STATE OF CALIFORNIA — ENVIRONMENTAL PROTECTION AGENCY

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

REGION 2
700 HEINZ AVE., SUITE 200
BERKELEY, CA 94710-2737

(510) 540-3724

May 23, 1995

Commander
Western Division
Naval Facilities Engineering Command
Attn.: Mr. Gary Munekawa, Engineer in Charge
Code 09ER3GM
900 Commodore Drive
San Bruno, California 94066-2402

Dear Mr. Munekawa:

REMEDIAL INVESTIGATION/FEASIBILITY STUDY AQUIFER TESTING WORKPLAN, APRIL 11, 1995, NAVAL AIR STATION, ALAMEDA

The California Environmental Protection Agency, Department of Toxic Substances Control and Regional Water Quality Control Board have reviewed the draft Aquifer Testing Workplan. Enclosed are the comments of the DTSC. The RWQCB has deferred to the DTSC for providing comments on this workplan.

The enclosed comments have been prepared by Michelle Rembaum of the Geological Services Unit. Some of the comments are suggestions, while other comments were written in order to prompt discussion on the draft Aquifer Testing Workplan. The comments also identified elements of an Aquifer Testing Workplan that are required by the DTSC. Ms. Rembaum and myself will be available to discuss our comments at a future meeting and look forward to that discussion. Please respond if a meeting is necessary.

If you have any questions regarding this letter or would like to schedule a meeting to discuss this workplan, please call me at (510) 540-3809.

Sincerely,

Thomas P. Lanphar
Project Manager
Base Closure Branch

Enclosure

cc: See next page

1196

cc. Mr. James Nusrala
Regional Water Quality Control Board
2101 Webster Street, Suite 500
Oakland, California 94612

Lt. Mike Petouhoff
Base Environmental Coordinator
Alameda Naval Air Station
Building 1, Code 52
Alameda, California 94501

Mr. James Ricks
U.S. Environmental Protection Agency
H-92
75 Hawthorne St.
San Francisco, CA 94105

State of California **Department of Toxic Substances Control**

MEMORANDUM

To: Tom Lanphar
Site Mitigation Branch C
Region 2
700 Heniz Avenue
Berkeley, California 94710

From: Michelle Rembaum Michelle Rembaum
Geological Services Unit Concur: M. Finch
Region 2

Date: May 19, 1995

Subject: **Naval Air Station Alameda - Aquifer Testing Workplan**

INTRODUCTION

Per your request I have reviewed the Aquifer Testing workplan for the Naval Air Station Alameda (NAS Alameda), prepared by PRC Environmental Management, INC., and Montgomery Watson, dated April 11, 1995. The objective of the aquifer testing program is to collect data for evaluation and design of a groundwater extraction system. In order to effectively meet this objective, I recommend re-evaluating the locations and well construction design for the proposed pumping wells. The proposed pumping wells for Site 1, 2, and 5 (M-031-E, M-105-A, and M-05-010), are only screened within a portion of the first water-bearing zone. It is recommended by Driscoll, 1986, that for pumping wells the entire thickness of the aquifer should be screened, otherwise assumptions used in equations for determining well yield must be corrected to account for partial penetration of the aquifer. DTSC recommends the use of properly designed wells for both pumping and observation as discussed in our technical guidance (Aquifer Testing for Hydrogeologic Characterization, 1994). Pumping wells should be placed closer to the areas of contamination, so they could be used as extraction wells in the future, if needed. Some of the existing wells could be suitable as observation wells if pumping wells are relocated as shown on the attached figures. Most of the existing wells are constructed in clusters ("A " wells -- screened in the upper water-bearing zone and "E" wells -- screened in the lower water-bearing zone). Additional observation wells (piezometers) screened similar to the pumping well may be required.

NAS Alameda is underlain by a heterogeneous assemblage of sediments: estuarine, alluvial, eolian, mud, and artificial. The artificial fill is the focus for the aquifer tests which consists of dredge spoils hydraulically placed from the surrounding San Francisco Bay. The artificial fill ranges from clays to gravels arranged in irregular lenses. Sand and silty sand predominates the unit. The hydraulic conductivity of the artificial fill will vary widely depending on type of material encountered in the borehole. Any future extraction well, therefore, will need to undergo similar aquifer tests (pump tests) as presented in this workplan in order to properly design the groundwater pump and treat system. It appears more technically sound and cost effective to conduct pump tests during the remedial design phase. A more thorough discussion should be provided on the objectives and rational for the pump tests. I suggest that more slug tests are conducted in Site 1 and 2 instead of pump tests. Also, a discussion should be provided about recharge from the bay and effects the boundary conditions may have on the pump tests. Please provide the reference material used from Lohman, 1972.

