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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

ORDER NO. 88-013

SITE CLEANUP REQUIREMENTS FOR:

LOCKHEED MISSILES AND SPACE COMPANY
SUNNYVALE, SANTA CLARA COUNTY

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

1. Lockheed Missiles and Space Company (hereinafter called the discharger) is involved in defense research and fabrication of prototype missile components at a site located North of Highway 237, East of Moffett Field and generally west of Mathilda Road, Sunnyvale, Santa Clara County. A location map is included in Attachment A.
2. Ground water monitoring associated with underground storage tanks showed the presence of solvents, heavy metals and nitrates. In March 1987 the discharger was requested to define the lateral and vertical extent of the waste constituents in the ground water. A Phase 1 report was submitted in November 1987. The Phase 1 report identified waste constituents in numerous areas of the site in the first, second and third transmissive zones.
3. The site geology includes the presence of buried stream channels, fluvial and interfluvial deposits, and possible vertical and horizontal interconnections of deposits. Additional work is needed to better define site geology and hydrogeology before the lateral and vertical extent of the waste constituents can be adequately determined. The discharger acknowledges the need for additional site investigatory work and has submitted a proposed work plan to do such work.
4. The Board adopted a revised Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) on December 17, 1986. The Basin Plan contains water quality objectives and beneficial uses for South San Francisco Bay and contiguous surface and ground waters.
5. The actual or potential beneficial uses of the groundwater underlying and adjacent to the facility include:
 - a. Industrial process water supply
 - b. Industrial service water supply
 - c. Agricultural water supply
6. The existing beneficial uses of the South Bay include:
 - a. Estuarine habitat
 - b. Shellfish harvesting
 - c. Fish migration
 - d. Preservation of rare and endangered species
 - e. Wildlife habitat

- f. Commercial and sports fishing
 - g. Water contact and non-contact recreation
 - h. Navigation
 - i. Industrial service supply
7. The discharge of waste constituents creates or threatens to create a condition of pollution or nuisance.
 8. These Site Cleanup Requirements are written to direct an investigation to define the lateral and vertical extent of the waste constituents, the local geology, the rate and direction of ground water and waste constituent movement, and the potential impact of the waste constituents on ground and surface water quality. The investigation should be designed to prevent or remediate migration of waste constituents, and finally remove them from the subsurface and restore the water quality to acceptable levels under a strict time schedule.
 9. This action is an order to enforce the laws and regulations administered by the Board. This action is categorically exempt from the provisions of the CEQA pursuant to Section 15321 of the Resources Agency Guidelines.
 10. On-site and off-site interim containment and cleanup measures may be needed to alleviate the threat to the environment posed by the continued migration of waste constituents and to provide a substantive technical basis for designing and evaluating the effectiveness of final cleanup alternatives.
 11. The Board has notified the dischargers and interested agencies and persons of its intent under California Water Code Section 13304 to prescribe Site Cleanup Requirements for the discharge and has provided them with the opportunity for a public hearing and an opportunity to submit their written views and recommendations.
 12. 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 Lockheed Missiles and Space Company Inc. shall cleanup and abate the effects described in the above findings as follows:

A. PROHIBITIONS

1. The discharge of wastes or hazardous materials in a manner which will degrade water quality or adversely affect the beneficial uses of the waters of the State is prohibited.
2. Further significant migration of pollutants through subsurface transport to waters of the State is prohibited.
3. Activities associated with the subsurface investigation and cleanup which will cause significant adverse migration of pollutants are prohibited.

B. SPECIFICATIONS

1. The storage, handling, treatment or disposal of soil or groundwater containing pollutants shall not create a nuisance as defined in Section 13050(m) of the California Water Code.
2. The discharger shall conduct monitoring activities as needed to define the current local hydrogeologic conditions, and the lateral and vertical extent of soil and groundwater pollution. Should monitoring results show evidence of waste constituent migration, additional waste constituent characterization of pollutant extent may be required.

