FOCUSED FEASIBILITY STUDY

Block A & N, ECSI #5830

510 NW 3rd Avenue

Portland, Oregon

Prepared for:

Portland Development Commission
222 NW Fifth Avenue
Portland, Oregon 97209

Prepared by:

AMEC Environment & Infrastructure, Inc.
7376 SW Durham Road
Portland, Oregon 97224
(503) 639-3400

November 12, 2014

Project No. 4-61M-128332

November 12, 2014
Project No. 4-61M-128332

Portland Development Commission
222 NW Fifth Avenue
Portland, Oregon 97209

Attention: Mr. Colin Polk

Subject: Focused Feasibility Study
Block A & N, ECSI #5830
510 NW 3rd Avenue
Portland, Oregon

Dear Mr. Polk:

AMEC Environment & Infrastructure, Inc. (AMEC) is pleased to submit this Focused Feasibility Study (FFS). The FFS presents remediation alternatives for soil impacted by former site operations, and includes AMEC's recommendation for a preferred remediation alternative.

Sincerely,

AMEC Environment & Infrastructure, Inc.

Leonard Farr Jr., RG
Senior Associate

Attachment: Focused Feasibility Study

TW/lp

AMEC Environment & Infrastructure, Inc.
7376 SW Durham Road
Portland, Oregon
USA 97224
Tel+1 (503) 639-3400
Fax+1 (503) 620-7892
www.amec.com

TABLE OF CONTENTS

Page

TABLE

FIGURES

APPENDICES

FOCUSED FEASIBILITY STUDY
Block A & N, ECSI #5830
510 NW 3rd Avenue, Portland, Oregon

1.0 INTRODUCTION

AMEC Environment & Infrastructure, Inc. (AMEC) has prepared this Focused Feasibility Study (FFS) on behalf of the Portland Development Commission (PDC) for the Block A & N property located at 510 NW 3rd Avenue in Portland, Oregon (Site). PDC recently enrolled the 0.77-acre Site into the Oregon Department of Environmental Quality (DEQ) Voluntary Cleanup Program. The purpose of the FFS is to evaluate remedial alternatives to address potential risk from exposure to contaminants found on the Site.

This FFS was completed in general accordance with DEQ's *Final Guidance for Conducting Feasibility Studies* issued July 1, 1998, and updated November 1, 2006 (DEQ, 2006). This FFS contains the following elements:

1. Site and investigation background (Sections 1.1 through 1.3);
2. Conceptual Site Model (CSM) summary (Section 2.0);
3. Identification of remedial action objectives (Section 3.0);
4. Identification of remedial action alternatives (Section 4.0);
5. Analysis of remedial action alternatives (Section 5.0); and
6. Recommendations (Section 6.0).

1.1 SITE LOCATION

The Site comprises tax lot 600 (0.77 acres) on Multnomah County tax assessment map 1N 1E 34BD. The latitude and longitude of the Site are 45.5271 degrees and -122.6729 degrees, respectively. The Site location is shown on Figure 1.

1.2 SITE DESCRIPTION AND HISTORY

The Site consists of a triangular shaped parcel at the northeast corner of the intersection of NW Glisan Street and NW 3rd Avenue. Immediately adjacent to the north is a railroad line; to the south is the base of the Steel Bridge. A railroad engine house and warehouse were located on the Site between 1890 and 1906 prior to sale of the property to the City of Portland for construction of the existing fire station building in 1913. The fire station building was occupied by the fire department until approximately 1950. The Site was conveyed back to the Northern Pacific Terminal Company of Oregon (now known as Portland Terminal Railroad Company or PTRR) in 1953. From 1953 to 1980 the building was used by PTRR as a carpenter shop, and was then converted to small office space.

PDC acquired the property on October 30, 1987, as part of a purchase from PTRR. Under PDC ownership, the building was occupied as leased office space until 1997 and has been vacant thereafter. The Site lot was used by varies entities for temporary construction staging from 1996 through 2012. During active use of the property, PDC conducted periodic inspections of the property to ensure compliance with the terms of PDC's temporary use permit, including a prohibition on the storage of fuels or hazardous substances on the property. Following each of these uses, 12 in all, PDC conducted a post-use inspection and confirmed that the use to not detrimentally impact the environmental condition of the Site. These inspections included a reconnaissance of the property to observe for evidence of hazardous substance releases such as stressed vegetation or staining. In September 2008 a portion of the Site (northwest corner) was dedicated as an easement to TriMet for light rail use and a very small portion (southwest edge) dedicated for rail right-of-way. PDC intends to sell the property with future development anticipated to consist of a new ground floor commercial/office building with potential upper floor office/residential, with external parking and landscaping. No subgrade parking is envisioned with the redevelopment.

