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From: Commanding Officer, Engineering Field Activity, West, Naval Facilities Engineering Command

Subj: NAVAL AIR STATION ALAMEDA BACKGROUND DATA SETS AND RANGES

Encl: (1) Naval Air Station Alameda Background Data Sets And Ranges

1. The Navy has completed its evaluation of the NAS Alameda Remedial Investigation (RI) database and presents for your review in enclosure (1) selected samples and background ranges that provide background information for the installation.

2. The samples selected represent three distinct fill areas previously identified through statistical analysis from the RI data. A preliminary list of samples and accompanying map were previously provided to you. A revised list (Table 1) and map (Plate 1) are provided in enclosure (1). Included in the enclosure is a description of the selection criteria and additional samples which were identified. A data summary table for inorganic and polycyclic aromatic hydrocarbon (PAH) analytes and cumulative plots for all inorganic analytes are also provided.

3. This report is organized into the following sections: Purpose of Background, Background Project History, and Background Data Set Selection. Attachment A includes graphical presentations of the data for each fill area.

4. A meeting is scheduled on 26 February 1997 from 9:00-3:00 at NAS Alameda to discuss enclosure (1) and the Regional Background Ranges to be provided by DTSC. The goal of the meeting is to agree on background ranges which will be used at NAS Alameda.

5. Please call me at 415-244-2516 or FAX at 415-244-2654 for questions or comments.

CAMILLE GARIBALDI
By direction of
the Commanding Officer

Distribution:
NAS Alameda (Attn: Steve Edde)
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California Regional Water Quality Control Board (Attn: Lyn Suer)
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REVISED BACKGROUND DATA SETS

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NAVAL AIR STATION ALAMEDA
BACKGROUND DATA SETS AND RANGES

Purpose of Background

According to the U.S. Environmental Protection Agency (EPA) (1989), background chemicals are categorized as either:

> Naturally occurring or nonanthropogenic: minerals or other substances present in the environment in forms that have not been influenced by human activities; and
>
> Anthropogenic: natural and manmade substances present in the environment as a result of human activities not specifically related to site activities.

Nonanthropogenic chemicals are naturally occurring organic or inorganic chemicals that are in soil or water as part of the geological or hydrogeological conditions of the area and are in an unaltered form not related to human activity (for example, metals from rock formations or Poly Aromatic Hydrocarbons (PAHs) from forest fires). Anthropogenic background chemicals are related to human activity in the region but are unrelated to site operations; PAHs and metals may be considered anthropogenic background because they are also from sources such as car exhaust.

Background information is typically collected and analyzed iteratively as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. In a site investigation, determining if a release has occurred requires that information regarding background conditions be available. Data must be obtained to determine "whether site concentrations are sufficiently different from background" (EPA 1990). The determination of background conditions is an integral part of the baseline human health risk assessment (HHRA) and ecological risk assessment, which are conducted as part of the RI to ensure protection of human health and the environment — one of the two threshold criteria of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Risk Assessment Guidance for Superfund, Human Health Evaluation Manual (Volume I) (EPA 1989) presents a discussion of hypothesis testing and levels of precision of statistical tests that should be met when differentiating background from site-related chemicals.

California Department of Toxic Substances Control (DTSC) guidance (1994) also presents a similar rationale for collecting background samples (emphasis not added):

> Background samples are collected to distinguish between site-related contamination and naturally occurring or anthropogenic contaminant levels. In general, the use of regional background levels for comparison to site contamination is not acceptable. <u>Background samples should be collected for each medium being investigated, be it water, soil, soil gas, or air.</u> Background samples should be collected at or near the site but not in areas likely to be influenced by the contamination and/or facility operations (past or present).

It is important to distinguish between background chemicals and site-related chemicals because: 1) CERCLA limits responses to a release or threat of a release above background, 2) background is necessary to properly identify site activity releases, 3) background is also used to establish remediation levels.

Inorganic Chemicals

The purpose of identifying background levels of inorganic chemicals is to distinguish between those levels that represent natural soil constituents and those related to site activities. This is a commonly accepted practice, as described in many EPA guidance documents (EPA 1989, EPA 1990). Inorganic chemicals present as part of the natural soil composition may be considered nonanthropogenic. Concentrations of inorganic chemicals may also be affected by non-site related anthropogenic activities. It was expected that concentrations of inorganic chemicals from background samples at NAS Alameda would reflect naturally occurring, ambient levels consistent with concentrations found in bay sediment, which is the source of fill soil at NAS Alameda.

Organic Chemicals (PAHs)

The Navy considers the random detections of PAHs in fill (also called polynuclear aromatic hydrocarbons [PNAs]) at many areas of NAS Alameda to be anthropogenic background for two reasons. However, the Navy excludes areas where PAHs are suspected to be the result of site activities.

As described in the following section, NAS Alameda is constructed of fill dredged from the San Francisco Bay. The systematic detections of PAHs at the fill soil-native material interface at most Installation Restoration Program (IRP) sites is evidence that the bay floor was contaminated with PAHs prior to base construction (PRC 1992). The Regional Water Quality Control Board (RWQCB) lists a total ambient level of PAHs in San Francisco Bay sediment of 5.13 milligrams per kilogram (mg/kg) (RWQCB 1996); PAHs detected at or below this concentration are likely to represent the ambient bay levels because the base is constructed of bay sediment.

Due to its urban location, soil is expected to contain an ambient level of PAHs. For example, the Agency for Toxic Substances and Disease Control (1995) published background soil concentrations of PAHs in urban areas. The ranges are presented on a chemical-specific basis (rather than total) and are as high as 62 mg/kg for heavy molecular weight PAHs and 166 mg/kg for light molecular weight PAHs.

DTSC has also recognized background levels of PAHs in the San Francisco Bay area of at least 8.5 mg/kg. As described in correspondence between DTSC and Ecology and Environment, Inc. (1993): At DTSC's request, and to put the remedial goal in perspective, background levels of PNAs were evaluated. PNAs are present in urban environments due to vehicle exhaust, asphalt paving, tobacco and barbecue smoke, and other sources. PNAs were detected in 17 out of 19 of the background samples taken as part of the RI; the level of total PNAs measured in the area near the site ranged from 0.02 to 1.03 mg/kg. The level of PNAs has also been recently measured in 98 background surface soil samples throughout northern California for 17 Preliminary Endangerment Assessments recently submitted to the Cal-EPA and presented in the Draft PHEE [Public Health and Environmental Evaluation]. Analytical data compiled and analyzed from these reports indicate a mean background concentration of total PNAs of 8.5 mg/kg for the 17 sites.

DTSC also accepted background levels of PAHs at the PG&E Martin Service Center (MSC) (1992):

> Background concentrations of total PNAs in soil from parks and along roadsides in the MSC site vicinity ranged from less than the analytical detection limits to 0.11 milligrams per kilogram (mg/kg). This falls within the range reported in the literature for other urban areas of 0.04 to 13 mg/kg (Edwards, 1983).

With these definitions and expected uses of background data, the RI database of NAS Alameda was reviewed to select appropriate background samples since background samples had not been previously collected for the installation. However, samples had been collected in and around the Installation Restoration Program (IRP) sites as part of the RI investigation. Some were collected at sites that were suspected of containing petroleum contamination as described below. Samples from these areas were considered potential background data, in accordance with DTSC recommendations for identifying background (DTSC 1995):

> 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 analyzed for metals, the basewide data set can be augmented.

Accordingly, samples in the IRP data set were evaluated for use as background samples, and both metals and PAHs were considered as having a background level.

Background Project History

Selection of background data at NAS Alameda is complicated by the fact that the installation is constructed of fill soil. Although the exact sources of fill are unknown, it was dredged from San Francisco Bay over a period of approximately 75 years (1900 to 1975). The lithology of the fill soil is not classifiable, as it is heterogeneous throughout the base. At the southeastern corner of the base, approximately 3 feet of soil overlay the native Merritt Sand. Over the rest of the installation, fill soil represents the top 10 to 14 feet of soil; soil below these depths represents the bay floor material as it existed prior to placement of fill. It is difficult to establish background for fill soil because the exact sources are unknown.

In a previous letter to the regulatory agencies (dated October 11, 1996), the identification of the different fill areas across the base has been described. Briefly, the base was examined by aggregating data collected within areas delineated by time of fill deposition. Five fill areas were first identified: the far west portion of the base ("Site 1/Site 2" area) and a small strip of land bordering the Oakland Inner Harbor; the runway area; the area east of the runway to the base boundary; and two areas within the southeast corner of the base. Iron and manganese data were compared statistically to determine whether these areas contained geologically similar soils and could be represented by one background data set. The reasons for using iron and manganese for this evaluation and the methodology employed (described in the letter of October 11, 1996) are:

- Both iron and manganese are common soil components
- Based on site history, neither chemical is related to any site activity at NAS Alameda
- Both chemicals are present at quantities well above detection limits at all sites (that is, they have 100 percent frequencies of detection), eliminating the potential problem of differing detection limits between sampling efforts at NAS Alameda. (Multiple detection limits can be a confounding factor in the interpretation of results.)
- U.S. Environmental Protection Agency (EPA)-established analytical methods for these two analytes have not changed between sampling efforts at NAS Alameda.

- The distributions of iron and manganese oxides have been shown to affect the concentration of many other chemicals in soil (Evans 1989; Jenne 1968)

Using nonparametric statistical tests, results of the evaluation indicated that some areas could be combined, but that more than one data set would be needed to represent background for the entire installation. Specifically, it appeared that Site 1 and Site 2 areas were similar; the runway and central portion of the installation were similar; and the two areas at the southeast corner of the base were similar. (These areas are denoted on Figure 1 by the colors blue, pink, and yellow.) Therefore, three background data sets are indicated to accurately conduct statistical evaluations for the purpose of selecting chemicals of concern (COCs) and establishing remediation levels, if necessary.

Environmental Baseline Survey (EBS) data were not included in the evaluation of the fill area soil types. Although this data had at one point been considered potential background data, it was eventually excluded from the evaluation because concerns about the whether the data from the RI and EBS sampling efforts could be combined. The EBS data had been collected for a different type of assessment and data quality objectives for EBS data had not included use as potential background data. Therefore, the EBS data was not used in the background data sets.

Background Data Selection

Some samples collected as part of the IRP investigation could be used as background samples for the three areas. Use of this data would avoid costly delays associated with additional sampling and so was considered the most efficient method for developing a background data set. The RI database was reviewed on a sample-by-sample basis to select samples that could represent background. First, for each area, all samples collected from IRP sites that could contain metal contamination based on site history (Sites 4 and 5) were excluded as background samples. Also excluded from consideration were areas of suspected PAH contamination, specifically, the landfill and burn pit areas of Site 1.

Next, samples from borings that contained non-PAH organic chemicals, except for insignificant levels of laboratory contaminants and organic carbon measurements, were excluded from consideration. Common laboratory contaminants, according to EPA, are acetone, 2-butanone (methyl ethyl ketone), methylene chloride, toluene, and phthalate ethers (EPA 1989). This consideration was necessary because older data collected by Canonie had not been validated as thoroughly as data collected after 1990.

This process resulted in many samples being rejected as potential background data. After applying these steps, samples located within the IRP sites were excluded as well. The remaining samples were considered potential background data.

In the three fill areas identified (denoted by the colors blue, pink, and yellow on the attached plate), a total of 247 samples have been selected as potential background samples. Table 1 lists the sample identification numbers and depth interval for each sample selected. As shown in Plate 1 and Tables 2 through 4, 140 samples were identified in the blue area, 56 samples in the pink area, and 51 samples in the yellow area. Samples in the blue area were not consistently analyzed for both metals and PAHs: 34 were analyzed for both, while 55 were analyzed only for metals and 51 only for semivolatile organic compounds (including PAHs). The samples are indicated on Plate 1 by point name, rather than sample name, because often samples were collected at multiple depths within a borehole.

Tables 2 through 4 provide data summaries for the data sets, including maximum, minimum, and average values, as well as the probability density function for each chemical. Sample quantitation

limits, frequencies of detection, and standard deviations are also presented. Cumulative frequency plots for each chemical in each area are included as an attachment to this letter. The plots include all detected results and, for chemicals with less than 100 percent frequency of detection, detected results and nondetected results set equal to one-half the sample quantitation limit. Probability density functions (PDFs) were determined from detected results only. This information allows for comparison of the data selected to regional values and among the three fill areas identified at NAS Alameda. The ranges of chemical concentrations are specific to each of the three fill areas, as shown below for select chemicals (in milligrams per kilogram):

	Blue	Pink	Yellow
Arsenic	0.74 - 23.0	0.44 - 15.6	1.1 - 33.0
Beryllium	0.09 - 0.77	0.25 - 2.3	0.3 - 1.3
Chromium	11.4 - 81.7	12.3 - 66.7	5.0-69.7
Iron	760 - 26, 900	4,500-27,900	10 - 20,800
Manganese	50 - 1,060	55.5-885	5.0-330
Nickel	11.6 - 88.5	11.5 - 80.4	5.0 - 71.1
Benzo(a) pyrene	0.048 - 1.3	2.6	0.024
Chrysene	0.058 - 1.3	1.5	0.022 - 0.13

The cumulative frequency plots are provided in Attachment A, as well as coefficients of variation (standard deviation divided by the mean). These are provided on the plots in Attachment A . Overall, the coefficients of variation (also presented in Tables 2 through 4) are below 1.0. When nondetects are excluded from the data set and only detected results are plotted, the cumulative frequency graphs are relatively straight for those chemicals with lower frequencies of detection. The plots have elsewhere been used to establish a single background value for each analyte, which were subsequently used to select COCs. This value could be selected from the lower portion of a cumulative frequency plot, assuming that a "hinge point" exists to demarcate site contamination from background levels (according to a letter from DTSC to Navy dated September 29, 1995). As described by Gilbert (1996), this "definition of ambient background is predicated on the idea that testing for compliance with a background standard should be done by comparing the highest measurement from a PCA [potentially contaminated area] with a single background number (threshold). That is, the background data set should be reduced to a single number for testing purposes." Gilbert concludes that the hinge point approach is not defensible for at least two reasons. First, "the Type I decision error rate (probability that the analyte will be incorrectly declared a COPC [chemical of potential concern]) depends critically on the number of measurements from the PCA" (Gilbert 1996). As Gilbert describes, the hinge point method has the potential for generating extremely low background threshold levels, which will in turn result in many false positive decision errors. That is, the probability of incorrectly deciding that the analyte is a COPC becomes very high, if not certain.

Second, the hinge point method "does not make full use of the information about variability of the background measurements.... The existence of a hinge point does not necessarily mean that two populations are present and that the lower portion of the plot (nearest the origin) is the ambient background distribution....However, the more fundamental point is that, as pointed out above, the practice of reducing the background population to a single threshold value is not a technically defensible method for determining if an analyte is a COPC. "

Gilbert presents a detailed discussion of this in his letter to the Navy (1996) and in Hardin and Gilbert (1993). Therefore, while these plots provide a visual inspection of the data, they will not be used to determine a background data set or one value to represent "background."

In conclusion, the data presented ranges presented in Tables 2 through 4 represent the background data for the three fill areas of NAS Alameda. The number of samples and areal distribution of samples within each of the three fill areas has appropriate statistical power, confidence, and spatial representation. The background ranges and data will be used to statistically determine which chemicals are above or below levels for each sites using the NAS Alameda Statistical Methology for Background Comparisons (December 20, 1995

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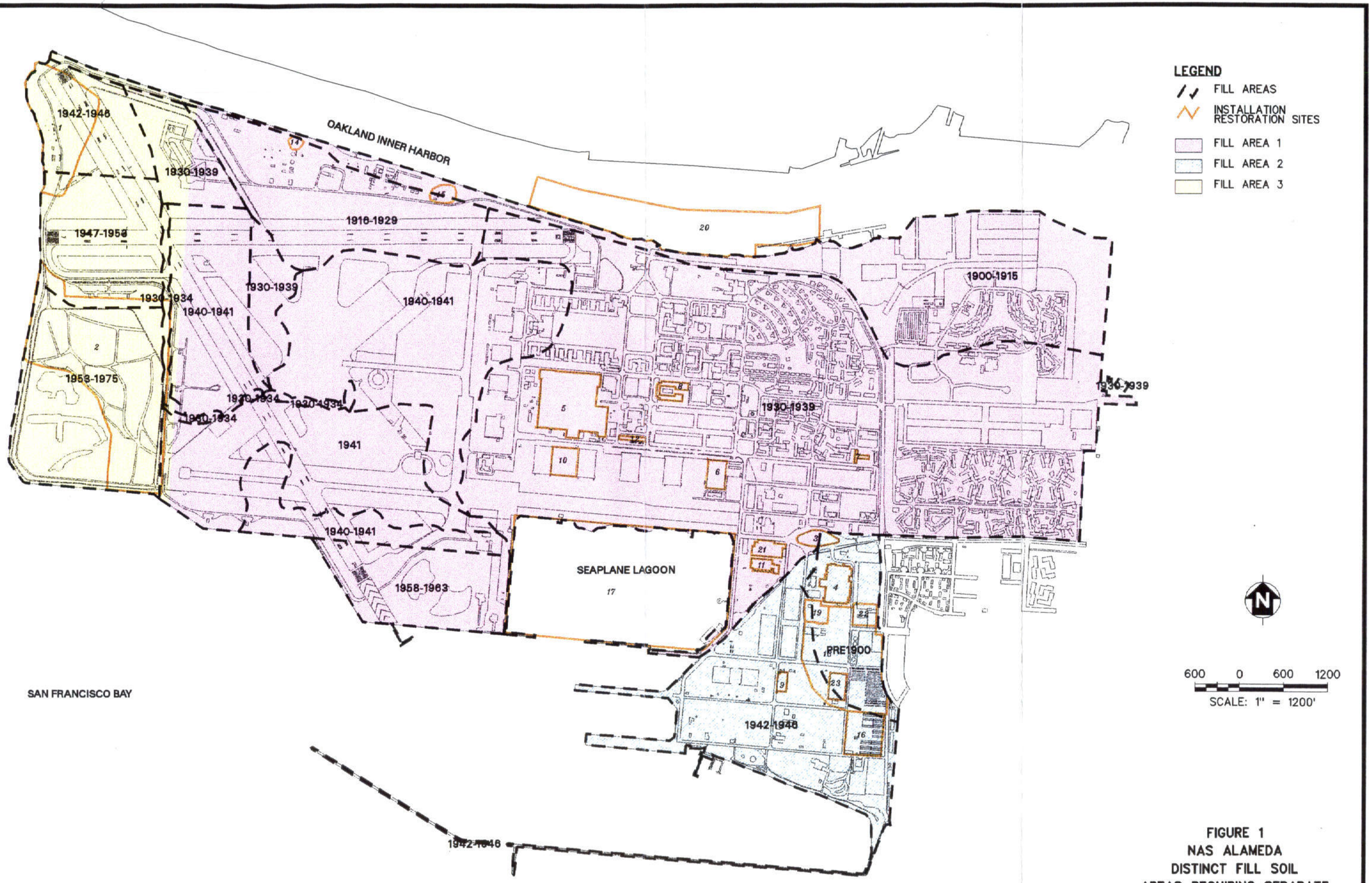


FIGURE 1
NAS ALAMEDA
DISTINCT FILL SOIL
AREAS REQUIRING SEPARATE
BACKGROUND DATA SETS

/data0/home/anne/bckgrd61177.aml bckgrd61177.grp AML
02/

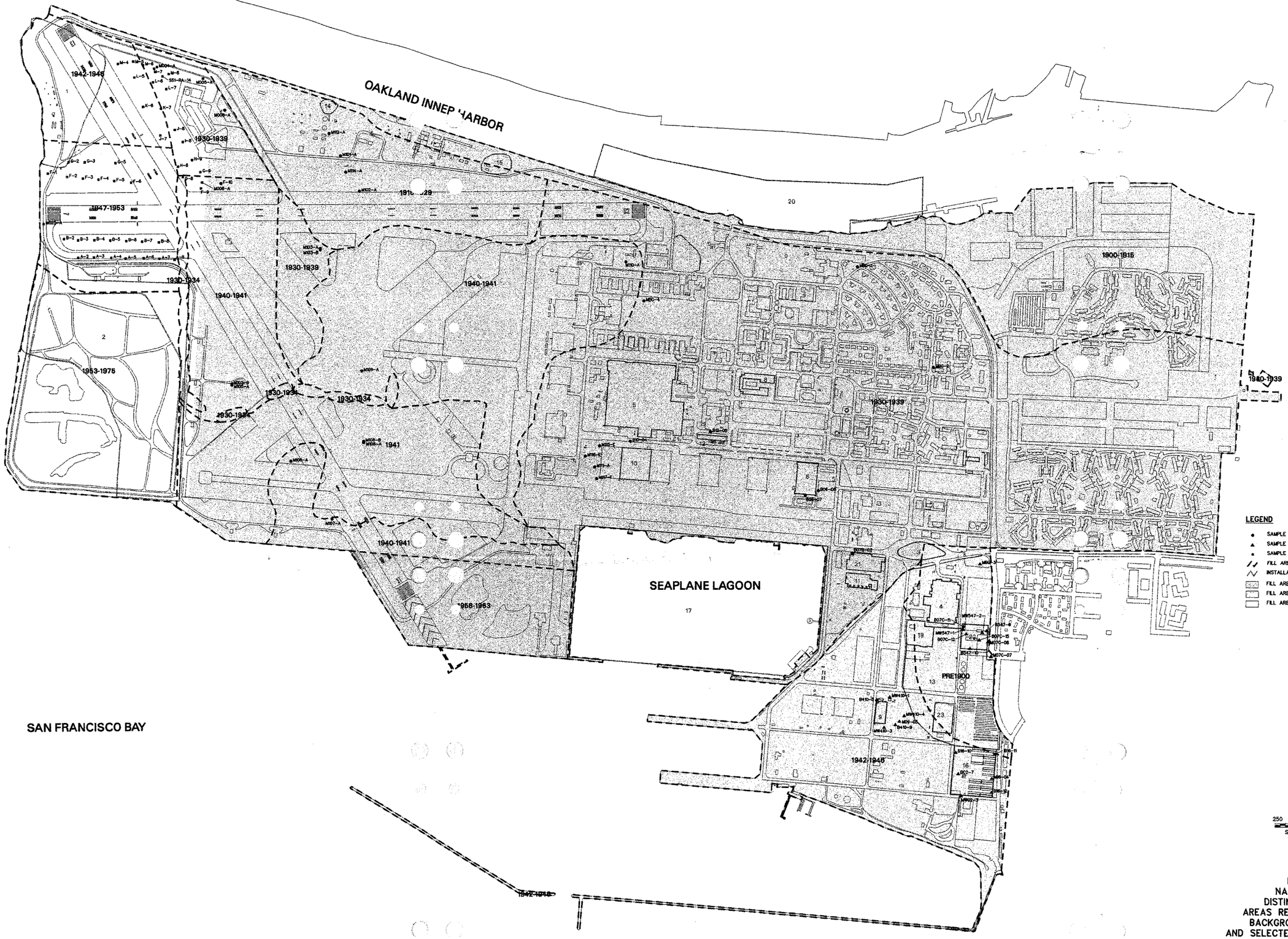


PLATE 1
NAS ALAMEDA
DISTINCT FILL SOIL
AREAS REQUIRING SEPARATE
BACKGROUND DATA SETS
AND SELECTED SAMPLE LOCATIONS

PRC Environmental Management, Inc.

TABLE 1

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
BLUE	280-S09-001	1.5	2.5	M09-05
BLUE	280-S09-002	3.0	4.0	M09-05
BLUE	280-S09-003	5.0	6.0	M09-05
BLUE	280-S16-018	0.5	1.5	B16-10
BLUE	280-S16-019	2.5	3.5	B16-10
BLUE	280-S16-020	3.5	4.5	B16-10
BLUE	280-S16-021	5.0	6.0	B16-10
BLUE	280-S16-022	1.5	2.5	B16-11
BLUE	280-S16-023	2.5	3.5	B16-11
BLUE	280-S16-024	5.0	6.0	B16-11
BLUE	280-S16-025	0.5	1.5	B16-12
BLUE	280-S16-026	2.5	3.5	B16-12
BLUE	280-S16-027	5.0	6.0	B16-12
BLUE	280-S16-028	1.0	2.0	M16-04
BLUE	280-S16-029	2.0	3.0	M16-04
BLUE	280-S7C-001	0.5	1.5	B07C-11
BLUE	280-S7C-002	2.5	3.5	B07C-11
BLUE	280-S7C-003	5.0	6.0	B07C-11
BLUE	280-S7C-004	0.5	1.5	B07C-12
BLUE	B410-7 [1.0-1.5]	1.0	1.5	B410-7
BLUE	B410-7 [3.0-3.5]	3.0	3.5	B410-7
BLUE	B410-7 [5.5-6.0]	5.5	6.0	B410-7
BLUE	B410-7 [6.0-6.5]	6.0	6.5	B410-7
BLUE	B410-7 [8.5-9.0]	8.5	9.0	B410-7
BLUE	B410-7 [9.0-9.5]	9.0	9.5	B410-7
BLUE	B410-7 [11.0-11.5]	11.0	11.5	B410-7
BLUE	B410-7 [11.5-12.0]	11.5	12.0	B410-7
BLUE	B410-7 [14.5-15.0]	14.5	15.0	B410-7
BLUE	B410-7 [15.0-15.5]	15.0	15.5	B410-7
BLUE	B410-9 [1.0-1.5]	1.0	1.5	B410-9
BLUE	B410-9 [2.5-3.0]	2.5	3.0	B410-9
BLUE	B410-9 [3.0-3.5]	3.0	3.5	B410-9
BLUE	B410-9 [5.5-6.0]	5.5	6.0	B410-9
BLUE	B410-9 [6.0-6.5]	6.0	6.5	B410-9
BLUE	B410-9 [8.5 -9.0]	8.5	9.0	B410-9
BLUE	B410-9 [9.0-9.5]	9.0	9.5	B410-9
BLUE	B410-9 [11.5-12.0]	11.5	12.0	B410-9
BLUE	B410-9 [12.0-12.5]	12.0	12.5	B410-9
BLUE	B410-9 [14.5-15.0]	14.5	15.0	B410-9
BLUE	B410-9 [15.0-15.5]	15.0	15.5	B410-9
BLUE	B547-10 [0.5-1.0]	0.5	1.0	B547-10
BLUE	B547-10 [2.0-2.5]	2.0	2.5	B547-10
BLUE	B547-10 [2.5-3.0]	2.5	3.0	B547-10
BLUE	B547-10 [5.0-5.5]	5.0	5.5	B547-10
BLUE	B547-10 [5.5-6.0]	5.5	6.0	B547-10

TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
BLUE	B547-10 [8.0-8.5]	8.0	8.5	B547-10
BLUE	B547-10 [8.5-9.0]	8.5	9.0	B547-10
BLUE	B547-10 [11.0-11.5]	11.0	11.5	B547-10
BLUE	B547-10 [11.5-12.0]	11.5	12.0	B547-10
BLUE	B547-10 [14.0-14.5]	14.0	14.5	B547-10
BLUE	B547-10 [14.5-15.0]	14.5	15.0	B547-10
BLUE	B547-6 [2.0-2.5]	2.0	2.5	B547-6
BLUE	B547-6 [2.5-3.0]	2.5	3.0	B547-6
BLUE	B547-6 [3.5-4.0]	3.5	4.0	B547-6
BLUE	B547-6 [4.0-5.0]	4.0	5.0	B547-6
BLUE	B547-6 [5.0-5.5]	5.0	5.5	B547-6
BLUE	B547-6 [6.0-6.5]	6.0	6.5	B547-6
BLUE	B547-6 [6.5-7.0]	6.5	7.0	B547-6
BLUE	B547-6 [9.0-9.5]	9.0	9.5	B547-6
BLUE	B547-6 [9.5-10.0]	9.5	10.0	B547-6
BLUE	B547-6 [11.0-11.5]	11.0	11.5	B547-6
BLUE	B547-6 [11.5-12.0]	11.5	12.0	B547-6
BLUE	B547-6 [14.0-14.5]	14.0	14.5	B547-6
BLUE	B547-6 [14.5-15.0]	14.5	15.0	B547-6
BLUE	BC2-7 [0.5-1.0]	0.5	1.0	BC2-7
BLUE	BC2-7 [2.5-3.0]	2.5	3.0	BC2-7
BLUE	BC2-7 [5.0-5.5]	5.0	5.5	BC2-7
BLUE	BC2-7 [7.0-7.5]	7.0	7.5	BC2-7
BLUE	BC2-7 [9.5-10.0]	9.5	10.0	BC2-7
BLUE	BC2-7 [11.0-11.5]	11.0	11.5	BC2-7
BLUE	BC2-7 [13.5-14.0]	13.5	14.0	BC2-7
BLUE	BC2-7 [14.0-14.5]	14.0	14.5	BC2-7
BLUE	M-BG3-000	0.3	0.5	MBG-3
BLUE	M-BG3-002	2.0	2.5	MBG-3
BLUE	M-BG3-004	4.0	4.5	MBG-3
BLUE	M-BG3-006	5.5	6.0	MBG-3
BLUE	MW410-1 [0.5-1.0]	0.5	1.0	MW410-1
BLUE	MW410-1 [2.0-2.5]	2.0	2.5	MW410-1
BLUE	MW410-1 [3.0-3.5]	3.0	3.5	MW410-1
BLUE	MW410-1 [5.5-6.0]	5.5	6.0	MW410-1
BLUE	MW410-1 [6.5-7.0]	6.5	7.0	MW410-1
BLUE	MW410-1 [7.0-7.5]	7.0	7.5	MW410-1
BLUE	MW410-1 [7.5-8.0]	7.5	8.0	MW410-1
BLUE	MW410-1 [8.0-8.5]	8.0	8.5	MW410-1
BLUE	MW410-1 [11.0-11.5]	11.0	11.5	MW410-1
BLUE	MW410-1 [11.5-12.0]	11.5	12.0	MW410-1
BLUE	MW410-1 [12.5-13.0]	12.5	13.0	MW410-1
BLUE	MW410-1 [14.0-14.5]	14.0	14.5	MW410-1
BLUE	MW410-1 [14.5-15.0]	14.5	15.0	MW410-1
BLUE	MW410-3 [1.0-1.5]	1.0	1.5	MW410-3
BLUE	MW410-3 [3.0-3.5]	3.0	3.5	MW410-3
BLUE	MW410-3 [4.0-4.5]	4.0	4.5	MW410-3
BLUE	MW410-3 [5.5-6.0]	5.5	6.0	MW410-3
BLUE	MW410-3 [6.0-6.5]	6.0	6.5	MW410-3

TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
BLUE	MW410-3 [8.5-9.0]	8.5	9.0	MW410-3
BLUE	MW410-3 [9.0-9.5]	9.0	9.5	MW410-3
BLUE	MW410-3 [11.5-12.0]	11.5	12.0	MW410-3
BLUE	MW410-3 [12.0-12.5]	12.0	12.5	MW410-3
BLUE	MW410-3 [14.5-15.0]	14.5	15.0	MW410-3
BLUE	MW410-3 [15.0-15.5]	15.0	15.5	MW410-3
BLUE	MW410-4 [1.0-1.5]	1.0	1.5	MW410-4
BLUE	MW410-4 [3.0-3.5]	3.0	3.5	MW410-4
BLUE	MW410-4 [4.0-4.5]	4.0	4.5	MW410-4
BLUE	MW410-4 [5.5-6.0]	5.5	6.0	MW410-4
BLUE	MW410-4 [6.0-6.5]	6.0	6.5	MW410-4
BLUE	MW410-4 [8.5-9.0]	8.5	9.0	MW410-4
BLUE	MW410-4 [9.0-9.5]	9.0	9.5	MW410-4
BLUE	MW410-4 [11.5-12.0]	11.5	12.0	MW410-4
BLUE	MW410-4 [12.0-12.5]	12.0	12.5	MW410-4
BLUE	MW410-4 [14.5-15.0]	14.5	15.0	MW410-4
BLUE	MW410-4 [15.0-15.5]	15.0	15.5	MW410-4
BLUE	MW547-1 [0.5-1.0]	0.5	1.0	MW547-1
BLUE	MW547-1 [2.0-2.5]	2.0	2.5	MW547-1
BLUE	MW547-1 [2.5-3.0]	2.5	3.0	MW547-1
BLUE	MW547-1 [4.5-5.0]	4.5	5.0	MW547-1
BLUE	MW547-1 [5.0-5.5]	5.0	5.5	MW547-1
BLUE	MW547-1 [8.0-8.5]	8.0	8.5	MW547-1
BLUE	MW547-1 [8.5-9.0]	8.5	9.0	MW547-1
BLUE	MW547-1 [11.0-11.5]	11.0	11.5	MW547-1
BLUE	MW547-1 [11.5-12.0]	11.5	12.0	MW547-1
BLUE	MW547-1 [14.0-14.5]	14.0	14.5	MW547-1
BLUE	MW547-1 [14.5-15]	14.5	15.0	MW547-1
BLUE	MW547-2 [0.5-1.0]	0.5	1.0	MW547-2
BLUE	MW547-2 [2.0-2.5]	2.0	2.5	MW547-2
BLUE	MW547-2 [2.5-3.0]	2.5	3.0	MW547-2
BLUE	MW547-2 [5.0-5.5]	5.0	5.5	MW547-2
BLUE	MW547-2 [5.5-6.0]	5.5	6.0	MW547-2
BLUE	MW547-2 [6.0-6.5]	6.0	6.5	MW547-2
BLUE	MW547-2 [6.5-7.0]	6.5	7.0	MW547-2
BLUE	MW547-2 [9.5-10.0]	9.5	10.0	MW547-2
BLUE	MW547-2 [10.0-10.5]	10.0	10.5	MW547-2
BLUE	MW547-2 [12.5-13.0]	12.5	13.0	MW547-2
BLUE	MW547-2 [13.0-13.5]	13.0	13.5	MW547-2
BLUE	MW547-2 [14.0-14.5]	14.0	14.5	MW547-2
BLUE	MW547-2 [14.5-15.0]	14.5	15.0	MW547-2
BLUE	MWC2-3 [1.0-1.5]	1.0	1.5	MWC2-3
BLUE	MWC2-3 [4.0-4.5]	4.0	4.5	MWC2-3
BLUE	MWC2-3 [5.0-5.5]	5.0	5.5	MWC2-3
BLUE	MWC2-3 [6.5-7.0]	6.5	7.0	MWC2-3
BLUE	MWC2-3 [7.0-7.5]	7.0	7.5	MWC2-3
BLUE	MWC2-3 [8.0-8.5]	8.0	8.5	MWC2-3
BLUE	MWC2-3 [8.5-9.0]	8.5	9.0	MWC2-3
BLUE	MWC2-3 [9.5-10.0]	9.5	10.0	MWC2-3

TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
BLUE	MWC2-3 [10.0-10.5]	10.0	10.5	MWC2-3
BLUE	MWC2-3 [11.0-11.5]	11.0	11.5	MWC2-3
BLUE	MWC2-3 [12.5-13.0]	12.5	13.0	MWC2-3
PINK	280-RA-033	0.0	1.5	M112-A
PINK	280-RA-034	2.5	3.5	M112-A
PINK	280-RA-035	5.0	6.0	M112-A
PINK	280-RA-039	0.0	1.0	M114-A
PINK	280-RA-040	2.0	3.0	M114-A
PINK	280-RA-041	3.5	4.5	M114-A
PINK	280-RA-042	0.0	1.5	M115-E
PINK	280-RA-043	2.5	3.5	M115-E
PINK	280-RA-044	5.0	6.0	M115-E
PINK	280-RA-045	0.0	1.5	M116-E
PINK	280-RA-046	2.5	3.5	M116-E
PINK	280-RA-047	5.0	6.0	M116-E
PINK	280-RA-048	0.0	1.5	M117-E
PINK	280-RA-049	2.5	3.5	M117-E
PINK	280-RA-050	5.0	6.0	M117-E
PINK	B06-07-000	0.5	1.0	B06-07
PINK	B06-07-002	2.0	3.3	B06-07
PINK	B06-07-007	6.5	7.5	B06-07
PINK	B06-07-008	8.0	9.5	B06-07
PINK	B06-08-000	1.0	1.5	B06-08
PINK	B06-08-002	2.0	3.0	B06-08
PINK	B07B-02-000	0.5	1.5	B07B-02
PINK	B07B-02-004	3.5	5.0	B07B-02
PINK	B10-04-000	0.5	1.0	B10-04
PINK	B10-04-005	5.0	6.0	B10-04
PINK	B12-08-000	0.5	1.0	B12-08
PINK	B12-08-004	3.5	5.0	B12-08
PINK	B12-08-010	9.5	10.0	B12-08
PINK	F10 [0.0-0.0]	0.0	0.0	F-10
PINK	M-006A-0	2.0	2.5	M006-A
PINK	M-006A-005	3.5	4.5	M006-A
PINK	M-101A-004	2.0	3.5	M101-A
PINK	M-102A-004	2.0	3.3	M102-A
PINK	M-106A-0	0.0	0.0	M106-A
PINK	M-106A-003	2.0	3.0	M106-A
PINK	M-107A-0	0.0	0.0	M107-A
PINK	M-107A-002	0.5	2.0	M107-A
PINK	M-109A-0	0.0	0.0	M109-A
PINK	M-109A-007	5.5	6.3	M109-A
PINK	M-110A-003	1.5	3.0	M110-A
PINK	M-111A-0	0.5	0.0	M111-A
PINK	M-111A-003	2.0	3.5	M111-A
PINK	M-BG1-002	2.0	2.5	MBG-1
PINK	M-BG1-003	3.0	3.5	MBG-1
PINK	M-BG1-004	5.0	5.5	MBG-1

TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
PINK	M-BG2-002	2.0	2.5	MBG-2
PINK	M-BG2-005	5.0	5.5	MBG-2
PINK	M-BG4-002	2.0	2.5	MBG-4
PINK	M-BG4-007	7.5	8.0	MBG-4
PINK	M-BG4-010	10.0	10.5	MBG-4
PINK	M103-A	5.0	6.5	M103-A
PINK	M103-B	0.0	0.5	M103-B
PINK	M105-A	5.5	7.0	M105-A
PINK	M105-B	0.0	0.5	M105-B
PINK	M108-A	5.0	6.5	M108-A
PINK	M108-B	0.0	0.5	M108-B
YELLOW	280-S01-016	0.0	0.0	SS1-RA-14
YELLOW	A2 [0.0-0.0]	0.0	0.0	A-2
YELLOW	A3 [0.0-0.0]	0.0	0.0	A-3
YELLOW	A4 [0.0-0.0]	0.0	0.0	A-4
YELLOW	A5 [0.0-0.0]	0.0	0.0	A-5
YELLOW	A6 [0.0-0.0]	0.0	0.0	A-6
YELLOW	A7 [0.0-0.0]	0.0	0.0	A-7
YELLOW	A8 [0.0-0.0]	0.0	0.0	A-8
YELLOW	B2 [0.0-0.0]	0.0	0.0	B-2
YELLOW	B3 [0.0-0.0]	0.0	0.0	B-3
YELLOW	B4 [0.0-0.0]	0.0	0.0	B-4
YELLOW	B5 [0.0-0.0]	0.0	0.0	B-5
YELLOW	B6 [0.0-0.0]	0.0	0.0	B-6
YELLOW	B7 [0.0-0.0]	0.0	0.0	B-7
YELLOW	B8 [0.0-0.0]	0.0	0.0	B-8
YELLOW	F1 [0.0-0.0]	0.0	0.0	F-1
YELLOW	F2 [0.0-0.0]	0.0	0.0	F-2
YELLOW	F3 [0.0-0.0]	0.0	0.0	F-3
YELLOW	F4 [0.0-0.0]	0.0	0.0	F-4
YELLOW	F5 [0.0-0.0]	0.0	0.0	F-5
YELLOW	F6 [0.0-0.0]	0.0	0.0	F-6
YELLOW	F9 [0.0-0.0]	0.0	0.0	F-9
YELLOW	G2 [0.0-0.0]	0.0	0.0	G-2
YELLOW	G3 [0.0-0.0]	0.0	0.0	G-3
YELLOW	G5 [0.0-0.0]	0.0	0.0	G-5
YELLOW	G8 [0.0-0.0]	0.0	0.0	G-8
YELLOW	G9 [0.0-0.0]	0.0	0.0	G-9
YELLOW	H8 [0.0-0.0]	0.0	0.0	H-8
YELLOW	H9 [0.0-0.0]	0.0	0.0	H-9
YELLOW	I7 [0.0-0.0]	0.0	0.0	I-7
YELLOW	I8 [0.0-0.0]	0.0	0.0	I-8
YELLOW	J7 [0.0-0.0	0.0	0.0	J-7
YELLOW	J8 [0.0-0.0]	0.0	0.0	J-8
YELLOW	K6 [0.0-0.0]	0.0	0.0	K-6
YELLOW	K7 [0.0-0.0]	0.0	0.0	K-7
YELLOW	L5 [0.0-0.0]	0.0	0.0	L-5
YELLOW	L6 [0.0-0.0]	0.0	0.0	L-6

TABLE 1 (Continued)

NAS ALAMEDA
SAMPLES SELECTED FOR BACKGROUND DATA SET

AREA	SAMPLE	DEPTH INTERVAL (FEET BGS)		POINT NAME
YELLOW	L7 [0.0-0.0]	0.0	0.0	L-7
YELLOW	M-004A-0	2.0	2.5	M004-A
YELLOW	M-004A-004	3.5	4.5	M004-A
YELLOW	M-005A-0	0.5	1.5	M005-A
YELLOW	M-005A-003	2.0	2.5	M005-A
YELLOW	M-008A-0	0.5	1.8	M008-A
YELLOW	M-008A-004	2.0	3.3	M008-A
YELLOW	M-025A-004	4.0	0.0	M025-A
YELLOW	M4 [0.0-0.0]	0.0	0.0	M-4
YELLOW	M5 [0.0-0.0]	0.0	0.0	M-5
YELLOW	M6 [0.0-0.0]	0.0	0.0	M-6
YELLOW	M7 [0.0-0.0]	0.0	0.0	M-7
YELLOW	M8 [0.0-0.0]	0.0	0.0	M-8

Notes:

bgs = Below ground surface
Point Name designates the sample location as shown on Figure 1.

TABLE 2

NAS ALAMEDA
BACKGROUND DATA FOR BLUE AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Inorganic Chemicals (mg/kg)								
Aluminum[2]	NA	89/89	2,880	26,800	5,726	1.6	7,096	0.06
Antimony[3]	0.46-9.2	2/89	0.89	1.0	1.8	1.3	2.1	0.71
Arsenic[2]	0.61-13	34/89	0.74	23.0	2.2	2.9	4.8	1.3
Barium[1]	24-25	86/89	0.30	198	48.9	32.3	55.7	0.66
Beryllium[1]	0.2-1.3	25/89	0.09	0.77	0.32	0.21	0.36	0.67
Cadmium[1]	0.06-1.3	30/89	0.1	0.82	0.32	0.23	0.37	0.73
Calcium[2]	NA	89/89	1,360	19,200	3,044	1.9	4,185	0.08
Chromium[1]	NA	89/89	11.4	81.7	33.7	12.9	36.5	0.38
Cobalt[1]	3.9-6.8	67/89	1.9	14	5.0	2.7	5.6	0.53
Copper[2]	5.8-6.3	84/89	4.2	89.4	10.4	2.0	15.2	0.30
Iron[1]	NA	89/89	760	26,900	10,068	5,070	11,135	0.50
Lead[2]	1.4-6.8	28/89	1.3	41	3.3	2.3	5.4	0.68
Magnesium[2]	NA	89/89	1,510	42,400	2,560	1.6	3,156	0.06
Manganese[2]	NA	89/89	50	1,060	126	1.7	160.0	0.11
Nickel[2]	NA	89/89	11.6	88.5	26.9	1.5	31.9	0.13
Potassium[2]	610	88/89	310	6,382	802	1.6	998	0.07
Selenium[3]	0.39-13	1/89	5.7	5.7	2.8	2.1	3.3	0.75
Silver[3]	0.18-6.5	2/89	0.44	0.61	0.95	1.2	1.2	1.2
Sodium[2]	288-650	69/89	88.1	3,510	299.8	2.2	470.7	0.14
Thallium[3]	0.33-13	1/89	5.3	5.3	2.3	2.2	2.8	0.94
Titanium[1]	NA	66/66	223	1,020	408.4	145.8	444.3	0.36
Vanadium[1]	NA	89/89	12.8	62.3	22.5	8.9	24.3	0.39

TABLE 2 (Continued)

NAS ALAMEDA
BACKGROUND DATA FOR BLUE AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Zinc[2]	NA	89/89	14	316	27.0	1.6	33.5	0.15
Polycyclic Aromatic Hydrocarbons (µg/kg)								
Acenaphthene[3]	83-14,000	1/85	130	130	293.1	743.2	453.5	2.5
Anthracene[3]	83-14,000	2/85	59	390	294.2	743.5	454.7	2.5
Benzo(a)anthracene[4]	100-14,000	8/85	61	1,000	290.1	747.9	451.5	2.6
Benzo(a)pyrene[2]	140-14,000	11/85	48	1,300	208.4	1.8	277.3	0.11
Benzo(b)fluoranthene[2]	100-14,000	9/85	66	760	202.4	1.8	273.9	0.11
Benzo(g,h,i)perylene[4]	170-14,000	6/85	140	950	304.6	745.8	465.6	2.4
Benzo(k)fluoranthene[2]	100-14,000	6/85	100	1,100	208.1	1.8	280.9	0.11
Chrysene[4]	100-14,000	11/85	58	1,300	288.9	752.6	451.3	2.6
Dibenzo(a,h)anthracene[3]	170-14,000	1/85	230	230	296.4	742.4	456.7	2.5
Fluoranthene[2]	83-14,000	12/85	54	2,000	198.2	1.9	284.2	0.13
Fluorene[3]	83-14,000	1/85	100	100	292.7	743.3	453.2	2.5
Indeno(1,2,3-cd)pyrene[2]	170-14,000	6/85	120	930	215.2	1.7	279.3	0.10
Naphthalene[3]	83-14,000	1/85	35	35	292.3	743.5	452.8	2.5
Phenanthrene[2]	83-14,000	8/85	27	1,600	196.0	2.0	284.2	0.13
Pyrene[1]	83-14,000	12/85	65	2,500	343.4	785.3	484.6	2.3
2-methylnaphthalene[3]	100-14,000	1/85	320	320	294.2	742.9	454.6	2.5

Notes:

(1) Data normally distributed
(2) Data lognormally distributed. Calculated coefficient of variation for natural logarithm-transformed data.
(3) Too few detections to determine distribution. Calculated coefficient of variation from arithmetic mean and standard deviation.
(4) Data are not normally or lognormally distributed. Calculated coefficient of variation from arithmetic mean and standard deviation.
NA Not applicable
mg/kg milligrams per kilogram
µg/kg micrograms per kilogram

TABLE 3

NAS ALAMEDA
BACKGROUND DATA FOR YELLOW AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Inorganic Chemicals (mg/kg)								
Aluminum[1]	NA	51/51	20.0	13,300	6,156	2,532	6,869	0.41
Antimony[3]	1.3-7.3	3/51	2.8	3.6	2.9	0.69	3.1	0.24
Arsenic[1]	10-12	22/51	1.1	33	7.6	6.4	9.4	0.84
Barium[2]	21-24	44/51	19.8	260	30.4	1.9	43.5	0.18
Beryllium[1]	1-1.2	10/51	0.3	1.3	0.58	0.19	0.63	0.33
Cadmium[1]	0.36-1.2	12/51	0.33	2.9	0.66	0.49	0.80	0.74
Calcium[2]	NA	51/51	500	97,000	3,441	2.0	5,269	0.08
Chromium[4]	NA	51/51	5.0	69.7	32.1	8.4	34.4	0.26
Cobalt[1]	5-7.6	20/51	4.3	11.4	4.3	2.3	4.9	0.53
Copper[1]	5.5-5.6	49/51	4.2	49	15.9	12.0	19.3	0.76
Iron[1]	NA	51/51	10.0	20,800	10,324	3,859	11,410	0.37
Lead[2]	NA	51/51	3.3	752	22.2	2.8	51.7	0.33
Magnesium[2]	NA	51/51	500	8,820	2,541	1.6	3,178	0.06
Manganese[1]	NA	51/51	5.0	330	136.9	73.6	157.6	0.54
Mercury[1]	0.05-0.15	5/10	0.05	0.18	0.08	0.05	0.12	0.68
Nickel[4]	NA	51/51	5.0	71.1	27.8	9.8	30.6	0.35
Potassium[1]	NA	51/51	500	1,700	921	291	1,003	0.32
Silver[4]	0.18-6	6/51	0.52	30	2.9	4.1	4.0	1.4
Sodium[1]	125-610	11/51	232	1,380	353	260.8	425.9	0.74
Titanium[1]	NA	41/41	280	663	456	77.1	480.2	0.17
Vanadium[1]	NA	51/51	15.6	50.0	25.7	7.9	27.9	0.31
Zinc[1]	NA	51/51	17.0	140.0	47.8	31.9	56.8	0.67

TABLE 3 (Continued)

NAS ALAMEDA
BACKGROUND DATA FOR YELLOW AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Polycyclic Aromatic Hydrocarbons (µg/kg)								
Benzo(a)pyrene[3]	84-,6,700	1/51	24.0	24.0	400.4	487.1	537.4	1.2
Benzo(g,h,i)perylene[3]	96-6,700	1/51	19.0	19.0	402.2	485.9	538.9	1.2
Chrysene[3]	60-6,700	2/51	22.0	130.0	398.2	488.7	535.6	1.2
Fluoranthene[3]	48-6,700	3/51	30.0	790.0	407.0	492.1	545.4	1.2
Indeno(1,2,3-cd)pyrene[3]	96-6,700	1/51	21.0	21.0	402.2	485.9	538.9	1.2
Phenanthrene[3]	48-6,700	2/51	120.0	200.0	401.9	486.7	538.8	1.2
Pyrene[3]	48-6,700	4/51	33.0	900.0	411.1	492.8	549.7	1.2

Notes:

(1) Data normally distributed
(2) Data lognormally distributed. Calculated coefficient of variation for natural logarithm-transformed data.
(3) Too few detections to determine distribution
(4) Data are not normally or lognormally distributed
NA Not applicable
mg/kg milligrams per kilogram
µg/kg micrograms per kilogram

TABLE 4

NAS ALAMEDA
BACKGROUND DATA FOR PINK AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Inorganic Chemicals (mg/kg)								
Aluminum[2]	NA	56/56	1,700	22,600	5304.7	1.6	6,657.7	0.05
Antimony[1]	0.46-11.0	19/56	0.7	8.6	2.3	1.9	2.8	0.83
Arsenic[2]	0.59-10.0	46/56	0.44	15.6	1.8	2.3	3.2	1.4
Barium[2]	NA	56/56	6.9	156.0	36.6	1.7	48.7	0.15
Beryllium[1]	0.15-1.0	29/56	0.25	2.3	0.53	0.43	0.64	0.81
Cadmium[2]	0.08-1.0	11/56	0.1	3.2	0.18	2.7	0.42	0.58
Calcium[2]	NA	56/56	816.0	66,600.0	2,962.6	2.1	4,785.2	0.09
Chromium[1]	NA	56/56	12.3	66.7	30.1	10.1	32.8	0.34
Cobalt[4]	3.96-5.7	49/56	3.0	62.1	7.1	10.0	9.8	1.4
Copper[2]	8.8-10.2	53/56	3.1	49.1	7.6	1.8	10.5	0.29
Iron[2]	NA	56/56	4,500.0	27,900.0	9,543.0	1.5	11,604.9	0.05
Lead[2]	1.9-3.0	52/56	0.47	165.0	4.3	2.9	10.4	0.73
Magnesium[2]	NA	56/56	1,290.0	8,800.0	2,646.9	1.5	3,195.9	0.05
Manganese[2]	NA	56/56	55.5	885.0	130.6	1.8	181.7	0.12
Mercury[2]	0.06-0.269	8/56	0.057	2.71	0.064	2.4	0.12	0.32
Nickel[2]	NA	56/56	11.5	80.4	25.6	1.4	29.9	0.10
Potassium[2]	NA	56/56	209.0	2,480.0	696.3	1.5	847.9	0.07
Silver[2]	0.18-1.47	12/56	0.32	5.6	0.32	2.5	0.63	0.80
Sodium[2]	NA	56/56	62.6	1,580.0	337.3	1.9	503.1	0.11
Thallium[4]	0.11-10.0	1/56	0.53	0.53	0.25	0.65	0.43	0.34
Titanium[3]	NA	1/1	518.0	518.0	518.0	NA	NA	NA
Vanadium[1]	NA	56/56	10.5	55.3	22.9	9.2	25.4	0.40

TABLE 4 (Continued)

