & E) performed a Targeted Brownfields Assessment (TBA) at the Gold Hill Cement Power Plant (Former) site located in Gold Hill, Oregon (Figure 1-1). The EPA's Brownfields Economic Redevelopment Initiative is designed to empower states, cities, tribes, communities, and other stakeholders in economic redevelopment to work together in a timely manner to prevent, assess, safely clean up, and sustainably reuse brownfields sites (EPA 2002).

The purpose of this project is to investigate new and previously identified recognized environmental conditions (RECs) at the site in coordination with stakeholders. Stakeholders consist of the City of Gold Hill, EPA, and Oregon Department of Environmental Quality (ODEQ). The assessment included sampling of specific areas within the site related to RECs and determining whether cleanup at the site will be necessary. At each step of the TBA process, the EPA sought input and concurrence with stakeholders.

The objective of this TBA report is to present the results of the limited site sampling for preliminary site characterization purposes. This report is organized as follows:

- **Section 1 (Introduction):** Authority for performance of this work and summary of report contents.
- **Section 2 (Site Background):** Description of site conditions, history, and concerns.
- **Section 3 (Recognized Environmental Conditions):** Description of RECs investigated for this TBA.
- **Section 4 (Investigation and Results):** Summary of the field effort and chemicals detected at the site and comparison of detected chemical concentrations to criteria values.
- **Section 5 (Conceptual Site Model):** Discussion of the three primary elements of a risk-based assessment (sources, receptors, and pathways) and how they potentially cause a risk to human health and safety of potential cleanup options and their estimated costs.
- **Section 6 (Cleanup Options and Cost Estimate):** Discussion of potential cleanup options and their estimated costs.

- **Section 7 (Findings and Summary):** Summary of site conditions and conclusions drawn based on the information gathered during this investigation.
- **Section 8 (References):** List of references cited throughout the text.

2 Site Background

This section describes the site location and background, site history, general environmental setting, historical property use, future uses of the property, and the START site visit.

2.1 Site Description

Site Name	Gold Hill Cement Power Plant (former)
Site Address	Highway 234 and Ambrose Street (east side of Highway 235)
Latitude/Longitude	42.4390750 North/-123.0433528 West
Reference Point for Coordinates	Center of Power Plant
Horizontal Collection Method	GPS
Horizontal Reference Datum	WGS84
Legal Description	Township 36 south, Range 3 west, Section 15
Parcel Number	#35-3W-15-600, lot #600
Size (in acres)	52.45 acres
Site Owner	City of Gold Hill 420 Sixth Avenue P.O. Box 308 Gold Hill, Oregon 97525 (541) 855-1525

2.2 Site Summary

The Gold Hill Cement Power Plant (former) site is located near the center of an approximately 52.45-acre parcel of land (parcel #35-3W-15-600) owned by the City of Gold Hill. This parcel is located 0.5 miles northeast of the city at approximately 1,070 feet above mean sea level (Figure 1-1). The roughly rectangular-shaped parcel is bounded by the Rogue River to the east and Sams Valley Highway (Highway 234) to the west. Several residential properties are located to the northwest of the former power plant. Many features, or portions of features, associated with the Gold Hill Cement Power Plant (former) remain on the parcel today, including the headgate, water diversion channel, fish screens, fish ladders, and penstocks/gates power plant (Figures 2-1 and 2-2). A description of these features is provided below, summarized from an Oregon Inventory of Historic Properties Section 106 Documentation Form prepared by George Kramer, in July of 2007.

- **Headgate:** This 50-foot-wide concrete structure increased or decreased water flow into a water diversion canal. Divided into three sections by buttresses, the headgate included three 14-foot-wide, 4-foot-high steel radial gates that were manually controlled by turnscrews accessed via a walkway along the crest of the headgate. Only a portion of the original headgate remains. The top of the former headgate provides a view of the Rogue River. The gate house is no longer at this location and appears to have been moved from the headgate area to a location to the south, adjacent to the fish screens.

- **Water Diversion Canal:** Varying in width but generally 50 feet wide and unlined, the canal flowed for approximately 1,700 feet south from the headgate to a fish barrier, screens, and power plant forebay/penstocks. The northern portion of the canal, approximately 220 feet long, was filled in in 2008 when the diversion dam, discussed below, was removed.
- **Fish Screens:** Located approximately 200 feet upstream of the former power plant, a concrete and steel fish screen system is present that consists of a full-width fish barrier and a series of "V-shaped" concrete and steel fish baffles. Built in 1944, this feature was abandoned and replaced by a fish ladder.
- **Fish Ladder:** The fish ladder lies on the east side of the diversion canal. The entrance to the fish ladder is located at the upstream side of the power plant. Construction of the fish ladder is believed to post-date the construction of the power plant.
- **Penstocks/Gates:** Six radial flood gates (semi-circular gates that pivot on at a central point) built of steel are pocketed in a concrete extension of the power plant foundation. These gates once controlled water flow to the power plant turbines. Similar in design to the headgates, these features are approximately 10 feet wide and 12 feet tall, each originally controlled by an electric motor.
- **Power Plant:** Constructed on a poured-in-place concrete foundation approximately 26 feet wide and 72 feet long, the superstructure of the power plant is made of stucco over diagonal sheathing and wood framing. Heavy wood posts support the steel beams of a gantry crane that runs the full length of the building. No longer operational and in very poor condition, all three generation units and portions of the control console, governors, and other equipment, remain in place. Much, if not all, of the electrical wiring has been removed from the site.
- **Tailrace/Return Flow:** Water exiting the power plant turbines returns to the main channel of the Rogue River though exit tubes at the base of the power plant's foundation into the tailrace. Excess water flowed toward a "wasteway" or return flow channel through a 10-foot vertical narrow tunnel in bedrock (Figure 2-2).

The former power plant once had an approximately 1,000-foot-long concrete water diversion dam. This diversion dam was a gravity-type, L-shaped dam that consisted of two main portions, an east and a west crest. The east dam crest consisted of a roughly 400-foot-long section that extended from the east bank across the main channel of the Rogue River and averaged 2 feet in height above the river bottom. The west dam crest consisted of a roughly 600-foot-long concrete section that was generally parallel to the river channel to direct water flow into the diversion canal headgate. The west dam crest averaged 6 feet in height. The concrete water diversion dam was removed in 2008 because it was considered a hindrance to fish passage and because the water it impounded was no longer needed by the City of Gold Hill (the City built a new water supply intake in 2006 at an upstream location). (Kramer 2007; Gold Hill 2015)

In addition, the power transmission equipment (i.e., transformers and power lines) is no longer present at the site. It is not known when the power transmission equipment was removed from the site. Based on historic aerial photographs (Appendix A), this equipment may have been located just south of the former power plant building (Figure 2-2).

More recently, the City has developed a water treatment plant and a park (Gold Hill Regional Park) with a baseball field and walking trails on the parcel (Figure 2-2).

2.3 Historical Property Use

The Gold Hill Cement Power Plant (former) is the last structure in a series of waterworks and hydroelectric facilities that have served the City of Gold Hill from this location since the late 19th century and, as such, has had some general association with the industrial and economic development of the region (Kramer 2007).

The first water diversion activities in the Gold Hill area of the Rogue River Channel date from the late 19th century with the construction of the Houck Mill, a water-powered flour mill that opened in 1892. The mill was powered with water conveyed via a ditch/diversion channel, remnants of which survived as late as 1925. The City of Gold Hill initially drew its domestic water supply from the Rogue River and may have been the entity that built the first diversion canal sometime prior to World War I. (Kramer 2007)

This canal was later expanded, first as a log dam and later as a concrete diversion dam, to feed a power plant believed to be located in the general vicinity of the current Gold Hill Cement Power Plant (former). Construction of the first power plant located at the site is believed to be related to the development of the Beaver Portland Cement Company plant operations in Gold Hill; however, the construction of the first power plant and improvements to the original diversion channel were not documented. (Kramer 2007)

Cement manufacturing requires considerable amounts of energy, and by 1925, the Beaver Portland Cement Company was described as the largest user of electric power in southern Oregon. Most of this power was still purchased from the local private utility and the California Oregon Power Company. In late 1925, the Beaver Portland Cement Company announced its plan to invest $400,000 to improve and upgrade its Gold Hill operation, roughly doubling production capacity. As a part of this effort, Beaver Portland Cement Company, in connection with the City of Gold Hill, intended to build a new and larger power plant near the existing plant on the Rogue River. (Kramer 2007)

In 1933, the Beaver Portland Cement Company sold its entire operation in Gold Hill to the Ideal Cement Company of Denver, Colorado (Kramer 2007).

The Ideal Cement Company began construction on the new dam and power plant in late 1944. Construction was completed in about a year, with the plant going into operation sometime in late 1945 or very early 1946. The new power plant consisted of three horizontal-type generation units, which generated a total of 25 kilowatts of power. Diverting water to the power plant was a new dam consisting of two sections, an east and west crest. (Kramer 2007)

In addition to supplying power for cement plant operations, the power plant generated excess power that was sold to the citizens of Gold Hill (Kramer 2007).

