STAFF REPORT

RECOMMENDED REMEDIAL ACTION

For

J.H. Baxter & Co. Facility

EUGENE, OREGON

Prepared By

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY

May 2019

TABLE OF CONTENTS

Appendices

Acronyms and Abbreviations

ACDP	air contaminant discharge permit
ARL	acceptable risk level
Baxter	J.H. Baxter & Co.
bgs	below ground surface
BWUD	beneficial use determination
BWUS	beneficial use survey
CFR	Code of Federal Regulations
COC	chemical of concern
CY	cubic yard
DEQ	Oregon Department of Environmental Quality
DNAPL	dense nonaqueous phase liquid
ERA	ecological risk assessment
FIFRA	Federal Insecticide Fungicide and Rodenticide Act
FYR	Five year review
FS	feasibility study
gpm	gallons per minute
GSI	GSI Water Solutions, Inc.
HHRA	human health risk assessment
IC	institutional controls
IRAM	interim remedial action measures
LNAPL	light nonaqueous phase liquid
LRAPA	Lane Regional Air Protection Agency
mg/kg	milligram per kilogram
µg/l	microgram per liter
µg/kg	microgram per kilogram
MNA	monitored natural attenuation
NAPL	nonaqueous phase liquid
NPDES	National Pollution Discharge Elimination System
OAR	Oregon Administrative Rules
O&M	operation and maintenance
PAH	polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyls
PCP	pentachlorophenol
pg/g	picograms per gram
RAO	remedial action objectives
RI	Remedial investigation
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial design/remedial action
ROW	Right-of-way
SVOC	semivolatile organic compound
TEQ	toxic equivalent quotient
USDHHS	United States Department of Health and Human Services

VOC	volatile organic compounds

1. INTRODUCTION

1.1 INTRODUCTION

This document presents the recommended remedial action for the J.H Baxter & Co. (Baxter) Eugene facility (the Site) at 85 Baxter Street in Eugene, Oregon. This document was developed in accordance with Oregon Revised Statutes (ORS) 465.200 et. seq. and Oregon Administrative Rules (OAR) Chapter 340, Division 122, Sections 010 through 115.

The recommended remedial action is based on the administrative record for this site. A copy of the Administrative Record Index is included in Appendix A. This report summarizes the detailed information contained in the remedial investigation (RI), human health and ecological risk assessments, and feasibility study (FS) reports that have been completed under Oregon Department of Environmental Quality (DEQ) Consent Order No. ECSR-WVR-88-06, which went into effect on August 7, 1989.

1.2 SCOPE AND ROLE OF THE RECOMMENDED REMEDIAL ACTION

The recommended remedial action addresses the contamination at the site, including pentachlorophenol (PCP) in the groundwater on and offsite and arsenic, benzo(a)pyrene, dibenzo(a,h)anthracene, and dioxins/furans in soil onsite. DEQ has determined that these contaminants could pose an unacceptable risk if left unaddressed. The recommended remedial action consists of the following primary elements, which are described further in Sections 5.2 and 8:

- Excavation of contaminated soil in the ditch along the southern edge of the property and consolidating in the wood storage area before capping;
- Capping of the onsite contaminated soil and the sediments in the onsite pond with an engineered cap of asphalt and/or gravel;
- Hydraulic containment and contaminant removal using groundwater extraction and onsite treatment;
- Institutional controls (IC) to maintain soil cap integrity, protect areas with offsite groundwater contamination, and restrict groundwater use on the Site; and
- A periodic review of the remedial action and contingency planning.

2. SITE HISTORY AND DESCRIPTION

2.1 SITE LOCATION AND LAND USE

The Baxter-Eugene facility is located on 31.5 acres at 85 Baxter Street in northwest Eugene, Oregon, Township 17S, Range 4W, Section 27, Lane County (Figure 1). The Site latitude is 44.062133, longitude is -123.151536.

The Site and surrounding areas are generally flat and highly developed, consisting of a mix of industrial, commercial, and residential properties; railways; and public roads. Roosevelt Boulevard and the Roosevelt Channel border the site to the north and northwest. Commercial properties, including Yale Transport, Armored Transport, and Lile of Oregon, are located northeast of the facility along Roosevelt Boulevard. The Southern Pacific Railroad right-of-way (ROW) borders the Site to the south and there is a stormwater drainage channel along that property line. On the west is Zip-O-Log Manufacturing, Cascade Plating and Machine, and Heli-Jet. To the east, is Pacific Recycling.

2.2 PHYSICAL SETTING

2.2.1 Climate

Eugene receives an average of 49.4 inches of precipitation annually. The majority of the precipitation falls between November and March, with monthly totals ranging from 5.5 to 8.6 inches, with the highest rainfall in January. Precipitation totals for the remainder of the year are generally less than 1.5 inches per month. The average annual minimum and maximum temperature is 41.8°F and 63.3°F, respectively.

2.2.2 Geology

Eugene is located in the southern part of the Willamette Valley between the Cascades to the east and the Coast Range to the west. Topography in the vicinity is flat, and slopes gently toward Amazon Creek, located approximately two miles west of the Site. The ground elevation of the Site ranges from 390 to 395 feet above mean sea level.

The Eugene area is predominately underlain by unconsolidated alluvial deposits of Quaternary age. The deposits are broken down into older and younger alluvial deposits, which are both composed of sands and gravels, with intermixed silt and clay materials. The facility is situated on the older alluvium, which is estimated to be approximately 150 to 200 feet thick beneath the Site (Keystone, 1991). Based on numerous boreholes and wells completed by Baxter, the older alluvium consists of interbedded layers of heterogeneous clay, silt, sands, and gravel. Figure 2 shows cross-section lines for the Site, and Figures 3 and 4 show the corresponding geologic cross-sections.

2.2.3 Hydrogeology

Three water-bearing zones have been identified beneath the facility and in the surrounding area: a shallow water-bearing zone, an intermediate water-bearing zone, and a deeper water-bearing zone. In between these zones are discontinuous layers of fine-grained sediments that serve to slow groundwater movement between these primary water-bearing zones; however, these fine grained strata do not prevent vertical groundwater migration, as proven by geologic, pump test data, and chemical data.

The shallow water-bearing zone is present in the sandy gravel beneath a surficial silty clay layer, and is present at depths from approximately 10 to 30 feet below ground surface (bgs). Groundwater flows to the north-northwest in this shallow zone, under a horizontal hydraulic gradient of 10^{-02} to 10^{-03}. Between the shallow water-bearing zone and the intermediate water-bearing zone is a discontinuous silty sand and gravel unit.

The intermediate water-bearing zone is present beneath most of the facility. The top of this zone starts at depths of approximately 20 feet bgs on the eastern portion of the facility to approximately 40 feet bgs west of the facility, and the bottom of the intermediate zone is approximately 60 to 80 feet bgs. Groundwater flows in this zone to the northwest, with a horizontal hydraulic gradient of approximately 10^{-03}. A discontinuous layer of fine-grained silts and clay delineates the bottom of the intermediate zone.

The deeper water-bearing zone is present beneath the facility at a depth beginning at approximately 80 to 100 feet bgs, and is comprised of primarily of sandy gravel.

The depth to groundwater varies seasonally and typically is first encountered between five and 10 feet bgs. Vertical hydraulic gradients may be upward or downward depending on the seasonal recharge and localized pumping effects. At the northern facility boundary, a groundwater capture zone has developed around the existing groundwater extraction wells in both the shallow and intermediate zones (Baxter, 2010b).

2.2.4 Surface Water and Stormwater Features

Ditches and canals, built in the 1950s, control the surface water drainage near the Site. Rain falling on the facility gets collected through a series of onsite ditches and sumps that then get pumped into an onsite treatment system. This includes a settling pond, storage tanks, treatment tanks, and piping to a discharge point, called Outfall 001, which enters a ditch on the south side of the Site and connects to Roosevelt Channel. DEQ's Water Quality Program oversees the collection, treatment, and discharge of the stormwater through the facility's National Pollutant Discharge Elimination System (NPDES) permit. Beyond the site, Roosevelt Channel drains into the lower Amazon Creek Watershed, which drains west and north through Fern Ridge Reservoir and the Long Tom River to the Willamette River about 40 miles north of Eugene (Keystone, 1991).

2.3 PLANT OPERATIONS

2.3.1 Physical Plant

Baxter first developed the Site as a wood treatment facility in 1943. Before 1943, the area was undeveloped farmland. Figure 5 presents the general site layout and location of historical features. The earliest treating processes used creosote formulations in a single retort (Retort 82). In 1945, they added a second retort (Retort 83) for treating wood products with PCP. In 1952, the facility starting using metals-based treating solutions, and in 1955 began treating wood products with fire retardants, used to reduce the flammability of the product. Additional retorts were added in 1966 (Retort 84), 1967 (Retort 81), and 1970 (Retort 85).

According to the RI report (Keystone, 1991), between 1945 and 1955, a burn pit reportedly was used to dispose of waste onsite. The burn pit, which was approximately 40 square feet and 4 feet deep, was located northeast of the former log pond (see Figure 5).

A log pond historically was located on the southwestern portion of the facility (Figure 5). Raw logs were stored in this pond to prevent staining and to soften the wood before milling. During the mid-1970s, Baxter purchased the property that included the log pond and filled it in to construct a stormwater retention pond. The pond was initially sealed by distributing bentonite on top of the water and allowing it to sink and expand, forming a loose seal (Keystone, 1991). Bentonite was added again in the late 1990s to more effectively seal the pond. The existing pond is approximately 0.75 acre in size and five feet deep.

Currently, the Eugene facility processes untreated wood products to produce treated wood products. Processing includes framing, trimming, marking, seasoning, and treatment. The finished products, which include dimensional wood products, guardrails, crossarms, poles, and pilings, are shipped to utilities and other users by truck or rail. The main elements of the pressure treatment system, processes and handling of treated products are summarized below:

- Five retorts are currently in use onsite for pressure treatment of wood products.
- Chemicals used include:
    - creosote,
    - PCP,
    - Chemonite® (ammoniacal copper zinc arsenate), and
    - ACQ (ammoniacal copper quat).
- Retort 85 utilizes PCP for wood treatment and there are several process and storage tanks associated with this area (Figure 5).
- South of Retort 85 is the main pressure treatment area, which includes the remaining four retorts (Retorts 81, 82, 83, and 84), and multiple work, process, and storage tanks (also shown on Figure 5).

- The ground surface beneath all retorts and tanks is paved, but approximately 80% of the remaining facility is unpaved.
- All of the retorts have concrete drip pads.

Untreated wood products are placed in the retorts and conditioned according to preservative type and customer specifications. Then, heated treating solution is applied to the retort under pressure. Following application of the pressurized treatment solution, the excess preservative is removed from the retort. Water and oil removed during the conditioning process are transferred to an oil/water separator where the oil is recovered and recycled in the system. In-process water leaving the oil/water separator is recovered or evaporated. Treated wood products are removed from the retort and kept on sealed drip pads until all dripping has ceased.

Pressure-treated products are moved to the treated wood storage areas located throughout the facility, placed on skids for storage, and ultimately shipped offsite by truck. Untreated wood products are stored throughout the facility. In late 2007, the eastern portion of the facility was capped with 12 inches of gravel fill, as part of an interim remedial action measure (IRAM) approved by DEQ. A boundary line adjustment was completed in 2009 and the IRAM capped area is now a separate tax parcel owned by Pacific Recycling.

2.3.2 Chemical Use and Waste Generation and Management

PCP, creosote, Chemonite®, and other metal-based treating solutions are registered pesticides under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), and have been used for treating wood products at the facility. Baxter recycles and reuses process residuals and wastewater in accordance with the federal Resource Conservation and Recovery Act (RCRA). In addition, under Baxter's *Incidental and Infrequent Drippage Plan* (Baxter, 2013), soil is inspected daily during operations and any liquid or stained soil is collected and disposed of as hazardous waste. Hazardous wastes generated at the Eugene facility are managed in accordance with federal, state, and local regulations. Hazardous wastes generated onsite are shipped offsite for disposal. Before shipment, the wastes are stored in a hazardous waste accumulation area (Figure 5).

3. RESULTS OF INVESTIGATIONS

3.1 NATURE AND EXTENT OF CONTAMINATION

Investigations of contamination in the soil, groundwater, and surface water began in 1981, roughly 38 years after Baxter began operations. Contaminants of interest included metals, semi-volatile organic compounds (SVOC), volatile organic compounds (VOC), polychlorinated biphenyls (PCBs), and polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (dioxins/furans). All of these were discovered in soils onsite, but the primary contaminant of concern off-site was pentachlorophenol (PCP) in the groundwater, an SVOC that is a common ingredient in wood treatment products.

In 1989, Baxter entered into a Consent Order with DEQ to conduct an RI, and ecological and human health risk assessments. On October 26, 1990 DEQ amended the Consent Order to include the submittal and implementation of a groundwater monitoring work plan. A second addendum, dated September 16, 1994, required the completion of additional investigation and a feasibility study to evaluate cleanup alternatives.

Characterization of the nature and extent of contaminants at the site was performed during the two phases of remedial investigation. Phase I included an RI and human health risk screening in 1991 (Keystone, 1991). Phase II was submitted to DEQ in 1994 (Keystone, 1994). This report included data from additional wells, boreholes, surface soils, sediment, and surface water.

Following the Phase I and Phase II RI reports, several additional investigations have been conducted at the Site, including an ecological risk assessment (Keystone, 1999), a revised baseline human health risk assessment (HHRA) (Baxter, 2006a), and a HHRA addendum (AMEC, 2014). The key findings of these investigations are provided in the following subsections.

3.1.1 Groundwater

The HHRA evaluated all of the contaminants of concern detected in the groundwater and found that PCP posed an unacceptable risk to humans (Baxter, 2006a). The extent of PCP in shallow and intermediate water-bearing zones from 2014 through the most recent (2018) data is shown in Figures 6 and 7, respectively. Figure 6 also shows the approximate source areas for PCP. As can be seen in the figures, groundwater contamination extends further in the intermediate zone, to the north and west beneath neighboring properties.

Besides the dissolved PCP in groundwater, small quantities of dense nonaqueous-phase liquid (DNAPL) and light nonaqueous-phase liquid (LNAPL) were detected on the groundwater at monitoring wells W-2S (located near the stormwater retention pond) and

W-8S (located near the former burn pit) from 1986 to the late 1990s, as shown in Figure 8. Observations in these wells for at least the last five years, though, have not noted any NAPL and there has not been NAPL observed in any other wells at or near the facility.

In 2002, Baxter evaluated the possibility of extraction of NAPL from wells W-2S and W-8S (Baxter, 2002b), but the quantity and mobility were too low in both wells to successfully recover any product. The RI Summary Report (Baxter, 2010b) and the 2011 FS Report (Baxter, 2011) summarize these findings.

3.1.2 Surface Water

Surface water from Roosevelt Channel and the ditch leading from the stormwater retention pond, where Outfall 001 is located, were sampled in 1990, 1993, 2000, and 2001 for metals, SVOCs, and PCP. Chemicals from all three analyte groups were detected at low levels. To look at a worst case scenario, the risk assessment considered the potential for an unacceptable risk if a child were to swim in the channel for several hours, but even under this extreme case, the concentrations were too low to pose an unacceptable risk. Due to the stormwater collection and treatment system, which was installed in 1997 and will be upgraded under the NPDES permit, concentrations of site-related contaminants in surface water should continue to decline with time. Thus, the risks from exposure to surface water leaving the site are very low.

3.1.3 Soil

Both surface soil, from 0-3 feet below ground surface (bgs), and subsurface soil (greater than three feet bgs), have been sampled at the Site for a wide variety of general chemistry parameters and contaminants of interest. A map illustrating the sample locations in surface and subsurface soil is shown in Figures 9 and 10. PCP was detected in 17 of 61 surface samples and 18 out of 76 subsurface samples. The highest concentration of PCP was detected at B-11 near the main wood treating area at a concentration 182 milligrams per kilogram (mg/kg).

In general, PCP concentrations in both surface and subsurface soil are highest in the main wood treating area and near the former burn pit, where PCP solutions were handled for pressure treating the wood. PCP concentrations in the soil away from the main treatment area and former burn pit are generally lower or below method reporting limits.

Total PAHs were detected in 57 of 62 surface soil samples and 41 of 66 subsurface soil samples. The highest total PAH concentration was from soil excavated from the drip pad area during construction of new drip pads in 1992 (Baxter, 2010a). The distribution of PAHs in soil is similar to that of PCP.

Metals, including arsenic, chromium, copper, and zinc, were detected in nearly all of the surface and subsurface soil samples analyzed. The maximum concentrations in surface soil were 2,390 mg/kg; 468 mg/kg; 4,090 mg/kg; and 1,790 mg/kg, respectively and located southeast of the main treating area. Maximum concentrations for these four metals were all lower at deeper levels. Metals concentrations in areas away from the main treatment area are considerably lower (Baxter, 2010a).

Dioxins/furans were analyzed in nine surface soil samples (Figure 10a). Dioxins/furans concentrations ranged from 2.32 picograms per gram (pg/g) near the southern property line to 1,400 pg/g toxic equivalent quotient (TEQ) in the soil pile. Baxter later removed the soil pile and disposed of the soil at an appropriate disposal facility; however, unacceptable concentrations of dioxins remain in the surface soils.

Residual NAPL was observed in soil near the main treatment area, the stormwater retention pond, and the former burn pit during the remedial investigation. Figure 8 shows these areas. They coincide with the highest concentrations found in soil samples. As discussed earlier, Baxter made an effort to collect the NAPL, but the quantity and mobility is too low to effectively recover.

3.1.4 Sediment

Sediment samples were collected in 1990, 1993, 1996, 1998, and 2003 from locations in and around the Baxter facility. Sediment samples from the drainage ditch at the southwest corner of the Site were combined with soil data in subsequent analyses. Sediment samples from Roosevelt Channel were evaluated as a separate data set, and included low level detections of arsenic, dioxins/furans, and some PAHs. Figure 3-4 in the Remedial Investigation Summary Report (Baxter. 2010a) shows the sediment sample locations.

3.1.5 Air

Air discharges from active operations are regulated by an Air Contaminant Discharge Permit (ACDP) issued by the Lane Regional Air Protection Agency (LRAPA). The air permit addresses ongoing operations, and permitted discharge limits are below levels that would endanger human health and the environment. In addition, a health consultation was performed by the United States Department of Health and Human Services (USDHHS) and Oregon Department of Human Services, based on air monitoring data from the Site (USDHHS 2007). The health consultation considered exposure of near-by residents to site-related emissions. The report concluded that adverse health effects are not anticipated from exposure to emissions from the Site (USDHHS 2007). In addition to the health consultation, the HHRA (Baxter 2006a) also considered the potential for exposure chemicals volatilizing from soil and groundwater, and from air dispersion of dust-borne particulate. DEQ determined that these pathways did not pose a risk based on the historical data and the remedial action proposed will further reduce any potential for exposure. LRAPA will continue to address all current air emissions under the ACDP permit.

3.2 RISK ASSESSMENT

The results of the risk assessment for human health and potential ecological receptors at the Site are summarized below. More detail is available in the following documents:

- *Ecological Risk Assessment of J.H. Baxter & Co., Eugene, Oregon Plant Site*. Keystone (1999).
- *Draft Human Health Risk Assessment, J.H. Baxter & Company, Eugene, Oregon Facility*. Baxter (2002c).
- *Revised Baseline Human Health Risk Assessment*. Baxter (2006a).
- Technical Memorandum: *Revised Baseline Human Health Risk Assessment Addendum.* AMEC (2013).
- Technical Memorandum: *Revised Baseline Human Health Risk Assessment Addendum.* AMEC (2014).

3.2.1 Conceptual Site Model

Figure 11 presents the hydrogeological conceptual site model for the Site, including the sources and releases of contaminants of concern (COCs), generalized hydrogeologic information, and COC distribution and potential movement at the facility. Based on the current understanding of land and groundwater use conditions at or near the facility, potential current and future human exposure scenarios evaluated in the HHRA included the following:

Table 1. Risk Conceptual Site Model
Pertinent Human Health Pathways and Receptors

Source	Exposure Pathway	Receptor Scenario
Onsite Soil	Ingestion and Dermal Contact	Occupational Worker, Construction and Excavation Workers
Onsite Soil	Inhalation of soil dust	Occupational Worker, Construction and Excavation Workers
Offsite Soil	Ingestion and Dermal Contact	Residential, Occupational Worker, Construction and Excavation Workers
Onsite Groundwater	Incidental ingestion and dermal contact	Excavation Workers
Offsite Groundwater	Incidental ingestion and dermal contact	Residential use for irrigation, and Occupational Worker
Offsite Surface Water and	Incidental ingestion and	Residential –recreation in

Sediment in Roosevelt Channel	dermal contact	channel
Offsite Groundwater	Ingestion	Residential - consumption of vegetables irrigated with groundwater

Table Notes:

1. Onsite groundwater exposure to an industrial worker was not evaluated because groundwater is not used on site for drinking purposes. City water is used for the water source on site, except for treated groundwater from the onsite treatment system being used for dust suppression in dry months.

2. Ingestion of offsite groundwater as a drinking water source is considered unlikely because the homes and businesses in the immediate vicinity of the facility are connected to the city water supply. The Beneficial Water Use Determination (BWUD), completed in 2002, indicated no domestic wells were being used for drinking water within the plume area (Baxter 2002a). Seven irrigation wells were identified during that search. An updated well search was completed of the Oregon Department of Water Resources data base in 2015 and only one new irrigation well was identified. Please see Section 3.3 below for a more detailed description of that determination. Once the remedy is in place, the BWUD will be updated on a regular basis.

