REMEDIAL INVESTIGATION (RI) REPORT
TACOMA COAL GASIFICATION SITE
(TCGS- 22nd & A St.)
TACOMA, WASHINGTON

Prepared for:
PacifiCorp and Puget Sound Energy

Dalton, Olmsted & Fuglevand, Inc. *Environmental Consultants*

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Glossary and List of Acronyms

AO	Agreed Order
bgs	Below ground surface
BaPEq	Benzo(a)pyrene equivalent concentration
B&V	Black & Veatch Waste Science, Inc.
BNSF	Burlington Northern – Santa Fe Railroad
CLARC	Cleanup Levels and Risk Calculations (Ecology on-line database)
COPC	Contaminant of Potential Concern
COT	City of Tacoma
cPAHs	Carcinogenic PAH
CPF	Carcinogenic Potency Factor
CUL	Cleanup Level
CWA	Clean Water Act
dCAP	Draft Cleanup Action Plan
DL	Detection Limit
DNAPL	Dense Non-Aqueous Phase Liquid
DOF	Dalton, Olmsted & Fuglevand, Inc.
EF	Exposure Frequency
EPA	Environmental Protection Agency
FS	Feasibility Study
GW	Groundwater
HH	Human Health

Kg	Kilogram
LNAPL	Light (Less Dense) Non-Aqueous Phase Liquid
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
MGP	Manufactured Gas Plant
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
MTCA	Model Toxics Control Act (Chapter 173-340 WAC)
NTR	National Toxics Rule
PAH	Polycyclic Aromatic Hydrocarbon
PLP	Potentially Liable Person (or entity)
POC	Point of Compliance
PQL	Practical Quantitation Limit
PSE	Puget Sound Energy
RAO	Remedial Action Objective
RL	Reporting Limit
RI	Remedial Investigation
SL	Screening Level
TCGS	Tacoma Coal Gasification Site
TEE	Terrestrial Ecologic Evaluation
TEF	Toxicity Equivalency Factors
ug/l	Micrograms per liter
WAC	Washington Administrative Code

WSDOT Washington State Department of Transportation

Executive Summary
TCGS (22nd & A St.) Remedial Investigation
Tacoma, Washington

A manufactured gas plant (MGP) operated on the west slope facing the Thea Foss Waterway from approximately 1884 to 1924. Both coal gas and carbureted water gas processes were used at the plant. Gas production ended in 1924, although the northern most gas holder was used until the mid-1950s. Over a period of decades, the MGP was dismantled and some of the demolition debris was placed in the gas holders. Fill materials imported to the site eventually covered the remaining plant facilities and the presence of the plant remained generally unknown until the mid-1980s, when geotechnical drilling associated with the construction of I-705 discovered the presence of MGP waste materials. Releases of MGP tars and oils occurred within the MGP manufacturing and gas storage area. Aromatic hydrocarbons (primarily benzene) and polycyclic aromatic hydrocarbons (PAHs) are the primary contaminants of potential concern (COPCs) at MGPs. Separate phase product (dense non-aqueous phase liquid or DNAPL) has been detected in one well (MW-27). I-705/SR-509 roadway abutments, piers, retaining walls, and elevated roadway sections, South "A" St., a paved parking area and uncontaminated soil fill lie above the former MGP footprint.

Three oil storage tanks were constructed east of the MGP in about 1912 in an area now covered by Dock Street. While the plant operated, the tanks stored heavy oil used in the carbureted water gas process. From 1931 to 1975 the tanks were used by a variety of companies that stored petroleum products, Raylig and creosote. The tanks were removed in 1977 when a 30-inch sewer line was installed and Dock Street was realigned. Creosote is a distilled coal tar, and similar to coal tar, aromatic hydrocarbons and PAHs are the primary COPCs. Releases of heavy-oil and coal tar derived materials occurred to soil and groundwater beneath the former three tank area. Separate phase product has been detected in wells situated on the immediate downgradient side of where the tanks formerly existed.

A tar reprocessing plant (Standard Chemical) existed on the west bank of the Thea Foss Waterway during the early 1900s, just north of the former three tanks. Available data indicate that this plant released coal tar derived materials to the property on which it operated and to the head of the waterway. Standard Chemical waste materials discharged to the waterway were covered by shoreline fills and storm water sediment that was, in turn, covered by an engineered sand cap (in 2004) as part of the waterway remediation. The Standard Chemical site was remediated by the Washington State Department of Ecology (Ecology) in 2002 and 2003 and is outside of the TCGS boundary.

As part of construction of the I-705 road way and SR-509 interchanges, a substantial volume of demolished plant facilities (e.g. piping containing tar, demolished gas holder debris, coal tar waste materials, etc.) and contaminated soils were excavated and removed from the site. These materials included 16,000 tons of hazardous waste and 26,500 tons of non-hazardous waste. These materials were disposed of off-site. Contaminated soil remained on the site after roadway construction.

In 1986, WSDOT installed a sub-drain system (referred to as the DA-1 Sub-drain System) to stabilize the roadbed of South "A" St. (now closed). The system was installed within the former gas manufacturing area and collected contaminated groundwater and oily gas plant waste material containing PAHs. The system was connected to the South "A" Street storm drainage system that discharged to the Head of the Thea Foss Waterway. After several attempts to prevent contaminated materials from entering the storm drainage system, the DA-1 sub-drain was disconnected from the storm system in 2003 (i.e. the storm drainage system was abandoned). For some period prior to the closing of South "A" St. (when the D Street overpass was constructed), storm water was pumped to an infiltration basin located on the east side of I-705. Currently, during the wetter portion of the year, water ponds at the bottom of South "A" Street. When pond levels rise to a certain level, water migrates to the east and infiltrates into railroad ballast. A low volume seep (hillside seep) is located on the northwest side of South "A" Street. The seepage water contains benzene and PAHs and mixes with storm water at the bottom of South "A" Street.

The western portion of the site (west of the park) is zoned "WR" – Warehouse/ Residential District while the portion of the site along the waterway is zoned "S8" – Shoreline District. Current land uses on the TCGS include parking, park land, roadways and railroad activities. Adjacent land uses are generally commercial in nature. The entire site is covered by paving, structures supporting the roadways, railroad ballast, some landscaping (slopes under I-705), well maintained lawns (21st Street Park – now George Weyerhaeuser Park) and imported uncontaminated fill.

The site is underlain by unconsolidated fills, and deltaic and glacial materials consisting primarily of interbedded sandy gravels, sands and silts. The water table lies at depths of approximately 5 to 10 feet depending on land surface elevation and, along the shoreline, tidal stage. Groundwater flows in an easterly direction towards the Thea Foss Waterway. As the waterway is approached, hydraulic gradients become steeply vertically upward. Shallow groundwater discharges through shoreline seeps that are visible during lower tides.

Screening levels to identify COPCs were developed based on possible receptors of the remaining contaminated residuals present in soil and groundwater beneath the RI/FS project area including the following:

- Subsurface site workers via the soil contact exposure pathway who may be involved with construction or maintenance that requires soil excavation.
- Casual visitors via soil contact to the TCGS, primarily the George Weyerhaeuser Park.
- Aquatic organisms via groundwater discharge to the waterway.
- Humans via possible ingestion of aquatic organisms.

COPCs were identified based on media and possible receptors described above as summarized in Table ES-1.

Table ES-1 - COPCs

Media	Soil		Groundwater
Constituent	**Contact**	**Leaching to Groundwater**	**Discharge to Surface Water**
Benzene		X	X
Petroleum Hydrocarbons	X (a)	X	X
Acenaphthene		X	X
Fluorene		X	X
BaPEq.	X		
Cyanide		X	X
Arsenic		X	X

X – Identified as a COPC; (a) Based on the Method A, non-health based CUL to prevent the accumulation of mobile product on the water table.

Other possible exposure pathways were evaluated but were not complete as follows:

- The indoor air (vapor) inhalation exposure pathway is not considered complete because no buildings exist within the project area and it is unlikely that any buildings will be constructed in the future because of existing long-term land uses (interstate highway, local well used roadway, railroad tracks, small park etc.). Furthermore, any soil excavation would likely occur in well ventilated areas for short periods of time that would substantially reduce inhalation risks to site workers.

- A simplified Terrestrial Ecologic Evaluation (TEE) was completed using guidance in WAC 173-340-7490. The TEE ended when the criteria in WAC 173-340-7491 was met indicating soil contact risks to terrestrial wildlife are low.

- Groundwater beneath the TCGS is connected to marine surface water and is not classified as a potable water supply.

Testing of groundwater seep discharges at the anticipated point of compliance indicate COPC concentrations below screening levels, except for cyanide, based on protection of surface water. Deeper groundwater flow occurs upward through contaminated sediment and a sand cap before discharging to the waterway. The sand cap was placed in 2004 as part of the remediation of the head of the waterway and was designed to sequester underlying contamination. Over fourteen years of monitoring indicate the sand cap is functioning as intended.

With completion of the draft Final RI report, the next step in the RI/FS process to meet the requirements of the AO, is the completion of a Feasibility Study (FS). The FS will include an evaluation of possible remedial technologies that could be applied to meet the following remedial action objectives (RAOs):

- **RAO 1 – Reduce Risks to Subsurface Utility Workers and Casual Visitors.** Soils containing COPCs are covered by roadway piers, retaining walls, embankments, paving, maintained lawns and uncontaminated imported fill.

    - **Subsurface Utility Workers**. A site specific risk assessment indicates acceptable risk via soil contact to subsurface utility workers under existing conditions. These risks could be further reduced by requiring a restrictive covenant to notify such workers of the contamination and require a health and safety plan meeting the requirements of WAC 173-340-810 as part of the work planning. Such a plan should also describe how any disturbed materials that would be transported off-site be handled and disposed.

    - **Casual Visitors**. Risk to casual visitors under existing conditions are acceptable (low to non-existent) provided the existing cover materials are not disturbed by digging. The potential for digging by such visitors is low, as most areas are covered with hard paving, maintained lawns and railroad ballast. Some exposed cover soil is present beneath I-705 that shows some signs of minor erosion by storm water runoff that should be repaired. Placement of relatively permeable coarse materials in this area, such as quarry spalls, would be a means to minimize erosion and the potential for uncontrolled digging.

- **RAO 2 – Prevent Groundwater Use as Drinking Water Supply.** Groundwater beneath the impacted area is not classified as a potable water supply. It is unlikely that groundwater would be extracted in the future based on site land use, location next to a marine waterway, and the availability of a municipal water supply. Consistent with MTCA, a restrictive covenant preventing such use, would further reduce the potential for exposure via this pathway.

- **RAO 3 – Reduce Potential for NAPL and COPC Migration to Waterway**. Available data indicate that NAPL detected in wells adjacent to the former three tank area (MW-8, MW-9 and MW-25) is not migrating to the waterway. This is based on the logs, observations and soil/groundwater analytical data from shoreline wells (MW24, MW26, MW29, and MW30). In 1998 and 1999, approximately 15 gallons of NAPL was removed from the wells noted above. Although available data indicate that NAPL in not migrating to the waterway, additional NAPL could be removed from the wells or NAPL containing soil could be removed reducing even further the potential for NAPL migration.

- **RAO 4 – Prevent Hillside Seepage COPCs From Mixing With Storm Water**. A low volume seep on the north side of South “A” Street contains benzene above the SL. This seepage water mixes with storm water at the bottom of the street near the railroad grade where ponded water infiltrates. During the FS, alternatives to address the seep will be evaluated.

Applicable remedial technologies will be combined to form a set of remedial alternatives that will be evaluated in the FS using the criteria in WAC 173-340-350(8), -355, -360 and -370. Based on this evaluation, a preferred remedial alternative will be recommended.

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REMEDIAL INVESTIGATION (RI) REPORT
TACOMA COAL GASIFICATION SITE (TCGS-22nd & A St.)
TACOMA, WASHINGTON

1.0 INTRODUCTION

1.1 Purpose and Scope

This Remedial Investigation (RI) report for the Tacoma Coal Gasification Site (TCGS or the Site at 22nd & A St.) was prepared to meet the requirements of WAC 173-340-350 of the Washington State Model Toxics Control Act - Chapter 173-340 WAC (MTCA) and Agreed Order (AO) AO DE 13972. This order became effective on September 13, 2018 after public review and supersedes an older AO (No. DE 93TC-S166). Past work at the site and recent groundwater monitoring (through July 2018) were completed under the older AO and two subsequent amendments as discussed in Section 2.7 below. The September 2018 AO requires the City of Tacoma (COT), Puget Sound Energy (PSE), PacifiCorp, and the Washington Department of Transportation (WSDOT), herein-after referred to as the potentially liable parties (PLPs), to complete a RI and Feasibility Study (FS) and develop a Draft Cleanup Plan (dCap) for the TCGS.

A preliminary draft RI report was submitted to the Washington Department of Ecology (Ecology) on July 30, 2018. That report was revised based on comments by Ecology and the COT. The comments and resolutions were discussed in a meeting with Ecology and the PLP group on November 20, 2018, that were documented in a memorandum prepared by Dalton, Olmsted & Fuglevand, Inc. (DOF) dated December 12, 2018. Additional comments were received from Ecology (Marv Coleman) in an e-mail dated December 18, 2018. The revised RI includes the results of the July 2018 sampling round, which were not included in the earlier draft.

The purpose of an RI is to *"collect, develop and evaluate sufficient information regarding a site to support preparation of a Feasibility Study (FS) and to select a cleanup action under WAC 173-340-360 through 173-340-390"* (WAC 173-340-350[1]). The TCGS is the site of a former manufactured gas plant (MGP).

A considerable amount of geologic, hydrogeologic and environmental data were collected at the site from 1979 to 2005 as part of construction of the I-705/SR-509 roadways and upland source control evaluations associated with remediation of the Thea Foss Waterway. The earlier collected data was supplemented with groundwater and seep data collected in the period 2016 to 2018. Past investigations and sources of information and data are listed in Section 12.0. Significant site investigations are summarized in Section 3.0 of this report.

1.2 Agreed Order Required Remedial Actions

Section VII of the AO outlines remedial actions to be completed by the PLPs. The remedial actions and which actions are fulfilled by preparation of this RI report are summarized below.

1.2.1 Required Remedial Actions Fulfilled by This RI Report

- *VII.A. – Conduct monitoring of wells that have been established in the upland and shoreline of the site: To determine the current status of groundwater with respect to the nature and extent, as well as concentrations, of COCs that have been identified at the site, in accordance with the "Groundwater Sampling and Analysis Plan, DOF, April 22, 2016". Additionally, analyses of conventional parameters to determine the migratory characteristics of contaminated groundwater will be performed.*

  Status: Requirement A. has largely been completed with the compilation of a well inventory (2016), seven rounds of monitoring well sampling and analysis (July 2016 to July 2018), seep reconnaissance (2017) and four rounds of seep sampling (April 2017 to July 2018). Additional monitoring to fill remaining data gaps is proposed in Section 9.0 of this report and will be reported as part of the Feasibility Study (FS).

- *VII.B. – Develop a comprehensive Compilation of Existing Information and Data Gaps Analysis: Existing data shall be compiled to provide a preliminary assessment of the nature and extent of contamination within the Site and to identify current and historical source areas of contamination. Data gaps identified during the review of existing data must be filled to assure that the RI/FS Work Plan is properly tailored to the Site conditions. The compilation of existing information should include, but is not limited to the following information:*
  - *Historical site operational and source information*
  - *Groundwater and NAPL product monitoring results*
  - *Seep testing information*
  - *Surface and core test results for soils*
  - *Hydrologic information*
  - *Air monitoring data*
  - *Previous interim remedial actions or other onsite construction activities.*

  The compilation of existing data shall also include information on property ownership within the site by the PLPs and other parties. In conjunction with the compilation of existing site information, the report shall include a discussion of data gaps and a preliminary analysis of work to be performed to complete the site characterization.

Status: Requirement B. has largely been completed for RI purposes. The draft RI report presents the available information outlined in the AO. As the initial draft was prepared, data gaps were identified and plans to fill these gaps were submitted and approved by Ecology. These plans are included in the references section of the RI report and were prepared to update groundwater conditions beneath the site to identify possible receptors and contaminants of potential concern (COPCs). Additional monitoring to fill remaining data gaps is proposed in Section 9.0 of this report and will be reported as part of the FS.

- *VII.C. – Develop a RI/FS Work Plan: Develop and submit to Ecology an RI/FS Work Plan to perform agreed upon activities to finalize characterization of the Site and determine feasible options to perform remedial actions for the Site.*

  Status: Requirement C. has largely been completed for RI purposes. As data gaps were identified, work plans were submitted to Ecology for review, comment and approval. These plans are included in the references section of the RI report. Additional monitoring to fill remaining data gaps is proposed in Section 9.0 of this report and will be reported as part of the Feasibility Study (FS). Existing work plans will be revised/supplemented or new work plans will be prepared and submitted to Ecology before future field investigation is performed at the site.

- *VII.D. – Perform additional remedial investigation of Site: If it is determined that additional characterization of the Site in necessary, perform the work in accordance with the Work Plan.*

  Status: Requirement D. has been fulfilled on an on-going basis as data gaps were identified. Additional monitoring to fill remaining data gaps is proposed in Section 9.0 of this report and will be reported as part of the FS. Existing work plans will be revised/supplemented or new work plans will be prepared and submitted to Ecology before future field investigation is performed at the site.

- *VII.E. – Generate a RI/FS Report: Provide an Agency Review Draft RI/FS Report that discusses the findings of the final remedial investigation and presents options for remedial actions that can be undertaken to do a final Site cleanup, including a Cost Benefit Analysis of the potential remedial options. Ecology will review and comment on the draft. Issue a final RI/FS in accordance with Ecology and public comments.*

  Status: Requirement E. is in the process of being fulfilled with submittal of this final draft RI. The initial draft of the RI report was revised based on comments provided by Ecology and the COT. Discussion of remedial options have begun with Ecology in anticipation of preparing the FS.

  VII.F. – Generate a Preliminary Draft Cleanup Action Plan [dCAP] that presents the preferred alternative for final Site cleanup, as derived from the FS.

Status: The dCAP will be prepared and submitted to Ecology once the FS is approved by Ecology.

1.3 Agency Oversight and Project Contacts

Ecology is the lead agency for completion of the RI/FS. Contact information for those primarily involved with the RI are listed in Table 1.1 below.

Table 1.1 – Project Contacts

Contacts	Role	Affiliation
Andy Smith	Ecology Project Coordinator	Dept. of Ecology (Ecology)
Jackie Wetzsteon	PLP Project Coordinator	PacifiCorp
Libby Goldstein	PLP Representative	Puget Sound Energy (PSE)
Mary Henley	PLP Representative	City of Tacoma (COT)
Jeff Sawyer	PLP Representative	Washington State Department of Transportation (WSDOT)
Matt Dalton	Technical Consultant	Dalton, Olmsted & Fuglevand, Inc. (DOF)

PLP – Potentially Liable Person (or entity)

1.4 Site Location and Boundaries

The site is located on the west side of the head of the Thea Foss Waterway (Figures 1.1 to 1.3). The RI covers the upland area adjacent to the waterway above an approximate elevation of +12 feet Mean Lower Low Water (MLLW) in the general area of the former manufactured gas plant (MGP). The former TCGS is located in the vicinity of South "A" Street and I-705. The site location is as follows:

- Address: 22nd St. and "A" St., Tacoma,
- Location Coordinates: Latitude, 47.243; Longitude, -122.435
- Township 20N, Range 3E, Section 37

The site has the following Ecology identifier numbers:

- Facility (FS) ID – 1249
- Cleanup Site ID – 3675

The legal description of the Site is: Blocks 57, 2200, 2300, 2101, 2201, and 2301 of Tacoma Land Company's Second Addition to Tacoma, W.T. The Site is defined by the extent of contamination caused by the release of hazardous substances at the Site. Based upon factors currently known, the site boundaries are depicted on Figure 1.2. For RI/FS purposes, the boundary along Lot 12 of Block 57 was shifted southward[1] based on the extent of hot-spot remediation by Ecology (Geoengineers 2003) associated with the Standard Chemical site, discussed in Sections 2.4 and 4.3 of this report.

1.5 Site Description and Relationship to Thea Foss Waterway

1.5.1 Site Description

The TCGS is located on an west facing slope near the head of the waterway (Figures 1.1 to 1.3). The RI/FS boundary area includes approximately 5 acres. The TCGS (main MGP) occupied approximately 1.5 acres and a supporting tank farm (herein termed the three tank area) of 0.3 acres. Elevations within the RI/FS boundary decline from approximately 40 feet mean lower low water (MLLW) along "A" Street to approximately 20 feet MLLW near the top of bank adjacent to the waterway.

Land uses, ownership and zoning in the area are as follows (Figures 1.3 to 1.6):

- Most of the former MGP is covered by the elevated I-705 roadway and SR-509 interchanges including buried footings, piers, embankments, and retaining walls associated with the roadway (Figure 1.6). Property within the roadway *"drip-line"* is owned by Washington State and is managed by WSDOT.

- Beneath I-705 is South "A" Street (now closed) and a for-fee paved parking area (that includes a portion of South "A" Street parcel 2022010010 on Figure 1.5a).

- Burlington Northern-Santa Fe (BNSF) rail tracks and Dock Street are located east of I-705 (Figure 1.3).

- A portion of the 21st Street Park (now George Weyerhaeuser Park) is located within the northeast portion of the site and along the waterway shoreline in the vicinity of the site (Figure 1.5b). This park is managed by the Foss Development Authority.

- A small unpaved area is located within the southeast portion of the project area (Figure 1.3). This area was used by WSDOT as a storm water infiltration basin associated with drainage from South "A" Street and I-705 after a portion of the storm water drainage system was abandoned in 2003 The basin is no longer in use and storm water ponds at the lower end of South "A" St. during storm events.

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[1] For purposes of this report and consistent with past work, directions are referenced to the trend of the Thea Foss Waterway. North is towards the mouth of the waterway and the former gas plant is located near the west bank.

- A number of commercial businesses are located to the south and west of the project area (Figure 1.5b).

The western portion of the site is zoned by Tacoma as WR – Warehouse/Residential District and the portion east of the freeway lies within the S8 Shoreline Zoning District (Figure 1.5b). The intent of the zoning for these areas are summarized on Figure 1.5b.

MGP Location. At full build-out, the MGP consisted of three gas holders, associated manufacturing facilities (discussed below) and heavy-oil storage tanks (three tank area). Gas was manufactured and stored (in two gas holders) in the portion of the site (Block 2201) between the extension of South 22st Street and South 23rd Street (Figure 1.2). A third gas holder was constructed north of the manufacturing area across the extension of South 22nd Street. The heavy-oil storage tanks were constructed east of the manufacturing area.

Figure 1.3 shows the approximate location of the gas holders and oil storage tanks in relation to I-705. The former location of the MGP lies beneath the elevated I-705 road way. South “A” Street trends under I-705 (Figures 1.4a and 1.4b) and was constructed over the gas manufacturing area. The former storage tank area now lies beneath Dock Street.

Relationship to Thea Foss Waterway. The Thea Foss Waterway was originally part of the Puyallup River (Bower 1999). In the late 1800’s, the Northern Pacific Railroad occupied the tide flats and built rail tracks and supporting facilities. By the time the waterway (as City Waterway) was established in 1894, much of the tide flats had been filled including the upland area where the MGP was constructed. The waterway was physically created by dredging supervised by the U.S. Army Corps of Engineers. The initial dredging was completed by 1905.

Construction of the TCGS started in 1884 and gas production for lighting purposes began in 1885. The operating area of the plant was located adjacent to A-Street between South 21st and South 23rd Streets (Figure 1.7). Figure 1.7 also shows the approximate shoreline configuration for 1888, 1892, 1912 and present day (B&V 1994). The MGP never was located immediately adjacent to the waterway.

1.5.2 Climate and Storm Drainage

The site vicinity is characterized by a mild, temperate climate. The mean annual precipitation for the Tacoma/Pierce County area is 35.2 inches.

Storm water drainage from I-705 and the southern portion of South “A” Street was formerly collected and routed to outfall 237A located at the head of Thea Foss via the

DA-1 Line drainage system2. After this system was disconnected from the waterway in 2003, drainage was pumped to a small infiltration basin (Figure 1.3) that is no longer used. South "A" Street was closed when the "D" Street overpass was constructed. With closure of South "A" Street, storm water is allowed to pond within the lower section of the roadway. It appears that when the ponded water level rises to a certain level, the water migrates to and infiltrates into ballast along the unpaved railroad right-of-way.

[2] The DA-1 Line was a survey line that trended along the centerline of South "A" Street. It was originally used as part of the design and construction of I-705. Some features constructed along this survey line described in this report are referenced to this survey line (e.g. DA-1 Line drainage system).

2.0 HISTORY OF TCGS

2.1 Construction, Operation and Layout (Up to approximately 1924)

In September 1883, the Tacoma Light and Water Co. purchased land from the Tacoma Land Co., and construction of the MGP began in 1884. In 1885, the gas plant started up with gas being supplied into Tacoma. Manufactured gas was produced at the plant using the coal carbonization process until approximately 1907, when the carbureted water gas process was added. Both coal gas and carbureted water gas were manufactured between approximately 1907 and 1924.

The original plant included one gas holder and associated structures located on Block 2201 (Figure 1.2). By 1892, a second gas holder had been constructed. By 1896, two gas holders, a building with retorts, a building with purifiers, a tar pump, a coal house and another piece of equipment related to tar were present on Block 2201 (Figure 2.1). By 1912, the facility had been remodeled from that constructed in 1896. Block 2201 included two gas holders with different buildings for retorts, purifiers, coal and coke (Figure 2.2). There was also an ammonia plant, cinder bins, an office and generator house. On Block 2101, located immediately north of Block 2201 across South 22nd St., there was a third gas holder. There was also a note on the 1912 Sanborn map that indicated three oil storage tanks were to be placed adjacent to the waterway on a portion of Block 2200. The locations of these tanks are shown on Figures 1.2 and 1.3.

2.2 Production Processes and Waste Materials

The plant initially started making coal gas using the coal carbonization process (B&V 1994). The process involved roasting bituminous coal in a controlled atmosphere at $2{,}000^0$ F to burn off part of the carbon and drive off volatiles yielding coal gas, coke and coal tar. The principal gas was carbon monoxide that was used as a fuel gas as well as to make ammonia, methanol, and other chemicals.

The carbureted water gas process was introduced at the plant in about 1909 because the process was more efficient. In this process, air was injected into the furnace and coal was heated to approximately $3{,}000^0$F. Once the coal reached the designed temperature, the superheated air was vented and a new mixture of steam and air was then blown over the heated coal yielding water gas. The water gas was then passed to another chamber where it was enriched or mixed with an oil gas produced from spraying heavy oil (stored in the three tanks) over hot brick. Waste materials included ash, slag, clinker, wastewater, tar, condensate sludge, and sometimes spent iron oxides.

2.3 MGP Dismantling and Three Oil Storage Tanks (1924 to 1977)

Gas manufacturing ended at the TCGS in 1924 as a new plant on River Street started producing gas. Thereafter, the gas plant was partially dismantled. By 1928, only two gas holders remained. A 1930 map shows two gas holders, along with purifiers and gas/meter house. By 1942, only one gas holder remained (on Block 2101). By 1950 the remaining gas holder and the three oil storage tanks were still present; however the Sanborn map does not show the gas works. The northern most gas holder was used for auxiliary storage of gas until the mid-1950s. By 1957, the last gas holder was not in use and was in a deteriorated condition. The 1969 Sanborn map does not show the gas works or holders but does show the footprint of the three oil storage tanks.

It appears the three oil storage tanks were constructed sometime around 1912 and stored oil used in water gas manufacturing until the TCGS was shut down. The tanks were constructed in a concrete vault. From 1931 to 1975 the tanks were used by a number of companies for storage of a variety of materials listed below (DOF 1999).

- Fuel oil, diesel oil and gasoline – Signal Oil & Gas Co./Liberty Petroleum Co. (1933 to 1937);
- Raylig – Rayonier Inc./Rainier Pulp & Paper Co. (1937 to 1950);
- Creosote – Cascade Pole Company (1950 to 1951);
- Contents Unknown – American Tar Company (195? to 1957);
- Contents Unknown – Foss Launch & Tug Company (1956 to 1969);
- Contents Unknown – Dillingham Company (1969 to 1975)

The tanks were demolished in the mid-1970s (B&V 1994). The City demolished the concrete vault that surrounded the tanks in 1977 when a 30-inch sanitary sewer line was installed near Dock Street. Dock Street was realigned over the former location of the storage tanks in 1977.

2.4 Standard Chemical Company Site and Relationship to TCGS

The Standard Chemical Company operated on the west bank of the Thea Foss Waterway generally east of the TCGS site (Figures 1.2 and 1.3). The site was discovered during review of a Corps of Engineers 1924 dredging/conditions map (DOF 1999). Originally the company was called the Standard Creosote Company, but changed its name in June 1916.

The company produced industrial chemicals, fertilizers and spraying materials from distilled coal tar and gas pipe drip oil. Feed stocks were coal tar derived materials and other byproducts from almost all the MGPs in Washington State (TSL 1919). Standard Chemical started operation sometime between 1915 and 1916 and continued operation until 1922. Washington State administratively dissolved the company in 1926. The building that housed the Standard Chemical Company burned completely in 1928. Later land uses of the site included storage of material apparently related to a shipping company that was located immediately north of the former Standard Chemical Company site (Geoengineers 2002).

Coal tar derived materials containing high concentrations of polycyclic aromatic hydrocarbons (PAHs) were found in sediment near the head of the Thea Foss Waterway (DOF 1999; Hart Crowser 1997, 1999). Relatively high PAH concentrations and the Standard Chemical oily seep (also referred to as the West Bank oily seep) were present in surface sediment in the vicinity of the former Standard Chemical dock (Figure 1.2). Coal tar derived materials were also detected in deeper sediment. Based on available evidence and data, the Standard Chemical Company was a likely source of coal tar derived materials discovered in the Thea Foss Waterway (DOF 1999).

The Standard Chemical site was originally considered part of the TCGS site. However, in mid-2001 when PacifiCorp, PSE, COT, WSDOT, and Ecology executed the Second Amendment to Agreed Order DE 93TC-S116, the original TCGS site was administratively divided into two separate sites; the TCGS site and the Standard Chemical Site. The division was based on historical information that Standard Chemical operated within the original TCGS site boundary (DOF 1999; Geoengineers 2000) and a determination by Ecology that PacifiCorp, PSE, COT and WSDOT were not responsible for contamination on the Standard Chemical site (Geoengineers 2003; Lederman 2001a). Ecology concluded that *"The contamination at the Site derives from two separate and distinct sources"* (Lederman 2001a). Ecology's finding was confirmed in a second letter dated June 5, 2001 (Lederman 2001b). Remediation of the Standard Chemical Site was completed by Ecology in late 2002 and early 2003 as described in Section 4.3 of this report.

2.5 Upland Coal Tar Discovery and Highway Construction (I-705 and SR-509)

In the late 1970's planning began for construction of SR-705 (also known as the "*Tacoma Spur*" and now known as I-705). The proposed roadway consisted of two sections (Hart Crowser 1979):

- North-south section to connect I-5 to the Schuster Parkway (I-705), and
- East-west section to connect I-705 to the Port of Tacoma industrial area (SR-509).

In 1984 during foundation drilling for roadway construction, Hart Crowser (1984) discovered visually contaminated material in the vicinity of South 21st and 23rd Streets between the City Waterway (now Thea Foss Waterway) and "A" Street (Figure 1.2). During this drilling a "*tar-like*" substance with similarities to "*coal tar waste*" was encountered. Soon after the discovery, information was obtained that a coal gasification plant operated in the area in the late 1800's and early 1900's.

I-705 was constructed between 1984 and 1987. SR-509 was constructed in the mid-1990s. Contaminated materials were encountered in soil and groundwater during construction of both roadways.

2.6 Modifications to Dock Street and South "A" Street, and Installation of DA-1 Line Sub-Drain System

Dock Street – originally extended in a southerly direction near the end of the Thea Foss Waterway (Figure 1.7). In 1977, as part of installing a 30" sewer line, Dock Street was realigned to its present configuration (Figures 1.2 and 1.3). As discussed above, during installation of the sewer line the concrete containment area that formerly surrounded the three oil tanks was demolished and a portion of the realigned street was constructed over the area where the tanks formerly resided.

South "A" Street – As part of construction of I-705 in the mid-1980s, South "A" Street was modified to end at South 22nd St. (Figure 1.2). Just north of Puyallup Ave., South "A" Street (also designated as E. 22nd St.) was constructed beneath SR-705 to provide access to Dock Street. As shown on Figure 1.6, construction of South "A" Street (and roadway piers, access ramps, embankments, etc. for I-705 and SR-509) occurred over the former MGP area. With construction of the "D" Street overpass, South "A" Street was closed.

DA-1 Sub-Drain System. The DA-1 survey line trends along South "A" Street, under I-705 (Figure 1.6). Construction of the road along the DA-1 survey alignment required the excavation of over 20 feet of soil from within the former gas plant footprint (Figure 2.3) (Hart Crowser 1984). This soil contained coal tar contamination and the excavation bottom was near the water table. To provide for a stable roadbed, a sub-grade drainage system (herein termed the DA-1 Line Sub-Drain System) was installed in 1986. The general layout of the sub-drain system is shown on Figure 2.4.

The sub-drain system was designed to collect groundwater that would be discharged to the Thea Foss Waterway via outfall 237A (West 96" Outfall) (Figure 2.4). Storm water catch basins were also part of the system. Information contained in B&V (1994) indicated the system consisted of three French drains. However, a drawing prepared by the COT (Tacoma 2000) and a design drawing provided by WSDOT indicated the system actually consisted of two drains connected by laterals. The drains were constructed of 6-inch diameter, perforated, corrugated plastic pipe in gravel filled trenches.

In 1992, Ecology discovered that coal tar derived materials were migrating into the storm water catch basins. Several attempts were made to seal the sub-drainage system from the storm water catch basins so storm water could still be collected and routed to the waterway. These attempts were not successful and the entire system was sealed and disconnected from Outfall 237A in 2003.

2.7 Regulatory History

The regulatory history of the TCGS began in the mid-1980s when coal tar was discovered as part of geotechnical drilling for the I-705 roadway project. As part of roadway construction, Ecology worked with WSDOT to remove and dispose of contaminated materials so the project could be constructed.

2.7.1 Agreed Order DE 93TC-S166 (October 1993)

An Agreed Order (AO) was negotiated between Ecology and a number of Potentially Liable Persons (PLPs) including the COT, WSDOT, Washington Natural Gas (now PSE), PacifiCorp, Advance Ross Corporation and Waterway Properties, Inc. The AO became effective in October 1993 and outlined a number of work tasks including the following:

- **Task 1** - Prepare Focused Site Characterization and Interim Action Evaluation Work Plan
- **Task 2** - Submit a Final Focused Site Characterization and Interim Action Evaluation Work Plan
- **Task 3** - Implement and Complete the Focused Site Characterization and Interim Action Evaluation Tasks
- **Task 4** - Prepare Draft Focused Site Characterization and Interim Remedial Action Evaluation Reports
- **Task 5** - Submit a Final Focused Site Characterization and Interim Remedial Action Evaluation Report
- **Task 6** - Prepare Engineering Report/Plans and Specifications
- **Task 7** - Implement Interim Remedial Action

To meet the AO requirements, COT contracted B&V to complete the reports outlined in the AO. At that point in time, the primary focus was assessing the potential for the TCGS to be a recontamination source to Thea Foss.

2.7.2 First Amendment to Agreed Order DE 93TC-S166

Based on the focused characterization data and other issues, the initial AO was amended. The purpose of the First Amendment was to:

- Redefine the site boundaries.
- Amend portions of the Order to reflect the new relationship between the PLPs.
- Redefine the Scope of Work, responsibilities and schedule.

The provisions of the first amendment were later rescinded by the Second Amendment to the AO.

2.7.3 Second Amendment to Agreed Order DE 93TC-S166 (Sept. 2001)

The purposes of the Second Amendment were as follows:

- Redefine the Site boundaries, based on data developed during remedial and historical investigation activities, to delineate the properties that are subject to this Order.

- Remove Waterway Properties, Inc. as a PLP in this matter, and delineate the responsibilities of the remaining PLP's.

- Redefine the Scope of Work, the responsibilities for specific tasks assigned to the various PLPs, and the schedule for completion of tasks according to Revised Schedule B.

Schedule B of the Second Amendment stated that Tasks 1 to 4 identified in Exhibit B of the original AO and revised Exhibit B of the First Amendment were completed. The Second Amendment included the following tasks:

- Responsibility: WSDOT in coordination with the COT.
  - Task 5 - 'A' Street Storm Lines Focused Feasibility Study Report,
  - Task 6 - 'A' Street Storm Lines Engineering Report/Plans and Specifications,
- Responsibility: Utilities (PacifiCorp, PSE and Advance Ross)
  - Task 7 - Nearshore (Three Tank Area) Focused Feasibility Report
  - Task 8 - Nearshore (Three Tank Area) Engineering Report/Plans and Specifications.
  - Task 9 - Shoreline Characterization of SP-6 Area (West Bank Seep)
- Responsibility: All PLPs as provided for in the respective Engineering Reports/Plans and Specifications
  - Task 10 - Implementation of Interim Remedial Actions

The status of Tasks 5 to 10 is summarized below:

- **Tasks 5, 6 and 10 (related to storm drains)** - WSDOT completed these tasks and in 2003 the storm drains and piping were abandoned and disconnected from the waterway. Storm water was collected and pumped to an infiltration basin located within the southeast portion of the RI/FS boundary area (Figure 1.3).

- **Tasks 7, 8 and 10 (three tank area)** - The Second Amendment requirements for Tasks 7 and 8 were fulfilled by the Utilities. A Focused Feasibility Report

(Geoengineers 2000d) and Remedial Design Report (Geoengineers 2001c) were prepared and submitted to Ecology.

- **Tasks 9 and 10 (SP-6 Area)** - The SP-6 area was within the Standard Chemical area that was removed from the RI/FS boundary by the Second Amendment. However, the Utilities agreed to contract work to characterize the area (Geoengineers 2000c; 2002) and to prepare the engineering report/plans and specifications (Geoengineers 2002e). Ecology funded the Standard Chemical upland and shoreline hot-spot remediation that was completed in 2003 (Geoengineers 2003b).

3.0 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Data and information used to prepare this RI were obtained from past investigations that included assessment of property history/operations and hydrogeologic characterization, as well as soil, groundwater, and seep sampling and analysis. The locations of test pit, boring, monitoring well and seep locations installed at the site are shown on Figure 3.1a, the logs of which are presented in Appendix A. Existing well and seep sampling locations are shown on Figure 3.1b. The upland site characterization investigations were supported by characterization and remedial work completed in support of I-705 construction, and cleanup of the Thea Foss Waterway and Standard Chemical site. Significant investigations are described below. Section 12 of this report provides a detailed listing of reports and information sources.

- ***WSDOT Investigations for I-705 Construction – 1979 to 1985***

In the 1970s, WSDOT began planning for construction of I-705. Hart-Crowser (1979) was retained to complete a geotechnical evaluation of the roadway alignment which provided general geologic information in the vicinity of the site. At that point in time, the presence of the MGP had not been discovered.

In 1984, geotechnical drilling by Hart-Crowser (1984) encountered a tar-like material similar to coal tar waste. WSDOT obtained information that a coal gasification plant formerly operated on the site and Hart-Crowser completed a characterization of the site conditions to support roadway construction. The characterization work included the drilling and sampling of twenty-six borings (E-1 to E-26), a hydrogeologic assessment of site geology and groundwater flow directions/rates, and collection and analysis of fifty-seven soil and groundwater samples. The samples were analyzed by Analytical Technologies Inc. for metals (AA and ICAP), polynuclear aromatics (EPA Method 8100), volatile organic compounds (VOCs by EPA Method 8240 [soil] and Method 624 [water]), semivolatile organic compounds (SVOCs by EPA Method 8270 [soil] and Method 625 [water]), and pesticides/PCBs (EPA Method 8080). Additional analyses were made for EP TOX Metals (similar to the current TCLP test used for waste designation purposes), Total Organic Halides (TOX – EPA Method 9020) and Total Organic Carbon (EPA Method 415.2).

Based on the 1984 testing, Hart-Crowser identified and mapped two areas of contamination (Figure 3.2) including the former MGP site and a former service station site[3] formerly located near the intersection of "A" Street and S. 24th St. Hart-Crowser referred to these areas as potential post-construction outcrops of contaminated soil and identified contamination to be related to coal tar and its related by-products (former MGP site) and gasoline contamination (former service station site)[4]. The coal tar by-product

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[3] The former service station site is not associated with the Tacoma Coal Gasification Site.
[4] Pesticides/PCBs were generally not detected in the groundwater samples collected in 1984-85 at a

contamination took the form of oily soil and tar-like material containing numerous aromatic and polynuclear aromatic hydrocarbons. The gasoline contamination was distinctly different containing aromatic hydrocarbons.

In December 1984, Hart-Crowser (1985) installed three additional monitoring wells (E-27 to E-29) along the Thea Foss shoreline north of the three tank area. Several rounds of monitoring were completed in these and selected other wells. Analyses were made for VOCs, SVOCs, pesticides/PCBs and total (unfiltered) metals using the same laboratory and methods discussed above. The highest concentrations of coal tar derived constituents were detected in wells E-4, E-27, E-28 and E-29 (Figure 3.1a). The range of detected concentrations in three sampling rounds completed between August 1984 and June 1985 are summarized in Table 3.1 below.

Table 3.1 – Range of Detected MGP Groundwater Constituents in 1985

Constituent (ug/l)	E-4	E-27	E-28	E-29
Benzene	273-890	<4	230-480	<4 to 1100
Toluene	28-110	<6-22	T-9	<6
Ethylbenzene	138-370	<7	<7-24	<7-T
Xylenes	<10-577	<10	49-90	<10-14.2
Phenol	<8	27-56	<8-14	T-30
Naphthalene	<1.6 - 1800	18-32	<1.6-1400	<1.6-49
2-Methylnaphthalene	<2.5 – 215	<2.5-13	<2.5-48	<2.5-T
Acenaphthylene	<3.5-26	<3.5	<3.5	<3.5
Acenaphthene	<1.9-160	12-25	52-120	<1.9-T
Dibenzofuran	<5-19	<5-T	<5-20	<5
Fluorene	<1.9-T	6-11	T-43	<1.9
Phenanthrene	<5.4-T	10-21	T-62	<5.4
Pyrene	<1.9-17	T-2.6	T-21	<1.9

From: Table 1 (Hart-Crowser 1985); T=trace; <7 – Not detected at indicated reporting limit

- ***COT/WSDOT/Utilities' - Upland and Waterway Investigations – 1993 to 2005***

The Thea Foss Waterway is an operable unit of the Commencement Bay-Nearshore/Tideflats Federal Superfund site. Ecology completed an RI report on contaminated sediments and sources and the results were published in August 1985. Sediment testing indicated that coal tar derived deposits were buried beneath the head of the waterway. In 1992, Ecology discovered coal tar derived material in a storm water catch basin along South "A" Street (along the DA-1 survey line) that ultimately discharged to the waterway. The primary issue at the time was whether residues from the MGP site had been controlled to a sufficient degree to prevent recontamination of the waterway after cleanup. An AO was negotiated between Ecology, the COT and other PLPs to further characterize the site. B&V was retained by the COT to prepare a plan to

reporting limit of 0.7 ug/l for PCBs and from 0.04 to 2.4 ug/l for pesticides. The only pesticide reported was endrin in a sample from well E-7A collected in February 1985 at 0.5 ug/l. It had not been detected in a previous sample at a reporting limit of 0.06 ug/l.

further characterize the site and identify interim remedial actions. Also during this period, WSDOT completed construction of the SR-509 Bridge and associated interchanges. Some of the construction occurred within the TCGS boundary.

B&V (1994). B&V compiled and reviewed available historic information to identify site characterization data gaps and identify interim actions to prevent migration to the waterway. Based on their review of site history, past investigations and discussions with Ecology, they developed a field sampling and a laboratory analysis program (B&V 1993) that was implemented in October and November 1993. The field and analysis program consisted of the following:

- Excavation of seven test pits (DA-1 to DA-7) in the area of the DA-1 sub-drain system that appeared to be collecting coal tar derived material.

- Drilling and sampling of five borings that were converted into monitoring wells (MW-7 to MW-12).

- Collection and analysis of forty-one subsurface soil samples (seven from test pits and thirty-four from the borings). Analyses were completed by Tacoma's Technical Support Laboratory and included analyses for metals (EPA Methods 6010/6020), VOCs (EPA Method 8240), SVOCs (Method 8270), pesticides/PCBs (MW-10 samples - Method 8080), cyanide (EPA Method 9010) and petroleum hydrocarbons (Methods WTPH-G, WTPH-D and 418.1). The results are summarized in attached Table 3.2.

- Collection and analysis of fourteen groundwater samples for the same constituents as those described above for soils. Tidally influenced wells were sampled at low and high tides. The results are summarized in attached Table 3.3.

- Hydrogeologic testing including measurement of monitoring well water levels (to determine groundwater flow directions) and assessment of hydraulic conductivity (slug tests).

B&V identified benzene, PAHs and, to a lesser extent, petroleum hydrocarbons (TPH) as the contaminants of concern. They estimated the extent of contamination that approximated a plume extending from the DA-1 area to the vicinity of wells MW-8/MW-9 (three tank area) and stated interim measures were required to prevent further contaminant migration. A subsurface "*coal tar related hot-spot*" was identified at location MW-12. They recommended that interim actions focus on two areas:

- **DA1-Line Area** –Plugging of the French drain system with collection and treatment of groundwater with discharge to the sanitary sewer, and

- **MW-8/MW-9 Area** – Installation of a pump and treat system to prevent migration to the waterway. Groundwater would be treated in the same facility as groundwater from the DA1-Line area and be discharged to the sanitary sewer.

These specific interim measures were not implemented for the following reasons: (1) the DA1-Line drain system was disconnected from the storm water conveyance to Outfall 237A and water was allowed to pond along a portion of South "A" Street; (2) later testing and analysis indicated a more complicated set of subsurface conditions were present at the site (e.g. the Standard Chemical site had not yet been discovered); and (3) there was little evidence for potential recontamination of waterway sediments from groundwater migration.

EMCON (1995). As part of planning for construction of SR-509 by WSDOT, EMCON (1995) completed soil sampling and analysis at the locations of roadway interchange piers to assess excavated soil disposal options. Piers 1, 2 and 3 are located within the TCGS as illustrated on Figure 1.6. The piers are supported by concrete spread footings. A design drawing in the report indicates that excavations to install the footings were to be up to forty by forty feet in size and excavated to depths below existing grade of fourteen to seventeen feet. The concrete footings were to be five feet thick to support concrete columns and the roadway. Soil represented by the analytical data was removed from the site and the data is not included in this report. As discussed below, sidewall and bottom soil samples were obtained for chemical analysis from several SR-509 excavations during construction.

B&V (1996). In 1995 and 1996, B&V completed a "*Pre-Remedial Design Investigation*" to supplement their 1994 report and "*to collect additional data necessary to complete a remedial design and implement source control of the Tacoma Coal Gasification Site*". A work plan to support this work was prepared by B&V (1995). The supplemental field and analysis program consisted of the following.

- Excavation of sixteen test pits (TP-1 to TP-17 – there was no TP-14) and collection/analysis of forty-four soil samples. Soil analyses were made for BTEX, PAHs, metals and cyanide. Soil analyses were completed by the COT Technical Support laboratory using EPA Methods 8260 (VOCs), 8270 (PAHs), SM 4500-CN C/F (cyanide) and 6010/7000 (metals). Data for TP-10 to TP-16 are summarized in attached Table 3.2. TP-1 to TP-9 were located on the Standard Chemical site and data for these test pits are not included in this report. Samples from TP-17 do not appear to have been analyzed as no data were reported.

- Drilling and sampling of eight borings that were converted into monitoring wells (DOT-MW4, MW-13 to MW-16, MW-17A/B, and MW-18A/B). Fifty-six soil samples were analyzed for BTEX and PAHs using the same methods described for the test pit samples. Wells MW13 and MW-14 were on the

Standard Chemical site. Data for pertinent locations are summarized in Table 3.2.

- During construction of the SR-509 interchange in the mid-1990s, eight soil samples were collected from WSDOT excavations for the PLP group. The samples were analyzed for BTEX, PAHs and metals, the results of which are reported in the B&V 1996 report and summarized in Table 3.2. Samples SD-1 and SD-2 were collected from the bottom of the excavation for a new storm drain line south of South "A" Street. Samples R2-1 to R2-4 were collected from the side walls of the Pier 2 bridge-footing excavation south of South "A" Street. Sample R3-2 was collected from a bottom excavation north of South "A" Street. Sample R3-1 was a sludge sample collected from a concrete vault that was removed during I-705 construction.

- Collection and analysis of groundwater samples from new and previously installed wells and four temporary WSDOT wells for BTEX, PAHs and total/dissolved metals using EPA Methods 8260 (VOCs), 8270 (SVOCs), 6010/6020 (total/dissolved metals) and 4500-CN C/F (cyanide). The results are summarized in attached Table 3.3.

- Four seeps were sampled along the west bank of Thea Foss on the north side of the former pier along the Standard Chemical shoreline. The samples were analyzed for BTEX, PAHs and other water quality parameters.

- Hydrogeologic testing including measurement of monitoring well water levels (to determine groundwater flow directions), assessment of hydraulic conductivity (slug tests) and a 72-hour tidal study to assess tidal influence on groundwater levels along the waterway shoreline. Measurements were made in wells MW-13, MW-14, MW-16, MW-17A and MW-17B.

Hart-Crowser (1995, 1997, 1999). Hart-Crowser for the COT, completed three rounds of pre-design investigations for cleanup of the Thea Foss Waterway. The investigations included the sampling and analysis of sediment cores within the head of the waterway that encountered coal tar derived deposits covered by storm water sediment. Several monitoring wells were installed within and below the sediments, including MW-5 A/B/C located adjacent to the three tank area. The primary focus of the sediment testing were metals, phenols, semivolatile organic compounds including PAHs, phthalates and pesticides/PCBs. Data from these investigations were used to characterize conditions beneath the waterway and assess upland flow paths and loadings to sediment and surface water. Specific data used to complete this RI are discussed in later sections of this report.

Papadopulos & Associates (1998). The selected remedy for the head of Thea Foss included an engineered sediment cap (DOF 2004). The Hart-Crowser pre-design studies indicated that upward groundwater flow occurred beneath the waterway through contaminated sediment and the cap design needed to address possible bottom-up recontamination of sediment and contamination of marine surface water. Papadopulos, with assistance from Geoengineers, constructed a numerical groundwater model to estimate loadings to the waterway as a result of groundwater flowing from the uplands and through contaminated sediment. The model determined upland flow paths to the waterway and provided the necessary criteria to design the engineered cap. The indicator constituents of concern modelled in the analysis included 2-methylnaphthalene, phenanthrene, pyrene, dibenzo(a,h)anthracene, bis(2-ethylhexyl)phthalate and mercury.

Geoengineers (see reference section). Between June 1998 and March 2005, Geoengineers, for the Utilities, installed additional monitoring wells (MW-7R, MW-28 to MW-31) and completed groundwater monitoring. Laboratory analyses were completed for BTEX and PAHs. The results are summarized in Table 3.3. Geoengineers also sampled two well point clusters installed by Black & Veatch in 1997 in sediment adjacent to the TCGS. The results are discussed in Section 7.2.1 later in this report.

- ***Update Groundwater Conditions – 2016 to 2018***

As part of this RI, the Utilities retained DOF to assess the groundwater conditions beneath the site. The update included the following investigations.

  - **Well Inventory (DOF 2016a) -** A well inventory was completed in January 2016 (DOF 2016a) to assess the status of the thirty-six previously installed monitoring wells (not including those installed by Hart-Crowser for WSDOT in the mid-1980s which were abandoned). Eighteen wells were found to be useable while the remaining eighteen wells were not found and were assumed to be abandoned or destroyed.

  - **Well Monitoring**. A work plan (DOF 2016b) to complete the groundwater quality update was reviewed and approved by Ecology. Existing wells were professionally surveyed for coordinate locations and top of casing elevations. To date, monitoring rounds were completed in July and December 2016 (DOF 2016c, 2017a), April, August and December 2017 (DOF 2017c, e; 2018a), and April 2018 (DOF 2018b) and July 2018 (documented herein). Analyses were completed by Analytical Resources Inc. (ARI) for BTEX (EPA Method 8260C), PAHs (EPA Method 8270D-SIM) and a number of conventional parameters. Analyses for total and dissolved metals (EPA Method 200.8 w/ UCT-KED and 7470A), total and weak Acid Dissociable Cyanide (Method SM 4500 E-99 and I-97), and total petroleum hydrocarbons (NWTPH-Dx) were also analyzed during the July 2018 sampling round. The recent groundwater data are summarized in Table 3.4.

  - **Shoreline Seep Sampling**. Monitoring well water level data suggested that seeps could be present along the shoreline at lower tides. A seep reconnaissance and sampling plan (DOF 2017b) was prepared and approved by Ecology in March 2017. During a daylight low tide on April 27, 2017, two seeps were identified (SEEP-1 and SEEP-2) downgradient of the three tank area (DOF 2017c). The initial sampling occurred the same day of the reconnaissance. After the initial sampling and review of analytical data, the shoreline seep sampling procedure was revised to include a short well screen to minimize suspended solids (DOF 2017d). To date, shoreline seep samples have been obtained in April and August 2017 (DOF 2017e), and April (DOF 2018b) and July 2018 (documented herein). The seep samples were analyzed for the same constituents as the monitoring wells; the results are summarized in Table 3.5.

- **Hillside Seep Sampling**. Construction of South "A" Street under I-705 created a seep that flowed from an embankment slope on the northwest side of the street (Figures 1.6, 3.1a and 3.1b). Water from the seep flowed over the sidewalk/street and mixed with ponded storm water in a low area adjacent to the former railway crossing (now closed). In March 2003, WSDOT constructed a low Jersey (concrete) wall in an attempt to halt the seepage, however seepage continued. At the request of Ecology, a hillside seep sampling plan was submitted and approved (DOF 2017f). Sampling occurred behind the Jersey wall using the same procedure as for collection of the shoreline seep samples. To date, the hillside seep has been sampled in December 2017 (DOF 2018a) and April (DOF 2018b) and July 2018 (documented herein) the results of which are summarized in Table 3.6.

4.0 PAST REMEDIAL ACTIONS

4.1 Soil/Tar Removal during I-705 and SR-509 Construction

As discussed above, in 1984, during foundation drilling by Hart Crowser for construction of I-705, buried tar was discovered. Hart Crowser completed borings and provided to WSDOT a general characterization of the site conditions (Hart Crowser 1984; 1985). Two types of visual contamination were discovered including "*tar*" and "*oily silt and sand*" (Figure 3.2). Soil with a distinct chemical odor was also encountered.

WSDOT road construction specifications described these materials as follows:

- **Tar** material has a consistency ranging from hard brittle chunks to very viscous fluid having an odor similar to creosote.
- **Oily Silt and Sand** is a gray to black material with a distinct oily appearance and strong creosote-like odor.
- **Soil with a Chemical Odor** is characterized by a chemical or creosote-like odor, but has no visible evidence of contamination.

Testing indicated that PAH concentrations of tar approached the level (1%) where the tar would be regulated as an extremely hazardous waste (EHW) under the Washington State Dangerous Waste Regulations (Chapter 173-303 WAC). Based on this testing WSDOT, as recommended by Ecology, took the approach that tar be considered an EHW (Ecology 1985).

During roadway construction in the period October 1985 to July 1986, the remains of much of the MGP were exhumed and disposed of off-site. A one to two-foot layer of tar was first encountered on December 16, 1985 during excavation for NB Pier 22 footing (Figure 1.6) located within the TCGS manufacturing area. Excavation also uncovered hazardous material (tar) at NB 21 and SB Pier 23 footings. On December 20, 1985, a 60-foot diameter brick/concrete tank and foundation were uncovered (southern-most gas holder). In February 1986, the "*old insurance maps*" were located by the Contractor showing two additional gas storage tanks, possibly containing tarry materials, that lay directly beneath the proposed footings and the DA1 Line (WSDOT 1986).

WSDOT specifications gave the contractor direction on what to excavate and where to dispose the various contaminated materials. The pertinent specifications are summarized below:

- *"During excavation operations within the area of contaminated soil, the Contractor may encounter hazardous tar material existing in the sidewall of the excavation. If this material is found within 5 feet of subgrade, the*

Contractor shall remove the tar contaminated material for a distance of 5 feet laterally into the sidewall or as designated by the Engineer."[5]

- *"Where the oily silt and sand material remains exposed on the finished cut slope and/or subgrade or where designated by the Engineer, the Contractor shall remove an additional two feet of contaminated material and replace it with fine-grained material to form a seal as detailed in the plans. The oily silt and sand seal shall meet the following gradation requirements:*

  Passing 1-inch screen 100% (by weight)
  Passing #200 screen 30% to 50% (by weight)"

- *"The tar was designated as a hazardous material to be disposed of at the disposal facility of Chem-Security Systems Inc., Arlington, Oregon."*

- *"The oily silt and sand and the chemical odors [material with chemical odors] were designated as contaminated but not as a hazardous waste, in accordance with the WDOE Dangerous Waste Regulation WAC 173-303. The oily silt and sand material shall be disposed of within the project limits in the Oily Silt and Sand Storage Site"*[6]

- *"The Contractor will be required to provide a clear zone for utility relocation work by removing and disposing of all hazardous and contaminated materials found within the utility corridor as designated by the Engineer. The following utility relocations will require the clear zone:*

  1) New Water Main – Vicinity of Dock Street between 23rd and 22nd Streets.
  2) New Gas Line – Vicinity of Dock Street between 24th and 23rd Streets."

A construction change order (Contract 2992 Change Order No. 13) was issued to Kiewit Pacific Co. on April 17, 1986 that provided additional direction for excavation of hazardous material as presented below.

ADDITIONAL HAZARDOUS WASTE

- *An approximately 3,500 sq. ft. area surrounding Pier 23SB (commonly referred to as "Tank 1"), from original ground to a depth equal to the bottom of footing elevation.*

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[5] DOF interprets this provision to indicate that tar, where encountered, was removed to a maximum depth of 5 feet below excavation subgrade.

[6] The oily silt and sand storage site is not part of the TCGS. This site is composed of three permanent storage vaults located near the intersection of I-705 and I-5. These were constructed during the I-705 project and, in addition to oily silt and sand, also contain demolition debris from the former gas plant (e.g. – brick and other rubble from demolition of the gas holders).

- *An approximately 5,000 sq. ft. area vic. of DA1 8+00, 30 ft. lt. (commonly referred to as "Tank 2", from original ground to a depth equal to the bottom of footing elevation.*

- *An approximately 200 sq. ft. area vic. DA1 7+15, (commonly referred to as the "tar pump"), from original ground to a depth of 8 ft.*

REMOVAL OF TANKS AND APPURTENANCES

- *The Contractor shall remove and dispose of the existing brick and mortar tank walls vic. of DA1 8+00, 30 ft. Lt. (commonly referred to as "Tank 2") and vic. Pier 23SB footing (commonly referred to as "Tank 1"). In addition any connecting pipes or other appurtenances discovered shall be likewise removed and disposed of. The Contractor shall also remove and dispose of the existing concrete vault in the vicinity of DA1 7+15 (commonly referred to as the "tar pump").*

- *All concrete, brick and other debris removed from the "Tank 1", "Tank 2", and "tar pump" areas shall be disposed of in accordance with the contract special provision "Handling and Disposal of Oily Silt and Sand".*

By the time excavation was completed, all or portions of the former gas holders, tar pump, vaults and tanks, and piping had been removed. Most of these structures/tanks contained tar. WSDOT construction records indicated that much, if not all, of the gas holders on Block 2201 were demolished and removed from the site and the gas holder on block 2101 was partially removed.

WSDOT records indicate that the following materials were removed from the I-705 construction site in the vicinity of South "A" Street (WSDOT 1987 MOU):

- Approximately 16,000 tons of tar to Chem-Security Systems, Inc. (now Waste Management), Arlington, Oregon (EHW).
- Approximately 26,500 tons "problem waste" (oily silt and sand) to storage vaults located within the I-705 right of way.

4.2 Abandonment of DA-1 Line and Storm Water Management

In 1992, Ecology discovered that oily material was migrating into a series of storm water catch basins located on South "A" Street below I-705. The capture of coal tar derived materials was confirmed by DA-1 Line catch basin sampling completed in October 1993 (B&V 1994). A soil sample obtained from test pit DA1-5, located within the area of the subsurface drainage system (Figure 2.4) had a sum of high molecular weight PAH (HPAH) concentration of 1,110,000 ug/kg that is consistent with a coal tar derived source. It was later discovered that the catch basins were connected to the DA-1 Line sub-drain system. Near the time of the initial discovery (1992), measures were undertaken to block the sub-drains. However, oily/tarry materials continued to migrate into the catch basins through pipe connections and bottom of the catch basins.

In 1996, additional actions were completed that consisted of blocking a number of laterals and placing a concrete/cement mixture around the catch basins and portions of buried piping. Even after these actions, oily material was discovered migrating into the catch basins. The sub-drain system was finally disconnected from the COT's storm water drainage system in 2003. Metal conduit (deteriorated corrugated metal pipe or CMP) connecting the DA-1 Line System to the storm water outfall was removed and trench dams were installed along the pipe alignment.

4.3 Remediation of Standard Chemical Site (by Ecology)

Remediation of the Standard Chemical Site (SP-6 area designated in Second Amendment to the 1993 Agreed Order) was completed by Ecology in late 2002/early 2003 (Geoengineers 2003). Two hot-spots (Figure 1.2) were remediated including:

- Standard Chemical Company Seep (SP-6 or West Bank Seep) Hot-Spot located in the intertidal area along the west bank of the Thea Foss Waterway, and
- SB-16 Hot-Spot located on the upland near the south boundary of the Standard Chemical Site.

4.3.1 Standard Chemical Company Seep Hot-Spot

The objective of the intertidal oily seep remediation was to reduce concentrations of PAHs in surface sediment and remove coal tar derived materials to an extent that capping materials would not be recontaminated by upward migration (Geoengineers 2002). A sheet pile wall enclosure was placed around the target materials to be excavated. Approximately 5,000 cubic yards of contaminated sediments were removed from the waterway and bank area, including some material outside of the sheet pile wall enclosure, using a crane and clamshell bucket. The excavated sediments were disposed of off-site. The tops of the sheet pile wall were cut to specified elevations and the excavation was backfilled to the approximate original grade (Geoengineers 2003). A final cap was subsequently placed over the remediated hot-spot area as part of the Utilities' remediation in the head of Thea Foss (DOF 2004).

As part of the seep hot-spot remediation, several monitoring wells were abandoned on January 2, 2003 (Geoengineers 2003). These wells included MW-10, MW-14 and MW-31. COT well P-4/MW-01 was also abandoned.

4.3.2 SB-16 Upland Hot-Spot Removal

SB-16 hot-spot soils were identified as having a total PAH concentration of greater than 5,000 mg/kg (Geoengineers 2002, 2003). The remediated hot-spot is shown on Figure

1.2. A sheet pile wall was installed around the target soils to be excavated. Approximately 3,800 cubic yards of soil was removed from the excavation and disposed off-site. After excavation was complete, the sheets were removed, H-piles used to support the sheets were cutoff two feet below the final grade, and the excavated area was backfilled. Contaminated soil removal on the west side of the hot-spot was limited by the presence of a 30-inch diameter COT sewer line.

Excavation depths ranged up to 19 to 20 feet below ground surface (bgs). The bottom of the excavation was generally defined by native deltaic deposits (silty clay). Coal tar derived materials were encountered in wood debris and other man-made debris (bottles, bricks, etc.) at depths of approximately 12 to 16 feet bgs. Most of the coal tar derived materials were observed within the northern section of the enclosed sheet pile cell, although a smaller amount of material was observed within the southern portion of the cell. The coal tar derived material appeared to be contained within the limits of the sheet pile cell and was approximately two feet in thickness.

As part of the remediation, well MW-8 was abandoned. The well was pressure grouted on January 22, 2003.

4.3.3 Standard Chemical Sediment/Soil Disposal

Most of the excavated materials were designated as non-dangerous waste and disposed of at the Olympic View Landfill and the Pierce County Landfill. Approximately 60 cubic yards were designated as a characteristic dangerous waste based on the TLCP test procedure for lead. Material designated as dangerous waste was disposed at the Waste Management facility in Arlington, Oregon.

4.4 Thea Foss Waterway

For remedial purposes, the Thea Foss Waterway was divided into two work areas. The head of the waterway (upper 1,000 feet – approximately station 70+00 to 80+00) was the responsibility of PacifiCorp and PSE (Utilities Work Area) with the balance of the waterway, the lower 7,000 feet, being the responsibility of the COT (City Work Area). The Utilities finished remedial construction in February 2004 (DOF 2004) and have been monitoring remedy performance since that time. The remedy has been performing as intended.

The remedy components for the head of the waterway are shown on Figure 4.1 and included the following:

- Installation of a sheet pile wall and rock buttress at waterway station 70+00 (north of the SR-509 Bridge). The wall separates the two work areas and allowed the COT to maintain the authorized navigation channel within their work area. The navigation channel within the Utilities work area was deauthorized by an Act of Congress.

- Dredging at the head of the waterway to construct a scour protection apron where storm water from Outfalls 237A and 237B ("Twin 96" Outfalls") discharge to the waterway (Figures 1.3 and 4.1).

- Placement of a high density polyethylene (HDPE) cap over the former location of the "SR-509" seep (located along the east side of the waterway beneath the SR-509 Bridge).

- Placement of a sand cap over contaminated sediments and the HDPE cap.

- Placement of slope cap and armor material on the waterway slopes. The as-built cap adjacent to the TCGS (Station 78+00) is shown on Figure 4.2 where up to ten to twelve feet of waterway sand cap and three feet of armor material were placed adjacent to the site. The slope armor material was placed over existing rip-rap.

The TCGS site boundary along the waterway shoreline lies adjacent to the scour protection apron where slope armor materials were placed by the Utilities during cap construction in the head of the Thea Foss Waterway in 2005.

In 2016, the COT removed the public pier located north of the southern TCGS RI/FS boundary (Floyd/Snider 2016).

5.0 HYDROGEOLOGY

5.1 General Statement

The TCGS is located along the margin of a glacial upland that was truncated by erosion and deposition of alluvial (river) deposits associated with the Puyallup River. The upper portions of the glacial and alluvial deposits were further modified by shoreline development (primarily filling) and dredging of the Tacoma/Port of Tacoma waterways including the Thea Foss Waterway (formerly the City Waterway).

In general, groundwater recharge occurs in upland areas. Groundwater then flows towards surface water bodies where discharge occurs. The recharge/discharge relationships indicate that downward vertical hydraulic gradients are present beneath the uplands and upward vertical gradients are present beneath the discharge areas. This is evident in the Tacoma tide flats (a discharge area) where hydraulic heads in the deeper aquifers are above ground surface.

As part of the source control and remedial work completed for the head of the Thea Foss, the hydrogeology in the vicinity of the TCGS was characterized to develop a numerical model (USGS MODFLOW/MT3D96) to estimate contaminant loadings to waterway sediments (Papadopulos & Associates, 1998). Data and geologic unit designations in the modeling report are used herein to describe the hydrogeology of the project area. The Papadopulos work was supplemented with the logs of wells installed after the model was developed. Well locations are shown on Figure 3.1a and the logs of subsurface explorations are included in Appendix A.

5.2 Geologic Units

The geologic units in the vicinity of the TCGS with increasing depth are listed and described below. Figures 5.2 and 5.3 show geologic sections that illustrate the relationship between the units. The trend of the sections are shown on Figure 5.1.

- Engineered Cap (Sand Cap and Scour Protection Apron – along and adjacent to TCGS shoreline)
- Waterway Sediment Unit (below engineered cap - bottom of Thea Foss Waterway)
- Recent Fill Unit (RFU)
- Deltaic Deposit Unit (DDU)
- Recessional Outwash Deposit (ROD)
- Dry Sand Unit (DSU)
- Glacially Overridden Unit (GOU)

Engineered Cap – As illustrated on Figure 4.2, the shoreline was capped as part of the Thea Foss remediation. Existing rip-rap was left in place and a waterway cap and slope armor were placed.

- **Slope Armor**. Covers both rip-rap and waterway cap. Slope armor consists of small rock. Habitat mix (clean, sand and gravel) was placed on the slope armor.

- **Waterway Sand Cap**. Clean silty sand augmented with organic carbon.

Waterway Sediment Unit - Silt, sandy silt and silty sands were deposited in the bottom of the Thea Foss Waterway after construction in the early 1900s. While maintenance dredging has been completed, fine grained sediments, primarily from storm water discharges, remain in the waterway. Coal tar derived materials are mixed with sediments in the lower portion of the unit that are covered with fine grained storm water sediment. An engineered cap was placed over the storm water sediments in 2004 as part of the Head of the Thea Foss Waterway remedial work (DOF 2004). Since the cap was constructed, fine grained storm water sediment continues to accumulate over the bottom of the waterway (i.e. above the sand cap).

Recent Fill Unit (RFU): The RFU consists of heterogeneous and randomly distributed fill materials placed from the late 1800s to the present. Contains a wide range of soil types as well as brick, slag, clinker, coal, dredge spoils, concrete rubble and wood.

Deltaic Deposit Unit (DDU): The DDU consists of sandy to gravelly silt deposited by the Puyallup River and other surface drainages discharging into Commencement Bay. Where present, the DDU underlies the RFU. These deposits are part of the Puyallup River Delta that formed between the end of the last glacial period in the Puget Sound area and the early 1800's when waterway development generally began in the area. Dredging of the Thea Foss Waterway removed a portion of the DDU deposits.

Recessional Outwash Deposit (ROD): The ROD consists of medium dense, sandy to gravelly silt that underlies the RFU, DDU and Thea Foss sediments. These materials were deposited during the last glacial retreat and are reworked and re-deposited materials carried by glacial ice and deposited along the glacial margins.

Dry Sand Unit (DSU): The DSU consists of dense, low permeability, fine grained material that is variously described as silty sand, silt, or as a volcanic ash deposit. The origin of the unit is uncertain, but it appears to mantle the prehistoric topography of the area, and it is suspected to be of volcanic origin. The unit appears to be present beneath a portion of the project area but is truncated, most likely by erosion.

Glacially Overridden Unit (GOU): The GOU consists of very dense, gravelly sands to gravels that underlie the general area. These deposits were overridden by advancing glaciers during the last glaciation of Puget Sound, and have been over-consolidated by the weight of the overlying ice. The thickness of the unit is deeper than that shown on the sections. The unit appears to host a deeper regional confined aquifer that is the source of vertical gradients observed in wells located in and adjacent to the waterway.

5.3 Hydraulic Conductivity

The calibrated numerical model indicated hydraulic conductivities that ranged from 10 feet per day (ft/day) to 200 ft/day as summarized below.

Table 5.1 – Unit Hydraulic Conductivity Model Estimates

Unit	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (cm/sec)
Recent Fill Unit (RFU)	200	7.1E-2
Thea Foss Sediment	10	3.5E-3
Deltaic Deposit Unit (DDU)	30	1.1E-2
Recessional Outwash Unit (ROD)	30	1.1E-2
Dry Sand Unit (DSU)	0.06	2.1E-5
Glacially Overridden Unit (GOU)	30	1.1E-2

5.4 Groundwater Flow Directions and Gradients

Groundwater Flow Directions. On November 11 and 12, 1993, B&V (1994), measured water levels and estimated flow directions in what they termed the "*shallow aquifer*". The shallow aquifer generally consists of the RFU, ROD and DDU geologic units. Water levels were measured with data loggers over a 28 hour period (approximately two tidal cycles) in wells MW-7, MW-8 and MW-10. Spot measurements were made in other wells. During this period, high tide was about (+)12.5 feet MLLW and low tide ranged between (-)0.87 and (-)2.06 MLLW. A tidal fluctuation of approximately 14.4 feet was measured off the Tacoma public pier (now removed) during the measurement period.

Figure 5.4 shows the groundwater contours for MLLW and mean higher high water (MHHW). Groundwater flow directions at both tidal stages were towards the waterway. The B&V 1993 flow directions are consistent with the results of the 1998 Papadopulos groundwater flow model and later evaluations completed as part of assessing current groundwater conditions in 2016 to 2018.

An evaluation of well screen depths/elevations indicates that the wells should be divided into three groups to minimize the possible impact of vertical gradients on the estimation of flow directions. The well groupings and construction information are summarized in attached Table 5.2 and include shallow, intermediate and deeper well groups. Well screen elevations for existing shallow (water table) and intermediate depth wells are graphically presented in Figure 5.5. Eleven existing wells are designated as Shallow Wells and seven existing wells are designated as Intermediate Wells. All wells characterized as deeper wells have been abandoned. Estimated groundwater flow directions based on measurements made on December 5, 2017 are shown on Figures 5.6a (shallow wells) and 5.6b (intermediate wells). Water level measurements were made during a rising tide level of approximately 5.5 feet NAVD88 (8.2 feet MLLW). Estimated flow directions for both the shallower and deeper wells are to the waterway.

The 1998 groundwater flow model integrated both horizontal and vertical groundwater flow gradients, along with variations in hydraulic conductivity and tidal stage. Mean groundwater flow directions were estimated that are conceptually illustrated on Figure 5.2. Flow in the shallower portions of the geologic section is predominately horizontal with discharge along the shoreline. Flow in the deeper portions of the geologic section is slightly downward to horizontal beneath the upland and becomes steeply vertical (upward) beneath the waterway.

During lower tides, shallow groundwater discharges to the waterway via groundwater seeps that are visible at the lower tides. A seep reconnaissance was made on April 27, 2017 during a low tide of (-)1.7 feet MLLW (DOF 2017c). Two seeps were identified downgradient of the former three tanks. These seeps are designated SEEP 1 and SEEP 2 and their locations are shown on Figures 3.1a,b and 5.6a,b. Their relationship to the groundwater flow system is illustrated on Figure 5.2.

As tides fluctuated, B&V reported that water levels in wells MW-2, MW-4, MW-5, MW-6 and MW-7 did not fluctuate with the tides. However, water level fluctuations caused by tides occurred in wells MW-8 (0.53 feet), MW-9 (0.25 feet), MW-10 (6.15 feet), MW-11 (3.61 feet) and MW-12 (5.42 feet). It appears that groundwater water levels in the area generally east of Dock Street are affected by tidal changes. The higher fluctuations were in wells located near the shoreline bank.

5.5 Mixing of Groundwater and Surface Water

At the request of Ecology, a number of conventional parameters (calcium, magnesium, sodium and chloride) were analyzed to assess groundwater mixing with marine surface water. These parameters are major constituents dissolved in seawater as summarized in Figure 5.7 and were analyzed during the April and August 2017 sampling events (DOF 2017c,e).

During the August 2017 monitoring, a sample of Thea Foss Waterway surface water was also collected and analyzed for conventional parameters to provide data specific to the Thea Foss Waterway. The sample was obtained at a depth of 2 to 4 feet from the non-motorized boat dock located on the east side of the waterway. The sample was collected using a peristaltic pump. The results are summarized below in Table 5.3.

Table 5.3 - Thea Foss Waterway Surface Water (a)

Constituent	Units	Result
Temperature	C	15.1
Conductivity	uS	33,134
pH	Std. Units	8.5
Dissolved Oxygen	mg/l	11.4
Oxidation-Reduction Potential	mV	136
Calcium	mg/l	326
Magnesium	mg/l	1010
Sodium	mg/l	9100
Chloride	mg/l	15300

(a) - Collected from a depth of 2 to 4 feet at 3:00PM on Aug. 30, 2017

Conventional data collected as part of this monitoring program are summarized in Figure 5.7 along with a table of correlations and a plot of sodium vs. chloride concentrations. As expected, conductivity (electrical conductivity) and the analyzed conventional parameters are highly correlated (R=0.95 to 1.0 – see Figure 5.7 page 1).

Figure 5.7 (page 2) shows a plot of sodium vs chloride concentrations. The end points (assumed all groundwater and all marine water) are defined by the groundwater sample with the lowest sodium/chloride concentrations (MW-28) and saline Thea Foss (TF) surface water. Note that concentrations are lower in the Thea Foss saline surface water as compared to seawater because the head of the waterway receives fresh water from the Twin 96" outfalls and groundwater inflow.

The shoreline seep samples plot between the groundwater samples and the TF Surface Water sample. The position of the seep samples on the line suggests that the seep samples are composed of approximately 70 to 75% surface water. During higher tides, oxygenated surface water migrates into the bank and mixes with groundwater. As the tides lower, the mixed groundwater discharges to the waterway.

6.0 CONSTITUENTS OF POTENTIAL CONCERN (COPCS)

6.1 Exposure Pathway Analysis

As part of the process of identifying Constituents of Potential Concern (COPCs), an exposure pathway analysis was prepared based on review of site data and land use. The purpose of the analysis was to identify the media and relevant possible exposure pathways to assist in developing appropriate screening levels (SLs) to identify COPCs. This analysis addressed media and possible exposure pathways/transport pathways. Completed pathways are carried forward for evaluation and development of SLs.

Figure 6.1 illustrates possible exposure/receptor pathways for various media at the site. Possible media include in-door air, soil, groundwater, surface water and sediment. Possible receptors include those who visit/work on the site including wildlife. Other possible receptors are off-site marine life or those who might consume drinking water or seafood impacted by the site.

Releases at a site can be transported to other media/locations. Figure 6.2 illustrates possible transport pathways that can result in exposure to other receptors. For example, contaminants can leach from soil to groundwater and be transported to surface water by groundwater. Figure 6.3 summarizes the results of the exposure pathway analysis which are discussed below.

6.1.1 Potential Soil Receptors and Exposure Pathways

Two potential receptors (humans and terrestrial organisms) and three exposure pathways (ingestion, dermal contact and inhalation) were identified for soil as summarized in Table 6.1 below.

Table 6.1 – Possible Upland Soil Receptors and Exposure Pathways

Receptor	Pathway
Humans	Soil contact (ingestion/dermal contact) – upland soil
	Inhalation of air borne soil particles
	Volatilization of VOCs from soil into in-door air with inhalation
	Erosion of Surface Soils
Terrestrial Organisms	Exposure to upland area soils

Human Exposure to Upland Area Soils and Soil Erosion. The TCGS site is covered with paving, roadway abutments/retaining walls, uncontaminated soil placed as part of the I-705/SR-509 roadway construction, tended lawns and landscaping (park area), and shoreline slope capping materials (placed during waterway remediation). Furthermore, there are no buildings or enclosed structures on the site. Based on these features, the soil inhalation (particulates and vapors) and soil erosion pathways are incomplete. However, soil contamination is present at depths less than the point of compliance (fifteen feet), so the soil contact exposure pathway is complete, primarily for subsurface utility workers.

Terrestrial Ecologic Contact. WAC 173-340-7491(1) presents criteria for determining when no further terrestrial ecological evaluation (TEE) is required. If any one of the listed criteria are satisfied, than the MTCA regulation provides an exclusion from further evaluation. WAC 173-340-7492(2) presents procedures to complete a simplified TEE and when this evaluation may be ended as listed below:

- The first criterion is whether the total area of soil contamination is not more than 350 square feet (roughly 19 by 19 feet in size). Soil contamination exceeds this area so the simplified TEE was continued.

- The second criterion is whether land use at the site and surrounding area makes substantial wildlife exposure unlikely using the procedure outlined in Table 749-1. This evaluation is presented in Table 6.2 below.

Table 6.2 – Simplified TEE Exposure Analysis (after Table 749-1)

Criteria	Points
1) The largest area of contiguous (connected) undeveloped land on or within 500 feet is approximately 1.3 acres. Undeveloped land means land that is not covered by existing buildings, roads, paved areas or other barriers that will prevent wildlife from feeding on plants, earthworms, insects or other food in or on the soil (estimated at 1.3 acres – rounded to 1.5 acres). See Table 749-1 in WAC 173-340-900 for scoring (1.5 acres = 7 points).	7
2) Is this an industrial property? If yes enter a score of 3 if no enter a score of 1.	1
3) Quality of habitat. 1= high, 2 = intermediate, and 3 = low	3
4) Will undeveloped land likely attract wildlife?. If yes enter 1 if no enter a score of 2	1
5) Are there any bioaccumulative compounds such as PCBs present in soil at the site?. If yes enter a score of 1. If no enter a score of 4.	4
6) Sum of numbers in boxes 2 to 5	9

The number in box 6) is larger than the number in box 1), therefore the simplified TEE was ended under WAC 173-340-7492(2)(a)(ii). This means that potential risks to terrestrial ecologic receptors are low and they can be eliminated as potential receptors.

A major driver in the simplified TEE analysis is the size of the contiguous undeveloped land on and within 500 feet of the site. Figure 6.4 shows the undeveloped land based on analysis of the air photograph (May 2017) and physical mapping of features beneath the roadways in June 2018. Four "*undeveloped*" (non-contiguous) areas labeled "A" (1.2 acres), "B" (1.3 acres), "C" (0.6 acres) and "D" (0.6 acres) are shown on the figure. Area "B" is the largest area at approximately 1.3 acres (rounded to 1.5 acres). The size of Area "B" was used in the simplified TEE.

Summary of Soil Contact Exposure/Migration Pathways. Exposure/migration pathways for inhalation/erosion of soil particles and inhalation of in-door vapors are not complete and the simplified TEE indicate potential risks to terrestrial ecological receptors are low. Based on evaluation of potential human contact with subsurface soils less than fifteen-feet deep, the soil contact exposure pathway is complete, primarily for subsurface utility workers. This exposure pathway is discussed further in Section 6.2.

6.1.2 Potential Groundwater Receptors and Exposure Pathway

Two potential receptors and four exposure pathways were identified for groundwater as summarized in Table 6.3 below.

Table 6.3 – Possible Groundwater Receptors and Exposure Pathways

Receptor	Pathway
Humans	Ingestion of groundwater as drinking water
	Groundwater discharge to surface water and consumption of marine organisms
	Volatilization of VOCs from groundwater to soil vapor with potential in-door air inhalation
Aquatic Organisms	Groundwater discharge to surface water

Beneficial Uses of Groundwater. According to WAC 173-340-720, groundwater cleanup levels must be based on the highest beneficial use of groundwater, which is drinking water, unless the criteria outlined in WAC-340-720(2), subsections (a) through (c) are met. Unless meeting the criteria can be demonstrated, WAC 173-340-720(2) defines groundwater as potable. The pertinent criteria of this section are discussed below.

***(a) The groundwater does not serve as a current source of drinking wat*er.**

There are no water supply wells located on the property. A check of Ecology's well log and water rights databases indicates there are no water supply wells in the vicinity of the Site.

(b) The groundwater is not a potential future source of drinking water for any of the following reasons:

(i) The groundwater is present in insufficient quantity to yield greater than 0.5 gallon per minute on a sustainable basis to a well constructed in compliance with chapter 173-160 WAC and in accordance with

normal domestic water construction practices for the area in which the site is located.

It is likely a well could be constructed according to applicable standards and would yield greater than 0.5 gallon per minute on a sustainable basis.

(ii) The groundwater contains natural background concentrations of organic or inorganic constituents that make use of the water as drinking water source as not practical. Groundwater containing total dissolved solids at concentrations greater than 10,000 mg/l shall normally be considered to have fulfilled this requirement.

Natural background concentrations of total dissolved solids are less than 10,000 mg/l and concentrations of other background concentrations of organic and inorganic constituents would not likely preclude the use of the groundwater for drinking water purposes.

(c) The department determines it is unlikely that hazardous substances will be transported from the contaminated ground water to groundwater that is a current or potential future source of drinking water, as defined in (a) and (b) of this subsection, at concentrations which exceed groundwater criteria published in chapter 173-200 WAC. In making this determination, the department shall consider site-specific factors including:

(i) The extent of affected groundwater

Affected groundwater is limited to a relatively small upland area (less than 4 acres) between the site and the waterway.

(ii) The distance to water supply wells

No water supply wells are located in the vicinity of the Site. The Site is also located in a discharge zone where groundwater discharges to marine water.

(iii) The likelihood of interconnection between the contaminated groundwater that is a current or potential future source of drinking water due to well construction practices in the area of the state where the site is located.

Wells could be drilled into aquifers below the contaminated zone and be pumped for drinking water purposes. Well construction methods are readily available to seal off such wells from the contaminated zone. Furthermore, the downward migration of contamination is significantly reduced because the site lies within a groundwater discharge zone with upward vertical gradients.

(iv) The physical and chemical characteristic of the hazardous substance

Site groundwater is contaminated with non-aqueous phase liquid (NAPL), aromatic hydrocarbons and PAHs. Available data indicates that dissolved constituents are significantly attenuating with migration.

(v) The hydrogeologic characteristic of the site

The groundwater zone beneath and in the vicinity of the site is hydraulically connected to marine surface water where flow reversals occur during higher tidal levels. This finding is based on the previously discussed groundwater flow directions, and changes in groundwater levels caused by tidal fluctuations.

(vi) The presence of discontinuities in the affected geologic stratum

The upland shallower groundwater zones are truncated by the Thea Foss Waterway channel. Deeper upland groundwater flow occurs upward through coal tar derived materials present and capped in the waterway channel.

(vii) The degree of confidence in any predictive modeling performed

Not applicable as no predictive modeling has been performed for water supply purposes. A numerical model was developed to estimate contaminant loadings to the water way to provide the basis for the head of Thea Foss cap design. This model confirmed the interconnection between the upland and waterway and provided an analysis of groundwater flow paths to surface water.

***(d) Even if groundwater is classified as a potential future source of drinking water under (b) of this subsection, the department recognizes that there may be sites where there is an extremely low probability that the groundwater will be used for that purpose because of the site's proximity to surface water that is not suitable as a domestic water supply. An example of this situation would be shallow groundwater in proximity to marine waters such as on Harbor Island in Seattle. At such sites, the department may allow groundwater to be non-potable for purposes of this section if each of the following conditions can be demonstrated. These determinations must be for reasons other than that the groundwater or surface water has been contaminated by a release of a hazardous substance at the site*.**

***(i) The conditions specified in (a) and (c) of this subsection have been met*.**

The conditions of (a) and (c) are met. Groundwater is not a current source of drinking water and it is unlikely that contaminated groundwater would migrate to areas (or zones) where groundwater is a current or future source of drinking water at concentrations that would exceed groundwater-quality criteria published in Chapter 173-200 WAC.

(ii) There are known or projected points of entry of the groundwater into the surface water

Groundwater beneath the site is discharging to the waterway. This is evident by the observed groundwater seeps that discharge into the waterway at lower tides.

(iii) The surface water is not classified as a suitable water supply source under Chapter 173-201A

The Thea Foss is a marine (salt water) waterway adjacent to the site and is not classified as a suitable drinking water supply.

(iv) The groundwater is sufficiently hydraulically connected to the surface water that the groundwater is not practicable to use as a drinking water source.

Groundwater beneath the site is sufficiently connected to the Thea Foss so that sustained pumping of wells in the site vicinity would likely result in the intrusion of saline surface water into the upper aquifers and wells screened in these aquifers. This groundwater could be treated to reduce salinity, however because of the cost of such treatment, a water purveyor or other entity would avoid installing wells into these aquifers.

Beneficial Use Summary. Groundwater beneath the Site can be classified as non-potable. Groundwater is not used as a drinking water source and is not suitable for future use as a potential source because pumping would likely cause saline water intrusion into the groundwater zones beneath the site. Furthermore, groundwater does not discharge to a potential source of drinking water as the waterway is not a suitable source. The highest beneficial use of groundwater beneath the site is protection of the surface water. Furthermore, municipal water supplies are available. A restrictive covenant is also anticipated as part of the final remedy that will prohibit use of groundwater from the site as drinking water.

Groundwater Discharge to Surface Water. Groundwater beneath the site discharges to surface water. Therefore this exposure pathway is considered complete for protection of aquatic organisms and humans, via consumption of marine organisms.

Volatilization from Groundwater with Vapor Intrusion into Closed Spaces. VOCs have been detected in shallow groundwater but there are no enclosed structures on the site. Therefore, this exposure pathway is not complete.

6.2 Soil Contaminants of Potential Concern (S-COPCs)

Available soil analytical data were compiled for the RI/FS project area and are presented in attached Table 3.2. Sample locations are shown on Figure 3.1a. Soil analyses were conducted for petroleum hydrocarbons, aromatic hydrocarbons, PAHs, cyanide, a number of metals (arsenic, cadmium, chromium, lead, mercury and silver) and total organic carbon as summarized in Section 3.0. Soil contact COPCs are identified below. The soil leaching to groundwater pathway is discussed later in this report.

6.2.1 – Soil Contact Screening Approach

The identified completed soil exposure pathway is soil contact as discussed in Section 6.1.1 above. Possible receptors include casual visitors (primarily to the park area along the shoreline) and subsurface utility workers. The point of compliance is fifteen feet below ground surface [WAC 173-340-740(6)]. Screening for soil contact COPCs was conducted in two steps because the default SL land use assumptions do not match the actual land use within the site, including the park setting along the shoreline and parking/railroad activities beneath and immediately adjacent to the elevated portions of the I-705/SR-509 roadways. The default SLs do provide a conservative basis to eliminate constituents detected in soil and to provide focus on those constituents to be of potential greater concern.

- **Step 1** – An initial screening was completed using SLs based on MTCA unrestricted (WAC 173-340-740) and industrial (WAC 173-340-745) site uses. Method B and Method C soil contact CULs were used, as available. Method A values were used when Method B/C values were not available. The unrestricted site use exposure assumptions provide a conservative set of exposure assumptions for casual visitors to the site (primarily the park) while the industrial use assumption provides a conservative set of exposure assumptions for subsurface utility workers. Possible soil COPCs identified in Step 1 were carried forward to Step 2 for further evaluation.

- **Step 2** – Step 1 possible COPCs were further evaluated using site specific exposure assumptions that are further discussed below.

Method B/C soil contact CULs were generally obtained from Ecology's on-line data base; Cleanup Levels and Risk Calculations (CLARC). The CULs in CLARC are based on the soil cleanup equations and default assumptions listed in WAC 173-340-740 and -745. For those constituents that are classified as carcinogenic (e.g. benzo[a]pyrene) a carcinogenic potency factor (CPF) is required as defined in WAC 173-340-708(8). This section of the MTCA specifies "*a carcinogenic potency factor established by the Environmental Protection Agency and available through the IRIS* [Integrated Risk Information System] *data base shall be used*". In January 2017 (EPA 2017), the CPF for benzo(a)pyrene was changed from 7.3 mg/kg-day to 1.0 mg/kg-day in the IRIS database.

The updated CPF was used to calculate the SLs (using the Method B and C default assumptions) for benzo(a)pyrene listed in attached Table 3.2.

Carcinogenic PAH (cPAH) concentrations were converted to benzo(a)pyrene equivalent (BaPEq.) concentrations using the method described in Ecology guidance (Ecology 2007). This was done by multiplying the individual cPAH concentration by a toxicity equivalency factor (TEF) and summing the results to derive a BaPEq. concentration. In cases were one or more of the individual cPAH concentrations were below the reporting limit, the not-detected concentration was not included in the calculation as the analytical method generally achieved the practical quantitation limits (PQLs) for PAHs. TEFs used to make the calculations are summarized below in Table 6.4.

Table 6.4 – cPAH Toxicity Equivalency Factors

cPAH	TEF
Benzo(a)pyrene	1.0
Benzo(a)anthracene	0.1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.1
Chrysene	0.01
Dibenzo(a,h)anthracene[7]	1.0
Indeno(1,2,3-cd)pyrene	0.1

6.2.2 – Results of Step 1 Soil Contact Screening

Step 1 soil contact SLs are listed in Table 3.2. Based on comparison of the maximum detected soil concentrations with the SLs, the constituents listed in Table 6.5 below were identified as Step 1 S-COPCs and were carried forward for Step 2 screening.

Table 6.5 – Step 1 Soil Contact COPCs

Constituent	Highest Concentration (mg/kg)	SL Soil Contact Unrestricted Site Use	SL Soil Contact Industrial Site Use
Benzene	84	18	2400
2-Methylnaphthalene	710	320	14000
Naphthalene	5200	1600	70000
BaPEq.	375	1	131

Soil contact screening levels are applied to soil less than fifteen feet in depth. Most of the available soil analyses (61 of 89 samples or approximately 68%) were conducted on samples collected from depths of less than 15 feet.

[7] Since the Ecology 2007 guidance was published, the TEF for dibenzo(a,h)anthracene was adjusted from 0.1 to 1.0.

- **Benzene** concentrations exceeded the unrestricted site use soil contact SL (18 mg/kg) in only 3 of 52 samples (5.8%) collected from depths less than 15 feet deep. A concentration of 84 mg/kg was detected in a sample from test pit DA1-5 (3.8 feet), a concentration of 26 mg/kg was detected in a sample from DA1-6 (3.3 feet) and a concentration of 56 mg/kg was detected in a roadway footing excavation (R3-1). None of the samples exceeded the industrial site use soil contact SL of 2,400 mg/kg or the unrestricted site use SL in soil beneath the city park.

- **2-Methylnaphthalene and naphthalene** concentrations exceeded the unrestricted site use soil contact SLs in only 2 of 64 samples (3.1%) collected from depths of less than 15 feet. The exceedances occurred at locations DA1-5 and R1-3. 2-methylnaphthalene concentrations ranged between 550 and 710 mg/kg (unrestricted site use SL is 320 mg/kg) and naphthalene concentrations ranged from 2,500 to 5,200 mg/kg (unrestricted site use SL is 1,600 mg/kg). None of the sample concentrations exceeded the soil contact industrial site use SLs of 14,000 mg/kg (2-methylnaphthalene) and 70,000 mg/kg (naphthalene).