In 1965, the Ideal Cement Company announced plans to shut down its Gold Hill plant because it was rapidly approaching obsolescence, and a new plant had been constructed in Seattle, Washington. The Ideal Cement Company's Gold Hill plant operated continuously until operations ceased on April 30, 1969. (Kramer 2007)

2.4 Site Ownership

The City of Gold Hill currently owns the property on which the Gold Hill Cement Power Plant (former) site is located, having acquired the property after the closure of the Ideal Cement Company's cement manufacturing operations in 1969 (Kramer 2007; Gold Hill 2015).

2.5 Aerial Photographs

Historic aerial photographs were obtained from the University of Oregon's Map & Aerial Photography Library. Aerial photographs were available for the following years: 1952, 1960, 1966, 1969, 1976 1979, 1985, 1995, 2001, and 2009 and are provided in Appendix A. A review of these photographs reveals the following progression of site features:

- 1952: This photograph shows the power plant and associated diversion dam and headgate. Little development has occurred in the surrounding area.
- 1960: No apparent change from 1952.
- 1966: No changes are apparent at the site. Additional development has occurred on the east side of the Rogue River south of the power plant, as well as northwest of the power plant.
- 1969: No changes are apparent at the site, though water does not appear to be exiting the tailrace as in earlier photographs. Additional development has occurred on the east side of the Rogue River.

- 1976: No changes are apparent at the site. Additional development has occurred on the east side of the Rogue River, as well as west of the power plant. A baseball field is visible southwest of the power plant.
- 1979: No changes are apparent at the site or surrounding area. However, a boat launch can now be seen south of the power plant.
- 1985: The Gold Hill water treatment plant is visible west of the power plant, and development of the Gold Hill Regional Park appears to have begun. No other changes are apparent.
- 1995: Photograph resolution is poor, but no changes are apparent.
- 2001: No changes are apparent at the site, though additional development of the Gold Hill Regional Park has occurred with the addition of baseball field.
- 2009: The concrete diversion dam and headgate have been removed, and the upper portion of the diversion canal has been filled in; therefore, little to no water is visible in the diversion canal. Additional residential development has occurred in the surrounding area, as has further development of the Gold Hill Regional Park.

2.6 Certified Sanborn Maps

The following Certified Sanborn Maps for the site were provided by the Gold Hill Historical Society: 1898, 1907, 1911, 1920, and 1930; however, the Gold Hill Cement Power Plant (former) site is not depicted on any of the available Sanborn Maps. Available Sanborn Maps are provided in Appendix B.

2.7 Previous Investigations

One previous investigation has been conducted at the site. On May 30, 2013, First Response Environmental Services from Grants Pass, Oregon, conducted an asbestos and lead-based paint inspection at the Gold Hill Cement Power Plant in an effort to determine if asbestos and/or lead-based paint were present in the construction materials used. A total of 17 paint samples were submitted for lead analysis, and 12 construction material samples, including roofing material, electrical equipment, mastics, pump gaskets, and transite pipe, were submitted for asbestos analysis (FRES 2013).

Paint samples were collected from many different surfaces, including window and door casings, walls, electrical equipment, piping and valves, and hand railings. Lead concentrations ranged from 0.014% to 20% by weight. The EPA has defined lead-based paint as paint with lead levels equal to or exceeding 1.0 milligrams per square centimeter or 0.5% by weight. Of the 17 paint samples submitted for lead analysis, 11 had lead concentrations greater than 0.5% by weight. Asbestos concentrations ranged from non-detected to 40% and were primarily detected in electrical equipment, joint compound, and transite piping, indicating that these items could represent a health hazard if disturbed (FRES 2013).

2.8 Projected/Proposed Site Uses

This property is viewed by the City of Gold Hill as having tremendous potential for recreational redevelopment because of its immediate proximity to the scenic Rogue River and the 50-acre Gold Hill Regional City Park, which contains Little League baseball fields, over 2 miles of hard surface walking paths, and a boat launch. Over the years, several possible future uses have been explored, focusing on recreational use, including a city park facility, a nature center/information center, a commercial venture to support whitewater kayaking, a restaurant or other commercial development, and an outdoor amphitheater for regional music and theater events.

In February 2014, the City participated in a Vision-to-Action workshop sponsored by the EPA, the results of which generated strong community support for several potential redevelopment scenarios including commercial recreation (whitewater kayaking) reuse. The Gold Hill City Council has envisioned that the future economics of the community will be connected to the Rogue River. The council believes that an economy focused on recreational opportunities will further encourage development of the Gold Hill community. The City is supporting the Gold Hill White Water Center's development of a whitewater park on the Rogue River adjacent to the site of the former power plant. The City has funded an initial mapping of the river bottom and believes, as does the Gold Hill White Water Center, that the site of the former Gold Hill Cement Power Plant (former) has the potential to be a major whitewater park for the west coast. (Gold Hill 2015; GHWW 2015).

2.9 Environmental Setting

2.9.1 Climate

The site is situated on the northwestern edge of the South Rogue-Gold Hill Watershed, which covers approximately 64 square miles (59,566 acres) in the Klamath Mountains in southwestern Oregon. The South Rogue-Gold Hill Watershed is located in the Middle Rogue River Subbasin. A Mediterranean-like climate consisting of mild, wet winters and hot, dry summers characterizes this area. During the winter months, the moist, westerly flow of air from the Pacific Ocean results in frequent storms of varied intensities. Summer months are dominated by the Pacific high pressure system, which results in hot, dry summers and occasional short duration rainstorms with limited coverage areas. Average annual precipitation in the area ranges from approximately 24 inches at lower elevations to 36 inches at higher elevations (BLM 2001; MRWA 2001). The average total annual precipitation as recorded in Grants Pass, Oregon, located approximately 14 miles west (the closest weather station with available weather data), is 30.61 inches, with most of the precipitation occurring between the months of October and April (WRCC 2015).

2.9.2 Geology

The majority of the Gold Hill area is predominately forest lands interspersed with patches of grassland, shrubland, and woodland. The southwest facing slopes tend to be dry and rocky; rock outcrops and rocky surfaces are common throughout the analysis area. This area straddles the contact between the eastern edge of the Klamath Mountains Geologic Province (also called the Siskiyou Mountains) and the Western Oregon Interior Valleys Physiographic Province. The geology of the area can be briefly described as eroding metamorphic and granitic uplands with minor amounts of sedimentary deposits draping the lower slopes (BLM 2001; MRWA 2001).

Metasedimentary and metavolcanic rock of the Applegate Group compose the bedrock near the site. Specifically, bedrock near the site consists of porphyritic augite andesite and andesitic basalt ranging from Triassic to Paeozoic in age, as well as metasedimentary rocks (Smith 1982). These metasedimentary and metavolcanic rocks of the Applegate Group form a very dense, tight formation as a result of interlocking crystals in the original sediments and lava flows, and low grade metamorphism, that are more resistant to weathering and erosion. This, coupled with their position in the lower precipitation zone of the watershed, leads to the rugged relief of the metavolcanics (BLM 2001; MRWA 2001).

2.9.3 Soils

Soils in the immediate vicinity of the site consist of Riverwash, a deep, excessively drained to very poorly drained soil, composed of recently deposited alluvium. This alluvium occurs in narrow, irregular strips along the Rogue River. Most areas of Riverwash are very cobbly, extremely cobbly, or extremely gravelly sand to a depth of 60 inches or more. Land slope in the area generally is 0% to 3%. Permeability is very rapid in the areas of Riverwash. Available water capacity is low. Runoff is slow, and the hazard of water erosion is slight to severe. This unit is subject to flooding during prolonged, high-intensity storms (NRCS 1993).

2.10 START Site Visit

On April 1, 2015, a site visit to the Gold Hill Cement Power Plant (former) site was conducted. Photographs of the site taken during the site visit are provided in Appendix C. Attendees included the following people:

- Rick Hohnbaum (Gold Hill City Manager);
- Chris Stanley (Gold Hill City Council);
- Janet Sessions (Gold Hill Historical Society);
- Margret Dials (Gold Hill City Council);
- John Galbraith (Landscape Architect);
- Molly Bradly (RARE AmeriCorps Program);
- Karen Homolac (Business Oregon);
- Mary Camarata (ODEQ);
- Cathy Rodda (ODEQ);

- Joanne LaBaw (EPA); and
- Jeff Fetters (E & E).

