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Kennedy/Jenks Consultants

Engineers & Scientists

32001 - 32nd Avenue South, Suite 100
Federal Way, Washington 98001
253-874-0555 (Seattle)
253-927-8688 (Tacoma)
FAX 253-952-3435

17 February 2009

Mr. Steve Teel, LHG
Washington State Department of Ecology
Toxics Cleanup Program
Southwest Regional Office
P.O. Box 47775
Olympia, Washington 98504

Subject: Response to Ecology Comments
Forensic Evaluation of Hydrocarbons
Former Tacoma Metals Facility
K/J 996098.00

Dear Mr. Teel:

This letter presents Kennedy/Jenks Consultants' response to the *Transmittal of Ecology Comments on the Results of Forensic Analysis of Hydrocarbons, Former Tacoma Metals Site, 1919 Portland Avenue, Tacoma, Washington, Agreed Order DE-97-5435* letter from Mr. Steve Teel of the Washington State Department of Ecology (Ecology) dated 30 April 2008. This document includes a response letter from Friedman & Bruya, Inc. (Friedman & Bruya) dated 14 August 2008 (refer to Attachment 1) and supplemental information from Kennedy/Jenks Consultants.

We disagree with Ecology's opinion regarding the presence of gasoline sources at the site and suggest that the additional information presented herein warrants a re-evaluation by Ecology on this matter. We understand that during preparation of the 30 April 2008 letter, Ecology might not have had access to all applicable information for this site. Additional information presented in this letter is intended to supplement the forensic evaluation response letter from Friedman & Bruya (Attachment 1) and provide an overall context within which to consider the appropriateness of cleanup standards for the site.

Background

Ecology's 30 April 2008 letter was a response to Kennedy/Jenks Consultants' *Results of Forensic Evaluation of Hydrocarbons* letter dated 9 May 2007, which included a forensic evaluation of soil, groundwater, and non-aqueous phase liquid (NAPL) samples collected at the site. The forensic evaluation was provided in a letter prepared by Dr. James Bruya of Friedman & Bruya, dated 19 January 2007, which concluded that the origin of the hydrocarbons was primarily pyrogenic rather than petrogenic.

In our 9 May 2007 letter, we proposed that total petroleum hydrocarbon (TPH) cleanup standards are inappropriate for the site and that specific compounds [primarily polycyclic aromatic hydrocarbons (PAHs)] are more appropriate for evaluation of site conditions based on the pyrogenic origin of coal tar creosote, the primary contaminant of concern (COC).

Ecology's 30 April 2008 letter (received by Kennedy/Jenks Consultants on 5 May 2008) stated that, in its opinion, petroleum hydrocarbon cleanup standards are applicable to the site, primarily based on an assertion that chromatograms provided in Friedman & Bruya's 19 January 2007 letter indicate the presence of gasoline and related compounds from a petroleum hydrocarbon source (i.e., a petrogenic origin).

Friedman & Bruya's response to Ecology's 30 April 2008 letter is presented in the attached 14 August 2008 letter from Dr. James Bruya (Attachment 1). Additional information regarding historic site uses, previous site investigation observations, and examples of sites with similar contaminants is presented in this letter to supplement Friedman & Bruya's response.

Applicability

This letter pertains specifically to COCs identified at the former location of a creosoting plant in the northwestern portion of the former Tacoma Metals site. For the purposes of this letter, "former creosoting plant site" refers only to the former creosoting plant and affected areas, not to the entire former Tacoma Metals site. Specifically, the former creosoting plant site includes the western portion of the former Tacoma Metals property and three additional properties located northwest of the former Tacoma Metals property: the East 18th Street right-of-way, the Simpson Property, and the JJ Port Property (refer to Figure 1). Where the entire former Tacoma Metals site is referenced herein, it is referred to as the "former Tacoma Metals Property."

The discussion presented herein draws from the findings of previous investigations performed by Kennedy/Jenks Consultants, as well as additional historical and regulatory research presented in this letter. The results of our previous investigation activities are summarized in the reports listed below, which have been previously submitted to Ecology:

- The *Remedial Investigation/Feasibility Study (RI/FS) Report* (Kennedy/Jenks Consultants 2001) summarizes the findings of investigation activities performed at the former Tacoma Metals Property and former creosoting plant site in 2000.
- The *Site Supplemental Data Summary Report* (Kennedy/Jenks Consultants 2007) summarizes the findings of investigation activities performed at the former creosoting plant site between 2002 and 2006.
- The *Soil and Groundwater Investigation Results – Data Transmittal* (Kennedy/Jenks Consultants 2008) summarizes the findings of investigation activities performed at the former creosoting plant site in 2007 and 2008.

SECTION 1 – INTRODUCTION AND PURPOSE

The purpose of this letter is to provide additional background and historical information to assist Ecology with its evaluation of the relevance of petroleum hydrocarbon-based cleanup standards for the former creosoting plant site.

This information, which is presented in support of Friedman & Bruya's response to Ecology's 30 April 2008 letter, includes an evaluation of potential contaminant sources at the former creosoting plant site based on past uses and findings of the previous investigations referenced above.

Friedman & Bruya's response to Ecology, presented in the letter from Dr. James Bruya dated 14 August 2008 (refer to Attachment 1), includes the following general information:

- Discussion of the composition of coal tar creosote.
- Discussion of the differentiation between coal tar creosote and gasoline.
- Discussion of the composition and use of byproducts from manufactured gas plants (MGP) as creosote diluents for wood treatment applications.
- Discussion of the partitioning behavior of coal tar creosote compounds, with particular respect to the unique contaminant profiles expected for different contaminant phases.
- Responses to each bullet-list item in Ecology's 30 April 2008 letter.

The remainder of this letter is intended to supplement Friedman & Bruya's response letter with the following information:

- Section 2 summarizes Kennedy/Jenks Consultants' findings regarding past uses and contaminant sources at the former creosoting plant site, including historical research and field observations.
- Section 3 discusses the Wyckoff/Eagle Harbor and Tacoma Tar Pits sites. These sites are local United States Environmental Protection Agency (EPA) Superfund sites where creosote (Wyckoff/Eagle Harbor) and coal tar (Tacoma Tar Pits) are COCs. They are presented as examples of the appropriate application of cleanup standards for sites that have been impacted by releases of contaminants with a pyrogenic origin.
- Section 4 summarizes Kennedy/Jenks Consultants' and Friedman & Bruya's opinion and justification regarding appropriate cleanup standards for the former creosoting plant site.

SECTION 2 – PAST USES AND CONTAMINANT SOURCES

This section summarizes our findings regarding historic property uses and contaminant sources at the former creosoting plant site and compares our historical research findings to the findings of our previous site investigations.

Kennedy/Jenks Consultants has performed extensive historical research of past property uses and potential contaminant sources during our investigations. Most of this information has been developed and used in ongoing negotiations with potentially liable parties (PLPs) associated with the former Tacoma Metals Property, including the former creosoting plant site, and includes information not previously provided to Ecology.

Findings from Kennedy/Jenks Consultants' previous investigations include field observations recorded during our investigation activities at the former creosoting plant site and the former Tacoma Metals Property. These findings were previously submitted to Ecology in the reports referenced in the "Applicability" section of this letter.

Historical Research and Findings

Historical research regarding past uses of the former creosoting plant site included the following information sources:

- Review of Sanborn Fire Insurance Maps for 1912, 1950, and 1965.
- Review of aerial photographs from 1931, 1941, 1946, 1950, 1961, 1965, 1971, 1976, 1981, 1985, 1989, and 1995 (for reference, aerial photographs for some of these years, and others, are available for review at the City of Tacoma's GovME website at http://wspwit01.ci.tacoma.wa.us/govMe/Maps/Inter/MapGuideCS/MGMain.aspx).
- Review of historical information for the St. Paul and Tacoma Lumber Company (operators of the former creosoting plant) and ground-level photographs from 1921 provided in *The Mill on the Boot: The Story of the St. Paul and Tacoma Lumber Company* by Murray Cromwell Morgan (1985), and "A Story of the Development of one of America's Greatest Lumber Manufacturing Institutions, the St. Paul and Tacoma Lumber Company of Tacoma, Washington," published in the 21 May 1921 issue of *American Lumberman* magazine.
- Review of ground-level photographs from 1920, 1922, 1927, and 1944 at the Washington State Historical Society and Tacoma Public Library.
- Review of the Metsker's Map for 1926 at the Tacoma Public Library.
- Review of St. Paul and Tacoma Lumber Company documents housed in the University of Washington Special Collections library.

This extensive historical research provided no indication of gasoline (or other petroleum hydrocarbon) storage or dispensing facilities located at the former creosoting plant site. The creosoting plant facility is the primary potential contaminant source identified in our historical research. A small underground storage tank (UST) that once contained gasoline was identified approximately 450 feet south of the former creosoting plant site, adjacent to the former main warehouse building on the former Tacoma Metals Property. The UST is listed in Ecology's database as "removed," and no indications of a release were identified during our RI.

The historical information sources listed above provided maps, descriptions, and detailed photographs of the former creosoting plant in operation. Copies of select materials are provided in Attachment 2 and referenced below. A chronology of the former creosoting plant site uses identified in our historical research is presented below.

1910s to 1930s

The St. Paul and Tacoma Lumber Company operated a creosoting plant in the far northwestern corner of the former Tacoma Metals Property during this period. The approximate former location of the main facility structure, which housed a 130-foot treatment retort, is shown on Figure 1. An oil house associated with the facility was located at the northeastern corner of the former Tacoma Metals Property. The creosoting plant is shown on the 1912 Sanborn Map and the 1926 Metsker's Map (included in Attachment 2). Creosoting plant structures are visible on the 1931 aerial photograph, but the facility does not appear operational. (Note: Based on available information, it appears that the creosoting plant ceased operation in the late 1920s to early 1930s.)

Two circular structures associated with the former creosoting plant (labeled "oil tanks" with 102,000- and 450,000-gallon capacities on the 1912 Sanborn Map) were identified at the approximate location of the current Simpson Property and appear to be storage tanks for wood treatment materials. The 1912 Sanborn Map also shows a 1,500-gallon "oil tank" located inside the main creosoting plant structure and positioned above the retort. The 1,500-gallon tank might have been used to mix wood treatment materials prior to use. Ground level photographs of the former creosoting plant site from 1920, 1921, and 1922 (included in Attachment 2) clearly depict the facility (including the retort, storage tanks, site structures, rails, platforms, etc.) and the immediate area. The structures and improvements identified in the Sanborn Maps correlate well with the features displayed in the historical photographs.

Our historical research indicates that creosote was the primary material used to treat wood at the facility. The St. Paul and Tacoma Lumber Company historical documents include references to "creosote tanks" and list "creosote oil" as an operating expense (included in Attachment 2). The St. Paul and Tacoma Lumber Company documents also indicate that "creosote dip tanks" were installed in 1916. The 21 May 1921 *American Lumberman* article refers to the facility as a "creosoting plant" in both the main text and photograph captions. A section of the article entitled "Creosoting Department" describes the former creosoting plant facility and refers to treated wood products as "creosoted" (included in Attachment 2).

Freidman & Bruya indicate in the 14 August 2008 letter (Attachment 1) that creosote used at the facility was derived from coal tar (as opposed to wood-based creosote) and that waste materials (coal tar and carbureted water gas tar, aka coal tar liquor) from MGPs were commonly used as a creosote diluent (up to 20%) for wood treatment in the Pacific Northwest region. The presence of multiple storage tanks at the site, including a possible mixing tank above the treatment retort, indicates that creosote appears to have been blended with a diluent at the former wood treatment facility site. Both the creosote and the MGP-waste diluents were derived from coal tar.

1940s

A coke manufacturing facility was constructed on the former Tacoma Metals Property in the early 1940s. Captions for the 1944 photographs indicate that the coke plant primarily produced metallurgical coke, but also provided coal gas (a byproduct of the coke production process) to the City of Tacoma.

The creosoting plant was demolished prior to construction of the coke plant, and approximately 3 to 5 feet of sand/gravel fill material was placed over the former creosoting plant site area. This fill layer represents a "marker bed" that is associated with the particular time period between the abandonment of the creosoting plant and construction of the coke plant. Based on aerial and ground-level photographs, it appears that the fill was placed between 1940 and 1943.

Several structures associated with the coke plant were located on the former creosoting plant site, but the primary coke manufacturing facility was located more than 250 feet south of the former creosoting plant site on the former Tacoma Metals Property. The structures located on the former creosoting plant site might have been related to storage and distribution of coal gas (photograph included in Attachment 2).

It appears that the coke plant was operational for only a short time beginning in 1943. Most of the coke plant structures, except part of the main building and several concrete foundation pads (three of which were located at the former creosoting plant site), were demolished in the 1950s, prior to use of the former Tacoma Metals Property for metals recycling.

1950s to 1990s

During this period, metals were recycled on the former Tacoma Metals Property, including the former creosoting plant site. The existing asphalt surface appears to have been installed at the former creosoting plant site in the mid-1970s. Metals recycling activities generally included the collection, storage, cutting, shredding, and bundling of various items. Operations included dismantling and shredding of automobiles, motors, locomotives, and similar products. Equipment used as part of the daily recycling operation included gasoline- and diesel-powered vehicles and equipment, as well as mobile and stationary hydraulic machinery. Stockpiles of various materials and associated processing machinery (balers, shears, etc.) were located throughout the former Tacoma Metals Property, including the former creosoting plant site area. Tacoma Metals vacated the property in 1999.

2000 to Present

Structures located on the former Tacoma Metals Property (excluding one warehouse building) were demolished in 2000 (refer to the 2001 RI/FS Report). Demolition activities in the former creosoting plant site area included several concrete foundation pads associated with the coke plant.

Our extensive historical review has shown no indication of former gasoline storage or distribution facilities at the former creosoting plant site.

Field Observations

The findings of our previous site investigations support the results of the historical research discussed above, that the former creosoting plant is the primary contaminant source in the former creosoting plant site area. Field observations at the former creosoting plant site indicate that the affected soil and groundwater exhibit distinctive characteristics of creosote and that the creosote contaminants are distributed in a manner consistent with a source located at the former creosoting plant.

Field observations of soil and groundwater conditions at the former creosoting plant site and former Tacoma Metals Property were documented by Kennedy/Jenks Consultants during field investigations performed from 2000 to 2008, including the following:

- Excavation of 74 test pits at the former Tacoma Metals Property, including 20 at the former creosoting plant site.
- Advancement of 47 soil borings to depths of approximately 20 to 50 feet below ground surface (bgs) at the former creosoting plant site, including collection of reconnaissance groundwater samples from 19 of the 47 borings.
- Advancement of 18 soil borings exclusively for the collection of reconnaissance groundwater samples at the former Tacoma Metals Property.
- Installation and sampling of 33 groundwater monitoring wells, including 20 at the former Tacoma Metals Property and 13 at off-property locations (18th Street right-of-way, Simpson property, JJ Port property). Twenty-six of these monitoring wells are located on the former creosoting plant site.
- Monitoring for the presence of NAPL in up to 26 monitoring wells at the former creosoting plant site.

Soil boring and monitoring well locations in the former creosoting plant site area are shown on Figure 1. Field observations are documented in reports cited in the Applicability section of this letter. For reference, Table 1 (attached) provides a generalized description of stratigraphic units identified at the former Tacoma Metals Property and former creosoting plant site.

Contaminants identified at the former Tacoma Metals Property during the RI/FS [lead, cadmium, TPH, polychlorinated biphenyls (PCBs), and carcinogenic PAHs (cPAHs)] were primarily located within the shallow sand/gravel fill material at less than 6 feet bgs, typically less than 3 feet bgs. Diesel- and oil-range petroleum hydrocarbons were identified from 0 to 10 feet bgs at the location of a hydraulic shear southeast of the former creosoting plant site. The former hydraulic shear is the only known location of a release of diesel- and oil-range petroleum hydrocarbons in proximity to the former creosoting plant site area. During the RI, field conditions indicated that hydraulic fluid used to operate the hydraulic sheer was released to subsurface soils directly adjacent to the shear building. Lead (locally at 0 to 1 feet bgs) was the only shallow soil contaminant identified during the RI/FS in the former creosoting plant site area. Carcinogenic PAHs and diesel- and oil-range petroleum hydrocarbons (from the release of creosote) were identified beneath the former creosoting plant location from 6 to 10 feet bgs, below the recent fill material placed in this area.

Kennedy/Jenks Consultants has observed distinct field characteristics of affected soil and groundwater in the former creosoting plant site area. Soil materials exhibit a distinct creosote odor and are typically dark to very dark gray or brown in color. NAPL, where observed in sheen testing or adsorbed to soil, is typically dark brownish in color, semi-opaque, and exhibits a distinct creosote odor. Groundwater exhibits a distinct creosote odor similar to that observed in soil materials, as do light NAPL (LNAPL) and dense NAPL (DNAPL), where encountered. LNAPL and DNAPL encountered in monitoring wells are dark brownish in color and semi-opaque.

Kennedy/Jenks Consultants has no documented field observations of any gasoline-like odors or light gray soil staining typically associated with gasoline releases in the former creosoting plant site area. Our field observations fully support Friedman & Bruya's conclusion that gasoline-range hydrocarbons detected in soil and groundwater samples collected at the site are attributed to a creosote (pyrogenic) source rather than a gasoline (petrogenic) source [Friedman & Bruya, 19 January 2007, and letter dated 14 August 2008 (see Attachment 1)].

Figures 2A, 2B, 2C, and 2D illustrate the degree of soil impacts observed at various depth intervals (0 to 10 feet, 10 to 20 feet, 20 to 30 feet, and 30 to 40 feet). The depths are normalized to the approximate existing surface elevation (10 feet above mean sea level) at the former location of the creosoting plant. The most heavily impacted soil (NAPL evident) at shallow (0 to 10 feet) depths is encountered beneath the former creosoting plant. At intermediate depths (10 to 20 feet and 20 to 30 feet), heavily impacted soil is encountered both beneath and laterally away from the former creosoting plant to the northeast/northwest. The lateral extent of heavily impacted soil is greatest in the 20- to 30-foot depth interval. Heavily impacted soil was observed at only one location distal to the former creosoting plant location in the 30- to 40-foot depth interval. Impacted soil was not observed below 40 feet bgs. This indicates a creosote source at the former creosoting plant location and creosote migration vertically and laterally away from the facility. The degree and magnitude of impacted soils are clearly greatest directly beneath the former location of the creosoting plant (the only documented source at the site).

Figures 3A, 3B, 3C, and 3D provide generalized geologic cross-sections of the former creosoting plant site area, illustrating the vertical and lateral distribution of the degree of observed soil impacts (cross-section locations are shown on Figure 1). Stratigraphic units observed at the former creosoting plant site, and shown on the cross-sections, are similar to those observed on other parts of the former Tacoma Metals Property (refer to Table 1).

The cross-sections clearly show that the former creosoting plant is the source of contaminants in the former creosoting plant site area. The vertical and lateral distribution of heavily impacted soil is consistent only with a source at the former location of the creosoting plant. Furthermore, our field observations indicate that visible creosote impacts are initially encountered beneath, or at the base of, the 3 to 5 feet of fill material placed at the former creosoting plant site prior to construction of the coke plant. This indicates that the creosote impacts observed at the former creosoting plant site resulted from a release that occurred before the fill material was placed (prior to approximately 1940 to 1943).

In addition, our findings provide no indication of any significant hydrocarbon contaminant releases affecting the upper 3 to 5 feet of fill material in the former creosoting plant site area. Only localized and minor (below site soil cleanup levels) hydrocarbon impacts have been identified in the material installed above the former creosoting plant location. This indicates that no significant hydrocarbon contaminant releases have occurred in the former creosoting plant site area since the facility ceased operations and that no other hydrocarbon contaminant source has contributed to the soil and groundwater impacts observed at the former creosoting plant site.

Kennedy/Jenks Consultants acknowledges that the previous metal recycling activities have the potential for petroleum hydrocarbon releases; however, no evidence of such releases was identified at the former creosoting plant site area. The magnitude and distribution (lateral and vertical) of evident creosote impacts indicates a contaminant source at the former creosoting plant location and migration vertically and laterally away from the facility. The degree and magnitude of impacted soils are clearly greatest directly beneath the former location of the creosoting plant, and the vertical and lateral distribution of soil impacts is fully consistent with a source at the former location of the creosoting plant.

Historical and Field Observation Summary

Kennedy/Jenks Consultants' historical research identifies the former creosoting plant as the source of contaminants at the former creosoting plant site area. No indication or suggestion of the storage or dispensing of gasoline (or other petroleum hydrocarbons) at the former creosoting plant site was identified during our review of the historical information sources previously listed. Historical research indicates that the only material used for wood treatment was creosote, likely mixed with a coal tar diluent from a local MGP facility (refer to Friedman & Bruya's 14 August 2008 letter in Attachment 1 for a discussion of the historic use of coal tar MGP wastes as creosote diluents).

Kennedy/Jenks Consultants' field observations fully support the conclusion of our historical research, that the former creosoting plant facility is the only significant contaminant source at the former creosoting plant site. The vertical and lateral distribution of creosote contaminants clearly illustrates the prevalence of contaminants beneath the former creosoting plant facility location and the downward and lateral migration of contaminants away from the facility. Furthermore, our findings indicate that significant hydrocarbon impacts have not been identified in fill materials installed after the creosoting plant was demolished, supporting our contention that the creosoting plant is the primary source of contaminants in the former creosoting plant site area.