1.3 PREVIOUS INVESTIGATIONS

Two Phase I Environmental Site Assessments (ESAs) have been completed for the Site, by AMEC (formerly Rittenhouse Zeman and Associates, Inc. [RZA]) in January 1990, and by Parametrix, Inc., in December 2005. Both Phase I ESAs identified an underground heating oil tank (HOT) near the fire station building and historical railroad operations as potential areas/issues of concern. Parametrix recommended: 1) a geophysical survey to locate the HOT, and investigation and decommissioning of the HOT (if present), and 2) a Site-wide Phase II ESA to investigate areas on the Site that may have been impacted by railroad operations and imported fill material. Figure 2 shows the HOT location in the southwestern corner of the Site.

In 2010, PBS Engineering + Environmental, Inc., conducted a Phase II ESA on the Site for PDC (Figure 2). One of four soil samples collected near the HOT contained diesel (8,370 milligrams per kilogram [mg/kg]) at 13 feet below ground surface (bgs). Petroleum hydrocarbons in the diesel and heavy oil range also were detected across the Site. Concentrations of polynuclear aromatic hydrocarbons (PAHs) exceeded DEQ risk-based concentrations (RBCs) (DEQ, 2012) for occupational direct contact in two samples. Arsenic concentrations ranged from 2.6 to 10.2 mg/kg, with three samples slightly exceeding the geographically applicable background concentration of 8.8 mg/kg.

PDC notified DEQ of the leaking HOT in January 2010, and leaking HOT file 26-10-0031 was initiated by the DEQ. In November 2013, the HOT was decommissioned by removal. In response to the receipt of the HOT Decommissioning Report prepared by 3 Kings Environmental, Inc., DEQ issued a no further action determination for the HOT on December 10, 2013. Figure 2 shows the extent of the excavation associated with the HOT removal.

In 2014, AMEC completed additional soil and groundwater sampling at the Site in areas outside of the HOT area (Figure 2), in accordance with the DEQ-approved Remedial Investigation/Feasibility Study (RI/FS) Work Plan (AMEC, 2013; DEQ, 2013). The work consisted of collecting soil samples from five borings to 5 feet bgs, and sampling groundwater from three of the five borings. Oil-range organics (ORO), PAHs, and metals were detected in most soil samples collected from Site subsurface fill materials. This testing generally indicates that petroleum hydrocarbon, PAH, and metal analytes are widespread in subsurface soils across the Site, but at relatively low concentrations. The findings are consistent with contaminants found at urban industrial sites in the area and in other urban settings (Appendix A). Petroleum hydrocarbons were not detected in the three groundwater samples by Method Northwest Total Petroleum Hydrocarbons (NWTPH)-diesel extended/gasoline-range (Dx/Gx); low levels of PAHs were detected at two locations (DP-1 and DP-4). Metals were detected in all three groundwater samples, and one or more metals in each of the groundwater samples exceeded default background concentrations for freshwater published by the DEQ (DEQ, 2010).

AMEC prepared a Remedial Investigation (RI) Report dated May 27, 2014. The purpose of the RI was to develop information to determine the need for remedial action at the Site. The RI Report included background information, environmental setting, a summary of site investigations completed, a Conceptual Site Model (CSM), and a risk screening. AMEC concluded that unacceptable risk to future urban residential, occupational, and construction worker receptors may result from direct contact exposure to soil at the Site, and recommended development of an FFS that considers feasibility study outcomes for other vicinity properties (i.e., Station Place and The Yards at Union Station) (AMEC, 2014).

2.0 SUMMARY OF DETECTED CONCENTRATIONS AND RISK SCREENING

2.1 SITE GEOLOGY AND HYDROGEOLOGY

During the subsurface exploration field sampling activities conducted at the Site by AMEC in February 2014, fill material comprised primarily of gravels, sands, and silt was encountered. Brick and wood debris were commonly observed in the fill materials. Fill thickness appeared to be more than 25 feet, which is the maximum depth explored at the Site by PBS and AMEC.

AMEC encountered groundwater in Site borings at a depth of approximately 10 to 15 feet bgs. Groundwater is presumed to flow to the northeast toward the Willamette River.

2.2 CONTAMINATION SOURCES AND NATURE AND EXTENT OF CONTAMINATION

There are no known on-going sources of contamination present at the Site. The only historical potential point source of contamination was a HOT associated with the Site building (AMEC, 2014).

As mentioned in Section 1.3 in the context of previous Site environmental investigations, a HOT formerly was located in the southwest corner of the Site. The installation date of the 675-gallon HOT is unknown. The HOT was decommissioned by removal in November 2013. During decommissioning the HOT was noted to be in poor condition, with holes observed in the bottom of the tank. A total of 26.5 tons of petroleum-containing soil was excavated and transported to the Wasco County Landfill for disposal. Following tank and petroleum-containing soil removal, seven confirmation soil samples were collected from the base and sidewalls of the HOT excavation (RI Report, Table 1). The maximum diesel/oil concentration detected was 628 mg/kg. This concentration is well below the urban residential direct contact RBC for diesel of 2,200 mg/kg. This is the most conservative potentially applicable diesel-range RBC for the Site. Based upon these testing results, low level diesel-containing soil associated with the HOT remaining at the Site does not pose a risk to human health or the environment (AMEC, 2014).