The City of Gold Hill hosted a site scoping meeting prior to the site visit to discuss the site's history and future use and to try to identify potential RECs. The City indicated that the power plant rests on an approximately 50-acre parcel of land, which contains no individual tax lots. Features present on the parcel include the Gold Hill Cement Power Plant (former) and associated features, Gold Hill Regional Park, and the City municipal water intake and water treatment plant (located downgradient of the municipal water intake). For the purposes of the TBA, the site was defined as the headgate, water diversion channel, power plant building, and the area immediately adjacent to the power plant building. (E & E 2015a)

Upon arriving at the site, the site investigation team first inspected the area outside of the power plant building. Entry to the site is available through a locked gate, although there was evidence of trespassing as a small homeless encampment was observed, and there was a person sleeping in the lower level of the power plant. The area outside of the power plant building was covered in either grass or blackberry brambles; no stressed vegetation was noted. The water diversion canal was also overgrown with tall grass, and no water was visible in the canal. What appeared to be concrete foundations, possibly for power transmission equipment (i.e., transformers), were noted in the area south of the power plant. No power transmission equipment was present on site. (E & E 2015a)

The team next inspected the power plant building, which is in poor condition. The three turbines and much of the associated equipment were present in the power plant building, as was the main switch panel. However, much, if not all, of the wiring and high value materials that could be easily removed, such as copper wiring and other scrap metals, were no longer present. The floor of the power plant, which was wet at the time of the site walk, was covered in an unknown dark brown to black material, which resembled petroleum-stained soil. One small area of potentially stained soil was noted just outside the south door of the power plant building. Water was visible under each of the three turbines and at the base of the east side of the building. Also visible on the east side of the building was the fish ladder and what was thought to be the overflow pipe from the water treatment plant. (E & E 2015a)

Lastly, the area around the headgate was observed. Only the upper portion of the headgate was visible as a result of the dam removal in 2008. The area behind the headgate was filled in with debris from the dam removal. The diversion canal was visible beyond the area that has been filled. No stained soil or stressed vegetation was noted in the headgate area. (E & E 2015a)

3 Recognized Environmental Conditions

A recognized environmental condition (REC) is defined as the presence or likely presence of any hazardous substance or petroleum product on a property under conditions that indicate an existing release, a past release, or a material threat of a release into structures on the property or into the ground, ground water, or surface water of the property. RECs do not include *de minimis* conditions (i.e., conditions that generally do not present a threat to human health or the environment (ASTM 2013). The following RECs at the site were identified to be addressed as part of this TBA:

- **Lead Contaminated Soil and Sediment**;
- **Former Power Transmission Equipment Area**; and
- **Power Plant Floor** (where former electrical equipment was located).

As part of this TBA, surface soil, sediment, and concrete were collected in an effort to address the above on-site RECs.

The following issue was not addressed as part of this TBA:

- **Asbestos-containing Construction Material:** Based on the 2013 asbestos and lead-based paint inspection, asbestos is present in some of the construction materials used in the power plant. Because the locations of such materials are known, no additional samples were collected to address this REC.

The following sections summarize information relating to the potential or known RECs at the site.

3.1 Lead Contaminated Soil and Sediment

Based on the 2013 asbestos and lead-based paint inspection, lead-based paint is present at the power plant structure and its associated equipment, at concentrations as high as 20%. As this lead-based paint aged, it is likely that it peeled/sluffed off of surfaces in the power plant surfaces and associated equipment. This may have resulted in contamination of the surrounding surface soils or sediments around the perimeter of the power plant, as well as the gate house. Potential contaminates include target analyte list (TAL) metals - specifically, lead.

3.2 Former Power Transmission Equipment Area

The former power plant produced a total of 25 kilowatts of electrical power to run the cement plant, with excess power going to the City of Gold Hill. Given the age of the power plant, it is likely that power transmission equipment (i.e., transformers) contained insulating oil, which also may have contained PCBs. Based on aerial photographs, the power transmission equipment was located south of the power plant. Any leaks or spills of insulating oil from this equipment may have contaminated nearby surface soils. Potential contaminates include dioxins/furans, PCBs, SVOCs, and TPH-Dx.

3.3 Power Plant Floor (where former electrical equipment was located)

Given the age of the power plant, it is possible that electrical equipment utilized inside the plant contained insulating oil that may have contained polychlorinated biphenyls (PCBs). Any oil used to insulate electrical equipment that leaked or spilled may have been absorbed into the porous concrete floors within the power plant. Insulating oil containing PCBs was used in electrical equipment well into the 1970s, as PCBs were domestically manufactured from 1929 until their manufacture was banned in 1979. Several PCBs share structural similarities to dioxins/furans and can exhibit "dioxin-like" properties. Dioxins/furans were common contaminants of commercial PCB mixtures since they are by-products of industrial processes, including the manufacture of PCBs. Further, under certain conditions, PCBs may form dibenzofurans through partial oxidation (EPA 2003; WHO 2010). Because of this, dioxins/furans may have been present in the insulating oil if it contained PCBs. Potential contaminates include PCBs, dioxins/furans, semivolatile organic compounds (SVOCs), and diesel range total petroleum hydrocarbons (TPH-Dx).

4 Investigation and Results

E & E conducted field sampling at the Gold Hill Cement Power Plant (former) site from October 12 through October 16, 2015. Fieldwork was conducted in coordination with the City of Gold Hill and the EPA.

4.1 Potential Site Contaminants

As discussed in Section 3, several types of contaminants may have been released as a result of historic site uses. These include dioxins/furans, SVOCs, TPH-Dx, and gasoline range total petroleum hydrocarbons (TPH-Gx) may also have been released to soils as a result of historical work practices.

Based on an asbestos and lead-based paint inspection by First Response Environmental Services (see section 2.7), it is known that lead-based paint was used on the power plant structure and associated equipment; some of this paint may have sluffed or flaked off, contaminating the soil and/or sediment below.

4.2 Regulatory Standards

Regulatory standards to be applied to this project are presented in Table 4-1. Because future site development is anticipated to be geared towards recreational use, soil sample results were compared to recreational risk-based concentrations (RBCs) calculated by ODEQ specifically for this site. The recreational RBC values are focused on children ages 3 to 13 since they would have the highest and most likely exposure potential, and assume an exposure time of 78 days per year for 10 years, soil ingestion of 200 milligrams per day, and a body weight of 36 kilograms. In general, all sample results were compared to the recreational RBC calculated by ODEQ.

For metals, analytes were first compared to ODEQ recreational RBC values. If no recreational RBC value was available (e.g., thallium and zinc), or if the recreational RBC value was available but less than regional background concentrations developed by ODEQ in 2013 (e.g., arsenic) (ODEQ 2013), samples were compared to the regional background level. Due to the narrow range of concentrations detected regardless of depth, as well as that both cobalt and thallium were not suspected contaminants of concern at the site, detected concentrations of these analytes are thought to be indicative of naturally occurring conditions at the site.

With the exception of three analytes (acetone, methyl acetate, and methylene chloride), the analytes detected at the Gold Hill Cement Power Plant (former) have corresponding ODEQ RBC or regional background values. Acetone, methyl acetate, and methylene chloride were compared to the December 2015 EPA Regional Screening Levels (RSLs) for direct soil contact in a residential and/or occupational scenario. None of these analytes exceeded their respective RSL value. RSLs are not cleanup values, though exceedances of them can provide an indication of the potential need for further assessment or for site cleanup. RSLs are risk-based values derived from equations that combine exposure assumptions with chemical-specific toxicity values. If used, sample results were compared to the most stringent (i.e., lowest) EPA RSL value available. RSLs are discussed in the following sections and are presented in each of the applicable data summary tables along with ODEQ RBC and regional background values for informational purposes.

Sediment samples were first compared to ODEQ sediment bioaccumulation screening level values provided in Table A-1 of their *Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment* (ODEQ 2007). If an ODEQ screening level value was not available, samples were then compared to National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRT) values for freshwater sediment. The NOAA SQuiRTs include multiple screening values to help portray a spectrum of concentrations associated with various probabilities of adverse biological effects. This spectrum ranges from presumably nearly non-toxic to toxic levels. For this TBA, sediment sample results were first compared to NOAA SQuiRT freshwater sediment Threshold Effects Levels (TELs). Contaminants below these levels have a low probability of being toxic, as tested through standard bioassays. However, concentrations exceeding TELs do not necessarily predict toxicity. For this reason, contaminant concentrations in sediment also were compared to Probable Effects Levels (PELs). Exceedances of these values are more likely to be associated with toxic concentrations.

The "rule of 20" was used to compare concrete core samples to Resource Conservation and Recovery Act (RCRA) Toxicity Characteristic Leaching Procedure (TCLP) regulatory values. This comparison provides an indication of how concrete waste should be disposed of if removed in the future as a part of redevelopment plans. With this approach, the total analyte concentration must be less than 20 times the RCRA TCLP regulatory value in order to be consider "non-hazardous" for disposal purposes. As concentrations obtained using the "rule of 20" approach can be overly conservative and result in "false positives," it is typically only used to confirm that contaminants are below the toxicity threshold or for general estimating purposes, and follow-up testing with TCLP methodology is strongly advised.

PCB results were compared to Toxic Substances Control Act (TSCA) disposal standards, which indicate that materials containing less than 50 ppm PCB must be disposed of in a responsible manner; that is, they may be disposed of in a municipal waste landfill or equivalent.

