PORT OF OAKLAND

July 21, 2006

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

Subject: **Response to Comments from Alameda County Health Services – Environmental Protection, dated July 5, 2006**
APL Terminal, Yard and Gate Redevelopment Project
Oakland, California

Dear Mr. Chan:

The Port of Oakland (Port) herein submits our responses to comments from the July 5, 2006 Alameda County Health Care Services Agency (ACHCSA) letter to the Port regarding the Soil Management and Contingency Plan ("SMCP") previously prepared by ETIC Engineering, Inc. (ETIC) for the Port APL redevelopment Project, 1395 Middle Harbor Road, Oakland, California. The responses to the ACHCSA comments enclosed with this letter were prepared by ETIC working on the behalf of the Port. Following your review of the response memorandum, we request a meeting so we can discuss our respective comments and expeditiously reach a mutual understanding without further delay. Please contact me at 627-1176 or the Port Project Manager, Mr. John Prall at 627-1373 or by email at jprall@portoakland.com regarding any questions or clarifications.

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

Sincerely,

Roberta Reinstein
Manager, Port Environmental Programs and Safety

530 Water Street ◙ Jack London Square ◙ P.O. Box 2064 ◙ Oakland, California 94604–2064
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Enclosure noted:

ETIC Engineering, Inc., 2006. Response to Comments from Alameda County Health Services – Environmental Protection dated July 5, 2006, American President Lines (APL) Terminal, Berths 60-63 Yard and Gate Redevelopment Project, Oakland, California, July 20, 2006.

Cc: Jeff Jones
Michele Heffes
Christine Noma
Deborah Ballati
Joseph Whalen
John Prall

July 20, 2006

MEMORANDUM

To: John Prall
Environmental Health and Safety Compliance (EH&SC)
Port of Oakland (Port)

From: Alan Anselmo, P.E. and Mehrdad Javaherian, Ph.D., P.E.
ETIC Engineering, Inc. (ETIC)

Re: **Response to Comments from Alameda County Health Services – Environmental Protection dated July 5, 2006**
American President Lines (APL) Terminal
Berths 60-63 Yard and Gate Redevelopment Project
Oakland, California

On behalf of the Port, ETIC has prepared this memorandum responding to the July 5, 2006 comment letter from the Alameda County Health Care Services Agency (ACHCS). Specifically, this memorandum outlines responses to comments regarding ETIC's May 17, 2006 Soil Management and Contingency Plan (SMCP) for the APL Terminal Yard and Gate Redevelopment Project located at Berths 60-63 at the Port of Oakland (site).

RESPONSE TO COMMENTS

In general and to the extent possible, the Port intends on addressing ACHCS's environmental concerns through activities during and subsequent to the proposed redevelopment activities. This intent stems from the desire to minimize construction delays during redevelopment, minimize costs related to remediation and redevelopment, and utilize any soil or groundwater data obtained during implementation of redevelopment activities to assess the extent of site impacts. Addressing these issues during and/or subsequent to redevelopment activities should achieve these goals while providing the necessary information to assess the need for any focused investigations following redevelopment.

Below, ETIC provides a response to each of the County's specific comments in their letter dated July 5, 2006. For clarity, each ACHCS comment is presented prior to ETIC's response.

ACHCS Comment 1: *"Under the Previous Investigations section of the SMC plan seven areas of potential environmental concern are noted along with the suspected contaminants in these areas. It is noted that PAHs and metals are among the COCs. Please describe how these contaminants will be screened in the field since they are not detected visually, by odor or by a PID instrument. If these COCs are not proposed for analysis, please provide justification."*

Response: **PAHs**: As described in ETIC's memorandum regarding the evaluation of environmental screening level (ESL) exceedances dated April 4, 2006[1], detections of semi-volatile organic compounds (SVOCs), including polynuclear aromatic hydrocarbons (PAHs) in soil, are typically co-located with heavy-range hydrocarbon (i.e., diesel [TPH-d], motor oil [TPH-mo], bunker C [TPH-bc], and hydraulic oil [TPH-ho]) detections. Correspondingly, a review of available data across the Project Area indicates that 94 percent of the PAH detections were co-located with detection of heavy-range hydrocarbons and all PAH detections are protective of the proposed soil reuse criteria discussed later herein.

Because PAHs are associated with a large portion of heavy-end TPH, and such petroleum hydrocarbons, if present at significant levels, are expected to leave observable staining and strong residue/odor in the soils. Therefore visible screening for PAHs and TPH will occur as part of the same field-screening process. For the purposes of this redevelopment project, this approach is considered appropriate, particularly since the PAH data collected at the site indicate the absence of significant risk to human health and the environment (ETIC, 2006 Table 1c, ETIC/SAIC 2005[2]) and are below the proposed soil reuse criteria (see Table 1, attached to this document).

Metals: Naturally occurring metals are present in soils across the entire site; however, with a few exceptions, detected concentrations of metals are within the range of soil background levels defined by Lawrence Berkeley National Laboratory (LBNL, 1995)[3]. Exceedance of the background range is primarily limited to lead (29 out of 150 samples). The highest detected lead concentration approximates 1,300 mg/kg (in the Boring B20 Area) and is significantly greater than the second highest detected lead concentration of 390 mg/kg (also in the Boring B20 Area). To put these detections in perspective, Figure 1 presents the distribution of detected soil-lead concentrations across the entire Project Area. As indicated on this figure, only one lead detection out of 150 soil samples exceeded the Commercial/Industrial Direct Exposure ESL of 750 mg/kg. Also worth noting is that lead was only detected in two out of 60 groundwater samples (below action level of 15 ug/L), reflecting its limited presence in soil and limited potential for leaching to groundwater. As a result, lead is not considered a primary chemical of potential concern (COPC) and does not pose a significant risk to human health or the environment across the Project Area (ETIC, 2006; ETIC/SAIC, 2005).

Sporadic detections for other metals include zinc, vanadium, antimony, and copper. None of these metal detections were greater than their corresponding ESL values and reuse criteria. Importantly, all 109 arsenic samples exhibited concentrations below the upper end of the soil background range. As with lead, the presence of other metals in groundwater is similarly insignificant (ETIC, 2006).

Based on the conservative screening above and the more detailed Tier II analysis (presented in the April 4, 2006 ESL memorandum), the observed levels of COPCs, including metals in soil and groundwater potentially remaining following redevelopment activities, will not pose significant risks to human health and the environment, including the potential for preferential transport toward the Oakland Harbor. Furthermore, ETIC/SAIC conducted a human health risk assessment focusing on construction worker exposure to chemicals in soils and groundwater underlying the site (ETIC/SAIC, 2005). The risk assessment concluded that based on data collected to date, the anticipated health risks to construction workers and incidental exposure to nearby Terminal workers are insignificant when appropriate health and safety measures are implemented.

[1] ETIC Engineering, Inc., 2006. Memorandum, Evaluation of ESL Exceedances, American President Lines Terminal, Berths 60-63 Yard and Gate Redevelopment Project, Oakland, California. April 4.
[2] ETIC and SAIC, 2005. Construction Worker Risk Assessment, Berths 60-63 Yard and Gate Redevelopment Project Area, Port of Oakland. March 21.
[3] LBNL, 1995. Protocol for Determining Background Concentrations of Metals in Soil at LBNL. August.

Based on the data presented above and the demonstrated absence of risks to human health and the environment, additional soil sampling or field screening of metals beyond what is proposed in the SMCP is not appear warranted. As stated in the SMCP, soil observed to be potentially impacted will be sampled and managed in accordance with the procedures outlined in the SMCP.

ACHCS Comment 2: *"Sampling of any non-impacted reused soils must be done at a frequency consistent with the SFRWQCB draft document, November 2002, Characterization & Reuse of Petroleum Hydrocarbon Impacted Soil as Inert Waste. The chemicals of concern, COCs, analyzed may be determined based on historic data and site usage. The proposed sampling frequency, which is in accordance with DTSC October 2001 Information Advisory, Clean Imported Fill Material, is not appropriate since using fill material from sites undergoing environmental cleanup like this, is not recommended. The sampling frequency recommended in the SFRWQCB document is the most appropriate."*

Response: The proposed soil sampling frequency described in the SMCP is based on the Department of Toxic Substances Control (DTSC) October 2001 guidance document *Information Advisory, Clean Imported Fill Material*, and is commonly accepted by the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) on projects of this nature. As examples of approval of the DTSC protocol acceptance by the RWQCB, copies of previously approved plans (Final Soil Management Protocol, Oakland International Airport Materials Management Program[4] and Railyard Excavation and Soil Reuse Operations Plan, Berths 57/58 and 59 Wharf and Container Yards[5]) for two similar Port projects containing the same sampling frequency as listed in the October 2001 DTSC document are attached.

Based on similar approvals by the RWQCB and DTSC, the stated sampling frequency in the Draft SCMP should be considered appropriate for the purposes of this redevelopment project.

ACHCS Comment 3: *"The proposed soil cleanup levels based upon the SFRWQCB ESLs for commercial/industrial sites or for soil leaching to groundwater where groundwater is not considered potable, US EPA Region 9 PRGs and the upper end of the background concentration range for metals in soil (LBNL, 1995) are potential cleanup sources, however, there appears to be a lack of consistency for the basis of selecting those listed in Table 1. Some of the proposed reuse levels are based upon the soil leaching to groundwater ESL, some based upon background and some based upon C/I Direct Exposure ESL. Please provide your justification for the specific selection of cleanup levels for all chemicals listed in Table 1. This should take into account all complete exposure pathways and selection of the lowest cleanup level. If this is not the case, please explain your discrepancy. Please provide a copy of the reference for the background metal concentrations in Table 1."*

Response: Table 1, attached to this document, presents the proposed soil reuse criteria for excavated soil from the site. It is important to note that these are not "cleanup levels" as implied in the comment, but rather proposed reuse levels for screening of chemicals detected in visibly contaminated stockpiled soils, such that a decision may be made as to the fate of the referenced soils (i.e., either reused knowing that impacts to groundwater will be insignificant or disposed of offsite). Also worth recognizing is that the previously referenced ESL Memorandum submitted to the County indicates various exceedances of the

[4] Baseline Environmental Consulting, 2005. Final Soil Management Protocol, Oakland International Airport Materials Management Program. October.
[5] Baseline Environmental Consluting, 2000. Railyard Excavation and Soil Reuse Operations Plan, Berths 57/58 and 59 Whard and Container Yards. June.

ESLs (for soil leaching to non-potable groundwater) do not in fact yield significant impacts to the harbor based on site-specific (i.e., Tier II analysis) conditions. The proposed use of ESLs as reuse criteria are considered conservative and protective of the environment.

The list of chemicals in Table 1 includes all compounds which have been previously detected during site characterization work conducted by Geomatrix (1992)[6], GAIA Consulting, Inc. (2003)[7], and Treadwell and Rollo, Inc. (2005)[8]. The soil reuse criteria incorporate the following: (1) RWQCB ESLs for commercial/ industrial worker exposure or for soil leaching to groundwater where groundwater is not a potable groundwater resource (RWQCB, 2005)[9]; (2) U.S. EPA Region 9 Preliminary Remediation Goals (PRGs) for commercial/industrial properties (EPA, 2004)[10]; and (3) upper end of background concentration range for metals in soil (LBNL, 1995). A copy of the LBNL document is attached.

Use of the above criteria was based on the following rationale: As discussed in the ESL Memorandum, soil leaching to (non-potable) groundwater is considered the primary complete exposure pathway within the Project Area, reflecting potential transport in groundwater to the Oakland Harbor. For every chemical where an RWQCB ESL for soil leaching to non-potable groundwater pathway was available, that value was used as a conservative reuse criterion. For chemicals where the referenced soil leaching to groundwater ESL was not available, the ESL for direct exposure under commercial/industrial land use was conservatively used as the reuse criteria. Furthermore, for chemicals where no ESL for direct exposure was available, the PRG for that chemical (corresponding to direct exposure to commercial/industrial soil) was conservatively used.

To account for naturally occurring metals in soil, the soil reuse criteria for metals incorporate the following: (1) RWQCB ESLs; and (2) upper end of the typical background levels of metals in Bay Area soils (LBNL, 1995). RWQCB ESLs for soil leaching to non-potable groundwater pathway were not available for metals. Therefore, ESLs for commercial/industrial worker exposure were typically used as the proposed reuse level criterion. However, if the upper end of the typical background levels in Bay Area soils values were higher than the ESL values, then the upper end of the typical background range were used as the proposed reuse levels for metals in soil.

The above approach is considered conservative and resulted in reuse criteria consistent with past practices at the Port (Baseline, 2005).

ACHCS Comment 4: "*Unimpacted materials are proposed to be removed, stockpiled in unlined areas and/or reused onsite. Prior to reuse, the soil must be sampled and analyzed to verify it meets the proposed reuse criteria and sampling frequency should be in accordance with the referenced SFRWQCB document. Field observation alone does not appear sufficient.*"

Response: The proposed soil management approach described in the SMCP and further explained in this response to ACHCS Comment 1 is sufficient based on the absence of significant risks to human health

[6] Geomatrix, 1992. Underground Storage Tank Removal Report, American President Lines Terminal, 1395 Middle Harbor Road, Oakland, California. June.
[7] GAIA Consulting, Inc., 2003. Subsurface Site Investigation Report, American President Lines Terminal. April.
[8] Treadwell and Rollo, 2005. Redevelopment Planning Report, Environmental Subsurface Assessment, Berths 60-63 Yard and Gate Redevelopment Project. March 30.
[9] California Regional Water Quality Control Board, San Francisco Bay Region, 2005. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater. Interim Final. February.
[10] U.S. Environmental Protection Agency, Region 9, 2004. Preliminary Remediation Goals (PRGs) for commercial/industrial properties (http://www.epa.gov/region09/waste/sfund/prg/index.html).

and the environment both during and following completion of the redevelopment project (refer to ACHCS Comment 1, above).

Of particular importance to note is that the earthwork activities for the redevelopment project (i.e., primarily mass grading) do not necessarily involve the creation of soil stockpiles that can be easily stockpiled and sampled. Rather, the majority of earthwork activities will consist of mass grading and movement of shallow existing base rock and underlying soil (generally to depths of less than 2 feet) using heavy equipment such as bulldozers, scrapers, and graders in an effort to slightly alter the existing grade to promote proper drainage. Trenching and other limited excavation activities will also be conducted, however, at a much smaller scale in comparison to the mass grading activities. Therefore, the routine stockpiling and sampling of excavated soils will not be feasible while the Port engages in the mass grading/shallow re-grading of excavated soils. In lieu of stockpiling and sampling, as described in the SMCP, ETIC field personnel will be present at the site during earthwork activities to screen for the presence of impacted or potentially impacted materials.

ACHCS Comment 5: *"Either groundwater or runoff water will be generated during the development. Water that is not contaminated must meet NPDES standards and must be discharged under permit or variance from the Water Board. All other disposed water must have proper disposal receipts."*

Response: The redevelopment activities will be conducted in accordance with the State Water Resources Control Board's General Permit for Discharges of Storm Water Associated with Construction Activity (Construction General Permit, 99-08-DWQ). The following protocols may be used for management of groundwater or runoff encountered during project activities. For un-impacted water, the water will be filtered through a bag filter and discharged to the storm drain. For impacted water three options for treatment may be explored. Due to the potential large volume of water to be managed during the redevelopment project, the Port may elect to utilize granular activated carbon vessels (containing 500 to 2,000 pounds or more of carbon) for treatment of groundwater or runoff water prior to discharge to the storm drain in lieu of containerizing the water for sampling and analysis prior to discharge. The carbon vessels will be sized to have a much larger flow throughput and adsorptive capacity than required to treat potential organic compounds in the water. The Port may also elect to transport the water to the existing permitted onsite TOFC treatment system. The water would be treated and discharged to the sanitary sewer in accordance with the treatment system permit. A third alternative would be for water to be transported offsite to a proper disposal facility for treatment and disposal.

The presence of potential organic compounds in groundwater will be assessed by either (1) collecting and analyzing a representative sample of the groundwater from within the excavation, or (2) using existing groundwater sample laboratory analytical data from monitoring wells at the site. The presence of potential organic compounds in runoff water will be assessed by either (1) collecting and analyzing a representative sample of the runoff water from within the bermed area, or (2) using the soil sample laboratory analytical data from the stockpiled soil within the bermed area.

ACHCS Comment 6: "*The removal of free product and highly impacted soil should be done to the extent possible, since this represents a potential on-going source of contamination to soil and groundwater. We concur that an in-situ sample should be taken after excavation to verify the residual contaminant concentration."*

Response: If possible and practicable during redevelopment activities, the Port may elect to remove free product and/or highly impacted soil. While the stated goal of this project is to move the redevelopment project forward in an efficient manner and to limit removal efforts to soils within the extent/limits of

redevelopment activities, ETIC field personnel will collect in-situ soil samples as necessary to further define the extent and/or nature of COPCs.

***ACHCS Comment 7*:** *"Two areas formerly under the SFRWQCB oversight have been temporarily transferred to Alameda County for oversight. We request that you continue to observe Water Board recommendations for investigation (Berths 57-59, Former Union Pacific Motor Freight Area) and any previously existing site management plan (UP Roundhouse)."*

Response: Comment noted.

CLOSING

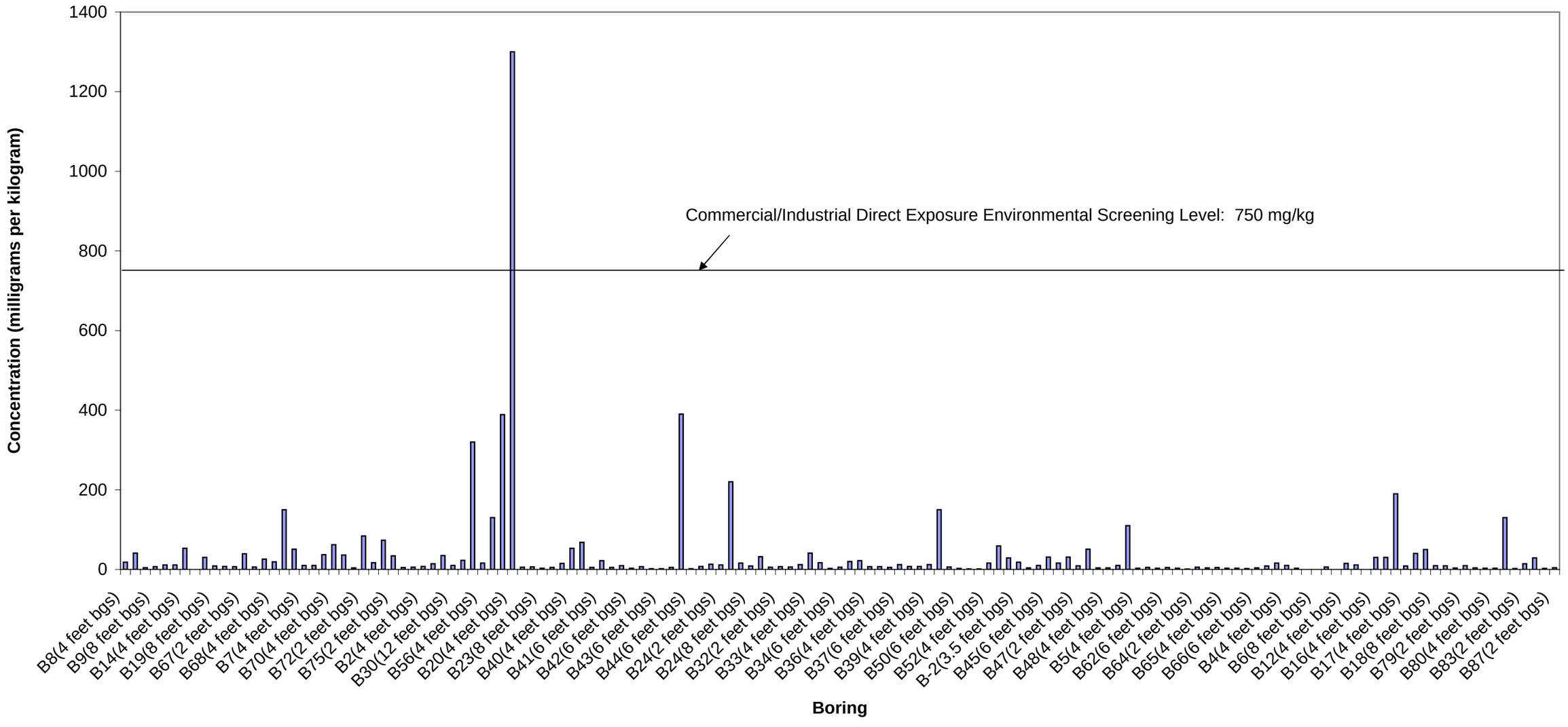
Should you have any questions regarding the above responses to comments, please do not hesitate to contact Mr. Alan Anselmo (aanselmo@eticeng.com) or Dr. Mehrdad Javaherian (mjavaherian@eticeng.com) at 510-208-1600 extensions 14 and 25, respectively.

Table 1
Proposed Soil Reuse Criteria
Berths 60-63 Yard and Gate Redevelopment Project, Port of Oakland

Chemical	Soil Reuse Criteria (mg/kg)	Basis
TPH - Gasoline	400	Soil Leaching to Groundwater ESL
TPH - Diesel	500	Soil Leaching to Groundwater ESL
TPH - Motor Oil	1000	Soil Leaching to Groundwater ESL
TPH - Bunker C	1000	Soil Leaching to Groundwater ESL
TPH - Hydraulic Oil	1000	Soil Leaching to Groundwater ESL
Antimony	77	C/I Direct Exposure ESL
Arsenic	63	Background Concentration
Barium	2500	C/I Direct Exposure ESL
Beryllium	36	C/I Direct Exposure ESL
Cadmium	16	Background Concentration
Chromium	478	Background Concentration
Cobalt	37	Background Concentration
Copper	7700	C/I Direct Exposure ESL
Lead	750	C/I Direct Exposure ESL
Mercury	37	C/I Direct Exposure ESL
Molybdenum	960	C/I Direct Exposure ESL
Nickel	1000	C/I Direct Exposure ESL
Selenium	960	C/I Direct Exposure ESL
Silver	960	C/I Direct Exposure ESL
Thallium	130	Background Concentration
Vanadium	1300	C/I Direct Exposure ESL
Zinc	58000	C/I Direct Exposure ESL
2-Methylnaphthalene	0.25	Soil Leaching to Groundwater ESL
Acenaphthene	19	Soil Leaching to Groundwater ESL
Acenaphthylene	13	Soil Leaching to Groundwater ESL
Anthracene	2.8	Soil Leaching to Groundwater ESL
Benzo(a) Anthracene	12	Soil Leaching to Groundwater ESL
Benzo(a) Pyrene	130	Soil Leaching to Groundwater ESL
Benzo(b) Fluoranthene	46	Soil Leaching to Groundwater ESL
Benzo(g,h,i) Perylene	27	Soil Leaching to Groundwater ESL
Benzo(k) Fluoranthene	37	Soil Leaching to Groundwater ESL
Bis(2-Ethylhexyl)Phthalate	530	Soil Leaching to Groundwater ESL
Chrysene	23	Soil Leaching to Groundwater ESL
Dibenz(a,h) Anthracene	140	Soil Leaching to Groundwater ESL
Fluoranthene	60	Soil Leaching to Groundwater ESL
Fluorene	8.9	Soil Leaching to Groundwater ESL
Indeno (1,2,3-cd) Pyrene	7.7	Soil Leaching to Groundwater ESL
Naphthalene	4.8	Soil Leaching to Groundwater ESL
Phenanthrene	11	Soil Leaching to Groundwater ESL
Pyrene	85	Soil Leaching to Groundwater ESL
1,1,1-Trichloroethane	7.8	Soil Leaching to Groundwater ESL
1,2,4-Trimethylbenzene	170	C/I Direct Exposure PRG
1,3,4-Trimethylbenzene	70*	C/I Direct Exposure PRG
Acetone	0.5	Soil Leaching to Groundwater ESL
Benzene	2	Soil Leaching to Groundwater ESL
Chlorobenzene	1.5	Soil Leaching to Groundwater ESL
Chloroform	9.8	Soil Leaching to Groundwater ESL
cis-1,2-Dichlorethene	18	Soil Leaching to Groundwater ESL
cis-1,3-Dichloropropene	1.8**	C/I Direct Exposure PRG
Ethylbenzene	32	Soil Leaching to Groundwater ESL
Isopropylbenzene	2000	C/I Direct Exposure PRG
Methyl Ethyl Ketone	13	Soil Leaching to Groundwater ESL
Methylene Chloride	34	Soil Leaching to Groundwater ESL
n-Butylbenzene	240	C/I Direct Exposure PRG
PCE	17	Soil Leaching to Groundwater ESL
Propylbenzene	240***	C/I Direct Exposure PRG
Tert-Butylbenzene	390	C/I Direct Exposure PRG
Toluene	9.3	Soil Leaching to Groundwater ESL
TCE	33	Soil Leaching to Groundwater ESL
Xylenes (total)	11	Soil Leaching to Groundwater ESL

Soil Leaching to Groundwater ESL = ESL corresponding to soil leaching to groundwater- Non-potable groundwater resource (Table G, RWQCB, 2005)
C/I Direct Exposure ESL = ESL corresponding to direct exposure to soil-Commercial/Industrial land use (Table K-2 of RWQCB, 2005)
C/I Direct Exposure PRG = USEPA Region IX PRG corresponding to direct exposure to soil-Commercial/Industrial land use (http://www.epa.gov/region09/waste/sfund/prg/index.html)
Upper End of Background Concentrations = (Lawrence Berkeley National Laboratory, 1995)
* Value reflects PRG for 1,3,5 Trimethylbenzene
** Value reflects PRG for 1,3-Dichloropropene
*** Value reflects PRG for n-Propylbenzene

Figure 1
Distribution of Detected Lead Concentrations
Berths 60-63 Yard and Gate Redevelopment Project, Port of Oakland



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Lawrence Berkeley National Laboratory
UNIVERSITY OF CALIFORNIA

ENVIRONMENTAL RESTORATION PROGRAM

Protocol for Determining Background Concentrations of Metals in Soil at Lawrence Berkeley National Laboratory (LBNL)

August 1995

Protocol for Determining Background Concentrations of Metals in Soil at Lawrence Berkeley National Laboratory (LBNL)

A Joint Effort of
Environment, Health and Safety Division and
Earth Sciences Division
Lawrence Berkeley National Laboratory
University of California
Berkeley, CA 94720

August 1995

This work was done at the Lawrence Berkeley National Laboratory, which is operated by the University of California for the U. S. Department of Energy under contract DE-AC03-76SF00098.

Protocol for Determining Background Concentrations of Metals in Soil at Lawrence Berkeley National Laboratory (LBNL)

Background concentrations for metals in soil at LBNL were determined in accordance with procedures described in "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities" Interim Final Guidance, United States Environmental Protection Agency (EPA), February 1989 (PB89-151047). The background concentration was defined as the 95% upper confidence limit (UCL). A tolerance coefficient of 95%, as recommended in the EPA guidance document, was used to determine the 95% UCL, which was used to define the background levels. This means that one has a confidence level of 95% that the 95% UCL will contain at least 95% of the distribution of observations from the background data.

The upper confidence limit for background data that follows a normal distribution can be calculated by the formula:

$UCL = X_{av} + K\sigma$

where:

UCL	=	the upper confidence (tolerance) limit
X_{av}	=	the arithmetic mean
σ	=	the standard deviation
K	=	the one sided normal tolerance factor

Background concentrations were determined from the 95% upper confidence limit for the following California Code of Regulations (CCR) Title 22, California Assessment Manual (CAM) 17 metals:

1. antimony (Sb)
2. arsenic (As)
3. barium (Ba)
4. beryllium (Be)
5. cadmium (Cd)
6. chromium (Cr)
7. cobalt (Co)
8. copper (Cu)
9. lead (Pb)
10. mercury (Hg)
11. molybdenum (Mo)
12. nickel (Ni)
13. selenium (Se)
14. silver (Ag)
15. thallium (Tl)
16. vanadium (Vn)
17. zinc (Zn)

Site background concentrations were determined from the data set of 498 soil samples from the borings for construction of 71 monitoring wells. Samples from two monitoring wells, MW7-94-3 and MW77-92-10, which were installed in areas of potential metals contamination were excluded from the data set. In addition, the data set was reviewed for extreme outliers and those values were also excluded from the data set. The data used for the calculation of background concentrations are included in Table 1. The arithmetic mean (X_{av}) and standard deviation (σ) were calculated by assigning a value of the detection limit for all analytes with non-detectable concentrations. The one-sided normal tolerance factor (K) for the 95% UCL was obtained from Table 5, Appendix B of the EPA guidance document. This tolerance factor (K) is dependent on the number of the samples in the data set. Values of X_{av}, σ, and K used to calculate background concentrations are listed in Table 2.

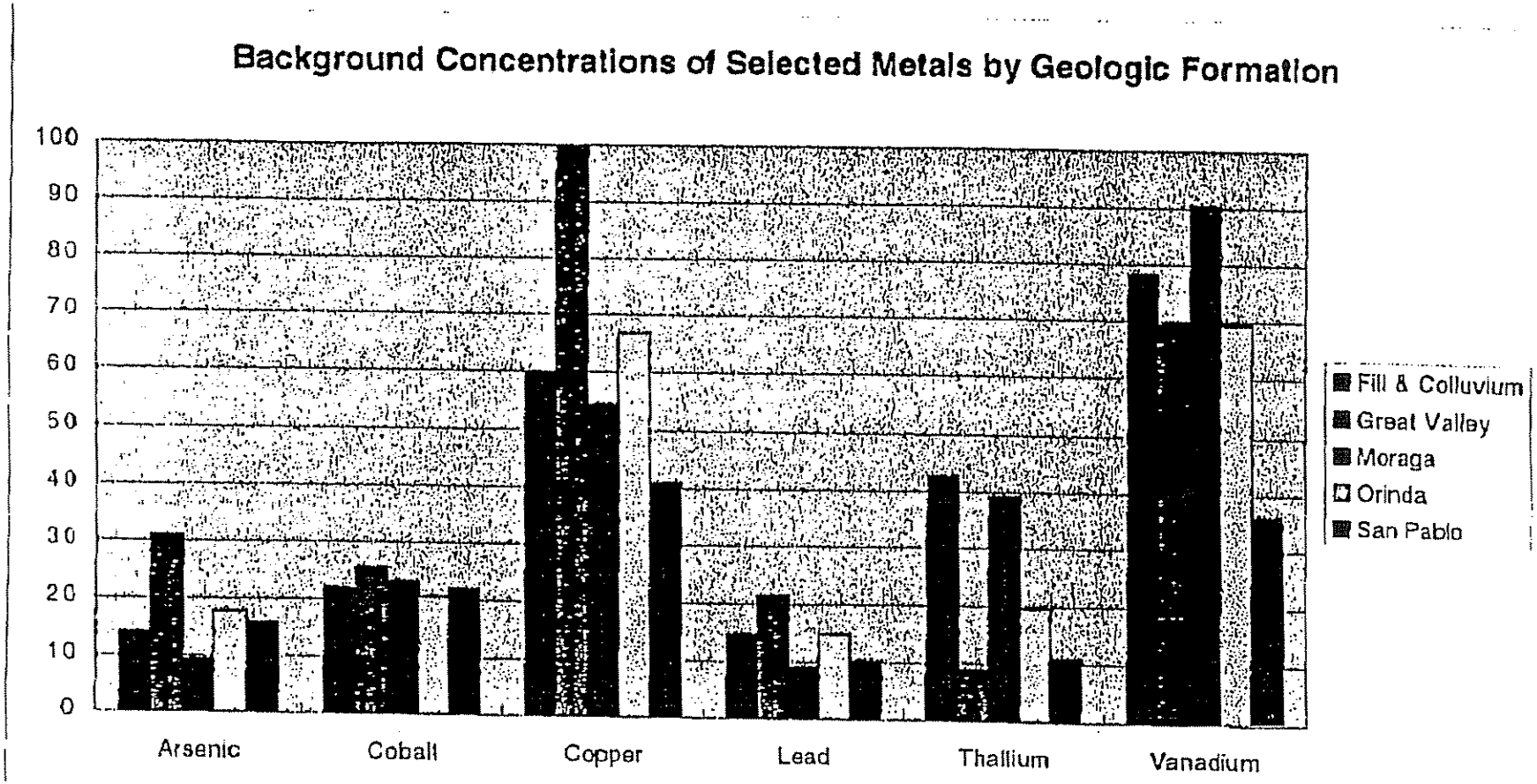
The same data set was also used to calculate background concentrations (95% UCL) of metals for individual geologic units at LBNL, in order to assess if there is a geological dependent variation in background metals concentrations. Background concentrations were determined for the following geologic units:

- Colluvium/Fill
- Moraga Formation
- Orinda Formation
- San Pablo Group
- Great Valley Group

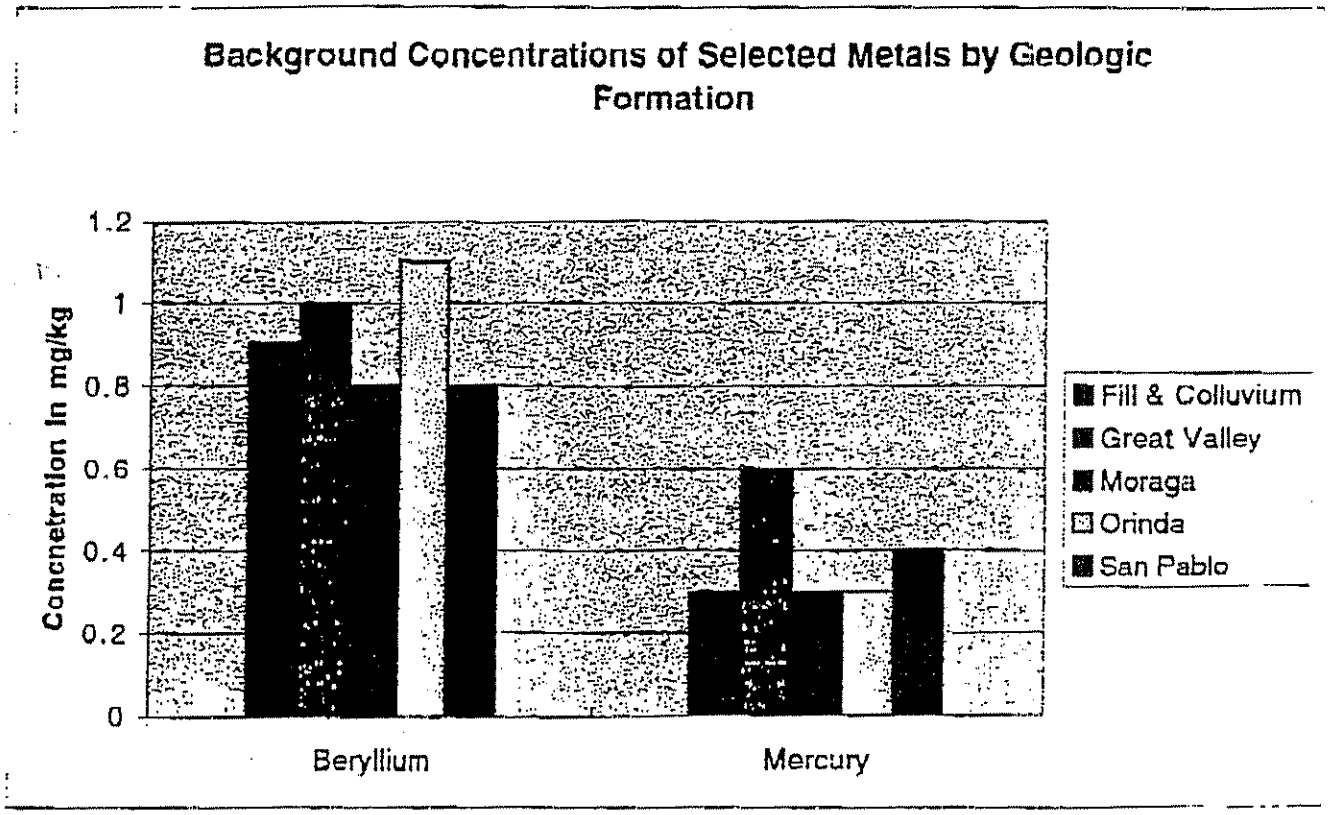
The calculated site background metals concentrations and the background concentrations for individual geologic units are listed in Table 3. The background concentrations for the geologic units are also presented graphically on chart 1 (arsenic, cobalt, copper, lead, thallium, and vanadium), chart 2 (beryllium and mercury), chart 3 (cadmium, antimony, selenium, silver, and molybdenum), and chart 4 (nickel, chromium, zinc, and barium). Since the background concentrations are generally similar for the different geologic units and since the specific formation corresponding to the sample location is not always known, overall site background levels will generally be utilized for requesting No Further Investigation (NFI) status for LBNL's Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs). Background metals concentrations for specific geologic units with background concentrations significantly greater than site background may also be used in some cases to request NFI status, including:

- Arsenic in Great Valley Group rocks
- Thallium in fill/colluvium and Moraga Formation rocks
- Molybdenum and selenium in Orinda Formation rocks
- Copper in Great Valley Group rocks

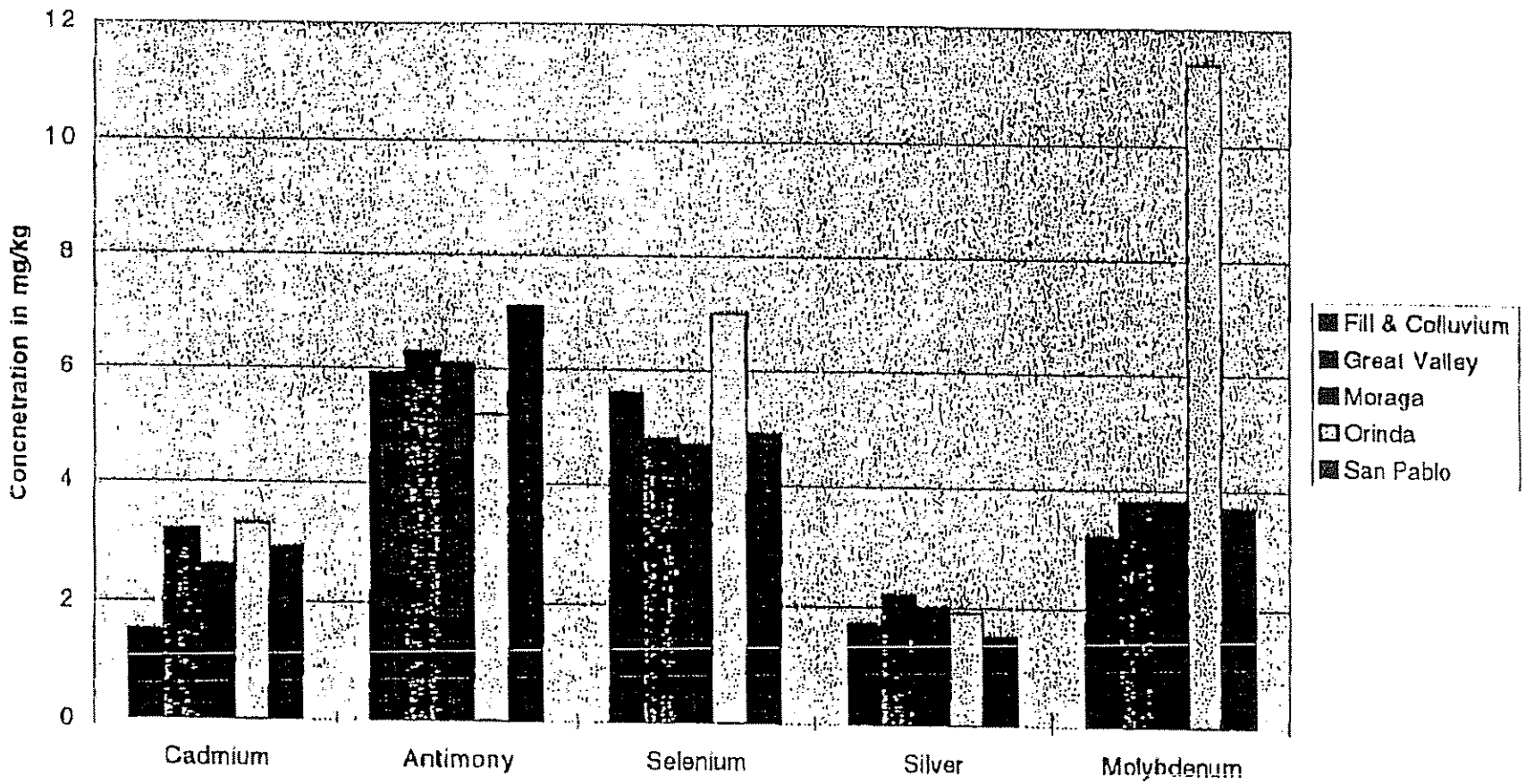
LIST OF FIGURES



BG Met/geology Chart 2



Background Concentrations of Selected Metals by Geologic Formation



Background Concentrations of Selected Metals by Geologic Formation

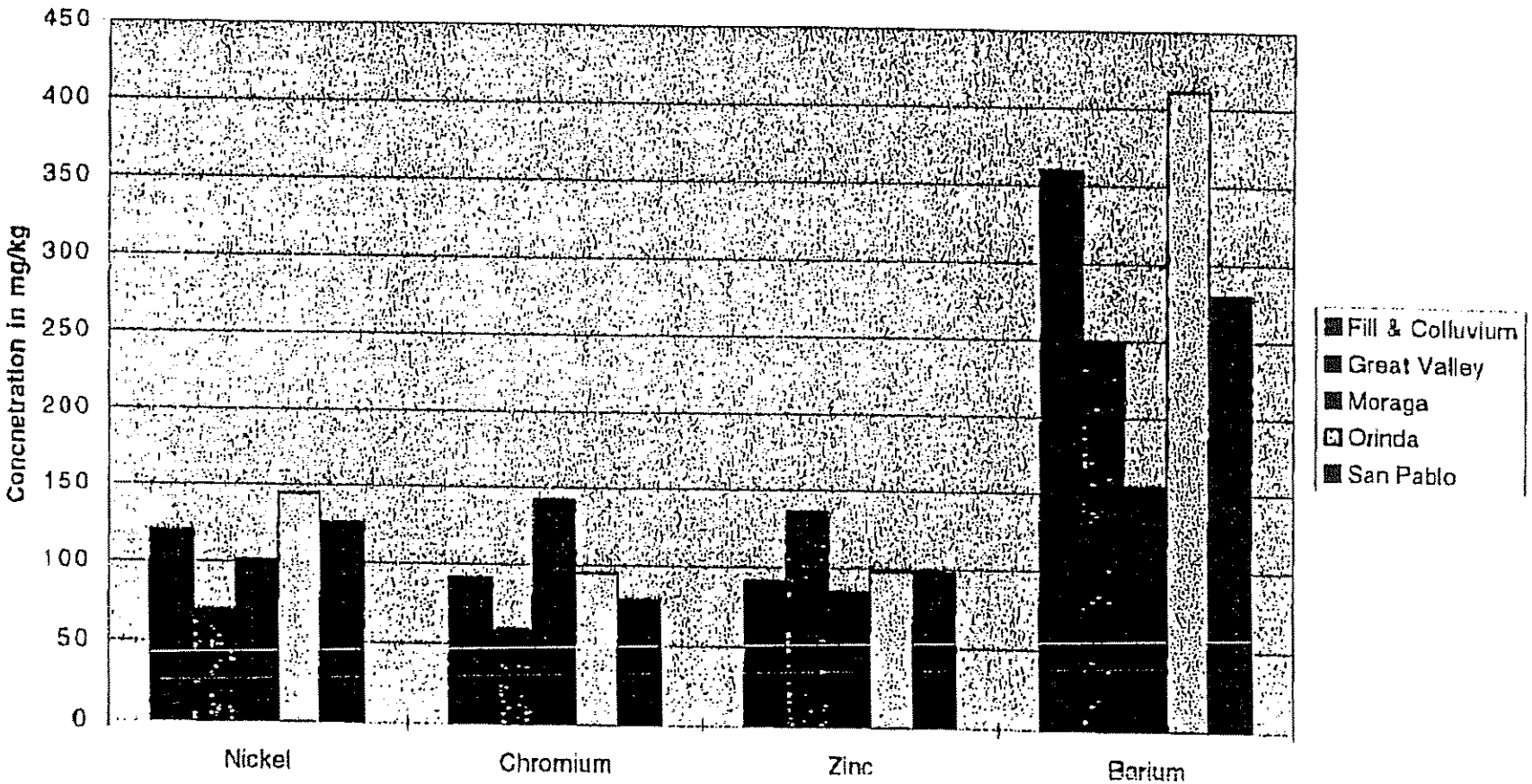


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TABLE 1
Metals Concentrations in soils used to calculate background (in mg/kg)

Location	Sample ID	Geol. Unit	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Sln	Ni	Se	Ag	Tl	Vn	Zn
MWS1-92-2	BS51-92-2-5	f/c	2	9	93	0.6	0.4	71	18	20	10	0.2	0.6	48	2	0.2	3	61	54
	BS51-92-2-15	gv	2	9	930	0.8	0.2	89	14	33	12	0.2	0.6	110	2	0.2	3	44	67
MW88-92-4	BS88-92-4-5.5	f/c	2	13	130	0.6	0.2	23	8.8	13	11	0.2	1.1	18	2	0.2	3	42	46
	BS88-92-4-15.5	gv	2	13	210	0.7	0.7	25	15	15	10	0.2	0.7	46	2	0.2	4	59	57
	BS88-92-4-25.5	gv	2	13	38	0.2	0.2	6	2.4	4	5	0.2	0.6	9	2	0.2	3	15	15
	BS88-92-4-34.5	gv	2	17	56	0.7	0.5	41	9.5	47	13	0.2	0.9	33	3	0.2	3	42	82
	BS88-92-4-58	gv	2	14	24	0.3	0.3	7	4.2	43	8	0.2	0.7	6	2	0.3	3	22	52
MW37-92-5	BS37-92-5-8	o	2	12	88	0.5	0.2	68	25	34	23	0.2	0.6	62	2	0.2	3	65	96
	BS37-92-5-16	o	2	22	230	1.1	0.2	110	14	28	16	0.2	0.6	93	2	0.2	9	72	84
	BS37-92-5-36	o	2	18	1300	1.2	0.3	30	11	31	15	0.2	0.6	32	2	0.3	3	59	69
	BS37-92-5-65	o	2	17	93	1.1	0.3	38	15	21	13	0.2	0.6	36	2	0.2	3	62	88
	BS37-92-5-74	o	2	12	110	1.6	0.5	51	18	35	25	0.2	2.5	56	4	0.3	3	69	110
	BS37-92-5-81	gv	2	12	72	0.9	0.5	35	14	50	15	0.2	1.5	36	2	0.2	4	48	98
	BS37-92-5-88	gv	2	6	110	0.7	0.4	36	15	48	14	0.2	1	41	2	0.2	6	45	92
	BS37-92-5-97	gv	2	9	290	1	0.4	47	16	51	20	0.2	0.7	47	3	0.2	4	69	96
MW37-92-6	BS37-92-6-5.5	o	2	3	120	0.8	0.3	38	12	37	14	0.2	0.6	40	2	0.2	6	43	74
	BS37-92-6-16	o	2	6	280	0.8	0.2	40	14	36	16	0.2	1	58	3	0.2	10	39	82
	BS37-92-6-26	o	2	4	260	0.8	0.3	32	16	35	18	0.2	0.6	44	2	0.2	4	43	95
	BS37-92-6-35	gv	2	3	280	0.8	0.2	34	35	250	31	0.2	0.6	64	2	0.2	3	59	130
MW70-92-7	BS70-92-7-5.5	gv	2	17	180	0.9	0.5	56	18	53	17	0.2	0.6	57	2	0.2	3	56	110
	BS70-92-7-10.5	gv	2	16	59	1	0.5	45	12	39	16	0.2	0.6	37	2	0.2	3	53	96
	BS70-92-7-15.5	gv	2	19	51	0.8	0.3	47	13	34	15	0.2	0.6	45	2	0.2	3	57	81
	BS70-92-7-21	gv	2	10	37	0.4	0.2	27	7.8	21	8	0.2	0.6	25	3	0.2	3	33	48
MW58-92-8	BS58-92-8-5.5	m	2	2	97	0.3	0.3	52	15	21	4	0.2	0.6	21	2	0.2	3	22	45
	BS58-92-8-11	o	2	28	340	1.1	0.8	18	4.8	14	5	0.2	11	38	3	1	3	28	27
	BS58-92-8-16	o	2	8	330	0.8	1	51	23	95	13	0.2	0.6	79	6	0.5	3	36	76
	BS58-92-8-21	o	2	13	190	0.8	0.5	97	15	25	14	0.2	0.7	110	3	0.2	6	52	87
	BS58-92-8-30.8	o	2	5	270	0.8	0.3	33	15	24	12	0.2	0.6	51	3	0.2	3	35	75
MW46-92-9	BS46-92-9-5.5	f/c	2	7	100	0.9	0.2	73	23	28	11	0.2	0.6	72	2	0.4	3	85	49
	BS46-92-9-11	o	2	7	110	0.6	0.3	92	13	24	7	0.2	0.6	98	2	0.2	7	60	43
	BS46-92-9-15.5	o	2	5	110	0.7	0.3	43	10	26	9	0.2	0.6	59	2	0.2	4	45	50
	BS46-92-9-20.5	o	2	8	120	0.7	0.2	53	10	33	12	0.2	0.6	58	2	0.5	6	43	57
	BS46-92-9-30	o	2	11	200	2.7	0.2	61	12	29	11	0.2	0.6	65	2	0.6	5	50	58
	BS46-92-9-40.5	o	2	3	280	0.9	0.2	83	16	34	12	0.2	0.6	80	2	0.2	7	78	64
	BS46-92-9-50	o	2	11	230	0.9	0.2	99	16	21	14	0.2	0.6	100	2	0.6	8	67	80
	BS46-92-9-80	o	2	8	270	0.8	0.3	97	16	27	12	0.3	1.3	110	2	0.5	4	59	61
MW26-92-11	BS26-92-11-4	m	2	11	91	0.8	0.3	67	17	15	9	0.2	0.6	54	2	5.2	3	64	56
	BS26-92-11-8	o	2	7	170	0.8	0.2	59	19	20	6	0.2	0.6	40	2	0.2	3	60	36
	BS26-92-11-20.5	o	2	10	100	0.5	0.2	100	20	32	7	0.2	0.8	190	2	0.2	4	30	53
	BS26-92-11-30.2	o	2	11	94	0.6	0.2	77	16	35	8	0.2	0.6	130	2	0.2	8	50	57
MW61-92-12	BS61-92-12-10.5	f/c	2	4	370	0.8	0.3	34	12	43	13	0.2	0.6	41	2	0.2	5	33	74
	BS61-92-12-20.3	o	2	4	120	0.7	0.4	28	5.6	15	9	0.2	0.6	21	2	0.2	3	26	36
	BS61-92-12-30.3	o	2	6	240	0.5	0.2	19	7.1	21	11	0.2	0.9	36	2	0.2	11	18	48
	BS61-92-12-40.5	o	2	4	210	0.5	0.2	31	5.1	3	7	0.2	0.6	29	2	0.3	5	22	34
	BS61-92-12-60	o	2	3	170	0.4	0.2	43	4.6	4	6	0.2	0.6	26	2	0.2	3	25	40
	BS61-92-12-71	o	2	5	34	0.4	1.7	28	5.6	7	8	0.2	0.6	26	2	0.9	3	22	29
	BS61-92-12-85	o	2	7	230	0.6	0.2	30	6.6	200	9	0.2	0.7	28	2	0.3	3	25	130
MW74-92-13	BS74-92-13-6	f/c	1.5	0.25	45	0.1	1.2	12	3.2	7.5	4.5	0.12	0.28	45	0.5	0.25	2	7.8	26
	BS74-92-13-16	f/c	1	0.25	39	0.23	1.4	11	3.5	11	9.5	0.1	0.25	10	0.5	0.25	2	5.4	24
	BS74-92-13-25.5	sp	1	0.25	38	0.08	3.3	11	3.7	21	4.3	0.39	0.25	25	0.5	0.25	2	9	29
	BS74-92-13-33	sp	1	0.25	49	0.26	1.4	12	3.6	17	3.8	0.4	0.26	21	0.63	0.25	2	5.5	24
	BS74-92-13-40	sp	1	0.25	1.7	0.06	0.89	4.1	1.7	6.6	2.3	0.07	0.38	6.2	0.5	0.5	2	3.3	17
MW83-92-14	BS83-92-14-6	f/c	2	3	69	0.4	0.5	21	10	18	7	0.2	0.6	56	2	0.2	4	28	55
	BS83-92-14-11	f/c	2	1	87	0.4	0.2	16	9	13	8	0.2	0.6	51	2	0.2	3	8	42
	BS83-92-14-16	sp	2	3	250	0.4	0.5	27	9.7	20	8	0.2	0.6	56	3	0.2	8	13	75
	BS83-92-14-20	sp	2	4	59	0.3	0.5	22	7.1	7	4	0.2	0.6	51	3	0.2	5	11	32
	BS83-92-14-30.5	sp	2	7	210	0.6	0.3	34	23	30	9	0.2	0.6	120	3	0.2	5	8	84
	BS83-92-14-40.5	sp	2	14	100	0.3	0.2	9	4.6	5	6	0.2	0.6	21	3	0.2	10	7	19
	BS83-92-14-50	sp	2	4	120	0.4	0.3	14	5.4	16	7	0.2	1.2	33	2	0.2	3	8	47
	BS83-92-14-57	sp	2	3	92	0.3	0.3	10	4.5	6	6	0.2	0.6	34	3	0.2	3	6	41
MW46A-92-15	BS46A-92-15-6	f/c	1.5	9.9	62	0.1	0.05	41	12	16	5.5	0.09	0.25	34	2.7	0.25	2	37	39
	BS46A-92-15-16	f/c	1.3	7.6	87	0.12	0.05	49	12	21	5.9	0.05	1.3	40	1.2	0.25	2	46	44
	BS46A-92-15-26	f/c	1	6.6	41	0.08	0.05	20	8.5	21	2	0.05	0.25	12	1.2	0.25	2	42	63
	BS46A-92-15-36	o	1.1	12	56	0.08	0.05	51	13	65	5.7	0.11	0.25	63	0.5	0.25	2	42	78
MW7-92-16	BS7-92-16-5.5	f/c	1	9.7	130	0.23	0.13	41	14	107	6.8	0.07	0.25	46	9.1	0.25	2	42	47
	BS7-92-16-21	f/c	1.3	21	130	0.28	0.08	56	17	16	6.1	0.05	0.25	41	8.2	0.25	2	62	38
	BS7-92-16-30.8	m	1	2.7	51	0.12	0.05	57	13	33	2.2	0.05	0.25	21	0.5	0.25	2	38	66
	BS7-92-16-40.5	m	1	0.25	26	0.06	0.05	17	6.5	29	0.91	0.05	0.25	9.1	0.5	0.25	2	17	34
	BS7-92-16-50.2	m	1	1.1	28	0.29	0.05	34	10	39	1.8	0.05	0.25	13	0.5	0.25	2	46	65
MW6-92-17	BS6-92-17-6	m	1	6.3	69	0.22	0.21	75	16	31	5.5	0.05	0.25	120	0.5	0.25	2	46	49
	BS6-92-17-15.5	m	1	3.4	50	0.12	0.17	120	17	20	2.4	0.05	0.25	190	0.5	0.25	2	31	37

TABLE 1
Metals Concentrations in soils used to calculate background (in mg/kg)

Location	Sample ID	Geol. Unit	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	Vn	Zn
MW6-92-17	BS6-92-17-25.5	m	1	2.8	31	0.27	0.3	23	7.1	20	2.8	0.05	0.25	71	1.6	0.25	2	32	32
	BS6-92-17-30	o	1	7.8	40	0.26	0.29	109	17	32	4.1	0.29	0.25	180	0.5	0.25	2	40	46
	BS6-92-17-40.5	o	1	4	56	0.19	0.21	54	11	31	3.4	0.09	0.25	73	0.5	0.25	2	29	40
MW37-92-16	BS37-92-16-6	o	1.3	13	150	0.24	0.05	27	11	23	9.5	0.1	0.25	37	0.5	0.25	2	34	75
	BS37-92-16-16	o	1	3.7	80	0.05	0.05	22	4.3	8.1	4.5	0.08	0.25	23	0.5	0.25	2	17	37
	BS37-92-16-26	o	1	6.8	43	0.38	0.05	14	5.7	18	4	0.06	0.25	14	0.5	0.25	2	22	47
	BS37-92-16-31	o	1	4.2	25	0.05	0.16	29	7	15	5	0.05	0.25	30	0.5	0.25	2	20	71
MW37-92-16A	BS37-92-16A-11	o	1	5.5	150	0.07	0.05	18	5.7	6.9	3.4	0.08	0.8	15	2.1	0.5	2	14	22
	BS37-92-16A-20.5	o	1.1	6.3	44	0.16	0.05	11	3	4.3	4.7	0.06	0.25	16	0.5	0.25	2	7.8	21
	BS37-92-16A-31.5	o	1.9	9.6	48	0.42	0.05	14	6.1	11	4.1	0.05	0.25	17	5.2	0.25	2	21	43
	BS37-92-16A-41.3	gv	2.4	6.5	62	0.32	0.05	17	7.8	16	5.3	0.05	0.25	24	0.5	0.25	2	24	54
	BS37-92-16A-51	gv	2.1	29	96	0.59	0.05	27	13	42	8.5	0.12	0.49	41	16	0.25	2	38	88
	BS37-92-16A-60.7	gv	1.8	30	77	0.43	0.05	25	18	42	16	0.12	1.3	39	3.4	0.25	2	33	90
	BS37-92-16A-70.4	gv	1.5	9.4	120	0.45	0.05	24	37	32	4.7	0.11	0.25	72	2.1	0.25	2	27	108
MW7-92-19	BS7-92-19-6	f/c	1.3	8.4	70	0.17	0.05	34	14	20	5.8	0.05	0.25	34	2.3	0.25	2	40	36
	BS7-92-19-15.5	m	1.8	15	57	0.11	0.05	51	15	13	3.3	0.05	0.25	32	3.3	0.25	2	39	43
	BS7-92-19-26	m	1	6	36	0.69	0.05	38	11	12	1.8	0.05	0.25	18	0.5	0.25	2	27	35
	BS7-92-19-36	m	1.5	4.5	53	0.13	0.05	26	14	24	5.1	0.05	0.25	76	7.8	0.25	2	30	53
	BS7-92-19-45.5	m	1.2	3.2	49	0.12	0.05	47	14	23	2.8	0.05	0.25	110	2.7	0.25	2	47	44
	BS7-92-19-55.5	o	1	3.8	79	0.16	0.05	140	25	20	4.1	0.05	0.25	309	1.7	0.25	2	44	57
MW27-92-20	BS27-92-20-10.2	m	4.6	15	38	0.35	0.05	52	19	12	5.1	0.05	0.25	21	6	0.25	2	28	54
	BS27-92-20-20	m	1.5	3.9	26	0.05	0.05	51	15	17	3.4	0.05	0.25	22	1.1	0.25	2	34	54
	BS27-92-20-30.4	m	0.7	9.4	27	0.05	0.05	36	15	10	4.9	0.05	0.25	16	0.5	0.25	2	30	40
	BS27-92-20-45	m	1	9.6	43	0.05	0.05	57	15	15	1.2	0.05	0.25	18	12	0.25	2	32	43
	BS27-92-20-55	m	1.6	5.1	39	0.05	0.05	48	12	20	1.8	0.05	0.25	17	2.1	0.25	2	33	87
	BS27-92-20-60C	m	1	6.9	39	0.05	0.05	58	12	13	3.3	0.05	0.25	18	0.5	0.25	2	29	44
MW53-92-21	BS53-92-21-8.9	m	1	4.3	54	0.14	0.05	34	12	23	4	0.11	0.25	16	4.6	0.25	2	16	41
	BS53-92-21-20.3	m	1	4.7	46	0.05	0.05	36	13	11	2.3	0.06	0.25	19	4.9	0.25	2	22	38
	BS53-92-21-20.8	m	1	4.5	28	0.05	0.05	29	10	8.4	2.2	0.05	0.25	10	3.6	0.25	2	16	31
	BS53-92-21-39.1	m	1	3.2	20	0.05	0.05	24	9.6	8.9	1.9	0.05	0.25	9.4	2.8	0.25	2	24	30
	BS53-92-21-48.8	m	1	4.3	28	0.06	0.05	32	13	11	2.2	0.05	0.4	26	4.5	0.25	2	25	34
	BS53-92-21-58	m	1	3.1	31	0.05	0.05	28	11	25	2	0.05	0.25	14	2.5	0.25	2	15	40
	BS53-92-21-68.9	m	1	2.8	16	0.05	0.05	26	11	5.9	0.83	0.08	0.25	11	2.8	0.25	2	11	30
	BS53-92-21-78.8	m	1	4.3	38	0.05	0.05	25	12	11	1.1	0.05	0.25	18	2.1	0.25	2	15	38
	BS53-92-21-83.5	m	1	4.5	90	0.25	0.05	35	10	13	4.7	0.13	0.25	86	6.5	0.25	2	17	29
	BS53-92-21-95	o	1	5.2	71	0.08	0.05	27	6.8	28	3.5	0.12	0.25	37	3.8	0.61	2	26	35
	BS53-92-21-109	o	1.2	11	560	0.28	0.05	41	9	18	3.2	0.1	0.85	61	4.8	0.25	5.3	35	45
	BS53-92-21-115.7	o	1.2	18	790	0.05	0.05	41	9.4	20	3.6	0.05	0.25	73	21	0.88	9.3	30	54
	BS53-92-21-126.3	o	2.5	13	250	0.05	0.05	36	8.6	12	4.9	0.05	0.25	70	28	1.3	71	16	55
	BS53-92-21-135.3	o	1	8	310	0.49	0.05	52	8.9	29	8.3	0.1	0.43	80	3.1	0.25	2	23	91
	BS53-92-21-150.5	o	1	21	220	0.74	0.05	69	14	43	14	0.27	3.6	110	4.8	0.25	2	37	91
	BS53-92-21-165.5	o	1	51	130	0.49	0.05	23	8.5	22	10	0.23	32	71	3.8	0.25	2	20	47
	BS53-92-21-180.5	o	1	8.9	280	0.44	0.54	66	14	38	7.6	0.05	0.47	130	0.5	0.25	2	39	87
MW69A-92-22	BS69A-92-22-5.8	m	1	17	71	0.54	4.8	73	18	44	0.5	0.09	0.25	60	0.5	0.25	2	59	52
	BS69A-92-22-10	m	1	12	120	1.2	3.7	76	14	33	7.4	0.1	0.63	86	0.5	0.25	2	45	64
	BS69A-92-22-15	o	1	8.7	170	0.65	4.3	71	15	36	7.2	0.21	0.25	91	0.5	0.25	2	39	75
	BS69A-92-22-20.8	o	3.9	2.7	130	1.2	3.2	52	11	27	6.9	0.05	0.25	77	0.6	0.25	2	37	68
	BS69A-92-22-25.2	o	1	0.73	150	1.2	3.7	53	13	27	0.5	0.1	0.25	80	0.5	0.25	2	34	68
	BS69A-92-22-30	o	1	1.4	97	0.32	3.2	43	12	24	2.2	0.05	0.25	49	0.5	0.25	2	44	47
MW75-92-23	BS75-92-23-5.5	f/c	1.3	12	140	0.14	0.05	78	13	35	4	0.05	0.25	98	1.3	0.25	2	51	63
	BS75-92-23-15	f/c	1	14	87	0.5	0.05	32	8.1	0.3	5.2	0.1	0.25	68	0.5	0.25	2	0.79	45
	BS75-92-23-25	f/c	1.5	20	60	0.1	0.05	54	15	87	1.7	0.05	0.25	37	17	0.25	110	59	112
	BS75-92-23-35.5	f/c	1	5.1	31	0.08	0.05	46	15	78	1.8	0.05	0.25	31	1.9	0.25	2	42	51
	BS75-92-23-45.5	f/c	1	9	99	0.15	0.05	43	11	34	4.6	0.06	0.25	87	0.5	0.25	2	29	51
MW75B-92-24	BS75B-92-24-5	f/c	1	14	89	0.18	0.06	48	12	39	5.3	0.07	0.25	65	0.5	0.25	2	40	53
	BS75B-92-24-15	f/c	1.1	8.6	106	0.13	0.05	102	15	31	5	0.06	0.25	140	0.5	0.25	2	51	48
	BS75B-92-24-25	o	1.2	8.4	160	0.34	0.05	36	10	27	4.3	0.05	0.25	70	2.6	0.25	2	28	46
	BS75B-92-24-35	o	1	8	73	0.09	0.06	32	8.4	31	4.1	0.05	0.25	55	0.5	0.25	2	28	63
	BS75B-92-24-45	o	1	9	99	0.15	0.05	43	11	34	4.6	0.09	0.25	87	0.5	0.25	2	30	51
	BS75B-92-24-54	o	1	6.6	85	0.12	0.05	42	12	38	2.4	0.1	0.25	100	0.5	0.25	2	31	54
MW76-92-25	BS76-92-25-5.5	f/c	1	12	81	0.17	0.05	47	14	34	2	0.05	1	24	3	0.25	2	33	51
	BS76-92-25-16	o	1.6	6.9	71	0.37	0.05	26	9.4	26	2	0.05	0.25	67	2	0.26	2	21	110
	BS76-92-25-26	o	1	7.5	190	0.14	0.05	48	10	39	2.3	0.05	0.25	82	0.6	0.25	2	26	55
	BS76-92-25-36	o	1	7.1	110	0.16	2.5	42	10	27	2.5	0.06	0.35	66	0.5	0.25	2	27	67
MW62-92-26	BS62-92-26-6	f/c	1	13	120	0.38	0.05	25	2.5	9.8	2.8	0.05	0.25	18	5.7	0.25	90	14	39
	BS62-92-26-11	gv	1	11	170	0.39	0.06	21	5.2	27	8.4	0.05	0.25	23	2.5	0.25	2	17	140
	BS62-92-26-21	gv	1	11	84	0.17	0.05	23	4.6	30	2.6	0.05	0.25	26	0.9	0.25	2	16	60
	BS62-92-26-30.5	gv	1.3	21	53	0.11	0.05	26	13	46	11	0.11	0.25	28	0.5	0.25	2	43	98
	BS62-92-26-40.3	gv	1	26	39	0.16	0.05	29	14	53	9.9	0.08	0.25	31	0.5	0.25	2	51	95
	BS62-92-26-50.5	gv	1.3	28	37	0.07	0.05	27	17	41	12	0.09	0.25	38	0.5	0.25	2	38	90

TABLE 1

Metals Concentrations in soils used to calculate background (in mg/kg)

Location	Sample ID	Geol. Unit	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Mg	Mo	Ni	Se	Ag	Tl	Vn	Zn
MW62-92-27	BS62-92-27-5.5	f/c	1.2	16	193	0.17	0.05	19	6.3	11	6.1	0.05	0.68	14	2	0.25	2	38	49
	BS62-92-27-15.5	gv	1.9	17	511	0.11	0.05	32	11	60	12	0.08	0.25	33	0.5	0.25	2	40	130
	BS62-92-27-25.5	gv	1.8	18	3201	0.57	0.05	31	10	77	9.2	0.05	0.25	28	0.5	0.25	2	47	130
	BS62-92-27-35.5	gv	1	25	361	0.09	0.05	26	16	45	12	0.07	0.25	38	0.5	0.25	2	34	93
	BS62-92-27-45.5	gv	1.2	18	411	0.15	0.05	29	11	44	9.6	0.08	0.25	37	0.5	0.25	2	37	107
	BS62-92-27-55.5	gv	1	24	531	0.23	0.05	34	12	50	11	0.08	0.25	37	0.5	0.25	2	43	106
	BS62-92-27-65	gv	1.9	18	551	0.13	0.05	32	9.3	53	8.9	0.06	0.25	28	0.5	0.25	2	45	107
MWCD-92-28	BSCD-92-28-9.5	f/c	3	10	160	0.49	2	26	6.4	28	8.4	0.09	0.58	22	0.5	0.25	2	35	60
	BSCD-92-28-19.5	f/c	1	12	1200	0.8	2.6	29	12	41	6.7	0.18	0.73	29	0.5	0.25	2	32	71
	BSCD-92-28-28.5	gv	3	42	521	0.4	2.4	17	15	22	15	0.42	1.9	42	0.86	0.25	2	21	74
	BSCD-92-28-38.5	gv	1.5	17	581	0.25	3.2	35	9.2	49	11	0.15	0.97	32	0.5	0.25	2	40	80
	BSCD-92-28-48.5	gv	1.5	25	561	0.28	3.1	31	17	42	17	0.27	1.2	42	0.5	0.25	2	37	78
MW71-93-1	BS71-93-1-4.5	m	1.1	0.25	37	0.14	1.8	41	16	11	0.5	0.05	2.6	13	0.5	0.25	2	37	47
	BS71-93-1-14.5	m	1.6	0.99	71	0.22	1.4	42	15	12	0.5	0.05	2.8	22	0.5	0.25	2	50	42
	BS71-93-1-24.7	m	1	0.25	66	0.39	1.2	43	14	12	0.5	0.05	1.8	29	0.5	0.25	2	46	97
	BS71-93-1-35	m	1	0.25	50	0.18	1.1	56	14	7.7	0.5	0.05	2.5	12	0.5	0.25	2	44	45
	BS71-93-1-44.9	m	1.3	0.25	86	0.13	0.88	72	11	29	0.5	0.35	1.9	84	0.5	0.25	2	56	3.8
	BS71-93-1-54.8	o	1	3.9	68	0.34	0.19	11	3.9	6.4	0.66	0.05	0.69	18	0.5	0.25	2	24	17
	BS71-93-1-64	o	1	1.1	58	0.34	0.5	27	8.9	21	0.5	0.05	1.7	38	0.5	0.25	2	36	31
MW71-93-2	BS71-93-2-10	m	2.5	0.25	26	0.48	1.1	29	12	17	0.5	0.05	2.4	15	0.5	0.25	2	22	44
	BS71-93-2-20	m	2.8	7.7	46	0.53	1.7	43	15	34	0.5	0.05	3.4	18	0.5	0.25	2	44	62
	BS71-93-2-30	m	3.1	0.3	49	0.45	1.7	56	20	35	0.5	0.05	3.3	22	0.5	0.25	2	44	69
	BS71-93-2-35.7	m	1	0.33	72	0.49	1.1	46	15	74	0.5	0.05	2.2	44	0.5	0.25	2	48	71
	BS71-93-2-41	m	2.4	3.5	41	0.32	1.2	52	14	36	0.5	0.05	1.8	18	0.5	0.25	2	34	59
	BS71-93-2-50	m	1	6.3	25	0.1	0.64	17	17	32	0.5	0.05	2.3	15	0.5	0.25	2	44	46
	BS71-93-2-60.6	m	1.2	3.5	46	0.16	0.52	36	19	37	0.5	0.05	1.9	24	0.5	0.25	2	34	60
	BS71-93-2-70	m	1.1	3.2	44	0.08	0.52	16	11	8.6	0.5	0.05	0.62	13	0.5	0.25	2	25	27
	BS71-93-2-80	o	1	0.25	73	0.38	0.77	41	14	26	0.5	0.05	2.3	72	0.5	0.25	2	37	50
MW6-93-4	BS6-93-4-6	f/c	1.3	0.25	99	0.26	2	44	13	76	9.8	0.06	1.3	53	0.6	0.25	2	37	110
	BS6-93-4-16	f/c	1	0.25	118	0.46	1.8	42	12	24	7.2	0.05	0.49	82	0.5	0.25	2	24	42
	BS6-93-4-26	f/c	1	0.25	105	0.5	1.5	44	15	19	4.4	0.05	0.25	58	0.5	0.39	2	46	31
	BS6-93-4-35.5	m	2.2	3.2	130	0.29	3.5	65	20	23	0.5	0.05	4.7	41	0.5	0.96	2	91	64
	BS6-93-4-45	m	1	3.7	58	0.1	2.5	40	15	10	0.5	0.05	2.8	23	0.5	2.1	2	28	49
MW37-93-5	BS37-93-5-11	o	1	0.25	140	0.45	2.9	26	11	22	0.5	0.06	2.3	22	0.5	2.3	2	49	53
	BS37-93-5-21	o	1	16	230	0.42	4.3	25	17	48	14	0.08	3.8	31	0.5	3.2	2	71	69
	BS37-93-5-30.5	gv	5	19	63	0.54	7.5	31	8.1	65	0.5	0.08	6.6	37	0.5	6.5	2	24	110
	BS37-93-5-40.5	gv	9	42	53	0.46	5.6	24	13	77	17	0.08	4.1	49	0.5	4.1	2	28	110
	37-93-5-50-50.9	gv	1	63	80	0.41	3.9	36	16	60	0.5	0.09	4.7	45	0.5	3.8	2	45	140
MW76-93-6	76-93-6-5.8-6.3	o	3	2.2	81	0.39	3.7	33	13	19	0.5	0.31	2.8	140	0.5	3	2	0.5	46
	76-93-6-15.4-16.9	o	5	7.9	110	0.31	3.3	67	15	38	0.5	0.2	5.7	120	0.5	3.4	2	47	50
	76-93-6-26-26.5	o	1	0.56	180	0.31	3.8	73	17	45	0.5	0.2	5.8	210	0.5	3.6	2	11	59
	76-93-6-35.2-35.7	o	7	0.25	64	0.34	3.8	52	15	38	0.5	0.11	63	120	0.5	4.1	2	0.5	40
	76-93-6-45.1-45.6	o	1	11	220	0.35	1.8	42	32	41	0.5	0.33	2.1	160	0.5	2	2	17	69
MW76-93-7	BS76-93-7-5.5	m	3	0.25	30	0.1	2.1	49	15	34	0.5	0.06	3.2	130	0.5	1	2	21	26
	BS76-93-7-15.5	o	1	0.25	54	0.28	3	38	8.8	42	0.5	0.06	3.7	130	0.5	1.1	2	42	58
	BS76-93-7-26	o	1	3	120	0.29	4	43	16	58	5.4	0.12	5.3	91	0.5	2	2	49	86
	BS76-93-7-35.5	o	3.1	13	180	0.36	2.9	34	13	25	0.5	0.05	5.7	68	0.5	1.8	2	20	43
MW77-93-8	77-93-8-5.7-6.2	f/c	1	0.25	48	0.21	1.5	47	13	26	6.1	0.2	1.7	110	0.5	3.1	2	8.6	45
	77-93-8-16-16.5	f/c	1	7	98	0.3	3.5	82	21	35	9.6	0.2	4.6	140	0.5	4	2	43	47
	77-93-8-25.6-26.1	o	3	0.25	86	0.23	2.3	31	10	38	9.5	0.2	1.6	62	0.5	4.4	2	22	50
MW53-93-9	BS53-93-9-10	m	1	0.25	82	0.15	2.5	36	20	20	7.1	0.05	2.8	15	0.5	1.8	2	47	48
	BS53-93-9-25	m	1	0.25	77	0.17	2.3	31		25	0.5	0.05	4.2	16	0.5	2.3	2	36	50
	BS53-93-9-40.5	m	1	0.25	90	0.53	4.6	61	24	22	0.5	0.05	2.5	19	0.5	1.9	2	59	65
	BS53-93-9-50	m	1	3.9	45	0.17	2.7	51	18	11	0.5	0.05	1.6	16	0.5	2	2	42	46
	BS53-93-9-60	m	1	0.25	67	0.16	4.2	51	17	18	0.5	0.05	3.1	17	0.5	2	2	34	49
	BS53-93-9-80	m	1	0.25	35	0.12	0.77	25	12	8.5	0.5	0.05	1.5	21	0.5	0.25	2	16	35
MW5-93-10	BS5-93-10-6	f/c	1	0.94	85	0.22	0.65	26	10	11	1.2	0.05	1.2	35	0.5	0.25	2	38	30
	BS5-93-10-15.3	f/c	1	0.25	57	0.19	0.23	18	9.4	19	0.5	0.05	1.6	60	0.5	0.25	2	42	31
	BS5-93-10-25.8	m	1	3	57	0.38	0.21	12	7.9	15	0.5	0.05	1.2	36	0.5	0.25	2	14	24
	BS5-93-10-35.2	o	1	1.3	84	0.14	0.05	17	7.5	21	3.3	0.05	1.1	44	0.5	0.25	2	14	33
MW88-93-11	BS88-93-11-5.5	gv	1	1.8	180	0.51	3.6	40	6.7	23	10	0.05	2.9	52	0.5	0.77	2	51	82
	BS88-93-11-15.3	gv	2.8	9.6	140	0.81	3.4	49	10	50	10	0.05	5.3	47	0.5	0.61	2	63	110
	BS88-93-11-25.7	gv	1.9	8.8	36	0.56	3.7	33	12	36	9.6	0.05	2.2	48	0.5	1.6	2	45	81
	BS88-93-11-36	gv	15	0.25	42	0.58	4.6	31	20	66	17	0.05	2.6	50	0.5	0.86	2	40	79
	BS88-93-11-45.2	gv	2.2	6.7	22	0.33	3.3	46	11	31	3.4	0.05	2.1	43	0.5	1.5	2	62	67
	BS88-93-11-55	gv	1	8.6	16	0.15	2.8	41	9.4	17	3.3	0.05	1.5	37	0.5	1	5	50	53
MW88-93-11A	BS88-93-11A-10.2	gv	5	8.7	196	0.82	0.5	68	13	57	13	0.2	2.5	58	0.5	1	5	63	113
	BS88-93-11A-20.3	gv	5	12	127	0.68	0.5	53	9.1	52	12	0.2	2.5	50	0.5	1	5	46	101
	BS88-93-11A-30.6	gv	5	1.9	54	0.5	0.5	42	16	49	9.7	0.2	2.5	47	0.5	1	5.6	45	89
	BS88-93-11A-40.8	gv	5	4.4	50	0.5	0.5	47	12	31	4.3	0.2	2.5	44	0.5	1	5	67	61
	BS88-93-11A-50.3	gv	5	5.4	53	0.5	0.5	42	15	36	5.1	0.2	2.5	46	0.5	1	5	57	69

TABLE 1

Metals Concentrations in soils used to calculate background (in mg/kg)

Location	Sample ID	Geol Unit	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	Vn	Zn
MW88-93-11A	BS88-93-11A-65	gv	5	4.1	27	0.5	0.5	41	8.8	27	3.2	0.2	2.5	38	0.5	1	5	48	62
MW88-93-13	BS88-93-13-3.5	f/c	5	8.1	155	0.63	0.5	25	3.4	22	7	0.2	2.5	22	0.5	1	5	46	62
	BS88-93-13-19.6	gv	5	8.9	144	0.85	0.5	60	17	65	14	0.2	2.6	78	0.5	1	5	81	124
	BS88-93-13-29.3	gv	5	7.2	129	0.72	0.5	58	11	65	13	0.2	2.5	50	0.5	1	5	59	117
MW88-93-13	BS88-93-13-39.5	gv	5	34	54	0.57	1.3	46	39	83	16	0.27	7.4	102	2.2	1	6.5	74	174
	BS88-93-13-49.4	gv	5	8.9	80	0.59	0.5	52	18	64	9.2	0.2	2.5	41	0.5	1	5	86	107
	BS88-93-13-59.6	gv	5	9.8	120	0.61	0.5	50	18	60	9.8	0.2	2.5	38	0.5	1	5	66	102
	BS88-93-13-69	gv	5	16	116	0.53	0.5	51	22	59	15	0.2	2.6	41	0.5	1	5	65	115
	BS88-93-13-70	gv	5	6.6	104	0.58	0.61	58	14	48	7.7	0.2	2.5	36	0.5	1.1	5	68	102
	BS88-93-13-89	gv	5	6.3	63	0.5	0.5	41	10	145	17	0.2	2.5	22	0.5	1	5	58	69
	BS88-93-13-9	f/c	5	8.7	126	0.7	0.5	49	17	63	11	0.2	2.5	50	0.5	1	5	62	104
MW52-93-14	BS52-93-14-4.5	m	5	0.58	112	0.5	0.5	76	16	15	2.5	0.2	2.5	37	0.5	1	5	74	45
	BS52-93-14-15.8	m	5	0.5	48	0.5	0.5	69	16	14	2.5	0.2	2.5	25	0.5	1	5	41	52
	BS52-93-14-25.3	m	5	0.5	34	0.5	0.5	48	16	21	2.5	0.2	2.5	23	0.5	1	5	35	73
	BS52-93-14-35	m	5	0.64	51	0.5	0.5	38	11	16	2.5	0.2	2.5	18	0.5	1	5	24	42
	BS52-93-14-46.2	o	5	9.1	162	0.5	0.5	54	12	36	6.4	0.2	2.5	67	0.5	1	5	51	63
MW25-93-15	BS25-93-15-8.8	m	5	0.73	148	0.55	0.53	66	23	41	2.5	0.2	2.5	38	0.5	1	5	87	66
	BS25-93-15-13.8	m	5	0.5	0.5	0.5	0.5	35	17	48	2.5	0.2	2.5	23	0.5	1	5	37	84
	BS25-93-15-23.5	m	5	1.5	87	0.61	0.5	51	13	21	4.5	0.2	2.5	32	0.5	1	5	70	54
	BS25-93-15-33	m	5	0.5	69	0.66	0.5	57	17	95	2.5	0.2	2.5	43	0.5	1	5	104	92
	BS25-93-15-43.2	m	5	0.5	88	0.5	0.5	46	20	20	2.5	0.2	2.6	22	0.6	1	5	38	62
	BS25-93-15-57	m	5	0.5	81	0.6	0.5	72	22	37	2.5	0.2	2.5	33	0.5	1	5	61	84
	BS25-93-15-67.5	o	5	2	111	0.6	0.84	49	14	46	5.7	0.2	2.5	71	0.5	1	5	38	65
MW51B-93-18A	BS51B-93-18A-4.4	f/c	5	1.6	96	0.5	0.5	63	16	22	7.7	0.76	2.5	32	0.5	1	5	51	60
	BS51B-93-18A-9	f/c	5	6.9	118	0.52	0.5	64	14	36	6.8	0.2	2.5	92	0.5	1	5	50	79
	BS51B-93-18A-14	o	5	7.3	226	0.59	0.5	76	16	60	7.3	0.2	2.5	89	0.5	1	5	60	96
	BS51B-93-18A-19	o	5	7.6	270	0.67	0.5	82	17	36	7.9	0.2	2.6	105	0.54	1	6	67	97
	BS51B-93-18A-24	o	5	7.1	230	0.6	0.5	76	15	47	7.2	0.2	2.5	95	0.62	1	5	62	88
	BS51B-93-18A-29.3	o	5	5.7	231	0.58	0.5	80	15	69	6.9	0.2	2.6	97	0.5	1	6	61	75
	BS51B-93-18A-34	o	5	3	248	0.51	0.5	56	8.9	32	7.5	0.2	2.5	64	0.5	1	5	34	60
	BS51B-93-18A-39	o	5	4.3	232	0.58	0.5	72	12	35	6.8	0.2	2.5	77	0.5	1	5	53	71
	BS51B-93-18A-41	o	5	5.4	211	0.51	0.5	65	12	105	5.9	0.2	2.5	74	0.5	1	5	48	103
MW71-94-1	BS71-94-1-4	f/c	5	1.7	172	0.5	0.5	68	17	31	5.3	0.2	2.6	56	0.5	1	0.5	64	54
	BS71-94-1-8.5	f/c	5	1.8	133	0.5	0.5	69	18	27	6.3	0.2	2.5	60	0.5	1	0.5	68	52
	BS71-94-1-14.2	f/c	5	3.4	141	0.5	0.5	65	17	36	5.3	0.2	2.5	52	0.5	1	0.5	68	58
	BS71-94-1-23.7	m	5	0.5	103	0.5	0.5	24	24	25	2.5	0.2	2.5	27	0.5	1	0.5	83	57
	BS71-94-1-33.7	m	5	0.75	74	0.5	0.5	43	20	28	2.8	0.2	2.5	32	0.5	1	0.5	105	50
	BS71-94-1-48.5	m	5	1.2	98	0.5	0.5	55	15	13	2.5	0.2	2.5	25	0.5	1	0.5	78	54
MW77-94-5	BS77-94-5-4.3	f/c	5	0.5	74	0.5	0.5	45	17	16	2.5	0.2	2.5	26	0.5	1	5	32	43
	BS77-94-5-9.3	f/c	5	1.3	87	0.5	0.5	66	14	24	2.6	0.2	2.5	53	0.5	1	5	58	45
	BS77-94-5-14.1	f/c	5	4.1	125	0.5	0.5	39	9.8	21	4.5	0.2	2.5	62	0.5	1	5	29	46
	BS77-94-5-19	f/c	5	1.4	96	0.5	0.5	46	14	31	2.5	0.2	2.5	54	0.5	1	5	40	37
	BS77-94-5-29.5	f/c	5	6	131	0.64	0.5	60	16	36	5.2	0.31	2.5	104	0.5	1	5	39	73
	BS77-94-5-38.8	o	5	6.7	337	0.67	0.5	78	15	34	7	0.2	2.5	110	0.5	1	5	45	87
	BS77-94-5-48.5	o	5	3.4	384	0.61	0.5	72	19	41	9	0.27	2.5	126	0.5	1	5	41	71
	BS77-94-5-58.5	o	5	6.7	268	0.62	0.5	65	15	28	5	0.2	2.5	84	0.5	1	5	57	77
MW77-94-6	BS77-94-6-3.7	f/c	5	1.1	87	0.5	0.5	62	20	27	3	0.2	2.5	34	0.5	1	5	59	57
	BS77-94-6-9.3	f/c	5	0.71	63	0.5	0.5	61	18	18	2.5	0.2	2.5	28	0.5	1	5	52	58
	BS77-94-6-14.2	f/c	5	5.2	106	0.5	0.61	70	14	46	5.8	0.2	2.5	92	0.5	1	5	40	68
	BS77-94-6-24.2	f/c	5	4.6	211	0.5	0.5	66	13	36	6.9	0.2	2.5	89	0.5	1	6	43	64
	BS77-94-6-34	f/c	5	1.9	92	0.5	0.5	82	18	27	5.2	0.2	2.5	84	0.5	1	5	71	68
	BS77-94-6-44	f/c	5	2.1	139	0.5	0.5	52	17	46	3.8	0.2	2.5	61	0.5	1	5	62	51
	BS77-94-6-54.5	o	5	9.2	179	0.5	0.5	86	15	38	4.8	0.2	2.5	83	0.5	1	5	50	61
	BS77-94-6-63.5	o	5	5.1	141	0.5	0.5	67	13	48	5.6	0.2	2.5	81	0.5	1	6	48	70
MW74-94-7	BS74-94-7-5.1	f/c	5	3.7	94	0.5	0.52	38	9.2	16	4.3	0.2	2.5	41	0.5	1	5	42	47
	BS74-94-7-15.5	f/c	5	6.5	170	0.53	0.5	66	17	30	6.5	0.2	2.5	97	0.5	1	5	49	61
	BS74-94-7-25.5	sp	5	0.59	97	0.5	0.5	46	9.7	18	4.5	0.2	2.5	73	0.5	1	5	25	48
	BS74-94-7-35.7	sp	5	0.89	105	0.5	0.5	58	9.6	32	4.6	0.2	2.5	62	0.5	1	5	29	58
	BS74-94-7-44.7	sp	5	5.6	116	0.5	0.5	66	9.8	24	5.3	0.2	2.5	65	0.6	1	5	28	49
MW74-94-8	BS74-94-8-4.2	f/c	5	3.4	125	0.5	0.5	22	4.9	17	5.2	0.2	2.5	34	0.5	1	5	20	59
	BS74-94-8-10	f/c	5	3.9	136	0.5	0.59	19	4.6	25	6.5	0.2	2.5	37	0.5	1	5	15	82
	BS74-94-8-13.8	f/c	5	1.5	151	0.5	0.68	45	11	20	4.5	0.2	2.5	57	0.5	1	5	23	55
	BS74-94-8-19.5	f/c	5	1	90	0.5	0.5	25	8.2	18	2.5	0.2	2.6	45	0.6	1	5	37	46
	BS74-94-8-29	sp	5	11	92	0.5	0.5	19	4.3	12	5.6	0.2	2.5	34	0.5	1	5	12	43
MW37-94-9	BS37-94-9-4.2	f/c	5	6	138	0.5	0.5	33	9.1	27	6.7	0.2	2.5	30	0.5	1	5	36	63
	BS37-94-9-8.5	f/c	5	4.7	100	0.58	0.5	49	14	27	8.9	0.2	2.5	69	0.5	1	5	29	60
	BS37-94-9-14.2	f/c	5	2	114	0.5	0.5	29	4.3	13	3.4	0.2	2.5	23	0.5	1	5	16	33
	BS37-94-9-18.5	o	5	0.5	190	0.66	0.5	22	6.4	19	8.5	0.2	2.5	32	0.5	1	5	27	50
	BS37-94-9-24.3	o	5	3.8	51	0.5	0.5	23	5.2	6.6	3.8	0.2	2.5	22	0.5	1	5	14	29
	BS37-94-9-28.6	o	5	2.6	66	0.5	0.5	16	4.1	15	4.9	0.2	2.5	20	0.5	1	5	14	43
	BS37-94-9-34	o	5	5.2	210	0.54	0.5	28	12	30	7.7	0.2	2.5	38	0.5	1	5	45	93

TABLE 1

Metals Concentrations in soils used to calculate background (in mg/kg)

Location	Sample ID	Geol. Unit	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	Vn	Zn
MW37-94-9	BS37-94-9-38.7	gv	5	5.4	193	0.6	0.5	29	13	47	8.1	0.2	2.5	35	0.5	1	5	44	93
	BS37-94-9-44.5	gv	5	10	50	0.61	0.5	39	15	52	12	0.2	2.5	47	0.75	1	5	49	107
MW52-94-10	BS-MW52-94-10-4	m	5	1.1	100	0.5	0.5	63	21	40	2.6	0.2	2.6	37	0.6	1	5	66	69
	BS-MW52-94-10-9	m	5	0.94	100	0.5	0.5	62	20	29	2.5	0.2	2.5	37	0.6	1	5	71	65
	BS-MW52-94-10-13.9	m	5	3.2	82	0.5	0.6	65	17	47	2.5	0.2	2.5	54	0.6	1	5	86	103
MW52-94-10	BS-MW52-94-10-19	m	5	0.5	47	0.5	0.5	41	17	13	2.6	0.2	2.5	13	0.5	1	5	15	55
	BS-MW52-94-10-23.5	m	5	0.94	81	0.5	0.5	44	16	22	2.6	0.2	2.5	14	0.5	1	5	66	56
	BS-MW52-94-10-28.5	m	5	0.6	63	0.5	0.5	33	22	36	2.6	0.2	2.5	17	0.6	1	5	45	77
	BS-MW52-94-10-33.5	m	5	0.87	44	0.5	0.5	22	11	7	2.5	0.2	2.5	17	0.5	1	5	32	29
	BS-MW52-94-10-39.1	m	5	0.83	127	0.5	0.5	59	16	53	3.3	0.2	2.5	38	0.6	1	5	78	57
	BS-MW52-94-10-43.5	m	5	0.63	166	0.71	0.5	50	19	47	3.7	0.2	2.6	42	0.6	1	6	74	105
	BS-MW52-94-10-48.6	m	5	1.5	172	0.64	0.6	45	18	37	3.7	0.2	2.5	43	0.5	1	5	58	59
	BS-MW52-94-10-53.6	m	5	0.6	84	0.5	0.5	45	17	57	2.5	0.2	2.5	20	0.5	1	5	41	65
	BS-MW52-94-10-58.5	o	5	2.5	110	0.5	0.5	93	19	47	3.4	0.2	2.5	173	0.5	1	5	57	72
	BS-MW52-94-10-63.6	o	5	2	55	0.5	0.5	81	10	37	2.5	0.2	2.6	85	0.6	1	5	40	56
	BS-MW52-94-10-68.5	o	5	5.6	141	0.61	0.6	54	11	40	4.9	0.2	2.5	58	0.6	1	5	38	73
MW51-94-11	BS-MW51-94-11-2.6	m	5	3.4	153	0.52	0.5	62	14	41	4	0.2	2.5	85	0.5	1	5	47	87
	BS-MW51-94-11-5	m	5	2.9	190	0.5	0.5	92	17	38	2.5	0.2	2.5	132	0.6	1	5	52	63
	BS-MW51-94-11-14	m	5	8.9	185	0.5	0.5	75	14	29	3.8	0.2	2.5	85	0.5	1	5	64	65
	BS-MW51-94-11-19	o	5	10	232	0.5	0.5	43	9.5	21	3.8	0.2	2.6	63	0.5	1	5	38	51
	BS-MW51-94-11-24.3	o	5	6.5	242	0.5	0.6	48	11	28	4.4	0.2	2.5	61	0.5	1	5	34	56
	BS-MW51-94-11-29.3	o	5	2.9	188	0.5	0.55	30	8.2	47	3.7	0.2	2.5	45	0.5	1	5	25	57
	BS-MW51-94-11-9.3	m	5	0.95	175	0.5	0.5	86	14	33	2.5	0.2	2.5	84	0.5	1	5	66	58
MW25-94-12	BS-MW25-94-12-4.2	f/c	5	2.4	115	0.5	0.5	41	17	39	5.3	0.2	2.5	91	0.5	1	5	78	55
	BS-MW25-94-12-10	f/c	5	3.9	109	0.5	0.5	51	18	29	5.1	0.2	2.5	90	0.5	1	5	77	80
	BS-MW26-94-12-14.2	m	5	2.3	101	0.5	0.5	47	22	43	2.5	0.2	2.5	65	0.5	1	5	83	61
	BS-MW25-94-12-19	m	5	0.5	132	0.51	0.5	40	17	24	2.5	0.2	2.5	16	0.5	1	5	77	73
	BS-MW25-94-12-24	m	5	0.5	126	0.5	0.5	31	18	15	2.5	0.2	2.5	26	0.5	1	5	60	70
	BS-MW25-94-12-34	m	5	0.5	183	0.5	0.5	16	20	14	2.5	0.2	2.5	20	0.5	1	5	41	45
	BS-MW25-94-12-39.1	o	5	2.7	83	0.5	0.5	64	15	35	4.3	0.2	2.5	97	0.5	1	5	41	67
	BS-MW25-94-12-49	o	5	4.6	152	0.55	0.6	53	13	35	4.9	0.2	2.5	78	0.6	1	5	34	67
	BS-MW25-94-12-54.3	o	5	3.9	120	0.5	0.5	48	10	28	3.1	0.2	2.5	55	0.5	1	5	29	48
	BS-MW25-94-12-59.1	o	5	10	282	0.61	0.5	59	11	42	5.3	0.2	2.5	83	0.5	1	5	34	64
	BS-MW25-94-12-64.1	o	5	0.5	182	0.5	0.5	55	12	37	2.9	0.2	2.5	71	0.5	1	5	35	66
	BS-MW25-94-12-69	o	5	0.59	158	0.5	16	55	12	33	2.8	0.2	2.5	70	0.5	1	5	33	60
	BS-MW25-94-12-74	o	5	7.5	252	0.62	0.5	86	15	98	8.3	0.2	2.5	109	0.5	1	5	62	90
MW16-94-13	BS-MW16-94-13-6.5	f/c	5	2.2	85	0.5	0.5	94	16	31	5.1	0.2	2.5	132	0.5	1	5	56	50
	BS-MW16-94-13-11	m	5	2.3	133	0.5	0.52	478	18	48	3.7	0.29	2.5	166	0.5	1	5	80	63
	BS-MW16-94-13-15.7	o	5	1.9	91	0.5	0.5	43	15	38	7.1	0.2	2.5	66	0.5	1	5	28	57
	BS-MW16-94-13-20.2	o	5	1.3	129	0.5	0.5	46	14	47	6.3	0.23	2.5	67	0.5	1	5	34	67
	BS-MW16-94-13-25.4	o	5	1	152	0.5	0.5	46	12	44	4.6	0.2	2.5	71	0.5	1	5	37	64
	BS-MW16-94-13-30.8	o	5	0.5	236	0.55	0.6	27	8.1	33	7.7	0.2	2.5	46	0.5	1	5	83	45
	BS-MW16-94-13-35.1	o	5	3.4	169	0.56	0.5	60	16	48	7.7	0.2	2.5	82	0.5	1	5	55	73
	BS-MW16-94-13-40.3	o	5	5.1	236	0.51	0.5	61	15	66	6.4	0.2	2.5	101	0.5	1	5	51	75
	BS-MW16-94-13-45	o	5	26	206	0.5	0.58	43	12	27	5.5	0.2	2.5	74	0.5	1	5	38	53
MW58A-94-14	BS-MW58A-94-14-6	f/c	5	0.54	69	0.5	0.5	61	19	23	2.5	0.2	2.5	31	0.5	1	5	78	52
	BS-MW58A-94-14-11	f/c	5	0.98	99	0.5	0.5	92	18	31	7.5	0.2	2.5	71	0.5	1	5	81	65
	BS-MW58A-94-14-15	m	5	3.7	113	0.6	1.5	68	15	72	20	0.2	2.5	41	0.5	1	5	65	
	BS-MW58A-94-14-21	m	5	0.6	107	0.5	0.5	76	17	19	2.5	0.2	2.5	31	0.5	1	5	60	54
	BS-MW58A-94-14-23	m	5	0.5	48	0.5	0.6	70	14	19	2.5	0.2	2.5	26	0.5	1	5	42	57
	BS-MW58A-94-14-26	o	5	0.5	132	0.5	0.5	64	17	24	2.5	0.2	2.5	79	0.5	1	5	57	55
	BS-MW58A-94-14-31	o	5	0.5	117	0.5	0.5	80	17	29	2.5	0.2	2.5	33	0.5	1	5	70	46
	BS-MW58A-94-14-36	o	5	0.96	126	0.5	0.5	69	17	27	2.5	0.2	2.5	39	0.5	1	5	55	51
MW91-1	91-1-S1	f/c	2	3	48	0.3	0.2	45	17	13	3	0.2	0.8	27	2	0.2	3	33	40
	91-1-S2	o	2	4	110	0.5	0.2	42	8.4	14	7	0.2	0.6	51	2	0.2	3	25	42
	91-1-S3	o	2	2	73	0.6	0.2	58	13	31	6	0.2	0.6	82	2	0.2	3	54	56
	91-1-S4	o	2	2	290	0.7	0.2	63	17	20	9	0.2	0.6	96	2	0.2	3	46	60
	91-1-S5	o	2	2	120	0.5	0.2	57	13	25	6	0.2	0.6	68	2	0.2	3	39	52
	91-1-S6	o	2	4	170	0.7	0.2	87	16	63	2	0.2	0.8	110	2	0.2	3	51	140
	91-1-S7	o	2	5	140	0.7	0.2	66	15	31	7	0.2	0.6	98	2	0.2	3	36	58
	91-1-S8	o	2	6	57	0.5	0.2	72	13	26	4	0.2	0.6	90	2	0.2	3	38	48
	91-1-SC	o	2	6	210	0.8	0.2	81	16	32	8	0.2	0.6	110	2	0.2	3	47	69
MW91-2	91-2-S1	f/c	2	3	76	0.6	0.2	56	20	30	4	0.2	0.8	29	2	0.2	3	45	51
	91-2-S2	f/c	2	3	72	0.6	0.2	64	19	19	7	0.2	0.6	36	2	0.2	3	53	104
	91-2-S3	o	2	3	130	0.5	0.2	65	14	29	7	0.2	0.6	80	2	0.2	3	47	93
	91-2-S4	o	2	2	130	0.6	0.2	58	15	26	8	0.2	0.6	68	2	0.2	3	53	28
	91-2-S5	o	2	1	140	0.6	0.2	59	13	26	7	0.2	0.8	77	2	0.2	5	47	35
	91-2-S6	o	2	1	100	0.5	0.2	53	13	28	8	0.2	0.6	77	2	0.2	4	39	54
	91-2-S7	o	2	4	88	0.6	0.2	64	22	41	5	0.2	0.6	62	2	0.2	4	66	20
	91-2-S8	o	2	2	110	0.9	0.2	92	17	27	12	0.2	0.6	110	2	0.2	9	64	68
	91-2-S9	o	2	2	330	0.9	0.2	81	20	25	11	0.2	0.8	110	2	0.2	10	62	63

TABLE 1

Metals Concentrations in soils used to calculate background (in mg/kg)

Location	Sample ID	Geol. Unit	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	Vn	Zn
MW91-2	91-2-SC	o	2	3	490	0.6	0.2	83	16	28	9	0.2	0.6	91	2	0.2	3	58	65
MW91-3	91-3-S1	f/c	2	2	75	0.6	0.2	59	13	23	7	0.2	0.6	75	2	0.2	5	39	52
	91-3-S2	o	2	4	100	0.6	0.2	54	12	21	7	0.2	0.6	64	2	0.2	3	33	48
	91-3-S3	o	2	3	190	0.7	0.2	69	12	30	8	0.2	0.6	87	2	0.2	6	39	53
	91-3-S4	o	2	2	240	0.5	0.2	46	11	24	5	0.2	0.6	61	2	0.2	3	32	45
	91-3-S5	o	2	5	100	0.7	0.3	74	14	29	10	0.2	0.6	96	2	0.3	3	34	65
MW91-3	91-3-S6	o	2	4	180	0.5	0.2	56	16	31	7	0.2	0.6	82	2	0.2	3	46	59
	91-3-S7	o	2	3	180	0.6	0.2	64	15	27	7	0.2	0.6	99	2	0.2	3	41	65
MW91-4	91-4-S1	f/c	2	1	150	0.6	0.2	74	15	35	14	0.2	0.6	100	2	0.2	10	57	67
	91-4-S2	o	2	2	140	0.7	0.2	86	16	46	16	0.2	0.6	97	2	0.2	14	62	84
	91-4-S3	o	2	1	220	0.8	0.2	85	19	26	14	0.2	0.6	76	2	0.2	11	71	49
	91-4-S4	o	2	1	140	0.8	0.2	77	17	29	16	0.2	0.6	96	2	0.2	16	62	77
	91-4-S5	o	2	1	220	0.7	0.3	62	15	29	15	0.2	0.6	100	2	0.2	4	48	68
	91-4-S6	o	2	1	170	0.6	0.3	60	15	36	13	0.2	0.6	88	2	0.2	10	42	70
	91-4-S7	o	2	1	240	0.6	0.2	55	14	30	13	0.2	0.6	84	2	0.2	4	53	66
MW91-5	91-5-S1	f/c	2	4	130	0.6	0.2	59	13	27	6	0.2	0.6	84	2	0.2	3	38	53
	91-5-S2	f/c	2	4	84	0.7	0.2	65	17	23	8	0.2	0.6	94	2	0.2	3	53	62
	91-5-S3	o	2	3	51	0.5	0.2	67	18	39	3	0.2	0.6	50	2	0.2	3	59	27
	91-5-S4	o	2	4	40	0.5	0.2	58	17	37	3	0.2	0.6	46	2	0.2	3	60	30
	91-5-S5	o	2	16	400	0.9	0.2	69	13	35	10	0.2	0.6	89	16	0.2	3	44	69
	91-5-S6	o	2	3	490	0.6	0.8	52	12	21	9	0.2	0.6	80	2	0.3	3	41	61
	91-5-S7	o	2	3	190	0.6	0.2	48	11	20	6	0.2	0.6	68	2	0.2	3	43	47
	91-5-SC	o	2	3	270	0.8	0.2	82	16	31	9	0.2	0.6	93	2	0.2	3	62	68
MW91-6	91-6-S1	f/c	2	9	99	0.7	0.2	76	15	32	12	0.2	0.6	99	2	0.2	9	52	61
	91-6-S2	o	2	10	100	0.7	0.2	79	18	36	14	0.2	0.6	98	2	0.2	18	70	62
	91-6-S3	o	2	15	100	0.8	0.2	71	16	32	12	0.2	0.6	83	2	0.2	9	63	54
	91-6-S4	o	2	8	88	0.5	0.2	60	13	27	7	0.2	0.6	56	2	0.2	4	59	41
	91-6-S5	o	2	10	73	0.5	0.2	49	19	40	7	0.2	0.6	54	2	0.2	3	62	52
	91-6-S6	o	2	9	100	0.6	0.2	66	14	87	10	0.2	0.6	72	2	0.2	3	49	84
MW91-7	91-7-S1	f/c	2	3	130	0.9	0.2	70	18	18	12	0.2	0.6	32	2	0.2	72	72	43
	91-7-S2	f/c	2	4	170	1	0.2	73	23	19	8	0.2	0.6	31	2	0.2	77	77	41
	91-7-S3	m	2	2	110	0.9	0.2	41	18	10	4	0.2	0.6	28	2	0.2	130	130	27
	91-7-S4	m	2	2	150	0.8	0.2	67	23	24	7	0.2	0.6	31	2	0.3	59	59	51
	91-7-S5	m	2	1	93	0.6	0.2	66	23	24	5	0.2	0.6	32	2	0.2	40	40	52
	91-7-S6	m	2	2	100	0.5	0.2	49	16	20	4	0.2	0.6	23	2	0.2	52	52	48
	91-7-S7	m	2	2	46	0.4	0.2	46	16	11	4	0.2	0.6	21	2	0.2	42	42	40
	91-7-S8	m	2	1	29	0.3	0.2	35	12	6	2	0.2	0.6	18	2	0.2	22	22	37
	91-7-S9	m	2	1	50	0.4	0.2	70	18	26	4	0.2	0.6	36	2	0.2	64	64	62
	91-7-S10	m	2	1	33	0.3	0.2	73	23	13	3	0.2	0.6	34	2	0.2	27	27	70
	91-7-S11	m	2	1	27	0.2	0.2	34	13	14	2	0.2	0.6	16	2	0.2	18	18	45
	91-7-S12	m	2	1	36	0.3	0.2	36	13	14	2	0.2	0.6	19	2	0.2	27	27	45
MW91-8	91-8-S1	m	2	3	44	0.5	0.2	50	21	19	4	0.2	0.6	26	2	0.2	3	31	65
	91-8-S2	m	2	3	54	0.4	0.2	58	20	13	5	0.2	0.6	31	2	0.2	3	44	50
	91-8-S3	m	2	3	73	0.4	0.3	58	19	9	5	0.2	0.6	24	2	0.2	3	53	44
	91-8-S4	m	2	2	42	0.3	0.2	55	14	7	3	0.2	0.6	22	2	0.2	3	37	36
MW91-9	91-9-S1	f/c	2	11	120	0.6	0.3	86	19	17	12	0.2	0.6	86	2	0.2	66	66	34
	91-8-S2	o	2	8	120	0.7	0.2	57	18	21	10	0.2	0.6	54	2	0.2	64	64	58
	91-8-S3	o	2	8	130	0.6	0.4	47	13	27	10	0.2	0.6	73	2	0.2	39	39	56
	91-9-S4	o	2	5	82	0.3	0.4	61	12	20	8	0.2	0.6	77	2	0.2	41	41	39
MWP-1	MWP1-S1	f/c	2	2	110	0.7	0.2	56	14	22	9	0.2	0.6	40	2	0.2	3	52	48
	MWP1-S2	f/c	2	3	170	0.8	0.2	41	12	32	14	0.2	0.6	41	2	0.2	6	48	66
	MWP1-S3	f/c	2	9	130	0.7	0.2	33	13	41	11	0.2	0.6	33	2	0.2	4	44	77
	MWP1-S4	f/c	2	5	150	0.7	0.2	99	16	40	7	0.2	0.6	120	2	0.2	5	53	52
	MWP1-S5	f/c	2	4	110	0.6	0.2	67	14	33	7	0.2	0.6	91	2	0.3	6	43	50
	MWP1-S6	f/c	2	5	120	0.6	0.2	50	12	33	6	0.2	0.6	85	2	0.2	5	34	46
	MWP1-S7	f/c	2	6	130	0.7	0.2	56	11	24	8	0.2	0.6	52	2	0.2	3	44	56
	MWP1-S8	f/c	2	6	140	0.6	0.2	50	20	21	6	0.2	0.6	38	2	0.2	2	47	51
	MWP1-S8	gv	2	4	82	0.7	0.2	63	18	16	6	0.2	0.6	36	2	0.2	3	62	43
MWP-2	MWP2-S1	f/c	2	13	180	0.9	0.4	39	15	41	31	0.2	0.6	39	2	0.2	4	55	97
	MWP2-S2	gv	2	9	180	0.7	0.4	34	11	14	14	0.2	0.6	19	2	0.3	3	62	64
	MWP2-S3	gv	2	11	64	0.8	0.2	38	20	53	17	0.2	0.6	48	2	0.2	12	54	110
	MWP2-S4	gv	2	9	120	0.7	0.2	36	15	45	15	0.2	0.6	40	2	0.3	4	46	110
	MWP2-S5	gv	2	8	55	0.7	0.2	36	13	40	16	0.2	0.6	41	2	0.2	8	46	99
	MWP2-S6	gv	2	8	71	0.8	0.2	37	15	41	18	0.2	0.6	40	2	0.2	14	54	84
	MWP2-S7	gv	2	8	98	0.6	0.2	29	13	23	12	0.2	0.6	27	2	0.5	3	39	63
MWP-4	MWP4-S1	f/c	2	12	120	0.7	0.2	36	12	30	12	0.2	0.6	31	2	0.2	7	53	72
	MWP4-S2	gv	2	14	210	0.8	0.3	35	17	45	14	0.2	0.6	44	2	0.2	10	49	100
	MWP4-S3	gv	2	8	190	0.8	0.6	37	17	48	16	0.2	0.6	59	2	0.3	3	52	97
	MWP4-S4	gv	2	15	130	0.7	0.2	35	17	49	15	0.2	0.6	40	2	0.2	7	50	92
	MWP4-S5	gv	2	11	190	0.7	0.2	31	22	43	14	0.2	0.6	34	2	0.2	3	54	90
	MWP4-S6	gv	2	9	140	0.7	0.2	36	17	53	14	0.2	0.6	42	2	0.3	5	50	93

TABLE 1

Metals Concentrations in soils used to calculate background (in mg/kg)

Location	Sample ID	Geol Unit	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	Vn	Zn
MWP-4	MWP4-S7	gv	2	14	67	0.6	0.2	33	14	43	13	0.2	0.6	39	2	0.2	7	49	85
	MWP4-S8	gv	2	12	110	0.7	0.2	38	15	50	14	0.2	0.6	40	2	0.3	6	57	90
	MWP4-S9	gv	2	9	76	0.7	0.2	31	15	43	13	0.2	0.6	36	2	0.3	5	42	89
MWP-5	MWP5-S1	f/c	2	8	210	0.7	0.2	37	14	37	14	0.2	0.6	41	2	0.4	3	38	90
	MWP5-S2	gv	2	7	270	0.8	0.2	38	15	41	16	0.2	0.6	39	2	0.2	3	54	78
	MWP5-S3	gv	2	14	200	0.8	0.2	35	14	47	16	0.2	0.6	38	2	0.2	7	44	93
	MWP5-S4	gv	2	8	130	0.5	0.2	27	20	38	13	0.2	0.6	30	2	0.2	4	40	78
MWP-5	MWP5-S5	gv	2	13	160	0.6	0.4	28	27	41	23	0.2	0.6	52	2	0.4	3	35	100
	MWP5-S6	gv	2	5	170	0.8	0.2	33	19	53	19	0.2	0.6	43	2	0.2	7	43	110
	MWP5-S7	gv	2	4	160	0.6	0.2	33	10	41	12	0.2	0.6	35	2	0.2	6	31	90
	MWP5-S8	gv	2	10	63	0.7	0.2	35	15	45	13	0.2	0.6	46	2	0.2	8	42	86
	MWP5-S9	gv	2	10	79	0.6	0.2	32	15	51	14	0.2	0.6	42	2	0.2	6	41	90
	MWP5-S10	gv	2	7	69	0.7	0.2	35	15	47	13	0.2	0.6	41	2	0.4	8	41	95
	MWP5-S11	gv	2	10	73	0.5	0.2	32	15	45	12	0.2	0.6	47	2	0.3	7	39	84
	MWP5-S12	gv	2	12	55	0.5	0.2	31	14	37	10	0.2	0.6	38	2	0.3	6	40	75
	MWP5-S13	gv	2	5	54	0.7	0.2	38	14	51	13	0.2	0.6	42	2	0.3	9	42	94
	MWP5-S14	gv	2	12	240	0.6	0.2	31	13	43	14	0.2	0.6	39	2	0.4	5	37	80
	MWP5-S15	gv	2	24	47	0.6	0.2	31	13	37	10	0.2	0.6	41	2	0.3	6	38	82
	MWP5-S16	gv	2	8	59	0.5	0.2	28	12	29	10	0.2	0.6	35	2	0.2	7	36	68
	MWP5-S17	gv	2	14	55	0.6	0.2	36	16	39	13	0.2	0.6	51	2	0.2	7	43	85
	MWP5-S18	gv	2	8	52	0.7	0.2	35	13	40	10	0.2	0.6	39	2	0.3	5	39	80
MWP-6	MWP6-S1	f/c	2	7	220	0.9	0.2	41	17	45	16	0.2	0.6	44	2	0.2	3	60	90
	MWP6-S2	gv	2	9	180	1	0.2	39	14	53	15	0.2	0.6	42	2	0.2	5	47	110
	MWP6-S3	gv	2	10	160	0.8	0.2	39	20	57	23	0.2	0.6	53	2	0.2	3	53	100
	MWP6-S4	gv	2	6	180	0.8	0.2	37	14	52	15	0.2	0.6	44	2	0.2	3	47	100
	MWP6-S5	gv	2	4	58	0.8	0.2	39	13	55	15	0.2	0.6	40	2	0.2	7	51	110
	MWP6-S6	gv	2	13	69	0.5	0.2	26	16	51	12	0.2	0.6	44	2	0.8	3	34	79
MWP-7	MWP7-S1	f/c	2	8	160	0.6	0.2	41	12	30	10	0.2	0.6	46	2	0.2	3	38	72
	MWP7-S2	o	2	8	210	0.7	0.2	51	14	40	12	0.2	0.6	70	2	0.2	3	50	120
	MWP7-S3	o	2	9	280	0.9	0.2	73	14	28	12	0.2	0.6	110	2	0.2	4	34	88
	MWP7-S4	gv	2	4	170	0.6	0.2	41	9	20	20	0.2	0.6	47	2	0.2	3	33	49
	MWP7-S5	gv	2	2	65	0.5	0.2	17	3.5	6	9	0.2	0.6	7	2	0.2	3	28	32
	MWP7-S6	gv	2	2	310	0.7	0.2	32	13	37	12	0.2	0.6	36	2	0.2	3	48	80
	MWP7-S7	gv	2	2	120	0.6	0.3	33	14	62	12	0.2	0.6	36	2	0.2	3	45	95
MWP-8	MWP8-S1	f/c	2	5	140	0.6	0.2	74	20	26	10	0.2	0.6	27	2	0.2	3	47	68
	MWP8-S2	f/c	2	3	84	0.6	0.2	58	12	32	8	0.2	0.6	74	2	0.2	3	37	53
	MWP8-S3	f/c	2	6	290	0.7	0.2	100	14	34	10	0.2	0.6	120	2	0.2	3	64	81
	MWP8-S4	o	2	2	110	0.5	0.2	22	7.6	18	8	0.2	0.6	24	2	0.2	3	26	45
	MWP8-S5	o	2	2	170	0.7	0.2	32	12	42	10	0.2	0.6	42	2	0.2	3	35	70
	MWP8-S6	o	2	1	110	0.3	0.2	21	6.1	8	7	0.2	0.6	24	2	0.2	3	14	33
	MWP8-S7	o	2	2	97	0.6	0.2	31	9.2	28	9	0.2	0.6	32	2	0.2	3	30	50
	MWP8-S8	o	2	4	88	0.5	0.2	37	8.5	17	8	0.2	0.6	29	2	0.2	3	27	47
	MWP8-S9	o	2	4	83	0.6	0.2	26	5.8	25	10	0.2	0.6	25	2	0.2	3	22	47
MWP-9	MWP9-S1	f/c	2	3	160	0.5	0.2	46	10	30	6	0.2	0.6	79	2	0.2	3	16	58
	MWP9-S11	o	2	7	82	0.3	0.2	36	5.5	7	4	0.2	0.6	47	2	0.2	3	24	30
	MWP9-S2	o	2	3	180	0.7	0.2	83	13	22	8	0.2	0.6	120	2	0.2	3	36	76
	MWP9-S3	o	2	3	140	0.6	0.6	59	8.8	25	7	0.2	0.6	73	2	0.2	3	39	55
	MWP9-S4	o	2	11	40	0.5	0.2	54	8.9	23	7	0.2	0.6	82	2	0.2	3	28	52
	MWP9-S5	o	2	3	87	0.5	0.2	59	8.8	21	6	0.2	0.6	71	2	0.2	3	27	45
	MWP9-S6	o	2	27	100	0.7	0.2	69	9	25	8	0.2	0.6	82	2	0.2	3	32	63
	MWP9-S7	o	2	3	80	0.5	0.2	46	10	27	8	0.2	0.6	79	2	0.2	3	24	54
	MWP9-S8	o	2	2	130	0.6	0.2	45	7.5	23	7	0.2	0.6	69	2	0.3	3	23	59
	MWP9-S9	o	2	4	140	0.6	0.2	45	8.2	25	7	0.2	0.9	65	2	0.2	3	26	51
	MWP9-S100	o	2	12	140	0.7	0.3	57	11	32	8	0.2	0.9	78	2	0.2	5	26	64
MWP-10	MWP10-S1	f/c	2	3	110	0.5	0.2	67	14	39	7	0.2	0.6	81	2	0.2	3	44	64
	MWP10-S2	f/c	2	2	140	0.6	0.2	52	15	24	7	0.2	0.6	110	2	0.2	3	37	76
	MWP10-S3	f/c	2	4	110	0.6	0.3	68	17	16	9	0.2	0.6	140	2	0.2	3	34	79
	MWP10-S4	f/c	2	3	150	0.7	0.2	76	14	36	7	0.2	0.6	95	2	0.2	3	47	79
	MWP10-S5	o	2	3	130	0.4	0.2	59	13	34	6	0.2	0.6	84	2	0.2	3	33	66
	MWP10-S6	o	2	5	160	0.8	0.5	69	15	40	9	0.2	0.6	110	2	0.2	3	35	86
	MWP10-S7	o	2	3	220	0.5	0.2	67	9.9	42	8	0.2	0.6	94	2	0.2	3	32	72
	MWP10-S8	o	2	2	170	0.5	0.2	47	8	22	7	0.2	0.6	69	2	0.2	3	22	54
	MWP10-S9	o	2	4	130	0.4	0.2	41	7.1	25	6	0.2	0.6	54	2	0.2	3	23	50
	MWP10-S10	o	2	30	190	0.6	0.2	64	14	41	9	0.2	0.6	93	2	0.2	4	34	86
	MWP10-S11	o	2	9	180	0.6	0.2	63	12	28	8	0.2	0.6	95	2	0.2	3	35	66
	MWP10-S12	o	2	6	210	0.6	0.2	56	11	44	12	0.2	0.6	100	2	0.2	4	24	76
	MWP10-S13	o	2	7	190	0.7	0.2	64	10	37	9	0.2	0.6	89	2	0.2	3	33	64

Geologic Formations:
f/c - Fill/Colluvium
gv - Great Valley
m - Moraga
o - Orinda
sp - San Pablo

TABLE 2

Parameters Used to Determine Upper 95% Confidence Limit for Background Soil Metals Data

(Concentrations in mg/kg)

	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	Vn	Zn
Site Background	5.5	19.1	323.6	1	2.7	99.6	22.2	69.4	16.1	0.4	7.4	119.8	5.6	1.8	27.1	74.3	106.1
Colluvium & Fill																	
Mean (Xav)	2.77	5.39	126.33	0.50	0.46	51.34	13.67	29.05	6.86	0.17	1.26	59.23	1.60	0.55	7.72	44.49	57.37
Standard Deviation (σ)	1.62	4.47	120.84	0.21	0.55	20.81	4.33	15.90	4.05	0.09	0.99	31.67	2.09	0.57	18.07	17.50	17.74
Tolerance Factor (K)	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924
Great Valley																	
Mean (Xav)	2.63	12.53	107.43	0.58	0.73	36.06	14.40	46.95	12.21	0.19	1.24	41.48	1.62	0.56	4.24	45.49	90.00
Standard Deviation (σ)	1.90	9.59	73.30	0.22	1.31	11.93	5.78	27.43	4.84	0.22	1.32	14.68	1.68	0.86	2.33	12.37	23.87
Tolerance Factor (K)	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924
Moraga Formation																	
Mean (Xav)	2.74	2.82	71.80	0.36	0.71	52.80	15.76	24.26	2.84	0.13	1.61	36.50	1.35	0.68	7.41	45.68	52.44
Standard Deviation (σ)	1.77	3.35	42.78	0.22	0.98	46.38	3.82	15.52	3.13	0.06	1.14	33.22	1.76	0.68	16.36	23.08	16.76
Tolerance Factor (K)	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924	1.924
Orinda Formation																	
Mean (Xav)	2.55	6.31	169.83	0.56	0.65	54.48	12.54	31.91	7.17	0.18	1.77	75.39	1.85	0.58	5.16	39.87	60.89
Standard Deviation (σ)	1.46	6.27	131.30	0.28	1.45	22.16	4.41	19.05	4.17	0.06	5.25	37.49	2.83	0.70	7.96	16.02	20.33
Tolerance Factor (K)	1.838	1.838	1.838	1.838	1.838	1.838	1.838	1.838	1.838	1.838	1.838	1.838	1.838	1.838	1.838	1.838	1.838
San Pablo Group																	
Mean (Xav)	2.69	4.14	102.28	0.36	0.73	25.55	7.44	16.35	5.42	0.22	1.16	46.25	1.59	0.48	4.62	12.68	43.54
Standard Deviation (σ)	1.65	4.34	66.55	0.17	0.83	19.88	5.44	9.20	1.81	0.09	0.96	29.83	1.23	0.37	2.36	8.80	20.28
Tolerance Factor (K)	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67

TABLE 3
BACKGROUND CONCENTRATIONS OF METALS
(Concentrations in mg/kg)

	Number of Samples	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	Vn	Zn
Site Background	498	5.5	19.1	323.6	1.0	2.7	99.6	22.2	69.4	16.1	0.4	7.4	119.8	5.6	1.8	27.1	74.3	106.1
Colluvium & Fill	97	5.9	14.0	358.8	0.9	1.5	91.4	22.0	59.6	14.7	0.3	3.2	120.2	5.6	1.7	42.5	78.2	91.5
Great Valley Group	97	6.3	31.0	248.5	1.0	3.2	59.0	25.5	99.7	21.5	0.6	3.8	69.7	4.8	2.2	8.7	69.3	135.9
Moraga Formation	101	6.1	9.3	154.1	0.8	2.6	142.2	23.1	54.1	8.9	0.3	3.8	100.4	4.7	2.0	38.9	90.1	84.7
Orinda Formation	184	5.2	17.8	411.2	1.1	3.3	95.2	20.6	66.9	14.8	0.3	11.4	144.3	7.0	1.9	19.8	69.3	98.3
San Pablo Group	13	7.1	15.7	280.0	0.8	2.9	78.6	22.0	40.9	10.3	0.4	3.7	125.9	4.9	1.5	10.9	36.2	97.7

Note: Background concentrations determined for Upper 95% Confidence Limit (UCL) from data from 71 monitoring well borings.

FINAL SOIL MANAGEMENT PROTOCOL

PART OF

OAKLAND INTERNATIONAL AIRPORT MATERIALS MANAGEMENT PROGRAM

OCTOBER 2005

For:

Port of Oakland
Oakland, California

Y5395-01

5900 Hollis Street, Suite D • Emeryville, CA 94608 • (510) 420-8686

FINAL
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SOIL MANAGEMENT PROTOCOL
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1.0 INTRODUCTION

This document constitutes a Soil Management Protocol ("SMP"), part of the Oakland International Airport ("OIA") Materials Management Program ("MMP"), prepared by the Port of Oakland ("Port"). The MMP was evaluated for potential environmental impacts in accordance with the California Environmental Quality Act ("CEQA") in August 2004. The MMP and the CEQA document, an Initial Study/Negative Declaration ("Neg. Dec."), were adopted by the Board of Port Commissioners on 7 September 2004 ("August 2004 Neg. Dec."). In December 2004, the Port prepared a Draft Subsequent Initial Study/Negative Declaration for the MMP; that document is currently in public review ("December 2004 Neg. Dec.").

The MMP provides for Material Management Sites on Port-owned properties within OIA where construction debris (e.g., concrete and asphalt) associated with OIA construction projects can be processed and recycled/reused, as well as where excavated soils can be stockpiled prior to reuse on Port-owned properties within OIA. The boundaries of OIA are depicted on Figure 1.

The objective of this SMP is to specify appropriate protocols to be followed by the Port and its contractors to ensure that excess soil from Port construction projects within OIA, stored at the Materials Management Sites prior to reuse, do not pose a potential threat to human health and the environment during storage or after reuse as fill within OIA.

2.0 PROJECT DESCRIPTION

This SMP consists of protocols for soil characterization and soil management activities at the point of origin ("Soil Source Site"), at the stockpile storage areas at the Materials Management Site(s) ("Storage Site"), and at the locations where the soil will be reused for fill ("Reuse Site"). All Soil Source Sites, Storage Sites, and Reuse Sites will be located on Port-owned properties within OIA.

The OIA area consists of about 2,500 acres of land in the southwestern portion of the City of Oakland. The Oakland General Plan Land Use and Transportation Element (City of Oakland, 1998) designates OIA as General Industrial/Transportation, and OIA is zoned as industrial and commercial.

2.1 Soil Source Sites

Soil Source Sites consist of locations within OIA where construction activities will generate excavated soil. Construction activities within OIA include: utility installation and maintenance; development projects for parking areas, buildings, roadways, taxi ways and aprons; and reconfiguration of existing facilities. Prior to construction activities at Soil Source Sites, the Port will have completed the appropriate planning process, as applicable. These activities may include obtaining permits from local, state, and/or federal agencies, and preparation of CEQA and/or National Environmental Policy Act ("NEPA") documentation.

The Soil Source Sites Protocol (Section 3.1, below) requires that only soil that has been fully characterized, that meets environmental screening levels ("ESLs"), as developed by the RWQCB (RWQCB, 2005) for chemicals of potential concern ("COPCs"), and that has been demonstrated to be nonhazardous wastes may be transported to the Storage Sites, and subsequently reused as fill on the Reuse Sites.

Excavated soil resulting from small, routine utility maintenance activities (i.e., generating less than 500 in-place cubic yards) in or near utility corridors, will be reused within the same excavations without characterization, unless those soils are contaminated based on visual observations or odorous conditions. Odorous or visually contaminated soil from excavations associated with routine utility maintenance activities will be characterized and disposed of off-site at a permitted facility. A separate protocol will be followed for managing excavated soil from small, routine utility maintenance projects (Protocol 5, below).

2.2 Storage Sites

Soil from Soil Source Sites will be transported and stored at the Storage Sites, after the soil has been deemed appropriate for transfer to the Storage Sites in accordance with the Soil Source Site Protocols (Section 3.1, below). The soil will be stored at the Storage Sites until transported to Reuse Sites within OIA where a need for fill has been identified.

The Storage Site Protocols (Section 3.2, below) requires management of soil stockpiles to ensure that the soil does not migrate, by wind or water, to off-site areas, and does not have the potential to affect water quality, biological resources, or public health.

2.3 Reuse Sites

Soil from Storage Sites will be reused on Reuse Sites within OIA. Reuse Sites will be development sites that have undergone the Port's planning process. The planning process will have included obtaining local, state, and/or federal permits and have been subject to CEQA and/or NEPA review, as applicable.

The Reuse Site Protocols (Section 3.3, below) requires that all applicable permits for fill placement have been obtained and the development activities at Reuse Sites have been subject to CEQA/NEPA review, as necessary.

3.0 PROTOCOLS

The protocols described in this section will be implemented by the Port for all Soil Source Sites, Storage Sites, and Reuse Sites.

3.1 Soil Source Site Protocol

Shallow soils within OIA is artificial fill. The North Field was gradually filled between 1927 and 1945 with silts, sands, clays, and organic materials dredged from San Leandro Bay and with imported fill. The perimeter levee around the South Field was constructed in the mid- 1950s and the area mostly filled between 1957 and1968 with eight to 15 feet of hydraulically dredge sands; additional filling has occurred under permits from the U.S. Army Corps of Engineers and for emergency repairs. The fill is underlain by Young Bay Mud; Young Bay Mud is underlain by native coarser-grained sediment (e.g., the San Antonio Formation, including the Merritt Sands). The perimeter levee around the South Field is between about 11 and 13 feet above the National Geodetic Vertical Datum.

Groundwater occurs at relatively shallow depths, generally between about one to six feet below the ground surface ("bgs"). Since about 1989, the Port has collected total dissolved solids ("TDS") data from groundwater investigations in the OIA and adjacent Lew Galbraith Golf Course. Review of those data show that the mean TDS concentrations of the shallow groundwater exceeds 10,000 mg/L, indicating that the shallow groundwater underlying OIA is not a potential source of drinking water according to the criteria contained in State Water Resources Control Board Resolution No. 88-63.

Excavation for construction activities within OIA are expected to generate three general types of materials (depending on the depth of excavation): artificial fill, Young Bay Mud, and/or native sediments underneath the Young Bay Mud. These types of materials will exhibit different chemical characteristics.

The chemical characteristics of the artificial fill will be related to the source of the fill and historic or current land uses. The chemical characteristics of the Young Bay Mud and the native sediments may have been affected by historic or current land uses, contaminated groundwater migrating through the materials, and/or leaching of contaminants from overlying potentially contaminated artificial fill.

These protocols require that each type of material to be excavated from a given Soil Source Site must be characterized separately and in a manner that will be representative. This requires both an identification of the COPCs for the soil to be excavated for each type of material, and the implementation of an appropriate sampling methodology, in terms of both the number of samples and choice of sample locations.

Identification of COPCs will be based on research into the land use history of the Soil Source Site in substantial compliance with ASTM standards for a Phase I site assessment (ASTM Standard E1527-00). If a Phase I is not conducted, soil samples must be analyzed for a complete suite of

common organic and inorganic compounds. Sample analyses will be performed by California certified laboratories, certified to conduct the specific analyses.

The guidance to be used for ensuring representative soil sampling is the U.S. EPA document, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*, Chapter 9, dated 1986, as updated ("SW-846").

Once the soil quality data have been collected and the chemical characteristics of the soil to be excavated (or soils already stockpiled at the Soil Source Sites) have been determined, the data will be evaluated to determine whether the soil quality meets ESLs and whether the soils would be considered nonhazardous wastes. Only those soils that have chemical concentrations below the specified ESLs and that have been demonstrated to be nonhazardous wastes can be transported to the Storage Sites for ultimate reuse as fill on Reuse Sites.

The ESLs to be used are those developed by the RWQCB in *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater - Interim Final - February 2005*, as updated. The applicable ESLs for excavated soils are for commercial land uses for shallow soils, where groundwater is <u>not</u> a potential drinking water source. Two exceptions to the use of ESLs will be the use of an alternative screening level for arsenic and cobalt. The environmental screening level for arsenic and cobalt will be the background concentration (95th percentile) developed at Lawrence Berkeley National Laboratory (LBNL, 2002) of 17 and 22 mg/kg, respectively.

Definitions for Federal ("RCRA") and California hazardous wastes are contained in Title 22 of the California Code of Regulations ("CCR"), Section 66261.

Protocol 1: Identify Chemicals of Potential Concern

a. Conduct a Phase I site assessment in substantial compliance with ASTM standards. Develop a list of COPCs for each type of material to be excavated (i.e., artificial fill, Bay Mud, and/or native coarser-grained sediments). The COPCs must reflect the potential for historic or current land uses to have used, stored, generated, or disposed of hazardous materials. Representative samples of each type of excavated material will be analyzed for all the identified COPCs.

<u>or</u>

b. If a Phase I site assessment is not conducted, COPCs at OIA will be assumed to be: volatile organic compounds ("VOCs") associated with fuels, specifically benzene, toluene, ethylbenzene, and xylenes ("BTEX") and methyl tert-butyl ether ("MTBE"); semi-volatile organic compounds ("SVOCs"), specifically polynuclear compounds ("PAHs"), volatile and extractable total petroleum hydrocarbons ("TPH"), and Title 22 metals. Representative samples of each type of excavated material will be analyzed for all of these compounds.

Protocol 2: Determine Analytical Requirements

a. Depending on the identified COPCs, soil samples will be analyzed using the appropriate method(s), as listed below:

- EPA Method 8260B for VOCs
- EPA Method 8270C for SVOCs
- EPA Method 8310 for polynuclear aromatic compounds ("PAHs")*
- EPA Methods 6010/7000 for total Title 22 metals*
- EPA Method 8081A for PCBs
- EPA Method 8015M for TPH (as gasoline, as diesel, and as motor oil [with silica gel cleanup for extractable hydrocarbons])*
- EPA Method 8020 for BTEX and MTBE*
- EPA Method 8081A for organochlorine pesticides
- EPA Method 8151A for chlorinated herbicides
- EPA Method 335.2 for total cyanides
- EPA Method 8280 for dioxin
- EPA Method 1311 for Toxicity Characteristic Leaching Procedures ("TCLP")
- Title 22 CCR, Section 66261, Appendix II for Waste Extraction Test ("WET") Procedures
- EPA Method 1312 for Synthetic Precipitation Leaching Procedure ("SPLP")

If Phase I site assessment findings suggest the potential presence of compounds not detected by the methods listed above, those compounds will also be analyzed using applicable EPA Method(s) contained in SW-846.

If analytical results indicate the potential for any compound to exceed hazardous waste thresholds based on soluble concentrations, then the soluble concentration of the compound(s) will be determined using the TCLP and/or WET procedures, as appropriate.

b. If a Phase I site assessment is not conducted, all soil samples will be analyzed using the methods identified by an "*" in the Protocol 2.a list, above; analyses for soluble concentrations using the TCLP, SPLP, and/or WET procedures will also be performed, as appropriate.

Protocol 3: Determine Sampling Strategy and Collect Samples

a. Collect representative samples from each type of material to be excavated (i.e., artificial fill, Bay Mud, and/or native coarser-grained sediments) in accordance with the guidance in SW-846. The sampling can occur either in-place or from stockpiled material. The sampling scheme may be systematic, systematic random, or random, but must be representative of each type of material.

Soil sampling frequency for excavated soils will be consistent with the Department of Toxic Substances Control ("DTSC") guidance document, *Information Advisory, Clean Imported Fill Material,* October 2001, and is listed below.

Volume of Excavated Soils (for each type of excavated material)	Number of Samples
Up to 1,000 cubic yards	1 discrete sample per 250 cubic yards, with a minimum of 4 samples
Between 1,000 and 5,000 cubic yards	4 samples for first 1,000 cubic yards, plus 1 discrete sample per additional 500 cubic yards
Greater than 5,000 cubic yards	12 samples for first 5,000 cubic yards, plus 1 discrete sample per additional 1,000 cubic yards

b. If the Phase I site assessment identifies potential contaminant source areas (e.g., sumps, oil/water separators, vehicle maintenance areas, underground tanks), soil from these areas will be sampled separately to define the extent of possible contamination.

c. Sample collection, handling, and decontamination procedures will be conducted in a manner consistent with current industry practices. Investigation-derived wastes will be characterized and disposed of at a permitted facility.

d. If soil samples are collected from stockpiles, excavated soil will be segregated in separate stockpiles by type of material (i.e., artificial fill, Bay Mud, and/or native coarser-grained sediments) and stockpiles will be configured to facilitate volume estimation and sample collection. Samples will be collected that are representative of the entire depth of the stockpiles. If a Soil Source Site contains one or more suspected contaminant source areas (e.g., sumps, oil/water separators, vehicle maintenance areas, underground tanks), the excavated soil from each of the suspected contaminant source areas will be stockpiled separately.

Protocol 4: Determine Suitability of Material for Transport to Storage Site

Two categories of criteria will be used to determine whether excavated soils are suitable for transfer to Storage Sites. The first criterion is that soil must be a nonhazardous waste; and the second criterion is that concentrations of COPCs must not exceed ESLs, as described below and graphically depicted on Figure 2.

a. Determine whether each type of excavated material is a nonhazardous waste (i.e., below Federal and State hazardous waste thresholds). If the maximum total concentration of all compounds in samples collected from a type of excavated material is below State hazardous waste thresholds for <u>total</u> concentrations, and if the total concentrations do not indicate the potential for soluble concentrations to exceed Federal or State hazardous waste thresholds (or if soluble concentrations were determined, as appropriate, based on total concentrations, and the soluble concentrations were also below hazardous waste

thresholds), then the excavated material will be considered to have met the nonhazardous waste criterion for transport to a Storage Site.

If the maximum concentration of a compound in any soil sample of a given type of excavated material exceeds Federal or State hazardous waste thresholds, then the 90% UCL (one-tailed)[1] of the data will be calculated, based on the methodology in EPA Guidance *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites*, dated December 2002. The 90% UCL will be compared to hazardous waste thresholds. If the 90% UCLs for these compounds for a given type of excavated material are below the hazardous waste thresholds, then the excavated material will be considered to have met the nonhazardous waste criterion for transport to a Storage Site.

b. Determine whether the chemical concentrations in samples of each type of excavated material meets ESLs for commercial land uses. This criterion requires a multi-stage evaluation and is illustrated in Figure 2.

Calculate the 95% Upper Confidence Limit (one-tailed) ("UCL") of the data, based on the methodology in EPA Guidance *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites*, dated December 2002. If the 95% UCL or the maximum concentration for all compounds analyzed for a given type of material excavated from a Soil Source Site is below the ESL for commercial land uses for shallow soils, where groundwater is <u>not</u> a potential drinking water source, the soil will be considered to have met the ESL criterion for transport to a Storage Site, followed by ultimate reuse at a Reuse Site. Table 1 shows the applicable ESLs to be used for screening the analytical data.

If the 95% UCL for any one compound exceeds the soil ESL for commercial land uses, then the samples with the four highest concentrations of that compound will be subjected to the SPLP by EPA Method 1312. The 95% UCL for these samples will be compared to the ESLs for groundwater that is not a drinking water source (Table 1). If the 95% UCL does not exceed the applicable ESLs, the soil meets ESL criterion and can be transported to the storage site for future reuse.

c. Only soils that meet both the ESL and nonhazardous waste criteria described in Protocol 4.a and 4.b, above, may be transported to a Storage Site, and subsequently reused at Reuse Sites in OIA. Soils not meeting both criteria will be profiled for off-site disposal at a permitted facility. Data for profiling will be either from in-place sampling or sampling from a stockpile and will comply with the requirements of SW-846 and of the specific disposal facility.

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[1] The 90% one-tailed UCL is numerically equivalent to the 80% two-tailed UCL.

d. If sampling has occurred from potential contaminant source areas (e.g., sumps, oil/water separators, vehicle maintenance areas, underground tanks), those data will not be included in the evaluation described in Protocol 4.a and 4.b.

Protocol 5: Small Routine Maintenance Projects

Soil excavated as part of small (generating less than 500 in-place cubic yards) routine utility-related maintenance projects, will be placed in a stockpile adjacent to the trench. Any soil that is visually contaminated or odoriferous will be separated from other excavated soil, profiled, and hauled off-site for disposal at a permitted facility. The remaining soil (or all soil if there is no visually contaminated or odoriferous soil) will be replaced into the excavation.

Protocol 6: Health and Safety and Storm Water Pollution Prevention

a. All soil sampling activities will be conducted in accordance with a site-specific health and safety plan meeting the requirements of Title 8 California Code of Regulations Section 5192 for the protection of construction workers. Compliance with these requirements may also be applicable for excavation or other soil handling activities if workers may be exposed to contaminants in the soil. The site-specific health and safety plans will include monitoring requirements to ensure that contaminant levels do not exceed action levels for specific contaminants at the site boundary, as appropriate.

b. All excavation and soil handling activities will be undertaken in accordance with a site-specific Storm Water Pollution Prevention Plan ("SWPPP") for the Soil Source Site. The SWPPP will be prepared by the contractor and approved by the Port.

3.2 Storage Site Protocol

Excavated soils meeting the criteria for transport to Storage Sites and ultimate reuse will be transported to one of the approved Materials Management Sites, as defined in the MMP. The operation of the Materials Management Sites is described in the MMP. The December 2004 Neg. Dec. requires that the contractors operating the Materials Management Sites operate in accordance with a site-specific SWPPP. When a contractor is not present at a Materials Management Site, the Port Environmental Health and Safety Compliance Department ("EH&SC") will have the responsibility for compliance with a site-specific SWPPP.

The soils at the Storage Site will remain stockpiled until fill is needed at a Reuse Site within OIA. The Port will track the soils transported to and stockpiled at the Storage Sites, and the ultimate placement of these soils at Reuse Sites.

Protocol 7: Tracking Soil Volumes

The Port will maintain a tracking system to document the volume of soil received at and removed from the Storage Sites. A spreadsheet will be maintained by EH&SC and will contain the following information:

Transport of Soil from Soil Source Site to Storage Site

1. Name or identification of Soil Source Site
2. Name or identification of Storage Site
3. Date of receipt at the Storage Site
4. Type and volume of each type of material transported to the Storage Site (i.e., artificial fill, Bay Mud, and/or coarse-grained native sediments)

Transport of Soil from Storage Site to Reuse Site

1. Name or identification of Storage Site
2. Name or identification of Reuse Site
3. Date of transport to Reuse Site
4. Type and volume of each type of material transported to the Reuse Site

Protocol 8: Storm Water Pollution Prevention Plans

a. All contractors operating a Materials Management Site will prepare a SWPPP to be approved by the Port. The Port will inspect the Materials Management Sites on a regular basis to determine compliance with the SWPPP, as well as to review documentation for compliance with the SWPPP requirements.

b. The Port will implement SWPPP provisions for Materials Management Sites, in accordance with a Port-prepared SWPPP, when a contractor is not actively working at a specific Materials Management Site. The Port-prepared SWPPP will be submitted to the RWQCB prior to initiation of operations at a Materials Management Site.

3.3 Reuse Site Protocol

Excavated soils from Soil Source Sites that have met the criteria for transport to the Storage Site (i.e., satisfies Protocol 4) will be reused without restrictions as fill within OIA. The soils will have been sampled prior to transport to the Storage Site and the Port will have demonstrated, through collection and analysis of representative samples, that the soil quality meets ESLs for commercial land uses for shallow soils where the groundwater is not a potential drinking water source, and that the soils are nonhazardous wastes.

The ESLs take into account leaching of chemicals from the soil to groundwater to ensure that contaminants do not exceed the water quality objectives protective of surface water and aquatic organisms. The ESL for the COPCs is the lowest of: 1) leaching to groundwater, 2) human exposure to indoor air quality, 3) human direct exposure to contaminants, 4) urban area toxicity criteria, or 5) ceiling values. Therefore, the use of the ESLs for one of the reuse criteria is protective of groundwater, groundwater discharging to surface water, aquatic organisms, as well as direct human exposure.

Soils will only be placed at Reuse Sites in areas where soils cannot be eroded by wind or wave action into adjacent surface waters. At the North Field, reuse soils will only be placed southwest of Doolittle Drive. In addition, reuse soils will not be placed in Fan Marsh or the EZBH Site, which are tidal and non-tidal wetlands located southwest of Doolittle Drive, without further

evaluation and agency approvals. The rest of OIA is protected from adjacent surface water bodies by levees.

Protocol 9: Placement of Reuse Soils at Reuse Site

a. Only soils that meet the criteria as described in Protocol 4 will be placed at the Reuse Site.

b. Reuse soil will only be placed inland of Doolittle Drive and levees surrounding OIA.

3.4 Documentation and Reporting Protocol

Investigations and characterization of excavated soils from Soil Source Sites and the evaluation of whether the excavated soils meet the reuse criteria as described in this Soil Management Protocol will be documented in technical reports prepared by licensed professionals by or on behalf of the Port. The reports will be kept on file at the Port's EH&SC Department and be available for RWQCB review. The Port will, on an annual basis, by January 31st, provide the RWQCB with a letter summarizing the soil reuse activities conducted during the previous year. The letter will contain information from the soil tracking system, described in Protocol 7.

Protocol 10: Documentation

The Port will prepare documentation for evaluating the chemical quality of excavated soils at each Source Site. The documentation will be prepared by a licensed professional and kept on file at the EH&SC Department.

Protocol 11: Annual Reporting to the RWQCB

By January 31st of each year, the Port will submit an annual report to the RWQCB documenting the soils removed from Source Sites to the Storage Sites, and transported to Reuse Sites, as described in Protocol 7.

4.0 REFERENCES

City of Oakland, 1998, *General Plan*, March.

Department of Toxic Substances Control, 2001, *Information Advisory, Clean Imported Fill Material*, October.

Lawrence Berkeley National Laboratory, 2002, *Analysis of Background Distributions of Metals in the Soil at Lawrence Berkeley National Laboratory*, June.

San Francisco Regional Water Quality Control Board, 2005, *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater - Interim Final*, February, as updated.

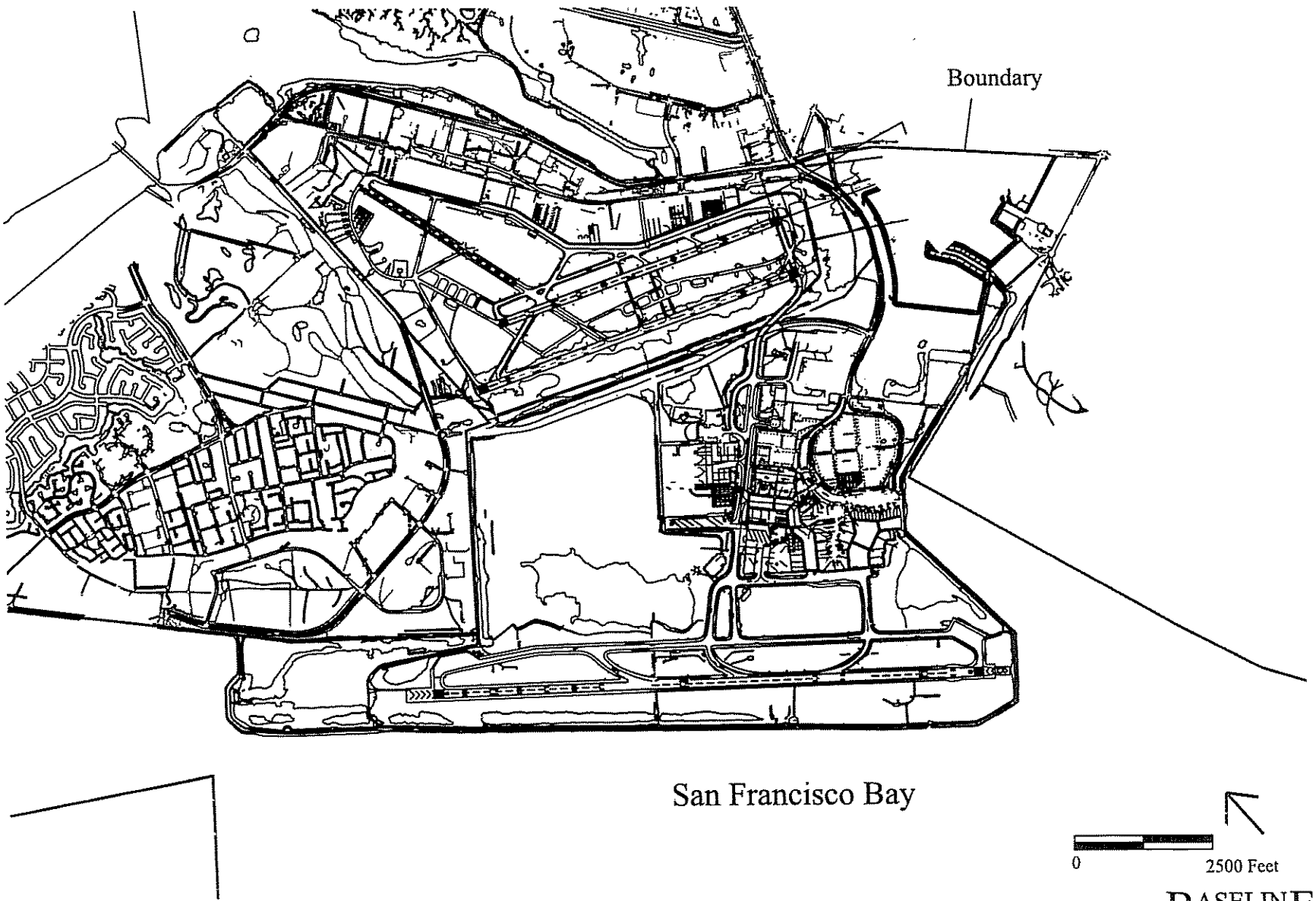
U.S. EPA, 2002, *Guidance Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites*, December.

_____, 1986, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*, Chapter 9, as updated.

FIGURES

OAKLAND INTERNATIONAL AIRPORT BOUNDARY

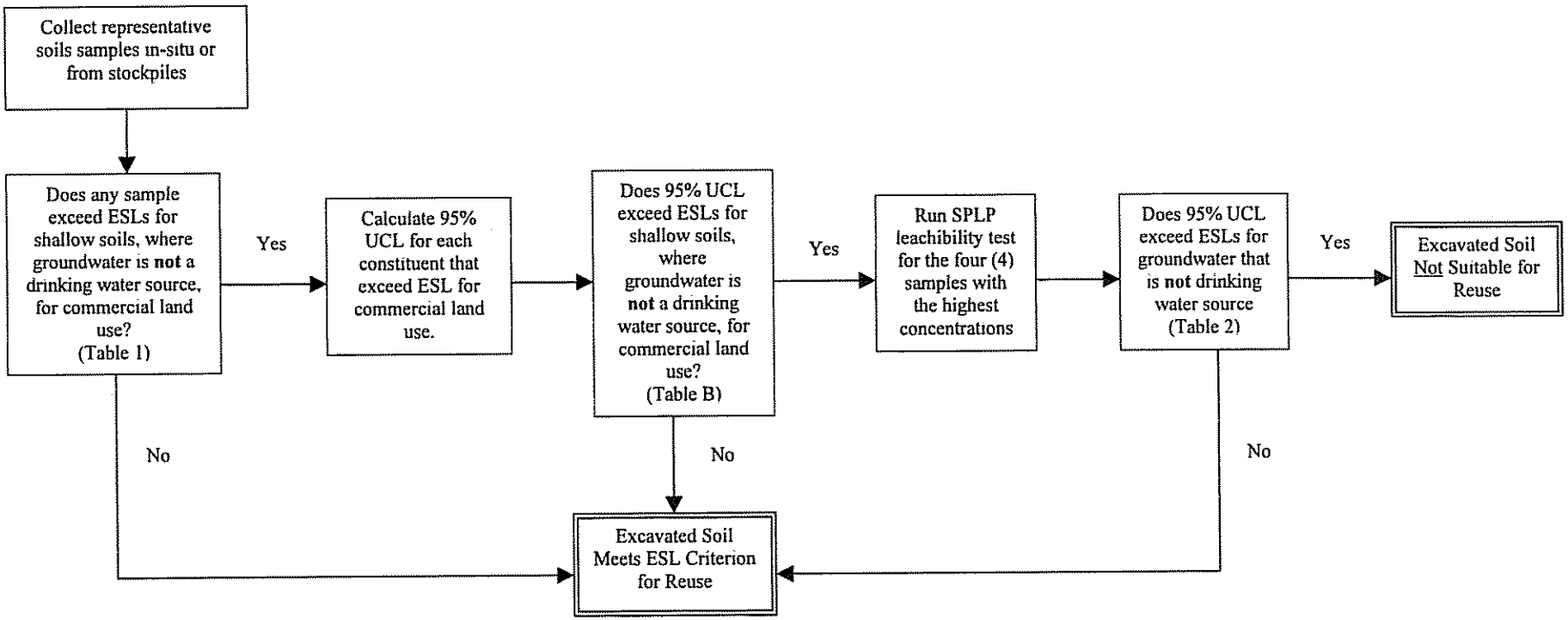
Figure 1



Y5395-01.00266.OIA.Fig1

Decision Flowchart for Soil Reuse at OIA to Demonstrate Compliance with Commercial ESLs

Figure 2



ESLs are from RWQCB, 2003 (Tables B and F-1b) and LBLN, 2002, and reproduced in this report as Tables 1 and 2.
ESL – Environmental Screening Levels (RWQCB, 2003)
UCL = upper confidence level

Note: Soil for reuse must also meet the criterion of nonhazarrdous waste in Protocol 4a.

BASELINE

TABLE

TABLE 1: **Environmental Screening Levels**
Oakland International Airport Soil Management Protocol

CHEMICAL PARAMETER	**ESLs for Shallow Soils**[1] Groundwater is NOT Drinking Water Source Commercial Land Use (mg/kg)	**ESLs for Groundwater**[2] Groundwater is NOT Drinking Water Source (μg/L)
ACENAPHTHENE	19	23
ACENAPHTHYLENE	13	30
ACETONE	0.50	1,500
ALDRIN	0.10	0.13
ANTHRACENE	2.8	0.73
ANTIMONY	40	30
ARSENIC	17[3]	36
BARIUM	1,500	1,000
BENZENE	0.38	46
BENZO(a)ANTHRACENE	1.3	0.027
BENZO(a)PYRENE	0.13	0.014
BENZO(b)FLUORANTHENE	1.3	0.029
BENZO(g,h,i)PERYLENE	27	0.10
BENZO(k)FLUORANTHENE	1.3	0.40
BERYLLIUM	8.0	2.7
BIPHENYL, 1,1-	6.5	5.0
BIS(2-CHLOROETHYL)ETHER	0.013	61
BIS(2-CHLOROISOPROPYL)ETHER	0.66	61
BIS(2-ETHYLHEXYL)PHTHALATE	530	32
BORON	2.0	1.6
BROMODICHLOROMETHANE	0.039	160
BROMOFORM	69	3,200
BROMOMETHANE	0.51	160
CADMIUM	7.4	1.1
CARBON TETRACHLORIDE	0.035	9.5
CHLORDANE	1.7	0.0040
CHLOROANILINE, p-	0.053	5.0
CHLOROBENZENE	1.5	25
CHLOROETHANE	0.85	12
CHLOROFORM	1.9	340
CHLOROMETHANE	0.2	41
CHLOROPHENOL, 2-	0.12	1.8
CHROMIUM (Total)	58	180
CHROMIUM III	750	180
CHROMIUM VI	1.8	11
CHRYSENE	13	0.35
COBALT	22[3]	3.0
COPPER	230	3.1
CYANIDE (Free)	0.0036	1.0
DIBENZO(a,h)ANTHTRACENE	0.38	0.25
DIBROMOCHLOROMETHANE	0.058	180
1,2-DIBROMO-3-CHLOROPROPANE	0.0011	0.20
DIBROMOETHANE, 1,2-	0.021	160
DICHLOROBENZENE, 1,2-	1.6	14
DICHLOROBENZENE, 1,3-	7.4	65
DICHLOROBENZENE, 1,4-	0.13	15
DICHLOROBENZIDINE, 3,3-	1.4	250
DICHLORODIPHENYLDICHLOROETHANE (DDD)	10	0.0010
DICHLORODIPHENYLDICHLOROETHYLENE (DDE)	4.0	0.0010
DICHLORODIPHENYLTRICHLOROETHANE (DDT)	4.0	0.0010

TABLE 1: **Environmental Screening Levels**
Oakland International Airport Soil Management Protocol

CHEMICAL PARAMETER	**ESLs for Shallow Soils**[1] Groundwater is NOT Drinking Water Source Commercial Land Use (mg/kg)	**ESLs for Groundwater**[2] Groundwater is NOT Drinking Water Source (μg/L)
DICHLOROETHANE, 1,1-	0 91	47
DICHLOROETHANE, 1,2-	0 069	200
DICHLOROETHYLENE, 1,1-	4.3	25
DICHLOROETHYLENE, Cis 1,2-	3.6	590
DICHLOROETHYLENE, Trans 1,2-	7.3	590
DICHLOROPHENOL, 2,4-	3.0	3 0
DICHLOROPROPANE, 1,2-	0.15	100
DICHLOROPROPENE, 1,3-	0.091	49
DIELDRIN	0 0023	0.0019
DIETHYLPHTHALATE	0.035	1.5
DIMETHYLPHENOL, 2,4-	0.74	110
DIMETHYLPHTHALATE	0.035	1.5
DINITROPHENOL, 2,4-	0.21	75
DINITROTOLUENE, 2,4-	0.86	120
1,4 DIOXANE	30	50,000
DIOXIN (2,3,7,8-TCDD)	0 000018	0 0000050
ENDOSULFAN	0.0046	0.0087
ENDRIN	0.00065	0.0023
ETHANOL	45	50,000
ETHYLBENZENE	32	290
FLUORANTHENE	40	8.0
FLUORENE	8.9	3 9
HEPTACHLOR	0 014	0 0038
HEPTACHLOR EPOXIDE	0 015	0 0038
HEXACHLOROBENZENE	0.96	3.7
HEXACHLOROBUTADIENE	22	4.7
HEXACHLOROCYCLOHEXANE (gamma) LINDANE	0 049	0 080
HEXACHLOROETHANE	41	12
INDENO(1,2,3-cd)PYRENE	1.3	0 029
LEAD	750	2.5
MERCURY	10	0 012
METHOXYCHLOR	19	0 019
METHYL ETHYL KETONE	13	14,000
METHYL ISOBUTYL KETONE	3.9	170
METHYL MERCURY	10	0.0030
METHYL TERT BUTYL ETHER	5 6	1,800
METHYLENE CHLORIDE	1 5	2,200
METHYLNAPHTHALENE (total 1- & 2-)	0.25	2.1
MOLYBDENUM	40	240
NAPHTHALENE	1.5	24
NICKEL	150	8 2
PENTACHLOROPHENOL	5.0	7 9
PERCHLORATE	1 2	600
PHENANTHRENE	11	4 6
PHENOL	19	1,300
POLYCHLORINATED BIPHENYLS (PCBs)	0 74	0 014
PYRENE	85	2.0
SELENIUM	10	5 0
SILVER	40	0 19
STYRENE	15	100

TABLE 1: **Environmental Screening Levels**
Oakland International Airport Soil Management Protocol

CHEMICAL PARAMETER	ESLs for Shallow Soils[1] Groundwater is NOT Drinking Water Source Commercial Land Use (mg/kg)	ESLs for Groundwater[2] Groundwater is NOT Drinking Water Source (μg/L)
tert-BUTYL ALCOHOL	110	18,000
TETRACHLOROETHANE, 1,1,1,2-	7.2	930
TETRACHLOROETHANE, 1,1,2,2-	0.025	190
TETRACHLOROETHYLENE	0.25	120
THALLIUM	13	20
TOLUENE	9.3	130
TOXAPHENE	0.00042	0.00020
TPH (gasolines)	400	500
TPH (middle distillates)	500	640
TPH (residual fuels)	1,000	640
TRICHLOROBENZENE, 1,2,4-	1.0	25
TRICHLOROETHANE, 1,1,1-	7.8	62
TRICHLOROETHANE, 1,1,2-	0.091	350
TRICHLOROETHYLENE	0.73	360
TRICHLOROPHENOL, 2,4,5-	0.18	11
TRICHLOROPHENOL, 2,4,6-	10	490
VANADIUM	200	19
VINYL CHLORIDE	0.019	4.0
XYLENES	1.5	13
ZINC	600	81

Notes:
ESLs = Environmental Screening Levels (RWQCB, 2005 and LBNL, 2002)
mg/kg = milligram per kilogram
mg/L = microgram per liter
ESLs listed in this table may change over time; future updates to the ESLs must be researched before using the values listed in this table.

[1] Source: Table B (RWQCB, 2005)
[2] Source: Table F-1b (RWQCB, 2005)
[3] 95th Percentile established by Lawrence Berkeley National Laboratory (LBNL, 2002)

BASELINE

ENVIRONMENTAL CONSULTING

FAX TRANSMITTAL

Date: 11/14/05 Fax No.: ___

Time: ___

To: John Prall, E&S

From: Yane

Subject: ___

Project No.: ___ Total Pages: 4 (including transmittal)

Original to follow: ☐ Yes ☒ No

♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦♦

Comments: ___

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Emeryville Petaluma San Francisco

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PORT OF OAKLAND

OCT 27 2005

October 24, 2005

RECEIVED
OCT 28 2005
BASELINE

Mr. Max Shahbazian, P.G.
Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

RE: FINAL SOIL MANAGEMENT PROTOCOL FOR THE OAKLAND INTERNATIONAL AIRPORT, OAKLAND, CALIFORNIA (FILE NO. 01S0634)

Dear Mr. Shahbazian:

The purpose of this letter is to inform you that the Port of Oakland ("Port") has finalized the Draft Soil Management Protocol ("DSMP") for the Oakland International Airport ("OAK"). The Port previously submitted the DSMP to the Regional Water Quality Control Board ("Water Board") for review in February 2005 and received an acceptance letter for the DSMP executed by Bruce H. Wolfe, Executive Officer, forwarded by Ms. Betty Graham dated March 15, 2005. As part of finalizing the DSMP, the Port has made a revision to one of the protocols described in the DSMP, as described below; we would appreciate your concurrence with this proposed change. In addition, this letter also provides the Port's understanding of one of the issues presented in the Water Board's letter of 15 March 2005; our understanding of the issue is provided to clarify potential ambiguities. We would also appreciate your concurrence with our understanding of this issue.

Background:

As you know, the Final Soil Management Plan ("SMP") proposes, among other things, to reuse soils excavated from the Oakland International Airport ("OAK") within the boundaries of OAK, if: 1) the soils meet commercial/industrial Environmental Screening Levels ("ESLs") (except for arsenic, where the soils would need to be below the background concentrations, as defined by the Lawrence Berkeley National Laboratory ["LBNL"]); 2) a reuse site has undergone the Port planning process, which includes obtaining Federal, State, and/or local permits, as applicable; and 3) a reuse site has been subject to environmental analysis and public review as part of the California Environmental Quality Act requirements, as applicable.

The Final SMP provides for record-keeping and annual reporting of soil reuse to the Water Board. The annual report will be submitted to the Executive Director of the Water Board by January 31 of each year while the SMP is in effect.

Clarification:

The March 15, 2005 acceptance letter of the DSMP from the Water Board indicated, in the third paragraph, last sentence:

"By implication, the draft protocol would not apply to construction debris from areas under or proposed to be under regulatory oversight due to unauthorized releases of hazardous materials."

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530 Water Street ■ Jack London Square ■ P.O. Box 2064 ■ Oakland, California 94604-2064
Telephone: (510) 627 1100 ■ Facsimile: (510) 627-1826 ■ Web Page: *www.portofoakland.com*

Since it is unknown which sites could be under regulatory agency oversight in the future, the Port would like to clarify that the Final SMP would apply to the entire OAK, except those sites that are, as of the date of this letter or in the future, under regulatory agency oversight for investigation and cleanup. We have provided, in an attached table, sites that are currently under regulatory oversight, or expected to be under regulatory oversight. The Final SMP does not apply to these sites.

Furthermore, as to those sites that are currently NOT under regulatory oversight, if and when new sites become subject to regulatory agency oversight in the future, the Final SMP will prospectively NOT apply to the new sites. However, to the extent that excavated soils, qualified for re-use, were placed on those sites, PRIOR to regulatory oversight, the past placement of those soils on such sites is acceptable.

Revision:

The Final SMP proposes to use commercial/industrial ESLs as a screening criterion for determining reuse of excavated soil, except for arsenic and cobalt. The screening values that will be used for arsenic and cobalt are the background levels developed by Lawrence Berkeley National Laboratory ("LBNL"). The LBNL background levels for arsenic and cobalt are 17 mg/kg and 22 mg/kg, respectively.

We would appreciate your acknowledging these clarification/revision for the Final SMP, either by a letter to us, or by signing below and returning a copy of this letter by mail or fax (510) 465-3755 to my attention at the Port of Oakland. We have attached a copy of the Final SMP for your files.

Thank you for your attention in this matter.

Sincerely,

Douglas P. Herman
Associate Port Environmental Scientist

Reviewed and Accepted:

Max Shahbazian
Regional Water Quality Control Board

Date: 10-31-2005

cc: Michelle Heffes
Chris Noma (Wendell, Rosen, Black & Dean)
Yana Nordhav (Baseline Environmental)
Project File No. 2004079

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TABLE 1:

Current and Anticipated Future Regulatory Agency Oversight Sites at Oakland International Airport

A. Alameda County Health Care Services Agency, of Environmental Health Services

1. Avis - STID# 1103/RO0001603
2. Hertz - STID# 2260/RO0000157
3. National - STID# 510 (Site closed)
4. MF8/9/10 - STID# 6409/RO0000087
5. Former UAL/OMC includes MF23/24/25/26 and MF35/36 - STID# 1049
6. Rolls Royce Test Cell/Main Administration Buildings - RO0002606
7. U.S. Army Corps of Engineers - TRACON Facility - RO0002593

B. San Francisco Bay Regional Water Quality Control Board

1. South Field Tank Farm - Order# R2-2002-0013
2. Chevron North Field Tank Farm - Cleanup Order # 92-150
3. Former Galbraith Golf Course - Waste Discharge Order 94-131
4. Alaska Airlines - Hangar 6 - No Site # as of yet

C. Department of Toxic Substances Control

1. EZBH Site - Site Code #201364, Voluntary Cleanup Agreement dated 12/14/01.

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RAILYARD EXCAVATION AND SOIL REUSE OPERATIONS PLAN, BERTHS 57/58 AND 59 WHARF AND CONTAINER YARDS

JUNE 2000

UNION PACIFIC INTERMODAL RAILYARD
VISION 2000 PROGRAM
Port of Oakland
Oakland, California

For:

Port of Oakland
Oakland, CA

98379-20

BASELINE Environmental Consulting
5900 Hollis Street, Suite D • Emeryville, California 94608
(510) 420-8686

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I. INTRODUCTION

PROJECT DESCRIPTION

The Port of Oakland (Port) is developing new marine terminals as part of the Vision 2000 Maritime Development Program (Figure 1). The berths associated with the new terminals will be built on the former Union Pacific (UP) Intermodal Railyard and will be designated Berths 55/56, Berths 57/58, and Berth 59. Container yards associated with the berths will be built on both the former UP Railyard and the former Navy Fleet and Industrial Supply Center, Oakland (FISCO). Construction for Berths 55/56 began in December 1999 and soil excavation along that portion of the shoreline has been completed; excavation of the UP Mole (Mole) is underway; construction for Berths 57/58 and 59 is expected to begin in July 2000.

Berths 55/56 and Berths 57/58 will be container vessels berths with adjacent upland container yards, and represent approximately 2,400 feet and 3,000 feet of new shoreline, respectively (Appendix A, Figure A-1). The Port currently plans to construct a general purpose tug boat facility at Berth 59. Construction of the new facilities will require excavation of terrestrial soils (including artificial fill), dredging of underlying sediments along the waterfront, and construction of the berths and container yards.

Construction of Berths 55-59 will require the excavation and dredging of about 5.1 million cubic yards, including about 1.3 million cubic yards of previously placed artificial fill. Dredged materials will be placed behind a new rock dike in the Middle Harbor to create a portion of the Berths 55/56 container yard and a new shoreline park. Excavated artificial fill will either be reused to raise the ground elevation within the Vision 2000 Program boundary, or disposed of off-site, depending on the chemical quality.

PURPOSE OF DOCUMENT

This *Railyard Excavation and Soil Reuse Operations Plan* for the construction of Berths 57/58 and 59 wharf and container yards (hereafter referred to as the Plan) exclusively addresses excavation and management of artificial fill at the former UP Railyard. The Plan was prepared to comply with the requirements of the Regional Water Quality Control Board (RWQCB), San Francisco Bay Region, to specify minimum requirements for plans required of the contractor, and to specify the conventions and procedures to be used by Port staff during the implementation of this Project.

Compliance with WDR Issued by Regional Water Quality Control Board

The RWQCB issued Waste Discharge Requirements (WDR), Order No. 99-055, to the Port for the Berth 55 - 58 Project (RWQCB, 1999a).[1] The WDR specifies groundwater target values, soil reuse

[1] In addition to WDR Order No. 99-055 issued by the RWQCB, the Port has also obtained permits from the US Army Corps of Engineers (Permit No. 23141S), the Bay Conservation and Development Commission (Permit No. 7-99), and the California State Lands Commission (Lease No. 8102.9) for this Project. The Port and its contractors are responsible for complying with all the conditions set forth in these permits, including conditions incorporated by reference.

criteria, receiving water limits, discharge specifications, and monitoring and reporting requirements for the Project. Provision E.2, Task 4 of the WDR requires the Port to prepare and submit an excavation and soil reuse plan(s) for management of the artificial fill. This Plan fulfills the excavation and soil reuse plan requirement for the Berths 57/58 and 59 project and is subject to the approval of the RWQCB staff.[2]

Minimum Requirements for Contractor-Prepared Plans

In addition to complying with the WDR, this Plan is intended to be used by the contractor as detailed guidance during the preparation of the contractor's plans required by the *Project Manual for Construction of Berths 57/58 Container Wharf, Fill and Middle Harbor Shoreline Modifications, Vision 2000, Oakland, California, March 2000*, as revised by Addenda No. 1, 2, and 3 (hereafter referred to as Project Manual) (Port, 2000a, 2000b, 2000c, and 2000d).

Sections 02111 (subsection 1.06A), 01340, 01563, and 01572 of the Project Manual and the WDR require the contractor to prepare a series of plans related to excavation and stockpile management. The contractor-prepared plans must be approved by both the Port and RWQCB staff prior to the commencement of construction. These plans must be submitted to the Port for review six weeks prior to commencing work, revised, and finalized at least two weeks before construction begins. All of the contractor's plans must meet the minimum standards discussed in this Plan. The plans required of the contractor are as follows:

- Excavation Plan (see Section IV of this Plan for details)
- Stockpile Management Plan (see Section V of this Plan for details)
- Health and Safety Plan (see Section X of this Plan for details)
- Site Security Plan (see Section X of this Plan for details)
- Dust Control Plan (see Section X of this Plan for details)
- Erosion Control Plan (see Section X of this Plan for details)
- Contingency Plan (see Sections IV and X of this Plan for details)
- Emergency Response Plan (see Section X of this Plan for details)

Procedures for Port Staff and Consultants

Port Environmental Staff, Port Construction Staff, and Port consultants will be integrally involved in ensuring compliance with the WDR. This Plan lists the responsibilities that have been assigned to the different parties, and specifies the processes and procedures that will be followed during excavation and soil management phases of Berths 57/58 and 59 construction.

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[2] This Plan is a complementary plan to the *Hot Spot Excavation and Remediation Work Plan, General Plan and Berths 57/58 and 59* (Dames & Moore, 2000). Previous Hot Spot and Excavation and Reuse plans were prepared and implemented for Berths 55/56 construction.

II. SITE DESCRIPTION

SITE CONDITIONS

Soils that need to be dredged and excavated for construction of the berths consist of artificial fill (Stratum Type 1), Young Bay Mud (Stratum Type 2), and Merritt Sand (Stratum Type 3). In addition, the former US Army Corp of Engineers Training Wall (hereafter referred to as the Training Wall), and rip rap along the existing shoreline will also be removed. This Plan only addresses the management of Stratum Type 1 soils.

Stratum Type 1 soils, or artificial fill, consist of a wide variety of materials placed at the site in the late 1800s through the mid-1900s. The fill is from both terrestrial sources and hydraulically placed sediments dredged from the adjacent Inner Harbor Ship Channel. Stratum Type 1 materials generally extend to a depth of about 15 feet below the existing ground surface, and are underlain by naturally occurring and undisturbed Young Bay Mud.

The volume of Stratum Type 1 materials that will be excavated for the construction of Berths 57/58 and Berth 59 is estimated to be about 420,000 and 60,000 in-place (bank) cubic yards, respectively. The majority of these soils is expected to be reused within the Vision 2000 project area in accordance with criteria established in the WDR. The portion that cannot be reused will be disposed of off-site at appropriately permitted facilities.

Groundwater is expected to be encountered approximately five feet below the ground surface. Management of unsaturated and saturated fill excavated from both above and below the groundwater table, respectively, will be required.

NEARBY AREAS OF POTENTIAL CONCERN

Soil and groundwater in two areas located inland from the planned excavation for Berths 57/58 and Berth 59 have been impacted by past petroleum hydrocarbons releases. These areas are referred to as the Union Pacific Motor Freight (UPMF) and Trailer-on-Freight-Car (TOFC) sites. In addition to impacted soils and groundwater, a free product plume is present on the TOFC site under a former fueling area. A free product recovery system has been in operation since 1992. The Port is currently evaluating improvements to the existing system.

Plans are being developed to minimize or avoid excavation within the petroleum impacted areas under the UPMF and TOFC sites for construction of the Berths 57/58 container yard. If soil excavation within these petroleum-impacted sites were necessary, these soils would be handled either in the same manner as that described in this Plan for Hot Spot Soils, or disposed of off-site directly without stockpiling. If the Port were to determine that contaminated groundwater would be encountered during any unavoidable excavation, the Port would prepare a supplemental plan to be submitted to the RWQCB staff for approval, which would address groundwater management issues specific to these petroleum-impacted sites.

III. RESPONSIBILITIES

Compliance with the WDR issued for the Berth 55-58 Project requires the coordinated efforts of Port staff, consultants, and contractors. This section lists the primary responsibilities assigned to Port Construction Staff, Port construction management firm(s), Port Environmental Staff, Port environmental consultants, and the contractor. These responsibilities may be reassigned to best meet the Project's needs.

PORT CONSTRUCTION STAFF

- Review, critique, and when satisfactory, approve contractor plans required by the Project Manual and/or WDR.
- Direct and provide oversight for construction management firm(s), and contractor(s).

PORT CONSTRUCTION MANAGEMENT FIRM

- Monitor contractor's activities for compliance with approved plans and all permits issued for the Berth 55-58 Project, including WDR (Order No. 99-055) and Mitigation Monitoring and Reporting Program (MMRP) specified in the Project Environmental Impact Report (EIR) (URS, 1999); coordinate and consult with Port Environmental Staff on compliance issues; direct contractor to correct deficiencies.
- Perform and record daily observations, as required by the WDR.
- Direct contractor on excavating and stockpiling activities.
- Direct contractor(s) to reuse soils at appropriate locations, based on soil reuse instructions provided by Port Environmental Staff.
- Review records/reports prepared by contractor of soil excavating, stockpiling, and reuse/disposal activities on a daily basis; submit the approved reports, or a summary of the contractor's reports, to Port Construction and Environmental Staff on a semi-weekly basis.
- Direct contractor in the handling of unexpected conditions.
- Other tasks as directed by Port Construction Staff.

PORT ENVIRONMENTAL STAFF

- Monitor project's compliance with WDR; apply for permit amendment(s), as needed.
- Interface with RWQCB and other regulatory staff.
- Prepare daily, weekly, and monthly monitoring reports for RWQCB staff, as required by WDR and plans prepared pursuant to WDR.
- Review, critique, and when satisfactory, approve contractor plans required by Project Manual and/or WDR.
- Direct and provide oversight for environmental consultants.
- Provide soil reuse instructions to Port Construction Staff based on designations determined by Port or environmental consultant; provide off-site disposal directions to Port Construction Staff, as needed.
- Advise Port Construction Staff and construction management firm on approaches for handling unexpected conditions, and approaches to achieving compliance with WDR.

- Inspect site periodically to assess compliance with WDR and other permits.

PORT ENVIRONMENTAL CONSULTANTS

- Perform sampling of stockpiles and water stored in Baker Tanks, and maintain detailed records of sampling activities.
- Coordinate with analytical laboratory(ies).
- Review and comment on laboratory quality control data.
- Prepare reports of sampling information, analytical results, and statistical analysis.
- Determine soil reuse designation for stockpiles, as appropriate.
- Maintain on-going spreadsheets or database of excavation, stockpiling, and soil placement/disposal information provided by contractor and construction management firm.
- Perform receiving water monitoring as required by WDR.
- Perform and record daily observations, as required by the WDR.
- Coordinate with construction management firm and contractor to deploy and/or move monitoring equipment appropriate for each phase of construction.
- Perform groundwater monitoring as required by WDR.
- Assist Port Environmental Staff in preparation of monthly monitoring report, as required by WDR.
- Other tasks, as directed by Port Environmental Staff.

CONTRACTOR FOR BERTHS 57/58 AND 59 CONSTRUCTION

- Prepare plans as listed and described in Sections IV, V, and X of this Plan and/or required by Project Manual (Sections 02111, 01340, 01563, and 01572); revise plans as directed by Port; and implement plans during construction.
- Adhere to the Project Manual, except as directed by Port Construction Staff.
- Maintain detailed records of excavation, stockpiling, soil reuse/disposal, and water management activities. Prepare and submit daily reports to the Port's construction management firm on a daily basis.
- Comply with all permits, including WDR and MMRP, issued for the Berth 55-58 Project.
- Comply with the General Permit issued by the State Water Resources Control Board for Discharges of Storm Water Runoff Associated with Construction Activity.
- Comply with other permits issued for the Berth 55-58 Project, and all other applicable local, State, and Federal regulations.

IV. EXCAVATION OF STRATUM TYPE 1 MATERIAL

All artificial fill (Stratum Type 1) soils excavated during construction will be stockpiled for testing. The contractor is required by the Project Manual (Section 02111, subsection 1.06A) to prepare an Excavation Plan, which must be approved by the Port and RWQCB staff prior to the commencement of construction. The plan will describe how excavation of Stratum Type 1 materials will be conducted and how the contractor will maintain records of where soils from particular sources are stockpiled. The contractor's plan will be approved by the Port only if the contractor's plan substantively conforms to the excavation process described in this section and to the soil tracking requirements described in Section VIII of this Plan.

In addition to the Excavation Plan, the contractor is also required to prepare a Contingency Plan (Section 02111, subsection 1.06A of Project Manual) that specifies how the contractor will handle unexpected contamination encountered during excavation and possible misplacement of reuse soil. Guidelines for acceptable methods for managing unexpected contamination are also provided in this section; guidelines for mitigating isolated instances of soil mismanagement are provided in Section X of this Plan. The contractor's Contingency Plan is also subject to the approval of the Port and RWQCB, and must conform to the guidelines presented in this Plan.

All Stratum Type 1 soils have been categorized by the Port as being: 1) potentially suitable for on-site reuse (hereafter referred to as Reuse Soils); or 2) potentially requiring off-site disposal (hereafter referred to as Hot Spot Soils). Hot Spots have been identified in the construction plans (Appendix A, Figures A-2 to A-4); soils from Hot Spots must be stockpiled in lined cells. Unless unexpected soil contamination were encountered, the remainder of the Stratum Type 1 soils not located within Hot Spots may be potentially reused on-site and will be stockpiled in unlined stockpile cells.

It is anticipated that Stratum Type 1 soils will generally be directly loaded onto trucks after excavation and moved to stockpile cells. If indicated in the contractor's Excavation Plan, Reuse Soils may be temporarily stockpiled adjacent to the excavation to allow excess water to drain from the soil before trucking. Such temporary stockpiles should be placed at sufficient distance from the edge of the excavation to not cause slope failure and should not remain at the temporary location for more than 96 hours.

EXCAVATION SEQUENCE

The contractor will indicate the sequence of excavation in the Excavation Plan. All surface debris and trash, including rails and ties, pavement, and concrete, will be removed from the excavation area prior to the beginning of soil excavation. Trash and debris, including materials encountered during excavation, will be stockpiled separately from the Stratum Type 1 soils and disposed of properly.

The primary constraint in the excavation process is that all soils from Hot Spots must be excavated before any connection between the active excavation face and the adjacent Bay is created (Section 02111, subsection 3.01D of Project Manual, and Provision E.12 of the WDR). For example, if excavation were to proceed from the edge of the Bay inland, then all Hot Spots must be excavated

first. Alternatively, if the existing Training Wall or rock jetty/dike were to be maintained between the Bay and the active excavation area, such that a pond of groundwater were created inside of the Training Wall, excavation of both Hot Spot Soils and Reuse Soils may occur concurrently, provided the two categories of soils are stockpiled separately in the appropriate cells. However, all Hot Spot Soils must have been excavated before the Training Wall is breached.

IDENTIFICATION OF HOT SPOTS

Soils from Hot Spots will be stockpiled in lined stockpile cells.[3] Hot Spots within the excavation area are shown on the construction plans for Berths 57/58 and 59 for the intervals between the existing ground surface and 5 feet below the ground surface (bgs), between 5 and 10 feet bgs, and between 10 and 15 feet bgs (Appendix A, Figures A-2 to A-4). The majority of Hot Spot Soils are located within the top five feet of fill. Before any excavation is conducted, the contractor will delineate the Hot Spots in the field using the coordinates indicated on the drawings and assign a unique identification (ID) to each Hot Spot and depth interval combination. The boundaries of Hot Spots will be marked clearly in the field such that operators of heavy equipment can easily see the boundaries while excavating. Wet and dry Hot Spot Soils will not be segregated in the stockpiles.

The format of the ID will be "HS#-depth," where "#" is a unique sequential number and "depth" indicates the depth interval. For example, the top five feet of the first Hot Spot will be assigned the ID "HS1-5"; if this Hot Spot were to extend into the 5 to 10 feet bgs interval, then that interval will assigned the ID "HS1-10." The contractor will include drawings in the Excavation Plan showing the assigned Hot Spot IDs. The contractor may choose an alternative system of labeling Hot Spots, provided the system substantively conforms to that described above.

A new storm drain will be installed that extends inland of the berth excavation area from the Bay. Soil excavated along the storm drain alignment within the area designated as potential hazardous soils will be stockpiled in lined cells (Section 02111, subsection 3.08 and Drawing ENV 7 of Project Manual).

IDENTIFICATION OF POTENTIAL REUSE SOILS

Reuse Soils, or artificial fill (Stratum Type 1) located outside of Hot Spots, will be stockpiled in unlined stockpile cells. The extent of excavation is shown on the construction plans (Appendix A, Figure A-5). The excavation area has been divided into areas A through M, starting from the western project boundary and proceeding east. In addition, each area has been divided into northern and southern portions along the N2000 line (see Appendix A, Figure A-5). Reuse Soils from area "A" from the northern and southern portions will be assigned the IDs "AN" and "AS," respectively.

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[3] See Section V of this Plan for the definition of a stockpile cell.

Wet and dry Reuse Soils must be stockpiled separately. The contractor will designate different cells for wet materials (excavated from below the groundwater table) and dry materials (excavated between the ground surface and the groundwater table) for Reuse Soils. The groundwater table is expected to be about 5 feet bgs.

FILLING OF STOCKPILE CELLS

To expedite ultimate soil removal from the stockpile cells, the contractor will completely fill each cell with the appropriate soils as soon as possible. At all times, the contractor will actively fill only one cell for Hot Spot Soils, one cell for wet Reuse Soils, and one cell for dry Reuse Soils. Only when a cell has been completely filled and the contractor has released the entire cell for sampling will a new cell for a given type of soil be used for stockpiling. Exceptions to this approach of filling cells may be made if unexpected conditions arise.

TRACKING OF EXCAVATION AND STOCKPILING

The Project Manual (Section 02111, subsection 1.06D) requires the contractor to maintain detailed records of excavation and stockpiling activities. Detailed record-keeping requirements for tracking of these activities are described in Section VIII of this Plan. In summary, the contractor must record for each truckload of soil transported to a stockpile cell (which is correlated to volume): 1) the date of excavation, 2) where the soil originated (i.e., Hot Spot ID for Hot Spot Soils and area ID for Reuse Soils), and 3) where the soil is stockpiled (cell and subcell IDs). This information will be compiled into Daily Excavation/ Stockpile Reports, which will be submitted to the Port construction management firm daily for review (see Section VIII of this Plan).

HANDLING OF UNEXPECTED CONTAMINATED MATERIALS

During excavation outside of known Hot Spots, the contractor may encounter contaminated soil and debris that have not been identified during previous investigations by the Port. The presence of contaminated materials may be detected by staining or other visual indications, or by odors. If excavation were being conducted along the edge of the Bay, exposure of Bay waters to contaminated soil and/or groundwater must be mitigated immediately.

The contractor is required by the Project Manual (Section 02111, subsection 1.06A) to prepare a Contingency Plan to specify how unexpected contamination will be handled and how accidental misplacement of reuse soil will be handled.[4] The portion of the contractor's plan to address handling of unexpected contamination must substantively comply with the following:

- The contractor will segregate unanticipated contaminated soil, stockpile the soil in a lined cell, and notify the Port construction managers immediately.[5] The source location of the

---

[4] The Port has also prepared a Receiving Water Contingency Plan to address potential construction impacts on the Bay (Port, 1999).

[5] Port Construction Staff and construction management firm are jointly referred to as the construction managers in this Plan.

contaminated soil and the cell and subcell IDs where the soil was stockpiled will be indicated in the Daily Excavation/Stockpile Report (see Section VIII of this Plan).

- Similarly, if obvious soil contamination were found to extend beyond the boundary of a known Hot Spot, the contractor will treat the contaminated material outside the boundary in the same manner as the soil from within the Hot Spot boundary, and stockpile the material in lined cells. The contractor will notify Port construction managers via the Daily Excavation/Stockpile Report.
- If contaminated debris (e.g., piles, railroad ties) were encountered in the soil, regardless of whether excavation were occurring inside or outside of a Hot Spot, the contractor will stockpile the debris on top of plastic liners, cover the materials, notify Port construction managers immediately, and arrange for proper disposal of the debris.
- If sheen were observed on groundwater or petroleum free product[6] were encountered during excavation, the contractor will immediately notify the Port's construction managers and Environmental Staff upon discovery. The contractor will also immediately initiate emergency response measures, as indicated in the contractor's Emergency Response Plan (see Section X of this Plan), to contain and remove the contaminated liquid.
- If debris were accidentally discharged onto the Bay or onto ponded groundwater, the contractor will promptly retrieve the debris and manage the debris appropriately. Debris from the Bay must be removed by the end of the day on which the debris was discharged.

Section X of this Plan provides additional guidelines for the contractor in the preparation of the Contingency Plan (i.e., handling of reuse soil misplaced in the incorrect zone).

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[6] Free product is a separate-phased petroleum product that floats on the surface of the water.

V. STOCKPILE DESIGN/LAYOUT AND LABELING

An area measuring approximately 2,500 feet by 1,500 feet has been designated by the Port in the construction plans (Appendix A, Figure A-5) for stockpiling Stratum Type 1 soil. Additional areas may become available during construction. In addition, lined cells used during Berths 55/56 construction may be used during the Berths 57/58 and 59 phase. The contractor is required by the Project Manual (Section 02111, subsection 1.06A and C) to prepare a Stockpile Management Plan to describe how the stockpiles will be constructed and managed. The plan must be approved by the Port and RWQCB staff prior to the commencement of excavation. The Port will approve the contractor's Stockpile Management Plan only if the contractor's plan substantively conforms to the stockpile design, layout, labeling convention, and management procedures described in this section.

The terms stockpile **cell, subcell, section,** and **unit** are defined as follows and illustrated in Figure 2 of this Plan:

Cell - a contiguous area of stockpiles. Each stockpile **cell** will be assigned a unique ID. Unlined **cells** used for Reuse Soils will be designated "C1," "C2," "C3," etc. Lined **cells** used for Hot Spot Soils will be designated "L1," "L2," "L3," etc.

Subcell - a delineated grid within a **cell** that ideally contains about 4,200 cubic yards of soil. Each **subcell** will be designated by a letter unique within each **cell** that indicates the "address" or geographic location of the **subcell**. For example, the second subcell in **lined** stockpile area "L1" will be designated "L1-B"; and the fifth subcell in **unlined** stockpile area C3 will be designated "C3-E." The letters assigned to adjacent subcells need not be sequential.

Section - a portion of a **subcell**, generally consisting of approximately 1,000 cubic yards, in which one soil sampling location will be chosen.

Unit - soil in one or more subcells within the same **cell** that is grouped for sampling, compositing, and data evaluation purposes. The total volume of soil in a **unit** will be between 4,000 and 20,000 cubic yards in a lined stockpile **cell,** and between 3,000 and 6,000 cubic yards in an unlined stockpile **cell**. Each stockpile **unit** will be assigned a stockpile **unit** ID that will be unique for the duration of the Berths 57/58 and Berth 59 project. The **unit** ID will be linked to the analytical results associated with soil samples.

The contractor will construct two types of stockpile cells. Previously delineated Hot Spot Soils will be stockpiled in lined cells, and the remaining Stratum Type 1, or Reuse Soils, will be stockpiled in unlined cells. Unanticipated contaminated soils will also be stockpiled in lined cells. The contractor will assign separate unlined cells for stockpiling dry and wet Reuse Soils, excavated from above and below the groundwater table, respectively. The separation of wet and dry Reuse Soils is intended to aid in the construction of uniform stockpiles that will facilitate the soil sampling process and to assist construction managers in planning for soil reuse. Wet and dry Hot Spot Soils will not be separated.

LINED AND UNLINED STOCKPILE DESIGN

The approximate boundaries of individual lined and unlined stockpile cells should be indicated in the contractor's Stockpile Management Plan. Based on how high soil can be stockpiled, the contractor will determine optimum subcell dimensions within each cell to produce subcells containing about 4,200 cubic yards of soil. The maximum height achievable for stockpiles within a given cell should be evident after approximately 10,000 cubic yards of soil, or about three subcells, have been stockpiled. At this point, the contractor will determine the optimum dimensions for the subcells within that cell. All subcells must have the same dimensions within a given cell. For example, if stockpiles within a cell were 10 feet high, the contractor may delineate subcells that measure 90 feet x 125 feet since these dimensions would correspond to a soil volume of about 4,170 cubic yards.

Story poles will be placed at the corners of each subcell such that the top of the poles extend at least three feet above the top of the highest subcell within each cell. The story poles will be marked at one-foot intervals with tick marks and the numerical height from the bottom will be marked at 5-foot intervals (e.g., 5, 10, and 15 feet). In addition, the top of the story poles will be marked with the IDs of the adjacent subcells in such a way that the location of each subcell is clearly indicated.

All stockpiles should be constructed to have a level top surface (within ± 6 inches), and sloped sides as shown on the construction plans (Appendix A, Figure A-6). Each cell in both the lined and unlined cells should have one or more ramps with a slope no steeper than 30 degrees to allow a drill rig to be driven onto the top of the stockpiles for soil sampling purposes. The height of the stockpiles should be as high as practicable given the consistency of the material, but not greater than 12 feet; the stockpile heights for dry Reuse Soils and all Hot Spot Soils are expected to be about ten feet, and for wet Reuse Soils to be about five feet. The stockpile cells should be configured to allow heavy equipment access to load and unload soils, as described in the Project Manual, and to allow a drill rig to access the top of the piles.

Lined Stockpiles

Lined cells will be constructed with a two-foot berm surrounding the entire perimeter for the purpose of containing water that may leach out from the soil and rain water that may come into contact with the soil (Appendix A, Figure A-6). A 40-mil cross-linked or high density polyethylene liner will be placed on the bottom and the stockpiled soil will be covered with a 10-mil cover. The bottom liner should be installed according to the Project Manual (Section 02111, subsection 3.06A). The cover should be secured by placing sand bags at intervals necessary to maintain the functional integrity of the cover.

Each lined stockpile cell should be fenced and secured during non-work hours to prevent access by unauthorized personnel. Signs should be posted around the perimeter of the cells to clearly indicate the presence of potentially hazardous materials inside the cells. Signs should also be placed at the access point(s) for each cell indicating the cell ID. Examples of these signs will be included in the contractor's Stockpile Management Plan.

Unlined Stockpiles

Unlined stockpiles cells will be constructed similar to lined cells, except that perimeter berms and polyethylene liners/covers are not required. Temporary swales or barriers (e.g., silt fences, hay bales) will be installed to prevent erosion of the Reused Soils from rain run-on and run-off, as necessary. Signs should also be placed along each side of each cell that indicate the cell ID. An example of the sign will be included in the contractor's Stockpile Management Plan.

REUSE OF STOCKPILE CELLS

After all the soil stockpiled at a particular cell has been sampled, analyzed, assigned a reuse designation or waste classification, and removed from the cell, the contractor may use the same cell for a second round of stockpiling (Section 02111, subsection 3.01J). The contractor and Port construction managers must obtain the Port Environmental Staff's concurrence that all the soil from the entire cell has been removed and records of the removal activities are up-to-date before the cell can be used for the next round of stockpiling.

If needed, repairs will be made to the cells before a next round of soil is stockpiled. The contractor may use the previous configuration, if appropriate, or in the case of unlined cells, may regrid the subcells, as needed. The cell will be assigned a new and unique ID for each round of stockpiling. For example, if the first round of stockpiling required the creation of ten unlined stockpile cell, "C1" to "C10," then the first cell to be reused for a second round of stockpiling will be designated "C11."

ON-GOING STOCKPILE MANAGEMENT

After stockpiles have been created and the contractor has released individual subcells for sampling, the contractor must not disturb the subcells in any manner until instructed to remove or dispose of the soil in the subcells by Port construction managers (Section 02111, subsection 3.01I). The stockpiled soils may be stored in the cells for an extended period of time and be subsequently removed by a different contractor. The contractor is responsible for ongoing management of the stockpiles until the Port construction managers direct the contractor to move or dispose of the soil in the subcells, direct the contractor to release the soil to a different contractor, or take over direct responsibility for the stockpiles (Section 02111, subsection 3.01O). On-going management may include, but is not limited to, dust control, maintenance of erosion control measures, and repair of covers, fences, story poles, and signs.

CLEANUP OF STOCKPILE CELLS

The contractor will clean up and remove remaining debris in stockpile cells at the end of the contract or when cells are turned over to the Port (Section 02111, subsection 3.06I of Project Manual). Miscellaneous debris, fences, holding tanks, story poles, plastic liners/cover, and equipment and supplies must be removed from the site. Areas where former cells were located must be left clean and level.

VI. STOCKPILE SAMPLING AND COMPOSITING

Stockpiles of Stratum Type 1 soils stockpiled in lined and unlined cells will be sampled by the Port's environmental consultant to determine whether the soils are suitable for reuse on-site or require off-site disposal. Because the final dimensions of the stockpile cells and subcells will be defined by the contractor, a detailed sampling plan cannot be provided in this Plan. Instead, this section describes the sampling and compositing scheme that will be adapted to the actual stockpile configurations. Sampling and analysis will be conducted in accordance with the *Quality Assurance Project Plan, Berth 55-58 Project, Vision 2000 Program* (Dames & Moore, 1999), and any amendments approved by the RWQCB staff.

For both lined and unlined stockpiles, one set of samples collected through the entire depth of the stockpile will be collected for approximately every 1,000 cubic yards of soil. Compositing schemes for samples collected from lined and unlined stockpiles would be different, as described below. The composite soil samples will be analyzed for all the compounds listed in Table 2 of the WDR (Table 1 of this Plan). Refer to Section V of this document for the definition of stockpile cell, subcell, section, and unit.

LINED STOCKPILES

One or more subcells within a lined cell will be grouped as one stockpile unit for sample compositing and data evaluation purposes, provided the total volume of the unit is between 4,000 and 20,000 cubic yards. A unit will be divided in sections that have volumes of approximately 1,000 cubic yards. One set of samples will be collected from each section of soil. Each set will consist of a series of discrete samples collected at the approximate center of the section within every one-foot depth interval, but not necessarily spaced at one-foot intervals, from the top of the stockpile to approximately one-foot above the bottom of the stockpile.[7]

The number of sampling locations within stockpile units, where the total volumes are not exact multiples of 1,000 cubic yards, will be determined as follows:

- If the volume in excess of the 1,000-cubic yard multiple were less than or equal to 500 cubic yards, then samples from the excess volume will not be collected.
- If the excess volume were greater than 500 cubic yards, then one additional set of samples will be collected from the excess volume.

For example, if the volume of a stockpile unit were 8,500 cubic yards, then eight sets of samples would be collected from eight locations. The last sample location will be adjusted to be near the

[7] The bottom one foot of stockpiles in lined cells will not be sampled because the contractor will leave about one foot of soil at the bottom of lined cells to prevent damage to the liner when soil is removed. When a lined stockpile cell will no longer be used, the remaining one foot of soil will be combined into a new stockpile that will be sampled independently to determine reuse or disposal options

center of the combined excess volume and the adjacent 1,000-cubic yard section. If the volume were 8,550 cubic yards, then nine vertical sets of samples would be collected from nine locations.

Each set of samples collected through the depth of the stockpile at one location will be composited by the laboratory for analysis. If the depth of the stockpile at a sampling location were ten feet, then the nine samples collected from that location will be composited into one sample for analysis.

For each stockpile unit, an 80 percent, two-tailed upper confidence limit (UCL) of the mean will be calculated using all the composite sample results for each analyte. For example, if the stockpile unit were to have a total volume of 10,000 cubic yards, then ten sets of analytical results associated with the ten composited samples will be used to calculate a 80 percent UCL. The 80 percent UCL will be compared to the reuse criteria in Table 1 of this Plan to determine appropriate reuse designation or off-site disposal options for the stockpile unit (see Section VII of this Plan).

UNLINED STOCKPILES

One or more subcells in unlined stockpile areas will be grouped into units of 3,000 to 6,000 cubic yards for sample compositing and data evaluation purposes. The sampling scheme will be the same as that described above for the lined stockpiles, except that a sample from the bottom one-foot interval will also be collected. One set of samples will be collected for every section and sampling for excess volumes will be the same as that described for lined stockpiles.

All the samples collected from the unlined stockpile unit will be composited into one sample by the laboratory for analysis. For example, if the stockpile unit were 3,000 cubic yards and the height of the stockpile at all three sampling locations were six feet, then the 18 discrete samples collected will be composited into one for analysis. The one set of analytical results from the one composite sample will be compared to Table 1 of this Plan to determine appropriate reuse designation or offsite disposal options (although this is not anticipated for Reuse Soils) for the stockpile unit.

HIGHER SAMPLING FREQUENCY OF STOCKPILE SECTIONS

At the discretion of the Port, higher frequency sampling of particular sections of stockpile units may be conducted. This scenario is envisioned to apply to stockpile units in lined cells in which the chemical concentration(s) associated with samples collected from one or more sections was elevated and appear to be anomalous when compared to concentration(s) for other samples collected from the same unit. The Port may choose to exclude the anomalous section(s) from the stockpile unit and characterize the excluded sections(s) separately. The minimum additional sampling that will be conducted for excluded section(s) is four vertical sets of samples per section, or one vertical set of samples per 500 cubic yards, whichever results in the larger number of samples.

If only one section from a stockpile unit were to be excluded, an additional four vertical sets of samples will be collected from the excluded section in the same manner as the original sampling. An 80 percent UCL will be calculated based on the five sets of analytical results associated with the excluded section (one from the original composite sample collected from the section and four from the additional composite samples). The 80 percent UCL calculated for the excluded section will be

compared to Table 1 of this Plan to determine the appropriate reuse designation or disposal options for that section.

If more than one section of the stockpile unit were to be excluded, the Port may choose to treat the excluded sections separately, or combine all the excluded sections from the same unit for determining additional sampling requirements. Additional sampling for excluded sections will be conducted at a frequency of no less than one vertical set of samples per 500 cubic yards. The 80 percent UCL calculated for excluded sections will be compared to Table 1 of this Plan to determine the appropriate reuse designation or disposal options for the excluded sections.

Provided there were at least four sets of analytical results for the reduced unit (i.e., the original stockpile unit minus the excluded section(s)), an 80 percent UCL will be calculated for the reduced unit. The 80 percent UCL will be compared to Table 1 of this Plan to determine the appropriate reuse designation or disposal options for the reduced stockpile unit. If there were three or fewer sets of analytical results for the reduced unit, then individual concentrations from each data set will be compared to Table 1 of this Plan. The most restrictive reuse designation indicated by this comparison will be assigned to the entire reduced unit.

SOIL SAMPLING PROCEDURES

Sample Location

The sampling crew will first measure the dimensions of the stockpiles created by the contractor and determine the optimal grouping of subcells to form stockpile units based on the guidelines described above. After the units have been determined, the crew will delineate approximate 1,000-cubic yard sections within each stockpile unit, and mark a location in the approximate center of each section for sample collection with labeled flags.

Sample Collection and Handling

Stockpile samples will be collected either by using a direct-push drill rig, by manual direct-push equipment, or by a hollow-stem auger rig. If possible, a drill rig will be used to obtain the samples. However, if field conditions were to prevent a drill rig to access the top of the stockpiles, manually operated direct-push sampling equipment will be used.

Samplers fitted with stainless steel liners, brass liners, or new pre-packaged plastic liners will be driven into the stockpiled soil and retrieved. The sampling crew will retain one 6-inch long liner for laboratory analysis from within each one-foot interval, from the surface down to the bottom of the stockpile (as determined by encountering refusal). The crew will attempt to retain samples spaced at one-foot intervals. However, if sample recovery were not 100 percent, as often is the case when sampling wet materials, the crew will collect one sample within each one-foot interval, but sequential samples need not be spaced one foot apart. For example, if a sample were retained from 0 to 0.5 foot bgs and there was no recovery for the 1.0 to 1.5 feet bgs sample, the crew may retain the 1.5 to 2.0 feet bgs sample to represent the 1.0 to 2.0 feet bgs interval. If there were no recovery within a one-foot interval, the sampling crew will redrive the sampler immediately adjacent to the original location to obtain a sample from the missed interval.

The ends of the liners retained for laboratory analysis will be sealed with a Teflon film and plastic caps. Labels written with indelible ink will be immediately affixed onto the liners with the date and time the sample was collected, the sampler's initials, the sample ID that identifies the stockpile cell, subcell, section, and the depth from which the sample was collected. The tubes will be placed in sealable plastic bags and placed in a cooler with frozen blue ice.

The sampling crew will fill out chain-of-custody forms listing the sample IDs and compositing directions as the liners are placed into the cooler. The forms will accompany the samples to the certified analytical laboratory chosen by the Port, where the custody for the samples will be transferred to the laboratory.

Field Records

The sampling crew will fill out a field form for each subcell sampled. The information recorded will include the cell and subcell IDs, the grouping of the subcells to form a unit, the dimensions and overall average height of the subcell, the number of sections delineated in the subcell, the depth of the stockpile at each sampling location, and the sample ID format used. In addition, the crew will record the sampling locations on drawings labeled with the sample IDs, and the date of sample collection. Only the drawings showing higher frequency sampling locations will be drawn to scale; drawings showing the routine sampling locations will be schematic. The drawings and field forms will be archived in the project files.

Sample Analysis

All stockpile samples will be analyzed for the chemicals listed in Table 2 of the WDR (Table 1 of this Plan). Arsenic, lead, and zinc will be analyzed using EPA Method 6010. Total petroleum hydrocarbons as diesel, as hydraulic fluid, and as motor oil will be analyzed by modified EPA Method 8015 with silica gel cleanup (EPA Method 3630). Polycyclic aromatic hydrocarbons (PAHs), phenol, and bis(2-ethylhexyl)-phthalate will be analyzed by EPA Method 8270 with gel permeation cleanup (EPA Method 3640). Selected chlorinated pesticides and polychlorinated biphenyls will be analyzed by EPA Method 8081/8082. The Port may propose alternative methods, subject to RWQCB staff approval.

In cases where the Port elects to perform higher frequency sampling for section(s) of stockpile units, the analyses that will be performed on the additional samples will generally be limited to the analytes that were found to be apparently anomalous. However, the specific analytical needs will be determined on a case-by-case basis.

If a stockpile unit, or section(s) of a stockpile unit, were determined to be unsuitable for on-site reuse, additional analyses may be performed on the available samples to determine off-site disposal options. Additional analytical requirements for off-site disposal will be determined on a case-by-case basis. If additional sampling were to be required, the sampling will be performed by a consultant for the contractor or the Port's consultant.

Decontamination Procedure

All sampling equipment that contacts soil will be decontaminated between each use. Samplers and liners will be scrubbed in an Alconox solution and rinsed in two sequential buckets of potable water. In addition, the entire inside and outside of the samplers and the drive rods will be steam cleaned with hot potable water. All decontamination water will be transferred into Baker Tanks™ maintained at the site by the contractor for the management of water from lined stockpile cells.

VII. REUSE DESIGNATION

The Port and/or environmental consultant will evaluate the analytical data from the samples collected from stockpile units against the soil reuse criteria, specified in Table 1 of this Plan, to determine whether the soils can be reused on-site, and if so, to determine in which zone(s) the soils may be reused.[8] The WDR for the Berth 55-58 Project specifies reuse criteria for three zones (Appendix A, Figure A-7):

Zone 1 - Shoreline Protection Zone located within 300 feet of the future shoreline
Zone 2 - Buffer Zone located between 300 and 1,000 feet from the future shoreline
Zone 3 - Upland Zone located between 1,000 and 3,000 feet from the future shoreline

The criteria for Zone 1 are more stringent (lower values) than those for Zone 2, which are more stringent than the criteria for Zone 3. Soil in a stockpile unit may be reused in Zones 1, 2, or 3 if the analytical data for the unit were less than or equal to the Zone 1 criteria for all chemicals listed in Table 1 of this Plan. Similarly, stockpile units may be reused in Zones 2 or 3 if the data were to exceed the Zone 1 criteria but are less than or equal to the Zone 2 criteria, and units may be reused in Zone 3 if the data were to exceed Zone 2 criteria but are less than or equal to Zone 3 criteria. Unless higher frequency sampling were to be performed, stockpile units must be transported off-site for disposal if the data were to exceed Zone 3 criteria.

LINED STOCKPILES

Four to 20 sets of analytical results will represent the chemical quality of a lined stockpile unit depending on the total volume of the unit.[9] For each lined stockpile unit, an 80 percent UCL will be calculated using all the composite samples results collected from the unit for every analyte in Table 1 of this Plan. For example, if a stockpile unit contained 12,000 cubic yards, there would be 12 sets of analytical results associated with 12 composite samples. The calculated 80 percent UCL for each analyte will be compared against the reuse criteria in Table 1 of this Plan.

A value of one-half the reporting limit will be used in the calculation if results are reported as less than the reporting limit (i.e., "ND"). If the concentrations for a particular analyte for all the composite samples from the unit were below laboratory reporting limits, the reporting limit for the analyte will be compared against the reuse criteria. Through this process, a zone designation will be assigned for each analyte. The overall reuse designation for the entire stockpile unit will be the most restrictive (farthest away from the shoreline) zone designation assigned for all the analytes. For example, if the designation for all but one analyte were Zone 1 and the designation for one analyte was Zone 3, then the overall reuse designation for the stockpile unit will be Zone 3.

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[8] The reuse criteria for two compounds, benzo(a)pyrene and chlordane, listed in Table 1 of this Plan, have been modified from those adopted in Table 2 of the WDR, as documented in a 28 April 2000 letter from Lawrence Kolb of the RWQCB to Joseph Wong of the Port.

[9] Duplicate sample results, if any, will not be considered in calculation of the 80 percent UCL or in direct comparison with reuse criteria.

UNLINED STOCKPILES

One set of analytical results will represent the chemical quality of an unlined stockpile unit.[9] The concentration of each analyte will be compared against the reuse criteria in Table 1 of this Plan and assigned a zone designation. If an analyte were reported as less than the laboratory reporting limit, the reporting limit will be compared against the criteria. The most restrictive designation assigned to all of the analytes will be applied to the entire stockpile unit.

ISSUANCE OF SOIL REUSE INSTRUCTIONS

Once the reuse designation for a stockpile unit has been determined, instructions will be provided by the Port Environmental Staff to the Port construction managers. These instructions will be in the form of memoranda and accompanying figures, which will indicate where soil from particular stockpile subcells may be reused. The figures will show the layout of the stockpile cells, and indicate the appropriate reuse zone(s) for individual subcells being released for reuse. The figures will be initialed by the Port Environmental Staff who reviewed the reuse evaluation.

ISSUANCE OF OFF-SITE DISPOSAL INSTRUCTIONS

If analytical data associated with soils in a subcell(s) or section(s) indicate that off-site disposal were needed, the Port Environmental Staff will issue instructions to the Port construction managers for appropriate disposal. On each occasion, a memorandum and scaled figure will be provided to indicate the boundary and approximate volume of the soil that requires off-site disposal.

VIII. STOCKPILE AND ANALYTICAL RESULTS TRACKING

Detailed information on excavation, stockpiling, soil testing, reuse designation, and final soil reuse/disposal will be recorded and tracked during the construction of Berths 57/58 and 59. The information will be documented on a continual basis by the excavation and stockpiling contractor, the Port's environmental consultant, the Port's construction management firm, and the soil reuse/disposal contractor(s). All information collected by the various parties will be transmitted to the Port's Environmental Staff on a regular basis. The Port's environmental consultant will compile and maintain all the information on either a series of spreadsheets or a database. It is anticipated that the soil tracking system for Berths 57/58 and 59 construction will include all the information that has been tracked during the construction of Berths 55/56, including source of soil, cell and subcell IDs, volume in subcells, stockpile unit ID, analytical results, reuse or off-site disposal instructions, and final soil reuse or disposal information.

EXCAVATION AND STOCKPILING

The contractor will continually keep detailed records of the sources of excavated soil, and where the soils have been stockpiled. During each day of excavation, the contractor will record the source of soil placed in each truckload and the destination cell and subcell where each truckload of soil is stockpiled. Using these detailed records, the contractor will compile the information into Daily Excavation/Stockpile Reports. Each daily report must list the following information (see also Section 02111, subsection 1.06D of Project Manual):

1. The source areas where excavation occurred during each day (using source area IDs for Reuse Soils and Hot Spot IDs for Hot Spot Soils, as indicated in the contractor's excavation plan approved by the Port and RWQCB);

2. The volume excavated from each area and/or hot spot based on the number of truckloads;

3. The cell and subcell IDs where different sources of soils were stockpiled;

4. The cell and subcell IDs that have been completely filled and are ready to be sampled. Once subcells have been released for sampling, the contractor is prohibited from disturbing the soil in the subcells in any way, including adding, mixing, or removing soil, until the Port's Construction Staff or construction management firm issues directions for soil reuse or disposal.

5. The number identifying any Baker Tanks™ (or equivalent) that have been filled to about 75 percent capacity.

6. Description of any difficulties or unexpected conditions related to soil excavation and stockpile management encountered during the day;

7. Description of other stockpile and water management activities performed during the day (e.g., creation of a new cell, newly defined subcells dimensions for a cell, placement of Baker Tanks™, volume and method of pumping into or discharge from Baker Tanks™); and

8. Drawings showing the current layout of cells and subcells where soil was stockpiled.

The contractor's Daily Excavation/Stockpile Reports will be submitted to the Port construction management firm on a daily basis, who will review the reports for accuracy and completeness. The construction management firm will submit the approved reports to Port Construction and Environmental Staff on Wednesday and Friday of each week.

STOCKPILE SAMPLING

Upon notification by the Port that specific subcells are available for sampling, the Port's environmental consultant will inspect the completed subcells. The consultant will measure the dimensions and height of the subcells and determine optimal grouping of subcells to form stockpile units for sampling and analytical data evaluation purposes. Stockpile units in lined stockpile cells will consist of one or more subcells that have a total volume of between 4,000 and 20,000 cubic yards; stockpile units in unlined stockpile cells will consist of one or more subcells that have a total volume of between 3,000 and 6,000 cubic yards. (See Section VI of this Plan for details on soil sampling activities).

The consultant will assign a unique stockpile unit ID to each grouping, which will be used to track sampling information, analytical data, and ultimate soil reuse/disposal information. The unit ID will be a combination of the cell ID, the subcell ID(s), and a sequential number unique to each stockpile cell. Information on stockpile subcell dimensions, stockpile units, and sample collection will be recorded on field forms and drawings by the sampling crew. This information will be provided to the Port Environmental Staff, and archived and compiled by the Port's environmental consultant.

SOIL REUSE OR DISPOSAL INSTRUCTIONS

Once the analytical results are made available by the laboratory, the Port Environmental Staff or Port's environmental consultant will evaluate the data to determine whether a stockpile unit can be reused on-site and, if so, identify the zones where the soil in the unit may be reused. The results of these evaluations will be documented in memoranda and figures indicating whether particular subcells may be reused on-site or require off-site disposal (See Section VII of this Plan for details). If reuse on-site were appropriate, the memoranda will indicate the zones where the soil may be reused. If off-site disposal were required, the memoranda and scaled drawings will indicate which subcells and/or sections need to be removed from the site. These memoranda will be issued to the Port construction managers as soon as possible upon receipt of the analytical results. Soil reuse/disposal decisions will be compiled by the Port's environmental consultant.

FINAL SOIL REUSE OR DISPOSAL

The Port construction managers will direct the contractor(s) to remove soil from stockpiles based on the soil reuse/disposal decisions indicated in the memoranda and figures issued by the Port's Environmental Staff. The Port's construction management firm is responsible for ensuring that the contractor(s) adhere to the soil reuse/disposal instructions.

For each day during which soil is removed from any of the stockpiles, the contractor removing the soil will maintain detailed records indicating the subcells from which soil was removed, the location(s) and zone(s) where soil from each subcell was reused, and the name of the contractor performing the transfer. Similar information will be recorded for soils removed for off-site disposal. This information will be compiled into Daily Reuse/Disposal Reports by the contractor and submitted to the Port's construction management firm on a daily basis. Each daily report must include the following information:

1. The cell and subcell IDs from which soil was removed.

2. The volume removed from each subcell.

3. The location(s) and zone(s) in which soil from each subcell was reused.

4. If off-site disposal of soil were required, the landfill where soil from each subcell was transported for disposal. Manifests, bills-of-lading, and weight tickets for loads taken off-site will be provided within 24 hours.

5. The cell and subcell IDs that were completely cleared of stockpiled soil by the end of the day.

6. Drawings showing the subcells from which soils were removed and where soils were reused.

The construction management firm will review the Daily Reuse/Disposal Reports for accuracy and completeness and submit the approved contractor's reports, or a summary of the contractor's reports, to Port Construction and Environmental Staff on Wednesday and Friday each week. The Port's environmental consultant will compile and maintain the information.

IX. WATER MANAGEMENT

The Project Manual requires the contractor to manage water throughout the duration of construction in a manner that complies with the WDR issued for the Berth 55-58 project and with the WDR for Discharges of Storm Water Runoff Associated with Construction Activity issued by the State Water Resources Control Board (SWRCB) (Order No. 99-08-DWQ, NPDES General Permit No. CAS000002) (hereafter referred to as the General Permit). Water that the contractor will need to manage includes water that drains from excavated saturated soils (both within and outside of stockpile cells), rain water, and groundwater. These types of water need to be controlled to prevent the release of solids (soil/sediment), contaminants, and debris to the Bay (directly or via storm drains) and/or ponded groundwater retained behind the Training Wall.

The contractor should refer to guidance prepared by the SWRCB and RWQCB and to Section 01345 of the Project Manual for General Permit requirements. Guidance for complying with the water quality-related aspects of the WDR (Order No. 99-055) issued for the Berth 55-58 Project is addressed in Section 01346 of the Project Manual and further described in this section.

WATER MANAGEMENT DURING EXCAVATION

The purpose of water management during excavation is to prevent the discharge of excessive sediments, debris, and other pollutants, including chemical pollutants, to the Bay in violation of the WDR. The potential for excavation activities to adversely affect the Bay will depend on the manner in which excavation will be conducted, which will be described in the contractor's Excavation Plan. Two possible excavation scenarios are anticipated. Excavation may begin along the edge of the Bay and proceed inland such that the excavation face would be continuously exposed to Bay water. Alternatively, the excavation may begin inland and proceed toward the Bay, such that the excavation area would not be exposed to Bay water until the Training Wall is breached. A combination of the two scenarios may be used.

If the contractor chooses to conduct land-based excavation beginning from the edge of the Bay and proceeding inland, the contractor will install a silt curtain immediately beyond the excavation area that effectively prevents excess turbidity in the Bay (as required by Provision E.7 of the WDR and Section 2320, subsection 3.06H of the Project Manual). If water-saturated soils were to be temporarily stockpiled inland of the excavation to allow excess water to drain, the contractor will implement measures to prevent the return water from eroding the banks (e.g., prevent channelization and/or use hay bales to filter return water). The contractor will be prepared to immediately retrieve any debris that may fall into the Bay, and deploy absorbent booms and pads should an unexpected sheen or other signs of contamination appear on the water.

If excavation were to be conducted behind the Training Wall, such that excavation activities would be separated from the Bay water except when the Training Wall is breached, one or more ponds of groundwater will be created behind the Training Wall. As would be the case under the previous excavation scenario, the contractor will immediately retrieve debris that may fall onto the ponded groundwater and deploy absorbent booms if sheen is observed. Prior to breaching the Training Wall, the contractor will notify the Port construction managers, who will arrange for biological

testing of the water ponded behind the wall as specified in the *Receiving Water Quality Monitoring Program* (EVS, 2000). The contractor must not breach the Training Wall until the Port Environmental Staff and RWQCB staff authorize the breach. The contractor will employ the same control measures (silt curtain, booms, debris retrieval), as described above, when the Training Wall is breached and rip rap is removed.

If the contractor elects to perform excavation in a manner other than the two anticipated scenarios discussed above, the general principles for water management described for the two scenarios will be applied to the actual scenario.

If obviously contaminated groundwater or petroleum free product were encountered during excavation, the contractor will promptly initiate emergency response measures, as indicated in the contractor's Emergency Response Plan (see Section X of this Plan), to contain the contaminated groundwater and remove free product from the groundwater. The contractor will immediately notify the Port construction managers and Port Environmental Staff.

WATER MANAGEMENT IN STOCKPILE CELLS

Lined Stockpile Cells

Lined stockpile cells will be constructed with a continuous berm around the perimeter to contain rain water that may come into contact with the soil and water that drains from the soil. The contractor will pump the water into Baker Tanks ™ (or their equivalent), as necessary to prevent overtopping of the berms, for temporary storage and testing.[10] The contractor will inform the Port construction managers in the Daily Excavation/Stockpile Reports (see Section VIII of this document) when a tank has been filled to 75 percent capacity.

The Port will mobilize the Port's environmental consultant to collect one sample from each filled Baker Tank for chemical analysis. The laboratory data will be used to determine whether the water is suitable for discharge to the Bay, requires treatment before discharge to the Bay, or requires off-site disposal. The water sample will be analyzed for all the chemicals listed in Table 1 of the WDR Order No. 99-055, except for bis(2-ethylhexyl)phthalate and vinyl chloride. Bis(2-ethylhexyl)phthalate will be not be included because it is a common sampling- and laboratory-introduced contaminant; vinyl chloride will not be included because it is not a chemical of concern in the soil (vinyl chloride is not included in Table 2 of the WDR).

Analytical results from the Baker Tank samples will be compared to the groundwater target values for the Shoreline Protection Zone listed in Table 1 of the WDR (see Table 2 of this Plan), except for those compounds for which commonly achieved laboratory reporting limits exceed the target values and for arsenic, lead, and zinc. The compounds with reporting limits that exceed the groundwater target values are benzo(a)pyrene, total petroleum hydrocarbons (TPH) as hydraulic fluid, TPH as motor oil, 4,4-DDT, chlordane, dieldrin, endosulfan I, heptachlor epoxide, PCB-1016, and PCB-1260. For these compounds, alternative target values reflective of the reporting limits achieved by

[10] The capacity of the tanks is anticipated to be about 10,000 gallons.

the contract laboratories for water samples from the Berths 55/56 project will be used as the comparison criteria. For arsenic, lead, and zinc, effluent limits, expressed as daily mass limits, specified in WDR Order No. 99-051 issued by the RWQCB will be used for comparison (RWQCB, 1999b). The groundwater target values listed in Table 1 of the WDR and the proposed target values for determining whether water from the Baker Tanks™ may be discharged to the Bay during the Berths 57/58 and 59 project are shown in Table 2 of this Plan.

If the analytical results from a Baker Tank™ sample were below the proposed target values listed in Table 2 of this Plan for every analyte, then water from that Baker Tank will be discharged directly to the Bay. If results for some analytes were less than the laboratory reporting limits, the reporting limits must be less than the proposed target values in order to discharge directly to the Bay. When water is discharged from a Baker Tank to the Bay, the intake hose of the pump will be secured at least one foot above the top of any sediment that may have accumulated at the bottom of the Baker Tank. The discharge will be visually monitored by the contractor to ensure that sediments are not entrained in the water. Water will be discharged into a storm drain inlet through a hose such that the discharge does not cause erosion.

If the concentrations of organic compounds were to exceed the proposed target values, or if the laboratory reporting limits were to exceed the target values for results reported as "ND,"[11] then the water from the Baker tank will be pumped through a 500 to 2,000 pound granular activated carbon filter before discharge to the Bay. The carbon filter will have a much larger throughput and adsorptive capacity than required to treat the water from the Baker Tanks, based on experience from the Berths 55/56 project, and therefore, sampling of the effluent from the carbon filter is not proposed.

Unlined Stockpile Cells

Water management for unlined stockpiles will consist of controls needed to prevent rain water from eroding the stockpiles. The contractor will install controls, such as temporary shallow swales and/or barriers (e.g., hay bales, silt fences) around the cells to control the runoff from the stockpiles themselves, and to prevent runoff from nearby areas from eroding the perimeter of the stockpiles. These measures will be specified in the contractor's Erosion Control Plan (see Section X of this Plan).

[11] "ND" means that the chemical analyte was not found at concentrations above the laboratory reporting limit.

X. ADDITIONAL PLANS REQUIRED OF CONTRACTOR

The Project Manual (Sections 02111, 1340, 01563, and 01572) and the WDR for the Berth 55-58 Project (Order No. 99-055, Provision E2, Task 4) require the contractor to prepare certain plans related to excavation and stockpiling activities. These plans must be submitted to the Port for review six weeks prior to the beginning of construction, and revised to address all of the Port's comments and finalized at least two weeks prior to construction. All of the contractor's plans must be approved by both the Port and RWQCB prior to the beginning of construction. These plans are:

- Health and Safety Plan
- Site Security Plan
- Dust Control Plan
- Erosion Control Plan
- Contingency Plan (also see Section IV of this Plan)
- Emergency Response Plan
- Excavation Plan (see Section IV of this Plan)
- Stockpile Management Plan (see Section V of this Plan)

Guidelines and minimum requirements for the Excavation, Contingency, and Stockpile Management plans were described in Sections IV and V of this Plan. The minimum requirements and guidelines for the remaining plans are provided in this section. The Port will approve the contractor's plans only if they substantively conform to the guidelines contained in this section.

HEALTH AND SAFETY PLAN

Workers may be exposed to chemical hazards during construction. A human health risk assessment was prepared for the Port that evaluated potential construction worker exposure to the contaminants on-site (CDM/FEJ, 1999). The contractor will retain a Certified Industrial Hygienist for the duration of Berths 57/58 and 59 construction who will be responsible for developing and signing a Health and Safety Plan (H&S Plan) that will be protective of construction workers and provide a safe work environment (Section 02111, subsection 1.06A, and Section 1340, subsection 1.03.A of Project Manual). The H&S Plan will be implemented during all aspects of construction where workers may be exposed to chemical hazards in soil and groundwater, either in-place or disturbed, especially during excavation and stockpiling management activities. The contractor must appoint a Site Safety Officer for the duration of the project who will be responsible for ensuring that the H&S Plan is implemented properly.

All construction workers who may be exposed to chemical hazards at the site must be trained in accordance with applicable regulations contained in Section 1910.120 in Title 29 of Code of Federal Regulations and Section 5192 in Title 8 of the California Code of Regulations (CCR) for Hazardous Waste Operations and Emergency Response, and in Section 1532.1 in Title 8 CCR for Lead in Construction (Section 02111, subsection 107, and Section 1340, subsection 1.03.A of the Project Manual). The H&S Plan must also comply with these regulations and contain the following elements:

- health risk or hazard analysis for each task to be performed by construction workers;
- training required for workers assigned to specific tasks;
- personal protective equipment to be used by workers performing specific tasks;
- medical surveillance for workers;
- environmental and personal monitoring;
- site control measures;
- decontamination procedures;
- emergency response plan; and
- spill containment program.

The contractor is responsible for informing all sub-contractors of the potential health hazards at the site, and for ensuring that each sub-contractor prepares and implements a Health and Safety Plan appropriate for the tasks assigned to the sub-contractor.

SITE SECURITY PLAN

The contractor will prepare a Site Security Plan that describes how the areas where excavation, stockpiling, and active hauling are being conducted will be secured against entry by unauthorized persons and by untrained or inadequately trained personnel (Section 02111, subsection 1.06A of Project Manual). At a minimum, the plan will include the following control measures:

- Installation of site access control (e.g., fences, signs) at all entry points to the construction site to direct visitors to a designated sign in location.

- Installation of fences around all lined stockpiles cells with locked gates to prevent entry during non-work hours. Placement of signs around lined cells that clearly indicate the cell ID, provide warning that potentially hazardous materials may be present in the soil, and can be read at a minimum distance of 25 feet.

- Placement of signs around unlined cells that clearly indicate the cell ID and can be read at a minimum distance of 25 feet.

- Installation of temporary barriers and signs to delineate active excavation areas and routes used by haul trucks to active stockpile cells.

- Establishment of procedures to ensure that stockpiled soils and water in Baker Tanks are not disturbed or removed between the time when the contractor notifies the Port that subcells or tanks are ready to be sampled and the time when the Port issues written directions for where to move or how to dispose of the material.

- Establishment of traffic and haul routes to ensure safe movement of vehicles and equipment and for foot traffic in the active construction areas.

DUST CONTROL PLAN

The contractor will prepare a Dust Control Plan that will describe the measures to be used to minimize dust emissions and creation of nuisance conditions during all phases of construction. Section 01563 and Section 02111, subsection 3.04 of the Project Manual list the minimum measures that must be included in the contractor's plan, including periodic watering of all disturbed soil surfaces (including uncovered stockpiles and haul roads) when needed, maintaining two feet of freeboard on all haul trucks and covering the trucks, limiting speed on unpaved roads, and suspending excavation and grading operations when winds exceed 25 miles per hour.

In addition, the contractor's Dust Control Plan must also specify a monitoring program that will provide for continuous dust monitoring around the active portions (including all stockpile areas) of the construction site during all operating hours. The plan must indicate the monitoring locations, the equipment that will be used, and criteria that will be used to identify progressively unacceptable dust conditions, which will then trigger appropriate corrective measures. Corrective measures may include increased watering or stabilization (using only Port-approved products) of soil surfaces, modifying the method of excavation, and temporary suspension of active soil disturbing activities.

EROSION CONTROL PLAN

The contractor will prepare an Erosion Control Plan that will describe the measures and procedures to be used to minimize erosion from the project site. Sections 01345 and 01572 of the Project Manual describe elements required in the contractor's plan. Requirements are also contained in the Storm Water Pollution Prevention Plan provisions of the WDR issued by the State Water Resources Control Board for Discharges of Storm Water Runoff Associated with Construction Activity (Order No. 99-08-DWQ, NPDES General Permit No. CAS000002) (see Section IX of this Plan).

Erosion may result from rain runoff across disturbed areas and from the drainage of water that is released from stockpiles of saturated soil in unlined cells. The contractor's plan must address both potential causes of erosion. Measures for the control of erosion from rain runoff will be installed and operational by October 1st; measures for other potential causes of erosion will be in-place before the potential for erosion is created.

Locations where erosion control measures will be placed include, but are not limited to, exposed slopes along the Bay, uncovered soil stockpiles, constructed and incidental temporary drainage ditches, haul roads, disturbed land surfaces, and discharge points along the Bay or into storm drains. Control measures may include constructing diversion ditches around erosion-prone sources, applying soil stabilizers/straw, seeding, mulching, fabric, or rock on exposed soil surfaces and slopes, installing silt fences and/or hay bales along ditches and discharge points, and creating temporary sedimentation basins to reduce suspended sediments in the runoff.

The contractor's plan must also specify a schedule for inspection of the erosion control measures, including during rain events, and indicate when and how quickly corrective measures will be implemented.

CONTINGENCY PLAN

Unexpected soil and/or groundwater contamination encountered during excavation and incidents where soil designated for reuse on-site are accidentally misplaced in the incorrect zone may occur during the course of construction. The contractor is required to prepare a Contingency Plan to specify how these conditions will be managed (Section 02111, subsection 106A of Project Manual). Section IV of this Plan specifies the minimum requirements for the portion of the contractor's Contingency Plan describing how unexpected soil and groundwater contamination encountered during excavation will be handled. Guidelines for handling incidents of soil being misplaced in the incorrect zone are as follows:

- The contractor and/or the construction management firm will immediately notify Port Construction and Environmental Staff upon discovery that soil designated for on-site reuse has been deposited in an incorrect zone.

- The entire soil volume deposited in the incorrect zone will be reloaded onto trucks and transported to the appropriate zone(s) if: 1) the misplaced soil has not already been mixed (graded) with other soils; 2) the misplaced soil has not been covered by other soils; and 3) the location and extent of the misplaced soil are identifiable based on the contractor's records or knowledge.

- If the conditions listed in the previous bulleted item were not met, the Port will consult with RWQCB staff on a case-by-case basis to determine the appropriate measures for mitigating the soil misplacement incident, if any.

EMERGENCY RESPONSE PLAN

Accidental or unexpected releases of chemicals from construction equipment and from contaminated soil and/or groundwater may occur during the course of the project. The contractor must act to contain, mitigate, and/or remove such releases immediately upon discovery (Section 01310, subsection 1.04B of Project Manual). The contractor must prepare an Emergency Response Plan (Section 02111, subsection 106A of Project Manual). The contractor's plan must address the following aspects of emergency response:

- Designation of specific personnel with appropriate training and authority to direct and coordinate emergency response actions. At least one such designated person must be present at the work site whenever work is being conducted.

- Notification procedures that specify who will be notified when an emergency is discovered, and when and how the notification will be accomplished.

- Arrangements with commercial emergency response operators to promptly respond to the site when contacted (emergency responders and equipment must be able to arrive at the project site within two hours of notification).

- Equipment that will be staged at the project site exclusively for emergency use. Minimum equipment that must be available at all times must include absorbent boom for deployment on water (and equipment needed to deploy the boom), absorbent materials for cleanup of spills, 55-gallon drums and/or bins for waste containment, personal protective equipment, containment and diversion devices to contain liquid releases and to seal storm drain inlets, and pumps/shovels/brooms to be used for cleanup. Sufficient emergency equipment must be available at the site at all times.

- List of personnel assigned to the project site who have been trained to perform limited emergency response, the tasks each person is qualified to perform, and the training each person has received.

- Identification of possible emergency response scenarios and procedures that will be followed under each scenario. At a minimum, potential emergency scenarios must include: 1) release of petroleum product or sheen to the Bay or onto ponded water behind a Training Wall; 2) release of suspended solids into the Bay (see Contingency Plan guidelines in Section IV of this Plan); 3) spill of chemicals/fuel onto unpaved ground; and 4) spill of chemical/fuel in or near storm drain inlets and the Bay.

XI. REFERENCES

CDM/FEJ, 1999, Human Health Risk-Based Action Levels, Union Pacific Intermodal Railyard, Port of Oakland, Oakland, California, Final, Camp Dresser & McKee Inc. and Javaherian Consulting, 10 March.

Dames & Moore, 1999, Quality Assurance Project Plan, Berth 55-58 Project, Vision 2000 Program, Oakland, California, 4 October.

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Port of Oakland, 1999, Receiving Water Quality Monitoring Program, Contingency Plan, Berth 55-58 Construction Project, October.

_____, 2000a, Plans and Project Manual and Plans for Construction of Berths 57/58 Container Wharf, Fill, and Middle Harbor Shoreline Modifications, Vision 2000, Oakland, California, March.

_____, 2000b, Addendum No. 1 to Plans and Project Manual for Construction of Berths 57/58 Container Wharf, Fill, and Middle Harbor Shoreline Modifications, Vision 2000, Oakland, California, dated March 2000, 28 April.

_____, 2000c, Addendum No. 2 to Plans and Project Manual for Construction of Berths 57/58 Container Wharf, Fill, and Middle Harbor Shoreline Modifications, Vision 2000, Oakland, California, dated March 2000, 9 May.

_____, 2000d, Addendum No. 3 to Plans and Project Manual for Construction of Berths 57/58 Container Wharf, Fill, and Middle Harbor Shoreline Modifications, Vision 2000, Oakland, California, dated March 2000, 10 May.

Regional Water Quality Control Board (RWQCB), 1999a, Waste Discharge Requirements for Port of Oakland, Berth 55-58 Project, Oakland, Alameda County, Order No. 99-055, 21 July.

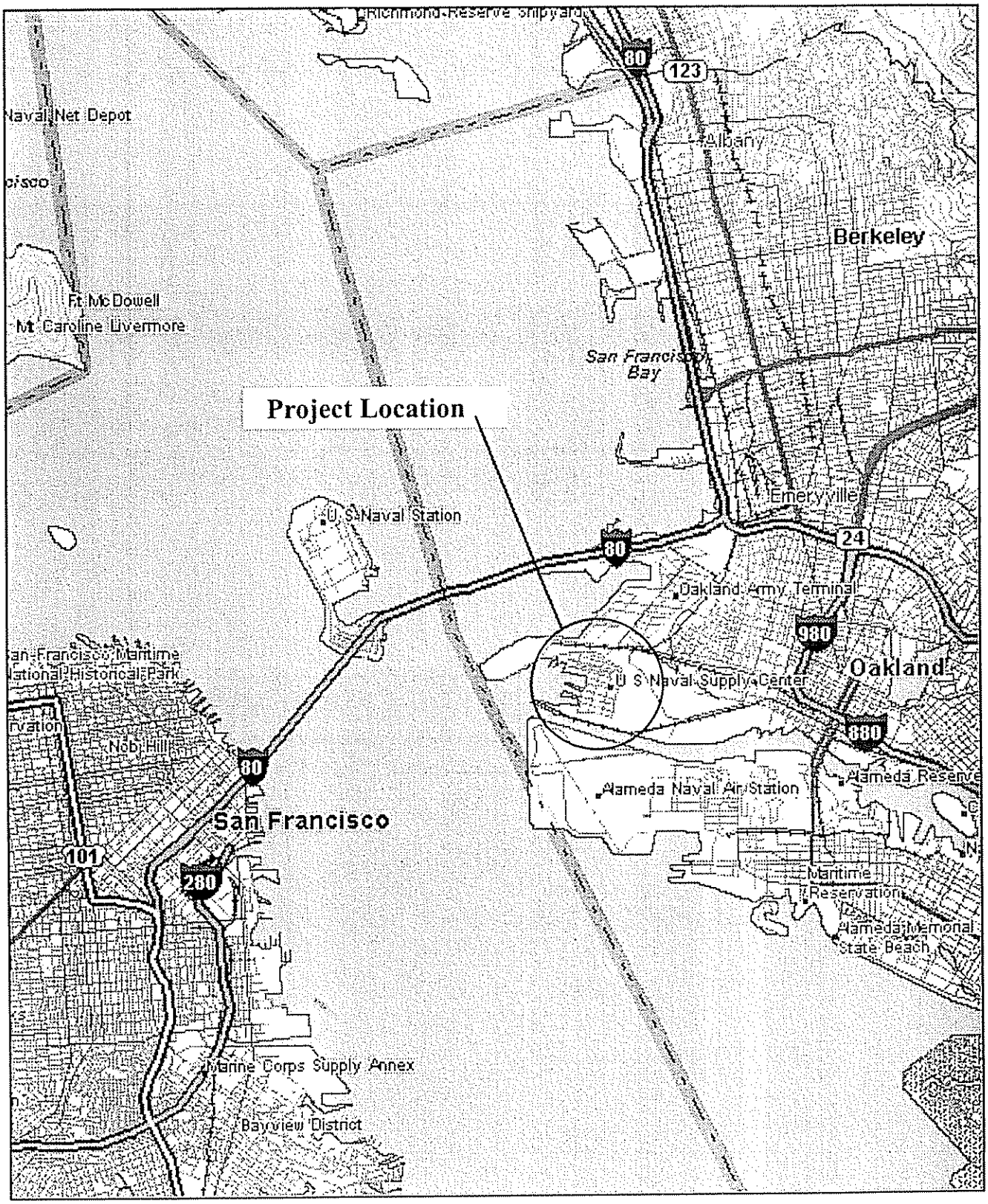
_____, 1999b, General Waste Discharge Requirements for Discharge or Reuse of Extracted and Treated Groundwater Resulting from the Cleanup of Groundwater Polluted by Volatile Organic Compounds, and Rescission of Order No. 94-087, Order No. 99-051, NPDES No. CAG912003, 21 July.

URS Greiner Woodward Clyde, 1999, Berths 55-58 Project Final Environmental Impact Report, SCH No. 97102076, 8 April.

FIGURES

REGIONAL LOCATION

Figure 1



Berths 57/58 and 59 Project
Port of Oakland
Oakland, California

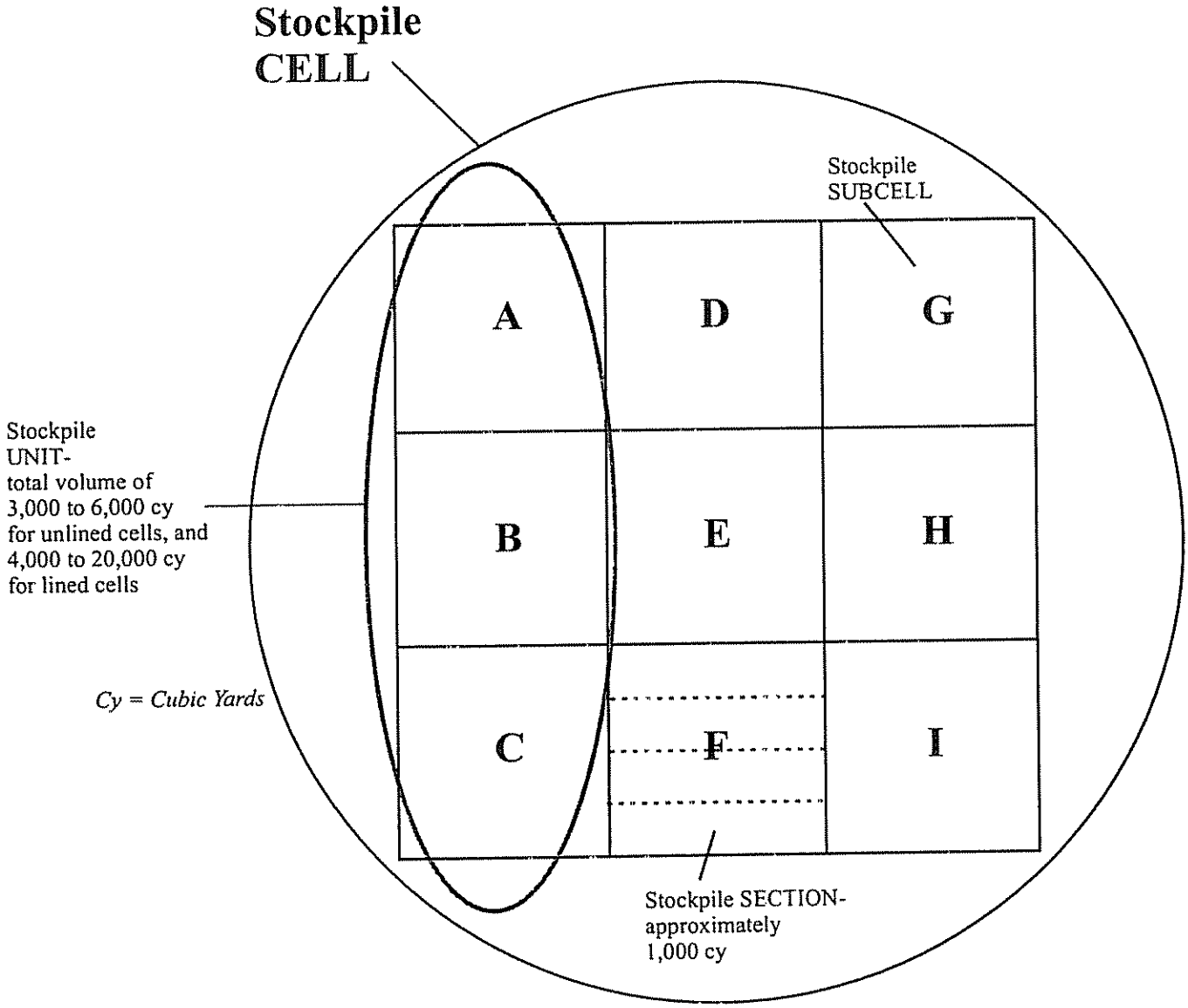
0 15000 Feet

BASELINE

D:\Graphics\98379-20\RL cdr 5/22/00

STOCKPILE SCHEMATIC

Figure 2



Berths 57/58 and 59 Project
Port of Oakland
Oakland, California

BASELINE

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TABLES

TABLE 1
SOIL REUSE CRITERIA
Berths 57/58 And 59 Project
(mg/kg)

	Shoreline Protection Zone (Zone 1)	Buffer Zone (Zone 2)	Upland Zone (Zone 3)
Acenaphthene	0.5	19	200
Acenaphthylene	0.64	19	190
Anthracene	1.1	19	200
Benzo(a)anthracene	1.6	19	19
Benzo(b)fluoranthene	8	19	19
Benzo(g,h,i)perylene	5.4	19	190
Benzo(k)fluoranthene	8	19	36
Benzo(a)pyrene	0.1[1]	0.1[1]	6.8
Chrysene	2.8	19	200
Dibenz(a,h)anthracene	0.26	19	19
Fluoranthene	5.1	19	200
Fluorene	0.54	19	200
Indeno(1,2,3-cd)pyrene	5.2	19	19
Naphthalene	2.1	100	200
Phenanthrene	1.5	19	190
Pyrene	2.6	19	200
Total PAHs	44.8	150	200
Bis(2-ethylhexyl)phthalate	13.8	19	200
Phenol	1.2	5.8	200
Arsenic	70	125	250
Lead	218	250	500
Zinc	410	1,250	2,500
TPH as Diesel	518	518	1,000
TPH as Hydraulic Fluid	500	750	1,000
TPH as Motor Oil	500	750	1,000
4,4´-DDD	0.02	0.25	0.5
4,4´-DDE	0.027	0.25	0.5
4,4´-DDT	0.007	0.25	0.5
Chlordane (tech)	0.088[1]	0.5	1.25
Dieldrin	0.008	1	4
Endosulfan I	0.477	10.8	100
Heptachlor epoxide	0.037	17	33
Aroclor-1016	0.05	0.4	25
Aroclor-1260	0.05	0.4	25

Source: Waste Discharge Requirements for Port of Oakland, Berth 55-58 Project, Order No. 99-055, Table 2 (RWQCB, 1999a)

[1] Reuse criteria as modified by 28 March 2000 letter from Lawrence Kolb of RWQCB to Joseph Wong of the Port.

TABLE 2

CRITERIA FOR DISCHARGE OF BAKER TANK WATER TO THE BAY

Berths 57/58 and 59

(µg/L unless otherwise specified)

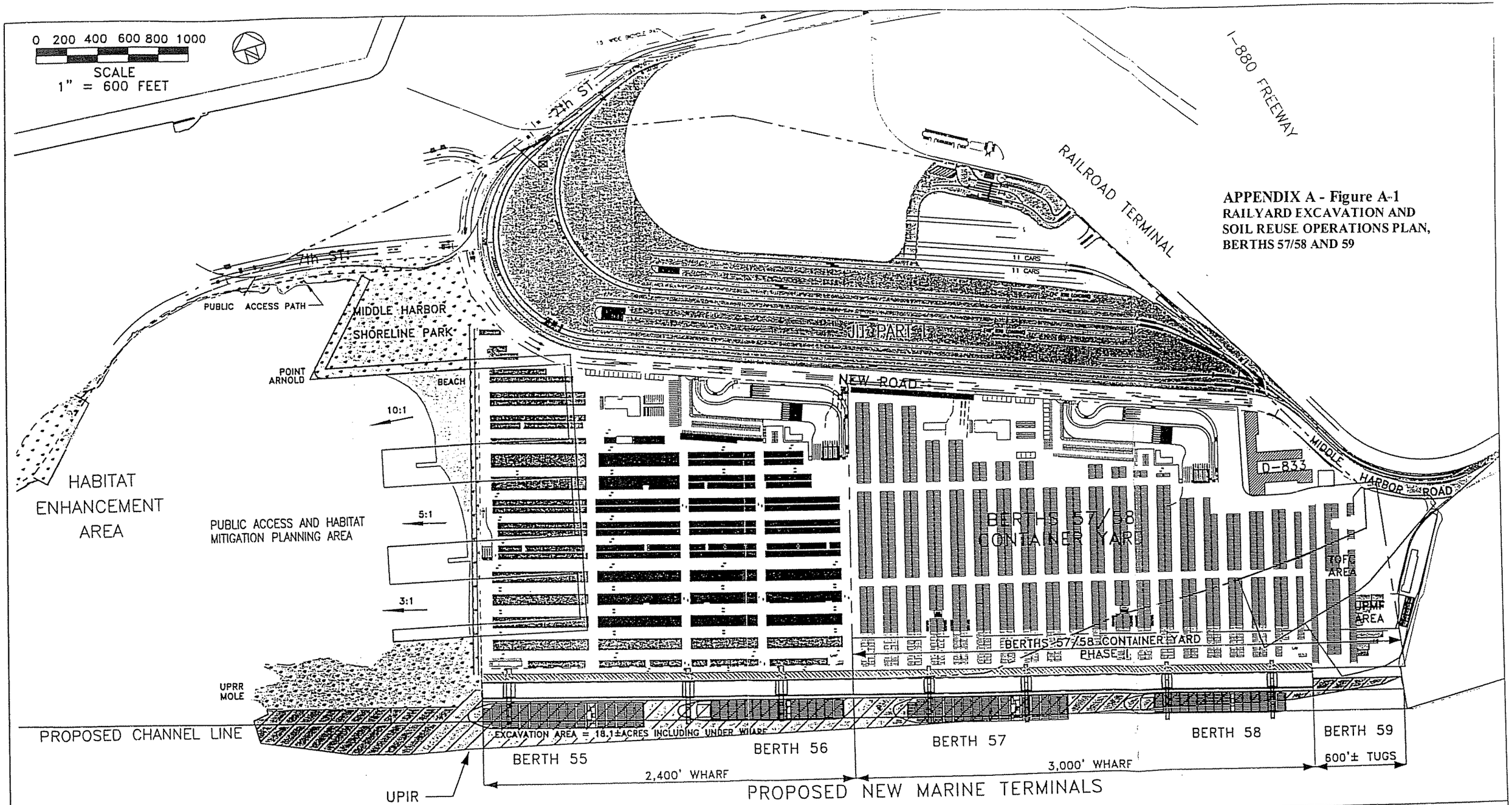
	Target Value from Table 1 of WDR[1]	Proposed Target Value for Berths 57/58 and 59
Acenaphthene	15	15
Acenaphthylene	15	15
Anthracene	15	15
Benzo(a)anthracene	15	15
Benzo(b)fluoranthene	15	15
Benzo(g,h,i)perylene	15	15
Benzo(k)fluoranthene	15	15
Benzo(a)pyrene	0.031	10
Chrysene	15	15
Dibenz(a,h)anthracene	15	15
Fluoranthene	15	15
Fluorene	15	15
Indeno(1,2,3-cd)pyrene	15	15
Naphthalene	470	470
Phenanthrene	15	15
Pyrene	15	15
Phenol	500	500
Arsenic	20	3 gm/day[2]
Lead	5.6	6 gm/day[2]
Zinc	58	70 gm/day[2]
TPH as Diesel	640	640
TPH as Hydraulic Fluid	90	100
TPH as Motor Oil	90	100
4,4´-DDD	0.36	0.36
4,4´-DDE	1.4	1.4
4,4´-DDT	0.01	0.1
Chlordane (tech)	0.004	1.0
Dieldrin	0.002	0.1
Endosulfan I	0.009	0.1
Heptachlor epoxide	0.004	0.1
Aroclor-1016	0.03	1.0
Aroclor-1260	0.03	1.0

[1] Source: Waste Discharge Requirements for Port of Oakland, Berth 55-58 Project, Order No. 99-055, Table 1 (RWQCB, 1999a).

[2] Daily mass limits for flow rates between 10 and 100 gallons per minute (RWQCB, 1999b).

APPENDIX A

DRAWINGS BY OTHERS



APPENDIX A - Figure A-1
RAILYARD EXCAVATION AND SOIL REUSE OPERATIONS PLAN, BERTHS 57/58 AND 59

NOTE:
THIS FIGURE DEPICTS THE PROPOSED FUTURE LAYOUT OF THE BERTHS 55–58 PROJECT.

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY
JOB# 02501-029

SUB15-FIG02.DWG
1=1 04-14-00

REFERENCES:
BASEMAP PROVIDED PORT OF OAKLAND, 1999
"PORT OF OAKLAND DATUM" IS 3.20' BELOW MEAN SEA LEVEL
CAUTION: CHECK TRACING FOR LATEST REVISIONS

REVISIONS			
NO.		DATE	APP'D

REVIEWED ____ FACILITIES DEPARTMENT
REVIEWED ____ CONSTRUCTION DEPARTMENT
REVIEWED ____ VISION 2000 DEPARTMENT

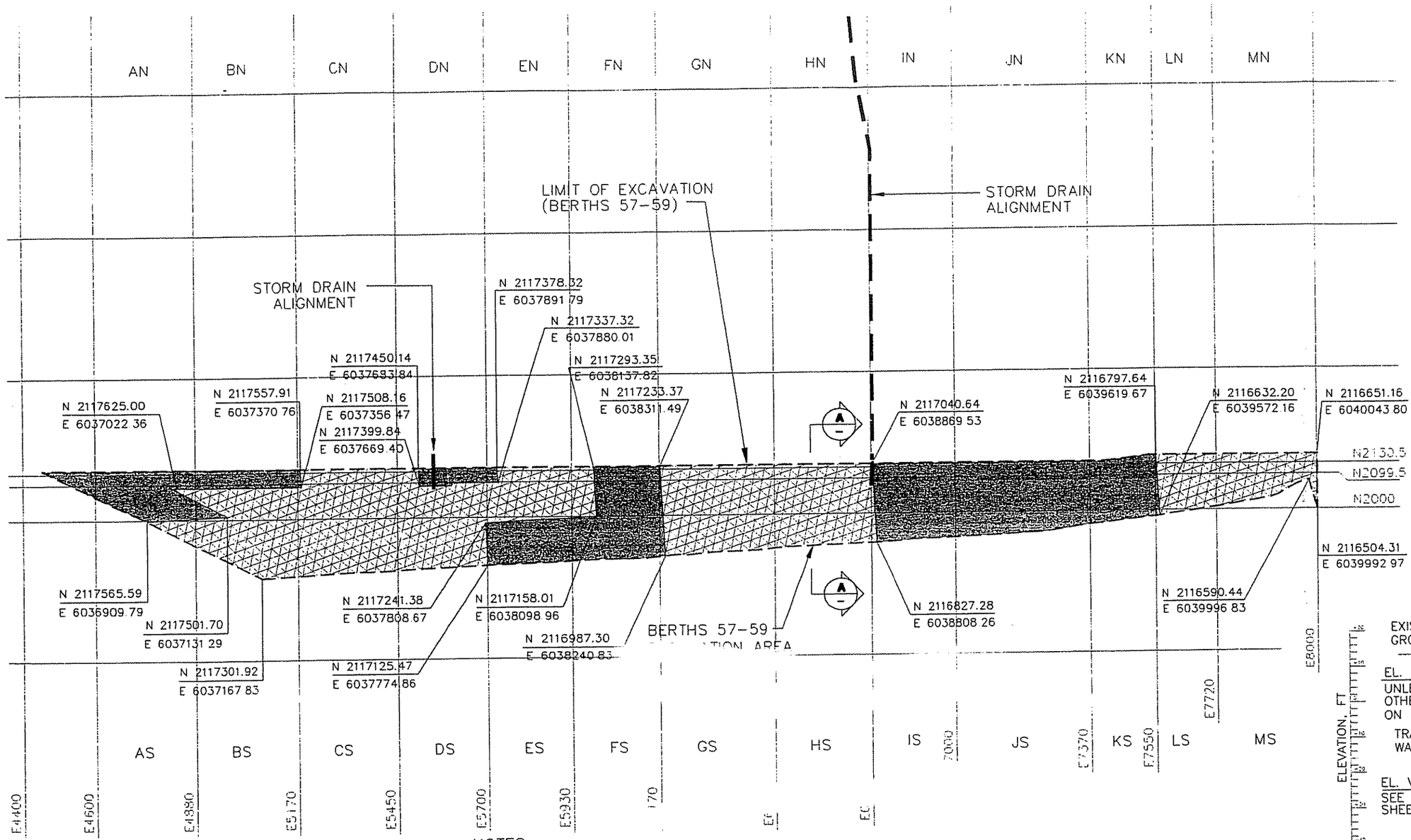
DRAWN SLD
DESIGNED ____ REG. ENGINEER NO.
CHECKED ____ REG. ENGINEER NO.
REVIEWED ____ REG. ENGINEER NO.

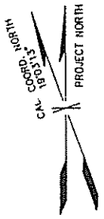
PORT OF OAKLAND
530 WATER ST OAKLAND, CALIFORNIA

CHIEF ENGINEER
APPROVED ____ REG. ENGINEER NO.
RECOMMENDED ____ REG. ENGINEER NO.

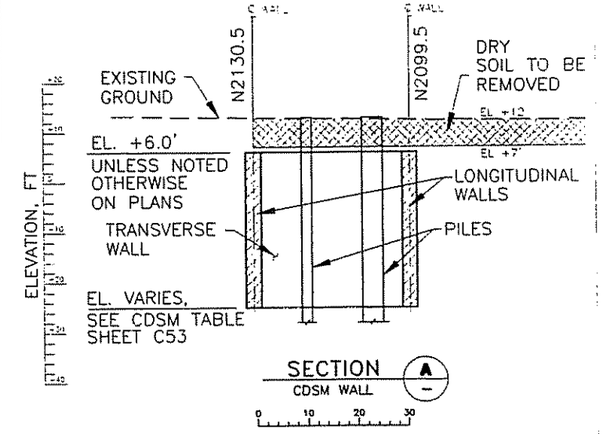
VISION 2000 PROGRAM
HOT SPOT EXCAVATION AND REMEDIATION WORK PLAN
BERTHS 57/58 AND 59
PROJECT LOCATION MAP

DATE: 04-14-00
SCALE: AS NOTED
SHEET: OF SHEETS
FIG. 1B





APPENDIX A - Figure A-2
RAILYARD EXCAVATION AND SOIL REUSE OPERATIONS PLAN, BERTHS 57/58 AND 59



LEGEND

- MATERIAL FOR UPLAND REUSE EXCAVATION AREA
- MATERIAL FOR POTENTIAL OFFSITE DISPOSAL EXCAVATION AREA

NOTES

1. ELEVATIONS ARE BASED ON PORT OF OAKLAND DATUM.
2. REFER TO SHEETS C50 AND C55 FOR CDSM WALL DETAILS
3. BN IDENTIFIES THE SECOND EXCAVATION ZONE (WEST TO EAST) NORTH OF CENTERLINE N2000. BS IDENTIFIES THE SECOND EXCAVATION ZONE (WEST TO EAST) SOUTH OF CENTERLINE N2000.
4. FOR TRACKING PURPOSES, POTENTIAL OFFSITE MATERIAL FROM EXCAVATION ZONE BN WILL BE DESIGNATED AS BN–5 AND MATERIAL FOR UPLAND REUSE WILL BE DESIGNATED AS BN.
5. COORDINATES SHOWN ARE BASED ON CALIFORNIA COORDINATE SYSTEM

CAUTION: THIS PLAN MAY BE REDUCED — 0 100 200 300 ORIGINAL SCALE

S10-ENV-03.DWG
1=1 3-15-00

REFERENCES:
BASEMAP PROVIDED BY CDM/FEJ "SITE CHARACTERIZATION SAMPLE LOCATIONS, UPUP, 1999
BASEMAP REVISED PER FIELD SURVEY BY PLS SURVEYS, INC., 1999
"PORT OF OAKLAND DATUM" IS 3.20' BELOW MEAN SEA LEVEL

CAUTION: CHECK TRACING FOR LATEST REVISIONS

NO.	REVISIONS	DATE	APP'D

REVIEWED _____ FACILITIES DEPARTMENT
REVIEWED _____
REVIEWED _____ CONSTRUCTION DEPARTMENT
VISION 2000 DEPARTMENT

DRAWN S. DUGAN \ C. KOSSA
DESIGNED S. GOYAL
CHECKED D. RATHNAYAKE C45296 REG. ENGINEER NO.
REVIEWED D. RATHNAYAKE C45296 REG. ENGINEER NO.