SPECIFIC COMMENTS

1. **Section 1.4., Hydrogeology in the Area of NAS Alameda.**

Geologic cross sections should be provided to support statements made in this section. Groundwater elevations for both the confined and unconfined aquifers should be indicated on the cross sections. Indicate water table and potentiometric surfaces. All groundwater elevation data collected to date should be provided for all wells on Sites 1, 2, 5 and 13. Contour maps should also be provided for groundwater elevations for each monitoring period for all site areas discussed in this workplan. Well logs for all proposed pumping wells, observation wells and background monitoring wells discussed in the workplan should be provided.

2. **Section 1.5., Tidal Influence.**

In order to review tidal influences in water levels from both the first and second water-bearing zones, all groundwater elevation data from the Tidal Influence Study should be provided. Figure 1-10 is missing water level data for M-021-B and M-025-B. See comment number 6, for a more detailed explanation.

3. **Section 2.1.1., Design of Aquifer Tests at Site 1 and Site 2.**

Please provide all data, calculations and results from the slug tests previously performed on the proposed pumping well (M-105-A), or any other wells on-site. The slug test data should be included in an appendix to this workplan along with the well logs. A geologic cross section

should be prepared through the area of M-105-A. Please provide the reference material used from Lohman, 1972, for placement of observation wells at distances of 1.5, 2.5, and 4 times the aquifer thickness. Please provide the reference for locating the observation wells at distances of 5, 20, and 60 feet downgradient of the pumping well. All piezometer locations should be indicated on a figure. Please provide all design and construction details for the proposed piezometers. DTSC's technical guidance document "Monitoring Well Design and Construction for Hydrogeologic Characterization, 1994" is available for assistance.

4. **Page 2-3, last paragraph.**

On which wells were the Bouwer and Rice in-situ permeability tests (slug test methods for unconfined aquifers) performed? Which wells were used for determination of the horizontal hydraulic conductivity for both the first and second water-bearing zone? All data and calculations used to determine hydraulic conductivity should be provided (see comment number three). Assess the impact of vertical gradients on Sites 1 and 2.

5. **Page 2-5, first paragraph.**

The proposed pumping well number M-031-E is only screened in the bottom portion of the first water bearing zone. The entire length of the aquifer should be screened (zones A through E). For minimum optimal distances for placement of observation wells see recommendations in Driscoll, 1986.

6. **Page 2-5, last paragraph.**

The complete tidal influence study for M-031-E should be provided in order to compare it to M-027-E, which is proposed to be used as the background well to monitor barometric pressure.

7. **Page 2-8, third paragraph.**

DTSC recommends that for at least 2 days prior to the initiation of the pumping phase of the aquifer test, water levels should be measured and recorded on an hourly basis for all zones anticipated to be monitored during the aquifer test. Barometric pressure should also be monitored. This comment also applies to Sites 5 and 13.

8. **Section 2.1.2., Design of Aquifer Tests at Site 5.**
Page 2-9, second paragraph.

All groundwater elevations contained in the Remedial Investigation Report (RI) including contour maps with groundwater flow direction should be provided..

9. **Page 2-10, third paragraph.**

It does not appear that the geologic conditions observed in M-05-01 from the fence diagram are representative of the geology throughout the site area, as the text states. The subsurface geology observed in this well is only similar to M-05-04. Wells M-05-01 and M-05-04 are screened in sand, and silty sand. The individual well logs must be provided to support this statement. Wells M-05-02, M-05-03 and M-05-05 are primarily screened in sand. It is inappropriate to apply aquifer properties obtained in one well to the rest of the site. The hydraulic conductivity will vary widely depending on type of material encountered in the borehole.

10. **Page 2-11, first paragraph.**

Please provide the reference for locating observation wells at distances of 5, 20 and 48 feet downgradient of the pumping well. Comment number one, above, should also be addressed for this Site. Downgradient directions as referenced in the text can not be identified without providing groundwater contour maps and the raw data upon which they are based.

Second paragraph.

In order for M-05-08 to be used as a background well for recording barometric conditions it should be screened in the same water-bearing zone as M-05-01. Well logs and groundwater elevation data should be provided to support the use of this well. Provide information from the tidal influence study to support recommendations identified in the workplan.

11. **Page 2-12, first paragraph.**

A groundwater contour map should be provided with groundwater flow directions (see comment number one).

12. **Page 2-13, third paragraph.**

Provide a figure showing locations of the proposed piezometers. Provide the appropriate text from the reference Lohman, 1972, to support locations of the observation wells. All new wells should follow DTSC's technical guidance document " Monitoring Well Design and Construction for Hydrogeologic Characterization, 1994" (see comment number one).

13. **Page 2-16, last paragraph.**

Additional wells should be used for recording background conditions as a contingency . There are a number of factors that might affect the aquifer test data including: tidal influence, rainfall, and changes in barometric pressures. DTSC recommends that for at least 2 days prior to the initiation of the pumping phase of the aquifer test, water levels should be measured and recorded on an hourly basis for all zones anticipated to be monitored during the aquifer test. Weather conditions should also be noted.