- **BaPEq. Concentrations** exceeded the Step 1 unrestricted site use soil contact SL in 49 of 61 samples (80%) collected from depths of less than 15 feet. Only 2 of 71 samples (1.5%) exceeded the Step 1 industrial site use soil contact SL. A BaPEq. concentration of 158 mg/kg was detected at location DA1-5 (3.8 feet) and 375 mg/kg was detected at location MW-28 (12.5-14 feet). Note that MW-28 is located north of the site boundary on the former Standard Chemical site.

6.2.3 – Results of Step 2 Soil Contact Screening

The greatest potential exposures at the site would likely be associated with installation/repair of subsurface utilities. Casual visitors to the site that disturb site soil have some possible risk of exposure, but the potential is far less than for subsurface utility works as discussed below.

Subsurface Utility Workers. The industrial Method B SL for BaPEq. (131 mg/kg) was exceeded in only two samples and is based on an exposure frequency (EF) of 145 days per year (EF=0.4 * 365 days/yr. = 146 days) for 20 years with an ingestion rate of 50 mg/kg. A survey of utility workers associated with utilities (PSE) and governmental service organizations (e.g. Tacoma Water Department, Tacoma Rail) was conducted by Pioneer Technology Corporation (PTC) in 2014 (PTC 2014) to set remediation levels for cleanup of the Superlon Plastics Property, Tacoma, Washington. The results of the survey were that more realistic EFs for subsurface utility workers were on the order of 0.54 to 1.9 days per year (lower and upper 95th percentile values of the survey) with a mid-point of 1.2 days/year. PTC applied a 10-fold uncertainty factor to the mid-point result to arrive at a recommended EF of 10 days per year.

Using an EF of 10 days per year (EF=10 days/365 days per year=0.028) and assuming a doubling of the default ingestion rate to 100 mg/kg (to account for a possible increased ingestion rate), an SL of 937 mg/kg for BaPEq. is calculated using equation 745-2 in WAC 173-340-745. Another way to view this issue is to calculate what EF would be needed to exceed the highest detected BaPEq concentration. Using Equation 745-2 and an ingestion rate of 100 mg/kg, an EF of 0.069 or 25 days (365 days/year*0.069=25 days) would be required. Based on the limited number of locations where the Method B SL is exceeded (using the industrial land use default assumptions) and the calculations discussed above, BaPEq is not identified as a soil contact COPC for subsurface utility workers. It should be noted that use of an industrial CUL would require that a restrictive covenant be filed for the site.

Casual Visitors. The site includes two general areas including a portion of the George Weyerhaeuser Park and the area to the west including Dock Street, rail lines and under I-705, a portion of which is currently used for parking. Casual visitors would visit the park portion of the site most frequently, especially as South "A" Street is closed and visits, while not restricted to the area west of the park, are far less likely as compared to the park. Visits to the park include strolling along the Thea Foss bank of the waterway on paved walkways, or sitting on benches and the maintained lawn. While access to the park is not restricted, activities such as digging are restricted.

As discussed previously, extensive construction and remediation has been completed on the site since the mid-1980s with the result that remaining MGP residues are covered by roadway abutments, paving, railroad ballast, uncontaminated soil and maintained lawns. These surface covers prevent soil contact exposures to those who visit the TCGS, unless digging occurs into the residues, which is highly unlikely for causal visitors.

The unrestricted land use Method B CUL assumes full time occupation/exposure on a residential site (EF=1.0 or 365 days per year) for a duration of 6 years by children with a daily soil ingestion rate of 200 mg/day. Exposures are also assumed to occur to a depth of fifteen feet, the maximum depth for soil contact point of compliance. Risks caused by exposure assuming unrestricted site uses are quantified by reference to two criteria:

- For carcinogens (benzene and carcinogenic PAHs) – The acceptable cancer risk level for unrestricted site uses is 1 in 1,000,000 or 1*E-6. The degree of carcinogenicity is expressed as a carcinogenic potency factor (CPF); benzene = 0.055 kg-day/mg; benzo(a)pyrene = 1.0 kg-day/mg.

- For non-carcinogens (2-methynaphthalene and naphthalene) – Risk is expressed in reference to a hazard quotient (HQ) where an HQ less than 1.0 is an acceptable risk. The degree of toxicity is expressed as a reference dose (RfD); 2-methylnaphthalene = 0.004 mg/kg-day; naphthalene = 0.02 mg/kg-day.

To provide perspective on the residual soil concentrations for benzene, 2-methylnaphthalene, naphthalene and BaPEq. protective soil concentrations at various EFs were calculated in a similar manner as for subsurface utility workers discussed above. The results were compared to the maximum detected concentration and the Upper 95% Concentration on the Mean (UCL95%)[8] for soil samples collected above a depth of fifteen feet. The results are graphically shown on Figure 6.5 and summarized below in Table 6.6.

Table 6.6 – Estimated Protective EFs – Causal Visitors

Constituent	Protective EF at Highest Conc.	Protective EF at UCL95% Conc.
Benzene	75 to 100 days/yr.	+300 days
BaPEq.	<1 day/yr.	4 to 5 days/yr.
2-Methylnaphthalene	225 to 250 days/yr.	<CUL at 365 days/yr.
Naphthalene	100 to 150 days/yr.	<CUL at 365 days/yr.

EF = Exposure Frequency

The EF analysis using unrestricted site use exposure assumptions and acceptable risk levels indicates that soil contact risks related to benzene, 2-methylbenzene and naphthalene would not exceed applicable criteria (carcinogenic risk of 1E-6 and HQ >1) unless the exposure frequency exceeded 75 to 250 days per year, even assuming exposure to the highest concentrations, the possibility of which is remote to non-existent. Possible soil contact risks to BaPEq. in soil are significantly higher and will be discussed further below. Based on this analysis, BaPEq. is identified as a soil contact COPC.

6.2.4 – Petroleum Hydrocarbons in Soil

Soil analyses for gasoline-range, diesel-range and Method 418.1 petroleum hydrocarbons are available. There is no evidence that lighter-end petroleum fuels such as gasoline were released at the site and data for aromatic hydrocarbons (BTEX) associated with MGP tars that lie within the gasoline carbon range are available. Therefore, the gasoline-range hydrocarbon analyses are not discussed further in this report.

Heavy-oils were used as part of the water gas process. Methods WTPH-D and 418.1 would capture the presence of heavy oils. The non-health based Method A CUL for diesel- and heavy-oil range petroleum fuels is 2,000 mg/kg, set to prevent the accumulation of separate, mobile (free) product on the water table. As summarized in attached Table 3.2, concentrations up to 10,500 mg/kg (Method 418.1) and 15,000 mg/kg (WTPH-D) were detected at locations MW-7 and DA1-5, respectively, within the former MGP footprint. Diesel- and heavy-oil petroleum hydrocarbons in soil are identified as COPCs.

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[8] The UCL95% concentration is one of three criteria used to apply cleanup levels under the MTCA (WAC 173-340-740(7). This value was calculated using the Ecology statistical program MTCA-Stat assuming a log-normal distribution of data.

6.3 Groundwater Contaminants of Potential Concern (GW-COPCs)

Available groundwater analytical data were compiled for the project area and are summarized in Tables 3.3 to 3.5. Sample locations are shown on Figure 3.1a. In the tables, data are summarized by well groupings as follows:

- **MGP Samples** - These are samples from monitoring wells that lie upgradient, within, or downgradient of the former MGP and generally west of Dock Street.

- **Three Tank Area** - Includes samples from monitoring wells on the immediate downgradient side of the Three Tank Area but upgradient of the shoreline. These wells include MW-8 (abandoned), MW-9 and MW-25.

- **Shoreline Well Samples** - Include samples from wells located along the marine water shoreline. Several of the wells are located along the shoreline of the former Standard Chemical Site because they are generally downgradient of the MGP area.

- **Shoreline Seep Samples** – Point of shallow groundwater discharge to surface water adjacent to the Three Tank Area (SEEP-1 and SEEP-2) located within the intertidal zone.

Groundwater analyses were conducted for field parameters (e.g. pH), volatile and semivolatile organic compounds including aromatic hydrocarbons (BTEX) and PAHs, gasoline and diesel range petroleum hydrocarbons, total and dissolved metals, cyanide and a number of conventional parameters (e.g. nitrate, nitrite, chloride). Analytical methods are summarized above in Section 3.0.

6.3.1 Screening of Groundwater Analytical Data

SLs were based on surface water cleanup levels (CULs) obtained from sources listed in WAC 173-340-730(2) including those listed below. Possible SLs include those based on criteria promulgated by the federal government and Washington State[9]:

- Chapter 173-201A WAC (Washington State Surface Water Standards),
- Section 304 Clean Water Act (CWA), and
- National Toxics Rule (40 C.F.R. Part 131)

In 2016, the human health (HH) criteria in WAC 173-201A-240 were revised to account for an increased fish consumption rate of 175 g/day and adjustment to several other exposure assumptions (Ecology 2016). The state criteria were reviewed by EPA and

[9] The CWA and State surface water criteria were revised in 2016. Portions of the Washington State surface water standards were revised in January 2019. However, those revisions do not affect SLs.

some, but not all, the state human health criteria revisions were accepted under the CWA (EPA 2016). Accepted criteria are the same under CWA and WAC 173-201A-240 (e.g. benzene) and, where not accepted, the criteria are different (e.g. benzo[a]anthracene). Both federal and state criteria are listed in attached Table 6.7

It was not necessary to calculate Method B surface water HH criteria using the procedure in the Washington State Model Toxics Control Act (MTCA – WAC 173-340-730), as the calculated criteria would be the same as those in WAC 173-201A-240 using the revised exposure assumptions. Criteria, or data necessary to calculate criteria, are not available for all detected constituents.

SLs were selected from the possible criteria listed in attached Table 6.7 as follows:

- Generally the lowest criteria listed in Table 6.7 were used as the SL (e.g. toluene).

- Where the lowest SL was below the practical quantitation limit (PQL), the SL was set at the PQL (e.g. benzo[a]anthracene).

- SLs for petroleum hydrocarbons were set using the Method A criteria in WAC 173-340-720 to protect drinking water, as surface water criteria are not available.

- The SL for arsenic was set at natural background for Washington State consistent with WAC 173-340-900 (Table 720-1).

- The SL for copper was set using the criterion in 173-201A and CWA as the criterion under NTR 40 CFR 131 (2.4 ug/l) needs to be adjusted using a site specific water effects ratio (WER) which has not been determined for the site.

- Dissolved (filtered) and total metal concentrations were compared to SLs. Total metal SLs were determined using the conversion factors listed in Table 6.7 as the metal SLs to protect aquatic life are typically expressed as the dissolved metal fraction in the water column. The conversion factors are listed in the footnote section of WAC 173-201A-240 (footnote "dd"). The SL for mercury is applied on a total fraction basis per WAC 173-201A-240 (footnote "s").

- Numerical criteria are not available for non-aqueous phase liquids (NAPLs), per se. Groundwater criteria are available for constituents contained in the NAPLs (primarily benzene, PAHs and petroleum hydrocarbons). Physical observation of the presence of NAPL (e.g. wells MW-8, MW-9, MW-25 and MW-27) identify areas of the site to be of potential concern.

Attached Table 6.8 presents a summary of analytical data by location and period in which the samples were collected, along with the proposed SLs and highest detected concentrations. Dissolved metals criteria are generally used to protect aquatic life (except for mercury). The dissolved vs. total recoverable metal issue was addressed by

EPA in 1993 (EPA 1993) to protect aquatic life. In this document EPA stated the following:

> *"It is now the policy of the Office of Water that the use of dissolved metal to set and measure compliance with water quality standards is the recommended approach, because dissolved metal more closely approximates the bioavailable fraction of metal in the water column than does total recoverable metal. This conclusion regarding metal bioavailability is supported by a majority of the scientific community within and outside the Agency. One reason is that a primary mechanism for water column toxicity is adsorption at the gill surface which requires metals to be in the dissolved form."*

Both EPA's National Recommended Water Quality Criteria (EPA 2016) and Washington State's surface water quality standards continue to express most metals criteria to protect aquatic life as the dissolved fraction in the water column, with the exception of mercury.

HH criteria are applied on a total fraction basis [WAC 173-201A-240(5)(b)]. However, the HH criteria are strictly intended to be applied in the surface water column; not in groundwater samples. Total metal concentrations in groundwater are often higher than dissolved concentrations because of soil particles that are entrained in the samples. For initial screening purposes in this RI, dissolved and total metal groundwater concentrations in monitoring well samples were compared to surface water criteria.

The maximum detected constituent concentrations were compared to the lowest SLs to prepare a list of preliminary COPCs as discussed below and highlighted below in Table 6.9. The evaluation focused on data from the analysis of recent (2016 and later) shoreline wells and seeps which are the closest points of groundwater discharge to surface water.

Table 6.9 - Preliminary List of COPCs[10]

Constituent	Comment
Benzene(B), Toluene(T), Ethylbenzene(E)	Commonly associated with MGPs and bulk heavy oil storage
Polycyclic Aromatic Hydrocarbons (PAHs)	
Cyanide	
Petroleum hydrocarbons	Diesel range organics
Arsenic, Copper, Lead, Mercury	Based on both dissolved and total fractions

The following discussion is primarily based on groundwater data collected between 2016 and 2018.

[10] 2,4-dimethylphenol was detected in a sample from MW-7 at 100 ug/l, just above the SL of 97 ug/l. It was detected (16 to 17 ug/l) below the SL in samples from MW-9 where NAPL was present and was not detected in most other samples at a reporting limit of 10 ug/l (Table 3.3). Based on these data, this compound was not identified as a COPC.

- **Diesel Range Organics (DROs)** include constituents such as naphthalene and other low molecular weight PAHs that are present in coal tar, coal tar derived materials and heavy oil. DROs were analyzed in samples collected from shoreline wells MW-24, MW-26, MW-28, MW-29, and MW-30 and Seeps 1 and 2 collected in July 2018. Concentrations exceeded the SL (500 ug/l) in samples from wells MW-24 (1,500 ug/l) and MW-26 (680 ug/l). Concentrations of DRO were either not detected or were detected below the SL in samples from wells MW-28, MW-29, and MW-30. DRO was not detected in the seeps samples (RL=100 ug/l).

  Status as Preliminary COPC – DROs are identified as a preliminary COPC because the SL was exceeded in samples from two shoreline wells and are carried forward for additional evaluation in Section 7.0 below.

- **Benzene** was frequently detected in groundwater samples and is associated with coal tar and coal tar derived waste materials. The SL to protect surface water is 1.6 ug/l. The highest concentrations detected before 2006 and more recently (2016-2018) are summarized below in Table 6.10. As discussed later in this report, benzene concentrations have declined in a number of shoreline wells between 2006 and 2018.

Table 6.10 - Highest Detected Benzene Concentrations (ug/l)

Area	Before 2006	2016 to 2018
SL	1.6	1.6
MGP Area	7,800	na (a)
Hillside Seep	na	87
Three Tank Area	2,300	na (b)
Shoreline (wells)	360	87
Shoreline (seeps)	na	nd (<0.2)

Notes: na – not available; nd – not detected at indicated reporting level; (a) only cross gradient well samples are available; (b) NAPL in wells – wells not sampled.

Status as Preliminary COPC – Benzene is identified as a preliminary COPC because it has been detected above its SL in multiple samples from multiple wells, including the shoreline wells and hillside seep in more recent sampling. It is carried forward for additional evaluation in Section 7 below.

- **Toluene, Ethylbenzene and Xylenes** are associated with coal tar derived materials. SLs for toluene and ethylbenzene are 130 ug/l and 31 ug/l, respectively. Surface water SLs for xylene are not available. The highest concentrations of toluene and ethylbenzene detected before 2006 and more recently (2016-2018) are summarized below in Table 6.11.

Table 6.11 - Highest Detected Toluene and Ethylbenzene Concentrations (ug/l)

Area	Before 2006		2016 to 2018	
	Toluene	Ethybenzene	Toluene	Ethylbenzene
SL	130	31	130	31
MGP Area	930	2,800	na (a)	na (a)
Hillside Seep	na	na	2.4	24
Three Tank Area	150	840	na(b)	na(b)
Shoreline (wells)	9	97	0.32	4.5
Shoreline (seeps)	na	na	nd(<0.2)	nd (<0.2)

Notes: na – not available; nd – not detected at indicated reporting level; (a) only cross gradient well samples are available; (b) NAPL in wells – wells not sampled.

Status as Preliminary COPCs – Toluene and ethylbenzene are not identified as COPCs because the recent (2016 to 2018) concentrations detected in the shoreline wells and seeps, and hillside seep are below SLs. As a practical matter, toluene, ethylbenzene and xylenes will be part of future monitoring because they are typically analyzed with benzene.

- **Polycyclic Aromatic Hydrocarbons (PAHs)**. Attached Table 6.8 summarizes the highest detected concentrations of individual PAHs in groundwater samples collected before 2006 and more recently in 2016 to 2018 for wells and shoreline seeps. Hillside seep sample concentrations are summarized in Table 3.6. The 2016 to 2018 data were used to identify PAH COPCs for evaluation as these data are more representative of current site conditions and were collected at or near the likely point of compliance. Carcinogenic PAH (cPAH) concentrations were converted to benzo(a)pyrene equivalent (BaPEq) concentrations in a similar manner as for those in soil discussed in Section 6.1.1. TEFs used to calculate BaPEq concentrations in soil are listed in Table 6.4 above.

  The highest concentrations of acenaphthene, fluorene and BaPEq. exceeded their respective SLs as summarized in Table 6.12 below. Acenaphthene and fluorene are low molecular weight PAHs (LPAHs) while the BaPEq. concentrations represent the cPAHs listed in Table 6.4. These identified LPAHs and cPAHs, along with benzene, are considered indicator hazardous substances for MGP waste materials containing high concentrations of PAHs.

Table 6.12 - Highest Detected Concentrations (ug/l) of Target PAHs

Area	Before 2006			2016 to 2018		
	Acenaph-thene	**Fluorene**	**BaPEq.**	**Acenaph-thene**	**Fluorene**	**BaPEq (TEQ)**
SL	**30**	**10**	**0.01**	**30**	**10**	**0.01**
MGP	500	160	64	na (a)	na (a)	na (a)
Hillside Seep	na	na	na	13	10.4	nd (<0.01)
Three Tank	1700	1600	105	na(b)	na(b)	na(b)
Shoreline (wells)	107	17	0.49	215	92	0.05
Shoreline (seeps)	na	na	Na	0.03	nd(<0.01)	nd (<0.01)

Notes: na – not available; nd – not detected at indicated reporting level; (a) only cross gradient well samples are available; (b) NAPL in wells – wells not sampled.

Status as Preliminary COPC – Acenaphthene and fluorene are identified as preliminary COPCs because they are associated with MGP waste materials and have been detected near to (wells MW-29 and MW-30) or above (wells MW-24 and MW-28) their respective SLs in one or more samples from wells located along the site shoreline. They were carried forward for additional evaluation in Section 7.0 below. BaPEq. is also carried forward for additional evaluation in Section 7.0 because cPAHs are major components of MGP waste materials.

- **Metals.** As summarized in Table 6.8, dissolved and/or total arsenic, copper, lead, and mercury exceeded their respective surface water SLs in one or more samples collected in the period 2016 to 2018.

  Status as Preliminary COPC – Arsenic, copper, lead and mercury are identified as preliminary COPCs because of detections above their respective SLs in samples from several shoreline wells collected in July 2018. They are carried forward for additional evaluation in Section 7.0 below.

- **Cyanide**. Data collected prior to 2016 suggested that cyanide might exceed SLs. In July 2018, samples collected from wells MW-24, MW-26, MW-28, MW-29, and MW-30, and Seeps 1 and 2 were analyzed for total cyanide. Concentrations ranged between not detected (RL=5 ug/l) to 97 ug/l. All sample concentrations were below the HH criteria. However, samples from MW-24, MW-26, MW-29, MW-30 and Seep S-2 exceeded the SL of 1.0 ug/l.

  Status as Preliminary COPC – Cyanide is identified as a preliminary COPC because it was detected above its SL in samples from several shoreline wells and Seep 2 collected in July 2018. It is carried forward for additional evaluation in Section 7.0 below.

7.0 NATURE AND EXTENT OF CONTAMINATION

For discussion purposes, the TCGS project site was divided into areas based on historical activities as generally shown on Figure 7.1. The areas include the following:

- **Gas Plant (MGP) Area** - generally includes the former TCGS footprint and the immediate adjacent area, including South "A" Street and the DA-1 subsurface drainage system. This area lies within the northwest portion of the project site west of Dock Street and the railroad tracks.

- **Three Tanks Area** - located within and to the east of the former location of three above ground storage tanks, beneath and east of Dock Street.

- **Storm Water Pipeline Area** - The area where the former storm water discharge pipe connected the DA-1 subsurface drainage system to outfall 237W.

Identified preliminary COPCs by media and exposure pathway are summarized below in Table 7.1.

Table 7.1 – Preliminary COPCs

Constituent	**Soil**		**Groundwater**
	Contact	**Leaching to Groundwater**	**Discharge to Surface Water**
NAPL	X	X	
Benzene		X	X
Petroleum Hydrocarbons	X (a)	X	X
Acenaphthene		X	X
Fluorene		X	X
BaPEq.	X	(b)	(b)
Cyanide		X	X
Metals		X	X

X – Identified as a COPC; (a) Based on the non-health based Method A CUL - WAC 173-340-900; Table 720-1 to prevent accumulation of mobile product on water table, (b) Carried forward for additional evaluation - see Section 7.2.1 below.

7.1 Coal Tar and Coal Tar Derived Material Observations

The primary waste material of concern at MGPs is coal tar that contains high concentrations of volatile aromatic hydrocarbons (benzene, toluene, ethylbenzene and xylenes) and semivolatile PAHs. Visual indications of coal tar or coal tar derived materials (such as creosote) on geologic logs include the presence of tarry material, oily sheens, and the presence of non-aqueous phase liquids (NAPLs) in monitoring wells. Soil vapor concentrations may also be elevated where MGP tar residues reside and were used to support the visible observations documented on the test pit and well logs. At this site, oily materials/NAPLs were also observed to be present in DA-1 line storm water catch basins (now sealed) and in a number of wells (discussed below).

7.1.1 – Visible Indications of Coal Derived Materials

Figure 7.1 illustrates the locations where MGP waste materials were noted based on physical observations and supported by vapor measurements using a photoionization detector (PID). Visible evidence indicated the presence of MGP residue materials within and adjacent to the MGP area. Tarry/oily materials were encountered in near surface and deeper soils. During the drilling of MW-27 "*visible oily globules*" were observed at a depth of 26 feet near the contact of sand and underlying silty clay logged as the DSU (Figure 5.2). Oily materials and sheens were observed during the drilling of wells MW-8, MW-25 and MW-9 on the immediate east side of the former three tank area at depths between approximately 10 and 25 feet. "*Black oily nodules*" were detected in soils less than 10 feet deep during the drilling of MW-15, located near the former storm water pipeline. The source of this latter material is unclear, but may be related to oily material leakage from the storm water pipe or excavation activities during pipe installation/abandonment.

Light (Less Dense) NAPLs (LNAPLs) – Light NAPLs are materials that are immiscible in water and are less dense than water. If present and of sufficient volume, LNAPLs will accumulate on the water table and migrate in the prevailing direction of groundwater flow and will migrate into wells if the wells are screened across the water table (see upper graph on Figure 5.5 for wells screened across or near the water table).

Evidence of small amounts of LNAPL have been detected in wells MW-9 and MW-25 located along the former perimeter of the three tank enclosure during the recent sampling rounds (2016 to 2018). The amounts are summarized below:

- MW-9 – Sheen to 0.02 feet.
- MW-25 – 0.01 to 0.15 feet

LNAPLs have not been detected in any of the wells located downgradient of wells MW-9 and MW-25 and along the shoreline. No visible sheens have been observed along the three tank area shoreline.

Dense NAPLs (DNAPLs) - Dense NAPLs are materials that are immiscible in water and are denser than water. In contrast to LNAPLs, DNAPLs can migrate to and below the water table in soil pores. Evidence for the presence of DNAPL was detected in wells MW-8, MW-9, MW-25 and MW-27 as summarized below in Table 7.2.

Table 7.2 – Range of DNAPL Thicknesses (in feet)

Well	Thicknesses	Period
MW-8	0.13 to 3	October 1998 to July 2000
MW-9	0.01 to 1.0	October 1998 to April 2018
MW-25	0.2 to 0.85	April 1999 to April 2018
MW-27	1.4	July & October 2017

DNAPL thicknesses have varied between the measurement periods. Thickness trends are shown on Figure 7.2. Data used to prepare Figure 7.2 were obtained from Geoengineers (2000) and during the recent monitoring completed by DOF (2016c, 2017a,c,e, 2018a). The greatest thicknesses were reported for wells MW-8 and MW-9 in late October 1998. DNAPL was removed from the indicated wells on two occasions:

- October 29, 1998 – Ten gallons from wells MW-8 and MW-9
- April 29, 1999 – Five gallons from wells MW-8, MW-9 and MW-25[11]

Recent measurements indicate DNAPL thicknesses of approximately 0.02 feet in Well MW-9, 0.2 to 0.85 feet in Well MW-25, and 1.4 feet in Well MW-27. It does not appear that the DNAPL removals completed in 1998 and 1999 had an appreciable impact on thicknesses in wells MW-9 and MW-25, as those currently measured are similar to those measured in the past.

DNAPLs have not been detected in any of the wells located downgradient of the three tank area along the shoreline or downgradient of the MGP footprint. It appears that DNAPL has accumulated on top of the low permeability DSU in the vicinity of Well MW-27.

7.2.1 Nature and Extent of Groundwater COPCs

Using the identified preliminary GW-COPCs, the nature and extent of groundwater contamination was evaluated and a final determination was made on whether a preliminary COPC should be identified as a COPC to carry forward to the FS. For discussion purposes, the evaluation was based on relative well depths in relation to the water table and well depths. Groundwater analytical data for the identified COPCs were divided into shallow, intermediate and deeper well depth samples as summarized in Table 5.2. The shoreline and hillside seep data are discussed with the shallow well sample results.

Benzene Concentrations. Average benzene concentrations are plotted on Figures 7.3a to 7.3c. Concentrations exceeding the SL of 1.6 ug/l were detected in samples from the three depth zones with the highest concentrations being detected in the shallow zone samples (in the past up to 5,700 ug/l in a sample from HC-MW-7). The estimated area with concentrations above the SL include the former MGP footprint and three tank area

[11] DNAPL was first discovered in well MW-25 in April 1999. It had not been detected before this time.

up to the shoreline as illustrated on the figures. However, benzene has not been detected in the two shoreline seep samples where shallow groundwater discharges to the waterway (reporting limit or RL of 0.2 ug/l – during four sampling rounds). An average benzene concentration of 49.7 ug/l was detected in three hillside seep samples. Benzene was not detected in the sample obtained in July 2018.

Figures 7.4a and 7.4b show the subsurface benzene concentration patterns along and perpendicular to the shoreline. Average concentrations above the SL (8.1 to 47 ug/l) are present in shallow and intermediate well samples along the three tank area shoreline. In historic deeper samples from wells MW-17A and -17B (Section N-S on Figure 7.4a) average concentrations were between 47 and 71 ug/l. Figure 7.4b shows the interpreted relationship between shallow groundwater and the shoreline seeps. The data indicate that as groundwater flows to the seeps, benzene concentrations are being attenuated to below the SL. Benzene degradation is supported by the following:

- Benzene is well known to degrade in most environments.

- Shallow benzene concentrations immediately upgradient of the seeps and the groundwater/surface water mixing analysis described in Section 5.5 above. Average benzene concentrations in samples from MW-24 and MW-26 were 26 and 47 ug/l, respectively. Assuming that the seeps consist of approximately 75% surface water and 25% groundwater (ratio of 3:1) based on the mixing analysis, if degradation were not occurring, benzene should be detected in the seep samples at approximately 6 and 12 ug/l. Benzene was not detected in the seep samples at a RL of 0.2 ug/l.

The deeper benzene exceedances in samples from MW-17A (average 47 ug/l) and -17B (71 ug/l) occur at elevations of (-)30 to (-50) feet MLLW (Figure 7.4a). Before discharge to the waterway, this groundwater would flow through coal tar derived materials containing benzene capped as part of the Thea Foss remediation (Figure 7.4b).

Any groundwater that flows through the capped materials would contain benzene which appears to be attenuating prior to discharge to the waterway as, benzene was not identified to be of concern for the Thea Foss portion of the Commencement Bay/Nearshore Tide flats (CB/NT) Superfund site. In July 1997, Black & Veatch for the COT installed five well point clusters near 0-feet MLLW into sediment (Geoengineers 2000b). The purpose of the sampling was to characterize the chemical quality of groundwater in sediment and provide data for groundwater modelling. Two of the clusters (WP-3 and WP-4) were installed east of the site (Figure 7.3a). Each cluster consisted of three well points driven to 4, 8, and 12 feet below mudline. Samples were obtained from the well points in June, September and December 1998 and March 1999. Average benzene concentrations are summarized below in Table 7.3:

Table 7.3 Average Benzene Concentrations in Well Points

Well Point Depth (ft)	WP-3 (ug/l)	WP-4 (ug/l)
4	<1	968
8	215	773
12	568	1225

As summarized above, benzene concentrations were highest in the deeper well points and declined an upward direction. In addition, benzene concentrations in the well point samples were substantially higher than those in samples from well MW-17A and MW-17B, or in any of the shoreline well and seep samples collected downgradient of the three tank area, indicating that upland groundwater is not the source of the benzene.

A comparison of historic and more recent benzene data indicate concentrations have declined based on time-series plots of available data presented in Appendix B. Compared to earlier data, lower concentration were present in samples from MW-17B, MW-24, MW-29, MW-26, and MW-16. The concentration of benzene has increased in samples recently collected from MW-30, the cause of which is not known.

> **Benzene - Final COPC Status**: Based on available data, benzene is identified as a COPC because it is a typical constituent of MGP waste materials and is present above the SL in shoreline well samples downgradient of the three tank area.

Diesel-Range Organics (DRO) Concentrations. DRO concentrations for samples collected in July 2018 are plotted on Figures 7.5a and 7.5b. Concentrations exceeding the SL of 500 ug/l were detected in samples from the shallow depth zone at concentrations between 680 and 1500 ug/l (MW-24 and MW-26). DRO concentrations in intermediate zone samples (MW-28, MW-29 and MW-30) were below the SL and ranged from <100 to 350 ug/l. DROs were not detected in the two seep samples at an RL of 100 ug/l.

Figures 7.6a and 7.6b show the subsurface DRO concentration patterns along and perpendicular to the shoreline. Concentrations above the SL were detected in shallow zone wells and were below the SL in deeper wells and the seep samples. The data indicate that as groundwater flows to the seeps, DRO concentrations are being attenuated to below the SL. Degradation is based on the following:

- DROs are known to degrade in most environments.
- Shallow DRO concentrations immediately upgradient of the seeps and the groundwater/surface water mixing analysis described in Section 5.5 above. DRO concentrations in samples from MW-24 and MW-26 were 1500 and 680 ug/l, respectively. Assuming that the seeps consist of approximately 75% surface water and 25% groundwater (ratio of 3:1) based on the mixing analysis, if degradation were not occurring, DRO should be detected in the seep samples at

approximately 350 and 170 ug/l, respectively. DROs were not detected in the seep samples at a RL of 100 ug/l.

DRO Final COPC Status: Based on the available data DRO is identified as a COPC because DRO is present above the SL in shoreline well samples downgradient of the three tank area.

Acenaphthene Concentrations. Average acenaphthene concentrations are plotted on Figures 7.7a to 7.7c. Concentrations exceeding the SL of 30 ug/l were detected in samples from the shallow and intermediate zones located within the MGP footprint and in one shoreline well (shallow zone well MW-24) at an average concentration of 164 ug/l. The SL was not exceeded in the shoreline seep samples (highest concentration 0.02 ug/l) or in the hillside seep samples (10.9 ug/l).

A review of historic and recent acenaphthene data indicate groundwater concentrations have been below the SL along the shoreline, except for samples from well MW-24, based on time-series plots of available data presented in Appendix B. Concentrations have remained stable or have declined in samples from most wells. Increases appear to have occurred in samples from wells MW-24 and MW-29.

Figures 7.8a and 7.8b show the subsurface acenaphthene concentration patterns along and perpendicular to the shoreline. Average concentrations above the SL (164 ug/l) are only present in samples from shallow well MW-24. Figure 7.6b shows the interpreted relationship between shallow groundwater and the shoreline seeps. The data indicate that as groundwater flows to the seeps, acenaphthene concentrations are being attenuated to below the SL. Degradation is indicated by the following:

- Acenaphthene is a low molecular weight PAH that are known to degrade in most environments.

- Shallow acenaphthene concentrations immediately upgradient of the seeps and the groundwater/surface water mixing analysis described in Section 5.5 above. Acenaphthene concentrations in samples from MW-24 and MW-26 were 164 and 7.4 ug/l, respectively. Assuming that the seeps consist of approximately 75% surface water and 25% groundwater (ratio of 3:1) based on the mixing analysis, if degradation were not occurring, acenaphthene should be detected in the seep samples at approximately 41 and 1.9 ug/l, respectively. Acenaphthene was not detected in the seep samples at a RL of 0.02 ug/l.

Acenaphthene Final COPC Status: Based on the available data, acenaphthene is identified as a COPC because it is present above the SL in shoreline well samples from MW-24 downgradient of the three tank area.

Fluorene Concentrations. Average fluorene concentrations are plotted on Figures 7.9a to 7.9c. Concentrations exceeding the SL of 10 ug/l were detected in samples from the shallow and intermediate zones located within the MGP footprint and in one shoreline well (shallow zone well MW-24) at an average concentration of 75 ug/l. The SL was not exceeded or detected in the shoreline seep samples (RL=0.01 ug/l). The average concentration in the hillside seep samples (8.6 ug/l) was also below the SL.

A review of historic and recent fluorene data indicate groundwater concentrations have been below the SL along the shoreline, except for samples from well MW-24, based on time-series plots of available data presented in Appendix B. Concentrations have remained stable or have declined in samples from most wells. Increases appear to have occurred in samples from wells MW-24.

Figures 7.10a and 7.10b show the subsurface fluorene concentration patterns along and perpendicular to the shoreline. Average concentrations above the SL (75 ug/l) were only present in samples from shallow well MW-24. Figure 7.10b shows the interpreted relationship between shallow groundwater and the shoreline seeps. The data indicate that as groundwater flows to the seeps, fluorene concentrations are being attenuated to below the SL. Degradation is indicated by the following:

- Fluorene is a low molecular weight PAH that is known to degrade in most environments.

- Shallow fluorene concentrations immediately upgradient of the seeps and the groundwater/surface water mixing analysis described in Section 5.5 above. Fluorene concentrations in samples from MW-24 and MW-26 were 75 and 1.7 ug/l, respectively. Assuming that the seeps consist of approximately 75% surface water and 25% groundwater (ratio of 3:1) based on the mixing analysis, if degradation were not occurring, fluorene should be detected in the seep samples at approximately 19 and 0.5 ug/l, respectively. Acenaphthene was not detected in the seep samples at a RL of 0.01 ug/l.

Fluorene Final COPC Status: Based on the available data, fluorene is identified as a COPC because it is present above the SL in shoreline well samples from MW-24 downgradient of the three tank area.

BaPEq. Concentrations. Average BaPEq. concentrations are plotted on Figures 7.11a to 7.11c. Concentrations exceeding the SL of 0.01 ug/l were only detected in samples from shallow zone well HC-MW7 located within the MGP footprint. The SL was not exceeded or detected in the shoreline seep samples (general RL=0.01 ug/l) or in the hillside seep sample.

Figures 7.12a and 7.12b show the subsurface BaPEq. concentration patterns along and perpendicular to the shoreline. Average concentrations above the SL were not detected in any of the recent shoreline well or seep samples. Figure 7.12b shows the interpreted relationship between shallow groundwater and the shoreline seeps. The data indicate that BaPEq. constituents are not leaching from soil or NAPL.

BaPEq. Final COPC Status: Based on the available data, BaPEq <u>is not</u> identified as a COPC because it is not leaching from NAPL or soil at concentrations above SLs.

Cyanide Concentrations. Cyanide concentrations (as total cyanide) detected in samples collected in July 2018 are plotted on Figures 7.13a to 7.13c and 7.14a and 7.14b. Concentrations in a number of shallow and intermediate zone well samples and the sample from Seep 2 appear to exceed the SL of 1 ug/l. Shallow zone sample concentrations downgradient of the three tank area were 25 ug/l (MW-24) and 97 ug/l (MW-26). Concentrations in the intermediate zone samples were 29 ug/l (MW-29) and 7 ug/l (MW-30). Cyanide was not detected (RL=5 ug/l) in Seep 1 and was detected at 11 ug/l in Seep 2.

A review of historic cyanide data generally indicated higher concentrations. The highest reported concentration was 255 ug/l in a shallow zone sample from well HC-MW-7 located within the former gas plant area (Figures 7.13a and 7.14b). Cyanide was not detected (RL=10 ug/l) in deeper samples collected in 1996 from wells MW-17A/B and MW-18A/B as illustrated on Figures 7.13c, 7.14a and 7.14b.

Available data indicate that cyanide is attenuating with migration to the waterway. Concentrations in shallow groundwater on the immediate downgradient side of the former MGP were as high as 255 ug/l, declined to a maximum of 97 ug/l downgradient of the three tank area and were either not detected (Seep 1) or detected at 11 ug/l (Seep 2). Degradation is indicated by the following:

- Cyanide in known to degrade in both aerobic and anaerobic environments (ASTDR 2006).

- Shallow total cyanide concentrations immediately upgradient of the seeps and the groundwater/surface water mixing analysis described in Section 5.5 above. Cyanide concentrations in samples from MW-24 and MW-26 were 25 and 97 ug/l, respectively. Seep 1 appears to be located downgradient of MW-24 and MW-26. Assuming that the seeps consist of approximately 75% surface water and 25% groundwater (ratio of 3:1) based on the mixing analysis, if degradation were not occurring, cyanide should be detected in the seep samples at approximately 6 and 24 ug/l, respectively. Total cyanide was not detected in the Seep 1 (RL=5 ug/l) and at 11 ug/l samples at a RL of 0.01 ug/l. Similarly, if Seep 2 were being influenced by groundwater flowing past MW-26, if degradation were not occurring, a concentration of 24 ug/l is estimated.

Total Cyanide Final COPC Status: Based on the available data, total cyanide is identified as a COPC because it is present above the SL in shoreline well and Seep 2 samples downgradient of the three tank area.

Arsenic Concentrations. Arsenic concentrations detected in samples collected in July 2018 are plotted on Figures 7.15a to 7.15c and 7.16a and 7.16b. Concentrations in shallow zone well and seep samples downgradient of the three tank area were below the SL of 5 ug/l. Concentrations of total and dissolved arsenic above the SL were detected in intermediate zone wells MW-28 and MW-30 at concentrations of approximately 11.5 to 20 ug/l. A consistent pattern of SL exceedances is not evident in the data.

A review of historic arsenic data indicated that arsenic was detected in a sample from shallow well MW-10 at between 20 ug/l (dissolved) and 32 ug/l (total) in 1993. In 1996, dissolved arsenic was not detected in samples from shallow well MW-16 and deeper wells MW-17A/B and MW-18A/B at an RL of 10 ug/l.

The source of arsenic appears to be naturally occurring based on the following:

- Twenty-six soil samples were analyzed for total arsenic as summarized in Table 3.2. Arsenic concentrations ranged from 0.2 to 8 mg/kg where detected. Arsenic was not detected in fifteen soil samples at a reporting limit of 5 mg/kg. These concentrations are at or below the Puget Sound background concentration of 7 mg/kg (Ecology 1994).

- Arsenic leaching is largely dependent on the oxidation-reduction conditions in the aquifer in a similar manner as that for ferrous/ferric iron. Arsenic becomes more soluble (leachable as arsenite) with increased reducing groundwater conditions as occurs with the degradation of hydrocarbons. The presence of arsenic is used to determine if anaerobic biological activity is solubilizing arsenic from aquifer matrix material (EPA 1998). The oxidation potential would increase in the presence of oxygen, such as would be expected where groundwater mixes with surface water.

- For the most part, arsenic concentrations are higher in the samples from the wells (up to 19/20 ug/l) as compared to the seeps (2.5 ug/l or lower). Dissolved oxygen concentrations and the reduction-oxidation potential of the seeps are higher in the seep samples as compared to the groundwater samples.

Arsenic Final COPC Status: Based on the available data, arsenic is identified as a COPC because it is present above the SL in shoreline well samples from MW-28 and MW-30 downgradient of the three tank area.

Copper Concentrations. Copper concentrations detected in samples collected in July 2018 are plotted on Figures 7.17a to 7.17c and 7.18a and 7.18b. Concentrations in shallow and intermediate zone well samples and the Seep 2 sample were below SLs. Total and dissolved concentrations in Seep 1 samples were just above the SL (3.8 ug/l vs. 3.7 ug/l total; 3.2 ug/l vs. 3.1 ug/l dissolved).

> **Copper Final COPC Status**: Based on the available data copper is not identified as a COPC. While copper concentrations in the Seep 1 samples marginally exceed the SL, none of the upgradient well sample concentrations exceeded the SL.

Mercury Concentrations. Mercury concentrations detected in samples collected in July 2018 are plotted on Figures 7.19a to 7.19c and 7.20a and 7.20b. Mercury was not detected in samples from shallow and intermediate zone well samples and the Seep 2 sample at an RL of 0.10 ug/l. Mercury was only detected (total fraction) in the sample from Seep 1 at a concentration of 0.12 ug/l, just above the RL.

In 1996, samples from shallow wells MW-10 and MW-16, and deep wells MW-17A/B and MW-18A/B were analyzed for dissolved mercury. Mercury was not detected at RLs between 0.2 ug/l and 0.5 ug/l.

The detection of total mercury in the Seep 1 sample was likely caused by a small amount of suspended solids in the sample. Seep 1 had a total suspended solids (TSS) concentration of 6 mg/l as compared to the TSS concentration of 2 mg/l in the Seep 2 sample where total mercury was not detected.

> **Mercury Final COPC Status**: Based on the available data, mercury is not identified as a COPC. Mercury was not detected in most of the samples. However, the RLs were above the SL of 0.025 ug/l and it is recommended that mercury be included in later sampling rounds using a low level analysis to achieve a lower RL.

7.2.2 Nature and Extent of BaPEq. And Petroleum Hydrocarbons in Soil

BaPEq. and petroleum hydrocarbons are identified as soil COPCs. The nature and extent of these constituents in soil are discussed below.

BaPEq. In Soil. BaPEq. is identified as a soil contact COPC. Its general concentration pattern with depth is illustrated by the histogram on Figure 7.21. The highest detected concentration was encountered in soil between zero and six feet below ground surface. The estimated UCL95% concentration for soil between zero and six feet, and between zero and fifteen feet within the TCGS boundary are estimated at 206 and 60 mg/kg, respectively.

BaPEq. concentrations are plotted on Figure 7.22a to 7.22e. The plots show the sample density and BaPEq. soil concentrations at depth intervals of five to six feet. Within the upper fifteen feet of soil, the highest concentrations (up to 192 mg/kg at location HC-MW7) are present beneath the former MGP footprint at depths of less than six feet. Lower concentrations are present beneath and adjacent to the three tank area where available data indicate concentrations from 0.6 to 6.7 mg/kg in soil less than six feet deep (Figure 7.22a). The highest detected concentration in the three tank area was 63 mg/kg detected in a sample collected from MW-8 at a depth of between six and ten feet (Figure 7.22b).

Relatively higher BaPEq. concentrations were detected in deeper soil north of the TCGS boundary on the Standard Chemical site. Concentrations greater than 100 mg/kg were detected at depths between ten and twenty-five feet as illustrated on Figures 7.12a and 7.22c to 7.22e. BaPEq. concentrations in these deeper soils are interpreted to be associated with releases from the Standard Chemical site.

Petroleum Hydrocarbons. Petroleum hydrocarbon (TPH) concentrations are plotted on Figures 7.23a to 7.23e. As with BaPEq. concentrations, the highest concentrations were detected in soil less than six feet deep within the MGP foot print (Figure 7.23a). Concentrations up to 9,400 mg/kg (DA1-5) were detected. Deeper concentrations in the MGP footprint ranged between 3,500 to 6,700 mg/kg at location HC-MW7.

Lower TPH concentrations were detected in the three tank area where concentrations between 250 and 2,500 mg/kg were detected. The highest concentration was detected at MW-9 in a sample collected at a depth of between fifteen and twenty feet.

Higher concentrations were detected in soils samples north of the TCGS boundary that appear related to releases from the Standard Chemical site. TPH concentrations up to 15,000 mg/kg were detected in a sample from MW-12 collected between depths of fifteen to twenty feet. TPH concentrations up to 10,500 mg/kg were detected at location MW-10. TPH concentrations in these deeper soils are interpreted to be associated with releases from the Standard Chemical site.

7.2.3 Leaching of Soil Constituents to Groundwater

Benzene, DRO, acenaphthene, fluorene, cyanide, and arsenic are identified as groundwater COPCs because they have been detected in groundwater samples above SLs in shoreline wells. While they are identified as COPCs, benzene, DRO, acenaphthene and fluorene have not been detected in shoreline seep samples that discharge to the waterway. While arsenic has been detected in the seep samples, concentrations are below the SL.

The source of these groundwater COPCs are leaching from subsurface soil and NAPL that contain these constituents. While leaching is occurring, the available data indicate that concentrations are attenuating (including degrading) with migration and prior to discharge to the waterway.

8.0 SUMMARY AND CONCEPTUAL MODEL

Based on the available data, a conceptual model of the site conditions was developed as described below:

- A manufactured gas plant (MGP) operated on the west slope facing the Thea Foss Waterway from approximately 1884 to 1924. Both coal gas and carbureted water gas processes were used at the plant. Gas production ended in 1924, although the northern most gas holder was used until the mid-1950s.

- Releases of MGP tars and oils occurred within the MGP manufacturing and gas storage area. DNAPL is present in one well (MW-27). Aromatic hydrocarbons (BTEX) and PAHs are the primary COPCs at MGPs. Cyanide is also associated with MGPs.

- Over a period of decades, the MGP was dismantled and some of the demolition debris was placed in the gas holders. Fills imported to the site eventually covered the remaining plant facilities and the presence of the plant remained generally unknown until the mid-1980s, when geotechnical drilling associated with the construction of I-705 discovered the presence of MGP waste materials.

- Three oil storage tanks were constructed east of the MGP in about 1912 in the area beneath a portion of Dock Street. While the plant operated, the tanks stored heavy oil used in the carbureted water gas process. From 1931 to 1975 the tanks were used by a variety of companies that stored petroleum products, Raylig and creosote. The tanks were removed in 1977 when a 30-inch sewer line was installed and Dock Street was realigned. Creosote is a distilled coal tar, and similar to coal tar, aromatic hydrocarbons and PAHs are the primary COPCs. Releases of heavy-oil and coal tar derived materials occurred to soil and groundwater beneath the former three tank area. Separate phase product has been detected in wells situated on the immediate downgradient side of where the tanks formerly existed.

- As part of construction of the I-705 road way and SR-509 interchanges, a substantial volume of demolished plant facilities (e.g. piping containing tar, demolished gas holder debris, coal tar waste materials, etc.) and contaminated soils were excavated and removed from the site. These materials included 16,000 tons of hazardous waste and 26,500 tons of non-hazardous waste. These materials were disposed of off-site.

- Testing completed after the construction of I-705/SR-509 and installation of the sewer line in the former three tank area indicated that contaminated residuals remain in soil. I-705 was constructed (piers, retaining walls, embankments, etc.)

over the former location of the gas plant and a sewer line/Dock Street were constructed over the three tank area.

- In 1986, WSDOT installed a sub-drain system (referred to as the DA-1 Sub-drain System) to stabilize the roadbed of South "A" Street (now closed). The system was installed within the former gas manufacturing area and collected contaminated groundwater and oily gas plant waste material containing PAHs. The system was connected to the South "A" Street storm drainage system that discharged to the Head of the Thea Foss Waterway. After several attempts to prevent contaminated materials from entering the storm drainage system, the DA-1 sub-drain was disconnected from the storm system in 2003 (i.e. the storm drainage system was abandoned). For some period prior to the closing of South “A” St. (when the D Street overpass was constructed), storm water was pumped to an infiltration basin located on the east side of I-705. Currently, during the wetter portion of the year, water ponds at the bottom of South "A" Street. When pond levels rise to a certain level, water migrates to the east and infiltrates into railroad ballast.

- A low volume seep (hillside seep) is located on the north side of South “A” Street. The seepage water contains benzene and PAHs and mixes with storm water at the bottom of South “A” Street.

- The western portion of the site (west of the park) is zoned “WR” – Warehouse/Residential District while the portion of the site along the waterway is zoned “S8” – Shoreline District. Current land uses on the TCGS include parking, park land, roadways and railroad activities. Adjacent land uses are generally commercial in nature. The entire site is covered by paving, structures supporting the roadways, railroad ballast, some landscaping (slopes under I-705), imported uncontaminated soil and well maintained lawns (21st Street Park, now George Weyerhaeuser Park).

- A tar reprocessing plant (Standard Chemical) existed on the west bank of the Thea Foss Waterway and north of the TCGS during the early 1900s. Available data indicate that this plant released coal tar derived materials to the property on which it operated and to the head of the waterway. Standard Chemical waste materials discharged to the waterway were covered by shoreline fills and storm water sediment that was, in turn, covered by an engineered sand cap (in 2004) as part of the waterway remediation. The Standard Chemical site was remediated by Ecology in 2002 and 2003.

- The site is underlain by unconsolidated fills, and deltaic and glacial materials consisting primarily of interbedded sandy gravels, sands and silts. The water table lies at depths of approximately 5 to 10 feet depending on land surface elevation and, along the shoreline, tidal stage.

- Groundwater flows in an easterly direction towards the Thea Foss Waterway. Downward to horizontal hydraulic gradients are present beneath the upland. As the waterway is approached, the hydraulic gradients become steeply vertically upward. Shallow groundwater discharges through shoreline seeps that are visible during lower tides. Testing of seep groundwater discharges indicate COPC concentrations below SLs, except for cyanide. Deeper groundwater flow occurs upward through contaminated sediment and a sand cap before discharging to the waterway. The sand cap was placed in 2004 as part of the remediation of the head of the waterway and was designed to sequester underlying contamination. Fourteen years of monitoring indicate the sand cap is functioning as intended.

- Screening levels to identify contaminants of concern (COCs) were developed based on possible receptors of the remaining contaminated residuals present in soil and groundwater beneath the TCGS project area including the following:

    - Subsurface site workers via the soil contact exposure pathway who may be involved with construction or maintenance that requires soil excavation.
    - Casual visitors to the TCGS, primarily the George Weyerhaeuser Park.
    - Aquatic organisms via groundwater discharge to the waterway.
    - Humans via possible ingestion of aquatic organisms.

  The indoor air (vapor) inhalation exposure is not considered complete because no buildings exist within the project area and it is unlikely that any buildings will be constructed in the future because of existing long-term land uses (interstate highway, local roadway, railroad tracks, small park etc.). Furthermore, any soil excavation would likely occur in well ventilated areas for short periods of time that would substantially reduce inhalation risks to site workers.

  A simplified Terrestrial Ecologic Evaluation (TEE) was completed using guidance in WAC 173-340-7490. The TEE ended when the criteria in WAC 173-340-7491 was met indicating soil contact risks to terrestrial wildlife are low.

  Groundwater beneath the TCGS is connected to marine surface water and is not classified as a potable water supply.

- COPCs were identified based on media and possible receptors as follows:

Table 8.1 - COPCs

Media	Soil		Groundwater
Constituent	**Contact**	**Leaching to Groundwater**	**Discharge to Surface Water**
NAPL	X	X	
Benzene		X	X
Petroleum Hydrocarbons	X (a)	X	X
Acenaphthene		X	X
Fluorene		X	X
BaPEq.	X		
Cyanide	-----	X	X
Arsenic	-----	X	X

X – Identified as a COPC; (a) Based on the non-health based Method A CUL - WAC 173-340-900; Table 720-1 to prevent accumulation of mobile product on the water table.

9.0 DATA GAPS

During analysis of the available information a data gap was identified that is being filled to complete the RI as follows

- The northeastward extent of COPC migration in shallow groundwater from the three tank area needs to be further refined. To fill this data gap a work plan was prepared to include 1) a seep reconnaissance in the vicinity of the former pier, 2) sampling of up to two identified seeps and 3) the drilling and sampling of two wells. Information from this sampling will be incorporated into the FS.

10.0 SITE RISKS AND REMEDIAL ACTION OBJECTIVES (RAOS)

As part of roadway construction, utility relocation and park development, a number of what might be considered interim remedial actions were completed. These actions have reduced site risks to acceptable standards. Most of the facilities associated with the former MGP and a large volume of MGP waste materials and contaminated soil were removed from the site. Furthermore, the entire site is now covered with materials that prevent contact with underlying soils (without significant digging) and testing of shallow groundwater discharge to the waterway (via shoreline seeps) indicates COPC concentrations below SLs, except for cyanide in one of two seeps.

Based on the available data, the following Remedial Action Objectives (RAOs) were developed for the site.

- **RAO 1 – Reduce Risks to Subsurface Utility Workers and Casual Visitors.** Soils containing COPCs are covered by roadway piers, retaining walls, embankments, paving, maintained lawns and uncontaminated imported fill.

  - **Subsurface Utility Workers**. A site specific risk assessment indicates acceptable risk via soil contact to subsurface utility workers under existing conditions. These risks could be further reduced by requiring a restrictive covenant to notify such workers of the contamination and require a health and safety plan meeting the requirements of WAC 173-340-810 as part of the work planning. Such a plan should also describe how any disturbed materials that would be transported off-site be handled and disposed.

  - **Casual Visitors**. Risk to casual visitors under existing conditions are acceptable (low to non-existent) provided the existing cover materials are not disturbed by digging. The potential for digging by such visitors is low, as most areas are covered with hard paving, maintained lawns and railroad ballast. Some exposed cover soil is present beneath I-705 that shows some signs of minor erosion by storm water runoff that should be repaired. Placement of relatively permeable coarse materials in this area, such as quarry spalls, would be a means to minimize erosion and the potential for uncontrolled digging.

- **RAO 2 – Prevent Groundwater Use as Drinking Water Supply.** Groundwater beneath the impacted area is not classified as a potable water supply. It is unlikely that groundwater would be extracted in the future based on site land use, location next to a marine waterway, and the availability of a municipal water supply. Consistent with MTCA, a restrictive covenant preventing such use, would further reduce the potential for exposure via this pathway.

- **RAO 3 – Reduce Potential for NAPL and COPC Migration to Waterway**. Available data indicate that NAPL detected in wells adjacent to the former three tank area (MW-8, MW-9 and MW-25) is not migrating to the waterway. This is based on the logs, observations and soil/groundwater analytical data from shoreline wells (MW24, MW26, MW29, and MW30). In 1998 and 1999, approximately 15 gallons of NAPL was removed from the wells noted above. Although available data indicate NAPL is not migrating to the waterway, additional NAPL could be removed from the wells or NAPL containing soil could be removed reducing even further the potential for NAPL migration.

- **RAO 4 – Prevent Hillside Seepage COPCs From Mixing With Storm Water**. A low volume seep on the north side of South “A” Street contains benzene above the SL. This seepage water mixes with storm water at the bottom of the street near the railroad grade where ponded water infiltrates. During the FS, alternatives to address the Hillside seep will be evaluated.

11.0 CLOSING

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, expressed or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

12.0 REFERENCES AND DATA SOURCES

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TABLE 3.2 - Summary of Soil Analytical Data (a)

Location	DA1-1	DA1-2	DA1-3	DA1-4	DA1-5	DA1-6	DA1-7	TP10	TP10	TP10	TP-11	TP-11	TP-11
Date	10/19/93	10/19/93	10/19/93	10/19/93	10/19/93	10/19/93	10/19/93	9/27/95	9/27/95	9/27/95	9/27/95	9/27/95	9/27/95
Source	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96
Depth (feet)	3.3	3.0	4(b)	4.3	3.8	3.3	4 (b)	3-4	5-6	9-10	2-3	5-6	7-8
WTPH-G	<25	na	330	37	4600	1900	-----	-----	-----	-----	-----	-----	-----
TPH-418.1	935	86.2	1500	256	476	429	209	-----	-----	-----	-----	-----	-----
WTPH-D	180	na	2200	290	9400	4700	-----	-----	-----	-----	-----	-----	-----
Cyanide	<1.0	<1.0	<1.0	<1.0	<1.0	1.05	1.36	-----	<0.05	<0.05	-----	-----	-----
Benzene	<0.01	<0.01	0.41	<0.01	84	26	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.01	<0.01	6.1	0.06	24	10	0.38	0.019	0.066	0.052	0.007	0.007	0.01
Toluene	<0.01	<0.01	3	0.03	210	77	0.41	<0.005	<0.005	<0.005	<0.005	<0.005	0.008
Xylenes	<0.01	<0.01	17	0.38	280	110	2.9	0.015	0.23	0.1	0.008	0.008	0.01
Arsenic	-----	-----	-----	-----	-----	-----	-----	<5	<5	<5	<5	<5	<5
Cadmium	-----	-----	-----	-----	-----	-----	-----	0.26	0.16	0.53	0.32	0.51	0.44
Total Chromium (III/IV)	-----	-----	-----	-----	-----	-----	-----	21.1	24.8	27.5	21.9	27.3	18.5
Lead	-----	-----	-----	-----	-----	-----	-----	23	8	102	17.2	68.5	46.1
Mercury	-----	-----	-----	-----	-----	-----	-----	0.17	0.63	0.38	0.08	0.35	0.11
Silver	-----	-----	-----	-----	-----	-----	-----	<0.7	1.8	1.8	1.8	10.7(d)	<0.7
Total Organic Carbon	28000	550	6400	8700	23700	16700	8000	-----	-----	-----	-----	-----	-----
Acenaphthene	<0.38	<0.44	8.7	0.6	27	9.5	3.1	<0.33	<33	<33	<3.3	0.39	<3.3
Acenaphthylene	1.1	<0.44	83	2.3	400	130	25	<33	4.5	<33	<3.3	0.21	0.61
Anthracene	1	<0.44	38	2.9	150	53	17	<33	3.0	1.9	0.11	0.68	0.58
Benzo(g,h,I)Perylene	1.5	<0.44	10	1.9	35	15	11	<33	<33	<33	<3.3	0.18	0.17
Fluroanthene	5.1	<0.44	63	7.7	230	89	51	3.3	5.9	3.7	0.38	2.33	1.65
Fluorene	0.71	<0.44	50	2.9	240	78	20	<33	3.4	<33	<3.3	<3.3	<3.3
2-Methylnaphthalene	<0.38	<0.44	55	2.6	710	190	20	<33	5.3	<33	<3.3	<3.3	<3.3
Naphthalene	1	<0.44	200	9.7	5200	730	46	<33	<33	3.1	<3.3	0.26	0.4
Phenanthrene	3.8	<0.44	150	11	720	200	88	3.3	11.5	6.4	0.31	2.41	1.41
Pyrene	6.6	<0.44	82	8.1	320	110	64	3.7	6.9	3.9	0.44	2.48	1.78
Benzo(a)Anthracene (j)	3	<0.44	27	3.5	120	44	29	1.8	2.7	1.6	<3.3	0.92	0.73
Benzo(b)fluoranthene (j)	2.3	<0.44	14	2.3	59	24	16	1.4	1.9	<33	<3.3	0.73	0.75
Benzo(k)fluoranthene (j)	2.4	<0.44	15	1.9	62	24	14	<33	<33	<33	<3.3	0.47	0.35
Benzo(a)Pyrene (j)	3.3	<0.44	24	3.2	110	40	23	1.9	2.7	1.6	<3.3	0.98	0.96
Chrysene (j)	3.2	<0.44	28	3.6	120	46	26	1.9	3.2	2.0	<3.3	1.2	0.96
Dibenzo(a,h)Anthracene (j)	0.6	<0.44	5.6	0.71	19	8.7	6.1	<33	<33	<33	<3.3	0.26	0.28
Indeno(1,2,3-cd)Pyrene (j)	1.4	<0.44	9	1.7	35	14	11	<33	<33	<33	<3.3	0.49	0.5
Dibenzofuran	<0.38	<0.44	6.5	1.7	32	14	3.4	-----	-----	-----	-----	-----	-----
BaPEq (TEQ) (k)	4.8	0.53(nd)	36.4	4.9	158	59.8	36.4	22.0	23.0	23.2	<4.0(nd)	1.5	1.5

Notes: See last page of table.

TABLE 3.2 - Summary of Soil Analytical Data (a)

Location	TP-12	TP-12	TP-12	TP-13	TP-13	TP-13	TP-15	TP-15	TP-15	TP-16	TP-16	TP-16	R2-1	R2-2
Date	9/27/95	9/27/95	9/27/95	9/29/95	9/29/95	9/29/95	9/29/95	9/29/95	9/29/95	12/20/95	12/20/95	12/20/95	Nov-95	Nov-95
Source	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96
Depth (feet)	2-3	5-6	8-9	2-3	6-7	10-11	2-3	5-6	10-11	0-2	2-4	4-10	(e)	(e)
WTPH-G	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
TPH-418.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
WTPH-D	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cyanide	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-----	-----	-----	-----	-----
Benzene	<0.005	0.063	<0.005	-----	-----	-----	-----	-----	-----	<0.005	<0.005	0.004	<0.25	<0.25
Ethylbenzene	<0.005	33	0.49	-----	-----	-----	-----	-----	-----	<0.005	<0.005	0.003	6.7	27
Toluene	0.004	1.1	0.008	-----	-----	-----	-----	-----	-----	<0.005	<0.005	<0.005	0.45	42
Xylenes	<0.005	45	0.41	-----	-----	-----	-----	-----	-----	0.003	0.003	0.018	5	130
Arsenic	<5	<5	<5	<5	<5	<5	<5	<5	<5	-----	-----	-----	-----	-----
Cadmium	0.21	<0.1	0.15	0.18	0.36	0.15	0.84	0.94	0.15	-----	-----	-----	-----	-----
Total Chromium (III/IV)	15.5	8.7	11.1	11.3	14.7	20.4	19.6	22.1	26.8	-----	-----	-----	-----	-----
Lead	20.4	3	6.2	10	32.9	3.6	154	188	4	-----	-----	-----	-----	-----
Mercury	0.07	<0.05	0.05	<0.05	<0.05	0.16	0.13	0.33	<0.05	-----	-----	-----	-----	-----
Silver	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	-----	-----	-----	-----	-----
Total Organic Carbon	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Acenaphthene	<3.3	38	4.28	<3.3	<33	<0.33	<33	<66	<0.33	7.82	<0.33	0.45	<190	<160
Acenaphthylene	7.56	213	3.79	0.58	33	<0.33	<33	21	<0.33	4.59	<0.33	0.17	94	280
Anthracene	1.9	107	2.79	0.41	33	<0.33	2.58	45.8	<0.33	9.38	<0.33	0.37	<190	130
Benzo(g,h,I)Perylene	<3.3	10	<3.3	<3.3	<33	<0.33	3.7	7.73	<0.33	<1.7	<0.33	<0.33	<190	<160
Fluroanthene	5.9	141	3.97	1.56	9.69	<0.33	9.83	167	<0.33	20.2	0.19	0.71	64	170
Fluorene	<3.3	141	3.81	<3.3	33	<0.33	<33	23	<0.33	7.2	<0.33	0.36	60	120
2-Methylnaphthalene	<3.3	275	4.67	<3.3	<33	<0.33	<3.3	6	<0.33	8.95	0.33	0.55	83	210
Naphthalene	<3.3	683	10.1	<3.3	<33	<0.33	<33	5	<0.33	4.56	0.81	2.58	360	1400
Phenanthrene	<3.3	323	9.4	0.79	6.27	<0.33	7.9	196	<0.33	25.7	0.42	1.3	190	420
Pyrene	10.34	158	4.59	1.77	10.7	<0.33	9.27	141	<0.33	16	0.17	0.62	94	240
Benzo(a)Anthracene (j)	5.19	58	1.75	0.84	5.77	<0.33	4.1	56.5	<0.33	10.3	<0.33	0.22	<190	70
Benzo(b)fluoranthene (j)	6.61	35	1.25	0.88	6.63	<0.33	4.33	53.8	<0.33	8.37	<0.33	0.21	<190	<160
Benzo(k)fluoranthene (j)	3.23	19	0.53	0.42	4.37	<0.33	2.77	27.1	<0.33	3.82	<0.33	<0.33	<190	<160
Benzo(a)Pyrene (j)	10.53	53	1.73	1.15	8.67	<0.33	5.7	52.5	<0.33	10.4	<0.33	0.24	<190	<160
Chrysene (j)	6.59	69	1.86	1.06	7.53	<0.33	5.33	69.5	<0.33	9.68	<0.33	0.23	<190	100
Dibenzo(a,h)Anthracene (j)	<3.3	<66	<3.3	<3.3	3.97	<0.33	2.32	8.53	<0.33	<1.7	<0.33	<0.33	<190	<160
Indeno(1,2,3-cd)Pyrene (j)	4.57	19	<3.3	0.66	5.27	<0.33	3.37	26.1	<0.33	4.15	<0.33	<0.33	<190	<160
Dibenzofuran	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BaPEq (TEQ) (k)	14.2	99.8	3.9	3.1	14.9	<0.4(nd)	9.5	78.1	<0.4(nd)	14.0	<0.4(nd)	0.483	<229(nd)	192

Notes: See last page of table.

TABLE 3.2 - Summary of Soil Analytical Data (a)

Location	R2-3	R2-4	R3-1	R3-2	SD-1	SD-2	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-8
Date	Nov-95	Nov-95	Nov-95	Nov-95	Nov-95	Nov-95	11/4/93	11/4/93	11/4/93	11/4/93	11/4/93	11/4/93	11/4/93	11/2/93
Source	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94
Depth (feet)	(e)	(e)	(g)	(f)	(h)	(h)	0-2	2-4 (b,c)	4-6 (c)	6-8	8-10(b)	10-12(b)	22-24	0-2
WTPH-G	-----	-----	-----	-----	-----	-----	-----	<25	<25	-----	1300	530	<25	-----
TPH-418.1	-----	-----	-----	-----	-----	-----	62	770	314	130	1540	376	2930	<50
WTPH-D	-----	-----	-----	-----	-----	-----	-----	880	190	-----	3700	6700	3500	-----
Cyanide	-----	-----	<1	<1	na	-----	1.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	0.83	2.3	56	1.3	0.026	0.75	<0.01	<0.01	<0.01	<0.01	8.4	1.9	<0.01	<0.01
Ethylbenzene	17	35	17	0.55	<0.25	21	<0.01	<0.01	<0.01	<0.01	40	13	<0.01	<0.01
Toluene	6.1	9.4	92	0.28	0.086	23	<0.01	<0.01	<0.01	<0.01	0.04	0.09	<0.01	<0.01
Xylenes	30	44	120	1.2	0.1	53	<0.01	<0.01	<0.01	<0.01	35	12	<0.01	<0.01
Arsenic	-----	-----	3.6	1.9	2.2	0.2	-----	-----	-----	-----	-----	-----	-----	-----
Cadmium	-----	-----	0.4	<0.1	0.1	<0.1	-----	-----	-----	-----	-----	-----	-----	-----
Total Chromium (III/IV)	-----	-----	15.8	9.1	13.5	<0.7	-----	-----	-----	-----	-----	-----	-----	-----
Lead	-----	-----	173	3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Mercury	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Silver	-----	-----	<0.7	<0.7	<0.7	<0.7	-----	-----	-----	-----	-----	-----	-----	-----
Total Organic Carbon	-----	-----	-----	-----	-----	-----	75600	46600	na	4890	19000	19700	37400	3300
Acenaphthene	<220	140	51	<3.5	<3.4	<38	<0.43	0.58	0.48	0.79	73	60	4.2	<0.29
Acenaphthylene	140	110	170	1.8	1.1	99	<0.43	<0.38	<0.35	<0.37	4.6	4.5	<0.45	<0.29
Anthracene	<220	130	140	1.6	<3.4	47	<0.43	<0.38	<0.35	<0.37	34	29	1.6	<0.29
Benzo(g,h,I)Perylene	<220	<230	<43	<3.5	<3.4	<38	<0.43	<0.38	<0.35	<0.37	9.4	8.7	1.1	<0.29
Fluroanthene	90	130	160	1.9	3	61	1.1	0.54	<0.35	<0.37	48	40	3.1	<0.29
Fluorene	70	95	160	1.6	<3.4	58	<0.43	<0.38	<0.35	<0.37	39	34	2.3	<0.29
2-Methylnaphthalene	140	210	550	3.3	<3.4	170	<0.43	<0.38	<0.35	<0.37	110	86	0.86	<0.29
Naphthalene	630	800	2500	8.3	2	390	<0.43	1.2	0.48	0.73	200	150	2.1	<0.29
Phenanthrene	240	340	380	5.1	1.8	150	0.99	<0.38	<0.35	<0.37	130	110	1.4	<0.29
Pyrene	120	180	200	2.5	3	73	1.2	0.61	<0.35	<0.37	64	52	4.4	<0.29
Benzo(a)Anthracene (j)	<220	<230	82	<3.5	1.4	27	0.55	<0.38	<0.35	<0.37	24	23	1.6	<0.29
Benzo(b)fluoranthene (j)	<220	<230	48	<3.5	1.6	15	<0.43	<0.38	<0.35	<0.37	13	12	1.3	<0.29
Benzo(k)fluoranthene (j)	<220	<230	25	<3.5	<3.4	<38	<0.43	<0.38	<0.35	<0.37	9.7	8.4	0.84	<0.29
Benzo(a)Pyrene (j)	<220	<230	75	<3.5	2.1	24	0.43	<0.38	<0.35	<0.37	20	18	1.8	<0.29
Chrysene (j)	<220	<230	100	1.1	1.7	32	0.59	<0.38	<0.35	<0.37	22	22	1.7	<0.29
Dibenzo(a,h)Anthracene (j)	<220	<230	<43	<3.5	<3.4	<38	<0.43	<0.38	<0.35	<0.37	2.9	2.5	<0.45	<0.29
Indeno(1,2,3-cd)Pyrene (j)	<220	<230	29	<3.5	1.5	<38	<0.43	<0.38	<0.35	<0.37	7.6	6.9	0.91	<0.29
Dibenzofuran	-----	-----	-----	-----	-----	-----	<0.43	<0.38	<0.35	<0.37	11	10	0.5	<0.29
BaPEq (TEQ) (k)	<265(nd)	<277(nd)	116	4.2	4.4	51.3	0.770	<0.46(nd)	<0.42(nd)	<0.45(nd)	28.6	25.8	2.5	<0.35(nd)

Notes: See last page of table.

TABLE 3.2 - Summary of Soil Analytical Data (a)

Location	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9
Date	11/2/93	11/2/93	11/2/93	11/2/93	11/2/93	11/2/93	11/2/93	11/2/93	11/3/93	11/3/93	11/3/93	11/3/93	11/3/93	11/3/93
Source	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94
Depth (feet)	2-4	4-6	6-8	8-10	10-12	12-14	14-16	20-22	0-2	2-4	4-6	6-8	8-10	10-12
WTPH-G	-----	<25	-----	<25	<25	-----	-----	<25	-----	-----	<25	-----	<25	-----
TPH-418.1	124	245	113	279	683	195	92	228	<50	87	724	147	305	115
WTPH-D	-----	250	-----	1300	840	-----	-----	<48	-----	-----	-----	-----	1700	-----
Cyanide	<1.0	1.2	16.3	31.1	29.8	21.6	42.5	<1.0	<1.0	<1.0	<1.0	16.9	34.1	16.9
Benzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.15
Ethylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.27	1.7
Toluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04
Xylenes	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.08	0.55
Arsenic	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cadmium	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Chromium (III/IV)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Lead	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Mercury	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Silver	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Organic Carbon	4700	5000	55000	41000	42000	16000	14000	5900	7460	6060	7690	14000	13600	15900
Acenaphthene	<0.28	4	0.35	6.8	5.5	2.1	3.1	0.66	<0.36	<0.29	<0.30	2.2	14	56
Acenaphthylene	<0.28	<0.32	2	3.8	1.9	0.95	0.46	<0.35	<0.36	<0.29	<0.30	<0.35	<0.38	0.65
Anthracene	<0.28	15	3.8	14	4.1	5.3	3.2	3.1	<0.36	<0.29	<0.30	3.2	12	23
Benzo(g,h,I)Perylene	<0.28	0.62	11	28	5.5	2.7	1.9	<0.35	<0.36	<0.29	<0.30	1.2	1.4	0.8
Fluroanthene	<0.28	8.3	19	74	19	18	21	1.5	<0.36	<0.29	1.4	7	25	80
Fluorene	<0.28	8.4	1.1	8.8	5.1	3.7	5	1.5	<0.36	<0.29	<0.30	2.5	17	58
2-Methylnaphthalene	<0.28	3.1	0.61	<3.5	0.45	0.55	nd	0.42	<0.36	<0.29	<0.30	0.61	7.1	25
Naphthalene	<0.28	4.5	1.6	5.2	2.3	1.6	0.98	0.61	<0.36	<0.29	0.43	1.8	16	52
Phenanthrene	<0.28	19	9.6	21	3.9	12	1.5	4.9	<0.36	<0.29	0.73	10	51	210
Pyrene	<0.28	5.7	24	72	17	15	16	1.1	<0.36	<0.29	1.3	7	17	48
Benzo(a)Anthracene (j)	<0.28	1.8	12	35	7.6	6.4	6.7	0.37	<0.36	<0.29	0.46	2.8	5.4	12
Benzo(b)fluoranthene (j)	<0.28	0.82	12	31	6.2	3.3	2.7	<0.35	<0.36	<0.29	0.33	1.4	1.9	2.8
Benzo(k)fluoranthene (j)	<0.28	0.69	8.4	22	4.5	3.2	2.7	<0.35	<0.36	<0.29	<0.30	1.3	2	2
Benzo(a)Pyrene (j)	<0.28	1	15	43	7.8	4.9	2	<0.35	<0.36	<0.29	0.36	1.9	2.3	2.2
Chrysene (j)	<0.28	2.2	14	39	8.5	7.3	7.5	0.5	<0.36	<0.29	0.6	3.3	6.4	13
Dibenzo(a,h)Anthracene (j)	<0.28	<0.32	3.3	8.4	1.5	0.82	0.69	<0.35	<0.36	<0.29	<0.30	0.38	0.41	0.4
Indeno(1,2,3-cd)Pyrene (j)	<0.28	0.54	9	24	4.6	2.3	1.6	<0.35	<0.36	<0.29	<0.30	1	1.3	0.81
Dibenzofuran	<0.28	4.1	0.63	<3.5	1.8	0.99	<0.41	0.63	<0.36	<0.29	<0.30	1.3	10	40
BaPEq (TEQ) (k)	<0.34(nd)	1.6	22.6	63.0	11.7	7.3	4.1	0.445	<0.43(nd)	<0.35(nd)	0.625	3.0	3.8	4.5

Notes: See last page of table.

TABLE 3.2 - Summary of Soil Analytical Data (a)

Location	MW-9	MW-9	MW-9	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-12	MW-12	MW-12	MW-12
Date	11/3/93	11/3/93	11/3/93	11/1/93	11/1/93	11/1/93	11/1/93	11/1/93	11/1/93	11/1/93	10/25/93	10/25/93	10/25/93	10/25/93
Source	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94	B&V 94
Depth (feet)	12-14	14-16	20-22	0-2	2-4	4-6	6-8	8-10	10-12	17-19	0-2	2-4	4-6	6-8
WTPH-G	<25	120	-----	nd	nd	nd	nd	nd	nd	nd	nd	nd	-----	nd
TPH-418.1	354	368	-----	10500	6460	7420	3320	329	1250	248	1090	308	94	221
WTPH-D	2100	2500	-----	600	42	120	71	72	52	1100	50	30	-----	nd
Cyanide	7.1	-----	<1.0	nd	nd	nd	2.1	22.8	5.1	nd	nd	nd	nd	nd
Benzene	0.38	1.3	<0.01	nd	nd	nd	nd	nd	nd	0.18	nd	nd	nd	nd
Ethylbenzene	1.5	3.2	<0.01	nd	nd	nd	nd	nd	nd	0.08	nd	nd	nd	nd
Toluene	0.44	0.25	<0.01	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Xylenes	1.5	5.7	<0.01	nd	nd	nd	nd	nd	nd	0.1	nd	nd	nd	nd
Arsenic	-----	-----	-----	7	5.4	6.1	6.2	6.6	8	2.2	-----	-----	-----	-----
Cadmium	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Chromium (III/IV)	-----	-----	-----	14.3	14.5	21	16.1	31.6	41.1	10.8	-----	-----	-----	-----
Lead	-----	-----	-----	63.3	80.2	79.9	140	41	215	16.5	-----	-----	-----	-----
Mercury	-----	-----	-----	nd	nd	nd	0.92	0.35	0.5	nd	-----	-----	-----	-----
Silver	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Organic Carbon	16600	-----	6060	81000	75000	64000	39000	45000	77000	5000	17000	21000	25000	35000
Acenaphthene	56	66	<0.35	nd	nd	nd	nd	nd	nd	1.8	nd	nd	nd	nd
Acenaphthylene	0.93	1.1	<0.35	-----	-----	-----	-----	-----	-----	-----	nd	nd	nd	nd
Anthracene	24	22	<0.35	nd	nd	nd	0.45	1.2	nd	3	nd	0.57		
Benzo(g,h,I)Perylene	1.1	1.5	<0.35	1.2	0.76	0.47	1.8	5.3	0.79	1	nd	3.3	0.4	0.52
Fluroanthene	68	80	<0.35	1.6	1	0.7	4.1	11	0.92	7.1	nd	3.7	0.6	0.71
Fluorene	61	69	<0.35	nd	nd	nd	nd	nd	nd	1.8	nd	nd	nd	nd
2-Methylnaphthalene	37	42	<0.35	nd	nd	nd	nd	nd	nd	0.46	nd	nd	nd	nd
Naphthalene	57	63	<0.35	nd	nd	nd	0.41	0.73	nd	3	nd	nd	nd	nd
Phenanthrene	190	210	<0.35	1.1	1	0.79	2.3	2.3	nd	12	nd	2.9	nd	0.55
Pyrene	45	53	<0.35	2.4	1.9	1.1	6.2	15	1.2	6.7	nd	4.9	0.66	0.87
Benzo(a)Anthracene (j)	13	18	<0.35	1.3	0.77	0.48	3.1	7.3	0.77	2.5	nd	2.5	0.41	0.42
Benzo(b)fluoranthene (j)	2.8	4.2	<0.35	1.4	0.71	nd	2.2	4.8	0.64	1.2	nd	2.4	0.4	0.46
Benzo(k)fluoranthene (j)	3	3.4	<0.35	1.1	0.66	nd	1.6	5	0.53	1.3	nd	1.9	nd	
Benzo(a)Pyrene (j)	2.9	4.2	<0.35	1.6	0.81	nd	2.2	6.1	0.72	1.9	nd	3.2	0.48	0.56
Chrysene (j)	14	17	<0.35	2.5	1	0.75	2.8	6.5	0.76	2.5	nd	2.7	0.51	0.56
Dibenzo(a,h)Anthracene (j)	0.47	0.71	<0.35	0.7	nd	nd	0.48	1.5	nd	nd	nd	1.1	nd	nd
Indeno(1,2,3-cd)Pyrene (j)	1.1	1.5	<0.35	0.64	0.65	nd	1.4	4.3	0.55	0.89	nd	2.5	nd	0.4
Dibenzofuran	53	61	<0.35	nd	nd	nd	nd	nd	nd	1.3	nd	nd	nd	nd
BaPEq (TEQ) (k)	5.5	7.8	<0.42(nd)	2.8	1.1	0.1	3.5	9.8	1.0	2.5	nd	5.3	0.6	0.7

Notes: See last page of table.

TABLE 3.2 - Summary of Soil Analytical Data (a)

Location	MW-12	MW-12	MW-12	MW-12	MW-15	MW-15	MW-15	MW-15	MW-15	MW-15	MW-15	MW-15	MW-16
Date	10/25/93	10/25/93	10/25/93	10/25/93	1/9/96	1/9/96	1/9/96	1/9/96	1/9/96	1/9/96	1/9/96	1/9/96	1/8/96
Source	B&V 94	B&V 94	B&V 94	B&V 94	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96
Depth (feet)	8-10	14-16	18-20	24-26	4-5	7-8	9-10	14-15	19-20	24-25	29-30	34-35	0-2
WTPH-G	nd	nd	100	nd	-----	-----	-----	-----	-----	-----	-----	-----	-----
TPH-418.1	413	476	1040	nd	-----	-----	-----	-----	-----	-----	-----	-----	-----
WTPH-D	2000	630	15000	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cyanide	nd	nd		nd	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzene	nd	nd	0.02	nd	0.004	0.004	<0.005	0.008	<0.005	<0.005	<0.005	<0.005	nd
Ethylbenzene	nd	nd	0.42	nd	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	nd
Toluene	nd	nd	0.03	nd	0.006	0.005	0.006	0.007	0.005	0.005	0.014	0.014	nd
Xylenes	nd	nd	0.58	nd	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.003
Arsenic	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cadmium	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Chromium (III/IV)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Lead	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Mercury	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Silver	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Organic Carbon	300000	220000	520000	110000	-----	-----	-----	-----	-----	-----	-----	-----	-----
Acenaphthene	nd	1.2	81	1	<1.65	<1.65	<0.33	<1.65	<0.33	<0.33	<0.33	<0.33	-----
Acenaphthylene	3.6	4.2	65	nd	2.71	<1.65	0.25	<1.65	<0.33	<0.33	<0.33	<0.33	-----
Anthracene	10	16	160	1.7	2.56	<1.65	0.34	<1.65	<0.33	<0.33	<0.33	<0.33	-----
Benzo(g,h,I)Perylene	25	30	85	0.92	2.55	1.43	0.68	1.7	<0.33	<0.33	<0.33	<0.33	-----
Fluroanthene	52	52	370	4.4	8.64	2.47	1.4	3.92	<0.33	<0.33	0.19	<0.33	-----
Fluorene	2.3	5.1	88	0.42	1.34	<1.65	<0.33	<1.65	<0.33	<0.33	<0.33	<0.33	-----
2-Methylnaphthalene	2.3	1.3	10	nd	<1.65	<1.65	<0.33	<1.65	<1.65	<0.33	<0.33	<0.33	-----
Naphthalene	7	4.2	79	0.96	0.93	<1.65	<0.33	<1.65	<0.33	<0.33	<0.33	<0.33	-----
Phenanthrene	26	31	530	5	10.71	1.4	0.84	2.47	<0.33	<0.33	<0.33	<0.33	-----
Pyrene	73	59	350	4.7	8.6	2.67	1.49	4.05	<0.33	<0.33	0.19	<0.33	-----
Benzo(a)Anthracene (j)	33	32	160	1.7	3.79	1.45	0.8	2.23	<0.33	<0.33	<0.33	<0.33	-----
Benzo(b)fluoranthene (j)	35	28	100	1.1	3.59	1.78	0.8	2.11	<0.33	<0.33	<0.33	<0.33	-----
Benzo(k)fluoranthene (j)	24	24	69	0.87	1.53	<1.65	0.46	0.79	<0.33	<0.33	<0.33	<0.33	-----
Benzo(a)Pyrene (j)	39	43	140	1.8	4.02	1.95	1.01	2.48	<0.33	<0.33	0.17	<0.33	-----
Chrysene (j)	38	36	160	1.8	4	1.62	0.89	2.26	<0.33	<0.33	<0.33	<0.33	-----
Dibenzo(a,h)Anthracene (j)	9.2	12	27	nd	<1.65	<1.65	<0.33	<1.65	<0.33	<0.33	<0.33	<0.33	-----
Indeno(1,2,3-cd)Pyrene (j)	21	25	72	0.79	2.55	1.38	0.68	1.66	<0.33	<0.33	<0.33	<0.33	-----
Dibenzofuran	1	1.5	30	nd	-----	-----	-----	-----	-----	-----	-----	-----	-----
BaPEq (TEQ) (k)	60	66	209	2.3	6.0	3.3	1.5	4.0	<0.4(nd)	<0.4(nd)	0.403	<0.4(nd)	-----

Notes: See last page of table.

TABLE 3.2 - Summary of Soil Analytical Data (a)

Location	MW-16	MW-16	MW-16	MW-16	MW-16	MW-16	MW-17	MW-17	MW-17	MW-17	MW-17	MW-17
Date	1/8/96	1/8/96	1/8/96	1/8/96	1/8/96	1/8/96	1/16/96	1/16/96	1/16/96	1/16/96	1/16/96	1/16/96
Source	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96
Depth (feet)	2-4	4-10	7-8	10-11	15-16	25-26	5-6	10-11	15-16	20-21	25-26	30-31
WTPH-G	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
TPH-418.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
WTPH-D	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cyanide	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzene	nd	0.004	-----	-----	-----	-----	nd	-----	0.007	0.026	0.012	nd
Ethylbenzene	nd	0.003	-----	-----	-----	-----	nd	-----	0.005	0.037	0.028	0.003
Toluene	nd	nd	-----	-----	-----	-----	0.009	-----	0.009	0.063	0.007	0.005
Xylenes	0.003	0.018	-----	-----	-----	-----	nd	-----	0.013	0.17	0.037	0.008
Arsenic	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cadmium	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Chromium (III/IV)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Lead	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Mercury	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Silver	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Organic Carbon	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Acenaphthene	-----	-----	0.81	0.47	nd	nd	nd	nd	0.88	29.8	0.94	0.64
Acenaphthylene	-----	-----	0.22	0.14	0.12	0.28	2.21	0.42	6.87	90.5	3.42	2.01
Anthracene	-----	-----	0.78	0.42	nd	0.07	2.27	0.49	8.4	150.1	5.39	2.96
Benzo(g,h,I)Perylene	-----	-----	0.62	0.26	0.15	0.13	2.87	0.58	12.01	65.3	2.42	1.43
Fluroanthene	-----	-----	2	0.94	0.2	0.35	12	1.53	30.64	285	10	6.22
Fluorene	-----	-----	0.86	0.47	nd	nd	nd	0.21	4.5	84.5	2.66	1.69
2-Methylnaphthalene	-----	-----	0.19	0.14	0.09	nd	nd	nd	1.11	12.2	nd	0.68
Naphthalene	-----	-----	0.4	0.32	0.3	nd	nd	0.17	4.02	58.3	1.69	0.61
Phenanthrene	-----	-----	2.14	1.2	0.16	0.2	8.35	1.46	22.91	402	14.4	9.01
Pyrene	-----	-----	1.93	0.86	0.23	0.5	12.56	1.87	32.73	315.8	12	7.27
Benzo(a)Anthracene (j)	-----	-----	0.8	0.36	0.14	0.24	4.79	0.85	19.48	127.3	4.65	2.97
Benzo(b)fluoranthene (j)	-----	-----	0.74	0.31	0.19	0.19	4.48	0.84	16.92	93.1	3.31	2.16
Benzo(k)fluoranthene (j)	-----	-----	0.29	0.16		0.08	1.74	0.28	7.67	47.7	1.58	0.88
Benzo(a)Pyrene (j)	-----	-----	0.8	0.33	0.14	0.15	4.59	0.96	22.36	123.8	4.62	2.96
Chrysene (j)	-----	-----	0.84	0.42	0.18	0.28	5.05	0.9	19.28	138.4	4.92	2.86
Dibenzo(a,h)Anthracene (j)	-----	-----	nd	nd	nd	nd	0.72	nd	2.68	13.9	nd	nd
Indeno(1,2,3-cd)Pyrene (j)	-----	-----	0.57	0.25	0.14	0.12	2.87	0.55	12.14	65.3	2.33	1.42
Dibenzofuran	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BaPEq (TEQ) (k)	-----	-----	1.0	0.4	0.2	0.2	6.7	1.2	30.9	172.4	5.9	3.7

Notes: See last page of table.

TABLE 3.2 - Summary of Soil Analytical Data (a)

Location	MW-17	MW-17	MW-17	MW-17	MW-17	MW-17	MW-17	MW-17	MW-18	MW-18	MW-18
Date	1/16/96	1/16/96	1/16/96	1/16/96	1/16/96	1/16/96	1/16/96	1/16/96	1/15/96	1/15/96	1/15/96
Source	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96
Depth (feet)	35-36	40-41	45-46	50-51	55-56	60-61	65-66	70-71	30-31	35-36	40-41
WTPH-G	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
TPH-418.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
WTPH-D	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cyanide	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzene	nd	0.003	nd	0.49	0.105	0.034	nd	0.01	0.042	0.004	<0.005
Ethylbenzene	nd	0.006	nd	nd	nd	0.138	0.005	0.01	0.18	0.026	<0.005
Toluene	0.007	0.015	0.005	0.029	0.003	0.004	0.006	0.01	0.004	<0.005	<0.005
Xylenes	nd	0.017	0.005	0.003	0.003	0.043	0.003	0.007	0.045	<0.005	<0.005
Arsenic	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cadmium	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Chromium (III/IV)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Lead	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Mercury	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Silver	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Organic Carbon	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Acenaphthene	0.11	nd	nd	-----	nd	nd	0.2	nd	<0.33	<0.33	<0.33
Acenaphthylene	0.37	nd	0.16	-----	nd	nd	0.4	nd	<0.33	<0.33	<0.33
Anthracene	0.61	0.2	0.27	-----	0.19	nd	0.88	nd	<0.33	<0.33	<0.33
Benzo(g,h,I)Perylene	0.31	1.43	0.14	-----	0.12	nd	0.44	nd	<0.33	<0.33	<0.33
Fluroanthene	1.37	0.4	0.55	-----	0.42	nd	1.9	0.18	<0.33	<0.33	<0.33
Fluorene	0.31	nd	0.14	-----	nd	nd	0.32	nd	<0.33	<0.33	<0.33
2-Methylnaphthalene	0.14	nd	nd	-----	nd	nd	nd	nd	<0.33	<0.33	<0.33
Naphthalene	0.16	nd	nd	-----	nd	0.68	nd	nd	<0.33	<0.33	<0.33
Phenanthrene	1.89	0.6	0.77	-----	0.52	0.11	2.51	0.22	<0.33	<0.33	<0.33
Pyrene	1.49	nd	0.63	-----	0.47	nd	2.09	0.19	<0.33	<0.33	<0.33
Benzo(a)Anthracene (j)	0.55	nd	0.24	-----	0.21	nd	0.86	nd	<0.33	<0.33	<0.33
Benzo(b)fluoranthene (j)	0.42	nd	0.19	-----	0.16	nd	0.66	nd	<0.33	<0.33	<0.33
Benzo(k)fluoranthene (j)	0.19	nd	0.09	-----	0.08	nd	0.29	nd	<0.33	<0.33	<0.33
Benzo(a)Pyrene (j)	0.55	nd	0.28	-----	0.22	nd	0.87	nd	<0.33	<0.33	<0.33
Chrysene (j)	0.57	nd	0.28	-----	0.21	nd	0.9	nd	<0.33	<0.33	<0.33
Dibenzo(a,h)Anthracene (j)	nd	nd	nd	-----	nd	nd	0.1	nd	<0.33	<0.33	<0.33
Indeno(1,2,3-cd)Pyrene (j)	0.3	nd	0.13	-----	0.11	nd	0.44	nd	<0.33	<0.33	<0.33
Dibenzofuran	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BaPEq (TEQ) (k)	0.7	nd	0.3	-----	0.3	nd	1.2	nd	<0.4(nd)	<0.4(nd)	<0.4(nd)

Notes: See last page of table.

TABLE 3.2 - Summary of Soil Analytical Data (a)

Location	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-28	MW-28	MW-28	MW-28	MW-28
Date	1/15/96	1/15/96	1/15/96	1/15/96	1/15/96	1/15/96	2/24/99	2/24/99	2/24/99	2/24/99	2/24/99
Source	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	B&V 96	Geo 99	Geo 99	Geo 99	Geo 99	Geo 99
Depth (feet)	45-46	50-51	55-56	60-61	65-66	70-71	11-12.5	12.5-14	17-18.5	21.5-23	42.5-44
WTPH-G	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
TPH-418.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
WTPH-D	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cyanide	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-----	-----	-----	-----	-----
Ethylbenzene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-----	-----	-----	-----	-----
Toluene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-----	-----	-----	-----	-----
Xylenes	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-----	-----	-----	-----	-----
Arsenic	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cadmium	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Chromium (III/IV)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Lead	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Mercury	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Silver	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Organic Carbon	-----	-----	-----	-----	-----	-----	180000	190000	190000	15000	1600
Acenaphthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	0.49	28	24	3.4	<0.021
Acenaphthylene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	12	230	130	13	0.052
Anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	4.3	410	190	21	0.1
Benzo(g,h,I)Perylene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	12	89	65	3.2	0.025
Fluroanthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	13	490	320	31	0.13
Fluorene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	1.2	160	140	14	0.042
2-Methylnaphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	2.6	90	43	5.7	<0.021
Naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	4.3	290	180	23	0.036
Phenanthrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	9.9	880	530	66	0.26
Pyrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	16	620	380	36	0.15
Benzo(a)Anthracene (j)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	11	210	140	15	0.061
Benzo(b)fluoranthene (j)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	23	220	140	11	0.063
Benzo(k)fluoranthene (j)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	8.9	48	45	4.3	0.061
Benzo(a)Pyrene (j)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	16	290	170	16	0.065
Chrysene (j)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	12	230	130	15	0.063
Dibenzo(a,h)Anthracene (j)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	2.8	25	14	1.1	<0.021
Indeno(1,2,3-cd)Pyrene (j)	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	12	100	66	2.2	0.025
Dibenzofuran	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BaPEq (TEQ) (k)	<0.4(nd)	<0.4(nd)	<0.4(nd)	<0.4(nd)	<0.4(nd)	<0.4(nd)	24.4	375	224	20.5	0.097

Notes: See last page of table.