Soil and/or groundwater samples have been collected from 17 soil borings located across the Site, plus 2 borings near the HOT where soil has since been removed (Figure 2). Testing of soil and groundwater samples focused on petroleum hydrocarbons, PAHs, and metals. As indicated in RI Report Tables 1 through 3, ORO, PAHs, and metals were detected in most soil samples collected from Site subsurface fill materials. This testing generally indicates that petroleum hydrocarbon, PAH, and metal analytes are widespread in subsurface soils across the Site, but at relatively low concentrations. An assessment of risk associated with these analyte concentrations is contained in Section 6.3 of the RI Report (AMEC, 2014).

Three direct-push groundwater samples have been collected in areas outside the HOT area. It is worthy of noting that groundwater results from direct-push borings may potentially have a high bias for TPH, PAHs, and metals due to the tendency of these compounds to adsorb to suspended solids. DP-4 and DP-5 were located in areas presumed downgradient of the HOT area. DP-1 was located in the eastern portion of the Site (Figure 2). Petroleum hydrocarbons were not detected in the three groundwater samples. Low levels of PAHs were detected in DP-1 and DP-4. Metals were detected in all three groundwater samples, and one or more metals in each of the groundwater samples exceeded default background concentrations for freshwater published by the DEQ (DEQ, 2010).

2.3 CONTAMINANTS OF CONCERN

According to the risk screen conducted as part of the RI (AMEC, 2014), contaminants of concern (COCs) for soil are:

- Diesel
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b+k)fluoranthene
- Dibenz(a,h)anthracene
- Indeno(1,2,3-cd)pyrene
- Arsenic
- Lead

Based on the results of a beneficial use of water survey completed at the nearby Station Place property, groundwater ingestion was ruled out as a complete exposure pathway for the Site. No RBCs exceedances were noted for any other receptor exposure pathways for groundwater. COCs were, therefore, not defined for Site groundwater.

2.4 CONCEPTUAL SITE MODEL AND RISK SCREENING

A CSM is a summary that:

- Describes all of the known or suspected sources of contamination;
- Considers how and where the contaminants are likely to move (pathways); and
- Identifies who/what is likely to be affected by the contaminants (receptors).

Figure 3 provides a graphical representation of the CSM prepared for the Site. Justification for decisions regarding the applicable receptors and complete exposure pathways for the Site are provided in Sections 6.1 and 6.2 of the RI Report (AMEC, 2014).

As discussed in Section 6.1 of the RI Report, the current use of the Site is commercial/industrial, and the reasonably likely future land use for the Site is urban residential and commercial. Therefore, potential receptors for the Site include urban residential, occupational, construction, and excavation worker receptors, and do not include residential receptors (as defined in DEQ's *Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites* [DEQ, 2003]).

As discussed in Section 6.2 of the RI Report, there are no current or reasonably likely future beneficial water uses (both surface water and groundwater) associated with first-encountered groundwater or the Troutdale Formation. Therefore, all groundwater ingestion exposure pathways are considered incomplete (AMEC, 2014). Furthermore, based on the geology at the Site and vicinity, the nature of the constituents detected in shallow soil, and the age of the releases (based on timing of Site operations), it is unlikely that the constituents in soil will impact groundwater quality and cause a future unacceptable risk to receptors.

The COCs in soil exceeded RBCs at one or more locations and are specific to the inhalation, ingestion, and dermal contact exposure pathway ("direct contact" pathway) for urban residential, occupational worker, and construction worker receptors (Table 1). No constituents exceeded RBCs for volatilization to outdoor air or vapor intrusion into buildings exposure pathways (AMEC, 2014).

3.0 REMEDIAL ACTION OBJECTIVES

Based on the risk screening results, remedial action will need to address the following receptors, pathways, and media.

- Future urban residential receptors via direct contact with soil.
- Future occupational receptors via direct contact with soil.
- Future construction workers via direct contact with soil.

3.1 REMEDIAL ACTION AREA

Based on the distribution of constituents exceeding RBCs in soil, the remedial action area consists of unsaturated soil across the entire Site.

3.2 REMEDIAL OBJECTIVES

The remedial objective for this Site is to minimize the exposure of potential future urban residential, occupational, or construction worker receptors to COCs in soil above concentrations that present unacceptable risk, and to maintain no beneficial use of Site groundwater.

4.0 REMEDIAL ACTION ALTERNATIVES

The general response actions of No Action, Institutional and Engineering Controls are discussed below in Sections 4.1 and 4.2, respectively. Removal, physical treatment, and in-situ destruction are discussed briefly in Section 4.3.

4.1 NO ACTION

Given the potential risks to future urban residents, occupational workers, and construction workers identified in the risk screening (AMEC, 2014), it is appropriate to take action at the Site to eliminate potential exposure to soil. A No Action alternative will not be considered for this Site.