C. PROVISIONS

1. The discharger shall submit to the Board acceptable monitoring program reports containing results of work performed according to the program as prescribed below by the Executive Officer.
2. The discharger shall comply with Prohibitions A.1., A.2., and A.3., and Specifications B.1. and B.2. above, in accordance with the following time schedule and tasks:

COMPLETION DATE/TASK:

- a. 1) COMPLETION DATE: March 31, 1988

IDENTIFY SOURCES AND CHARACTERIZE SOIL POLLUTION: Submit a technical report acceptable to the Executive Officer containing a proposal to identify all pollution sources on-site and to define the horizontal and vertical extent of soil pollution on-site. The report shall include an evaluation of pollution sources on-site for immediate removal.

- 2) COMPLETION DATE: To be set by the Executive Officer based on the report submitted for Task 2.a.1).

COMPLETION OF IDENTIFICATION AND CHARACTERIZATION: Submit a technical report acceptable to the Executive Officer documenting completion of the necessary tasks identified in the technical report submitted for Task 2.a.1).

- b. 1) COMPLETION DATE: March 15, 1988

WELL ASSESSMENT: Perform an assessment on the acceptability of all the existing monitoring wells for use in both monitoring of water quality and the measurement of the ground water surface and piezometric surfaces at the site. The evaluation must include justification for the acceptability or abandonment of each individual well for obtaining water level measurements and monitoring water quality. The assessment shall take into consideration the precision of the boring logging, and appropriateness of well construction.

2) **COMPLETION DATE:** March 15, 1988

COMPLETION OF WELL ASSESSMENT: Submit a report, acceptable to the Executive Officer, documenting the results of the evaluation of the acceptability of the existing monitoring wells, prepared under the supervision of and signed by a registered geologist.

c. 1) **COMPLETION DATE:** March 31, 1988

HYDROGEOLOGY CHARACTERIZATION: Submit a detailed plan and schedule, acceptable to the Executive Officer, to accomplish the tasks listed below:

a) Clearly identify the various aquifer/aquitard zones across the site and designate which wells are screened in the respective zones. Determine flow paths, and establish variations in gradients relative to waste constituents; define the stream channels. Based on borehole information, construct a sufficient number of detailed geologic cross sections to define the geology and hydrogeology of the site. Discuss and provide specific data that demonstrate the integrity and continuity of the confining layers between the transmissive zones. In addition to the standard data shown on geologic sections, the following will be shown on each section:

i. Well screen interval for all new and existing monitoring wells, piezometers, or test wells.

ii. Filter pack interval for all new and existing monitoring wells, piezometers, or test wells.

b) Define vertical gradients across the site with actual depth specific data (as would be gathered from cluster piezometers). Also define vertical hydraulic conductivities between the various transmissive units beneath the site. The location (depth/elevation) of piezometer screens is to be determined from the lithology at each location and from the depth of the screen locations for the other, or planned, piezometer installations at the site. The haphazard placement of piezometer screens, within a single aquifer zone, is to be avoided such that accurate maps of the water surface can be prepared.

c) Demonstrate, with specific data, the relationship of the ground and surface waters, and explain the apparent water table depression at the northern part of the site. Included in this task are (1) cross sections showing the relative water levels of surface waters and the ground waters, (2) a determination of whether the surface water acts as a recharge or discharge area for groundwater, (3) the possible effects of tidal influences upon water levels at the site, (4) the potential effects of these influences on monitoring well placement, and (5) seasonal variations in ground water elevations and gradients.

d) Compile, tabulate, and summarize all the available static water level data since August 1987 by individual wells. For each well and each sampling period, the information shall include:

- i. Water levels shall be measured to the nearest 0.01 foot, relative to the surveyed reference elevation and mean-sea-level;
- ii. The date and time the water levels were taken;
- iii. Method used to determine water levels;
- iv. Surveyed reference elevation for each well; and
- v. Correct for chloride concentration.

