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Report

Feasibility Study Addendum J.H. Baxter & Co. Eugene, OR Facility

Prepared for
J.H. Baxter & Co.

June 2015

Prepared by
GSI Water Solutions, Inc.

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SECTION 1

Introduction

This Feasibility Study (FS) Addendum has been prepared on behalf of J.H. Baxter & Co. (Baxter) to supplement the *Feasibility Study Report, Revision 0, J.H. Baxter & Co., Eugene, Oregon Facility* (Baxter 2011) for the wood-treating facility at 85 Baxter Street, Eugene, Oregon. A Remedial Investigation (RI) and FS were performed for the Site under an Oregon Department of Environmental Quality (DEQ) Order on Consent, as described in the FS Report (Baxter 2011). The Site has been assigned a DEQ ECSI number of 55.

The purpose of this Addendum is as follows:

- Recommend a modified preferred alternative from the one proposed in the FS Report (Baxter 2011), based on a review of Site data and discussions with DEQ.
- Update the FS Report to provide additional information and clarification on specific sections as needed to support the modified preferred alternative

Because this Addendum has been prepared as a supplement to the main FS Report (Baxter 2011), the reader is referred to that report for a detailed understanding of the Site and Site actions to date.

This FS Addendum is organized into the following sections:

- Section 1. Introduction: this section provides the purpose and organization of this document.
- Section 2. Site Background: this section summarizes the pertinent background information for the site to set the context for the modified preferred alternative.
- Section 3. Remedial Action Objectives (RAOs): this section presents the RAOs and cleanup levels for the Site.
- Section 4. Remedial Alternative 3a: this section presents a modified preferred alternative for the Site, and compares it against the evaluation criteria for remedy selection, relative to the previous preferred alternative.
- Section 5. Conclusion: this section summarizes the recommendation for the modified alternative.
- Section 6. References.

SECTION 2

Site Background

A complete summary of the Site background, including Site history, current operations, previous investigations, and the environmental setting is provided in Section 2 of the FS Report (Baxter 2011). This section provides an abbreviated summary of the Site background.

The J.H. Baxter Eugene Facility covers approximately 42 acres. It is surrounded by residential properties to the north, and industrial properties to the west, east, and south (Figure 1). It has operated as a wood treatment facility since 1943, and is currently still in operation. Historical operations included the use of pentachlorophenol (PCP), creosote, metals-based wood treating solutions, and fire retardants.

Approximately 80% of the Site is unpaved, and is used for storage or transportation of materials around the property. There are five retorts currently in use on the central portion of the property. The southwest corner of the Site includes an approximately 1-acre pond, three tanks, and an undeveloped field (3.5 acres) covered by primarily ruderal plants. All retorts and tanks are on paved surfaces, and the retorts have concrete drip pads. The Site has a stormwater collection and treatment system, which discharges treated stormwater to an outfall under an NPDES permit.

The local hydrogeology consists of three water-bearing zones beneath the property. The depth of these water-bearing zones varies across the Site as there are numerous discontinuous confining layers present beneath the Site. Generally, the shallow water-bearing zone is present at 10 to 30 feet below ground surface (ft bgs); the intermediate water-bearing zone is present between 40 and 100 ft bgs, and the deeper water-bearing zone is present at 120 to 140 ft bgs. Geologic cross-sections are provided in the FS Report (Baxter 2011). The vertical gradient between the water bearing zones is generally downward; however with the pump and treat system running, gradients are upwards towards the extraction system within the hydraulic capture zone of the system.

The City of Eugene provides water to both residents and industrial properties in the area, however, the Revised Beneficial Water Use Determination (Baxter 2006) identified 27 wells registered for domestic, irrigation, or industrial uses within the locality of facility. In 2006, Baxter verified that the residential neighborhood adjacent to the Site was using City water for domestic purposes. Because the residents are on city water, DEQ approved the Beneficial Use Determination that future beneficial uses for the area include irrigation and industrial uses only (DEQ, 2009).

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Environmental investigations and activities have been on-going at the site since 1985, and include interim remedial measures for groundwater, stormwater, and soil (Baxter 2010). These activities are summarized in the RI Summary Report (Baxter 2010). A groundwater extraction and treatment system has been operating onsite since 1993, which extracts groundwater from both the shallow and intermediate water-bearing zones. Semi-annual groundwater monitoring occurs under DEQ oversight.

An ecological risk assessment was performed for the Site in 1999 and concluded that there was no unacceptable risk to ecological receptors. DEQ approved the ecological risk assessment in a letter dated July 23, 1999.

Human Health Risk Assessment Findings

A Revised Baseline Human Health Risk Assessment (BHHRA) was submitted to DEQ in 2006, and identified the following chemicals of concern (COCs) for the Site: PCP, polyaromatic hydrocarbons (PAHs), dioxins/furans, and arsenic. Arsenic is the risk driver in soil, and PCP is the risk driver in groundwater, both for direct contact scenarios (Baxter 2006). An addendum to the Revised BHHRA was submitted to DEQ on February 19, 2014 to assess and update risks to onsite workers and off-site residents. It concluded that there was no potentially unacceptable risk to off-site receptors from direct contact with soil or sediment. However, for off-site residential receptors exposed to groundwater through irrigation, it found that PCP presents potentially unacceptable risk. A summary of human health risk assessment findings as presented in the BHHRA, BHHRA Addendum, and FS Report is provided as Table 1.

Only the shallow and intermediate water-bearing zones were identified as posing potential human health risk from exposure to groundwater. A plume stability study was performed as part of the RI Summary Report and concludes that the groundwater plume of PCP is in dynamic equilibrium, and is not expanding (Baxter 2010, 2011). In 2015, an evaluation of the plume between 2001 and 2014 for PCP in the shallow and intermediate water-bearing zones was conducted, coupled with a review of the concentration trends for PCP at individual wells. This evaluation showed that the 2014 plume footprint in the intermediate zone is shrinking.

Agreed

SECTION 3

Cleanup Levels and Remedial Action Objectives

Sections 4-6 of the FS Report (Baxter 2011) provide a detailed discussion of the conceptual site model (CSM), remedial action objectives (RAOs), and proposed cleanup levels. This section summarizes the cleanup levels, and updates the RAOs from the FS Report.

Cleanup and Hot Spot Levels

Table 2 presents proposed cleanup levels and hot spot levels for the site, as discussed in the FS Report. In addition to the cleanup levels presented in the FS Report, a cleanup level was calculated for exposure to PCP from residential use of groundwater for irrigation, based on the exposure scenario described in the BHHRA Addendum (Baxter 2014) and as discussed with DEQ. Exposure parameters provided by DEQ (via e-mail from Susan Turnblom dated 5/6/2015) were used to calculate the cleanup level for the irrigation scenario; toxicity values and chemical/physical parameters for the calculation are the same as those used in the BHHRA and BHHRA Addendum, and are shown in Table 3. The PCP proposed cleanup level for the residential off-site irrigation scenario is 59 ug/l.

There are areas in onsite soil that **exceed hot spot** criteria for **arsenic** in both **surface** and **subsurface soils**, as shown in Figure 2.

As indicated in the FS Report, there are **no hot spots identified in groundwater**. Figures 4 and 6 show groundwater concentrations from the August 2014 sampling event for the shallow and intermediate water-bearing zones, respectively.

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Remedial Action Objectives

RAOs for the Site are updated from those presented in the FS Report to include the conclusions of the BHHRA Addendum (Baxter 2014), and to be consistent with DEQ guidance for feasibility studies (DEQ 2006). The RAOs for the Site are:

Soil:

- Minimize human exposure to on-site surface and subsurface soil containing chemicals of concern (COCs) at concentrations above industrial cleanup levels. ✓
- Prevent human exposure to arsenic in soil at concentrations above hot spot levels. ✓

Groundwater:

- Prevent or minimize human exposure to COCs in on-site and off-site groundwater. ✓
- Minimize the contaminant mass of COCs in groundwater to achieve cleanup levels and protect human health and the environment. ✓

SECTION 4

Remedial Alternative 3a

Sections 8 through 10 of the FS Report provide a technology screening, present five remedial alternatives, and provide a detailed evaluation of alternatives (Baxter 2011). This FS Addendum provides a modification to Alternative 3, called Alternative 3a.

Alternative 3 includes capping, hot spot excavation and disposal, enhanced biodegradation and recirculation, and monitored natural attenuation (MNA). The Alternative 3a update includes capping, groundwater extraction and treatment that results in hydraulic containment, a contingency plan for off-site residential groundwater use, and monitored natural attenuation (MNA). DEQ cleanup rules specify that remedy selection should be

based on the following balancing criteria: effectiveness, long-term reliability, implementability, implementation risk, and reasonableness of cost (DEQ 2006). An evaluation of Alternative 3a relative to the balancing factors for remedy selection, specifically in comparison to Alternative 3, is provided below and summarized in Table 4. All of the alternatives considered for the Site, as presented in the FS Report, are also presented in Table 4; the reader is referred to the FS Report for a detailed discussion of the technologies and other alternatives considered. For the purposes of comparison, costs for Alternative 3 from the FS Report are provided as Table 5, and costs for Alternative 3a are provided as Table 6. A schematic of the updated remedies for Alternative 3a is provided as Figure 7. Details regarding the Alternative components are described below.

Capping to eliminate exposure to site soils containing arsenic, including hot spots. There were three small area identified as hot spots in the FS based on elevated arsenic concentrations. Low arsenic concentrations in the site groundwater indicate that there is not significant leaching to groundwater, so the soil hot spots are not considered to be mobile.

The FS called for excavation and offsite disposal of the three soil hot spots.

Capping of hot spots (i.e. Alternative 3a) is a preferred alternative to excavation (i.e. Alternative 3) in an evaluation of balancing factors, primarily due to cost. As shown in Table 5, excavation of hot spots has a high cost, with an estimated cost of excavation, backfill, and disposal is over \$1,300,000 (Table 5). Capping the soil hot spots provides effectiveness and long-term reliability similar to excavation, and scores higher for implementability, implementation risk and reasonableness of cost criteria. Costs for capping of hot spots are low because the capping will be a small addition to site capping already proposed and excavation/disposal fees would be eliminated (Table 6). Anticipated future use of the Site is the same as current use, so in terms of the protectiveness criteria, capping scores the same as excavation, since both remedies eliminate exposure to hot spot concentrations in soil. Although there is a preference for treatment to address hot spots, in this case, capping provides a more reasonable update to the preferred alternative in the FS Report, and scores higher overall the against the balancing criteria.

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In addition to the capping of hot spots, Alternative 3a updates the cap area and thickness across the Site according to site use (see Figure 5). In areas of limited industrial activity, cap thickness is reduced from 12" to 6", further reducing costs. In areas where arsenic does not exceed cleanup levels, or there is already no exposure to soils, the cap is eliminated. This includes the former pond area, the tank area, and currently paved areas. These updates to the proposed cap result in a change of estimated costs from \$1,360,000 (Table 5) to \$1,040,000 (Table 6), further supporting Alternative 3a under the reasonableness of cost criteria.

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

The facility has been operating extraction wells since 1993 as part of an interim remedial action measure (Baxter 2011). The groundwater extraction and treatment system consists of three wells, and of filtration system of granulated activated carbon. At a recent meeting with DEQ, it was demonstrated that the pump and treat system is effective and that installation of a recirculation system may not be as effective at containing the plume. The supporting information is included in this FS Addendum (Figures 3 through 6). Analytical data collected since the FS Report was completed indicate that the areal extent of the intermediate water-bearing zone PCP plume in groundwater is shrinking and concentrations in individual wells are generally decreasing. The shallow water-bearing plume is limited to on-site wells within the source area. This plume is stable in size and concentrations in individual wells are either stable or decreasing in PCP concentration. Trend plots of groundwater concentrations through the second half of 2014 are provided as Appendix A. Maps of PCP iso-concentrations in groundwater in the shallow and intermediate water bearing zones for 2001 and 2014 are provided as Figures 3 through 6. The groundwater contour maps for both the shallow and intermediate zones show that the extraction system is achieving capture of the source area. Figures 4 and 6 indicate that PCP concentrations in the intermediate water-bearing zone from the second half of 2014 are below the proposed cleanup levels of 59 ug/l in the residential areas and 89 ug/l in the industrial areas. Agreed ?

The groundwater extraction system and treatment facility will be evaluated for long term operations and maintenance, and will be updated as needed. The system is currently functioning, but will need upgrades for long term use, likely including the replacement of treatment tanks, a new carbon filter, and miscellaneous plumbing upgrades. These costs, as well as operational costs, are included in the estimates in Table 6. However, physical extraction, treatment, and discharge is a better alternative to the proposed recirculation system of Alternative 3 when weighed against the balancing criteria, again because of reasonableness of cost. In addition, because there will be no fouling of the recirculation system, Alternative 3a scores higher for the long-term reliability balancing factor. Finally, Alternative 3a does not include infiltration, and instead will discharge treated groundwater to a permitted-outfall, which improves its scoring on implementability.

The MNA component of Alternative 3 in the FS is carried forward to Alternative 3a, and long term monitoring will be conducted using existing facility monitoring wells. A revised groundwater monitoring schedule was submitted to DEQ on May 1, 2015 and approved by

DEQ on May 7, 2015. The semi-annual monitoring reports will continue to evaluate whether the extraction system continues to maintain capture of the source area and verify that the PCP concentration trends are either stable or decreasing.

Ditch Sediment. Alternative 3 provides a remedy for the nearby ditch sediment. However, the BHHRA Addendum (AMEC 2014), produced after the FS Report (Baxter 2011), concludes that ditch sediment is not an area of concern, based on regional background concentrations of arsenic in soil. Therefore, Alternative 3a does not address ditch sediment.

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Contingency Plan for New Domestic Wells. The DEQ-approved future beneficial groundwater uses for the area include irrigation and industrial use. As stated previously, residents down-gradient of PCP plume use the municipal water supply. To ensure that residents north of the Site are not using private wells for potable water, a contingency plan will be developed to confirm and address this scenario. The contingency plan will consist of an annual review of new well installations in the area (based on Oregon water Resources Department Records). If a well has been installed and is listed as having a domestic use, then Baxter will send the resident a letter asking if and how they are using the well. If they are using the well for drinking water, Baxter will request that they use the public water supply. If a well owner insists on using their well for drinking water uses, then Baxter will sample the well and if the water contains PCP, offer to provide wellhead treatment (a carbon filter at the tap) to protect the user from ingesting potentially contaminated water.

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Institutional Controls. As outlined above, institutional controls for Alternative 3a include maintenance of the cap over areas of concern, maintenance of existing paved areas in lieu of a cap, preparation and adherence to a contaminated media management plan, and installation of residential well-head treatment as needed, as part of a drinking water contingency plan.

SECTION 5

Conclusions

An RI and BHHRA were completed for the J.H. Baxter Wood Treating Facility in Eugene, OR, and indicated unacceptable risks may be present due primarily to arsenic in soil and PCP in groundwater for a limited number of exposure scenarios. An FS was performed in 2011 to determine RAOs, cleanup levels based on the BHHRA, and the preferred remedial alternative for addressing potential risks at the Site.

This Addendum provides an update to the RAOs and cleanup levels based on discussions with DEQ. In addition, an update to the preferred alternative is presented, based on a review of data collected since the FS Report and discussions with DEQ. The updated preferred alternative includes the following actions:

- Capping of soil in areas of concern that exceed cleanup levels and hot spot levels
- Ex situ groundwater treatment and discharge, coupled with MNA
- Development and implementation of a contingency plan to address potential domestic use of groundwater.

SECTION 6

References

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

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

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

Baxter 2010. 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 2006. Revised Baseline Human Health Risk Assessment. Prepared for Oregon Department of Environmental Quality by J.H. Baxter. July 28, 2006.

Baxter, 2002. Beneficial Use Determination, JH Baxter Eugene Facility. Prepared for the Oregon Department of Environmental Quality by J.H. Baxter dated June 28, 2002.

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

DEQ 2006. Guidance for Conducting Feasibility Studies. Final. Oregon Department of Environmental Quality. 1998, rev. 2006.

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

TABLES

Table 1. Summary of Human Health Risk Assessment Conclusions

J.H. Baxter Wood Treating Facility

Eugene, Oregon

Exposure Medium	Receptor	Exposure Scenario	Chemicals of Concern	Source
On-site Soil	Worker	direct contact	Arsenic, Benzo(a)pyrene, Dibenzo(a,h)anthracene, dioxins/furans	Baxter, 2006
	Trenchworker	direct contact	none	Baxter, 2006
Off-site Soil	Off-site Resident	direct contact	none	AMEC, 2014
On-site Groundwater	Trenchworker	direct contact	Benzo(a)pyrene, Dibenzo(a,h)anthracene, Pentachlorophenol	Baxter, 2006
Off-site Groundwater	Off-site Resident	direct contact	Pentachlorophenol, Indeno(1,2,3-cd)pyrene (based on non-detect data) Dioxins/furans (based on non-detect data)	AMEC, 2014
	Off-site Industrial Worker	direct contact	Pentachlorophenol	Baxter, 2006
Surface Water	Recreational User	direct contact	none	AMEC, 2014
Sediment	Recreational User	direct contact	none	AMEC, 2014

Sources

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

AMEC, 2014. Memorandum to Geoff Brown, DEQ, from AMEC Environmental & Infrastructure, Inc. RE: *Revised Baseline Human Health Risk Assessment Addendum* . February 19, 2014.