4.2 INSTITUTIONAL CONTROL AND ENGINEERING CONTROLS

Engineering controls for the Site include a surface cap. A surface cap is an engineered physical barrier that can be used to prevent exposure to surface soil. PDC has successfully employed surface caps for this purpose at nearby Station Place and The Yards at Union Station sites. Placement and maintenance of a clean soil layer or less-permeable capping materials over the entire Site will eliminate potential exposure via direct contact with soil. This action can be implemented during Site redevelopment such that cap thickness is maintained beneath various finished ground surface elevations. The surface cap may consist of a 2-foot-thick layer of clean soil, a low-permeability cap such as asphalt underlain by crushed rock, or infrastructure such as buildings and concrete sidewalks underlain by crushed rock or gravel. Examples of typical cap designs that may be applicable to future Site development are provided on Figure 4.

Institutional controls for the Site include: 1) notification of the presence of an engineered surface cap, 2) inspection requirement for the surface cap, 3) requirement that DEQ be notified of any disturbance of contaminated soil underlying the surface cap, and 4) prohibition of groundwater use.

As discussed in Section 2.4, ingestion of groundwater is not considered a current complete exposure pathway for the Site, and concentrations were not compared to RBCs. However, potential future risk associated with ingestion of groundwater will be addressed through a restriction preventing the use of groundwater at the Site.

As part of this remedial alternative, a contaminated media management plan (CMMP) would be prepared to address uncontrolled exposure of construction/excavation workers to impacted soil and groundwater during Site development, and during post-development subsurface maintenance activities. The purpose of the CMMP is to provide site-specific information and guidance to contractors that may encounter contaminated media during redevelopment activities. The CMMP also would provide instructions to construction/excavation workers regarding required management procedures for contaminated soils. The CMMP must include:

- Identified locations of residual contamination in soil;
- Descriptions of constituents and concentrations remaining in soil as of the last applicable sampling dates;
- Recommended protocols for monitoring potential environmental contaminants during construction activities;
- Options for management of contaminated soil encountered during future excavation activities; and
- Contractor Health and Safety training requirements, options for personal protective equipment (PPE), and decontamination procedures.

Following the implementation of all engineering controls, which will occur concurrently with development of the Site, an Easement and Equitable Servitude (EES) agreement will be prepared. The EES will formalize all institutional controls for the Site, and will be recorded on the property deed to ensure that future owners of the Site are aware of on-going requirements associated with Site remedial actions.

4.3 Removal, Physical Treatment, and In-Situ Destruction

The remaining general response actions are not considered effective alternatives for soil remedy at this Site, and are not included in the analysis in Section 5. Rationale for elimination of each action from consideration is provided in the list below.

- **Removal** – While removal (excavation and off-site disposal) is generally a viable approach to address risk associated with exposure to shallow soil, it is not expected to be cost-effective for this Site as soil contamination is low-level and widespread.

- **Physical Treatment** – Remedial technologies that may be applicable to address the heavy petroleum hydrocarbons, PAHs, and metals in shallow soils at the Site include enhanced bioremediation, thermal treatment, landfarming, and solidification/stabilization. Bioremediation would not effectively treat metals. Thermal treatment would be significantly more expensive than capping and would not effectively treat metals. Landfarming would require excavation and use of the Site for extended periods of time, or transport to a landfarming facility, and would not effectively treat metals. Solidification/stabilization would be moderately effective at treating the Site organics and effective at addressing inorganics such as metals, but it tends to be considerably more expensive than other technologies. None of these technologies is considered more protective than the institutional and engineering control remedial alternative described in Section 4.2.
- **In-Situ Destruction** – Chemical oxidation is not considered effective in destruction of PAHs in the subsurface, and is generally not effective for metals. Implementation would require multiple injection points across the Site and includes some implementation risk due to handling of dangerous chemicals, potential damage to utilities, potential surfacing or short circuiting of oxidizing chemicals into sensitive environments, and very poor distribution of oxidizing solution into shallow unsaturated soils. Chemical oxidation would be expected to be much more costly and likely less effective than engineering controls.

5.0 ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

The purpose of this FFS is to define and evaluate, in a streamlined manner, relevant alternatives that mitigate risk to human health and the environment.

Based on AMEC's and PDC's prior experience with DEQ at similar sites, including Union Station (ECSI #1885) and Station Place (ECSI #2407), the remedial action objectives (RAOs) for this Site do not warrant a generic evaluation of remedial alternatives using the criteria in Oregon Administrative Rule (OAR) 340-122-0090: Effectiveness, Long-Term Reliability, Implementability, Implementation Risk, and Reasonableness of Cost. Based on the nature of soil contamination at the Site, potential exposure pathways, and future development plans, risk-based decision management (RBDM) principles (DEQ, 2003) are applied to protect human health and the environment from Site contaminants through the use of institutional and engineering controls to mitigate potentially complete exposure pathways.