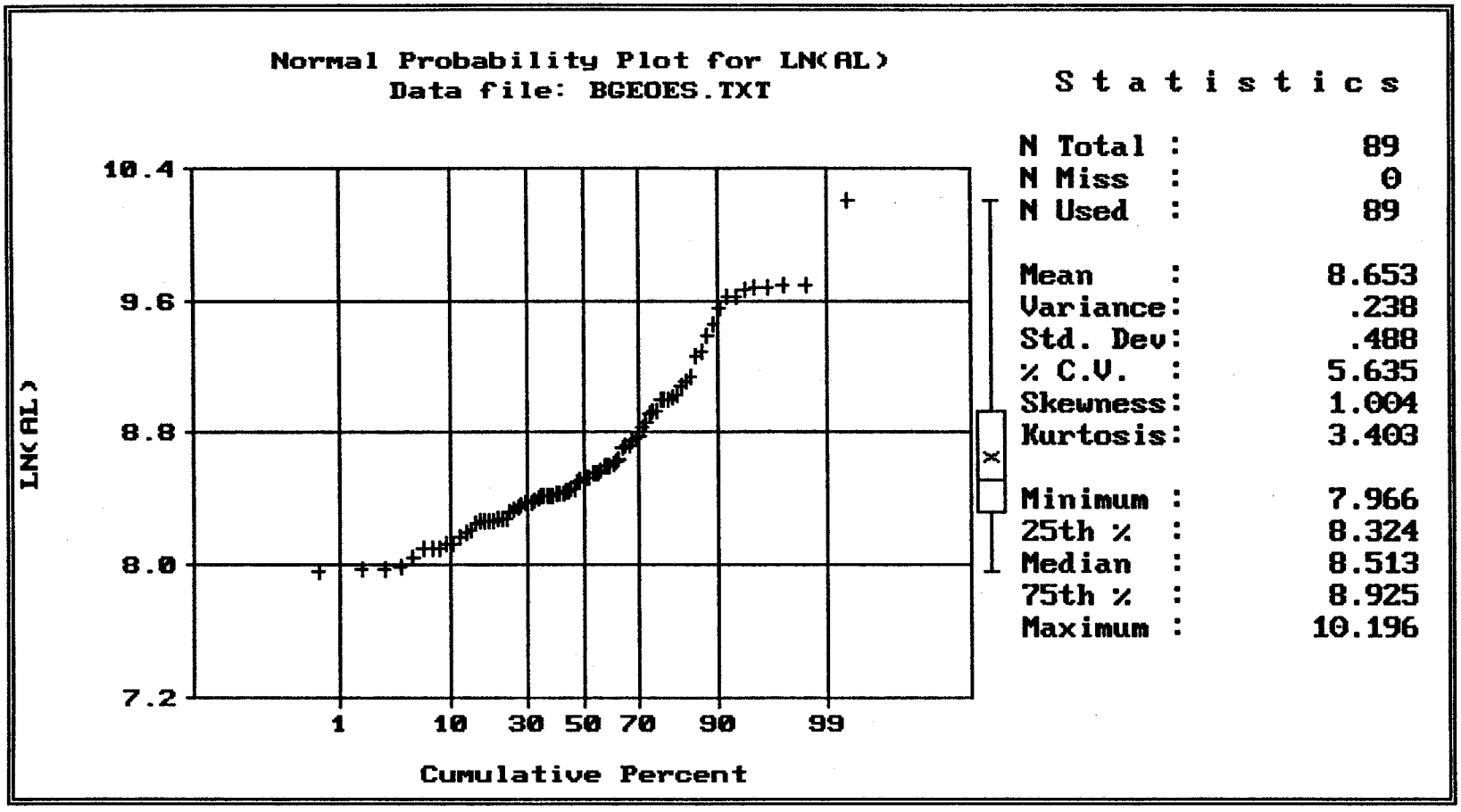
NAS ALAMEDA
BACKGROUND DATA FOR PINK AREA
DATA SUMMARY

Chemical	Sample Quantitation Limit	Frequency of Detection	Minimum Concentration	Maximum Concentration	Mean Concentration	Standard Deviation	95 Percent Upper Confidence Limit Concentration	Coefficient of Variation
Zinc[2]	18.0	55/56	10.0	191.0	23.2	1.7	30.8	0.17
Polycyclic Aromatic Hydrocarbons (:g/kg)								
Acenaphthene[3]	70-3,400	1/56	150.0	150.0	121.6	226.2	182.3	1.9
Anthracene[3]	70-3,400	1/56	240.0	240.0	123.2	226.8	184.1	1.8
Benzo(a)anthracene[3]	100-3,400	1/56	1,600.0	1,600.0	497.1	2,264.3	1,105.0	4.6
Benzo(a)pyrene[3]	140-3,400	1/56	2,600.0	2,600.0	186.4	394.9	292.4	2.1
Benzo(b)fluoranthene[3]	100-3,400	1/56	2,300.0	2,300.0	168.1	366.1	266.4	2.2
Benzo(g,h,i)perylene[3]	160-3,400	1/56	1,700.0	1,700.0	177.1	300.4	257.7	1.7
Benzo(k)fluoranthene[3]	100-3,400	1/56	620.0	620.0	138.1	232.9	200.6	1.7
Chrysene[3]	100-3,400	1/56	1,500.0	1,500.0	153.8	288.9	231.4	1.9
Fluoranthene[3]	70-3,400	3/56	34.0	3,600.0	207.5	477.0	355.6	2.3
Indeno(1,2,3-cd)pyrene[3]	160-3,400	1/56	1,800.00	1,800.00	178.8	309.8	262.0	1.7
Naphthalene[3]	70-3,400	1/56	99.0	99.0	120.7	226.2	181.4	1.9
Phenanthrene[3]	70-3,400	2/56	240.0	2,200.0	131.3	291.1	209.4	2.2
Pyrene[3]	70-3,400	3/56	210.0	6,100.0	240.5	831.0	463.5	3.5

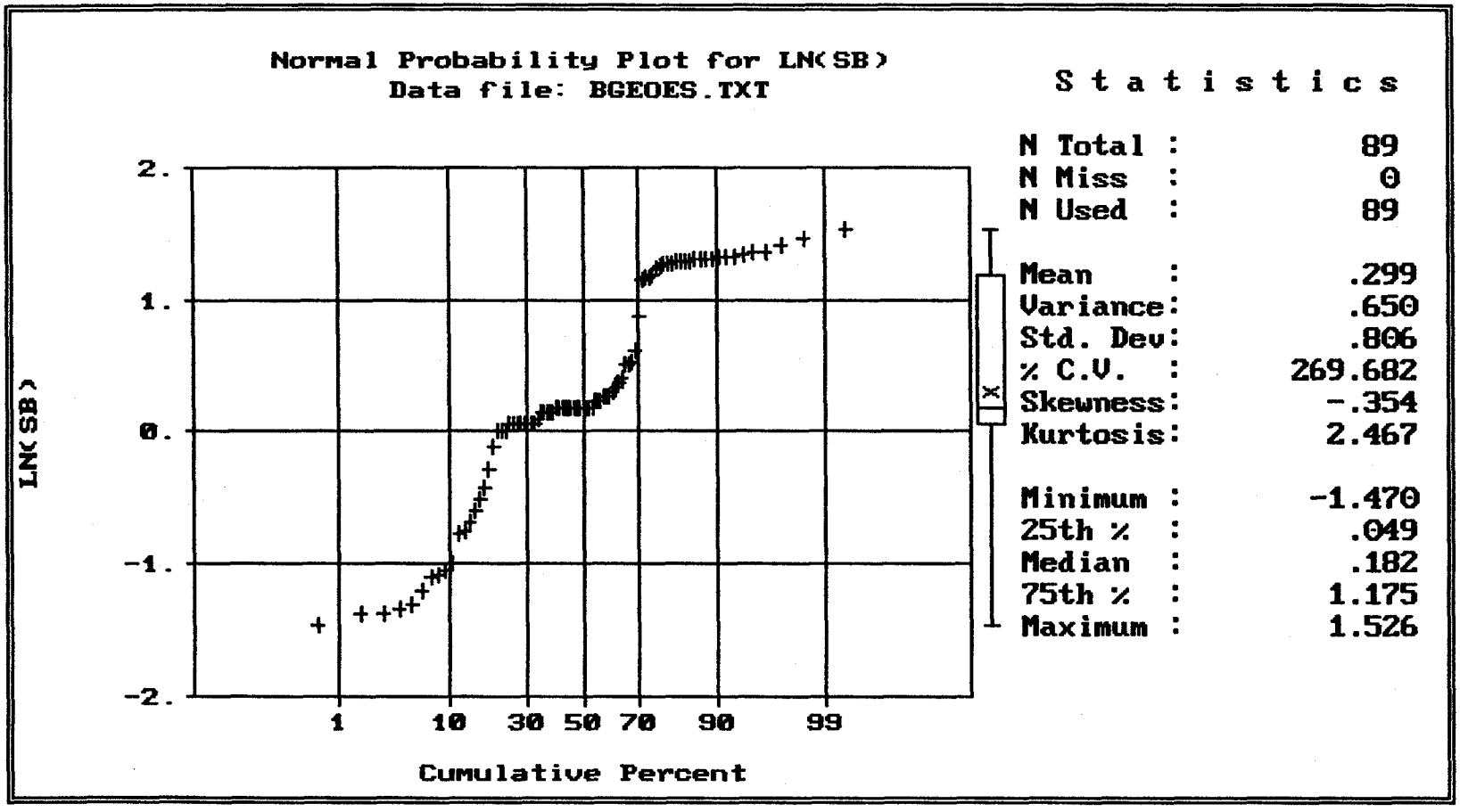
Notes:

(1) Data normally distributed
(2) Data lognormally distributed. Calculated coefficient of variation for natural logarithm-transformed data.
(3) Too few detections to determine distribution. Calculated coefficient of variation from arithmetic mean and standard deviation.
(4) Data are not normally or lognormally distributed. Calculated coefficient of variation from arithmetic mean and standard deviation.
NA Not applicable
mg/kg milligrams per kilogram
µg/kg micrograms per kilogram

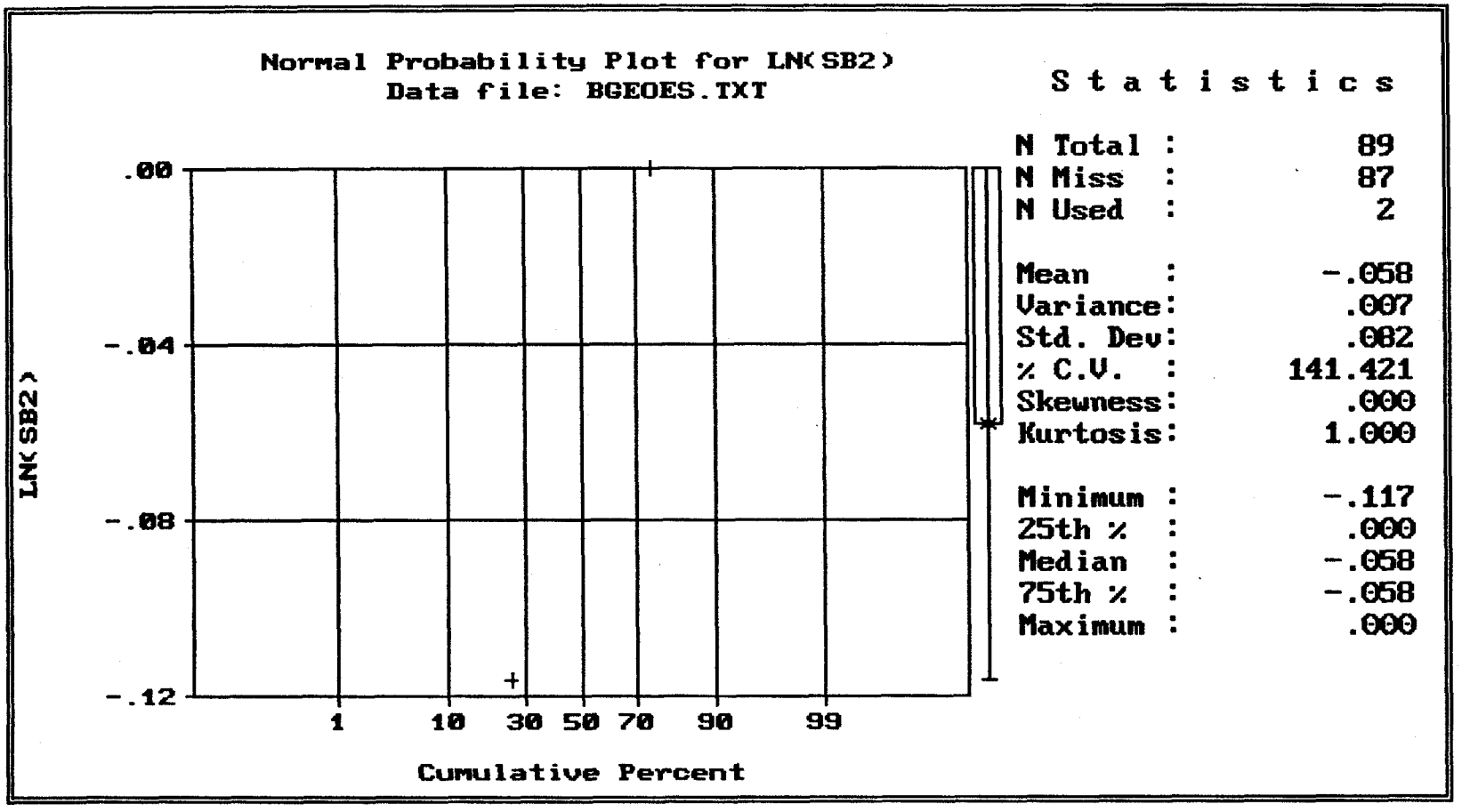
ATTACHMENT A
BLUE AREA
ALUMINUM (ALL SAMPLES)



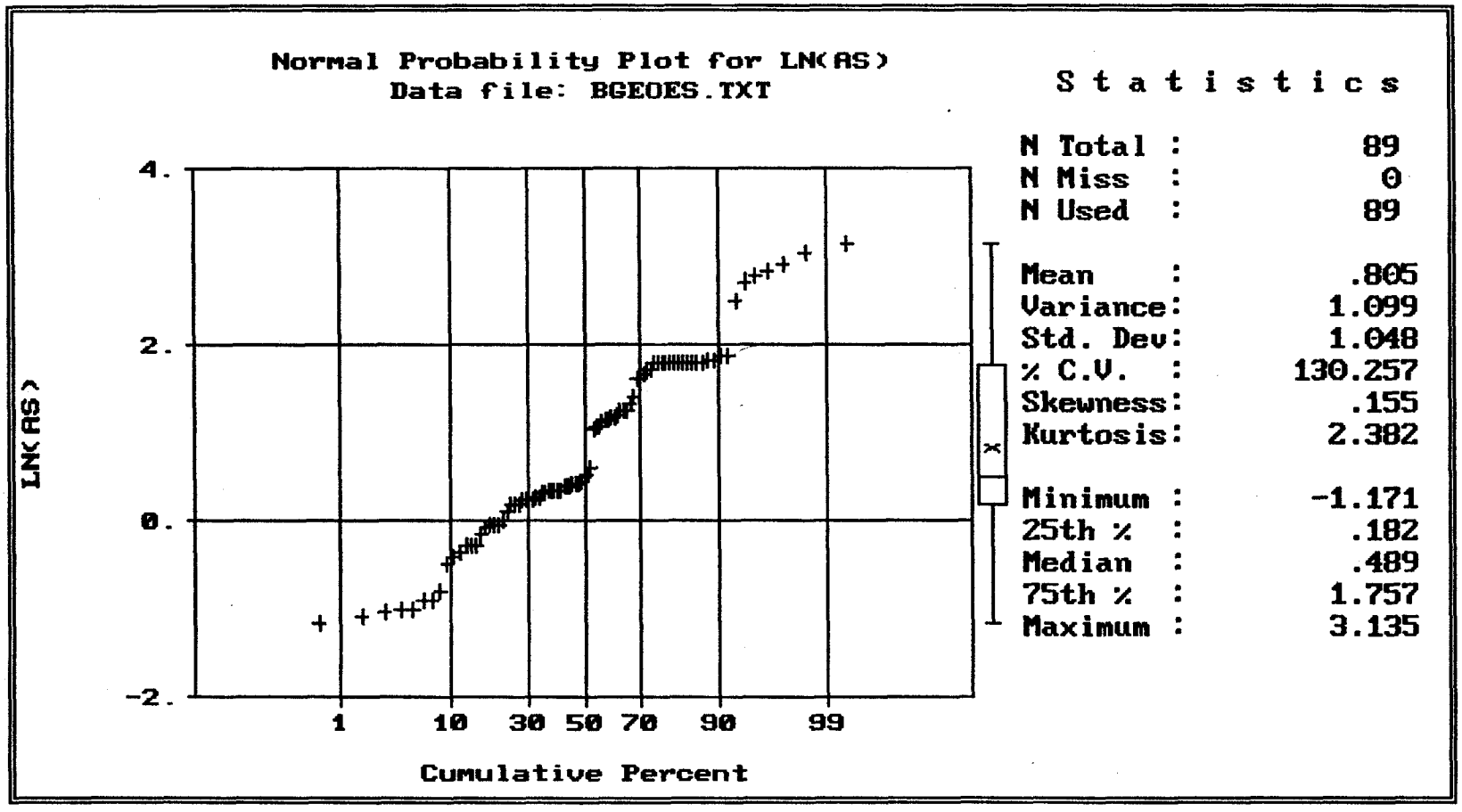
ATTACHMENT A
BLUE AREA
ANTIMONY (ALL SAMPLES)



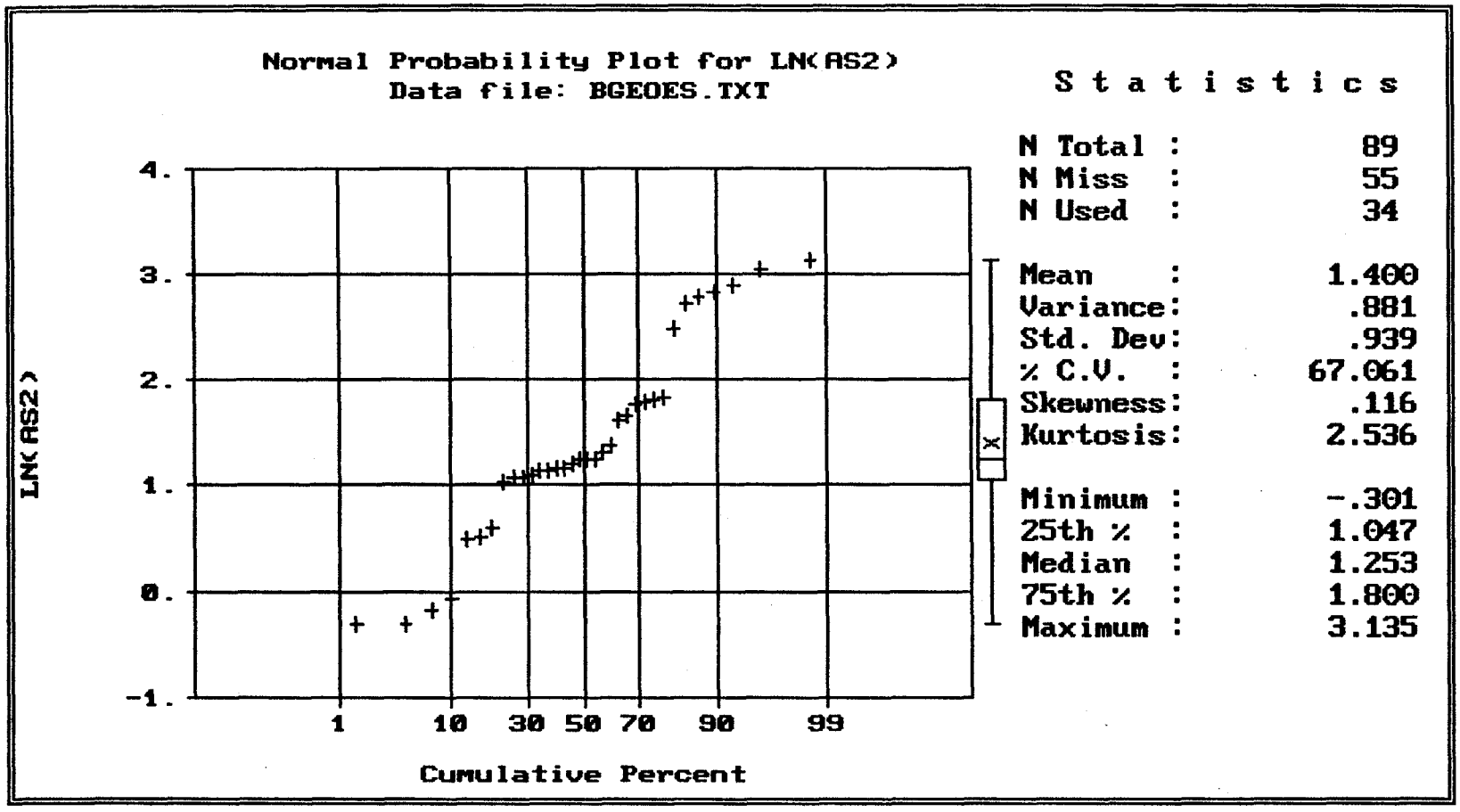
ATTACHMENT A
BLUE AREA
ANTIMONY (DETECTED RESULTS ONLY)



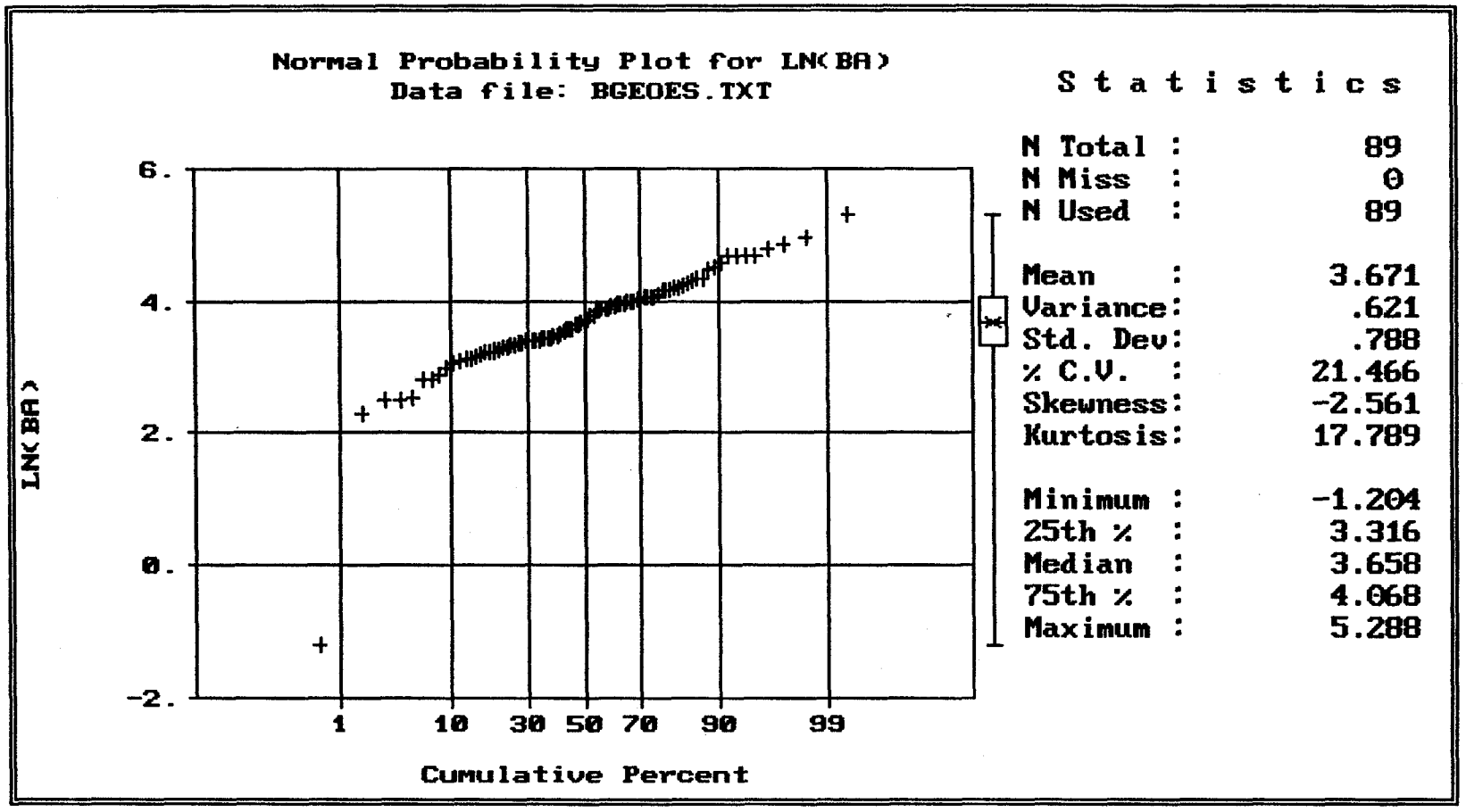
ATTACHMENT A
BLUE AREA
ARSENIC (ALL SAMPLES)



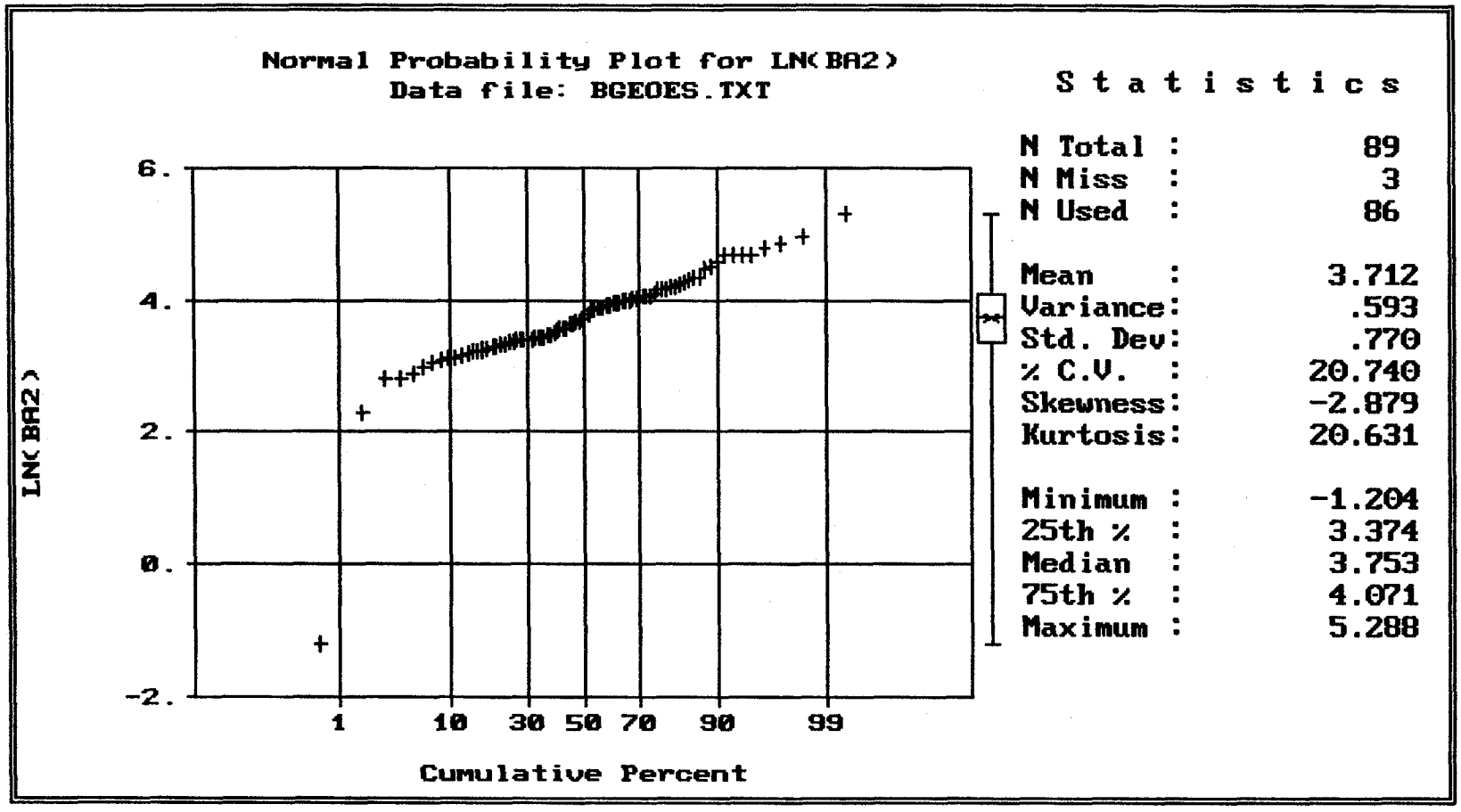
ATTACHMENT A
BLUE AREA
ARSENIC (DETECTED RESULTS ONLY)



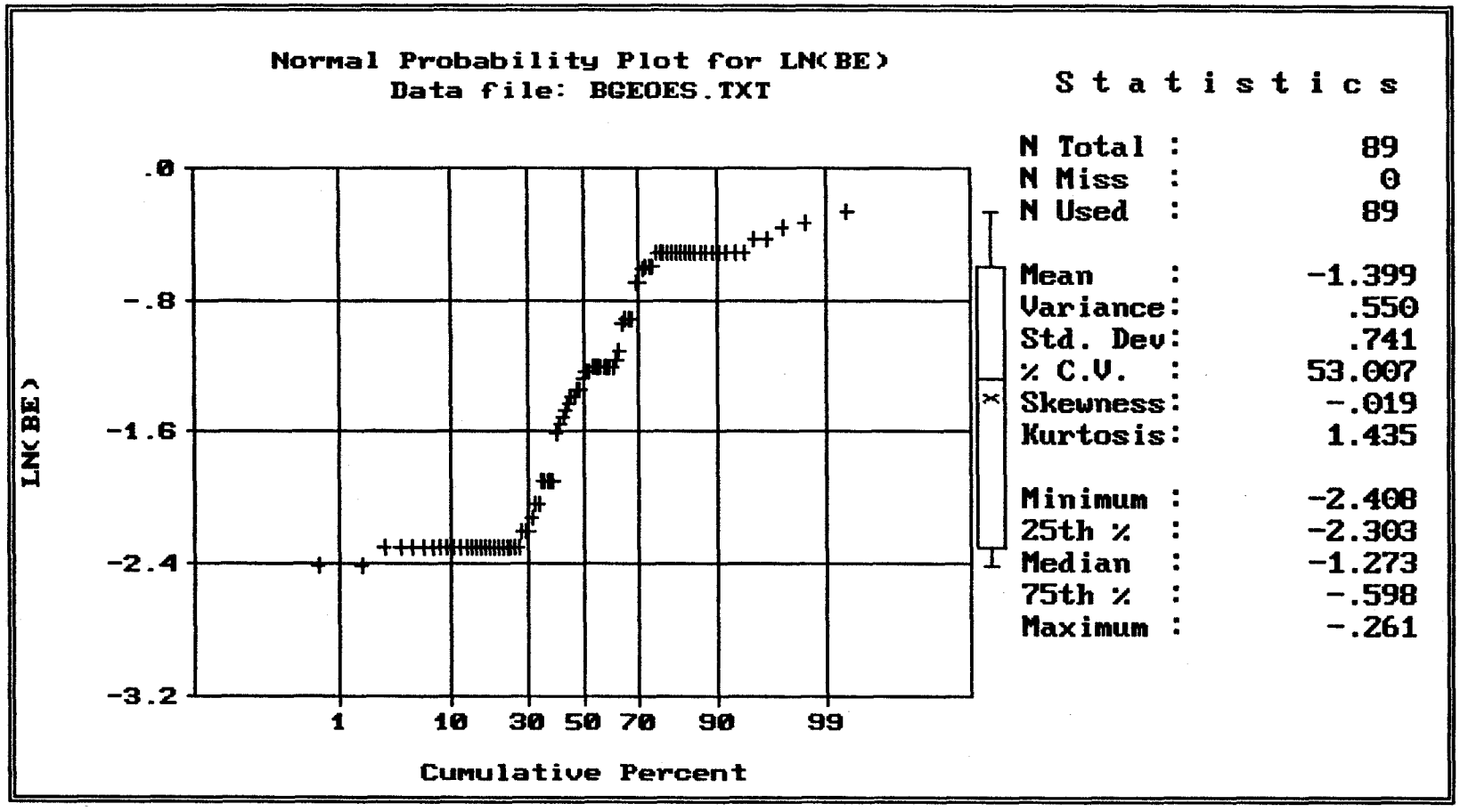
ATTACHMENT A
BLUE AREA
BARIUM (ALL SAMPLES)



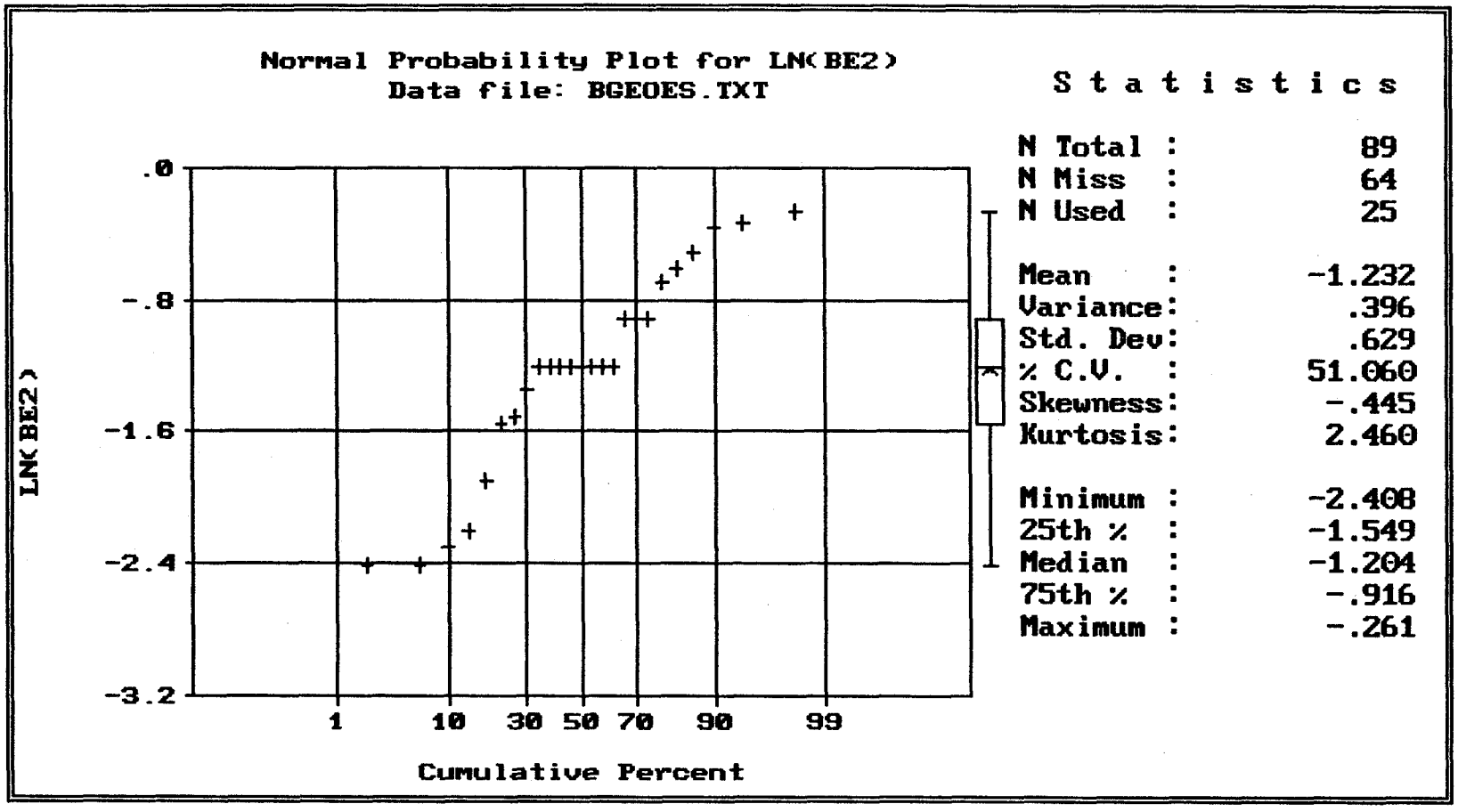
ATTACHMENT A
BLUE AREA
BARIUM (DETECTED RESULTS ONLY)



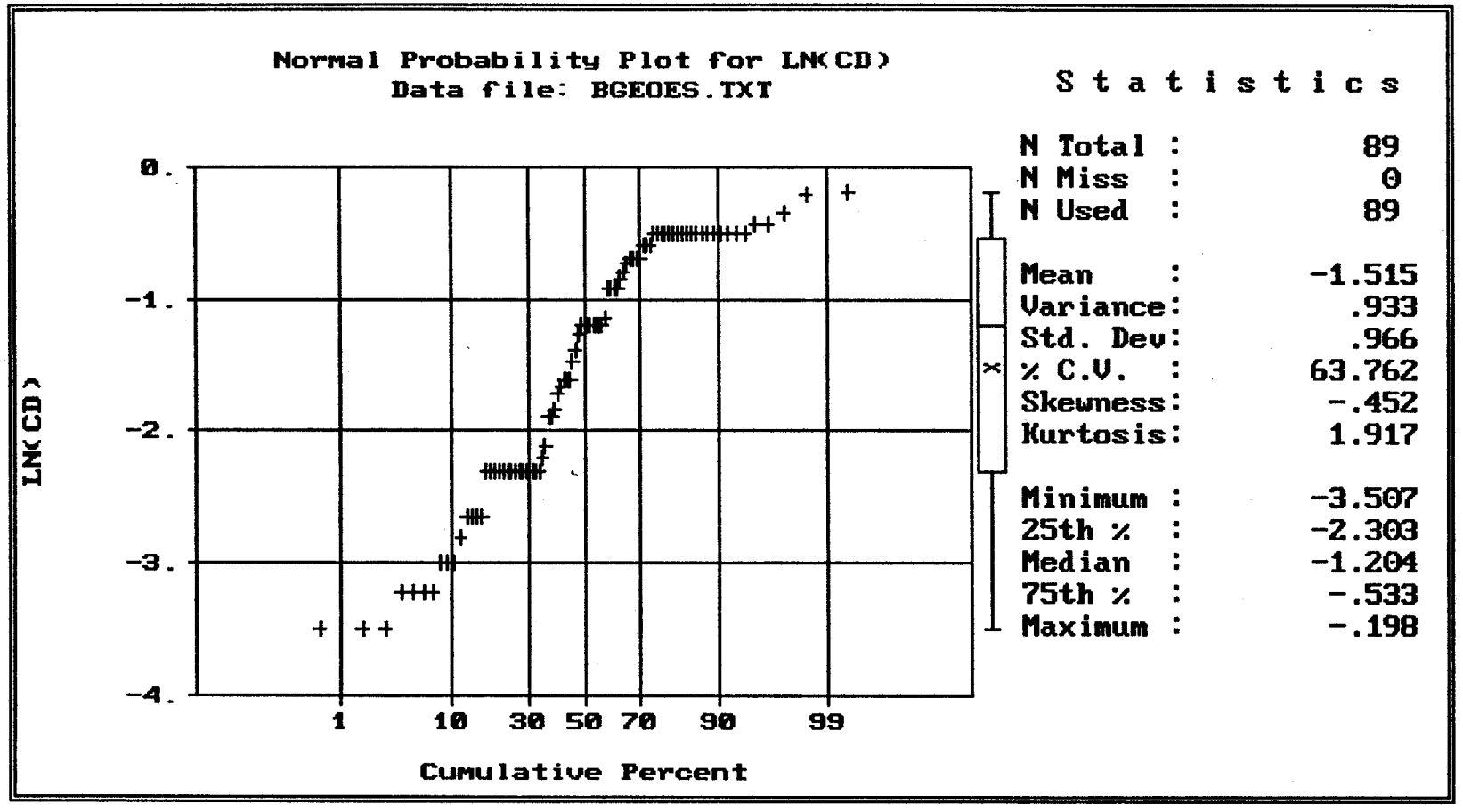
ATTACHMENT A
BLUE AREA
BERYLLIUM (ALL SAMPLES)



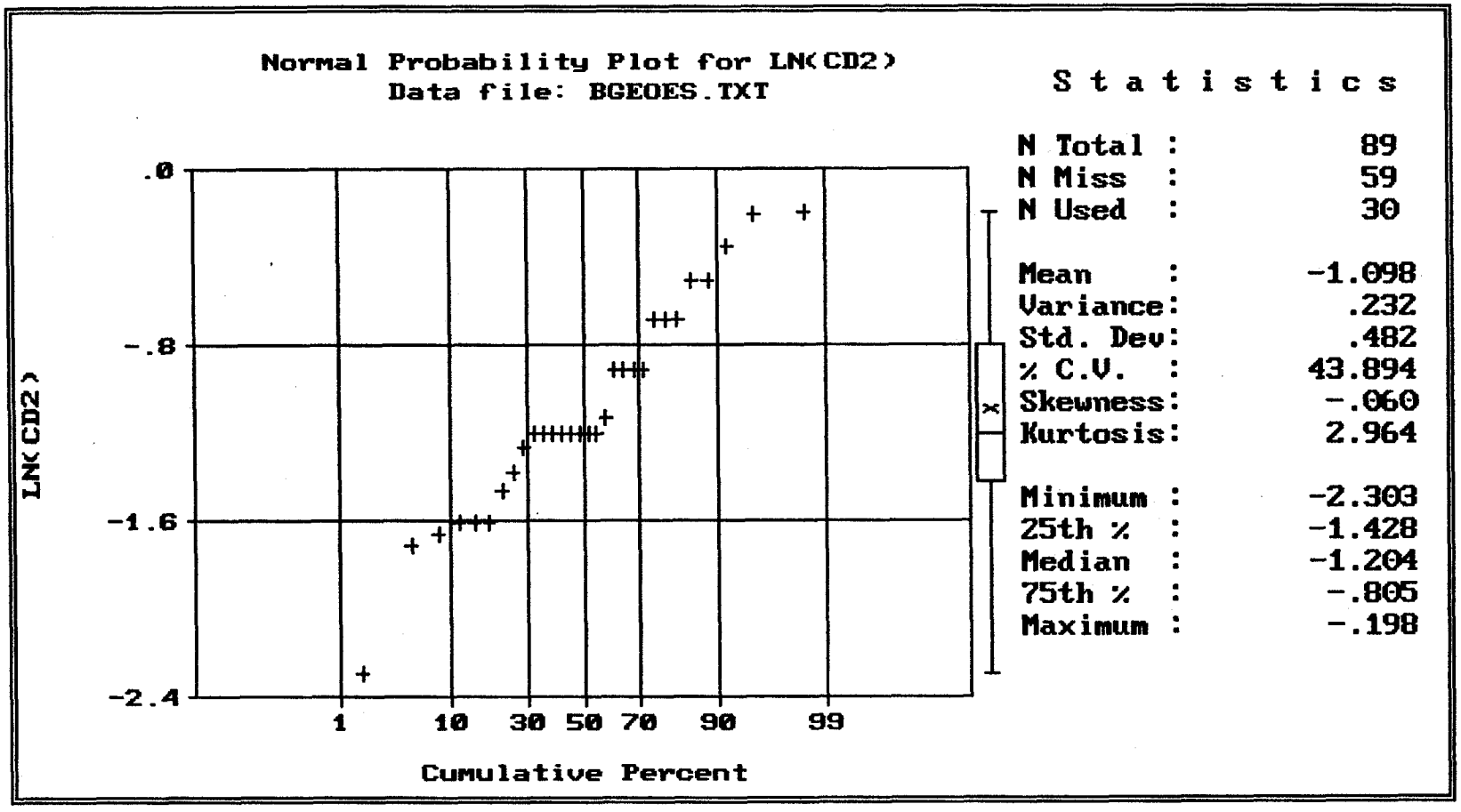
ATTACHMENT A
BLUE AREA
BERYLLIUM (DETECTED RESULTS ONLY)



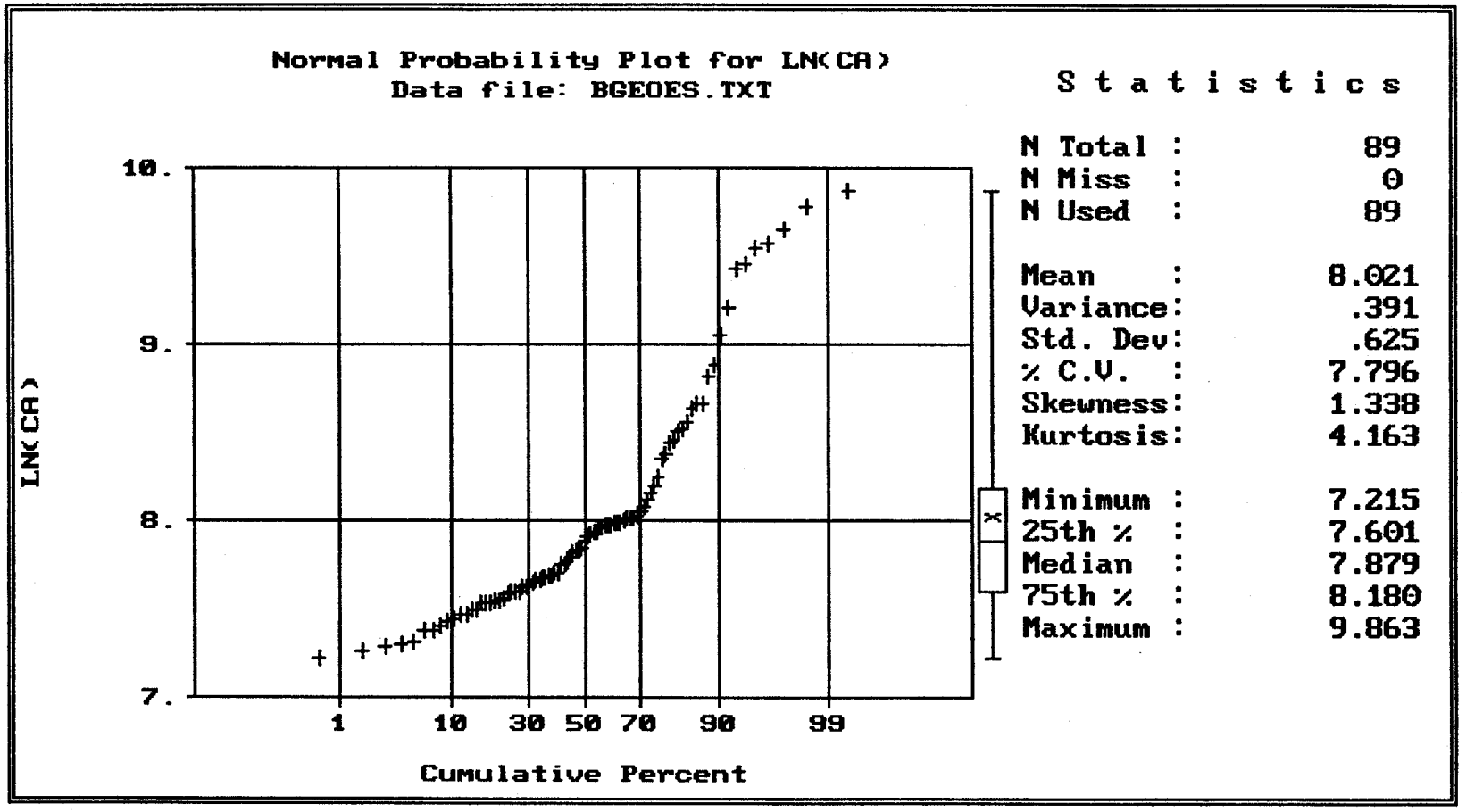
ATTACHMENT A
BLUE AREA
CADMIUM (ALL SAMPLES)



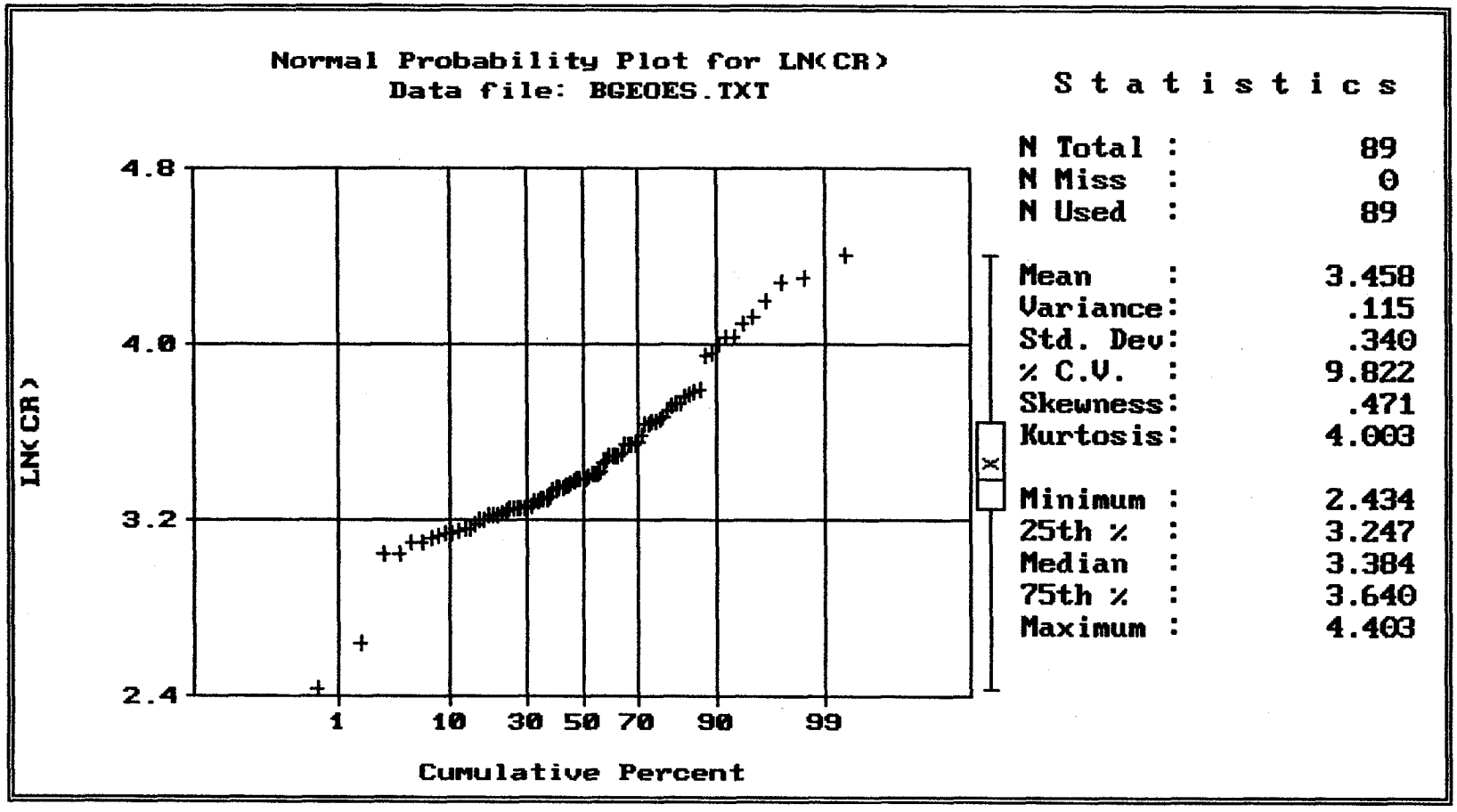
ATTACHMENT A
BLUE AREA
CADMIUM (DETECTED RESULTS ONLY)



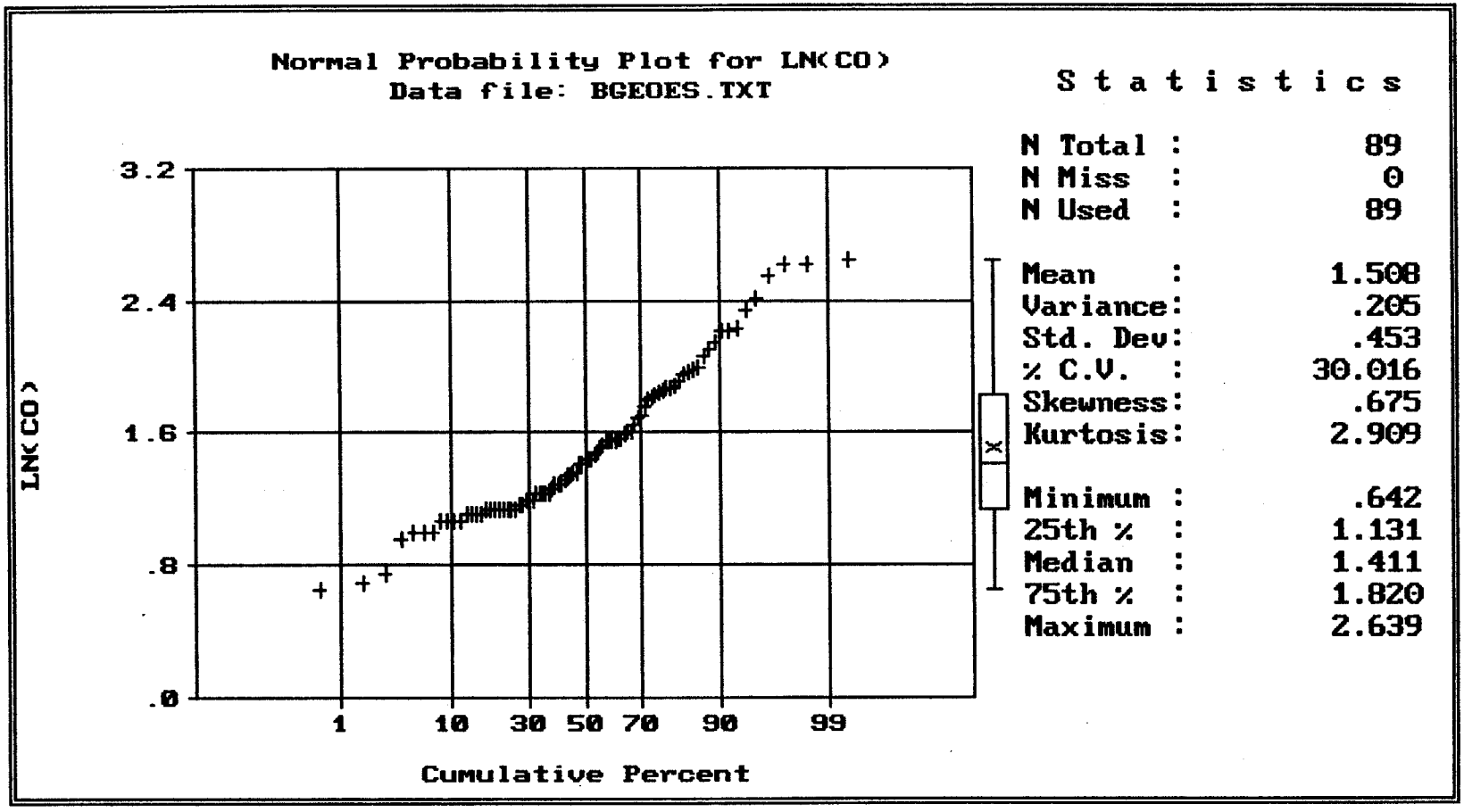
ATTACHMENT A
BLUE AREA
CALCIUM (ALL SAMPLES)