4.3 Analytical Methods

A total of 42 samples (including quality assurance (QA)/quality control (QC) samples) were collected during this TBA and submitted for fixed laboratory analysis. The samples were analyzed in varying combinations for dioxins/furans, PCBs, SVOCs, TAL metals, TPH-Dx, TPH-Gx, and volatile organic compounds (VOCs). Copies of the QA/QC and data validation memoranda are provided in Appendix D. The following samples were submitted to fixed laboratories for analysis:

- **Dioxins/Furans:** Thirteen samples (10 soil/sediment and three QA/QC samples) were submitted for dioxins/furans analysis using EPA Method DLM02.2+ MA and 1613B. These samples were submitted to Analytical Resources, Inc., an EPA contract laboratory program (CLP) laboratory located in Tukwila, Washington. Additionally, one concrete sample was submitted to the EPA Region 10 Manchester Environmental Laboratory (MEL) located in Port Orchard, Washington, where it was prepared for analysis (ground to the specified size) and then shipped to Analytical Resources, Inc. for analysis.
- **PCBs/SVOCs:** Thirty-three soil/sediment samples and two water samples (QA/QC rinsates) were submitted for PCB/SVOC analysis. Samples were analyzed using EPA CLP Statement of Work (SOW) SOM02.2 by ChemTech Consulting Group, an EPA CLP laboratory located in Mountainside, New Jersey. Additionally, four concrete samples were submitted to the EPA Region 10 MEL located in Port Orchard, Washington; this samples were analyzed using EPA SW-846 8270D.
- **TAL Metals:** Thirty-five samples (33 soil/sediment and two QA/QC water samples) were submitted for TAL metal analysis. Samples were analyzed using EPA CLP SOW ISM02.2 by ChemTech Consulting Group, an EPA CLP laboratory located in Mountainside, New Jersey.
- **TPH-Dx:** Two water samples (QA/QC rinsates) were submitted for TPH-Dx analysis using NWTPH-Dx. These samples were submitted to the EPA Region 10 MEL located in Port Orchard, Washington.
- **TPH-Dx + Percent Solids:** Thirty-three soil/sediment samples and four concrete samples were submitted for TPH-Dx analysis using NWTPH-Dx. These samples were submitted to the EPA Region 10 MEL located in Port Orchard, Washington.
- **TPH-Gx:** Thirty-seven samples (33 soil/sediment and four QA/QC water samples) were submitted for TPH-Gx analysis using NWTPH-Gx. These samples were submitted to the EPA Region 10 MEL located in Port Orchard, Washington.
- **VOCs:** Thirty-seven samples (33 soil/sediment and four QA/QC water samples) were submitted for VOC analysis. Samples were analyzed using EPA CLP SOW SOM02.2 by ChemTech Consulting Group, an EPA CLP laboratory located in Mountainside, New Jersey.

4.4 Reporting of Sample Results

The analytical results summary tables provided in this section are a condensed version of the laboratory data provided in Appendix D. Omitted data and the presentation of data in the summary tables are described below:

- Analytes that were not detected in any samples were omitted from their respective tables.
- All detected concentrations are shown in bold type; a non-detect concentration is shown as the detection limit reported by the laboratory (e.g., 0.66 U).
- The regulatory standards provided in the first column of these tables were used as criteria values to which the sampling results were compared. Analytes detected at concentrations greater than the criteria value are considered a potential concern, and the concentration is shaded.
- Analytes detected at concentrations greater than the criteria value were considered a potential concern, and the concentration is shaded.
- Analytes with no comparative criteria levels are listed in the tables but could not be qualitatively evaluated.

Based on EPA Region 10 policy, evaluation of aluminum, calcium, iron, magnesium, potassium, and sodium (i.e., common earth crust metals) is generally used only in mass tracing, which is beyond the scope of this report. Furthermore, these analytes are not associated with toxicity to humans under normal circumstances (EPA 1996). For these reasons, these analytes are not included in the evaluation or discussion, but are provided in the analytical summary tables if they were detected above the instrument detection limit.

The EPA provides a method for determining the dioxin Toxic Equivalent (TEQ) for soil and water samples (EPA 2010). The TEQ is used to assess a sample's toxicity by expressing the results of all dioxins/furans detected in a given sample relative to the toxicity of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) in a single number. The TEQ is determined by multiplying each dioxin/furan by its corresponding Toxic Equivalence Factor (TEF) and summing the results. TEF values specific to mammals (including humans), fish and birds are used when calculating TEQ values. TEFs approximate each dioxin/furan's toxicity relative to the toxicity of 2,3,7,8-TCDD. When an analyte was not detected in a sample, the detection limit was divided in half, and that result was then multiplied by that analyte's corresponding TEF to be used in the TEQ calculation. It is important to note that since this calculation is based on using half the detection limit for undetected analytes, it is possible for TEQs to be greater than the associated regulatory criteria value, even when few or no dioxin/furans are detected in the sample. TEQs for mammals (including humans), fish, and birds have been calculated for each soil and sediment sample which was analyzed for dioxins/furans and are provided in the analytical summary tables.

4.5 Sampling Design

A judgmental sampling design was used for the Gold Hill Cement Power Plant (former) site TBA to fulfill project-specific objectives by collecting biased data required for preliminary site characterization. The following subsections describe the types of sampling, analysis, and measurements that were conducted.

Samples were collected in accordance with an approved sampling and quality assurance plan (E & E 2015b). Photographic documentation of the sample collection event is provided in Appendix C. When deviations from the sampling and quality assurance plan (SQAP) were required, they were noted in the field logbook, recorded on the sample plan alteration form (SPAF; Appendix E), and approved by the EPA task monitor (TM).

Because no environmental sampling has previously occurred at the site, the purpose of the TBA sampling was to determine if contamination was present and, if so, define the nature and extent of the contamination to the greatest degree possible. To achieve this, samples of surface soil, sediment, and concrete samples were collected as part of this TBA.

A total of 42 samples were collected during the field event; Figure 4-1 depicts sample locations. A description of each sample submitted for fixed laboratory analysis is provided in Table 4-2.

Table 4-3 summarizes the sample coding system used to formulate sample numbers. For example, the sample number BP01SS01 indicates the following:

- BP for the source code (in this case, for the building perimeter).
- 01 for the sequential number of samples from a given source by matrix (in this case, the first subsurface soil sample).
- SS for the sample matrix (in this case, surface soil).
- 01 for the depth of the sample interval (in this case, 0 to 6 inches below ground surface [bgs]; samples ending in 02 indicate they were collected from 6 to 12 inches bgs).

The frequencies of exceedance of regulatory criteria values are provided in Table 4-4. Summaries of analytical data are provided in Tables 4-5 through 4-9.

Investigative activities conducted at the site included surface soil sampling, sediment sampling, and concrete sampling.

4.5.1 Sampling Methodologies

4.5.1.1 Surface Soil Sampling

In general, two surface soil samples were collected at each sample location. One surface soil sample was collected from 0 to 6 inches bgs and based on a recommendation by ODEQ, another sample was collected from 6 to 12 inches bgs from the same location. All samples were collected using a dedicated stainless steel spoon. In cases where the ground surface was too hard to allow sample collection with a stainless steel spoon, a non-dedicated decontaminated pickaxe was utilized to break the soil up prior to sampling; the pickaxe was decontaminated after each use. Collected material was placed in a dedicated stainless steel bowl, thoroughly homogenized, and placed into pre-labeled certified clean containers. The VOC and TPH-Gx aliquots were removed directly from the sample location using a 5-gram Core-N-One™ sampler and were not homogenized. To the greatest extent possible, any debris (i.e., rocks and vegetation) entrained within the sample material was removed during sample homogenization.

4.5.1.2 Surface Sediment Sampling

Two sediment samples were collected from each sediment sample location. One sediment sample was collected from 0 to 6 inches bgs and another from 6 to 12 inches bgs. All samples were collected using a dedicated stainless steel spoon. Collected material was placed in a dedicated stainless steel bowl, thoroughly homogenized, and placed into pre-labeled certified clean containers. The VOC and TPH-Gx aliquots were removed using 5-gram Core-N-One™ samplers directly from the sample location and were not homogenized. To the extent possible, any debris (i.e., rocks and vegetation) entrained within the sample material were removed during sample homogenization.

4.5.1.3 Concrete Sampling

A rented concrete core drill was utilized to collect concrete core samples for fixed laboratory analysis. Prior to sampling, the floor area to be sampled was cleared of debris. A 3-inch-diameter core drill was utilized to collected concrete from an approximate 9- by 9-inch area, to an approximate depth of 2 inches to ensure sufficient sample volume. Several overlapping cuts were made to facilitate removal of the concrete chunks. The concrete chunks from each sample location were placed in appropriately sized plastic zip lock bags and submitted to the laboratory; no homogenization occurred in the field. The concrete core drill bit was decontaminated between the collection of each sample.

Once at the laboratory, the concrete pieces were ground to reduce their size to a gravel consistency that could then be pulverized in a puck mill into a powder consistency for subsampling and analysis.

4.6 Sampling and Analytical Results

4.6.1 Lead Contaminated Soil and Sediment

4.6.1.1 Power Plant Perimeter

A total of eight surface soil samples were collected from five separate locations around the perimeter of the power plant (Figure 4-1). On the north side of the power plant, four samples were collected from two sample locations, BP01SS and BP02SS. Samples BP01SS01 and BP02SS01 were collected from 0 to 6 inches bgs, while samples BP01SS02 and BP02SS02 were collected from 6 to 12 inches bgs. On the south side of the power plant, four samples were collected from three locations. Samples BP03SS01 and BP03SS02 were collected from one location at 0 to 6 and 6 to 12 inches bgs, respectively. Samples BP04SS01 and BP04SS02 were collected from two separate sample locations due to refusal. Sample BP04SS01was collected adjacent to the power plant, while sample BP04SS02 was offset approximately 15 feet south of sample BP04SS01. Both samples were collected from 0 to 6 inches bgs (see the SPAF in Appendix E).

A small cove on the Rogue River abuts the power plant to the east. Six sediment samples were collected from three separate sample locations within this cove along the east side of the power plant (Figure 4-1). At each location, samples of sediment resting on the foundation of the power plant were collected from 0 to 6 inches bgs and 6 to 12 inches bgs.