14. **Page 3-2, third paragraph.**

The pumping rate should be determined according to recommendations by Driscoll, 1986 (see page 556). Driscoll recommends using 5 to 8 different pumping rates each lasting 1 - 2 hours.

15. **Page 3-3, third paragraph.**

Explain how the pumping rate will be determined. How will the pumping rate be measured and kept constant? How was a pumping rate of 2 gpm determined? What is the maximum pump rate?

16. **Section 3.3., Constant Discharge Test.**

DTSC recommends that the water level measurements be taken as follows:

Pumping Well

Time since Pumping Started (or stopped) in minutes	Time Intervals Between Measurements in Minutes
0 - 10	0.5 - 1
10 - 15	1
15 - 60	5
60 - 300	30
300 - 1440	60
1440 - termination of test	480

Observation Wells

Time Since Pumping Started (or stopped) in Minutes	Time Intervals Between Measurements in Minutes
0 - 60	2
60 - 120	5
120 - 240	10
240 - 360	30
360 - 1440	60
1440 - termination of test	480

What is the accuracy of the water level measurements in the observation wells?

17. **Page 3-4., Section 3.3.2.**

Initial water level measurements should be taken "hourly" on all selected wells for all zone anticipated to be monitored during the aquifer test (see comment number 13). This section recommends " twice daily."

18. **Page 3-5., Section 3.3.3.**

A third water quality parameter be included (pH or turbidity) during the drawdown tests. DTSC's Sampling And Analysis Plan (SAP) guidance should be followed.

19. **Page 4-1., Field Procedures.**

The text states that water generated during the aquifer tests will only be sampled for VOCs. Are there other chemicals of concern (metals, pesticides, semi-volatiles, etc.)? Sites 1 and 2 are in the landfill, what other constituents have been identified in the leachate? Are biological and radioactive wastes possible? A health and safety plan should be prepared for the work to be conducted during the aquifer tests.

Attachments

Reference

Driscoll, F.G. 1986. Ground Water and Wells, 2nd edition. Johnson Division, St. Paul, Minnesota, 1089 pp.

Sampling and Analysis Plan Checklist

Introduction - Purpose and Scope

This sampling and analysis plan (SAP) checklist was developed to address the physical process of obtaining field information, measurements, and water quality samples. The SAP should be included in the Water Quality Sampling and Analysis Plan (WQSAP) for each facility and should be written as an enforceable document. Deviations from the procedures described in the current SAP for a facility are subject to enforcement by the Department.

This checklist is continually updated as I discover new items to include and better ways to say what should be said. For the sake of consistency, if you agree with an item, please try to use this exact language with only the modifications that are needed for your site. Of course, if you disagree with an item leave it out or change it as you see fit. When you do, please call me so that I can learn what is wrong and modify this basic checklist as needed. I keep this in Wordperfect 5.1 and will gladly supply you with a disk of the most current version anytime you need it. Call Margie Youngs (916) 255-2105, or CALNET 8-494-2105.

The Checklist

The SAP must be written to unambiguously describe exactly what steps will be taken to ensure that representative samples are collected. The SAP must contain sufficient detail for a sampler with limited experience to understand and follow and to ensure that sampling will be conducted in the same manner by different samplers. For example:

- The SAP must state that, before each sampling event (e.g. quarterly sampling) each member of the field team must sign a document stating that he/she has read and understands the current version of the SAP. A copy of this document must be submitted to the Department with the report of analytical results.

- The SAP must describe equipment and procedures for the measurement of the depth to water. The SAP must specifically state that water levels will be measured in all wells and piezometers at least quarterly for the calculation of ground water flow rate and direction, that all water levels will be measured in the shortest possible time and that water levels in all wells will be measured before any well is purged.

- The SAP must specify that water levels for the calculation of ground water flow rate and direction will be measured during times of expected seasonal maximum and minimum water levels. The SAP should specify when the seasonal maximum and minimum water levels are expected (by month) and should provide documentation (hydrographs) to support the conclusions.

- The SAP must state that the depth to water will be measured with reference to a marked point that has been surveyed by a licensed surveyor. The water level probe must be capable of obtaining reliable measurements to +/- 0.01 foot. The SAP must specify the method for decontamination of the water level probe between use at each well.

- The SAP must state the order in which wells will be visited for water level monitoring, sampling, and maintenance and must contain the rationale for the selected order in terms of minimizing the possibility of cross-contaminating the wells and/or samples.

- The SAP must describe calibration procedures, frequency, and recordkeeping for water level probes.

- The SAP must describe the procedures, frequency, and recordkeeping for measuring the depth of the well casing.

- The SAP must describe calibration procedures, frequency, and recordkeeping for the well depth sounding instrument.

- The SAP must describe or contain copies of example field data sheets.

- The SAP must state that well-head conditions (condition of well casing, well lock, markings, standing water at surface) and any suggested maintenance will be recorded in the field notes. The SAP must describe procedures for performing necessary well maintenance in a timely manner.