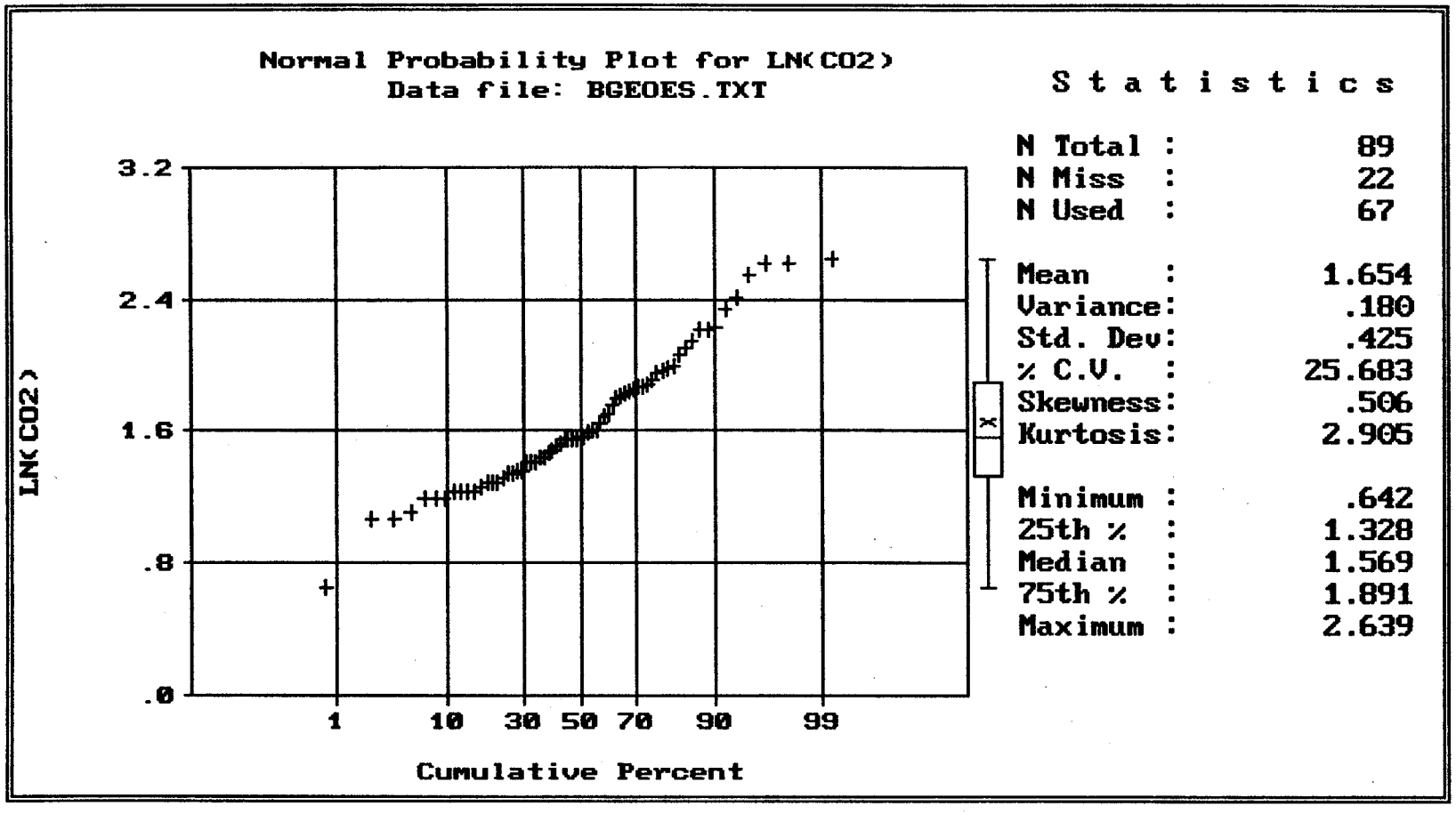
ATTACHMENT A
BLUE AREA
CHROMIUM (ALL SAMPLES)



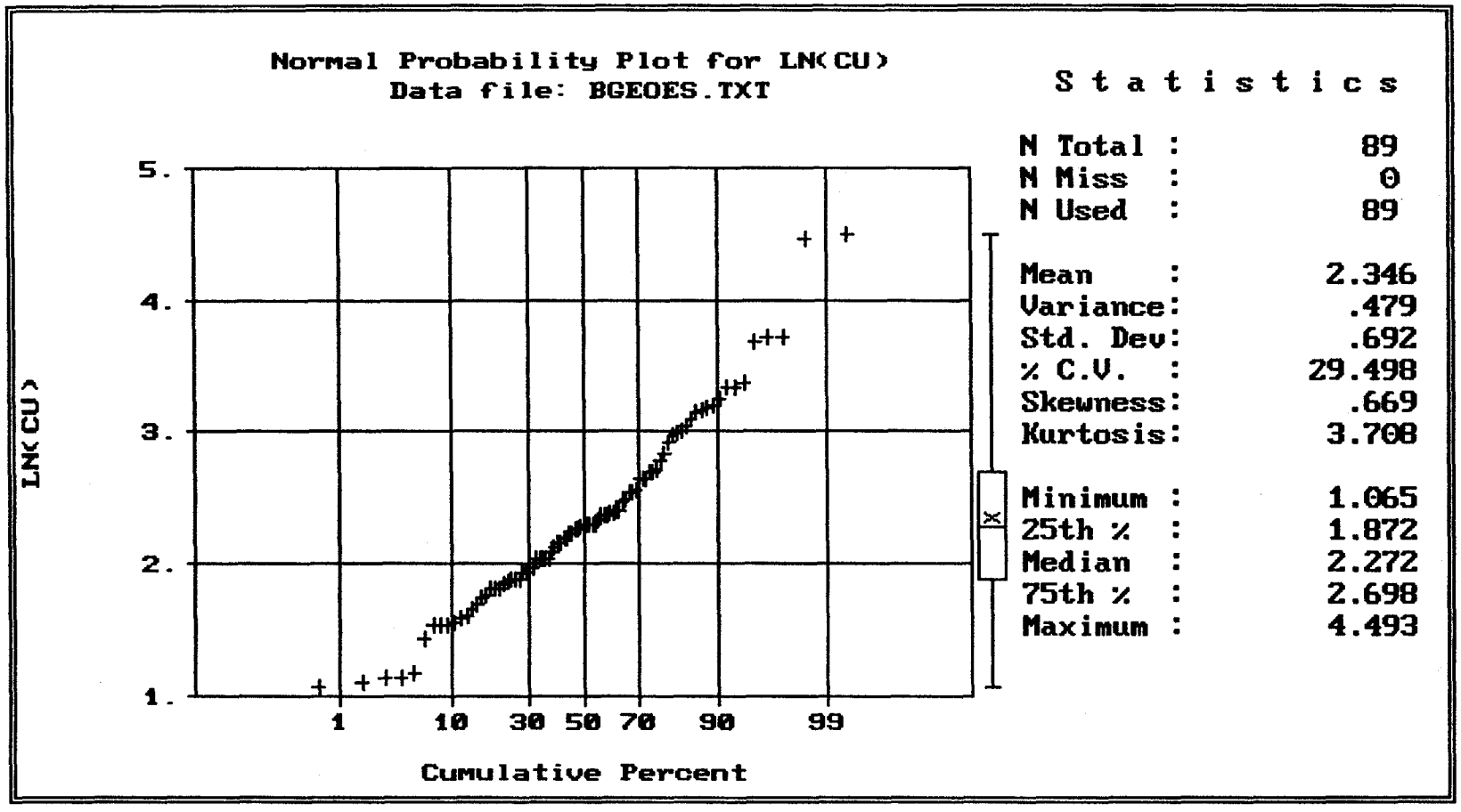
ATTACHMENT A
BLUE AREA
COBALT (ALL SAMPLES)



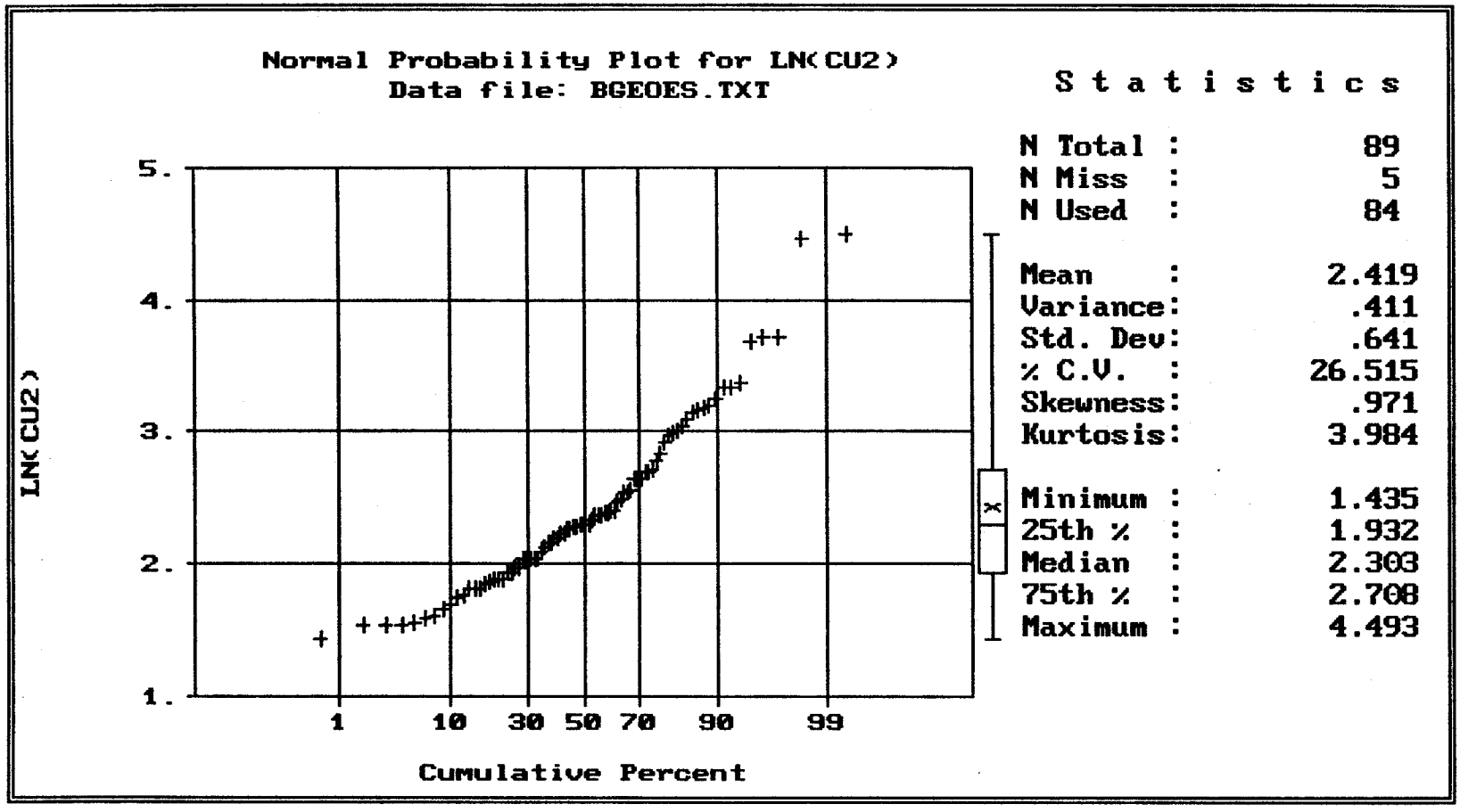
ATTACHMENT A
BLUE AREA
COBALT (DETECTED RESULTS ONLY)



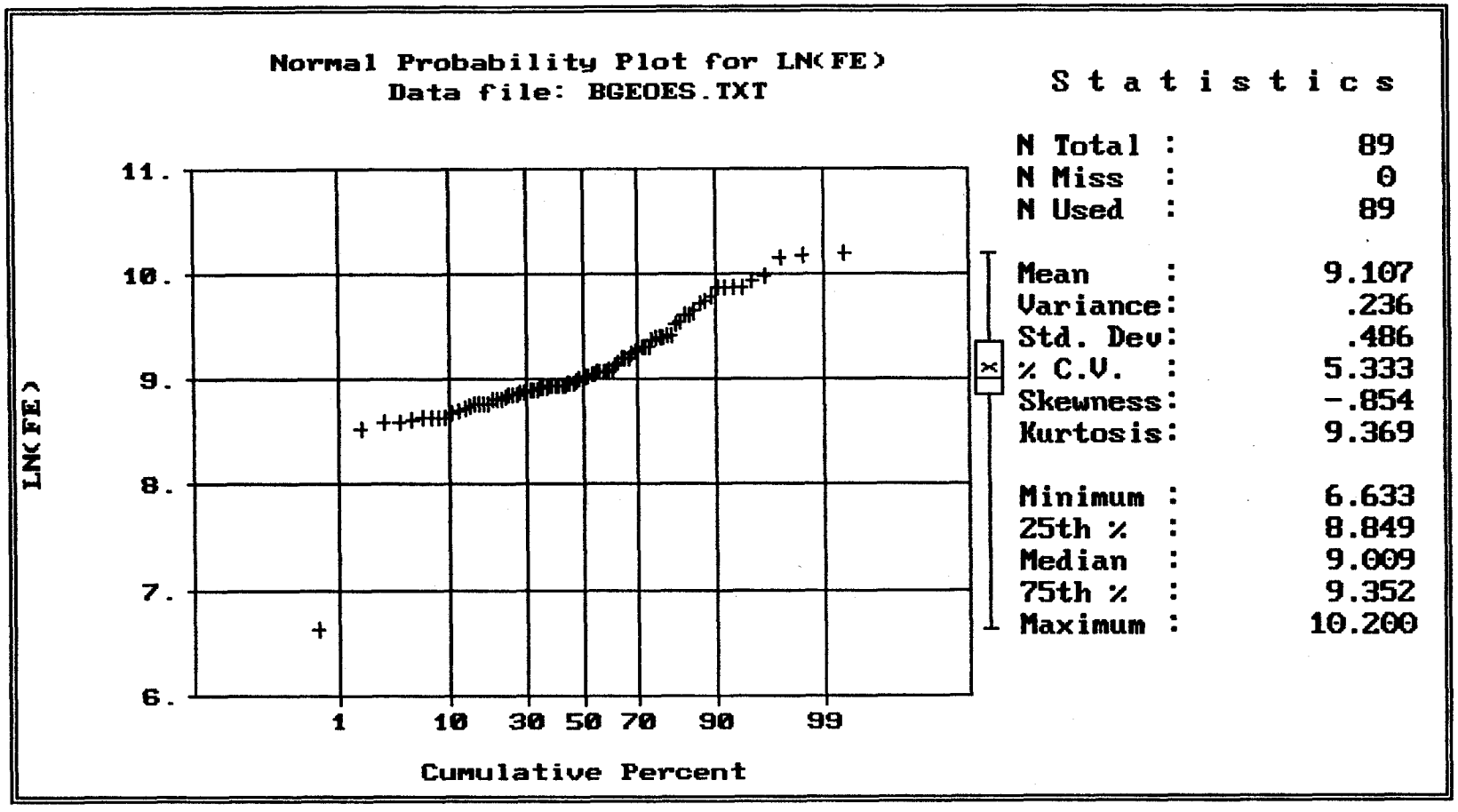
ATTACHMENT A
BLUE AREA
COPPER (ALL SAMPLES)



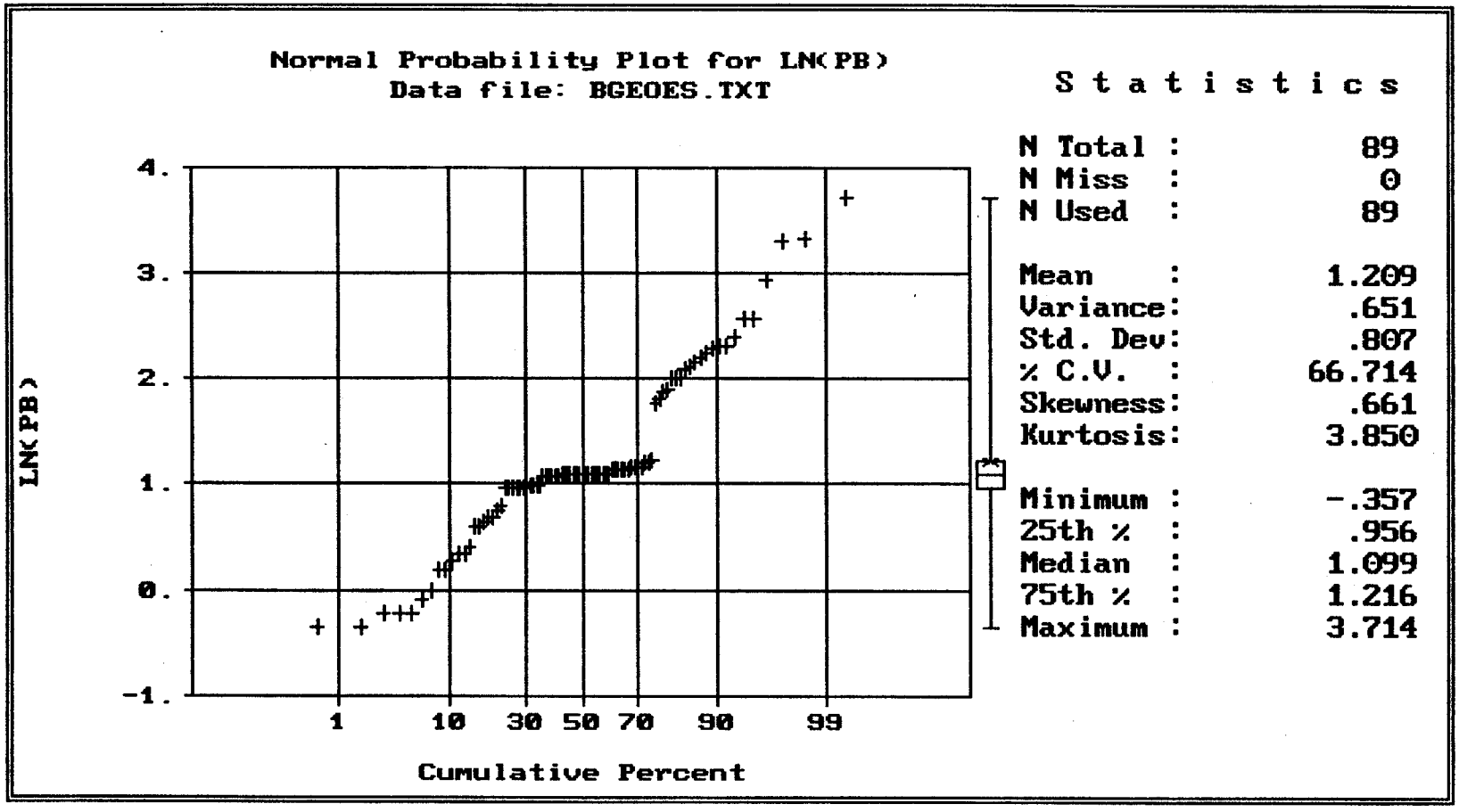
ATTACHMENT A
BLUE AREA
COPPER (DETECTED RESULTS ONLY)



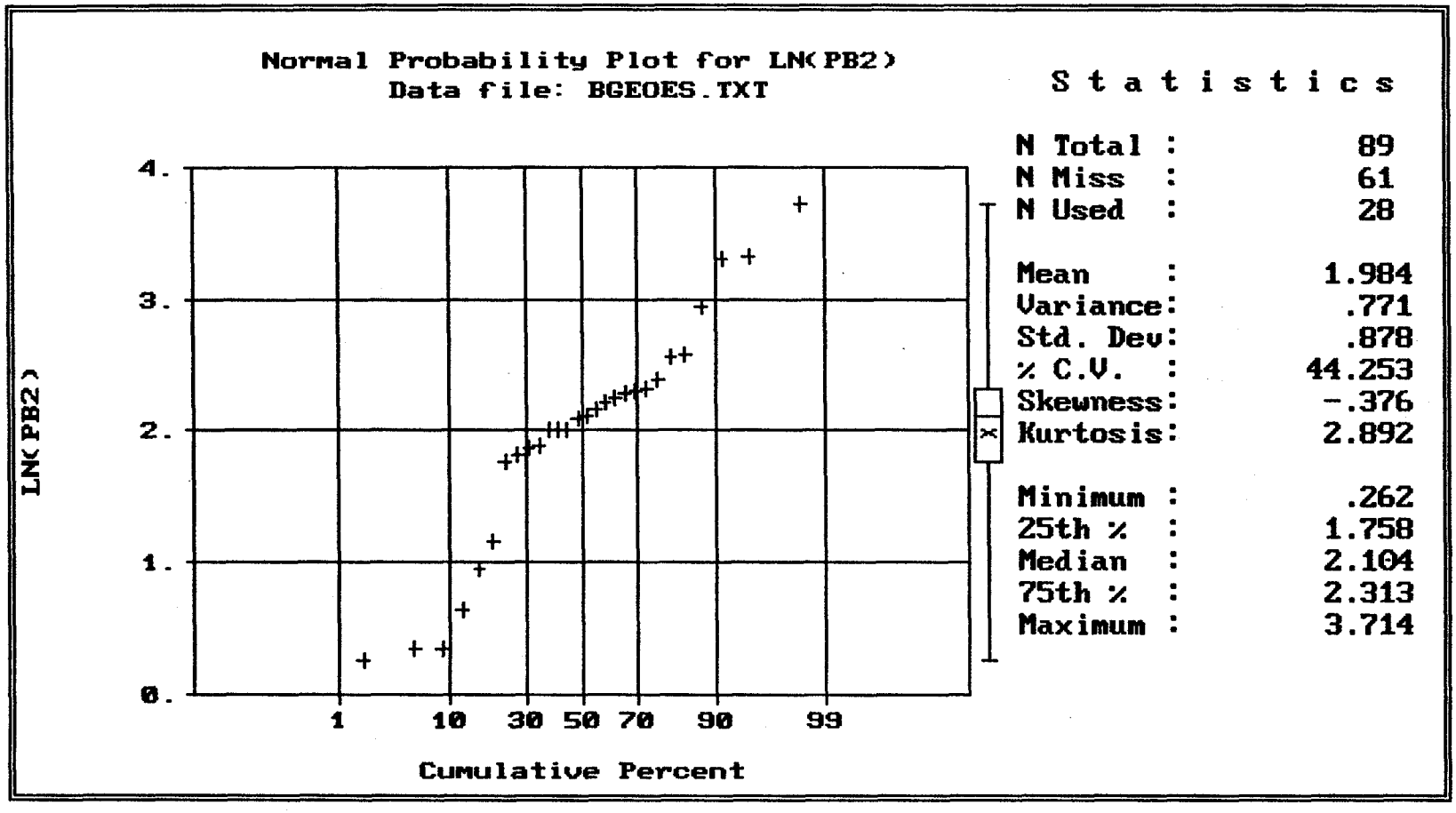
ATTACHMENT A
BLUE AREA
IRON (ALL SAMPLES)



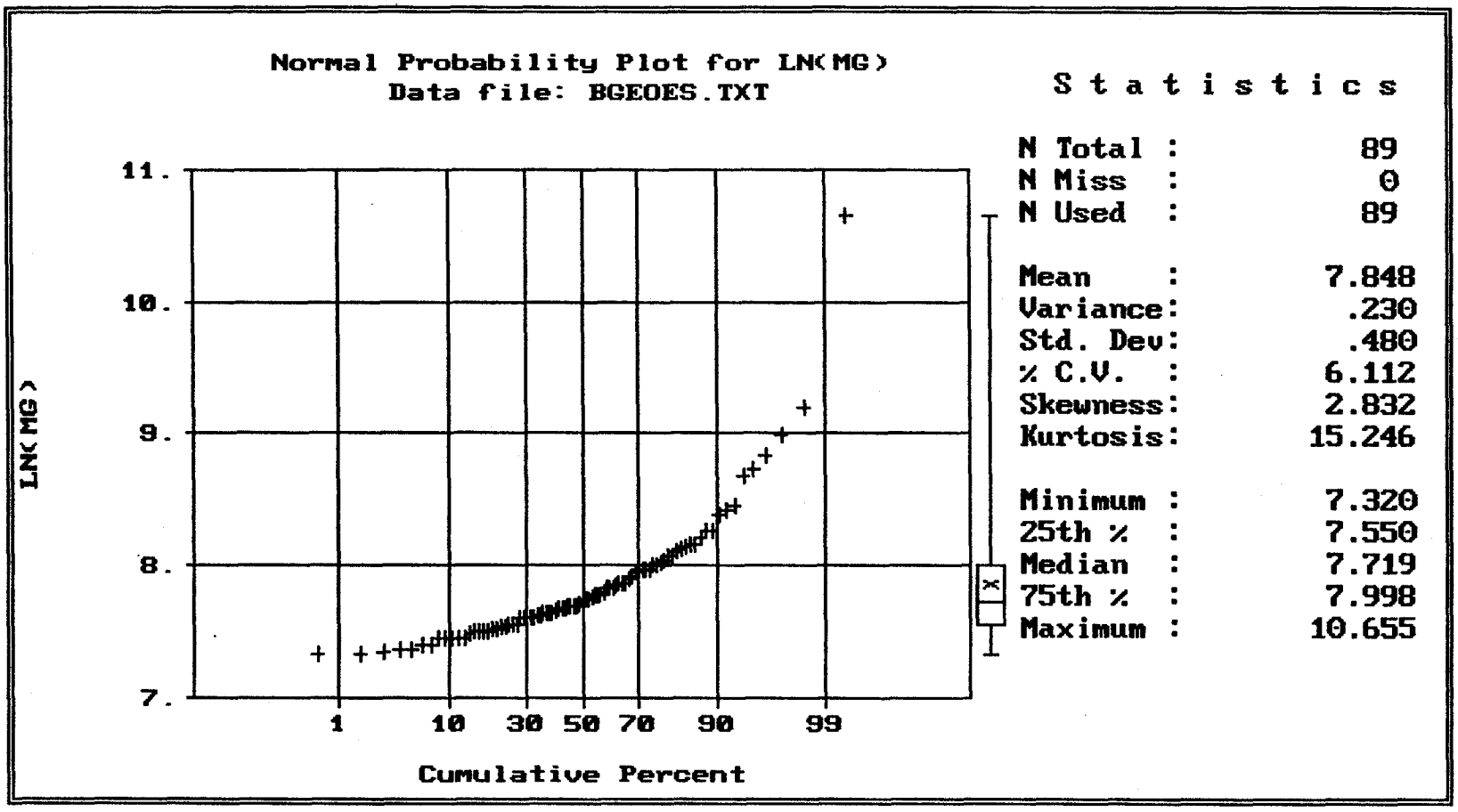
ATTACHMENT A
BLUE AREA
LEAD (ALL SAMPLES)



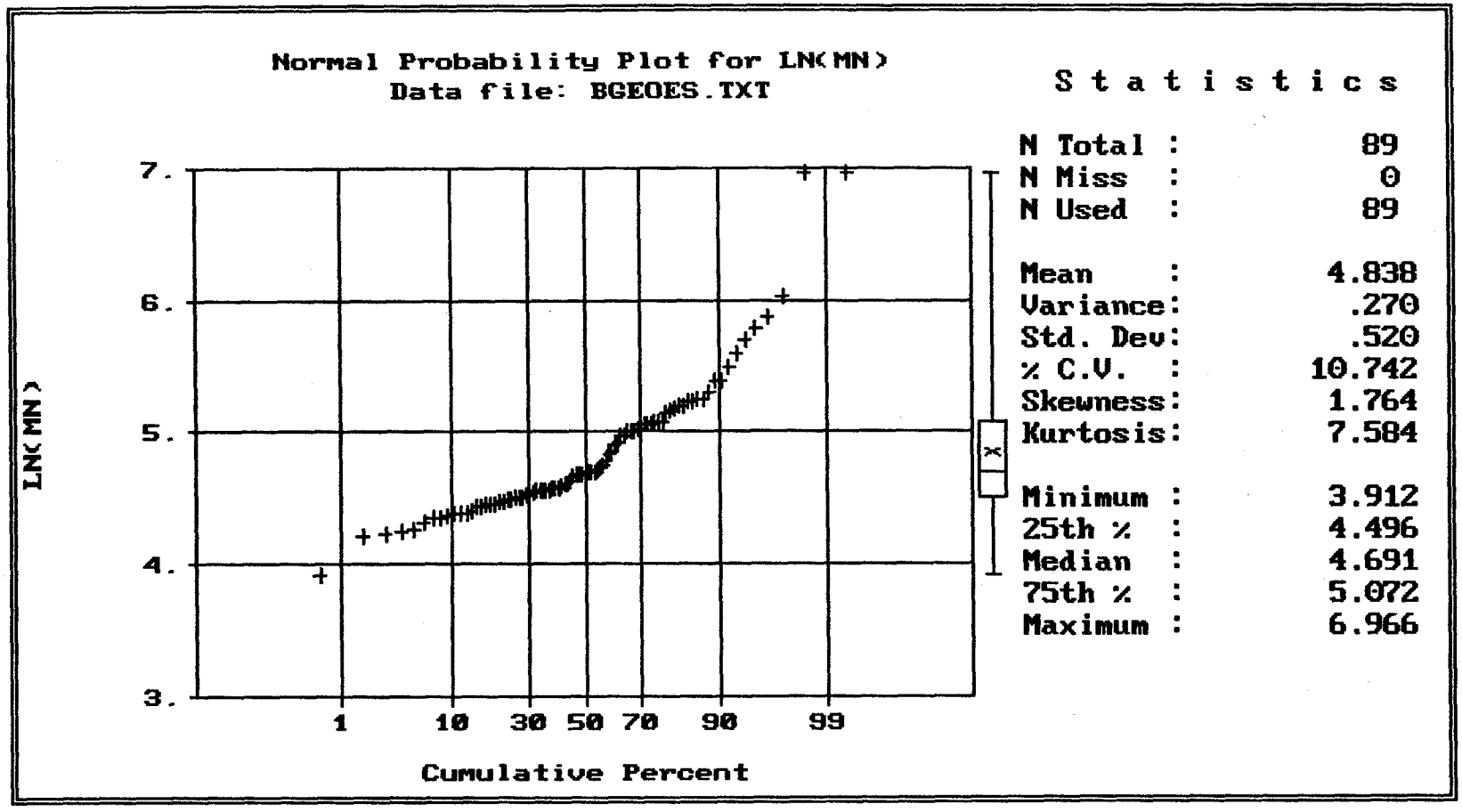
ATTACHMENT A
BLUE AREA
LEAD (DETECTED RESULTS ONLY)



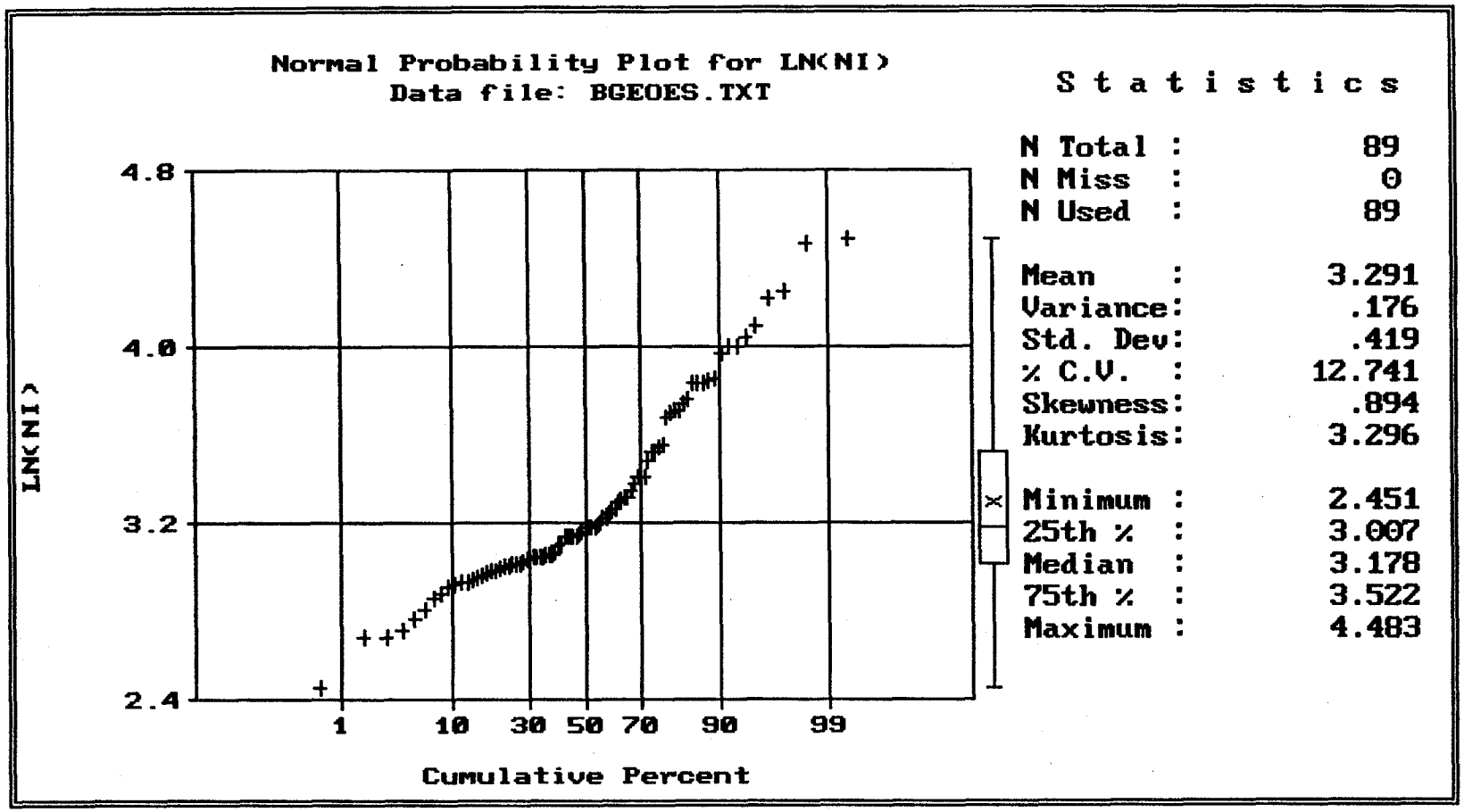
ATTACHMENT A
BLUE AREA
MAGNESIUM (ALL SAMPLES)



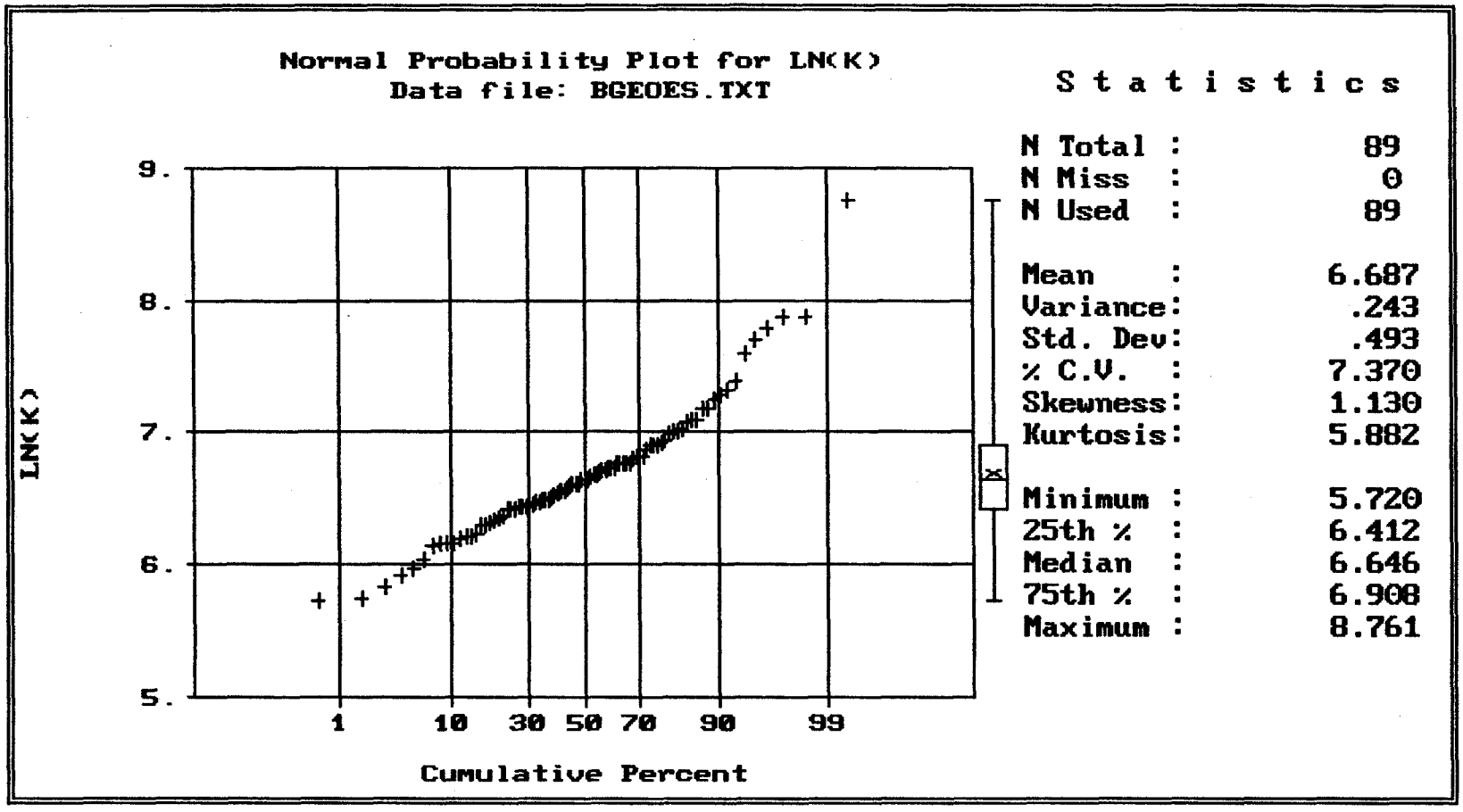
ATTACHMENT A
BLUE AREA
MANGANESE (ALL SAMPLES)



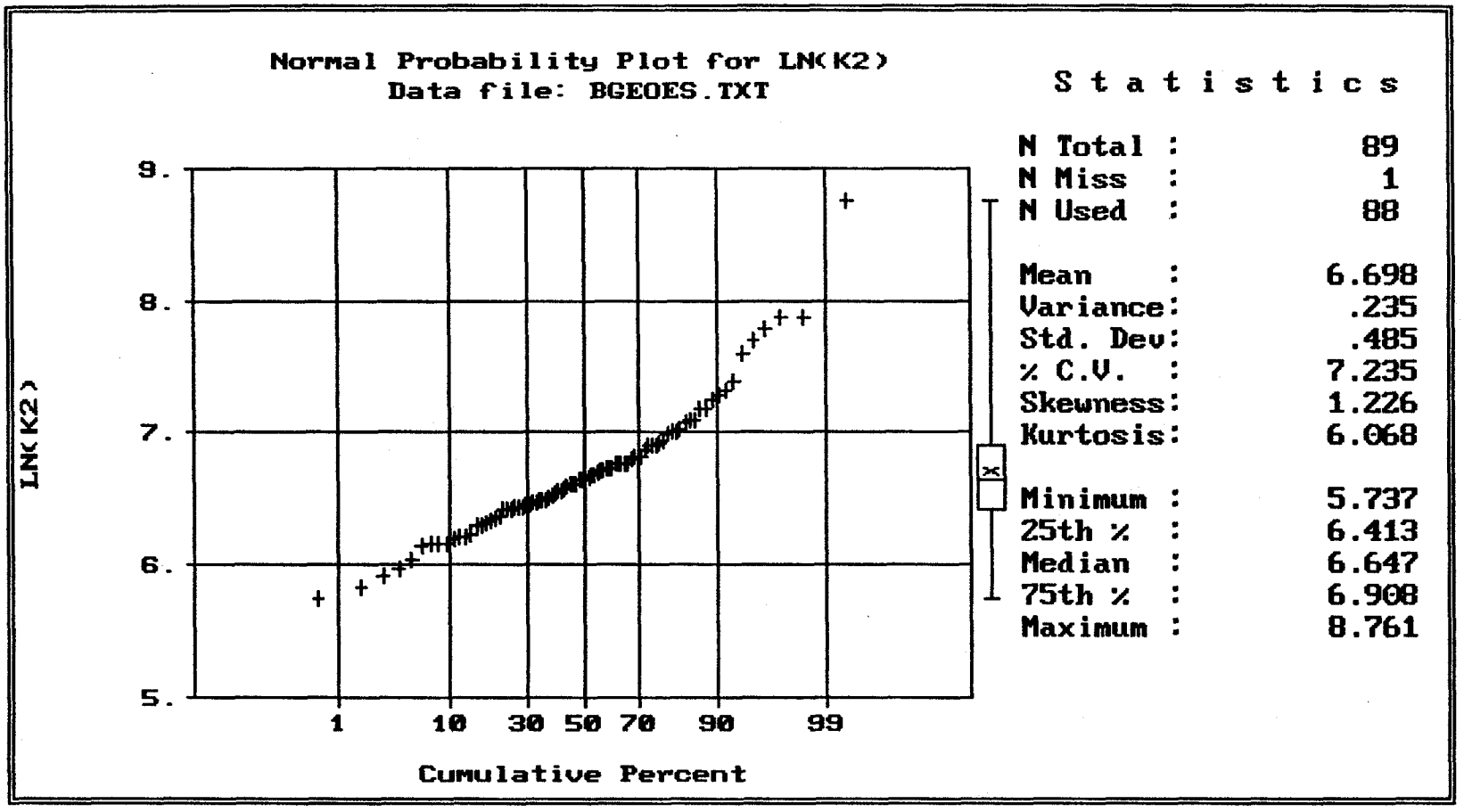
ATTACHMENT A
BLUE AREA
NICKEL (ALL SAMPLES)



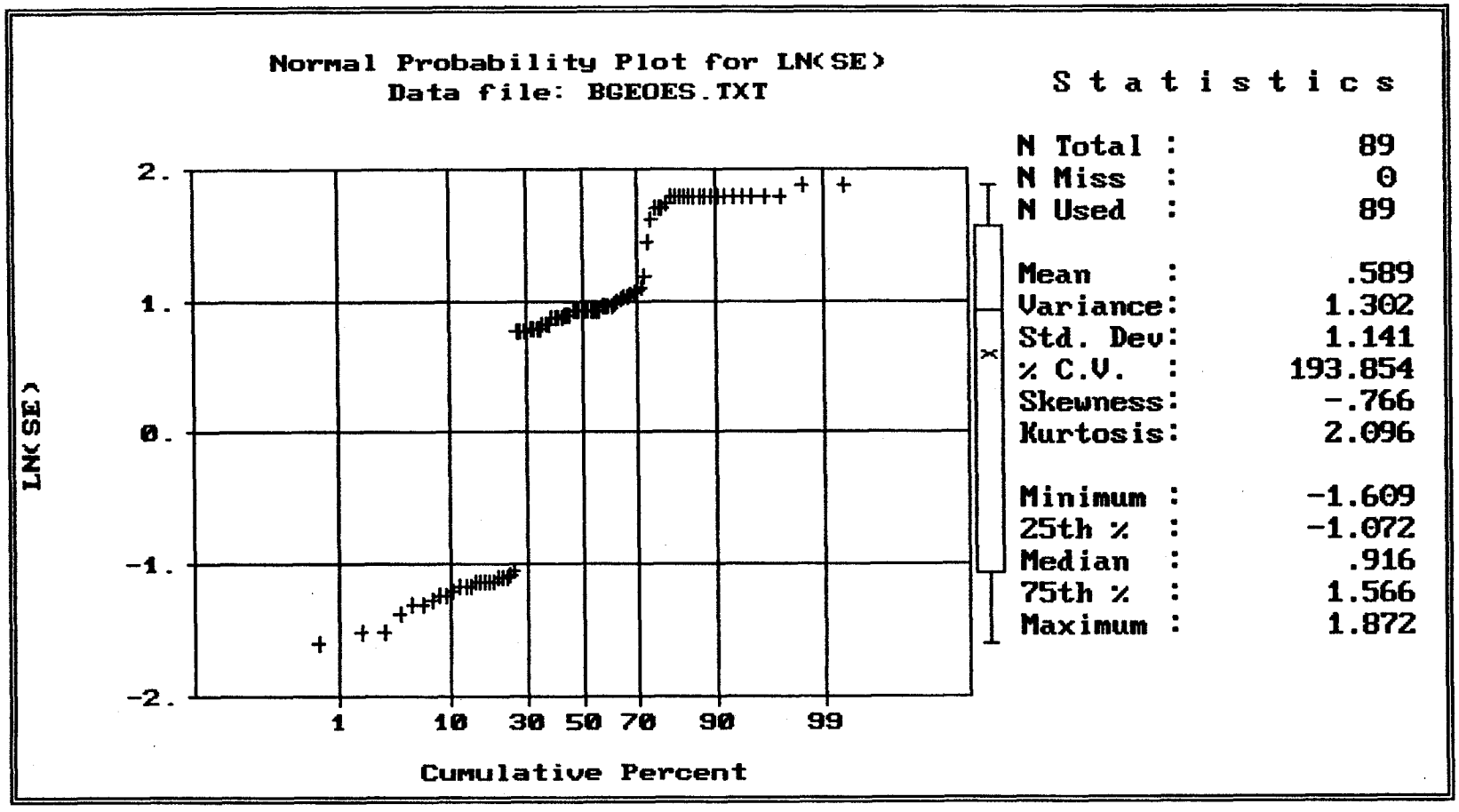
ATTACHMENT A
BLUE AREA
POTASSIUM (ALL SAMPLES)



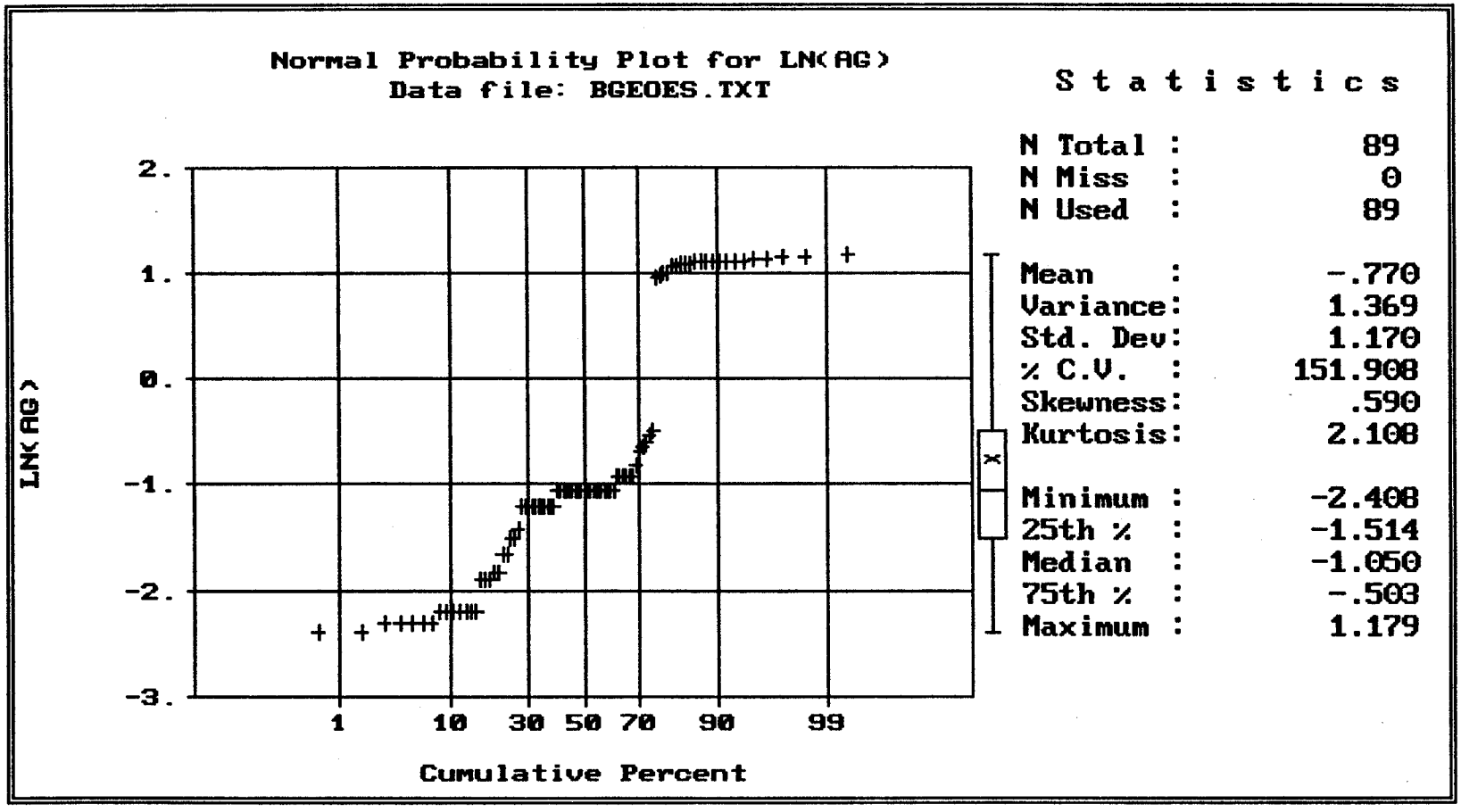
ATTACHMENT A
BLUE AREA
POTASSIUM (DETECTED RESULTS ONLY)



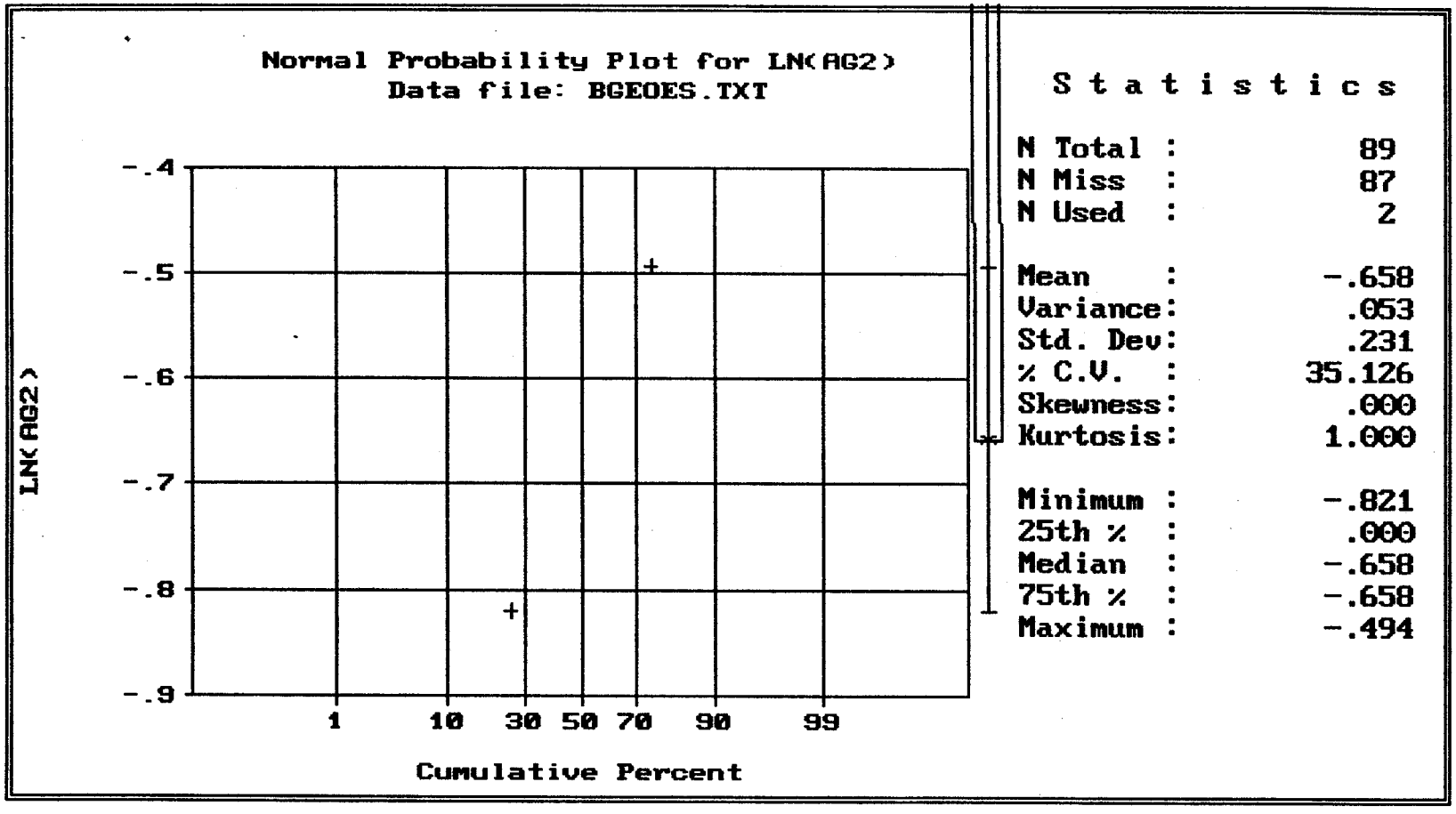
ATTACHMENT A
BLUE AREA
SELENIUM (ALL SAMPLES)



