PORT OF OAKLAND

March 30, 2007

Mr. Barney Chan
Hazardous Materials Specialist
Alameda County Health Care Services Agency,
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: Evaluation of ESL Exceedances, American Presidents Line Terminal Berths 60-63 Yard and Gate Redevelopment Project
Oakland, California

Dear Mr. Chan:

Pursuant to our November 7, 2006, letter to you, the Port of Oakland ("Port") rescinded the Evaluation of ESL Exceedances Memorandum, American Presidents Line Terminal, Berths 60-63 Yard and Gate Redevelopment Project, prepared by ETIC Engineering, Inc. ("ETIC") and dated April 4, 2006 ("Original Memorandum") which Roberta Reinstein, Port Environment and Safety Department Manager forwarded to you by letter dated April 11, 2006.

Subsequent to the Port's rescission of the Original Memorandum, ETIC and the Port have thoroughly reviewed the Original Memorandum and ETIC has prepared another report entitled *Revised Evaluation of ESL Exceedances Memorandum, American Presidents Line Terminal, Berths 60-63 Yard and Gate Redevelopment Project*, and dated March 19, 2007 ("Revised Memorandum") which is attached as a replacement report and for your review. The Revised Memorandum reflects further quality assurance/quality control review and incorporates editorial changes to improve the readability of the document. In addition, the Revised Memorandum includes references for some of the assumptions used in the modeling effort, and adds a Surface Water Screening Level for dibromochloromethane (which is a synonym for chlorodibromomethane for which a screening level was not included in the Original Memorandum). Please note that the Revised Memorandum screens on-site contaminant levels against marine screening levels, similar to the Original Memorandum, since the Regional Water Quality Control Board revised its previous guidance that the Oakland Inner Harbor was considered estuarine and now considers the Oakland Inner Harbor a marine environment (per Roger Papler, RWQCB, 510-622-2435).

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The conclusion of the Original Memorandum that chemicals and chemical compounds in the soil and groundwater at the site are not discharging into the Oakland Inner Harbor at levels above the applicable surface water quality goals, has not changed in the attached Revised Memorandum.

I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge.

If you have any technical questions regarding this matter, please contact Port Project Manager, John Prall at (510) 627-1373 or at jprall@portoakland.com.

Very Truly Yours,

JEFFREY R. JONES
Environmental Compliance Supervisor

cc: Michele Heffes
Roberta Reinstein
John Prall
Roger Papler
Deborah S. Ballati

March 19, 2007

MEMORANDUM

To: John Prall
Environmental Programs and Safety Department
Port of Oakland

From: Alan Anselmo, P.E., Julio Garcia, Ph.D., and Vibhav Mankad,
ETIC Engineering, Inc.

Re: **Revised Evaluation of ESL Exceedances**
American President Lines Terminal
Berths 60-63 Yard and Gate Redevelopment Project
Oakland, California

INTRODUCTION AND OBJECTIVES

On behalf of the Port of Oakland (Port), ETIC Engineering, Inc. (ETIC) has prepared this revised memorandum which includes several changes to the original (dated April 4, 2006) evaluation of soil and groundwater concentrations exceeding select Tier I environmental screening levels (ESLs) [1] per the concentration screening performed by Treadwell & Rollo (2005)[2] at the American President Lines Terminal (Project Area). This revised memorandum reflects changes to the screening criteria for several chemicals used to establish exceedances requiring additional evaluation so that such criteria are consistent with previously approved methodologies. In addition, the evaluation of estimated impacts of soil and groundwater exceedances on the nearby Oakland Inner Harbor are now compared to the appropriate Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) Surface Water Screening Levels (SWSLs) for Marine Aquatic Habitats[1] applicable to this area of the San Francisco Bay.

Concerns regarding exceedance of ESLs and the need for additional evaluation were initially identified by the Alameda County Health Care Services Agency (ACHCS) in their comment letter to the Port dated November 14, 2005. Specifically, ACHCS (2005) expressed concerns regarding the ESL exceedances previously documented by Treadwell & Rollo (2005), and requiring the Port to determine whether the ESL exceedances pose significant risks and/or warrant further investigation prior to, during, or after planned redevelopment activities within the Project Area.

This memorandum serves to further evaluate the ESL exceedances cited by Treadwell & Rollo (2005) and the need, if any, for further investigation. The approach to addressing the ESL exceedances and

[1] California Regional Water Quality Control Board, San Francisco Bay Region, 2005. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater. Interim-Final. February, with March Updates.
[2] Treadwell & Rollo, Inc., 2005. Redevelopment Planning Report, Environmental Subsurface Assessment, Berths 60-63 Yard and Gate Redevelopment Project, Oakland, California. March 30.

documentation in this memorandum were previously discussed among the Port, ACHCS, and ETIC in a meeting held on February 2, 2006.

Per the approach discussed with the ACHCS, the objectives of this analysis included:

1) Re-screening of site-specific concentrations in soil and groundwater versus Tier I ESLs that appropriately reflect potential future exposure pathways based on current/future land use and site configuration. As discussed in more detail in following sections, re-screening to appropriate ESLs was warranted because the initial screening by Treadwell & Rollo (2005) made use of more conservative than necessary ESLs applicable to a commercial/industrial site (i.e., non site-specific). As a result, the re-screening incorporates site-specific complete exposure pathways and typical background metals concentrations in soils.
2) Further evaluating any exceedance of the highly conservative Tier I ESLs by performing a more representative (i.e., Tier II) site-specific analysis of potential impacts, including potential risks to the adjacent Oakland Inner Harbor associated with groundwater migration within the shallow water-bearing zone sediments and utility trench backfill materials.

It is worth noting that the Tier I/Tier II screening analyses performed herein reflect data collected to date across the footprint of the Project Area. As indicated on Figure 2, most of the historical features/operations, now removed and terminated, have been investigated via soil samples; grab groundwater samples, and/or monitoring well samples. Select locations such as the location of former Moore Dry Dock area buildings (e.g., Machine Shop (E-107), Planning Mill, Electric Shop, Utility Building, Plating Shop (E-211), and Dry Kiln (shed) shown on Figure 2) have not been locally investigated, but are represented by downgradient groundwater quality data (e.g., borings B6, B11, B16, B17, B42, B83- see Figure 2) considered adequate to evaluate impacts to the harbor. For the areas not directly investigated to date, the analysis herein may be updated following future investigations (e.g., placement of monitoring wells) implemented after completion of the planned redevelopment project.

BACKGROUND

The Port is currently in the process of redeveloping plans to redevelop the American Presidential Lines (APL) Terminal, located at Berths 60-63, as part of the Yard and Gate Redevelopment Project (Project Area) (Figure 1). The goal of the redevelopment activities is to develop a modern terminal for more efficient marine cargo storage and transfer operations.

Although the excavation depths associated with the planned redevelopment activities are generally shallow (i.e., predominantly limited to 1 to 2 feet of soils beneath the paved surface), the Port recognizes that chemically impacted soils and materials may be encountered during the redevelopment activities. Known or suspected sources of chemicals may be defined as those characterized by site investigations performed to date (Treadwell & Rollo, 2005), which have identified the presence of chemically impacted soils and groundwater across seven areas of potential environmental concern within the Project Area. To this end, ETIC (2006)[3], on behalf of the Port, is preparing a Soil Management and Contingency Plan (SMCP) to address visibly impacted materials encountered within the planned limits of redevelopment. In order to maintain the redevelopment schedule and maximize the efficiency of remedial activities,

[3] ETIC Engineering, Inc., 2006. Revised Soil Management and Contingency Plan, APL Terminal Redevelopment Project, Port of Oakland, California. August 30.

remediation activities during the redevelopment project will be limited to chemically impacted soils observed during field screening activities and will not extend beyond the planned extent/limits of the redevelopment activities.

This memorandum serves to reevaluate available site data with respect to relevant exposure pathways and screening criteria to evaluate the significance, if any, of the known chemicals of potential concern (COPC) remaining in place following planned redevelopment activities.

CONCEPTUAL SITE MODEL

Historical Operations and Potential Sources: As a result of approximately 100 years of industrial and shipping activities, the Project Area has been built up by successive phases of fill placement associated with past railyard operations, lumberyard operations, shipbuilding and repair activities, and a municipal garbage wharf. The historical operations and related features, including former underground fuel and waste oil tanks previously present within the Project Area, are considered the likely sources of COPCs in soil and groundwater. Importantly, these operations ceased no later than 1990 (see table below) and the related buildings/features have been removed (see Figure 2). The few existing buildings (see Figure 2) have been used for administrative/maintenance purposes and have not involved chemical storage/handling. As such, no active (i.e., primary) sources of COPCs have been present at the Project Area for the past 16 years.

Summary of Key Building and Facility Use Information
(Source: Iris Environmental, 2002 [4])

USTs EF6-9 - EF6 was installed in 1966 or 1969. The initial permit application was dated 1966; however, a subsequently filed operating permit indicates EF6 was installed in 1969. Operating permits indicate the tanks (EF7 through EF9) were installed in 1969. All of these tanks were removed in January 1992.

UST EF10 – Located near the wharf along the eastern boundary. Date of installation not confirmed. Underground storage tank (UST) and associated piping, hose and reel vault were removed in 1995.

USTs EF11-13- Port records indicate that the USTs were installed in 1975 and used until late 1987. All three USTs were removed in 1990. Area was over-excavated.

UST EF14 – Installed in 1975 and was used until late 1987. UST, piping, hose and reel pit removed in 1990.

[4] Iris Environmental, 2002. Planning Scale Environmental Site Assessment, American President Lines Terminal, Port of Oakland, Oakland, California. June 10. In addition to the site structures and operations noted by Iris, the Port has since discovered other structures and site operators that may also have contributed to contaminants at the site associated or related to the structures noted in the Iris report, including but not limited to the operations of Oakland Scavenger Company in the Municipal Debris Area and the warehouse operations of Oakland Dock and Warehouse Company and its tenants following the closure of the Moore Dry Dock facility. U.S. Lines also operated an intermodal container facility on a portion of the site, adjacent to the Sealand Lines terminal.

Continued from previous page

C & O Lumber Company - Operated in the eastern portion of the site (survey maps (1926 and 1927)). By 1933 aerial photos, the C & O Lumber Company appears to have been removed.

Oakland Paving Company Yard - Operated on the extreme eastern edge (the former Sherex property).

Municipal Garbage Wharf – Located along the training wall was identified in a 1927 survey map. It was in use between 1926 and 1949.

Moore Dry Dock – Began operation in 1941**.** Moore remained in operation through the 1950s and closed by 1960. In 1945, Moore Dry Dock covered the entire site, with the exception of the El Dorado Oil/Sherex facility, which was located to the east. Photos from 1968 indicate the Moore slips and dry docks were removed. A dike was built and the shoreline was built up for the conversion to a terminal.

El Dorado Oil Facility (or former Sherex site by 1960) –1930 photographs indicate aboveground storage tanks (ASTs) and pier paralleling the shore at the eastern end. The Sherex site was decommissioned in 1986 and demolished in 1989. Four USTs were closed and/or removed from this site.

Seatrain Lines – 1968-Conversion of the site to an Intermodal container facility began. By 1971 Seatrain was operating a container terminal. Current shoreline achieved in 1973. In 1974, the newly constructed terminal to the west was combined with Seatrain and named Middle Harbor Terminal.

Hydrogeologic Conditions: Based on observation of lithologic data and information regarding historical uses at the Project Area, the soils beneath the area represent terrestrial and marine-derived fill materials to approximate depths of 10 to 15 feet below ground surface (bgs). The terrestrial fill consists generally of silty to gravelly, poorly-graded sands with debris (brick, wood, asphalt, etc.). The marine fill is composed of sediments dredged from the Inner Harbor channel, generally brown to gray, poorly-graded sands and silty sands (Treadwell & Rollo, 2005). Beneath the fill is the naturally occurring Young Bay Mud, consisting of gray, thinly bedded to massive silty clay to silty sands with locally abundant shells and organic matter.

Shallow, unconfined groundwater occurs at approximately 4 to 13 feet bgs within the fill materials. While locally variable in upland areas, the general groundwater flow direction is toward the south, draining toward the harbor. Seasonal groundwater fluctuations along the shoreline area across the Port typically approximate 3 to 5 feet (Subsurface Consultants/Todd Engineers, 1999)[5], resulting in minimal vadose zone thickness throughout much of the year.

Areas of Potential Environmental Concern: Previous site investigations have documented the subsurface presence of chemicals in soil and shallow groundwater within the fill materials beneath the Project Area. COPCs detected to date in the Project Area include petroleum hydrocarbons, semi-volatile organic compounds (SVOCs) including polynuclear aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and metals detected in soil and groundwater. In defining the extent of soil and groundwater impacts and targeting potential historical release areas, Treadwell & Rollo (2005) divided the Project Area into seven areas of potential environmental concern (see Figure 2). These areas include:

[5] Subsurface Consultants and Todd Engineers, 1999. Hydrologic Investigation Oakland Harbor Navigation Improvement (-50 Foot) Project, Port of Oakland, CA, Vol 1 and 2. February 12.

- The Municipal Debris Fill Area;
- The Diesel Spill/Railyard Area;
- The Boring B20 Area;
- The Tanks EF6-9 Area;
- The Tanks EF11-13 Area;
- The Tank EF14 Area; and
- The General Area.

Available soil and groundwater quality data within the footprint of each of the areas of potential environmental concern are summarized in Tables 1a-1e and 2a-2e, respectively. Soil Tables 1a through 1e also call out exceedance of soil leaching to (non-potable) groundwater ESLs (Table G of RWQCB, 2005) for organic compounds and exceedance of 95% upper confidence limit (UCL) of typical soil background concentrations (Lawrence Berkeley National Laboratory [LBNL], 1995)[6] for metals. Similarly, groundwater Tables 2a through 2e call out exceedances of groundwater screening levels (GWSL) for non-potable groundwater (Table F-1b of RWQCB, 2005) for all COPCs. The GWSLs for non-potable groundwater developed by RWQCB reflect the lowest of the chemical screening level for aquatic habitat protection (groundwater discharges to surface water), indoor-air impacts (for volatile chemicals only), and a "ceiling level" for tastes and odors or other nuisance concerns. As discussed in forthcoming sections herein, these ESLs reflect the appropriate Tier I screening endpoints based on site-specific exposure pathways.

A detailed discussion of soil and groundwater concentrations within the Project Area is included in previous site documents (e.g., Treadwell & Rollo, 2005) and in forthcoming sections herein. To summarize, data in Tables 1a through 2e indicate that COPCs across the Project Area are primarily limited to heavy-range petroleum hydrocarbons related SVOCs/PAHs, which are typically co-located with the total petroleum hydrocarbon (TPH) detections and select heavy metals. VOC detections have been limited to sporadic and isolated concentrations of select petroleum hydrocarbon compounds at residual levels.

An important characteristic of the Project Area is that COPCs in soil appear to be at equilibrium with those in groundwater. Specifically, it is evident that all historical operations and related features have been removed from the site for at least 16 years. Correspondingly, no active primary chemical sources (i.e., ongoing releases) remain at the site. COPCs in soil and groundwater underlying the Project Area have been subject to attenuation for the past decade. Due to the thin vadose zone (depth to groundwater of 4 to 13 feet bgs) and typical groundwater fluctuations within the shoreline environment, soil COPCs capable of impacting groundwater have already done so since termination of historical operations and are considered at equilibrium with groundwater COPCs. Similarly, groundwater concentrations detected today are expected to be relatively stable given that the bulk of impacts (i.e., leaching) from overlying soils have already occurred. Also contributing to the soil-groundwater equilibrium conditions and the stability of groundwater concentrations is the immobile nature (i.e., limited solubility) of the COPCs including heavy-range hydrocarbons, PAHs, and heavy metals.

The above conceptualization is supported by existing data from across the Project Area. As previously indicated, additional data may be required to address select locations not directly investigated yet

[6] LBNL, 1995. Protocol for Determining Background Concentrations of Metals in Soil at LBNL. August.

(e.g., locations of former buildings associated with Moore Dry Dock operations). As to those locations, further monitoring will be performed as necessary following completion of the planned redevelopment project.

PREVIOUS ESL SCREENING

Treadwell & Rollo (2005), as part of its site investigation activities, compared observed soil and groundwater concentrations across Berths 60-63 to the following ESLs outlined by the RWQCB:

- Soil: Direct exposure screening levels for commercial/industrial land use; and
- Groundwater: Direct exposure screening levels for industrial site use and non-potable drinking water source.

The results of this screening are summarized on Figures 7 and 8 (soil) and 9 (groundwater) of Treadwell & Rollo (2005), also included herein as Appendix A.

In evaluating the previous ESL screening, it is important to recognize that current land use and site configuration at the APL Terminal prohibit potential direct exposure by soils and groundwater to daily site occupants. The proposed land use and site configuration following redevelopment will remain the same as today, including the presence of a paved surface across the entire terminal. As a result, the potential for direct exposure to soils and groundwater at the terminal is limited to construction/maintenance workers during planned redevelopment activities or during future maintenance activities. To this end, ETIC and SAIC (2005)[7] prepared a Construction Worker Risk Assessment which served to conservatively quantify and evaluate potential risks associated with direct exposure to soils and groundwater during such activities. This report concluded that the risk to future construction/maintenance workers is considered insignificant[8] and recommended that future construction/maintenance activities be preceded by preparation and implementation of a construction worker Health and Safety Plan (HSP).

Based on the above rationale, the primary exposure pathways to COPCs in soil and groundwater at the site today and following redevelopment are those associated with potential discharge of COPCs in groundwater to the adjacent harbor, and do not include direct exposure to daily site occupants. Therefore, the following exposure pathways warranted evaluation and re-screening versus relevant ESLs:

- Soil: Soil leaching to groundwater and subsequent transport and discharge to the harbor; and
- Groundwater: Groundwater transport and discharge to the harbor.

As an initial step, a highly conservative Tier 1 screening evaluation was performed, focusing on re-screening all detected COPC concentrations in soil and groundwater to soil background levels (for metals) and relevant ESLs. This screening assessment identified select soil and groundwater COPCs (and specific locations) which warranted a more representative (i.e., Tier II) site-specific fate and transport analysis and screening ecological hazard (i.e., impacts to harbor) evaluation. The details of the

[7] ETIC Engineering. Inc. and SAIC, 2005. Construction Worker Risk Assessment. Berths 60-63 Yard and Gate Redevelopment Project Area, Port of Oakland. March 21.

[8] Cumulative risks ranged from 6.2×10^{-9} to 6.03×10^{-6} and cumulative hazards ranged from 0.048 to 0.0000059 across the seven areas of potential environmental concern at the terminal.

initial screening to identify COPCs and site-specific ecological hazard evaluation are summarized in the following sections.

RE-SCREENING OF COPCS

Re-screening of COPCs consisted of comparing soil detections above laboratory reporting limits beneath the Project Area to the ESLs for soil leaching to (non-potable) groundwater (see Tables 1a through 1e) adopted by the RWQCB (2005, Table G). Due to the absence of soil leaching to groundwater ESLs for metals, the soil screening included comparison of soil concentrations with the 95% UCL of background levels in Bay Area soils as documented by LBNL (1995).

Tables 2a through 2e reflect a similar screening for each groundwater COPC detection versus GWSL for non-potable groundwater (Table F-1b of RWQCB, 2005). Elevated detection limits were screened using half the detection limit as illustrated in Tables 1a through 1e and 2a through 2e. Exceedance of these ESLs are called out by solid (detected concentration exceeding ESL) and dashed (1/2 the detection limit exceeding ESL) boxes in Tables 1a through 2e and are further summarized on Figures 3 through 6.

The following general observations were made based on a review of data summarized in Tables 1a through 2e and re-screening of concentrations versus relevant ESLs/background levels:

- TPH detections in soil (Table 1a) occur across the Project Area, with the majority of detections limited to heavy-range hydrocarbons (i.e., Diesel [TPH-d], Motor Oil [TPH-mo], Bunker C [TPH-bc], and hydraulic oil [TPH-ho]) at residual levels (i.e., less than Tier I soil leaching to groundwater ESLs). The highest soil concentrations occur in the Municipal Debris Fill Area, including a maximum detected TPH-bc concentration of 8,200 mg/kg. Correspondingly, the majority of the Tier I ESL hydrocarbon exceedances were identified in the Municipal Debris Fill Area (12 exceedances) and the Tanks EF6-9 Area (11 exceedances). Sporadic exceedances were cited for the Boring B20 Area (5 exceedances), the Tanks EF11-13 Area (4 exceedances), the Diesel Spill/Railyard Area (2 exceedances), and the General Area (2 exceedances). No ESL exceedances were cited for TPH detections in the Tank EF14 Area.

- Consistent with TPH detections in soil, related detections in groundwater (Table 2a) occur across the Project Area. The majority of detections occur at residual levels (i.e., below non-potable GWSLs) and at locations away from the harbor. The highest TPH concentrations in groundwater occur within the Diesel Spill/Railyard Area (TPH-d at 240,000 ug/L), the Municipal Debris Fill Area (TPH-mo at 9,200 ug/L), and the Tanks EF6-9 Area (TPH-ho at 140,000 ug/L).

- PAH (and SVOC) detections in soil are primarily limited to the Diesel Spill/Railyard Area and the Municipal Debris Fill Area, typically co-located with the previously discussed heavy-range hydrocarbon detections in these two areas. Sporadic detections of PAHs also occur in the Tanks EF6-9 Area and the General Area. With the exception of 1- and 2- methylnaphthalene (concentrations at ½ of detection limit), all detected PAH concentrations across the entire Project Area were below the soil leaching to (non-potable) groundwater ESLs. Due to high detection limits in laboratory analysis, several PAHs have been accordingly called out in Table 1c.

- Consistent with detections in soil, PAHs in groundwater (Table 2c) occur predominantly in the Diesel Spill/Railyard Area, where locations exceeding the GWSL occur at significant distances

away from the harbor. Like the soil data, the highest detected PAH concentration is associated with phenanthrene (370 ug/L) within the Diesel Spill/Railyard Area.

- Naturally occurring metals are present in soils across the entire Project Area (Table 1b). Exceedance of the 95% UCL of typical soil background levels (LBNL, 1995) is primarily limited to lead (49 exceedances) and zinc (23 exceedances). The highest detected lead concentration approximates 1,300 mg/kg (in the Boring B20 Area and the Municipal Debris Fill Area) and the highest detected zinc concentration approximates 1,500 mg/kg (in the Boring B20 Area). Sporadic exceedances at above-95% UCL of background levels for other metals include mercury (11 exceedances), copper (9 exceedances), barium (4 exceedances), arsenic (4 exceedances), and vanadium (3 exceedances).

- Due to limited solubility, metals detections in groundwater across the Project Area are limited. For example, lead was detected in only two samples. Importantly, only one out of 28 samples exceed the arsenic GWSL (36 ug/L). Detection limits of several metals exceed the GWSL and are accordingly outlined in Table 2b.

- As reported by Treadwell & Rollo (2005), analytical results for TPH-g, TPH-d, and BTEX constituents in groundwater at MW7 within the Municipal Debris Fill Area during the December 2003 sampling event were influenced by the reported presence of a tar-like substance within the well. As a result of this interference, analytical results from the subsequent sampling event in March 2004 were considered representative of groundwater in the area of well MW7 and screened against appropriate GWSLs for assessment of potential impacts to the Oakland Inner Harbor (Table F-1b of RWQCB, 2005).

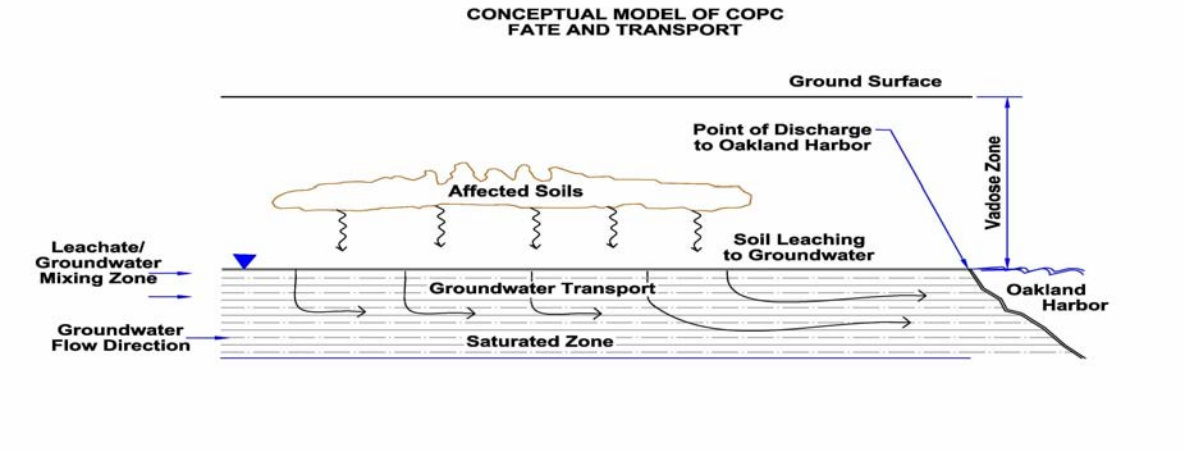
For each exceedance shown in Tables 1a through 2e and on Figures 3 through 6, the sample boring ID, specific area of potential environmental concern, and detected concentration were noted for further evaluation. The chemical (and related concentration) corresponding to each occurrence of ESL exceedance (and exceedance of 95% UCL of soil background levels for metals only) was accordingly retained as a soil and/or groundwater COPC for a Tier II fate and transport and screening ecological hazard assessment.

SCREENING ECOLOGICAL HAZARD ASSESSMENT

To evaluate the significance, if any, of each of the COPCs exceeding the Tier I ESLs, a fate and transport analysis was performed for each COPC at its respective concentration and location. This analysis was performed in order to estimate the potential contribution to the harbor of each soil/groundwater detection across the Project Area. Estimates of resulting COPC concentrations in groundwater at points of discharge to the harbor were subsequently compared to the appropriate SWSLs for marine aquatic habitats (Table F-2b of RWQCB, 2005) to determine potential ecological impacts (see Tables 3 and 4). The SWSLs for marine aquatic habitat protection developed by RWQCB reflect the lowest of the chemical screening level for marine aquatic habitat protection (chronic toxicity), a “ceiling value” for nuisance concerns, and bioaccumulation of chemicals and subsequent human consumption of aquatic organisms.

The approach, input data, and assumptions used in the fate and transport analysis are documented in detail in Appendix B. To summarize, a highly conservative modeling approach was implemented to estimate

leachate concentrations reaching the water table from soil COPCs, followed by subsequent migration along the path (and distance) of groundwater transport to the nearest point of discharge at the harbor. For groundwater COPCs, transport was simulated directly from each point of detection in groundwater along the path of migration to the nearest point of discharge at the shoreline (see Appendix B). This relationship is represented schematically in the schematic below.



To evaluate the potential for migration of COPCs in groundwater through possible preferential pathways, including high-permeability trench backfill materials, the modeling approach incorporated conservative assumptions regarding direct migration pathways along the shortest paths to the shoreline (i.e., direct line from the point of COPC detection to the nearest groundwater discharge point along the shoreline) and further included use of a hydraulic conductivity value representative of highly permeable utility trench backfill material (see Appendix B).

Ecological Hazard Assessment Results: Using the conservative approach to fate and transport discussed above and documented in Appendix B, the contribution of each COPC originating as a "soil source" (soil COPCs) or "groundwater source" (groundwater COPCs) was defined at the nearest points of groundwater discharge to the harbor. These discharge point concentrations were subsequently compared to the relevant SWSLs for protection of marine aquatic habitats adopted by the USEPA and summarized by the RWQCB (2005).

Comparison of groundwater discharge point concentrations to the SWSL for marine surface waters is summarized in Tables 3 and 4 for soil and groundwater COPCs, respectively. As indicated in the tables, the resulting discharge point concentration for each soil and groundwater COPC detection is below its respective SWSL. This conservative screening, taking into account the significant conservative components of this analysis (see Appendix B), indicates that known soil and groundwater COPCs remaining in place following redevelopment activities do not pose a significant risk to marine aquatic habitats at the harbor.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations have been formulated based on a review of all available site data, re-screening of COPC concentrations versus relevant ESLs, and results of a conservative Tier II analysis of potential impacts to the harbor:

- Exposure pathways to COPCs under current and future land use (i.e., commercial/industrial land use) and site configuration (i.e., the site is currently entirely paved and will be entirely paved following redevelopment activities) are limited to (1) construction workers, (2) soil leaching to groundwater, and (3) transport in groundwater to the adjacent Oakland Inner Harbor;

- Direct exposure to COPCs in soil and groundwater is limited to future construction/maintenance workers, a concern that has been previously addressed via the construction worker risk assessment (ETIC, 2005) and related conclusions/recommendations for a construction/ maintenance worker health and safety plan;

- Based on a conservative Tier I and Tier II screening evaluation, the observed levels of COPCs in soil and groundwater potentially remaining following redevelopment activities will not pose significant risks to human health and the environment, including the potential for preferential transport via groundwater to the Oakland Inner Harbor; and

- Additional investigations, including monitoring of groundwater quality, may be necessary to more directly characterize soil/groundwater quality at locations of select historical features (e.g., locations of former Moore Dry Dock buildings) Any additional investigation/monitoring activities will be performed following completion of redevelopment activities to (1) minimize delays to the redevelopment construction schedule and (2) utilize any soil or groundwater data obtained during implementation of redevelopment activities to assess the extent of site impacts. The results of this investigation/monitoring may be used to update the analysis performed herein.

CLOSING

ETIC is pleased to provide the Port with environmental consulting services. Should you have any questions regarding the above analysis, please do not hesitate to contact Mr. Alan Anselmo (aanselmo@eticeng.com) at 925-602-4710, extension 19.

Alan Anselmo, P. E.

3/19/07

Date

FIGURES

Figure 1 – Site Vicinity Map
Figure 2 – Soil Boring and Well Locations with Overlay of Historical and Present Areas of Concern
Figure 3 – Chemicals of Potential Concern and Source Concentrations in Soil (Metals)
Figure 4 – Chemicals of Potential Concern and Source Concentrations in Soil (PAHs, SVOCs, VOCs, and TPHs)
Figure 5 – Chemicals of Potential Concern and Source Concentrations in Groundwater (Metals)
Figure 6 – Chemicals of Potential Concern and Source Concentrations in Groundwater (PAHs, SVOCs, VOCs, and TPHs)

TABLES

Table 1a – Historical Soil Analytical Results – Total Petroleum Hydrocarbons
Table 1b – Historical Soil Analytical Results – Metals
Table 1c – Historical Soil Analytical Results – Polynuclear Aromatic Hydrocarbons
Table 1d – Historical Soil Analytical Results – Semi-Volatile Organic Compounds
Table 1e – Historical Soil Analytical Results – Volatile Organic Compounds
Table 2a – Historical Groundwater Analytical Results – Total Petroleum Hydrocarbons
Table 2b – Historical Groundwater Analytical Results – Metals
Table 2c – Historical Groundwater Analytical Results – Polynuclear Aromatic Hydrocarbons
Table 2d – Historical Groundwater Analytical Results – Semi-Volatile Organic Compounds
Table 2e – Historical Groundwater Analytical Results – Volatile Organic Compounds
Table 3 – Ecological Screening Evaluation for Soil
Table 4 – Ecological Screening Evaluation for Groundwater

APPENDICES

Appendix A
Treadwell&Rollo Figure 7 – Soil Exceedances (0-5 feet bgs)
Treadwell&Rollo Figure 8 – Soil Exceedances (5-10 feet bgs)
Treadwell&Rollo Figure 9 – Groundwater Exceedances

Appendix B
Chemical Fate and Transport Simulations

FIGURES

SITE LOCATION

N

0 1,000 2,000

Approx. Scale (feet)

SITE VICINITY MAP

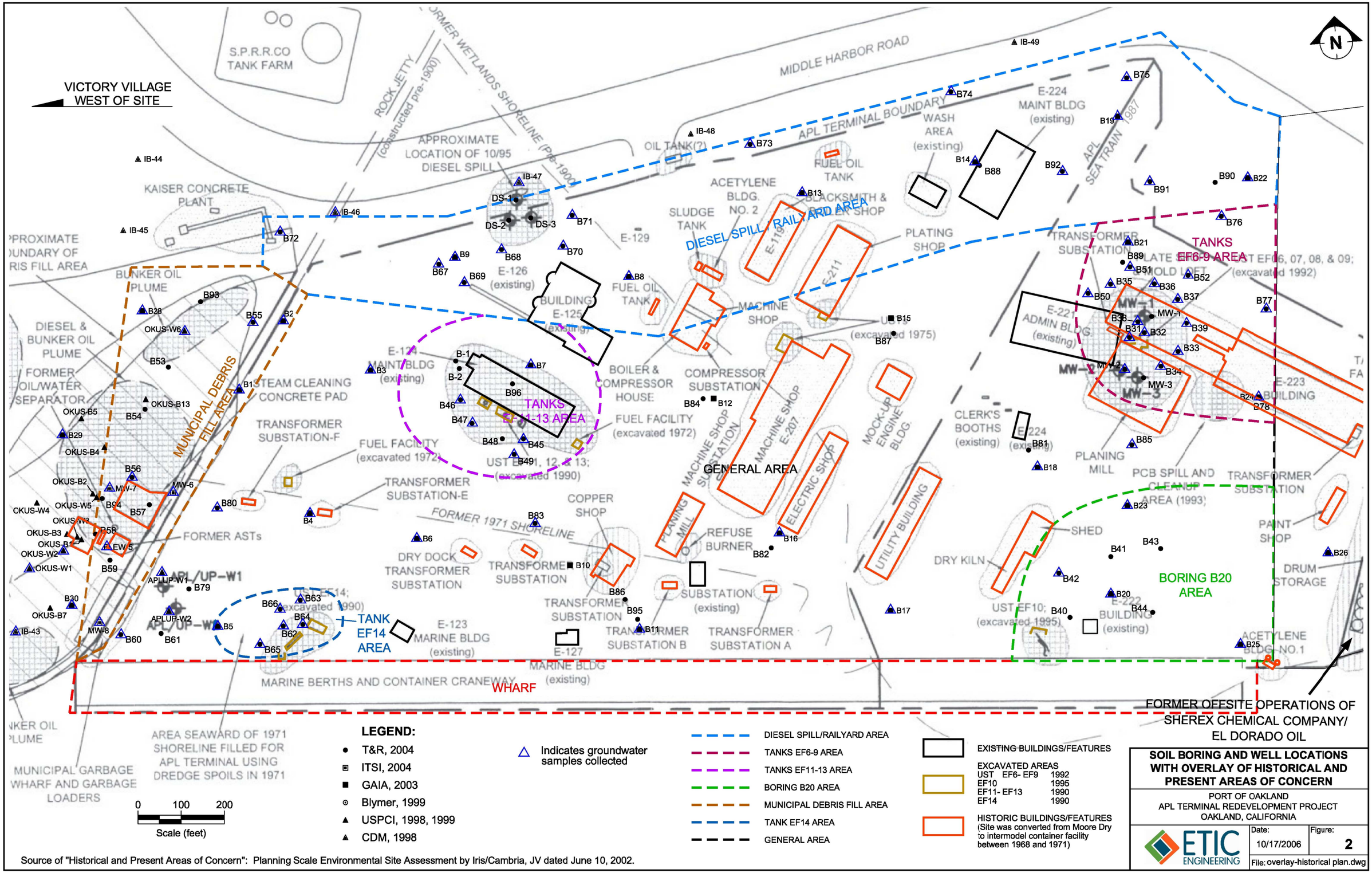
PORT OF OAKLAND
APL TERMINAL REDEVELOPMENT PROJECT
OAKLAND, CALIFORNIA

ETIC ENGINEERING

Date: 2/3/2006

Figure: 1

TOPO0106.DWG



Source of "Historical and Present Areas of Concern": Planning Scale Environmental Site Assessment by Iris/Cambria, JV dated June 10, 2002.

SOIL BORING AND WELL LOCATIONS WITH OVERLAY OF HISTORICAL AND PRESENT AREAS OF CONCERN

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OAKLAND, CALIFORNIA

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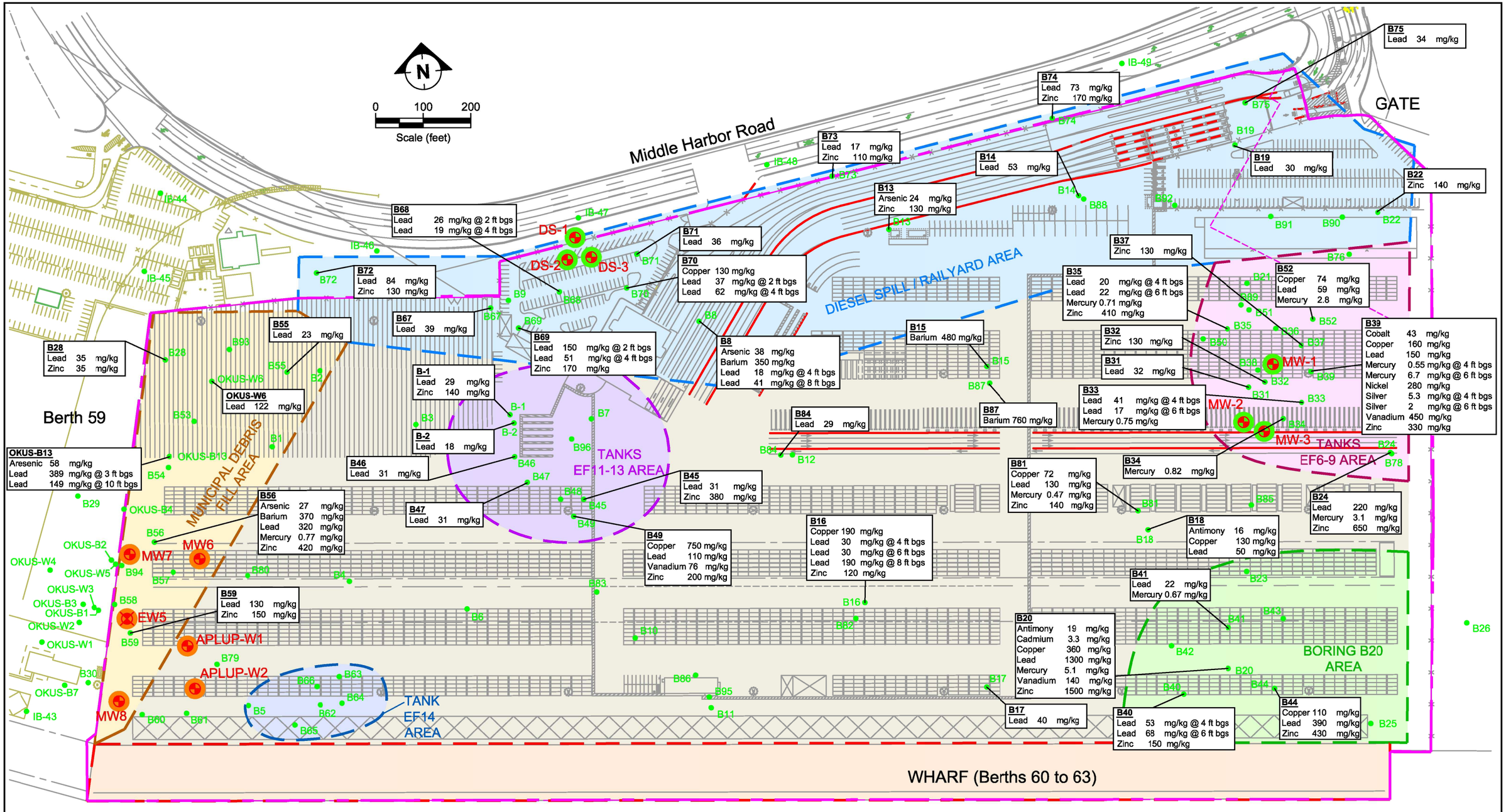
Date: 10/17/2006

Figure: 2

File: overlay-historical plan.dwg



CHEMICALS OF POTENTIAL CONCERN AND SOURCE CONCENTRATION IN SOIL (METALS)

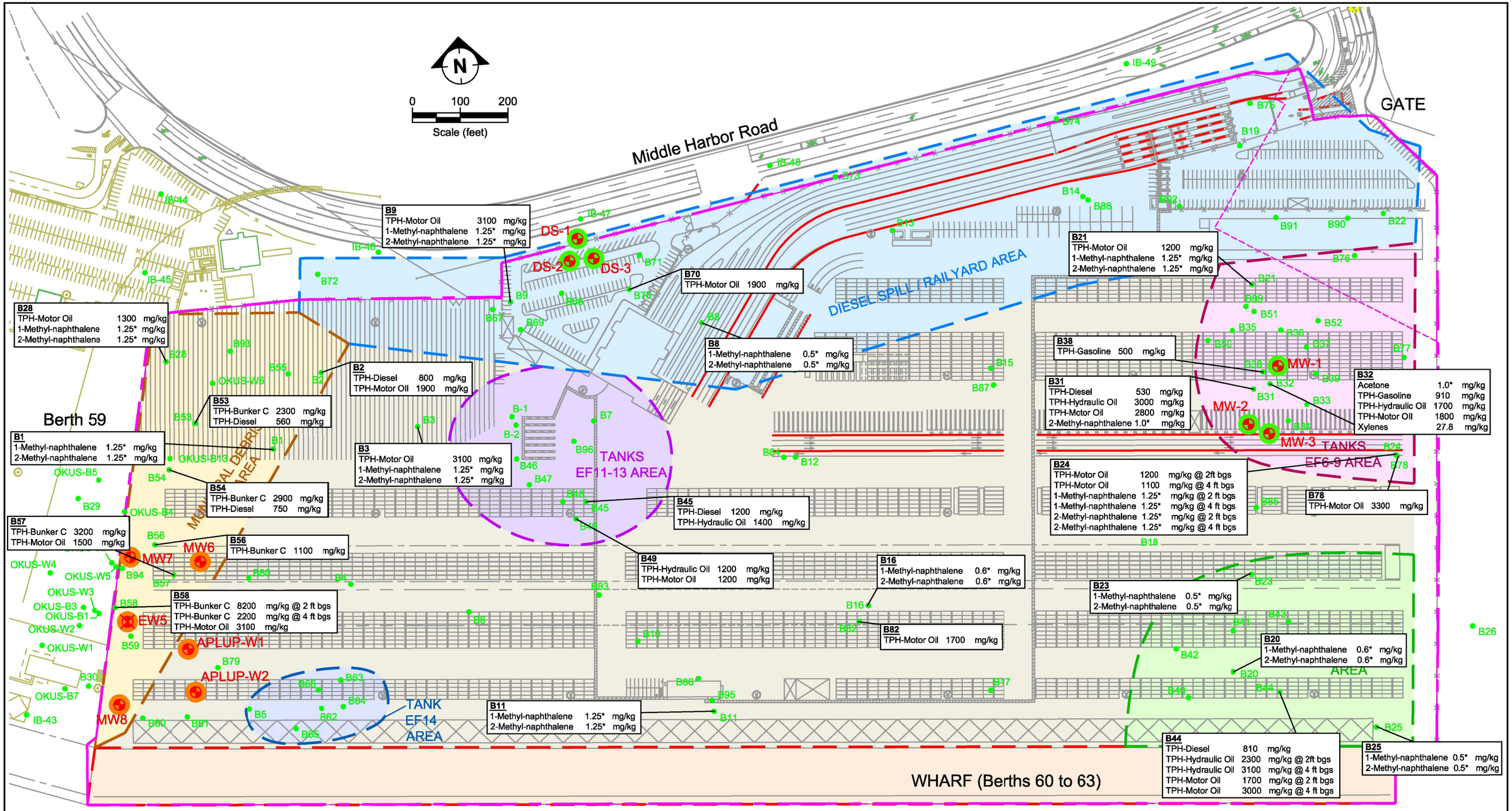
PORT OF OAKLAND
APL TERMINAL REDEVELOPMENT PROJECT
OAKLAND, CALIFORNIA

ETIC ENGINEERING

Date: 10/17/2006

Figure: 3

File: site plan w chemical.dwg



NOTE:

* Concentrations corresponding to ½ detection limit.