Kennedy/Jenks Consultants' historical and field findings do not support Ecology's contention of other significant contaminant sources, particularly gasoline storage or distribution facilities, in the former creosoting plant site area.

SECTION 3 – WYCKOFF/EAGLE HARBOR AND TACOMA TAR PITS SITES

This section presents information for two local Superfund sites as examples of the use of appropriate cleanup standards for soil and groundwater contamination resulting from releases of coal tar and creosote. The Wyckoff/Eagle Harbor site is an example of a wood treatment facility where soil and groundwater are impacted by creosote contaminants. The Tacoma Tar Pits site is an example of a former MGP site where coal tar waste materials were produced and the contaminants associated with these materials.

For both sites, the EPA identified specific constituent compounds (i.e., naphthalene and cPAHs) as the basis for compliance with cleanup standards, rather than generic contaminant profiles, such as gasoline- or diesel-range hydrocarbons. In addition, volatile compounds, such as benzene, toluene, ethylbenzene, and xylenes (BTEX), were present in both soil and groundwater and considered to be components of the creosote and coal tar contaminants. The association of these volatile compounds with creosote and coal tar contaminants is consistent with the composition of the materials used for wood treatment and produced as MGP wastes (refer to the letter from Friedman & Bruya in Attachment 1).

Wyckoff/Eagle Harbor

The Wyckoff/Eagle Harbor Superfund site is located on Bainbridge Island, Washington. Two of the operable units (OU) associated with the site, the Soil OU and the Groundwater OU, are located on the Wyckoff site, which is the former location of a large-scale wood treatment facility. The EPA's Record of Decision (ROD) for the site indicates that the wood treatment facility operated at the Wyckoff site from the early 1900s to 1988. Wood treatment materials used at the facility included creosote and pentachlorophenol (PCP) after 1957. [Note: The creosoting plant associated with the former Tacoma Metals Property was operational from circa 1910 to 1930; therefore, PCP could not have been used.]

The ROD indicates that the primary source of contamination at the site was the release of wood-treating contaminants to the ground during facility operation and from storage tanks. COCs for the Soil and Groundwater OUs are identified in the ROD as PAHs, PCP, and dioxins/furans (related to PCP). Groundwater contaminants occur as both dissolved-phase contaminants and as both LNAPL and DNAPL. A list of ROD cleanup standards for soil and groundwater is provided in Attachment 3.

The ROD further indicates that volatile organic compounds (VOCs) detected in groundwater are assumed to be co-located with the PAHs for purposes of site cleanup. These VOCs include, among others, benzene (groundwater), ethylbenzene (groundwater, LNAPL, DNAPL), toluene (LNAPL, DNAPL), and xylenes (LNAPL).

Tacoma Tar Pits

The Tacoma Tar Pits site is located in the tide flats area of Tacoma, approximately ¼ to ½ mile south of the former Tacoma Metals Property. A MGP operated at the site from 1924 to 1956. Coal gas was manufactured from coal materials, and coal tar, coal tar liquor, and coal ash were generated as waste materials. Some waste materials were shipped offsite for other uses, and the remainder accumulated onsite.

In addition to the MGP, a metal recycling and auto wrecking facility that was located at the site after 1967 contributed to site impacts.

The ROD for the Tacoma Tar Pits site indicates that the primary coal tar contaminants are PAHs (naphthalene and cPAHs) and aromatic hydrocarbons (including BTEX). Additional contaminants related to auto wrecking included lead and PCBs. Contaminants identified in the ROD as site cleanup indicators for the MGP wastes included cPAHs and benzene, but not TPH. A summary table of the ROD cleanup standards for the Tacoma Tar Pits site is provided in Attachment 3.

SECTION 4 – SUMMARY AND CONCLUSIONS

This letter presents Kennedy/Jenks Consultants' findings regarding potential contaminant sources at the former creosoting plant site associated with the former Tacoma Metals Property and the appropriate application of cleanup standards for the site. Our findings include the following:

- The former creosoting plant facility is the only significant source of subsurface contaminants in the former creosoting plant site area. No other significant sources of subsurface contaminants, including petroleum hydrocarbon sources, were identified in the former creosoting plant site area during the RI or subsequent investigations.

- The wood treatment product used at the facility was creosote (likely mixed with MGP wastes), which was likely released to the ground surface during facility operation and appears to have migrated downward and laterally to the northeast/northwest.

- Significant hydrocarbon impacts were not identified in the new fill materials placed on the former creosoting plant site following facility demolition, indicating that no significant hydrocarbon releases have occurred at the former creosoting plant site since the fill material was placed.

- Cleanup standards for creosote and other coal-tar-derived contaminants should be based on the constituents of the materials (primarily PAHs) rather than on generic contaminant profiles such as those used for petroleum hydrocarbons. This position is based on the fact that the hydrocarbon compounds associated with creosote are pyrogenic rather than petrogenic in origin (Friedman & Bruya, 19 January 2007).

These findings support the conclusions presented by Friedman & Bruya in its 14 August 2008 response (see Attachment 1) to Ecology's 30 April 2008 letter. The following points summarize Friedman & Bruya's conclusions (refer to the letter for a full discussion):

- Soil, groundwater, and NAPL samples collected at the former creosoting plant site indicate contamination from a coal tar creosote (pyrogenic) source, not a petroleum hydrocarbon (petrogenic) source.

- For historic wood treatment applications in the Pacific Northwest, creosote was often blended with other materials, including coal tar and coal tar liquor from MGP facilities.

- Creosote and coal tar materials are both composed primarily of PAHs, but they may also contain low levels of aromatic hydrocarbons such as BTEX.

- The solubility of the compounds associated with creosote and coal tar varies by several orders of magnitude, resulting in significant differences in the contaminant profiles in different phases (adsorbed to particles, dissolved-phase, NAPL). Consequently, direct comparisons with gasoline (or other petroleum hydrocarbon) contaminants based on contaminant ratios are misleading and inappropriate.

- Chromatogram traces for soil, groundwater, and NAPL samples collected at the former creosoting plant site are fully consistent with the partitioning behavior of creosote and coal tar compounds released to the environment.

Based on the information presented in this letter, the use of petroleum hydrocarbon-based cleanup standards for the former creosoting plant site associated with the former Tacoma Metals Property is inappropriate. The only significant contaminant source identified at the former creosoting plant site is the former creosoting plant, where only creosote (likely mixed with MGP wastes) was used. The composition and distribution of contaminants detected in soil, groundwater, and NAPL samples are fully consistent with a release from a creosote source at the former creosoting plant location.

If you have any questions regarding the information presented in this letter, please call us at (253) 874-0555.

Very truly yours,

KENNEDY/JENKS CONSULTANTS

M E Godlewski / for

Dean Malte, L.G.
Project Geologist

Ty C. Schreiner

Ty C. Schreiner, L.Hg.
Vice President

Enclosures:

cc: Mr. Guy Sternal, Eisenhower & Carlson, PLLC
Mr. Bill Hengemihle, LECG

Table

TABLE 1

GENERALIZED SUMMARY OF STRATIGRAPHIC UNITS
Former Creosoting Plant Site and Former Tacoma Metals Property
Tacoma, Washington

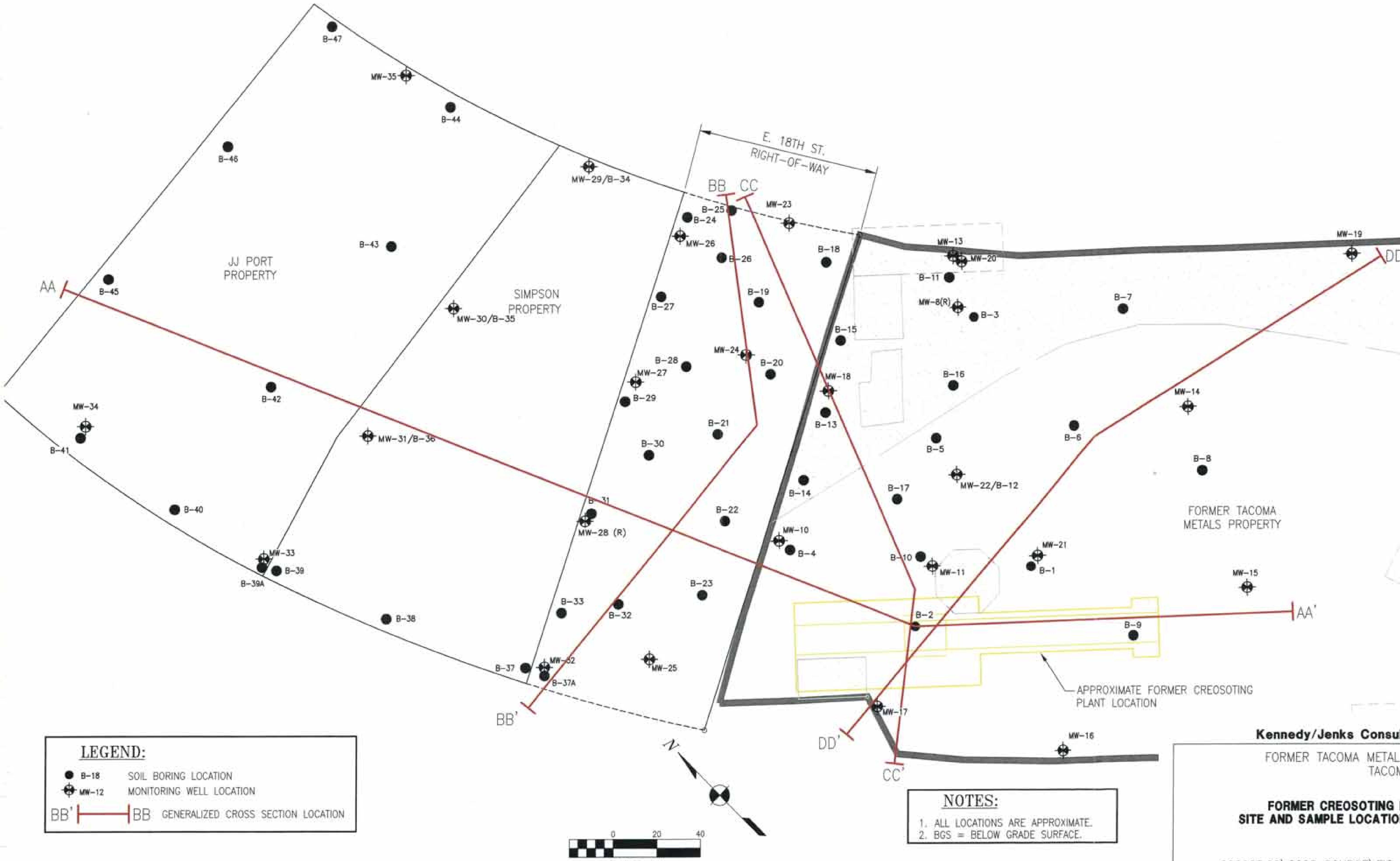
Approximate Depths (feet bgs)[a]		Approximate Thickness (feet)[a]	Generalized Description[b]
Top	Bottom		
0	1 to 8	1 to 8	**Gravelly and sandy fill materials.** This material is located throughout the former creosoting plant site and former Tacoma Metals Property. Metal, wood, and miscellaneous debris are typically mixed with the gravel and sand on the former Tacoma Metals Property, primarily in the central and eastern portions. This unit includes the 3 to 5 feet of fill material installed on the former creosoting plant area prior to construction of the coke plant.
0 to 4	5 to 6	2 to 5	**Wood fill material with no evident soil material.** This material is primarily located beneath the Simpson Property and 18th Street right-of-way.
5 to 6	7 to 13	1 to 8	**Silty sand material locally mixed with gravel, coarse sand, and/or woody material.** Silty sand is also observed at greater depths, but typically does not include gravel and woody material.
3 to 13	7 to 26	1 to 18	**Wood fill material typically mixed with 5-30% sandy, silty, and/or clayey soil.** This material is encountered throughout the former Tacoma Metals Property and former creosoting plant site, but is generally thickest at the former creosoting plant site.
10 to 19	22 to 30	2 to 15	**Sandy material, typically poorly graded, locally with some silt and/or fine gravel.** Sand is also encountered locally at shallower depths and at deeper depths beneath the silt/clay described below.
22 to >40	>22 to >40	see description	**Silty/clayey material.** This material is typically several inches to several feet in thickness and is encountered throughout the former creosoting plant site area.

Notes:

(a) Depths are given in feet below ground surface (bgs) relative to the exiting surface elevation at the former wood treatment facility, approximately 10 feet above mean sea level. Depth and thickness values indicate the ranges at which the stratigraphic units have typically been observed during our investigation activities. Generalized site soil stratigraphy is shown on the cross sections in Figures 3A, 3B, 3C, and 3D.

(b) Generalized descriptions based on previous field investigations performed by Kennedy/Jenks Consultants. Refer to the Remedial Investigation/Feasibility Study (RI/FS) Report (2001), Site Supplemental Data Summary (2007), and Soil and Groundwater Investigation Results (2008) for additional information.

Figures



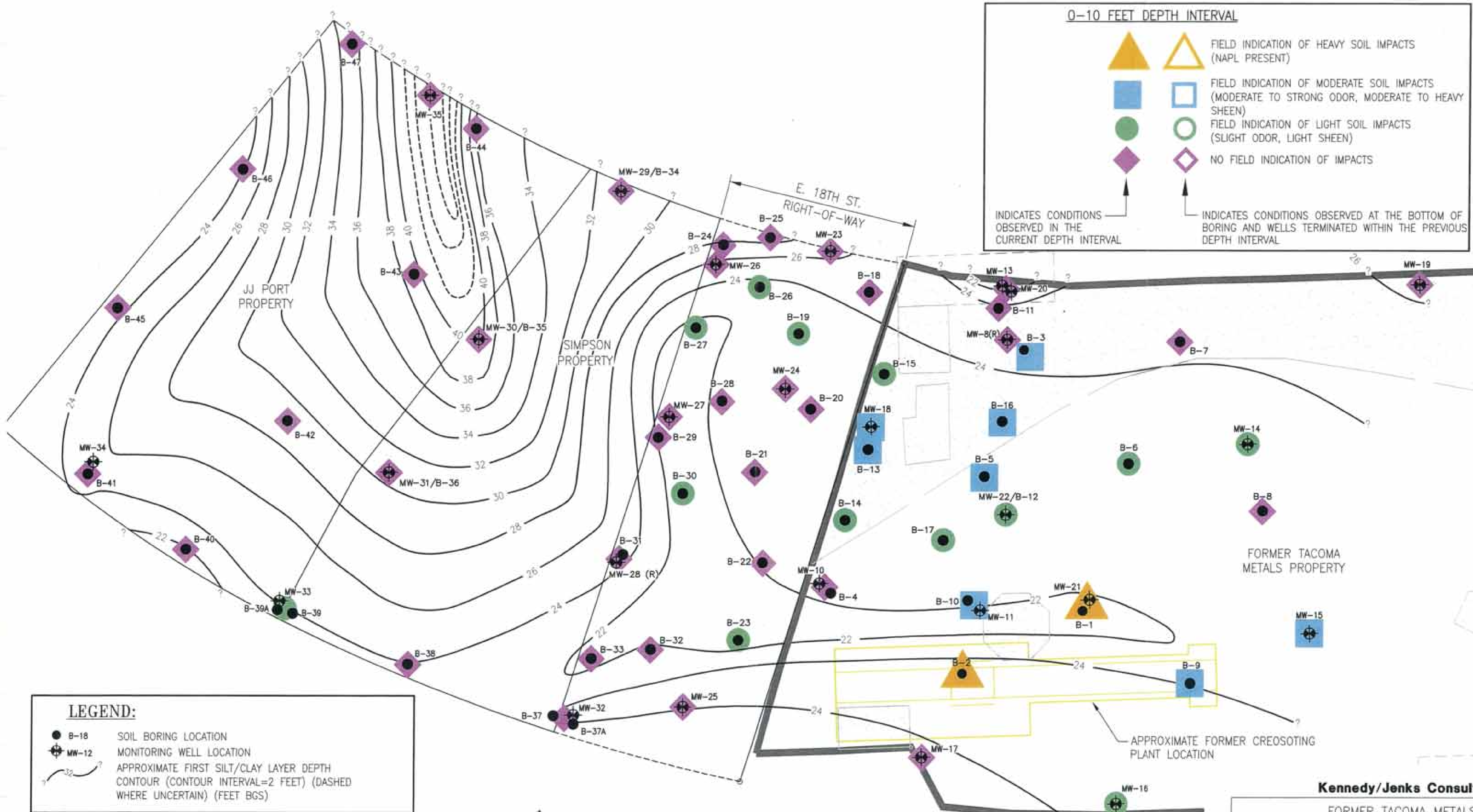
Kennedy/Jenks Consultants

FORMER TACOMA METALS SITE
TACOMA, WA

FORMER CREOSOTING PLANT SITE AND SAMPLE LOCATION MAP

996098.00\2008 SOURCE\FIG_01dwg

FIGURE 1



NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. BGS = BELOW GROUND SURFACE.
3. THIS MAP SHOWS THE HIGHEST LEVEL OF SOIL IMPACTS OBSERVED WITHIN THE INDICATED DEPTH INTERVAL. THESE CONDITIONS ARE NOT NECESSARILY REPRESENTATIVE OF THE ENTIRE DEPTH INTERVAL.
4. DEPTHS ARE IN FEET BGS NORMALIZED TO AN ELEVATION DATUM OF 10 FEET (THE APPROXIMATE EXISTING SURFACE ELEVATION AT THE FORMER CREOSOTING PLANT STRUCTURE).
5. NAPL = NON-AQUEOUS PHASE LIQUID.

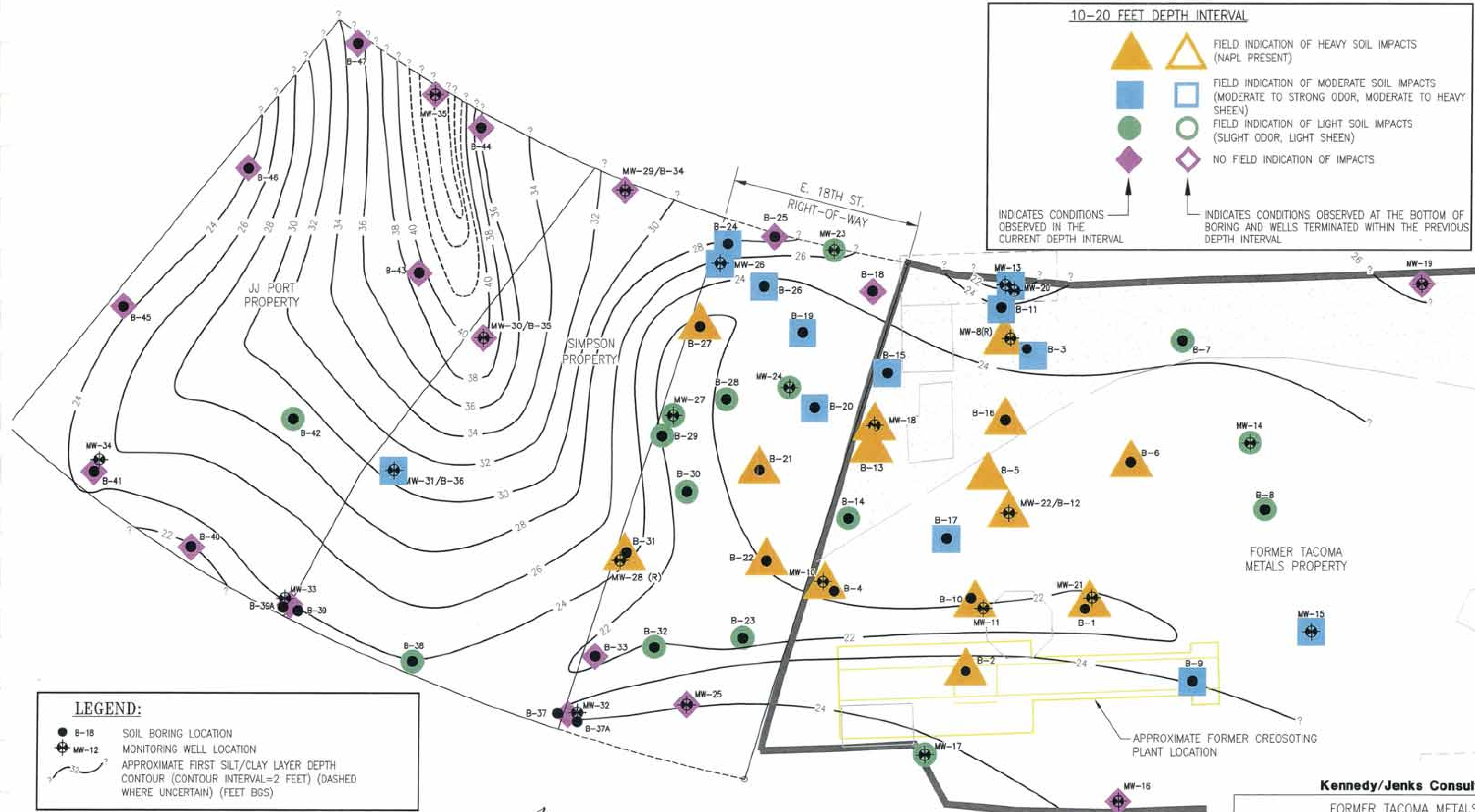
Kennedy/Jenks Consultants

FORMER TACOMA METALS SITE
TACOMA, WA

FORMER CREOSOTING PLANT SITE
SUMMARY OF SUBSURFACE SOIL IMPACTS
0-10 FEET BGS

996098.00\2008 SOURCE\FIG_02A.dwg

FIGURE 2A



0 20 40
SCALE: 1=40

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. BGS = BELOW GROUND SURFACE.
3. THIS MAP SHOWS THE HIGHEST LEVEL OF SOIL IMPACTS OBSERVED WITHIN THE INDICATED DEPTH INTERVAL. THESE CONDITIONS ARE NOT NECESSARILY REPRESENTATIVE OF THE ENTIRE DEPTH INTERVAL.
4. DEPTHS ARE IN FEET BGS NORMALIZED TO AN ELEVATION DATUM OF 10 FEET (THE APPROXIMATE EXISTING SURFACE ELEVATION AT THE FORMER CREOSOTING PLANT STRUCTURE).
5. NAPL = NON-AQUEOUS PHASE LIQUID.