6.0 RECOMMENDATIONS

This FFS was completed in general accordance with DEQ's *Final Guidance for Conducting Feasibility Studies* (DEQ, 2006). Based on the information provided in this FFS, AMEC recommends the following.

Soil

- Create a CMMP to guide worker protection and contaminated soil handling during construction activities and future subsurface maintenance activities.
- Provide guidelines for a surface cap for the Site that minimizes the potential for exposure to soil that will be installed when the Site is redeveloped in the future. Current Site fencing and gravel surface cover is suitable as a temporary surface cap until the Site is redeveloped.
- Implement the cap as part of Site redevelopment activities.
- Prepare and record on the property deed an EES agreement to that describes engineering and institutional controls used to mitigate risk associated with contaminated soils present at the Site.

Groundwater

- Include a restriction on use of Site groundwater at the Site, and memorialize this restriction in the EES.

It should be noted that after remediation begins, additional or unexpected contamination and/or debris may be encountered. In the event unexpected conditions arise, PDC will follow the CMMP and consult with DEQ regarding appropriate response actions, as needed.

We appreciate the opportunity to be of service to PDC on this project. If you have any questions or comments regarding this report, please contact the undersigned at (503) 639-3400.

AMEC Environment & Infrastructure, Inc.	**REVIEWED BY:**
Teresa A.R. Wilson, RG	Leonard Farr Jr., RG
Project Manager	Senior Associate

TARW/lp

REFERENCES

AMEC Environment & Infrastructure, Inc., 2013. Remedial Investigation/Feasibility Study Work Plan, Block A&N, 510 NW 3rd Avenue, Portland, Oregon. October 4, 2013.

Oregon Department of Environmental Quality. 2003. Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites. September 1999, updated September 22, 2003.

Oregon Department of Environmental Quality. 2006. Final Guidance for Conducting Feasibility Studies. Issued July 1, 1998; updated November 1, 2006.

Oregon Department of Environmental Quality. 2010. Human Health Risk Assessment Guidance; Table 1 – Oregon Default Background Concentrations for Inorganic Chemicals. Issued December 1998; updated October 18, 2010.

Oregon Department of Environmental Quality. 2012. Risk-Based Concentrations for Individual Chemicals. http://www.deq.state.or.us/lq/pubs/docs/RBDM12a.xlsm. June 7, 2012.

Oregon Department of Environmental Quality. 2013. Letter Approval of Remedial Investigation/Feasibility Study Work Plan, Block A&N, 510 NW 3rd Avenue, Portland, Oregon. December 18, 2013.

LIMITATIONS

This report was prepared exclusively for Portland Development Commission (PDC) by AMEC Environment & Infrastructure, Inc. The quality of information, conclusions, and estimates contained herein is consistent with the level of effort involved in AMEC services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions, and qualifications set forth in this report. This Focused Feasibility Study is intended to be used by PDC for the Block A & N Property only, subject to the terms and conditions of its contract with AMEC. Any other use of, or reliance on, this report by any third party is at that party's sole risk.

TABLE

TABLE 1
Risk Screening Summary
Block A + N
Portland, Oregon

Receptor	Exposure Pathway	Facility-Related Hazardous Substances Detected (Post HOT Decommissioning)	RBC	Maximum Concentration Detected	# of Samples That Exceed
Media - Soil			mg/kg	mg/kg	
Urban Residential	Inhalation, Ingestion, or Dermal Contact (≤ 3 feet)	Diesel	2,200	2,220	1
		Benzo(a)anthracene	0.34	6.51	5
		Benzo(a)pyrene	0.034	17.4	9
		Benzo(b+k)fluoranthene	0.34	21.3	6
		Dibenz(a,h)anthracene	0.034	3.68	4
		Indeno(1,2,3-cd)pyrene	0.34	19.4	4
		Arsenic	8.8*	10.2	3
		Lead	400	411	1
	Vapor Intrusion Into Buildings	No Exceedances			
	Volatilization to Outdoor Air	No Exceedances			
Occupational	Inhalation, Ingestion, or Dermal Contact (≤ 3 feet)	Benzo(a)anthracene	2.7	6.51	1
		Benzo(a)pyrene	0.27	17.4	6
		Benzo(b+k)fluoranthene	2.7	21.3	2
		Dibenz(a,h)anthracene	0.27	3.68	1
		Indeno(1,2,3-cd)pyrene	2.70	19.4	1
		Arsenic	8.8*	10.2	3
	Volatilization to Outdoor Air	No Exceedances			
	Vapor Intrusion into Buiildings	No Exceedances			
Construction Worker	Inhalation, Ingestion, or Dermal Contact	Benzo(a)pyrene	2.1	17.4	1
		Benzo(b+k)fluoranthene	21	21.3	1
		Dibenz(a,h)anthracene	2	3.68	1
Media - Groundwater			µg/L	µg/L	
Urban Residential	Volatilization to Outdoor Air	No Exceedances			
Occupational	Volatilization to Outdoor Air	No Exceedances			
	Vapor Intrusion into Buildings	No Exceedances			
Construction/ Excavation Worker	Groundwater in Excavation	No Exceedances			

