

Site Cleanup Requirements for
Meade Street Operable Unit, Subunit 2

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION**

ORDER NO. 01-102

SITE CLEANUP REQUIREMENTS FOR:

**UNIVERSITY OF CALIFORNIA BERKELEY
ZENECA INC.**

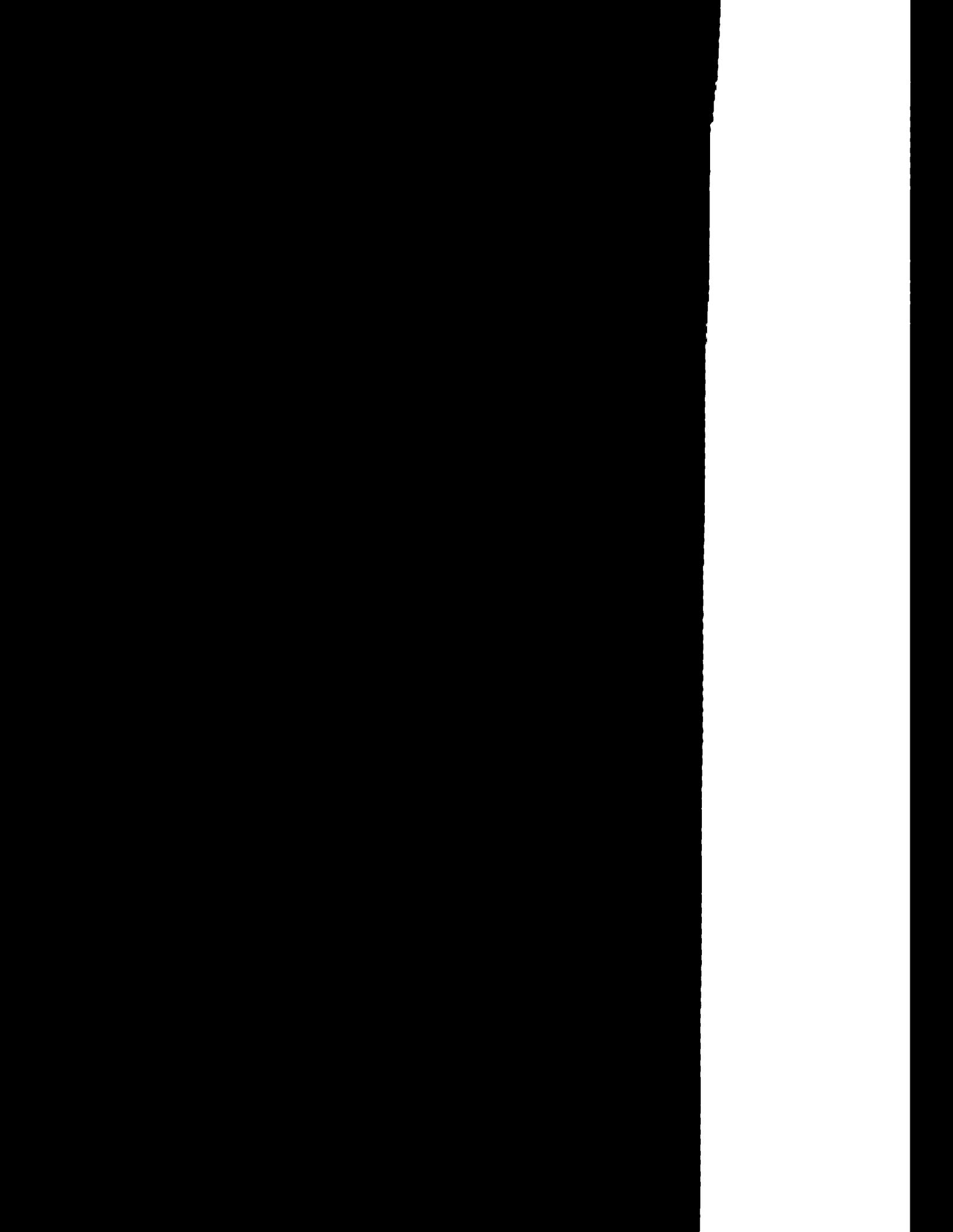
**UNIVERSITY OF CALIFORNIA RICHMOND FIELD STATION
1301 SOUTH 46th STREET
RICHMOND, CONTRA COSTA COUNTY**

**MEADE STREET OPERABLE UNIT
SUBUNIT 2**

The California Regional Water Quality Control Board, San Francisco Bay Region, (hereinafter called the Board), finds that:

SITE LOCATION AND OWNER

1. Site location: The University of California Richmond Field Station (UCRFS) site is located at 1301 South 46th Street in Richmond, California, south of Interstate 580, and along the San Francisco Bay shoreline in Richmond, California (refer to Figure 1). The site is bound by industrial areas to the north, east, and west. To the south of the site is the East Bay Regional Park District's Bay Trail. The site consists of approximately 100 acres and is used for academic research and activities by the University. The UCRFS site, the adjacent Zeneca, Inc. (Zeneca) site, and portions of the adjacent Stege Marsh comprise the area designated as the Meade Street Operable Unit (refer to Figure 2).
2. Site owner: Portions of the UCRFS site were formerly owned by the California Cap Company, which produced blasting caps on the eastern portion of the site. In 1950, the site was acquired by University of California Berkeley (UC Berkeley). The site is utilized by UC Berkeley for academic and research programs administered by the Department of Engineering, the Forest Products Lab, and other departments. As current owner of the site, UC Berkeley is responsible for releases originating at the site and is hereinafter named as a discharger. Zeneca, which is the current owner of the adjoining property, was the source of pyrite cinders used as fill at the site, is also named as a discharger. UC Berkeley and Zeneca are collectively referred to hereinafter as the dischargers.



PURPOSE OF ORDER

3. Site Cleanup Requirements: This order prescribes Site Cleanup Requirements (SCRs) for Subunit 2 of the Meade Street Operable Unit, which consists of the UCRFS site including a portion of the adjacent Western Stege Marsh. The order includes general provisions and tasks necessary to contain and remediate soil and groundwater pollution at the site and is being issued pursuant to Section 13304 of the California Water Code.
4. Implementation of remedial measures: This order requires additional site investigation and implementation of remedial measures for Subunit 2 of MSOU, which consists of the upland portion of the UCRFS site and the adjacent Western Stege Marsh. The dischargers are required to submit conceptual remediation and risk management plans which propose site screening criteria, and risk assessments which evaluate exposure of human and ecological receptors to impacted soil and groundwater at the site and propose remedial actions and risk management practices to eliminate or significantly reduce the potential for exposure of human or ecological receptors to impacted soil and groundwater at the site.
5. Coordinated cleanup: This order, in conjunction with Site Cleanup Requirements for the adjacent Zeneca site, located immediately to the east, comprise a coordinated plan which addresses impacts to upland areas and wetland areas of both the UCRFS site and the Zeneca site.

SITE DESCRIPTION

6. Upland area: The site comprises approximately 100 acres and is relatively flat. The site consists of two main areas: the upland area on the northern portion of the site, and Western Stege Marsh at the southern portion of the site. The uplands area consists of buildings and various ornamental trees, shrubs, and lawn areas. Most of the current and historic site development is located on the eastern portion of the upland area. A sea wall and fill areas are also located in the southern portion of the upland area.
7. Western Stege Marsh: The adjacent Western Stege Marsh consists of approximately 10 acres. The inner portion of Western Stege Marsh (inner marsh) is bounded to the south by the East Bay Regional Park District's paved Bay Trail. Meeker Slough flows through the western portion of the inner marsh. The inner marsh is vegetated primarily with saltgrass, pickleweed, cordgrass, and reed.