Table 2. Proposed Cleanup Levels

J.H. Baxter Wood Treating Facility
Eugene, Oregon

Medium		Proposed Cleanup Level	Source	Proposed Hot Spot Level	Source
On-site Soil	Arsenic	17 mg/kg ^a	DEQ Willamette Valley regional background, DEQ 2013 (AMEC 2014)	340 mg/kg	Baxter 2011
	Benzo(a)pyrene	0.27 mg/kg	Baxter 2011	27 mg/kg	Baxter 2011
	Dibenzo(a,h)anthracene	0.27 mg/kg	Baxter 2011	27 mg/kg	Baxter 2011
	Dioxins/furans	2x 10 ⁻⁵ pg/g TEQ ^b	Baxter 2011	2x 10 ⁻³ pg/g TEQ	Baxter 2011
Off-site Groundwater	Pentachlorophenol	89 ug/l ^c	Baxter 2011 (Industrial Worker)	NA ^e	Baxter 2011
	Pentachlorophenol	59 ug/l	Off-site residential irrigation ^d	NA	See Table 3

Notes

a mg/kg = milligrams per kilogram

b pg/g TEQ = picograms per gram of 2,3,7,8-tetrachlorodibenzodioxin toxic equivalence

c ug/l = micrograms per liter

d Cleanup level for the off-site residential irrigation scenario was developed from exposure parameters provided by DEQ, and chemical/toxicity factors used in the risk assessment and risk addendum (Baxter 2006, AMEC 2014). Parameter values are presented in Table 3.

Sources

DEQ 2013. Development of Oregon Background Metals Concentrations in Soil. Oregon Department of Environmental Quality. Portland, OR. March 2013.

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

AMEC, 2014. Memorandum to Geoff Brown, DEQ, from AMEC Environmental & Infrastructure, Inc. RE: *Revised Baseline Human Health Risk Assessment Addendum*. February 19, 2014.

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Table 3. Parameters Used in the Calculation of Off-site Groundwater Cleanup Level for Residential Irrigation

J.H. Baxter Wood Treating Facility

Eugene, Oregon

Exposure Parameters	Units	Value	Source
Averaging Time - Carcinogen	d	25550	DEQ 2010
Averaging Time - Noncarcinogen - adult	d	10950	DEQ 2010
Averaging Time - Noncarcinogen - child	d	2190	DEQ 2010
Body Weight - adult	kg	70	DEQ 2010
Body Weight - child	kg	15	DEQ 2010
Exposure Duration - adult resident	yr	30	DEQ 2010
Exposure Duration - child resident	yr	6	DEQ 2010
Exposure Frequency-groundwater	d/yr	60	DEQ 2015
Event frequency	ev/d	1	DEQ 2015
Duration of exposure event	hr/ev	2	DEQ 2015
Water Ingestion Rate - adult	L/d	0.05	DEQ 2015
Water Ingestion Rate - child	L/d	0.1	DEQ 2015
Skin Surface Area to Groundwater - adult	cm ²	3300	DEQ 2015
Skin Surface Area to Groundwater - child	cm ²	6600	DEQ 2015
Toxicity Factors			
Cancer slope factor - oral	(mg/kg-day) ⁻¹	0.12	Baxter 2006, AMEC 2014
Cancer slope factor - dermal	(mg/kg-day) ⁻¹	0.12	Baxter 2006, AMEC 2014
Reference Dose - oral	mg/kg-day	0.03	Baxter 2006, AMEC 2014
Reference Dose - dermal	mg/kg-day	0.03	Baxter 2006, AMEC 2014
Dermal Absorption Factors			
K _p - dermal permeability coefficient	cm/hr	0.65	AMEC 2014
τ - lag time	hr/ev	3.70	AMEC 2014
t* - time to reach steady state	hr	17.00	AMEC 2014
B - relative hydrophobicity	unitless	72.00	AMEC 2014

Sources:

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

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

DEQ 2015. Provided by DEQ during discussions regarding preliminary remediation goal development.

DEQ 2010. Human Health Risk Assessment Guidance. Oregon Department of Environmental Quality. Portland, Oregon.

Table 4. Comparative Evaluation of Balancing Factors^a

J.H. Baxter Wood Treating Facility

Eugene, Oregon

Alternative	Effectiveness	Long-term Reliability	Implementability	Implementation Risk	Reasonableness fo Cost	Total Score
1. No Action	1	1	1	5	5	13
2. Capping, hot spot excavation and consolidation, enhanced groundwater treatment, MNA	2	4	3	3	4	16
3. Capping, hot spot excavation and disposal, enhanced biodegradation and recirculation, MNA	4	4	3	3	4	18
3a. Capping, ex situ groundwater treatment, MNA, groundwater contingency plan	4 ✓	4.5 ✓	4 ✓	3 ✓	4.5	20
4. Capping, hot spot excavation and disposal, physical/hydraulic containment, MNA	4	3	3	2	2	14
5. Capping, excavation and disposal, MNA	5	5	2	1	1	14

Notes

a Scoring for all alternatives except 3a is presented as shown in the Feasibility Study Report (Baxter 2011).

Bold font indicates updated preferred alternative.

probably higher / conservative

TABLE 5. ESTIMATED COST - ALTERNATIVE 3 (CAPPING, HOT SPOT EXCAVATION AND DISPOSAL, ENHANCED BIODEGRADATION AND RECIRCULATION, MNA)^a

J.H. Baxter Wood Treating Facility
Eugene, Oregon

Initial and Annual Costs

Item	Quantity	Unit	Rate/ %	Total
Initial Construction Costs				
Mobilization	1	LS	25,000	25,000
Hot spot excavation (5 ft deep)	4817	ton	12	57,806
Backfill	4817	ton	10	48,170
Offsite transportation and disposal	4817	ton	250	1,204,250
Place and grade soil cap (18" +textile)	16	ac	85,000	1,360,000
Infiltration gallery and controls	1	LS	150,000	150,000
Extraction wells and piping	6	LS	25,000	150,000
Drain and place ditch material in pond	1	LS	50,000	50,000
Initial Construction Costs Subtotal				3,045,226
Initial Other Costs				
Institutional controls	1	LS	10,000	10,000
Consultant	1	LS	50,000	50,000
Design and Permitting	1	LS	150,000	150,000
Construction Management			20%	609,045
				0
Initial Other Cost Subtotal				\$819,045
Total Initial Construction and Other Costs				\$3,864,271

Annual Long Term Costs	Quantity	Unit	Rate/ %	Annual Total	Years	Total
Annual Costs - Yrs 1-5						
Maintain Inst. Controls	1	LS	\$1,000	\$1,000	5	\$5,000
Groundwater recirculation O&M	1	LS	15,000	15,000	5	75,000
Groundwater Sampling	2	LS (ave)	2,500	5,000	5	25,000
Analytical Costs/round	2	LS (ave)	4,200	8,400	5	42,000
Evaluation / Reporting	2	LS	5,000	10,000	5	50,000
Annual Costs - Yrs 6-30						
Maintain Inst. Controls	1	LS	1,000	1,000	25	25,000
Groundwater Recirc. O&M	1	LS	15,000	15,000	25	375,000
Groundwater Sampling	1	LS	2,500	2,500	25	62,500
Analytical Costs/round	1	LS	3,950	3,950	25	98,750
Evaluation / Reporting	1	LS	5,000	5,000	25	125,000
One-time Construction Costs				27,450		
Abandon wells	24	LS	2,500	60,000	yr 10	60,000
Replace wells	16	LS	10,000	160,000	yr 10	160,000
Replace GW Recirc Components	4	LS	20,000	80,000	yr 6, 12, 18, 24	80,000
Subtotal Long Term Costs						\$1,183,250
Total Construction and Other Initial Costs						\$3,864,271
Total Construction, Other, and Long Term Costs						\$5,047,521
Contingency (20%)						\$1,009,504
Total Project Cost						\$6,057,000
Total Net Present Value						\$5,660,000

Notes

a Table is replicate of Table B-4 from Baxter 2011. Feasibility Study Report, Revision 0, J.H. Baxter & Co. Eugene, Oregon Facility. Prepared by J.H.Baxter & Co. October 3, 2011.

Net Present Value Calculation

Year	Initial/One Time Costs	Annual	Contingency (20%)	Total
1	\$3,864,271	\$39,400	\$780,734	\$4,684,406
2	0	39,400	7,880	47,280
3	0	39,400	7,880	47,280
4	0	39,400	7,880	47,280
5	0	39,400	7,880	47,280
6	20,000	27,450	9,490	56,940
7	0	27,450	5,490	32,940
8	0	27,450	5,490	32,940
9	0	27,450	5,490	32,940
10	240,000	27,450	53,490	320,940
11	0	27,450	5,490	32,940
12	20,000	27,450	9,490	56,940
13	0	27,450	5,490	32,940
14	0	27,450	5,490	32,940
15	0	27,450	5,490	32,940
16	0	27,450	5,490	32,940
17	0	27,450	5,490	32,940
18	20,000	27,450	9,490	56,940
19	0	27,450	5,490	32,940
20	0	27,450	5,490	32,940
21	0	27,450	5,490	32,940
22	0	27,450	5,490	32,940
23	0	27,450	5,490	32,940
24	20,000	27,450	9,490	56,940
25	0	27,450	5,490	32,940
26	0	27,450	5,490	32,940
27	0	27,450	5,490	32,940
28	0	27,450	5,490	32,940
29	0	27,450	5,490	32,940
30	0	27,450	5,490	32,940
Totals	\$883,250		\$1,013,504	\$6,081,000
Net Present Value (2%)				\$5,660,000

Notes:

NPV based on a net discount rate of 2% (interest rate of 4.5% and inflation of 2%

Groundwater monitoring assumes reduction in frequency to annual after 5 years

All estimated costs in 2011 dollars

Assumes average well operation life of 20 years (replacement of existing wells in year 10)

per Randy Pratt
these estimates
refined in consultation
with Scott @
Stratus Corp.

Table 6. ESTIMATED COST - ALTERNATIVE 3a (CAPPING, GROUNDWATER TREATMENT SYSTEM OPERATION)

J.H. Baxter Wood Treating Facility

Eugene, Oregon

Initial and Annual Costs¹

Item	Quantity	Unit	Rate/ %	Total
Initial Construction Costs				
Mobilization	1	LS	25,000	\$25,000
Place and grade soil cap (12" + heavy textile)	12	ac	75,000	900,000
Place and grade soil cap (6" + light textile)	4	ac	35,000	140,000
Refurbish groundwater treatment system ²	1	LS	50,000	50,000
Initial Construction Costs Subtotal				\$1,120,000
Initial Other Costs				
Intitutional controls	1	LS	10,000	10,000
Design and Permitting	1	LS	80,000	80,000
Construction Management			5%	60,000
Initial Other Cost Subtotal				\$150,000
Total Initial Construction and Other Costs				\$1,270,000

Annual Long Term Costs	Quantity	Unit	Rate/ %	Annual Total	Years	Total
Annual Costs - Yrs 1-5						
Maintain Inst. Controls	1	LS	1,000	\$1,000	5	\$5,000
Groundwater extraction O&M ³	1	LS	8,000	8,000	5	40,000
NPDES discharge analytical costs	12	LS	400	4,800	5	24,000
Groundwater Sampling	2	LS (ave)	2,500	5,000	5	25,000
Analytical Costs/round	2	LS (ave)	3,625	7,250	5	36,000
Evaluation / Reporting	2	LS	10,000	20,000	5	100,000
Annual Costs - Yrs 6-30						
Maintain Inst. Controls	1	LS	1,000	1,000	25	25,000
Groundwater Treatment O&M	1	LS	8,000	8,000	25	200,000
NPDES discharge analytical costs ⁴	4	LS	400	1,600	25	40,000
Groundwater Sampling ⁴	1	LS	2,500	2,500	25	63,000
Analytical Costs ⁴	1	LS	3,625	3,625	25	91,000
Evaluation / Reporting	1	LS	5,000	5,000	25	125,000
One-time Construction and Permit Costs						
NPDES Permit Renewal	5	LS	7,500	38,000	yr 5, 10, 15, 20, 25	38,000
Replace extraction wells ⁵	3	LS	15,000	45,000	yr 10	45,000
Replace GW Treatment System Components	2	LS	20,000	40,000	yr 10, 20	40,000
Abandon wells	46	LS	2,500	115,000	yr 30	115,000
Subtotal Long Term Costs						
						\$1,012,000
Total Construction and Other Initial Costs						\$1,270,000
Total Construction, Other, and Long Term Costs						\$2,282,000
Contingency ⁶ (10%)						\$228,200
Total Project Cost						\$2,510,000
Total Net Present Value						\$2,364,000

Net Present Value Calculation

Year	Initial/One Time Costs	Annual	Contingency (10%)	Total
1	\$1,270,000	\$46,050	\$131,605	\$1,447,655
2	0	46,050	4,605	50,655
3	0	46,050	4,605	50,655
4	0	46,050	4,605	50,655
5	7,500	46,050	5,355	58,905
6	0	21,725	2,173	23,898
7	0	21,725	2,173	23,898
8	0	21,725	2,173	23,898
9	0	21,725	2,173	23,898
10	72,500	21,725	9,423	103,648
11	0	21,725	2,173	23,898
12	0	21,725	2,173	23,898
13	0	21,725	2,173	23,898
14	0	21,725	2,173	23,898
15	7,500	21,725	2,923	32,148
16	0	21,725	2,173	23,898
17	0	21,725	2,173	23,898
18	0	21,725	2,173	23,898
19	0	21,725	2,173	23,898
20	27,500	21,725	4,923	54,148
21	0	21,725	2,173	23,898
22	0	21,725	2,173	23,898
23	0	21,725	2,173	23,898
24	0	21,725	2,173	23,898
25	7,500	21,725	2,923	32,148
26	0	21,725	2,173	23,898
27	0	21,725	2,173	23,898
28	0	21,725	2,173	23,898
29	0	21,725	2,173	23,898
30	142,500	21,725	16,423	180,648
Totals		\$773,375	\$230,838	\$2,539,000

Net Present Value⁷ (1%) \$2,364,000

Notes:

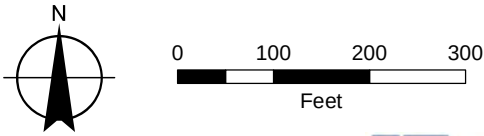
1. All estimated costs in 2015 dollars
2. Assumes groundwater treatment system requires carbon vessel and media replacement with minor conveyance upgrades.
3. Assumes intermittent treatment system maintenance provided by owner/operator staff
4. Groundwater and NPDES discharge monitoring assumes reduction in frequency to annual after 5 years
5. Assumes average well operation life of 20 years (replacement of existing wells in year 10)
6. Contingency rate based upon EPA cost estimating guidance for surface grading, synthetic cap installation (EPA 540-R-00-002)
7. NPV based on a net discount rate of 1% (interest rate of 3% and inflation of 2%). 3% corresponds to the 30-yr U.S. Treasury Bond rate as of 6/2/2015 (www.treasury.gov) and an averaged 2% inflation rate from construction cost inflation of 2.4% and a CPI of 1.6% for 2014 (enr.construction.com)

FIGURES



FIGURE 1
Site Detail Map
J.H. Baxter Wood Treating Facility
Eugene, Oregon

- LEGEND**
- Facility Boundary
 - Union Pacific Railroad



MAP NOTES:
Date: June 17, 2015
Data Sources: AMEC, OGIC, ESRI, Air photo taken on July 5, 2011 by Microsoft





