NOTICE

All drawings located at the end of the document.

Final
Phase III RFI/RI

Rocky Flats Plant
881 Hillside Area

(Operable Unit No. 1)

June 1994

ADMIN RECORD

A-OU01-000651

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APPENDIX D

DETERMINATION OF CONTAMINANTS AT OU1

D1 INTRODUCTION

Before a meaningful site conceptual model can be developed that presents a framework for understanding contaminant sources and their distribution in the various media at Operable Unit No. 1 (OU1), it is first necessary to determine which of the chemical analytes that have been measured are actually contaminants. At every hazardous waste site, including OU1, a myriad of chemicals are analyzed for in the various media. Not all chemicals are detected, and, of those detected, only a subset actually represent contaminants. The OU1 Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) investigations have generated considerable data for many inorganic and organic analytes. Of these analytes, historically only two chemical classes were expected to be present as contaminants based on historical waste disposal activities: volatile organic compounds (VOCs) (chlorinated solvents) and radionuclides (plutonium, americium, and uranium). Other analytes were measured to provide a basic geochemical characterization of the environmental media and/or to confirm that other classes of analytes are not present at levels that constitute significant contamination. All of the Phase III chemical data, for both "expected" and "unexpected" contaminants, were carefully assessed to determine which analytes are actual contaminants at OU1. The assessment included statistical comparisons of OU1 concentrations to background, examination of spatial and temporal concentration distributions at OU1, and evaluation of the potential for laboratory introduced sample contamination.

D2 BACKGROUND GEOCHEMICAL CHARACTERIZATION

The concentration of an analyte is one factor in determining if the analyte is a contaminant. Whether the concentration of an analyte, particularly inorganic parameters, is deemed high or low is in relation to the background concentration. This is because, with few exceptions, the inorganic parameters analyzed also occur naturally (e.g., iron, lead, uranium, etc.).

For several years, a background geochemical characterization program has been in progress for the RFP. This program has quantified the spatial and temporal variations in inorganic analytes in soils, groundwater, and surface water in areas near the plant that are undisturbed by plant operations. Data and summary statistics for organic analytes also exist for surface water, groundwater, and sediments. The September 1992 *Background Geochemical Characterization Report, Rocky Flats Plant, Golden, Colorado* (EG&G, 1992) summarizes the results and findings from the program. The Environmental Protection Agency (EPA) and the Colorado Department of Health (CDH) have been continuously involved in the background geochemical characterization program. The 1992 report incorporates their comments and suggestions on data presentation and analysis based on their review of previous submittals. The data in this document are recognized by the regulatory agencies as being the basis for statistical comparisons to OU data. The data and statistics provided in this report have been used to determine the analytes, by medium, that exceed background concentrations at OU1.

Background samples were collected from six media: 1) geological materials (Rocky Flats Alluvium [RFA], Colluvium [COL], and weathered claystone [WCS]), 2) groundwater (RFA, COL, valley fill alluvium [VFA], WCS, and deep Laramie-Arapahoe sandstone [KAR]), 3) surface water, 4) seeps, 5) sediments, and 6) surface soils (Technical Memorandum 5 program). The samples were collected at stations located in the Buffer Zone areas west, north, and south of the main plant. The samples were analyzed for chemical constituents including radionuclides, EPA target analyte list (TAL) metals, the EPA target compound list (TCL) organics (some media), and water quality parameters, e.g., chloride, sulfate, bicarbonate, total dissolved solids, etc. With the exception of surface soils, chemical data for each sample medium and for units within a medium (e.g., geologic material and groundwater) were compared using analysis of variance (ANOVA). Within a medium, subpopulations for an analyte were defined if significant differences (5% significance level) in mean concentrations exist either between the units (groundwater and geologic material) or between locations (north versus south in the buffer zone).

Summary statistics were computed for each subpopulation defined by the ANOVA test results. The statistics included mean, standard deviation, upper tolerance limit (UTL), maximum concentration, sample size, and percentage of detectable concentrations.

The background program did not include characterization of surface soils. Background surface soil data were collected from the Rock Creek drainage west of the plant under a separate program described in Technical Memorandum 5 for OU1. Technical Memorandum 5 was reviewed by EPA and CDH, and their comments and concerns were addressed. Semivolatile organic compound (SVOC), pesticide/ polychlorinated biphenyl (PCB), metal, and radionuclide data were collected for the background surface soils. All data generated from this program are presented in Appendix C1. These data are the basis for determining the analytes that exceed background concentrations in surface soil at OU1.

Background values for each analyte, by medium (and geologic unit within each medium, as appropriate) are presented in Table D-1. The values are from the Final Background Geochemical Characterization Report (EG&G, 1992), or were computed from the surface soil data collected for the Rock Creek drainage. These background values are the upper limit of a one-sided 95% tolerance interval (95% confidence and including 95% of the population). One-sided tolerance interval limits are appropriate where only an increase (not a decrease) over background may be indicative of contamination. This is true for the compounds and elements measured at OU1. If the background data for a particular medium (or geologic unit within the medium) included less than 50% detections, then the maximum concentration was reported as the background value. Less than 50% detections is considered an inadequate basis for computing tolerance interval statistics.

Summary statistics for background and OU1 data are provided in Appendix C2. Background and OU1 means were calculated using the following procedure that minimizes bias resulting from: 1) nondetections with high detection limits, and 2) large disparities in data quantity amongst groundwater wells and surface water monitoring stations:

- Delete all nondetections from the data where the detection limit is greater than two times the detection limit identified in the General Radiochemistry and Routine Analytical Services Protocol (GRRASP) (EG&G, 1991) (EPA, 1991). Replace all other nondetections with one-half the reported detection limit.

- For groundwater wells and surface water stations, calculate the mean for the individual wells/stations, and then calculate the grand mean from the means of the individual wells/stations.

D3 OVERVIEW OF METHODOLOGY TO DETERMINE CONTAMINANTS AT OU1

The determination of organic and inorganic contaminants at OU1 relied heavily on analysis of temporal and spatial concentration distributions; however, selection of inorganic contaminants also involved statistical comparisons of site and background concentrations. The procedures for determining OU1 contaminants and public health evaluation (PHE) contaminants of concern (COCs) are illustrated on Figures D-1, D-2, and Figure D-3. EPA/CDH approved the procedures in their comments on the November 1993 draft of the OU1 RFI/RI Report. However, EPA noted that the procedures should not be cited as a precedent for other OUs at the RFP or other CERCLA sites as the methodology deviates somewhat from standard EPA practice.

The contaminants, by medium, determined from application of these procedures are addressed in Sections 4 and 5 of the RFI/RI Report (nature and extent as well as fate and transport), in the PHE, and in the ecological evaluation (EE). The PHE and EE further define unique COCs, which are subsets of these contaminants, using PHE- and EE-specific screening procedures.

D4 INORGANIC ANALYTES

The inorganic analytes are of particular importance because many of these substances occur naturally and thus will be detected in most media during most sampling events. Thus, the mere presence of many of these substances does not necessarily indicate a site contaminant. The flow chart developed to guide the determination of which substances are actual site contaminants is shown in Figure D-2. At each decision point on the flow chart, each analyte was evaluated and either eliminated or passed on as a potential site contaminant.

The first step in the screening process involved comparing an analyte's concentrations for a specific medium (or unit within the medium) to the appropriate background UTL (or the

maximum value), as determined from the RFP background geochemical characterization. If all of an analyte's concentrations for a specific medium were less than the UTL (or maximum background value), that analyte was determined not to be a site contaminant of that medium (or unit). If any analyte concentration was greater than the UTL (or maximum background value), then the analyte was passed on to the next step as a potential site contaminant of that medium (or unit).

The second step involved an ANOVA comparison in which the mean of the background concentrations was compared to the mean of the site concentrations for a given medium (or unit within the medium). Selection of the appropriate ANOVA test to determine significant differences between background and non-background populations followed the procedure identified in the Final Background Geochemical Characterization Plan (EG&G, 1992) (Figure D-3). The first step was to determine the percent detections in the grouped background and non-background populations. If there were less than 50% detections, then the Kruskal-Wallis non-parametric ANOVA was the statistical method used. If there were greater than 50% detections, then it was necessary to identify sample distributions and equality of variances to determine whether parametric or non-parametric ANOVA should be used (see Figure D-3). If the appropriate ANOVA test indicated the means were not equal at the 5% significance level, then the analyte was considered a potential site contaminant of that medium (or unit) and was subjected to further conceptual analysis (scientific reasoning as discussed below) to evaluate if the analyte was actually a contaminant. If the means were equal at the 5% significance level, then the analyte was not considered a site contaminant of that medium (or unit).

The scientific reasoning included examination of three criteria: 1) spatial distribution of concentrations within a medium, 2) temporal distribution of concentrations at a well or surface water station, and 3) laboratory or field sampling artifact.

In order to evaluate the spatial distribution of each inorganic analyte not eliminated during the statistical tests, the fraction of samples where concentrations exceed the UTL, as well as the concentration range, were posted on a map for every sampling location. These data were reviewed to determine whether the spatial distribution of these concentrations and UTL exceedances are indicative of contamination. Subcriteria examined here included magnitude and

frequency (groundwater and surface water) of the UTL exceedances, existence of contiguous areas of concentrations exceeding the UTL, presence of concentration gradients indicative of a source or plume, and the vertical distribution of the UTL exceedances considering the expected depth of the waste migration.

Temporal distribution was evaluated for groundwater and surface water samples. Variations in an analytes concentration over time for a given well or surface water station was reviewed to determine the frequency of UTL (or the maximum background value) exceedances over time. If the UTL (or maximum background value) was only rarely exceeded at the wells or stations, then the analyte was not considered a site contaminant.

The final criterion examined was to determine whether analytes, thus far not eliminated as a site contaminants, could be present in samples as a result of laboratory or field sampling artifact. If an analyte was detected in the laboratory or the field blanks at similar levels to those in the samples, or often occurred at similar levels in background (organics only), then the analyte was not considered a site contaminant.

D5 ORGANIC ANALYTES

The approach utilized to determine whether organic compounds are site contaminants is different than that used for the inorganic analytes because many of the organic compounds are not naturally occurring compounds. A flow chart indicating the sequence of steps used to determine whether organic compounds were site contaminants is presented on Figure D-4. The initial step in the determination of organic site contaminants was to list all of the VOCs and SVOCs detected at OU1. This list was compared to the list of organic compounds known to have been disposed at OU1 and their degradation (biotic and abiotic) products. Any organic compounds detected in OU1 samples that are known to be constituents of wastes stored at the site, or are degradation products of one of these constituents, were determined to be site contaminants. (Degradation products must also not be laboratory or field sampling artifacts to be considered contaminants.)

For all other detected compounds, scientific reasoning using the same three criteria identified for the inorganic substances (i.e., spatial and temporal concentration distributions, and assessment of laboratory or field sampling introduced sample contamination) were used to further evaluate whether these organic compounds were site contaminants.

D6 RESULTS

This section presents the results of the statistical analyses and scientific reasoning to determine contaminants at OU1. Contaminant distribution maps and histograms of the OU1 data are provided in Figures D-5 through D-227. Histograms of the data were prepared for those analytes in the various media passing through the UTL and ANOVA screens. The histograms indicate frequency of detection versus concentration and identify the background UTL and mean. By way of example using aluminum in colluvial groundwater (Figure D-5), the histograms clearly portray that the site data are significantly different from the background data, i.e. a higher site mean concentration and exceedances of the UTL.

D6.1 Inorganic Analytes

As mentioned in Section D3, none of the inorganic analytes was eliminated as OU1 contaminants in the UTL screen, i.e., in a given medium or geologic unit, there was at least one inorganic analyte concentration exceeding the background UTL (Tables D-2, D-3, and D-4). Those analytes that were eliminated as OU1 contaminants in specific media only (no exceedances of the UTL) are as follows:

Surface and Subsurface Soils	Groundwater	Surface Water and Sediments
Mercury	Beryllium	Beryllium
Selenium	Cadmium	Cadmium
Silver	Cobalt	Cesium
Thallium	Silver	Manganese
Sulfide	Thallium	Tin
pH	Tin	Radium-226
	Plutonium-239,240	Carbonate
	Tritium	Orthophosphate
	Carbonate	pH
	Cyanide	

As can be seen from Table D-5, most inorganic analytes passed (were not eliminated as site contaminants) the next statistical screen, i.e., the ANOVA comparison of background and OU1 mean analyte concentrations. The significance levels ("p" values) from the ANOVA tests for the analytes in the various media and geologic units are provided in Table D-6. A "p" value of 5% or less was considered to represent a statistically significant difference. Beryllium, mercury, tin, cesium-134, cesium-137, strontium-89,90, radium-226, and radium-228 were eliminated as site contaminants at OU1 through ANOVA testing. ANOVA tests were not performed for the water quality parameters due to time considerations. To be conservative, all water quality parameters where there was an exceedance of the UTL in any medium were further evaluated using scientific reasoning.

Although use of scientific reasoning as a tool to further evaluate whether analytes with statistically higher site concentrations relative to background are actual contaminants is generally necessary at any site, it is a particularly important tool for use at OU1 because of the numerous potential contaminants that were identified. As discussed in Section D3, it is necessary that a thorough evaluation of the analytes that constitute contamination be provided so that the RFI/RI presents the most concise and accurate depiction of the nature and extent of contamination for subsequent use in the PHE, EE, and the FS. Tables D-7 through D-11 present a summary of the statistical test results as well as the spatial and temporal distribution assessment for groundwater, surface soil, geologic materials, sediments, and surface water, respectively. A summary of the assessment by analyte, inclusive of all media, is presented below.

ANALYTE	RATIONALE
Al	Aluminum (Al) is elevated in the groundwater (COL, WCS, KAR) (see Figures D-5, D-6, and D-7); and is not elevated in any other media. At IHSS 119.1, it does not co-occur with all wells showing organic contamination (wells 1074 and 0974), and there are higher levels at downgradient well 0487 relative to the upgradient wells (Figure D-8). The magnitude of the UTL exceedances are small. At the western IHSSs, only well 5387 exceeds the UTL but there is only one measurement at this well. The highest concentration occurs at IHSS 130 (205,000 ppb), but the two other values at this well (37191) are below the UTL and as low as 5,730 ppb. In the bedrock wells, at IHSS 119.1, there are occasional exceedances of the UTLs but the magnitude of the exceedance is not different from that at bedrock well 31891 which is remote from the

IHSSs. No plume is apparent from the filtered data (Figure D-9) which suggests it is not soluble and migrating from a source. Elevated Al is probably associated with clay particles in some of the wells due to disturbance of the surrounding geologic material.

Sb

Antimony (Sb) is elevated in colluvial (Figure D-10) and weathered claystone (Figure D-11) geologic material and WCS (Figure D-12) and KAR (Figure D-13) groundwater. It is also elevated in surface water (Figure D-14) but there is less than a 5% UTL exceedance. The spatial distribution of Sb results does not indicate the presence of obvious concentration gradients indicative of a source, either an on-site or off-site (concentrations increasing toward the boundary) source (Figure D-15). Exceedances of the background UTL occur in four wells (UHSU and LHSU) within OU1. Three of these wells are located within IHSS 119.1; however, there is no discernable concentration gradient either vertically or horizontally. Furthermore, none of these wells showed consistently elevated concentrations of antimony. This large disparity in concentration values from one sampling period to the next is inconsistent with the presence of contamination. Only one well (37191) contained antimony at a concentration more than 2 times the UTL (70U micrograms per liter [$\mu g/\ell$]). However, this detection (210 $\mu g/\ell$) was a one-time (and first-time) occurrence, i.e., the data from subsequent quarters show antimony was undetected. A review of well development and sampling forms for well 37191 reveals an apparent development problem. The development water from this well is consistently described as cloudy or brown (i.e., the well could not be developed to produce low turbidity water. Therefore, the 210 $\mu g/\ell$ concentration appears to be unrepresentative of the Sb concentration in groundwater at this location. Lastly, mean concentrations in bedrock groundwater (Figure D-15) are 30 to 40 parts per billion [ppb] and are generally lower in the alluvial system (background maximum is 70U ppb). Elevated levels in bedrock groundwater, but not in overlying colluvial groundwater where waste are introduced, indicates that the elevated levels in bedrock groundwater are not contamination. With respect to geologic materials, the location of UTL exceedances are widespread, relatively low in magnitude (background value is 18.1U ppm), and the highest values do not occur in the source areas but rather along the transect of the French Drain (Figure D-16). As for surface water, there are only 2 exceedances in Woman Creek: 1 of 20 at SW033 (44.5 ppb), and 1 of 20 at SW032 (55.9 ppb) (Figure D-17). The background maximum concentration is 42.2U ppb. These low concentrations in Woman Creek do not indicate the presence of contamination in surface water.

As

Arsenic (As) is elevated in COL (Figure D-19), WCS (Figure D-20), and KAR (Figure D-21) groundwater. As is also elevated in geologic material COL (Figure D-22) and WCS (Figure D-23), and in surface water (Figure D-24) but exceedances of UTLs are less than 5%. At IHSS 119.2, there

are 4 of 4 exceedances of the UTL (3 ppb) in bedrock well 4587 (range 6.6 - 9.3 ppb), but there are no exceedances of the UTL in the alluvial system which does not suggest contamination (Figure D-25). The highest concentration observed is in well 5387 (11.4 ppb), but there are no elevated values up- or downgradient. Also, a similarly high concentration exists at remotely located well 31491 (8.2 ppb). Concentrations immediately upgradient of well 31491 are below the UTL, which does not suggest contamination. The filtered fraction is not elevated nor does it give the appearance of a dissolved mobile plume (Figure D-26). With respect to geologic materials, there is only one UTL exceedance in the colluvium (18.1 ppm at B300490 along the French Drain alignment [UTL is 12.1 ppm]) and one UTL exceedance in the WCS at 36291 in IHSS 130 (13.9 ppm [UTL is 12.1 ppm]) (Figures D-27 and D-28). These infrequent and low exceedances of the UTL are not indicative of contamination in geologic material because contamination would be evidenced by more consistent exceedances of the UTL and some indication of a source. As for surface water, there are only three UTL exceedances: 1 of 13 at upgradient station SW036 (3.8 ppb vs. a UTL of 2.9 ppb), 1 of 8 at SW066 (4.3 ppb), and 1 of 19 at SW070 (3.0 ppb) (Figure D-29). These isolated, low exceedances of the UTL are not indicative of contamination in surface water because contamination should be associated with higher UTL exceedance frequencies and a source-release pattern.

Ba

Barium (Ba) is elevated in the COL groundwater (Figure D-30) and sediments (Figure D-31). Ba is also elevated in the colluvial geologic material (Figure D-32) and surface water (Figure D-33), but the UTL exceedances are less than 5%. There are only two exceedances of the UTL (603 ppb) in colluvial groundwater: one at well 37191 (1880 ppb) but the other concentrations at this well are less than 603 ppb and as low as 182 ppb; the other exceedance of the UTL is at well 5387 (759 ppb) which just exceeds the UTL and there is only one measurement (Figure D-34). Like Al, there is no plume indicated by the dissolved fraction (Figure D-35). In sediments, exceedances of the UTL are infrequent and low in magnitude. One exceedance is at upgradient station SED037 on the SID (1 of 2 at 240 ppm [UTL = 193]), and one exceedance is at the furthest downgradient station SED028 on the SID (1 of 4 at 196 ppm) (Figure D-36). This is not indicative of contamination. With respect to geologic materials, Ba concentrations above the UTL occur infrequently and randomly throughout OU1 (Figure D-37). The concentration range for UTL exceedances is 479 to 836 ppm (UTL is 438 ppm). The highest concentration is remote from the IHSSs (at 30391 which is south of the SID and Building 881). This does not appear to reflect contamination because contamination would be evidenced by more consistent exceedances of the UTL and some indication of a concentration gradient. As for surface water, contrary to the above conclusions, exceedances of the UTL are frequent along the SID (Figure D-38). Maximum concentrations range from 130 ppb to 551 ppb (UTL is 115.9 ppb), and

concentrations at the stations along the entire length of the SID are similar. Because Ba is not a contaminant in any other OU1 medium, these data do not indicate Ba is a contaminant of surface water.

Be

The statistical analyses indicate beryllium (Be) is not a contaminant.

Cd

Cadmium (Cd) is elevated in WCS geologic material (Figure D-39); however; UTL exceedances are in the 0 to 5% range. There are only three exceedances of the UTL: at 32891 (3.6 ppm) and 32691 (3.3 ppm) in IHSS 119.2, and at 30091 south of the SID and IHSS 119.2 (2.1 ppm) (Figure D-40). The UTL is 1.8 ppm, and these infrequent, random, and low magnitude exceedances of the UTL do not indicate contamination because contamination would be evidenced by more consistent exceedances of the UTL and some indication of a concentration gradient.

Ca

Calcium (Ca) is elevated in surface soil (Figure D-41), sediment (Figure D-42), and colluvial geologic material (Figure D-43), in RFA (Figure D-44), WCS (Figure D-45), and KAR (Figure D-46) groundwater, and in surface water (Figure D-47). In colluvial geologic material, most of the UTL exceedances and those with some of the highest concentrations occur along the French Drain alignment (Figure D-48). This is not indicative of contamination because the French Drain did not pass through any IHSSs (sources) with the exception of IHSS 102; however, the borehole sample results in the vicinity of IHSS 102 do not show the higher concentrations. Furthermore, several caliche zones were noted during the French Drain excavation. This likely explains the elevated calcium concentrations. In groundwater, most of the exceedances are in bedrock groundwater at IHSS 119.1; however, the overlying colluvial groundwater is not elevated in Ca (Figure D-49). Ca in the RFA exceeds the UTL south of Building 881, but concentrations are similar throughout the area with no obvious concentration gradient that would be indicative of either an on-site or off-site source. In surface soil, there are exceedances of the UTL in IHSSs 119.1 and 130; however, there are as many exceedances outside these IHSSs that are not directly downgradient, e.g., in RA016, RA017, and RA011, upgradient of IHSS 119.1, and at RA010 and RA026, downgradient of IHSS 119.2 (Figure D-50). Magnitude of the UTL exceedances are similar even though the highest concentration occurs at IHSS 130 (42,100 ppm vs. a UTL of 12,250 ppm). This does not indicate contamination of surface soil with Ca. In sediments, the UTL is exceeded in most of the stations; however, the highest concentrations are in the furthest downgradient station (Figure D-51). This does not indicate contamination because upgradient station data should have shown higher concentrations if the source were an IHSS at OU1 or some other waste disposal area upstream of OU1. Lastly, in surface water, Ca concentrations often exceed the UTL throughout the entire reach of the SID (Figure D-52). However, the concentrations are similar upgradient

and downgradient. Because Ca is not a contaminant in any other OU1 medium, these data do not indicate Ca is a contaminant of surface water.

Cs

The statistical analyses indicate cesium (Cs) is not a contaminant.

Cr

Chromium (Cr) is elevated in surface water only (Figure D-53); however, UTL exceedance are in the 0 to 5% range. The only exceedances of the UTL are at upgradient station SW036 (1 of 13 at 23.7 ppb (UTL = 18.9) and upgradient station SW035 (1 of 21 at 660 ppb) on the SID (Figure D-54). This is not indicative of contamination.

Co

Cobalt (Co) is elevated in the sediments (Figure D-55). Co is also elevated in colluvial geologic material (Figure D-56); however, UTL exceedance is in the 0 to 5% range. In the sediments (Figure D-57), there was only one exceedance: at upgradient station SED037 (1 of 2 at 13.1 ppm (UTL = 11.9) which is not indicative of contamination. In geologic material, there is only one exceedance of the UTL (36 ppm at borehole 34991 in IHSS 119.1 [UTL = 29.7]) (Figure D-58). This isolated, low magnitude exceedance of the UTL is not indicative of contamination because contamination would be evidenced by more consistent exceedances of the UTL and some indication of a concentration gradient.

Cu

Copper (Cu) is elevated in colluvial geologic material (Figure D-59), colluvial groundwater (Figure D-60), and surface water (Figure D-61); however, UTL exceedances are in the 0 to 5% range. In geologic material there are only 2 exceedances above the UTL: at 32491, south of Building 881 (41.25 ppm), and at 34991 in IHSS 119.1 (34.4 ppm) (Figure D-62). The UTL is 32.3 ppm, and these random, infrequent, and low magnitude exceedances of the UTL do not indicate contamination because contamination would be evidenced by more consistent exceedances of the UTL and some indication of a concentration gradient. In groundwater, there is only one exceedance of the UTL: at 5387 where there is only one observation at 2,440 ppb (UTL = 32.2) (Figure D-63). Although this dramatically exceeds the UTL, there are no elevated concentrations downgradient. Also, concentrations in the filtered fraction do not exceed the UTL. In surface water, Cu infrequently exceeds the UTL at any one station (Figure D-64). The maximum frequency is at upgradient station SW035 (3 of 21) with a maximum concentration of 61.4 ppb [UTL is 22.7 ppb]). The highest concentration is at SW069 (226 ppb) but all 18 other observations at this station are below the UTL. Cu does not appear to be a contaminant of surface water because contamination should be associated with higher UTL exceedance frequencies.

Fe

Iron (Fe) is elevated in the WCS groundwater (Figure D-65), not elevated in any other media, and in particular is not elevated in the overlying

alluvial groundwater where the source of contamination is expected to be (Figure D-66). It also inconsistently exceeds the UTL (36,800 ppb) in the bedrock wells 37991 (only 1 of 3 measurements at 38,800 ppb) and 37891 (only 1 of 3 measurements at 56,500 ppb).

Pb

Lead (Pb) is elevated in WCS (Figure D-67) and KAR (Figure D-68) groundwater, and surface soil (Figure D-69), and sediment (Figure D-70). It is elevated in surface water (Figure D-71), but UTL exceedance is in the 0 to 5% range. Bedrock wells have consistently high levels of lead relative to the colluvial wells (see IHSS 119.1) (Figure D-72). The absence of elevated levels of Pb in the overlying colluvial groundwater does not indicate Pb contamination from waste disposal. With respect to surface soil, Pb is elevated at two locations in 119.1 (RA032 and RA033): one location in 119.2 (RA031), and one location south of 119.2 (RA022). With the exception of RA032 in IHSS 119.1, these values only slightly exceeded the UTL of 45 mg/kg (Figure D-73). The range of Pb concentrations at RA032 is 79 to 228 mg/kg. Because Pb surface soil concentrations are below or near the background UTL at all other locations, the elevated levels at this one station are not high enough to be convincing evidence of lead contamination. Two exceedances occur in sediments along the SID, but the concentrations just exceed the UTL (Figure D-74). In surface water, there is only one exceedance of the UTL downgradient of OU1 in the SID (1 of 9 at 30.4 ppb at SW066 [UTL is 21 ppb]) (Figure D-75). The other exceedances are upgradient of OU1 along the SID with a maximum concentration of 118 ppb at SW035. The low frequency of UTL exceedances at any one surface water station indicates it is not a contaminant of surface water.

Li

Lithium (Li) is elevated in colluvial geologic material (Figure D-76), in RFA (Figure D-77), WCS (Figure D-78), and KAR (Figure D-79) groundwater, and in surface water (Figure D-80). In geologic material, with the exception of two UTL exceedances, all exceedances of the UTL are along the French Drain alignment (Figure D-81). The two exceedances in IHSS 119.1 are of similar low magnitude to the exceedances along the French Drain alignment (range of all exceedances is 19 to 28 ppm [UTL is 18.5 ppm]). In groundwater, the exceedances are largely in bedrock groundwater at IHSS 119.1; however, the overlying colluvial groundwater is not elevated in Li which does not suggest contamination (Figure D-82). The only other exceedance of the UTL is at 5187 (91.9 ppb [UTL is 34.2 ppb]), south of Building 881. However, there are no UTL exceedances downgradient which renders this one datum highly inconclusive. Considering all the groundwater data, Li does not appear to be a contaminant of groundwater. In surface water, there are infrequent UTL exceedances along the entire reach of the SID (Figure D-83) and concentrations are similar along the entire reach which does not indicate lithium is a surface water contaminant.

Mg

Magnesium (Mg) is elevated in RFA (Figure D-84), WCS (Figure D-85), and KAR (Figure D-86) groundwater, and in surface water (Figure D-87). In groundwater, Mg is elevated in bedrock at IHSS 119.1, but the overlying colluvial groundwater is not elevated in Mg which does not suggest contamination (Figure D-88). It is noted that the concentrations are similar in colluvial and bedrock groundwater although the lower UTL for bedrock groundwater is the reason those concentrations are elevated. Concentrations of Mg often exceed the UTL in RFA groundwater surrounding Building 881; however, the highest concentration of Mg is upgradient of the building (and upgradient of OU1) at 37791 (50,600 ppb). In general, concentrations of Mg are similar from Building 881 to IHSS 119.1, which does not suggest contamination. In surface water, there are frequent exceedances of the UTL along the entire reach of the SID (Figure D-89), and concentrations are similar along the entire reach, including upgradient locations. Because Mg is not a contaminant in any other OU1 medium, these data do not indicate Mg is a contaminant of surface water.

Mn

Manganese (Mn) is elevated in COL (Figure D-90), VFA (Figure D-91), and WCS (Figure D-92) groundwater, and in colluvial geologic materials (Figure D-93). The UTL exceedances are few in geologic material and are scattered randomly across OU1 (Figure D-94). Many of these exceedances are along the French Drain alignment. Mn does not appear to be a contaminant of colluvial geologic material because contamination would be evidenced by more consistent exceedances of the UTL and some indication of a source. With respect to groundwater, examination of the spatial distribution of the Mn results indicates that there are no well-defined horizontal concentration gradients indicative of a source, either on-site or off-site (concentrations increasing toward the boundary) (Figure D-95). Exceedances of the background UTL occur in five UHSU wells within OU1. Three of these wells (36391, 37991, and 37191) are located within IHSS boundaries; however, these wells contained little or no organic contamination. Co-occurrence of high Mn values with high volatile organic contamination would be partial evidence that Mn is a site contaminant. Also, the maximum concentrations of Mn in the two off-site wells are of similar magnitude to the concentrations at the IHSS. With respect to vertical concentration gradients, the arithmetic mean concentration of Mn in groundwater was calculated for alluvial/colluvial groundwater monitoring wells (shallow) and for bedrock wells (deep). The mean Mn concentrations for shallow and deep wells are 377 $\mu g/\ell$ and 258 $\mu g/\ell$, respectively. These values are similar and do not demonstrate an obvious concentration gradient between the shallow and deep water bearing zones. An estimate of vertical migration rate was made to further investigate the potential for vertical Mn migration from a near-surface source. Using aquifer parameters specific to the IHSS 119.1 area of OU1 (vertical hydraulic conductivity and gradient, porosity etc.) coupled with a conservative literature value of the distribution coefficient (Kd) for Mn

(5,000) and a 25-year travel time, a maximum travel distance of 0.78 feet is calculated. This suggests that Mn could not naturally migrate vertically over any appreciable distance. Lastly, none of the wells at OU1 showed consistently elevated (above the UTL) concentrations of Mn. Only one well (37191) contained Mn at a concentration more than 2 times the UTL (3,660 $\mu g/\ell$). This high detection was a one-time occurrence, and the data from subsequent quarters show a steep decline in Mn concentrations. As discussed for Sb this appears to be related to a well development problem. The most recent Mn concentration for well 37191 was below the UTL. The large disparity in concentration values from one sampling period to the next is inconsistent with the presence of contamination.

Hg

Mercury (Hg) is not an OU1 contaminant based on statistical analyses.

Mo

Molybdenum (Mo) is elevated in surface soil (Figure D-96) and sediment (Figure D-97) only. It is also elevated in colluvial geologic material (Figure D-98); however the UTL exceedance is in the 0 to 5% range. The only sediment station with an exceedance of the UTL is at Station 40 on Woman Creek, but the concentration (6.1 mg/kg) just exceeds the UTL (5.4 mg/kg) (Figure D-99). In surface soil, the only exceedances of the UTL (3.9 ppm) are at RA037 (4.3 ppm) and at RA031 (5.1 ppm). Concentrations are low and neighboring stations do not exceed UTL (Figure D-100). In colluvial geologic material, the only exceedances of the UTL are along the French Drain alignment (B303490 and B303590) (Figure D-101). The magnitudes of the exceedances are low, and together with the locations of the UTL exceedances, does not indicate contamination because contamination would be evidenced by more consistent exceedances of the UTL and some indication of a concentration gradient.

Ni

Nickel (Ni) is only elevated in the surface water (Figure D-102); however, the UTL exceedance is in the 0 to 5% range. The exceedances occur along the SID and are infrequent at the stations where they occur (Figure D-103). The maximum concentration is 50 ppb occurring at upgradient station SW035 (UTL = 16.9). Ni is not a surface water contaminant.

K

Potassium (K) is elevated in RFA (Figure D-104), COL (Figure D-105), and WCS (Figure D-106) groundwater. It is also elevated in surface water (Figure D-107); however, the UTL exceedance range is 0 to 5%. In groundwater, most of the UTL exceedances are in bedrock groundwater at IHSS 119.1; however the overlying colluvial groundwater is not elevated which does not suggest contamination (Figure D-108). (The closest colluvial well with an exceedance of the UTL is well 37191 in IHSS 130. However, the exceedance occurred only once in three observations.) The RFA groundwater is elevated around Building 881; however, the highest concentration is upgradient of the building (and upgradient of OU1). The spatial distribution of concentration in this area,

particularly the lack of UTL exceedances in some adjacent wells, does not suggest K contamination. In surface water, the UTL exceedances are in stations along the SID (SW044 and SW067), but these exceedances are low in frequency and magnitude (Figure D-109). Also, the highest concentrations are in upgradient stations, e.g., SW035. K does not appear to be a contaminant of surface water.

Se

Selenium (Se) is elevated in COL (Figure D-110), WCS (D-111), and KAR (Figure D-112) groundwater, and is elevated in surface water (Figure D-113). Figure D-114 indicates Se appears to be a contaminant of groundwater as seen by the high concentrations at IHSS 119.1 relative to the UTL. **Therefore, selenium is retained as a groundwater contaminant.** Figure D-115 indicates it is not a contaminant of surface water. In the latter case, this is due to the low magnitude and frequency UTL exceedances along the SID, i.e., contamination should be associated with higher UTL exceedance frequencies. In Woman Creek, one station (SW033) has a higher frequency of UTL exceedance (6 of 19), but surrounding stations do not exhibit this characteristic. Also these stations are not downgradient of the apparent Se groundwater contamination.

It should be noted that highly elevated selenium concentrations occur elsewhere at the Rocky Flats Plant but do not appear to be related to waste releases from IHSSs (Table D-12). Concentrations as high as 817 $\mu g/\ell$ and 1,210 $\mu g/\ell$ occur downgradient of the Present Landfill and Solar Evaporation Ponds, respectively, but selenium is not comparably elevated, if at all, in waste or groundwater at the IHSSs. Because selenium is also not a known waste constituent disposed at OU1, this evidence suggests the high selenium concentrations may be naturally occurring. However, because the supporting data for this contention are not thoroughly developed, selenium is nevertheless retained at this time as a groundwater contaminant at OU1.

Si

Silicon (Si) is elevated in COL (Figure D-116) and WCS (Figure D-117) groundwater, and surface soils (Figure D-118). At IHSS 119.1, there are exceedances of the UTL (32,800 ppb) at well 1074 (34,600 ppb) and well 4387 (67,800 ppb) (Figure D-119). The concentration downgradient at 4387 is higher (83,800 ppb) which does not suggest IHSS 119.1 origin. Other UTL exceedances are at well 5387 (132,000 ppb) and at well 36391 (36,300 ppb) but there is only one sample at each location. Filtered concentration data do not show a concentration gradient suggesting the existence of dissolved mobile plume (Figure D-120). With respect to surface soils, concentrations are elevated throughout OU1 including locations outside IHSSs (Figure D-121). The distribution of concentrations is not indicative of contamination.

Ag

Silver (Ag) is elevated in the sediments (Figure D-122). It is also elevated in surface water (Figure D-123); however, the UTL exceedance

range is 0 to 5%. In surface water, the UTL exceedances are low in frequency and magnitude and occur along the entire reach of the SID (Figure D-124). This is not indicative of Ag contamination of surface water because contamination should be associated with higher UTL exceedance frequencies and a source-release pattern. There is only one exceedance of the UTL in sediments, and it occurs in Woman Creek (SED040 at 1.7 ppm) (Figure D-125). The UTL is 1.6U ppm. This isolated, remote from an IHSS, exceedance of the UTL is not indicative of Ag contamination of the sediments.

Na

Sodium (Na) is elevated in RFA (Figure D-126) and WCS (Figure D-127) groundwater, and in surface water (Figure D-128) and sediments (Figure D-129). Figure D-130 indicates groundwater in the vicinity of Building 881 is clearly elevated in Na as noted by the UTL exceedances. However, concentrations throughout OU1 west of IHSS 119.2 are similar. The highest concentrations occur at IHSS 119.1 in colluvium, but these concentrations do not exceed the UTL for colluvium. The apparently elevated concentrations in RFA in the vicinity of Building 881 may be due to the presence of considerable artificial fill in this area and throughout OU1 or possibly due to infiltration of saline parking lot/pavement runoff resulting from deicing activities; however, the levels are not elevated to the extent that the colluvial UTL is exceeded. It is concluded that Na is not an OU1 groundwater contaminant. Also, the elevated levels in bedrock are at IHSS 119.1; however, the overlying colluvial groundwater is not elevated in Na (although the concentrations are of similar magnitude to the bedrock) and therefore does not represent contamination. In surface water, there are exceedances of the UTL along the entire reach of the SID (Figure D-131). Because Na is not a contaminant in any other OU1 medium, these data do not indicate Na is a contaminant of surface water. In sediments, there are only two exceedances of the UTL: at SED039 (696 ppm), and at upgradient station SED037 (399 ppm) (Figure D-132). This is not indicative of Na contamination of sediments because UTL exceedance frequencies are low and the concentrations are similar along the entire reach of the SID at OU1.

Sr

Strontium (Sr) is elevated in surface soil (Figure D-133), in RFA (Figure D-134), WCS (Figure D-135), and KAR (Figure D-136) groundwater, and in surface water (Figure D-137), and sediments (Figure D-138). It is elevated in colluvial geologic material (Figure D-139); however, the UTL exceedance range is 0 to 5%. The random and low frequency and low magnitude exceedances of the UTL in surface soil and colluvial geologic material does not indicate that Sr is a contaminant in these media (Figures D-140 and D-141) because contamination would be evidenced by more consistent exceedances of the UTL and some indication of a concentration gradient. Sr frequently exceeds the UTL in surface water and sediments along the entire reach of the SID (Figures D-142 and D-143). However, concentrations are similar at all locations, including upgradient locations.

Because Sr is not a contaminant in any other OU1 medium, these data do not indicate Sr is a contaminant of surface water. Similar to Na, Figure D-144 indicates groundwater in the vicinity of Building 881 is clearly elevated in Sr as noted by the UTL exceedances. However, concentrations throughout OU1 west of IHSS 119.2 are similar. The highest concentrations occur at IHSS 119.1 in colluvium, but these concentrations do not exceed the UTL for colluvium. The apparently elevated concentrations in RFA in the vicinity of Building 881 may be due to the presence of considerable artificial fill in this area and throughout OU1 is likely the reason for the elevated levels; however, the levels are not elevated to the extent that the colluvial UTL is exceeded. It is concluded that Sr is not an OU1 groundwater contaminant. Also, the elevated levels in bedrock are at IHSS 119.1; however, the overlying colluvial groundwater is not elevated in strontium and therefore does not represent contamination.

Sn — Tin (Sn) is not an OU1 contaminant based on statistical analyses.

Tl — Thallium (Tl) is elevated in sediments only (Figure D-145). However, there is only one exceedance of the UTL (SED028 at 1 ppm (UTL = 0.55U ppm) (Figure D-146). The data do not indicate Tl contamination of sediments.

V — Vanadium (V) is elevated in COL (Figure D-147), WCS (Figure D-148), and KAR (Figure D-149) groundwater. It is elevated in surface water (Figure D-150); however the UTL exceedance range is 0 to 5%. Figure D-151 shows many exceedances of moderate magnitude of the UTL in groundwater at IHSS 119.1. **Therefore, V is retained as a groundwater contaminant.** The low frequency and low magnitude exceedances of the UTL in surface water indicate it is not a contaminant in this medium (Figure D-152).

Zn — Zinc (Zn) is elevated in sediments only (Figure D-153). However, there are only two exceedances of the UTL, and they occur along the SID: at SED039 (199 ppm), and at SED037 (291 ppm) (Figure D-154). The UTL is 168 ppm. This does not indicate Zn contamination of the sediments.

Am-241 — Americium (Am) is elevated in surface soil (Figure D-155), RFA geologic material (Figure D-156), and surface water (Figure D-157). It is also a contaminant of recently discovered "hot spots." In addition to the media listed above, it is classified as a contaminant of sediments because of its known widespread occurrence above background in this vicinity due to airborne releases from OU2.

Cs-134 and 137 — Cesium (Cs) isotopes are only elevated in surface water (Figure D-158), although there is insufficient data in several other media to determine if Cs is elevated elsewhere. However, there has never been a criticality

incident at the RFP, and, therefore, any elevated levels have been determined to be natural variations in ambient concentrations that have resulted from fallout.

Pu-239,240

The ANOVA indicated plutonium (Pu) to be elevated in only surface soil (Figure D-159); however, in many media, there is insufficient data to perform the ANOVA. It is a contaminant of recently discovered "hot spots" which necessarily renders it a contaminant of subsurface soil. Also, it is classified as a contaminant of surface water and sediments because of its known widespread occurrence above background in this vicinity due to airborne releases from OU2.

Ra-226 and 228

Radium (Ra) is not elevated in any media, although in some media there is insufficient data to perform the ANOVA or the isotope was not analyzed (e.g., Ra-228). Because Ra is not elevated in the many media where supporting data do exist, Ra has been determined to not be a contaminant at OU1.

Sr-89,90

Strontium (Sr) is not elevated in any media, although in some media there is insufficient data to perform the ANOVA. However, there has never been a criticality at the RFP, and, therefore, the presence of Sr at OU1 simply reflects natural variations in concentrations that have resulted from fallout.

H-3

Tritium is only elevated in colluvial geologic material (Figure D-160). The elevated levels occur randomly (Figure D-161). Two boreholes in 119.2 had exceedances; the four other exceedances are both upgradient and downgradient of the IHSSs and are similar in magnitude to the concentrations at 119.2. This is not indicative of contamination.

U-233,234
U-235
U-238

Uranium isotopes are elevated in COL geologic materials (Figure D-162), surface soil (Figures D-163 and D-164), RFA groundwater (Figure D-165 and D-166), and surface water (Figures D-167, D-168, and D-169). Because of its presence in recently discovered "hot spots," it is retained as a contaminant of geologic material (subsurface soil) and surface soil. The "hot spot" data indicate the uranium is either depleted or enriched, or is the 233 isotope based on uranium-233,234/uranium-238 activity ratios. With respect to groundwater, although U is elevated for RFA, it is not elevated in COL. Figures D-170 and D-171 (total and filtered U) indicate groundwater in the vicinity of Building 881 is elevated in U as noted by the UTL exceedances. However, concentrations throughout OU1 west of IHSS 119.2 are similar, although concentrations are somewhat higher upgradient, downgradient, and at Building 881. The apparently elevated concentrations in RFA in the vicinity of Building 881 may be due to the presence of considerable artificial fill in this area and throughout OU1;

although the levels are not elevated to the extent that the colluvial UTL is exceeded. Also, the U-234/U-238 activity ratios (Tables D-13 and D-14) indicate the uranium is naturally occurring (the theoretical U-234/U-238 activity ratio for naturally occurring U is 1.06; however, ratios usually range between 1 and 3 due to selective U-234 mobilization by alpha recoil). It is recognized that depleted (U-234/U-238 ratio of 0.07), enriched (U-234/U-238 ratio of 5.74), and U-233 "hot spots" exist at OU1. High isotopic ratios in groundwater could be viewed as indicating enriched uranium or U-233 contamination (in the latter case, U-233 is analyzed together with U-234, and the U-234/U-238 ratio analysis uses the U-233,234 data). The total uranium isotopic ratios (Table D-12) indicate quotients in excess of 5.74 for samples from well 0387, and samples from surface water stations SW032, SW033, and SW039. The filtered uranium isotopic ratios (Table D-14) indicate high quotients for samples from well 0387 and 0887. However, in all these cases the concentrations of the U-238 isotope are far below the Minimum Detectable Activities (MDA), and the high ratios appear to be an artifact of the imprecision of the analytical instrument. Therefore, it is assumed that uranium is not a contaminant of groundwater. With respect to surface water, U frequently exceeds the UTL along the entire reach of the SID (Figure D-172). However, concentrations are similar at all locations, including upgradient locations, which is not indicative of contamination originating from OU1. Furthermore, the U appears to be naturally occurring based on isotope ratios.

Bicarbonate

Bicarbonate exceeds the UTLs in RFA (Figure D-173), COL (Figure D-174), and KAR (Figure D-175) groundwater and in surface water (Figure D-176). Figure D-177 indicates groundwater in the vicinity of Building 881 is elevated in bicarbonate as noted by the UTL exceedances. However, concentrations throughout OU1 are similar. The apparently elevated concentrations in RFA in the vicinity of Building 881 may be due to the presence of considerable artificial fill in this area and throughout OU1, although the levels are only elevated to the extent that the colluvial UTL is rarely exceeded. This does not appear to be indicative of contamination from either an on-site or off-site source. With respect to surface water, bicarbonate often exceeds the UTL along the entire reach of the SID (Figure D-178). However, concentrations are similar at all locations, including upgradient locations. Because bicarbonate is not a contaminant in any other OU1 medium, these data do not indicate bicarbonate is a contaminant of surface water.

Carbonate

Carbonate is not elevated in any medium.

Chloride

Chloride exceeds the UTLs in RFA (Figure D-179), COL (Figure D-180), and WCS (Figure D-181) groundwater and in surface water (Figure D-182). In the alluvial/colluvial and shallow bedrock systems, the UTLs are exceeded throughout OU1 (Figure D-183). Concentrations are highest

around IHSS 119.1 and 119.2. Because of the similarity in concentrations throughout this area and with depth, and the nature of contaminant releases to soils and groundwater at these IHSSs from drum leakage in discrete storage areas, it is inconceivable that these high chloride concentrations are from waste disposal activities. Also, the pattern of contamination is unlike that for the organics in groundwater which is clearly due to leakage from drum storage. It is hypothesized that the high chloride in groundwater in this vicinity is due to discharge of high chloride bedrock groundwater to the alluvial/colluvial system upgradient of these IHSSs. Boreholes drilled north of IHSS 119.1 encountered moist to wet conditions in the shallow bedrock. The subcropping sandstone at 31891, south of IHSS 102 contains high chloride groundwater (690 - 700 mg/ℓ) which is further evidence of the existence of high chloride bedrock groundwater at OU1. With respect to surface water, chloride often exceeds the UTL along the entire reach of the SID (Figure D-184). However, concentrations are similar at all locations, including upgradient locations. Because chloride is not a contaminant in any other OU1 medium, these data do not indicate chloride is a contaminant of surface water.

Cyanide

Cyanide UTL exceedances occur in surface water only (D-185). The UTL exceedances are in stations along the SID, but these exceedances are low in frequency and magnitude (Figure D-186). This is not indicative of contamination from OU1 or elsewhere. Also, cyanide is not a contaminant of soils or groundwater at OU1.

Fluoride

Fluoride UTL exceedances occur in RFA groundwater (Figure D-187) and in surface water (Figure D-188). The exceedances of fluoride in groundwater are only at well 37791, north and upgradient of Building 881 (Figure D-189). The magnitude of the exceedances are small. Fluoride is clearly not a groundwater contaminant of OU1 origin and does not appear to be a contaminant at all. With respect to surface water, fluoride often exceeds the UTL along the entire reach of the SID (Figure D-190). However, concentrations are similar at all locations, including upgradient locations. Because fluoride is not a contaminant in any other OU1 medium, these data do not indicate fluoride is a contaminant of surface water.

Nitrate/Nitrite

Nitrate/nitrite exceeds the UTL in RFA (Figure D-191), COL (Figure D-192), VFA (Figure D-193), WCS (Figure D-194), and KAR (Figure D-195) groundwater, colluvial geologic materials (Figure D-196), and surface water (Figure D-197). In geologic materials the frequency of exceedance of the UTL was only 3%, and the maximum concentration was 4.3 mg/kg (UTL = 3.2 mg/kg) which does not indicate nitrate/nitrite contamination of colluvial material. In groundwater, the exceedances of the UTL are mostly at IHSS 119.1 (Figure D-198). The concentrations are similar throughout this area in colluvial and shallow bedrock

groundwater. The magnitude of the UTL exceedance is relatively low in the colluvial groundwater. Like chloride, because of the similarly in concentrations throughout this area and with depth, and the nature of soils and groundwater contamination at this IHSS is leakage from drum storage, it is inconceivable that these nitrate concentrations are from waste disposal activities. Also, the distribution of nitrate/nitrite concentrations is unlike that for the organics in groundwater, the latter being clearly due to leakage from drums in storage. With respect to surface water, nitrate/nitrite often exceeds the UTL along the entire reach of the SID (Figure D-199). However, concentrations are similar at all locations, including upgradient locations. Because nitrate/nitrite is not a contaminant in any other OU1 medium, these data do not indicate nitrate/nitrite is a contaminant of surface water.

Orthophosphate

Orthophosphate exceeds the UTL in COL groundwater only (Figure D-200). However the exceedance occurs only at well 0974 (1 of 2 samples at 590 $\mu g/\ell$). The other observation at this well is a nondetect (Figure D-201). This isolated exceedance of the UTL is not indicative of contamination.

Silica

Silica exceeds the UTL in RFA (Figure D-202) and COL (Figure D-203) groundwater and in surface water (Figure D-204). The silica concentrations in alluvial/colluvial groundwater are similar across OU1 (Figure D-205). The exceedances of the UTL are few, low in magnitude, and never consistent for any one well. This is not indicative of groundwater contamination. In surface water, UTL exceedances are rare and low in magnitude. Concentrations are similar at all locations. This is not indicative of contamination (Figure D-206).

Sulfate

Sulfate is elevated in RFA (Figure D-207) and WCS (Figure D-208) groundwater and in surface water (Figure D-209). Figure D-210 indicates groundwater in the vicinity of Building 881 is clearly elevated in sulfate as noted by the UTL exceedances. However, concentrations throughout OU1 west of IHSS 119.2 are similar. The highest concentrations occur at IHSS 119.1 in colluvium, but these concentrations do not exceed the UTL for colluvium. The apparently elevated concentrations in RFA in the vicinity of Building 881 may be due to the presence of considerable artificial fill in this area, although the levels are not elevated to the extent that the colluvial UTL is exceeded. It is concluded that sulfate is not an OU1 contaminant. Also, the elevated levels in bedrock are at IHSS 119.1; however, the overlying colluvial groundwater is not elevated in sulfate and therefore does not represent contamination. With respect to surface water, sulfate often exceeds the UTL along the entire reach of the SID (Figure D-211). However, concentrations are similar at all locations, including upgradient locations. Because sulfate is not a contaminant in any other OU1 medium, these data do not indicate sulfate is a contaminant of surface water.

Sulfide	Sulfide is elevated in surface water only (Figure D-212). There is only one UTL exceedance (1 of 2 samples at 39,000 $\mu g/\ell$; UTL = 4,000 $\mu g/\ell$). However, the other sample at this station did not have a detectable sulfide concentration. Little significance can be attached to the one high concentration of sulfide at this station. Sulfide is also not elevated in any other media at OU1. Lastly, sulfide is not predicted to exist under the oxidizing conditions found at OU1. Sulfide does not appear to be a contaminant.
Tot. Dis. Solids	Total dissolved solids (TDS) exceeds the UTL in RFA (Figure D-214), COL (Figure D-215), WCS (Figure D-216), and KAR (Figure D-217) groundwater and in surface water (Figure D-218). Figure D-219 indicates that TDS concentrations exceed the UTLs throughout OU1 in most wells and in all groundwater units. However, concentrations are similar in magnitude at all locations, although somewhat higher concentrations occur at IHSS 119.1. The distribution of concentrations is not indicative of contamination of OU1 waste sources and may not represent contamination at all. The elevated concentrations in RFA in the vicinity of Building 881 may be due to the presence of considerable artificial fill in this area. With respect to surface water, TDS often exceeds the UTL along the entire reach of the SID (Figure D-220). However, concentrations are similar at all locations, including upgradient locations. Because TDS is not a contaminant in any other OU1 medium, these data do not indicate TDS is a contaminant of surface water.
pH	pH exceeds the UTL in all groundwater units. Since pH is largely controlled by the bicarbonate content of the groundwater, and bicarbonate has been shown to not be a contaminant, the pHs of groundwater at OU1 are not indicators of contamination.

D6.2 Organic Analytes

D6.2.1 Volatile Organic Compounds

VOCs are the primary organic contaminants at OU1. Their presence in samples from the various media is depicted in Table D-15. The VOCs identified as OU1 contaminants at OU1 are listed below along with the rationale for the identification.

ANALYTE	RATIONALE
1,1,1-trichloroethane	This compound is known to have been disposed at the site and is present in subsurface soils, groundwater, surface water, and sediments.