3.2.2 Human Health Risk Screening

All contaminants of interest were screened against the DEQ risk-based screening levels. Chemicals and pathways that exceeded the screening levels were carried through for detailed evaluation in the baseline risk assessment.

3.2.3 Human Health Risk Assessment

Quantitative risk estimates were calculated for all complete exposure pathways, listed in Table 1. The results of these calculations are described in detail in the HHRA (Baxter, 2006a) and HHRA Addendum (AMEC, 2014), and summarized below.

The risk estimates were the result of a HHRA for current and hypothetical future receptors and exposure routes. The risk assessment reports listed above describe in detail the procedures used to evaluate the potential risks associated with the chemicals and media retained for evaluation following the screening step, and identify areas of the site where the calculated risks are greater than DEQ's acceptable risk levels as defined in OAR 340-122-0115

The risk assessments found unacceptable risk for the pathways and contaminants listed in Table 2.

Table 2. Pathways and Contaminants Requiring Remedial Action

Exposure Pathway	Receptor Scenario	Contaminants of Concern
Onsite Soil		
Ingestion and Dermal Contact	Occupational Worker, Construction and Excavation Workers	arsenic, benzo(a)pyrene, dibenzo(a)anthracene, and dioxins/furans
Onsite Groundwater		
Incidental Ingestion and Dermal Contact	Construction and Excavation Workers	benzo(a)pyrene, dibenzo(a)anthracene, and PCP
Offsite Groundwater		
Incidental ingestion and dermal contact	Residential users during irrigation practices	PCP, benzo(a)pyrene, dibenzo(a)anthracene, and dioxins/furans[1]
Incidental ingestion and dermal contact	Industrial Workers during irrigation practices	PCP[2]

1. Dioxins/furans were retained as COCs for residential contact with offsite groundwater because the laboratory methods could not achieve a low enough detection level to eliminate with certainty the potential for unacceptable risk. However, no dioxins or furans were actually detected in the groundwater and these chemicals, under normal environmental conditions, do not dissolve in water. Therefore, DEQ has determined there is no additional remedial action necessary for the groundwater based on this artifact of the laboratory limitations.
2. The PAHs and dioxin/furans do not pose a risk for industrial workers because of the minimal exposure time.

Only the shallow and intermediate water-bearing zones were identified as posing potential human health risk from exposure to groundwater. Contamination did not impact the deeper zone to a degree that poses unacceptable risk.

The risk assessment concluded that there was no unacceptable risk from direct contact with soil or sediment or to recreational users of surface water in Roosevelt Channel. Additionally, there was no unacceptable risk associated with consuming home-grown fruits and vegetables that are irrigated with water from off-site wells.

3.2.4 Ecological Risk Assessment

A qualitative ecological scoping assessment was performed as part of the Phase II RI for the Site in 1994, which led to a more detailed, quantitative ecological risk assessment in 1999 (Keystone, 1999). All contaminants of interest were screened for risk to soil invertebrates, plants, avian species, and small mammals. Dioxins and furans were carried through the screening due to their bioaccumulative nature, but given the concentrations, the size of the impacted area, and number of each species in the area, the assessment concluded that the site contamination does not pose an unacceptable risk to any of these receptors.

3.3 BENEFICIAL USE AND HOT SPOT DETERMINATION

3.3.1 Groundwater Beneficial Use Determination

A BWUD for groundwater was performed in 2002 (Baxter, 2002a). Beneficial uses were evaluated for each water-bearing zone considering current use and the following factors:

- Historical land and water uses
- Anticipated future land and water uses
- Concerns of community and nearby property owners
- Regional and local development patterns
- Regional and local population projections
- Availability of alternate water sources

The BWUD showed the reasonably likely future beneficial use is irrigation and industrial use. No drinking water wells were identified in 2002 within the area of the plume. However, seven irrigation wells have been located within this area. The detailed results of the determination are presented in the feasibility study (GSI, 2016). An updated well search was completed on the Oregon Department of Water Resources data base in 2015 and no new drinking water wells were identified. One new irrigation well was identified. The detailed results of the determination are presented in the feasibility study (GSI, 2016).

3.3.2 Surface Water Beneficial Use Determination

The main surface water feature in the locality of facility is the Roosevelt Channel, which drains into Amazon Creek approximately two miles to the west. This channel serve as the area's stormwater drainage channel. Minor surface runoff drainage ditches to the east, south along the railroad tracks, and to the west of the facility all flow into Roosevelt Channel. Beneficial use could include irrigation, occasional recreation, fish and aquatic habitat, and the aesthetic quality of Amazon Creek and the Willamette River.

3.3.3 Hot Spots

As previously discussed in Section 3.3.1 the future beneficial use of groundwater in the locality of the facility is irrigation and industrial purposes. Because concentrations of PCP in groundwater exceed proposed cleanup levels for the designated beneficial uses, the groundwater plume shown in Figures 6 and 7 is considered a hot spot for the Site.

NAPL present at the Site is in the form of residual (or non-mobile) NAPL, consequently, there are no hot spots related to NAPL because it is not expected to migrate.

Hot spot concentrations were exceeded for arsenic in surface and subsurface soils as shown on Figure 11a. Soil hot spot areas at the facility include the main treatment area and other areas where other operations were conducted.

3.4 PILOT TESTS AND INTERIM REMEDIAL ACTIONS

Several pilot tests and IRAMs have been performed at the facility. These are described in the RI report (Keystone 1991) and are summarized below.

3.4.1 Groundwater Extraction and Treatment System

In 1993, Baxter installed a groundwater extraction and treatment system, which extracts from three wells located on the north and northwest boundaries of the site. One well, W-13S, is in the shallow zone, while the other two W-13I and W-20 are in the intermediate zone. They have a combined flow rate of approximately 50 gallons per minute (gpm). The groundwater is treated by flowing through an equalization tank, aeration tank, sand filter, and activated carbon units, which have been operational since January 1994. The treated water is sampled at the effluent and then discharged into Roosevelt Channel at Outfall 002 in accordance with the NPDES permit.

3.4.2 Stormwater Treatment System

Baxter installed a collection and treatment system for onsite stormwater in 1997. The system consists of catch basins located around the facility, aboveground piping to three 1-million-gallon storage tanks, flocculation and precipitation systems, and granulated activated carbon treatment. Treated stormwater is discharged to Outfall 001 under the current NPDES permit.

The 0.75-acre retention pond in the southwest corner of the facility is filled seasonally by precipitation and groundwater infiltration. On infrequent occasions, this pond receives overflow from the stormwater storage tanks. There is occasional overflow from the pond through a v-notch weir into the adjacent ditch. These overflows occur during extreme rainfall events so upgrades are planned for this system, to help eliminate overflows, concurrent with the implementation of the remedial action for the contamination. This systems and the discharges are overseen by the DEQ Water Quality Program through the NPDES permit, which requires regular sampling, reporting, and upgrades.

3.4.3 Offsite Tax Lot Removal Action

In October and November 1999, under DEQ oversight, Baxter conducted interim removal actions at three tax lots off the northeast corner of the Site (see Figure 5). These sites had arsenic concentrations in soil above DEQ risk-based levels. Four separate areas on the three tax lots were remediated by excavation and removal of 416 cubic yards of soil

(Baxter 2010a). Soil with concentrations above the DEQ hot spot levels were shipped offsite for disposal. Soil with concentrations below hot spot levels, but above the 10^{-6} cleanup standard was used to construct the tank base for two stormwater tanks installed in 2001, as described below (Baxter 2010a). Prior to the implementation of this removal action, DEQ held a 30-day public comment period and held a public meeting to present the proposed cleanup.

3.4.4 Stormwater Tank Base Cap

In August 2001, Baxter installed two one-million-gallon stormwater storage tanks (T-102 and T-103 on Figure 5) to upgrade their onsite stormwater treatment system per requirements in their NPDES permit. The soil in the installation area contained unacceptable levels of arsenic, so Baxter added a portion of the arsenic-contaminated soil excavated from the off-site tax lots as mentioned above. Then constructed a protective, engineered cap over the impacted soils to create a foundation for the new tanks. The cap consisted of placing a geotextile liner over the impacted soil, and then topping it with 12 inches of imported crushed rock. The tanks were then placed over the rock. DEQ considers this protective of the workers on site as long as the tanks are in-place and the soil cap is maintained. These requirements will be included in institutional controls for the site.

The onsite containment of contaminated soil from the offsite tax lots required a RCRA Hazardous Waste Exemption. The exemption was granted by DEQ on July 20, 2001 in accordance with (ORS) 465-260(2), OAR 340-122-0070, and ORS 465.315(3) (DEQ 2001, Baxter 2010a).

4. PEER REVIEW SUMMARY

A project team consisting of a project manager, hydrogeologist, engineer, and a toxicologist have been involved throughout the course of this project. Team members have reviewed project documents such as work plans, draft and final versions of the RI, FS, HHRA, and interim remedial action plans, and have submitted comments on these documents. Team members have also participated in various meetings with Baxter and their consultants to discuss the investigation, risk, and remedial options. Written comments, final documents, and DEQ's written approvals are maintained in the project file, and are a part of the Administrative Record for the Site, under ECSI# 055. The project team unanimously supports the recommended remedial action.

5. DESCRIPTION OF REMEDIAL ACTION OPTIONS

5.1 REMEDIAL ACTION OBJECTIVES

Based on the Oregon Cleanup Statute (ORS 465.200 through 465.900) and the Oregon Environmental Cleanup Rules (OAR 340-122); consideration of other laws, standards, and guidance; and the results of the remedial investigation and risk assessment; the following cleanup levels and remedial action objectives have been selected for soil and groundwater.

5.1.1 Cleanup Levels

The cleanup levels are equal to concentrations that meet the acceptable risk level (ARL), as defined in OAR 340-122-0115(1) through (6), except arsenic, whose cleanup level is equal to the naturally-occurring background level. This means the site is not contributing any additional risk beyond the naturally occurring levels of arsenic. The following acceptable cleanup levels were calculated for groundwater and soil to protect the identified beneficial uses and potential receptors:

	Cleanup Level (µg/L)		**Cleanup Level (mg/kg)**	
COC	**Groundwater**		**Soil**	
Arsenic	N/A	a	18	c
Pentachlorophenol	1.5 (industrial), 0.65 (residential)	b	N/A	a
Benzo(a)pyrene	N/A	a	0.27	d
Dibenzo(a,h)anthracene	N/A	a	0.27	d
Dioxins/furans*	N/A	a	2×10^{-5}	d

[a] N/A = Not applicable because chemical is not a COC for given medium.
[b] Risk-based concentrations protective of industrial (non-drinking) groundwater use and offsite residential irrigation, respectively.
[c] DEQ South Willamette Valley regional background, DEQ (2013).
[d] Risk-based concentration protective of direct contact with soil by onsite workers.
COC = chemicals of concern, µg/L = microgram per liter, µg/kg = microgram per kilogram
*Dioxin/furan cleanup level is the TEQ value.
All cleanup levels developed from exposure factors from 2018. These will be revaluated at five-year reviews and updated as appropriate to ensure protectiveness.

5.1.2 Remedial Action Objectives

Site-specific RAOs were developed for soil and groundwater for the purpose of achieving protection of human health, ecological receptors, and beneficial uses, as required by OAR 340-122-0040. The RAOs for the Site are:

Soil:

- Prevent human exposure to onsite surface and subsurface soil, including hot spots, containing COCs, including arsenic, benzo(a)pyrene, dibenzo(a,h)anthracene, and dioxins/furans, at concentrations above DEQ's acceptable risk levels. The current cleanup levels are listed in Section 5.1.1.

Groundwater:

- Prevent human exposure to PCP in groundwater above the ARLs onsite and offsite.
- Prevent or minimize further offsite migration of COCs.
- Reduce the concentrations of COCs in offsite groundwater to achieve cleanup levels, or to the lowest concentrations feasible above those levels with active treatment, and to protect human health and the environment.

5.2 REMEDIAL ACTION OPTIONS

General response actions and remedial technologies were screened in the FS (GSI, 2016). The general response actions considered included soil excavation and disposal, capping, groundwater containment, groundwater extraction and treatment, in situ biological treatment and recirculation, monitored natural attenuation (MNA), institutional and engineering controls. Several remedial technologies were evaluated for each general response action. Viable response actions and technologies that can meet the RAOs were assembled into remedial action options, which are described in detail in the FS (GSI, 2016).

The following six remedial alternatives were evaluated and are further summarized in the sections below:

- Alternative 1: No Action
- Alternative 2: Capping, Hot Spot Excavation and Consolidation, Enhanced Groundwater Extraction, MNA
- Alternative 3: Capping, Hot Spot Excavation and Disposal, Enhanced Biodegradation Recirculation System, MNA
- Alternative 3a: Capping, Hot Spot Consolidation and Capping, Groundwater Extraction and Treatment, Updated Beneficial Water Use Survey with Contingency Plan for Offsite Groundwater Use, MNA
- Alternative 4: Capping, Hot Spot Excavation and Disposal, Physical/Hydraulic Containment, MNA
- Alternative 5: Excavation, Offsite Disposal, and MNA

5.2.1 Alternative 1: No Action

The “no action” alternative serves as a baseline to compare other remedial alternatives. The feasibility study considered this alternative to include the continued operation of the existing groundwater extraction and treatment system, the existing groundwater monitoring program, and institutional controls (ICs) with no additional remedy. However, this alternative should envision that no remedial action would occur, including the currently ongoing groundwater extraction and treatment system and the existing groundwater-monitoring program. Under this alternative, these activities would stop.

5.2.2 Alternative 2: Capping, Hot Spot Excavation and Consolidation, Enhanced Groundwater Extraction, MNA

Alternative 2 uses containment technology (e.g., an engineered cap over the contaminated material) to minimize the risk from site soils, consolidation of hot spot soils, enhanced groundwater extraction for treatment of groundwater, and monitored natural attenuation (MNA). This alternative is depicted in Figure 13.

Capping
For the purpose of this alternative (as well as alternatives 3 and 4), an area of approximately 16 acres would be capped. Areas at the Eugene facility that are already paved would not require further remediation, as the asphalt cap effectively serves as a barrier to site soils. However, all paved areas will require repairs and other maintenance that would be conducted as part of ongoing operations, under a facility maintenance plan.

Affected soils at the facility would be contained by a geotextile fabric cover, followed by approximately 12 inches of clean asphalt, concrete, or gravel, after compaction. Installation of the cap itself will utilize common construction methods. Delivered fill material will be rough graded in six-inch lifts using a bulldozer. Once each lift is graded, the surface will be smoothed, then compacted with a vibratory compactor to prepare the final surface. This final surface will be used to create the drainage patterns needed to allow precipitation to drain toward the stormwater catch basins, which then are directed to the stormwater treatment system.

In some areas, asphalt or concrete may be used instead of gravel material for the cap. Use of asphalt or concrete has advantages of decreasing the infiltration of precipitation into the subsurface, and provides a better surface for heavy equipment.

Consolidation
Soil material from the hot spot areas would be excavated to a depth of approximately 5 feet bgs based on sample results. These contaminated soils would be consolidated into the area presently occupied by the pond located at the southwest corner of the Site (Figure 13). Prior to placement in the pond, the pond would be drained and lined with an impermeable, synthetic liner to prevent infiltration and migration of COCs.

In addition to the hot spot soils, contaminated soil from the ditch located in the southwest corner of the Site would be excavated and consolidated in the pond. Once all of the contaminated soil is placed over the liner, they would be compacted, and covered with an engineered cap designed to minimize water infiltration.

Enhanced Groundwater Extraction
Alternative 2 includes the removal of existing recovery wells W-20I and W-13I. Four new recovery wells would be installed just downgradient of and in an arc around the Main Treatment Area at locations and depth configurations to optimize extraction of contaminants. The proposed locations of the wells for the evaluation of this option are shown in Figure 13.

Extracted groundwater would be conveyed to the existing stormwater treatment building via underground pipes, and treated using conventional granulated activated carbon methods. A new treatment system (pipes, valves, and carbon vessels) would be added to the existing stormwater system. Treated groundwater would be discharged to the surface ditch as part of the NPDES permit.

MNA
A long-term groundwater monitoring program would be implemented as part of the MNA component of all alternatives per the Revised Monitoring Program (Baxter, 2015b) that would be updated and included in the Remedial Design/Remedial Action (RD/RA) work plan. The long-term monitoring program would involve the use of existing facility monitoring wells.

5.2.3 Alternative 3: Capping, Hot Spot Excavation and Disposal, Enhanced Biodegradation Recirculation System, MNA

Alternative 3 uses containment technology (e.g., an engineered cap) to minimize the risk from site soils, offsite disposal of hot spot soils, enhanced biodegradation recirculation system for treatment of groundwater, and MNA. Alternative 3 is depicted in Figure 14 and described below.

Capping
The engineered cap for this alternative would be the same as in Alternative 2. Ditch material at the southwest portion of the facility would be excavated and spread as thin fill over other contaminated soils prior to capping, rather than being consolidated in the pond.

Hot Spot Soil Excavation and Disposal
Excavation of hot spot material would be similar to Alternative 2, but instead of placement into a consolidation area, affected soils would be transported and disposed of at an offsite facility.

Enhanced Biodegradation Recirculation System

Alternative 3 uses groundwater recovery wells to provide a hydraulic flow barrier and would effectively capture the plume; however, the water being pumped would not be brought to the surface and treated. Instead, the recovered water would be treated in situ by recirculating it through the vadose zone via an aeration trench to, in effect, form a large biological treatment cell. The design also includes a layer of crushed limestone to increase the groundwater's pH to optimum levels for degradation. The well and trench layout shown on Figure 14 was established to accommodate constraints imposed by the configuration of the facility.

This alternative assumes that water is pumped from extraction wells placed in an arc just downgradient of the Main Treating Area. Water is pumped from each well at flow rates of 10 gpm each for a total flow of 60 gpm. The pumped water is returned to the aquifer via an infiltration gallery located approximately 100 feet upgradient of the arc of extraction wells. This alternative assumes no treatment of extracted water; rather it is recirculated back into the ground at a reduced concentration resulting from exposure to oxygen and percolation through the infiltration gallery and unsaturated soil.

MNA
Long-term groundwater monitoring program would be conducted as part of the MNA component, as described for Alternative 2.

5.2.4 Alternative 3a: Capping, Groundwater Extraction and Treatment, Updated Beneficial Water Use Survey with Contingency Plan for Off-site Groundwater Use, MNA

Alternative 3a includes some elements of Alternatives 2 and 3, using containment technology in the form of an engineered cap to eliminate exposure to contaminated soils, including hot spots, and MNA. This alternative, however, would include ex situ groundwater treatment using the existing groundwater treatment system and a contingency plan to prevent exposures to COCs from off-site groundwater use. Alternative 3a is depicted in Figure 15 and described below:

Capping
The engineered cap for this alternative would cap hot spots in place instead of excavating them (see Figure 15). Low arsenic concentrations in the site groundwater indicate that there is not significant leaching to groundwater, so the soil hot spots are not mobile, so capping would provide protectiveness.

Alternative 3a bases the cap area and thickness across the Site according to site use (see Figure 15). In areas of limited industrial activity, cap thickness is reduced from 12" to 6" as compared to Alternative 3, and in areas where arsenic does not exceed cleanup levels, the cap is eliminated. The area beneath the tanks, beneath permanent structures, and currently paved areas are already capped/covered. These areas are considered part of the capped areas and will be incorporated into the remedy with long-term maintenance requirements.

Inclusion of southwest ditch in remedy
The contaminated soil from the ditch in the southwest portion of the facility will be excavated and placed in the wood storage area, rather than the pond, before that area is capped with soil (Figure 15). The placed ditch material would be spread in a thin lift and compacted before placement of the cap. The excavated bottom of the ditch would be backfilled with clean gravel to match the hydraulic grade of the ditch.

Capping of the pond.
The contaminated sediment in the bottom of the pond onsite will be capped with a permeable liner and three inches of gravel in order to eliminate the potential for direct contact with workers on site or movement of the sediments (Figure 15). The gravel cap is only three inches thick in the bottom of the pond because potential exposure is limited to a short period in the summer when the pond is dry. The liner is permeable to allow groundwater connection with the pond, but prevent movement of the contaminated sediment.

Ex situ groundwater treatment using existing groundwater treatment system
Alternative 3 proposes a recirculation groundwater treatment system with biotreatment, whereas Alternative 3a proposes continuing with the current groundwater remedy of groundwater extraction, treatment, and disposal to a permitted outfall, coupled with MNA.

The facility has been operating extraction wells since 1993 as part of an interim remedial action measure. The groundwater extraction and treatment system consists of three wells and a filtration system of granulated activated carbon, which removes both PAHs and PCPs from the groundwater. It has been demonstrated that the pump and treat system has reduced the size of the groundwater plume in the shallow and intermediate zones based on an evaluation of the PCP groundwater data from 2001 to 2014. The capture zone suggests that the groundwater pump and treat system is preventing offsite groundwater migration and empirical data from individual wells has shown that source area groundwater capture is achieved by the system (GSI, 2015).

The groundwater extraction system and treatment facility would be detailed in the RD/RA work plan and updated/maintained as needed. The system is currently functioning, but would need upgrades for long term use, such as the replacement of treatment tanks, a new carbon filter, and miscellaneous plumbing upgrades.