- The SAP must discuss the need to monitor for wellhead gases and immiscible layers. If necessary, the SAP must describe equipment and procedures for testing wellhead gases and for testing the water surface for immiscible layers.

- The SAP must describe the procedure for calculation of well casing volumes. Where references are made to total well depth, it must be clear that the total well depth is the well depth as measured from the permanent mark on the well casing. (Total well depth is also commonly recorded as depth below ground surface.)

- The SAP must specify the maximum purge rate for each well. Whenever possible, purge rates should not exceed recharge rates. (Note: For wells completed at the water table, maximum purge rates may be a function of the water level in the well. The objective is to avoid purging a well to dryness whenever possible.)

- The SAP must state that, unless wells are purged to dryness, a minimum of three casing volumes will be removed during well purging.

- Except for wells that are purged to dryness, the SAP must state that wells will be purged until field parameters stabilize. DTSC believes that stability of field parameters is the best indication that the water being sampled is representative of the ground water in the aquifer. All measurements of field parameters are to be recorded in the field log. The final, stable value for each field parameter must be recorded and graphed through time for each well.

- For wells purged to dryness, the SAP must describe procedures for removing as much water as possible from the well, monitoring recharge, collecting samples as soon as the well has recharged sufficiently, and documenting the sampling events. For wells that are bailed, the SAP must state that a well will only be considered to have been purged until "dry" if less than 10% of the original volume of water remains in the well after purging. (Note: The objective is to minimize the amount of water that remains in the well after the well has been purged "dry", because that water is expected to mix with the recharging water so that the sample will be a combination of "stagnant" and "fresh" groundwater. It is important to optimize the percentage of "fresh" water.) The SAP must specify the frequency for measuring recharge and the criteria for initiating sampling. Sampling must proceed as soon as possible after the recharge criteria have been satisfied.

Samples for volatile organics must be collected no more than two hours after purging.

- For wells not purged to dryness, sampling should be conducted as soon as possible after purging is complete. The SAP must specify, based on measured recharge rates, the approximate time period after purging that sampling will occur; or the SAP must describe the procedures for measuring and recording water levels after purging and before sampling and must specify the criteria for recharge.

- The SAP must describe the equipment and procedures for measuring field indicator parameters during purging. The SAP must specify the criteria for determining that field parameters have stabilized before sampling (e.g., pH +/- .1 pH unit, temperature +/- 1 degree Celsius, conductivity +/- 10%, turbidity +/- 10%) and must state the minimum purge volume between tests to determine if field parameters have stabilized (e.g., one half casing volume). The SAP must specifically state that turbidity will be measured with a turbidity meter. Visual estimates are not sufficient.

- The SAP must describe calibration procedures, frequency and recordkeeping for all meters used during sampling. The SAP must state that the expiration dates of standard solutions used for calibration will be recorded in the field log. Any deviations noted during the day (e.g. meter drift) must also be recorded. If meter drift requires an adjustment to any final values for field parameters, the results must be flagged in the data base.

- The SAP must describe the procedures for recording flow rates and volumes of water purged and for disposing of purged water. Field notes must include the appearance of the purged water including its color and odor.

- The SAP must describe the equipment and procedures for collecting samples. Sampling equipment must be constructed of inert materials. Dedicated equipment should be used whenever possible. If equipment must be used at more than one well the SAP must describe in detail the procedures to decontaminate the equipment and procedures for the collection of equipment blanks.

- The SAP must state that clean, powderless, surgical gloves (or another approved type of glove) shall be worn by sampling personnel and shall be changed often.

- The SAP must describe the sample containers (size and materials) for each type of analysis.

- The SAP must describe the labeling of the sample containers.

- The SAP must describe the preservation techniques necessary for each type of sample.

- The SAP must describe the procedures for determining the amount of preservative necessary to achieve the required chemical stability (e.g., amount of acid necessary to ensure pH<2 for metals analysis).

- The SAP must describe the procedures for checking and documenting the results of preservation (e.g., checking whether metals samples have been acidified to a pH of less than 2 and that temperatures are maintained at 4 degrees Celsius during shipping and storage). The SAP must state that problems will be reported to the Department. (We have had some trouble with laboratories documenting problems but not reporting them.)

- The SAP must describe the equipment and procedures for taking each type of sample. Sampling procedures must be designed to minimize disturbance of the sample that could result in changes in water chemistry.

- The SAP must present the rationale for deciding if samples for metals will be filtered or not. The decision must include a consideration of the purpose of sampling (i.e., detection monitoring, evaluation of a release or risk assessment).

- If filtering is required, the SAP must describe the equipment (including filter size) and procedures for filtering samples. The use of in-line filters is preferred. If in-line filtration is not possible, filtering should be done as quickly as possible (immediately) using positive pressure filtering equipment. The SAP must specify the discard volume (the volume of groundwater that should be used to flush the filter before sampling) for the type of

filter to be used. If manufacturer's guidelines are not available, the SAP should specify that two times the capacity of the filtering device will be passed through the filter and discarded before samples are collected.