Water level contours shall be constructed for each sampling period and each stratigraphic horizon, and submitted with all the above information. Contours are to be constructed from measurements taken in wells screened in the same stratigraphic horizon and have similar screen elevations and screen lengths. The data points and values used to construct each contour shall be shown on each map. A report including all the information listed in this sub-task, 2.c.1)d), is due March 1, 1988.

All future reporting of water level data shall include the information listed above.

e) Define the seasonal variations in groundwater levels in all existing wells and present the results in the form of hydrographs. The hydrographs shall present monthly data over a full year. All information required by sub-task 2.c.1)d). of this Order shall be included in this report.

f) Conduct aquifer tests for all identified aquifers/transmissive zones, to determine the aquifer characteristics, water quality, and the degree of interconnection, if any, between the aquifer zones, as necessary, to define potential pathway of waste migration.

g) Implementation of the items for this Task must include, at a minimum, the following details:

- i. Borings: All boreholes, whether for exploratory purposes or for monitoring well installation, are to be continuously sampled and sample recovery must exceed 75%. The following two exceptions to the continuous sampling of borings may be approved by the Executive Officer: 1) Continuous sampling may not be required in all boreholes at the site of a cluster well group, where the deepest of the boreholes is sampled and logged satisfactorily; 2) Interval sampling, at a maximum of 5-foot intervals or at a change in lithology, may be allowable below depths of 50-feet if it can be demonstrated that an acceptable level of detail can be obtained or that excessive difficulty in completing the

boring, due to continuous sampling, will result. Each individual boring log must present the following specific data: 1) Name of geologist who actually performs the logging of the borehole; 2) Type of drilling equipment utilized; 3) Specific type of drilling method used; 4) Sampling devices used; 5) Sample recovery rate; 6) Water levels as appropriate; and 7) Ground surface elevation. The Board staff must be given at least 48 hours notice prior to the start of the drilling program.

- ii. Well Construction: Monitoring wells are to be selectively screened within permeable water bearing zones. Well screen lengths generally should be restricted to a maximum of 10-feet in length, but are not to exceed 15-feet in length. The length of the well screens are to be sized to the zone monitored. The sand/filter packs are not to extend more than 2-feet above the well screen; sumps below the well screen are to be avoided or sealed. The rationale for the selected well screen slot size and filter pack is to be provided for each monitoring well installation.

The detailed data and analyses are to be presented for well development and for any aquifer tests performed.

- 2) **COMPLETION DATE**: according to a schedule approved by the Executive Officer based on the report submitted for Task 2.c.1).

COMPLETION OF HYDROGEOLOGY CHARACTERIZATION: Submit a technical report acceptable to the Executive Officer documenting the findings of the hydrogeologic characterization program, signed by a registered civil engineer or registered geologist. The report shall include all support data, tabulated and presented in a logical and easy to follow format.

- d. 1) **COMPLETION DATE**: March 31, 1988

GROUND WATER POLLUTION CHARACTERIZATION: Submit a technical report acceptable to the Executive Officer containing a proposal to define the horizontal and vertical extent of the on-site ground water pollution as follows:

- a) Establish initial background ground water quality levels as follows:

Submit a detailed plan and schedule, acceptable to the Executive Officer, for collecting and statistically analyzing ground water quality data to establish initial background levels. The plan shall provide for determining background levels for different aquifer units, and take into account spatial and seasonal variations in groundwater quality. If existing ground water monitoring wells are to be used for establishing initial background levels, the Discharger shall provide specific hydrogeologic data to support the placements of the wells and the selection of the screened intervals. All future submittal

of ground water quality data shall include all field analyses and measurements; and all field and laboratory quality control measurements, including but not limited to: detection limits; travel, field, field equipment, laboratory equipment and laboratory method blanks; the results of surrogate and spiked samples, and an explanation for any recovery rate less than 80%; and a list of which constituents were tested for each individual well.

b) Further assess the waste constituent migration into the ground water as follows:

Submit a detailed plan and time schedule acceptable to the Executive Officer which will identify the vertical and horizontal extent of waste constituent migration. The plan shall be focused towards constituents of concern.

- 2) **COMPLETION DATE:** According to a time schedule approved by the Executive Officer based on the report submitted for Task 2.d.1).

COMPLETION OF GROUND WATER POLLUTION CHARACTERIZATION:

Implement the proposed background ground water quality investigation and assessment program according to a schedule approved by the Executive Officer.

Submit a report acceptable to the Executive Officer documenting the results of the background ground water quality investigation with a statistical analysis of the analytical data, and the findings of the assessment characterization program, signed by a registered geologist, registered civil engineer or certified engineering geologist. All the support data shall be included and presented in a logical and easy to follow format.

- e. 1) **COMPLETION DATE:** April 30, 1988

SAMPLING AND ANALYSIS PLAN: Submit a Sampling and Analysis Plan acceptable to the Executive Officer. The Sampling and Analysis Plan shall include well specific sampling and analysis procedures and schedules.

- f. 1) **COMPLETION DATE:** To be set by the Executive Officer

INTERIM REMEDIAL ACTIONS: Submit a technical report acceptable to the Executive Officer which contains an evaluation of interim remedial alternatives, a recommended plan for interim remediation on-site, and an implementation time schedule. This report shall evaluate the removal and/or cleanup of polluted soils; evaluate alternative hydraulic control systems to contain and to initiate cleanup of polluted groundwater; and include a completed NPDES application to discharge to surface waters, if such discharge is an element of the plan.

- 2) **COMPLETION DATE:** To be set by the Executive Officer based on the report submitted for Task 2.f.1).

COMPLETION OF INTERIM REMEDIAL ACTIONS: Submit a technical report acceptable to the Executive Officer documenting completion of the necessary tasks identified in the technical report submitted for Task 2.f.1).

- g. 1) **COMPLETION DATE:** To be set by the Executive Officer

a) **EVALUATE INTERIM CONTAINMENT AND SOIL REMOVAL MEASURES:** Submit a technical report acceptable to the Executive Officer which evaluates the effectiveness of the interim on-site containment system. Such an evaluation shall include, but need not be limited to, an estimation of the flow capture zone of the extraction wells, establishment of the cones of depression by field measurements, and presentation of chemical monitoring data, if extraction wells are proposed. This report shall also evaluate and document the removal and/or cleanup of polluted soils, if such removal and/or cleanup is an element of the remedial measures.

b) **MODIFICATION TO INTERIM ACTIONS:** Specific modifications to the system and an implementation time schedule shall be proposed in the event that the soil remediation or ground water control system is demonstrated not to be effective in containing and removing the on-site pollutants.

- 2) **COMPLETION DATE:** To be set by the Executive Officer based on the report submitted for Task 2.g.1).

COMPLETION OF MODIFICATIONS TO INTERIM ACTIONS: Submit a technical report acceptable to the Executive Officer documenting completion of the necessary tasks identified in the technical report submitted for Task 2.g.1)b).

- h. **COMPLETION DATE:** To be set by the Executive Officer

PROPOSED FINAL CLEANUP OBJECTIVES AND ACTIONS: Submit a technical report acceptable to the Executive Officer containing the results of the remedial investigation; an evaluation of the installed interim remedial measures; a feasibility study evaluating alternative final remedial measures; the recommended measures necessary to achieve final cleanup objectives; and the tasks and time schedule necessary to implement the recommended final remedial measures.

3. The submittal of technical reports evaluating immediate, interim and final remedial measures will include a projection of the cost, effectiveness, benefits, and impact on public health, welfare, and environment of each alternative measure. The remedial investigation and feasibility study shall consider the guidance provided by Subpart F of the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300); Section 25356.1 (c) of the California Health and Safety Code; Resource Conservation and Recovery Act regulations and guidance

documents, and the State Water Resources Control Board's Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California".

4. If the discharger is delayed, interrupted or prevented from meeting one or more of the completion dates specified in this Order, the discharger shall promptly notify the Executive Officer and the Board may consider revision to this Order.
5. Information on the status of compliance with the Prohibitions, Specifications, and Provisions of this Order shall be provided to the Board monthly, commencing within 30 days of adoption of this Order, and covering the previous month. The information may be provided either as a letter report, or in a meeting with Board staff. The information shall,
 - (1) summarize work completed during the previous month, and work projected to be completed in the current and future months,
 - (2) identify any obstacles which may threaten compliance with the schedule of this Order and what actions are being taken to overcome these obstacles, and
 - (3) include, in the event of non-compliance with Provision C.2. or any other Specification or Provision of this Order, written notification which clarifies the reasons for non-compliance and which proposes specific measures and a schedule to achieve compliance. This written notification shall identify work not completed that was projected for completion, and shall identify the impact of non-compliance on achieving compliance with the remaining requirements of this Order.

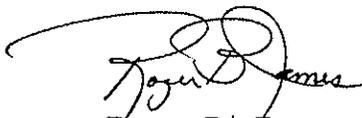
Draft updated water table and piezometric surface maps for all affected water bearing zones; draft cross-sectional geological maps describing the hydrogeological setting of the site; and appropriately scaled and detailed base maps showing the location of all monitoring wells and extraction wells, and identifying adjacent facilities and structures shall be presented as they are developed.

7. All hydrogeological plans, specifications, reports, and documents shall be signed by or stamped with the seal of a registered geologist, certified engineering geologist or registered engineer.
8. All samples shall be analyzed by State certified laboratories or laboratories accepted by the Board using approved EPA methods for the type of analysis to be performed. All laboratories shall maintain quality assurance/quality control records for Board review.
9. The discharger shall maintain in good working order, and operate, as efficiently as possible, any facility or control system installed to achieve compliance with the requirements of this Order.
10. All submittals must be made as follows: two copies to the Board; one copy to the Department of Health Services, Toxic Substance Control Division; one copy to the Environmental Protection Agency; one copy to the Santa Clara Valley Water District; one copy to the Santa Clara County Health Department; and one copy to the City of Sunnyvale.
11. The discharger shall permit the Board or its authorized representative, in accordance with Section 13267(c) of the California Water Code:

- a. Entry upon premises in which any pollution sources exist, or may potentially exist, or in which any required records are kept, which are relevant to this Order.
 - b. Access to copy any records required to be kept under the terms and conditions of this Order.
 - c. Inspection of any monitoring equipment or methodology implemented in response to this Order.
 - d. Sampling of any groundwater or soil which is accessible, or may become accessible, as part of any investigation or remedial action program undertaken by the discharger.
12. The discharger(s) shall file a report on any changes in site occupancy and ownership associated with the facility described in this Order.
 13. If any hazardous substance is discharged in or on any waters of the state, or discharged and deposited where it is, or probably will be discharged in or on any waters of the state, the discharger shall report such discharge to this Regional Board, at (415) 464-1255 on weekdays during office hours from 8 a.m. to 5 p.m., and to the Office of Emergency Services at (800) 852-7550 during non-business hours. A written report shall be filed with the Regional Board within five (5) working days and shall contain information relative to: the nature of waste or pollutant, quantity involved, duration of incident, cause of spill, Spill Prevention, Control, and Countermeasure Plan (SPOC) in effect, if any, estimated size of affected area, nature of effects, corrective measures that have been taken or planned, and a schedule of these activities, and persons/agencies notified.
 14. The Board will review this Order periodically and may revise the requirements when necessary.

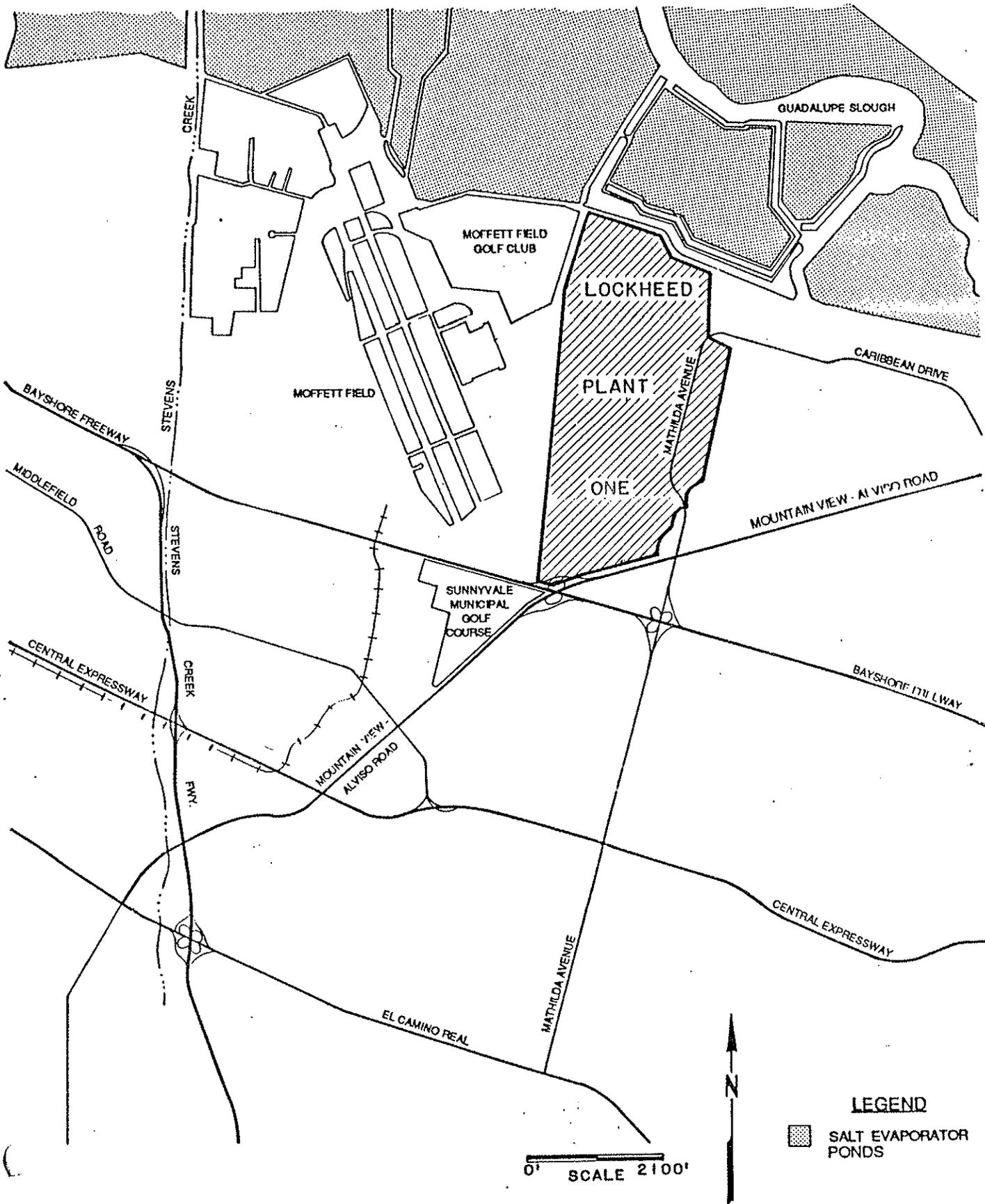
Pursuant to California Water Code Sections 13304 and 13350, if the Discharger fails to comply with the provisions of this Order, the Executive Officer may request the Attorney General to take appropriate enforcement action against the Discharger, including injunctive relief, or the Regional Board may schedule a hearing to consider assessing civil monetary penalties of up to \$5,000 per day of violation and to consider requesting the Attorney General to take appropriate enforcement action against the Discharger, including injunctive and civil monetary remedies of up to \$15,000 per day of violation.

I, Roger B. James, Executive Officer, do hereby certify that the foregoing is a full, true and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on January 20, 1988.


Roger B. James
Executive Officer

SITE LOCATION MAP

SAN FRANCISCO BAY



LEGEND

■ SALT EVAPORATOR PONDS

0' SCALE 2100'