TABLE 3.2 - Summary of Soil Analytical Data (a)

Location	MW-29	MW-29	MW-29	MW-29	MW-30	MW-30	MW-30	MW-30	MW-30
Date	2/25/99	2/25/99	2/25/99	2/25/99	2/24/99	2/24/99	2/24/99	2/24/99	2/24/99
Source	Geo 99	Geo 99	Geo 99	Geo 99	Geo 99	Geo 99	Geo 99	Geo 99	Geo 99
Depth (feet)	11-12.5	14-15.5	17-18.5	32-33.5	14-15.5	17-18.5	20-21.5	23-24.5	29-30.5
WTPH-G	-----	-----	-----	-----	-----	-----	-----	-----	-----
TPH-418.1	-----	-----	-----	-----	-----	-----	-----	-----	-----
WTPH-D	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cyanide	-----	-----	-----	-----	-----	-----	-----	-----	-----
Benzene	-----	-----	-----	-----	-----	-----	-----	-----	-----
Ethylbenzene	-----	-----	-----	-----	-----	-----	-----	-----	-----
Toluene	-----	-----	-----	-----	-----	-----	-----	-----	-----
Xylenes	-----	-----	-----	-----	-----	-----	-----	-----	-----
Arsenic	-----	-----	-----	-----	-----	-----	-----	-----	-----
Cadmium	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Chromium (III/IV)	-----	-----	-----	-----	-----	-----	-----	-----	-----
Lead	-----	-----	-----	-----	-----	-----	-----	-----	-----
Mercury	-----	-----	-----	-----	-----	-----	-----	-----	-----
Silver	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Organic Carbon	250000	230000	-----	960	90000	-----	67000	8500	-----
Acenaphthene	0.41	1	<0.019	<0.019	2.4	0.033	0.98	0.34	<0.019
Acenaphthylene	7.3	7.4	0.047	<0.019	1.5	0.027	0.52	0.061	<0.019
Anthracene	4.7	8.7	0.083	<0.019	1.9	0.031	0.95	0.067	<0.019
Benzo(g,h,I)Perylene	16	7.6	<0.019	<0.019	1.1	0.031	0.83	0.032	<0.019
Fluroanthene	23	22	0.22	0.042	4.3	0.13	3.6	0.18	<0.019
Fluorene	1.9	3.3	0.036	<0.019	1.5	<0.021	0.44	0.11	<0.019
2-Methylnaphthalene	1.2	0.74	<0.019	<0.019	0.76	<0.021	0.19	<0.019	<0.019
Naphthalene	1.7	1.8	<0.019	<0.019	2.6	0.097	0.78	0.086	<0.019
Phenanthrene	11	18	0.21	0.035	3.2	0.12	3.2	0.25	<0.019
Pyrene	30	26	0.25	0.05	4.7	0.12	3.7	0.18	<0.019
Benzo(a)Anthracene (j)	23	16	0.11	0.031	2.1	0.06	1.5	0.072	<0.019
Benzo(b)fluoranthene (j)	24	17	0.053	<0.019	2.3	0.056	1.4	0.074	<0.019
Benzo(k)fluoranthene (j)	6.2	4.3	<0.019	<0.019	0.68	0.025	0.4	<0.019	<0.019
Benzo(a)Pyrene (j)	29	22	0.03	<0.019	2	0.06	1.5	0.076	<0.019
Chrysene (j)	25	14	0.091	0.029	2.1	0.052	1.5	0.068	<0.019
Dibenzo(a,h)Anthracene (j)	2.5	1.8	<0.019	<0.019	<0.19	<0.021	0.13	<0.019	<0.019
Indeno(1,2,3-cd)Pyrene (j)	11	4.4	<0.019	<0.019	0.82	<0.021	0.82	<0.019	<0.019
Dibenzofuran	-----	-----	-----	-----	-----	-----	-----	-----	-----
BaPEq (TEQ) (k)	38.2	28.1	0.059	0.025	2.7	0.086	2.1	0.103	<0.02 (nd)

Notes: See last page of table.

TABLE 3.2 - Summary of Soil Analytical Data (a)

Location / Date / Source / Depth (feet)	Max. Conc.	Location	Depth (feet)	Human Health SLs			
				Unrestricted Site Use		Industrial Site Use	
				Method A	Method B (soil contact)	Method A	Method C (soil contact)
WTPH-G	4600	DA1-5	3.8	30 (l)	-----	30 (l)	-----
TPH-418.1	10500	MW7	21	2000 (m)	-----	2000 (m)	-----
WTPH-D	15000	DA1-5	3.8	2000 (m)	-----	2000 (m)	-----
Cyanide	42.5	MW8	15	-----	48	-----	2100
Benzene	84	DA1-5	3.8	0.03 (l)	18	0.03 (l)	2400
Ethylbenzene	40	MW7	9	6 (l)	8000	6 (l)	350000
Toluene	210	DA1-5	3.8	7 (l)	6400	7 (l)	280000
Xylenes	280	DA1-5	3.8	9 (l)	16000	9 (l)	700000
Arsenic	<8	multiple	-----	20 (n)	20 (n)	20 (n)	20 (n)
Cadmium	0.94	TP15	5	2 (l)	80	2 (l)	3500
Total Chromium (III/IV)	41.1	TP10	9	2000 (l)	120000/240	2000 (l)	5.25E+06/ 1.05E+04
Lead	215	TP15	5	250 (o)	-----	1000 (o)	-----
Mercury	0.92	TP10	5	2 (l)	-----	2 (l)	-----
Silver	1.8	TP10	5	-----	400	-----	18000
Total Organic Carbon	520000	-----	-----	-----	-----	-----	-----
Acenaphthene	140	R2-4	-----	-----	4800	-----	210000
Acenaphthylene	400	DA1-5	3.8	-----	-----	-----	-----
Anthracene	410	MW28	13	-----	24000	-----	1050000
Benzo(g,h,I)Perylene	410	MW28	13	-----	-----	-----	-----
Fluroanthene	490	MW28	13	-----	3200	-----	140000
Fluorene	240	DA1-5	3.8	-----	3200	-----	140000
2-Methylnaphthalene	710	DA1-5	3.8	-----	320	-----	14000
Naphthalene	5200	DA1-5	3.8	-----	1600	-----	70000
Phenanthrene	880	MW28	13	-----	-----	-----	-----
Pyrene	620	MW28	13	-----	2400	-----	105000
Benzo(a)Anthracene (j)	210	MW28	13	-----	See BaPEq	-----	-----
Benzo(b)fluoranthene (j)	220	MW28	13	-----	See BaPEq	-----	-----
Benzo(k)fluoranthene (j)	230	DA1-5	3.8	-----	See BaPEq	-----	-----
Benzo(a)Pyrene (j)	290	MW28	13	-----	See BaPEq	-----	-----
Chrysene (j)	230	MW28	13	-----	See BaPEq	-----	-----
Dibenzo(a,h)Anthracene (j)	25	MW29	11	-----	See BaPEq	-----	-----
Indeno(1,2,3-cd)Pyrene (j)	230	MW28	13	-----	See BaPEq	-----	-----
Dibenzofuran	61	MW9	15	-----	80	-----	3500
BaPEq (TEQ) (k)	375	MW28	13	0.1(p)	1(q)	2 (l)	131(q)

Notes: See last page of table.

Notes to Table

< less than indicated value
----- - Not analyzed
(a) - Concentrations in mg/kg (ppm) unless otherwise noted
(b) - Black stained cobbles and/or sheen noted on log
(c) - Sawdust/wood chips noted on log
(d) - <0.7 mg/kg in duplicate sample
(e) - Composite samples from Pier 2 footing excavation -south side of "A" St.
(f) - Grab sample from excavation - north side of "A" St.
(g) - Sample of coal tar "sludge" discovered in concrete vault structure
(h) - Sample of excavation bottom - new storm drain line - south of "A" St.
(i) - Sum of naphthalene, 1-methylnaphthalene, 2-methylnaphthalene
(j) - Carcinogenic polycyclic aromatic hydrocarbon (cPAH)
(k) - Benzo(a)pyrene equivalent concentration (Ecology 2007)
(l) - Based on protection of drinking water quality
(m) - Based on accumulation of free product
(n) - Background concentration for Washington State
(o) - Based on preventing unacceptable blood levels
(p) - Based on dated oral cancer potency factor of 7.3 kg-day/mg
(q) - Based on oral carcer potency factor of 1.0 kg-day/mg (updated Jan. 2017)
(r) - WAC 173-340-900, Table 749-2

Maximum concentration exceeds screening level (yellow)

Soil Sample < 6' Deep

Soil Sample >6' to 15' Deep

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

Well Numbers	Units	MGP Area Wells																						
		HC-MW-2	HC-MW-2	HC-MW-2	HC-MW-4	DOTMW-4	DOTMW-4	DOTMW-4	DOTMW-4	DOTMW-4	HC-MW-5	HC-MW-5	HC-MW-6	HC-MW-6	HC-MW-7	HC-MW-7	MW-7R	MW-7R	MW-7R	MW-14	MW-14	MW-14	MW-14	MW-14
Sample Date	----	11/15/93	Jan-96	Jun-98	11/15/93	Jan-96	Jun-98	Sep-98	Dec-98	Mar-99	11/18/93	Jan-96	11/15/93	Jan-96	11/15/93	Jan-96	Nov-98	Dec-98	Mar-99	Jan-96	Sep-98	Dec-98	Mar-99	Sep-99
Screen Depth	feet	16-26	16-26	16-26	6-16	10-20	10-20	10-20	10-20	6-16	11-20	11-20	20-25	20-25	5-21	5-21	21-31	21-31	21-31	12-32	12-32	12-32	12-32	12-32
Year Installed	----	1987	1987	1987	1987	1996	1996	1996	1996	1987	1987	1987	1987	1987	1993	1993	1998	1998	1998	1996	1996	1996	1996	1996
Source	----	B&V 94	B&V 96	GeoE 98	B&V 94	B&V 96	GeoE 98	GeoE 98	GeoE 99	GeoE 99	B&V 94	B&V 96	B&V 94	B&V 96	B&V 94	B&V 96	GeoE 99	GeoE 99	GeoE 99	B&V 96	GeoE 98	GeoE 99	GeoE 99	GeoE 99
Field Parameters																								
TOC	mg/l	6.3	----	----	10	----	----	----	----	----	1.1	----	4.4	----	47	----	----	----	----	2.9	----	----	----	----
pH	----	6.3	6.56	7.68	6.51	6.96	7.59	9.03	----	----	7.2	6.67	6.47	6.88	6.39	----	----	----	----	6.67	7.58	----	----	6.91
Conductivity (a)	uS	440	710	700	700	1118	1000	488	----	----	500	807	390	607	590	----	----	----	----	144	----	----	----	9600
Salinity (a)	ppt	<0.5	----	----	<0.5	----	----	----	----	----	<0.5	----	<0.5	----	<0.5	----	----	----	----	----	----	----	----	----
Total Dissolved Solids	mg/l	484	----	----	727	----	----	----	----	----	507	----	402	----	514	----	----	----	----	22200	----	----	----	----
Total Suspended Solids	mg/l	1460	----	----	693	----	----	----	----	----	46	----	1920	----	9540	----	----	----	----	144	----	----	----	----
Turbidity (a)	(NTU)	184	----	46.3	80	----	7.9	3.5	----	----	30	----	>200	----	>200	----	----	----	----	----	44	----	----	1.8
Alkalinity	mg/l	----	----	----	350	----	----	----	----	----	220	----	171	----	418	----	----	----	----	99.5	----	----	----	----
Bicarbonate	mg/l	----	----	----	361	----	----	----	----	----	216	----	172	----	369	----	----	----	----	----	----	----	----	----
Hardness	mg/l	----	----	----	540	----	----	----	----	----	320	----	320	----	430	----	----	----	----	3760	----	----	----	----
Volatile Organics																								
Benzene	ug/l	<1	<2.5	<1.0	<1	14.1	0.55	<1.0	1.1	<1	<1	<2.5	<1	<2.5	7800	3600	450	560	470	<2.5	4.2	7.8	9.1	54
Toluene	ug/l	<1	<2.5	<1.0	<1	<2.5	<1.0	<1.0	<1.0	<1	<1	<2.5	<1	<2.5	930	260	290	270	260	<2.5	<1.0	0.72	0.66	<1.0
Ethylbenzene	ug/l	<1	<2.5	<1.0	<1	<2.5	<1.0	<1.0	<1.0	<1	<1	<2.5	<1	<2.5	2800	1200	900	1300	1500	<2.5	2.1	4.1	4.7	2.9
Xylenes	ug/l	<1	<2.5	<3.0	<1	<2.5	<3.0	<3.0	<3.0	<3	<1	<2.5	<1	<2.5	1700	980	750	960	1120	<2.5	4.03	6	7.5	3.7
Solvents	----	----	----	----	----	----	----	----	----	----	nd	----	----	----	----	----	----	----	----	----	----	----	----	----
Petroleum Hydrocarbons																								
WTPH-G	ug/l	----	<2.5	----	----	----	----	----	----	----	----	----	----	<2.5	----	----	----	----	----	----	----	----	----	----
TPH-418.1	ug/l	2500	----	----	1300	----	----	----	----	----	<1	----	1500	----	6700	----	----	----	----	----	----	----	----	----
WTPH-D	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Semivolatile Organics																								
Naphthalene	ug/l	<5	<10	<0.01	<5	140	0.064	0.19	0.23	0.056	<5	<10	<5	<10	8200	8500	2400	15	2700	<10	4.4	11	15	7.1
2-Methylnaphthalene	ug/l	<5	<10	<0.01	<5	6	0.013	<0.02	<0.02	0.02	<5	<10	<5	<10	700	1000	94	17	81	<10	0.094	0.096	0.14	0.08
2-Chloronaphthalene	ug/l	----	----	----	----	----	----	0.1	----	<0.02	----	----	----	----	----	----	----	----	<0.02	----	<0.02	----	0.011	<0.01
Acenaphthylene	ug/l	<5	<10	<0.01	<5	<10	1.8	1.5	1.3	0.93	<5	<10	<5	<10	87	74	39	<0.02	<0.95	<10	0.81	2	2	1.5
Acenaphthene	ug/l	<5	<10	<0.01	<5	16	8	7	8.5	5.3	<5	<10	<5	<10	220	500	150	160	210	<10	4	8.4	9.2	8.3
Fluorene	ug/l	<5	<10	<0.01	<5	<10	3.6	2.8	3.6	2.8	<5	<10	<5	<10	92	160	1.8	42	46	<10	0.028	0.062	0.079	<0.005
Phenanthrene	ug/l	<5	<10	0.021	<5	<10	0.035	<0.02	0.47	<0.01	<5	<10	<5	<10	110	470	39	44	43	<10	0.44	0.67	0.68	0.52
Anthracene	ug/l	<5	<10	0.011	<5	<10	0.3	0.2	<0.02	0.38	<5	<10	<5	<10	23	140	7.4	8.4	8	<10	0.061	0.093	0.093	0.08
Fluoranthene	ug/l	<5	<10	<0.01	<5	<10	1.2	0.82	1.1	1.3	<5	<10	<5	<10	17	130	1.9	2.1	2.8	<10	0.028	<0.02	0.017	0.017
Pyrene	ug/l	<1	<10	<0.01	<1	<10	1.6	1.1	1.7	1.7	<1	<10	<1	<10	25	160	1.5	2.4	2.7	<10	<0.02	<0.02	0.013	0.018
Benzo(a)anthracene	ug/l	<1	<10	<0.01	<1	<10	0.055	0.056	0.062	<0.01	<1	<10	<1	<10	<10	50	<0.01	0.064	0.13	<10	<0.02	<0.02	<0.01	<0.005
Chrysene	ug/l	<1	<10	<0.01	<1	<10	0.045	0.037	0.051	<0.01	<1	<10	<1	<10	<10	60	<0.01	0.049	0.077	<10	<0.02	<0.02	<0.01	<0.005
Benzo(b)fluoranthene	ug/l	<1	<10	<0.01	<1	<10	<0.01	<0.02	<0.02	<0.01	<1	<10	<1	<10	<10	32	<0.01	<0.02	<0.01	<10	<0.02	<0.02	<0.01	<0.005
Benzo(k)fluoranthene	ug/l	<1	<10	<0.01	<1	<10	<0.01	<0.02	<0.02	<0.01	<1	<10	<1	<10	<10	17	<0.01	<0.02	<0.01	<10	<0.02	<0.02	<0.01	<0.005
Benzo(a)pyrene	ug/l	<1	<10	<0.01	<1	<10	<0.01	<0.02	<0.02	<0.01	<1	<10	<1	<10	<10	46	<0.01	<0.02	<0.01	<10	<0.02	<0.02	<0.01	<0.005
Indeno(1,2,3-cd)pyrene	ug/l	<1	<10	<0.01	<1	<10	<0.01	<0.02	<0.02	<0.01	<1	<10	<1	<10	<10	24	<0.01	<0.02	<0.01	<10	<0.02	<0.02	<0.01	<0.005
Dibenzo(a,h)anthracene	ug/l	<1	<10	<0.01	<1	<10	<0.01	<0.02	<0.02	<0.01	<1	<10	<1	<10	<10	<10	<0.01	<0.02	<0.01	<10	<0.02	<0.02	<0.01	<0.005
Benzo(g,h,i)perylene	ug/l	<1	<10	<0.01	<1	<10	<0.01	<0.02	<0.02	<0.01	<1	<10	<1	<10	<10	26	<0.01	<0.02	<0.01	<10	<0.02	<0.02	<0.01	<0.005
Dibenzofuran	ug/l	<10	----	----	<10	----	----	----	----	----	<10	----	<10	----	25	----	----	----	----	----	----	----	----	----
2-4-Dimethylphenol	ug/l	<10	----	----	<10	----	----	----	----	----	<10	----	<10	----	100	----	----	----	----	----	----	----	----	----
4-Methylphenol	ug/l	<10	----	----	<10	----	----	----	----	----	<10	----	<10	----	51	----	----	----	----	----	----	----	----	----
Phenol	ug/l	<10	----	----	<10	----	----	----	----	----	<10	----	<10	----	11	----	----	----	----	----	----	----	----	----
Total Naphthalenes	ug/l	nd	nd	nd	nd	146	0.077	0.19	0.23	0.076	nd	nd	nd	nd	8900	9500	2494	32	2781	nd	4.49	11.1	15.1	7.2
BaPEq		<1.2(nd)	<12.1(nd)	<0.01(nd)	<1.2(nd)	<12.1(nd)	<0.017	<0.032	<0.029	<0.01(nd)	<1.2(nd)	<12.1(nd)	<1.2(nd)	<12.1(nd)	<12.1(nd)	63.9	<0.01(nd)	<0.029	<0.025	<12.1(nd)	<0.03(nd)	<0.03(nd)	<0.01(nd)	<0.006(nd)

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

Well Numbers	Units	MGP Area Wells																						
		HC-MW-2	HC-MW-2	HC-MW-2	HC-MW-4	DOTMW-4	DOTMW-4	DOTMW-4	DOTMW-4	DOTMW-4	HC-MW-5	HC-MW-5	HC-MW-6	HC-MW-6	HC-MW-7	HC-MW-7	MW-7R	MW-7R	MW-7R	MW-14	MW-14	MW-14	MW-14	MW-14
Sample Date	----	11/15/93	Jan-96	Jun-98	11/15/93	Jan-96	Jun-98	Sep-98	Dec-98	Mar-99	11/18/93	Jan-96	11/15/93	Jan-96	11/15/93	Jan-96	Nov-98	Dec-98	Mar-99	Jan-96	Sep-98	Dec-98	Mar-99	Sep-99
Screen Depth	feet	16-26	16-26	16-26	6-16	10-20	10-20	10-20	10-20	6-16	11-20	11-20	20-25	20-25	5-21	5-21	21-31	21-31	21-31	12-32	12-32	12-32	12-32	12-32
Year Installed	----	1987	1987	1987	1987	1996	1996	1996	1996	1987	1987	1987	1987	1987	1993	1993	1998	1998	1998	1996	1996	1996	1996	1996
Source	----	B&V 94	B&V 96	GeoE 98	B&V 94	B&V 96	GeoE 98	GeoE 98	GeoE 99	GeoE 99	B&V 94	B&V 96	B&V 94	B&V 96	B&V 94	B&V 96	GeoE 99	GeoE 99	GeoE 99	B&V 96	GeoE 98	GeoE 99	GeoE 99	GeoE 99
Total Metals																								
Aluminum	ug/l	----	----	----	----	----	----	----	----	----	2660	----	----	----	----	----	----	----	----	----	----	----	----	----
Antimony	ug/l	----	----	----	----	----	----	----	----	----	<60	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	ug/l	----	----	----	----	----	----	----	----	----	<5	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	ug/l	----	----	----	----	----	----	----	----	----	<200	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	ug/l	----	----	----	----	----	----	----	----	----	<5	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	ug/l	----	----	----	----	----	----	----	----	----	<10	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	ug/l	----	----	----	----	----	----	----	----	----	<25	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	ug/l	----	----	----	----	----	----	----	----	----	2430	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	ug/l	----	----	----	----	----	----	----	----	----	3.3	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	ug/l	----	----	----	----	----	----	----	----	----	264	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	ug/l	----	----	----	----	----	----	----	----	----	<0.2	----	----	----	----	----	----	----	----	----	----	----	----	----
Nickel	ug/l	----	----	----	----	----	----	----	----	----	<40	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	ug/l	----	----	----	----	----	----	----	----	----	<10	----	----	----	----	----	----	----	----	----	----	----	----	----
Vanadium	ug/l	----	----	----	----	----	----	----	----	----	<50	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	ug/l	----	----	----	----	----	----	----	----	----	<20	----	----	----	----	----	----	----	----	----	----	----	----	----
Dissolved Metals																								
Aluminum	ug/l	----	----	----	----	----	----	----	----	----	<200	----	----	----	----	----	----	----	----	----	----	----	----	----
Antimony	ug/l	----	----	----	----	----	----	----	----	----	234	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	ug/l	----	----	----	----	----	----	----	----	----	<5	----	----	----	----	----	----	----	----	<10	----	----	----	----
Barium	ug/l	----	----	----	----	----	----	----	----	----	<200	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	ug/l	----	----	----	----	----	----	----	----	----	<5	----	----	----	----	----	----	----	----	<3	----	----	----	----
Chromium	ug/l	----	----	----	----	----	----	----	----	----	<10	----	----	----	----	----	----	----	----	23	----	----	----	----
Copper	ug/l	----	----	----	----	----	----	----	----	----	<25	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	ug/l	----	----	----	----	----	----	----	----	----	<100	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	ug/l	----	----	----	----	----	----	----	----	----	<3	----	----	----	----	----	----	----	----	<2	----	----	----	----
Magnesium	ug/l	----	----	----	----	----	----	----	----	----	34300	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	ug/l	----	----	----	----	----	----	----	----	----	184	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	ug/l	----	----	----	----	----	----	----	----	----	<0.2	----	----	----	----	----	----	----	----	<0.5	----	----	----	----
Nickel	ug/l	----	----	----	----	----	----	----	----	----	<40	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	ug/l	----	----	----	----	----	----	----	----	----	<10	----	----	----	----	----	----	----	----	9	----	----	----	----
Vanadium	ug/l	----	----	----	----	----	----	----	----	----	<50	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	ug/l	----	----	----	----	----	----	----	----	----	<20	----	----	----	----	----	----	----	----	----	----	----	----	----
Pesticides/PCBs	ug/l	----	----	----	----	----	----	----	----	----	nd	----	----	----	----	----	----	----	----	----	----	----	----	----
Other Constituents																								
Cyanide	ug/l	69	----	----	470	----	----	----	----	----	15	----	<10	----	255	----	----	----	----	<10	----	----	----	----
Chloride	mg/l	----	----	----	15.7	----	----	----	----	----	12	----	40	----	21	----	----	----	----	12000	----	----	----	----
Sulfate	mg/l	----	----	----	132	----	----	----	----	----	98.5	----	32.6	----	13.4	----	----	----	----	----	----	----	----	----
Fluoride	mg/l	----	----	----	<0.5	----	----	----	----	----	<0.5	----	<0.5	----	<0.5	----	----	----	----	0.46	----	----	----	----
Nitrate	mg/l	----	----	----	<0.2	----	----	----	----	----	1.11	----	<0.2	----	<0.2	----	----	----	----	20.6	----	----	----	----
Nitrite	mg/l	----	----	----	<0.01	----	----	----	----	----	<0.01	----	<0.01	----	<0.01	----	----	----	----	<0.01	----	----	----	----
Sodium (dissolved)	mg/l	----	----	----	26	----	----	----	----	----	28.5	----	18.5	----	38	----	----	----	----	----	----	----	----	----
Potassium (dissolved)	mg/l	----	----	----	8.25	----	----	----	----	----	<5	----	6.48	----	9.3	----	----	----	----	----	----	----	----	----
Magnesium (dissolved)	mg/l	----	----	----	66.6	----	----	----	----	----	34.3	----	34.9	----	43.8	----	----	----	----	----	----	----	----	----
Calcium (dissolved)	mg/l	----	----	----	90	----	----	----	----	----	54.1	----	44.4	----	62.4	----	----	----	----	----	----	----	----	----

Notes: (a) - Measurements made during well purging
< - Less than indicated value
> - Greater than indicated value
---- - Not analyzed or not applicable

LT - Low Tide
HT - High Tide
R - Results rejected during data validation process
nd - Not detected

- MGP Area Well
- Three Tank Area Well
- Shoreline Line Well
- Individual Well Grouping

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

	Units	MGP Area Wells																		Three Tank Area					
Well Numbers		**MW-14**	**MW-14**	**MW-14**	**MW-14**	**MW-15**	**MW-15R**	**MW-15R**	**MW-15R**	**MW-18A**	**MW-18B**	**MW-19**	**MW-20**	**MW-21**	**MW-22**	**MW-23**	**MW-27**	**MW-27**	**MW-27**	**MW-8(HT)**	**MW-8(LT)**	**MW-8**	**MW-8**	**MW-9(HT)**	**MW-9(LT)**
Sample Date	----	Mar-00	Sep-00	Mar-01	Sep-01	Jan-96	Nov-98	Dec-98	Mar-99	Feb-96	Jan-96	Jun-98	Jun-98	Jun-98	----	----	Sep-98	Dec-98	Mar-99	11/18/93	11/18/93	Jan-96	Jun-98	11/18/93	11/18/93
Screen Depth	feet	12-32	12-32	12-32	12-32	14-34	23-33	23-33	23-33	40-45	58-68	25-40	32-52	37-52	5-15	10-20	12-27	12-27	12-27	16-26	16-26	16-26	16-26	9-25	9-25
Year Installed	----	1996	1996	1996	1996	1996	1998	1998	1998	1996	1996	1997	1997	1997	1997	1997	1998	1998	1998	1993	1993	1993	1993	1993	1993
Source	----	GeoE 00	GeoE 01	GeoE 01	GeoE 02	B&V 96	GeoE 99	GeoE 99	GeoE 99	B&V 96	B&V 96	GeoE 98	GeoE 98	GeoE 98	GeoE 98	GeoE 98	GeoE 98	GeoE 99	GeoE 99	B&V 94	B&V 94	B&V 96	GeoE 98	B&V 94	B&V 94
Field Parameters																									
TOC	mg/l	----	----	----	----	13.8	----	----	----	18.7	1.6	----	----	----	----	----	----	----	----	20	16	----	----	130	31
pH	----	7.1	7.33	7	7.55	6.86	----	----	----	10.3	8.02	----	8.31	----	----	----	9.75	----	----	6.95	7.27	----	----	7.21	7.27
Conductivity (a)	uS	272	376	232	199	61.3	----	----	----	4360	38	360	540	----	----	----	----	----	----	500	----	819	----	3300	----
Salinity (a)	ppt	----	0.1	----	0.2	----	----	----	----	----	----	----	----	----	----	----	----	----	----	0	----	----	----	2	----
Total Dissolved Solids	mg/l	----	----	----	----	575	----	----	----	1040	142	----	----	----	----	----	----	----	----	440	459	----	----	2830	2960
Total Suspended Solids	mg/l	----	----	----	----	61.3	----	----	----	4360	38	----	----	----	----	----	----	----	----	11300	32300	----	----	1160	7450
Turbidity (a)	(NTU)	2.8	1.1	0.5	3	----	----	----	----	----	----	3.3	13.8	4.6	----	----	11.4	----	----	>200	----	----	26	45	----
Alkalinity	mg/l	----	----	----	----	389	----	----	----	287	84	----	----	----	----	----	----	----	----	312	339	----	----	686	682
Bicarbonate	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	345	----	----	669	673
Hardness	mg/l	----	----	----	----	390	----	----	----	52.2	55.3	----	----	----	----	----	----	----	----	737	1550	----	----	924	1080
Volatile Organics																									
Benzene	ug/l	7.2	3.6	3.3	2.5	11.3	27	31	18	86.4	1.3	<1.0	<1.0	<1.0	----	----	390	260	220	720	890	2300	560	270	260
Toluene	ug/l	<1.0	<0.5	<1.0	1.5	1.8	2.5	1.5	1.4	5.6	2.5	<1.0	<1.0	<1.0	----	----	330	230	140	<100	<100	150	22	28	26
Ethylbenzene	ug/l	4.8	4.7	4	3.6	2	2.9	<1.0	1.9	55.8	3.7	<1.0	<1.0	<1.0	----	----	1400	1200	710	200	260	840	260	240	230
Xylenes	ug/l	5.4	4.7	2.7	2.8	20.9	10.1	11.2	8.2	36.1	1.4	<3.0	<3.0	<3.0	----	----	3600	2790	1730	170	220	910	228	220	210
Solvents	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Petroleum Hydrocarbons																									
WTPH-G	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	27000
TPH-418.1	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	<1	<1	----	----	10500	233000
WTPH-D	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	25000
Semivolatile Organics																									
Naphthalene	ug/l	13	3.7	11	7.6	8	16	16	----	<10	<10	0.25	<0.01	0.8	----	----	6900	7400	4900	1600	2300	3400	2400	2100	2400
2-Methylnaphthalene	ug/l	0.13	0.074	<0.01	<0.01	<10	<0.01	0.028	----	<10	<10	0.035	<0.01	0.032	----	----	510	510	480	310	470	500	450	380	370
2-Chloronaphthalene	ug/l	<0.01	0.0099	<0.01	<0.01	----	----	----	----	----	----	----	----	----	----	----	<0.02	----	<0.02	----	----	----	----	----	----
Acenaphthylene	ug/l	1.8	1.4	1.7	1.6	33	37	73	----	<10	<10	0.18	<0.01	0.075	----	----	130	70	69	17	20	11	2.9	<5	<5
Acenaphthene	ug/l	10	11	11	8.6	61	47	93	----	29	<10	0.4	<0.01	0.038	----	----	79	93	120	180	240	230	320	360	360
Fluorene	ug/l	0.087	0.12	0.082	0.057	<10	0.21	0.42	----	6	<10	0.031	<0.01	0.078	----	----	31	34	42	100	140	159	160	200	200
Phenanthrene	ug/l	0.81	0.72	0.82	0.52	6	1.1	2.1	----	<10	<10	0.037	0.022	<0.01	----	----	31	39	49	120	140	280	180	230	230
Anthracene	ug/l	0.11	0.12	0.12	0.1	<10	0.14	0.26	----	<10	<10	<0.01	<0.01	<0.01	----	----	7	7	9	14	15	44	17	18	18
Fluoranthene	ug/l	<0.01	0.086	0.023	0.031	<10	<0.01	<0.02	----	<10	<10	<0.01	<0.01	<0.01	----	----	2.4	1.9	3.1	19	20	140	28	32	34
Pyrene	ug/l	0.015	0.053	0.018	0.025	<10	<0.01	<0.02	----	<10	<10	<0.01	<0.01	<0.01	----	----	2.4	2.1	3.1	14	14	94	<0.28	27	27
Benzo(a)anthracene	ug/l	<0.01	<0.01	<0.01	<0.01	<10	<0.01	<0.02	----	<10	<10	<0.01	<0.01	<0.01	----	----	0.38	0.07	0.17	1.9	2.3	30	5.7	<10	<10
Chrysene	ug/l	<0.01	0.016	<0.01	<0.01	<10	<0.01	<0.02	----	<10	<10	<0.01	<0.01	<0.01	----	----	0.45	0.048	0.15	1.8	2	27	4.6	<10	<10
Benzo(b)fluoranthene	ug/l	<0.01	<0.01	<0.01	<0.01	<10	<0.01	<0.02	----	<10	<10	<0.01	<0.01	<0.01	----	----	0.4	0.014	0.12	<1	<1	15	3.3	<10	<10
Benzo(k)fluoranthene	ug/l	<0.01	<0.01	<0.01	<0.01	<10	<0.01	<0.02	----	<10	<10	<0.01	<0.01	<0.01	----	----	0.06	R	0.028	<1	<1	6	1.2	<10	<10
Benzo(a)pyrene	ug/l	<0.01	<0.01	<0.01	<0.01	<10	<0.01	<0.02	----	<10	<10	<0.01	<0.01	<0.01	----	----	0.47	0.038	0.12	<1	<1	15	3.2	<10	<10
Indeno(1,2,3-cd)pyrene	ug/l	<0.01	<0.01	<0.01	<0.01	<10	<0.01	<0.02	----	<10	<10	<0.01	<0.01	<0.01	----	----	0.15	R	0.036	<1	<1	7	0.86	<10	<10
Dibenzo(a,h)anthracene	ug/l	<0.01	<0.01	<0.01	<0.01	<10	<0.01	<0.02	----	<10	<10	<0.01	<0.01	<0.01	----	----	0.046	R	<0.01	<1	<1	<10	0.26	<10	<10
Benzo(g,h,i)perylene	ug/l	<0.01	<0.01	<0.01	<0.01	<10	<0.01	<0.02	----	<10	<10	<0.01	<0.01	<0.01	----	----	0.017	R	0.043	<1	<1	7	0.91	<10	<10
Dibenzofuran	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	120	160	----	----	260	260
2-4-Dimethylphenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	<10	<10	----	----	16	17
4-Methylphenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	<10	<10	----	----	<10	<10
Phenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	<10	<10	----	----	<10	<10
Total Naphthalenes	ug/l	13.1	3.8	11	7.6	8	16	16.0	----	nd	nd	0.29	nd	0.83	----	----	7410	7910	5380	1910	2770	3900	2850	2480	2770
BaPEq		<0.01(nd)	<0.01	<0.01(nd)	<0.01(nd)	<12.1(nd)	<0.01(nd)	<0.02(nd)	-----	<12.1(nd)	<12.1(nd)	<0.01(nd)	<0.01(nd)	<0.01(nd)	-----	-----	0.62	0.047	0.16	<1.4	<1.4	26.1	4.61	<12.1(nd)	<12.1(nd)

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

	Units	MGP Area Wells																		Three Tank Area					
Well Numbers		MW-14	MW-14	MW-14	MW-14	MW-15	MW-15R	MW-15R	MW-15R	MW-18A	MW-18B	MW-19	MW-20	MW-21	MW-22	MW-23	MW-27	MW-27	MW-27	MW-8(HT)	MW-8(LT)	MW-8	MW-8	MW-9(HT)	MW-9(LT)
Sample Date	----	Mar-00	Sep-00	Mar-01	Sep-01	Jan-96	Nov-98	Dec-98	Mar-99	Feb-96	Jan-96	Jun-98	Jun-98	Jun-98	----	----	Sep-98	Dec-98	Mar-99	11/18/93	11/18/93	Jan-96	Jun-98	11/18/93	11/18/93
Screen Depth	feet	12-32	12-32	12-32	12-32	14-34	23-33	23-33	23-33	40-45	58-68	25-40	32-52	37-52	5-15	10-20	12-27	12-27	12-27	16-26	16-26	16-26	16-26	9-25	9-25
Year Installed	----	1996	1996	1996	1996	1996	1998	1998	1998	1996	1996	1997	1997	1997	1997	1997	1998	1998	1998	1993	1993	1993	1993	1993	1993
Source	----	GeoE 00	GeoE 01	GeoE 01	GeoE 02	B&V 96	GeoE 99	GeoE 99	GeoE 99	B&V 96	B&V 96	GeoE 98	GeoE 98	GeoE 98	GeoE 98	GeoE 98	GeoE 98	GeoE 99	GeoE 99	B&V 94	B&V 94	B&V 96	GeoE 98	B&V 94	B&V 94
Total Metals																									
Aluminum	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Antimony	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	ug/l	----	----	----	----	<10	----	----	----	<10	<10	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	ug/l	----	----	----	----	<3	----	----	----	<3	<3	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	ug/l	----	----	----	----	<7	----	----	----	49	<7	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	ug/l	----	----	----	----	54	----	----	----	220	<2	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	ug/l	----	----	----	----	<0.5	----	----	----	<0.5	<0.5	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nickel	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	ug/l	----	----	----	----	<7	----	----	----	<7	<7	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Vanadium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Dissolved Metals																									
Aluminum	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Antimony	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	ug/l	----	----	----	----	<10	----	----	----	<10	<10	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	ug/l	----	----	----	----	<3	----	----	----	<3	<3	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	ug/l	----	----	----	----	11	----	----	----	9	<7	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	ug/l	----	----	----	----	<2	----	----	----	<2	<2	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Magnesium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	ug/l	----	----	----	----	<0.5	----	----	----	<0.5	<0.5	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nickel	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	ug/l	----	----	----	----	<7	----	----	----	<7	<7	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Vanadium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Pesticides/PCBs	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Other Constituents																									
Cyanide	ug/l	----	----	----	----	<10	----	----	----	<10	<10	----	----	----	----	----	----	----	----	252	306	----	----	411	165
Chloride	mg/l	----	----	----	----	39.4	----	----	----	19.7	11.8	----	----	----	----	----	----	----	----	128	15.5	----	----	1390	1310
Sulfate	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	<5	<5	----	----	60.1	51.8
Fluoride	mg/l	----	----	----	----	0.14	----	----	----	0.42	0.26	----	----	----	----	----	----	----	----	<0.5	<0.5	----	----	<0.5	<0.5
Nitrate	mg/l	----	----	----	----	3.45	----	----	----	5.66	1.98	----	----	----	----	----	----	----	----	----	<0.2	----	----	<0.2	<0.2
Nitrite	mg/l	----	----	----	----	<0.01	----	----	----	0.5	<0.01	----	----	----	----	----	----	----	----	----	<0.01	----	----	<0.01	<0.01
Sodium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----		----	----	----	----	----	----	----	----	38.8	38.5	----	----	542	608
Potassium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	14.4	16	----	----	40.2	43.4
Magnesium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	28.5	30.9	----	----	106	112
Calcium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	45.2	44.6	----	----	150	147

Notes: (a) - Meas(a) - Measurements made during well purging
< - Less tl< - Less than indicated value
> - Greate> - Greater than indicated value
---- - Not a---- - Not analyzed or not applicable

LT - Low Tide
HT - High Tide
R - Results rejected during data validation process
nd - Not detected

- MGP Area Well
- Three Tank Area Well
- Shoreline Line Well
- Individual Well Grouping

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

	Units	Three Tank Area				Shoreline Wells																			
Well Numbers		**MW-9**	**MW-25**	**MW-25**	**MW-25**	**MW-10(HT)**	**MW-10(LT)**	**MW-10**	**MW-10**	**MW-10**	**MW-10**	**MW-10**	**MW-10**	**MW-10**	**MW-10**	**MW-10**	**MW-10**	**MW-11(HT)**	**MW-11(LT)**	**MW-11**	**MW-11**	**MW-11**	**MW-11**	**MW-11**	**MW-11**
Sample Date	----	Jan-96	Jul-98	Sep-98	Dec-98	11/18/93	11/18/93	Jan-96	Jun-98	Sep-98	Dec-98	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	11/18/93	11/18/93	Jan-96	Jun-98	Sep-98	Dec-98	Mar-99	Sep-99
Screen Depth	feet	9-25	12-22	12-22	12-22	6-22	6-22	6-22	6-22	6-22	6-22	6-22	6-22	6-22	6-22	6-22	6-22	7-18	7-18	7-18	7-18	7-18	7-18	7-18	7-18
Year Installed	----	1993	1998	1998	1998	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993
Source	----	B&V 96	GeoE 98	GeoE 98	GeoE 99	B&V 94	B&V 94	B&V 96	GeoE 98	GeoE 98	GeoE 99	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02	B&V 94	B&V 94	B&V 96	GeoE 98	GeoE 98	GeoE 99	GeoE 99	GeoE 99
Field Parameters																									
TOC	mg/l	----	----	----	----	66	64	----	----	----	----	----	----	----	----	----	----	25	8.5	----	----	----	----	----	----
pH	----	6.99	----	----	----	6.7	6.97	----	7.02	----	----	----	6.34	6.4	6.37	6.4	6.6	6.54	6.83	----	7.58	----	----	----	9.98
Conductivity (a)	uS	2270	----	----	----	22000	----	31800	1980	----	----	----	>20000	>20000	>20000	>20000	----	25500	----	27400	1928	----	----	----	>20000
Salinity (a)	ppt	----	----	----	----	18	----	----	----	----	----	----	14.4	14.4	15.1	15.7	23.8	24.5	----	----	----	----	----	----	13.1
Total Dissolved Solids	mg/l	----	----	----	----	30700	20500	----	----	----	----	----	----	----	----	----	----	31500	25300	----	----	----	----	----	----
Total Suspended Solids	mg/l	----	----	----	----	2370	635	----	----	----	----	----	----	----	----	----	----	3540	408	----	----	----	----	----	----
Turbidity (a)	(NTU)	----	----	1.9	----	>200	----	----	7	11.1	----	----	0.7	1.2	1.3	3.1	2	>200	----	----	0.9	0.1	----	----	1.5
Alkalinity	mg/l	----	----	----	----	96.8	431	----	----	----	----	----	----	----	----	----	----	----	0.11	----	----	----	----	----	----
Bicarbonate	mg/l	----	----	----	----	106	444	----	----	----	----	----	----	----	----	----	----	130	----	----	----	----	----	----	----
Hardness	mg/l	----	----	----	----	3940	3220	----	----	----	----	----	----	----	----	----	----	4160	----	----	----	----	----	----	----
Volatile Organics																									
Benzene	ug/l	840	710	390	520	28	180	<2.5	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<1	<1	<2.5	<1	<1	<1	<1	<1
Toluene	ug/l	75	3.2	3.7	14	<10	<10	<2.5	<1	<1	<1	<1	<1	<1	<0.5	<1.0	<1.0	<1	<1	<2.5	<1	<1	<1	<1	<1
Ethylbenzene	ug/l	460	76	52	70	<10	37	<2.5	<1	<1	<1	<1	<1	<1	<0.5	<1.0	<1.0	<1	<1	<2.5	<1	<1	<1	<1	<1
Xylenes	ug/l	420	58	40	65	<10	32	<2.5	<3	<3	<3	<3	<3	<3	<1.5	<3.0	<3.0	<1	<1	<2.5	<3	<3	<3	<3	<3
Solvents	----	----	----	----	----	nd	nd	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Petroleum Hydrocarbons																									
WTPH-G	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TPH-418.1	ug/l	----	----	----	----	<1	<1	----	----	----	----	----	----	----	----	----	----	<1	<1	----	----	----	----	----	----
WTPH-D	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Semivolatile Organics																									
Naphthalene	ug/l	2700	500	450	740	9.1	200	<10	0.026	0.085	0.025	0.022	0.0081	0.016	0.089	0.023	0.013	<5	<5	<10	<0.01	0.56	0.031	0.012	0.0062
2-Methylnaphthalene	ug/l	860	100	110	130	<5	9.5	<10	0.015	<0.03	<0.02	0.014	<0.005	<0.010	<0.013	<0.01	<0.01	<5	<5	<10	<0.01	0.042	<0.02	<0.01	<0.005
2-Chloronaphthalene	ug/l	----	----	0.024	----	----	----	----	----	<0.03	----	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	----	----	----	----	<0.02	----	<0.02	<0.01
Acenaphthylene	ug/l	30	0.8	2.2	0.18	<5	<5	<10	0.035	0.095	0.038	0.035	0.0071	<0.010	0.073	<0.01	0.012	<5	<5	<10	<0.01	<0.02	0.019	<0.01	<0.005
Acenaphthene	ug/l	1700	200	190	170	7.3	23	<10	0.036	0.075	0.035	0.041	0.0062	<0.010	0.037	<0.01	<0.01	<5	<5	<10	0.26	0.21	0.039	<0.01	<0.005
Fluorene	ug/l	1600	98	98	86	<5	14	<10	<0.01	0.04	<0.02	<0.01	<0.005	<0.010	<0.01	<0.01	<0.01	<5	<5	<10	<0.01	0.065	<0.02	<0.01	<0.005
Phenanthrene	ug/l	3900	79	92	84	6.4	24	<10	0.021	0.065	<0.02	0.012	0.0071	0.017	0.015	0.013	0.012	<5	<5	<10	<0.01	0.07	<0.02	0.014	<0.005
Anthracene	ug/l	340	8.2	4.4	6.4	<5	<5	<10	0.026	0.035	<0.02	0.018	0.0062	0.013	0.032	0.014	<0.01	<5	<5	<10	<0.01	0.028	0.056	0.018	0.0057
Fluoranthene	ug/l	1600	7.5	6.3	7.6	<5	<5	<10	0.1	0.13	0.019	0.055	0.0057	<0.010	0.09	0.083	0.049	<5	<5	<10	<0.01	<0.02	<0.02	<0.01	<0.005
Pyrene	ug/l	1000	3.5	3.4	3.8	2.3	<1	<10	0.087	0.1	0.017	0.018	<0.005	<0.010	0.061	0.076	0.036	<1	<1	<10	<0.01	<0.02	<0.02	<0.01	<0.005
Benzo(a)anthracene	ug/l	240	<0.05	0.12	0.17	<1	<1	<10	0.027	<0.03	<0.02	<0.01	<0.005	<0.010	<0.01	<0.01	<0.01	<1	<1	<10	<0.01	<0.02	<0.02	<0.01	<0.005
Chrysene	ug/l	240	<0.05	0.12	0.1	<1	<1	<10	0.029	<0.03	<0.02	<0.01	<0.005	<0.010	<0.01	<0.01	<0.01	<1	<1	<10	<0.01	<0.02	<0.02	<0.01	<0.005
Benzo(b)fluoranthene	ug/l	89	<0.05	<0.02	<0.02	<1	<1	<10	0.05	0.045	<0.02	<0.01	<0.005	<0.010	<0.01	0.015	<0.01	<1	<1	<10	<0.01	<0.02	<0.02	<0.01	<0.005
Benzo(k)fluoranthene	ug/l	25	<0.05	<0.02	<0.02	<1	<1	<10	0.015	<0.03	<0.02	<0.01	<0.005	<0.010	<0.01	<0.01	<0.01	<1	<1	<10	<0.01	<0.02	<0.02	<0.01	<0.005
Benzo(a)pyrene	ug/l	60	<0.05	<0.02	<0.02	<1	<1	<10	0.043	<0.03	<0.02	<0.01	<0.005	<0.010	<0.01	<0.01	<0.01	<1	<1	<10	<0.01	<0.02	<0.02	<0.01	<0.005
Indeno(1,2,3-cd)pyrene	ug/l	19	<0.05	<0.02	<0.02	<1	<1	<10	0.023	<0.03	<0.02	<0.01	<0.005	<0.010	<0.01	<0.01	<0.01	<1	<1	<10	<0.01	<0.02	<0.02	<0.01	<0.005
Dibenzo(a,h)anthracene	ug/l	<10	<0.05	<0.02	<0.02	<1	<1	<10	<0.01	<0.03	<0.02	<0.01	<0.005	<0.010	<0.01	<0.01	<0.01	<1	<1	<10	<0.01	<0.02	<0.02	<0.01	<0.005
Benzo(g,h,i)perylene	ug/l	16	<0.05	<0.02	<0.02	<1	<1	<10	0.029	<0.03	<0.02	<0.01	<0.005	<0.010	<0.01	<0.01	<0.01	<1	<1	<10	<0.01	<0.02	<0.02	<0.01	<0.005
Dibenzofuran	ug/l	----	----	----	----	<10	15	----	----	----	----	----	----	----	----	----	----	<10	<10	----	----	----	----	----	----
2-4-Dimethylphenol	ug/l	----	----	----	----	<10	<10	----	----	----	----	----	----	----	----	----	----	<10	<10	----	----	----	----	----	----
4-Methylphenol	ug/l	----	----	----	----	<10	<10	----	----	----	----	----	----	----	----	----	----	<10	<10	----	----	----	----	----	----
Phenol	ug/l	----	----	----	----	<10	<10	----	----	----	----	----	----	----	----	----	----	<10	<10	----	----	----	----	----	----
Total Naphthalenes	ug/l	3560	600	560	870	9.1	210	nd	0.04	0.09	0.03	0.04	0.01	0.02	0.09	0.02	0.01	nd	nd	nd	nd	0.56	0.05	0.02	0.01
BaPEq		104.7	<0.06(nd)	<0.041	<0.040	<1.2(nd)	<1.2(nd)	<12.1(nd)	0.06	<0.03	<0.02(nd)	<0.01(nd)	<0.006(nd)	<0.01(nd)	<0.01(nd)	<0.01	<0.01(nd)	<1.2(nd)	<1.2(nd)	<12.1(nd)	<0.01(nd)	<0.02(nd)	<0.02(nd)	<0.01(nd)	<0.006(nd)

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

	Units	Three Tank Area				Shoreline Wells																			
Well Numbers		MW-9	MW-25	MW-25	MW-25	MW-10(HT)	MW-10(LT)	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-11(HT)	MW-11(LT)	MW-11	MW-11	MW-11	MW-11	MW-11	MW-11
Sample Date	----	Jan-96	Jul-98	Sep-98	Dec-98	11/18/93	11/18/93	Jan-96	Jun-98	Sep-98	Dec-98	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	11/18/93	11/18/93	Jan-96	Jun-98	Sep-98	Dec-98	Mar-99	Sep-99
Screen Depth	feet	9-25	12-22	12-22	12-22	6-22	6-22	6-22	6-22	6-22	6-22	6-22	6-22	6-22	6-22	6-22	6-22	7-18	7-18	7-18	7-18	7-18	7-18	7-18	7-18
Year Installed	----	1993	1998	1998	1998	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993
Source	----	B&V 96	GeoE 98	GeoE 98	GeoE 99	B&V 94	B&V 94	B&V 96	GeoE 98	GeoE 98	GeoE 99	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02	B&V 94	B&V 94	B&V 96	GeoE 98	GeoE 98	GeoE 99	GeoE 99	GeoE 99
Total Metals																									
Aluminum	ug/l	----	----	----	----	81300	76500	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Antimony	ug/l	----	----	----	----	3130	2400	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	ug/l	----	----	----	----	25.3	31.6	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	ug/l	----	----	----	----	440	460	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	ug/l	----	----	----	----	<5	<5	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	ug/l	----	----	----	----	61	57	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	ug/l	----	----	----	----	90	88	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	ug/l	----	----	----	----	52700	50700	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	ug/l	----	----	----	----	45	30	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	ug/l	----	----	----	----	1120	3560	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	ug/l	----	----	----	----	<0.2	<0.2	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nickel	ug/l	----	----	----	----	73	63	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	ug/l	----	----	----	----	<10	<10	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Vanadium	ug/l	----	----	----	----	150	158	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	ug/l	----	----	----	----	222	134	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Dissolved Metals																									
Aluminum	ug/l	----	----	----	----	<200	<200	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Antimony	ug/l	----	----	----	----	2430	2260	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	ug/l	----	----	----	----	20	21	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	ug/l	----	----	----	----	<200	<200	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	ug/l	----	----	----	----	<5	<5	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	ug/l	----	----	----	----	<10	<10	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	ug/l	----	----	----	----	<25	<25	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	ug/l	----	----	----	----	780	1130	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	ug/l	----	----	----	----	<3	14.6	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Magnesium	ug/l	----	----	----	----	706000	616000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	ug/l	----	----	----	----	646	1970	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	ug/l	----	----	----	----	<0.2	<0.2	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nickel	ug/l	----	----	----	----	<40	<40	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	ug/l	----	----	----	----	<10	<10	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Vanadium	ug/l	----	----	----	----	<50	<50	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	ug/l	----	----	----	----	85	24	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Pesticides/PCBs	ug/l	----	----	----	----	nd	nd	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Other Constituents																									
Cyanide	ug/l	----	----	----	----	74	59	----	----	----	----	----	----	----	----	----	----	71	110	----	----	----	----	----	----
Chloride	mg/l	----	----	----	----	14200	10400	----	----	----	----	----	----	----	----	----	----	15300	12800	----	----	----	----	----	----
Sulfate	mg/l	----	----	----	----	1780	1200	----	----	----	----	----	----	----	----	----	----	2080	1860	----	----	----	----	----	----
Fluoride	mg/l	----	----	----	----	<0.5	<0.5	----	----	----	----	----	----	----	----	----	----	<0.5	<0.5	----	----	----	----	----	----
Nitrate	mg/l	----	----	----	----	<0.2	<0.2	----	----	----	----	----	----	----	----	----	----	0.21	<0.2	----	----	----	----	----	----
Nitrite	mg/l	----	----	----	----	<0.01	<0.01	----	----	----	----	----	----	----	----	----	----	<0.01	<0.01	----	----	----	----	----	----
Sodium (dissolved)	mg/l	----	----	----	----	6540	6240	----	----	----	----	----	----	----	----	----	----	7120	6260	----	----	----	----	----	----
Potassium (dissolved)	mg/l	----	----	----	----	281	239	----	----	----	----	----	----	----	----	----	----	270	222	----	----	----	----	----	----
Magnesium (dissolved)	mg/l	----	----	----	----	706	616	----	----	----	----	----	----	----	----	----	----	741	660	----	----	----	----	----	----
Calcium (dissolved)	mg/l	----	----	----	----	287	299	----	----	----	----	----	----	----	----	----	----	304	320	----	----	----	----	----	----

Notes: (a) - Measurements made during well purging
< - Less than indicated value
> - Greater than indicated value
---- - Not analyzed or not applicable

LT - Low Tide
HT - High Tide
R - Results rejected during data validation process
nd - Not detected

- MGP Area Well
- Three Tank Area Well
- Shoreline Line Well
- Individual Well Grouping

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

	Units	Shoreline Wells																							
Well Numbers		**MW-11**	**MW-11**	**MW-11**	**MW-11**	**MW-12(HT)**	**MW-12(LT)**	**MW-12**	**MW-12**	**MW-12**	**MW-12**	**MW-12**	**MW-13(LT)**	**MW-13**	**MW-13**	**MW-16**	**MW-16**	**MW-16**	**MW-16**	**MW-16**	**MW-16**	**MW-16**	**MW-16**	**MW-16**	**MW-17A**
Sample Date	----	Mar-00	Sep-00	Mar-01	Sep-01	11/18/93	11/18/93	Jan-96	Jun-98	Sep-98	Dec-98	Mar-99	11/18/93	Jan-96	Jun-98	Jan-96	Jun-98	Sep-98	Dec-98	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Jan-96
Screen Depth	feet	7-18	7-18	7-18	7-18	28-38	28-38	28-38	28-38	28-38	28-38	28-38	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30	47-52
Year Installed	----	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1996???	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996
Source	----	GeoE 00	GeoE 01	GeoE 01	GeoE 02	B&V 94	B&V 94	B&V 96	GeoE 98	GeoE 98	GeoE 99	GeoE 99	B&V 94	B&V 96	GeoE 98	B&V 96	GeoE 98	GeoE 98	GeoE 99	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	B&V 96
Field Parameters																									
TOC	mg/l	----	----	----	----	95	14	----	----	----	----	----	13	16	----	3.4	----	----	----	----	----	----	----	----	2.5
pH	----	6.32	6.16	6.4	6.56	6.52	6.62	----	7.1	7.14	----	----	6.64	6.8	8.3	6.92	7	----	----	----	6.59	6.66	6.6	6.4	8.02
Conductivity (a)	uS	>20000	>20000	>20000	>18560	19000	----	18900	1440	13000	----	----	----	511	1990	18	7930	----	----	----	8080	677	11390	7450	164
Salinity (a)	ppt	12.4	14.4	13.1	22.4	15.5	----	----	----	----	----	----	----	----	----	----		----	----	----	2.53	0.2	3.8	2.9	----
Total Dissolved Solids	mg/l	----	----	----	----	27500	27400	----	----	----	----	----	18200	577	----	6650		----	----	----	----	----	----	----	152
Total Suspended Solids	mg/l	----	----	----	----	1520	185	----	----	----	----	----	236	511	----	30		----	----	----	----	----	----	----	164
Turbidity (a)	(NTU)	1.7	0.4	1.4	0.9	78	----	----	14.6	0.4	----	----	----	----	5	----	1.4	----	----	0.3	2.9	1.2	2.2	0.6	----
Alkalinity	mg/l	----	----	----	----	196	235	----	----	----	----	----	213	530	----	208	----	----	----	----	----	----	----	----	129
Bicarbonate	mg/l	----	----	----	----	125	220	----	----	----	----	----	224	----	----	----	----	----	----	----	----	----	----	----	----
Hardness	mg/l	----	----	----	----	3910	3200	----	----	----	----	----	3000	368	----	1150	----	----	----	----	----	----	----	----	92.8
Volatile Organics																									
Benzene	ug/l	<1	<0.5	<0.5	<0.5	3.3	6.8	<2.5	<1	<1	1	<1	4.9	<2.5	<1	<2.5	<1	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.5	18.3
Toluene	ug/l	<1	<0.5	<1.0	<1.0	<1	1.5	<2.5	<1	<1	<1	<1	1.0	<2.5	<1	<2.5	<1	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<2.5
Ethylbenzene	ug/l	<1	<0.5	<1.0	<1.0	<1	<1	<2.5	<1	<1	<1	<1	<1	<2.5	<1	<2.5	<1	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	4
Xylenes	ug/l	<3	<1.5	<3.0	<3.0	<1	<1	<2.5	<3	<3	<3	<3	<1	<2.5	<3	<2.5	<3	<3.0	<3.0	<3.0	<3.0	<3.0	<1.5	<3.0	<2.5
Solvents	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Petroleum Hydrocarbons																									
WTPH-G	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TPH-418.1	ug/l	----	----	----	----	<1	<1	----	----	----	----	----	<1	----	----	----	----	----	----	----	----	----	----	----	----
WTPH-D	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Semivolatile Organics																									
Naphthalene	ug/l	0.027	0.018	0.015	0.019	<5	<5	<10	0.29	3.7	0.66	0.18	<5	<10	0.36	<10	0.011	0.14	6.8	----	0.085	0.048	0.016	0.016	15
2-Methylnaphthalene	ug/l	0.013	0.0076	<0.01	<0.01	<5	<5	<10	<0.09	0.47	0.035	0.016	<5	<10	0.055	<10	<0.01	<0.02	0.11	----	0.14	<0.01	0.0086	<0.01	8
2-Chloronaphthalene	ug/l	<0.01	<0.01	<0.01	<0.01	----	----	----	----	<0.02	----	<0.02	----	----	----	----	----	<0.02	----	----	<0.01	<0.01	<0.01	<0.01	----
Acenaphthylene	ug/l	<0.01	<0.01	<0.01	<0.01	5.8	5	10	3.3	1.7	2	2.3	<5	<10	0.04	<10	0.059	<0.02	0.2	----	0.13	0.027	0.057	0.043	6
Acenaphthene	ug/l	0.033	0.025	0.016	0.022	<5	<5	9	3.2	0.57	1.2	0.74	<5	<10	2.2	<10	0.3	0.21	0.91	----	0.42	0.26	0.2	0.17	<10
Fluorene	ug/l	<0.01	<0.01	<0.01	<0.01	<5	<5	<10	0.13	0.096	0.087	0.15	<5	<10	0.89	<10	0.016	0.028	0.25	----	<0.005	0.017	<0.01	<0.01	5
Phenanthrene	ug/l	0.017	0.049	0.021	<0.01	7.9	6.8	6	2.2	0.12	0.5	0.26	5.9	<10	0.38	<10	0.011	0.032	0.29	----	0.023	0.044	0.014	0.021	12
Anthracene	ug/l	0.018	0.0086	0.018	0.01	<5	<5	<10	0.33	0.043	0.11	0.064	<5	<10	0.12	<10	0.011	<0.02	0.099	----	0.013	0.025	0.025	<0.01	<10
Fluoranthene	ug/l	<0.01	0.047	0.12	<0.01	<5	<5	15	1.8	0.37	1.7	0.93	<5	<10	0.11	<10	<0.01	<0.02	0.043	----	<0.005	<0.01	<0.01	0.066	<10
Pyrene	ug/l	<0.01	0.014	0.084	<0.01	1.1	1.2	16	0.96	0.31	1.7	0.61	1.0	<10	0.079	<10	0.029	0.028	0.064	----	0.025	<0.01	0.042	0.055	<10
Benzo(a)anthracene	ug/l	<0.01	<0.01	0.024	<0.01	<1	<1	5	0.16	<0.02	0.025	0.024	<1	<10	<0.01	<10	<0.01	<0.02	<0.02	----	<0.005	<0.01	<0.01	<0.01	<10
Chrysene	ug/l	<0.01	<0.01	0.034	<0.01	<1	<1	5	0.16	<0.02	0.026	0.013	<1	<10	<0.01	<10	<0.01	<0.02	0.013	----	0.0071	<0.01	<0.01	<0.01	<10
Benzo(b)fluoranthene	ug/l	<0.01	<0.01	0.038	<0.01	<1	<1	<10	0.15	<0.02	<0.02	<0.01	<1	<10	<0.01	<10	<0.01	<0.02	<0.02	----	<0.005	<0.01	<0.01	<0.01	<10
Benzo(k)fluoranthene	ug/l	<0.01	<0.01	0.016	<0.01	<1	<1	<10	0.032	<0.02	<0.02	<0.01	<1	<10	<0.01	<10	<0.01	<0.02	<0.02	----	<0.005	<0.01	<0.01	<0.01	<10
Benzo(a)pyrene	ug/l	<0.01	<0.01	0.023	<0.01	<1	<1	6	0.17	<0.02	<0.02	<0.01	<1	<10	<0.01	<10	<0.01	<0.02	<0.02	----	<0.005	<0.01	<0.01	<0.01	<10
Indeno(1,2,3-cd)pyrene	ug/l	<0.01	<0.01	0.019	<0.01	<1	<1	<10	0.067	<0.02	<0.02	<0.01	<1	<10	<0.01	<10	<0.01	<0.02	<0.02	----	<0.005	<0.01	<0.01	<0.01	<10
Dibenzo(a,h)anthracene	ug/l	<0.01	<0.01	<0.01	<0.01	<1	<1	<10	<0.09	<0.02	<0.02	<0.01	<1	<10	<0.01	<10	<0.01	<0.02	<0.02	----	<0.005	<0.01	<0.01	<0.01	<10
Benzo(g,h,i)perylene	ug/l	<0.01	<0.01	<0.02	<0.01	<1	<1	<10	0.076	<0.02	<0.02	<0.01	<1	<10	<0.01	<10	<0.01	<0.02	<0.02	----	<0.005	<0.01	<0.01	<0.01	<10
Dibenzofuran	ug/l	----	----	----	----	<10	<10	----	----	----	----	----	<10	----	----	----	----	----	----	----	----	----	----	----	----
2-4-Dimethylphenol	ug/l	----	----	----	----	<10	<10	----	----	----	----	----	<10	----	----	----	----	----	----	----	----	----	----	----	----
4-Methylphenol	ug/l	----	----	----	----	19	36	----	----	----	----	----	27	----	----	----	----	----	----	----	----	----	----	----	----
Phenol	ug/l	----	----	----	----	<10	<10	----	----	----	----	----	<10	----	----	----	----	----	----	----	----	----	----	----	----
Total Naphthalenes	ug/l	0.03	0.02	0.02	0.03	nd	nd	nd	0.29	4.2	0.70	0.20	nd	nd	0.42	nd	0.011	0.14	6.9		0.2	0.048	0.02	0.016	23.0
BaPEq		<0.01(nd)	<0.01(nd)	0.038	<0.01(nd)	<1.2(nd)	<1.2(nd)	<13.1	0.259	<0.03(nd)	<0.02	<0.01	<1.2(nd)	<12.1(nd)	<0.01(nd)	<12.1(nd)	<0.01(nd)	<0.03(nd)	<0.02	-----	<0.01	<0.01(nd)	<0.01(nd)	<0.01(nd)	<12.1(nd)

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

	Units	Shoreline Wells																							
Well Numbers		**MW-11**	**MW-11**	**MW-11**	**MW-11**	**MW-12(HT)**	**MW-12(LT)**	**MW-12**	**MW-12**	**MW-12**	**MW-12**	**MW-12**	**MW-13(LT)**	**MW-13**	**MW-13**	**MW-16**	**MW-16**	**MW-16**	**MW-16**	**MW-16**	**MW-16**	**MW-16**	**MW-16**	**MW-16**	**MW-17A**
Sample Date	----	Mar-00	Sep-00	Mar-01	Sep-01	11/18/93	11/18/93	Jan-96	Jun-98	Sep-98	Dec-98	Mar-99	11/18/93	Jan-96	Jun-98	Jan-96	Jun-98	Sep-98	Dec-98	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Jan-96
Screen Depth	feet	7-18	7-18	7-18	7-18	28-38	28-38	28-38	28-38	28-38	28-38	28-38	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30	47-52
Year Installed	----	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1996???	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996
Source	----	GeoE 00	GeoE 01	GeoE 01	GeoE 02	B&V 94	B&V 94	B&V 96	GeoE 98	GeoE 98	GeoE 99	GeoE 99	B&V 94	B&V 96	GeoE 98	B&V 96	GeoE 98	GeoE 98	GeoE 99	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	B&V 96
Total Metals																									
Aluminum	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Antimony	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nickel	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Vanadium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Dissolved Metals																									
Aluminum	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Antimony	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	<10	----	<10	----	----	----	----	----	----	----	----	<10
Barium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	<3	----	<3	----	----	----	----	----	----	----	----	<3
Chromium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	<7	----	10	----	----	----	----	----	----	----	----	<7
Copper	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	<2	----	<2	----	----	----	----	----	----	----	----	5
Magnesium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	<0.5	----	<0.5	----	----	----	----	----	----	----	----	<0.5
Nickel	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	<7	----	<7	----	----	----	----	----	----	----	----	<7
Vanadium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Pesticides/PCBs	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Other Constituents																									
Cyanide	ug/l	----	----	----	----	90	53	----	----	----	----	----	47	<10	----	<10	----	----	----	----	----	----	----	----	<10
Chloride	mg/l	----	----	----	----	14300	9070	----	----	----	----	----	9800	172	----	3500	----	----	----	----	----	----	----	----	19.7
Sulfate	mg/l	----	----	----	----	1780	1230	----	----	----	----	----	1420	----	----	----	----	----	----	----	----	----	----	----	----
Fluoride	mg/l	----	----	----	----	<0.5	<0.5	----	----	----	----	----	<0.5	0.45	----	0.3	----	----	----	----	----	----	----	----	0.3
Nitrate	mg/l	----	----	----	----	<0.2	<0.2	----	----	----	----	----	<0.2	<1.9	----	10	----	----	----	----	----	----	----	----	3.13
Nitrite	mg/l	----	----	----	----	<0.01	0.013	----	----	----	----	----	0.013	<0.01	----	<0.01	----	----	----	----	----	----	----	----	<0.01
Sodium (dissolved)	mg/l	----	----	----	----	6310	4370	----	----	----	----	----	4540	----	----	----	----	----	----	----	----	----	----	----	----
Potassium (dissolved)	mg/l	----	----	----	----	240	154	----	----	----	----	----	170	----	----	----	----	----	----	----	----	----	----	----	----
Magnesium (dissolved)	mg/l	----	----	----	----	682	519	----	----	----	----	----	546	----	----	----	----	----	----	----	----	----	----	----	----
Calcium (dissolved)	mg/l	----	----	----	----	294	318	----	----	----	----	----	309	----	----	----	----	----	----	----	----	----	----	----	----

Notes: (a) - Meas(a) - Measurements made during well purging
< - Less tl< - Less than indicated value
> - Greate> - Greater than indicated value
---- - Not a---- - Not analyzed or not applicable

LT - Low Tide
HT - High Tide
R - Results rejected during data validation process
nd - Not detected

- MGP Area Well
- Three Tank Area Well
- Shoreline Line Well
- Individual Well Grouping

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

	Units	Shoreline Wells																						
Well Numbers		**MW-17A**	**MW-17A**	**MW-17A**	**MW-17A**	**MW-17A**	**MW-17A**	**MW-17A**	**MW-17A**	**MW-17A**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-24**	**MW-24**	**MW-24**	**MW-24**
Sample Date	----	Jun-98	Sep-98	Dec-98	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	Jan-96	Jun-98	Sep-98	Dec-98	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	Jul-98	Sep-98	Dec-98	Mar-99
Screen Depth	feet	47-52	47-52	47-52	47-52	47-52	47-52	47-52	47-52	47-52	58-68	58-68	58-68	58-68	58-68	58-68	58-68	58-68	58-68	58-68	22-32	22-32	22-32	22-32
Year Installed	----	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1998	1998	1998	1998
Source	----	GeoE 98	GeoE 98	GeoE 99	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02	B&V 96	GeoE 98	GeoE 98	GeoE 99	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02	GeoE 98	GeoE 98	GeoE 99	GeoE 99
Field Parameters																								
TOC	mg/l	----	----	----	----	----	----	----	----	----	2.4	----	----	----	----	----	----	----	----	----	----	----	----	----
pH	----	----	8.15	----	----	6.99	7.17	7.15	7.4	7.85	8.04	----	8.25	----	----	7	7.56	7.12	7.4	7.83	----	7.28	----	----
Conductivity (a)	uS	----	480	----	----	187	182	191	173	221	44	----	----	----	----	176	168	167	161	190	----		----	----
Salinity (a)	ppt	----	----	----	----	<0.03	<0.03	<0.03	<0.03	0.1	----	----	----	----	----	<0.03	<0.03	<0.03	<0.03	0.1	----	----	----	----
Total Dissolved Solids	mg/l	----	----	----	----	----	----	----	----	----	116	----	----	----	----	----	----	----	----	----	----	----	----	----
Total Suspended Solids	mg/l	----	----	----	----	----	----	----	----	----	44	----	----	----	----	----	----	----	----	----	----	----	----	----
Turbidity (a)	(NTU)	3.3	0.8	----	----	1	5.1	2.7	1.5	1.2	----	26	1.9	----	----	2	1.5	3.1	1.1	1	----	10.8	----	----
Alkalinity	mg/l	----	----	----	----	----	----	----	----	----	112	----	----	----	----	----	----	----	----	----	----	----	----	----
Bicarbonate	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Hardness	mg/l	----	----	----	----	----	----	----	----	----	84.9	----	----	----	----	----	----	----	----	----	----	----	----	----
Volatile Organics																								
Benzene	ug/l	76	78	53	29	34	48	30	51	51	178.7	99	86	100	74	54	58	41	84	46	2.3	39	29	30
Toluene	ug/l	<1.0	<1.0	0.63	<1.0	<1.0	<1.0	<0.5	2.7	1.3	2.8	1.2	0.57	2.7	1.5	<1.0	0.9	<0.50	3.3	1.4	<1.0	<1.0	<0.6	1
Ethylbenzene	ug/l	3	7.1	8.8	2.8	<1.0	1.2	3	3.1	1.8	96.6	65	<58	66	63	46	47	28	52	37	<1.0	0.79	<1.0	1.2
Xylenes	ug/l	<3.0	2.2	2.7	0.88	<3.0	<3.0	<1.5	0.59	<3.0	34.3	23.5	19.9	55	16.5	13.9	13	5.6	13	10.8	1.3	2.4	0.64	1.8
Solvents	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Petroleum Hydrocarbons																								
WTPH-G	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TPH-418.1	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
WTPH-D	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Semivolatile Organics																								
Naphthalene	ug/l	0.18	0.21	52	0.25	0.035	0.023	<0.01	0.054	0.25	86	42	2.2	0.41	34	1.6	0.36	0.017	47	<0.01	0.087	7.9	0.21	1.8
2-Methylnaphthalene	ug/l	<0.01	0.075	0.51	<0.01	0.021	0.012	<0.01	<0.01	<0.01	<10	2	0.33	<0.02	<0.02	0.3	0.017	0.0057	4.3	0.7	0.31	2.8	<0.02	0.26
2-Chloronaphthalene	ug/l	----	<0.02	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	----	<0.02	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	----	<0.02	----	<0.02
Acenaphthylene	ug/l	0.094	<0.02	0.072	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	12	0.032	<0.02	0.031	0.032	<0.005	0.014	<0.01	<0.01	<0.01	0.1	0.21	0.15	<0.01
Acenaphthene	ug/l	0.14	0.042	1.8	0.048	<0.005	<0.01	<0.01	<0.01	<0.01	6	0.9	0.033	0.57	0.34	0.69	0.67	<0.01	0.25	<0.01	3.7	5.5	1.3	4
Fluorene	ug/l	0.18	<0.02	0.52	0.061	<0.005	<0.01	<0.01	<0.01	<0.01	10	0.094	0.028	0.047	0.039	<0.005	0.038	<0.01	<0.01	<0.01	0.82	1.2	0.29	0.46
Phenanthrene	ug/l	0.75	0.047	0.61	0.38	0.042	0.01	0.02	0.019	0.34	24	0.28	0.07	0.032	0.33	0.015	0.13	0.021	0.16	0.033	0.54	1.6	0.058	0.29
Anthracene	ug/l	0.14	<0.02	0.11	0.034	<0.005	<0.01	0.0067	<0.01	0.032	5	0.075	<0.02	0.029	0.084	0.086	0.035	0.011	0.041	0.019	0.23	0.36	0.045	0.11
Fluoranthene	ug/l	0.16	<0.02	0.16	0.18	0.081	0.076	0.024	0.093	0.32	5	0.1	0.037	0.044	0.095	0.094	0.054	0.03	0.047	0.07	0.29	0.23	<0.02	0.041
Pyrene	ug/l	0.15	<0.02	0.28	0.19	0.088	0.098	0.019	0.11	0.24	4	0.1	0.084	0.044	0.098	0.0095	0.06	0.034	0.046	0.061	0.17	0.12	<0.02	0.029
Benzo(a)anthracene	ug/l	0.016	<0.02	0.017	0.017	<0.005	0.01	<0.01	<0.01	0.034	<10	0.018	<0.02	<0.02	0.014	0.0095	0.014	<0.01	<0.01	<0.01	<0.01	0.033	<0.02	0.012
Chrysene	ug/l	0.019	<0.02	0.016	0.013	0.0071	0.012	0.015	<0.01	0.036	<10	0.02	<0.02	<0.02	0.018	0.014	0.013	0.018	<0.01	0.016	<0.01	0.042	<0.02	<0.01
Benzo(b)fluoranthene	ug/l	<0.01	<0.02	<0.02	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<10	0.016	<0.02	<0.02	0.013	0.013	0.012	<0.01	<0.01	<0.01	<0.01	0.037	<0.02	<0.01
Benzo(k)fluoranthene	ug/l	<0.01	<0.02	<0.02	<0.01	<0.005	<0.01	<0.01	<0.01	0.022	<10	<0.01	<0.02	<0.02	<0.01	0.0071	0.011	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01
Benzo(a)pyrene	ug/l	0.011	<0.02	0.018	<0.01	<0.005	<0.01	0.021	<0.01	0.016	<10	<0.01	<0.02	<0.02	<0.01	0.0067	0.010	0.027	<0.01	<0.01	<0.01	0.028	<0.02	<0.01
Indeno(1,2,3-cd)pyrene	ug/l	<0.01	<0.02	<0.02	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<10	<0.01	<0.02	<0.02	<0.01	<0.005	<0.01	0.016	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01
Dibenzo(a,h)anthracene	ug/l	<0.01	<0.02	<0.02	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<10	<0.01	<0.02	<0.02	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01
Benzo(g,h,i)perylene	ug/l	<0.01	<0.02	<0.02	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<10	<0.01	<0.02	<0.02	<0.01	0.011	<0.01	0.014	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01
Dibenzofuran	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
2-4-Dimethylphenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
4-Methylphenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Phenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Total Naphthalenes	ug/l	0.18	0.3	52.5	0.25	0.06	0.04	nd	0.054	0.25	86	44.0	2.53	0.41	34	1.90	0.38	0.02	51.3	0.70	0.40	10.7	0.21	2.1
BaPEq		<0.01	<0.03(nd)	<0.03	<0.01	<0.01	<0.01	<0.02	<0.01(nd)	0.028	<12.1(nd)	<0.01	<0.03(nd)	<0.02(nd)	<0.01	0.012	0.019	<0.03	<0.01(nd)	<0.01	<0.01(nd)	0.049	<0.02(nd)	<0.01

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

	Units	Shoreline Wells																						
Well Numbers		**MW-17A**	**MW-17A**	**MW-17A**	**MW-17A**	**MW-17A**	**MW-17A**	**MW-17A**	**MW-17A**	**MW-17A**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-17B**	**MW-24**	**MW-24**	**MW-24**	**MW-24**
Sample Date	----	Jun-98	Sep-98	Dec-98	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	Jan-96	Jun-98	Sep-98	Dec-98	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	Jul-98	Sep-98	Dec-98	Mar-99
Screen Depth	feet	47-52	47-52	47-52	47-52	47-52	47-52	47-52	47-52	47-52	58-68	58-68	58-68	58-68	58-68	58-68	58-68	58-68	58-68	58-68	22-32	22-32	22-32	22-32
Year Installed	----	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1996	1998	1998	1998	1998
Source	----	GeoE 98	GeoE 98	GeoE 99	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02	B&V 96	GeoE 98	GeoE 98	GeoE 99	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02	GeoE 98	GeoE 98	GeoE 99	GeoE 99
Total Metals																								
Aluminum	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Antimony	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nickel	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Vanadium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Dissolved Metals																								
Aluminum	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Antimony	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	ug/l	----	----	----	----	----	----	----	----	----	<10	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	ug/l	----	----	----	----	----	----	----	----	----	<3	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	ug/l	----	----	----	----	----	----	----	----	----	<7	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	ug/l	----	----	----	----	----	----	----	----	----	<2	----	----	----	----	----	----	----	----	----	----	----	----	----
Magnesium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	ug/l	----	----	----	----	----	----	----	----	----	<0.5	----	----	----	----	----	----	----	----	----	----	----	----	----
Nickel	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	ug/l	----	----	----	----	----	----	----	----	----	<7	----	----	----	----	----	----	----	----	----	----	----	----	----
Vanadium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Pesticides/PCBs	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Other Constituents																								
Cyanide	ug/l	----	----	----	----	----	----	----	----	----	<10	----	----	----	----	----	----	----	----	----	----	----	----	----
Chloride	mg/l	----	----	----	----	----	----	----	----	----	19.7	----	----	----	----	----	----	----	----	----	----	----	----	----
Sulfate	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Fluoride	mg/l	----	----	----	----	----	----	----	----	----	0.25	----	----	----	----	----	----	----	----	----	----	----	----	----
Nitrate	mg/l	----	----	----	----	----	----	----	----	----	3.26	----	----	----	----	----	----	----	----	----	----	----	----	----
Nitrite	mg/l	----	----	----	----	----	----	----	----	----	<0.01	----	----	----	----	----	----	----	----	----	----	----	----	----
Sodium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Potassium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Magnesium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Calcium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

Notes: (a) - Meas(a) - Measurements made during well purging
< - Less th< - Less than indicated value
> - Greate> - Greater than indicated value
---- - Not a---- - Not analyzed or not applicable

LT - Low Tide
HT - High Tide
R - Results rejected during data validation process
nd - Not detected

- MGP Area Well
- Three Tank Area Well
- Shoreline Line Well
- Individual Well Grouping

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

	Units	Shoreline Wells																							
Well Numbers		MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26
Sample Date	----	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	Mar-02	Oct-02	Mar-03	Sep-03	Mar-04	Mar-05	Jul-98	Sep-98	Dec-98	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	Mar-02	Oct-02	Mar-03	Sep-03
Screen Depth	feet	22-32	22-32	22-32	22-32	22-32	22-32	22-32	22-32	22-32	22-32	22-32	15-25	15-25	15-25	15-25	15-25	15-25	15-25	15-25	15-25	15-25	15-25	15-25	15-25
Year Installed	----	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998
Source	----	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02	GeoE 02	GeoE 03	GeoE 03	GeoE 03	GeoE 04	GeoE 05	GeoE 98	GeoE 98	GeoE 99	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02	GeoE 02	GeoE 03	GeoE 03	GeoE 04
Field Parameters																									
TOC	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
pH	----	6.46	6.6	6.15	6.5	6.68	7.18	5.98	7.2	6.3	6.94	6.94	----	8.75	----	----	6.53	6.47	6.47	6.6	6.96	7.31	6.69	6.84	6.8
Conductivity (a)	uS	>20000	>20000	>20000	16590	>20000	19400	>20000	4520	31900	11210	10000	----	3270	----	----	6310	5730	4950	5120	6580	5050	5920	6760	7320
Salinity (a)	ppt	8.5	11.1	15.7	14.4	24.1	12	22.9	2.8	17	3.6	4.8	----		----	----	1.7	1.5	1.6	1.7	3.9	3	4	4	3.4
Total Dissolved Solids	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Total Suspended Solids	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Turbidity (a)	(NTU)	2	2.4	1.6	1.3	1.4	1	2.5	4.1	1	0.94	1.9	----	13.8	----	----	0.8	3	2	0.8	2.2	1.3	1.8	2.41	1.4
Alkalinity	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Bicarbonate	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Hardness	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Volatile Organics																									
Benzene	ug/l	29	6.7	1.9	0.91	<0.5	8.19	<0.5	88.4	7.1	162	45.5	120	360	250	150	130	75	35	57	49	49.1	45	31.1	28.4
Toluene	ug/l	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	0.932	<1.0	0.967	0.372	<1.0	9	2.8	1.2	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	ug/l	2.8	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	9.02	1.6	13.7	1.7	5.7	20	14	1.1	9.5	6.5	1.9	3.5	5.6	3.08	3.35	2.11	1.4
Xylenes	ug/l	<3.0	<3.0	<1.5	<3.0	<3.0	<3.0	<3.0	6.00	<3.0	7.59	2.77	20.5	41	21	16.7	9.9	4.6	0.88	3.02	1.8	2.38	2.45	<3.0	2.6
Solvents	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Petroleum Hydrocarbons																									
WTPH-G	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TPH-418.1	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
WTPH-D	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Semivolatile Organics																									
Naphthalene	ug/l	0.47	0.34	0.36	0.29	0.16	0.48	0.112	64.4	0.128	14.9	0.684	----	250	140	130	17	2.4	1.4	1.9	0.94	1.36	1.16	0.594	1.23
2-Methylnaphthalene	ug/l	<0.005	0.026	0.018	<0.01	<0.01	0.401	<0.05	10.4	<0.02	10.2	0.787	----	9.5	1.6	0.23	1.9	0.016	0.018	<0.01	<0.10	<0.01	<0.05	0.050	<0.02
2-Chloronaphthalene	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	----	<0.02	----	<0.02	<0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.20	<0.02	<0.02
Acenaphthylene	ug/l	<0.005	0.047	<0.01	0.054	0.02	0.138	0.036	<0.02	<0.02	0.220	<0.02	0.92	5.1	4.8	7.3	2.3	2.5	2.9	4	4.1	2.38	3.14	2.19	1.74
Acenaphthene	ug/l	3.8	1.1	1.8	1.1	0.3	13.6	0.179	61.1	1.46	87.9	107	4.7	11	8.5	11	10	8	8.8	13	12	10.8	11.1	10.3	7.72
Fluorene	ug/l	0.2	0.11	0.078	0.073	<0.01	<0.47	0.014	6.52	0.142	17.4	15.2	1.6	4.5	3.8	5.5	4	2.7	3.1	4.5	4.4	3.53	2.48	1.71	1.45
Phenanthrene	ug/l	0.039	0.13	0.096	0.028	0.022	0.079	<0.02	0.817	<0.02	6.37	3.43	1.5	4.9	4.3	7.4	5.5	3.7	5.3	7.5	5.9	3.21	3.04	1.68	0.966
Anthracene	ug/l	0.031	0.065	0.11	0.041	<0.01	<0.01	0.041	0.219	0.044	0.634	0.687	0.49	0.9	0.86	1.3	0.53	0.48	0.63	0.41	0.4	0.341	0.445	0.237	0.304
Fluoranthene	ug/l	<0.005	0.044	0.05	0.045	<0.01	0.152	0.028	<0.02	0.095	0.17	<0.02	0.19	0.47	0.39	0.56	0.3	0.33	0.52	0.75	0.57	0.652	0.789	0.64	0.731
Pyrene	ug/l	<0.005	0.029	0.0048	<0.01	<0.01	0.012	0.019	<0.02	0.061	0.136	<0.02	0.1	0.32	0.29	0.42	0.22	0.24	0.34	0.34	0.35	0.432	0.489	0.519	0.518
Benzo(a)anthracene	ug/l	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.01	<0.02	<0.02	0.012	<0.005	<0.01	<0.01	<0.01	<0.10	<0.01	<0.20	<0.02	<0.02
Chrysene	ug/l	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.01	<0.02	<0.02	0.016	<0.005	<0.01	<0.01	<0.01	<0.10	<0.01	<0.20	0.0584	<0.02
Benzo(b)fluoranthene	ug/l	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	0.019	<0.02	<0.02	<0.05	0.054	<0.01	<0.02	<0.02	<0.01	<0.005	<0.01	<0.01	0.2	<0.10	<0.01	<0.20	<0.02	<0.02
Benzo(k)fluoranthene	ug/l	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	0.019	<0.02	<0.02	<0.05	0.054	<0.01	<0.02	<0.02	<0.01	<0.005	<0.01	<0.01	<0.01	<0.10	<0.01	<0.20	<0.02	<0.02
Benzo(a)pyrene	ug/l	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	0.019	<0.02	<0.02	<0.05	0.025	<0.01	<0.02	<0.02	<0.01	<0.005	<0.01	<0.01	0.17	<0.10	<0.01	<0.20	<0.02	<0.02
Indeno(1,2,3-cd)pyrene	ug/l	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	0.019	<0.02	<0.02	<0.05	0.019	<0.01	<0.02	<0.02	<0.01	<0.005	<0.01	<0.01	0.25	<0.10	<0.01	<0.20	<0.02	<0.02
Dibenzo(a,h)anthracene	ug/l	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.01	<0.02	<0.02	<0.01	<0.005	<0.01	<0.01	0.27	<0.10	<0.01	<0.20	<0.02	<0.02
Benzo(g,h,i)perylene	ug/l	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.02	<0.05	0.0166	<0.01	<0.02	<0.02	<0.01	<0.005	<0.01	<0.01	0.27	<0.10	<0.01	<0.20	<0.02	<0.02
Dibenzofuran	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
2-4-Dimethylphenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
4-Methylphenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Phenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Total Naphthalenes	ug/l	0.47	0.37	0.38	0.29	0.16	0.88	0.11	74.8	0.13	25.1	1.5	----	260	142	130	18.9	2.4	1.4	1.9	0.94	1.4	1.2	0.64	1.2
BaPEq		<0.006(nd)	<0.01(nd)	<0.01(nd)	<0.01(nd)	<0.01(nd)	<0.01(nd)	0.035	<0.02(nd)	<0.02(nd)	<0.06(nd)	0.050	<0.01(nd)	<0.03(nd)	<0.02(nd)	<0.01	<0.006(nd)	<0.01(nd)	<0.01(nd)	0.486	<0.12(nd)	<0.01(nd)	<0.23(nd)	<0.02	<0.03(nd)

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

	Units	Shoreline Wells																							
Well Numbers		MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26
Sample Date	----	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	Mar-02	Oct-02	Mar-03	Sep-03	Mar-04	Mar-05	Jul-98	Sep-98	Dec-98	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	Mar-02	Oct-02	Mar-03	Sep-03
Screen Depth	feet	22-32	22-32	22-32	22-32	22-32	22-32	22-32	22-32	22-32	22-32	22-32	15-25	15-25	15-25	15-25	15-25	15-25	15-25	15-25	15-25	15-25	15-25	15-25	15-25
Year Installed	----	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998	1998
Source	----	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02	GeoE 02	GeoE 03	GeoE 03	GeoE 03	GeoE 04	GeoE 05	GeoE 98	GeoE 98	GeoE 99	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02	GeoE 02	GeoE 03	GeoE 03	GeoE 04
Total Metals																									
Aluminum	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Antimony	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nickel	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Vanadium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Dissolved Metals																									
Aluminum	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Antimony	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Magnesium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nickel	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Vanadium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Pesticides/PCBs	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Other Constituents																									
Cyanide	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chloride	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Sulfate	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Fluoride	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nitrate	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nitrite	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Sodium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Potassium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Magnesium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Calcium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

Notes: (a) - Meas(a) - Measurements made during well purging
< - Less tl< - Less than indicated value
> - Greate> - Greater than indicated value
---- - Not a---- - Not analyzed or not applicable

LT - Low Tide
HT - High Tide
R - Results rejected during data validation process
nd - Not detected

- MGP Area Well
- Three Tank Area Well
- Shoreline Line Well
- Individual Well Grouping

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

	Units	Shoreline Wells																							
Well Numbers		MW-26	MW-26	MW-28	MW-28	MW-28	MW-28	MW-28	MW-28	MW-29	MW-29	MW-29	MW-29	MW-29	MW-29	MW-29	MW-29	MW-29	MW-29	MW-29	MW-29	MW-30	MW-30	MW-30	MW-30
Sample Date	----	Mar-04	Mar-05	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	Mar-02	Oct-02	Jul-03	Sep-03	Mar-04	Mar-05	Mar-99	Sep-99	Mar-00	Sep-00
Screen Depth	feet	15-25	15-25	34-44	34-44	34-44	34-44	34-44	34-44	23-33	23-33	23-33	23-33	23-33	23-33	23-33	23-33	23-33	23-33	23-33	23-33	21-31	21-31	21-31	21-31
Year Installed	----	1998	1998	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999
Source	----	GeoE 04	GeoE 05	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02	GeoE 02	GeoE 03	GeoE 03	GeoE 04	GeoE 04	GeoE 05	GeoE 99	GeoE 99	GeoE 00	GeoE 01
Field Parameters																									
TOC	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
pH	----	7.01	6.8	----	7.46	7.54	7.09	7.4	7.12	----	6.93	7.14	7.03	7.2	7.39	6.5	7.07	6.77	6.8	7.46	7.03	----	6.87	6.6	6.68
Conductivity (a)	uS	5320	6410	----	240	265	197	169	127	----	396	585	478	886	1473	590	965	1239	1750	1040	488	----	512	512	487
Salinity (a)	ppt	3.3	3.7	----	<0.03	<0.03	<0.03	<0.03	0.1	----	<0.03	0.1	0.1	0.2	1	0.7	0.5	1.1	0.9	0.5	0.3	----	<0.07	0.1	0.1
Total Dissolved Solids	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Total Suspended Solids	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Turbidity (a)	(NTU)	3.6	0	----	2.6	1.3	4.5	3.1	3.8	----	3.4	5.2	2	1.9	3.6	2.6	2.9	2.22	1.9	2.43	0.6	----	2.9	3.8	3.1
Alkalinity	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Bicarbonate	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Hardness	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Volatile Organics																									
Benzene	ug/l	29	11.4	<1.0	<1.0	<1.0	<0.5	2.8	3.3	53	34	46	27	29	20	24.1	18.1	33.5	94.6	113	54.3	<1.0	<1.0	<1.0	<0.5
Toluene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	0.77	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	0.69	0.604	<1.0	<1.0	<1.0	<1.0	<0.5
Ethylbenzene	ug/l	2.07	0.981	2.4	2.1	3.1	0.5	2.3	1.4	6.1	3.6	4.8	2	2.4	1.6	1.63	1.34	0.554	3.37	2.87	0.585	<1.0	<1.0	<1.0	<0.5
Xylenes	ug/l	<3.0	2.73	<3.0	<3.0	<3.0	<1.5	<3.0	<3.0	7	5	5.8	8.3	4.04	3.7	1.14	2.71	<3.0	2.31	5.03	4.38	<3.0	<3.0	<3.0	<1.5
Solvents	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Petroleum Hydrocarbons																									
WTPH-G	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
TPH-418.1	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
WTPH-D	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Semivolatile Organics																									
Naphthalene	ug/l	2.06	1.04	0.09	0.44	1	0.016	0.8	0.21	55	0.049	25	0.29	11	1.6	4.65	4.57	24.6	4.49	9.23	1.43	0.035	0.13	0.075	0.061
2-Methylnaphthalene	ug/l	0.028	0.074	0.018	0.042	0.039	0.0048	<0.01	<0.01	7.4	0.32	3.8	0.87	0.56	0.18	0.805	0.638	5.03	0.892	13.2	15.1	0.012	0.032	0.012	0.017
2-Chloronaphthalene	ug/l	<0.05	<0.02	----	<0.01	<0.01	<0.01	<0.01	<0.01	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	----	0.022	0.021	<0.01
Acenaphthylene	ug/l	1.12	1.2	0.39	0.13	0.048	0.037	0.046	0.018	0.16	0.027	0.067	0.05	0.042	<0.01	0.034	<0.20	<0.02	0.142	0.068	<0.02	0.026	0.47	0.3	0.43
Acenaphthene	ug/l	9.67	11	0.23	0.057	0.024	0.011	0.036	<0.01	10	4.3	6.6	6.6	8.2	3.3	5.71	6.7	15	9.47	16.1	17.4	0.48	24	16	15
Fluorene	ug/l	1.28	0.291	0.16	0.16	0.094	<0.01	0.074	0.025	2.5	0.74	1.5	1.6	1.1	0.89	1.28	1.42	1.83	1.73	2.62	3.78	15	0.58	0.46	0.43
Phenanthrene	ug/l	0.762	0.288	0.053	0.32	0.44	0.066	0.32	0.064	0.53	0.11	0.24	0.21	0.11	0.018	<0.01	<0.20	0.214	0.285	0.739	1.36	0.46	0.071	0.063	0.024
Anthracene	ug/l	0.344	0.238	0.16	0.2	0.15	0.063	0.15	0.049	0.13	0.012	0.024	0.024	0.034	0.044	0.027	<0.20	0.148	0.118	0.166	0.139	0.06	0.0067	0.068	0.045
Fluoranthene	ug/l	0.53	1.01	0.5	0.21	0.11	0.15	0.17	0.095	0.12	0.021	0.026	<0.01	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	0.062	0.037	<0.01	0.025
Pyrene	ug/l	0.363	0.601	0.43	0.32	0.14	0.16	0.2	0.1	0.13	0.015	0.025	0.022	0.036	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	0.036	<0.005	<0.01	<0.01
Benzo(a)anthracene	ug/l	<0.05	<0.02	0.058	0.061	0.022	0.045	0.059	0.015	0.012	<0.005	<0.01	0.01	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	0.03	<0.005	<0.01	<0.01
Chrysene	ug/l	<0.05	<0.02	0.054	0.061	0.024	0.065	0.093	0.031	0.014	<0.005	<0.01	0.0095	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	<0.01	<0.005	<0.01	<0.01
Benzo(b)fluoranthene	ug/l	<0.05	<0.02	0.043	0.014	0.019	0.044	0.069	0.011	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	0.06	<0.01	<0.005	<0.01	<0.01
Benzo(k)fluoranthene	ug/l	<0.05	<0.02	0.011	0.02	<0.01	0.024	0.033	0.014	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	0.06	<0.01	<0.005	<0.01	<0.01
Benzo(a)pyrene	ug/l	<0.05	<0.02	0.037	0.022	0.017	0.05	0.086	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	0.032	<0.01	<0.005	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	ug/l	<0.05	<0.02	0.011	<0.005	<0.01	0.022	0.032	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	0.021	<0.01	<0.005	<0.01	<0.01
Dibenzo(a,h)anthracene	ug/l	<0.05	<0.02	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	<0.01	<0.005	<0.01	<0.01
Benzo(g,h,i)perylene	ug/l	<0.05	<0.02	0.013	<0.005	<0.01	0.028	0.029	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.20	0.0267	<0.02	<0.05	0.029	<0.01	<0.005	<0.01	<0.01
Dibenzofuran	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
2-4-Dimethylphenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
4-Methylphenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Phenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Total Naphthalenes	ug/l	2.1	1.1	0.11	0.48	1.0	0.02	0.8	0.21	62.4	0.37	28.8	1.2	11.6	1.8	5.5	5.2	29.6	5.4	22.4	16.5	0.05	0.16	0.09	0.08
BaPEq		<0.06(nd)	<0.02(nd)	0.055	0.035	0.027	0.069	0.111	0.014	<0.014	<0.01	<0.01(nd)	<0.01	<0.01(nd)	<0.01(nd)	<0.01(nd)	<0.24(nd)	<0.02(nd)	<0.02(nd)	<0.06(nd)	0.056	<0.01	<0.006(nd)	<0.01(nd)	<0.01(nd)