Trichloroethene	This compound is known to have been disposed at the site and is present in the subsurface soils, groundwater, surface water, and in seeps.
Tetrachloroethene	This compound is known to have been disposed at the site and is present in the subsurface soils, groundwater, surface water, and in seeps.
Carbon Tetrachloride	This compound is known to have been disposed at the site and is present in subsurface soils and groundwater.
1,2-Dichloroethene	This compound is a known degradation product of 1,1,1-trichloroethane and is present in the groundwater and the surface water at the site.
Chloroform	This compound is a known degradation product of carbon tetrachloride and is present in subsurface soils and groundwater.
1,1-Dichloroethene	This compound is a known degradation product of 1,1,1-trichloroethane and is present in subsurface soils, groundwater, and surface water.
cis 1,2-Dichloroethene	This compound is a known degradation product of 1,1,1-trichloroethane and is present in the groundwater at the site.
1,1,2-Trichloroethane	This chlorinated solvent was detected in the groundwater obtained from two wells (0974 and 4387) which are both located in the source area and both contain other compounds known to be disposed at the site.
1,1-Dichloroethane	This chlorinated solvent was detected in groundwater obtained from three wells (0187, 0974, and 4387) which are all located in the source area and contain other chlorinated solvents known to be disposed at the site. In addition, it was detected in the subsurface soils and surface water.
1,2-Dichloroethane	This chlorinated solvent was detected in the groundwater obtained from two wells (0974 and 4387) which are both located in the source area and both contain other chlorinated solvents known to be disposed at the site. In addition, it was detected in the surface water at the site.

Toluene	This compound was detected in the groundwater in numerous wells including two wells (0974 and 4387) both located in the source area and both containing other compounds known to be disposed at the site. In addition, toluene was detected in the subsurface soil samples, surface water, seeps, and sediments at the site (see below for further discussion).
Total Xylenes	This compound was detected in only two wells (0974 and 4387) which are both located in the source area and both contain other compounds known to be disposed at the site. In addition, toluene was detected in subsurface soils and surface water. It is in the same class of compounds (aromatics) as toluene and therefore is retained as a contaminant.

Toluene was detected in samples obtained from subsurface soils, groundwater, sediments, and surface water at OU1. The ubiquitous occurrence of toluene in OU1 media, particularly in subsurface soils, and the absence of concentration gradients indicating a source for toluene contamination suggests toluene is an artifact of laboratory or field sampling introduced contamination. However, the laboratory and field blank data (see Section 4.1.2 and Appendix G) do not support this premise even though toluene was occasionally detected in the blanks. A discussion of the occurrence of toluene in the various OU1 media is presented below.

With respect to groundwater, toluene was detected in 10% (21 detections) of the 210 groundwater samples obtained from the 46 monitoring wells at OU1. Seven of the 46 wells had a detection of toluene during at least one sampling event:

Well	Detections/Sample Events	% Detection	Concentration Range ($\mu g/\ell$)
0974	9/9	100%	32-270
4387	4/11	36%	15-40
4987	1/1	100%	0.42
37791	1/3	33%	0.2
37991	1/3	33%	1.1
6486	1/5	20%	0.24
6286	3/10	33%	0.27-5.0
34791	1/3	33%	.59

The highest concentrations of toluene in the groundwater were detected in monitoring wells 0974 and 4387 in IHSS 119.1. Groundwater chemistry at these two wells exhibits obvious contamination with chlorinated solvents. The remaining detections are all at concentrations below 1.1 $\mu g/\ell$, and with the exception of well 6286 which had two detections, toluene was not detected at any other well when resampled. Although the data do not provide unambiguous evidence of toluene groundwater contamination, to be conservative, it has been retained as a groundwater contaminant largely because of its higher frequency and magnitude of occurrence in wells at IHSS 119.1.

With respect to surface water, toluene was detected in nine samples from seven locations at OU1. However, toluene was confirmed at only one station, SW068, at which the highest concentration, 5 $\mu g/\ell$ was reported. The lack of persistence of this contaminant in surface water, combined with low concentrations (at or below the detection limit of 5 $\mu g/\ell$) and its detection at upgradient station SW039 suggest that, if toluene is actually present in the surface water at OU1, it may not be attributable to OU1 activities. Nevertheless, it has been retained as a surface water contaminant because it was determined to be a groundwater contaminant, and groundwater is a medium that interacts with surface water.

Toluene was detected in 97% of the 437 subsurface soil samples obtained from OU1. The toluene detections in the subsurface soils are generally uniformly distributed throughout OU1, in both source areas and nonsource areas. The higher concentrations (>700 $\mu g/kg$) occurred in samples from boreholes that did not target specific IHSSs. Concentrations were generally less than 300 $\mu g/kg$ in most subsurface soil samples. At IHSS 102 (Oil Sludge Pit), toluene was detected in the subsurface soil samples obtained from the two boreholes within 50 feet of the IHSS at concentrations in excess of 100 $\mu g/kg$ with the highest concentrations in the intervals shallower than 10 feet below ground surface. In the soil samples obtained from boreholes further downslope, the concentration of toluene decreases to below 100 $\mu g/kg$ for all samples in each borehole. The concentrations in subsurface soils at this IHSS tend to decrease with depth below surface. Although these trends are noted and toluene is a potential contaminant of the oil sludge disposed at IHSS 102, the widespread occurrence of toluene in subsurface soils outside the IHSS with no clear concentration gradients indicating a definitive source at IHSS 102 does not support that toluene is a contaminant of subsurface soils in this area. At IHSSs 103,

104, 119.1, 119.2, 130, and in the vicinity of Building 881, toluene was detected in many of the subsurface soil samples. Disposal of toluene is not documented for these IHSSs (CDH, 1991a, 1992; DOE, 1992d). In addition to the lack of a disposal history for toluene at these IHSSs, no sitewide trends are obvious in the vertical and horizontal distribution of the toluene concentrations.

It is interesting to note that toluene was detected in only isolated subsurface soil samples during the Phase II RFI/RI. This suggests laboratory or field sampling artifact regarding toluene in the Phase III data. Toluene is recognized as a common laboratory contaminant by EPA (EPA, 1990a); however, if the toluene detected at OU1 were a laboratory artifact, then toluene would be expected to be present in the laboratory blanks and the result would be qualified ("B" qualified data). This is not the case with the subsurface soil data for only 25 of the 437 subsurface soil samples are qualified with a "B." Similarly, toluene showed up in a low percentage of the field blanks and at low concentrations which does not support field sampling introduced contamination.

The lack of concentration gradients, occurrence in areas distal from potential sources, absence of information regarding disposal of toluene, the absence of toluene in Phase II samples, and the lack of any association of toluene with other contaminants, suggest toluene is not a contaminant of subsurface soils. It was hypothesized at one time that Coherex, a dust suppressant used in the earlier RFI/RI field investigations, was the source of the toluene. However, chemical analysis of Coherex indicates toluene is not a component of this material. Although the field data do not portray toluene as a subsurface contaminant arising from obvious sources, the laboratory and field blank data do not indicate laboratory or field sampling artifact. Therefore, to be conservative, toluene has been retained as a subsurface soil contaminant.

Lastly, toluene was detected at an estimated concentration below the detection limit during one sampling event in two sediment samples (SED037 and SED039); however, toluene was not observed when these sediment stations were resampled. The low, inconsistent nature of the detections of toluene in the sediment stations casts doubt on the actual presence of toluene in the sediments at OU1. However, consistent with the OU1 contaminant screening process, toluene is retained as a contaminant of the sediments.

The following volatile organic analytes were determined not to be contaminants at OU1.

2-Hexanone	This compound was detected in 1% (3 samples) of the subsurface soil samples and was detected in only one well (6986) in only one sampling event (7/17/90). This well is approximately 400 feet southwest of the known source area. This well does not contain other known compounds disposed at the site and only contains low concentrations of acetone and methylene chloride, both suspected laboratory contaminants, and estimated concentrations of benzene and carbon disulfide. The subsurface soil results are all estimated values below the detection limits.
4-Methyl-2-Pentanone	This compound was detected in 2% (8 samples) of the subsurface soil samples and in 1% (1 sample) of the groundwater samples and in no other media. The subsurface soil sample results are all estimated values below the detection limit. The detection in the groundwater was in only one well (0887) in only one sampling event (9/11/90). This well is approximately 400 feet southwest of the known source area and does not contain any of the known compounds disposed at the site.
Carbon Disulfide	This compound was detected in 2% (7 samples) of the subsurface soil samples, in 2% of the surface water samples, and in one groundwater sample. All detected values were estimated below the detection limit.
Dichlorodifluoromethane	This compound was detected in the groundwater in only three wells (6286, 6886, and 37891) at a maximum of 2.8 ppb, and was not detected in any other media. The detections were on 11/25/91 in wells 6286 and 6886 with no other occurrences, and on 6/4/92 for well 37891.
Styrene	This compound was detected in subsurface soils, surface water, and groundwater samples. Detections in subsurface soils occurred in 3 of 432 samples. Two of the detections were estimated values at or below the detection limit. The third detection was 28 ppb. The groundwater samples were obtained from three wells (6886, 31791, and 39191 on 2/26/92, 5/8/92, and 2/26/92, respectively) at a maximum of 0.225 ppb and was not otherwise detected in these wells. The one surface water sample result was estimated below the detection limit (0.2 ppb).

Trichlorofluoromethane	This compound was detected only in groundwater and a total of three times, in one well twice (35391) and in a second well once (34791). The concentrations are low (10.2 ppb).
Vinyl Acetate	This compound was detected only in groundwater and in only one well (0287) during only one sampling event (7/17/90) at 8 ppb. Well 0287 is remote from source areas.
m-Xylene	This compound was detected only in groundwater and in only one well (37991) during only one sampling event (12/16/91) at 0.39 ppb. It was not analyzed for in the other media.
p-Chlorotoluene	This compound was detected only in groundwater and in only one well (37191) during only one sampling event (2/10/92) at 0.60 ppb. It was not analyzed for in the other media.
p-Cymene	This compound was detected only in groundwater and in only one well (37991) during only one sampling event (12/16/91) at 0.38 ppb. It was not analyzed for in the other media.
sec-Butylbenzene	This compound was detected in five wells (6886, 30991, 31491, 34791, and 39191) all during May 1992 but not detected in these wells at any other time. It was not analyzed for in the other media.
tert-Butylbenzene	This compound was detected in only one well (37191) during only one sampling event (2/10/92) at 4 ppb, and was not detected in these wells at any other time. It was not analyzed for in the other media.
2-Butanone	This compound was detected in many samples from all media (Figures D-221 and D-222). It is a common laboratory contaminant, and most reported values carry a "B" qualifier. A review of Figure D-222, particularly in the area of IHSS 119.1, reveals that 2-butanone does not co-occur with other known VOC wastes such as the chlorinated solvents that have been repeatedly detected at high concentrations in samples collected from wells 0974, 1074, and 4387. Although 2-butanone was detected at well 1074, this was a one-time occurrence.

Acetone

This compound was detected in most environmental samples (Figures D-221 and D-222). It is a common laboratory contaminant, and most of the detections carry a "B" qualifier. Acetone was also detected in 18% of the samples collected from the background area at concentrations up to 36 ppb. It is recognized that the maximum acetone concentrations in groundwater co-occur with the maximum chlorinated solvent concentrations (IHSS 119.1). However, most of these acetone values are B and/or J qualified. In addition, it is suspected that these reported relatively high concentrations (up to 1,400 ppb) are an artifact of sample dilutions, whereby a low acetone detection in a diluted sample is multiplied by the dilution factor with a resulting value reported as the measured concentration.

Figure D-223 compares the temporal variation in acetone concentrations in well 0974 (IHSS 119.1) with TCE (a known OU1 contaminant). A review of this figure reveals that while TCE concentrations remain stable over a period of years, the acetone concentration varies greatly with nondetectable levels frequently reported. This, coupled with other evidence discussed above, suggests that acetone is a laboratory contaminant.

Methylene Chloride

This compound was detected in most environmental samples including background samples (e.g., 55% of background sediment samples and 25% of groundwater samples). It is recognized that the maximum methylene chloride concentrations in groundwater co-occurred with the maximum chlorinated solvent concentrations (IHSS 119.1). However, most of these methylene chloride values are B and/or J qualified. In addition, it is suspected that these reported relatively high concentrations (up to 620 ppb) are an artifact of sample dilutions, whereby a low methylene chloride detection in a diluted sample is multiplied by the dilution factor with a resulting value reported as the measured concentration. Figure D-223 compares the temporal variation in methylene chloride concentrations in well 0974 (IHSS 119.1) with TCE (a known OU1 contaminant). A review of this figure reveals that while TCE concentrations remain stable over a period of years, the methylene chloride concentration varies significantly. The occurrence of this compound throughout OU1 and across all media coupled with the frequent occurrence in background samples strongly suggests that methylene chloride is a laboratory contaminant.

Chlorobenzene	This compound was detected in 1 subsurface soil sample out of a total of 889 environmental samples. In addition, the one detection was "J" qualified at 5 ppb.
Dibromochloromethane	This compound was detected in 1 groundwater sample (well 0974) out of a total of 889 environmental samples. In addition, the one detection was "J" qualified at 56 ppb.
Ethylbenzene	This compound was detected in 3 samples out of a total of 890 environmental samples. It occurred once in groundwater, surface water, and subsurface soils, however, each detection was either "B" or "J" qualified at a concentration below the method detection limit.
Benzene	This compound was detected in 1 groundwater sample out of a total of 890 environmental samples. This detection was "J" qualified at a concentration below the method detection limit (3 ppb).
Vinyl Chloride	This compound was detected at a concentration of 0.28 ppb in 1 field duplicate groundwater sample out of 889 environmental samples. The vinyl chloride concentration in the original groundwater sample was reported at 0.20U ppb.
1,2 Dichloropropane	This compound was detected in 1 surface water and in 1 groundwater sample out of a total of 889 environmental samples. The surface water sample contained 3J ppb, and the groundwater sample contained 0.35 ppb.
Benzene 1,2,4-Trimethyl	This compound was detected at a concentration of 0.12 ppb in 1 groundwater sample out of a total of 56 environmental samples.
Trans 1,3-Dichloropropene	This compound was detected in 1 subsurface soil sample out of a total of 413 environmental samples. The reported value (5J ppb) was below the detection limit.
1,4-Dichlorobenzene	This compound was detected in 4 subsurface soil samples out of a total of 187 environmental samples. The reported values were all below the detection limit.

D6.2.2 SVOCs and Pesticide/PCBs

Most of the SVOCs and pesticide/PCBs have been determined not to be contaminants at OU1. Of these classes of compounds, only PAHs and PCBs (Aroclor-1248 and -1254) have been determined to be OU1 contaminants. However, the PAHs do not appear to be derived from OU1 waste disposal practices. These compounds were detected in a high percentage of the surface soil samples and in a low percentage of the subsurface soil and sediment samples, and not in other media. Although not present in background surface soils, the widespread distribution of PAHs, internal and external to IHSSs, in surface soils is not indicative of contamination derived from waste disposal at OU1. Also, background sediment samples for some PAHs contain similar concentrations. Nevertheless, PAHs are retained as OU1 contaminants and are discussed in Section 4 of the RFI/RI Report. PCB contamination of surface soil appears to be very localized at OU1. This is also discussed further in Section 4 of the RFI/RI Report. The SVOCs determined not to be OU1 contaminants are listed below along with the rationale for the determination. Figures D-225, D-226, and D-227 depict the infrequent and sporadic nature of the occurrence of these compounds and VOCs not determined to be contaminants at OU1 in soils, groundwater, and surface water, respectively.

ANALYTE	RATIONALE
1,4-Dichlorobenzene	This compound was only detected in the 2% (4 samples) of the subsurface soil samples and not in any other media. All of the results were estimated below the detection limit.
2,6-Dinitrotoluene	This compound was only detected in 4% (1 sample) of the groundwater samples and not in any other media. The one detection was at a concentration of 2 ppb which is estimated below the detection limit of 10 ppb.
Naphthalene	This compound was only detected in 5% of the groundwater samples. Although a soil contaminant, naphthalene occurred in groundwater only at wells 6286 and 6886 both of which are remote from the IHSSs. In each case naphthalene was detected at low concentrations (2.4 $\mu g/\ell$ and 0.2 $\mu g/\ell$ for wells 6286 and 6886, respectively) and was nondetected in two other sampling events at each well.

4-Methylphenol	This compound was only detected in 15% (2 samples) of the sediment samples with a maximum concentration of 720 ppb. This compound was detected in 27.8% of the background sediment samples with a maximum concentration in the background sediment samples of 900 ppb.
4-Nitrophenol	This compound was detected in 1% (2 samples) of the subsurface soil samples and in no other media. Both of these results were estimated concentrations below the detection limit.
Benzoic Acid	This compound was detected in 1% (2 samples) of the subsurface soil samples and in 5% (1 sample) of the groundwater samples and in no other media. The detection in the groundwater was an estimated value below the detection limit.
Benzyl Alcohol	This compound was detected in 2% (1 sample) of the surface water samples and in no other media. The one result was an estimated concentration below the detection limit.
Bis(2-Ethylhexyl)phthalate	This compound was detected in all of the media sampled at OU1. It is a common contaminant introduced by field sampling equipment. Background data for the sediment samples indicate it was detected in 77.3% of the samples with a maximum concentration of 1321 ppb, whereas in the OU1 sediment samples this compound was detected in 85% of the samples with a maximum concentration of 1400 ppb.
Butyl Benzyl Phthalate	This compound was detected only in 1% (2 samples) of the subsurface soil samples and in 8% (1 sample) of the sediment samples and in no other media. It was detected in 18.8% of the background sediment samples with a maximum concentration of 660 ppb, whereas in the OU1 sediment samples this compound was detected in 8% of the samples with a maximum concentration of 75 ppb. In addition, all of the results are estimated values below the detection limit.
Di-n-Butyl Phthalate	This compound was detected in all of the media sampled at OU1. It is a common contaminant introduced by field sampling equipment. Background data for the sediment samples indicate it was detected in 35% of the samples with a maximum concentration of 1900 ppb, whereas in the

Di-n-Octyl Phthalate	OU1 sediment samples this compound was detected in 46% of the samples with a maximum concentration of 130 ppb. This compound was detected in 1% (2 samples) of the subsurface soil samples and in 8% (1 sample) of the sediment samples and in no other media. All of the detections were estimated values below the detection limit.
Dibenzofuran	This compound was detected only in 7% (2 samples) of the surface soil samples and in 1% (2 samples) of the subsurface soil samples and in no other media. The results from the surface soil samples were estimated values below the detection limit.
Diethyl Phthalate	This compound was detected in 1% (2 samples) of the subsurface soil samples and in 19% (2 samples) of the groundwater samples and in no other media. The results from the groundwater samples were estimated values below the detection limit.
n-Nitrosodiphenylamine	This compound was detected in 1% (2 samples) of the subsurface soil samples and in 2% (1 sample) of the surface water samples and in no other media. All of the results were estimated values below the detection limits.
Pentachlorophenol	This compound was detected in 1% (2 samples) of the subsurface soil samples and in no other media. The two results were estimated values below the detection limit.
Beta-BHC	Only detected in groundwater, in one well and in only one sample at a very low concentration (0.05 $\mu g/\ell$).
4,4'-DDT	Only detected in sediments and in only one sample.

D6.2.3 Tentatively Identified Compounds

A number of Tentatively Identified Compounds (TICs) were present in soil and water samples collected at OU1. These TICs and their concentration ranges are presented below:

TIC	Concentration Range Water (µg/ℓ)	Soil µg/kg)
Terephthalic Acid	Not Detected (ND)	880-3,100
2-Hydroxy-2-methyl-4-pentanone	8.9-35	46,000-190,000
Ethyl acetate	4.3-13	ND
Palmitic Acid	ND	460-610
1,1,1-Trichloro-1,2,2-trifluoroethane	9.5-740	14-14
Triphenylphosphine oxide	10-10	ND
Methyl methacrylate	ND	9.5-9.5
N-methylpyrrolidone	26-270	1,900-7,800
M-toluic Acid	ND	1,300-3,900

The TICs have not been included as site contaminants because they are not known waste constituents disposed at OU1. They often co-occurred in the laboratory blanks, and their concentrations could only be estimated. However, it is noted that none of these compounds are EPA carcinogens based on the listings provided in the 1992 Health Effects Assessment Summary Tables (HEAST) (EPA, 1992c).

D6.3 CONCLUSIONS

Based on the foregoing analysis, analytes within the chemical classes VOCs, SVOCs, pesticide/PCBs, metals, and RADs have been determined to be contaminants at OU1 (Table D-16). As noted in the table none of these contaminants are present in every medium. As expected, chlorinated solvents (VOCs) and RADs are contaminants at OU1. Unexpected contaminants at OU1 are selenium and vanadium in groundwater, and PAHs and PCBs in surface soils. It is possible that the selenium and vanadium are naturally occurring, but their high concentrations and the lack of sufficient data to conclusively prove their natural occurrence has resulted in selenium and vanadium being retained as groundwater contaminants. The PAHs occur throughout OU1 including areas outside IHSSs. Their distribution in surface soils is not indicative of contamination originating from an OU1 waste source. Nevertheless, their absence in background surface soils and frequent occurrence in surface soils at OU1 indicate they are contaminants at OU1. The PCB contamination is localized and occurs at low levels. Because PCB contamination exists elsewhere at RFP, it is not possible to definitely conclude that PCBs

are not contaminants at OU1. For easy reference, Table D-17 lists the analytes determined not to be contaminants. "Step-by-step" results of the contaminant screening process are shown in Tables D-18 through D-37 for the various environmental media and classes of analytes.

Table D-1

Background Concentrations for Surface Soil, Geologic Materials, Groundwater, Surface Water, Seeps, and Sediments at Rocky Flats Plant

Total Metals

Analyte	Ground Water (ug/l)					Surface Water (ug/l)	Seep Water (ug/l)	Geologic Materials (mg/kg)			Sediments (mg/kg)	Surface Soil (mg/kg)
	RFA	VFA	COL	WCS	KAR			RFA	COL	WCS		
ALUMINUM	23957.775	23957.775	23957.775	23957.775	23957.775	5705.632 *	382571.544	46580.729	23302.696	23302.696	20839.704	20560.2837
ANTIMONY	70 U *	70 U *	70 U *	70 U *	70 U *	42.2 U *	643 *	18.1 U •	18.1 U •	18.1 U *	11.1 •	11.8 U •
ARSENIC	3 *	3 *	3 *	3 *	3 *	2.9 •	528.333 *	12.140	12.140	12.140	11.469 •	11.4063
BARIUM	603.523	603.523	603.523	603.523	603.523	115.983 •	4658.715 *	259.619	438.136	343.408	193.741 •	343.7506
BERYLLIUM	160 *	160 •	160 *	160 •	160 •	4.8 *	14 •	18.123	18.123	18.123	1.212 *	1.0995
CADMIUM	1720 *	1720 *	1720 *	1720 •	1720 •	5 U •	68.4 •	1.8 U •	1.8 U •	1.8 U •	1.6 U •	1.0 •
CALCIUM	97261.404	314074.899	354200.012	117426.734	154031.314	66809.125	374036.215	16862.533	23235.833	43000.871	9957.426 •	12248.6741
CESIUM	1000 U •	1000 U •	1000 U •	1000 U •	1000 U *	1000 U •	2530 *	302 U *	302 U *	302 U *	231.433 *	3.3140
CHROMIUM	453.916	453.916	453.916	453.916	453.916	18.9 *	275 •	76.172	42.256	76.172	25.263 •	22.7473
COBALT	1620 *	1620 •	1620 *	1620 •	1620 •	7.9 •	489 *	29.7 *	29.7 *	29.7 •	11.945 •	11.6964
COPPER	1750 •	1750 •	1750 •	1750 •	1750 •	22.754 *	429.490 *	29.956	32.268	55.669	55.438 •	20.6648
IRON	36844.569	36844.569	36844.569	36844.569	36844.569	7559.389 •	1292392.12	33287.206	33287.206	33287.206	33548.400	26919.2110
LEAD	9.233	9.233	9.233	9.233	9.233	21 •	583.019 *	24.489	30.029	69.360	28.042 •	44.8539
LITHIUM	34.288	120.427	15762.425	86.885	271.802	12.076 *	75.293 *	18.531	18.531	18.531	21.279 •	17.4270
MAGNESIUM	11567.976	56291.142	115184.880	32173.857	26784.488	9851.822 *	41209.066	7600.652	7373.561	7373.128	9110.102 •	6362.0823
MANGANESE	932.505	932.505	932.505	932.505	932.505	687.399 *	12630.442	643.487	643.487	643.487	1675.660 *	802.5413
MERCURY	0.27 *	0.27 •	0.27 •	0.27 •	0.27 •	1.4 •	1.3 •	0.64 •	0.64 *	0.64 *	0.16 U *	0.08 U •
MOLYBDENUM	1600 •	1600 *	1600 •	1600 *	1600 •	20.3 •	203 *	37.559	26.8 •	37.559	5.4 •	2.8 •
NICKEL	1660 •	1660 *	1660 *	1660 •	1660 •	16.9 •	646 *	72.204	72.204	72.204	40.884 *	21.0634
POTASSIUM	3854.795	7464.326	7464.326	7464.326	45111.676	4524.350 •	16886.243	3726.431	3726.431	3726.431	4395.039 •	4594.5643
SELENIUM	80 •	80 •	80 *	80 *	80 *	2.2 U •	11.1 •	3.05 *	3.05 •	3.05 *	2.9 *	0.9546
SILICON	32846.609	32845.609	32845.609	32845.609	32845.609	12645.901	17802.633				2304.398 •	272.7822
SILVER	300 *	300 *	300 *	300 *	300 •	7.2 •	148 •	40.9 •	40.9 •	40.9 *	1.6 U •	1.4 U •
SODIUM	12460.018	135608.198	2406648.61	93698.884	1751482.49	33766.998	114173.180	3680 •	3680 •	3680	327.168 •	254.2149
STRONTIUM	289.374	2051.452	4001.538	1162.795	1842.292	364.267 •	1953.147 *	226 •	131.132	251.807	73.210 *	89.6858
THALLIUM	3 *	3 *	3 *	3 *	3 *	3.4 •	10 U •	2.9 U •	2.9 U *	2.9 U •	0.55 U •	0.5840
TIN	100 U •	100 U *	100 U •	100 U *	100 U *	180 •	969 •	338 •	338 *	338	27.1 *	69.7918
VANADIUM	29.721 *	12.323	29.721 •	5.9 U •	6.3 •	18.2 *	1782.282 *	77.097	77.097	77.097	102.877 *	46.2982
ZINC	498 •	498 *	498 *	498 *	498 •	221.480 •	2033.588 *	141.742	111.420	171.516	168.581 •	80.2709

Value represents upper limit of the background 95% tolerance interval (95% confidence and 95% population coverage).
* Maximum value. Data did not meet statistical critieria for computation of a tolerance interval.

Table D-1

Background Concentrations for Surface Soil, Geologic Materials, Groundwater, Surface Water, Seeps, and Sediments at Rocky Flats Plant. (continued)

Filtered Metals

Analyte	Ground Water (ug/l)					Surface Water (ug/l)	Seep Water (ug/l)
	RFA	VFA	COL	WCS	KAR		
ALUMINUM	229.710	229.710	229.710	229.710	229.710	631 *	200 U
ANTIMONY	51.248	51.248	51.248	51.248	51.248	104 U *	104 U *
ARSENIC	10 U *	10 U *	2 U *	15 *	10 U *	10 U *	18 *
BARIUM	151.368	214.185	169.894	153.252	153.252	221.622 *	211 *
BERYLLIUM	5 U *	5 U *	5 U *	5 U *	5 U *	17 *	5 U *
CADMIUM	8.6 *	8.6 *	8.6 *	8.6 *	8.6 *	5 U *	5 U *
CALCIUM	125662.019	156794.709	108075.372	216291.187	109384.457	69236.441	124279.352
CESIUM	2500 U *	2500 U *	2500 U *	2500 U *	2500 U *	1000 U *	1000 U *
CHROMIUM	23.2 *	23.2 *	23.2 *	23.2 *	23.2 *	20 U *	14.8 *
COBALT	50 U *	50 U *	50 U *	50 U *	50 U *	51.1 U *	50 U *
COPPER	175 *	175 *	175 *	175 *	175 *	28 *	25 U *
IRON	265.914	265.914	265.914	265.914	265.914	1112.682 *	50763.072
LEAD	64 *	64 *	64 *	64 *	64 *	6.6 *	5.4 *
LITHIUM	12.478	145.992	2618.415	197.230	221.946	119.098 *	100 U *
MAGNESIUM	21444.922	84998.896	31171.179	66356.399	14572.883	9610.910 *	18262.474
MANGANESE	43.659	2791.629	5.7 *	2222.336	149.813	292.497 *	2734.438 *
MERCURY	1.2 *	1.2 *	1.2 *	1.2 *	1.2 *	0.44 *	5.1 *
MOLYBDENUM	100 U *	100 U *	100 U *	100 U *	100 U *	100 U *	100 U *
NICKEL	35.8 *	20.686	40 U *	40 U *	40 U *	60 U *	40 U *
POTASSIUM	1272.334	5331.389	176851.328	4528.665	14589.066	4755.058 *	7073 U *
SELENIUM	607 *	56 *	157.956	229.328	6 *	10 U *	5 U *
SILICON	19534.566	12332.136	12332.136	12332.136	11058.616	13471.140	19832.749
SILVER	20 U *	20 U *	20 U *	20 U *	20 U *	16.4 U *	12.5 U *
SODIUM	40691.169	148389.299	584414.329	197886.543	912186.843	31918.400	24221.075
STRONTIUM	581.734	2925.851	2188.331	3242.179	599.523	521.087 *	685.151 *
THALLIUM	328 *	328 *	328 *	328 *	328 *	12 U *	10 U *
TIN	57.891	57.891	340 *	57.891	100 U *	100 U *	100 U *
VANADIUM	15.944	15.944	15.944	15.944	15.944	50 U *	50 U *
ZINC	50.223	50.223	50.223	50.223	50.223	140.968 *	105 *

Value represents upper limit of the background 95% tolerance interval (95% confidence and 95% population coverage).
* Maximum value. Data did not meet statistical critieria for computation of a tolerance interval.

Table D-1

Background Concentrations for Surface Soil, Geologic Materials, Groundwater, Surface Water, Seeps, and Sediments at Rocky Flats Plant. (continued)

Total Radiochemistry

Analyte	Ground Water (pCi/l)					Surface Water (pCi/l)	Seep Water (pCi/l)	Geologic Materials (pCi/g**)			Sediments (pCi/g**)	Surface Soil (pCi/g**)
	RFA	VFA	COL	WCS	KAR			RFA	COL	WCS		
AMERICIUM-241	0.032	0.032	0.032	0.032	0.032	0.018 *	0.059 *	0.013	0.013	0.013	1.597 *	0.0407
CESIUM-137	0.700	0.700	0.700	0.713	0.479	0.734 •	4.958 *	0.081	0.081	0.081	1.155 *	
GROSS ALPHA	314.552	314.552	314.552	314.552		30.032 *	322.212 *	37.833	51.315	55.251	69.203 •	
GROSS BETA	191.580	191.580	191.580	191.580		20.556 *	332.300 *	36.932	35.060	34.627	55.464 *	55.9516
PLUTONIUM-238	0.028	0.028	0.028	0.028	0.028	-0.000135	0.0006768				0.002 *	
PLUTONIUM-239,-24	0.064	0.064	0.064	0.064	0.064	0.019 *	1.812 *	0.017	0.017	0.017	4.963 *	0.1049
RADIUM-226	1.480 •		1.480			2.3 •	32.623 *	0.853	1.502	1.704	1.780 *	1.3538
STRONTIUM-89,-90	0.836	0.836	0.836	0.836	0.836	1.630 •	1.243 *	0.637	0.637	0.637	0.931 *	
STRONTIUM-90	0.906		0.906		0.906	1.409 •	1.219 •					
TRITIUM	936.738	936.738	936.738	936.738	936.738	475.216 *	2789.766 •	411.455	303.422	448.928	374.202 *	
URANIUM-233,-234	1.717	156.312	320.452	27.585	3.685	1.456 *	3.521 •	1.488	1.749	2.203	4.018 •	1.5545
URANIUM-235	0.999	7.652	10.939 *	1.339	0.04 •	0.152 *	0.211 *	0.081	0.171	0.442	0.174 *	0.1260
URANIUM-238	1.817	91.978	294.870	91.978	91.978	1.332 •	3.363 •	1.363	1.676	1.935	3.717 *	2.0274

Filtered Radiochemistry

AMERICIUM-241	0.028 *		0.028 *	0.028 •	0.028 *	0.026 •	0.01 U
CESIUM-137						0.899 •	-0.1 •
GROSS ALPHA	0.9 *	0.9 *	0.9 *	0.9 *	0.9 *	3.3 •	7.035 •
GROSS BETA	7.9 •	7.9 *	7.9 *	7.9 *	7.9 •	7.946 *	9.243 •
PLUTONIUM-238							
PLUTONIUM-239,-24				0.011 *	0.011 •	0.52 *	0.02 U •
RADIUM-226	1.878 •	1.878	1.878	1.878	1.878	0.3423 *	1.909 •
STRONTIUM-89,-90	0.604	1.150	0.967	0.908	0.908	2.264 •	1.406 •
STRONTIUM-90						1.1 *	0.8 U •
TRITIUM						2700 *	1336.790 *
URANIUM-233,-234	0.721	10.467	204.433	15.176	9.057	1.074 *	2.883 •
URANIUM-235	0.167	0.430	5.073	0.377	0.184	0.369 *	0.333 •
URANIUM-238	0.478	8.140	143.657	10.297	4.765	0.958 *	2.065 *

Value represents upper limit of the background 95% tolerance interval (95% confidence and 95% population coverage).
• Maximum value. Data did not meet statistical critieria for computation of a tolerance interval.
** Units for soil tritium values are pCi/l

Table D-1

Background Concentrations for Surface Soil, Geologic Materials, Groundwater, Surface Water, Seeps, and Sediments at Rocky Flats Plant. (continued)

Water Quality Parameters

Analyte	Ground Water (ug/l)					Surface Water (ug/l)	Seep Water (ug/l)	Geologic Materials (mg/kg)			Sediments (mg/kg)	Surface Soil (mg/kg)
	RFA	VFA	COL	WCS	KAR			RFA	COL	WCS		
BICARBONATE (as CaCO3)	227839.588	509332.113	379954.511	770424.028	529689.314	152257.350	862419.656					1253.2238
CARBONATE (as CaCO3)	54000 *	54000 *	54000 •	54000 •	54000 •	25500 *	48193.894					
CHLORIDE	35876.450	347746.155	39980.040	127071.870	1278362.93	72912.404	47973.113					
CYANIDE	20 U *	20 U *	20 U *	20 U *	20 U *	26 *	45.2 •					
FLUORIDE	1716.747	9517.363	7841.469	1781.180	2672.161	527.693	1274.084					
NITRATE/NITRITE	2577.081	1123.800	25819.417	6317.637	12663.275	2790.155	15299.247	3.224	3.224	3.224	41.757	6.7836
ORTHOPHOSPHATE	190 •	190 •	190 •	190 •	190 •	98 *	50 U *					
SILICA, DISSOLVED	22030.351	38605.129	24023.241	25061.682	37098.104	26128.346	58093.392					
SULFATE	53734.539	1034598.01	1063290.46	503510.082	895031.054	35090.871	235607.327					
SULFIDE						4000 •	18000 *	43000 *	43000 •	43000 •		
TOTAL SOLIDS (Dissolved)	304827.148	5208971.59	801632.030	2760446.58	1206931.63	312491.903	640041.819					
TOTAL SOLIDS (Suspended)	2896760.03	236329.032	57179.718	88706.417	2222530.62	83085.126	19336044.6					

Value represents upper limit of the background 95% tolerance interval (95% confidence and 95% population coverage).
* Maximum value. Data did not meet statistical critieria for computation of a tolerance interval.

Table D-2

Inorganic Analytes with Exceedances of the UTL

Geologic Materials

Analyte	S. Soil	RFA	COL	WCS
METALS				
Aluminum	*			
Antimony			X	X
Arsenic			*	*
Barium			*	*
Beryllium	X			
Cadmium	*			*
Calcium	X	X	X	*
Cesium	X			
Chromium	X		*	
Cobalt	*		*	
Copper	X		*	
Iron	*		*	
Lead	X		*	
Lithium			X	
Magnesium			*	
Manganese			X	*
Mercury				
Molybdenum	X		*	
Nickel	X			
Potassium	*			
Selenium				
Silicon	X		X	X
Silver				
Sodium	X		*	
Strontium	X		*	
Thallium				
Tin	X			*
Vanadium	X			
Zinc	X		*	

Table D-2 (Continued)

Inorganic Analytes with Exceedances of the UTL

Geologic Materials

Analyte	S. Soil	RFA	COL	WCS
RADIONUCLIDES				
Americium-241	X	X	X	X
Cesium-137			X	
Plutonium-239,240	X	X	X	X
Radium-226			*	*
Radium-228			X	*
Strontium-89,90		X	X	X
Tritium			X	*
Uranium-233,234	X		*	*
Uranium-235			*	
Uranium-238	*		X	X
WATER QUALITY PARAMETERS				
Bicarbonate as $CaCO_3$	NA	NA	NA	NA
Carbonate as $CaCO_3$	NA	NA	NA	NA
Chloride	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA
Fluoride	NA	NA	NA	NA
Nitrate/Nitrite		NA	*	
Orthophosphate	NA	NA	NA	NA
Silica	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA
Sulfide	NA	NA		
pH	NA	NA		
Total Dissolved Solids	NA	NA	NA	NA

S. Soil = Surface Soil
RFA = Rocky Flats Alluvium
COL = Colluvium
WCS = Weathered Claystone
X = >5% exceedance of UTL
• = Greater than 0% and less than or equal to 5% exceedance of UTL
Blank = Does not exceed UTL
NA = Not analyzed

Table D-3

Inorganic Analytes with Exceedances of the UTL
Groundwater

Analyte	RFA	COL	VFA	WCS	KAR
METALS					
Aluminum		X/*		X/*	X/*
Antimony	/X	X/*		X/*	X/X
Arsenic		X/X		X/	X/*
Barium	/X	X/*		/*	
Beryllium					
Cadmium					
Calcium	X/X	/X		X/X	X/X
Cesium					
Chromium		X/X		/X	/X
Cobalt					
Copper		*/*			
Iron	/X	X/*	/X	X/X	/X
Lead	X/	X/		X/	X/
Lithium	X/X			X/X	X/X
Magnesium	X/X	/X		X/X	X/X
Manganese	/X	X/X	X/	X/	/X
Mercury		X/			
Molybdenum		/*			
Nickel	/X	/X			/*
Potassium	X/X	X/		X/X	
Selenium		X/X		X/X	X/X
Silicon	X/	X/		X/	X/X
Silver					
Sodium	X/X		X/X	X/X	
Strontium	X/X			X/*	X/X
Thallium					
Tin					
Vanadium	X/	X/X	X/	X/	X/X
Zinc	/X	X/X			/*

Table D-3 (Continued)

Inorganic Analytes with Exceedances of the UTL
Groundwater

Analyte	RFA	COL	VFA	WCS	KAR
RADIONUCLIDES					
Americium-241		*/	X/		*/
Cesium-137	/X	/X	/X	/X	X/X
Plutonium-239,240					
Radium-226	X/			/X	
Radium-228		/X			
Strontium-89,90	/X	/*	/X	/X	
Tritium					
Uranium-233,234	X/X		/X	/X	/X
Uranium-235	X/X		/X	/X	/X
Uranium-238	X/X		/X	/X	/X
WATER QUALITY PARAMETERS					
Bicarbonate as $CaCo_3$	X	X			X
Carbonate as $CaCO_3$					
Chloride	X	X		X	
Cyanide				NA	NA
Fluoride	X				
Nitrate/Nitrite	X	X	X	X	X
Orthophosphate		X			
Silica	X	X			
Sulfate	X			X	
Sulfide	NA	NA	NA	NA	NA
Total Dissolved Solids	X	X			X
pH	X	X	X	X	X

KAR = Arapahoe-Laramie Formation
RFA = Rocky Flats Alluvium
COL = Colluvium
VFA = Valley Fill Alluvium
WCS = Weathered Claystone
X = >5% exceedance of UTL
• = Greater than 0% and less than or equal to 5% exceedance of UTL
Blank = Does not exceed UTL
-/- = Total/filtered
NA = Not analyzed

Table D-4

Inorganic Analytes with Exceedances of the UTL
Surface Water, Seeps, and Sediments

Analyte	Surface Water	Seeps	Sediments
METALS			
Aluminum	*/		
Antimony	*/		
Arsenic	*/		
Barium	X/		X
Beryllium			
Cadmium			
Calcium	X/X		X
Cesium			
Chromium	X	/*	
Cobalt			X
Copper	*/		
Iron	*/		
Lead	*/*		X
Lithium	X/		
Magnesium	X/X	/X	
Manganese			
Mercury	/*		
Molybdenum		/*	X
Nickel	*/		
Potassium	*/*		
Selenium	X/	/X	
Silicon	X/		
Silver	*/		X
Sodium	X/X	/X	X
Strontium	X/*	/X	X
Thallium			X
Tin			
Vanadium	*/		
Zinc	*/		X

Table D-4 (Continued)

Inorganic Analytes with Exceedances of the UTL
Surface Water, Seeps, and Sediments

Analyte	Surface Water	Seeps	Sediments
RADIONUCLIDES			
Americium-241	X/X	*/X	
Cesium-137	X/	/X	
Plutonium-239,240	X/		X
Radium-226			
Radium-228	/X		
Strontium-89,90	*/		X
Tritium	*/		
Uranium-233,234	X/X	X/X	
Uranium-235	X/*	X/	
Uranium-238	X/X	X/X	
WATER QUALITY PARAMETERS			
Bicarbonate as $CaCo_3$	X		
Carbonate as $CaCO_3$			NA
Chloride	X	X	NA
Cyanide	*		NA
Fluoride	X		NA
Nitrate/Nitrite	X	*	
Orthophosphate			NA
Silica	X		NA
Sulfate	X		NA
Sulfide	*		NA
Total Dissolved Solids	X		NA
pH			

X = >5% exceedance of UTL
• = Greater than 0% and less than or equal to 5% exceedance of UTL
Blank = Does not exceed UTL
-/- = Total/filtered
NA = Not analyzed

Table D-5

Summary of Potential Metal and Radionuclide Contaminants by Media Determined by UTL Screening and ANOVA

Analyte	Surface Soil	RFA			COL			VFA		WCS			KAR		Seep		SW		Sediments
		GM	TM	FM	GM	TM	FM	TM	FM	GM	TM	FM	TM	FM	TM	FM	TM	FM	TM
Aluminum						X	*				X	*	X	*					
Antimony				X	X		*			X	X		X	*			*		
Arsenic			X		*	X	X			*	X		X	*			*		
Barium				X	*	X											*		X
Beryllium																			
Cadmium										*									
Calcium	X		X	X	X		X				X		X	X			X	X	X
Cesium																			
Chromium							X					X		X		*	*		
Cobalt					*														X
Copper					*	*	*										*		
Iron							*		X		X	X		X					
Lead	X										X		X				*	*	X
Lithium			X	X	X						X	X	X	X			X		
Magnesium			X	X			X				X	X	X	X		*	X	X	
Manganese				X	X	X	X	X			X			X		X			
Mercury																			
Molybdenum	X				*		*					*							X
Nickel				X			X					X		*			*		
Potassium			X	X		X					X	X					*	*	
Selenium						X	X				X	X	X	X		X	X		
Silicon	X				I	X					X			X		X			
Silver																	*		X

Table D-5 (Continued)

Summary of Potential Metal and Radionuclide Contaminants by Media Determined by UTL Screening and ANOVA

Analyte	Surface Soil	RFA			COL			VFA		WCS			KAR		Seep		SW		Sediments
		GM	TM	FM	GM	TM	FM	TM	FM	GM	TM	FM	TM	FM	TM	FM	TM	FM	TM
Sodium			X	X							X	X				X	X	X	X
Strontium	X		X	X	*						X	*	X	X		X	X	*	X
Thallium																			X
Tin																			
Vanadium						X	X				X		X	X			*		
Zinc				X			X							*					X
Americium-241	X	X			I	*				I							X		
Cesium-134	I		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cesium-137				I					I			I		I		I	X		
Plutonium-239,240	X*	IX*			I					I							I	I	I
Strontium-89,90	I	I		I	I		I		I	I		I					I	I	I
Radium-226			I	I	I			I			I		I						
Radium-228			NA	NA	I	NA	NA	NA	NA		NA	NA	I	NA		I	NA		
Tritium	NA			I	X							I						I	
Uranium-233,234	X*		I	I	I				I			I	I	I	I	I	I	I	I
Uranium-235	X*		X	X	*							X		X	X		X		
Uranium-238	X*		X	X	X							X			X	X	X	X	

NOTES: 'Blank' = There was 0% exceedance of the UTL and/or ANOVA did not indicate a significant difference in mean concentration relative to background.

COL = Colluvium
GM = Geologic Material
KAR = Unweathered Bedrock
RFA = Rocky Flats Alluvium
TM = Total Metals (water analysis)
WCS = Weathered Claystone

FM = Filtered Metals (water analysis)
I = Insufficient data to perform ANOVA
NA = Not analyzed
SW = Surface Water
VFA = Valley Fill Alluvium

X = ANOVA indicates a significant difference in mean concentration relative to background and there was greater than a 5% exceedance at the UTL
* = Although the UTL and ANOVA screen did not indicate significant differences relative to background, h[illegible] and "hot spot" data indicate the radionuclides are contaminants of surface soil at OU1.
* = ANOVA indicates a significant difference in mean concentration relative to background and there was [illegible] than 0% and less than or equal to 5% exceedance of the UTL

TABLE D-6

DATE: 06/23/93

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GMOUTM	COL	ALUMINUM	1	YES	0.0255	*
		ANTIMONY	1	YES	0.0001	*
		ARSENIC	2	YES	0.0281	*
		BARIUM	1	YES	0.0006	*
		BERYLLIUM	2	YES	0.0001	*
		CADMIUM	3	NO	0.1927	*
		CALCIUM	2	YES	0.0234	*
		CESIUM	3	YES	0.0001	*
		CHROMIUM	1	NO	0.8778	
		COBALT	2	YES	0.0001	*
		COPPER	1	YES	0.0060	*
		IRON	1	NO	0.3701	*
		LEAD	2	NO	0.3870	*
		LITHIUM	2	YES	0.0270	*
		MAGNESIUM	1	NO	0.1099	*
		MANGANESE	1	YES	0.0018	*
		MERCURY	3	YES	0.0001	*
		MOLYBDENUM	3	YES	0.0076	
		NICKEL	2	NO	0.2842	
		POTASSIUM	2	YES	0.0393	*
		SELENIUM	3	NO	0.2216	*
		SILICON	2		.	*
		SILVER	3	YES	0.0143	*
		SODIUM	2	NO	0.0577	
		STRONTIUM	1	YES	0.0001	*
		THALLIUM	3	YES	0.0314	*
		TIN	3	NO	0.1612	
		VANADIUM	1	NO	0.0564	
		ZINC	1	NO	0.5831	*
GMOUTR	COL	AMERICIUM-241	2		.	*
		CESIUM-137	2	NO	0.1331	*
		GROSS ALPHA	2	YES	0.0294	*
		GROSS BETA	2	NO	0.5313	*
		PLUTONIUM-239	2		.	*
		PLUTONIUM-239,240	2		.	*
		RADIUM-226	1	NO	0.4091	*
		RADIUM-228	2	NO	0.6254	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		TRITIUM	2	YES	0.0040	*
		URANIUM, TOTAL	2		.	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2	YES	0.0203	*
		URANIUM-238	1	YES	0.0048	*

* = No Difference by Area

Type: 1 = Parametric
2 = Non-parametric/unknown distribution
3 = Non-parametric/ < 50% detections

Media: SS = Stream Sediments
DI = Dirt
SW = Surface Water
EW = Seep Water
KAR = Unweathered Bedrock
RFA = Rocky Flats Alluvium
VFA = Valley Fill Alluvium
WCS = Weathered Claystone

TABLE D-6 (continued)

DATE: 06/23/93

PAGE: 2

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GWOUFM	COL	ALUMINUM	1	YES	0.0071	*
		ANTIMONY	2	YES	0.0051	
		ARSENIC	3	YES	0.0005	
		BARIUM	1	NO	0.3229	
		BERYLLIUM	3	YES	0.0001	*
		CADMIUM	3	YES	0.0001	*
		CALCIUM	2	YES	0.0004	
		CESIUM	3	YES	0.0072	
		CHROMIUM	3	YES	0.0270	*
		COBALT	3	YES	0.0001	*
		COPPER	3	YES	0.0001	*
		IRON	1	NO	0.3496	*
		LEAD	3	YES	0.0001	*
		LITHIUM	2	NO	0.2625	*
		MAGNESIUM	2	YES	0.0002	
		MANGANESE	2	YES	0.0017	
		MERCURY	3	NO	0.4607	*
		MOLYBDENUM	2	NO	0.0848	
		NICKEL	3	YES	0.0001	*
		PHOSPHORUS	2		.	*
		POTASSIUM	2	NO	0.1418	
		SELENIUM	2	YES	0.0001	*
		SILICON	1	NO	0.3730	*
		SILVER	3	YES	0.0002	*
		SODIUM	2	YES	0.0343	*
		STRONTIUM	2	YES	0.0004	
		THALLIUM	3	YES	0.0001	*
		TIN	2	YES	0.0091	*
		VANADIUM	2	YES	0.0001	*
		ZINC	2	YES	0.0159	*
GWOUFR	COL	AMERICIUM-241	2		.	*
		CESIUM-137	2		.	*
		GROSS ALPHA	2		.	*
		GROSS ALPHA - DISSOLVED	2		.	*
		GROSS BETA	2		.	*
		GROSS BETA - DISSOLVED	2		.	*
		PLUTONIUM-239	2		.	*
		RADIUM-226	2	NO	0.2058	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		TRITIUM	2		.	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2	NO	0.0791	*
		URANIUM-238	2	NO	0.3417	*

* = No Difference by Area

Type: 1 = Parametric
2 = Non-parametric/unknown distribution
3 = Non-parametric/ < 50% detections

Media: SS = Stream Sediments
DI = Dirt
SW = Surface Water
EW = Seep Water
KAR = Unweathered Bedrock
RFA = Rocky Flats Alluvium
VFA = Valley Fill Alluvium
WCS = Weathered Claystone

TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GWOUTM	COL	ALUMINUM	2	YES	0.0409	
		ANTIMONY	3	NO	0.0564	
		ARSENIC	1	YES	0.0277	
		BARIUM	2	YES	0.0003	*
		BERYLLIUM	3	YES	0.0001	*
		CADMIUM	2	NO	0.2640	*
		CALCIUM	1	YES	0.0077	*
		CESIUM	3	YES	0.0001	*
		CHROMIUM	1	NO	0.0632	*
		COBALT	1	YES	0.0001	*
		COPPER	2	YES	0.0002	*
		CYANIDE	3		.	*
		IRON	2	NO	0.0568	
		LEAD	1	NO	0.2973	
		LITHIUM	2	NO	1.0000	*
		MAGNESIUM	1	YES	0.0018	*
		MANGANESE	1	YES	0.0001	
		MERCURY	3	NO	0.2046	*
		MOLYBDENUM	2	YES	0.0102	*
		NICKEL	2	YES	0.0028	*
		PHOSPHORUS	2		.	*
		POTASSIUM	1	YES	0.0003	
		SELENIUM	2	YES	0.0048	*
		SILICON	2	YES	0.0204	*
		SILVER	3	YES	0.0001	*
		SODIUM	2	NO	0.2703	*
		STRONTIUM	2	YES	0.0027	*
		THALLIUM	3	YES	0.0001	*
		TIN	3	NO	0.0635	
		VANADIUM	1	YES	0.0269	*
		ZINC	1	NO	0.0703	
GWOUTR	COL	AMERICIUM-241	2	YES	0.0411	*
		CESIUM-137	2	NO	0.3661	*
		GROSS ALPHA	2	NO	0.0743	*
		GROSS ALPHA - DISSOLVED	2		.	*
		GROSS ALPHA - SUSPENDED	2		.	*
		GROSS BETA	2	NO	0.5472	*
		GROSS BETA - DISSOLVED	2		.	*
		GROSS BETA - SUSPENDED	2		.	*
		PLUTONIUM-238	2		.	*
		PLUTONIUM-239	2		.	
		PLUTONIUM-239,240	2		.	
		RADIUM-226	2	NO	1.0000	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		STRONTIUM-90	2		.	*
		TRITIUM	2	YES	0.0107	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2		.	
		URANIUM-238	2	NO	0.7723	*

* = No Difference by Area

Type: 1 = Parametric
2 = Non-parametric/unknown distribution
3 = Non-parametric/ < 50% detections

Media: SS = Stream Sediments KAR = Unweathered Bedrock
DI = Dirt RFA = Rocky Flats Alluvium
SW = Surface Water VFA = Valley Fill Alluvium
EW = Seep Water WCS = Weathered Claystone

TABLE D-6 (continued)