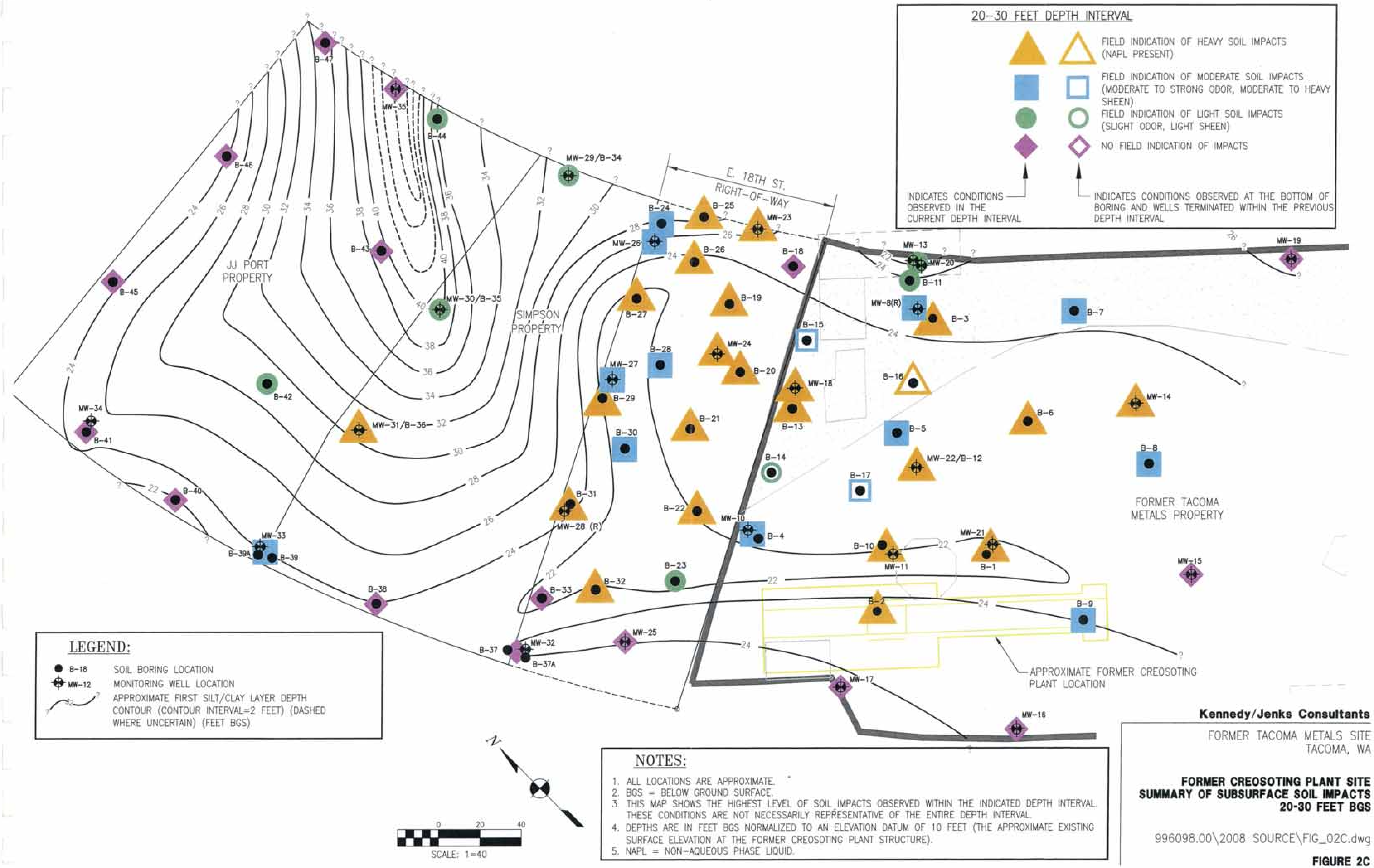
Kennedy/Jenks Consultants

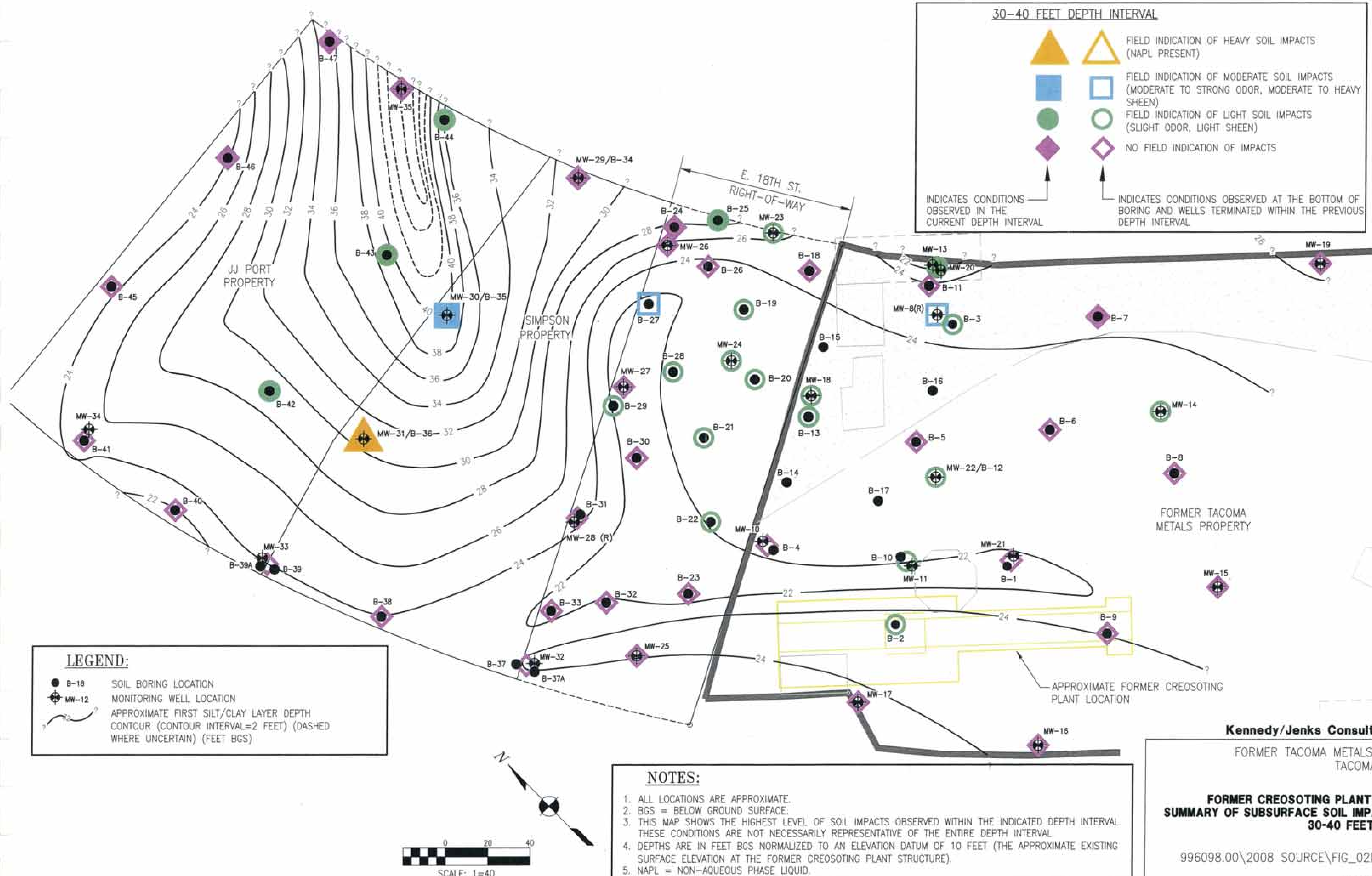
FORMER TACOMA METALS SITE
TACOMA, WA

FORMER CREOSOTING PLANT SITE
SUMMARY OF SUBSURFACE SOIL IMPACTS
10-20 FEET BGS

996098.00\2008 SOURCE\FIG_02B.dwg

FIGURE 2B


20-30 FEET DEPTH INTERVAL
FIELD INDICATION OF HEAVY SOIL IMPACTS (NAPL PRESENT)
FIELD INDICATION OF MODERATE SOIL IMPACTS (MODERATE TO STRONG ODOR, MODERATE TO HEAVY SHEEN)
FIELD INDICATION OF LIGHT SOIL IMPACTS (SLIGHT ODOR, LIGHT SHEEN)
NO FIELD INDICATION OF IMPACTS
INDICATES CONDITIONS OBSERVED IN THE CURRENT DEPTH INTERVAL
INDICATES CONDITIONS OBSERVED AT THE BOTTOM OF BORING AND WELLS TERMINATED WITHIN THE PREVIOUS DEPTH INTERVAL
E. 18TH ST. RIGHT-OF-WAY
JJ PORT PROPERTY
SIMPSON PROPERTY
FORMER TACOMA METALS PROPERTY
APPROXIMATE FORMER CREOSOTING PLANT LOCATION
LEGEND:
B-18 SOIL BORING LOCATION
MW-12 MONITORING WELL LOCATION
APPROXIMATE FIRST SILT/CLAY LAYER DEPTH CONTOUR (CONTOUR INTERVAL=2 FEET) (DASHED WHERE UNCERTAIN) (FEET BGS)
N
0 20 40
SCALE: 1=40
NOTES:
1. ALL LOCATIONS ARE APPROXIMATE.
2. BGS = BELOW GROUND SURFACE.
3. THIS MAP SHOWS THE HIGHEST LEVEL OF SOIL IMPACTS OBSERVED WITHIN THE INDICATED DEPTH INTERVAL. THESE CONDITIONS ARE NOT NECESSARILY REPRESENTATIVE OF THE ENTIRE DEPTH INTERVAL.
4. DEPTHS ARE IN FEET BGS NORMALIZED TO AN ELEVATION DATUM OF 10 FEET (THE APPROXIMATE EXISTING SURFACE ELEVATION AT THE FORMER CREOSOTING PLANT STRUCTURE).
5. NAPL = NON-AQUEOUS PHASE LIQUID.
Kennedy/Jenks Consultants
FORMER TACOMA METALS SITE
TACOMA, WA
FORMER CREOSOTING PLANT SITE
SUMMARY OF SUBSURFACE SOIL IMPACTS
20-30 FEET BGS
996098.00\2008 SOURCE\FIG_02C.dwg
FIGURE 2C



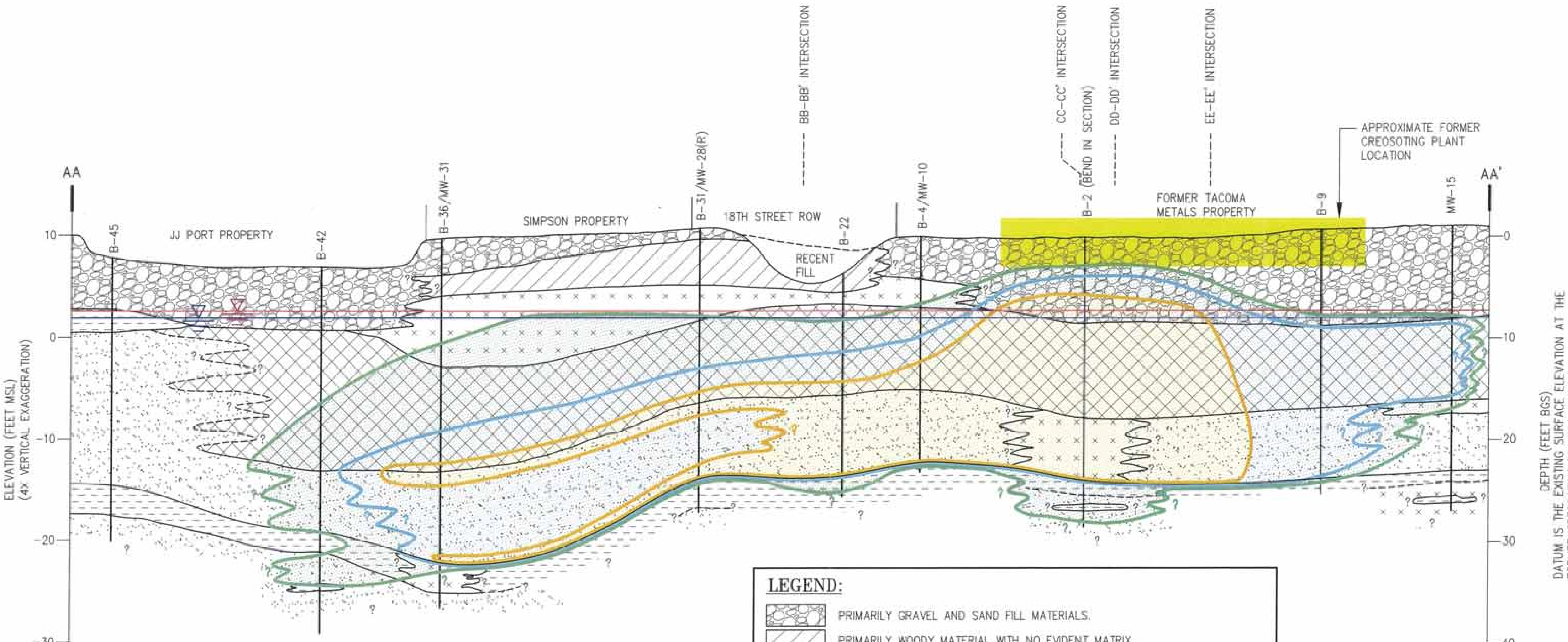
Kennedy/Jenks Consultants

FORMER TACOMA METALS SITE
TACOMA, WA

FORMER CREOSOTING PLANT SITE
SUMMARY OF SUBSURFACE SOIL IMPACTS
30-40 FEET BGS

996098.00\2008 SOURCE\FIG_02D.dwg

FIGURE 2D



LEGEND:

- PRIMARILY GRAVEL AND SAND FILL MATERIALS.
- PRIMARILY WOODY MATERIAL WITH NO EVIDENT MATRIX.
- PRIMARILY SILTY SAND WITH SOME GRAVEL AND/OR CLAY LOCALLY.
- PRIMARILY WOODY MATERIAL WITH SAND, SILT, AND/OR CLAY MATRIX.
- PRIMARILY SAND WITH SOME SILT LOCALLY.
- PRIMARILY CLAY AND SILT WITH SOME SAND LOCALLY.
- APPROXIMATE AREA OF FIELD INDICATION OF HEAVY SOIL IMPACTS (NAPL PRESENT).
- APPROXIMATE AREA OF FIELD INDICATION OF MODERATE SOIL IMPACTS (MODERATE TO STRONG ODOR, MODERATE TO HEAVY SHEEN).
- APPROXIMATE AREA OF FIELD INDICATION OF LIGHT SOIL IMPACTS (SLIGHT ODOR, LIGHT SHEEN).
- APPROXIMATE POTENTIOMETRIC SURFACE ELEVATION AT HIGH TIDE, 11 APRIL 2008.
- APPROXIMATE POTENTIOMETRIC SURFACE ELEVATION AT LOW TIDE, 11 APRIL 2008.

NOTES:

1. REFER TO FIGURE 1 FOR CROSS SECTION LOCATIONS.
2. ALL LOCATIONS AND DEPTHS ARE APPROXIMATE.
3. MSL = FEET ABOVE MEAN SEA LEVEL (NGVD 1929).
4. NAPL = NON-AQUEOUS PHASE LIQUID.
5. BGS = BELOW GROUND SURFACE.

SCALE: 1=40 HORIZONTAL (0, 20, 40)

SCALE: 1=10 VERTICAL (0, 5, 10)

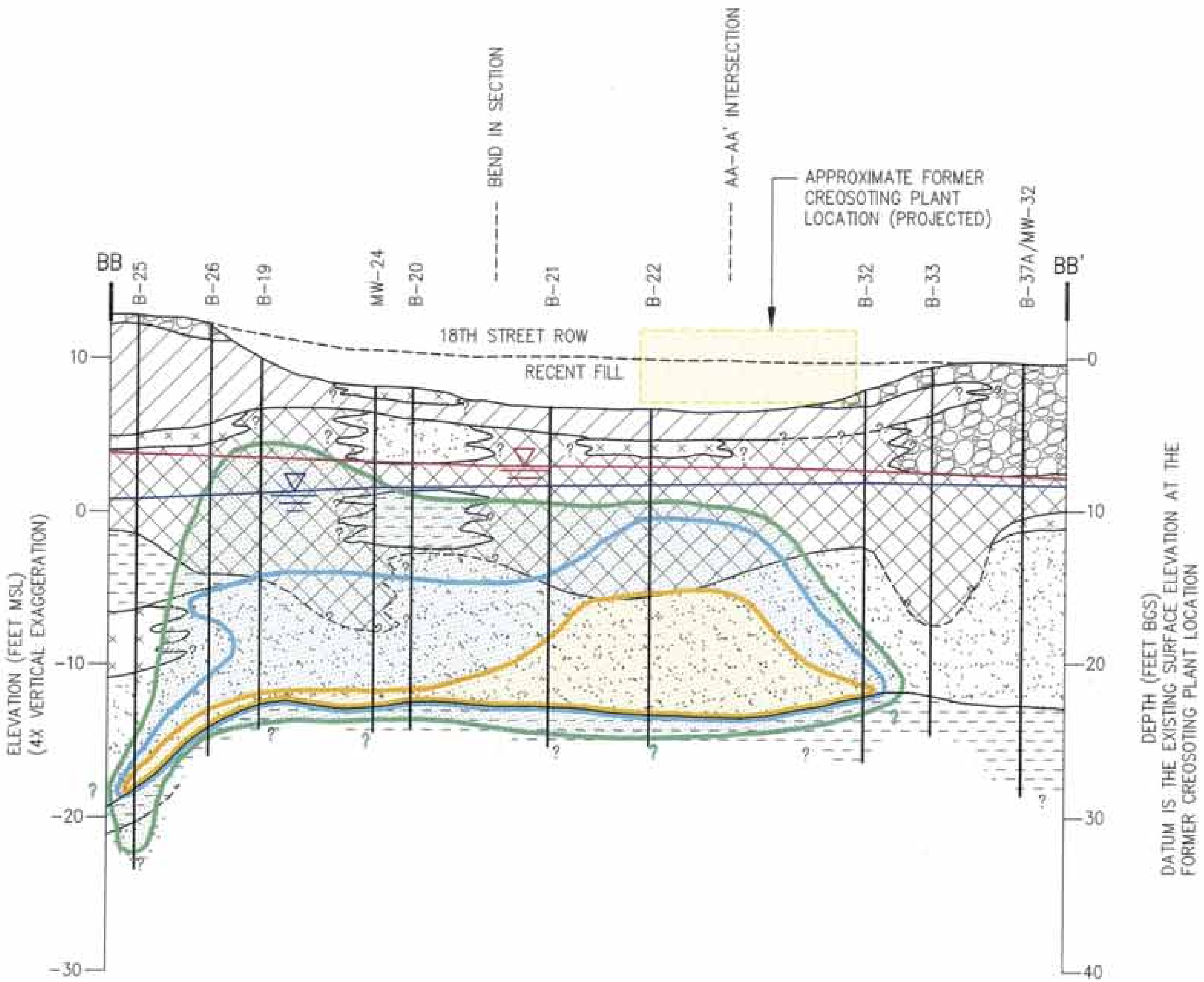
Kennedy/Jenks Consultants

FORMER TACOMA METALS SITE
TACOMA, WA

FORMER CREOSOTING PLANT SITE
GENERALIZED CROSS SECTION AA-AA'

996098.00\2008 SOURCE\FIG_03A.dwg

FIGURE 3A



LEGEND:

- PRIMARILY GRAVEL AND SAND FILL MATERIALS.
- PRIMARILY WOODY MATERIAL WITH NO EVIDENT MATRIX.
- PRIMARILY SILTY SAND WITH SOME GRAVEL AND/OR CLAY LOCALLY.
- PRIMARILY WOODY MATERIAL WITH SAND, SILT, AND/OR CLAY MATRIX.
- PRIMARILY SAND WITH SOME SILT LOCALLY.
- PRIMARILY CLAY AND SILT WITH SOME SAND LOCALLY.
- APPROXIMATE AREA OF FIELD INDICATION OF HEAVY SOIL IMPACTS (NAPL PRESENT).
- APPROXIMATE AREA OF FIELD INDICATION OF MODERATE SOIL IMPACTS (MODERATE TO STRONG ODOR, MODERATE TO HEAVY SHEEN).
- APPROXIMATE AREA OF FIELD INDICATION OF LIGHT SOIL IMPACTS (SLIGHT ODOR, LIGHT SHEEN).
- APPROXIMATE POTENTIOMETRIC SURFACE ELEVATION AT HIGH TIDE, 11 APRIL 2008.
- APPROXIMATE POTENTIOMETRIC SURFACE ELEVATION AT LOW TIDE, 11 APRIL 2008.