CHEMICALS OF POTENTIAL CONCERN AND SOURCE CONCENTRATION IN SOIL (PAHs, SVOCs, VOCs, AND TPHs)

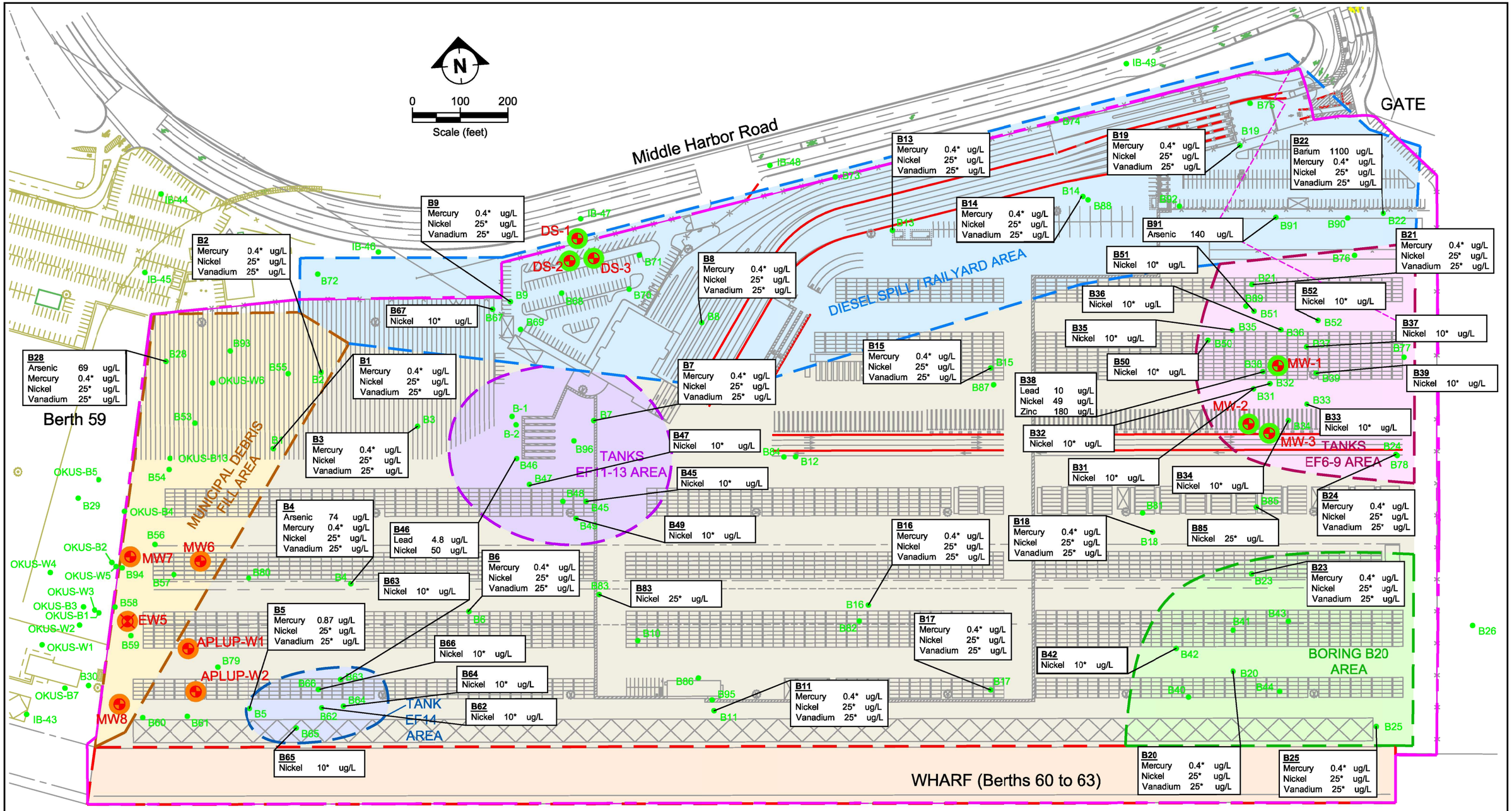
PORT OF OAKLAND
APL TERMINAL REDEVELOPMENT PROJECT
OAKLAND, CALIFORNIA

ETIC ENGINEERING

Date: 10/17/2006

Figure: 4

File: site plan w chemical.dwg



NOTE:

* Concentrations corresponding to ½ detection limit.

CHEMICAL OF POTENTIAL CONCERN AND SOURCE CONCENTRATION IN GROUNDWATER (METALS)

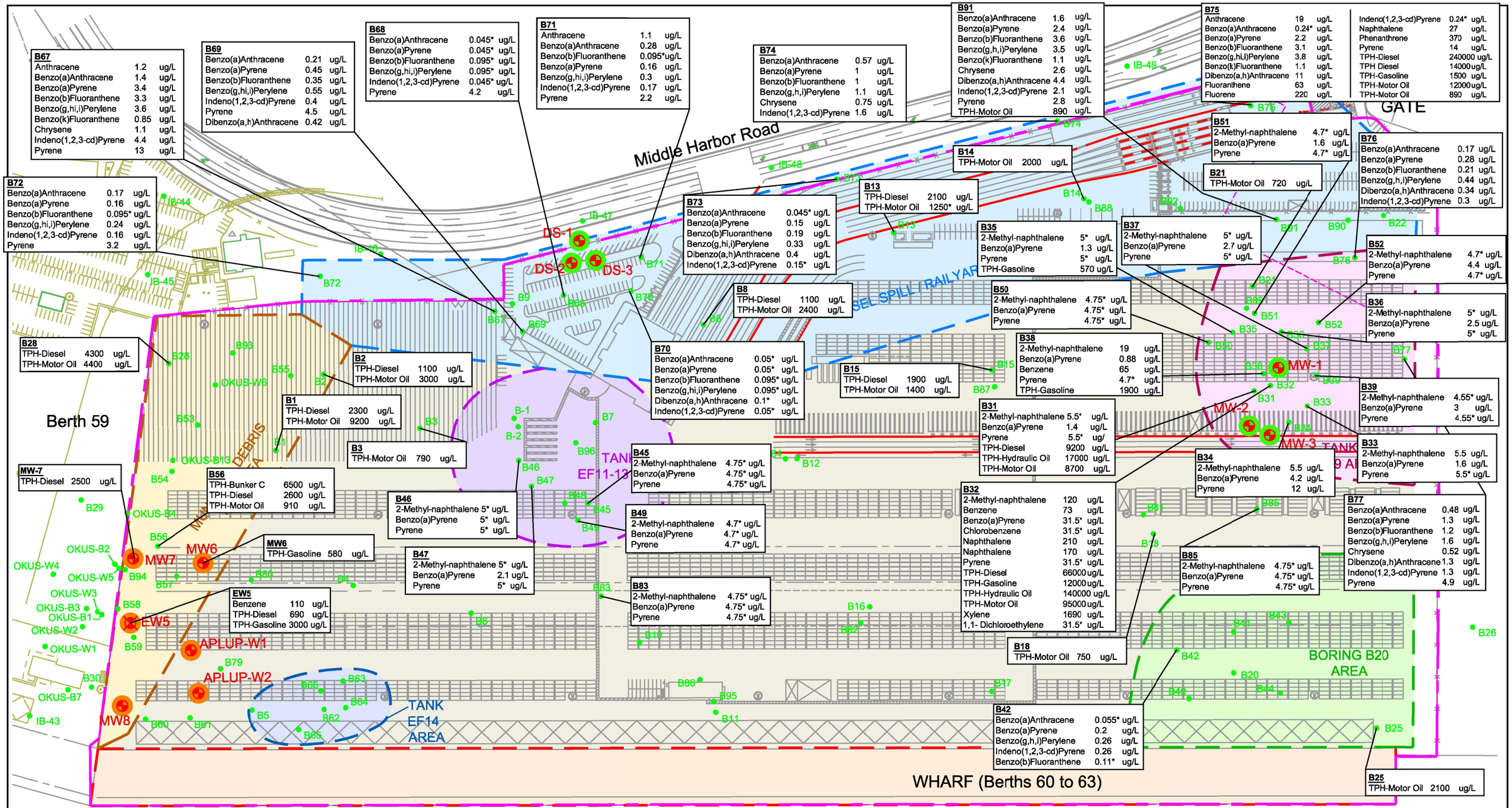
PORT OF OAKLAND
APL TERMINAL REDEVELOPMENT PROJECT
OAKLAND, CALIFORNIA

ETIC ENGINEERING

Date: 10/17/2006

Figure: 5

File: site plan w chemical.dwg



NOTE:

* Concentrations corresponding to ½ detection limit.

CHEMICALS OF POTENTIAL CONCERN AND SOURCE CONCENTRATION IN GROUNDWATER (PAHs, SVOCs, VOCs, and TPHs)

PORT OF OAKLAND
APL TERMINAL REDEVELOPMENT PROJECT
OAKLAND, CALIFORNIA

ETIC ENGINEERING

Date: 10/17/2006 | Figure: 6

File: site plan w chemical.dwg

TABLES

TABLE 1a. HISTORICAL SOIL ANALYTICAL RESULTS
TOTAL PETROLEUM HYDROCARBONS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Soil Concentrations (mg/kg)

Location ID	Depth (feet)	Sample Date [1]	TPH-Gasoline (No Silica Gel Cleanup)	TPH- Diesel (Silica Gel Cleanup)	TPH- Diesel (No Silica Gel Cleanup)	TPH-Motor Oil (Silica Gel Cleanup)	TPH-Motor Oil (No Silica Gel Cleanup)	TPH-Bunker C (Silica Gel Cleanup)	TPH-Bunker C (No Silica Gel Cleanup)	TPH-h (Silica Gel Cleanup)
Soil leaching to groundwater ESL (Non-Potable Groundwater Resource)*			**400**	**500**	**500**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**
DIESEL SPILL / RAILYARD AREA										
B8	4	12/14/2002	< 1	--	25 G	--	120	--	--	--
B8	8	12/14/2002	< 1	--	2.7 G	--	10	--	--	--
B9	4	12/21/2002	1.4 A	--	370 G	--	3,100	--	--	--
B9	8	12/21/2002	< 1	--	10 G	--	26	--	--	--
B13	4	12/21/2002	< 1	--	15 G	--	43	--	--	--
B13	8	12/21/2002	< 1	--	1.7 G	--	< 5	--	--	--
B14	4	12/15/2002	< 1	--	1.4 BG	--	< 5	--	--	--
B14	8	12/15/2002	< 1	--	2.4 BG	--	5.1	--	--	--
B19	4	12/21/2002	< 1	--	16 GB	--	100	--	--	--
B19	8	12/21/2002	< 1	--	2.2 G	--	9.9	--	--	--
B22	4	12/21/2002	< 1	--	10 G	--	71	--	--	--
B22	8	12/21/2002	< 1	--	1 G	--	6.4	--	--	--
B67	2	5/19/2004	--	15 HY	--	160	--	--	--	--
B67	4	5/19/2004	--	< 1	--	6.9	--	--	--	--
B67	6	5/19/2004	--	< 1	--	< 5	--	--	--	--
B68	2	5/20/2004	--	34 HY	--	100	--	--	--	--
B68	4	5/20/2004	--	100 HY	--	660	--	--	--	--
B69	2	5/20/2004	--	20 HY	--	130	--	--	--	--
B69	4	5/20/2004	--	61 HY	--	370	--	--	--	--
B70	2	5/20/2004	--	79 HY	--	260	--	--	--	--
B70	4	5/20/2004	--	340 HY	--	1,900	--	--	--	--
B71	2	5/20/2004	--	54 HY	--	380	--	--	--	--
B71	4	5/20/2004	--	< 1	--	< 5	--	--	--	--
B72	2	5/20/2004	--	37 HY	--	150	--	--	--	--
B73	2	5/21/2004	--	1.7 HY	--	8	--	--	--	--
B74	2	5/21/2004	--	23 HY	--	140	--	--	--	--
B75	2	5/21/2004	--	57 HY	--	360	--	--	--	--
B88	2	5/25/2004	--	< 1	--	5.2	--	--	--	--
MUNICIPAL DEBRIS FILL AREA										
B1	4	12/14/2002	< 1	--	1.8 G	--	820	--	--	--
B1	8	12/14/2002	< 1	--	3.3 G	--	13	--	--	--
B2	4	12/14/2002	2.3 b	--	800 G	--	1,900	--	--	--
B2	8	12/14/2002	< 1	--	16 G	--	38	--	--	--
B28	4	12/21/2002	1.8 A	--	320 G	--	1,300	--	--	--
B28	8	12/21/2002	< 1	--	35 BG	--	47	--	--	--
B30	4	12/21/2002	2.3 A	--	140 BG	--	270	--	--	--
B30	12	12/21/2002	< 1	--	5.3 G	--	12	--	--	--
B53	2	5/17/2004	< 0.98	11 H	--	36	--	82 Y	--	--
B53	4	5/17/2004	< 1.1	560 H	--	740	--	2,300 Y	--	--
B54	2	5/17/2004	1.3 YZ	750 H	730 H	830 L	860 L	2,900 Y	2,900 Y	--
B54	4	5/17/2004	5.7 YZ	2.4 HY	3.2 HY	6.1	7.3	15 Y	19 Y	--
B55	2	5/18/2004	--	33 HY	--	80	--	--	--	--
B55	4	5/18/2004	--	79 HY	--	--	--	--	--	--
B55	6	5/18/2004	--	65 HY	--	--	--	--	--	--
B56	2	5/18/2004	< 1	170 HY	--	430	--	1,100 Y	--	--
B56	4	5/18/2004	1.6 HY	24 HY	--	48	--	130 Y	--	--
B57	2	5/18/2004	< 1.1	310 HY	--	1,500	--	3,200 Y	--	--
B57	4	5/18/2004	< 1	3.2 HY	--	17	--	41 Y	--	--
B58	2	5/18/2004	< 1.1	130 HY	--	3,100	--	8,200 HY	--	--
B58	4	5/18/2004	< 1.1	260 HY	--	980	--	2,200 Y	--	--
B59	2	5/18/2004	< 0.94	15 HY	--	58	--	130 Y	--	--
B59	4	5/18/2004	< 1	17 HY	--	51	--	130 Y	--	--
OKUS-B13	3	7/13/1993	2.49	< 0.5	--	--	--	--	--	--
OKUS-B13	10	7/13/1993	1.03	< 0.5	--	--	--	--	--	--
BORING B20 AREA										
B20	4	12/15/2002	2.3 Fb	--	82 G	--	160	--	--	--
B20	8	12/15/2002	< 1	--	5.1 G	--	13	--	--	--
B23	4	12/15/2002	< 1	--	83 GB	--	780	--	--	--
B23	8	12/15/2002	< 1	--	< 1	--	< 5	--	--	--

TABLE 1a. HISTORICAL SOIL ANALYTICAL RESULTS
TOTAL PETROLEUM HYDROCARBONS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Soil Concentrations (mg/kg)

Location ID	Depth (feet)	Sample Date [1]	TPH-Gasoline (No Silica Gel Cleanup)	TPH- Diesel (Silica Gel Cleanup)	TPH- Diesel (No Silica Gel Cleanup)	TPH-Motor Oil (Silica Gel Cleanup)	TPH-Motor Oil (No Silica Gel Cleanup)	TPH-Bunker C (Silica Gel Cleanup)	TPH-Bunker C (No Silica Gel Cleanup)	TPH-h (Silica Gel Cleanup)
Soil leaching to groundwater ESL (Non-Potable Groundwater Resource)*			**400**	**500**	**500**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**
B25	4	12/15/2002	< 1	--	160 G	--	650	--	--	--
B25	8	12/15/2002	< 1	--	5.1 G	--	21	--	--	--
B40	2	5/13/2004	--	6.4 HY	--	44 Y	--	--	--	47
B40	4	5/13/2004	--	150 HY	--	400 Y	--	--	--	490
B40	6	5/13/2004	--	40 HY	--	87 Y	--	--	--	120
B41	2	5/13/2004	--	6 HY	--	30 Y	--	--	--	33
B41	6	5/13/2004	--	36 HY	--	92 H	--	--	--	110 L
B42	2	5/13/2004	--	140 HY	--	730 Y	--	--	--	730
B42	5	5/13/2004	--	160 HY	--	760 Y	--	--	--	830
B42	6	5/13/2004	--	< 1	--	< 5	--	--	--	< 5
B43	2	5/13/2004	--	7.3 HY	--	27 Y	--	--	--	33
B43	3.5	5/13/2004	--	< 1	--	< 5	--	--	--	< 5
B43	6	5/13/2004	--	< 1	--	< 5	--	--	--	< 5
B44	2	5/13/2004	--	810 HY	--	1,700 H	--	--	--	2,300 L
B44	4	5/13/2004	--	430 HY	--	3,000 Y	--	--	--	3,100
B44	6	5/13/2004	--	2 HY	--	11 Y	--	--	--	13
TANKS EF6-9 AREA										
B21	4	12/21/2002	< 1	--	250 G	--	1,200	--	--	--
B21	8	12/21/2002	< 1	--	17 G	--	220	--	--	--
B24	2	12/15/2002	< 1	--	140 G	--	1,200	--	--	--
B24	4	12/15/2002	< 1	--	79 BG	--	1,100	--	--	--
B24	6	12/15/2002	< 1	--	4.6 G	--	8.9	--	--	--
B24	8	12/15/2002	< 1	--	6.2 G	--	8.6	--	--	--
B31	4	5/11/2004	< 0.92	20 HY	--	63 Y	--	--	--	65
B31	6	5/11/2004	< 0.91	530 HY	--	2,800 Y	--	--	--	3,000
B32	2	5/11/2004	--	1.1 HY	--	< 5	--	--	--	< 5
B32	4	5/11/2004	910 H	3.1 Y	--	< 5	--	--	--	5.4 Y
B32	6	5/11/2004	5	200 HY	--	1,800 Y	--	--	--	1,700
B33	4	5/11/2004	< 1.1	64 HY	--	160 Y	--	--	--	180
B33	6	5/11/2004	< 1.1	17 HY	--	51 Y	--	--	--	54
B34	4	5/11/2004	< 1.1	< 0.99	--	< 5	--	--	--	< 5
B34	6	5/11/2004	< 0.95	23 HY	--	95 Y	--	--	--	94
B35	4	5/12/2004	< 1	1.9 HY	--	--	--	--	--	--
B35	6	5/12/2004	< 0.99	68 HY	--	--	--	--	--	--
B36	4	5/12/2004	< 1	< 0.99	--	--	--	--	--	--
B36	6	5/12/2004	< 1.1	6.4 HY	--	--	--	--	--	--
B37	4	5/12/2004	< 0.92	22 HY	--	--	--	--	--	--
B37	6	5/12/2004	< 0.99	6.3 HY	--	--	--	--	--	--
B38	4	5/12/2004	500 Y	2.9 HY	--	--	--	--	--	--
B38	6	5/12/2004	< 0.98	15 HLY	--	--	--	--	--	--
B39	4	5/13/2004	< 1	22 HY	--	64 Y	--	--	--	83
B39	6	5/13/2004	< 1.1	180 HY	--	330 Y	--	--	--	470
B50	4	5/17/2004	< 0.91	4.6 HY	--	--	--	--	--	--
B50	6	5/17/2004	< 1.1	4.7 HY	--	--	--	--	--	--
B51	4	5/17/2004	< 0.99	< 1	--	--	--	--	--	--
B51	6	5/17/2004	< 1	< 1	--	--	--	--	--	--
B52	4	5/17/2004	< 1	5.6 HY	--	--	--	--	--	--
B52	7	5/17/2004	< 0.98	43 HY	--	--	--	--	--	--
B76	2	5/24/2004	--	390 HY	--	290 L	--	--	--	--
B77	2	5/24/2004	--	66 HY	--	290	--	--	--	--
B78	2	5/24/2004	--	2 HY	--	14	--	--	--	--
B78	4.5	5/24/2004	--	480 HY	--	3,300	--	--	--	--
B78	6	5/24/2004	--	< 1	--	< 5	--	--	--	--
TANKS EF11-13 AREA										
B-1	3.5	3/12/1999	< 1	49 g	--	--	--	--	--	--
B-2	3.5	3/12/1999	< 1	9.2 g	--	--	--	--	--	--
B-2	7	3/12/1999	< 1	1.4 g	--	--	--	--	--	--
B7	4	12/14/2002	< 1	--	1.5 G	--	8.6	--	--	--
B7	8	12/14/2002	< 1	--	1.3 G	--	< 5	--	--	--
B45	4	5/14/2004	< 1	3.1 HY	--	14 Y	--	--	--	15

TABLE 1a. HISTORICAL SOIL ANALYTICAL RESULTS
TOTAL PETROLEUM HYDROCARBONS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Soil Concentrations (mg/kg)

Location ID	Depth (feet)	Sample Date [1]	TPH-Gasoline (No Silica Gel Cleanup)	TPH- Diesel (Silica Gel Cleanup)	TPH- Diesel (No Silica Gel Cleanup)	TPH-Motor Oil (Silica Gel Cleanup)	TPH-Motor Oil (No Silica Gel Cleanup)	TPH-Bunker C (Silica Gel Cleanup)	TPH-Bunker C (No Silica Gel Cleanup)	TPH-h (Silica Gel Cleanup)
Soil leaching to groundwater ESL (Non-Potable Groundwater Resource)*			**400**	**500**	**500**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**
B45	6	5/14/2004	2.2	1,200 HY	--	320 LY	--	--	--	1,400 L
B46	4	5/14/2004	< 0.97	110 HY	--	360 Y	--	--	--	430
B46	6	5/14/2004	< 1.1	50 HY	--	46 Y	--	--	--	85 Y
B47	2	5/14/2004	--	8 HY	--	28 Y	--	--	--	31
B47	4	5/14/2004	< 0.95	41 HY	--	160 Y	--	--	--	180
B47	6	5/14/2004	< 1.1	< 1	--	< 5	--	--	--	< 5
B48	4	5/14/2004	< 1.1	< 1	--	< 5	--	--	--	< 5
B49	4	5/14/2004	< 1.1	2.9 HY	--	12 Y	--	--	--	13
B49	6	5/14/2004	< 1	150 HY	--	1,200 Y	--	--	--	1,200
TANK EF14 AREA										
B5	4	12/15/2002	< 1	--	< 1	--	< 5	--	--	--
B5	8	12/15/2002	< 1	--	2.7 B	--	< 5	--	--	--
B62	4	5/19/2004	< 1.1	3.1 HY	--	--	--	--	--	--
B62	6	5/19/2004	< 0.94	2.2 Y	--	--	--	--	--	--
B63	4	5/19/2004	< 1	1.3 HY	--	--	--	--	--	--
B63	6	5/19/2004	< 0.98	< 1	--	--	--	--	--	--
B64	2	5/19/2004	< 1.1	1 Y	--	< 5	--	--	--	--
B64	4	5/19/2004	< 1	2.4 HY	--	--	--	--	--	--
B64	6	5/19/2004	< 1	1.2 Y	--	--	--	--	--	--
B65	4	5/19/2004	< 1.1	< 0.99	--	--	--	--	--	--
B65	6	5/19/2004	< 1.1	< 1	--	--	--	--	--	--
B66	4	5/19/2004	< 1.1	< 1	--	--	--	--	--	--
B66	6	5/19/2004	< 1	< 1	--	--	--	--	--	--
GENERAL AREA										
B3	4	12/14/2002	2.5 b	--	340 G	--	3,100	--	--	--
B3	8	12/14/2002	< 1	--	4 G	--	9.9	--	--	--
B4	4	12/14/2002	< 1	--	< 1	--	< 5	--	--	--
B4	8	12/14/2002	< 1	--	< 1	--	< 5	--	--	--
B6	4	12/14/2002	< 1	--	21	--	14	--	--	--
B6	8	12/14/2002	< 1	--	< 1	--	< 5	--	--	--
B11	4	12/15/2002	< 1	--	83 G	--	390	--	--	--
B11	8	12/15/2002	< 1	--	2 BG	--	< 5	--	--	--
B12	4	12/21/2002	< 1	--	3.6 G	--	28	--	--	--
B15	4	12/21/2002	< 1	--	1.6 G	--	8.2	--	--	--
B15	8	12/21/2002	< 1	--	< 1	--	< 5	--	--	--
B16	4	12/15/2002	2.8 g	--	72 BG	--	150	--	--	--
B16	6	12/15/2002	3.6 b	--	47 G	--	310	--	--	--
B16	8	12/15/2002	< 1	--	19 BG	--	73	--	--	--
B17	4	12/21/2002	< 1	--	3.4 G	--	54	--	--	--
B17	8	12/21/2002	< 1	--	2.2 B	--	< 5	--	--	--
B18	4	12/15/2002	< 1	--	6.2 GB	--	20	--	--	--
B18	8	12/15/2002	< 1	--	21 G	--	71	--	--	--
B60	2	5/18/2004	< 0.97	3 HY	--	8.9	--	21 Y	--	--
B60	4	5/18/2004	< 1	14 HY	--	20	--	62 Y	--	--
B61	2	5/18/2004	< 1	3.1 HY	--	12	--	28 Y	--	--
B61	4	5/18/2004	< 1	4.1 HY	--	18	--	40 Y	--	--
B79	2	5/24/2004	< 1	5.3 HY	--	19	--	49 Y	--	--
B79	4	5/24/2004	< 1	1.7 HY	--	9.3	--	29 Y	--	--
B80	2	5/24/2004	< 1.1	1.1 HY	--	< 5	--	7.7 Y	--	--
B80	4	5/24/2004	< 0.99	3.7 HY	--	13	--	39 Y	--	--
B81	2	5/24/2004	--	79 HY	--	320	--	--	--	--
B82	2	5/24/2004	--	410 HY	--	1,700	--	--	--	--
B83	2	5/25/2004	--	6 HY	--	17 L	--	--	--	--
B84	2	5/25/2004	--	410 H	--	960 H	--	--	--	--
B85	4	5/25/2004	< 1	120 HY	--	--	--	--	--	--
B85	6	5/25/2004	< 1	28 H	--	--	--	--	--	--
B86	2	5/25/2004	--	48 HY	--	210 H	--	--	--	--
B87	2	5/25/2004	--	7.2 HY	--	80	--	--	--	--
APL/UP-W1	6	7/16/1993	0.11	< 100	--	--	--	--	--	--
APL/UP-W1	12	7/16/1993	0.1	< 100	--	--	--	--	--	--

TABLE 1a. HISTORICAL SOIL ANALYTICAL RESULTS
TOTAL PETROLEUM HYDROCARBONS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Soil Concentrations (mg/kg)

Location ID	Depth (feet)	Sample Date [1]	TPH-Gasoline (No Silica Gel Cleanup)	TPH- Diesel (Silica Gel Cleanup)	TPH- Diesel (No Silica Gel Cleanup)	TPH-Motor Oil (Silica Gel Cleanup)	TPH-Motor Oil (No Silica Gel Cleanup)	TPH-Bunker C (Silica Gel Cleanup)	TPH-Bunker C (No Silica Gel Cleanup)	TPH-h (Silica Gel Cleanup)
Soil leaching to groundwater ESL (Non-Potable Groundwater Resource)*			**400**	**500**	**500**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**
APL/UP-W1	12	7/16/1993	< 100	< 100	--	--	--	--	--	--
APL/UP-W2	3	7/16/1993	0.11	86.5	--	--	--	--	--	--
APL/UP-W2	11	7/16/1993	0.1	76.4	--	--	--	--	--	--
APL/UP-W2	11	7/16/1993	0.13	< 100	--	--	--	--	--	--

Notes
mg/kg - miligrams per kilogram
"--" - Not Analyzed
ND - Not Detected at or above laboratory reporting limits
A - Unmodified or weakly modified gasoline or diesel is significant
B - Diesel range compounds are significant
b - Heavier gasoline range compounds are significant (aged gasoline?)
G - Oil range compounds are significant
g - Strongly aged gasoline or diesel range compounds are significant
H - Heavier hydrocarbons contributed to the quantitation
L - Lighter hydrocarbons contributed to the quantitation
Y - Sample exhibits chromatographic pattern which does not resemble standard
TPH - total petroleum hydrocarbons
TPH-h - Total Petroleum Hydrocarbons as hydraulic oil.
* = ESL corresponding to soil leaching to groundwater pathway for non-potable groundwater resource (Table G of RWQCB, 2005)
Detected concentration exceeds the soil leaching to groundwater ESL (non-potable groundwater resource)

[1]Sampling dates and related data references:
1/1993 - USPCI, 1993
7/1993 - CDM, 1999
4/1998 - CDM, 1998
3/1999 - Blymer, 1999
12/2002 - GAIA, 2003
5/2004 - T&R, 2004

Note - analyses are listed as "no silica cleanup unless silica gel cleanup is specified in the laboratory analytical report, table, and/or

TABLE 1b. HISTORICAL SOIL ANALYTICAL RESULTS
METALS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Concentrations (mg/kg)

Location ID	Depth (feet)	Sample Date [1]	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
95% UCL of Soil Background Levels*			**5.5**	**19.1**	**323.6**	**1**	**2.7**	**99.6**	**22.2**	**69.4**	**16.1**	**0.4**	**7.4**	**119.6**	**5.6**	**1.8**	**27.1**	**74.3**	**106.1**
DIESEL SPILL / RAILYARD AREA																			
B8	4	12/14/2002	< 2.5	2.9	350	< 0.5	< 0.5	15	8.8	50	18	0.38	< 2	25	< 2.5	< 1	< 2.5	25	45
B8	8	12/14/2002	< 2.5	38	180	< 0.5	< 0.5	32	8.7	30	41	0.14	< 2	47	< 2.5	< 1	< 2.5	27	50
B9	4	12/21/2002	< 2.5	2.9	93	< 0.5	< 0.5	10	4.9	11	4.2	< 0.06	< 2	20	< 2.5	< 1	< 2.5	25	38
B9	8	12/21/2002	< 2.5	< 2.5	36	< 0.5	< 0.5	29	4.9	9.2	7	< 0.06	< 2	26	< 2.5	< 1	< 2.5	22	26
B13	4	12/21/2002	3.1	24	110	< 0.5	< 0.5	31	< 2	34	11	0.17	< 2	41	< 2.5	< 1	< 2.5	38	130
B13	8	12/21/2002	< 2.5	2.6	36	< 0.5	< 0.5	18	2.1	9.4	11	< 0.06	< 2	12	< 2.5	< 1	< 2.5	16	19
B14	4	12/15/2002	< 2.5	4	48	< 0.5	< 0.5	31	5.8	14	53	0.075	< 2	31	< 2.5	< 1	< 2.5	24	59
B14	8	12/15/2002	< 2.5	3	27	< 0.5	< 0.5	14	2.9	3.8	< 3	< 0.06	< 2	13	< 2.5	< 1	< 2.5	10	10
B19	4	12/21/2002	< 2.5	3.3	270	< 0.5	< 0.5	17	5.7	37	30	0.065	< 2	18	< 2.5	< 1	< 2.5	23	62
B19	8	12/21/2002	< 2.5	< 2.5	44	< 0.5	< 0.5	27	5.5	13	8.7	< 0.06	< 2	27	< 2.5	< 1	< 2.5	21	26
B22	4	12/21/2002	< 2.5	4.2	140	< 0.5	< 0.5	11	11	26	7.2	< 0.06	< 2	13	< 2.5	< 1	< 2.5	41	140
B22	8	12/21/2002	< 2.5	16	64	< 0.5	< 0.5	46	9	18	7.1	< 0.06	< 2	83	< 2.5	< 1	< 2.5	20	50
B67	2	5/19/2004	--	--	--	--	--	--	--	19	39	--	--	--	--	--	--	--	98
B67	4	5/19/2004	--	--	--	--	--	--	--	6.1	6.1	--	--	--	--	--	--	--	22
B68	2	5/20/2004	--	--	--	--	--	--	--	24	26	--	--	--	--	--	--	--	34
B68	4	5/20/2004	--	--	--	--	--	--	--	37	19	--	--	--	--	--	--	--	67
B69	2	5/20/2004	--	--	--	--	--	--	--	43	150	--	--	--	--	--	--	--	170
B69	4	5/20/2004	--	--	--	--	--	--	--	15	51	--	--	--	--	--	--	--	51
B7	4	12/14/2002	< 2.5	4.8	92	< 0.5	< 0.5	19	6.9	18	9.8	0.071	< 2	23	< 2.5	< 1	< 2.5	21	32
B7	8	12/14/2002	< 2.5	6.4	38	< 0.5	< 0.5	39	6.9	19	10	< 0.06	< 2	44	< 2.5	< 1	< 2.5	33	46
B70	2	5/20/2004	--	--	--	--	--	--	--	41	37	--	--	--	--	--	--	--	52
B70	4	5/20/2004	--	--	--	--	--	--	--	130	62	--	--	--	--	--	--	--	88
B71	2	5/20/2004	--	--	--	--	--	--	--	16	36	--	--	--	--	--	--	--	81
B71	4	5/20/2004	--	--	--	--	--	--	--	4.5	3.8	--	--	--	--	--	--	--	13
B72	2	5/20/2004	--	--	--	--	--	--	--	63	84	--	--	--	--	--	--	--	130
B73	2	5/21/2004	--	--	--	--	--	--	--	6.5	17	--	--	--	--	--	--	--	110
B74	2	5/21/2004	--	--	--	--	--	--	--	39	73	--	--	--	--	--	--	--	170
B75	2	5/21/2004	--	--	--	--	--	--	--	17	34	--	--	--	--	--	--	--	97
B88	2	5/25/2004	< 2.5	5	92	0.65	< 0.21	14	7.8	14	11	0.066	< 0.83	18	1.2	< 0.21	< 0.21	24	32
MUNICIPAL DEBRIS FILL AREA																			
B1	4	12/14/2002	< 2.5	< 2.5	270	< 0.5	< 0.5	44	17	27	4.6	< 0.06	< 2	54	< 2.5	< 1	< 2.5	64	45
B1	8	12/14/2002	< 2.5	2.9	250	< 0.5	< 0.5	34	6.3	14	5.6	< 0.06	< 2	28	< 2.5	< 1	< 2.5	26	32
B2	4	12/14/2002	< 2.5	< 2.5	180	< 0.5	< 0.5	15	7.2	25	7.5	< 0.06	< 2	30	< 2.5	< 1	< 2.5	17	31
B2	8	12/14/2002	< 2.5	3.9	56	< 0.5	< 0.5	52	12	24	14	0.15	< 2	64	< 2.5	< 1	< 2.5	41	57
B28	4	12/21/2002	< 2.5	5.3	130	< 0.5	< 0.5	38	6.1	21	35	0.073	< 2	46	< 2.5	< 1	< 2.5	31	120
B30	12	12/21/2002	< 2.5	< 2.5	28	< 0.5	< 0.5	19	3.2	5.3	10	< 0.06	< 2	16	< 2.5	< 1	< 2.5	11	22
B55	2	5/18/2004	< 2.9	2.2	100	0.31	< 0.24	39	5.8	12	23	0.084	< 0.95	38	0.78	< 0.24	< 0.24	27	39
B56	2	5/18/2004	2.8	27	370	0.23	0.33	26	4.7	48	320	0.77	< 0.83	29	1.5	0.23	< 0.21	35	420
B56	4	5/18/2004	--	--	--	--	--	--	--	--	16	--	--	--	--	--	--	--	28
B59	2	5/18/2004	< 2.1	7.7	120	0.26	< 0.18	41	6.8	64	130	0.2	< 0.71	31	0.66	< 0.18	< 0.18	31	150
B59	4	5/18/2004	--	--	--	--	--	--	--	--	71	--	--	--	--	--	--	--	38
OKUS-B13	3	7/13/1993	--	58	--	--	--	--	--	--	389	--	--	--	--	--	--	--	--
OKUS-B13	10	7/13/1993	--	9	--	--	--	--	--	--	149	--	--	--	--	--	--	--	--
OKUS-W6	10	7/12/1993	--	< 0.2	--	--	--	--	--	--	122	--	--	--	--	--	--	--	--

TABLE 1b. HISTORICAL SOIL ANALYTICAL RESULTS
METALS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Concentrations (mg/kg)

Location ID	Depth (feet)	Sample Date [1]	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
95% UCL of Soil Background Levels*			**5.5**	**19.1**	**323.6**	**1**	**2.7**	**99.6**	**22.2**	**69.4**	**16.1**	**0.4**	**7.4**	**119.6**	**5.6**	**1.8**	**27.1**	**74.3**	**106.1**
BORING B20 AREA																			
B20	4	12/15/2002	19	16	320	< 0.5	3.3	63	9.4	360	1,300	5.1	4	70	< 2.5	< 1	< 2.5	140	1,500
B20	8	12/15/2002	< 2.5	< 2.5	73	< 0.5	< 0.5	23	4.6	7.9	5.5	< 0.06	< 2	21	< 2.5	< 1	< 2.5	17	22
B23	4	12/15/2002	< 2.5	4.7	81	< 0.5	< 0.5	11	6.7	22	6.3	0.069	< 2	14	< 2.5	< 1	< 2.5	33	94
B23	8	12/15/2002	< 2.5	< 2.5	32	< 0.5	< 0.5	12	3.3	4.7	3	< 0.06	< 2	12	< 2.5	< 1	< 2.5	8.2	14
B25	4	12/15/2002	< 2.5	< 2.5	95	< 0.5	< 0.5	8.8	7.3	15	5.3	0.2	< 2	11	< 2.5	< 1	< 2.5	22	60
B25	8	12/15/2002	< 2.5	< 2.5	16	< 0.5	< 0.5	5.7	< 2	7.2	28	0.0082	< 2	7	< 2.5	< 1	< 2.5	4.7	170
B40	2	5/13/2004	--	--	--	--	--	--	--	57	15	--	--	--	--	--	--	--	100
B40	4	5/13/2004	--	--	--	--	--	--	--	37	53	--	--	--	--	--	--	--	91
B40	6	5/13/2004	--	--	--	--	--	--	--	23	68	--	--	--	--	--	--	--	150
B41	2	5/13/2004	< 2.5	6.5	86	0.31	0.4	12	8	19	5	0.67	< 0.83	12	1.1	< 0.21	< 0.21	33	75
B41	6	5/13/2004	--	--	--	--	--	--	--	21	22	--	--	--	--	--	--	--	62
B42	2	5/13/2004	--	--	--	--	--	--	--	6.7	5.1	--	--	--	--	--	--	--	69
B42	5	5/13/2004	--	--	--	--	--	--	--	6.4	9.6	--	--	--	--	--	--	--	71
B42	6	5/13/2004	--	--	--	--	--	--	--	4.9	2.9	--	--	--	--	--	--	--	20
B43	2	5/13/2004	--	--	--	--	--	--	--	26	6.8	--	--	--	--	--	--	--	79
B43	3.5	5/13/2004	--	--	--	--	--	--	--	4.6	1.6	--	--	--	--	--	--	--	18
B43	6	5/13/2004	--	--	--	--	--	--	--	5.5	1.9	--	--	--	--	--	--	--	21
B44	2	5/13/2004	--	--	--	--	--	--	--	23	5.2	--	--	--	--	--	--	--	63
B44	4	5/13/2004	--	--	--	--	--	--	--	110	390	--	--	--	--	--	--	--	430
B44	6	5/13/2004	--	--	--	--	--	--	--	4.1	1.6	--	--	--	--	--	--	--	19
TANKS EF6-9 AREA																			
B21	4	12/21/2002	< 2.5	2.8	60	< 0.5	< 0.5	19	5	16	7.4	< 0.06	< 2	29	< 2.5	< 1	< 2.5	21	44
B21	8	12/21/2002	< 2.5	2.8	52	< 0.5	< 0.5	18	4.3	10	13	0.087	< 2	16	< 2.5	< 1	< 2.5	22	30
B24	2	12/15/2002	< 2.5	3	68	< 0.5	< 0.5	23	5.7	18	11	0.37	< 2	39	< 2.5	< 1	< 2.5	19	41
B24	4	12/15/2002	< 2.5	10	170	< 0.5	< 0.5	24	13	57	220	3.1	< 2	38	< 2.5	< 1	< 2.5	23	650
B24	6	12/15/2002	< 2.5	3.1	98	< 0.5	< 0.5	41	3.9	15	16	0.092	< 2	28	< 2.5	< 1	< 2.5	30	90
B24	8	12/15/2002	< 2.5	7.5	23	< 0.5	< 0.5	27	9.9	18	8.5	< 0.06	< 2	31	< 2.5	< 1	< 2.5	24	27
B31	4	5/11/2004	< 3	2.3	68	0.31	0.36	27	7	30	32	0.4	< 1	43	0.58	< 0.25	< 0.25	30	68
B31	6	5/11/2004	< 2.4	2.7	87	0.39	0.24	25	5.3	15	5.7	0.056	0.92	32	0.5	< 0.2	< 0.2	31	31
B32	2	5/11/2004	< 3	2.2	87	0.54	< 0.25	13	4.6	8	7	0.089	< 1	14	< 0.25	< 0.25	< 0.25	20	29
B32	4	5/11/2004	< 2.3	1.8	74	0.48	< 0.19	10	4.1	7.5	5.9	0.1	< 0.75	13	< 0.19	< 0.19	< 0.19	18	25
B32	6	5/11/2004	< 3.1	2.9	98	0.49	0.82	25	5.5	14	12	0.097	1.3	28	0.27	< 0.26	< 0.26	31	130
B33	4	5/11/2004	< 2.2	3.1	45	0.2	< 0.18	31	3.6	29	41	0.75	< 0.72	26	0.47	< 0.18	< 0.18	23	38
B33	6	5/11/2004	< 3.1	2.8	32	0.25	< 0.26	34	5.7	16	17	0.058	< 1	30	0.73	< 0.26	< 0.26	27	52
B34	4	5/11/2004	< 2.9	1.5	66	0.26	< 0.24	20	7.1	11	2.7	0.2	< 0.95	9.7	0.8	< 0.24	< 0.24	45	65
B34	6	5/11/2004	< 2.6	3.6	75	0.27	< 0.22	14	5.5	16	5.8	0.82	1.6	12	1.1	< 0.22	< 0.22	33	61
B35	4	5/12/2004	< 2.9	1.8	20	< 0.098	< 0.25	24	3.3	17	20	0.71	< 0.98	14	0.35	< 0.25	< 0.25	15	35
B35	6	5/12/2004	< 2.8	13	120	0.3	1.3	40	12	52	22	0.28	< 0.94	53	1	< 0.24	< 0.24	31	410
B36	4	5/12/2004	< 2.7	1.7	70	0.49	0.24	13	4.7	7.6	6.7	0.08	< 0.88	12	< 0.22	< 0.22	< 0.22	21	25
B36	6	5/12/2004	< 2.9	2.5	100	0.51	0.31	22	5.8	9.8	6.9	0.074	1	17	< 0.24	< 0.24	< 0.24	26	26
B37	4	5/12/2004	< 2.7	1.8	40	< 0.09	< 0.23	25	2.2	5.5	5	0.033	< 0.9	15	< 0.23	< 0.23	< 0.23	18	130
B37	6	5/12/2004	< 3.1	3.3	23	0.17	0.3	47	4.3	22	12	0.046	< 1	25	0.67	< 0.26	< 0.26	36	35
B38	4	5/12/2004	< 2.7	2.3	73	0.58	0.28	13	5.3	10	7.5	0.086	< 0.89	14	< 0.22	< 0.22	< 0.22	24	31
B38	6	5/12/2004	< 3.3	2.5	85	0.52	< 0.27	13	5.3	11	7.5	0.12	< 1.1	13	< 0.27	< 0.27	< 0.27	21	33

TABLE 1b. HISTORICAL SOIL ANALYTICAL RESULTS
METALS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Concentrations (mg/kg)