SITE HISTORY

8. Explosives manufacturing: In approximately 1870, various companies began producing chemicals and explosives on the property. The California Cap Company acquired the site

- in 1877 and established several facilities for the manufacture of explosives. California Cap Company's operations on-site included production of mercury fulminate, blasting caps, and shells. California Cap Company also had facilities for testing and storing explosives. Production of explosives ceased in 1948 prior to UC Berkeley's purchase of the property in 1950. California Cap Company removed all production facilities and attempted to remove hazardous materials at the site.
9. UC Berkeley use: During the 1950's, UC Berkeley erected a number of new buildings in the upland area to accommodate research programs, including administration buildings and the Forest Products Laboratory where wood preservatives were tested. Current facilities at the UCRFS site include the Forest Products Laboratory, research facilities for seismic engineering, fire testing, hydraulic modeling, soil mechanics, sanitary engineering, environmental health, and library storage facilities.
10. Pyrite cinders: Stauffer Chemical Company generated pyrite cinders as a byproduct of their sulfuric acid manufacturing operations from approximately 1919 through 1962. Sometime during this period, pyrite cinders were deposited on the southeast portion of the UCRFS site and the adjacent portion of Western Stege Marsh. Cinders were also placed directly into Stege Marsh in the vicinity of a seawall, breakwater, and a pier. Pyrite ore contains primarily pyrite (FeS_2), and lesser amounts of chalcopyrite (CuFeS_2), sphalerite (ZnS), and magnetite (Fe_3O_4). Various other metals such as arsenic and lead, and inorganics are also commonly associated with pyrite ore utilized by Stauffer. UC Berkeley constructed roads, utilities, and research ponds on, or using the pyrite cinders that were deposited in this area.

REGULATORY STATUS

11. No previous SCRs were adopted for the site.

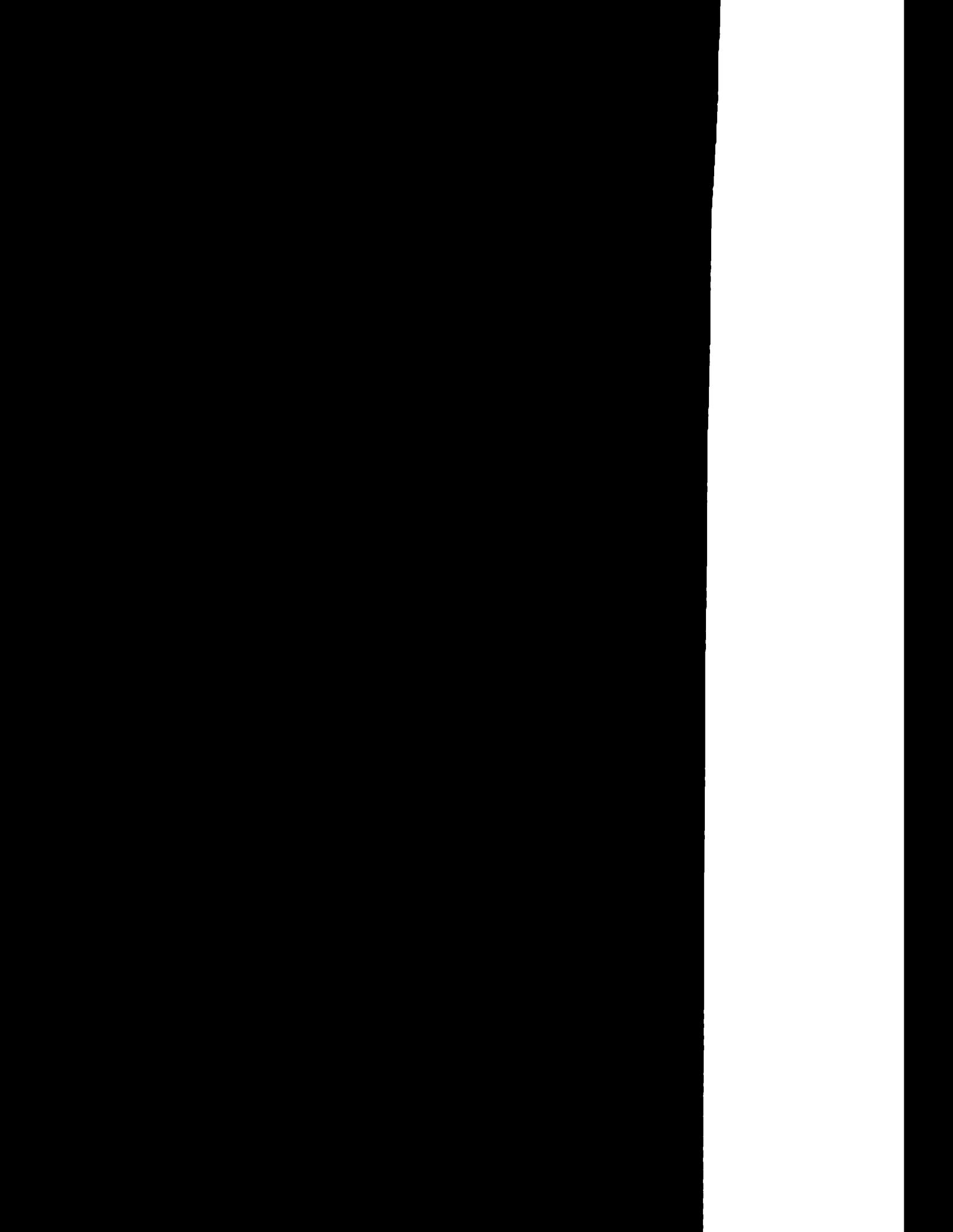
OPERABLE UNITS AND DISCHARGERS NAMED

12. Operable Unit/subunit structure: The area containing the UCRFS site and the adjacent Zeneca sites and their groundwater pollution plumes is referred to as the Meade Street Operable Unit (MSOU). The MSOU has been subdivided into two subunits: Subunit 1 consists of the area of the Zeneca site and the adjacent portion of Eastern Stege Marsh; Subunit 2 consists of the UCRFS site and the adjacent portion of Western Stege Marsh. The subunit boundaries are shown in Figure 2. Subunit 2 is further subdivided into Subunits 2A and 2B. Subunit 2A consists of the cinder fill area located in the southeastern portion of the upland area of the site and the eastern portion of the Western Stege Marsh. Subunit 2B consists of the remainder of the upland portion of the UCRFS site and the western portion of Western Stege Marsh.

13. Dischargers named: Zeneca and University of California Berkeley, as the sources of pollution in Subunit 2A of MSOU, are both named dischargers responsible for addressing pollution within Subunit 2A. University of California Berkeley, as the source of pollution within the area of Subunit 2B of MSOU, is the discharger named responsible for addressing pollution within Subunit 2B. Zeneca and University of California Berkeley are wholly responsible for addressing pollution in the subunit(s) to which they are named and complying with the requirements of this Orders.
14. Future modification of order: As additional information is generated in the MSOU and its subunits, the Board may modify the dischargers named in this order.

SITE GEOLOGIC AND HYDROGEOLOGIC SETTING

14. General geology: The Subunit 2 site geology consists primarily of alluvial sediments that were deposited at the site from the Berkeley Hills, located east and northeast of the facility. The hydrogeologic evaluations indicate that the sediments in the upper 80 to 100 feet beneath the facility can be subdivided into four units: fill, Bay Sediments, Quaternary Alluvium, and Yerba Buena mud. Fill material consists of clean soil, concrete, and cinders, a byproduct of sulfuric acid production at the adjacent Zeneca site, and ranges from zero to approximately 15 feet thick. Fill is generally thicker in the southern part of the facility adjacent to the San Francisco Bay. Bay sediments are in the southern portion of the site, south of the San Francisco Bay shoreline. Bay sediments are primarily composed of fine-grained silty sand with smaller amounts of mud and peat, and range from approximately 5 feet to 9 feet thick. Beneath the Bay Sediments lie the Quaternary Alluvium, which consists of interbedded gravel, sand, silt, and clay units. The Quaternary Alluvium are upper and lower water bearing units; an aquitard has not been consistently observed between the units. The lowermost layer observed is the Yerba Buena Mud. The Yerba Buena Mud is laterally extensive and is approximately 40-50 feet thick. The top of the Yerba Buena Mud is present at depths of approximately 25-35 feet below ground surface in the northern portion of the site, and at approximately 35 feet below groundwater surface in the southern portion of the site.
15. Hydrogeology: Two hydrogeologic units have been identified at the site: the water bearing sand and gravel in the Upper Horizon, and the water bearing sand and gravel in the Lower Horizon. The Upper Horizon is typically found ranging from approximately 10 to 20 feet below ground surface, and the sand and gravel units in the Upper Horizon appears to be mostly continuous laterally across the site. The Lower Horizon is encountered above the Yerba Buena Mud at depths ranging from approximately 25-35 feet below ground surface. The sand and gravel units in the Lower Horizon vary in thickness from less than 2 feet thick to 8 feet thick. Groundwater within the U



Horizon and the Lower Horizon generally flows southwesterly toward the Bay, and has a relatively low gradient. The groundwater deeper than approximately 25 feet below ground surface is considered a potential drinking water source. The primary sources of recharge to the shallow groundwater units are through direct infiltration of on-site precipitation in upgradient areas, and tidal seepage from the Bay.