Updated Beneficial Water Use Survey With Contingency Plan for Off-site Groundwater Use
Under Alternative 3a, the BWUS for the Site would be updated following the procedures described in the DEQ Guidance for Conducting Beneficial Water Use Determinations at Environmental Cleanup Sites and to be detailed specifically in the RD/RA work plan that will follow the record of decision. A contingency plan would be developed and implemented in the case that off-site wells are used for purposes that could result in

unacceptable risks from exposure to COCs groundwater (industrial or residential use). The contingency plan will be initiated if a new well is identified in the locality of facility. If the well is identified for domestic use, Baxter will notify DEQ immediately. The resident would be contacted to determine if and how they are using the well, and to ask permission to sample the water. If the sample results and use are such that there could be unacceptable risk, Baxter will work with them to develop an acceptable alternative, subject to approval from DEQ. The details of an acceptable alternative, to include a potential wellhead filtration system, will be included in the RD/RA work plan.

Institutional Controls
As outlined above, institutional controls for Alternative 3a include the following:

1. Baxter will develop a RD/RA work plan that will detail the long-term operations and maintenance of the groundwater extraction system, design and maintenance of the soil cap, monitoring and maintenance of monitoring wells, and procedures for updating the BWUS. This will include periodically inspecting the soil cap and maintaining or repairing it as necessary to maintain the integrity.
2. Baxter will regularly report to DEQ on the integrity of the capped areas and summarize any work performed to repair or maintain the cap during the past year and any work scheduled to repair or maintain the cap in the upcoming year.
3. Baxter will conduct a regular review of the Oregon Water Resources Department records for any new well installation. If a new well has been installed, Baxter will immediately notify DEQ and attempt to contact the well owner to eliminate unacceptable exposure. The specifics of well-head treatment contingencies and other resolution options will be detailed in the RD/RA work plan.
4. Baxter will record an Easement and Equitable Servitudes on the Property that will include obligations to:
    a. Maintain the capped areas of the Property,
    b. Restrict groundwater and land use on the Baxter property from residential or agricultural use,
    c. Compliance with the RD/RA work plan, and
    d. Installation of residential well-head treatment as needed, as part of an off-site groundwater use contingency plan.

MNA
Long-term groundwater monitoring program will be conducted as part of the MNA component, and long term monitoring would be conducted using existing facility monitoring wells per the RD/RA work plan and associated long-term monitoring plan.

5.2.5 Alternative 4: Capping, Hot Spot Excavation and Disposal, Physical/Hydraulic Containment, MNA

Alternative 4 uses an engineered cap for the soil, offsite disposal of hot spot soils, and MNA as described in Alternative 3. In addition, this alternative would use a hanging containment wall with the groundwater extraction and treatment to control the groundwater plume. Alternative 4 is depicted in Figure 16 and described below.

Capping
The engineered cap for this alternative would be the same as in Alternatives 2 and 3.

Hot Spot Soil Excavation and Disposal
Hot spot soil excavation and disposal would be the same as Alternative 3.

Physical/Hydraulic Containment of Contaminated Groundwater
This alternative includes installation of a low-permeability sub-surface containment wall, groundwater extraction and treatment from within the containment wall, capping, hot spot removal and excavation, as well as ICs and MNA. The containment approach would utilize a low-permeability containment wall that would completely encircle the source area. Groundwater extraction wells inside the wall would enhance contaminant removal effectiveness in the containment area, reducing potential for migration of contaminated groundwater through the containment wall. The groundwater extraction wells would be used to induce an inward flow gradient, to minimize the flow of groundwater under the barrier wall. The proposed location of the containment wall is shown in Figure 16.

The proposed containment wall under this alternative would be installed to a depth of approximately 40 feet and the upper portion of the affected groundwater. It is assumed that a 2,070-foot-long slurry wall would be constructed around the Main Treatment Area (GSI 2016).

Fluffing of the excavated soil as well as addition of admixture (water and bentonite) during the construction of the containment wall would generate some excess soil that would require disposal. Approximately 25 percent of the excavated soil would have to be disposed offsite.

The extracted groundwater would undergo the same treatment process and permitting considerations described for Alternative 2. Similar to Alternative 2, it is assumed that water would be treated on site under and discharged to surface water as part of the NPDES permit.

MNA
Long-term groundwater monitoring program would be conducted as part of the MNA component, as described for Alternative 2.

5.2.6 Alternative 5: Excavation, Offsite Disposal, and MNA

This alternative is the most aggressive remedial action alternative to be considered and is based on the excavation and offsite disposal of the affected surface and subsurface soil. ICs and MNA would also be employed as part of this alternative. Groundwater use restrictions would be included in the ICs, such as described in Alternative 3a. Alternative 5 is depicted in Figure 17 and described below:

Excavation and Offsite Disposal
The excavation would include the entire area of soils with COCs above cleanup levels, including hot spots. This would result in a large excavation in the Main Treatment Area with a maximum depth of approximately 10 feet. Figure 17 shows the area of excavation.

This area currently includes a large portion of the Main Treatment Area and, therefore, would require:

1. Closure of the wood treatment facility;
2. Demolition of several structures in this area, including the drip pads and aprons;
3. Excavation of contaminated soil with offsite disposal;
4. Backfilling of excavation with clean imported fill material; and
5. Rebuilding of the wood treatment facility.

All the affected soil in the Main Treatment Area down to the water table would be removed. In addition, shallow soils across much of the site would be excavated to a depth of approximately 2 feet. Clean fill would be replaced over 50 percent of the excavated area and graded to facilitate ongoing operations.

Since this alternative removes much of affected source soils, the COCs in the groundwater would decrease more rapidly through monitored natural attenuation than for the alternatives that do not include source removal. However, affected soils beneath the water table would remain in place contributing to groundwater contamination.

It is estimated that approximately 193,000 tons of soil (based on a density of 1.6 ton/CY) of soil would be excavated and disposed offsite, based on the dimensions of the excavation stated above.

Updated Beneficial Water Use Survey With Contingency Plan for Off-site Groundwater Use
The updated BWUS with implementation of a contingency plan, as described for Alternative 3A, would also be part of this alternative.

Institutional Controls
The ICs, as described for Alternative 3a, for onsite groundwater use, offsite groundwater use, long-term monitoring, and reporting would also be part of this alternative.

MNA
Long-term groundwater monitoring program would be conducted as part of the MNA component, as described for Alternative 2.

5.2.7 Five-Year Reviews

With each of the remedial options there are a number of uncertainties at the Site related to the long-term effectiveness of the remedial action alternatives described above, including:

- Heterogeneity in the subsurface
- Potential changes in future groundwater or surface water use patterns (i.e., beneficial uses)
- Potential changes in future land use and zoning
- Changes in community concerns regarding remedial actions at the Site
- Long-term performance of the groundwater treatment system
- The potential for NAPL to provide a long-term source of COCs in groundwater
- Additional research or other information that may be affect the protectiveness of a remedy, such as EPA updating data on chemical toxicities.

Because of these uncertainties, there will be long term operations and maintenance plans developed that will include regular monitoring of the selected remedy. Then, on a five year basis, DEQ in conjunction with Baxter will complete a detailed review of all of the available data to evaluate the performance of the selected remedy, and any changes that may affect the ability of the remedy to meet the RAOs. The objective of the Five Year Review (FYR) will be to maintain the overall protectiveness of the selected remedy. The methodology for this review will be specifically detailed in the RD/RA workplan; however, at a minimum, it will establish a series of decision criteria and related response actions for each potential area of uncertainty identified above, and the RAOs identified in Section 5.1.2 of this report.

A key component of the FYR will be a review of both performance monitoring data and local land and water uses. If monitoring data exceed trigger values in select monitoring wells, an expanded monitoring program will be initiated. If the supplemental monitoring indicates that the RAOs are not being met, additional remedial actions will be evaluated to ensure that human health and the environment are protected.

6. EVALUATION OF REMEDIAL ACTION OPTIONS

6.1 EVALUATION CRITERIA

The criteria used to evaluate the remedial action alternatives are defined in OAR 340-122-0090, and establish a two-step approach to evaluate and select a remedial action. The first step evaluates whether a remedial action is protective; if not, the alternative is unacceptable and the second step evaluation is not required. The remedial alternatives considered protective are compared to each other using five balancing factors:

1. Effectiveness in achieving protection,
2. Long-term reliability,
3. Implementability,
4. Implementation risk, and
5. Reasonableness of cost.

Where a hot spot has been identified, an evaluation of how each alternative achieves the specific requirements for treatment of hot spots also is considered. The alternative that compares most favorably against these balancing factors is selected for implementation. A residual risk assessment is then conducted for the selected alternative to document that it is protective of human health and the environment.

6.2 PROTECTIVENESS

The protectiveness of a given remedial action is evaluated by comparing current or estimated future COC concentrations to the concentrations needed to meet ARLs. The pathways or beneficial uses for which the anticipated maximum concentration of a COC exceeds the ARLs are:

- Direct contact with arsenic, benzo(a)pyrene, dibenzo(a,h)anthracene, and dioxins/furans in onsite soil by an industrial worker, and in onsite groundwater that could seep into deep excavations by a trench worker.

- Direct contact with PCP in offsite groundwater by an industrial worker

- Direct contact with PCP, PAHs, and dioxins/furans in offsite groundwater through irrigation wells

These are the pathways and beneficial uses that will be directly evaluated to establish if a given remedial alternative is protective.

OAR 340-122-0090 states that protectiveness may be achieved by any of the following methods:

- Treatment
- Excavation and offsite disposal
- Engineering controls
- Institutional controls
- Any other method of protection
- A combination of the above

With the exception of hot spots, there is no preference for any one of the above methods for achieving protectiveness. Where a hot spot has been identified, OAR 340-122-0090(4) establishes a preference for treatment to the extent feasible, including a higher threshold for evaluating the reasonableness of costs for treatment.

With the exception of Alternative 1 (No Action), all remedial alternatives considered would be protective of human health, and, therefore, the five remaining alternatives were evaluated against the balancing factors listed in Section 6.1 described further below.

6.3 BALANCING FACTORS

The five remedial action alternatives determined to be protective are evaluated against the following balancing factors defined in OAR 340-122-0090(3):

- **Effectiveness in Achieving Protection.** The evaluation of this factor includes the following components:

  - Magnitude of the residual risk from untreated waste or treatment residuals, without considering risk reduction achieved through onsite management of exposure pathways (e.g., engineering and institutional controls). The characteristics of the residuals are considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, propensity to bio-accumulate, and propensity to degrade.

  - Adequacy of any engineering and institutional controls necessary to manage residual risks.

  - The extent to which the remedial action restores or protects existing or reasonably likely future beneficial uses of water.

  - Adequacy of treatment technologies in meeting treatment objectives.

  - The time until RAOs are achieved.

- **Long-term Reliability.** The following components are considered when evaluating this factor, as appropriate:

  - The reliability of treatment technologies in meeting treatment objectives.

  - The reliability of engineering and institutional controls needed to manage residual risks, taking into consideration the characteristics of the hazardous substances being managed, the ability to prevent migration and manage risk, and the effectiveness and enforceability over time of the controls.

  - The nature and degree of uncertainties associated with any necessary long-term management (e.g., operations, maintenance, monitoring).

- **Implementability.** This factor includes the following components:

  - Practical, technical, legal difficulties, and unknowns associated with the construction and implementation of the technologies, engineering controls, and/or institutional controls, including the potential for scheduling delays.

  - The ability to monitor the effectiveness of the remedy.

  - Consistency with regulatory requirements, activities needed to coordinate with and obtain necessary approvals and permits from other governmental bodies.

  - Availability of necessary services, materials, equipment, and specialists, including the availability of adequate treatment and disposal services.

- **Implementation Risk.** This factor includes evaluation of the potential risks and the effectiveness and reliability of protective measures related to implementation of the remedial action, including the following receptors: the community, workers involved in implementing the remedial action, and the environment; and the time until the remedial action is complete.

- **Reasonableness of Cost.** This factor assesses the reasonableness of the capital, operations and maintenance (O&M), and periodic review costs for each remedial alternative; the net present value of the preceding; and if a hot spot has been identified at this site, the degree to which the cost is proportionate to the benefits to human health and the environment created through treatment of the hot spot.

  In general, the least expensive remedial action is preferred unless the additional cost of a more expensive corrective action is justified by proportionately greater benefits to one or more of the other balancing factors. For sites with hot spots, the costs of remedial actions must be evaluated to determine the degree to which they are proportionate to the benefits created through restoration or protection of beneficial uses of water. A higher threshold will be used for evaluating the reasonableness of costs for treatment of hot spots than for remediation of areas other than hot spots. The sensitivity and uncertainty of the costs are also considered.

6.4 EVALUATION OF BALANCING FACTORS

This section evaluates each of the remedial action alternatives that met the protectiveness criteria against the balancing factors described in Section 6.3. Table 6-1 summarizes how each alternative compares on each of the balancing factors. The sections below summarize the major conclusions of this comparison and provide additional discussion for differentiating issues at this Site.

6.4.1 Alternative 2: Capping, Hot Spot Excavation and Consolidation, Enhanced Groundwater Extraction, MNA

Alternative 2 uses containment technology (e.g., a soil cap) to minimize the risk from Site soils, onsite excavation and consolidation of hot spot soils, and enhanced groundwater extraction for treatment of groundwater. The potential for direct exposure to affected groundwater and/or soil would be mitigated through the excavation of the hot spots and ICs under Alternative 2, along with long-term groundwater monitoring to assess MNA.

6.4.1.1 Effectiveness

Capping of soils at wood treating sites has proven to be an effective technology for reducing risks of dermal exposure at these sites.

Excavation and onsite consolidation of highly contaminated soils would minimize the risk and mobility associated with hot spot soils. Since these soils would be placed in the pond and capped with a liner, their toxicity would not be reduced, but the contamination will be immobilized and therefore the remedy is considered effective.

Groundwater extraction and treatment have been proven effective for wood treating sites. MNA would degrade COCs downgradient of the groundwater capture zone, but degradation rates would be slow and there is no offsite contingency plan to protect current and future water users within the plume.

Overall effectiveness of Alternative 2 is ranked as moderate.

6.4.1.2 Long-term Reliability

The soil cap is considered reliable because no mechanical equipment would be needed to maintain Alternative 2 after the cap material was placed and graded. Periodic inspections would be required to monitor for erosion of the cap, which may require simple repairs. In addition, a soil management plan would be prepared to provide information and protocols for health and safety and soil management if excavations were required in the capped areas.

The excavation of hot spots is highly reliable because no mechanical equipment would be needed to maintain Alternative 2 after excavated soils were removed. Onsite consolidation and capping are considered to be reliable.

The groundwater component of Alternative 2 would require long-term operation and maintenance to ensure reliability of the extraction and treatment. The only equipment expected to require routine checks and maintenance are the extraction pumps and components of the treatment system. Submersible well pumps have proven to be highly reliable, but they require periodic maintenance and replacement after about 3 to 5 years of operation. Continued monitoring would be required to confirm the effectiveness of Alternative 2, but this element is common to all alternatives. Based on these considerations, Alternative 2 is ranked moderately high for reliability.

6.4.1.3 Implementability

The implementation of the soil cap and excavation of hot spot soils is somewhat routine, although is slightly more complicated because of the presence of ongoing operations and the requirement to integrate the soil cap with existing infrastructure at the facility.

Implementability of the soil consolidation area (in the former pond) may be complex because of removing water from the existing pond and allowing soils to dry sufficiently to facilitate construction of the containment cell. The design criteria would be determined in the final design.

Groundwater extraction and treatment systems are routinely installed at wood treating facilities, and are readily implemented.

For Alternative 2, the effectiveness of the remedy is relatively easy to measure though routine inspections of the soil cap, and groundwater monitoring and MNA, and is consistent with federal, state, and local requirements.

Overall, implementability for Alternative 2 is ranked moderately low because of soil management on an active facility.

6.4.1.4 Implementation Risk

Implementation of the soil cap and excavation and onsite consolidation of hot spots would be associated with some short-term risks to workers as a result of increased truck traffic, the potential to generate dust during construction activities, the presence of workers in the immediate vicinity of the operating plant, and operation of heavy equipment.

The groundwater component of Alternative 2 could be implemented with moderate concerns for short-term risk. Safety concerns would result from operation of heavy equipment (i.e., drilling machines) in the vicinity of an operating plant, as well as construction and initial startup of a groundwater treatment system with contaminated groundwater.

Overall, implementation risk for Alternative 2 is ranked moderate.

6.4.1.5 Reasonableness of Cost

The estimated total net present value for Alternative 2 is approximately $5,654,000. First year costs associated with Alternative 2 include implementation of ICs, excavation and consolidation of hot spot soils, placement of the soil cap, construction of a new groundwater extraction and treatment system, and design and permitting costs. Annual O&M costs include maintenance of ICs, operation and maintenance of the groundwater extraction and treatment system, and groundwater monitoring for a period of 30 years. Alternative 2 is ranked moderate for reasonableness of cost.

It should be noted that first year costs include construction costs for all necessary remedial action components. Actual costs likely would be spread over several years to facilitate ongoing operations, and lead times for design, permitting, and agency reviews. Combining all initial component costs into the first year allows costs for each remedial alternative to be evaluated against other alternatives.

6.4.2 Alternative 3: Capping, Hot Spot Excavation and Disposal, Enhanced Biodegradation Recirculation System, MNA

Alternative 3 combines soil capping, excavation and offsite disposal of hotspot soils, in situ bioremediation through groundwater recirculation, and MNA to provide a comprehensive contaminant containment program in the vicinity of the source area, which is shown in Figure 6. This system intercepts groundwater immediately downgradient of the main treatment area using groundwater extraction wells. The extraction wells recirculate the groundwater in situ to an aeration/infiltration trench, which mixes the collected groundwater and aerates it to promote in situ biological degradation of groundwater COCs. The water in the trench then re-infiltrates, creating a recirculation cell to enhance aerobic biodegradation of groundwater COCs. Groundwater flowing from the recirculation cell undergoes additional biodegradation and natural attenuation in the area downgradient from the recirculation cell.

6.4.2.1 Effectiveness

Capping of soils at wood treating sites has proven to be an effective technology for reducing risks of dermal exposure. Excavation and offsite treatment/disposal of highly contaminated soils meet DEQ’s requirements for hot spots.

The recirculation system would be designed to enhance aerobic bioremediation. Enhanced aerobic bioremediation has been proven effective for wood treating sites. Based on the data collected in three years of operation of a similar recirculation system at Baxter's Arlington (Oregon) facility, the proposed bioremediation approach has been effective, as noted by decreasing concentrations. However, the system has not operated long enough to achieve remedial action objectives at this time. The potential effectiveness is less certain at the Eugene Site for the following reasons: (1) the depth to groundwater is minimal at the Eugene Site and does not provide an adequate unsaturated zone in which the infiltrated groundwater would entrain oxygen, and (2) the plume is located in the intermediate zone and it is uncertain whether the shallow recirculation system would deliver the required oxygen to the intermediate zone.

MNA would degrade COCs downgradient of the enhanced bioremediation system, but degradation rates would be slow, especially as distance from the bioremediation system increases.

Biodegradation of constituents caused by the enhanced bioremediation system and MNA in the downgradient plume would permanently destroy the constituents, thereby reducing both the toxicity and volume of affected groundwater. The enhanced bioremediation system also would increase biodegradation rates downgradient of the extraction wells because of increased dissolved oxygen in groundwater exiting the recirculation zone. The mobility of COCs would decrease as a result of the hydraulic control and enhanced biodegradation created by the groundwater recirculation wells; however, complete capture would not be achieved with the recirculation system, and there is no offsite contingency plan to protect current water users within the plume.

Based on these considerations, Alternative 3 is ranked moderately low for effectiveness.

6.4.2.2 Long-term Reliability

The soil cap is considered reasonably reliable because no mechanical equipment would be needed to maintain Alternative 3 after the cap material was placed and graded. Periodic inspections would be required to monitor for erosion of the cap, which may require simple repairs. In addition, a soil management plan would be prepared to provide information and protocols for health and safety and soil management if excavations were required in the capped areas.

The excavation and offsite disposal of hotspots is highly reliable because no mechanical equipment would be needed to maintain Alternative 3 after excavated soils were removed, and offsite treatment would be performed using facilities designed and permitted for waste materials and soil.

The groundwater component of Alternative 3 would require long-term operation and maintenance to ensure reliability of the enhanced bioremediation. However, O&M requirements at Baxter's Arlington facility have been nominal because the mechanical systems are simple and incorporate minimal rotating and electrical equipment. The only equipment expected to require routine checks and maintenance are the groundwater recirculation pumps. Submersible well pumps have proven to be highly reliable, but they require periodic maintenance and replacement after about 3 to 5 years of operation. Continued monitoring would be required to confirm the effectiveness of Alternative 3, but this element is common to all alternatives.

The enhanced bioremediation system has been applied previously to wood treating sites; the actual configuration has varied in previous applications because of site-specific design requirements. Aerobic bioremediation of groundwater has been used widely and is known to be reliable at wood treating sites. Other components of Alternative 3 also have been used reliably at wood treating sites.

No substantial adverse effects, other than reduction in the rate of biodegradation, would result from failure of the enhanced bioremediation recirculation system. If recirculation pumping fails or is stopped for short times, the effectiveness of the bioremediation system would not be significantly affected. If extraction wells stop operating, system warnings would indicate the shutdown, thereby limiting the duration of shutdowns; however, because of the high hydraulic conductivity of the aquifer, groundwater containing elevated COC concentrations could migrate downgradient following a shutdown. Long-term failure of all recirculation wells would result in reduced treatment effectiveness.