Notes:

HOT = heating oil tank

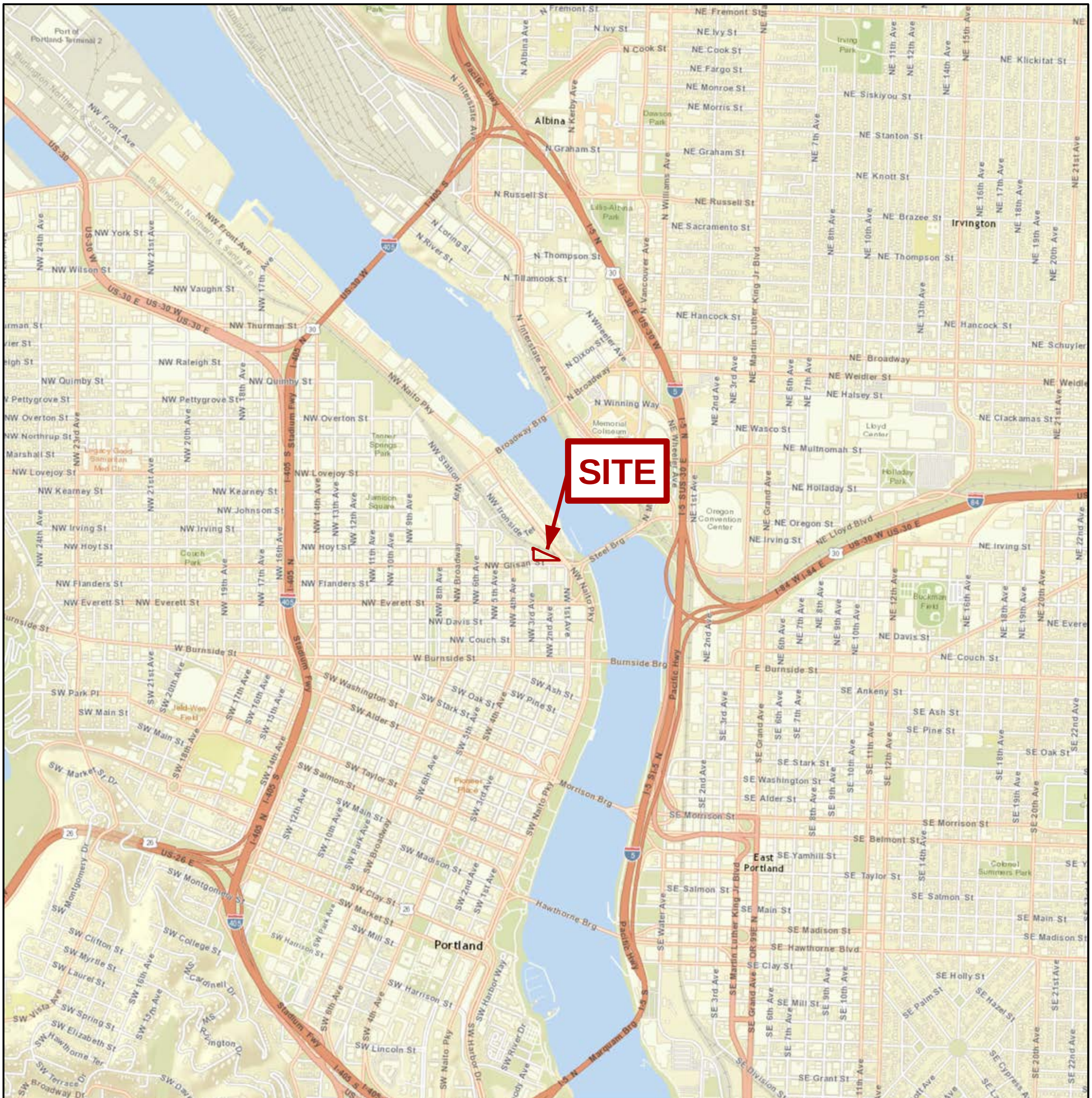
mg/kg = milligrams per kilogram

µg/L = micrograms per liter

RBC = risk-based concentration (DEQ, 2012)

* = concentration is background, as background is greater than (>) risk-based concentration (RBC)

FIGURES



0 1,000 2,000 4,000
Feet

AMEC 7376 SW Durham Road Portland, OR, U.S.A. 97224	amec		CLIENT: PORTLAND DEVELOPMENT COMMISSION
TITLE: SITE LOCATION MAP	DWN BY: SD	DATUM: NAD83	DATE: AUGUST 2014
PROJECT: FOCUSED FEASIBILITY STUDY BLOCK A & N PORTLAND, OREGON	CHK'D BY: TW	REV. NO.: -	PROJECT NO.: 461M128332
	PROJECTION: OR SP N. Ft.	SCALE: 1 inch = 2,000 feet	FIGURE NO.: 1

