Erler &
Kalinowski, Inc.

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FINAL
RISK MANAGEMENT PLAN FOR THE 64TH STREET PROPERTIES EMERYVILLE, CALIFORNIA

8/9/99

9 August 1999
(EKI 990016.01)

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Consulting Engineers and Scientists

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9 August 1999

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Subject: Risk Management Plan
64th Street Properties, Emeryville, California
(EKI 990016.01)

Dear Dr. Arulanantham and Ms. Hugo:

8/9/99

On behalf of Simeon Commercial Properties ("Simeon"), Erler & Kalinowski, Inc. ("EKI") is pleased to submit the *Final Risk Management Plan for the 64th Street Properties, Emeryville, California*, dated 6 August 1999 ("Simeon RMP"), for your approval. The Simeon RMP incorporates the comments you made on a draft version of this document during our 28 July 1999 meeting.

The Simeon RMP was prepared for the properties on the north side of 64th Street, between Bay and Hollis Streets ("Site"). As you know, the *Final Risk Management Plan for the 64th and 65th Street Properties*, dated 26 October 1995 ("Sybase RMP"), was prepared on behalf of Sybase, Inc. for the Site and the adjacent Ryerson Steel facility, but Sybase's redevelopment never took place and the Sybase RMP was not implemented. The Simeon RMP is similar to the Sybase RMP, but is specific to Simeon's redevelopment plans. One significant difference between the Sybase and Simeon redevelopment plans is that Simeon's plans may include a child day care facility. Potential health risks to children at a Site day care facility are addressed in Section 5 of the Simeon RMP.

The Simeon RMP completes the requirement for a Site risk management plan stated in your letter dated 7 June 1999. In accordance with your request, Simeon will notify both of you that construction has begun once redevelopment activities actually start.

Construction on the Site is scheduled to begin on 30 August 1999. Consequently, expedited approval of the Simeon RMP would be appreciated.

Thank you for your continuing assistance on this project.

Very truly yours,

ERLER & KALINOWSKI, INC.

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enclosure

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DRAFT FINAL RISK MANAGEMENT PLAN FOR THE 64TH STREET PROPERTIES EMERYVILLE, CALIFORNIA

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1.0 INTRODUCTION

On behalf of Simeon Commercial Properties ("Simeon"), Erler & Kalinowski, Inc. ("EKI") has prepared this risk management plan for the properties on the north side of 64th Street between Hollis and Bay Streets ("the Site") in Emeryville, California (Figure 1). The east portion of the Site is occupied by a former Breuner's warehouse ("Lowenberg property") (Figure 2). The west portion of the Site is an asphalt-paved area ("Ryerson paved lot property") (Figure 2). The Site is bounded to the north by the Ryerson Steel facility, to the west by railroad tracks, to the south by 64th Street, and to the east by Hollis Street. Simeon is planning to acquire the Site and redevelop it for commercial/office uses.

This risk management plan has been prepared in accordance with the requirements of the Regional Water Quality Control Board, San Francisco Bay Region ("RWQCB") and the Alameda County Department of Environmental Health ("ACDEH"). This risk management plan provides a decision framework to manage residual chemicals of concern ("COCs") in soil and groundwater on the Site in a manner that is consistent with planned land use and is protective of human health and the environment, including water quality. Implementation of this risk management plan is subject to Simeon's acquisition of the Site and will apply to the property acquired by Simeon.

Petroleum hydrocarbons and low concentrations of volatile organic compounds and arsenic were detected in soil and/or groundwater at the Site (EKI, 1999). This risk management plan contains the following:

- a description of the Site background, including a brief Site history and a summary of residual COCs in Site soil and groundwater;

- a description of Simeon's planned redevelopment;

- construction risk management protocols to be implemented during Site redevelopment; and

- post-construction risk management protocols for mitigation of any long-term risks.

The risk management protocols specified in this risk management plan are based on a current understanding of Site environmental conditions and current policies, laws, and regulations. All owners, tenants, developers, and any other entities with responsibility for Site activities shall continue to have the obligation (1) to determine the adequacy of this risk management plan in light of the conditions actually encountered and the intended land use; (2) to evaluate the current understanding of the health effects of identified COCs, to the extent health effects assumed in this risk management plan may change; and (3) to comply with applicable policies, laws, and regulations. No representation is made by any present or future owner or developer of the Site or their consultants, agents, and contractors as to the applicability of this risk management plan with respect to future Site conditions.

2.0 SITE BACKGROUND

The Site is located in Emeryville, California, and is bounded to the north by the Ryerson Steel facility, to the west by railroad tracks, to the south by 64th Street, and to the east by Hollis Street (see Figure 2). Presented below is a brief summary of Site use history, environmental investigations and remedial actions performed at the Site, and remaining environmental conditions at the Site. More detailed descriptions can be found in the EKI report *Phase I and Phase II Environmental Site Assessment for 64th Street Properties, Emeryville, California*, dated 20 May 1999 ("Phase I&II Report"). Figures from the Phase I&II Report that show chemical data are included in Appendix A.

2.1 FORMER REFINERY

According to available historical land use information, a petroleum refinery occupied the western portion of the Site from at least 1903 to 1911 (EKI, 1995a). The approximate location of the former petroleum refinery and associated features are shown on Figure 2.

Investigations performed on the Site indicate that soil and groundwater in the vicinity of the former petroleum refinery have been impacted by petroleum hydrocarbons. Concentrations of total extractable petroleum hydrocarbons ("TEPH") as high as 3,400 mg/kg have been detected in Site soil (EKI, 1995a). TEPH concentrations as high as 130,000 ug/L have been detected in groundwater samples collected from the vicinity of the former refinery (EKI, 1999). Based on groundwater samples collected downgradient of the Site, significant migration of these petroleum hydrocarbons has not occurred (EKI, 1999).

2.2 FORMER LOWENBERG TANKS

In February 1990, two underground fuel storage tanks were removed from the Lowenberg property (the eastern portion of the Site), adjacent to 64th Street (EKI, 1995a). Soil and groundwater in the vicinity of the Lowenberg tanks were found to be impacted by TEPH and total purgeable petroleum hydrocarbons ("TPPH"), as well as benzene, toluene, ethylbenzene, and xylenes ("BTEX"). Maximum concentrations of TPPH and BTEX detected in soil and recent maximum concentrations of TPPH and BTEX in groundwater are as follows (EKI, 1999):

Compound	Maximum Soil Concentration (mg/kg)	Recent Maximum Groundwater Concentration (ug/L)
TPPH	3,900	560
Benzene	75	26
Toluene	85	<5
Ethylbenzene	43	19
Xylenes	120	42

The data used to generate the "recent maximums" only include data from groundwater samples most recently collected from a given point on the Site (e.g., since a sample was collected from well TMW-1 in March 1995, data from the sample collected from well TMW-1 in January 1993 was not included).

The ACDEH issued a no-further-action letter for the Lowenberg tank site in March 1996. Wells in the vicinity of the Lowenberg tank site were destroyed in accordance with Alameda County Flood Control and Water Conservation District, Zone 7 regulations (EKI, 1996).

2.3 CHEMICALS OF CONCERN IN GROUNDWATER FROM UPGRADIENT SOURCES

Investigations performed on the Site indicate that Site groundwater has been impacted by halogenated volatile organic compounds ("HVOCs"). Data collected during these investigations and information available in regulatory agency files indicate that these HVOCs originated from one or more sources upgradient of the Site (EKI, 1999). Recent maximum HVOC concentrations detected in Site groundwater are as follows (EKI, 1999) (see also Table D-1 in Appendix D):

Compound	Recent Maximum Groundwater Concentration (ug/L)
Chloroethane	34
1,1-Dichloroethane	5.6
1,1-Dichloroethene	42
cis-1,2-Dichloroethene	51
trans-1,2-Dichloroethene	54
1,1,1-Trichloroethane	7.4
Trichloroethene	170
Vinyl Chloride	6.1

As discussed above, the data used to generate these "recent maximums" only include data from groundwater samples most recently collected from a given point on the Site.

In addition, elevated TEPH concentrations (1,100 ug/L in April 1999) have been detected in groundwater samples collected from well MW-1. This TEPH also appears to be migrating onto the Site from upgradient sources (EKI, 1999).

3.0 SIMEON'S PLANNED REDEVELOPMENT

Simeon's redevelopment plan for the Site includes (1) demolition of the western portion of the warehouse on the Lowenberg property, (2) conversion of the remainder of the warehouse to office/commercial space, and (3) construction of a multi-story office building and a multi-level parking structure in the vicinity of the Ryerson paved lot property (Figure 3). In addition to office/commercial uses, a portion of the Site may be used as a child day care facility.

The foundation design for the new building and new parking structure have not yet been finalized. Preliminary foundation plans call for use of continuous and non-continuous spread footings under the new building and the new parking structure. The maximum footing depth below existing grade is expected to be about 5 feet, based on preliminary design calculations.

Construction is currently scheduled to begin at the end of August 1999.

4.0 CONSTRUCTION RISK MANAGEMENT

The construction risk management protocols address precautions that will be taken for mitigation of any risks to human health and the environment during construction for Simeon's redevelopment of the Site. The precautions described in detail below are:

- health and safety training requirements for construction workers who may directly contact soil or groundwater containing COCs (e.g., during site preparation, grading, foundation construction, or landscape installation) (Section 4.1),

- requirements for establishing worker protection procedures for construction workers who may directly contact soil or groundwater containing COCs (Section 4.1);

- construction impact mitigation measures, including control of dust generation at the Site, decontamination of equipment, prevention of sediment from leaving the Site in storm water runoff, and management of groundwater removed from excavations (Section 4.2);

- procedure(s) for earthwork construction personnel to manage soil that is obviously affected, as identified by visual observation or elevated organic vapor readings, and to handle abandoned subsurface structures such as tanks, sumps, and pipes (Section 4.3);

- requirements for proper abandonment of existing monitoring wells (Section 4.4); and

- procedures for driving piles through affected soil, if required (Section 4.5).

As discussed in Section 4.3.1, the Site will be separated into three areas (Areas A, B, and C; see Figure 4) on the basis of historic use and analytical results from soil and groundwater sampling. Area A includes the former refinery area (where elevated levels of petroleum hydrocarbons have been detected in soil and groundwater). Area B includes portions of the Site where (1) chemical concentrations in soil samples were low or not detected and (2) there are no known sources of chemicals in soil. Area C includes the former Lowenberg tanks and vicinity (where elevated levels of petroleum hydrocarbons and BTEX compounds have been detected in soil and groundwater samples).

4.1 WORKER PROTECTION

Each construction contractor with workers who may directly contact Site soil or groundwater (e.g., during site preparation, grading, and foundation construction) will prepare its own site-specific health and safety plan ("H&SP"), consistent with State and Federal Occupational Safety and Health Administration standards for hazardous waste operations (California Code of Regulations, Title 8, Section 5192 and 29 Code of Federal Regulations 1910.120, respectively) and any other applicable health and safety standards. Each contractor will provide copies of its H&SP to Simeon and the ACDEH. Among other things, the H&SPs will include a description of health and safety training requirements for on-Site personnel, a description of the level of personal protective equipment to be used and any other applicable precautions to be undertaken to minimize direct contact with soil and groundwater.

Workers who may directly contact Site soil or groundwater will have the appropriate level of health and safety training and will use the appropriate level of personal protective equipment, as determined in the relevant H&SP.

4.2 CONSTRUCTION IMPACT MITIGATION MEASURES

This section outlines measures that will be implemented to mitigate potential impacts to human health and the environment during construction at the Site. Measures will be implemented to mitigate the following impacts:

- dust generation associated with excavation and/or loading activities, construction or transportation equipment traveling over soil, and wind traversing COC-containing soil stockpiles;

- tracking soil off the Site with construction or transportation equipment;

- transporting sediments from the Site in surface water run-off; and

- managing groundwater extracted while performing below-grade construction activities.

The mitigation measures for these potential impacts will include, but are not limited to, the following:

- implementing dust control measures;

- decontaminating construction and transportation equipment;

- implementing storm water pollution controls; and

- treating extracted groundwater prior to disposal to the storm drain, to the sanitary sewer, or at an appropriate off-Site facility.

These mitigation measures are discussed in more detail below.

4.2.1. Dust Control

Dust control measures will be implemented during construction activities at the Site to minimize the generation of dust. It is particularly important to minimize exposure of on-Site construction workers to dust containing COCs and to prevent nuisance dust and dust containing COCs from migrating off-Site. Dust generation that will be mitigated includes that associated with excavation activities, truck traffic, ambient wind traversing soil stockpiles, and loading of transportation vehicles.

Dust generation will be minimized by all appropriate measures. These measures may include the following:

- mist or spray water while performing excavation activities and loading transportation vehicles;
- limit vehicle speeds on the property to 5 miles per hour;
- control excavation activities to minimize the generation of dust;
- minimize drop heights while loading transportation vehicles; and
- cover with plastic sheeting or tarps any soil stockpiles generated as a result of excavating soil potentially impacted by COCs (e.g., soil from Areas A or C prior to testing).

Additional dust control measures may be implemented, as necessary, especially if windy conditions persist.

4.2.2. Decontamination

Construction equipment and transportation vehicles that contact Site soil will be decontaminated prior to leaving the Site to minimize the possibility that this equipment tracks COC-containing soil onto roadways. To minimize the possibility of cross-contamination, construction equipment and transportation vehicles will also be decontaminated prior to moving from Areas A or C to Area B or other areas (e.g., capped areas) that are not expected to contain COCs.

Decontamination methods will include scraping, brushing, and/or vacuuming to remove dirt on vehicle exteriors and wheels. In the event that these dry decontamination methods are not adequate, methods such as steam cleaning, high-pressure washing, and cleaning solutions will be used, as necessary, to thoroughly remove accumulated dirt and other materials. Wash water resulting from decontamination activities will be collected and managed in accordance with all applicable laws and regulations.

4.2.3. Storm Water Pollution Controls

Should rainfall occur during construction, storm water pollution controls will be implemented to minimize storm water runoff from exposed COC-containing soil at the Site and to prevent sediment from leaving the Site.

Storm water pollution controls will be based on best management practices ("BMPs"), such as those described in the *California Storm Water Best Management Practice Handbooks Construction Activity* (Storm Water Quality Task Force, March 1993). On-Site sediment and erosion protection controls will be the primary methods for minimizing discharges of sediments from the Site. Sediment and erosion protection controls may include, but are not limited to, the following:

- constructing berms or erecting silt fences at entrances to the Site,
- placing straw bale barriers around catch basins and other entrances to the storm drain, and
- during significant rainfall events, covering with plastic sheeting or tarps any soil stockpiles generated as a result of excavating soil potentially impacted by COCs (e.g., soil from Areas A or C prior to testing).

4.2.4. Dewatering

If dewatering is to be performed as part of construction activities, then the groundwater will be

- discharged to the sanitary sewer,
- discharged to the storm drain, or
- disposed at an appropriate off-Site facility.

Approval from the RWQCB will be obtained prior to discharge of extracted groundwater to the storm drain. Approval from the East Bay Municipal Utility District ("EBMUD"), which operates the wastewater treatment plant, will be obtained prior to discharge of extracted groundwater to the sanitary sewer. Prior to discharge to either the storm drain or the sanitary sewer, an encroachment permit will be obtained from the City of Emeryville Public Works Department for the use of their storm water or sanitary sewer collection system. Groundwater will be treated, as necessary, to meet requirements of relevant discharge permits.

4.3 SOIL MANAGEMENT PROCEDURES

The soil management procedures provide the protocol to determine where soil excavated during construction activities can be used as backfill on the Site. The soil management procedures also include contingency protocols in the event that abandoned subsurface structures such as sumps, underground tanks, and pipes are encountered during redevelopment.

4.3.1 Soil Handling and Re-Use Protocol

In order to manage the soil during earthwork activities, the Site will be separated into three areas (Areas A, B, and C) on the basis of historic use and analytical results from soil and groundwater sampling. The approximate boundaries of these areas are depicted on

Figure 4. Area A includes the former refinery area (where elevated levels of petroleum hydrocarbons have been detected in soil and groundwater). Area B includes portions of the Site where (1) chemical concentrations in soil samples were low or not detected and (2) there are no known sources of chemicals in soil. Area C includes the former Lowenberg tanks and vicinity (where elevated levels of petroleum hydrocarbons and BTEX compounds have been detected in soil and groundwater samples).

Decision diagrams for handling soil excavated from Areas A, B, and C are presented on Figures 5, 6, and 7, respectively. The decision diagrams present the methodology that will be used to determine where excavated soil can be re-used as backfill on the Site. The decision process illustrated on the diagrams also provides an option to test and appropriately dispose of excavated soil at an off-Site location. Soil from the Site will be handled and re-used as backfill as discussed in the following sections.

4.3.1.1 Soil Handling Protocols for Area A

Soil in Area A will be handled as follows (see Figure 5):

- Soil excavated from Area A can remain in Area A (under a cap) without any testing.

- If it is desired to use soil from Area A in Areas B or C or as cap material, the soil must be visually inspected and tested using an organic vapor meter ("OVM") (i.e., a field instrument using an photoionization or flame-ionization detector).

  - ♦ The soil can be used as backfill in Areas B or C or as cap material if (1) the soil is not visibly stained (i.e., discolored, shiny, or oily) or odorous (i.e., has a chemical-like or hydrocarbon odor) and (2) OVM readings are less than 5 parts per million ("ppm") above background concentrations.