All samples collected from the power plant perimeter were submitted for TPH-Dx, TPH-Gx, metals, PCB, SVOC, and VOC analysis. Three of the surface soil samples (BP03SS01, BP04SS01, and BP04SS02) and one of the sediment samples (BP02SD01) were also submitted for dioxins/furans analysis.

Power Plant Perimeter Surface Soil Sample Results: 0-6 inches bgs

Analytical results are presented in Table 4-5. These analytical results indicate that 17 dioxins/furan congeners were detected in two samples (BP03SS01 and BP04SS01), while 12 dioxins/furan congeners were detected in sample BP04SS02. All three of these samples were collected from the south side of the power plant from 0 to 6 inches bgs. None of the detected dioxins/furan congeners have established regulatory levels; however, as stated previously, TEQs were calculated for each sample to assess its toxicity relative to the toxicity of 2,3,7,8-TCDD. Based on these TEQ calculations, none of the samples analyzed for dioxins/furans exceeded the established ODEQ recreational RBC mammal TEQ value. However, each of the calculated TEQ values did exceed the EPA RSL, which is significantly lower than the ODEQ recreational RBC mammal TEQ value.

Numerous metals were detected in the samples collected from 0 to 6 inches bgs around the power plant perimeter, though only one (lead) slightly exceeded recreational RBCs in two samples, samples BP03SS01 and BP04SS01. ODEQ does not currently have RBCs for thallium or zinc, as such, both analytes were compared to ODEQ background levels. Thallium exceeded its ODEQ regional background level in four of the five samples (BP01SS01, BP03SS01, BP04SS01, and BP04SS02), while zinc exceeded its ODEQ regional background level in three samples (BP01SS01, BP03SS01, and SB04SS01) collected from this area. Further, thallium exceeded its EPA RSL in a residential scenario in all samples in which it was detected; however, the detected thallium concentrations may indicate naturally occurring concentrations due to the narrow range of concentrations detected at both depths, as well as that thallium is not a suspected contaminant of concern at the site.

No other analytes from the 0- to 6-inch bgs sample interval were detected at concentrations above established regulatory levels in samples collected from the power plant perimeter.

Power Plant Perimeter Surface Soil Sample Results: 6-12 inches bgs
Analytical results are presented in Table 4-5. Numerous metals were detected in the samples collected from 6 to 12 inches bgs around the power plant perimeter, although none were detected above the ODEQ recreational RBC values. Both thallium and zinc exceeded established ODEQ background levels in one sample, sample BP01SS02. At this sample location, the concentrations of these metals appear to decrease with depth. As with the 0 to 6 inch samples, thallium concentrations exceeded the EPA RSL in a residential scenario. As mentioned above, the detected thallium concentrations may indicate naturally occurring concentrations due to the narrow range of thallium concentrations detected at both depths, as well as that thallium is not a suspected contaminant of concern at the site.

Power Plant Perimeter Sediment Sample Results: 0-6 inches bgs
Analytical results are presented in Table 4-6. Analytical results indicate that seven dioxins/furan congeners were detected in one sample (BP02SD01) collected from the east side of the power plant from 0 to 6 inches bgs. None of the detected dioxins/furans have established regulatory levels; however, as stated previously, TEQs were calculated for each sample to assess its toxicity relative to the toxicity of 2,3,7,8-TCDD. Based on the TEQ calculations, this sample exceeded the established NOAA SQuiRT freshwater sediment TEL TEQ value; however, it is important to note that this calculation is based on using half the detection limit for many undetected analytes. The NOAA SQuiRT freshwater sediment PEL was not exceeded. TEQ values for fish and birds are not available.

Numerous metals were detected in the samples collected from 0 to 6 inches bgs on the east side of power plant. One metal (cadmium) slightly exceeded the established ODEQ sediment criteria value. Copper and nickel exceeded their respective NOAA SQuiRT TEL values in samples BP01SD01 and BP02SD01. No analytes exceeded the NOAA SQuiRT PEL values.

No other analytes from the 0- to 6-inch bgs sample interval were detected at concentrations above established regulatory levels in sediment samples collected from the east side of the power plant.

Power Plant Perimeter Sediment Sample Results: 6-12 inches bgs
Analytical results are presented in Table 4-6. These results indicate that numerous metals were detected in the samples collected from 6 to 12 inches bgs. Two metals (copper and nickel) slightly exceeded established NOAA SQuiRT TEL values in sample BP01SD02. ODEQ sediment criteria values are not available for copper and nickel. Neither copper nor nickel exceeded their respective NOAA SQuiRT PEL values.

No other analytes from the 6- to 12-inch bgs sample interval were detected at concentrations above established regulatory levels in sediment samples collected from the east side of the power plant.

4.6.1.2 Gate House

Four surface soil samples were collected at the gate house from two separate locations (Figure 4-1). Samples GH02SS01 and CH02SS02 were collected on the north side of the gate house from 0 to 6 and 6 to 12 inches bgs, respectively. Samples GH01SS01 and GH01SS02 were collected on the south side of the gate house, also from 0 to 6 and 6 to 12 inches bgs, respectively. All samples collected from the gate house were submitted for TPH-Dx, TPH-Gx, metals, PCB, SVOC, and VOC analysis. Gate house sample results are presented in Table 4-7.

Gate House Surface Soil Sample Results: 0-6 inches bgs

No analytes were detected at concentrations above established regulatory levels in surface soil samples collected from the 0- to 6-inch bgs sample interval.

Gate House Surface Soil Sample Results: 6-12 inches bgs

As with the 0- to 6-inch bgs sample interval, numerous metals were detected in the samples collected from 6 to 12 inches bgs on both the north and south side of the gate house; however, only thallium exceeded the ODEQ background concentration in sample GH02SS02. As mentioned above, ODEQ does not currently have an established RBC for thallium. Thallium also exceeded its EPA RSL in a residential scenario in all samples in which it was detected. The detected thallium concentrations may indicate naturally occurring concentrations due to the narrow range of thallium concentrations detected regardless of depth, as well as that thallium is not a suspected contaminant of concern at the site.

No other analytes from the 6- to 12-inch sample interval were detected at concentrations above established regulatory levels in surface soil samples collected from the gate house.

4.6.2 Former Power Transmission Equipment Area

To determine if potential leaks or spills from power transmission equipment have contaminated surface soils, surface soil samples were collected from eight separate locations (PT01SS through PT08SS) near the suspected location of the former power transmission equipment (Figure 4-1). Sampled locations were chosen based on aerial photograph interpretation and the positions of former foundations located during the field event.

In general, two samples were collected at each sample location, with samples being collected from 0 to 6 inches bgs and 6 to 12 inches bgs at each location. The only exception to this was at sample location PT04SS, where, due to refusal, no sample was collected from 6 to 12 feet bgs (see the SPAF in Appendix E). A total of 15 surface soil samples were collected near the former power transmission equipment area.

All samples were submitted for TPH-Dx, TPH-Gx, metals, PCB, SVOC, and VOC analysis. Six samples (PT01SS02, PT03SS02, PT04SS01, PT05SS02, PT07SS01, and PT08S01) were also submitted for dioxins/furans analysis. Former power transmission equipment surface soil sample results are presented in Table 4-8.

Former Power Transmission Equipment Area Surface Soil Sample Results: 0-6 inches bgs

Analytical results indicate that all 16 dioxin/furan congeners were detected in sample PT04SS01, 10 congeners were detected in sample PT07SS01, and 12 congeners were detected in sample PT08SS01. None of the detected dioxins/furan congeners have established regulatory levels; however, as stated previously, TEQs were calculated for each sample to assess its toxicity relative to the toxicity of 2,3,7,8-TCDD. Based on the TEQ calculations, none of the samples exceeded the established ODEQ recreational RBC mammal TEQ value. However, each of the calculated TEQ values did exceed the EPA RSL, which is significantly lower than the ODEQ recreational RBC mammal TEQ value.

Numerous metals were detected in the samples collected from 0 to 6 inches bgs in the former power transmission equipment area. Three metals, arsenic, thallium, and zinc exceeded the ODEQ background concentration. Arsenic exceed its ODEQ background concentration in one sample—PT07SS01. Thallium exceeded its ODEQ background concentration in samples PT03SS01, PT04SS01, PT07SS01, and PT08SS01. Zinc exceeded its ODEQ background concentration only in samples PT02SS01, PT04SS01, and PT05SS01.

Further, arsenic exceeded both the ODEQ recreational RBC and EPA RSL in sample PT07SS01. As previously mentioned, ODEQ does not currently have RBC values for thallium or zinc. Thallium exceeded its EPA RSL in a residential scenario in all samples in which it was detected. However, the detected thallium concentrations may indicate naturally occurring concentrations due to the narrow range of concentrations detected at both depths, as well as that thallium is not a suspected contaminant of concern at the site. Zinc did not exceed the EPA RSL in any sample.

No other analytes from the 0-6 inch bgs sample interval were detected at concentrations above established regulatory levels in surface soil samples.

Former Power Transmission Equipment Surface Soil Sample Results: 6-12 inches bgs

Analytical results indicate that 16 dioxin/furan congeners were detected in samples PT01SS02, PT03SS02, and PT05SS02. None of the detected dioxins/furan congeners have established regulatory levels; however, as stated previously, TEQs were calculated for each sample to assess its toxicity relative to the toxicity of 2,3,7,8-TCDD. Based on the TEQ calculations, samples PT01SS02, PT03SS02 and PT05SS02 did not exceed the ODEQ recreational RBC mammal TEQ value.