Location ID	Depth (feet)	Sample Date [1]	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
95% UCL of Soil Background Levels*			**5.5**	**19.1**	**323.6**	**1**	**2.7**	**99.6**	**22.2**	**69.4**	**16.1**	**0.4**	**7.4**	**119.6**	**5.6**	**1.8**	**27.1**	**74.3**	**106.1**
B39	4	5/13/2004	< 2.7	4.4	49	0.31	0.23	23	43	24	12	0.55	1.2	18	1.6	5.3	< 0.23	18	53
B39	6	5/13/2004	< 2.8	9.5	110	< 0.092	1.5	51	17	160	150	6.7	2.8	280	1.7	2	< 0.23	450	330
B50	4	5/17/2004	< 3	2.1	66	0.21	< 0.25	54	6.3	6.8	6.2	0.028	< 0.99	35	0.72	< 0.25	< 0.25	28	19
B50	6	5/17/2004	< 2.6	1.3	67	0.15	< 0.22	25	4.3	6.5	2.7	0.091	< 0.87	22	0.37	< 0.22	< 0.22	19	15
B51	4	5/17/2004	< 3	5.2	21	0.11	< 0.25	21	3.1	2.8	1.1	< 0.019	< 1	14	< 0.25	< 0.25	< 0.25	12	7.4
B51	6	5/17/2004	< 3.2	3.4	24	0.11	< 0.26	20	3.2	3	1.2	< 0.018	< 1.1	13	0.27	< 0.26	< 0.26	12	8.3
B52	4	5/17/2004	< 3.3	1.9	44	0.2	0.29	22	5.8	20	16	0.4	< 1.1	19	0.66	< 0.28	< 0.28	29	53
B52	7	5/17/2004	< 2.9	6.4	76	0.29	0.49	48	6.7	74	59	2.8	< 0.96	39	1.2	< 0.24	< 0.24	42	100
TANKS EF11-13 AREA																			
B-1	3.5	3/12/1999	--	--	--	--	< 0.5	26	--	--	29	--	--	32	--	--	--	--	140
B-2	3.5	3/12/1999	--	--	--	--	< 0.5	36	--	--	18	--	--	51	--	--	--	--	82
B-2	7	3/12/1999	--	--	--	--	< 0.5	23	--	--	3.9	--	--	23	--	--	--	--	16
B45	4	5/14/2004	< 2.9	5.3	160	0.77	0.38	15	14	19	9.7	0.12	< 0.98	18	0.95	< 0.25	< 0.25	27	43
B45	6	5/14/2004	< 3.2	9.4	140	0.36	0.67	18	6.1	61	31	0.15	1.4	13	1.9	< 0.26	< 0.26	63	380
B46	4	5/14/2004	< 3	5	41	0.18	0.35	40	6.1	13	16	0.024	1.7	30	0.43	< 0.25	< 0.25	23	59
B46	6	5/14/2004	< 2.8	2.3	55	0.19	< 0.23	37	5.7	28	31	0.03	< 0.92	31	0.27	< 0.23	< 0.23	25	36
B47	2	5/14/2004	< 2.7	5.3	14	0.14	0.26	24	5.3	5.2	9.1	0.086	< 0.91	26	0.67	< 0.23	< 0.23	20	23
B47	4	5/14/2004	< 2.9	4.7	28	0.24	0.3	27	5.6	10	51	0.046	1	26	0.35	< 0.24	< 0.24	21	31
B47	6	5/14/2004	< 2.5	1	24	0.12	< 0.21	21	3.1	3.8	3.9	0.02	< 0.83	17	0.39	< 0.21	< 0.21	15	16
B48	4	5/14/2004	< 2.2	5.1	9.7	0.15	0.22	24	5.2	2.9	3.7	< 0.017	< 0.74	25	0.35	< 0.18	< 0.18	19	20
B49	4	5/14/2004	< 3.2	5.5	160	0.77	0.31	15	7.6	17	10	0.093	< 1.1	19	0.76	< 0.27	< 0.27	27	44
B49	6	5/14/2004	< 2.6	9.6	91	0.42	1.1	20	12	750	110	0.14	1.7	22	1.3	< 0.22	< 0.22	76	200
TANK EF14 AREA																			
B5	4	12/15/2002	< 2.5	5.2	6.2	< 0.5	< 0.5	19	5.2	3.2	3	< 0.06	< 2	26	< 2.5	< 1	< 2.5	15	17
B5	8	12/15/2002	< 2.5	4.4	6.2	< 0.5	< 0.5	17	4.6	3.1	5.3	< 0.06	< 2	23	< 2.5	< 1	< 2.5	12	18
B62	4	5/19/2004	< 2.6	4.9	16	0.15	0.25	25	4.6	4.1	3.2	0.077	< 0.85	22	< 0.21	< 0.21	< 0.21	19	17
B62	6	5/19/2004	< 2.8	5	22	0.15	< 0.23	24	4.9	3.2	4.7	< 0.018	< 0.93	22	< 0.23	< 0.23	< 0.23	19	18
B63	4	5/19/2004	< 2.2	4.4	25	0.21	0.26	21	5	4	3.1	0.019	< 0.73	20	0.21	< 0.18	< 0.18	20	18
B63	6	5/19/2004	< 2.5	2.1	34	0.12	< 0.21	27	3.7	3.6	0.94	< 0.02	< 0.85	22	< 0.21	< 0.21	< 0.21	22	15
B64	2	5/19/2004	< 2.3	1.9	100	0.55	0.24	8.4	4.2	6.5	5.8	0.065	< 0.76	14	< 0.19	< 0.19	< 0.19	17	26
B64	4	5/19/2004	< 2.7	4.6	24	0.2	0.27	27	5.3	5.1	3.8	0.027	< 0.88	25	< 0.22	< 0.22	< 0.22	22	22
B64	6	5/19/2004	< 2.2	4.3	14	0.15	0.27	24	5.7	3.8	4.6	< 0.02	< 0.75	28	< 0.19	< 0.19	< 0.19	19	30
B65	4	5/19/2004	< 2.3	4.5	8.8	0.15	< 0.19	27	4.4	2.8	3.1	< 0.018	< 0.75	23	0.31	< 0.19	< 0.19	17	16
B65	6	5/19/2004	< 2.6	4.9	11	0.17	< 0.21	22	4.5	3.2	3.2	< 0.018	< 0.85	25	0.32	< 0.21	< 0.21	18	17
B66	4	5/19/2004	< 2	4.9	6.8	0.16	0.19	22	4.3	2.5	2.3	< 0.017	< 0.68	24	< 0.17	< 0.17	< 0.17	17	15
B66	6	5/19/2004	< 2.8	4.5	20	0.094	< 0.23	21	4.4	2.8	3.7	< 0.019	< 0.92	20	< 0.23	< 0.23	< 0.23	17	18
GENERAL AREA																			
B3	4	12/14/2002	< 2.5	4.1	27	< 0.5	< 0.5	21	4.9	8	8.8	< 0.06	< 2	26	< 2.5	< 1	< 2.5	14	38
B3	8	12/14/2002	< 2.5	3.9	35	< 0.5	< 0.5	25	5.9	5.9	16	< 0.06	< 2	30	< 2.5	< 1	< 2.5	17	51
B4	4	12/14/2002	< 2.5	4.7	6.6	< 0.5	< 0.5	20	4.4	3.1	9.8	< 0.06	< 2	23	< 2.5	< 1	< 2.5	15	16
B4	8	12/14/2002	< 2.5	4.8	7.5	< 0.5	< 0.5	18	4.4	2.9	3	< 0.06	< 2	22	< 2.5	< 1	< 2.5	13	15
B6	4	12/14/2002	< 2.5	6.4	6.4	< 0.5	< 0.5	20	4.8	2.7	< 3	< 0.06	< 2	52	< 2.5	< 1	< 2.5	13	15
B6	8	12/14/2002	< 2.5	5.2	7.1	< 0.5	< 0.5	23	5.1	3.4	< 3	< 0.06	< 2	24	< 2.5	< 1	< 2.5	17	18
B11	4	12/15/2002	< 2.5	3.3	54	< 0.5	< 0.5	15	5.1	14	6	< 0.06	< 2	23	< 2.5	< 1	< 2.5	18	41

TABLE 1b. HISTORICAL SOIL ANALYTICAL RESULTS
METALS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Concentrations (mg/kg)

Location ID	Depth (feet)	Sample Date [1]	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
95% UCL of Soil Background Levels*			**5.5**	**19.1**	**323.6**	**1**	**2.7**	**99.6**	**22.2**	**69.4**	**16.1**	**0.4**	**7.4**	**119.6**	**5.6**	**1.8**	**27.1**	**74.3**	**106.1**
B11	8	12/15/2002	< 2.5	5.6	6.6	< 0.5	< 0.5	23	4.2	3.6	< 3	< 0.06	< 2	24	< 2.5	< 1	< 2.5	15	17
B12	4	12/21/2002	< 2.5	< 2.5	140	< 0.5	< 0.5	16	6.3	12	15	0.16	< 2	19	< 2.5	< 1	< 2.5	21	40
B15	4	12/21/2002	< 2.5	< 2.5	480	< 0.5	< 0.5	20	15	54	11	< 0.06	< 2	26	< 2.5	< 1	< 2.5	35	41
B15	8	12/21/2002	< 2.5	< 2.5	32	< 0.5	< 0.5	11	< 2	< 2	< 3	< 0.06	< 2	7.2	< 2.5	< 1	< 2.5	5.9	5
B16	4	12/15/2002	< 2.5	4.1	46	< 0.5	< 0.5	24	5.1	15	30	0.073	< 2	25	< 2.5	< 1	< 2.5	19	63
B16	6	12/15/2002	< 2.5	6.8	59	< 0.5	< 0.5	20	5.8	17	30	< 0.06	< 2	25	< 2.5	< 1	< 2.5	17	42
B16	8	12/15/2002	< 2.5	3.3	29	< 0.5	< 0.5	8.5	2.4	190	190	0.13	< 2	7.5	< 2.5	< 1	< 2.5	6.5	120
B17	4	12/21/2002	< 2.5	9.7	100	< 0.5	< 0.5	58	12	32	8.8	0.19	< 2	26	< 2.5	< 1	< 2.5	57	120
B17	8	12/21/2002	< 2.5	< 2.5	23	< 0.5	< 0.5	15	3.6	12	40	< 0.06	< 2	11	< 2.5	< 1	< 2.5	9.2	31
B18	4	12/15/2002	< 2.5	3.7	90	< 0.5	< 0.5	23	5.4	21	50	0.097	< 2	38	< 2.5	< 1	< 2.5	20	49
B18	8	12/15/2002	16	7.6	53	< 0.5	< 0.5	48	6.4	130	9.4	< 0.06	< 2	81	< 2.5	< 1	< 2.5	21	29
B60	2	5/18/2004	--	--	--	--	--	--	--	8.6	9.2	--	--	--	--	--	--	--	28
B60	4	5/18/2004	--	--	--	--	--	--	--	3.3	3.4	--	--	--	--	--	--	--	18
B79	2	5/24/2004	--	--	--	--	--	--	--	11	9.6	--	--	--	--	--	--	--	34
B79	4	5/24/2004	--	--	--	--	--	--	--	3.7	4	--	--	--	--	--	--	--	19
B80	2	5/24/2004	--	--	--	--	--	--	--	3.8	3.1	--	--	--	--	--	--	--	18
B80	4	5/24/2004	--	--	--	--	--	--	--	4.1	3.1	--	--	--	--	--	--	--	16
B81	2	5/24/2004	< 3	8.9	150	0.23	0.8	57	11	72	130	0.47	2.9	53	1.9	< 0.25	< 0.25	35	140
B82	2	5/24/2004	< 2.5	0.95	48	0.17	0.35	66	12	46	2.1	0.075	1.3	36	0.64	< 0.2	< 0.2	67	35
B83	2	5/25/2004	< 2.4	4.6	15	0.1	< 0.2	24	4.8	6.9	14	0.031	0.84	27	0.94	< 0.2	< 0.2	18	23
B84	2	5/25/2004	< 2.8	8	120	0.29	0.32	24	7	23	29	0.19	< 0.93	36	1.4	< 0.23	< 0.23	35	63
B86	2	5/25/2004	< 3.2	3	84	0.12	< 0.27	21	8.8	41	2.6	0.11	< 1.1	32	1.6	< 0.27	< 0.27	45	34
B87	2	5/25/2004	< 2.6	1.9	760	0.29	< 0.21	18	1.7	45	4.4	0.039	< 0.85	8.6	1.8	< 0.21	< 0.21	53	10

Notes
mg/kg - miligrams per kilogram
"--" - Not Analyzed
ND - Not Detected at or above laboratory reporting limits
UCL - Upper Confidence Limit
* 95% Upper Confidence Limit of Soil Background Levels from 1995 Lawrence Berkeley Laboratory Protocol for Determining Background Concentrations of Metals in Soil at Lawrence Berkeley National Laboratory dated August 19
Detected soil concentration exceeds the 95% UCL of soil background level
[1]Sampling dates and related data references: 1/1993 - USPCI, 1993; 7/1993 - CDM, 1999; 4/1998 - CDM, 1998; 3/1999 - Blymer, 1999; 12/2002 - GAIA, 2003; 5/2004 - T&R, 2004

TABLE 1c. HISTORICAL SOIL ANALYTICAL RESULTS
POLYNUCLEAR AROMATIC HYDROCARBONS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Concentrations (µg/kg)

Location ID	Depth (feet)	Sample Date [1]	1-Methyl-naphthalene	2-Methyl-naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) Anthracene	Benzo(a)Pyrene	Benzo(b) Fluoranthene	Benzo(g,h,i) Perylene	Benzo(k) Fluoranthene	Chrysene	Dibenzo(a,h) Anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-cd) Pyrene	Naphthalene	Phenanthrene	Pyrene
Soil leaching to groundwater ESL (Non-Potable Groundwater Resource)*			**250**	**250**	**19,000**	**13,000**	**2,800**	**12,000**	**130,000**	**46,000**	**27,000**	**37,000**	**23,000**	**140,000**	**60,000**	**8,900**	**7,700**	**4,800**	**11,000**	**85,000**
DIESEL SPILL / RAILYARD AREA																				
B8	4	12/14/2002	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
B8	8	12/14/2002	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25
B9	4	12/21/2002	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500
B9	8	12/21/2002	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	510	< 500	< 500	< 500	600	< 500	< 500	< 500	< 500	1,200
B13	4	12/21/2002	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250
B13	8	12/21/2002	< 10	< 10	25	73	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
B14	4	12/15/2002	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B14	8	12/15/2002	< 50	< 50	< 50	< 50	< 50	< 50	53	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50
B19	4	12/21/2002	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250
B19	8	12/21/2002	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	27
B22	4	12/21/2002	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250
B22	8	12/21/2002	< 5	< 5	< 5	< 5	< 5	< 5	7	5.8	10	< 5	< 5	< 5	< 5	< 5	5.5	< 5	< 5	6.7
B67	2	5/19/2004	--	--	< 130	< 260	31	51	110	130	650	52	390	360	60	< 26	240	< 130	< 13	93
B67	4	5/19/2004	--	--	< 34	< 67	< 3.4	< 3.4	5.4	< 6.7	< 6.7	< 3.4	4.9	< 6.7	< 6.7	< 6.7	6	< 34	6.5	6.1
B68	2	5/20/2004	--	--	< 33	< 66	5.3	15	17	21	25	8.4	22	62	37	< 6.6	12	< 33	27	37
B68	4	5/20/2004	--	--	< 33	< 67	< 3.3	< 3.3	11	82	61	< 3.3	< 3.3	< 6.7	16	< 6.7	19	< 33	26	6.9
B69	2	5/20/2004	--	--	< 33	< 67	< 3.3	28	27	56	40	13	32	230	70	< 6.7	18	< 33	160	49
B69	4	5/20/2004	--	--	< 33	< 67	16	120	94	110	68	46	140	75	180	< 6.7	36	54	130	190
B70	2	5/20/2004	--	--	< 33	< 66	< 3.3	19	31	69	18	30	40	< 6.6	44	< 6.6	25	< 33	8.1	55
B70	4	5/20/2004	--	--	< 170	< 330	< 17	36	26	87	< 33	30	120	< 33	130	< 33	< 17	< 170	670	36
B71	2	5/20/2004	--	--	< 170	< 330	< 17	< 17	26	95	< 33	18	< 17	< 33	37	< 33	< 17	< 170	< 17	< 17
B71	4	5/20/2004	--	--	< 33	< 67	< 3.3	31	93	90	110	27	41	120	110	< 6.7	100	< 33	13	140
B72	2	5/20/2004	--	--	< 330	< 660	< 33	110	88	150	430	110	150	< 66	810	< 66	< 33	< 330	1,900	74
B73	2	5/21/2004	--	--	< 33	< 67	< 3.3	< 3.3	< 3.3	< 6.7	< 6.7	< 3.3	< 3.3	< 6.7	< 6.7	< 6.7	< 3.3	< 33	< 3.3	< 3.3
B74	2	5/21/2004	--	--	< 33	< 66	< 3.3	8.6	26	26	22	11	8	22	< 6.6	< 6.6	< 3.3	< 33	15	16
B75	2	5/21/2004	--	--	< 33	< 66	< 3.3	< 3.3	20	52	65	< 3.3	23	< 6.6	94	< 6.6	19	< 33	140	15
B88	2	5/25/2004	--	--	< 33	< 66	< 3.3	< 3.3	< 3.3	< 6.6	< 6.6	< 3.3	4.6	< 6.6	< 6.6	< 6.6	< 3.3	< 33	8.5	< 3.3
MUNICIPAL DEBRIS FILL AREA																				
B1	4	12/14/2002	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500
B1	8	12/14/2002	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	56
B2	4	12/14/2002	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500
B2	8	12/14/2002	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	1,100	< 500	< 500	< 500	1,700
B28	4	12/21/2002	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
B28	8	12/21/2002	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	1,300
B55	2	5/18/2004	--	--	< 130	< 270	160	1,200	2,600	2,400	1,700	840	1,300	2,900	3,800	< 27	2,400	150	1,700	4,700
B56	2	5/18/2004	--	--	< 160	< 330	< 16	530	660	830	540	310	470	770	790	< 33	410	< 160	420	890
B56	4	5/18/2004	--	--	< 66	< 130	39	180	340	370	260	150	200	270	290	< 13	210	< 66	230	340
B59	2	5/18/2004	--	--	< 140	< 270	130	750	1,800	1,700	1,200	590	920	1,800	2,500	< 27	1,900	170	1,300	3,400
B59	4	5/18/2004	--	--	< 130	< 270	88	140	74	120	160	45	140	74	860	110	42	170	1,300	550
BORING B20 AREA																				
B20	4	12/15/2002	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	2,100	1,300	2,400	< 1,200	< 1,300	< 1,200	3,400	< 1,200	1,900	< 1,200	1,600	4,900
B20	8	12/15/2002	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120
B23	4	12/15/2002	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
B23	8	12/15/2002	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B25	4	12/15/2002	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000
B25	8	12/15/2002	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 130	< 120	< 120	< 120	< 120	< 120	< 120	140

TABLE 1c. HISTORICAL SOIL ANALYTICAL RESULTS
POLYNUCLEAR AROMATIC HYDROCARBONS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Concentrations (µg/kg)

Location ID	Depth (feet)	Sample Date [1]	1-Methyl-naphthalene	2-Methyl-naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) Anthracene	Benzo(a)Pyrene	Benzo(b) Fluoranthene	Benzo(g,h,i) Perylene	Benzo(k) Fluoranthene	Chrysene	Dibenzo(a,h) Anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-cd) Pyrene	Naphthalene	Phenanthrene	Pyrene
Soil leaching to groundwater ESL (Non-Potable Groundwater Resource)*			**250**	**250**	**19,000**	**13,000**	**2,800**	**12,000**	**130,000**	**46,000**	**27,000**	**37,000**	**23,000**	**140,000**	**60,000**	**8,900**	**7,700**	**4,800**	**11,000**	**85,000**
B40	2	5/13/2004	--	--	< 33	< 66	< 3.3	< 3.3	< 3.3	9.6	< 6.6	< 3.3	8.9	25	< 6.6	< 6.6	< 3.3	< 33	8.7	< 3.3
B40	4	5/13/2004	--	--	< 670	< 1,300	90	450	390	540	410	240	520	2,600	770	< 130	280	< 670	250	980
B40	6	5/13/2004	--	--	< 660	< 1,300	270	1,100	420	680	350	340	1,300	2,400	1,400	520	220	< 660	2,200	1,600
B41	2	5/13/2004	--	--	< 34	< 67	< 3.4	5	4.2	13	< 6.7	< 3.4	12	< 6.7	8.3	< 6.7	< 3.4	< 34	16	< 3.4
B41	6	5/13/2004	--	--	< 33	< 67	4.4	30	56	75	68	28	42	1,100	64	< 6.7	91	< 33	26	82
B42	2	5/13/2004	--	--	< 33	< 67	< 3.3	< 3.3	< 3.3	< 6.7	12	< 3.3	< 3.3	< 6.7	< 6.7	< 6.7	< 3.3	< 33	< 3.3	< 3.3
B42	5	5/13/2004	--	--	< 160	< 330	< 16	240	150	270	180	110	480	820	130	< 33	81	< 160	280	120
B42	6	5/13/2004	--	--	< 33	< 67	< 3.3	< 3.3	< 3.3	< 6.7	< 6.7	< 3.3	< 3.3	< 6.7	< 6.7	< 6.7	< 3.3	< 33	< 3.3	< 3.3
B43	2	5/13/2004	--	--	< 33	< 66	< 3.3	< 3.3	3.5	8.9	11	< 3.3	< 3.3	55	< 6.6	< 6.6	< 3.3	< 33	< 3.3	< 3.3
B43	3.5	5/13/2004	--	--	< 33	< 66	< 3.3	< 3.3	< 3.3	< 6.6	< 6.6	< 3.3	< 3.3	< 6.6	< 6.6	< 6.6	< 3.3	< 33	< 3.3	< 3.3
B43	6	5/13/2004	--	--	< 33	< 66	< 3.3	< 3.3	< 3.3	< 6.6	< 6.6	< 3.3	< 3.3	< 6.6	< 6.6	< 6.6	< 3.3	< 33	< 3.3	< 3.3
B44	2	5/13/2004	--	--	< 33	< 66	< 3.3	< 3.3	< 3.3	6.9	< 6.6	< 3.3	8.1	< 6.6	< 6.6	< 6.6	< 3.3	< 33	< 3.3	< 3.3
B44	4	5/13/2004	--	--	< 33	< 66	< 3.3	36	36	84	270	25	71	550	86	< 6.6	< 3.3	< 33	140	60
B44	6	5/13/2004	--	--	< 33	< 67	4	< 3.3	< 3.3	< 6.7	< 6.7	< 3.3	< 3.3	< 6.7	< 6.7	< 6.7	< 3.3	< 33	7.6	< 3.3
TANKS EF6-9 AREA																				
B21	4	12/21/2002	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500
B21	8	12/21/2002	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250
B24	2	12/15/2002	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500
B24	4	12/15/2002	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500
B24	6	12/15/2002	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B24	8	12/15/2002	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	180
B76	2	5/24/2004	--	--	3,200	< 67	< 3.3	< 3.3	13	28	21	9.6	< 3.3	89	140	< 6.7	11	< 33	530	65
B77	2	5/24/2004	--	--	< 170	< 330	< 17	180	420	460	410	140	230	380	430	< 33	590	< 170	85	530
TANKS EF11-13 AREA																				
B7	4	12/14/2002	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B7	8	12/14/2002	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 130	< 120	< 120	< 120	< 120	< 120	< 120	< 120
TANK EF14 AREA																				
B5	4	12/15/2002	< 5	< 5	< 5	< 5	< 5	< 5	5.5	< 5	< 5	< 5	< 5	< 5	12	< 5	< 5	< 5	7.1	9.5
B5	8	12/15/2002	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	180	< 120	< 120	< 120	230	220
GENERAL AREA																				
B3	4	12/14/2002	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500
B3	8	12/14/2002	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	110
B4	4	12/14/2002	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B4	8	12/14/2002	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B6	4	12/14/2002	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B6	8	12/14/2002	< 5	< 5	< 5	< 5	6.3	< 5	6.3	< 5	< 5	< 5	6.1	< 5	14	< 5	< 5	< 5	11	11
B11	4	12/15/2002	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500	< 2,500
B11	8	12/15/2002	< 500	< 500	< 500	< 500	< 500	< 500	540	< 500	< 500	< 500	500	< 500	1,300	< 500	< 500	< 500	< 500	1,100
B12	4	12/21/2002	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25
B15	4	12/21/2002	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B15	8	12/21/2002	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B16	4	12/15/2002	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	420	< 120	< 120	< 120	160	250
B16	6	12/15/2002	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200	< 1,200
B16	8	12/15/2002	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	350	< 250	< 250	< 250	< 250	280
B17	4	12/21/2002	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25

TABLE 1c. HISTORICAL SOIL ANALYTICAL RESULTS
POLYNUCLEAR AROMATIC HYDROCARBONS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Concentrations (µg/kg)

Location ID	Depth (feet)	Sample Date [1]	1-Methyl-naphthalene	2-Methyl-naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) Anthracene	Benzo(a)Pyrene	Benzo(b) Fluoranthene	Benzo(g,h,i) Perylene	Benzo(k) Fluoranthene	Chrysene	Dibenzo(a,h) Anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-cd) Pyrene	Naphthalene	Phenanthrene	Pyrene
Soil leaching to groundwater ESL (Non-Potable Groundwater Resource)*			**250**	**250**	**19,000**	**13,000**	**2,800**	**12,000**	**130,000**	**46,000**	**27,000**	**37,000**	**23,000**	**140,000**	**60,000**	**8,900**	**7,700**	**4,800**	**11,000**	**85,000**
B17	8	12/21/2002	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	7.6	< 5	< 5	< 5	< 5	< 5	< 5	17	5.5	6.7
B18	4	12/15/2002	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120
B18	8	12/15/2002	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 120	< 130	< 120	< 120	< 120	< 120	< 120	< 120	< 120
B60	2	5/18/2004	--	--	< 33	< 66	< 3.3	< 3.3	< 3.3	< 6.6	< 6.6	< 3.3	4.5	< 6.6	< 6.6	< 6.6	< 3.3	< 33	10	< 3.3
B60	4	5/18/2004	--	--	< 34	< 67	5.3	20	28	26	56	10	22	19	33	< 6.7	21	< 34	22	48
B79	2	5/24/2004	--	--	< 33	< 67	< 3.3	< 3.3	< 3.3	< 6.7	< 6.7	< 3.3	3.8	< 6.7	< 6.7	< 6.7	< 3.3	< 33	9.9	3.5
B79	4	5/24/2004	--	--	< 33	< 66	20	70	76	66	51	27	73	68	150	< 6.6	48	< 33	170	190
B80	2	5/24/2004	--	--	< 33	< 67	24	90	73	73	39	30	110	59	150	25	40	< 33	200	200
B80	4	5/24/2004	--	--	< 33	< 67	3.8	6.2	6.1	6.8	< 6.7	< 3.3	9.2	11	7.3	< 6.7	< 3.3	< 33	13	9.6
B81	2	5/24/2004	--	--	< 33	< 66	< 3.3	32	140	220	33	81	66	80	64	7.2	34	< 33	27	84
B82	2	5/24/2004	--	--	< 170	< 330	< 17	< 17	69	210	230	53	120	1,700	430	< 33	< 17	810	1,700	190
B83	2	5/25/2004	--	--	< 34	< 67	< 3.4	7.4	8.8	11	12	5.5	9.6	< 6.7	12	< 6.7	16	< 34	7.2	14
B84	2	5/25/2004	--	--	< 99	< 200	230	< 9.9	280	1,300	140	< 9.9	400	330	240	280	95	< 99	210	390
B86	2	5/25/2004	--	--	< 130	< 270	< 13	41	31	60	< 27	< 13	100	< 27	83	< 27	< 13	< 130	46	120
B87	2	5/25/2004	--	--	< 34	< 67	< 3.4	< 3.4	< 3.4	< 6.7	< 6.7	< 3.4	< 3.4	< 6.7	< 6.7	< 6.7	< 3.4	< 34	< 3.4	< 3.4

Notes
µg/kg - micrograms per kilogram.
"--" - Not Analyzed.
ND - Not Detected at or above laboratory reporting limits.
Note that Samples B40 -44, B55, B56, B59, B60, B67-77, B79-84, B86-88, IB-43, IB-45-49 were prepared using silica gel permeation cleanup.
* = ESL corresponding to soil leaching to groundwater pathway for non-potable groundwater resource (Table G of RWQCB, 2005)
Detected concentration exceeds the soil leaching to groundwater ESL (non-potable groundwater resource)

Half of the detection limit exceeds the soil leaching to groundwater ESL (non-potable groundwater resource)

[1]Sampling dates and related data references:
4/1998 - CDM, 1998
12/2002 - GAIA, 2003
5/2004 - T&R, 2004

TABLE 1d. HISTORICAL SOIL ANALYTICAL RESULTS
SEMI-VOLATILE ORGANIC COMPOUNDS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Concentrations (µg/kg)

Location ID	Depth (feet)	Sample Date [1]	2-Methyl-naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) Anthracene	Benzo(a)Pyrene	Benzo(b) Fluoranthene	Benzo(g,h,i) Perylene	Benzo(k) Fluoranthene	Bis(2-Ethyl-hexyl)Phthalate	Chrysene	Fluoranthene	Fluorene	Indeno(1,2,3-cd) Pyrene	Naphthalene	Phenanthrene	Pyrene
Soil leaching to groundwater ESL (Non-Potable Groundwater Resource)*			**250**	**19,000**	**13,000**	**2,800**	**12,000**	**130,000**	**46,000**	**27,000**	**37,000**	**530,000**	**23,000**	**60,000**	**8,900**	**7,700**	**4,800**	**11,000**	**85,000**
TANKS EF6-9 AREA																			
B31	4	5/11/2004	< 66	< 66	< 66	< 66	< 66	110	110	91	84	< 330	120	120	< 66	86	< 66	67	170
B31	6	5/11/2004	1,000	740	< 670	860	< 670	< 670	< 670	< 670	690	< 3,300	1,300	680	710	< 670	1,600	1,100	1,000
B32	2	5/11/2004	< 66	< 66	< 66	< 66	< 66	< 66	< 66	< 66	< 66	< 330	< 66	< 66	< 66	< 66	< 66	< 66	< 66
B32	4	5/11/2004	110	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 340	< 67	< 67	< 67	< 67	160	< 67	< 67
B32	6	5/11/2004	150	< 66	< 66	< 66	< 66	< 66	< 66	< 66	< 66	< 330	< 66	78	< 66	< 66	88	< 66	< 66
B33	4	5/11/2004	< 67	180	< 67	210	540	1,000	1,200	680	580	< 340	980	1,800	150	760	< 67	270	2,700
B33	6	5/11/2004	< 67	< 67	< 67	< 67	< 67	24	< 67	< 67	< 67	< 330	110	< 67	< 67	< 67	< 67	< 67	84
B34	4	5/11/2004	< 66	< 66	< 66	< 66	< 66	< 66	< 66	< 66	< 66	< 330	< 66	< 66	< 66	< 66	< 66	< 66	< 66
B34	6	5/11/2004	95	79	120	100	130	100	170	< 67	100	< 330	170	250	73	< 67	< 67	180	250
B35	4	5/12/2004	< 67	< 67	< 67	< 67	< 67	46	140	< 67	< 67	< 340	68	76	< 67	< 67	< 67	< 67	< 67
B35	6	5/12/2004	< 68	< 68	< 68	< 68	< 68	< 68	98	< 68	< 68	< 340	< 68	< 68	< 68	< 68	< 68	< 68	< 68
B36	4	5/12/2004	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 340	< 67	< 67	< 67	< 67	< 67	< 67	< 67
B36	6	5/12/2004	< 67	< 67	< 67	< 67	< 67	< 67	99	< 67	< 67	< 340	< 67	< 67	< 67	< 67	< 67	< 67	< 67
B37	4	5/12/2004	< 66	< 66	< 66	< 66	< 66	51	120	< 66	< 66	< 330	< 66	68	< 66	< 66	< 66	< 66	160
B37	6	5/12/2004	< 67	< 67	< 67	74	84	190	270	140	77	< 340	140	220	< 67	120	< 67	< 67	330
B38	4	5/12/2004	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 330	< 67	< 67	< 67	< 67	< 67	< 67	< 67
B38	6	5/12/2004	220	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 330	< 67	< 67	67	< 67	170	< 67	< 67
B39	4	5/13/2004	< 66	96	< 66	100	250	500	540	590	350	< 330	440	740	95	440	< 66	180	1,000
B39	6	5/13/2004	< 170	< 170	< 170	370	2,100	3,200	4,500	3,200	3,000	< 830	3,800	5,200	< 170	3,000	< 170	350	9,200
B50	4	5/17/2004	97	< 66	< 66	< 66	< 66	< 66	< 66	< 66	< 66	< 330	100	< 66	< 66	< 66	< 66	< 66	69
B50	6	5/17/2004	< 67	< 67	< 67	< 67	< 67	28	< 67	< 67	< 67	< 340	100	< 67	< 67	< 67	< 67	< 67	150
B51	4	5/17/2004	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 330	< 67	< 67	< 67	< 67	< 67	< 67	< 67
B51	6	5/17/2004	< 66	< 66	< 66	< 66	< 66	< 66	< 66	< 66	< 66	< 330	< 66	< 66	< 66	< 66	< 66	< 66	< 66
B52	4	5/17/2004	< 67	< 67	< 67	79	140	340	410	220	230	< 340	230	360	< 67	240	< 67	< 67	580
B52	7	5/17/2004	< 67	< 67	< 67	84	160	450	520	290	260	< 330	280	440	< 67	330	< 67	81	740
TANKS EF11-13 AREA																			
B-1	3.5	3/12/1999	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330
B-2	3.5	3/12/1999	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330
B-2	7	3/12/1999	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330	< 330
B45	4	5/14/2004	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 340	< 67	< 67	< 67	< 67	< 67	< 67	< 67
B45	6	5/14/2004	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 330	81	< 67	< 67	< 67	< 67	77	< 67
B46	4	5/14/2004	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 330	< 67	< 67	< 67	< 67	< 67	< 67	< 67
B46	6	5/14/2004	< 66	< 66	< 66	< 66	< 66	13	< 66	< 66	< 66	< 330	< 66	< 66	< 66	< 66	< 66	< 66	73
B47	2	5/14/2004	< 66	< 66	< 66	< 66	< 66	15	100	< 66	< 66	< 330	< 66	< 66	< 66	< 66	< 66	< 66	< 66
B47	4	5/14/2004	< 67	< 67	< 67	< 67	< 67	< 67	120	< 67	< 67	< 340	69	< 67	< 67	< 67	< 67	< 67	80
B47	6	5/14/2004	< 67	73	< 67	< 67	< 67	< 67	< 67	< 67	< 67	590	98	< 67	< 67	< 67	< 67	< 67	< 67

TABLE 1d. HISTORICAL SOIL ANALYTICAL RESULTS
SEMI-VOLATILE ORGANIC COMPOUNDS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Concentrations (µg/kg)

Location ID	Depth (feet)	Sample Date [1]	2-Methyl-naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) Anthracene	Benzo(a)Pyrene	Benzo(b) Fluoranthene	Benzo(g,h,i) Perylene	Benzo(k) Fluoranthene	Bis(2-Ethyl-hexyl)Phthalate	Chrysene	Fluoranthene	Fluorene	Indeno(1,2,3-cd) Pyrene	Naphthalene	Phenanthrene	Pyrene
Soil leaching to groundwater ESL (Non-Potable Groundwater Resource)*			**250**	**19,000**	**13,000**	**2,800**	**12,000**	**130,000**	**46,000**	**27,000**	**37,000**	**530,000**	**23,000**	**60,000**	**8,900**	**7,700**	**4,800**	**11,000**	**85,000**
B48	4	5/14/2004	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 330	< 67	< 67	< 67	< 67	< 67	< 67	< 67
B49	4	5/14/2004	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 67	< 340	< 67	< 67	< 67	< 67	< 67	< 67	< 67
B49	6	5/14/2004	< 67	< 67	< 67	< 67	< 67	< 67	110	< 67	< 67	< 340	97	< 67	< 67	< 67	< 67	< 67	< 67
GENERAL AREA																			
B85	4	5/25/2004	< 66	< 66	< 66	< 66	< 66	18	100	< 66	< 66	< 330	< 66	< 66	< 66	< 66	< 66	< 66	< 66
B85	6	5/25/2004	< 66	< 66	< 66	< 66	< 66	46	< 66	< 66	< 66	< 330	< 66	< 66	< 66	< 66	< 66	< 66	230

Notes
µg/kg - micrograms per kilogram
"--" - Not Analyzed
Note the samples B31-39, B45-52, B85 and IB-46 were prepared using silica gel permeation cleanup method.
* = ESL corresponding to soil leaching to groundwater pathway for non-potable groundwater resource (Table G of RWQCB, 2005)
Detected concentration exceeds the soil leaching to groundwater ESL (non-potable groundwater resource)

[1]Sampling dates and related data references:
1/1993 - USPCI, 1993
4/1998 - CDM, 1998
3/1999 - Blymer, 1999
5/2004 - T&R, 2004

TABLE 1e. HISTORICAL SOIL ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Concentrations (µg/kg)

Location ID	Depth (feet)	Sample Date [1]	1,1,1-Trichloroethane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Acetone	Benzene	Chlorobenzene	Chloroform	cis-1,2-Dichloroethene	cis-1,3-Dichloropropene	Ethylbenzene	Isopropyl-benzene	Methyl Ethyl Ketone	Methylene Chloride	Naphthalene	n-Butylbenzene	PCE	Propylbenzene	Tert-Butyl-benzene	Toluene	TCE	Xylenes (total)
Soil leaching to groundwater ESL (Non-Potable Groundwater Resource)*			**7,800**	**-**	**-**	**500**	**2,000**	**1,500**	**9,800**	**18,000**		**32,000**	**-**	**13,000**	**34,000**	**4,800**	**-**	**17,000**	**-**	**-**	**9,300**	**33,000**	**11,000**
DIESEL SPILL / RAILYARD AREA																							
B8	4	12/14/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B8	8	12/14/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B9	4	12/21/2002	< 5	--	--	--	5.7	< 5	< 5	< 5	--	20	--	--	< 5	--	--	< 5	--	--	120	< 5	130
B9	8	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B13	4	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B13	8	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B14	4	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B14	8	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B19	4	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B19	8	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B22	4	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B22	8	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
MUNICIPAL DEBRIS FILL AREA																							
B1	4	12/14/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	18	< 5	6.3
B1	8	12/14/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B2	4	12/14/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	9.6	--	--	< 5	--	--	< 5	--	--	550	< 5	50
B2	8	12/14/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B28	4	12/21/2002	< 5	--	--	--	11	< 5	< 5	< 5	--	6.5	--	--	< 5	--	--	< 5	--	--	22	< 5	42
B29	8	12/21/2002	< 20	--	--	--	130	< 20	< 20	< 20	--	70	--	--	< 20	--	--	< 20	--	--	120	< 20	700
B30	4	12/21/2002	< 5	--	--	--	120	< 5	< 5	< 5	--	47	--	--	< 5	--	--	< 5	--	--	76	< 5	88
B30	12	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B53	2	5/17/2004	< 4.6	< 4.6	< 4.6	< 19	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 9.3	< 19	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6
B53	4	5/17/2004	< 5	< 5	< 5	39	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B54	4	5/17/2004	< 5	8.8	< 5	44	21	< 5	< 5	< 5	< 5	64	< 5	11	< 20	< 5	< 5	< 5	< 5	< 5	37	< 5	142
B56	2	5/18/2004	< 4.8	< 4.8	< 4.8	28	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.6	140	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
B56	4	5/18/2004	< 5	< 5	< 5	28	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	120	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B57	2	5/18/2004	< 4.8	< 4.8	< 4.8	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.6	310	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
B57	4	5/18/2004	< 4.9	< 4.9	< 4.9	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.8	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
B58	2	5/18/2004	< 4.5	< 4.5	< 4.5	< 18	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 9.1	220	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5
B58	4	5/18/2004	< 4.8	< 4.8	< 4.8	60	5	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	14	520	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
B59	2	5/18/2004	< 4.9	< 4.9	< 4.9	29	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.8	180	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
B59	4	5/18/2004	< 4.7	< 4.7	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	25	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
OKUS-B13	6	1/14/1993	--	--	--	--	11	--	--	--	--	< 0.5	--	--	--	--	--	--	--	--	< 0.5	--	< 0.5
BORING B20 AREA																							
B20	4	12/15/2002	< 5	--	--	--	180	< 5	< 5	< 5	--	53	--	--	< 5	--	--	< 5	--	--	55	< 5	77
B20	8	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B23	4	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B23	8	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B25	4	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	19	< 5	< 5
B25	8	12/15/2002	< 5	--	--	--	10	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	13	< 5	6.4
TANKS EF6-9 AREA																							
B21	4	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	32	< 5	12
B21	8	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B24	2	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B24	4	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B24	6	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B24	8	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B31	4	5/11/2004	< 4.7	< 4.7	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
B31	6	5/11/2004	8.7	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	67	< 5	< 5	110	< 5	< 5	< 5	13	< 5
B32	4	5/11/2004	< 500	44,000	13,000	< 2,000	< 500	< 500	< 500	< 500	< 500	10,000	1,800	< 1,000	< 2,000	8,900	4,900	< 500	6,700	< 500	< 500	< 500	27,800
B32	6	5/11/2004	< 25	610	150	< 100	< 25	< 25	< 25	< 25	< 25	70	< 25	< 50	< 100	260	79	< 25	63	< 25	< 25	< 25	186
B33	4	5/11/2004	< 4.7	< 4.7	< 4.7	39	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	35	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
B33	6	5/11/2004	< 4.8	< 4.8	< 4.8	44	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.6	34	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8

TABLE 1e. HISTORICAL SOIL ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Concentrations (µg/kg)

Location ID	Depth (feet)	Sample Date [1]	1,1,1-Trichloroethane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Acetone	Benzene	Chlorobenzene	Chloroform	cis-1,2-Dichloroethene	cis-1,3-Dichloropropene	Ethylbenzene	Isopropyl-benzene	Methyl Ethyl Ketone	Methylene Chloride	Naphthalene	n-Butylbenzene	PCE	Propylbenzene	Tert-Butyl-benzene	Toluene	TCE	Xylenes (total)
Soil leaching to groundwater ESL (Non-Potable Groundwater Resource)*			**7,800**	**-**	**-**	**500**	**2,000**	**1,500**	**9,800**	**18,000**		**32,000**	**-**	**13,000**	**34,000**	**4,800**	**-**	**17,000**	**-**	**-**	**9,300**	**33,000**	**11,000**
B34	4	5/11/2004	< 4.9	< 4.9	< 4.9	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.8	59	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
B34	6	5/11/2004	< 4.8	< 4.8	< 4.8	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.6	20	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
B35	4	5/12/2004	< 4.9	< 4.9	< 4.9	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.8	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
B35	6	5/12/2004	< 4.7	< 4.7	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
B36	4	5/12/2004	< 4.6	< 4.6	< 4.6	< 19	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 9.3	< 19	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6
B36	6	5/12/2004	< 4.7	< 4.7	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
B37	4	5/12/2004	< 5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B37	6	5/12/2004	< 4.9	< 4.9	< 4.9	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.8	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
B38	4	5/12/2004	< 23	< 23	< 23	< 91	< 23	44	< 23	< 23	< 23	< 23	350	< 45	< 91	< 23	1,300	< 23	930	240	< 23	< 23	< 23
B38	6	5/12/2004	< 4.6	< 4.6	< 4.6	21	5.2	< 4.6	< 4.6	< 4.6	< 4.6	11	< 4.6	< 9.3	< 19	< 4.6	< 4.6	< 4.6	13	< 4.6	< 4.6	< 4.6	< 4.6
B39	4	5/13/2004	< 4.7	< 4.7	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
B39	6	5/13/2004	< 4.9	< 4.9	< 4.9	23	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.8	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
B50	4	5/17/2004	< 4.8	< 4.8	< 4.8	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.6	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
B50	6	5/17/2004	< 4.5	< 4.5	< 4.5	< 18	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 9.1	< 18	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5
B51	4	5/17/2004	< 4.6	< 4.6	< 4.6	21	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 9.3	< 19	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6
B51	6	5/17/2004	< 4.6	< 4.6	< 4.6	< 19	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 9.3	< 19	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6
B52	4	5/17/2004	< 4.7	< 4.7	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
B52	7	5/17/2004	< 4.7	< 4.7	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
TANKS EF11-13 AREA																							
B-1	7	3/12/1999	< 5	--	--	--	< 5	< 5	< 5	< 5	< 6	< 5	--	--	< 5	--	--	< 5	--	--	20	< 5	< 5
B-1	3.5	3/12/1999	< 5	--	--	--	< 5	< 5	< 5	< 5	< 5	< 5	--	--	< 5	--	--	< 5	--	--	14	< 5	15
B-2	3.5	3/12/1999	< 5	--	--	--	< 5	< 5	< 5	< 5	< 5	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B-2	7	3/12/1999	< 5	--	--	--	< 5	< 5	< 5	< 5	< 5	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B7	4	12/14/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B7	8	12/14/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	11	< 5	5.1
B45	4	5/14/2004	< 4.8	< 4.8	< 4.8	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.6	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
B45	6	5/14/2004	< 4.8	< 4.8	< 4.8	28	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.6	53	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
B46	4	5/14/2004	< 4.7	< 4.7	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	36	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
B46	6	5/14/2004	< 4.9	< 4.9	< 4.9	25	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.8	33	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
B47	4	5/14/2004	< 4.7	< 4.7	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
B47	6	5/14/2004	< 4.9	< 4.9	< 4.9	22	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 9.8	< 20	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9	< 4.9
B48	4	5/14/2004	< 4.8	< 4.8	< 4.8	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.6	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
B49	4	5/14/2004	< 4.8	< 4.8	< 4.8	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.6	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
B49	6	5/14/2004	< 4.6	< 4.6	< 4.6	< 19	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 9.3	< 19	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6
TANK EF14 AREA																							
B5	4	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	14	< 5	< 5
B5	8	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
GENERAL AREA																							
B3	4	12/14/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	17	< 5	5.3
B3	8	12/14/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B4	4	12/14/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B4	8	12/14/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B6	4	12/14/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B6	8	12/14/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B11	4	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	17	< 5	6.6
B11	7.1	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	23	< 5	< 5
B11	7.3	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B11	8	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B12	4	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B12	7	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B15	4	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B15	8	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B16	4	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	17	< 5	< 5
B16	6	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	34	< 5	6.1

TABLE 1e. HISTORICAL SOIL ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Concentrations (µg/kg)