In the event that the groundwater component of Alternative 3 is not effective at controlling the PCP plume, the system could be readily modified to transfer extracted groundwater to a conventional treatment system.

Based on each of the main component's expected reliability, Alternative 3 is ranked as moderate.

6.4.2.3 Implementability

The implementability of the soil cap and excavation of hot spot soils is complicated because of the presence of ongoing operations and the requirement to integrate the soil cap with existing infrastructure at the facility. However, Baxter has experience with integrating facility operations because a soil cap was installed in the eastern portion of the facility during the IRAM work in 2007.

Groundwater extraction and treatment systems are routinely installed at wood treating facilities, and are readily implemented.

For Alternative 3, the effectiveness of the remedy is relatively easy to measure through routine inspections of the soil cap, and groundwater monitoring and MNA, and is consistent with federal, state, and local requirements.

Overall, implementability for Alternative 3 is ranked moderately low.

6.4.2.4 Implementation Risk

Implementation of the soil cap and excavation and offsite disposal of hot spots would be associated with some short-term risks to workers and the community because of increased truck traffic, the potential to generate dust during construction activities, the presence of workers in the immediate vicinity of the operating plant, and operation of heavy equipment.

The groundwater component of Alternative 3 could be implemented with moderate concerns for short-term risk. Safety concerns would result from operation of heavy equipment (i.e., drilling machines) in the vicinity of an operating plant.

Overall, implementation risk for Alternative 3 is ranked moderate because of the management of soils on an active facility.

6.4.2.5 Reasonableness of Cost

The estimated total net present value for Alternative 3 is approximately $5,640,000. First year costs associated with Alternative 3 include implementation of ICs, excavation and offsite disposal of hot spot soils, placement of the soil cap, construction of the groundwater recirculation system, and design and permitting costs. Annual O&M costs include maintenance of ICs, O&M of the groundwater extraction and treatment system, and groundwater monitoring for a period of 30 years. Alternative 3 is ranked moderate for reasonableness of cost.

As noted for Alternative 2, actual costs likely would be spread over several years to facilitate ongoing operations, lead times for design, permitting, and agency reviews.

6.4.3 Alternative 3a: Capping, Groundwater Extraction and Treatment, Updated Beneficial Water Use Survey with Contingency Plan for Offsite Groundwater Use, MNA

Alternative 3a is a variation of Alternative 3, therefore, considerations in balancing factors are similar. However, the modifications to Alternative 3 result in a higher ranking for most criteria.

6.4.3.1 Effectiveness

As with Alternative 3, capping of soils at wood treating sites has proven to be an effective technology for reducing risks of dermal exposure at those sites. Anticipated future use of the Site is the same as current use, so in terms of the effectiveness criteria, capping scores the same as excavation because both remedies eliminate exposure to hot spot concentrations in soil.

The ex situ groundwater treatment and contingency plan for offsite uses would be more effective than the other alternatives, because while there may be exceedances of the PCP offsite groundwater cleanup level long after implementation of the remedial actions included in this alternative, the contingencies prevent direct exposure to the groundwater by receptor populations. In addition, the pump and treat system has been operating and proven to be effective at containing the source area groundwater, shown in Figure 6.

Based on these considerations, Alternative 3a is ranked moderately high for effectiveness.

6.4.3.2 Long-term Reliability

Also similar to Alternative 3, the soil cap is considered reasonably reliable because no mechanical equipment would be needed to maintain Alternative 3a after the cap material was placed and graded. Periodic inspections would be conducted to monitor for erosion of the cap, which may require simple repairs. In addition, a soil and groundwater management plan would be prepared to provide information and protocols for health and safety and soil management if excavations were required in the capped areas.

The groundwater component of Alternative 3a would require long-term operation and maintenance to ensure reliability of the ex situ treatment and hydraulic containment. However, reliability is higher than for Alternative 3 because there would be no fouling of the recirculation system, and the ex situ treatment and containment have shown to be reliable to date.

Based on each of the main component's expected reliability, Alternative 3a is ranked moderately high.

6.4.3.3 Implementability

Implementability of Alternative 3a is higher than Alternative 3 because capping instead of excavation of hot spots would provide for less disruption of operations and less complicated planning. Further, alternative 3a does not include infiltration of groundwater, and instead would discharge treated groundwater to a permitted-outfall, which improves its ranking. In other respects, the implementability of Alternative 3a is similar to Alternative 3. Overall, implementability for Alternative 3a is ranked moderately high.

6.4.3.4 Implementation Risk

Implementation risk is similar for Alternative 3a as for Alternative 3, but capping the soil hot spots would provide for lower implementation risk because there is no direct exposure to hot spots and there is little onsite soil management required.

Overall, implementation risk for Alternative 3a is ranked moderately low.

6.4.3.5 Reasonableness of Cost

The estimated total net present value for this alternative is approximately $2,775,000. The large difference between Alternative 3a and Alternative 3 is the result of several factors. Excavation of hot spots has a high cost, with an estimated cost of excavation, backfill, and disposal of more than $1,310,000. Costs for capping of hot spots are low because the capping would be a small addition to site capping already proposed and excavation/disposal fees would be eliminated. Also, the updates to the Alternative 3 cap in terms of location and thickness result in a change of estimated costs from $1,360,000 to $1,120,000. Actual costs likely would be spread over several years to facilitate ongoing operations, lead times, permitting, and agency reviews.

Finally, physical groundwater extraction, treatment, and discharge are lower cost than the recirculation system of Alternative 3.

Overall, reasonableness of cost for Alternative 3a is ranked moderately high.

6.4.4 Alternative 4: Capping, Hot Spot Excavation and Disposal, Physical/Hydraulic Containment, MNA

Alternative 4 uses containment technology (e.g., a soil cap) to minimize the risk from Site soils, excavation and offsite disposal of hot spot soils, and installation of a physical/hydraulic barrier for treatment of groundwater.

6.4.4.1 Effectiveness

Capping of soils at wood treating site has proven to be an effective technology for reducing risks of dermal exposure at these sites. Excavation and offsite treatment/disposal of highly contaminated soils eliminate the onsite risk related to hot spots.

Alternative 4 relies upon a containment barrier wall and active groundwater pumping to provide hydraulic containment and enhance contaminant removal. MNA would limit the toxicity and mobility of Site COCs within groundwater downgradient of the source area. The physical/hydraulic containment system could be effective, provided that active pumping is maintained. If pumping were to fail or stop, there is the potential for affected groundwater to migrate beyond the wall and outside the influence of the pumping, even once the pumps were repaired. This creates more of a problem than in the other remedial alternatives for effectiveness if pumps should temporarily fail. MNA would remain active for degradation of many constituents in groundwater, as with the other alternatives.

COCs present in groundwater recovered at the facility would be removed from the groundwater and destroyed permanently; this would contribute to reduced toxicity and mobility within the source area. The mobility of COCs in the source area would be reduced because of the physical and hydraulic containment system. Even if the groundwater recovery component failed, the hanging barrier wall would reduce mobility of the groundwater plume somewhat by lengthening the flow path for affected groundwater and by limiting the flux of groundwater from the source area.

Based on these considerations, Alternative 4 is ranked moderate for effectiveness.

6.4.4.2 Long-term Reliability

The soil cap and offsite disposal of hot spots is highly reliable, as discussed for Alternatives 2 and 3.

Alternative 4 incorporates a containment wall and groundwater extraction. The system requires long-term O&M for most reliable performance; however, the barrier wall alone would provide a nominal level of containment in the absence of the groundwater extraction component. Given that both the groundwater recovery and treatment components include rotating and electronic equipment, regular maintenance is necessary. All components of Alternative 4 have been proven appropriate and reliable for remediation of wood treating sites. Because the hanging barrier wall does not provide full physical containment, Alternative 4 may provide only partial containment of the source area if the groundwater recovery and treatment system fails; such a failure likely would result in the loss of affected groundwater from the source area, potentially affecting downgradient groundwater.

Given these considerations, Alternative 4 is ranked moderate for reliability.

6.4.4.3 Implementability

Implementability of the soil cap and hot spot excavation aspects of Alternative 4 are the same as Alternatives 2 and 3.

The groundwater component of Alternative 4 would require extensive and highly invasive construction to install the barrier wall using either conventional slurry wall or other applicable barrier wall installation techniques (e.g., vibrated beam barrier wall). Alternative 4 would be difficult to implement. Excavation and containment wall construction would be complicated by the presence of existing structures, including buildings, rail lines, any underground lines or utilities, and treated pole storage areas. The Site is also an active industrial facility, and ongoing facility operations would be disrupted by required construction work. Additionally, the groundwater collection piping, the groundwater treatment system, and the treated water discharge piping must be installed.

For Alternative 4, the effectiveness of the remedy is relatively easy to measure through groundwater monitoring and MNA, and is consistent with federal, state, and local requirements.

Based on the considerations presented above, Alternative 4 has been ranked moderately low for overall implementability because of the large amount of construction required on an active facility.

6.4.4.4 Implementation Risk

Implementation of the soil cap and excavation and offsite disposal of hot spots would be associated with some short-term risks to workers and the community because of increased truck traffic, the potential to generate dust during construction activities, the presence of workers in the immediate vicinity of the operating plant, and operation of heavy equipment.

Significant short-term risks are associated with implementation of the groundwater component in Alternative 4. Risks include potential exposure to affected soil during barrier wall construction or affected groundwater during excavation, and the normal construction safety concerns related to construction using heavy equipment. Additional safety concerns specific to slurry wall installation include potential trench failure because of the depth of the slurry trench and the potential effects of failure on adjacent structures, underground utilities, and rail lines.

Based on the considerations presented above, Alternative 4 is ranked moderately high for implementation risk.

6.4.4.5 Reasonableness of Cost

The estimated total net present value for Alternative 4 is approximately $9,639,000. First year costs associated with Alternative 4 include implementation of ICs, excavation and offsite disposal of hot spot soils, placement of the soil cap, construction of the containment wall and groundwater extraction system, and design and permitting. Annual O&M costs include maintenance of ICs, O&M of the groundwater extraction and treatment system, and groundwater monitoring for a period of 30 years. Alternative 4 is ranked moderately low for reasonableness of cost.

As noted for Alternatives 2 and 3, actual costs likely would be spread over several years to facilitate ongoing operations, lead times for design, permitting, and agency reviews.

6.4.5 Alternative 5: Excavation, Offsite Disposal, and MNA

Alternative 5 is the most intrusive remedial action alternative to be considered and is based on the excavation and offsite disposal of nearly all of the affected surface and subsurface soil. ICs, groundwater monitoring, and MNA also would be employed as part of Alternative 5. Included with Alternative 5 is the temporary closure of the facility, facility demolition, and facility reconstruction.

6.4.5.1 Effectiveness

Under Alternative 5, practically all affected soil would be removed for offsite treatment and disposal. MNA would continue to degrade COCs present in groundwater beneath and downgradient from the source area; because the source would be eliminated, it is expected that MNA would cause the plume to contract over time after source area removal. This approach would be highly effective in removing COCs from the Site and in reducing the contaminant loading to downgradient groundwater. Given that Alternative 5 does not rely on engineering controls to limit the mobility or toxicity of affected media and because it would permanently remove most affected soil from the facility, the useful life of Alternative 5 would be long.

Under applicable regulations, excavated soil would be treated at a permitted facility to permanently destroy COCs. Residuals remaining after treatment would be disposed of in a secure, appropriately permitted landfill. This would substantially decrease the toxicity and mobility of the COCs present in soils at the facility. Biodegradation and immobilization of COCs in the plume beneath and downgradient from the source area would permanently destroy the constituents, gradually reducing both the toxicity and volume of affected groundwater. Based on these considerations, Alternative 5 is ranked high for effectiveness and reduction in toxicity, mobility, and volume.

6.4.5.2 Long-term Reliability

Alternative 5 does not rely on engineering controls requiring active operation or maintenance. No mechanical equipment would be needed to maintain Alternative 5 after excavated soils were removed, and offsite treatment would be performed using facilities designed and permitted for waste materials and soil. Alternative 5 is ranked high for expected reliability.

6.4.5.3 Implementability

Alternative 5 would require complete demolition of the main treatment area followed by extensive and highly invasive construction to excavate affected soil. For these reasons, excavation and disposal would be difficult and extremely costly. The groundwater monitoring program would be sufficient to provide groundwater quality monitoring for the MNA component. The ICs included in Alternative 5 would apply to the facility and affected offsite groundwater and could be readily implemented.

Given the complexities involved in demolishing existing facilities and excavating affected soil, it is expected that the implementation time for Alternative 5 would be fairly long. The practical and technical aspects of Alternative 5 result in a low implementability ranking.

6.4.5.4 Implementation Risk

Alternative 5 would create substantial safety concerns for demolition and remediation workers. These concerns include potential exposure to dust and other materials during demolition, potential exposure to affected soil and groundwater during excavation, and the normal construction safety concerns related to demolition and earthwork using heavy equipment. Transportation of large quantities of excavated soil to disposal facilities also would raise safety concerns along transportation routes for other traffic and for affected communities. In addition, closure of the facility would affect the community in the short term due to an increased risk of accidents from the traffic and/or potential for spread of contamination during the transport. Alternative 5 is ranked high for implementation risk.

6.4.5.5 Reasonableness of Cost

The estimated total net present value for Alternative 5 is approximately $65,043,000. First year costs associated with Alternative 5 include implementation of ICs, facility demolition, excavation and offsite disposal of COC-affected soils, backfill and grading, and reconstruction of the treatment plant. Annual O&M costs would include maintenance of ICs, O&M of the groundwater extraction and treatment system, and groundwater monitoring for a period of 30 years. Alternative 5 is ranked low for reasonableness of cost.

Given the magnitude of activities associated with Alternative 5, costs likely would be spread over a 2- or 3-year period.

Table 6-1

Comparison of Balancing Factors for Remedial Action Alternatives

Alternative	Effectiveness	Long-term Reliability	Implementability	Implementation Risk	Reasonableness of Cost	Total Score
1. No Action	1	1	1	4	5	12
2. Capping, hot spot excavation and consolidation, enhanced groundwater treatment, MNA	3	4	2	3	3	15
3. Capping, hot spot excavation and disposal, enhanced biodegradation and recirculation, MNA	2	3	2	3	3	13
3a. Capping, ex situ groundwater treatment, MNA, groundwater contingency plan	**4**	**4**	**4**	**4**	**4**	**20**
4. Capping, hot spot excavation and disposal, physical/hydraulic containment, MNA	3	3	2	2	2	12
5. Capping, excavation and disposal, MNA	5	5	1	1	1	13
Notes: **Bold font** indicates preferred alternative.						

7. COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

This section compares the remedial action alternatives that have been developed and evaluated for the Site. This comparative analysis was used to select the recommended remedial action alternative for the facility. In the following sections the alternatives are compared against DEQ's requirement of protectiveness, as well as the five balancing factors.

DEQ guidance describes two sets of criteria for evaluating corrective measures alternatives: (1) protectiveness or threshold criteria that must be attained by the remedial action selected for implementation; and (2) balancing factors that are used for detailed evaluation and screening of alternatives. All remedial actions, with the exception of Alternative 1, were designed to attain the threshold criteria; however, the alternatives may differ in how well they achieve these threshold criteria. Further, each alternative was evaluated for its performance relative to the balancing criteria in Section 6.

7.1 COMPARATIVE EVALUATION: PROTECTIVENESS

DEQ requires that a selected remedy must be protective, and not result in unacceptable risk to human health or ecological receptors. Specifically, "protectiveness is defined as meeting specific acceptable risk levels specified in OAR 340-122-0115 for individual carcinogens (10^{-6}), multiple carcinogens (10^{-5}), non-carcinogens (Hazard Index of 1).

Alternatives 2 through 5 result in a protective outcome, however, some of these alternatives may require a longer time periods to attain the criteria while others, such as Alternative 5, may attain the criteria in a short time.

Alternative 5, including excavation and offsite disposal, would provide the most complete and rapid removal of COCs, eliminate the majority of the source area and future releases, and is ranked highest for meeting the threshold criteria. Alternative 5 would remove risks from dermal exposure to surface and near surface soil. However, some COCs would remain onsite at deeper depths, and would require ongoing monitoring to assess whether natural attenuation processes could effectively manage risks from the groundwater plume.

Alternatives 3 and 4 are ranked the next highest for protectiveness. Both of these alternatives manage residual risks of soil using proven containment technology to prevent dermal exposure (e.g., soil cap), and soil hot spots would be excavated and removed offsite for disposal. Groundwater would be managed by either the enhanced bioremediation recirculation system or containment wall with groundwater extraction and treatment.

Alternatives 2 and 3a are also protective, but fall slightly lower in ranking when compared to Alternatives 3 and 4 for protectiveness because hot spot soils would be contained onsite, rather than excavated and disposed of offsite. Alternative 1 is not protective because risks associated with exposure to onsite soil, and potential off-site risks associated with groundwater beneficial uses could be above acceptable levels.

7.2 COMPARATIVE EVALUATION: BALANCING FACTORS

The six corrective measures alternatives are compared for the balancing factors in this section. Each alternative was evaluated against the balancing criteria consisting of effectiveness, long-term reliability, implementability, implementation risk, and reasonableness of cost, and assigned a numerical rating (Table 6-1). A total score was calculated from these numerical ratings and used to rank the five remedial alternatives against each other. In calculating the total score, each element of each criterion was weighted equally.

The relative ranking of the alternatives for the balancing factors is based on the total score shown on Table 6-1. The highest ranked alternative is Alternative 3a and the lowest ranked alternative is Alternative 1. Thus, based on this balancing criteria, the recommended alternative is Alternative 3a.

8. RECOMMENDED REMEDIAL ACTION ALTERNATIVE

Based on the detailed evaluation of the alternatives in Sections 6 and 7, DEQ recommends alternative 3a for implementation at the Site. Alternative 3a achieves the threshold criteria and was the highest rated for the balancing factors. This remedial alternative can be implemented in a reasonable time while allowing continued facility operations and it would achieve beneficial results in a reasonable time frame.

8.1 DESCRIPTION OF THE RECOMMENDED ALTERNATIVE

Alternative 3a will include the following components:

- Capping of contaminated soil, including the hot spots of Arsenic, with an engineered cap of 6 to 12-inches of asphalt and/or compacted gravel over a geotextile fabric.

- Excavating contaminated soil from the ditch in the southwest portion of the facility and consolidating it with the existing soil contamination in the wood storage area before capping.

- Capping of the contaminated sediment in the bottom of the pond onsite with an engineered cap of 3-inches of compacted gravel over permeable liner. The liner is permeable to allow groundwater connection with the pond, but prevent movement of the contaminated sediment.

- Operating and maintaining the existing groundwater extraction and treatment system, which includes three extraction wells pumping into a granulated activated carbon filtration system, which removes both PAHs and PCPs from the groundwater.

- Long-term groundwater monitoring to confirm that the exsitu groundwater treatment system remains effective in achieving contaminant reduction and containment for the source area, and that MNA achieves contaminant reduction within the plume downgradient of the recovery wells, including offsite groundwater that has been affected by the facility.

- Surveying the area for water use on a regular basis with a specific contingency plan for any new wells discovered. The details of an acceptable contingency plan, to include a potential wellhead filtration system, will be included in the RD/RA work plan.

- Establishing institutional controls that will ensure implementation and long term maintenance of the recommended remedial action; and protection of human health until RAOs are met.

- Completing a FYR of the protectiveness of the recommended remedial action.

The soil cap would be implemented over several years so it would not disrupt ongoing operations and facilitate other Site improvements (such as removal of unused buildings and operations to increase production efficiency). The RD/RA work plan will provide the specific design details for DEQ approval, along with details of the contingency plan. Further detail of this remedial alternative is described in Section 5.2.4 and shown in Figure 15.

8.2 RESIDUAL RISK ASSESSMENT

OAR 340-122-0084(4)(c) requires a residual risk evaluation of the recommended alternative that demonstrates that the standards specified in OAR 340-122-0040 will be met, namely:

- Assure protection of present and future public health, safety, and welfare, and the environment.

- Achieve acceptable risk levels.

- For designated hot spots of contamination, evaluate whether treatment is reasonably likely to restore or protect a beneficial use within a reasonable time.

- Prevent or minimize future releases and migration of hazardous substances in the environment.

Because the selected remedy eliminates exposures to COCs in soil and groundwater (and provides a contingency plan for potential future exposures to COCs in offsite groundwater), there will no longer be any complete exposure pathways to elevated levels of COCs at the Site, and a formal residual risk assessment for post-remedy conditions was not performed. However, the remedy is deemed protective of human health and the environment because there will no longer be direct exposure to contaminated soils at the Site, and a contingency plan is in place to prevent current and future exposure to groundwater in conjunction with ex situ treatment.

9. REFERENCES

AMEC. 2014. Technical Memorandum. Subject: Revised Baseline Human Health Risk Assessment Addendum. To: Geoff Brown, Oregon DEQ. AMEC Environmental and Infrastructure, Inc. February 19, 2014.

Baxter. 2002a. Beneficial Water Use Determination, J.H. Baxter & Co. Eugene, Oregon Facility. Prepared by J.H. Baxter &Co. June 28, 2002.

Baxter. 2002b. Draft RI Summary Report, J.H. Baxter & Co. Eugene, Oregon Facility. Prepared by J.H. Baxter &Co. June 28, 2002.

Baxter. 2002c. Draft Human Health Risk Assessment. J.H. Baxter & Company, Eugene, Oregon Facility. Prepared for Oregon Department of Environmental Quality by J.H. Baxter. September 20, 2002.