Numerous metals were detected in the samples collected from 6 to 12 inches bgs in the former power transmission equipment area. Three metals, arsenic, thallium, and zinc exceeded the ODEQ regional background concentration. Arsenic exceed its ODEQ background concentration in one sample—PT07SS02. Thallium exceeded its ODEQ background concentration in samples PT07SS02 and PT08SS02. Zinc exceeded its ODEQ background concentration in sample

PT05SS02.

Further, arsenic exceeded both the ODEQ recreational RBC and EPA residential RSL in sample PT07SS02, though both of these standards are considerably lower than the established ODEQ background level. ODEQ does not currently have an RBC for thallium or zinc. Thallium exceeded its EPA RSL in a residential scenario in all samples in which it was detected. However, the detected thallium concentrations may indicate naturally occurring concentrations due to the narrow range of concentrations detected at both depths, as well as that thallium is not a suspected contaminant of concern at the site. Zinc did not exceed the EPA RSL in any sample.

No other analytes from the 6- to 12-inch bgs sample interval were detected at concentrations above established regulatory levels in surface soil samples.

4.6.3 Power Plant Floor (where former electrical equipment was located)

To determine if leaks or spills have contaminated the concrete floor of the power plant, six concrete samples were collected from the floor of the power plant structure. Samples were to be collected from areas of visible staining with a 3-inch core drill to a depth of 3 inches. However, due to limited surface staining, as well as the small area of the former power plant structure, only four concrete samples were collected (Figure 4-1; see the SPAF in Appendix E). Further, due to the absence of staining at depth, sample cores were only drilled to a depth of 2 rather than 3 inches. Sample locations were located in areas where heaviest staining was noted. Sample CC01CF was collected on the north side of the south turbine, sample CC02CF was collected from the switch room, sample CC03CF was collected on the north side of the north turbine, and sample CC04CF was collected between the north and middle turbines. All samples were submitted for total TPH-Dx, PCB, and SVOC analysis: one sample (CC02CF) was also submitted for dioxins/furans analysis.

Power plant floor concrete sample results are presented in Table 4-9. The detected dioxins/furans and total petroleum hydrocarbons do not have corresponding TCLP regulatory values. While select SVOCs do have corresponding TCLP regulatory values, much of this data was qualified as rejected and as such are unusable for any purpose. This data was qualified as rejected due to the highly alkaline pH of the pulverized concrete not allowing for satisfactory recover of many phenolic surrogates of the matrix spike compounds (see QA memoranda in Appendix D for explanations of data rejection). Had this data not been rejected, the “rule of 20” would have been applied to for comparison purposes.

Two Aroclors (1254 and 1260) were detected in sample CF03CC, though at concentrations much lower than the TSCA limit of 50 ppm for PCBs.

4.7 Historic Preservation Act Considerations

This TBA did not involve intrusive activities such as drilling and excavation work. However, to coordinate TBA activities with the National Historic Preservation Act, the EPA contacted the Oregon State Historic Preservation Officer (SHPO) prior to the field sampling field event. The SHPO responded that this sampling effort is not likely to adversely impact the site (Appendix F). No artifacts or indications of human remains were encountered during the field sampling event.

4.8 Global Positioning System

Global positioning system (GPS) coordinates of TBA sample locations were collected utilizing a Trimble™ Geo XH handheld unit. Recorded GPS coordinates by sample point are listed in Appendix G.

4.9 Investigation-Derived Waste

Investigation-derived waste (IDW) was generated during the Gold Hill Cement Power Plant (former) TBA sampling event. IDW included disposable sampling supplies and disposable personal protection equipment. All disposable IDW was double-bagged in opaque plastic bags and disposed of at the EPA Region 10 warehouse located in Seattle, Washington. Materials that could be recycled (plastic, cardboard, stainless steel spoons and bowls, and paper) were segregated from trash for recycling. All decontamination water was evaporated on site. No IDW remains on site.

5 Conceptual Site Model

A conceptual site model (CSM) was prepared for the Gold Hill Cement Power Plant (former) site using guidance provided in ODEQ's *Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites* (ODEQ 2003). The CSM is intended to evaluate the three primary elements of a risk-based assessment: sources, receptors, and pathways. Together, these three elements could cause a risk to human health and safety. If any one of these three elements is absent, incomplete, or not applicable, there is no potential risk to human health and safety (ODEQ 2003). A general explanation of the three primary elements of a CSM is presented below:

- Sources: Sources represent the contaminants (e.g., lead) and the media (e.g., soil) in which the contaminants are present.
- Receptors: Receptors include the representative segments of the population (residents recreational users, occupational workers, construction workers, and excavation workers) that occupy or work in the vicinity of a site based on zoning, current and permitted land uses, and potential likely future uses of the property.
- Pathways: Pathways represent the potential mechanisms of transport and routes of exposure (inhalation, ingestion, and dermal contact) that may provide a means of contact between the sources and the receptors.

The three primary elements of a CSM are discussed in greater detail in the following sections. Table 5-1 provides a summary of the Gold Hill Cement Power Plant (former) CSM.

5.1 Source Contaminant and Media

Recreational RBCs calculated by ODEQ were used for this evaluation and are presented in Table 4-1. Based on the results of the TBA sampling, metals (arsenic, lead, thallium, and zinc) are present in surface soil of the site at concentrations greater than their respective recreational RBC value or ODEQ background level. These contaminants may have been released at the site due to historical site operations or, as previously mentioned, may indicate naturally occurring concentrations (e.g., thallium).

Sediment samples indicate the presence of cadmium, copper, and nickel at concentrations greater than values provided in ODEQ's (2007) *Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment* or NOAA SQuiRT values. These contaminants may have been released at the site due to historical site operations.

5.2 Receptors

The potential receptors (recreational users, occupational workers, and construction and excavation workers) were evaluated based on the planned recreational use and development of the site. Based on this planned site use, the potential receptors for exposure to arsenic, thallium, and zinc in the soil are recreational users and occupational, construction, and excavation workers. The potential receptors for exposure to lead in the soil are recreational site users.

5.3 Human Health Exposure Pathways

The following subsections describe the potential human health exposure pathways for the substances analyzed. These descriptions include site-specific considerations that increase or decrease the viability of each pathway. The descriptions also explain whether corresponding receptors are currently exposed and/or whether they may be exposed in the future, given the proposed redevelopment plans for recreational site use. Should the expected redevelopment plans change, the CSM should be reanalyzed to determine whether the changes result in the inclusion of new exposure pathways or, conversely, whether they result in the exclusion of complete pathways as outlined below.

5.3.1 Soil

The soil exposure pathway comprises the incidental ingestion, dermal contact, and inhalation of fugitive dust routes. For this site, all three routes are complete for nearby and future recreational site users, future occupational users, and future construction and excavation workers. Factors that increase the risk of exposure include the presence of metals (arsenic, thallium, and zinc in the surface soil from 0 to 12 inches bgs and lead in the surface soil from 0 to 6 inches bgs) at concentrations greater than the recreational RBC.

Sample results indicate that arsenic concentrations exceeded the recreational RBC only at one sample location (PT07SS) in the former power transmission area. Lead exceeded the recreational RBC on the south side of the power plant building at sample locations PT03SS and PT04SS. Thallium and zinc exceeded ODEQ background levels in all areas sampled, though concentrations appear to be higher near the power plant. In general, much of the site is covered by vegetation, decreasing the risk of exposure from fugitive dust emissions during dry seasons.

5.3.2 Ground Water

The ground water pathway comprises the ingestion, dermal absorption, and inhalation of volatile compounds in tap water routes. For this site, the ingestion and dermal absorption routes are incomplete for future recreational site users, future occupational users, and future construction and excavation workers. This pathway is considered to be incomplete because ground water is not expected to be encountered in future excavations at the site and because the City of Gold Hill provides municipal water to residences near the site from a surface water intake on the Rogue River.

5.3.3 Air

The air pathway is taken into account indirectly by considering volatilization from contaminated soil or ground water. TBA sampling did not indicate the presence of VOCs in any media sampled. Because of this, this pathway is incomplete for future recreational site users, future occupational users, and future construction and excavation workers.

5.3.4 Surface Water

The surface water pathway comprises the ingestion, dermal absorption, and inhalation routes. Surface water samples were not collected at the site; however, metals were detected in the surface soil of the site and could migrate via surface water runoff to the back water lagoon at the base of the power plant building. The back water lagoon is not used by any receptors, but the water in the lagoon may intermingle with the Rogue River during times of high water. The Rogue River is heavily used for recreation; however, the risk of exposure is lessened by the fact that these contaminants were detected in an area not utilized for recreation. If the site is developed in the future, occupational workers and construction and excavation workers may be subject to risk of exposure.

5.3.5 Sediment

The sediment pathway comprises the incidental ingestion and direct contact routes. This route is complete for future recreational site users, future occupational users, and future construction and excavation workers. Elevated levels of cadmium, copper, and nickel were detected (compared to ODEQ sediment and NOAA SQuiRT values) in the samples collected from sediment resting on the foundation of the power plant in the cove at the base of the power plant building. The risk of exposure is lessened by the fact that these contaminants were detected in an area of the river not typically utilized for recreational use. If the site is developed in the future, construction, excavation, and occupational workers may be subject to risk of exposure.