K:\12000\12800\12833\128331\dwg_FFS\Figure 1 - Site Location Map.mxd - patrick.mccarthy - 8/19/2014 - 4:22:46 PM

CLIENT:
PORTLAND DEVELOPMENT COMMISSION

AMEC
7376 SW Durham Road
Portland, OR, U.S.A. 97224

amec

DWN BY:	SD
CHK'D BY:	TW
DATUM:	NAD83
PROJECTION:	OR SP N. Ft.
SCALE:	1 inch = 50 feet

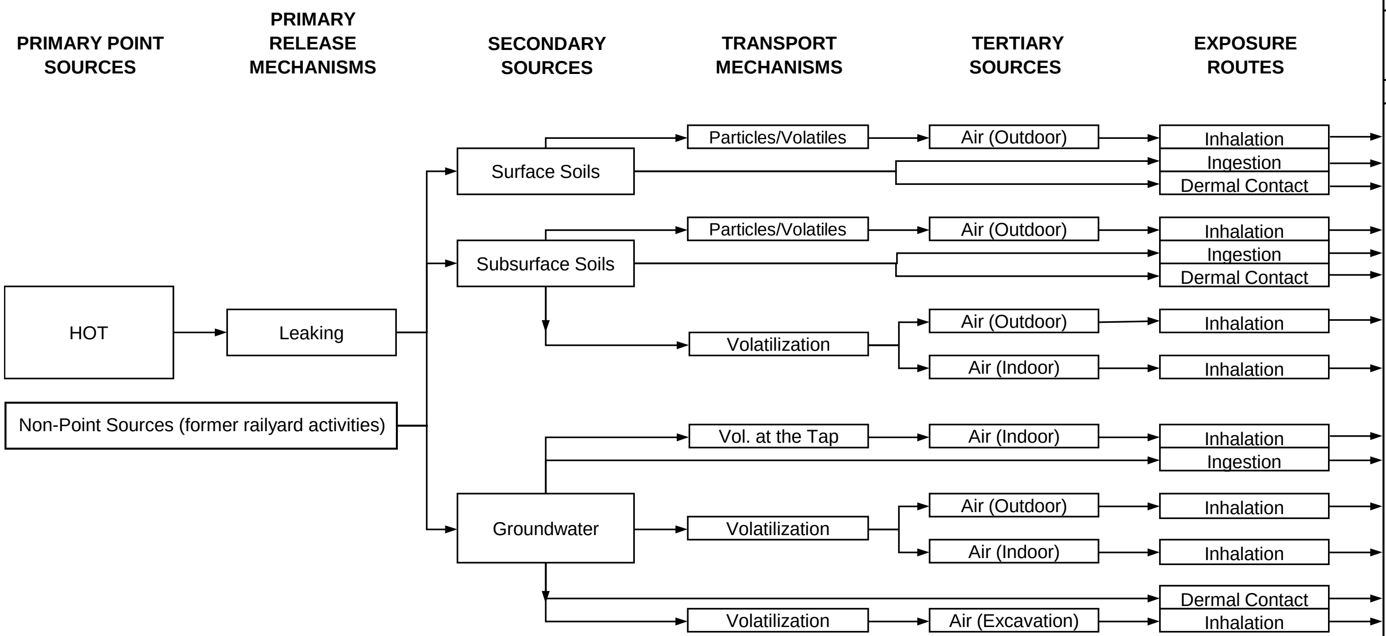
PROJECT:
FOCUSED FEASIBILITY STUDY
BLOCK A & N
PORTLAND, OREGON

TITLE:
SITE PLAN WITH BORING LOCATIONS

DATE:	AUGUST 2014
PROJECT NO.:	461M128332
REV. NO.:	-
FIGURE NO.:	2

K:\12000\12800\12833\128331\dwg_FFS\Figure 2 - Site Plan with Boring Locations.mxd - patrick.mccarthy - 8/19/2014 - 4:22:41 PM