DATE: 06/23/93

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
DIOUTM	DI	ALUMINUM	2	NO	0.2905	*
		✓ ANTIMONY	3	YES	0.0001	*
		ARSENIC	1	NO	0.1412	•
		BARIUM	1	NO	0.1173	•
		BERYLLIUM	2	NO	0.4386	•
		CADMIUM	3	NO	0.1123	•
		✓ CALCIUM	2	YES	0.0117	•
		CESIUM	2	NO	0.1964	•
		CHROMIUM	2	NO	0.6995	•
		COBALT	1	NO	0.8393	•
		COPPER	2	NO	0.1114	•
		IRON	1	NO	0.7051	•
		✓ LEAD	2	YES	0.0222	•
		LITHIUM	1	YES	0.0045	•
		MAGNESIUM	1	NO	0.3700	•
		MANGANESE	1	YES	0.0307	•
		✓ MERCURY	3	YES	0.0001	•
		✓ MOLYBDENUM	2	YES	0.0002	•
		NICKEL	2	NO	0.2663	•
		✓ POTASSIUM	1	YES	0.0298	•
		SELENIUM	2	NO	0.8022	•
		✓ SILICON	2	YES	0.0334	•
		SILVER	3	YES	0.0001	•
		SODIUM	2	NO	0.0575	•
		✓ STRONTIUM	1	YES	0.0233	*
		THALLIUM	2	YES	0.0276	•
		TIN	2	NO	0.3484	•
		VANADIUM	2	NO	0.0695	•
		ZINC	2	NO	0.0594	•
DIOUTR	DI	AMERICIUM-241	2	YES	0.0001	•
		CESIUM-134	2		.	*
		CESIUM-137	2		.	*
		GROSS ALPHA	1	YES	0.0001	*
		GROSS BETA	1	NO	0.8583	•
		GROSS BETA - DISSOLVED	2		.	•
		PLUTONIUM-239,-240	2		.	•
		PLUTONIUM-239/240	2		.	•
		RADIUM-226	1	NO	0.1511	•
		RADIUM-228	2	NO	0.0665	•
		STRONTIUM-89,90	2		.	•
		URANIUM-233,-234	2	NO	0.6392	•
		URANIUM-235	1	NO	0.2411	•
		URANIUM-238	1	NO	0.8263	•

• = No Difference by Area

Type: 1 = Parametric
2 = Non-parametric/unknown distribution
3 = Non-parametric/ < 50% detections

Media: SS = Stream Sediments
DI = Dirt
SW = Surface Water
EW = Seep Water
KAR = Unweathered Bedrock
RFA = Rocky Flats Alluvium
VFA = Valley Fill Alluvium
WCS = Weathered Claystone

TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
EWOUFM	EW	ALUMINUM	3	YES	0.0039	*
		ANTIMONY	3	NO	0.0855	*
		ARSENIC	3	YES	0.0001	*
		BARIUM	2	YES	0.0001	*
		BERYLLIUM	3	YES	0.0001	*
		CADMIUM	3	YES	0.0001	*
		CALCIUM	2	YES	0.0001	*
		CESIUM	3	NO	0.0797	*
		CHROMIUM	3	YES	0.0001	*
		COBALT	3	YES	0.0001	*
		COPPER	3	YES	0.0046	*
		IRON	2	YES	0.0015	*
		LEAD	3	YES	0.0001	*
		LITHIUM	2	NO	0.2342	*
		MAGNESIUM	1	YES	0.0001	*
		MANGANESE	2	YES	0.0184	*
		MERCURY	3	YES	0.0029	*
		MOLYBDENUM	3	NO	0.1311	*
		NICKEL	3	YES	0.0001	*
		PHOSPHORUS	3		.	*
		POTASSIUM	2	YES	0.0001	*
		SELENIUM	3	YES	0.0001	*
		SILICON	1	YES	0.0158	*
		SILVER	3	YES	0.0001	*
		SODIUM	2	YES	0.0001	*
		STRONTIUM	2	YES	0.0001	*
		THALLIUM	3	YES	0.0002	*
		TIN	3	NO	0.8654	*
		VANADIUM	3	YES	0.0008	*
		ZINC	1	NO	0.2561	*
EWOUFR	EW	AMERICIUM-241	3	NO	0.1904	*
		CESIUM-137	3		.	*
		GROSS ALPHA	1	YES	0.0111	*
		GROSS ALPHA - DISSOLVED	2		.	*
		GROSS BETA	1	YES	0.0202	*
		GROSS BETA - DISSOLVED	2		.	*
		GROSS GAMMA	3		.	*
		PLUTONIUM-239	3		.	*
		PLUTONIUM-239,240	3		.	*
		RADIUM-226	2	NO	1.0000	*
		RADIUM-228	3		.	*
		STRONTIUM-89	3		.	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		STRONTIUM-90	3		.	*
		TRITIUM	2		.	*
		URANIUM, TOTAL	2		.	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	1	NO	0.3639	*
		URANIUM-238	2	YES	0.0001	*

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SW = Surface Water
EW = Seep Water
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RFA = Rocky Flats Alluvium
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TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
EWOUTM	EW	ALUMINUM	2	YES	0.0001	*
		ANTIMONY	3	NO	0.4088	*
		ARSENIC	3	YES	0.0056	*
		BARIUM	2	NO	0.1915	*
		BERYLLIUM	3	NO	0.9632	*
		CADMIUM	3	NO	0.7125	*
		CALCIUM	2	YES	0.0029	*
		CESIUM	3	NO	0.3310	*
		CHROMIUM	3	NO	0.3239	*
		COBALT	3	NO	0.8177	*
		COPPER	3	NO	0.1305	*
		CYANIDE	3		.	*
		IRON	2	YES	0.0001	*
		LEAD	2	YES	0.0002	*
		LITHIUM	2	NO	0.3307	*
		MAGNESIUM	2	YES	0.0001	*
		MANGANESE	2	YES	0.0004	*
		MERCURY	3	NO	0.0851	*
		MOLYBDENUM	3	NO	0.9193	*
		NICKEL	3	NO	0.8643	*
		PHOSPHORUS	1	NO	0.4990	*
		POTASSIUM	2	NO	0.4146	*
		SELENIUM	3	YES	0.0237	*
		SILICON	1	YES	0.0149	*
		SILVER	3	NO	0.7053	*
		SODIUM	2	YES	0.0001	*
		STRONTIUM	2	YES	0.0076	*
		THALLIUM	3	YES	0.0081	*
		TIN	3	NO	0.8063	*
		VANADIUM	3	YES	0.0007	*
		ZINC	2	NO	0.7430	*
EWOUTR	EW	AMERICIUM-241	2	NO	0.3065	*
		CESIUM-137	1	NO	0.1941	*
		GROSS ALPHA	2	NO	0.3184	*
		GROSS ALPHA - DISSOLVED	2		.	*
		GROSS ALPHA - SUSPENDED	2		.	*
		GROSS BETA	2	NO	0.8709	*
		GROSS BETA - DISSOLVED	2		.	*
		GROSS BETA - SUSPENDED	2		.	*
		PLUTONIUM-238	2		.	*
		PLUTONIUM-239	2		.	*
		PLUTONIUM-239,240	2		.	*
		RADIUM-226	2	YES	0.0094	*
		RADIUM-228	2		.	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		STRONTIUM-90	2		.	*
		TRITIUM	1	NO	0.7212	*
		URANIUM, TOTAL	2		.	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2	YES	0.0001	*
		URANIUM-238	2	YES	0.0001	*

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TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GMOUTM	KAR	ALUMINUM	2		.	*
		ANTIMONY	3		.	*
		ARSENIC	2		.	*
		BARIUM	2		.	*
		BERYLLIUM	2		.	*
		CADMIUM	3		.	•
		CALCIUM	2		.	*
		CESIUM	3		.	*
		CHROMIUM	2		.	
		COBALT	3		.	*
		COPPER	2		.	*
		IRON	2		.	*
		LEAD	2		.	•
		LITHIUM	2		.	*
		MAGNESIUM	2		.	*
		MANGANESE	2		.	*
		MERCURY	3		.	*
		MOLYBDENUM	3		.	
		NICKEL	2		.	
		POTASSIUM	3		.	*
		SELENIUM	3		.	*
		SILVER	3		.	•
		SODIUM	3		.	
		STRONTIUM	2		.	*
		THALLIUM	3		.	*
		TIN	3		.	
		VANADIUM	2		.	
		ZINC	2		.	*
GMOUTR	KAR	CESIUM-137	2		.	*
		GROSS ALPHA	2		.	*
		GROSS BETA	2		.	*
		PLUTONIUM-239,240	2		.	•
		RADIUM-226	2		.	*
		RADIUM-228	2		.	•
		STRONTIUM-89,90	2		.	*
		TRITIUM	2		.	*
		URANIUM, TOTAL	2		.	•
		URANIUM-233,234	2		.	•
		URANIUM-235	2		.	*
		URANIUM-238	2		.	*

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TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GWOUFM	KAR	ALUMINUM	1	YES	0.0011	*
		ANTIMONY	3	YES	0.0001	
		ARSENIC	3	YES	0.0001	
		BARIUM	2	YES	0.0001	
		BERYLLIUM	3	YES	0.0001	*
		CADMIUM	3	YES	0.0001	*
		CALCIUM	2	YES	0.0001	
		CESIUM	3	YES	0.0001	
		CHROMIUM	3	YES	0.0001	*
		COBALT	3	YES	0.0001	*
		COPPER	3	YES	0.0001	*
		CYANIDE	3		.	*
		IRON	2	YES	0.0001	*
		LEAD	3	YES	0.0001	*
		LITHIUM	1	YES	0.0001	*
		MAGNESIUM	2	YES	0.0001	
		MANGANESE	2	YES	0.0001	
		MERCURY	3	NO	0.7186	*
		MOLYBDENUM	2	YES	0.0001	
		NICKEL	3	YES	0.0001	*
		PHOSPHORUS	3		.	*
		POTASSIUM	2	YES	0.0001	
		SELENIUM	3	YES	0.0001	*
		SILICON	2	YES	0.0230	*
		SILVER	3	YES	0.0001	*
		SODIUM	2	NO	0.0508	*
		STRONTIUM	2	YES	0.0001	
		THALLIUM	3	YES	0.0001	*
		TIN	3	YES	0.0001	*
		VANADIUM	3	YES	0.0001	*
		ZINC	1	YES	0.0165	*
GWOUFR	KAR	AMERICIUM-241	2		.	*
		CESIUM-137	2		.	*
		GROSS ALPHA	2		.	*
		GROSS ALPHA - DISSOLVED	2		.	*
		GROSS ALPHA - SUSPENDED	2		.	*
		GROSS BETA	2		.	*
		GROSS BETA - DISSOLVED	2		.	*
		GROSS BETA - SUSPENDED	2		.	*
		PLUTONIUM-239	2		.	*
		RADIUM-226	2	NO	0.2590	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		TRITIUM	2		.	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2	YES	0.0244	*
		URANIUM-238	2	NO	0.7743	*

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TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GWOUTM	KAR	ALUMINUM	1	YES	0.0100	
		ANTIMONY	2	YES	0.0003	
		ARSENIC	2	YES	0.0002	
		BARIUM	2	NO	0.1196	*
		BERYLLIUM	3	YES	0.0001	*
		CADMIUM	3	YES	0.0009	*
		CALCIUM	2	YES	0.0004	*
		CESIUM	3	YES	0.0001	*
		CHROMIUM	2	YES	0.0004	*
		COBALT	3	YES	0.0010	*
		COPPER	2	YES	0.0055	*
		CYANIDE	3		.	*
		IRON	1	YES	0.0156	
		LEAD	1	YES	0.0028	
		LITHIUM	2	YES	0.0003	*
		MAGNESIUM	2	YES	0.0001	*
		MANGANESE	1	YES	0.0015	
		MERCURY	3		0.0	*
		MOLYBDENUM	2	YES	0.0109	*
		NICKEL	3	YES	0.0003	*
		PHOSPHORUS	2		.	*
		POTASSIUM	2	YES	0.0001	
		SELENIUM	3	YES	0.0001	*
		SILICON	1	NO	0.7285	*
		SILVER	3	YES	0.0010	*
		SODIUM	2	NO	0.2155	*
		STRONTIUM	2	YES	0.0001	*
		THALLIUM	3	YES	0.0001	*
		TIN	3	YES	0.0001	
		VANADIUM	1	YES	0.0004	
		ZINC	1	YES	0.0497	
GWOUTR	KAR	AMERICIUM-241	2	NO	0.5507	*
		CESIUM-137	2	NO	0.3038	*
		GROSS ALPHA	2		.	*
		GROSS ALPHA - DISSOLVED	2		.	*
		GROSS ALPHA - SUSPENDED	2		.	*
		GROSS BETA	2		.	*
		GROSS BETA - DISSOLVED	2		.	*
		PLUTONIUM-238	2		.	*
		PLUTONIUM-239	2		.	
		PLUTONIUM-239,240	2		.	
		RADIUM-226	2		.	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		STRONTIUM-90	2		.	*
		TRITIUM	1	YES	0.0114	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2	NO	0.0572	
		URANIUM-238	2	NO	0.5528	*

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TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GMOUTM	RFA	ALUMINUM	2	YES	0.0067	*
		ANTIMONY	3	NO	0.7522	*
		ARSENIC	1	NO	0.6045	*
		BARIUM	1	NO	0.1392	*
		BERYLLIUM	1	YES	0.0007	*
		CADMIUM	3	NO	0.0687	*
		CALCIUM	2	NO	0.0724	*
		CESIUM	3	YES	0.0153	*
		CHROMIUM	2	NO	0.3479	
		COBALT	3	YES	0.0244	*
		COPPER	2	NO	0.6059	*
		IRON	2	YES	0.0094	*
		LEAD	2	YES	0.0226	*
		LITHIUM	2	YES	0.0046	*
		MAGNESIUM	2	YES	0.0116	*
		MANGANESE	1	NO	0.1757	*
		MERCURY	3	NO	0.0554	*
		MOLYBDENUM	2	NO	0.4636	
		NICKEL	2	YES	0.0143	
		POTASSIUM	1	NO	0.2357	*
		SELENIUM	3	NO	0.9309	*
		SILVER	3	NO	0.2909	*
		SODIUM	3	YES	0.0031	
		STRONTIUM	3	NO	0.4547	*
		THALLIUM	3	NO	0.4021	*
		TIN	3	NO	0.5417	
		VANADIUM	2	YES	0.0063	
		ZINC	2	NO	0.0751	*
GMOUTR	RFA	AMERICIUM-241	2	YES	0.0032	*
		CESIUM-137	2	NO	0.6056	*
		GROSS ALPHA	1	NO	0.1986	*
		GROSS BETA	2	NO	0.3614	*
		PLUTONIUM-239	2		.	*
		PLUTONIUM-239,240	2		.	*
		RADIUM-226	2	NO	0.2086	*
		RADIUM-228	1	YES	0.0001	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		TRITIUM	2	NO	0.3203	*
		URANIUM, TOTAL	2		.	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2	YES	0.0175	*
		URANIUM-238	2	NO	0.3722	*

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TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GWOUFM	RFA	ALUMINUM	2	YES	0.0004	*
		ANTIMONY	3	YES	0.0001	
		ARSENIC	3	YES	0.0001	
		BARIUM	1	YES	0.0001	
		BERYLLIUM	3	YES	0.0001	*
		CADMIUM	3	YES	0.0001	*
		CALCIUM	2	YES	0.0001	
		CESIUM	3	YES	0.0001	
		CHROMIUM	3	YES	0.0183	*
		COBALT	3	YES	0.0001	*
		COPPER	3	YES	0.0001	*
		CYANIDE	3		.	*
		IRON	2	NO	0.1736	*
		LEAD	3	YES	0.0001	*
		LITHIUM	1	YES	0.0001	*
		MAGNESIUM	2	YES	0.0001	
		MANGANESE	1	YES	0.0001	
		MERCURY	3	YES	0.0205	*
		MOLYBDENUM	3	YES	0.0001	
		NICKEL	3	YES	0.0001	*
		PHOSPHORUS	3		.	*
		POTASSIUM	2	YES	0.0001	
		SELENIUM	3	YES	0.0001	*
		SILICON	1	NO	0.3533	*
		SILVER	3	YES	0.0004	*
		SODIUM	2	YES	0.0001	*
		STRONTIUM	2	YES	0.0001	
		THALLIUM	3	YES	0.0001	*
		TIN	3	YES	0.0001	*
		VANADIUM	2	YES	0.0003	*
		ZINC	1	YES	0.0003	*
GWOUFR	RFA	AMERICIUM-241	2		.	*
		CESIUM-137	2		.	*
		GROSS ALPHA	1	YES	0.0496	*
		GROSS ALPHA - DISSOLVED	2		.	*
		GROSS ALPHA - SUSPENDED	2		.	*
		GROSS BETA	1	NO	0.0792	*
		GROSS BETA - DISSOLVED	2		.	*
		PLUTONIUM-239	2		.	*
		PLUTONIUM-239,240	2		.	*
		RADIUM-226	2		.	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		TRITIUM	2		.	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2	YES	0.0001	*
		URANIUM-238	2	YES	0.0001	*

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TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GWOUTM	RFA	ALUMINUM	1	NO	0.1761	
		ANTIMONY	3	YES	0.0002	
		ARSENIC	3	YES	0.0032	
		BARIUM	2	YES	0.0027	*
		BERYLLIUM	3	YES	0.0001	*
		CADMIUM	3	YES	0.0001	*
		CALCIUM	1	YES	0.0001	*
		CESIUM	3	YES	0.0001	*
		CHROMIUM	1	NO	0.3076	*
		COBALT	3	YES	0.0026	*
		COPPER	2	YES	0.0214	*
		CYANIDE	3		.	*
		IRON	2	NO	0.1703	
		LEAD	1	NO	0.0800	
		LITHIUM	2	YES	0.0003	*
		MAGNESIUM	2	YES	0.0001	*
		MANGANESE	2	YES	0.0025	
		MERCURY	3	NO	0.5091	*
		MOLYBDENUM	3	YES	0.0001	*
		NICKEL	3	YES	0.0202	*
		PHOSPHORUS	2		.	*
		POTASSIUM	2	YES	0.0001	
		SELENIUM	3	YES	0.0001	*
		SILICON	1	NO	0.5653	*
		SILVER	3	YES	0.0001	*
		SODIUM	2	YES	0.0001	*
		STRONTIUM	1	YES	0.0001	*
		THALLIUM	3	YES	0.0001	*
		TIN	3	YES	0.0001	
		VANADIUM	1	NO	0.3042	
		ZINC	1	YES	0.0389	
GWOUTR	RFA	AMERICIUM-241	2	NO	0.5733	*
		CESIUM-137	2	YES	0.0242	*
		GROSS ALPHA	1	YES	0.0001	*
		GROSS ALPHA - DISSOLVED	2		.	*
		GROSS ALPHA - SUSPENDED	2		.	*
		GROSS BETA	1	YES	0.0001	*
		GROSS BETA - DISSOLVED	2		.	*
		GROSS BETA - SUSPENDED	2		.	*
		PLUTONIUM-238	2		.	*
		PLUTONIUM-239	2		.	
		PLUTONIUM-239,240	2		.	
		RADIUM-226	2		.	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		STRONTIUM-90	2		.	*
		TRITIUM	2	NO	0.2295	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2	YES	0.0263	
		URANIUM-238	2	YES	0.0040	*

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TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
SSOUTM	SS	ALUMINUM	2	YES	0.0005	
		ANTIMONY	3	NO	0.1067	*
		ARSENIC	1	YES	0.0021	*
		BARIUM	1	YES	0.0001	
		BERYLLIUM	2	YES	0.0498	*
		CADMIUM	3	NO	0.1334	*
		CALCIUM	1	YES	0.0001	
		CESIUM	3	NO	0.5249	*
		CHROMIUM	2	YES	0.0005	
		COBALT	1	YES	0.0025	*
		COPPER	2	YES	0.0011	*
		IRON	2	YES	0.0004	*
		LEAD	1	YES	0.0001	
		LITHIUM	2	YES	0.0281	*
		MAGNESIUM	1	YES	0.0001	
		MANGANESE	1	NO	0.1003	
		MERCURY	3	NO	0.7444	*
		MOLYBDENUM	3	YES	0.0308	*
		NICKEL	1	YES	0.0004	*
		POTASSIUM	1	YES	0.0004	*
		SELENIUM	3	YES	0.0002	*
		SILICON	1	NO	0.0751	*
		SILVER	3	YES	0.0019	*
		SODIUM	1	YES	0.0039	
		STRONTIUM	1	YES	0.0003	
		THALLIUM	3	YES	0.0138	*
		TIN	3	NO	0.2644	*
		VANADIUM	2	YES	0.0002	
		ZINC	1	YES	0.0050	*
SSOUTR	SS	AMERICIUM-241	2	YES	0.0394	*
		CESIUM-137	2	NO	0.3848	*
		GROSS ALPHA	2	NO	0.9126	*
		GROSS BETA	1	NO	0.3036	*
		PLUTONIUM-238	2		.	*
		PLUTONIUM-239	2		.	*
		PLUTONIUM-239,240	2		.	*
		RADIUM-226	1	NO	0.3476	*
		RADIUM-228	1	NO	0.2288	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		TRITIUM	1	NO	0.1080	*
		URANIUM, TOTAL	2		.	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2	YES	0.0228	*
		URANIUM-238	1	NO	0.2665	*

* = No Difference by Area

Type: 1 = Parametric
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Media: SS = Stream Sediments
DI = Dirt
SW = Surface Water
EW = Seep Water
KAR = Unweathered Bedrock
RFA = Rocky Flats Alluvium
VFA = Valley Fill Alluvium
WCS = Weathered Claystone

TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
SWOUFM	SW	ALUMINUM	3	YES	0.0232	*
		ANTIMONY	3	YES	0.0002	*
		ARSENIC	3	YES	0.0001	*
		BARIUM	2	YES	0.0001	*
		BERYLLIUM	3	YES	0.0055	*
		CADMIUM	3	YES	0.0028	*
		CALCIUM	2	YES	0.0001	
		CESIUM	3	NO	0.0597	*
		CHROMIUM	3	YES	0.0001	*
		COBALT	3	YES	0.0001	*
		COPPER	3	YES	0.0021	*
		CYANIDE	3		.	*
		IRON	2	YES	0.0001	*
		LEAD	3	YES	0.0001	*
		LITHIUM	2	YES	0.0314	*
		MAGNESIUM	2	YES	0.0001	*
		MANGANESE	1	NO	0.1112	
		MERCURY	3	NO	0.1835	*
		MOLYBDENUM	3	NO	0.0593	*
		NICKEL	3	YES	0.0001	*
		PHOSPHORUS	2		.	*
		POTASSIUM	2	YES	0.0001	*
		SELENIUM	3	YES	0.0001	*
		SILICON	2	NO	0.5344	*
		SILVER	3	YES	0.0001	*
		SODIUM	2	YES	0.0001	
		STRONTIUM	2	YES	0.0001	*
		THALLIUM	3	YES	0.0001	*
		TIN	3	NO	0.2156	*
		VANADIUM	3	YES	0.0001	*
		ZINC	1	NO	0.0605	*
SWOUFR	SW	AMERICIUM-241	3	NO	0.4637	
		CESIUM-137	3	NO	0.1700	*
		GROSS ALPHA	2	YES	0.0001	*
		GROSS ALPHA - DISSOLVED	2		.	*
		GROSS BETA	2	YES	0.0021	*
		GROSS BETA - DISSOLVED	2		.	*
		GROSS GAMMA	3		.	*
		PLUTONIUM-239	3		.	*
		PLUTONIUM-239,240	3		.	*
		RADIUM-226	3	NO	0.7987	*
		RADIUM-228	3	NO	0.8309	*
		STRONTIUM-89	3		.	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		STRONTIUM-90	3		.	*
		TRITIUM	3		.	*
		URANIUM, TOTAL	2		.	*
		URANIUM-233,-234	2		.	
		URANIUM-233,234	2		.	
		URANIUM-235	3	NO	0.3255	*
		URANIUM-238	2	YES	0.0001	

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KAR = Unweathered Bedrock
RFA = Rocky Flats Alluvium
VFA = Valley Fill Alluvium
WCS = Weathered Claystone

TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
SWOUTM	SW	9COBALT	3		.	*
		ALUMINUM	1	NO	0.0879	*
		ANTIMONY	3	YES	0.0001	*
		ARSENIC	3	YES	0.0001	*
		BARIUM	2	YES	0.0001	*
		BERYLLIUM	3	YES	0.0001	*
		CADMIUM	3	YES	0.0001	*
		CALCIUM	2	YES	0.0001	
		CESIUM	3	YES	0.0001	*
		CHROMIUM	3	YES	0.0003	*
		COBALT	3	YES	0.0001	*
		COPPER	3	YES	0.0001	*
		CYANIDE	3		.	*
		IRON	1	NO	0.0895	*
		LEAD	3	YES	0.0001	*
		LITHIUM	2	YES	0.0001	*
		MAGNESIUM	2	YES	0.0001	*
		MANGANESE	1	YES	0.0390	
		MERCURY	3	NO	0.3014	*
		MOLYBDENUM	3	YES	0.0001	*
		NICKEL	3	YES	0.0001	*
		PHOSPHORUS	1	YES	0.0103	*
		POTASSIUM	2	YES	0.0001	*
		SELENIUM	3	YES	0.0001	*
		SILICON	2	NO	0.0902	*
		SILVER	3	YES	0.0001	*
		SODIUM	2	YES	0.0001	
		STRONTIUM	2	YES	0.0001	*
		THALLIUM	3	YES	0.0001	*
		TIN	3	YES	0.0081	*
		VANADIUM	3	YES	0.0002	*
		ZINC	1	NO	0.2439	*
SWOUTR	SW	AMERICIUM-241	2	YES	0.0023	*
		CESIUM-137	2	YES	0.0366	*
		GROSS ALPHA	2	YES	0.0060	*
		GROSS ALPHA - DISSOLVED	2		.	*
		GROSS ALPHA - SUSPENDED	2		.	*
		GROSS BETA	2	NO	0.0604	*
		GROSS BETA - DISSOLVED	2		.	*
		GROSS BETA - SUSPENDED	2		.	*
		PLUTONIUM-239	2		.	*
		PLUTONIUM-239,240	2		.	*
		RADIUM-226	1	YES	0.0039	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		STRONTIUM-90	2		.	*
		TRITIUM	2	NO	0.2396	*
		URANIUM, TOTAL	2		.	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2	YES	0.0001	*
		URANIUM-238	2	YES	0.0001	*

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Media: SS = Stream Sediments
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EW = Seep Water
KAR = Unweathered Bedrock
RFA = Rocky Flats Alluvium
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WCS = Weathered Claystone

TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GMOUTM	VFA	ALUMINUM	2		.	*
		ANTIMONY	2		.	*
		ARSENIC	2		.	*
		BARIUM	2		.	*
		BERYLLIUM	2		.	*
		CADMIUM	3		.	*
		CALCIUM	2		.	*
		CESIUM	2		.	*
		CHROMIUM	2		.	
		COBALT	2		.	*
		COPPER	2		.	*
		IRON	2		.	*
		LEAD	2		.	*
		LITHIUM	2		.	*
		MAGNESIUM	2		.	*
		MANGANESE	2		.	*
		MERCURY	3		.	*
		MOLYBDENUM	2		.	
		NICKEL	2		.	
		POTASSIUM	2		.	*
		SELENIUM	2		.	*
		SILVER	3		.	*
		SODIUM	2		.	
		STRONTIUM	2		.	*
		THALLIUM	3		.	*
		TIN	3		.	
		VANADIUM	2		.	
		ZINC	2		.	*
GMOUTR	VFA	AMERICIUM-241	2		.	*
		CESIUM-137	2		.	*
		GROSS ALPHA	2		.	*
		GROSS BETA	2		.	*
		PLUTONIUM-239	2		.	*
		RADIUM-226	2		.	*
		RADIUM-228	2		.	*
		STRONTIUM-89,-90	2		.	*
		TRITIUM	2		.	*
		URANIUM-233,-234	2		.	*
		URANIUM-235	2		.	*
		URANIUM-238	2		.	*

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Type: 1 = Parametric
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Media: SS = Stream Sediments KAR = Unweathered Bedrock
DI = Dirt RFA = Rocky Flats Alluvium
SW = Surface Water VFA = Valley Fill Alluvium
EW = Seep Water WCS = Weathered Claystone

TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GWOUFM	VFA	ALUMINUM	1	NO	0.6213	*
		ANTIMONY	3	YES	0.0039	
		ARSENIC	3	YES	0.0001	
		BARIUM	1	YES	0.0325	
		BERYLLIUM	3	YES	0.0001	*
		CADMIUM	3	YES	0.0001	*
		CALCIUM	2	YES	0.0001	
		CESIUM	3	NO	0.1825	
		CHROMIUM	3	YES	0.0406	*
		COBALT	3	YES	0.0001	*
		COPPER	3	YES	0.0092	*
		CYANIDE	3		.	*
		IRON	1	YES	0.0001	*
		LEAD	3	YES	0.0001	*
		LITHIUM	1	YES	0.0244	*
		MAGNESIUM	2	YES	0.0004	
		MANGANESE	2	YES	0.0001	
		MERCURY	3	YES	0.0024	*
		MOLYBDENUM	3	YES	0.0031	
		NICKEL	3	YES	0.0003	*
		PHOSPHORUS	3		.	*
		POTASSIUM	1	YES	0.0140	
		SELENIUM	3	NO	0.0714	*
		SILICON	1	NO	0.5197	*
		SILVER	3	YES	0.0075	*
		SODIUM	2	NO	0.2189	*
		STRONTIUM	2	YES	0.0002	
		THALLIUM	3	YES	0.0001	*
		TIN	3	YES	0.0014	*
		VANADIUM	1	NO	0.2794	*
		ZINC	1	NO	0.2063	*
GWOUFR	VFA	AMERICIUM-241	2		.	*
		CESIUM-137	2		.	*
		GROSS ALPHA	2		.	*
		GROSS ALPHA - DISSOLVED	2		.	*
		GROSS ALPHA - SUSPENDED	2		.	*
		GROSS BETA	2		.	*
		GROSS BETA - DISSOLVED	2		.	*
		GROSS BETA - SUSPENDED	2		.	*
		PLUTONIUM-239	2		.	*
		RADIUM-226	1	YES	0.0208	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		TRITIUM	2		.	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2	NO	0.1321	*
		URANIUM-238	2	NO	0.4361	*

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SW = Surface Water
EW = Seep Water
KAR = Unweathered Bedrock
RFA = Rocky Flats Alluvium
VFA = Valley Fill Alluvium
WCS = Weathered Claystone

TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GWOUTM	VFA	ALUMINUM	1	NO	0.0619	
		ANTIMONY	3	YES	0.0019	
		ARSENIC	3	YES	0.0001	
		BARIUM	1	NO	0.0945	*
		BERYLLIUM	3	YES	0.0001	*
		CADMIUM	3	YES	0.0303	*
		CALCIUM	1	NO	0.4478	*
		CESIUM	3	YES	0.0005	*
		CHROMIUM	2	NO	0.7795	*
		COBALT	3	YES	0.0007	*
		COPPER	1	YES	0.0293	*
		CYANIDE	3		.	*
		IRON	2	NO	0.0920	
		LEAD	1	YES	0.0298	
		LITHIUM	2	NO	0.2620	*
		MAGNESIUM	1	NO	0.2889	*
		MANGANESE	1	YES	0.0033	
		MERCURY	3	NO	0.0578	*
		MOLYBDENUM	3	YES	0.0004	*
		NICKEL	2	NO	0.1451	*
		POTASSIUM	1	YES	0.0250	
		SELENIUM	3	NO	0.1295	*
		SILICON	2	YES	0.0343	*
		SILVER	3	YES	0.0003	*
		SODIUM	2	NO	0.5607	*
		STRONTIUM	1	NO	0.5199	*
		THALLIUM	3	YES	0.0001	*
		TIN	3	YES	0.0019	
		VANADIUM	2	NO	0.7195	
		ZINC	1	NO	0.1472	
GWOUTR	VFA	AMERICIUM-241	2	NO	0.1951	*
		CESIUM-137	1	NO	0.7100	*
		GROSS ALPHA	1	NO	0.6287	*
		GROSS ALPHA - DISSOLVED	2		.	*
		GROSS ALPHA - SUSPENDED	2		.	*
		GROSS BETA	1	NO	0.6520	*
		GROSS BETA - DISSOLVED	2		.	*
		PLUTONIUM-238	2		.	*
		PLUTONIUM-239	2		.	
		PLUTONIUM-239,240	2		.	
		RADIUM-226	2		.	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		STRONTIUM-90	2		.	*
		TRITIUM	2	NO	0.1187	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2	NO	0.1012	
		URANIUM-238	2	NO	0.5734	*

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Media: SS = Stream Sediments
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SW = Surface Water
EW = Seep Water
KAR = Unweathered Bedrock
RFA = Rocky Flats Alluvium
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WCS = Weathered Claystone

TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GMOUTM	WCS	ALUMINUM	1	NO	0.9237	*
		ANTIMONY	1	YES	0.0064	*
		ARSENIC	1	YES	0.0016	*
		BARIUM	1	NO	0.2784	*
		BERYLLIUM	1	YES	0.0001	*
		CADMIUM	3	YES	0.0013	*
		CALCIUM	2	NO	0.8828	*
		CESIUM	3	YES	0.0001	*
		CHROMIUM	2		.	
		COBALT	2	NO	0.8828	*
		COPPER	1	NO	0.5860	*
		IRON	1	NO	0.9871	*
		LEAD	2	NO	0.9647	*
		LITHIUM	1	NO	0.1121	*
		MAGNESIUM	2	NO	0.7738	*
		MANGANESE	1	NO	0.2928	*
		MERCURY	3	YES	0.0078	*
		MOLYBDENUM	3		.	
		NICKEL	2		.	
		POTASSIUM	1	NO	0.5248	*
		SELENIUM	3	NO	0.2921	*
		SILICON	2		.	*
		SILVER	3	NO	0.8269	*
		SODIUM	2		.	
		STRONTIUM	1	NO	0.9843	*
		THALLIUM	3	NO	0.1582	*
		TIN	3		.	
		VANADIUM	2		.	
		ZINC	1	NO	0.2980	*
GMOUTR	WCS	AMERICIUM-241	2		.	*
		CESIUM-137	2	NO	0.2885	*
		GROSS ALPHA	2	NO	0.0584	*
		GROSS BETA	2	NO	0.1947	*
		PLUTONIUM-239	2		.	*
		PLUTONIUM-239,240	2		.	*
		RADIUM-226	2	NO	0.1796	*
		RADIUM-228	2	NO	0.4774	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		TRITIUM	2	NO	0.5353	*
		URANIUM, TOTAL	2		.	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2	NO	0.4579	*
		URANIUM-238	2	NO	0.4831	*
		URANIUM-238	2	NO	0.4831	*

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KAR = Unweathered Bedrock
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TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GWOUFM	WCS	ALUMINUM	2	YES	0.0073	*
		ANTIMONY	1	YES	0.0002	
		ARSENIC	3	YES	0.0019	
		BARIUM	2	NO	0.8089	
		BERYLLIUM	3	YES	0.0001	*
		CADMIUM	3	YES	0.0001	*
		CALCIUM	2	NO	0.0591	
		CESIUM	3	NO	0.0995	
		CHROMIUM	2	YES	0.0001	*
		COBALT	3	YES	0.0001	*
		COPPER	3	YES	0.0403	*
		IRON	2	YES	0.0293	*
		LEAD	3	YES	0.0001	*
		LITHIUM	2	YES	0.0001	*
		MAGNESIUM	2	YES	0.0011	
		MANGANESE	2	YES	0.0098	
		MERCURY	3	NO	0.0584	*
		MOLYBDENUM	1	YES	0.0059	
		NICKEL	3	YES	0.0001	*
		PHOSPHORUS	3		.	*
		POTASSIUM	2	YES	0.0001	
		SELENIUM	2	YES	0.0001	*
		SILICON	1	NO	0.2693	*
		SILVER	3	YES	0.0008	*
		SODIUM	2	YES	0.0001	*
		STRONTIUM	2	YES	0.0045	
		THALLIUM	3	YES	0.0001	*
		TIN	2	YES	0.0001	*
		VANADIUM	2	YES	0.0001	*
		ZINC	1	NO	0.8993	*
GWOUFR	WCS	CESIUM-137	2		.	*
		GROSS ALPHA	2		.	*
		GROSS ALPHA - DISSOLVED	2		.	*
		GROSS ALPHA - SUSPENDED	2		.	*
		GROSS BETA	2		.	*
		GROSS BETA - DISSOLVED	2		.	*
		GROSS BETA - SUSPENDED	2		.	*
		PLUTONIUM-239	2		.	*
		RADIUM-226	1	NO	0.0871	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		TRITIUM	2		.	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	2	YES	0.0006	*
		URANIUM-238	2	YES	0.0003	*

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KAR = Unweathered Bedrock
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TABLE D-6 (continued)

ANOVA SUMMARY

File Name	Media	Analyte	Type	Sig	P-Value	
GWOUTM	WCS	ALUMINUM	2	YES	0.0013	
		ANTIMONY	3	YES	0.0023	
		ARSENIC	2	YES	0.0431	
		BARIUM	1	NO	0.1079	*
		BERYLLIUM	3	YES	0.0001	*
		CADMIUM	2	YES	0.0001	*
		CALCIUM	1	YES	0.0011	*
		CESIUM	3	YES	0.0002	*
		CHROMIUM	1	YES	0.0001	*
		COBALT	2	YES	0.0002	*
		COPPER	1	YES	0.0001	*
		CYANIDE	3		.	*
		IRON	2	YES	0.0007	
		LEAD	2	YES	0.0264	
		LITHIUM	2	YES	0.0001	*
		MAGNESIUM	1	YES	0.0001	*
		MANGANESE	1	YES	0.0005	
		MERCURY	3		0.0	*
		MOLYBDENUM	2	YES	0.0093	*
		NICKEL	1	YES	0.0001	*
		POTASSIUM	2	YES	0.0007	
		SELENIUM	2	YES	0.0001	*
		SILICON	1	NO	0.0953	*
		SILVER	3	YES	0.0001	*
		SODIUM	1	YES	0.0001	*
		STRONTIUM	1	YES	0.0001	*
		THALLIUM	3	YES	0.0001	*
		TIN	3	YES	0.0027	
		VANADIUM	2	YES	0.0007	
		ZINC	2	YES	0.0007	
GWOUTR	WCS	AMERICIUM-241	2	NO	0.3656	*
		CESIUM-137	1	NO	0.4439	*
		GROSS ALPHA	1	NO	0.8116	*
		GROSS ALPHA - DISSOLVED	2		.	*
		GROSS ALPHA - SUSPENDED	2		.	*
		GROSS BETA	1	NO	0.4162	*
		GROSS BETA - DISSOLVED	2		.	*
		GROSS BETA - SUSPENDED	2		.	*
		PLUTONIUM-239	2		.	
		PLUTONIUM-239,240	2		.	
		RADIUM-226	2		.	*
		STRONTIUM-89,-90	2		.	*
		STRONTIUM-89,90	2		.	*
		STRONTIUM-90	2		.	*
		TRITIUM	1	NO	0.1235	*
		URANIUM-233,-234	2		.	*
		URANIUM-233,234	2		.	*
		URANIUM-235	1	NO	0.4167	
		URANIUM-238	1	NO	0.7038	*

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Media: SS = Stream Sediments
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SW = Surface Water
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Table D-7
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Metals							
Aluminum	RFA	0	—		X	Magnitude of UTL exceedances are small. Spatial distribution does not indicate the presence of obvious concentration gradients indicative of either an on-site or off-site (concentrations increasing towards OU1 boundaries) source. No evidence of a mobile plume in the filtered fraction.	N
	COL	15	Yes				
	VFA	0	—				
	WCS	20	Yes				
	KAR	8	Yes				
Antimony	RFA	0	—		X	Based on ANOVA results, elevated in deep bedrock but not in overlying colluvial groundwater which is not indicative of waste disposal related contamination.	N
	COL	6	No				
	VFA	0	—				
	WCS	8	Yes				
	KAR	17	Yes				
Arsenic	RFA	0	Yes		X	At IHSS 119.2, elevated in deep bedrock but not in overlying colluvial groundwater which is not indicative of waste disposal related contamination. In other areas of OU1, spatial distribution of total and dissolved concentrations in alluvial/colluvial groundwater does not indicate the presence of an obvious concentration gradient indicative of either an on-site or off-site (concentration increasing towards OU1 boundaries) source.	N
	COL	29	Yes				
	VFA	0	—				
	WCS	47	Yes				
	KAR	54	Yes				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Barium	RFA	0	—		X	Only 2 exceedances of the UTL. One exceedance is in a well where other data over time show considerably smaller concentrations. The other exceedance is in a well where there is only one observation but the UTL is just exceeded.	N
	COL	6	Yes				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				
Beryllium	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				
Cadmium	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Calcium	RFA	60	Yes		X	At IHSS 119.1, elevated in deep bedrock but not in overlying colluvial groundwater which is not indicative of waste disposal related contamination. In other areas of OU1, spatial distribution in alluvial/colluvial groundwater does not indicate an obvious concentration gradient indicative of either and on-site or off-site (concentrations increasing towards OU1 boundaries) source.	N
	COL	0	—				
	VFA	0	—				
	WCS	67	Yes				
	KAR	38	Yes				
Cesium	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				
Chromium	RFA	0	—	X		Not applicable.	N
	COL	6	No				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Cobalt	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				
Copper	RFA	0	—	X		Only one exceedance of the UTL in a well where there is only one observation, and there is no evidence of a concentration gradient in the total or filtered fraction in the vicinity of this well.	N
	COL	3	Yes				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				
Iron	RFA	0	—		X	Elevated in deep bedrock but not in overlying colluvial groundwater which is not indicative of waste disposal related contamination.	N
	COL	6	No				
	VFA	0	—				
	WCS	13	Yes				
	KAR	0	—				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Lead	RFA	10	No		X	Elevated in deep bedrock but not in overlying colluvial groundwater which is not indicative of RFP related contamination.	N
	COL	35	No				
	VFA	0	—				
	WCS	53	Yes				
	KAR	46	Yes				
Lithium	RFA	10	Yes		X	Largely elevated in deep bedrock but not in overlying colluvial groundwater which is not indicative of waste disposal related contamination, and there is no evidence of a concentration gradient in the alluvial/colluvial system where UTL exceedances are isolated occurrences.	N
	COL	0	—				
	VFA	0	—				
	WCS	60	Yes				
	KAR	38	Yes				
Magnesium	RFA	100	Yes		X	At IHSS 119.1, elevated in deep bedrock but not in overlying colluvial groundwater which is not indicative of waste disposal related contamination. In other areas of OU1, spatial distribution in alluvial/colluvial groundwater does not indicate of a concentration gradient.	N
	COL	0	—				
	VFA	0	—				
	WCS	67	Yes				
	KAR	54	Yes				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Manganese	RFA	0	—		X	Low frequency of UTL occurrences and no defined concentration gradient is apparent.	N
	COL	9	Yes				
	VFA	22	Yes				
	WCS	13	Yes				
	KAR	0	—				
Mercury	RFA	0	—	X		Not applicable.	N
	COL	15	No				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				
Molybdenum	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Nickel	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				
Potassium	RFA	20	Yes		X	At IHSS 119.1, elevated in deep bedrock but not in overlying colluvial groundwater which is not indicative of waste disposal related contamination. In other areas of OU1, spatial distribution of concentrations in alluvial/colluvial groundwater does not indicate either an on-site or off-site source.	N
	COL	6	Yes				
	VFA	0	—				
	WCS	60	Yes				
	KAR	0	—				
Selenium	RFA	0	—		X	Retained as a groundwater contaminant.	Y
	COL	36	Yes				
	VFA	0	—				
	WCS	53	Yes				
	KAR	38	Yes				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Silicon	RFA	20	No		X	Spatial distribution of total and dissolved concentrations in alluvial/colluvial groundwater does not indicate the presence of a concentration gradient indicative of either an on-site or off-site source.	N
	COL	33	Yes				
	VFA	0	—				
	WCS	75	Yes				
	KAR	25	No				
Silver	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				
Sodium	RFA	100	Yes		X	At IHSS 119.1, elevated in deep bedrock but not in overlying colluvial groundwater which is not indicative of waste disposal related contamination. In other areas of OU1, spatial distribution in alluvial/colluvial groundwater does not indicate the presence of a concentration gradient indicative of either an on-site or off-site source.	Y
	COL	0	—				
	VFA	11	No				
	WCS	67	Yes				
	KAR	0	—				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Strontium	RFA	100	Yes		X	At IHSS 119.1, elevated in deep bedrock but not in overlying colluvial groundwater which is not indicative of waste disposal related contamination. In other areas of OU1, spatial distribution in alluvial/colluvial groundwater does not show the presence of an obvious concentration gradient indicative of either an on-site or off-site source.	Y
	COL	0	—				
	VFA	0	—				
	WCS	67	Yes				
	KAR	54	Yes				
Thallium	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				
Tin	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Vanadium	RFA	10	No		X	Retained as a groundwater contaminant.	Y
	COL	44	Yes				
	VFA	11	No				
	WCS	100	Yes				
	KAR	69	Yes				
Zinc	RFA	0	—	X		Not applicable.	N
	COL	12	No				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				
Radionuclides							
Americium-241	RFA	0	—		X	Co-occurs with plutonium which was not found to be elevated in groundwater.	N
	COL	2	Yes				
	VFA	7	No				
	WCS	0	—				
	KAR	3	No				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Cesium-134	RFA	NA	NA	NA	NA	Cs-134 would only be present as a contaminant had wastes from a criticality been disposed at OU1. There has never been a criticality at OU1.	N
	COL	NA	NA				
	VFA	NA	NA				
	WCS	NA	NA				
	KAR	NA	NA				
Cesium-137	RFA	0	—	X		Cs-137 would only be present as a contaminant had wastes from a criticality been disposed at OU1. There has never been a criticality at OU1.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	8	No				
Plutonium-239, 240	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Radium-226	RFA	50	I	X		Not applicable.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	I				
	KAR	0	—				
Radium-228	RFA	NA	NA	NA	NA	Ra-228 is a daughter isotope of thorium decay. Although there is no data, there is no reason to expect Ra-228 (or thorium) to be present as a contaminant.	N
	COL	NA	NA				
	VFA	NA	NA				
	WCS	NA	NA				
	KAR	NA	NA				
Strontium-89, 90	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Tritium	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				
Uranium-233, 234	RFA	100	I		X	The distribution of uranium concentrations does not indicate an obvious concentration gradient indicative of either an on-site or off-site source. The isotopic ratio of U-234/U238 indicates the uranium is naturally occurring and not depleted uranium which is a surface soil contaminant at OU1.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				
Uranium-235	RFA	50	Yes		X	The distribution of uranium concentrations does not indicate an obvious concentration gradient indicative of either an on-site or off-site source. The isotopic ratio of U-234/U238 indicates the uranium is naturally occurring and not depleted uranium which is surface soil contaminant at OU1.	N
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Uranium-238	RFA	100	Yes		X	The distribution of uranium concentrations is does not indicate an obvious concentration gradient indicative of either an on-site or off-site source. The isotopic ratio of U-234/U238 indicates the uranium is naturally occurring and not depleted uranium which is a surface soil contaminant at OU1.	Y
	COL	0	—				
	VFA	0	—				
	WCS	0	—				
	KAR	0	—				
Water Quality Parameter							
Bicarbonate	RFA	88	NR		X	The distribution of bicarbonate concentrations show no obvious gradients indicative of a source either on-site or off-site (concentrations increasing toward the boundary).	N
	COL	29	NR				
	VFA	0	NR				
	WCS	0	NR				
	KAR	15	NR				
Carbonate	RFA	0	NR	X		No exceedences of the UTL in any unit.	N
	COL	0	NR				
	VFA	0	NR				
	WCS	0	NR				
	KAR	0	NR				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Chloride	RFA	75	NR		X	It is hypothesized that the high chloride in groundwater in the vicinity of IHSS 119.1 and 119.2 is due to discharge of high chloride bedrock groundwater to the alluvial/colluvial system.	N
	COL	98	NR				
	VFA	0	NR				
	WCS	64	NR				
	KAR	0	NR				
Cyanide	RFA	0	NR	X		The UTLs were not exceeded in groundwater.	N
	COL	0	NR				
	VFA	0	NR				
	WCS	NA	NR				
	KAR	NA	NR				
Fluoride	RFA	11	NR		X	Fluoride UTL exceedences occur only in RFA groundwater and in only one well. The exceedences are small and not indicative of contamination.	N
	COL	0	NR				
	VFA	0	NR				
	WCS	0	NR				
	KAR	0	NR				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Nitrate/Nitrite	RFA	18	NR		X	Concentrations of nitrate are similar at all locations including upgradient locations. The lack of obvious concentration gradients is not indicative of contamination.	N
	COL	13	NR				
	VFA	14	NR				
	WCS	33	NR				
	KAR	13	NR				
Orthophosphate	RFA	0	NR		X	Othorphosphate only exceeds the UTL in COL groundwater at one well which is not indicative of contamination.	N
	COL	9	NR				
	VFA	0	NR				
	WCS	0	NR				
	KAR	0	NR				
Silica	RFA	11	NR		X	The exceedances of silica are rare and low in magnitude which is not indicative of groundwater contamination.	N
	COL	14	NR				
	VFA	0	NR				
	WCS	8	NR				
	KAR	0	NR				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Sulfate	RFA	88	NR		X	A review of the distribution of sulfate concentrations reveals that the levels are similar at all locations, including upgradient locations. This is not indicative of contamination	N
	COL	0	NR				
	VFA	0	NR				
	WCS	21	NR				
	KAR	0	NR				
Sulfide	RFA	NA	NR	NA	NA	Not analyzed.	N
	COL	NA	NR				
	VFA	NA	NR				
	WCS	NA	NR				
	KAR	NA	NR				
Total Dissolved Solids	RFA	100	NR		X	The distribution of TDS concentrations show no obvious gradients indicative of a source either on-site or off-site (concentrations increasing toward the boundary).	N
	COL	76	NR				
	VFA	0	NR				
	WCS	21	NR				
	KAR	41	NR				

Table D-7 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Groundwater

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
pH	RFA	100	NR		X	pH is largely controlled by the bicarbonate content of the groundwater, and bicarbonate has been shown not to be a contaminant. The pH of groundwater at OU1 is not indicative of contamination.	
	COL	100	NR				
	VFA	100	NR				
	WCS	100	NR				
	KAR	100	NR				

(1) Percent of data where concentrations exceed the background UTL or maximum concentration, whichever is reported in the Background Geochemical Characterization Report.
(2) Analysis of Variance (ANOVA) was used to test whether a difference in site and background mean concentrations exists at the 5% significance level.
(3) Either 0% exceedance of UTL, or ANOVA test results indicate no significant difference in site and background mean concentrations.
(4) Greater than 0% exceedance of the UTL and ANOVA test results indicate a significant difference exists between site and background mean concentrations.

I = Insufficient data to perform ANOVA.
— = ANOVA result is irrelevant to statistical conclusion (see note 3 above)
NA = Not analyzed
NR = No result. ANOVA test not performed.

Table D-8
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Surface Soil

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant?		Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
			No (3)	Yes (4)		
Metals						
Aluminum	3	No	X		Not applicable.	N
Antimony	0	—	X		Not applicable.	N
Arsenic	0	—	X		Not applicable.	N
Barium	0	—	X		Not applicable.	N
Beryllium	18	No	X		Not applicable.	N
Cadmium	4	No	X		Not applicable.	N
Calcium	32	Yes		X	Exceedances of the UTL occur as often outside the IHSSs as within the IHSSs. The magnitude of the UTL exceedances is similar regardless of location. Does not indicate contamination from either on-site or off-site sources.	N
Cesium	15	No	X		Not applicable.	N
Chromium	18	No	X		Not applicable.	N
Cobalt	3	No	X		Not applicable.	N
Copper	24	No	X		Not applicable.	N
Iron	3	No	X		Not applicable.	N
Lead	15	Yes		X	Only three exceedances of the UTL; two within IHSSs and one outside IHSSs. The exceedances are similar in each case and low in magnitude. Does not indicate contamination from either on-site or off-site sources.	N
Lithium	0	—	X		Not applicable.	N

Table D-8 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Surface Soil

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Magnesium	0	—	X		Not applicable.	N
Manganese	0	—	X		Not applicable.	N
Mercury	0	—	X		Not applicable.	N
Molybdenum	28	Yes		X	Only two exceedances of the UTL, each within IHSSs. However, the magnitude of the UTL exceedances are very low and surrounding stations do not show elevated levels.	N
Nickel	21	No	X		Not applicable.	N
Potassium	3	No	X		Not applicable.	N
Selenium	0	—	X		Not applicable.	N
Silicon	59	Yes		X	Spatial distribution of concentrations show no indication of areas of relatively higher concentrations. Does not indicate contamination.	N
Silver	0	—	X		Not applicable.	N
Sodium	12	No	X		Not applicable.	N
Strontium	9	Yes		X	Random and low exceedances of the UTL does not indicate contamination.	N
Thallium	0	—	X		Not applicable.	N
Tin	9	No	X		Not applicable.	N
Vanadium	21	No	X		Not applicable.	N
Zinc	26	No	X		Not applicable.	N

Table D-8 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Surface Soil

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Radionuclides						
Americium-241	82	Yes		X	Retained as a surface soil contaminant.	Y
Cesium-134	I	I	X		Cs-134 would only be present as a contaminant had wastes from a criticality been disposed at OU1. There has never been a criticality at RFP.	N
Cesium-137	NA	NA	X		Cs-137 would only be present as a contaminant had wastes from a criticality been disposed at OU1. There has never been a criticality at RFP.	N
Plutonium-239, 240	88	Yes		X	Retained as a surface soil contaminant.	Y
Radium-226	0	—	X		Not applicable.	N
Radium-228	0	—	X		Not applicable.	N
Strontium-89, 90	NA	NA	X		Sr-89, 90 would only be present as a contaminant had wastes from a criticality been disposed at OU1. There has never been a criticality at RFP.	N
Tritium	NA	NA	X		Not applicable.	N
Uranium-233, 234	6	Yes		X	Retained as a surface soil contaminant.	Y
Uranium-235	0	No	X		Retained as a surface soil contaminant because it is an isotope in depleted uranium.	Y
Uranium-238	3	Yes		X	Retained as a surface soil contaminant.	Y

Table D-8 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Surface Soil

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
Water Quality Parameters						
Bicarbonate as $CaCO_3$	NA	NR	NA	NA	Although not analyzed, none of the water quality parameters are expected contaminants of surface soils.	N
Carbonate at $CaCO_3$	NA	NR	NA	NA	Although not analyzed, none of the water quality parameters are expected contaminants of surface soils.	N
Chloride	NA	NR	NA	NA	Although not analyzed, none of the water quality parameters are expected contaminants of surface soils.	N
Cyanide	NA	NR	NA	NA	Although not analyzed, none of the water quality parameters are expected contaminants of surface soils.	N
Fluoride	NA	NR	NA	NA	Although not analyzed, none of the water quality parameters are expected contaminants of surface soils.	N
Nitrate/Nitrite	0	NR	X	0	Not applicable	N
Orthophosphate	NA	NR	NA	NA	Although not analyzed, none of the water quality parameters are expected contaminants of surface soils.	N
Silica	NA	NR	NA	NA	Although not analyzed, none of the water quality parameters are expected contaminants of surface soils.	N
Sulfate	NA	NR	NA	NA	Although not analyzed, none of the water quality parameters are expected contaminants of surface soils.	N
Sulfide	NA	NR	NA	NA	Although not analyzed, none of the water quality parameters are expected contaminants of surface soils.	N
Total Dissolved Solids	NA	NR	NA	NA	Although not analyzed, none of the water quality parameters are expected contaminants of surface soils.	N

Table D-8 (Continued)
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Surface Soil

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant?		Spatial/Temporal/Other (See Text)	OU1 Contaminant ? (Y/N)
			No (3)	Yes (4)		
pH	NA	NR	NA	NA	Although not analyzed, none of the water quality parameters are expected contaminants of surface soils.	N

(1) Percent of data where concentrations exceed the background UTL or maximum concentration, whichever is reported in the Background Geochemical Characterization Report.
(2) Analysis of Variance (ANOVA) was used to test whether a difference in site and background mean concentrations exists at the 5% significance level.
(3) Either 0% exceedance of UTL, or ANOVA test results indicate no significant difference in site and background mean concentrations.
(4) Greater than 0% exceedance of the UTL and ANOVA test results indicate a significant difference exists between site and background mean concentrations.