5.4 Level I Scoping - Ecological Risk Assessment

A Level I scoping - Ecological Risk Assessment (ERA) was conducted for the Gold Hill Cement Power Plant (former) site using guidance provided in ODEQ's *Guidance for Ecological Risk Assessment: Levels I, II, III, IV* (ODEQ 1998). An Ecological Scoping Checklist also was completed as required by the ODEQ guidance. Both the ERA and Ecological Scoping Checklist are provided in Appendix H.

The ERA indicates that industrial activities are responsible for contamination of site soil and proximal sediments found within the small cove adjacent to the Rogue River. Overall, the detected concentrations for several compounds were noted as greater than regional ODEQ background concentrations or federal/state screening benchmarks that were applied. However, the ERA indicated that none of the concentrations appeared to be high enough to indicate risk to upper trophic receptors. A slight degree of uncertainty was noted due to the lack of screening values for some compounds, but, overall, the low level of contamination, limited number of detections, and lack of sensitive local receptors suggest that further risk analysis is not warranted. For this reason, the ERA did not proceed beyond Level I.

6 Cleanup Options and Cost Estimate

The following preliminary evaluation of cleanup options for the Gold Hill Cement Power Plant (former) site is based on the analytical data gathered during the investigation conducted for this TBA (Section 4). Laboratory sample results indicate that a cleanup may be necessary. Changes in site conditions would require a reevaluation of the following discussion. It is recommended that ODEQ be consulted prior to conducting any cleanup activities.

This TBA focused primarily on dioxins/furans, PCBs, SVOCs, metals, TPH-Dx, TPH-Gx, and VOCs as the contaminants of concern. The decision to focus on these contaminants was based on available information and professional judgment. Given this limitation, it is possible that other contaminants could also be present at levels exceeding applicable regulatory criteria.

Due to the limited contamination and low concentrations, ODEQ may not deem that a cleanup at the site is necessary. However, a single cleanup option (excavating contaminated soil and offsite disposal) was prepared for the site should ODEQ deem that a cleanup is warranted. This single option is described below and corresponding rationale are presented in Table 6-1. A summary of estimated costs associated with this option is presented in Table 6-2. Detailed preliminary cost estimates, including notes and assumptions, are provided in Appendix I. No further consideration was given to other cleanup methods since other cleanup methods, such as capping or in-situ bioremediation, are expected to have a much higher long-term cost than excavation and disposal.

The cost estimate included in this section was developed using unit prices contained in *RS Means Heavy Construction Cost Data* (RS Means 2016) and professional judgment based on costs at similar sites. The costs derived from the RS Means reference were adjusted using the RS Means City Cost Index for Medford, Oregon—the nearest similar sized city in the region. The quantities used have been estimated based on analytical data, site observations, and best engineering judgment. The work to be performed is intended to address the known environmental conditions resulting from past practices. Any additional costs incurred as a result of new or differing discoveries would be in addition to the projected estimated costs described in this section. The cost includes a 15% contingency to allow for unforeseen expenses. The estimate does not include additional study or investigation.

6.1 Option 1: No Cleanup Warranted

Sample results indicate that there was only limited contamination at the site and the contaminants that were present were detected at fairly low analyte concentrations. Lead slightly exceed its ODEQ recreational RBC value of 400 mg/kg at two sample locations, BP03SS01 (443 mg/kg) and BP04SS01 (455 mg/kg). Arsenic slightly exceeded its ODEQ regional background level of 12 mg/kg in samples PT07SS01 (19.4 mg/kg) and PT07SS02 (12.2 mg/kg). Thallium concentrations ranged from 2.1 to 3.9 mg/kg, exceeding its ODEQ regional background level of 0.31 mg/kg; however, the detected thallium concentrations are thought to be indicative of naturally occurring concentrations due to the narrow range of concentrations detected regardless of depth, as well as the that thallium was not a suspected contaminant of concern at the site. Lastly, zinc exceeded its ODEQ regional background level of 140 mg/kg in six samples, with concentrations ranging from 145 to 633 mg/kg: though it did not exceed the EPA RSL in for a residential setting.

Given the above information, it is possible that ODEQ may not deem that a cleanup at the site is necessary; however, this is only a speculation and it is strongly recommended that ODEQ be consulted regarding this determination prior to proceeding with any redevelopment.

6.2 Option 2: Contaminated Soil Excavation and Off-site Disposal

The cleanup option that is considered to be both cost-effective and protective involves excavating the soil that exceeds removal action levels and disposing of it at an off-site, licensed disposal facility. For this option, it is assumed that the power plant structure and foundation will remain in place.

The cost estimate assumes that the majority of the work, including grading and major earthwork, will be completed in one week. This is based on the assumption that a three-person construction crew will be employed. A three-person crew can likely complete the excavation work in one week; however, due to uncertainty regarding the number of haul trucks available and daily volume restrictions at the local landfill, five days are assumed.

The area to be excavated was determined by bounding those sample locations where lead was detected at concentrations exceeding ODEQ RBCs or where zinc exceeded ODEQ established background concentrations (as stated earlier, there are no ODEQ RBCs for zinc so the ODEQ background concentration was used as a default cleanup value). The soil to be removed includes a 1,700-square-foot area south of the power plant building and one smaller area, which is 25 square feet, at the northeastern corner of the power plant building. These areas are shown on Figure 6-1. Excavation depths of 12 inches are assumed for each of the excavation areas. The size and depth of the excavations are based on locations of samples exceeding Oregon risked-based cleanup concentrations. The total excavation volume is expected to be approximately 63 bank cubic yards (as measured in place prior to excavation), or approximately 95 tons. Following excavation, confirmation samples should be collected; however, the costs for this sampling work have not been included in the cleanup estimate.

Because of the relatively shallow depth of the excavations, no backfill material will be needed to fill the excavations. The excavated areas can be graded to match the surrounding sloping terrain to provide positive drainage. Post-excavation soil stabilization can be accomplished by placing a fast growing seed and straw or other mulch at relatively low cost. No asphalt or other improved surface is provided in the cost estimate.

The cost to excavate the three identified areas of contaminated soil and dispose these soils at a Subtitle D landfill is estimated to be $49,000, including indirect costs (planning, construction project management, design, and oversight).

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7 Findings and Summary

The Gold Hill Cement Power Plant (former) site is located within the city limits of Gold Hill, Oregon, approximately 0.5 miles northeast of the city adjacent to the Rogue River. The site is positioned near the center of an approximately 52.45-acre parcel of land bound by the Rogue River to the east and Sams Valley Highway (Highway 234) to the west. Many features, or portions of the features, associated with the Gold Hill Cement Power Plant (former) are present, including the headgate, water diversion channel, fish screens, fish ladders, and penstocks/gates power plant.

The Ideal Cement Company began construction of the current dam and power plant in late 1944. Construction was completed in about a year, with the plant going into operation sometime in late 1945 or very early 1946, generating a total of 25 kilowatts of power. Excess power was sold to the citizens of Gold Hill. In 1965, the Ideal Cement Company announced plans to shut down its Gold Hill plant because it was rapidly approaching obsolescence, and a new plant had been constructed in Seattle, Washington. The Ideal Cement Company's Gold Hill plant operated continuously until operations at the plant ceased on April 30, 1969.

The primary environmental concerns stem from a previous investigation that indicated the presence of both lead-based paint and asbestos. Due the site's age and use of power transmission equipment, PCBs and heavy range TPHs were also of concern. No previous environmental sampling had occurred on site.

With few exceptions, the TBA was conducted in accordance with the EPA-approved SQAP.

7.1 REC Findings

The following sections briefly reiterate the Gold Hill Cement Power Plant (former) outstanding RECs, the remaining environmental concerns at each (if any), and the findings of this TBA as it relates to each REC. Table 4-4 presents a summary of regulatory standard exceedances.

7.1.1 Lead Contaminated Soil and Sediment

Power Plant Perimeter - Surface Soil

Analytical results indicate the presence of three metals (lead, thallium, and zinc) at concentrations greater than ODEQ recreational RBC values or established ODEQ background concentrations in the surface soil samples collected from 0 to 6 inches bgs. Thallium and zinc were similarly detected in the surface soil samples collected from 6 to 12 inches bgs as well, though generally at slightly lower concentrations. Lead was only detected in the samples collected from 0 to 6 inches bgs. Of the eight samples collected from this area, lead exceeded the ODEQ recreational RBC value in two samples, while thallium and zinc exceeded the ODEQ background concentrations in five and four samples respectively (see Table 4-4). ODEQ does not currently have an established RBC for thallium or zinc. Thallium and zinc were also compared to their respective EPA RSLs in a residential scenario. Thallium exceeded this value in each sample where it was detected. However, as previously mentioned, detected thallium concentrations may indicate naturally occurring concentrations due to the narrow range of concentrations detected regardless of depth, and that thallium was not a suspected contaminant of concern at the site. Zinc did not exceed the EPA RSL for residential scenarios in any sample collected.

Based on the dioxin TEQs calculated for the three samples analyzed for dioxins/furans, there were no exceedances of the ODEQ RBC for mammals (including humans) in a recreational scenario.

It is possible, based on the analytical results, that surface soils near the south side of the power plant near sample locations BP03SS01 and BP04SS01 could require some degree of remediation, due to elevated lead concentrations.