SOIL AND GROUNDWATER CONTAMINATION

16. Releases in UCRFS site: Extensive sampling was conducted on-site in order to evaluate soil and groundwater impacts associated with operations on-site. The sampling and site history data indicate that significant soil and groundwater contamination at the site was caused by releases at sources on the southern portion of the uplands areas, including the California Cap facilities associated with the production of mercury fulminate used to make blasting caps for detonating explosives. The data also indicate that the soil and groundwater on the southeast portion of the site has been significantly impacted by pyrite cinders. Pyrite cinders have also been found in small isolated pockets in other areas of the upland portion of the site. However, these isolated pockets of pyrite cinders have not significantly impacted soil and groundwater. The chemicals detected in soil and groundwater reflect historic site and chemical use and storage practices and may reflect off-site releases.
17. Soil in uplands area: Investigations show that some of the pyrite cinders primarily in the southeastern portion of the site have oxidized, resulting in pH levels as low as 3.4 in soil. Investigations also indicate elevated concentrations of metals in soil, including arsenic (160 ppm maximum, 44 ppm mean), lead (850 ppm maximum, 60 ppm mean), copper (4,600 ppm maximum, 508 ppm mean), and mercury (5,300 ppm maximum, 49 ppm mean). Pesticides detected in soil include DDT (380 ppb maximum, 53 ppb mean), and DDD (1,600 ppb maximum, 50 ppb mean). PCBs were also detected in sediment with the western storm drain at concentrations up to 42 ppm.
18. Groundwater in uplands area: Sampling indicates that groundwater has been significantly impacted by operations at the site. Elevated metals and inorganics concentrations in groundwater include: arsenic (17 ppb maximum, 4 ppb mean), cobalt (4,100 ppb maximum, 148 ppb mean), mercury (5.9 ppb maximum, 0.5 ppb mean), nickel (470 ppb maximum, 56 ppb mean), selenium (10 ppb maximum, 4 ppb mean), zinc (12,000 ppb maximum, 1033 ppb mean). Pesticides detected along the eastern property boundary in groundwater include DDT (1.5 ppb maximum, <0.1 ppb mean), endrin (1.8 ppb maximum, <0.1 ppb mean). PCBs were also detected in groundwater (1.3 ppb maximum, 0.52 ppb mean).

19. Western Stege Marsh impacts: Western Stege Marsh has been impacted by releases on Subunit 2 and the placement of pyrite cinders in the uplands area and into the marsh areas. The benthic community of the marsh has been significantly impaired by the low pH conditions, metals, PCBs, and pesticides detected in sediment samples. The pH of the marsh water has been measured as low as 2.2. Metals in sediment include: arsenic (1,200 ppm maximum, 226 mean), copper (22,000 ppm maximum, 815 ppm mean), lead (800 ppm maximum, 147 ppm mean), mercury (430 ppm maximum, 16 ppm mean), nickel (140 ppm maximum, 52 ppm mean), and zinc (8,800 ppm maximum, 903 ppb mean). Pesticides detected in marsh sediment include: DDD (1,600 ppb maximum, 25 ppb mean), DDT (380 ppb maximum, 39 ppb mean), and DDE (620 ppb maximum, 6 ppb mean). PCBs were also detected in the marsh at levels of up to 1,600 ppm. Water samples obtained from Western Stege Marsh include elevated concentrations of metals and inorganics and pesticides, including: arsenic (260 ppb maximum, 46 ppb mean), copper (30,000 ppb maximum, 3,030 ppb mean), mercury (5.9 ppb maximum, 0.19 ppb mean), nickel (1,200 ppb maximum, 153 ppb mean), zinc (55,000 ppb maximum, 7,217 ppb mean), and DDT (1.5 ppb maximum, <0.1 ppb mean). PCBs were also detected in water at levels up to 0.8 ppb.
20. Impacts at the adjacent Zeneca site from use of pyrite cinders as fill: The adjacent Zeneca site has also been significantly impacted by the use of pyrite cinders as fill. The thickness of the cinder fill at the Zeneca site is up to 15 feet thick. As observed at the UCRFS site, oxidation of sulfur associated with cinders has resulted in low pH conditions and elevated metals in soil and groundwater at the Zeneca site and in the adjacent Eastern Stege Marsh.
21. Impacts at Zeneca site from other on-site Zeneca sources: The Zeneca site has also been impacted by releases associated with other historic on-site operations. Other operations at the Zeneca include the research and production of pesticides and fertilizers. Releases associated with Zeneca on-site operations have impacted soil and groundwater at the Zeneca site with metals, VOCs, SVOCs, and pesticides.
22. Basis for Cleanup Standards
 - a. State Board Resolution 68-16: State Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California," applies to this discharge and requires attainment of background levels of water quality, or the highest levels of water quality which is reasonable if background levels of water quality cannot be restored. Cleanup levels other than background must be consistent with the maximum benefit to the people of the State, not unreasonably affect present and anticipated beneficial uses of such water, and not result in exceedance of applicable water quality objectives. The previously-cited cleanup plan indicates that restoration of water quality to background levels is not

necessary to protect beneficial use of groundwater at the site and potential site receptors. This order and its requirements are consistent with Resolution No. 68-16.

- b. State Board Resolution 92-49: State Board Resolution No. 92-49, "Policies and procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304," applies to this discharge. This order and its requirements are consistent with the provisions of Resolution No. 92-49 as amended.
- c. Board Resolution 89-39: Board Resolution No. 89-39, "Sources of Drinking Water," defines potential sources of drinking water to include all groundwater in the region, with limited exceptions for areas of high TDS, low yield, or naturally-high contaminant levels. Based on site investigations, groundwater within the upper aquifer zone is brackish and is therefore not considered a potential source of drinking water. However, the deeper aquifers beneath the site are not brackish and are therefore considered a potential source of drinking water.
- d. Beneficial uses as specified by the Basin Plan: The Board adopted a revised Water Quality Control Plan for the San Francisco Bay Basin Plan (Basin Plan) on June 21, 1995. This updated and consolidated plan represents the Board's master water quality control planning document. The revised Basin Plan was approved by the State Water Resources Control Board and the Office of Administrative Law on July 20, 1995, and November 13, 1995, respectively. A summary of regulatory provisions is contained in Title 23, California Code of Regulations, Section 3912. The Basin Plan defines beneficial uses and water quality objectives for waters of the State, including surface waters and groundwaters.

The beneficial uses of San Francisco Bay include:

- a. wildlife habitat;
- b. navigation;
- c. water contact recreation;
- d. non-contact water recreation;
- e. commercial and sport fishing;
- f. preservation of rare and endangered species;
- g. estuarine habitat;
- h. fish migration;
- i. fish habitat;
- j. industrial service supply; and
- k. shellfish harvesting.

The existing and potential beneficial uses for Stege Marsh include:

- a. estuarine habitat
- b. preservation of rare and endangered species
- c. water contact recreation
- d. non-contact water recreation
- e. fish spawning
- f. wildlife habitat

The existing and potential beneficial uses for groundwater in the vicinity of Subunit 2 include:

- a. municipal and domestic water supply
 - b. industrial process water supply
 - c. industrial service water supply
 - d. agricultural water supply
 - e. freshwater replenishment to surface water
- e. Future Changes to Cleanup Standards: The goal of this remedial action is to restore the beneficial uses of groundwater underlying and adjacent to the site. Results of cleanup at other sites suggest that full restoration of beneficial uses to groundwater as a result of active remediation at this site may not be possible. If full restoration of beneficial uses is not technologically nor economically achievable within a reasonable period of time, then the discharger may request modification of the cleanup standards or establishment of a containment zone, a limited groundwater pollution zone where water quality objectives are exceeded. Conversely, if new technical information indicates that cleanup standards can be surpassed, the Board may decide that further cleanup action should be taken. Cleanup standards will also be reassessed if residential land use is proposed for the Upland Area in the future and as warranted by additional site data.

MONITORING PROGRAMS

23. Groundwater Monitoring – Only one groundwater monitoring well is located on the site (MW-1). Submittal of workplans for the installation and monitoring of additional wells is a requirement of Tasks 2.b and 4.c of this order. Additional wells at the site are necessary to more completely characterize groundwater conditions and to monitor the effectiveness of remedial measures.
24. Surface Water Monitoring – Surface water monitoring is necessary to evaluate the conditions within Stege Marsh and the effectiveness of remedial measures. Submittal of surface water monitoring plans is required in Tasks 3.b and 5.a of this order.