I = Insufficient data to perform ANOVA.
— = ANOVA result is irrelevant to statistical conclusion (see note 3 above).
NA = Not analyzed
NR = No results. ANOVA test not performed.

Table D-9
Rocky Flats Plant OU1
Summary of Background Comparison
Inorganic Analytes in Geologic Material

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Metals							
Aluminum	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	WCS	0	—				
Antimony	RFA	0	—		X	The UTL exceedances are widespread, relatively low in magnitude, and the highest values do not occur at the source areas but rather along the french drain alignment.	N
	COL	18	Yes				
	WCS	8	Yes				
Arsenic	RFA	0	—		X	Only two exceedances of the UTL which are low in magnitude and random in distribution.	N
	COL	1	Yes				
	WCS	2	Yes				
Barium	RFA	0	—		X	UTL exceedances occur infrequently and randomly throughout OU1. Highest conentration is not within an IHSS.	N
	COL	3	Yes				
	WCS	3	No				
Beryllium	RFA	0	—	X		Not appplicable.	N
	COL	0	—				
	WCS	0	—				

Table D-9 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Geologic Material

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Cadmium	RFA	0	—		X	UTL exceedances occur infrequently and randomly throughout OU1, and are low in magnitude.	N
	COL	0	—				
	WCS	5	Yes				
Calcium	RFA	50	No		X	The UTL exceedances are widespread but mostly along the french drain alignment, relatively low in magnitude, and the highest values do not occur at the source areas but rather along the french drain alignment.	N
	COL	16	Yes				
	WCS	2	No				
Cesium	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	WCS	0	—				
Chromium	RFA	0	—	X		Not applicable.	N
	COL	1	No				
	WCS	0	—				
Cobalt	RFA	0	—		X	Only one exceedance of the UTL which is very low in magnitude.	N
	COL	1	Yes				
	WCS	0	—				

Table D-9 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Geologic Material

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Copper	RFA	0	—		X	UTL exceedances occur infrequently and randomly throughout OU1, and are low in magnitude.	N
	COL	1	Yes				
	WCS	0	—				
Iron	RFA	0	—	X		Not applicable.	N
	COL	1	No				
	WCS	0	—				
Lead	RFA	0	—	X		Not applicable.	N
	COL	3	No				
	WCS	0	—				
Lithium	RFA	0	—		X	The UTL exceedances are widespread and occur as often in IHSSs as along the french drain alignment. The exceedances are all similar and low in magnitude.	N
	COL	6	Yes				
	WCS	0	—				
Magnesium	RFA	0	—	X		Not applicable.	N
	COL	1	No				
	WCS	0	—				

Table D-9 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Geologic Material

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Manganese	RFA	0	—		X	The UTL exceedances are widespread and occur as often in IHSSs as along the french drain alignment. The exceedances are all similar and low in magnitude.	N
	COL	6	Yes				
	WCS	3	No				
Mercury	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	WCS	0	—				
Molybdenum	RFA	0	—		X	The UTL exceedances are all along the french drain alignment. The exceedances are all similar and low in magnitude.	N
	COL	1	Yes				
	WCS	0	—				
Nickel	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	WCS	0	—				
Potassium	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	WCS	0	—				
Selenium	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	WCS	0	—				

Table D-9 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Geologic Material

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Silicon	RFA	0	—		X	Not applicable.	N
	COL	100	I				
	WCS	100	No				
Silver	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	WCS	0	—				
Sodium	RFA	0	—	X		Not applicable.	N
	COL	2	No				
	WCS	0	—				
Strontium	RFA	0	—		X	UTL exceedances are low in frequency and magnitude and occur randomly.	N
	COL	2	Yes				
	WCS	0	—				
Thallium	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	WCS	0	—				
Tin	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	WCS	2	I				

Table D-9 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Geologic Material

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Vanadium	RFA	0	—	X		Not applicable.	N
	COL	0	—				
	WCS	0	—				
Zinc	RFA	0	—	X		Not applicable.	N
	COL	4	No				
	WCS	0	—				
Radionuclides							
Americium-241	RFA	50	Yes		X	Retained as a contaminant of geologic material.	Y
	COL	23	I				
	WCS	15	I				
Cesium-134	RFA	NA	NA	X		Cs-134 would only be present as a contaminant had wastes from a criticality been disposed at OU1. There has never been a criticality at RFP.	N
	COL	NA	NA				
	WCS	NA	NA				
Cesium-137	RFA	0	—	X		Cs-137 would only be present as a contaminant had wastes from a criticality been disposed at OU1. There has never been a criticality at RFP.	N
	COL	9	No				
	WCS	0	—				

Table D-9 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Geologic Material

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Plutonium-239, 240	RFA	50	I		X	Retained as a contaminant of geologic material because of its co-occurrence with americium and its presence in hot spots.	Y
	COL	35	I				
	WCS	10	I				
Radium-226	RFA	0	—	X		Not applicable.	N
	COL	2	I				
	WCS	3	No				
Radium-228	RFA	0	—	X		Not applicable.	N
	COL	15	I				
	WCS	3	No				
Strontium-89, 90	RFA	50	I	X		Sr-89, 90 would only be present as a contaminant had wastes from a criticality been disposed at OU1. There has never been a criticality at RFP.	N
	COL	8	I				
	WCS	6	I				
Tritium	RFA	0	—		X	The UTL exceedances are widespread and occur more often outside of IHSSs as within IHSSs. The exceedances are all similar and low in magnitude.	N
	COL	11	Yes				
	WCS	2	No				

Table D-9 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Geologic Material

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Uranium-233, 234	RFA	0	—	X		Retained as a contaminant of geologic material because of its presence in hot spots.	Y
	COL	3	I				
	WCS	2	No				
Uranium-235	RFA	0	—	X		Retained as a contaminant of geologic material because of its presence in hot spots.	Y
	COL	2	—				
	WCS	0	—				
Uranium-238	RFA	0	—		X	Retained as a contaminant of geologic material because of its presence in hot spots.	Y
	COL	8	Yes				
	WCS	9	No				
Water Quality Parameters							
Bicarbonate	RFA	NA	NR	NA	NA	Not analyzed.	N
	COL	NA	NR				
	WCS	NA	NR				
Carbonate	RFA	NA	NR	NA	NA	Not analyzed.	N
	COL	NA	NR				
	WCS	NA	NR				

Table D-9 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Geologic Material

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Chloride	RFA	NA	NR			Not analyzed.	
	COL	NA	NR				N
	WCS	NA	NR	NA	NA		
Cyanide	RFA	NA	NR			Not analyzed.	
	COL	NA	NR				N
	WCS	NA	NR				
Fluoride	RFA	NA	NR			Not analyzed.	
	COL	NA	NR				N
	WCS	NA	NR				
Nitrate/Nitrite	RFA	NA	NR			Maximum concentration was only 4.3 mg/kg and the UTL is 3.2 mg/kg. Only 3% exceedance of the UTL.	
	COL	3	NR				N
	WCS	0	NR		X		
Orthophosphate	RFA	NA	NR			Not analyzed.	
	COL	NA	NR				N
	WCS	NA	NR				

Table D-9 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Geologic Material

Analyte		% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Silica	RFA	NA	NR			Not analyzed.	
	COL	NA	NR				N
	WCS	NA	NR	NA	NA		
Sulfate	RFA	NA	NR			Not analyzed.	
	COL	NA	NR				N
	WCS	NA	NR	NA	NA		
Sulfide	RFA	NA	NR			Not applicable.	
	COL	0	NR				N
	WCS	0	NR	NA	NA		
Total Dissolved Solids	RFA	NA	NR			Not analyzed.	
	COL	NA	NR				N
	WCS	NA	NR	NA	NA		
pH	RFA	NA	NR			Not applicable.	
	COL	0	NR				N
	WCS	0	NR	NA	NA		

Table D-9 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Geologic Material

(1) Percent of data where concentrations exceed the background UTL or maximum concentration, whichever is reported in the Background Geochemical Characterization Report.
(2) Analysis of Variance (ANOVA) was used to test whether a difference in site and background mean concentrations exists at the 5% significance level.
(3) Either 0% exceedance of UTL, or ANOVA test results indicate no significant difference in site and background mean concentrations.
(4) Greater than 0% exceedance of the UTL and ANOVA test results indicate a significant difference exists between site and background mean concentrations.

I = Insufficient data to perform ANOVA.
— = ANOVA result is irrelevant to statistical conclusion (see note 3 above).
NA = Not analyzed
NR = No result. ANOVA test not performed.

Table D-10
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Sediments

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant?		Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
			No (3)	Yes (4)		
Metals						
Aluminum	0	—	X		Not applicable.	N
Antimony	0	—	X		Not applicable.	N
Arsenic	0	—	X		Not applicable.	N
Barium	17	Yes		X	Only two exceedances of the UTL, both of which are low in magnitude. One occurs upgradient of OU1.	N
Beryllium	0	—	X		Not applicable.	N
Cadmium	0	—	X		Not applicable.	N
Calcium	67	Yes		X	Exceedances of the UTL occur frequently along the entire reach of the SID, upgradient and downgradient of OU1. Spatial distribution of concentrations shows no obvious gradients indicative of either an on-site or off-site source.	N
Cesium	0	—	X		Not applicable.	N
Chromium	0	—	X		Not applicable.	N
Cobalt	8	Yes		X	There is only one exceedance of the UTL. It occurs upgradient of OU1 and is low in magnitude.	N
Copper	0	—	X		Not applicable.	N
Iron	0	—	X		Not applicable.	N
Lead	17	Yes		X	Only two exceedances of the UTL; both are very low in magnitude.	N
Lithium	0	—	X		Not applicable.	N
Magnesium	0	—	X		Not applicable.	N

Table D-10 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Sediments

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Manganese	0	—	X		Not applicable.	N
Mercury	0	—	X		Not applicable.	N
Molybdenum	8	Yes		X	Only exceedance of the UTL is on Woman Creek, and it just exceeds the UTL. There are no exceedances in the SID which is closer to any sources at OU1.	N
Nickel	0	—	X		Not applicable.	N
Potassium	0	—	X		Not applicable.	N
Selenium	0	—	X		Not applicable.	N
Silicon	0	—	X		Not applicable.	N
Silver	8	Yes		X	Only exceedance of the UTL is on Woman Creek, and it just exceeds the UTL. There are no exceedances in the SID which is closer to any sources at OU1.	N
Sodium	17	Yes		X	Only two exceedances of the UTL, both of which are low in magnitude. One occurs upgradient of OU1.	N
Strontium	50	Yes		X	Exceedances of the UTL occur frequently along the entire reach of the SID, upgradient and downgradient of OU1. Spatial distribution of concentrations does not indicate a concentration gradient indicative of either an on-site or off-site source.	N
Thallium	8	Yes		X	Not applicable.	N
Tin	0	—	X		Only one exceedance of the UTL, and it is very low in magnitude.	N
Vanadium	0	—	X		Not applicable.	N

Table D-10 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Sediments

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Zinc	17	Yes		X	Only two exceedances of the UTL, both of which are low in magnitude.	N
Radionuclides						
Americium-241	0	—		X	Retained as a contaminant because of its widespread occurrence due to an off-site release.	Y
Cesium-134	NA	NA	X		Cs-134 would only be present as a contaminant had wastes from a criticality been disposed at OU1. There has never been a criticality at RFP.	N
Cesium-137	0	—	X		Not applicable.	N
Plutonium-239, 240	8	I		X	Retained as a contaminant because of its widespread occurrence due to an off-site release.	Y
Radium-226	0	—	X		Not applicable.	N
Radium-228	0	—	X		Not applicable.	N
Strontium-89, 90	8	I	X		Sr-89, 90 would only be present as a contaminant had wastes from a criticality been disposed at OU1. There has never been a criticality at RFP.	N
Tritium	0	—	X		Not applicable.	N
Uranium-233, 234	0	I	X		Not applicable.	N
Uranium-235	0	—	X		Not applicable.	N
Uranium-238	0	—	X		Not applicable.	N
Water Quality Parameters						
Bicarbonate as $CaCO_3$	0	NR	X	0	0% exceedances based on alkalinity.	N

Table D-10 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Sediments

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant?		Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
			No (3)	Yes (4)		
Carbonate at $CaCO_3$	0	NR	NA	NA	0% exceedances based on alkalinity.	N
Chloride	NA	NR	NA	NA	Not analyzed.	N
Cyanide	NA	NR	NA	NA	Not analyzed.	N
Fluoride	NA	NR	NA	NA	Not analyzed.	N
Nitrate/Nitrite	0	NR	X	0	Not applicable.	N
Orthophosphate	NA	NR	NA	NA	Not analyzed.	N
Silica	NA	NR	NA	NA	Not analyzed.	N
Sulfate	NA	NR	NA	NA	Not analyzed.	N
Sulfide	NA	NR	NA	NA	Not analyzed.	N
Total Dissolved Solids	NA	NR	NA	NA	Not analyzed.	N
pH	0	NR	X		Not applicable.	N

(1) Percent of data where concentrations exceed the background UTL or maximum concentration, whichever is reported in the Background Geochemical Characterization Report.
(2) Analysis of Variance (ANOVA) was used to test whether a difference in site and background mean concentrations exists at the 5% significance level.
(3) Either 0% exceedance of UTL, or ANOVA test results indicate no significant difference in site and background mean concentrations.
(4) Greater than 0% exceedance of the UTL and ANOVA test results indicate a significant difference exists between site and background mean concentrations.

I = Insufficient data to perform ANOVA.
— = ANOVA result is irrelevant to statistical conclusion (see note 3 above).
NA = Not analyzed
NR = No results. ANOVA test not performed.

Table D-11
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Surface Water

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Metals						
Aluminum	3	No	X		Not applicable.	N
Antimony	1	Yes		X	Few stations have exceedances of the UTL. At those stations, the magnitude of the exceedance is low and the occurrence is very infrequent.	N
Arsenic	1	Yes		X	Few stations have exceedances of the UTL. At those stations, the magnitude of the exceedance is low and the occurrence is very infrequent.	N
Barium	38	Yes		X	Few stations have exceedances of the UTL (one is upgradient). At those stations, the magnitude of the exceedance is low and the occurrence is very infrequent.	N
Beryllium	0	—	X		Not applicable.	N
Cadmium	0	—	X		Not applicable	N
Calcium	34	Yes		X	The UTL is frequently exceeded along the entire reach of the SID; however concentrations are similar at all locations including upgradient locations. Calcium is not a contaminant of any other OU1 medium.	N
Cesium	0	—	X		Not applicable.	N
Chromium	1	Yes		X	Few stations have exceedances of the UTL. At those stations, the magnitude of the exceedance is low and the occurrence is very infrequent.	N
Cobalt	0	—	X		Not applicable.	N
Copper	3	Yes		X	Few stations have exceedances of the UTL. At those stations, the magnitude of the exceedance is low and the occurrence is very infrequent.	N

Table D-11 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Surface Water

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Iron	1	No	X		Not applicable.	N
Lead	2	Yes		X	Not applicable.	N
Lithium	6	Yes		X	Few stations have exceedances of the UTL. At those stations, the magnitude of the exceedance is low and the occurrence is very infrequent.	N
Magnesium	55	Yes		X	The UTL is frequently exceeded along the entire reach of the SID; however concentrations are similar at all locations including upgradient locations. Magnesium is not a contaminant of any other OU1 medium.	N
Manganese	0	—	X		Not applicable.	N
Mercury	0	—	X		Not applicable.	N
Molybdenum	0	—	X		Not applicable.	N
Nickel	2	Yes		X	Few stations have exceedances of the UTL. At those stations, the magnitude of the exceedance is low and the occurrence is very infrequent.	N
Potassium	2	Yes		X	Few stations have exceedances of the UTL. At those stations, the magnitude of the exceedance is low and the occurrence is very infrequent.	N
Selenium	5	Yes		X	Few stations have exceedances of the UTL. At those stations, the magnitude of the exceedance is low and the occurrence is very infrequent.	N
Silicon	8	No	X		Not applicable.	N
Silver	2	Yes		X	Few stations have exceedances of the UTL. At those stations, the magnitude of the exceedance is low and the occurrence is very infrequent.	N

Table D-11 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Surface Water

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Sodium	14	Yes		X	The UTL is frequently exceeded along the entire reach of the SID; however concentrations are similar at all locations including upgradient locations. Sodium is not a contaminant of any other OU1 medium.	N
Strontium	33	Yes		X	The UTL is frequently exceeded along the entire reach of the SID; however concentrations are similar at all locations including upgradient locations. Strontium is not a contaminant of any other OU1 medium.	N
Thallium	0	—	X		Not applicable.	N
Tin	0	—	X		Not applicable.	N
Vanadium	3	Yes		X	Few stations have exceedances of the UTL. At those stations, the magnitude of the exceedance is low and the occurrence is very infrequent.	N
Zinc	3	No	X		Not applicable.	N
Radionuclides						
Americium-241	11	Yes		X	Retained as a contaminant of surface water.	Y
Cesium-134	NA	NA	X		Cs-134 would only be present as a contaminant had wastes from a criticality been disposed at OU1. There has never been a criticality at RFP.	N
Cesium-137	6	Yes		X	Cs-137 would only be present as a contaminant had wastes from a criticality been disposed at OU1. There has never been a criticality at RFP.	N
Plutonium-239, 240	6	I		X	Retained as a contaminant of surface water because of its association with americium and its widespread occurrence emanating from an off-site source.	Y

Table D-11 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Surface Water

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant?		Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
			No (3)	Yes (4)		
Radium-226	0	—	X		Not applicable.	N
Radium-228	NA	NA	X		Ra-228 is a daughter isotope of thorium decay. Although there is no data, there is no reason to expect Ra-228 (or thorium) to be present as a contaminant.	N
Strontium-89, 90	3	I	X		Sr-89, 90 would only be present as a contaminant had wastes from a criticality been disposed at OU1. There has never been a criticality at RFP.	N
Tritium	2	No	X		Not applicable.	N
Uranium-233, 234	51	I		X	Total uranium concentrations are similar along the entire reach of the SID. Isotopic ratio of U-234/U238 indicates the uranium is naturally occurring, and is not depleted uranium which is known to be a contaminant of OU1 surface soils. Uranium is not a contaminant of groundwater at OU1.	N
Uranium-235	21	Yes		X	Total uranium concentrations are similar along the entire reach of the SID. Isotopic ratio of U-234/U238 indicates the uranium is naturally occurring, and is not depleted uranium which is known to be a contaminant of OU1 surface soils. Uranium is not a contaminant of groundwater at OU1.	N
Uranium-238	49	Yes		X	Total uranium concentrations are similar along the entire reach of the SID. Isotopic ratio of U-234/U238 indicates the uranium is naturally occurring, and is not depleted uranium which is known to be a contaminant of OU1 surface soils. Uranium is not a contaminant of groundwater at OU1.	N

Table D-11 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Surface Water

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant? No (3)	Potential Contaminant? Yes (4)	Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
Water Quality Parameters						
Bicarbonate as $CaCO_3$	48	NR	0	X	Bicarbonate concentrations often exceed the UTL along the entire reach of the SID. Concentrations are similar at all locations, including upgradient locations. Bicarbonate is not a contaminant in any other OU1 medium.	N
Carbonate at $CaCO_3$	0	NR	X	0	Not applicable.	N
Chloride	16	NR	0	X	Chloride concentrations often exceed the UTL along the entire reach of the SID. Concentrations are similar at all locations, including upgradient locations. Chloride is not a contaminant in any other OU1 medium.	N
Cyanide	5	NR	0	X	Not applicable. UTL exceedance are low in frequency and magnitude. Cyanide is also not a soils or groundwater contaminant.	N
Fluoride	45	NR	0	X	Not applicable. Fluoride concentrations often exceed the UTL along the entire reach of the SID. Concentrations are similar at all locations, including upgradient locations. Fluoride is not a contaminant in any other OU1 medium.	N
Nitrate/Nitrite	27	NR	0	X	Not applicable. Nitrate concentrations often exceed the UTL along the entire reach of the SID. Concentrations are similar at all locations, including upgradient locations. Nitrate is not a contaminant in any other OU1 medium.	N
Orthophosphate	0	NR	X	0	Not applicable.	N
Silica	14	NR	0	X	Not applicable. UTL exceedances are low in frequency and magnitude. Concentrations are similar at all locations.	N

Table D-11 (Continued)
Rocky Flats Plant OU-1
Summary of Background Comparison
Inorganic Analytes in Surface Water

Analyte	% Data > UTL (1)	Difference per ANOVA? (Y/N) (2)	Potential Contaminant?		Spatial/Temporal/Other (See Text)	OU1 Contaminant? (Y/N)
			No (3)	Yes (4)		
Sulfate	43	NR	0	X	Sulfate concentrations often exceed the UTL along the entire reach of the SID. Concentrations are similar at all locations, including upgradient locations. Sulfate is not a contaminant in any other OU1 medium.	N
Sulfide	4	NR	0	X	Sulfide concentrations often exceed the UTL along the entire reach of the SID. Concentrations are similar at all locations, including upgradient locations. Sulfide is not a contaminant in any other OU1 medium.	N
Total Dissolved Solids	48	NR	0	X	TDS concentrations often exceeded the UTL along the entire reach of the SID. Concentrations are similar at all locations, including upgradient locations. TDS is not a contaminant in any other OU1 medium.	N
pH	0	NR	0	0	Not applicable.	N

(1) Percent of data where concentrations exceed the background UTL or maximum concentration, whichever is reported in the Background Geochemical Characterization Report.
(2) Analysis of Variance (ANOVA) was used to test whether a difference in site and background mean concentrations exists at the 5% significance level.
(3) Either 0% exceedance of UTL, or ANOVA test results indicate no significant difference in site and background mean concentrations.
(4) Greater than 0% exceedance of the UTL and ANOVA test results indicate a significant difference exists between site and background mean concentrations.
I = Insufficient data to perform ANOVA.
— = ANOVA result is irrelevant to statistical conclusion (see note 3 above).
NA = Not analyzed
NR = No results. ANOVA test not performed.

Table D-12

Elevated Selenium Concentrations in Groundwater at the Rocky Flats Plant

Well	Location	Completion	Maximum Selenium Concentration ($\mu g/\ell$)
260	Immediately downgradient of Solar Ponds	Unknown	340
1786	N. Walnut Creek drainage downgradient of Solar Ponds	Colluvial	232
10089	N. Walnut Creek drainage downgradient of Solar Ponds	Weathered Claystone	1,210
6789	Downgradient of Present Landfill	Weathered Claystone	817

TABLE D-13
RATIO OF ACTIVITIES - URANIUM 233,234 TO URANIUM 238
TOTAL RADIOCHEMISTRY

LOCATION	DATE	SAMPLE	RATIO
SW046	01/16/90	SW04690001	2.30960
SW046	02/19/90	SW04690002	1.24324
SW046	03/17/90	SW04690003	1.37610
SW066	06/12/90	SW00014WC	0.74698
SW066	10/17/90	SW00414WC	1.23907
SW066	01/11/90	SW06690001	0.59428
SW066	02/08/90	SW06690002	0.95670
SW066	03/14/90	SW06690003	0.47045
SW066	05/15/90	SW066W051590A	1.05405
SW067	06/12/90	SW00015WC	0.92766
SW067	10/17/90	SW00415WC	1.05969
SW067	01/11/90	SW06790001	0.83624
SW067	02/08/90	SW06790002	0.68089
SW067	05/16/90	SW067W051690A	1.00000
SW068	06/13/90	SW00017WC	0.77209
SW068	09/18/90	SW00325WC	1.24309
SW068	10/16/90	SW00416WC	1.50761
SW068	09/17/91	SW01556WC	1.41176
SW068	10/10/91	SW01662WC	0.82758
SW068	01/11/90	SW06890001	0.94339
SW068	05/16/90	SW068W051690A	0.86046
SW069	08/20/90	0248WC/SW80035WC	1.00456
SW069	06/12/90	SW00063WC	0.64557
SW069	10/16/90	SW00417WC	0.80279
SW069	09/17/91	SW01557WC	1.25806
SW069	10/10/91	SW01663WC	1.11111
SW069	01/11/90	SW06990001	0.66862
SW069	02/07/90	SW06990002	0.87131
SW070	06/12/90	SW00065WC	0.92340
SW070	10/16/90	SW00418WC	0.92694
SW070	09/17/91	SW01558WC	1.10000
SW070	10/10/91	SW01664WC	1.05000
SW070	11/05/91	SW01712WC	0.91666
SW070	01/11/90	SW07090001	0.90188
SW070	02/07/90	SW07090002	0.87664

ND - U233,234 AND/OR U238 NOT DETECTED - NO RATIO CALCULATED

TABLE D-13
RATIO OF ACTIVITIES - URANIUM 233,234 TO URANIUM 238
TOTAL RADIOCHEMISTRY

LOCATION	DATE	SAMPLE	RATIO
SW034	08/13/90	0236WC/SW80029WC	1.00000
SW034	01/15/90	349000/SW03490001D	1.19148
SW034	06/07/90	SW00007WC	1.73913
SW034	09/13/90	SW00314WC	**********
SW034	10/04/90	SW00405WC	0.83338
SW034	09/26/91	SW01545WC	1.24528
SW034	10/10/91	SW01651WC	3.66666
SW034	11/18/91	SW01723WC	2.00000
SW034	02/20/90	SW03490002	2.00000
SW035	06/11/90	SW00061WC	0.57347
SW035	09/17/90	SW00319WC	0.60688
SW035	09/05/91	SW01550WC	0.88235
SW035	10/17/91	SW01656WC	0.71428
SW035	11/06/91	SW01714WC	0.92857
SW035	01/11/90	SW03590001	0.59778
SW035	02/08/90	SW03590002	0.59824
SW035	03/14/90	SW03590003	0.32151
SW036	06/07/90	SW00057WC	0.32355
SW036	11/07/91	SW01715WC	0.38028
SW036	01/12/90	SW03690001	0.42418
SW036	02/09/90	SW03690002	0.43554
SW036	03/14/90	SW03690003	0.18608
SW038	10/15/90	SW00419WC	1.89971
SW038	08/28/91	SW01453WC	1.66666
SW038	10/23/91	SW01665WC	1.25000
SW038	11/07/91	SW01716WC	1.07142
SW038	01/20/92	SW01789WC	1.91666
SW039	06/07/90	0058WC/SW00059WC	0.67692
SW039	08/15/90	SW00235WC	0.28562
SW039	08/15/90	SW00237WC	2.19979
SW039	09/13/90	SW00315WC	0.66671
SW039	09/05/91	SW01546WC	1.81250
SW039	10/02/91	SW01652WC	1.55555
SW039	11/18/91	SW01726WC	1.66666
SW039	04/15/92	SW01881WC	30.44444
SW039	01/17/90	SW03990001	1.24137
SW039	02/08/90	SW03990002	0.92307
SW039	03/21/90	SW03990003	3.00051
SW044	06/13/90	SW00069WC	1.09897
SW044	09/17/90	SW00328WC	0.85759
SW044	01/17/90	SW04490001	2.46012
SW044	02/19/90	SW04490002	0.67741
SW044	03/17/90	SW04490003	0.28231
SW045	06/13/90	SW00066WC	1.81415
SW045	09/18/90	SW00327WC	1.79969
SW045	01/16/90	SW04590001	1.89268
SW045	02/19/90	SW04590002	1.26666
SW045	03/17/90	SW04590003	1.78030
SW046	10/16/90	SW00423WC	0.93263
SW046	09/05/91	SW01563WC	1.25806
SW046	10/17/91	SW01669WC	1.76000

ND - U233,234 AND/OR U238 NOT DETECTED - NO RATIO CALCULATED

TABLE D-13
RATIO OF ACTIVITIES - URANIUM 233,234 TO URANIUM 238
TOTAL RADIOCHEMISTRY

LOCATION	DATE	SAMPLE	RATIO
0187	02/02/90	G01870290001	1.57939
0387	02/16/90	G03870290001	14.00000
0487	06/07/90	G04870607021215	1.46588
0487	08/29/90	GW00318IT	1.41739
0887	02/15/90	G08870290001	2.00000
0974	05/31/90	G09740530021540	1.54658
0974	08/09/90	GW00209IT	1.49043
1074	02/05/90	G10740290001	1.12048
1074	05/31/90	G10740530021340	1.21670
1074	08/08/90	GW00149IT	1.43720
4387	06/07/90	G43870606020900	1.19934
5287	08/24/90	GW00301IT	1.43379
6286	02/16/90	G62860290001	1.61538
6486	05/25/90	G64860524020840	1.14655
6886	05/23/90	860523/G6886052302104	1.77272
SW029	09/12/90	0311WC/SW80042WC	1.40849
SW029	06/06/90	SW00003WC	1.10377
SW029	08/09/90	SW00233WC	2.00053
SW029	09/26/91	SW01542WC	1.14942
SW029	10/09/91	SW01648WC	1.66666
SW029	11/13/91	SW01720WC	1.24528
SW029	01/09/92	SW01793WC	1.12162
SW029	01/16/90	SW02990001	1.29069
SW029	02/08/90	SW02990002	0.65476
SW029	05/10/90	SW029W051090A	1.55882
SW031	05/15/90	31W051/SW031W051590D	0.77497
SW031	06/11/90	SW00060WC	1.00269
SW031	09/13/90	SW00318WC	1.34734
SW031	10/10/90	SW00409WC	1.51563
SW031	09/26/91	SW01549WC	1.09523
SW031	10/16/91	SW01655WC	1.70588
SW031	01/11/90	SW03190001	0.56493
SW031	02/20/90	SW03190002	1.10000
SW031	03/14/90	SW03190003	0.42868
SW032	08/09/90	SW00234WC	1.12514
SW032	09/13/90	SW00312WC	1.49972
SW032	10/04/90	SW00403WC	5.00085
SW032	09/26/91	SW01543WC	15.28571
SW032	10/10/91	SW01649WC	2.35483
SW032	11/13/91	SW01721WC	2.30555
SW032	01/16/90	SW03290001	1.39473
SW032	02/20/90	SW03290002	2.33333
SW032	05/10/90	SW032W051090A	1.41666
SW033	06/07/90	SW00006WC	3.40000
SW033	09/13/90	SW00313WC	10.00000
SW033	10/04/90	SW00404WC	1.33356
SW033	09/26/91	SW01544WC	1.46774
SW033	10/10/91	SW01650WC	1.21538
SW033	11/13/91	SW01722WC	0.60000
SW033	01/16/90	SW03390001	1.25714
SW033	02/20/90	SW03390002	2.00000

ND - U233,234 AND/OR U238 NOT DETECTED - NO RATIO CALCULATED

TABLE D-14
RATIO OF ACTIVITIES - URANIUM 233,234 TO URANIUM 238
FILTERED RADIOCHEMISTRY

LOCATION	DATE	SAMPLE	RATIO
0187	07/26/90	GW00093IT	1.38144
0187	10/16/90	GW00506IT	1.52516
0187	08/15/91	GW01659IT	1.78991
0187	12/05/91	GW02076IT	1.61123
0287	02/02/90	G02870290001	1.85064
0287	07/17/90	GW00013IT	1.89306
0287	10/18/90	GW00536IT	1.62500
0287	03/07/91	GW00929IT	1.65434
0287	05/13/91	GW01252IT	1.54594
0287	09/06/91	GW01752IT	1.46653
0287	11/14/91	GW02021IT	1.42797
0387	02/16/90	G03870290001	14.00000
0387	09/12/90	GW00017IT	7.84729
0387	10/29/90	GW00601IT	0.68977
0387	03/14/91	GW00984IT	2.60844
0387	05/14/91	GW01253IT	4.20023
0387	08/22/91	GW01696IT	4.79557
0387	11/13/91	GW02022IT	4.25467
0487	10/30/90	GW00602IT	1.18253
0487	03/19/91	GW00980IT	1.61121
0487	05/10/91	GW01250IT	1.26024
0487	08/21/91	GW01677IT	1.46066
0487	02/11/92	GW02421IT	1.24752
0587	02/14/90	G05870290001	1.21422
0587	08/07/90	GW00207IT	1.65981
0587	10/12/90	GW00499IT	1.53062
0587	03/07/91	GW00930IT	1.63006
0587	05/13/91	GW01276IT	1.41870
0587	08/15/91	GW01661IT	1.33918
0587	12/04/91	GW02078IT	1.50721
0587	02/14/92	GW02420IT	1.50248
0587	05/29/92	GW02992IT	1.45454
0687	01/31/90	G06870190001	1.30107
0687	07/20/90	GW00027IT	1.46136
0687	10/09/90	GW00489IT	1.01328
0687	03/19/91	GW00981IT	1.08195
0687	05/17/91	GW01251IT	1.27297
0687	08/19/91	GW01679IT	1.16416
0887	09/11/90	GW00024IT	2.87794
0887	11/09/90	GW00568IT	3.39161
0887	03/14/91	GW00983IT	2.63614
0887	05/10/91	GW01267IT	3.52711
0887	09/19/91	GW01675IT	5.14688
0887	11/14/91	GW02019IT	3.00000
0974	02/06/90	G09740290001	1.22069
0974	10/16/90	GW00507IT	1.40289
0974	05/14/91	GW01270IT	1.35736
0974	08/15/91	GW01662IT	1.05108
0974	12/10/91	GW02105IT	1.37783
0974	02/18/92	GW02396IT	1.31195
1074	10/19/90	GW00515IT	1.21012

ND - U233,234 AND/OR U238 NOT DETECTED - NO RATIO CALCULATED

TABLE D-14
RATIO OF ACTIVITIES - URANIUM 233,234 TO URANIUM 238
FILTERED RADIOCHEMISTRY

LOCATION	DATE	SAMPLE	RATIO
1074	05/17/91	GW01291IT	1.32491
1074	08/22/91	GW01678IT	1.36966
1074	12/11/91	GW02106IT	1.22114
1074	02/14/92	GW02395IT	1.63422
1074	05/06/92	GW02851IT	1.42168
31791	02/13/92	GW02468IT	1.50830
31791	05/08/92	GW02829IT	1.52886
31891	11/11/91	GW01997IT	0.96038
31891	02/10/92	GW02446IT	0.99856
31891	06/05/92	GW03060IT	1.64469
34791	12/17/91	GW02157IT	1.15388
34791	02/10/92	GW02447IT	1.58954
34791	05/20/92	GW02908IT	0.34615
35691	11/11/91	GW01994IT	1.33265
35691	02/17/92	GW02449IT	1.30200
35691	05/14/92	GW02891IT	1.17357
36191	02/11/92	GW02459IT	1.44338
36191	06/10/92	GW03020IT	1.53846
36391	06/05/92	GW03021IT	1.16046
37191	11/12/91	GW01995IT	1.12926
37191	02/10/92	GW02460IT	1.41422
37191	06/25/92	GW03024IT	1.98937
37591	02/25/92	GW02507IT	1.69405
37591	06/10/92	GW03025IT	1.10204
37791	01/20/92	GW02275IT	1.13469
37791	04/21/92	GW02757IT	1.11983
37891	12/16/91	GW02148IT	1.68396
37891	02/27/92	GW02461IT	1.71892
37891	06/04/92	GW03026IT	1.43410
37991	12/16/91	GW02147IT	1.42744
37991	02/26/92	GW02462IT	1.63036
37991	06/04/92	GW03043IT	1.51000
38591	12/18/91	GW02163IT	1.51333
38591	02/10/92	GW02463IT	1.57622
38591	05/08/92	GW02831IT	1.59215
39191	12/18/91	GW02162IT	2.00843
39191	02/26/92	GW02464IT	1.77129
39191	05/14/92	GW02832IT	1.41687
4387	02/01/90	G43870290001	3.80981
4387	09/11/90	GW00063IT	1.34766
4387	11/14/90	GW00624IT	1.39483
4387	03/19/91	GW00986IT	1.07912
4387	05/15/91	GW01268IT	1.33709
4387	08/15/91	GW01660IT	1.30468
4387	12/12/91	GW02102IT	1.50379
4587	09/10/90	GW00364IT	1.25731
4587	10/25/90	GW00592IT	1.54698
4587	03/07/91	GW00931IT	3.49944
4587	05/14/91	GW01269IT	1.74962
4587	08/16/91	GW01663IT	0.71008
4587	12/11/91	GW02097IT	3.44928

ND - U233,234 AND/OR U238 NOT DETECTED - NO RATIO CALCULATED

TABLE D-14
RATIO OF ACTIVITIES - URANIUM 233,234 TO URANIUM 238
FILTERED RADIOCHEMISTRY

LOCATION	DATE	SAMPLE	RATIO
4587	02/22/92	GW02377IT	4.89926
4587	06/23/92	GW03047IT	4.74932
4887	07/24/90	GW00039IT	1.47555
5187	10/18/91	GW01926IT	1.23508
5287	01/29/90	G52870190001	1.38928
5287	12/11/90	GW00797IT	1.27394
5287	03/26/91	GW01044IT	1.51980
5287	06/07/91	GW01390IT	1.48602
5287	08/08/91	GW01628IT	1.51632
5287	10/11/91	GW01897IT	1.35486
5287	01/17/92	GW02274IT	1.55883
5287	04/22/92	GW02719IT	1.31856
5387	02/05/90	G53870190001	1.47800
5387	07/31/90	GW00127IT	1.21288
5487	01/30/90	G54870190001	3.08547
5487	11/18/91	GW02016IT	2.44183
5986	03/20/90	G59860390001	1.20032
5986	07/18/90	GW00014IT	1.33248
5986	10/09/90	GW00500IT	1.69489
5986	03/15/91	GW00985IT	1.48691
5986	05/10/91	GW01265IT	1.37207
5986	08/22/91	GW01700IT	1.40610
5986	11/15/91	GW02018IT	1.53692
6286	09/18/90	GW00402IT	1.46506
6286	11/21/90	GW00731IT	1.52854
6286	01/09/91	GW00855IT	1.72190
6286	05/14/91	GW01284IT	1.22201
6286	08/22/91	GW01708IT	1.34243
6286	11/25/91	GW02046IT	1.57376
6286	06/11/92	GW03056IT	1.16602
6386	06/13/90	G63860612021210	1.13203
6886	08/01/90	0187IT/GW00190IT	0.48662
6886	05/14/91	1286IT/GW01289IT	2.67434
6886	11/25/91	2058IT/GW02060IT	1.11129
6886	02/26/92	2381IT/GW02383IT	1.41475
6886	02/13/90	G68860290001	1.32051
6886	11/02/90	GW00629IT	0.70000
6886	03/19/91	GW00991IT	0.66649
6886	09/06/91	GW01751IT	1.23014
6986	03/06/91	0925IT/GW00927IT	1.39430
6986	08/20/91	1692IT/GW01695IT	1.29769
6986	02/12/90	860290/G69860290001D	1.21142
6986	07/17/90	GW00018IT	1.43922
6986	10/23/90	GW00509IT	1.61976
6986	05/13/91	GW01277IT	1.28062
6986	11/13/91	GW02020IT	1.39845
SW029	07/17/90	SW00130WC	1.48723
SW029	06/13/91	SW01227WC	0.99195
SW029	07/11/91	SW01330WC	2.00027
SW029	08/08/91	SW01436WC	0.87915
SW031	07/19/90	SW00199WC	1.08780

ND - U233,234 AND/OR U238 NOT DETECTED - NO RATIO CALCULATED

TABLE D-14
RATIO OF ACTIVITIES - URANIUM 233,234 TO URANIUM 238
FILTERED RADIOCHEMISTRY

LOCATION	DATE	SAMPLE	RATIO
SW031	08/12/91	SW01443WC	1.17258
SW032	07/16/90	SW00136WC	2.07062
SW032	06/13/91	SW01228WC	0.92629
SW032	07/10/91	SW01331WC	1.00000
SW032	08/07/91	SW01437WC	2.17424
SW032	01/15/92	SW01794WC	1.14084
SW032	04/11/90	SW032W041190A	0.79812
SW033	08/07/91	1438WC/SW80145WC	1.09389
SW033	07/16/90	SW00128WC	1.19047
SW033	06/13/91	SW01229WC	1.78800
SW033	07/10/91	SW01332WC	3.05725
SW033	01/15/92	SW01795WC	1.48148
SW033	04/11/90	SW033W041190A	1.18918
SW034	06/13/91	1230WC/SW80131WC	0.43933
SW034	07/10/91	1333WC/SW80139WC	1.83593
SW034	07/16/90	SW00129WC	3.74934
SW034	08/08/91	SW01439WC	4.89930
SW034	04/11/90	SW034W041190A	1.12711
SW035	05/14/91	1132WC/SW80123WC	1.19607
SW035	07/19/90	SW00141WC	0.89045
SW035	06/25/91	SW01235WC	0.74724
SW035	07/10/91	SW01338WC	0.99457
SW035	08/13/91	SW01444WC	0.62616
SW035	04/12/90	SW035W041290A	1.67857
SW036	08/13/91	SW01445WC	0.30759
SW036	04/12/90	SW036W041290A	0.45559
SW036	08/08/90	SW70008WC	1.22001
SW038	11/05/90	SW00520WC	1.74603
SW038	06/20/91	SW01244WC	2.01902
SW038	07/25/91	SW01347WC	3.14578
SW039	07/16/90	SW00138WC	1.43758
SW039	06/04/91	SW01231WC	0.64555
SW039	07/08/91	SW01334WC	4.76093
SW039	04/12/90	SW039W041290A	1.58333
SW044	07/19/90	SW00169WC	1.47981
SW044	11/28/90	SW00523WC	1.44117
SW044	12/07/90	SW00627WC	ND
SW044	04/08/91	SW01037WC	1.00000
SW044	05/14/91	SW01144WC	0.82608
SW044	06/25/91	SW01247WC	0.89117
SW044	07/09/91	SW01350WC	0.77989
SW045	07/19/90	SW00175WC	1.32766
SW046	11/28/90	SW00524WC	1.59375
SW046	12/07/90	SW00628WC	1.28947
SW046	04/08/91	SW01038WC	1.37500
SW046	05/22/91	SW01145WC	1.24412
SW046	06/25/91	SW01248WC	1.23556
SW046	07/09/91	SW01351WC	1.40842
SW046	08/08/91	SW01457WC	1.48080
SW066	07/19/90	SW00146WC	0.94474
SW067	06/12/90	SW00015WC	2.00000

ND - U233,234 AND/OR U238 NOT DETECTED - NO RATIO CALCULATED

TABLE D-14
RATIO OF ACTIVITIES - URANIUM 233,234 TO URANIUM 238
FILTERED RADIOCHEMISTRY

ION	DATE	SAMPLE	RATIO
	06/19/91	SW01241WC	0.91700
	07/10/91	SW01344WC	1.34375
	08/08/91	SW01450WC	1.29298
	07/19/90	SW00147WC	0.94324
	06/19/91	SW01242WC	0.82456
	07/10/91	SW01345WC	1.09151
	08/08/91	SW01451WC	0.99483
	07/18/90	SW00142WC	1.18952
	05/13/91	SW01140WC	0.02735
	06/19/91	SW01243WC	0.72556
	07/10/91	SW01346WC	0.86360
	08/08/91	SW01452WC	1.39038

- NO RATIO CALCULATED

Table D-15

Summary
Volatile Organic Compounds
Detected at OU1

Analyte	GM	SS	GW	SW	SEEPS	SEDS
1,1,1-TRICHLOROETHANE	YES	NA	YES	YES	NO	YES
TRICHLOROETHENE	YES	NA	YES	YES	YES	NO
TETRACHLOROETHENE	YES	NA	YES	YES	YES	NO
CARBON TETRACHLORIDE	YES	NA	YES	NO	NO	NO
1,2-DICHLOROETHENE	NO	NA	YES	YES	NO	NO
CHLOROFORM	YES	NA	YES	NO	NO	NO
1,1-DICHLOROETHENE	YES	NA	YES	YES	NO	NO
cis 1,2-DICHLOROETHENE	NO	NA	YES	NO	NO	NO
1,1,2-TRICHLOROETHANE	NO	NA	YES	NO	NO	NO
1,1-DICHLOROETHANE	NO	NA	YES	YES	NO	NO
1,2-DICHLOROETHANE	YES	NA	YES	YES	NO	NO
TOLUENE	YES	NA	YES	YES	YES	YES
TOTAL XYLENES	YES	NA	YES	YES	NO	NO
2-HEXANONE	YES	NA	YES	NO	NO	NO
4-METHYL-2-PENTANONE	YES	NA	YES	NO	NO	NO
CARBON DISULFIDE	YES	NA	YES	YES	NO	NO
DICHLOROFLUOROMETHANE	NO	NA	YES	NO	NO	NO

Table D-15 (Continued)

Summary
Volatile Organic Compounds
Detected at OU1

Analyte	GM	SS	GW	SW	SEEPS	SEDS
STYRENE	YES	NA	YES	YES	NO	NO
TRICHLOROFLUOROMETHANE	NO	NA	YES	NO	NO	NO
VINYL ACETATE	NO	NA	YES	NO	NO	NO
m-XYLENE	NA	NA	YES	NA	NA	NA
p-CHLOROTOLUENE	NA	NA	YES	NA	NA	NA
p-CYMENE	NO	NA	YES	NO	NO	NO
sec-BUTYLBENZENE	NA	NA	YES	NA	NA	NA
tert-BUTYLBENZENE	NA	NA	YES	NA	NA	NA
2-BUTANONE	YES	NA	YES	YES	YES	YES
ACETONE	YES	NA	YES	YES	YES	YES
METHYLENE CHLORIDE	YES	NA	YES	YES	YES	YES
CHLOROBENZENE	YES	NA	NO	NO	NO	NO
DIBROMOCHLOROMETHANE	NO	NA	YES	NO	NO	NO
ETHYLBENZENE	YES	NA	YES	YES	NO	NO
BENZENE	NO	NA	YES	NO	NO	NO
VINYL CHLORIDE	NO	NA	YES	NO	NO	NO
1,2-DICHLOROPROPANE	NO	NA	YES	YES	NO	NO
BENZYL 1,2,4-TRIMETHYL	NO	NA	YES	NO	NO	NO
trans-1,3-DICHLOROPROPENE	YES	NA	NO	NO	NO	NO
1,4-DICHLOROBENZENE	YES	NA	NO	NO	NO	NO

Table D-15 (Continued)

Summary
Volatile Organic Compounds
Detected at OU1

NOTES:

YES/NO indicates if present in identified medium
GAR - geologic material
SS - surface soil
GW - groundwater
SW - surface water
SEDS - sediments
NA - not analyzed

Many VOCs present in samples from OU1 have been determined not to be contaminants at OU1. These VOCs are listed below along with the rationale for the determination.

Table D-16

Summary of Contaminants at OU1

	Surface Soil	Subsurface Soil	Groundwater	Surface Water/ Seeps	Sediments
Inorganic Analytes					
Selenium			X		
Vanadium			X		
Plutonium	X*	X*		X**	X**
Americium	X	X*		X**	X**
Uranium	X*	X*			
Volatile Organic Compounds					
1,1,1-Trichloroethane		X	X	X	X
Trichloroethene		X	X	X	
Tetrachloroethene		X	X	X	
Carbon Tetrachloride		X	X		
1,2-Dichloroethane		X	X	X	
Chloroform		X	X		
1,1-Dichloroethene		X	X	X	
1,2-Dichloroethene			X	X	
cis-1,2-Dichloroethene			X		
1,1,2-Trichloroethane			X		
1,1-Dichloroethane			X	X	
Toluene		X	X	X	X
Total Xylenes		X	X	X	
Semivolatile Organic Compounds					
Polynuclear Aromatic Hydrocarbons	X	X			X
Aroclor-1254	X				X
Aroclor-1248	X				

* Presence in these media is based on recently collected hot spot data.

** Presumed to be present as a contaminant of these media because of the widespread nature of the contamination originating from an off-site source.