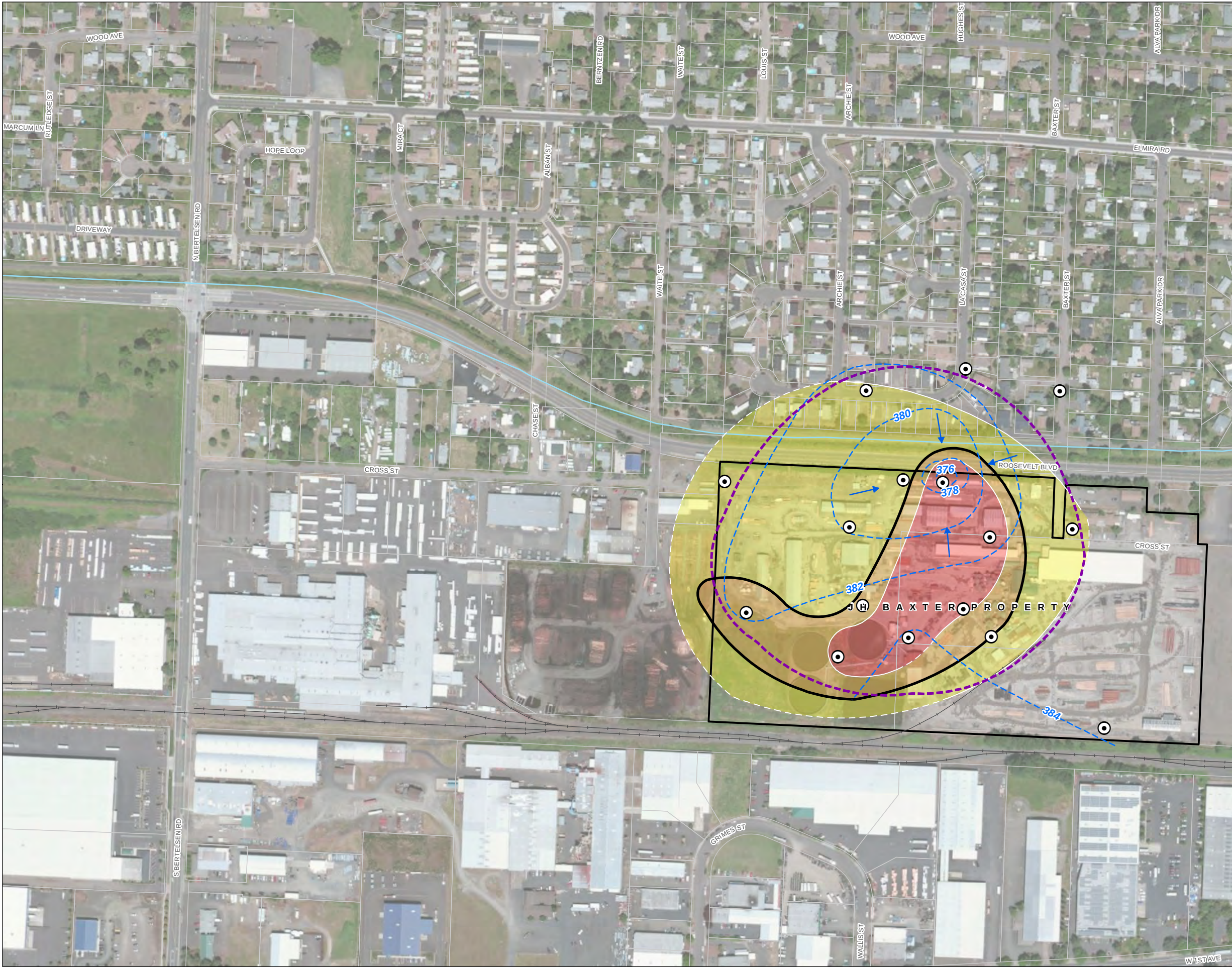


FIGURE 3
PCP Concentrations in
Shallow Monitoring Wells 2001 or
Maximum Concentration Prior to 2001
JH Baxter
Eugene, Oregon

LEGEND

- Monitoring Well, Shallow
- Groundwater Flow Direction
- Inferred Groundwater Elevation Contours (dashed where inferred) September 2001 (AMEC)
- Approximate Hydraulic Capture Zone
- Proposed Cleanup Boundary

PCP Concentration (ug/L)

- <89
- ≥89 - 500
- ≥500

All Other Features

- Facility Boundary
- Tax Lot
- Railroad
- Watercourse

NOTES:
PCP results in ug/L
ND: Non-Detect

N

0 160 320 480
Feet

MAP NOTES:
Date: June 18, 2015
Data Sources: AMEC, USGS, ESRI, Lane Co.





FIGURE 4
PCP Concentrations in
Shallow Monitoring Wells 2014
JH Baxter
Eugene, Oregon

- LEGEND**
- Monitoring Well, Shallow
 - Groundwater Flow Direction
 - Groundwater Elevation Contours (dashed where inferred)
 - Approximate Hydraulic Capture Zone
 - Proposed Cleanup Boundary
 - PCP Concentration (ug/L)**
 - <89
 - ≥89 - 500
 - ≥500
 - All Other Features**
 - Facility Boundary
 - Tax Lot
 - Railroad
 - Watercourse

NOTES:
PCP results in ug/L
ND: Non-Detect

N

0 160 320 480
Feet

MAP NOTES:
Date: June 18, 2015
Data Sources: AMEC, USGS, ESRI, Lane Co.



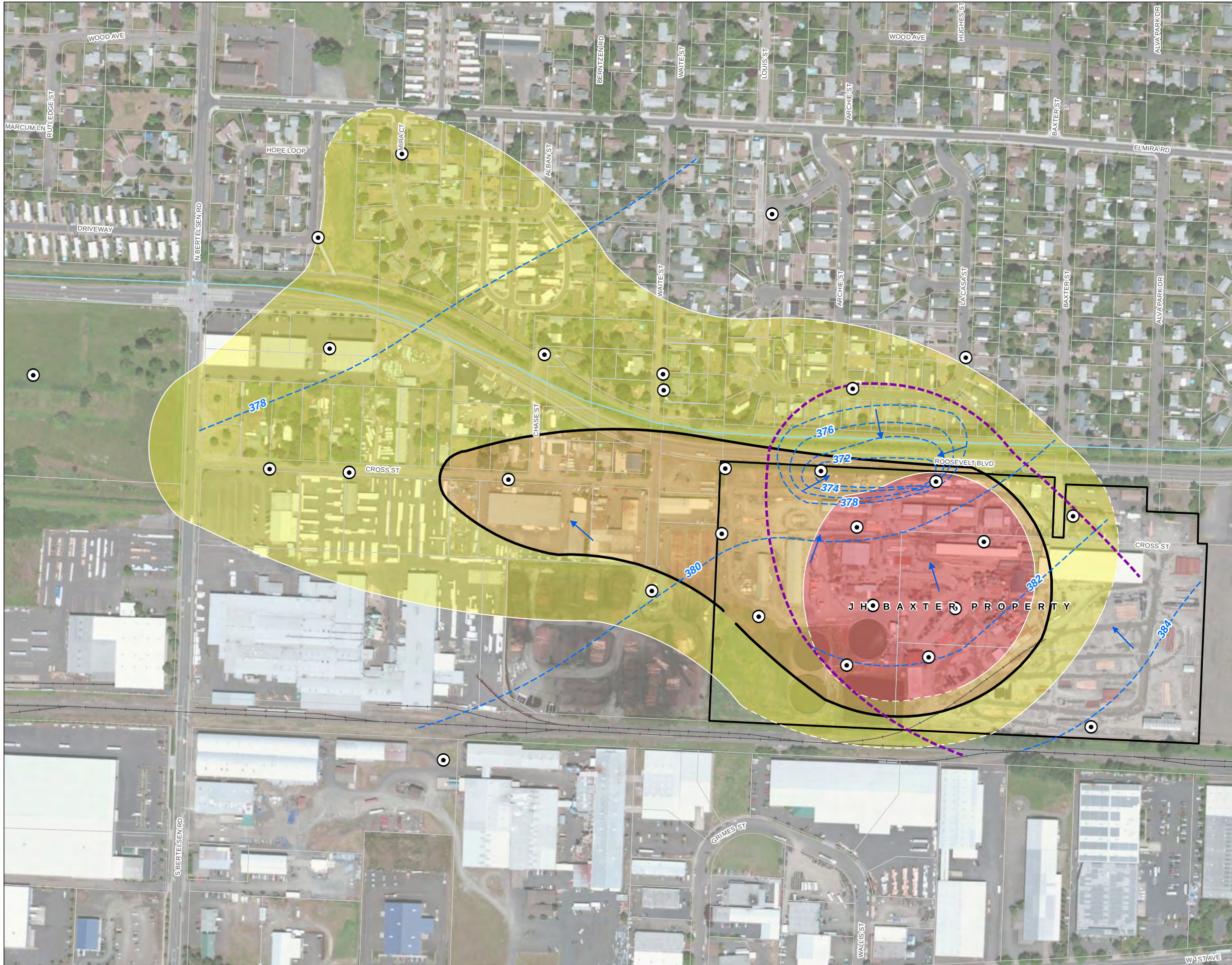


FIGURE 5
PCP Concentrations in
Intermediate Monitoring Wells 2001 or
Maximum Concentration Prior to 2001
JH Baxter
Eugene, Oregon

LEGEND

- Monitoring Well, Intermediate
- Groundwater Flow Direction
- Inferred Groundwater Elevation Contours (dashed where inferred) September 2001 (AMEC)
- Approximate Hydraulic Capture Zone
- Proposed Cleanup Boundary

PCP Concentration (ug/L)

- <89
- ≥89 - 500
- ≥500

All Other Features

- Facility Boundary
- Tax Lot
- Railroad
- Watercourse

NOTES:
PCP results in ug/L
ND: Non-Detect

N

0 160 320 480
Feet

MAP NOTES:
Date: June 18, 2015
Data Sources: AMEC, USGS, ESRI, Lane Co.



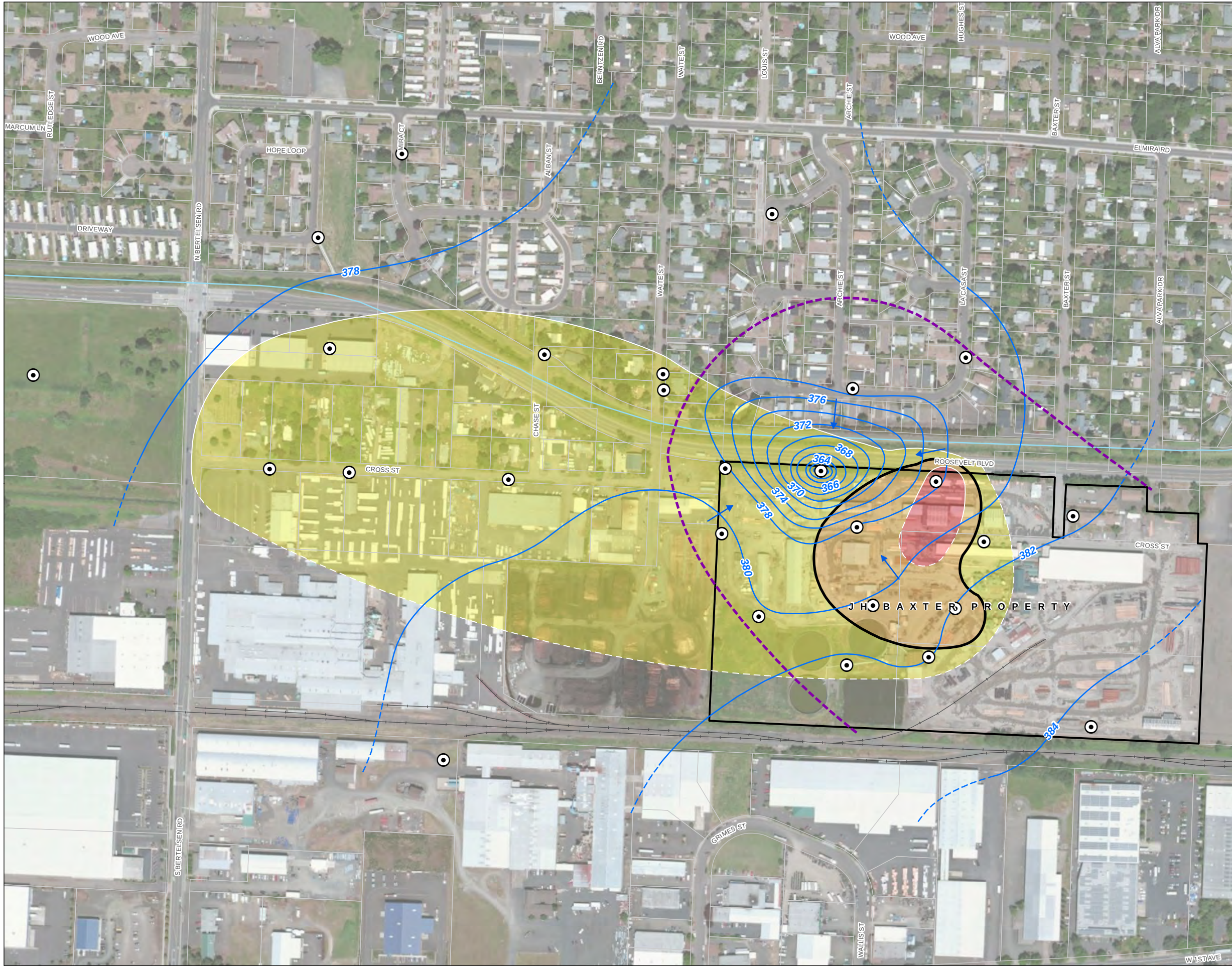


FIGURE 6
PCP Concentrations in
Intermediate Monitoring Wells 2014
JH Baxter
Eugene, Oregon

LEGEND

- Monitoring Well, Intermediate
- Groundwater Flow Direction
- Groundwater Elevation Contours (dashed where inferred)
- Approximate Hydraulic Capture Zone
- Proposed Cleanup Boundary

PCP Concentration (ug/L)

- <89
- ≥89 - 500
- ≥500

All Other Features

- Facility Boundary
- Tax Lot
- Railroad
- Watercourse

NOTES:
PCP results in ug/L
ND: Non-Detect

N

0 160 320 480
Feet

MAP NOTES:
Date: June 18, 2015
Data Sources: AMEC, USGS, ESRI, Lane Co.



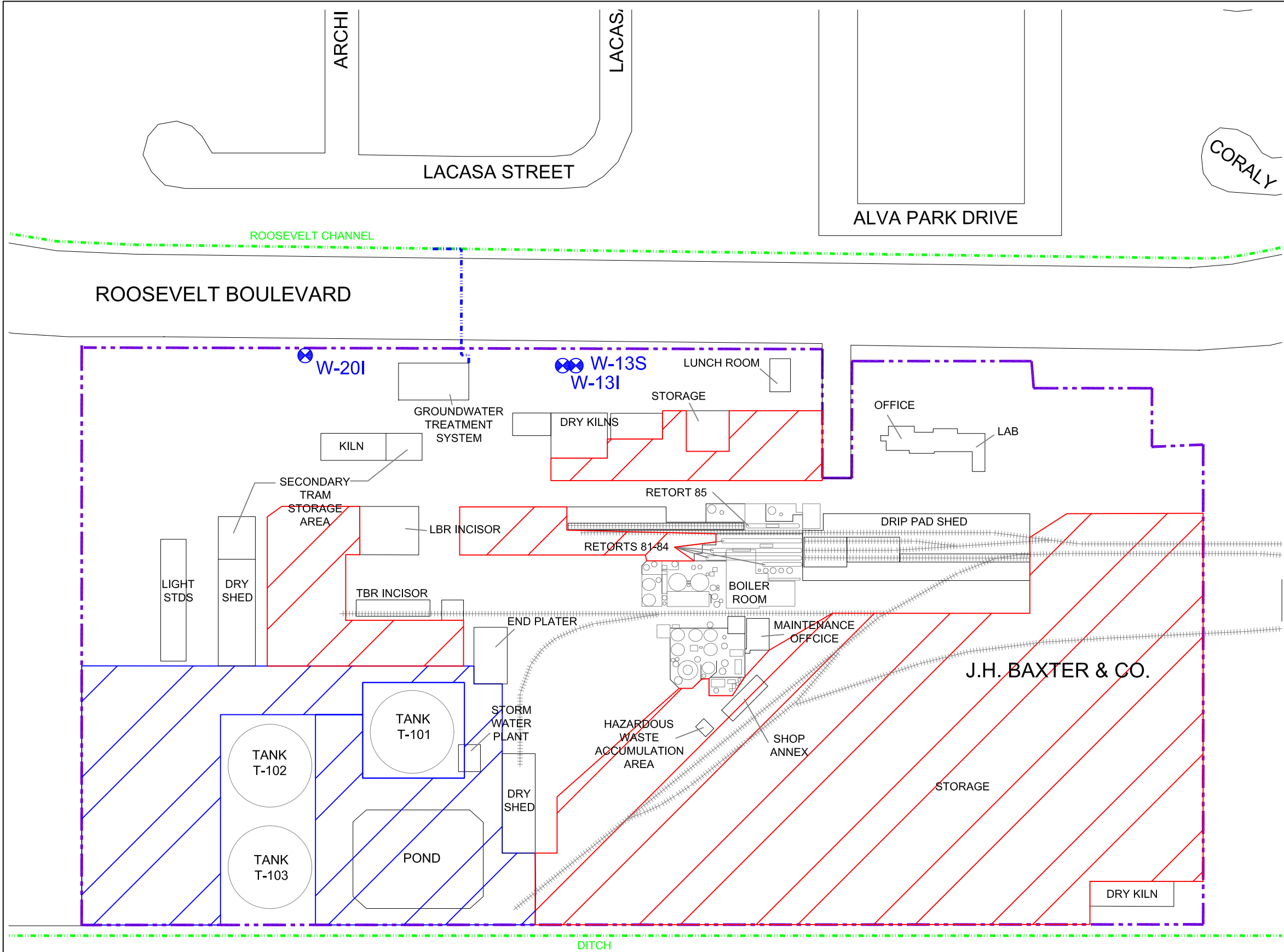


FIGURE 7
UPDATED PREFERRED ALTERNATIVE 3-A
JUNE, 2015
J.H. Baxter Wood Treating Facility
Eugene, Oregon

