STATE OF CALIFORNIA — ENVIRONMENTAL PROTECTION AGENCY

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

REGION 2
700 'Z AVE., SUITE 200
BER EY, CA 94710-2737
(510) 540-3724

March 1, 1996

N00236.001272
ALAMEDA POINT
SSIC NO. 5090.3

LCDR Michael Petouhoff
BRAC Environmental Coordinator
Naval Air Station, Alameda
Building 1, Code 52
Alameda, California 94501-5000

Dear LCDR Petouhoff:

INORGANIC AMBIENT FILL CONDITIONS AT NAVAL AIR STATION, ALAMEDA

Thank you for your letter and data package dated 22 February 1996 on establishing the ambient fill conditions for inorganics at the Naval Air Station Alameda. The California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) and San Francisco Regional Water Quality Control Board (RWQCB) have reviewed your letter and data package. The U.S. Environmental Protection Agency has also participated in a joint review of these documents and has collaborated in the development of the enclosed comments. Therefore, the enclosed comments represents a consensus position by the State and Federal regulatory agencies on these documents.

The State and Federal Environmental Protection Agencies have previously stated what we consider an acceptable approach for determining 'background' of inorganic constituents at NAS Alameda in a letter from the DTSC on September 29, 1995. The Agencies meet with the Navy on October 3, 1995 and again communicated what we consider as necessary elements in the methodology for determine 'background' concentrations of inorganic constituents. Most recently, the Agencies and the Navy meet on January 30, 1996. On that date the Navy agreed to incorporate the Agencies' request in the methodology proposed for determining inorganic 'background'. The enclosed comments address the data package that was to reflect the Agencies' necessary elements in that methodology. Based on our review, we have concluded that this did not occur. We fully expect the Navy to incorporate the enclosed comments in this methodology and that these comments are reflected in the future data package submittal by the Navy.

If you have any questions regarding this letter and the enclosed comments please call me at (510) 540-3809.

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Sincerely,

Thomas P. Lanphar
Project Manager
Base Closure Branch

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STATE OF CALIFORNIA—CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY PETE WILSON, Governor

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MEMORANDUM

TO: Tom Lanphar, Project Manager
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FROM: James M. Polisini, Ph.D.
Staff Toxicologist
Office of Scientific Affairs (OSA)
Human and Ecological Risk Section (HERS)

DATE: March 1, 1996

SUBJECT: PROPOSED 'BACKGROUND' DATA SET FOR INORGANIC CONSTITUENTS AT NAS ALAMEDA [PCA 14740, SITE 200004-45 25]

Background

We have reviewed a data submittal from EFA West attached to a memorandum from M.L. Petouhoff, BRAC Environmental Coordinator for NAS Alameda, to Tom Lanphar, of the Department of Toxic Substances Control, dated 22 February 1996. This data package contains the Navy response to agency requests for additional analysis of proposed inorganic 'background' concentrations made at the January 30, 1996 meeting.

Naval Air Station (NAS) Alameda occupies the western third of Alameda Island and has been a military installation since 1930. NAS Alameda occupies 2842 acres of land, water and airspace easement, including 1734 acres of land. The majority of the land at NAS Alameda was created by filling existing tidelands with dredged material from San Francisco Bay and the Oakland Inner Harbor.

General Comments

A comparison of the inorganic 'background' methodology proposed by OSA to the Navy inorganic 'background' proposal cannot be performed using the material supplied. Additional analyses and methods of presentation are required in order to evaluate the Navy proposal for inorganic 'background'.

Specific Comments

Several data sets were combined in an attempt to increase the sample size of the inorganic 'background' data set: 1) the College of Alameda data set which contains 15 samples; 2) a set of 19 soil samples selected from the Installation Restoration Program (IRP) Site 1 soil data; and, 3) 39 soil samples from the Environmental Baseline Survey (EBS). When the College of Alameda and IRP Site 1 data, presented in Table 1, are combined with the EBS data, presented in Table 2, every metric (e.g. mean, 95th Upper Confidence Limit (UCL)) increases for every analyte except thallium and titanium (Table 3). This is an indication that there may be significant statistical differences among these soil data sets. Appropriate statistical tests should be applied to these data sets to determine whether they are from the same population and therefore whether it is appropriate to combine them.