Table D-17

Analytes Eliminated as OU1 Site Contaminants

Inorganic Parameters

Aluminum	Cesium	Lead	Potassium	Strontium
Antimony	Cesium-134	Lithium	Radium-226	Strontium-89,90
Arsenic	Cesium-137	Magnesium	Radium-228	Thallium
Barium	Chromium	Manganese	Silicon	Tin
Beryllium	Cobalt	Mercury	Silver	Tritium
Cadmium	Copper	Molybdenum	Sodium	Zinc
Calcium	Iron	Nickel		

Volatile Organic Compounds

Acetone	Dibromochloromethane	p-Cymene
Benzene	Dichlorodifluoromethane	sec-Butylbenzene
Benzene 1,2,4-Trimethyl	Ethylbenzene	Styrene
2-Butanone	2-Hexanone	Trans 1,3-Dichloropropene
Carbon Disulfide	4-Methyl-2-Pentanone	tert-Butylbenzene
Chlorobenzene	m-Xylene	Trichlorofluoromethane
1,2 Dichloropropane	Methylene Chloride	Vinyl Chloride
1,4 Dichlorobenzene	p-Chlorotoluene	Vinyl Acetate

Semivolatile Organic Compounds

Benzoic Acid	1,4-Dichlorobenzene	2-Methylnaphthalene
Benzyl Alcohol	2,6-Dinitrotoluene	4-Methylphenol
Beta-BHC	Di-n-Butyl Phthalate	Naphthalene
Bis(2-ethylhexyl)Phthalate	Di-n-Octyl Phthalate	4-Nitrophenol
Butyl Benzyl Phthalate	Dibenzofuran	N-Nitrosodipheylamine
4,4'-DDT	Diethyl Phthalate	Pentachlorophenol

Table D-18
Contaminant Screening Process
Groundwater Total Metals

Analyte	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
ALUMINUM	81/81	100.00	YES	YES	ELIMINATED	NO
ANTIMONY	38/77	49.35	YES	YES	ELIMINATED	NO
ARSENIC	51/81	62.96	YES	YES	ELIMINATED	NO
BARIUM	81/81	100.00	YES	YES	ELIMINATED	NO
BERYLLIUM	25/80	31.25	NO	NA	NA	NO
CADMIUM	42/79	53.16	NO	NA	NA	NO
CALCIUM	81/81	100.00	YES	YES	ELIMINATED	NO
CESIUM	16/74	21.62	NO	NA	NA	NO
CHROMIUM	70/81	86.42	YES	NO	NA	NO
COBALT	51/81	62.96	NO	NA	NA	NO
COPPER	76/80	95.00	YES	YES	ELIMINATED	NO
IRON	81/81	100.00	YES	YES	ELIMINATED	NO
LEAD	69/81	85.19	YES	YES	ELIMINATED	NO
LITHIUM	78/81	96.30	YES	YES	ELIMINATED	NO
MAGNESIUM	81/81	100.00	YES	YES	ELIMINATED	NO
MANGANESE	80/81	98.77	YES	YES	ELIMINATED	NO
MERCURY	6/81	7.41	YES	NO	NA	NO
MOLYBDENUM	71/81	87.65	NO	NA	NA	NO
NICKEL	68/81	83.95	NO	NA	NA	NO
POTASSIUM	79/81	97.53	YES	YES	ELIMINATED	NO
SELENIUM	47/80	58.75	YES	YES	RETAINED	YES
SILICON	31/31	100.00	YES	YES	ELIMINATED	NO
SILVER	26/78	33.33	NO	NA	NA	NO
SODIUM	81/81	100.00	YES	YES	ELIMINATED	NO
STRONTIUM	76/76	100.00	YES	YES	ELIMINATED	NO
THALLIUM	4/81	4.94	NO	NA	NA	NO
TIN	22/81	27.16	NO	NA	NA	NO
VANADIUM	80/81	98.77	YES	YES	RETAINED	YES
ZINC	79/81	97.53	YES	NO	NA	NO

NA - Not Applicable; ID - Insufficient Data

Table D-19
Contaminant Screening Process
Groundwater Total Radiochemistry

Isotope	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
AMERICIUM-241	117/118	99.15	YES	YES	ELIMINATED	NO
CESIUM-137	100/103	97.09	YES	NO	ELIMINATED	NO
GROSS ALPHA	13/13	100.00	NA	NA	NA	NA
GROSS BETA	10/10	100.00	NA	NA	NA	NA
PLUTONIUM-239,-240	131/133	98.50	NO	NA	NA	NO
RADIUM-226	4/4	100.00	YES	ID	ELIMINATED	NO
STRONTIUM-89,-90	8/8	100.00	NO	NA	NA	NO
TRITIUM	160/166	96.39	NO	NA	NA	NO
URANIUM-233,-234	15/15	100.00	YES	ID	ELIMINATED	NO
URANIUM-235	15/15	100.00	YES	YES	ELIMINATED	NO
URANIUM-238	18/18	100.00	YES	YES	ELIMINATED	NO

NA - Not Applicable; ID - Insufficient Data

Table D-20
Contaminant Screening Process
Groundwater Water Quality Parameters

Analyte	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
BICARBONATE AS CACO3	97/97	100.00	YES	NP	ELIMINATED	NO
CARBONATE AS CACO3	26/75	34.67	NO	NA	NA	NO
CHLORIDE	102/104	98.08	YES	NA	ELIMINATED	NO
CYANIDE	1/5	20.00	NO	NA	NA	NO
FLUORIDE	109/114	95.61	YES	NA	ELIMINATED	NO
NITRATE/NITRITE	93/115	80.87	YES	NA	ELIMINATED	NO
ORTHOPHOSPHATE	34/56	60.71	YES	NA	ELIMINATED	NO
SILICA, DISSOLVED	53/54	98.15	YES	NA	ELIMINATED	NO
SULFATE	107/111	96.40	YES	NA	ELIMINATED	NO
TOTAL DISSOLVED SOLIDS	113/115	98.26	YES	NA	ELIMINATED	NO
pH	21/21	100.00	YES	NA	ELIMINATED	NO

NP - Not Performed

NA - Not Applicable; ID - Insufficient Data

Table D-21
Contaminant Screening Process
Groundwater Organics

Compound	Detections/ Observations	Percent Detected	Known Waste?	Known Degradation Product?	Spatial/ Temporal Considerations?	Laboratory Artifact Considerations?	OU1 Contaminant?
1,1,1-TRICHLOROETHANE	30/211	14.22	YES	NA	NA	NA	YES
1,1,2-TRICHLOROETHANE	6/211	2.84	NO	NO	RETAINED	RETAINED	YES
1,1-DICHLOROETHANE	10/211	4.74	NO	NO	RETAINED	RETAINED	YES
1,1-DICHLOROETHENE	27/211	12.80	NO	YES	NA	RETAINED	YES
1,2-DICHLOROETHANE	5/211	2.37	NO	NO	RETAINED	RETAINED	YES
1,2-DICHLOROETHENE	6/146	4.11	NO	YES	NA	RETAINED	YES
1,2-DICHLOROPROPANE	1/211	0.47	NO	NO	ELIMINATED	NA	NO
2,6-DINITROTOLUENE	1/26	3.85	NO	NO	ELIMINATED	NA	NO
2-BUTANONE	4/123	3.25	NO	NO	ELIMINATED	ELIMINATED	NO
2-HEXANONE	1/138	0.72	NO	NO	ELIMINATED	NA	NO
4-METHYL-2-PENTANONE	1/148	0.68	NO	NO	ELIMINATED	NA	NO
ACETONE	47/142	33.10	NO	NO	ELIMINATED	ELIMINATED	NO
BENZENE	1/211	0.47	NO	NO	ELIMINATED	NA	NO
BENZENE, 1,2,4-TRIMETHYL	1/56	1.79	NO	NO	ELIMINATED	NA	NO
BENZOIC ACID	1/19	5.26	NO	NO	ELIMINATED	NA	NO
BIS(2-ETHYLHEXYL)PHTHALATE	2/26	7.69	NO	NO	ELIMINATED	ELIMINATED	NO
CARBON DISULFIDE	1/156	0.64	NO	NO	ELIMINATED	NA	NO
CARBON TETRACHLORIDE	34/211	16.11	YES	NA	NA	NA	YES
CHLOROFORM	40/211	18.96	NO	YES	RETAINED	RETAINED	YES
DI-n-BUTYL PHTHALATE	4/26	15.38	NO	NO	ELIMINATED	ELIMINATED	NO
DIBROMOCHLOROMETHANE	1/211	0.47	NO	NO	ELIMINATED	NA	NO
DICHLORODIFLUOROMETHANE	3/56	5.36	NO	NO	ELIMINATED	NA	NO
DIETHYL PHTHALATE	5/26	19.23	NO	NO	ELIMINATED	ELIMINATED	NO
ETHYLBENZENE	1/211	0.47	NO	NO	ELIMINATED	NA	NO
METHYLENE CHLORIDE	96/212	45.28	NO	NO	ELIMINATED	ELIMINATED	NO
NAPHTHALENE	2/56	3.57	YES	NA	ELIMINATED	NA	NO
STYRENE	3/211	1.42	NO	NO	ELIMINATED	NA	NO
TETRACHLOROETHENE	60/211	28.44	YES	NA	NA	NA	YES
TOLUENE	21/211	9.95	NO	NO	RETAINED	RETAINED	YES
TOTAL XYLENES	5/160	3.13	NO	NO	RETAINED	RETAINED	YES
TRICHLOROETHENE	72/211	34.12	YES	NA	NA	NA	YES
TRICHLOROFLUOROMETHANE	3/56	5.36	NO	NO	ELIMINATED	NA	NO
VINYL ACETATE	1/142	0.70	NO	NO	ELIMINATED	NA	NO
VINYL CHLORIDE	1/211	0.47	NO	NO	ELIMINATED	NA	NO
beta-BHC	1/15	6.67	NO	NO	ELIMINATED	NA	NO
cis-1,2-DICHLOROETHENE	3/56	5.38	NO	YES	RETAINED	RETAINED	YES
m-XYLENE	1/51	1.96	NO	NO	ELIMINATED	NA	NO
p-CHLOROTOLUENE	1/56	1.79	NO	NO	ELIMINATED	NA	NO
p-CYMENE	1/56	1.79	NO	NO	ELIMINATED	NA	NO
sec-BUTYLBENZENE	5/56	8.93	NO	NO	ELIMINATED	NA	NO
tert-BUTYLBENZENE	1/56	1.79	NO	NO	ELIMINATED	ELIMINATED	NO

NA - Not Applicable; ID - Insufficient Data

Table D-22
Contaminant Screening Process
Surface Soil Total Metals

Analyte	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
ALUMINUM	34/34	100.00	YES	NO	NA	NO
ANTIMONY	1/34	2.94	NO	NA	NA	NO
ARSENIC	33/34	97.06	NO	NA	NA	NO
BARIUM	34/34	100.00	NO	NA	NA	NO
BERYLLIUM	34/34	100.00	YES	NO	NA	NO
CADMIUM	6/28	21.43	YES	NO	NA	NO
CALCIUM	34/34	100.00	YES	YES	ELIMINATED	NO
CESIUM	34/34	100.00	YES	NO	NA	NO
CHROMIUM	34/34	100.00	YES	NO	NA	NO
COBALT	34/34	100.00	YES	NO	NA	NO
COPPER	34/34	100.00	YES	NO	NA	NO
IRON	34/34	100.00	YES	NO	NA	NO
LEAD	33/34	97.06	YES	YES	ELIMINATED	NO
LITHIUM	34/34	100.00	NO	NA	NA	NO
MAGNESIUM	34/34	100.00	NO	NA	NA	NO
MANGANESE	34/34	100.00	NO	NA	NA	NO
MERCURY	5/34	14.71	NO	NA	NA	NO
MOLYBDENUM	26/32	81.25	YES	YES	ELIMINATED	NO
NICKEL	34/34	100.00	YES	NO	NA	NO
POTASSIUM	34/34	100.00	YES	NO	NA	NO
SELENIUM	17/33	51.52	NO	NA	NA	NO
SILICON	34/34	100.00	YES	YES	ELIMINATED	NO
SODIUM	34/34	100.00	YES	NO	NA	NO
STRONTIUM	34/34	100.00	YES	YES	ELIMINATED	NO
THALLIUM	22/34	64.71	NO	NA	NA	NO
TIN	24/34	70.59	YES	NO	NA	NO
VANADIUM	34/34	100.00	YES	NO	NA	NO
ZINC	34/34	100.00	YES	NO	NA	NO

NA - Not Applicable; ID - Insufficient Data

Table D-23
Contaminant Screening Process
Surface Soil Total Radiochemistry

Isotope	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
AMERICIUM-241	28/28	100.00	YES	YES	NA	YES
PLUTONIUM-239,-240	34/34	100.00	YES	YES	NA	YES
RADIUM-226	21/21	100.00	NO	NA	NA	NO
RADIUM-228	21/21	100.00	NO	NA	NA	NO
URANIUM-233,-234	34/34	100.00	YES	YES	NA	YES
URANIUM-235	34/34	100.00	NO	NA	RETAINED	YES
URANIUM-238	34/34	100.00	YES	YES	NA	YES

NA - Not Applicable; ID - Insufficient Data

Table D-24
Contaminant Screening Process
Surface Soil Water Quality Parameters

Analyte	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
NITRATE/NITRITE	26/29	89.66	NO	NA	NA	NO

NA - Not Applicable; ID - Insufficient Data

Table D-25
Contaminant Screening Process
Surface Soil Organics

Compound	Detections/ Observations	Percent Detected	Known Waste?	Known Degradation Product?	Spatial/ Temporal Considerations?	Laboratory Artifact Considerations?	OU1 Contaminant?
ACENAPHTHENE	6/28	21.43	YES	NA	NA	NA	YES
ACENAPHTHYLENE	1/28	3.57	YES	NA	NA	NA	YES
ANTHRACENE	6/28	21.43	YES	NA	NA	NA	YES
AROCLOR-1248	1/28	3.46	NO	NO	RETAINED	RETAINED	YES
AROCLOR-1254	3/29	10.34	NO	NO	RETAINED	RETAINED	YES
BENZO(a)ANTHRACENE	13/28	46.43	YES	NA	NA	NA	YES
BENZO(a)PYRENE	14/28	50.00	YES	NA	NA	NA	YES
BENZO(b)FLUORANTHENE	13/28	46.43	YES	NA	NA	NA	YES
BENZO(g,h,i)PERYLENE	8/28	28.57	YES	NA	NA	NA	YES
BENZO(k)FLUORANTHENE	12/28	42.86	YES	NA	NA	NA	YES
BIS(2-ETHYLHEXYL)PHTHALATE	5/28	17.86	NO	NO	ELIMINATED	ELIMINATED	NO
CHRYSENE	19/28	67.14	YES	NA	NA	NA	YES
DI-n-BUTYL PHTHALATE	5/28	17.86	NO	NO	ELIMINATED	ELIMINATED	NO
DIBENZO(a,h)ANTHRACENE	4/27	14.81	YES	NA	NA	NA	YES
DIBENZOFURAN	2/28	7.14	NO	NO	ELIMINATED	NA	NO
FLUORANTHENE	19/28	67.86	YES	NA	NA	NA	YES
FLUORENE	5/28	17.86	YES	NA	NA	NA	YES
INDENO(1,2,3-cd)PYRENE	11/28	39.29	YES	NA	NA	NA	YES
NAPHTHALENE	1/28	3.57	YES	NA	NA	NA	YES
PHENANTHRENE	19/28	67.14	YES	NA	NA	NA	YES
PYRENE	18/28	64.29	YES	NA	NA	NA	YES

NA - Not Applicable; ID - Insufficient Data

Table D-26
Contaminant Screening Process
Geologic Materials Total Metals

Analyte	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
ALUMINUM	227/227	100.00	NO	NA	NA	NO
ANTIMONY	161/228	70.61	YES	YES	ELIMINATED	NO
ARSENIC	212/229	92.58	YES	YES	ELIMINATED	NO
BARIUM	228/229	99.56	YES	YES	ELIMINATED	NO
BERYLLIUM	179/229	78.17	NO	NA	NA	NO
CADMIUM	28/223	12.56	YES	YES	ELIMINATED	NO
CALCIUM	229/229	100.00	YES	YES	ELIMINATED	NO
CESIUM	47/213	22.07	NO	NA	NA	NO
CHROMIUM	229/229	100.00	YES	NO	NA	NO
COBALT	167/229	72.93	YES	YES	ELIMINATED	NO
COPPER	228/229	99.56	YES	YES	ELIMINATED	NO
IRON	228/228	100.00	YES	NO	NA	NO
LEAD	229/229	100.00	YES	NO	NA	NO
LITHIUM	147/229	64.19	YES	YES	ELIMINATED	NO
MAGNESIUM	229/229	100.00	YES	NO	NA	NO
MANGANESE	229/229	100.00	YES	YES	ELIMINATED	NO
MERCURY	38/228	16.67	NO	NA	NA	NO
MOLYBENDUM	89/227	39.21	YES	YES	ELIMINATED	NO
NICKEL	222/229	96.94	NO	NA	NA	NO
POTASSIUM	186/228	81.58	NO	NA	NA	NO
SELENIUM	41/227	18.06	NO	NA	NA	NO
SILICON	21/21	100.00	YES	NO	NA	NO
SILVER	27/224	12.05	NO	NA	NA	NO
SODIUM	156/229	68.12	YES	NO	NA	NO
STRONTIUM	155/229	67.69	YES	YES	ELIMINATED	NO
THALLIUM	83/227	36.56	NO	NA	NA	NO
TIN	18/223	8.07	YES	ID	NA	NO
VANADIUM	228/229	99.56	NO	NA	NA	NO
ZINC	229/229	100.00	YES	NO	NA	NO

NA - Not Applicable; ID - Insufficient Data

Table D-27
Contaminant Screening Process
Geologic Materials Total Radiochemistry

Isotope	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
AMERICIUM-241	194/200	97.00	YES	YES	RETAINED	YES
CESIUM-137	152/152	100.00	YES	NO	ELIMINATED	NO
PLUTONIUM-239,-240	154/158	98.72	YES	ID	RETAINED	YES
RADIUM-226	138/138	100.00	YES	NO	NA	NO
RADIUM-228	158/158	100.00	YES	NO	NA	NO
STRONTIUM-89,-90	169/174	97.13	YES	ID	ELIMINATED	NO
TRITIUM	190/192	98.98	YES	YES	ELIMINATED	NO
URANIUM-233,-234	199/199	100.00	YES	NO	RETAINED	YES
URANIUM-235	199/199	100.00	YES	ID	RETAINED	YES
URANIUM-238	199/199	100.00	YES	YES	RETAINED	YES

NA - Not Applicable; ID - Insufficient Data

Table D-28
Contaminant Screening Process
Geologic Materials Water Quality Parameters

Analyte	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
NITRATE/NITRITE	31/66	46.97	YES	NA	ELIMINATED	NO
SULFIDE	29/83	34.94	NO	NA	NA	NO
pH	83/83	100.00	NO	NA	NA	NO

NA - Not Applicable; ID - Insufficient Data

Table D-29
Contaminant Screening Process
Geologic Materials Organics

Compound	Detections/ Observations	Percent Detected	Known Waste?	Known Degradation Product?	Spatial/ Temporal Considerations?	Laboratory Artifact Considerations?	OU1 Contaminant?
1,1,1-TRICHLOROETHANE	2/432	0.46	YES	NA	NA	NA	YES
1,1-DICHLOROETHENE	2/432	0.46	NO	YES	NA	RETAINED	YES
1,2-DICHLOROETHANE	1/422	0.24	NO	NO	YES	RETAINED	YES
1,4-DICHLOROBENZENE	4/187	2.14	NO	NO	ELIMINATED	NA	NO
2-BUTANONE	21/330	6.36	NO	NO	ELIMINATED	ELIMINATED	NO
2-HEXANONE	3/373	0.80	NO	NO	ELIMINATED	NA	NO
2-METHYLNAPHTHALENE	1/187	0.53	YES	NA	NA	NA	YES
4-METHYL-2-PENTANONE	8/387	2.07	NO	NO	ELIMINATED	NA	NO
4-NITROPHENOL	2/185	1.08	NO	NO	ELIMINATED	NA	NO
ACENAPHTHENE	4/187	2.14	YES	NA	NA	NA	YES
ACETONE	170/365	46.58	NO	NO	ELIMINATED	ELIMINATED	NO
ANTHRACENE	5/187	2.67	YES	NA	NA	NA	YES
BENZO(a)ANTHRACENE	4/187	2.14	YES	NA	NA	NA	YES
BENZO(a)PYRENE	3/187	1.60	YES	NA	NA	NA	YES
BENZO(b)FLUORANTHENE	3/184	1.63	YES	NA	NA	NA	YES
BENZO(g,h,i)PERYLENE	2/187	1.07	YES	NA	NA	NA	YES
BENZO(k)FLUORANTHENE	2/184	1.09	YES	NA	NA	NA	YES
BENZOIC ACID	2/182	1.10	NO	NO	ELIMINATED	NA	NO
BIS(2-ETHYLHEXYL)PHTHALATE	30/184	16.30	NO	NO	ELIMINATED	ELIMINATED	NO
BUTYL BENZYL PHTHALATE	1/187	0.53	NO	NO	ELIMINATED	ELIMINATED	NO
CARBON DISULFIDE	7/424	1.65	NO	NO	ELIMINATED	NA	NO
CARBON TETRACHLORIDE	2/432	0.46	YES	NA	NA	NA	YES
CHLOROBENZENE	1/432	0.23	NO	NO	ELIMINATED	NA	NO
CHLOROFORM	1/432	0.23	NO	YES	RETAINED	RETAINED	YES
CHRYSENE	4/187	2.14	YES	NA	NA	NA	YES
DI-n-BUTYL PHTHALATE	41/187	21.93	NO	NO	RETAINED	ELIMINATED	NO
DI-n-OCTYL PHTHALATE	2/187	1.07	NO	NO	ELIMINATED	ELIMINATED	NO
DIBENZOFURAN	1/185	0.54	NO	NO	ELIMINATED	NA	NO
DIETHYL PHTHALATE	1/187	0.53	NO	NO	ELIMINATED	ELIMINATED	NO
ETHYLBENZENE	1/432	0.23	NO	NO	ELIMINATED	NA	NO
FLUORANTHENE	11/187	5.88	YES	NA	NA	NA	YES
FLUORENE	2/187	1.07	YES	NA	NA	NA	YES
INDENO(1,2,3-cd)PYRENE	2/187	1.07	YES	NA	NA	NA	YES
METHYLENE CHLORIDE	211/424	49.76	NO	YES	ELIMINATED	ELIMINATED	NO
N-NITROSODIPHENYLAMINE	2/187	1.07	NO	NO	ELIMINATED	NA	NO
NAPHTHALENE	3/187	1.60	YES	NA	NA	NA	YES
PENTACHLOROPHENOL	2/187	1.07	NO	NO	ELIMINATED	NA	NO
PHENANTHRENE	9/187	4.81	YES	NA	NA	NA	YES
PYRENE	13/187	6.95	YES	NA	NA	NA	YES
STYRENE	3/432	0.69	NO	NO	ELIMINATED	NA	NO
TETRACHLOROETHENE	7/431	1.62	YES	NA	NA	NA	YES
TOLUENE	418/432	96.99	NO	NO	RETAINED	RETAINED	YES
TOTAL XYLENES	1/432	0.23	NO	NO	RETAINED	RETAINED	YES
TRICHLOROETHENE	9/432	2.08	YES	NA	NA	NA	YES
trans-1,3-DICHLOROPROPENE	1/413	0.24	NO	NO	ELIMINATED	NA	NO

NA - Not Applicable; ID - Insufficient Data

Table D-30
Contaminant Screening Process
Sediment Total Metals

Analyte	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
ALUMINUM	11/11	100.00	NO	NA	NA	NO
ARSENIC	12/12	100.00	NO	NA	NA	NO
BARIUM	12/12	100.00	YES	YES	ELIMINATED	NO
BERYLLIUM	9/12	75.00	NO	NA	NA	NO
CADMIUM	4/12	33.33	NO	NA	NA	NO
CALCIUM	12/12	100.00	YES	YES	ELIMINATED	NO
CESIUM	3/12	25.00	NO	NA	NA	NO
CHROMIUM	12/12	100.00	NO	NA	NA	NO
COBALT	12/12	100.00	YES	YES	ELIMINATED	NO
COPPER	12/12	100.00	NO	NA	NA	NO
IRON	12/12	100.00	NO	NA	NA	NO
LEAD	12/12	100.00	YES	YES	ELIMINATED	NO
LITHIUM	12/12	100.00	NO	NA	NA	NO
MAGNESIUM	12/12	100.00	NO	NA	NA	NO
MANGANESE	12/12	100.00	NO	NA	NA	NO
MOLYBDENUM	6/12	50.00	NO	NA	NA	NO
NICKEL	11/12	91.67	NO	NA	NA	NO
POTASSIUM	11/12	91.67	NO	NA	NA	NO
SELENIUM	7/12	58.33	NO	NA	NA	NO
SILICON	11/11	100.00	NO	NA	NA	NO
SILVER	3/12	25.00	YES	YES	ELIMINATED	NO
SODIUM	12/12	100.00	YES	YES	ELIMINATED	NO
STRONTIUM	12/12	100.00	YES	YES	ELIMINATED	NO
THALLIUM	2/12	16.67	YES	YES	ELIMINATED	NO
TIN	4/12	33.33	NO	NA	NA	NO
VANADIUM	12/12	100.00	NO	NA	NA	NO
ZINC	12/12	100.00	YES	YES	ELIMINATED	NO

NA - Not Applicable; ID - Insufficient Data

Table D-31
Contaminant Screening Process
Sediment Total Radiochemistry

Isotope	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
AMERICIUM-241	11/11	100.00	NO	NA	RETAINED	YES
CESIUM-134	4/4	100.00	NP	NP	ELIMINATED	NO
CESIUM-137	12/12	100.00	NO	NA	NA	NO
PLUTONIUM-239,-240	12/12	100.00	YES	ID	RETAINED	YES
RADIUM-226	3/3	100.00	NO	NA	NA	NO
RADIUM-228	6/6	100.00	NO	NA	NA	NO
STRONTIUM-89,-90	12/12	100.00	YES	NO	ELIMINATED	NO
TRITIUM	7/7	100.00	NO	NA	NA	NO
URANIUM-233,-234	12/12	100.00	NO	NA	NA	NO
URANIUM-235	12/12	100.00	NO	NA	NA	NO
URANIUM-238	12/12	100.00	NO	NA	NA	NO

NP - Not Performed

NA - Not Applicable; ID - Insufficient Data

Table D-32
Contaminant Screening Process
Sediment Water Quality Parameters

Analyte	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
BICARBONATE AS CACO3	2/2	100.00	NO	NA	NA	NO
CARBONATE	2/2	100.00	NO	NA	NA	NO
NITRATE/NITRITE	8/10	80.00	NO	NA	NA	NO
pH	10/10	100.00	NO	NA	NA	NO

NA - Not Applicable; ID - Insufficient Data

Table D-33
Contaminant Screening Process
Sediment Organics

Compound	Detections/ Observations	Percent Detected	Known Waste?	Known Degradation Product?	Spatial/ Temporal Considerations?	Laboratory Artifact Considerations?	OU1 Contaminant?
1,1,1-TRICHLOROETHANE	1/11	9.09	YES	NA	NA	NA	YES
2-BUTANONE	5/13	38.46	NO	NO	ELIMINATED	ELIMINATED	NO
4,4'-DDT	1/10	10.00	NO	NO	ELIMINATED	NA	NO
4-METHYLPHENOL	2/13	15.38	NO	NO	ELIMINATED	NA	NO
ACETONE	10/13	76.92	NO	NO	ELIMINATED	ELIMINATED	NO
AROCLOR-1254	2/10	20.00	NO	NO	RETAINED	RETAINED	YES
BENZO(b)FLUORANTHENE	1/13	7.69	YES	NA	NA	NA	YES
BENZO(k)FLUORANTHENE	1/13	7.69	YES	NA	NA	NA	YES
BIS(2-ETHYLHEXYL)PHTHALATE	11/13	84.62	NO	NO	ELIMINATED	ELIMINATED	NO
BUTYL BENZYL PHTHALATE	1/13	7.69	NO	NO	ELIMINATED	ELIMINATED	NO
CHRYSENE	2/13	15.38	YES	NA	NA	NA	YES
DI-n-BUTYL PHTHALATE	6/13	46.15	NO	NO	ELIMINATED	ELIMINATED	NO
DI-n-OCTYL PHTHALATE	1/13	7.69	NO	NO	ELIMINATED	ELIMINATED	NO
FLUORANTHENE	4/13	30.77	YES	NA	NA	NA	YES
METHYLENE CHLORIDE	10/13	76.92	NO	NO	ELIMINATED	ELIMINATED	NO
PHENANTHRENE	1/13	7.69	YES	NA	NA	NA	YES
PYRENE	4/13	30.77	YES	NA	NA	NA	YES
TOLUENE	2/13	15.38	NO	NO	RETAINED	RETAINED	YES

NA - Not Applicable; ID - Insufficient Data

Table D-34
Contaminant Screening Process
Surface Water Total Metals

Analyte	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
ALUMINUM	233/271	85.98	YES	NO	NA	NO
ANTIMONY	33/270	12.22	YES	YES	ELIMINATED	NO
ARSENIC	28/259	10.81	YES	YES	ELIMINATED	NO
BARIUM	231/273	84.62	YES	YES	ELIMINATED	NO
BERYLLIUM	17/257	6.61	NO	NA	NA	NO
CADMIUM	23/253	9.09	NO	NA	NA	NO
CALCIUM	272/273	99.63	YES	YES	ELIMINATED	NO
CESIUM	30/271	11.07	NO	NA	NA	NO
CHROMIUM	50/272	18.38	YES	YES	ELIMINATED	NO
COBALT	28/273	10.26	NO	NA	NA	NO
COPPER	113/271	41.70	YES	YES	ELIMINATED	NO
IRON	253/273	92.67	YES	NO	NA	NO
LEAD	133/271	49.08	YES	YES	ELIMINATED	NO
LITHIUM	152/270	56.30	YES	YES	ELIMINATED	NO
MAGNESIUM	269/273	98.53	YES	YES	ELIMINATED	NO
MANGANESE	244/273	89.38	NO	NA	NA	NO
MERCURY	12/252	4.76	NO	NA	NA	NO
MOLYBDENUM	42/270	15.56	NO	NA	NA	NO
NICKEL	37/266	13.91	YES	YES	ELIMINATED	NO
POTASSIUM	206/272	75.74	YES	YES	ELIMINATED	NO
SELENIUM	54/262	20.61	YES	YES	ELIMINATED	NO
SILICON	131/131	100.00	YES	NO	NA	NO
SILVER	41/271	15.13	YES	YES	ELIMINATED	NO
SODIUM	271/273	99.27	YES	YES	ELIMINATED	NO
STRONTIUM	212/268	79.10	YES	YES	ELIMINATED	NO
THALLIUM	3/260	1.15	NO	NA	NA	NO
TIN	47/251	18.73	NO	NA	NA	NO
VANADIUM	115/273	42.12	YES	YES	ELIMINATED	NO
ZINC	225/272	82.72	YES	NO	NA	NO

NA - Not Applicable; ID - Insufficient Data

Table D-35
Contaminant Screening Process
Surface Water Total Radiochemistry

Isotope	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
AMERICIUM-241	177/206	85.94	YES	YES	RETAINED	YES
CESIUM-137	151/172	87.79	YES	YES	ELIMINATED	NO
PLUTONIUM-239,-240	151/164	92.07	YES	ID	RETAINED	YES
RADIUM-226	17/18	94.44	NO	NA	NA	NO
RADIUM-228	4/4	100	ID	ID	ELIMINATED	NO
STRONTIUM-89,-90	65/77	84.42	YES	ID	ELIMINATED	NO
TRITIUM	153/229	66.81	YES	NO	NA	NO
URANIUM-233,-234	122/122	100.00	YES	ID	ELIMINATED	NO
URANIUM-235	105/122	86.07	YES	NO	ELIMINATED	NO
URANIUM-238	122/122	100.00	YES	YES	ELIMINATED	NO

NA - Not Applicable; ID - Insufficient Data

Table D-36
Contaminant Screening Process
Surface Water Quality Parameters

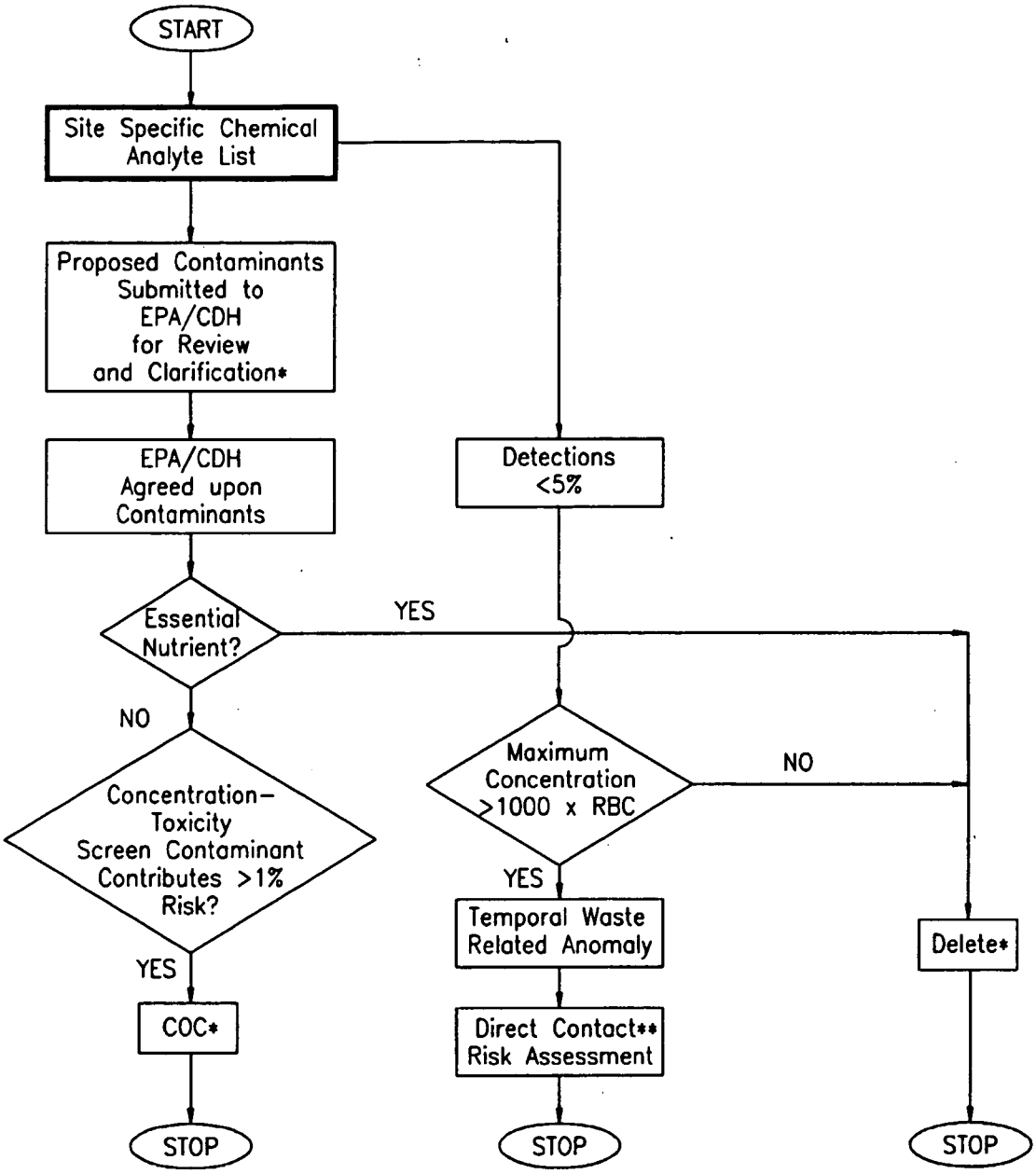
Analyte	Detections/ Observations	Percent Detected	UTL Exceedance?	Significant Difference by ANOVA?	Spatial/ Temporal Considerations?	OU1 Contaminant?
BICARBONATE AS CACO3	92/93	98.92	YES	NA	ELIMINATED	NO
CARBONATE AS CACO3	44/77	57.14	NO	NA	NA	NO
CHLORIDE	163/163	100.00	YES	NA	ELIMINATED	NO
CYANIDE	4/94	4.26	YES	NA	ELIMINATED	NO
FLUORIDE	80/89	89.89	YES	NA	ELIMINATED	NO
NITRATE/NITRITE	127/158	80.38	YES	NA	ELIMINATED	NO
ORTHOPHOSPHATE	9/69	13.04	NO	NA	NA	NO
SILICA, DISSOLVED	52/53	98.11	YES	NA	ELIMINATED	NO
SULFATE	156/158	98.73	YES	NA	ELIMINATED	NO
SULFIDE	9/52	17.31	YES	NA	ELIMINATED	NO
TOTAL DISSOLVED SOLIDS	168/170	98.82	YES	NA	ELIMINATED	NO
pH	73/73	100.00	NO	NA	NA	NO

NA - Not Applicable; ID - Insufficient Data

Table D-37
Contaminant Screening Process
Surface Water Organics

Compound	Detections/ Observations	Percent Detected	Known Waste?	Known Degradation Product?	Spatial/ Temporal Considerations?	Laboratory Artifact Considerations?	OU1 Contaminant?
1,1,1-TRICHLOROETHANE	2/236	0.85	YES	NA	NA	NA	YES
1,1-DICHLOROETHANE	1/235	0.43	NO	YES	RETAINED	RETAINED	YES
1,1-DICHLOROETHENE	1/233	0.43	NO	YES	NA	RETAINED	YES
1,2-DICHLOROETHANE	3/236	1.28	NO	NO	RETAINED	RETAINED	YES
1,2-DICHLOROETHENE	1/235	0.43	NO	YES	NA	RETAINED	YES
1,2-DICHLOROPROPANE	1/236	0.43	NO	NO	ELIMINATED	NA	NO
2-BUTANONE	7/223	3.14	NO	NO	ELIMINATED	ELIMINATED	NO
ACETONE	60/205	29.27	NO	NO	ELIMINATED	ELIMINATED	NO
BENZYL ALCOHOL	1/42	2.38	NO	NO	ELIMINATED	NA	NO
BIS(2-ETHYLHEXYL)PHTHALATE	6/42	14.29	NO	NO	ELIMINATED	ELIMINATED	NO
CARBON DISULFIDE	3/230	1.30	NO	NO	ELIMINATED	NA	NO
DI-n-BUTYL PHTHALATE	1/42	2.38	NO	NO	ELIMINATED	ELIMINATED	NO
ETHYLBENZENE	1/238	0.42	NO	NO	ELIMINATED	NA	NO
METHYLENE CHLORIDE	120/234	51.28	NO	NO	ELIMINATED	ELIMINATED	NO
N-NITROSODIPHENYLAMINE	1/42	2.38	NO	NO	ELIMINATED	NA	NO
STYRENE	1/235	0.43	NO	NO	ELIMINATED	NA	NO
TETRACHLOROETHENE	15/235	6.38	YES	NA	NA	NA	YES
TOLUENE	8/239	3.35	NO	NO	RETAINED	RETAINED	YES
TOTAL XYLENES	1/239	0.42	NO	NO	RETAINED	RETAINED	YES
TRICHLOROETHENE	9/236	3.83	YES	NA	NA	NA	YES

NA - Not Applicable; ID - Insufficient Data



* PROFESSIONAL JUDGEMENT MAY BE USED TO RETAIN OR DELETE A CHEMICAL.

** DIRECT EXPOSURE THROUGH INGESTION, INHALATION OR DERMAL EXPOSURE AS APPLICABLE.

UTL = Upper Tolerance Limit
ANOVA = Analysis of Variance
RBC = Risk Based Concentration

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881 HILLSIDE AREA
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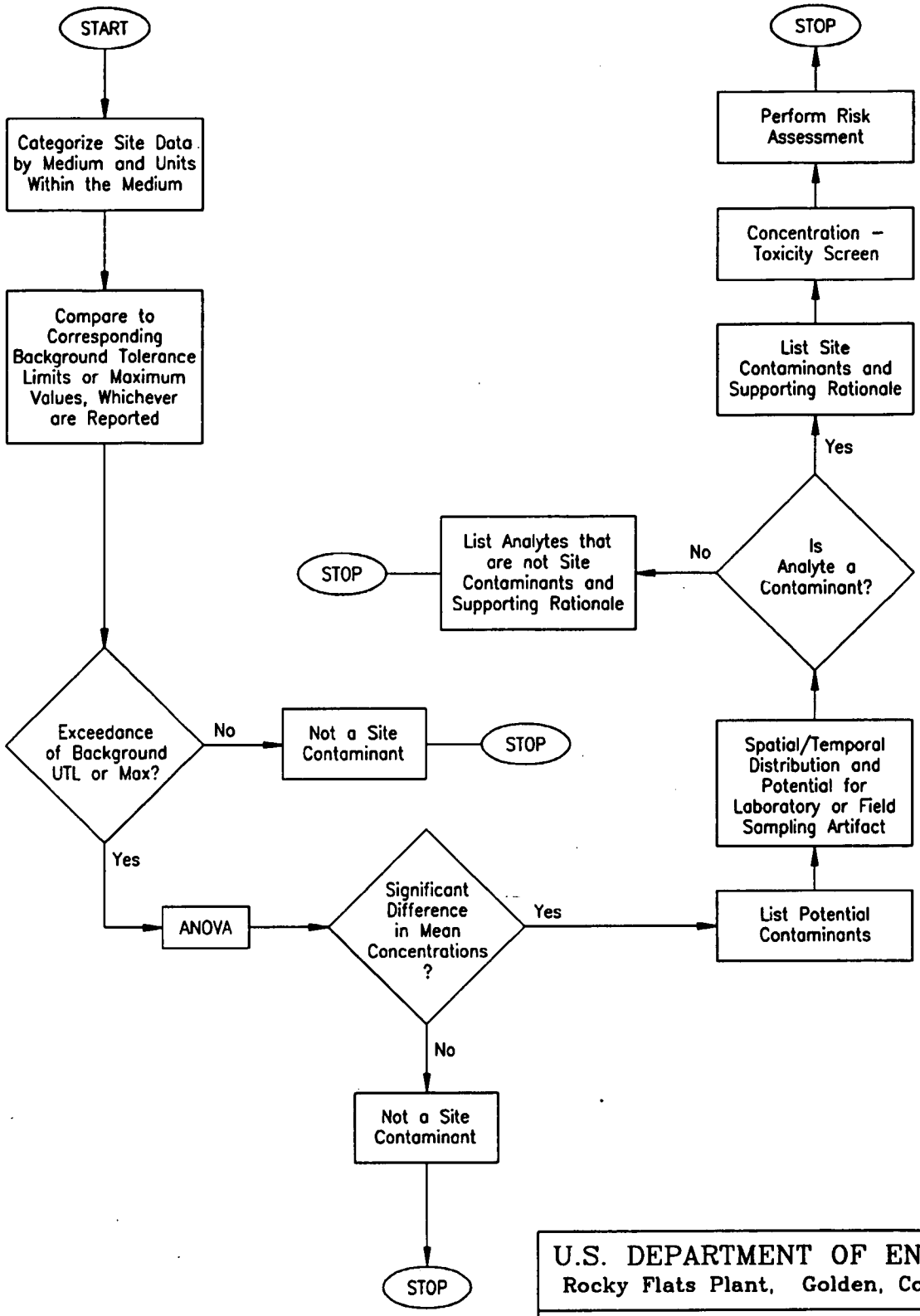
Contaminants of Concern Screening Flow Chart

Figure D-1

REV. FEBRUARY 1994
AUGUST 1993

R74266.PJMBPJ-053194



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881 HILLSIDE AREA
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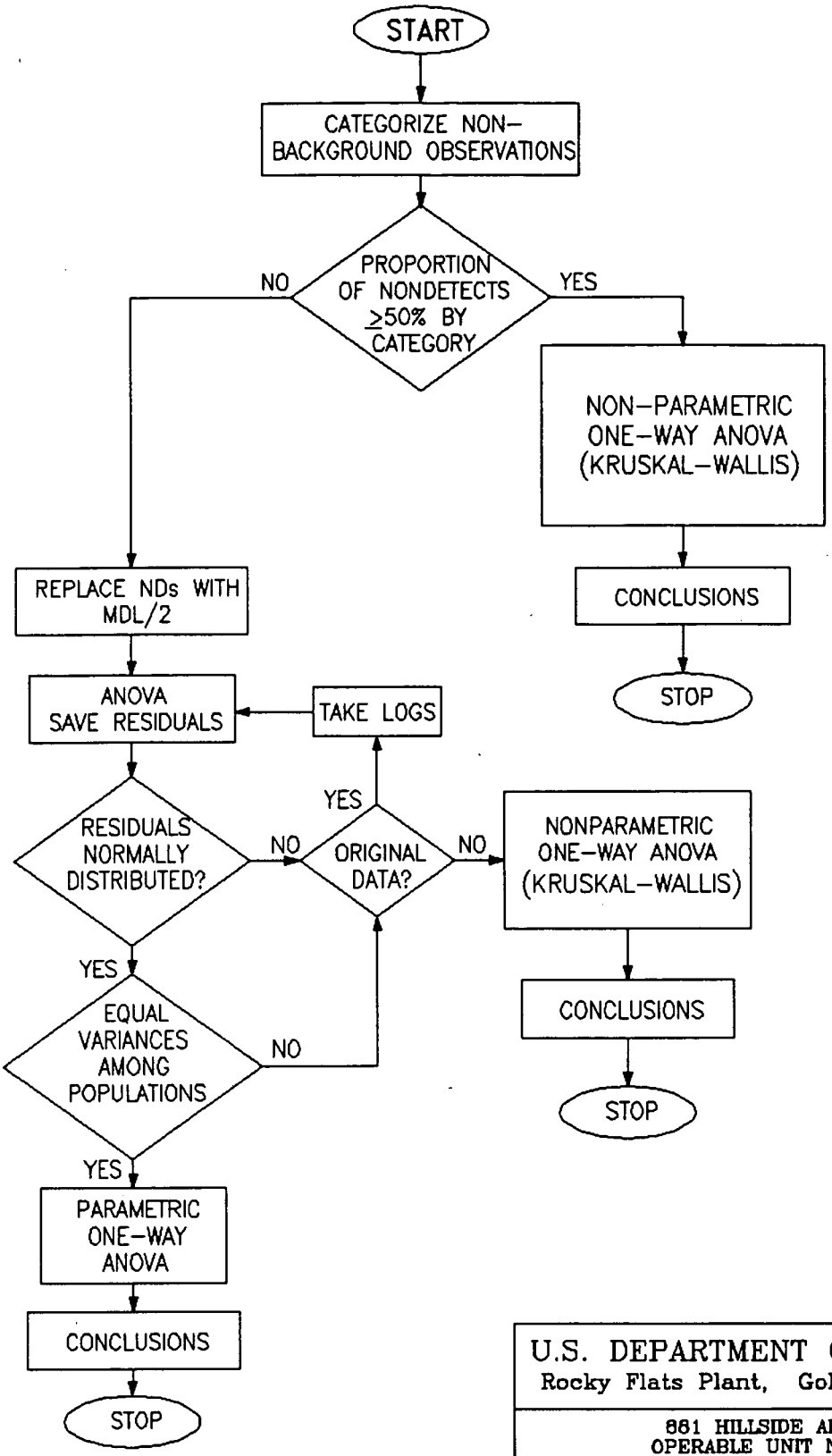
Determination of Site Contaminants
Inorganic Analytes

Figure D-2

REV. JUNE 1994
AUGUST 1993

R74029.MBCW-061094



ADAPTED FROM EPA, 1989

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881 HILLSIDE AREA
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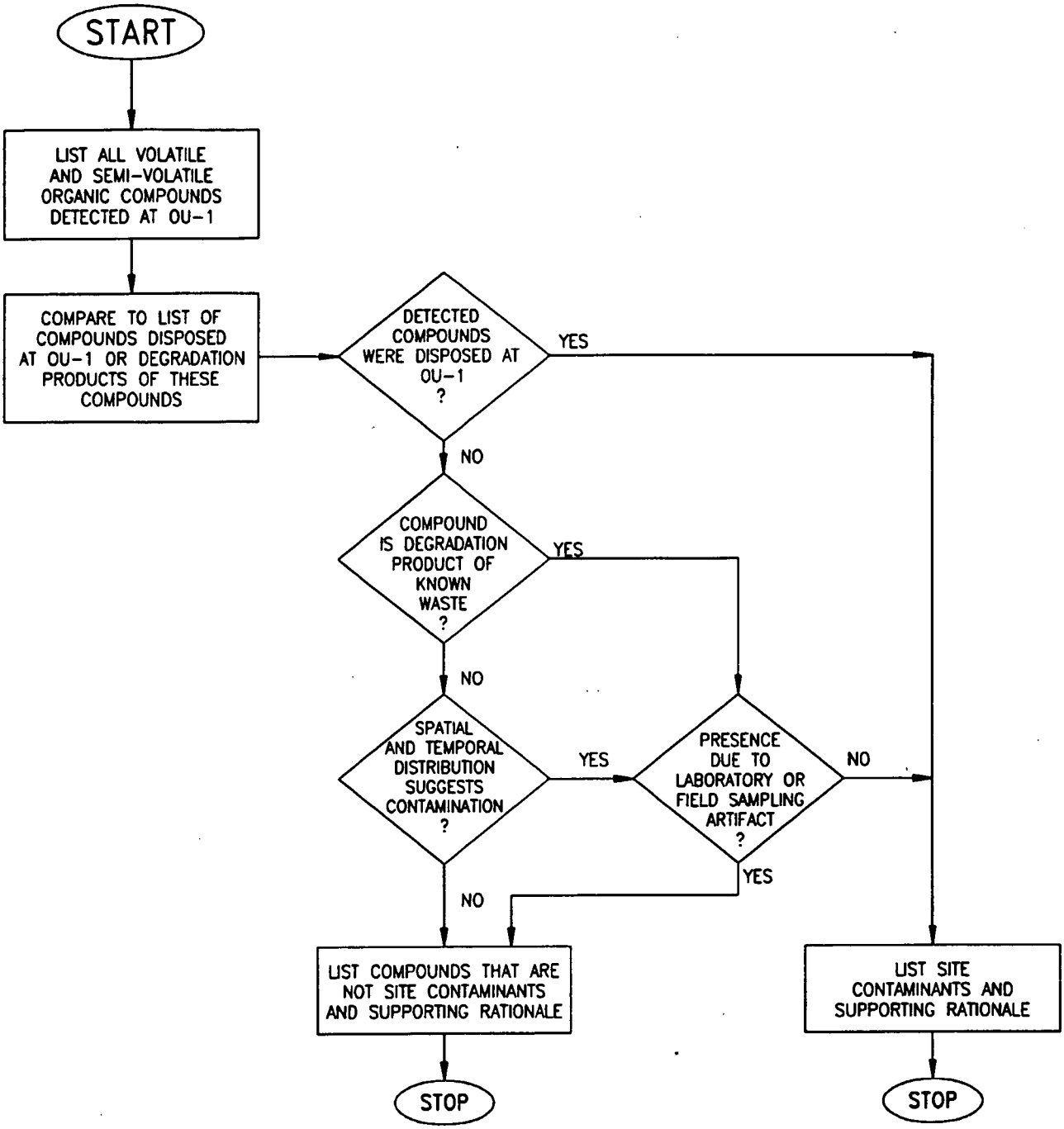
Selection of Statistical Method for Comparision of Background and Non-Background Populations

Figure D-3

REV. OCTOBER 1993
AUGUST 1993

R74156.PJMB102093



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Determination of Site Contaminants
Volatile and Semi-Volatile
Organic Analyte