- LEGEND**
- FACILITY BOUNDARY
 - ==== RAILROAD
 - [Red Hatched Box] 12" GRAVEL CAP AND HEAVY LINER
 - [Blue Hatched Box] 6" GRAVEL CAP AND LIGHT LINER
 - [Blue Circle with Cross] GROUNDWATER EXTRACTION WELL
 - TREATMENT SYSTEM DISCHARGE (OUTFALL 002)

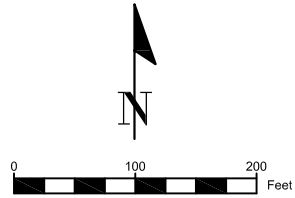


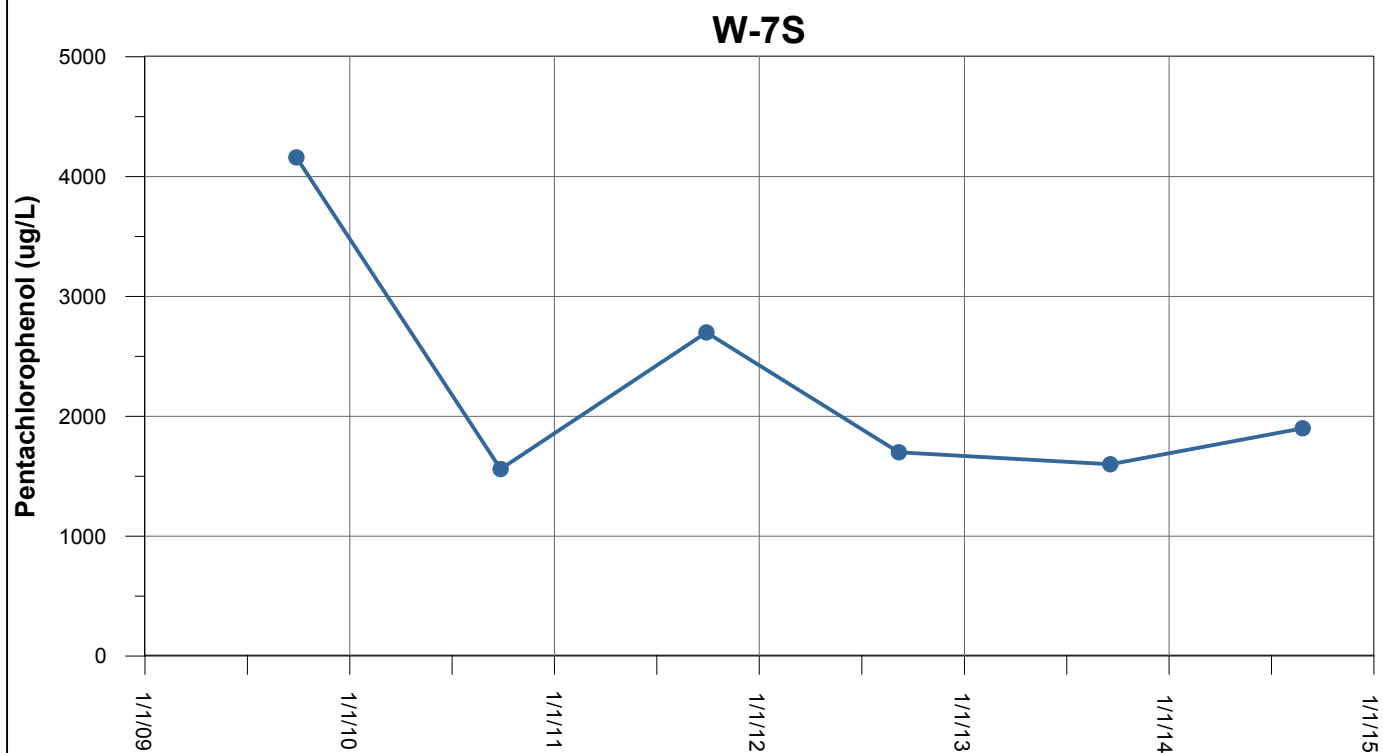
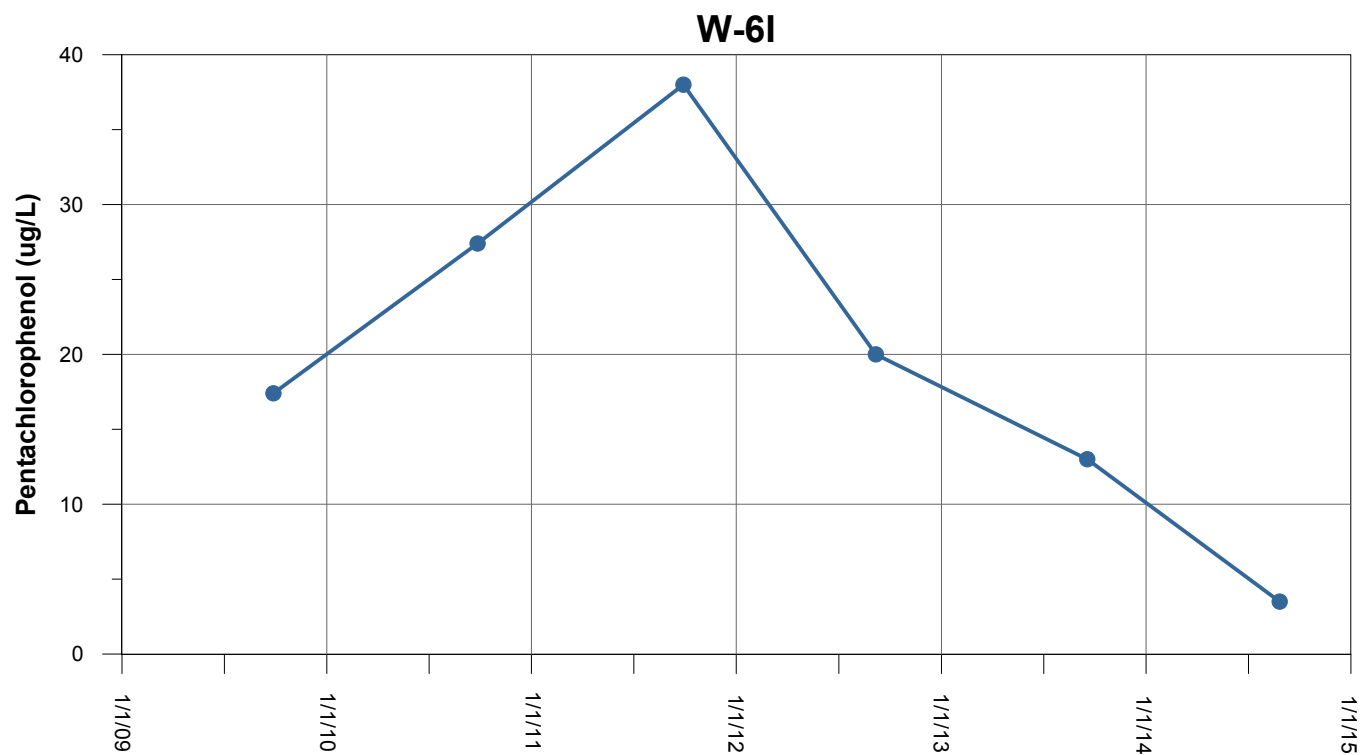
Figure Notes
Date: June 17, 2015
Data Source: AMEC



Appendix A

Time Trend Plots for Pentachlorophenol in Groundwater

(Excerpted from Appendix C from *Second Half 2014 Groundwater
Monitoring Report, GSI Water Solutions, Inc., March 2015*)



Legend:

- Pentachlorophenol Detected Values
- Pentachlorophenol Non-Detected Values

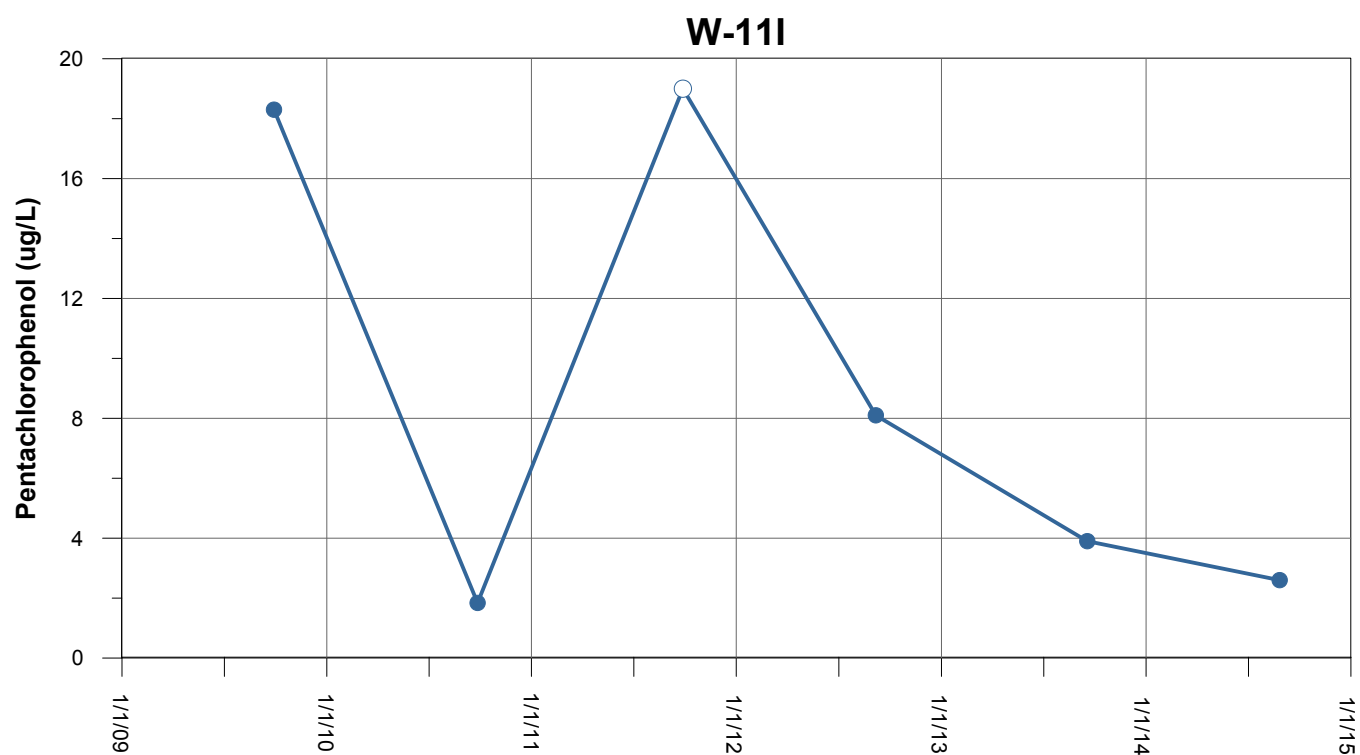
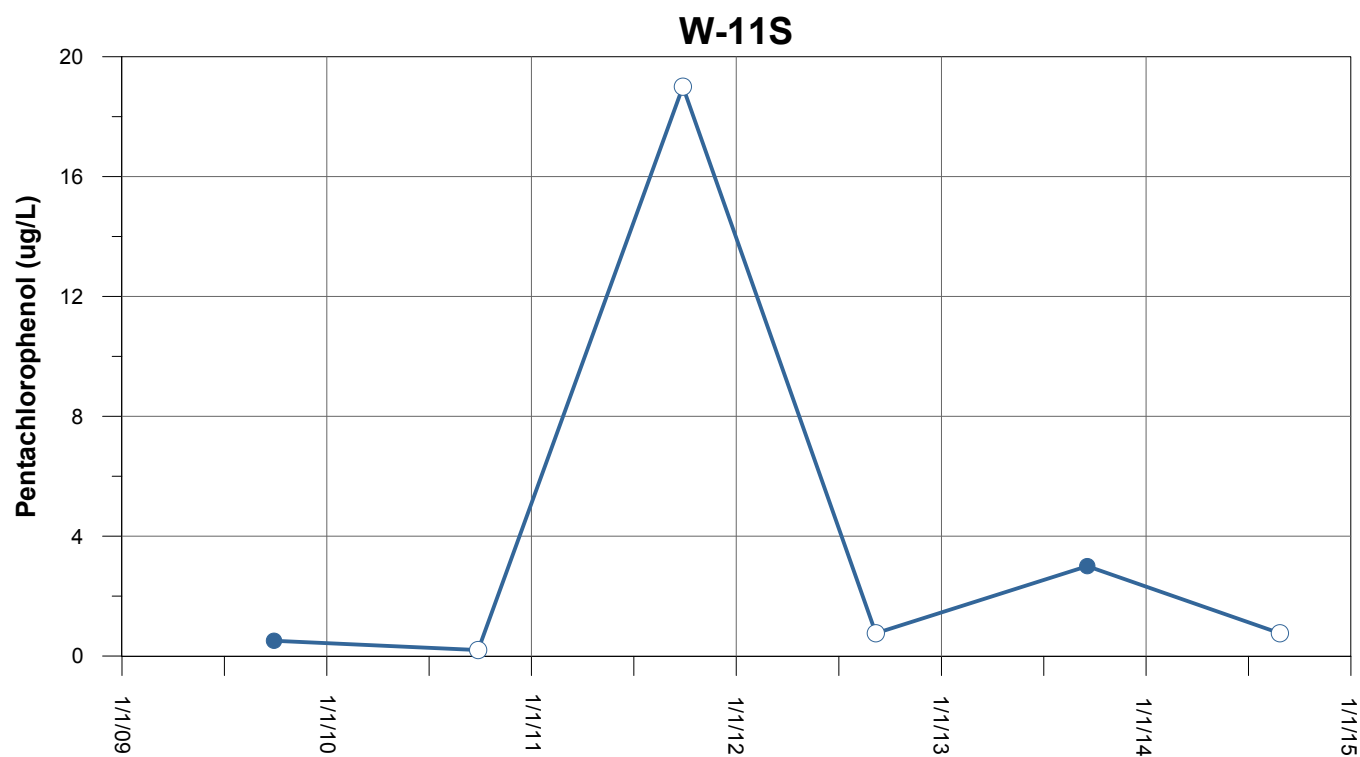
Notes:

ug/L = microgram per liter

FIGURE C-1
Pentachlorophenol Groundwater Concentrations
in W-6I and W-7S

J.H. Baxter Wood Treating Facility
Eugene, Oregon





Legend:

- Pentachlorophenol Detected Values
- Pentachlorophenol Non-Detected Values

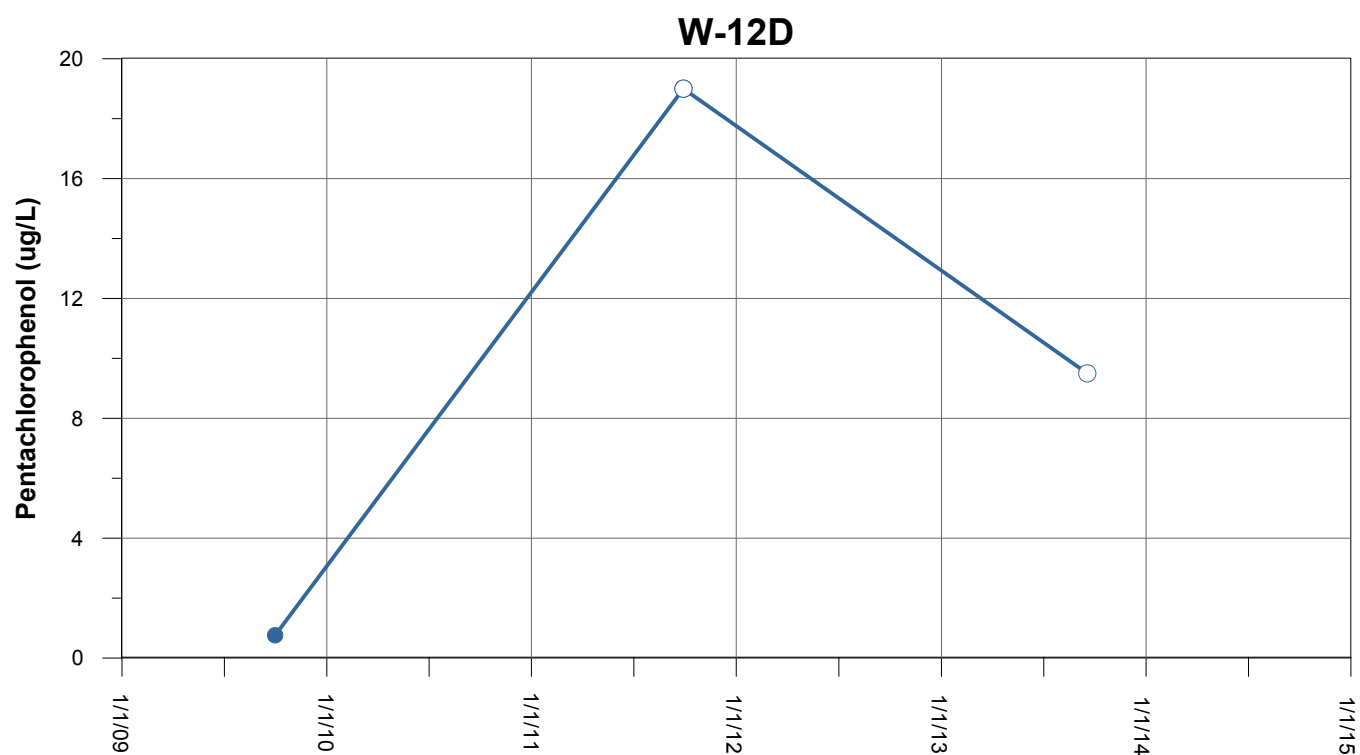
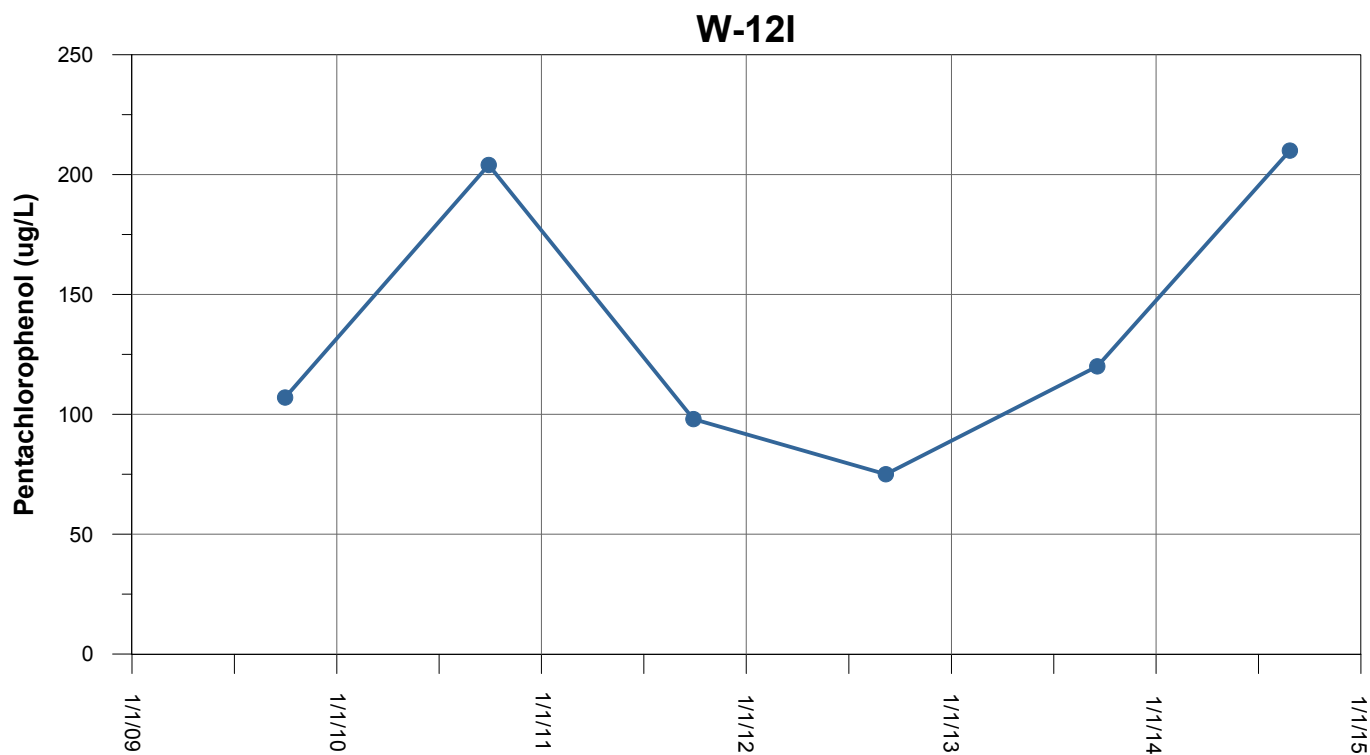
Notes:

ug/L = microgram per liter

FIGURE C-2
Pentachlorophenol Groundwater Concentrations
in W-11S and W-11I

J.H. Baxter Wood Treating Facility
Eugene, Oregon





Legend:

- Pentachlorophenol Detected Values
- Pentachlorophenol Non-Detected Values

Notes:

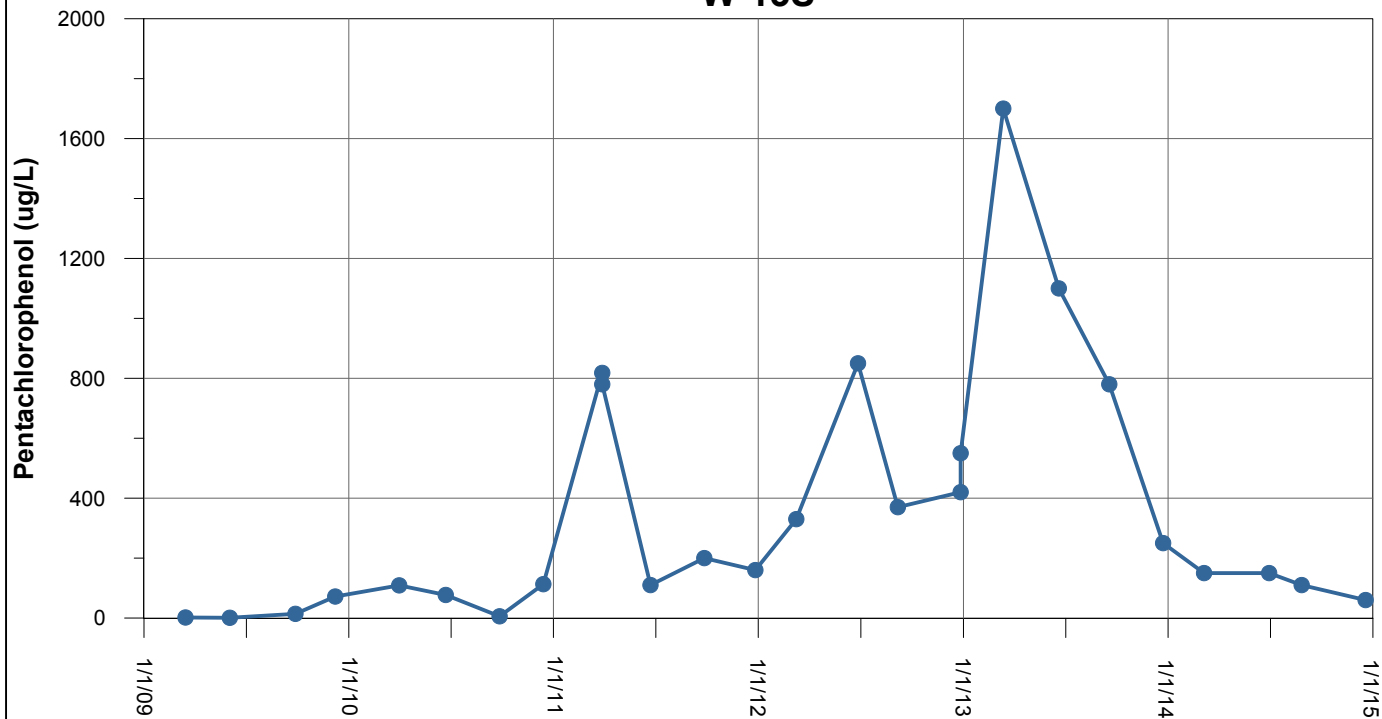
ug/L = microgram per liter
W-12D sampled every other year.

FIGURE C-3
Pentachlorophenol Groundwater Concentrations
in W-12I and W-12D

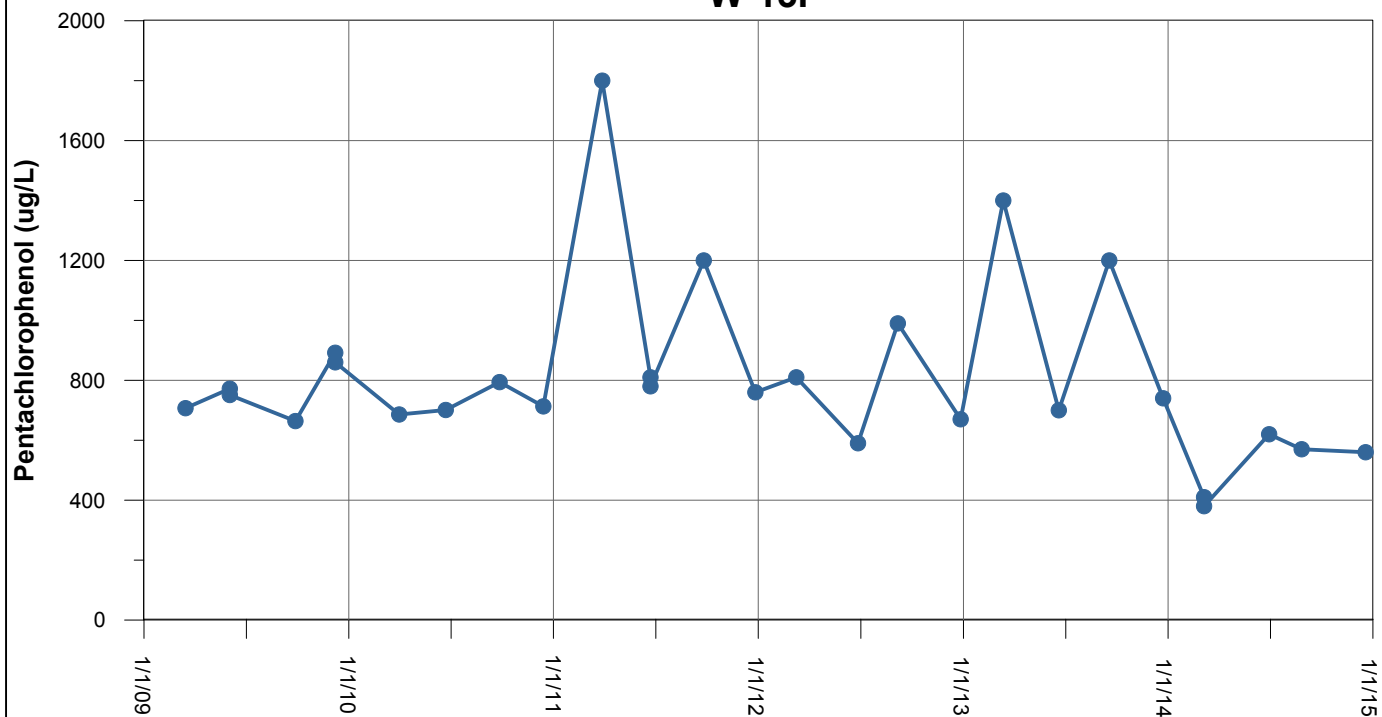
J.H. Baxter Wood Treating Facility
Eugene, Oregon



W-13S



W-13I



Legend:

- Pentachlorophenol Detected Values
- Pentachlorophenol Non-Detected Values

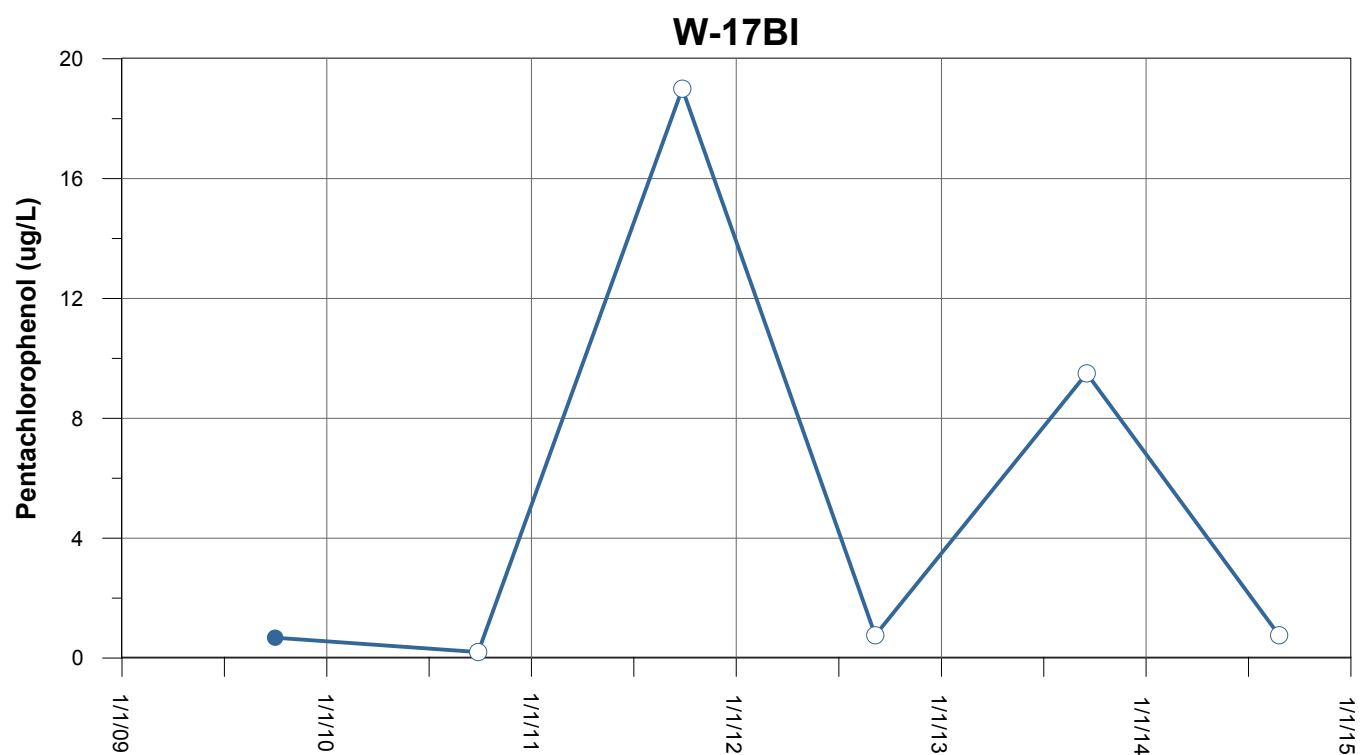
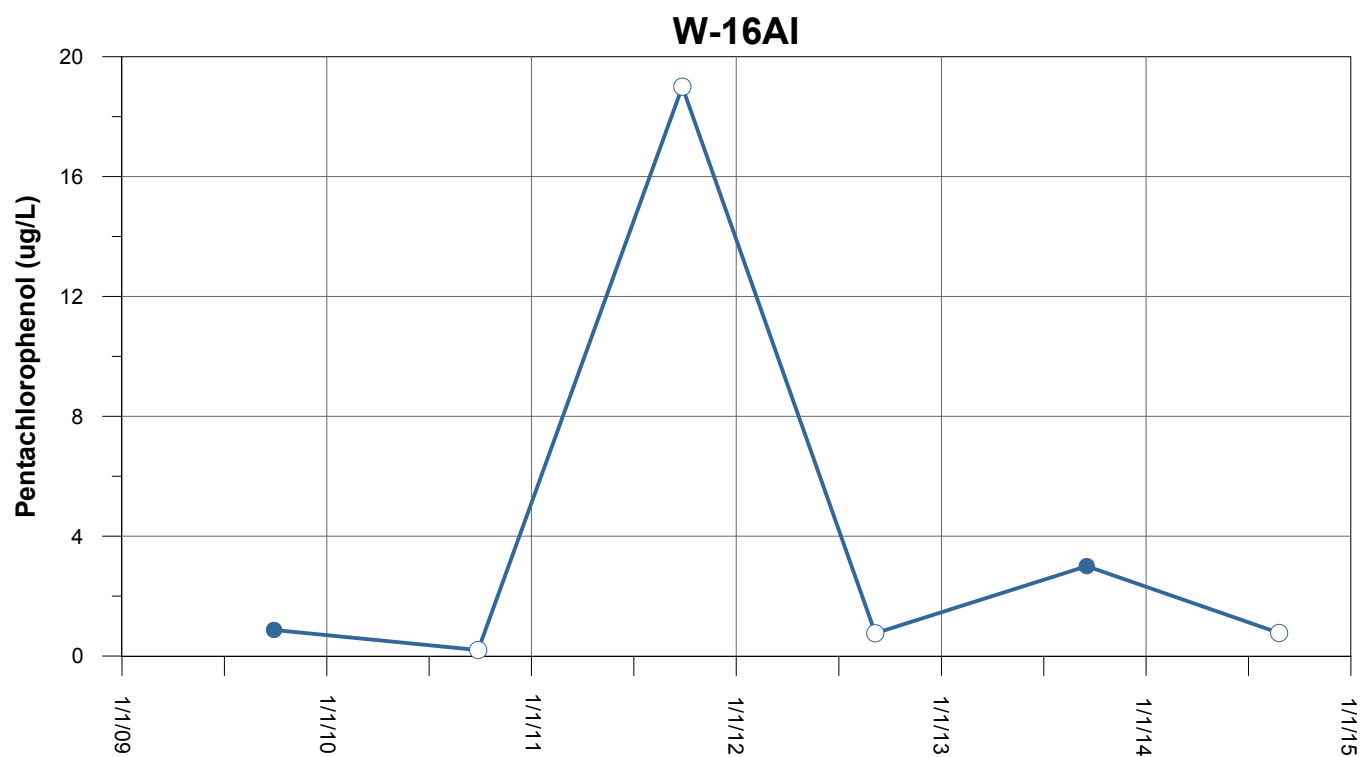
Notes:

ug/L = microgram per liter

FIGURE C-4 Pentachlorophenol Groundwater Concentrations in W-13S and W-13I

J.H. Baxter Wood Treating Facility
Eugene, Oregon





Legend:

- Pentachlorophenol Detected Values
- Pentachlorophenol Non-Detected Values

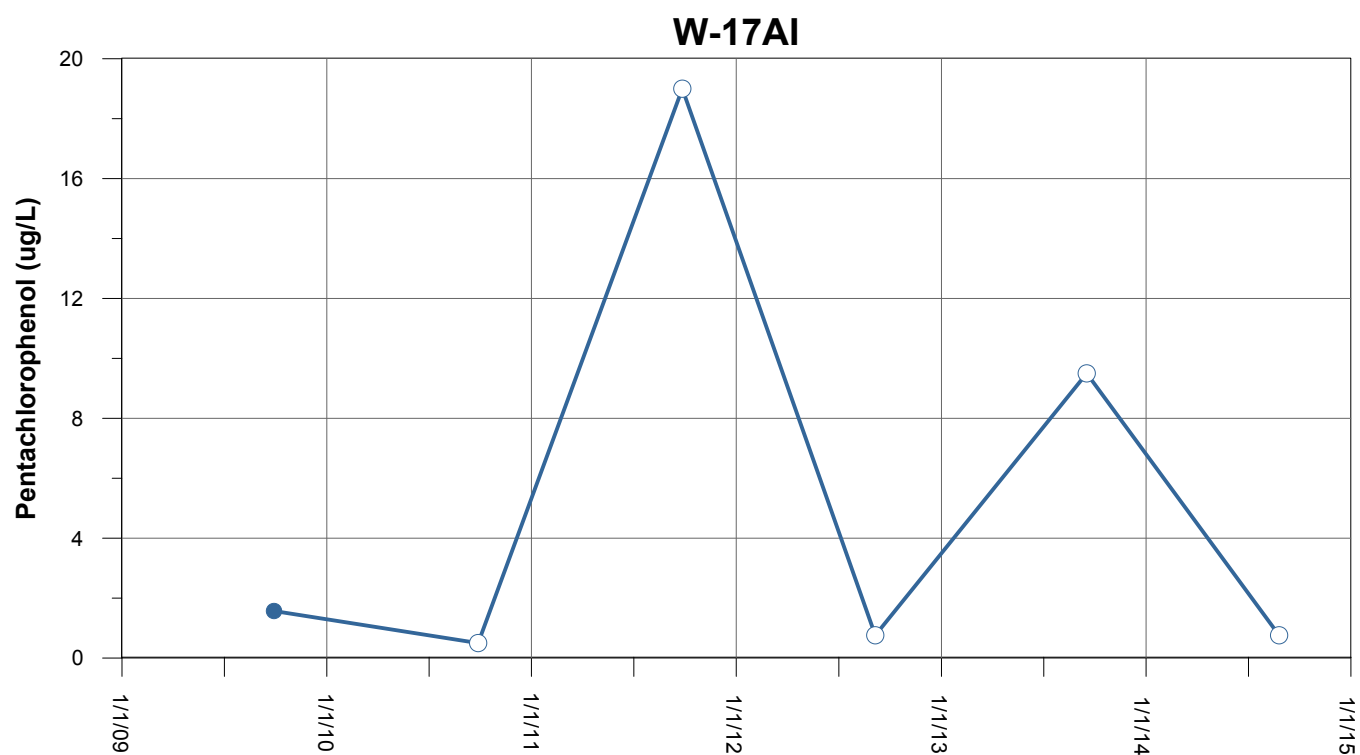
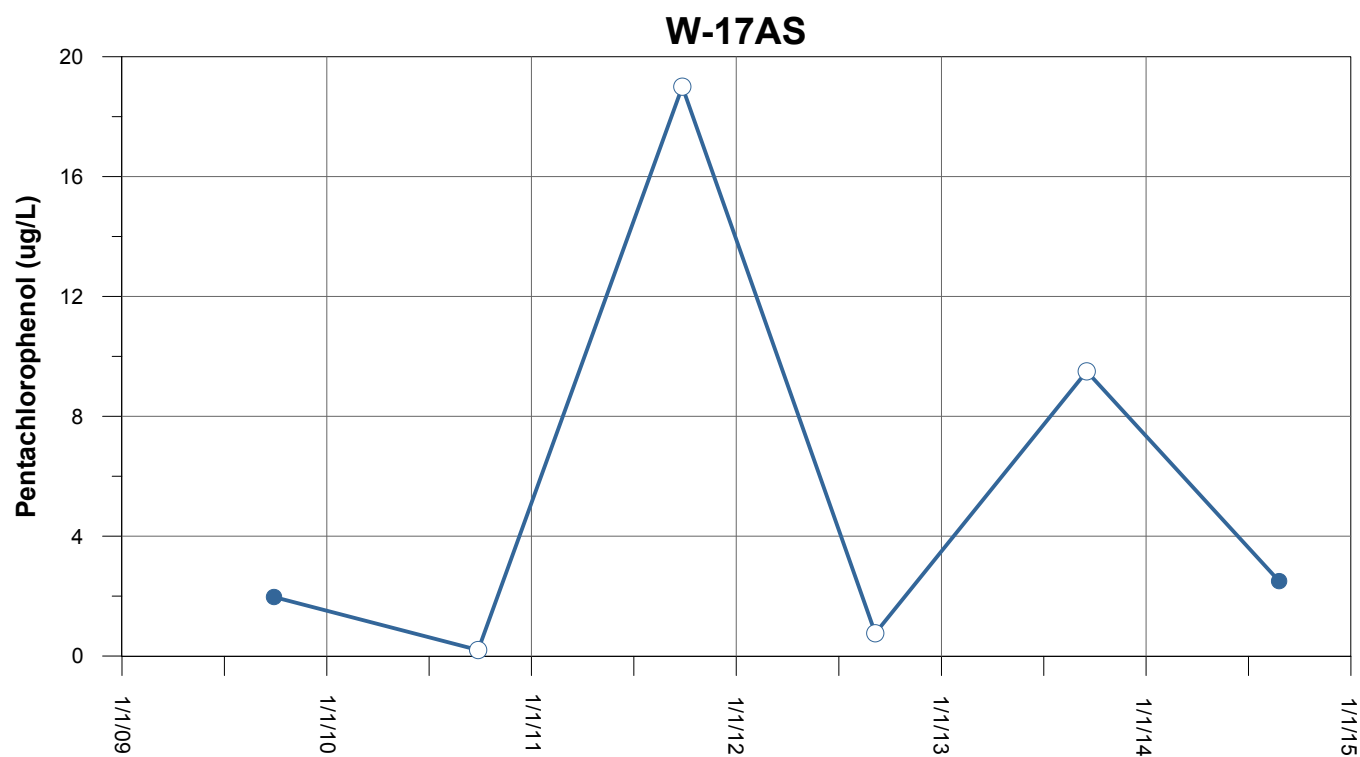
FIGURE C-5

Pentachlorophenol Groundwater Concentrations in W-16AI and W-17BI

J.H. Baxter Wood Treating Facility
Eugene, Oregon

Notes:

ug/L = microgram per liter



Legend:

- Pentachlorophenol Detected Values
- Pentachlorophenol Non-Detected Values

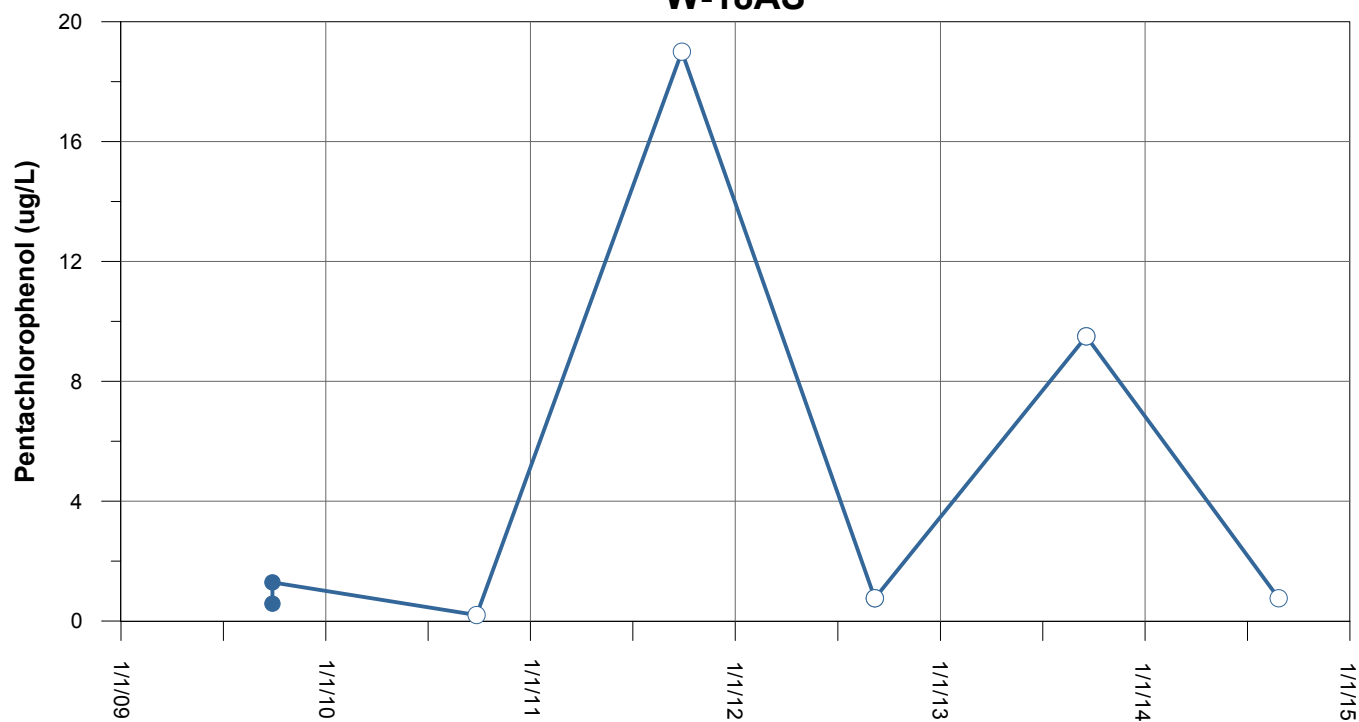
FIGURE C-6
Pentachlorophenol Groundwater Concentrations
in W-17AS and W-17AI

J.H. Baxter Wood Treating Facility
Eugene, Oregon

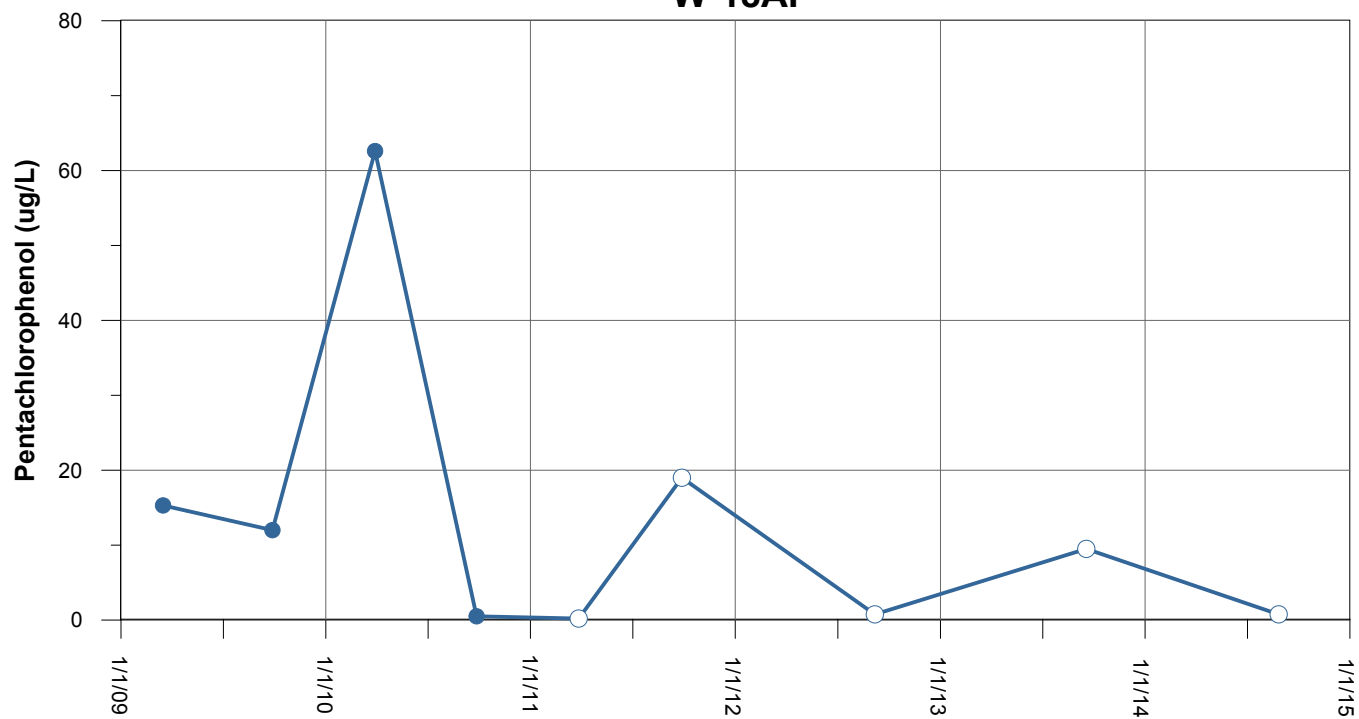
Notes:

ug/L = microgram per liter

W-18AS



W-18AI



Legend:

- Pentachlorophenol Detected Values
- Pentachlorophenol Non-Detected Values

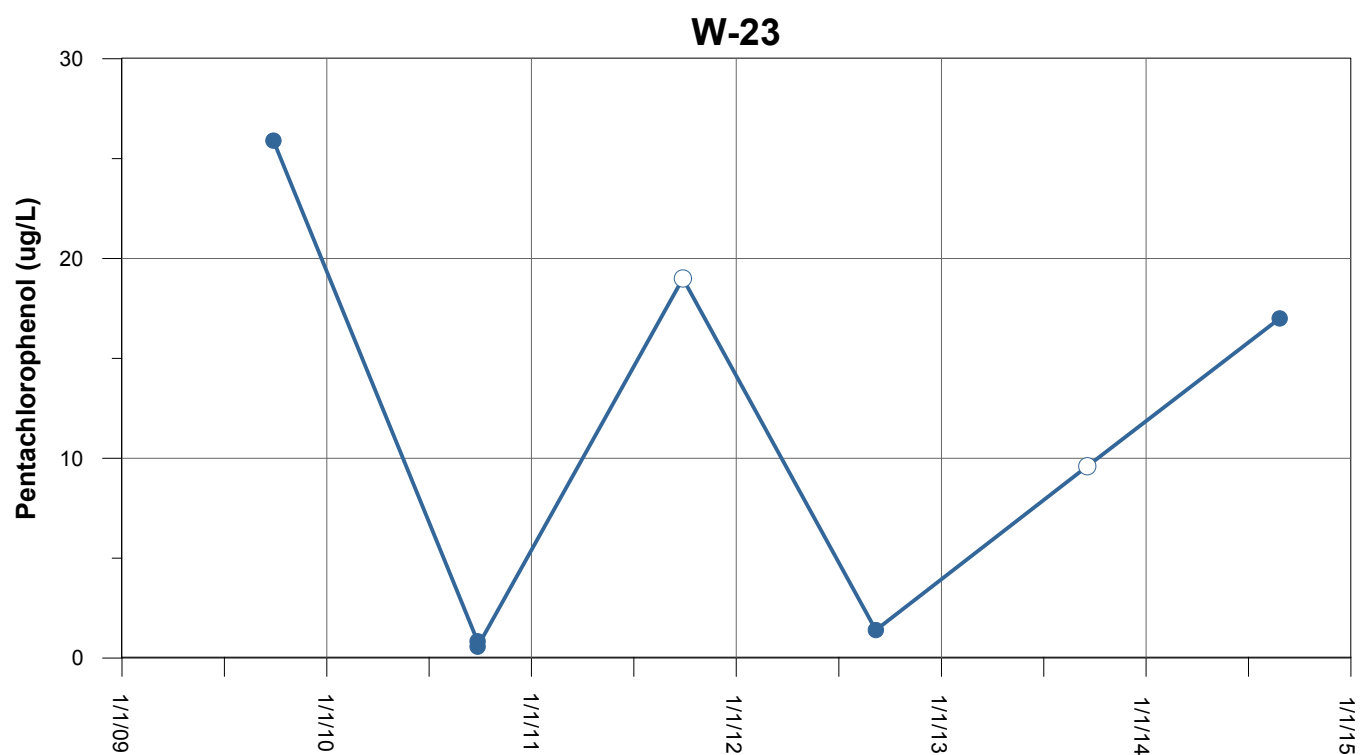
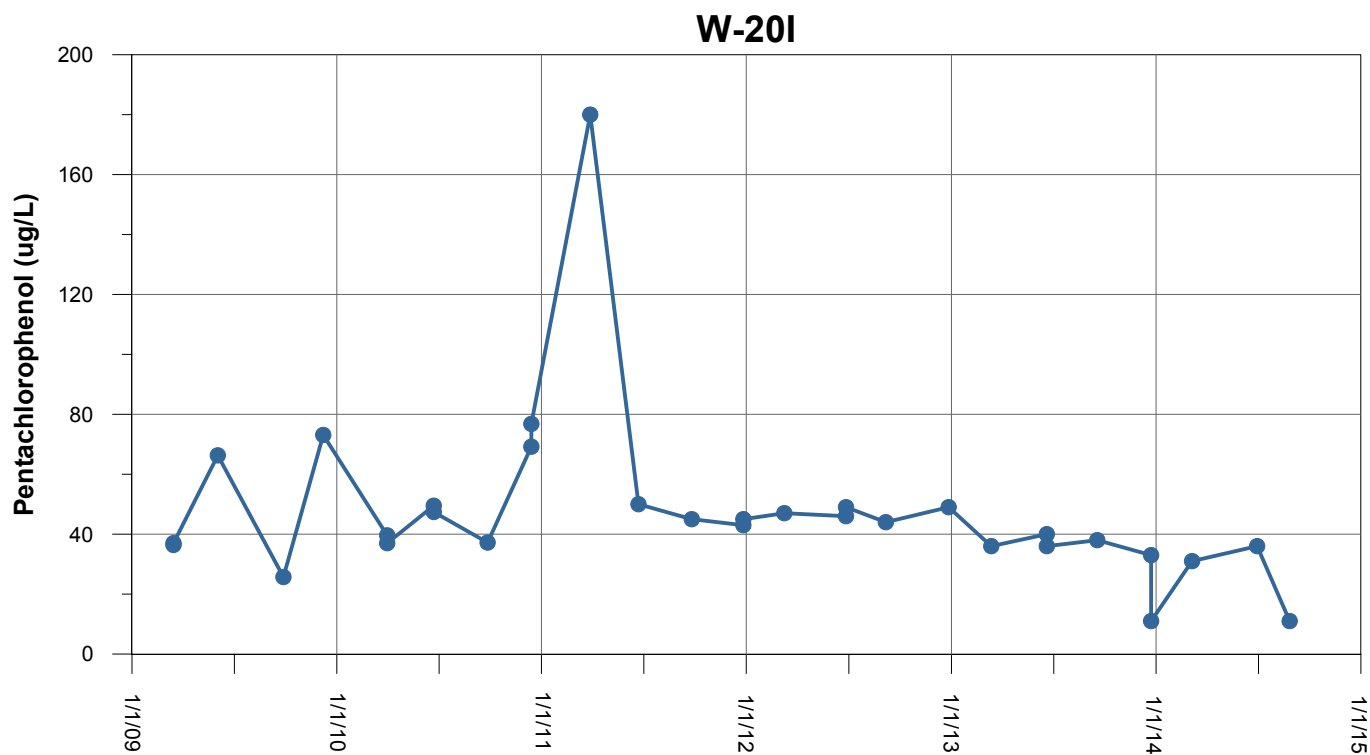
Notes:

ug/L = microgram per liter

FIGURE C-7 Pentachlorophenol Groundwater Concentrations in W-18AS and W-18AI

J.H. Baxter Wood Treating Facility
Eugene, Oregon





Legend:

- Pentachlorophenol Detected Values
- Pentachlorophenol Non-Detected Values

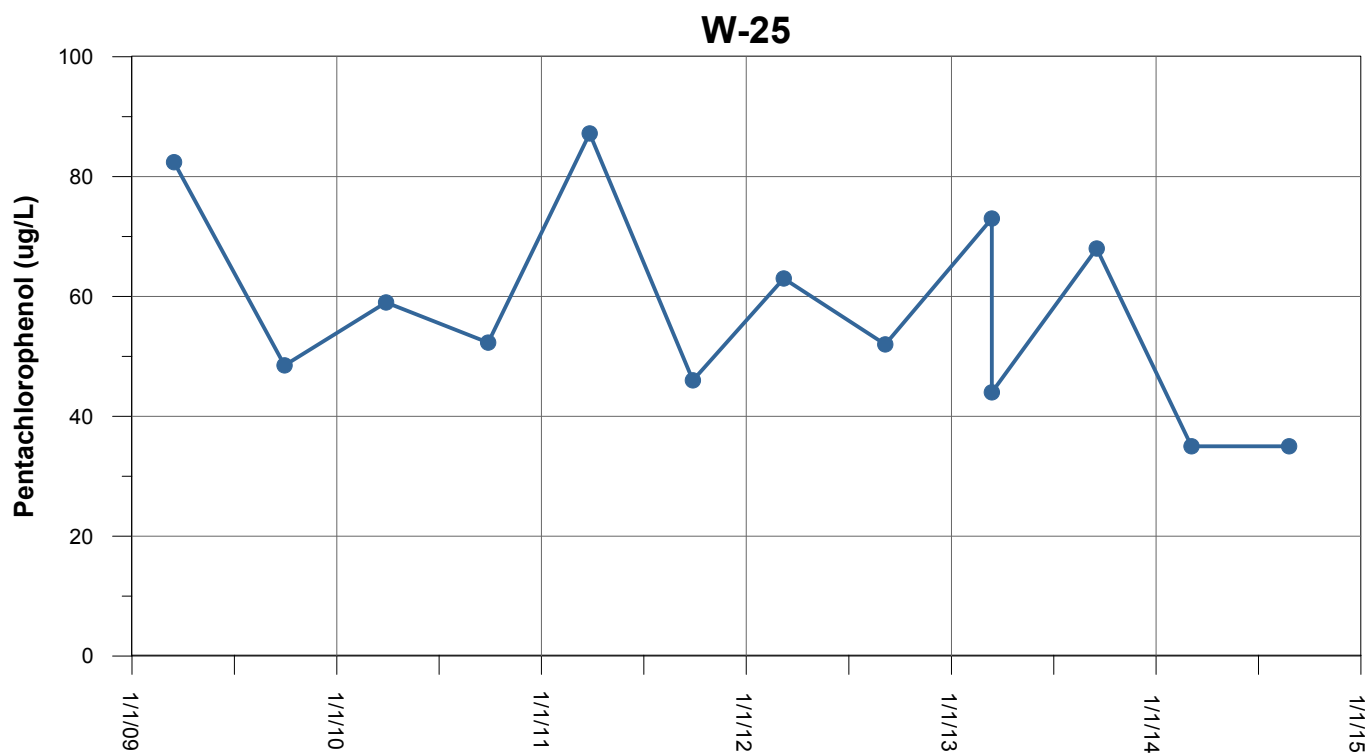
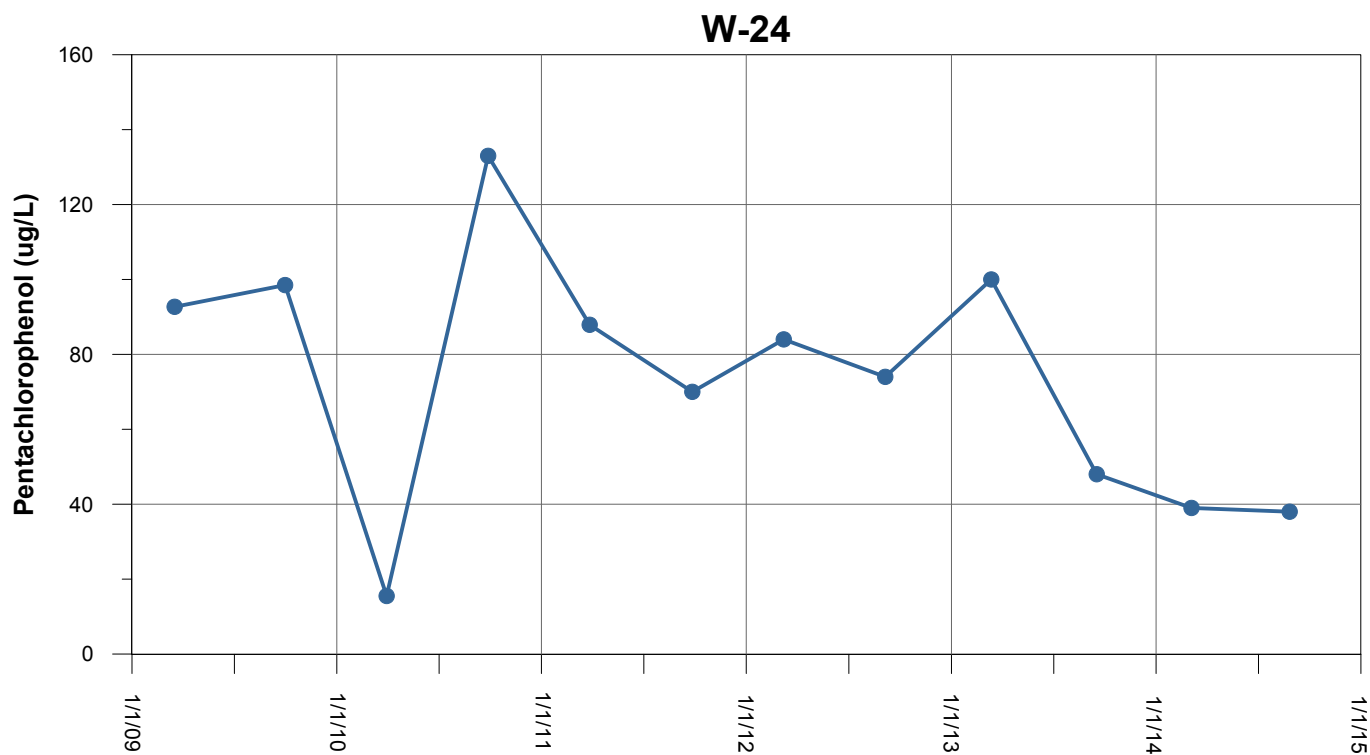
Notes:

ug/L = microgram per liter

FIGURE C-8
Pentachlorophenol Groundwater Concentrations
in W-201 and W-23

J.H. Baxter Wood Treating Facility
 Eugene, Oregon





Legend:

- Pentachlorophenol Detected Values
- Pentachlorophenol Non-Detected Values

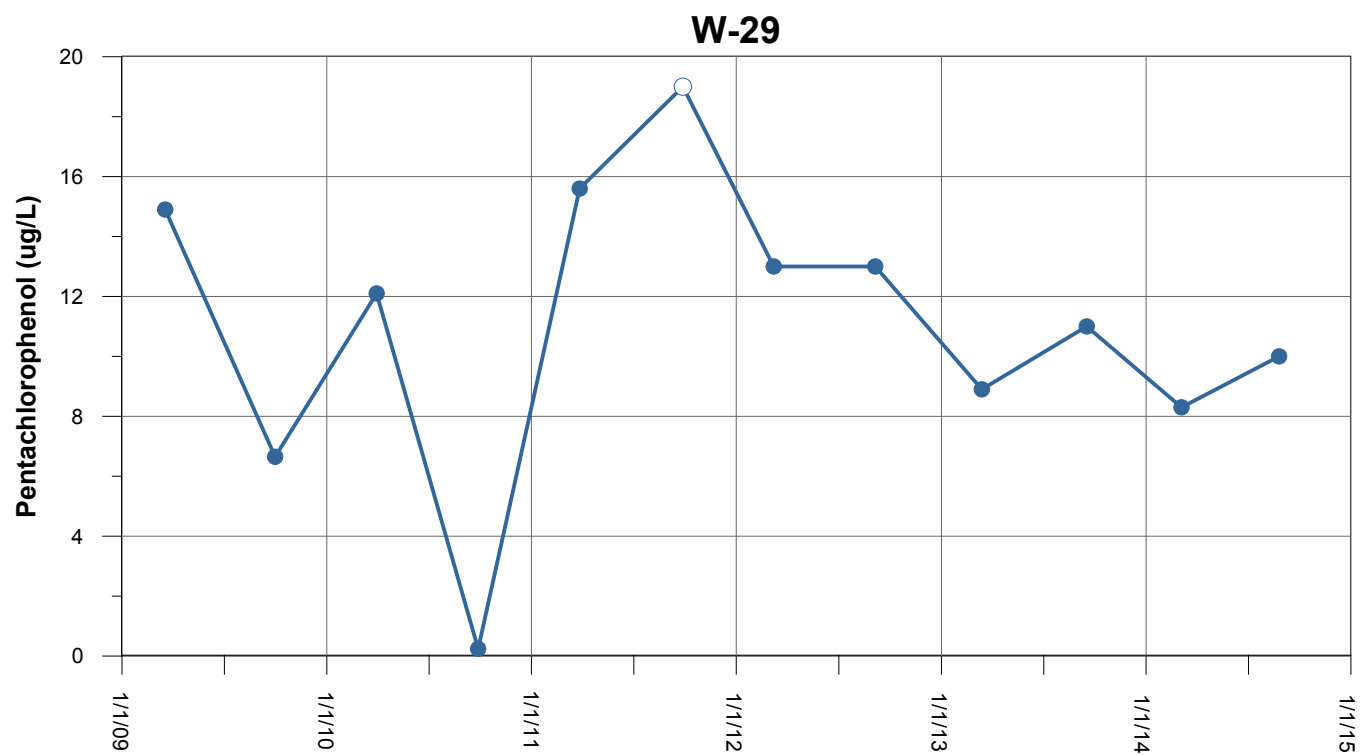
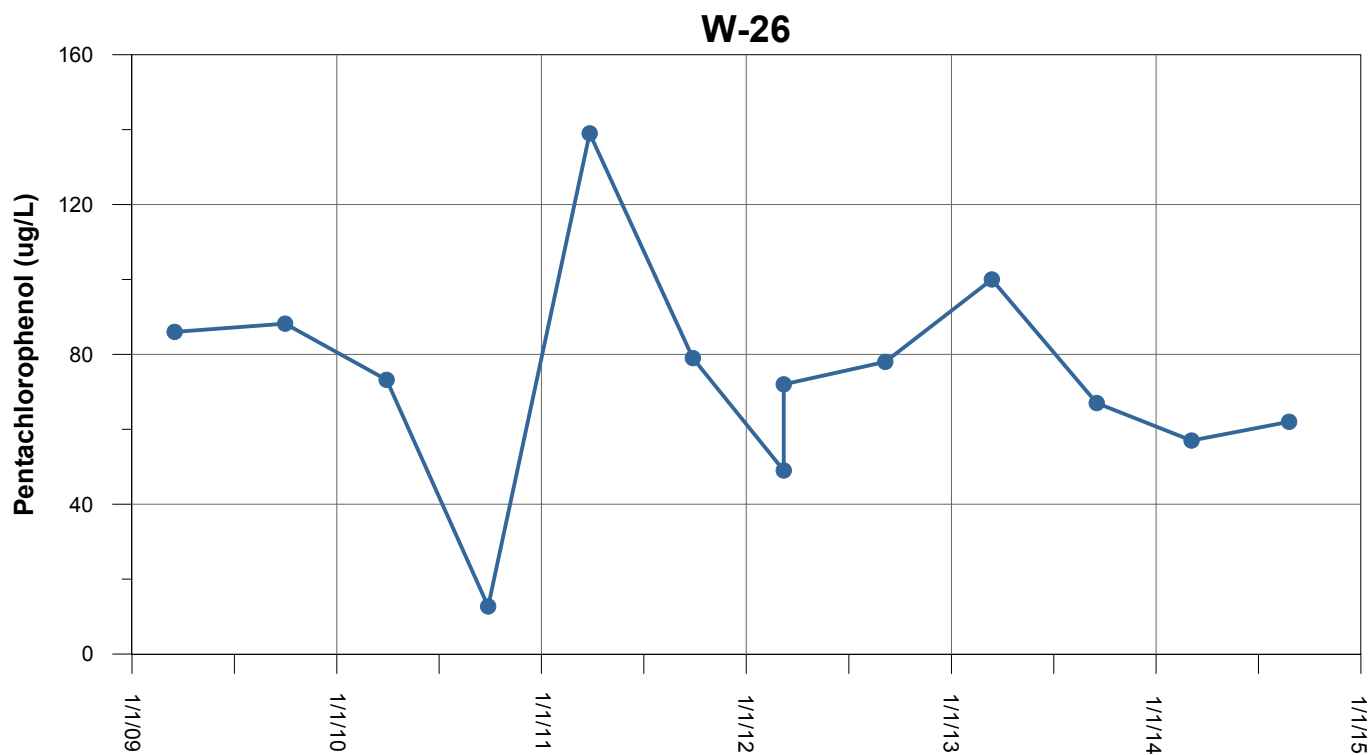
Notes:

ug/L = microgram per liter

FIGURE C-9
Pentachlorophenol Groundwater Concentrations
in W-24 and W-25

J.H. Baxter Wood Treating Facility
Eugene, Oregon





Legend:

- Pentachlorophenol Detected Values
- Pentachlorophenol Non-Detected Values

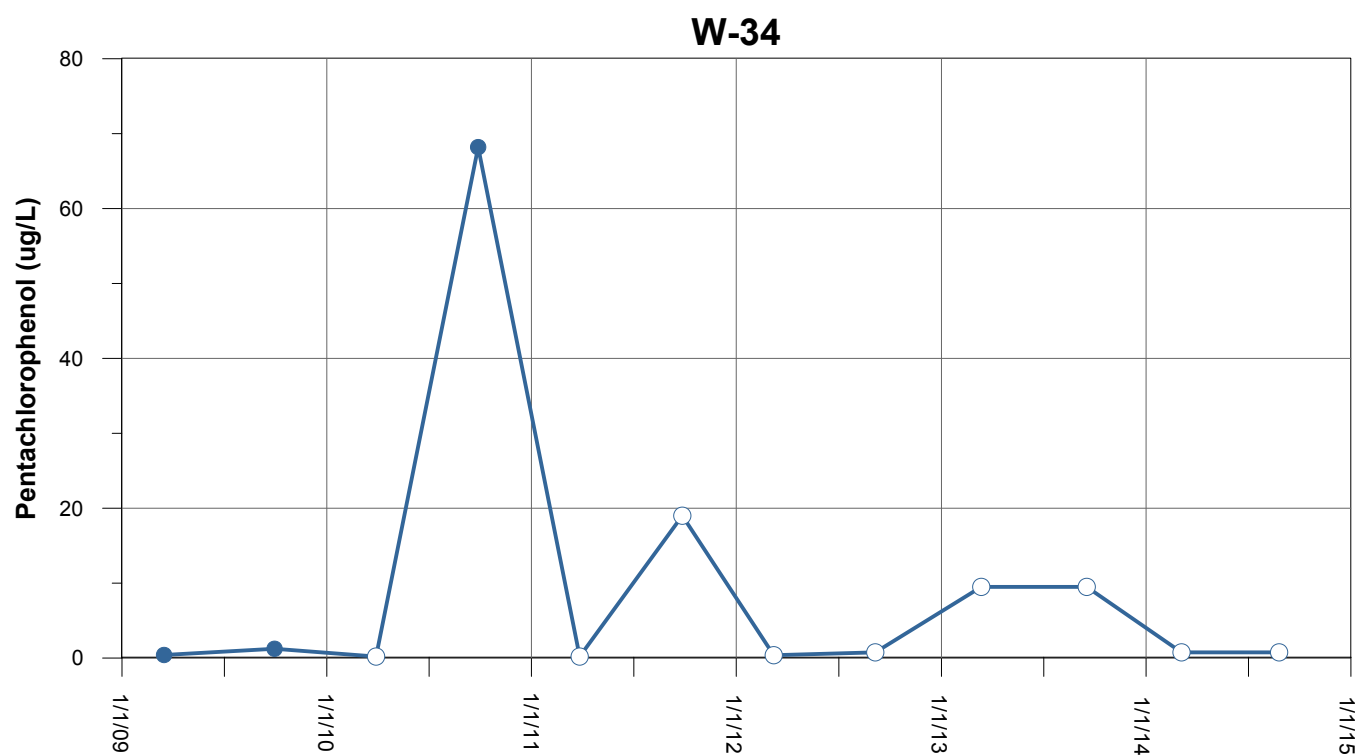
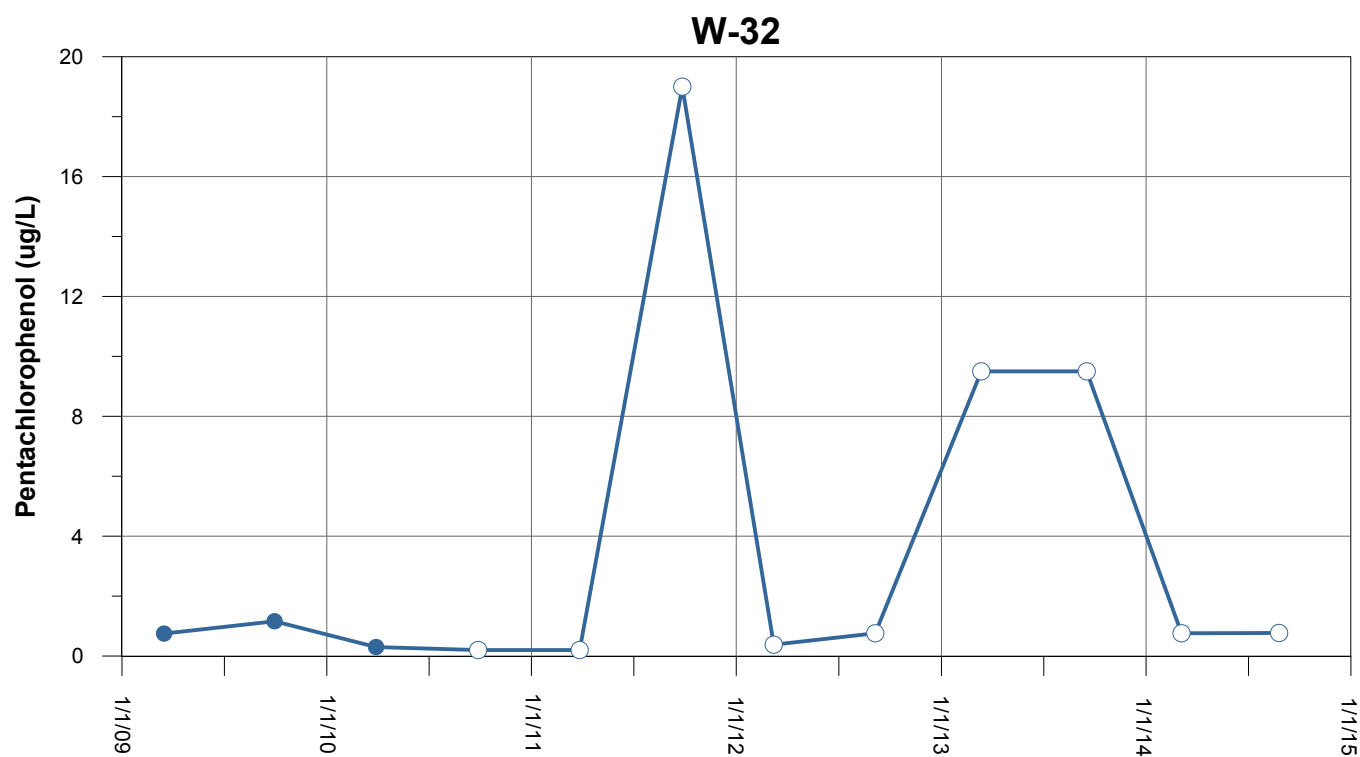
FIGURE C-10

Pentachlorophenol Groundwater Concentrations in W-26 and W-29

J.H. Baxter Wood Treating Facility
Eugene, Oregon

Notes:

ug/L = microgram per liter



Legend:

- Pentachlorophenol Detected Values
- Pentachlorophenol Non-Detected Values

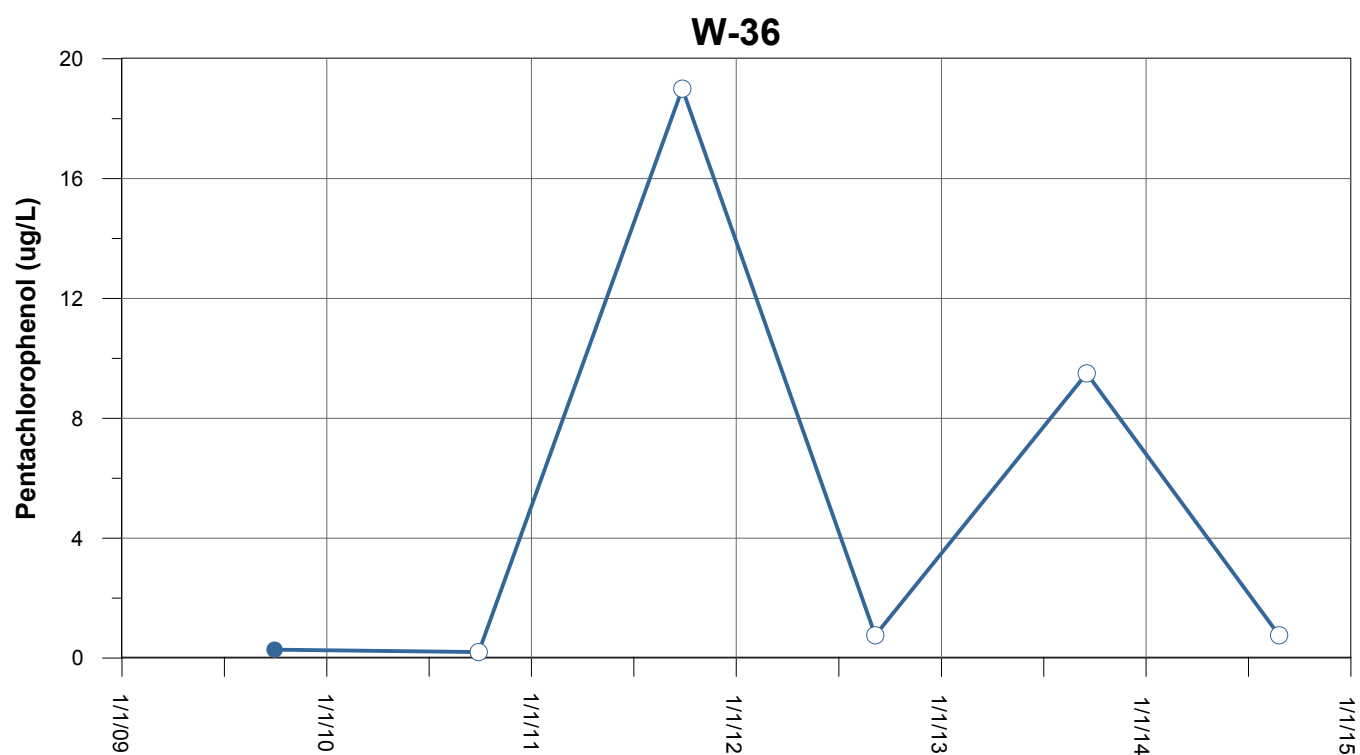
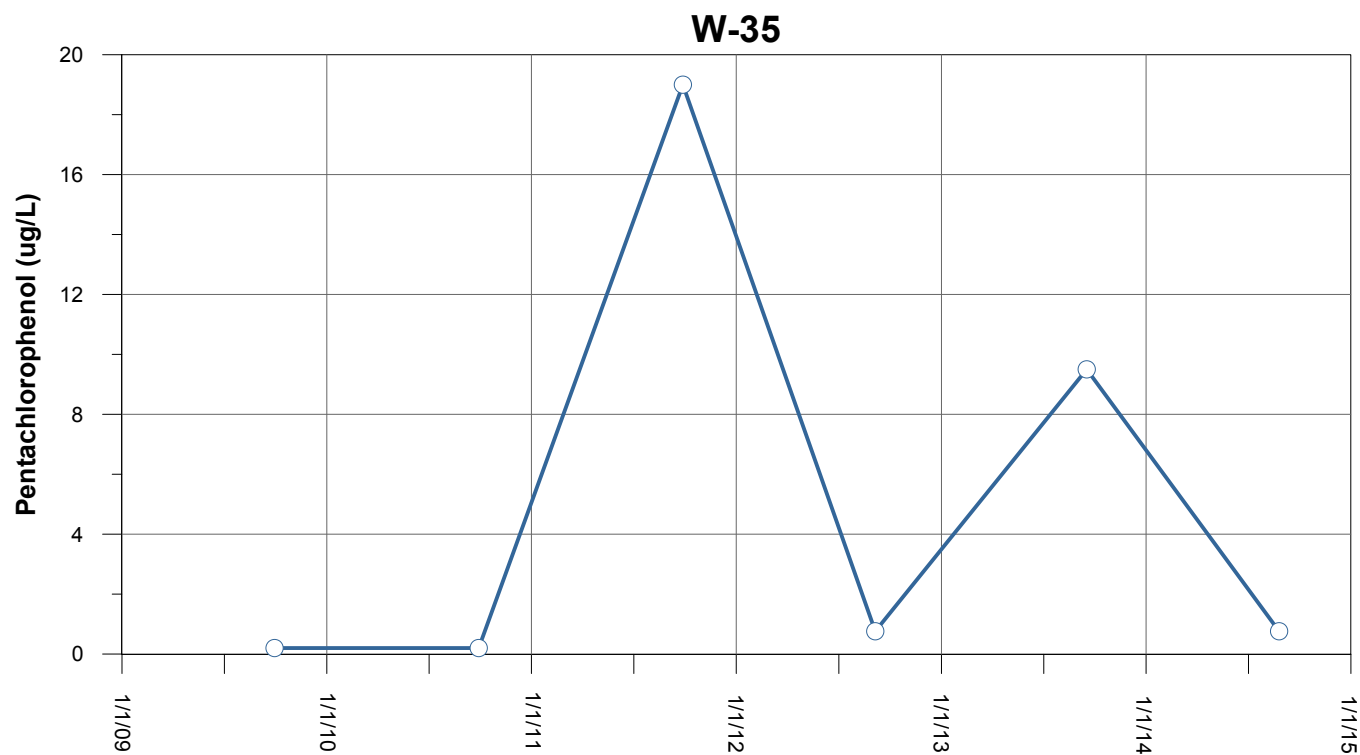
FIGURE C-11

Pentachlorophenol Groundwater Concentrations in W-32 and W-34

J.H. Baxter Wood Treating Facility
Eugene, Oregon

Notes:

ug/L = microgram per liter



Legend:

- Pentachlorophenol Detected Values
- Pentachlorophenol Non-Detected Values

FIGURE C-12

Pentachlorophenol Groundwater Concentrations in W-35 and W-36

J.H. Baxter Wood Treating Facility
Eugene, Oregon

Notes:

ug/L = microgram per liter