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

Well Numbers	Units	Shoreline Wells																							
		MW-26	**MW-26**	**MW-28**	**MW-28**	**MW-28**	**MW-28**	**MW-28**	**MW-28**	**MW-29**	**MW-29**	**MW-29**	**MW-29**	**MW-29**	**MW-29**	**MW-29**	**MW-29**	**MW-29**	**MW-29**	**MW-29**	**MW-29**	**MW-30**	**MW-30**	**MW-30**	**MW-30**
Sample Date	----	Mar-04	Mar-05	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	Mar-02	Oct-02	Jul-03	Sep-03	Mar-04	Mar-05	Mar-99	Sep-99	Mar-00	Sep-00
Screen Depth	feet	15-25	15-25	34-44	34-44	34-44	34-44	34-44	34-44	23-33	23-33	23-33	23-33	23-33	23-33	23-33	23-33	23-33	23-33	23-33	23-33	21-31	21-31	21-31	21-31
Year Installed	----	1998	1998	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999
Source	----	GeoE 04	GeoE 05	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02	GeoE 02	GeoE 03	GeoE 03	GeoE 04	GeoE 04	GeoE 05	GeoE 99	GeoE 99	GeoE 00	GeoE 01
Total Metals																									
Aluminum	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Antimony	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nickel	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Vanadium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Dissolved Metals																									
Aluminum	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Antimony	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Arsenic	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Barium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Cadmium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chromium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Copper	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Iron	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lead	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Magnesium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Manganese	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Mercury	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nickel	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Silver	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Vanadium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Zinc	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Pesticides/PCBs	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Other Constituents																									
Cyanide	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Chloride	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Sulfate	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Fluoride	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nitrate	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Nitrite	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Sodium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Potassium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Magnesium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Calcium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

Notes: (a) - Meas(a) - Measurements made during well purging
< - Less tl< - Less than indicated value
> - Greate> - Greater than indicated value
---- - Not a---- - Not analyzed or not applicable

LT - Low Tide
HT - High Tide
R - Results rejected during data validation process
nd - Not detected

- MGP Area Well
- Three Tank Area Well
- Shoreline Line Well
- Individual Well Grouping

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

	Units	Shoreline Wells														Summaries			
Well Numbers		**MW-30**	**MW-30**	**MW-30**	**MW-30**	**MW-30**	**MW-30**	**MW-30**	**MW-30**	**MW-31**	**MW-31**	**MW-31**	**MW-31**	**MW-31**	**MW-31**	**Max.**	**Max.**	**Max.**	**Max.**
Sample Date	----	Mar-01	Sep-01	Mar-02	Oct-02	Mar-03	Sep-03	Mar-04	Mar-05	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	Conc.	Conc.	Conc.	Conc.
Screen Depth	feet	21-31	21-31	21-31	21-31	21-31	21-31	21-31	21-31	49-59	49-59	49-59	49-59	49-59	49-59	(All	(MGP Area	(3 Tank	(Shore-
Year Installed	----	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	Samples)	Samples)	Area	Line
Source	----	GeoE 01	GeoE 02	GeoE 02	GeoE 03	GeoE 03	GeoE 04	GeoE 04	GeoE 05	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02			Samples)	Samples)
Field Parameters																			
TOC	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	130	47	130	95
pH	----	6.6	6.6	6.51	6.99	7	6.7	6.59	6.72	----	7.43	7.51	7.01	7.4	7.6	10.3	10.3	7.27	9.98
Conductivity (a)	uS	----	277	588	533	527	485	519	994	----	171	168	167	155	157	31900	9600	3300	31900
Salinity (a)	ppt	0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	----	<0.03	<0.03	<0.03	<0.03	0.2	24.5	<0.5	2	24.5
Total Dissolved Solids	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	31500	22200	2960	31500
Total Suspended Solids	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	32300	9540	32300	3540
Turbidity (a)	(NTU)	5.9	3.5	2.6	1.4	4.8	0.21	0.68	0.4	----	2.9	2.7	2.9	3.9	2.3	<200	<200	<200	<200
Alkalinity	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	686	418	686	530
Bicarbonate	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	673	369	673	444
Hardness	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	4160	3760	1550	4160
Volatile Organics																			
Benzene	ug/l	<0.5	<0.5	<0.5	<0.5	<0.5	0.37	<0.5	0.55	<1.0	<1.0	<1.0	<0.5	<0.5	<0.5	7800	7800	2300	360
Toluene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	930	930	150	9
Ethylbenzene	ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	2800	2800	840	96.6
Xylenes	ug/l	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<1.0	<3.0	<3.0	3600	3600	910	55
Solvents	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	nd	nd	----	nd
Petroleum Hydrocarbons																			
WTPH-G	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	27000	<2.5	27000	-----
TPH-418.1	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	233000	6700	233000	<1
WTPH-D	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	25000	-----	25000	-----
Semivolatile Organics																			
Naphthalene	ug/l	0.062	0.04	0.0775	<0.49	0.052	0.052	<0.06	<0.05	0.82	0.018	0.014	0.0086	0.031	0.025	8500	8500	3400	250
2-Methylnaphthalene	ug/l	<0.01	<0.01	<0.01	<0.49	<0.05	<0.02	<0.05	<0.05	0.18	0.0052	<0.01	0.0076	<0.01	<0.01	1000	1000	860	15.1
2-Chloronaphthalene	ug/l	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	----	<0.01	<0.01	<0.01	<0.01	<0.01	0.197	0.1	0.024	0.197
Acenaphthylene	ug/l	0.39	0.48	0.34	0.456	0.36	0.303	0.261	0.082	0.14	0.0057	<0.01	<0.01	<0.01	<0.01	130	130	30	12
Acenaphthene	ug/l	15	19	19.9	15.4	14.5	8.05	8.31	0.584	0.18	<0.005	<0.01	<0.01	<0.01	<0.01	1700	500	1700	107
Fluorene	ug/l	0.38	0.45	0.612	0.428	0.492	0.064	0.110	<0.02	0.37	<0.005	<0.01	<0.01	<0.01	<0.01	1600	160	1600	17.4
Phenanthrene	ug/l	0.042	0.038	0.044	<0.20	0.045	<0.02	<0.05	<0.02	1.4	0.01	<0.01	0.045	0.041	0.02	3900	470	3900	24
Anthracene	ug/l	<0.01	<0.01	<0.01	<0.20	0.152	0.056	0.061	0.041	0.38	<0.005	<0.01	<0.01	0.019	0.015	340	140	340	5
Fluoranthene	ug/l	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	0.73	0.017	0.047	0.077	0.034	0.036	1600	130	1600	15
Pyrene	ug/l	<0.03	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	0.63	0.022	0.044	0.043	0.035	0.028	1000	160	1000	16
Benzo(a)anthracene	ug/l	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	0.052	<0.005	<0.01	0.011	<0.01	<0.01	240	50	240	5
Chrysene	ug/l	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	0.044	<0.005	0.014	0.017	<0.01	0.013	240	60	240	5
Benzo(b)fluoranthene	ug/l	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	0.013	<0.005	<0.01	<0.01	<0.01	<0.01	89	32	89	0.2
Benzo(k)fluoranthene	ug/l	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	25	17	25	0.06
Benzo(a)pyrene	ug/l	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	60	46	60	6
Indeno(1,2,3-cd)pyrene	ug/l	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	24	24	19	0.25
Dibenzo(a,h)anthracene	ug/l	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	0.26	<10	0.26	0.27
Benzo(g,h,i)perylene	ug/l	<0.01	<0.01	<0.01	<0.20	<0.02	<0.02	<0.05	<0.02	<0.01	<0.005	<0.01	<0.01	<0.01	<0.01	26	26	16	0.27
Dibenzofuran	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	260	25	260	15
2-4-Dimethylphenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	100	100	17	<10
4-Methylphenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	51	51	<10	36
Phenol	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	11	11	<10	<10
Total Naphthalenes	ug/l	0.06	0.04	0.08	nd	0.05	0.05	0.06	0.05	1.0	0.02	0.01	0.02	0.03	0.03	9500	9500	3900	260
BaPEq		<0.01(nd)	<0.01(nd)	<0.01(nd)	<0.24(nd)	<0.02(nd)	<0.02(nd)	<0.06(nd)	<0.02(nd)	<0.02	<0.006(nd)	<0.01	<0.01	<0.01(nd)	<0.01	104.7	63.9	104.7	0.49

TABLE 3.3 - Summary of Groundwater Analytical Data (1993 to 2006)

	Units	Shoreline Wells														Summaries			
Well Numbers		MW-30	MW-30	MW-30	MW-30	MW-30	MW-30	MW-30	MW-30	MW-31	MW-31	MW-31	MW-31	MW-31	MW-31	Max.	Max.	Max.	Max.
Sample Date	----	Mar-01	Sep-01	Mar-02	Oct-02	Mar-03	Sep-03	Mar-04	Mar-05	Mar-99	Sep-99	Mar-00	Sep-00	Mar-01	Sep-01	Conc.	Conc.	Conc.	Conc.
Screen Depth	feet	21-31	21-31	21-31	21-31	21-31	21-31	21-31	21-31	49-59	49-59	49-59	49-59	49-59	49-59	(All	(MGP Area	(3 Tank	(Shore-
Year Installed	----	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	1999	Samples)	Samples)	Area	Line
Source	----	GeoE 01	GeoE 02	GeoE 02	GeoE 03	GeoE 03	GeoE 04	GeoE 04	GeoE 05	GeoE 99	GeoE 99	GeoE 00	GeoE 01	GeoE 01	GeoE 02			Samples)	Samples)
Total Metals																			
Aluminum	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	81300	2660	----	81300
Antimony	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	3130	<60	----	3130
Arsenic	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	31.6	<10	----	31.6
Barium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	460	<200	----	460
Cadmium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	5	<5	----	<5
Chromium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	61	49	----	61
Copper	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	90	<25	----	90
Iron	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	52700	2430	----	52700
Lead	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	220	220	----	45
Manganese	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	3560	264	----	3560
Mercury	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	0.5	<0.5	----	<0.2
Nickel	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	73	<40	----	73
Silver	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	10	<10	----	<10
Vanadium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	158	<50	----	158
Zinc	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	222	<20	----	222
Dissolved Metals																			
Aluminum	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	<200	<200	----	<200
Antimony	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2430	234	----	2430
Arsenic	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	21	<10	----	21
Barium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	<200	<200	----	<200
Cadmium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	<5	<5	----	<5
Chromium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	23	23	----	<10
Copper	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	<25	<25	----	<25
Iron	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1130	<100	----	1130
Lead	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	14.6	<3	----	14.6
Magnesium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	706000	34300	----	706000
Manganese	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1970	184	----	1970
Mercury	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	<0.5	<0.5	----	<0.5
Nickel	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	<40	<40	----	<40
Silver	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	<10	<10	----	<10
Vanadium	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	<50	<50	----	<50
Zinc	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	85	<20	----	85
Pesticides/PCBs	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	nd	nd	----	nd
Other Constituents																			
Cyanide	ug/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	470	470	411	110
Chloride	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	15300	12000	1390	15300
Sulfate	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2080	132	60.1	2080
Fluoride	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	<0.5	<0.5	<0.5	<0.5
Nitrate	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	20.6	20.6	<0.2	10
Nitrite	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	0.5	0.5	<0.01	0.013
Sodium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	7120	38	608	7120
Potassium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	281	9.3	43.4	281
Magnesium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	741	66.6	112	741
Calcium (dissolved)	mg/l	----	----	----	----	----	----	----	----	----	----	----	----	----	----	320	90	150	320

Notes: (a) - Meas(a) - Measurements made during well purging
< - Less tl< - Less than indicated value
> - Greate> - Greater than indicated value
---- - Not a---- - Not analyzed or not applicable

LT - Low Tide
HT - High Tide
R - Results rejected during data validation process
nd - Not detected

- MGP Area Well
- Three Tank Area Well
- Shoreline Line Well
- Individual Well Grouping

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	MGP Area Well					
	DOT-MW-4	DOT-MW-4	DOT-MW-4	DOT-MW-4	DOT-MW-4	DOT-MW-4
Sample Date	**7/19/16**	**12/21/16**	**4/28/17**	**8/30/17**	**12/6/17**	**4/18/18**
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310
Field Parameters						
pH	6.8	6.8	6.8	7.1	6.7	6.8
Conductivity (uS)	670	672	601	572	608	721
Temperature (C)	16.6	15.2	12.5	16.1	13.7	11.5
Dissolved Oxygen (mg/l)	0.2	0.19	0.18	0.13	0.72	0.14
Oxidation-Reduction Potential (ORP) (mV)	22.9	10.8	24	-53.7	-17.4	-80.5
Ferrous Iron (mg/l)	2.8	4.5	4	3.5	3.3	3.5
Turbidity (NTU)	8.3	3.3	8.1	3.9	18	18
Laboratory Constituents						
Conventionals (mg/l)						
Total Suspended Solids	-----	-----	-----	-----	-----	16
Calcium	-----	-----	83.9	76.0	-----	-----
Magnesium	-----	-----	31.1	27.5	-----	-----
Sodium	-----	-----	33.9	30.4	-----	-----
Chloride	-----	-----	50.3	29.6	-----	-----
Total Cyanide (ug/l)	-----	-----	-----	-----	-----	-----
Total Metals (ug/l)						
Antimony	-----	-----	-----	-----	-----	-----
Arsenic	-----	-----	-----	-----	-----	-----
Copper	-----	-----	-----	-----	-----	-----
Lead	-----	-----	-----	-----	-----	-----
Mercury	-----	-----	-----	-----	-----	-----
Nickel	-----	-----	-----	-----	-----	-----
Silver	-----	-----	-----	-----	-----	-----
Zinc	-----	-----	-----	-----	-----	-----
Dissolved Metals (ug/l)						
Antimony	-----	-----	-----	-----	-----	-----
Arsenic	-----	-----	-----	-----	-----	-----
Copper	-----	-----	-----	-----	-----	-----
Lead	-----	-----	-----	-----	-----	-----

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	MGP Area Well					
	DOT-MW-4	DOT-MW-4	DOT-MW-4	DOT-MW-4	DOT-MW-4	DOT-MW-4
Sample Date	7/19/16	12/21/16	4/28/17	8/30/17	12/6/17	4/18/18
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310
Mercury	-----	-----	-----	-----	-----	-----
Nickel	-----	-----	-----	-----	-----	-----
Silver	-----	-----	-----	-----	-----	-----
Zinc	-----	-----	-----	-----	-----	-----
Petroleum Hydrocarbons (mg/l)						
Diesel Range Organics	-----	-----	-----	-----	-----	-----
Motor Oil Range Organics	-----	-----	-----	-----	-----	-----
Aromatic Hydrocarbons (ug/l)				0.06		
Benzene	0.34	<0.2	<0.2	<0.2	0.24	<0.2
Toluene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
m-p-Xylene	<0.4	<0.4	<0.4	<0.4	<0.4	<0.2
o-Xylene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
PAHs (ug/l)						
Naphthalene	0.03	0.02	0.03	0.03	0.02	0.02
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1-Methylnaphthalene	0.02	0.04	0.04	0.07	0.03	0.03
Acenaphthylene	0.16	0.14	0.15	0.21	0.11	0.11
Acenaphthene	1.7	0.91	1.5	3.1	0.56	0.76
Dibenzofuran	0.02	0.02	0.02	0.02	0.01	<0.01
Fluorene	0.05	0.06	0.07	0.09	0.06	0.05
Phenanthrene	0.02	0.01	0.01	0.02	<0.01	<0.01
Anthracene	0.08	0.08	0.08	0.12	0.07	0.04
Fluroanthene	0.40	0.16	0.28	0.60	0.13	0.12
Pyrene	2.0	2.1	2.1	2.6	1.9	1.5
Benzo(a)anthracene*	0.07	0.07	0.07	0.09	0.06	0.05
Chrysene*	0.07	0.06	0.06	0.09	0.06	0.04
Benzo(b)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(j)fluoranthene*	<0.01	<0.01	0.01	<0.01	<0.01	<0.01

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	MGP Area Well					
	DOT-MW-4	DOT-MW-4	DOT-MW-4	DOT-MW-4	DOT-MW-4	DOT-MW-4
Sample Date	7/19/16	12/21/16	4/28/17	8/30/17	12/6/17	4/18/18
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310
Benzo(a)pyrene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BaPEq. (TEQ)	0.008	0.008	0.007	0.010	0.007	0.005

Notes: < - Not detected at indicated reporting level
J - Estimated Concentration
----- - Not analyzed
* - Denotes carcinogenic PAH

- MGP Area Well
- Shoreline Well

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	MGP Area Well					
	HC-MW2	HC-MW2	HC-MW2	HC-MW2	HC-MW2	HC-MW2
Sample Date	7/19/16	12/21/16	4/28/17	8/30/17	12/6/17	4/18/18
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310
Field Parameters						
pH	6.7	6.5	6.5	6.7	6.5	6.5
Conductivity (uS)	463	457	403	388	426	504
Temperature (C)	14.1	15.3	12.7	14.3	13.8	11.6
Dissolved Oxygen (mg/l)	3.8	3.3	3.4	2.4	7.2	5.3
Oxidation-Reduction Potential (ORP) (mV)	33.1	54.6	47	139	9.3	74.6
Ferrous Iron (mg/l)	0	0	0	0	0	0
Turbidity (NTU)	12.5	2.2	0.3	1.7	1.0	0.0
Laboratory Constituents						
Conventionals (mg/l)						
Total Suspended Solids	-----	-----	-----	-----	-----	<1
Calcium	-----	-----	33.5	35.4	-----	-----
Magnesium	-----	-----	29.0	31.0	-----	-----
Sodium	-----	-----	20.1	19.6	-----	-----
Chloride	-----	-----	20.8	19.9	-----	-----
Total Cyanide (ug/l)	-----	-----	-----	-----	-----	-----
Total Metals (ug/l)						
Antimony	-----	-----	-----	-----	-----	-----
Arsenic	-----	-----	-----	-----	-----	-----
Copper	-----	-----	-----	-----	-----	-----
Lead	-----	-----	-----	-----	-----	-----
Mercury	-----	-----	-----	-----	-----	-----
Nickel	-----	-----	-----	-----	-----	-----
Silver	-----	-----	-----	-----	-----	-----
Zinc	-----	-----	-----	-----	-----	-----
Dissolved Metals (ug/l)						
Antimony	-----	-----	-----	-----	-----	-----
Arsenic	-----	-----	-----	-----	-----	-----
Copper	-----	-----	-----	-----	-----	-----
Lead	-----	-----	-----	-----	-----	-----

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	MGP Area Well					
	HC-MW2	HC-MW2	HC-MW2	HC-MW2	HC-MW2	HC-MW2
Sample Date	**7/19/16**	**12/21/16**	**4/28/17**	**8/30/17**	**12/6/17**	**4/18/18**
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310
Mercury	-----	-----	-----	-----	-----	-----
Nickel	-----	-----	-----	-----	-----	-----
Silver	-----	-----	-----	-----	-----	-----
Zinc	-----	-----	-----	-----	-----	-----
Petroleum Hydrocarbons (mg/l)						
Diesel Range Organics	-----	-----	-----	-----	-----	-----
Motor Oil Range Organics	-----	-----	-----	-----	-----	-----
Aromatic Hydrocarbons (ug/l)				0.01		
Benzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
m-p-Xylene	<0.4	<0.4	<0.4	<0.4	<0.4	<0.2
o-Xylene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
PAHs (ug/l)						
Naphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1-Methylnaphthalene	<0.01	<0.01	0.04	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	<0.01	<0.01	0.06	<0.01	<0.01	<0.01
Dibenzofuran	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluroanthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Benzo(a)anthracene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(j)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	MGP Area Well					
	HC-MW2	HC-MW2	HC-MW2	HC-MW2	HC-MW2	HC-MW2
Sample Date	**7/19/16**	**12/21/16**	**4/28/17**	**8/30/17**	**12/6/17**	**4/18/18**
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310
Benzo(a)pyrene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BaPEq. (TEQ)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Notes: < - Not detected at indicated reporting level
J - Estimated Concentration
----- - Not analyzed
* - Denotes carcinogenic PAH

- MGP Area Well (yellow)
- Shoreline Well (blue)

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well					
	MW-16	**MW-16**	**MW-16**	**MW-16**	**MW-16**	**MW-16**
Sample Date	**7/19/16**	**12/20/16**	**4/28/17**	**8/30/17**	**12/6/17**	**4/19/18**
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310
Field Parameters						
pH	6.7	6.6	6.6	7.0	6.7	6.8
Conductivity (uS)	2630	2601	679	1351	434	412
Temperature (C)	16.1	16.9	14.7	15.7	13.4	13.9
Dissolved Oxygen (mg/l)	0.1	0.1	0	0.12	0.73	0.08
Oxidation-Reduction Potential (ORP) (mV)	-11.7	-47.4	-10	-70.8	-3.5	-86.5
Ferrous Iron (mg/l)	4.5	4.5	3.5	3.5	3.5	3
Turbidity (NTU)	9.7	6.9	6.8	4.8	3.7	4.6
Laboratory Constituents						
Conventionals (mg/l)						
Total Suspended Solids	-----	-----	-----	-----	-----	16
Calcium	-----	-----	33.1	61.7	-----	-----
Magnesium	-----	-----	24.3	86.7	-----	-----
Sodium	-----	-----	105	559	-----	-----
Chloride	-----	-----	168	1160	-----	-----
Total Cyanide (ug/l)	-----	-----	-----	-----	-----	-----
Total Metals (ug/l)						
Antimony	-----	-----	-----	-----	-----	-----
Arsenic	-----	-----	-----	-----	-----	-----
Copper	-----	-----	-----	-----	-----	-----
Lead	-----	-----	-----	-----	-----	-----
Mercury	-----	-----	-----	-----	-----	-----
Nickel	-----	-----	-----	-----	-----	-----
Silver	-----	-----	-----	-----	-----	-----
Zinc	-----	-----	-----	-----	-----	-----
Dissolved Metals (ug/l)						
Antimony	-----	-----	-----	-----	-----	-----
Arsenic	-----	-----	-----	-----	-----	-----
Copper	-----	-----	-----	-----	-----	-----
Lead	-----	-----	-----	-----	-----	-----

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well					
	MW-16	**MW-16**	**MW-16**	**MW-16**	**MW-16**	**MW-16**
Sample Date	**7/19/16**	**12/20/16**	**4/28/17**	**8/30/17**	**12/6/17**	**4/19/18**
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310
Mercury	-----	-----	-----	-----	-----	-----
Nickel	-----	-----	-----	-----	-----	-----
Silver	-----	-----	-----	-----	-----	-----
Zinc	-----	-----	-----	-----	-----	-----
Petroleum Hydrocarbons (mg/l)						
Diesel Range Organics	-----	-----	-----	-----	-----	-----
Motor Oil Range Organics	-----	-----	-----	-----	-----	-----
Aromatic Hydrocarbons (ug/l)				0.02		
Benzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
m-p-Xylene	<0.4	<0.4	<0.4	<0.4	<0.4	<0.2
o-Xylene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
PAHs (ug/l)						
Naphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1-Methylnaphthalene	0.042	0.03	<0.01	0.06	0.02	0.04
Acenaphthylene	<0.01	0.01	0.01	<0.01	<0.01	<0.01
Acenaphthene	0.057	0.06	0.02	0.12	0.04	0.07
Dibenzofuran	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	0.017	<0.01	<0.01	0.03	<0.01	0.02
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluroanthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	0.02	0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene*	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Chrysene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(j)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well					
	MW-16	MW-16	MW-16	MW-16	MW-16	MW-16
Sample Date	7/19/16	12/20/16	4/28/17	8/30/17	12/6/17	4/19/18
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310
Benzo(a)pyrene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BaPEq. (TEQ)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Notes: < - Not detected at indicated reporting level
J - Estimated Concentration
----- - Not analyzed
* - Denotes carcinogenic PAH

- MGP Area Well
- Shoreline Well

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well						
	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24
Sample Date	7/18/16	12/20/16	4/27/17	8/30/17	12/7/17	4/18/18	7/26/18
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Field Parameters							
pH	7.0	6.5	7.1	7.2	6.9	7.0	7.1
Conductivity (uS)	740	14200	751	699	800	850	896
Temperature (C)	14.4	15.3	14	13.8	13.4	12.8	15
Dissolved Oxygen (mg/l)	0.5	0.21	0.15	0.13	0.25	0.06	0.3
Oxidation-Reduction Potential (ORP) (mV)	-10.7	-63.1	-20.1	-118	-56	-134.6	-110
Ferrous Iron (mg/l)	5	6	5	3	3.5	4.5	1.5
Turbidity (NTU)	12	6.3	4.9	3.8	4.5	42	3
Laboratory Constituents							
Conventionals (mg/l)							
Total Suspended Solids	-----	-----	-----	-----	-----	18	23
Calcium	-----	-----	63.9	71.4	-----	-----	-----
Magnesium	-----	-----	31.5	34.6	-----	-----	-----
Sodium	-----	-----	43.7	46.0	-----	-----	-----
Chloride	-----	-----	80.9	109	-----	-----	-----
Total Cyanide (ug/l)	-----	-----	-----	-----	-----	-----	25
Total Metals (ug/l)							
Antimony	-----	-----	-----	-----	-----	-----	0.06 J
Arsenic	-----	-----	-----	-----	-----	-----	0.33
Copper	-----	-----	-----	-----	-----	-----	<0.50
Lead	-----	-----	-----	-----	-----	-----	<0.10
Mercury	-----	-----	-----	-----	-----	-----	<0.10
Nickel	-----	-----	-----	-----	-----	-----	0.28 J
Silver	-----	-----	-----	-----	-----	-----	<0.20
Zinc	-----	-----	-----	-----	-----	-----	1.8 J
Dissolved Metals (ug/l)							
Antimony	-----	-----	-----	-----	-----	-----	<0.20
Arsenic	-----	-----	-----	-----	-----	-----	0.28
Copper	-----	-----	-----	-----	-----	-----	0.54
Lead	-----	-----	-----	-----	-----	-----	<0.10

Constituent	Shoreline Well						
	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24	MW-24
Sample Date	7/18/16	12/20/16	4/27/17	8/30/17	12/7/17	4/18/18	7/26/18
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Mercury	-----	-----	-----	-----	-----	-----	<0.10
Nickel	-----	-----	-----	-----	-----	-----	0.21 J
Silver	-----	-----	-----	-----	-----	-----	<0.20
Zinc	-----	-----	-----	-----	-----	-----	1.2 J
Petroleum Hydrocarbons (mg/l)							
Diesel Range Organics	-----	-----	-----	-----	-----	-----	1.5
Motor Oil Range Organics	-----	-----	-----	-----	-----	-----	<0.2
Aromatic Hydrocarbons (ug/l)				73.72			
Benzene	18	18.4	32.9	23.1	23.0	31.6	37.2
Toluene	<0.2	<0.2	0.27	0.32	0.23	0.24	0.28
Ethylbenzene	0.49	0.45	1.1	1.4	1.1	1.2	1.1
m-p-Xylene	1.4	0.93	1.5	1.7	1.6	1.7	1.9
o-Xylene	1.49	1.2	1.6	2.3	2.1	2.3	2.8
PAHs (ug/l)							
Naphthalene	0.57	0.61	0.88	0.94	0.70	0.74	1.2
2-Methylnaphthalene	7.6	0.97	13.7	13.2	7.8	10.0	11.2
1-Methylnaphthalene	70.5	71.6	107	95	83	85	88
Acenaphthylene	0.41	0.40	0.53	0.53	0.40	0.51	0.55
Acenaphthene	147	151	215	176	151	147	162
Dibenzofuran	5.0	5.7	7.0	6.4	4.3	4.0	4.7
Fluorene	57.1	67.8	91.8	76.2	74.8	74.6	82.1
Phenanthrene	22.2	28.7	43.5	29.4	37.8	27.2	34.3
Anthracene	1.5	1.9	2.2	3.3	2.1	2.4	2.4
Fluroanthene	0.53	0.58	0.64	0.69	0.53	0.56	0.69
Pyrene	0.26	0.27	0.40	0.29	0.25	0.26	<0.50
Benzo(a)anthracene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50
Chrysene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50
Benzo(b)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50
Benzo(k)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50
Benzo(j)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well						
	MW-24	**MW-24**	**MW-24**	**MW-24**	**MW-24**	**MW-24**	**MW-24**
Sample Date	**7/18/16**	**12/20/16**	**4/27/17**	**8/30/17**	**12/7/17**	**4/18/18**	**7/26/18**
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Benzo(a)pyrene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50
Indeno(1,2,3-cd)pyrene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50
Dibenzo(a,h)anthracene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50
BaPEq. (TEQ)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.50

Notes: < - Not detected at indicated reporting level
J - Estimated Concentration
----- - Not analyzed
* - Denotes carcinogenic PAH

(yellow) - MGP Area Well
(blue) - Shoreline Well

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well						
	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26
Sample Date	7/18/16	12/20/16	4/28/17	8/30/17	12/7/17	4/18/18	7/26/18
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Field Parameters							
pH	6.9	6.8	6.7	7.1	6.8	6.9	7.0
Conductivity (uS)	2536	2377	1945	1977	1728	2267	2595
Temperature (C)	14.6	15.3	13.7	14.4	13.7	12.5	15.2
Dissolved Oxygen (mg/l)	0.1	0.11	0.03	0.17	0.14	0.05	0.1
Oxidation-Reduction Potential (ORP) (mV)	-8.7	-48.8	16.7	-99.8	-57	-104	-123
Ferrous Iron (mg/l)	4.5	5.5	5.2	4.5	2.5	4	5.2
Turbidity (NTU)	22	4.6	11	17	3.6	96	6
Laboratory Constituents							
Conventionals (mg/l)							
Total Suspended Solids	-----	-----	-----	-----	-----	30	36
Calcium	-----	-----	104	110	-----	-----	-----
Magnesium	-----	-----	69.0	73.5	-----	-----	-----
Sodium	-----	-----	267	333	-----	-----	-----
Chloride	-----	-----	506	574	-----	-----	-----
Total Cyanide (ug/l)	-----	-----	-----	-----	-----	-----	97
Total Metals (ug/l)							
Antimony	-----	-----	-----	-----	-----	-----	0.05 J
Arsenic	-----	-----	-----	-----	-----	-----	0.26
Copper	-----	-----	-----	-----	-----	-----	<0.50
Lead	-----	-----	-----	-----	-----	-----	0.07 J
Mercury	-----	-----	-----	-----	-----	-----	<0.10
Nickel	-----	-----	-----	-----	-----	-----	0.29 J
Silver	-----	-----	-----	-----	-----	-----	<0.20
Zinc	-----	-----	-----	-----	-----	-----	2.8 J
Dissolved Metals (ug/l)							
Antimony	-----	-----	-----	-----	-----	-----	0.04 J
Arsenic	-----	-----	-----	-----	-----	-----	0.19 J
Copper	-----	-----	-----	-----	-----	-----	<0.50
Lead	-----	-----	-----	-----	-----	-----	<0.10

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well						
	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26	MW-26
Sample Date	7/18/16	12/20/16	4/28/17	8/30/17	12/7/17	4/18/18	7/26/18
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Mercury	-----	-----	-----	-----	-----	-----	<0.10
Nickel	-----	-----	-----	-----	-----	-----	0.13 J
Silver	-----	-----	-----	-----	-----	-----	<0.20
Zinc	-----	-----	-----	-----	-----	-----	<4.0
Petroleum Hydrocarbons (mg/l)							
Diesel Range Organics	-----	-----	-----	-----	-----	-----	0.68
Motor Oil Range Organics	-----	-----	-----	-----	-----	-----	<0.2
Aromatic Hydrocarbons (ug/l)				1.67			
Benzene	87.3	35.8	37.5	55.5	33.8	32.7	48.8
Toluene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	0.81	0.32	<0.2	0.81	0.24	0.2	0.29
m-p-Xylene	7.1	4.5	3.4	6.5	3.7	3.8	4.1
o-Xylene	2.5	1.4	1.0	2.0	1.1	1.2	1.3
PAHs (ug/l)							
Naphthalene	5.8	5.2	2.3	15.7	4.5	4.5	3.7
2-Methylnaphthalene	0.37	0.40	0.39	0.99	0.43	0.55	0.59
1-Methylnaphthalene	6.36	5.8	3.6	8.4	5.3	4.6	8.7
Acenaphthylene	0.06	0.06	0.05	0.09	0.05	0.04	0.08
Acenaphthene	7.7	7.5	4.4	9.6	6.3	4.1	12.1
Dibenzofuran	1.7	1.4	0.65	1.9	1.0	0.7	1.3
Fluorene	2.0	1.8	0.92	2.6	1.8	0.9	1.9
Phenanthrene	0.03	1.4	0.93	2.4	2.0	1.0	2.0
Anthracene	0.22	0.24	0.14	0.37	0.26	0.17	0.23
Fluroanthene	0.36	0.30	0.15	0.35	0.25	0.15	0.22
Pyrene	0.28	0.23	0.13	0.23	0.18	0.10	0.16
Benzo(a)anthracene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05
Chrysene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05
Benzo(b)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05
Benzo(k)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05
Benzo(j)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well						
	MW-26	**MW-26**	**MW-26**	**MW-26**	**MW-26**	**MW-26**	**MW-26**
Sample Date	**7/18/16**	**12/20/16**	**4/28/17**	**8/30/17**	**12/7/17**	**4/18/18**	**7/26/18**
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Benzo(a)pyrene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05
Indeno(1,2,3-cd)pyrene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05
Dibenzo(a,h)anthracene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05
BaPEq. (TEQ)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05

Notes: < - Not detected at indicated reporting level
J - Estimated Concentration
----- - Not analyzed
* - Denotes carcinogenic PAH

[yellow] - MGP Area Well
[blue] - Shoreline Well

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well						
	MW-28	MW-28	MW-28	MW-28	MW-28	MW-28	MW-28
Sample Date	7/18/16	12/20/16	4/27/17	8/30/17	12/7/17	4/18/18	7/26/18
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Field Parameters							
pH	7.3	7.3	7.5	7.6	7.7	7.5	7.2
Conductivity (uS)	152	151	153	132	148	167	180
Temperature (C)	14.1	14.7	14.1	13.8	13.3	12.6	14.0
Dissolved Oxygen (mg/l)	0.8	0.3	0.21	0.08	0.42	0.1	0.25
Oxidation-Reduction Potential (ORP) (mV)	-5.8	-56.3	-10.4	-113	-33	-110	-79.8
Ferrous Iron (mg/l)	0.5	0.5	1	0.5	0.5	0.5	3.5
Turbidity (NTU)	17	5.5	4.8	5.0	1.2	0.8	1.2
Laboratory Constituents							
Conventionals (mg/l)							
Total Suspended Solids	-----	-----	-----	-----	-----	3	<1
Calcium	-----	-----	14.0	14.3	-----	-----	-----
Magnesium	-----	-----	8.0	8.1	-----	-----	-----
Sodium	-----	-----	9.3	8.8	-----	-----	-----
Chloride	-----	-----	3.7	3.2	-----	-----	-----
Total Cyanide (ug/l)	-----	-----	-----	-----	-----	-----	<5.0
Total Metals (ug/l)							
Antimony	-----	-----	-----	-----	-----	-----	<0.20
Arsenic	-----	-----	-----	-----	-----	-----	11.5
Copper	-----	-----	-----	-----	-----	-----	<0.50
Lead	-----	-----	-----	-----	-----	-----	<0.10
Mercury	-----	-----	-----	-----	-----	-----	<0.10
Nickel	-----	-----	-----	-----	-----	-----	0.06 J
Silver	-----	-----	-----	-----	-----	-----	<0.20
Zinc	-----	-----	-----	-----	-----	-----	1.9 J
Dissolved Metals (ug/l)							
Antimony	-----	-----	-----	-----	-----	-----	<0.20
Arsenic	-----	-----	-----	-----	-----	-----	11.5
Copper	-----	-----	-----	-----	-----	-----	<0.50
Lead	-----	-----	-----	-----	-----	-----	<0.10

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well						
	MW-28	MW-28	MW-28	MW-28	MW-28	MW-28	MW-28
Sample Date	**7/18/16**	**12/20/16**	**4/27/17**	**8/30/17**	**12/7/17**	**4/18/18**	**7/26/18**
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Mercury	-----	-----	-----	-----	-----	-----	<0.10
Nickel	-----	-----	-----	-----	-----	-----	<0.50
Silver	-----	-----	-----	-----	-----	-----	<0.20
Zinc	-----	-----	-----	-----	-----	-----	0.98 J
Petroleum Hydrocarbons (mg/l)							
Diesel Range Organics	-----	-----	-----	-----	-----	-----	<0.1
Motor Oil Range Organics	-----	-----	-----	-----	-----	-----	<0.2
Aromatic Hydrocarbons (ug/l)				0.01			
Benzene	1.9	0.90	1.7	1.0	2.4	0.94	0.86
Toluene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	3.3	2.6	3.5	3.6	4.5	2.8	3.0
m-p-Xylene	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
o-Xylene	0.75	0.50	0.58	0.56	0.75	0.41	0.5
PAHs (ug/l)							
Naphthalene	<0.01	0.93	0.19	1.1	2.0	<0.01	1.2
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1-Methylnaphthalene	0.02	0.02	0.02	0.04	0.03	<0.01	0.02
Acenaphthylene	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Acenaphthene	0.02	0.03	0.04	0.05	0.02	<0.01	0.01
Dibenzofuran	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	0.01	0.02	0.02	0.01	<0.01	<0.01
Phenanthrene	<0.01	0.02	<0.01	0.03	0.02	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Fluroanthene	0.01	0.02	0.02	0.08	0.02	0.01	0.01
Pyrene	0.01	0.03	0.02	0.09	0.02	0.01	0.02
Benzo(a)anthracene*	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01
Chrysene*	<0.01	<0.01	<0.01	0.05	<0.01	<0.01	<0.01
Benzo(b)fluoranthene*	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Benzo(k)fluoranthene*	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Benzo(j)fluoranthene*	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well						
	MW-28	MW-28	MW-28	MW-28	MW-28	MW-28	MW-28
Sample Date	7/18/16	12/20/16	4/27/17	8/30/17	12/7/17	4/18/18	7/26/18
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Benzo(a)pyrene*	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene*	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
BaPEq. (TEQ)	<0.01	<0.01	<0.01	0.05	<0.01	<0.01	<0.01

Notes: < - Not detected at indicated reporting level
J - Estimated Concentration
----- - Not analyzed
* - Denotes carcinogenic PAH

- MGP Area Well
- Shoreline Well

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well						
	MW-29	MW-29	MW-29	MW-29	MW-29	MW-29	MW-29
Sample Date	**7/19/16**	**12/20/16**	**4/27/17**	**8/30/17**	**12/7/17**	**4/18/18**	**7/26/18**
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Field Parameters							
pH	7.1	7.1	6.9	7.2	7.1	7.0	7.1
Conductivity (uS)	664	399	755	537	477	808	690
Temperature (C)	14.2	14.9	13.7	13.8	13.3	12.7	14.3
Dissolved Oxygen (mg/l)	0.2	0.1	0.08	0.12	0.3	0.08	0.25
Oxidation-Reduction Potential (ORP) (mV)	-9	-36.9	-18.2	-115	-63	-136	-114
Ferrous Iron (mg/l)	4	3.5	4.5	4.5	3.3	3	5
Turbidity (NTU)	21	6.4	1.3	5.8	2.4	49	6
Laboratory Constituents							
Conventionals (mg/l)							
Total Suspended Solids	-----	-----	-----	-----	-----	16	12
Calcium	-----	-----	55	46.8	-----	-----	-----
Magnesium	-----	-----	34.4	29.7	-----	-----	-----
Sodium	-----	-----	49.7	38.4	-----	-----	-----
Chloride	-----	-----	81	46.8	-----	-----	-----
Total Cyanide (ug/l)	-----	-----	-----	-----	-----	-----	29
Total Metals (ug/l)							
Antimony	-----	-----	-----	-----	-----	-----	0.03 J
Arsenic	-----	-----	-----	-----	-----	-----	4.1
Copper	-----	-----	-----	-----	-----	-----	<0.50
Lead	-----	-----	-----	-----	-----	-----	<0.10
Mercury	-----	-----	-----	-----	-----	-----	<0.10
Nickel	-----	-----	-----	-----	-----	-----	0.13 J
Silver	-----	-----	-----	-----	-----	-----	<0.20
Zinc	-----	-----	-----	-----	-----	-----	<4.0
Dissolved Metals (ug/l)							
Antimony	-----	-----	-----	-----	-----	-----	<0.20
Arsenic	-----	-----	-----	-----	-----	-----	4.0
Copper	-----	-----	-----	-----	-----	-----	<0.50
Lead	-----	-----	-----	-----	-----	-----	<0.10

Constituent	Shoreline Well						
	MW-29	MW-29	MW-29	MW-29	MW-29	MW-29	MW-29
Sample Date	7/19/16	12/20/16	4/27/17	8/30/17	12/7/17	4/18/18	7/26/18
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Mercury	-----	-----	-----	-----	-----	-----	<0.10
Nickel	-----	-----	-----	-----	-----	-----	0.12 J
Silver	-----	-----	-----	-----	-----	-----	<0.20
Zinc	-----	-----	-----	-----	-----	-----	0.92 J
Petroleum Hydrocarbons (mg/l)							
Diesel Range Organics	-----	-----	-----	-----	-----	-----	0.35
Motor Oil Range Organics	-----	-----	-----	-----	-----	-----	<0.2
Aromatic Hydrocarbons (ug/l)				4.02			
Benzene	6.9	12.7	7.1	6.9	12.0	3.3	7.7
Toluene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
m-p-Xylene	0.41	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
o-Xylene	0.56	0.58	0.47	0.52	0.50	0.41	0.51
PAHs (ug/l)							
Naphthalene	0.15	0.32	0.21	0.20	0.30	0.09	0.2
2-Methylnaphthalene	0.33	0.87	0.47	0.65	0.74	0.23	0.43
1-Methylnaphthalene	17.3	13.1	21.3	20.4	16.8	17.6	17.2
Acenaphthylene	0.03	0.04	0.07	0.06	0.06	0.04	<0.06
Acenaphthene	19	16.9	27.7	24	20.4	17.7	20.1
Dibenzofuran	0.04	0.04	0.06	0.07	0.05	0.03	<0.06
Fluorene	3.3	3.23	5.3	4.7	4.1	3.5	4.3
Phenanthrene	0.66	0.65	1.8	1.2	0.8	0.8	1.0
Anthracene	0.04	0.04	0.09	0.08	0.06	0.05	0.06
Fluroanthene	0.015	0.01	0.03	0.03	0.02	0.02	<0.06
Pyrene	<0.01	<0.01	0.02	0.01	<0.01	<0.01	<0.06
Benzo(a)anthracene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.06
Chrysene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.06
Benzo(b)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.06
Benzo(k)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.06
Benzo(j)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.06

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well						
	MW-29	MW-29	MW-29	MW-29	MW-29	MW-29	MW-29
Sample Date	**7/19/16**	**12/20/16**	**4/27/17**	**8/30/17**	**12/7/17**	**4/18/18**	**7/26/18**
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Benzo(a)pyrene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.06
Indeno(1,2,3-cd)pyrene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.06
Dibenzo(a,h)anthracene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.06
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.06
BaPEq. (TEQ)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.06

Notes: < - Not detected at indicated reporting level
J - Estimated Concentration
----- - Not analyzed
* - Denotes carcinogenic PAH

- MGP Area Well
- Shoreline Well

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Tacoma Coal Gasification Site
Tacoma, Washington

Constituent	Shoreline Well						
	MW-30	MW-30	MW-30	MW-30	MW-30	MW-30	MW-30
Sample Date	7/19/16	12/20/16	4/27/17	8/30/17	12/6/17	4/18/18	7/26/18
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Field Parameters							
pH	6.9	6.9	6.8	7.2	6.8	6.9	6.9
Conductivity (uS)	425	415	388	329	379	407	438
Temperature (C)	16.2	16.8	15.1	15.2	15.4	14.4	15.7
Dissolved Oxygen (mg/l)	0.2	0.09	0	0.11	0.32	0.06	0.06
Oxidation-Reduction Potential (ORP) (mV)	8.7	-8.1	-12.9	-111	-60	-137	-113
Ferrous Iron (mg/l)	6	5.5	4	5.5	3.5	4	1.5
Turbidity (NTU)	7.5	7.4	5.9	3.3	8.2	88	3
Laboratory Constituents							
Conventionals (mg/l)							
Total Suspended Solids	-----	-----	-----	-----	-----	30	22
Calcium	-----	-----	27.5	27.6	-----	-----	-----
Magnesium	-----	-----	20.7	20.7	-----	-----	-----
Sodium	-----	-----	14.8	14.3	-----	-----	-----
Chloride	-----	-----	18.8	17.6	-----	-----	-----
Total Cyanide (ug/l)	-----	-----	-----	-----	-----	-----	7
Total Metals (ug/l)							
Antimony	-----	-----	-----	-----	-----	-----	<0.20
Arsenic	-----	-----	-----	-----	-----	-----	19.9
Copper	-----	-----	-----	-----	-----	-----	<0.50
Lead	-----	-----	-----	-----	-----	-----	<0.10
Mercury	-----	-----	-----	-----	-----	-----	<0.10
Nickel	-----	-----	-----	-----	-----	-----	0.28 J
Silver	-----	-----	-----	-----	-----	-----	<0.20
Zinc	-----	-----	-----	-----	-----	-----	1.3 J
Dissolved Metals (ug/l)							
Antimony	-----	-----	-----	-----	-----	-----	<0.20
Arsenic	-----	-----	-----	-----	-----	-----	19
Copper	-----	-----	-----	-----	-----	-----	<0.50
Lead	-----	-----	-----	-----	-----	-----	<0.10

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well						
	MW-30	MW-30	MW-30	MW-30	MW-30	MW-30	MW-30
Sample Date	**7/19/16**	**12/20/16**	**4/27/17**	**8/30/17**	**12/6/17**	**4/18/18**	**7/26/18**
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Mercury	-----	-----	-----	-----	-----	-----	<0.10
Nickel	-----	-----	-----	-----	-----	-----	0.25 J
Silver	-----	-----	-----	-----	-----	-----	<0.20
Zinc	-----	-----	-----	-----	-----	-----	<4.0
Petroleum Hydrocarbons (mg/l)							
Diesel Range Organics	-----	-----	-----	-----	-----	-----	0.26
Motor Oil Range Organics	-----	-----	-----	-----	-----	-----	<0.2
Aromatic Hydrocarbons (ug/l)				1.27			
Benzene	16.3	12.6	32.8	40.3	39.2	45.9	56.3
Toluene	<0.2	<0.2	<0.2	0.22	<0.2	0.2	0.25
Ethylbenzene	<0.2	0.22	2.6	1.5	0.29	0.55	0.72
m-p-Xylene	<0.4	<0.4	0.58	0.72	0.62	0.84	1.0
o-Xylene	0.49	0.33	0.65	1.1	1.1	1.57	2.3
PAHs (ug/l)							
Naphthalene	0.11	0.24	6.9	8.8	4.7	5.0	10.6
2-Methylnaphthalene	0.18	0.14	0.25	0.45	0.38	0.52	1.1
1-Methylnaphthalene	2.7	3.03	5.0	8.5	7.9	9.5	11.7
Acenaphthylene	0.12	0.17	0.18	0.19	0.2	0.14	0.20
Acenaphthene	20.6	24.6	27.3	25.5	27.1	22.9	27.1
Dibenzofuran	0.03	0.03	0.03	0.04	0.04	0.04	<0.10
Fluorene	0.78	1.1	1.3	1.3	1.7	1.5	2.2
Phenanthrene	0.28	0.40	0.46	0.58	0.57	0.67	1.2
Anthracene	0.08	0.10	0.11	0.13	0.13	0.14	0.18
Fluroanthene	0.03	0.03	0.04	0.04	0.04	0.03	<0.10
Pyrene	0.03	0.03	0.04	0.03	0.03	0.03	<0.10
Benzo(a)anthracene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10
Chrysene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10
Benzo(b)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10
Benzo(k)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10
Benzo(j)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent	Shoreline Well						
	MW-30	MW-30	MW-30	MW-30	MW-30	MW-30	MW-30
Sample Date	7/19/16	12/20/16	4/27/17	8/30/17	12/6/17	4/18/18	7/26/18
Lab. Work Order	16G0069	16L0317	17E0005	17H0358	17L0145	18D0310	18G0332
Benzo(a)pyrene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10
Indeno(1,2,3-cd)pyrene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10
Dibenzo(a,h)anthracene*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10
BaPEq. (TEQ)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10

Notes: < - Not detected at indicated reporting level
J - Estimated Concentration
----- - Not analyzed
* - Denotes carcinogenic PAH

(yellow) - MGP Area Well
(blue) - Shoreline Well

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent Sample Date Lab. Work Order	MGP Area Well Maximum	Shoreline Well Maximum
Field Parameters		
pH	7.1	7.7
Conductivity (uS)	721	14200
Temperature (C)	16.6	16.9
Dissolved Oxygen (mg/l)	7.2	0.8
Oxidation-Reduction Potential (ORP) (mV)	139.1	16.7
Ferrous Iron (mg/l)	4.5	6.0
Turbidity (NTU)	18.4	96.0
Laboratory Constituents		
Conventionals (mg/l)		
Total Suspended Solids	16.0	36.0
Calcium	83.9	110
Magnesium	31.1	86.7
Sodium	33.9	559
Chloride	50.3	1160
Total Cyanide (ug/l)	-----	97
Total Metals (ug/l)		
Antimony	-----	0.06
Arsenic	-----	19.9
Copper	-----	<0.50
Lead	-----	0.07
Mercury	-----	<0.10
Nickel	-----	0.29
Silver	-----	<0.20
Zinc	-----	2.8
Dissolved Metals (ug/l)		
Antimony	-----	0.04
Arsenic	-----	19.0
Copper	-----	0.54
Lead	-----	<0.10

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent / Sample Date / Lab. Work Order	MGP Area Well Maximum	Shoreline Well Maximum
Mercury	-----	<0.10
Nickel	-----	0.21
Silver	-----	<0.20
Zinc	-----	1.2
Petroleum Hydrocarbons (mg/l)		
Diesel Range Organics	-----	1.5
Motor Oil Range Organics	-----	<0.2
Aromatic Hydrocarbons (ug/l)		
Benzene	0.3	87.3
Toluene	0.2	0.32
Ethylbenzene	0.2	4.5
m-p-Xylene	0.4	7.1
o-Xylene	0.2	2.8
PAHs (ug/l)		
Naphthalene	0.03	15.7
2-Methylnaphthalene	0.01	13.7
1-Methylnaphthalene	0.07	107
Acenaphthylene	0.21	0.55
Acenaphthene	3.1	215
Dibenzofuran	0.02	7.0
Fluorene	0.09	91.8
Phenanthrene	0.02	43.5
Anthracene	0.12	3.3
Fluroanthene	0.60	0.69
Pyrene	2.6	0.40
Benzo(a)anthracene*	0.09	0.04
Chrysene*	0.09	0.05
Benzo(b)fluoranthene*	0.01	0.02
Benzo(k)fluoranthene*	<0.01	0.01
Benzo(j)fluoranthene*	0.01	0.02

TABLE 3.4 - Monitoring Well Analytical Data - July 2016 to July 2018 (By Utilities)

Constituent Sample Date Lab. Work Order	MGP Area Well Maximum	Shoreline Well Maximum
Benzo(a)pyrene*	<0.01	0.04
Indeno(1,2,3-cd)pyrene*	<0.01	0.02
Dibenzo(a,h)anthracene*	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	0.02
BaPEq. (TEQ)	0.01	0.05

Notes: < - Not detected at indicated reporting level
J - Estimated Concentration
----- - Not analyzed
* - Denotes carcinogenic PAH

(yellow) - MGP Area Well
(blue) - Shoreline Well

TABLE 3.5 - Shoreline Seep Analytical Data - August 2017 to July 2018

Constituent	SEEP-1			
Sample Date	**4/27/2017(1)**	**8/22/2017(2)**	**4/19/2018(2)**	**7/27/2018(2)**
Lab. Work Order	17E0005	17H0256	18D0310	18G0339
Field Parameters				
pH	6.7	7.0	7.1	7.2
Conductivity (uS)	27350	33773	32738	36323
Temperature (C)	11.3	17.9	10.9	17.7
Dissolved Oxygen (mg/l)	7.1	7.8	7.4	5.1
Oxidation-Reduction Potential (ORC) (mV)	54	112	42.2	56.3
Ferrous Iron (mg/l)	0	0	0	0
Turbidity (NTU)	4.3	2.6	2.1	3.9
Laboratory Constituents				
Conventionals (mg/l)				
Total Suspended Solids	-----	4.6	6	6
Calcium	268	261	-----	-----
Magnesium	814	775	-----	-----
Sodium	7100	6790	-----	-----
Chloride	9250	11100	-----	-----
Total Cyanide (ug/l)	-----	-----	-----	<5.0
Total Metals (ug/l)				
Antimony	-----	-----	-----	0.51 J
Arsenic	-----	-----	-----	2.5
Copper	-----	-----	-----	3.8 J
Lead	-----	-----	-----	9.5
Mercury	-----	-----	-----	0.107
Nickel	-----	-----	-----	2.4 J
Silver	-----	-----	-----	<2.0
Zinc	-----	-----	-----	18.4 J
Dissolved Metals (ug/l)				
Antimony	-----	-----	-----	0.28
Arsenic	-----	-----	-----	2.3
Copper	-----	-----	-----	3.2

TABLE 3.5 - Shoreline Seep Analytical Data - August 2017 to July 2018

Constituent	SEEP-1			
Sample Date	4/27/2017(1)	8/22/2017(2)	4/19/2018(2)	7/27/2018(2)
Lead	-----	-----	-----	<0.50
Mercury	-----	-----	-----	<0.100
Nickel	-----	-----	-----	1.9 J
Silver	-----	-----	-----	<1.0
Zinc	-----	-----	-----	10.7 J
Petroleum Hydrocarbons (mg/l)				
Diesel Range Organics	-----	-----	-----	<0.1
Motor Oil Range Organics	-----	-----	-----	<0.2
Aromatic Hydrocarbons (ug/l)				
Benzene	<0.2	<0.2	<0.2	<0.2
Toluene	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	<0.2	<0.2	<0.2	<0.2
m-p-Xylene	<0.4	<0.4	<0.2	<0.4
o-Xylene	<0.2	<0.2	<0.2	<0.2
PAHs (ug/l)				
Naphthalene	0.02	0.01	0.03	0.01
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01
1-Methylnaphthalene	0.02	<0.01	0.03	0.01
Acenaphthylene	0.02	<0.01	<0.01	<0.01
Acenaphthene	0.02	<0.01	0.03	0.02
Dibenzofuran	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01
Phenanthrene	0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01
Fluroanthene	0.07	<0.01	<0.01	0.01
Pyrene	0.10	<0.01	<0.01	0.01
Benzo(a)anthracene*	0.07	<0.01	<0.01	<0.01
Chrysene*	0.09	<0.01	<0.01	<0.01
Benzo(b)fluoranthene*	0.04	<0.01	<0.01	<0.01
Benzo(k)fluoranthene*	0.03	<0.01	<0.01	<0.01
Benzo(j)fluoranthene*	0.03	<0.01	<0.01	<0.01

TABLE 3.5 - Shoreline Seep Analytical Data - August 2017 to July 2018

Constituent	SEEP-1			
Sample Date	4/27/2017(1)	8/22/2017(2)	4/19/2018(2)	7/27/2018(2)
Benzo(a)pyrene*	0.07	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene*	0.03	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene*	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	0.04	<0.01	<0.01	<0.01
BapEQ. (TEQ)	0.09	<0.01	<0.01	<0.01

Notes: (1) - Collected directly from small depression.
(2) - Collected using a small screen and sand pack (improved procedure).
(3) - PAHs - maximum of Aug. 17,April 18, July 18 samples w/improved sampling technique.
< - Not detected at indicated reporting level (PQL).
----- - Not analyzed
J - Estimated concentration
* - Denotes carcinogenic PAH

TABLE 3.5 - Shoreline Seep Analytical Data - August 2017 to July 2018

Constituent	SEEP-2				Shoreline Seep Max. (3)
Sample Date	4/27/2017(1)	8/22/2017(2)	4/19/2018(2)	7/27/2018(2)	
Lab. Work Order	17E0005	17H0256	18D0310	18G0339	
Field Parameters					
pH	6.9	7.0	7.1	7.2	7.2
Conductivity (uS)	29706	30627	31281	33151	36323
Temperature (C)	11.6	18.3	10.7	18.7	18.7
Dissolved Oxygen (mg/l)	6.4	7.9	7.1	4.9	7.9
Oxidation-Reduction Potential (ORC) (mV)	48.3	99	41.2	38.3	112
Ferrous Iron (mg/l)	0	0	0	0	0
Turbidity (NTU)	2.7	1.8	1.3	2.7	4.3
Laboratory Constituents					
Conventionals (mg/l)					
Total Suspended Solids	-----	3.7	3	2	6
Calcium	274	231	-----	-----	274
Magnesium	829	715	-----	-----	829
Sodium	7220	6100	-----	-----	7220
Chloride	9570	11500	-----	-----	11500
Total Cyanide (ug/l)	-----	-----	-----	11	11
Total Metals (ug/l)					
Antimony	-----	-----	-----	0.29 J	0.51 J
Arsenic	-----	-----	-----	2.1	2.5
Copper	-----	-----	-----	<5.0	3.8 J
Lead	-----	-----	-----	<1.0	9.5
Mercury	-----	-----	-----	<0.100	0.107
Nickel	-----	-----	-----	1.9 J	2.4 J
Silver	-----	-----	-----	<2.0	<2.0
Zinc	-----	-----	-----	14.8 J	18.4 J
Dissolved Metals (ug/l)					
Antimony	-----	-----	-----	0.24 J	0.28 J
Arsenic	-----	-----	-----	2.2	2.3
Copper	-----	-----	-----	2.4 J	3.2

TABLE 3.5 - Shoreline Seep Analytical Data - August 2017 to July 2018

Constituent	SEEP-2				Shoreline
Sample Date	**4/27/2017(1)**	**8/22/2017(2)**	**4/19/2018(2)**	**7/27/2018(2)**	**Seep**
Lead	-----	-----	-----	<0.50	<0.50
Mercury	-----	-----	-----	<0.100	<0.100
Nickel	-----	-----	-----	1.6 J	1.9 J
Silver	-----	-----	-----	<1.0	<1.0
Zinc	-----	-----	-----	13.6 J	13.6 J
Petroleum Hydrocarbons (mg/l)					
Diesel Range Organics	-----	-----	-----	<0.1	<0.1
Motor Oil Range Organics	-----	-----	-----	<0.2	<0.2
Aromatic Hydrocarbons (ug/l)					
Benzene	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	<0.2	<0.2	<0.2	<0.2	<0.2
m-p-Xylene	<0.4	<0.4	<0.2	<0.4	<0.4
o-Xylene	<0.2	<0.2	<0.2	<0.2	<0.2
PAHs (ug/l)					
Naphthalene	0.01	0.01	0.01	<0.01	0.03
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01
1-Methylnaphthalene	<0.01	<0.01	0.03	<0.01	0.03
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	<0.01	<0.01	0.02	<0.01	0.03
Dibenzofuran	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01
Fluroanthene	0.03	<0.01	0.01	<0.01	0.01
Pyrene	0.03	<0.01	0.01	<0.01	0.01
Benzo(a)anthracene*	0.02	<0.01	<0.01	<0.01	<0.01
Chrysene*	0.02	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene*	0.02	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(j)fluoranthene*	<0.01	<0.01	<0.01	<0.01	<0.01

TABLE 3.5 - Shoreline Seep Analytical Data - August 2017 to July 2018

Constituent	SEEP-2				Shoreline
Sample Date	4/27/2017(1)	8/22/2017(2)	4/19/2018(2)	7/27/2018(2)	Seep
Benzo(a)pyrene*	0.02	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene*	0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene*	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	0.02	<0.01	<0.01	<0.01	<0.01
BapEQ. (TEQ)	0.03	<0.01	<0.01	<0.01	<0.01

Notes: (1) - Collected directly from small depression.
(2) - Collected using a small screen and sand pack (improved procedure).
(3) - PAHs - maximum of Aug. 17,April 18, July 18 samples w/improved sampling technique.
< - Not detected at indicated reporting level (PQL).
----- - Not analyzed
J - Estimated concentration
* - Denotes carcinogenic PAH

TABLE 3.6 - Hillside Seep Analytical Data - Dec. 2017 and July 2018

Constituent	Hillside SEEP			Hillside Seep Maximum
Sample Date	12/20/17	4/19/18(a)	7/26/18(a)	
Lab. Work Order	17L0382	18D0310	18G0332	
Field Parameters				
pH	7.5	6.7	6.8	7.5
Conductivity (uS)	404	574	524	574
Temperature (C)	9.1	10.3	22.3	10.3
Dissolved Oxygen (mg/l)	-----	4.4	ISV	4.4
Oxidation-Reduction Potential (ORC) (mV)	-12.3	-35.6	ISV	-12.3
Ferrous Iron (mg/l)	1.8	4	ISV	4
Turbidity (NTU)	25	(b)	ISV	25
Laboratory Constituents				
Conventionals (mg/l)				
Total Suspended Solids	49	19	ISV	49
Calcium	-----	-----	-----	-----
Magnesium	-----	-----	-----	-----
Sodium	-----	-----	-----	-----
Chloride	-----	-----	-----	-----
Total Cyanide	-----	-----	ISV	-----
Total Metals (ug/l)				
Antimony	-----	-----	ISV	-----
Arsenic	-----	-----	ISV	-----
Copper	-----	-----	ISV	-----
Lead	-----	-----	ISV	-----
Mercury	-----	-----	ISV	-----
Nickel	-----	-----	ISV	-----
Silver	-----	-----	ISV	-----
Zinc	-----	-----	ISV	-----
Dissolved Metals (ug/l)				
Antimony	-----	-----	ISV	-----
Arsenic	-----	-----	ISV	-----
Copper	-----	-----	ISV	-----
Lead	-----	-----	ISV	-----
Mercury	-----	-----	ISV	-----
Nickel	-----	-----	ISV	-----
Silver	-----	-----	ISV	-----
Zinc	-----	-----	ISV	-----
Petroleum Hydrocarbons (mg/l)				
Diesel Range Organics	-----	-----	ISV	-----
Motor Oil Range Organics	-----	-----	ISV	-----
Aromatic Hydrocarbons (ug/l)				
Benzene	88.6	60.3	<0.2	88.6
Toluene	2.4	1.1	<0.2	2.4
Ethylbenzene	21.5	24	<0.2	24

TABLE 3.6 - Hillside Seep Analytical Data - Dec. 2017 and July 2018

Tacoma Coal Gasification Site
Tacoma, Washington

Constituent	Hillside SEEP			Hillside
Sample Date	**12/20/17**	**4/19/18(a)**	**7/26/18(a)**	**Seep**
m-p-Xylene	6.3	1.9	<0.4	6.3
o-Xylene	22.4	13.7	<0.2	22.4
PAHs (ug/l)				
Naphthalene	205	13.2	ISV	205
2-Methylnaphthalene	1.1	0.02	ISV	1.1
1-Methylnaphthalene	44.5	25.4	ISV	44.5
Acenaphthylene	2.7	0.92	ISV	2.7
Acenaphthene	13.4	8.3	ISV	13.4
Dibenzofuran	2.3	1.12	ISV	2.3
Fluorene	10.4	6.7	ISV	10.4
Phenanthrene	2.9	2.5	ISV	2.9
Anthracene	1.0	0.51	ISV	1.0
Fluroanthene	0.80	0.33	ISV	0.80
Pyrene	0.87	0.34	ISV	0.87
Benzo(a)anthracene*	<0.12	<0.01	ISV	<0.12
Chrysene*	<0.12	<0.01	ISV	<0.12
Benzo(b)fluoranthene*	<0.12	<0.01	ISV	<0.12
Benzo(k)fluoranthene*	<0.12	<0.01	ISV	<0.12
Benzo(j)fluoranthene*	<0.12	<0.01	ISV	<0.12
Benzo(a)pyrene*	<0.12	<0.01	ISV	<0.12
Indeno(1,2,3-cd)pyrene*	<0.12	<0.01	ISV	<0.12
Dibenzo(a,h)anthracene*	<0.12	<0.01	ISV	<0.12
Benzo(g,h,i)perylene	<0.12	<0.01	ISV	<0.12
Benzofluoranthenes, total*	<0.12	<0.01	ISV	<0.12
BaPEQ. (TEQ)	<0.12	<0.01	ISV	<0.12

Notes:

Collected using a small screen and sand pack
< - Not detected at indicated reporting level
----- - Not analyzed
* - Denotes carcinogenic PAH
(a) - Pumped dry. Sample obtained after
45 minute recovery.
(b) - Turbidity measurements by container:
VOA - 23.1 NTU
PAH - 7.2 NTU
TSS - 13.8 NTU
ISV - Insufficient Volume

TABLE 5.2 - Well Construction Data

Well	Date Installed	Logged By	Status	Coordinates North	Coordinates East	Surface Elev. (ft)	TOC Elev (feet)	Stick-Up (fee)	Elev. Ref.	Total Depth (ft)	Top Screen (ft)	Bottom Screen (ft)	Comment
Shallow Wells													
HC-MW1	11/2/87	HC	aban	-----	-----	-----	-----	-----	-----	23.4	15	25	
HC-MW2	11/2/87	HC	Exist	701781	1160267	31.6	31.48	-0.1	NAVD88	29	15	25	
HC-MW3	11/2/87	HC	aban	-----	-----	-----	-----	-----	-----	23	5	15	Tar-like substance
HC-MW4	11/2/87	HC	aban	-----	-----	-----	-----	-----	-----	22.2	6	16	Oil-like coating on soil 6'-7'
DOT-MW4	1/27/96	BV	Exist	702133	1160123	24.1	23.87	-0.2	NAVD88	28	10.5	20.5	
HC-MW5	11/2/87	HC	Exist	702228	1159859	46.8	46.39	-0.39	NAVD88	23.5	11	20	
HC-MW6	11/2/87	HC	Exist	701754	1159987	47.4	47.16	-0.24	NAVD88	32.2	19	29	
MW7	11/4/93	BV	aban	702000	1160170	18.00	17.72	-0.28	Tacoma	27	5	21	Heavy oil sheens
MW8	11/2/93	BV	aban	702029	1160320	17.44	17.19	-0.25	-----	32	10	26	
MW9	11/3/93	BV	Exist	701950	1160366	20.1	19.77	-0.34	NAVD88	34	9	25	Sheen; oil saturated soil
MW10	11/1/93	BV	aban	702118	1160360	14.11	13.9	-0.21	-----	42	6	22	Tar & slag
MW11	11/1/93	BV	aban	702236	1160308	13.69	13.36	-0.33	-----	42	7	18	
MW13	1/8/96	BV	aban	702294	1160252	14.37	13.97	-0.4	msl	30	9.5	29.5	
MW14	1/9/96	BV	aban	702127	1160263	17.45	17.05	-0.4	msl	35.5	11.5	31.5	
MW15	1/9/96	BV	aban	701846	1160243	25.66	25.26	-0.4	msl	35.5	13.5	33.5	
MW16	1/8/96	BV	Exist	701896	1160422	20.3	19.88	-0.43	NAVD88	36.5	9.5	29.5	
MW22	3/14/97	BV	Exist	701675	1160143	32.5	32.04	-0.41	NAVD88	40	4.5	14.5	Installed in same hole MW19
MW23	3/14/97	BV	Exist	702021	1159930	42.2	41.71	-0.44	NAVD88	40	9.5	19.5	Installed in same hole MW21
MW24	7/14/98	BV	Exist	702031	1160369	18.1	17.68	-0.37	NAVD88	22	11.5	21.5	
MW25	7/14/98	BV	Exist	701991	1160343	20.5	20.20	-0.29	NAVD88	23	12.5	22.5	
MW26	7/14/98	BV	Exist	701995	1160374	18.4	18.01	-0.41	NAVD88	25	14.5	24.5	
Intermediate Wells													
MW7(R)	10/20/98	Geoeng	aban	-----	-----	28.39	27.8	-0.59	MLLW	33.5	21	31	
MW12	10/25/93	BV	aban	702078	1160375	14.13	13.79	-0.34	NAVD88	40	27.9	37.9	
MW15(R)	10/20/98	Geoeng	aban	-----	-----	30.66	30.27	-0.39	MLLW	33.5	23	33	
MW19	3/14/97	BV	Exist	701679	1160142	32.3	31.97	-0.29	NAVD88	40	24.5	39.5	Installed in same hole MW22
MW20	3/13/97	BV	Exist	701639	1159997	48.6	48.32	-0.29	NAVD88	55	31.5	51.5	
MW21	3/13/97	BV	Exist	702023	1159926	42.1	41.89	-0.22	NAVD88	55	36.5	51.5	Installed in same hole MW23
MW27	7/14/98	BV	Exist	702004	1160107	20.7	19.93	-0.76	NAVD88	27	11.5	26.5	Visual oil globules
MW28	2/24/99	Geoeng	Exist	702061	1160377	17.1	16.77	-0.32	NAVD88	44	33.5	44	
MW29	2/25/99	Geoeng	Exist	702015	1160374	18.5	17.92	-0.56	NAVD88	33	22.5	32.5	
MW30	2/24/99	Geoeng	Exist	701943	1160387	18.8	18.39	-0.41	NAVD88	31	21.5	30.5	
Deeper Wells													
MW17A	1/17/96	BV	aban	702091	1160379	14.07	13.67	-0.4	msl	72	47	52	
MW17B	1/17/96	BV	aban	702091	1160379	14.03	13.63	-0.4	msl	72	58.5	68.5	
MW18A	1/15/96	BV	aban	702005	1160169	17.86	17.46	-0.4	msl	72.5	40.5	45.5	
MW18B	1/15/96	BV	aban	702005	1160169	17.86	17.46	-0.4	msl	72.5	58.5	68.5	
MW31	2/23/99	Geoeng	aban	-----	-----	19.98	19.41	-0.57	MLLW	61.5	49.5	59.5	

Notes: Aban - Abandoned or Destroyed Well
Exist - Existing Wells - Inventoried and resurveyed in July 2016 (DOF 2016a,b,c)

TABLE 6.7 - Groundwater Screening Levels

Detected Constituents	Surface Water Screening Levels (SLs)						SL
	NTR 40 CFR 131		173-201A		CWA (d)		
	Aq. Life	HH	Aq. Life	HH	Aq. Life	HH	
Volatile Organics (ug/l)							
Benzene	-----	71	-----	1.6	-----	1.6	1.6
Toluene	-----	2.0E+05	-----	410	-----	130	130
Ethylbenzene	-----	2.9E+04	-----	270	-----	31	31
Xylenes	-----	-----	-----	-----	-----	-----	-----
Petroleum Hydrocarbons (mg/l)							
WTPH-G	-----	-----	-----	-----	-----	-----	800(h)
TPH-418.1	-----	-----	-----	-----	-----	-----	500(h)
WTPH-D	-----	-----	-----	-----	-----	-----	500(h)
Semivolatile Organics (ug/l)							
Naphthalene	-----	-----	-----	-----	-----	870(g)	870
2-Methylnaphthalene	-----	-----	-----	-----	-----	-----	-----
1-Methylnaphthalene	-----	-----	-----	-----	-----	-----	-----
Acenaphthylene	-----	-----	-----	-----	-----	-----	-----
Acenaphthene	-----	-----	-----	110	-----	30	30
Fluorene	-----	1.4E+04	-----	610	-----	10	10
Phenanthrene	-----	-----	-----	-----	-----	-----	-----
Anthracene	-----	1.1E+05	-----	4600	-----	100	100
Fluoranthene	-----	3.7E+02	-----	16	-----	6	6
Pyrene	-----	1.1E+04	-----	460	-----	8	8
Benzo(a)anthracene	-----	0.03	-----	0.021	-----	1.60E-04	0.01(e)
Chrysene	-----	0.03	-----	2.1	-----	1.60E-02	0.01(e)
Benzo(b)fluoranthene	-----	0.03	-----	0.021	-----	1.60E-04	0.01(e)
Benzo(k)fluoranthene	-----	0.03	-----	0.21	-----	1.60E-03	0.01(e)
Benzo(a)pyrene	-----	0.03	-----	2.1E-03	-----	1.60E-05	0.01(e)
Indeno(1,2,3-cd)pyrene	-----	0.03	-----	0.021	-----	1.60E-04	0.01(e)
Dibenzo(a,h)anthracene	-----	0.03	-----	2.1E-03	-----	1.60E-05	0.01(e)
Benzo(g,h,i)perylene	-----	-----	-----	-----	-----	-----	-----
Dibenzofuran	-----	-----	-----	-----	-----	-----	-----
2-4-Dimethylphenol	-----	-----	-----	97	-----	97	97
4-Methylphenol	-----	-----	-----	-----	-----	-----	-----
Phenol	-----	4.6E+06	-----	2.0E+05	-----	7.0E+04	7.0E+04
Total Metals (ug/l)							
Aluminum	-----	-----	-----	-----	-----	-----	-----
Antimony	-----	-----	-----	180T	-----	640T	180T
Arsenic (CF=1)	36D	0.14T	36T	10T	36T	0.14T	5T(f)
Barium	-----	-----	-----	-----	-----	1000j	1000T
Cadmium (CF=0.994)	9.3D	-----	9.4T	-----	8.0T	-----	8.0T
Chromium (CF=0.993)	50D(a)	-----	50.4T(a)	-----	50.4T(a)	-----	50.4T(a)
Copper (CF=0.83)	2.4D	-----	3.7T	-----	3.7T	-----	3.7T
Iron	-----	-----	-----	-----	-----	-----	-----
Lead (CF=0.951)	8.1D	-----	8.5T	-----	8.5T	-----	8.5T
Manganese	-----	-----	-----	-----	-----	-----	-----
Mercury (CF=0.85)	0.025T	0.15T	0.025T	0.15T	1.4T	-----	0.025T
Nickel (CF=0.990)	8.2D	4.6E+03	8.3T	190T	8.3T	100T	8.3T
Silver (CF=0.85)	-----	-----	2.2T(c)	-----	2.2T(c)	-----	2.2T(c)
Vanadium	-----	-----	-----	-----	-----	-----	-----
Zinc (CF= 0.946)	81D	-----	85.6T	2900T	85.6T	1000T	85.6T

TABLE 6.7 - Groundwater Screening Levels

Detected Constituents	Surface Water Screening Levels (SLs)						SL
	NTR 40 CFR 131		173-201A		CWA (d)		
	Aq. Life	HH	Aq. Life	HH	Aq. Life	HH	
Dissolved Metals (ug/l)							
Aluminum	-----	-----	-----	-----	-----	-----	-----
Antimony	-----	4.3E+03	-----	180T	-----	640T	180T
Arsenic	36D	-----	36D	10T	36D	0.14T	5D(f)
Barium	-----	-----	-----	-----	-----	1000j	1000T
Cadmium	9.3D	-----	9.3D	-----	7.9D	-----	7.9D
Chromium (total)	50D	-----	50D(a)	-----	50D(a)	-----	50D(a)
Copper	2.4D	-----	3.1D	-----	3.1D	-----	3.1D
Iron	-----	-----	-----	-----	-----	-----	-----
Lead	8.1D	-----	8.1D	-----	8.1D	-----	8.1D
Manganese	-----	-----	-----	-----	-----	-----	-----
Mercury	0.025T	-----	0.025T	0.15T	0.94D	-----	0.025T
Nickel	8.2D	-----	8.2D	190T	8.2D	100T	8.2D
Silver	-----	-----	1.9D(c)	-----	1.9D(c)	-----	1.9D(c)
Vanadium	-----	-----	-----	-----	-----	-----	-----
Zinc	81D	-----	81D	2900T	81D	1000T	81D
Other Constituents							
Cyanide (ug/l)	1.0D(b1)	220000(b2)	2.8D(b1)	270T(b2)	1D(b1)	100T(b2)	1D(b1)
Chloride (mg/l)	(i)	(i)	(i)	(i)	(i)	(i)	-----
Sulfate (mg/l)	(i)	(i)	(i)	(i)	(i)	(i)	-----
Fluoride (mg/l)	(i)	(i)	(i)	(i)	(i)	(i)	-----
Nitrate (mg/l)	(i)	(i)	(i)	(i)	(i)	(i)	-----
Nitrite (mg/l)	(i)	(i)	(i)	(i)	(i)	(i)	-----
Sodium (dissolved-mg/l)	(i)	(i)	(i)	(i)	(i)	(i)	-----
Potassium (dissolved-mg/l)	(i)	(i)	(i)	(i)	(i)	(i)	-----
Magnesium (dissolved-mg/l)	(i)	(i)	(i)	(i)	(i)	(i)	-----
Calcium (dissolved-mg/l)	(i)	(i)	(i)	(i)	(i)	(i)	-----

Notes: (a) - As Cr+6
(b1) - As weak acid dissociable cyanide; b2 - as total cyanide
(c) - Acute value
(d) - Clean Water Act
(e) - Based on practical quantitation limit (PQL)
(f) - Based on Washington State background
(g) - Method B value using updated exposure criteria (WAC -173-201A and Ecology - 2016)
(h) - Aquatic criteria not available, based on drinking water criteria in WAC 173-340-900, Table 720-1.
(i) - Aquatic criteria not available
T - Total (unfiltered) value
D - Dissolved (filtered) value
HH - Human Health (consumption of aquatic organisms)
----- - Not available
CF - Conversion factor to convert chronic aquatic life metal SL based on dissolved fraction to total metal SL. Dissolved SL divided by CF = total metal SL.

TABLE 6.8 - Groundwater Screening Level Comparison Summary

Constituents	All Samples Before 2006			Shoreline Well Samples Before 2006			Shoreline Well Samples (2016-18)			Shoreline Seeps (2017-18)			Proposed SL
	Maximum Detected Conc.	Location	Date	Maximum Detected Conc.	Location	Date	Maximum Detected Conc.	Location	Date	Maximum Detected Conc.(c)	Location	Date	
Volatile Organics (ug/l)													
Benzene	7800	MW7	11/93	360	MW26	Sep-98	87.3	MW26	Jul-16	<0.2	-----	-----	1.6
Toluene	930	MW7	11/93	9	MW26	Sep-98	0.32	MW26	Dec-16	<0.2	-----	-----	130
Ethylbenzene	2800	MW7	11/93	96.6	MW17B	Jan-96	4.5	MW26	Dec-16	<0.2	-----	-----	31
Xylenes	3600	MW27	9/98	55	MW17B	Jan-96	9.6	MW26	Jul-16	<0.4	-----	-----	-----
Petroleum Hydrocarbons (ug/l)													
WTPH-G	27000(b)	MW9	11/93	-----	-----	-----	-----	-----	-----	-----	-----	-----	800
TPH-418.1	233000(b)	MW9	11/93	<1	-----	-----	-----	-----	-----	-----	-----	-----	500
WTPH-D/Diesel Range Organics	25000(b)	MW9	11/93	-----	-----	-----	1500	MW24	Jul-18	<0.1	-----	-----	500
Motor Oil Range Organics	-----	-----	-----	-----	-----	-----	<0.20	-----	-----	<0.2	-----	-----	500
Semivolatile Organics (ug/l)													
Naphthalene	8500	MW7	11/93	250	MW26	Sep-98	15.7	MW26	Aug-17	0.03	Seep 1	Apr-18	870
2-Methylnaphthalene	1000	MW7	11/93	15.1	MW29	Mar-05	13.7	MW24	Apr-17	<0.01	-----	-----	-----
1-Methylnaphthalene	-----	-----	-----	-----	-----	-----	107	MW24	Apr-17	0.03	Seep 1&2	Apr-18	-----
Acenaphthylene	130	MW27	9/98	12	MW17B	Jan-96	0.55	MW24	Jul-18	<0.01	-----	-----	-----
Acenaphthene	1700	MW9	11/93	107	MW24	Mar-05	215	MW24	Apr-17	0.03	Seep 1	Apr-18	30
Fluorene	1600	MW9	11/93	17.4	MW24	Mar-04	91.8	MW24	Apr-17	<0.01	-----	-----	10
Phenanthrene	3900	MW9	11/93	24	MW17B	Jan-96	43.5	MW24	Apr-17	<0.01	-----	-----	-----
Anthracene	340	MW9	11/93	5	MW17B	Jan-96	3.3	MW-24	Aug-17	<0.01	-----	-----	100
Fluoranthene	1600	MW9	11/93	15	MW12	Jan-96	0.69	MW24	Aug-17	0.01	Seep 2	Apr-18	6
Pyrene	1000	MW9	11/93	16	MW12	Jan-96	0.4	MW24	Apr-17	0.01	Seep 2	Apr-18	8
Benzo(a)anthracene	240	MW9	11/93	5	MW12	Jan-96	0.04	MW28	Aug-17	<0.01	-----	-----	see BaPEq
Chrysene	240	MW9	11/93	5	MW12	Jan-96	0.05	MW28	Aug-17	<0.01	-----	-----	see BaPEq
Benzo(b)fluoranthene	89	MW9	11/93	0.2	MW26	Mar-01	0.02	MW28	Aug-17	<0.01	-----	-----	see BaPEq
Benzo(k)fluoranthene	25	MW9	11/93	0.06	MW29	Mar-05	0.01	MW28	Aug-17	<0.01	-----	-----	see BaPEq
Benzo(a)pyrene	60	MW9	11/93	6	MW12	Jan-96	0.04	MW28	Aug-17	<0.01	-----	-----	see BaPEq
Indeno(1,2,3-cd)pyrene	24	MW7	11/93	0.25	MW26	Mar-01	0.02	MW28	Aug-17	<0.01	-----	-----	see BaPEq
Dibenzo(a,h)anthracene	0.26	MW8	6/98	0.27	MW26	Mar-01	<0.01	-----	-----	<0.01	-----	-----	see BaPEq
BapEq.	105	MW9	1/96	0.49	MW26	Mar-01	0.05	MW28	Aug-17	<0.01	-----	-----	0.01
Benzo(g,h,i)perylene	26	MW7	11/93	0.27	MW26	Mar-01	0.02	MW28	Aug-17	<0.01	-----	-----	-----
Dibenzofuran	260	MW9	11/93	15	MW10	Nov-93	7.0	MW24	Apr-17	<0.01	-----	-----	-----
2-4-Dimethylphenol	100	MW7	11/93	<10	-----	-----	-----	-----	-----	-----	-----	-----	97
4-Methylphenol	51	MW7	11/93	36	MW12	Nov-93	-----	-----	-----	-----	-----	-----	-----

TABLE 6.8 - Groundwater Screening Level Comparison Summary

Tacoma Coal Gasification Site
Tacoma,Washington

Constituents	All Samples Before 2006			Shoreline Well Samples Before 2006			Shoreline Well Samples (2016-18)			Shoreline Seeps (2017-18)			Proposed SL
	Maximum Detected Conc.	Location	Date	Maximum Detected Conc.	Location	Date	Maximum Detected Conc.	Location	Date	Maximum Detected Conc.(c)	Location	Date	
Phenol	11	MW7	11/93	<10	-----	-----	-----	-----	-----	-----	-----	-----	7.0E+04
Total Metals (ug/l) (a)													
Aluminum	81300	MW10	11/93	81300	MW10	Nov-93	-----	-----	-----	-----	-----	-----	-----
Antimony	3130	MW10	11/93	3130	MW10	Nov-93	0.06	MW24	Jul-18	0.51	Seep1	Jul-18	180T
Arsenic	31.6	MW10	11/93	31.6	MW10	Nov-93	19.9	MW30	Jul-18	2.5	Seep1	Jul-18	5T
Barium	460	MW10	11/93	460	MW10	Nov-93	-----	-----	-----	-----	-----	-----	1000T
Cadmium	<5	-----	-----	<5	-----	-----	-----	-----	-----	-----	-----	-----	8.0T
Chromium	61	MW10	11/93	61	MW10	Nov-93	-----	-----	-----	-----	-----	-----	50.4T
Copper	90	MW10	11/93	90	MW10	Nov-93	<0.50	-----	-----	3.8	Seep1	Jul-18	3.7T
Iron	52700	MW10	11/93	52700	MW10	Nov-93	-----	-----	-----	-----	-----	-----	-----
Lead	220	MW18A	2/96	45	MW10	Nov-93	0.07	MW26	Jul-18	9.5	Seep1	Jul-18	8.5T
Manganese	3560	MW10	11/93	3560	MW10	Nov-93	-----	-----	-----	-----	-----	-----	-----
Mercury	<0.5	-----	-----	<0.2	-----	-----	<0.10	-----	-----	0.11	Seep1	Jul-18	0.025T
Nickel	73	MW10	11/93	73	MW10	Nov-93	0.29	MW26	Jul-18	2.4	Seep1	Jul-18	8.3T
Silver	<10	-----	-----	<10	-----	-----	<0.20	-----	-----	<2.0	-----	-----	2.2T
Vanadium	158	MW10	11/93	158	-----	-----	-----	-----	-----	-----	-----	-----	-----
Zinc	222	MW10	11/93	222	MW10	Nov-93	2.8	MW26	Jul-18	18.4	Seep1	Jul-18	85.6T
Dissolved Metals (ug/l)													
Aluminum	<200	-----	-----	<200	-----	-----	-----	-----	-----	-----	-----	-----	-----
Antimony	2430	MW10	11/93	2430	MW10	Nov-93	0.04	MW26	Jul-18	0.28	Seep1	Jul-18	180T
Arsenic	21	MW10	11/93	21	MW10	Nov-93	19	MW30	Jul-18	2.3	Seep1	Jul-18	5D
Barium	<200	-----	-----	<200	MW10	Nov-93	-----	-----	-----	-----	-----	-----	1000D
Cadmium	<5	-----	-----	<5	MW10	Nov-93	-----	-----	-----	-----	-----	-----	7.9D
Chromium	23	MW14	1/96	<10	MW10	Nov-93	-----	-----	-----	-----	-----	-----	50D
Copper	<25	-----	-----	<25	MW10	Nov-93	0.54	MW24	Jul-18	3.2	Seep1	Jul-18	3.1D
Iron	1130	MW10	11/93	1130	MW10	Nov-93	-----	-----	-----	-----	-----	-----	-----
Lead	14.6	MW10	11/93	14.6	MW10	Nov-93	<0.10	-----	-----	<0.50	-----	-----	8.1D
Manganese	1970	MW10	11/93	1970	MW10	Nov-93	-----	-----	-----	-----	-----	-----	-----
Mercury	<0.5	-----	-----	<0.5	-----	-----	<0.10	-----	-----	<0.10	-----	-----	0.025T
Nickel	<40	-----	-----	<40	-----	-----	0.21	MW24	Jul-18	1.9	Seep1	Jul-18	8.2D
Silver	<10	-----	-----	<10	-----	-----	<0.20	-----	-----	<1.0	-----	-----	1.9D
Vanadium	<50	-----	-----	<50	-----	-----	-----	-----	-----	-----	-----	-----	-----

TABLE 6.8 - Groundwater Screening Level Comparison Summary

Constituents	All Samples Before 2006			Shoreline Well Samples Before 2006			Shoreline Well Samples (2016-18)			Shoreline Seeps (2017-18)			Proposed SL
	Maximum Detected Conc.	Location	Date	Maximum Detected Conc.	Location	Date	Maximum Detected Conc.	Location	Date	Maximum Detected Conc.(c)	Location	Date	
Zinc	85	MW10	11/93	85	MW10	Nov-93	1.2	MW24	Jul-18	13.6	Seep2	Jul-18	81D
Other Constituents													
Total Cyanide (ug/l)	470	MW4	11/93	110	MW11	Nov-93	0.1	MW26	Jul-18	0.01	Seep2	Jul-18	1D(d)

Notes: < - Not detected at less than indicated reporting limit

(a) - Total metals SLs were determined using the apprpriate dissolved to total conversion factors listed in Table 6.7.

(b) - Concentrations biased high because of presence of non-aqueous phase liquid (NAPL)

(c) - Based on August 2017, April 2018 and July 2018 data collected using the improved sampling procedue.