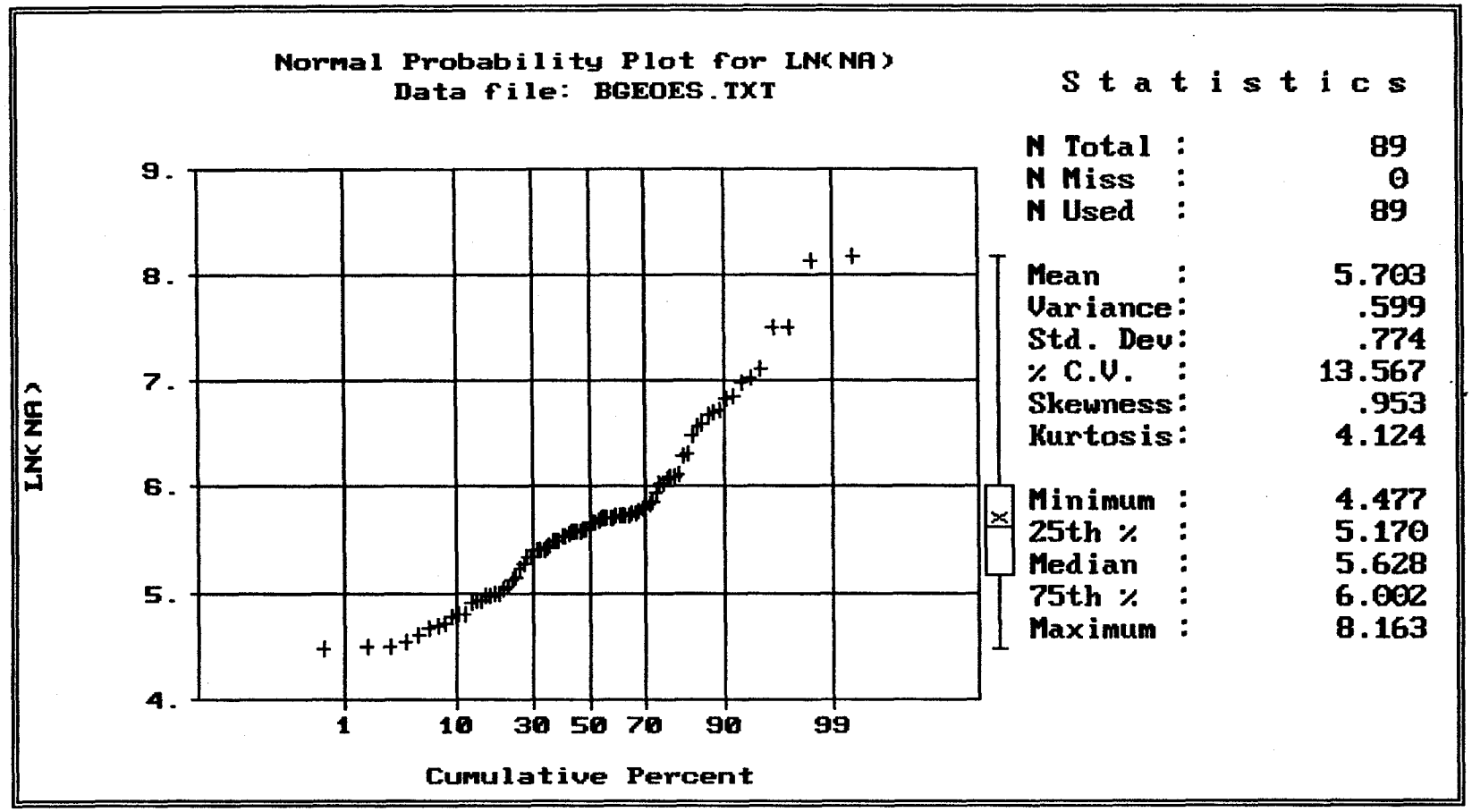
ATTACHMENT A
BLUE AREA
SILVER (ALL SAMPLES)



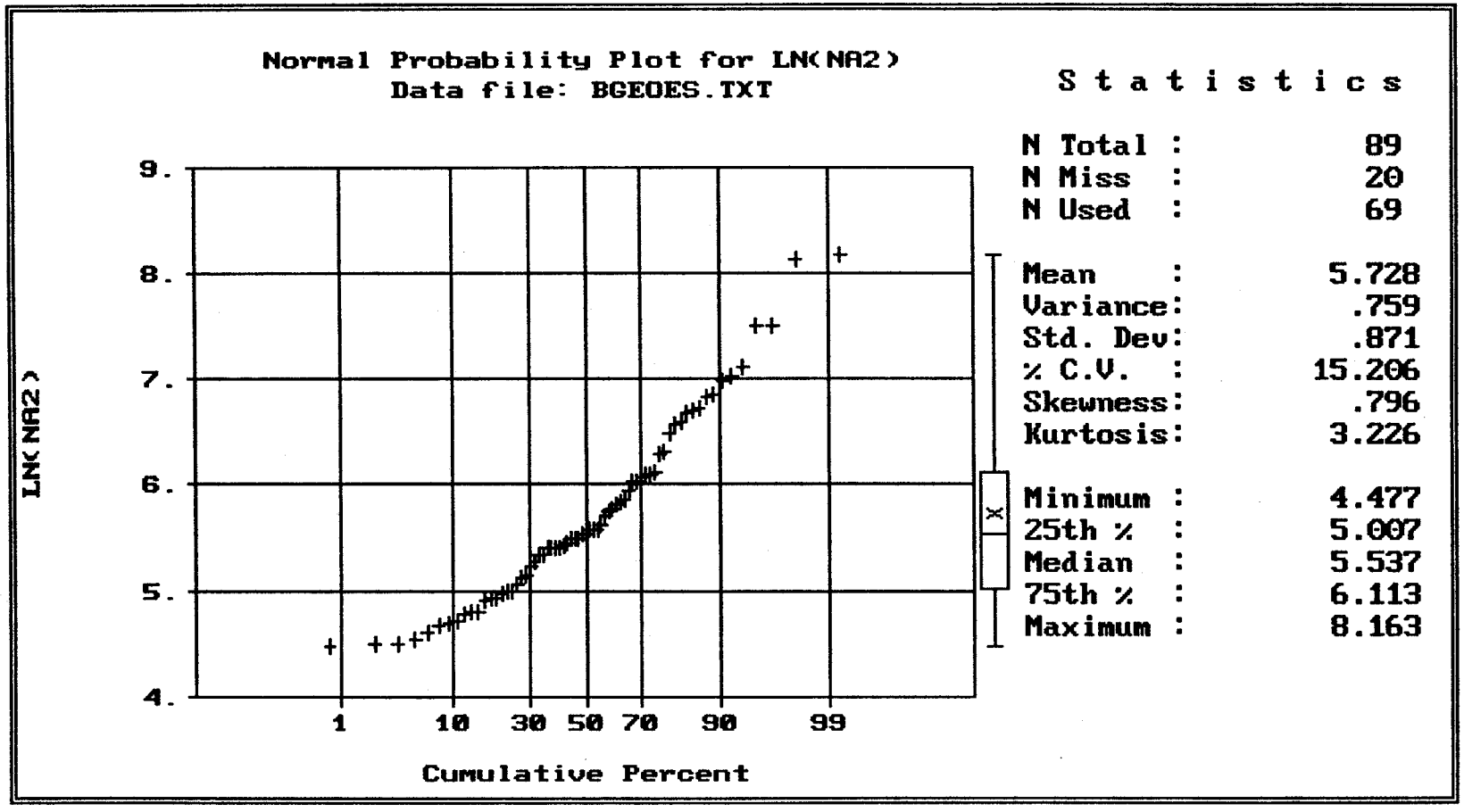
ATTACHMENT A
BLUE AREA
SILVER (DETECTED RSULTS ONLY)



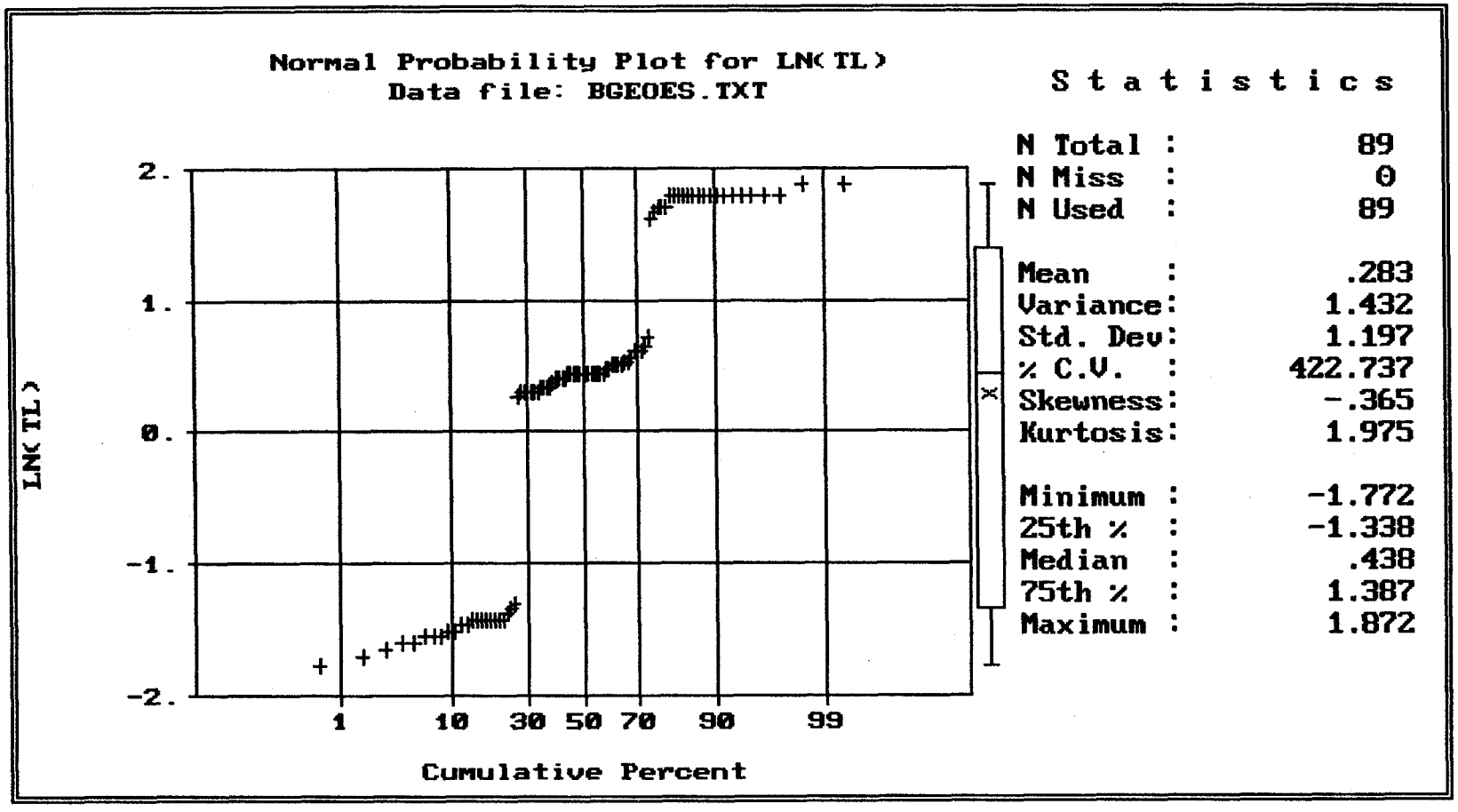
ATTACHMENT A
BLUE AREA
SODIUM (ALL SAMPLES)



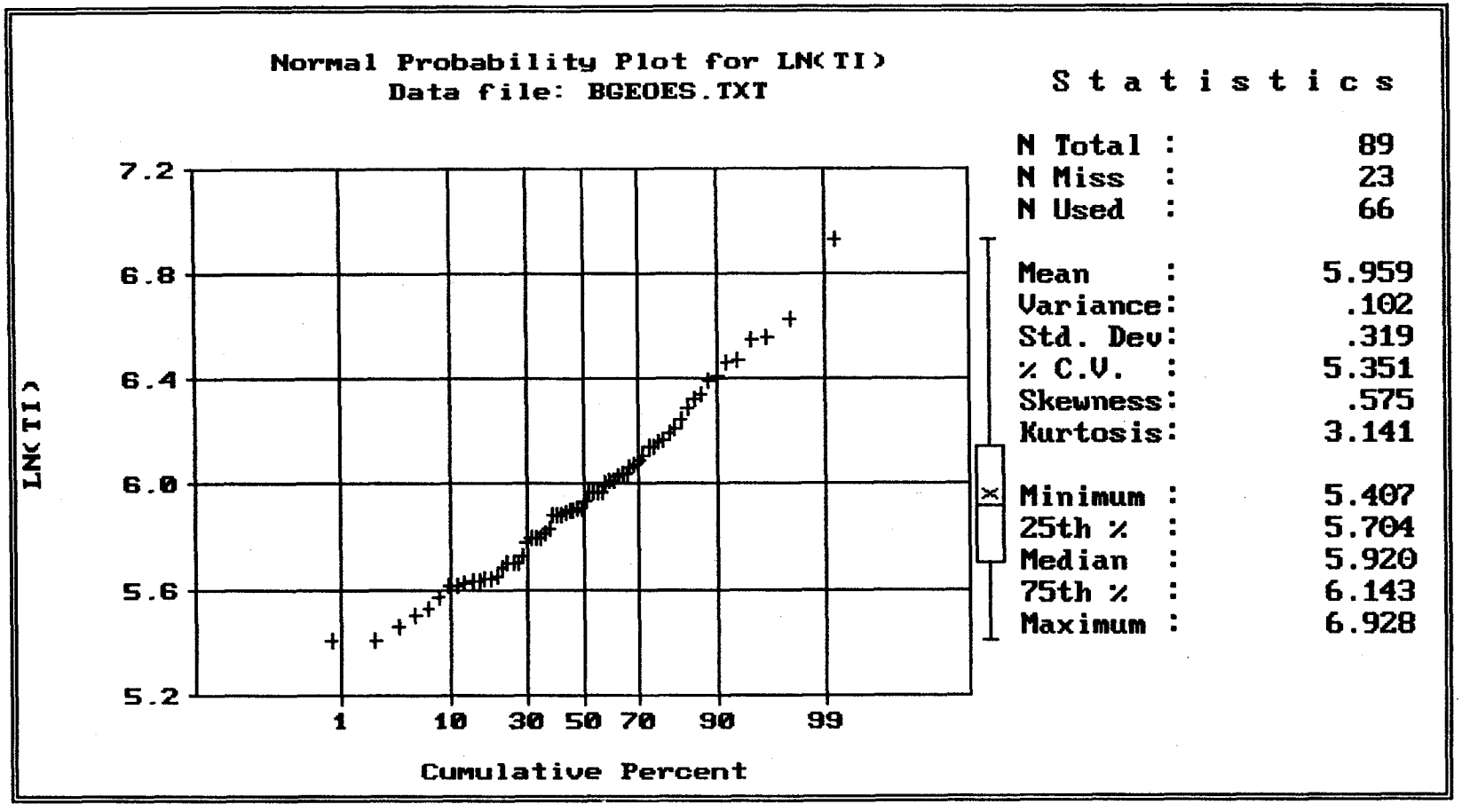
ATTACHMENT A
BLUE AREA
SODIUM (DETECTED RESULTS ONLY)



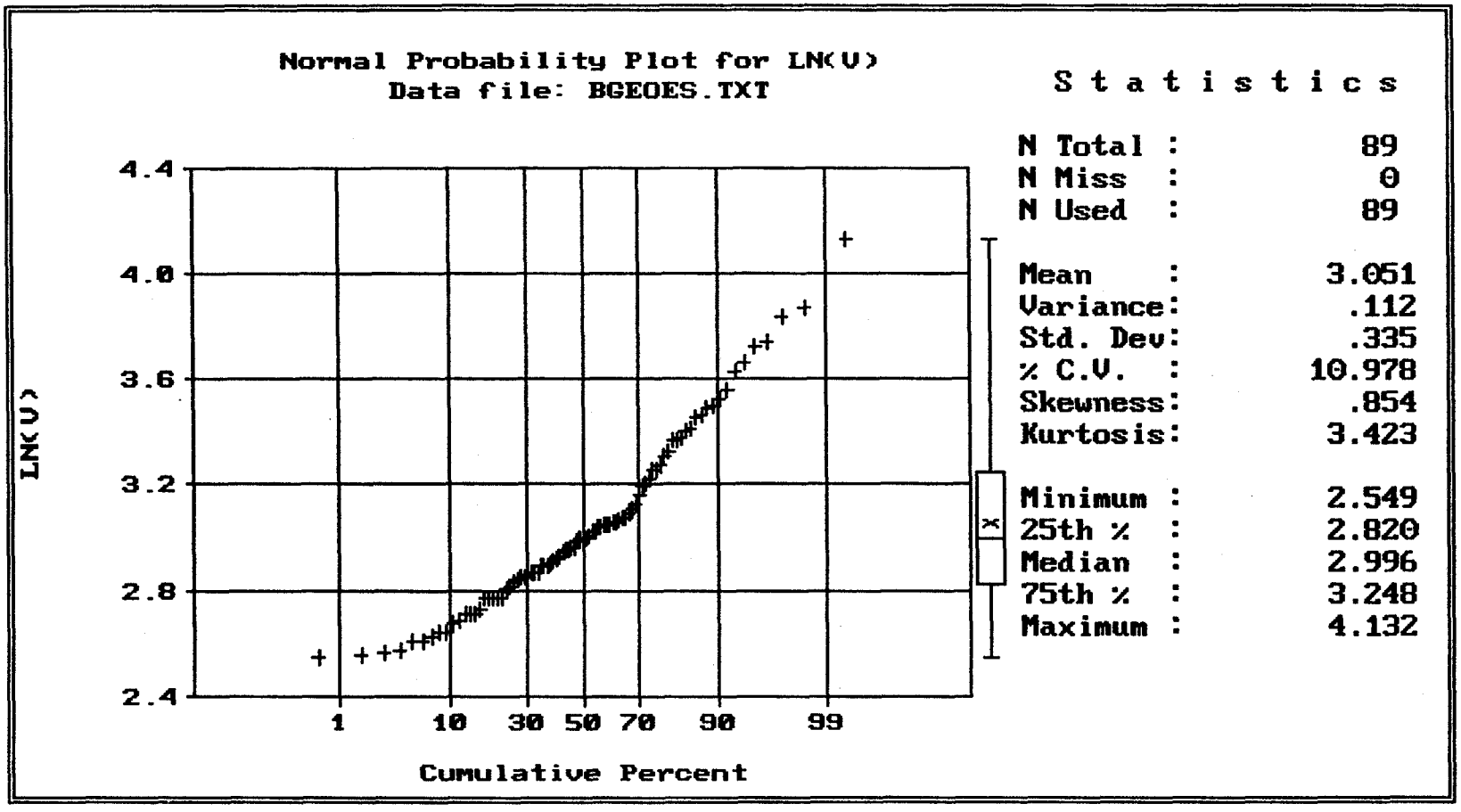
ATTACHMENT A
BLUE AREA
THALLIUM (ALL SAMPLES)



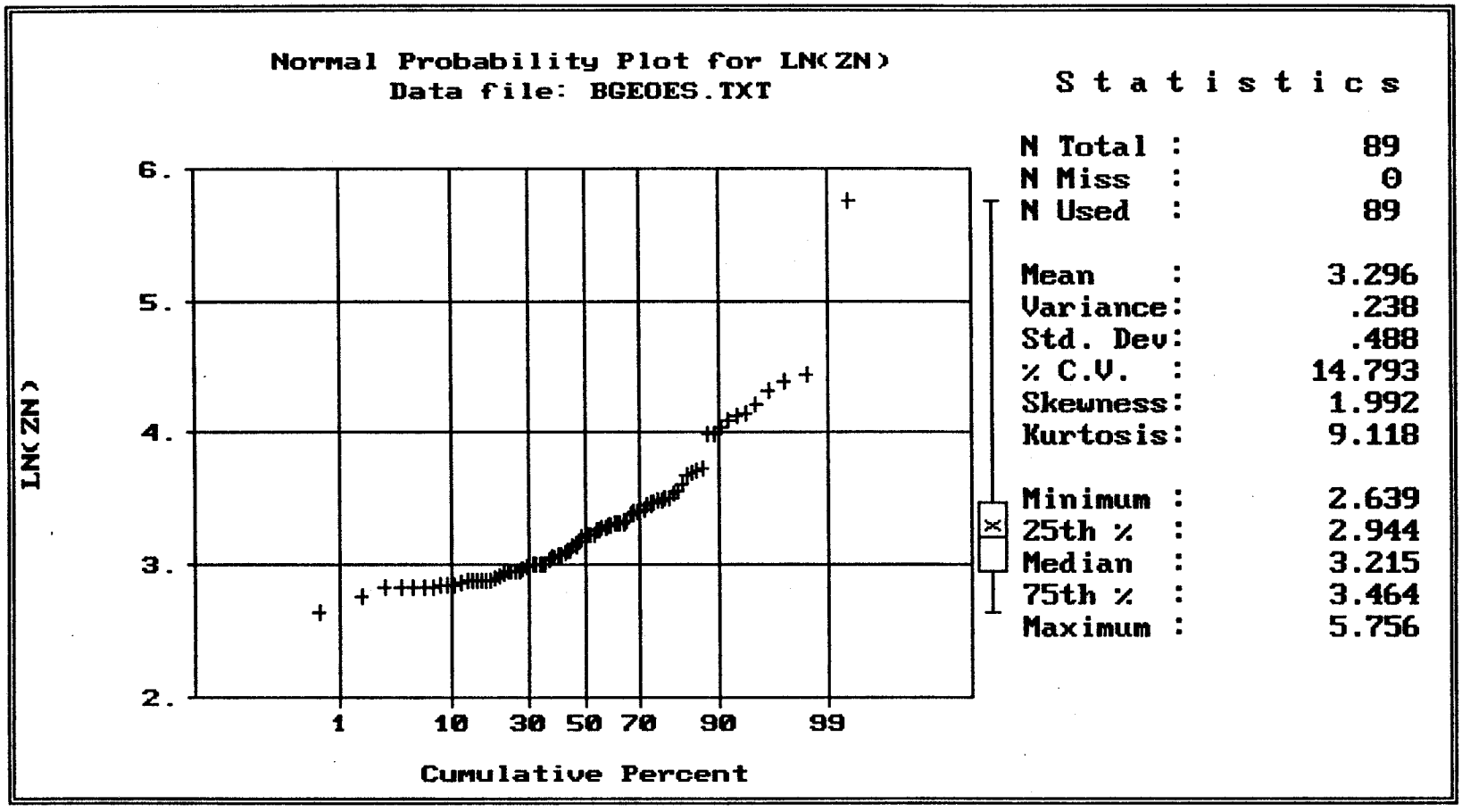
ATTACHMENT A
BLUE AREA
TITANIUM (ALL SAMPLES)



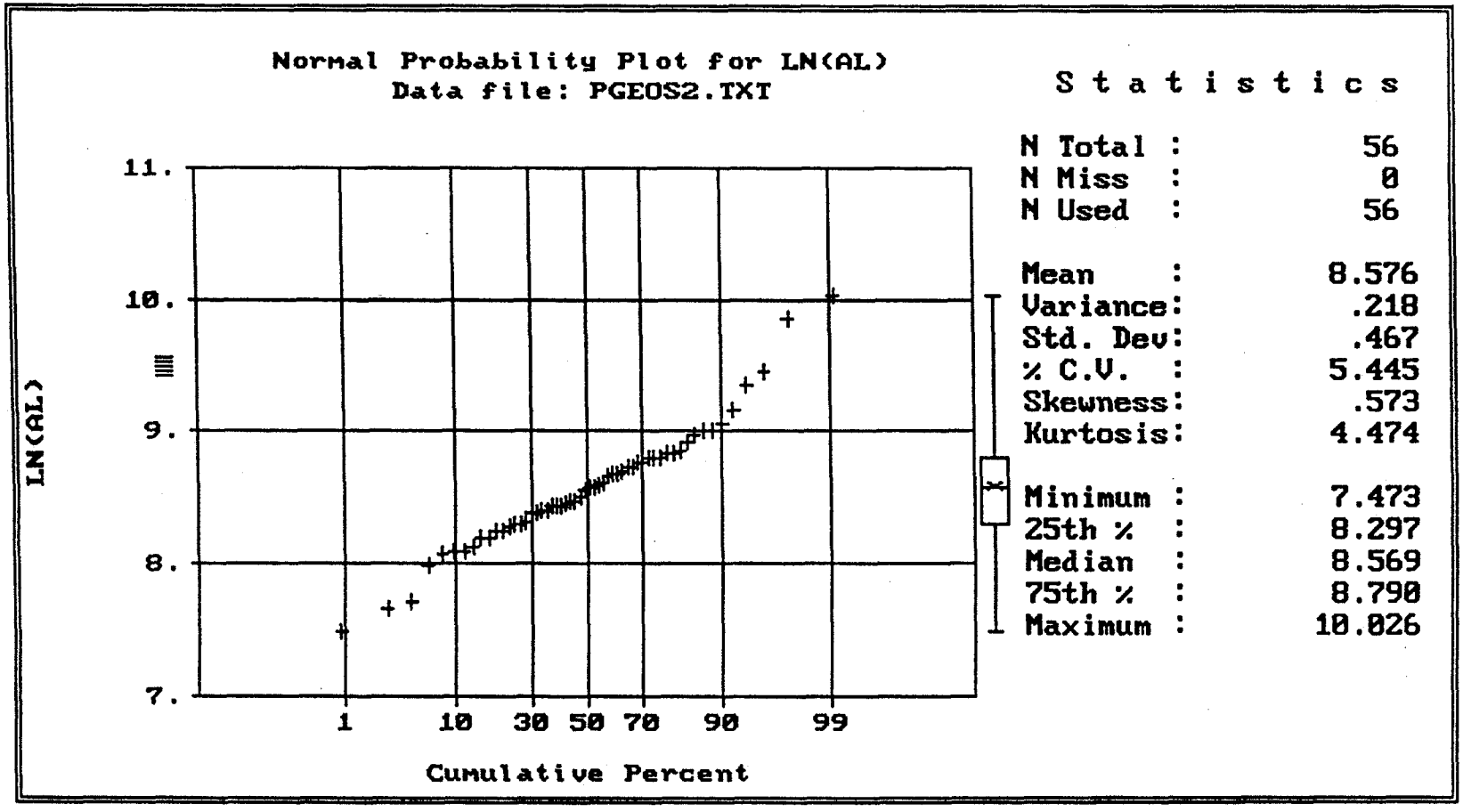
ATTACHMENT A
BLUE AREA
VANADIUM (ALL SAMPLES)



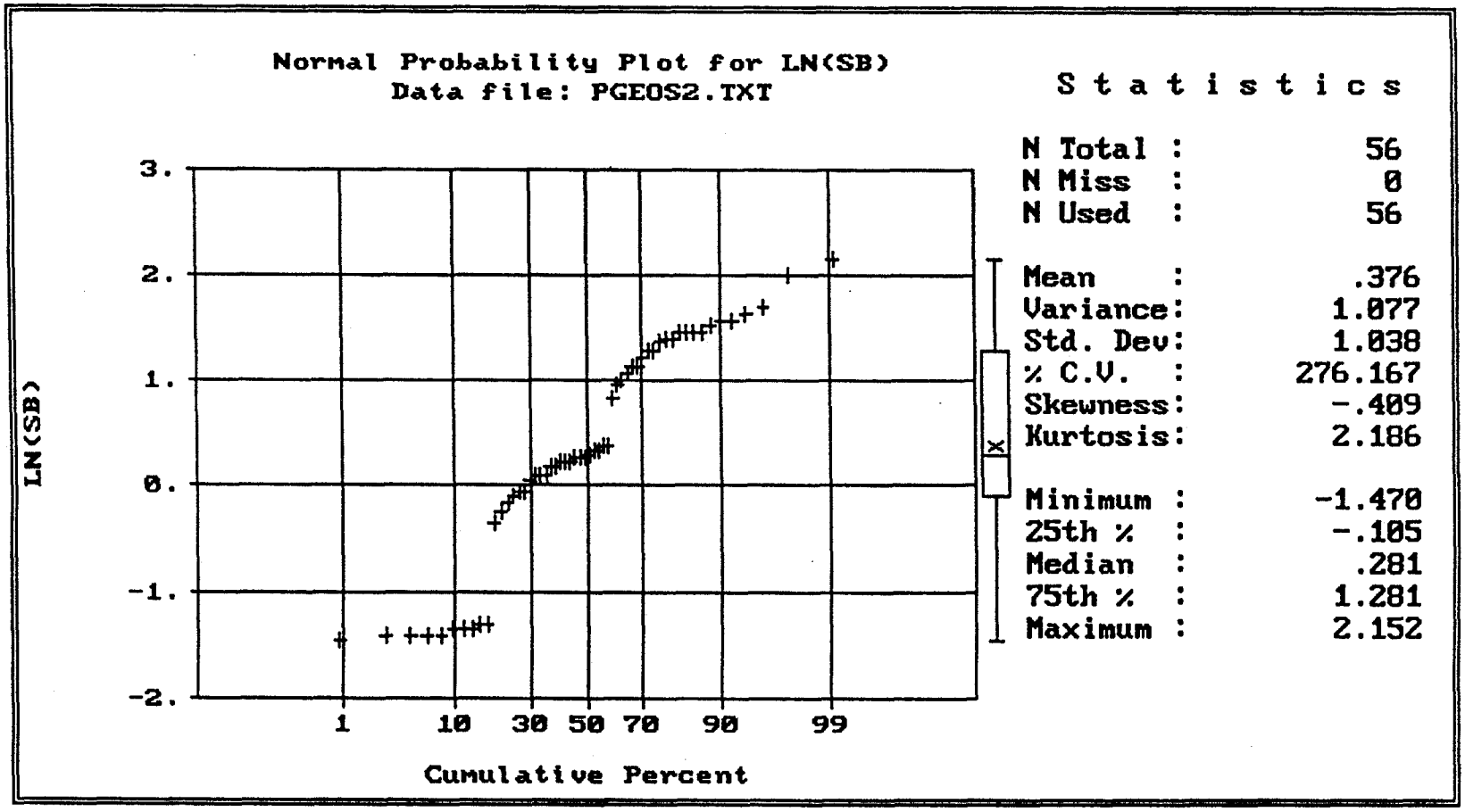
ATTACHMENT A
BLUE AREA
ZINC (ALL SAMPLES)



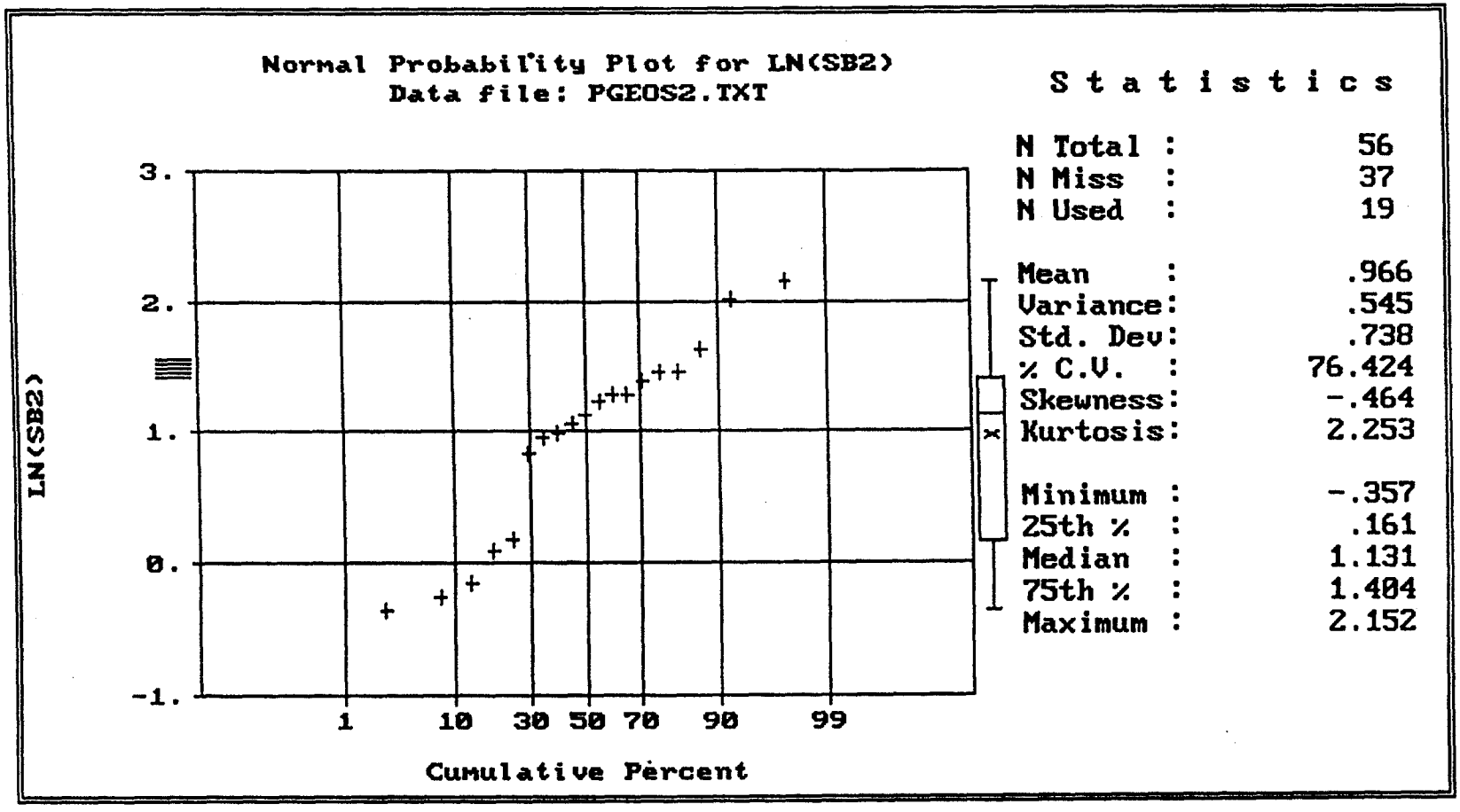
ATTACHMENT A
PINK AREA
ALUMINUM (ALL SAMPLES)



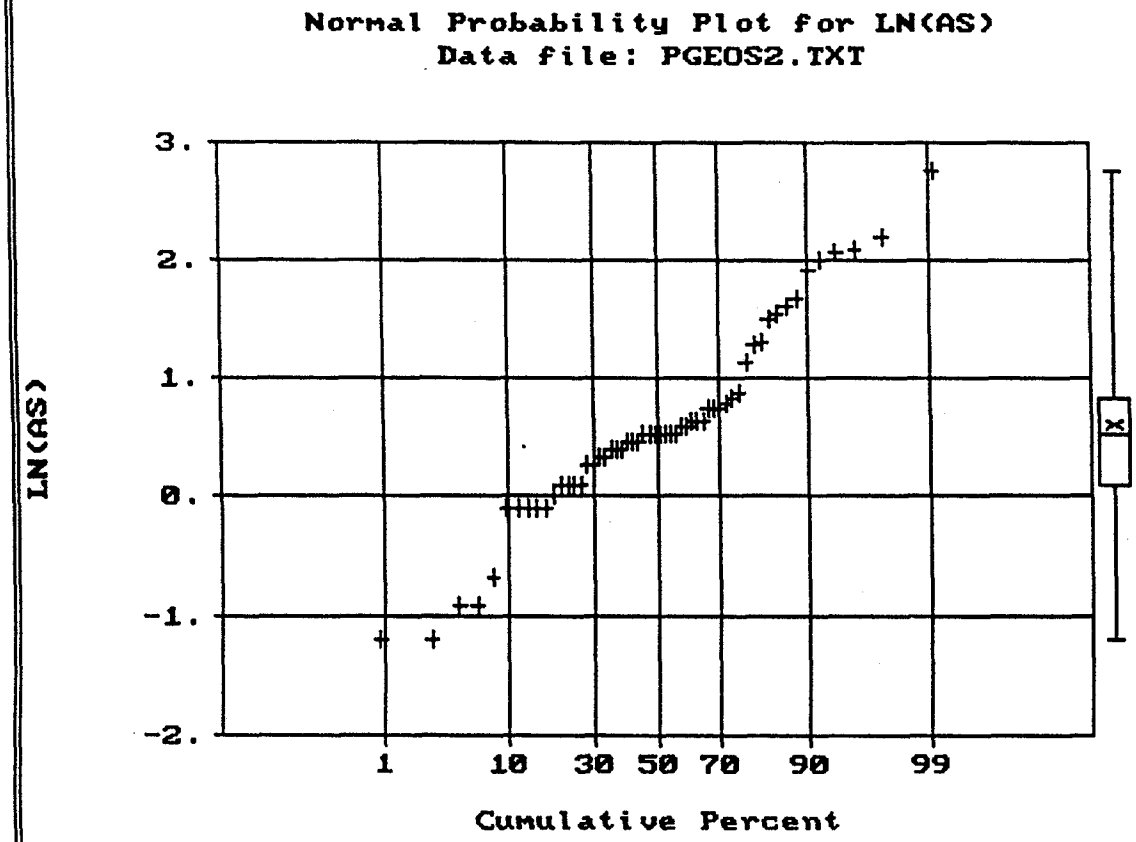
ATTACHMENT A
PINK AREA
ANTIMONY (ALL SAMPLES)



ATTACHMENT A
PINK AREA
ANTIMONY (DETECTED RESULTS ONLY)



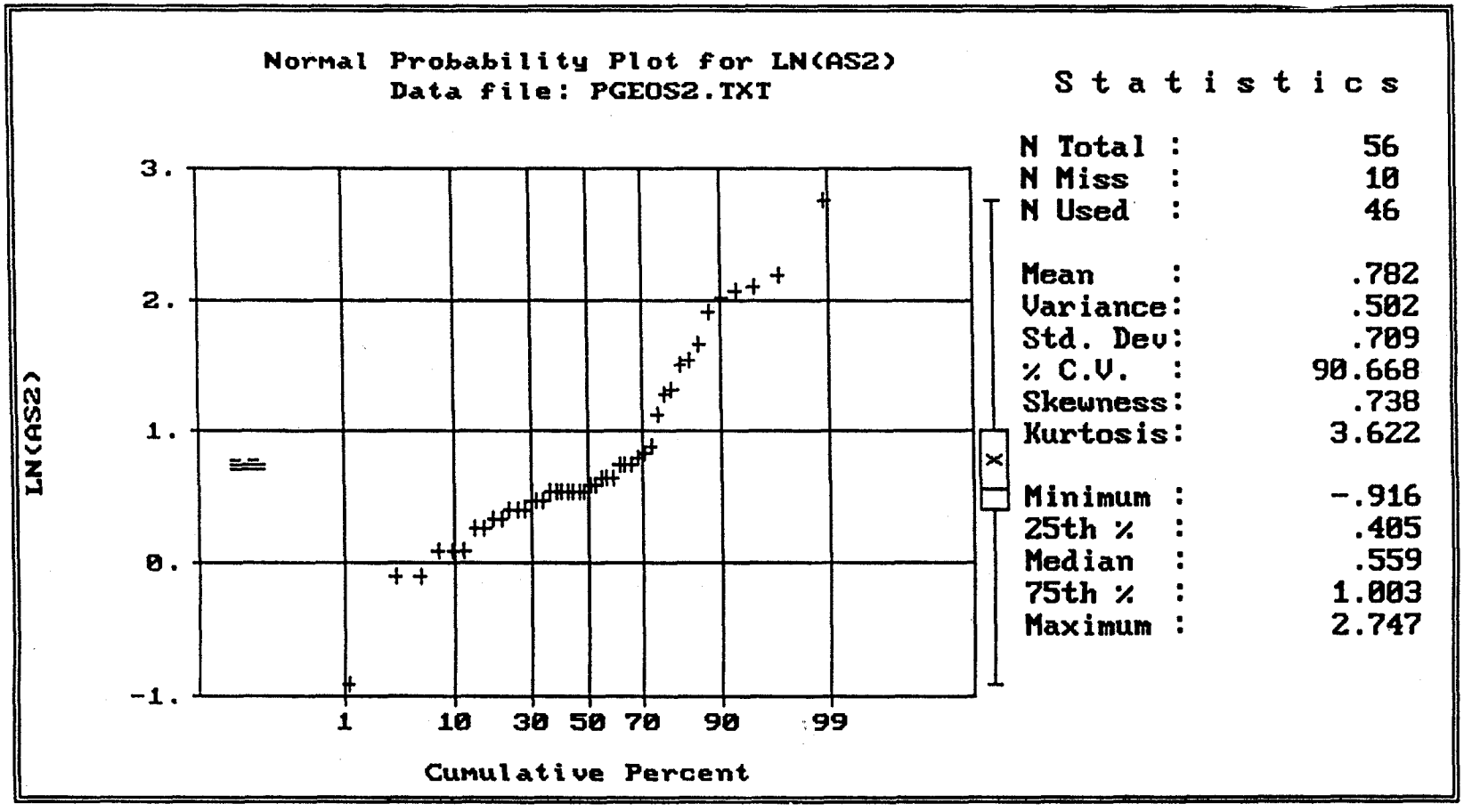
ATTACHMENT A
PINK AREA
ARSENIC (ALL SAMPLES)



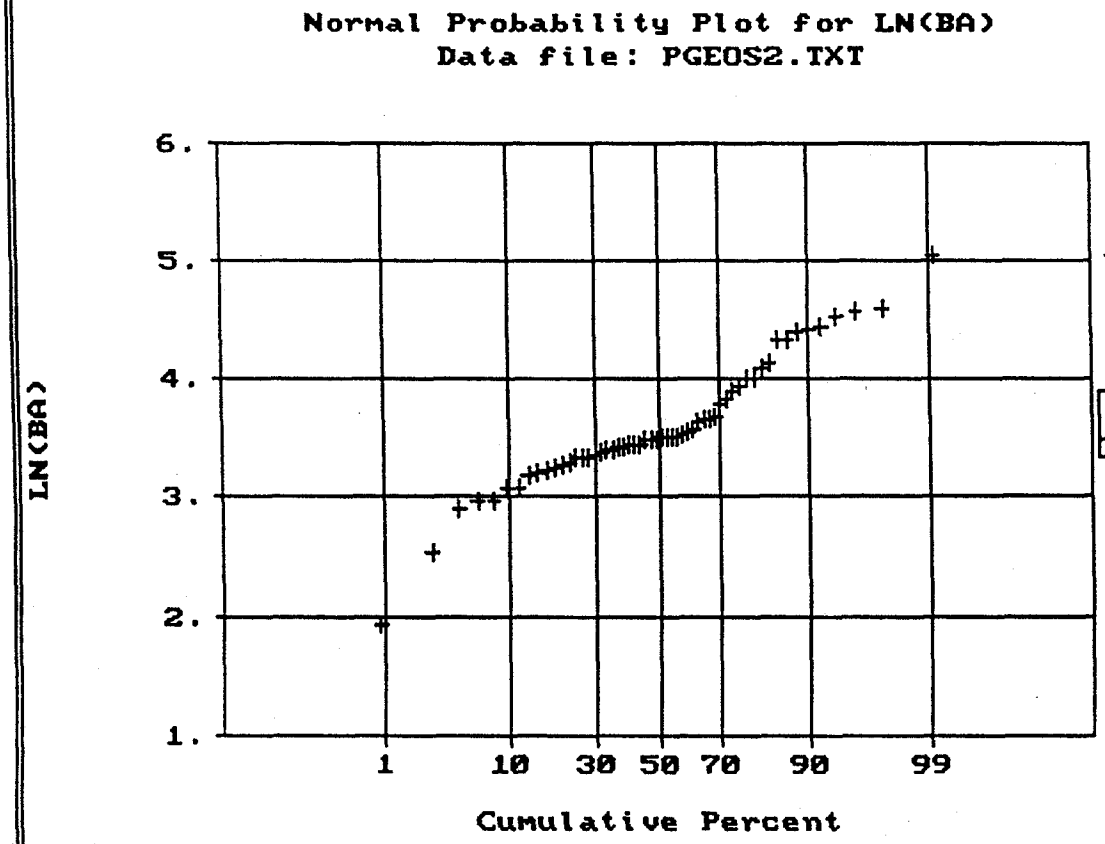
Statistics

N Total :	56
N Miss :	0
N Used :	56
Mean :	.595
Variance:	.686
Std. Dev:	.828
% C.V. :	139.161
Skewness:	.229
Kurtosis:	3.330
Minimum :	-1.204
25th % :	.095
Median :	.531
75th % :	.833
Maximum :	2.747

ATTACHMENT A
PINK AREA
ARSENIC (DETECTED RESULTS ONLY)



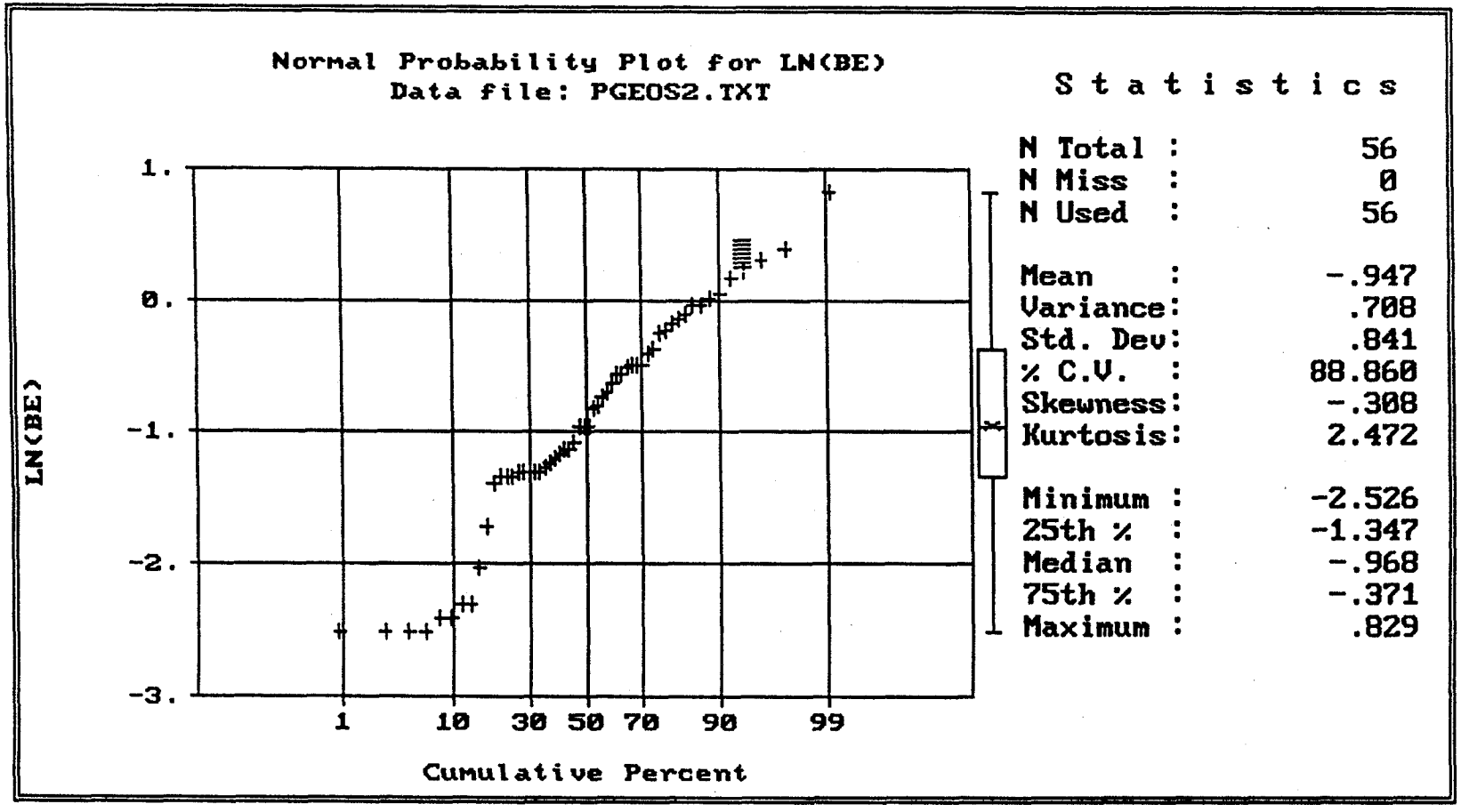
ATTACHMENT A
PINK AREA
BARIUM (ALL SAMPLES)



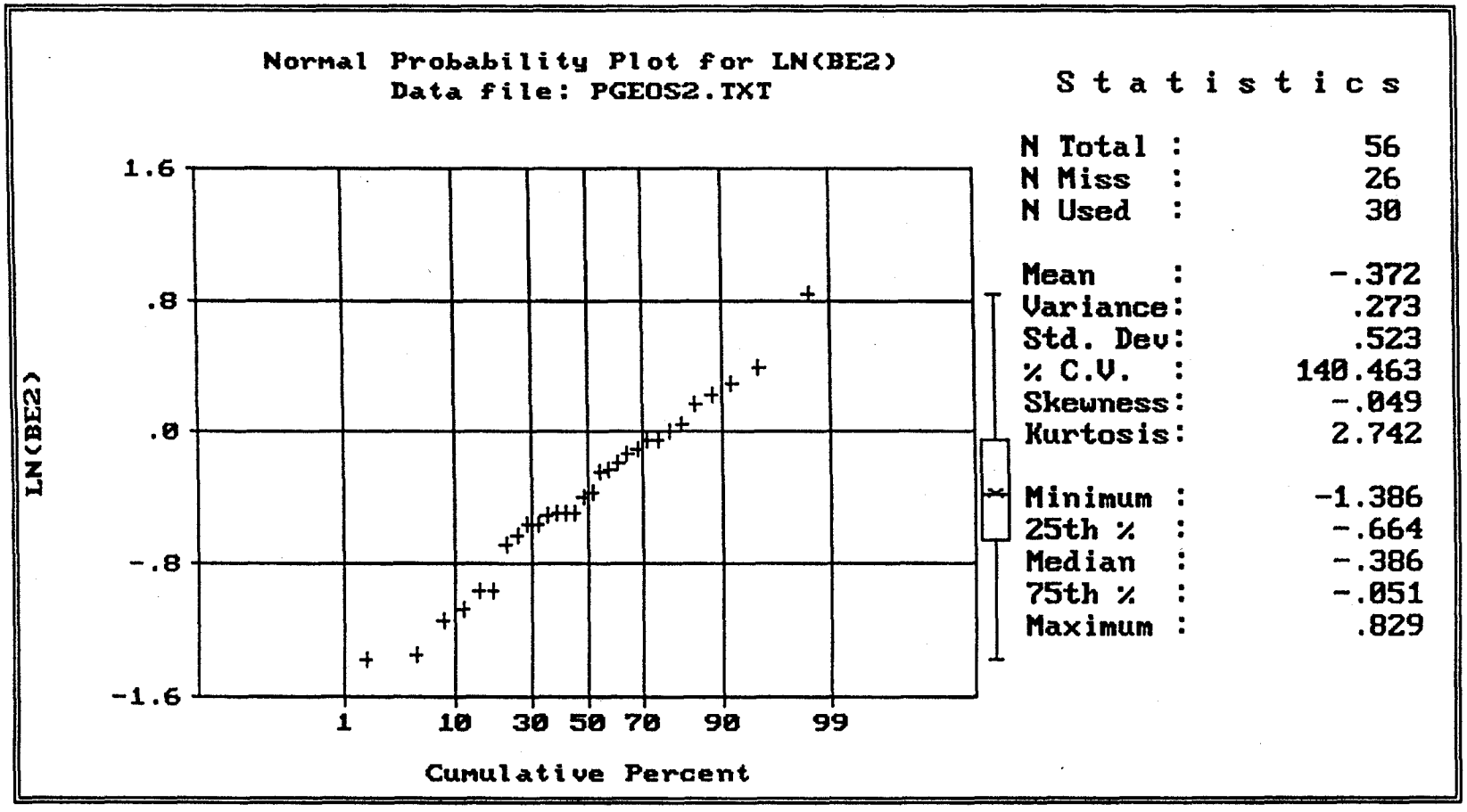
Statistics

N Total :	56
N Miss :	0
N Used :	56
Mean :	3.600
Variance:	.297
Std. Dev:	.545
% C.V. :	15.141
Skewness:	.130
Kurtosis:	3.997
Minimum :	1.932
25th % :	3.325
Median :	3.489
75th % :	3.896
Maximum :	5.050