NOTES:

1. REFER TO FIGURE 1 FOR CROSS SECTION LOCATIONS.
2. ALL LOCATIONS AND DEPTHS ARE APPROXIMATE.
3. MSL = FEET ABOVE MEAN SEA LEVEL (NGVD 1929).
4. NAPL = NON-AQUEOUS PHASE LIQUID.
5. BGS = BELOW GROUND SURFACE.

0 20 40
SCALE: 1=40 HORIZONTAL

0 5 10
SCALE: 1=10 VERTICAL

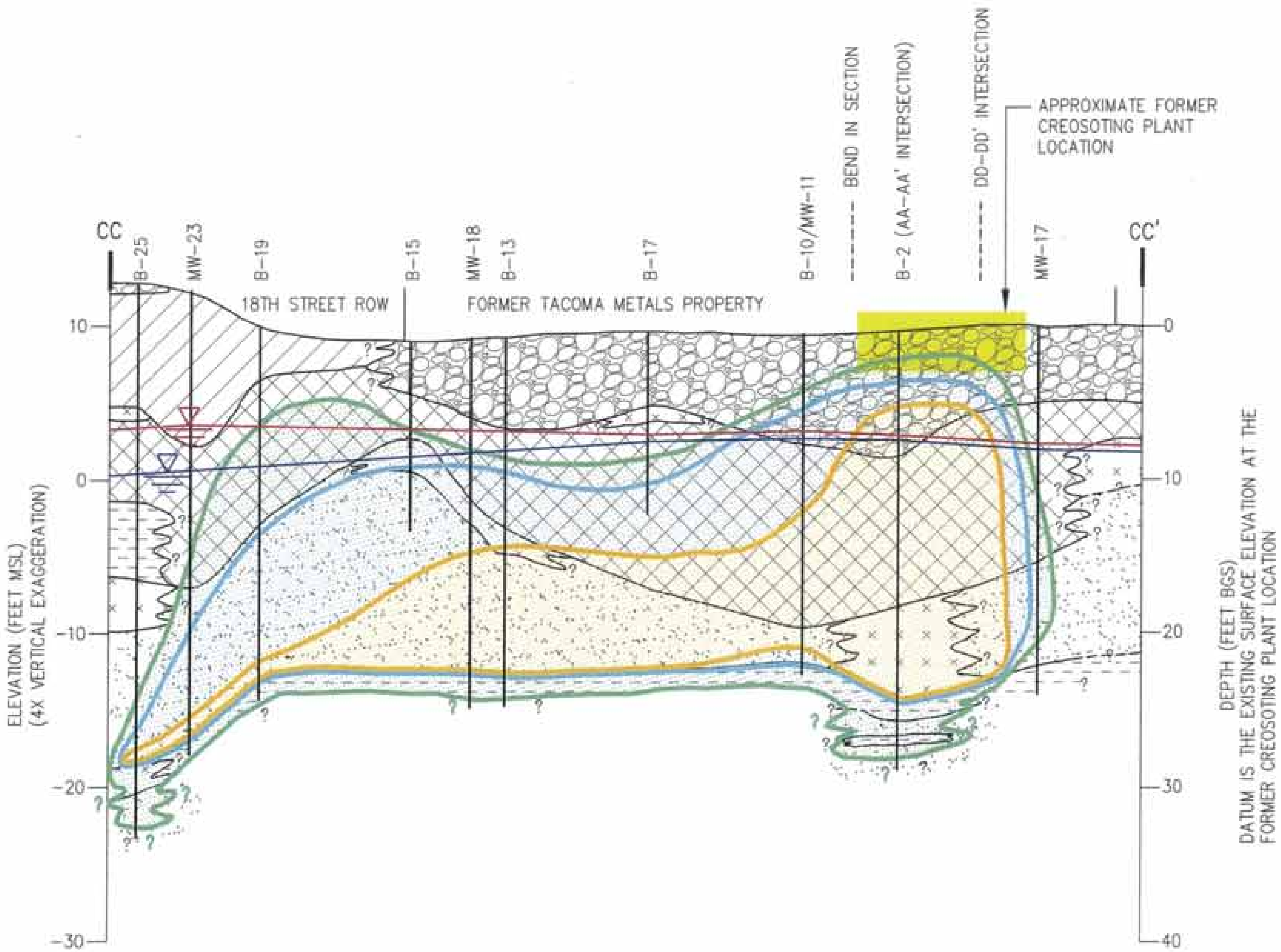
Kennedy/Jenks Consultants

FORMER TACOMA METALS SITE
TACOMA, WA

FORMER CREOSOTING PLANT SITE
GENERALIZED CROSS SECTION BB-BB'

996098.00\2008 SOURCE\FIG_03B.dwg

FIGURE 3B

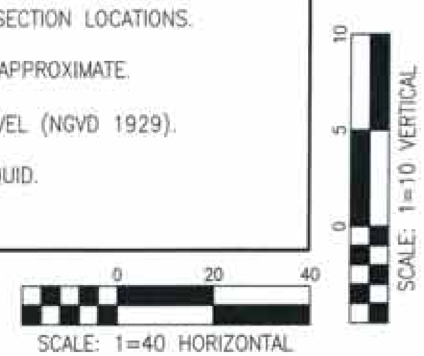


LEGEND:

- PRIMARILY GRAVEL AND SAND FILL MATERIALS.
- PRIMARILY WOODY MATERIAL WITH NO EVIDENT MATRIX.
- PRIMARILY SILTY SAND WITH SOME GRAVEL AND/OR CLAY LOCALLY.
- PRIMARILY WOODY MATERIAL WITH SAND, SILT, AND/OR CLAY MATRIX.
- PRIMARILY SAND WITH SOME SILT LOCALLY.
- PRIMARILY CLAY AND SILT WITH SOME SAND LOCALLY.
- APPROXIMATE AREA OF FIELD INDICATION OF HEAVY SOIL IMPACTS (NAPL PRESENT).
- APPROXIMATE AREA OF FIELD INDICATION OF MODERATE SOIL IMPACTS (MODERATE TO STRONG ODOR, MODERATE TO HEAVY SHEEN).
- APPROXIMATE AREA OF FIELD INDICATION OF LIGHT SOIL IMPACTS (SLIGHT ODOR, LIGHT SHEEN).
- APPROXIMATE POTENTIOMETRIC SURFACE ELEVATION AT HIGH TIDE, 11 APRIL 2008.
- APPROXIMATE POTENTIOMETRIC SURFACE ELEVATION AT LOW TIDE, 11 APRIL 2008.

NOTES:

1. REFER TO FIGURE 1 FOR CROSS SECTION LOCATIONS.
2. ALL LOCATIONS AND DEPTHS ARE APPROXIMATE.
3. MSL = FEET ABOVE MEAN SEA LEVEL (NGVD 1929).
4. NAPL = NON-AQUEOUS PHASE LIQUID.
5. BGS = BELOW GROUND SURFACE.



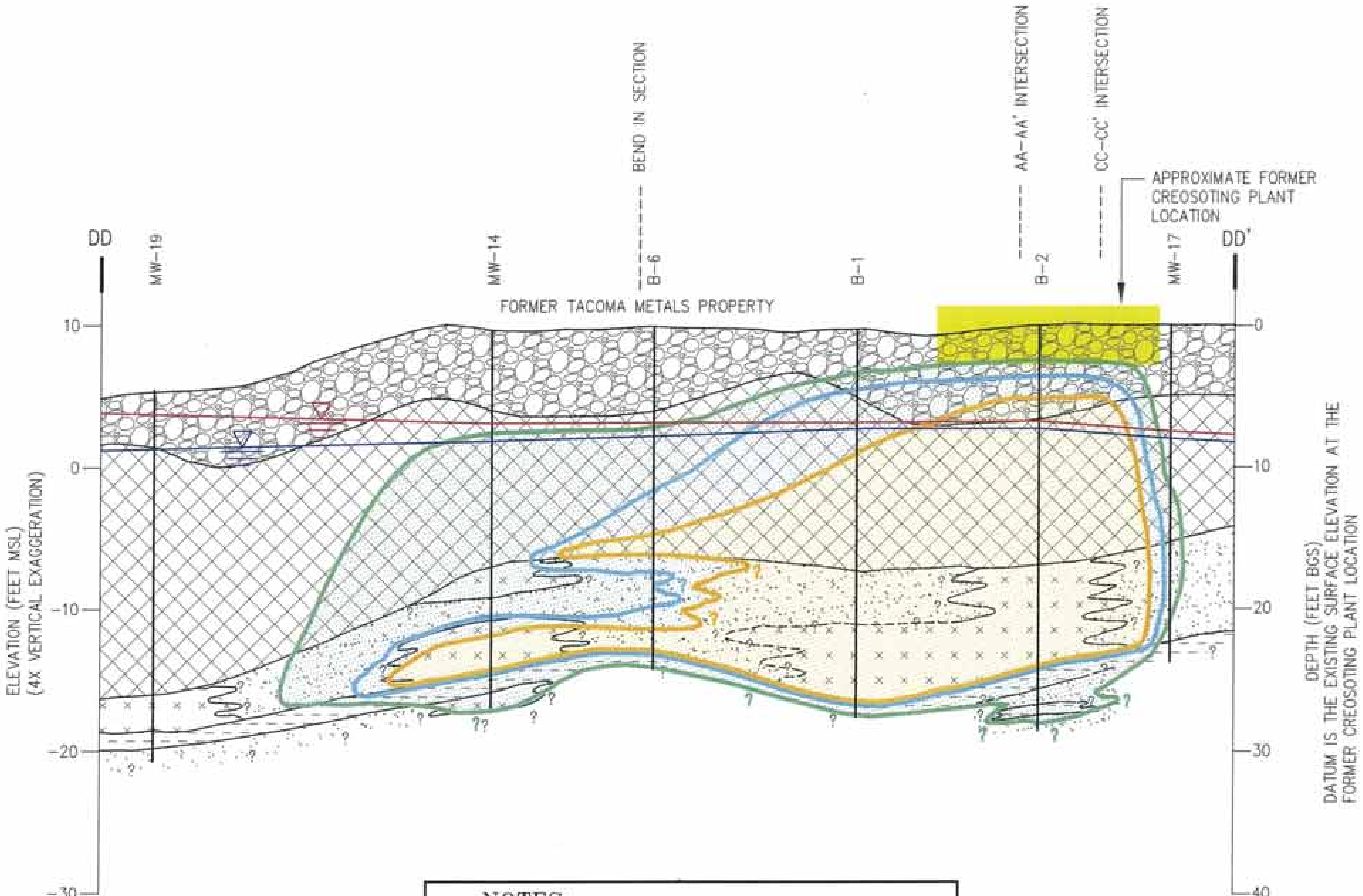
Kennedy/Jenks Consultants

FORMER TACOMA METALS SITE
TACOMA, WA

FORMER CREOSOTING PLANT SITE
GENERALIZED CROSS SECTION CC-CC'

996098.00\2008 SOURCE\FIG_03C.dwg

FIGURE 3C



NOTES:

1. REFER TO FIGURE 1 FOR CROSS SECTION LOCATIONS.
2. ALL LOCATIONS AND DEPTHS ARE APPROXIMATE.
3. MSL = FEET ABOVE MEAN SEA LEVEL (NGVD 1929).
4. NAPL = NON-AQUEOUS PHASE LIQUID.
5. BGS = BELOW GROUND SURFACE.

SCALE: 1=10 VERTICAL

SCALE: 1=40 HORIZONTAL

LEGEND:

- PRIMARILY GRAVEL AND SAND FILL MATERIALS.
- PRIMARILY WOODY MATERIAL WITH NO EVIDENT MATRIX.
- PRIMARILY SILTY SAND WITH SOME GRAVEL AND/OR CLAY LOCALLY.
- PRIMARILY WOODY MATERIAL WITH SAND, SILT, AND/OR CLAY MATRIX.
- PRIMARILY SAND WITH SOME SILT LOCALLY.
- PRIMARILY CLAY AND SILT WITH SOME SAND LOCALLY.
- APPROXIMATE AREA OF FIELD INDICATION OF HEAVY SOIL IMPACTS (NAPL PRESENT).
- APPROXIMATE AREA OF FIELD INDICATION OF MODERATE SOIL IMPACTS (MODERATE TO STRONG ODOR, MODERATE TO HEAVY SHEEN).
- APPROXIMATE AREA OF FIELD INDICATION OF LIGHT SOIL IMPACTS (SLIGHT ODOR, LIGHT SHEEN).
- APPROXIMATE POTENTIOMETRIC SURFACE ELEVATION AT HIGH TIDE, 11 APRIL 2008.
- APPROXIMATE POTENTIOMETRIC SURFACE ELEVATION AT LOW TIDE, 11 APRIL 2008.

Kennedy/Jenks Consultants

FORMER TACOMA METALS SITE
TACOMA, WA

FORMER CREOSOTING PLANT SITE
GENERALIZED CROSS SECTION DD-DD'

996098.00\2008 SOURCE\FIG_03D.dwg

FIGURE 3D

Attachment 1

14 August 2008 Letter from Dr. James Bruya of Friedman & Bruya, Inc.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Charlene Morrow, M.S.
Yelena Aravkina, M.S.
Bradley T. Benson, B.S.
Kurt Johnson, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
TEL: (206) 285-8282
FAX: (206) 283-5044
e-mail: fbi@isomedia.com

August 14, 2008

Ty Schreiner
Kennedy/Jenks Consultants
32001 32nd Avenue South, Suite 100
Federal Way, WA 98001

Dear Mr. Schreiner:

Subject: Response to Ecology's Letter dated 30 April 2008
Forensic Evaluation of Hydrocarbons

This letter provides technical responses to comments provided by the Washington state Department of Ecology (Ecology) in their letter dated 30 April 2008 regarding Friedman & Bruya's report on the forensic evaluation of the Former Tacoma Metals site dated 19 January 2007 and Kennedy/Jenks Consultants cover letter dated 9 May 2007.

Based on Ecology's comments, there appears to be a disagreement over the interpretation of the data. This disagreement is primarily based on incorrect assumptions made by Ecology with respect to the composition of creosote and gasoline. Other disagreements arise from the interpretation of the information provided in gas chromatograph (GC) traces and the usefulness of ratio analysis for volatile hydrocarbons in contact with groundwater. Finally, it does not appear that Ecology has considered the impact of weathering processes on the site chemicals, particularly the changes in chemical composition as the individual components of a product mixture dissolve into water.

Composition of Feed Stocks used in Creosoting Operations

Ecology appears to use the term creosote to describe a commodity product that was produced and sold throughout the world. We, on the other hand, used the term creosote in our reports to describe the material that was applied to wood products in the Pacific Northwest. In general, we do not disagree with Ecology regarding the "textbook" composition of creosote. However, it appears that there is a difference in opinion regarding the presence of benzene, toluene, ethylbenzene and the xylenes (BTEX) in creosote and the purity of liquid material used in Pacific Northwest creosoting operations. In most cases, wood treating products used in the Pacific Northwest were blend materials and contained a wide variety of hydrocarbon compounds derived from coal tar. Because of this, they did not display the specific set of hydrocarbon components that are ascribed to creosote by Ecology.

In the Pacific Northwest, there are reports that at least some of the creosote used at the turn of the century was imported from England and Germany.[1] This material was produced from coal tar by distillation. In the Pacific Northwest, the tar or by-products from manufactured gas plant (MGP) facilities was used as a diluent in the creosoting operations and was blended into creosote prior to its application to wood products. American Society of Testing and Materials (ASTM) developed specifications for the use of these creosote – coal tar mixtures in the manufacture of creosote treated materials. The use of these mixtures is documented in ASTM specifications such as ASTM D 391. According to the ASTM specifications, the maximum amount of coal tar that was allowed into the final application mixture of creosote was 20%. The use of coal tar as a diluent appears to have been the practice at the former Tacoma Metals site based on the presence of multiple storage tanks and their relative sizes.[2]

With respect to the chemical contamination that would be expected to arise from local creosoting operations, one must consider the chemical composition of creosote, as well as the chemical composition of local coal tars. Again, based on historical documents, the composition of local coal tars is surprising well documented.[3] In Seattle and Tacoma, the MGP facilities produced a mixed coal and carbureted water gas tar. There are some small differences between waste from coal tar operations and that from carbureted water gas operations, however both produce a material that has a very high aromatic hydrocarbon content. Everett produced a carbureted water gas tar, while Bellingham and North Yakima produced a coal tar. The production from the Seattle and Tacoma operations produced the vast majority of MGP tar in the local area. The use of a carbureted water gas process further complicates the composition of any MGP waste since unreacted petroleum distillate used as feed stock can also appear in the waste.

The composition of the Tacoma tar was reported to contain a large percentage of material that boiled below the boiling point of naphthalene (210°C). Almost 40% of the tar boiled below 210 °C, although 75% of this low boiling fraction was reported to be water. The tar, as well as any water, would be expected to contain aromatic

---

[1] "Oil-tar Creosote For Wood Preservation", G. Vorhies, Bulletin Series No. 13, Engineering Experiment Station, Oregon State College, June 1940.
[2] Sanborn Maps 1912 and 1912 1930.
[3] "Manufacture of Creosote from Washington Gas Tars", John Casper Washington Homestead Faas, Thesis for the degree of Bachelor of Science in Chemical Engineering, University of Washington, 1915.

hydrocarbons like the BTEX compounds,[4] all chemicals that Ecology attributes to coming from a gasoline source at the Tacoma Metals site. BTEX compounds were reportedly present in coal tar materials at the Tacoma Tar Pits, a former MGP site, and at other creosoting operations conducted in Washington, which would appear to confirm their presence in coal tar and creosote.[5, 6]

The release of the tar diluent, water from the diluent or blended application solution would have caused the release of gasoline-like chemicals in addition to other high boiling hydrocarbons commonly ascribed to creosote. Therefore, the presence of BTEX at the Tacoma Metals site is not necessarily due to the exclusive release of gasoline but is more likely due to the release from creosoting activities.

Tetramethylbenzenes

Ecology has also claimed that their review of the sample data enabled them to identify the presence of tetramethylbenzenes, which they claim are unique to gasoline. With respect to this claim, we are unable to confirm their unique presence in gasoline and request that Ecology document this claim. In addition, we are unable to confirm the presence of the tetramethylbenzenes in the former Tacoma Metals site samples. The reason that we cannot confirm the presence of tetramethylbenzenes is that the tests performed are not capable of positively identifying these compounds. There are a number of compounds other than the tetramethylbenzenes that can appear in GC traces and be indistinguishable from the tetramethylbenzenes when using the tests used in the analysis of these site samples. Potentially interfering compounds include hydrocarbons and degradation products of hydrocarbons and creosote.

In other analyses for samples from other sites where we can positively identify the presence of specific tetramethylbenzenes using tetramethylbenzene standards and a GCMS for detailed chemical analysis, we have always found that these compounds elute at retention times that are shorter than the methyl naphthalenes. The boiling point of several tetramethylbenzenes are available (1,2,4,5-tetramethylbenzene (196.8°C), 1,2,3,5-tetramethylbenzene (198°C), and 1,2,3,4-tetramethylbenzene (205°C)) and these are lower than the methylnaphthalenes (1-methylnaphthalene (244.6°C) and 2-methylnaphthalene (241.9°C)).[7] The lower boiling points of the tetramethylbenzenes would suggest that they would elute from a GC before the methylnaphthalenes. It is

[4] "Environmental Forensics Aspects of PAHs from Wood Treatment with Creosote Compounds", B.L. Murphy and J. Brown, Environmental Forensics, volume 6, pages 141 to 159, 2005.
[5] EPA Superfund ROD: Wyckoff Co./Eagle Harbor, EPA/ROD/R10-00-047.
[6] EPA Superfund ROD: Commencement Bay Near Tide Flats OU23 (Tacoma Tar Pits), EPA/ROD/R10-88.
[7] "Selection of Representative TPH Fractions Based on Fate and Transport Considerations", J.B Gustafson, J Griffith Tell and D. Orem, Total Petroleum Hydrocarbon Criteria Working Group Series, Volume 3, Amherst Scientific Publishers, Amherst, MA, 1997, ISBN 1-884-940-12-9.

possible that the compounds claimed by Ecology to be tetramethylbenzenes are actually dimethylnaphthalenes since these latter compounds elute after the methylnaphthalenes and are typical components of creosote. Regardless, the Ecology claim that the tetramethylbenzenes are present in some of the site samples is unconfirmed. In the absence of confirmatory analytical testing, Ecology's assertion that tetramethylbenzenes are present is speculative.

Even if tetramethylbenzenes are present, their presence does not mean that they are due to the exclusive release of gasoline. Tetramethylbenzenes are common petroleum constituents and have been reported to be present in crude oil, diesel, turbine fuel, and gasoline.[8] They would be expected to be present in any unreacted petroleum feed stock used in the carbureted water gas processes and in the waste from such processes. Tetramethylbenzenes have been reported to be constituents of waste oils from MGP operations.[9] Therefore, even if tetramethylbenzenes are present, it is not possible to use them to positively identify the presence of gasoline.