- The SAP must state that bottles that have been prepared with preservatives will not be overfilled.

- The SAP must describe the equipment and procedures for storing samples for transport.

- The SAP must describe forms and procedures for sample transport and chain of custody control. The SAP must specify the procedures to be followed to assure that strict custody of samples is maintained during sample collection, storage and transport (i.e., samples are not left unattended or samples are secured in storage areas with limited access). Sample copies of chain-of-custody and sample analysis request forms should be included.

- The SAP must describe equipment, procedures, and recordkeeping for decontamination of all sampling equipment and protective gear. Equipment shall not be used if visual signs, such as discoloration indicate that decontamination was insufficient.

- The SAP must describe the analytical method to be performed for each sample.

- The SAP must state that, following each sampling event, each member of the field team must sign a document that details any deviations from the SAP that were necessitated by field conditions (e.g, equipment failure, wells that could not be sampled, etc.) and states that, with the exceptions noted above, all field measurements and samples were collected in accordance with the procedures described in the SAP. A copy of this document must be submitted to the Department with the report of analytical results.

Additional comments - The following paragraphs address problems I have encountered in the review of many WQSAPs. Please read them and consider whether these items should be included in your review.

For detection monitoring, the monitoring plan must specify the maximum amount of time that will be needed after each monitoring episode to perform statistical analysis and make a determination of whether of not there is statistically significant evidence of a release from the regulated units.

The monitoring plan should describe well redevelopment and routine well maintenance. It would also be wise to include a section on well decommissioning and replacement so that those procedures can be implemented without a permit modification.

To evaluate the accuracy of the analytical data, the monitoring program should contain provisions for initially, and periodically characterizing the major cations and anions and testing the results by determining the charge balances. This could probably be most easily performed during the initial sampling to establish background values for CoCs and during the periodic testing of CoCs in downgradient wells.

The monitoring plan must describe in detail the content and submittal dates for periodic reports (including the submittal of quarterly determinations of groundwater flow rate and direction). The plan should specify the name and address of the person at DTSC to whom reports and notifications of significant finding must be addressed. Separate guidance is available for writing reporting requirements for water quality monitoring from Chris Guerre (310) 590-4940, or CALNET 8-635-4940. Examples of information that must be provided to DTSC follow:

- Raw monitoring data (field logs and activity sheets that support interpretations in reports, depth to water data, well-head data, immiscible layer data, field monitoring parameter results, purge volume data, and on-scene observations).

- Sampling and transport data (field data sheets and chain-of-custody forms that support interpretations in reports).

- Laboratory summary sheets (and, <u>if necessary,</u> chromatograms, IR spectra, other analytical instrumentation outputs, and QA/QC data that support interpretations in reports).

- Data tabulations, graphs and statistical analyses.

- Tabulated and graphic water level, potentiometric surface, flow direction, and flow rate data.

The SAP should contain, or contain reference to, the Quality Assurance Project Plan (QAPP). The QAPP must describe the data quality objectives (in terms of accuracy and precision), acceptance criteria for analytical data and the format for reporting the results of the Quality Assurance /Quality Control (QA/QC) program. (Note: Proposed detection limits must be low enough to fulfill the data needs of the monitoring program.)

For a detection monitoring program, the monitoring plan must specifically state that DTSC will be notified by certified mail within 7 days of determining statistically significant evidence of a release for any monitoring parameter or constituent of concern at any monitoring point (Section 66264.98(j)). The monitoring program must describe the exact procedures for performing verification sampling, specify the maximum amount of time before the results of the verification sampling are reported to DTSC and state that if the significant evidence of a release is confirmed the facility will comply with the requirements of Section 66264.98(k) Title 22 California Code of Regulations (CCR) for responding to significant evidence of a release (e.g., immediately collect samples for Appendix IX constituents and for all constituents of concern, etc.).

The monitoring plan should clearly state that actual laboratory values between the DL and the practical quantitation limit (PQL) will be reported (and maintained in the data base) with the numerical value determined by the laboratory and a flag to indicate that these values are below the PQL. In such cases the value of the PQL must also be reported and maintained in the data base. The practice of artificially censoring data that is reported below the calculated PQL can lead to the use of less powerful statistical methods. It is important to preserve the actual uncensored values for all concentrations above the DL for possible use in future statistical analysis.

The monitoring plan must describe in detail the format for graphical presentation of analytical **and water level** data. Following are some general guidelines for graphs that DTSC has found to be helpful:

Every monitoring parameter or constituent of concern should be shown on a separate graph with the data from as many wells as can be legibly displayed. As much historic data as possible should be included on each graph so that long-term and/or recurring trends can be distinguished.

When a concentration is reported as below the detection limit (DL), it must be displayed on the graph in such a way that the reviewer can clearly tell that the analyte was not detected. The value of the DL must be evident. If the DL has remained constant, it is sufficient to simply state what that limit is and to plot the data at a constant value (i.e., the value of the DL). If the DL has varied through time the facility must devise a way to depict that information on the graph.