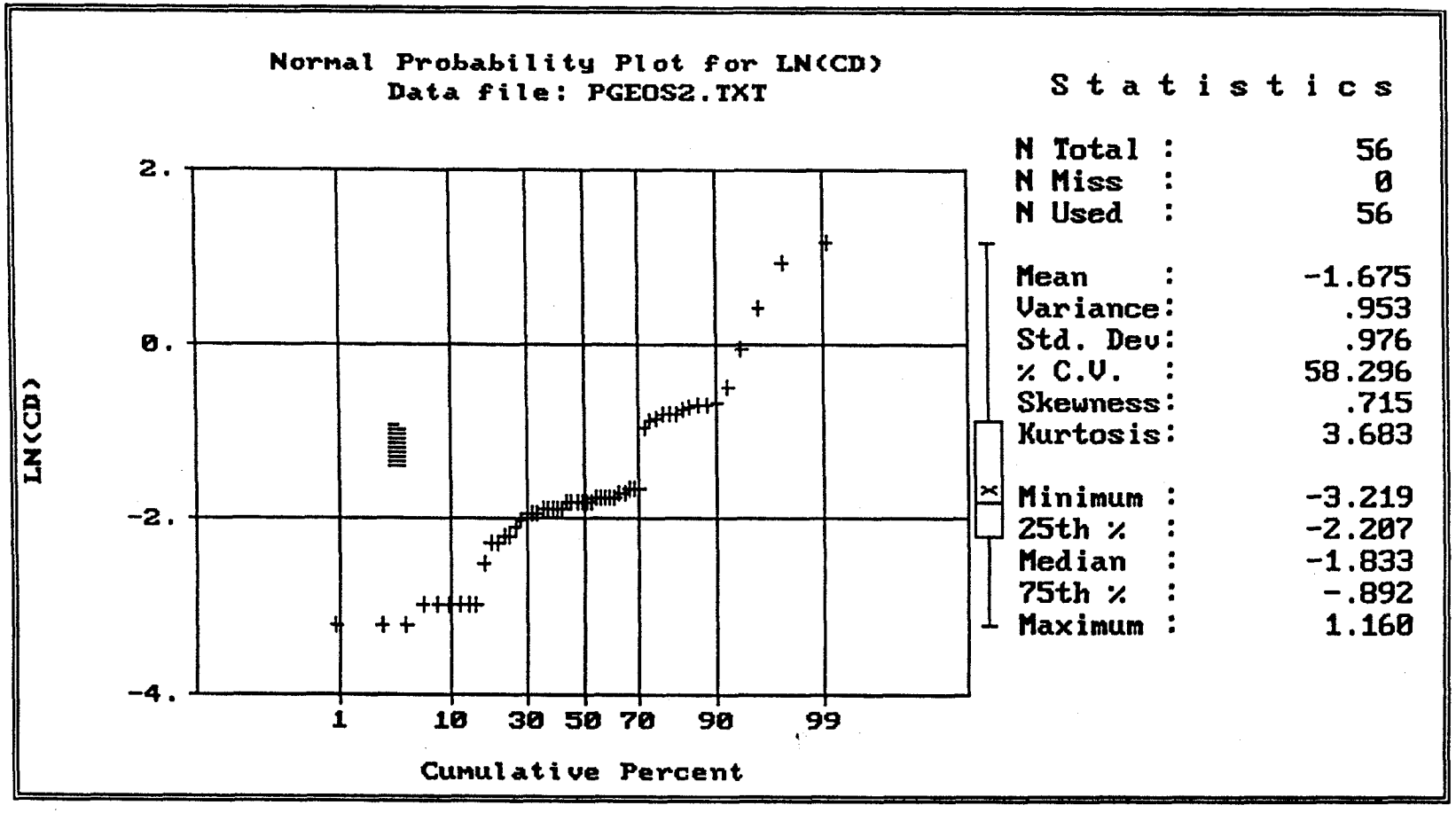
ATTACHMENT A
PINK AREA
BERYLLIUM (ALL SAMPLES)



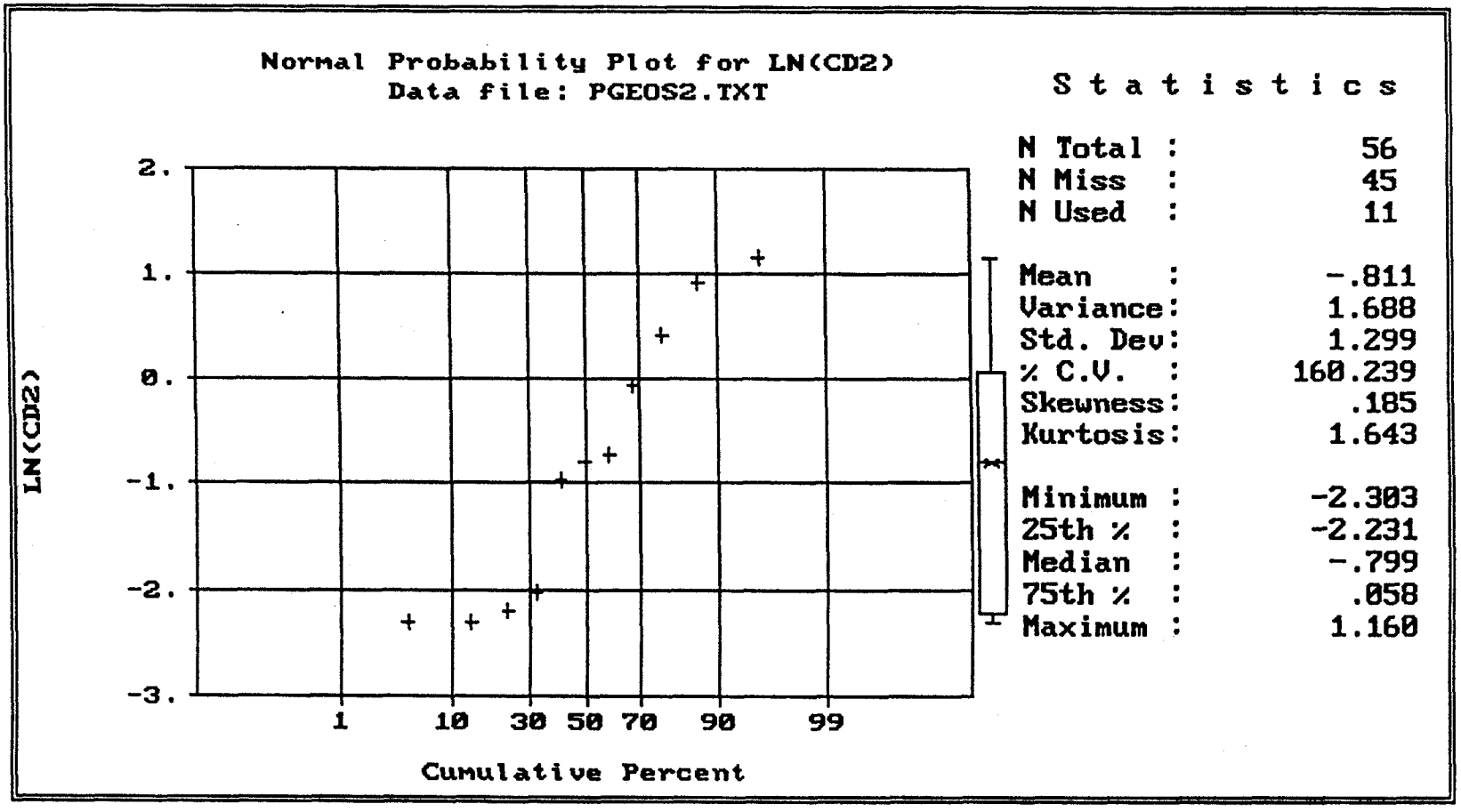
ATTACHMENT A
PINK AREA
BERYLLIUM (DETECTED RESULTS ONLY)



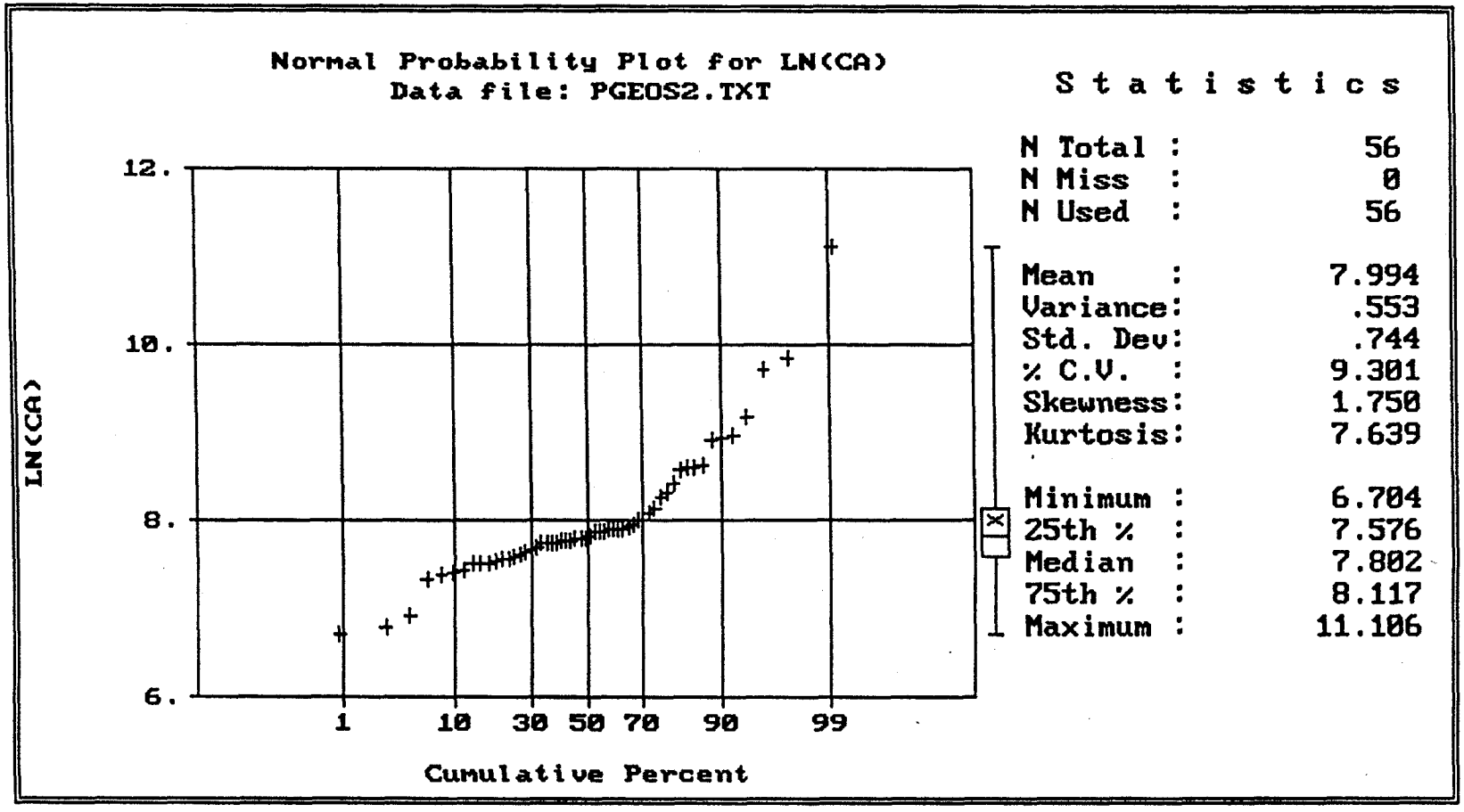
ATTACHMENT A
PINK AREA
CADMIUM (ALL SAMPLES)



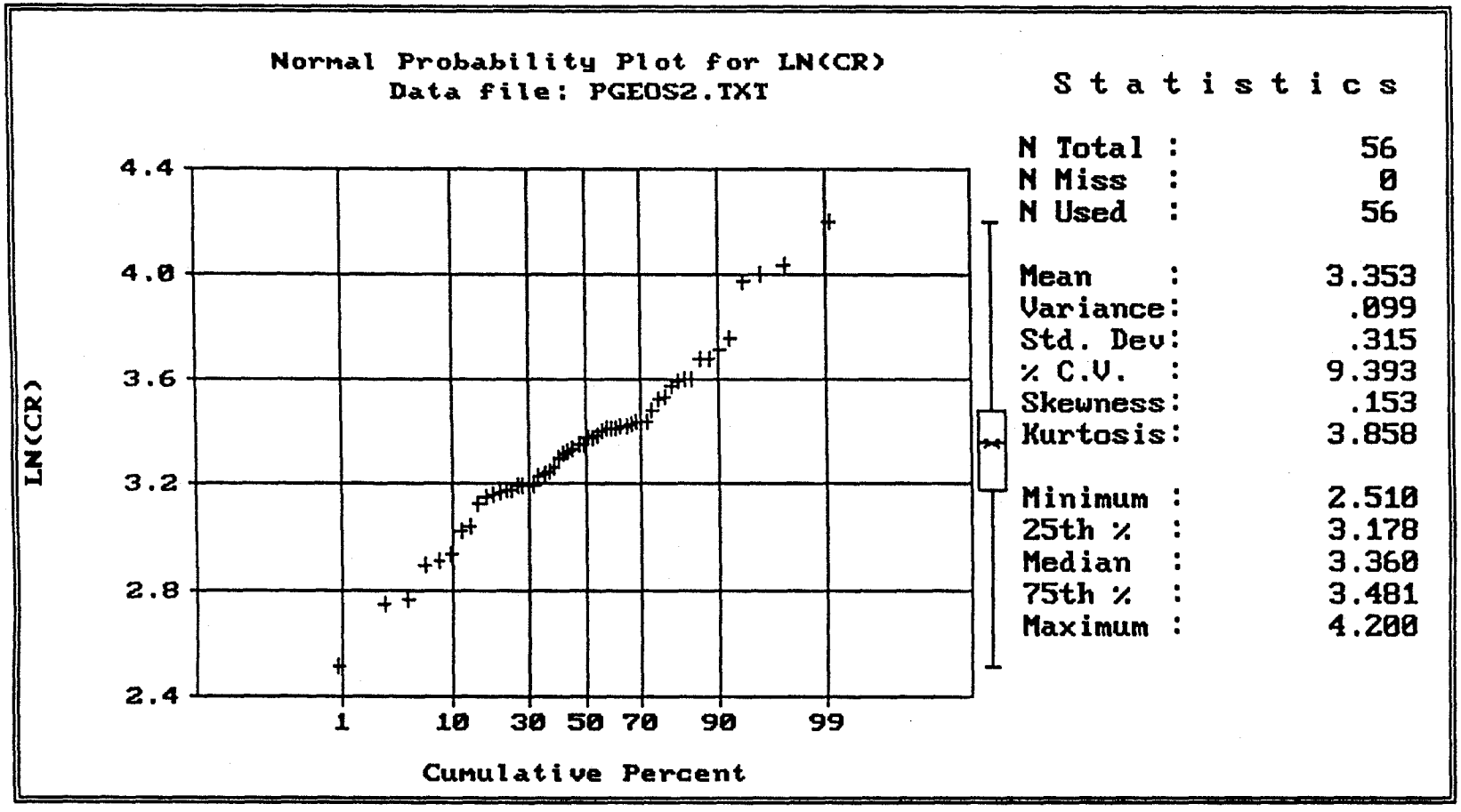
ATTACHMENT A
PINK AREA
CADMIUM (DETECTED RESULTS ONLY)



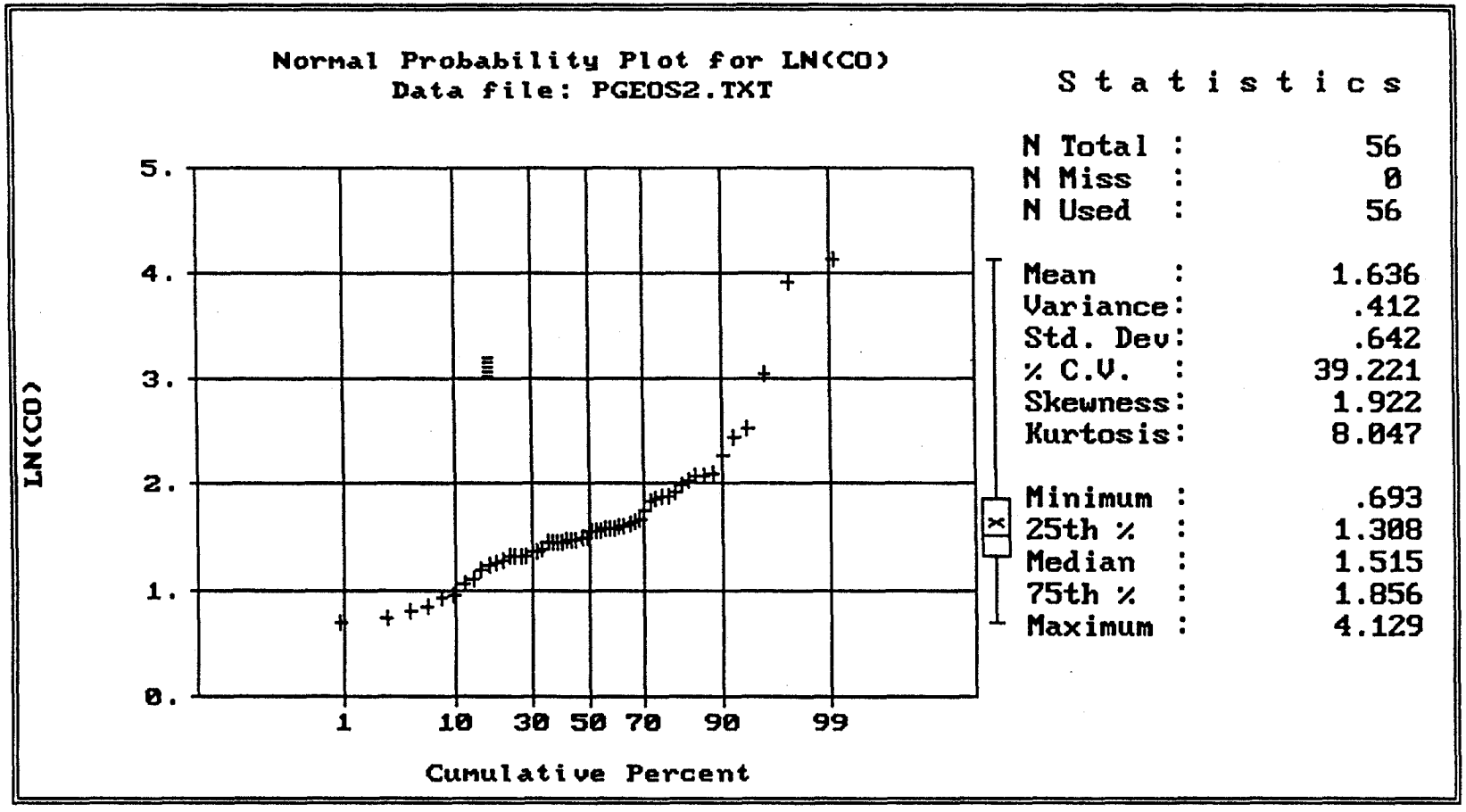
ATTACHMENT A
PINK AREA
CALCIUM (ALL SAMPLES)



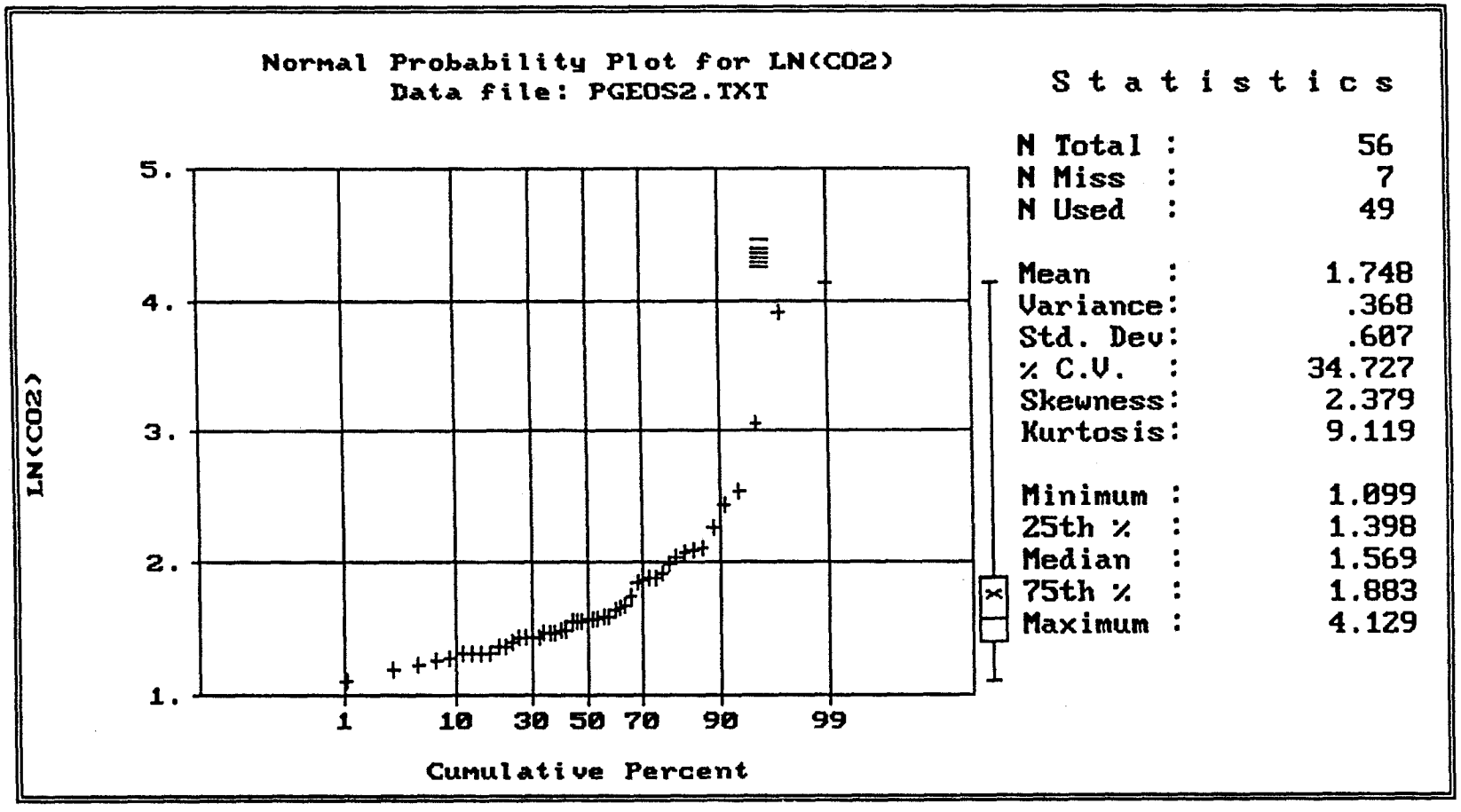
ATTACHMENT A
PINK AREA
CHROMIUM (ALL SAMPLES)



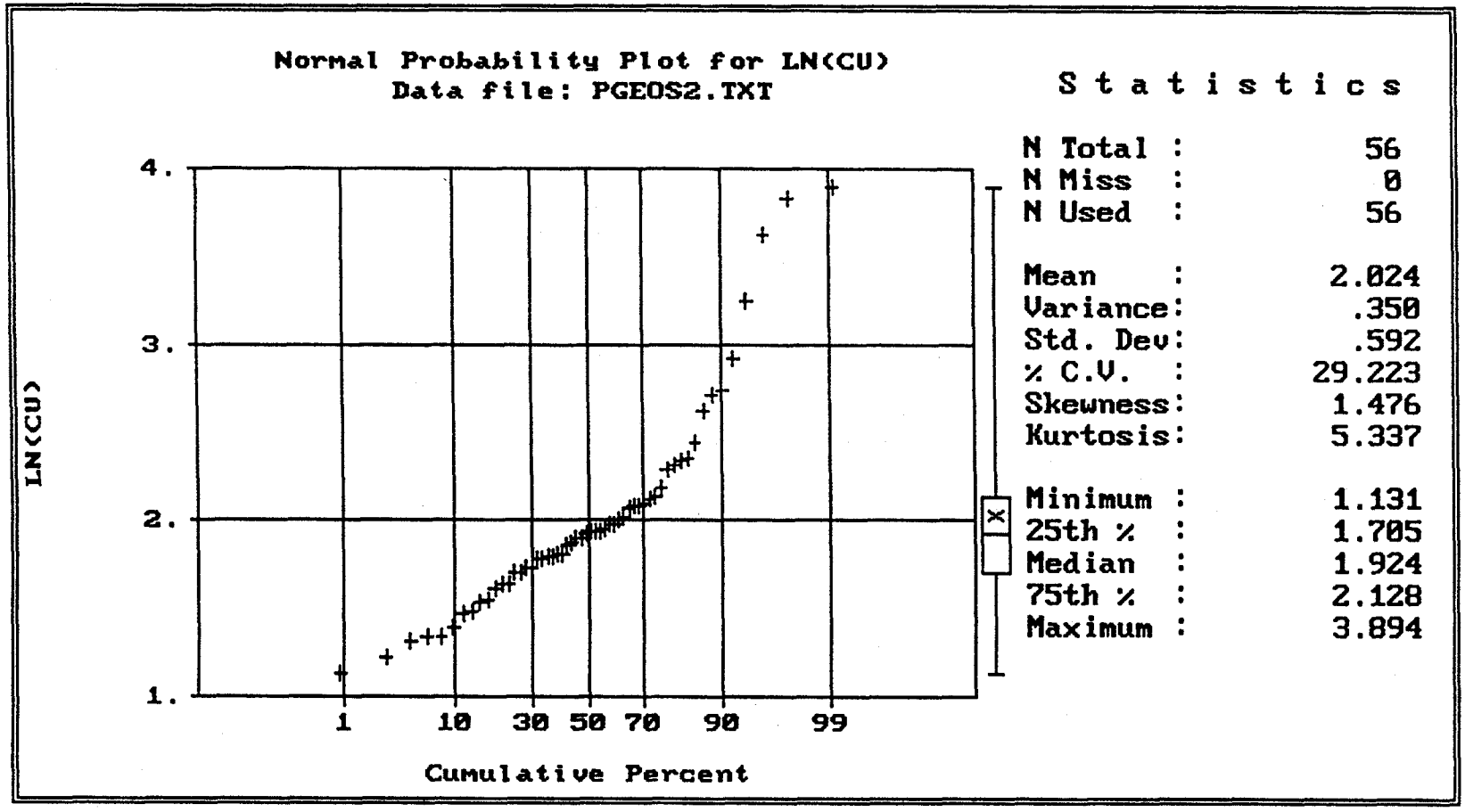
ATTACHMENT A
PINK AREA
COBALT (ALL SAMPLES)



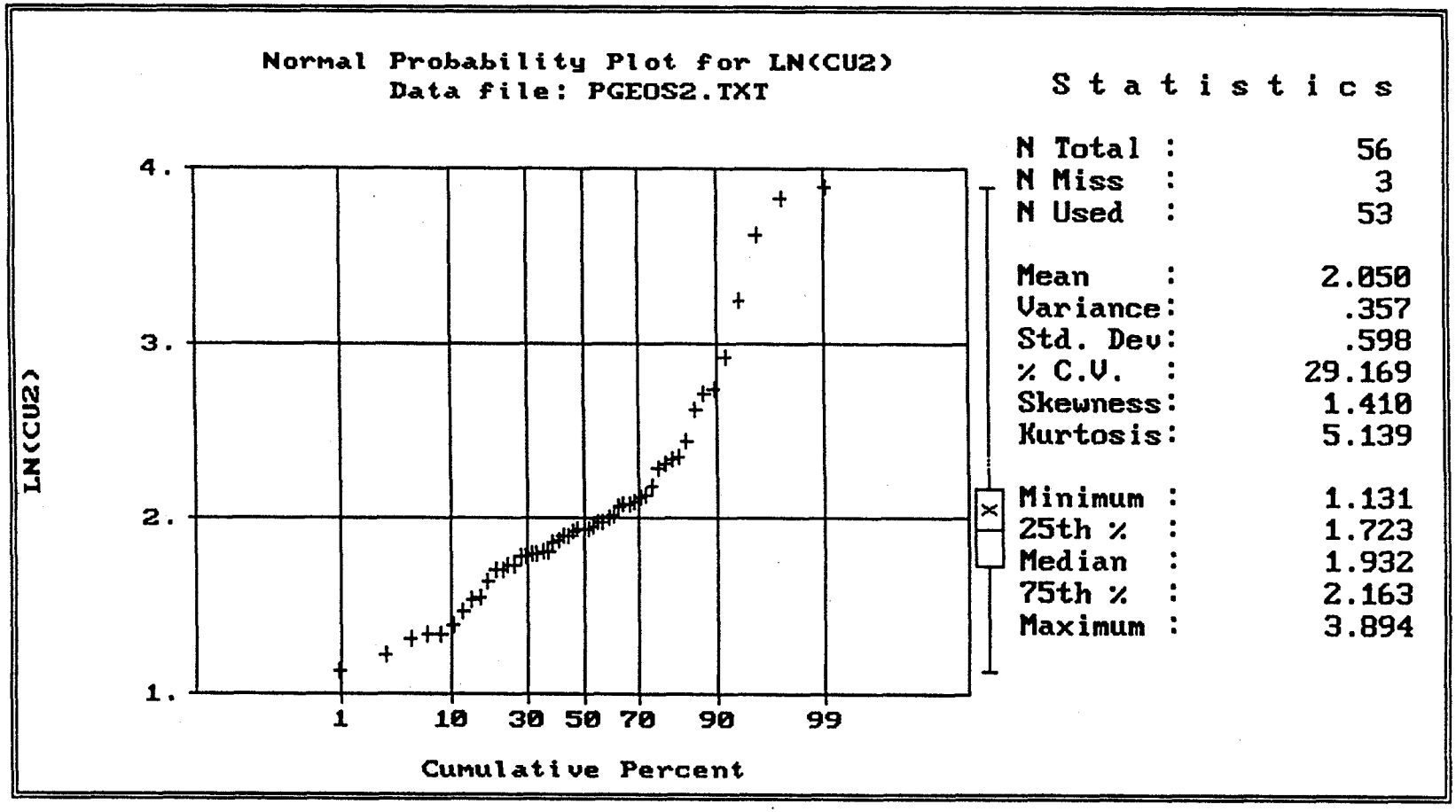
ATTACHMENT A
PINK AREA
COBALT (DETECTED RESULTS ONLY)



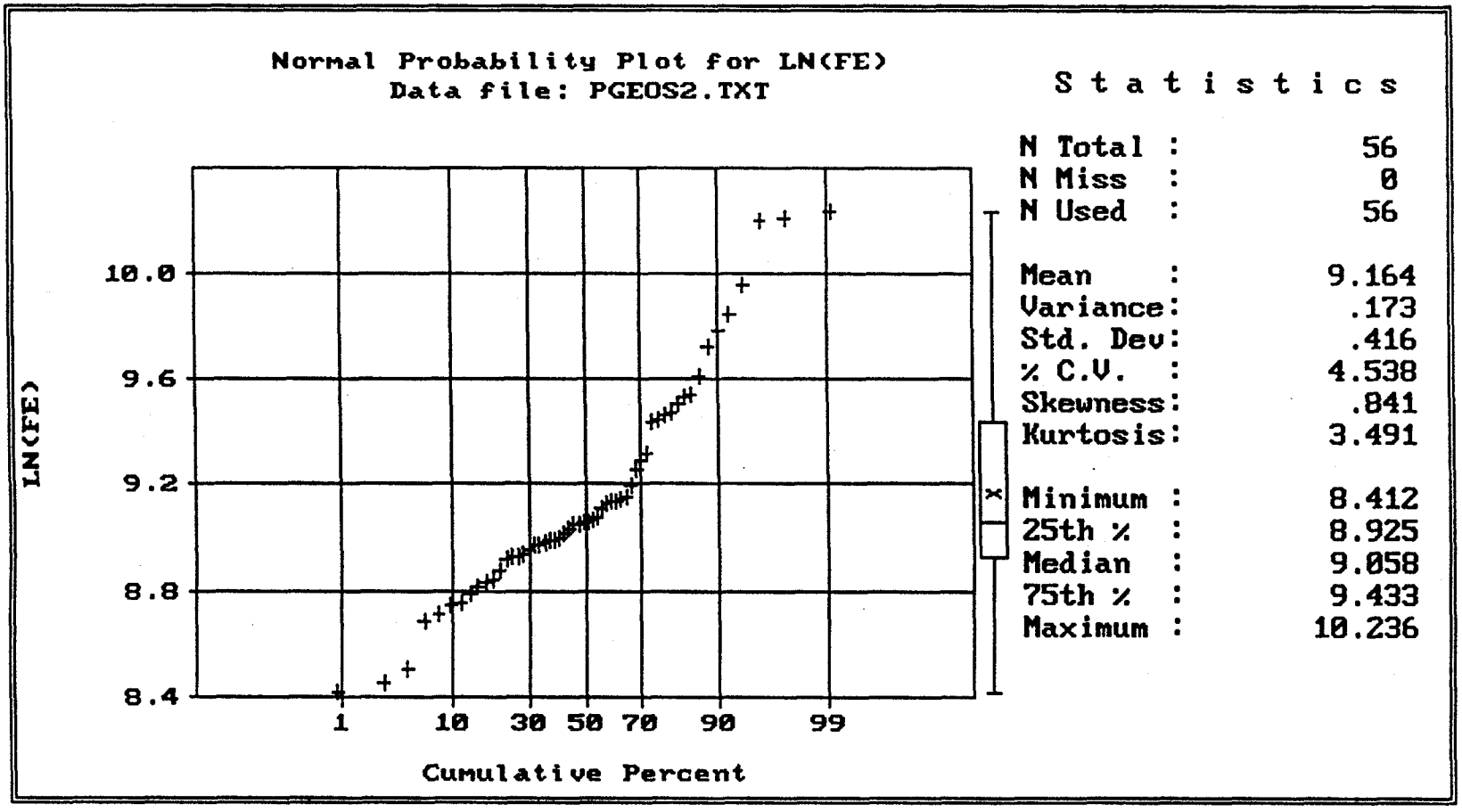
ATTACHMENT A
PINK AREA
COPPER (ALL SAMPLES)



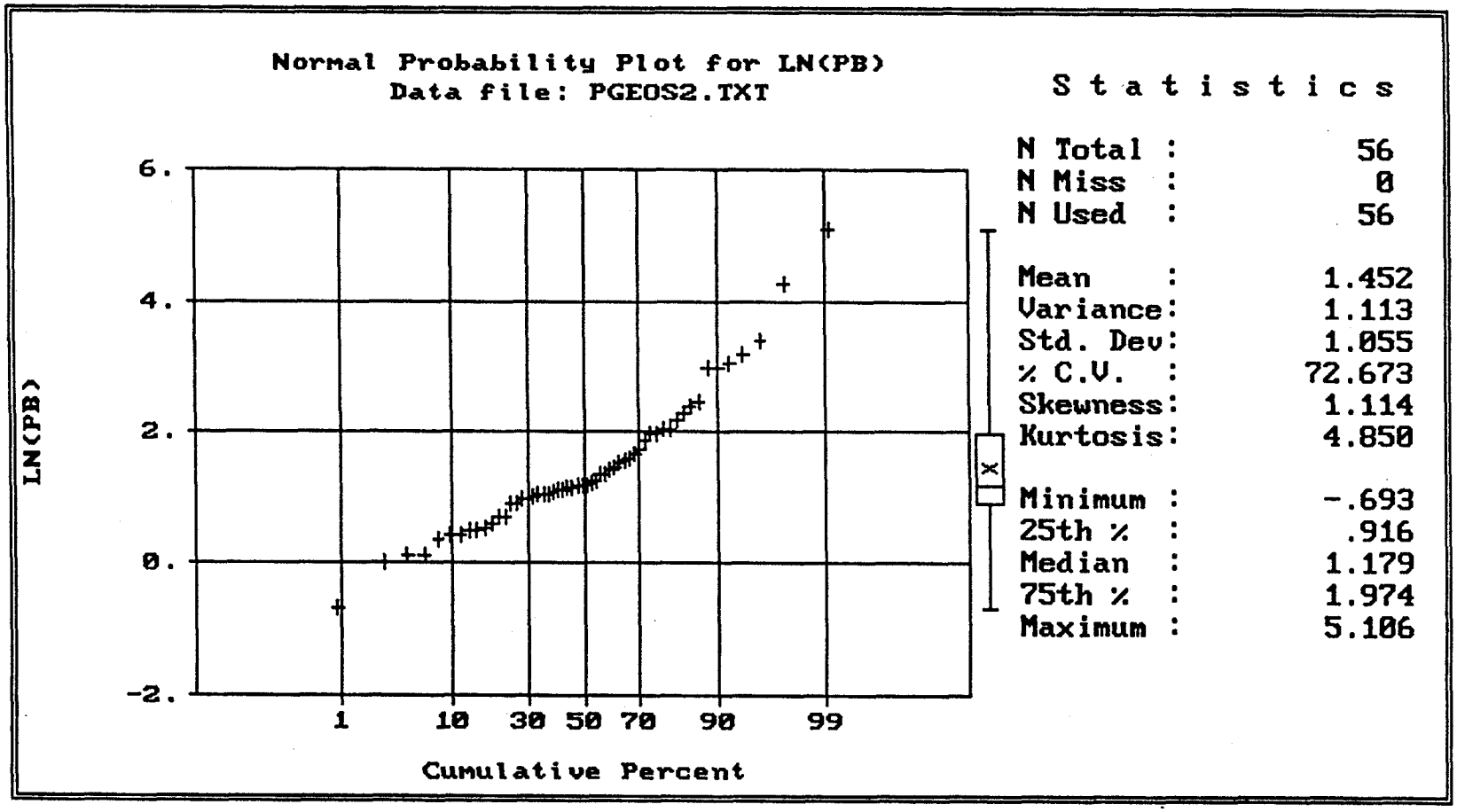
ATTACHMENT A
PINK AREA
COPPER (DETECTED RESULTS ONLY)



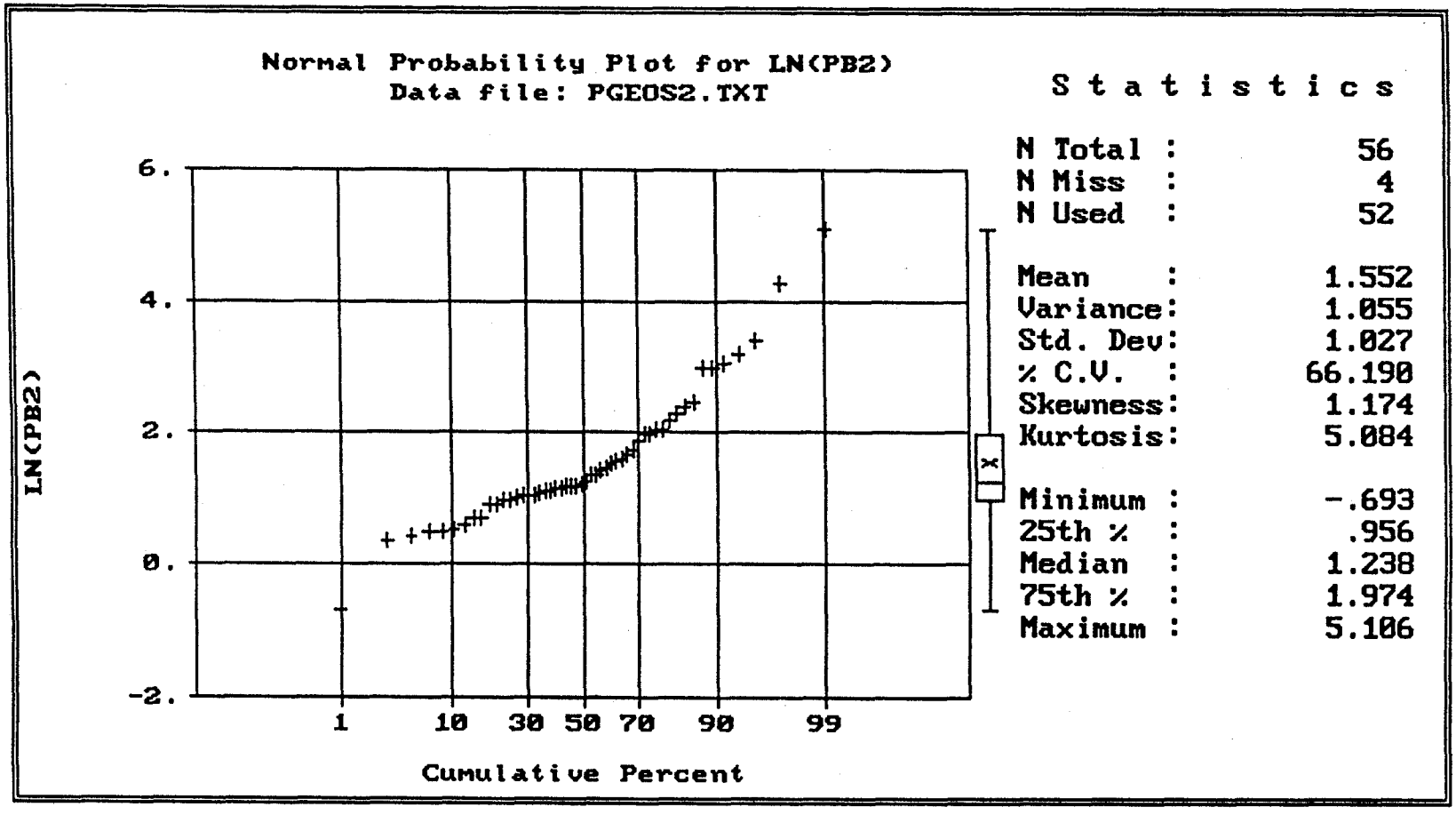
ATTACHMENT A
PINK AREA
IRON (ALL SAMPLES)



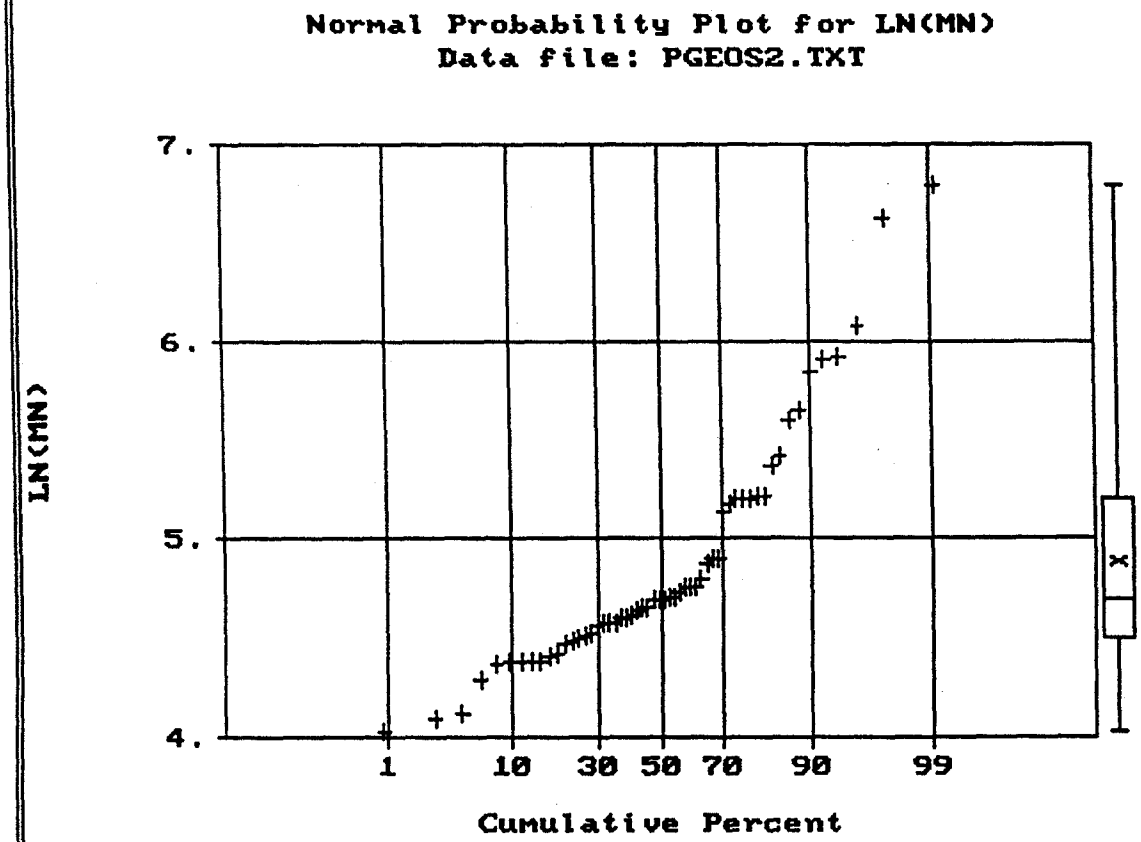
ATTACHMENT A
PINK AREA
LEAD (ALL SAMPLES)



ATTACHMENT A
PINK AREA
LEAD (DETECTED RESULTS ONLY)



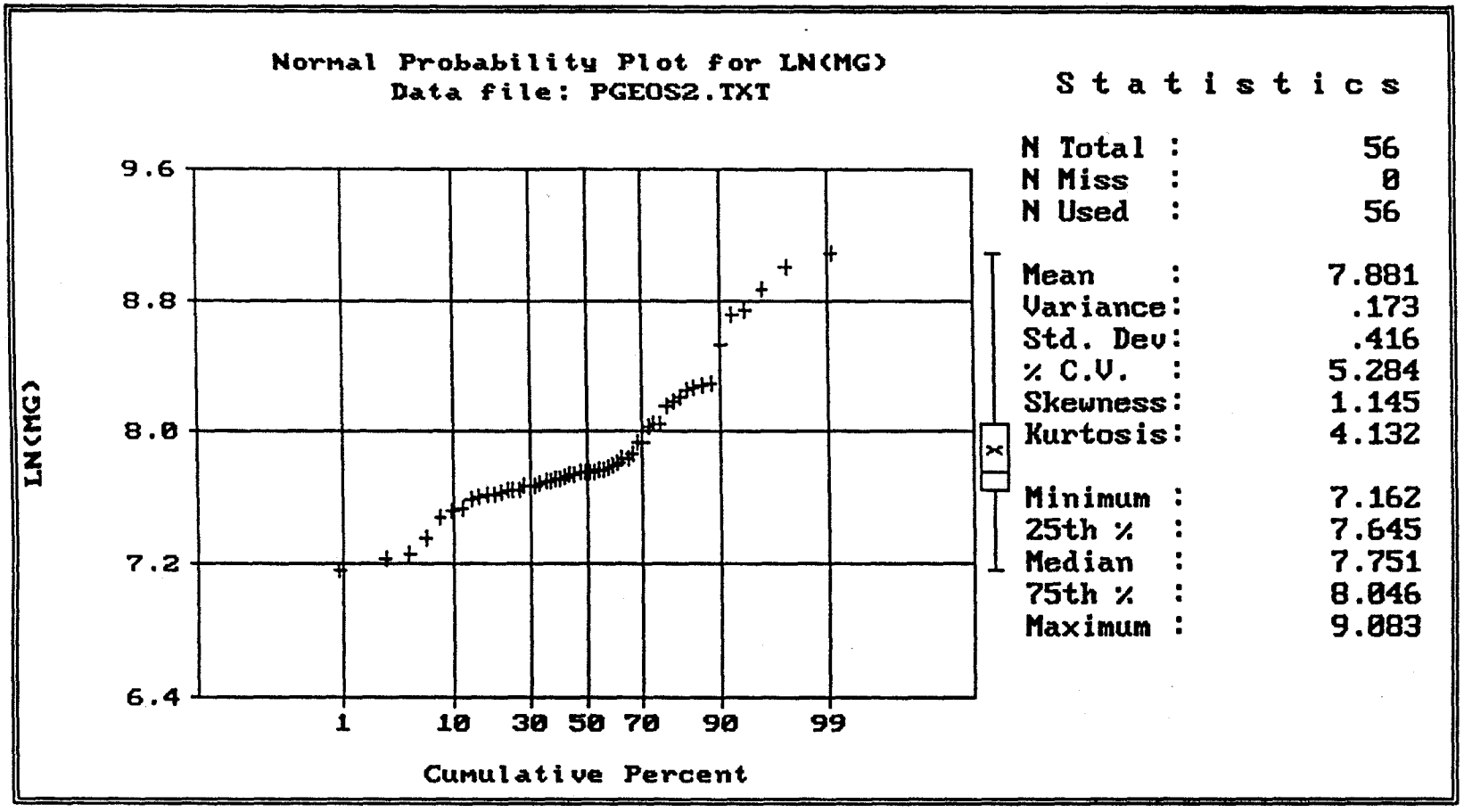
ATTACHMENT A
PINK AREA
MANGANESE (ALL SAMPLES)



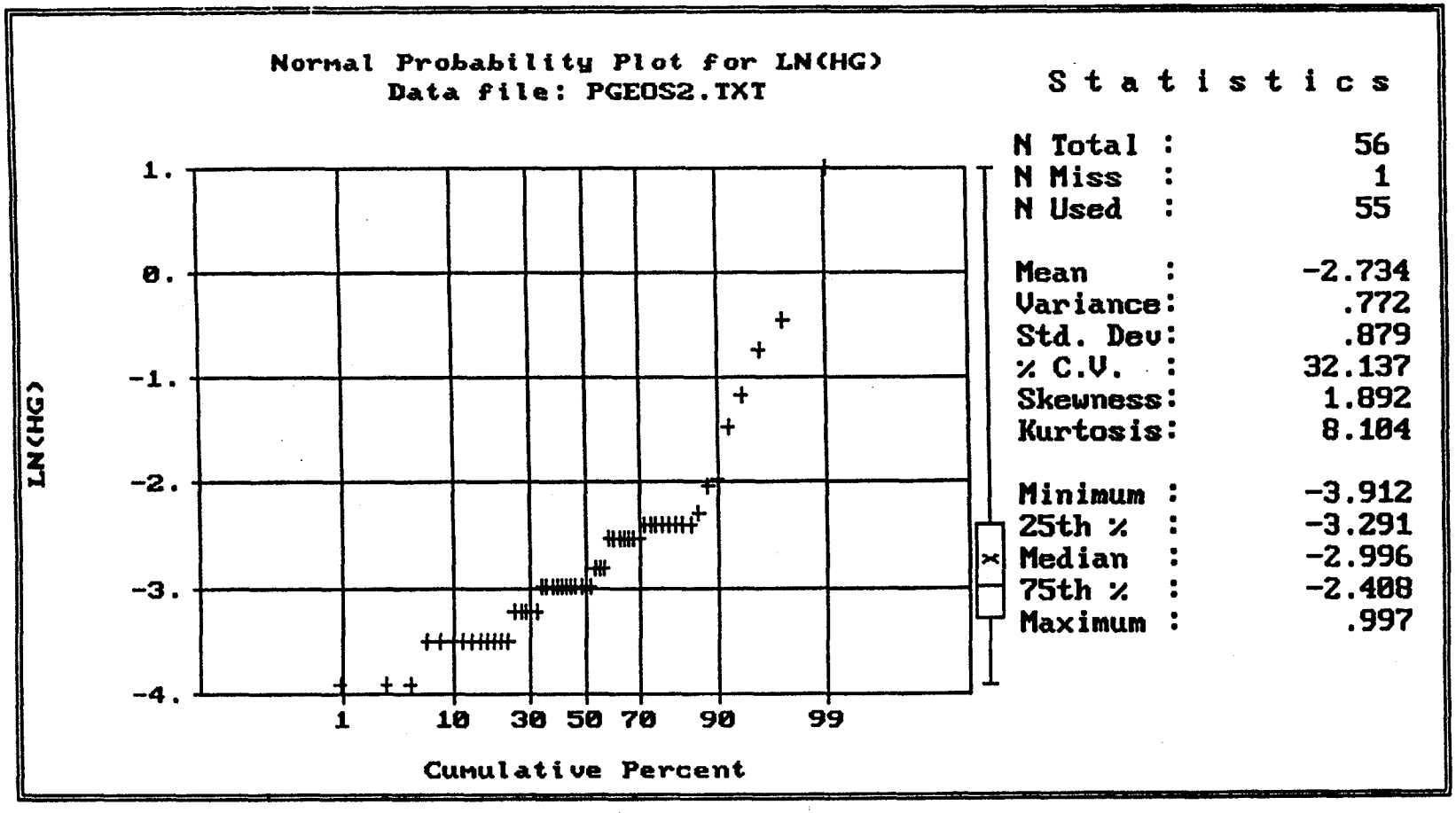
Statistics

N Total :	56
N Miss :	0
N Used :	56
Mean :	4.873
Variance:	.350
Std. Dev:	.591
% C.V. :	12.138
Skewness:	1.360
Kurtosis:	4.640
Minimum :	4.025
25th % :	4.489
Median :	4.687
75th % :	5.187
Maximum :	6.786

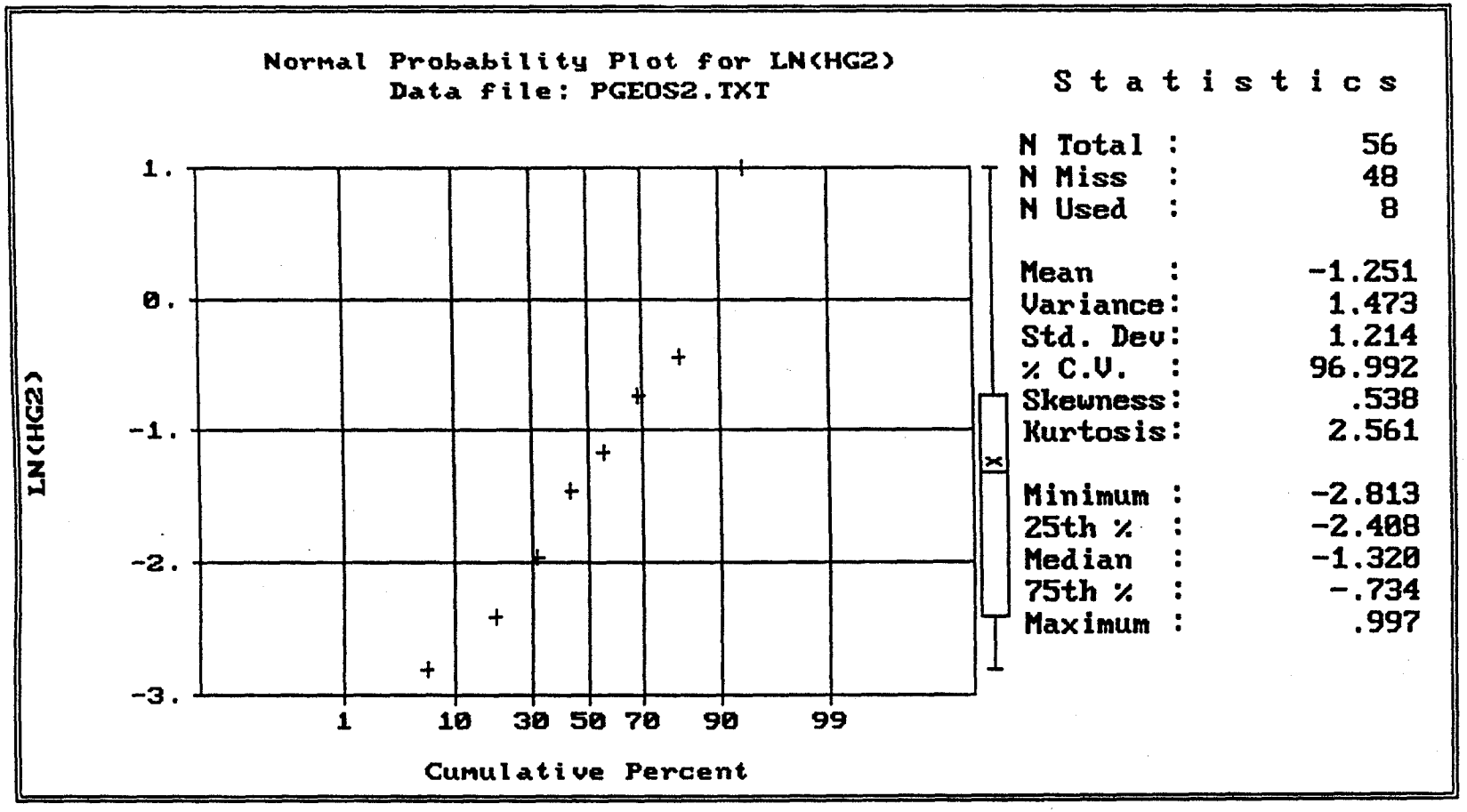
ATTACHMENT A
PINK AREA
MAGNESIUM (ALL SAMPLES)