Constituent Ratio Analyses

In our analysis of contamination at this site, we used semi-volatile compounds in our evaluation. These compounds were used due to their general recalcitrant nature. We did not use volatile compounds in a similar analysis. There are several reasons for this. First, volatile compounds are not considered to be recalcitrant in the environment as they decompose and transform readily under natural conditions. They readily volatilize and dissolve into water (groundwater). The rate of loss of volatile compounds is highly variable and a function of the site-specific conditions which can vary from location to location. In addition, the solubility of the volatile compounds vary by several orders of magnitude. This means that the ratio of volatile compounds in soil or a free product will be different from their ratio in groundwater which is in immediate contact with the soil or free product. On top of the variability caused by differences in volatilization and water solubilization, biological degradation and other natural attenuation factors can be compound specific and will complicate any ratio analysis to the point of uselessness.

For example, the solubility of benzene (1780 mg/L), toluene (515 mg/L), ethylbenzene (152 mg/L), the xylenes (160 to 220 mg/L), naphthalene (31 mg/L) and the methylnaphthalenes (25 and 28 mg/L) vary by over a factor of 50. The solubility of

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[8] "Selection of Representative TPH Fractions Based on Fate and Transport Considerations", J.B Gustafson, J Griffith Tell and D. Orem, Total Petroleum Hydrocarbon Criteria Working Group Series, Volume 3, Amherst Scientific Publishers, Amherst, MA, 1997, ISBN 1-884-940-12-9.

[9] US Production of Manufactured Gases: Assessment of Past Disposal Practices, USEPA Office of Research and Development, EPA/600/2-58-012.

PAH compounds including benzo(a)anthracene (0.011 mg/L), chrysene (0.0015 mg/L), benzo(a)pyrene (0.0038 mg/L), benzo(b)fluoranthene (0.0015 mg/L), benzo(k)fluoranthene (0.0008 mg/L), indeno(1,2,3-cd)pyrene (0.062 mg/L), and dibenz(a,h)anthracene (0.0005 mg/L) are typically much lower and also show a wide variation in their water solubility.[10]

Contact of water with a product that contains equal concentrations of these aromatic hydrocarbons will preferentially remove benzene and to a lesser extent toluene, ethylbenzene, the xylenes and the PAH compounds from the product and into the water. The concentration of the BTEX compounds and PAHs in the water will differ from each other based on their solubility with benzene being present at the highest concentration. The concentration of the BTEX compounds and PAHs in the remaining product will decrease with benzene being present at the lowest concentration.

Because volatile compounds are not recalcitrant and weathering processes cause their unequal loss from one matrix and their gain in another, similar or identical products are expected to develop dissimilar ratios over time. Therefore, the use of ratio analyses for volatile compounds is highly problematic and any findings cannot be relied upon at the former Tacoma Metals site.

Ecology's Specific Comments

Bullet 1 – The comments in this section are based on the Ecology assumption that creosote does not contain any gasoline constituents other than naphthalene and the methylnaphthalenes. This is a false assumption as discussed above. The presence of BTEX in creosote and coal tar is expected and clearly complicates any attempt to distinguish between gasoline and creosote based on the presence of these compounds. The analysis of Northwest creosote would be expected to yield a pattern of peaks that would include a variety of typical gasoline constituents. The quantitation range required by NWTPHG includes naphthalene and any testing of creosote using NWTPHG would result in a positive finding of gasoline range material which could be easily misinterpreted as gasoline. When correct assumptions are used, this comment is baseless.

Bullet 2 – The comments in this section ignore the complexity associated with the analysis of soil and groundwater samples. Creosote adsorbed to the surface of soils or present as a free product can give a distinct chromatographic pattern that is different from gasoline, diesel and motor oil. However, groundwater contaminated by creosote

[10] "Selection of Representative TPH Fractions Based on Fate and Transport Considerations", J.B Gustafson, J Griffith Tell and D. Orem, Total Petroleum Hydrocarbon Criteria Working Group Series, Volume 3, Amherst Scientific Publishers, Amherst, MA, 1997, ISBN 1-884-940-12-9.

will produce a chromatographic pattern similar to that of gasoline. This difference is due to differences in the solubility of the different creosote components in water. Generally, the lowest boiling compounds in creosote (the BTEX compounds) will appear at elevated levels in groundwater samples. To further complicate matters, soil samples typically contain 10 to 20% water. This water can contain the water soluble fraction of creosote (gasoline-like material). Analyzing a soil sample containing this water can impart a gasoline-like pattern to a soil sample even though the contamination present is due to creosote. When one considers the composition changes caused by the dissolution of creosote into groundwater, this comment is misleading.

Bullet 3 – The comments in this section are based on the Ecology assumptions that creosote does not contain any BTEX and that only gasoline contains tetramethylbenzenes. These are false assumption as discussed above. The comments are also based on the assertion that the tetramethylbenzenes elute after the methylnaphthalenes. This assertion is contradicted by our own findings and the boiling points of the tetramethylbenzenes and the naphthalene compounds. Any use of the ratio of BTEX compounds must account for the impact of weathering and other degradative processes which do not appear to have been taken into consideration by Ecology. There are several levels of incorrect assumptions integrated into this comment making it difficult to directly address on a technical basis.

Bullet 4 – The comments in this section are based on false assumptions discussed above and on an incomplete evaluation of sample data. Ecology compares the amplitude of two compounds, 1-methylnaphthalene and 2-methylnaphthalene. They then match this amplitude to that found in gasoline. What Ecology fails to do is to compare the amplitude of these two compounds when they are present in creosote and coal tar. If they had done so, they would have found similar amplitudes in these non-gasoline products.[11, 12] When one considers the composition of creosote and coal tar along with gasoline, this comment reaches an unsupported conclusion.

Bullet 5 – The comments in this section are based on false assumptions regarding the composition of creosote and gasoline and these have discussed above. When one takes into consideration the actual composition of creosote and coal tar and the impact caused in the composition through dissolution into groundwater, there is no conclusive evidence that gasoline is present in these samples.

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[11] Environmental Forensics Aspects of PAHs from Wood Treatment with Creosote Compounds, B.L. Murphy and J. Brown, Environmental Forensics, 6:151-159, 2005.

[12] Coal Carbonization Products, D. McNeil, Pergamon Press, New York, NY, 1966, page 49, Library of Congress Catalog Card No. 66-16880.

Bullet 6 – The comments in this section are based on false assumptions regarding the composition of creosote and gasoline. They also ignore the changes in the contaminant composition that occur when creosote compounds dissolve into groundwater. When these are taken into consideration, the semi-volatile chromatograms are exactly what one would expect for contamination originating from creosote.

Bullet 7 – Until some agreement can be reached on the composition of gasoline and creosote, further testing would be of no benefit.

Summary

In summary, there are fundamental errors in the basic assumptions used by Ecology with regards to the composition of materials used for creosoting operations, as well as the composition of petroleum products like gasoline. There also seem to be significant differences in the degree of confidence one can place on testing data, especially when one takes into account natural weathering processes. Agreement should be reached as to the composition of gasoline and creosote, and the significance of any potential findings, before further testing is conducted.

Sincerely,

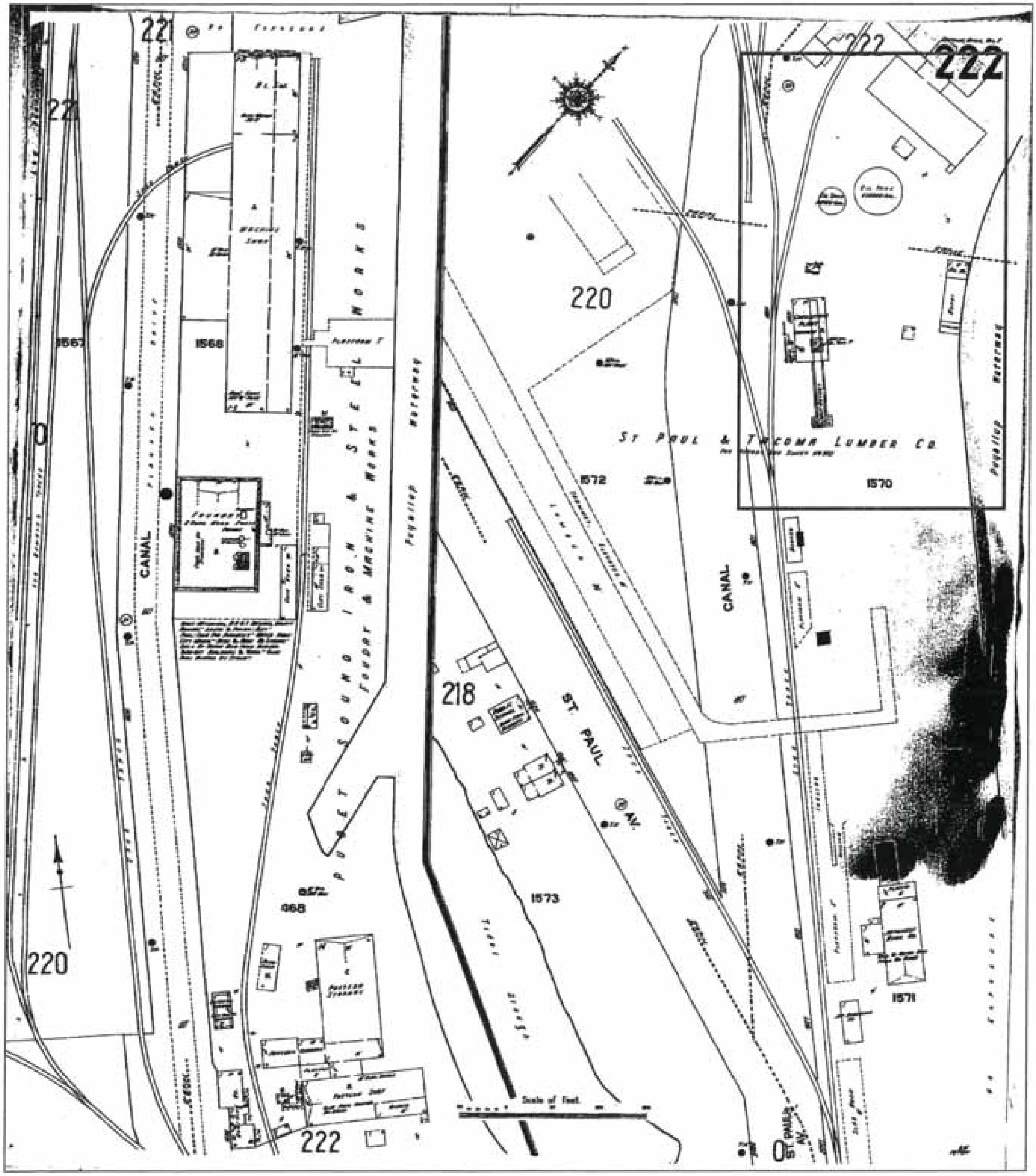
FRIEDMAN & BRUYA, INC.