25. CEQA exemption: This order for Site Cleanup Requirements is exempt from the provisions of the California Environmental Quality Act (CEQA) pursuant to Section 15321, Title 14 of the California Code of Regulations.
26. Other plans and permits: The dischargers are required to implement a soil management plan and to comply with NPDES Industrial and Construction Activity Storm Water permits, and a stormwater pollution prevention plan.
27. Public notice: The Board has notified the dischargers and interested agencies and persons of its intent to adopt revised, updated Site Cleanup Requirements for the dischargers and has provided them with an opportunity for a public hearing and an opportunity to submit their written views and recommendations.
28. Board hearing: The Board, in a public meeting heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED pursuant to Section 13304 of the California Water Code, that the dischargers, their agents, successors and assigns shall cleanup and abate the effects described in the above findings as follows:

A. PROHIBITIONS

1. The discharge of wastes or hazardous substances in a manner which will significantly degrade water quality or adversely affect the beneficial uses of the waters of the State is prohibited.
2. Further significant migration of wastes or hazardous substances through subsurface transport to waters of the State, and migration of wastes or hazardous substances at levels which may affect human or ecological receptors, is prohibited.
3. Activities associated with subsurface investigation, cleanup in a manner causing significant adverse migration of wastes or hazardous substances is prohibited.

B. TASKS

As described in Finding 13 of this Order, both Zeneca and UC Berkeley are dischargers responsible for addressing pollution within Subunit 2A, and UC Berkeley is the discharger responsible for addressing pollution within Subunit 2B. Thus, Zeneca and UC Berkeley are the dischargers responsible for completing Tasks B.1, B.2, B.3, B.6, B.7, B.8, and B.9. UC Berkeley is the discharger responsible for completing Tasks B.4 and B.5.

1. **HUMAN HEALTH RISK ASSESSMENT FOR SUBUNIT 2, INCLUDING AREAS 2A AND 2B**

COMPLIANCE DATE: October 31, 2001

The dischargers shall submit a technical report, acceptable to the Executive Officer, which documents the results of the risk assessment for both the upland portion as well as the entire portion of Western Stege Marsh (both Subunits 2A and 2B). The risk assessment must present Tier 2 site-specific target levels for human health and ecological receptors that have been identified at the site. Both direct toxicity and bioaccumulative impacts must be evaluated and considered in the development of the ecological SSTLs. Based on the results of the risk assessment, areas of concern must be identified and presented in the report.

UPLAND AREA OF SUBUNIT 2A

2.a. **RESULTS OF ADDITIONAL SOIL AND GROUNDWATER INVESTIGATION**

COMPLIANCE DATE: October 31, 2001

The dischargers shall submit a technical report, acceptable to the Executive Officer, which provides the results of soil and groundwater investigations performed since the Field Sampling and Analysis results submitted in December 2000. If necessary, the report shall propose additional soil and/or groundwater sampling in order completely define the extent of pollution in Subunit 2A.

2b. **GROUNDWATER SAMPLING AND ANALYSES MONITORING PLAN**

COMPLIANCE DATE: October 31, 2001

The dischargers shall submit a technical report, acceptable to the Executive Officer, which proposes installation of groundwater wells necessary to monitor the extent of groundwater contamination and evaluate the effectiveness of site cleanup in MSOU Subunit 2A. The workplan shall specify at a minimum, well location, well construction, sampling methods, and quality assurance controls. The discharger shall propose sampling frequency, methodology, and parameters, and laboratory analytical methods.

2.c. **CONCEPTUAL REMEDIAL ACTION PLAN**

COMPLIANCE DATE: December 15, 2001

The dischargers shall submit a technical report, acceptable to the Executive Officer, which provides a conceptual remedial action plan for addressing soil and groundwater pollution within the upland portion of Subunit 2A. The conceptual remedial measures shall be protective of water quality and human and ecological receptors. A site conceptual model shall be provided in the technical report. The report shall also consider all existing sampling data for the marshland and propose additional sampling if necessary.

2.d. **REMEDIAL DESIGN DETAILS FOR SOIL AND GROUNDWATER
NEUTRALIZATION AND METALS TREATMENT**

COMPLIANCE DATE: January 31, 2002

The dischargers shall submit a technical report, acceptable to the Executive Officer, which provides the remedial design for addressing metal and metalloid pollution and acidic conditions in soil and groundwater in the upland portion of MSOU Subunit 2A. The report shall take into consideration cleanup methodologies considered in the upland portion of MSOU Subunit 1, and provide for coordinated cleanup within MSOU. The report shall include detailed design criteria, construction details, and procedures and a schedule for implementation of the remedial measures, and a Residual Risk Management Plan to address any residual risks post remediation.

2.e. **IMPLEMENTATION OF SOIL AND GROUNDWATER REMEDIAL
MEASURES**

COMPLIANCE DATE: OCTOBER 31, 2003

The dischargers shall submit a technical report, acceptable to the Executive Officer, which documents implementation of the remedial measures for addressing soil and groundwater pollution associated with cinder fill in the upland portion of MSOU Subunit 2A, as described in the technical report described in Task 2.d. The report shall describe any variances between the remedial design specified in the technical report described in Task 2.d and the remedial measures actually implemented.

2.f. **WORKPLAN FOR EVALUATING REMEDIAL ACTION
EFFECTIVENESS**

COMPLIANCE DATE: January 31, 2004

The dischargers shall submit a workplan, acceptable to the Executive Officer, which proposes methods to evaluate the effectiveness of remedial actions implemented within the upland area of MSOU Subunit 2A. The report shall

evaluate the current field conditions and the groundwater and surface water monitoring program, and recommend new groundwater monitoring wells, surface water sampling locations, or other confirmation sampling locations. The report shall provide for collection and analyses of data sufficient to evaluate remedial action effectiveness 1 year and 3 years after implementation.

2.g. 1-YEAR EVALUATION OF REMEDIAL ACTION EFFECTIVENESS

COMPLIANCE DATE: January 31, 2005

The dischargers shall submit a technical report, acceptable to the Executive Officer, which documents implementation of the technical workplan specified in Task 2.f, as necessary to address soil and groundwater pollution within the upland portion of MSOU Subunit 2A. The report shall provide the results of the remedial action evaluation, and if necessary, propose modifications to improve the existing remedial measures or evaluation and implementation of alternative remedial measures.

2.h. 3-YEAR EVALUATION OF REMEDIAL ACTION EFFECTIVENESS

COMPLIANCE DATE: January 31, 2007 and every 3 years thereafter

The dischargers shall submit a technical report, acceptable to the Executive Officer, which documents implementation of the technical workplan specified in Task 2.f, as necessary to address soil and groundwater pollution within the upland area of MSOU Subunit 12A. The report shall provide the results of the remedial action evaluation, and if necessary, propose modifications to improve the existing remedial measures or evaluation and implementation of alternative remedial measures.

WESTERN STEGE MARSH AREA OF SUBUNIT 2A

3.a. RESULTS OF ADDITIONAL SOIL AND GROUNDWATER INVESTIGATION

COMPLIANCE DATE: October 31, 2001

The dischargers shall submit a technical report, acceptable to the Executive Officer, which provides the results of soil and groundwater investigations performed since the Field Sampling and Analysis results submitted in December 2000. If necessary, the report shall propose additional soil and/or groundwater sampling in order completely define the extent of pollution in the area of Western Stege Marsh in MSOU 2A.

3.b. **SAMPLING AND ANALYSES MONITORING PLAN**

COMPLIANCE DATE: October 31, 2001

The dischargers shall submit a technical report, acceptable to the Executive Officer, which proposes any additional surface water and sediment sampling necessary to monitor the extent of contamination within the Stege Marsh area of Subunit 2A. The workplan shall specify at a minimum, sample location, sampling methods, and quality assurance controls. The workplan shall specify at a minimum, sample locations, sampling methods, and quality assurance controls. The discharger shall propose sampling frequency, methodology, and parameters, and laboratory analytical methods.

3.c. **CONCEPTUAL REMEDIAL ACTION PLAN**

COMPLIANCE DATE: July 31, 2002

The dischargers shall submit a technical report, acceptable to the Executive Officer, which provides a conceptual remedial action plan for addressing soil and groundwater pollution within the upland portion of Subunit 2A. The conceptual remedial measures shall be protective of water quality and human and ecological receptors. A site conceptual model shall be provided in the technical report. The report shall also consider all existing sampling data for the marshland and propose additional sampling if necessary.