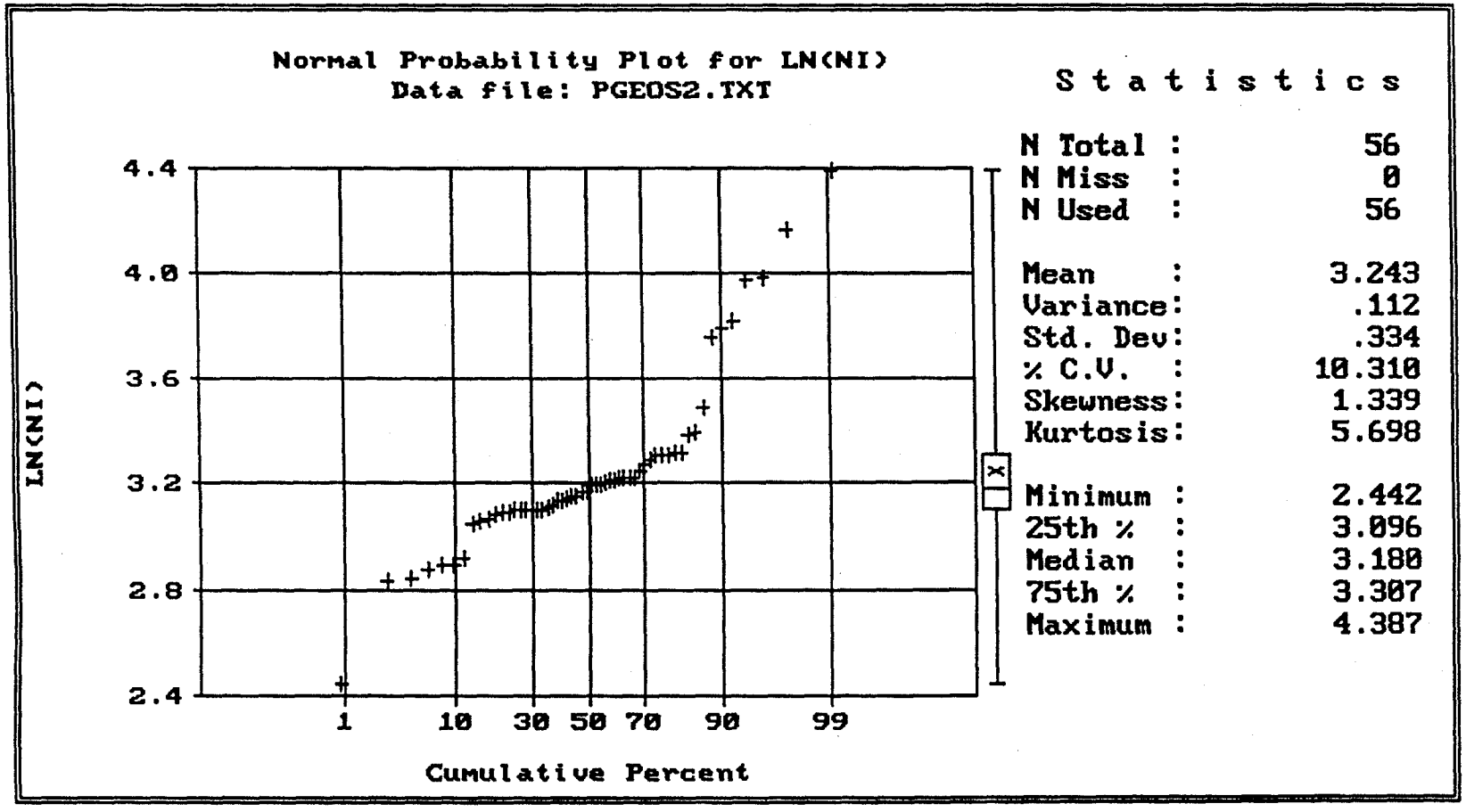
ATTACHMENT A
PINK AREA
MERCURY (ALL SAMPLES)



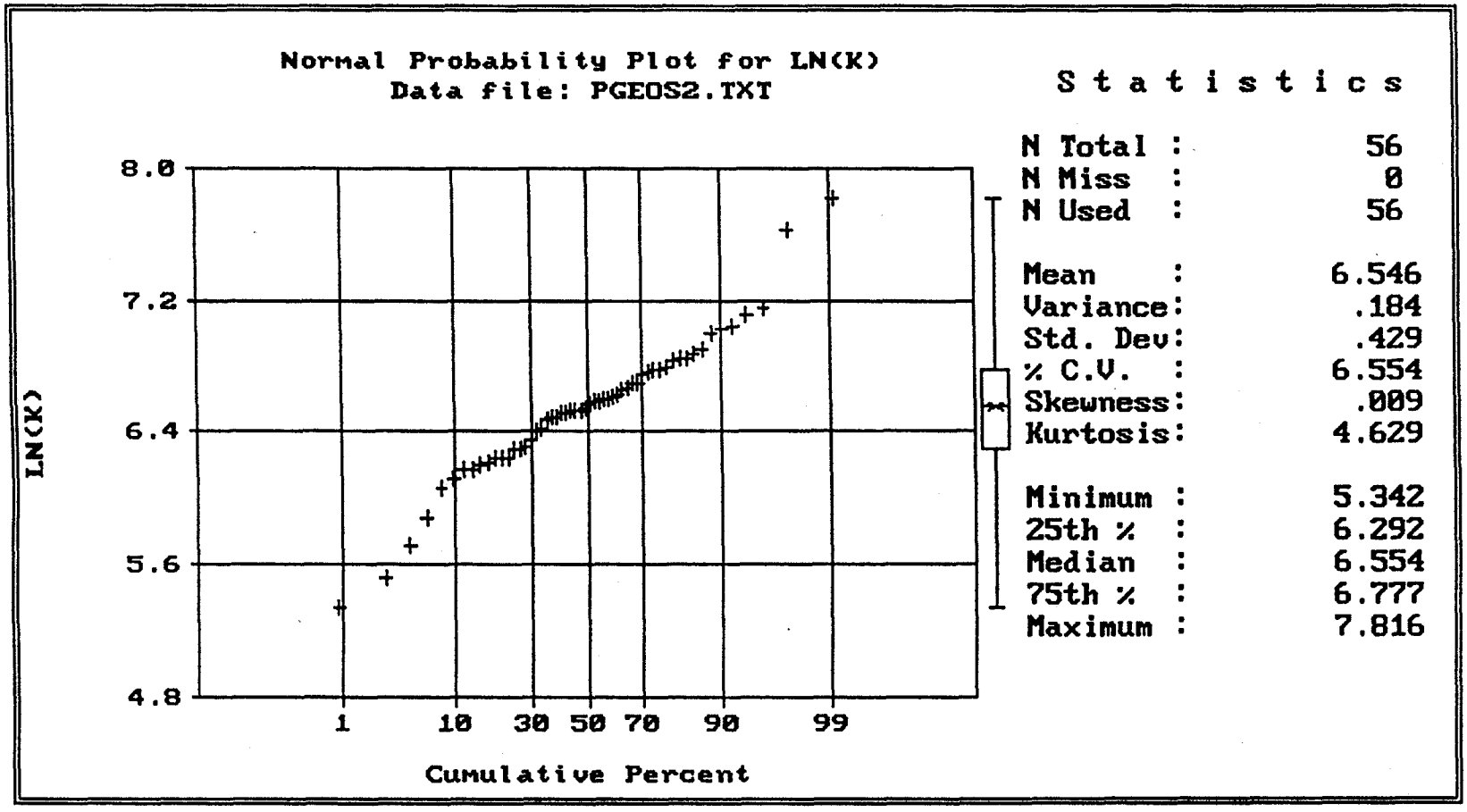
ATTACHMENT A
PINK AREA
MERCURY (DETECTED RESULTS ONLY)



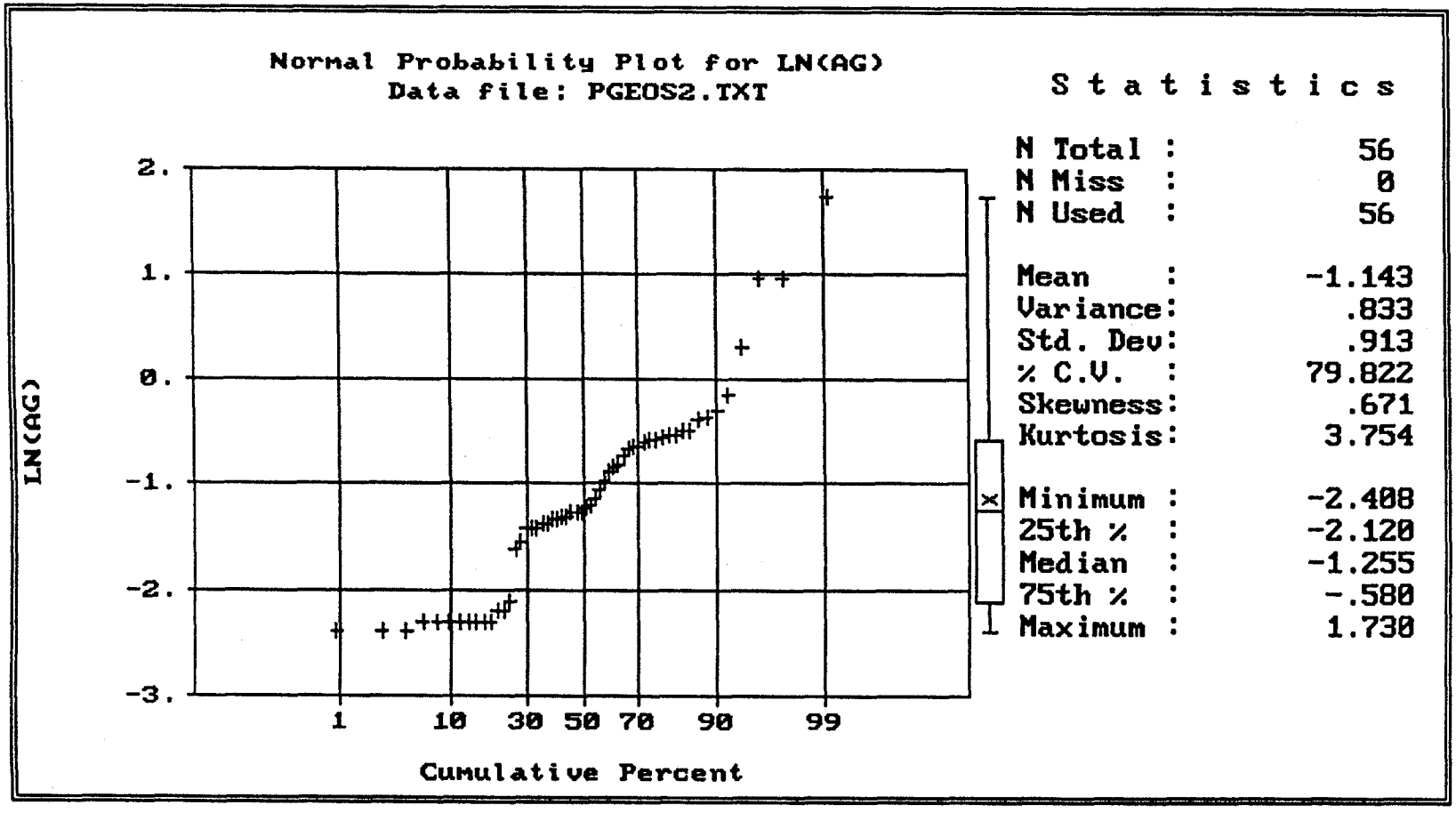
ATTACHMENT A
PINK AREA
NICKEL (ALL SAMPLES)



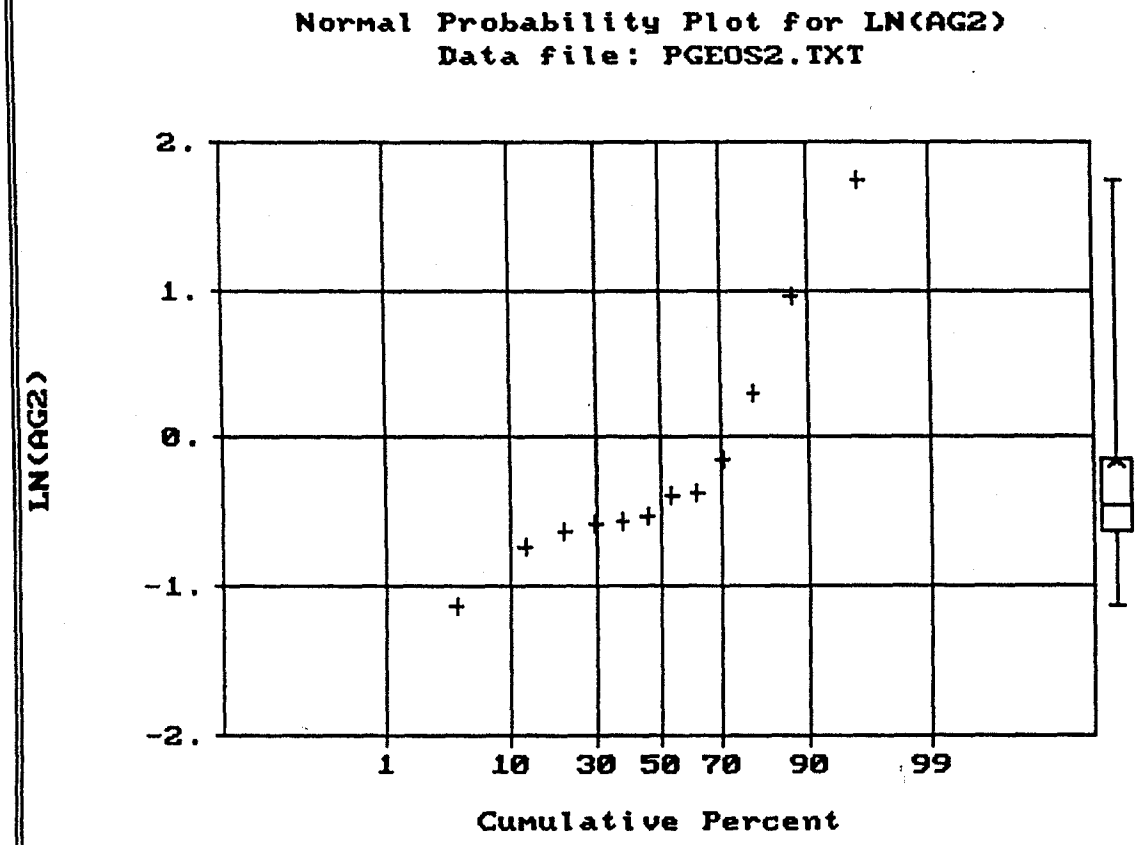
ATTACHMENT A
PINK AREA
POTASSIUM (ALL SAMPLES)



ATTACHMENT A
PINK AREA
SILVER (ALL SAMPLES)



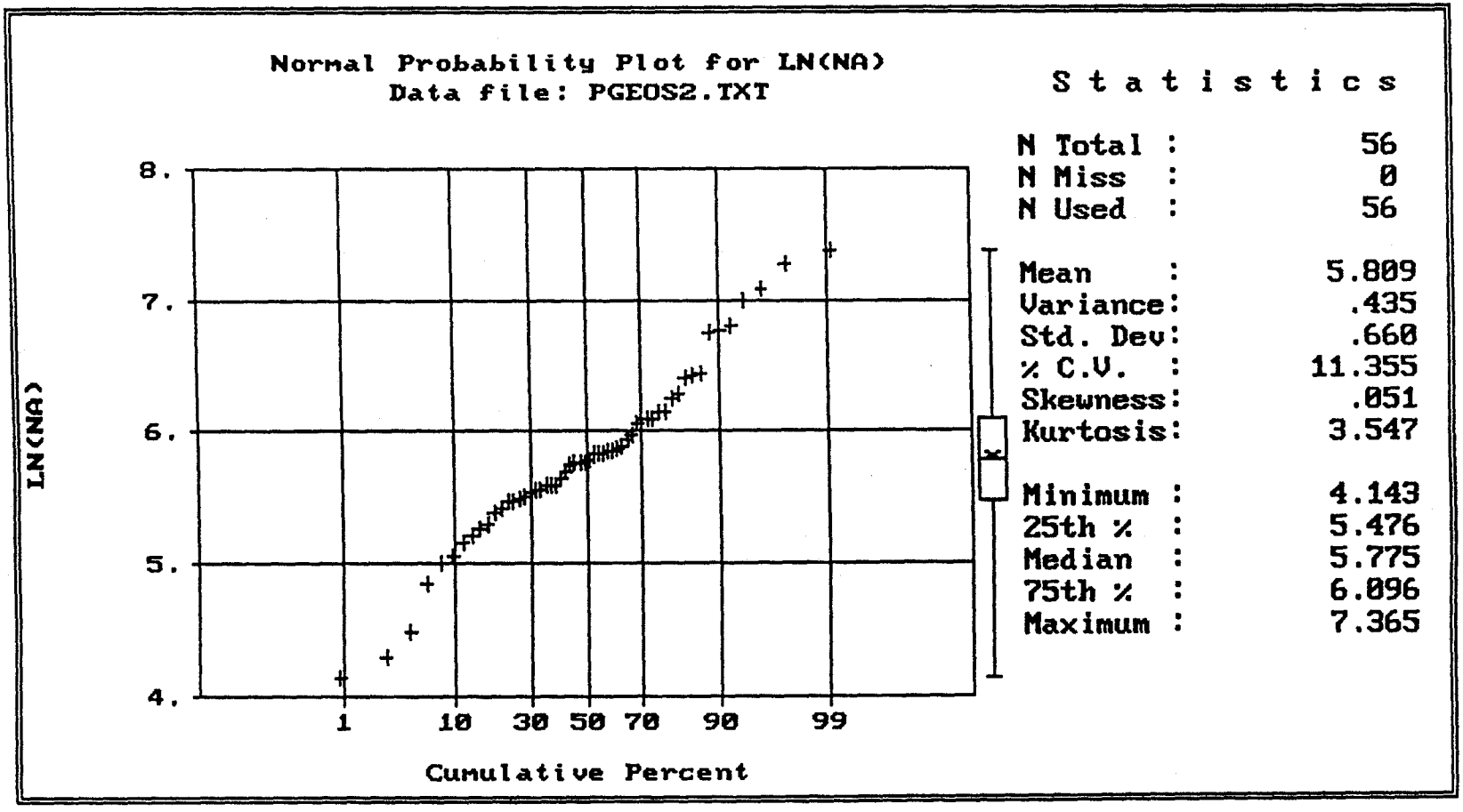
ATTACHMENT A
PINK AREA
SILVER (DETECTED RSULTS ONLY)



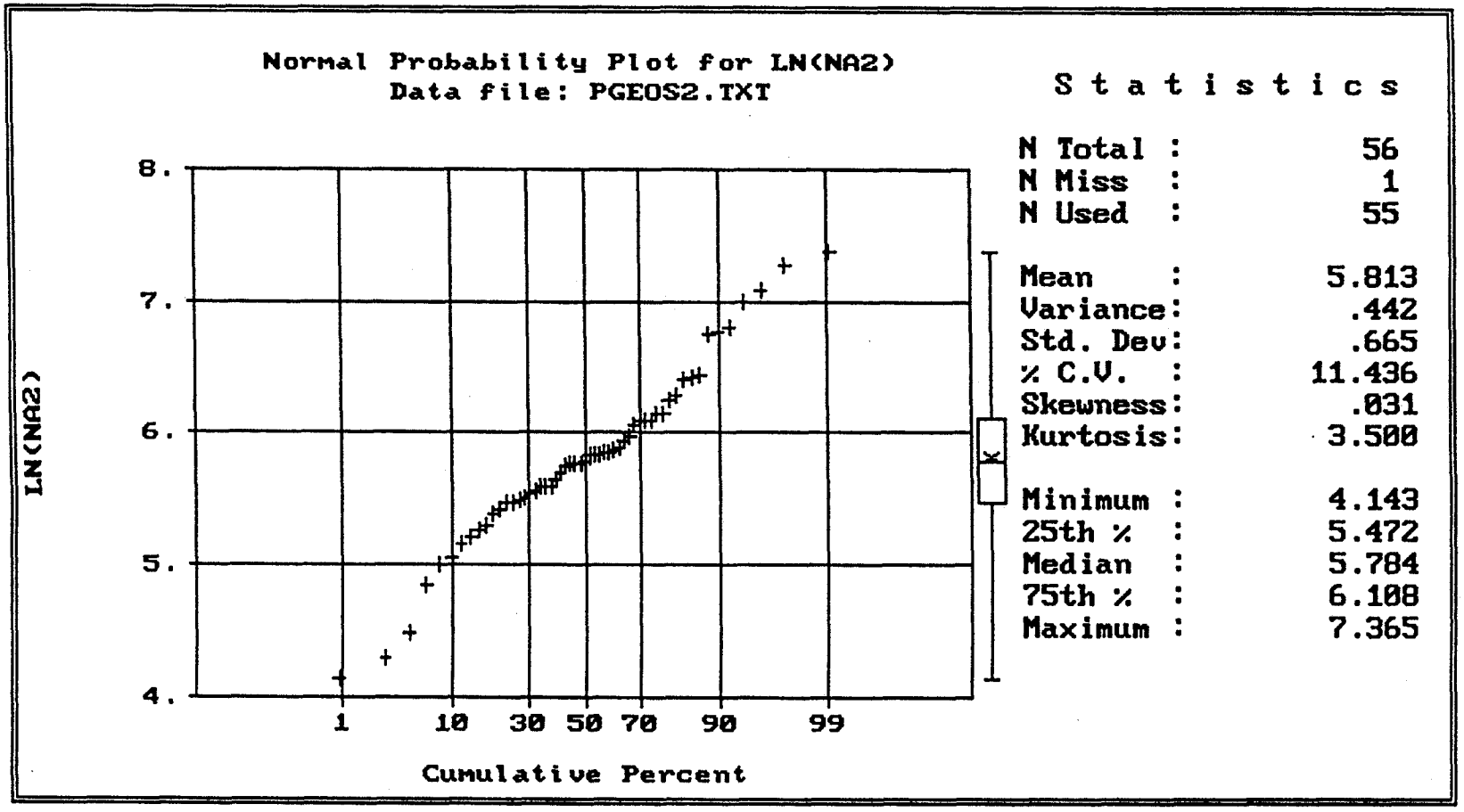
Statistics

N Total :	56
N Miss :	44
N Used :	12
Mean :	-.174
Variance:	.648
Std. Dev:	.805
% C.V. :	462.343
Skewness:	1.295
Kurtosis:	3.766
Minimum :	-1.139
25th % :	-.635
Median :	-.457
75th % :	-.151
Maximum :	1.730

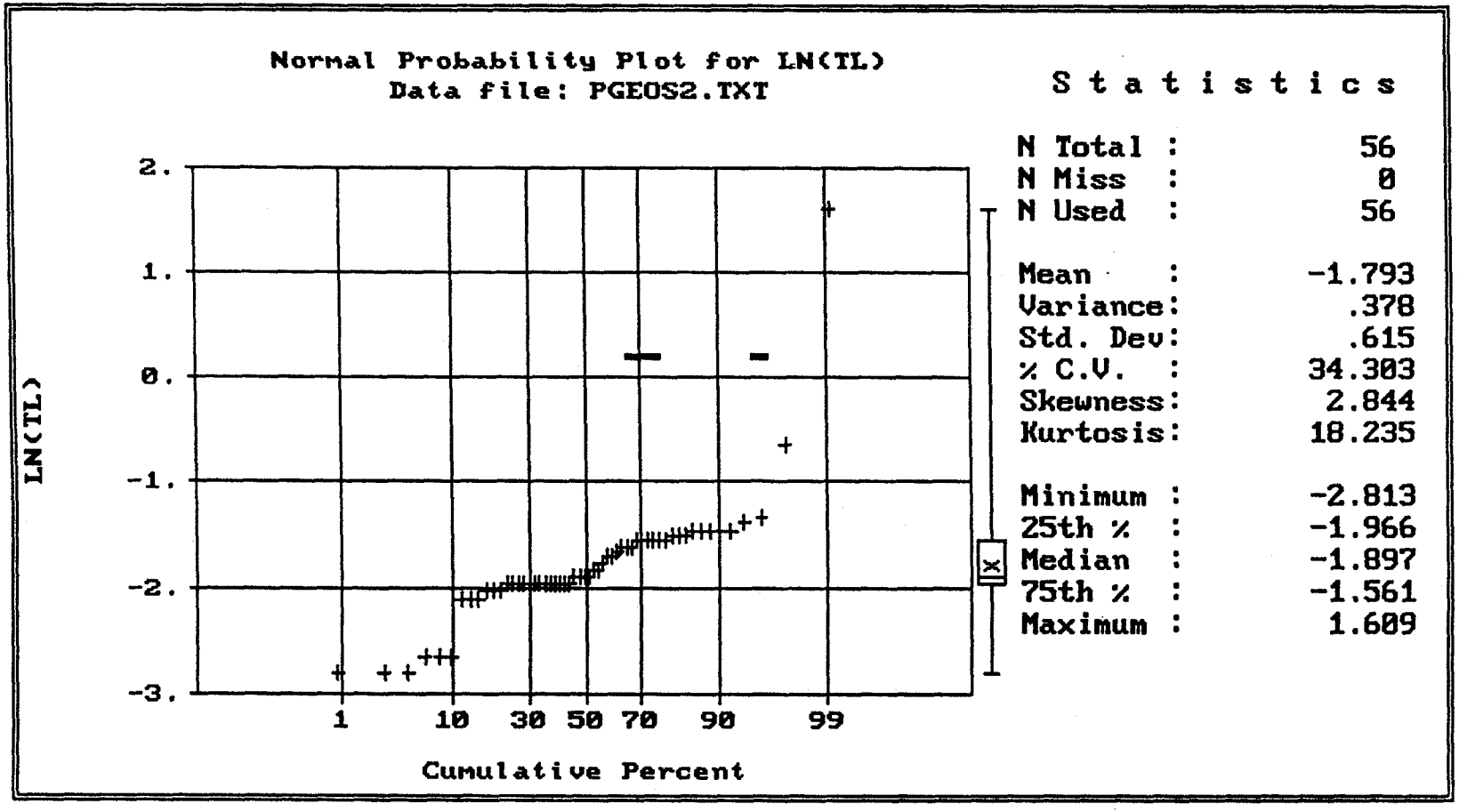
ATTACHMENT A
PINK AREA
SODIUM (ALL SAMPLES)



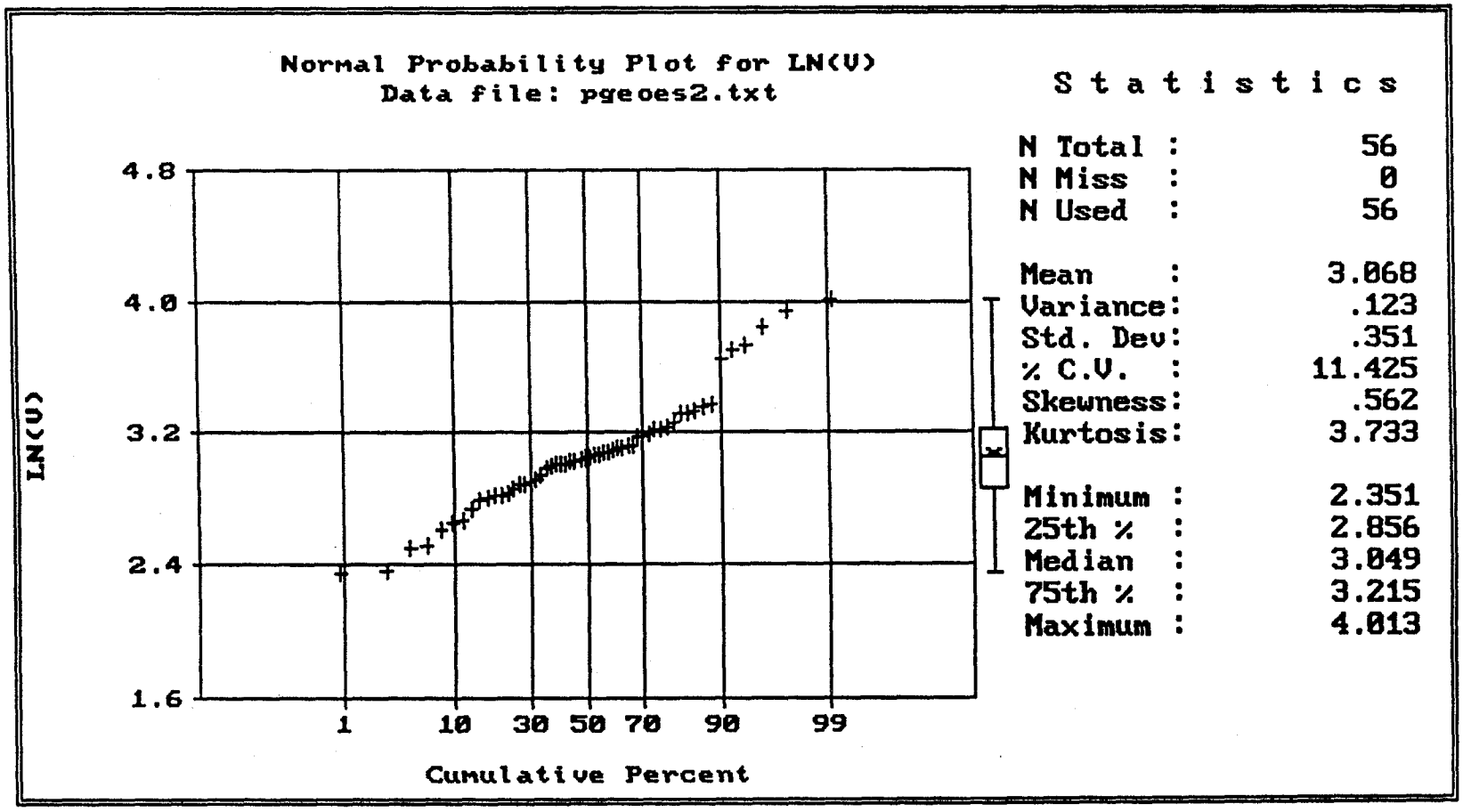
ATTACHMENT A
PINK AREA
SODIUM (DETECTED RESULTS ONLY)



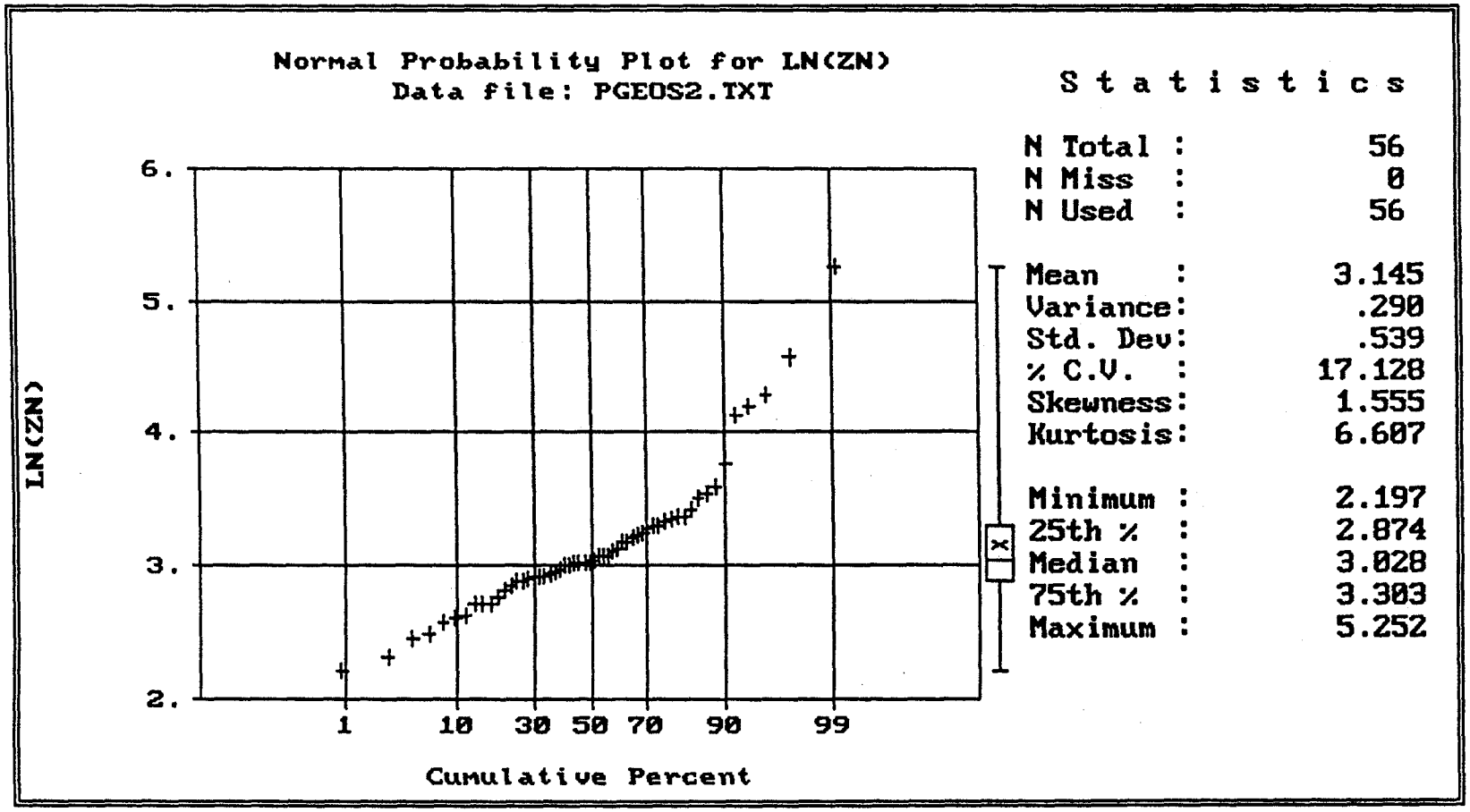
ATTACHMENT A
PINK AREA
THALLIUM (ALL SAMPLES)



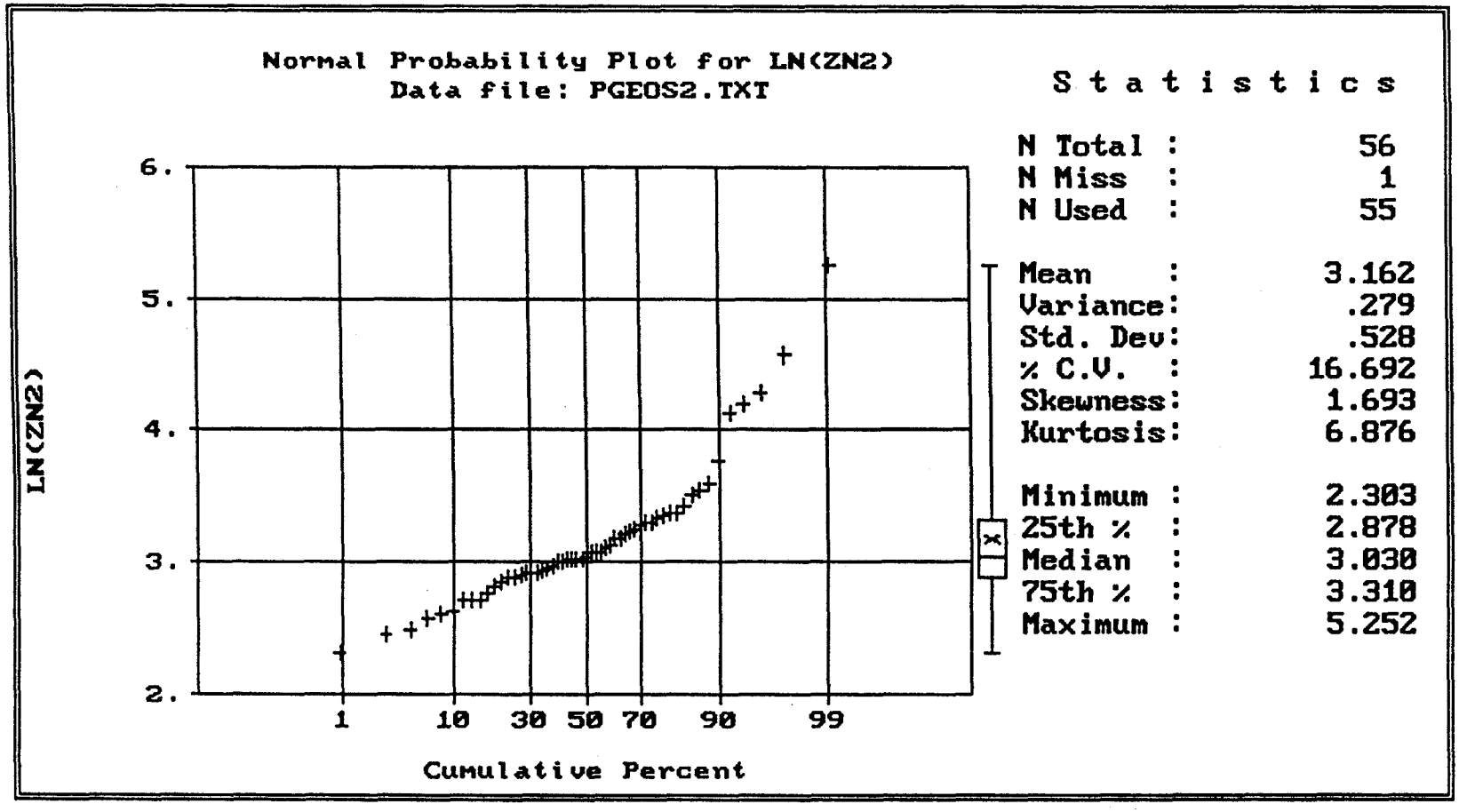
ATTACHMENT A
PINK AREA
VANADIUM (ALL SAMPLES)



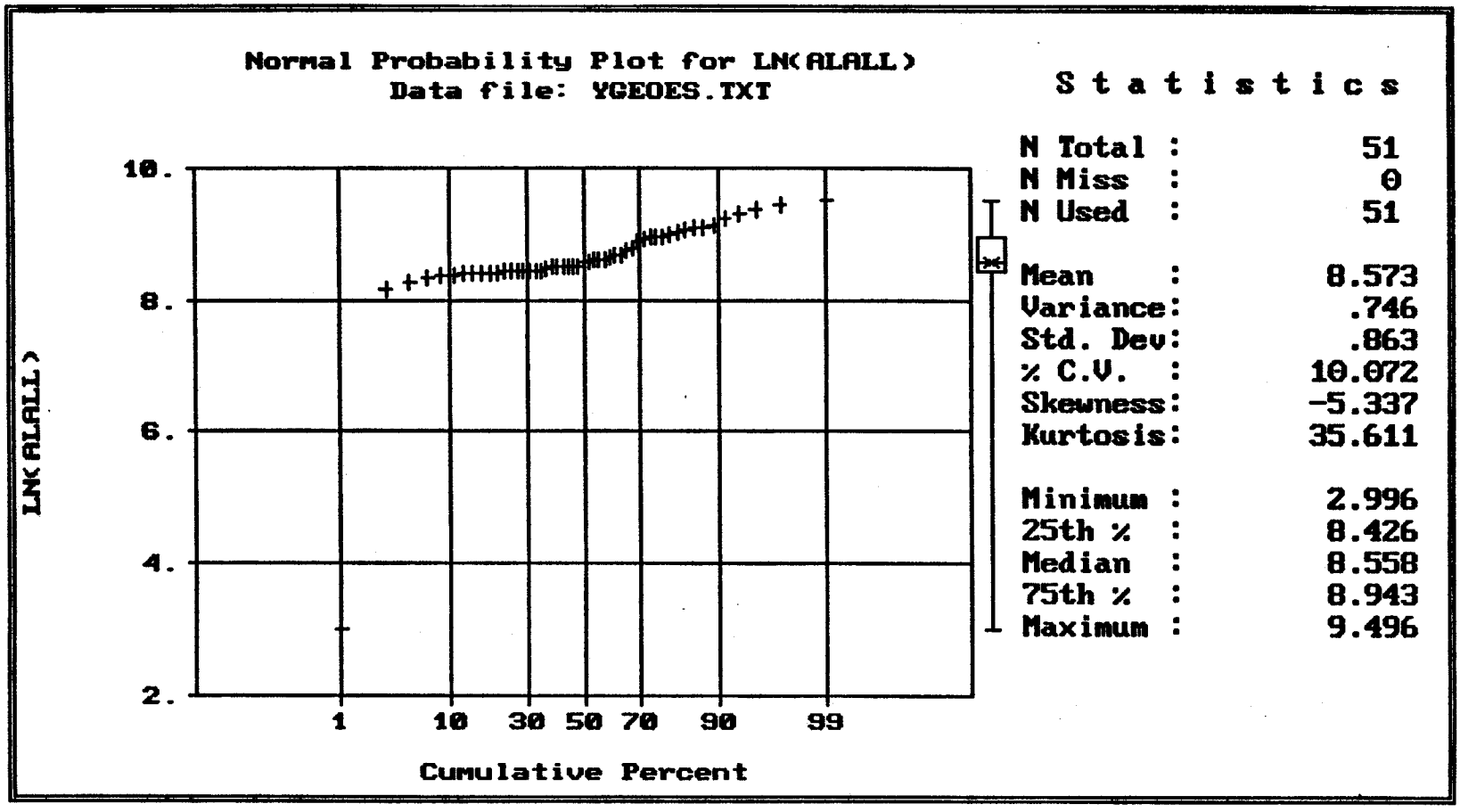
ATTACHMENT A
PINK AREA
ZINC (ALL SAMPLES)



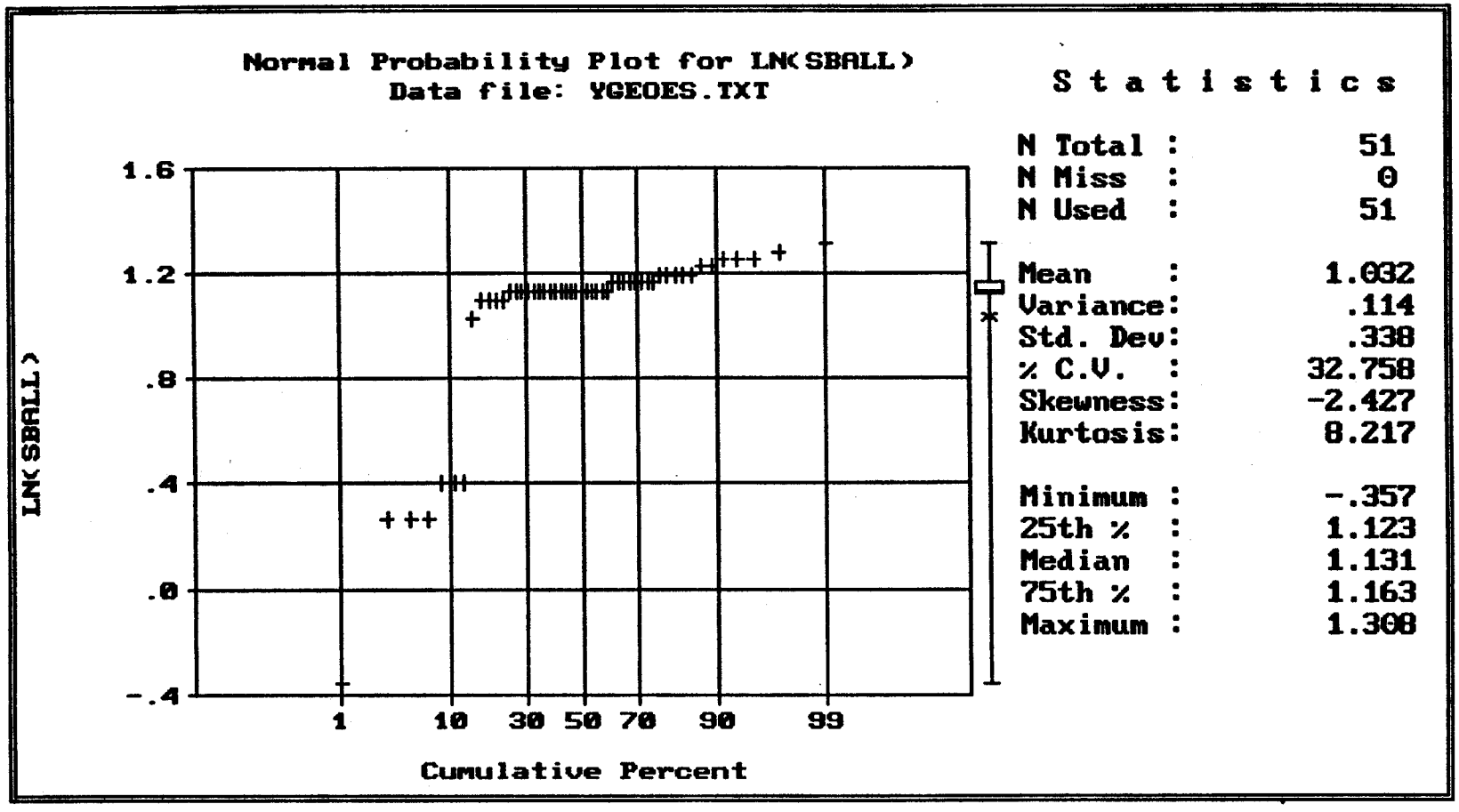
ATTACHMENT A
PINK AREA
ZINC (DETECTED RESULTS ONLY)



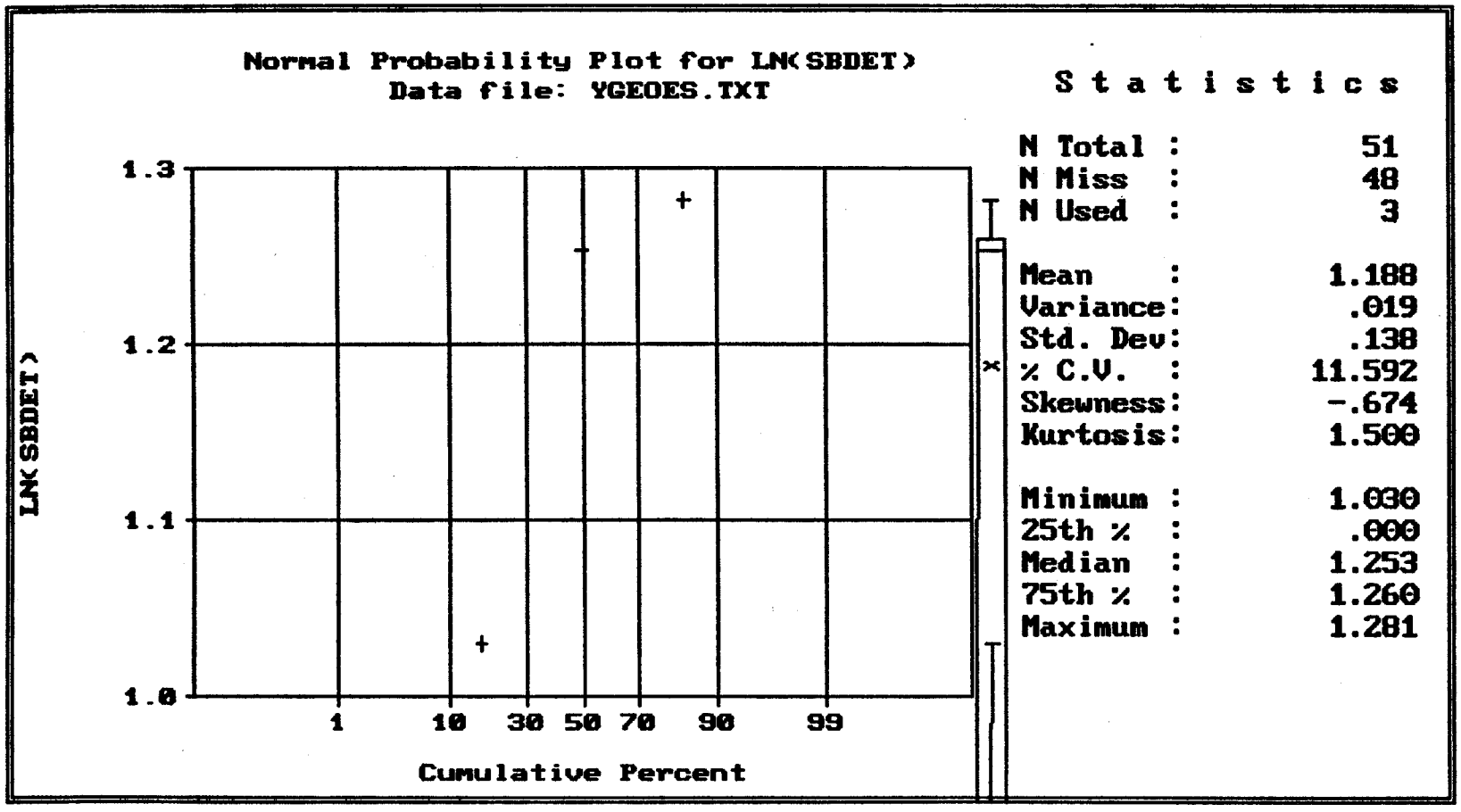
ATTACHMENT A
YELLOW AREA
ALUMINUM (ALL SAMPLES)



ATTACHMENT A
YELLOW AREA
ANTIMONY (ALL SAMPLES)



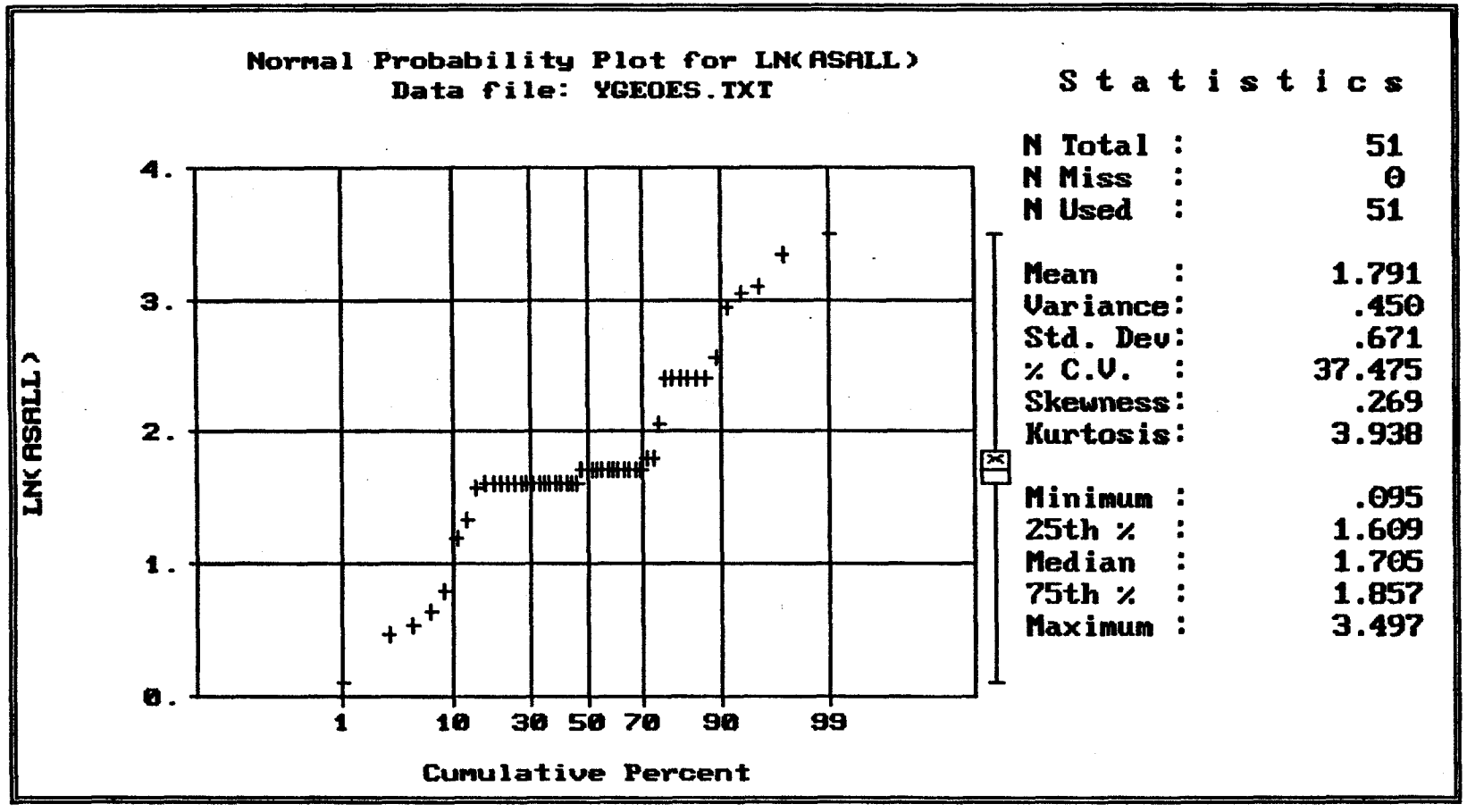
ATTACHMENT A
YELLOW AREA
ANTIMONY (DETECTED RESULTS ONLY)