James E. Bruya, Ph. D.
NAA0814L.DOC

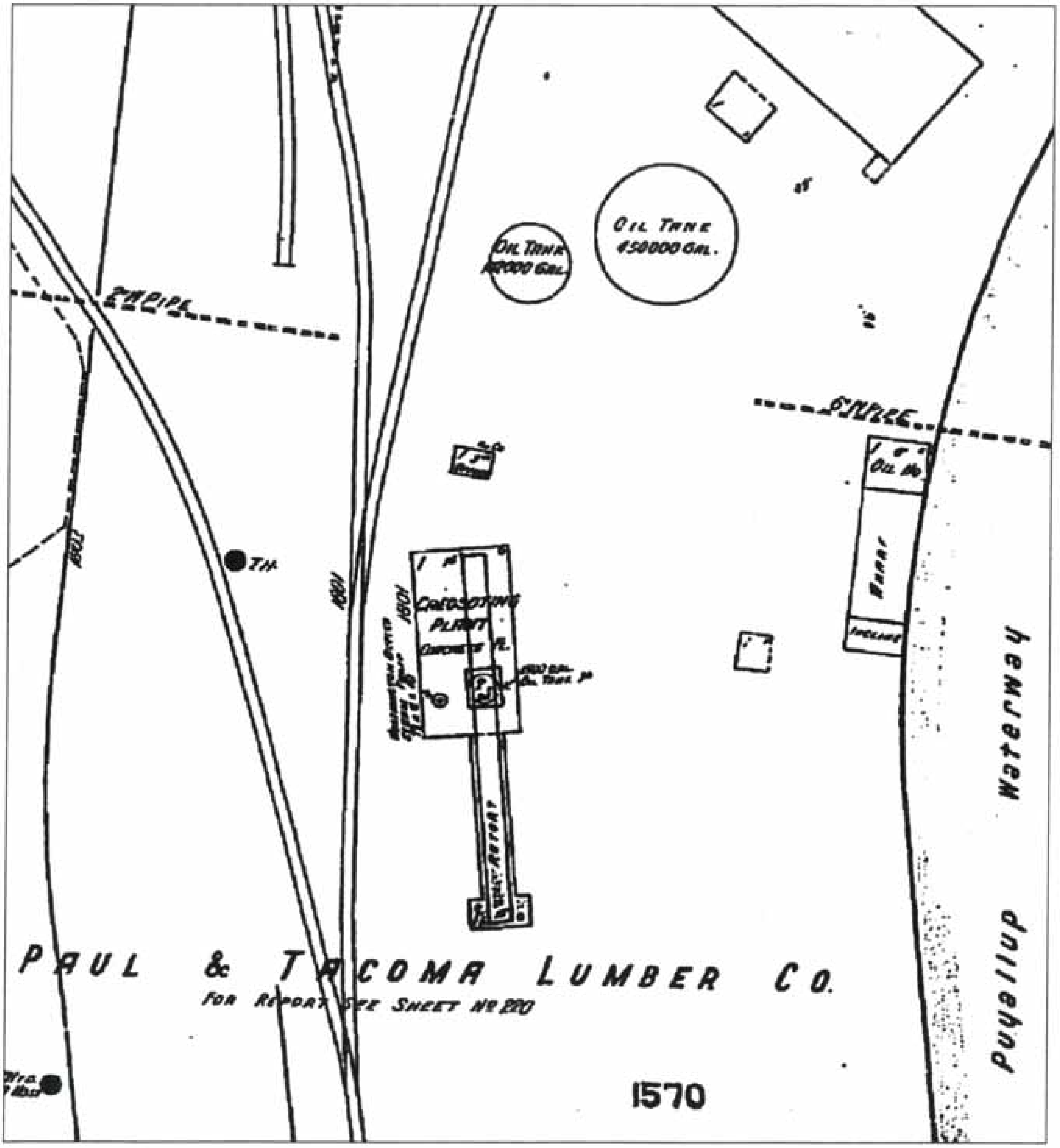
Attachment 2

Selected Historical Research Documents

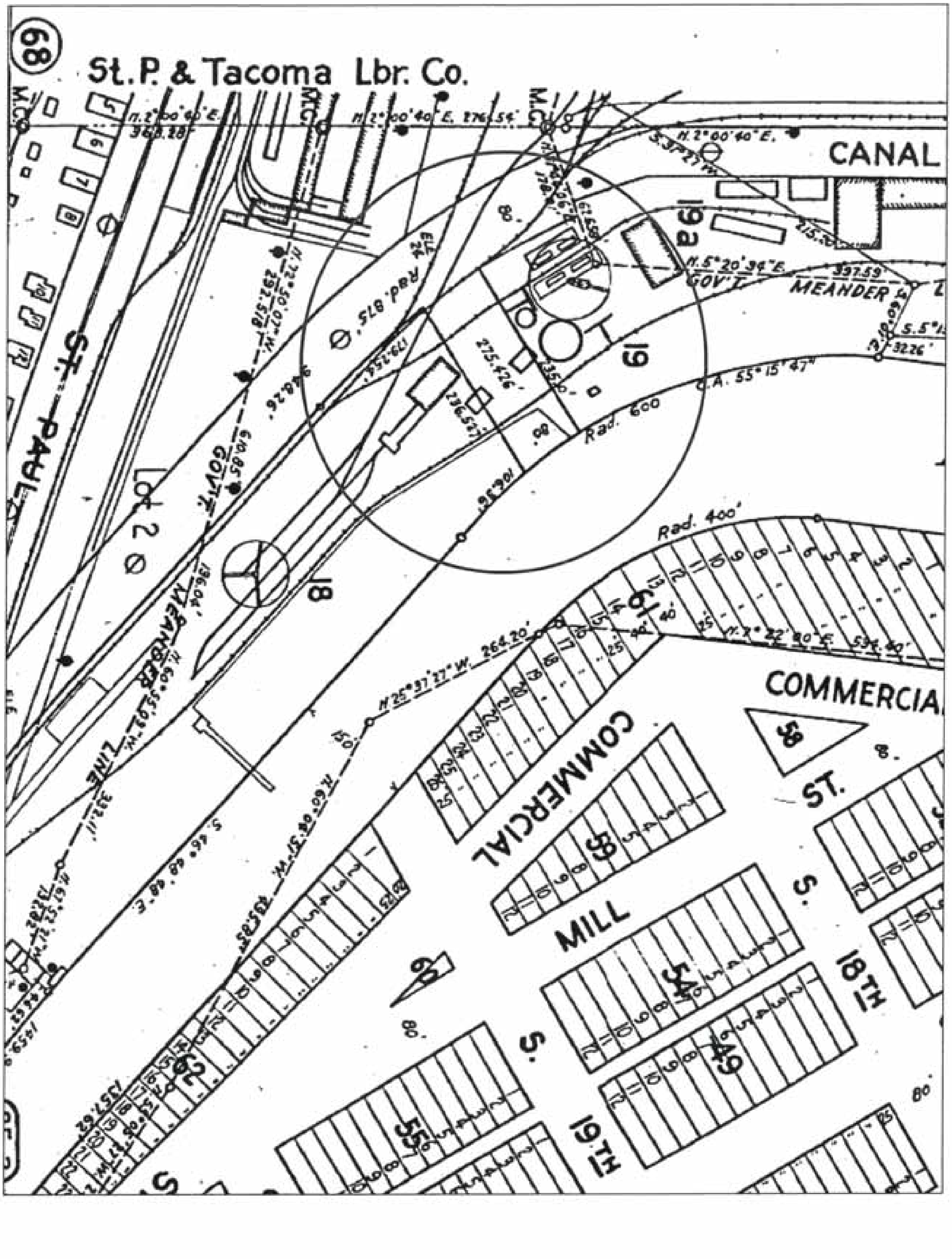
Maps



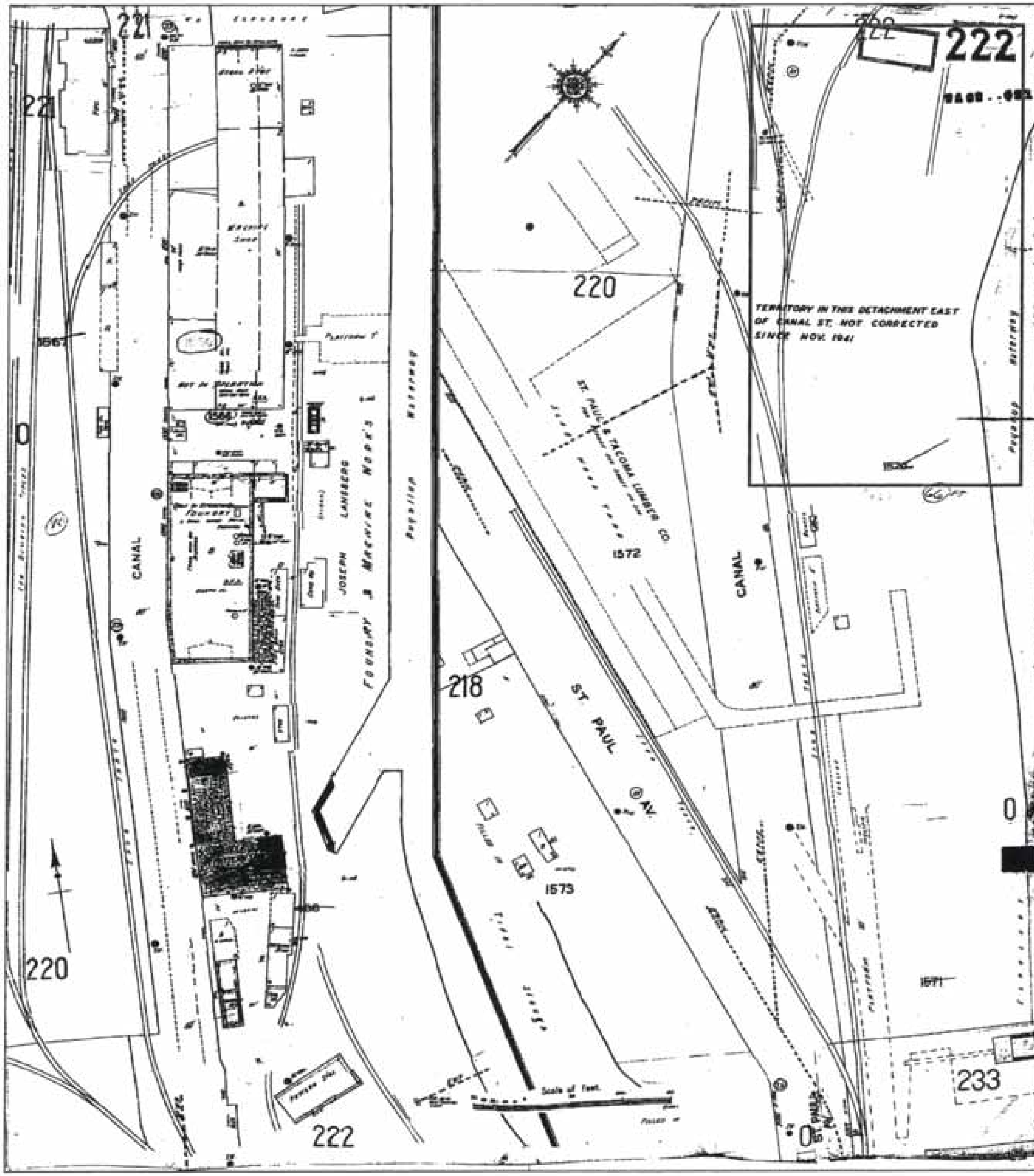
Map1. 1912 Sanborn Fire Insurance Map



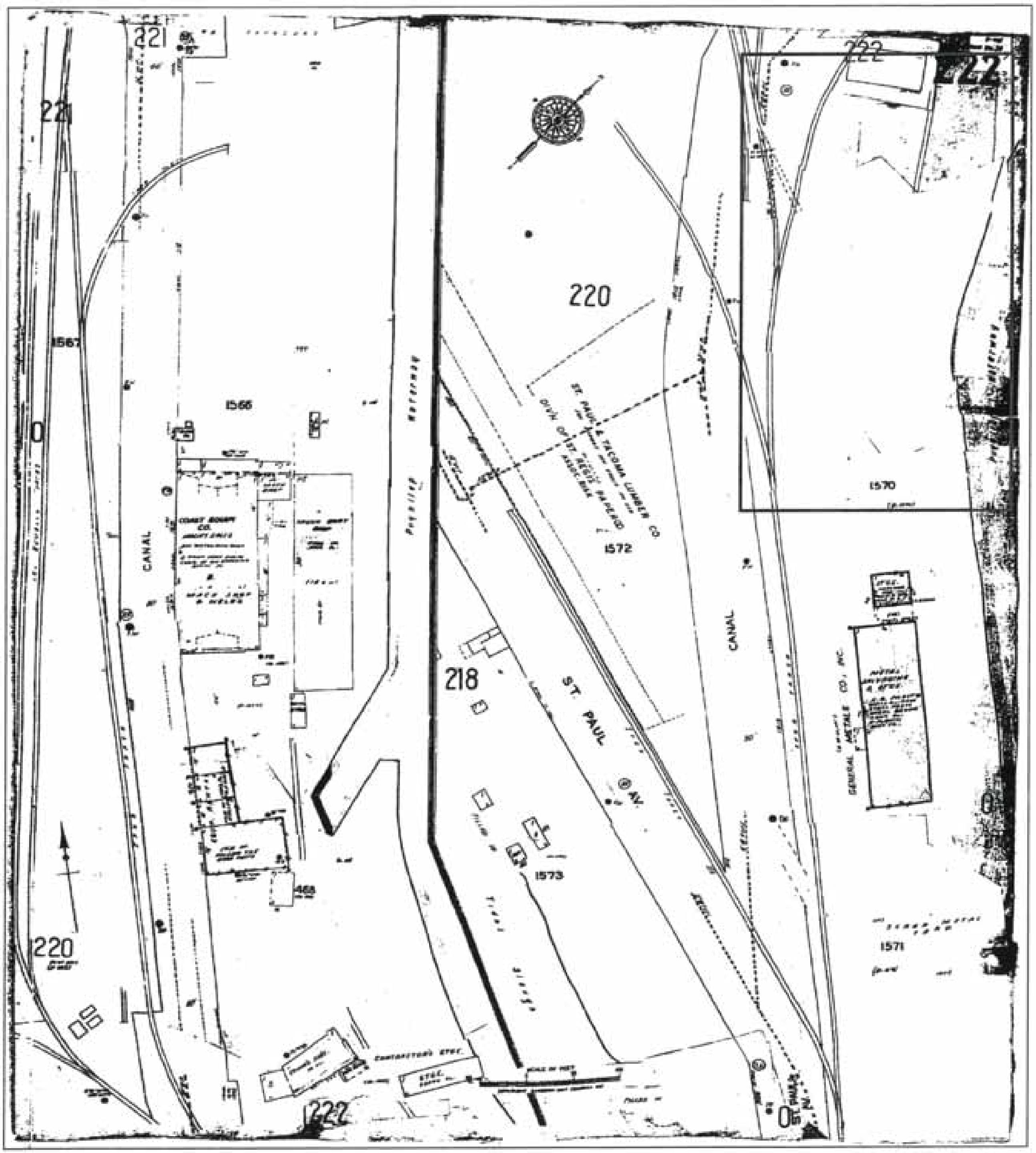
Map 2. 1912 Sanborn Fire Insurance Map, enlargement of former creosoting plant site area.



Map 3. 1926 Metsker's Map



Map 4. 1950 Sanborn Fire Insurance Map.



Map 5. 1965 Sanborn Fire Insurance Map.

Former Creosoting Plant and Coke Plant Photographs

Former Creosoting Plant and Coke Plant Photographs

1920 and 1922 photos were obtained from the Washington State Historical Society:
1920A by Boland #3441
1920B by Boland #3439
1922A by Boland #7063
1922B by Boland #7059

1944 Photos were obtained from the Tacoma Public Library
1927 by Boland #16901
1944A by Richards Studio Collection D17139-5
1944B by Richards Studio Collection D17139-6

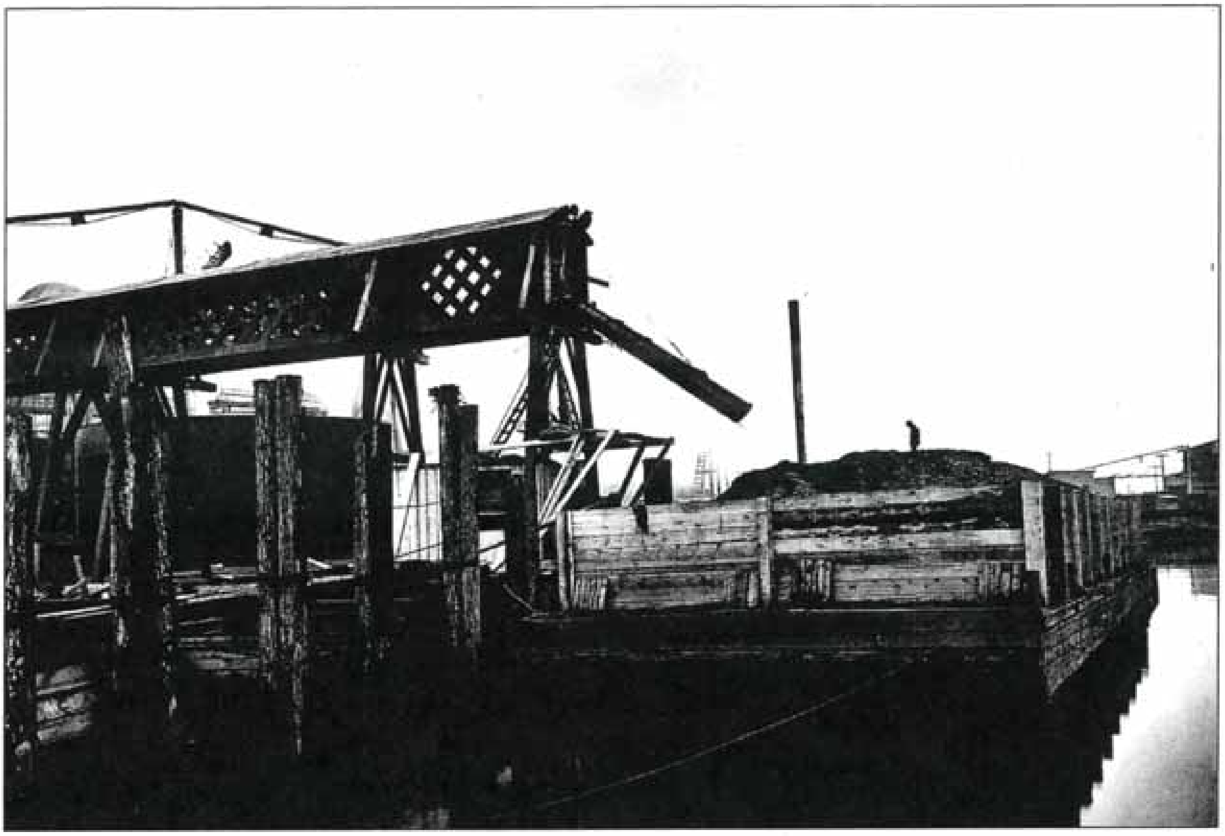


Photo 1920A. Storage tank (left half of photo) at the former creosoting plant site.

Photo 1920B. Former creosoting plant site tanks and structures (right half of photo)

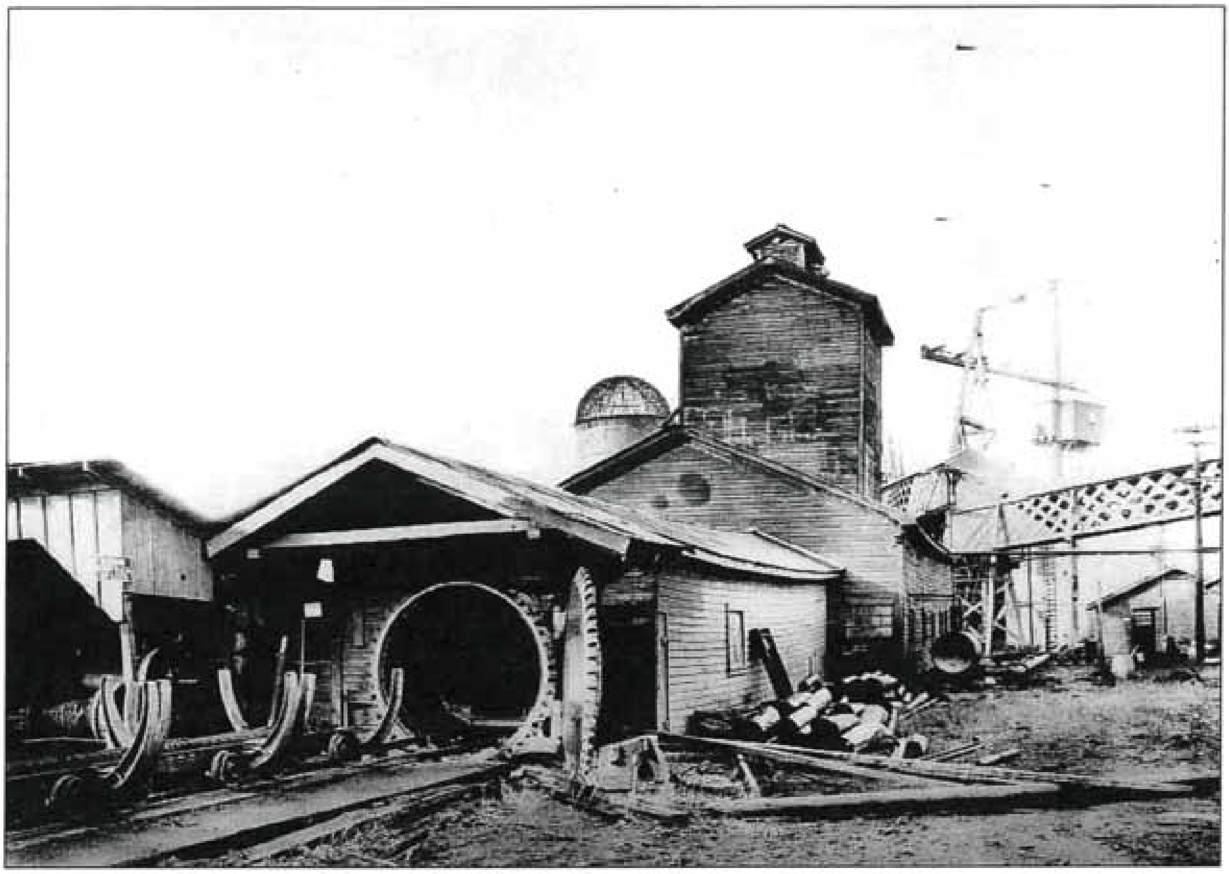


Photo 1922A. Former creosoting plant site main structure with retort and other structures.

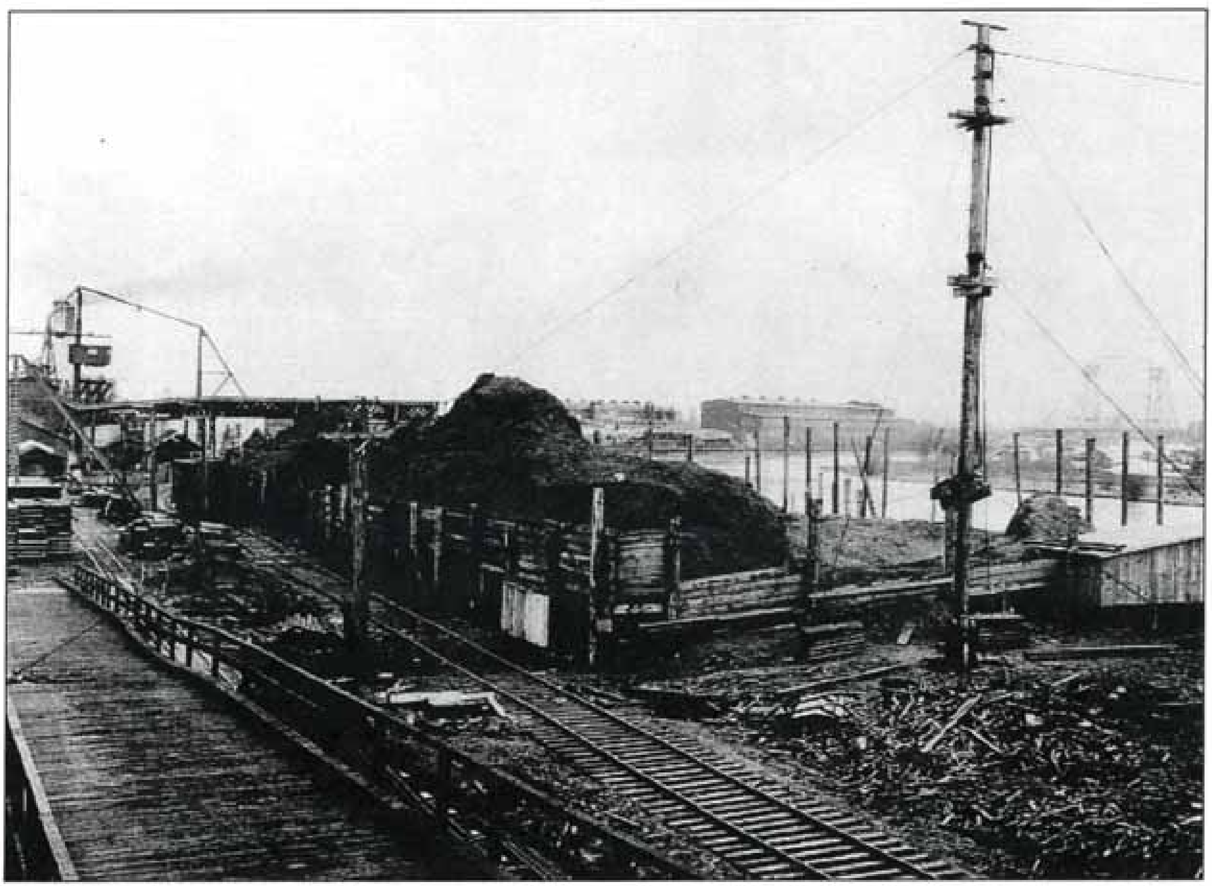


Photo 1922B. Former creosoting plant site area. Main structure at left edge of photo.

1927 Photo. Upper--Oblique view of the former creosoting plant site (upper left of photo, tanks and crane visible) and surrounding area. **Lower--**Former creosoting plant site, zoomed in from upper photo (arrow points to top of the main site structure that houses the retort).

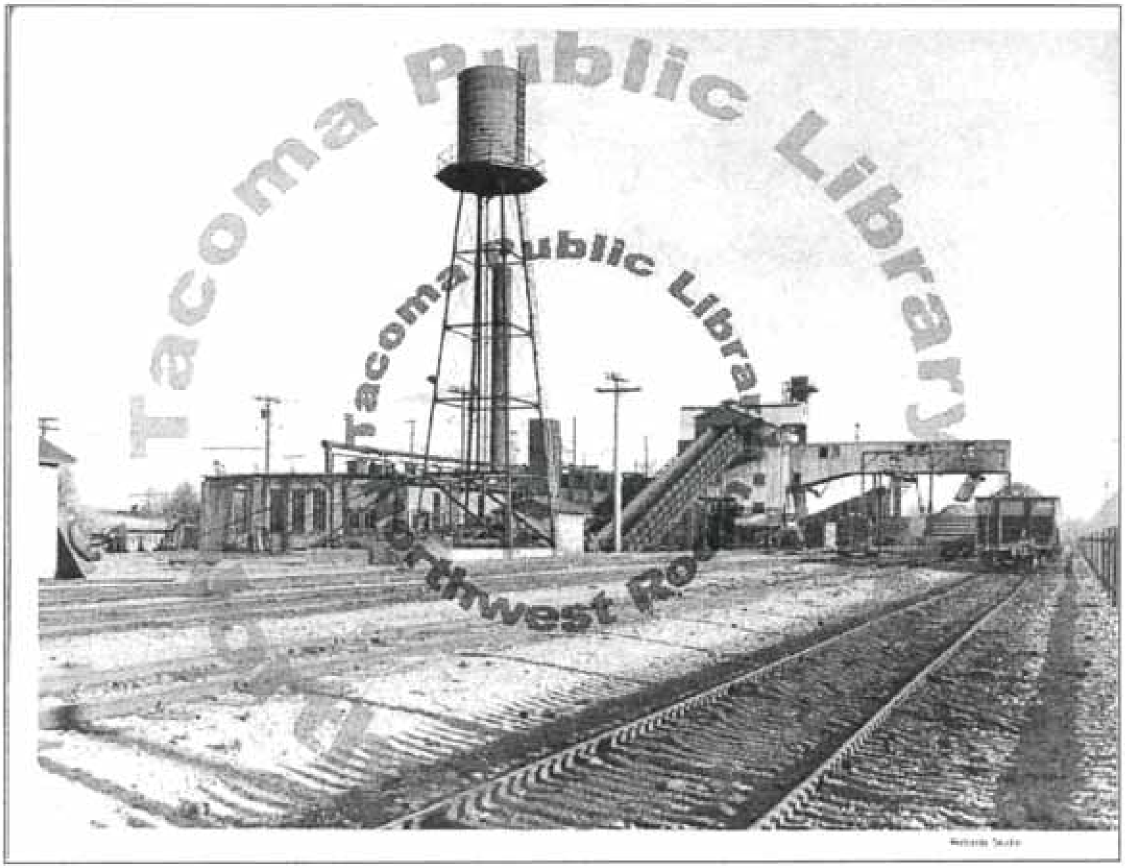


Photo 1944A. Former coke plant at the former Tacoma Metals Property, view to the east from the former creosoting site.

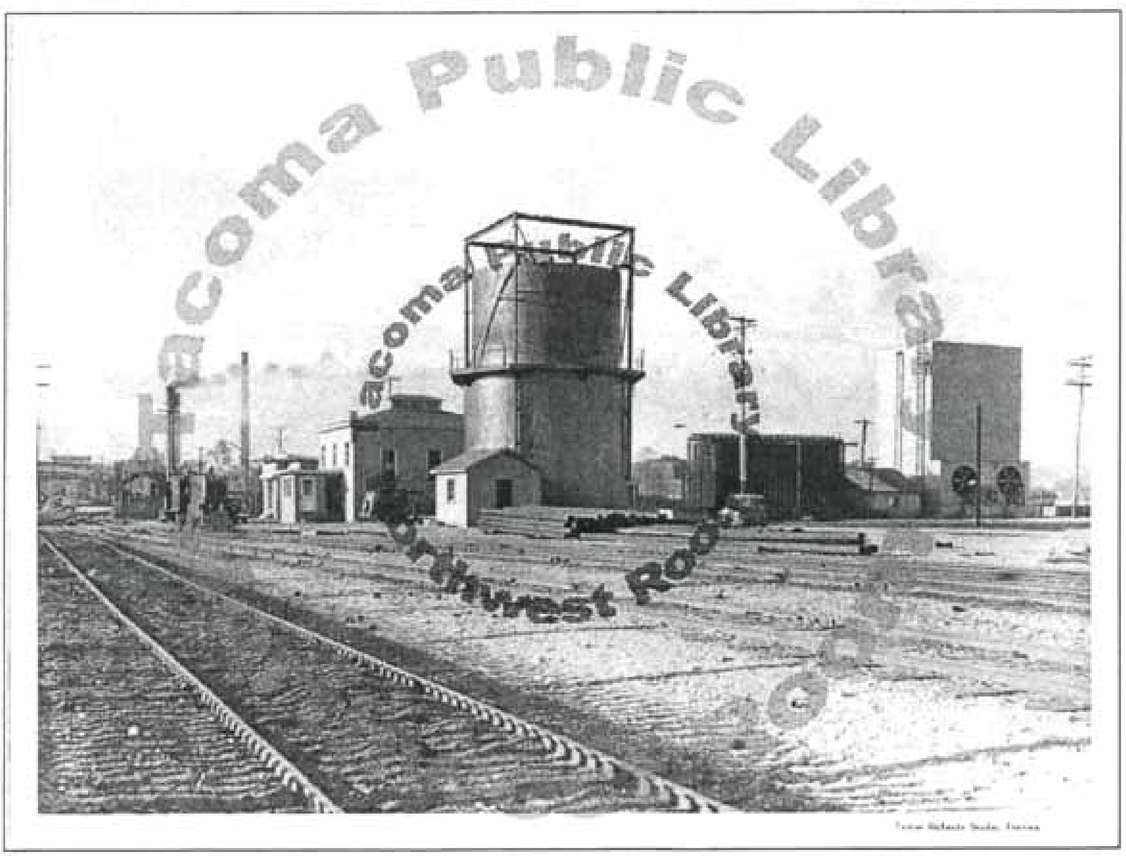


Photo 1944B. Likely coal gas storage and distribution structures located at the former creosoting plant site and associated with the former coke plant, view to the west.