(d) - As weak acid dissociable cyanide

T - Total (unfiltered) value

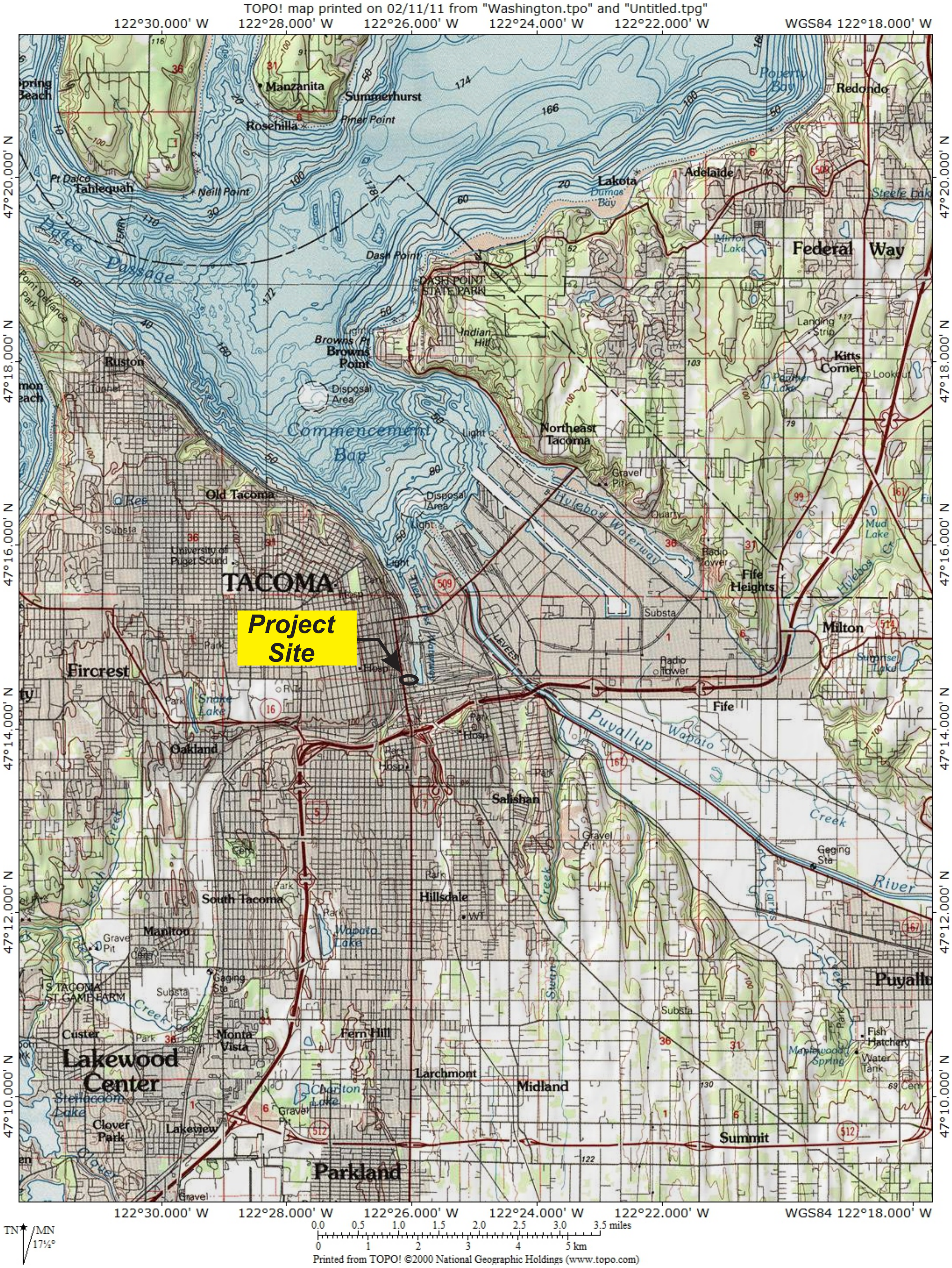
D - Dissolved (filtered) value

[yellow] - Concentration exceeds SL

[green] - Concentration or RL below SL or not detected at PQL w/ no SL

[blue] - Reporting limit is above SL

TOPO! map printed on 02/11/11 from "Washington.tpo" and "Untitled.tpg"



N

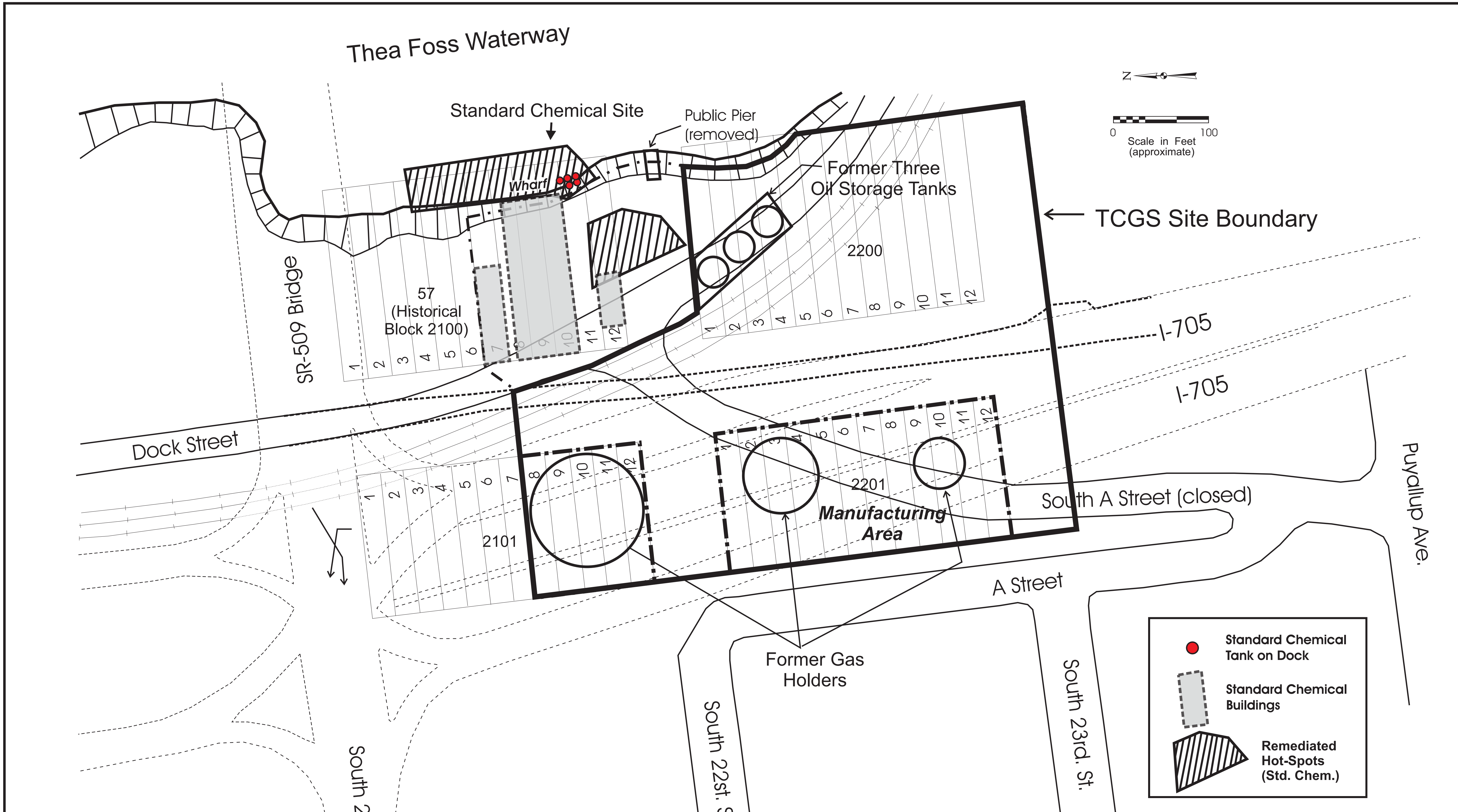
Tacoma Coal Gasification Site
Tacoma, Washington

Vicinity Map

PAP-001-08a,b **FIGURE 1.1** June 2018

Dalton, Olmsted & Fuglevand, Inc.

Ref: Vic Map A St.cdr



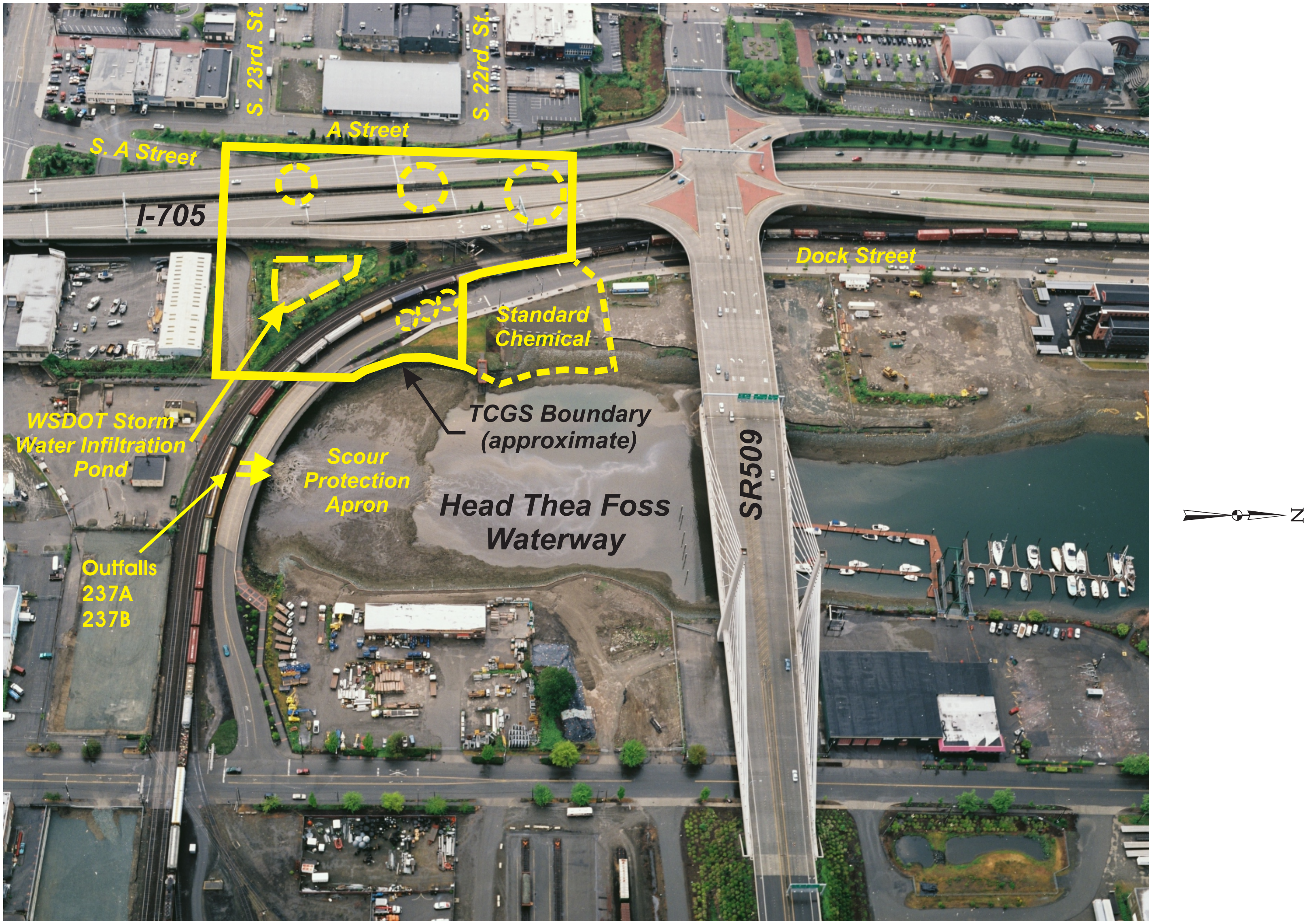
Tacoma Coal Gasification Site
Tacoma, WA

Site Boundary Map

PAP-001-08a,b **FIGURE 1.2** June 2018

Dalton, Olmsted & Fuglevand, Inc.

Ref: Site Area 1.cdr Base map adaped from Figure 1-2 (Geoengineers 2000)



Former Gas Holder   Former Three Tank Area

Note: Remediation of the Head of Thea Foss was completed in February 2004

Ref: Photo Aerial.cdr

Tacoma Coal Gasification Site
Tacoma, Washington

Aerial Photograph - 9/15/04
TCGS Site Boundary

PAP-001-08a,b   **FIGURE 1.3**   June 2018

Dalton, Olmsted & Fuglevand, Inc.

Tacoma Coal Gasification Site
Tacoma, Washington

Former Gas Plant Area
(May 2003 - view to southwest)

PAP-001-08a,b **FIGURE 1.4a** June 2018

Dalton, Olmsted & Fuglevand, Inc.

Ref: Photo SW View 6-2003.cdr

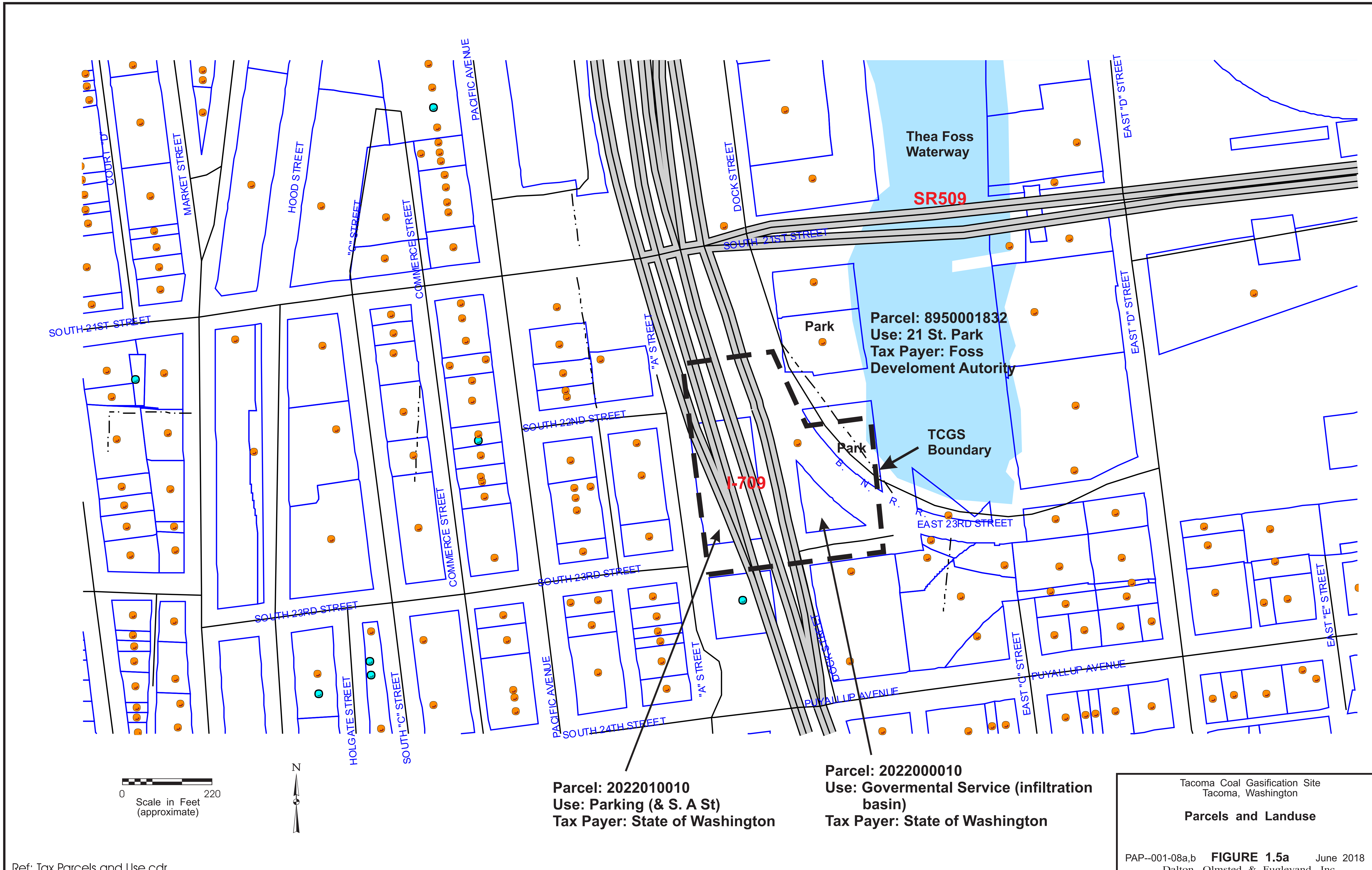
Tacoma Coal Gasification Site
Tacoma, Washington

Former Gas Plant Area
(July 2018 - view to southwest)

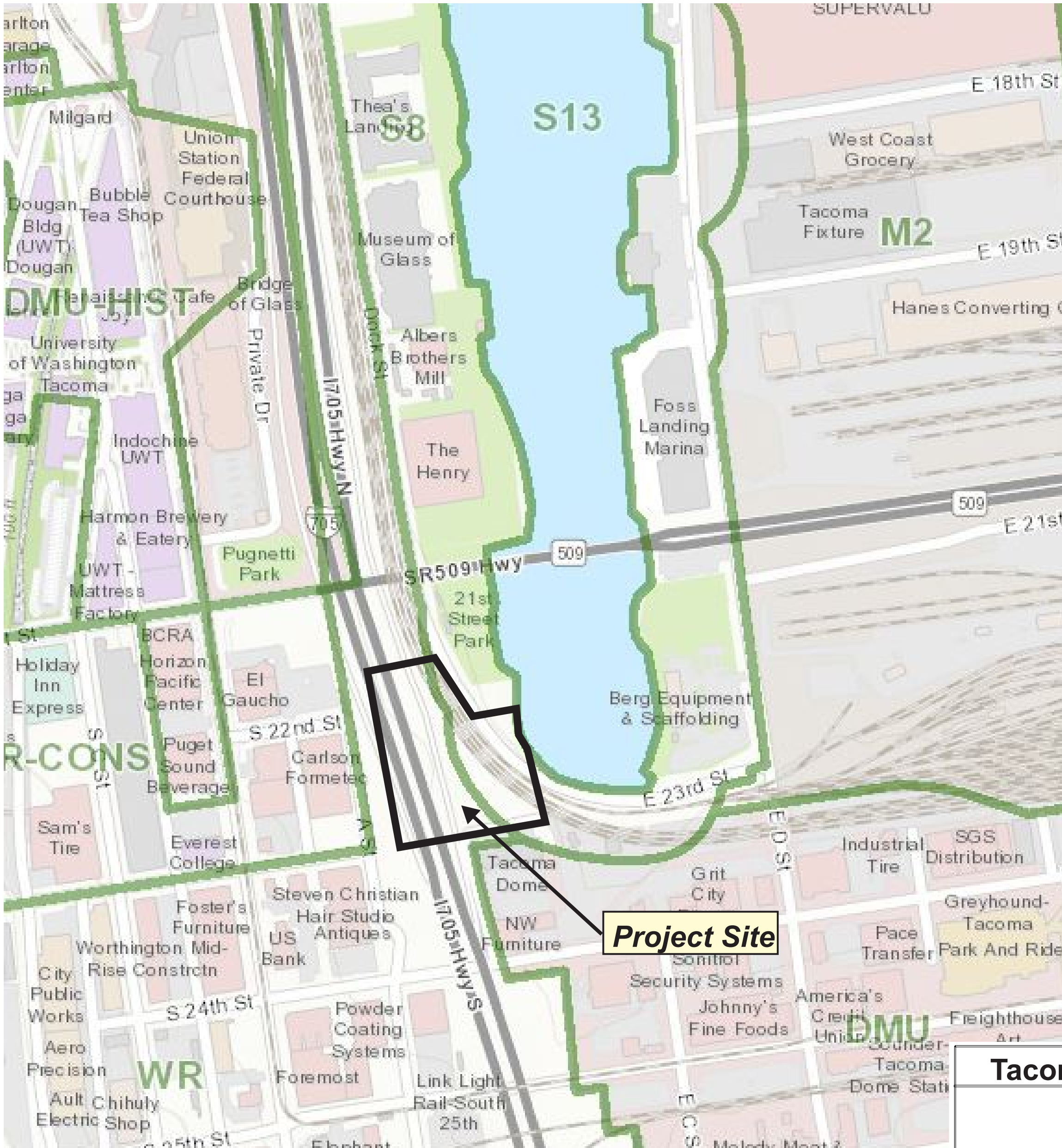
PAP-001-08a,b **FIGURE 1.4b** June 2018

Dalton, Olmsted & Fuglevand, Inc.

Ref: Photo SW View 6-2003.cdr



Thea Foss Waterway
SR509
I-709
SOUTH 21ST STREET
SOUTH 22ND STREET
SOUTH 23RD STREET
SOUTH 24TH STREET
EAST 23RD STREET
PUYALLUP AVENUE
PACIFIC AVENUE
COMMERCE STREET
"C" STREET
HOOD STREET
MARKET STREET
COURT "D"
"A" STREET
DOCK STREET
EAST "C" STREET
EAST "D" STREET
EAST "E" STREET
HOLGATE STREET
SOUTH "C" STREET
B. N. R. R.
Park
Park
Parcel: 8950001832
Use: 21 St. Park
Tax Payer: Foss
Develoment Autority
TCGS
Boundary
Parcel: 2022010010
Use: Parking (& S. A St)
Tax Payer: State of Washington
Parcel: 2022000010
Use: Govermental Service (infiltration basin)
Tax Payer: State of Washington
0
220
Scale in Feet
(approximate)
N
Ref: Tax Parcels and Use.cdr
Tacoma Coal Gasification Site
Tacoma, Washington
Parcels and Landuse
PAP--001-08a,b
FIGURE 1.5a
June 2018
Dalton, Olmsted & Fuglevand, Inc.



WR Zoning - Warehouse/Residential District

"*Intended to consist principally of a mixture of industrial activities and residential bldgs. in which occupants maintain a business involving industrial activities. The preferred uses of the WR District are industrial located entirely in a building and residential. Retail, educational, office, and governmental uses are allowed*" (Tacoma 2015).

S8 Shoreline Zoning District

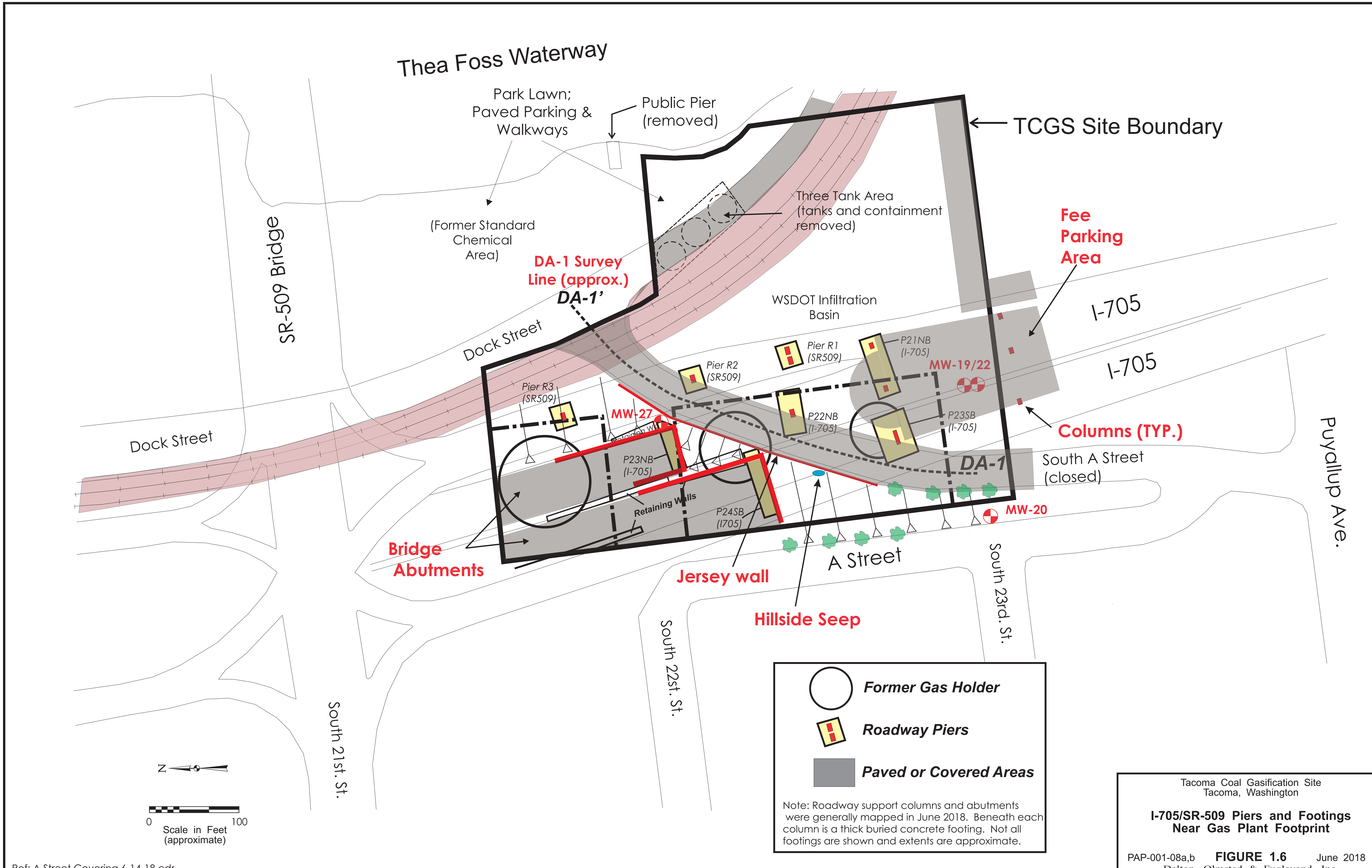
"*.....to im*prove the environmental quality of the Thea Foss Waterway, provide continuous public access to the Waterway, encourage the reuse and redevelopment of the area for mixed-use pedestrian-oriented development cultural features, marinas and related facilities, residential development, and waterborne transportation; and to allow new water-oriented industrial uses where appropriate" (Tacoma 2013).

75 0 150

Scale in Feet (approximate)

Tacoma Coal Gasification Site	FIGURE 1.5b
Area Zoning	
PAP-001-08a,b. *June 2018*	
Dalton, Olmsted & Fuglevand, Inc.	

Ref: Zoning.cdr Source: tacomapermits.org/zoning-map



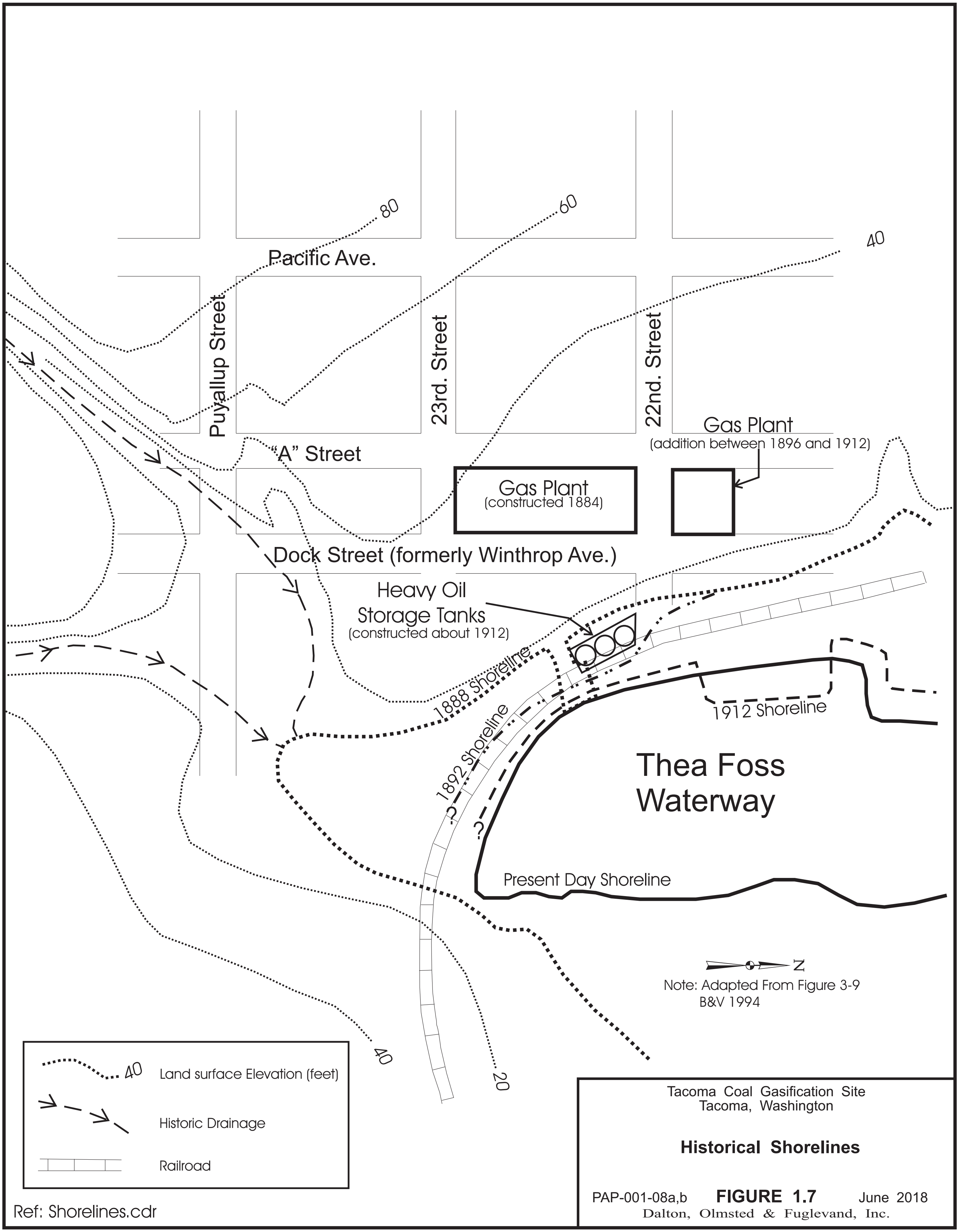
Tacoma Coal Gasification Site
Tacoma, Washington

I-705/SR-509 Piers and Footings Near Gas Plant Footprint

PAP-001-08a,b **FIGURE 1.6** June 2018

Dalton, Olmsted & Fuglevand, Inc.

Ref: A Street Covering 6-14-18.cdr

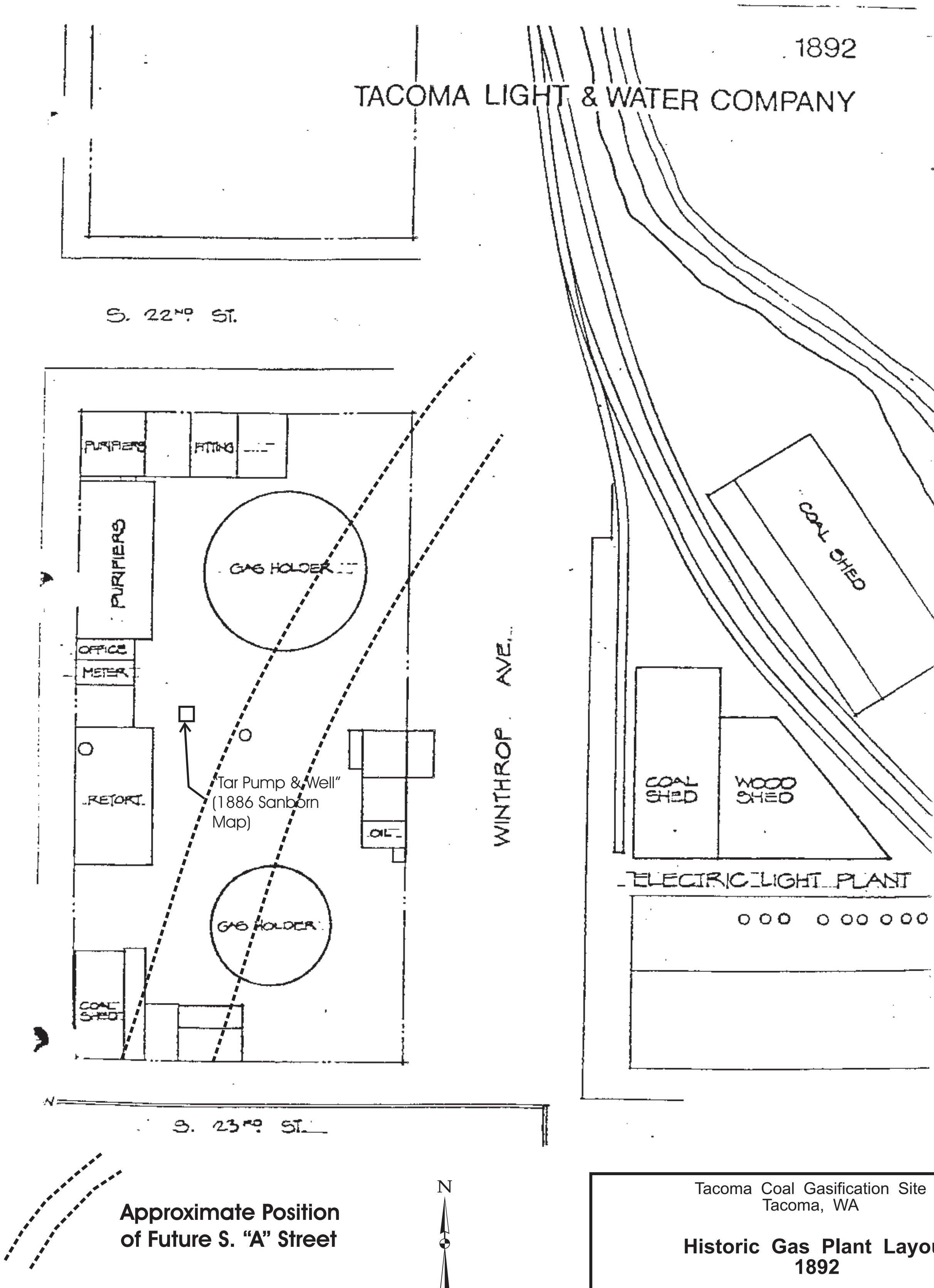


Tacoma Coal Gasification Site
Tacoma, Washington

Historical Shorelines

PAP-001-08a,b **FIGURE 1.7** June 2018

Dalton, Olmsted & Fuglevand, Inc.



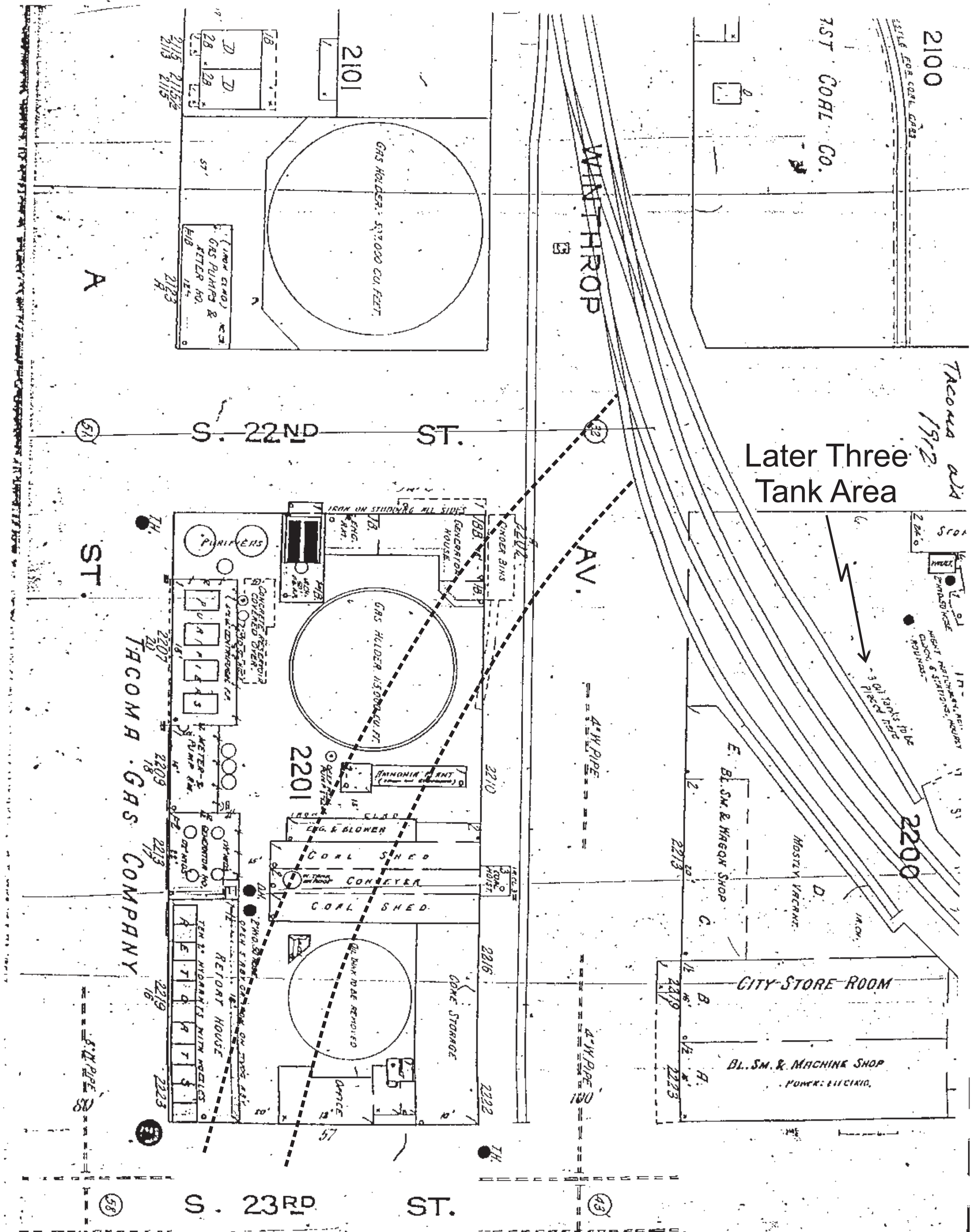
Tacoma Coal Gasification Site
Tacoma, WA

Historic Gas Plant Layout 1892

PAP-001-08a,b **FIGURE 2.1** June 2018

Dalton, Olmsted & Fuglevand, Inc.

Ref: Fig Plant Layout 1892.cdr



Approximate Position of Future S. "A" Street

N

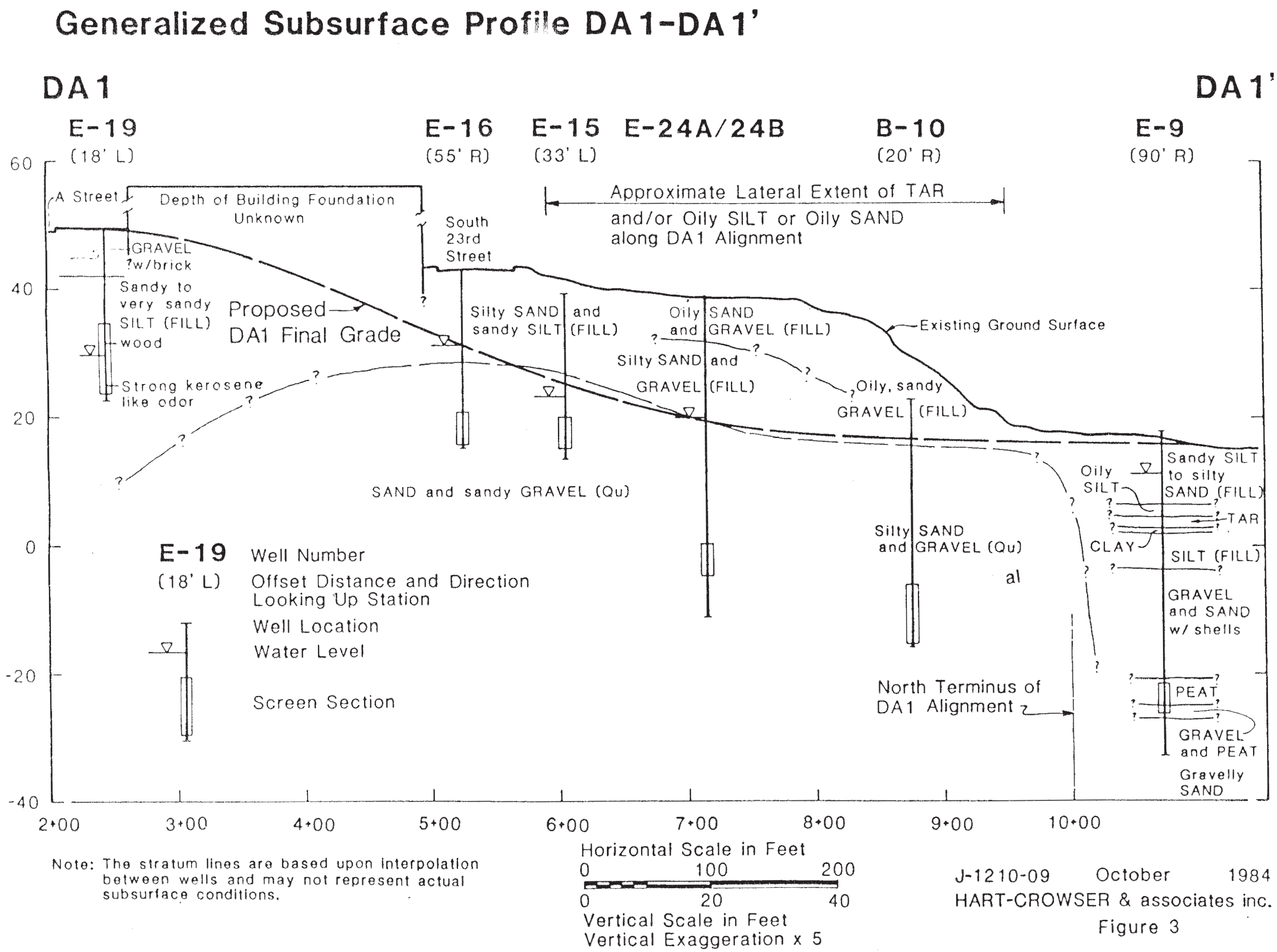
Tacoma Coal Gasification Site
Tacoma, WA

Historic Gas Plant Layout 1912

PAP-001-08a,b **FIGURE 2.2** June 2018

Dalton, Olmsted & Fuglevand, Inc.

Ref: Fig Layout 1912.cdr

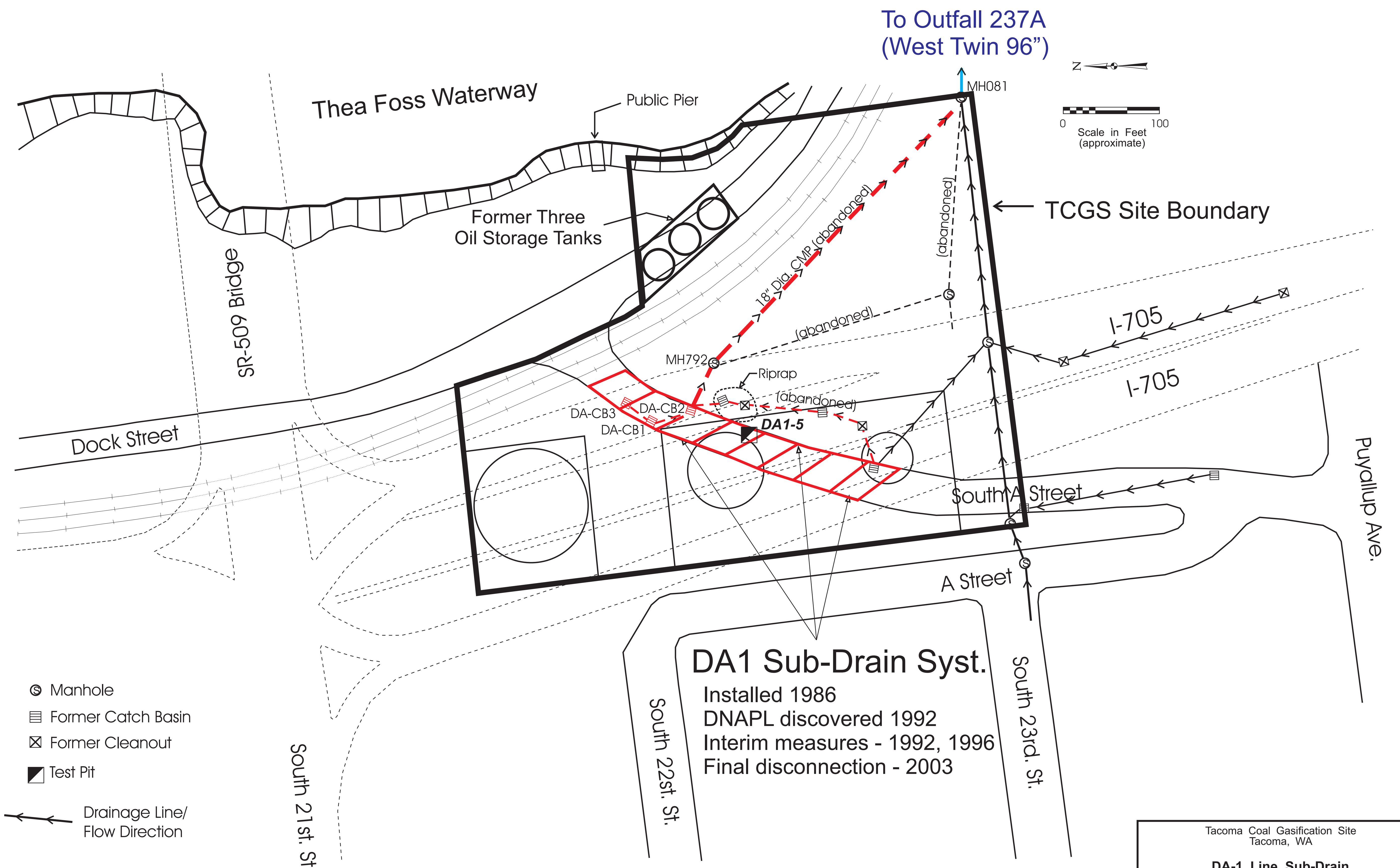


Tacoma Coal Gasification Site
Tacoma, Washington

Subsurface Profile DA1-DA1'

PAP-001-08a,b **FIGURE 2.3** June 2018
Dalton, Olmsted & Fuglevand, Inc.

Ref: DA1-DA1' HC 84.cdr (From Hart Crowser 1984)



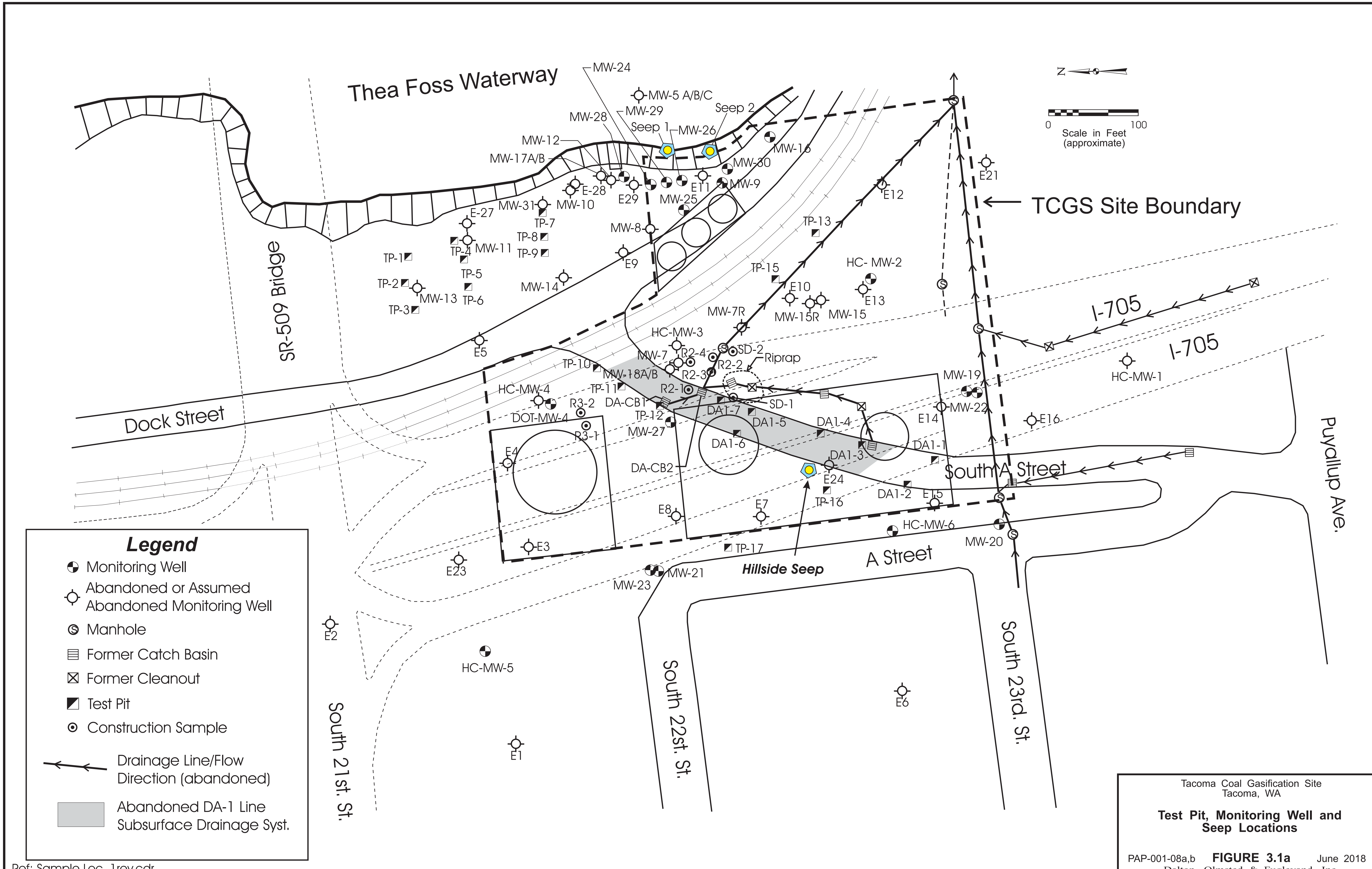
Tacoma Coal Gasification Site
Tacoma, WA

DA-1 Line Sub-Drain System

PAP-001-08a,b **FIGURE 2.4** June 2018

Dalton, Olmsted & Fuglevand, Inc.

Ref: DA1 Line 1.cdr



Legend

- Monitoring Well
- Abandoned or Assumed Abandoned Monitoring Well
- Manhole
- Former Catch Basin
- Former Cleanout
- Test Pit
- Construction Sample
- Drainage Line/Flow Direction (abandoned)
- Abandoned DA-1 Line Subsurface Drainage Syst.

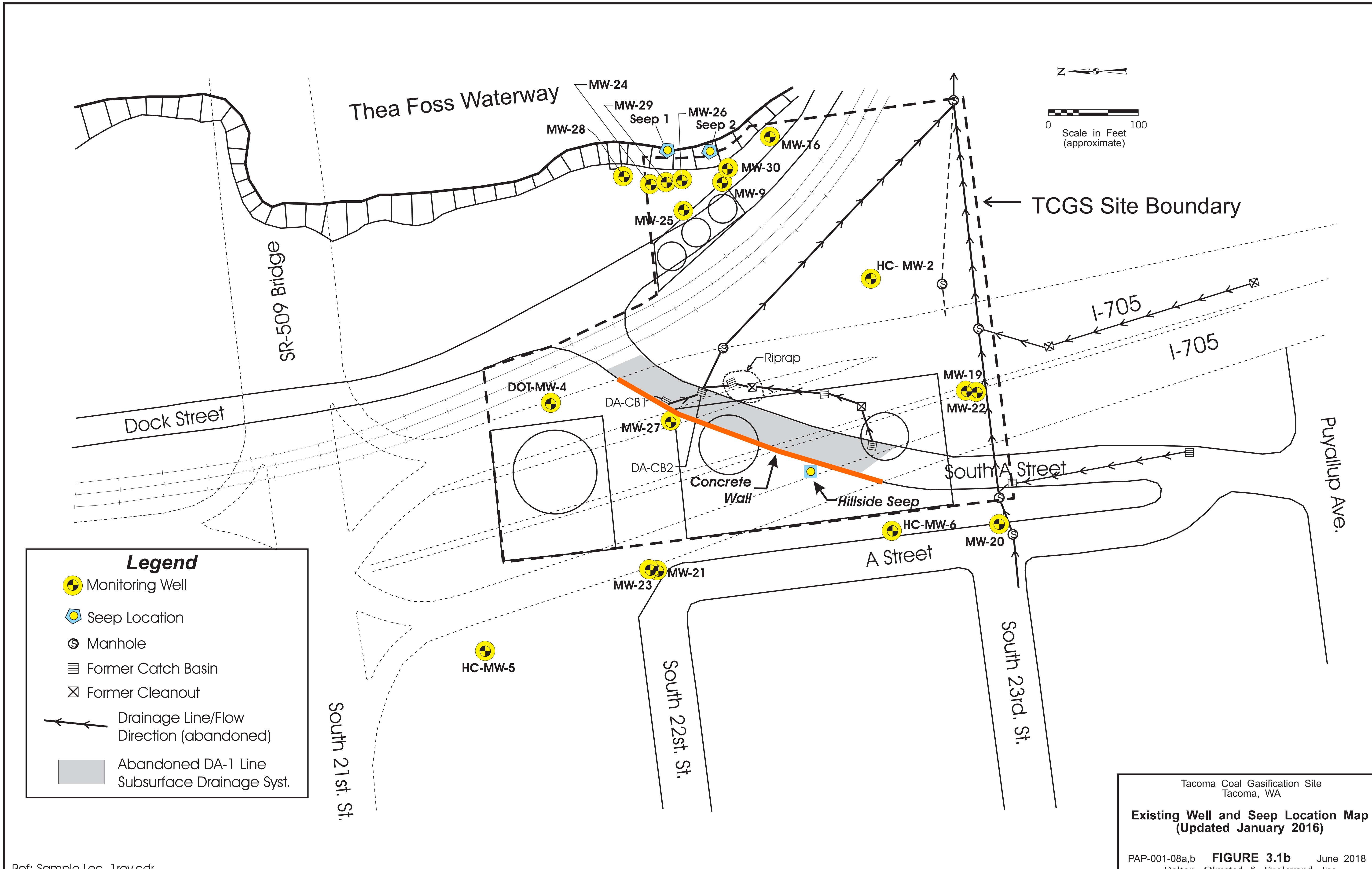
Ref: Sample Loc. 1rev.cdr

Tacoma Coal Gasification Site
Tacoma, WA

Test Pit, Monitoring Well and Seep Locations

PAP-001-08a,b **FIGURE 3.1a** June 2018

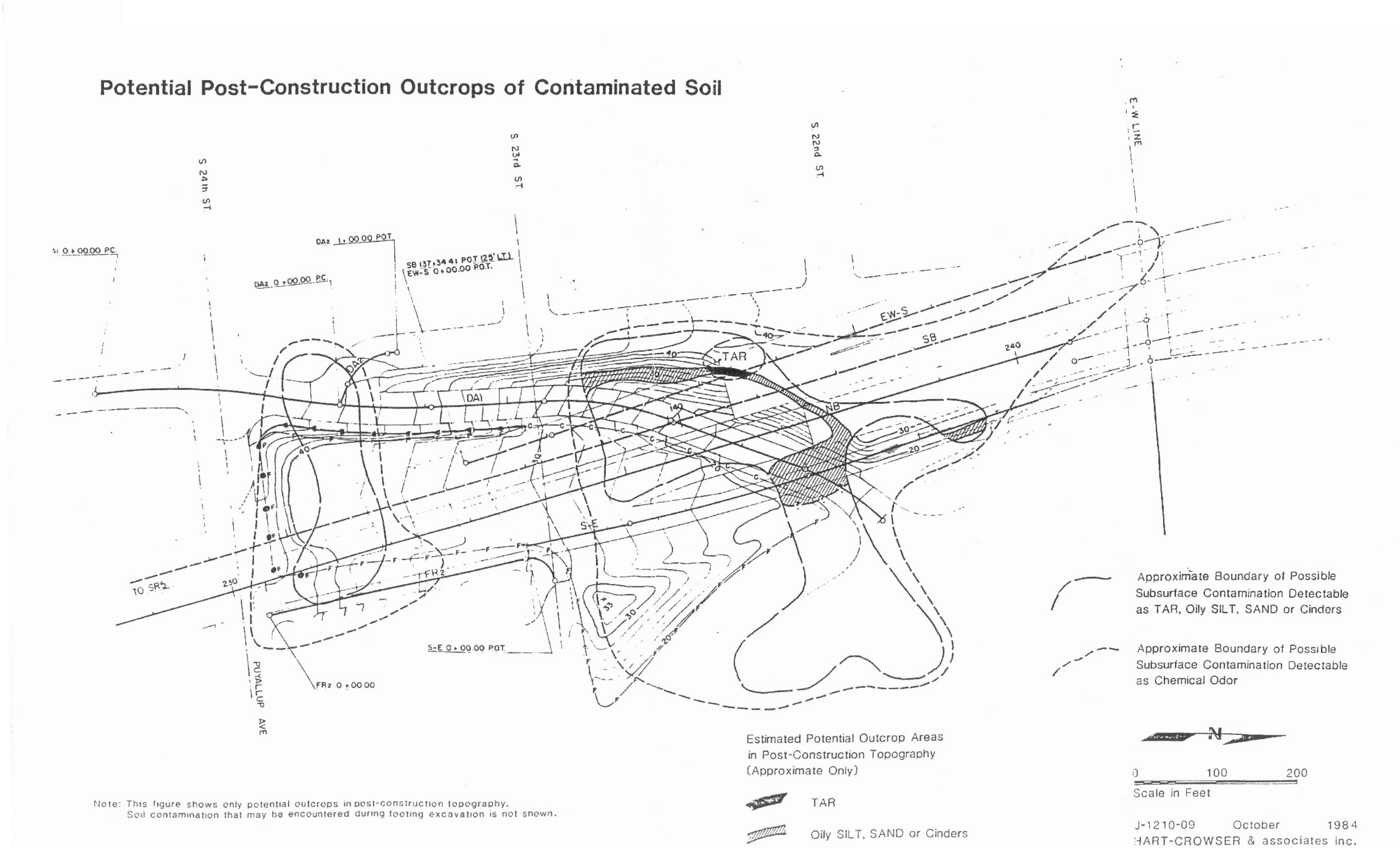
Dalton, Olmsted & Fuglevand, Inc.



Tacoma Coal Gasification Site
Tacoma, WA

Existing Well and Seep Location Map (Updated January 2016)

PAP-001-08a,b **FIGURE 3.1b** June 2018
Dalton, Olmsted & Fuglevand, Inc.



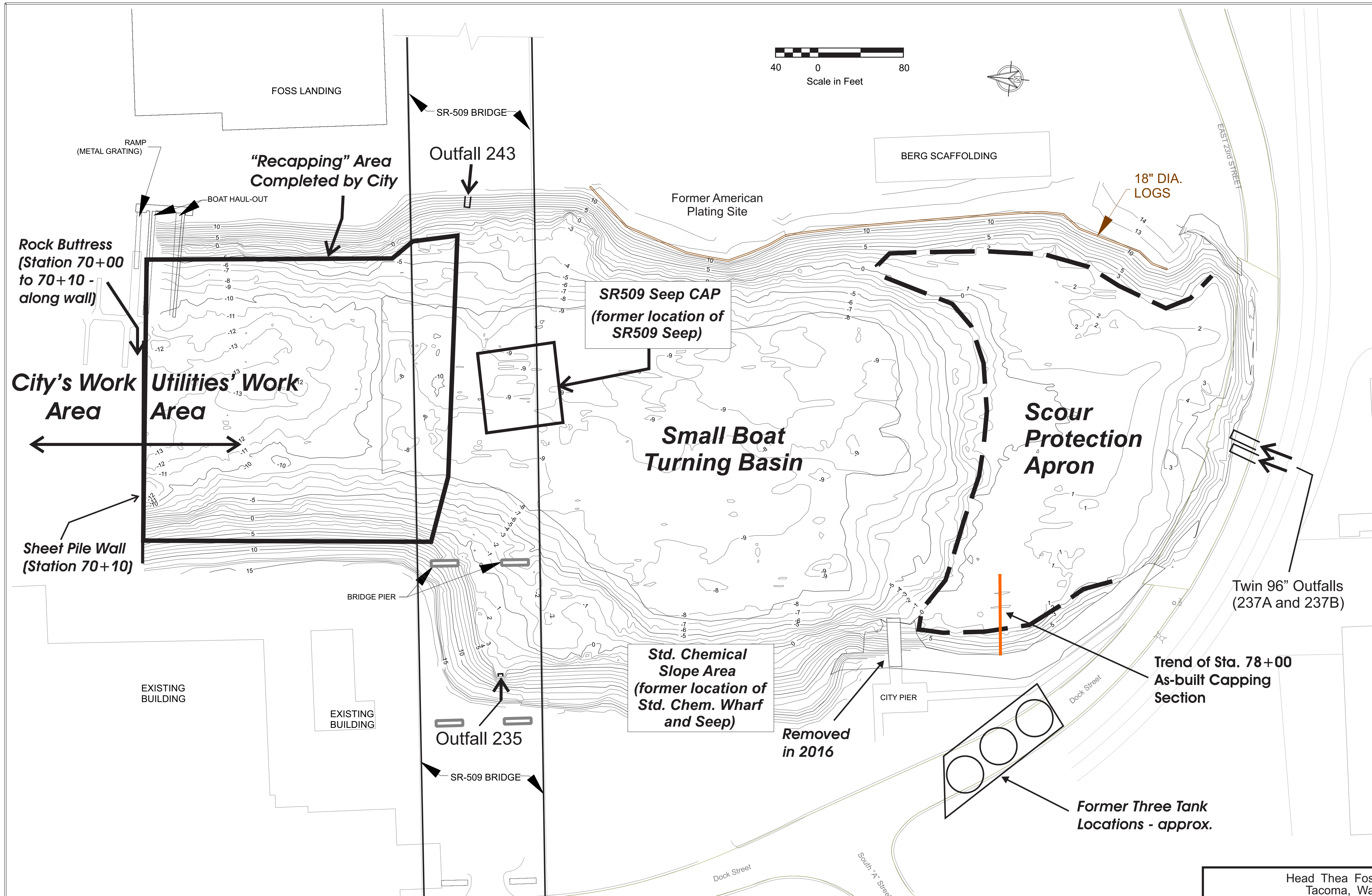
Ref: HC 1984 Post Const Outcrop.cdr

Tacoma Coal Gasification Site
Tacoma, Washington

1984 Post Construction Outcrop of Contaminanted Soil

PAP-001-08a,b **FIGURE 3.2** June 2018

Dalton, Olmsted & Fuglevand, Inc.



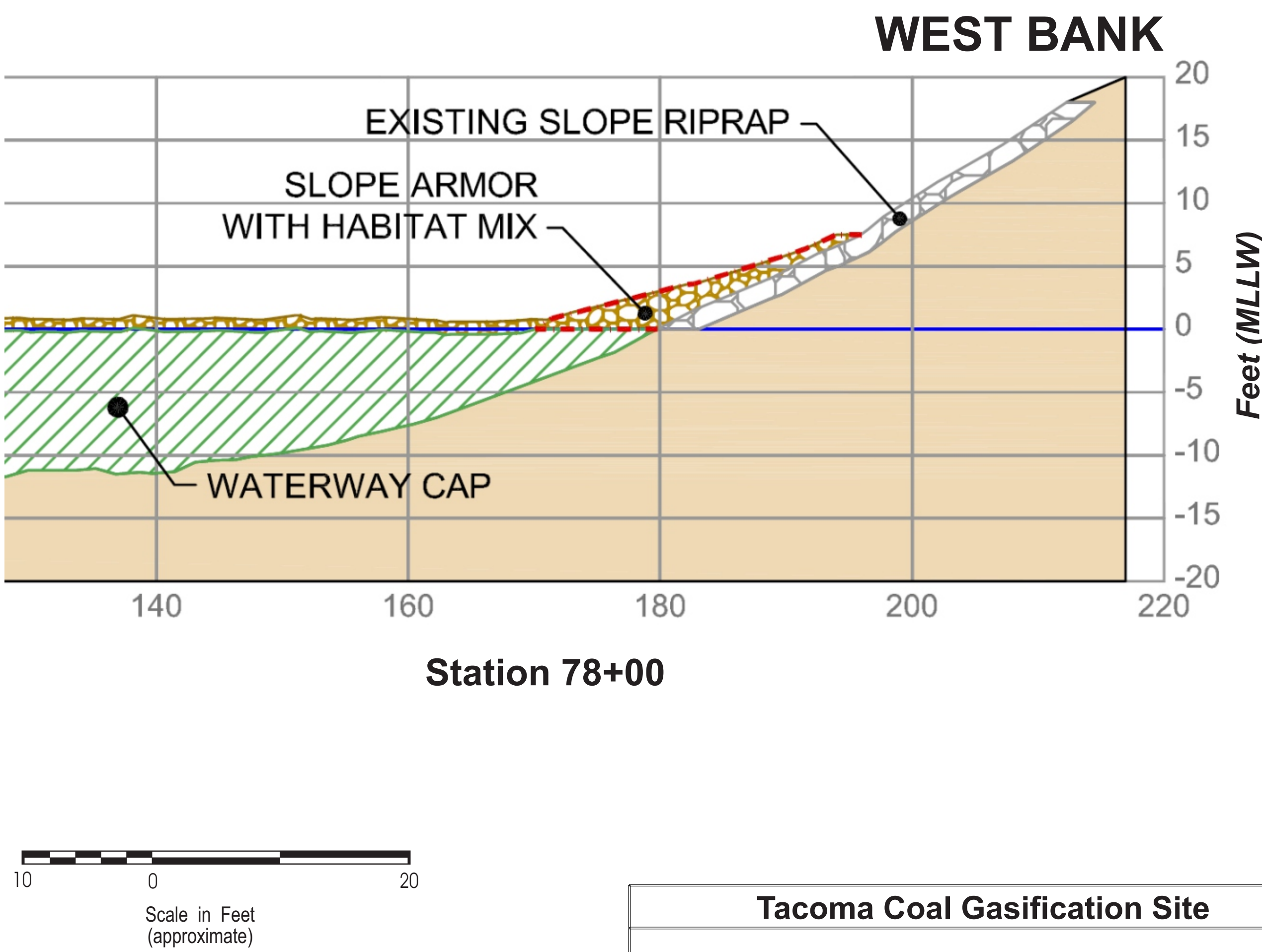
Head Thea Foss Waterway
Tacoma, Washington

Remedial Features
Utilities' Work Area

PAP-001-08a,b **FIGURE 4.1** June 2018

Dalton, Olmsted & Fuglevand, Inc.

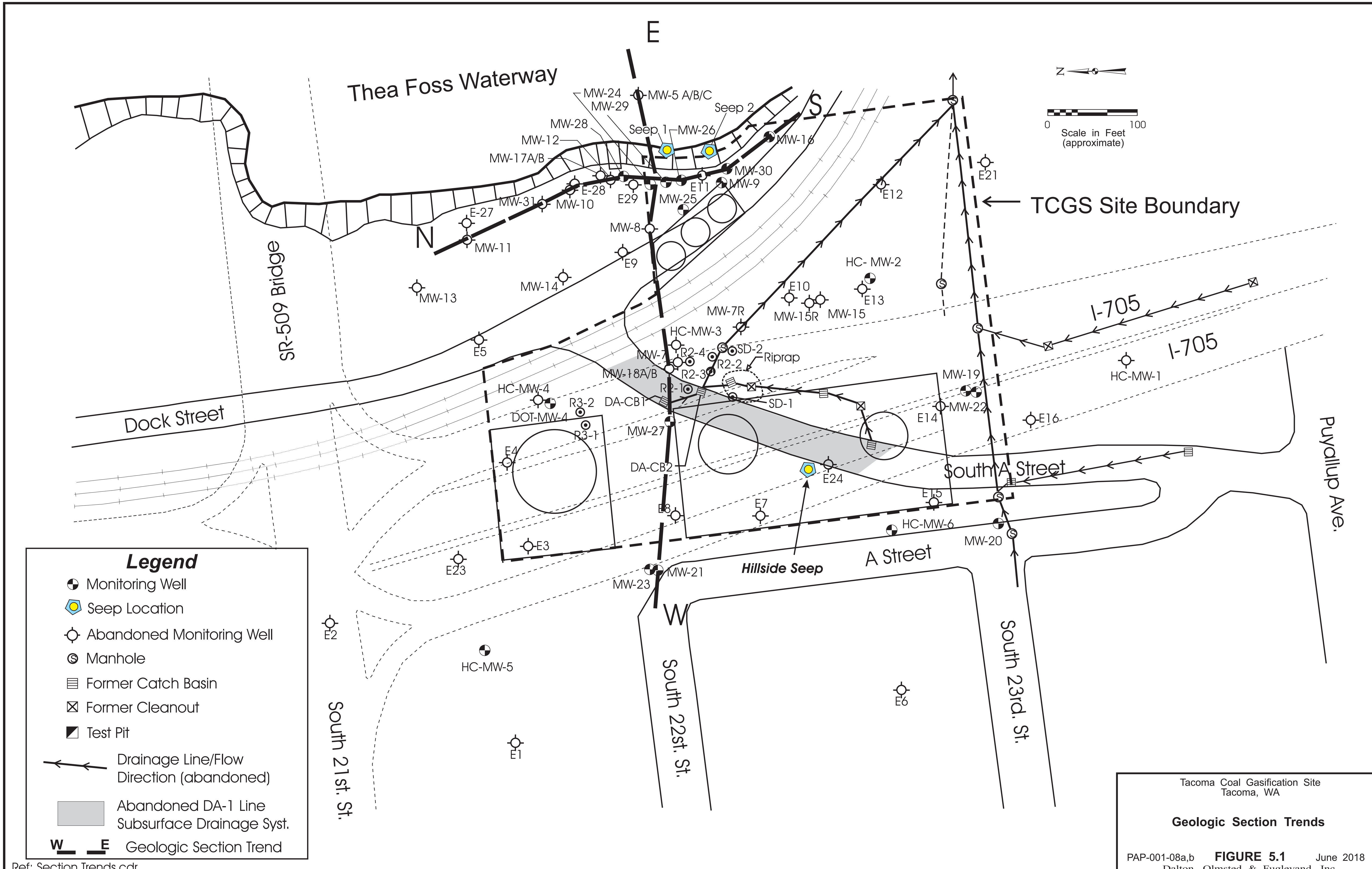
Ref: Head of waterway b 2006 RI rpt.cdr



Ref: West Bank Cap.cdr

Adapted from Figure 6 (DOF 2004 - Thea Foss Remedial Construction Report)

Tacoma Coal Gasification Site	**FIGURE 4.2**
West Bank Cap ***PAP-001-08a,b*** ***June 2018***	
Dalton, Olmsted & Fuglevand, Inc.	

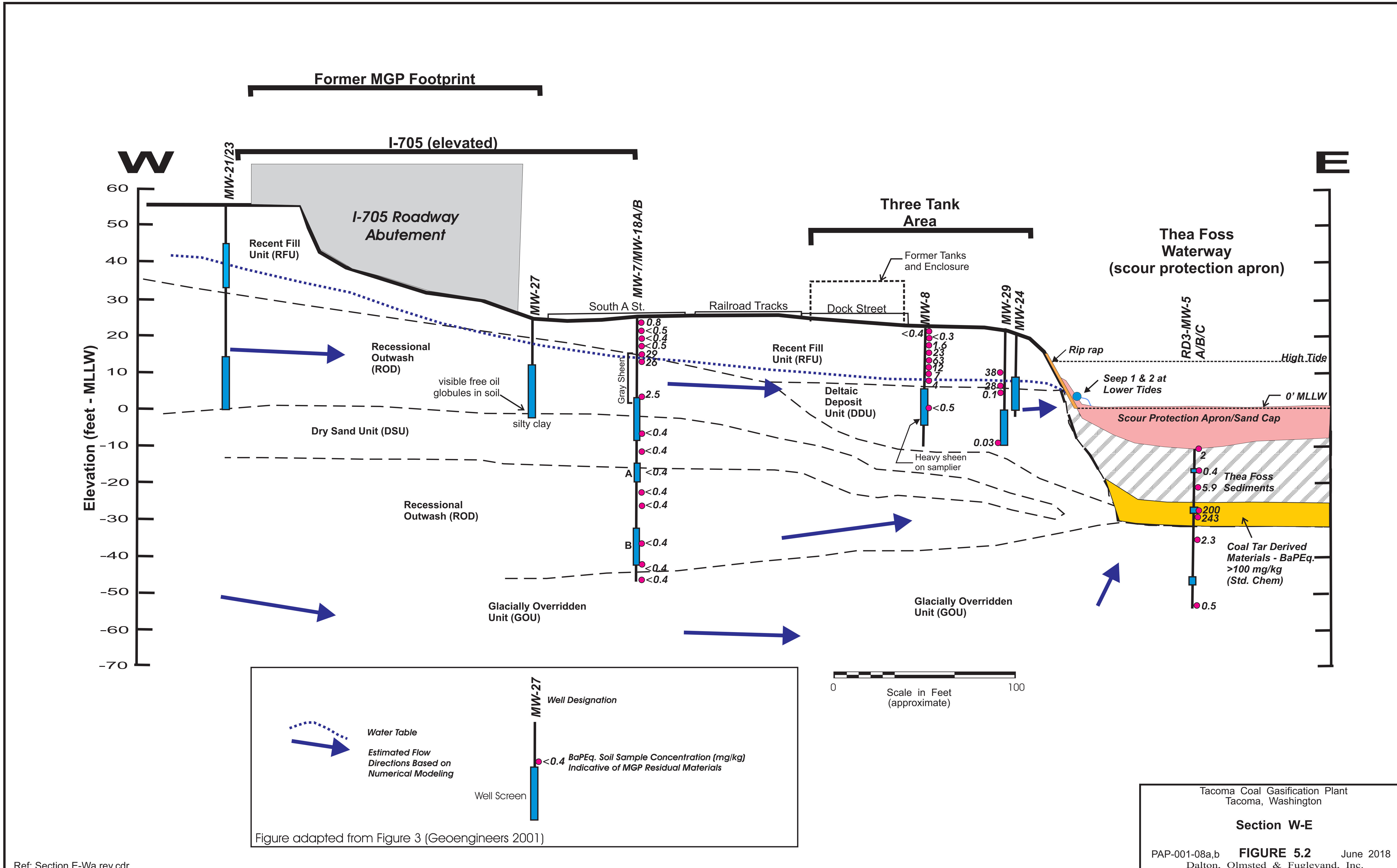


Tacoma Coal Gasification Site
Tacoma, WA

Geologic Section Trends

PAP-001-08a,b **FIGURE 5.1** June 2018

Dalton, Olmsted & Fuglevand, Inc.

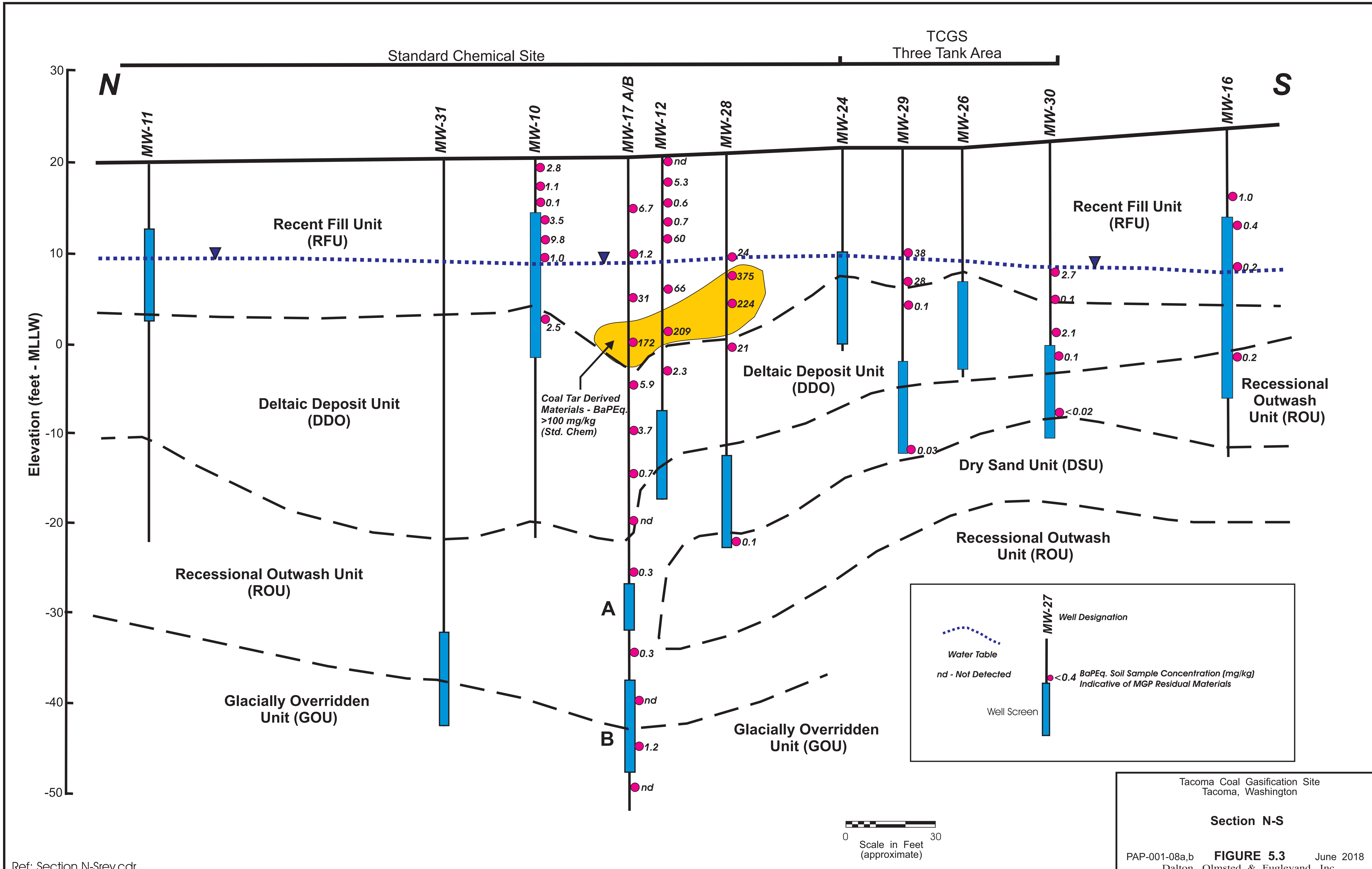


Tacoma Coal Gasification Plant
Tacoma, Washington

Section W-E

PAP-001-08a,b **FIGURE 5.2** June 2018

Dalton, Olmsted & Fuglevand, Inc.



Tacoma Coal Gasification Site
Tacoma, Washington

Section N-S

PAP-001-08a,b **FIGURE 5.3** June 2018

Dalton, Olmsted & Fuglevand, Inc.

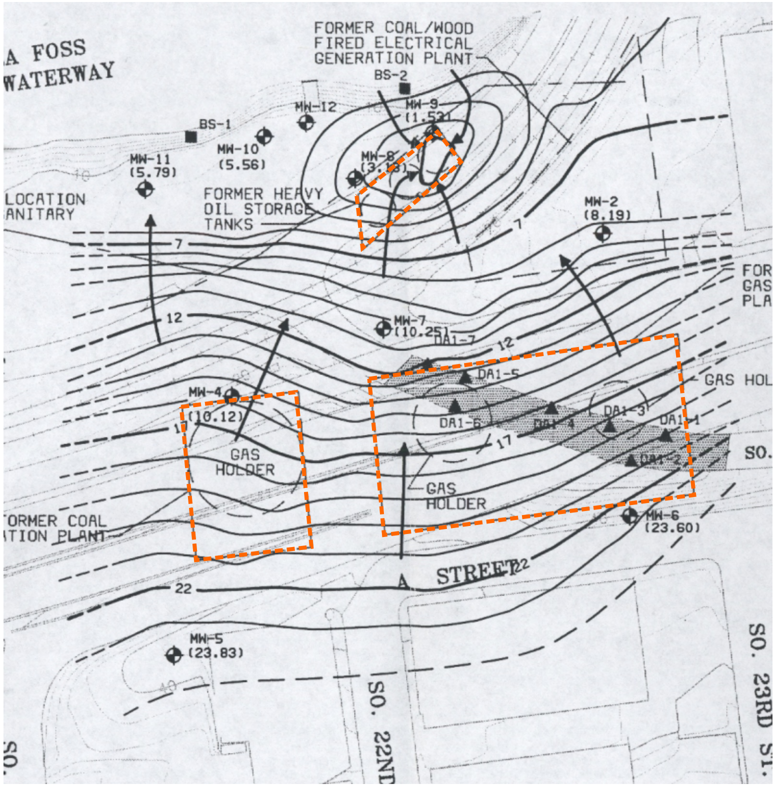


Figure 5.4a - High Tide
(+12.5 feet MLLW)

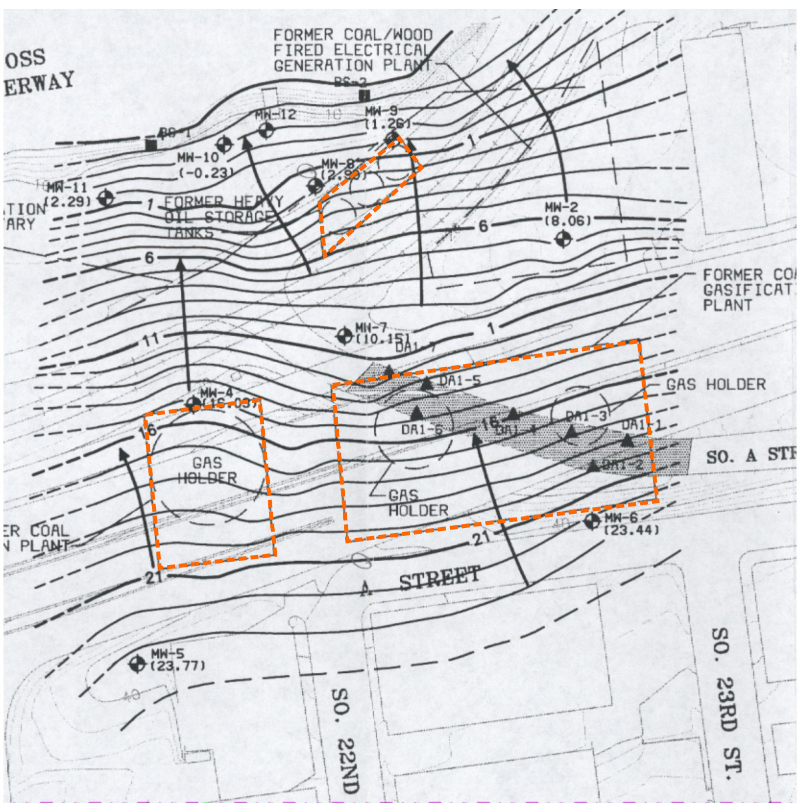


Figure 5.4b - Low Tide
(-2.0 feet MLLW)

0 192
Scale in Feet
(approximate)

Shallow Monitoring Well

Groundwater Contour

(23.44) Groundwater Elevation (feet - mean sea level)

Estimated Flow Direction

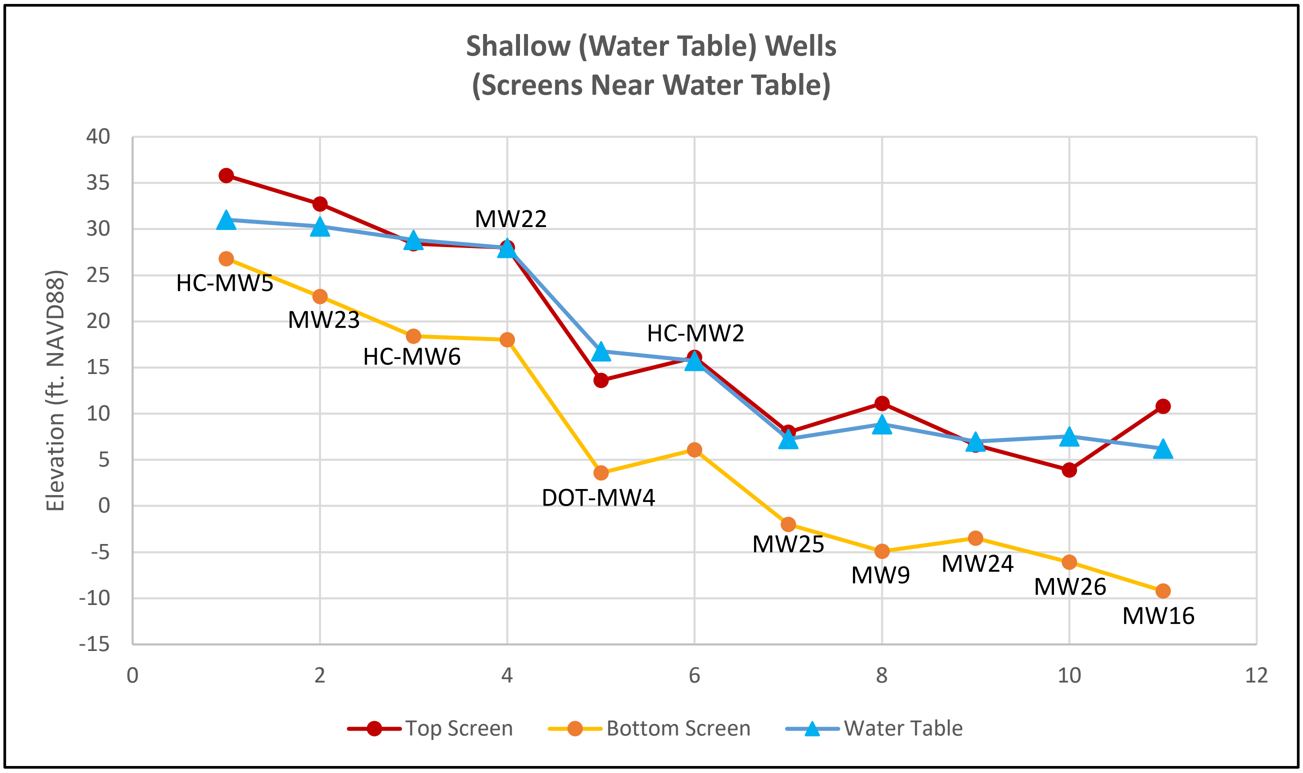
Ref: GW Flow 11-93.cdr (Source: Black & Veatch 1994)

Tacoma Coal Gasification Site
Tacoma, Washington

Groundwater Flow Directions
November 1993

PAP-001-08a,b **FIGURE 5.4** June 2018

Dalton, Olmsted & Fuglevand, Inc.



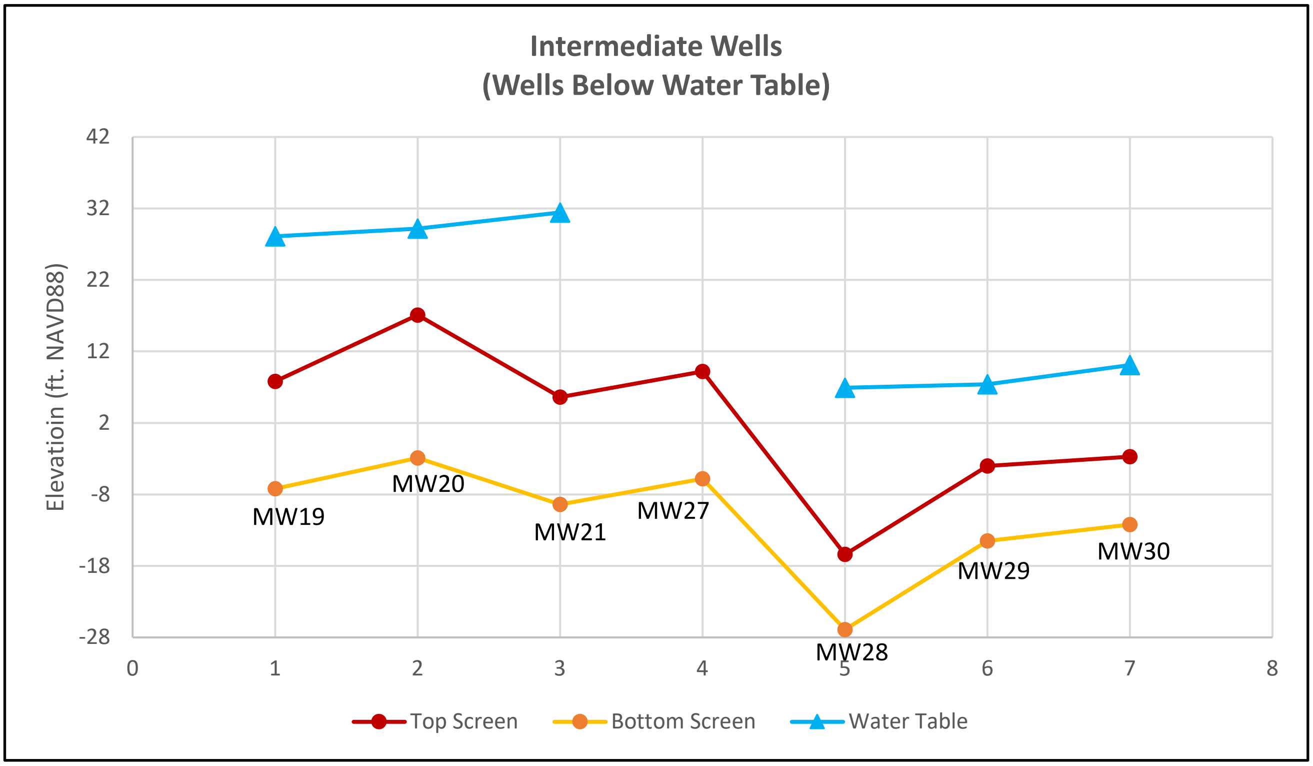
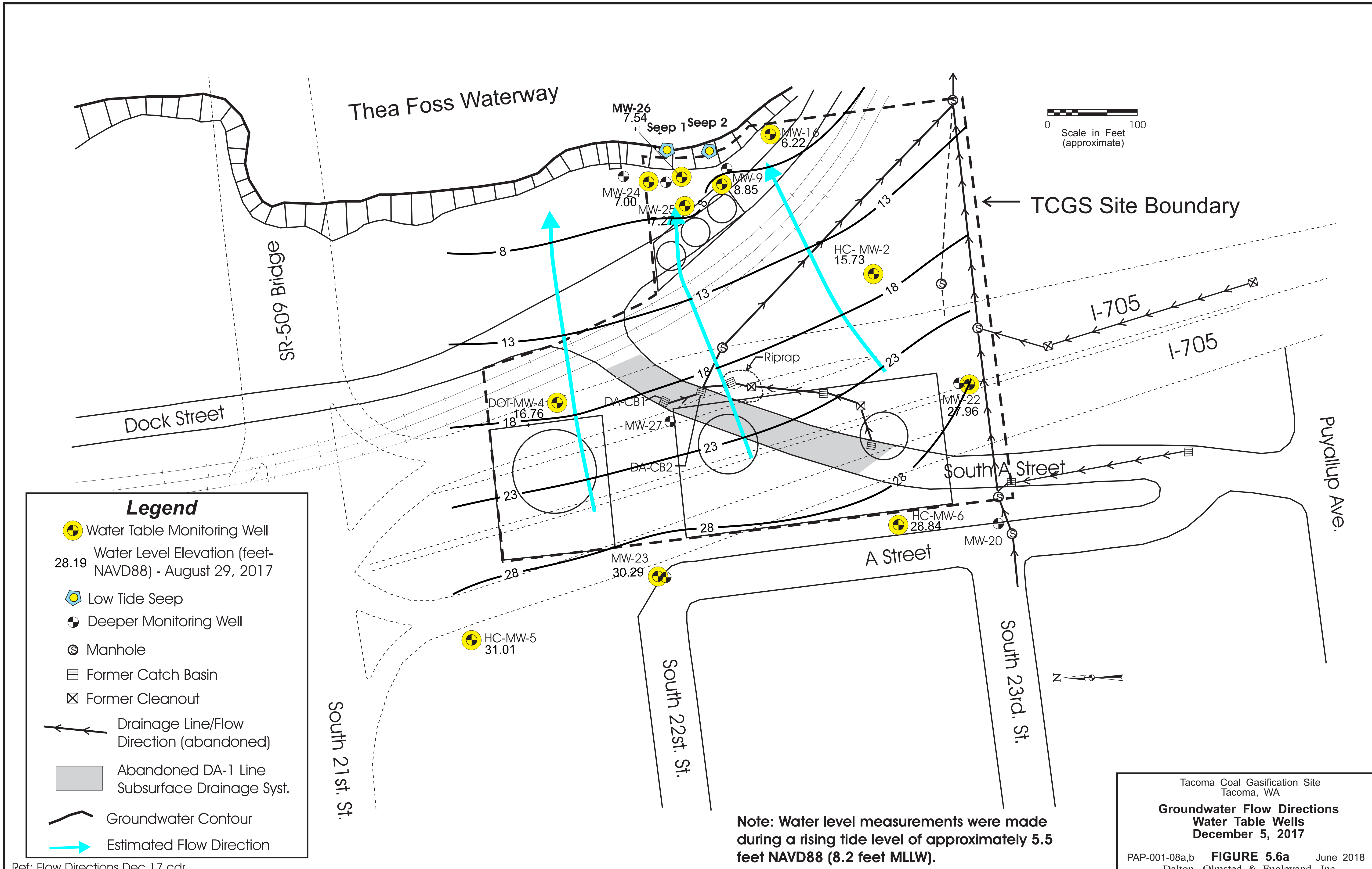


FIGURE 5.5 - Well Screen Elevations



Ref: Flow Directions Dec 17.cdr

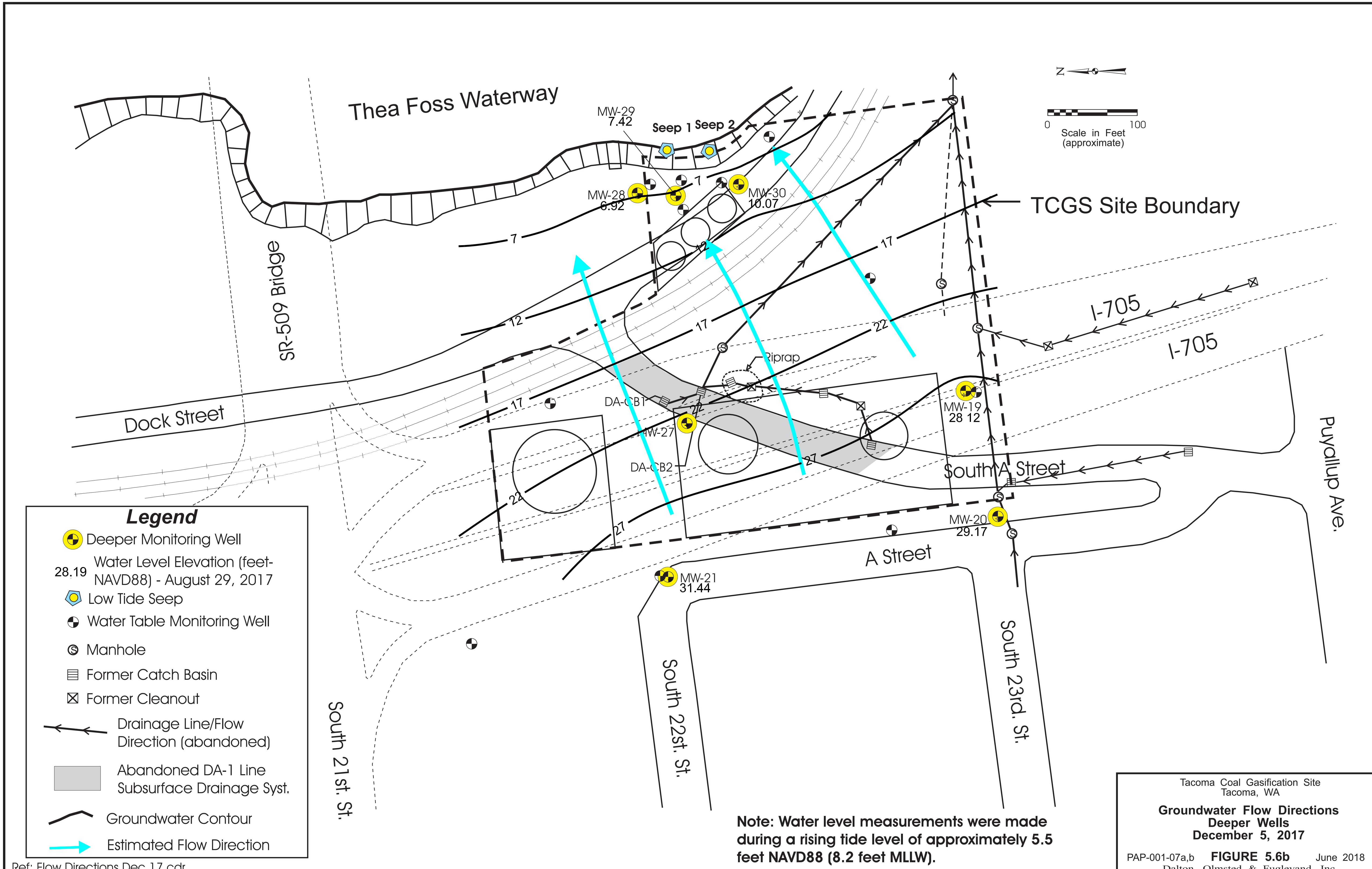
Note: Water level measurements were made during a rising tide level of approximately 5.5 feet NAVD88 (8.2 feet MLLW).