Statistics

N Total :	51
N Miss :	48
N Used :	3
Mean :	1.188
Variance:	.019
Std. Dev:	.138
% C.V. :	11.592
Skewness:	-.674
Kurtosis:	1.500
Minimum :	1.030
25th % :	.000
Median :	1.253
75th % :	1.260
Maximum :	1.281

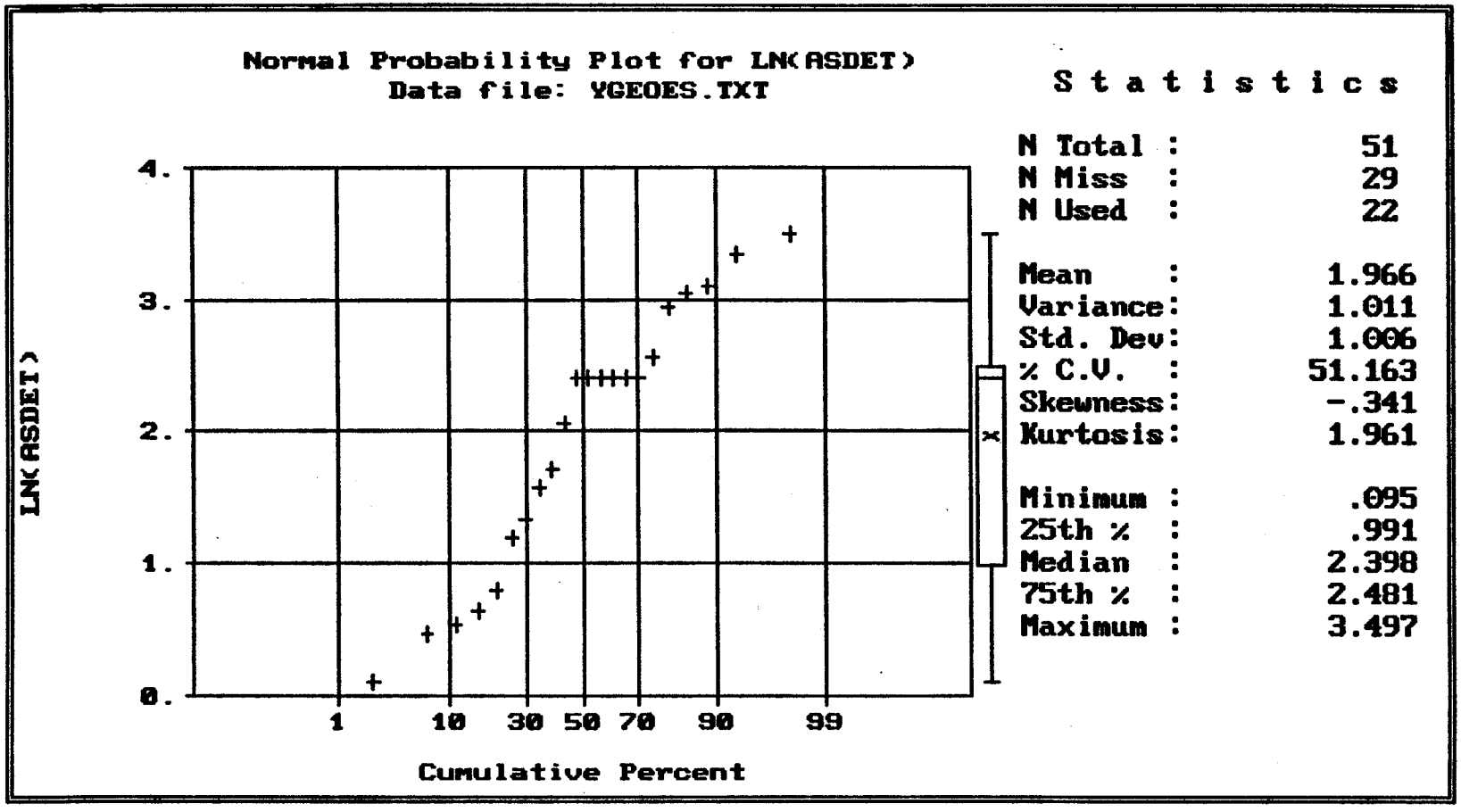
ATTACHMENT A
YELLOW AREA
ARSENIC (ALL SAMPLES)



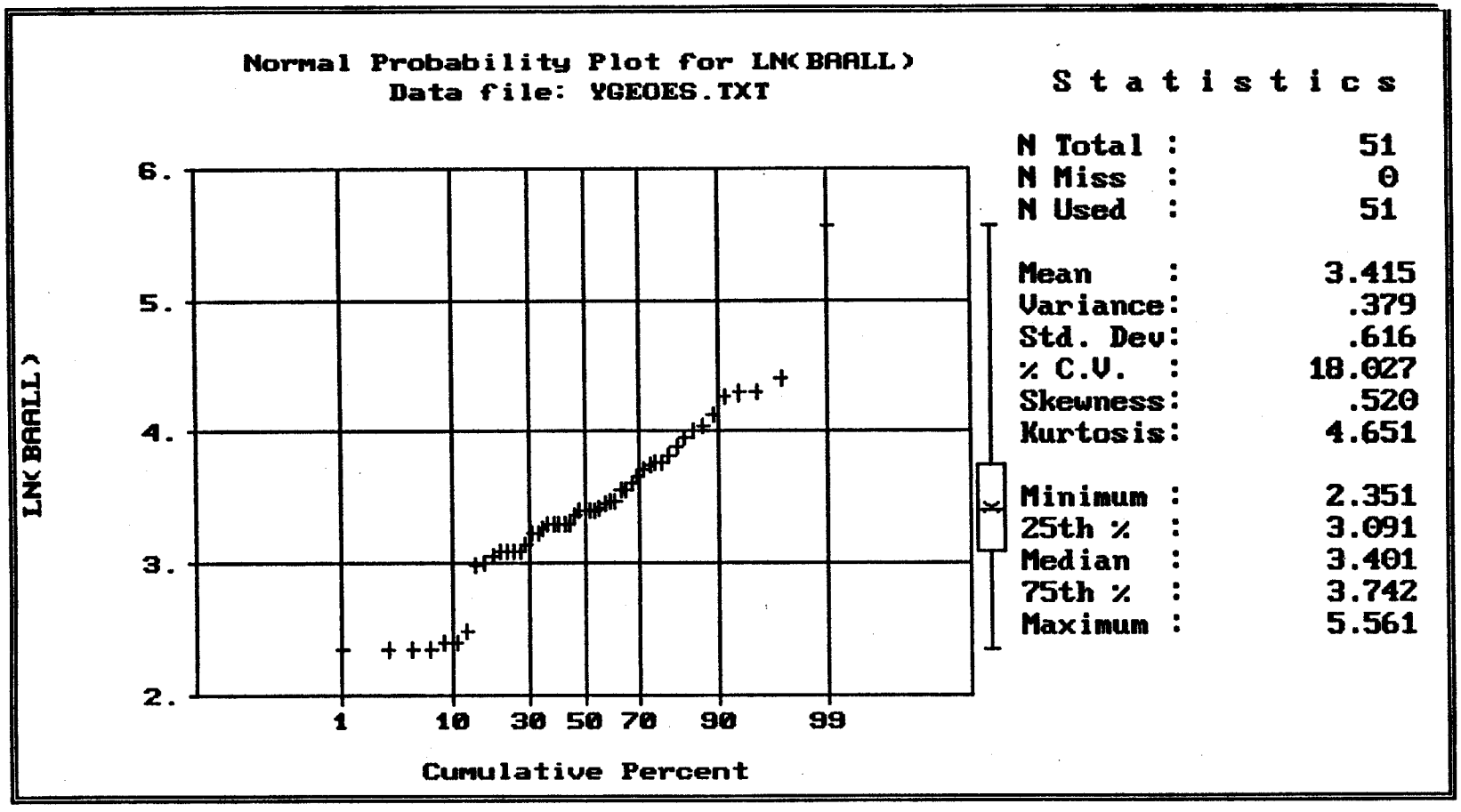
Statistics

N Total :	51
N Miss :	0
N Used :	51
Mean :	1.791
Variance:	.450
Std. Dev:	.671
% C.V. :	37.475
Skewness:	.269
Kurtosis:	3.938
Minimum :	.095
25th % :	1.609
Median :	1.705
75th % :	1.857
Maximum :	3.497

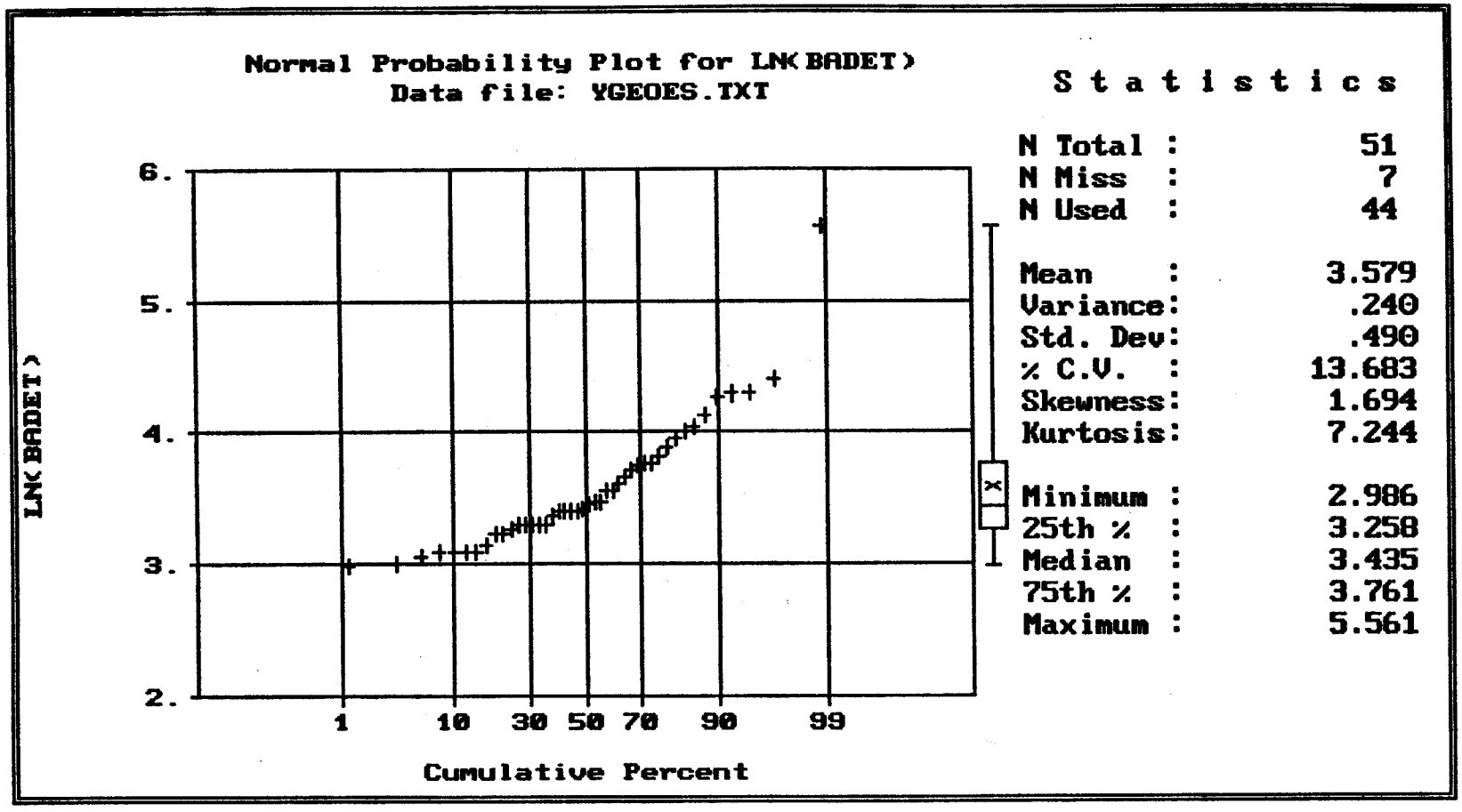
ATTACHMENT A
YELLOW AREA
ARSENIC (DETECTED RESULTS ONLY)



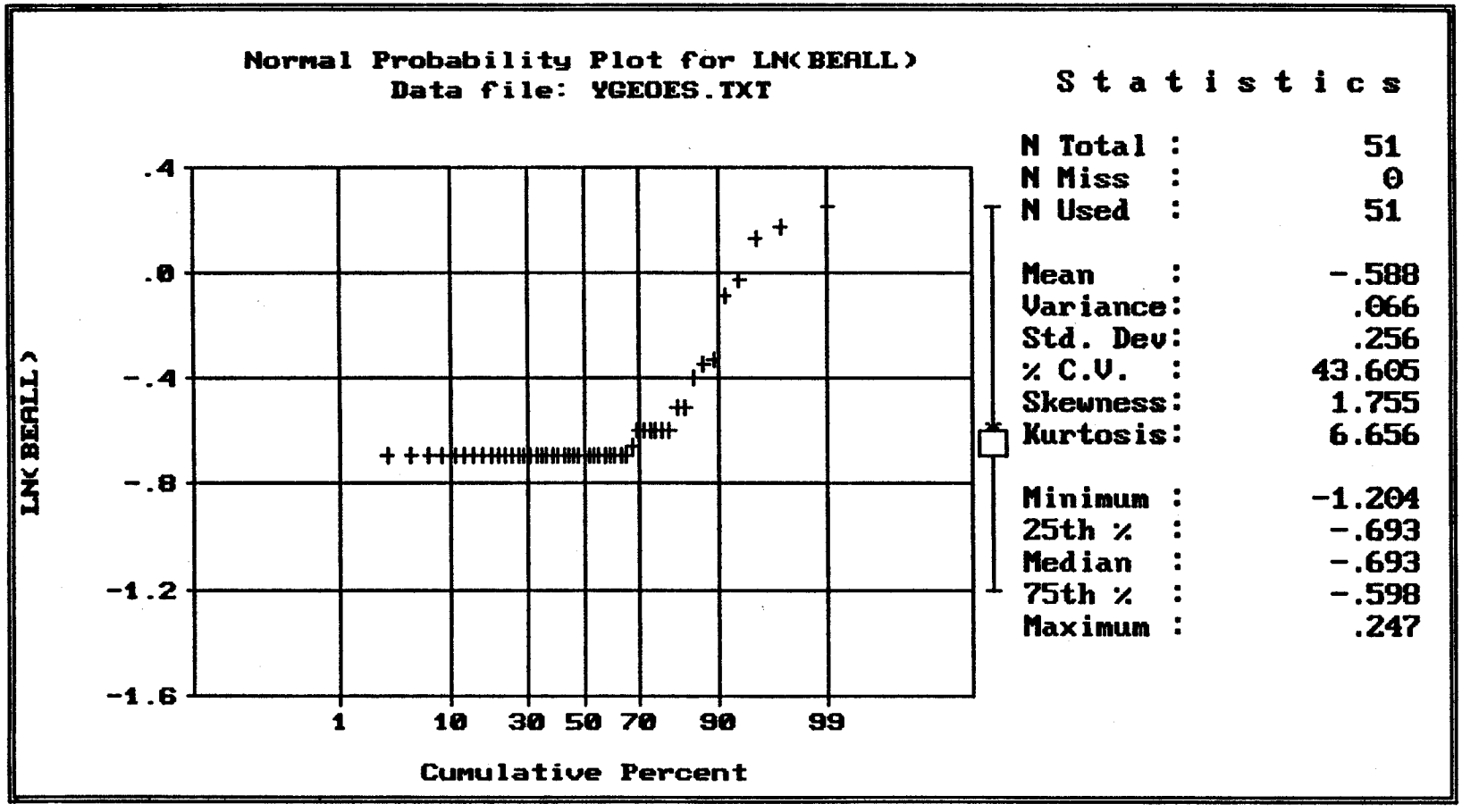
ATTACHMENT A
YELLOW AREA
BARIUM (ALL SAMPLES)



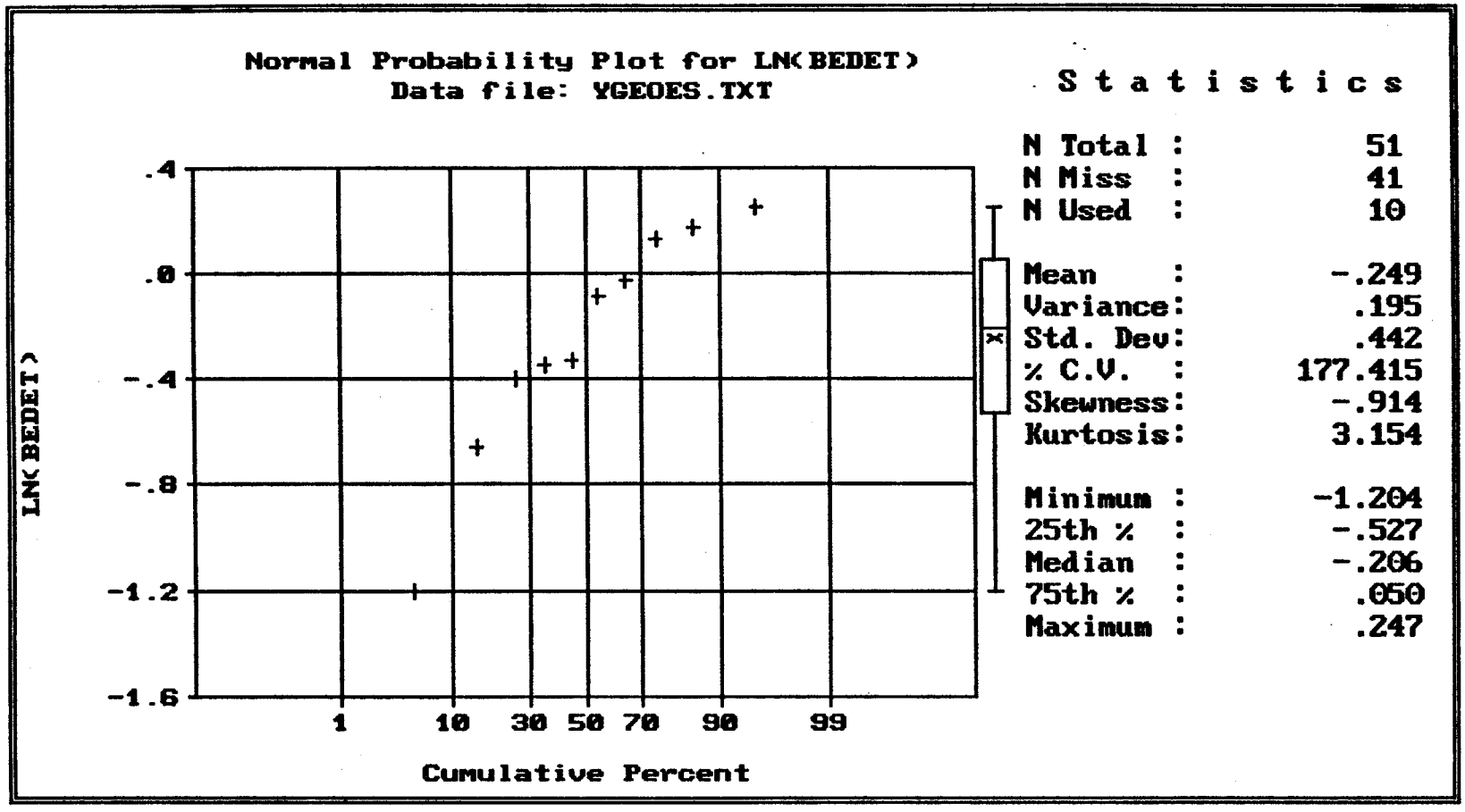
ATTACHMENT A
YELLOW AREA
BARIUM (DETECTED RESULTS ONLY)



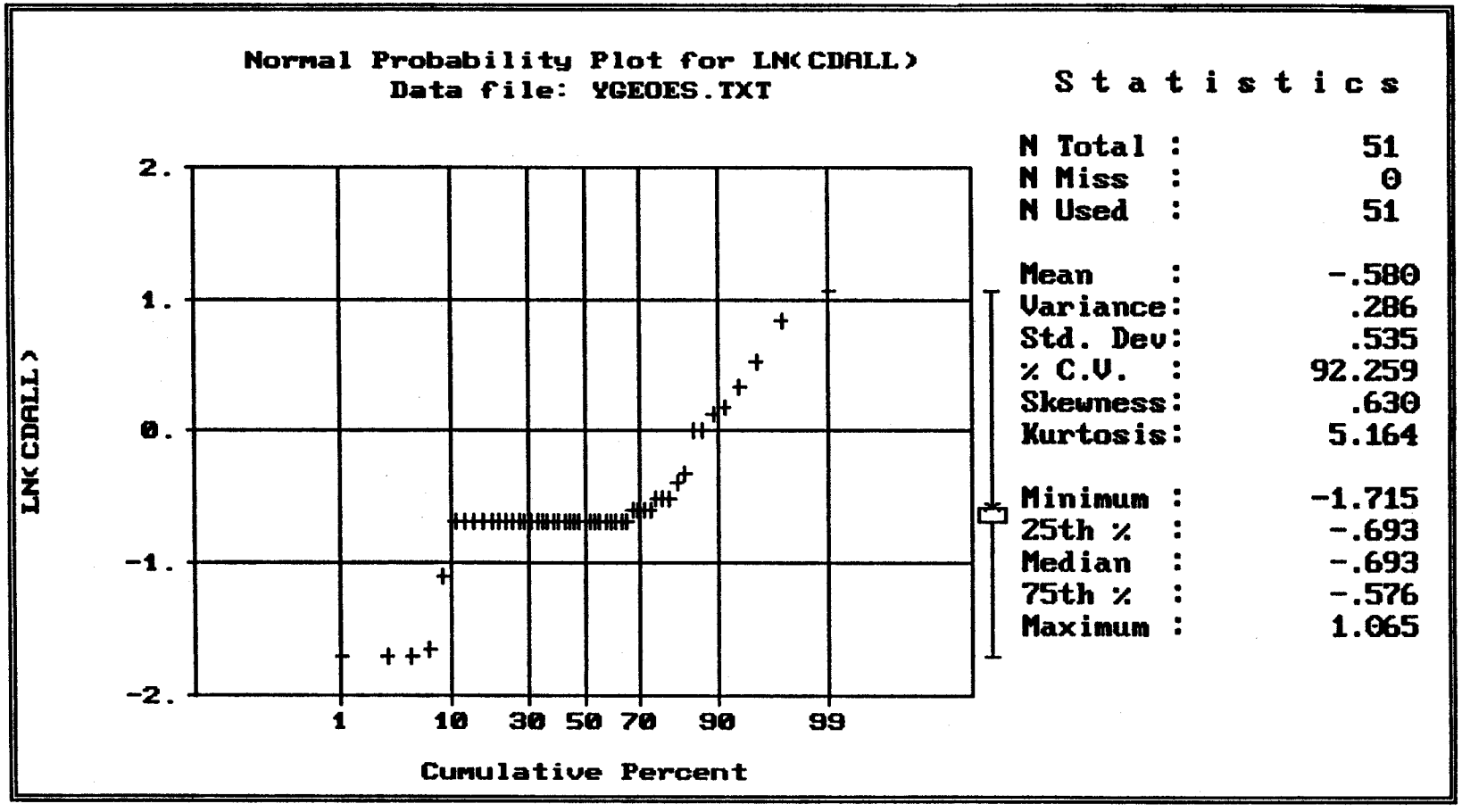
ATTACHMENT A
YELLOW AREA
BERYLLIUM (ALL SAMPLES)



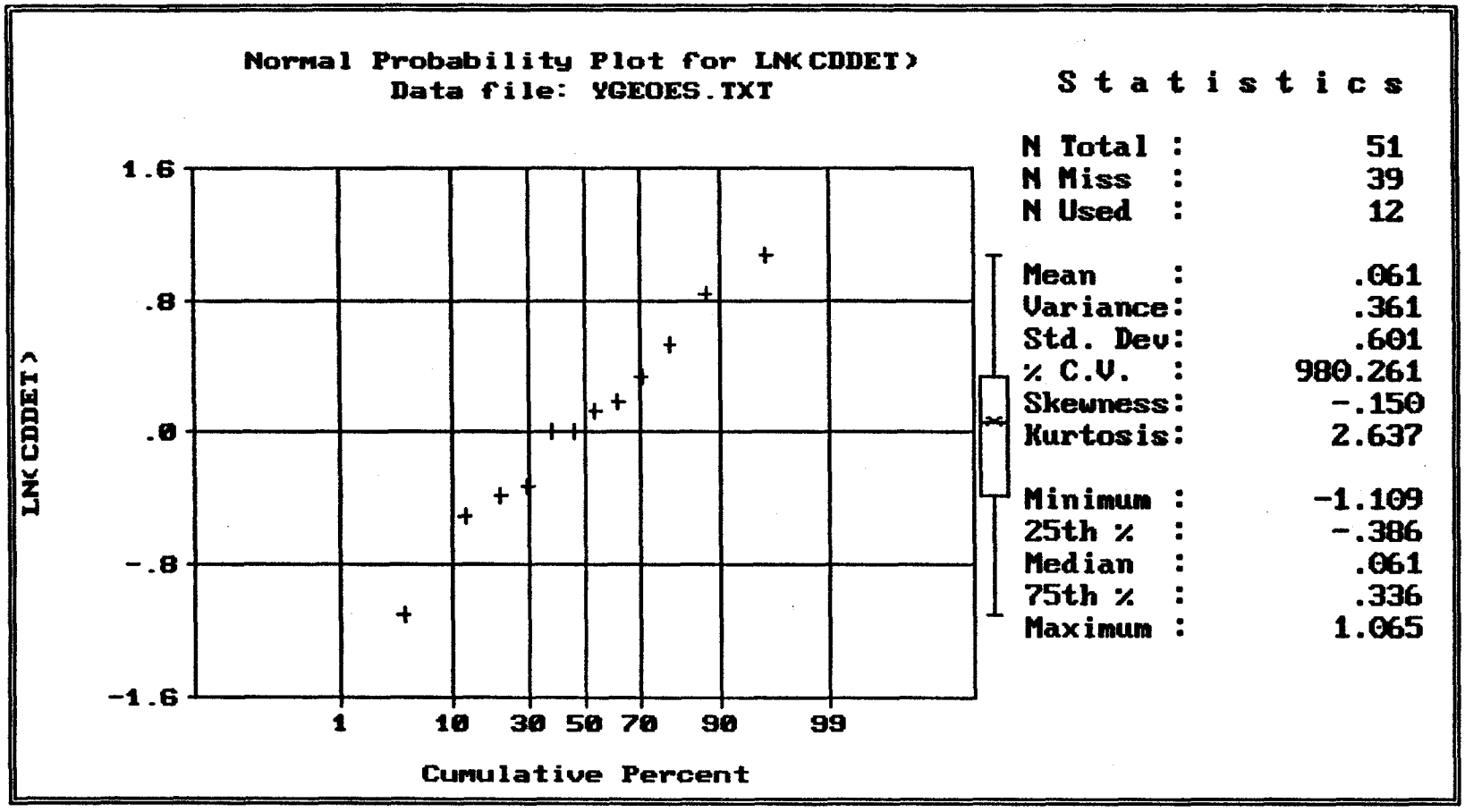
ATTACHMENT A
YELLOW AREA
BERYLLIUM (DETECTED RESULTS ONLY)



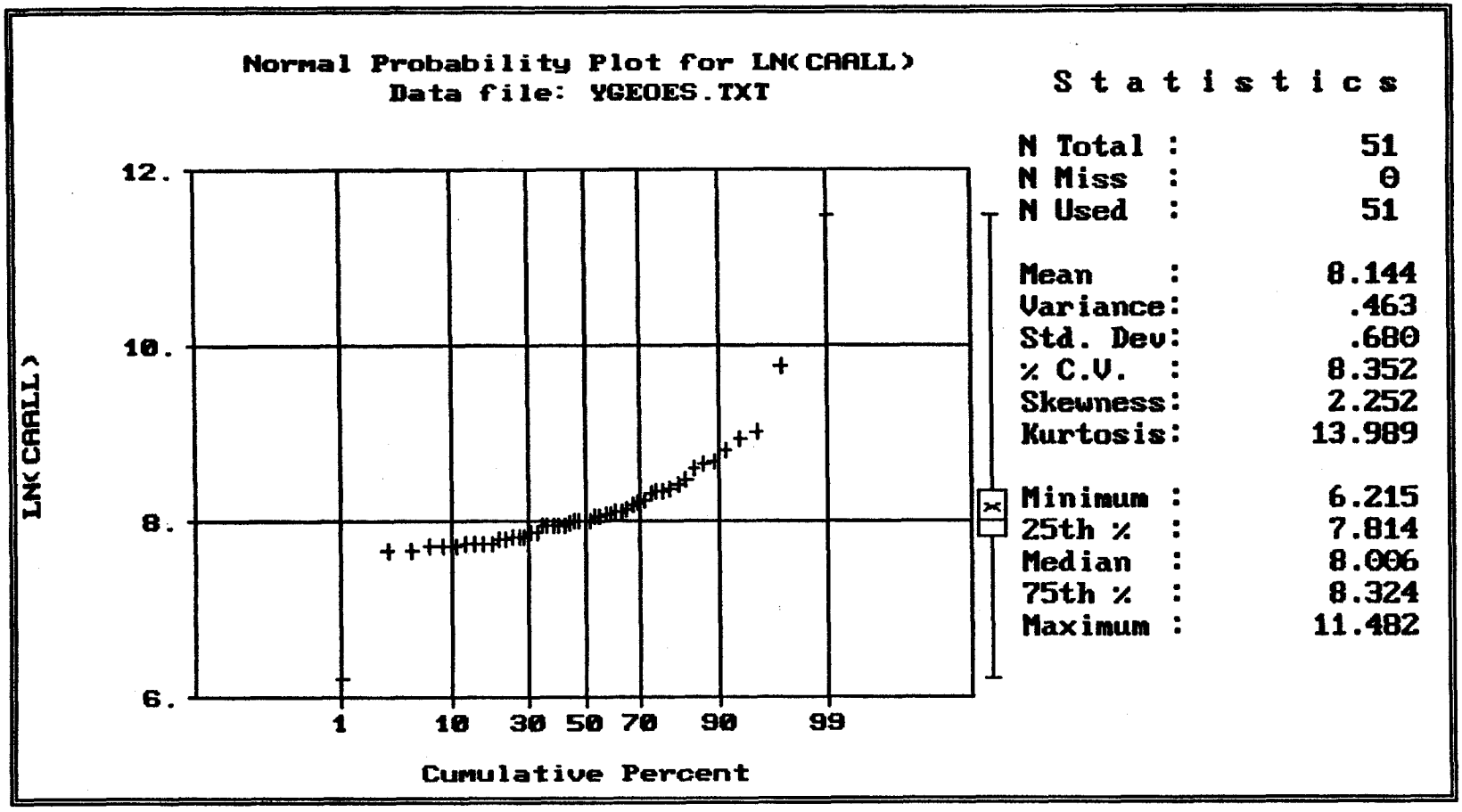
ATTACHMENT A
YELLOW AREA
CADMIUM (ALL SAMPLES)



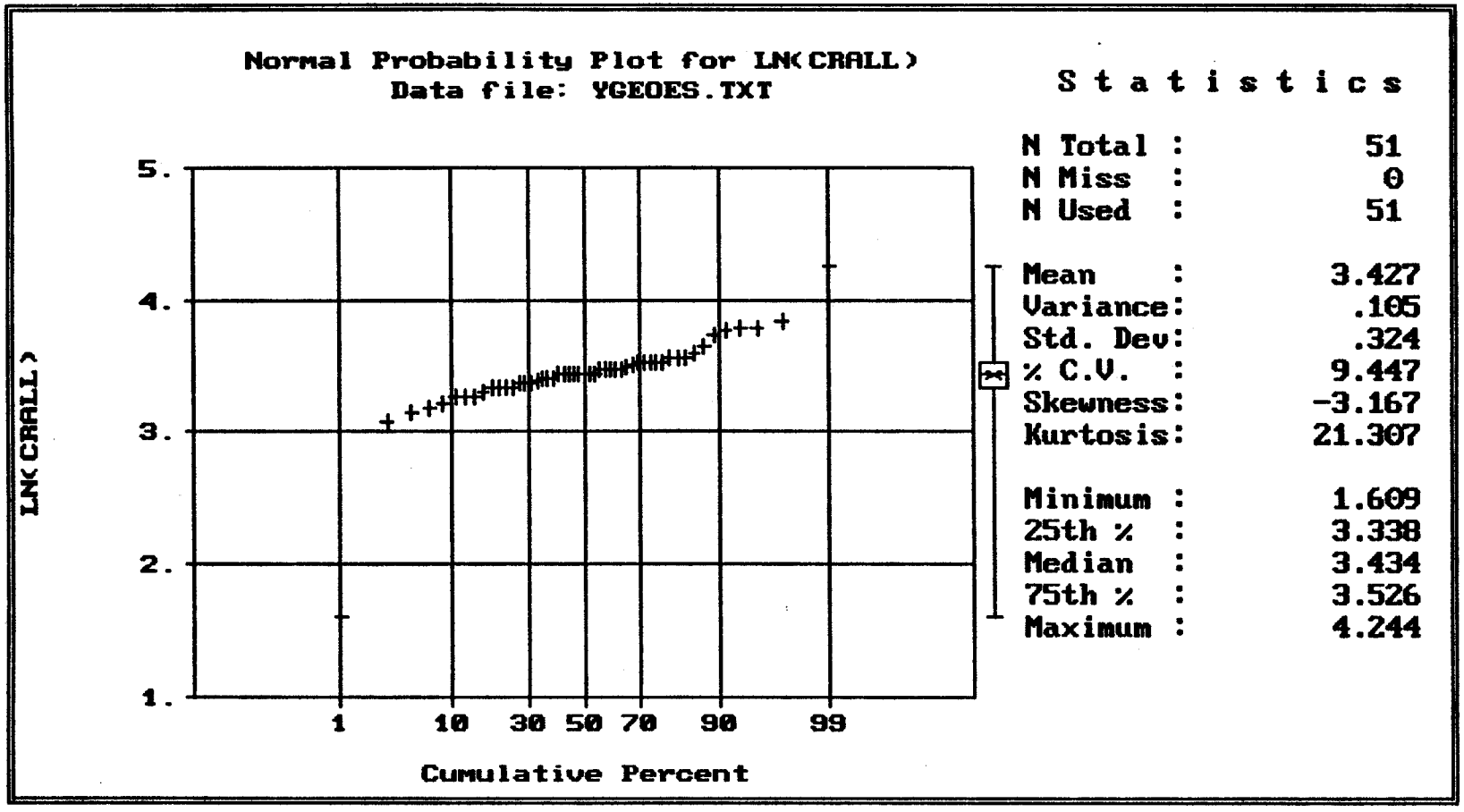
ATTACHMENT A
YELLOW AREA
CADMIUM (DETECTED RESULTS ONLY)



ATTACHMENT A
YELLOW AREA
CALCIUM (ALL SAMPLES)



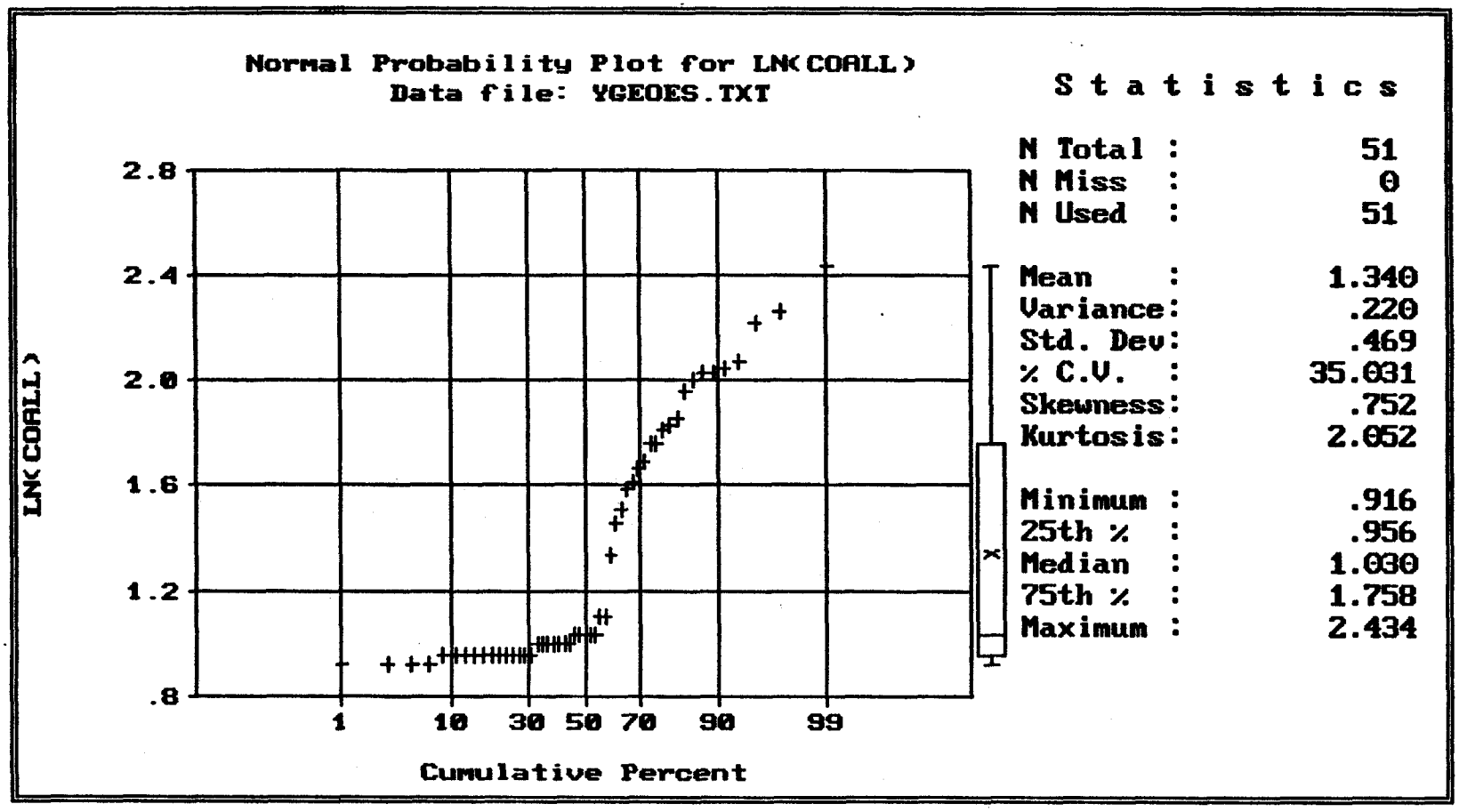
ATTACHMENT A
YELLOW AREA
CHROMIUM (ALL SAMPLES)



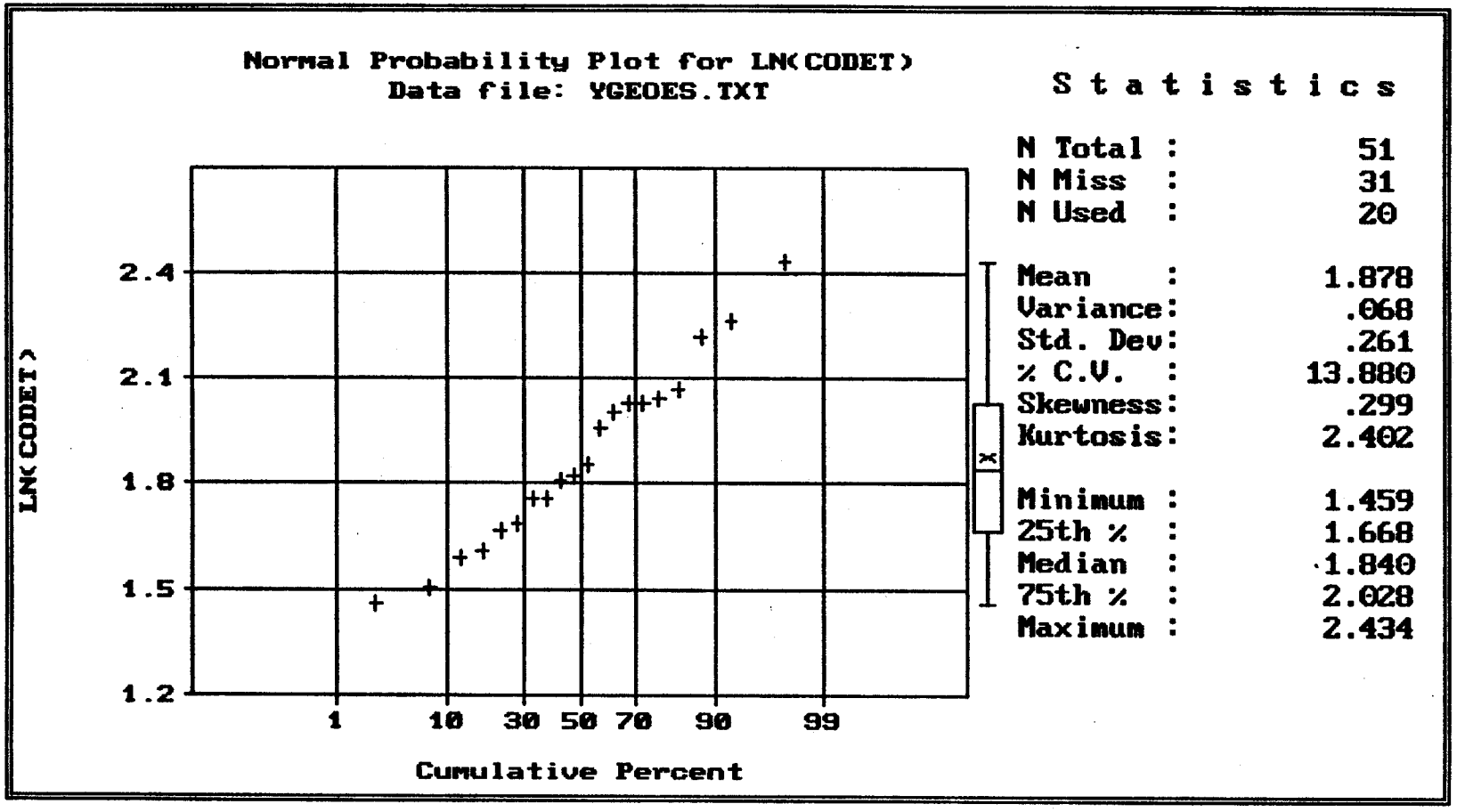
Statistics

N Total :	51
N Miss :	0
N Used :	51
Mean :	3.427
Variance:	.105
Std. Dev:	.324
% C.V. :	9.447
Skewness:	-3.167
Kurtosis:	21.307
Minimum :	1.609
25th % :	3.338
Median :	3.434
75th % :	3.526
Maximum :	4.244

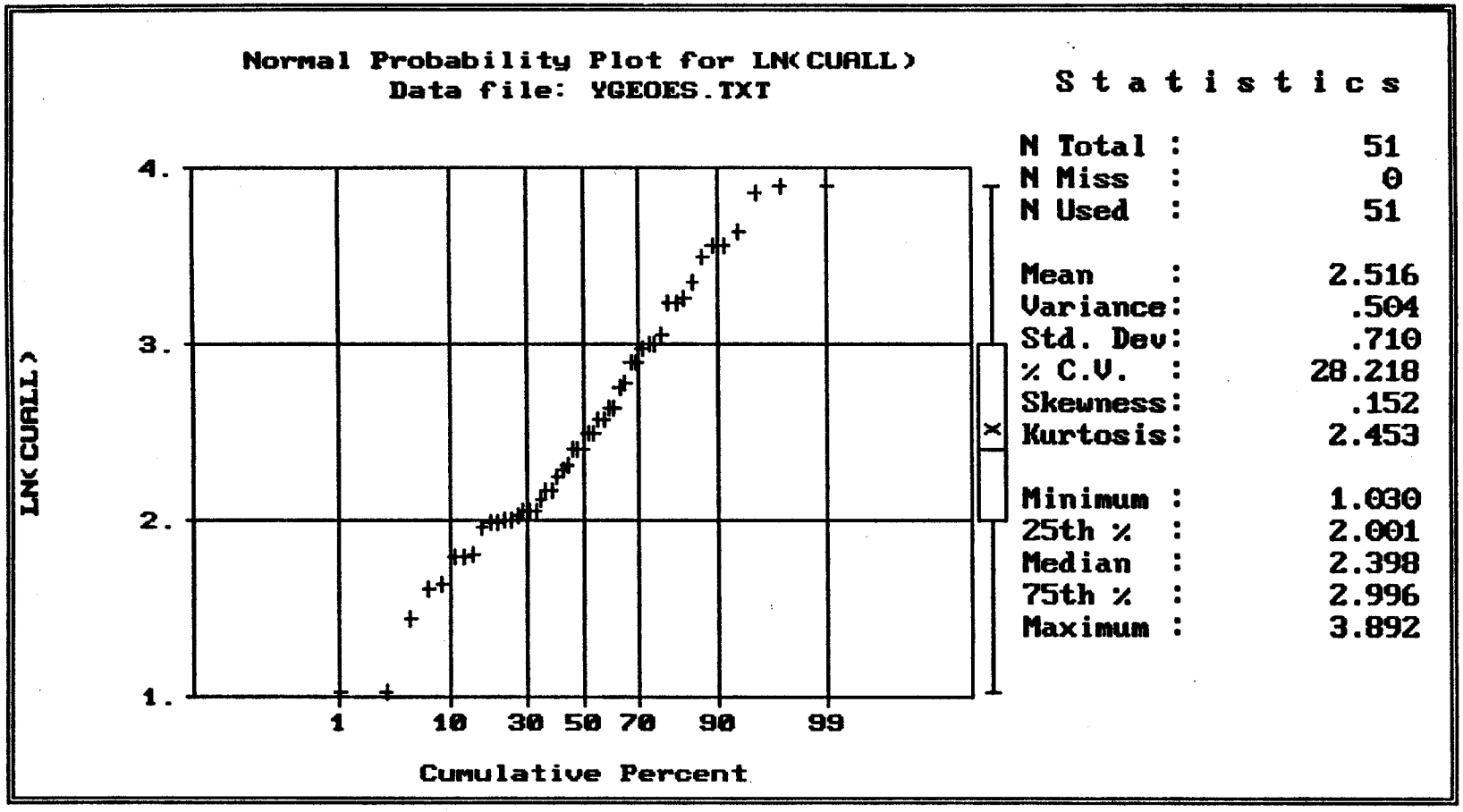
ATTACHMENT A
YELLOW AREA
COBALT (ALL SAMPLES)



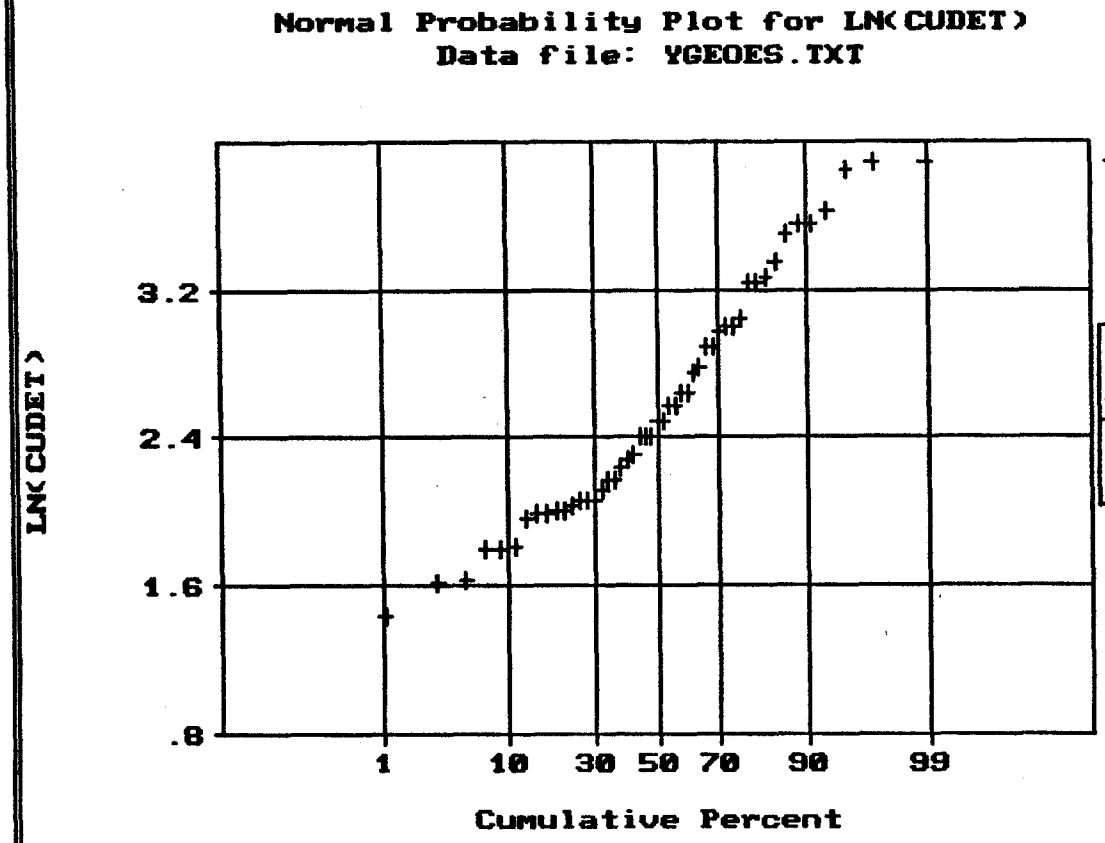
ATTACHMENT A
YELLOW AREA
COBALT (DETECTED RESULTS ONLY)



ATTACHMENT A
YELLOW AREA
COPPER (ALL SAMPLES)



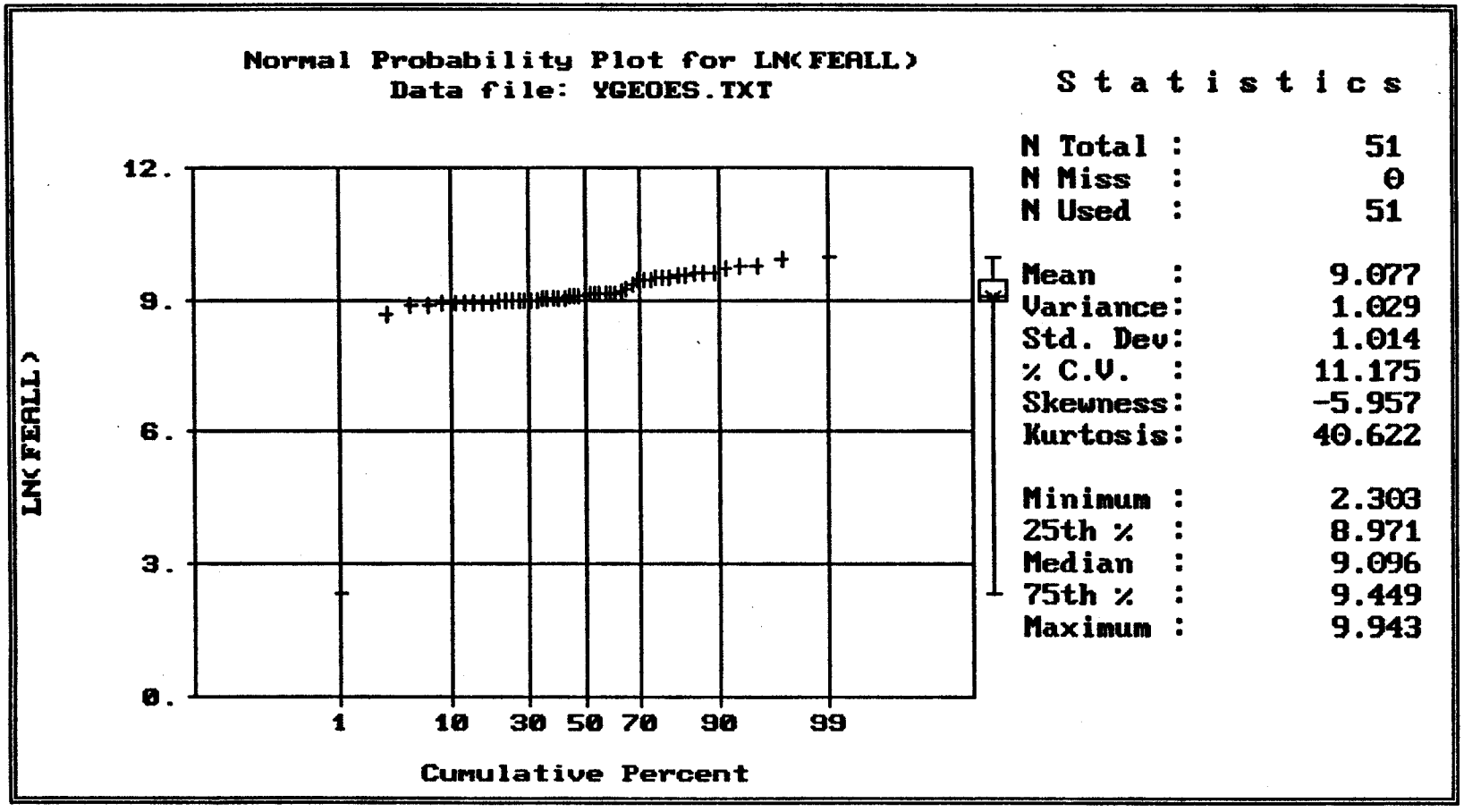
ATTACHMENT A
YELLOW AREA
COPPER (DETECTED RESULTS ONLY)