Figure D-4

REV. JUNE 1994
AUGUST 1993

R74030.MBCW-061094

Figure D-5
Groundwater (COL) Total Aluminum

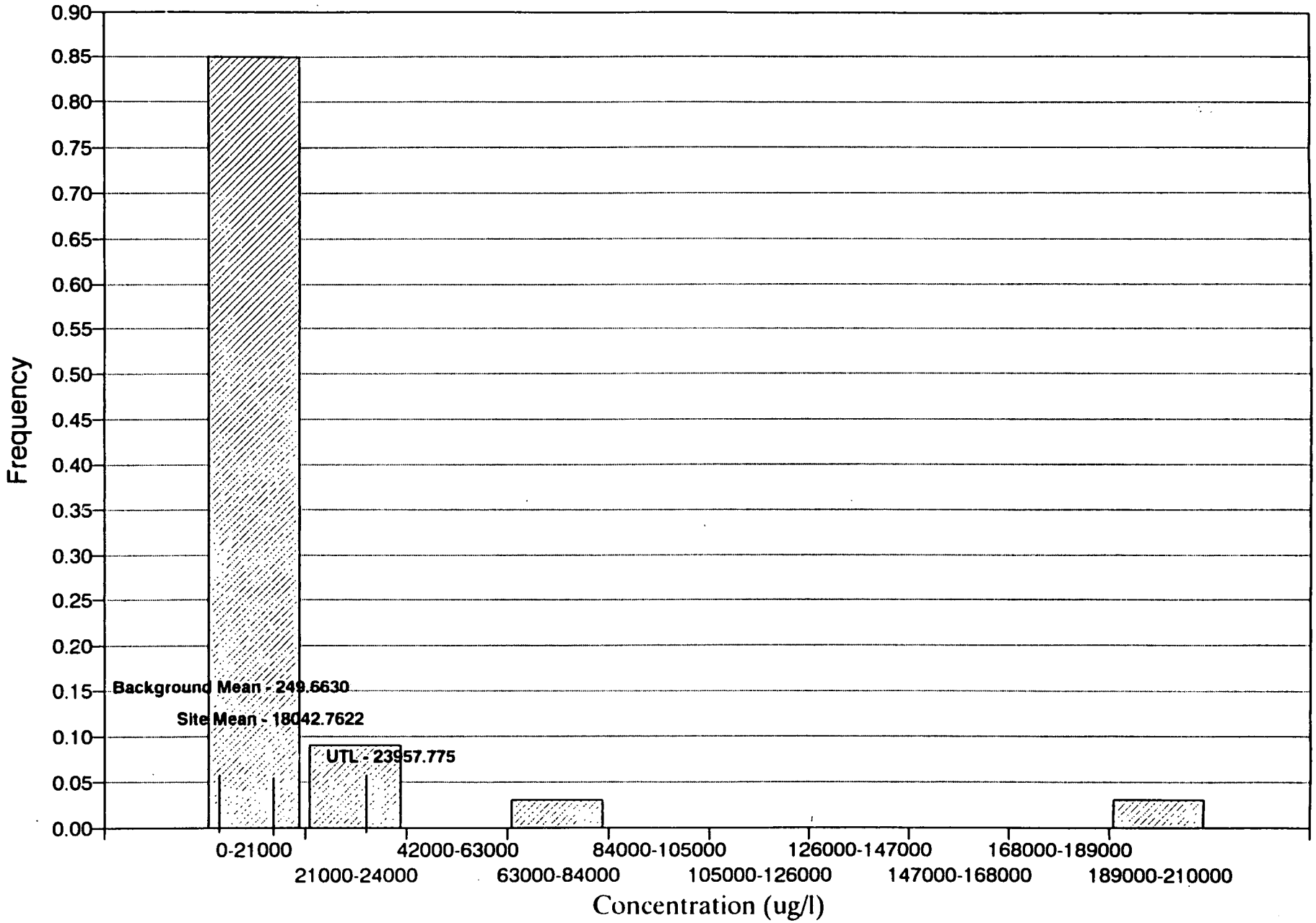


Figure D-6
Groundwater (WCS) Total Aluminum

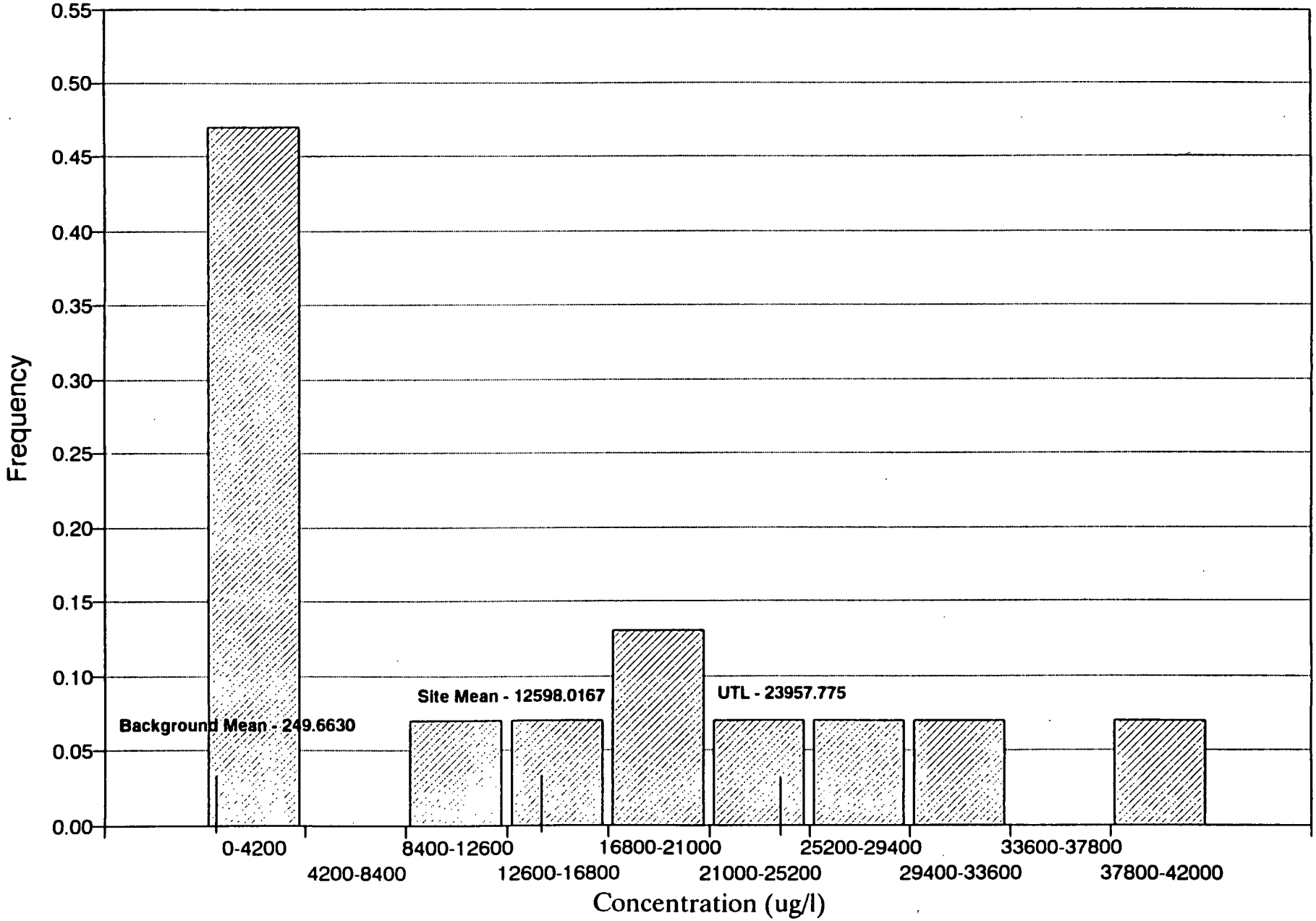
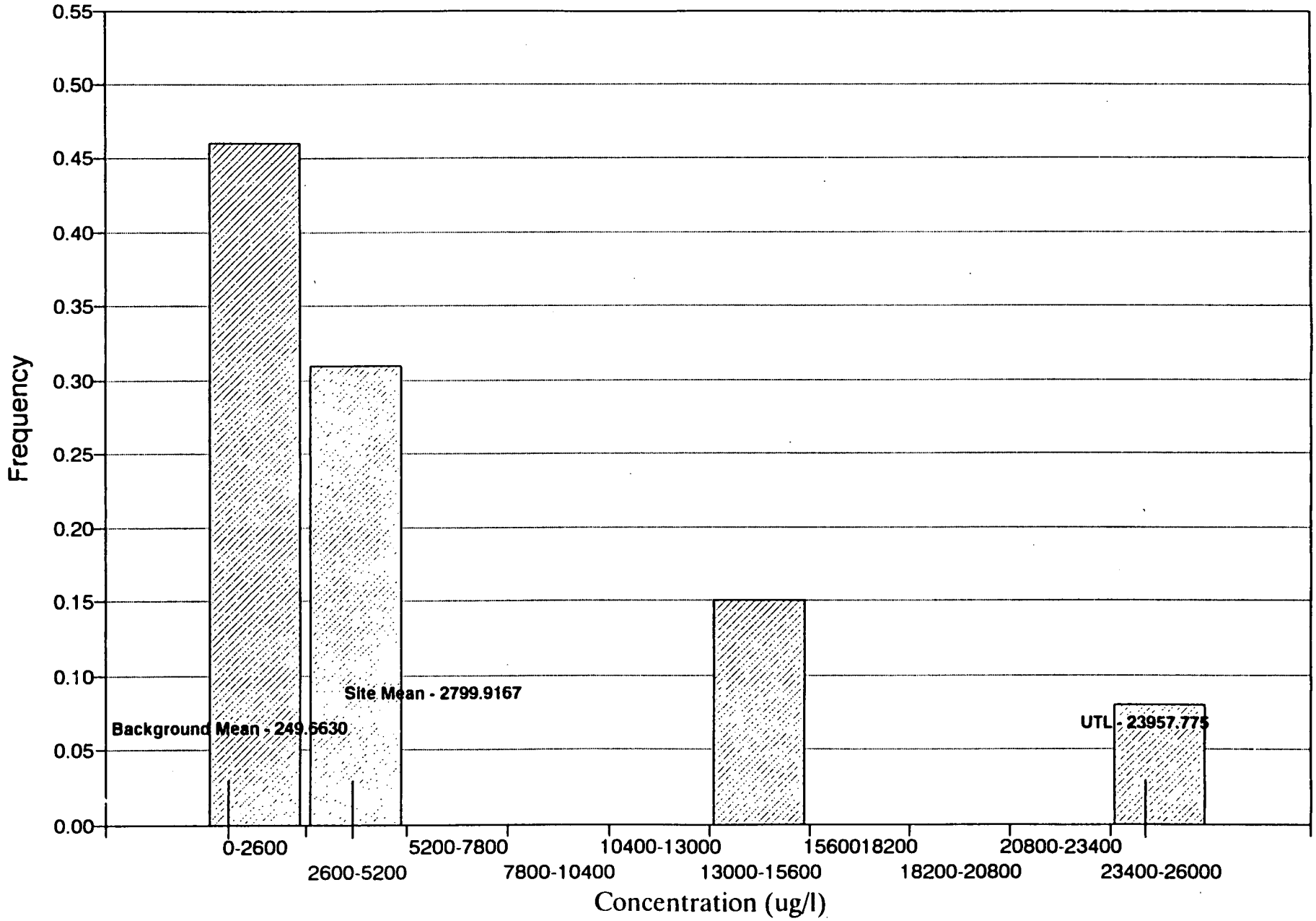
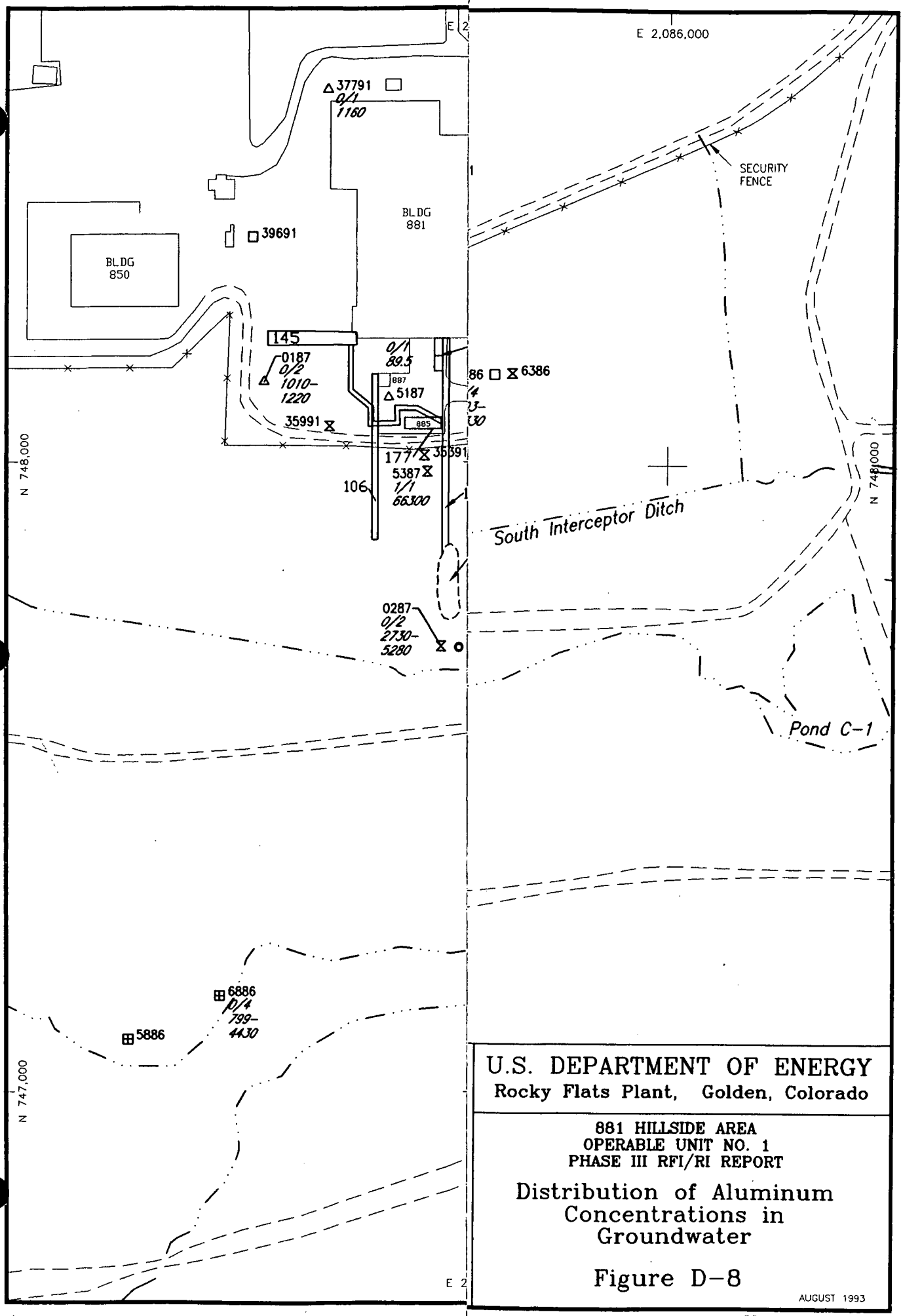


Figure D-7
Groundwater (KAR) Total Aluminum





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Distribution of Aluminum Concentrations in Groundwater