FIGURE 3
Conceptual Site Model
Block A and N
Portland, Oregon

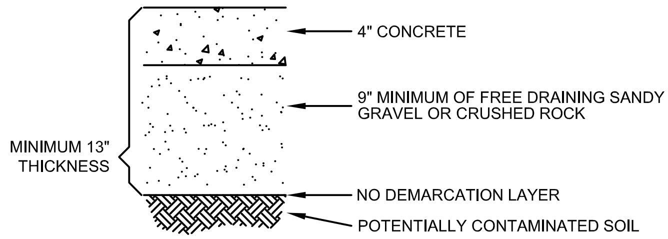


Secondary Source	Tertiary Source	Exposure Route	Urban Residential Current	Urban Residential Future	Occupational Current	Occupational Future	Construction & Excavation Current	Construction & Excavation Future
Surface Soils	Air (Outdoor)	Inhalation	-	+	-	+	-	+
Surface Soils		Ingestion	-	+	-	+	-	+
Surface Soils		Dermal Contact	-	+	-	+	-	+
Subsurface Soils	Air (Outdoor)	Inhalation	-	-	-	-	-	+
Subsurface Soils		Ingestion	-	-	-	-	-	+
Subsurface Soils		Dermal Contact	-	-	-	-	-	+
Subsurface Soils	Air (Outdoor)	Inhalation	-	+	-	+	-	-
Subsurface Soils	Air (Indoor)	Inhalation	-	+	-	+	-	-
Groundwater	Air (Indoor)	Inhalation	-	-	-	-	-	-
Groundwater		Ingestion	-	-	-	-	-	-
Groundwater	Air (Outdoor)	Inhalation	-	+	-	+	-	-
Groundwater	Air (Indoor)	Inhalation	-	+	-	+	-	-
Groundwater		Dermal Contact	-	-	-	-	-	+
Groundwater	Air (Excavation)	Inhalation	-	-	-	-	-	+

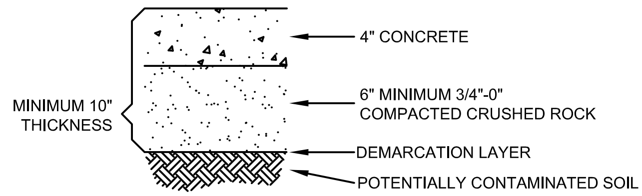
Notes:

- **+** This route is a primary source of exposure.
- **-** There is no exposure by this route.

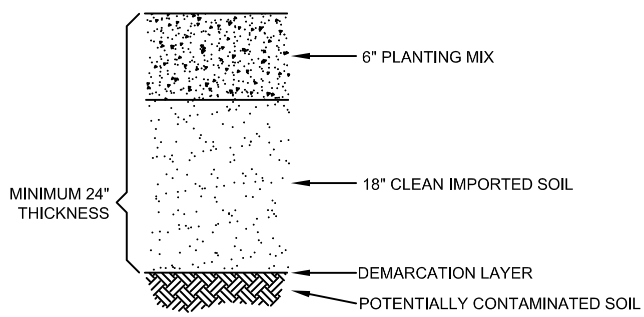
TYPICAL BUILDING UNDERSLAB



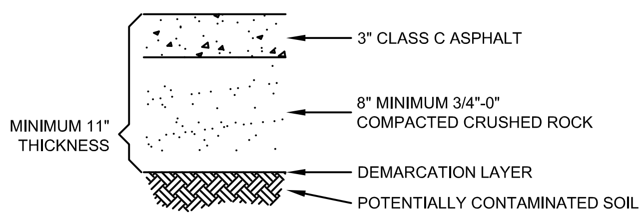
TYPICAL HARDSCAPE AREAS



TYPICAL LANDSCAPE AREAS



TYPICAL ASPHALT PAVED AREAS



AMEC
7376 S.W. Durham Road
Portland OR. U.S.A. 97224

CLIENT: PORTLAND DEVELOPMENT COMMISSION			
TITLE: EXAMPLE CAP DESIGNS	DWN BY: SD	DATUM: -	DATE: AUGUST 2014
PROJECT: FOCUSED FEASIBILITY STUDY BLOCK A & N PORTLAND, OREGON	CHK'D BY: TW	REV. NO.: -	PROJECT NO.: 461M128332
	PROJECTION: -	SCALE: NOT TO SCALE	FIGURE NO.: 4

K:\12000\12800\12833\128331\dwg_FFS\Figure 4 - Example Cap Designs.dwg - Layout1 - Sep. 15, 2014 8:01am - stephane.descombes

APPENDIX A

Urban Industrial Soil Background Data

TABLE A-1
Urban Industrial Soil Background Data

Individual PAH	Blocks A & N RI Max mg/kg	Portland 95th% mg/kg	Chicago MSA Bckg mg/kg	New England Bckg mg/kg
B(a)A	1.79	0.79	1.80	1.86
B(b)F	NT	3.26	2.00	1.97
B(k)F	NT	2.42	1.70	2.52
B(a)P	2.69	2.43	2.10	1.82
Chrysene	2.27	2.29	2.70	2.69
Dibenzo(a,h)A	0.15	0.23	0.42	0.52
Indeno(1,2,3-c,d)P	1.82	1.61	1.60	1.29

Notes:

mg/kg = milligrams per kilogram

PAH = polynuclear aromatic hydrocarbon

Portland 95th percentile includes data from City of Portland Eastside and Westside
CSO data set, Sellwood Bridge data sets detected concentrations

NT - not tested in most samples - non-detect in the one sample tested

Chicago - MSAs for illinois are identified in 35 Illinois Administration Code 742. Appendix A Table T of TACO

New England - Bradley, L. J. N., B.H Magee, and S. L. Allen. *Background Levels of Polycyclic Aromatic Hydrocarbons (PAH) and Selected Metals in New England Urban*