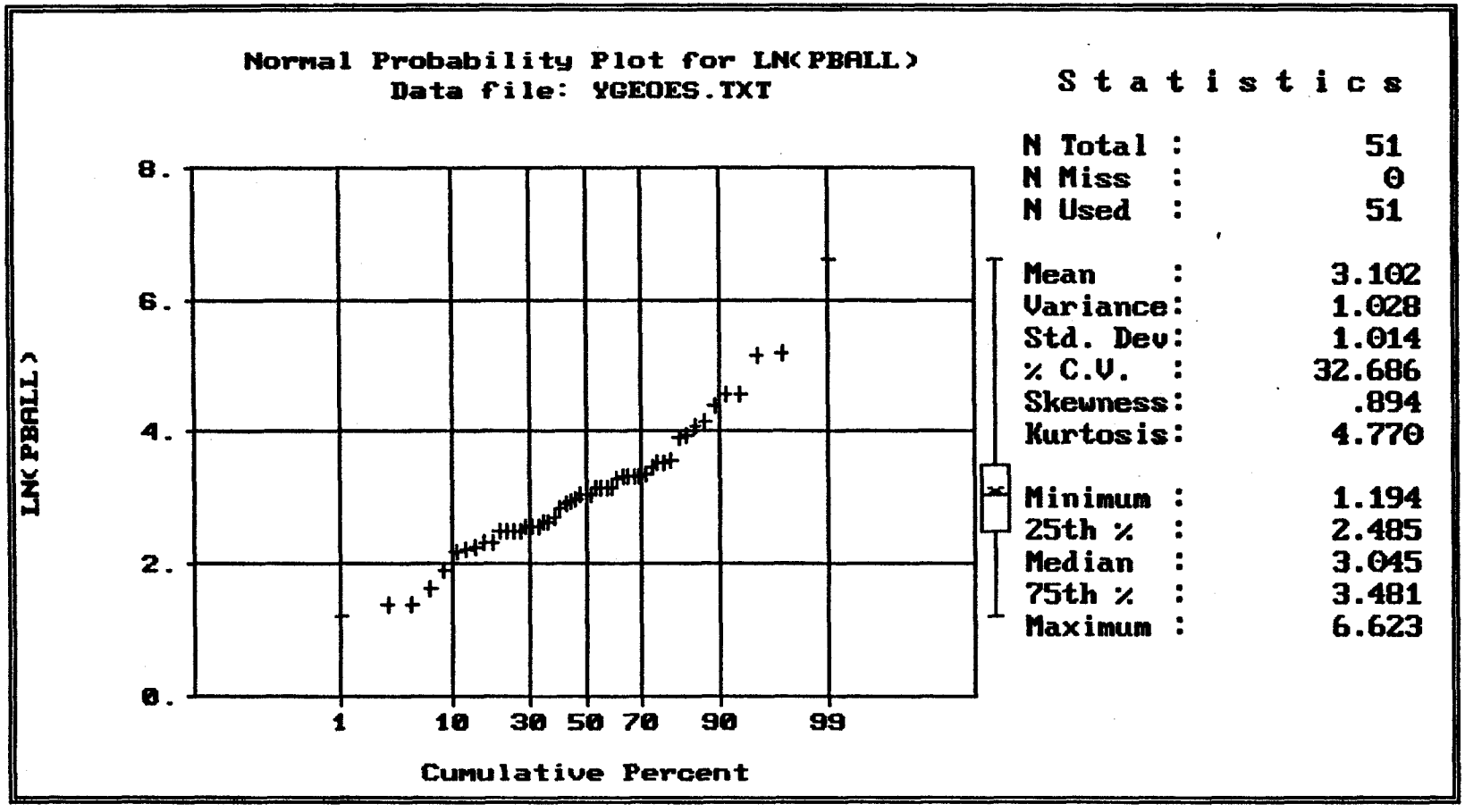
Statistics

N Total :	51
N Miss :	2
N Used :	49
Mean :	2.577
Variance:	.429
Std. Dev:	.655
% C.V. :	25.426
Skewness:	.412
Kurtosis:	2.192
Minimum :	1.435
25th % :	2.035
Median :	2.485
75th % :	2.996
Maximum :	3.892

ATTACHMENT A
YELLOW AREA
IRON (ALL SAMPLES)



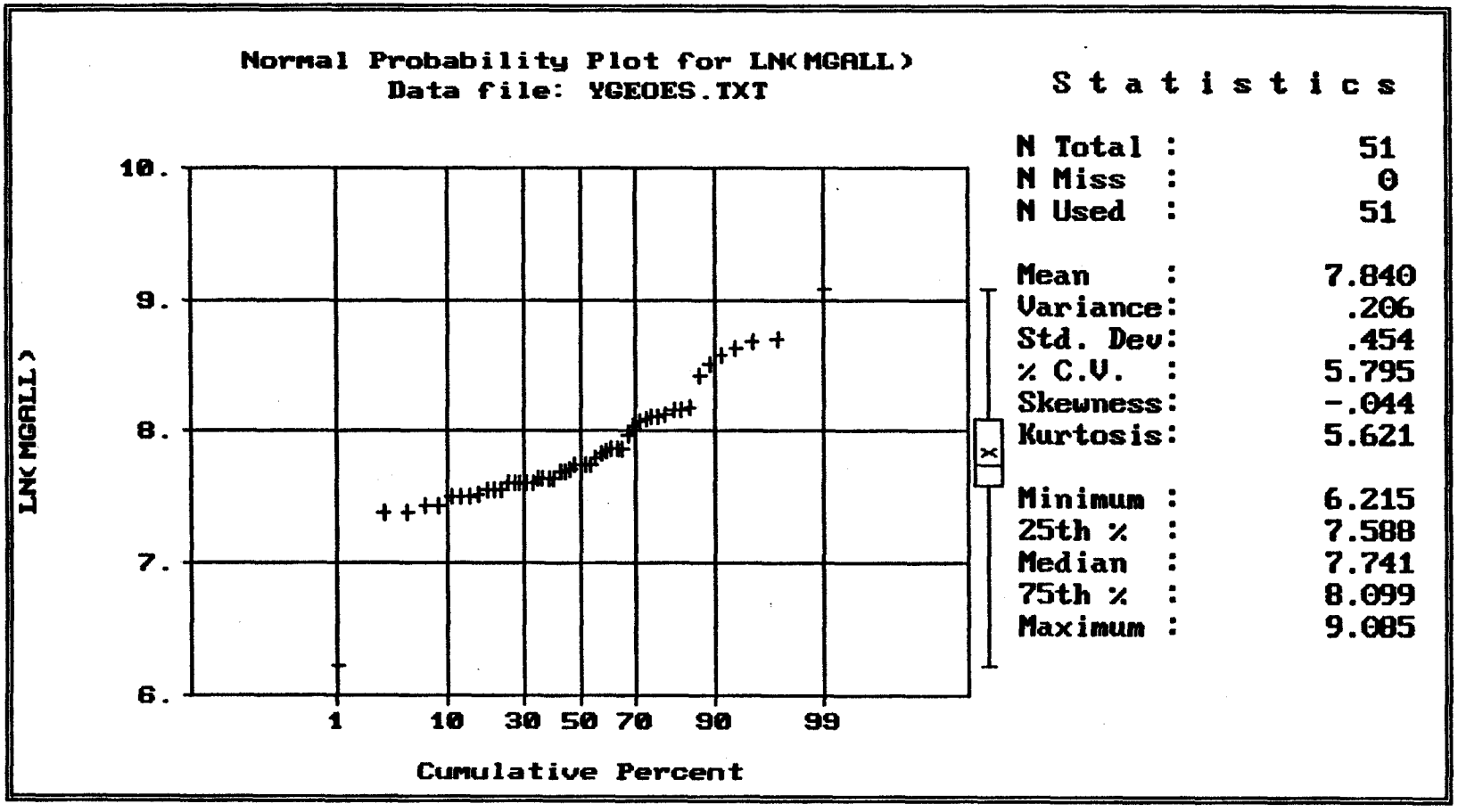
ATTACHMENT A
YELLOW AREA
LEAD (ALL SAMPLES)



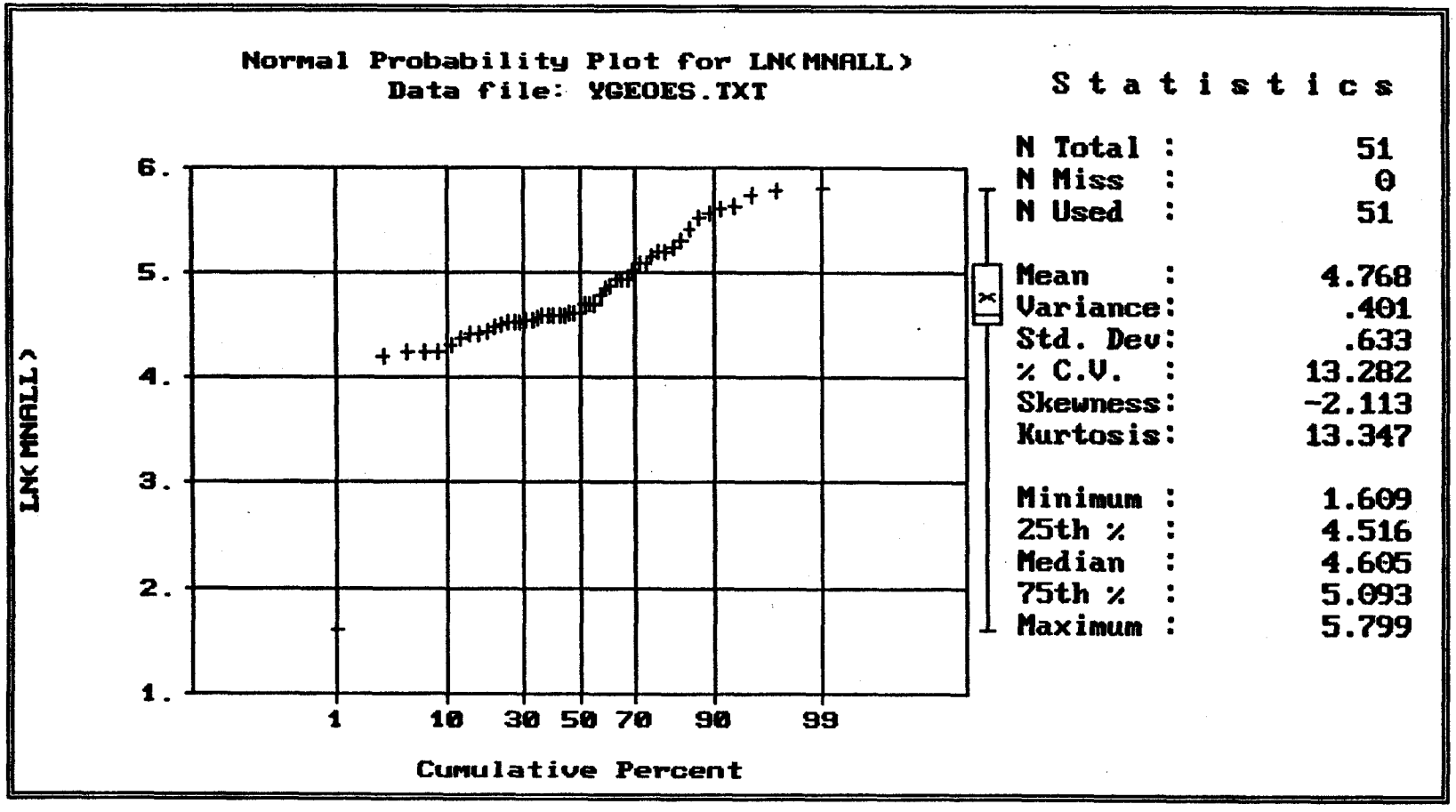
Statistics

N Total :	51
N Miss :	0
N Used :	51
Mean :	3.102
Variance:	1.028
Std. Dev:	1.014
% C.V. :	32.686
Skewness:	.894
Kurtosis:	4.770
Minimum :	1.194
25th % :	2.485
Median :	3.045
75th % :	3.481
Maximum :	6.623

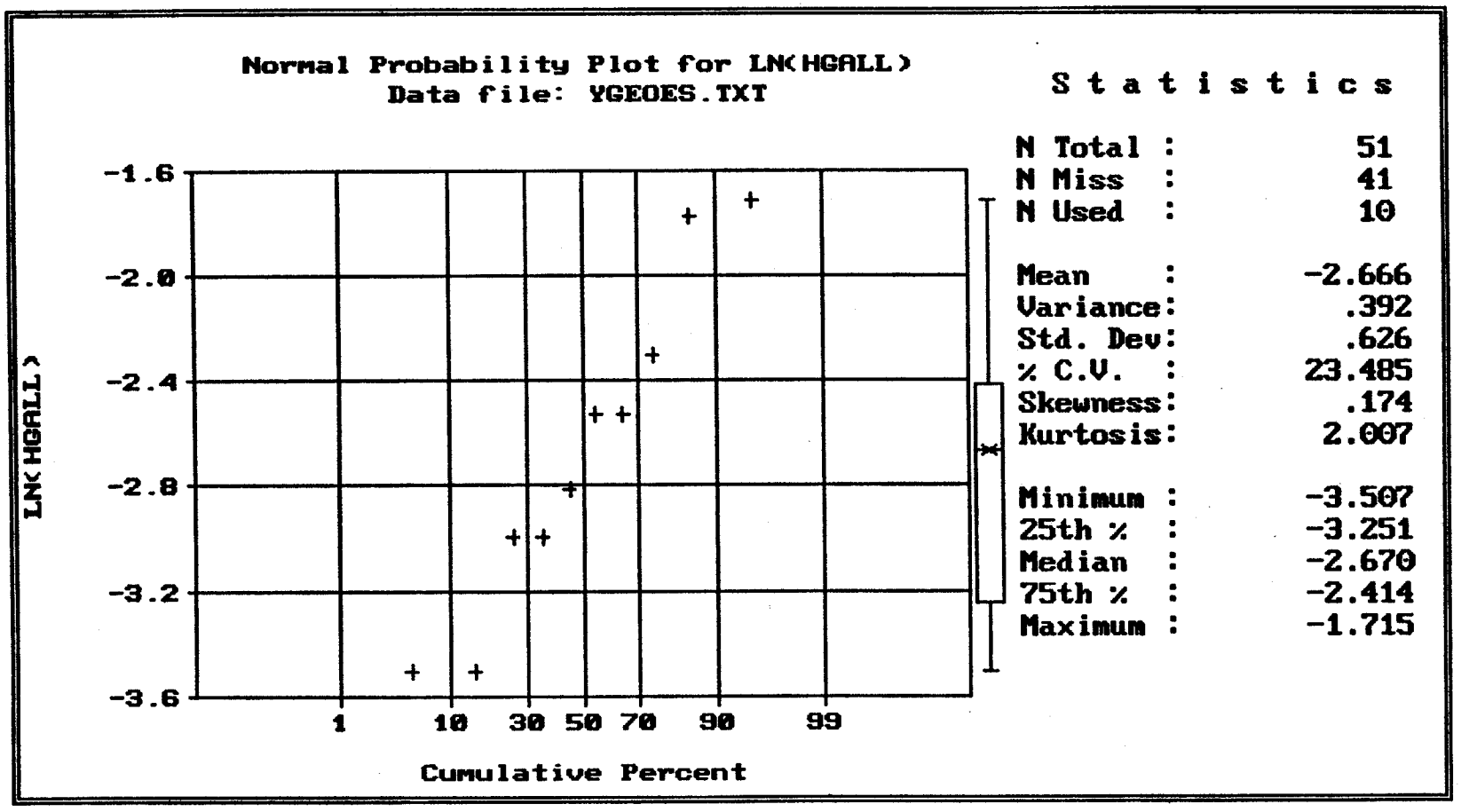
ATTACHMENT A
YELLOW AREA
MAGNESIUM (ALL SAMPLES)



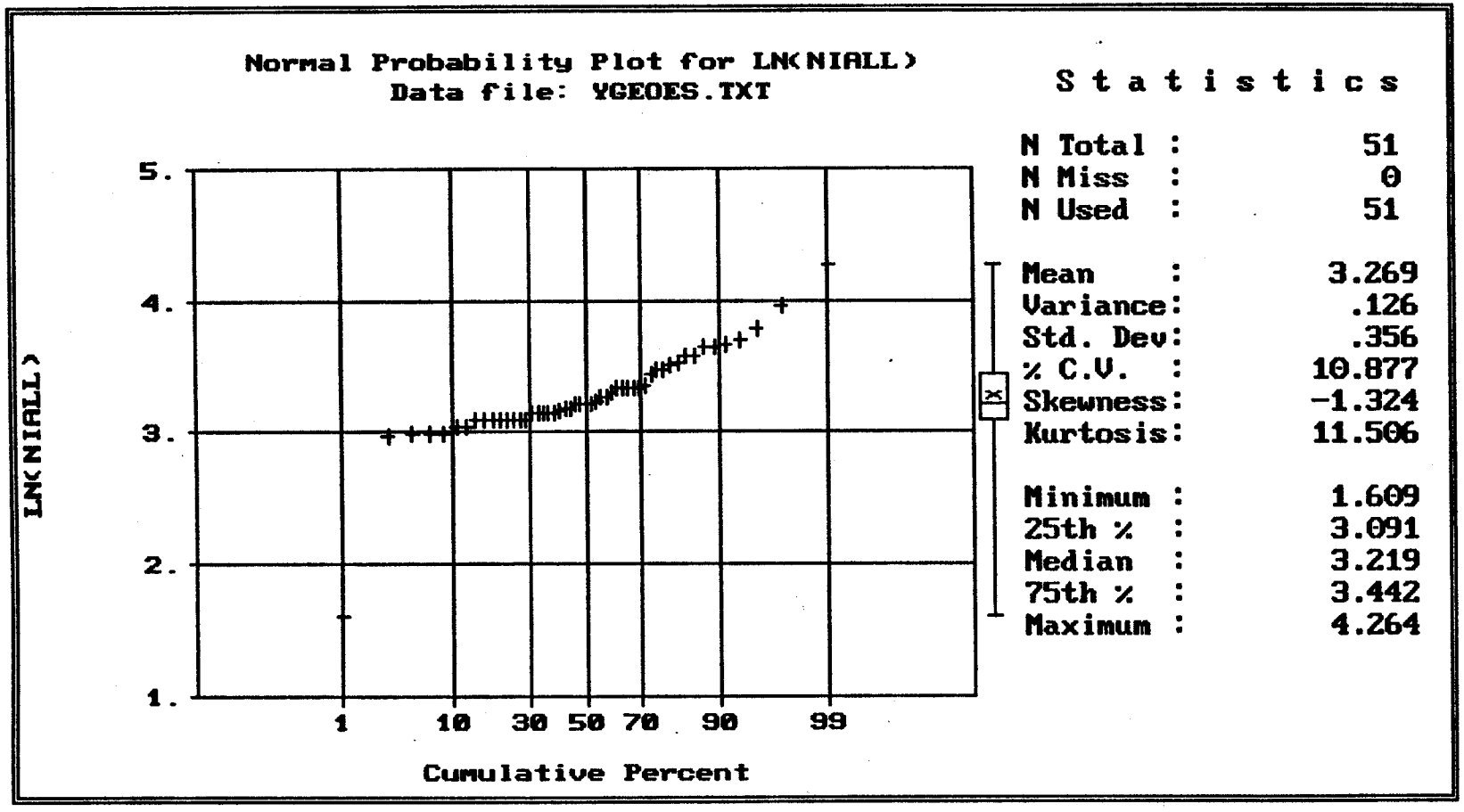
ATTACHMENT A
YELLOW AREA
MANGANESE (ALL SAMPLES)



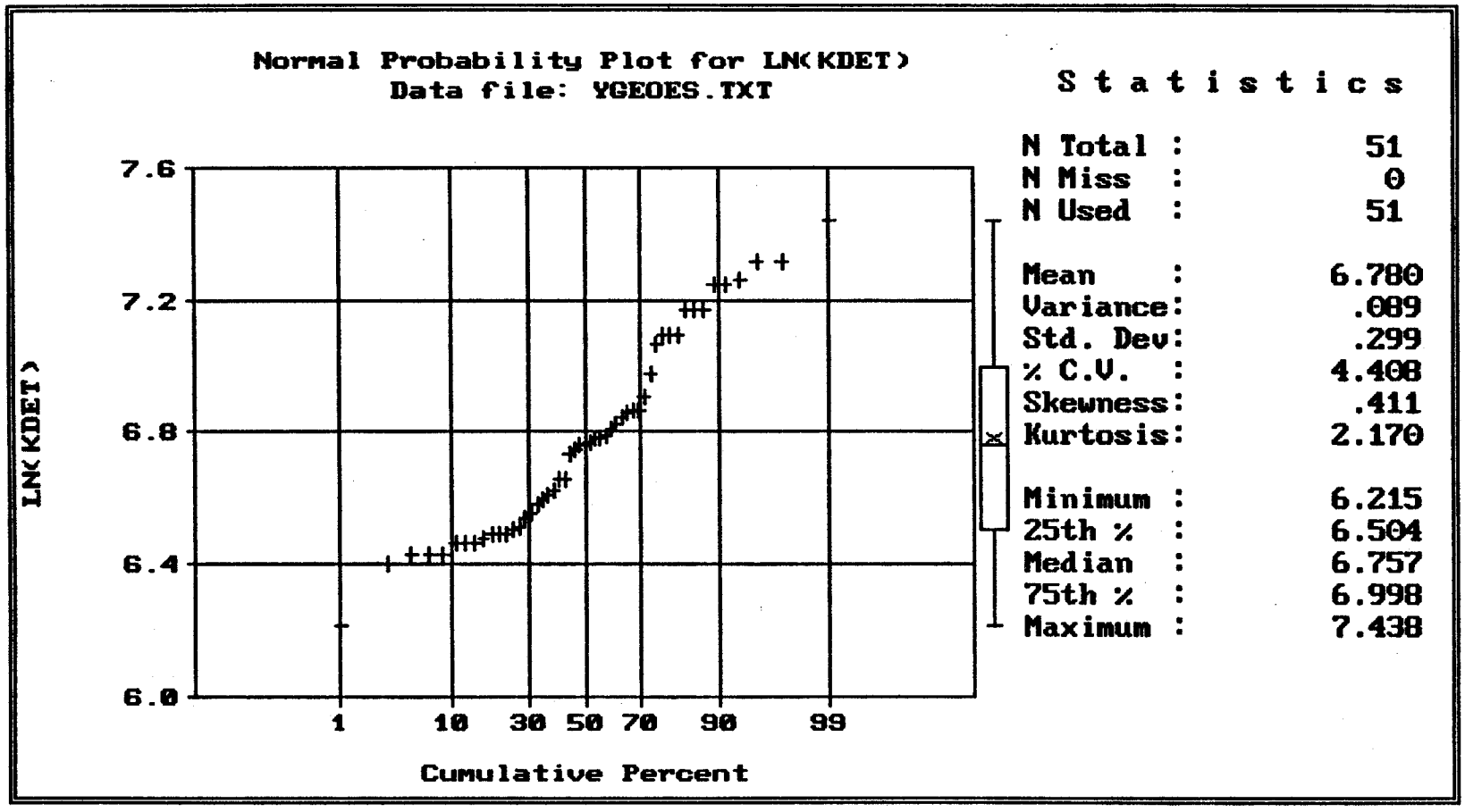
ATTACHMENT A
YELLOW AREA
MERCURY (ALL SAMPLES)



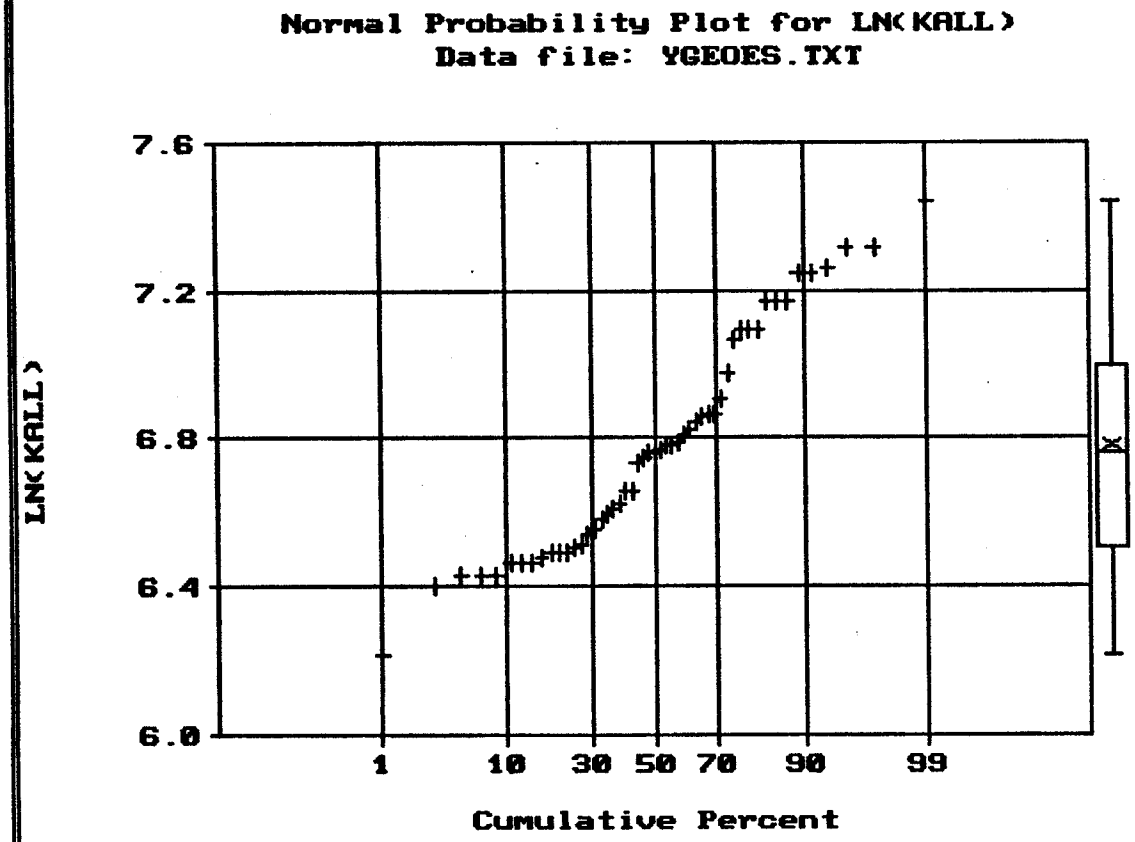
ATTACHMENT A
YELLOW AREA
NICKEL (ALL SAMPLES)



ATTACHMENT A
YELLOW AREA
POTASSIUM (DETECTED RESULTS ONLY)



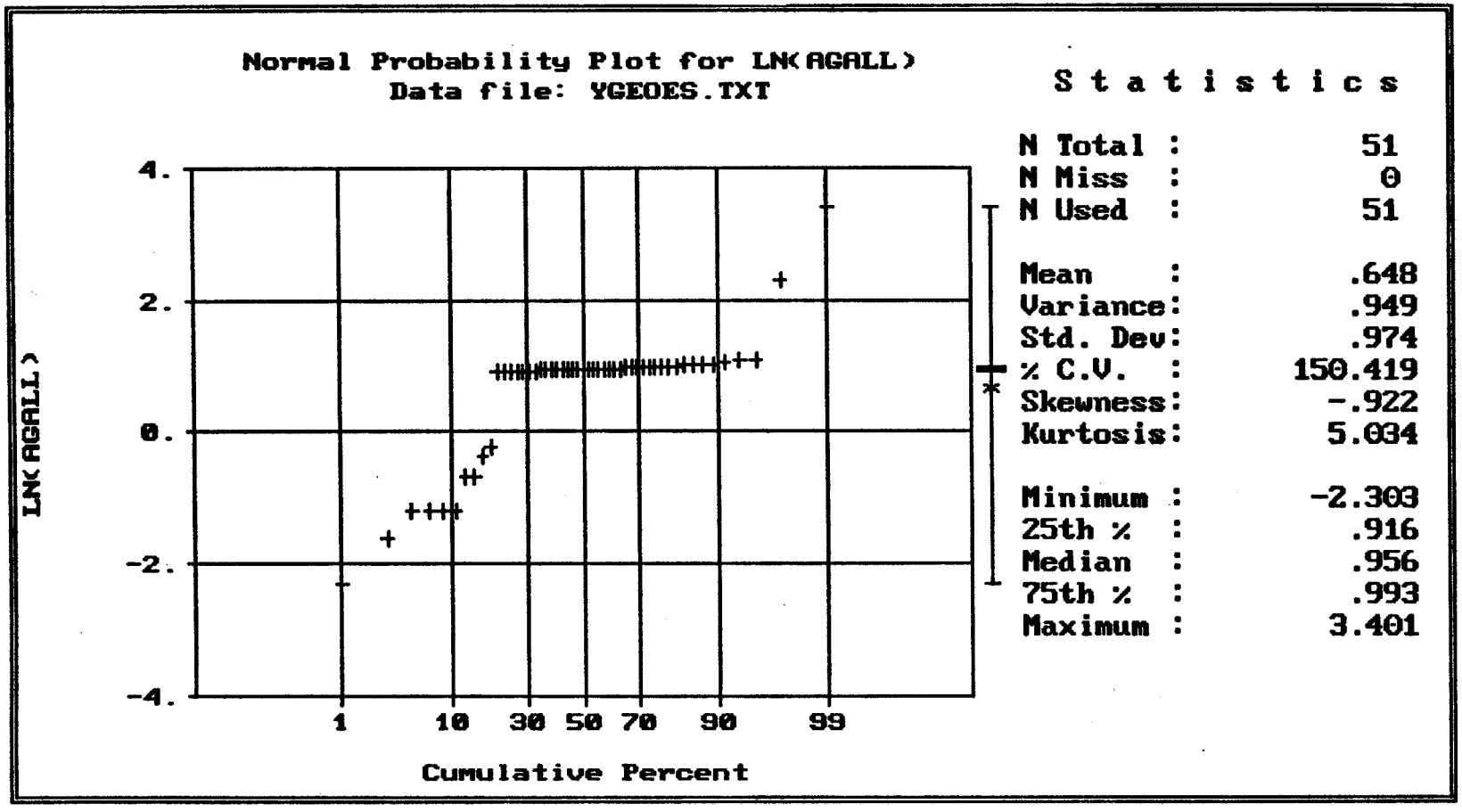
ATTACHMENT A
YELLOW AREA
POTASSIUM (ALL SAMPLES)



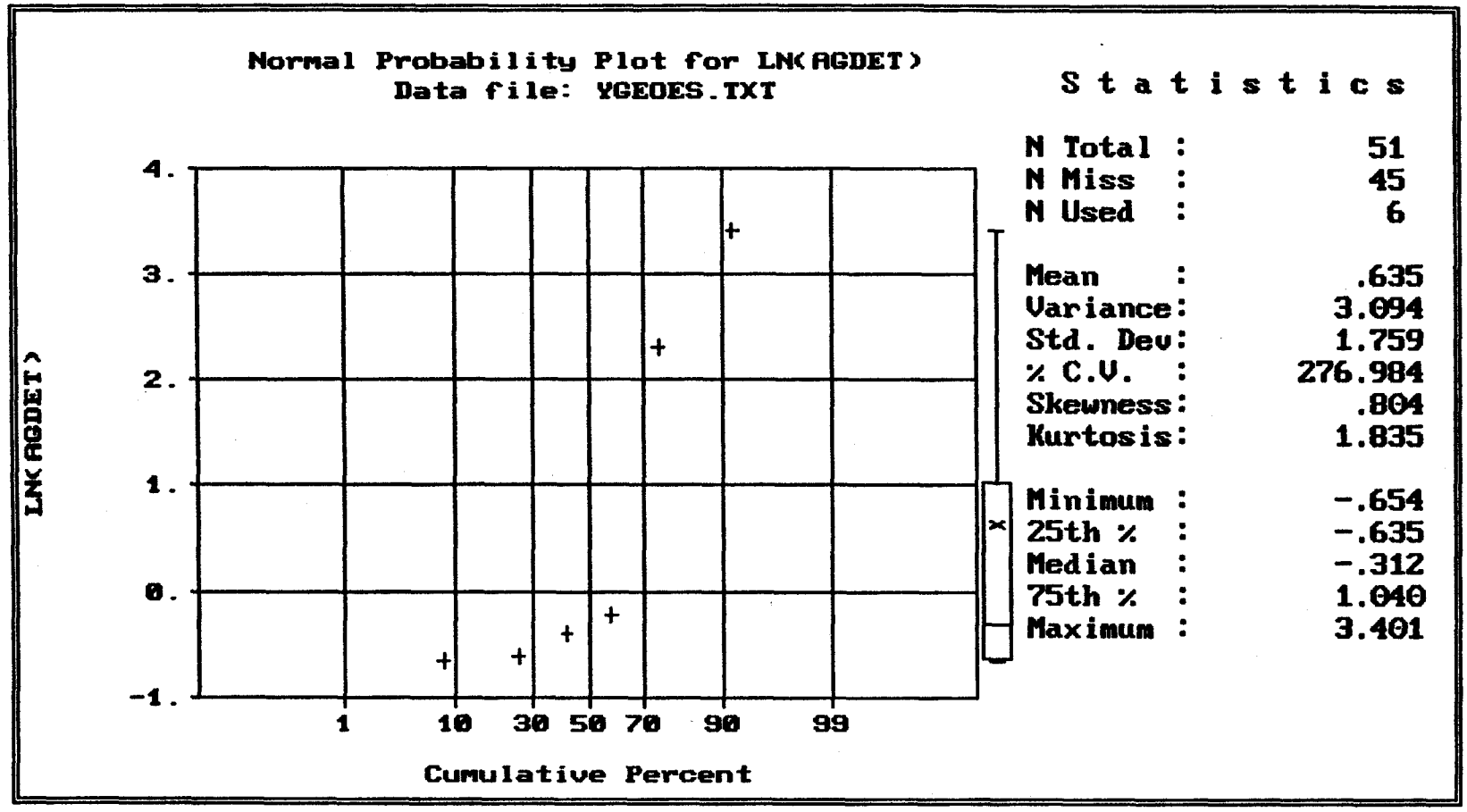
Statistics

N Total :	51
N Miss :	0
N Used :	51
Mean :	6.780
Variance:	.089
Std. Dev:	.299
% C.V. :	4.408
Skewness:	.411
Kurtosis:	2.170
Minimum :	6.215
25th % :	6.504
Median :	6.757
75th % :	6.998
Maximum :	7.438

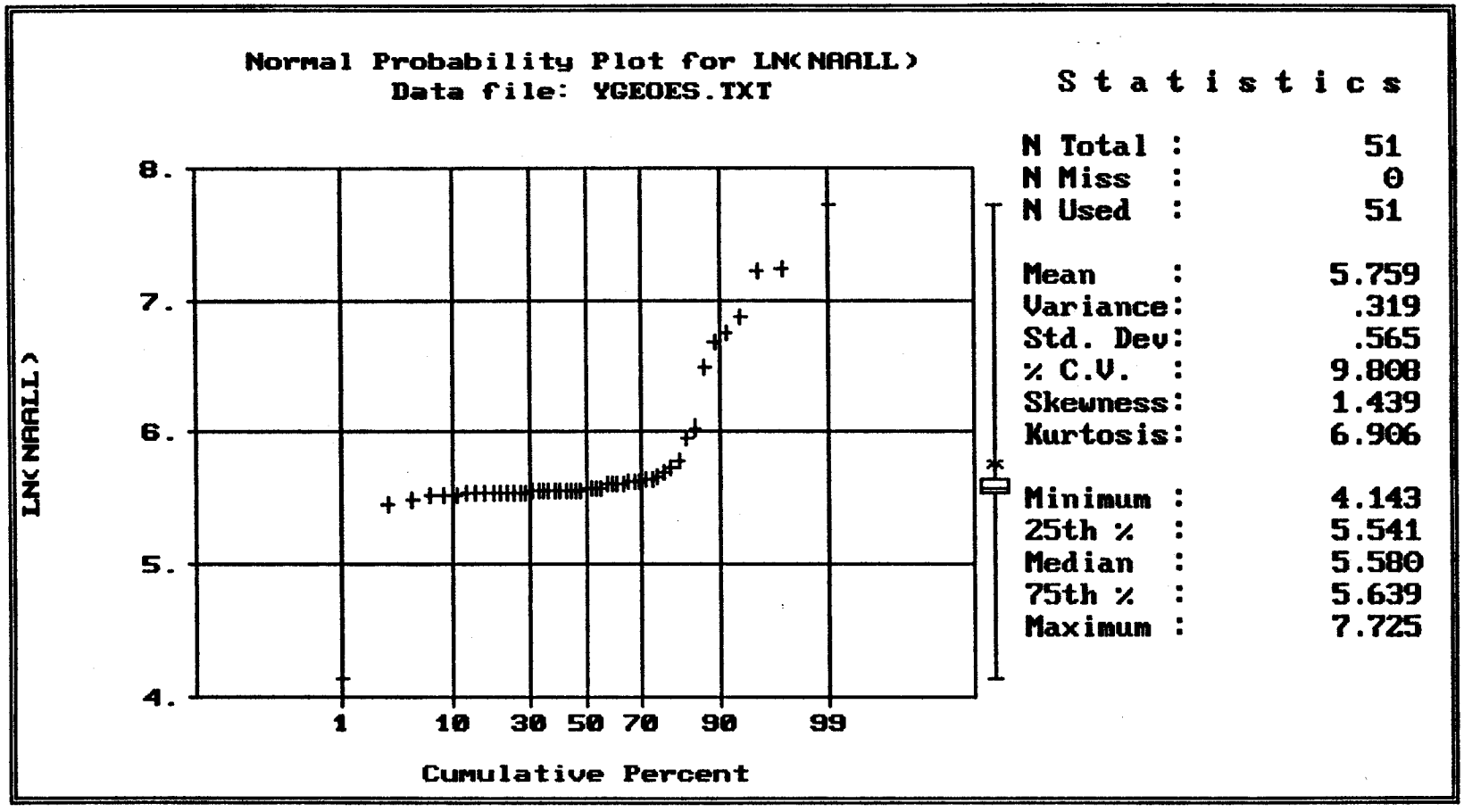
ATTACHMENT A
YELLOW AREA
SILVER (ALL SAMPLES)



ATTACHMENT A
YELLOW AREA
SILVER (DETECTED RESULTS ONLY)



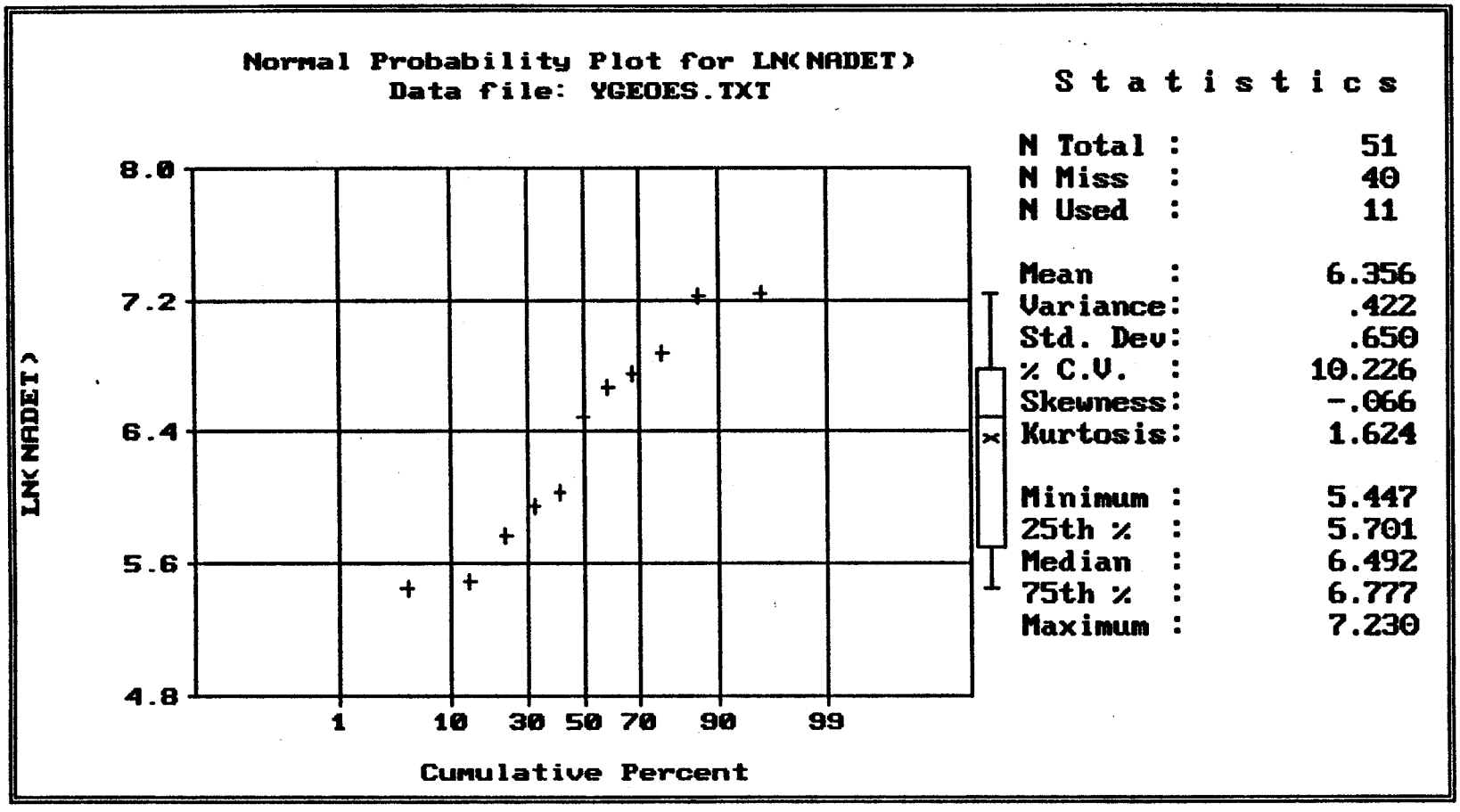
ATTACHMENT A
YELLOW AREA
SODIUM (ALL SAMPLES)



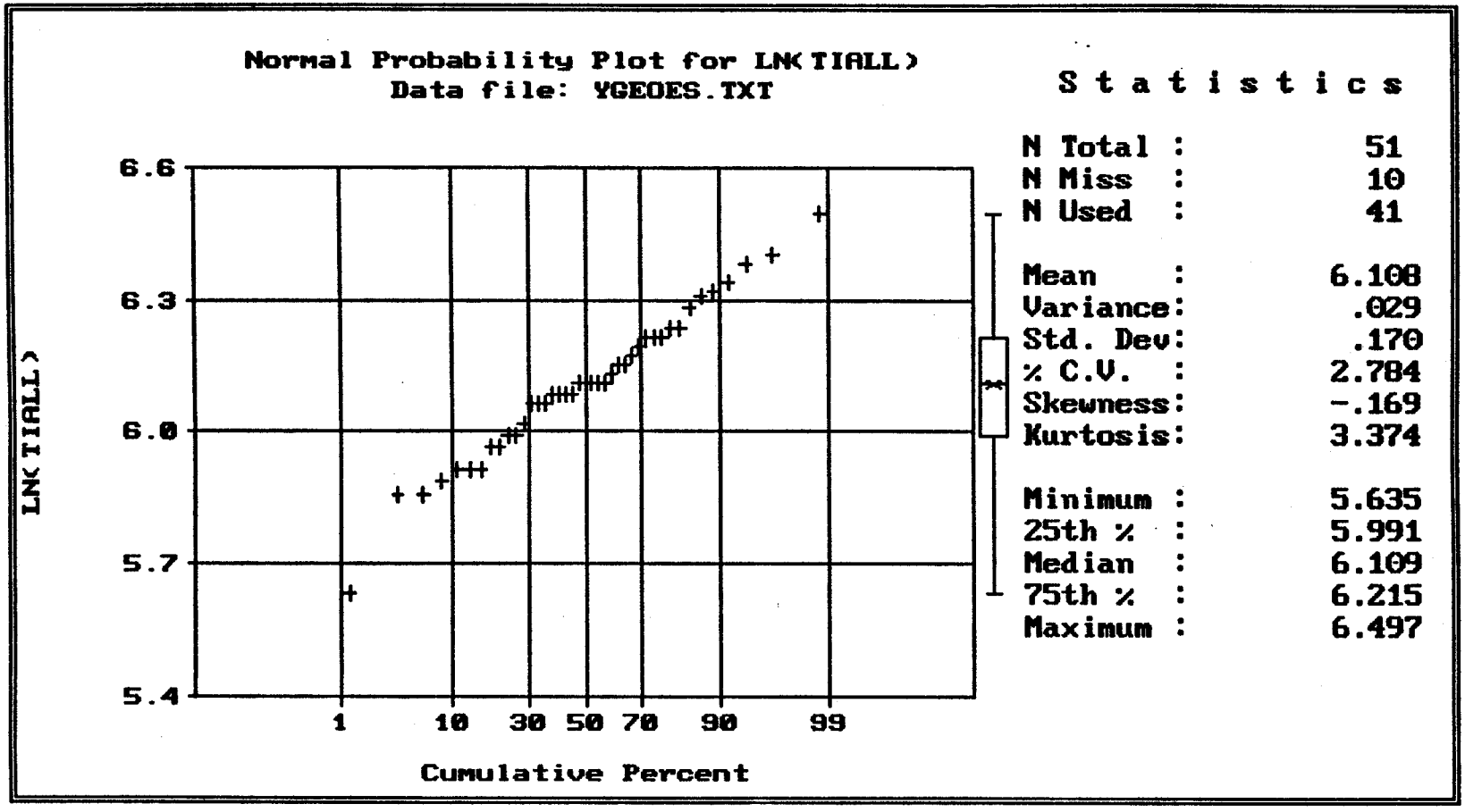
Statistics

N Total :	51
N Miss :	0
N Used :	51
Mean :	5.759
Variance:	.319
Std. Dev:	.565
% C.V. :	9.808
Skewness:	1.439
Kurtosis:	6.906
Minimum :	4.143
25th % :	5.541
Median :	5.580
75th % :	5.639
Maximum :	7.725

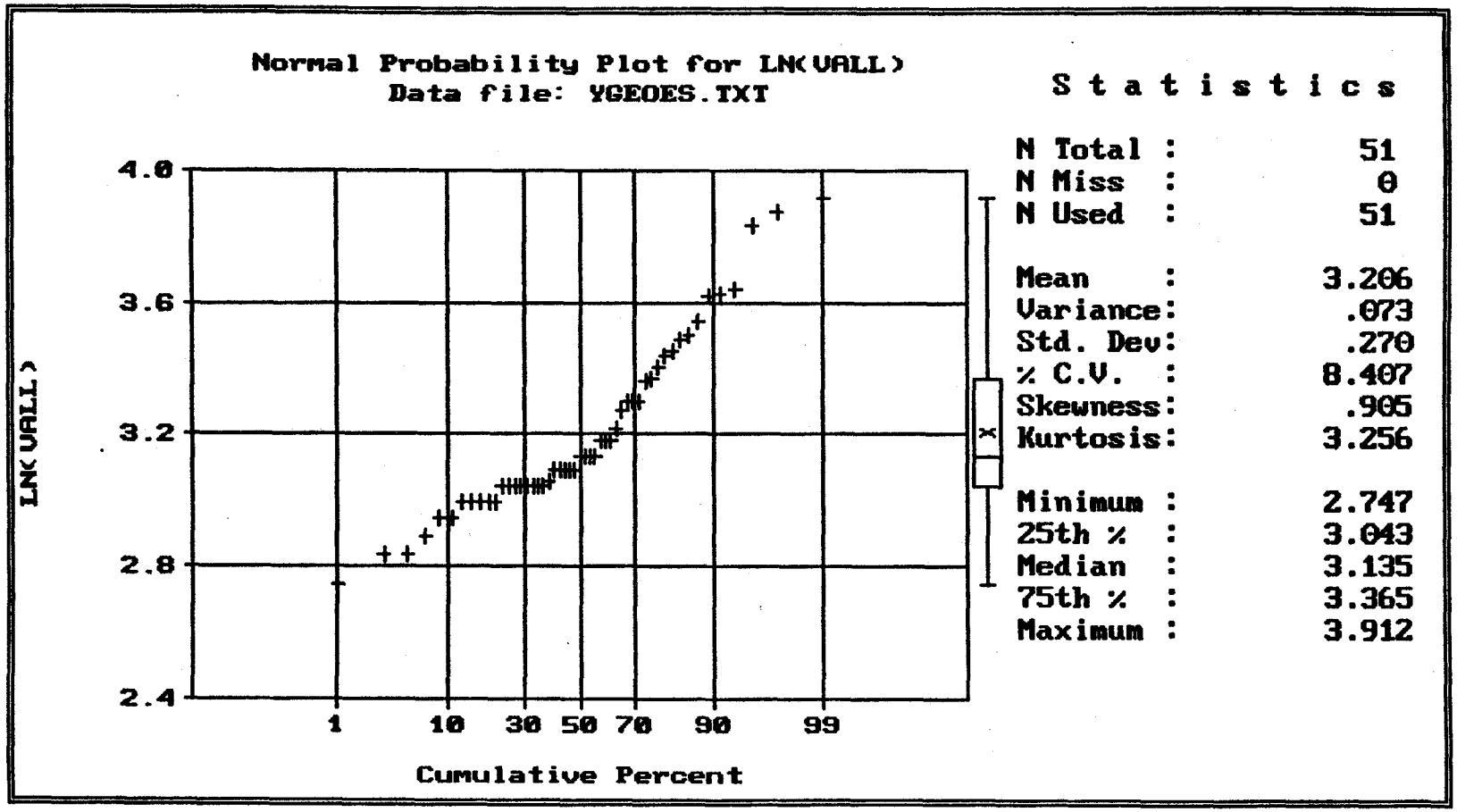
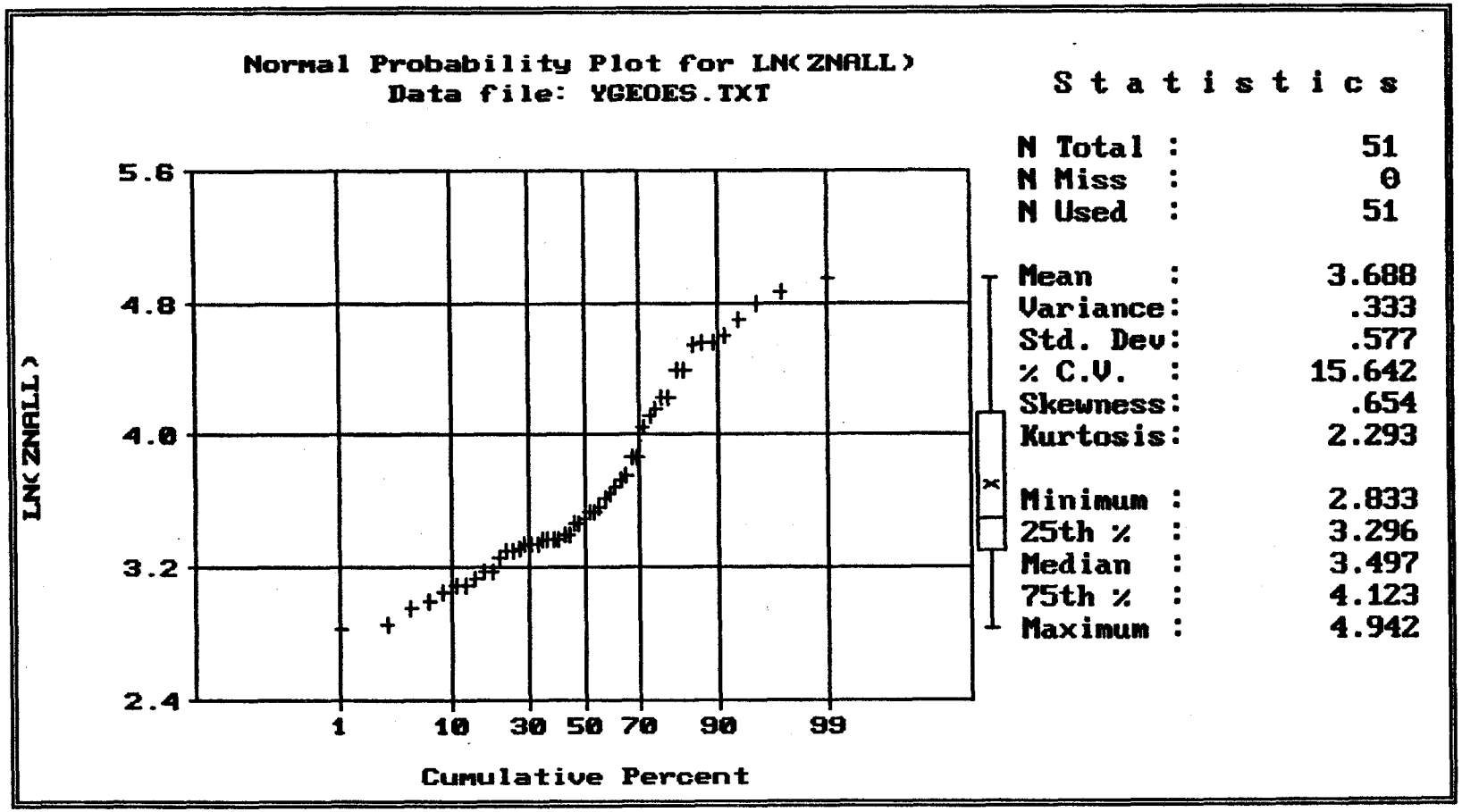
ATTACHMENT A
YELLOW AREA
SODIUM (DETECTED RESULTS ONLY)



ATTACHMENT A
YELLOW AREA
TITANIUM (ALL SAMPLES)



ATTACHMENT A
YELLOW AREA
VANADIUM (ALL SAMPLES)



ATTACHMENT A
YELLOW AREA
ZINC (ALL SAMPLES)