Location ID	Depth (feet)	Sample Date [1]	1,1,1-Trichloroethane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Acetone	Benzene	Chlorobenzene	Chloroform	cis-1,2-Dichloroethene	cis-1,3-Dichloropropene	Ethylbenzene	Isopropyl-benzene	Methyl Ethyl Ketone	Methylene Chloride	Naphthalene	n-Butylbenzene	PCE	Propylbenzene	Tert-Butyl-benzene	Toluene	TCE	Xylenes (total)
Soil leaching to groundwater ESL (Non-Potable Groundwater Resource)*			**7,800**	**-**	**-**	**500**	**2,000**	**1,500**	**9,800**	**18,000**		**32,000**	**-**	**13,000**	**34,000**	**4,800**	**-**	**17,000**	**-**	**-**	**9,300**	**33,000**	**11,000**
B16	8	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B17	4	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B17	8	12/21/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B18	4	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B18	8	12/15/2002	< 5	--	--	--	< 5	< 5	< 5	< 5	--	< 5	--	--	< 5	--	--	< 5	--	--	< 5	< 5	< 5
B60	2	5/18/2004	< 5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	91	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B60	4	5/18/2004	< 4.8	< 4.8	< 4.8	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.6	21	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
B61	2	5/18/2004	< 5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	110	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B61	4	5/18/2004	< 4.8	< 4.8	< 4.8	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.6	25	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
B79	2	5/24/2004	< 5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	35	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B79	4	5/24/2004	< 5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
B80	2	5/24/2004	< 4.7	< 4.7	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
B80	4	5/24/2004	< 4.8	< 4.8	< 4.8	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 9.6	< 19	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8	< 4.8
B85	4	5/25/2004	< 4.7	< 4.7	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	76	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7
B85	6	5/25/2004	< 4.7	< 4.7	< 4.7	< 19	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 9.4	57	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7	< 4.7

Notes

µg/kg - micrograms per kilogram
"--" - Not Analyzed
* = ESL corresponding to soil leaching to groundwater pathway for non-potable groundwater resource (Table G of RWQCB, 2005)
Detected concentration exceeds the soil leaching to groundwater ESL (non-potable groundwater resource)

Half of the detection limit exceeds the soil leaching to groundwater ESL (non-potable groundwater resource)

[1]Sampling dates and related data references:
1/1993 - USPCI, 1993
7/1993 - CDM, 1999
4/1998 - CDM, 1998
3/1999 - Blymer, 1999
12/2002 - GAIA, 2003
5/2004 - T&R, 2004

TABLE 2a. HISTORICAL GROUNDWATER ANALYTICAL RESULTS
TOTAL PETROLEUM HYDROCARBONS
BERTH 60-63 TERMINAL, PORT OF OAKLAND, OAKLAND, CALIFRONIA

Concentrations (µg/L)

Location ID	Sample Date [1]	TPH-Gasoline	TPH-Diesel		TPH-Motor Oil		TPH-Bunker C	TPH-Hydraulic Oil
		(No Silica Gel Cleanup)	(Silica Gel Cleanup)	(No Silica Gel Cleanup)	(Silica Gel Cleanup)	(No Silica Gel Cleanup)		
GWSL*		**500**	**640**	**640**	**640**	**640**	**640**	**640**
DIESEL SPILL / RAILYARD AREA								
B8	12/14/2002	< 50 I		1,100 GBI		2,400	--	--
B9	12/21/2002	110 bI		600 bGI		560	--	--
B13	12/21/2002	380 AI		2,100 DI		< 2,500	--	--
B14	12/15/2002	< 50 I		230 GI		2,000	--	--
B19	12/21/2002	< 50 I		280 AI		< 250	--	--
B22	12/21/2002	< 50 I		320 AD		< 250	--	--
B67	5/19/2004	< 50	100 Y		< 300		--	--
B68	5/20/2004	< 50	< 50		< 300		--	--
B69	5/20/2004	< 50	75 Y		< 300		--	--
B70	5/20/2004	< 50	< 50		< 300		--	--
B71	5/20/2004	< 50	61 Y		< 300		--	--
B72	5/20/2004	--	< 50		< 300		--	--
B73	5/21/2004	--	< 50		< 300		--	--
B74	5/21/2004	--	< 50		< 300		--	--
B75	5/21/2004	--	14,000		890 LY		--	--
B75R	5/28/2004	1,500 HY	240,000		12,000 JLY		--	--
B75R (Hydropunch)	5/28/2004	180 HY	--		--		--	--
B91	5/27/2004	< 50	380 HY		890		--	--
B92	5/27/2004	< 50	76 HY		350		--	--
"SPILL AREA" [2]	6/8/2004	--	280 LY		--		--	--
MUNICIPAL DEBRIS FILL AREA								
B1	12/14/2002	< 50 I		2,300 GBI		9,200	--	--
B2	12/14/2002	< 50 I		1,100 GI		3,000	--	--
B28	12/21/2002	< 50 I		4,300 BG		4,400	--	--
B55	5/18/2004	< 50	150 Y		< 300		310 Y	--
B56	5/18/2004	500	2,600 Y		910 LY		6,500	--
MW7	3/19/2004	310	2,500		--		--	--
MW6	12/8/2003	580	180		--		--	--
MW8	12/8/2003	<50	61		--		--	--
EW5	10/4/2003	3,000	690		--		--	--
BORING B20 AREA								
B20	12/15/2002	< 50 I		290 BGI		300	--	--
B23	12/15/2002	< 50 I		94 BGI		330	--	--
B25	12/15/2002	< 50 I		380 GI		2,100	--	--
B42	5/13/2004	--	< 50		< 300		--	< 300
TANKS EF6-9 AREA								
B21	12/21/2002	< 50 I		230 BGI		720	--	--
B24	12/15/2002	< 50 I		91 BGI		270	--	--
B31	5/11/2004	230	9,200 H		8,700 Y		--	17,000
B32	5/11/2004	12,000	66,000 HLY		95,000 Y		--	140,000
B33	5/11/2004	< 50	< 50		< 300		--	< 300
B34	5/11/2004	< 50	< 50		< 300		--	< 300
B35	5/12/2004	570	130 LY		--		--	--
B36	5/12/2004	51	< 50		--		--	--
B37	5/12/2004	< 50	< 50		--		--	--
B38	5/12/2004	1,900	260 LY		--		--	--
B39	5/13/2004	< 50	< 50		< 300		--	< 300
B50	5/17/2004	72	< 50		--		--	--
B51	5/17/2004	< 50	< 50		--		--	--
B52	5/17/2004	< 50	< 50		--		--	--
B76	5/24/2004	--	< 50		< 300		< 300	--
B77	5/24/2004	--	< 50		< 300		< 300	--

TABLE 2a. HISTORICAL GROUNDWATER ANALYTICAL RESULTS
TOTAL PETROLEUM HYDROCARBONS
BERTH 60-63 TERMINAL, PORT OF OAKLAND, OAKLAND, CALIFRONIA

Concentrations (µg/L)

Location ID	Sample Date [1]	TPH-Gasoline (No Silica Gel Cleanup)	TPH-Diesel (Silica Gel Cleanup)	TPH-Diesel (No Silica Gel Cleanup)	TPH-Motor Oil (Silica Gel Cleanup)	TPH-Motor Oil (No Silica Gel Cleanup)	TPH-Bunker C	TPH-Hydraulic Oil
GWSL*		**500**	**640**	**640**	**640**	**640**	**640**	**640**
TANKS EF11-13 AREA								
B45	5/14/2004	< 50	< 50		< 300		--	< 300
B46	5/14/2004	< 50	< 50		< 300		--	< 300
B47	5/14/2004	< 50	< 50		< 300		--	< 300
B49	5/14/2004	< 50	< 50		< 300		--	< 300
TANK EF14 AREA								
B5	12/15/2002	< 50 I		160 BGI		300	--	--
B62	5/19/2004	< 50	< 50		--		--	--
B63	5/19/2004	< 50	< 50		--		--	--
B64	5/19/2004	< 50	54 HY		--		--	--
B65	5/19/2004	< 50	< 50		--		--	--
B66	5/19/2004	< 50	< 50		--		--	--
GENERAL AREA								
B3	12/14/2002	< 50 I		440 BGI		790	--	--
B4	12/14/2002	< 50 I		< 50		< 250	--	--
B6	12/14/2002	< 50 I		500 BGI		590	--	--
B11	12/15/2002	< 50 I		150 GBI		420	--	--
B15	12/21/2002	< 50 I		1,900 A/MI		1,400	--	--
B16	12/15/2002	< 50 I		410 BGI		510	--	--
B17	12/21/2002	< 50 I		200 BI		< 250	--	--
B18	12/15/2002	< 50 I		300 GI		750	--	--
B60	5/18/2004	< 50	< 50		< 300		< 300	--
B79	5/24/2004	< 50	< 50		< 300		< 300	--
B80	5/24/2004	< 50	< 50		< 300		< 300	--
B83	5/25/2004	< 50	< 50		--		--	--
B85	5/25/2004	< 50	< 50		--		--	--
APLUP-W1	10/4/2003	420	100		--		--	--
APLUP-W1	12/8/2003	480	150		--		--	--
APLUP-W2	10/4/2003	150	56		--		--	--
APLUP-W2	12/8/2003	290	120		--		--	--

Notes
µg/L - micrograms per liter
"--" - Not Analyzed
A - Unmodified or weakly modified gasoline or diesel is significant
B - Diesel range compounds are significant
b - Heavier gasoline range compounds are significant (aged gasoline?)
G - Oil range compounds are significant
g - Strongly aged gasoline or diesel range compounds are significant
I = liquid sample that contains greater than 2 vol. % sediment
M = fuel oil
H - Heavier hydrocarbons contributed to the quantitation
L - Lighter hydrocarbons contributed to the quantitation
Y - Sample exhibits chromatographic pattern which does not resemble standard
TPH - total petroleum hydrocarbons
* Groundwater Screening Level (groundwater is NOT a current or potential drinking water resource), Table F1-b of RWQCB, 2005

Detected concentration exceeds the GWSL

Half of the detection limit exceeds the GWSL

[1]Sampling dates and related data references:

[2]"Spill Area" well is probably the same well as "DSMW-1" from USPCI, 1996.

1, 5, 8/1993 - CDM, 1999
4/1998 - CDM, 1998
12/2002 - GAIA, 2003
10, 12/2003 - ITSI, 2004
5, 6/2004 - T&R, 2004

TABLE 2b. HISTORICAL GROUNDWATER ANALYTICAL RESULTS
METALS
BERTH 60-63 TERMINAL, PORT OF OAKLAND, OAKLAND, CALIFRONIA

Concentrations (µg/L)

Location ID	Sample Date [1]	Arsenic	Barium	Chromium	Lead	Mercury	Molybdenum	Nickel	Vanadium	Zinc
GWSL*		**36**	**1,000**	**180**	**2.5**	**0.012**	**240**	**8.2**	**19**	**81**
DIESEL SPILL / RAILYARD AREA										
B8	12/14/2002	28	62	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B9	12/21/2002	< 5	260	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B13	12/21/2002	9.2	260	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B14	12/15/2002	< 5	350	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B19	12/21/2002	< 5	730	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B22	12/21/2002	< 5	1,100	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B67	5/19/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B68	5/20/2004	--	--	--	< 3	--	--	--	--	< 20
B69	5/20/2004	--	--	--	< 3	--	--	--	--	< 20
B70	5/20/2004	--	--	--	< 3	--	--	--	--	< 20
B71	5/20/2004	--	--	--	< 3	--	--	--	--	< 20
B72	5/20/2004	< 5	--	--	< 3	--	--	--	--	< 20
B73	5/21/2004	< 5	--	--	< 3	--	--	--	--	30
B74	5/21/2004	5.7	--	--	< 3	--	--	--	--	63
B75	5/21/2004	11	--	--	< 3	--	--	--	--	< 20
B91	5/27/2004	140	--	--	< 3	--	--	--	--	28
"SPILL AREA" [2]	6/8/2004	--	--	--	< 3	--	--	--	--	< 20
MUNICIPAL DEBRIS FILL AREA										
B1	12/14/2002	< 5	150	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B2	12/14/2002	9.5	170	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B28	12/21/2002	69	280	< 20	7	< 0.8	< 50	< 50	< 50	59
BORING B20 AREA										
B20	12/15/2002	< 5	270	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B23	12/15/2002	< 5	190	< 20	< 5	< 0.8	110	< 50	< 50	< 50
B25	12/15/2002	< 5	310	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B42	5/13/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
TANKS EF6-9 AREA										
B21	12/21/2002	7.7	670	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B24	12/15/2002	< 5	300	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B31	5/11/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B32	5/11/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B33	5/11/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B34	5/11/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B35	5/12/2004	--	--	< 10	< 3	--	--	< 20	--	50
B36	5/12/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B37	5/12/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B38	5/12/2004	--	--	29	10	--	--	49	--	180
B39	5/13/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B50	5/17/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B51	5/17/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B52	5/17/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B76	5/24/2004	--	--	--	< 3	--	--	--	--	< 20
B77	5/24/2004	--	--	--	< 3	--	--	--	--	< 20
TANKS EF11-13 AREA										
B7	12/14/2002	< 5	< 50	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B45	5/14/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B46	5/14/2004	--	--	< 10	4.8	--	--	50	--	65
B47	5/14/2004	--	--	< 10	< 3	--	--	< 20	--	27
B49	5/14/2004	--	--	< 10	< 3	--	--	< 20	--	< 20

TABLE 2b. HISTORICAL GROUNDWATER ANALYTICAL RESULTS
METALS
BERTH 60-63 TERMINAL, PORT OF OAKLAND, OAKLAND, CALIFRONIA

Concentrations (µg/L)

Location ID	Sample Date [1]	Arsenic	Barium	Chromium	Lead	Mercury	Molybdenum	Nickel	Vanadium	Zinc
GWSL*		**36**	**1,000**	**180**	**2.5**	**0.012**	**240**	**8.2**	**19**	**81**
TANK EF14 AREA										
B5	12/15/2002	< 5	< 50	< 20	< 5	0.87	< 50	< 50	< 50	< 50
B62	5/19/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B63	5/19/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B64	5/19/2004	--	--	< 10	< 3	--	--	< 20	--	21
B65	5/19/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B66	5/19/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
GENERAL AREA										
B3	12/14/2002	< 5	130	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B4	12/14/2002	74	< 50	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B6	12/14/2002	22	68	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B11	12/15/2002	< 5	< 50	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B15	12/21/2002	< 5	580	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B16	12/15/2002	< 5	76	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B17	12/21/2002	< 5	58	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B18	12/15/2002	16.8	1,000	< 20	< 5	< 0.8	< 50	< 50	< 50	< 50
B83	5/25/2004	--	--	< 10	< 3	--	--	< 20	--	< 20
B85	5/25/2004	--	--	< 10	< 3	--	--	< 20	--	< 20

Notes
µg/L - micrograms per liter
"--" - Not Analyzed
Samples were filtered in laboratory prior to analysis for the 5, 6/2004 sampling.
Filtration status of other samples not identified in assembling this table.
* Groundwater Screening Level (groundwater is NOT a current or potential drinking water resource), Table F1-b of RWQCB, 2005

Detected concentration exceeds the GWSL

Half of the detection limit exceeds the GWSL

[1]Sampling dates and related data references:
2, 5/1993 - CDM, 1999
4/1998 - CDM, 1998
12/2002 - GAIA, 2003
5, 6/2004 - T&R, 2004
[2]"Spill Area" well is probably the same well as "DSMW-1" from USPCI, 1996.

TABLE 2c. HISTORICAL GROUNDWATER ANALYTICAL RESULTS
POLYNUCLEAR AROMATIC HYDROCARBONS
BERTH 60-63 TERMINAL, PORT OF OAKLAND, OAKLAND, CALIFRONIA

Concentrations (µg/L)

Location ID	Sample Date [1]	Acenaphthene	Anthracene	Benzo(a) Anthracene	Benzo(a) Pyrene	Benzo(b) Fluoranthene	Benzo(b,k) Fluoranthene	Benzo(g,h,i) Perylene	Benzo(k) Fluoranthene	Chrysene	Dibenz0(a,h) Anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd) Pyrene	Naphthalene	Phenanthrene	Pyrene
GWSL*		**23**	**0.73**	**0.027**	**0.014**	**0.029**		**0.10**	**0.40**	**0.35**	**0.25**	**8.0**	**3.9**	**0.029**	**24**	**4.6**	**2.0**
DIESEL SPILL / RAILYARD AREA																	
B67	5/19/2004	9.6	1.2	1.4	3.4	3.3	--	3.6	0.85	1.1	< 0.19	6.4	1.6	4.4	1.1	4	13
B68	5/20/2004	< 0.94	< 0.09	< 0.09	< 0.09	< 0.19	--	< 0.19	< 0.09	< 0.09	< 0.19	< 0.19	< 0.19	< 0.09	< 0.94	< 0.09	4.2
B69	5/20/2004	14	0.59	0.21	0.45	0.35	--	0.55	0.12	0.2	0.42	1.5	< 0.19	0.4	1.3	3.9	4.5
B70	5/20/2004	< 0.95	< 0.1	< 0.1	< 0.1	< 0.19	--	< 0.19	< 0.1	< 0.1	< 0.19	< 0.19	< 0.19	< 0.1	< 0.95	0.18	< 0.1
B71	5/20/2004	< 0.95	1.1	0.28	0.16	< 0.19	--	0.3	< 0.1	0.24	< 0.19	3.1	0.83	0.17	2.4	2.3	2.2
B72	5/20/2004	2.2	0.17	0.17	0.16	< 0.19	--	0.24	< 0.09	0.18	< 0.19	2	< 0.19	0.16	< 0.94	0.36	3.2
B73	5/21/2004	< 0.94	< 0.09	< 0.09	0.15	0.19	--	0.33	< 0.09	0.16	0.4	< 0.19	< 0.19	0.15	< 0.94	0.24	0.16
B74	5/21/2004	< 0.97	0.2	0.57	1	1	--	1.1	0.37	0.75	< 0.19	0.93	< 0.19	1.6	< 0.97	0.68	1.4
B75	5/21/2004	< 4.8	19	< 0.48	2.2	3.1	--	3.8	1.1	< 0.48	11	63	220	< 0.48	27	370	14
B91	5/27/2004	--	0.24	--	--	--	--	3.5	--	--	4.4	--	--	--	--	1.4	--
B91	5/27/2004	< 1	--	1.6	2.4	3.6	--	--	1.1	2.6	--	1.9	< 0.21	2.1	< 1	--	2.8
BORING B20 AREA																	
B42	5/13/2004	< 1.1	< 0.11	< 0.11	0.2	< 0.22	--	0.26	< 0.11	0.11	< 0.22	0.44	< 0.22	0.26	< 1.1	0.19	0.91
TANKS EF6-9 AREA																	
B76	5/24/2004	< 0.95	< 0.1	0.17	0.28	0.21	--	0.44	0.1	0.21	0.34	0.21	< 0.19	0.3	< 0.95	0.27	0.59
B77	5/24/2004	< 0.95	0.37	0.48	1.3	1.2	--	1.6	0.4	0.52	1.3	1.8	< 0.19	1.3	< 0.95	1.1	4.9

Notes
µg/L - micrograms per liter
"--" - Not Analyzed
Note that samples B42, B67,-77, B91, IB-45, IB46, and IB47 were prepared using silica gel permeation cleanup.
* Groundwater Screening Level (groundwater is NOT a current or potential drinking water resource), Table F1-b of RWQCB, 2005

Detected concentration exceeds the GWSL

Half of the detection limit exceeds the GWSL

[1]Sampling dates and related data references:
2/1993 - CDM, 1999
4/1998 - CDM, 1998
5/2004 - T&R, 2004

TABLE 2d. HISTORICAL GROUNDWATER ANALYTICAL RESULTS
SEMI-VOLATILE ORGANIC CAMPOUNDS
BERTH 60-63 TERMINAL, PORT OF OAKLAND, OAKLAND, CALIFRONIA

Concentrations (µg/L)

Location ID	Sample Date [1]	2-Methyl-naphthalene	Benzo(a) Pyrene	Bis(2-Ethyl-hexyl) Phthalate	Naphthalene	Pyrene
GWSL*		**2.1**	**0.014**	**32**	**24**	**2.0**
TANKS EF6-9 AREA						
B31	5/11/2004	< 11	1.4 J	< 11	< 11	< 11
B32	5/11/2004	120	< 63	< 63	170	< 63
B33	5/11/2004	< 11	1.6 J	< 11	< 11	< 11
B34	5/11/2004	< 11	4.2 J	< 11	< 11	12
B35	5/12/2004	< 10	1.3 J	< 10	< 10	< 10
B36	5/12/2004	< 10	2.5 J	< 10	< 10	< 10
B37	5/12/2004	< 10	2.7 J	< 10	< 10	< 10
B38	5/12/2004	19	0.88 J	< 9.4	10	< 9.4
B39	5/13/2004	< 9.1	3 J	< 9.1	< 9.1	< 9.1
B50	5/17/2004	< 9.5	< 9.5	< 9.5	< 9.5	< 9.5
B51	5/17/2004	< 9.4	1.6 J	26	< 9.4	< 9.4
B52	5/17/2004	< 9.4	4.4 J	< 9.4	< 9.4	< 9.4
TANKS EF11-13 AREA						
B45	5/14/2004	< 9.5	< 9.5	< 9.5	< 9.5	< 9.5
B46	5/14/2004	< 10	< 10	< 10	< 10	< 10
B47	5/14/2004	< 10	2.1 J	< 10	< 10	< 10
B49	5/14/2004	< 9.4	< 9.4	< 9.4	< 9.4	< 9.4
GENERAL AREA						
B83	5/25/2004	< 9.5	< 9.5	< 9.5	< 9.5	< 9.5
B85	5/25/2004	< 9.5	< 9.5	< 9.5	< 9.5	< 9.5

Notes
µg/L - micrograms per liter
"--" - Not Analyzed
* Groundwater Screening Level (groundwater is NOT a current or potential drinking water resource), Table F1-b of RWQCB, 2005

Detected concentration exceeds the GWSL

Half of the detection limit exceeds the GWSL

[1]Sampling dates and related data references:
2/1993 - CDM, 1999
4/1998 - CDM, 1998
5, 6/2004 - T&R, 2004

TABLE 2e. HISTORICAL GROUNDWATER ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
BERTH 60-63 TERMINAL, PORT OF OAKLAND, OAKLAND, CALIFRONIA

Concentrations (µg/L)

Location ID	Sample Date [1]	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1-Dichloroethylene	1,2,4-Trimethylbenzene	1,2-Dichloroethane	1,3,5-Trimethylbenzene	2-Phenylbutane	Acetone	Benzene	Bromoform	CFC-11	Chlorobenzene	Chlorodibromo-methane	Chloroform	cis-1,2-Dichloroethene	cis-1,3-Dichloropropene	Ethylbenzene	Isopropyl-benzene	MTBE	Naphthalene	n-Butylbenzene	Propylbenzene	Tert-Butyl-benzene	Toluene	Xylenes (total)
GWSL*		**62**	**190**	**25**	**---**	**200**	**---**	**---**	**1,500**	**46**	**3,200**	**---**	**25**	**170**	**330**	**590**	**---**	**290**	**---**	**1,800**	**24**	**---**	**---**	**---**	**130**	**100**
DIESEL SPILL / RAILYARD AREA																										
B8	12/14/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	0.6	< 0.5
B9	12/21/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	0.99
B13	12/21/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	1.6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	6.7	--	< 5	--	--	--	--	8.2	4.4
B14	12/15/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
B19	12/21/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
B22	12/21/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
B91	5/27/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B92	5/27/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	33	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	3.3	< 5	< 5	< 5	< 5	< 5	< 5
MUNICIPAL DEBRIS FILL AREA																										
B1	12/14/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
B2	12/14/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	0.8	< 0.5
B28	12/21/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
B30	12/21/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	0.66	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 5	0.57
B55	5/18/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B56	5/18/2004	< 5	< 5	< 5	8.1	< 0.5	< 5	< 5	< 20	30	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	17	< 5	< 5	< 5	< 5	18.1
MW6	10/4/2003	--	--	--	--	--	--	--	--	30	--	--	--	--	--	--	--	--	--	<0.50	--	--	--	--	<0.50	26.1
MW6	12/8/2003	--	--	--	--	--	--	--	--	37	--	--	--	--	--	--	--	--	--	<0.50	--	--	--	--	0.7	32.1
MW7	10/4/2003	--	--	--	--	--	--	--	--	45	--	--	--	--	--	--	--	--	--	<0.50	--	--	--	--	4.8	14.1
MW7	3/19/2004	--	--	--	--	--	--	--	--	9.4	--	--	--	--	--	--	--	--	--	<0.50	--	--	--	--	<4.2	6.0
MW8	10/4/2003	--	--	--	--	--	--	--	--	1.0	--	--	--	--	--	--	--	--	--	<0.50	--	--	--	--	<0.50	<0.50
MW8	12/8/2003	--	--	--	--	--	--	--	--	1.0	--	--	--	--	--	--	--	--	--	<0.50	--	--	--	--	<0.50	0.6
EW5	10/4/2003	--	--	--	--	--	--	--	--	110	--	--	--	--	--	--	--	--	--	<1.7	--	--	--	--	20	20.9
BORING B20 AREA																										
B20	12/15/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
B23	12/15/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	1.6	0.66
B25	12/15/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
TANKS EF6-9 AREA																										
B21	12/21/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
B24	12/15/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
B31	5/11/2004	< 5	< 5	< 5	9.9	< 0.5	< 5	< 5	< 20	15	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	9.7
B32	5/11/2004	< 63	< 63	< 63	1,100	< 6.3	290	< 63	< 250	73	< 63	< 63	< 63	< 63	< 63	< 63	< 63	140	< 63	< 6.3	210	< 63	140	< 63	< 63	1,690
B33	5/11/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B34	5/11/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B35	5/12/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	14	17	8.1	< 5	< 5	15	6.8	< 5	< 5
B36	5/12/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B37	5/12/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B38	5/12/2004	< 5	< 5	< 5	6.6	1.5	< 5	5.9	< 20	65	< 5	< 5	< 5	< 5	< 5	< 5	< 5	13	40	< 0.5	6.9	7	91	< 5	< 5	6.1
B39	5/13/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B50	5/17/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B51	5/17/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B52	5/17/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
TANKS EF11-13 AREA																										
B45	5/14/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B46	5/14/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	5.2	< 5	< 5	< 5	< 5	< 5	< 5
B47	5/14/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B49	5/14/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5

TABLE 2e. HISTORICAL GROUNDWATER ANALYTICAL RESULTS
VOLATILE ORGANIC COMPOUNDS
BERTH 60-63 TERMINAL, PORT OF OAKLAND, OAKLAND, CALIFRONIA

Concentrations (µg/L)

Location ID	Sample Date [1]	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1-Dichloroethylene	1,2,4-Trimethylbenzene	1,2-Dichloroethane	1,3,5-Trimethylbenzene	2-Phenylbutane	Acetone	Benzene	Bromoform	CFC-11	Chlorobenzene	Chlorodibromo-methane	Chloroform	cis-1,2-Dichloroethene	cis-1,3-Dichloropropene	Ethylbenzene	Isopropyl-benzene	MTBE	Naphthalene	n-Butylbenzene	Propylbenzene	Tert-Butyl-benzene	Toluene	Xylenes (total)
GWSL*		**62**	**190**	**25**	**---**	**200**	**---**	**---**	**1,500**	**46**	**3,200**	**---**	**25**	**170**	**330**	**590**	**---**	**290**	**---**	**1,800**	**24**	**---**	**---**	**---**	**130**	**100**
TANK EF14 AREA																										
B5	12/15/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
GENERAL AREA																										
B3	12/14/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	0.91	0.93
B4	12/14/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
B6	12/14/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
B11	12/15/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	0.86	0.92
B15	12/21/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
B16	12/15/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	0.58	< 0.5
B17	12/21/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
B18	12/15/2002	< 0.5	< 0.5	< 0.5	--	< 0.5	--	--	--	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	--	< 5	--	--	--	--	< 0.5	< 0.5
B60	5/18/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B79	5/24/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B80	5/24/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B83	5/25/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
B85	5/25/2004	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 0.5	< 5	< 5	< 5	< 5	< 5	< 5
APLUP-W1	10/4/2003	--	--	--	--	--	--	--	--	33	--	--	--	--	--	--	--	--	--	<0.50	--	--	--	--	1.1	6.1
APLUP-W1	12/8/2003	--	--	--	--	--	--	--	--	34	--	--	--	--	--	--	--	--	--	<0.50	--	--	--	--	0.9	3.3
APLUP-W2	10/4/2003	--	--	--	--	--	--	--	--	11	--	--	--	--	--	--	--	--	--	<0.50	--	--	--	--	<0.50	3.0
APLUP-W2	12/8/2003	--	--	--	--	--	--	--	--	24	--	--	--	--	--	--	--	--	--	0.5	--	--	--	--	<0.50	1.9

Notes
µg/L - micrograms per liter
"--" - Not Analyzed
"---" - No GWSL available
* Groundwater Screening Level (groundwater is NOT a current or potential drinking water resource), Table F1-b of RWQCB, 2005

Detected concentration exceeds the GWSL

Half of the detection limit exceeds the GWSL

[1]Sampling dates and related data references:
1, 2, 5, 7, 8/1993 - CDM, 1999
4/1998 - CDM, 1998
12/2002 - GAIA, 2003
10, 12/2003 - ITSI, 2004
5, 6/2004 - T&R, 2004

TABLE 3. ECOLOGICAL SCREENING EVALUATION FOR SOIL
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Boring ID	Soil COPC	Soil Concentration (mg/kg)	Distance to Harbor (feet)	Estimated Groundwater Discharge Point Concentration (µg/L)	SWSL - Marine (µg/L)
DIESEL SPILL / RAILYARD AREA					
B8	Arsenic	38	880	1.07E-16	0.14
B13	Arsenic	24	1,080	8.10E-20	0.14
B8	Barium	350	880	2.98E-03	1,000
B70	Copper	130	960	4.22E-06	3.1
B14	Lead	53	1,140	2.37E-83	8.1
B67	Lead	39	910	1.29E-67	8.1
B69	Lead	150	870	2.89E-64	8.1
B70	Lead	62	960	7.19E-71	8.1
B71	Lead	36	1,030	6.15E-76	8.1
B72	Lead	84	990	8.26E-73	8.1
B74	Lead	73	1,310	6.51E-95	8.1
B75	Lead	34	1,340	2.62E-97	8.1
B8	Lead	18	880	7.05E-66	8.1
B8	Lead	41	880	1.60E-65	8.1
B19	Lead	30	1,260	7.35E-92	8.1
B69	Lead	51	870	9.82E-65	8.1
B68	Lead	26	950	1.48E-70	8.1
B68	Lead	19	950	1.08E-70	8.1
B70	Lead	37	960	4.29E-71	8.1
B73	Lead	17	1,190	2.74E-87	8.1
B13	Zinc	130	1,080	2.20E-11	81
B22	Zinc	140	1,110	1.39E-11	81
B69	Zinc	170	870	1.24E-09	81
B72	Zinc	130	990	1.09E-10	81
B73	Zinc	110	1,190	2.67E-12	81
B74	Zinc	170	1,310	5.07E-13	81
B70	TPH-Motor Oil	1,900	960	0.28	640
B9	TPH-Motor Oil	3,100	930	0.48	640
B8*	1-Methyl-naphthalene	0.50	880	2.05E-09	2.1
B9*	1-Methyl-naphthalene	1.25	930	2.94E-09	2.1
B8*	2-Methyl-naphthalene	0.50	880	5.29E-04	2.1
B9*	2-Methyl-naphthalene	1.25	930	1.18E-03	2.1
MUNICIPAL DEBRIS FILL AREA					
B56	Arsenic	27	420	7.00E-10	0.14
OKUS-B13	Arsenic	58	600	2.47E-12	0.14
B56	Barium	370	420	1.41E-02	1,000
B28	Lead	35	800	4.72E-60	8.1
B56	Lead	320	420	1.37E-32	8.1
B59	Lead	130	240	3.56E-20	8.1
OKUS-W6	Lead	122	760	9.75E-57	8.1
B55	Lead	23	780	7.55E-59	8.1
OKUS-B13	Lead	389	600	4.12E-45	8.1
OKUS-B13	Lead	149	600	1.58E-45	8.1
B56	Zinc	420	420	1.57E-05	81
B28	Zinc	120	800	3.15E-09	81
B59	Zinc	150	240	2.45E-04	81
B56	Mercury	0.77	420	1.49E-20	2.50E-02
B2	TPH-Diesel	800	780	0.17	640
B53	TPH-Diesel	560	680	0.16	640
B54	TPH-Diesel	750	580	0.30	640
B2	TPH-Motor Oil	1,900	780	0.42	640
B28	TPH-Motor Oil	1,300	800	0.27	640
B57	TPH-Motor Oil	1,500	360	1.52	640
B58	TPH-Motor Oil	3,100	290	4.79	640
B53	TPH-Bunker C	2,300	680	0.66	640
B54	TPH-Bunker C	2,900	580	1.14	640
B56	TPH-Bunker C	1,100	420	0.82	640
B57	TPH-Bunker C	3,200	360	3.24	640
B58	TPH-Bunker C	8,200	290	12.67	640
B1*	1-Methyl-naphthalene	1.25	620	1.03E-07	2.1
B2*	1-Methyl-naphthalene	1.25	780	1.60E-08	2.1
B28*	1-Methyl-naphthalene	0.50	800	5.09E-09	2.1
B1*	2-Methyl-naphthalene	1.25	620	2.66E-03	2.1
B2*	2-Methyl-naphthalene	1.25	780	1.69E-03	2.1
B28*	2-Methyl-naphthalene	0.50	800	6.41E-04	2.1
BORING B20 AREA					
B20	Antimony	19	150	2.64E-03	500
B20	Cadmium	3.3	150	1.02E-04	9.3
B20	Copper	360	150	2.00E-02	3.1
B44	Copper	110	110	1.00E-02	3.1
B20	Lead	1,300	150	1.33E-12	8.1
B40	Lead	53	100	3.09E-10	8.1
B40	Lead	68	100	3.96E-10	8.1

TABLE 3. ECOLOGICAL SCREENING EVALUATION FOR SOIL
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Boring ID	Soil COPC	Soil Concentration (mg/kg)	Distance to Harbor (feet)	Estimated Groundwater Discharge Point Concentration (µg/L)	SWSL - Marine (µg/L)
B44	Lead	390	110	3.95E-10	8.1
B40	Lead	53	100	3.09E-10	8.1
B41	Lead	22	250	1.15E-21	8.1
B20	Mercury	5.1	150	1.50E-09	2.50E-02
B41	Mercury	0.67	250	2.63E-14	2.50E-02
B20	Vanadium	140	150	7.30E-02	19
B20	Zinc	1,500	150	1.84E-02	81
B40	Zinc	150	100	5.73E-03	81
B44	Zinc	430	110	1.31E-02	81
B44	TPH-Diesel	810	110	7.59	640
B44	TPH-Motor Oil	1,700	110	15.93	640
B44	TPH-Motor Oil	3,000	110	28.11	640
B44	TPH-Hydraulic Oil	3,100	110	29.05	640
B44	TPH-Hydraulic Oil	2,300	110	21.55	640
B20*	1-Methyl-naphthalene	0.60	150	2.13E-05	2.1
B23*	1-Methyl-naphthalene	0.50	360	1.02E-06	2.1
B25*	1-Methyl-naphthalene	0.50	40	1.32E-04	2.1
B20*	2-Methyl-naphthalene	0.60	150	2.01E-02	2.1
B23*	2-Methyl-naphthalene	0.50	360	3.13E-03	2.1
B25*	2-Methyl-naphthalene	0.50	40	0.11	2.1
TANKS EF6-9 AREA					
B39	Cobalt	43	780	3.62E-04	3.0
B39	Copper	160	780	2.32E-05	3.1
B52	Copper	74	890	4.27E-06	3.1
B24	Lead	220	600	2.33E-45	8.1
B33	Lead	41	710	9.66E-54	8.1
B31	Lead	32	750	1.26E-56	8.1
B39	Lead	150	780	4.92E-58	8.1
B33	Lead	17	710	4.01E-54	8.1
B35	Lead	20	870	3.85E-65	8.1
B35	Lead	22	870	4.23E-65	8.1
B52	Lead	59	880	2.31E-65	8.1
B24	Mercury	3.1	600	1.91E-26	2.50E-02
B34	Mercury	0.82	680	7.06E-30	2.50E-02
B39	Mercury	6.7	780	1.63E-32	2.50E-02
B52	Mercury	2.8	890	8.87E-37	2.50E-02
B33	Mercury	0.75	710	5.54E-31	2.50E-02
B35	Mercury	0.71	870	1.14E-36	2.50E-02
B39	Mercury	0.55	780	1.34E-33	2.50E-02
B39	Nickel	280	780	1.06E-08	8.2
B39	Silver	5.3	780	2.43E-06	0.19
B39	Silver	2	780	9.19E-07	0.19
B39	Vanadium	450	780	1.00E-02	19
B24	Zinc	650	600	7.18E-07	81
B35	Zinc	410	870	3.00E-09	81
B39	Zinc	330	870	1.25E-08	81
B32	Zinc	130	760	7.13E-09	81
B37	Zinc	130	830	1.97E-09	81
B32	Acetone	1.00	760	1.10E-02	1,500
B32	Xylenes	27.8	760	6.30E-02	100
B32	TPH-Gasoline	910	760	0.21	3,700
B38	TPH-Gasoline	500	780	0.11	3,700
B31	TPH-Diesel	530	750	0.13	640
B21	TPH-Motor Oil	1,200	960	0.17	640
B24	TPH-Motor Oil	1,200	600	0.44	640
B24	TPH-Motor Oil	1,100	600	0.41	640
B31	TPH-Motor Oil	2,800	750	0.66	640
B32	TPH-Motor Oil	1,800	760	0.41	640
B78	TPH-Motor Oil	3,300	600	1.21	640
B31	TPH-Hydraulic Oil	3,000	750	0.71	640
B32	TPH-Hydraulic Oil	1,700	760	0.39	640
B21*	1-Methyl-naphthalene	1.25	960	2.11E-09	2.1
B24*	1-Methyl-naphthalene	1.25	600	1.31E-07	2.1
B24*	1-Methyl-naphthalene	1.25	600	1.31E-07	2.1
B21*	2-Methyl-naphthalene	1.25	960	1.11E-03	2.1
B24*	2-Methyl-naphthalene	1.25	600	2.84E-03	2.1
B24*	2-Methyl-naphthalene	1.25	600	2.84E-03	2.1
B31	2-Methyl-naphthalene	1.00	750	1.19E-05	2.1
TANKS EF11-13 AREA					
B49	Copper	750	480	1.50E-03	3.1
B46	Lead	31	600	3.28E-46	8.1
B49	Lead	110	480	2.86E-37	8.1
B-1	Lead	29	680	8.30E-52	8.1
B-2	Lead	18	660	1.27E-50	8.1

TABLE 3. ECOLOGICAL SCREENING EVALUATION FOR SOIL
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Boring ID	Soil COPC	Soil Concentration (mg/kg)	Distance to Harbor (feet)	Estimated Groundwater Discharge Point Concentration (µg/L)	SWSL - Marine (µg/L)
B45	Lead	31	520	1.27E-40	8.1
B47	Lead	51	550	1.67E-42	8.1
B49	Vanadium	76	480	4.44E-03	19
B45	Zinc	380	520	1.96E-06	81
B49	Zinc	200	480	2.27E-06	81
B-1	Zinc	140	680	3.41E-08	81
B45	TPH-Diesel	1,200	520	0.59	640
B49	TPH-Motor Oil	1,200	480	0.69	640
B45	TPH-Hydraulic Oil	1,400	520	0.68	640
B49	TPH-Hydraulic Oil	1,200	480	0.69	640
GENERAL AREA					
B18	Antimony	16	450	2.59E-04	500
B15	Barium	480	790	5.14E-03	1,000
B87	Barium	760	750	9.07E-03	1,000
B16	Copper	190	300	2.10E-03	3.1
B18	Copper	130	450	3.45E-04	3.1
B81	Copper	72	490	1.32E-04	3.1
B16	Lead	190	300	2.59E-24	8.1
B17	Lead	40	110	4.06E-11	8.1
B18	Lead	50	450	1.66E-35	8.1
B81	Lead	130	490	6.72E-38	8.1
B16	Lead	30	300	4.08E-25	8.1
B16	Lead	30	300	4.08E-25	8.1
B84	Lead	29	600	3.07E-46	8.1
B81	Mercury	0.47	490	2.62E-23	2.50E-02
B16	Zinc	120	300	5.37E-05	81
B17	Zinc	120	110	3.66E-03	81
B81	Zinc	140	490	1.30E-06	81
B3	TPH-Motor Oil	3,100	670	0.92	640
B82	TPH-Motor Oil	1,700	260	3.25	640
B3*	1-Methyl-naphthalene	1.25	670	5.71E-08	2.1
B11*	1-Methyl-naphthalene	1.25	70	1.69E-04	2.1
B16*	1-Methyl-naphthalene	0.60	300	2.70E-06	2.1
B3*	2-Methyl-naphthalene	1.25	670	2.28E-03	2.1
B11*	2-Methyl-naphthalene	1.25	70	0.15	2.1
B16*	2-Methyl-naphthalene	0.60	300	5.36E-03	2.1

Notes:
* - Concentraction corresponding to half the dection limit.
TPH - Total petroleum hydrocarbon
µg/L - micrograms per liter
COPC - Chemicals of potential concern
SWSL - Marine - Surface Water Screening Levels Corresponding to Marine Aquatic Habitats. Lowest of the chemical screening level for marine aquatic habitat protection (chronic toxicity), "ceiling value" for nuisance concerns, and bioaccumulation and human consumption
Table F2-b, RWQCB, 2005. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim-Final. February with March Updates.