Building Perimeter Sediment

Three metals were detected in the sediment samples collected from the east side of the power plant building. Cadmium slightly exceeded its ODEQ sediment bio-accumulation screening value in one of six samples, while both copper and nickel slightly exceeded their respective NOAA SQuiRT threshold effects levels (TEL) values in three of six samples (see Table 4-4). Neither nickel nor copper exceeded NOAA SQuiRT probable effects levels (PEL) values.

The dioxin TEQ calculated for the sample that was analyzed for dioxins/furans exceeded the NOAA SQuiRT (TEL) value, However, as previously mentioned, the TEQ value calculation used one-half of the detection limit for all or most compounds in the calculation and therefore, could be overly conservative.

Based on these analytical results, it is likely that the sediments on the east side of the power plant will not require remediation.

Gate House Surface Soil

One metal (thallium) exceeded its established ODEQ background level in one of four samples (GH02SS02) collected from the gate house. However, as previously mentioned, the detected thallium concentrations may indicate naturally occurring concentrations due to the narrow range of thallium concentrations detected regardless of depth, and that thallium was not a suspected contaminant of concern at the site.

7.1.2 Former Power Transmission Equipment Location

Arsenic exceeded both the ODEQ recreational RBC in the two samples where was detected, though both of these standards are considerably lower than the established ODEQ background level. ODEQ does not currently have established RBCs for thallium or zinc. Sample results indicate that arsenic, thallium, and zinc exceeded ODEQ background levels in the surface soils where the former power transmission equipment was located. Arsenic exceeded its ODEQ background level in two of 15 samples, thallium in six of 15 samples, and zinc in two of 15 samples collected from this area (see Table 4-4). When compared to the EPA RSL in a residential scenario, thallium exceeds this value in all samples collected. However, the detected thallium concentrations may indicate naturally occurring concentrations due to the narrow range of thallium concentrations detected regardless of depth, and that thallium was not a suspected contaminant of concern at the site. Zinc did not exceed the EPA RSL in a residential scenario in any sample collected.

7.1.3 Former Electrical Equipment (Power Plant Floor)

Based on the analytical results, if the concrete floor is to be removed, it is likely that the most heavily stained areas will require disposal as non-hazardous waste. Because much of the SVOC data was qualified as rejected, further sampling and analysis should take place to determine if the lightly stained and unstained areas of concrete are suitable for recycling.

7.2 Cleanup Options Summary

As indicated above, based on the level of contamination, the soils at the site may not require cleanup, however, ODEQ will need to make this determination. If ODEQ does determine that some degree of cleanup is warranted, the following cleanup option was developed. The recommended cleanup option will involve excavating soils where elevated concentrations of lead and zinc were present based on the sampling. Lead concentrations exceeded the Oregon risk-based concentration for recreational use and zinc concentrations exceeded the established ODEQ background concentrations (since there are no ODEQ RBCs for zinc, the ODEQ background concentration was used as a default cleanup value).

The cleanup option that is considered to be both cost-effective and sufficiently protective based on Oregon risk-based guidance involves excavating two areas of soil, totaling 1,725 square feet, to a depth of 12 inches. The soil, estimated to be 95 tons, will be disposed of at an off-site landfill. The cost for this option is estimated to be $49,000, including indirect capital costs (planning, construction project management, design, and oversight).

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Figures

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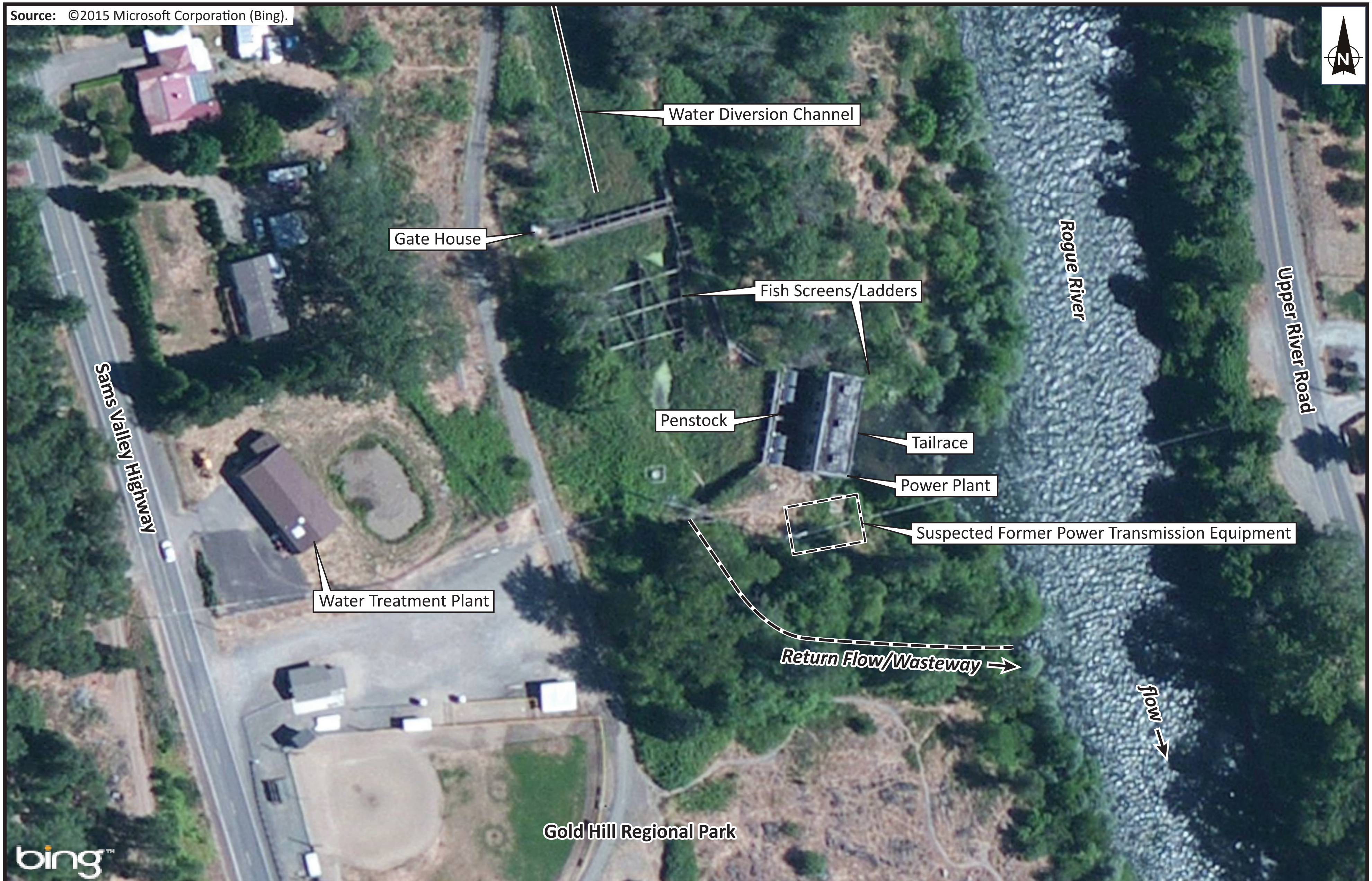
ecology and environment, inc.
Global Environmental Specialists
Seattle, Washington

GOLD HILL CEMENT POWER PLANT
(FORMER)
Gold Hill, Oregon

0 .25 .5
Approximate Scale in Miles

Figure 1-1
SITE VICINITY MAP

Date:	Drawn by:	
6/10/16	AES	10:START IV\15010009\fig 1-1



ecology and environment, inc.
Global Environmental Specialists
Seattle, Washington

GOLD HILL CEMENT POWER PLANT (FORMER)
Gold Hill, Oregon

0 50 100
Approximate Scale in Feet

Figure 2-1
SITE MAP (CLOSE UP)

Date:	Drawn by:	
1/27/16	AES	10:START IV\15010009\fig 2-1

ecology and environment, inc.
Global Environmental Specialists
Seattle, Washington

GOLD HILL CEMENT POWER PLANT (FORMER)
Gold Hill, Oregon

0 200 400
Approximate Scale in Feet

Figure 2-2
EXPANDED SITE MAP

Date:	Drawn by:	
7/21/16	AES	10:START IV\15010009\fig 2-2

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Image Source: Bing/Microsoft 2015

- Concrete Sample Locations
- Sediment Sample Locations
- Surface Soil Sample Locations

ecology and environment, inc. Global Environmental Specialists Seattle, Washington	GOLD HILL CEMENT POWER PLANT (FORMER) Gold Hill, Oregon	Figure 4-1 SAMPLE LOCATION MAP		
	0 25 50 100 Feet	Date: 7/21/16	Drawn by:	10:START IV\15010009\fig 4-1

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Image Source: Bing/Microsoft 2015

- Concrete Sample Locations
- Sediment Sample Locations
- Surface Soil Sample Locations
- Excavation Area

ecology and environment, inc. Global Environmental Specialists Seattle, Washington	GOLD HILL CEMENT POWER PLANT (FORMER) Gold Hill, Oregon	Figure 6-1 EXCAVATION AREA
	0 25 50 100 Feet	Date: 7/21/16 · Drawn by: · 10:START IV\15010009\fig 6-1