3.d. **REMEDIAL DESIGN DETAILS FOR SOIL AND GROUNDWATER
NEUTRALIZATION AND METALS TREATMENT**

COMPLIANCE DATE: March 31, 2003

The dischargers shall submit a technical report, acceptable to the Executive Officer, which provides the remedial design for addressing metal and metalloid pollutants and acidic conditions in soil and groundwater in the Stege Marsh area of MSOU Subunit 2A. The report shall take into consideration cleanup methodologies considered in the Stege Marsh portion of MSOU Subunit 1, and provide for coordinated cleanup within MSOU. The report shall include detailed design criteria, construction details, and procedures and a schedule for implementation of the remedial measures, and a Residual Risk Management Plan to address any residual risks post remediation.

3.e. **IMPLEMENTATION OF REMEDIAL MEASURES**

COMPLIANCE DATE: OCTOBER 31, 2003

The dischargers shall submit a technical report, acceptable to the Executive Officer, which documents implementation of the remedial measures for addressing pollution within the Stege Marsh area of MSOU Subunit 2A, as described in the technical report described in Task 3.d. The report shall describe any variances between the remedial design specified in the technical report described in Task 3.d and the remedial measures actually implemented.

3.f. **WORKPLAN FOR EVALUATING REMEDIAL ACTION EFFECTIVENESS**

COMPLIANCE DATE: April 30, 2004

The dischargers shall submit a workplan, acceptable to the Executive Officer, which proposes methods to evaluate the effectiveness of remedial actions implemented within the Stege Marsh area of MSOU Subunit 2A. The report shall evaluate the current field conditions in the marshland and recommend new surface and sediment sampling locations, or other confirmation sampling locations. The report shall provide for collection and analyses of data sufficient to evaluate remedial action effectiveness 1 year and 3 years after implementation.

3.g. **1-YEAR EVALUATION OF REMEDIAL ACTION EFFECTIVENESS**

COMPLIANCE DATE: April 30, 2005

The dischargers shall submit a technical report, acceptable to the Executive Officer, which documents implementation of the technical workplan specified in Task 3.f, as necessary to address pollution within the Stege Marsh area of MSOU Subunit 2A. The report shall provide the results of the remedial action evaluation, and if necessary, propose modifications to improve the existing remedial measures or evaluation and implementation of alternative remedial measures.

3.h. **3-YEAR EVALUATION OF REMEDIAL ACTION EFFECTIVENESS**

COMPLIANCE DATE: April 30, 2007 and every 3 years thereafter

The dischargers shall submit a technical report, acceptable to the Executive Officer, which documents implementation of the technical workplan specified in Task 3.f, as necessary to address pollution within the Stege Marsh area of MSOU Subunit 2A. The report shall provide the results of the remedial action evaluation, and if necessary, propose modifications to improve the existing remedial measures or evaluation and implementation of alternative remedial measures.

UPLAND AREA OF SUBUNIT 2B

4.a. **WORKPLAN FOR ADDITIONAL SOIL AND GROUNDWATER INVESTIGATION AND GROUNDWATER SAMPLING AND ANALYSES PLAN**

COMPLIANCE DATE: December 15, 2001

The discharger shall submit a technical report, acceptable to the Executive Officer, which proposes additional soil and groundwater sampling necessary to completely define the extent of pollution in the upland portion of Subunit 2B associated with on-site activities. The report should also propose installation of groundwater wells necessary to monitor the extent of groundwater contamination and evaluate the effectiveness of site cleanup in the upland portion of Subunit 2B. The workplan shall specify at a minimum, well location, well construction, sampling methods, and quality assurance controls.

4.b. **RESULTS OF ADDITIONAL SOIL AND GROUNDWATER INVESTIGATION**

COMPLIANCE DATE: July 31, 2002

The discharger shall submit a technical report, acceptable to the Executive Officer, which provides the results of investigations implemented as described in the technical report required in Task 4.a. If necessary, the report shall propose additional soil and/or groundwater sampling in order to completely define the extent of pollution in the upland portion of Subunit 2B.

4.c. **REMEDIAL ACTION PLAN**

COMPLIANCE DATE: January 31, 2003

The discharger shall submit a technical report, acceptable to the Executive Officer, which provides a remedial action plan for the upland portion of Subunit 2B. The report shall include detailed design criteria, construction details, and procedures and schedule for implementation of the remedial measures, as well as a residual Risk Management Plan for pollutants that may remain on-site post remediation.

4.d. **IMPLEMENTATION OF REMEDIAL ACTION PLAN**

COMPLIANCE DATE: September 30, 2003

The discharger shall submit a technical report, acceptable to the Executive Officer, which documents implementation of the remedial measures for addressing soil and groundwater pollution in the upland area of Subunit 2B, as

described in the technical report described in Task 4.c. The report shall describe any variances between the remedial design specified in the technical report described in Task 4.d and the remedial measures actually implemented.

4.e. **WORKPLAN FOR EVALUATING REMEDIAL ACTION EFFECTIVENESS**

COMPLIANCE DATE: December 31, 2003

The discharger shall submit a workplan, acceptable to the Executive Officer, which proposes methods to evaluate the effectiveness of remedial actions implemented within the upland area of Subunit 2B. The report shall evaluate the current field conditions and the groundwater and surface water monitoring program, and recommend new groundwater monitoring wells, surface water sampling locations, or other confirmation sampling locations. The report shall provide for collection and analyses of data sufficient to evaluate remedial action effectiveness 1 year and 3 years after implementation.

4.f. **1-YEAR EVALUATION OF REMEDIAL ACTION EFFECTIVENESS**

COMPLIANCE DATE: January 31, 2005

The discharger shall submit a technical report, acceptable to the Executive Officer, which documents implementation of the technical report specified in Task 4.e, as necessary to address noncinder-associated soil and groundwater pollution within Subunit 2. The report shall provide the results of the remedial action evaluation, and if necessary, propose modifications to improve the existing remedial measures or evaluation and implementation of alternative remedial measures.

4.g. **3-YEAR EVALUATION OF REMEDIAL ACTION EFFECTIVENESS**

COMPLIANCE DATE: January 31, 2007 and every 3 years thereafter

The discharger shall submit a technical report, acceptable to the Executive Officer, which documents implementation of the technical report specified in Task 4.e., as necessary to address noncinder-associated soil and groundwater pollution within Subunit 2. The report shall provide the results of the remedial action evaluation, and if necessary, propose modifications to improve the existing remedial measures or evaluation and implementation of alternative remedial measures.

STEGE MARSH AREA OF SUBUNIT 2B

5.a. SAMPLING AND ANALYSES MONITORING PLAN

COMPLIANCE DATE: December 15, 2001

The discharger shall submit a technical report, acceptable to the Executive Officer, which proposes any additional surface water and sediment sampling necessary to monitor the extent of contamination within the Stege Marsh area of Subunit 2A. The workplan shall specify at a minimum, sample location, sampling methods, and quality assurance controls. The workplan shall specify at a minimum, sample locations, sampling methods, and quality assurance controls. The discharger shall propose sampling frequency, methodology, and parameters, and laboratory analytical methods.

5.b. CONCEPTUAL REMEDIAL ACTION PLAN

COMPLIANCE DATE: July 31, 2002

The discharger shall submit a technical report, acceptable to the Executive Officer, which provides a conceptual remedial action plan for addressing sediment, pore water, and surface water contamination within the Western Stege Marsh area of Subunit 2B. The conceptual remedial measures shall be protective of water quality and potential human and ecological receptors. A site conceptual model shall be provided in the technical report. The report shall also consider all existing sampling data for the marshland and propose additional sampling if necessary.

5.c. REMEDIAL ACTION PLAN

COMPLIANCE DATE: February 28, 2003

The discharger shall submit a technical report, acceptable to the Executive Officer, which provides design details of remedial measures for the Western Stege Marsh area of Subunit 2B, as described in Task 5.b. The report shall include detailed design criteria, construction details, and procedures and schedule for implementation of the remedial measures.

5.d. IMPLEMENTATION OF REMEDIAL ACTION PLAN

COMPLIANCE DATE: March 31, 2004

The discharger shall submit a technical report, acceptable to the Executive Officer, which documents implementation of the remedial measures for

addressing pollution within the Western Stege Marsh area of Subunit 2B, as proposed in Provision 5.c. The report shall describe any variances between the remedial design specified in the technical report described in Task 5.c and the remedial measures actually implemented.

5.e. **WORKPLAN FOR EVALUATING REMEDIAL ACTION EFFECTIVENESS**

COMPLIANCE DATE: April 30, 2004

The discharger shall submit a workplan, acceptable to the Executive Officer, which proposes methods to evaluate the effectiveness of remedial actions implemented within Western Stege Marsh area of Subunit 2B. The report shall evaluate the current field conditions and the existing monitoring program, and recommend new confirmation sampling locations. The report shall provide for collection and analyses of data sufficient to evaluate remedial action effectiveness 1 year and 3 years after implementation.

5.f. **1-YEAR EVALUATION OF REMEDIAL ACTION EFFECTIVENESS**

COMPLIANCE DATE: April 30, 2005

The discharger shall submit a technical report, acceptable to the Executive Officer, which documents implementation of the technical report specified in Task 5.d, as necessary to address pollution within Western Stege Marsh area of Subunit 2B. The report shall provide the results of the remedial action evaluation, and if necessary, propose modifications to improve the existing remedial measures or evaluation and implementation of alternative remedial measures.

5.g. **3-YEAR EVALUATION OF REMEDIAL ACTION EFFECTIVENESS**

COMPLIANCE DATE: April 30, 2007 and every 3 years thereafter

The discharger shall submit a technical report, acceptable to the Executive Officer, which documents implementation of the technical report specified in Task 5.d, as necessary to address pollution within the Western Stege Marsh area of Subunit 2B. The report shall provide the results of the remedial action evaluation, and if necessary, propose modifications to improve the existing remedial measures or evaluation and implementation of alternative remedial measures.

MONITORING REPORT

6.a. WELL INSTALLATION REPORT

COMPLIANCE DATE: 45 days following completion of well installation activities

The discharger shall submit a technical report, acceptable to the Executive Officer, that provides well construction details, geologic boring logs, and well development logs for all new wells installed as part of the present or future Self Monitoring Program (Attachment A).

SITE MAINTANENCE

7.a. CHANGE IN SITE CONDITIONS

NOTIFICATION DUE DATE: Immediately upon occurrence

REPORTING DUE DATE: 30 days after initial notification

The dischargers shall immediately notify the Board of any flooding, ponding, settlement, equipment failure, slope failure, exposure of waste, or other change in site conditions that could impair water quality and shall immediately make repairs. Within 30 days, the dischargers shall prepare and submit a technical report, acceptable to the Executive Officer, documenting the corrective measures taken.

7.b. STORMWATER CONTROL PLANS

COMPLIANCE DATE: October 15 of the year of construction or prior to construction if commencing between October 15 and May 15

For each proposed development greater than 1 acre in size, the dischargers shall submit a Notice of Intent to the State Water Resources Control Board, prepare and submit a Storm Water Pollution Prevention Plan acceptable to the Executive Officer, and implement Best Management Practices (BMPs) for the control of storm water, in accordance with requirements specified in the State Water Resources Control Board General Permit for Storm Water Discharges Associated with Construction Activities (NPDES Permit No. CAS000002).

SITE DEVELOPMENT

8.a. DRAFT DEED RESTRICTION

COMPLIANCE DATE: December 31, 2003

The dischargers shall submit a draft deed restriction, acceptable to the Executive Officer, which prevents and minimizes activities at the site which may exacerbate water quality impacts or which may result in exposure of human or ecological receptors to soil and/or groundwater contamination at the site. The deed restriction must provide a mechanism for the appropriate notification of on-site workers of environmental hazards and prevent the use of significantly impacted soil and groundwater.

8.b. RECORDING OF DEED RESTRICTION

COMPLIANCE DATE: March 31, 2004

The dischargers shall submit documentation showing that an approved deed restriction, resulting from Provision 8.a. was recorded as final.

D. PROVISIONS

1. Contractor/consultant qualifications: All hydrogeological plans, specifications, technical reports and documents shall be signed by or stamped with the seal of a State registered geologist, registered engineer, registered hydrogeologist, or certified engineering geologist.
2. Lab qualifications: All samples shall be analyzed by a State certified laboratory or laboratory accepted by the Regional Board using approved EPA methods for the type of analysis to be performed. All laboratories or the consultant shall be required to maintain quality assurance/quality control records for Regional Board review.
3. Good operation and maintenance (O&M): The Dischargers shall maintain in good working order, and operate in the normal standard of care, any facility or control system installed to achieve compliance with the requirements of this Order.
4. Document distribution: Copies of all correspondence, reports, and documents pertaining to compliance with the Prohibitions and Provisions of this Order shall

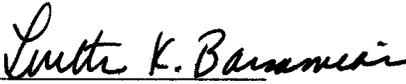
also be provided to (a) the non-lead discharger for the specific provision or activity. The Executive Officer may modify this distribution list as needed.

5. Delayed compliance: If the dischargers are delayed, interrupted, or prevented from meeting one or more of the completion dates specified for the above tasks, the dischargers shall promptly notify the Executive Officer and the Board may consider revisions to this Order.
6. Access to site and records: The dischargers shall permit the Regional Board or its authorized representative, upon presentation of credentials:
 - a. Immediate entry upon the premises on which wastes are located or in which any required records are kept.
 - b. Access to copy any records required under the terms and conditions of this order.
 - c. Inspection of any treatment equipment, monitoring equipment, or monitoring methods required by this order or by any other California State Agency.
 - d. Sampling of any discharge or groundwater governed by this order.
7. Reporting of changed owner or operator: The dischargers shall file a technical report on any changes in site occupancy or ownership associated with the property described in this Order.
8. Reporting of hazardous substance release: If any hazardous substance is discharged in or on any waters of the State, or discharged or deposited where it is, or probably will be, discharged in or on any waters of the State, the dischargers shall report such discharge to the Regional Board by calling (510) 622-2343 during regular office hours (Monday through Friday, 8:00 am to 5:00 pm). A written report shall be filed with the Board within five working days. The report shall describe: the nature of the hazardous substance, estimated quantity involved, duration of incident, cause of release, estimated size of affected area, nature of effect, corrective actions taken or planned, schedule of corrective actions planned, and persons/agencies notified. This reporting is in addition to reporting to the Office of Emergency Services required pursuant to the Health and Safety Code.
9. Reporting and correction of non-compliance: The dischargers shall report any noncompliance that may endanger public health or the environment. Any such information shall be provided orally to the Executive officer within 24 hours from the time the dischargers become aware of the circumstances. A written submission shall also be provided within five days of the time the dischargers become aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance,

including exact dates and times, and if the noncompliance has not been corrected; the anticipated time it is expected to continue and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. The Executive Officer, or an authorized representative, may waive the written report on a case-by-case basis if the oral report has been received within 24 hours [CWC Sections 13263 and 13267].

10. Cost recovery: The Dischargers shall be liable, pursuant to Section 13304 of the California Water Code, to the Board for all reasonable costs actually incurred by the Board to investigate unauthorized discharges of waste and to oversee cleanup of such waste, abatement of the effects thereof, or other remedial actions, required by this Order. If the Dischargers addressed by this Order are enrolled in a State Board-managed reimbursement program, reimbursement shall be made pursuant to this Order and according to procedures established in that program. Any disputes raised by dischargers over the reimbursement amounts or methods used in that program shall be consistent with the dispute resolution procedures of that program.
11. Periodic SCR review: The Board will review this Order periodically and may revise it when necessary. The dischargers may request revisions and upon review the Executive Officer may recommend that the Board revise these requirements.
12. Self Monitoring Program: The dischargers shall comply with the Self Monitoring Plan as attached to this Order and as may be amended by the Executive Officer.