Baxter. 2006a Revised Baseline Human Health Risk Assessment. Prepared for Oregon Department of Environmental Quality by J.H. Baxter. July 28, 2006.

Baxter. 2009. Second Half 2008 Groundwater Monitoring Report, J.H. Baxter & Co., Eugene, Oregon Facility. Prepared by J. H. Baxter & Co. June 3, 2009.

Baxter. 2010a. Remedial Investigation Summary Report, Revision 1, J.H. Baxter & Co. Wood Treating Facility, Eugene, Oregon. Prepared by the J.H. Baxter Project Team, March 10, 2010.

Baxter. 2010b, Remedial Action Pilot Study Report Stella-Jones (formerly J.H. Baxter & Co.) Wood Treating Facility Arlington, Washington: Prepared by J.H. Baxter Project Team, October 2010.

Baxter. 2011b. Corrective Measures Study, Revision 2, Former J.H. Baxter Wood Treating Facility, Arlington, WA. Prepared by the J.H. Baxter Project Team. March 2011.

Baxter. 2013. Contingency Plan for Incidental and Infrequent Drippage in the Treated Pole Storage Yard for J.H. Baxter & Company, Eugene, Oregon. Prepared by J.H. Baxter & Co. 2013.

DEQ. 1989. Order on Consent issued to J.H. Baxter & Co. by Oregon Department of Environmental Quality, ESCR-WVR-88-06. August 7, 1989.

DEQ. 1999. Approval of the revised Ecological Risk Assessment report. Memorandum from Max Rosenberg of Oregon Department of Environmental Quality to Georgia Baxter of J.H. Baxter & Co. July 23, 1999.

DEQ 2001. Approval of Removal Action; Exemption of RCRA Requirements. Memorandum from Max Rosenberg to Keith Anderson of Oregon Department of Environmental Quality. July 20, 2001.

DEQ. 2013. Development of Oregon Background Metals Concentrations in Soil. Technical Report, March 2013.

GSI. 2015. "Additional Information Requested Regarding Reduction in Monitoring Request Dated February 9, 2015," Technical Memorandum. Prepared by GSI Water Solutions on behalf of J.H. Baxter & Company, dated April 2, 2015.

GSI. 2016. Final Feasibility Study Report, J.H. Baxter & Co., Eugene, OR Facility. Prepared for J.H. Baxter & Company. February 2016.

Keystone. 1991. Remedial Investigation Report (Phase I) of J.H. Baxter & Company Eugene, Oregon Site. Prepared by Keystone Environmental Resources, Inc. for J.H. Baxter & Company. August 1991.

Keystone. 1994. Remedial Investigation Report (Phase II) of J.H. Baxter & Co. Eugene, Oregon Site. Prepared by Keystone Environmental Ltd. for J.H. Baxter & Company. October 1994.

Keystone. 1999. Ecological Risk Assessment of J.H. Baxter & Co., Eugene, Oregon Plant Site. Prepared by Keystone Environmental Consultants, Inc. for J.H. Baxter & Company. June 1999.

APPENDIX A
ADMINISTRATIVE RECORD INDEX
J.H. Baxter Facility
Eugene, Oregon

The Administrative Record consists of the documents on which the recommended remedial action for the site is based. The primary documents used in evaluating remedial action alternatives for the Baxter-Eugene site are listed below. Additional background and supporting information can be found in the Baxter-Eugene project file, ECSI file number 55, located at DEQ Western Region Office, 165 East 7th Avenue, Suite 100, Eugene, Oregon.

SITE-SPECIFIC DOCUMENTS

AMEC. 2013. Technical Memorandum. Subject: Revised Baseline Human Health Risk Assessment Addendum. To: Geoff Brown, Oregon DEQ. AMEC Environmental and Infrastructure, Inc. November 4, 2013.

AMEC. 2014. Technical Memorandum. Subject: Revised Baseline Human Health Risk Assessment Addendum. To: Geoff Brown, Oregon DEQ. AMEC Environmental and Infrastructure, Inc. February 19, 2014.

Baxter. 2002a. Beneficial Water Use Determination, J.H. Baxter & Co. Eugene, Oregon Facility. Prepared by J.H. Baxter &Co. June 28, 2002.

Baxter. 2002b. Draft RI Summary Report, J.H. Baxter & Co. Eugene, Oregon Facility. Prepared by J.H. Baxter &Co. June 28, 2002.

Baxter. 2002c. Draft Human Health Risk Assessment. J.H. Baxter & Company, Eugene, Oregon Facility. Prepared for Oregon Department of Environmental Quality by J.H. Baxter. September 20, 2002.

Baxter. 2006a. Revised Baseline Human Health Risk Assessment. Prepared for Oregon Department of Environmental Quality by J.H. Baxter. July 28, 2006.

Baxter. 2006b. Contingency Plan for Incidental and Infrequent Drippage in the Treated Pole Storage Yard for J.H. Baxter & Company, Eugene, Oregon. Prepared by J.H. Baxter & Co. 2006.

Baxter. 2009. Second Half 2008 Groundwater Monitoring Report, J.H. Baxter & Co., Eugene, Oregon Facility. Prepared by J. H. Baxter & Co. June 3, 2009.

Baxter. 2010a. Remedial Investigation Summary Report, Revision 1, J.H. Baxter & Co. Wood Treating Facility, Eugene, Oregon. Prepared by the J.H. Baxter Project Team, March 10, 2010.

Baxter. 2010b, Remedial Action Pilot Study Report Stella-Jones (formerly J.H. Baxter & Co.) Wood Treating Facility Arlington, Washington: Prepared by J.H. Baxter Project Team, October 2010.

Baxter. 2011a. Feasibility Study Report, Revision 0, J.H. Baxter & Co. Eugene, Oregon Facility. Prepared by J.H. Baxter & Co. October 3, 2011.

Baxter. 2011b. Corrective Measures Study, Revision 2, Former J.H. Baxter Wood Treating Facility, Arlington, WA. Prepared by the J.H. Baxter Project Team. March 2011.

Baxter. 2015a. Proposed Revised Monitoring Program. J.H. Baxter & Co. Eugene, Oregon Facility. Prepared by J.H. Baxter & Co. February 9, 2015.

Baxter. 2015b. Revised Monitoring Program, May 2015, J.H. Baxter Eugene Site, ECSI 55. Dated May 1, 2015.

DEQ. 1989. Order on Consent issued to J.H. Baxter & Co. by Oregon Department of Environmental Quality, ESCR-WVR-88-06. August 7, 1989.

DEQ. 1999. Approval of the revised Ecological Risk Assessment report. Memorandum from Max Rosenberg of Oregon Department of Environmental Quality to Georgia Baxter of J.H. Baxter & Co. July 23, 1999.

DEQ 2001. Approval of Removal Action; Exemption of RCRA Requirements. Memorandum from Max Rosenberg to Keith Anderson of Oregon Department of Environmental Quality. July 20, 2001.

DEQ 2009a. Approval for Revised Beneficial Use Determination, June 28, 2002, JH Baxter, ECSI 55. Letter dated February 24, 2009.

DEQ. 2009. Letter from Geoff Brown of DEQ to RueAnn Thomas of J.H. Baxter approving the Revised Beneficial Water Use Determination, June 28, 2002. February 24, 2009.

DEQ. 2011a. Letter from Paul Rosenberg of DEQ to RueAnn Thomas of J.H. Baxter providing a Partial No Further Action Determination for the eastern portion of the Baxter site. January 11, 2011.

DEQ 2011b. Letter from Geoff Brown of DEQ to RueAnn Thomas of J.H. Baxter approving the Remedial Investigation Summary Report, Revision 1, March 2010. March 15, 2011.

DEQ. 2015. E-mail Approval of Revised Monitoring Program, J.H. Baxter Eugene Site, ECSI 55. Dated May 7, 2015.

GSI. 2015. Feasibility Study Addendum, J.H. Baxter & Co., Eugene, OR Facility. Prepared for J.H. Baxter & Co. June 2015.

GSI. 2016. Final Feasibility Study Report, J.H. Baxter & Co., Eugene, OR Facility. Prepared for J.H. Baxter & Co. February 2016.

Keystone. 1991. Remedial Investigation Report (Phase I) of J.H. Baxter & Company Eugene, Oregon Site. Prepared by Keystone Environmental Resources, Inc. for J.H. Baxter & Company. August 1991.

Keystone. 1994. Remedial Investigation Report (Phase II) of J.H. Baxter & Co. Eugene, Oregon Site. Prepared by Keystone Environmental Ltd. for J.H. Baxter & Company. October 1994.

Keystone. 1999. Ecological Risk Assessment of J.H. Baxter & Co., Eugene, Oregon Plant Site. Prepared by Keystone Environmental Consultants, Inc. for J.H. Baxter & Company. June 1999.

STATE OF OREGON

Oregon's Environmental Cleanup Laws, Oregon Revised Statutes 465.200-.900, as amended by the Oregon Legislature in 1995.

Oregon's Hazardous Substance Remedial Action Rules, Oregon Administrative Rules, Chapter 340, Division 122, adopted by the Environmental Quality Commission in 1997.

Oregon's Hazardous Waste Rules, Chapter 340, Divisions 100 - 120.

Oregon's Groundwater Protection Act, Oregon Revised Statutes, Chapter 468B.

GUIDANCE AND TECHNICAL INFORMATION

DEQ. Consideration of Land Use in Environmental Remedial Actions. July 1998.

DEQ. Guidance for Conducting Beneficial Water Use Determinations at Environmental Cleanup Sites. July 1998.

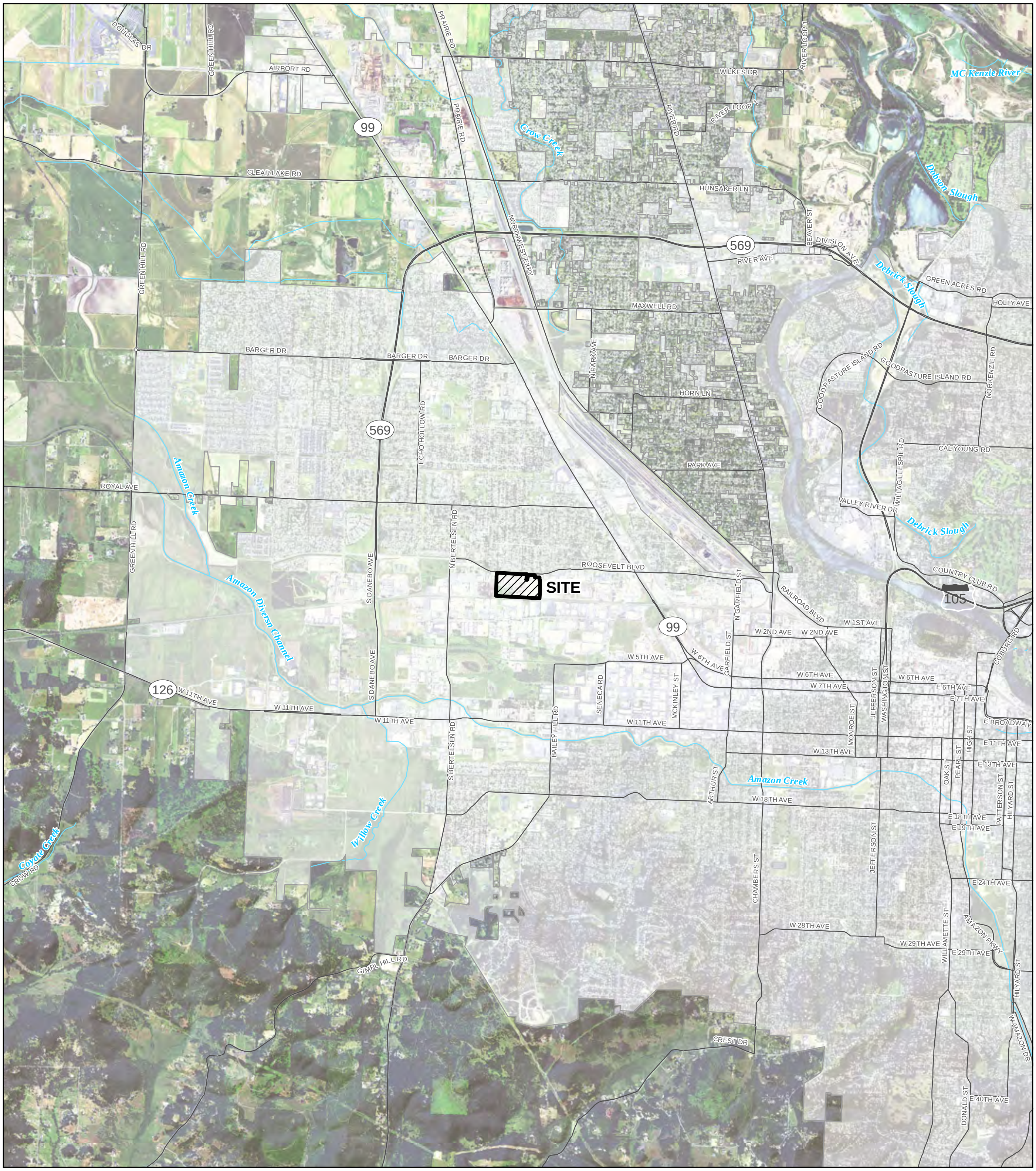
DEQ. Guidance for Conduct of Deterministic Human Health Risk Assessment. May 1998 (updated 5/00).

DEQ. Guidance for Conducting Feasibility Studies. July 1998.

DEQ. Guidance for Ecological Risk Assessment: Levels I, II, III, IV. April 1998.

DEQ. Guidance for Identification of Hot Spots. April 1998.

APPENDIX B
FIGURES
J.H. Baxter Facility
Eugene, Oregon



LEGEND

Eugene City Limits

Major Roads

Watercourses

FIGURE 1

Site Vicinity Map

J.H. Baxter Wood Treating Facility
Eugene, Oregon

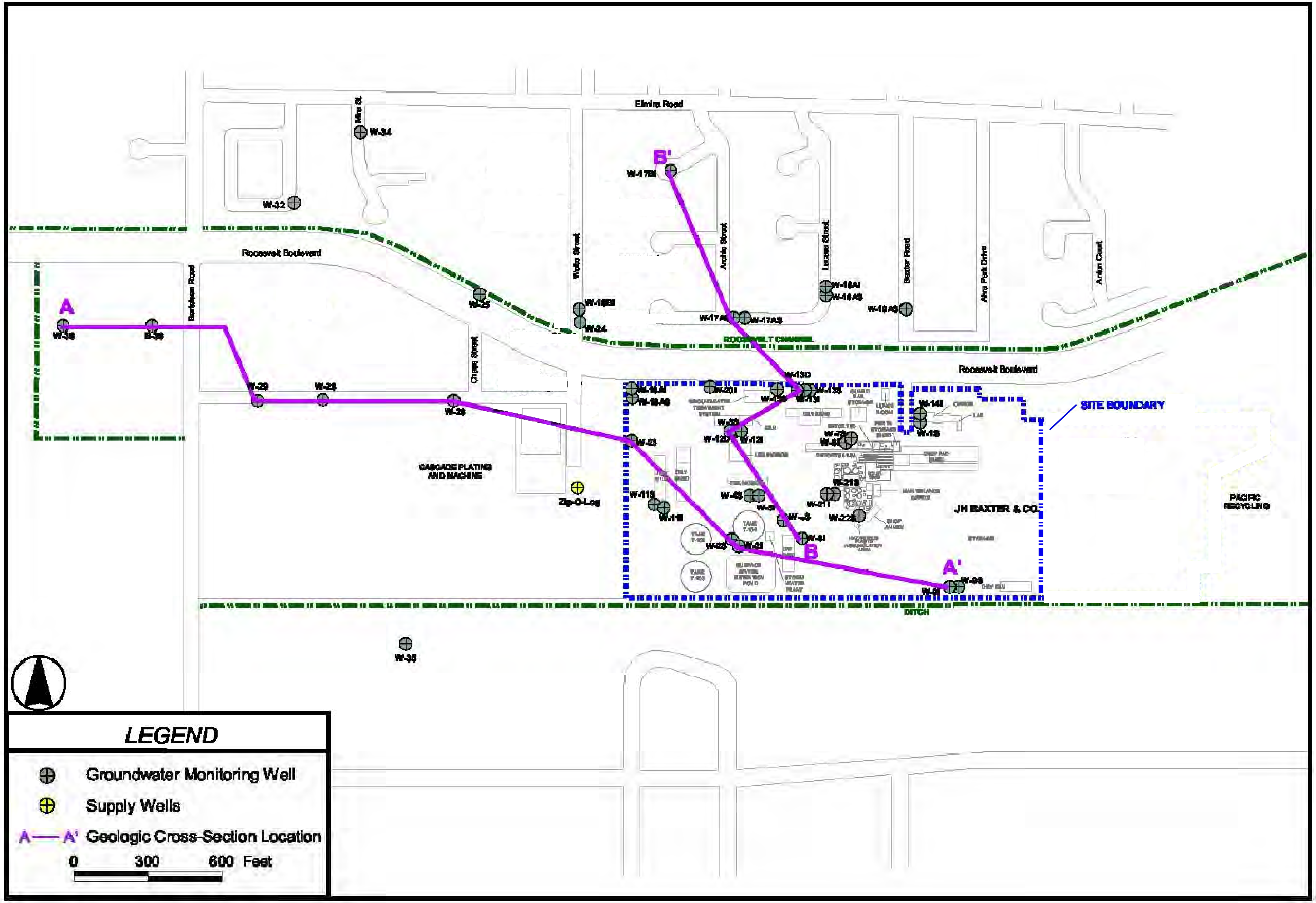
N

0 0.5 1
Miles

GSI Water Solutions, Inc.

MAP NOTES:
Date: January 15, 2016
Data Sources: Air photo taken on June 11, 2014 by the USDA

Document Path: \\PDX\Projects\Portland\302 - Baxter\GIS\Eugene\Project_mxds\2015_2h_Report\Figure1_Site_Vicinity_Map.mxd



JHBaxter

EUGENE, OREGON

PROJECT NO. 211088.00.005

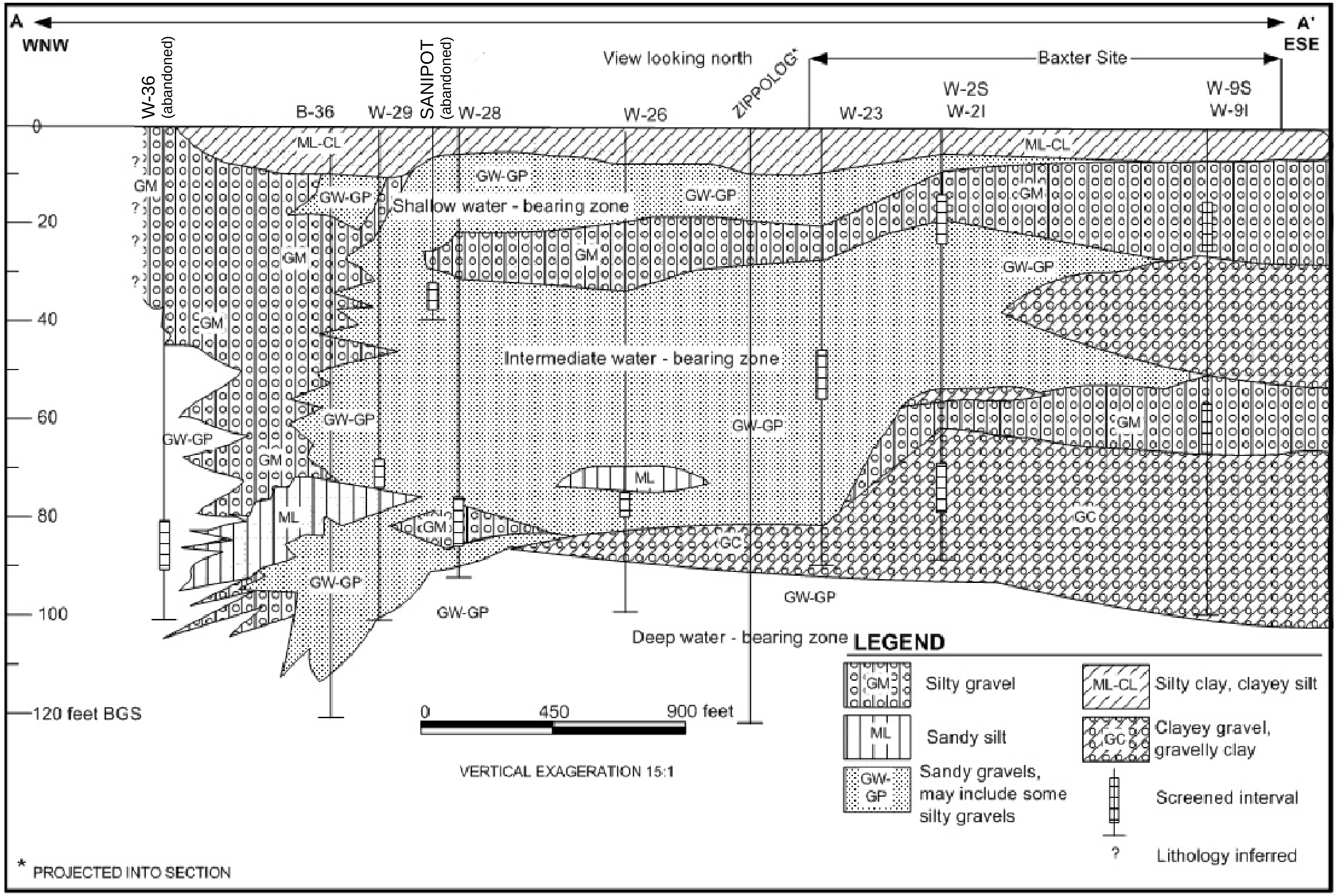
EARTHCON℠

EarthCon Consultants, Inc.