When a concentration is reported below the reporting limit (or practical quantitation limit, PQL), but above the DL (such data is frequently referred to as "censored" or "trace" data) it must be displayed on the graph at the estimated concentration reported by the laboratory, but in such a way that the reviewer can clearly tell that the concentration was estimated to be below the reporting limit (or PQL). The values of the reporting limit (or PQL) and the DL must be evident. Methods in use by other facilities include: substituting the letters TR (trace) for the well symbol on the graph, altering the well symbol in some standard way (e.g circling the well symbol, using alternate colors), and plotting detection limits on overlays.

The spread of the y axis should be selected to best display the variability of the data and must be no more than three times the range of the data.

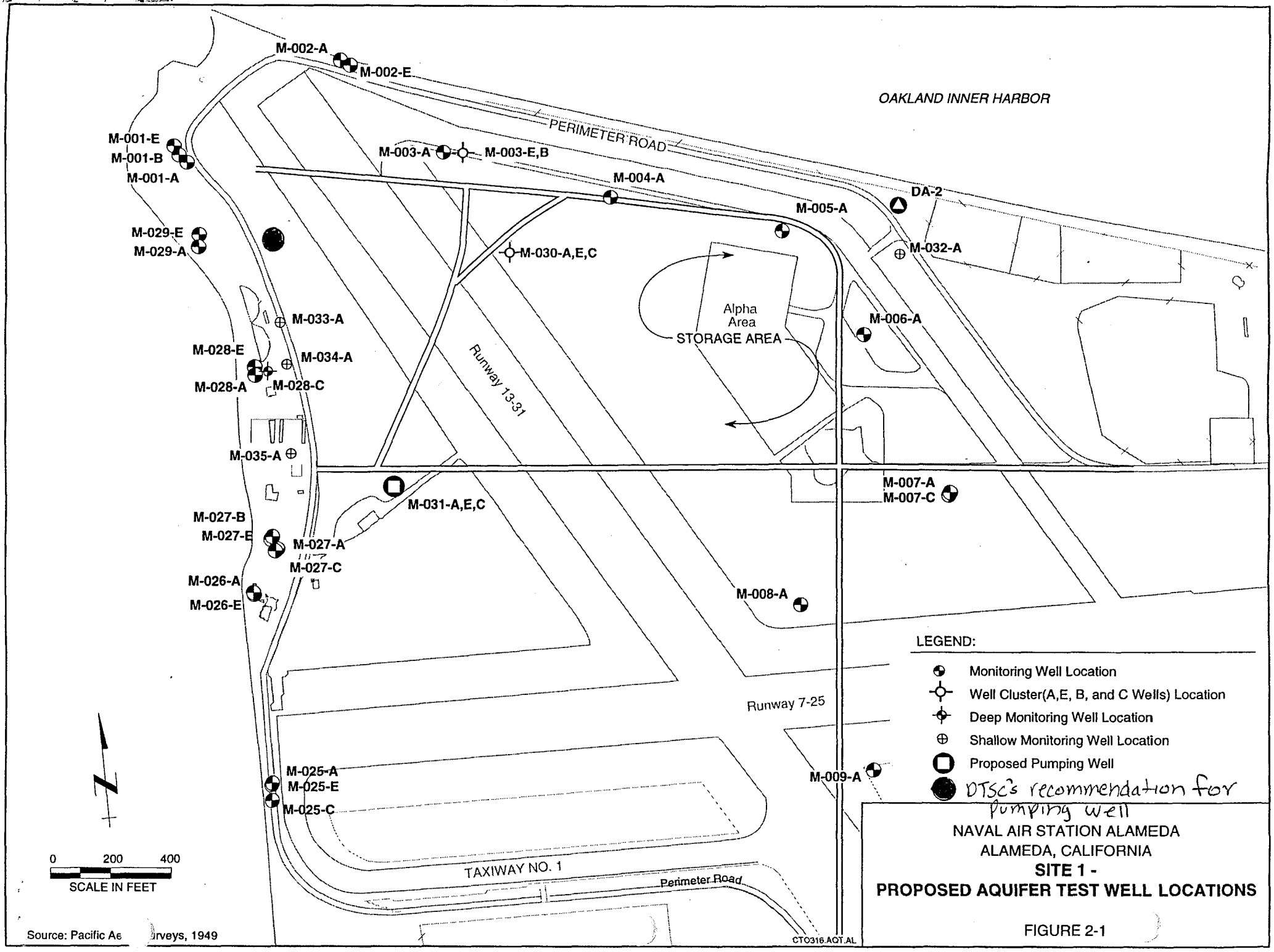
When plotting concentration data for multiple wells, it is expected that much of the data will overplot for values near the mean of the data set. This still provides useful information and should not be a problem as long as the graphs are submitted at an appropriate scale and well symbols are clearly legible in areas where the concentration deviates from normal.