PORT OF OAKLAND
530 WATER ST. OAKLAND, CALIFORNIA

CHIEF ENGINEER J.H. Daniels C 17439 REG. ENGINEER NO.
APPROVED C 32172 REG. ENGINEER NO.
RECOMMENDED C 45405 REG. ENGINEER NO.

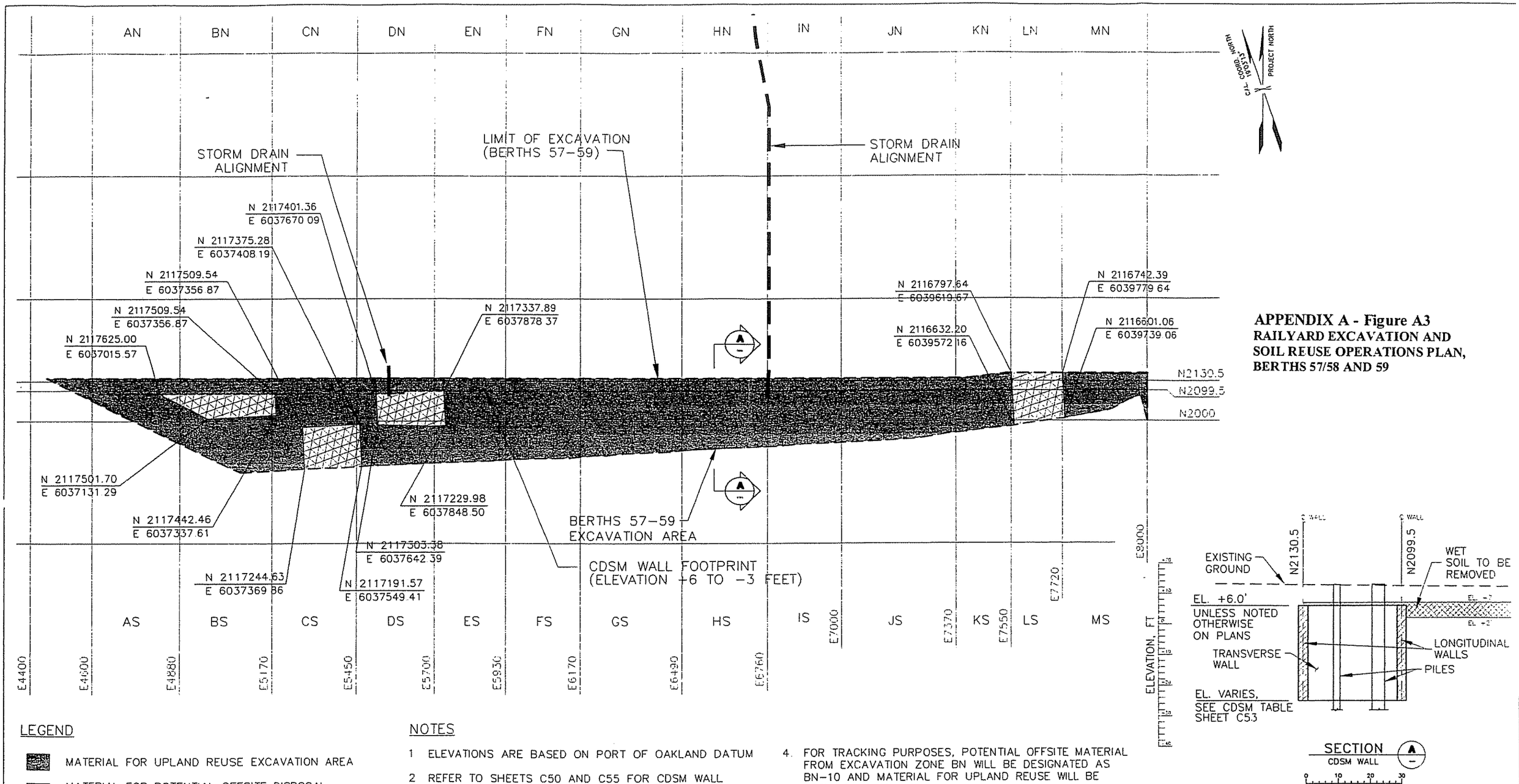
Liftech CONSULTANTS INC. 3566 Grand Ave Oakland CA 94610 510 832-5606 JOB# J1235
DAMES & MOORE GROUP A DAMES & MOORE GROUP COMPANY JOB# 02801-029
VISION 2000

REGISTERED PROFESSIONAL ENGINEER RAM D. RATHNAYAKE No. C45296 EXP. 9/30/02 CIVIL STATE OF CALIFORNIA

CONSTRUCTION OF BERTHS 57/58 CONTAINER WHARF, FILL, AND MIDDLE HARBOR SHORELINE MODIFICATIONS

BERTHS 57/58 – REMOVAL OF SOIL WITHIN EXCAVATION BOUNDARY +12 TO +7 FEET

DATE 3-16-00
SCALE AS NOTED
SHEET 215 OF 219 SHEETS
AA-3612 | ENV 3



APPENDIX A - Figure A3
RAILYARD EXCAVATION AND SOIL REUSE OPERATIONS PLAN, BERTHS 57/58 AND 59

LEGEND

- MATERIAL FOR UPLAND REUSE EXCAVATION AREA
- MATERIAL FOR POTENTIAL OFFSITE DISPOSAL EXCAVATION AREA

NOTES

1. ELEVATIONS ARE BASED ON PORT OF OAKLAND DATUM
2. REFER TO SHEETS C50 AND C55 FOR CDSM WALL DETAILS.
3. BN IDENTIFIES THE SECOND EXCAVATION ZONE (WEST TO EAST) NORTH OF CENTERLINE N2000. BS IDENTIFIES THE SECOND EXCAVATION ZONE (WEST TO EAST) SOUTH OF CENTERLINE N2000.
4. FOR TRACKING PURPOSES, POTENTIAL OFFSITE MATERIAL FROM EXCAVATION ZONE BN WILL BE DESIGNATED AS BN-10 AND MATERIAL FOR UPLAND REUSE WILL BE DESIGNATED AS BN
5. DO NOT REMOVE SOIL FROM CDSM WALL CELLS.
6. COORDINATES SHOWN ARE BASED ON CALIFORNIA COORDINATE SYSTEM.

CAUTION: THIS PLAN MAY BE REDUCED 0 100 200 300 ORIGINAL SCALE

REVISIONS			
NO.		DATE	APP'D

REVIEWED _____ FACILITIES DEPARTMENT
REVIEWED _____ CONSTRUCTION DEPARTMENT
REVIEWED _____ VISION 2000 DEPARTMENT

DRAWN S. DUGAN \ C. KOSSA
DESIGNED S. GOYAL
CHECKED D. RATHNAYAKE REG. ENGINEER NO. C45296
REVIEWED D. RATHNAYAKE REG. ENGINEER NO. C45296

PORT OF OAKLAND
530 WATER ST. OAKLAND, CALIFORNIA

CHIEF ENGINEER T.H. Daniels C 17439 REG. ENGINEER NO.
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RECOMMENDED _____ C 45405 REG. ENGINEER NO.

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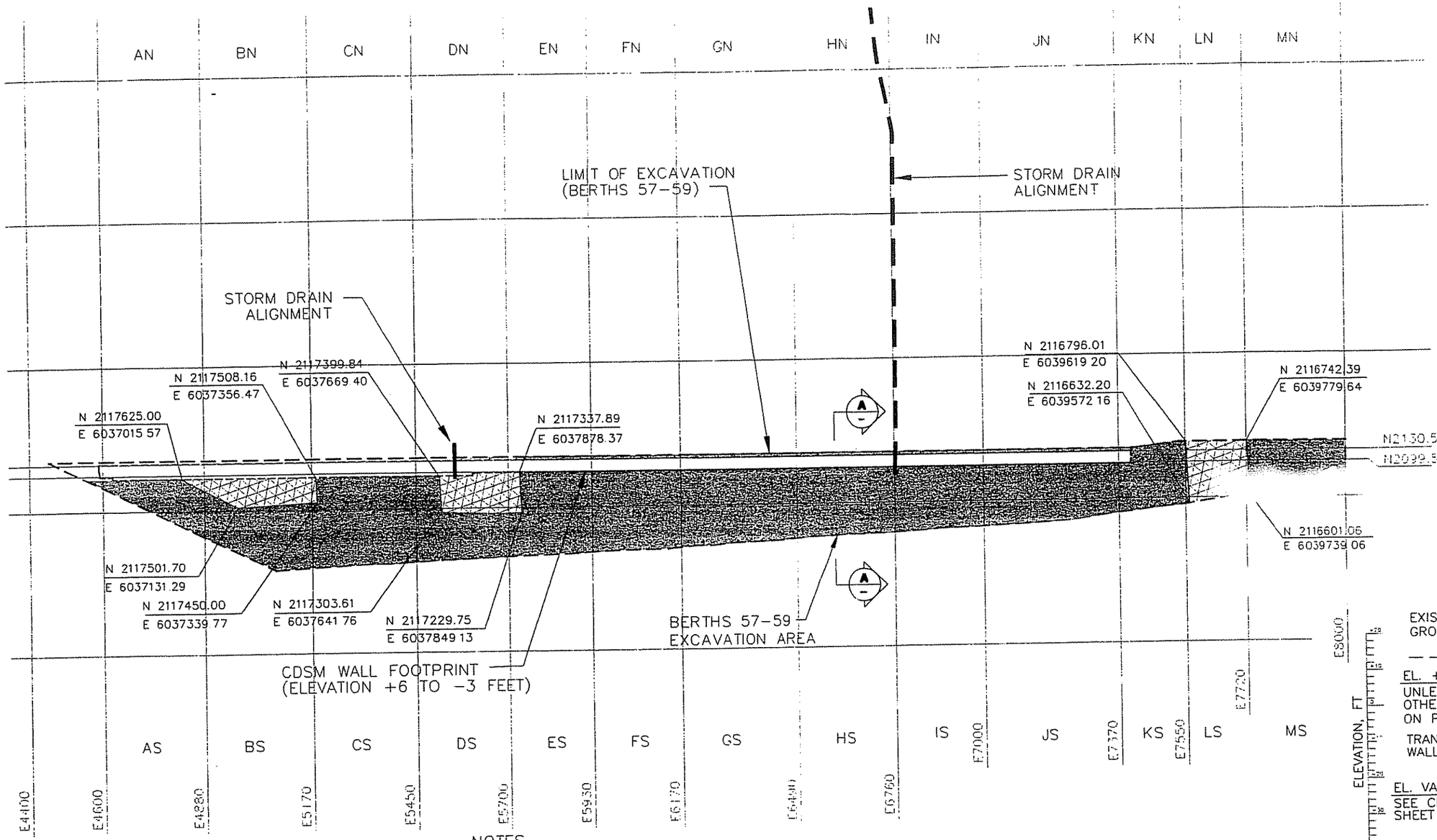
DAMES & MOORE GROUP A DAMES & MOORE GROUP COMPANY JOB# 02501-029
VISION 2000

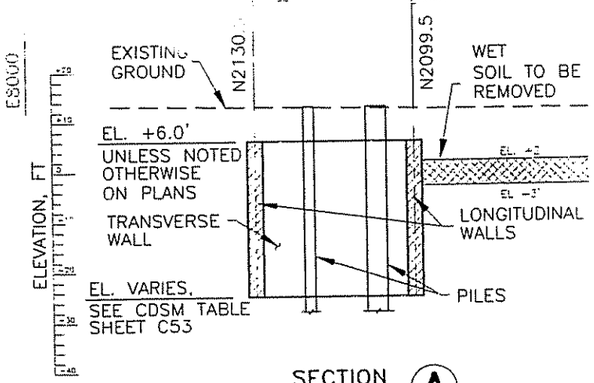
CONSTRUCTION OF BERTHS 57/58 CONTAINER WHARF, FILL, AND MIDDLE HARBOR SHORELINE MODIFICATIONS

BERTHS 57/58 – REMOVAL OF SOIL WITHIN EXCAVATION BOUNDARY +7 TO +2 FEET

REGISTERED PROFESSIONAL ENGINEER D. RATHNAYAKE No. C45296 EXP. 9/30/02 CIVIL STATE OF CALIFORNIA

DATE 3-16-00
SCALE AS NOTED
SHEET 26 OF 29 SHEETS
AA-3612 | ENV 4





APPENDIX A - Figure A-4
RAILYARD EXCAVATION AND SOIL REUSE OPERATIONS PLAN, BERTHS 57/58 AND 59

LEGEND

- MATERIAL FOR UPLAND REUSE EXCAVATION AREA
- MATERIAL FOR POTENTIAL OFFSITE DISPOSAL EXCAVATION AREA

NOTES

1. ELEVATIONS ARE BASED ON PORT OF OAKLAND DATUM
2. DO NOT REMOVE SOIL FROM CDSM WALL CELLS
3. REFER TO SHEETS C50 AND C55 FOR CDSM WALL DETAILS.
4. BN IDENTIFIES THE SECOND EXCAVATION ZONE (WEST TO EAST) NORTH OF CENTERLINE N2000. BS IDENTIFIES THE SECOND EXCAVATION ZONE (WEST TO EAST) SOUTH OF CENTERLINE N2000
5. FOR TRACKING PURPOSES, POTENTIAL OFFSITE MATERIAL FROM EXCAVATION ZONE BN WILL BE DESIGNATED AS BN–15 AND MATERIAL FOR UPLAND REUSE WILL BE DESIGNATED AS BN.
6. COORDINATES SHOWN ARE BASED ON CALIFORNIA COORDINATE SYSTEM

CAUTION: THIS PLAN MAY BE REDUCED 0 100 200 300 ORIGINAL SCALE

S10-ENV-05.DWG
1 of 1 3-15-00

REFERENCES:
BASEMAP PROVIDED BY CDM/FEJ "SITE CHARACTERIZATION SAMPLE LOCATIONS, UPRR, 1999"
BASEMAP REVISED PER FIELD SURVEY BY PLS SURVEYS, INC., 1999
"PORT OF OAKLAND DATUM" IS 3.20' BELOW MEAN SEA LEVEL

CAUTION: CHECK TRACING FOR LATEST REVISIONS

NO	REVISIONS	DATE	APP'D

REVIEWED ____ FACILITIES DEPARTMENT
REVIEWED ____ CONSTRUCTION DEPARTMENT
REVIEWED ____ VISION 2000 DEPARTMENT

DRAWN S. DUGAN \ C. KOSSA
DESIGNED S. GOYAL
CHECKED D. RATHNAYAKE REG. ENGINEER NO. C45296
REVIEWED D. RATHNAYAKE REG. ENGINEER NO. C45296

PORT OF OAKLAND
530 WATER ST OAKLAND, CALIFORNIA

CHIEF ENGINEER T.H. Daniels C 17439 REG. ENGINEER NO.
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DAMES & MOORE GROUP
A DAMES & MOORE GROUP COMPANY
JOB# 02801-029

VISION 2000

REGISTERED PROFESSIONAL ENGINEER
D. RATHNAYAKE
No. C45296
EXP. 9/30/02
CIVIL
STATE OF CALIFORNIA

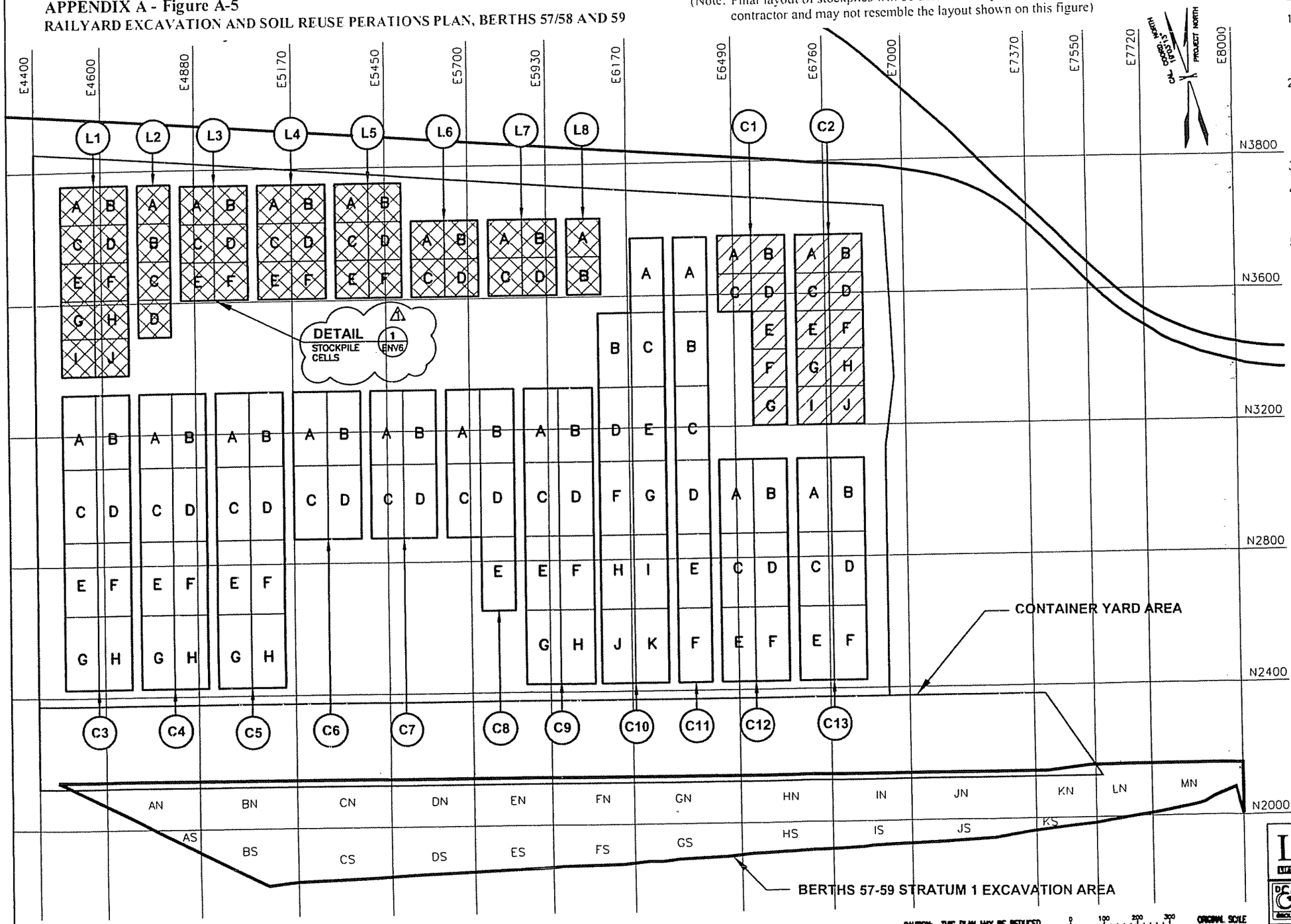
CONSTRUCTION OF BERTHS 57/58 CONTAINER WHARF, FILL, AND MIDDLE HARBOR SHORELINE MODIFICATIONS

BERTHS 57/58 – REMOVAL OF SOIL WITHIN EXCAVATION BOUNDARY +2 TO –3 FEET

DATE 3-16-00
SCALE AS NOTED
SHEET 217 OF 219 SHEETS
AA-3612 | ENV 5

APPENDIX A - Figure A-5
RAILYARD EXCAVATION AND SOIL REUSE PERATIONS PLAN, BERTHS 57/58 AND 59

(Note: Final layout of stockpiles will be determined by the contractor and may not resemble the layout shown on this figure)



NOTES

1. STRATUM 1 MATERIAL WITHIN BERTHS 57–59 WHARF AREA SHALL BE EXCAVATED AND STOCKPILED IN ACCORDANCE WITH THESE PLANS AND SPECIFICATIONS.
2. MATERIAL DESIGNATED FOR POTENTIAL OFF–SITE DISPOSAL SHALL BE LINED STOCKPILE CELLS (L1 THROUGH L8). MATERIAL FOR UPLAND REUSE SHALL BE PLACED IN UNLINED STOCKPILE CELLS (C1 THROUGH C13)
3. ALL STOCKPILES WILL BE TESTED BY THE PORT.
4. MATERIAL FOR CONSTRUCTING THE CONTAINER YARD SHALL BE OBTAINED FROM THE STOCKPILES AFTER TESTING AS DIRECTED BY PORT.
5. STOCKPILES TO BE MANAGED UNTIL TRANSPORTED FOR OFF–SITE DISPOSAL, REMOVED FOR REUSE OR UNTIL REQUIRED BY THE PORT.
6. FOR TRACKING PURPOSES, MATERIAL EXCAVATED SHALL BE IDENTIFIED AS NOTED ON SHEETS ENV 3 THROUGH ENV 5.
7. STORY POLES SHALL BE USED TO SEPARATE ONE STOCKPILE SUBCELL FROM ANOTHER WITHIN EACH STOCKPILE CELL.
8. SEE CIVIL DRAWINGS FOR LIMITS OF EXCAVATION.
9. SOILS ARE DESCRIBED AS WET OR DRY BASED ON TYPICAL SITE CONDITIONS. ACTUAL FIELD CONDITIONS MAY VARY.

LEGEND

- C11 L2 — STOCKPILE CELLS
- A — STOCKPILE SUBCELL
- KN — EXCAVATION ZONES NORTH OF N2000
- KS — EXCAVATION ZONES SOUTH OF N2000
- STOCKPILE CELLS FOR PLACING DRY MATERIAL FOR UPLAND REUSE (GENERALLY FROM 0 TO 5 FT BGS)
- STOCKPILE CELLS FOR PLACING MATERIAL FOR POTENTIAL OFF–SITE DISPOSAL

CAUTION: THIS PLAN MAY BE REDUCED — 0 100 200 300 — ORIGINAL SCALE

SUB19-ENV01.DWG
1=1 5-3-00

REFERENCES:
"PORT OF OAKLAND DATUM" IS 3.20' BELOW MEAN SEA LEVEL

NO	REVISIONS	DATE	APP'D
1.	Refer to ENV 6	5/5/00	DR

REVIEWED _____ FACILITIES DEPARTMENT
REVIEWED _____ CONSTRUCTION DEPARTMENT

DRAWN S. DUGAN \ C. KOSSA
DESIGNED G. TANG
CHECKED D. RATHNAYAKE C45298 REG ENGINEER NO

PORT OF OAKLAND
530 WATER ST. OAKLAND, CALIFORNIA

CHIEF ENGINEER J.H.D. Davis C 17439 REG ENGINEER NO
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VISION 2000

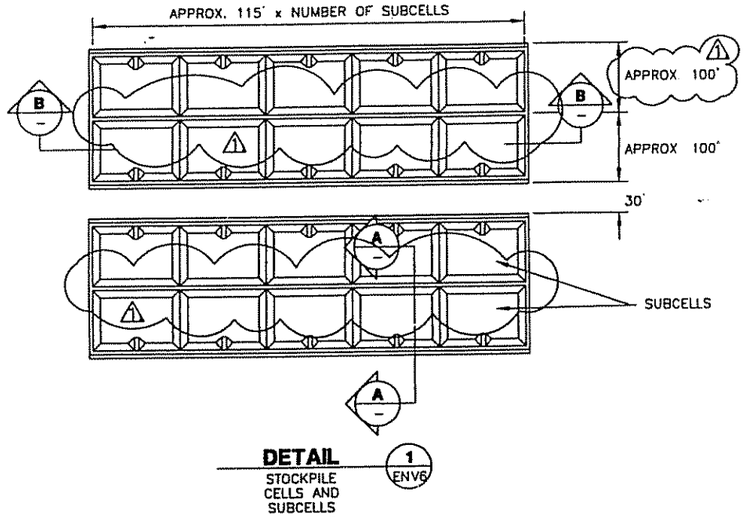
REGISTERED PROFESSIONAL ENGINEER D. RATHNAYAKE No. C45298 EXP. 3/31/01 CIVIL STATE OF CALIFORNIA

CONSTRUCTION OF BERTHS 57/58 CONTAINER WHARF, FILL, AND MIDDLE HARBOR SHORELINE MODIFICATIONS

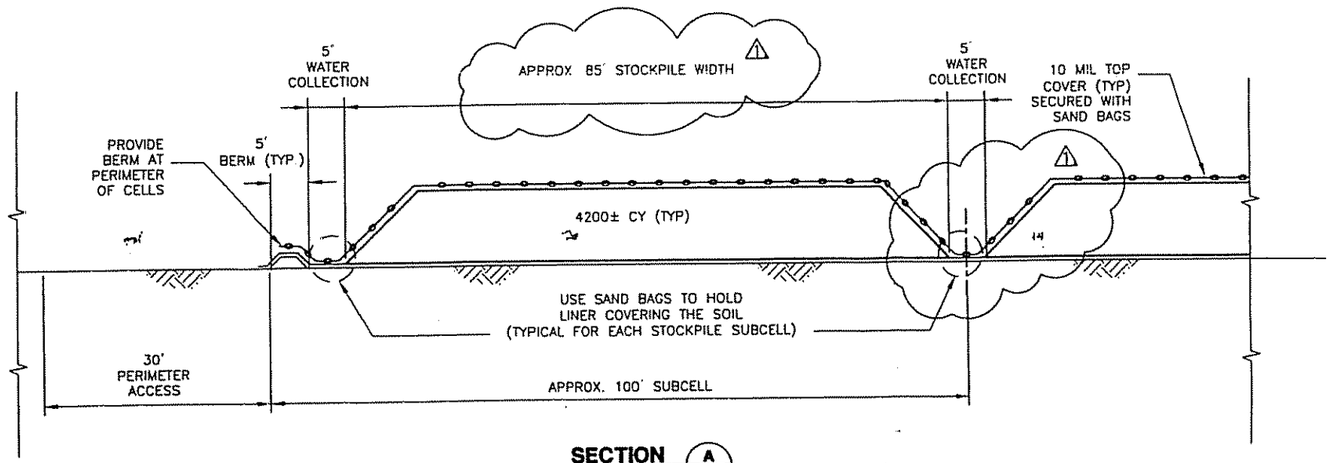
BERTHS 57–59 STRATUM 1 EXCAVATION AND STOCKPILE PLAN

DATE 5-5-00
SCALE AS NOTED
SHEET OF SHEETS

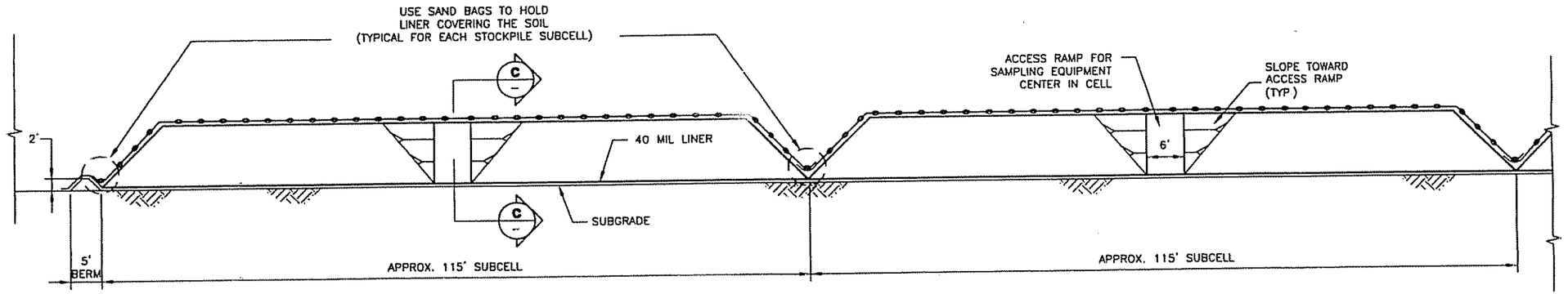
AA–3612 | ENV 1



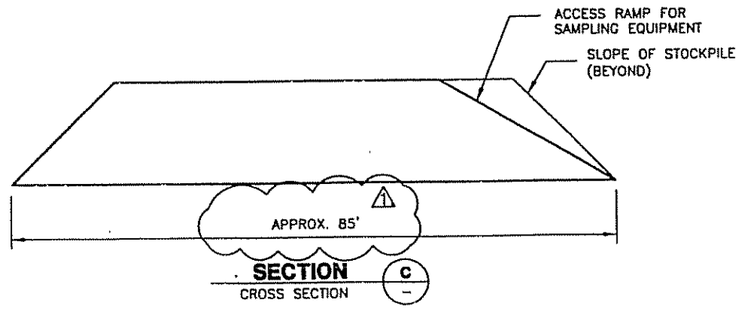
DETAIL 1 ENV6
STOCKPILE CELLS AND SUBCELLS
NOT TO SCALE



SECTION A
NOT TO SCALE



SECTION B
LONGITUDINAL VIEW
NOT TO SCALE



SECTION C
CROSS SECTION
NOT TO SCALE

NOTES

1. STOCKPILE DETAILS FOR UPLAND REUSE SUBCELLS (C1 THROUGH C13) ARE SIMILAR, BUT NO LINERS ARE REQUIRED.
2. ADD STORY POLES TO DIVIDE 4,200 CY OF MATERIAL. EACH STOCKPILE SUBCELL SHALL BE ACCESSIBLE FOR REMOVAL.
3. ALL DIMENSIONS ARE APPROXIMATE.
4. DO NOT PROVIDE BERMS @ UNLINED STOCKPILES

APPENDIX A - Figure A-6
RAILYARD EXCAVATION AND SOIL REUSE OPERATIONS PLAN, BERTHS 57/58 AND 59

SUB19-ENV06.dwg
1=1 5-3-00

REFERENCES:
"PORT OF OAKLAND DATUM" IS 3.20' BELOW MEAN SEA LEVEL

NO.	REVISIONS	DATE	APP'D
1.	REMOVED BERM BETWEEN SUBCELLS, CHANGED	5/5/00	DR

REVIEWED _____ FACILITIES DEPARTMENT
REVIEWED _____ CONSTRUCTION DEPARTMENT

DRAWN S. DUGAN \ C. KOSSA
DESIGNED G. TANG
CHECKED D. RATHNAYAKE REG. ENGINEER NO. C45296

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530 WATER ST. OAKLAND, CALIFORNIA

CHIEF ENGINEER T.H.Davis C 17439
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DCM GROUP DAMES & MOORE A DAMES & MOORE GROUP COMPANY JOB# 02501-029

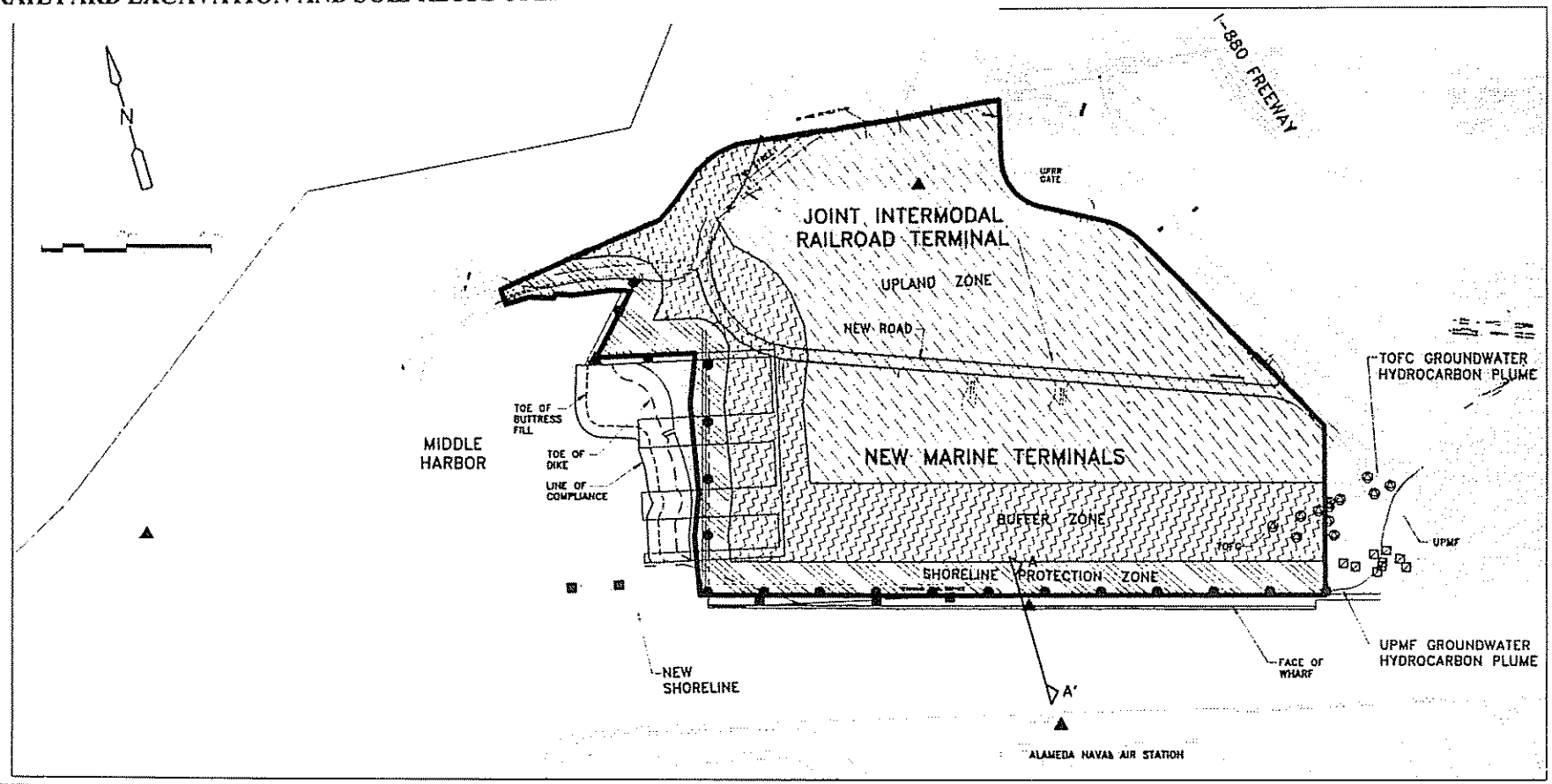
REGISTERED PROFESSIONAL ENGINEER D. RATHNAYAKE No. C45296 EXP. 9/30/02 CIVIL STATE OF CALIFORNIA

VISION 2000
CONSTRUCTION OF BERTHS 57/58 CONTAINER WHARF, FILL, AND MIDDLE HARBOR SHORELINE MODIFICATIONS

STOCKPILE DETAILS

DATE: 5-5-00
SCALE: AS NOTED
SHEET OF SHEETS
ENV-6

APPENDIX A - Figure A-7
RAILYARD EXCAVATION AND SOIL REUSE OPERATIONS PLAN, BERTHS 57/58 AND 59



- Shoreline Protection Zone, 0–300 Feet from New Shoreline (Zone I)
- Buffer Zone, 300–1,000 Feet from New Shoreline (Zone II)
- Upland Zone, Greater than 1,000 Feet from New Shoreline (Zone III)
- Location of Geologic Cross Section
- Union Pacific Intermodal Railyard (UPIR) Boundary
- PORT – Proposed Compliance Groundwater Monitoring Well
- PORT – Groundwater Monitoring Well Cluster Location, B and C Series
- PORT – Groundwater Monitoring Well Location
- Union Pacific Trailer on Flat Car (TOFC) Groundwater Monitoring Well Location
- Union Pacific Motor Freight (UPMF) Groundwater Monitoring Well Location

TOFC	Trailer on Flat Car
UPMF	Union Pacific Motor Freight
UPRR	Union Pacific Railroad
UPIR	Union Pacific Intermodal Railyard

FIGURE 3

PROPOSED SOIL RELOCATION PROJECT

Vision 2000 Program Area
(Union Pacific Intermodal Railyard and FISCO Sites)
Port of Oakland
Oakland, California