333 SW FIFTH AVENUE, SUITE 505, PORTLAND,OR 97204

GROUNDWATER MONITORING
WELL LOCATIONS

DRAWN:	CHECKED:	DATE:	FIGURE:
DCN	JSB	08/08/2011	2



EUGENE, OREGON

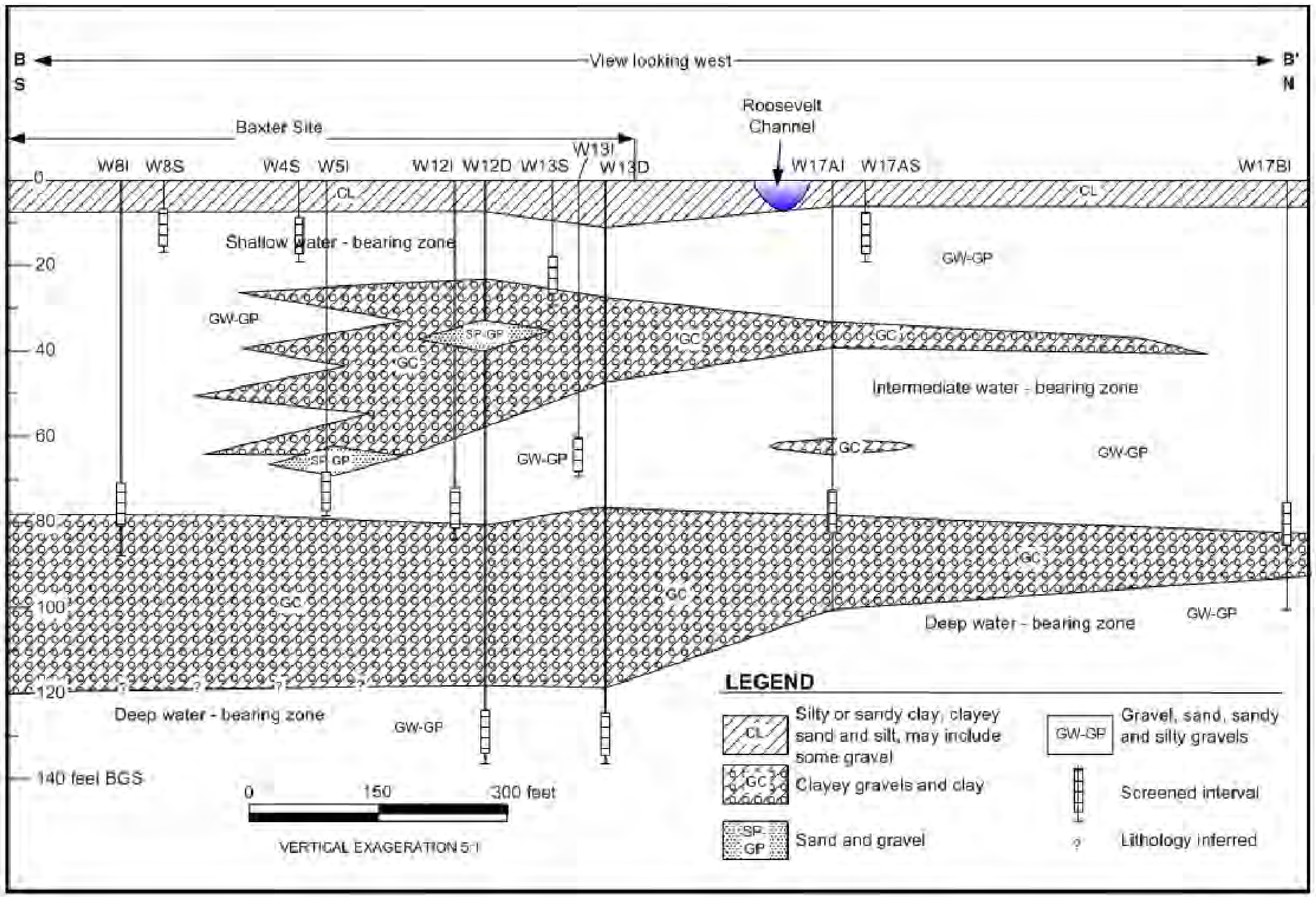
PROJECT NO. 211088.00.005

EarthCon Consultants, Inc.

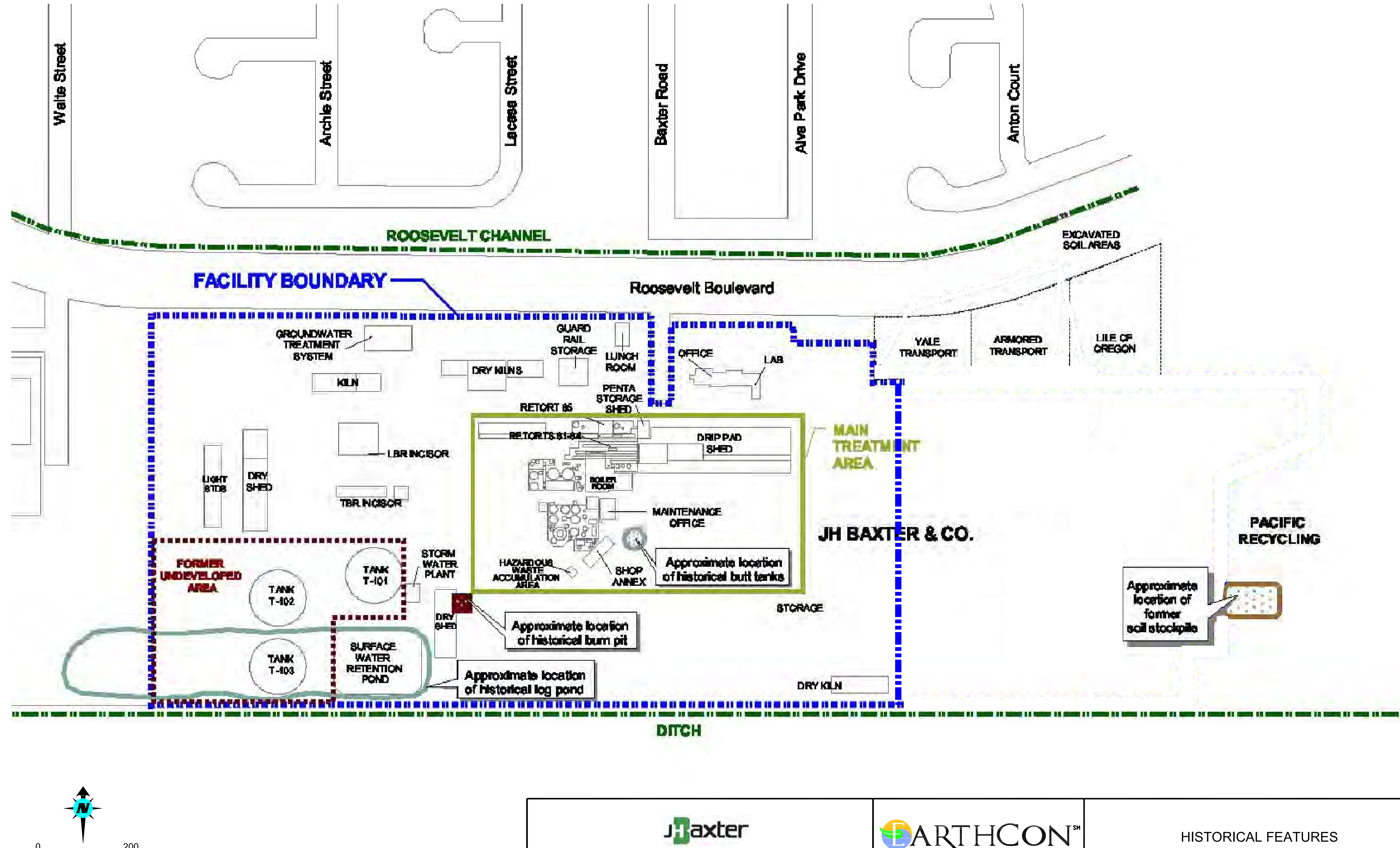
333 SW FIFTH AVENUE, SUITE 505, PORTLAND,OR 97204

GENERALIZED WEST - EAST
GEOLOGIC CROSS SECTION (A-A')

DRAWN:	CHECKED:	DATE:	FIGURE:
DCN	JSB	08/08/2011	3



JH Baxter	EarthCon	GENERALIZED SOUTH - NORTH GEOLOGIC CROSS SECTION (B-B')
EUGENE, OREGON	EarthCon Consultants, Inc.	DRAWN: DCN · CHECKED: JSB · DATE: 08/08/2011 · FIGURE: 4
PROJECT NO. 211088.00.005	333 SW FIFTH AVENUE, SUITE 505, PORTLAND,OR 97204	



JHBaxter

EUGENE, OREGON

PROJECT NO. 211088.00.005

EARTHCON

EarthCon Consultants, Inc.
333 SW FIFTH AVENUE, SUITE 505, PORTLAND,OR 97204

HISTORICAL FEATURES

DRAWN:	CHECKED:	DATE:	FIGURE:
DCN	JSB	08/08/2011	5

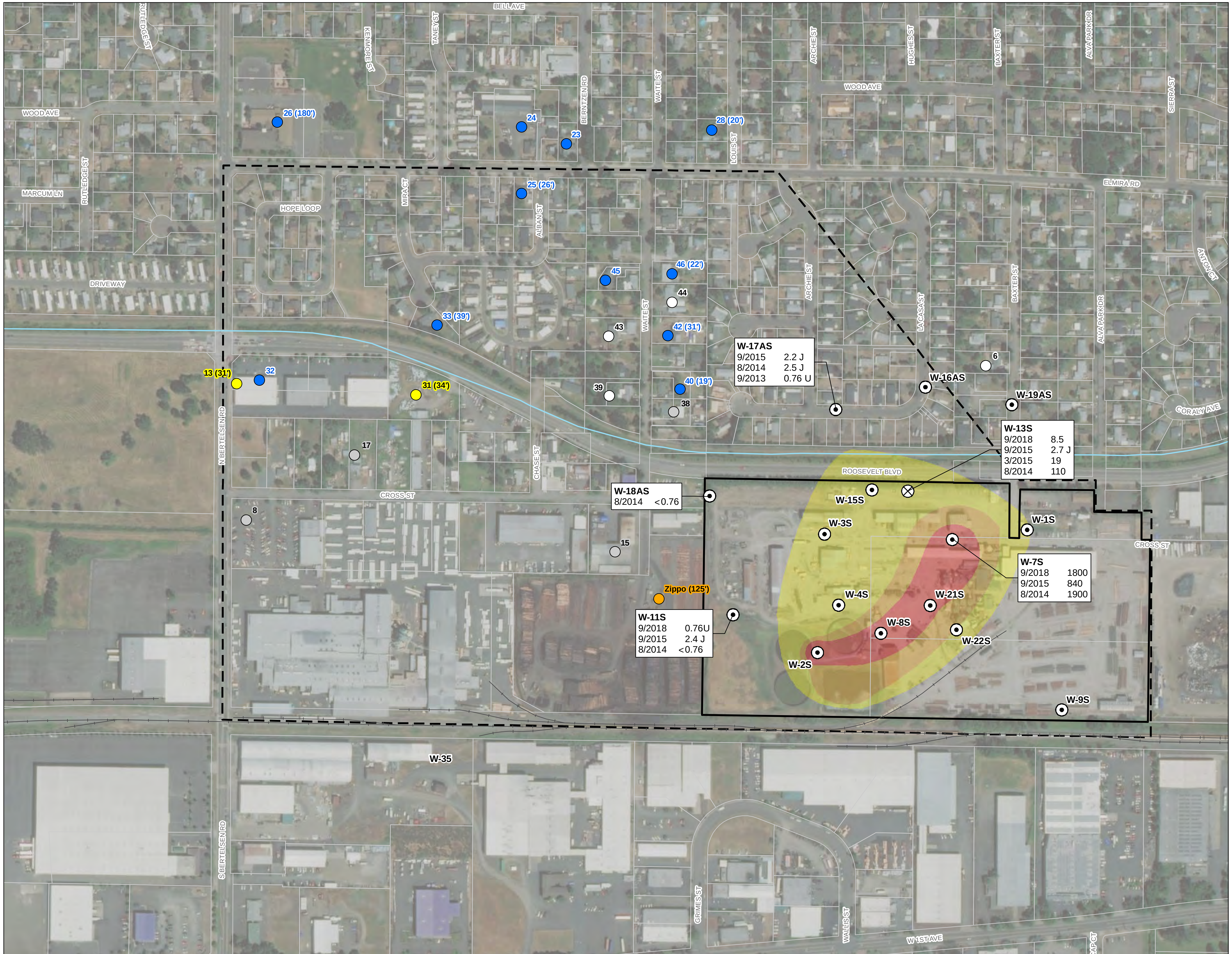


FIGURE 6

Area of Concern - Shallow Groundwater

JH Baxter
Eugene, Oregon

LEGEND

- Monitoring Well
- Extraction Well

Water Wells[3]

- Domestic, Irrigation in Use (depth)
- Industrial, in Use <35' (shallow)
- Industrial, in Use >100' (deep)
- Not in Use (residential)
- Abandoned (residential)

Pentachlorophenol Concentration (ug/L)

- 1 - <50
- 50 - <150
- ≥150

All Other Features

- Facility Boundary
- Locality of Facility
- Tax Lot
- Railroad
- Watercourse

NOTES:

1. Pentachlorophenol concentration in ug/L (microgram per liter).
2. Samples taken on dates shown. Not all wells were sampled.
3. Water wells and Locality of Facility from Beneficial Water Use Determination. June 28, 2002

Abbreviations:
J Estimated
< Not-Detected at concentration shown

N

0 175 350 525
Feet

Date: April 3, 2019
Data Sources: AMEC, USGS, ESRI, Lane Co.

GSI Water Solutions, Inc.

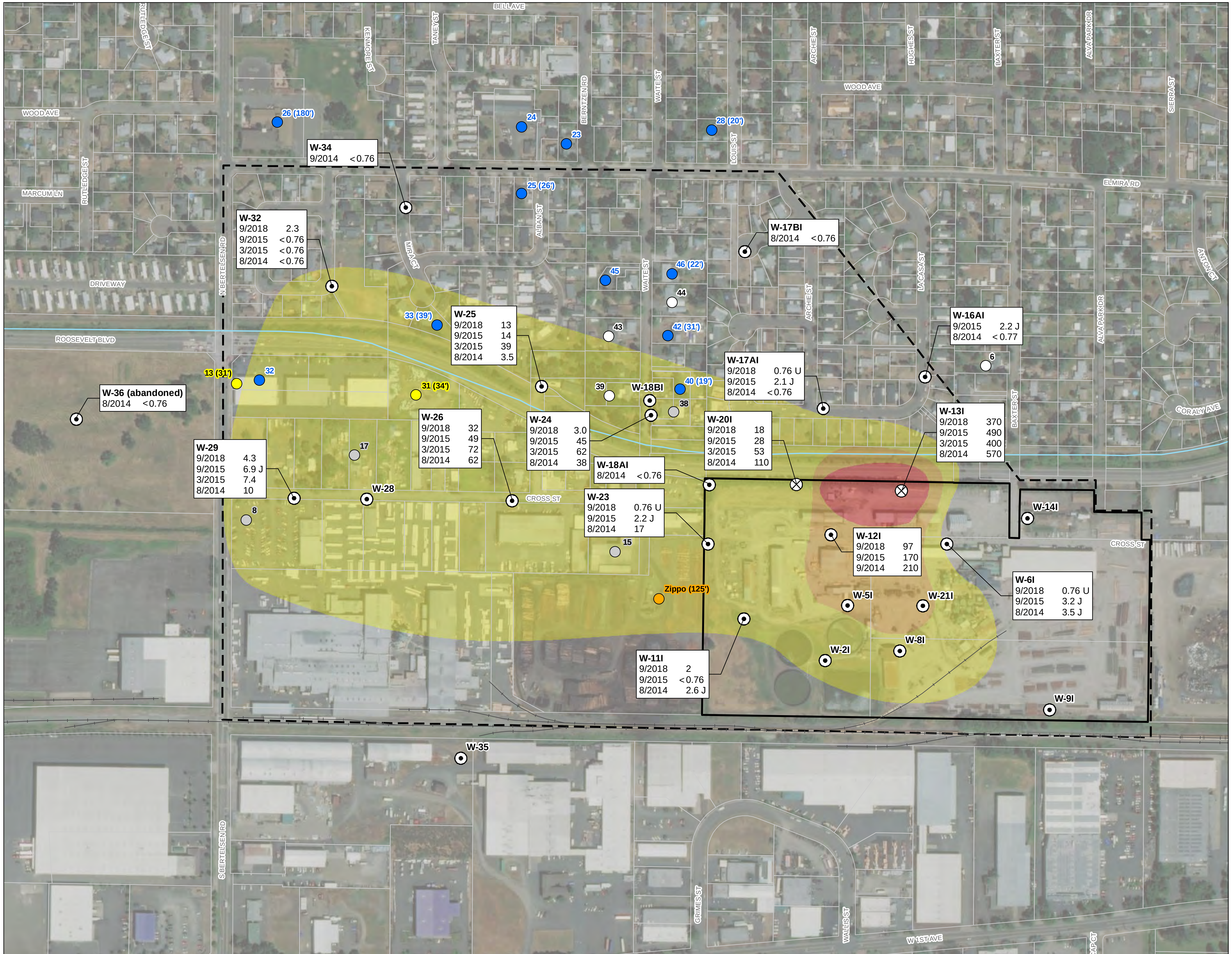


FIGURE 7

Area of Concern - Intermediate Groundwater

JH Baxter
Eugene, Oregon

LEGEND

- Monitoring Well
- Extraction Well

Water Wells[3]

- Domestic, Irrigation in Use (depth)
- Industrial, in Use <35' (shallow)
- Industrial, in Use >100' (deep)
- Not in Use (residential)
- Abandoned (residential)

Pentachlorophenol Concentration (ug/L)

- 1 - <50
- 50 - <150
- ≥150

All Other Features

- Facility Boundary
- Locality of Facility
- Tax Lot
- Railroad
- Watercourse

NOTES:

1. Pentachlorophenol concentration in ug/L (microgram per liter).
2. Samples taken on dates shown. Not all wells were sampled.
3. Water wells and Locality of Facility from Beneficial Water Use Determination. June 28, 2002

Abbreviations:

J Estimated
< Not-Detected at concentration shown

N

0 175 350 525
Feet

Date: April 3, 2019
Data Sources: AMEC, USGS, ESRI, Lane Co.

GSI Water Solutions, Inc.

Document Path: Y:\0302_Baxter\Source_Figures\Eugene\2019_Public_Meeting_Support\Figure7_AOC_Intermediate_GW.mxd

FIGURE 8

Residual NAPL Observations in Soil

JH Baxter
Eugene, Oregon

LEGEND

Subsurface Soil Samples

- Samples with Residual NAPL at time of drilling boreholes and wells from 1986 through 1995 (depth of NAPL observation)
- All Other Samples

All Other Features

- Facility Boundary
- Locality of Facility
- Tax Lot
- Railroad
- Watercourse

N

0 100 200 300
Feet

Date: March 28, 2019
Data Sources: AMEC, USGS, ESRI, Lane Co.

GSI Water Solutions, Inc.