A data summary for polycyclic aromatic hydrocarbons is included in the data package (Table 4), but not discussed in the cover memorandum. There are several analytes contained on this table with low frequencies of detection, high detection limits and high upper bound estimates. For example, dibenzo(a,h)anthracene was detected in one of 70 samples with a concentration of 410 μg/kg, but the mean for all 70 is shown as 4372 μg/kg with a 95th UCL on the mean of 7110 μg/kg. Standard risk assessment guidance permits the use of the lower of 1) the maximum value or 2) the 95th UCL on the mean. when the 95th UCL exceeds the maximum value detected.

The cover memorandum refers to the 'power' of the inorganic background data set in several places. Power is an estimate of the probability that the null hypothesis will be correctly rejected and is associated with a statistical test not a data set. Please indicate which statistical test was the basis for the power estimates.

The agencies requested, at the January 30, 1996 meeting, that the Navy prepare cumulative frequency plots for five analytes to compare the method for determining inorganic 'background' proposed by the agencies in a previous memorandum (Attachment 1) with the inorganic 'background' developed using the Navy proposed 'background' data set. The cumulative frequency plots were not prepared correctly. The cumulative frequency plots (Figures 2a through 2e) do not use logarithmic scales and in some cases (Figure 2c and 2d) include outliers which distort the true shape of the distribution making them useless. Also, summary statistics were not submitted to support Figures 2a through 2e. OSA prepared several cumulative probability plots of the type suggested by the agencies using the data on metals in soil contained in the geographic information system (GIS) data files previously supplied by the Navy. In an attempt to duplicate the data set contained in the proposal being reviewed, samples were excluded based on criteria provided via facsimile copy on February 29, 1996 from Theresa Lopez of PRC-Denver. The cumulative probability plot for arsenic (Attachment 2) indicates that the upper tail of the distribution of 'ambient' concentrations lies roughly in the range of 10 mg/kg plus or minus 2 mg/kg while the 'ambient' for cadmium (Attachment 3) lies in the range of 0.5 mg/kg to less than 1.0 mg/kg. The PRC Environmental Management office in San Francisco, California, has submitted similar cumulative probability plots in support of 'ambient' determination at Mare Island Naval Shipyard (Mare Island Naval Shipyard, Vallejo, California, Technical Memorandum Estimation of Ambient Metal Concentrations in Soils, December 14, 1995). A copy of one such plot is attached (Attachment 4).

Conclusions

Additional analysis and supporting documentation are needed to evaluate the Navy inorganic 'ambient' proposal. Regarding the proposed expansion of an inorganic 'background' data set, appropriate statistical tests should be applied to determine whether the College of Alameda, the Installation Restoration Program and the Environmental Baseline Survey data sets should be combined. Appropriate cumulative probability plots should be prepared for the five analytes discussed at the January 30, 1996 'ambient' meeting to facilitate comparison of the OSA-recommended method for inorganic 'background' and the Navy proposal.

More precise estimates of inorganic 'ambient' were not possible from the cumulative probability plots we prepared because of the short time frame required for this response. Plotting these cumulative probability plots with finer detail on the axes should be a straight forward exercise.

Reviewed by : John P. Christopher, Ph.D., DABT Deborah Oudiz for J. Christopher
Staff Toxicologist
Human and Ecological Risk Section

cc: Michael J. Wade, Ph.D., DABT, Senior Toxicologist, OMF Liaison, HERS
Deborah J. Oudiz, Ph.D., Senior Toxicologist, Northern California Liaison, HERS

Ms. Sophia Serda, Ph.D.
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Attachment 1 - Inorganic 'Background' Methodology Transmitted in September 18, 1995 OSA Memorandum

Determination of Inorganic 'Background'