Figure D-8

AUGUST 1993

R74136.PJMB090293/200

Figure D-10
Geologic Material (COL) Total Antimony

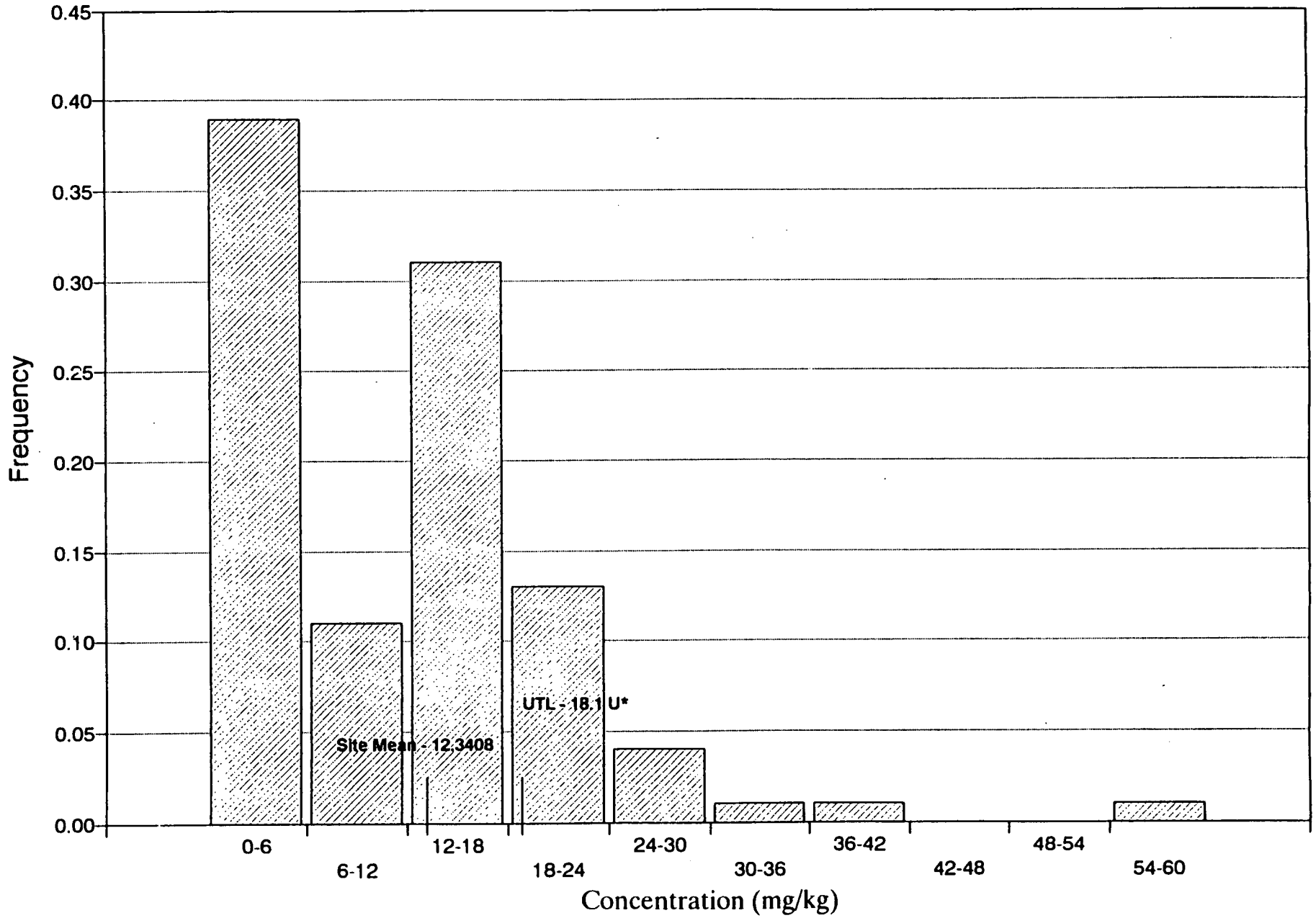


Figure D-11
Geologic Material (WCS) Total Antimony

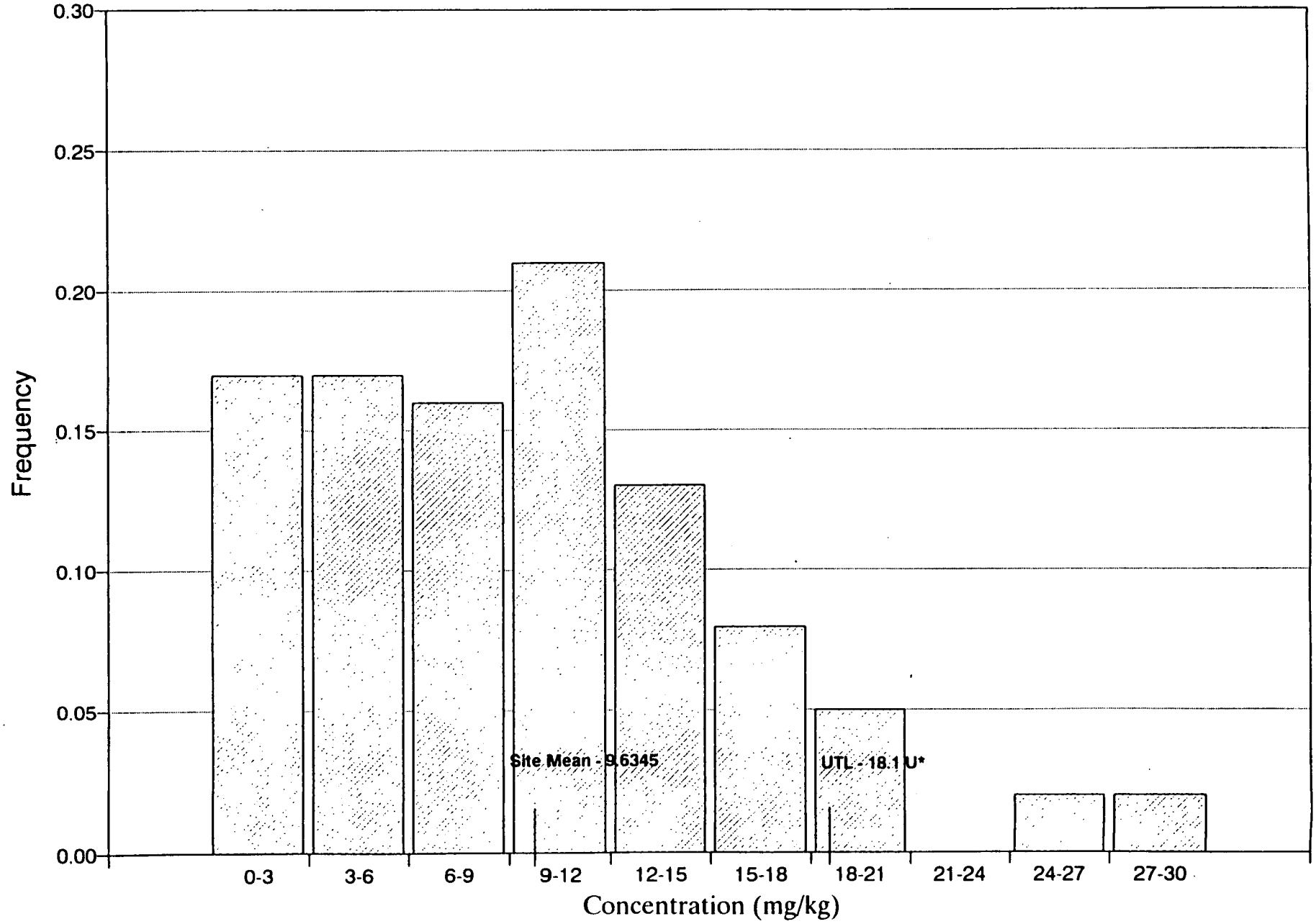


Figure D-12
Groundwater (WCS) Total Antimony

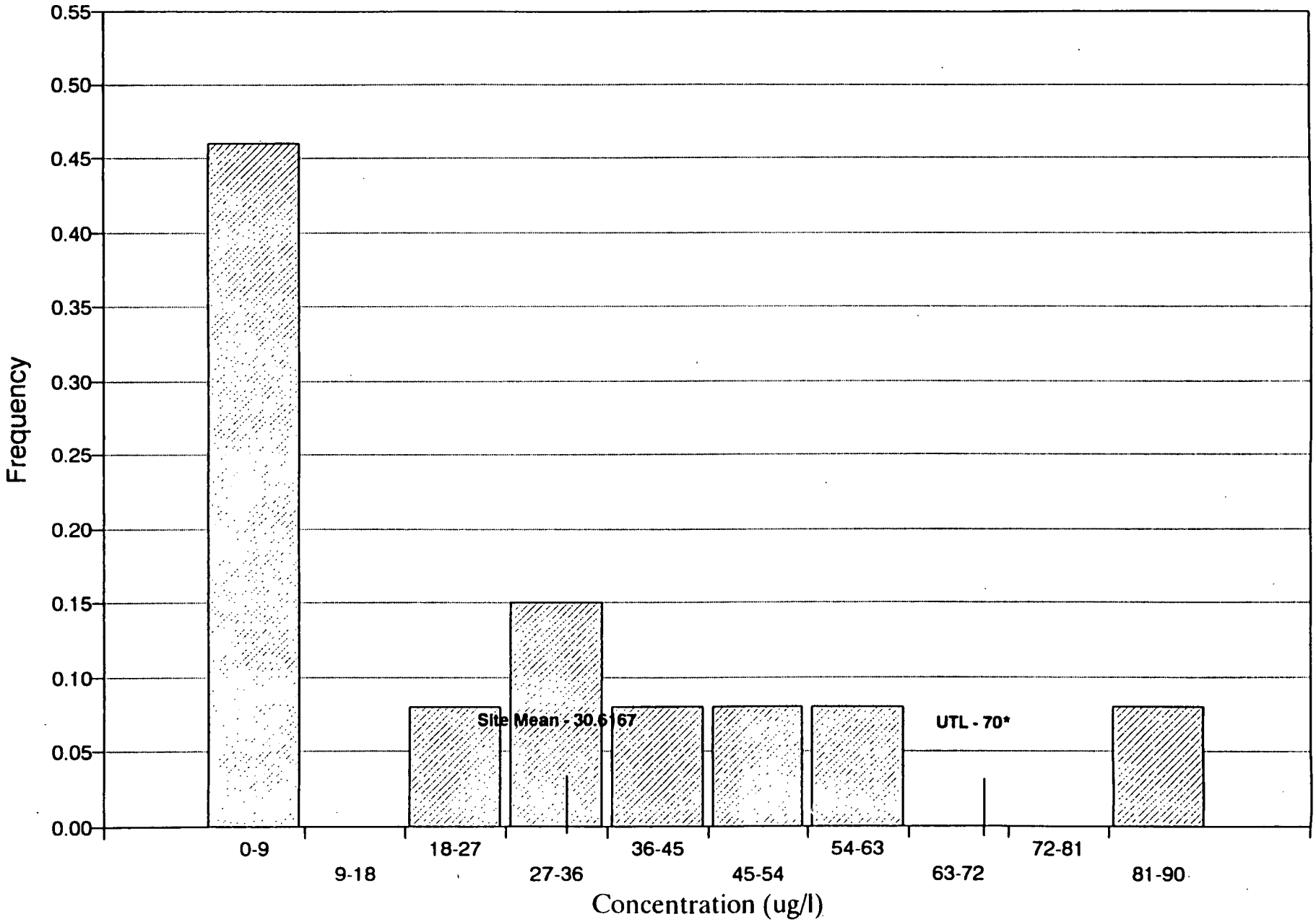


Figure D-13
Groundwater (KAR) Total Antimony

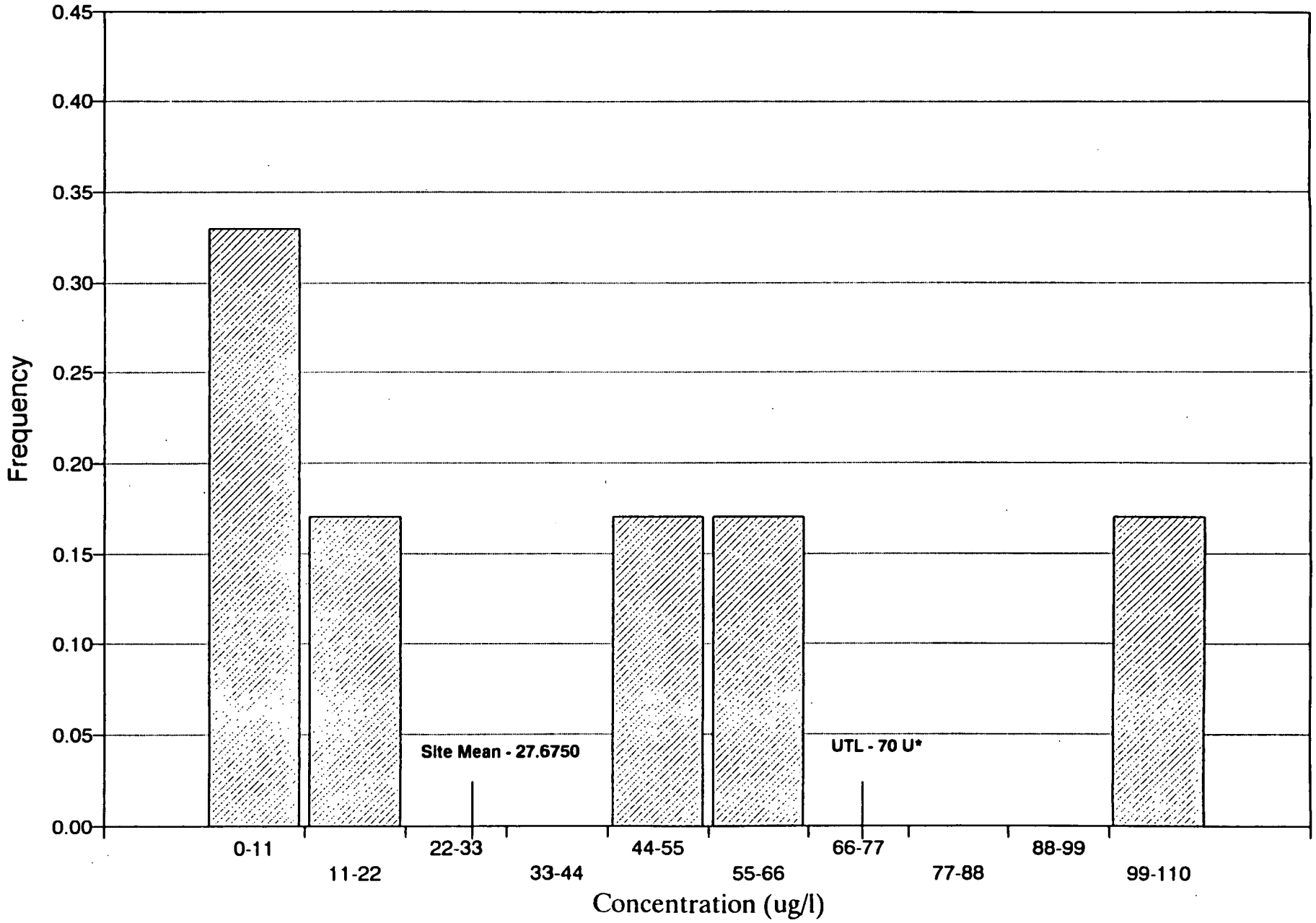


Figure D-14
Surface Water Total Antimony

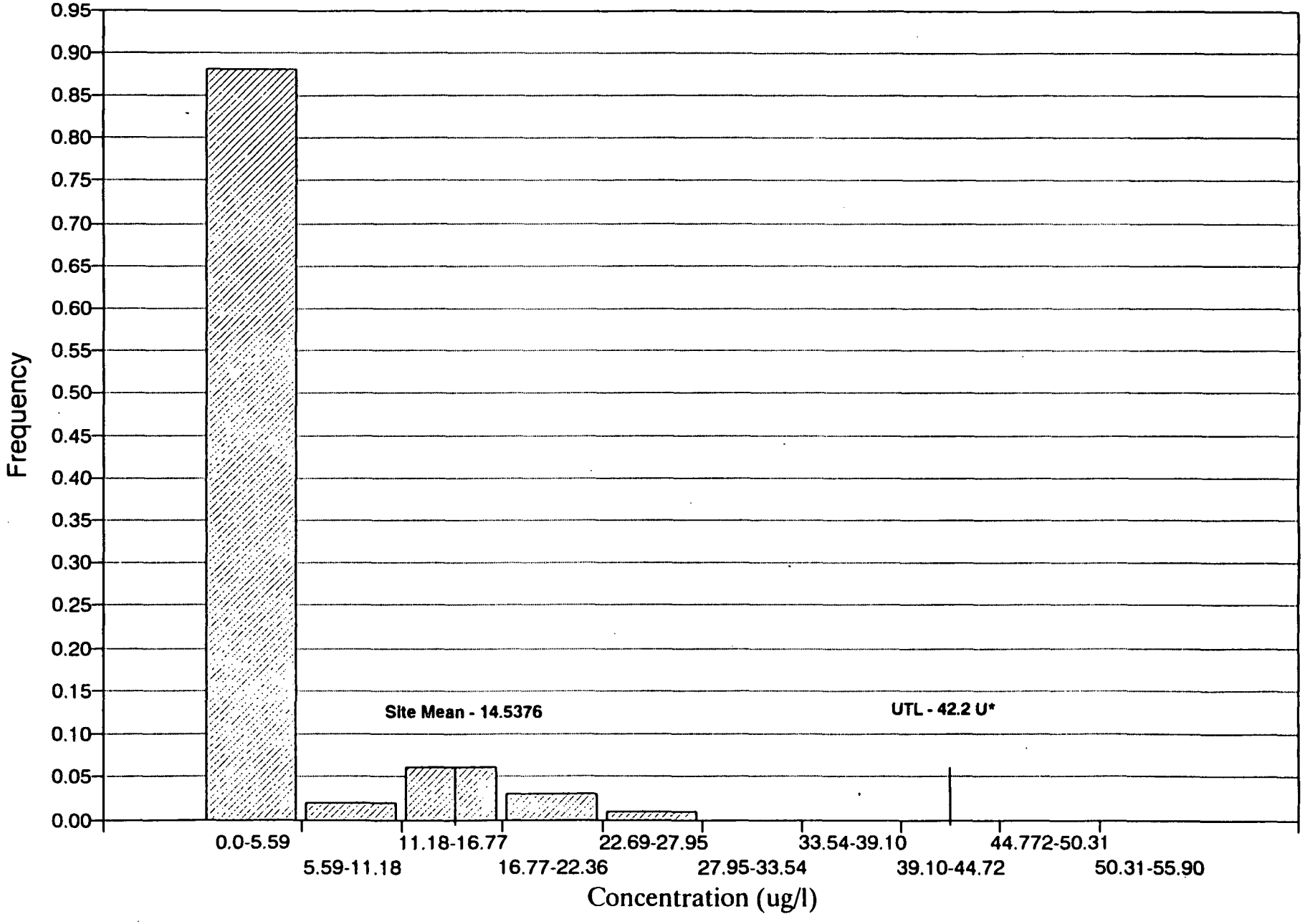


Figure D-18
Groundwater (RFA) Total Arsenic

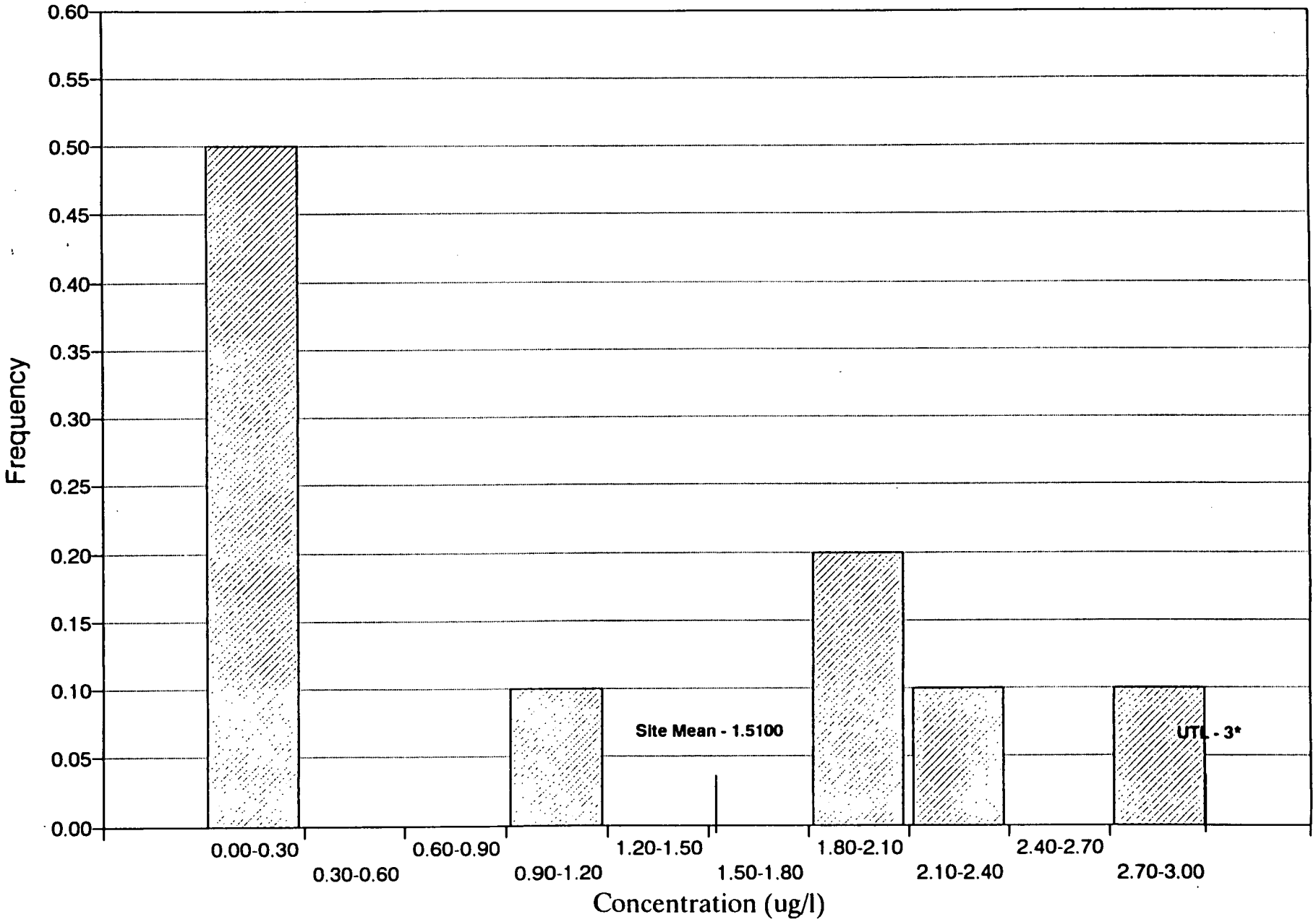


Figure D-19
Groundwater (COL) Total Arsenic

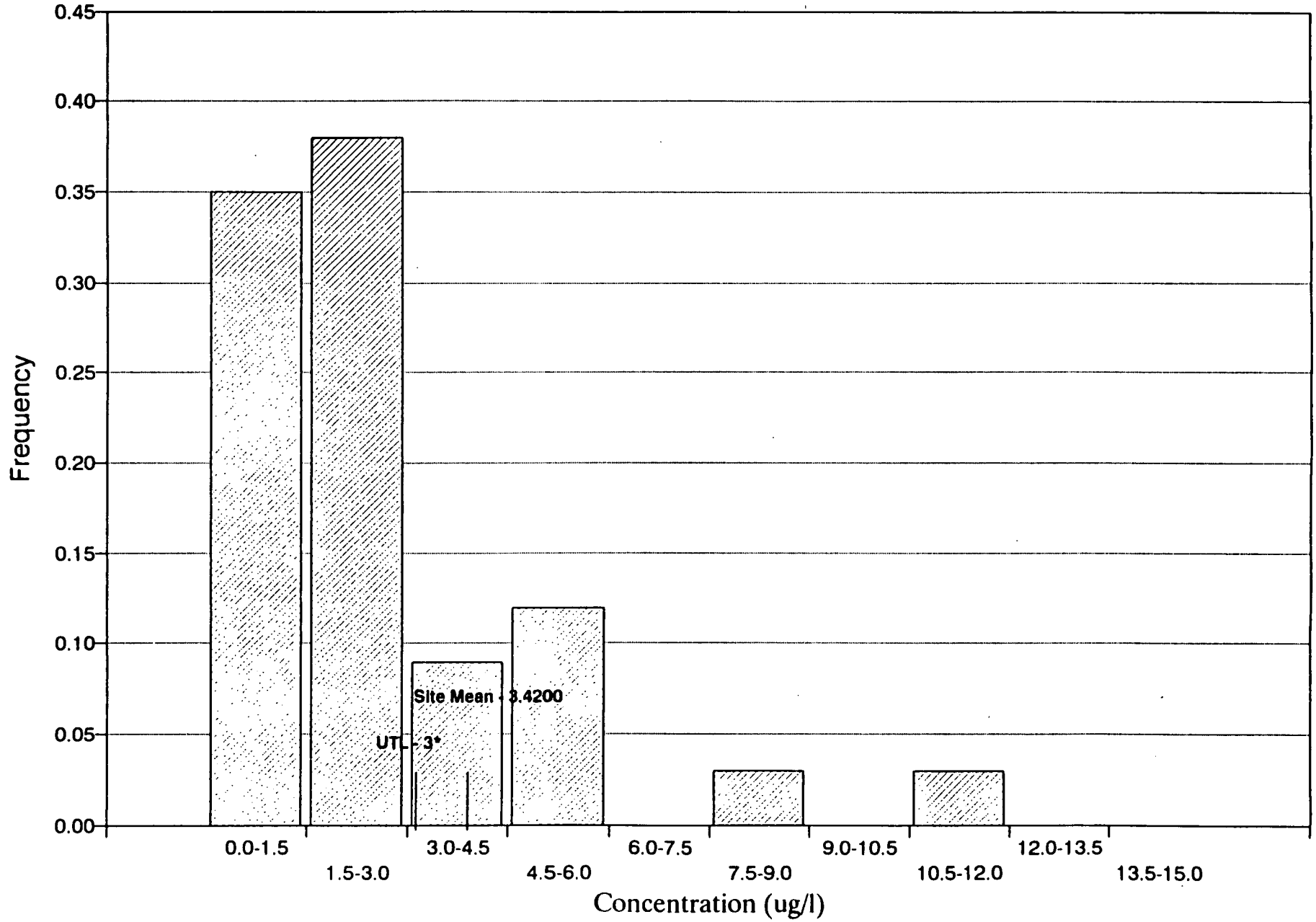


Figure D-20
Groundwater (WCS) Total Arsenic

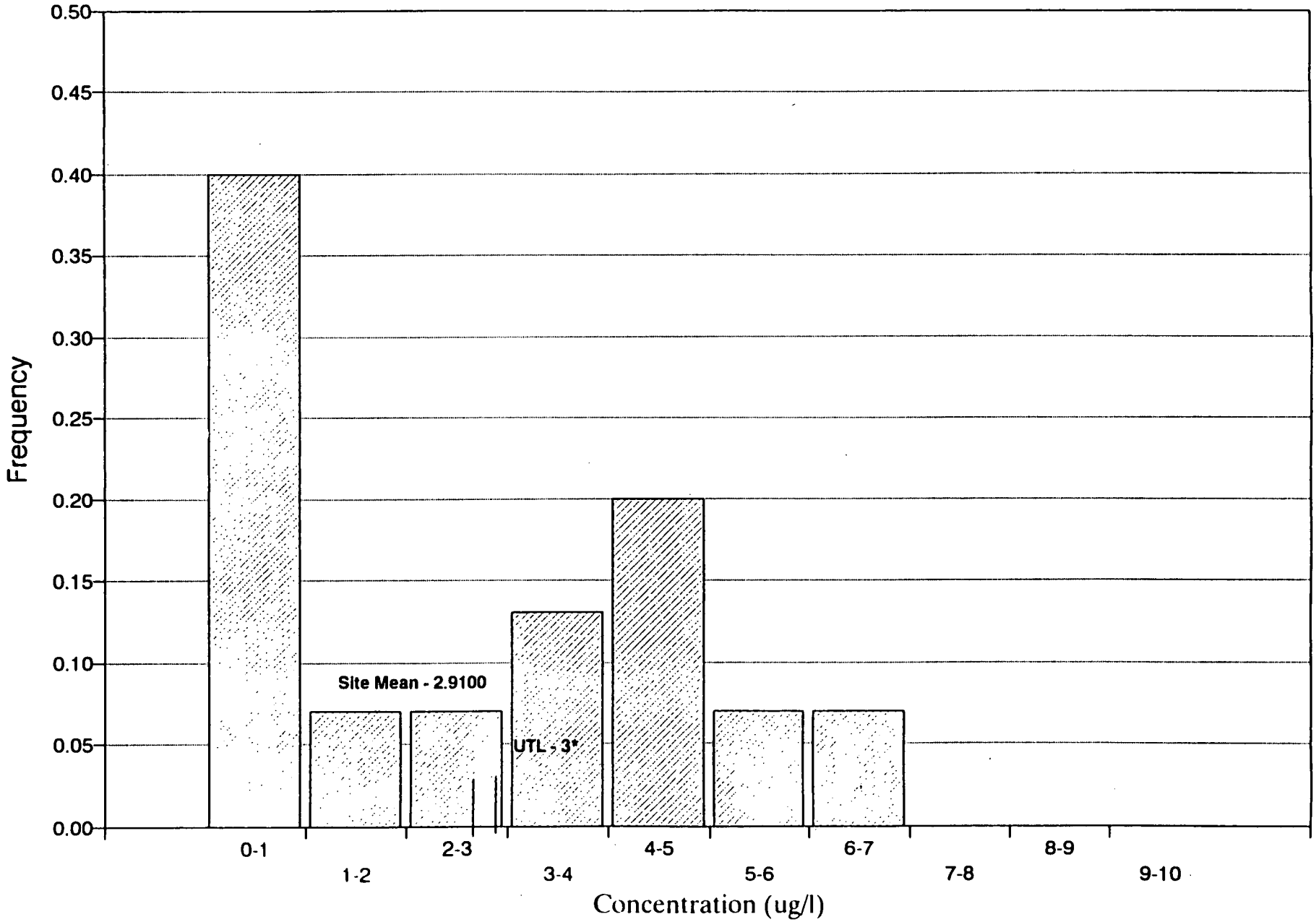


Figure D-21
Groundwater (KAR) Total Arsenic

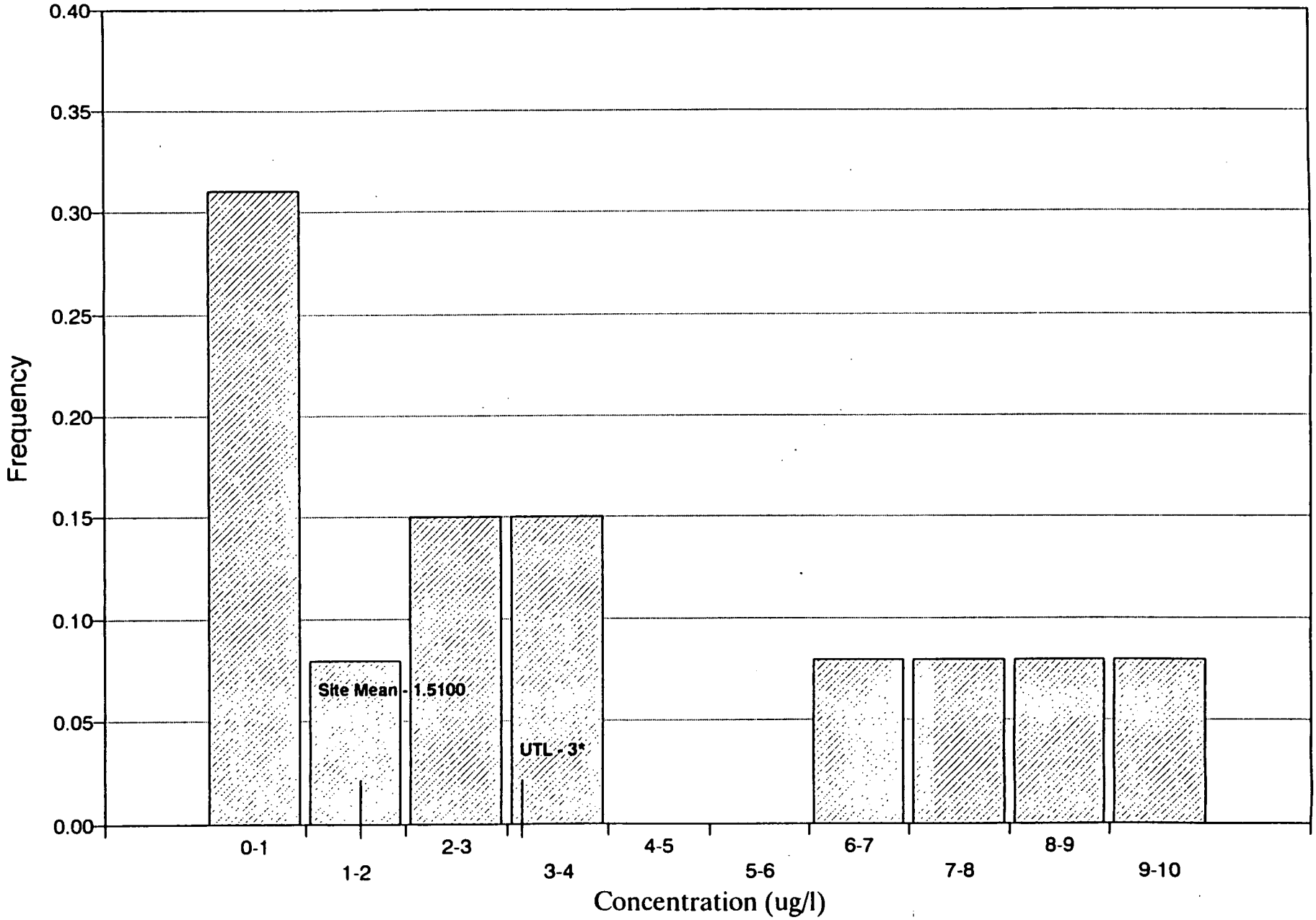


Figure D-22
Geologic Material (COL) Total Arsenic

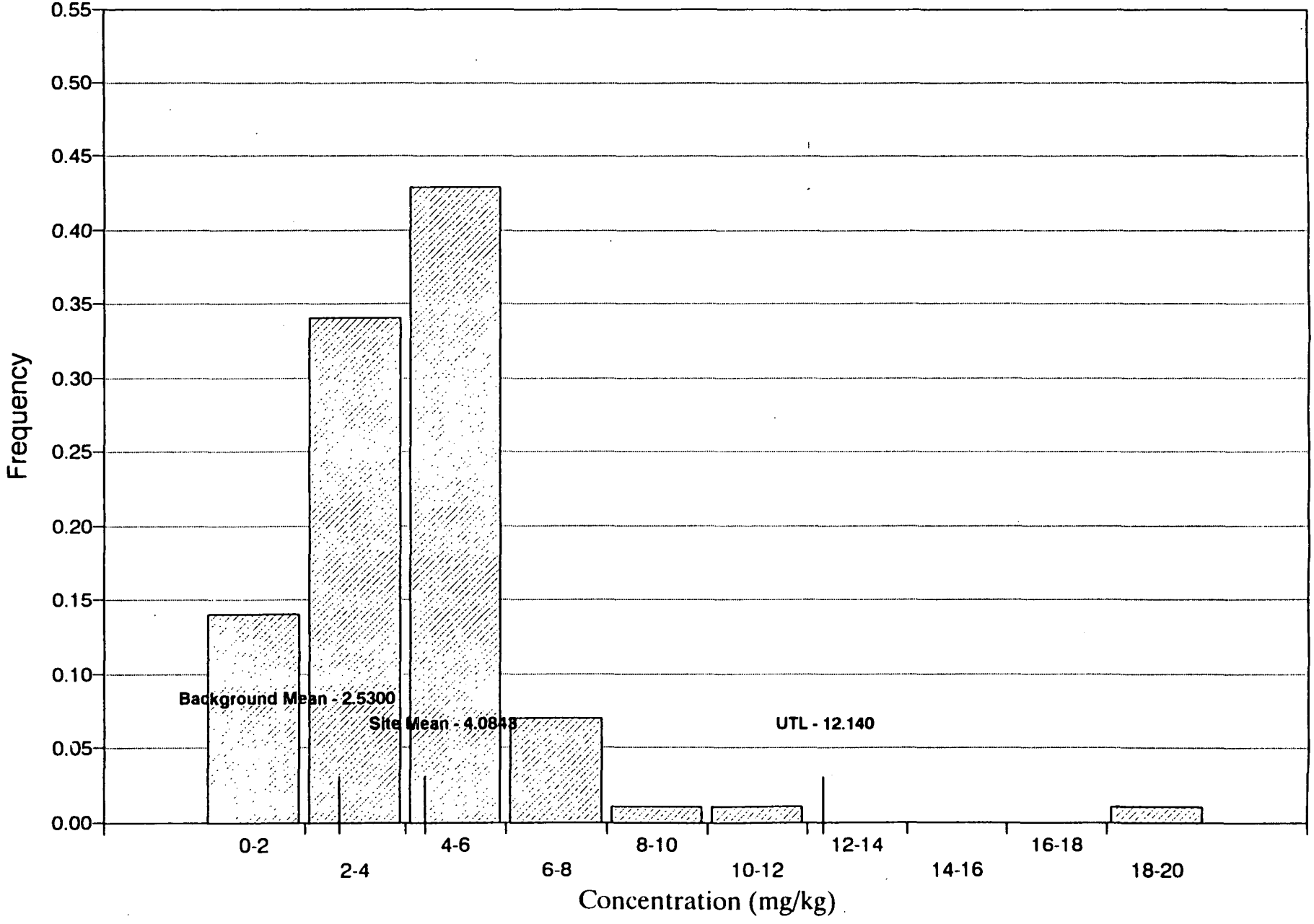


Figure D-23
Geologic Material (WCS) Total Arsenic

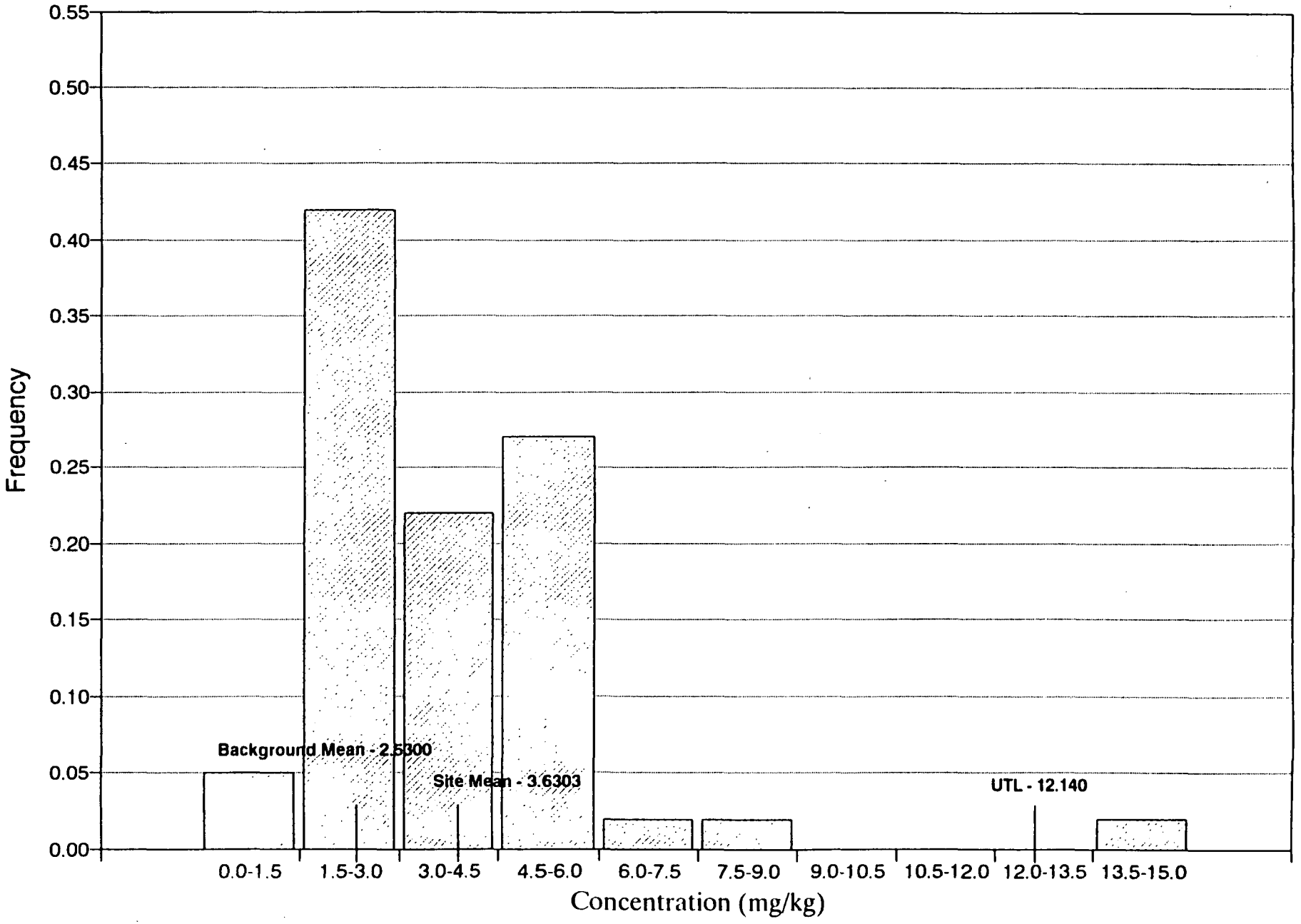


Figure D-24
Surface Water Total Arsenic

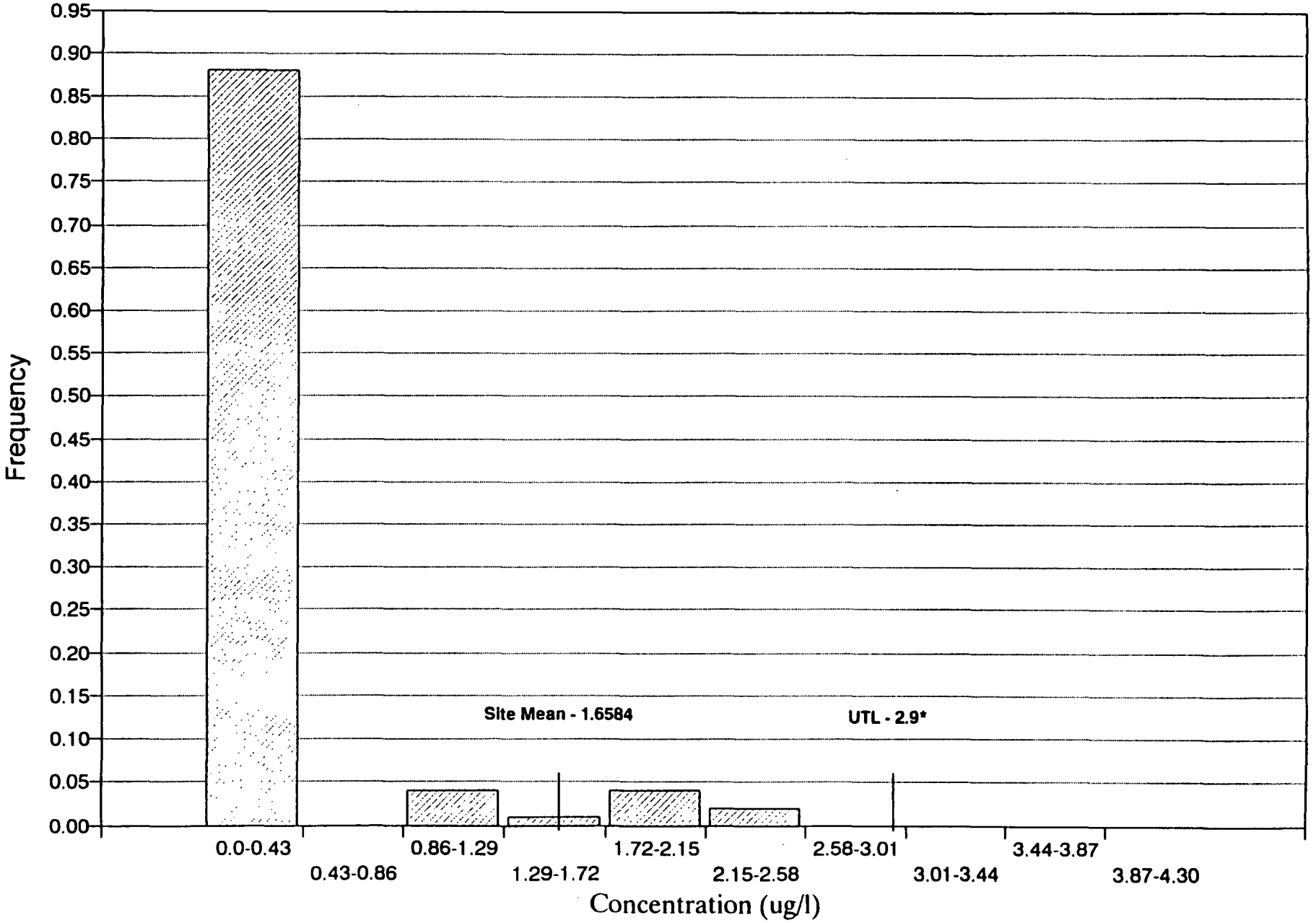


Figure D-30
Groundwater (COL) Total Barium

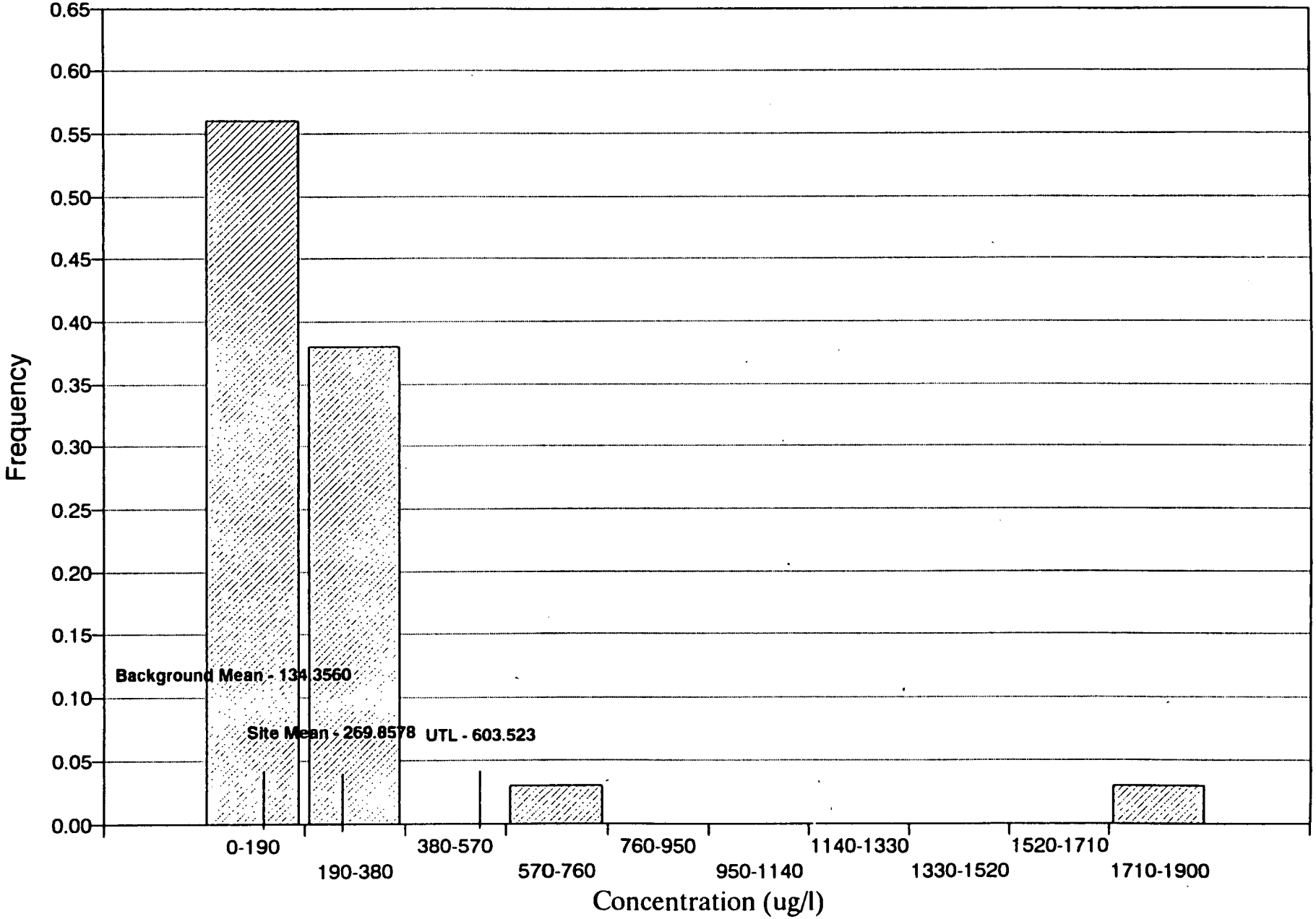


Figure D-31
Sediments Total Barium

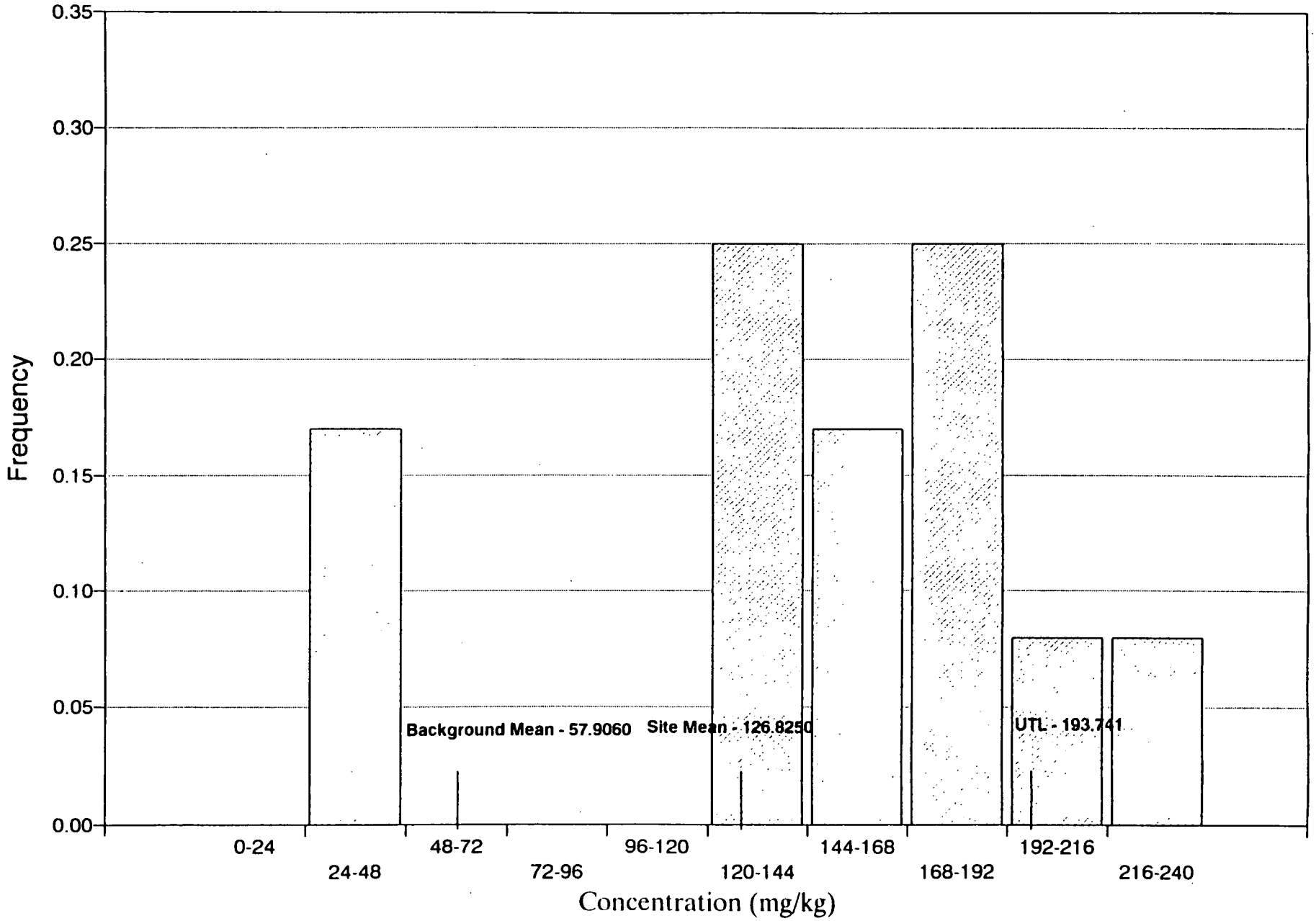


Figure D-32
Geologic Material (COL) Total Barium

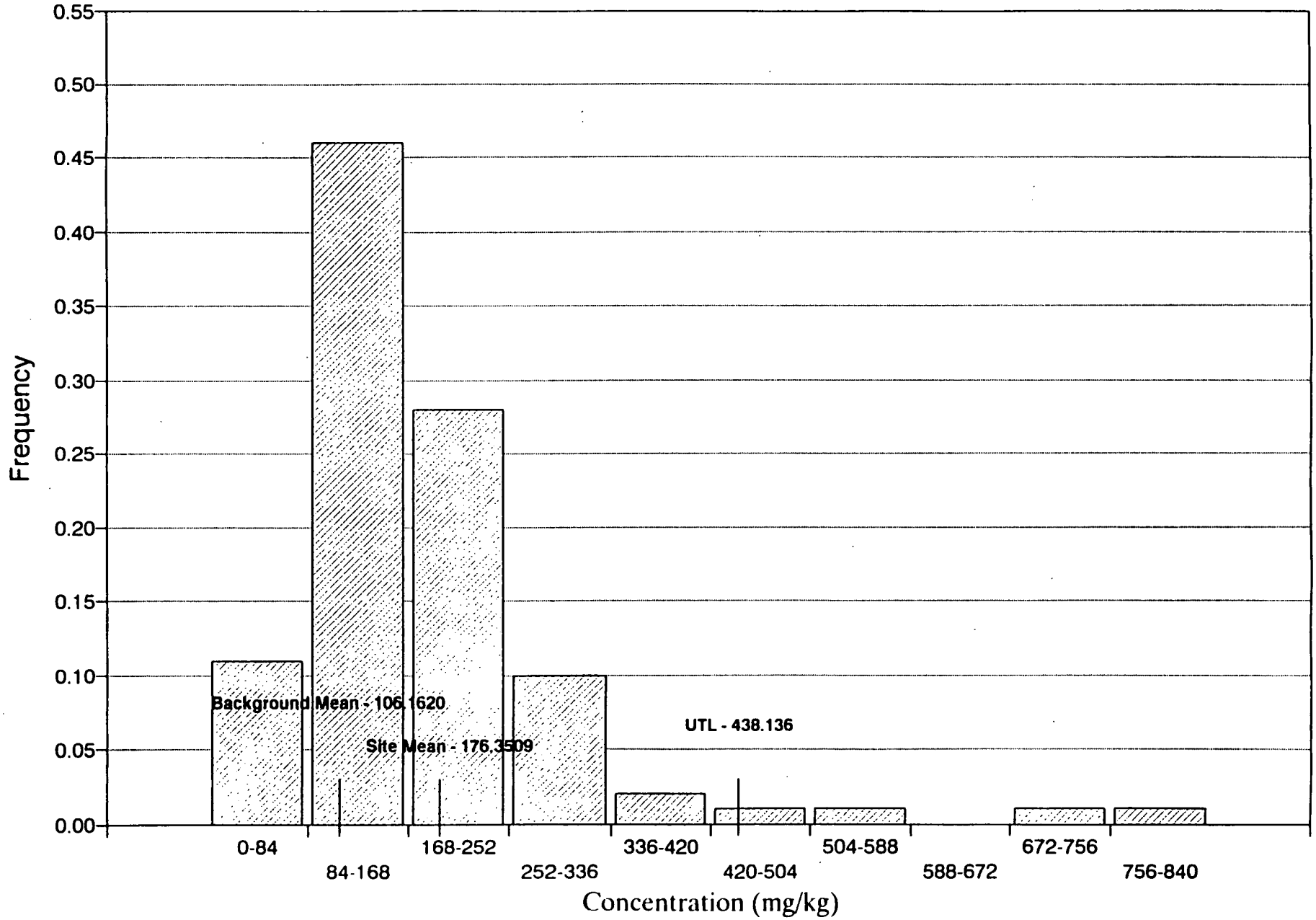


Figure D-33
Surface Water Total Barium

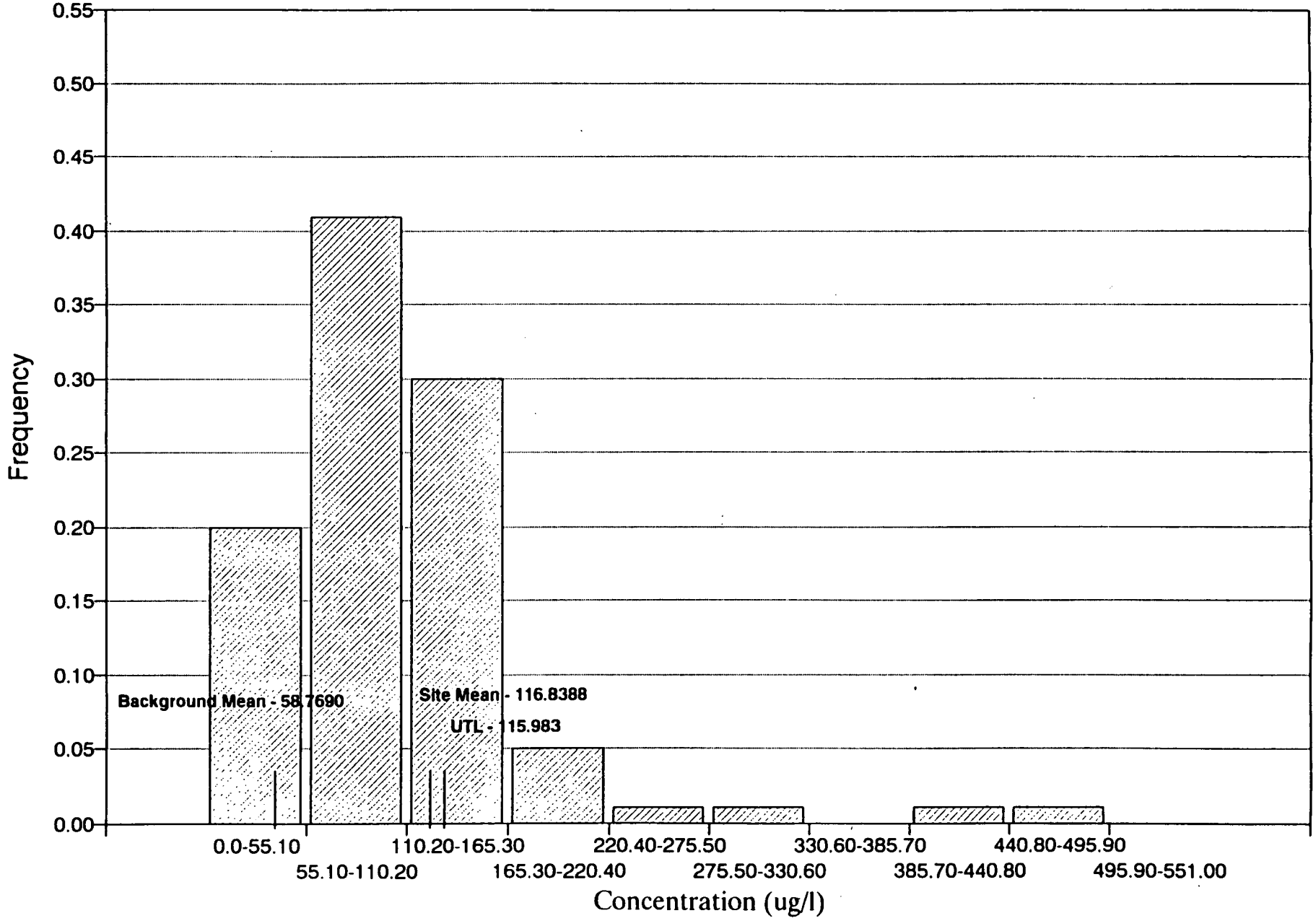


Figure D-39
Geologic Material (WCS) Total Cadmium

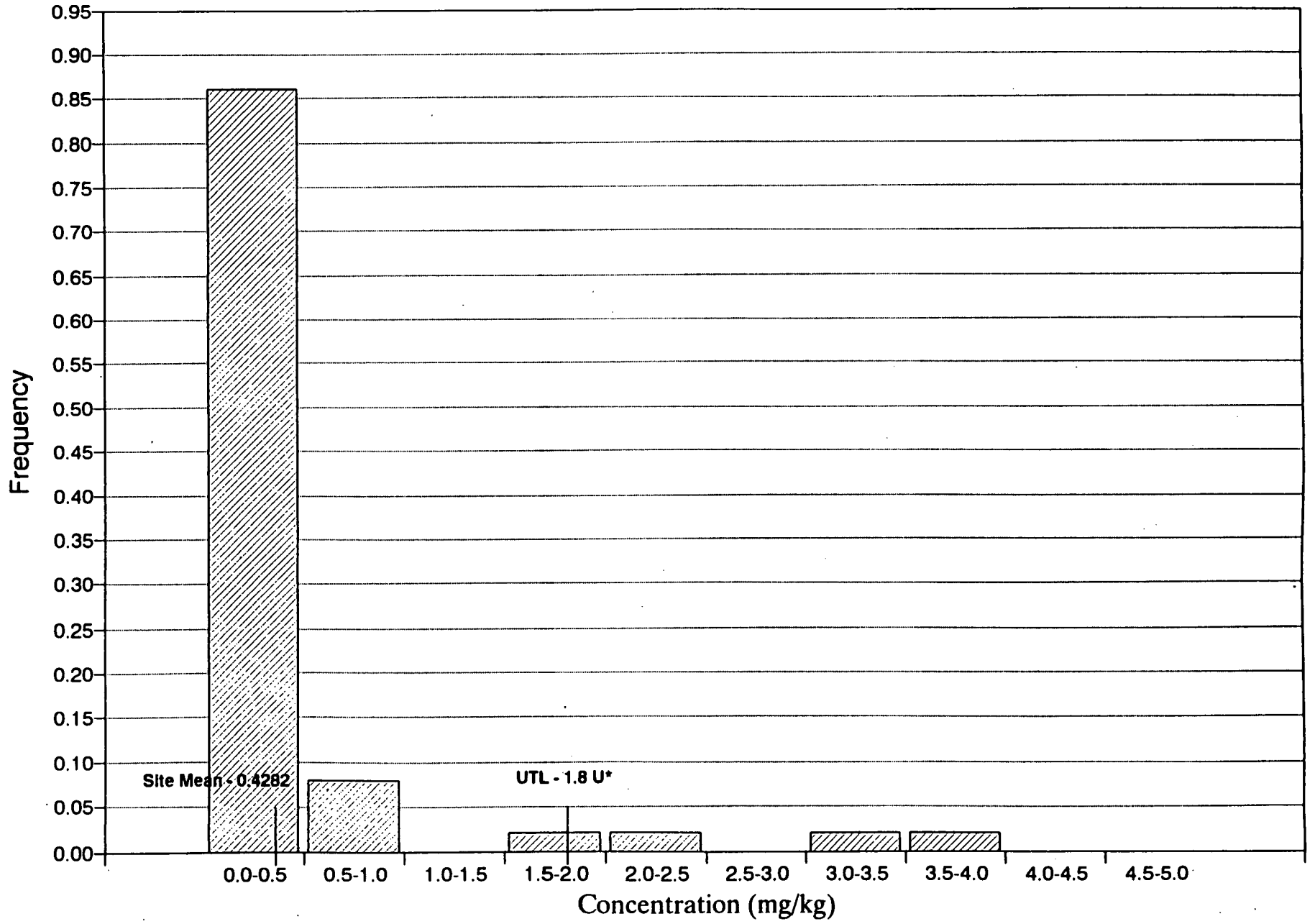


Figure D-41
Surface Soil Total Calcium

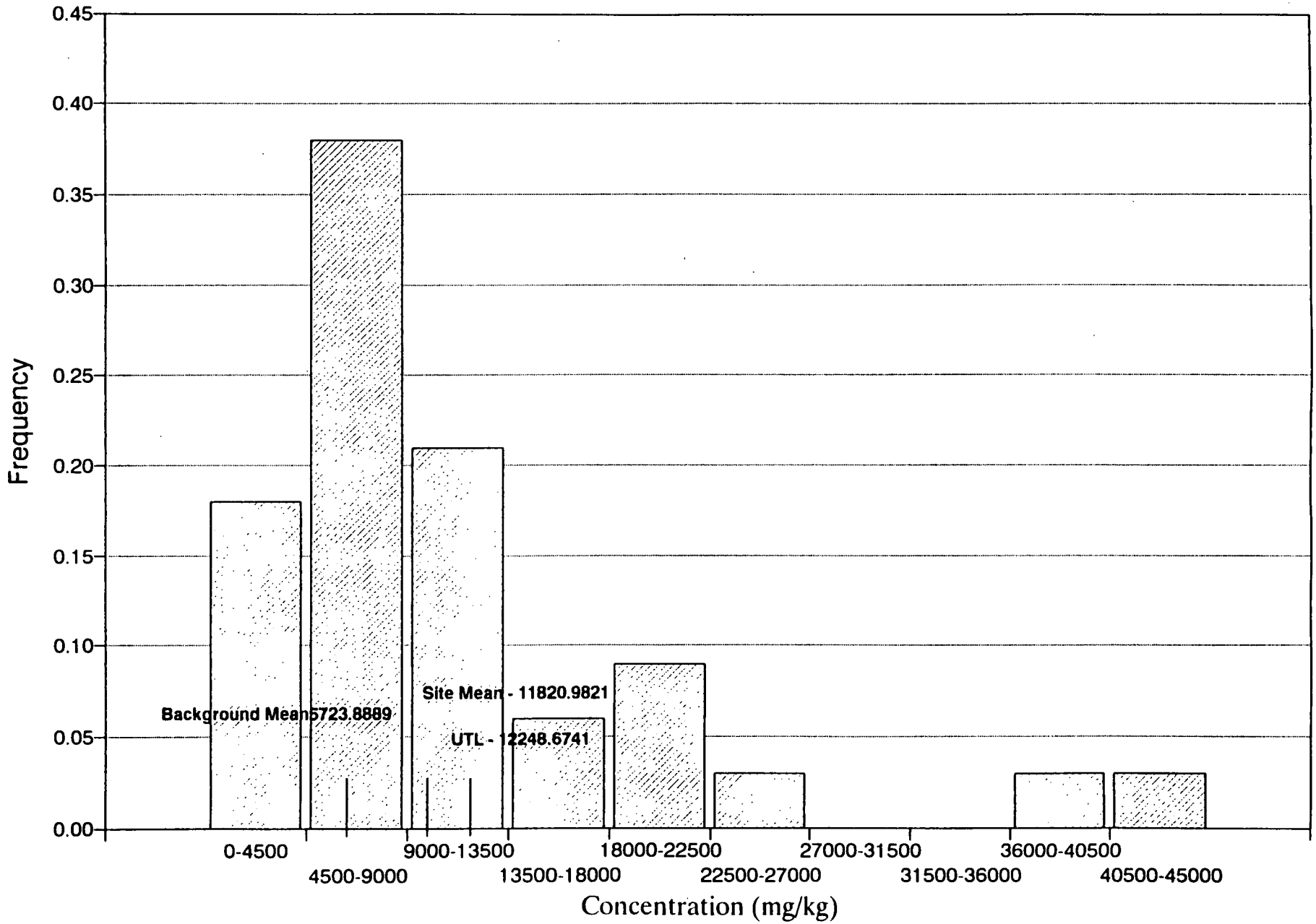


Figure D-42
Sediments Total Calcium

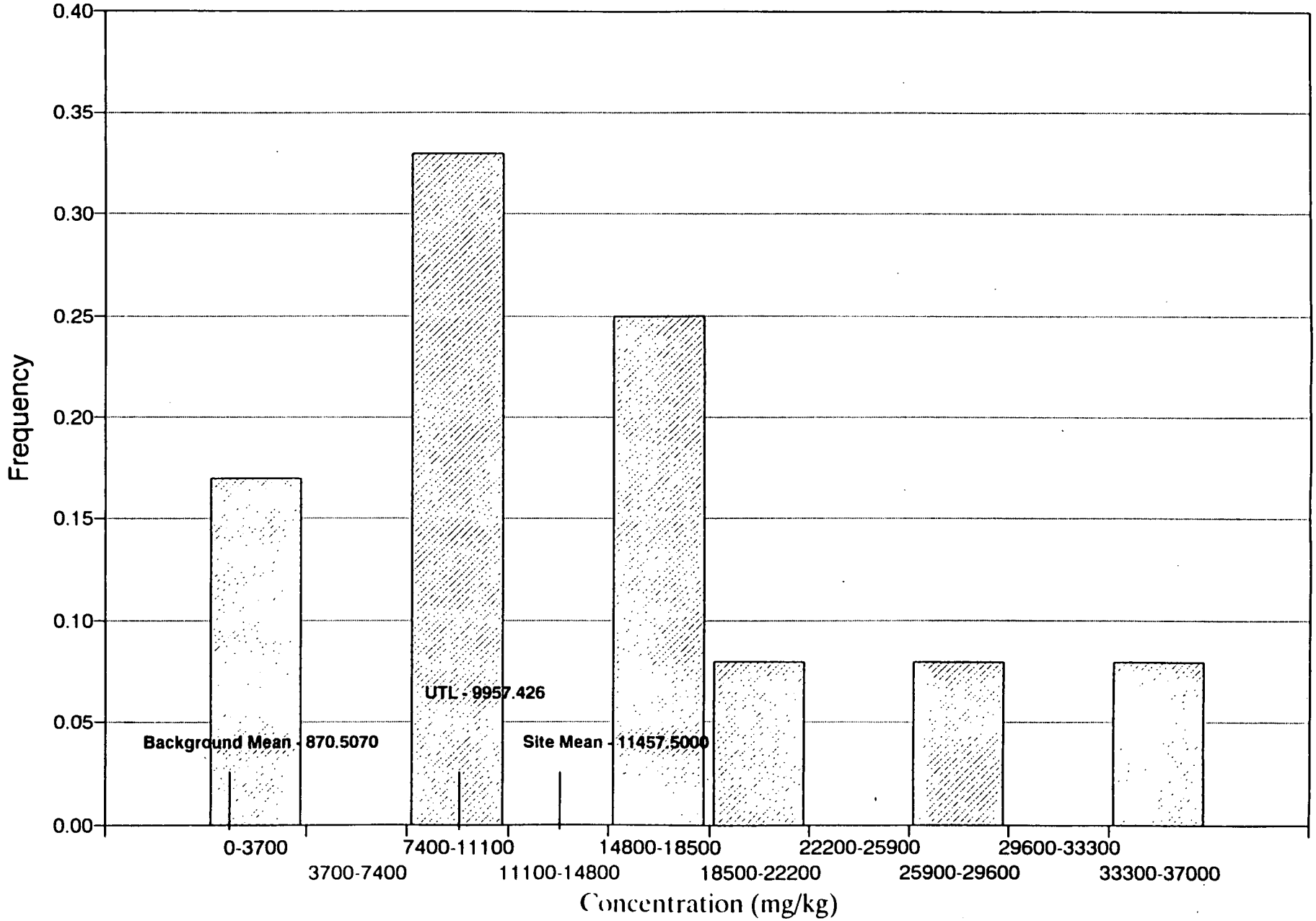


Figure D-43
Geologic Material (COL) Total Calcium