Document Path: Y:\0302_Baxter\Source_Figures\Eugene\Public_Meeting_Support\Figure8_Residual_NAPL_Subsurface_Soil.mxd

FIGURE 9

Surface Soil Sample Locations

JH Baxter
Eugene, Oregon

LEGEND

- SS-1 Surface Soil Location (1994)
- B-1 Surface Soil Location (1994)
- SS-1 Surface Soil Location (1997)
- SS98-1 Surface Soil Location (1998)
- BH00-1 Surface Soil Location (2000)
- COMP S1 Surface Soil Location (2002)

N

0 250 500
Feet

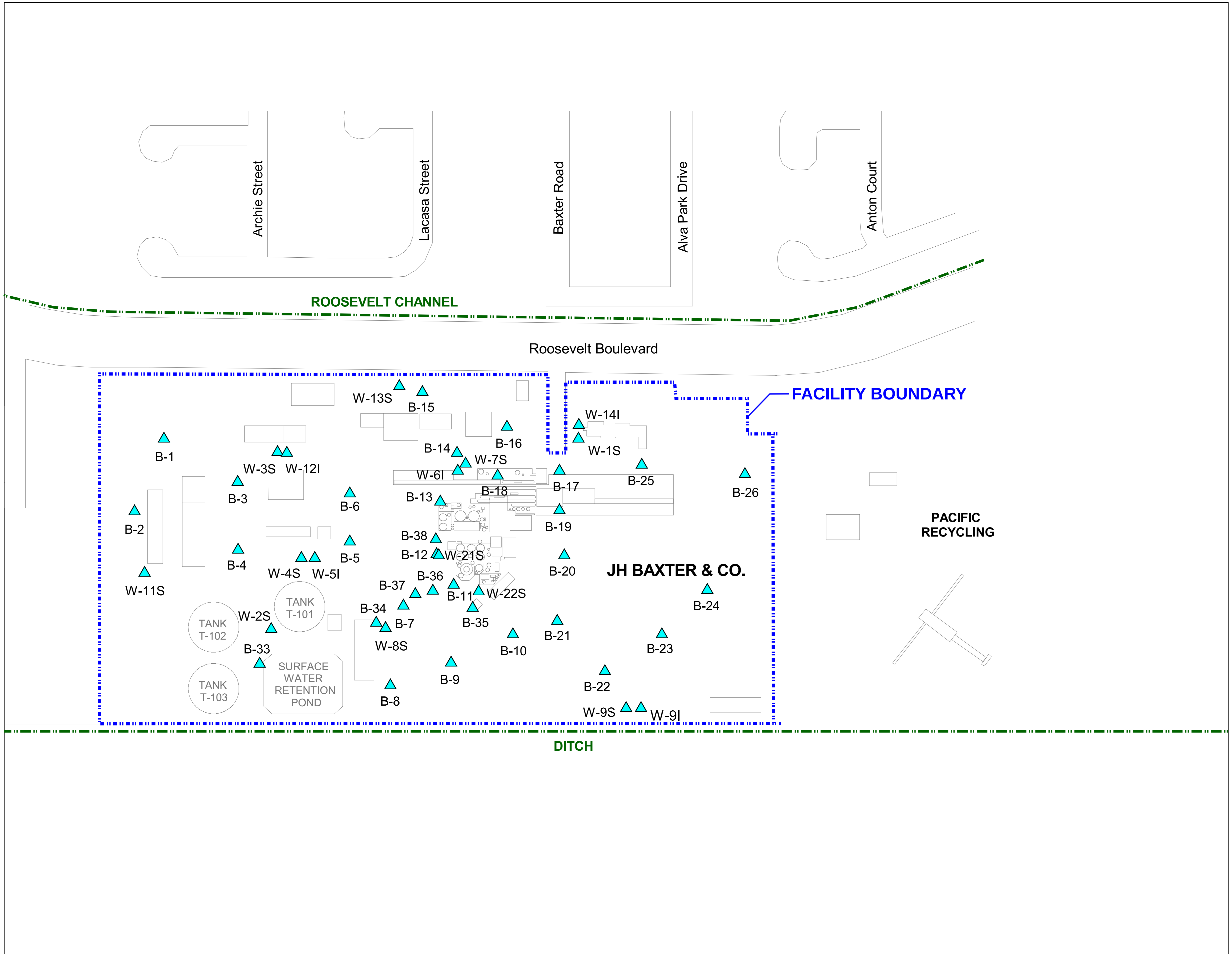
Date: March 28, 2019
Data Sources: JHBaxter

GSI Water Solutions, Inc.

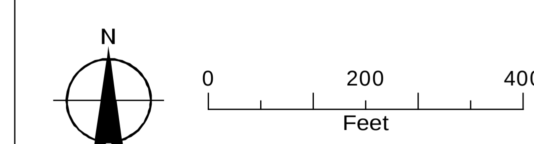
FIGURE 10

Subsurface Soil Sample Locations

JH Baxter
Eugene, Oregon



LEGEND



Date: March 28, 2019
Data Sources: JHBaxter

GSI Water Solutions, Inc.

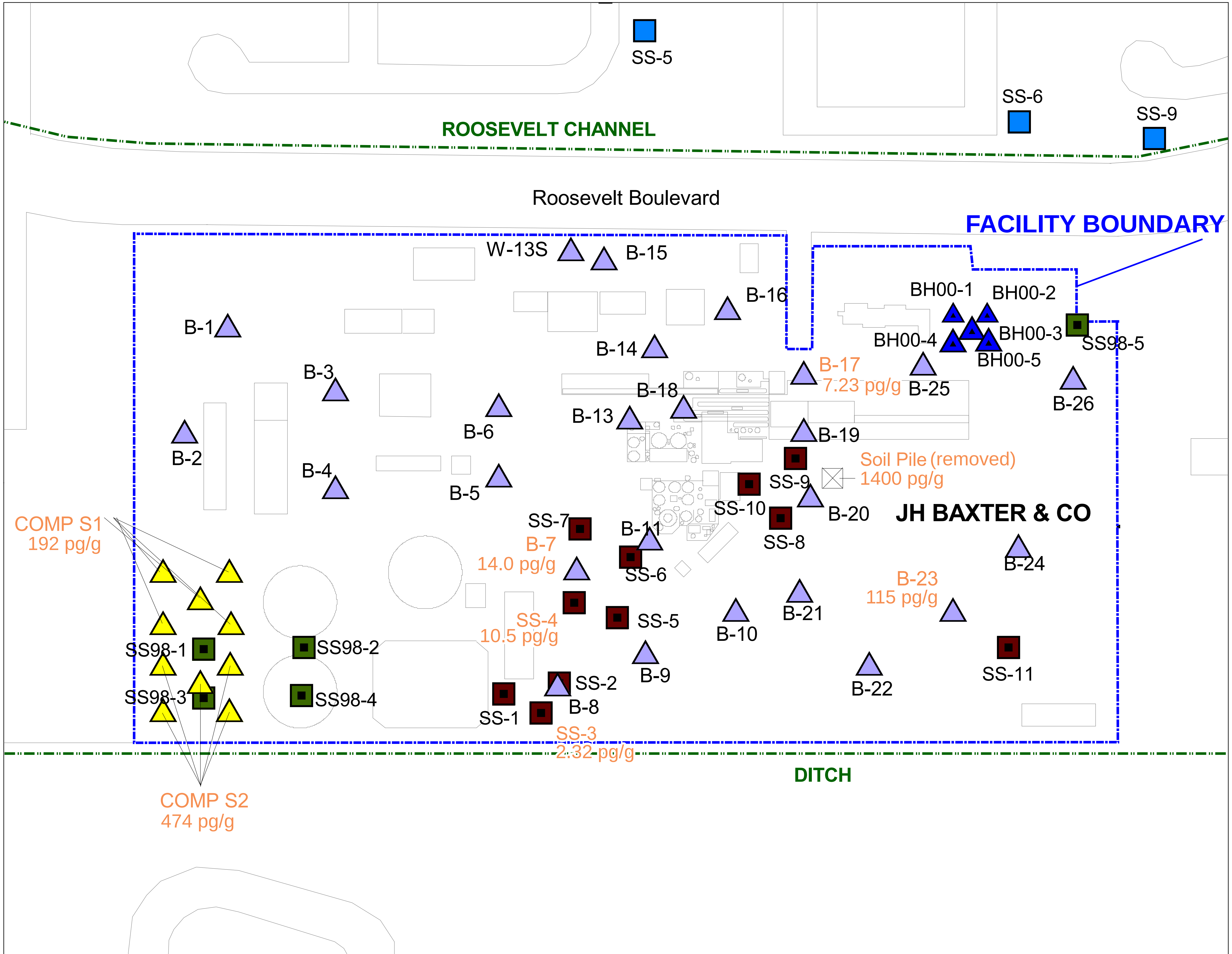


FIGURE 10a

Surface Soil Sample Locations for Dioxins/Furans

JH Baxter
Eugene, Oregon

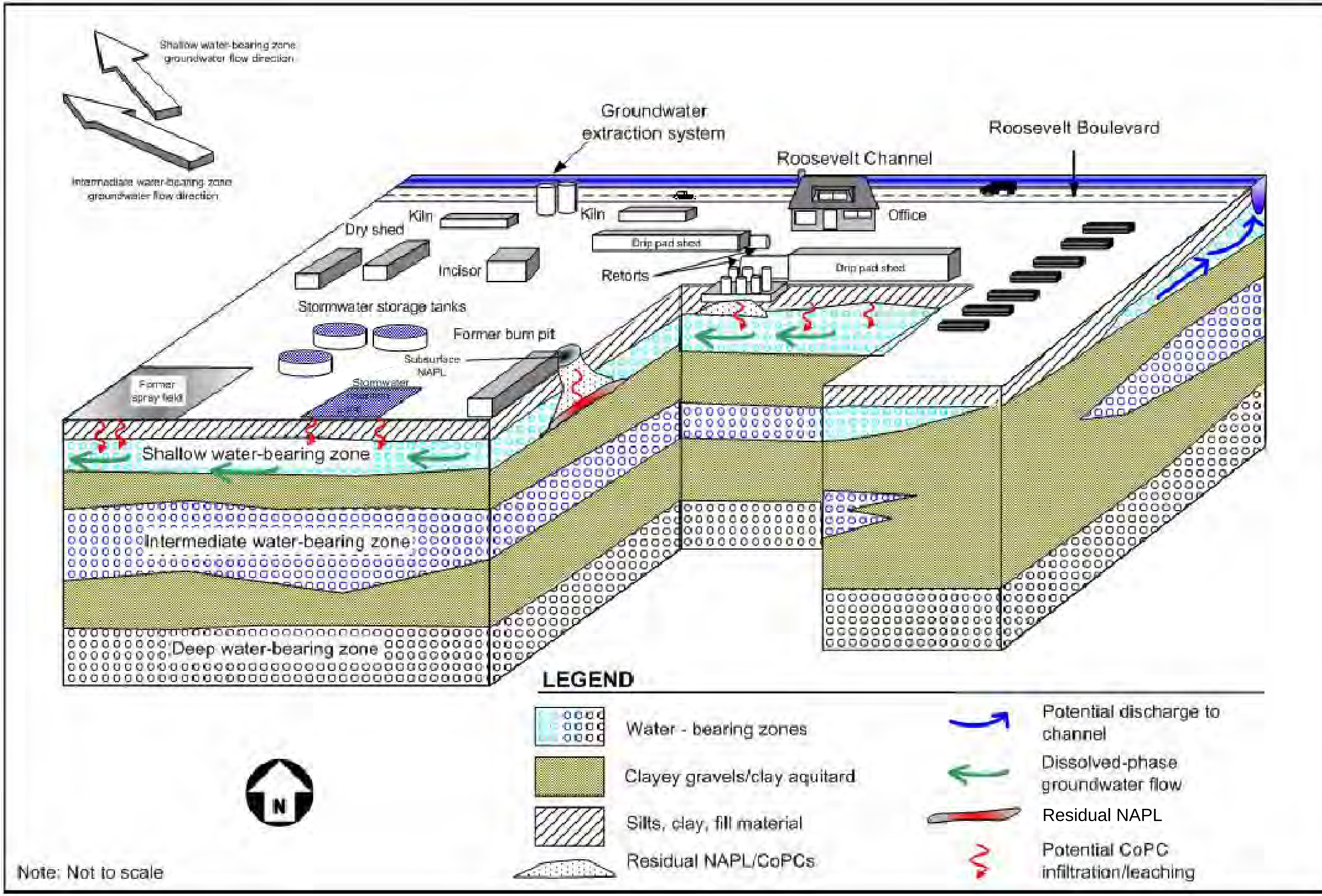
LEGEND

- SS-1 Surface Soil Location (1994)
- B-1 Surface Soil Location (1994)
- SS-1 Surface Soil Location (1997)
- SS98-1 Surface Soil Location (1998)
- BH00-1 Surface Soil Location (2000)
- COMP S1 Surface Soil Location (2002)

GSI Water Solutions, Inc.

Date: March 28, 2019
Data Sources: JHBaxter

Y:\0302_Baxter\Source_Figures\Eugene\2019_Public_Meeting_Support



JHBaxter

EUGENE, OREGON

PROJECT NO. 211088.00.005

EARTHCON

EarthCon Consultants, Inc.

333 SW FIFTH AVENUE, SUITE 505, PORTLAND,OR 97204

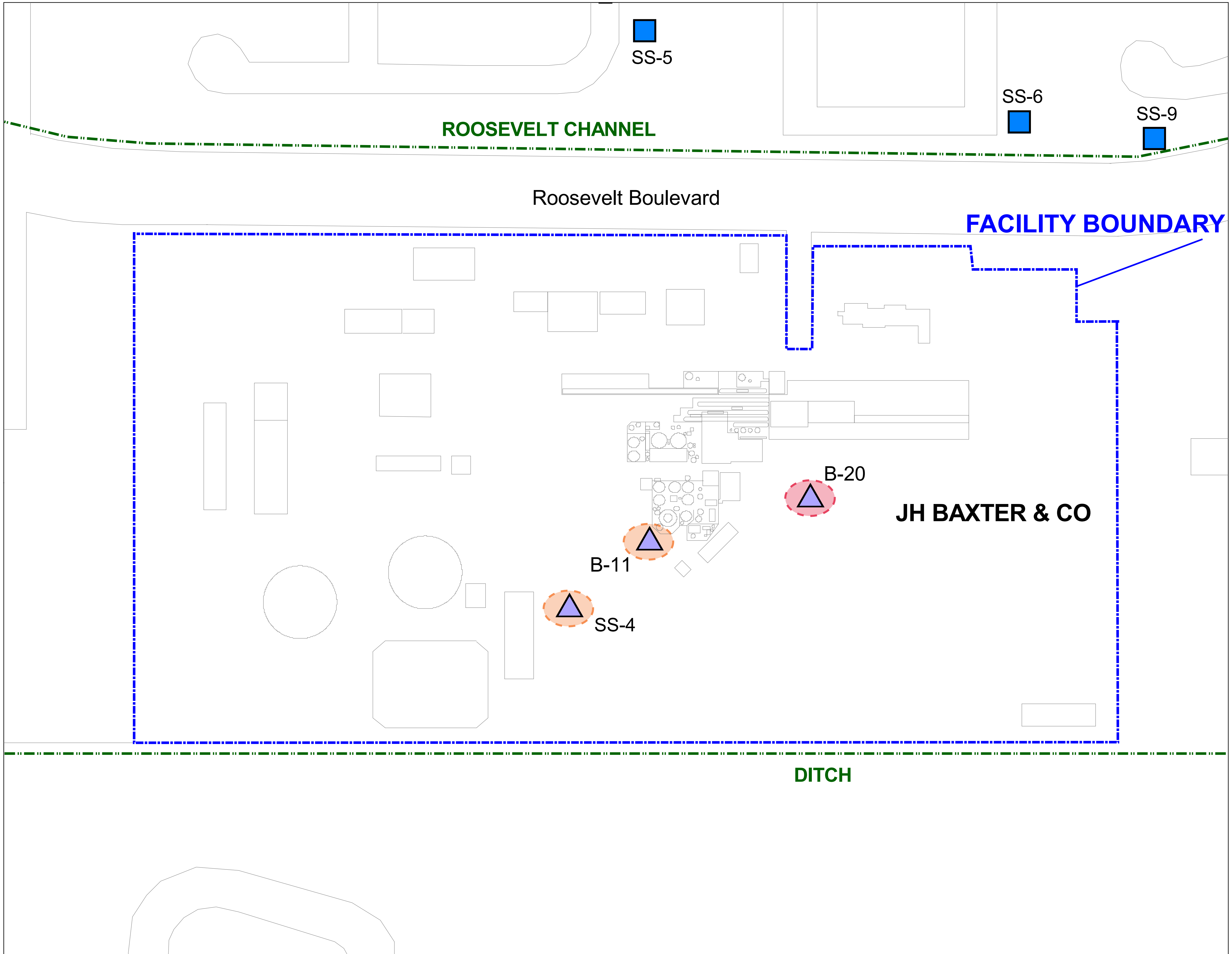
CONCEPTUAL SITE MODEL

DRAWN:	CHECKED:	DATE:	FIGURE:
DCN	JSB	08/08/2011	11

FIGURE 11a

Hotspot Soil Sample Locations for Arsenic

JH Baxter
Eugene, Oregon



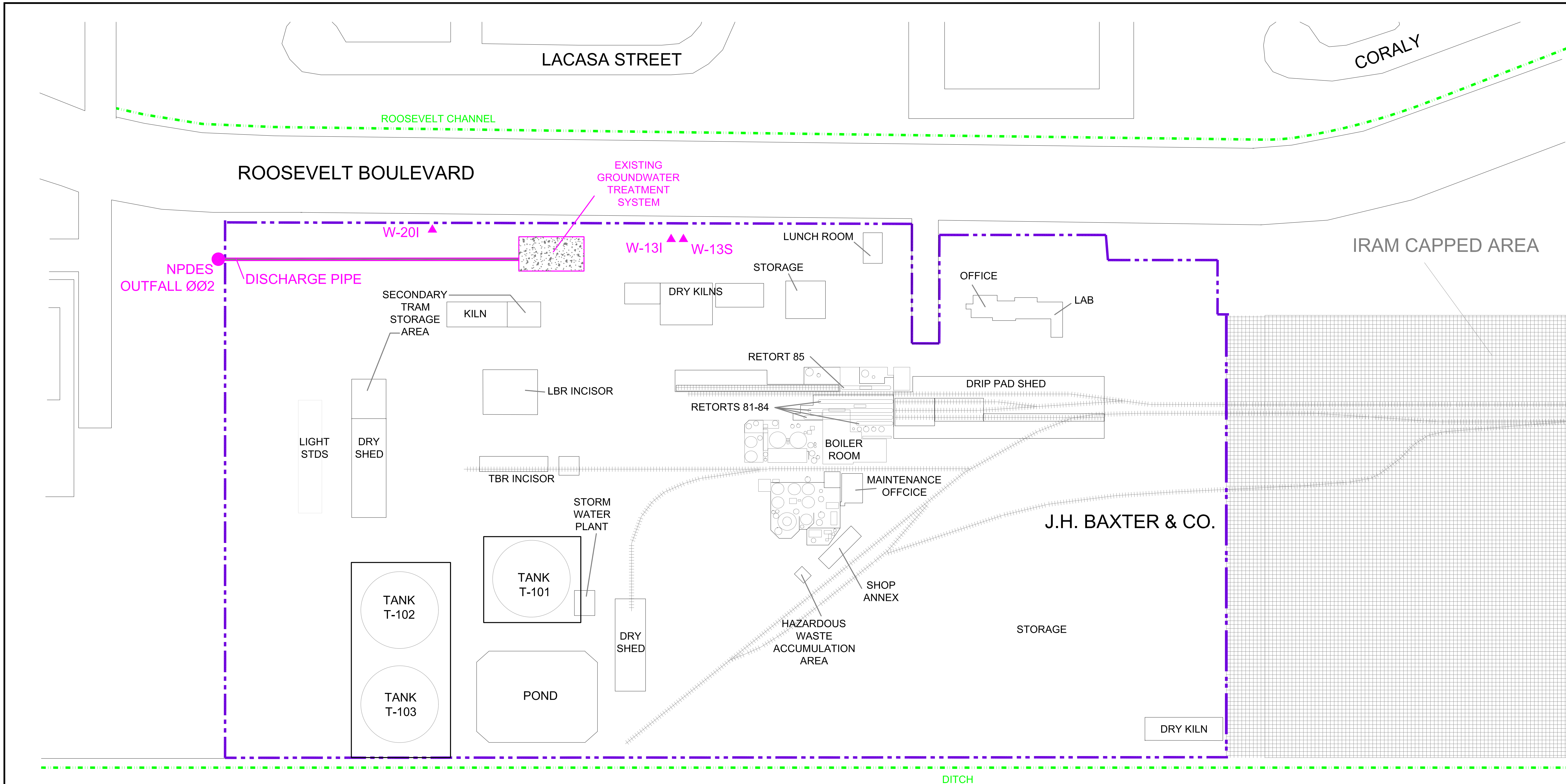
LEGEND

- B-1 Surface Soil Location (1994)
- Surface soil sample location with arsenic concentration above DEQ hotspot criteria (340 mg/kg)
- Surface and Subsurface soil sample location with arsenic concentration above DEQ hotspot criteria (1735 mg/kg for subsurface)

Date: March 28, 2019
Data Sources: JHBaxter

GSI Water Solutions, Inc.