Tacoma Coal Gasification Site
Tacoma, WA

Groundwater Flow Directions
Water Table Wells
December 5, 2017

PAP-001-08a,b **FIGURE 5.6a** June 2018

Dalton, Olmsted & Fuglevand, Inc.



Ref: Flow Directions Dec 17.cdr

Conventional Data

Location	Sample Date	Cond. (uS)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	Cl (mg/l)	Na/Cl
DOT-MW-4	**4/28/17**	601	83.9	31.1	33.9	50.3	0.67
DOT-MW-4	**8/30/17**	572	76	27.5	30.4	29.6	1.03
HC-MW2	**4/28/17**	403	33.5	29	20.1	20.8	0.97
HC-MW2	**8/30/17**	388	35.4	31	19.6	19.9	0.98
MW-16	**4/28/17**	679	33.1	24.3	105	168	0.63
MW-16	**8/30/17**	1351	61.7	86.7	559	1160	0.48
MW-24	**4/27/17**	751	63.9	31.5	43.7	80.9	0.54
MW-24	**8/30/17**	699	71.4	34.6	46	109	0.42
MW-26	**4/28/17**	1945	104	69	267	506	0.53
MW-26	**8/30/17**	1977	110	73.5	333	574	0.58
MW-28	**4/27/17**	153	14	8.0	9.3	3.7	2.51
MW-28	**8/30/17**	132	14.3	8.1	8.8	3.2	2.75
MW-29	**4/27/17**	755	55	34.4	49.7	81	0.61
MW-29	**8/30/17**	537	46.8	29.7	38.4	46.8	0.82
MW-30	**4/27/17**	388	27.5	20.7	14.8	18.8	0.79
MW-30	**8/30/17**	329	27.6	20.7	14.3	17.6	0.81
SEEP-1	**4/27/17**	27350	268	814	7100	9250	0.77
SEEP-1	**8/30/17**	33773	261	775	6790	11100	0.61
SEEP-2	**4/27/17**	29706	274	829	7220	9570	0.75
SEEP-2	**8/30/17**	30627	231	715	6100	11500	0.53
TF Waterway	**8/30/17**	33194	326	1010	9100	15300	0.59
Seawater	(1)	-----	400	1350	10500	19000	0.55

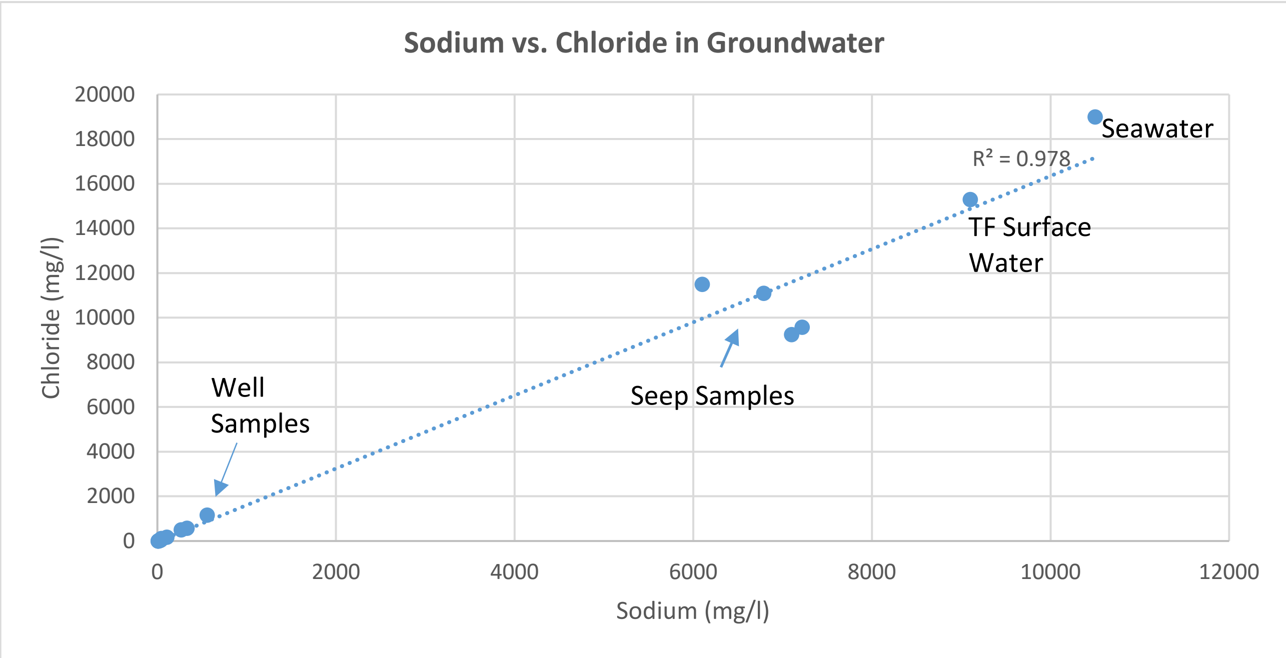
Notes: (1) - From Mason (1966)

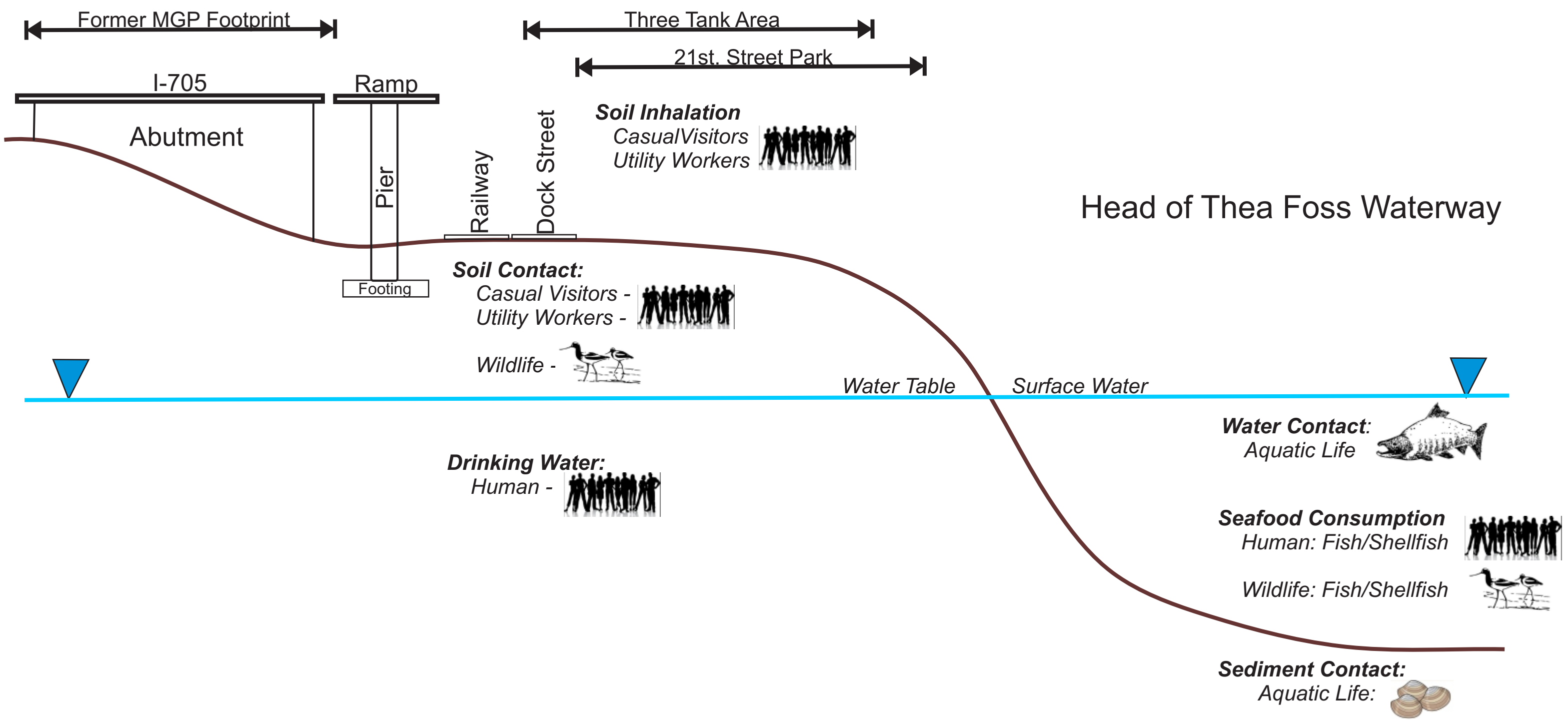
Correlations - April/August 2017 Data

	Cond.	*Ca*	*Mg*	*Na*	*Cl*
Cond.	1				
Ca	0.95	1			
Mg	0.99	0.98	1		
Na	0.99	0.98	1.00	1	
Cl	1.00	0.97	0.99	0.99	1

Cond.- Conductivity
Ca - Calcium
Mg - Magnesium
Na - Sodium
Cl - Chloride

FIGURE 5.7 - Conventional Parameter Data

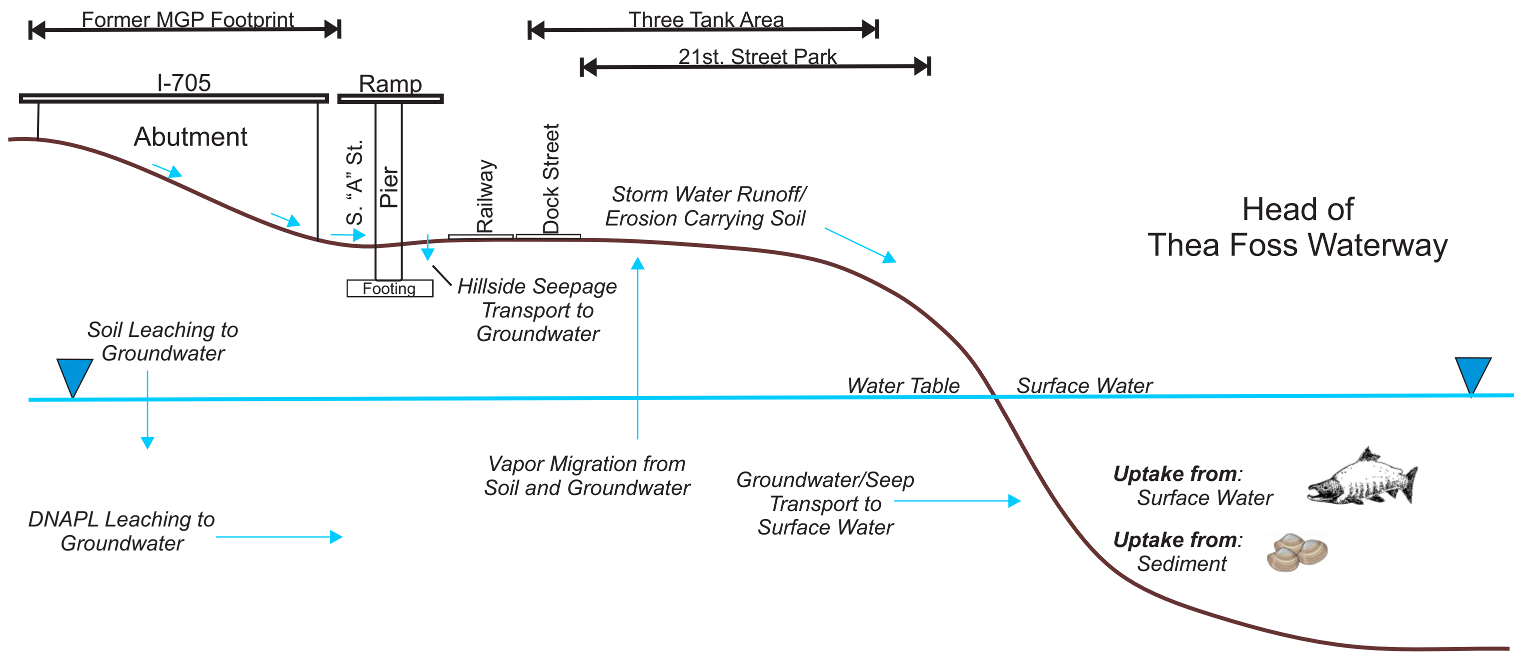

Sodium vs. Chloride in Groundwater
Chloride (mg/l)
Sodium (mg/l)
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
0
2000
4000
6000
8000
10000
12000
Seawater
R^2 = 0.978
TF Surface Water
Seep Samples
Well Samples



Tacoma Coal Gasification Site	FIGURE 6-1
Possible Exposure/Receptor Pathways PAP-001-08a,b June 2018	
Dalton, Olmsted & Fuglevand, Inc.	

Ref: TCGS Exposure Pathways.cdr

Adapted From Figure 2 Ecology (2017)



Ref: TCGS Exposure Pathways.cdr

Adapted From Figure 2 Ecology (2017)

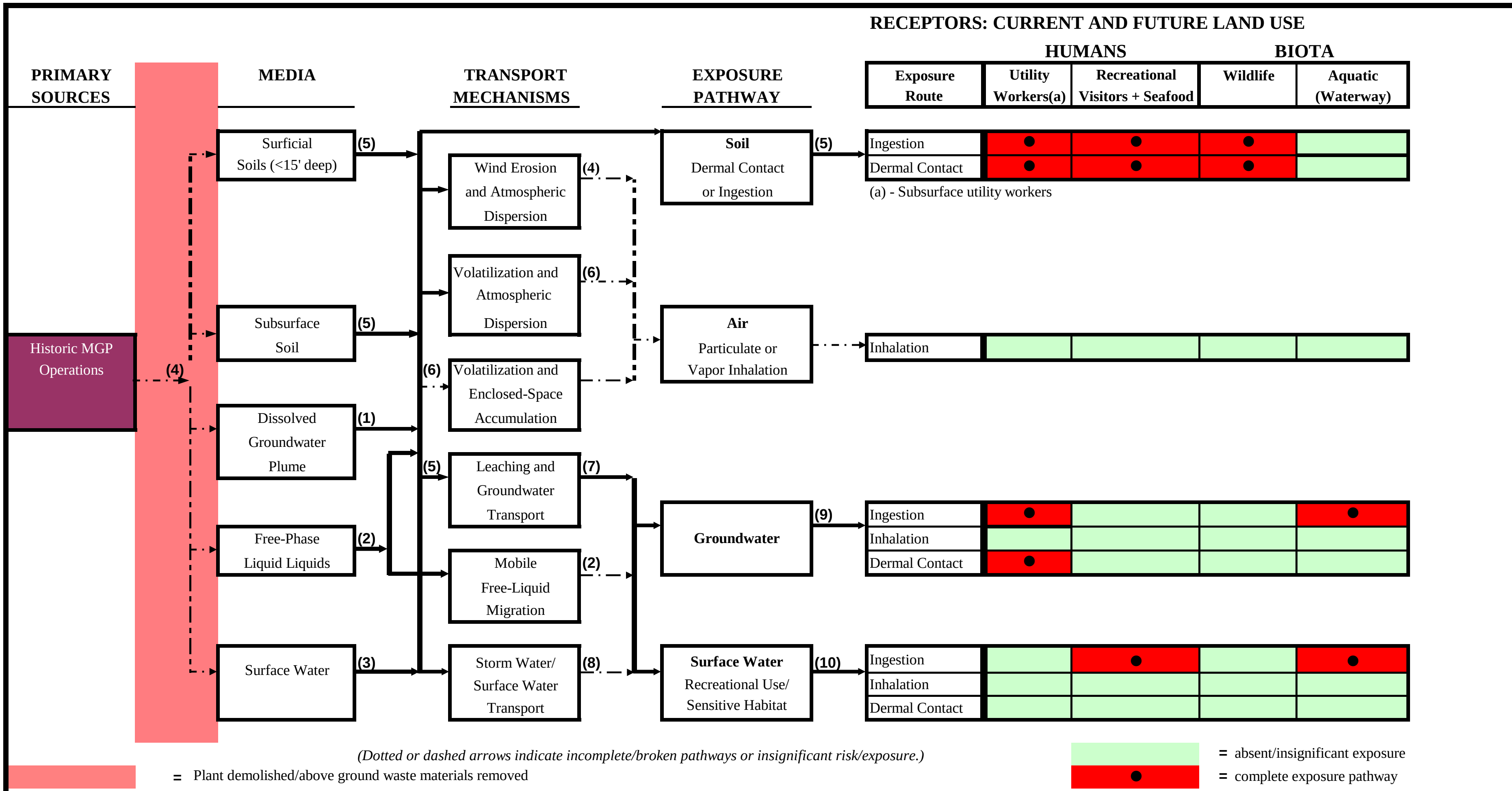
Tacoma Coal Gasification Site

Possible Transport Pathways

PAP-001-08a,b ***June 2018***

Dalton, Olmsted & Fuglevand, Inc.

FIGURE 6-2



(1) = Multiple constituents dissolved in groundwater

(2) = Free-phase liquids (NAPLs) encountered in several wells. No evidence of current NAPL migration.

(3) = Hillside seep water ponds and mixes with other storm water bottom of So. "A" St., infiltrates into rainroad ballast. Storm water sheet flow to waterway from park area.

(4) = Site is covered with paving, abutments, uncontaminated soil placed during roadway construction, tended lawns and slope capping material placed during waterway remediation.

(5) = Multiple constituents present in soil and free phase liquids (NAPLs).

(6) = No enclosed structures or unventilated spaces on site.

(7) = Groundwater discharge to surface water

(8) = Storm water sheet flow only from from covered (lawn/paving) park area.

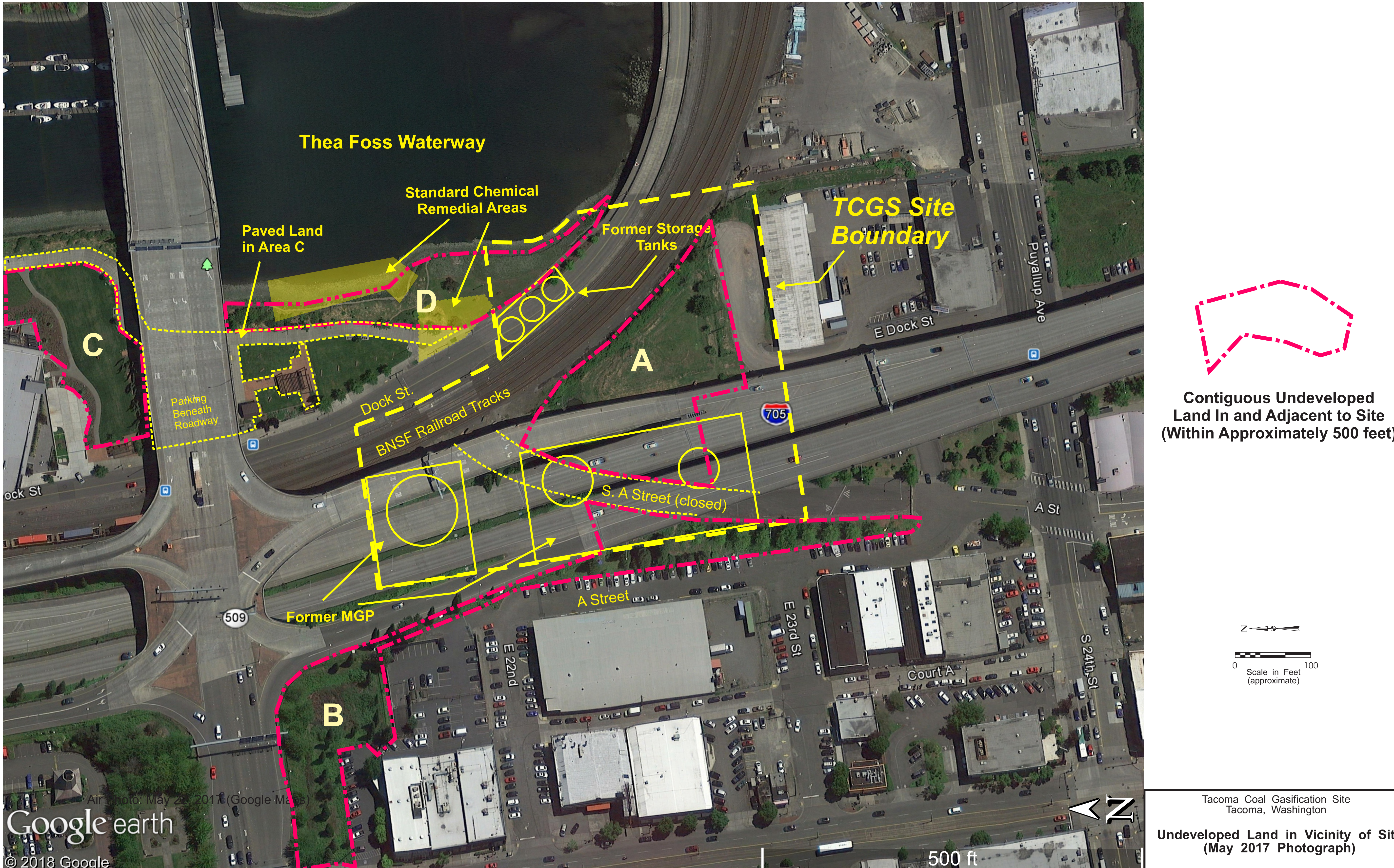
(9) = Contact of subsurface utility workers; groundwater discharge to sediments; Recreational harvesting of shellfish over scour protection apron and in turning basin unlikely.

(10) = Protection of aquatic life (water column); Consumption of fin fish.

Dalton, Olmsted Fuglevand, Inc.

(CSM-Exhibit ICS Pathwaysrev.xlsx-Exhibit)

FIGURE 6-3
Exposure Pathway Analysis



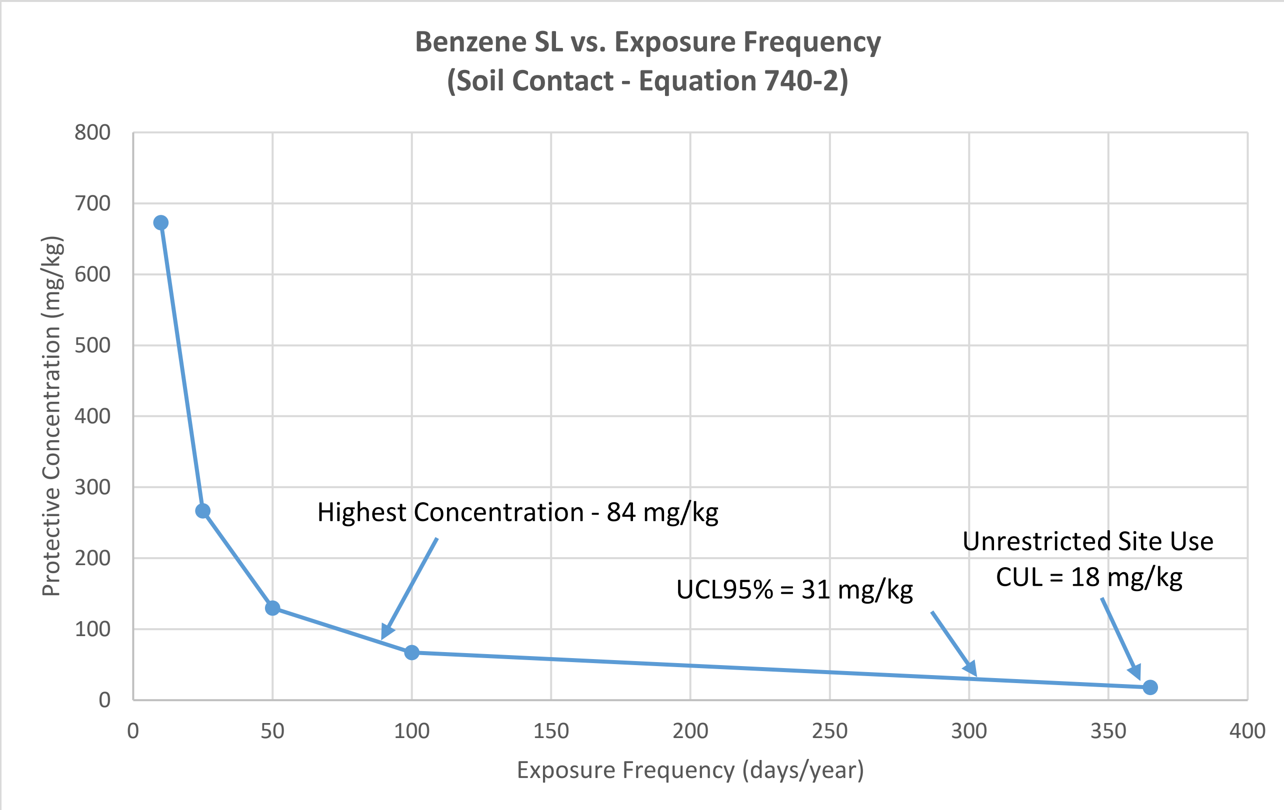
Ref: Air Photograph Site.adr

Tacoma Coal Gasification Site
Tacoma, Washington

Undeveloped Land in Vicinity of Site (May 2017 Photograph)

PAP-001-08a,b **FIGURE 6.4** June 2018

Dalton, Olmsted & Fuglevand, Inc.



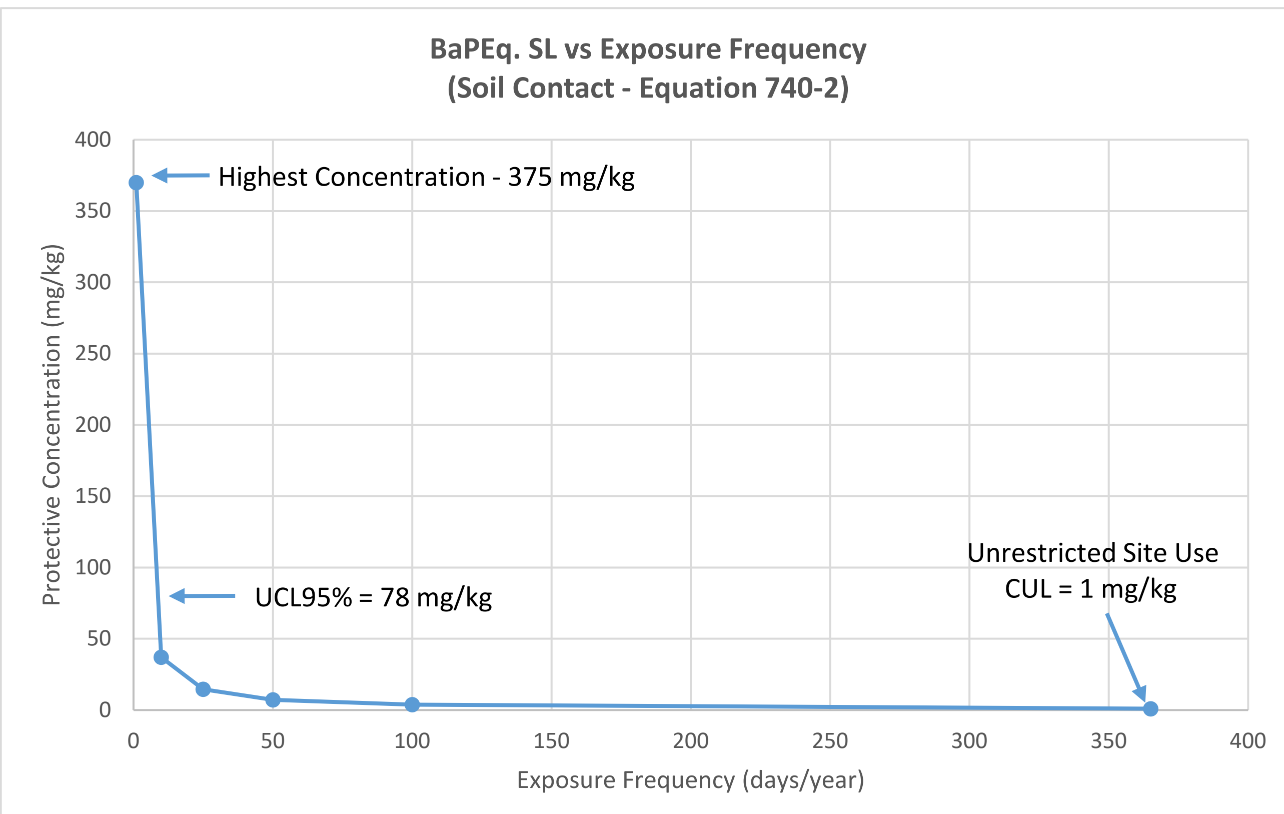
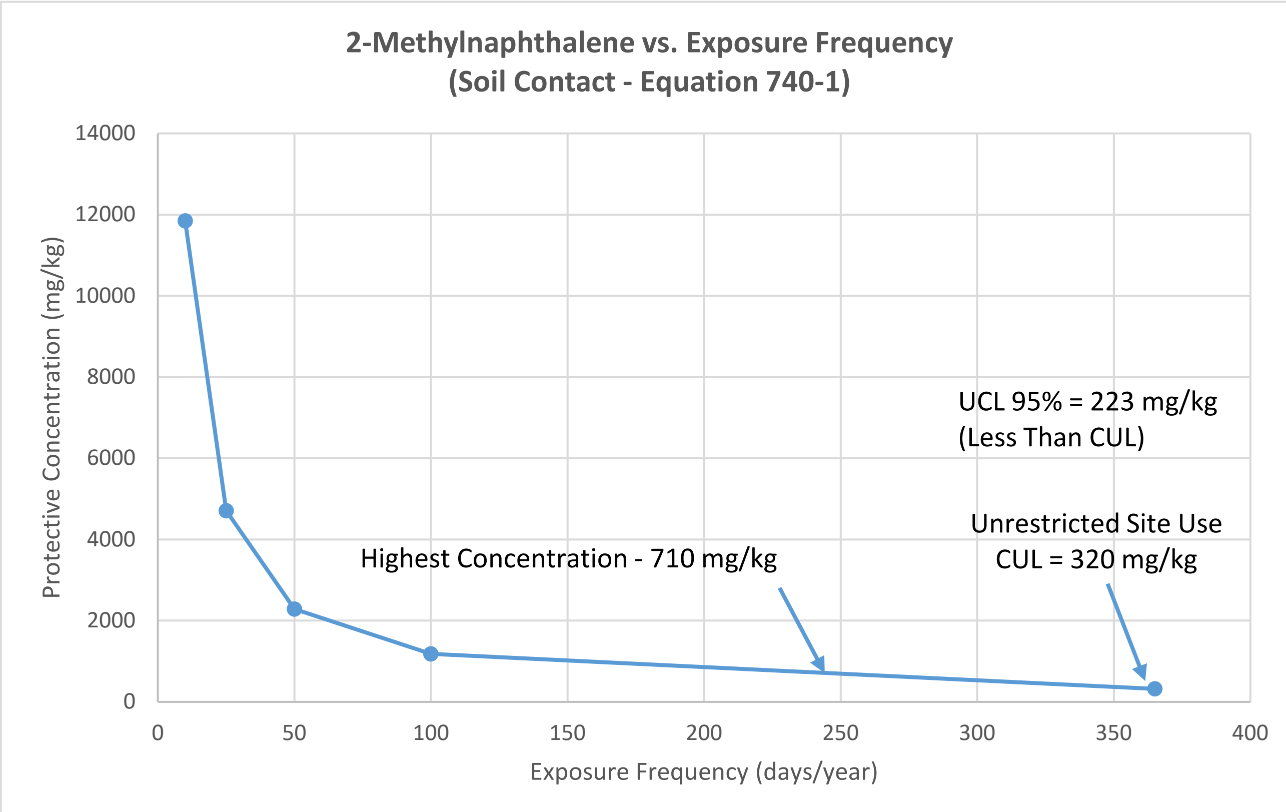


FIGURE 6.5 - Screening Levels and Exposure Frequency



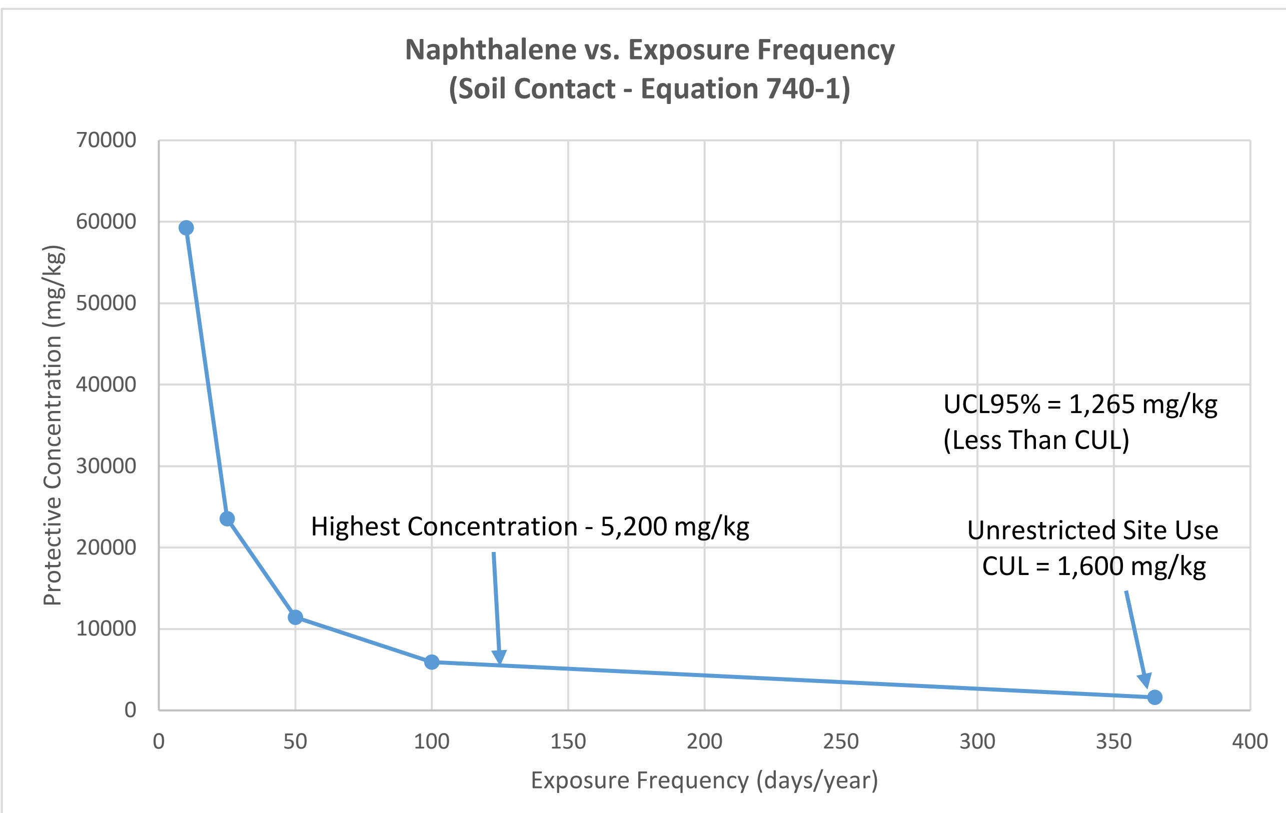
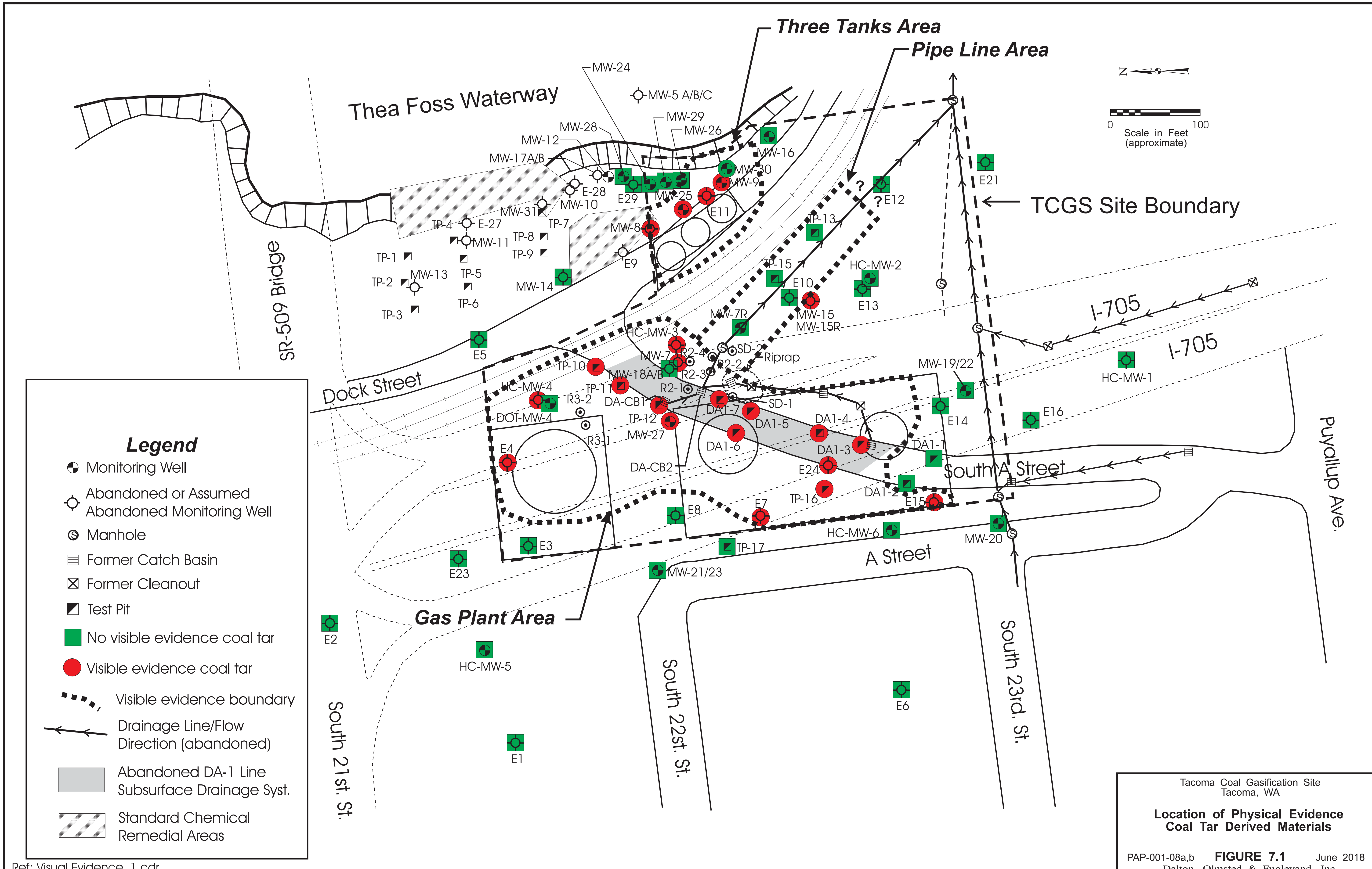


FIGURE 6.5 - Screening Levels and Exposure Frequency



Tacoma Coal Gasification Site
Tacoma, WA

Location of Physical Evidence Coal Tar Derived Materials

PAP-001-08a,b **FIGURE 7.1** June 2018

Dalton, Olmsted & Fuglevand, Inc.

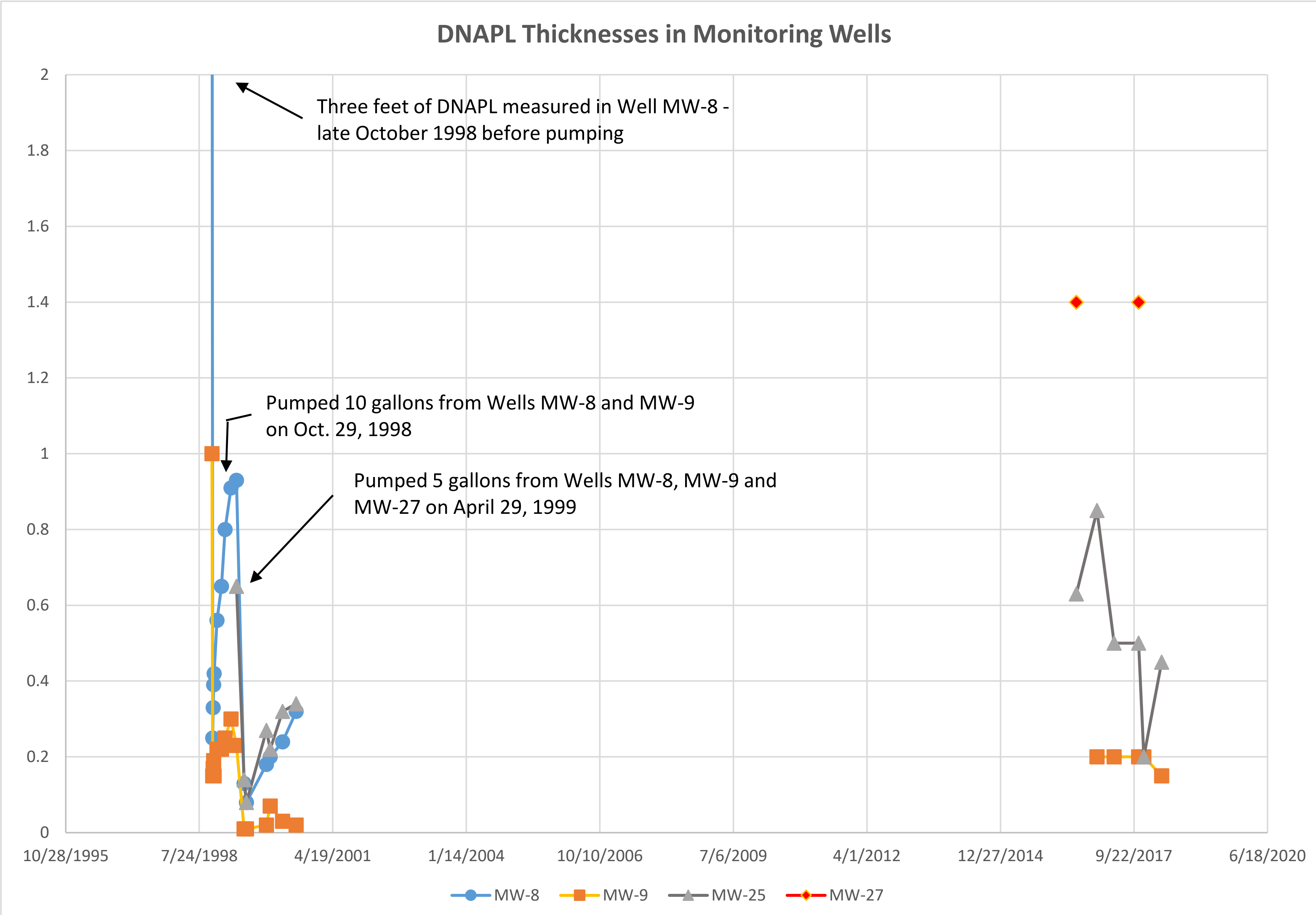
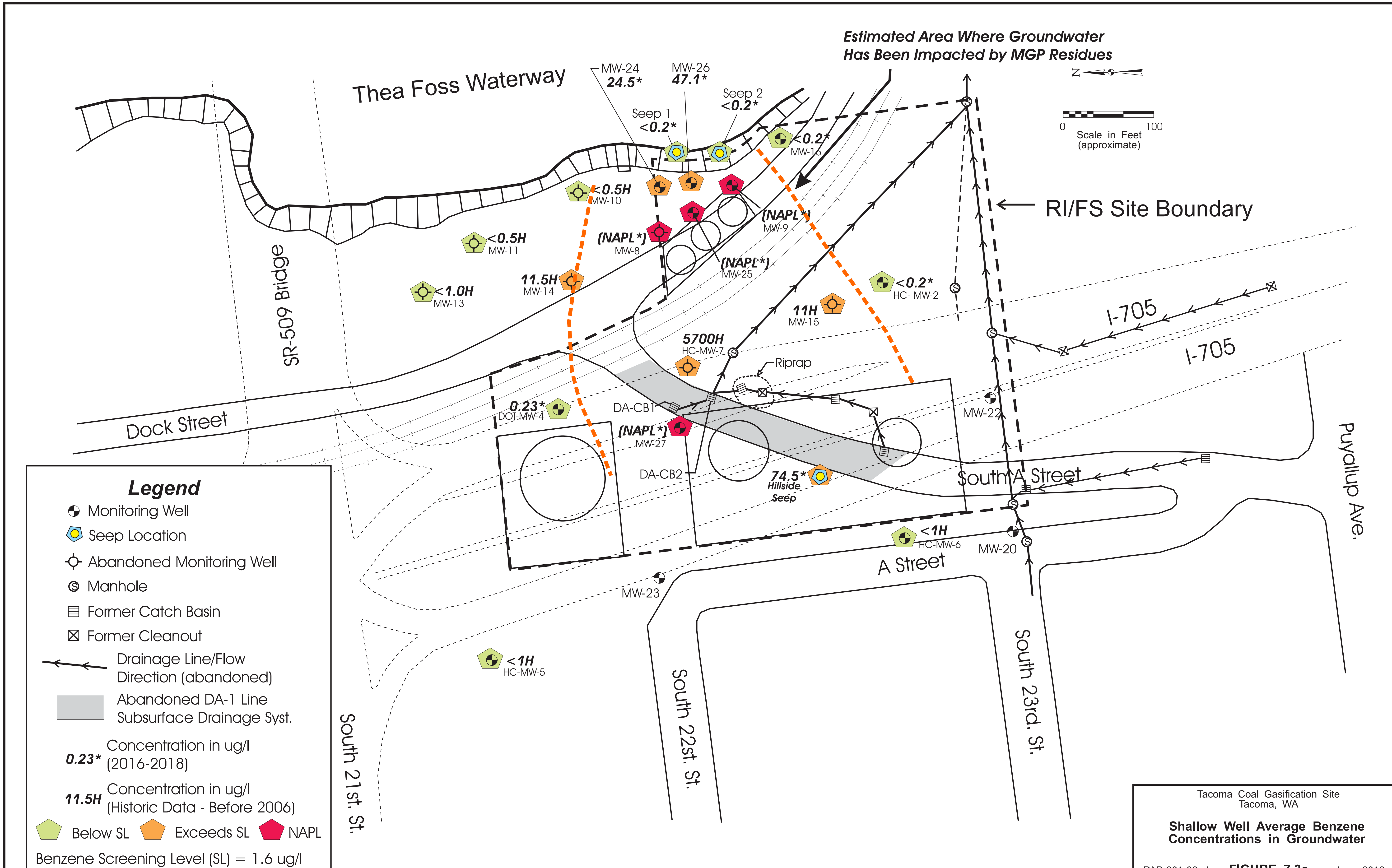


FIGURE 7.2 - DNAPL Thicknesses



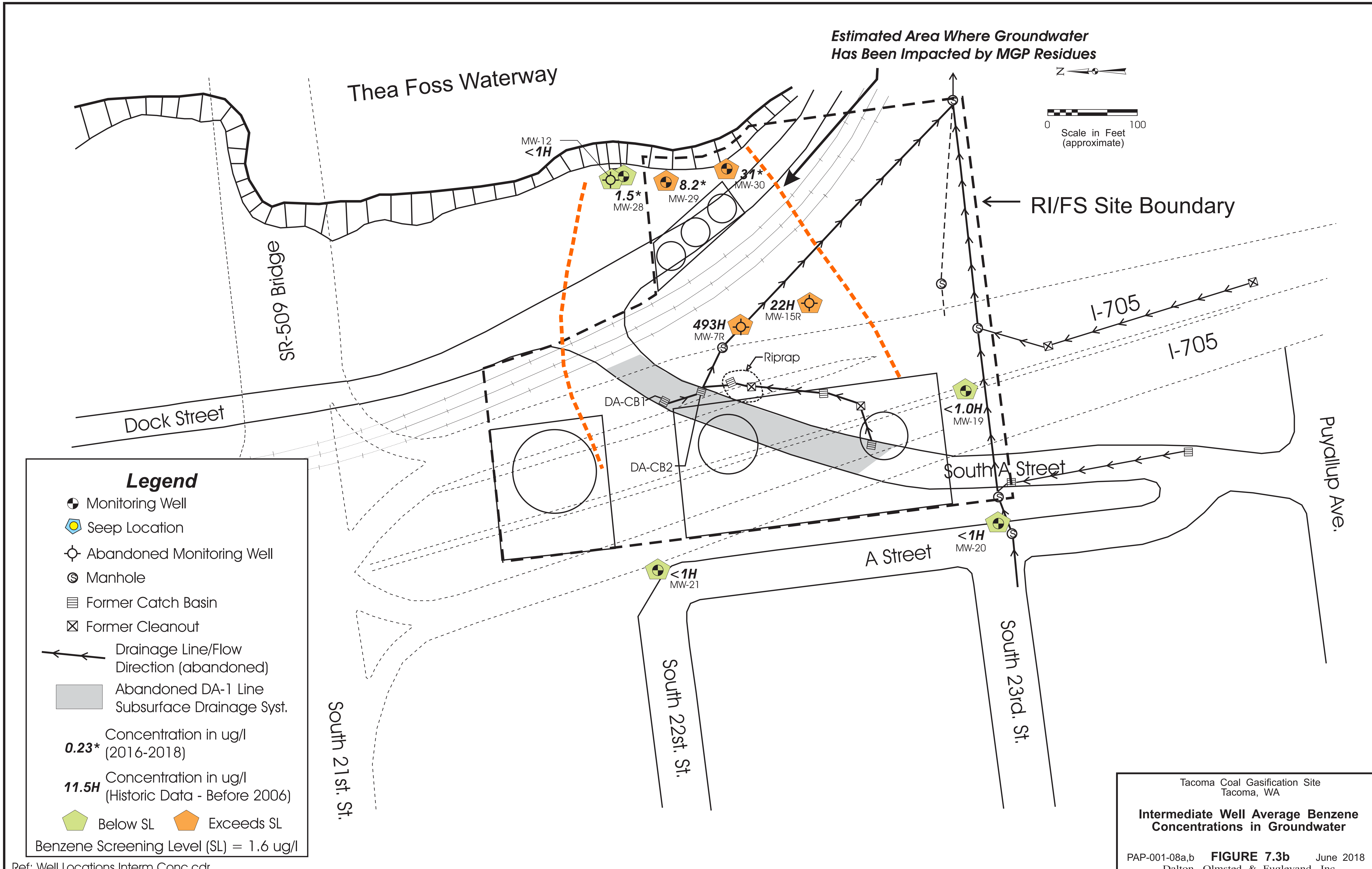
Ref: Well Locations Shallow Conc.cdr

Tacoma Coal Gasification Site
Tacoma, WA

Shallow Well Average Benzene Concentrations in Groundwater

PAP-001-08a,b **FIGURE 7.3a** June 2018

Dalton, Olmsted & Fuglevand, Inc.

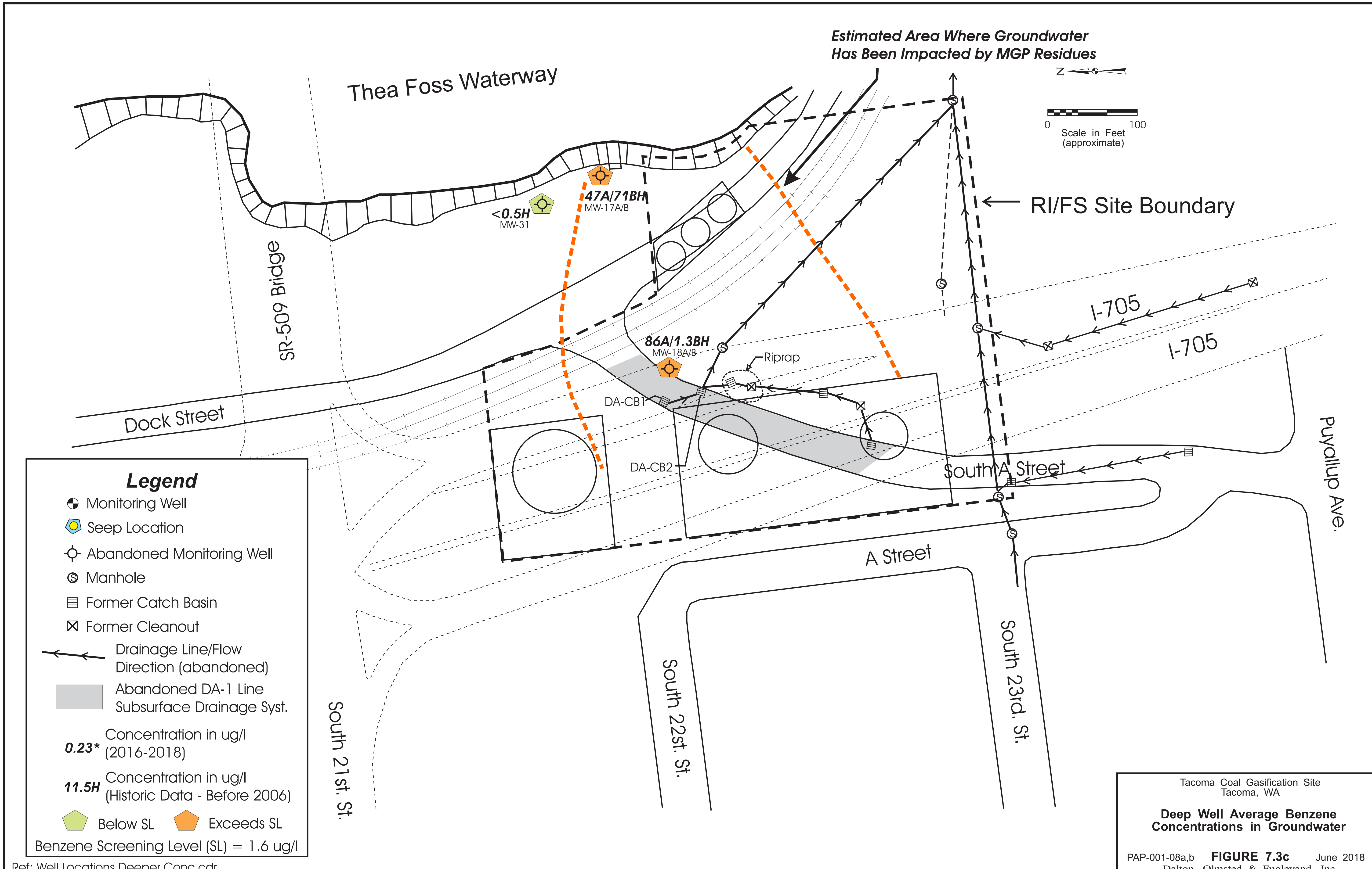


Tacoma Coal Gasification Site
Tacoma, WA

Intermediate Well Average Benzene Concentrations in Groundwater

PAP-001-08a,b **FIGURE 7.3b** June 2018

Dalton, Olmsted & Fuglevand, Inc.

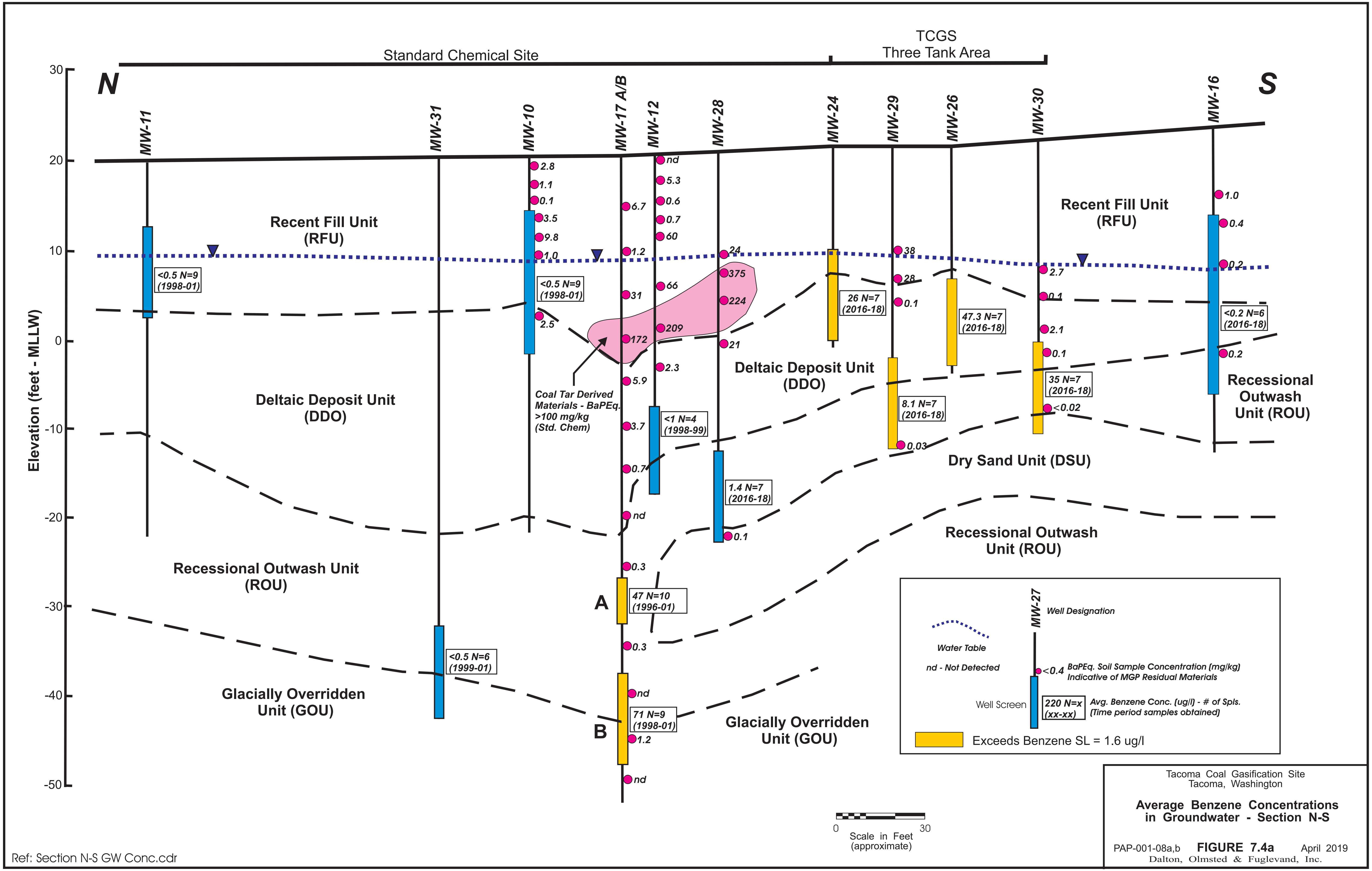


Tacoma Coal Gasification Site
Tacoma, WA

Deep Well Average Benzene Concentrations in Groundwater

PAP-001-08a,b **FIGURE 7.3c** June 2018

Dalton, Olmsted & Fuglevand, Inc.

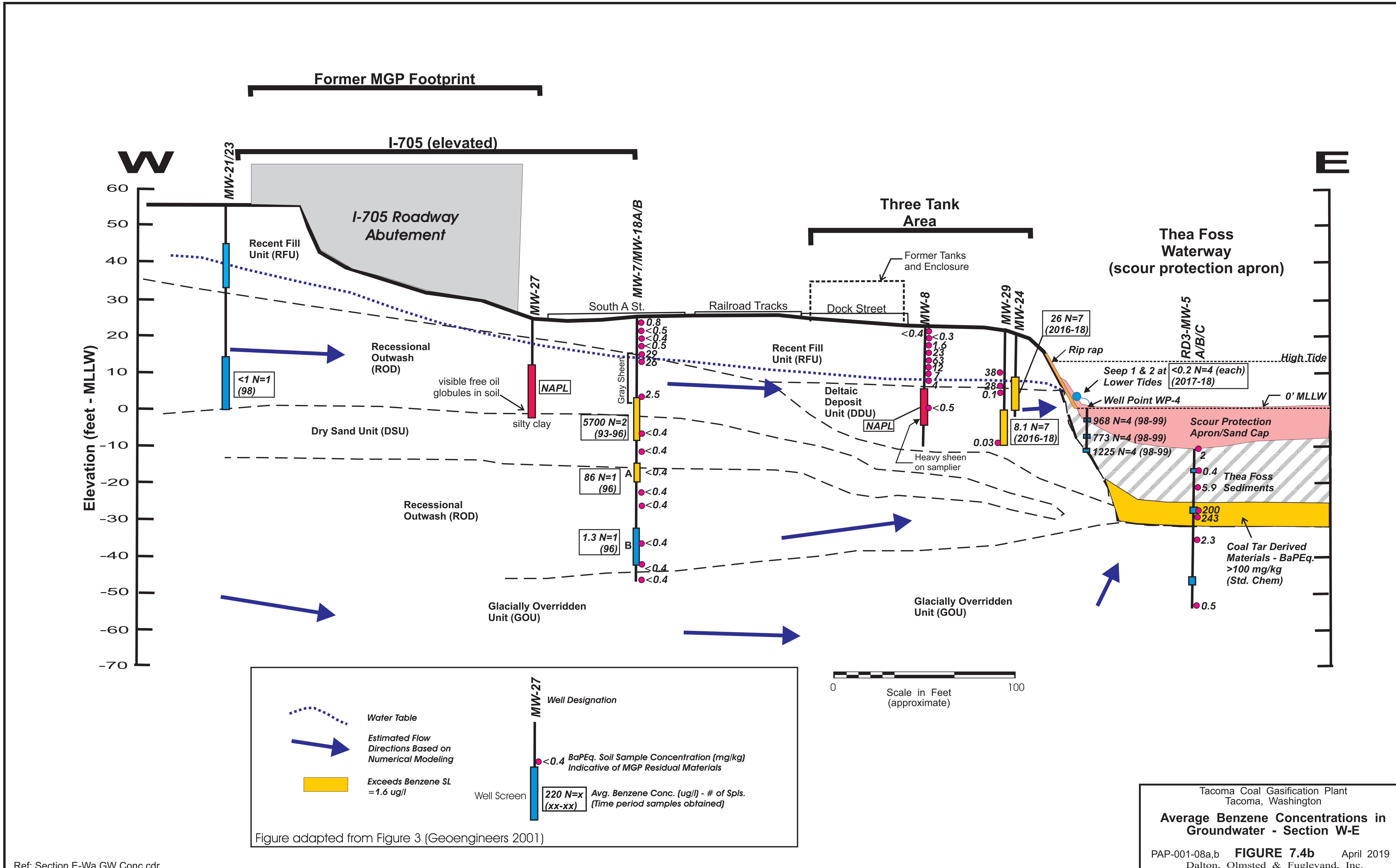


Tacoma Coal Gasification Site
Tacoma, Washington

Average Benzene Concentrations in Groundwater - Section N-S

PAP-001-08a,b **FIGURE 7.4a** April 2019

Dalton, Olmsted & Fuglevand, Inc.

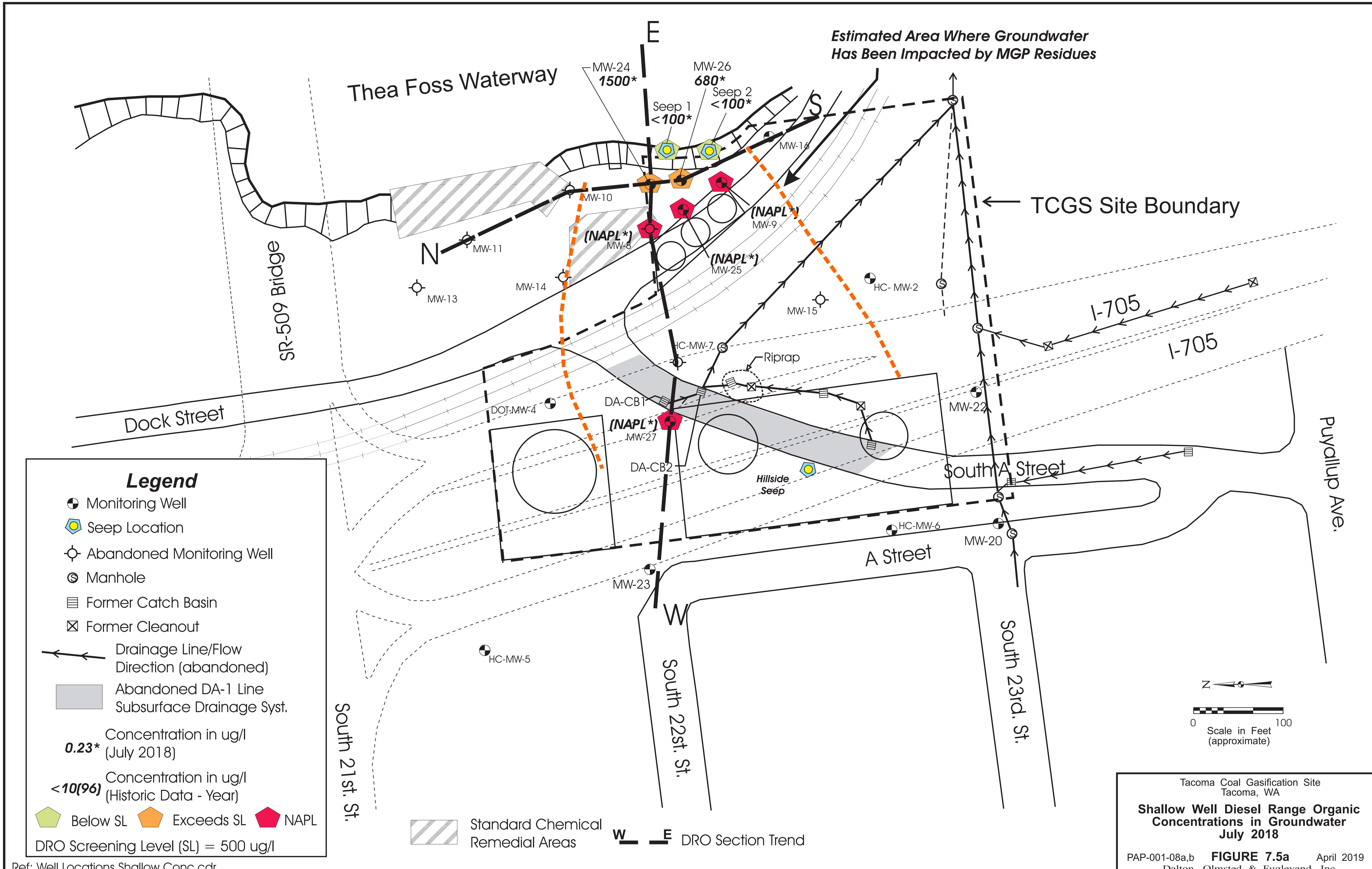


Tacoma Coal Gasification Plant
Tacoma, Washington

Average Benzene Concentrations in Groundwater - Section W-E

PAP-001-08a,b **FIGURE 7.4b** April 2019

Dalton, Olmsted & Fuglevand, Inc.

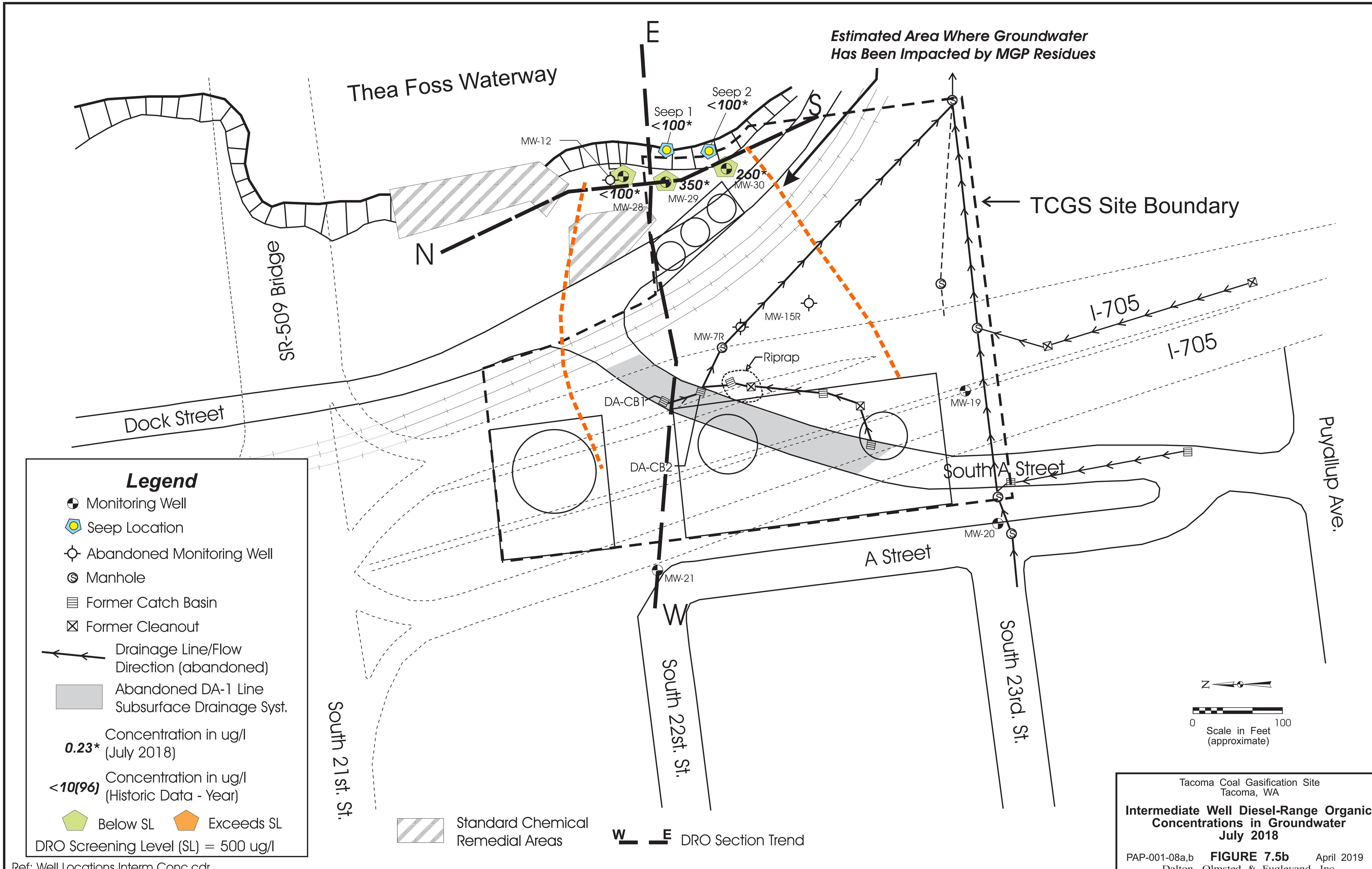


Tacoma Coal Gasification Site
Tacoma, WA

Shallow Well Diesel Range Organic Concentrations in Groundwater July 2018

PAP-001-08a,b **FIGURE 7.5a** April 2019

Dalton, Olmsted & Fuglevand, Inc.

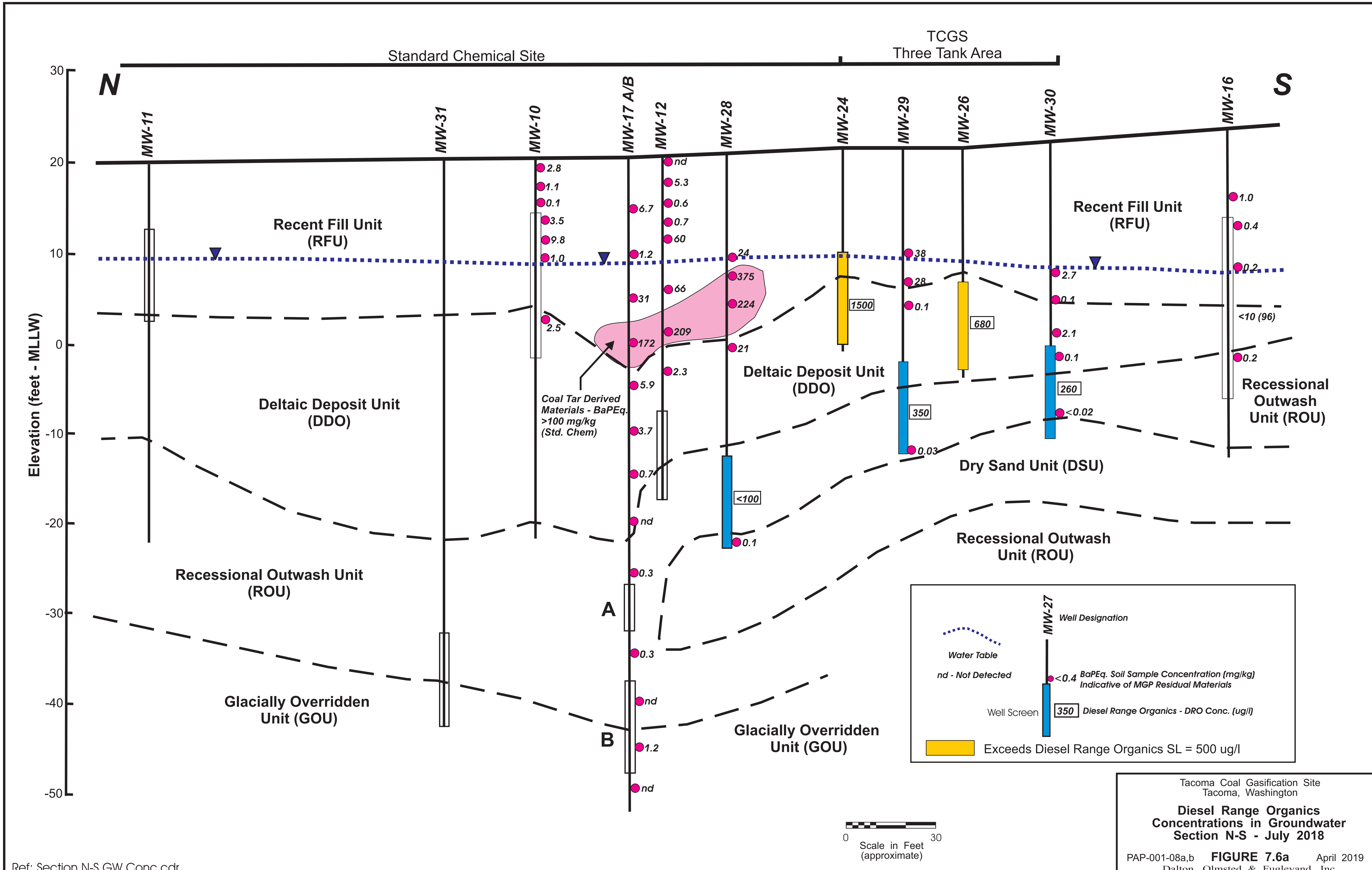


Tacoma Coal Gasification Site
Tacoma, WA

Intermediate Well Diesel-Range Organic Concentrations in Groundwater July 2018

PAP-001-08a,b **FIGURE 7.5b** April 2019

Dalton, Olmsted & Fuglevand, Inc.

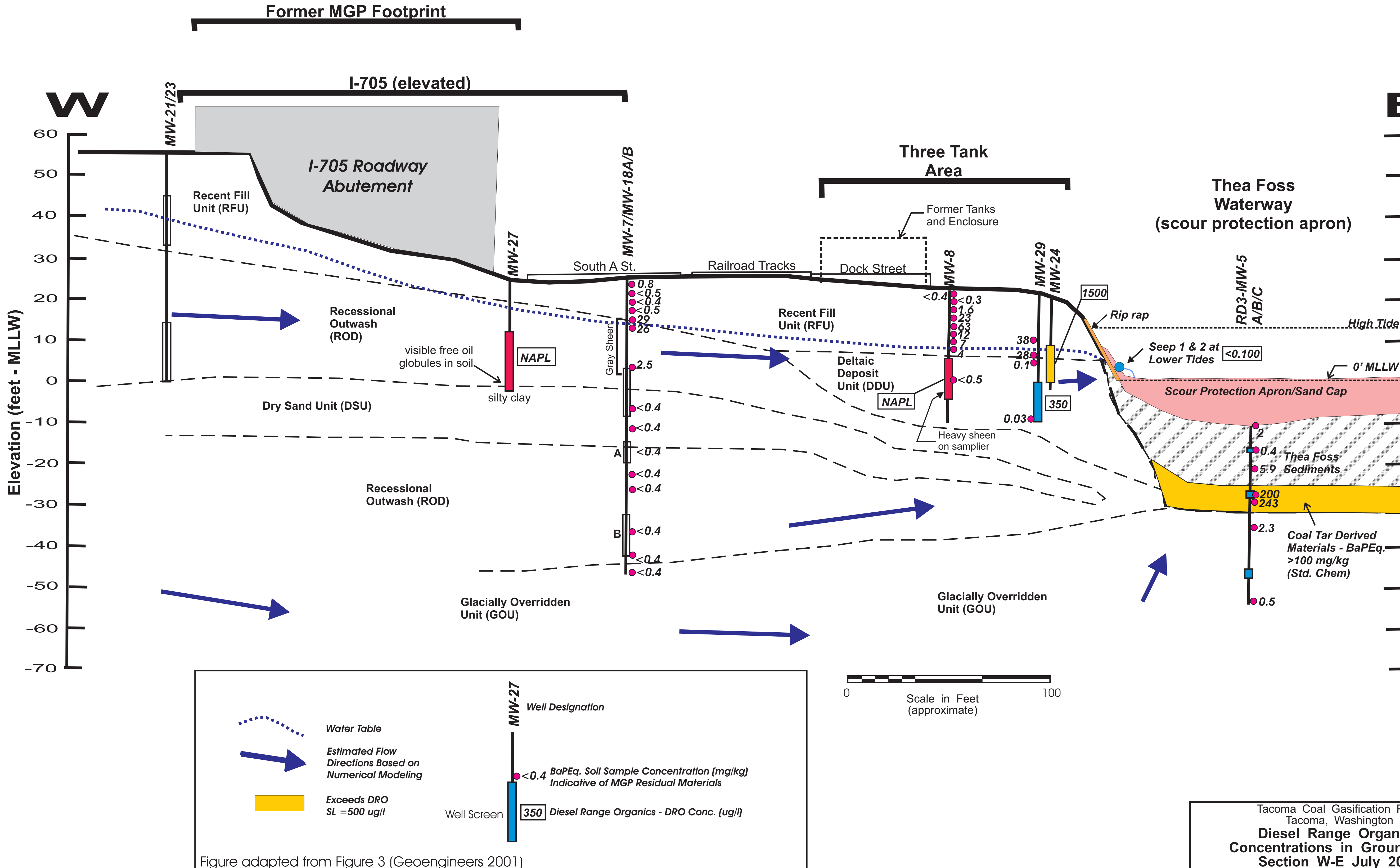


Tacoma Coal Gasification Site
Tacoma, Washington

Diesel Range Organics Concentrations in Groundwater Section N-S - July 2018

PAP-001-08a,b **FIGURE 7.6a** April 2019

Dalton, Olmsted & Fuglevand, Inc.



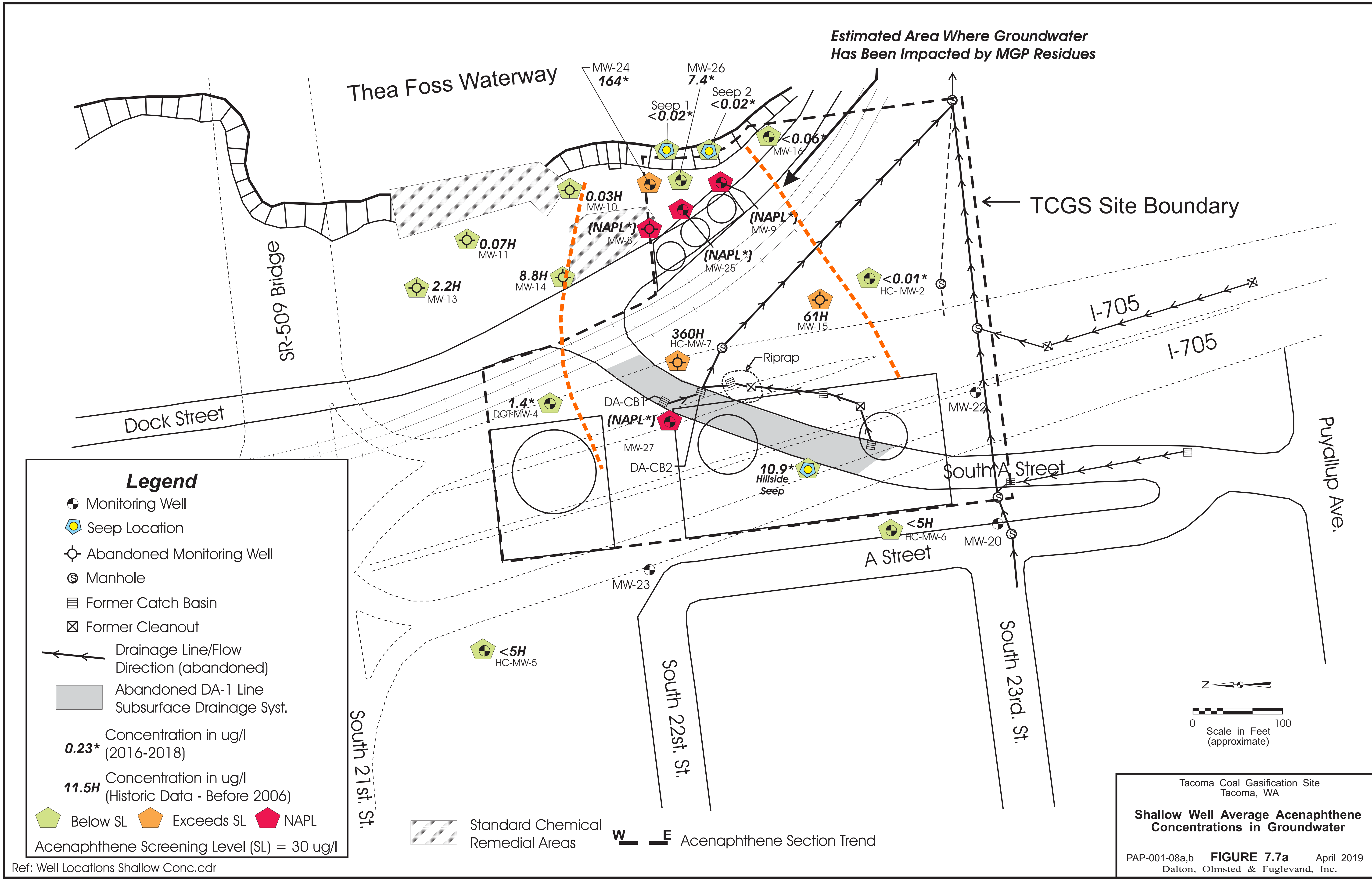
Ref: Section E-Wa GW Conc.cdr

Tacoma Coal Gasification Plant
Tacoma, Washington

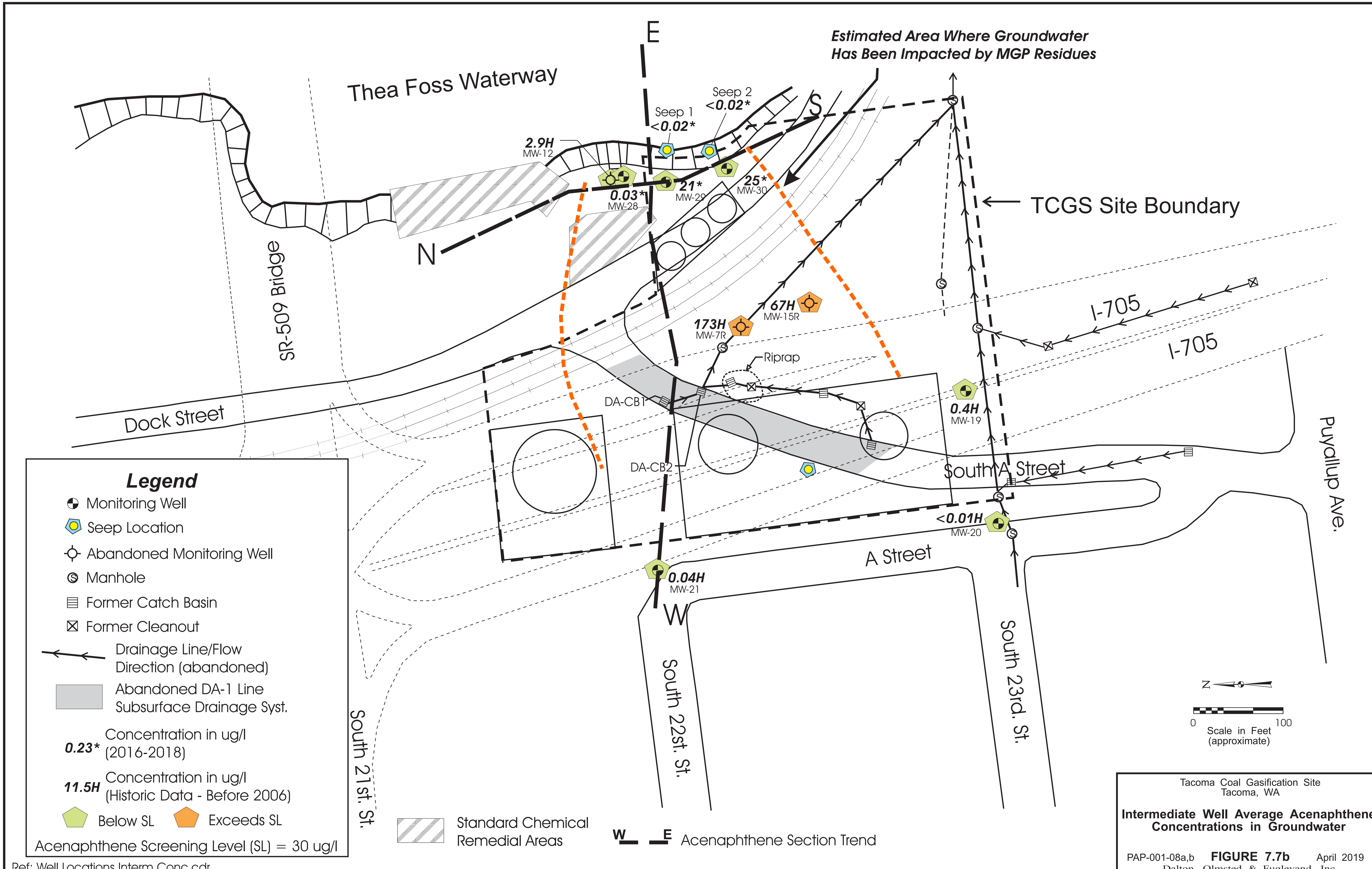
Diesel Range Organics Concentrations in Groundwater Section W-E July 2018

PAP-001-08a,b **FIGURE 7.6b** April 2019

Dalton, Olmsted & Fuglevand, Inc.



Estimated Area Where Groundwater Has Been Impacted by MGP Residues
Thea Foss Waterway
TCGS Site Boundary
MW-24 164*
MW-26 7.4*
Seep 1 <0.02*
Seep 2 <0.02*
<0.06* MW-16
0.03H MW-10
(NAPL*) MW-8
(NAPL*) MW-9
(NAPL*) MW-25
0.07H MW-11
8.8H MW-14
2.2H MW-13
<0.01* HC- MW-2
61H MW-15
360H HC-MW-7
Riprap
1.4* DOT-MW-4
DA-CB1
(NAPL*) MW-27
DA-CB2
10.9* Hillside Seep
MW-22
South A Street
<5H HC-MW-6
MW-20
A Street
MW-23
<5H HC-MW-5
I-705
I-705
SR-509 Bridge
Dock Street
Puyallup Ave.
South 21st. St.
South 22st. St.
South 23rd. St.
Legend
Monitoring Well
Seep Location
Abandoned Monitoring Well
Manhole
Former Catch Basin
Former Cleanout
Drainage Line/Flow Direction (abandoned)
Abandoned DA-1 Line Subsurface Drainage Syst.
0.23* Concentration in ug/l (2016-2018)
11.5H Concentration in ug/l (Historic Data - Before 2006)
Below SL
Exceeds SL
NAPL
Acenaphthene Screening Level (SL) = 30 ug/l
Standard Chemical Remedial Areas
W E Acenaphthene Section Trend
Ref: Well Locations Shallow Conc.cdr
N
0 100
Scale in Feet (approximate)
Tacoma Coal Gasification Site
Tacoma, WA
Shallow Well Average Acenaphthene Concentrations in Groundwater
PAP-001-08a,b
FIGURE 7.7a
April 2019
Dalton, Olmsted & Fuglevand, Inc.

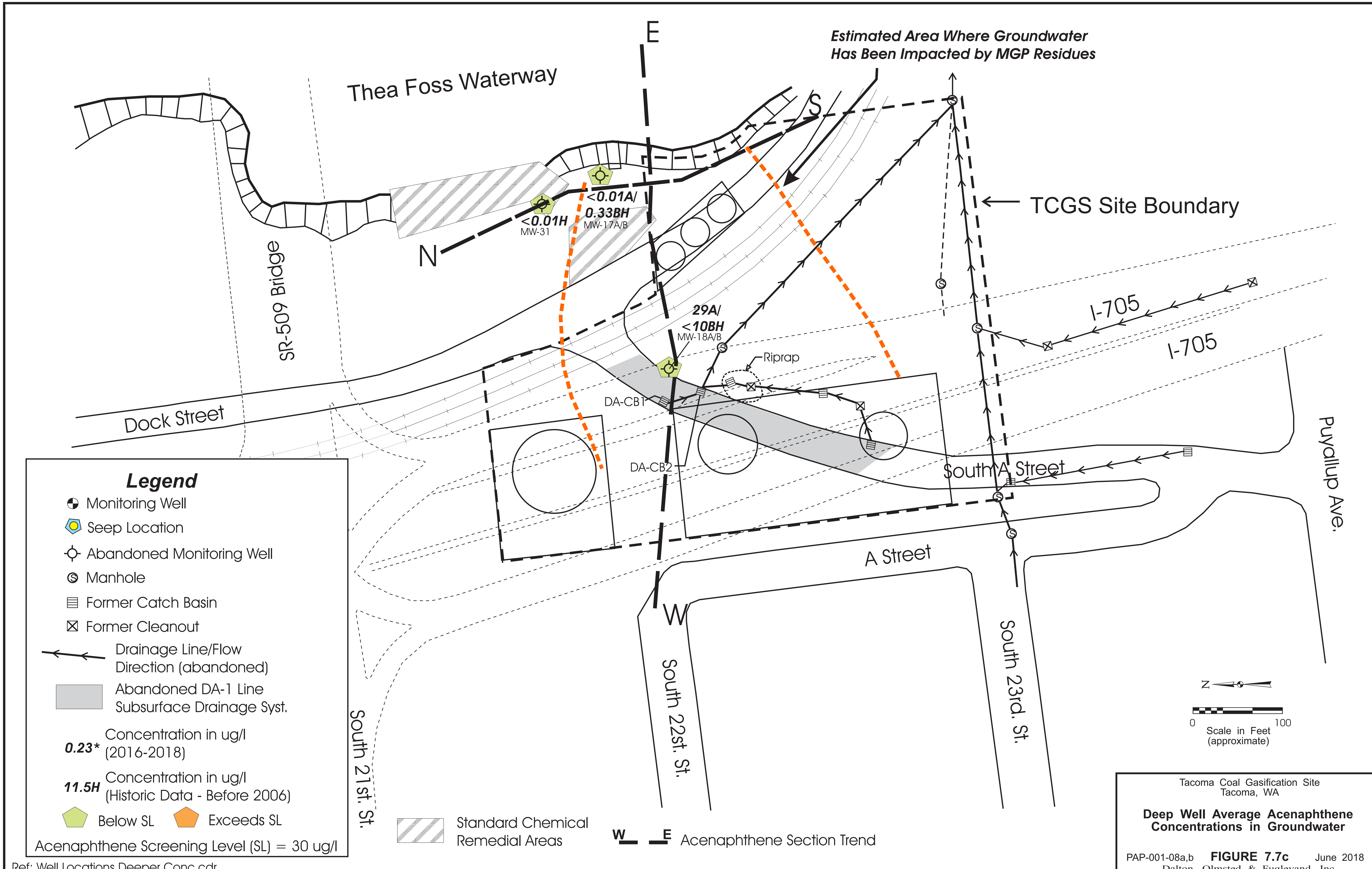


Tacoma Coal Gasification Site
Tacoma, WA

Intermediate Well Average Acenaphthene Concentrations in Groundwater

PAP-001-08a,b **FIGURE 7.7b** April 2019

Dalton, Olmsted & Fuglevand, Inc.