St. Paul and Tacoma Lumber Company Documents

CREOSOTE DEPARTMENT EARNINGS. 1912.

		Amount	Amount	Earnings.
LUMBER:	Purchased	10,505.39		
	Operating Expenses #35	12,554.40	23,059.79	
	Sales	25,931.21		
	Inventory Dec. 31, 1912	461.27	26,392.48	
	Net Earnings			3,332.69
PILES:	Purchased	9,022.18		
	Operating Expenses #35	21,611.55	30,633.73	
	Sales	26,495.67		
	Inventory Dec. 31, 1912	6,944.15	33,439.82	
	NET EARNINGS			2,806.09
CREOSOTING ONLY:				
	Operating Expenses		2,199.72	
	Revenue		2,945.22	
	NET EARNINGS			745.50
POLES:	Purchased	432.60		
	Operating Expenses #36	126.90	559.50	
	Sales	563.25		
	Inventory Dec. 31, 1912	34.80	598.05	
	NET EARNINGS			38.55
SHINGLES:	Purchased	123.75		
	Operating Expenses #35	34.22	157.97	
	Sales	160.88		
	Inventory		160.88	
	NET EARNINGS			2.91
PAVING CONTRACT 11th St. BRIDGE				619.63
FREIGHT UNDERWEIGHTS				23.74
PAVING BLOCKS:	Purchased	2,551.07		
	Operating Expenses	3,145.11	5,696.18	
	Sales	4,348.64		
	Inventory Dec. 31, 1912	1,358.25	5,706.89	
	NET GAIN			10.71
	TOTAL			7,579.82
Barn Paving Job (Loss)				77.98
	TOTAL NET GAIN 1912			7,501.84

OPERATING EXPENSES

Labor		5,099.00
Creosote Oil		24,719.81
Supplies & Expense		1,348.50
Power & Steam		390.39
General Expense		8,114.20
Salary	2,175.00	
Interest	3,364.89	
Insurance	906.46	
Office & Mis.Exp.	1,667.85	
Total		39,671.90

PURCHASES

Lumber	849,033 ft.	10,505.39
Piles	106,418 Lin	9,022.18
Poles	126 Pcs	432.60
Paving Blocks	4,830 Yds.	2,551.07
Shingles	49½ M	123.75
Total		22,634.99

SALES:

Lumber	25,931.21
Piles	26,495.67
Poles	563.25
Paving Blocks	4,348.64

9/16/20

C. L. P.

Please give me valuation or cost of our creosote dip tanks & crane for handling poles, in other words the plant we built for butt-treating poles.

E. G. G.

Installed 1916

Dip Tanks → $10,097.84

Total Cost

Tanks Stumps?

Derrick "C"

$4782.41

ACCT. ____
MEALS ____

FORM No. 262-C-RAY
ST. PAUL & TACOMA LUMBER CO. SERVICE CARD No. ____ DATE ____

BURDEN %	TOTAL

CR. NAME ____ NAME No. ____
DR. DEPT. No. ____ DIV. MACH. No. ____ ACCT. No. ____ ORDER No. ____
OPERATION ____ OPERATION No. ____

STOCK No.	STANDARD TIME	TIME FINISHED	TIME STARTED	TIME OR UNITS USED	RATE OR PRICE PER UNIT	AMOUNT	BURDEN %	TOTAL

DETAILS OF MATERIAL, LABOR, INT., DEP., TAXES OR INS.

ACCT. ____

ACCT. ____
MEALS ____

FORM No. 262-C-RAY
ST. PAUL & TACOMA LUMBER CO. SERVICE CARD No. ____ DATE ____

BURDEN % TOTAL

CR. NAME ____ NAME No. ____
DR. DEPT. No. ____ DIV. MACH. No. ____ ACCT. No. ____ ORDER No. ____
OPERATION ____ OPERATION No. ____
STOCK No. STANDARD TIME TIME FINISHED TIME STARTED TIME OR UNITS USED RATE OR PRICE PER UNIT AMOUNT BURDEN % TOTAL

DETAILS OF MATERIAL, LABOR, INT., DEP., TAXES OR INS.

ACCT. ____

Storage Tanks (2) Cost $6020.00 -
Total cost installed 7,635.15 -

Dip Tanks (3)
Total cost installed 10,303.45

Derrick "D" 4782.41

Brady —
Offers — 600.00 for
use of Blk Lead —
or 50.00 @ mo.
Will Conf W.F. & see re
Stampograph [illegible] & if can get
4000 Poles go — will talk loan [illegible]
[illegible]

FORM CS 10M 7-18

WE SPECIALIZE IN SUPPLYING LONG AND LARGE SIZED POLES FOR POWER TRANSMISSION AND TROLLEY LINES
COMPLETE ASSORTMENT OF ALL LENGTHS AND SIZES CARRIED IN STOCK

CASCADE TIMBER CO.

AFFILIATED WITH PACIFIC STATES LUMBER CO. AND MINERAL LAKE LUMBER CO.

CEDAR DEPARTMENT

PROMPT SHIPMENTS
QUALITY AND INSPECTION
GUARANTEED

E. J. BRADY, MGR-CEDAR DEPT.

PRODUCERS AND WHOLESALERS OF
CEDAR POLES, PILING AND POSTS
FIR PILING

YARDS AND STOCKS LOCATED ON
C. M. & ST. P.
O. W. R. & N.
NORTHERN PACIFIC
& GT. NORTHERN RYS.

TACOMA, WASH.

October 1,1920

Mr. E. G. Griggs, Pres.,
St Paul & Tacoma Lumber Co.,
Tacoma,Wash.

Dear Sir:

Referring to our recent conversation relative to rental charge for use of ground on which we are yarding poles:

Until such time as we can arrange to begin taking poles out of your logging works, the amount we will have for yarding here will be small and will not warrant making permanent arrangements for yard room or leasing your creosoting tanks, and as stated to you, while using the ground under pemporary arrangement the most we can afford to pay would be on bais of $600.00 per year.

The first car of poles unloaded on your ground was on June 10th and it will be satisfactory to us for you to bill on us for use of the ground beginning June 1st.

Just as soon as you are in a position for us to take over your pole stumpage we will be glad to take up the matter of a permanent lease of yarding ground and leasing your creosote tanks.

Yours truly,

CASCADE TIMBER COMPANY

BY E J Brady
Mgr Cedar Dept

EJB:A

Copies of Photographs and Text from American Lumberman and The Mill on the Boot

Copies of Photographs and Text from American Lumberman and The Mill on the Boot

A Story of the Development of one of America's Greatest Lumber Manufacturing Institutions, the St. Paul and Tacoma Lumber Company of Tacoma, Washington, American Lumberman, 21 May 1921.

The Mill on the Boot: The Story of the St. Paul and Tacoma Lumber Company by Murray Cromwell Morgan (1985).

is taken off the sorter and put into packages of a size to fit the carrier of the overhead monorail system which carries the load either to the dry storage in the front end of the shed or to the planing mill.

The elevation of the monorail track inside the shed is 40 feet and this elevation is used in the outside trussed structure which connects up with the planing mill. The machines in the planing mill are equipped with gravity rolls in order that the packages of lumber placed on the rolls by the 5-ton monorail hoist can roll on down to the feeding tables of the machines. All stackers, unstackers, sorters and transfers of the dry lumber system are motor driven.

The Electric Power Plant

All steam and electric current for the entire plant operations, as well as steam for several other industries located nearby, including the Carstens Packing Co., the Washington Handle Co., and the Puget Sound Iron & Steel Works, are furnished from a main power station located near the central part of the plant property, the distance from Mill B being approximately 1,200 feet and from the planing mill 800 feet. The power plant is adjacent to Mill C.

The fuel storage house, which has a capacity of 1,000 units, was built in 1916. Its supply comes from Mill B by belt conveyor, from Mill C by chain conveyor, from the planing mill by blower, and from the Washington Handle Co. plant by blower. A complete conveyor system handles the fuel from the fuel storage to the boiler plant located alongside the fuel house. To the boiler plant has recently been added four 400-horsepower Stirling water-tube boilers, equipped with automatic soot blowers and feed water regulators. Two Custodis radial brick smokestacks ten feet in diameter at the top and 150 feet high, connected to the boilers with new steel asbestos lined breeching, serve the boiler plant. A new 4-stage centrifugal feed pump directly connected to steam turbine furnishes water to the boilers from the 5,000 horsepower open type feed water heater. The entire boiler plant contains 12 Stirling boilers, capable of furnishing in exce 5,000 horsepower.

The electric generating plant directly adjoins the boiler plan which has been recently installed a 2,500-kilowatt turbine. In a tion there is a 1,000-kilowatt turbine. Both machines gene current at 480 volts, three phase, 60 cycles, and are connected proper switching equipment to a 3,750-kilowatt step-up transfo for boosting the voltage to 4,000 volts for outside transmissio various departments of the plant where it is transformed dow the motor voltage of 440. Direct current for operating cranes, ele locomotives and battery charging is furnished by a 75-kilowatt tur set and a 100-kilowatt motor generator set. Water for the densers of the two turbines is pumped from the east log pond discharges into the west pond, average temperature being 60 deg

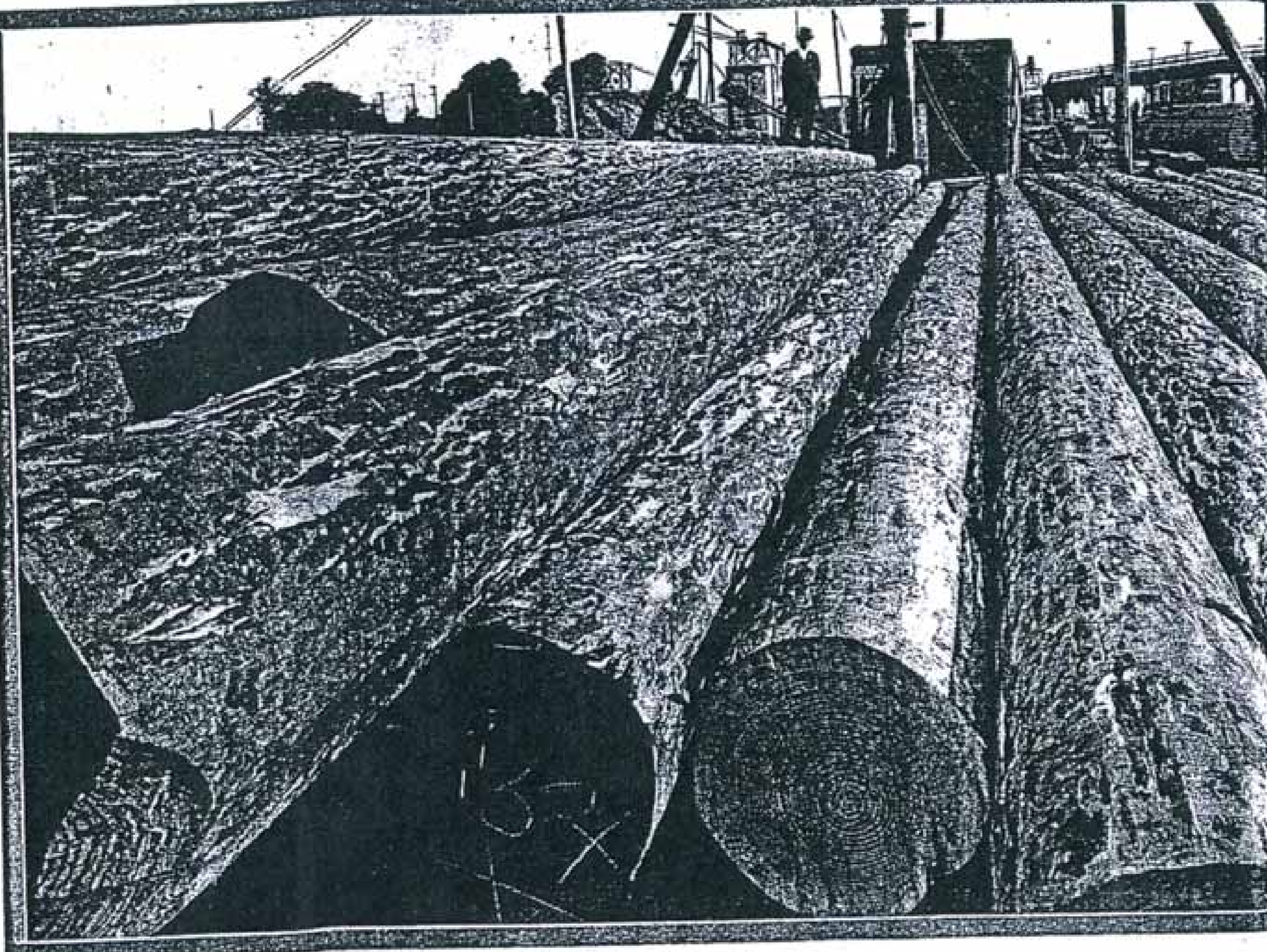
The electric power plant is tied in with the Tacoma municipal p for interchange of current. The city plant during its low w period not being able to handle all of its load, is thus able to electric power from the St. Paul & Tacoma Lumber Co.'s el power plant when desired.

All of the work in planning, engineering and working out the provements that have been made about the plant during the last years was handled by the company's own organization.

Progress of Lumber Thru the Plant

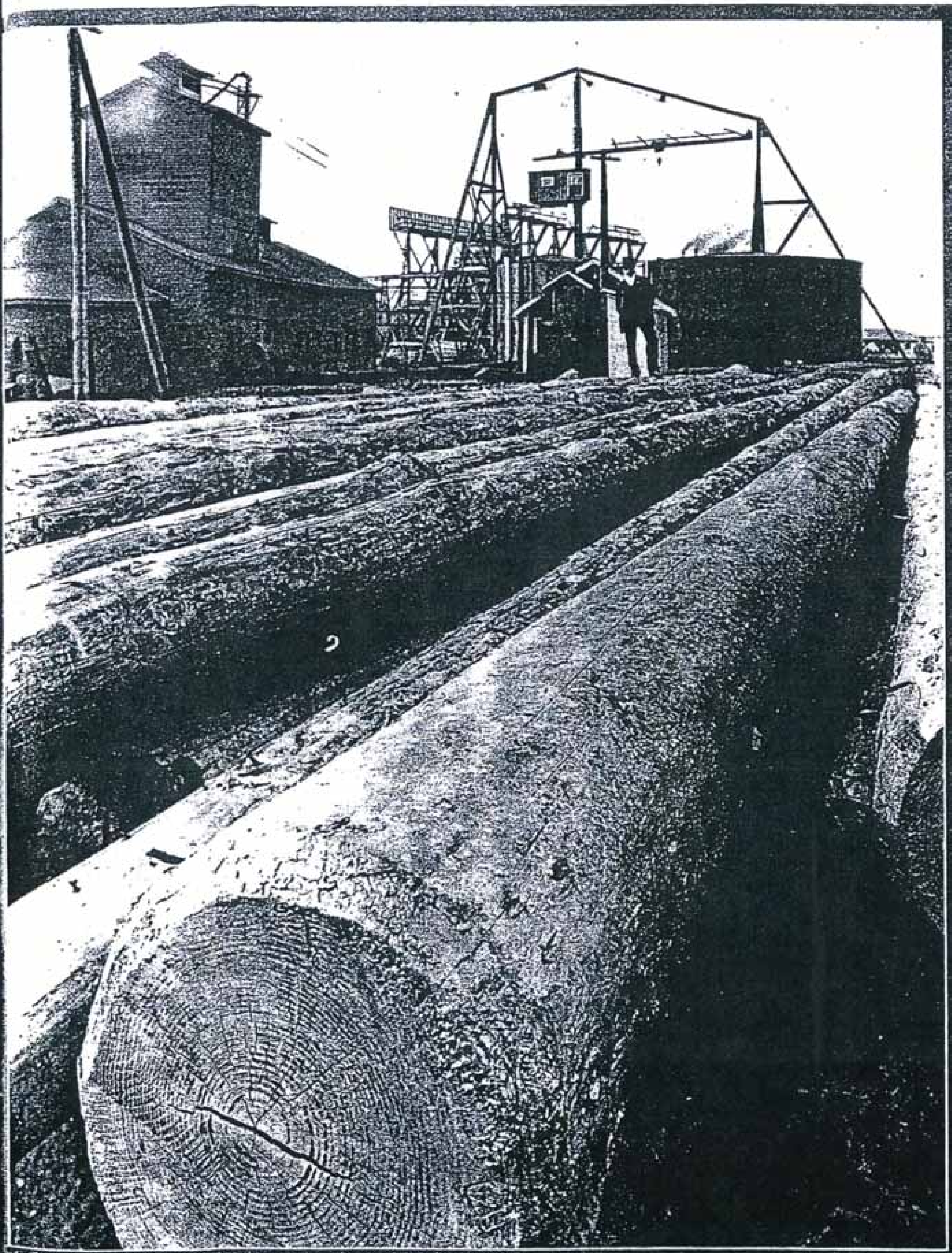
So much for a detailed description of the manufacturing faci Readers of the AMERICAN LUMBERMAN will no doubt be inter in a general description of the manner in which lumber and shi are handled about the plant.

As the logs are brought in trainloads from the company's forests they are dumped into the mill ponds, of which there are one for Mill B and one for Mill C. From the sorting platfor the "big mill," as Mill B is commonly known, the lumber is



Peeled piling at the creosoting plant ready for treatment

A partial
are



A partial view of the creosoting plant of the St. Paul & Tacoma Lumber Co., at Tacoma, Wash. In the foreground are shown treated piling. Piling, poles, timbers, and railroad ties are the principal creosoted products wide, fronted on Commencement Bay. Water alongside the dock was 35 feet deep at low tide. Three ocean-going steamers could take on cargo simultaneously. No dock on the Pacific Coast offered faster turn-around time. Two standard-gauge railroad tracks, two 36-inch gauge industrial tracks and a 20-foot crane track ran the length of the dock. A 76-foot electric whirly crane capable of lifting five tons at its extreme reach and much heavier loads at shorter distance could operate at any point along the dock.[3]

Across the bay, around the point, lay a world hungry for lumber, and beyond the mountains to the east, a nation.