We recommend that metals be eliminated as COPC as early as possible in the risk assessment. This is most easily accomplished by comparing the highest concentration detected to a value which represents the upper range of the ambient concentrations for that metal. For this purpose we recommend here a procedure which we have previously recommended for other sites in California. The crux of the method is the use of plots of the log of concentration vs. cumulative probability.

a. **Expand the data set.** The largest data set possible is desirable for describing ambient conditions. If the number of 'background' samples planned is not sufficiently large, the population size for 'background' analysis can be expanded by a technique used successfully at several other sites. Samples of soil collected because of suspected contamination with petroleum products often are found negative for these mixtures upon assay. If these same samples were assayed for metals, the basewide data set can be augmented. This method worked well for Marine Corps Air Ground Combat Center Twentynine Palms. At Naval Station Long Beach, data sets from several investigations were combined to good effect.

b. **Display summary statistics for the expanded data set.** Construct a table showing the following for each metal: frequency of detection, range of detected values, range of sample quantitation limits, arithmetic means and standard deviations, and coefficients of variation (CV). If ranges of values for a metal exceed two orders of magnitude or if the coefficient of variation exceeds 1.00, then data from contaminated samples may be present..

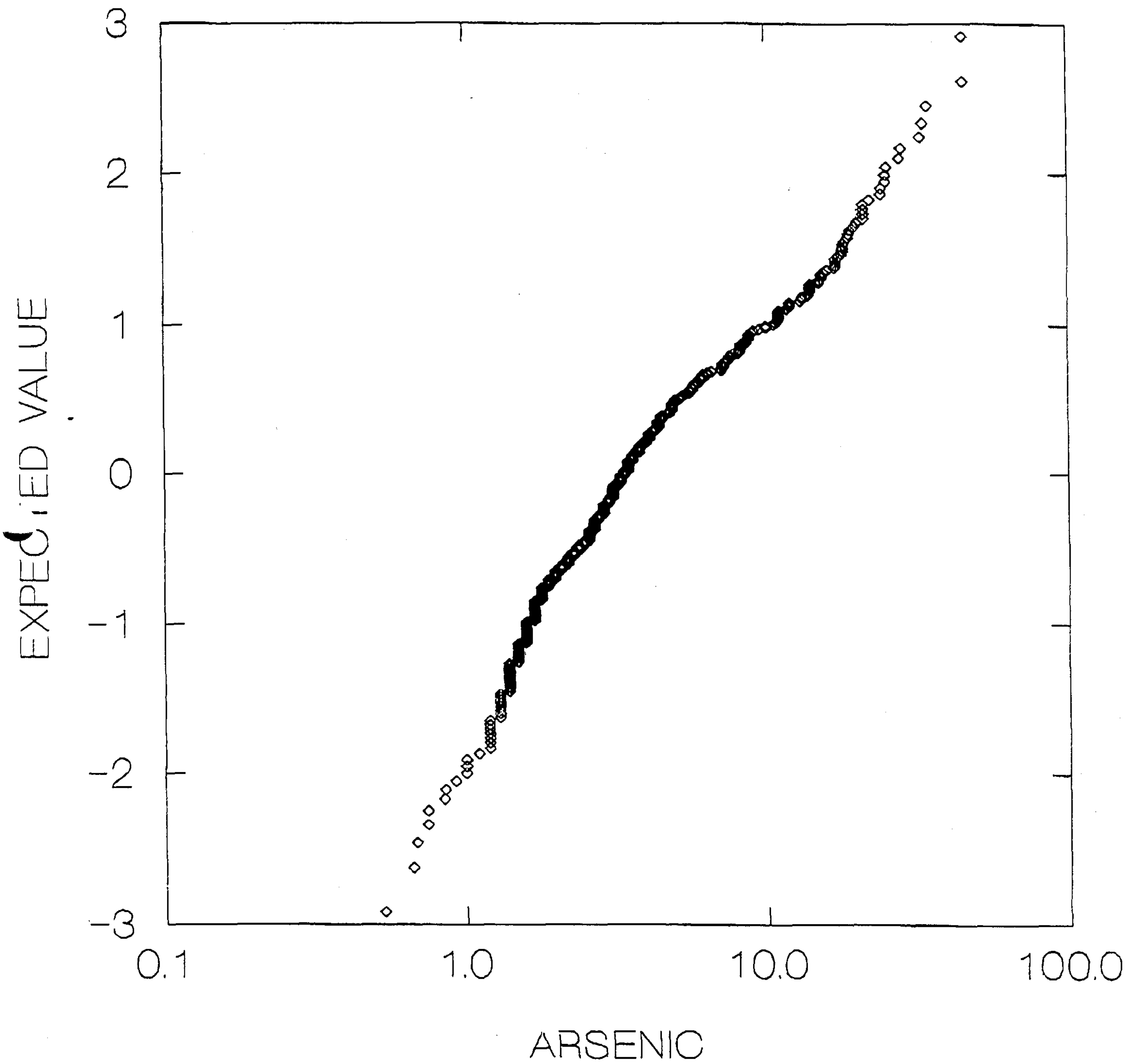
c. **Plot logarithm of concentration vs. cumulative probability.** Sort concentration data for a metal from the lowest to the highest value, using one-half the sample quantitation limit for non-detects. Assume that ambient concentrations of metals are lognormally distributed. Our experience at other sites in California has shown lognormality to be a robust and useful assumption for the distributions of ambient concentrations of metals, even at frequencies of detection much less than 100%. Construct a plot of cumulative probability vs. log of concentration. Equal distances on the probability axis represent equal numbers of standard deviations. If the sample population numbers 100, then the cumulative probability is 0.05 when the lowest five values have been plotted.