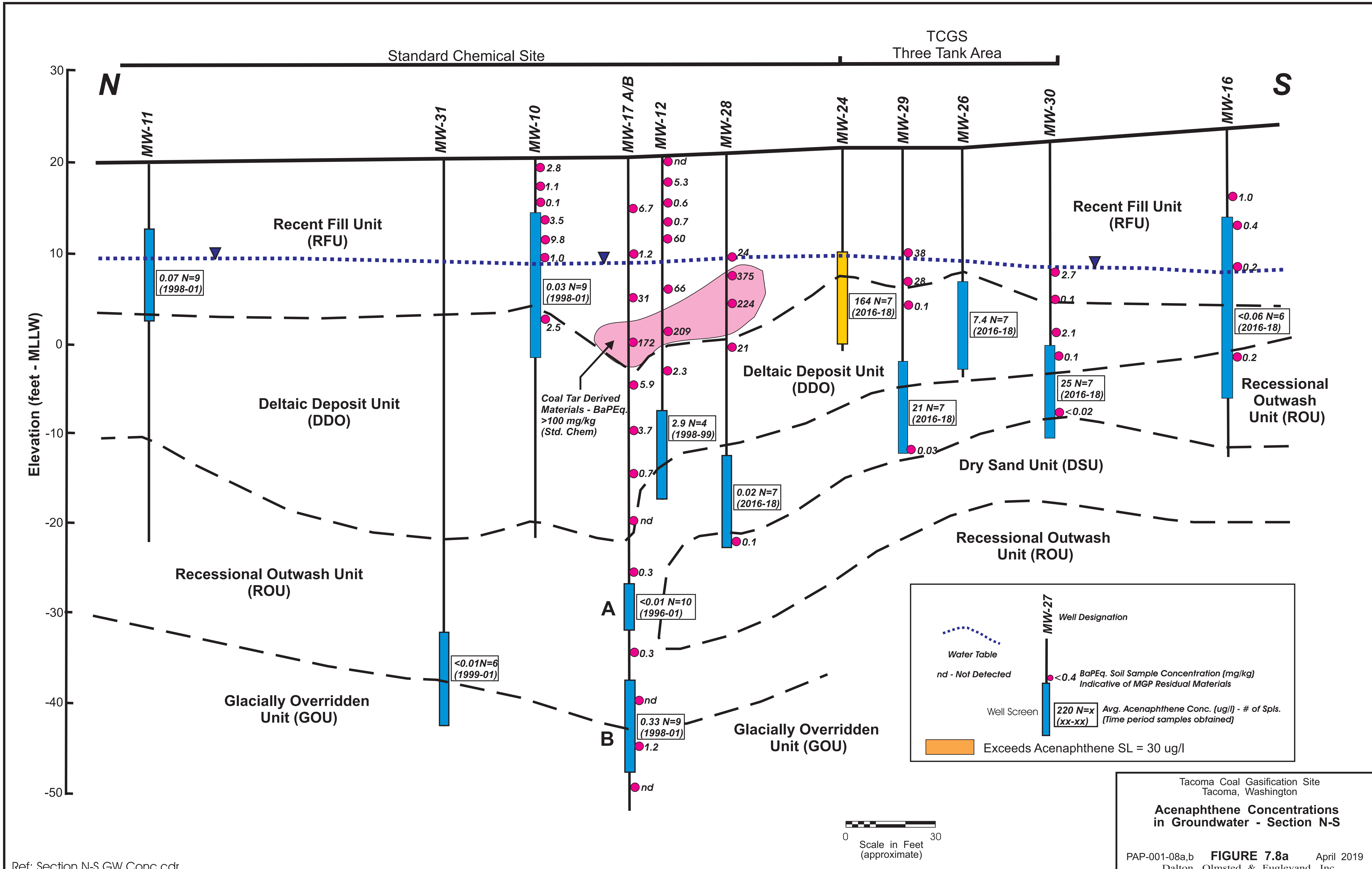


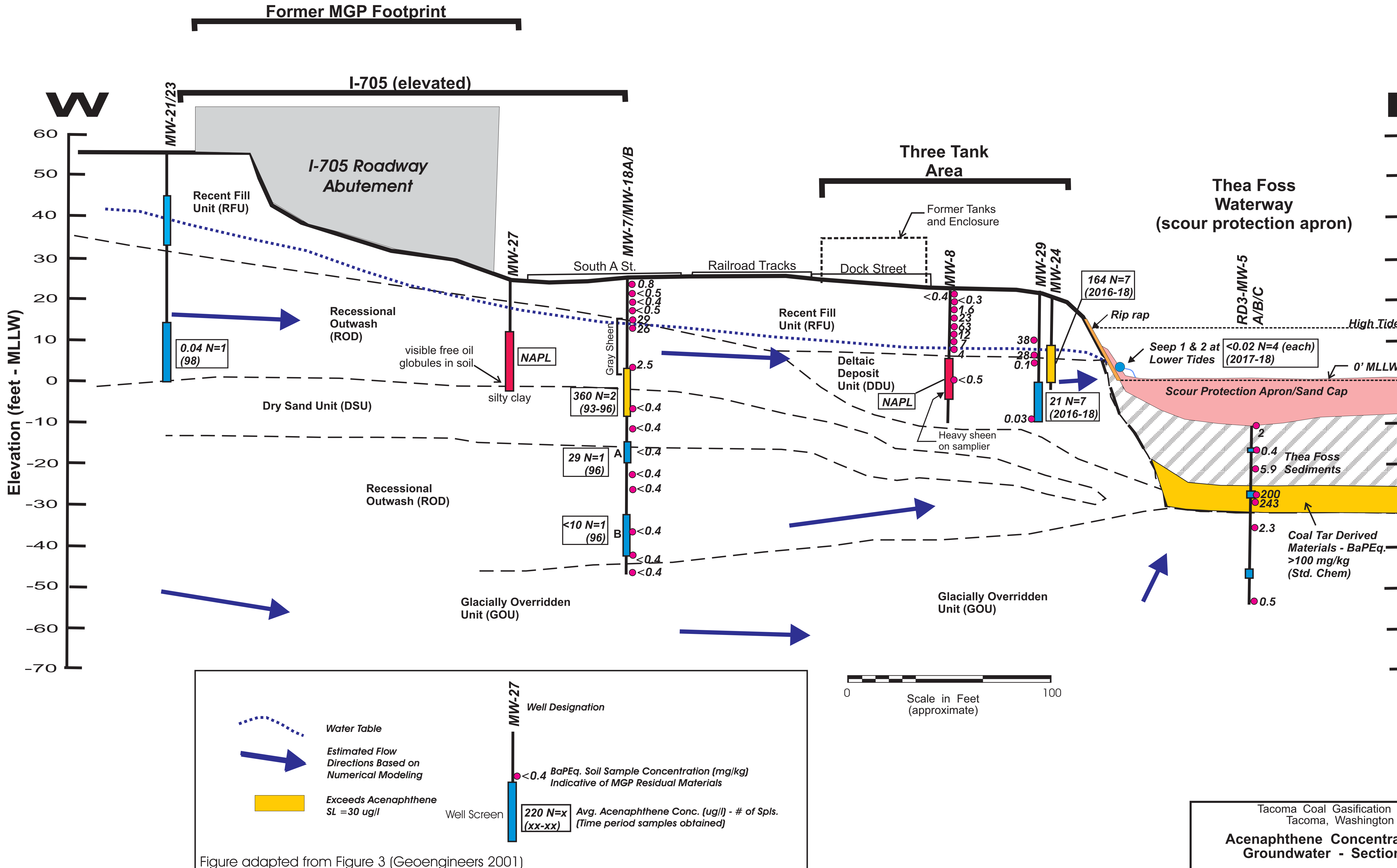
Tacoma Coal Gasification Site
Tacoma, WA

Deep Well Average Acenaphthene Concentrations in Groundwater

PAP-001-08a,b **FIGURE 7.7c** June 2018

Dalton, Olmsted & Fuglevand, Inc.


Standard Chemical Site
TCGS
Three Tank Area
N
S
Elevation (feet - MLLW)
30
20
10
0
-10
-20
-30
-40
-50
MW-11
MW-31
MW-10
MW-17 A/B
MW-12
MW-28
MW-24
MW-29
MW-26
MW-30
MW-16
Recent Fill Unit (RFU)
Deltaic Deposit Unit (DDO)
Recessional Outwash Unit (ROU)
Glacially Overridden Unit (GOU)
Dry Sand Unit (DSU)
Recessional Outwash Unit (ROU)
0.07 N=9 (1998-01)
0.03 N=9 (1998-01)
<0.01N=6 (1999-01)
<0.01 N=10 (1996-01)
0.33 N=9 (1998-01)
2.9 N=4 (1998-99)
0.02 N=7 (2016-18)
164 N=7 (2016-18)
21 N=7 (2016-18)
7.4 N=7 (2016-18)
25 N=7 (2016-18)
<0.06 N=6 (2016-18)
A
B
Coal Tar Derived Materials - BaPEq. >100 mg/kg (Std. Chem)
Water Table
nd - Not Detected
MW-27
Well Designation
<0.4 BaPEq. Soil Sample Concentration (mg/kg) Indicative of MGP Residual Materials
Well Screen
220 N=x (xx-xx)
Avg. Acenaphthene Conc. (ug/l) - # of Spls. (Time period samples obtained)
Exceeds Acenaphthene SL = 30 ug/l
0 Scale in Feet (approximate) 30
Ref: Section N-S GW Conc.cdr
Tacoma Coal Gasification Site
Tacoma, Washington
Acenaphthene Concentrations in Groundwater - Section N-S
PAP-001-08a,b
FIGURE 7.8a
April 2019
Dalton, Olmsted & Fuglevand, Inc.



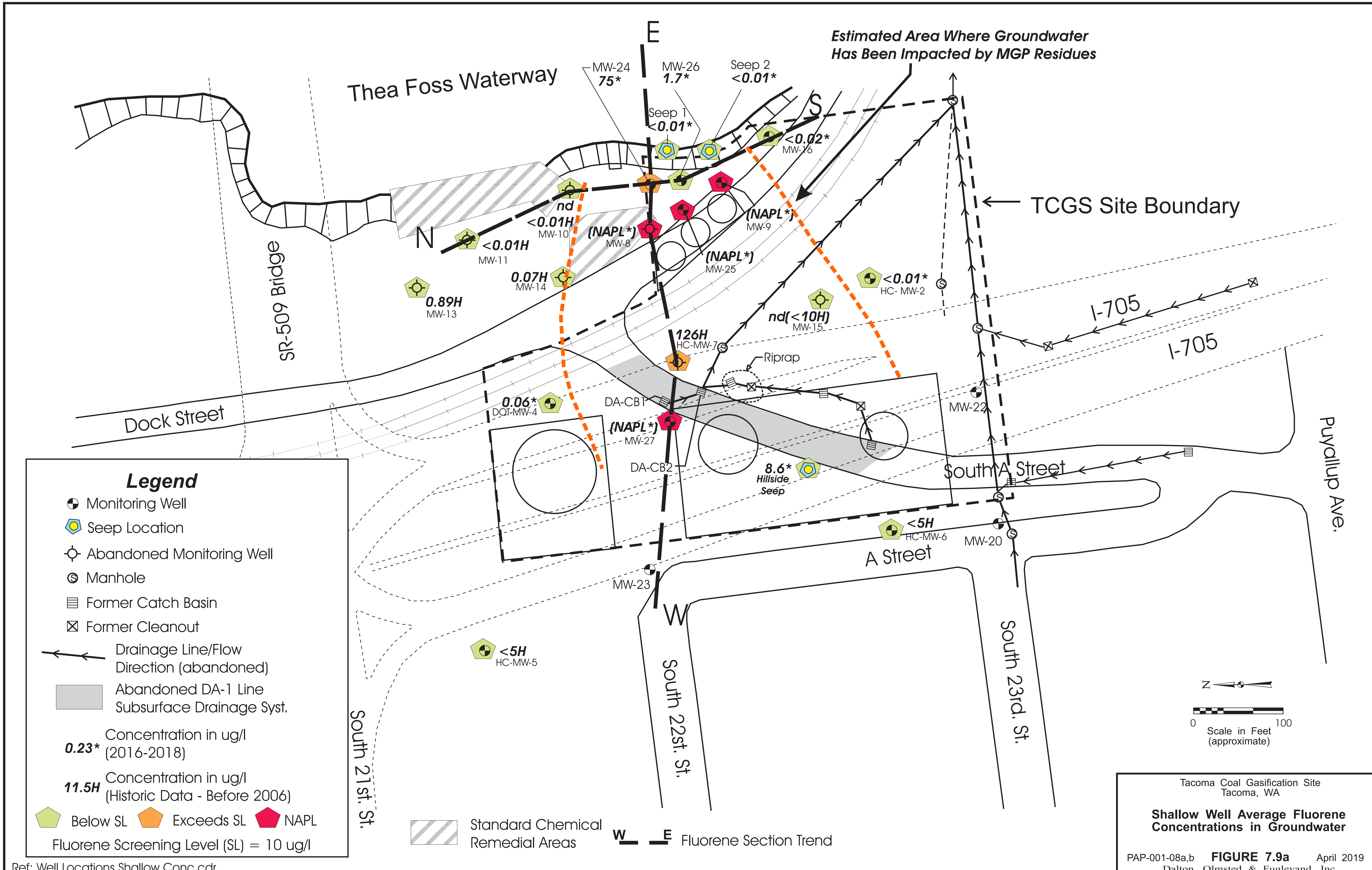
Ref: Section E-Wa GW Conc.cdr

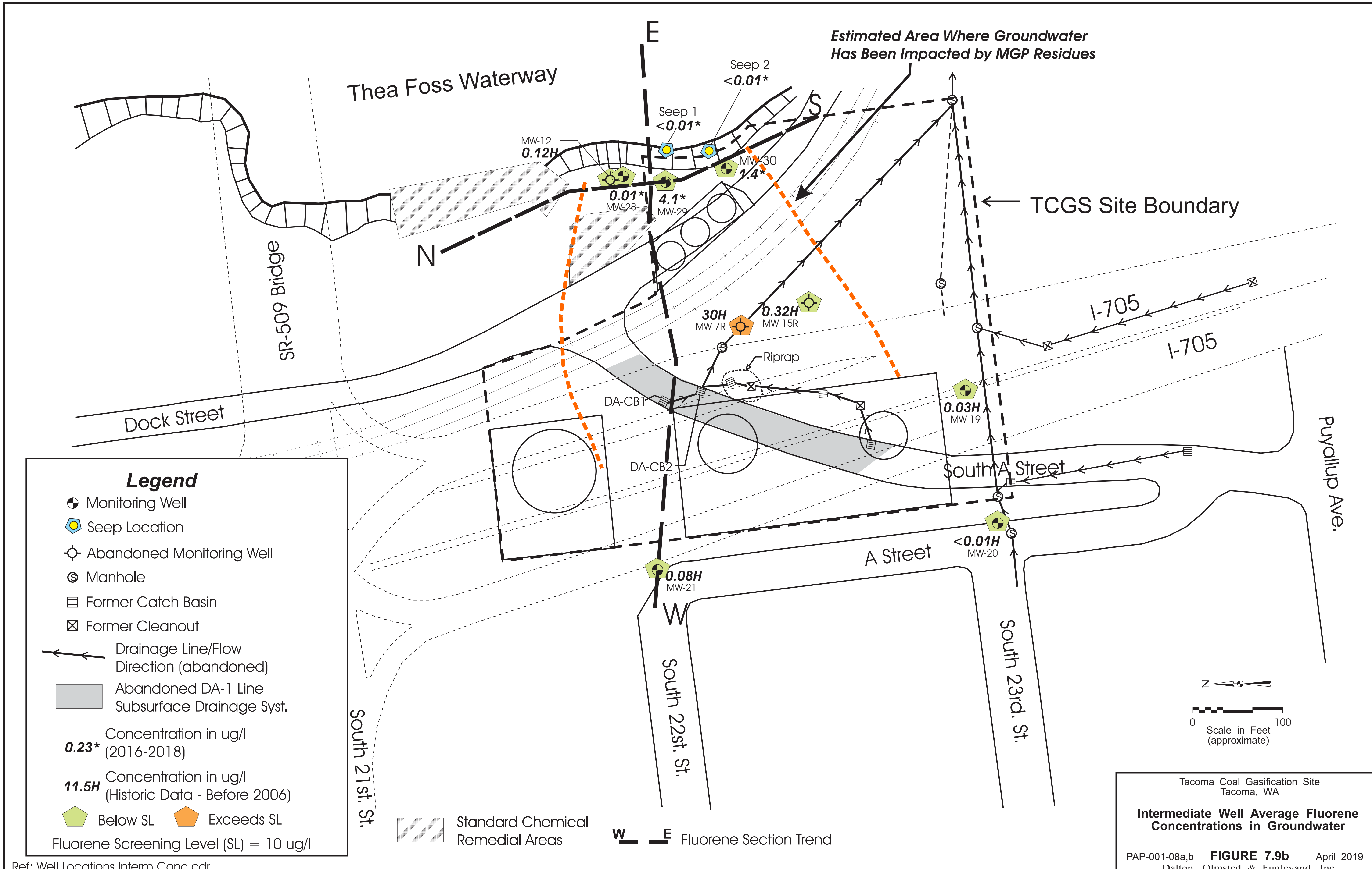
Tacoma Coal Gasification Plant
Tacoma, Washington

Acenaphthene Concentrations in Groundwater - Section W-E

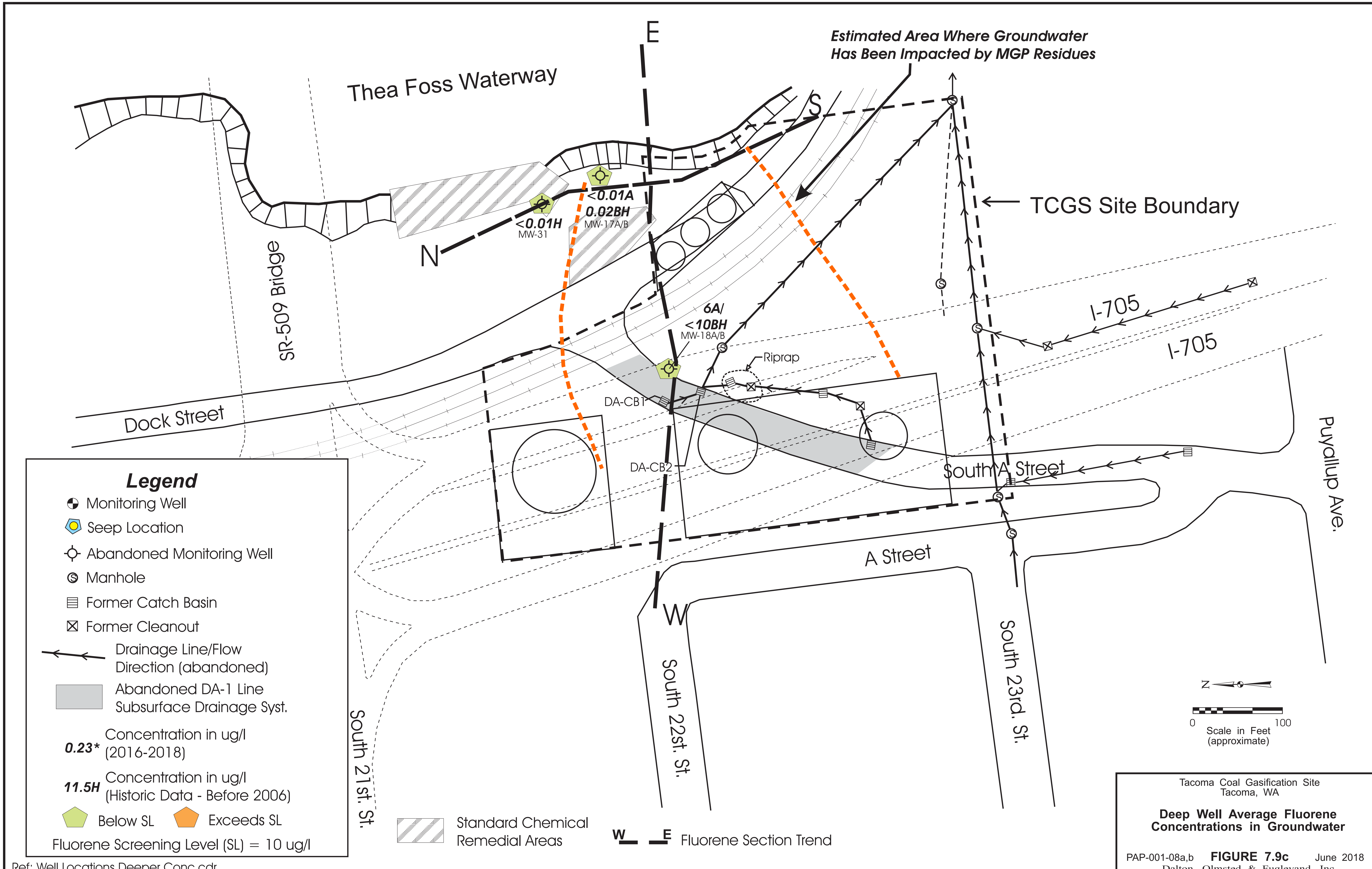
PAP-001-08a,b **FIGURE 7.8b** April 2019

Dalton, Olmsted & Fuglevand, Inc.


Thea Foss Waterway
E
MW-24
75*
MW-26
1.7*
Seep 2
<0.01*
Seep 1
<0.01*
<0.02*
MW-16
S
Estimated Area Where Groundwater
Has Been Impacted by MGP Residues
TCGS Site Boundary
nd
<0.01H
MW-10
(NAPL*)
MW-8
(NAPL*)
MW-9
(NAPL*)
MW-25
N
<0.01H
MW-11
0.07H
MW-14
0.89H
MW-13
<0.01*
HC- MW-2
nd(<10H)
MW-15
126H
HC-MW-7
Riprap
I-705
I-705
SR-509 Bridge
Dock Street
0.06*
DOT-MW-4
DA-CB1
(NAPL*)
MW-27
DA-CB2
8.6*
Hillside
Seep
MW-22
South A Street
Puyallup Ave.
<5H
HC-MW-6
MW-20
A Street
MW-23
W
<5H
HC-MW-5
South 22st. St.
South 23rd. St.
South 21st. St.
Legend
Monitoring Well
Seep Location
Abandoned Monitoring Well
Manhole
Former Catch Basin
Former Cleanout
Drainage Line/Flow Direction (abandoned)
Abandoned DA-1 Line Subsurface Drainage Syst.
0.23* Concentration in ug/l (2016-2018)
11.5H Concentration in ug/l (Historic Data - Before 2006)
Below SL
Exceeds SL
NAPL
Fluorene Screening Level (SL) = 10 ug/l
Standard Chemical Remedial Areas
W E Fluorene Section Trend
Z
0
100
Scale in Feet
(approximate)
Ref: Well Locations Shallow Conc.cdr
Tacoma Coal Gasification Site
Tacoma, WA
Shallow Well Average Fluorene Concentrations in Groundwater
PAP-001-08a,b
FIGURE 7.9a
April 2019
Dalton, Olmsted & Fuglevand, Inc.



Estimated Area Where Groundwater Has Been Impacted by MGP Residues
Thea Foss Waterway
TCGS Site Boundary
Seep 2 <0.01*
Seep 1 <0.01*
MW-12 0.12H
0.01* MW-28
4.1* MW-29
MW-30 1.4*
30H MW-7R
0.32H MW-15R
Riprap
DA-CB1
DA-CB2
0.03H MW-19
<0.01H MW-20
0.08H MW-21
SR-509 Bridge
Dock Street
I-705
I-705
South A Street
A Street
Puyallup Ave.
South 21st. St.
South 22st. St.
South 23rd. St.
N
S
E
W
Legend
Monitoring Well
Seep Location
Abandoned Monitoring Well
Manhole
Former Catch Basin
Former Cleanout
Drainage Line/Flow Direction (abandoned)
Abandoned DA-1 Line Subsurface Drainage Syst.
0.23* Concentration in ug/l (2016-2018)
11.5H Concentration in ug/l (Historic Data - Before 2006)
Below SL
Exceeds SL
Fluorene Screening Level (SL) = 10 ug/l
Standard Chemical Remedial Areas
W E Fluorene Section Trend
Ref: Well Locations Interm Conc.cdr
Z
0 100
Scale in Feet (approximate)
Tacoma Coal Gasification Site
Tacoma, WA
Intermediate Well Average Fluorene Concentrations in Groundwater
PAP-001-08a,b FIGURE 7.9b April 2019
Dalton, Olmsted & Fuglevand, Inc.



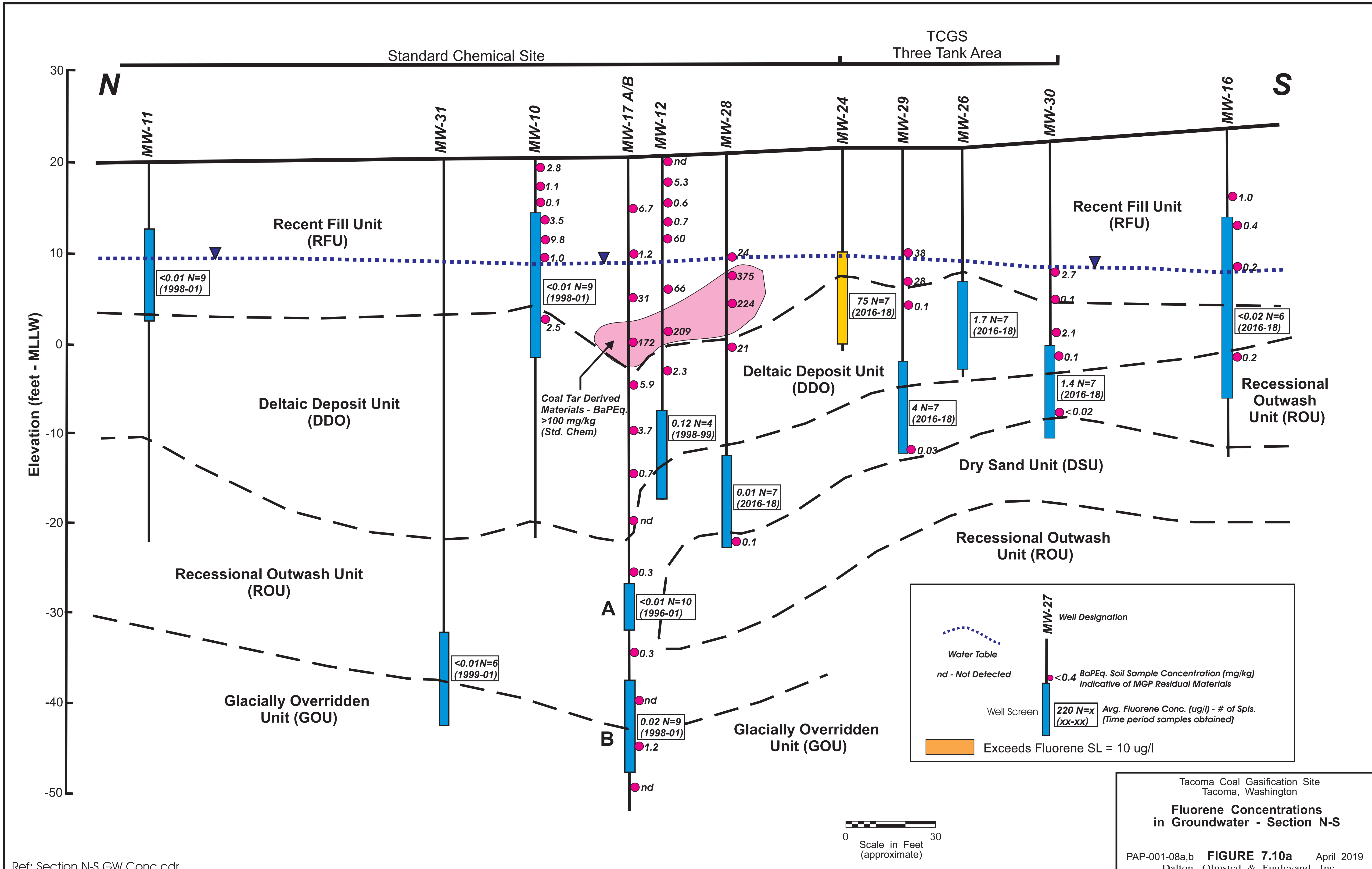
Tacoma Coal Gasification Site
Tacoma, WA

Deep Well Average Fluorene Concentrations in Groundwater

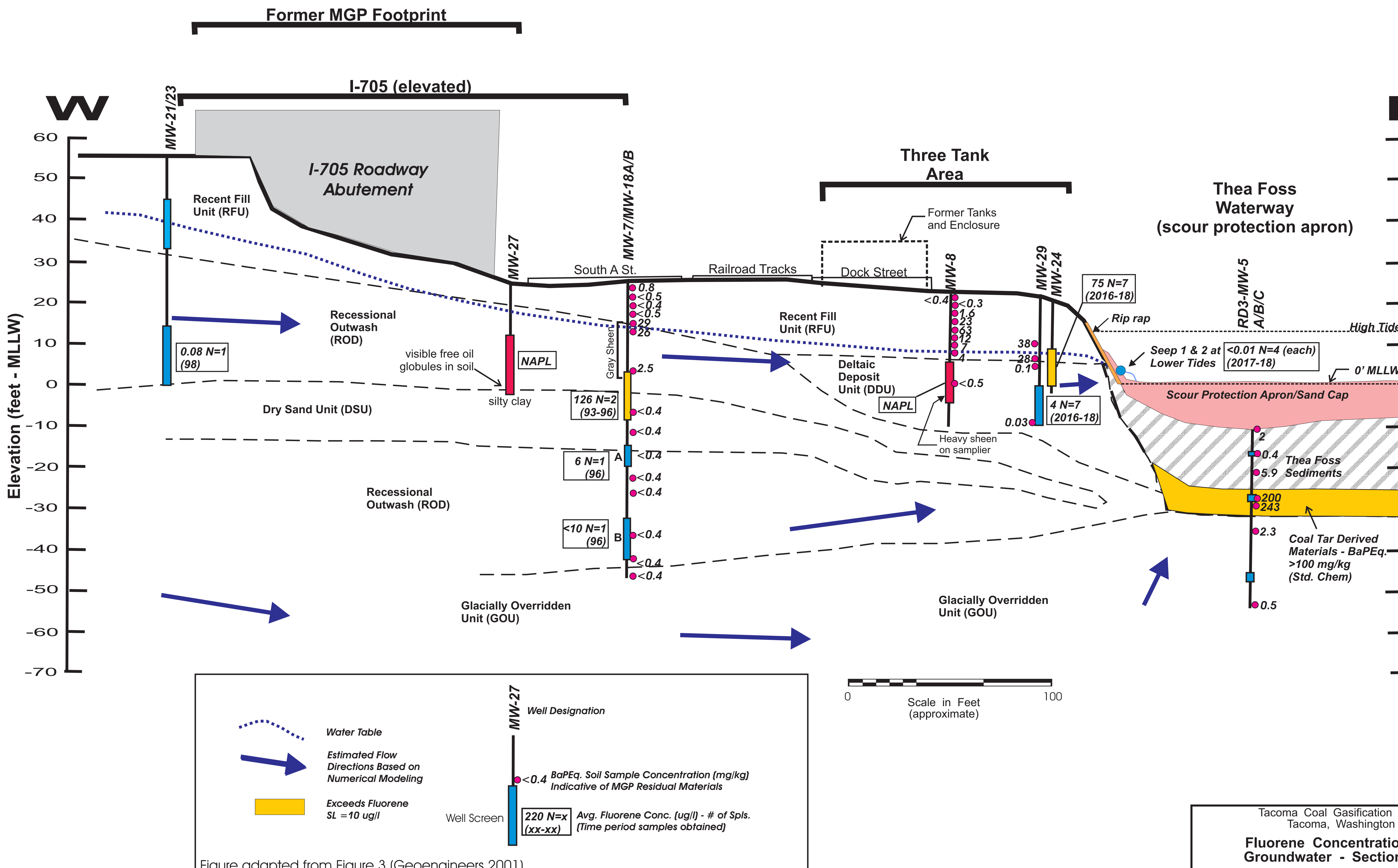
PAP-001-08a,b **FIGURE 7.9c** June 2018

Dalton, Olmsted & Fuglevand, Inc.

Ref: Well Locations Deeper Conc.cdr



Standard Chemical Site
TCGS
Three Tank Area
N
S
Elevation (feet - MLLW)
30
20
10
0
-10
-20
-30
-40
-50
MW-11
MW-31
MW-10
MW-17 A/B
MW-12
MW-28
MW-24
MW-29
MW-26
MW-30
MW-16
Recent Fill Unit (RFU)
Deltaic Deposit Unit (DDO)
Recessional Outwash Unit (ROU)
Glacially Overridden Unit (GOU)
Dry Sand Unit (DSU)
Recessional Outwash Unit (ROU)
Coal Tar Derived Materials - BaPEq. >100 mg/kg (Std. Chem)
<0.01 N=9 (1998-01)
<0.01 N=9 (1998-01)
<0.01N=6 (1999-01)
<0.01 N=10 (1996-01)
0.02 N=9 (1998-01)
0.12 N=4 (1998-99)
0.01 N=7 (2016-18)
75 N=7 (2016-18)
4 N=7 (2016-18)
1.7 N=7 (2016-18)
1.4 N=7 (2016-18)
<0.02 N=6 (2016-18)
A
B
2.8
1.1
0.1
3.5
9.8
1.0
2.5
6.7
1.2
31
172
5.9
3.7
0.7
nd
0.3
0.3
nd
1.2
nd
nd
5.3
0.6
0.7
60
66
209
2.3
24
375
224
21
0.1
38
28
0.1
0.03
2.7
0.1
2.1
0.1
<0.02
1.0
0.4
0.2
0.2
MW-27
Well Designation
Water Table
nd - Not Detected
<0.4 BaPEq. Soil Sample Concentration (mg/kg) Indicative of MGP Residual Materials
Well Screen
220 N=x (xx-xx) Avg. Fluorene Conc. (ug/l) - # of Spls. (Time period samples obtained)
Exceeds Fluorene SL = 10 ug/l
0
30
Scale in Feet (approximate)
Ref: Section N-S GW Conc.cdr
Tacoma Coal Gasification Site
Tacoma, Washington
Fluorene Concentrations in Groundwater - Section N-S
PAP-001-08a,b
FIGURE 7.10a
April 2019
Dalton, Olmsted & Fuglevand, Inc.



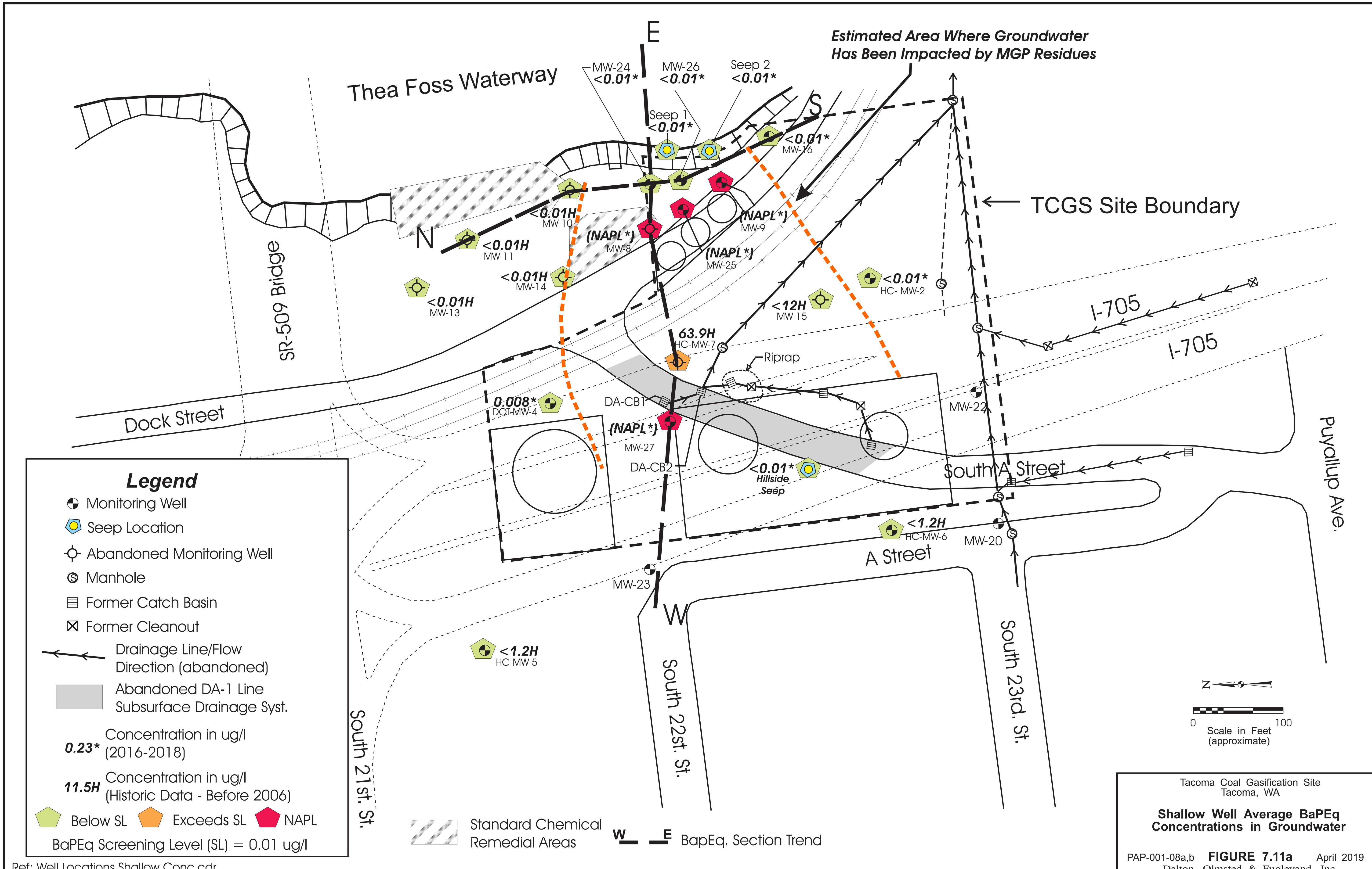
Ref: Section E-Wa GW Conc.cdr

Tacoma Coal Gasification Plant
Tacoma, Washington

Fluorene Concentrations in Groundwater - Section W-E

PAP-001-08a,b **FIGURE 7.10b** April 2019

Dalton, Olmsted & Fuglevand, Inc.

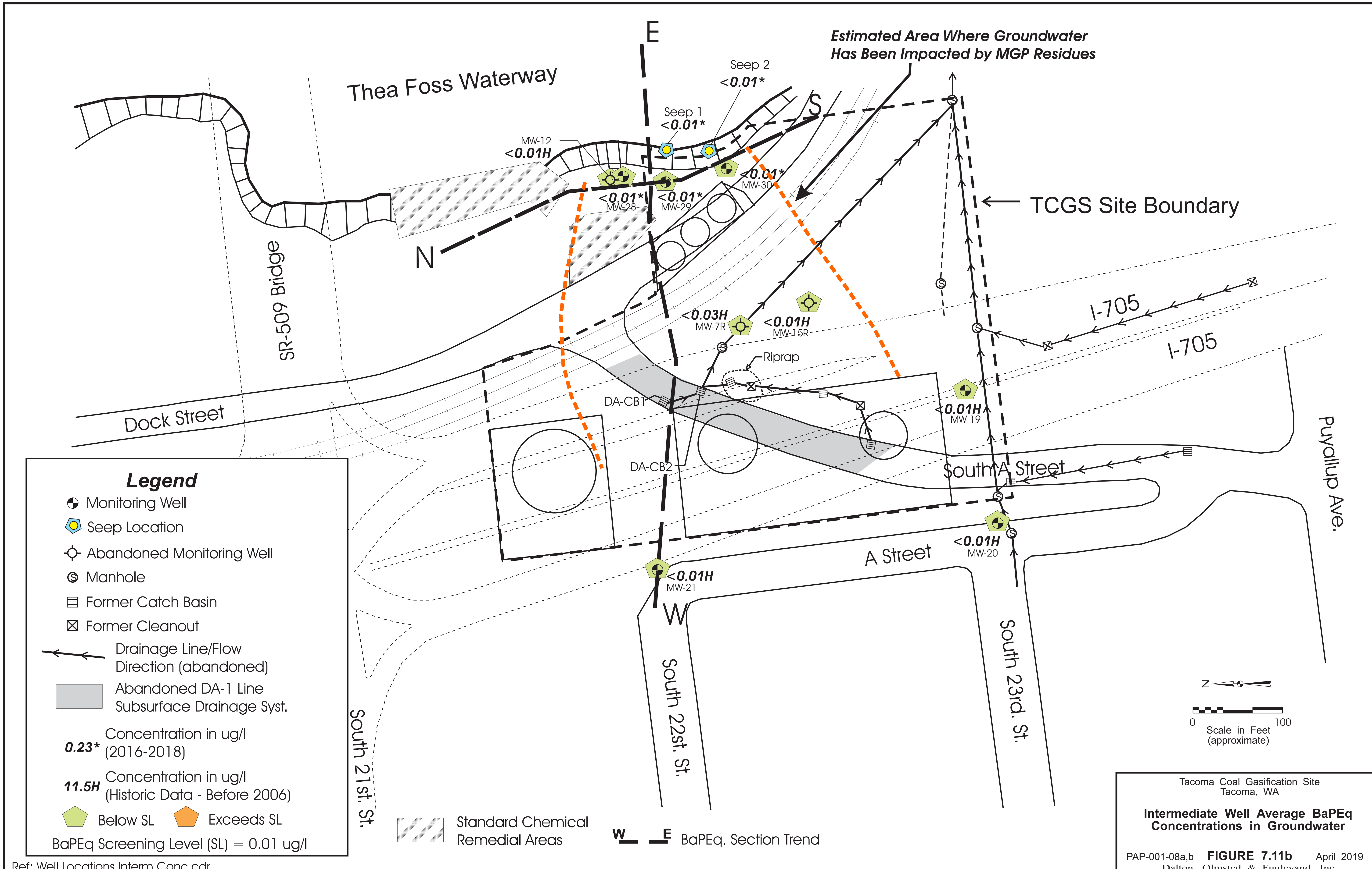


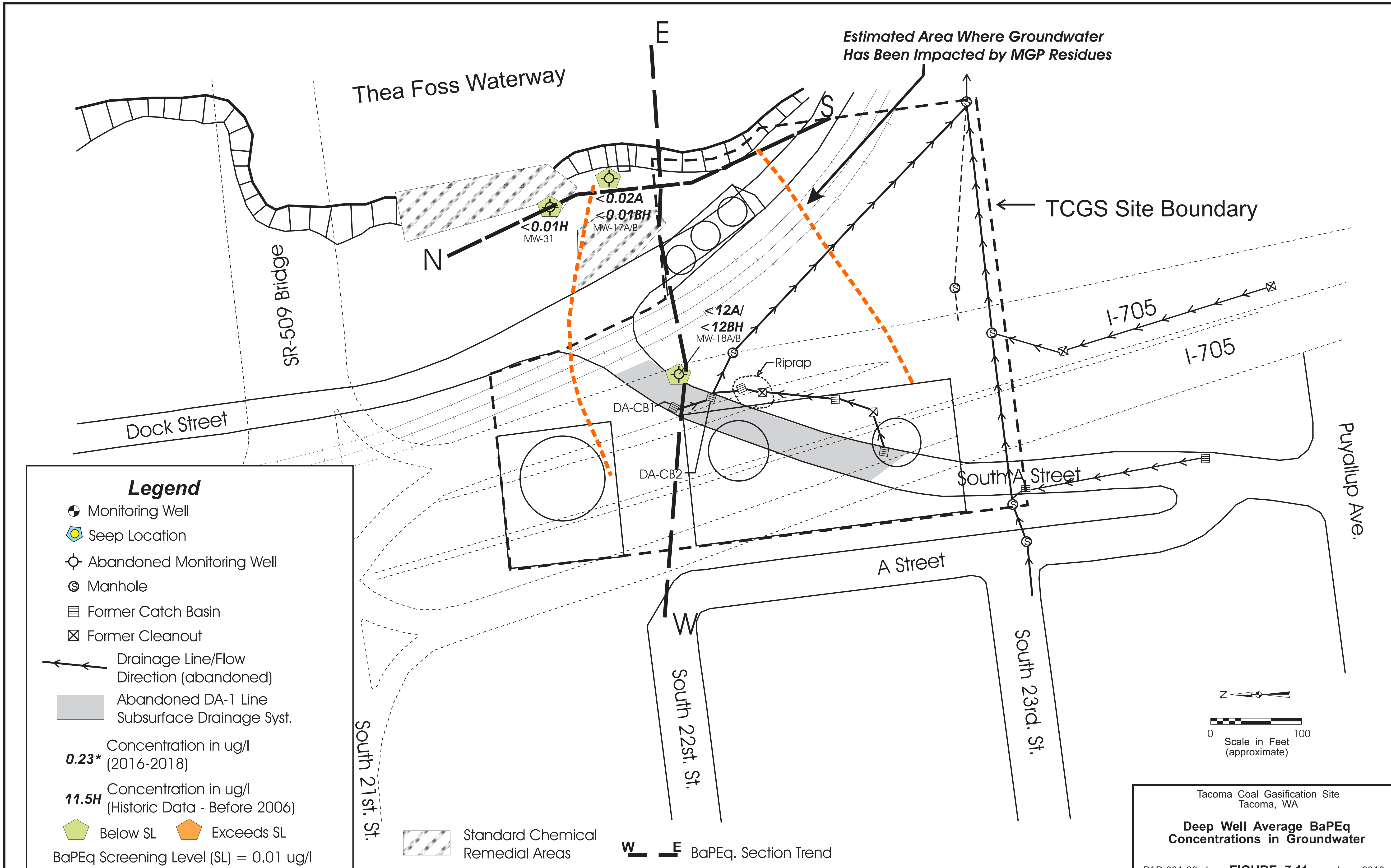
Tacoma Coal Gasification Site
Tacoma, WA

Shallow Well Average BaPEq Concentrations in Groundwater

PAP-001-08a,b **FIGURE 7.11a** April 2019

Dalton, Olmsted & Fuglevand, Inc.


Estimated Area Where Groundwater
Has Been Impacted by MGP Residues
Thea Foss Waterway
E
S
N
W
Seep 2
<0.01*
Seep 1
<0.01*
MW-12
<0.01H
<0.01*
MW-28
<0.01*
MW-29
<0.01*
MW-30
TCGS Site Boundary
SR-509 Bridge
<0.03H
MW-7R
<0.01H
MW-15R
Riprap
I-705
I-705
DA-CB1
DA-CB2
<0.01H
MW-19
Dock Street
South A Street
A Street
<0.01H
MW-20
<0.01H
MW-21
Puyallup Ave.
South 21st. St.
South 22st. St.
South 23rd. St.
Legend
Monitoring Well
Seep Location
Abandoned Monitoring Well
Manhole
Former Catch Basin
Former Cleanout
Drainage Line/Flow Direction (abandoned)
Abandoned DA-1 Line Subsurface Drainage Syst.
0.23* Concentration in ug/l (2016-2018)
11.5H Concentration in ug/l (Historic Data - Before 2006)
Below SL
Exceeds SL
BaPEq Screening Level (SL) = 0.01 ug/l
Standard Chemical Remedial Areas
W E BaPEq. Section Trend
N
0
100
Scale in Feet (approximate)
Ref: Well Locations Interm Conc.cdr
Tacoma Coal Gasification Site
Tacoma, WA
Intermediate Well Average BaPEq Concentrations in Groundwater
PAP-001-08a,b
FIGURE 7.11b
April 2019
Dalton, Olmsted & Fuglevand, Inc.



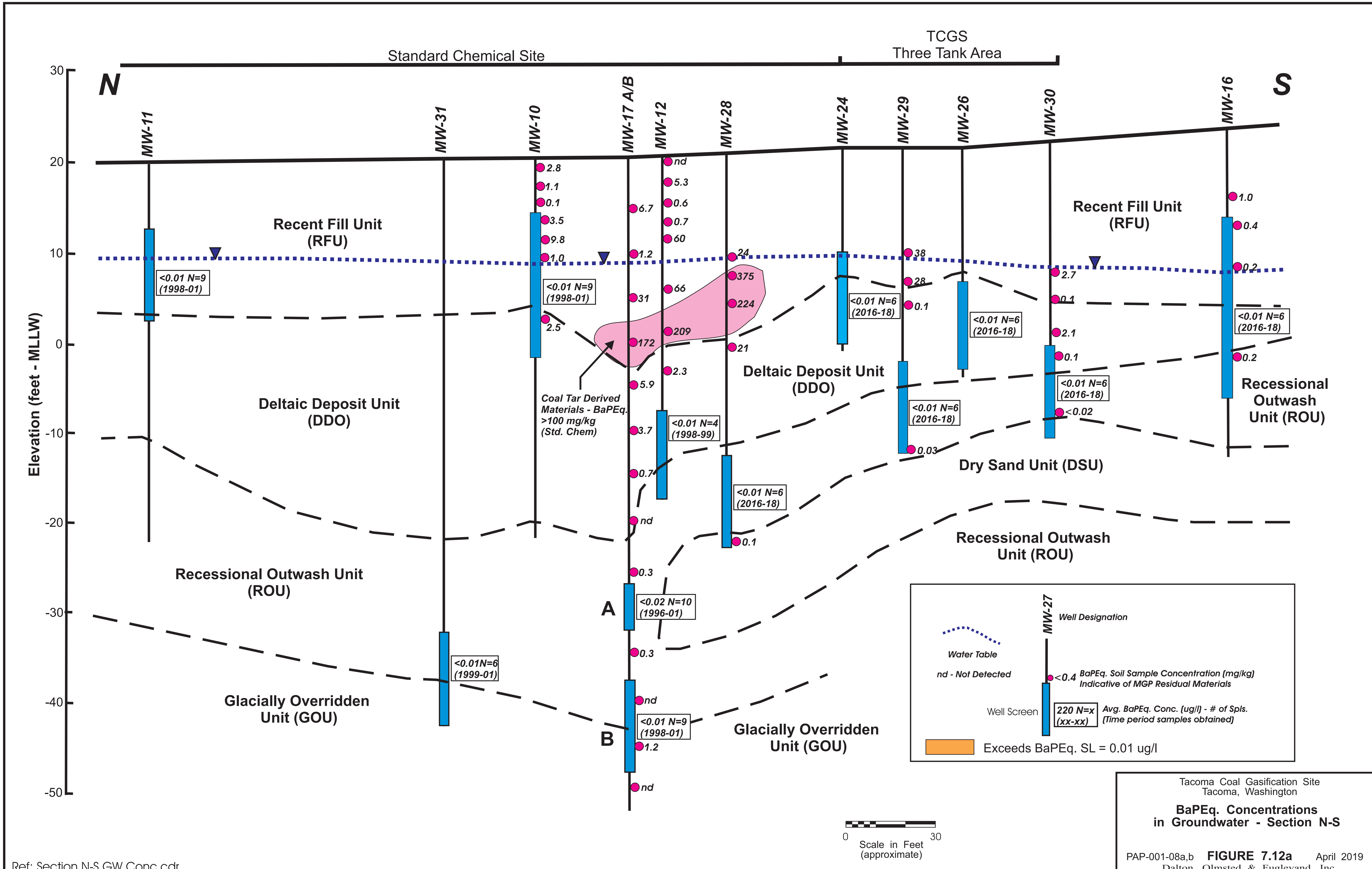
Ref: Well Locations Deeper Conc.cdr

Tacoma Coal Gasification Site
Tacoma, WA

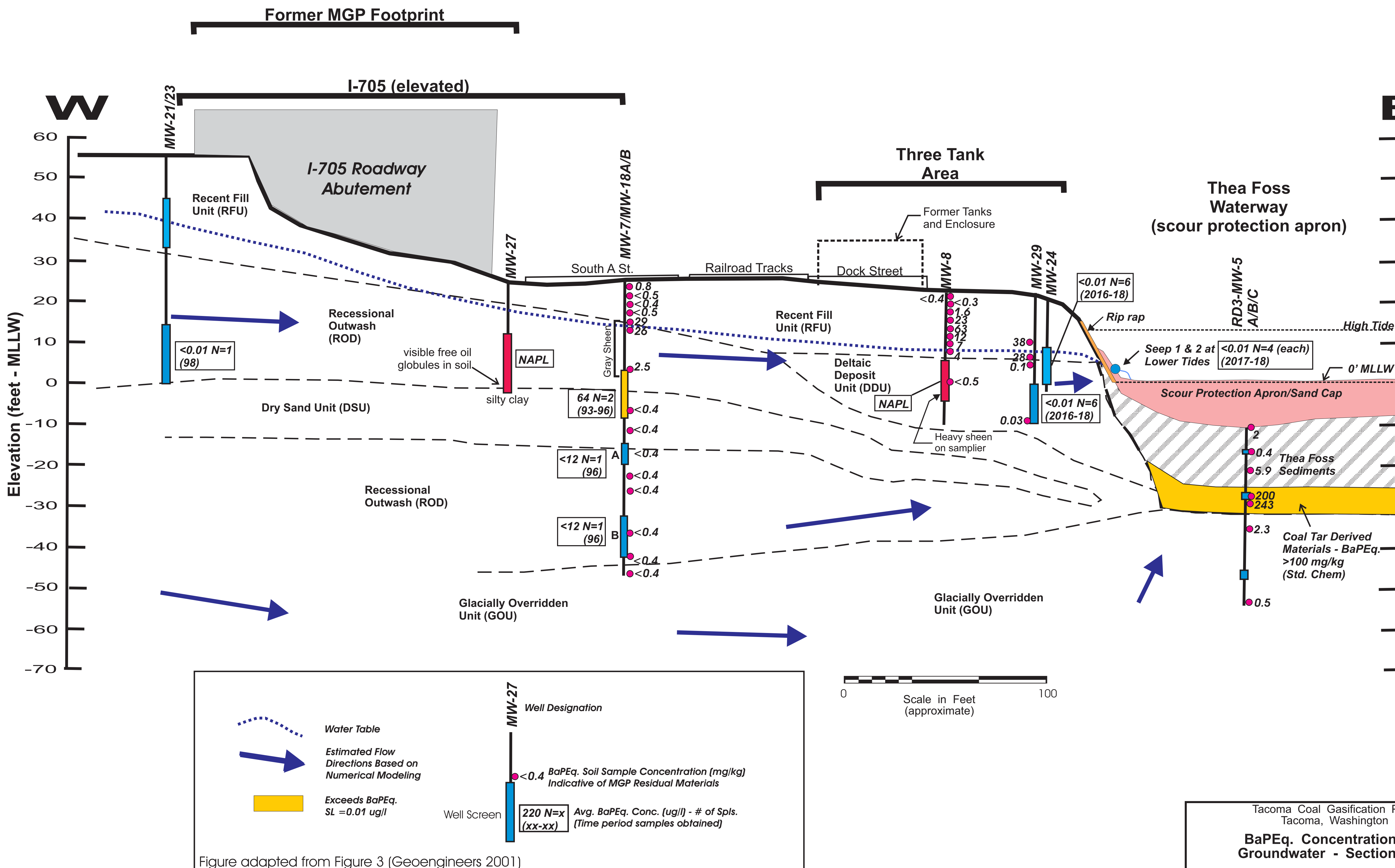
Deep Well Average BaPEq Concentrations in Groundwater

PAP-001-08a,b **FIGURE 7.11c** June 2018

Dalton, Olmsted & Fuglevand, Inc.



Standard Chemical Site
TCGS
Three Tank Area
N
S
MW-11
MW-31
MW-10
MW-17 A/B
MW-12
MW-28
MW-24
MW-29
MW-26
MW-30
MW-16
Elevation (feet - MLLW)
Recent Fill Unit (RFU)
Deltaic Deposit Unit (DDO)
Recessional Outwash Unit (ROU)
Glacially Overridden Unit (GOU)
Dry Sand Unit (DSU)
Recessional Outwash Unit (ROU)
Coal Tar Derived Materials - BaPEq. >100 mg/kg (Std. Chem)
<0.01 N=9 (1998-01)
<0.01N=6 (1999-01)
<0.02 N=10 (1996-01)
<0.01 N=4 (1998-99)
<0.01 N=6 (2016-18)
Water Table
nd - Not Detected
Well Designation
BaPEq. Soil Sample Concentration (mg/kg) Indicative of MGP Residual Materials
Well Screen
220 N=x (xx-xx)
Avg. BaPEq. Conc. (ug/l) - # of Spls. (Time period samples obtained)
Exceeds BaPEq. SL = 0.01 ug/l
Scale in Feet (approximate)
Tacoma Coal Gasification Site
Tacoma, Washington
BaPEq. Concentrations in Groundwater - Section N-S
PAP-001-08a,b
FIGURE 7.12a
April 2019
Dalton, Olmsted & Fuglevand, Inc.
Ref: Section N-S GW Conc.cdr



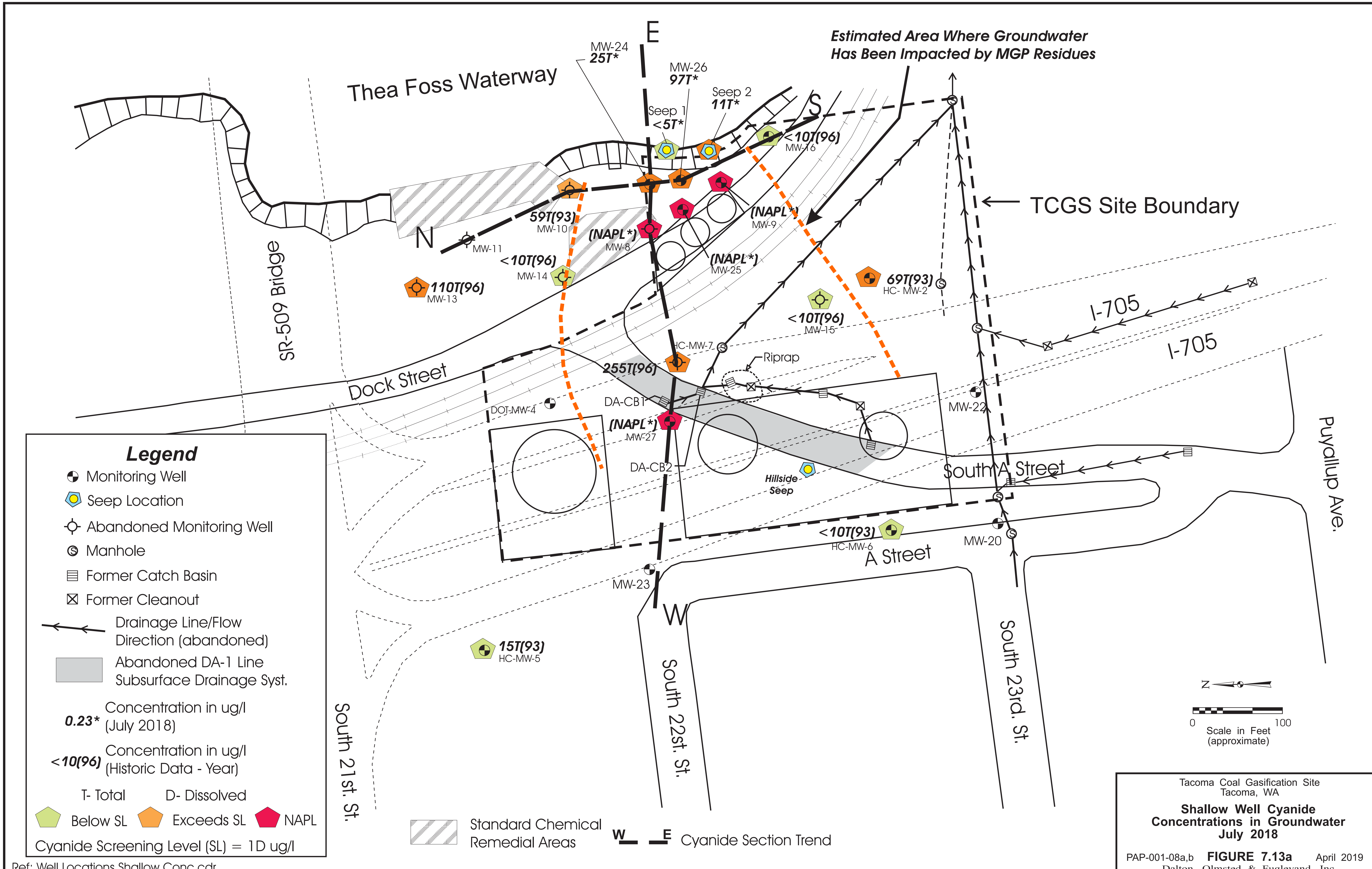
Ref: Section E-Wa GW Conc.cdr

Tacoma Coal Gasification Plant
Tacoma, Washington

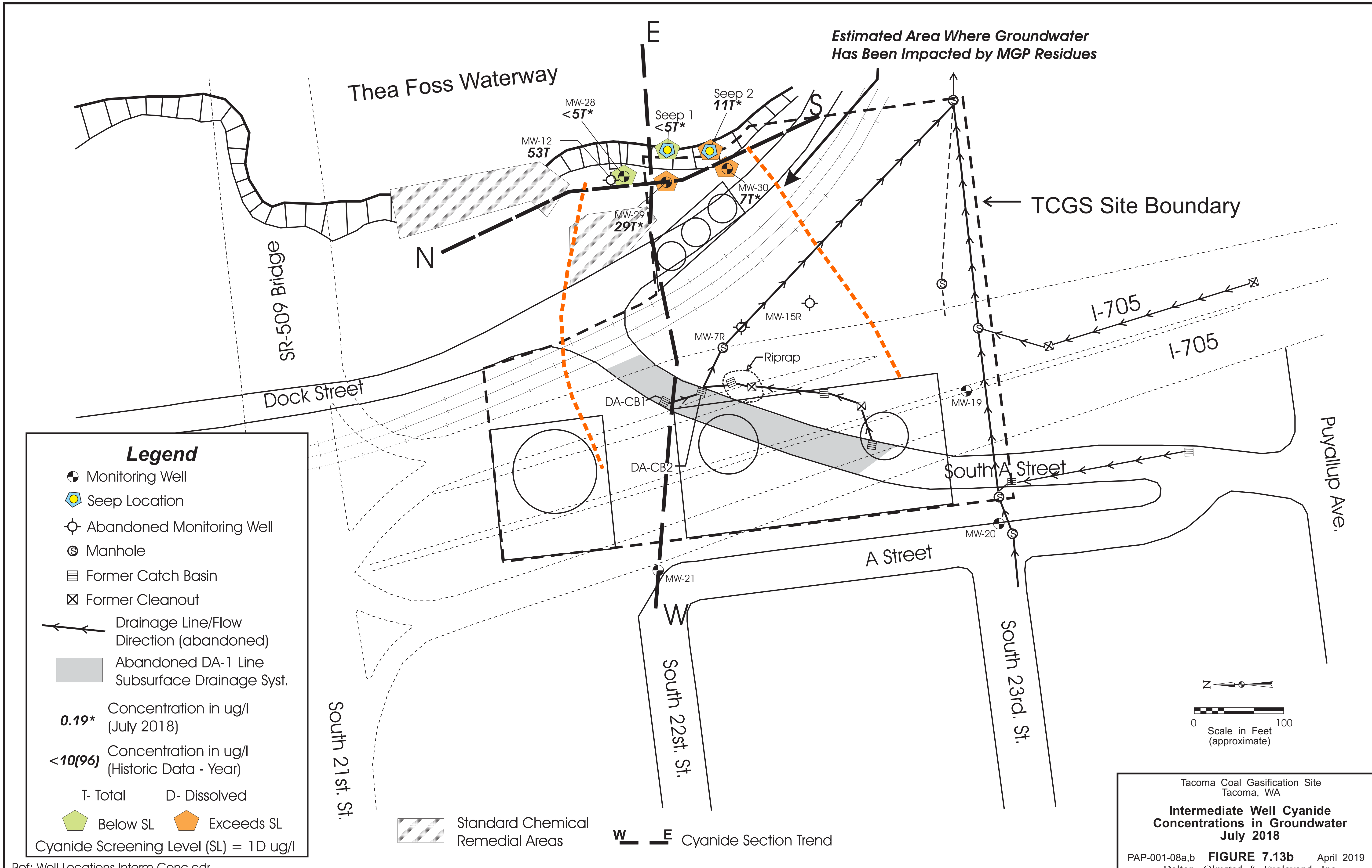
BaPEq. Concentrations in Groundwater - Section W-E

PAP-001-08a,b **FIGURE 7.12b** April 2019

Dalton, Olmsted & Fuglevand, Inc.



Thea Foss Waterway
Estimated Area Where Groundwater Has Been Impacted by MGP Residues
TCGS Site Boundary
E
N
S
W
MW-24
25T*
MW-26
97T*
Seep 1
<5T*
Seep 2
11T*
<10T(96)
MW-16
59T(93)
MW-10
(NAPL*)
MW-8
MW-11
<10T(96)
MW-14
110T(96)
MW-13
(NAPL*)
MW-9
(NAPL*)
MW-25
69T(93)
HC- MW-2
<10T(96)
MW-15
HC-MW-7
Riprap
255T(96)
DA-CB1
DOT-MW-4
(NAPL*)
MW-27
DA-CB2
Hillside Seep
MW-22
South A Street
<10T(93)
HC-MW-6
A Street
MW-20
MW-23
15T(93)
HC-MW-5
SR-509 Bridge
Dock Street
I-705
I-705
Puyallup Ave.
South 21st. St.
South 22st. St.
South 23rd. St.
Legend
Monitoring Well
Seep Location
Abandoned Monitoring Well
Manhole
Former Catch Basin
Former Cleanout
Drainage Line/Flow Direction (abandoned)
Abandoned DA-1 Line Subsurface Drainage Syst.
0.23* Concentration in ug/l (July 2018)
<10(96) Concentration in ug/l (Historic Data - Year)
T- Total
D- Dissolved
Below SL
Exceeds SL
NAPL
Cyanide Screening Level (SL) = 1D ug/l
Standard Chemical Remedial Areas
W E Cyanide Section Trend
N
0
100
Scale in Feet (approximate)
Ref: Well Locations Shallow Conc.cdr
Tacoma Coal Gasification Site
Tacoma, WA
Shallow Well Cyanide Concentrations in Groundwater July 2018
PAP-001-08a,b
FIGURE 7.13a
April 2019
Dalton, Olmsted & Fuglevand, Inc.



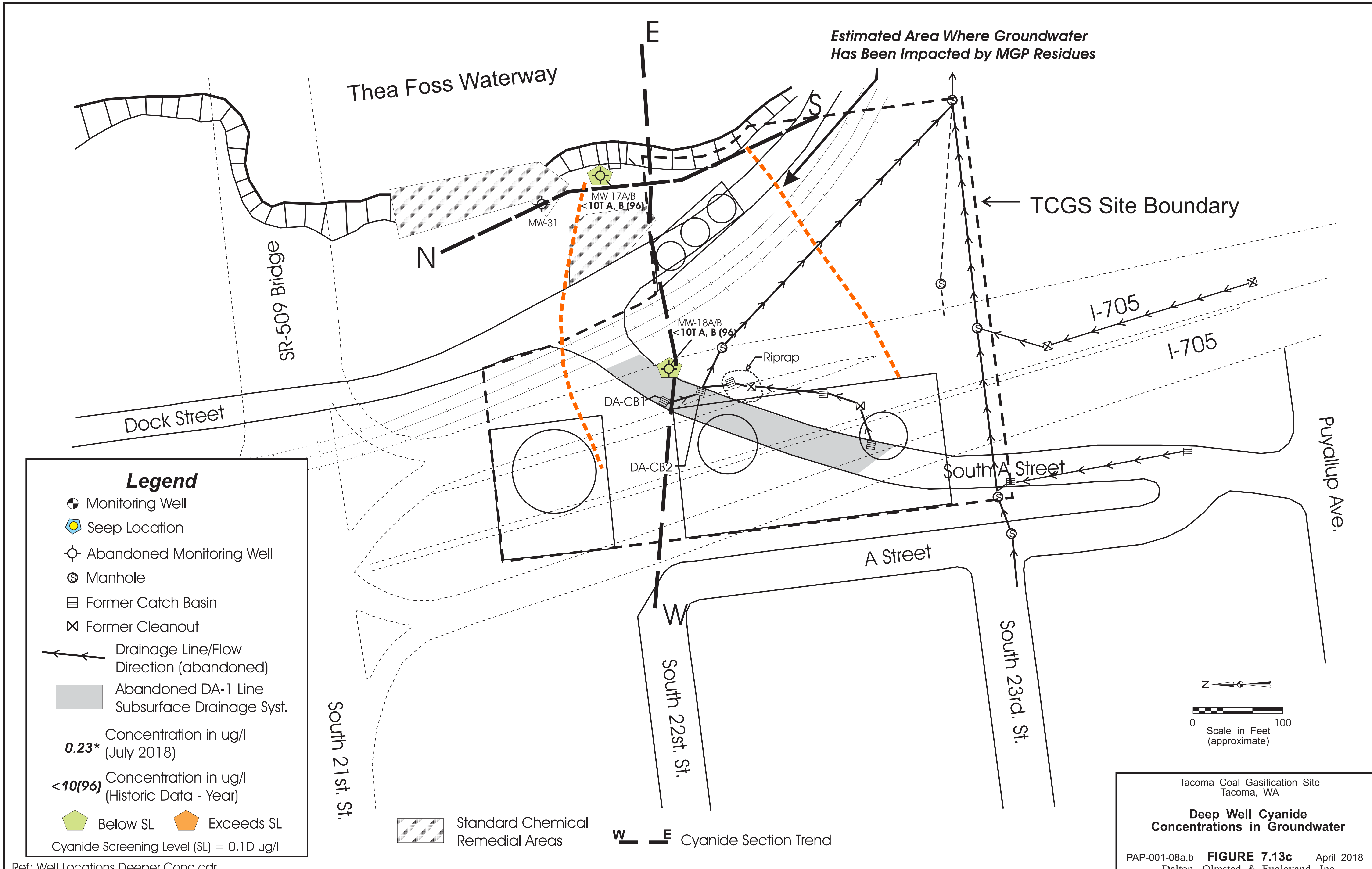
Ref: Well Locations Interm Conc.cdr

Tacoma Coal Gasification Site
Tacoma, WA

Intermediate Well Cyanide Concentrations in Groundwater July 2018

PAP-001-08a,b **FIGURE 7.13b** April 2019

Dalton, Olmsted & Fuglevand, Inc.



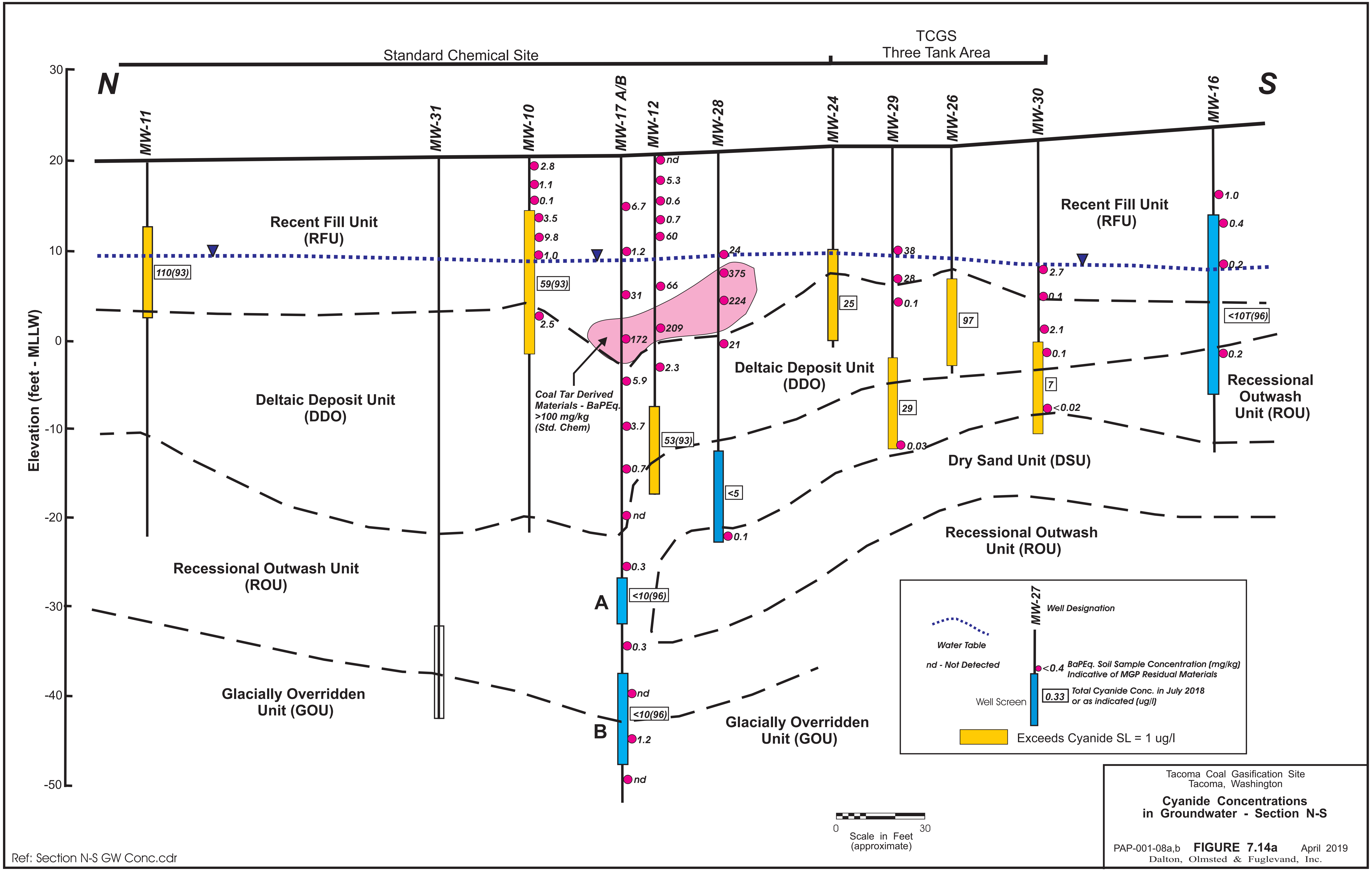
Ref: Well Locations Deeper Conc.cdr

Tacoma Coal Gasification Site
Tacoma, WA

Deep Well Cyanide Concentrations in Groundwater

PAP-001-08a,b **FIGURE 7.13c** April 2018

Dalton, Olmsted & Fuglevand, Inc.

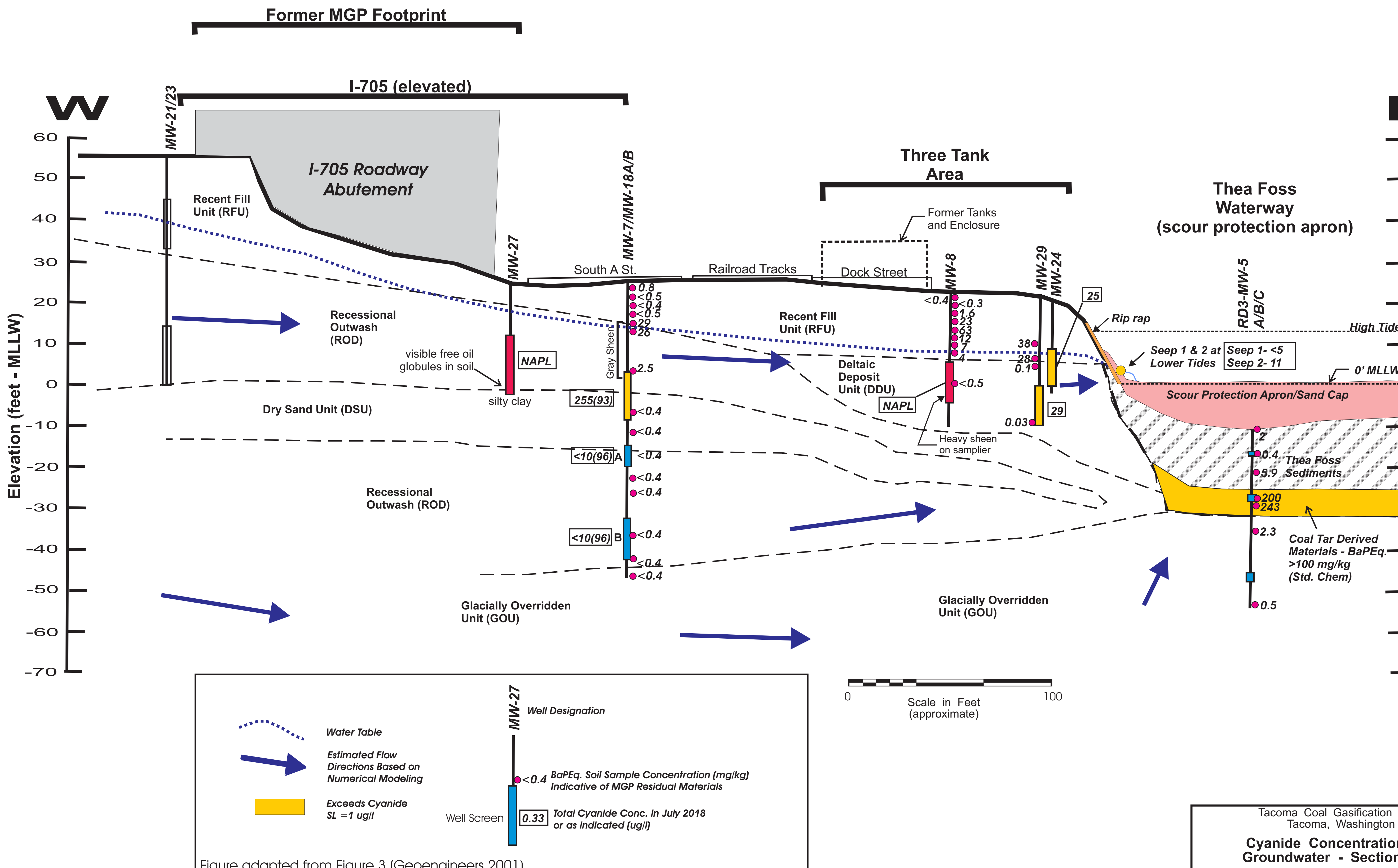


Tacoma Coal Gasification Site
Tacoma, Washington

Cyanide Concentrations in Groundwater - Section N-S

PAP-001-08a,b **FIGURE 7.14a** April 2019

Dalton, Olmsted & Fuglevand, Inc.



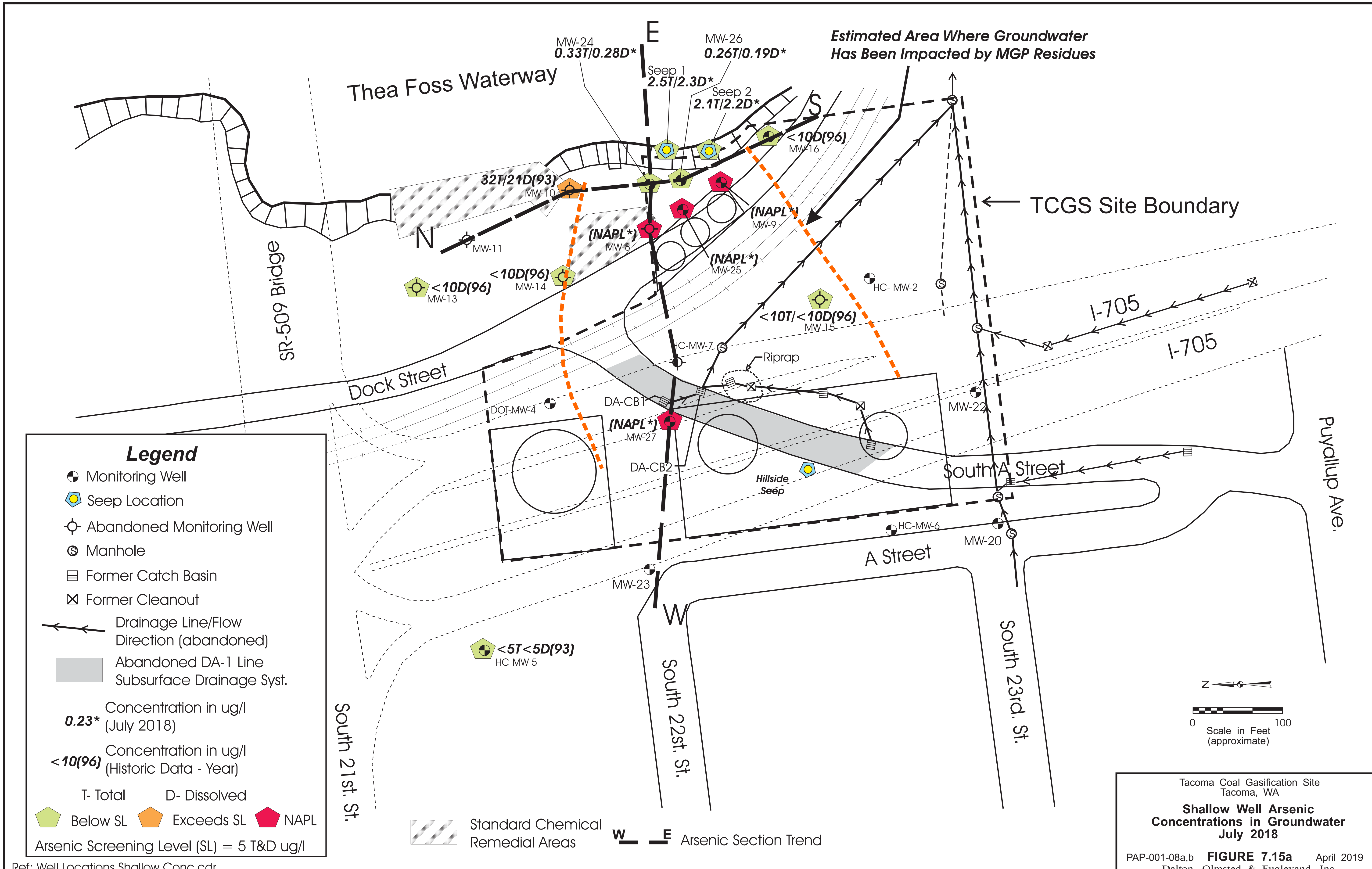
Tacoma Coal Gasification Plant
Tacoma, Washington

Cyanide Concentrations in Groundwater - Section W-E

PAP-001-08a,b **FIGURE 7.14b** April 2019

Dalton, Olmsted & Fuglevand, Inc.

Ref: Section E-Wa GW Conc.cdr

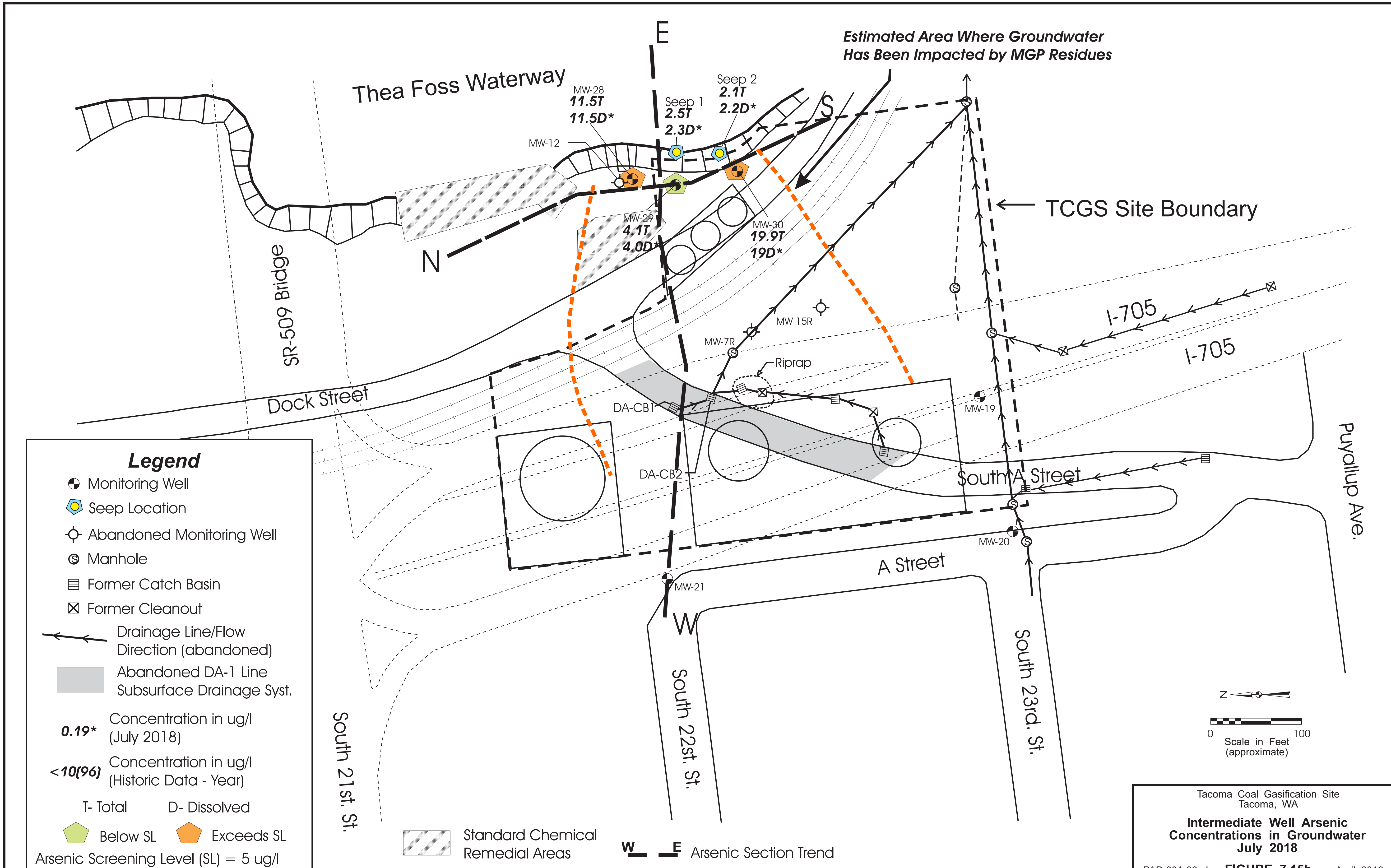


Tacoma Coal Gasification Site
Tacoma, WA

Shallow Well Arsenic Concentrations in Groundwater July 2018

PAP-001-08a,b **FIGURE 7.15a** April 2019

Dalton, Olmsted & Fuglevand, Inc.



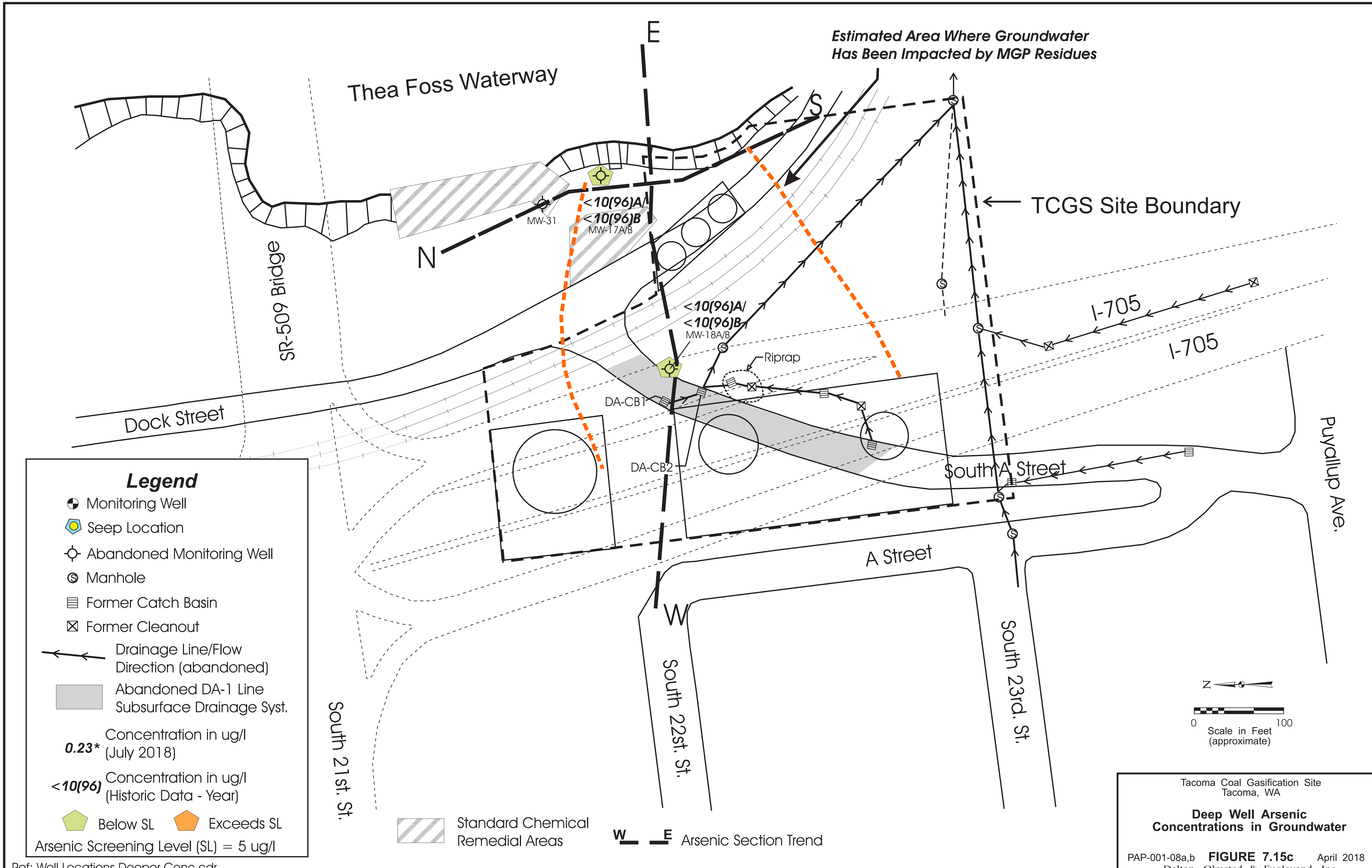
Ref: Well Locations Interm Conc.cdr

Tacoma Coal Gasification Site
Tacoma, WA

Intermediate Well Arsenic Concentrations in Groundwater July 2018

PAP-001-08a,b **FIGURE 7.15b** April 2019

Dalton, Olmsted & Fuglevand, Inc.

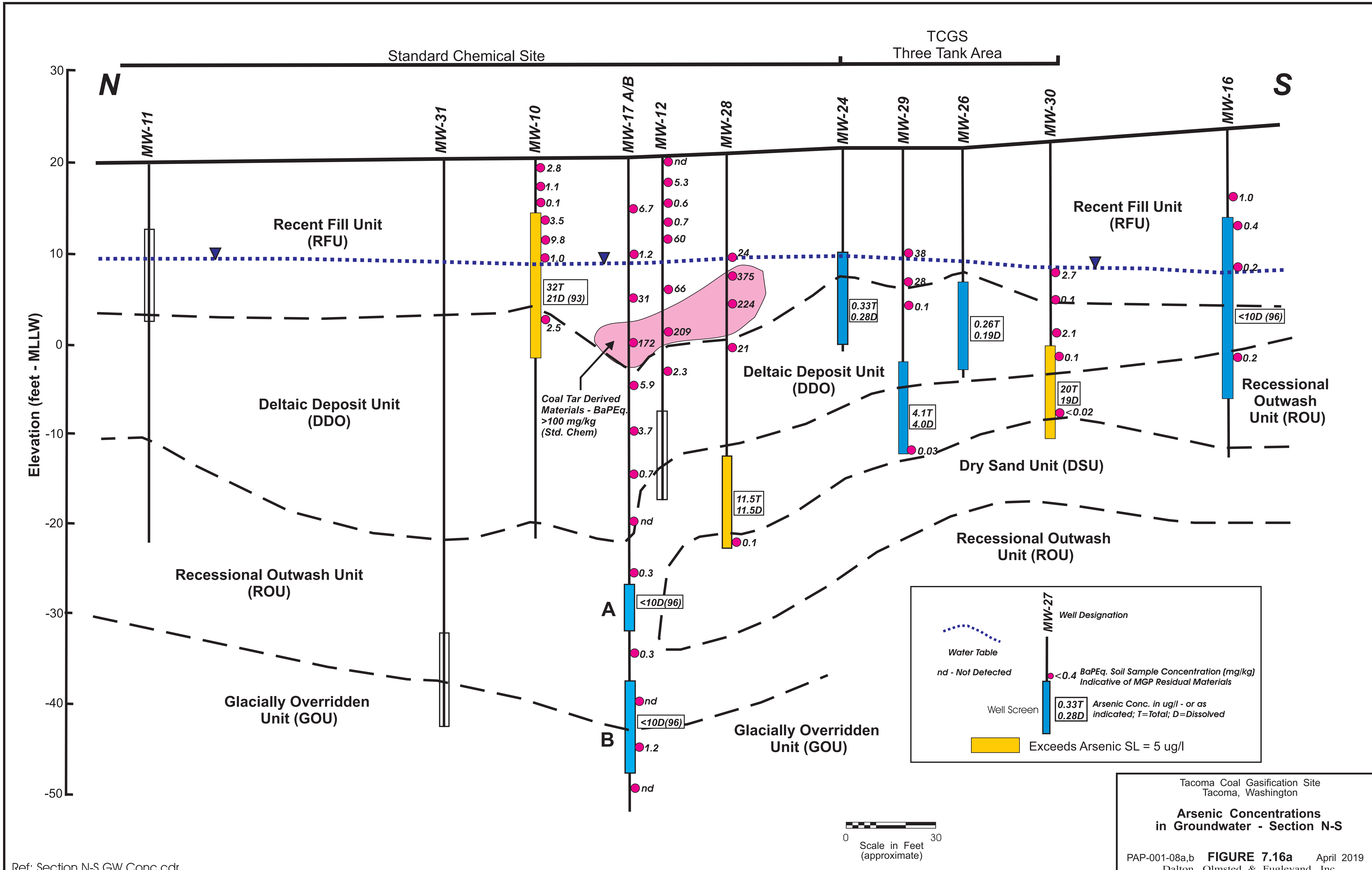


Tacoma Coal Gasification Site
Tacoma, WA

Deep Well Arsenic Concentrations in Groundwater

PAP-001-08a,b **FIGURE 7.15c** April 2018

Dalton, Olmsted & Fuglevand, Inc.