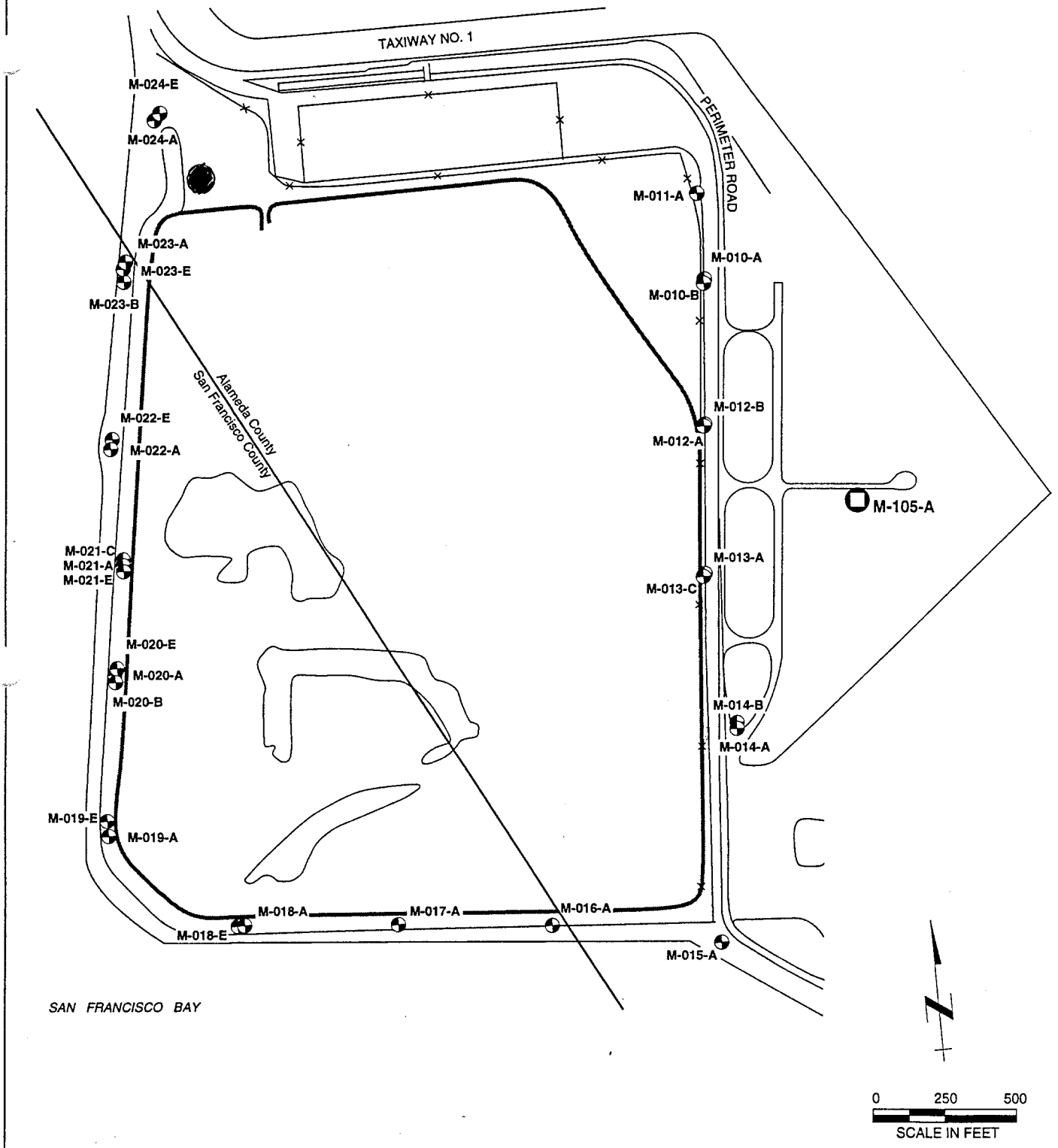
If more than one graph is needed for each parameter then:

a) to facilitate comparison between upgradient and downgradient data, each graph shall show data from the background monitoring points (Note: This can also be accomplished by printing graphs on transparencies and overlaying the graphs.);

b) downgradient wells shall be grouped by location or by other significant characteristics; and

c) all graphs for a parameter shall be at the same scale.