TABLE 4. ECOLOGICAL SCREENING EVALUATION FOR GROUNDWATER
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Boring ID	Groundwater COPC	Groundwater Concentration (µg/L)	Distance to Harbor (feet)	Estimated Groundwater Discharge Point Concentration (µg/L)	SWSL - Marine (µg/L)
DIESEL SPILL / RAILYARD AREA					
B91	Arsenic	140	1,100	2.24E-16	0.14
B22	Barium	1,100	1,110	0.20	1,000
B8*	Mercury	0.4	880	6.64E-34	2.50E-02
B9*	Mercury	0.4	930	1.15E-35	2.50E-02
B13*	Mercury	0.4	1,080	6.23E-41	2.50E-02
B14*	Mercury	0.4	1,140	4.94E-43	2.50E-02
B19*	Mercury	0.4	1,260	3.17E-47	2.50E-02
B22*	Mercury	0.4	1,110	5.54E-42	2.50E-02
B8*	Nickel	25	880	7.08E-08	8.2
B9*	Nickel	25	930	2.87E-08	8.2
B13*	Nickel	25	1,080	1.96E-09	8.2
B14*	Nickel	25	1,140	6.79E-10	8.2
B19*	Nickel	25	1,260	8.27E-11	8.2
B22*	Nickel	25	1,110	1.15E-09	8.2
B67*	Nickel	10	910	1.65E-08	8.2
B8*	Vanadium	25	880	8.10E-03	19
B9*	Vanadium	25	930	7.26E-03	19
B13*	Vanadium	25	1,080	5.38E-03	19
B14*	Vanadium	25	1,140	4.83E-03	19
B19*	Vanadium	25	1,260	3.94E-03	19
B22*	Vanadium	25	1,110	5.09E-03	19
B67	Anthracene	1.2	910	3.64E-04	0.73
B71	Anthracene	1.1	1,030	2.60E-04	0.73
B75	Anthracene	19	1,340	2.66E-03	0.73
B74	Benzo(a)Anthracene	0.57	1,310	2.31E-05	2.70E-02
B67	Benzo(a)Anthracene	1.4	910	2.50E-04	2.70E-02
B69	Benzo(a)Anthracene	0.21	870	4.36E-05	2.70E-02
B70*	Benzo(a)Anthracene	0.05	960	7.37E-06	2.70E-02
B71	Benzo(a)Anthracene	0.28	1,030	3.17E-05	2.70E-02
B75*	Benzo(a)Anthracene	0.24	1,340	8.71E-06	2.70E-02
B91	Benzo(a)Anthracene	1.6	1,100	1.40E-04	2.70E-02
B68*	Benzo(a)Anthracene	0.045	950	6.89E-06	2.70E-02
B72	Benzo(a)Anthracene	0.17	990	2.24E-05	2.70E-02
B73*	Benzo(a)Anthracene	0.045	1,190	2.82E-06	2.70E-02
B74	Benzo(a)Pyrene	1	1,310	8.04E-43	1.40E-02
B68*	Benzo(a)Pyrene	0.045	950	3.85E-33	1.40E-02
B67	Benzo(a)Pyrene	3.4	910	4.97E-30	1.40E-02
B70*	Benzo(a)Pyrene	0.05	960	2.11E-33	1.40E-02
B69	Benzo(a)Pyrene	0.45	870	1.13E-29	1.40E-02
B71	Benzo(a)Pyrene	0.16	1,030	4.74E-35	1.40E-02
B72	Benzo(a)Pyrene	0.16	990	8.04E-34	1.40E-02
B73	Benzo(a)Pyrene	0.15	1,190	5.57E-40	1.40E-02
B75	Benzo(a)Pyrene	2.2	1,340	2.15E-43	1.40E-02
B91	Benzo(a)Pyrene	2.4	1,100	5.07E-36	1.40E-02
B74	Benzo(b)Fluoranthene	1	1,310	1.67E-07	2.90E-02
B68*	Benzo(b)Fluoranthene	0.095	950	3.52E-07	2.90E-02
B70*	Benzo(b)Fluoranthene	0.095	960	3.22E-07	2.90E-02
B71*	Benzo(b)Fluoranthene	0.095	1,030	1.74E-07	2.90E-02
B72*	Benzo(b)Fluoranthene	0.095	990	2.47E-07	2.90E-02
B67	Benzo(b)Fluoranthene	3.3	910	1.74E-05	2.90E-02
B69	Benzo(b)Fluoranthene	0.35	870	2.64E-06	2.90E-02
B73	Benzo(b)Fluoranthene	0.19	1,190	8.77E-08	2.90E-02
B75	Benzo(b)Fluoranthene	3.1	1,340	4.03E-07	2.90E-02
B91	Benzo(b)Fluoranthene	3.6	1,100	3.60E-06	2.90E-02
B74	Benzo(g,h,i)Perylene	1.1	1,310	5.47E-15	0.1
B68*	Benzo(g,h,i)Perylene	0.095	950	1.28E-12	0.1
B70*	Benzo(g,h,i)Perylene	0.095	960	1.02E-12	0.1
B67	Benzo(g,h,i)Perylene	3.6	910	1.18E-10	0.1
B69	Benzo(g,h,i)Perylene	0.55	870	4.42E-11	0.1
B73	Benzo(g,h,i)Perylene	0.33	1,190	2.23E-14	0.1
B75	Benzo(g,h,i)Perylene	3.8	1,340	9.87E-15	0.1
B91	Benzo(g,h,i)Perylene	3.5	1,100	1.70E-12	0.1
B71	Benzo(g,h,i)Perylene	0.3	1,030	6.82E-13	0.1
B72	Benzo(g,h,i)Perylene	0.24	990	1.32E-12	0.1
B67	Benzo(k)Fluoranthene	0.85	910	4.49E-06	4.90E-02
B75	Benzo(k)Fluoranthene	1.1	1,340	1.43E-07	4.90E-02
B91	Benzo(k)Fluoranthene	1.1	1,100	1.10E-06	4.90E-02
B74	Chrysene	0.75	1,310	1.43E-06	4.90E-02
B67	Chrysene	1.1	910	2.97E-05	4.90E-02
B91	Chrysene	2.6	1,100	1.96E-05	4.90E-02
B69	Dibenzo(a,h)Anthracene	0.42	870	2.77E-19	4.90E-02
B73	Dibenzo(a,h)Anthracene	0.4	1,190	2.49E-25	4.90E-02
B75	Dibenzo(a,h)Anthracene	11	1,340	1.10E-26	4.90E-02
B91	Dibenzo(a,h)Anthracene	4.4	1,100	1.33E-22	4.90E-02
B75	Fluoranthene	63	1,340	8.81E-03	8.0
B75	Fluorene	220	1,340	3.10E-02	3.9
B67	Indeno(1,2,3-cd)Pyrene	4.4	910	1.44E-10	2.90E-02
B69	Indeno(1,2,3-cd)Pyrene	0.4	870	3.22E-11	2.90E-02
B71	Indeno(1,2,3-cd)Pyrene	0.17	1,030	3.86E-13	2.90E-02
B72	Indeno(1,2,3-cd)Pyrene	0.16	990	8.82E-13	2.90E-02
B74	Indeno(1,2,3-cd)Pyrene	1.6	1,310	7.95E-15	2.90E-02
B91	Indeno(1,2,3-cd)Pyrene	2.1	1,100	1.02E-12	2.90E-02
B68*	Indeno(1,2,3-cd)Pyrene	0.045	950	6.04E-13	2.90E-02
B70*	Indeno(1,2,3-cd)Pyrene	0.05	960	5.37E-13	2.90E-02

TABLE 4. ECOLOGICAL SCREENING EVALUATION FOR GROUNDWATER
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Boring ID	Groundwater COPC	Groundwater Concentration (µg/L)	Distance to Harbor (feet)	Estimated Groundwater Discharge Point Concentration (µg/L)	SWSL - Marine (µg/L)
B73	Indeno(1,2,3-cd)Pyrene	0.15	1,190	1.01E-14	2.90E-02
B75*	Indeno(1,2,3-cd)Pyrene	0.24	1,340	6.23E-16	2.90E-02
B75	Naphthalene	27	1,340	3.78E-03	21
B75	Phenanthrene	370	1,340	5.20E-02	4.6
B67	Pyrene	13	910	3.76E-03	2.0
B68	Pyrene	4.2	950	1.10E-03	2.0
B69	Pyrene	4.5	870	1.44E-03	2.0
B71	Pyrene	2.2	1,030	4.79E-04	2.0
B72	Pyrene	3.2	990	7.65E-04	2.0
B75	Pyrene	14	1,340	1.54E-03	2.0
B91	Pyrene	2.8	1,100	5.20E-04	2.0
B75R	TPH-Gasoline	1,500	1,340	0.21	3,700
B8	TPH-Diesel	1,100	880	0.36	640
B13	TPH-Diesel	2,100	1,080	0.45	640
B75	TPH-Diesel	14,000	1,340	1.96	640
B75R	TPH-Diesel	240,000	1,340	33.60	640
B8	TPH-Motor Oil	2,400	880	0.78	640
B13	TPH-Motor Oil	1,250	1,080	0.27	640
B14	TPH-Motor Oil	2,000	1,140	0.39	640
B91	TPH-Motor Oil	890	1,100	0.19	640
B75	TPH-Motor Oil	890	1,340	0.13	640
B75R	TPH-Motor Oil	12,000	1,340	1.68	640
MUNICIPAL DEBRIS FILL AREA					
B28	Arsenic	69	800	1.76E-11	0.14
B1*	Mercury	0.4	620	1.11E-24	2.50E-02
B2*	Mercury	0.4	780	2.26E-30	2.50E-02
B28*	Mercury	0.4	800	4.43E-31	2.50E-02
B1*	Nickel	25	620	8.76E-06	8.2
B2*	Nickel	25	780	4.40E-07	8.2
B28*	Nickel	25	800	3.05E-07	8.2
B1*	Vanadium	25	620	1.60E-02	19
B2*	Vanadium	25	780	1.00E-02	19
B28*	Vanadium	25	800	1.00E-02	19
B32*	Chlorobenzene	31.5	760	1.40E-02	50
EW5	Benzene	110	270	0.37	71
MW6	TPH-Gasoline	580	400	0.90	3,700
EW5	TPH-Gasoline	3,000	270	10.07	3,700
B1	TPH-Diesel	2,300	620	1.50	640
B2	TPH-Diesel	1,100	780	0.45	640
B28	TPH-Diesel	4,300	800	1.69	640
B56	TPH-Diesel	2,600	420	3.67	640
MW7	TPH-Diesel	2,500	390	4.08	640
EW5	TPH-Diesel	690	270	1.64	640
B1	TPH-Motor Oil	9,200	620	5.99	640
B2	TPH-Motor Oil	3,000	780	1.24	640
B28	TPH-Motor Oil	4,400	800	1.72	640
B56	TPH-Motor Oil	910	420	1.28	640
B56	TPH-Bunker C	6,500	420	9.16	640
BORING B20 AREA					
B20*	Mercury	0.4	150	2.74E-07	2.50E-02
B23*	Mercury	0.4	363	2.22E-15	2.50E-02
B25*	Mercury	0.4	40	8.57E-03	2.50E-02
B20*	Nickel	25	150	0.14	8.2
B23*	Nickel	25	363	1.39E-03	8.2
B25*	Nickel	25	40	1.75	8.2
B42*	Nickel	10	200	1.80E-02	8.2
B20*	Vanadium	25	150	0.26	19
B23*	Vanadium	25	363	4.70E-02	19
B25*	Vanadium	25	40	1.75	19
B42*	Benzo(a)Anthracene	0.055	200	3.29E-04	2.70E-02
B42	Benzo(a)Pyrene	0.2	200	1.16E-08	1.40E-02
B42*	Benzo(b)Fluoranthene	0.11	200	6.01E-04	2.90E-02
B42	Benzo(g,h,i)Perylene	0.26	200	2.29E-04	0.1
B42	Indeno(1,2,3-cd)Pyrene	0.26	200	<1.00E-308	2.90E-02
B25	TPH-Motor Oil	2100	40	147.14	640
TANKS EF6-9 AREA					
B38	Lead	10	780	1.52E-55	8.1
B21*	Mercury	0.4	960	1.01E-36	2.50E-02
B24*	Mercury	0.4	600	5.74E-24	2.50E-02
B21*	Nickel	25	960	1.67E-08	8.2
B24*	Nickel	25	600	1.28E-05	8.2
B31*	Nickel	10	750	3.07E-07	8.2
B32*	Nickel	10	760	2.55E-07	8.2
B33*	Nickel	10	710	6.45E-07	8.2
B34*	Nickel	10	680	1.13E-06	8.2
B35*	Nickel	10	870	3.40E-08	8.2
B36*	Nickel	10	870	3.40E-08	8.2
B37*	Nickel	10	830	7.04E-08	8.2
B38	Nickel	49	780	8.63E-07	8.2
B39*	Nickel	10	780	1.76E-07	8.2
B50*	Nickel	10	850	4.89E-08	8.2
B51*	Nickel	10	910	1.65E-08	8.2

TABLE 4. ECOLOGICAL SCREENING EVALUATION FOR GROUNDWATER
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Boring ID	Groundwater COPC	Groundwater Concentration (µg/L)	Distance to Harbor (feet)	Estimated Groundwater Discharge Point Concentration (µg/L)	SWSL - Marine (µg/L)
B52*	Nickel	10	890	2.36E-08	8.2
B21*	Vanadium	25	960	6.81E-03	19
B24*	Vanadium	25	600	1.70E-02	19
B38	Zinc	180	780	3.17E-06	81
B32	Benzene	73	760	3.20E-02	71
B38	Benzene	65	780	2.70E-02	71
B76	Benzo(a)Anthracene	0.17	1,030	1.92E-05	2.70E-02
B77	Benzo(a)Anthracene	0.48	810	1.26E-04	2.70E-02
B76	Benzo(a)Pyrene	0.28	1,030	8.30E-35	1.40E-02
B77	Benzo(a)Pyrene	1.3	810	2.34E-27	1.40E-02
B31	Benzo(a)Pyrene	1.4	750	1.84E-25	1.40E-02
B32*	Benzo(a)Pyrene	31.5	760	2.02E-24	1.40E-02
B33	Benzo(a)Pyrene	1.6	710	3.68E-24	1.40E-02
B34	Benzo(a)Pyrene	4.2	680	8.34E-23	1.40E-02
B35	Benzo(a)Pyrene	1.3	870	3.26E-29	1.40E-02
B36	Benzo(a)Pyrene	2.5	870	6.27E-29	1.40E-02
B37	Benzo(a)Pyrene	2.7	830	1.17E-27	1.40E-02
B38	Benzo(a)Pyrene	0.88	780	1.36E-26	1.40E-02
B39	Benzo(a)Pyrene	3	780	4.60E-26	1.40E-02
B50*	Benzo(a)Pyrene	4.75	850	4.95E-28	1.40E-02
B51	Benzo(a)Pyrene	1.6	910	2.34E-30	1.40E-02
B52	Benzo(a)Pyrene	4.4	890	2.66E-29	1.40E-02
B76	Benzo(b)Fluoranthene	0.21	1,030	3.85E-07	2.90E-02
B77	Benzo(b)Fluoranthene	1.2	810	1.56E-05	2.90E-02
B76	Benzo(g,h,i)Perylene	0.44	1,030	1.00E-12	0.1
B77	Benzo(g,h,i)Perylene	1.6	810	4.98E-10	0.1
B77	Chrysene	0.52	810	2.80E-05	4.90E-02
B76	Dibenzo(a,h)Anthracene	0.34	1,030	2.12E-22	4.90E-02
B77	Dibenzo(a,h)Anthracene	1.3	810	1.19E-17	4.90E-02
B76	Indeno(1,2,3-cd)Pyrene	0.3	1,030	6.82E-13	2.90E-02
B77	Indeno(1,2,3-cd)Pyrene	1.3	810	4.05E-10	2.90E-02
B32	Ethylbenzene	140	760	6.10E-02	30
B32	Naphthalene	210	760	9.10E-02	21
B32	Naphthalene	170	760	7.40E-02	21
B77	Pyrene	4.9	810	1.83E-03	2.0
B31*	Pyrene	5.5	750	2.42E-03	2.0
B32*	Pyrene	31.5	760	1.35E-02	2.0
B33*	Pyrene	5.5	710	2.71E-03	2.0
B34	Pyrene	12	680	6.45E-03	2.0
B35*	Pyrene	5	870	1.60E-03	2.0
B36*	Pyrene	5	870	1.60E-03	2.0
B37*	Pyrene	5	830	1.77E-03	2.0
B38*	Pyrene	4.7	780	1.90E-03	2.0
B39*	Pyrene	4.55	780	1.84E-03	2.0
B50*	Pyrene	4.75	850	1.60E-03	2.0
B51*	Pyrene	4.7	910	1.36E-03	2.0
B52*	Pyrene	4.7	890	1.43E-03	2.0
B32*	1,1-Dichloroethylene	31.5	760	1.40E-02	3.2
B32	Xylenes	1,690	760	0.73	100
B31*	2-Methyl-naphthalene	5.5	750	2.45E-03	2.1
B32	2-Methyl-naphthalene	120	760	5.20E-02	2.1
B33*	2-Methyl-naphthalene	5.5	710	2.73E-03	2.1
B34*	2-Methyl-naphthalene	5.5	680	2.98E-03	2.1
B35*	2-Methyl-naphthalene	5	870	1.66E-03	2.1
B36*	2-Methyl-naphthalene	5	870	1.66E-03	2.1
B37*	2-Methyl-naphthalene	5	830	1.82E-03	2.1
B38	2-Methyl-naphthalene	19	780	7.83E-03	2.1
B39*	2-Methyl-naphthalene	4.55	780	1.88E-03	2.1
B50*	2-Methyl-naphthalene	4.75	850	1.65E-03	2.1
B51*	2-Methyl-naphthalene	4.7	910	1.42E-03	2.1
B52*	2-Methyl-naphthalene	4.7	890	1.49E-03	2.1
B32	TPH-Gasoline	12,000	760	5.21	3,700
B35	TPH-Gasoline	570	870	0.19	3,700
B38	TPH-Gasoline	1,900	780	0.78	3,700
B31	TPH-Diesel	9,200	750	2.88	640
B32	TPH-Diesel	66,000	760	20.09	640
B21	TPH-Motor Oil	720	960	0.20	640
B31	TPH-Motor Oil	8,700	750	3.88	640
B32	TPH-Motor Oil	95,000	760	41.24	640
B31	TPH-Hydraulic Oil	17,000	750	7.58	640
B32	TPH-Hydraulic Oil	140,000	760	60.78	640
TANKS EF11-13 AREA					
B46	Lead	4.8	600	1.47E-39	8.1
B7*	Mercury	0.4	680	8.02E-27	2.50E-02
B7*	Nickel	25	680	2.82E-06	8.2
B45*	Nickel	10	520	2.40E-05	8.2
B46	Nickel	50	600	2.57E-05	8.2
B47*	Nickel	10	550	1.34E-05	8.2
B49*	Nickel	10	480	5.26E-05	8.2
B7*	Vanadium	25	680	1.40E-02	19
B45*	Benzo(a)Pyrene	4.75	520	1.00E-17	1.40E-02
B46*	Benzo(a)Pyrene	5	600	3.17E-20	1.40E-02
B47	Benzo(a)Pyrene	2.1	550	5.00E-19	1.40E-02
B49*	Benzo(a)Pyrene	4.7	480	1.85E-16	1.40E-02

TABLE 4. ECOLOGICAL SCREENING EVALUATION FOR GROUNDWATER
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Boring ID	Groundwater COPC	Groundwater Concentration (µg/L)	Distance to Harbor (feet)	Estimated Groundwater Discharge Point Concentration (µg/L)	SWSL - Marine (µg/L)
B45*	Pyrene	4.75	520	4.38E-03	2.0
B46*	Pyrene	5	600	3.46E-03	2.0
B47*	Pyrene	5	550	4.13E-03	2.0
B49*	Pyrene	4.7	480	5.09E-03	2.0
B45*	2-Methyl-naphthalene	4.75	520	4.39E-03	2.1
B46*	2-Methyl-naphthalene	5	600	3.47E-03	2.1
B47*	2-Methyl-naphthalene	5	550	4.13E-03	2.1
B49*	2-Methyl-naphthalene	4.7	480	5.09E-03	2.1
TANK EF14 AREA					
B5	Mercury	0.87	80	4.82E-04	2.50E-02
B5*	Nickel	25	80	0.70	8.2
B62*	Nickel	10	80	0.28	8.2
B63*	Nickel	10	140	0.07	8.2
B64*	Nickel	10	82	0.27	8.2
B65*	Nickel	10	40	0.70	8.2
B66*	Nickel	10	120	0.11	8.2
B5*	Vanadium	25	80	0.74	19
GENERAL AREA					
B4	Arsenic	74	340	5.36E-05	0.14
B3*	Mercury	0.4	670	1.82E-26	2.50E-02
B4*	Mercury	0.4	340	1.57E-14	2.50E-02
B6*	Mercury	0.4	280	2.70E-12	2.50E-02
B11*	Mercury	0.4	70	5.11E-04	2.50E-02
B15*	Mercury	0.4	790	1.00E-30	2.50E-02
B16*	Mercury	0.4	300	4.80E-13	2.50E-02
B17*	Mercury	0.4	110	1.13E-05	2.50E-02
B18*	Mercury	0.4	450	1.46E-18	2.50E-02
B3*	Nickel	25	670	3.41E-06	8.2
B4*	Nickel	25	340	2.24E-03	8.2
B6*	Nickel	25	280	7.96E-03	8.2
B11*	Nickel	25	70	0.87	8.2
B15*	Nickel	25	790	3.66E-07	8.2
B16*	Nickel	25	300	5.20E-03	8.2
B17*	Nickel	25	110	0.35	8.2
B18*	Nickel	25	450	2.39E-04	8.2
B83*	Nickel	10	320	1.36E-03	8.2
B85*	Nickel	10	500	3.55E-05	8.2
B3*	Vanadium	25	670	1.40E-02	19
B4*	Vanadium	25	340	5.30E-02	19
B6*	Vanadium	25	280	7.80E-02	19
B11*	Vanadium	25	70	0.90	19
B15*	Vanadium	25	790	1.00E-02	19
B16*	Vanadium	25	300	6.80E-02	19
B17*	Vanadium	25	110	0.44	19
B18*	Vanadium	25	450	3.10E-02	19
B83*	Benzo(a)Pyrene	4.75	320	2.68E-11	1.40E-02
B85*	Benzo(a)Pyrene	4.75	500	4.32E-17	1.40E-02
B83*	Pyrene	4.75	320	1.14E-02	2.0
B85*	Pyrene	4.75	500	4.74E-03	2.0
B83*	2-Methyl-naphthalene	4.75	320	1.10E-02	2.1
B85*	2-Methyl-naphthalene	4.75	500	4.74E-03	2.1
B15	TPH-Diesel	1,900	790	0.54	640
B3	TPH-Motor Oil	790	670	0.44	640
B15	TPH-Motor Oil	1,400	790	0.56	640
B18	TPH-Motor Oil	750	450	0.92	640

Notes:
* - Concentraction corresponding to half the detection limit.
TPH - Total petroleum hydrocarbon
µg/L - micrograms per liter
COPC - Chemicals of potential concern
SWSL - Marine - Surface Water Screening Levels Corresponding to Marine Aquatic Habitats. Lowest of the chemical screening level for marine aquatic habitat protection (chronic toxicity), "ceiling value" for nuisance concerns, and bioaccumulation and human consumption
Table F2-b, RWQCB, 2005. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim-Final. February with March Updates.

APPENDIX A

Buried Training Jetty

Municipal Debris Fill Area

Diesel Spill / Railyard Area

Zone of Asphalt Debris

Free Product

Tanks EF6-9 Area

Tanks EF11-13 Area

General Area

Tank EF14 Area

Boring B20 Area

Wharf

Oakland Inner Harbor

LEGEND

- B64 Soil Boring with Data
- B63 Soil Boring with No Data
- METALS Exceeding Screening Criteria
- TPH Exceeding Screening Criteria
- PAH or SVOC Exceeding Screening Criteria
- VOC Exceeding Screening Criteria
- Preliminary Areas of Concern
- Zone of Asphalt Debris (2-4 feet bgs)
- Redevelopment Site Outline
- Proposed Building
- E-124 Existing Building (only building E-125 will remain after redevelopment)
- EF12 Former Underground Storage Tanks (UST)
- Extent of Free Product (HLA, 2000 defined by closely spaced borings and IRIS, 2002. Free Product observed during drilling by T&R at B56 and B75)
- Approximate extent of Municipal Debris (IRIS, 2002 with modifications)

N

200 0 200 Feet

Environmental Subsurface Assessment
Berths 60-63 Yard and Gate Redevelopment
Port of Oakland

SOIL EXCEEDANCES (0 - 5 feet bgs)

Date 3/30/05	Project No. 4000.04	Figure 7

Treadwell&Rollo

Treadwell & Rollo C:\GIS\4000_04\REPORT_FIGURES.APR 03/2005

Buried Training Jetty

"SPILL AREA" WELLS DSMW-1"

Municipal Debris Fill Area

Diesel Spill / Railyard Area

Zone of Asphalt Debris

Free Product

Tanks EF6-9 Area

Tanks EF11-13 Area

General Area

Tank EF14 Area

Boring B20 Area

Wharf

Oakland Inner Harbor

LEGEND

- B64 Soil Boring with Data
- B63 Soil Boring with No Data
- METALS Exceeding Screening Criteria
- TPH Exceeding Screening Criteria
- PAH or SVOC Exceeding Screening Criteria
- VOC Exceeding Screening Criteria
- Preliminary Areas of Concern
- Zone of Asphalt Debris (2-4 feet bgs)
- Redevelopment Site Outline
- Proposed Building
- E-124 Existing Building (only building E-125 will remain after redevelopment)
- EF12 Former Underground Storage Tanks (UST)
- Extent of Free Product (HLA, 2000 defined by closely spaced borings and IRIS, 2002. Free Product observed during drilling by T&R at B56 and B75)
- Approximate extent of Municipal Debris (IRIS, 2002 with modifications)

N

200 0 200 Feet

Environmental Subsurface Assessment
Berths 60-63 Yard and Gate Redevelopment
Port of Oakland

SOIL EXCEEDANCES (5 - 10 feet bgs)

Date 3/30/05	Project No. 4000.04	Figure 8

Treadwell&Rollo

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Buried Training Jetty

"SPILL AREA" WELL/ DSMW-1

Municipal Debris Fill Area

Diesel Spill / Railyard Area

Zone of Asphalt Debris

Tanks EF6-9 Area

Tanks EF11-13 Area

Tank EF14 Area

General Area

Boring B20 Area

Wharf

Oakland Inner Harbor

IB-44 IB-45 IB-46 IB-47 IB-48 IB-49

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B15 B16 B17 B18 B20 B21 B22 B23 B24 B25 B26 B27 B28 B29 B30 B31 B32 B33 B34 B35 B36 B37 B38 B39 B41 B42 B43 B44 B45 B46 B47 B48 B49 B51 B52 B53 B54 B55 B56 B57 B58 B59 B60 B61 B62 B63 B64 B65 B66 B67 B68 B69 B70 B71 B72 B73 B74 B75 B76 B77 B78 B79 B80 B81 B82 B83 B84 B85 B86 B87 B88 B89 B90 B91 B92 B93 B94 B95 B96

E-123 E-124 E-125 E-126 E-127 E-221 E-222 E-240

EF10 EF11 EF12 EF13 EF14 EF6-9

MW-2 MW-6 MW-7 MW-8

EW-5

APL/UP-W1 APL/UP-W2

OKUS-W1 OKUS-W2 OKUS-W3 OKUS-W4 OKUS-W5 OKUS-W6

OKUS-B1 OKUS-B2 OKUS-B3 OKUS-B4 OKUS-B5 OKUS-B6 OKUS-B7 OKUS-B8 OKUS-B9 OKUS-B10 OKUS-B11 OKUS-B12 OKUS-B13

LEGEND

- B64 Soil Boring with Data
- B63 Soil Boring with No Data
- METALS Exceeding Screening Criteria
- TPH Exceeding Screening Criteria
- PAH or SVOC Exceeding Screening Criteria
- VOC Exceeding Screening Criteria
- Preliminary Areas of Concern
- Current Site Boundaries
- Zone of Asphalt Debris (2-4 feet bgs)
- Redevelopment Site Outline
- Proposed Building
- E-124 Existing Building (only building E-125 will remain after redevelopment)
- EF12 Former Underground Storage Tanks (UST)
- Extent of Free Product (HLA, 2000 defined by closely spaced borings and IRIS, 2002. Free Product observed during drilling by T&R at B56 and B75)
- Approximate extent of Municipal Debris (IRIS, 2002 with modifications)

N

200 0 200 Feet

Environmental Subsurface Assessment
Berths 60-63 Yard and Gate Redevelopment
Port of Oakland

GROUNDWATER EXCEEDANCES

Date 3/30/05	Project No. 4000.04	Figure 9

Treadwell&Rollo

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APPENDIX B

APPENDIX B
CHEMICAL FATE AND TRANSPORT SIMULATIONS

INTRODUCTION

To evaluate the significance, if any, of each of the Chemicals Of Potential Concern (COPCs) exceeding the Tier I ESLs, a fate and transport analysis was performed for each COPC at its respective concentration and location. This analysis was performed in order to estimate the potential contribution to the harbor of each soil/groundwater detection across the Project Area. Estimates of resulting COPC concentrations in groundwater at points of discharge to the harbor were subsequently compared to the surface water screening levels (SWSLs) for marine aquatic habitat protection (Table F-2b of RWQCB, 2005) to determine potential ecological impacts. This appendix summarizes the methodology, mathematical formulation, input data, and assumptions used in the fate and transport analysis.

METHODOLOGY

For each COPC source in soil (i.e., soil COPCs), the methodology for modeling entailed a highly conservative approach involving the following processes, which are also graphically summarized on the schematic shown on Page 8 of this memorandum:

1) equilibrium partitioning of each COPC from solid (i.e., soil) to aqueous phase;

2) direct representation of the aqueous phase concentration (leachate concentration) as the resultant recharge concentration reaching the water table;

3) mixing of the recharge concentration with groundwater within the mixing zone (leachate mixing);

4) transport in groundwater along the path of migration (and distance) from each source to the harbor, and estimation of the resulting groundwater concentration at the point of discharge to the harbor; and

5) Comparison of the discharge point concentration to the SWSL.

For each COPC source in groundwater (i.e., groundwater COPCs), the process entailed:

1) transport in groundwater along the path of migration (and distance) from each source to the harbor, and estimation of the resulting groundwater concentration at the point of discharge to the harbor; and

2) Comparison of the discharge point concentration to the SWSL.

The following sections describe the mathematical formulation and input data used to describe each of the above-referenced processes.

Leachate concentration: In general, chemicals that are soluble in water and are volatile may exist in three phases within the vadose zone: as a gas (soil vapor) within unsaturated soil pore space, as a dissolved solute in the soil pore-water, and as a solid phase adsorbed to the soil organic matter or charged surfaces. Mathematically, the total mass of a chemical can be expressed in terms of phase contributions as:

$$M_t = M_s + M_l + M_a \quad (1)$$

where

M_t = total chemical mass in sample (mg)

M_s = chemical mass sorbed on soil materials (mg)

M_l = chemical mass in liquid-phase (mg)

M_a = chemical mass in soil vapor (mg)

Neglecting the gas-phase component, Equation (1) becomes:

$$M_t = M_s + M_l \quad (2)$$

Furthermore,

$$M_s = C_s \rho_b V_{sp} \quad (3)$$

$$M_l = C_l \theta V_{sp} \quad (4)$$

$$M_T = C_T \rho_b V_{sp} \quad (5)$$

where

ρ_b = dry soil bulk density (g/cm^3)

V_{sp} = sample volume (cm^3)

θ = volumetric water content

C_s = soil concentration (mg/kg)

C_l = liquid phase concentration (ug/l)

C_T = total concentration measured in soil sample (mg/kg)

The methodology used to estimate chemical release in soil leachate is based on a relationship between the adsorbed concentration C_s and the dissolved concentration C_l. This relationship at equilibrium is called an adsorption isotherm. A special form of the isotherm, called the linear adsorption isotherm is used in this calculation:

$$K_d = \frac{C_s}{C_l} \tag{6}$$

where

K_d = soil/water partition coefficient (l/kg)

Rearranging equations (2), (3), (4), (5), and (6) the final expression for leachate concentration is given by:

$$C_l = \frac{C_T}{\frac{K_d \rho_b}{\theta} + 1} \tag{7}$$

Leachate Mixing in Groundwater: Maintaining the conservative nature of this analysis, the aqueous-phase concentration for each soil COPC obtained from the partitioning calculation was assumed to directly represent the resulting leachate concentration reaching the water table. As such, attenuation of COPCs in pore-water (i.e., leachate) migrating through the vadose zone was conservatively ignored. This approach serves to overestimate groundwater concentrations resulting from leaching of COPCs to groundwater.

Concentrations in groundwater resulting from the leachate loading to the water table were estimated by a method using direct partitioning to groundwater of measured soil concentrations with a Leachate Mixing Factor (LMF) similar to the approach used by the US Environmental Protection Agency ([USEPA], 1996). The following equation is used to estimate the concentration in groundwater:

$$C_{ws} = \frac{C_l}{LMF} \tag{8}$$

where

C_{ws} = calculated concentration in groundwater (ug/l)

C_l = concentration in vadose zone leachate water (ug/l)

LMF = Leaching mixing factor

and

$$LMF = \frac{q_v A_v + q_a A_a}{q_v A_v} \tag{9}$$

where

q_v = vadose zone infiltration rate (ft/d)

A_v = source length parallel to groundwater flow direction (ft)

q_a = $K \cdot i$ where K = hydraulic conductivity (ft/d) and i = hydraulic gradient (-)

A_a = cross-sectional depth of mixing zone in aquifer (ft)

The equation for estimating mixing zone depth (A_a) is as follows (USEPA, 1996):

$$A_a = \sqrt{0.0112 A_v^{\,2}} + d_a \left\{ 1 - \exp\left[\frac{-A_v q_v}{K i d_a} \right] \right\} \qquad (10)$$

where

d_a = aquifer thickness (ft)

Groundwater Migration: Once in groundwater, migration of each COPC was conservatively simulated based on two-dimensional advective-dispersive transport along the path of groundwater migration from each source location to the nearest downgradient point along the harbor. The concentration of chemicals at the shoreline is calculated using the Domenico (1987) analytical model:

$$C(x,y,t) = \frac{C_o}{8} \exp\left\{ \left(\frac{x}{2\alpha_x} \right) \left[1 - \left(1 + \frac{4R\lambda\alpha_x}{v} \right)^{1/2} \right] \right\} \bullet erfc\left[\frac{x - \frac{v}{R} t \left(1 + 4R\lambda\alpha_x / v\right)^{1/2}}{2\left(\alpha_x \frac{v}{R} t \right)^{1/2}} \right]$$

$$\bullet \left\{ erf\left[\frac{(y + Y/2}{2(\alpha_y x)^{1/2}} \right] - erf\left[\frac{y - Y/2}{2(\alpha_y x)^{1/2}} \right] \right\} \bullet \left\{ erf\left[\frac{Z}{2(\alpha_z x)^{1/2}} \right] - erf\left[\frac{-Z}{2(\alpha_z x)^{1/2}} \right] \right\}$$

(11)

where

$C(x,y,t)$ = concentration at distance x downstream of source and distance y off centerline of the plume (ug/l)

C_o = concentration in source zone (ug/l)

R = retardation factor (dimensionless)

α_x = longitudinal groundwater dispersivity (ft/day)

α_y = transverse groundwater dispersivity (ft/day)

α_z = vertical groundwater dispersivity (ft/day)

v = groundwater seepage velocity (ft/day)
λ = first-order degradation rate (1/day)
Y = source width (ft)
Z = source Depth (ft)
t = time (day)

The retardation factor is expressed as:

$$R = 1 + \frac{k_d * \rho_b}{n} \quad (12)$$

where

k_d = distribution coefficient (cm^3/g,or ml/g)
ρ_b = bulk density (g/cm^3)
n = porosity

The seepage velocity v is equal to

$$v = \frac{q}{n_e} \quad (13)$$

where
q = Darcy velocity (ft/day)
n_e = effective porosity

An important component of this study was to simulate chemical transport in groundwater along the shortest path between each COPC-detected location and the nearest point of groundwater discharge to the harbor. Moreover, this analysis was meant to reflect not only transport in shallow groundwater (i.e., hydraulic fill aquifer), but transport along utility trench backfill materials and preferential pathways potentially encountered along the path of migration to the harbor. To this end, the above-referenced equation for flow and transport in groundwater was applied to the shortest, most direct distance from each COPC-detected location to the harbor. Simulated distance to the harbor for each COPC detection was previously summarized in Tables 3 and 4 within the main text of this memorandum.

ASSUMPTIONS

In addition to the assumptions outlined in Section B.2 herein, this section provides an overview of the underlying assumptions for the inputs values (parameters) required for the application of the above methodology.

Hydraulic Parameters: Hydraulic properties in the vadose and the saturated zone were assumed homogeneous and isotropic. The hydraulic gradient (magnitude and direction) between sources and the discharge points is uniform. Based on observed groundwater elevations reported by SAIC-ETIC (2005), a hydraulic gradient value of 0.0034 was assumed for the entire site

(gradient between wells MW6 and APLUP-W1). The effective porosity is equal to the total porosity, which for the more permeable materials where contaminant transport takes place, is assumed to be 0.34. Based on well borings, an average depth to the water table of 10 feet was assumed for the entire site, with soil COPCs occurring at the specified sampling depths. Since transport through vadose zone soils was conservatively ignored, leachate concentrations were immediately applied to the water table.

Within groundwater, the thickness of the artificial fill was assumed constant corresponding to approximately 17 feet (SAIC-ETIC, 2005). The hydraulic conductivity of the fill materials was assigned not only to reflect the fill permeability, but permeable sands typical of backfill materials. To this end, a hydraulic conductivity value of 0.01 cm/s (28.35 feet/day) was used, which is consistent with typical permeability of clean sands (Todd, 1980) and with Port-wide data for fill materials compiled and documented by Subsurface Consultants-Todd Engineers (1999).

Sources of contamination: The sources of contamination are assumed to be the individual point sources of contaminated soil in the vadose zone and individual point sources of contaminated groundwater in the saturated zones. In applying the solution for transport in groundwater represented by Equation (11), a constant vertical, rectangular groundwater source (1 foot wide by 5 feet deep) of concentration C_o was considered. Accordingly, each groundwater detection at the locations of the various borings and wells across the Project Area was represented by a uniform, constant (i.e., non-depleting) point source capable of supplying a continuous supply of COPC mass without depletion throughout the model simulation time and across a five-foot vertical zone beneath the water table. This approach is highly conservative, as discussed later herein.

Soil Properties: Soil properties utilized in the application of this methodology include soil-water distribution coefficient (K_d), moisture content (θ - 0.19 l/l, a typical value), porosity (n – 0.34), and bulk density (ρ_b - 1.75 kg/l, a typical value). For metals, the values of K_d reported in the literature span several orders of magnitude. An extensive literature survey conducted by HydroGeologic for the USEPA (2005) reported K_d values for soil/soil water, for different metals in several soil types. The USEPA (2005) provides range, median, and mean K_d values of metals for soil/soil water. In this study median K_d values were used for Arsenic, Cadmium, Cobalt, Copper, Lead, Mercury, Nickel, Silver, and Zinc. Since median K_d values were not reported for Antimony, Barium, and Vanadium, mean K_d values were used in this study for these metals.

Distribution coefficients for organic compounds (PAHs, SVOCs, VOCs, and TPHs) were calculated using the Soil Organic Carbon / Water Partitioning Coefficient K_{oc} and the soil organic carbon fraction f_{oc} as: $K_d = K_{oc} \cdot f_{oc}$. In calculating chemical specific K_d for organic compounds, this study used the K_{oc} values reported in RWQCB (2005) and assumed a soil with 0.1% (typical value) f_{oc}. Tables B-1 and B-2 document the K_d values used in the model for metals and organics compounds, respectively.

Infiltration rate: The average annual precipitation at the site is 23.5 inches (Western Regional Climate Center, 2006). The infiltration rate was assumed uniform for the entire site and equal to five percent (5%) of the mean annual precipitation, i.e., 1.18 in/year as infiltration rate. This rate of rainfall recharge is considered conservative given the presence of a thick paved surface across the entire site.

Solute transport parameters: Based on the approach presented in Section B.2, simulated processes for groundwater transport included uniform (i.e., homogeneous), steady (infinite-time), two-dimensional advective flow; three-dimensional (longitudinal, transverse, and vertical) dispersion; and retardation (adsorption from groundwater to soil). Retardation factors (Equation 12) were calculated using the soil properties discussed above. Dispersion, i.e., the process whereby a plume will spread out in a longitudinal direction, transversely, and vertically downwards due to mechanical mixing in the aquifer and chemical dispersion, was simulated via dispersivity values shown in Equation 11. The dispersivity values used in our model were obtained from formulations based on empirical data that indicate that longitudinal dispersivity is related to scale of the problem (distance between source and measurement point, i.e., the potential plume length). Specifically, the following relationships defined in the literature were used:

- Longitudinal dispersivity, $\alpha_x = 0.1 L_p$, (Pickens and Grisak, 1981)
- Transverse dispersivity, $\alpha_y = 0.1 \alpha_x$ (Gelhar et al., 1992)
- Vertical dispersivity, $\alpha_z = 0.01 \alpha_x$ (USEPA, 1996)

Additionally, attenuation processes in groundwater such as volatilization/biodegradation (organic compounds) and metals complexation/hydrolysis (metals) were conservatively ignored. These assumptions ensure overestimation of simulated groundwater concentrations at points of discharge to the harbor.

RESULTS

This section summarizes the results of the fate and transport analysis for each soil COPC and groundwater COPC detections that exceed the corresponding ESLs (see Tables 1a through 1e, Tables 2a through 2e, and Figures 3 through 6 in main text of this memorandum). For each COPC in soil, leachate concentration was calculated using Equation (7) and the mixing of leachate and groundwater was calculated using Equations (8), (9), and (10). Groundwater transport was simulated using Domenico's (1987) analytical solution (Equation 11), which has been also implemented in several publicly available models such as BIOSCREEN (USEPA, 1996). This solution was programmed in Visual Basic for applications as a function in an Excel spreadsheet.

All internal model calculations and results for COPCs are tabulated in Tables B-3 and B-4 for metals and organic compounds (PAHs, SVOCs, VOCs, and TPHs), respectively. Results for

groundwater COPCs for metals and organic compounds are presented in Tables B-5 and B-6, respectively.

A summary of these results and related discussion are included in the main text of this memorandum and related result tables 3 and 4.

UNCERTAINTY ANALYSIS

Use of the equilibrium portioning and Domenico groundwater transport models applied herein results in highly conservative estimates of chemical transport to the harbor. In turn, this conservatism results in an overestimation of exposure point concentrations used to screen ecological hazards through comparisons with SWSL. The conservative nature of these models is well documented in the literature (ASTM, 1995; Domenico, 1987; USEPA, 1996;). Specific conservative components of these models are summarized below, the effects of which are cumulative in ensuring overestimation of exposure point concentrations at the shoreline.

- Equilibrium Partitioning: Representation of chemical partitioning between soil and pore-water in the vadose zone through equilibrium partitioning coefficients results in an overestimation of resulting pore-water concentrations. This is particularly conservative for metals, whose distribution coefficients are rarely observed under neutral pH conditions in the field, and for volatile and semi-volatile chemicals, whose vapor-phase components were conservatively ignored in the equilibrium calculations.

- Vadose Zone Transport: Chemical attenuation through vadose zone was conservatively ignored by directly applying pore-water concentrations as leachate concentrations reaching the water table. This results in an overestimation of simulated groundwater impacts, including estimated concentrations reaching the harbor.

- Steady-state formulation: Steady-state conditions correspond to the maximum chemical flux rate through groundwater, which is assumed to remain constant over time. This results in an overestimation of groundwater flux and chemical concentrations at points of discharge to the harbor.

- Two-dimensional formulation: Absence of chemical migration and attenuation in three dimensions in both the vadose zone and groundwater results in overestimation of groundwater flux, chemical flux, and chemical concentrations at the points of groundwater discharge to the harbor.

- Constant contaminant source: Use of a non-depleting, constant source in groundwater results in an infinite supply of chemical contribution over time to groundwater. In turn, this results in overestimation of chemical concentrations at points of groundwater discharge to the harbor.

- Additional chemical attenuation processes: The groundwater modeling exercises ignored additional chemical (photolysis, hydrolysis, oxidation-reduction reactions), physical

(volatilization), and biological (biodegradation, biotransformation) processes, resulting in an overestimation of chemical contribution to the harbor.

- Metals solubility and migration: Representation of the fate and transport of metals in the groundwater model is considered highly conservative, as the impact of soil and groundwater pH on dissolution of metals, together with redox reactions are ignored. This results in overestimation of chemical concentrations reaching the harbor.

- Tidal dilution: Simulation of groundwater flow and chemical transport ignores the chemical dilution effects due to tidal influences, resulting in overestimation of chemical concentrations at points of groundwater discharge to the harbor.

- Surface water dilution: simulation of groundwater discharge to the harbor ignores the significant chemical dilution effects due to mixing of groundwater with surface water upon discharge to the harbor, resulting in a significant overestimation of chemical concentrations at points of potential exposure.

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TABLE B-1 DISTRIBUTION COEFFICIENTS
METALS
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Metals	Log Kd[1]	Kd [L/kg]
Antimony	2.3	199.53
Arsenic	3.4	2,511.89
Barium	2	100.00
Cadmium	2.9	794.33
Cobalt	2.1	125.89
Copper	2.7	501.19
Lead	4.1	12,589.25
Mercury	3.8	6,309.57
Nickel	3.1	1,258.93
Silver	2.6	398.11
Vanadium	1.7	50.12
Zinc	3.1	1,258.93

[1] USEPA, 2005: *Partition Coefficients for Metals in Surface Water, Soil, and Waste - EPA/600/R-05/075,* prepared for the U.S. EP.A, Office of Research and Development by HydroGeoLogic, Inc., and Allison Geoscience Consultants, Inc., under Contract No. 68-C6-0020, July.

Table B-2 Distribution Coefficients for PAHs, SVOCs, VOCs, and TPHs

Chemical Name	Log Koc	Koc* [l/kg]	Foc	Kd [l/kg]
Benzo(a)Anthracene	6.14	2.00E+05	0.001	200.00
Benzo(a)Pyrene	6.74	5.50E+06	0.001	5500.00
Benzo(b)Fluoranthene	5.74	5.50E+05	0.001	550.00
Benzo(g,h,i)Perylene	6.2	1.60E+06	0.001	1600.00
Benzo(k)Fluoranthene	5.74	5.50E+05	0.001	550.00
Chrysene	5.3	4.00E+05	0.001	400.00
Dibenz(a,h)Anthracene	6.52	3.30E+06	0.001	3300.00
Fluoranthene	4.58	3.80E+04	0.001	38.00
Fluorene	3.9	1.38E+04	0.001	13.80
Indeno(1,2,3-cd)Pyrene	6.2	1.60E+06	0.001	1600.00
Naphthalene	3.11	1.19E+03	0.001	1.19
Pyrene	4.58	1.05E+05	0.001	105.00
Benzene	1.81	5.90E+01	0.001	0.06
Xylenes	2.84	4.07E+02	0.001	0.41
TPH-Gasoline	-	5000	0.001	5.00
TPH-Diesel	-	5000	0.001	5.00
TPH-Motor oil	-	5000	0.001	5.00
TPH-Bunker C	-	5000	0.001	5.00
TPH - Hydraulic Oil	-	5000	0.001	5.00
Methylnapthalene	-	720	0.001	0.72
Phenanthrene	-	14000	0.001	14.00
1-Methyl-naphthale	-	720	0.001	0.72
2-Methyl-naphthale	-	720	0.001	0.72
Acetone	-	5.75E-01	0.001	0.001

* Table J, RWQCB, 2005. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim-Final. February with March Updates.