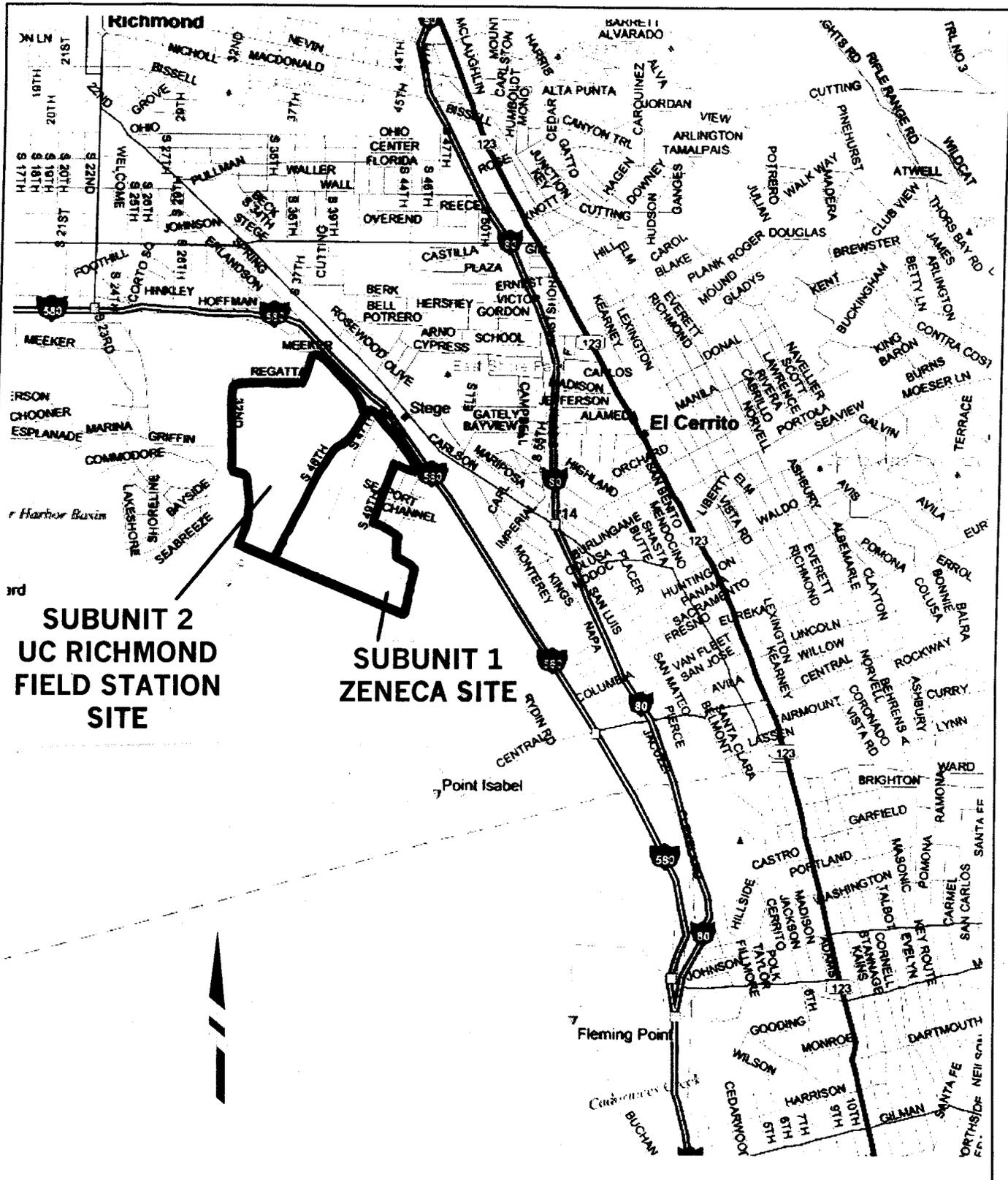
I, Loretta K. Barsamian, Executive Officer, do hereby certify that the foregoing is a full, complete, and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on September 19, 2001.


Loretta K. Barsamian
Executive Officer

Figures: Figure 1 - Site Location Map
 Figure 2 - Subunit 2, UCRFS site

Attachment A: Self Monitoring Plan

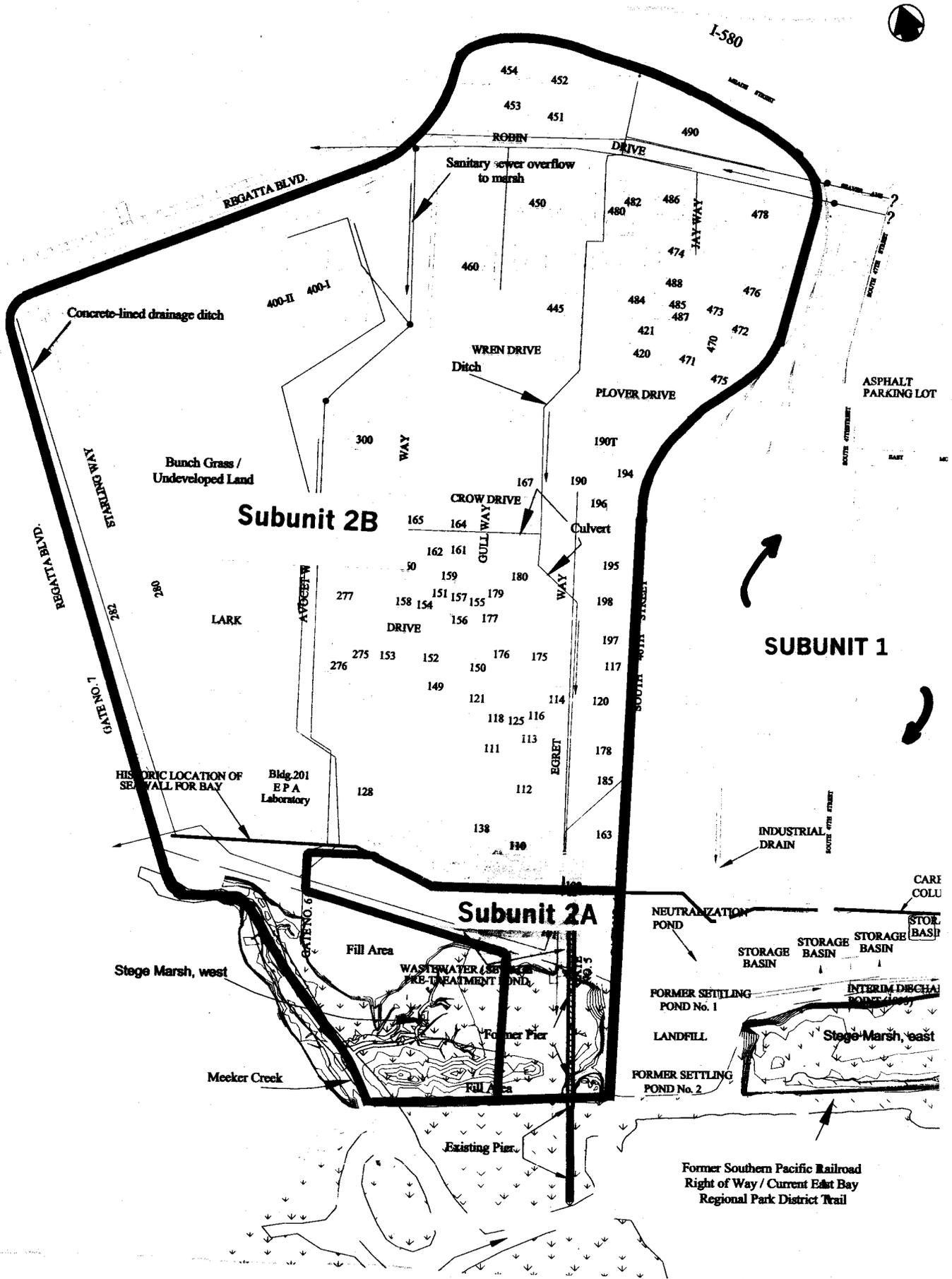
FAILURE TO COMPLY WITH THE REQUIREMENTS OF THIS ORDER MAY SUBJECT YOU TO ENFORCEMENT ACTION, INCLUDING BUT NOT LIMITED TO IMPOSITION OF ADMINISTRATIVE CIVIL LIABILITY UNDER WATER CODE SECTIONS 13268 OR 13350, OR REFERRAL TO THE ATTORNEY GENERAL FOR INJUNCTIVE RELIEF OR CIVIL CRIMINAL LIABILITY



**FIGURE 1
LOCATION MAP**

**MEADE STREET OPERABLE UNIT
AND SUBUNITS**

RICHMOND, CONTRA COSTA COUNTY



**SUBUNIT 2
UC RICHMOND FIELD STATION SITE**

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION**

SELF-MONITORING PROGRAM FOR:

**UNIVERSITY OF CALIFORNIA BERKELEY
ZENECA, INC.**

**UNIVERSITY OF CALIFORNIA RICHMOND FIELD STATION
1301 SOUTH 46th STREET
RICHMOND
CONTRA COSTA COUNTY**

**MEADE STREET OPERABLE UNIT
SUBUNIT 2**

1. **Authority and Purpose:** The Board requests the technical reports required in this Self-Monitoring Program pursuant to Water Code Sections 13267 and 13304. This Self-Monitoring Program is intended to document compliance with Board Order No.01-102 (site cleanup requirements).
2. **Groundwater and Surface Water Monitoring:** The dischargers shall measure groundwater elevations quarterly in all monitoring wells, and shall collect and analyze representative samples of groundwater and surface water according to the following table: (Groundwater monitoring wells and surface water sample locations are to be proposed by the dischargers in accordance with Task 2.b, 3b, 4.c, and 5.a of this Order.)

