Soil Risk Management Plan
Terminal One Site
1500 Dornan Drive
Richmond, California

Prepared for:
City of Richmond Redevelopment Agency

February 2005

Project No. 6293.002

Geomatrix Consultants
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1.0 INTRODUCTION

Geomatrix Consultants, Inc. (Geomatrix) has prepared this Soil Management Plan (SMP) on behalf of the Richmond Redevelopment Agency (RRA) for the Terminal One Site (the Site), located at 1500 Dornan Drive in Richmond, California (Figure 1). Remediation of soil and groundwater in portions of the Site is required to meet cleanup objectives based on potential risks to human health, to limit further degradation of groundwater resources, and to reduce the threat to surface water (i.e., San Francisco Bay). In-situ treatment and remediation of the Site is expected to be completed in 2005. Following completion of the remediation effort, the RRA proposes to allow redevelopment of the Site with a combined multi-family residential development and recreational area.

In accordance with the RAP, this SMP specifies soil management protocols for invasive activities completed at the Site, such as excavation, grading, and utility installation and describes provisions for excavations that require penetration of the slurry wall vapor barrier to be constructed as part of the remediation effort. This SMP specifies appropriate soil management protocols for the Site, provides re-use criteria and best management practices for underground utility placement and backfilling.

This SMP is designed to be used in conjunction with the other administrative controls (e.g., health and safety plan, regulatory permits) to be established for the Site. This SMP does not address activities other than construction and maintenance or future development activities beyond the proposed development plan.

The lead Regulatory Agency for this project is the Regional Water Quality Control Board, San Francisco Region (RWQCB). It is anticipated that implementation of this SMP will be the responsibility of the RRA and the developer of any future residential project on the residential portion of the Site. However, the protocols presented in this SMP are to be used by all parties involved in soil disturbance activities (e.g., excavation, grading, utility installation, and landscaping).
1.1 **OBJECTIVE**

The primary objective of this SMP is to provide protocols for the management of residual amounts of tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2 dichloroethene (cis-1,2-DCE), vinyl chloride (VC), and Total Petroleum Hydrocarbons (TPH) that will be present following remediation of the Site in a manner that is: (1) protective of human health and the environment; and (2) consistent with the planned redevelopment.

1.2 **POTENTIAL RECEPTORS**

Following in-situ treatment of the Southwestern Tank Farm Area potential receptors of concern include construction and maintenance workers who will be engaged in potentially invasive activities such as excavation, grading, and utility installation and residential and recreational users of the Site.

2.0 **BACKGROUND**

2.1 **SITE LOCATION AND HISTORY**

The Site, which covers approximately 14 acres, is bounded by Brickyard Cove Road to the north, Dornan Drive and San Francisco Bay to the west, the Richmond Yacht Club and San Francisco Bay to the east, and San Francisco Bay to the south (Figure 1). Based on information presented in the Phase I Environmental Site Assessment (Treadwell & Rollo, 1995), Terminal One was developed between 1915 and 1918 as a port facility used for shipping and industrial activities and was in use until the late 1980s. It was used primarily as a storage and warehouse facility, but cargo and bulk liquids were also transferred from ships to trucks and rail cars on the Site.

Site improvements completed at various times have included storage tanks, warehouse buildings, an office building, boilers, an underground fuel storage tank, a truck scale, and a below-grade storm water system consisting of sumps, clarifiers, and below-grade piping. Chemicals likely to have been stored at the Site include petroleum hydrocarbons, non-petroleum-based hydrocarbons (i.e. vegetable, coconut, and cottonseed oils), and solvents.

Apart from an approximately 6,000 square feet (sf) building foundation, a few concrete tank foundations in the northern portion of the Site, and an approximately 90,000 square-feet (sf) pile-supported warehouse building, all aboveground structures were removed from the Site between approximately 1998 and 2000. A site plan of Terminal One is provided in Figure 2.
For the purposes of this report, the former tank farm within the southwestern portion of the Site and the adjacent warehouse is referred to as the Southwestern Tank Farm Area. Following remediation and development of the Site, ownership of the Southwestern Tank Farm Area will remain with the City of Richmond and it is currently proposed that this area will be used as a recreational area. The former tank farm within the northeastern portion of the Site is referred to as the Northeastern Tank Farm Area. The remainder of the Site, extending from the northwestern corner to the southeastern corner, is referred to as the Central Area. It is currently proposed that the Northeastern Tank Farm Area and the Central Area will be developed into a residential area following remediation of the Site. These areas are identified in Figure 2.

2.2 PHYSICAL SETTING

The Site lies within a mixed industrial, residential, and recreational area of the Richmond shoreline. The Site is generally flat and is bounded by rip-rap on the east, south, and west; bedrock outcrops immediately north of the Site. Based on a review of historical maps (Nichols and Wright, 1971), the entire Site consists of reclaimed land.

Franciscan bedrock outcrops just north of the Site, sloping steeply to the south beneath the Site. This outcrop may represent the original shoreline prior to reclamation. Shallow sandy to gravelly fill material, Bay Mud, and deeper silty sediments are juxtaposed against the sloping bedrock surface. The shallow coarse-grained fill material ranges in thickness from less than a foot (at the southwest corner of the Site beneath the building) to approximately 13.5 feet (within the northeastern-central portion of the Site) and consists of a mixture of sand and gravel with local silt and clay layers. The coarse-grained fill material overlies Bay Mud.

The Bay Mud ranges in thickness from very thin (less than one foot thick) at the northern edge of the Site to at least 39 feet thick along the southern edge and consists primarily of dark greenish grey lean clay with minor amounts of sand. Shallow zones with sand and gravel in the clay have been observed locally as well as thin interbedded layers with abundant shells. A 4-feet thick shell-rich zone is present locally beneath the Southwestern Tank Farm Area between approximately 10 and 15 feet below ground surface (bgs). There is no evidence that the shallow sand and gravel deposits are continuous across the Site. The shell-rich zones appear to be local and discontinuous.

The Bay Mud is directly underlain by bedrock within the northern portion of the Site. Within the southern portion of the Site, the Bay Mud is underlain by a coarse-grained layer at depths ranging from 40 to 60 feet below ground surface (bgs). The coarse layer, which consists of
approximately 10 to 15 feet of silt, sand and gravel, is underlain by bedrock. A cross-section through the Southwest Tank Farm area is shown on Figure 3.

Depth to water beneath the Site generally ranges from approximately 3 to 8 feet bgs. Groundwater monitoring wells are screened across first encountered water, which was generally within Bay Mud. Over most of the Site, the coarse-grained fill material is generally unsaturated; however, in the Northeastern Tank Farm Area, groundwater has been observed to occur within the lowest portion of the coarse-grained fill layer. There appears to be minimal tidal influence on groundwater levels except at the very margins of the Site suggesting limited communication between shallow groundwater at the Site and the adjacent bay.

2.3 PROPOSED DEVELOPMENT
The following sections describe pre-construction demolition plans and proposed construction activities.

2.3.1 Phase One Remediation Activities
Phase One Remediation activities at the Site include the remediation of approximately 7,000 cubic yards of volatile organic compound (VOC) affected soil and associated groundwater in the Southwestern Tank Farm Area using in-situ thermal desorption techniques, the excavation of approximately 80 cubic yards of benzo(a)pyrene (B(a)p) affected soil from the Central Area, construction of a 12-feet deep slurry wall around the perimeter of the recreational area to serve as a vertical vapor barrier between the residential and recreational areas of the Site, and demolition of the existing approximately 90,000 square foot warehouse building located in the southwestern corner of the site. Details of the proposed site remediation can be found in the Geomatrix report “Updated Proposed Remedial Action Plan”, (Geomatrix, 2004b) October 2004.

2.3.2 Phase Two Remediation, Development and Construction Activities
Current development plans contemplated for the Site would involve construction of multi-family residential units in the Central and Northeastern Tank Farm Areas (Residential Area) and the development of a Recreational Area in the Southwestern Tank Farm Area (Recreational Area). Phase Two Remediation will comprise the management of TPH affected soils during the course of construction and development activities. It is likely that excavation in the proposed Residential and Recreational areas will be required during construction of foundations and installation of utilities.
2.4 ENVIRONMENTAL SITE INVESTIGATIONS

In total, twelve phases of investigation and assessment have been completed at the Site. Details on the investigations are presented in the Remedial Investigation (RI) Report (Geomatrix, 2003). Additionally, a pre-design site investigation was implemented between June 14 and June 30, 2004 to more accurately delineate those areas of the Southwestern Tank Farm Area and Central Area that exceed Site cleanup goals. Details of the investigation are presented in the Pre-Design Site Investigation Report (Geomatrix, 2004a).

The data in the RI Report indicate that over 120 chemicals have been detected in soil and groundwater at the Site. PCE, TCE, cis-1,2-DCE, and VC have been detected at elevated concentrations in soil and groundwater in the Southwestern Tank Farm Area. Benzo(a)pyrene has been detected at elevated concentrations in soil at isolated locations within the Central Area of the Site. Petroleum hydrocarbons have also been observed at a number of locations across the Site as indicated on Figures 4 and 5.

3.0 MANAGEMENT OF SOIL CONTAINING RESIDUAL LEVELS OF VOCS

A Human Health Risk Assessment (HHRA) completed for the Site indicates that, following remediation of the Southwestern Tank Farm Area, concentrations of VOCs in soil will be below the specified Site cleanup goals for exposure to ambient air; the area will be safe for recreational users. However, concentrations of VOCs in soil may not be below the specified Site cleanup goals protective of indoor air; the pathway via which residents may become exposed. In order to control this potential migration pathway, a subsurface slurry wall will be constructed to provide a vapor barrier around the recreational area of the Site. This vapor barrier will prevent the migration of chemically affected vapors into adjacent residences.

3.1 SOIL MANAGEMENT

To ensure that residents continue to be protected following the Phase One Remediation, soil cannot be moved from the Southwestern Tank Farm Area to other areas of the Site unless the soil contains concentrations of chemicals of potential concern (COPCs) below screening levels protective of indoor air as presented in “Screening For Environmental Concerns At Sites with Contaminated Soil And Groundwater” (July 2003 and update, RWQCB), which are:

- PCE 0.088 mg/kg
- TCE 0.26 mg/kg
- Vinyl Chloride 0.0067 mg/kg
3.2 VAPOR BARRIER

The subsurface slurry wall will remain in place in perpetuity as a barrier to prevent the potential migration of vapors from the recreational area to the residential area via the granular, near-surface material. If, in the future, there is a need to penetrate the vapor barrier with utility trenches or other subsurface activities then repairs shall be made to maintain the integrity of the barrier.

1. The RRA shall be notified of any proposed subsurface work that will, or may, impact the vapor barrier. The RRA may choose to have a representative on Site during the work.

2. Any penetration of the vapor barrier shall be repaired/backfilled with a 2-sack cement mix of control density fill (CDF) to ensure that the vapor barrier is properly sealed. This shall include the annular space around any pipe or conduit that passes through the vapor barrier.

4.0 SOIL CONTAINING PETROLEUM HYDROCARBONS

Petroleum hydrocarbons have not been identified as a risk driving chemical of potential concern (COPC) at the Site so active remediation of soil impacted by TPH will not occur. However, TPH has been identified in soil samples at concentrations that represent nuisance and/or non-aesthetic conditions, and that present a moderate though manageable risk to human health through dermal contact. Based on the direct exposure screening level, residential exposure scenario, Table K-1, “Screening For Environmental Concerns At Sites with Contaminated Soil And Groundwater” (July 2003 and update, RWQCB), a cleanup goal for TPH_{residual oil} of 2,300 mg/kg has been established for the Site.

If, during or following Phase Two Remediation, Development and Construction Activities petroleum affected soil or other suspect materials are encountered the contractor shall immediately notify the Site owner. A list of contacts is provided in Section 5 of this document. Equipment used to excavate or otherwise handle petroleum affected soil shall not be used to excavate or otherwise handle non-petroleum affected soil until it has been adequately decontaminated. If physical handling of petroleum affected material is required, gloves shall be worn.
4.1 MANAGEMENT OF TPH AFFECTED SOIL DURING PHASE TWO REMEDIATION, DEVELOPMENT AND CONSTRUCTION ACTIVITIES

Soil containing petroleum hydrocarbons shall be managed during Site Phase Two Remediation, Development and Construction Activities according to the following protocols:

1. Following demolition of remaining site improvements and grubbing of the Site to remove surface vegetation, rough grading of the Site will begin.

2. During rough grading activities, excavated soil shall be inspected. If a lens, or layer, of soil impacted by petroleum hydrocarbons (likely degraded fuel or crude oil) is encountered, the visibly impacted soil shall be excavated to the required subgrade elevations and stockpiled separately for off-Site disposal at an appropriate disposal facility. If additional soil is encountered that visually stains the excavation equipment with hydrocarbons during handling, this soil shall also be stockpiled separately for off-Site disposal at an appropriate disposal facility. Otherwise, all excavated soil shall be placed to achieve rough grades.

3. After rough grades have been achieved, the locations of buildings, roads, parking lots and other “hardscaped” areas will be staked.

4. Areas of the Site that will not be “hardscaped” (e.g., residential areas that will be landscaped) will be inspected for soil at the ground surface that is visually stained or has a noticeable odor (“nuisance condition”). The concentration of TPH (residual oils) in this soil is expected to be more than 500 mg/kg, the Environmental Screening Level (ESL) for TPH (residual oils) in shallow soil for residential land use where potentially impacted groundwater is not a current or potential source of drinking water (Table B-1, “Screening For Environmental Concerns At Sites with Contaminated Soil And Groundwater (July 2003 and update, RWQCB”)). This soil shall be removed to a maximum depth of 3 feet below ground surface (bgs) or the top of the capillary fringe in the vadose zone (which is defined to be 3 feet above the static groundwater level) whichever is shallower, and replaced with clean backfill. The removed material can be reused under hardscaped areas or disposed of at an appropriate off-Site facility.

5. Areas of the Site to be hardscaped shall be inspected for soil that visually stains excavation equipment with hydrocarbons during handling. This soil shall be removed to a maximum depth of 3 feet bgs or the top of the capillary fringe in the vadose zone (which is defined to be 3 feet above the static groundwater level) whichever is shallower, and replaced with clean backfill. This soil shall be stockpiled separately off-Site disposal at an appropriate disposal facility.

6. RWQCB shall be notified of grading activities and the rough-graded Site shall be inspected by RWQCB for concurrence with the proposed final Site disposition.
7. Following rough grading activities, surface soil shall be sampled at a rate of 4 samples per acre in non-hardscaped areas and analyzed for TPH (residual oil), defined as compounds eluting in the C10 to C30 range. Acceptable analysis results are an average concentration of less than 2,300 mg/kg (direct exposure screening level, residential exposure scenario, Table K-1, “Screening For Environmental Concerns At Sites with Contaminated Soil And Groundwater (July 2003 and update, RWQCB”), and no analytical results shall exceed a maximum value of 5,000 mg/kg.

4.2 MANAGEMENT OF TPH AFFECTED SOIL FOLLOWING PHASE TWO REMEDIATION, DEVELOPMENT AND CONSTRUCTION ACTIVITIES

According to current proposals, following site construction the majority of the multifamily residential area will be covered by asphalt-concrete, structures, or professional landscaping. It is unlikely that the underlying soil will be accessed except during maintenance work on subsurface utilities. The HHRA indicates that there will not be an unacceptable risk to future construction and maintenance workers who come into contact with site soil, however, any future intrusive activities must be completed in a manner consistent with this SMP.

4.3 DUST CONTROL

Dust control measures shall be implemented at the Site that correspond to the PM$_{10}$ control measures recommended by the Bay Area Air Quality Management District (BAAQMD) in their California Environmental Quality Act Guidelines. These measures specify that:

- Exposed soil at the Site shall be lightly sprayed with water to minimize dust during construction activities, including demolition and site grading;
- All active construction areas shall be watered at least twice daily or as necessary to prevent visible dust plumes from migrating outside of the Site limit;
- Water shall be misted or sprayed while loading transportation vehicles;
- Drop heights shall be minimized while loading transportation vehicles;
- Tarpaulins or other effective covers shall be used for trucks carrying soils that travel on public streets;
- Access roads, parking areas, and staging areas shall be paved, watered or covered with non-toxic soil stabilizers as needed;
- All paved access routes, parking areas, and staging areas shall be swept daily, if visibly soiled; and
• Streets shall be swept daily if visible soil material is carried onto public streets from the Site.

4.4 STORMWATER AND EROSION CONTROL

As per the U.S. EPA’s National Pollution Discharge Elimination System (NPDES) regulations, construction sites in which land disturbance of equal to or greater than 1 acre require the submittal of a Notice of Intent (NOI) to be covered by the State Water Resources Control Board (SWRCB) Water Quality Order 99-08-DWQ, NPDES General Permit for Storm Water Discharges Associated with Construction Activity (General Permit) and the preparation of a Storm Water Pollution Prevention Plan (SWPPP).

An Erosion Control Plan shall be developed by the contractor prior to initiation of Site work detailing procedures for minimizing erosion into local waterways. The plan shall include elements such as silt traps, hay roles, and gravel bags to minimize surface water runoff from the Site into storm drains, berms to control Site runoff, and covering soil stockpiles during the rainy season (October through May) to minimize sediment runoff.

4.5 SOIL STOCKPILE MANAGEMENT

Petroleum affected soil shall be segregated and stockpiled separately from non-petroleum affected soil, concrete, debris, and other materials removed during excavation activities. Petroleum affected soils shall be stockpiled in a designated area and shall be maintained as provided for in the NPDES General Permit for Storm Water Discharges Associated with Construction Activity. Excavated soil may be temporarily stockpiled within the area of the excavation, but shall be moved to the designated stockpile area as soon as is practical.

All soil stockpiled at the Site shall be lightly sprayed with water as needed to minimize dust. Soil stockpiles shall be either covered with plastic sheeting (minimum thickness of 10 mils, or similar material of appropriate thickness) or sprayed sealant material such as HydroSeal™ at times when not in active use. Soil stockpiles shall be surrounded by hay roles and/or gravel bags to minimize sediment runoff during times of precipitation and/or during the rainy season (October through May).

4.6 SOIL DISPOSAL

Soil that is generated at the Site that requires off-Site disposal shall be segregated and separately stockpiled. Prior to disposal, the soil shall be tested for the presence of hazardous materials according to the profiling requirements of the facility at which the soil will be
disposed. A state-approved manifest system shall be used so that wastes can be tracked from
generation to ultimate disposal. The manifests shall comply with all provisions of the
appropriate transportation and disposal regulations.

Appropriate vehicles and operating practices shall be used to prevent spillage or leakage of
materials from occurring on-Site or en-route. Trucks shall be properly lined and shall be
securely covered prior to leaving the Site. Transport vehicles shall be thoroughly
decontaminated and inspected before leaving the Site. All vehicles leaving work areas shall be
inspected to check that no soil adheres to its wheels or undercarriage. Any such material shall
be removed at the work area or decontamination pad before the truck is allowed to leave the
Site. Offsite roadways shall be regularly inspected along the designated routes that the vehicles
take from the Site to check that no leakage or tracking of mud has occurred. If contaminated
materials resulting from leakage or tracking are observed along the designated roadways, they
shall immediately be cleaned and procedures modified as necessary to prevent recurrence

5.0 CONTACTS

Information regarding the implementation of this SMP can be obtained by calling any of the
parties listed below.

Regional Water Quality
Control Board
1515 Clay Street, Suite 1400
Oakland, California  94612

Mr. Mark Johnson    (510) 622-2300

Richmond Redevelopment
Agency
330-25th Street
Richmond, CA  94804

Mr. Gary Hembree    (510) 307-8136

Geomatrix Consultants, Inc.
2101 Webster St., 12th Floor
Oakland, California  94612

Dr. Alison Jones     (510) 663-4242

Geomatrix Consultants, Inc.
2101 Webster St., 12th Floor
Oakland, California  94612

Dr. Frank Szerdy     (510) 663-4113
6.0 HEALTH AND SAFETY PLAN

Results of environmental investigation activities completed at the Site indicate that potential exposure to chemicals present at the Site do not pose a threat to construction or maintenance workers. However, standard health and safety precautions should be followed. Contractors should independently evaluate health and safety requirements for their employees and develop Site-specific Health and Safety Plans for their use. The Health and Safety Plan should refer to relevant provisions of this SMP.
7.0 REFERENCES

Geomatrix, 2003, Draft Remedial Investigation Report, Terminal One Site, 1500 Dornan Drive, Richmond, California, October 1.

Geomatrix, 2004a, Pre-Design Site Investigation Report, Terminal One Site, 1500 Dornan Drive, Richmond, California, September 17.

Geomatrix, 2004b, Updated Proposed Remedial Action Plan, Terminal One Site, 1500 Dornan Drive, Richmond, California, October 11.

RWQCB, 2003, Screening For Environmental Concerns At Sites with Contaminated Soil And Groundwater, July 2003 and update.
FIGURES
SITE LOCATION MAP
Terminal One Site
Richmond, California
CROSS SECTION THROUGH SOUTHWESTERN TANK FARM AREA
Terminal One Site
Richmond, California

1 Uribe, 1999, Predesign Geotechnical Report, Terminal One Site, Richmond California.
2 Haviland & Tibbetts, 1912, Richmond Harbor Project, Structural Design, Outer Harbor Wharf No 1, Plate 5 and 7.
EXPLANATION

- Groundwater monitoring well
- Cone penetrometer test (Urbe 1996-2003)
- Soil and/or groundwater sample (Urbe 1996-2003)
- Soil and/or groundwater sample (GeoMatrix, August 2000)
- Soil and/or groundwater sample (GeoMatrix, October 2000)
- Flux chamber sample (GeoMatrix, May 2001)
- Flux chamber sample (GeoMatrix, July 2001)
- Soil and/or groundwater sample (GeoMatrix, October 2001)
- Groundwater sample (GeoMatrix, November 2002)
- Deep soil and/or groundwater sample (GeoMatrix, July 2003)
- Sample(s) collected at this location analyzed for TPH using EPA method CADHS; no TPH constituents detected.
- Samples collected at this location analyzed for TPH using EPA method CADHS; TPH constituents detected in sample(s) collected at this location.
- Sample location
- Sampling depth (feet below ground surface)

Constituent concentration in milligrams per kilogram

Abbreviations:
- "bgs" below ground surface
- "TPH" total petroleum hydrocarbons
- "TPHG" total petroleum hydrocarbons quantified as gasoline
- "TPHD" total petroleum hydrocarbons quantified as diesel
- "TPHMD" total petroleum hydrocarbons quantified as motor oil
- "HYDUNK" unknown hydrocarbons (extraction method)
- "CHROMOG" chromatogram does not match laboratory standards
- "1800" compound concentration in mg/kg
- "GS" Ground surface

Note:
All samples analyzed for total petroleum hydrocarbons quantified as diesel (TPHD) jet fuel (TPHCF) and kerosene (TPHK) and for standard solvent (STSTD) using EPA Method CADHS.

SOIL RESULTS - TOTAL PETROLEUM HYDROCARBONS
Terminal One Site
Richmond, California