  - ♦ The soil must be (1) used within Area A (under a cap) or (2) disposed appropriately at an off-Site location if (1) the soil is visibly stained or odorous or (2) OVM readings are greater than or equal to 5 ppm above background concentrations.

4.3.1.2 Soil Handling Protocols for Area B

Soil in Area B will be handled as follows (see Figure 6):

- Soil within Area B can be used in Areas A, B, or C or as cap material if it is not visibly stained or odorous.

- If soil within Area B is visibly stained or odorous, the soil must be (1) used within Area A (under a cap) or (2) disposed appropriately at an off-Site location.

Soil sampling is not required in Area B unless the soil is to be disposed off-Site and the disposal facility requires testing.

4.3.1.3 Soil Handling Protocols for Area C

Soil in Area C will be handled as follows (see Figure 7):

- Soil excavated from Area C can remain in Area C (under a cap) without any testing.

- If it is desired to use soil from Area C in Areas A or B or as cap material, the soil must be visually inspected and tested using an OVM.

  - ♦ The soil can be used as backfill in Areas A or B or as cap material if (1) the soil is not visibly stained or odorous and (2) OVM readings are less than 5 ppm above background concentrations.

  - ♦ If (1) the soil is visibly stained or odorous or (2) OVM readings are greater than or equal to 5 ppm above background concentrations, the soil must be sampled and analyzed for BTEX.

    - ▪ The soil can be used as backfill in Areas A or C (under a cap) if BTEX concentrations are less than the decision criteria for Area C (see below).

    - ▪ The soil must be disposed appropriately at an off-Site location if BTEX concentrations exceed the decision criteria for Area C.

For benzene, the decision criterion for Area C is based on the United States Environmental Protection Agency's ("EPA") Preliminary Remediation Goal ("PRG") for commercial/industrial soil containing benzene (EPA, 1998). PRGs are calculated based on human health risk estimates that assume a commercial/industrial exposure scenario and a target incremental lifetime cancer risk level of 10^{-6} or a noncarcinogenic hazard index of unity, whichever is more stringent (EPA, 1998). In the case of benzene, the incremental lifetime cancer risk level is more stringent. The EPA PRG for commercial/industrial soil containing benzene, i.e., 1.4 mg/kg, is adjusted to include the more stringent California Cancer Potency Factor of 0.1 $(mg/kg\text{-}day)^{-1}$ for benzene (OEHHA, 1999), rather than the EPA cancer slope factor of 0.029 $(mg/kg\text{-}day)^{-1}$ (EPA, 1998). Accounting for this difference, the California-adjusted PRG for benzene is equal to 0.41 mg/kg.

Because an incremental lifetime cancer risk level of 10^{-5} (i.e., 10 times the 10^{-6} risk level) has been determined to represent an acceptable exposure level for commercial/industrial sites (National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part

300), the decision criterion for benzene in Area C is defined as 10 times the California-adjusted PRG, or 4.1 mg/kg. This concentration is less than the concentration at which the noncarcinogenic hazard index is unity (EPA, 1998).

For toluene, ethylbenzene, and xylenes, the EPA PRG is based on the soil saturation concentration (i.e., the concentration at which the compound is expected to be present in a free phase) because of the low toxicity of these compounds. Therefore, the decision criteria for toluene, ethylbenzene, and xylenes are defined as the EPA PRG. PRGs and decision criteria for BTEX compounds in Area C are summarized below:

Compound	PRG for Industrial Soil (mg/kg)	Decision Criteria for Area C (mg/kg)
Benzene	0.41*	4.1
Toluene	520	520
Ethylbenzene	230	230
Xylenes	210	210

Note:
*The PRG for benzene is the California-adjusted value (see above for discussion).

4.3.1.4 General Soil Handling Protocols

Soil in Areas A and C will be capped when construction is complete (see Section 5.1). Efforts will be made to place affected soil within Areas A and C (1) beneath future buildings and future parking structures and (2) as shallow as possible. The purpose of placing affected soil beneath buildings and other structures is to restrict potential contact with such soil by future Site workers. By also placing affected soil as shallow as possible, the likelihood of contact of such soil with groundwater will be minimized.

If subsurface conditions encountered during construction activities are substantially different than conditions encountered previously, the RWQCB and the ACDEH will be contacted. Under such conditions, soil handling and re-use protocols may be modified.

4.3.2 Soil Sampling Frequency

If soil testing is necessary (see Section 4.3.1), the soil sampling frequency (i.e., the quantity of samples per volume of soil) will be one representative sample per approximately 50 cubic yards ("cy") of soil. If desired, representative samples may be collected more frequently.

For OVM analyses, a representative sample will consist of up to five discrete samples combined in a zip-closure plastic bag. For BTEX analyses, a representative sample will consist of up to five discrete samples that will be collected in precleaned brass or stainless steel tubes and composited at the analytical laboratory.

4.3.3 Sample Collection from Borings or Stockpiles

If the extent of the excavation is known, representative samples may be collected from soil borings installed prior to excavation activities. Otherwise, representative samples may be collected from stockpiles formed during excavation activities.

To collect representative samples from soil borings, a sampling grid that covers the planned excavation area will be used. The size of the grid will depend on the planned excavation area and depth, such that a representative sample consisting of up to five discrete samples will be collected for approximately every 50 cy of soil. The borings will be installed to the depth of the planned excavation. Discrete samples will be collected from random depths within each boring.

To collect representative samples from stockpiles, the volume of soil within each stockpile, at any given time, will be estimated on the basis of either the estimated volume of the equipment used to handle the materials (e.g., counting backhoe bucket loads) or measurements of the stockpile dimensions and height. Stockpiles consisting of greater than 50 cy of soil will be divided into approximate 50 cy sections by means of flagging or other suitable marking device. Each 50 cy section will be distinctly labeled for subsequent identification. A maximum of five discrete samples will be collected from random locations throughout each 50 cy section and combined to form one representative sample.

Procedures to collect and analyze samples from stockpiles and soil borings are described in Appendix B. Results of OVM testing will be recorded in a field notebook. Once soil is tested, the destination of excavated materials (e.g., Area A, B, C, cap material or off-site) will be recorded in a field notebook.

4.3.4 Abandoned Subsurface Structures

Abandoned subsurface structures which may contain liquids, e.g., sumps, storage tanks, and pipes, may be encountered in the vicinity of the former refinery (Figure 2). Such structures may be on-going sources of petroleum hydrocarbons to soil and groundwater if they were not emptied prior to abandonment. A decision diagram presenting protocols to manage subsurface sumps and storage tanks, if encountered, is shown on Figure 8. A decision diagram presenting protocols to manage subsurface pipes, if encountered, is shown on Figure 9.

The following procedures will be followed if sumps, underground tanks, or pipes are encountered:

- ACDEH will be notified and applicable paperwork, such as an Underground Tank Closure Plan, will be initiated.
- Residual liquids in the sump(s), tank(s), and/or pipe(s) will be removed, contained, tested as required for disposal, and appropriately disposed.
- Sumps and tanks will be cleaned and closed in place or excavated and appropriately disposed.
- Sumps and tanks discovered in Areas B or C, if any, will also be subject to any soil sampling requirements in applicable ACDEH guidance (ACDEH, 1996; 1998).
- If it is not necessary to remove all of a discovered pipe to complete construction, then the pipe will be cut, the portion of the pipe required to be removed to complete construction will be removed and appropriately disposed, and the ends of the pipe remaining in place will be capped.
- Visibly contaminated or odorous soil discovered in Area B, whether or not it is associated with subsurface sumps, tanks, or pipes, will be subject to the soil management procedures shown on Figure 6.

If residual liquids are determined to contain compounds other than petroleum hydrocarbon constituents at significant concentrations or quantities, the ACDEH will be contacted and confirmation soil sampling in accordance with ACDEH guidance (ACDEH, 1996; 1998) may be required.

4.4 MONITORING WELL ABANDONMENT

Prior to or during construction, existing monitoring wells will be properly destroyed in accordance with Alameda County Public Works Agency ("ACPWA") procedures in order to prevent accidental contamination of groundwater. Appropriate permits will be obtained from the ACPWA. ACPWA refers to the California Department of Water Resources procedures for well abandonment (CDWR, 1981; 1991).

4.5 INSTALLATION OF PILINGS THROUGH AFFECTED SOIL LAYER

Simeon's preliminary foundation plans do not include installation of piles. However, if the plans changed to include installation of piles, there is the potential to drive shallow affected soil in Area A (see Figure 4 and Section 4.3.1) into deeper clean areas.

To mitigate the potential for driving affected soil towards the deep aquifer, one of two techniques will be used if piles are driven into soil in Area A. These two techniques are: (1) predrilling the affected soil layer (approximately 5 feet below ground surface) and installing conductor casing, or (2) installing pilings using a cone-shaped tip on the end of the pile. These are the techniques recommended in a Treadwell & Rollo, Inc. ("T&R") letter, dated 18 September 1995 (T&R, 1995). This letter was prepared on behalf of Sybase, Inc. for development of the Site and the adjacent Ryerson Steel Facility (EKI, 1995b) and is therefore presumably applicable to pile driving on the Site, if any, performed as part of Simeon's redevelopment. The T&R letter is attached as Appendix C.

If piles are predrilled, the removed soil will be handled as described in Section 4.3.1, above.

Chemicals in the shallow groundwater should not impact the deep aquifer after pile installation, if performed, because: (1) the soils along the sides of the pile adhere to the pile and form a low permeability seal, and (2) the pile is of low permeability and, thus, cannot act as a groundwater conduit (T&R, 1995) (see Appendix C).

5.0 POST-CONSTRUCTION RISK MANAGEMENT

The post-construction risk-management protocols address precautions that will be undertaken for mitigation of any risks to human health and the environment after construction and redevelopment of the Site are complete. The hypothetical risk to on-site personnel after construction is presented in a screening risk analysis included as Appendix D. Potential receptors include industrial/commercial workers and day care children.

As described in the screening risk analysis, the relevant exposure pathway for on-site personnel is inhalation of chemicals volatilizing from groundwater. Soil exposure pathways are considered incomplete, for the following reasons:

- Petroleum hydrocarbons and individual components of petroleum are the only COCs detected in Site soil.
- Except for low levels of BTEX detected in the vicinity of the former Lowenberg tanks, no petroleum hydrocarbon components for which toxicity data exist have been detected in Site soil samples analyzed for these components.
- When redevelopment is complete, soil in areas where petroleum-impacted soil is known to exist will be capped, preventing contact with this soil by Site workers and children. Any play structures will be placed above grade (i.e., on top of the cap).

- For maintenance or construction workers who may disturb the cap, protective procedures are specified in this risk management plan.

A more complete discussion of exposure pathways can be found in the screening risk analysis in Appendix D.

The total calculated hazard indices for hypothetical exposure of Site workers and children to COCs in Site groundwater are 0.016 and 0.009, respectively, which are below the threshold at which non-carcinogenic effects may occur (i.e., one). The total estimated incremental lifetime carcinogenic risk for hypothetical exposure of Site workers and children to COCs in Site groundwater is 1.2×10^{-6} and 6.7×10^{-7}, respectively. These risks are less than or at the lower end of the EPA-specified acceptable risk range (i.e., 10^{-4} to 10^{-6}) and less than the Proposition 65 notification level of 10^{-5}. The screening risk analysis uses a conservative, reasonable maximum exposure scenario based on maximum concentrations. Actual risks are likely to be lower than those estimated by the screening risk analysis.

Any future construction that may modify potentially affected soil or the cap must be completed in a manner that is consistent with the risk management plan. Components of the post-construction risk management protocols are as follows:

- minimize or prevent exposure of Site occupants or Site visitors to affected soil by capping it (e.g., using buildings, pavement, or a clean soil cover) (Section 5.1);

- inspect the Site at least every 2 years to verify that risk management protocols are being implemented and that they are effective in preventing potential exposure to soil and groundwater containing COCs (Section 5.2);

- establish protocols for on-site workers engaged in subsurface excavation activities (e.g., utility repairs, work on building foundations, changes to paved areas) to define adequate protective measures (Section 5.3);

- preclude use of groundwater beneath the Site (Section 5.4);

- establish a groundwater monitoring plan that includes perimeter groundwater monitoring wells to confirm that groundwater quality is stable or improving (Section 5.5); and

- establish notification procedures to ensure long-term compliance with this risk management plan (Section 5.6).

5.1 CAPPING OF SOIL IN AREAS A AND C

All soil in Areas A and C will be capped with materials such as concrete building slabs, pavement, or clean soil cover. The clean soil cover will be at least 3 feet thick to minimize or eliminate exposure of gardeners and routine maintenance personnel (e.g., those who repair landscaping irrigation systems) to affected soil.

5.2 INSPECTIONS

The Site will be inspected to ensure that cap materials are not damaged or disturbed to the extent that soil in Areas A or C is exposed or likely to become exposed. The Site will be inspected every 2 years by a third party designated by the property owner to verify that risk management protocols (e.g., the cap) are effectively preventing potential exposure to soil in Areas A and C. The results of each inspection will be summarized in a report prepared by the party inspecting the Site.

5.3 PROTOCOLS FOR FUTURE SUBSURFACE ACTIVITIES

Workers engaged in on-site subsurface excavation activities in which the cap is removed (e.g., utility repairs, work on building foundations, changes to paved areas) will be required to define adequate protective measures. For subsurface work to be performed on the Site, H&SPs will be prepared, workers will be health and safety trained, and workers will use the appropriate level of personal protective equipment, in accordance with Section 4.1 of this risk management plan, with the exception that H&SPs will not have to be submitted to the ACDEH.

Workers excavating soil below the cap will follow the detailed soil handling protocol outlined in Section 4.3, above. The decision diagrams for handling soil excavated from Areas A, B, and C presented on Figures 5, 6, and 7, respectively, present the methodology that will be used to determine where excavated soil can be re-used as backfill on the Site. The decision process illustrated on the diagrams also provides an option to test and appropriately dispose of excavated soil at an off-site location.

5.4 GROUNDWATER USE AT THE SITE

Because chlorinated solvents are known to be present in groundwater at concentrations that exceed United States and California maximum contaminant levels for drinking water, groundwater beneath the Site will not be used for drinking water or for any other purpose without first securing approval from RWQCB and ACDEH staff. The City of Emeryville is supplied by a public water distribution system containing imported surface water.

5.5 GROUNDWATER MONITORING PLAN

The purpose of the perimeter groundwater monitoring program is to confirm that water quality on the Site after completion of redevelopment is stable or improving. The groundwater monitoring plan described in this section includes the location and number of wells to be installed, the chemical analyses to be performed on groundwater samples, the frequency of monitoring, contingency options if chemical concentration trends significantly increase, and the option to terminate monitoring once it is shown that conditions are stable or improving.

As part of the groundwater investigations on the Site, levels of petroleum hydrocarbons suggestive of a residual free hydrocarbon phase were measured in groundwater samples collected in the vicinity of the former oil refinery (EKI, 1999). However, soil and groundwater sample analyses indicated that the hydrocarbons are of high molecular weight and they do not contain polycyclic aromatic hydrocarbons ("PAHs"). Ethylbenzene and xylenes were detected in only two groundwater samples collected in the vicinity of the former refinery, at low concentrations (i.e., less than 44 ug/L). Low petroleum hydrocarbon concentrations detected in groundwater samples collected 110 to 160 feet downgradient of the Site (i.e., 123 to 190 ug/L) indicate that migration of petroleum hydrocarbons from the former oil refinery has not occurred or is negligible (EKI, 1999).

The groundwater monitoring detailed below includes monitoring of the more shallow of the two aquifers beneath the Site because neither significant short-term or long-term migration of petroleum hydrocarbons from the shallow aquifer zone to the deeper aquifer zone is expected (EKI, 1995b). Migration of the petroleum hydrocarbons associated with the former petroleum refinery is not expected because:

- the two aquifers are separated by a clay and silt confining layer (i.e., aquitard) approximately 10 to 18 feet thick;
- the petroleum hydrocarbons have been present at the Site for at least 50 years and they have not migrated significantly off-site in the shallow aquifer zone (horizontally); and
- the petroleum hydrocarbons are of high molecular weight and adsorb strongly to natural organic matter, resulting in retardation that restrict their migration through the aquitard.

5.5.1 Proposed Monitoring Well Locations

After the Site is redeveloped, four wells proposed for the perimeter groundwater monitoring program (Figure 10) will be constructed, subject to the receipt of necessary permits or approvals. Monitoring wells SMW-1, SMW-2, and SMW-3 will be located in the sidewalk along Bay Street. Well SMW-4 will be located inside the property boundary between the new office building and 64th Street.

All wells will be drilled and screened in the shallow aquifer zone (i.e., less than 25 ft bgs). If possible, the well will be screened across the water table-unsaturated zone interface. Monitoring well installation and sampling procedures are described in Appendix E. The data from groundwater collected from the monitoring wells will be evaluated to determine if groundwater quality on the Site is stable or improving.

Proposed wells SMW-1 through SMW-3 are located downgradient and off-site (i.e., outside of the area with hydrocarbon concentrations suggestive of residual free phase hydrocarbons). Well SMW-4 is located downgradient of sampling location P-4, in the vicinity of the former refinery. The likely presence of residual free phase hydrocarbons in well SMW-4 might give rise to significant variation in the groundwater chemical analytical results.

The proposed monitoring schedule, analytical program, and contingency plan are discussed below. The monitoring schedule and analytical program are summarized in Table 1.

5.5.2 Well Sampling Schedule

The four groundwater monitoring wells will be sampled quarterly during the first year, semi-annually during the second year, and annually thereafter (Table 1). If a statistically significant upward trend in dissolved petroleum hydrocarbon concentrations is identified using the first four quarters of monitoring data or a greater than 10-fold difference in concentrations is measured during the first four quarters of monitoring, the wells will be sampled quarterly in the second year. If significant variations of dissolved petroleum hydrocarbons are present in well SMW-4 due to the presence of residual free-phase hydrocarbons, groundwater monitoring of well SMW-4 will be re-evaluated. Efforts will be made to minimize entrainment of free-phase hydrocarbons in groundwater samples from well SMW-4 by sampling groundwater through a stilling tube, as described by EPA (1992) and summarized in Appendix E.

Once annual monitoring commences, Simeon can submit a request to the RWQCB and the ACDEH to discontinue groundwater monitoring if it can be demonstrated that hydrocarbon concentrations are stable or decreasing.

5.5.3 Well Sampling Analytical Program

All groundwater samples collected as part of the monitoring program will be analyzed by a State-certified laboratory for total extractable petroleum hydrocarbons using EPA Method 8015, modified. During the first three years, samples collected in the first quarter of the year will also be analyzed for volatile organic compounds by EPA Method 8260. Appropriate quality assurance and quality control measures will be taken in the field (e.g., chain-of-custody records, field duplicates) and in the laboratory (e.g., matrix spike, matrix spike duplicates, method blanks).

Results of sampling and analysis performed for the perimeter groundwater monitoring program will be submitted in reports after each sampling event to the RWQCB and the ACDEH.

5.5.4 Contingency Plan

In the event that hydrocarbon concentrations in samples collected as part of the monitoring program exhibit an increasing trend, the contingency plan described below will be implemented.

If hydrocarbon concentrations increase (as defined in Section 5.5.2, above) an additional year of quarterly monitoring will be performed to confirm the increasing trend. Attempts will be made to identify the source of the increasing hydrocarbon concentration if hydrocarbon concentrations continue to increase after a year of quarterly monitoring. Under such circumstances, Simeon will contact the RWQCB and the ACDEH. A plan of action will be submitted to the RWQCB and the ACDEH, as appropriate.

It should be noted that potential hydrocarbon sources exist between the Site and proposed monitoring wells SMW-1 through SMW-3. Pipelines carrying petroleum products are believed to run parallel to and underneath the railroad tracks located immediately west of the Site. Releases of hydrocarbons may occur or may have occurred from these pipelines and/or along the railroad tracks themselves. Thus, if hydrocarbon concentrations measured in downgradient off-site wells SMW-1 through SMW-3 were to increase, it may not be the result of hydrocarbons migrating from the Site. The plan of action submitted to the RWQCB and the ACDEH will address this issue as deemed appropriate.

5.6 LONG-TERM COMPLIANCE

A deed restriction for the Site will be recorded in the Alameda County Recorder's office. Simeon and any future purchaser of the Site or any portion of the Site will be bound by the deed restriction. The deed restriction will require the property owner to comply with this risk management plan and to contact the ACDEH and the RWQCB if the land use changes from the intended commercial/industrial and child day care use.

6.0 REFERENCES

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CDWR, 1981. California Department of Water Resources, December 1981, *Water Well Standards: State of California*, Sacramento, California, Bulletin 74-81.

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EKI, 1996. Erler & Kalinowski, Inc., 5 March 1996, *Abandonment of Monitoring Wells at 1410 64th Street, Emeryville, California.*

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National Oil and Hazardous Substances Pollution Contingency Plan, 1990, Code of Federal Regulations, Title 40, Part 300, Section 430(e)(2)(I).

OEHHA, 1999. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, April 1999, *Technical Support Document for Describing Available Cancer Potency Factors*, Sacramento, California.

T&R, 1995. Treadwell & Rollo, Inc., 18 September 1995, Letter to Sybase, Inc., *Pile Foundations*, Sybase Hollis Street Campus, Emeryville, California.

TABLE 1
SCHEDULE AND ANALYTICAL REQUIREMENTS FOR THE PERIMETER GROUNDWATER MONITORING PROGRAM

64th Street Properties, Emeryville, California

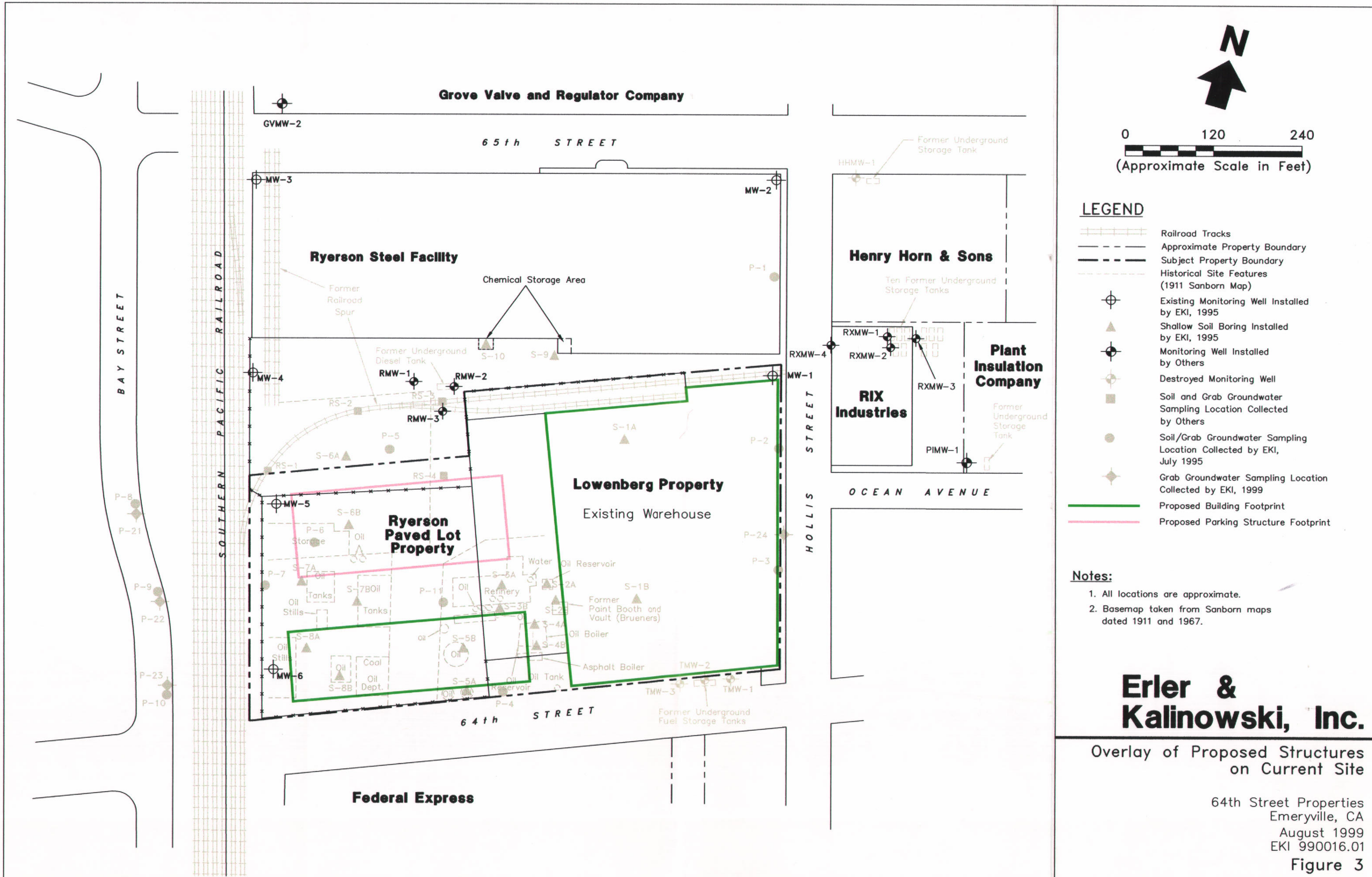
Monitoring Year	Monitoring Frequency	Analysis (a)
1	Quarterly Annually	TEPH (8015m) VOCs (8260)
2	Semi-Annually (b) Annually	TEPH (8015m) VOCs (8260)
3	Annually (c)	TEPH (8015m) VOCs (8260)
4 and thereafter	Annually (c)	TEPH (8015m)

Notes:

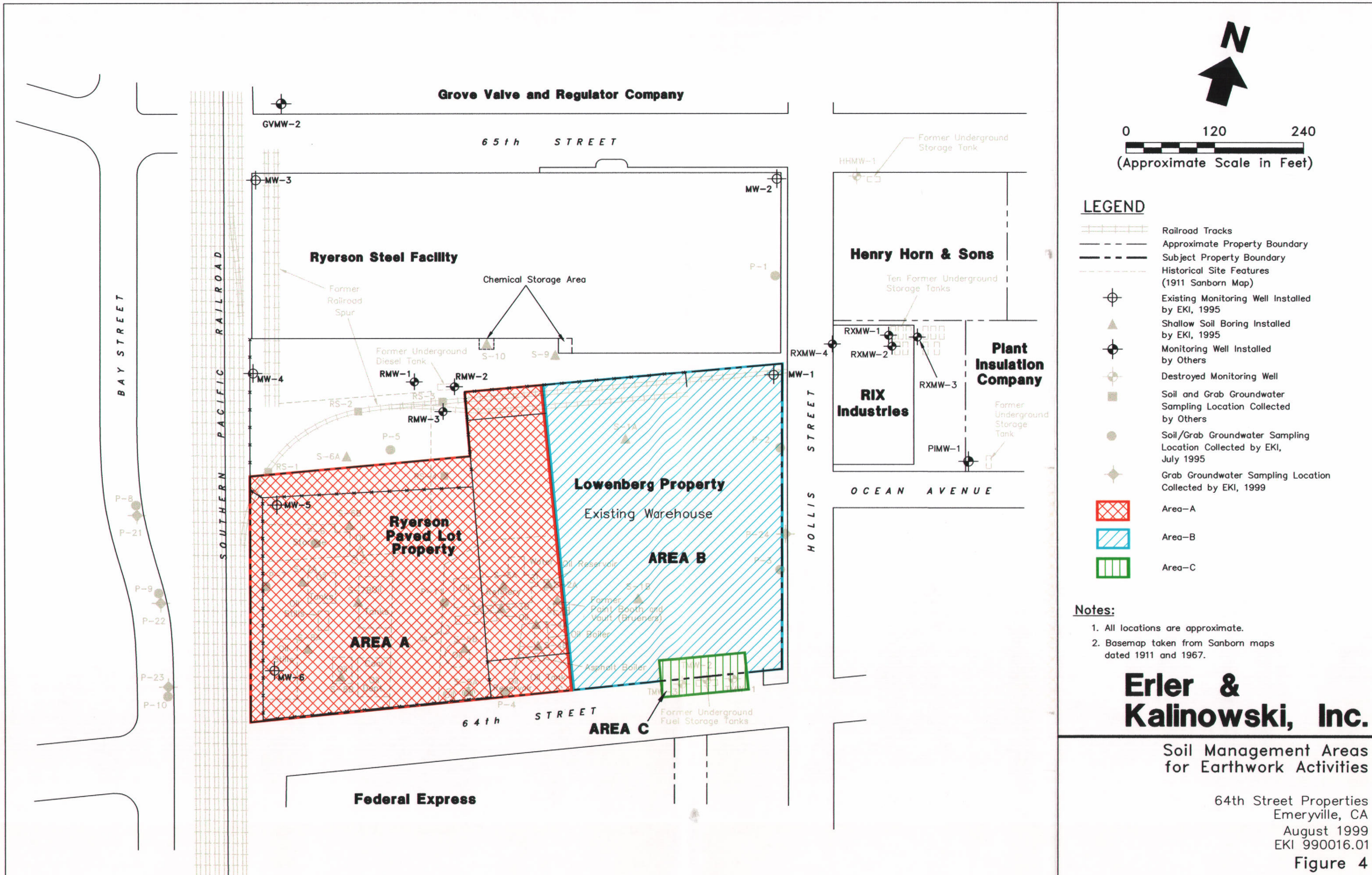
(a) Total extractable petroleum hydrocarbons (TEPH) by EPA Method 8015 modified and volatile organic compounds by EPA Method 8260. Analyses to be performed on samples collected from wells SMW-1 through SMW-4, which are to be installed subsequent to Site redevelopment (Figure 10).

(b) If TEPH concentrations show an upward trend or a greater than 10-fold difference in concentration, continue quarterly monitoring for year 2.

(c) Once annual monitoring commences, Simeon Commercial Properties can submit a request to the RWQCB and the ACDEH to discontinue monitoring if TEPH concentrations are stable or decreasing.



Grove Valve and Regulator Company
GVMW-2
65th STREET
MW-3
MW-2
Ryerson Steel Facility
Chemical Storage Area
Former Railroad Spur
P-1
Former Underground Diesel Tank
S-10
S-9
MW-4
RMW-1
RMW-2
RMW-3
RS-2
P-5
S-6A
RS-1
RS-4
MW-5
S-6B
P-6
Storage
Oil
Ryerson Paved Lot Property
Lowenberg Property
Existing Warehouse
S-1A
P-2
P-24
P-3
S-1B
Water
Oil Reservoir
Refinery
S-2A
Former Paint Booth and Vault (Brueners)
Oil Boiler
Asphalt Boiler
Tanks
S-7B
P-7
Oil Stills
S-8A
S-8B
Coal
Oil Dept.
S-5B
S-5A
Oil Tank
Reservoir
P-4
MW-6
TMW-1
TMW-2
TMW-3
Former Underground Fuel Storage Tanks
MW-1
64th STREET
SOUTHERN PACIFIC RAILROAD
BAY STREET
P-8
P-21
P-9
P-22
P-23
P-10
Federal Express
HOLLIS STREET
OCEAN AVENUE
Former Underground Storage Tank
HHMW-1
Henry Horn & Sons
Ten Former Underground Storage Tanks
RXMW-4
RXMW-1
RXMW-2
RXMW-3
RIX Industries
Plant Insulation Company
Former Underground Storage Tank
PIMW-1
N
0
120
240
(Approximate Scale in Feet)
LEGEND
Railroad Tracks
Approximate Property Boundary
Subject Property Boundary
Historical Site Features (1911 Sanborn Map)
Existing Monitoring Well Installed by EKI, 1995
Shallow Soil Boring Installed by EKI, 1995
Monitoring Well Installed by Others
Destroyed Monitoring Well
Soil and Grab Groundwater Sampling Location Collected by Others
Soil/Grab Groundwater Sampling Location Collected by EKI, July 1995
Grab Groundwater Sampling Location Collected by EKI, 1999
Proposed Building Footprint
Proposed Parking Structure Footprint
Notes:
1. All locations are approximate.
2. Basemap taken from Sanborn maps dated 1911 and 1967.
Erler & Kalinowski, Inc.
Overlay of Proposed Structures on Current Site
64th Street Properties
Emeryville, CA
August 1999
EKI 990016.01
Figure 3



Notes:

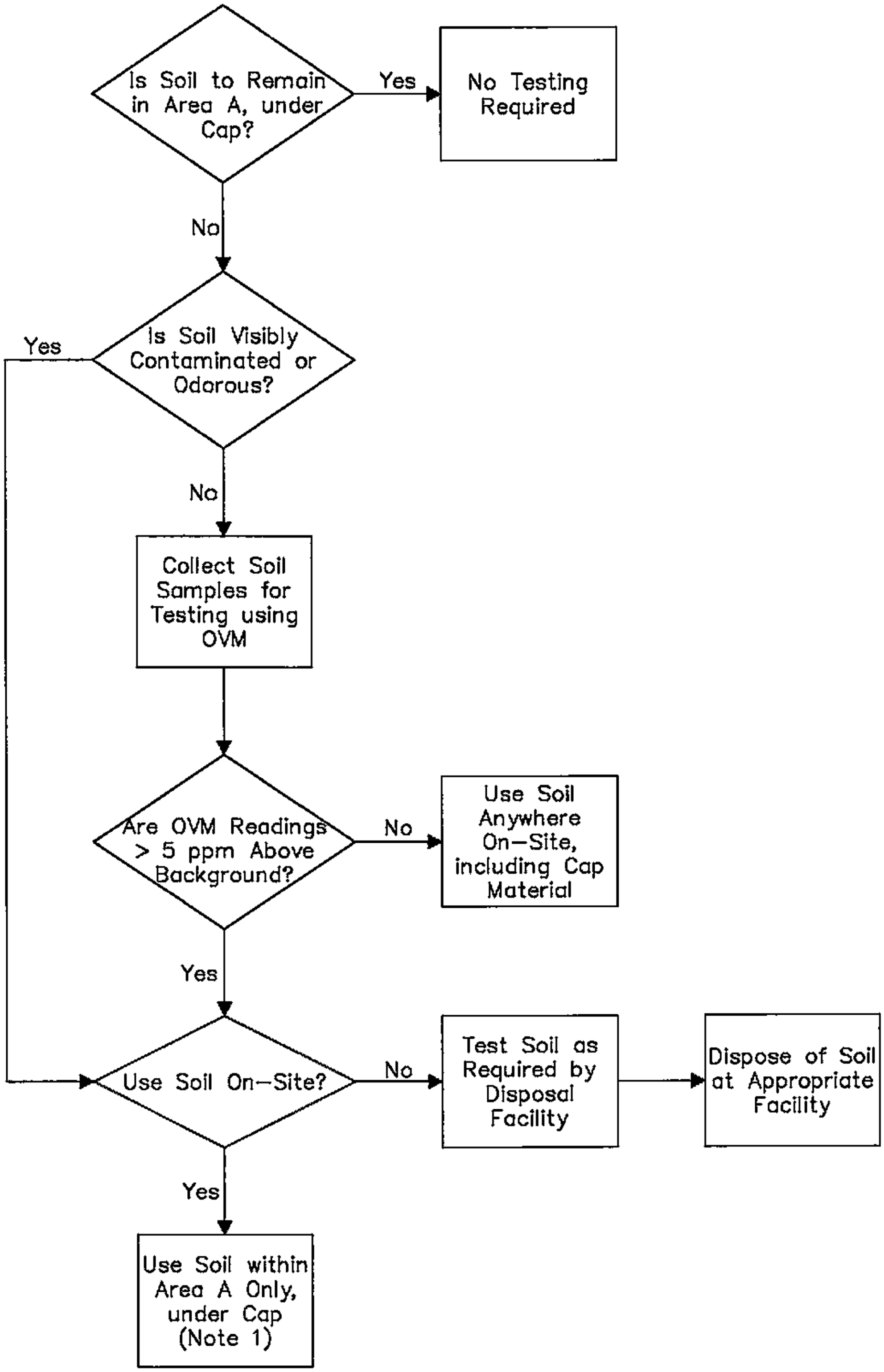
1. All locations are approximate.
2. Basemap taken from Sanborn maps dated 1911 and 1967.

Erler & Kalinowski, Inc.

Soil Management Areas for Earthwork Activities

64th Street Properties
Emeryville, CA
August 1999
EKI 990016.01

Figure 4



Notes:

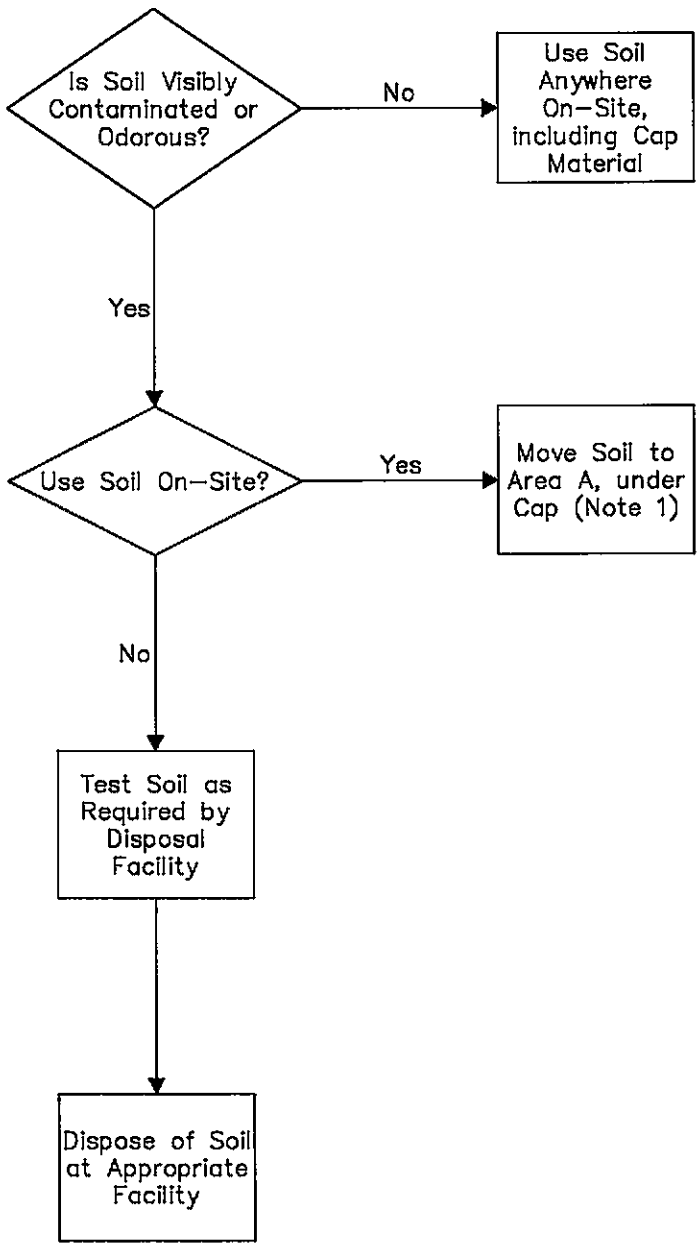
1. Cap in Areas A and C will consist of materials such as concrete, asphalt, or 3 feet of clean soil cover.

Erler & Kalinowski, Inc.

Area A Soil Management Decision Diagram

64th Street Properties
Emeryville, CA
August 1999
EKI 990016.01

Figure 5



Notes:

1. Cap in Areas A and C will consist of materials such as concrete, asphalt, or 3 feet of clean soil cover.

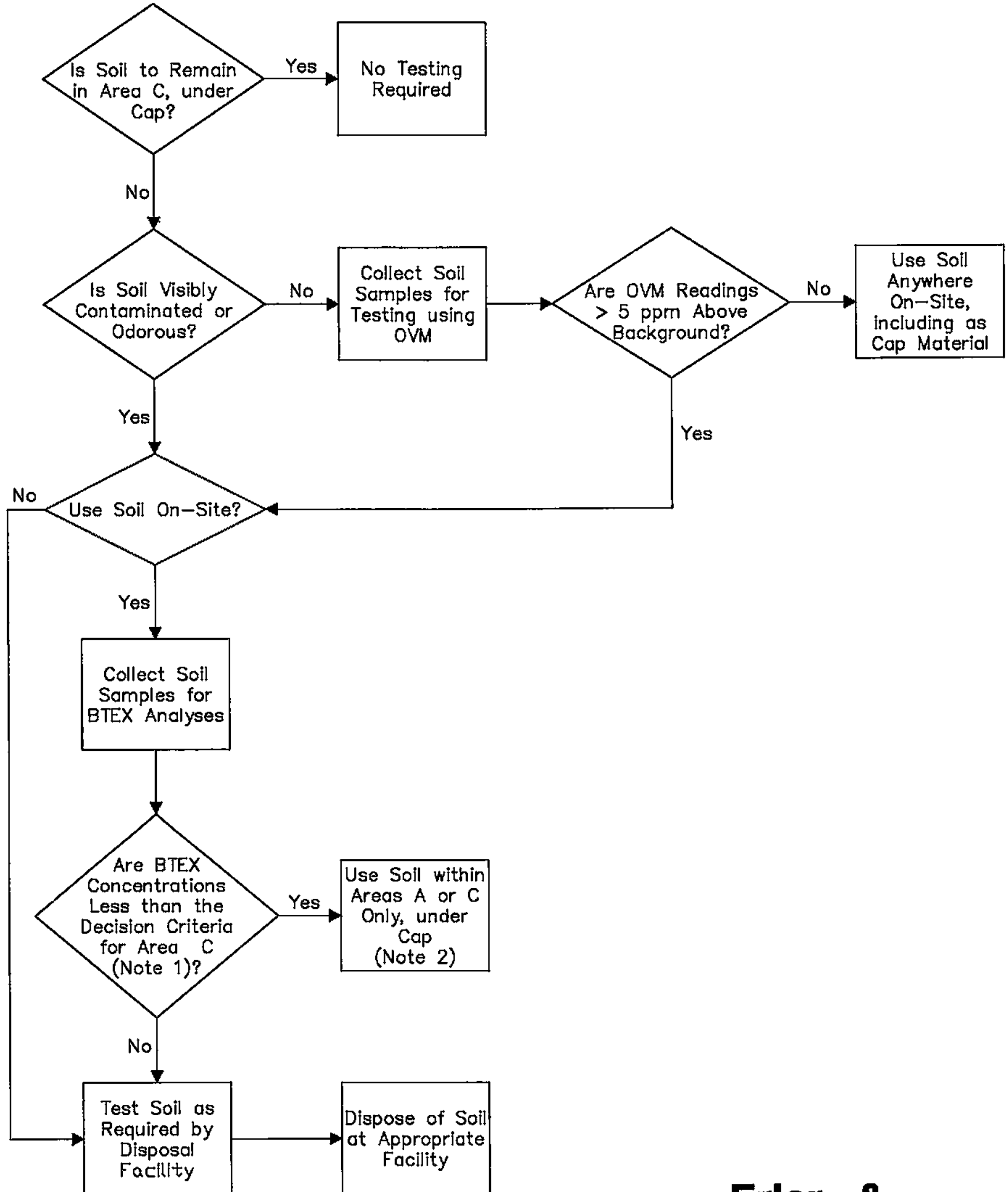
Erler & Kalinowski, Inc.

Area B Soil Management Decision Diagram

64th Street Properties
Emeryville, CA

August 1999
EKI 990016.01

Figure 6



Notes:

1. The decision criteria for BTEX compounds in Area C are as follows:

Benzene	4.1	mg/kg
Toluene	520	mg/kg
Ethylbenzene	230	mg/kg
Xylenes	210	mg/kg

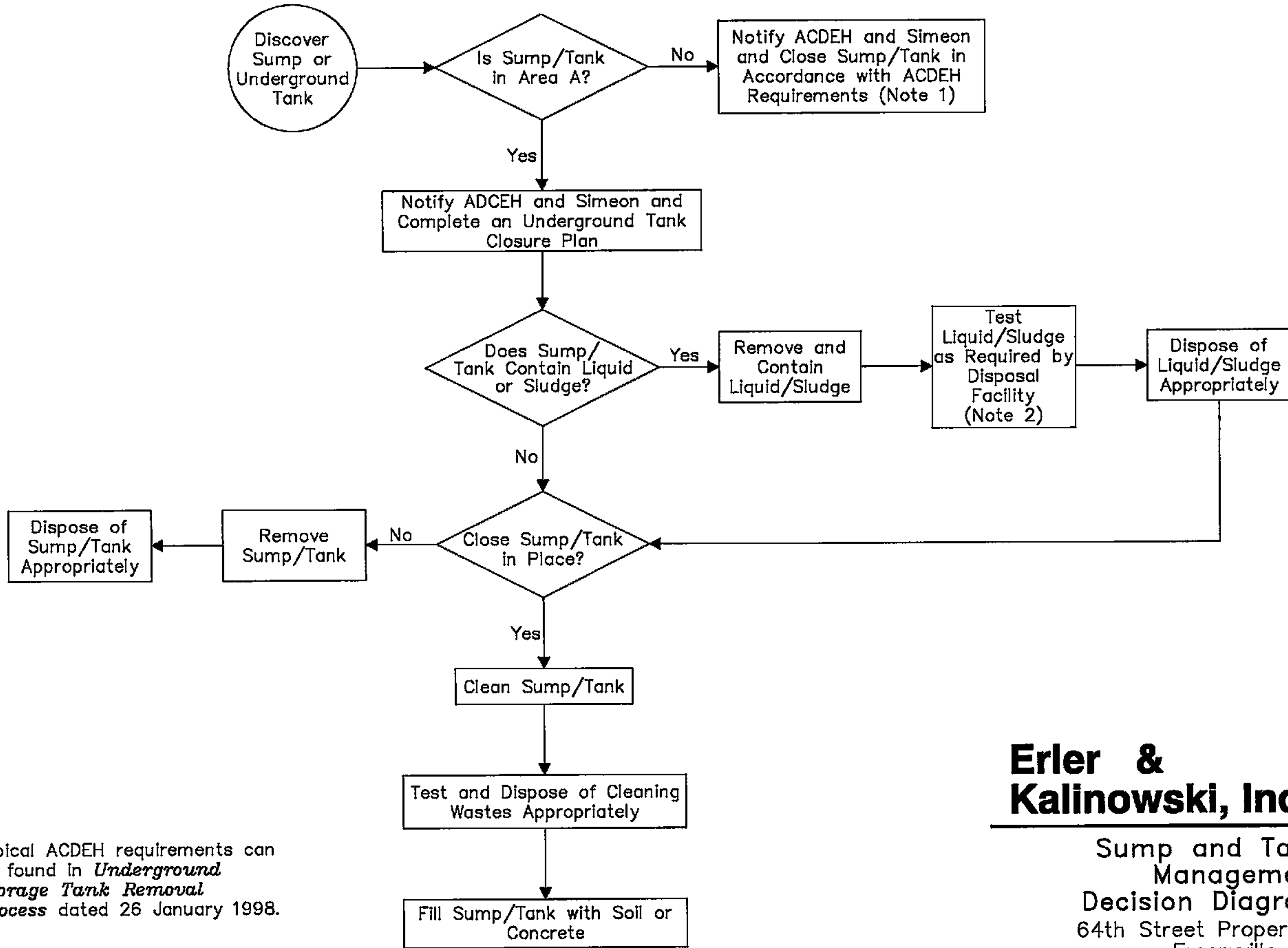
2. Cap in Areas A and C will consist of materials such as concrete, asphalt, or 3 feet of clean soil cover.

Erler & Kalinowski, Inc.

Area C Soil Management Decision Diagram

64th Street Properties
Emeryville, CA
August 1999
EKI 990016.01

Figure 7



Notes:

1. Typical ACDEH requirements can be found in *Underground Storage Tank Removal Process* dated 26 January 1998.

2. If liquid contains compounds other than petroleum hydrocarbon constituents, contact ACDEH, as confirmation soil sampling may be required.

Erler & Kalinowski, Inc.

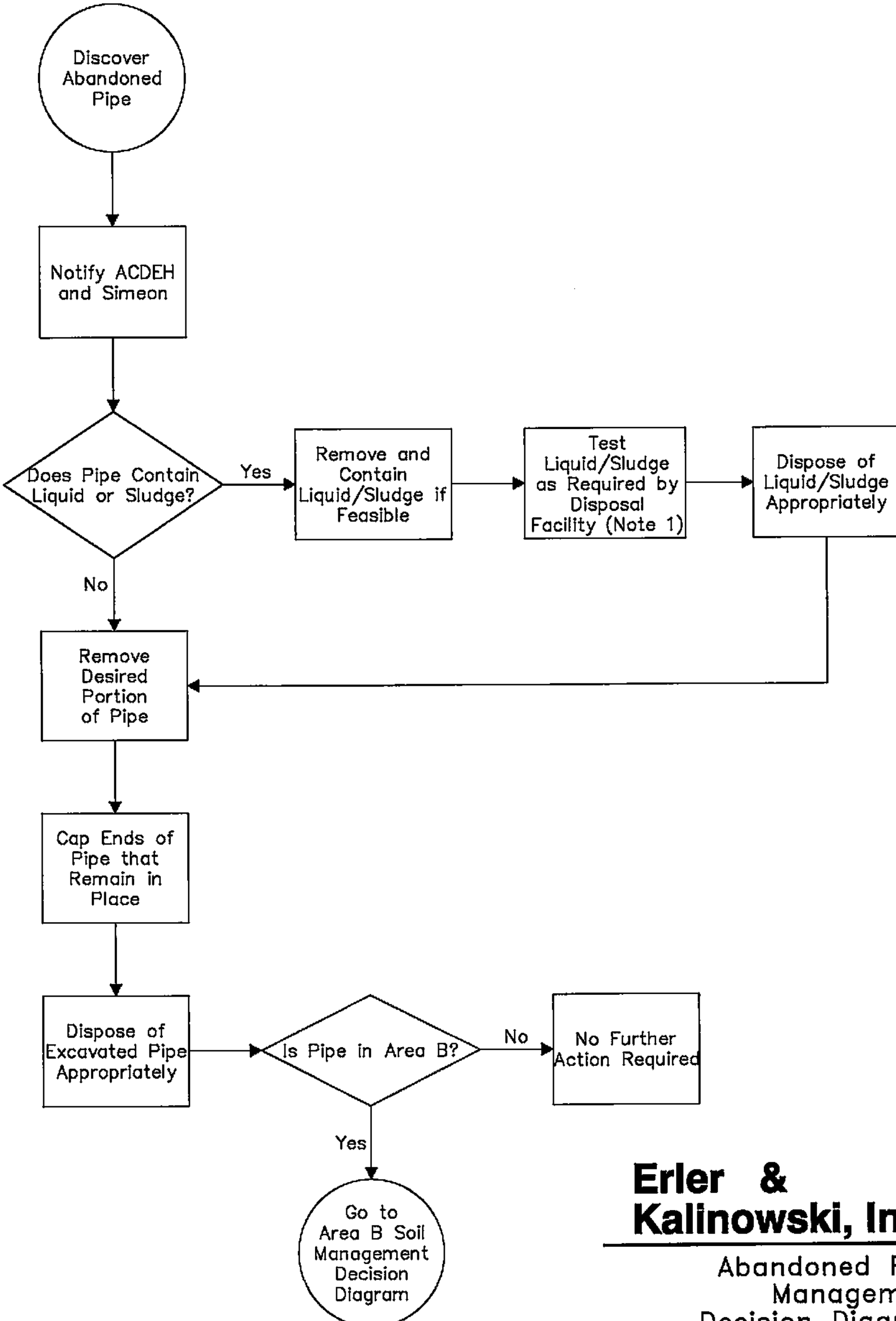
Sump and Tank Management Decision Diagram

64th Street Properties
Emeryville, CA

August 1999

EKI 990016.01

Figure 8



Notes:

1. If liquid contains compounds other than petroleum hydrocarbon constituents, contact ACDEH, as confirmation soil sampling may be required.

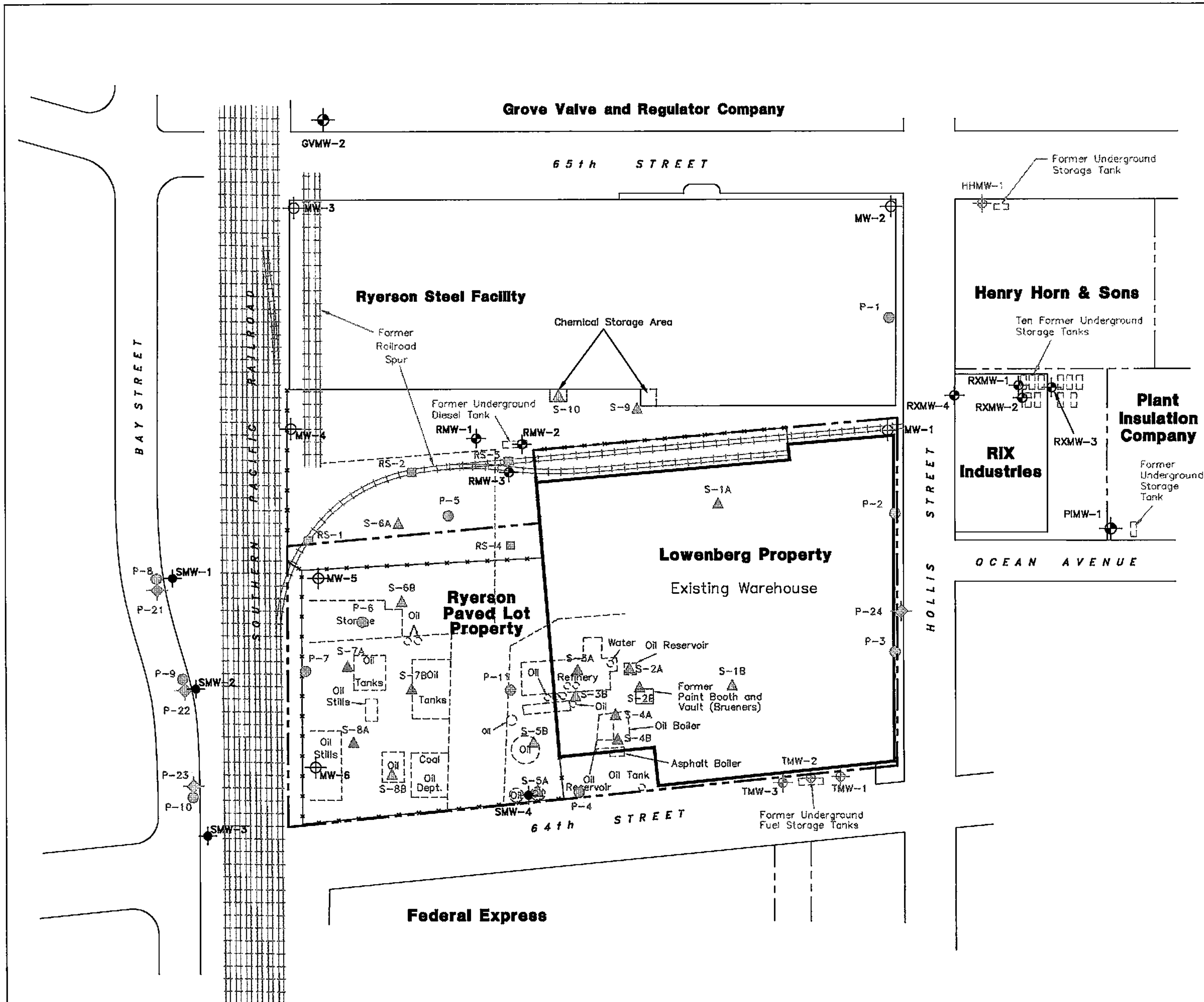
Erler & Kalinowski, Inc.

Abandoned Pipe Management Decision Diagram

64th Street Properties
Emeryville, CA

August 1999
EKI 990016.01

Figure 9



N

0 120 240
(Approximate Scale in Feet)

LEGEND

- Railroad Tracks
- Approximate Property Boundary
- Subject Property Boundary
- Historical Site Features (1911 Sanborn Map)
- Existing Monitoring Well Installed by EKI, 1995
- Shallow Soil Boring Installed by EKI, 1995
- Monitoring Well Installed by Others
- Destroyed Monitoring Well
- Soil and Grab Groundwater Sampling Location Collected by Others
- Soil/Grab Groundwater Sampling Location Collected by EKI, July 1995
- Grab Groundwater Sampling Location Collected by EKI, 1999
- Proposed Location of Perimeter Monitoring Well

Notes:

1. All locations are approximate.
2. Basemap taken from Sanborn maps dated 1911 and 1967.

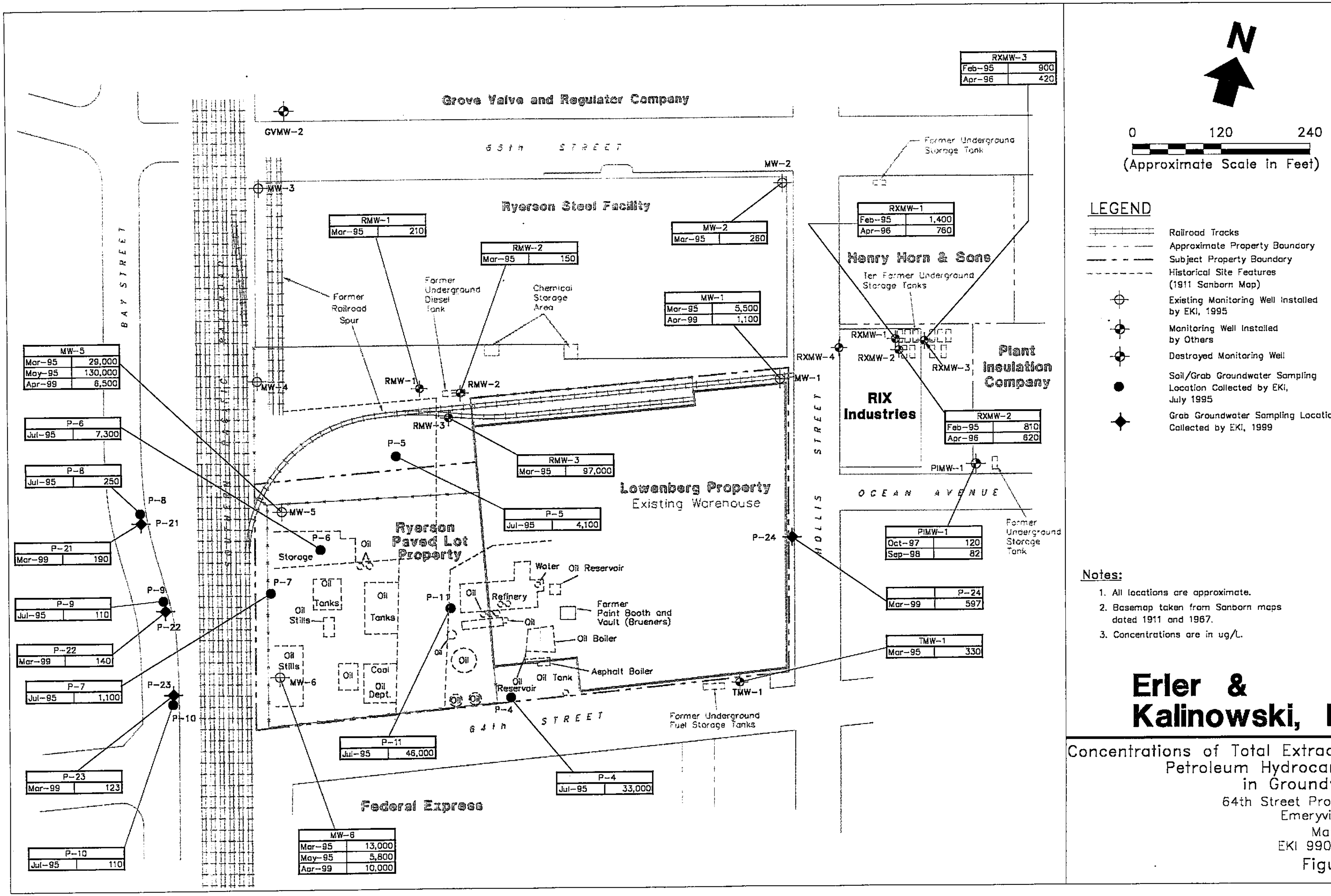
Erler & Kalinowski, Inc.

Proposed Locations of Perimeter Monitoring Wells

64th Street Properties
Emeryville, CA
August 1999
EKI 990016.01
Figure 10

Appendix A

Copies of Figures 3, 4, and 5 from
Phase I and Phase II Environmental Site Assessment for 64th Street Properties
by Erler & Kalinowski, Inc.
Dated 20 May 1999



Notes:

1. All locations are approximate.
2. Basemap taken from Sanborn maps dated 1911 and 1967.
3. Concentrations are in ug/L.

Erler & Kalinowski, Inc.

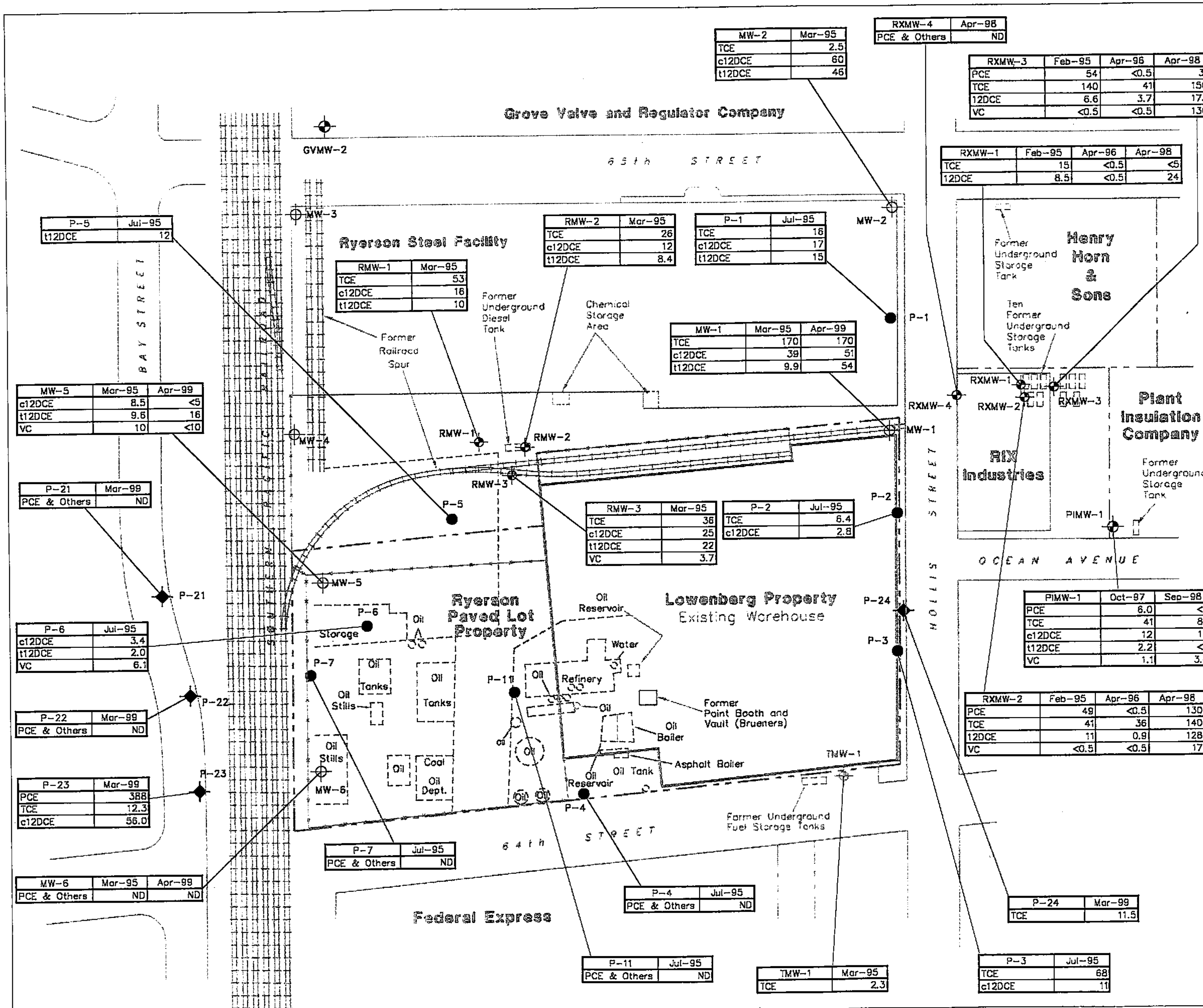
Concentrations of Total Extractable Petroleum Hydrocarbons in Groundwater

64th Street Properties
Emeryville, CA

May 1999
EKI 990016.00

Figure 3

1999-06-14 11:19:37 G:\990016.00\MAY99\MAY99-3.DWG



N

0 120 240
(Approximate Scale in Feet)

LEGEND

- Railroad Tracks
- Approximate Property Boundary
- Subject Property Boundary
- Historical Site Features (1911 Sanborn Map)
- Existing Monitoring Well Installed by EKI, 1995
- Monitoring Well Installed by Others
- Destroyed Monitoring Well
- Soil/Grab Groundwater Sampling Location Collected by EKI, July 1995
- Grab Groundwater Sampling Location Collected by EKI, 1999

Abbreviations:

PCE = tetrachloroethene
TCE = trichloroethene
12DCE = 1,2-dichloroethene (total)
c12DCE = cis-1,2-dichloroethene
t12DCE = trans-1,2-dichloroethene
VC = vinyl chloride

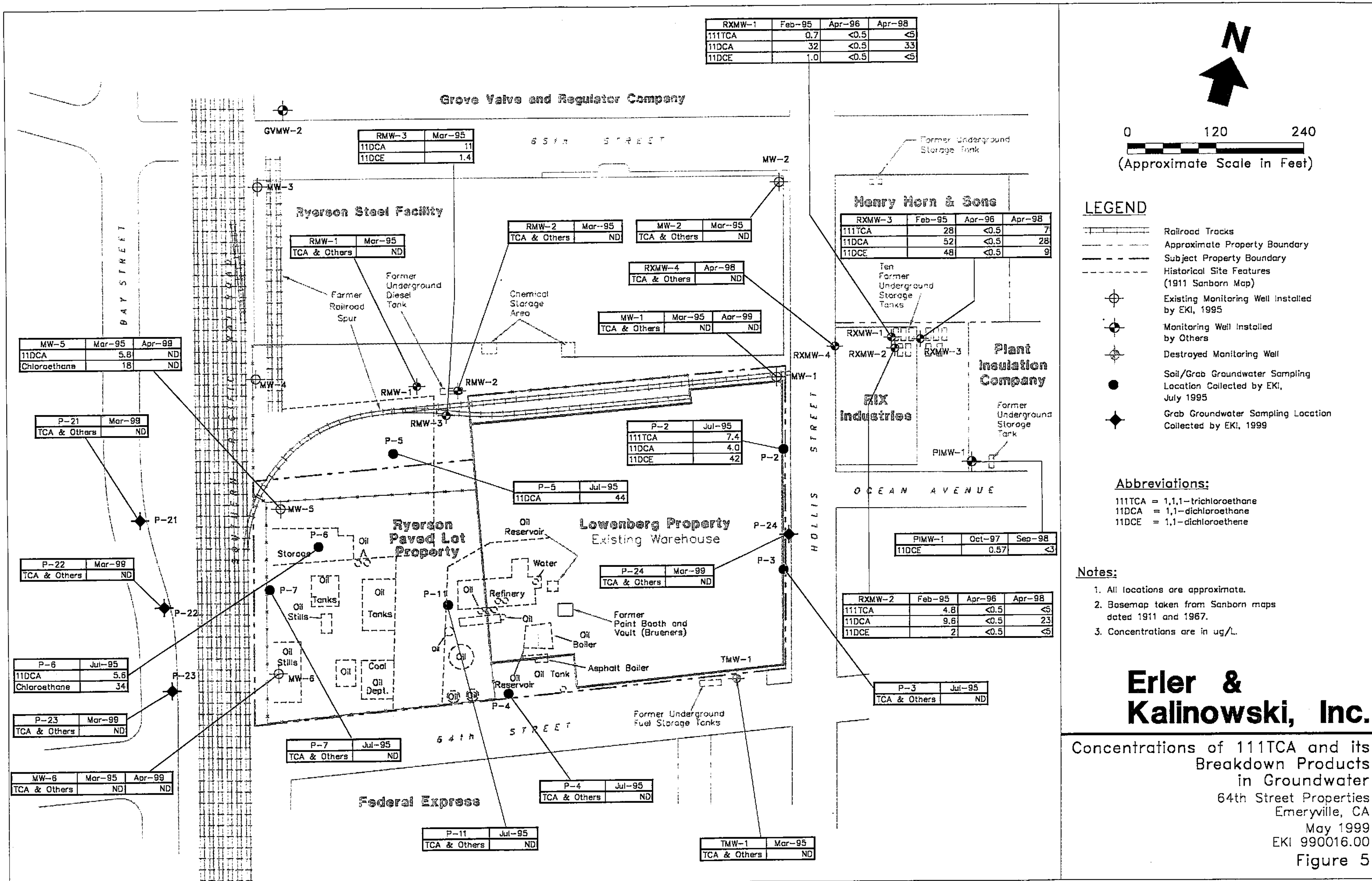
Notes:

1. All locations are approximate.
2. Basemap taken from Sanborn maps dated 1911 and 1967.
3. Concentrations are in ug/L.

Erler & Kalinowski, Inc.

Concentrations of PCE, TCE and their Breakdown Products in Groundwater
64th Street Properties
Emeryville, CA
May 1999
EKI 990016.00
Figure 4

1999-05-14 14:52:31 G:\990016.00\MAY99\MAY99-4.DWG



1999-06-14 11:31:51 G:\990016.00\MAY99\MAY99-5.DWG

Appendix B

Soil Sample Collection and Analysis during Earthwork Activities

Procedures to collect soil samples from stockpiles and soil borings are described in this Appendix. The methodology to analyze samples with the organic vapor meter ("OVM"), which is equipped with a photoionization detector, is also included.

B.1 SAMPLE COLLECTION PROCEDURES FOR STOCKPILED SOIL

Soil samples from stockpiles to be analyzed using the OVM will be collected using a clean stainless steel trowel or disposable plastic spoon. Each representative sample will be formed by combining scoops of material into a zip-closure plastic bag. Once the representative sample is collected, the soil in the bag will be mixed. The OVM probe will then be placed in the bag to take a reading. The OVM, which is equipped with a photoionization detector, will be calibrated to an isobutylene standard. For each representative sample, the stockpile name and location, the date, the time the sample was collected, and the OVM reading will be documented in a field notebook.

Soil samples from stockpiles to be analyzed for benzene, toluene, ethylbenzene, and xylenes ("BTEX") will be collected by scraping the top few inches of soil from the stock pile and manually driving a precleaned brass or stainless steel tube into the stockpile. Both ends of the tube containing the soil sample will be covered with Teflon sheets and capped with plastic end caps. A sample label will be attached to each brass liner and the label will include a unique sample identification number, the stockpile number and location, and the time and date the sample was collected. Sealed liners will be placed in zip-closure plastic bags, then placed on ice in a cooler for temporary storage and transport to the laboratory for chemical analysis. Chain-of-custody records will be initiated. Samples will be composited in the laboratory to make a representative sample that will be analyzed for BTEX compounds using EPA Method 8020.

B.2 SAMPLE COLLECTION PROCEDURES FROM SOIL BORINGS

Borings will be installed using a hand auger or other appropriate drilling equipment to bore to the desired sampling depth. A manually-operated slide-hammer sampler or other appropriate sampler will be used to obtain an undisturbed sample in a precleaned brass or stainless steel tube. Samples to be analyzed for BTEX compounds will be handled in the manner described above. For samples to be analyzed with an OVM, a portion of the sample will be transferred to a zip-closure plastic bag. Once a representative sample is obtained, the bag will be analyzed with the OVM, as described above. For each discrete sample included in the representative sample; the boring location, sampling depth, the date, and the time the sample was collected will be recorded in a field notebook. The OVM reading of the representative sample will also be recorded in the field notebook.

Appendix C

Treadwell & Rollo, Inc. Letter
Regarding Installation of Building Piles

Treadwell&Rollo

18 September 1995
Project 1798.01

Mr. John Bruno
Sybase
6475 Christie Avenue
Emeryville, California 94608

Subject: Pile Foundations
Sybase Hollis Street Campus
Emeryville, California

Dear Mr. Bruno:

We understand that a representative of the California Regional Water Quality Control Board (RWQCB) has expressed concern that the use of driven concrete piles at the Sybase Hollis Street Campus site may adversely the affect the water quality in the aquifer at a depth of 40 to 60 below the site. This letter presents our response to this concern.

Background
The parking garage site is blanketed by approximately 3 to 4 feet of fill, some of which is contaminated. Beneath the fill is a 2- to 4-foot-thick layer of overconsolidated Bay Mud (marsh deposit). The marsh deposit is underlain by interbedded alluvial soil consisting primarily of clay and silt with occasional layers of sand and silty sand. The alluvial clay and silt are of moderate to low plasticity. We estimate the permeability of these materials is on the order of 10^{-6} to 10^{-7} cm/sec.

We have recommended the proposed parking garage be supported on prestressed, precast concrete piles so that foundation settlement will be within acceptable limits. The length of the piles will depend on the size of the pile used (12- or 14-inch-square) and the design pile capacity. We anticipate the piles will be about 65 to 70 feet long. The piles will take their support primarily through skin friction in the interbedded alluvium underlying the site.

Discussion and Conclusions
There are three potential contaminant pathways that must be addressed with pile foundations:

Treadwell & Rollo, Inc. *Environmental & Geotechnical Consultants*
555 Montgomery Street, Suite 1300, San Francisco, CA 94111
Telephone (415) 955-9040 Facsimile (415) 955-9041

- o flow of contaminated groundwater alongside the pile
- o flow of contaminated groundwater through the pile
- o pushing of contaminated soil into underlying soil layers by the pile tip during pile installation.

Each of these potential pathways is addressed as follows:

Flow Alongside Pile - During pile installation, the cohesive soil along the sides of the pile is remolded with an accompanying increase in porewater pressure. As the porewater pressure dissipates, the soil gains strength and adheres tightly to the sides of the pile to provide "skin friction" for support of vertical loads. The remolding of the cohesive soil causes a decrease in permeability and an increase in shear strength of the soil. The adhesion to the pile and the lower permeability of this soil should provide an effective seal against downward migration of chemicals.

Flow Through Pile - The pile is composed of high-strength concrete with a low-water cement ratio. The 28-day strength of the piles is generally specified to be at least 6,000 pounds per square inch. Because of the low-water cement ratio, the concrete is very dense with a low permeability (between 10^{-5} and 10^{-6} cm/sec). Considering its high density and low permeability, we judge that contaminated groundwater will not migrate downward through the pile.

Pushing of Contaminated Soil Downward - When a friction pile is installed, it punches through the soil layers, causing a temporary shear failure of the soil in front and along the sides of the pile. Therefore, the pile will punch through the contaminated upper fill at the subject site. Any contaminated soil should not be carried downward more than a few feet. Methods to reduce the potential for pushing of contaminated soil in front of the pile include predrilling the contaminated layer prior to pile installation or casting a cone-shaped tip at the end of the pile. Predrilling would not be effective where the fill material is granular and would slough into the hole.

Treadwell&Rollo

We trust this letter addresses the concerns raised by the RWQCB. If you have any questions, please call.

Sincerely yours,
TREADWELL & ROLLO, INC.

Craig S. Shields
Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
CRAIG S. SHIELDS
GE 2116
Exp. 3/31/97
GEOTECHNICAL
STATE OF CALIFORNIA

17980104.CSS

cc: Ms. Michelle King - Erler & Kalinowski

Appendix D

Screening Human Health Risk Assessment

This Appendix presents calculations conducted to identify potential human health risks from exposure to residual chemicals of concern ("COCs") in soil and groundwater at the 64th Street Properties, in Emeryville, California ("Site"). The Site is bounded to the north by the Ryerson Steel facility, to the west by railroad tracks, to the south by 64th Street, and to the east by Hollis Street. The risk calculations address potential human health risks to occupants of potential future commercial/industrial buildings on the Site, including a potential child day care facility, using COC concentrations measured in soil and groundwater samples collected from the Site.

D.1 HUMAN HEALTH RISK CALCULATIONS

The objective of this screening risk assessment is to evaluate the potential health risks to future populations that may be exposed to Site COCs. This section presents toxicity information for each of the COCs, the assumptions used in the screening risk evaluation, and the results of the screening risk evaluation. This screening risk assessment uses a conservative, reasonable maximum exposure scenario based on maximum concentrations. Actual risks are likely to be lower than those estimated by this screening risk assessment.

These screening risk assessment calculations were performed utilizing the following guidelines published by the California Environmental Protection Agency ("CA EPA"), the United States Environmental Protection Agency ("U.S. EPA"), and the American Society for Testing and Materials ("ASTM"):

- CA EPA, January 1994, *Preliminary Endangerment Assessment Guidance Manual.*

- U.S. EPA, December 1989, *Risk Assessment Guidance for Superfund, Volume 1 - Human Health Evaluation Manual (Part A).*

- ASTM, December 1996, *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* ("RBCA").

Although all three guidance documents were relied upon to perform the screening risk assessment calculations, exposure point concentrations due to volatilization and attendant potential risks are estimated primarily through the use of transport models and risk equations provided by ASTM (1996).

D.1.1 Site COCs

Benzene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, trichloroethene and vinyl chloride are the primary volatile organic compounds ("VOCs") detected in groundwater at the Site. However, all VOCs detected in the most recent groundwater samples (i.e., the most recent samples collected from each sampling point) were conservatively retained as chemicals of concern ("COCs") for this screening risk evaluation.

To calculate human-health risks, the maximum concentrations detected in the most recent groundwater samples are used as the COC concentrations (see Table D-1). Since actual COC concentrations are likely to be lower, this approach is conservative.

As discussed in Section D.1.3, no COCs for which toxicity data exist have been detected in Site soil.

D.1.2 Toxicity Criteria

This section provides quantitative estimates of the toxic effects associated with the COCs included in the screening risk assessment calculations. The two broad categories of adverse human health effects recognized in the assessment of health risks are non-carcinogenic and carcinogenic effects. Health criteria for each of these effects are presented separately, where data allow.

The toxicity criteria developed by both CA EPA and U.S. EPA are derived primarily for two exposure routes, ingestion and inhalation. Another potential exposure pathway is dermal absorption. However, for the reasons discussed in Section D.1.3, these screening risk assessment calculations assume that the ingestion and dermal absorption pathways are incomplete.

D.1.2.1 Non-Carcinogenic Toxicity Criteria

Non-carcinogenic effects encompass adverse, chronic human health effects that do not result in the production of tumors, but which include both developmental and reproductive effects. When the chemical dose levels for non-carcinogens exceed the chemical-specific threshold doses, the potentially exposed populations may exhibit adverse health effects. Dose levels less than the threshold level are assumed not to produce adverse health effects in exposed individuals.

Threshold levels for non-carcinogenic effects are expressed as reference doses ("RfDs"). An RfD, published in units of mg/kg-day, reflects the maximum chemical dose level that must be exceeded before adverse effects would be expected to occur, but generally incorporates a safety or uncertainty factor of two or more orders of magnitude. This definition suggests that an RfD represents the maximum "safe" dosage of a chemical. A low RfD indicates a low threshold dose level, and therefore a high chemical toxicity.

Conversely, a chemical with a higher RfD value is less toxic, with respect to non-cancer end points, relative to chemicals having lower RfDs.

The following hierarchy for selecting RfD values is used in the screening risk evaluation. The preferred source for reference doses is the Draft Technical Support Document for Determination of Noncancer Chronic Reference Exposure Levels ("CA Noncancer") (CA EPA, 1997). In the absence of toxicity data from CA Noncancer, the Integrated Risk Information System ("IRIS") database (U.S. EPA, 1999) is used. The toxicity values available in IRIS are updated frequently and have undergone agency review and verification by work groups comprising staff from several U.S. EPA program offices. In the absence of toxicity data from IRIS, the FY-1997 edition of U.S. EPA's Health Effects Assessment Summary Tables ("HEAST") is used (U.S. EPA, 1997). These tables are updated regularly and contain work group-verified or interim toxicity values based on the toxicological literature. The final source of toxicity information is specific risk assessment issue papers issued by the U.S. EPA National Center for Environmental Assessment ("NCEA") in Cincinnati, Ohio. The values obtained from NCEA are based on a variety of U.S. EPA reports and the toxicological literature, but are not work group-verified.

As recommended in agency guidelines, the non-carcinogenic effects of potential human carcinogens are also considered in these screening risk assessment calculations, where data allow (U.S. EPA, 1989; CA EPA, 1992, 1994). This strategy provides for a more thorough evaluation of the potential non-carcinogenic effects posed by the COCs.

Inhalation toxicity information and RfD values used for COCs are summarized in Table D-2.

D.1.2.2 Carcinogenic Toxicity Criteria

The toxicity criteria that indicate the potential carcinogenicity of chemicals are called slope factors ("SFs"). U.S. EPA defines a slope factor as the "plausible upper-bound estimates of the probability of a carcinogenic response per unit of chemical intake over a lifetime" (U.S. EPA, 1989). SFs are developed using mathematical models and are expressed in reciprocal units of exposure, $(mg/kg\text{-}day)^{-1}$. Chemicals having a higher SF are believed to be inherently more carcinogenic, i.e., more potent, than those with a lower SF.

The U.S. EPA also categorizes chemicals that are potentially carcinogenic according to the strength of the existing experimental evidence (i.e., human and animal studies). The U.S. EPA Human Health Assessment Group ranks chemicals from Group A ("known human carcinogen") to Group E ("evidence of non-carcinogenicity for humans"). The Group A designation is assigned to those chemicals known to be carcinogenic to humans as substantiated by positive epidemiological evidence. Chemicals not known to be human carcinogens are classified into other categories based on the strength of the available human and animal toxicological data. The U.S. EPA carcinogen ranking classification is presented in Table D-2 for each potential human carcinogen included in the screening risk evaluation.

The following hierarchy for selecting SF values, which is generally based on CA EPA's recommended hierarchy (CA EPA, 1994), is used in the screening risk evaluation. The preferred source for carcinogenic slope factors is the list of SFs published in *Technical Support Document for Describing Available Cancer Potency Factors*, dated April 1999 (CA EPA, 1999). The secondary source of SFs is the list of SFs published in *California Cancer Potency Factors: Update*, dated April 1996 (CA EPA, 1996). The third source of SFs is the IRIS database (U.S. EPA, 1999). The fourth source of SFs is the FY-1997 edition of the U.S. EPA's HEAST (U.S. EPA, 1997).

One exception to the above hierarchy is that 1,1-dichloroethene ("1,1-DCE") was not included as a carcinogen in this screening risk evaluation. The U.S. EPA classifies 1,1-DCE as a Class C carcinogen ("possible human carcinogen"). However, the CA EPA does not list 1,1-DCE as a carcinogen in its 1996 *California Cancer Potency Factors: Update* or more recently in its *Technical Support Document for Describing Available Cancer Potency Factors*, dated April 1999 (CA EPA, 1999). In addition, 1,1-DCE is not included in the State of California Proposition 65 list of chemicals known to the State to cause cancer (California Code of Regulations ("CCR") Title 22, Section 12000).

The weight-of-evidence for carcinogenicity of 1,1-DCE is notably weak. The U.S. EPA classified 1,1-DCE as a Class C carcinogen because one of ten studies of 1,1-DCE inhalation showed evidence of carcinogenicity. Of the five studies of oral 1,1-DCE exposure, none showed evidence of carcinogenicity. Furthermore, the reliability of the one positive inhalation study has been questioned by the U.S. EPA Science Advisory Panel, which concluded that the study was not published in sufficient detail to support conclusions reached by the U.S. EPA regarding 1,1-DCE's carcinogenicity (Letter from H. Griffen and M. Nelson to W. Ruckelshaus, dated 14 January 1985). A detailed review performed by the State of California in 1986 concurred with the panel's assessment.

Inhalation toxicity information and slope factors used for the carcinogenic COCs are summarized in Table D-2.

D.1.3 Identification of Exposed Populations and Relevant Exposure Pathways

At present, the Site is zoned for commercial and industrial use and occupied by a warehouse. The Site is intended to be redeveloped to office/commercial use, with the possibility that part of space could be occupied by a child day care facility. Thus, future populations at the Site are commercial or industrial building occupants and children at a day care facility.

Site soil contains petroleum hydrocarbons. Identified toxic components of petroleum hydrocarbons (e.g., benzene, toluene, ethylbenzene, xylenes, ("BTEX") or polynuclear aromatic hydrocarbons) have not been detected in soil in the vicinity of the former refinery. Low levels of BTEX (e.g., up to 0.73 mg/kg xylenes) have been detected shallow soil samples collected adjacent to the former Lowenberg tanks. No other COCs have been detected in Site soil. Soil pathways are considered incomplete for the following reasons:

- Except for low levels of BTEX detected in the vicinity of the former Lowenberg tanks, no petroleum hydrocarbon components for which toxicity data exist have been detected in Site soil samples analyzed for these components.

- When redevelopment is complete, soil in areas where petroleum-impacted soil is known to exist will be capped, preventing contact with this soil by Site workers and children. Any play structures will be placed above grade (i.e., on top of the cap).

- For maintenance or construction workers who may disturb the cap, protective procedures are specified in a risk management plan, of which this risk assessment is an appendix.

Ingestion and dermal contact with COCs in groundwater were not included as complete exposure pathways for the following reasons:

- Groundwater at the Site is generally encountered at depths between 4 and 6 feet below ground surface ("bgs"), but can be as shallow as 2 feet bgs. Therefore, direct exposure to groundwater is only likely to occur during construction/excavation activities, which are likely to be of short duration and frequency and therefore would not likely pose a significant public health concern.

- No drinking water wells have been identified in or immediately downgradient of the Site, and water used on the Site is supplied from off-site sources. Therefore, exposure to shallow impacted Site groundwater through direct ingestion or dermal contact is unlikely.

Thus, the only potentially complete exposure pathway for the COCs is through inhalation of indoor and outdoor air containing VOCs volatilized from groundwater. Risks from inhalation of outdoor air containing VOCs volatilized from groundwater are typically much lower than risks for inhalation of indoor air containing VOCs volatilized from groundwater. As a result, only the indoor exposure pathway is included in these risk calculations.

D.1.4 Calculation of Exposure Point Concentrations

Exposure parameter values for the exposure pathway are summarized in Table D-3. The exposure assumptions are based on default assumptions recommended by U.S. EPA (1989, 1991) and CA EPA (1992) or best professional judgement. The source of each

 *added

exposure assumption is referenced in Table D-3. Since children are at day care so their parents can work, the exposure frequency for day care children is assumed to be five days per week, 50 weeks per year (i.e., the same as for a worker). Children are assumed to be at day care for only their first 6 years of life, since they will presumably attend school full-time after that.

Concentrations of VOCs volatilized from groundwater into indoor building air were estimated using the equations presented in RBCA (ASTM, 1996). The parameter values used in the RBCA model equations are summarized in Table D-4. Default parameter values (ASTM, 1996) were used except as noted in Table D-4. Chemical-specific parameter values describing physical and chemical properties are summarized in Table D-5.

D.1.5 Risk Calculations

Assumptions used to calculate hypothetical quantitative estimates of (a) incremental lifetime carcinogenic risk and (b) the potential adverse non-carcinogenic health impacts are presented in this section. Hypothetical risk estimates are calculated for each COC for the indoor air exposure pathway. The equations to calculate the risk estimates for this exposure pathway are included in the footnotes to Tables D-6 and D-7.

D.1.5.1 Non-Carcinogenic Risk

The non-carcinogenic risk characterization represents the relationship between the chemical doses estimated for the populations of concern and the non-carcinogenic toxicity of the individual COCs. The calculated hazard index ("HI") for each COC is the ratio of the estimated dose from exposure to the COC and its RfD, which represents the "safe" dosage level. The HIs for all COCs are then summed. If the total HI exceeds unity (one), the intake of the COCs is greater than the "safe" dosage level represented by the RfDs, and therefore adverse health effects may occur in the exposed population. When the total HI is less than unity, adverse health effects are not expected to occur in the exposed population.

As shown in Table D-6, the total non-carcinogenic hazard index for exposure of commercial or industrial building occupants to COCs in Site groundwater is 0.016. As shown in Table D-7, the total non-carcinogenic hazard index for exposure of day care children to COCs in Site groundwater is 0.009. Both of these hazard indices are below the threshold at which non-carcinogenic effects may occur (i.e., one).

D.1.5.2 Carcinogenic Risk

The characterization for carcinogens includes estimating the incremental risk of developing cancer for a duration of 25 years exposure to the potential human carcinogens. Incremental carcinogenic risk is calculated as the product of the estimated dose from exposure point concentrations of the COCs and the cancer SF. The U.S. EPA (1989) specifies an acceptable range of incremental lifetime carcinogenic risks of 10^{-4} to 10^{-6}. Notification to Site occupants is required by California Proposition 65 if carcinogenic risks are judged to exceed 10^{-5} (California Code of Regulations, Title 22, Section 12703).

As shown in Table D-6, the total estimated incremental lifetime carcinogenic risk for exposure of commercial or industrial building occupants to COCs in Site groundwater is 1.2×10^{-6}. This risk value is at the lower end of the U.S. EPA's acceptable range of 10^{-4} to 10^{-6} and is less than the Proposition 65 notification level of 10^{-5}.

As shown in Table D-7, the total estimated incremental lifetime carcinogenic risk for exposure of day care children to COCs in Site groundwater is 6.7×10^{-7}, which is below the U.S. EPA's acceptable range of 10^{-4} to 10^{-6} and the Proposition 65 notification level of 10^{-5}.

D.2 CONCLUSIONS

Based on the screening risk assessment calculations discussed above, it is concluded that Site COCs detected in groundwater do not pose a significant human health risk at the levels detected in the most recent groundwater samples collected from each sampling point.

Calculated human health risks to hypothetical future Site commercial/industrial workers and day care children from COCs in Site groundwater are summarized in Tables D-6 and D-7, respectively. The hazard index values are less than the threshold value at which non-carcinogenic effects may occur (i.e., one). Likewise, the total estimated incremental lifetime carcinogenic risks are less than or at the lower end of the U.S. EPA's acceptable range (i.e., 10^{-4} to 10^{-6}) and are less than the Proposition 65 notification level of 10^{-5}.

The screening risk assessment uses a conservative, reasonable maximum exposure scenario based on maximum concentrations. Actual risks are likely to be lower than those estimated by the screening risk assessment.

D.3 REFERENCES

American Society for Testing and Materials ("ASTM"), 1996. *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites*, Designation: E 1739-95, December 1996.

California Code of Regulations, Title 22, Section 12000, Revised 6 June 1997.

California Code of Regulations, Title 22, Section 12703, Revised 30 September 1996.

California Environmental Protection Agency ("CA EPA"), 1992. *Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities*, July 1992.

CA EPA, 1994 *Preliminary Endangerment Assessment Guidance Manual*, Department of Toxic Substances Control, January 1994.

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U.S. EPA, 1999. *Integrated Risk Information System (IRIS) Database*, Washington, D.C., May 1999.

TABLE D-1
CHEMICALS OF CONCERN OF VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER

64th Street Properties, Emeryville, California

Compound	Maximum Concentration (a) (µg/L)	Sample Location	Sample Date
Acetone	23	P-7	7/5/95
Benzene	26	TMW-2	1/4/93
Chloroethane	34	P-6	7/5/95
1,1-Dichloroethane	5.6	P-6	7/5/95
1,1-Dichloroethene	42	P-2	7/6/95
cis-1,2-Dichloroethene	51	MW-1	4/27/99
trans-1,2-Dichloroethene	54	MW-1	4/27/99
Ethylbenzene	19	P-11	7/6/95
1,1,1-Trichloroethane	7.4	P-2	7/6/95
Trichloroethene	170	MW-1	4/27/99
Vinyl Chloride	6.1	P-6	7/5/95
Xylenes	42.5	P-11	7/6/95

Notes:
(a) Maximum concentrations are obtained from the most recent data at a particular sampling location on the Lowenberg Property or the Ryerson Paved Lot Property.

TABLE D-2
SUMMARY OF INHALATION TOXICITY INFORMATION FOR POTENTIAL VOLATILE ORGANIC CHEMICALS OF CONCERN IN GROUNDWATER

64th Street Properties, Emeryville, California

Compound	Non-Carcinogenic Toxicity Information			Carcinogenic Toxicity Information		
	Chronic Reference Dose (RfD_i) (mg/kg-day)	Effect of Concern	Source (a)	Slope Factor (SF_i) $(mg/kg\text{-}day)^{-1}$	Weight-of-Evidence Classification (b)	Source (c)
Acetone	0.1 (d)	Increased Liver and Kidney Weights and Nephrotoxicity (d)	IRIS	- (e)	D	IRIS
Benzene	0.017	-	CA Noncancer	0.1	A	CA Cancer
Chloroethane	2.9	Delayed Fetal Ossification	IRIS	-	-	-
1,1-Dichloroethane	0.1	Kidney Damage	HEAST	0.0057	C	CA Cancer
1,1-Dichloroethene	0.0057	Hepatic Lesions (d)	CA Noncancer	-	C	IRIS
cis-1,2-Dichloroethene	0.01 (d)	Decreased Hematocrit, Decreased Hemoglobin (d)	HEAST	-	D	IRIS
trans-1,2-Dichloroethene	0.02 (d)	Increased Serum Alkaline Phosphatase (d)	IRIS	-	-	-
Ethylbenzene	0.29	Liver and Kidney Toxicity	CA Noncancer	-	D	IRIS
1,1,1-Trichloroethane	0.29	Reduced Body Weight Gain	NCEA	-	D	IRIS
Trichloroethene	0.17	-	CA Noncancer	0.01	under review	CA Cancer
Vinyl Chloride	0.0014	-	CA Noncancer	0.27	A	CA Cancer
Xylenes	0.057	Hyperactivity, Decreased Body Weight, and Increased Mortality in Male Rats (d)	CA Noncancer	-	D	IRIS

TABLE D-2
SUMMARY OF INHALATION TOXICITY INFORMATION
FOR POTENTIAL VOLATILE ORGANIC CHEMICALS OF CONCERN IN GROUNDWATER

64th Street Properties, Emeryville, California

Notes:

(a) Chronic reference doses obtained from the California EPA Office of Environmental Health Hazard Assessment's (OEHHA) Draft Technical Support Document for Determination of Noncancer Chronic Reference Exposure Levels (CA Noncancer), dated October 1997, U.S. EPA's Integrated Risk Information System (IRIS) (May 1999), U.S. EPA's Health Effects Assessment Summary Tables (HEAST), dated July 1997, or U.S. EPA's National Center for Environmental Assessment (NCEA), in this order of priority.

(b) U.S. EPA weight-of-evidence classification is as follows:
A = Human Carcinogen
B1 or B2 = Probable Human Carcinogen; B1 indicates that limited human data are available; B2 indicates that there is sufficient evidence in animals and inadequate or no evidence in humans.
C = Possible Human Carcinogen
D = Not Classifiable as to Human Carcinogenicity
E = Evidence of Non-Carcinogenicity for Humans
Weight-of-evidence information obtained from IRIS or HEAST.

(c) Cancer slope factors obtained from the document entitled "Technical Support Document for Describing Available Cancer Potency Factors" (CA Cancer) from OEHHA (April 1999), California EPA's "California Cancer Potency Factors: Update" (April 1996) (CA Potency), U.S. EPA's IRIS database (May 1999), or U.S. EPA's HEAST (July 1997), in this order of priority. Source listed for compounds without slope factors indicates the source of the weight-of-evidence classification.

(d) In the absence of an inhalation chronic reference dose or inhalation effect of concern, the respective oral value or effect of concern was used.

(e) Hyphen ("-") symbol indicates a respective reference dose, cancer slope factor, or effect of concern is not available for this compound. In the case of 1,1-dichloroethene, a carcinogenic slope factor was reported in IRIS but was not used in these risk calculations because 1,1-dichloroethene is not listed as a carcinogen by OEHHA (California Code of Regulations, Title 22, Section 1200).

TABLE D-3
EXPOSURE PARAMETER VALUES USED IN THE HUMAN HEALTH RISK SCREENING EVALUATION

64th Street Properties, Emeryville, California

Potentially Exposed Population	Exposure Parameter (a)			Reference
Commercial or Industrial Worker	EF	Exposure Frequency	250 days/year	U.S. EPA (1991); Cal-EPA (1992)
	ED	Exposure Duration	25 years	U.S.EPA (1991); Cal-EPA (1992)
	BW	Body Weight	70 kg	U.S.EPA (1989, 1991); Cal-EPA (1992)
	AT	Averaging Time	9,125 days; 25,550 days (b)	U.S.EPA (1989, 1991); Cal-EPA (1992)
	IRa	Inhalation Rate of Air	20 m^3/day	U.S.EPA (1989, 1991); Cal-EPA (1992)
Day Care Child	EF	Exposure Frequency	250 days/year	Best Professional Judgment (c)
	ED	Exposure Duration	6 years	Best Professional Judgment (c)
	BW	Body Weight	15 kg	U.S.EPA (1989, 1991); Cal-EPA (1992)
	AT	Averaging Time	9,125 days; 25,550 days (b)	U.S.EPA (1989, 1991); Cal-EPA (1992)
	IRa	Inhalation Rate of Air	10 m^3/day	U.S.EPA (1989, 1991); Cal-EPA (1992)

Notes:

(a) Exposure assumptions are compiled from:
- Cal-EPA, July 1992, Supplemental Guidance for Human Health Multimedia Risk Assessments for Hazardous Waste Sites and Permitted Facilities, DTSC.
- U.S. EPA, March 1991, Risk Assessment Guidance for Superfund - Volume I: Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors", Interim Final, OSWER Directive: 9285.6-03.
- U.S. EPA, December 1989, Risk Assessment Guidance for Superfund, Volume I - Human Health Evaluation Manual (Part A), OERR, EPA/540/12-89/002.

(b) Averaging time for non-carcinogenic effects, which equals the exposure duration in units of days, is listed first. Averaging time for carcinogenic effects, which equals a 70-year lifetime in units of days, is listed second.

(c) Children are assumed to be at day care 5 days per week, 50 weeks per year (i.e., similar to a worker scenario). Children are assumed to be at day care for only their first 6 years of life, since they will presumably attend school full-time after that.

TABLE D-4
ASSUMPTIONS USED IN THE RISK-BASED CORRECTIVE ACTION EXPOSURE MODEL (a)

64th Street Properties, Emeryville, California

Parameter	Definition	Units	Commercial/ Industrial
L_{gw}	Depth to groundwater	cm	61 (b)
h_v	Thickness of vadose zone	cm	56 (c)
h_{cap}	Thickness of capillary fringe	cm	5
ER	Enclosed-space air exchange rate	s^{-1}	0.00023
L_B	Enclosed-space volume/infiltration area ratio	cm	300
L_{crack}	Enclosed-space foundation thickness	cm	15
η	Areal fraction of cracks in foundations	cm^2-cracks/cm^2-total area	0.001 (d)
θ_{acrack}	Volumetric air content in foundation cracks	cm^3-air/cm^3-total volume	0.26
θ_{wcrack}	Volumetric water content in foundation cracks	cm^3-water/cm^3-soil	0.12
θ_T	Total soil porosity	cm^3/cm^3-soil	0.37 (e)
θ_{as}	Volumetric air content in vadose zone soils	cm^3-air/cm^3-soil	0.25
θ_{ws}	Volumetric water content in vadose zone soils	cm^3-water/cm^3-soil	0.12 (f)
θ_{acap}	Volumetric air content in capillary fringe soils	cm^3-air/cm^3-soil	0.037 (f)
θ_{wcap}	Volumetric water content in capillary fringe soils	cm^3-water/cm^3-soil	0.333 (f)

Notes:

(a) Except where noted, all values are default values from ASTM guidance document (1996).

(b) The depth to groundwater shown is the minimum depth to first-encountered groundwater for wells/borings by EKI at the site (i.e., 2 feet below ground surface in well TMW-1; EKI, 5 September 1995).

(c) The thickness of the vadose zone is calculated as the depth to groundwater minus the capillary fringe thickness.

(d) Areal fraction of cracks in foundations and walls for commercial buildings was set to 0.001 (Daugherty, 1991).

(e) Total soil porosity is the average value obtained from 3 soil samples collected from 2 to 3 feet below ground surface at the site.

(f) Consistent with RBCA default values, vadose zone porosity is assumed to be 32% water and capillary fringe porosity is assumed to be 90% water.

TABLE D-5
PHYSICAL AND CHEMICAL PROPERTIES FOR POTENTIAL CHEMICALS OF CONCERN IN GROUNDWATER

64th Street Properties, Emeryville, California

Compound	Henry's Law Constant H_c; (a) ($L\text{-}H_2O/L\text{-}air$)	Diffusivity in Air D_{air}; (b) (cm^2/s)	Diffusivity in Water D_{water}; (c) (cm^2/s)
Acetone	0.0016	0.1	1.0E-05
Benzene	0.19	0.087	9.0E-06
Chloroethane	0.39	0.1	1.1E-05
1,1-Dichloroethane	0.18	0.089	9.1E-06
1,1-Dichloroethene	0.86	0.091	9.6E-06
cis-1,2-Dichloroethene	0.12	0.091	9.6E-06
trans-1,2-Dichloroethene	0.30	0.091	9.6E-06
Ethylbenzene	0.24	0.071	7.2E-06
1,1,1-Trichloroethane	0.55	0.079	8.1E-06
Trichloroethene	0.30	0.081	8.4E-06
Vinyl Chloride	0.92	0.11	1.1E-05
Xylenes	0.24	0.071	7.2E-06

Notes:

(a) Dimensionless Henry's constant at 20 degrees Celcius obtained from Gossett (1987) or Montgomery (1996), in this order of priority.

(b) Diffusivity in air at 20 degrees Celcius were calculated using Fuller's method as recommended in the U.S. EPA Superfund Exposure Assessment Manual (April 1988).

(c) Diffusivity in water at 20 degrees Celcius calculated using method of Hayduk and Laudie (Lyman et al., 1990).

TABLE D-6
CHARACTERIZATION OF HUMAN HEALTH RISKS DUE TO INHALATION OF VOLATILE ORGANIC CHEMICALS FROM GROUNDWATER FOR COMMERCIAL OR INDUSTRIAL WORKER

64th Street Properties, Emeryville, California

Compound	Maximum Concentration of Compound in Groundwater; (a) (ug/L)	VF_{wesp}; (b) (L/m^3)	Indoor Air Exposure Point Concentration; (c) (mg/m^3)	Non-Carcinogen Chronic Daily Intake; (d) (mg/kg-day)	Carcinogen Chronic Daily Intake; (d) (mg/kg-day)	Non-Carcinogenic Inhalation Reference Dose (RfD_i); (e) (mg/kg-day)	Carcinogenic Inhalation Slope Factor (SF_i); (f) $(mg/kg\text{-}day)^{-1}$	Non-Carcinogenic Hazard Index; (g)	Estimated Lifetime Incremental Cancer Risk; (h)
Acetone	23	1.3E-05	2.9E-07	5.7E-08	2.0E-08	0.1	-	5.7E-07	-
Benzene	26	1.2E-03	3.0E-05	5.9E-06	2.1E-06	0.017	0.1	3.5E-04	2.1E-07
Chloroethane	34	2.7E-03	9.1E-05	1.8E-05	6.4E-06	2.9	-	6.2E-06	-
1,1-Dichloroethane	5.6	1.1E-03	6.4E-06	1.2E-06	4.4E-07	0.1	0.0057	1.2E-05	2.5E-09
1,1-Dichloroethene	42	5.2E-03	2.2E-04	4.3E-05	1.5E-05	0.0057	-	7.5E-03	-
cis-1,2-Dichloroethene	51	7.9E-04	4.0E-05	7.9E-06	2.8E-06	0.01	-	7.9E-04	-
trans-1,2-Dichloroethene	54	1.9E-03	1.0E-04	2.0E-05	7.1E-06	0.02	-	1.0E-03	-
Ethylbenzene	19	1.2E-03	2.3E-05	4.4E-06	1.6E-06	0.29	-	1.5E-05	-
1,1,1-Trichloroethane	7.4	2.9E-03	2.2E-05	4.3E-06	1.5E-06	0.29	-	1.5E-05	-
Trichloroethene	170	1.7E-03	2.9E-04	5.6E-05	2.0E-05	0.17	0.01	3.3E-04	2.0E-07
Vinyl Chloride	6.1	6.7E-03	4.1E-05	8.1E-06	2.9E-06	0.0014	0.27	5.8E-03	7.8E-07
Xylenes	42.5	1.2E-03	5.0E-05	9.9E-06	3.5E-06	0.057	-	1.7E-04	-
Estimated Risk due to Inhalation of Volatile Organic Chemicals from Groundwater:								**0.016**	**1.2E-06**

Notes:

(a) Refer to Table D-1 for compilation of maximum concentrations (MCs).

(b) Chemical-specific volatilization factor from groundwater to enclosed space air calculated using the Risk-Based Corrective Action (RBCA) model (ASTM, 1995). Parameters used in the RBCA model are listed in Table D-4 and D-5.

(c) The concentration in air (C_a) is calculated using the following equation: $C_a = VF_{wesp} * MC$.

(d) Chronic daily intakes (CDIs) were estimated using methodologies recommended by U.S. EPA or CA EPA. The equation used to calculate the CDIs is the following:

$$CDI_{(inhalation)} = \frac{C_a * IR_a * EF * ED}{BW * AT}$$

(Refer to Table D-3 for abbreviations and assumptions of the parameters to calculate CDIs.)

TABLE D-6
CHARACTERIZATION OF HUMAN HEALTH RISKS DUE TO INHALATION OF VOLATILE ORGANIC CHEMICALS FROM GROUNDWATER FOR COMMERCIAL OR INDUSTRIAL WORKER

64th Street Properties, Emeryville, California

Notes (cont.):

(e) Chronic reference doses (RfDs) for non-carcinogenic effects were obtained from CA EPA's Draft Noncancer Chronic Reference Exposure Levels Document (October 1997), IRIS, HEAST, or NCEA, in this order of priority. Origin of respective RfDs is included in Table D-2.

(f) Slope factors (SFs) for carcinogenic effects were obtained from CA EPA's Cancer Potency Factor Document (April 1999). Origin of respective SFs is included in Table D-2. Hyphen indicates SF is not available for this compound.

(g) Non-carcinogenic hazard index (HI) for compound i is defined as the CDI_i/RfD_i. The non-carcinogenic HI, summed for all compounds and exposure pathways, assumes that there is a level of exposure (i.e., RfD) below which it is unlikely even for sensitive populations to experience adverse health effects (U.S. EPA, 1989). If the chronic daily intake (i.e., CDI) exceeds this RfD threshold (i.e., HI greater than 1), there may be concern for potential non-carcinogenic effects.

(h) Estimated lifetime incremental cancer risk for chemical i is defined as $CDI_i \times SF_i$. The estimated incremental lifetime cancer risk to an individual developing cancer due to potential chemicals of concern is given by the sum of incremental cancer risks for all chemicals and exposure pathways.

TABLE D-7
CHARACTERIZATION OF HUMAN HEALTH RISKS DUE TO INHALATION OF VOLATILE ORGANIC CHEMICALS FROM GROUNDWATER FOR DAY CARE CHILD

64th Street Properties, Emeryville, California

Compound	Maximum Concentration of Compound in Groundwater; (a) (ug/L)	VF_{wesp}; (b) (L/m^3)	Indoor Air Exposure Point Concentration; (c) (mg/m^3)	Non-Carcinogen Chronic Daily Intake; (d) (mg/kg-day)	Carcinogen Chronic Daily Intake; (d) (mg/kg-day)	Non-Carcinogenic Inhalation Reference Dose (RfD_i); (e) (mg/kg-day)	Carcinogenic Inhalation Slope Factor (SF_i); (f) $(mg/kg\text{-}day)^{-1}$	Non-Carcinogenic Hazard Index; (g)	Estimated Lifetime Incremental Cancer Risk; (h)
Acetone	23	1.3E-05	2.9E-07	3.2E-08	1.1E-08	0.1	-	3.2E-07	-
Benzene	26	1.2E-03	3.0E-05	3.3E-06	1.2E-06	0.017	0.1	2.0E-04	1.2E-07
Chloroethane	34	2.7E-03	9.1E-05	1.0E-05	3.6E-06	2.9	-	3.5E-06	-
1,1-Dichloroethane	5.6	1.1E-03	6.4E-06	7.0E-07	2.5E-07	0.1	0.0057	7.0E-06	1.4E-09
1,1-Dichloroethene	42	5.2E-03	2.2E-04	2.4E-05	8.6E-06	0.0057	-	4.2E-03	-
cis-1,2-Dichloroethene	51	7.9E-04	4.0E-05	4.4E-06	1.6E-06	0.01	-	4.4E-04	-
trans-1,2-Dichloroethene	54	1.9E-03	1.0E-04	1.1E-05	4.0E-06	0.02	-	5.6E-04	-
Ethylbenzene	19	1.2E-03	2.3E-05	2.5E-06	8.8E-07	0.29	-	8.6E-06	-
1,1,1-Trichloroethane	7.4	2.9E-03	2.2E-05	2.4E-06	8.5E-07	0.29	-	8.2E-06	-
Trichloroethene	170	1.7E-03	2.9E-04	3.1E-05	1.1E-05	0.17	0.01	1.8E-04	1.1E-07
Vinyl Chloride	6.1	6.7E-03	4.1E-05	4.5E-06	1.6E-06	0.0014	0.27	3.2E-03	4.3E-07
Xylenes	42.5	1.2E-03	5.0E-05	5.5E-06	2.0E-06	0.057	-	9.7E-05	-
Estimated Risk due to Inhalation of Volatile Organic Chemicals from Groundwater:								**0.009**	**6.7E-07**

Notes:

(a) Refer to Table D-1 for compilation of maximum concentrations (MCs).

(b) Chemical-specific volatilization factor from groundwater to enclosed space air calculated using the Risk-Based Corrective Action (RBCA) model (ASTM, 1995). Parameters used in the RBCA model are listed in Table D-4 and D-5.

(c) The concentration in air (C_a) is calculated using the following equation: $C_a = VF_{wesp} * MC$.

(d) Chronic daily intakes (CDIs) were estimated using methodologies recommended by U.S. EPA or CA EPA. The equation used to calculate the CDIs is the following:

$$CDI_{(inhalation)} = \frac{C_a * IR_a * EF * ED}{BW * AT}$$

(Refer to Table D-3 for abbreviations and assumptions of the parameters to calculate CDIs.)

TABLE D-7
CHARACTERIZATION OF HUMAN HEALTH RISKS DUE TO INHALATION OF VOLATILE ORGANIC CHEMICALS FROM GROUNDWATER FOR DAY CARE CHILD

64th Street Properties, Emeryville, California

Notes (cont.):

(e) Chronic reference doses (RfDs) for non-carcinogenic effects were obtained from CA EPA's Draft Noncancer Chronic Reference Exposure Levels Document (October 1997), IRIS, HEAST, or NCEA, in this order of priority. Origin of respective RfDs is included in Table D-2.

(f) Slope factors (SFs) for carcinogenic effects were obtained from CA EPA's Cancer Potency Factor Document (April 1999). Origin of respective SFs is included in Table D-2. Hyphen indicates SF is not available for this compound.

(g) Non-carcinogenic hazard index (HI) for compound i is defined as the CDI_i/RfD_i. The non-carcinogenic HI, summed for all compounds and exposure pathways, assumes that there is a level of exposure (i.e., RfD) below which it is unlikely even for sensitive populations to experience adverse health effects (U.S. EPA, 1989). If the chronic daily intake (i.e., CDI) exceeds this RfD threshold (i.e., HI greater than 1), there may be concern for potential non-carcinogenic effects.

(h) Estimated lifetime incremental cancer risk for chemical i is defined as $CDI_i \times SF_i$. The estimated incremental lifetime cancer risk to an individual developing cancer due to potential chemicals of concern is given by the sum of incremental cancer risks for all chemicals and exposure pathways.

Appendix E

Groundwater Monitoring Well Installation and Sampling Procedures

As part of the perimeter groundwater monitoring program, the general procedures for monitoring well installation, development, and sampling described below should be followed.

Necessary permits will be obtained before well construction commences. Well construction will be observed by a qualified person who is either:

- a professional geologist, engineering geologist, or civil engineer who is registered or certified by the State of California and who is trained and experienced in the use of the Unified Soil Classification System; or

- a geologist or engineer who is trained and experienced in the use of the Unified Soil Classification System and who is working under the supervision of one of the registered or certified professionals listed above.

E.1 WELL CONSTRUCTION

E.1.1 Hollow-Stem Auger Drilling

A drill rig with eight-inch outside diameter continuous-flight hollow-stem augers will be used for drilling the soil borings. Soil borings that are to be completed as monitoring wells will be drilled using augers at least 4 inches greater in diameter than the diameter of the well casing (i.e., 4 inches), so as to allow for a minimum of 2 inches of sand pack to surround the casing. Prior to and between each boring, the augers will be steam cleaned to minimize to potential of cross-contamination.

For borehole logging, soil samples will be collected in the borings at predetermined depth intervals by driving a clean California split-spoon sampler into the undisturbed soil ahead of the augers. The split-spoon sampler will be fitted with precleaned brass or stainless steel tubes to retain samples. The sampler will be driven using a hammer having a weight of 140 lbs and a drop of 30 inches, or equivalent. Blow counts for each six inches that the sampler is driven will be noted on the boring log.

Upon completion of sampling activities, each boring will completed as a monitoring well. This procedure is discussed in following section.

E.1.2 Well Installation

The borings will be converted to monitoring wells upon reaching the designated depth. Monitoring wells will be constructed by installing 4-inch diameter, pre-cleaned PVC well casing through the hollow-stem auger. The soil boring will be of a diameter at least 4 inches greater than that of the well casing, so as to allow for a minimum of 2 inches of sand pack to surround the casing.

The well casing will be composed of flush-joint, threaded, Schedule 40 PVC casing. No solvents or glues will be used in the construction of monitoring wells. The lower part of the well casing will consist of factory-slotted PVC or stainless steel well screen extending upward through the upper shallow water-bearing zone. The lower end of PVC well screens will be plugged with a threaded PVC end cap or a slip cap. Slip caps will be permanently attached to the PVC screen using a stainless steel screw or rivet. The lower end of stainless steel well screens will be factory sealed. The upper part of all wells will consist of blank PVC casing. To complete the well at grade, the well casing will extend to approximately four inches below grade. The top of the casing will be fitted with a watertight, locking well cap.

Well construction includes placing a continuous filter pack in the annular space between the well screen and the wall of the boring. The filter pack will consist of pre-washed, packaged sand. The sand is sized according to the slot size of the well screen and available information on grain size in the formation at nearby borings. The filter pack will extend from the bottom of the boring to not more than two feet above the top of the well screen. The sand will be placed slowly through the hollow-stem augers and the augers will periodically be raised to allow the sand to fill the annulus between the well screen and the wall of the boring. The level of the sand will be monitored using a weighted tape.

Above the filter pack, a 1- to 2-foot-thick layer of bentonite pellets or chips will be placed to prevent downward migration of the grout seal into the filter pack. The bentonite pellets or chips will be placed through the augers in the same manner as the sand. Cement-and-bentonite grout, placed using a hose or tremie pipe, will extend continuously from the top of the bentonite layer to approximately six inches below grade. The grout will be composed of neat cement containing up to 5 percent bentonite powder to control shrinkage. The grout seal will be at least 5 feet thick, unless prior approval is obtained from the local well permitting agency.

Monitoring wells will be completed at the surface. Surface completion will be accomplished using a traffic-rated steel and/or concrete utility box set in concrete so that it is slightly above grade.

The identification number of each well will be permanently marked on the well casing and/or the well enclosure.

E.2 WELL DEVELOPMENT

Prior to development of any well, all tools and equipment that are to be used in the well will be thoroughly decontaminated. Decontamination may be accomplished by either (1) steam cleaning or (2) washing in a solution of Liquinox® or equivalent non-phosphate detergent, followed by rinsing with clean water, then rinsing with distilled water.

Following the completion a monitoring well, the grout and concrete will be allowed to cure for at least 24 hours. The well will be developed to remove fine-grained materials inside the filter pack and casing, to stabilize the filter pack around the well screen and to help produce more representative samples from the water-bearing zone. The well will be developed by bailing, pumping, surging, swabbing, or a combination of methods until (1) the extracted water flows clear and pH, temperature, and conductivity of the extracted groundwater stabilize, or (2) 5 casing volumes are removed. Surging can be performed by a Smeal rig or by hand.

For surging using a Smeal rig, the Smeal rig will be fitted with a surge block that is designed to snugly fit the inside diameter of the well casing. The rig operator will proceed to surge the well with shallow, smooth strokes forcing the water back and forth through the sand pack and screen. The surge block will then be removed, and the well will be pumped to remove the sediment. The operator will then alternately surge and pump the well until a minimum of 5 casing volumes have been removed or field parameters stabilize.

Development by hand is accomplished by using a hand held surge block and a hand bailer or pump. The well is developed when parameters stabilize or 5 casing volumes have been removed.

Well development water will be temporarily contained in steel drums pending receipt of results of analyses of groundwater from the respective well(s). The development water will then be disposed of properly.

E.3 WELL SAMPLING

Monitoring wells will be sampled in a sequence beginning with the well that has the lower anticipated hydrocarbon concentration and proceeding to the well exhibiting higher hydrocarbon concentrations, based on the most recent chemical analyses of water samples from the wells.

Prior to sampling any well, all tools and equipment that are to be used in the well will be thoroughly decontaminated. Decontamination may be accomplished by either (1) steam cleaning or (2) washing in a solution of Liquinox® or equivalent non-phosphate detergent, followed by rinsing with clean water, then rinsing with distilled water.

At each well to be sampled, the depth to water and the depth to the bottom of the well will be measured and recorded. This information will be used to calculate the volume of water in the well casing. Each well will also be checked for the presence of floating product on the water surface in the well.

Prior to sampling, a pump, a Teflon® bailer, and/or a disposable bailer will be used to purge each well. A different disposable bailer will be used for each well that is purged with a disposable bailer. If a well dewaters during purging, it will be allowed to recharge to at least 75 percent of original volume before sampling. If a well contain less than one foot of water, a grab water sample will be collected instead. During purging, each well will be monitored for temperature, conductivity, and pH. Purging will be considered complete when these parameters stabilize or a minimum of 3 casing volumes of water have been removed. The water level will be measured again immediately upon completion of purging.

Following purging, each well will be sampled with a Teflon® or disposable bailer. The sample will be collected from the midpoint of the water column. Upon retrieval of the bailer, the water samples will be transferred to the appropriate laboratory-supplied bottles.

For well SMW-4, which may contain free-phase hydrocarbons, groundwater samples will be collected through a chemically-inert stilling tube, as described by EPA (EPA, 1992) and summarized below. The end of the stilling tube will be covered with a membrane or other material that will be ruptured by the pump. The stilling tube will be inserted into the well to a depth that is significantly below the upper portion of the screened interval where free-phase hydrocarbons may be entering the well. Groundwater samples will be collected by inserting a pump through the stilling tube. Water samples will be transferred to the appropriate laboratory-supplied bottles.

A sample label will be attached to each sample container. The label will include a unique sample identification number, the well number, the time, and the date when the sample was collected. The sealed containers will be placed in zip-closure plastic bags, then placed on ice in a cooler for temporary storage and transport to the laboratory for chemical analysis. Chain-of-custody records will be initiated.

Well development water will be temporarily contained in steel drums pending receipt of results of analyses of groundwater from the respective well(s). The development water will then be disposed of properly.