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Antimony Transport

1.- Leachate Concentration

Boring ID	-->	BB20A	GA
Symbol	**units**	**B20**	**B18**
Max soil concentration above ground water table (miligrams per kilogram) Csoil	mg/kg	**19**	**16**
Adsorption coefficient (liter per kilogram) k_d	l/kg	**199.53**	**199.53**
Bulk density kilogram per liter) r_b	kg/l	1.75	1.75
Volumetric water content (liter per liter) q	l/l	0.19	0.19
Leachate concentration (microgram per liter) C_l	ug/l	**10.33**	**8.70**

2.- Leachate and Groundwater Mixing

Boring ID	-->	BB20A	GA
Symbol	**units**	**B20**	**B18**
Vadose zone infiltration rate (feet per year) q_v	ft/yr	0.098	0.098
Source length parallel to groundwater flow direction (feet) A_y	ft	10	10
Darcy velocity (feet per year) q_a	ft/yr	35.21	35.21
Aquifer thickness (feet) d_a	ft	17.00	17.00
Estimated mixing zone depth (feet) d	ft	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet) A_a	ft	1.09	1.09
Leachate Mixing Factor LMF		40.05	40.05

3. - Groundwater Transport

Area	Boring ID	-->	BB20A	GA
Location ID	**Symbol**	**units**	**B20**	**B18**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28
		ft/year	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	15.00	45.00
Dispersivity in the transverse direction (feet)	a_y	ft	1.50	4.50
Dispersivity in the vertical direction (feet)	a_z	ft	0.15	0.45
Source width (feet)	Y	ft	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00
Porosity	n	-	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**199.53**	**199.53**
Retardation factor	R	-	1027.97	1027.97
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.26**	**0.22**
Solute decay coefficient (day[2])	*m*	1/day	0.00	0.00
Boundary cond (source) decay coefficient (day[1])	*l*	1/day	0.00	0.00

Distance (feet)	L	ft	**150**	**450**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_x	ug/L	**2.639E-03**	**2.587E-04**
SWSL-Marine[2] (micrograms per liter)		ug/L	500	500

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Arsenic Transport

1.- Leachate Concentration

Boring ID	-->	DS / RA	DS / RA	MDFA	MDFA
Symbol	**units**	**B8**	**B13**	**B56**	**OKUS-B13**
Max soil concentration above ground water table (miligrams per kilogram) Csoil	mg/kg	**38**	**24**	**27**	**58**
Adsorption coefficient (liter per kilogram) k_d	l/kg	**2511.8864**	**2511.8864**	**2511.8864**	**2511.8864**
Bulk density kilogram per liter) r_b	kg/l	1.75	1.75	1.75	1.75
Volumetric water content (liter per liter) q	l/l	0.19	0.19	0.19	0.19
Leachate concentration (microgram per liter) C_l	ug/l	**1.64**	**1.04**	**1.17**	**2.51**

2.- Leachate and Groundwater Mixing

Boring ID	-->	DS / RA	DS / RA	MDFA	MDFA
Symbol	**units**	**B8**	**B13**	**B56**	**OKUS-B13**
Vadose zone infiltration rate (feet per year) q_v	ft/yr	0.097916667	0.097916667	0.097916667	0.097916667
Source length parallel to groundwater flow direction (feet) A_y	ft	10	10	10	10
Darcy velocity (feet per year) q_a	ft/yr	35.21	35.21	35.21	35.21
Aquifer thickness (feet) d_a	ft	17.00	17.00	17.00	17.00
Estimated mixing zone depth (feet) d	ft	1.09	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet) A_a	ft	1.09	1.09	1.09	1.09
Leachate Mixing Factor LMF		40.05	40.05	40.05	40.05

3. - Groundwater Transport

Area	Boring ID	-->	DS / RA	DS / RA	MDFA	MDFA
Location ID	**Symbol**	**units**	**B8**	**B13**	**B56**	**OKUS-B13**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	88.00	108.00	42.00	60.00
Dispersivity in the transverse direction (feet)	a_y	ft	8.80	10.80	4.20	6.00
Dispersivity in the vertical direction (feet)	a_z	ft	0.88	1.08	0.42	0.60
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**2511.89**	**2511.89**	**2511.89**	**2511.89**
Retardation factor	R	-	12929.83	12929.83	12929.83	12929.83
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.04**	**0.03**	**0.03**	**0.06**
Solute decay coefficient (day[1])	*m*	1/day	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day[1])	*l*	1/day	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**880**	**1080**	**420**	**600**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_x	ug/L	**1.069E-16**	**8.096E-20**	**7.000E-10**	**2.470E-12**
SWSL-Marine[2] (micrograms per liter)		ug/L	0.14	0.14	0.14	0.14

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Barium Transport

1.- Leachate Concentration

Boring ID	-->	DS / RA	MDFA	GA	GA
Symbol	**units**	**B8**	**B56**	**B15**	**B87**
Max soil concentration above ground water table (miligrams per kilogram) Csoil	mg/kg	**350**	**370**	**480**	**760**
Adsorption coefficient (liter per kilogram) k_d	l/kg	**100.0000**	**100.0000**	**100.0000**	**100.0000**
Bulk density kilogram per liter) r_b	kg/l	1.75	1.75	1.75	1.75
Volumetric water content (liter per liter) q	l/l	0.19	0.19	0.19	0.19
Leachate concentration (microgram per liter) C_l	ug/l	**379.59**	**401.28**	**520.58**	**824.25**

2.- Leachate and Groundwater Mixing

Boring ID	-->	DS / RA	MDFA	GA	GA
Symbol	**units**	**B8**	**B56**	**B15**	**B87**
Vadose zone infiltration rate (feet per year) q_v	ft/yr	0.097916667	0.097916667	0.097916667	0.097916667
Source length parallel to groundwater flow direction (feet) A_y	ft	10	10	10	10
Darcy velocity (feet per year) q_a	ft/yr	35.21	35.21	35.21	35.21
Aquifer thickness (feet) d_a	ft	17.00	17.00	17.00	17.00
Estimated mixing zone depth (feet) d	ft	1.09	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet) A_a	ft	1.09	1.09	1.09	1.09
Leachate Mixing Factor LMF		40.05	40.05	40.05	40.05

3. - Groundwater Transport

Area					
Location ID	Boring ID -->	DS / RA	MDFA	GA	GA
	Symbol **units**	**B8**	**B56**	**B15**	**B87**
Hydraulic conductivity (feet per day)	K ft/day	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i ft/ft	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a ft/day	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U ft/day	0.28	0.28	0.28	0.28
	ft/year	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x ft	88.00	42.00	79.00	75.00
Dispersivity in the transverse direction (feet)	a_y ft	8.80	4.20	7.90	7.50
Dispersivity in the vertical direction (feet)	a_z ft	0.88	0.42	0.79	0.75
Source width (feet)	Y ft	1.00	1.00	1.00	1.00
Source depth (feet)	Z ft	5.00	5.00	5.00	5.00
Porosity	n -	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b kg/l	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d l/kg	**100.00**	**100.00**	**100.00**	**100.00**
Retardation factor	R -	515.71	515.71	515.71	515.71
Initial source concentration (micrograms per liter)	C_0 ug/L	**9.48**	**10.02**	**13.00**	**20.58**
Solute decay coefficient (day[2])	*m* 1/day	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day[1])	*l* 1/day	0.00	0.00	0.00	0.00

Distance (feet)	L ft	**880**	**420**	**790**	**750**
Time (10,000 years ~ 3,652,500 days)	t days	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_x ug/L	**2.983E-03**	**1.413E-02**	**5.144E-03**	**9.072E-03**
SWSL-Marine[2] (micrograms per liter)	ug/L	1000	1000	1000	1000

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Cadmium Transport

1.- Leachate Concentration

Boring ID	-->	BB20A
Symbol	**units**	**B20**
Csoil	mg/kg	**3.3**
k_d	l/kg	**794.33**
r_b	kg/l	1.75
q	l/l	0.19
C_l	ug/l	**0.45**

Max soil concentration above ground water table (miligrams per kilogram)
Adsorption coefficient (liter per kilogram)
Bulk density kilogram per liter)
Volumetric water content (liter per liter)
Leachate concentration (microgram per liter)

2.- Leachate and Groundwater Mixing

Boring ID	-->	BB20A
Symbol	**units**	**B20**
q_v	ft/yr	0.097916667
A_y	ft	10
q_a	ft/yr	35.21
d_a	ft	17.00
d	ft	1.09
A_a	ft	1.09
LMF		40.05

Vadose zone infiltration rate (feet per year)
Source length parallel to groundwater flow direction (feet)
Darcy velocity (feet per year)
Aquifer thickness (feet)
Estimated mixing zone depth (feet)
cross-sectional depth of mixing zone in aquifer (feet)
Leachate Mixing Factor

3. - Groundwater Transport

Boring ID	-->	BB20A
Symbol	**units**	**B20**
K	ft/day	28.35
i	ft/ft	0.0034
q_a	ft/day	0.096
U	ft/day	0.28
	ft/year	103.55
a_x	ft	15.00
a_y	ft	1.50
a_z	ft	0.15
Y	ft	1.00
Z	ft	5.00
n	-	0.34
r_b	kg/l	1.75
k_d	l/kg	**794.33**
R	-	4089.45
C_0	ug/L	**0.01**
m	1/day	0.00
l	1/day	0.00

Area
Location ID
Hydraulic conductivity (feet per day)
Hydraulic gradient (foot/foot)
Darcy velocity (feet per day)
Seepage velocity (feet per day) and (feet per year)

Dispersivity in the longitudinal direction (feet)
Dispersivity in the transverse direction (feet)
Dispersivity in the vertical direction (feet)
Source width (feet)
Source depth (feet)
Porosity
Bulk density (kilograms per liter)
Adsorption coefficient (liter per kilogram)
Retardation factor
Initial source concentration (micrograms per liter)
Solute decay coefficient (day[2])
Boundary cond (source) decay coefficient (day[1])

L	ft	**150**
t	days	**3652500**
C_x	ug/L	**1.016E-04**
	ug/L	9.3

Distance (feet)
Time (10,000 years ~ 3,652,500 days)
Concentration at shoreline[1] (micrograms per liter)
SWSL-Marine[2] (micrograms per liter)

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Cobalt Transport

1.- Leachate Concentration

Boring ID	-->	TEF6-9A
Symbol	**units**	**B39**
Csoil	mg/kg	**43**
k_d	l/kg	**125.8925**
r_b	kg/l	1.75
q	l/l	0.19
C_l	ug/l	**37.05**

Max soil concentration above ground water table (miligrams per kilogram)
Adsorption coefficient (liter per kilogram)
Bulk density kilogram per liter)
Volumetric water content (liter per liter)
Leachate concentration (microgram per liter)

2.- Leachate and Groundwater Mixing

Boring ID	-->	TEF6-9A
Symbol	**units**	**B39**
q_v	ft/yr	0.097916667
A_v	ft	10
q_a	ft/yr	35.21
d_a	ft	17.00
d	ft	1.09
A_a	ft	1.09
LMF		40.05

Vadose zone infiltration rate (feet per year)
Source length parallel to groundwater flow direction (feet)
Darcy velocity (feet per year)
Aquifer thickness (feet)
Estimated mixing zone depth (feet)
cross-sectional depth of mixing zone in aquifer (feet)
Leachate Mixing Factor

3. - Groundwater Transport

Boring ID	-->	TEF6-9A
Symbol	**units**	**B39**
K	ft/day	28.35
i	ft/ft	0.0034
q_a	ft/day	0.096
U	ft/day	0.28
	ft/year	103.55
a_x	ft	78.00
a_y	ft	7.80
a_z	ft	0.78
Y	ft	1.00
Z	ft	5.00
n	-	0.34
r_b	kg/l	1.75
k_d	l/kg	**125.89**
R	-	648.98
C_0	ug/L	**0.93**
m	1/day	0.00
l	1/day	0.00

Area
Location ID
Hydraulic conductivity (feet per day)
Hydraulic gradient (foot/foot)
Darcy velocity (feet per day)
Seepage velocity (feet per day) and (feet per year)

Dispersivity in the longitudinal direction (feet)
Dispersivity in the transverse direction (feet)
Dispersivity in the vertical direction (feet)
Source width (feet)
Source depth (feet)
Porosity
Bulk density (kilograms per liter)
Adsorption coefficient (liter per kilogram)
Retardation factor
Initial source concentration (micrograms per liter)
Solute decay coefficient (day[2])
Boundary cond (source) decay coefficient (day[1])

L	ft	**780**
t	days	**3652500**
C_s	ug/L	**3.619E-04**
	ug/L	3.0

Distance (feet)
Time (10,000 years ~ 3,652,500 days)
Concentration at shoreline[1] (micrograms per liter)
SWSL-Marine[2] (micrograms per liter)

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Copper Transport

1.- Leachate Concentration

Boring ID	-->	BB20A	BB20A	DS/RA	TEF6-9	TEF6-9	TEF11-13	GA	GA	GA
Symbol	**units**	**B20**	**B44**	**B70**	**B39**	**B52**	**B49**	**B16**	**B18**	**B81**
Max soil concentration above ground water table (miligrams per kilogram)	Csoil	mg/kg	360	110	130	160	74	750	190	130	72
Adsorption coefficient (liter per kilogram)	k_d	l/kg	501.19	501.19	501.19	501.19	501.19	501.19	501.19	501.19	501.19
Bulk density kilogram per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Volumetric water content (liter per liter)	q	l/l	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Leachate concentration (microgram per liter)	C_l	ug/l	**77.97**	**23.82**	**28.16**	**34.65**	**16.03**	**162.44**	**41.15**	**28.16**	**15.59**

2.- Leachate and Groundwater Mixing

Boring ID	-->	BB20A	BB20A	DS/RA	TEF6-9	TEF6-9	TEF11-13	GA	GA	GA
Symbol	**units**	**B20**	**B44**	**B70**	**B39**	**B52**	**B49**	**B16**	**B18**	**B81**
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667
Source length parallel to groundwater flow direction (feet)	A_v	ft	10	10	10	10	10	10	10	10	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21
Aquifer thickness (feet)	d_a	ft	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Estimated mixing zone depth (feet)	d	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_a	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Leachate Mixing Factor	LMF	-	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05

3. - Groundwater Transport

Area	Boring ID	-->	BB20A	BB20A	DS/RA	TEF6-9	TEF6-9	TEF11-13	GA	GA	GA
Location ID	**Symbol**	**units**	**B20**	**B44**	**B70**	**B39**	**B52**	**B49**	**B16**	**B18**	**B81**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	15.00	11.00	96.00	78.00	89.00	48.00	30.00	45.00	49.00
Dispersivity in the transverse direction (feet)	a_y	ft	1.50	1.10	9.60	7.80	8.90	4.80	3.00	4.50	4.90
Dispersivity in the vertical direction (feet)	a_z	ft	0.15	0.11	0.96	0.78	0.89	0.48	0.30	0.45	0.49
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**501.19**	**501.19**	**501.19**	**501.19**	**501.19**	**501.19**	**501.19**	**501.19**	**501.19**
Retardation factor	R	-	2580.64	2580.64	2580.64	2580.64	2580.64	2580.64	2580.64	2580.64	2580.64
Initial source concentration (micrograms per liter)	C_0	ug/L	**1.95**	**0.59**	**0.70**	**0.87**	**0.40**	**4.06**	**1.03**	**0.70**	**0.39**
Solute decay coefficient (day[1])	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day[1])	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Distance (feet)	L	ft	**150**	**110**	**960**	**780**	**890**	**480**	**300**	**450**	**490**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.0197**	**0.0105**	**4.22E-06**	**2.32E-05**	**4.27E-06**	**0.0015**	**0.0021**	**3.45E-04**	**1.32E-04**
SWSL-Marine[2] (micrograms per liter)		ug/L	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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BB20A: Boring B20 Area
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TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Lead Transport

1.- Leachate Concentration

Boring ID	-->	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	MDFA	MDFA	MDFA
Symbol	**units**	**B14**	**B67**	**B69**	**B70**	**B71**	**B72**	**B74**	**B75**	**B8**	**B8**	**B19**	**B69**	**B68**	**B68**	**B70**	**B73**	**B28**	**B56**	**B59**
Max soil concentration above ground water table (miligrams per kilogram)	Csoil	mg/kg	53	39	150	62	36	84	73	34	18	41	30	51	26	19	37	17	35	320	130
Adsorption coefficient (liter per kilogram)	k_d	l/kg	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25
Bulk density kilogram per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Volumetric water content (liter per liter)	q	l/l	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Leachate concentration (microgram per liter)	C_l	ug/l	**0.46**	**0.34**	**1.29**	**0.53**	**0.31**	**0.72**	**0.63**	**0.29**	**0.16**	**0.35**	**0.26**	**0.44**	**0.22**	**0.16**	**0.32**	**0.15**	**0.30**	**2.76**	**1.12**

2.- Leachate and Groundwater Mixing

Boring ID	-->	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	MDFA	MDFA	MDFA
Symbol	**units**	**B14**	**B67**	**B69**	**B70**	**B71**	**B72**	**B74**	**B75**	**B8**	**B8**	**B19**	**B69**	**B68**	**B68**	**B70**	**B73**	**B28**	**B56**	**B59**
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667
Source length parallel to groundwater flow direction (feet)	A_v	ft	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21
Aquifer thickness (feet)	d_a	ft	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Estimated mixing zone depth (feet)	d	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_a	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Leachate Mixing Factor	LMF	-	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05

3. - Groundwater Transport

Area																					
Location ID	Boring ID	-->	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	MDFA	MDFA	MDFA
	Symbol	**units**	**B14**	**B67**	**B69**	**B70**	**B71**	**B72**	**B74**	**B75**	**B8**	**B8**	**B19**	**B69**	**B68**	**B68**	**B70**	**B73**	**B28**	**B56**	**B59**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	114.00	91.00	87.00	96.00	103.00	99.00	131.00	134.00	88.00	88.00	126.00	87.00	95.00	95.00	96.00	119.00	80.00	42.00	24.00
Dispersivity in the transverse direction (feet)	a_y	ft	11.40	9.10	8.70	9.60	10.30	9.90	13.10	13.40	8.80	8.80	12.60	8.70	9.50	9.50	9.60	11.90	8.00	4.20	2.40
Dispersivity in the vertical direction (feet)	a_z	ft	1.14	0.91	0.87	0.96	1.03	0.99	1.31	1.34	0.88	0.88	1.26	0.87	0.95	0.95	0.96	1.19	0.80	0.42	0.24
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**
Retardation factor	R	-	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.01**	**0.01**	**0.03**	**0.01**	**0.01**	**0.02**	**0.02**	**0.01**	**0.004**	**0.01**	**0.01**	**0.01**	**0.01**	**0.004**	**0.01**	**0.004**	**0.01**	**0.07**	**0.03**
Solute decay coefficient (day[3])	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day[1])	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**1140**	**910**	**870**	**960**	**1030**	**990**	**1310**	**1340**	**880**	**880**	**1260**	**870**	**950**	**950**	**960**	**1190**	**800**	**420**	**240**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[2] (micrograms per liter)	C_s	ug/L	**2.37E-83**	**1.29E-67**	**2.89E-64**	**7.19E-71**	**6.15E-76**	**8.26E-73**	**6.51E-95**	**2.62E-97**	**7.05E-66**	**1.60E-65**	**7.35E-92**	**9.82E-65**	**1.48E-70**	**1.08E-70**	**4.29E-71**	**2.74E-87**	**4.72E-60**	**1.37E-32**	**3.56E-20**
SWSL-Marine[2] (micrograms per liter)		ug/L	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Lead Transport

1.- Leachate Concentration

Boring ID	-->	MDFA	MDFA	MDFA	MDFA	BB20A	BB20A	BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF11-13A	TEF11-13A
Symbol	**units**	**OKUS-W6**	**B55**	**OKUS-B13**	**OKUS-B13**	**B20**	**B40**	**B40**	**B41**	**B44**	**B24**	**B33**	**B31**	**B39**	**B33**	**B35**	**B35**	**B52**	**B46**	**B49**
Max soil concentration above ground water table (miligrams per kilogram)	Csoil	mg/kg	122	23	389	149	1300	53	68	22	390	220	41	32	150	17	20	22	59	31	110
Adsorption coefficient (liter per kilogram)	k_d	l/kg	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25
Bulk density kilogram per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Volumetric water content (liter per liter)	q	l/l	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Leachate concentration (microgram per liter)	C_l	ug/l	**1.05**	**0.20**	**3.35**	**1.28**	**11.21**	**0.46**	**0.59**	**0.19**	**3.36**	**1.90**	**0.35**	**0.28**	**1.29**	**0.15**	**0.17**	**0.19**	**0.51**	**0.27**	**0.95**

2.- Leachate and Groundwater Mixing

Boring ID	-->	MDFA	MDFA	MDFA	MDFA	BB20A	BB20A	BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF11-13A	TEF11-13A
Symbol	**units**	**OKUS-W6**	**B55**	**OKUS-B13**	**OKUS-B13**	**B20**	**B40**	**B40**	**B41**	**B44**	**B24**	**B33**	**B31**	**B39**	**B33**	**B35**	**B35**	**B52**	**B46**	**B49**
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667
Source length parallel to groundwater flow direction (feet)	A_v	ft	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21
Aquifer thickness (feet)	d_a	ft	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Estimated mixing zone depth (feet)	d	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_a	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Leachate Mixing Factor	LMF	-	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05

3. - Groundwater Transport

Area																				
Location ID	Boring ID	-->	MDFA	MDFA	MDFA	MDFA	BB20A	BB20A	BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF11-13A	TEF11-13A
	Symbol	**units**	**OKUS-W6**	**B55**	**OKUS-B13**	**OKUS-B13**	**B20**	**B40**	**B40**	**B41**	**B44**	**B24**	**B33**	**B31**	**B39**	**B33**	**B35**	**B35**	**B52**	**B46**	**B49**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	76.00	78.00	60.00	60.00	15.00	10.00	10.00	25.00	11.00	60.00	71.00	75.00	78.00	71.00	87.00	87.00	88.00	60.00	48.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.60	7.80	6.00	6.00	1.50	1.00	1.00	2.50	1.10	6.00	7.10	7.50	7.80	7.10	8.70	8.70	8.80	6.00	4.80
Dispersivity in the vertical direction (feet)	a_z	ft	0.76	0.78	0.60	0.60	0.15	0.10	0.10	0.25	0.11	0.60	0.71	0.75	0.78	0.71	0.87	0.87	0.88	0.60	0.48
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**
Retardation factor	R	-	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.03**	**0.005**	**0.08**	**0.03**	**0.28**	**0.01**	**0.01**	**0.005**	**0.08**	**0.05**	**0.01**	**0.01**	**0.03**	**0.004**	**0.004**	**0.005**	**0.01**	**0.01**	**0.02**
Solute decay coefficient (day[1])	m	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day[1])	l	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**760**	**780**	**600**	**600**	**150**	**100**	**100**	**250**	**110**	**600**	**710**	**750**	**780**	**710**	**870**	**870**	**880**	**600**	**480**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**9.75E-57**	**7.55E-59**	**4.12E-45**	**1.58E-45**	**1.33E-12**	**3.09E-10**	**3.96E-10**	**1.15E-21**	**3.95E-10**	**2.33E-45**	**9.66E-54**	**1.26E-56**	**4.92E-58**	**4.01E-54**	**3.85E-65**	**4.23E-65**	**2.31E-65**	**3.28E-46**	**2.86E-37**
SWSL-Marine[2] (micrograms per liter)		ug/L	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Lead Transport

1.- Leachate Concentration

Boring ID	-->	TEF11-13A	TEF11-13A	TEF11-13A	TEF11-13A	GA	GA	GA	GA	GA	GA	GA
Symbol	**units**	**B-1**	**B-2**	**B45**	**B47**	**B16**	**B17**	**B18**	**B81**	**B16**	**B16**	**B84**
Max soil concentration above ground water table (miligrams per kilogram)	Csoil	mg/kg	29	18	31	51	190	40	50	130	30	30	29
Adsorption coefficient (liter per kilogram)	k_d	l/kg	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25	12,589.25
Bulk density kilogram per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Volumetric water content (liter per liter)	q	l/l	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Leachate concentration (microgram per liter)	C_l	ug/l	**0.25**	**0.16**	**0.27**	**0.44**	**1.64**	**0.34**	**0.43**	**1.12**	**0.26**	**0.26**	**0.25**

2.- Leachate and Groundwater Mixing

Boring ID	-->	TEF11-13A	TEF11-13A	TEF11-13A	TEF11-13A	GA	GA	GA	GA	GA	GA	GA
Symbol	**units**	**B-1**	**B-2**	**B45**	**B47**	**B16**	**B17**	**B18**	**B81**	**B16**	**B16**	**B84**
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667
Source length parallel to groundwater flow direction (feet)	A_v	ft	10	10	10	10	10	10	10	10	10	10	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21
Aquifer thickness (feet)	d_a	ft	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Estimated mixing zone depth (feet)	d	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_a	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Leachate Mixing Factor	LMF	-	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05

3. - Groundwater Transport

Area													
Location ID	Boring ID	-->	TEF11-13A	TEF11-13A	TEF11-13A	TEF11-13A	GA	GA	GA	GA	GA	GA	GA
	Symbol	**units**	**B1**	**B2**	**B45**	**B47**	**B16**	**B17**	**B18**	**B81**	**B16**	**B16**	**B84**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	68.00	66.00	52.00	55.00	30.00	11.00	45.00	49.00	30.00	30.00	60.00
Dispersivity in the transverse direction (feet)	a_y	ft	6.80	6.60	5.20	5.50	3.00	1.10	4.50	4.90	3.00	3.00	6.00
Dispersivity in the vertical direction (feet)	a_z	ft	0.68	0.66	0.52	0.55	0.30	0.11	0.45	0.49	0.30	0.30	0.60
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**	**12,589.25**
Retardation factor	R	-	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63	64798.63
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.01**	**0.004**	**0.01**	**0.01**	**0.04**	**0.01**	**0.01**	**0.03**	**0.01**	**0.01**	**0.01**
Solute decay coefficient (day[1])	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day[1])	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**680**	**660**	**520**	**550**	**300**	**110**	**450**	**490**	**300**	**300**	**600**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**8.30E-52**	**1.27E-50**	**1.27E-40**	**1.67E-42**	**2.59E-24**	**4.06E-11**	**1.66E-35**	**6.72E-38**	**4.08E-25**	**4.08E-25**	**3.07E-46**
SWSL-Marine[2] (micrograms per liter)		ug/L	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Mercury Transport

1.- Leachate Concentration

Boring ID	-->	MDFA	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	GA
Symbol	**units**	**B56**	**B20**	**B41**	**B24**	**B34**	**B39**	**B52**	**B33**	**B35**	**B39**	**B81**
Max soil concentration above ground water table (miligrams per kilogram) Csoil	mg/kg	0.77	5.1	0.67	3.1	0.82	6.7	2.8	0.75	0.71	0.55	0.47
Adsorption coefficient (liter per kilogram) k_d	l/kg	6310	6310	6310	6310	6310	6310	6310	6310	6310	6310	6310
Bulk density kilogram per liter) r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Volumetric water content (liter per liter) q	l/l	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Leachate concentration (microgram per liter) C_l	ug/l	**0.01**	**0.09**	**0.01**	**0.05**	**0.01**	**0.12**	**0.05**	**0.01**	**0.01**	**0.01**	**0.01**

2.- Leachate and Groundwater Mixing

Boring ID	-->	MDFA	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	GA
Symbol	**units**	**B56**	**B20**	**B41**	**B24**	**B34**	**B39**	**B52**	**B33**	**B35**	**B39**	**B81**
Vadose zone infiltration rate (feet per year) q_v	ft/yr	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667
Source length parallel to groundwater flow direction (feet) A_v	ft	10	10	10	10	10	10	10	10	10	10	10
Darcy velocity (feet per year) q_a	ft/yr	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21
Aquifer thickness (feet) d_a	ft	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Estimated mixing zone depth (feet) d	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet) A_a	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Leachate Mixing Factor LMF	-	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05

2. - Groundwater Transport

Area												
Location ID		MDFA	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	GA
Symbol	**units**	**B56**	**B20**	**B41**	**B24**	**B34**	**B39**	**B52**	**B33**	**B35**	**B39**	**B81**
Hydraulic conductivity (feet per day) K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot) i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day) q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year) U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
	ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet) a_x	ft	42.00	15.00	25.00	60.00	68.00	78.00	89.00	71.00	87.00	78.00	49.00
Dispersivity in the transverse direction (feet) a_y	ft	4.20	1.50	2.50	6.00	6.80	7.80	8.90	7.10	8.70	7.80	4.90
Dispersivity in the vertical direction (feet) a_z	ft	0.42	0.15	0.25	0.60	0.68	0.78	0.89	0.71	0.87	0.78	0.49
Source width (feet) Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet) Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter) r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram) k_d	l/kg	**6310**	**6310**	**6310**	**6310**	**6310**	**6310**	**6310**	**6310**	**6310**	**6310**	**6310**
Retardation factor R	-	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75
Initial source concentration (micrograms per liter) C_0	ug/L	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Solute decay coefficient (day^{-1}) *m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1}) *l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet) L	ft	**420**	**150**	**250**	**600**	**680**	**780**	**890**	**710**	**870**	**780**	**490**
Time (10,000 years ~ 3,652,500 days) t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter) C_s	ug/L	**1.49E-20**	**1.50E-09**	**2.63E-14**	**1.91E-26**	**7.06E-30**	**1.63E-32**	**8.87E-37**	**5.54E-31**	**1.14E-36**	**1.34E-33**	**2.62E-23**
SWSL-Marine[2] (micrograms per liter)	ug/L	2.50E-02	2.50E-02	2.50E-02	2.50E-02	2.50E-02	2.50E-02	2.50E-02	2.50E-02	2.50E-02	2.50E-02	2.50E-02

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Nickel Transport

1.- Leachate Concentration

Boring ID	-->	TEF6-9A
Symbol	**units**	**B39**
Max soil concentration above ground water table (miligrams per kilogram)	Csoil	mg/kg	**280**
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**1258.93**
Bulk density kilogram per liter)	r_b	kg/l	1.75
Volumetric water content (liter per liter)	q	l/l	0.19
Leachate concentration (microgram per liter)	C_l	ug/l	**24.15**

2.- Leachate and Groundwater Mixing

Boring ID	-->	TEF6-9A
Symbol	**units**	**B39**
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.097916667
Source length parallel to groundwater flow direction (feet)	A_y	ft	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21
Aquifer thickness (feet)	d_a	ft	17.00
Estimated mixing zone depth (feet)	d	ft	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_a	ft	1.09
Leachate Mixing Factor	LMF		40.05

3. - Groundwater Transport

Area	Boring ID	-->	TEF6-9A
Location ID	**Symbol**	**units**	**B39**
Hydraulic conductivity (feet per day)	K	ft/day	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28
		ft/year	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	78.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.80
Dispersivity in the vertical direction (feet)	a_z	ft	0.78
Source width (feet)	Y	ft	1.00
Source depth (feet)	Z	ft	5.00
Porosity	n	-	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**1259**
Retardation factor	R	-	6480.76
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.60**
Solute decay coefficient (day[2])	*m*	1/day	0.00
Boundary cond (source) decay coefficient (day[1])	*l*	1/day	0.00

Distance (feet)	L	ft	**780**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_x	ug/L	**1.062E-08**
SWSL-Marine[2] (micrograms per liter)		ug/L	8.2

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Silver Transport

1.- Leachate Concentration

Boring ID	-->	TEF6-9A	TEF6-9A
Symbol	**units**	**B39**	**B39**
Max soil concentration above ground water table (miligrams per kilogram) Csoil	mg/kg	5.3	2
Adsorption coefficient (liter per kilogram) k_d	l/kg	**398.11**	**398.11**
Bulk density kilogram per liter) r_b	kg/l	1.75	1.75
Volumetric water content (liter per liter) q	l/l	0.19	0.19
Leachate concentration (microgram per liter) C_l	ug/l	**1.45**	**0.55**

2.- Leachate and Groundwater Mixing

Boring ID	-->	TEF6-9A	TEF6-9A
Symbol	**units**	**B39**	**B39**
Vadose zone infiltration rate (feet per year) q_v	ft/yr	0.097916667	0.097916667
Source length parallel to groundwater flow direction (feet) A_y	ft	10	10
Darcy velocity (feet per year) q_a	ft/yr	35.21	35.21
Aquifer thickness (feet) d_a	ft	17.00	17.00
Estimated mixing zone depth (feet) d	ft	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet) A_a	ft	1.09	1.09
Leachate Mixing Factor LMF		40.05	40.05

3. - Groundwater Transport

Area	Boring ID	-->	TEF6-9A	TEF6-9A
Location ID	**Symbol**	**units**	**B39**	**B39**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28
		ft/year	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	78.00	78.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.80	7.80
Dispersivity in the vertical direction (feet)	a_z	ft	0.78	0.78
Source width (feet)	Y	ft	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00
Porosity	n	-	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**398**	**398**
Retardation factor	R	-	2050.08	2050.08
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.04**	**0.01**
Solute decay coefficient (day[2])	*m*	1/day	0.00	0.00
Boundary cond (source) decay coefficient (day[1])	*l*	1/day	0.00	0.00

Distance (feet)	L	ft	**780**	**780**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_x	ug/L	**2.435E-06**	**9.19E-07**
SWSL-Marine[2] (micrograms per liter)		ug/L	0.19	0.19

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Vanadium Transport

1.- Leachate Concentration

Boring ID	-->	BB20A	TEF6-9A	TEF11-13A
Symbol	**units**	**B20**	**B39**	**B49**
Max soil concentration above ground water table (miligrams per kilogram)	Csoil	mg/kg	140	450	76
Adsorption coefficient (liter per kilogram)	k_d	l/kg	50.12	50.12	50.12
Bulk density kilogram per liter)	r_b	kg/l	1.75	1.75	1.75
Volumetric water content (liter per liter)	q	l/l	0.18	0.19	0.19
Leachate concentration (microgram per liter)	C_l	ug/l	**286.73**	**972.72**	**164.28**

2.- Leachate and Groundwater Mixing

Boring ID	-->	BB20A	TEF6-9A	TEF6-9A
Symbol	**units**	**B20**	**B39**	**B39**
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.097916667	0.097916667	0.097916667
Source length parallel to groundwater flow direction (feet)	A_v	ft	10	10	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21	35.21	35.21
Aquifer thickness (feet)	d_a	ft	17.00	17.00	17.00
Estimated mixing zone depth (feet)	d	ft	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_a	ft	1.09	1.09	1.09
Leachate Mixing Factor	LMF	-	40.05	40.05	40.05

3. - Groundwater Transport

Area					
Location ID	Boring ID	-->	BB20A	TEF6-9A	TEF6-9A
	Symbol	**units**	**B20**	**B39**	**B39**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	15.00	78.00	48.00
Dispersivity in the transverse direction (feet)	a_y	ft	1.50	7.80	4.80
Dispersivity in the vertical direction (feet)	a_z	ft	0.15	0.78	0.48
Source width (feet)	Y	ft	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**50.119**	**50.119**	**50.119**
Retardation factor	R	-	258.96	258.96	258.96
Initial source concentration (micrograms per liter)	C_0	ug/L	**7.16**	**24.29**	**4.10**
Solute decay coefficient (day[2])	*m*	1/day	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day[1])	*l*	1/day	0.00	0.00	0.00

Distance (feet)	L	ft	**150**	**780**	**480**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.073**	**0.010**	**4.44E-03**
SWSL-Marine[2] (micrograms per liter)		ug/L	19	19	19

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Zinc Transport

1.- Leachate Concentration

Boring ID	-->	MDFA	MDFA	MDFA	DS/RA	DS/RA	DS/RA	DS/RA	DS/RA	DS/RA	BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A
Symbol	**units**	**B56**	**B28**	**B59**	**B13**	**B22**	**B69**	**B72**	**B73**	**B74**	**B20**	**B40**	**B44**	**B24**	**B35**	**B39**
Csoil	mg/kg	420	120	150	130	140	170	130	110	170	1500	150	430	650	410	330
k_d	l/kg	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93
r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
q	l/l	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
C_l	ug/l	**36.22**	**10.35**	**12.94**	**11.21**	**12.07**	**14.66**	**11.21**	**9.49**	**14.66**	**129.35**	**12.94**	**37.08**	**56.05**	**35.36**	**28.46**

Max soil concentration above ground water table (miligrams per kilogram)
Adsorption coefficient (liter per kilogram)
Bulk density kilogram per liter)
Volumetric water content (liter per liter)
Leachate concentration (microgram per liter)

2.- Leachate and Groundwater Mixing

Boring ID	-->	MDFA	MDFA	MDFA	DS/RA	DS/RA	DS/RA	DS/RA	DS/RA	DS/RA	BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A
Symbol	**units**	**B56**	**B28**	**B59**	**B13**	**B22**	**B69**	**B72**	**B73**	**B74**	**B20**	**B40**	**B44**	**B24**	**B35**	**B39**
q_v	ft/yr	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667
A_v	ft	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
q_a	ft/yr	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21
d_a	ft	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
d	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
A_a	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
LMF	-	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05

Vadose zone infiltration rate (feet per year)
Source length parallel to groundwater flow direction (feet)
Darcy velocity (feet per year)
Aquifer thickness (feet)
Estimated mixing zone depth (feet)
cross-sectional depth of mixing zone in aquifer (feet)
Leachate Mixing Factor

2. - Groundwater Transport

Area																
Location ID	-->	MDFA	MDFA	MDFA	DS/RA	DS/RA	DS/RA	DS/RA	DS/RA	DS/RA	BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A
Symbol	**units**	**B56**	**B28**	**B59**	**B13**	**B22**	**B69**	**B72**	**B73**	**B74**	**B20**	**B40**	**B44**	**B24**	**B35**	**B39**
K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
	ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
a_x	ft	42.00	80.00	24.00	108.00	111.00	87.00	99.00	119.00	131.00	15.00	10.00	11.00	60.00	87.00	78.00
a_y	ft	4.20	8.00	2.40	10.80	11.10	8.70	9.90	11.90	13.10	1.50	1.00	1.10	6.00	8.70	7.80
a_z	ft	0.42	0.80	0.24	1.08	1.11	0.87	0.99	1.19	1.31	0.15	0.10	0.11	0.60	0.87	0.78
Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
k_d	l/kg	**1259**	**1259**	**1259**	**1259**	**1259**	**1259**	**1259**	**1259**	**1259**	**1259**	**1259**	**1259**	**1258.925412**	**1258.925412**	**1258.925412**
R	-	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76
C_0	ug/L	**0.90**	**0.26**	**0.32**	**0.28**	**0.30**	**0.37**	**0.28**	**0.24**	**0.37**	**3.23**	**0.32**	**0.93**	**1.40**	**0.88**	**0.71**
m	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Area
Location ID
Hydraulic conductivity (feet per day)
Hydraulic gradient (foot/foot)
Darcy velocity (feet per day)
Seepage velocity (feet per day) and (feet per year)

Dispersivity in the longitudinal direction (feet)
Dispersivity in the transverse direction (feet)
Dispersivity in the vertical direction (feet)
Source width (feet)
Source depth (feet)
Porosity
Bulk density (kilograms per liter)
Adsorption coefficient (liter per kilogram)
Retardation factor
Initial source concentration (micrograms per liter)
Solute decay coefficient (day^{-1})
Boundary cond (source) decay coefficient (day^{-1})

L	ft	**420**	**800**	**240**	**1080**	**1110**	**870**	**990**	**1190**	**1310**	**150**	**100**	**110**	**600**	**870**	**780**
t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
C_s	ug/L	**1.57E-05**	**3.15E-09**	**2.45E-04**	**2.20E-11**	**1.39E-11**	**1.24E-09**	**1.09E-10**	**2.67E-12**	**5.07E-13**	**1.84E-02**	**5.73E-03**	**1.31E-02**	**7.18E-07**	**3.00E-09**	**1.25E-08**
	ug/L	81	81	81	81	81	81	81	81	81	81	81	81	81	81	81

Distance (feet)
Time (10,000 years ~ 3,652,500 days)
Concentration at shoreline[1] (micrograms per liter)
SWSL-Marine[2] (micrograms per liter)

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-3 SOIL COPCs
METAL SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Zinc Transport

1.- Leachate Concentration

Boring ID -->		TEF6-9A	TEF6-9A	TEF11-13A	TEF11-13A	TEF11-13A	GA	GA	GA
Symbol	**units**	**B32**	**B37**	**B45**	**B49**	**B-1**	**B16**	**B17**	**B81**
Max soil concentration above ground water table (miligrams per kilogram) Csoil	mg/kg	130	130	380	200	140	120	120	140
Adsorption coefficient (liter per kilogram) k_d	l/kg	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93	1,258.93
Bulk density kilogram per liter) r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Volumetric water content (liter per liter) q	l/l	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Leachate concentration (microgram per liter) C_l	ug/l	**11.21**	**11.21**	**32.77**	**17.25**	**12.07**	**10.35**	**10.35**	**12.07**

2.- Leachate and Groundwater Mixing

Boring ID -->		TEF6-9A	TEF6-9A	TEF11-13A	TEF11-13A	TEF11-13A	GA	GA	GA
Symbol	**units**	**B32**	**B37**	**B45**	**B49**	**B-1**	**B16**	**B17**	**B81**
Vadose zone infiltration rate (feet per year) q_v	ft/yr	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667	0.097916667
Source length parallel to groundwater flow direction (feet) A_v	ft	10	10	10	10	10	10	10	10
Darcy velocity (feet per year) q_a	ft/yr	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21
Aquifer thickness (feet) d_a	ft	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Estimated mixing zone depth (feet) d	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet) A_a	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Leachate Mixing Factor LMF	-	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05

2. - Groundwater Transport

Area									
Location ID									
Boring ID -->		TEF6-9A	TEF6-9A	TEF11-13A	TEF11-13A	TEF11-13A	GA	GA	GA
Symbol	**units**	**B32**	**B37**	**B45**	**B49**	**B-1**	**B16**	**B17**	**B81**
Hydraulic conductivity (feet per day) K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot) i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day) q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year) U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
	ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet) a_x	ft	76.00	83.00	52.00	48.00	68.00	30.00	11.00	49.00
Dispersivity in the transverse direction (feet) a_y	ft	7.60	8.30	5.20	4.80	6.80	3.00	1.10	4.90
Dispersivity in the vertical direction (feet) a_z	ft	0.76	0.83	0.52	0.48	0.68	0.30	0.11	0.49
Source width (feet) Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet) Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter) r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram) k_d	l/kg	**1259**	**1259**	**1258.925412**	**1258.925412**	**1259**	**1259**	**1259**	**1259**
Retardation factor R	-	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76
Initial source concentration (micrograms per liter) C_0	ug/L	**0.28**	**0.28**	**0.82**	**0.43**	**0.30**	**0.26**	**0.26**	**0.30**
Solute decay coefficient (day^{-1}) *m*	l/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1}) *l*	l/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet) L	ft	**760**	**830**	**520**	**480**	**680**	**300**	**110**	**490**
Time (10,000 years ~ 3,652,500 days) t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline [1] (micrograms per liter) C_s	ug/L	**7.13E-09**	**1.97E-09**	**1.96E-06**	**2.27E-06**	**3.41E-08**	**5.37E-05**	**3.66E-03**	**1.30E-06**
SWSL-Marine[2] (micrograms per liter)	ug/L	81	81	81	81	81	81	81	81

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-4 SOIL COPCs
ORGANIC COMPOUNDS - SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

TPH-Gasoline Transport

1.- Leachate Concentration

Boring ID	-->	TEF6-9A	TEF6-9A
Symbol	**units**	**B38**	**B32**
Max soil concentration above ground water table (miligrams per kilogram)	Csoil	mg/kg	500	910
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**5.00**	**5.00**
Bulk density (kilogram per liter)	r_b	kg/l	1.75	1.75
Volumetric water content (liter per liter)	q	l/l	0.19	0.19
Leachate concentration (microgram per liter)	C_l	ug/l	**10626.40**	**19340.04**

2.- Leachate and Groundwater Mixing

Boring ID	-->	TEF6-9A	TEF6-9A
Symbol	**units**	**B38**	**B32**
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.098	0.098
Source length parallel to groundwater flow direction (feet)	A_v	ft	10	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21	35.21
Aquifer thickness (feet)	d_a	ft	17	17
Estimated mixing zone depth (feet)	d	ft	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_a	ft	1.09	1.09
Leachate Mixing Factor	LMF	-	40.16	40.16

3. - Groundwater Transport

Boring ID	-->	TEF6-9A	TEF6-9A
Area			
Location ID			
Symbol	**units**	**B38**	**B32**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.10	0.10
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28
		ft/year	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	78.00	76.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.80	7.60
Dispersivity in the vertical direction (feet)	a_z	ft	0.78	0.76
Source width (feet)	Y	ft	1	1
Source depth (feet)	Z	ft	5	5
Porosity	n	-	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**5**	**5**
Retardation factor	R	-	26.74	26.74
Initial source concentration (micrograms per liter)	C_0	ug/L	**264.57**	**481.52**
Solute decay coefficient (day^{-1})	*m*	1/day	0	0
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0	0

Distance (feet)	L	ft	**780**	**760**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.109**	**0.209**
SWSL-Marine[2] (micrograms per liter)		ug/L	3,700	3,700

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-4 SOIL COPCs
ORGANIC COMPOUNDS - SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

TPH-Diesel Transport

1.- Leachate Concentration

Boring ID	-->	MDFA	MDFA	MDFA	BB20A	TEF6-9A	TEF11-13A
Symbol	**units**	**B2**	**B53**	**B54**	**B44**	**B31**	**B45**
Max soil concentration above ground water table (miligrams per kilogram)	Csoil	mg/kg	800	560	750	810	530	1,200
Adsorption coefficient (liter per kilogram)	k_d	l/kg	5.00	5.00	5.00	5.00	5.00	5.00
Bulk density (kilogram per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75
Volumetric water content (liter per liter)	q	l/l	0.19	0.19	0.19	0.19	0.19	0.19
Leachate concentration (microgram per liter)	C_l	ug/l	**17,002.2**	**11,901.6**	**15,939.6**	**17,214.8**	**11,264.0**	**25,503.4**

2.- Leachate and Groundwater Mixing

Boring ID	-->	MDFA	MDFA	MDFA	BB20A	TEF6-9A	TEF11-13A
Symbol	**units**	**B2**	**B53**	**B54**	**B44**	**B31**	**B45**
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.098	0.098	0.098	0.098	0.098	0.098
Source length parallel to groundwater flow direction (feet)	A_y	ft	10	10	10	10	10	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21	35.21	35.21	35.21	35.21	35.21
Aquifer thickness (feet)	d_a	ft	17	17.00	17.00	17.00	17.00	17.00
Estimated mixing zone depth (feet)	d	ft	1.09	1.09	1.09	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_s	ft	1.09	1.09	1.09	1.09	1.09	1.09
Leachate Mixing Factor	LMF	-	40.16	40.05	40.16	40.16	40.16	40.16

3. - Groundwater Transport

Area								
Location ID	Boring ID	-->	MDFA	MDFA	MDFA	BB20A	TEF6-9A	TEF11-13A
	Symbol	**units**	**B2**	**B53**	**B54**	**B44**	**B31**	**B45**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.10	0.096	0.10	0.10	0.10	0.10
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	78.00	68.00	58.00	11.00	75.00	52.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.80	6.80	5.80	1.10	7.50	5.20
Dispersivity in the vertical direction (feet)	a_z	ft	0.78	0.68	0.58	0.11	0.75	0.52
Source width (feet)	Y	ft	1	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**5**	**5**	**5**	**5**	**5**	**5**
Retardation factor	R	-	26.74	26.74	26.74	26.74	26.74	26.74
Initial source concentration (micrograms per liter)	C_0	ug/L	**423.31**	**297.16**	**396.86**	**428.61**	**280.45**	**634.97**
Solute decay coefficient (day[2])	*m*	1/day	0	0.00	0	0	0	0
Boundary cond (source) decay coefficient (day[1])	*l*	1/day	0	0.00	0	0	0	0

Distance (feet)	L	ft	**780**	**680**	**580**	**110**	**750**	**520**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.174**	**0.161**	**0.295**	**7.589**	**0.125**	**0.586**
SWSL-Marine[2] (micrograms per liter)		ug/L	640	640	640	640	640	640

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-4 SOIL COPCs
ORGANIC COMPOUNDS - SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

TPH-Motor Oil Transport

1.- Leachate Concentration

Boring ID	-->	DS/RA	DS/RA	MDFA	MDFA	MDFA	MDFA	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A
Symbol	**units**	**B9**	**B70**	**B2**	**B28**	**B57**	**B58**	**B44**	**B44**	**B21**	**B24**	**B24**	**B31**
Max soil concentration above ground water table (miligrams per kilogram)	Csoil	mg/kg	3,100	1,900	1,900	1,300	1,500	3,100	1,700	3,000	1,200	1,200	1,100	2,800
Adsorption coefficient (liter per kilogram)	k_d	l/kg	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Bulk density (kilogram per liter)	r_b	kg/l	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Volumetric water content (liter per liter)	q	l/l	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Leachate concentration (microgram per liter)	C_l	ug/l	**65,883.7**	**40,380.3**	**40,380.3**	**27,628.6**	**31,879.2**	**65,883.7**	**36,129.8**	**63,758.4**	**25,503.4**	**25,503.4**	**23,378.1**	**59,507.8**

2.- Leachate and Groundwater Mixing

Boring ID	-->	DS/RA	MDFA	MDFA	MDFA	MDFA	MDFA	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A
Symbol	**units**	**B9**	**B2**	**B2**	**B28**	**B57**	**B58**	**B44**	**B44**	**B21**	**B24**	**B24**	**B31**
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098
Source length parallel to groundwater flow direction (feet)	A_v	ft	10	10	10	10	10	10	10	10	10	10	10	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21
Aquifer thickness (feet)	d_a	ft	17	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Estimated mixing zone depth (feet)	d	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_a	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Leachate Mixing Factor	LMF	-	40.16	40.05	40.05	40.16	40.16	40.16	40.16	40.16	40.16	40.16	40.16	40.16

3. - Groundwater Transport

Area														
Location ID	Boring ID	-->	DS/RA	MDFA	MDFA	MDFA	MDFA	MDFA	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A
	Symbol	**units**	**B9**	**B2**	**B2**	**B28**	**B57**	**B58**	**B44**	**B44**	**B21**	**B24**	**B24**	**B31**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.10	0.096	0.096	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	93.00	96.00	78.00	80.00	36.00	29.00	11.00	11.00	96.00	60.00	60.00	75.00
Dispersivity in the transverse direction (feet)	a_y	ft	9.30	9.60	7.80	8.00	3.60	2.90	1.10	1.10	9.60	6.00	6.00	7.50
Dispersivity in the vertical direction (feet)	a_z	ft	0.93	0.96	0.78	0.80	0.36	0.29	0.11	0.11	0.96	0.60	0.60	0.75
Source width (feet)	Y	ft	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
Retardation factor	R	-	26.74	26.74	26.74	26.74	26.74	26.74	26.74	26.74	26.74	26.74	26.74	26.74
Initial source concentration (micrograms per liter)	C_0	ug/L	**1640.34**	**1008.22**	**1008.22**	**687.88**	**793.71**	**1640.34**	**899.54**	**1587.43**	**634.97**	**634.97**	**582.06**	**1481.60**
Solute decay coefficient (day^{-1})	*m*	1/day	0	0.00	0.00	0	0	0	0	0	0	0	0	0
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0	0.00	0.00	0	0	0	0	0	0	0	0	0
Distance (feet)	L	ft	**930**	**960**	**780**	**800**	**360**	**290**	**110**	**110**	**960**	**600**	**600**	**750**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline [1] (micrograms per liter)	C_s	ug/L	**0.476**	**0.275**	**0.416**	**0.270**	**1.517**	**4.789**	**15.928**	**28.108**	**0.173**	**0.441**	**0.405**	**0.660**
SWSL-Marine [2] (micrograms per liter)		ug/L	640	640	640	640	640	640	640	640	640	640	640	640

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-4 SOIL COPCs
ORGANIC COMPOUNDS - SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

TPH-Motor Oil Transport

1.- Leachate Concentration

Boring ID	-->	TEF6-9A	TEF6-9A	TEF11-13A	GA	GA
Symbol	**units**	**B32**	**B78**	**B49**	**B3**	**B82**
Csoil	mg/kg	1,800	3,300	1,200	3,100	1,700
k_d	l/kg	5.0	5.0	5.0	5.0	5.0
r_b	kg/l	1.8	1.8	1.8	1.8	1.8
q	l/l	0.2	0.2	0.2	0.2	0.2
C_l	ug/l	**38,255.0**	**70,134.2**	**25,503.4**	**65,883.7**	**36,129.8**

Max soil concentration above ground water table (miligrams per kilogram)
Adsorption coefficient (liter per kilogram)
Bulk density (kilogram per liter)
Volumetric water content (liter per liter)
Leachate concentration (microgram per liter)

2.- Leachate and Groundwater Mixing

Boring ID	-->	TEF6-9A	TEF6-9A	TEF11-13A	GA	GA
Symbol	**units**	**B32**	**B78**	**B38**	**B3**	**B82**
q_v	ft/yr	0.098	0.098	0.098	0.098	0.098
A_v	ft	10	10	10	10	10
q_a	ft/yr	35.21	35.21	35.21	35.21	35.21
d_a	ft	17.00	17.00	17.00	17.00	17.00
d	ft	1.09	1.09	1.09	1.09	1.09
A_a	ft	1.09	1.09	1.09	1.09	1.09
LMF	-	40.16	40.16	40.16	40.16	40.16

Vadose zone infiltration rate (feet per year)
Source length parallel to groundwater flow direction (feet)
Darcy velocity (feet per year)
Aquifer thickness (feet)
Estimated mixing zone depth (feet)
cross-sectional depth of mixing zone in aquifer (feet)
Leachate Mixing Factor

3. - Groundwater Transport

Boring ID	-->	TEF6-9A	TEF6-9A	TEF11-13A	GA	GA
Symbol	**units**	**B32**	**B78**	**B38**	**B3**	**B82**
K	ft/day	28.35	28.35	28.35	28.35	28.35
i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034
q_a	ft/day	0.10	0.10	0.10	0.10	0.10
U	ft/day	0.28	0.28	0.28	0.28	0.28
	ft/year	103.55	103.55	103.55	103.55	103.55
a_x	ft	76.00	60.00	48.00	67.00	26.00
a_y	ft	7.60	6.00	4.80	6.70	2.60
a_z	ft	0.76	0.60	0.48	0.67	0.26
Y	ft	1.00	1.00	1.00	1.00	1.00
Z	ft	5.00	5.00	5.00	5.00	5.00
n	-	0.34	0.34	0.34	0.34	0.34
r_b	kg/l	1.75	1.75	1.75	1.75	1.75
k_d	l/kg	**5**	**5**	**5**	**5**	**5**
R	-	26.74	26.74	26.74	26.74	26.74
C_0	ug/L	**952.46**	**1746.17**	**634.97**	**1640.34**	**899.54**
m	1/day	0	0	0	0	0
l	1/day	0	0	0	0	0

Area
Location ID
Hydraulic conductivity (feet per day)
Hydraulic gradient (foot/foot)
Darcy velocity (feet per day)
Seepage velocity (feet per day) and (feet per year)

Dispersivity in the longitudinal direction (feet)
Dispersivity in the transverse direction (feet)
Dispersivity in the vertical direction (feet)
Source width (feet)
Source depth (feet)
Porosity
Bulk density (kilograms per liter)
Adsorption coefficient (liter per kilogram)
Retardation factor
Initial source concentration (micrograms per liter)
Solute decay coefficient (day^{-1})
Boundary cond (source) decay coefficient (day^{-1})

L	ft	**760**	**600**	**480**	**670**	**260**
t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
C_s	ug/L	**0.413**	**1.214**	**0.687**	**0.915**	**3.248**
	ug/L	640	640	640	640	640

Distance (feet)
Time (10,000 years ~ 3,652,500 days)
Concentration at shoreline [1] (micrograms per liter)
SWSL-Marine [2] (micrograms per liter)

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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TABLE B-4 SOIL COPCs
ORGANIC COMPOUNDS - SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

TPH-Bunker C Oil Transport

1.- Leachate Concentration

Boring ID	-->	MDFA	MDFA	MDFA	MDFA	MDFA
Symbol	**units**	**B53**	**B54**	**B56**	**B57**	**B58**
Max soil concentration above ground water table (miligrams per kilogram)	Csoil	mg/kg	2,300	2900	1100	3200	8200
Adsorption coefficient (liter per kilogram)	k_d	l/kg	5.00	5.00	5.00	5.00	5.00
Bulk density (kilogram per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75
Volumetric water content (liter per liter)	q	l/l	0.19	0.19	0.19	0.19	0.19
Leachate concentration (microgram per liter)	C_l	ug/l	**48881.43**	**61633.11**	**23378.08**	**68008.95**	**174272.93**

2.- Leachate and Groundwater Mixing

Boring ID	-->	MDFA	MDFA	MDFA	MDFA	MDFA
Symbol	**units**	**B53**	**B54**	**B56**	**B57**	**B58**
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.098	0.098	0.098	0.098	0.098
Source length parallel to groundwater flow direction (feet)	A_y	ft	10	10	10	10	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21	35.21	35.21	35.21	35.21
Aquifer thickness (feet)	d_a	ft	17	17.00	17.00	17.00	17.00
Estimated mixing zone depth (feet)	d	ft	1.09	1.09	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_a	ft	1.09	1.09	1.09	1.09	1.09
Leachate Mixing Factor	LMF	-	40.16	40.05	40.16	40.16	40.16

3. - Groundwater Transport

Area	Boring ID	-->	MDFA	MDFA	MDFA	MDFA	MDFA
Location ID	**Symbol**	**units**	**B53**	**B54**	**B56**	**B57**	**B58**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.10	0.096	0.10	0.10	0.10
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	68.00	58.00	42.00	36.00	29.00
Dispersivity in the transverse direction (feet)	a_y	ft	6.80	5.80	4.20	3.60	2.90
Dispersivity in the vertical direction (feet)	a_z	ft	0.68	0.58	0.42	0.36	0.29
Source width (feet)	Y	ft	1	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**5**	**5**	**5**	**5**	**5**
Retardation factor	R	-	26.74	26.74	26.74	26.74	26.74
Initial source concentration (micrograms per liter)	C_0	ug/L	**1217.03**	**1538.87**	**582.06**	**1693.26**	**4338.97**
Solute decay coefficient (day[1])	*m*	1/day	0	0.00	0	0	0
Boundary cond (source) decay coefficient (day[1])	*l*	1/day	0	0.00	0	0	0

Distance (feet)	L	ft	**680**	**580**	**420**	**360**	**290**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_x	ug/L	**0.659**	**1.144**	**0.821**	**3.236**	**12.668**
SWSL-Marine[2] (micrograms per liter)		ug/L	640	640	640	640	640

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-4 SOIL COPCs
ORGANIC COMPOUNDS - SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

TPH-Hydraulic Oil Transport

1.- Leachate Concentration

Boring ID -->		BB20A	BB20A	TEF6-9A	TEF6-9A	TEF11-13A	TEF11-13A
Symbol	**units**	**B44**	**B44**	**B31**	**B32**	**B45**	**B49**
Max soil concentration above ground water table (miligrams per kilogram)	Csoil	mg/kg	3,100	2,300	3000	1700	1400	1200
Adsorption coefficient (liter per kilogram)	k_d	l/kg	5.00	5.00	5.00	5.00	5.00	5.00
Bulk density (kilogram per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75
Volumetric water content (liter per liter)	q	l/l	0.19	0.19	0.19	0.19	0.19	0.19
Leachate concentration (microgram per liter)	C_l	ug/l	**65883.67**	**48881.43**	**63758.39**	**36129.75**	**29753.91**	**25503.36**

2.- Leachate and Groundwater Mixing

Boring ID -->		BB20A	BB20A	TEF6-9A	TEF6-9A	TEF11-13A	TEF11-13A
Symbol	**units**	**B44**	**B44**	**B31**	**B32**	**B45**	**B38**
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.098	ft/year	0.098	0.098	0.098	0.098
Source length parallel to groundwater flow direction (feet)	A_v	ft	10	10	10	10	10	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21	35.21	35.21	35.21	35.21	35.21
Aquifer thickness (feet)	d_a	ft	17	17	17.00	17.00	17.00	17.00
Estimated mixing zone depth (feet)	d	ft	1.09	1.09	1.09	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_a	ft	1.09	1.09	1.09	1.09	1.09	1.09
Leachate Mixing Factor	LMF	-	40.16	40.16	40.16	40.16	40.16	40.16

3. - Groundwater Transport

Area								
Location ID	Boring ID -->		BB20A	BB20A	TEF6-9A	TEF6-9A	TEF11-13A	TEF11-13A
	Symbol	**units**	**B44**	**B44**	**B31**	**B32**	**B45**	**B38**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.10	0.10	0.10	0.10	0.10	0.10
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	11.00	11.00	75.00	76.00	52.00	48.00
Dispersivity in the transverse direction (feet)	a_y	ft	1.10	1.10	7.50	7.60	5.20	4.80
Dispersivity in the vertical direction (feet)	a_z	ft	0.11	0.11	0.75	0.76	0.52	0.48
Source width (feet)	Y	ft	1	1	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5	5	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**5**	**5**	**5**	**5**	**5**	**5**
Retardation factor	R	-	26.74	26.74	26.74	26.74	26.74	26.74
Initial source concentration (micrograms per liter)	C_0	ug/L	**1640.34**	**1217.03**	**1587.43**	**899.54**	**740.80**	**634.97**
Solute decay coefficient (day[1])	*m*	1/day	0	0	0	0	0	0
Boundary cond (source) decay coefficient (day[1])	*l*	1/day	0	0	0	0	0	0

Distance (feet)	L	ft	**110**	**110**	**750**	**760**	**520**	**480**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**29.045**	**21.549**	**0.708**	**0.391**	**0.684**	**0.687**
SWSL-Marine[2] (micrograms per liter)		ug/L	640	640	640	640	640	640

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-4 SOIL COPCs
ORGANIC COMPOUNDS - SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

1-Methyl-napthalene Transport

1.- Leachate Concentration

Boring ID	-->	DS / RA	DS / RA	MDFA	MDFA	MDFA	BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	GA	GA	GA
Symbol	**units**	**B8***	**B9***	**B1***	**B2***	**B28***	**B20***	**B23***	**B25***	**B21***	**B24***	**B24***	**B3***	**B11***	**B16***
Max soil concentration above ground water table (miligrams per kilogram)	Csoil	mg/kg	0.50	1.25	1.25	1.25	0.50	0.60	0.50	0.50	1.25	1.25	1.25	1.25	1.25	0.60
Adsorption coefficient (liter per kilogram)	k_d	l/kg	720.00	720	720.00	720.00	720.00	720.00	720.00	720.00	720.00	720.00	720.00	720.00	720.00	720.00
Bulk density (kilogram per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Volumetric water content (liter per liter)	q	l/l	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Leachate concentration (microgram per liter)	C_l	ug/l	**0.08**	**0.19**	**0.19**	**0.19**	**0.08**	**0.09**	**0.08**	**0.08**	**0.19**	**0.19**	**0.19**	**0.19**	**0.19**	**0.09**

2.- Leachate and Groundwater Mixing

Boring ID	-->	DS / RA	DS / RA	MDFA	MDFA	MDFA	BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	GA	GA	GA
Symbol	**units**	**B8***	**B9***	**B1***	**B2***	**B28***	**B20***	**B23***	**B25***	**B21***	**B24***	**B24***	**B3***	**B11***	**B16***
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098
Source length parallel to groundwater flow direction (feet)	A_x	ft	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21
Aquifer thickness (feet)	d_a	ft	17	17	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Estimated mixing zone depth (feet)	d	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_z	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Leachate Mixing Factor	LMF	-	40.16	40.16	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05

3. - Groundwater Transport

Area																
Location ID	Boring ID	-->	DS / RA	DS / RA	MDFA	MDFA	MDFA	BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	GA	GA	GA
	Symbol	**units**	**B8***	**B9***	**B1***	**B2***	**B28***	**B20***	**B23***	**B25***	**B21***	**B24***	**B24***	**B3***	**B11***	**B16***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.10	0.10	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	88.00	93.00	62.00	78.00	80.00	15.00	36.00	4.00	96.00	60.00	60.00	67.00	7.00	30.00
Dispersivity in the transverse direction (feet)	a_y	ft	8.80	9.30	6.20	7.80	8.00	1.50	3.60	0.40	9.60	6.00	6.00	6.70	0.70	3.00
Dispersivity in the vertical direction (feet)	a_z	ft	0.88	0.93	0.62	0.78	0.80	0.15	0.36	0.04	0.96	0.60	0.60	0.67	0.07	0.30
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**	**720**
Retardation factor	R	-	3706.88	3706.88	3706.88	3706.88	3706.88	3706.88	3706.88	3706.88	3706.88	3706.88	3706.88	3706.88	3706.88	3706.88
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Solute decay coefficient (day^{-1})	*m*	l/day	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	l/day	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**880**	**930**	**620**	**780**	**800**	**150**	**360**	**40**	**960**	**600**	**600**	**670**	**70**	**300**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**2.053E-09**	**2.935E-09**	**1.029E-07**	**1.597E-08**	**5.085E-09**	**2.128E-05**	**1.024E-06**	**1.319E-04**	**2.110E-09**	**1.306E-07**	**1.306E-07**	**5.707E-08**	**1.686E-04**	**2.695E-06**
SWSL-Marine[2] (micrograms per liter)		ug/L	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-4 SOIL COPCs
ORGANIC COMPOUNDS - SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

2-Methyl-napthalene Transport

1.- Leachate Concentration

Boring ID	-->	DS / RA	DS / RA	MDFA	MDFA	MDFA	BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	GA	GA	GA
Symbol	**units**	**B8***	**B9***	**B1***	**B2***	**B28***	**B20***	**B23***	**B25***	**B21***	**B24***	**B24***	**B31**	**B3***	**B11***	**B16***
Max soil concentration above ground water table (miligrams per kilogram	Csoil	mg/kg	0.50	1.25	1.25	1.25	0.50	0.60	0.50	0.50	1.25	1.25	1.25	1.00	1.25	1.25	0.60
Adsorption coefficient (liter per kilogram)	k_d	l/kg	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Bulk density (kilogram per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Volumetric water content (liter per liter	q	l/l	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Leachate concentration (microgram per liter)	C_l	ug/l	**65.52**	**163.79**	**163.79**	**163.79**	**65.52**	**78.62**	**65.52**	**65.52**	**163.79**	**163.79**	**163.79**	**131.03**	**163.79**	**163.79**	**78.62**

2.- Leachate and Groundwater Mixing

Boring ID	-->	DS / RA	DS / RA	MDFA	MDFA	MDFA	BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	GA	GA	GA
Symbol	**units**	**B8***	**B9***	**B1***	**B2***	**B28***	**B20***	**B23***	**B25***	**B21***	**B24***	**B24***	**B31**	**B3***	**B11***	**B16***
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098
Source length parallel to groundwater flow direction (feet)	A_x	ft	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21	35.21
Aquifer thickness (feet)	d_a	ft	17	17	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Estimated mixing zone depth (feet	d	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_z	ft	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Leachate Mixing Factor	LMF	-	40.16	40.16	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05	40.05

3. - Groundwater Transport

Area	Boring ID	-->	DS / RA	DS / RA	MDFA	MDFA	MDFA	BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	GA	GA	GA
Location ID	**Symbol**	**units**	**B8***	**B9***	**B1***	**B2***	**B28***	**B20***	**B23***	**B25***	**B21***	**B24***	**B24***	**B31**	**B3***	**B11***	**B16***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.10	0.10	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	88.00	93.00	62.00	78.00	80.00	15.00	36.00	4.00	96.00	60.00	60.00	75.00	67.00	7.00	30.00
Dispersivity in the transverse direction (feet)	a_y	ft	8.80	9.30	6.20	7.80	8.00	1.50	3.60	0.40	9.60	6.00	6.00	7.50	6.70	0.70	3.00
Dispersivity in the vertical direction (feet)	a_z	ft	0.88	0.93	0.62	0.78	0.80	0.15	0.36	0.04	0.96	0.60	0.60	0.75	0.67	0.07	0.30
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5	5	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**0.72**	**1**	**0.72**	**0.72**	**0.72**	**0.72**	**0.72**	**0.72**	**0.72**	**0.72**	**0.72**	**750**	**0.72**	**0.72**	**0.72**
Retardation factor	R	-	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	3861.29	4.71	4.71	4.71
Initial source concentration (micrograms per liter)	C_0	ug/L	**1.63**	**4.08**	**4.09**	**4.09**	**1.64**	**1.96**	**1.64**	**1.64**	**4.09**	**4.09**	**4.09**	**3.27**	**4.09**	**4.09**	**1.96**
Solute decay coefficient (day^{-1})	m	1/day	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	l	1/day	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**880**	**930**	**620**	**780**	**800**	**150**	**360**	**40**	**960**	**600**	**600**	**750**	**670**	**70**	**300**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**5.287E-04**	**1.184E-03**	**2.663E-03**	**1.686E-03**	**6.411E-04**	**2.008E-02**	**3.126E-03**	**1.146E-01**	**1.114E-03**	**2.842E-03**	**2.842E-03**	**1.188E-05**	**2.282E-03**	**1.466E-01**	**5.364E-03**
SWSL-Marine[2] (micrograms per liter)		ug/L	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-4 SOIL COPCs
ORGANIC COMPOUNDS - SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Acetone Transport

1.- Leachate Concentration

	Boring ID	-->	TEF6-9A
	Symbol	**units**	**B32***
Max soil concentration above ground water table (miligrams per kilogram)	Csoil	mg/kg	1.00
Adsorption coefficient (liter per kilogram)	k_d	l/kg	0.0006
Bulk density (kilogram per liter)	r_b	kg/l	1.75
Volumetric water content (liter per liter)	q	l/l	0.19
Leachate concentration (microgram per liter)	C_l	ug/l	**994.73**

2.- Leachate and Groundwater Mixing

	Boring ID	-->	TEF6-9A
	Symbol	**units**	**B32***
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.098
Source length parallel to groundwater flow direction (feet)	A_v	ft	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21
Aquifer thickness (feet)	d_a	ft	17
Estimated mixing zone depth (feet)	d	ft	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_a	ft	1.09
Leachate Mixing Factor	LMF	-	40.16

3. - Groundwater Transport

	Boring ID	-->	TEF6-9A
Area			
Location ID			
	Symbol	**units**	**B32***
Hydraulic conductivity (feet per day)	K	ft/day	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.10
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28
		ft/year	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	76.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.60
Dispersivity in the vertical direction (feet)	a_z	ft	0.76
Source width (feet)	Y	ft	1
Source depth (feet)	Z	ft	5
Porosity	n	-	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**0.41**
Retardation factor	R	-	3.09
Initial source concentration (micrograms per liter)	C_0	ug/L	**24.77**
Solute decay coefficient (day[1])	*m*	1/day	0
Boundary cond (source) decay coefficient (day[1])	*l*	1/day	0

Distance (feet)	L	ft	**760**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.011**
SWSL-Marine[2] (micrograms per liter)		ug/L	1500

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-4 SOIL COPCs
ORGANIC COMPOUNDS - SOIL AND GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Xylenes Transport

1.- Leachate Concentration

	Boring ID	-->	TEF6-9A
	Symbol	**units**	**B32**
Max soil concentration above ground water table (miligrams per kilogram)	Csoil	mg/kg	27.80
Adsorption coefficient (liter per kilogram)	k_d	l/kg	0.41
Bulk density (kilogram per liter)	r_b	kg/l	1.75
Volumetric water content (liter per liter)	q	l/l	0.19
Leachate concentration (microgram per liter)	C_l	ug/l	**5854.25**

2.- Leachate and Groundwater Mixing

	Boring ID	-->	TEF6-9A
	Symbol	**units**	**B59**
Vadose zone infiltration rate (feet per year)	q_v	ft/yr	0.098
Source length parallel to groundwater flow direction (feet)	A_v	ft	10
Darcy velocity (feet per year)	q_a	ft/yr	35.21
Aquifer thickness (feet)	d_a	ft	17
Estimated mixing zone depth (feet)	d	ft	1.09
cross-sectional depth of mixing zone in aquifer (feet)	A_a	ft	1.09
Leachate Mixing Factor	LMF	-	40.16

3. - Groundwater Transport

Area	Boring ID	-->	TEF6-9A
Location ID	**Symbol**	**units**	**B59**
Hydraulic conductivity (feet per day)	K	ft/day	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.10
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28
		ft/year	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	76.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.60
Dispersivity in the vertical direction (feet)	a_z	ft	0.76
Source width (feet)	Y	ft	1
Source depth (feet)	Z	ft	5
Porosity	n	-	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	**0.41**
Retardation factor	R	-	3.09
Initial source concentration (micrograms per liter)	C_0	ug/L	**145.76**
Solute decay coefficient (day[1])	*m*	1/day	0
Boundary cond (source) decay coefficient (day[1])	*l*	1/day	0

Distance (feet)	L	ft	**760**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.063**
SWSL-Marine[2] (micrograms per liter)		ug/L	100

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-5 GROUNDWATER COPCs
METAL GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Arsenic - Groundwater Transport

Area	Boring ID -->		DS / RA	GA	MDFA
Location ID	**Symbol**	**units**	**B91**	**B4**	**B28**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096
Seepage velocity (feet per day)	U	ft/day	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	110.00	37.78	88.89
Dispersivity in the transverse direction (feet)	a_y	ft	11.00	4.20	9.88
Dispersivity in the vertical direction (feet)	a_z	ft	1.10	0.42	0.99
Source width (feet)	Y	ft	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75
Adsorption coefficient (liters per kilogram)	k_d	l/kg	**2511.89**	**2511.89**	**2511.89**
Retardation factor	R	-	12929.83	12929.83	12929.83
Initial source concentration (micrograms per liter)	C_0	ug/L	**140.00**	**74.00**	**69.00**
Solute decay coefficient (day $^{-1}$)	*m*	1/day	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day $^{-1}$)	*l*	1/day	0.00	0.00	0.00
Distance (feet)	L	ft	**1100**	**340**	**800**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**2.24E-16**	**5.36E-05**	**1.76E-11**
SWSL-Marine[2] (micrograms per liter)		ug/L	0.14	0.14	0.14

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-5 GROUNDWATER COPCs
METAL GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Barium - Groundwater Transport

Area	Boring ID -->		DS / RA
Location ID	**Symbol**	**units**	**B22**
Hydraulic conductivity (feet per day)	K	ft/day	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096
Seepage velocity (feet per day)	U	ft/day	0.28
		ft/year	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	111.00
Dispersivity in the transverse direction (feet)	a_y	ft	11.10
Dispersivity in the vertical direction (feet)	a_z	ft	1.11
Source width (feet)	Y	ft	1.00
Source depth (feet)	Z	ft	5.00
Porosity	n	-	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75
Adsorption coefficient (liters per kilogram)	k_d	l/kg	**100.00**
Retardation factor	R	-	515.71
Initial source concentration (micrograms per liter)	C_0	ug/L	**1100.00**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00

Distance (feet)	L	ft	**1110**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.204**
SWSL-Marine[2] (micrograms per liter)		ug/L	1,000

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-5 GROUNDWATER COPCs
METAL GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Lead - Groundwater Transport

Area	Boring ID	-->	TEF6-9A	TEF11-13A
Location ID	**Symbol**	**units**	**B38**	**B46**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096
Seepage velocity (feet per day)	U	ft/day	0.28	0.28
		ft/year	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	78.00	66.67
Dispersivity in the transverse direction (feet)	a_y	ft	7.80	7.41
Dispersivity in the vertical direction (feet)	a_z	ft	0.78	0.74
Source width (feet)	Y	ft	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00
Porosity	n	-	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75
Adsorption coefficient (liters per kilogram)	k_d	l/kg	**12589.25**	**12589.25**
Retardation factor	R	-	64798.63	64798.63
Initial source concentration (micrograms per liter)	C_0	ug/L	**10.00**	**4.80**
Solute decay coefficient (day^{-1})	m	1/day	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	l	1/day	0.00	0.00
Distance (feet)	L	ft	**780**	**600**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**1.52E-55**	**1.47E-39**
SWSL-Marine[2] (micrograms per liter)		ug/L	8.1	8.1

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-5 GROUNDWATER COPCs
METAL GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Mercury - Groundwater Transport

Area	Boring ID	-->	TEF11-14A	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA
Location ID	**Symbol**	**units**	**B5**	**B8***	**B9***	**B13***	**B14***	**B19***	**B22***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	9.00	88.00	93.00	108.00	114.00	126.00	111.00
Dispersivity in the transverse direction (feet)	a_y	ft	1.00	8.80	9.30	10.80	11.40	12.60	11.10
Dispersivity in the vertical direction (feet)	a_z	ft	0.10	0.88	0.93	1.08	1.14	1.26	1.11
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liters per kilogram)	k_d	l/kg	**6309.57**	**6309.57**	**6309.57**	**6309.57**	**6309.57**	**6309.57**	**6309.57**
Retardation factor	R	-	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.87**	**0.40**	**0.40**	**0.40**	**0.40**	**0.40**	**0.40**
Solute decay coefficient (day $^{-1}$)	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day $^{-1}$)	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**80**	**880**	**930**	**1080**	**1140**	**1260**	**1110**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**4.824E-04**	**6.638E-34**	**1.151E-35**	**6.229E-41**	**4.940E-43**	**3.168E-47**	**5.542E-42**
SWSL-Marine[2] (micrograms per liter)		ug/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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TABLE B-5 GROUNDWATER COPCs
METAL GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Mercury - Groundwater Transport

Area	Boring ID	-->	MDFA	MDFA	MDFA	BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF11-13A
Location ID	**Symbol**	**units**	**B1***	**B2***	**B28***	**B20***	**B23***	**B25***	**B21***	**B24***	**B7***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	62.00	78.00	80.00	15.00	36.30	4.00	96.00	60.00	68.00
Dispersivity in the transverse direction (feet)	a_y	ft	6.20	7.80	8.00	1.50	3.63	0.40	9.60	6.00	6.80
Dispersivity in the vertical direction (feet)	a_z	ft	0.62	0.78	0.80	0.15	0.36	0.04	0.96	0.60	0.68
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liters per kilogram)	k_d	l/kg	**6309.57**	**6309.57**	**6309.57**	**6309.57**	**6309.57**	**6309.57**	**6309.57**	**6309.57**	**6309.57**
Retardation factor	R	-	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.40**	**0.40**	**0.40**	**0.40**	**0.40**	**0.40**	**0.40**	**0.40**	**0.40**
Solute decay coefficient (day $^{-1}$)	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day $^{-1}$)	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**620**	**780**	**800**	**150**	**363**	**40**	**960**	**600**	**680**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**1.106E-24**	**2.262E-30**	**4.434E-31**	**2.740E-07**	**2.216E-15**	**8.567E-03**	**1.013E-36**	**5.740E-24**	**8.016E-27**
SWSL-Marine[2] (micrograms per liter)		ug/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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TEF14A: Tanks EF14 Area

TABLE B-5 GROUNDWATER COPCs
METAL GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Mercury - Groundwater Transport

Area	Boring ID	-->	GA	GA	GA	GA	GA	GA	GA	GA
Location ID	**Symbol**	**units**	**B3***	**B4***	**B6***	**B11***	**B15***	**B16***	**B17***	**B18***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	67.00	34.00	28.00	7.00	79.00	30.00	11.00	45.00
Dispersivity in the transverse direction (feet)	a_y	ft	6.70	3.40	2.80	0.70	7.90	3.00	1.10	4.50
Dispersivity in the vertical direction (feet)	a_z	ft	0.67	0.34	0.28	0.07	0.79	0.30	0.11	0.45
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liters per kilogram)	k_d	l/kg	**6309.57**	**6309.57**	**6309.57**	**6309.57**	**6309.57**	**6309.57**	**6309.57**	**6309.57**
Retardation factor	R	-	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75	32476.75
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.40**	**0.40**	**0.40**	**0.40**	**0.40**	**0.40**	**0.40**	**0.40**
Solute decay coefficient (day $^{-1}$)	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day $^{-1}$)	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**670**	**340**	**280**	**70**	**790**	**300**	**110**	**450**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**1.820E-26**	**1.565E-14**	**2.695E-12**	**5.105E-04**	**1.001E-30**	**4.802E-13**	**1.127E-05**	**1.460E-18**
SWSL-Marine[2] (micrograms per liter)		ug/L	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-5 GROUNDWATER COPCs
METAL GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Nickel - Groundwater Transport

Area	Boring ID	-->	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	MDFA	MDFA	MDFA	BB20A
Location ID	**Symbol**	**units**	**B8***	**B9***	**B13***	**B14***	**B19***	**B22***	**B67***	**B1***	**B2***	**B28***	**B20***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	88.00	93.00	108.00	114.00	126.00	111.00	91.00	62.00	78.00	80.00	15.00
Dispersivity in the transverse direction (feet)	a_y	ft	8.80	9.30	10.80	11.40	12.60	11.10	9.10	6.20	7.80	8.00	1.50
Dispersivity in the vertical direction (feet)	a_z	ft	0.88	0.93	1.08	1.14	1.26	1.11	0.91	0.62	0.78	0.80	0.15
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liters per kilogram)	k_d	l/kg	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**
Retardation factor	R	-	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76
Initial source concentration (micrograms per liter)	C_0	ug/L	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**10.00**	**25.00**	**25.00**	**25.00**	**25.00**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**880**	**930**	**1080**	**1140**	**1260**	**1110**	**910**	**620**	**780**	**800**	**150**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**7.08E-08**	**2.87E-08**	**1.96E-09**	**6.79E-10**	**8.27E-11**	**1.15E-09**	**1.65E-08**	**8.76E-06**	**4.40E-07**	**3.05E-07**	**0.142**
SWSL-Marine[2] (micrograms per liter)		ug/L	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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TEF6-9A: Tanks EF6-9 Area
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TEF14A: Tanks EF14 Area

TABLE B-5 GROUNDWATER COPCs
METAL GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Nickel - Groundwater Transport

Area	Boring ID	-->	BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A
Location ID	**Symbol**	**units**	**B23***	**B25***	**B42***	**B21***	**B24***	**B31***	**B32***	**B33***	**B34***	**B35***	**B36***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	36.30	4.00	20.00	96.00	60.00	75.00	76.00	71.00	68.00	87.00	87.00
Dispersivity in the transverse direction (feet)	a_y	ft	3.63	0.40	2.00	9.60	6.00	7.50	7.60	7.10	6.80	8.70	8.70
Dispersivity in the vertical direction (feet)	a_z	ft	0.36	0.04	0.20	0.96	0.60	0.75	0.76	0.71	0.68	0.87	0.87
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liters per kilogram)	k_d	l/kg	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**
Retardation factor	R	-	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76
Initial source concentration (micrograms per liter)	C_0	ug/L	**25.00**	**25.00**	**10.00**	**25.00**	**25.00**	**10.00**	**10.00**	**10.00**	**10.00**	**10.00**	**10.00**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**363**	**40**	**200**	**960**	**600**	**750**	**760**	**710**	**680**	**870**	**870**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**1.39E-03**	**1.751**	**0.018**	**1.67E-08**	**1.28E-05**	**3.07E-07**	**2.55E-07**	**6.45E-07**	**1.13E-06**	**3.40E-08**	**3.40E-08**
SWSL-Marine[2] (micrograms per liter)		ug/L	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2

[1] Analytical solution for 2D mass transport equation
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TABLE B-5 GROUNDWATER COPCs
METAL GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Nickel - Groundwater Transport

Area	Boring ID	-->	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF11-13A	TEF11-13A	TEF11-13A	TEF11-13A	TEF11-13A
Location ID	**Symbol**	**units**	**B37***	**B38**	**B39***	**B50***	**B51***	**B52***	**B7***	**B45***	**B47***	**B46**	**B49***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	83.00	78.00	78.00	85.00	91.00	89.00	68.00	52.00	55.00	60.00	48.00
Dispersivity in the transverse direction (feet)	a_y	ft	8.30	7.80	7.80	8.50	9.10	8.90	6.80	5.20	5.50	6.00	4.80
Dispersivity in the vertical direction (feet)	a_z	ft	0.83	0.78	0.78	0.85	0.91	0.89	0.68	0.52	0.55	0.60	0.48
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liters per kilogram)	k_d	l/kg	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**
Retardation factor	R	-	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76
Initial source concentration (micrograms per liter)	C_0	ug/L	**10.00**	**49.00**	**10.00**	**10.00**	**10.00**	**10.00**	**25.00**	**10.00**	**10.00**	**50.00**	**10.00**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**830**	**780**	**780**	**850**	**910**	**890**	**680**	**520**	**550**	**600**	**480**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**7.04E-08**	**8.63E-07**	**1.76E-07**	**4.89E-08**	**1.65E-08**	**2.36E-08**	**2.82E-06**	**2.40E-05**	**1.34E-05**	**2.57E-05**	**5.26E-05**
SWSL-Marine[2] (micrograms per liter)		ug/L	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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TEF14A: Tanks EF14 Area

TABLE B-5 GROUNDWATER COPCs
METAL GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Nickel - Groundwater Transport

Area	Boring ID	-->	TEF14A	TEF14A	TEF14A	TEF14A	TEF14A	TEF14A	GA	GA	GA	GA	GA
Location ID	**Symbol**	**units**	**B5***	**B62***	**B63***	**B64***	**B65***	**B66***	**B3***	**B4***	**B6***	**B11***	**B15***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	8.00	8.00	14.00	8.20	4.00	12.00	67.00	34.00	28.00	7.00	79.00
Dispersivity in the transverse direction (feet)	a_y	ft	0.80	0.80	1.40	0.82	0.40	1.20	6.70	3.40	2.80	0.70	7.90
Dispersivity in the vertical direction (feet)	a_z	ft	0.08	0.08	0.14	0.08	0.04	0.12	0.67	0.34	0.28	0.07	0.79
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liters per kilogram)	k_d	l/kg	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**	**1258.93**
Retardation factor	R	-	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76	6480.76
Initial source concentration (micrograms per liter)	C_0	ug/L	**25.00**	**10.00**	**10.00**	**10.00**	**10.00**	**10.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**80**	**80**	**140**	**82**	**40**	**120**	**670**	**340**	**280**	**70**	**790**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.696**	**0.278**	**0.071**	**0.266**	**0.700**	**0.113**	**3.41E-06**	**2.24E-03**	**7.96E-03**	**0.870**	**3.66E-07**
SWSL-Marine[2] (micrograms per liter)		ug/L	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2

[1] Analytical solution for 2D mass transport equation
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TABLE B-5 GROUNDWATER COPCs
METAL GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Vanadium - Groundwater Transport

Area	Boring ID -->		DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	MDFA	MDFA	MDFA
Location ID	**Symbol**	**units**	**B8***	**B9***	**B13***	**B14***	**B19***	**B22***	**B1***	**B2***	**B28***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	88.00	93.00	108.00	114.00	126.00	111.00	62.00	78.00	80.00
Dispersivity in the transverse direction (feet)	a_y	ft	8.80	9.30	10.80	11.40	12.60	11.10	6.20	7.80	8.00
Dispersivity in the vertical direction (feet)	a_z	ft	0.88	0.93	1.08	1.14	1.26	1.11	0.62	0.78	0.80
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liters per kilogram)	k_d	l/kg	**50.12**	**50.12**	**50.12**	**50.12**	**50.12**	**50.12**	**50.12**	**50.12**	**50.12**
Retardation factor	R	-	258.96	258.96	258.96	258.96	258.96	258.96	258.96	258.96	258.96
Initial source concentration (micrograms per liter)	C_0	ug/L	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**
Solute decay coefficient (day $^{-1}$)	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day $^{-1}$)	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**880**	**930**	**1080**	**1140**	**1260**	**1110**	**620**	**780**	**800**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**8.10E-03**	**7.26E-03**	**5.38E-03**	**4.83E-03**	**3.94E-03**	**5.09E-03**	**0.016**	**0.010**	**0.010**
SWSL-Marine[2] (micrograms per liter)		ug/L	19	19	19	19	19	19	19	19	19

[1] Analytical solution for 2D mass transport equation
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TABLE B-5 GROUNDWATER COPCs
METAL GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Vanadium - Groundwater Transport

Area	Boring ID -->		BB20A	BB20A	BB20A	TEF6-9A	TEF6-9A	TEF11-13A	TEF14A	GA	GA
Location ID	**Symbol**	**units**	**B20***	**B23***	**B25***	**B21***	**B24***	**B7***	**B5***	**B3***	**B4***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	15.00	36.30	4.00	96.00	60.00	68.00	8.00	67.00	34.00
Dispersivity in the transverse direction (feet)	a_y	ft	1.50	3.63	0.40	9.60	6.00	6.80	0.80	6.70	3.40
Dispersivity in the vertical direction (feet)	a_z	ft	0.15	0.36	0.04	0.96	0.60	0.68	0.08	0.67	0.34
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liters per kilogram)	k_d	l/kg	**50.12**	**50.12**	**50.12**	**50.12**	**50.12**	**50.12**	**50.12**	**50.12**	**50.12**
Retardation factor	R	-	258.96	258.96	258.96	258.96	258.96	258.96	258.96	258.96	258.96
Initial source concentration (micrograms per liter)	C_0	ug/L	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**
Solute decay coefficient (day $^{-1}$)	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day $^{-1}$)	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**150**	**363**	**40**	**960**	**600**	**680**	**80**	**670**	**340**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.256**	**0.047**	**1.752**	**6.81E-03**	**0.017**	**0.014**	**0.738**	**0.014**	**0.053**
SWSL-Marine[2] (micrograms per liter)		ug/L	19	19	19	19	19	19	19	19	19

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-5 GROUNDWATER COPCs
METAL GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Vanadium - Groundwater Transport

Area	Boring ID -->		GA	GA	GA	GA	GA	GA
Location ID	**Symbol**	**units**	**B6***	**B11***	**B15***	**B16***	**B17***	**B18***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	28.00	7.00	79.00	30.00	11.00	45.00
Dispersivity in the transverse direction (feet)	a_y	ft	2.80	0.70	7.90	3.00	1.10	4.50
Dispersivity in the vertical direction (feet)	a_z	ft	0.28	0.07	0.79	0.30	0.11	0.45
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liters per kilogram)	k_d	l/kg	**50.12**	**50.12**	**50.12**	**50.12**	**50.12**	**50.12**
Retardation factor	R	-	258.96	258.96	258.96	258.96	258.96	258.96
Initial source concentration (micrograms per liter)	C_0	ug/L	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**	**25.00**
Solute decay coefficient (day $^{-1}$)	m	1/day	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day $^{-1}$)	l	1/day	0.00	0.00	0.00	0.00	0.00	0.00

Distance (feet)	L	ft	**280**	**70**	**790**	**300**	**110**	**450**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.078**	**0.896**	**0.010**	**0.068**	**0.443**	**0.031**
SWSL-Marine[2] (micrograms per liter)		ug/L	19	19	19	19	19	19

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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BB20A: Boring B20 Area
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TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-5 GROUNDWATER COPCs
METAL GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Zinc - Groundwater Transport

Area	Boring ID -->		TEF6-9A
Location ID	**Symbol**	**units**	**B38**
Hydraulic conductivity (feet per day)	K	ft/day	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096
Seepage velocity (feet per day)	U	ft/day	0.28
		ft/year	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	78.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.80
Dispersivity in the vertical direction (feet)	a_z	ft	0.78
Source width (feet)	Y	ft	1.00
Source depth (feet)	Z	ft	5.00
Porosity	n	-	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75
Adsorption coefficient (liters per kilogram)	k_d	l/kg	**1258.93**
Retardation factor	R	-	6480.76
Initial source concentration (micrograms per liter)	C_0	ug/L	**180.00**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00

Distance (feet)	L	ft	**780**
Time (10,000 years ~ 3,652,500 days)	t	days	**3652500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**3.17E-06**
SWSL-Marine[2] (micrograms per liter)		ug/L	81.0

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
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TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Anthracene - Groundwater Transport

Area	Boring ID -->		DS / RA	DS / RA	DS / RA
Location ID	**Symbol**	**units**	**B67**	**B71**	**B75**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	91.00	103.00	134.00
Dispersivity in the transverse direction (feet)	a_y	ft	9.10	10.30	13.40
Dispersivity in the vertical direction (feet)	a_z	ft	0.91	1.03	1.34
Source width (feet)	Y	ft	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	23.50	23.50	23.50
Retardation factor	R	-	121.96	121.96	121.96
Initial source concentration (micrograms per liter)	C_0	ug/L	**1.20**	**1.10**	**19.00**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00
Distance (feet)	L	ft	**910**	**1,030**	**1,340**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**3.637E-04**	**2.604E-04**	**2.660E-03**
SWSL-Marine[2] (micrograms per liter)		ug/L	**0.73**	**0.73**	**0.73**

[1] Analytical solution for 2D mass transport equation
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TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Benzo(a)Anthracene - Groundwater Transport

Area	Boring ID -->		DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA
Location ID	**Symbol**	**units**	**B74**	**B67**	**B69**	**B70***	**B71**	**B75***	**B91**	**B68***	**B72**	**B73***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	131.00	91.00	87.00	96.00	103.00	134.00	110.00	95.00	99.00	119.00
Dispersivity in the transverse direction (feet)	a_y	ft	13.10	9.10	8.70	9.60	10.30	13.40	11.00	9.50	9.90	11.90
Dispersivity in the vertical direction (feet)	a_z	ft	1.31	0.91	0.87	0.96	1.03	1.34	1.10	0.95	0.99	1.19
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	200	200	200	200	200	200	200	200	200	200
Retardation factor	R	-	1030.41	1030.41	1030.41	1030.41	1030.41	1030.41	1030.41	1030.41	1030.41	1030.41
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.57**	**1.40**	**0.21**	**0.05**	**0.28**	**0.24**	**1.60**	**0.045**	**0.17**	**0.045**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**1,310**	**910**	**870**	**960**	**1,030**	**1,340**	**1,100**	**950**	**990**	**1,190**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**2.305E-05**	**2.495E-04**	**4.362E-05**	**7.366E-06**	**3.169E-05**	**8.710E-06**	**1.395E-04**	**6.885E-06**	**2.236E-05**	**2.815E-06**
SWSL-Marine[2] (micrograms per liter)		ug/L	**2.70E-02**	**2.70E-02**	**2.70E-02**	**2.70E-02**	**2.70E-02**	**2.70E-02**	**2.70E-02**	**2.70E-02**	**2.70E-02**	**2.70E-02**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Benzo(a)Anthracene - Groundwater Transport

Area	Boring ID -->		B20A	TEF6-9	TEF6-9
Location ID	**Symbol**	**units**	**B42***	**B76**	**B77**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	20.00	103.00	81.00
Dispersivity in the transverse direction (feet)	a_y	ft	2.00	10.30	8.10
Dispersivity in the vertical direction (feet)	a_z	ft	0.20	1.03	0.81
Source width (feet)	Y	ft	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	200	200	200
Retardation factor	R	-	1030.41	1030.41	1030.41
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.055**	**0.17**	**0.48**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00
Distance (feet)	L	ft	**200**	**1,030**	**810**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**3.288E-04**	**1.924E-05**	**1.258E-04**
SWSL-Marine[2] (micrograms per liter)		ug/L	**2.70E-02**	**2.70E-02**	**2.70E-02**

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TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Benzo(a)pyrene - Groundwater Transport

Area	Boring ID -->		DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	B20 AREA	TEF6-9	TEF6-9
Location ID	**Symbol**	**units**	**B74**	**B68***	**B67**	**B70***	**B69**	**B71**	**B72**	**B73**	**B75**	**B91**	**B42**	**B76**	**B77**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	131.00	95.00	91.00	96.00	87.00	103.00	99.00	119.00	134.00	110.00	20.00	103.00	81.00
Dispersivity in the transverse direction (feet)	a_y	ft	13.10	9.50	9.10	9.60	8.70	10.30	9.90	11.90	13.40	11.00	2.00	10.30	8.10
Dispersivity in the vertical direction (feet)	a_z	ft	1.31	0.95	0.91	0.96	0.87	1.03	0.99	1.19	1.34	1.10	0.20	1.03	0.81
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500
Retardation factor	R	-	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82
Initial source concentration (micrograms per liter)	C_0	ug/L	**1.00**	**0.045**	**3.40**	**0.05**	**0.45**	**0.16**	**0.16**	**0.15**	**2.20**	**2.40**	**0.2**	**0.28**	**1.30**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**1,310**	**950**	**910**	**960**	**870**	**1,030**	**990**	**1,190**	**1,340**	**1,100**	**200**	**1,030**	**810**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**8.042E-43**	**3.849E-33**	**4.970E-30**	**2.105E-33**	**1.129E-29**	**4.744E-35**	**8.042E-34**	**5.567E-40**	**2.154E-43**	**5.067E-36**	**1.156E-08**	**8.302E-35**	**2.342E-27**
SWSL-Marine[2] (micrograms per liter)		ug/L	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
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TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Benzo(a)pyrene - Groundwater Transport

Area	Boring ID -->		TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A
Location ID	**Symbol**	**units**	**B31**	**B32***	**B33**	**B34**	**B35**	**B36**	**B37**	**B38**	**B39**	**B50***	**B51**	**B52**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	75.00	76.00	71.00	68.00	87.00	87.00	83.00	78.00	78.00	85.00	91.00	89.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.50	7.60	7.10	6.80	8.70	8.70	8.30	7.80	7.80	8.50	9.10	8.90
Dispersivity in the vertical direction (feet)	a_z	ft	0.75	0.76	0.71	0.68	0.87	0.87	0.83	0.78	0.78	0.85	0.91	0.89
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500	5500
Retardation factor	R	-	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82
Initial source concentration (micrograms per liter)	C_0	ug/L	**1.4**	**31.5**	**1.6**	**4.2**	**1.3**	**2.5**	**2.7**	**0.88**	**3**	**4.75**	**1.6**	**4.4**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**750**	**760**	**710**	**680**	**870**	**870**	**830**	**780**	**780**	**850**	**910**	**890**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**1.835E-25**	**2.019E-24**	**3.683E-24**	**8.336E-23**	**3.262E-29**	**6.274E-29**	**1.169E-27**	**1.350E-26**	**4.602E-26**	**4.948E-28**	**2.339E-30**	**2.663E-29**
SWSL-Marine[2] (micrograms per liter)		ug/L	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Benzo(a)pyrene - Groundwater Transport

Area	Boring ID -->		TEF11-13A	TEF11-13A	TEF11-13A	TEF11-13A	GA	GA
Location ID	**Symbol**	**units**	**B45***	**B46***	**B47**	**B49***	**B83***	**B85***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	52.00	60.00	55.00	48.00	32.00	50.00
Dispersivity in the transverse direction (feet)	a_y	ft	5.20	6.00	5.50	4.80	3.20	5.00
Dispersivity in the vertical direction (feet)	a_z	ft	0.52	0.60	0.55	0.48	0.32	0.50
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	5500	5500	5500	5500	5500	5500
Retardation factor	R	-	28309.82	28309.82	28309.82	28309.82	28309.82	28309.82
Initial source concentration (micrograms per liter)	C_0	ug/L	**4.75**	**5**	**2.1**	**4.7**	**4.75**	**4.75**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**520**	**600**	**550**	**480**	**320**	**500**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**1.004E-17**	**3.173E-20**	**4.999E-19**	**1.847E-16**	**2.681E-11**	**4.321E-17**
SWSL-Marine[2] (micrograms per liter)		ug/L	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**	**1.40E-02**

[1] Analytical solution for 2D mass transport equation
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[2] Surface Water Screening Level corresponding to marine aquatic habitats
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GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Benzo(b)Fluoranthene - Groundwater Transport

Area	Boring ID -->		DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA
Location ID	**Symbol**	**units**	**B74**	**B68***	**B70***	**B71***	**B72***	**B67**	**B69**	**B73**	**B75**	**B91**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	131.00	95.00	96.00	103.00	99.00	91.00	87.00	119.00	134.00	110.00
Dispersivity in the transverse direction (feet)	a_y	ft	13.10	9.50	9.60	10.30	9.90	9.10	8.70	11.90	13.40	11.00
Dispersivity in the vertical direction (feet)	a_z	ft	1.31	0.95	0.96	1.03	0.99	0.91	0.87	1.19	1.34	1.10
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	550	550	550	550	550	550	550	550	550	550
Retardation factor	R	-	2831.88	2831.88	2831.88	2831.88	2831.88	2831.88	2831.88	2831.88	2831.88	2831.88
Initial source concentration (micrograms per liter)	C_0	ug/L	**1.00**	**0.095**	**0.095**	**0.095**	**0.095**	**3.30**	**0.35**	**0.19**	**3.10**	**3.60**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**1,310**	**950**	**960**	**1,030**	**990**	**910**	**870**	**1,190**	**1,340**	**1,100**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**1.670E-07**	**3.518E-07**	**3.221E-07**	**1.742E-07**	**2.473E-07**	**1.743E-05**	**2.643E-06**	**8.765E-08**	**4.025E-07**	**3.596E-06**
SWSL-Marine[2] (micrograms per liter)		ug/L	**2.90E-02**	**2.90E-02**	**2.90E-02**	**2.90E-02**	**2.90E-02**	**2.90E-02**	**2.90E-02**	**2.90E-02**	**2.90E-02**	**2.90E-02**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
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TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Benzo(b)Fluoranthene - Groundwater Transport

Area	Boring ID -->		B20A	TEF6-9	TEF6-9
Location ID	**Symbol**	**units**	**B42***	**B76**	**B77**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	20.00	103.00	81.00
Dispersivity in the transverse direction (feet)	a_y	ft	2.00	10.30	8.10
Dispersivity in the vertical direction (feet)	a_z	ft	0.20	1.03	0.81
Source width (feet)	Y	ft	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	550	550	550
Retardation factor	R	-	2831.88	2831.88	2831.88
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.11**	**0.21**	**1.20**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00
Distance (feet)	L	ft	**200**	**1,030**	**810**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**6.014E-04**	**3.851E-07**	**1.557E-05**
SWSL-Marine[2] (micrograms per liter)		ug/L	**2.90E-02**	**2.90E-02**	**2.90E-02**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Benzo(g,h,i)Perylene - Groundwater Transport

Area	Boring ID -->		DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA	DS / RA
Location ID	**Symbol**	**units**	**B74**	**B68***	**B70***	**B67**	**B69**	**B73**	**B75**	**B91**	**B71**	**B72**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	131.00	95.00	96.00	91.00	87.00	119.00	134.00	110.00	103.00	99.00
Dispersivity in the transverse direction (feet)	a_y	ft	13.10	9.50	9.60	9.10	8.70	11.90	13.40	11.00	10.30	9.90
Dispersivity in the vertical direction (feet)	a_z	ft	1.31	0.95	0.96	0.91	0.87	1.19	1.34	1.10	1.03	0.99
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Retardation factor	R	-	8236.29	8236.29	8236.29	8236.29	8236.29	8236.29	8236.29	8236.29	8236.29	8236.29
Initial source concentration (micrograms per liter)	C_0	ug/L	**1.10**	**0.095**	**0.095**	**3.60**	**0.55**	**0.33**	**3.80**	**3.50**	**0.30**	**0.24**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**1,310**	**950**	**960**	**910**	**870**	**1,190**	**1,340**	**1,100**	**1,030**	**990**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**5.469E-15**	**1.275E-12**	**1.020E-12**	**1.180E-10**	**4.422E-11**	**2.231E-14**	**9.867E-15**	**1.700E-12**	**6.819E-13**	**1.323E-12**
SWSL-Marine[2] (micrograms per liter)		ug/L	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Benzo(g,h,i)Perylene - Groundwater Transport

Area	Boring ID -->		B20A	TEF6-9	TEF6-9
Location ID	**Symbol**	**units**	**B42**	**B76**	**B77**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	20.00	103.00	81.00
Dispersivity in the transverse direction (feet)	a_y	ft	2.00	10.30	8.10
Dispersivity in the vertical direction (feet)	a_z	ft	0.20	1.03	0.81
Source width (feet)	Y	ft	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	1,600	1,600	1,600
Retardation factor	R	-	8236.29	8236.29	8236.29
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.26**	**0.44**	**1.60**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00
Distance (feet)	L	ft	**200**	**1,030**	**810**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**2.292E-04**	**1.000E-12**	**4.981E-10**
SWSL-Marine[2] (micrograms per liter)		ug/L	**0.1**	**0.1**	**0.1**

[1] Analytical solution for 2D mass transport equation
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DS/RA: Diesel Spill / Railyard Area
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BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Benzo(k)Fluoranthene - Groundwater Transport

Area	Boring ID -->		DS / RA	DS / RA	DS / RA
Location ID	**Symbol**	**units**	**B67**	**B75**	**B91**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	91.00	134.00	110.00
Dispersivity in the transverse direction (feet)	a_y	ft	9.10	13.40	11.00
Dispersivity in the vertical direction (feet)	a_z	ft	0.91	1.34	1.10
Source width (feet)	Y	ft	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	550.00	550.00	550.00
Retardation factor	R	-	2831.88	2831.88	2831.88
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.85**	**1.10**	**1.10**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00
Distance (feet)	L	ft	**910**	**1,340**	**1,100**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**4.489E-06**	**1.428E-07**	**1.099E-06**
SWSL-Marine[2] (micrograms per liter)		ug/L	**4.90E-02**	**4.90E-02**	**4.90E-02**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Chlorobenzene - Groundwater Transport

Area	Boring ID -->		MDFA
Location ID	**Symbol**	**units**	**B32***
Hydraulic conductivity (feet per day)	K	ft/day	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28
		ft/year	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	76.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.60
Dispersivity in the vertical direction (feet)	a_z	ft	0.76
Source width (feet)	Y	ft	1.00
Source depth (feet)	Z	ft	5.00
Porosity	n	-	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	0.22
Retardation factor	R	-	2.13
Initial source concentration (micrograms per liter)	C_0	ug/L	**31.5**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00

Distance (feet)	L	ft	**760**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.014**
SWSL-Marine[2] (micrograms per liter)		ug/L	**50**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Chrysene - Groundwater Transport

Area	Boring ID	-->	DS / RA	DS / RA	DS / RA	TEF6-9A
Location ID	**Symbol**	**units**	**B74**	**B67**	**B91**	**B77**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	131.00	91.00	110.00	81.00
Dispersivity in the transverse direction (feet)	a_y	ft	13.10	9.10	11.00	8.10
Dispersivity in the vertical direction (feet)	a_z	ft	1.31	0.91	1.10	0.81
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	400.00	400.00	400.00	400.00
Retardation factor	R	-	2059.82	2059.82	2059.82	2059.82
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.75**	**1.10**	**2.60**	**0.52**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**1,310**	**910**	**1,100**	**810**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**1.434E-06**	**2.970E-05**	**1.956E-05**	**2.799E-05**
SWSL-Marine[2] (micrograms per liter)		ug/L	**4.90E-02**	**4.90E-02**	**4.90E-02**	**4.90E-02**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Dibenzo(a,h)Anthracene - Groundwater Transport

Area	Boring ID	-->	DS/RA	DS/RA	DS/RA	DS/RA	TEF6-9A	TEF6-9A
Location ID	**Symbol**	**units**	**B69**	**B73**	**B75**	**B91**	**B76**	**B77**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	87.00	119.00	134.00	110.00	103.00	81.00
Dispersivity in the transverse direction (feet)	a_y	ft	8.70	11.90	13.40	11.00	10.30	8.10
Dispersivity in the vertical direction (feet)	a_z	ft	0.87	1.19	1.34	1.10	1.03	0.81
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	3,300	3,300	3,300	3,300	3,300	3,300
Retardation factor	R	-	16986.29	16986.29	16986.29	16986.29	16986.29	16986.29
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.42**	**0.40**	**11.00**	**4.40**	**0.34**	**1.30**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**870**	**1,190**	**1,340**	**1,100**	**1,030**	**810**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**2.773E-19**	**2.492E-25**	**1.096E-26**	**1.328E-22**	**2.120E-22**	**1.191E-17**
SWSL-Marine[2] (micrograms per liter)		ug/L	**4.90E-02**	**4.90E-02**	**4.90E-02**	**4.90E-02**	**4.90E-02**	**4.90E-02**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Fluoranthene - Groundwater Transport

Area	Boring ID -->		DS/RA
Location ID	**Symbol**	**units**	**B75**
Hydraulic conductivity (feet per day)	K	ft/day	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28
		ft/year	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	134.00
Dispersivity in the transverse direction (feet)	a_y	ft	13.40
Dispersivity in the vertical direction (feet)	a_z	ft	1.34
Source width (feet)	Y	ft	1.00
Source depth (feet)	Z	ft	5.00
Porosity	n	-	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	38.00
Retardation factor	R	-	196.59
Initial source concentration (micrograms per liter)	C_0	ug/L	**63**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00

Distance (feet)	L	ft	**1,340**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**8.81E-03**
SWSL-Marine[2] (micrograms per liter)		ug/L	**8.0**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
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TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Fluorene - Groundwater Transport

Area	Boring ID -->		**DS/RA**
Location ID	**Symbol**	**units**	**B75**
Hydraulic conductivity (feet per day)	K	ft/day	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28
		ft/year	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	134.00
Dispersivity in the transverse direction (feet)	a_y	ft	13.40
Dispersivity in the vertical direction (feet)	a_z	ft	1.34
Source width (feet)	Y	ft	1.00
Source depth (feet)	Z	ft	5.00
Porosity	n	-	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	13.80
Retardation factor	R	-	72.03
Initial source concentration (micrograms per liter)	C_0	ug/L	**220**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00

Distance (feet)	L	ft	**1,340**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.031**
SWSL-Marine[2] (micrograms per liter)		ug/L	**3.9**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
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TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Indeno(1,2,3-cd)Pyrene - Groundwater Transport

Area	Boring ID -->		TEF6-9	TEF6-9	DS/RA	DS/RA	DS/RA	DS/RA	DS/RA	DS/RA	DS/RA	DS/RA
Location ID	**Symbol**	**units**	**B76**	**B77**	**B67**	**B69**	**B71**	**B72**	**B74**	**B91**	**B68***	**B70***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.284	0.284	0.284	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	103.00	81.00	91.00	87.00	103.00	99.00	131.00	110.00	95.00	96.00
Dispersivity in the transverse direction (feet)	a_y	ft	10.30	8.10	9.10	8.70	10.30	9.90	13.10	11.00	9.50	9.60
Dispersivity in the vertical direction (feet)	a_z	ft	1.03	0.81	0.91	0.87	1.03	0.99	1.31	1.10	0.95	0.96
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Retardation factor	R	-	8236.29	8236.29	8236.29	8236.29	8236.29	8236.29	8236.29	8236.29	8236.29	8236.29
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.3**	**1.3**	**4.4**	**0.4**	**0.17**	**0.16**	**1.6**	**2.1**	**0.045**	**0.05**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**1,030**	**810**	**910**	**870**	**1,030**	**990**	**1,310**	**1,100**	**950**	**960**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**6.819E-13**	**4.047E-10**	**1.442E-10**	**3.22E-11**	**3.86E-13**	**8.82E-13**	**7.954E-15**	**1.020E-12**	**6.039E-13**	**5.370E-13**
SWSL-Marine[2] (micrograms per liter)		ug/L	**2.90E-02**	**2.90E-02**	**2.90E-02**	**2.90E-02**	**2.90E-02**	**2.90E-02**	**2.90E-02**	**2.90E-02**	**2.90E-02**	**2.90E-02**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit
** Concentration at shoreline less than 1.00E-308, which is the minimum scientific notation reported in Excel

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BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Indeno(1,2,3-cd)Pyrene - Groundwater Transport

Area	Boring ID -->		DS/RA	DS/RA	B20
Location ID	**Symbol**	**units**	**B73**	**B75***	**B42****
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	119.00	134.00	20.00
Dispersivity in the transverse direction (feet)	a_y	ft	11.90	13.40	2.00
Dispersivity in the vertical direction (feet)	a_z	ft	1.19	1.34	0.20
Source width (feet)	Y	ft	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	1,600	1,600	1,600
Retardation factor	R	-	8236.29	8236.29	8236.29
Initial source concentration (micrograms per liter)	C_0	ug/L	**0.15**	**0.24**	**0.26**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00
Distance (feet)	L	ft	**1,190**	**1,340**	**200**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**1.014E-14**	**6.232E-16**	**0.000**
SWSL-Marine[2] (micrograms per liter)		ug/L	**2.90E-02**	**2.90E-02**	**2.90E-02**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit
** Concentration at shoreline less than 1.00E-308, which is the minimum scientific nc

DS/RA: Diesel Spill / Railyard Area
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BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Naphthalene - Groundwater Transport

Area	Boring ID -->		DS/RA	TEF6-9A	TEF6-9A
Location ID	**Symbol**	**units**	**B75**	**B32**	**B32**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	134.00	76.00	76.00
Dispersivity in the transverse direction (feet)	a_y	ft	13.40	7.60	7.60
Dispersivity in the vertical direction (feet)	a_z	ft	1.34	0.76	0.76
Source width (feet)	Y	ft	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	1.19	1.19	1.19
Retardation factor	R	-	7.13	7.13	7.13
Initial source concentration (micrograms per liter)	C_0	ug/L	**27**	**210**	**170**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00
Distance (feet)	L	ft	**1,340**	**760**	**760**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**3.78E-03**	**0.091**	**0.074**
SWSL-Marine[2] (micrograms per liter)		ug/L	**21**	**21**	**21**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Phenanthrene - Groundwater Transport

Area	Boring ID -->		DS/RA
Location ID	**Symbol**	**units**	**B75**
Hydraulic conductivity (feet per day)	K	ft/day	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28
		ft/year	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	134.00
Dispersivity in the transverse direction (feet)	a_y	ft	13.40
Dispersivity in the vertical direction (feet)	a_z	ft	1.34
Source width (feet)	Y	ft	1.00
Source depth (feet)	Z	ft	5.00
Porosity	n	-	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	14.00
Retardation factor	R	-	73.06
Initial source concentration (micrograms per liter)	C_0	ug/L	**370**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00
Distance (feet)	L	ft	**1,340**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.052**
SWSL-Marine[2] (micrograms per liter)		ug/L	**4.6**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
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TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Pyrene - Groundwater Transport

Area	Boring ID -->		TEF6-9A	DS/RA	DS/RA	DS/RA	DS/RA	DS/RA	DS/RA	DS/RA	TEF6-9A	TEF6-9A
Location ID	**Symbol**	**units**	**B77**	**B67**	**B68**	**B69**	**B71**	**B72**	**B75**	**B91**	**B31***	**B32***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	81.00	91.00	95.00	87.00	103.00	99.00	134.00	110.00	75.00	76.00
Dispersivity in the transverse direction (feet)	a_y	ft	8.10	9.10	9.50	8.70	10.30	9.90	13.40	11.00	7.50	7.60
Dispersivity in the vertical direction (feet)	a_z	ft	0.81	0.91	0.95	0.87	1.03	0.99	1.34	1.10	0.75	0.76
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	105.00	105.00	105.00	105.00	105.00	105.00	105.00	105.00	105	105
Retardation factor	R	-	541.44	541.44	541.44	541.44	541.44	541.44	541.44	541.44	541.44	541.44
Initial source concentration (micrograms per liter)	C_0	ug/L	**4.9**	**13**	**4.2**	**4.5**	**2.2**	**3.2**	**14**	**2.8**	**5.5**	**31.5**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**810**	**910**	**950**	**870**	**1,030**	**990**	**1,340**	**1,100**	**750**	**760**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**1.83E-03**	**3.76E-03**	**1.10E-03**	**1.44E-03**	**4.79E-04**	**7.65E-04**	**1.54E-03**	**5.20E-04**	**2.415E-03**	**1.345E-02**
SWSL-Marine[2] (micrograms per liter)		ug/L	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
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TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Pyrene - Groundwater Transport

Area	Boring ID -->		TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A
Location ID	**Symbol**	**units**	**B33***	**B34**	**B35***	**B36***	**B37***	**B38***	**B39***	**B50***	**B51***	**B52***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	71.00	68.00	87.00	87.00	83.00	78.00	78.00	85.00	91.00	89.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.10	6.80	8.70	8.70	8.30	7.80	7.80	8.50	9.10	8.90
Dispersivity in the vertical direction (feet)	a_z	ft	0.71	0.68	0.87	0.87	0.83	0.78	0.78	0.85	0.91	0.89
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	105	105	105	105	105	105	105	105	105	105
Retardation factor	R	-	541.44	541.44	541.44	541.44	541.44	541.44	541.44	541.44	541.44	541.44
Initial source concentration (micrograms per liter)	C_0	ug/L	**5.5**	**12**	**5**	**5**	**5**	**4.7**	**4.55**	**4.75**	**4.7**	**4.7**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**710**	**680**	**870**	**870**	**830**	**780**	**780**	**850**	**910**	**890**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**2.706E-03**	**6.450E-03**	**1.599E-03**	**1.599E-03**	**1.771E-03**	**1.900E-03**	**1.840E-03**	**1.598E-03**	**1.361E-03**	**1.430E-03**
SWSL-Marine[2] (micrograms per liter)		ug/L	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Pyrene - Groundwater Transport

Area	Boring ID -->		TEF11-13A	TEF11-13A	TEF11-13A	TEF11-13A	GA	GA
Location ID	**Symbol**	**units**	**B45***	**B46***	**B47***	**B49***	**B83***	**B85***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	52.00	60.00	55.00	48.00	32.00	50.00
Dispersivity in the transverse direction (feet)	a_y	ft	5.20	6.00	5.50	4.80	3.20	5.00
Dispersivity in the vertical direction (feet)	a_z	ft	0.52	0.60	0.55	0.48	0.32	0.50
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	105	105	105	105	105	105
Retardation factor	R	-	541.44	541.44	541.44	541.44	541.44	541.44
Initial source concentration (micrograms per liter)	C_0	ug/L	**4.75**	**5**	**5**	**4.7**	**4.75**	**4.75**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**520**	**600**	**550**	**480**	**320**	**500**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**4.383E-03**	**3.464E-03**	**4.125E-03**	**5.085E-03**	**1.144E-02**	**4.739E-03**
SWSL-Marine[2] (micrograms per liter)		ug/L	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**

[1] Analytical solution for 2D mass transport equation
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TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

1,1-Dichloroethylene - Groundwater Transport

Area	Boring ID -->		TEF6-9A
Location ID	**Symbol**	**units**	**B32***
Hydraulic conductivity (feet per day)	K	ft/day	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28
		ft/year	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	76.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.60
Dispersivity in the vertical direction (feet)	a_z	ft	0.76
Source width (feet)	Y	ft	1.00
Source depth (feet)	Z	ft	5.00
Porosity	n	-	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	0.06
Retardation factor	R	-	1.30
Initial source concentration (micrograms per liter)	C_0	ug/L	**31.5**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00

Distance (feet)	L	ft	**760**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.014**
SWSL-Marine[2] (micrograms per liter)		ug/L	**3.2**

[1] Analytical solution for 2D mass transport equation
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[2] Surface Water Screening Level corresponding to marine aquatic habitats
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TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Benzene - Groundwater Transport

Area	Boring ID -->		MDFA	TEF6-9A	TEF6-9A
Location ID	**Symbol**	**units**	**EW5**	**B32**	**B38**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	27.00	76.00	78.00
Dispersivity in the transverse direction (feet)	a_y	ft	2.70	7.60	7.80
Dispersivity in the vertical direction (feet)	a_z	ft	0.27	0.76	0.78
Source width (feet)	Y	ft	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	0.06	0.06	0.06
Retardation factor	R	-	1.30	1.30	1.30
Initial source concentration (micrograms per liter)	C_0	ug/L	**110**	**73**	**65**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00
Distance (feet)	L	ft	**270**	**760**	**780**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.369**	**0.032**	**0.027**
SWSL-Marine[2] (micrograms per liter)		ug/L	**71**	**71**	**71**

[1] Analytical solution for 2D mass transport equation
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[2] Surface Water Screening Level corresponding to marine aquatic habitats
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TEF14A: Tanks EF14 Area

TABLE B.6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Ethylbenzene - Groundwater Transport

Area	Boring ID -->		TEF6-9A
Location ID	**Symbol**	**units**	**B32**
Hydraulic conductivity (feet per day)	K	ft/day	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28
		ft/year	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	76.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.60
Dispersivity in the vertical direction (feet)	a_z	ft	0.76
Source width (feet)	Y	ft	1.00
Source depth (feet)	Z	ft	5.00
Porosity	n	-	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	0.36
Retardation factor	R	-	2.87
Initial source concentration (micrograms per liter)	C_0	ug/L	**140**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00

Distance (feet)	L	ft	**760**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.061**
SWSL-Marine[2] (micrograms per liter)		ug/L	**30**

[1] Analytical solution for 2D mass transport equation
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TABLE B-6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

Xylenes - Groundwater Transport

Area	Boring ID -->		TEF6-9A
Location ID	**Symbol**	**units**	**B32**
Hydraulic conductivity (feet per day)	K	ft/day	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28
		ft/year	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	76.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.60
Dispersivity in the vertical direction (feet)	a_z	ft	0.76
Source width (feet)	Y	ft	1.00
Source depth (feet)	Z	ft	5.00
Porosity	n	-	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	0.41
Retardation factor	R	-	3.09
Initial source concentration (micrograms per liter)	C_0	ug/L	**1,690**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00

Distance (feet)	L	ft	**760**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.734**
SWSL-Marine[2] (micrograms per liter)		ug/L	**100**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
MDFA: Municipal Debris Fill Area
BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

2-Methyl-napthtalene - Groundwater Transport

Area	Boring ID -->		TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A	TEF6-9A
Location ID	**Symbol**	**units**	**B31***	**B32**	**B33***	**B34***	**B35***	**B36***	**B37***	**B38**	**B39***	**B50***	**B51***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	75.00	76.00	71.00	68.00	87.00	87.00	83.00	78.00	78.00	85.00	91.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.50	7.60	7.10	6.80	8.70	8.70	8.30	7.80	7.80	8.50	9.10
Dispersivity in the vertical direction (feet)	a_z	ft	0.75	0.76	0.71	0.68	0.87	0.87	0.83	0.78	0.78	0.85	0.91
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Retardation factor	R	-	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71
Initial source concentration (micrograms per liter)	C_0	ug/L	**5.5**	**120**	**5.5**	**5.5**	**5**	**5**	**5**	**19**	**4.55**	**4.75**	**4.7**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**750**	**760**	**710**	**680**	**870**	**870**	**830**	**780**	**780**	**850**	**910**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**2.45E-03**	**0.052**	**2.73E-03**	**2.98E-03**	**1.66E-03**	**1.66E-03**	**1.82E-03**	**7.83E-03**	**1.88E-03**	**1.65E-03**	**1.42E-03**
SWSL-Marine[2] (micrograms per liter)		ug/L	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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BB20A: Boring B20 Area
GA: General Area
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TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

2-Methyl-napthtalene - Groundwater Transport

Area	Boring ID -->		TEF6-9A	TEF11-13A	TEF11-13A	TEF11-13A	TEF11-13A	GA	GA
Location ID	**Symbol**	**units**	**B52***	**B45***	**B46***	**B47***	**B49***	**B83***	**B85***
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	89.00	52.00	60.00	55.00	48.00	32.00	50.00
Dispersivity in the transverse direction (feet)	a_y	ft	8.90	5.20	6.00	5.50	4.80	3.20	5.00
Dispersivity in the vertical direction (feet)	a_z	ft	0.89	0.52	0.60	0.55	0.48	0.32	0.50
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	0.72	0.72	0.72	0.72	0.72	0.72	0.41
Retardation factor	R	-	4.71	4.71	4.71	4.71	4.71	4.71	3.09
Initial source concentration (micrograms per liter)	C_0	ug/L	**4.7**	**4.75**	**5**	**5**	**4.7**	**4.75**	**4.75**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**890**	**520**	**600**	**550**	**480**	**320**	**500**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**1.49E-03**	**4.39E-03**	**3.47E-03**	**4.13E-03**	**5.09E-03**	**0.011**	**4.74E-03**
SWSL-Marine[2] (micrograms per liter)		ug/L	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

TPH-Gasoline - Groundwater Transport

Area	Boring ID -->		TEF6-9A	TEF6-9A	TEF6-9A	DS/RA	MDFA	MDFA
Location ID	**Symbol**	**units**	**B32**	**B35**	**B38**	**B75R**	**MW6**	**EW5**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	76.00	87.00	78.00	134.00	40.00	27.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.60	8.70	7.80	13.40	4.00	2.70
Dispersivity in the vertical direction (feet)	a_z	ft	0.76	0.87	0.78	1.34	0.40	0.27
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	5.00	5.00	5.00	5.00	5.00	5.00
Retardation factor	R	-	26.74	26.74	26.74	26.74	26.74	26.74
Initial source concentration (micrograms per liter)	C_0	ug/L	**12,000**	**570**	**1,900**	**1,500**	**580**	**3,000**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**760**	**870**	**780**	**1,340**	**400**	**270**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**5.209**	**0.189**	**0.783**	**0.210**	**0.900**	**10.067**
SWSL-Marine[2] (micrograms per liter)		ug/L	**3,700**	**3,700**	**3,700**	**3,700**	**3,700**	**3,700**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

TPH-Diesel - Groundwater Transport

Area	Boring ID -->		DS/RA	DS/RA	DS/RA	DS/RA	MDFA	MDFA	MDFA	MDFA	MDFA	MDFA
Location ID	**Symbol**	**units**	**B8**	**B13**	**B75**	**B75R**	**B1**	**B2**	**B28**	**B56**	**MW7**	**EW5**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	88.00	108.00	134.00	134.00	62.00	78.00	80.00	42.00	39.00	27.00
Dispersivity in the transverse direction (feet)	a_y	ft	8.80	10.80	13.40	13.40	6.20	7.80	8.00	4.20	3.90	2.70
Dispersivity in the vertical direction (feet)	a_z	ft	0.88	1.08	1.34	1.34	0.62	0.78	0.80	0.42	0.39	0.27
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	3.50
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Retardation factor	R	-	26.74	26.74	26.74	26.74	26.74	26.74	26.74	26.74	26.74	26.74
Initial source concentration (micrograms per liter)	C_0	ug/L	**1,100**	**2,100**	**14,000**	**240,000**	**2,300**	**1,100**	**4,300**	**2,600**	**2,500**	**690**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**880**	**1,080**	**1,340**	**1,340**	**620**	**780**	**800**	**420**	**390**	**270**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.356**	**0.452**	**1.960**	**33.596**	**1.498**	**0.453**	**1.685**	**3.666**	**4.080**	**1.644**
SWSL-Marine[2] (micrograms per liter)		ug/L	**640**	**640**	**640**	**640**	**640**	**640**	**640**	**640**	**640**	**640**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

TPH-Diesel - Groundwater Transport

Area	Boring ID -->		TEF6-9A	TEF6-9A	GA
Location ID	**Symbol**	**units**	**B31**	**B32**	**B15**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	75.00	76.00	79.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.50	7.60	7.90
Dispersivity in the vertical direction (feet)	a_z	ft	0.75	0.76	0.79
Source width (feet)	Y	ft	1.00	1.00	1.00
Source depth (feet)	Z	ft	3.50	3.50	3.50
Porosity	n	-	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	5.00	5.00	5.00
Retardation factor	R	-	26.74	26.74	26.74
Initial source concentration (micrograms per liter)	C_0	ug/L	**9,200**	**66,000**	**1,900**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00
Distance (feet)	L	ft	**750**	**760**	**790**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**2.876**	**20.093**	**0.535**
SWSL-Marine[2] (micrograms per liter)		ug/L	**640**	**640**	**640**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

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BB20A: Boring B20 Area
GA: General Area
TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

TPH - Motor Oil - Groundwater Transport

Area	Boring ID -->		DS/RA	DS/RA	DS/RA	DS/RA	DS/RA	DS/RA	TEF6-9A	TEF6-9A	TEF6-9A	MDFA	MDFA
Location ID	**Symbol**	**units**	**B8**	**B13**	**B14**	**B91**	**B75**	**B75R**	**B21**	**B31**	**B32**	**B1**	**B2**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	88.00	108.00	114.00	110.00	134.00	134.00	96.00	75.00	76.00	62.00	78.00
Dispersivity in the transverse direction (feet)	a_y	ft	8.80	10.80	11.40	11.00	13.40	13.40	9.60	7.50	7.60	6.20	7.80
Dispersivity in the vertical direction (feet)	a_z	ft	0.88	1.08	1.14	1.10	1.34	1.34	0.96	0.75	0.76	0.62	0.78
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Retardation factor	R	-	26.74	26.74	26.74	26.74	26.74	26.74	26.74	26.74	26.74	26.74	26.74
Initial source concentration (micrograms per liter)	C_0	ug/L	**2,400**	**1,250**	**2,000**	**890**	**890**	**12,000**	**720**	**8,700**	**95,000**	**9,200**	**3,000**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**880**	**1,080**	**1,140**	**1,100**	**1,340**	**1,340**	**960**	**750**	**760**	**620**	**780**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**0.778**	**0.269**	**0.387**	**0.185**	**0.125**	**1.680**	**0.196**	**3.878**	**41.240**	**5.990**	**1.237**
SWSL-Marine[2] (micrograms per liter)		ug/L	**640**	**640**	**640**	**640**	**640**	**640**	**640**	**640**	**640**	**640**	**640**

[1] Analytical solution for 2D mass transport equation
Domenico, P. A. (1987)
[2] Surface Water Screening Level corresponding to marine aquatic habitats
* Concentration corresponding 1/2 detection limit

DS/RA: Diesel Spill / Railyard Area
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TEF6-9A: Tanks EF6-9 Area
TEF11-13A: Tanks EF11-13 Area
TEF14A: Tanks EF14 Area

TABLE B-6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

TPH - Motor Oil - Groundwater Transport

Area	Boring ID -->		MDFA	MDFA	B20	GA	GA	GA
Location ID	**Symbol**	**units**	**B28**	**B56**	**B25**	**B3**	**B15**	**B18**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35	28.35	28.35	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034	0.0034	0.0034	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096	0.096	0.096	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28	0.28	0.28	0.28	0.28
		ft/year	103.55	103.55	103.55	103.55	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	80.00	42.00	4.00	67.00	79.00	45.00
Dispersivity in the transverse direction (feet)	a_y	ft	8.00	4.20	0.40	6.70	7.90	4.50
Dispersivity in the vertical direction (feet)	a_z	ft	0.80	0.42	0.04	0.67	0.79	0.45
Source width (feet)	Y	ft	1.00	1.00	1.00	1.00	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00	5.00	5.00	5.00	5.00
Porosity	n	-	0.34	0.34	0.34	0.34	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75	1.75	1.75	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	5.00	5.00	5.00	5.00	5.00	5.00
Retardation factor	R	-	26.74	26.74	26.74	26.74	26.74	26.74
Initial source concentration (micrograms per liter)	C_0	ug/L	**4,400**	**910**	**2,100**	**790**	**1,400**	**750**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00	0.00	0.00	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00	0.00	0.00	0.00	0.00
Distance (feet)	L	ft	**800**	**420**	**40**	**670**	**790**	**450**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**1.724**	**1.283**	**147.140**	**0.441**	**0.563**	**0.923**
SWSL-Marine[2] (micrograms per liter)		ug/L	**640**	**640**	**640**	**640**	**640**	**640**

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TABLE B-6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

TPH - Bunker C - Groundwater Transport

Area	Boring ID -->		**MDFA**
Location ID	**Symbol**	**units**	**B56**
Hydraulic conductivity (feet per day)	K	ft/day	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28
		ft/year	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	42.00
Dispersivity in the transverse direction (feet)	a_y	ft	4.20
Dispersivity in the vertical direction (feet)	a_z	ft	0.42
Source width (feet)	Y	ft	1.00
Source depth (feet)	Z	ft	5.00
Porosity	n	-	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	5.00
Retardation factor	R	-	26.74
Initial source concentration (micrograms per liter)	C_0	ug/L	**6,500**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00

Distance (feet)	L	ft	**420**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**9.164**
SWSL-Marine[2] (micrograms per liter)		ug/L	**640**

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TABLE B-6 GROUNDWATER COPCs
ORGANIC COMPOUNDS GROUNDWATER TRANSPORT
BERTHS 60 - 63 TERMINAL, PORT OF OAKLAND, CALIFORNIA

TPH - Hydraulic Oil - Groundwater Transport

Area	Boring ID -->		TEF6-9A	TEF6-9A
Location ID	**Symbol**	**units**	**B31**	**B32**
Hydraulic conductivity (feet per day)	K	ft/day	28.35	28.35
Hydraulic gradient (foot/foot)	i	ft/ft	0.0034	0.0034
Darcy velocity (feet per day)	q_a	ft/day	0.096	0.096
Seepage velocity (feet per day) and (feet per year)	U	ft/day	0.28	0.28
		ft/year	103.55	103.55
Dispersivity in the longitudinal direction (feet)	a_x	ft	75.00	76.00
Dispersivity in the transverse direction (feet)	a_y	ft	7.50	7.60
Dispersivity in the vertical direction (feet)	a_z	ft	0.75	0.76
Source width (feet)	Y	ft	1.00	1.00
Source depth (feet)	Z	ft	5.00	5.00
Porosity	n	-	0.34	0.34
Bulk density (kilograms per liter)	r_b	kg/l	1.75	1.75
Adsorption coefficient (liter per kilogram)	k_d	l/kg	5.00	5.00
Retardation factor	R	-	26.74	26.74
Initial source concentration (micrograms per liter)	C_0	ug/L	**17,000**	**140,000**
Solute decay coefficient (day^{-1})	*m*	1/day	0.00	0.00
Boundary cond (source) decay coefficient (day^{-1})	*l*	1/day	0.00	0.00
Distance (feet)	L	ft	**750**	**760**
Time (10,000 years ~ 3,652,500 days)	t	days	**3,652,500**	**3,652,500**
Concentration at shoreline[1] (micrograms per liter)	C_s	ug/L	**7.577**	**60.775**
SWSL-Marine[2] (micrograms per liter)		ug/L	**640**	**640**

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