The creosoting plant with an array of treated piling in the foreground. The plant supplied some of the material for Tacoma's Eleventh Street bridge, which was originally paved with creosoted wood blocks (from American Lumberman, *May 21, 1921)*

From "Mill on the Boot"

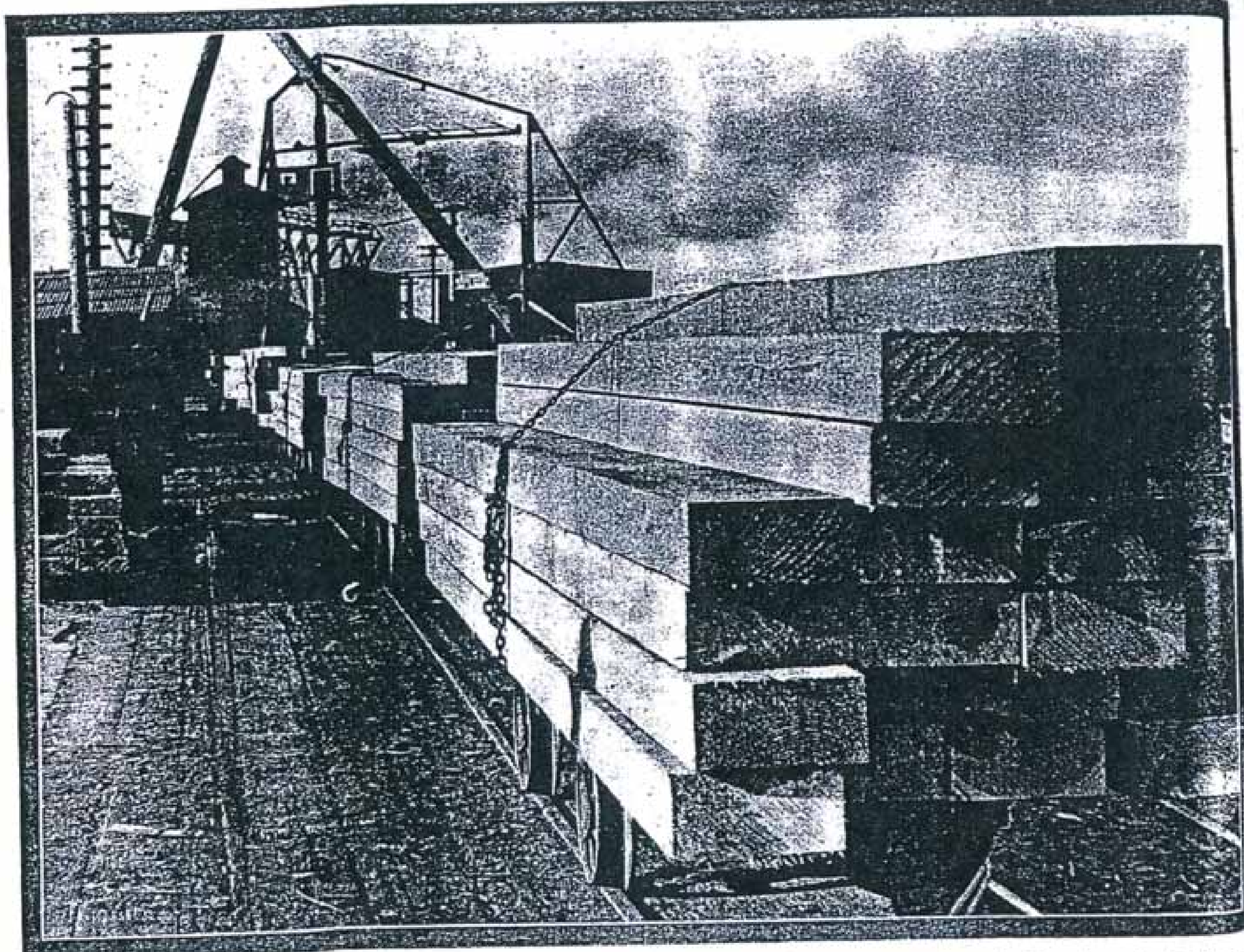
off, sorted in unit packages according to length, size and grade, picked up by the monorail, and carried and loaded onto the small cars hauled by electric locomotives that take these unit packages either directly to the shipping docks, nearly a mile from the mill, where water shipments are loaded for either coastwise transit or for export, or to the small storage yard alongside of the track on the way out to the cargo dock. Lumber destined for rail shipment later on is switched off into the main lumber yard, which covers 35 acres and contains 21 alleys, traversed by a double track system, allowing lumber to be piled from cars to pile and then direct to rail shipment.

Timbers coming directly out of the end of the mill are handled by a crane and hauled on industrial cars to either the cargo dock or railroad shipping dock, near the sorting platform.

On one side of the big mill is the shingle mill and on the other side are picked up by the monorail and either stored in the shed or t by the monorail direct to the planing mill, where the lumber i posited on trucks or moved by hand to the woodworking mach

After being planed the lumber is hauled on trucks to the shipping shed nearby, which lies between the planing mill and large yard alongside of the railroad tracks. The dressed lumb loaded into railroad cars as desired. On the other side of the tr rough lumber comes from the large yard and is transported by tr hauled by horses or tractors.

The dressed lumber not wanted for immediate shipment is take the dressed lumber shed, where it is stored and from which it is lo as desired into cars at shipping tracks running alongside of the l storage shed. If necessary to use lumber from this large dre lumber storage shed in making up mixed carloads the lumbe



Bridge stringers as they arrive at the creosoting plant for treatment. The daily capacity of this plant is 40,000 fe

is the lath mill. The lath and shingles are taken on conveyors to a battery of two reinforced cement kilns and after coming from the kilns the shingles and lath are either loaded directly on cars for shipment, or are stored in the storage shed. Those going for cargo shipment are loaded on electric cars and taken to the cargo dock.

Lumber to be put thru the kilns that dry the lumber, located near Mill B, is taken off the electric cars at the kilns. These cars run into the upper deck of the stacker shed. The lumber automatically is stacked on edge and goes to the kilns. Lumber from the yards can be brought direct by electric cars to the stacker. After coming out of the kilns the lumber on the dry kiln trucks is taken on an electric transfer direct to the unloading machines at the monorail rough dry shed. This is a large, high shed traversed by the monorail that takes the unit packages from there to the planing mill.

From the unloading machine the lumber goes onto a sorting chain in this large shed and is regraded and put into unit packages which brought back to the car shipping shed back of the planing mill.

Timbers from Mill C (the timber mill, which is equipped with double circular head saw, a 12-inch edger and three trimmer saws) from the rear of the mill directly on the shipping dock, from whi they are loaded on cars for railroad shipment, or on electric cars a taken to the cargo dock for water shipment. At the end of the timb mill is a large timber planer for dressing timbers.

The Planing Mill

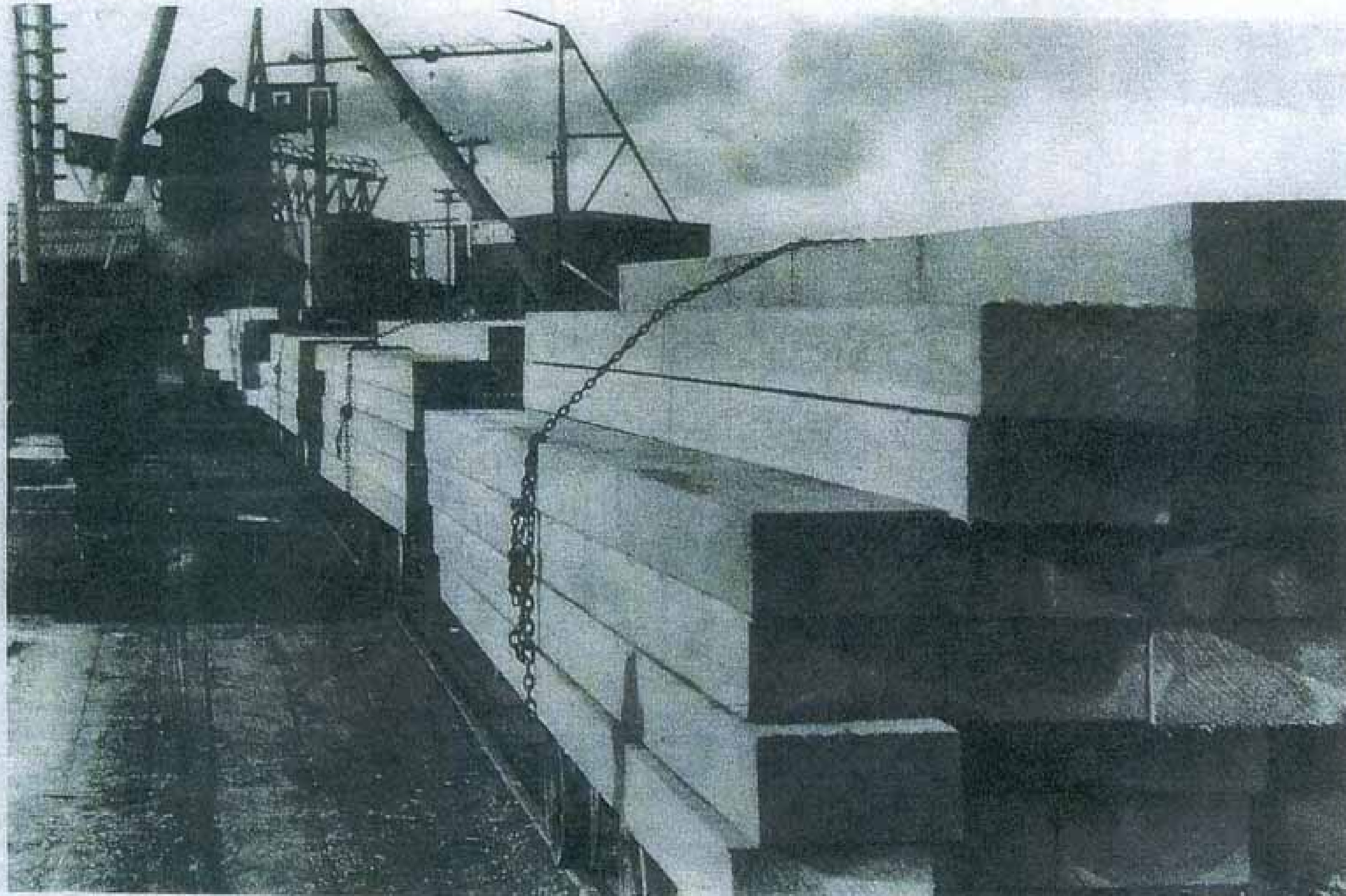
The old planing mill was destroyed in the fire of 1912. It was th decided to remodel the entire manufacturing plant of the compa and as the first step toward this a new main planing mill was bu 250x400 feet, equipped with uptodate machinery, giving the compa unexcelled facilities for caring for this portion of its product.

The building is light and airy and has a capacity for turning o 400,000 feet of finished lumber per day. It is also electrically driv

The big di berm

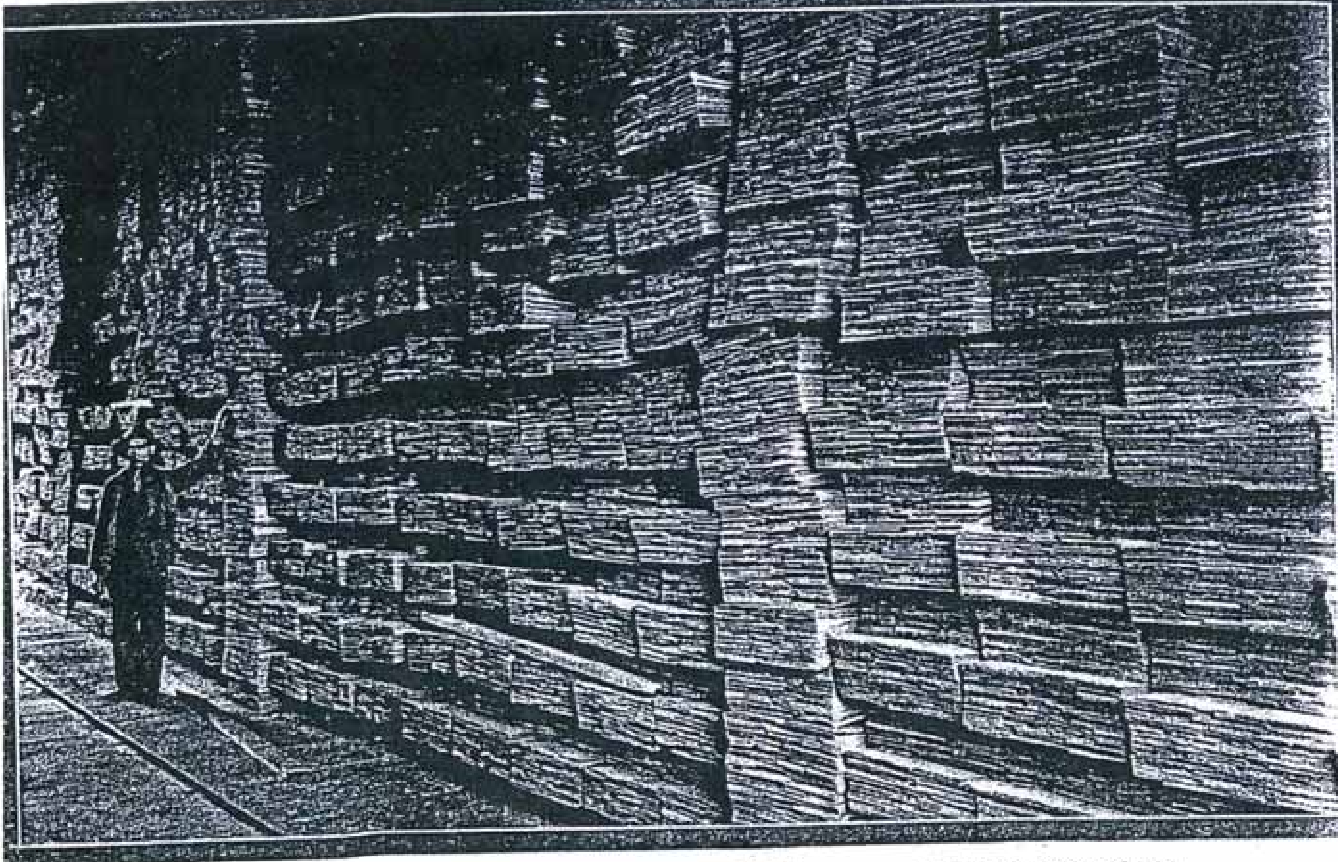
The St. room

Gene tl



Bridge stringers move into the creosoting plant for preservative treatment. Its 130-foot-long retort could process 40,000 board feet a day (from American Lumberman, *May 21, 1921)*

From "Mill on the Boot"



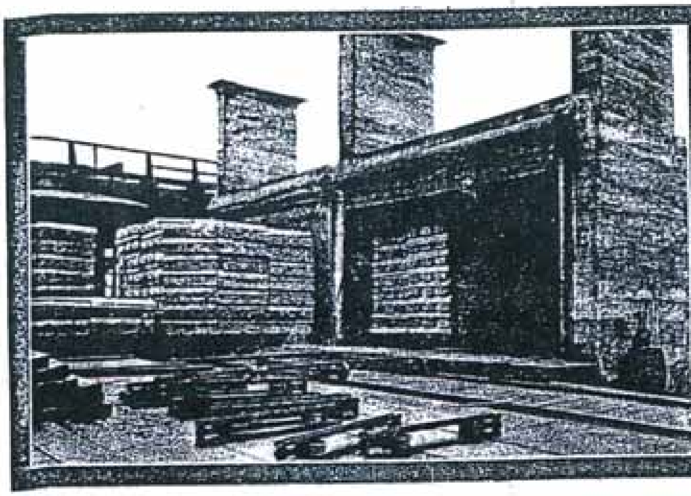
One section in the red cedar shingle warehouse, which has a capacity of 9,000,000 shingles

vith individual motors at each machine. This is one of the many facilities the company has provided for manufacturing and turning out its product to the satisfaction of its customers.

This planing mill is equipped with the following machinery: Paving block machine; ten cut-off machines; four 15-inch flooring machines; a 9-inch flooring machine; two four side 6x24-inch surfacers; one four side 20x24-inch surfacer; a combination resaw and surfacer; two molding machines, a rip saw and roller resaw.

This main planing mill is one of the most modern in the country. Its equipment embraces everything necessary to the dressing and preparing of lumber for shipment. Here is made the Douglas fir flooring, the excellent quality of which has aided in building a high reputation for this class of material for the St. Paul & Tacoma Lumber Co. Its splendid cedar siding is produced here also, as well as other high grade products.

The small planing mill at Mill B is equipped with three 15-inch fast feed automatic machines and a horizontal resaw.



Red cedar shingle and lath dry kiln

The General Offices

The general offices of the company are located in a comfortable 2-story building on St. Paul Avenue, at the entrance to the plant. Here are the private offices for the heads of the different departments, and a large counting room; on the second floor are several rooms, used for various purposes, including a library and directors' room, and a rest room for the women

C. L. Pierce, office manager, and E. G. Drain, cashier, have been with the company for many years.

In the general offices is another employee who has been with the company for years—Miss Faith MacDonald—and it is evident her given name has a real meaning. She has charge of the telephone exchange and her faithful efforts and knowledge of the business greatly facilitates the work of everyone connected with it.

Creosoting Department

In 1912 the St. Paul & Tacoma Lumber Co. built a creosoting plant equipped with a single retort 130 feet long, and some of the first treated material produced was used in the construction of the high bridge from the main business part of Tacoma across the waterway to the great industrial section of the city on the tideflats in which the St. Paul & Tacoma Lumber Co. is one of the principal institutions. This bridge required a large amount of creosoted lumber, and also was paved with creosoted wood blocks, all of which were treated in the St. Paul & Tacoma Lumber Co.'s creosoting plant.

This developed a department that treats piling for salt water construction and cedar poles in open tanks for shipment to all parts of the United States. The company has shipped creosoted ties to India, and other creosoted products have been produced for many purposes. With these modern facilities for creosoting the company is well prepared to develop this department of the business when the market warrants. Charles E. Lane is superintendent of the creosoting department.

Attachment 3

EPA Record of Decision

Cleanup Standards Documents for the
Wyckoff/Eagle Harbor and Tacoma Tar Pits Sites

U.S. Environmental Protection Agency
Region 10
Seattle, Washington

Wyckoff/Eagle Harbor
Superfund Site
Soil and Groundwater Operable Units
Bainbridge Island, Washington

RECORD OF DECISION

February 2000

Table 13 Groundwater Cleanup Levels for Protection of Human Health and the Marine Environment (• g/L)

Contaminant of Concern	WA SW Quality Stds. (173-201A WAC)	MTCA Method B SW for Human Consumption of Organisms (173-340 WAC)[b]	Federal WQStandards/ NTR (40 CFR 131)		Federal WQ Criteria		Calculated Pore-Water Concentrations Based on SMS or HH (See Table 15)	Groundwater Cleanup Level[c]
			Marine Chronic	Human Cons. of Orgs.	Marine Chronic	Human Cons		
Naphthalene		9880					83	83
Acenaphthylene								
Acenaphthene		643				2,700	3	3
Fluorene		3,460		14,000			3	3
Phenanthrene								
Anthracene		25,900		110,000		110,00	9	9
Fluoranthene		90		370		370	3	3
Pyrene		2,590		11,000		11,000	15	15
Benzo(a)anthracene		0296		031		049	308	0296
Chrysene		0296		031		049	262	0296
Benzo(b)fluoranthene		0296		031		049	079	0296
Benzo(k)fluoranthene		0296		031		049	079	0296
Benzo(a)pyrene		0296		031		049	102	0296
Dibenzo(a,h)anthracene		0296		031		049	007	007
Benzo(g,h,i)perylene								
Indeno(1,2,3-cd)pyrene		0296		031		049		0296
HPAH							0.254	0.254
Pentachlorophenol	7.9[a]	4.9	143	8.2	7.9	8.2	880	4.9

[a] Chronic criteria

[b] Values obtained from MTCA Cleanup Levels and Risk Calculations (CLARC II) Update (February 1996)

[c] Where there is no cleanup level specified for a certain chemical, benzo(a)pyrene will be used as an indicator chemical during remediation. Groundwater cleanup levels will be measured at the point of compliance (see Section 8.4.2).

Table 14
Soil Cleanup Levels[a]

Contaminants of Concern	MTCA Method B Cleanup Standards[b] (• g/kg)
Naphthalene	3.20E+06
Acenaphthylene	NA
Acenaphthene	4.80E+06
Fluorene	3.20E+06
Phenanthrene	NA
Anthracene	2.40E+07
Fluoranthene	3.20E+06
Pyrene	2.40E+06
Benzo(a)anthracene	1.37E+02
Chrysene	1.37E+02
Benzo(b)fluoranthene	1.37E+02
Benzo(k)fluoranthene	1.37E+02
Benzo(a)pyrene	1.37E+02
Dibenzo(a,h)anthracene	1.37E+02
Benzo(g,h,i)perylene	NA
Indeno(1,2,3-cd)pyrene	1.37E+02
Dioxin (2,3,7,8-TCDD)/tef[c]	6.67E-03
Pentachlorophenol	8.33E+03

[a] For surface soil to 15 feet bgs, the most stringent of Method B levels will need to be met. If the levels cannot be practically met, then a point of compliance will be established in the soils for direct contact at the ground surface (see Section 8.4.1, above).

[b] Model Toxics Control Act (MTCA) Cleanup Levels and Risk Calculation (CLARCII) Update, February 1996. Where both cancer and non-cancer values are provided, the most stringent are used.

Concentrations of individual hazardous substances shall be adjusted downward to take into account exposure to multiple hazardous substances and/or exposure resulting from more than one pathway of exposure. In making these adjustments, the hazard index shall not exceed 1 and the total excess cancer risk shall not exceed one in one hundred thousand (MTCA Chapter 173-340 WAC).

[c] Chlorinated Dioxin/Furan TEFs (expressed as 2,3,7,8 TCDD TEQ)

NA = There were no values available for these chemicals in CLARCII. For purposes of cleanup, assume they are co-located with other PAH compounds.

Five-Year Review Report

Second Five-Year Review Report

for

Tacoma Tar Pits Operable Unit (Operable Unit 23)

Commencement Bay Nearshore/Tideflats Superfund Site

EPA ID: WAD980723795

Tacoma

Pierce County, Washington

September 2003

PREPARED BY:

United States Environmental Protection Agency
Region 10
Seattle, Washington

Approved by:

Michael F. Gearheard
Director, Environmental Cleanup Office
U.S. EPA, Region 10

Date:

25 Sept. 2003

TABLE 4-1
ROD Cleanup Levels
Tacoma Tar Pits Site, Tacoma, WA

Media	Contaminant and Cleanup Level
Soil	Lead - 166 mg/kg
	PCBs - 1 mg/kg
	ROD-PAHs[a] - 1 mg/kg (individual)
	ROD-PAHs[a] - 5 mg/kg (total)
	Benzene - 56 mg/kg
Groundwater (Sand and Fill aquifers)	Lead - 50 µg/L
	PCBs - 0.2 µg/L
	ROD PAHs (total) - 30 µg/L
	ROD PAHs (individual) - 5 µg/L
	Benzene - 53 µg/L
Surface Water (at the site boundary)	Lead - 3.2 µg/L
	PCBs - 0.2 µg/L
	ROD PAHs (total) - 30 µg/L
	ROD PAHs (individual) - 5 µg/L
	Benzene - 53 µg/L

[a] ROD PAHs include benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene