



DEPARTMENT OF THE NAVY

MARE ISLAND NAVAL SHIPYARD  
VALLEJO, CALIFORNIA 94592-5100

5090  
Ser 461.6/45(107)

JUL 1 1988

Ms. Lila Tang  
Regional Water Quality  
Control Board  
San Francisco Bay Region  
1111 Jackson Street, Room 6040  
Oakland, CA 94607

Dear Ms. Tang:

This letter provides information sought by the Board in its Waste Discharge Requirements (WDR) Order CAO No. 87-170 of December 21, 1987, relative to hazardous waste sites at Mare Island Naval Shipyard.

Building 225 (WDR para. C.5.c)

Enclosure (1) provides a proposal for further investigation at Building 225. Negotiations are in progress with L&W Environmental for the performance of this work. In order to finalize these negotiations and award a contract, we need the Board's comments to enclosure (1). Upon award, we will provide the Board with a schedule for accomplishment of the work. Our preliminary estimate is 90 days from date of award.

Sanitary Landfill (WDR para. C.2.e.)

The January 1988 EPA/DHS proposed denial of our RCRA Part B permit for the Sanitary Landfill required that we first focus our Sanitary Landfill consultant, Kaman Tempo/Risk Science Associates (KT/RSA), on performing an extensive review of the technical information on which EPA/DHS based their proposed denial. KT/RSA have completed this review and submitted to us a draft report which includes a plan of action for obtaining the additional information necessary to make an informed decision on whether the Sanitary Landfill meets EPA/DHS requirements for continued operation. The results of KT/RSA's review should be directly applicable to their preparation of a WDR for the Sanitary Landfill. We will forward a copy of this report to the Board when finalized.

KT/RSA has initiated preparation of the WDR proposal. Their approach is described in enclosure (2). KT/RSA plans to submit a draft proposal to us by July 21, 1988. We will review, resolve comments and provide a final proposal to the Board within four weeks of receipt.

IWTP Surface Impoundments (WDR para. C.3.c)

Enclosure (3) provides an addendum to the report we submitted on April 1, 1988, under cover letter Ser 461.4/107. This addendum also addresses certain actions which will be taken relative to the Sanitary Landfill. Therefore, these

actions will first be considered as a part of developing the workplan proposal for the Sanitary Landfill discussed in enclosure (2). Remaining actions not covered by the enclosure (2) workplan will then be negotiated separately and a timetable established in these negotiations.

Navy Installation Restoration (IR) Program sites (WDR para. C.2.e, C.4.d, and C.5.e)

Enclosure (4) provides a status of the preparations for the workplans which are being developed under the Navy's Installation Restoration (IR) Program. Obviously, the workplan at the historic landfill will have to be coordinated with the workplans for the Sanitary Landfill and the IWTP Surface Impoundments discussed in enclosures (2) and (3) above.

While we had intended to be further along in the preparation of these plans at this time, our necessary reliance on outside consultants, which we can only obtain through formal Government contracting procedures, and the limitations on our own contracting resources prevented further progress than that reflected in this letter and its enclosures. We are continuing to explore ways of minimizing the impact of these factors on our schedules for accomplishing work. In the meantime, we will provide progress reports on the development of our workplans for the sites discussed above to the Board on a monthly basis. If you have any questions or would like to discuss this matter further, please call me at (707)646-3375.

Sincerely,

  
W. J. CORNILS

Head, Environmental  
Management Division  
By direction of the Shipyard Commander

Enclosure

Copy to:

Ms. Barbara Cook  
North Coast California Section  
Toxic Substances Control Division  
Department of Health Services  
5850 Shellmound Drive, Suite 390  
Emeryville, CA 94608

Ms. Karen Scheuermann  
U.S. Environmental Protection Agency  
Region IX  
215 Fremont Street  
San Francisco, CA 94106

Mr. Al Wanger  
Department of Health Services  
Site Remediation  
5850 Shellmound Drive  
Emeryville, CA 94608

Mr. Cliff Covey  
Solano County Department of Public Health  
601 Texas Street  
Fairfield, CA 94533

bcc: for 5090 Ser 461.6/45(107) ltr  
NAVSEA 07AE  
WESTDIV  
IT  
KT/RSA  
ERM West  
COMNAVBASE

NRRO, MI(2)

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3480N

## FAX IDENTIFICATION SHEET

DATE:

6/28/88

TO:

J. PEARSON - MARINE IS. NAVAL SHIPYARD

FAX # (707) 646-2238

FROM:

LFW ENVIRONMENTAL SERVICES

PHONE NUMBER:

(415) 822-4555

NUMBER OF PAGES TO FOLLOW:

8

PLUS COVER SHEET

You are receiving this correspondence from an automatic G-3 facsimile machine located at The Sales Mart Executive Suite, 1485 Bayshore Blvd., Suite 265, San Francisco, CA 94124. The FACSIMILE telephone number is (415) 467-0991. If you experience any problems or have any questions, please call our office at (415) 330-3500.

NOTE TO FACSIMILE OPERATOR: PLEASE PROMPTLY DELIVER THIS FACSIMILE TRANSMISSION TO THE ABOVE ADDRESSEE. THANK YOU.



## Environmental Services, Inc.

2111 Jennings Street, San Francisco, California 94124-3224, Phone (415) 822-4555

June 28, 1988

John C. Pearson  
Environmental Engineer  
Code 460  
Mare Island Naval Shipyard  
Vallejo, CA 94592

Dear Mr. Pearson:

Please find enclosed the Proposal for Further Soil and Groundwater Investigation, Building 225, Mare Island, prepared by L & W Environmental Services, Inc.

Please contact me if we can provide further assistance.

Sincerely,

A handwritten signature in dark ink, appearing to read 'George Wilson', written over a horizontal line.

George Wilson  
Vice President

GW/ls  
/F016/

PROPOSAL  
FOR  
FURTHER SOIL AND GROUNDWATER INVESTIGATION  
BUILDING 225, MARE ISLAND

INTRODUCTION

The reports entitled "Final Report, Soil and Groundwater Investigation, Building 225, Mare Island", dated February 29, 1988, and "Addendum to Final Report, Building 225, Mare Island", dated March 15, 1988, presented the following conclusions concerning the subsurface conditions in the vicinity of Building 225:

- 1) A confined aquifer consisting of a grey silty clay is present beneath Building 225 on the order of 20 to 25 feet below ground surface.
- 2) There is an upward gradient of groundwater from the confined aquifer, thus precluding migration of contaminants from the surface into the aquifer.
- 3) The confined aquifer beneath Building 225 does not contain significant concentrations of priority pollutant metals or petroleum hydrocarbons.
- 4) A clayey sand and gravel fill represents an unconfined aquifer between Building 225 and the Strait.
- 5) The unconfined aquifer between Building 225 and the Strait contains significant concentrations of both total and hexavalent chromium.

- 6) The lack of tidal influence indicates very slow movement of groundwater from the unconfined aquifer into the Strait.
- 7) Channelized leakage from Building 225 is moving along the contact between the fill and the consolidated formation beneath.
- 8) Channelized leakage from Building 225 has contaminated the unconfined aquifer between Building 225 and the Strait.
- 9) The unconfined aquifer between Building 225 and the Strait contains significant concentrations of Barium.
- 10) The rapid change in chemical characteristics of groundwater in monitoring well MW-8 indicates a direct connection with the plating shop through abandoned or broken sewers and drains.

#### PROPOSED SCOPE OF WORK

Prior to the contamination remediation, it is recommended that an additional soil and groundwater investigation be conducted in order to generate data that will allow a more detailed and complete remedial action plan to be developed. The proposed scope of work is as follows:

##### 1. Monitoring Well Installation

In order to define the areal extent of Chromium and Barium in the shallow groundwater between Building 225 and the Strait, five monitoring wells shall be installed. The wells shall be located along waterfront Avenue, between

Buildings 101/273 and the sea wall. The exact location of the wells shall be determined by the consultant, and shall meet the approval of the California Regional Water Quality Control Board.

Each well shall be installed using hollow-stem augers with a minimum diameter of 10 inches. During the drilling, soil samples for chemical analysis shall be collected at 5-foot intervals until the shallow water table is encountered. If possible, a soil sample shall be collected within the capillary zone directly above the water table. Each soil sample shall be collected by driving a split-barrel sampler fitted with brass liners. Below the water table, soil samples for mechanical tests shall be collected at 5-foot intervals to the bottom of the boring.

For two of the borings, the geology shall be continuously logged until bedrock is encountered. Soil samples for analysis shall be collected at 5-foot intervals, as stated above. After bedrock is encountered, the borings shall be partially backfilled in order to facilitate completion of the monitoring wells at the desired depths.

Each well shall be completed to 15 feet below the shallow water table. The completed depth of each well is expected to be approximately 25 feet. The borings shall be logged in the field by a registered geologist or registered engineering geologist. Each boring shall be cased up to five feet above the shallow water table with 4-inch PVC slotted screen pipe (0.02" slots). The annular space shall be packed to one foot above the slotted section with #3 Monterey Sand. At least one foot of wetted bentonite pellets shall be placed upon the sand pack, followed by a neat cement/bentonite seal up to the ground surface. Each well shall be fitted with a locking steel traffic lid.

## 2) Well Development & Groundwater Sampling

Following installation, each well shall be developed by removing water with a submersible pump until the water is relatively clear, or until the apparent turbidity of the water being removed has stabilized. All water removed from the monitoring wells shall be disposed of in the industrial waste treatment system drain located in building 225.

Both the new monitoring wells and the five existing wells shall be sampled twice, with at least a two week period between each sampling. Prior to collecting a groundwater sample, each well shall be purged by bailing 5 casing volumes of water. After a well has been purged, a groundwater sample shall be bailed and placed in the appropriate containers, as required by the particular laboratory method protocols. All samples shall immediately be placed on ice, then transported under chain-of-custody to the laboratory by the end of the working day.

At the time a monitoring well is sampled, the following information shall be recorded in the field: 1) depth-to-water prior to purging, 2) sample pH, 3) sample temperature, and 4) specific conductance of sample.

## 3) Soil Sampling

In order to determine the extent of soil contamination both beneath and in the areas immediately adjacent to building 225, soil and rock samples shall be collected at five locations within the building, and at five locations within the alley way between Building 225 and Buildings 101 and 273.

Each boring shall be drilled using either hollow or solid-stem augers. During the drilling, soil samples shall be collected at depths of 2 feet and

5 feet. Based upon the judgement of the field engineer, additional samples at other depths may be collected. Each soil sample shall be collected by driving a split-barrel sampler fitted with brass liners. Each liner shall be immediately capped and placed on ice, then transported under chain-of-custody to the laboratory by the end of the working day.

Each boring shall be logged in the field by a registered civil engineer, registered geologist, or registered engineering geologist.

#### 4) Soil Mechanical Tests

Sieve analyses shall be performed on all samples collected during the monitoring well installations. Besides providing information useful in the assessment of groundwater movement and contaminant migration, these sieve analyses would facilitate the proper design of one or more extraction wells in the future, should they be necessary as part of a remedial action program.

#### 5) Aquifer Tests

In order to determine transmissivity and storage coefficient values for the unconfined aquifer between Building 225 and the Strait, a pump test shall be performed. The test shall involve the pumping of groundwater from one of the new 4-inch monitoring wells, while at the same time measuring the drawdown at other nearby monitoring wells. The aquifer characteristics determined by this test shall be used in the design of a groundwater pumping scheme for future remediation. Also, the hydraulic conductivity value obtained from such testing can be used in estimating the rate of groundwater movement beneath the site.

#### 6) Survey Casings

The top-of-casing elevation at each monitoring well shall be determined by a licensed land surveyor. All elevations shall be set to feet above mean sea level and shall be based upon an established Mare Island datum.

#### 7) Water Level Measurements

In order to determine the direction, as well as the rate of shallow groundwater movement beneath the site, depth-to-water measurements shall be taken at each monitoring well location.

#### 8) Laboratory Analysis: Water

All groundwater samples shall be analyzed for all EPA priority heavy metals, including both total and hexavalent chromium. In addition, each sample shall be analyzed for cyanide, general oil and grease, and total petroleum hydrocarbons.

#### 9) Laboratory Analysis: Soil

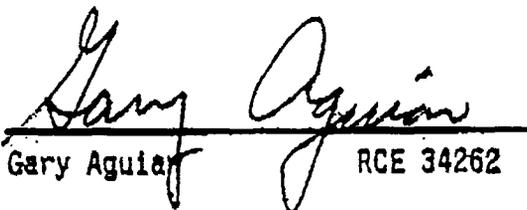
All soil samples shall be analyzed for all EPA priority heavy metals, including both total and hexavalent chromium. In addition, each sample shall be analyzed for cyanide, general oil and grease, and total petroleum hydrocarbons.

### 10) Final Report

A final report shall be written that will provide a description of all field work, present all geologic logs, and present all laboratory results. In addition, the report will contain a hydrogeologic assessment report (HAR). The HAR will include, but not be limited to the following:

- 1) soil and formation conditions
- 2) geologic cross-sections
- 3) depths to groundwater
- 4) shallow groundwater contour maps
- 5) determinations of aquifer characteristics
- 6) shallow groundwater velocities
- 7) analysis of laboratory results
- 8) contaminant plume definitions
- 9) contaminant source identification

In addition, the HAR will propose a plan of action that will ultimately remediate the soil and groundwater contamination associated with the operation of the plating activities inside Building 225. A minimum of three clean-up alternatives will be proposed, along with their relative costs and a discussion of their feasibilities.

  
Gary Aguiar RCE 34262 6/24/88

TELECOPY TRANSMITTAL

TRANSMISSION NO: 1 TRANSMITTED: 6/29/88 TIME: 9:55<sup>AM</sup>

TO: MR. JOHN PEARSON - CODE C/460

COMPANY NAME: MINS (707) 646-3576  
NAME TELECOPY NO.

NO. OF PAGES: 4  
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(805) 965-0551

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## **KAMAN**

29 June 1988

Mare Island Naval Shipyard (MINS)  
Public Works Department  
Code C/460  
Vallejo, CA 94592-5100

ATTN: John Pearson  
Environmental Engineer

SUBJ: Report of Waste Discharge (RWD) Proposal  
RCRA Landfill

REF: N62474-87-D-7073

Gentlemen:

MINS has requested Kaman Tempo/Risk Science Associates (KT/RSA) to prepare a Report of Waste Discharge to Land (RWD) proposal and schedule for the RCRA (Resource Conservation and Recovery Act) Landfill. As authorized by MINS, KT/RSA started today to develop the required document.

A RWD for a facility contains detailed information such as waste characteristics, hydrology, geology, groundwater use, land use, design and operation, and post-closure plans. Developing the various components of a multidiscipline report of this nature involves identifying applicable regulatory requirements and subsequently assembling the necessary technical and administrative information and data. It is very likely that considerable information that can be used in preparing the RWD exists in MINS files. Clearly, KT/RSA will need some time to review existing voluminous data for this purpose so that time consuming repetitions of work can be avoided. KT/RSA plans to conduct this literature survey starting today and prepare a draft proposal and schedule for the RWD for submittal to MINS by 21 July 1988. However, for your immediate use we are providing in this letter an overview that is the basis we will be using in developing the RWD proposal.

Mare Island Naval Shipyard  
Page 2  
29 June 1988

Title 23 of the California Administrative Code (CAC), Subchapter 15 contains State Water Resources Control Board (SWRCB) regulations for discharges of waste to land. Article 9 of Subchapter 15, Compliance Procedures, contains the specific requirements for a Report of Waste Discharge to Land under the following sections:

- Section 2590 Reporting Requirements for Waste Discharge to Land
- Section 2594 Waste Characteristics
- Section 2595 Waste Management Unit Characteristics
- Section 2596 Design Report and Operations Plan
- Section 2597 Closure and Post-Closure Maintenance Plan

Section 2590 basically describes the Compliance Procedures under Article 9, and states that

*"Dischargers shall be required to provide information on waste characteristics, geologic and climatologic characteristics of the unit and the surrounding region, installed features, operation plans for waste containment, precipitation and drainage control, and closure and post-closure maintenance plans as set forth in Sections 2594 through 2597 of this article".*

A significant requirement is that any report submitted under this section must be approved by a registered civil engineer or a certified engineering geologist.

KT/RSA are currently reviewing existing data and shall identify those applicable to the preparations of the RWD. Concurrently, we shall identify in the form of a checklist the requirements of Article 9 that are applicable to the RCRA Landfill. In combination, these will provide the basis for determining how individual Article 9 requirements can be accomplished, and how long it will take to do so. It is anticipated that some of the required information will be available in the existing database in sufficient detail for their use in the RWD. In view of these findings, we shall develop the proposal for the RWD.

Mare Island Naval Shipyard

Page 3

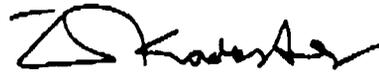
29 June 1988

The RWD proposal will contain the completed checklist, and will address the methodology for obtaining each individual item shown to be applicable on the checklist. If the information exists, we will discuss whether it can be used as is, or whether it needs to be further developed. In the latter case we will propose how the additional work will be performed, and what results would be obtained. If the information does not exist, we will propose method(s) of obtaining the data needed to complete the RWD. Along with discussions of each item proposed for the RWD, we shall provide a timetable for completion of the actual report. Upon final approval by the regulatory agency, the proposal can be used to assemble the RWD.

We hope that this information meets your immediate needs. Work on preparations for developing the RWD proposal is in progress. Please call the undersigned at (805) 963-6443 should you need additional information.

Sincerely,

KAMAN TEMPO



Omar I. Kadeetan, D R

Natural Resources Program

"NIK-hs

3 copies submitted

cc: Dr. Alvin Greenberg, RSA

PROPOSAL, REPORT OF WASTE DISCHARGE  
ADDENDUM  
INDUSTRIAL WASTEWATER TREATMENT PLAN  
MARE ISLAND NAVAL SHIPYARD

Prepared for:

WESTERN DIVISION NAVAL FACILITIES:  
ENGINEERING COMMAND

Prepared by:

ERM-WEST  
1777 Botelho Drive, Suite 260  
Walnut Creek, California 94596

(415) 946-0455

June 7, 1988

PROPOSAL, REPORT OF WASTE DISCHARGE  
INDUSTRIAL WASTE TREATMENT PLAN

DATED 01 APRIL 1988

THIS RECORD IS ENTERED IN THE DATABASE AND FILED  
AS

RECORD NO. N00221\_000136

## INTRODUCTION

This proposal is an addendum to a Report of Waste Discharge Proposal submitted April 1, 1988 to Western Division Naval Facilities, San Bruno, California. The changes contained herein pertain to the geological and hydrological portions of the original submittal. Specifically, the seismic study will address the areas of the Industrial Wastewater Treatment Plant (IWTP) and the Sanitary Landfill. Second, the geologic and hydrologic studies of the IWTP impoundment area will be performed in greater detail than presented in the Hydrogeologic Assessment Report (ERM-West, February 29, 1988). Last, the geologic and hydrologic studies of the IWTP and Sanitary Landfill will be expanded approximately 1,000 feet beyond the perimeter of both sites.

## SEISMICITY

### Maximum Credible Earthquake

The seismic study will address the maximum credible earthquake (MCE) and the associated strong ground motion that the sites could be subject to. The determination of the MCE will consider the significant faults within 100 kilometers of Mare Island. The distance of the faults from Mare Island, the length of the faults, the type of faults, historic seismicity, and the regional tectonic setting will be considered. The study will include the Franklin fault which has been mapped by URS(1985) as being immediately east and west of Mare Island.

## Peak Acceleration

Response of the soil profile to seismically induced motion of the underlying bedrock will be modeled using a one dimensional analytical model, SHAKE, developed for horizontally layered sites by Schnabel ,et al., (1972). Model soil profiles will be produced for the sites from existing information, new information from well construction proposed herein, and assumptions on the type and nature of the unconsolidated materials overlying bedrock. Dynamic properties of the soils will be based on laboratory tests for shear strength, density, and grain size on samples collected during well construction to derive estimates for each soil profile unit of shear strength, shear moduli, shear wave velocity, and density. The seismically induced strong ground motion of the bedrock will be addressed using empirically derived relationships from Seed and Idriss (1983) and strong motion records from similar site settings. The resulting surface, peak ground accelerations from the modeling will be contoured and a strong ground motion map produced. Amplification effects, estimated to be 0.2 to 0.4g, from the 1898 Mare Island Earthquake, noted from a preliminary study of historic information on damaged buildings located on fill soils and bedrock respectively, will be used as a comparison between computed bedrock and surface peak ground acceleration of the soils.

## Liquefaction

Accounts of the "Mare Island Earthquake" in March 1898 and accounts of the affects of the San Francisco Earthquake in April, 1906 describe the failure of "made land" at Mare Island. (Youd and Hoose, 1978). The failures described may have been the result of liquefaction induced by the earthquakes. It is proposed that the potential for liquefaction of the fill soils and shallow underlying natural soils be addressed as part of the seismic

study. Soil samples collected during well construction will provide some basic data necessary for liquefaction susceptibility, particularly through laboratory analysis for particle size distribution, in-place density, and percent moisture content of representative samples from each identified soil unit. This data will be combined with water table elevations, acceleration data from SHAKE, and estimates of duration of shaking as input into a model. It is proposed that a computer code, CUMLIQ (Donovan, 1974) will be used to analyze liquefaction potential.

### Slope Stability

Slope stability of the Sanitary Landfill will be addressed for the Report of Waste Discharge study. Values of strength and density of the Landfill will be assumed and combined with similar values obtained from laboratory tests of dredge spoils and possible underlying natural soils. Modeling will be completed through the use of a program that will analyze potential slope stability under static and dynamic conditions.

### Local Faulting

The search for Holocene age faulting within 3,000 feet of the sites will be conducted using several approaches; the collection and review of available literature, the study of aerial photographs, site reconnaissance of outcrops on the southern portion of Mare Island, and obtaining and plotting of earthquake epicenters. Another approach to locating and identifying faulting will be through the planned construction of a series of monitoring wells located approximately 1000 feet outside the site perimeters. It is anticipated that the deep wells will penetrate an unconformity identified during previous work (ERM-West, February,

1988). The unconformity will be structurally contoured and will be evaluated for abrupt dislocations potentially associated with faulting.

## HYDROGEOLOGY

### Installation Landfill Piezometers

ERM-West from previous work (July, 1987; February 29, 1988) has identified three saturated zones beneath both sites. It is proposed to refine the known extent and nature of the aquifers and subsurface geology by constructing additional piezometers and wells in three discrete areas, See Figure 1. Area one consists of seven sites, located approximately 1000 feet beyond the perimeters of the Wastewater Treatment Plant and Sanitary Landfill. Two piezometers will be installed at each site, one will penetrate the upper most portion of the deep aquifer, the other will penetrate the full thickness of the intermediate aquifer. The piezometers proposed will be constructed of 2-inch schedule 40 PVC casing with type 316 stainless steel wire wrap screen. The purpose of the piezometers will be to determine the hydraulic gradient of the two lower aquifers and map the extent of the Older Bay Mud - Younger Bay Mud unconformity beyond the site perimeters.

### Sanitary Landfill Piezometers

We propose to construct four piezometers at locations within approximately 100 feet of existing Sanitary Landfill monitoring wells constructed by ERM-West (January, 1988). During construction, samples will be collected for (Vertical) permeability tests of units of low hydraulic conductivity; density, percent saturation size distribution and shear tests for liquefaction susceptibility, slope stability and strong motion

studies. We anticipate the piezometers will be constructed utilizing 2-inch Schedule 40 PVC casing with type 316 stainless steel wire wrap well screen. Screens in the piezometers will be placed at the same depth interval as the adjacent monitoring well.

During pumping tests of selected monitoring wells water levels will be measured in the pumped well, piezometers, and other nearby monitoring wells with a transducer - data logging system. Water from the pumped well will be discharged to the ground surface at an appropriate distance from the well, and will be monitored for temperature, pH, and conductivity. It is anticipated seven pumping tests will be run, four in the deep aquifer and three in the intermediate aquifer.

We propose to conduct slug test (bail tests) in the shallow monitoring wells, and selected wells penetrating the intermediate aquifer. Unless previous sampling dictates otherwise, water from the shallow wells will be discharged to the ground surface, on the Sanitary Landfill side of the dikes. It is anticipated that approximately 12 bail tests will be run. The drawdown and recovery of the water levels will be monitored with a transducer-data logging system.

#### Industrial Wastewater Treatment Plant Monitoring Wells

We propose to construct additional monitoring wells in the vicinity of the Industrial Wastewater Treatment Plant impoundments. Three monitoring wells are proposed for the shallow water table. One well will be located hydraulically upgradient, adjacent to the Sanitary Landfill. The remaining two wells will be located east and west of the impoundments. The shallow wells will be constructed of 4-inch Schedule 40 PVC casing and type 316 stainless steel wire wrap well screen. The purpose of the shallow wells is to further define the groundwater mound around the

impoundments and to compare the water chemistry of the well adjacent to the Landfill with the hydraulically upgradient well adjacent to the impoundments.

A total of four additional wells are proposed in the vicinity of the impoundments, two in the intermediate aquifer and two in the deep aquifer. The wells in each aquifer would be located hydraulically up and down gradient from the impoundments. Due to the high concentrations of organic and inorganic compounds in the soils above the TTLC (ERM-West, February, 1988), we propose to double case the wells. An 8-inch diameter casing will be placed to a depth of approximately 30 feet and the annular space grouted. Further advancement of the drilling will be inside the 8-inch casing. The wells will be constructed of 2-inch Schedule 40 PVC with type 316 stainless steel wire wrap well screen. It is proposed to use smaller diameter casing for the monitoring wells due to past experience of the difficulty of advancing borings through the debris laden fill soils in the vicinity of the impoundments.

During drilling of one well into the deep aquifer, samples will be collected for permeability tests; density, percent moisture, and size distribution for liquefaction susceptibility. Cuttings from the drilling will be placed in drums, sealed and labeled for proper disposal. The U.S. Navy will be responsible for manifesting the drums that are removed and disposed of off site.

Slug test and pump tests will be conducted utilizing a transducer - data logging system. Pumping tests will be conducted using a nearby existing Sanitary Landfill monitoring well with the proposed 2-inch wells used as observation wells. Discharge from the slug tests will be disposed of into the impoundments.

## Sampling

We propose that the hydraulically up gradient monitoring wells around the impoundments be sampled on a quarterly basis for the same constituents as the adjacent Sanitary Landfill sampling program. Identical procedures for well purging, sample collecting, quality control, etc., will be followed. Samples from the landfill monitoring wells will be analyzed for: the parameters listed on Table 1.

TABLE 1. QUARTERLY SAMPLING

	EPA Test Method
Volatile Organics	624
Purgeable Organics	625
Base/Neutral Extractable	
Acid Extractable	
Priority Pollutant Metals	6010
Antimony	
Arsenic	
Beryllium	
Cadmium	
Chromium	
Copper	
Lead	
Mercury	
Nickel	
Selenium	
Silver	
Thallium	
Zinc	
Chlorinated Pesticides & PCBs	608
Chlorinated Herbicides	615
Cations	6010
Calcium, Magnesium, Potassium,	
Sodium, Iron	
Anions	300
Nitrate, Chloride, Sulfate	

## REFERENCES CITED

Donovan, N.C., 1974, CUMLIQ... Evaluation of Potential for Liquefaction of a Soil Deposit Using Random Vibration Procedures;; Dames & Moore, San Francisco, California.

ERM-West, February 29, 1988, Hydrogeological Assessment Report, Sludge Ponds, Industrial Wastewater Treatment Plant, Mare Island Naval Shipyard: Contract No. N-62474-85-D-5627.

ERM-West, January, 1988, Monitoring Well Completion Report for the Sanitary Landfill and Industrial Wastewater Treatment Plant, Mare Island Naval Shipyard: Contract No. N-62474-85-D-5627.

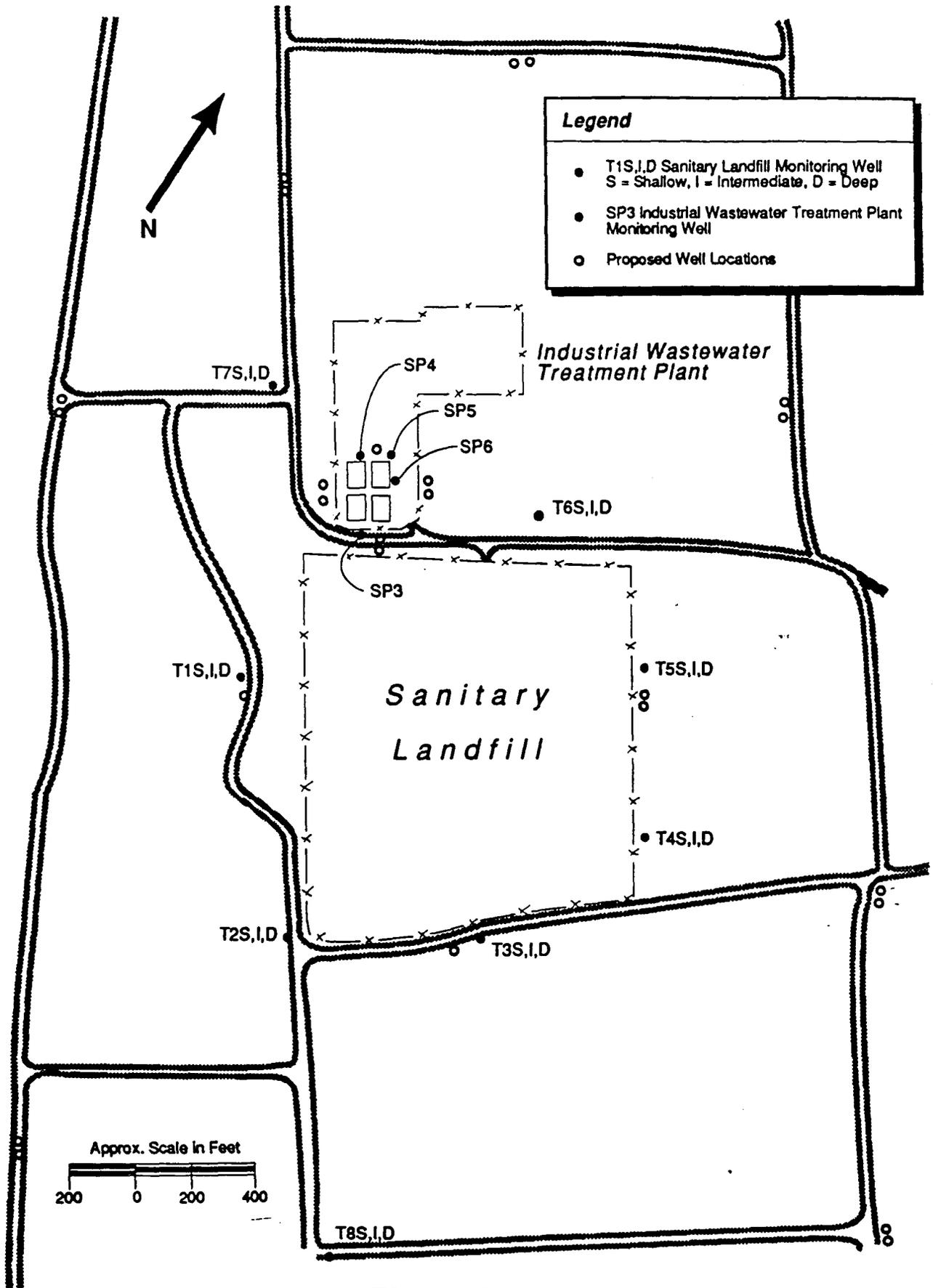
ERM-West, July 1987, Volume I Draft Report, Mare Island Landfill Site Investigation: Contract No. N-62474-85-D-5627.

Schnabel, P.B., Lysmer, J. and Seed, H.B., 1972, SHAKE... Earthquake Response Analysis of Horizontally Layered Sites: Department Civil Engineering, University of California at Berkeley, California.

Seed, H.B., and Idriss, I.M., 1983, Ground Motions and Soil Liquefaction During Earthquakes: EERI, Monograph 5, 140p.

URS, 1985, Investigation to Insure No Faults Exist Within 200 Feet of the Mare Island Landfill: Contract No. N62472-85-C-0102.

Youd, T.L., and Hoose, S. N., 1978, Historic Ground Failures in Northern California Triggered by Earthquakes: U. S. Geol. Surv., P.P. 993.



**Figure 1**  
**Proposed Well Locations**  
**Mare Island Naval Shipyards**

## IR PROGRAM ACTIONS AT MARE ISLAND NAVAL SHIPYARD

The California Regional Water Quality Control Board issued Waste Discharge Requirements (WDR), CAO 87-170, on December 21, 1987, for hazardous waste sites at Mare Island Naval Shipyard. Many of the sites addressed included those covered by the Navy's Installation Restoration (IR) Program established under CERCLA. This program is administered for Mare Island by the Western Division, Naval Facilities Engineering Command (WESTDIV) in San Bruno, California.

Subsequent to issuance of the WDR, the Navy initiated actions through the Department of Defense and the Department of Energy in Washington, D.C., to fund Martin Marietta Corporation in Oak Ridge, Tennessee. Funding was authorized in January 1988. Martin Marietta subcontracted this work to HAZWRAP Corporation who, in turn, further subcontracted the work to IT Corporation.

Consistent with the priorities established by the Board in the WDR, Mare Island first focused IT on the 900 Area and the Concord Annex. In February, 1988, Mare Island provided the Board with IT's Sampling and Analysis Plan for the 900 Area. Board comments were received at a meeting held 2 May 1988 and a revised plan was submitted on 10 June 1988. In May 1988, Mare Island provided the Board with IT's Sampling, Cleaning, and Inspection Plan for the Concord Annex storm drains.

In March and May 1988, Mare Island and WESTDIV held work scope package meetings, including discussion of scheduled deadlines, with all the contractors tasked to perform work addressed in the WDR. In mid-June 1988, Mare Island and WESTDIV were first advised that the work plans scheduled to be completed by IT by 1 July 1988, would not, in fact, be completed by that date. WESTDIV took action to get the IR Program back on track. The results are reflected in the following discussion.

### 1. Historic Landfill

This site actually encompasses three of the sites identified in the Statement of work (SOW). These are the Historic Landfill (IR-1), the Oil Sumps (IR-2), and the Sludge Ponds (IR-6). This is a large site consisting of about 29 acres with other activities, both past and present, within the boundaries. The analysis to determine the amount and consistency of the discharge will be complex and time consuming. A significant element in the schedule of this activity is that there are other contractors doing field work in the area of the landfill. For example, under the Consent Decree, which settled the Department of Health Services (DHS) lawsuit against Mare Island, monitoring wells construction for required pump tests and soil sample analysis is currently in progress in the vicinity of the landfill. IT Corporation wants to use as much of that data as possible to determine the hydrogeology of the area before committing to a particular program. In May 1988, Mare Island obtained the agreement of these contracts to share information. It is anticipated that the field program would consist of a line of wells approximately west of the landfill and several others on the inland sides of the landfill. This task is described below.

IT will prepare a work plan for the three sites included in the Historic Landfill. The plan shall indicate what actions are necessary to obtain the information required to complete the Report of Waste Discharge (RWD). If the actions necessary for the completion of the RWD include additional field sampling, IT will prepare appropriate plans for the field work. The following is a list of the plans that will be required for field work:

- o Sampling Plans (SP)
- o Data Management Plan (DMP)
- o Quality Assurance Project Plan (QAPP), and
- o Health and Safety Plan (HSP)

The plans shall be revised following receipt of comments from Martin Marietta Energy Systems, WESTNAVFACENGCOM, and appropriate regulatory agencies. For estimating purposes, IT will assume that there will be two revisions of each plan. Review meetings at WESTNAVFACENGCOM and Mare Island Naval Shipyard are to be assumed to coordinate resolution of comments.

The QAPP and the HSP for the 900 Area has been released for Navy comment [ Anticipated submission date for the RWD proposal is 1 December 1988. A large portion of the time between the estimated notice to proceed and this date will be spent in obtaining and interpreting the information from the other contractors. If that data is not forthcoming, or is not usable, there will be significant impact to the schedule. ]

## 2. Berths 4 and 5

This task is essentially a Site Inspection (SI) as described in the Remedial Investigation/Feasibility Study (RI/FS) Guidance. The site includes a complex interface with the water of the strait, the piers, groundwater, and soil. This is further complicated by the very highly restricted access problems. Drilling from the road surface is not advisable because of the crowded condition of the pipes and conduits under the pier. An additional question is whether all the berths will be accessible, or will access through the industrial area be required. A series of soil and water samples taken at selected points along the pier should provide information to the condition of the interface. A similar set of wells could provide information concerning the tidal influence as compared with the groundwater influence. This task is not technically difficult. It is extremely difficult from a logistics point of view. This task is described as:

### Remedial Investigation Sampling Plan (RISP)

The RISP shall consist of a detailed description of IT's approach to, and technical rationale for, the investigation. The requirements for the RISP are discussed in Chapter 2 of Guidance on Remedial Investigation under CERCLA. The RISP shall include, as a minimum, information on the following:

- o plans and objectives of all geophysical and/or soil gas surveys
- o plans and objectives for all borings, wells, test pits, and other direct physical investigations

- o the number, types, and location of all samples to be taken
- o the methods of sample acquisition, preparation, and analysis
- o the design, construction, and abandonment procedures for soil borings, monitoring wells, test pits, etc., and
- o a schedule for implementing the investigation tasks. Submission date is anticipated to be November 15, 1988.