Well # or Station #	Sampling Frequency	Analyses	Well # or Station #	Sampling Frequency	Analyses
TBP	quarterly	TBP	TBP	quarterly	TBP
TBP	quarterly	TBP	TBP	quarterly	TBP
TBP	quarterly	TBP	TBP	quarterly	TBP
TBP	quarterly	TBP	TBP	quarterly	TBP
TBP	quarterly	TBP	TBP	quarterly	TBP

TBP: To Be Proposed by Discharger per Task 2.b, 3.b, 4.c, and 5.a

The dischargers shall sample any new monitoring or extraction wells quarterly and analyze groundwater samples for the same constituents as shown in the above table. The discharger may propose changes in the above table; any proposed changes are subject to Executive Officer approval.

3. **Quarterly Monitoring Reports:** The dischargers shall submit quarterly monitoring reports to the Board no later than 30 days following the end of the quarter (e.g. report for first quarter of the year due April 30). The first required quarterly monitoring report shall be due on January 31, 2002. Additional quarterly reports shall comply with the following schedule.

Quarter	Months Covered	Report Due Date
First Quarter	January, February, March	April 30 th
Second Quarter	April, May, June	July 31 st
Third Quarter	July, August, September	October 30 th
Fourth Quarter	October, November, December	January 31 st

Each quarterly report shall include:

- a. **Transmittal Letter:** The transmittal letter shall identify and discuss any violations of the Order and/or the Self-Monitoring Program during the reporting period and actions taken or planned to correct the problem. A detailed description of the violation and the actions taken or planned to correct the violation shall be further described in the body of the monitoring report. The letter shall be signed by the discharger's principal executive officer or his/her duly authorized representative, and shall include a statement by the official, under penalty of perjury, that the report is true and correct to the best of the official's knowledge.
 - b. **Groundwater Elevations:** Groundwater elevation data shall be presented in tabular form, and a groundwater elevation map shall be prepared for each monitored water-bearing zone. Historical groundwater elevations shall be included in the fourth quarterly report each year.
 - c. **Groundwater Analyses:** Groundwater sampling data shall be presented in tabular form, and an isoconcentration map should be prepared for one or more key contaminants for each monitored water-bearing zone, as appropriate. The report shall indicate the analytical method used, detection limits obtained for each reported constituent, and a summary of QA/QC data. Historical groundwater sampling results shall be included in the fourth quarterly report each year. The report shall describe any significant increases in contaminant concentrations since the last report, and any measures proposed to address the increases. Supporting data, such as lab data sheets, need not be included (however, see record keeping - below).
 - d. **Groundwater Extraction:** If applicable, the report shall include groundwater extraction results in tabular form, for each extraction well and for the site as a whole, expressed in gallons per minute and total groundwater volume for the quarter. The report shall also include contaminant removal results, from groundwater extraction wells and from other remediation systems (e.g. soil vapor extraction), expressed in units of chemical mass per day and mass for the quarter. Historical mass removal results shall be included in the fourth quarterly report each year.
 - e. **Status Report:** The quarterly report shall describe relevant work completed during the reporting period (e.g. site investigation, interim remedial measures) and work planned for the following quarter.
4. **Violation Reports:** If the dischargers violate requirements in the Site Cleanup Requirements, then the discharger shall notify the Board office by telephone as soon as practicable once the discharger has knowledge of the violation. Board staff may,

depending on violation severity, require the discharger to submit a separate technical report on the violation within five working days of telephone notification.

5. **Other Reports:** The discharger shall notify the Board in writing prior to any site activities, such as construction or underground tank removal, which have the potential to cause further migration of contaminants or which would provide new opportunities for site investigation.
6. **Record Keeping:** The dischargers or their agents shall retain data generated for the above reports, including lab results and QA/QC data, for a minimum of six years after origination and shall make them available to the Board upon request.
7. **SMP Revisions:** Revisions to the Self-Monitoring Program may be ordered by the Executive Officer, either on his/her own initiative or at the request of the dischargers. Prior to making SMP revisions, the Executive Officer will consider the burden, including costs, of associated self-monitoring reports relative to the benefits to be obtained from these reports.

I, Loretta K. Barsamian, Executive Officer, hereby certify that this Self-Monitoring Program was adopted by the Board on September 19, 2001.


Loretta K. Barsamian
Executive Officer

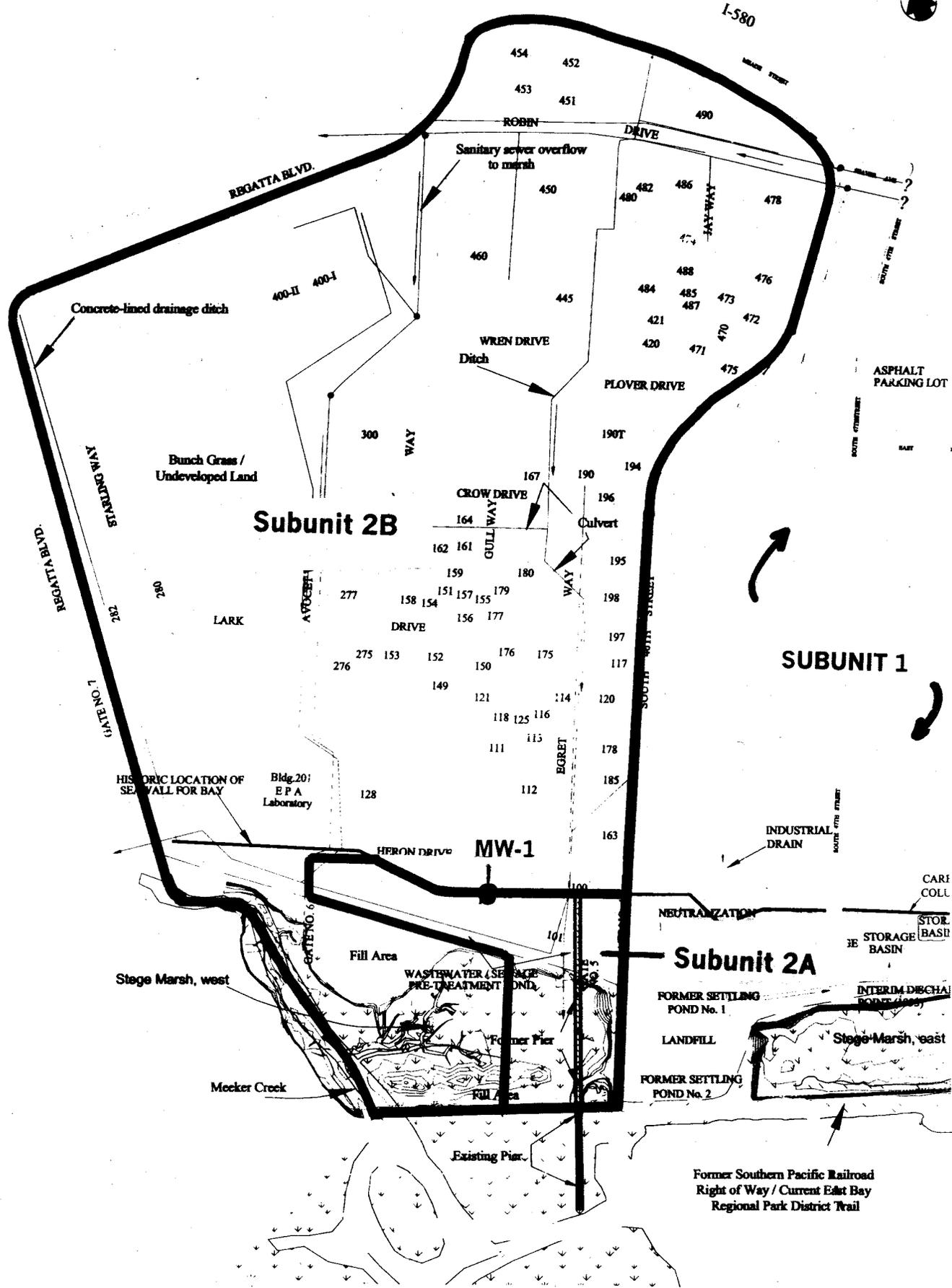


FIGURE 1 - MONITORING WELL LOCATION
SUBUNIT 2 - UCRFS SITE