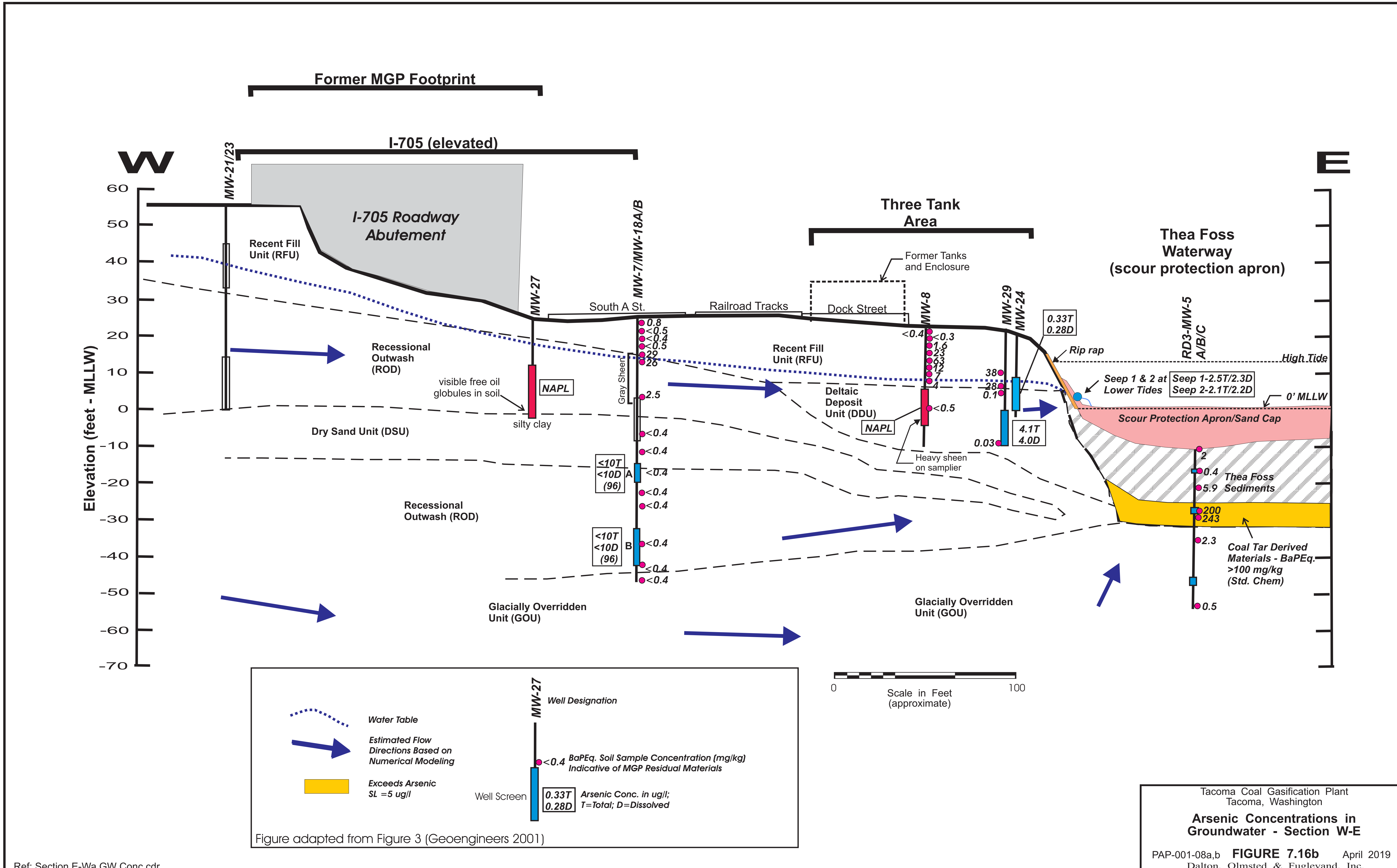


Tacoma Coal Gasification Site
Tacoma, Washington

Arsenic Concentrations in Groundwater - Section N-S

PAP-001-08a,b **FIGURE 7.16a** April 2019

Dalton, Olmsted & Fuglevand, Inc.

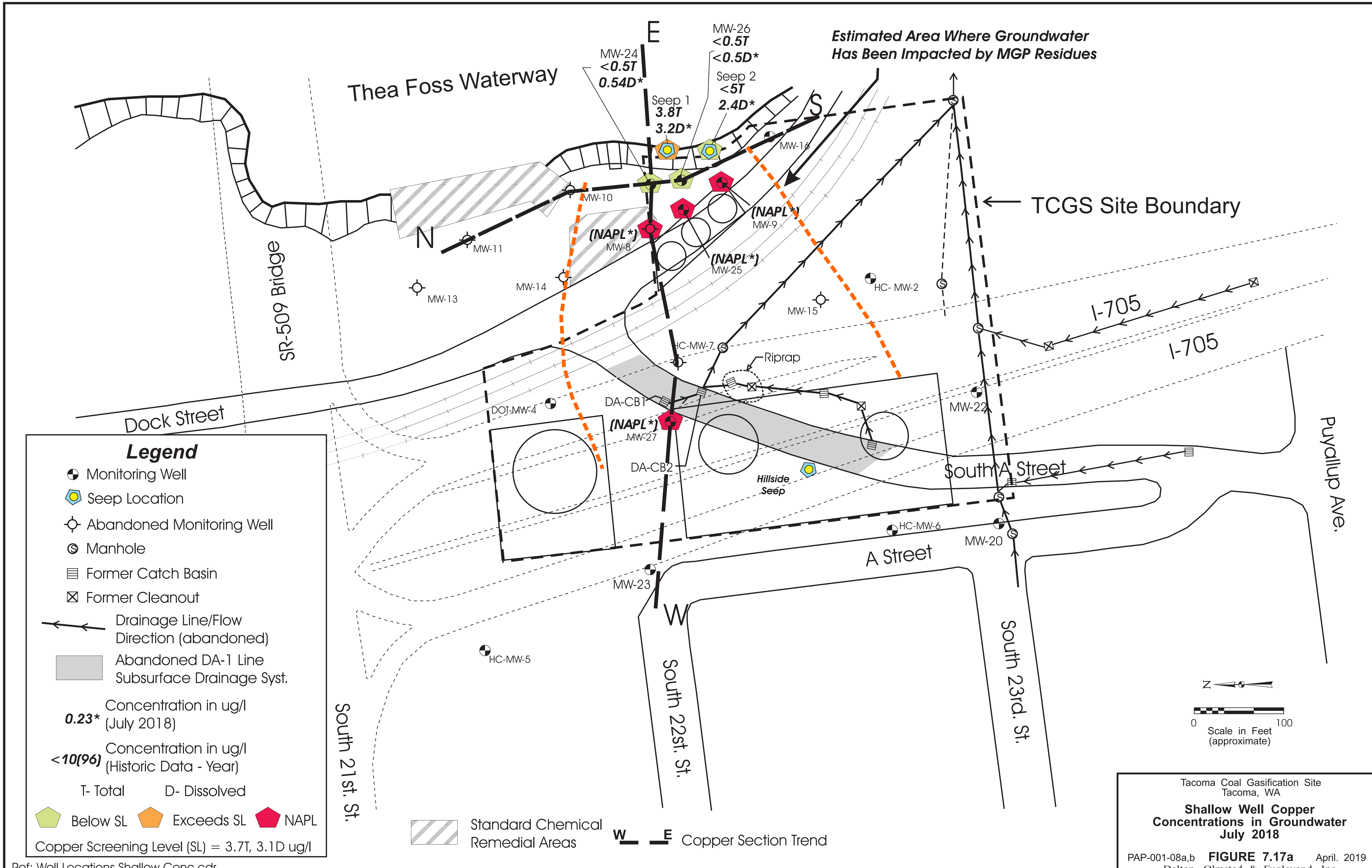


Tacoma Coal Gasification Plant
Tacoma, Washington

Arsenic Concentrations in Groundwater - Section W-E

PAP-001-08a,b **FIGURE 7.16b** April 2019

Dalton, Olmsted & Fuglevand, Inc.



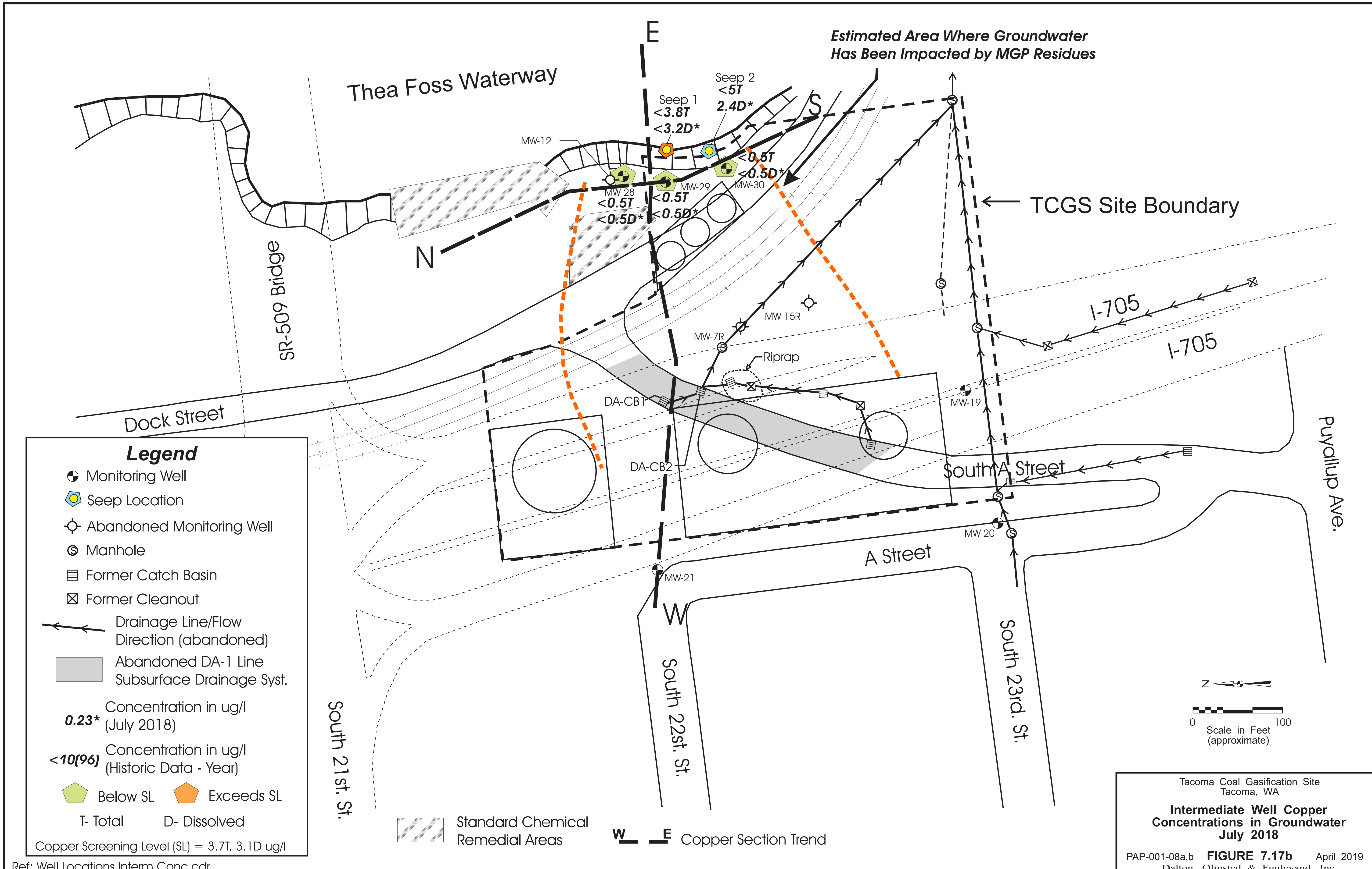
Ref: Well Locations Shallow Conc.cdr

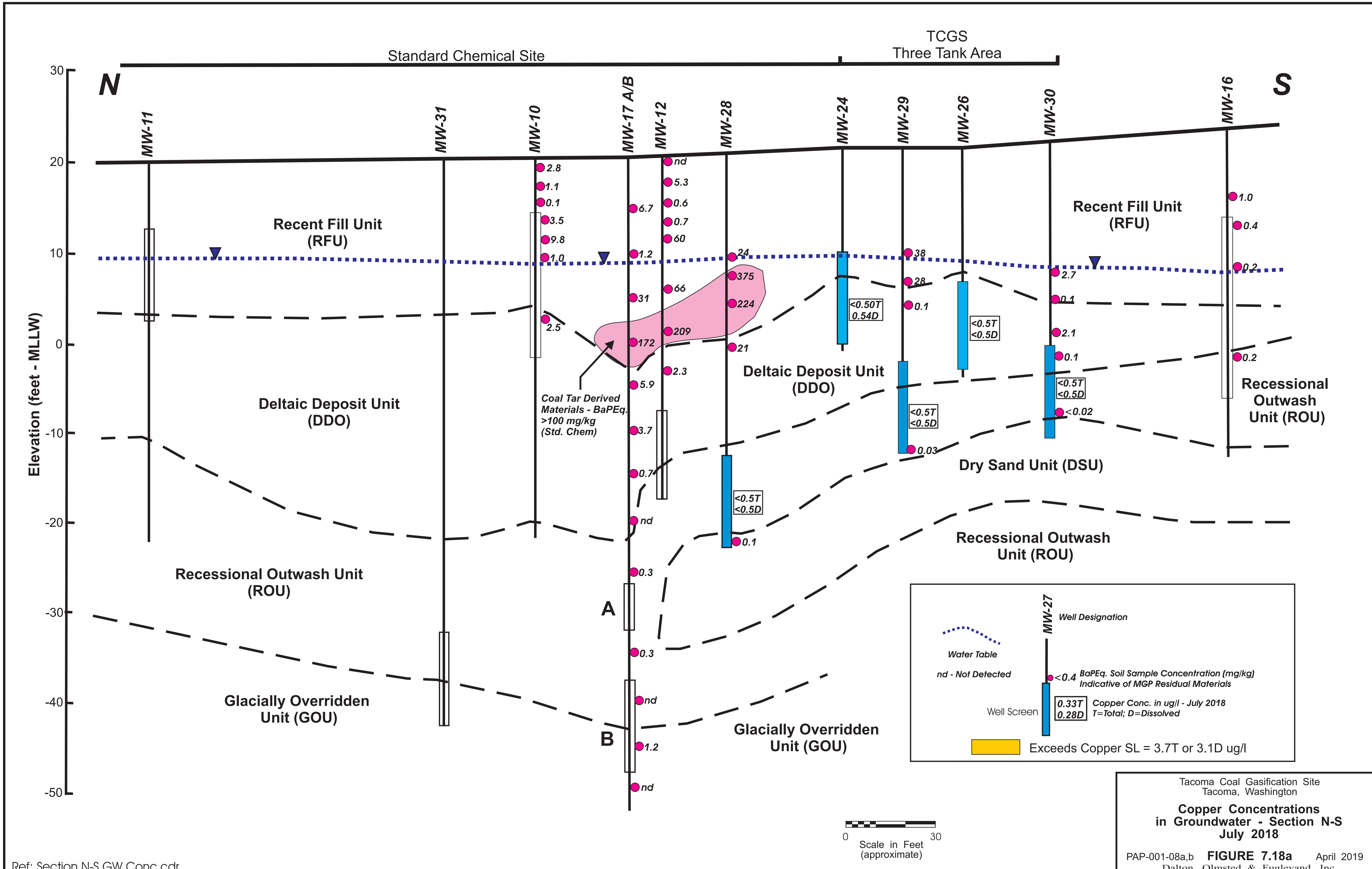
Tacoma Coal Gasification Site
Tacoma, WA

Shallow Well Copper Concentrations in Groundwater July 2018

PAP-001-08a,b **FIGURE 7.17a** April. 2019

Dalton, Olmsted & Fuglevand, Inc.


Thea Foss Waterway
Estimated Area Where Groundwater Has Been Impacted by MGP Residues
TCGS Site Boundary
E
N
S
W
Seep 1
<3.8T
<3.2D*
Seep 2
<5T
2.4D*
MW-12
MW-28
<0.5T
<0.5D*
MW-29
<0.5T
<0.5D*
MW-30
<0.5T
<0.5D*
MW-15R
MW-7R
Riprap
DA-CB1
DA-CB2
MW-19
MW-20
MW-21
SR-509 Bridge
Dock Street
I-705
I-705
South A Street
A Street
Puyallup Ave.
South 21st. St.
South 22st. St.
South 23rd. St.
Legend
Monitoring Well
Seep Location
Abandoned Monitoring Well
Manhole
Former Catch Basin
Former Cleanout
Drainage Line/Flow Direction (abandoned)
Abandoned DA-1 Line Subsurface Drainage Syst.
0.23* Concentration in ug/l (July 2018)
<10(96) Concentration in ug/l (Historic Data - Year)
Below SL
Exceeds SL
T- Total
D- Dissolved
Copper Screening Level (SL) = 3.7T, 3.1D ug/l
Standard Chemical Remedial Areas
W E Copper Section Trend
N
0
100
Scale in Feet (approximate)
Ref: Well Locations Interm Conc.cdr
Tacoma Coal Gasification Site
Tacoma, WA
Intermediate Well Copper Concentrations in Groundwater July 2018
PAP-001-08a,b
FIGURE 7.17b
April 2019
Dalton, Olmsted & Fuglevand, Inc.



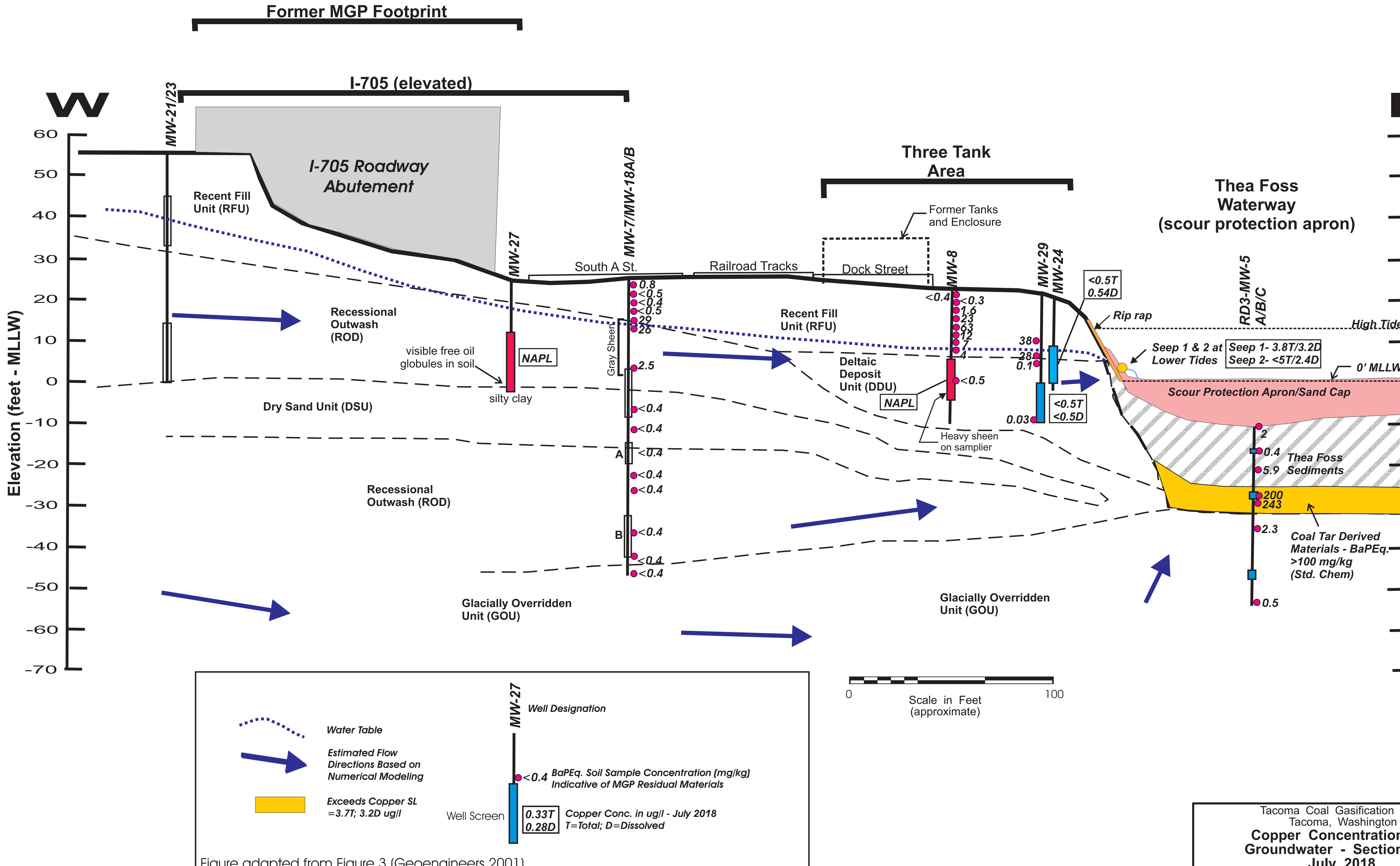
Tacoma Coal Gasification Site
Tacoma, Washington

Copper Concentrations in Groundwater - Section N-S July 2018

PAP-001-08a,b **FIGURE 7.18a** April 2019

Dalton, Olmsted & Fuglevand, Inc.

Ref: Section N-S GW Conc.cdr



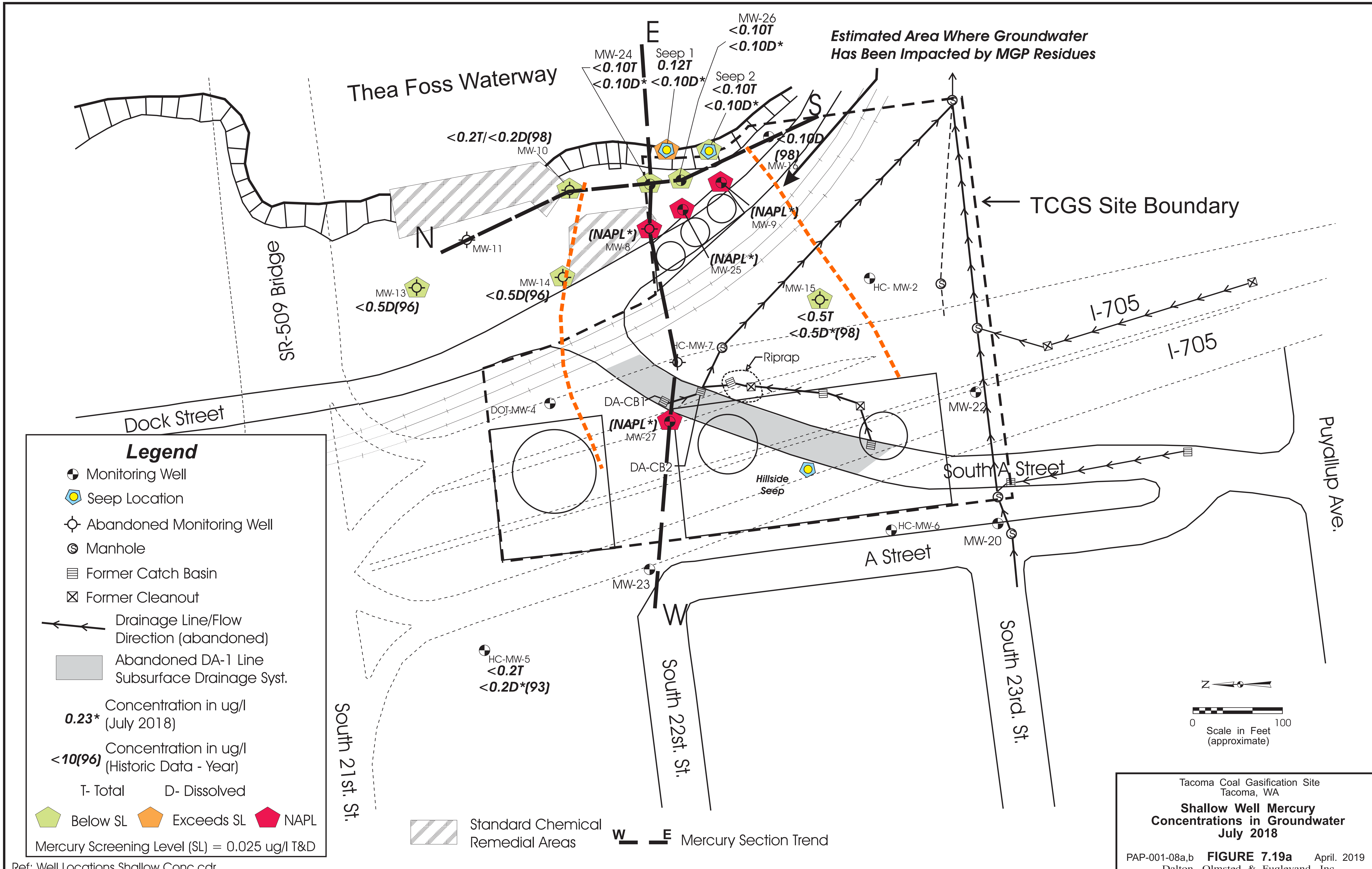
Ref: Section E-Wa GW Conc.cdr

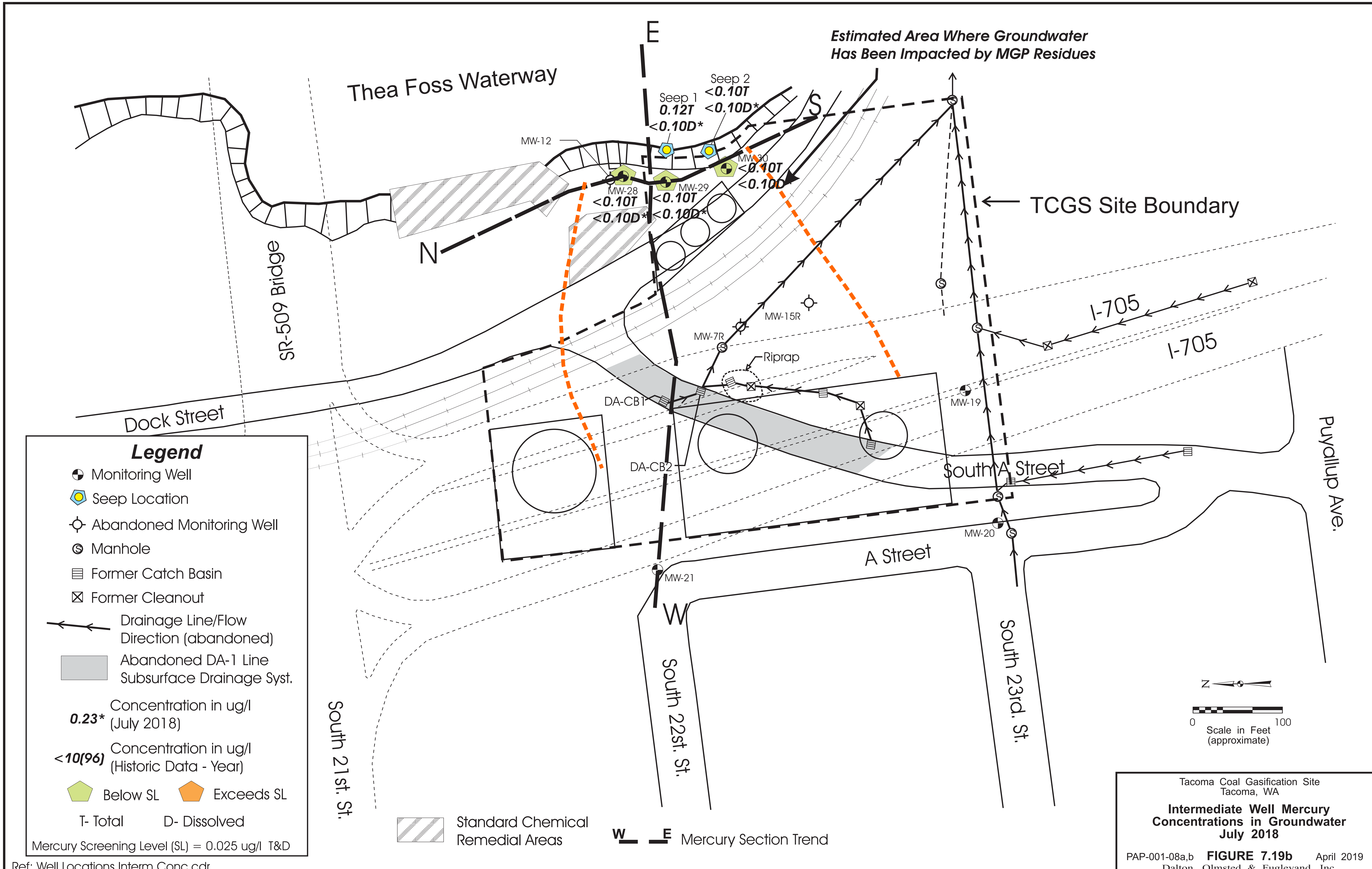
Tacoma Coal Gasification Plant
Tacoma, Washington

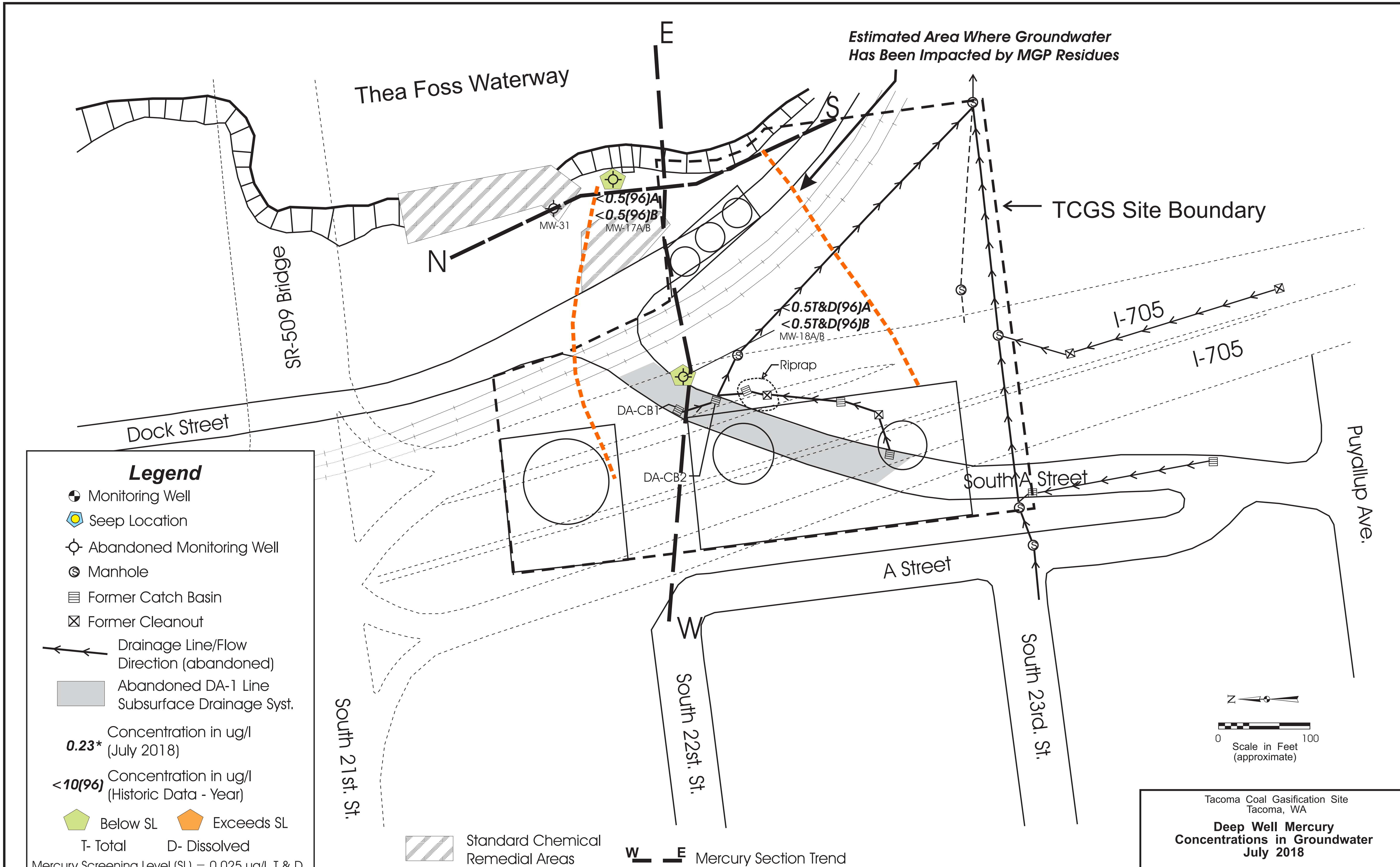
Copper Concentrations in Groundwater - Section W-E July 2018

PAP-001-08a,b **FIGURE 7.18b** April 2019

Dalton, Olmsted & Fuglevand, Inc.


Thea Foss Waterway
Estimated Area Where Groundwater Has Been Impacted by MGP Residues
TCGS Site Boundary
MW-24
<0.10T
<0.10D*
Seep 1
0.12T
<0.10D*
MW-26
<0.10T
<0.10D*
Seep 2
<0.10T
<0.10D*
<0.2T/<0.2D(98)
MW-10
<0.10D
(98)
MW-16
(NAPL*)
MW-9
(NAPL*)
MW-8
(NAPL*)
MW-25
MW-11
MW-14
<0.5D(96)
MW-13
<0.5D(96)
MW-15
<0.5T
<0.5D*(98)
HC- MW-2
HC-MW-7
Riprap
DA-CB1
(NAPL*)
MW-27
DA-CB2
DOT-MW-4
MW-22
Hillside Seep
HC-MW-6
MW-20
MW-23
HC-MW-5
<0.2T
<0.2D*(93)
E
S
N
W
SR-509 Bridge
Dock Street
I-705
I-705
South A Street
A Street
Puyallup Ave.
South 21st. St.
South 22st. St.
South 23rd. St.
Legend
Monitoring Well
Seep Location
Abandoned Monitoring Well
Manhole
Former Catch Basin
Former Cleanout
Drainage Line/Flow Direction (abandoned)
Abandoned DA-1 Line Subsurface Drainage Syst.
0.23* Concentration in ug/l (July 2018)
<10(96) Concentration in ug/l (Historic Data - Year)
T- Total D- Dissolved
Below SL
Exceeds SL
NAPL
Mercury Screening Level (SL) = 0.025 ug/l T&D
Standard Chemical Remedial Areas
W E Mercury Section Trend
N
0
100
Scale in Feet (approximate)
Ref: Well Locations Shallow Conc.cdr
Tacoma Coal Gasification Site
Tacoma, WA
Shallow Well Mercury Concentrations in Groundwater July 2018
PAP-001-08a,b
FIGURE 7.19a
April. 2019
Dalton, Olmsted & Fuglevand, Inc.


Estimated Area Where Groundwater
Has Been Impacted by MGP Residues
Thea Foss Waterway
E
S
N
W
Seep 1
0.12T
<0.10D*
Seep 2
<0.10T
<0.10D*
MW-12
MW-28
<0.10T
<0.10D*
MW-29
<0.10T
<0.10D*
MW-30
<0.10T
<0.10D
TCGS Site Boundary
SR-509 Bridge
Dock Street
MW-15R
MW-7R
Riprap
DA-CB1
DA-CB2
MW-19
I-705
I-705
South A Street
A Street
MW-20
MW-21
Puyallup Ave.
South 21st. St.
South 22st. St.
South 23rd. St.
Legend
Monitoring Well
Seep Location
Abandoned Monitoring Well
Manhole
Former Catch Basin
Former Cleanout
Drainage Line/Flow Direction (abandoned)
Abandoned DA-1 Line Subsurface Drainage Syst.
0.23* Concentration in ug/l (July 2018)
<10(96) Concentration in ug/l (Historic Data - Year)
Below SL
Exceeds SL
T- Total
D- Dissolved
Mercury Screening Level (SL) = 0.025 ug/l T&D
Standard Chemical Remedial Areas
W E Mercury Section Trend
N
0
100
Scale in Feet
(approximate)
Ref: Well Locations Interm Conc.cdr
Tacoma Coal Gasification Site
Tacoma, WA
Intermediate Well Mercury Concentrations in Groundwater July 2018
PAP-001-08a,b
FIGURE 7.19b
April 2019
Dalton, Olmsted & Fuglevand, Inc.



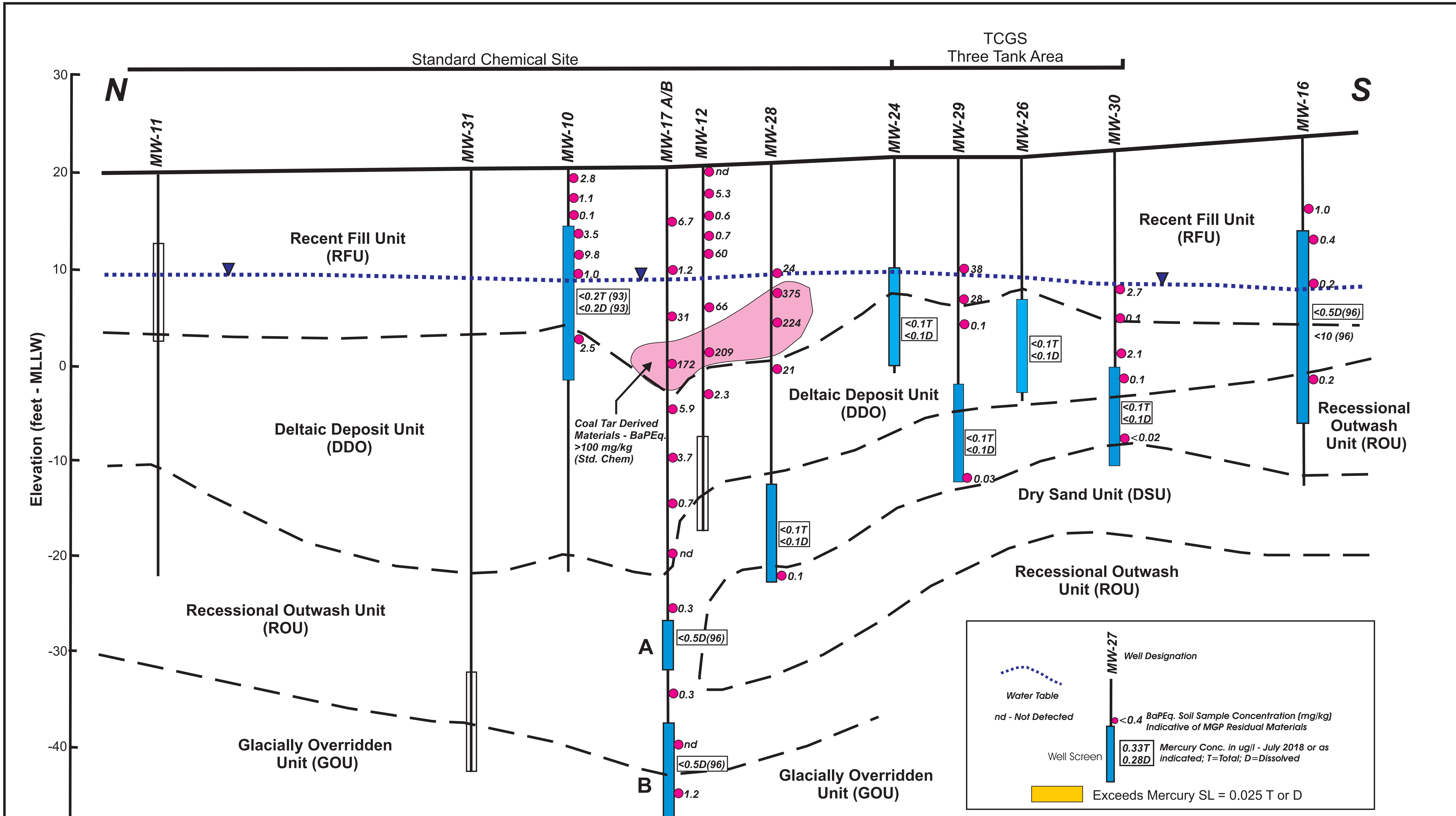
Ref: Well Locations Deeper Conc.cdr

Tacoma Coal Gasification Site
Tacoma, WA

Deep Well Mercury Concentrations in Groundwater July 2018

PAP-001-08a,b **FIGURE 7.19c** April 2018

Dalton, Olmsted & Fuglevand, Inc.



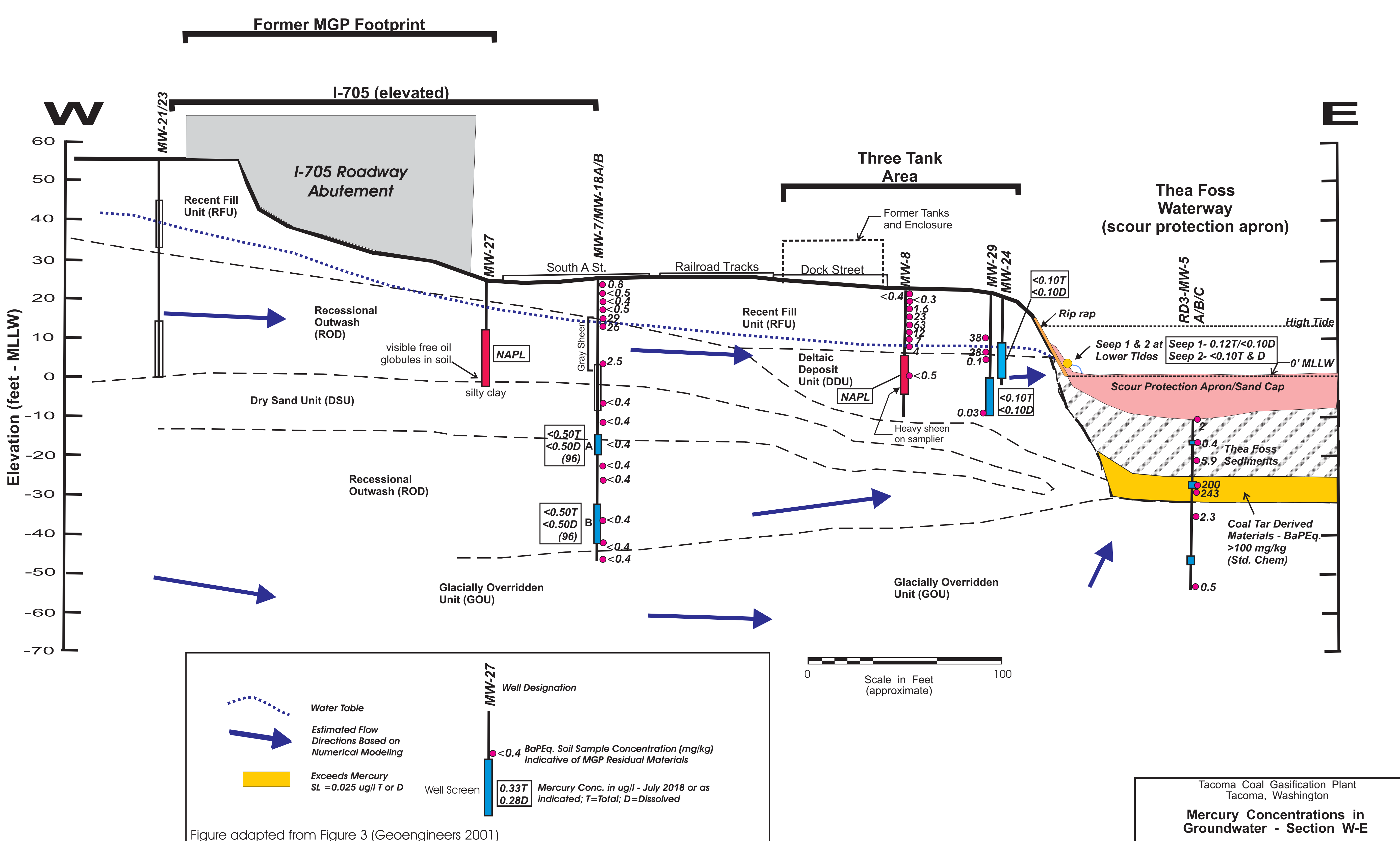
Ref: Section N-S GW Conc.cdr

Tacoma Coal Gasification Site
Tacoma, Washington

Mercury Concentrations in Groundwater - Section N-S

PAP-001-08a,b **FIGURE 7.20a** April 2019

Dalton, Olmsted & Fuglevand, Inc.



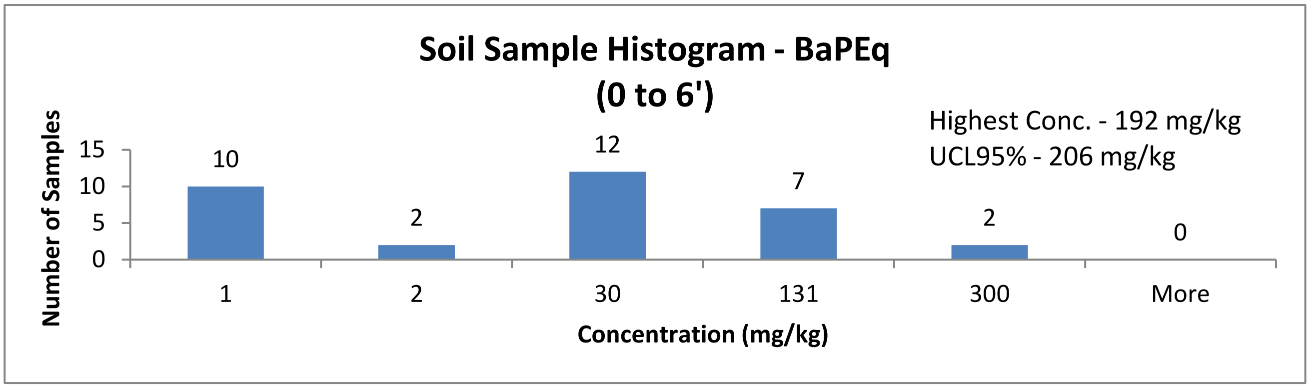
Tacoma Coal Gasification Plant
Tacoma, Washington

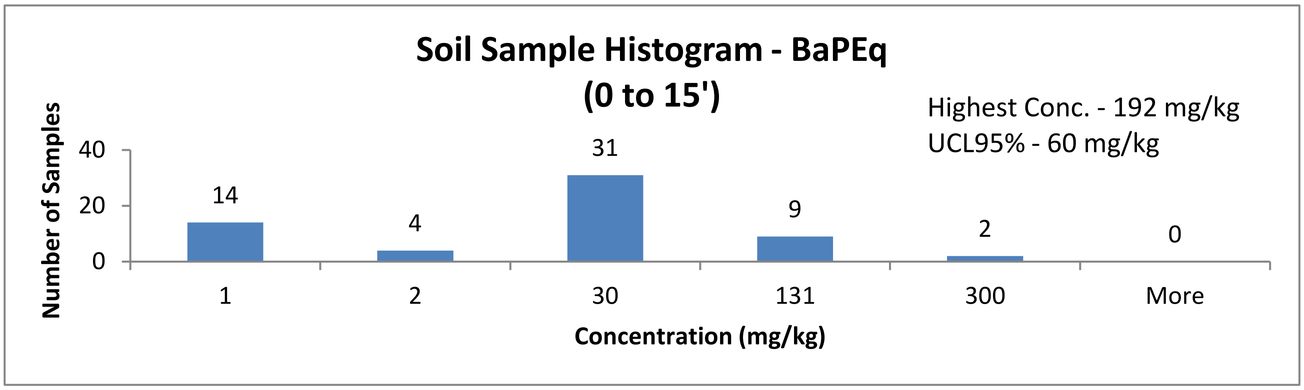
Mercury Concentrations in Groundwater - Section W-E

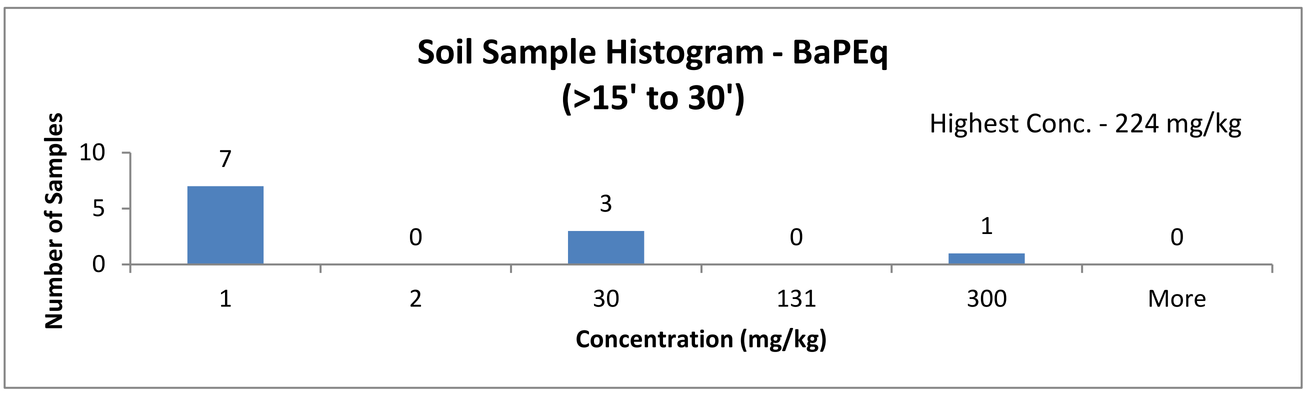
PAP-001-08a,b **FIGURE 7.20b** April 2019

Dalton, Olmsted & Fuglevand, Inc.

Ref: Section E-Wa GW Conc.cdr







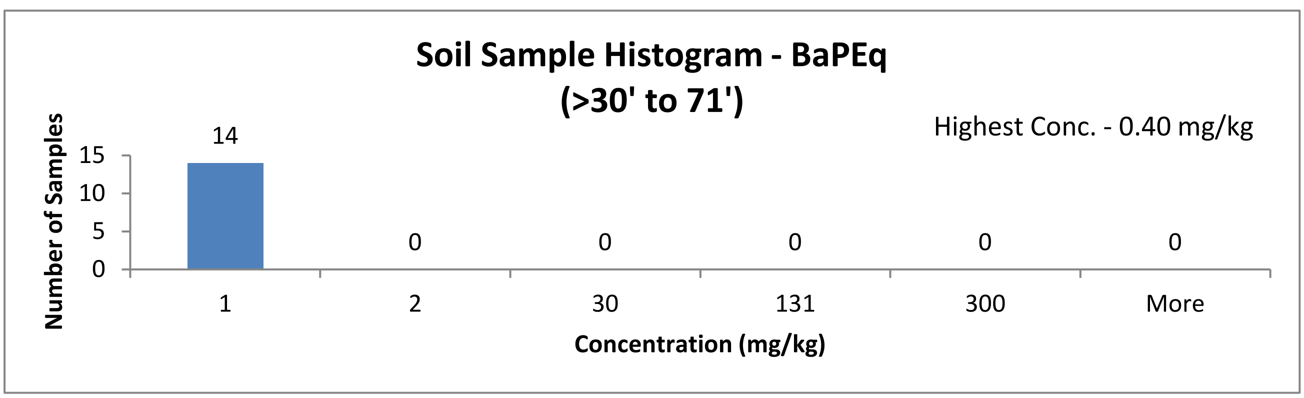
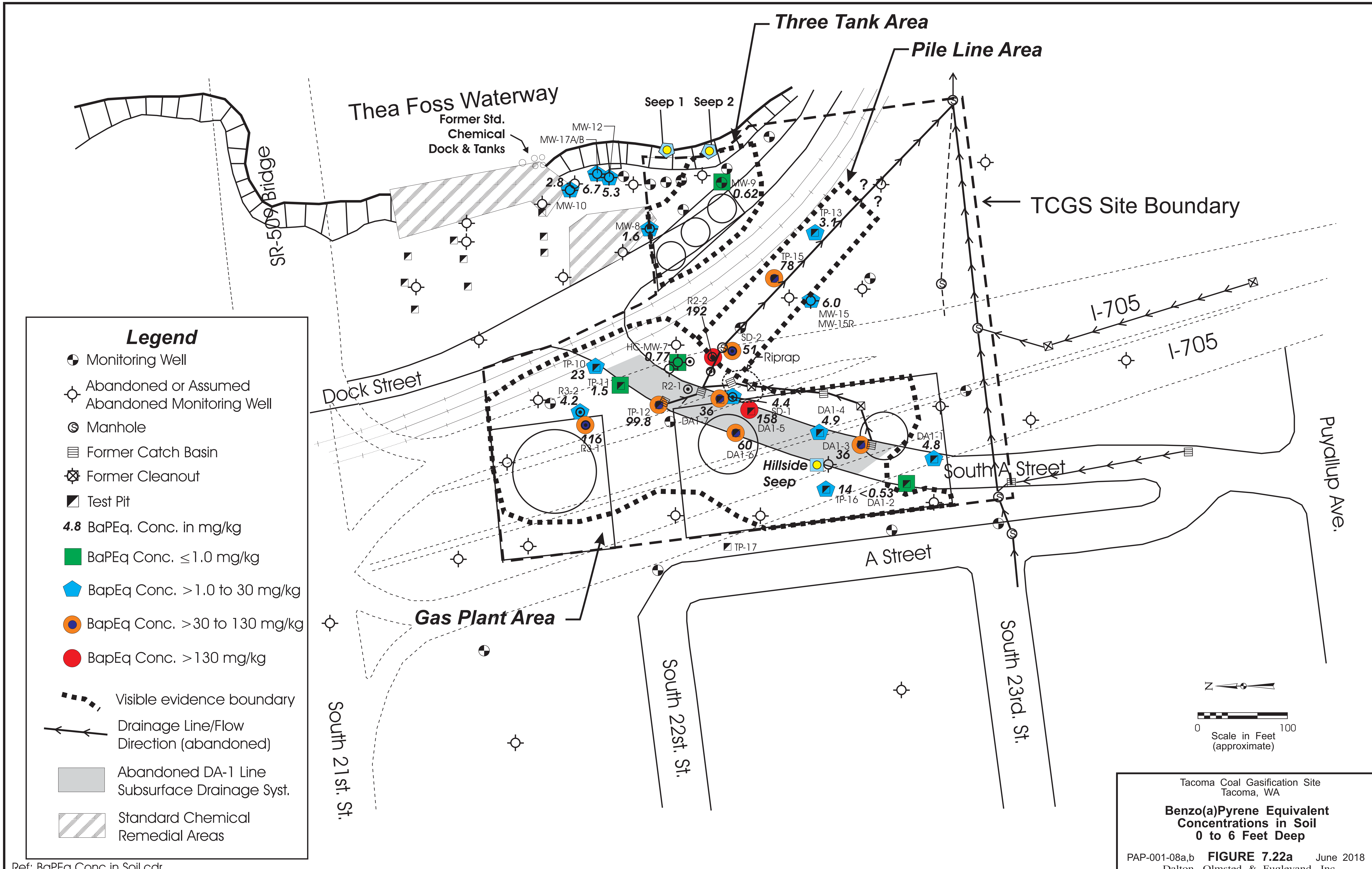


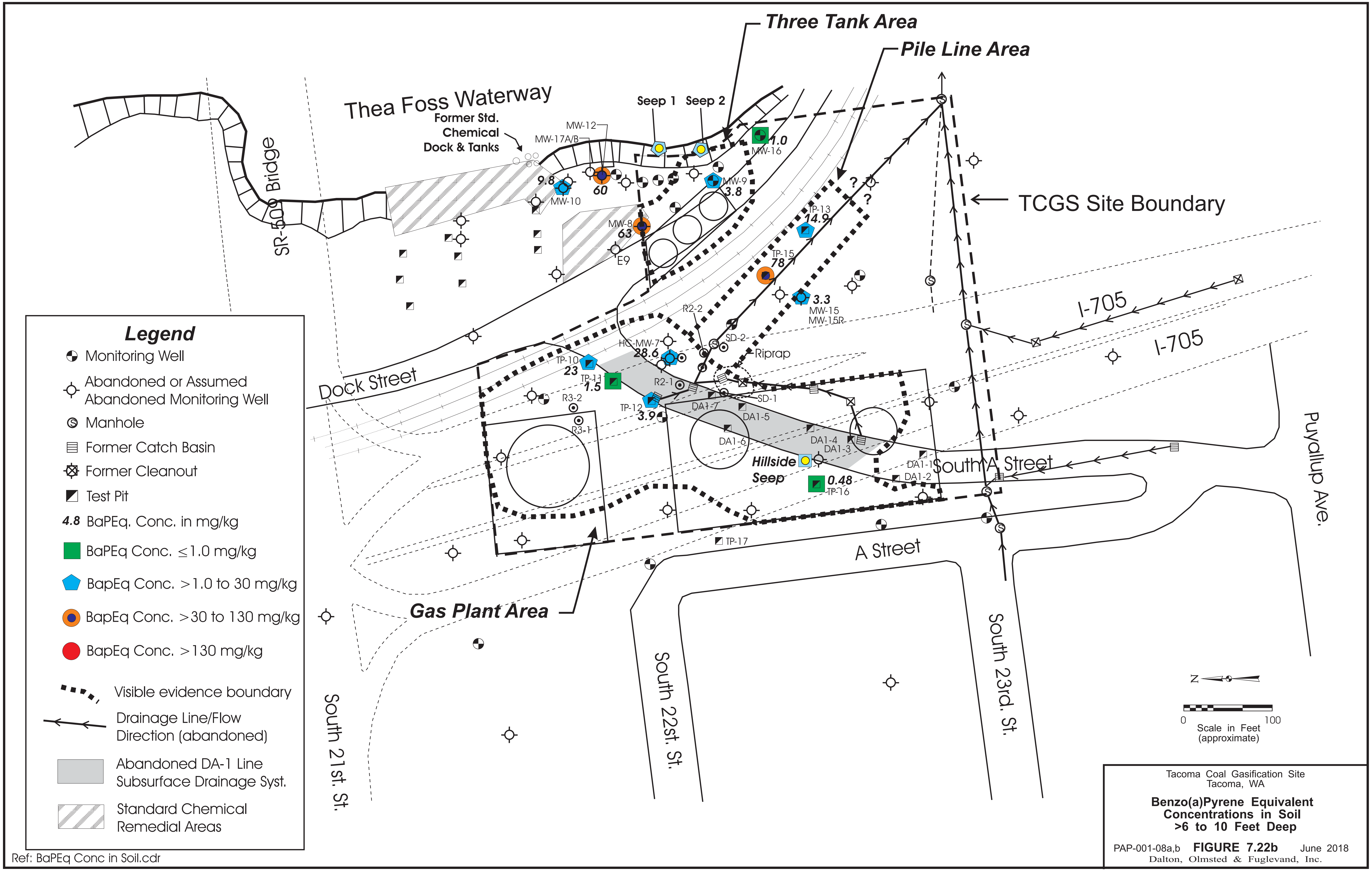
FIGURE 7.21 - Soil Sample Histogram - BaPEq



Tacoma Coal Gasification Site
Tacoma, WA

Benzo(a)Pyrene Equivalent Concentrations in Soil 0 to 6 Feet Deep

PAP-001-08a,b **FIGURE 7.22a** June 2018
Dalton, Olmsted & Fuglevand, Inc.

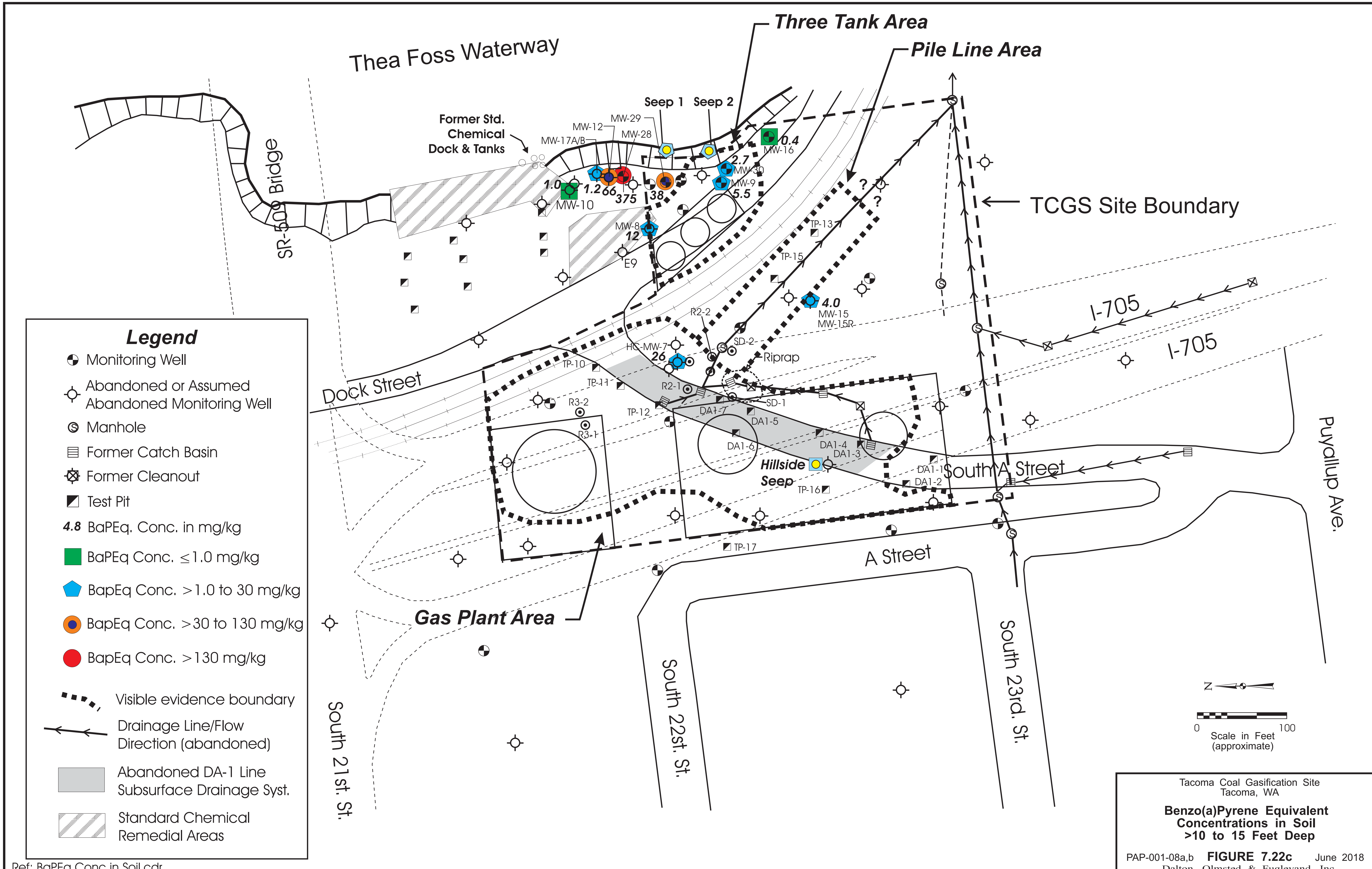


Tacoma Coal Gasification Site
Tacoma, WA

Benzo(a)Pyrene Equivalent Concentrations in Soil >6 to 10 Feet Deep

PAP-001-08a,b **FIGURE 7.22b** June 2018

Dalton, Olmsted & Fuglevand, Inc.

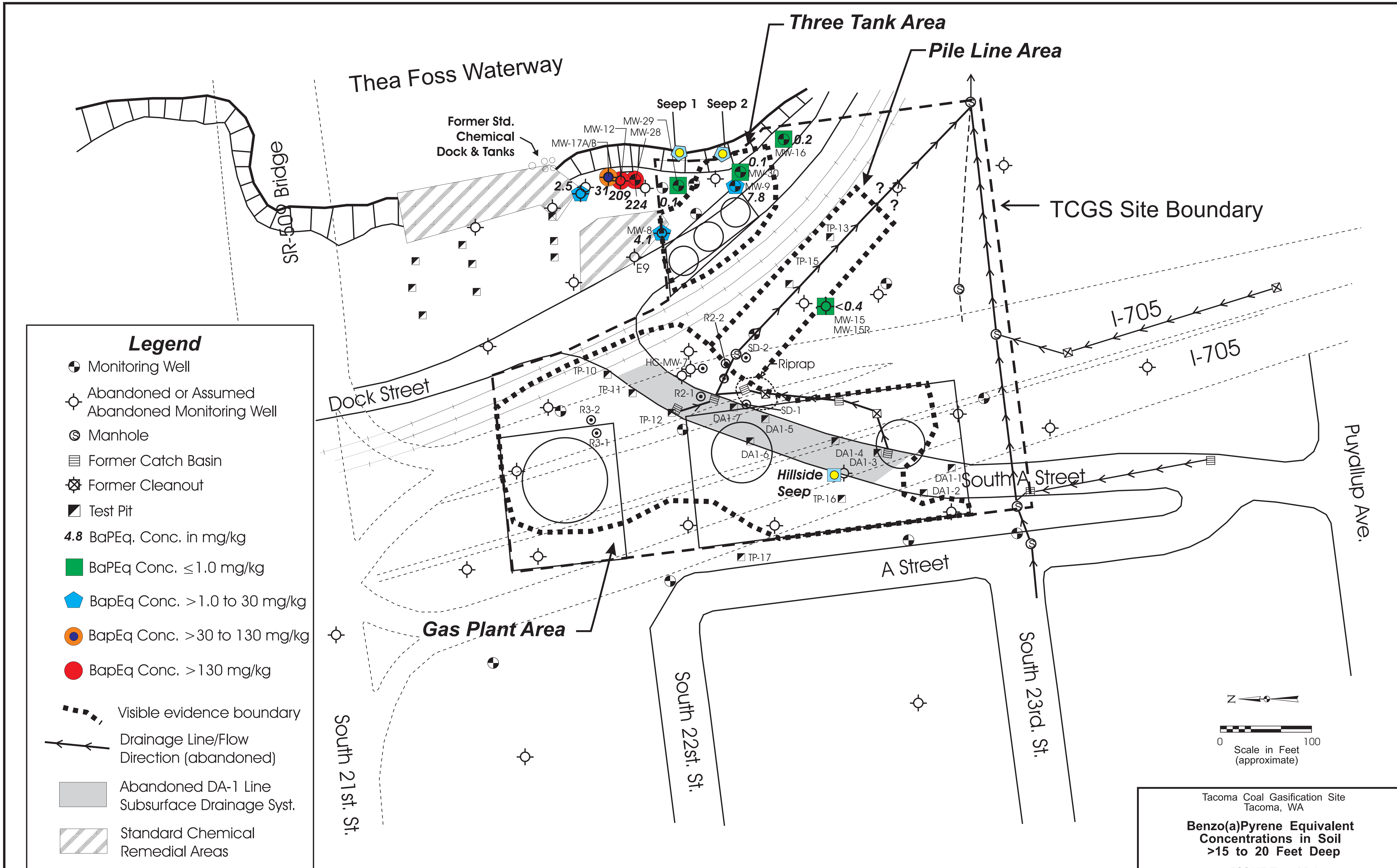


Tacoma Coal Gasification Site
Tacoma, WA

Benzo(a)Pyrene Equivalent Concentrations in Soil >10 to 15 Feet Deep

PAP-001-08a,b **FIGURE 7.22c** June 2018

Dalton, Olmsted & Fuglevand, Inc.



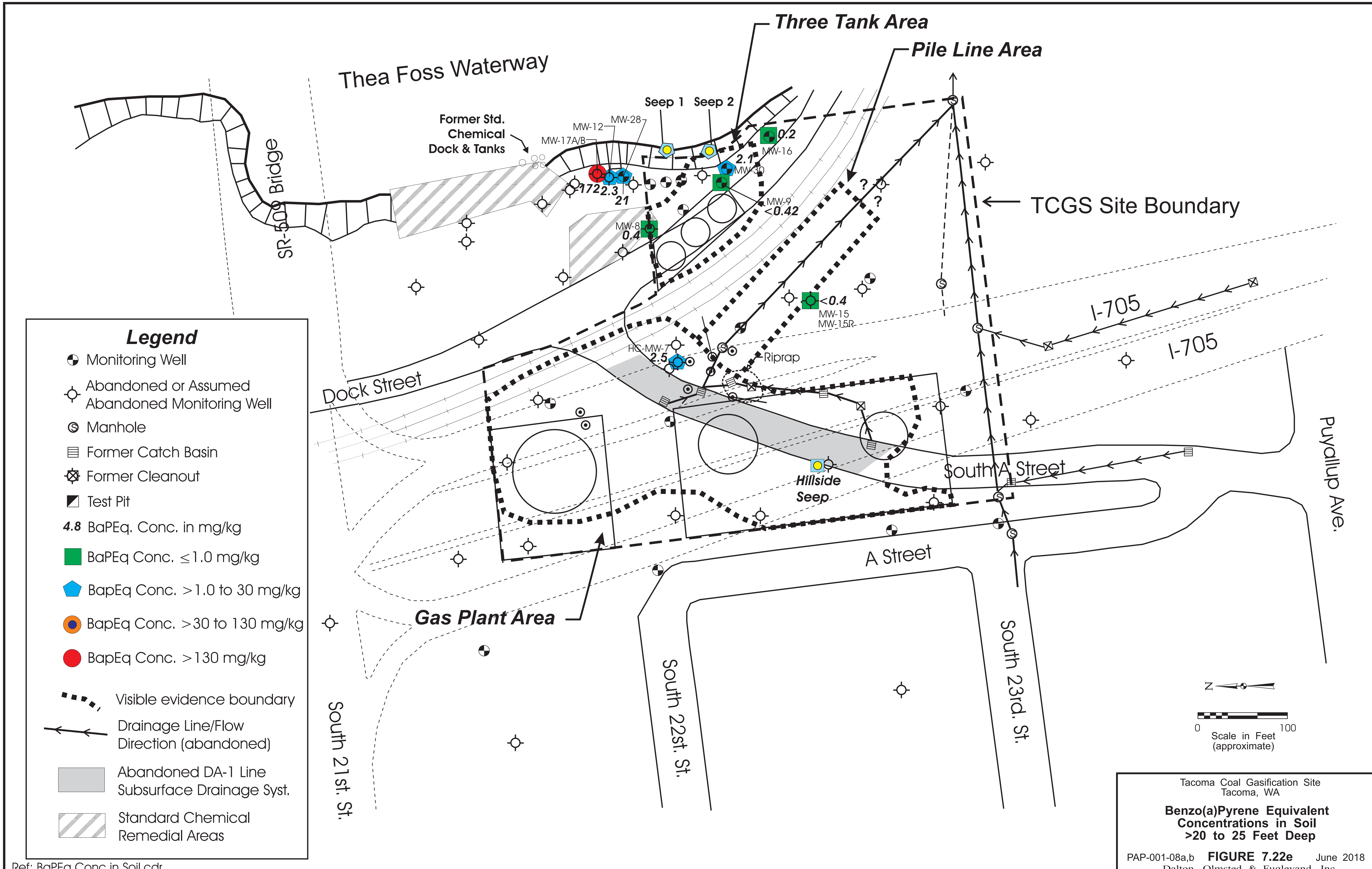
Ref: BaPEq Conc in Soil.cdr

Tacoma Coal Gasification Site
Tacoma, WA

Benzo(a)Pyrene Equivalent Concentrations in Soil >15 to 20 Feet Deep

PAP-001-08a,b **FIGURE 7.22d** June 2018

Dalton, Olmsted & Fuglevand, Inc.

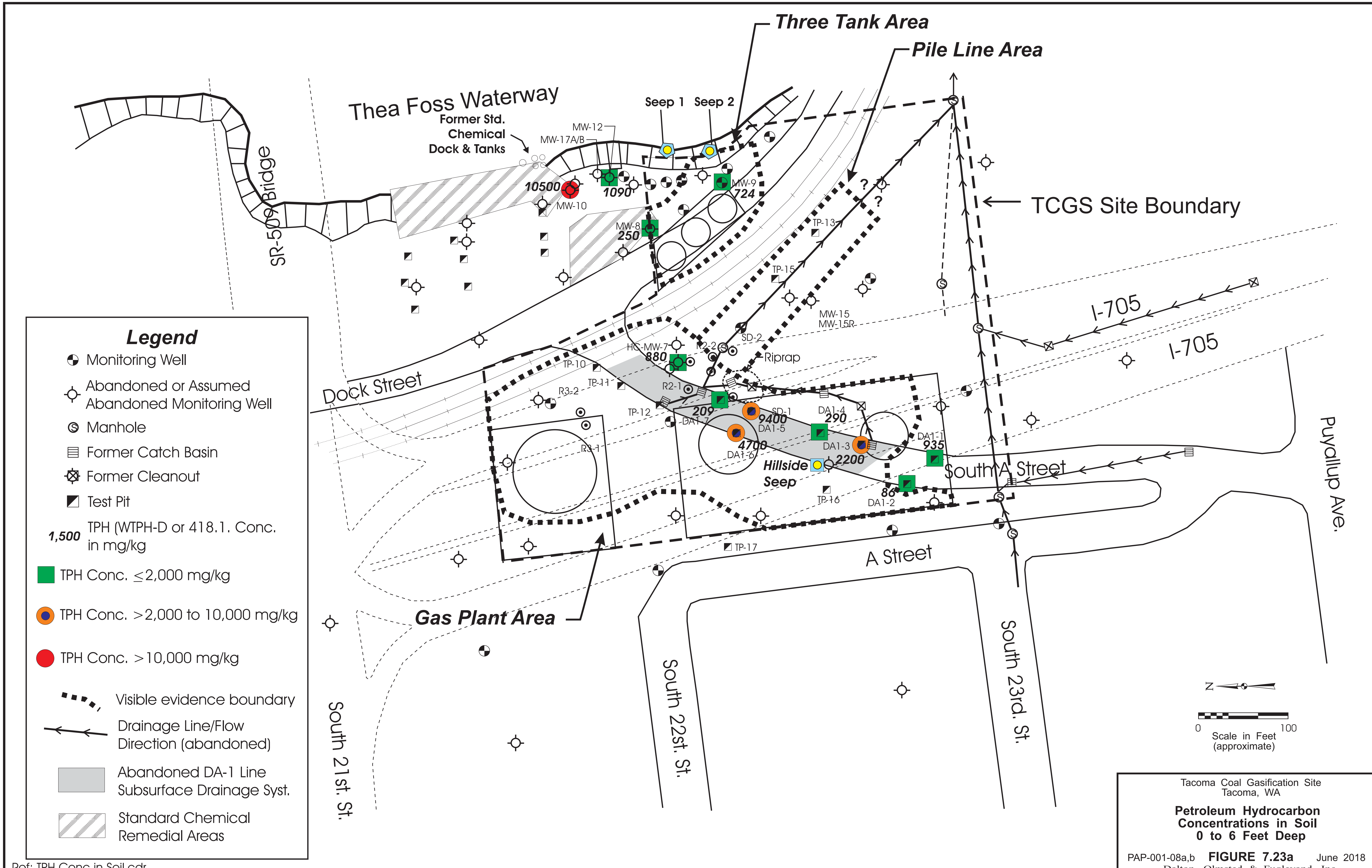


Tacoma Coal Gasification Site
Tacoma, WA

Benzo(a)Pyrene Equivalent Concentrations in Soil >20 to 25 Feet Deep

PAP-001-08a,b **FIGURE 7.22e** June 2018

Dalton, Olmsted & Fuglevand, Inc.



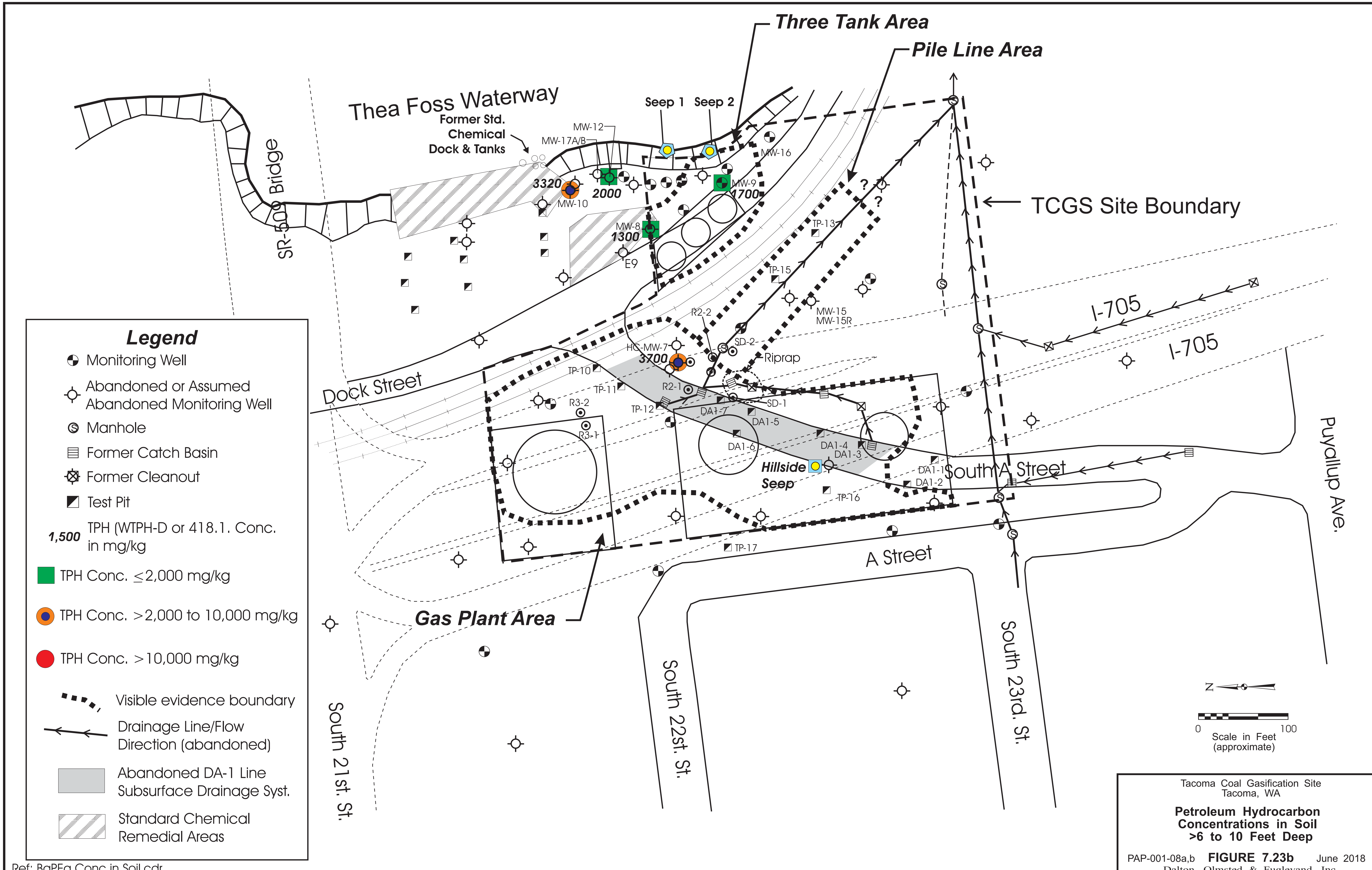
Ref: TPH Conc in Soil.cdr

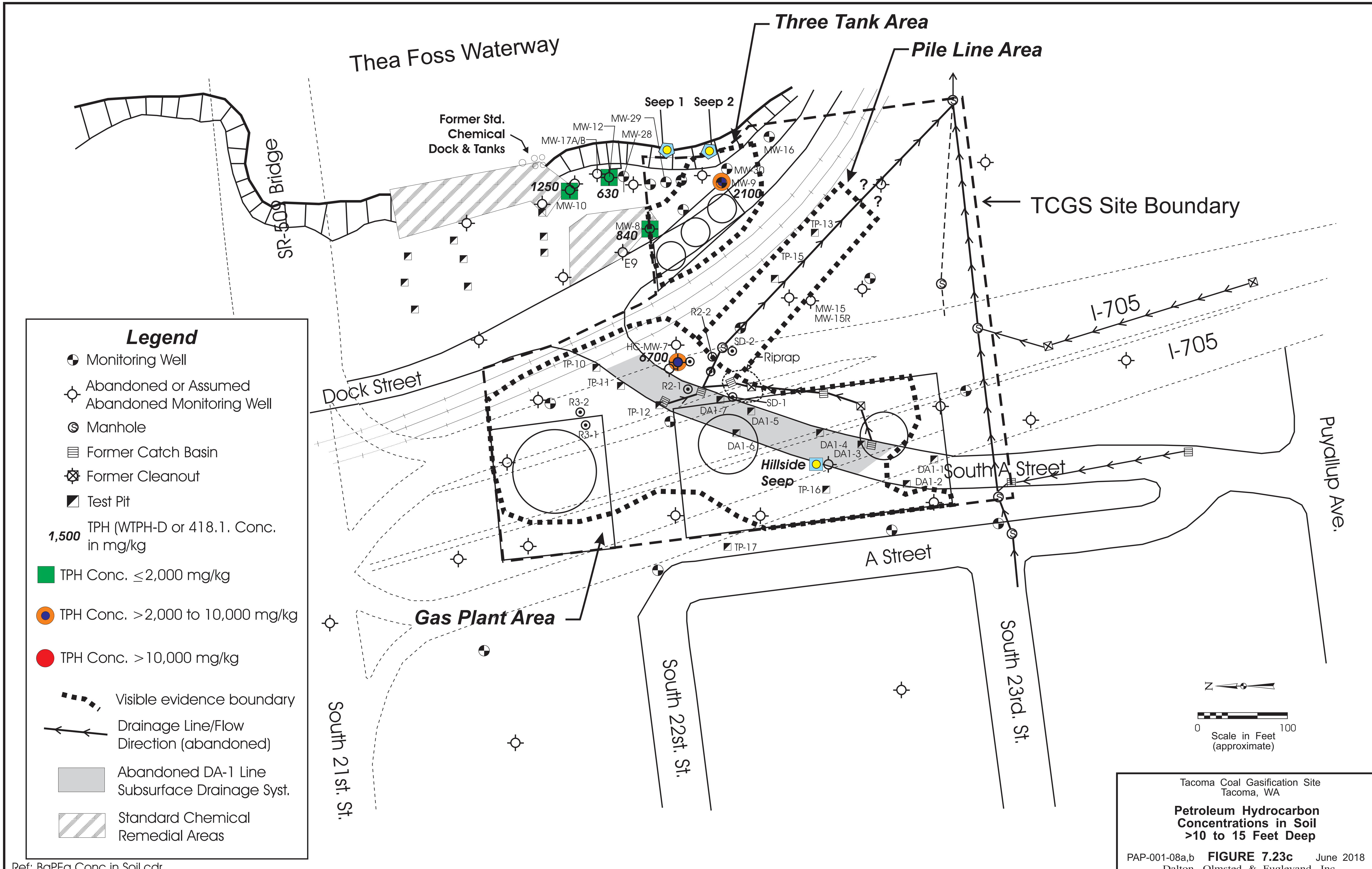
Tacoma Coal Gasification Site
Tacoma, WA

Petroleum Hydrocarbon Concentrations in Soil 0 to 6 Feet Deep

PAP-001-08a,b **FIGURE 7.23a** June 2018

Dalton, Olmsted & Fuglevand, Inc.


Three Tank Area
Pile Line Area
Thea Foss Waterway
Seep 1
Seep 2
Former Std. Chemical Dock & Tanks
MW-12
MW-17A/B
MW-16
3320
MW-10
2000
MW-9
1700
MW-8
1300
E9
TP-13
TP-15
MW-15
MW-15R
TCGS Site Boundary
I-705
I-705
SR-509 Bridge
Dock Street
R2-2
SD-2
HC-MW-7
3700
Riprap
TP-10
TP-11
R2-1
SD-1
R3-2
R3-1
TP-12
DA1-7
DA1-5
DA1-6
DA1-4
DA1-3
DA1-1
DA1-2
Hillside Seep
TP-16
TP-17
South A Street
A Street
Puyallup Ave.
Gas Plant Area
South 21st. St.
South 22st. St.
South 23rd. St.
Legend
Monitoring Well
Abandoned or Assumed Abandoned Monitoring Well
Manhole
Former Catch Basin
Former Cleanout
Test Pit
1,500 TPH (WTPH-D or 418.1. Conc. in mg/kg
TPH Conc. ≤2,000 mg/kg
TPH Conc. >2,000 to 10,000 mg/kg
TPH Conc. >10,000 mg/kg
Visible evidence boundary
Drainage Line/Flow Direction (abandoned)
Abandoned DA-1 Line Subsurface Drainage Syst.
Standard Chemical Remedial Areas
N
0
100
Scale in Feet (approximate)
Ref: BaPEq Conc in Soil.cdr
Tacoma Coal Gasification Site
Tacoma, WA
Petroleum Hydrocarbon Concentrations in Soil >6 to 10 Feet Deep
PAP-001-08a,b
FIGURE 7.23b
June 2018
Dalton, Olmsted & Fuglevand, Inc.



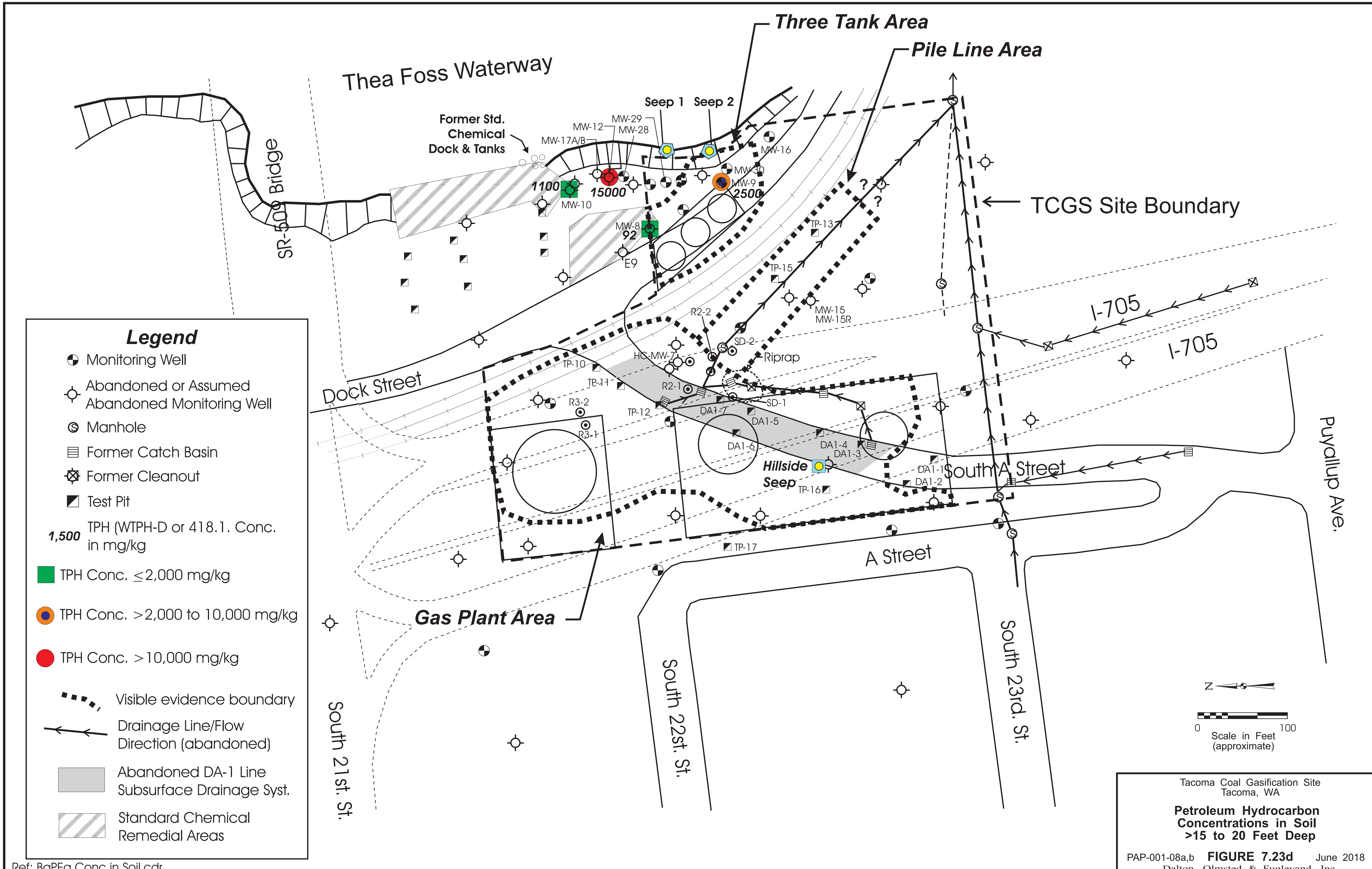
Ref: BaPEq Conc in Soil.cdr

Tacoma Coal Gasification Site
Tacoma, WA

Petroleum Hydrocarbon Concentrations in Soil >10 to 15 Feet Deep

PAP-001-08a,b **FIGURE 7.23c** June 2018

Dalton, Olmsted & Fuglevand, Inc.

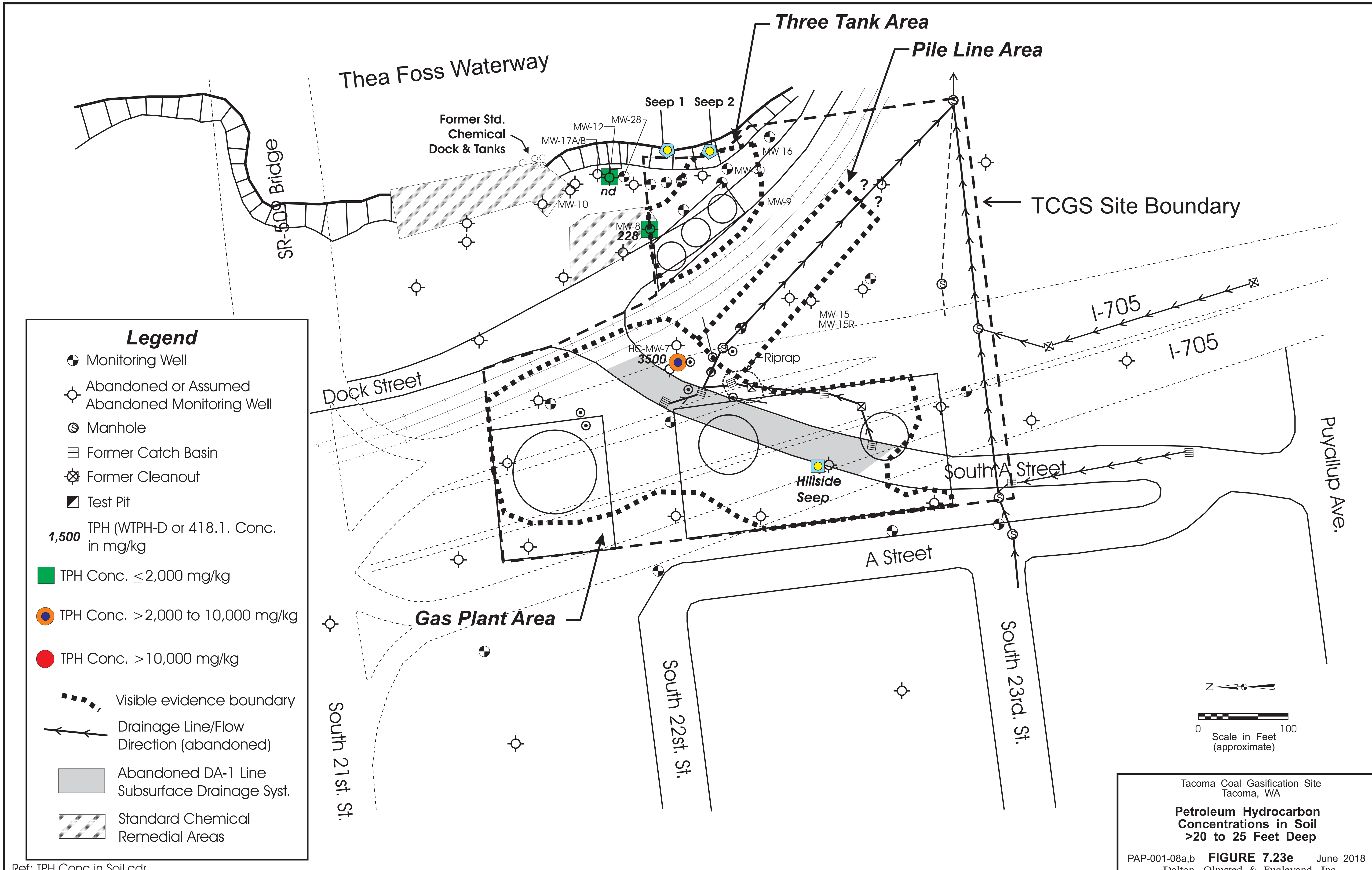


Tacoma Coal Gasification Site
Tacoma, WA

Petroleum Hydrocarbon Concentrations in Soil >15 to 20 Feet Deep

PAP-001-08a,b **FIGURE 7.23d** June 2018

Dalton, Olmsted & Fuglevand, Inc.



Tacoma Coal Gasification Site
Tacoma, WA

Petroleum Hydrocarbon Concentrations in Soil >20 to 25 Feet Deep

PAP-001-08a,b **FIGURE 7.23e** June 2018

Dalton, Olmsted & Fuglevand, Inc.