### 3. Tank T-3, Used Battery Acid Storage

This task will involve a relatively straight forward approach to determining the presence or absence of contaminants in the vicinity of the storage tank. As with other sites, the success of this planning activity will depend, to some extent on the availability of the information from other contractors concerning the groundwater gradients in this area. This sampling would consist of a series of boreholes around the tanks with the possibility of developing them into wells in the event that groundwater is near. This task is the same as the task described above for Berths 4 and 5. The anticipated submission date is October 30, 1988.

### 4. Tank 772

Tank 772 is a 1.4 million gallon fuel storage tank. This tank will involve a straight forward approach to characterize the site. Investigation will involve a series of boreholes and/or monitoring wells around the tank to determine the location of any anticipated contaminants. The task would follow the task described above for Berths 4 and 5. The plan should be available for release to the Regional Water Quality Control Board (RWQCB) by 1 December 1988.

### 5. PCB Contaminated Areas

This task is essentially an SI. There are four sites: IR-10 through IR-13. This is four separate buildings. There will be four different plans. The anticipated submission date to RWQCB is 10 October 1988.

### 6. Building 334

This is site IR-9 and is essentially a SI. Sampling and analysis for the contaminants here would be similar to those described above with the possible addition of soil gas analysis to screen the location before soil samples or boreholes were made.

### 7. Building 900 Area

A large percentage of the work required for this plan has been completed in the field work plan that is being used for the field work going on at Building 900 Area now. Development of the RWD plan for Building 900 Area can be done in the near future under the auspices of the current task. A sampling plan for this area was submitted to the RWQCB in February 1988 and a sampling plan addendum incorporating RWQCB comments of May 1988, was submitted 10 June 1988. The task is as follows:

IT shall prepare a work plan for the Building 900 Area. The plan shall indicate what actions are necessary obtain the information necessary to complete the Report of Waste Discharge (RWD). If the actions necessary for the completion of the RWD include field sampling, the Subcontractor shall prepare appropriate plans for the field work. The following is a list of the plans that will be required for field work:

- o Sampling Plans (SP)
- o Data Management Plant (DMP)
- o Quality Assurance Project Plan (QAPP), and
- o Health and Safety Plan (HSP)

The plans shall be revised following receipt of comments from Martin Marietta Energy Systems, WESTNAVFACENCOM, and appropriate regulatory agencies. For estimating purposes, the Subcontractor shall assume that there will be two revisions of each plan. Review meetings at WESTNAVFACENCOM and Mare Island Naval Shipyard are to be assumed to coordinate resolution of comments.

The QAPP and the HSP for the 900 Area has been released for Navy comment [ ]. The plan here would probably include a line of wells inland from the beach that is already being investigated. To some extent, the details of the RWD plan will be contingent on what is learned during the current sampling. IT Corporation feels that this activity is within the previously approved scope and will be initiating work on this plan as time allows with the ongoing activities at the 900 Area and the Concord Annex. Expected submission date is 30 September 1988.

#### 8. Concord Annex

Consistent with the RWQCB's priorities, the work at Concord Annex to date and has been focused on to the storm drains. Extrapolation of the current work to include the requirements for the RWD will be a significantly larger effort than that for Building 900 Area. This task would probably involve a line of wells along the rip-rap wall, as well as several inland, to provide background levels. IT will do the following:

Prepare a work plan for the Concord Annex. The plan shall indicate what actions are necessary to obtain the information necessary to complete the Report of Waste Discharge (RWD). If the actions necessary for the completion of the RWD include field sampling, the Subcontractor shall prepare appropriate plans for the field work. The following is a list of the plans that will be required for field work:

- o Sampling Plans (SP)
- o Data Management Plant (DMP)
- o Quality Assurance Project Plan (QAPP), and
- o Health and Safety Plan (HSP)

The plans shall be revised following receipt of comments from Martin Marietta Energy Systems, WESTNAVFACENGCOM, and appropriate regulatory agencies. For estimating purposes, the Subcontractor shall assume that there will be two revisions of each plan. Review meetings at WESTNAVFACENGCOM and Mare Island Naval Shipyard are to be assumed to coordinate resolution of comments.

The QAPP and the HSP for the 900 Area has been released for Navy comment under the partial release negotiated for the performance of the field work at the 900 Area. Anticipated submission date is 10 October 1988.

9. Industrial Waste Treatment Plant (IWTP) Collection System Bedding

The task covers evaluation of the backfill associated with about a mile of underground piping. At this time, the location of the pipes to be included is not completely clear. Before this plan can be initiated, a thorough understanding of the site itself is needed. The lack of reliable as-built drawings makes the initial identification of the pipes a problem in itself. IT will review the drawings and attempt to identify the underground piping at issue by 30 September 1988.

10. Progress Reports

Monthly Progress Reports will be forwarded to the RWQCB for information purposes.