d. **Define ambient conditions as the population with the lowest concentrations.** If data are drawn from just one population, then the log-probability plot will be a straight line. Inflection points suggest multiple populations, possibly as a result of differing soil types or anthropogenic influences (contamination). For the purpose of identifying COPC for risk assessment, we recommend defining ambient conditions as the range of concentrations associated with the population nearest the origin in the plot. This definition may be performed by inspection or via commercially available computer software. The population with the lowest range is selected to minimize the chance of erroneously eliminating a metal whose concentrations are actually due to contamination. The population with the highest range of concentrations might represent contamination, especially if the summary statistics show that the range of detected values exceeds two orders of magnitude and/or if the CV exceeds 1.00. Professional judgment is sometimes required to conclude that some portion of the data intended to represent ambient conditions actually represents contamination.

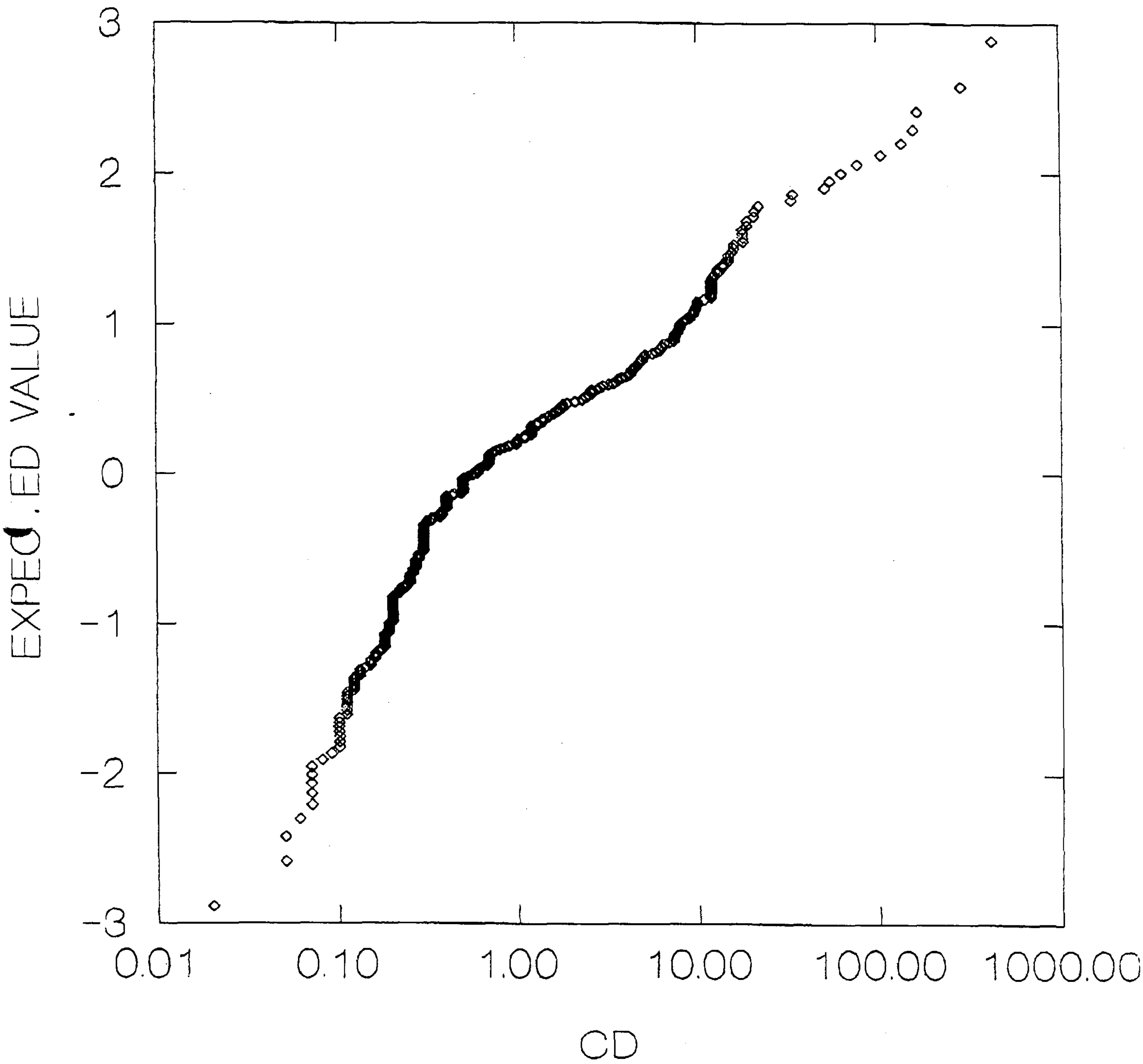
e. **Calculate a value to represent the upper range of ambient conditions.** Using only the data from the population with the lowest concentrations (with one-half sample quantitation limits substituting for non-detects), calculate the 80% lower confidence limit on the 95th quantile. A lower confidence limit on a quantile is used in preference to an upper confidence limit, because it is self-correcting with respect to sample size. By this is meant that small sample sizes will yield restrictive comparators (lower values) and metals will tend to retained as COPC, while larger sample populations will yield less restrictive comparators and COPC may be eliminated more easily. Statistical tables for calculating lower confidence limits on quantiles may be obtained from OSA. If the 'background' population size exceeds 50 use the 95th quantile itself, rather than a lower confidence limit on the 95th quantile.

f. **Include or exclude metals as COPC.** If the highest concentration of a metal detected at a site is less than the comparator selected to represent the upper range of ambient conditions, then eliminate the metal as a COPC. If concentrations higher than the comparator are found, then include the metal in the risk assessment as a COPC. For those metals retained, it is often useful to examine the spatial distribution of the elevated concentrations to determine if a "hot spot" is present.