M-002-A
M-002-E
OAKLAND INNER HARBOR
PERIMETER ROAD
M-001-E
M-001-B
M-001-A
M-003-A
M-003-E,B
M-004-A
DA-2
M-005-A
M-029-E
M-029-A
M-030-A,E,C
M-032-A
Alpha
Area
STORAGE AREA
M-033-A
M-006-A
M-028-E
M-034-A
M-028-A
M-028-C
Runway 13-31
M-035-A
M-007-A
M-007-C
M-031-A,E,C
M-027-B
M-027-E
M-027-A
M-027-C
M-026-A
M-026-E
M-008-A
Runway 7-25
M-025-A
M-025-E
M-025-C
M-009-A
TAXIWAY NO. 1
Perimeter Road
0
200
400
SCALE IN FEET
LEGEND:
Monitoring Well Location
Well Cluster(A,E, B, and C Wells) Location
Deep Monitoring Well Location
Shallow Monitoring Well Location
Proposed Pumping Well
DTSC's recommendation for pumping well
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 1 -
PROPOSED AQUIFER TEST WELL LOCATIONS
FIGURE 2-1
Source: Pacific Ae
rveys, 1949
CTO316.AQT.AL



LEGEND

⊕ Monitoring Well Location

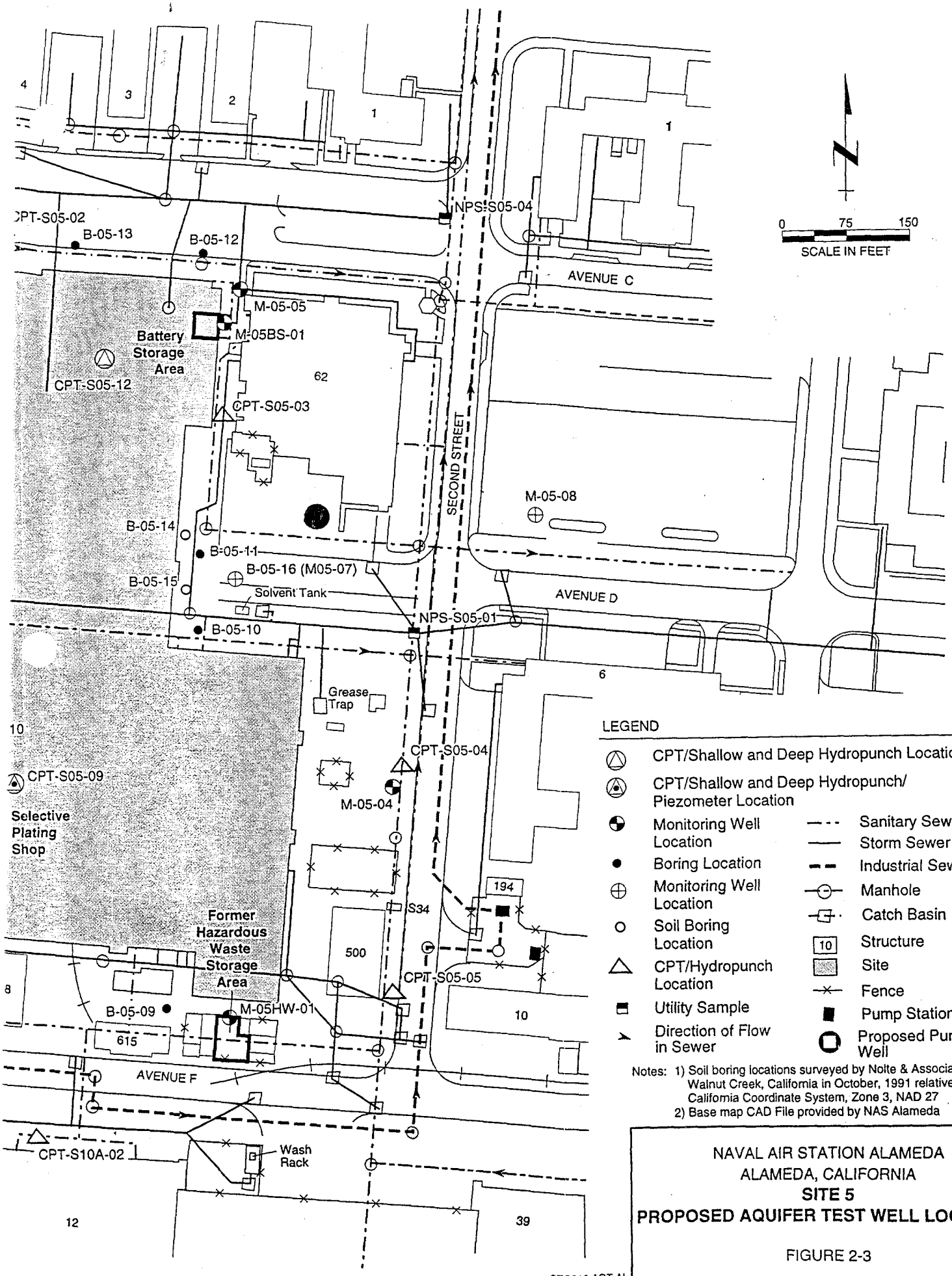
Proposed Pumping Well

DTSC's recommended location for pumping well

CTO316.AQT.AL

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 2
PROPOSED AQUIFER TEST WELL LOCATIONS

FIGURE 2-2



Notes: 1) Soil boring locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27
2) Base map CAD File provided by NAS Alameda

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE 5
PROPOSED AQUIFER TEST WELL LOCATIONS

FIGURE 2-3

CTO316.AQT.AL

● - DTSC's recommendation for location of pumping well