Y:\0302_Baxter\Source_Figures\Eugene\2019_Public_Meeting_Support



LEGEND

- FACILITY BOUNDARY
- RAILROAD
- PAVED AREAS
- EXISTING EXTRACTION WELL

0 160
Approximate Scale:
1 inch = 160 feet

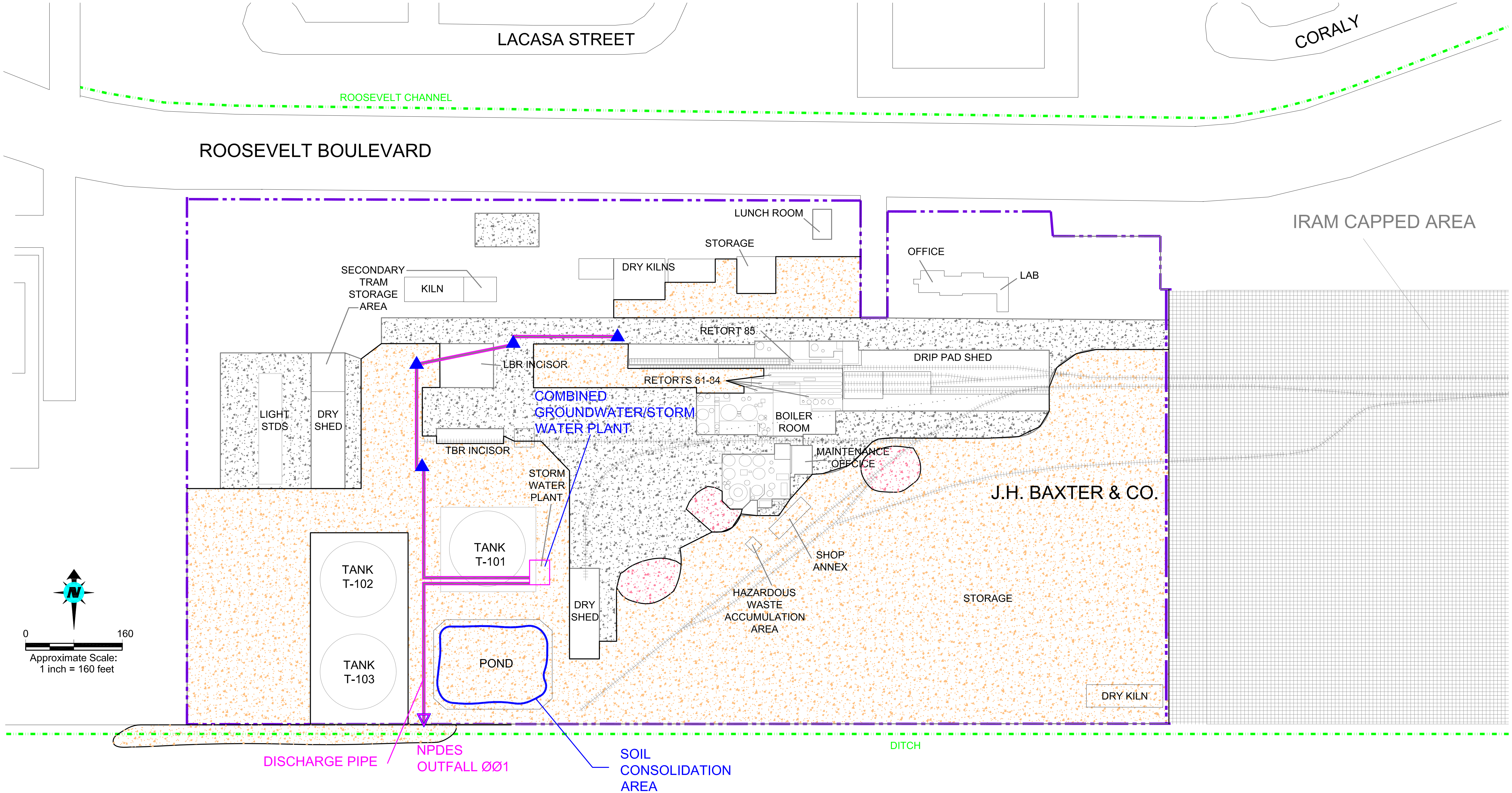
Baxter
EUGENE, OREGON
PROJECT NO. 211088.00.005

EARTHCON[SM]
EarthCon Consultants, Inc.
333 SW FIFTH AVENUE, SUITE 505, PORTLAND,OR 97204

ALTERNATIVE 1 - NO ACTION

DRAWN:	CHECKED:	DATE:	FIGURE:
DCN	JSB	08/08/2011	12

FILENAME: S:\CAD\PREMIER\JH BAXTER - EUGENE, OREGON\Series 4- and 9-



LEGEND

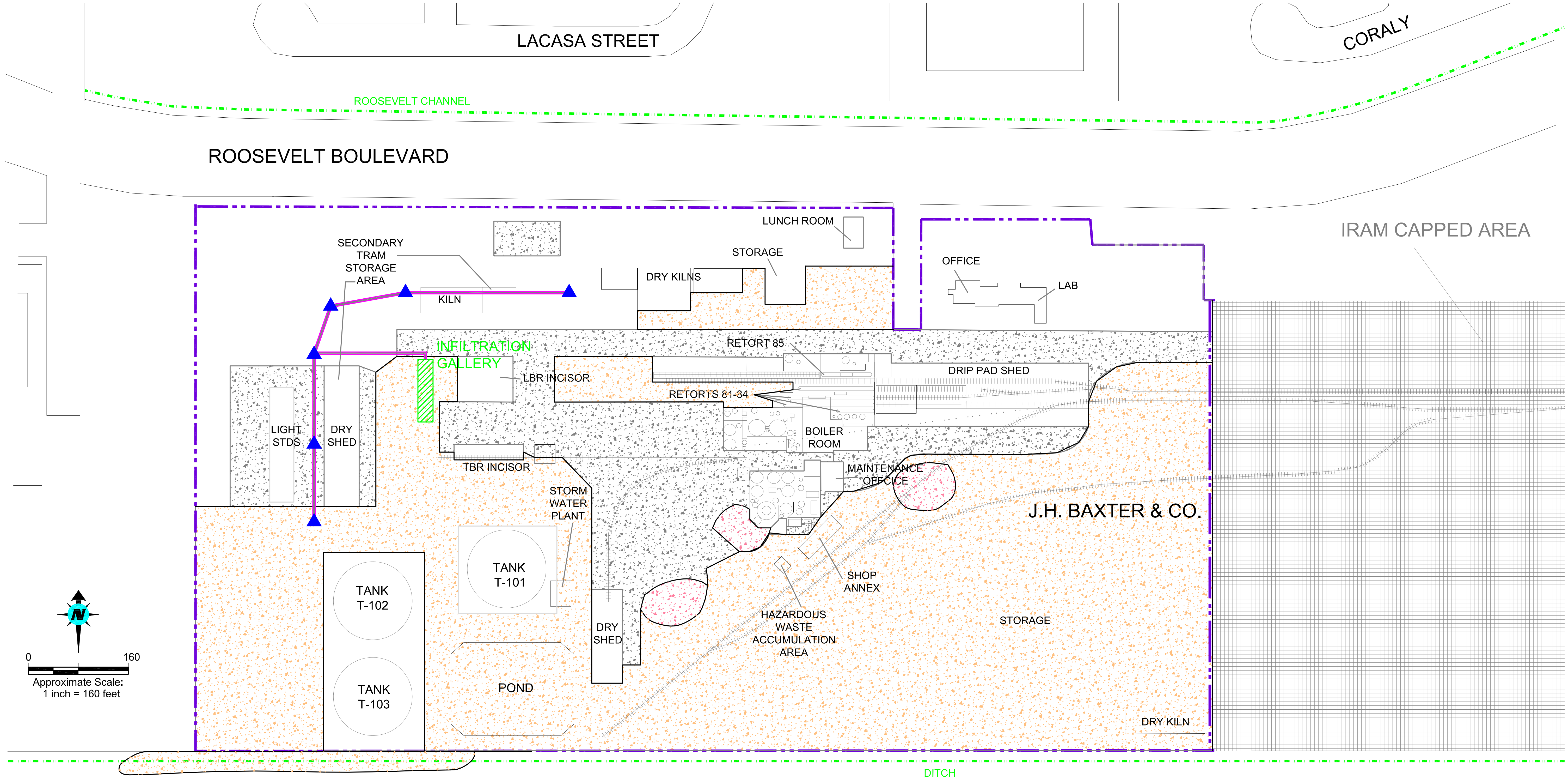
	FACILITY BOUNDARY		NEW EXTRACTION WELL
	RAILROAD		PIPING
	PAVED AREAS		
	HOT SPOT EXCAVATION AREAS		
	CAPPED AREAS		

J.H. Baxter
EUGENE, OREGON
PROJECT NO. 211088.00.005

EARTHCON
EarthCon Consultants, Inc.
333 SW FIFTH AVENUE, SUITE 505, PORTLAND,OR 97204

ALTERNATIVE 2 -
CAPPING, HOT SPOT CONSOLIDATION, AND
ENHANCED GROUNDWATER EXTRACTION, MNA

DRAWN:	CHECKED:	DATE:	FIGURE:
DCN	JSB	09/30/11	13



LEGEND

- FACILITY BOUNDARY
- RAILROAD
- PAVED AREAS
- HOT SPOT EXCAVATION AREAS
- CAPPED AREAS
- NEW EXTRACTION WELL
- PIPING

J.H. Baxter

EUGENE, OREGON

PROJECT NO. 211088.00.005

EARTHCON℠

EarthCon Consultants, Inc.

333 SW FIFTH AVENUE, SUITE 505, PORTLAND,OR 97204

ALTERNATIVE 3 -
CAPPING, HOT SPOT EXCAVATION AND DISPOSAL
ENHANCED BIOREMEDIATION

DRAWN:	CHECKED:	DATE:	FIGURE:
DCN	JSB	09/30/11	14

FILENAME: S:\CAD\PREMIER\JH BAXTER - EUGENE, OREGON\Series 4- and 9-

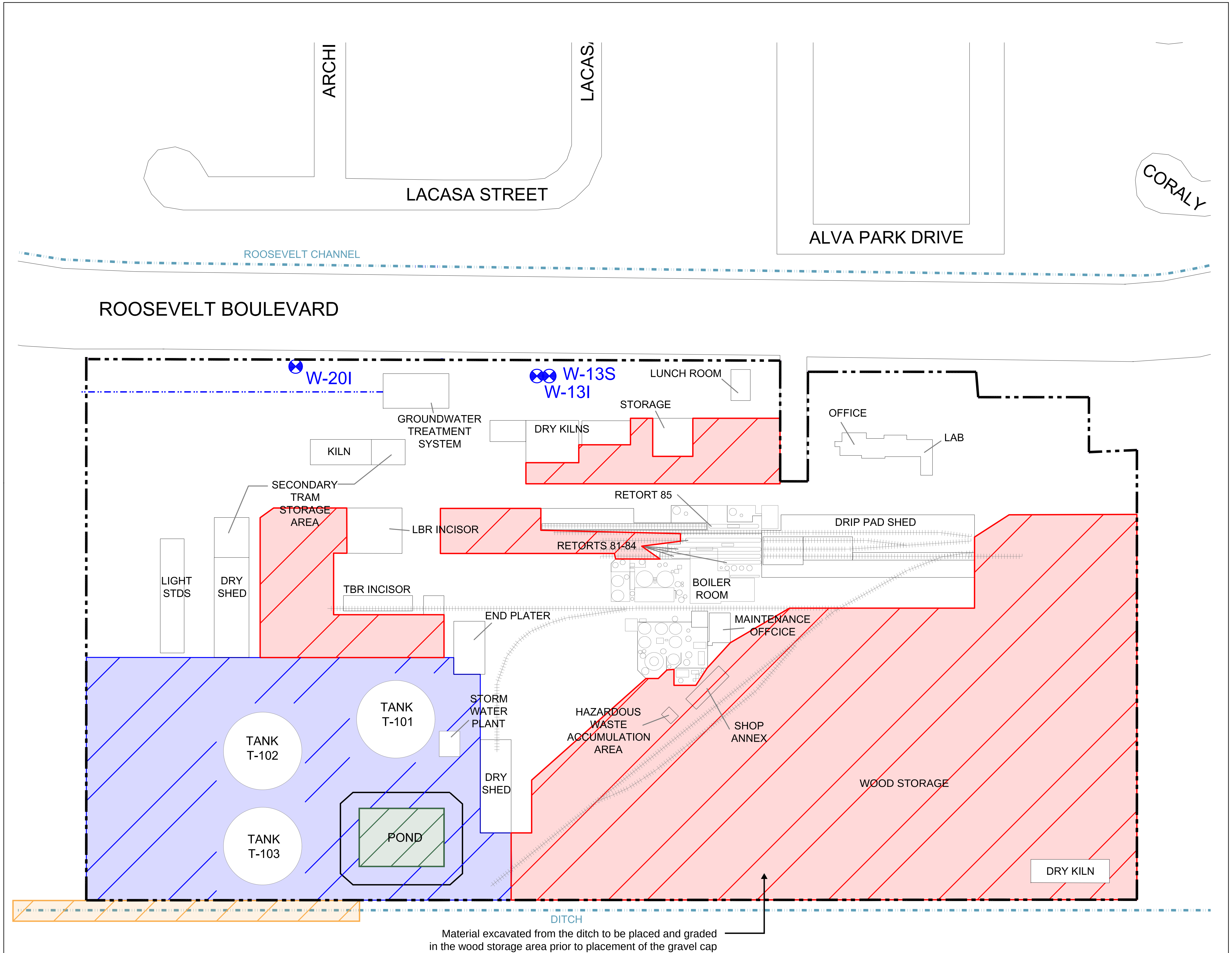


FIGURE 15

Preferred Alternative 3a

J. H. Baxter Wood Treating Facility

Eugene, Oregon

LEGEND

- Groundwater Extraction Well
- Facility Boundary (RCRA Area Of Contamination)
- Railroad
- Treatment System Discharge (Outfall 002)
- 12" Gravel and Geotextile Cap
- 6" Gravel and Geotextile Cap
- 6" Sediment Removal and Gravel Cap
- 3" Gravel and Geotextile Cap in Pond Bottom

NOTE:
The thickness and construction material for the cap may be different than described in the legend, based on operational needs and approval by DEQ.

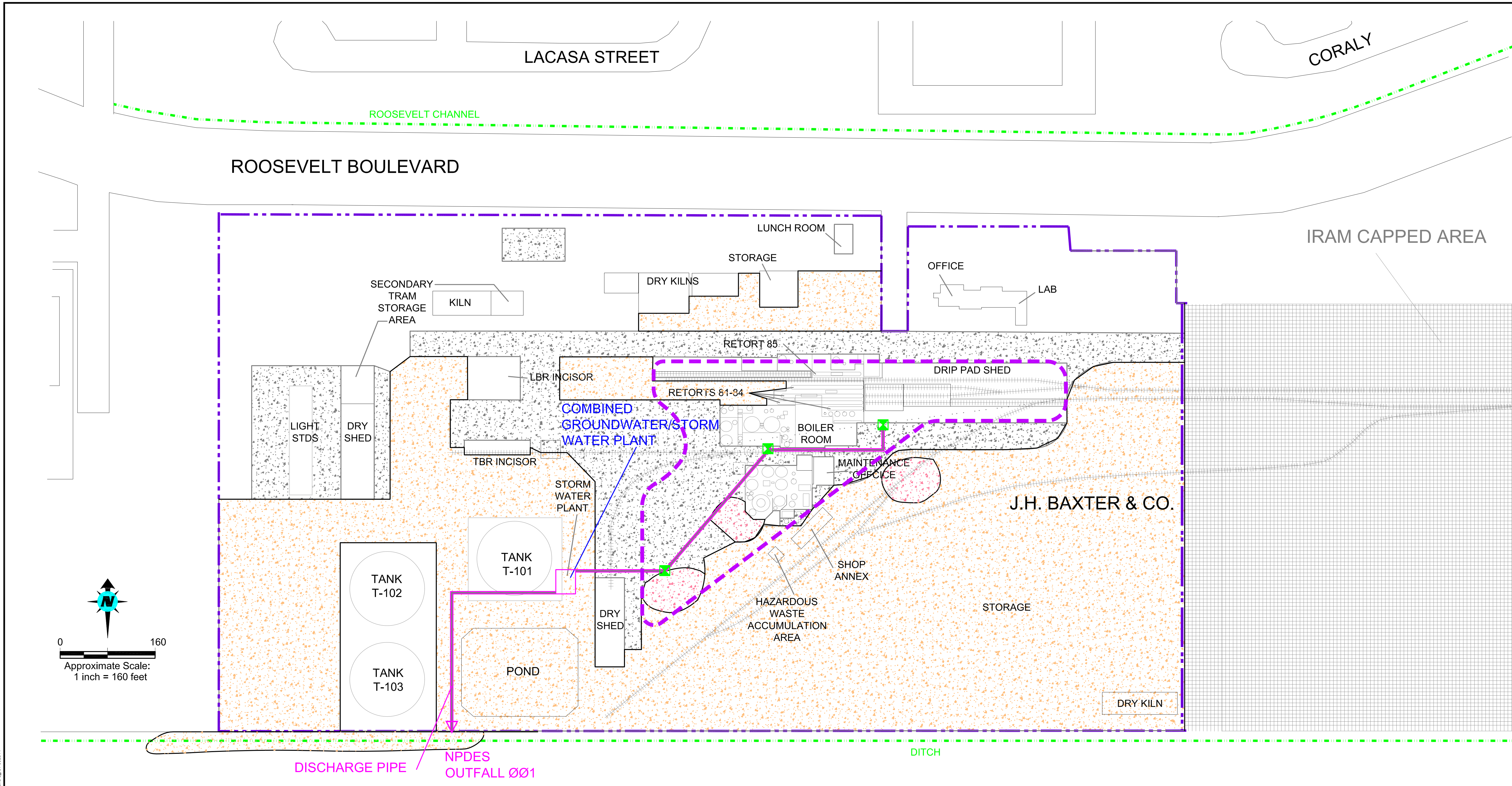
N

0 100 200
Feet

Data Sources: AMEC

GSI Water Solutions, Inc.

P:\Portland\001-ODEQ PPA\Figures\FS



LEGEND

- FACILITY BOUNDARY
- RAILROAD
- PAVED AREAS
- HOT SPOT EXCAVATION AREAS
- CAPPED AREAS
- TOTAL FLUID EXTRACTION WELL
- PIPING
- APPROXIMATE LOCATION OF CONTAINMENT WALL

JHBaxter

EUGENE, OREGON

PROJECT NO. 211088.00.005

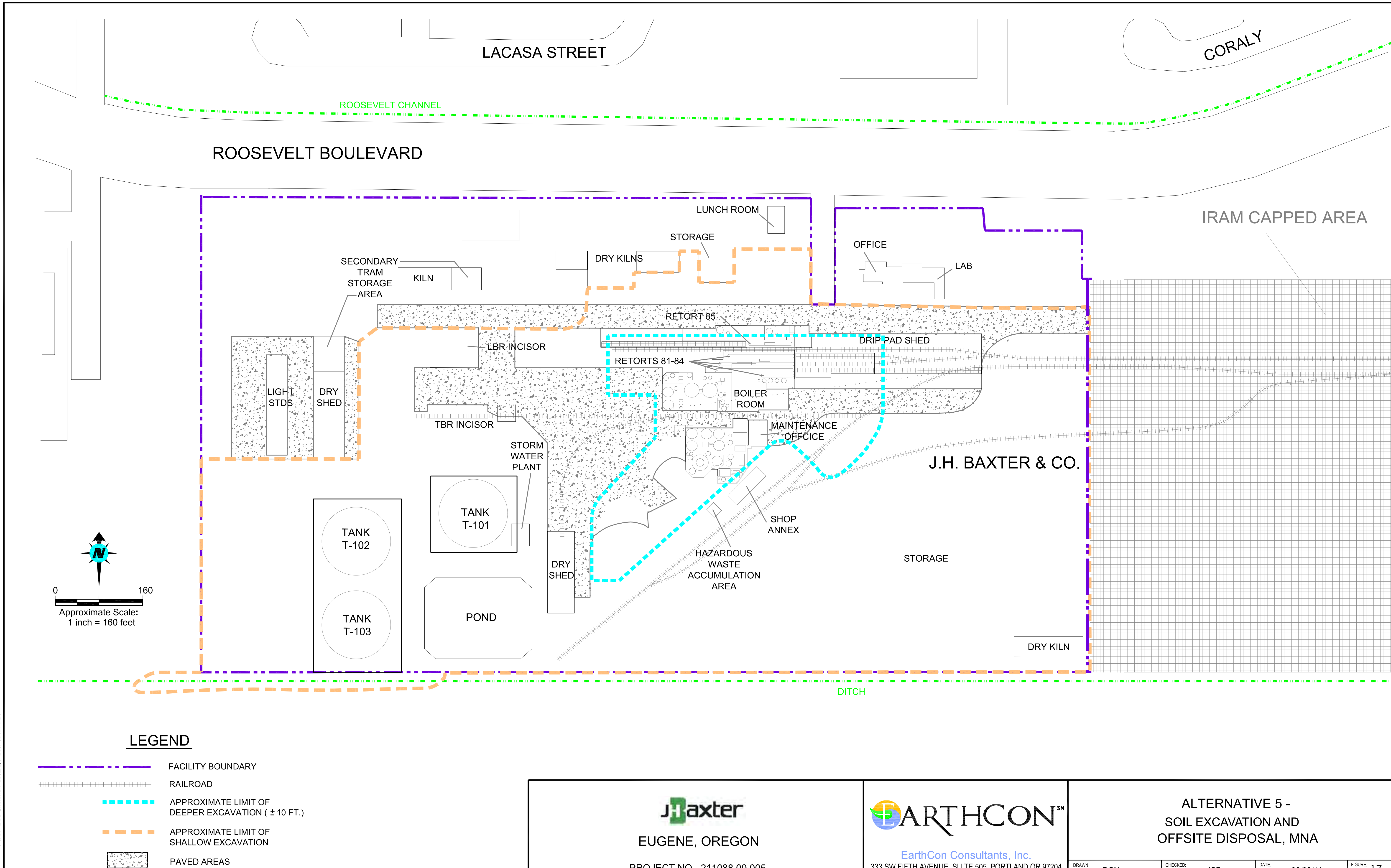
EARTHCON℠

EarthCon Consultants, Inc.

333 SW FIFTH AVENUE, SUITE 505, PORTLAND,OR 97204

ALTERNATIVE 4 -
CAPPING, HOT SPOT EXCAVATION AND DISPOSAL,
PHYSICAL/HYDRAULIC CONTAINMENT, MNA

DRAWN:	CHECKED:	DATE:	FIGURE:
DCN	JSB	09/30/11	16



J.H. Baxter

EUGENE, OREGON

PROJECT NO. 211088.00.005

EARTHCON℠

EarthCon Consultants, Inc.
333 SW FIFTH AVENUE, SUITE 505, PORTLAND,OR 97204

ALTERNATIVE 5 -
SOIL EXCAVATION AND
OFFSITE DISPOSAL, MNA

DRAWN:	CHECKED:	DATE:	FIGURE:
DCN	JSB	09/30/11	17