Attachment 2 - Cumulative Probability Plot of IRP Soil Arsenic (mg/kg) Concentrations at NAS Alameda

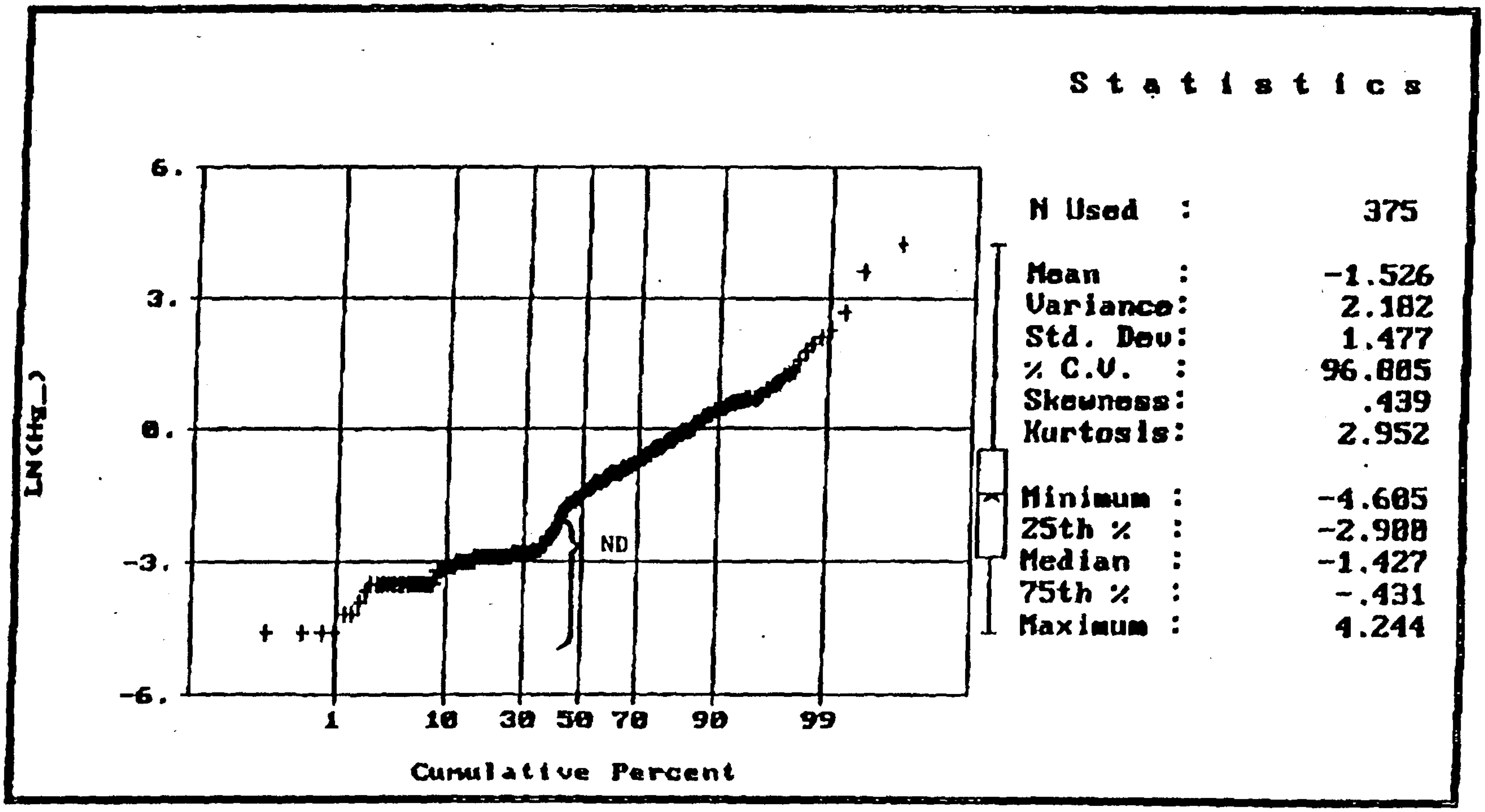


Attachment 3 - Cumulative Probability Plot of IRP Soil Cadmium (mg/kg) Concentrations at NAS Alameda



Attachment 4 - Cumulative Probability Plot of Natural Log of Mercury (mg/kg) in Fill at Mare Island Naval Shipyard

FIGURE 25: PROBABILITY PLOT OF MERCURY CONCENTRATIONS IN ARTIFICIAL FILL
MARE ISLAND NAVAL SHIPYARD



Note: The data set consists of the off-site laboratory data only. The data set distribution is nonparametric.