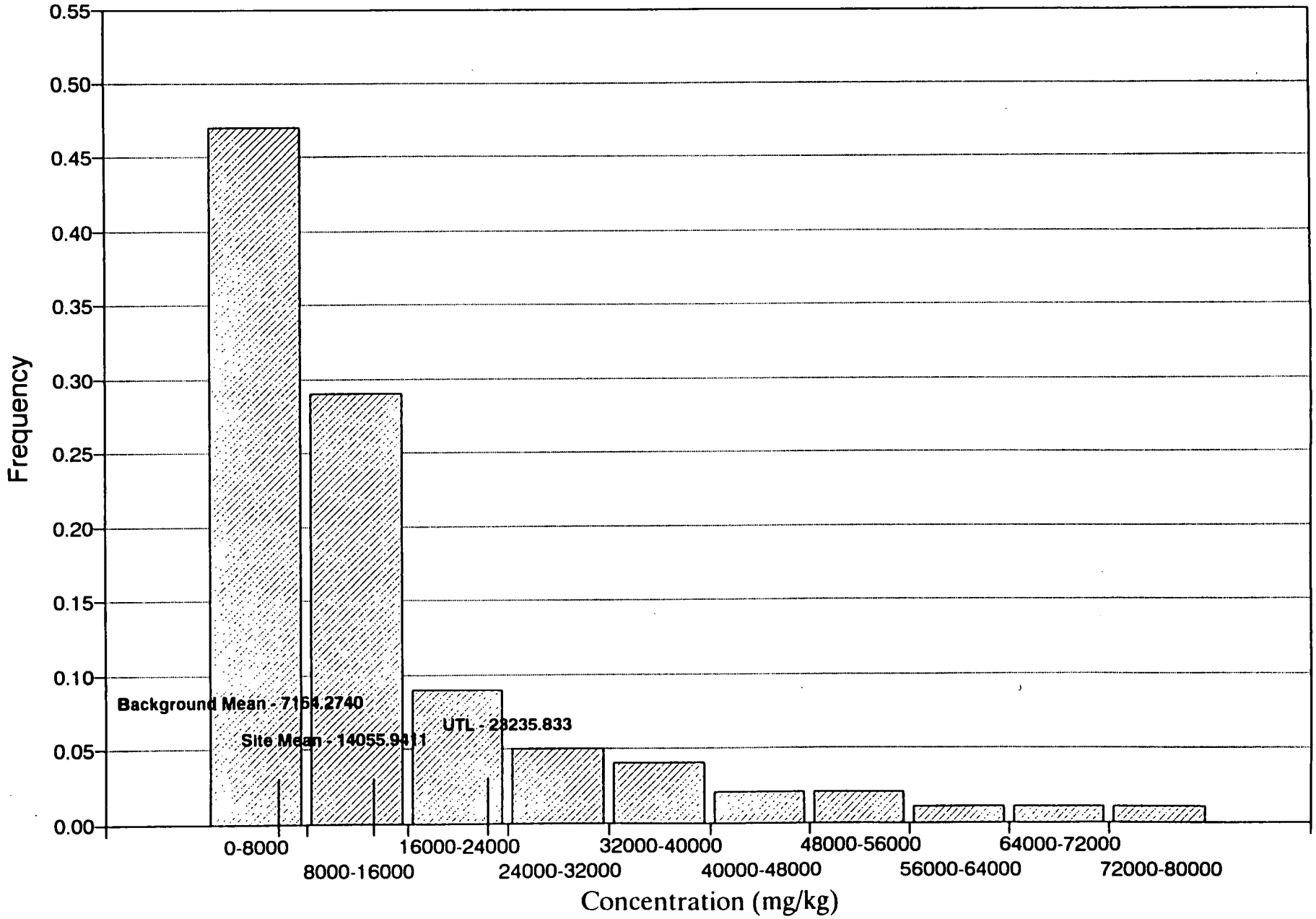


Figure D-44
Groundwater (RFA) Total Calcium

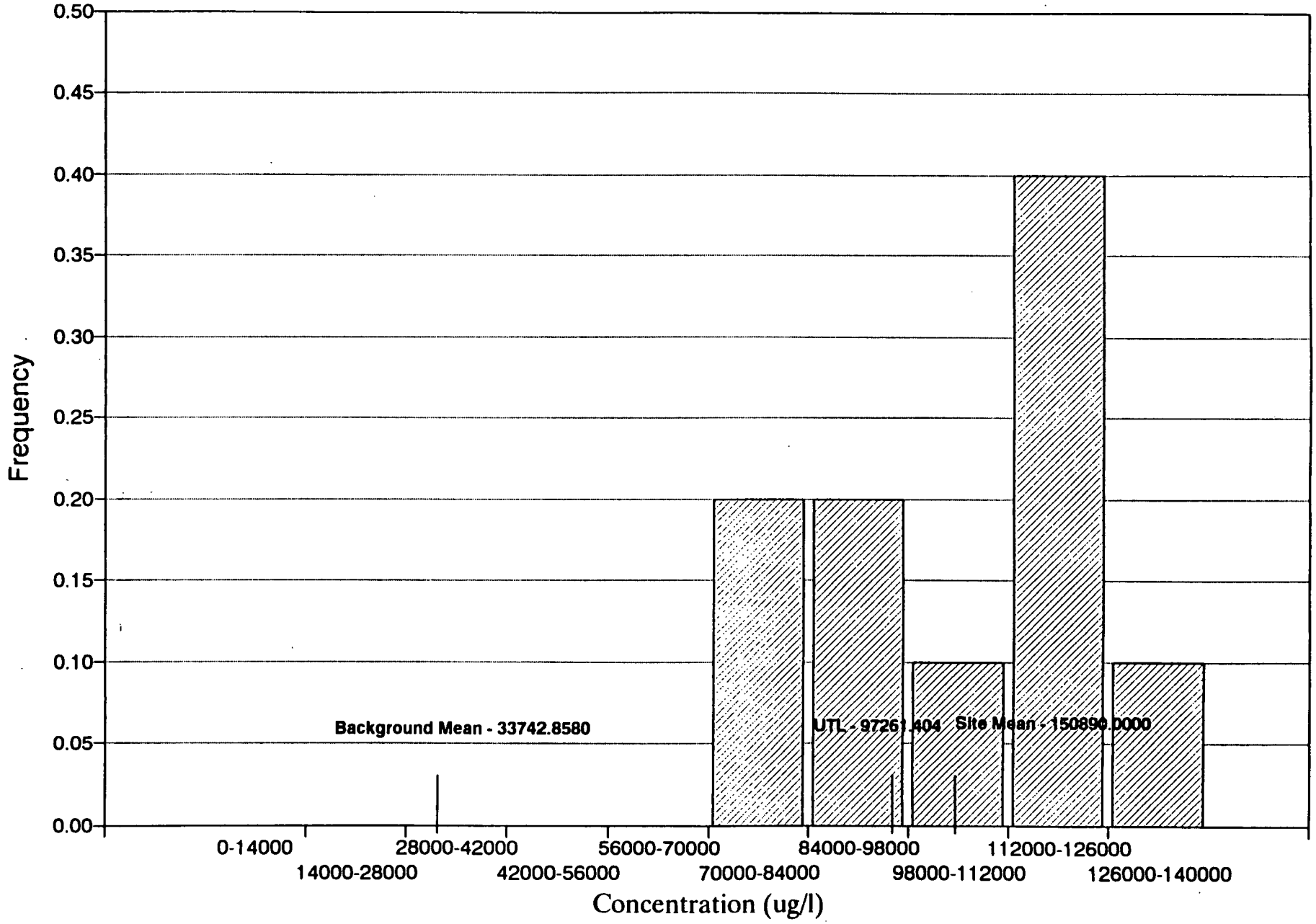


Figure D-45
Groundwater (WCS) Total Calcium

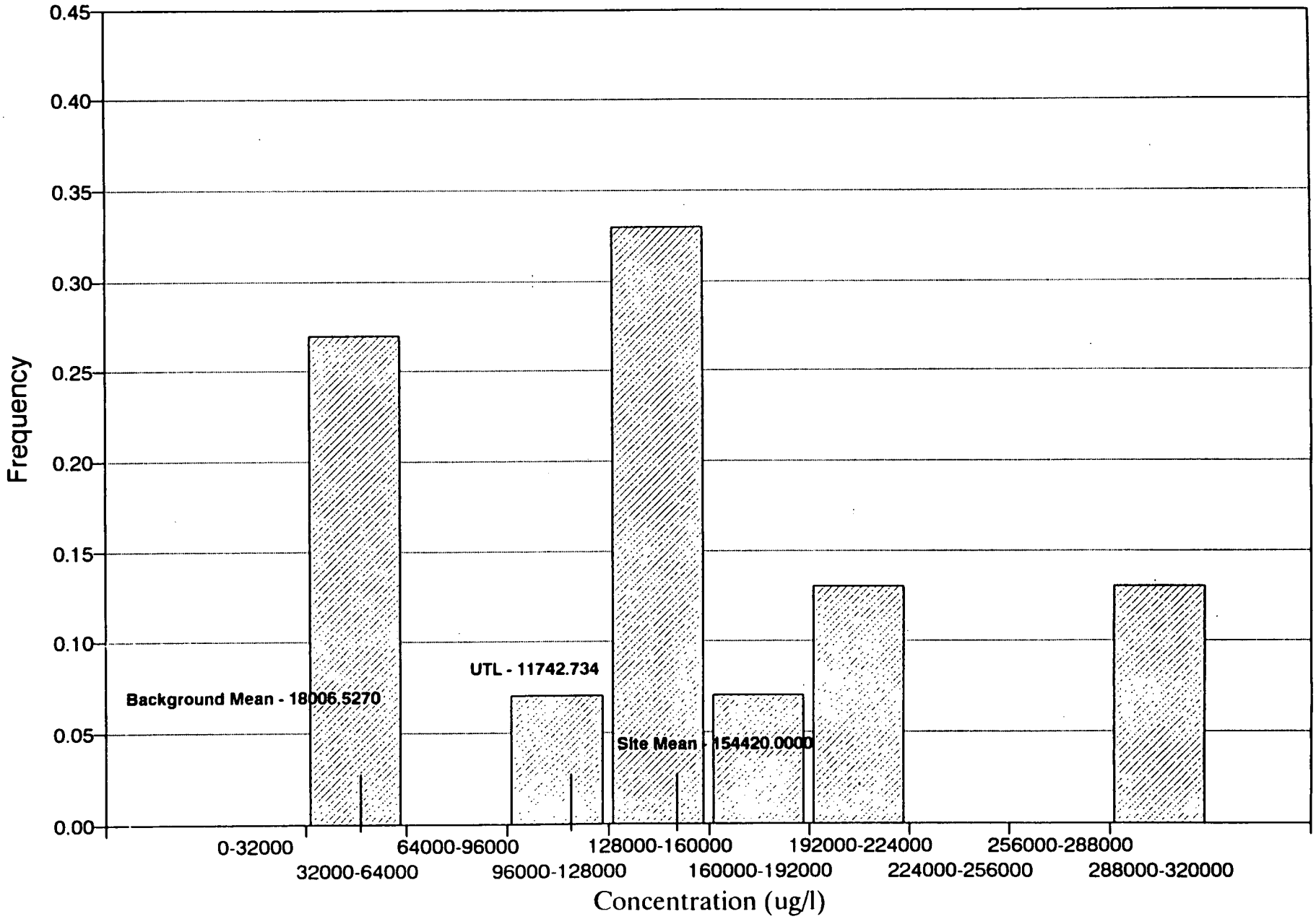


Figure D-46
Groundwater (KAR) Total Calcium

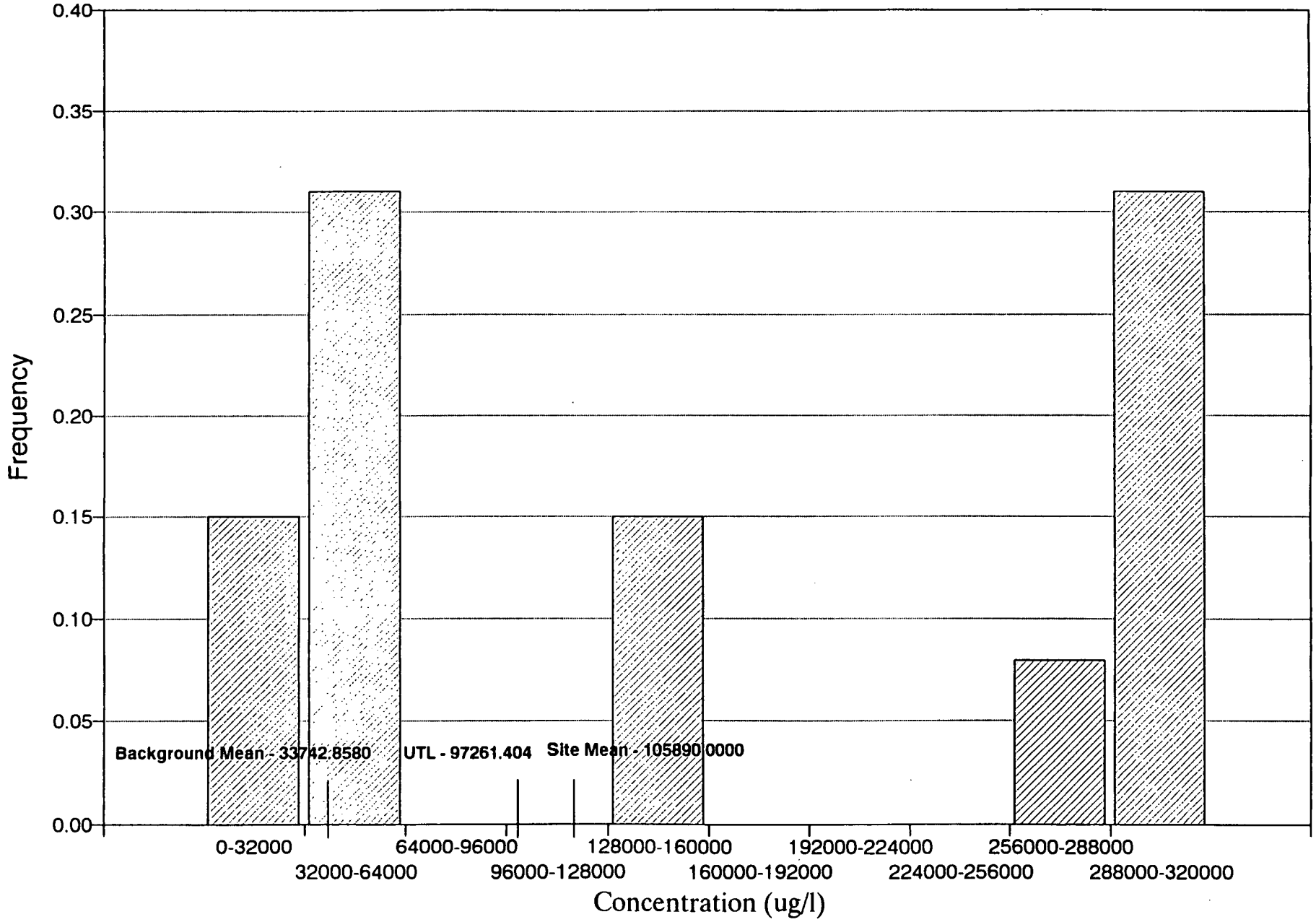


Figure D-47
Surface Water Total Calcium

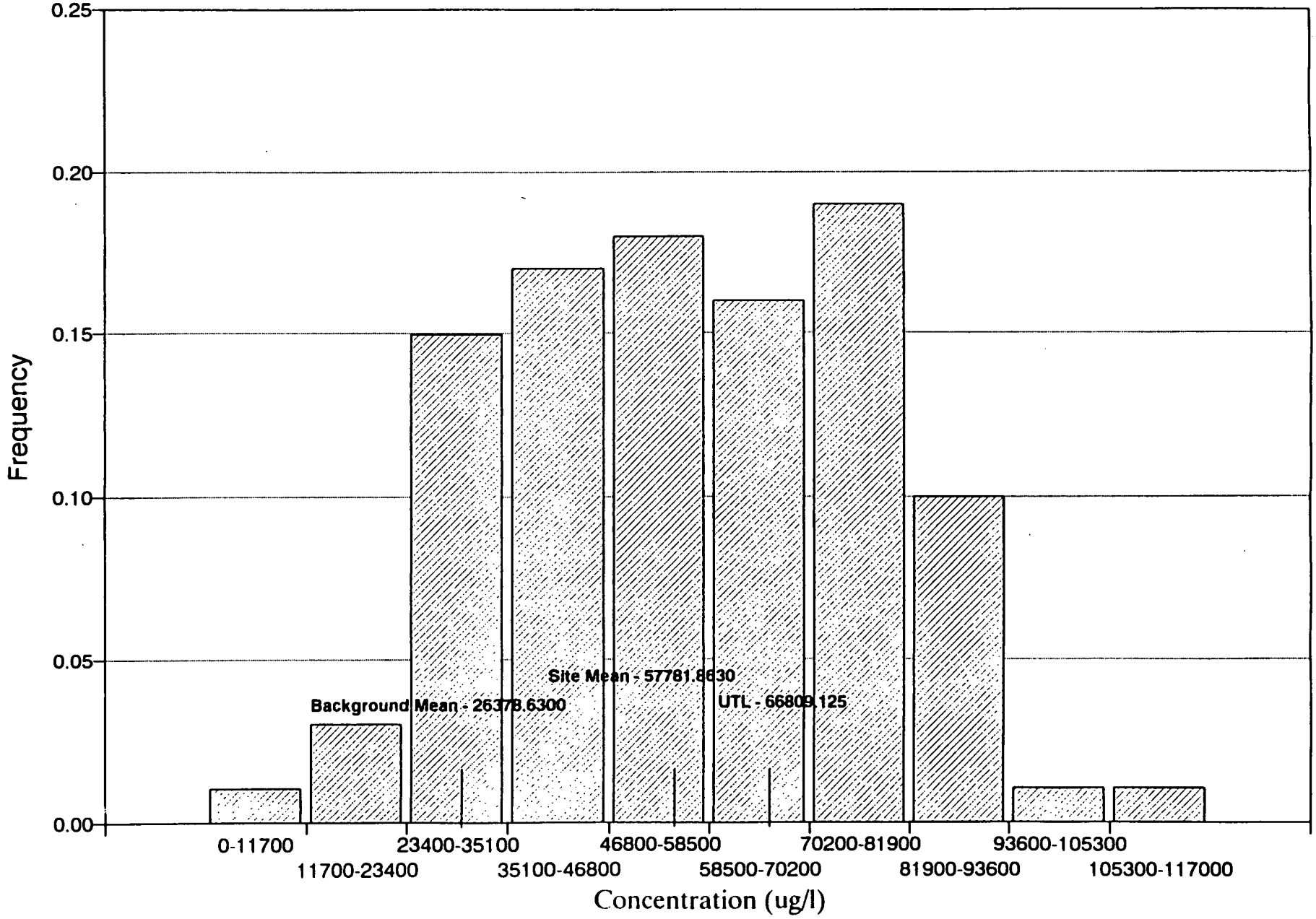


Figure D-53
Surface Water Total Chromium

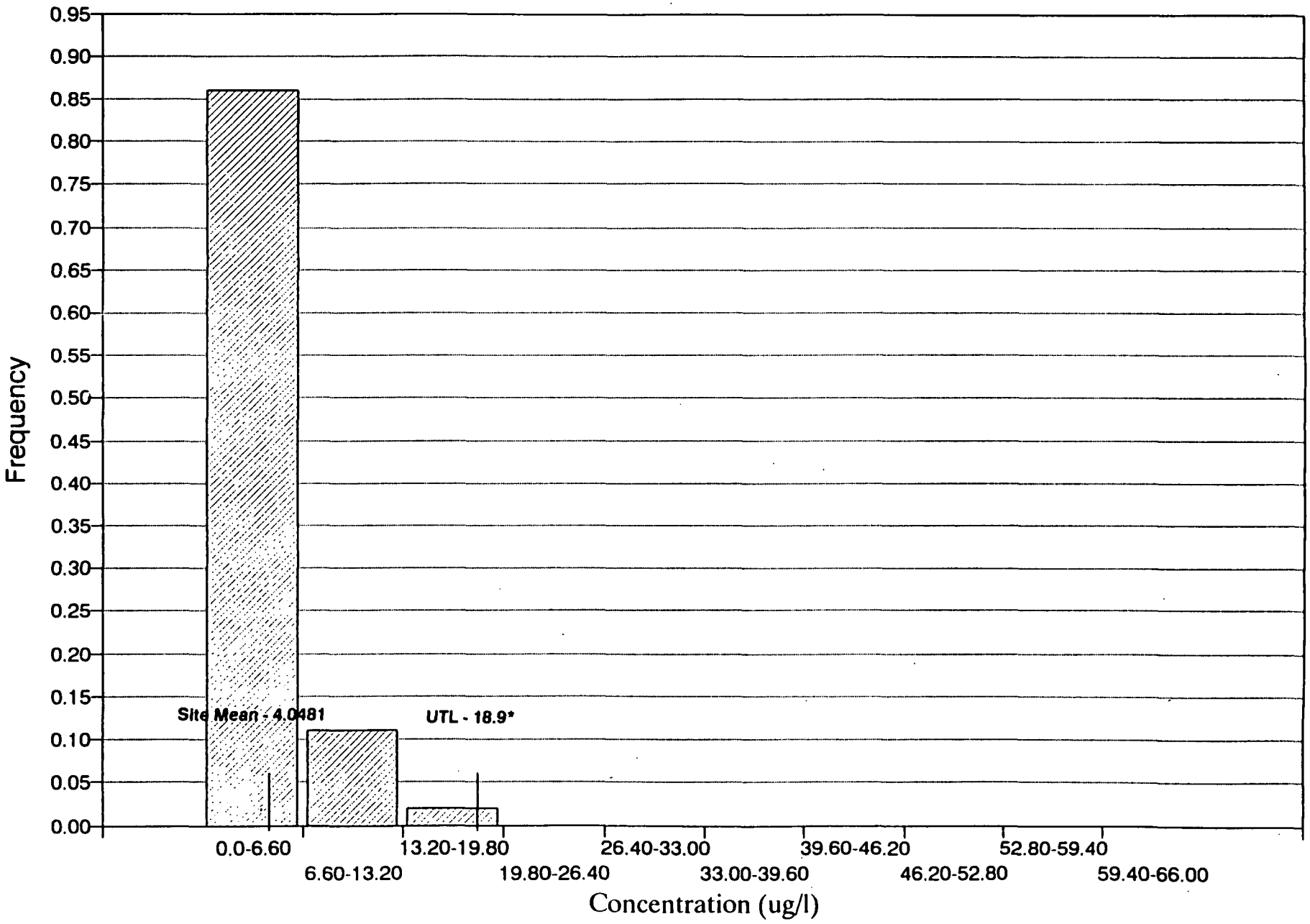


Figure D-55
Sediments Total Cobalt

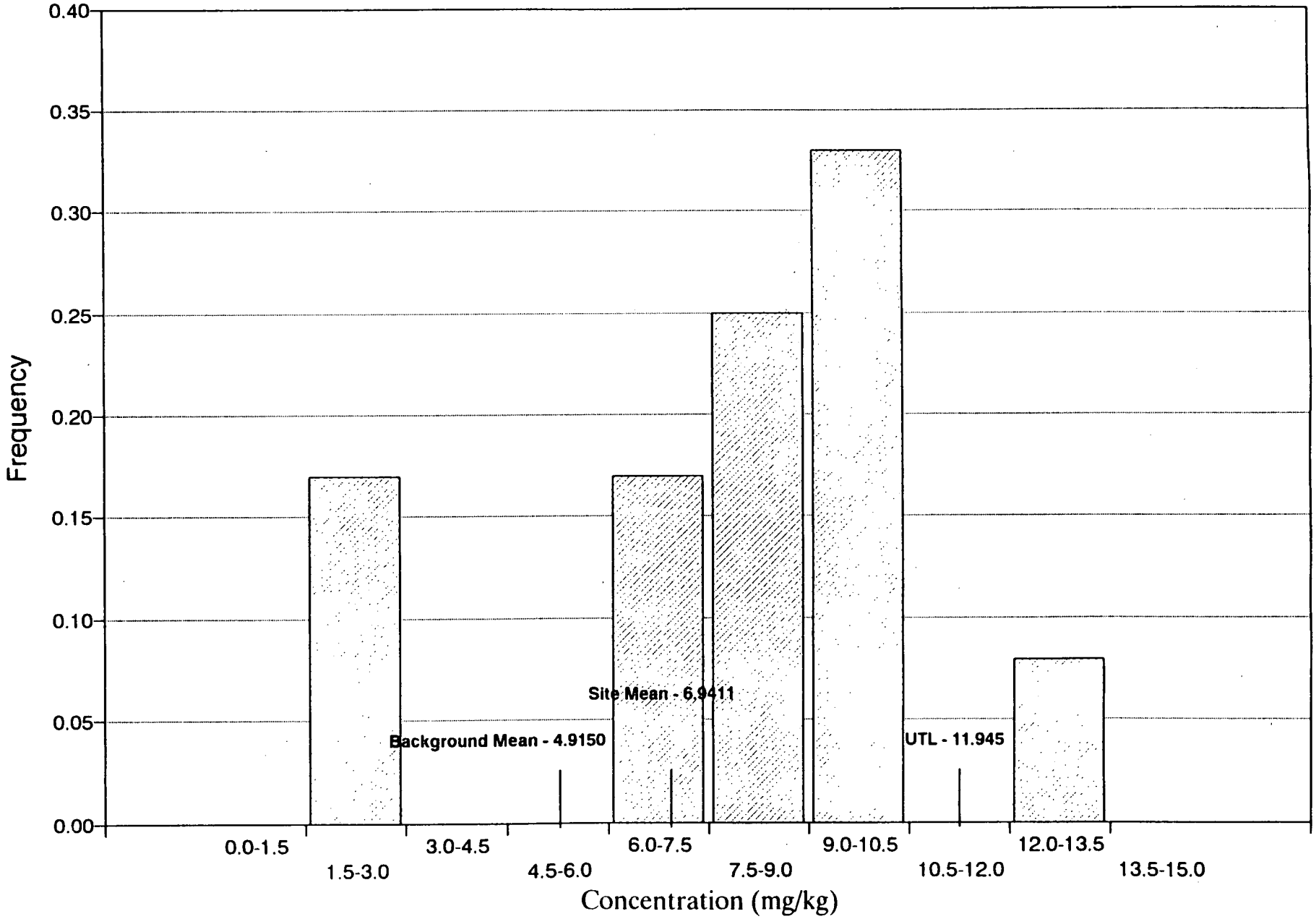


Figure D-56
Geologic Material (COL) Total Cobalt

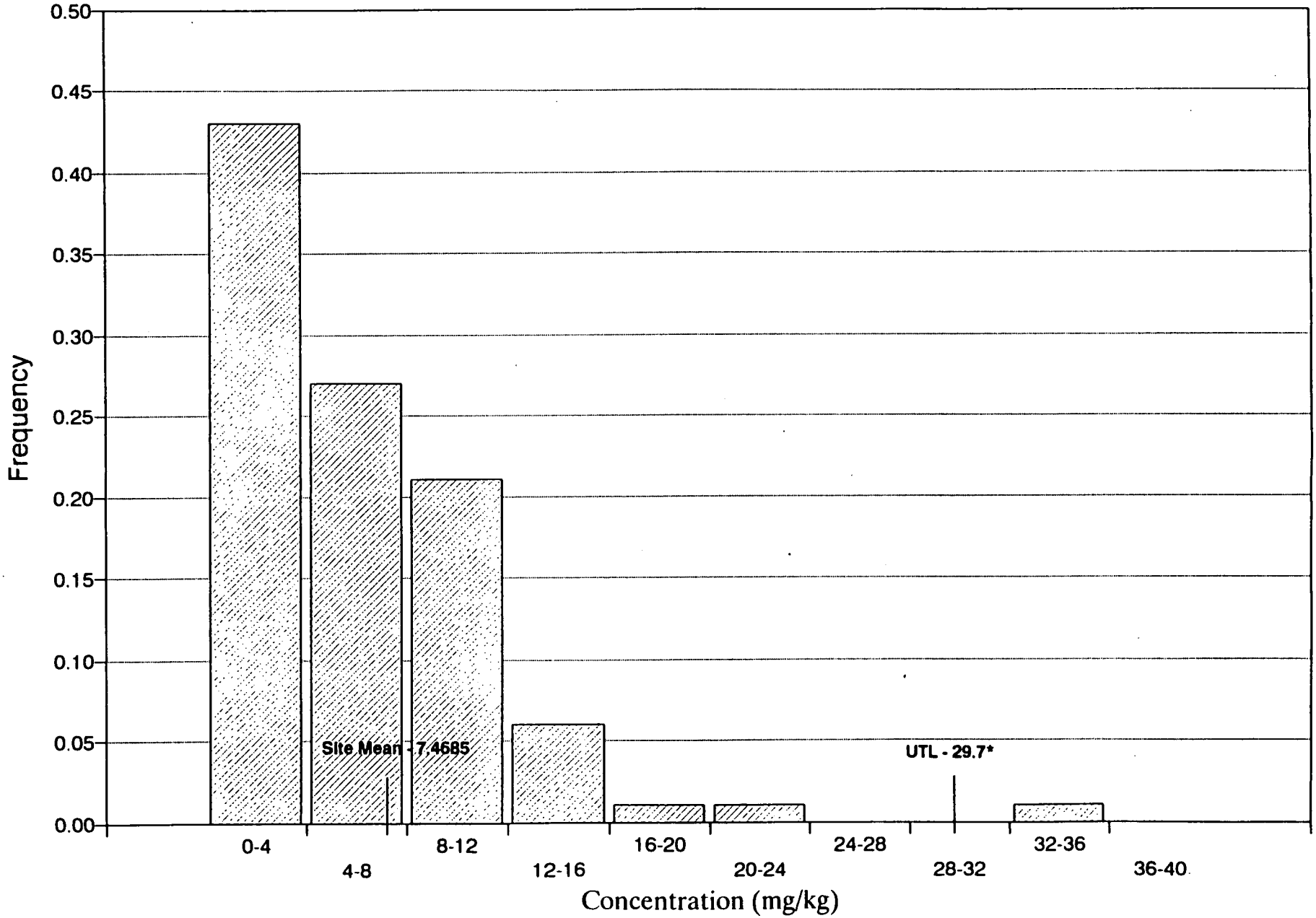


Figure D-59
Geologic Material (COL) Total Copper

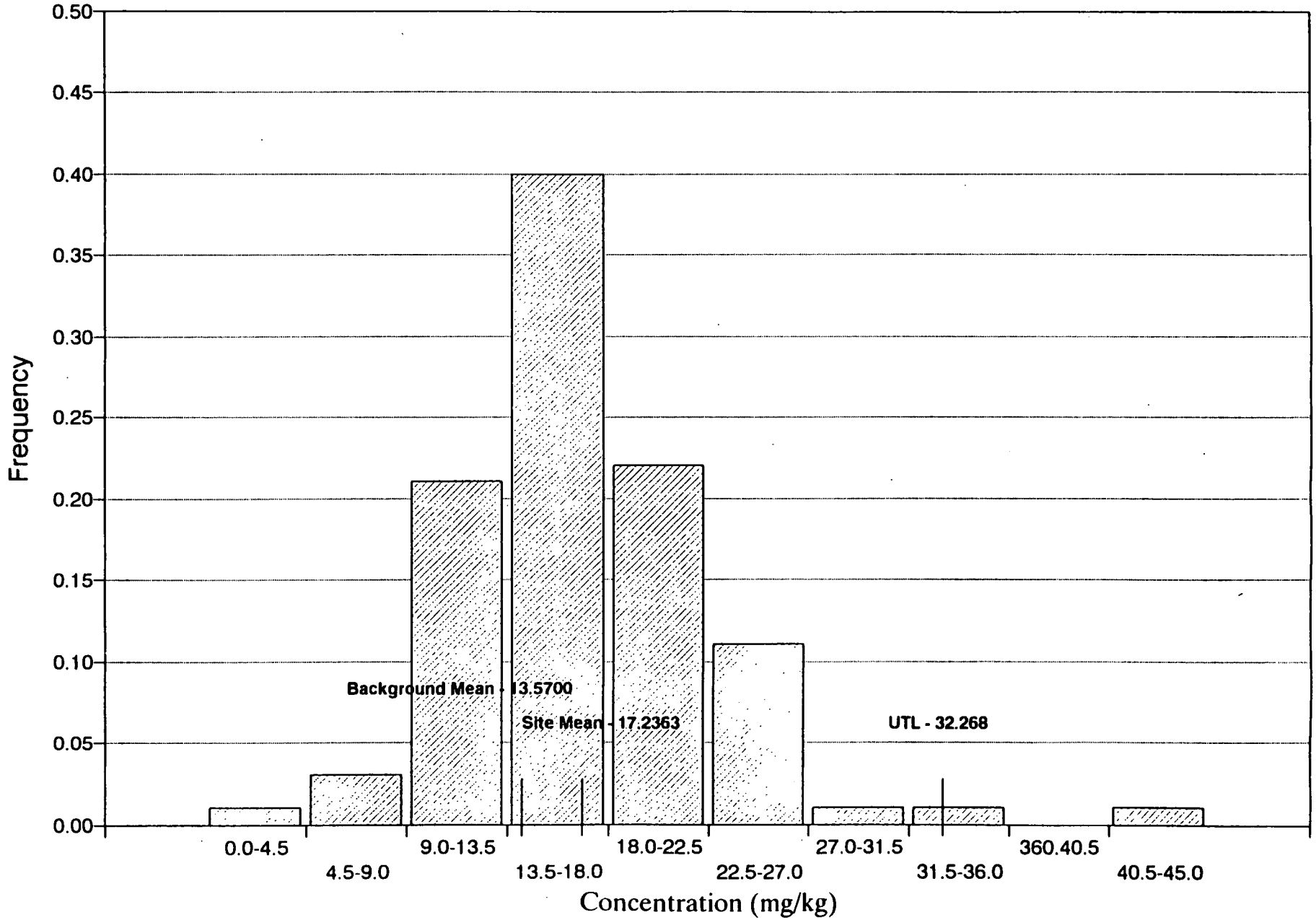


Figure D-60
Groundwater (COL) Total Copper

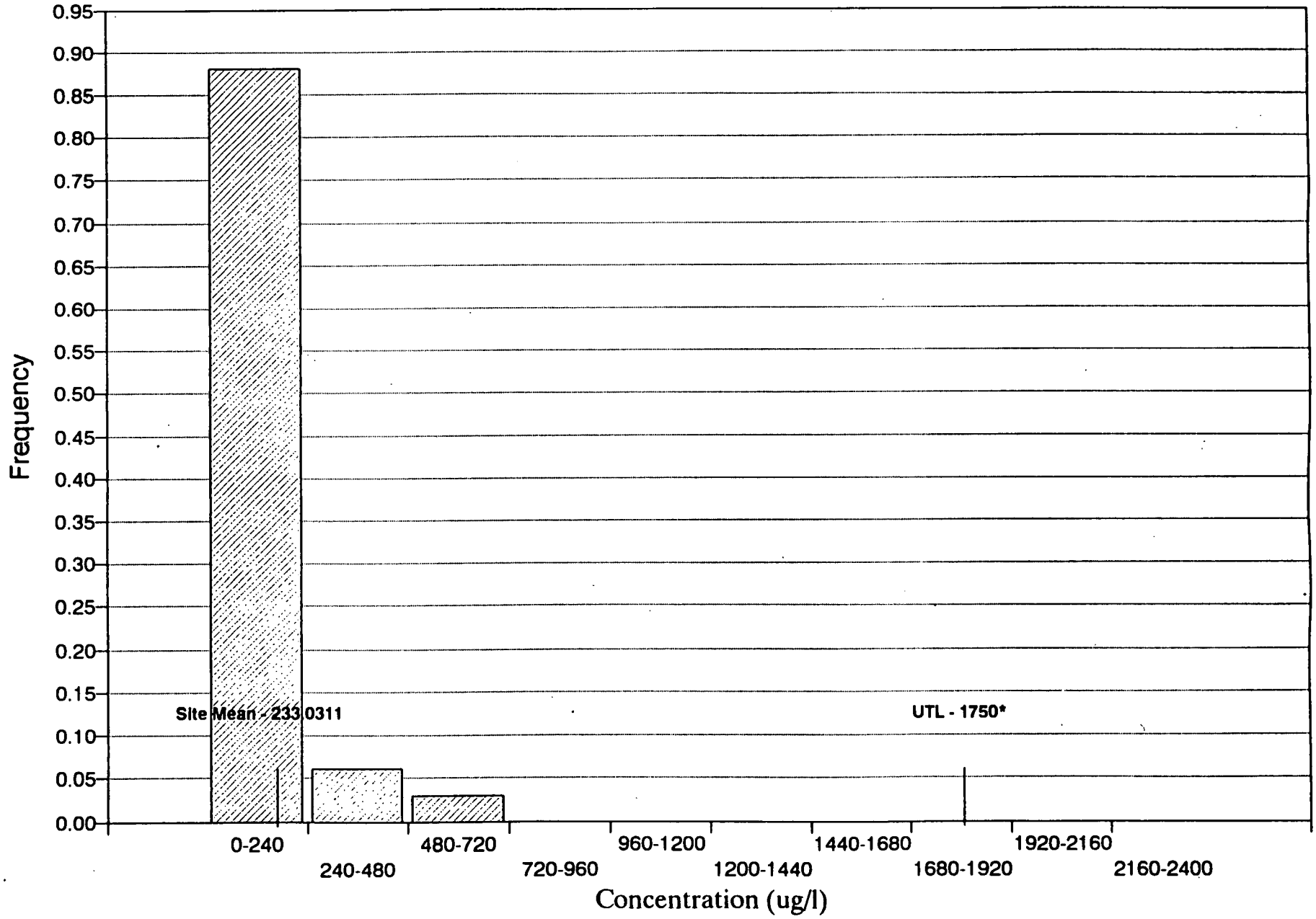


Figure D-61
Surface Water Total Copper

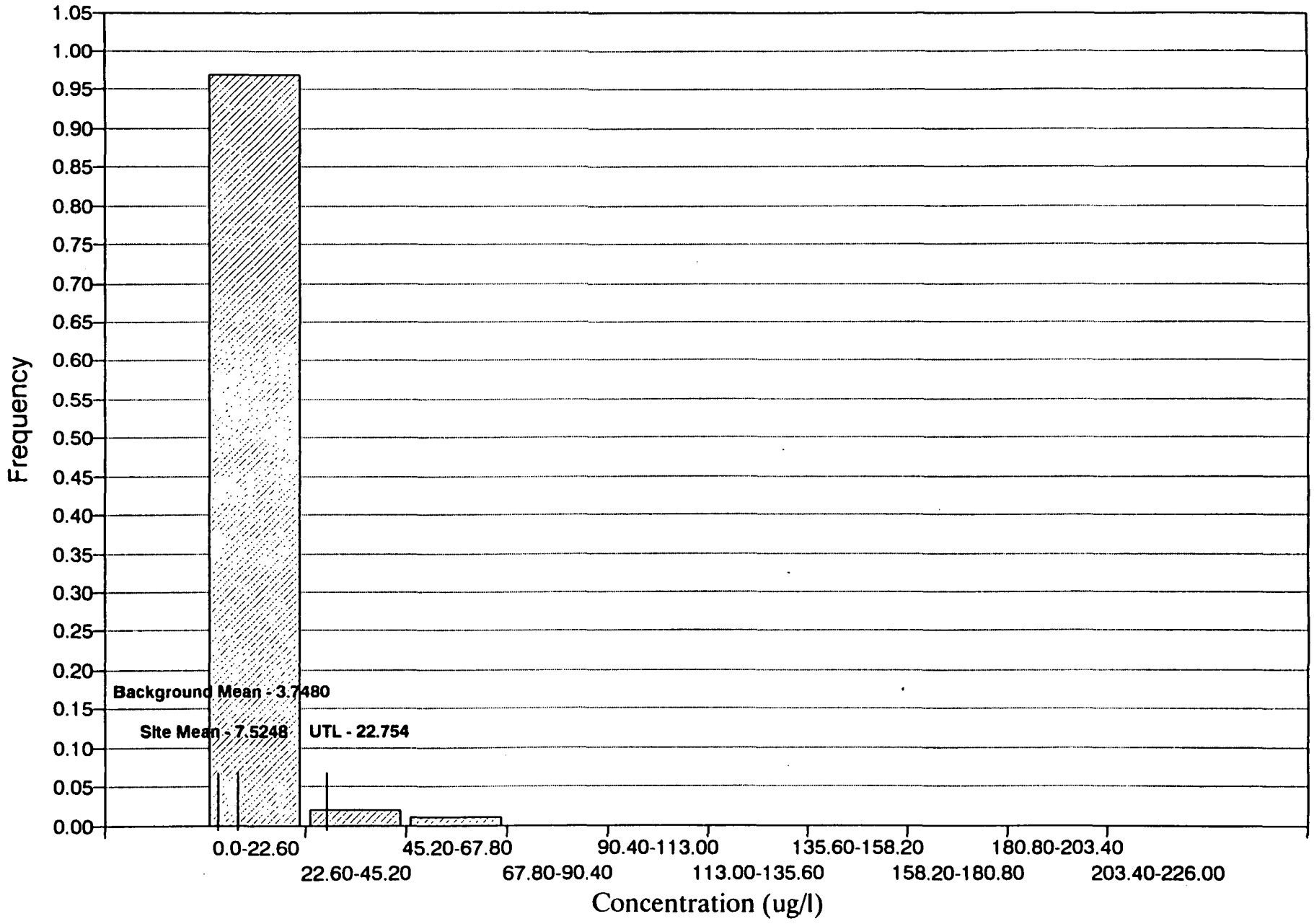


Figure D-65
Groundwater (WCS) Total Iron

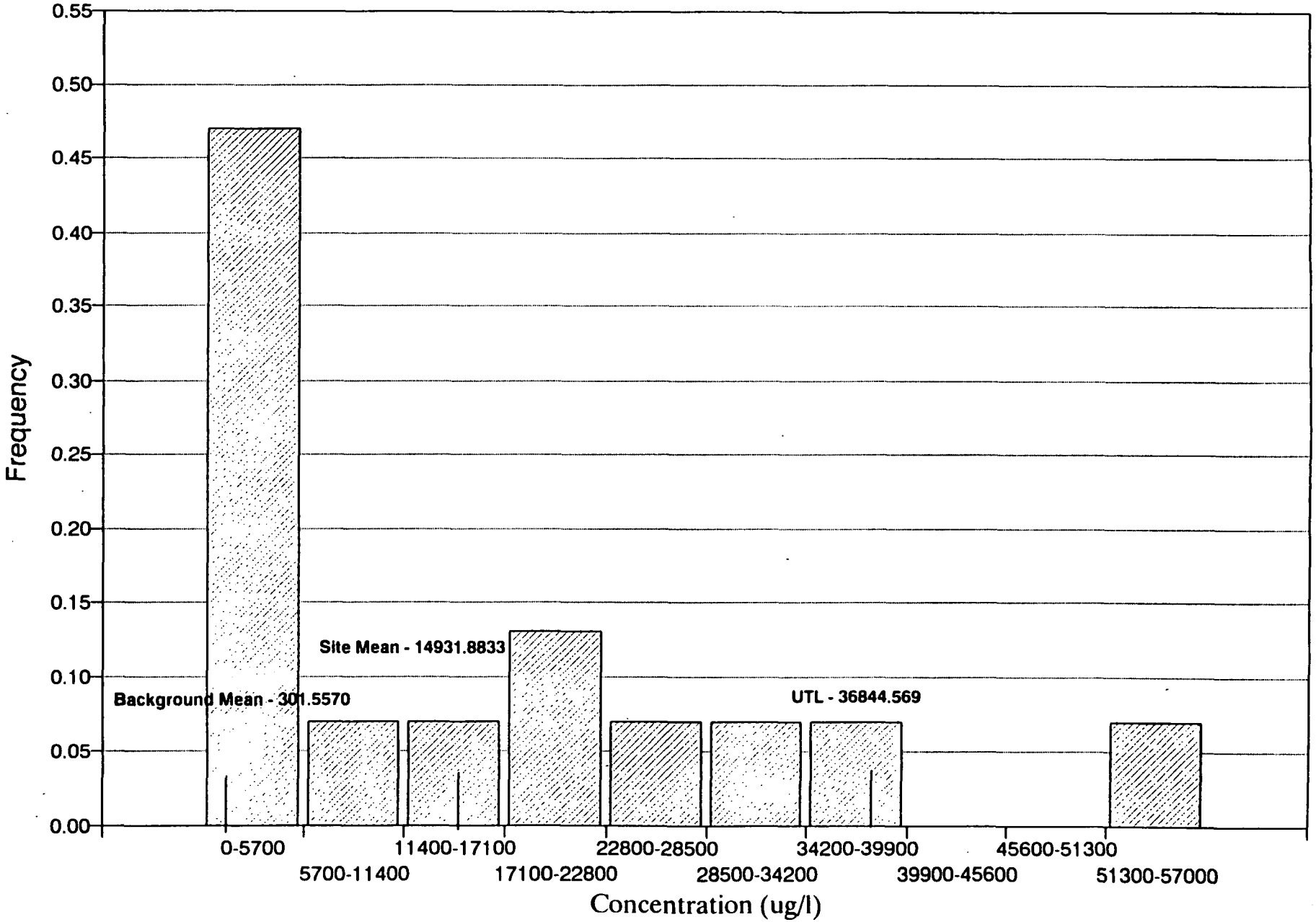


Figure D-67
Groundwater (WCS) Total Lead

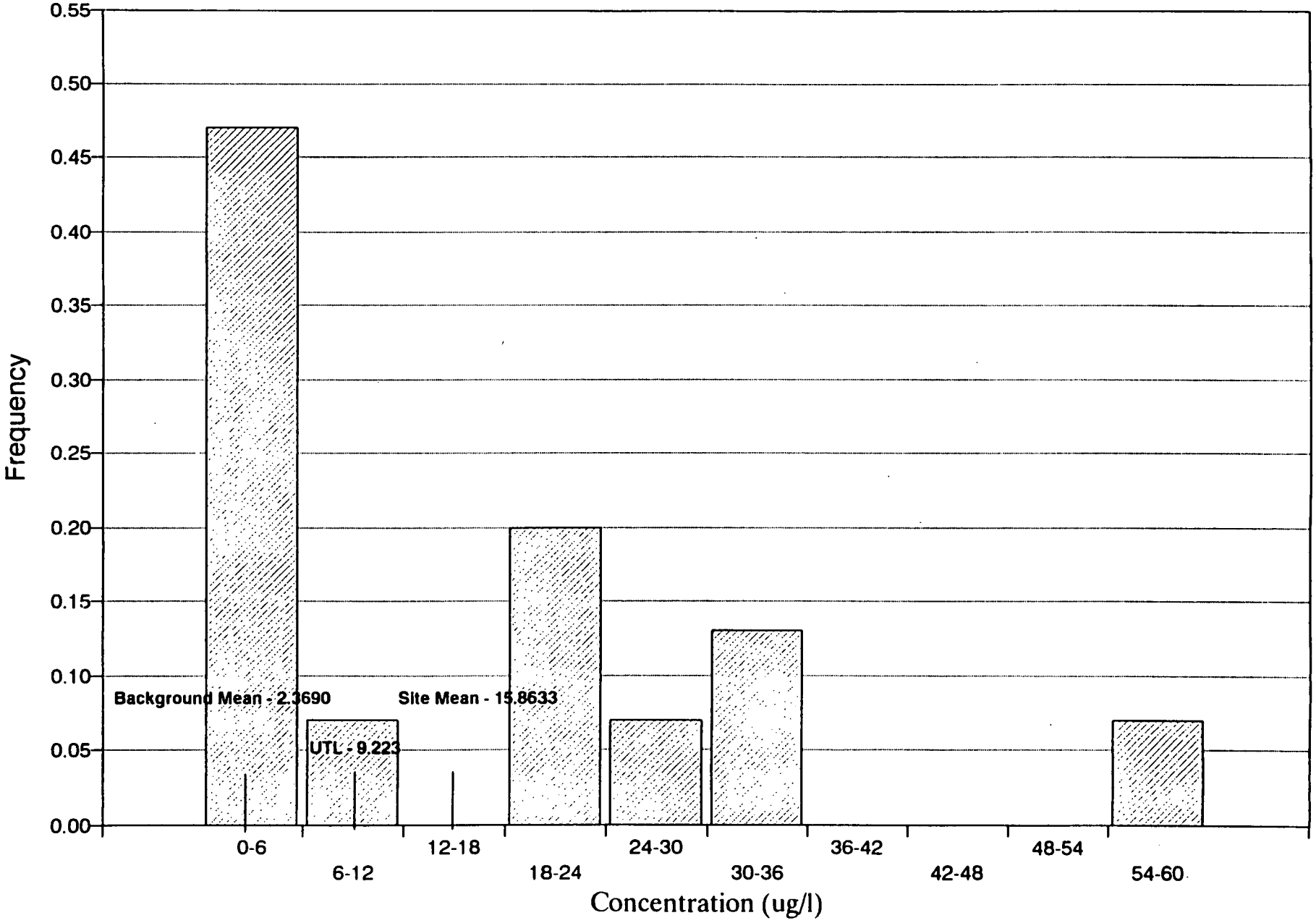


Figure D-68
Groundwater (KAR) Total Lead

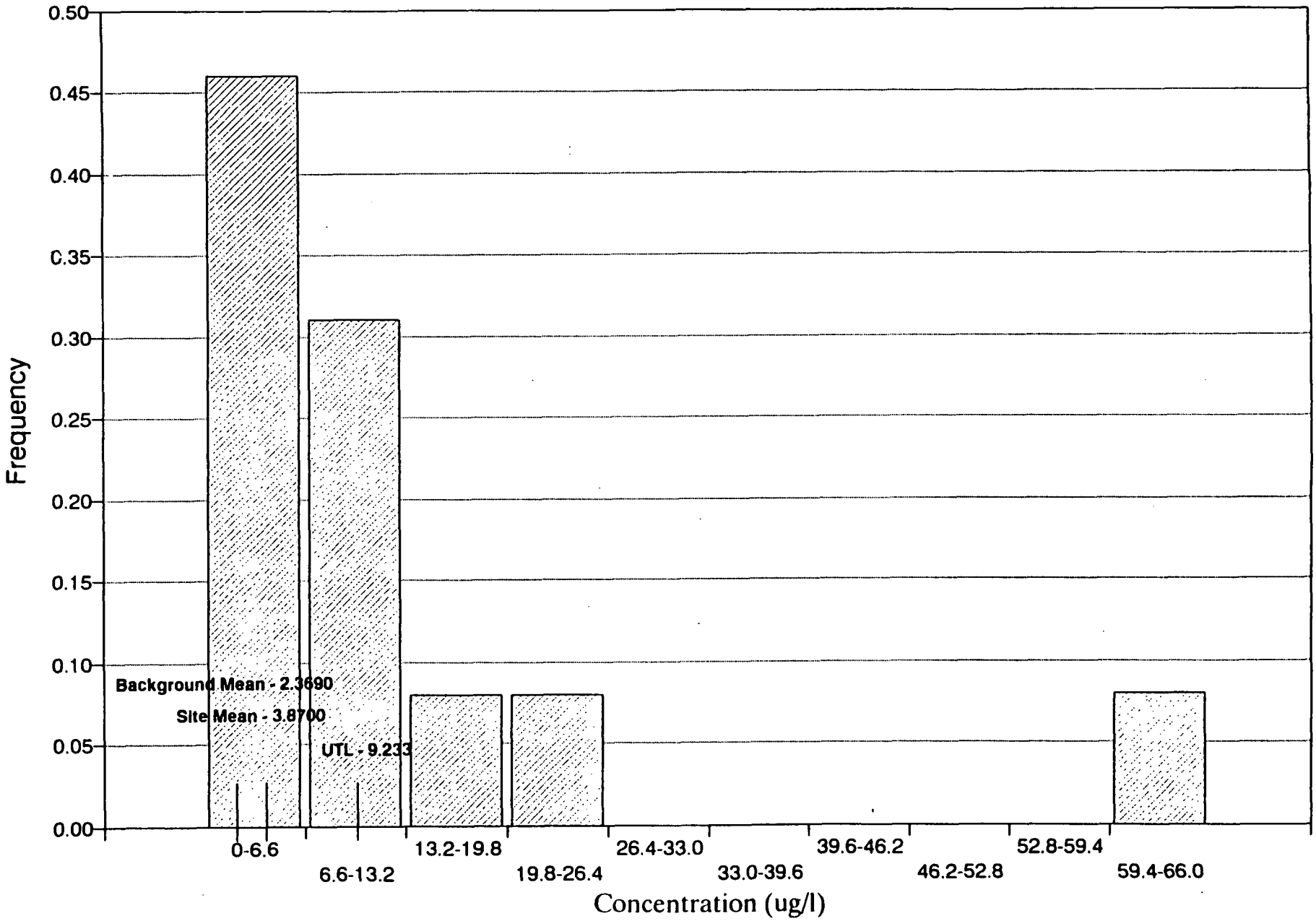


Figure D-69
Surface Soil Total Lead

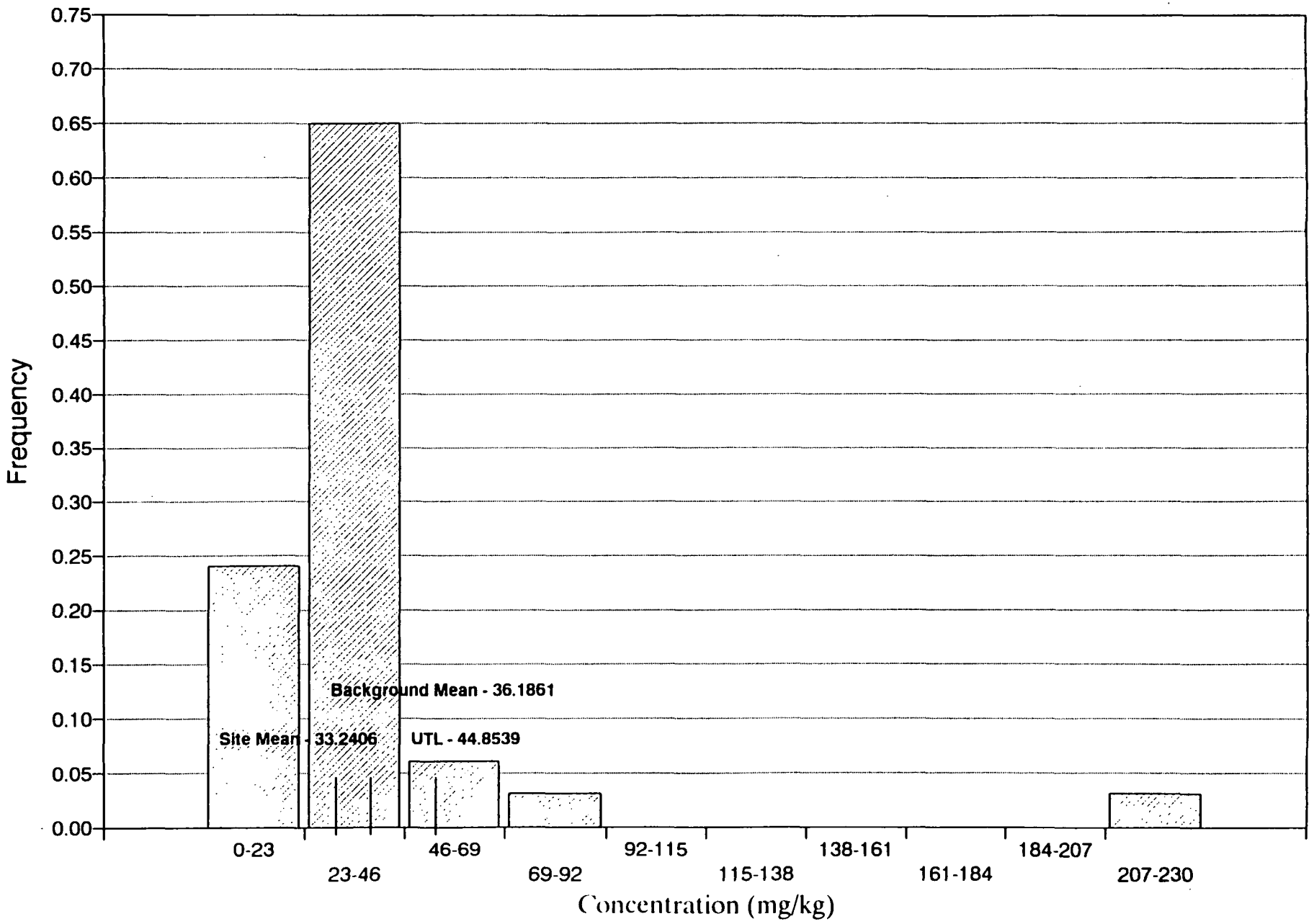


Figure D-70
Sediments Total Lead

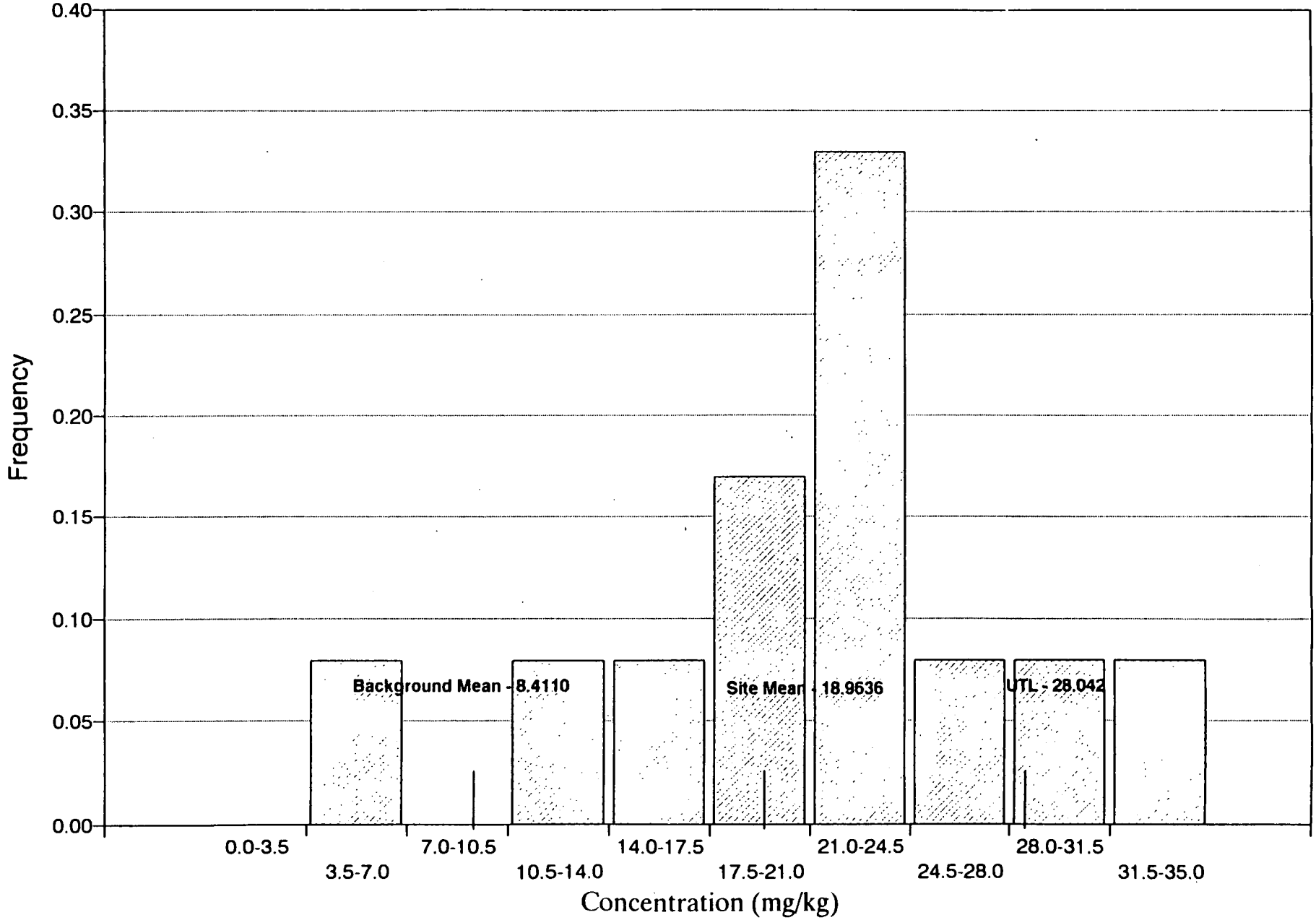


Figure D-71
Surface Water Total Lead

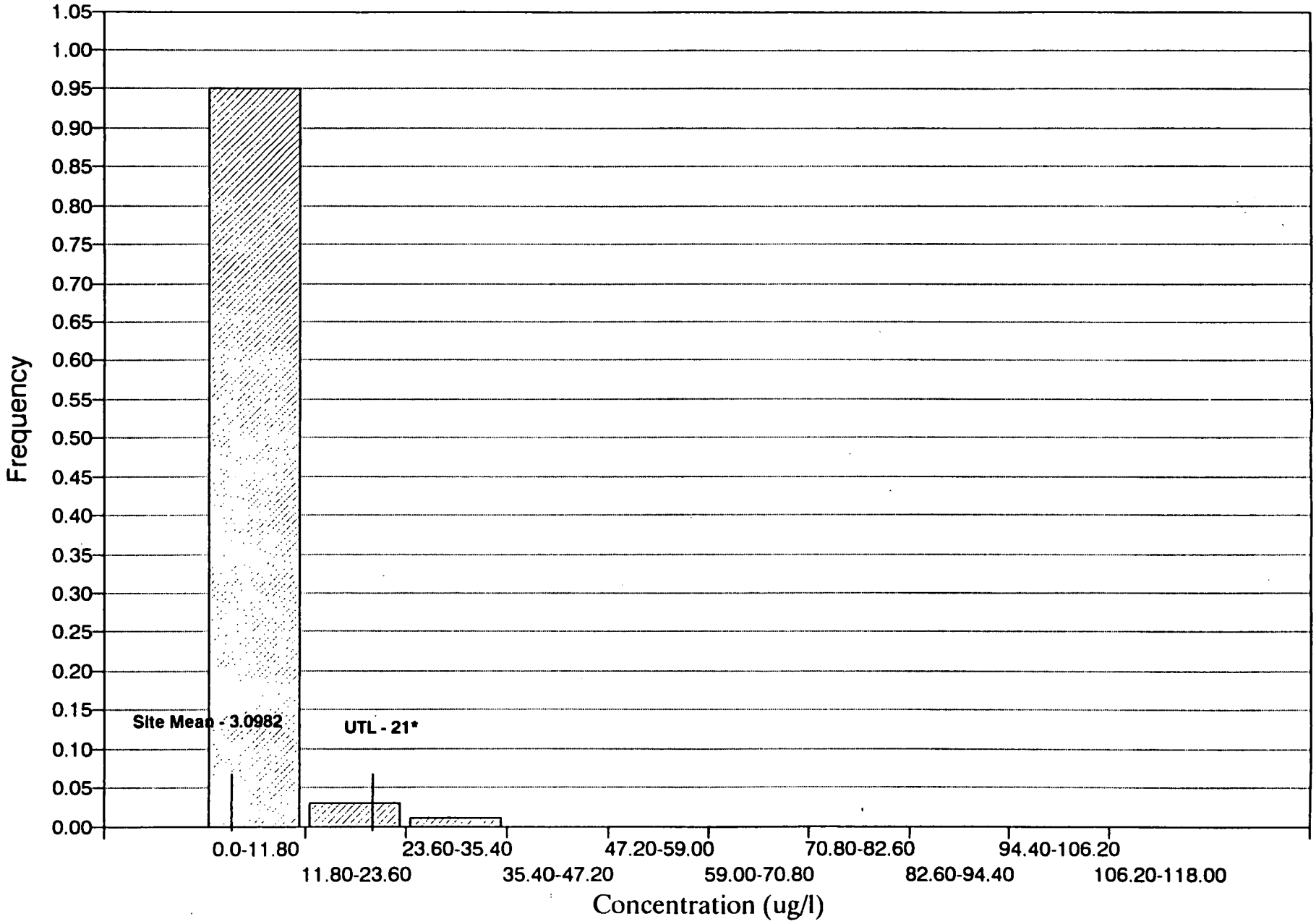


Figure D-76
Geologic Material (COL) Total Lithium

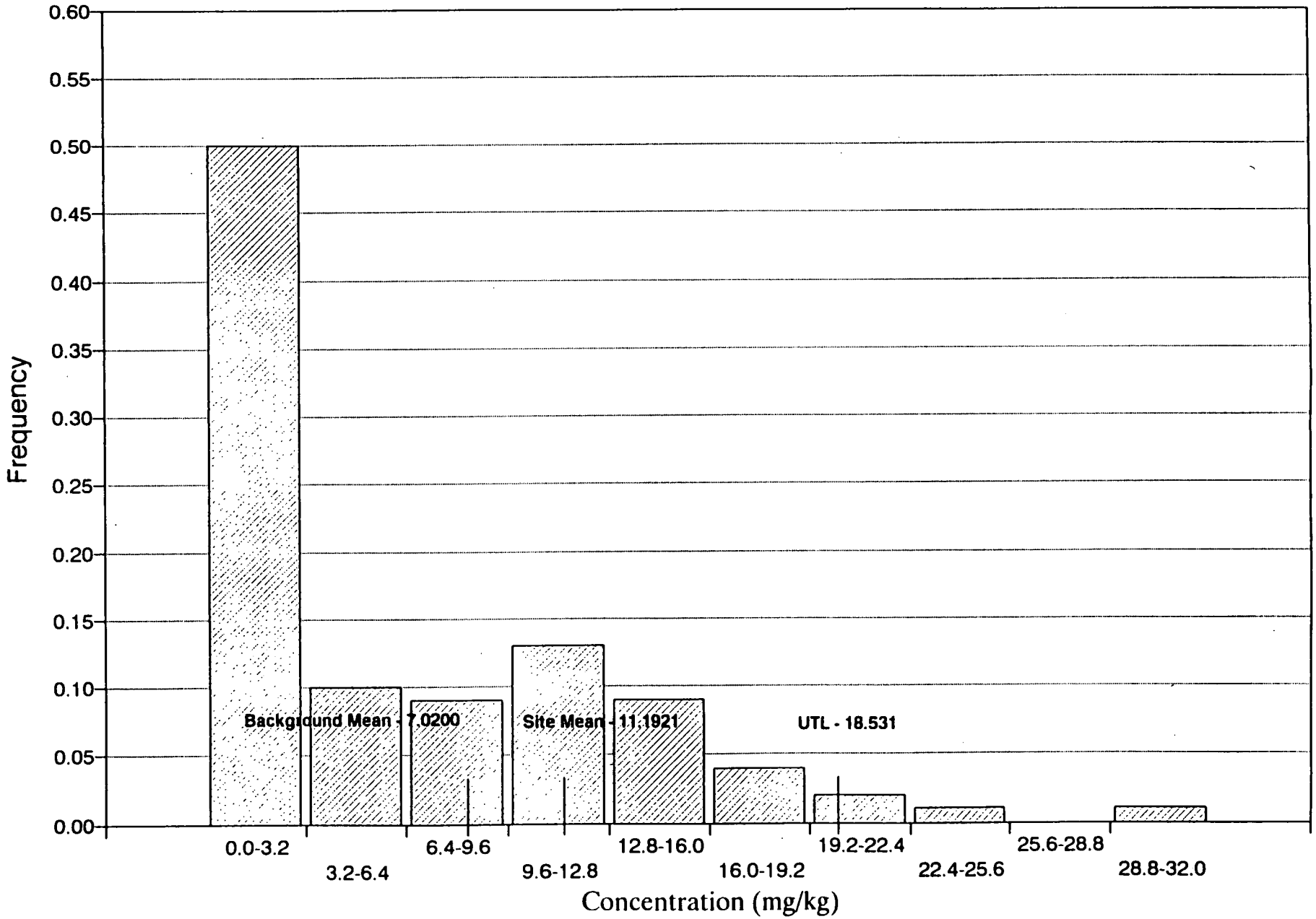


Figure D-77
Groundwater (RFA) Total Lithium

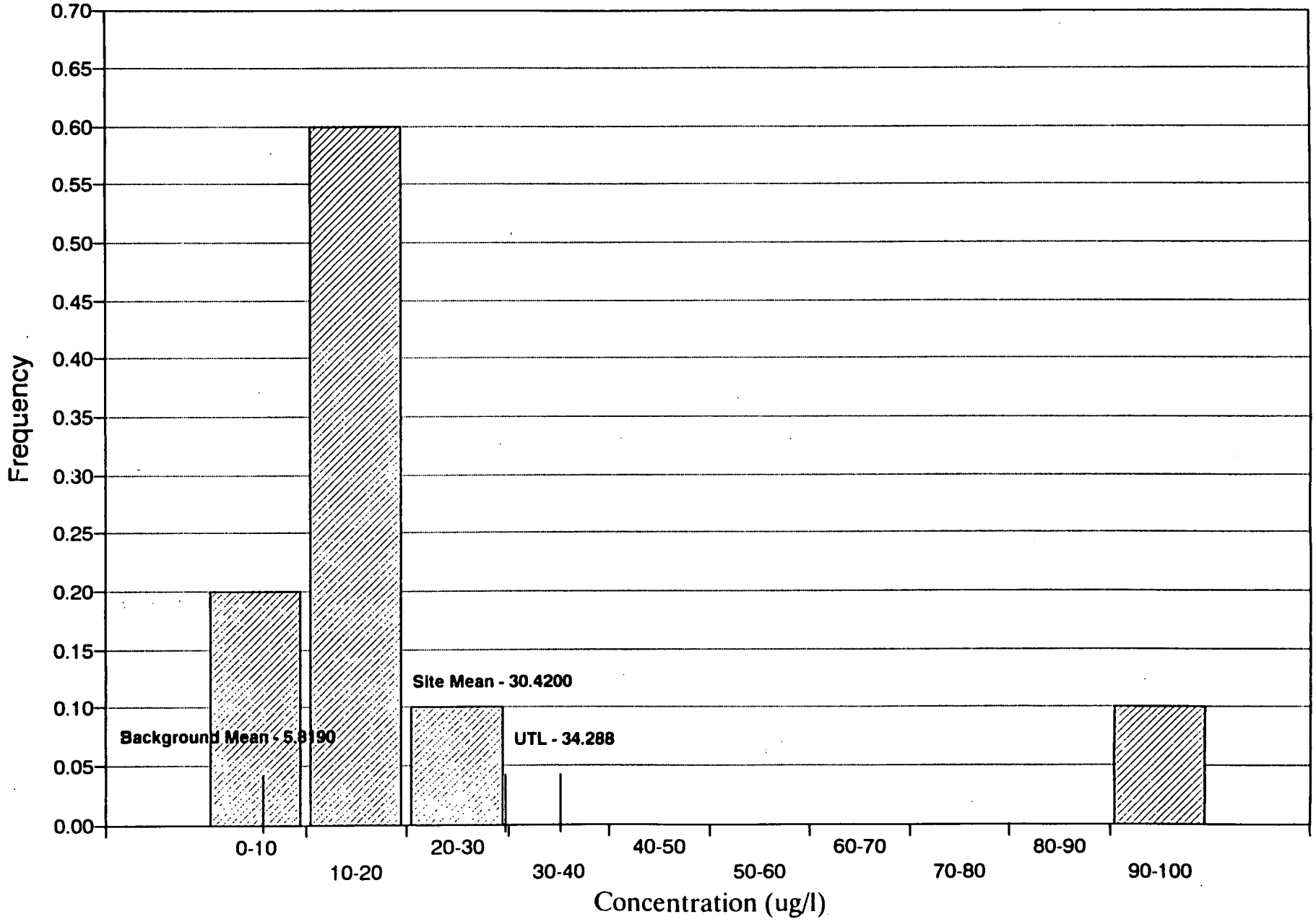


Figure D-78
Groundwater (WCS) Total Lithium

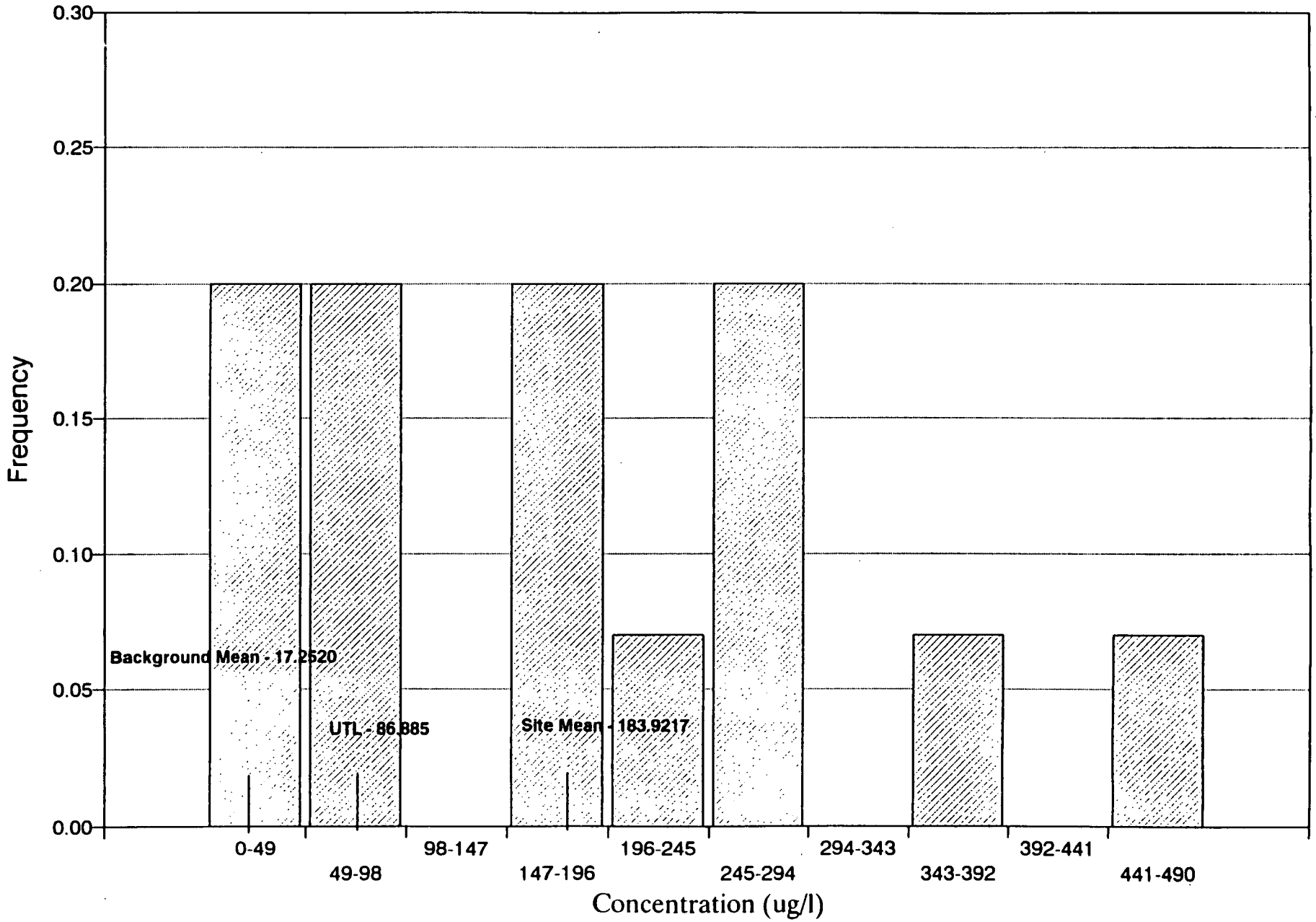


Figure D-79
Groundwater (KAR) Total Lithium

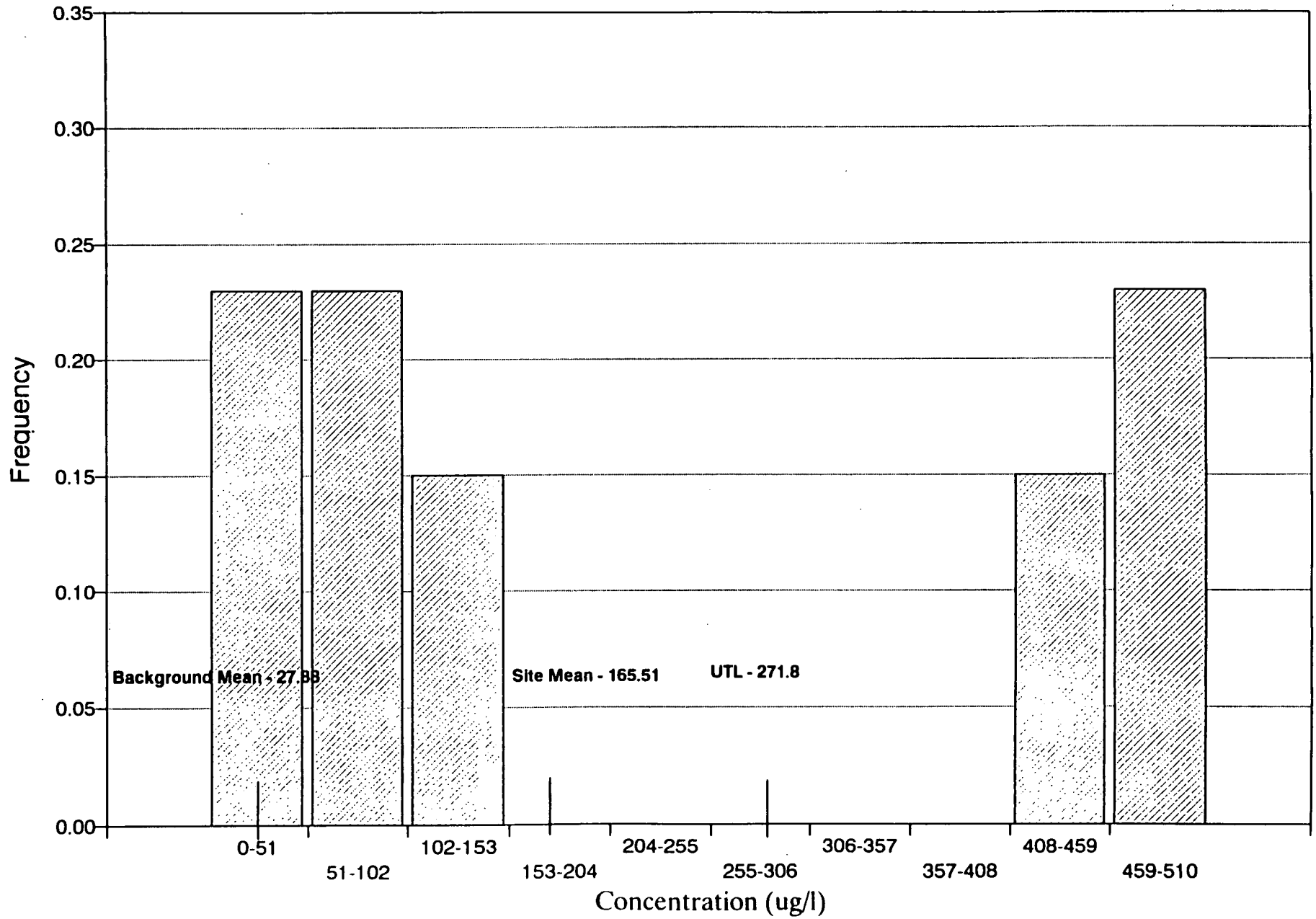


Figure D-80
Surface Water Total Lithium

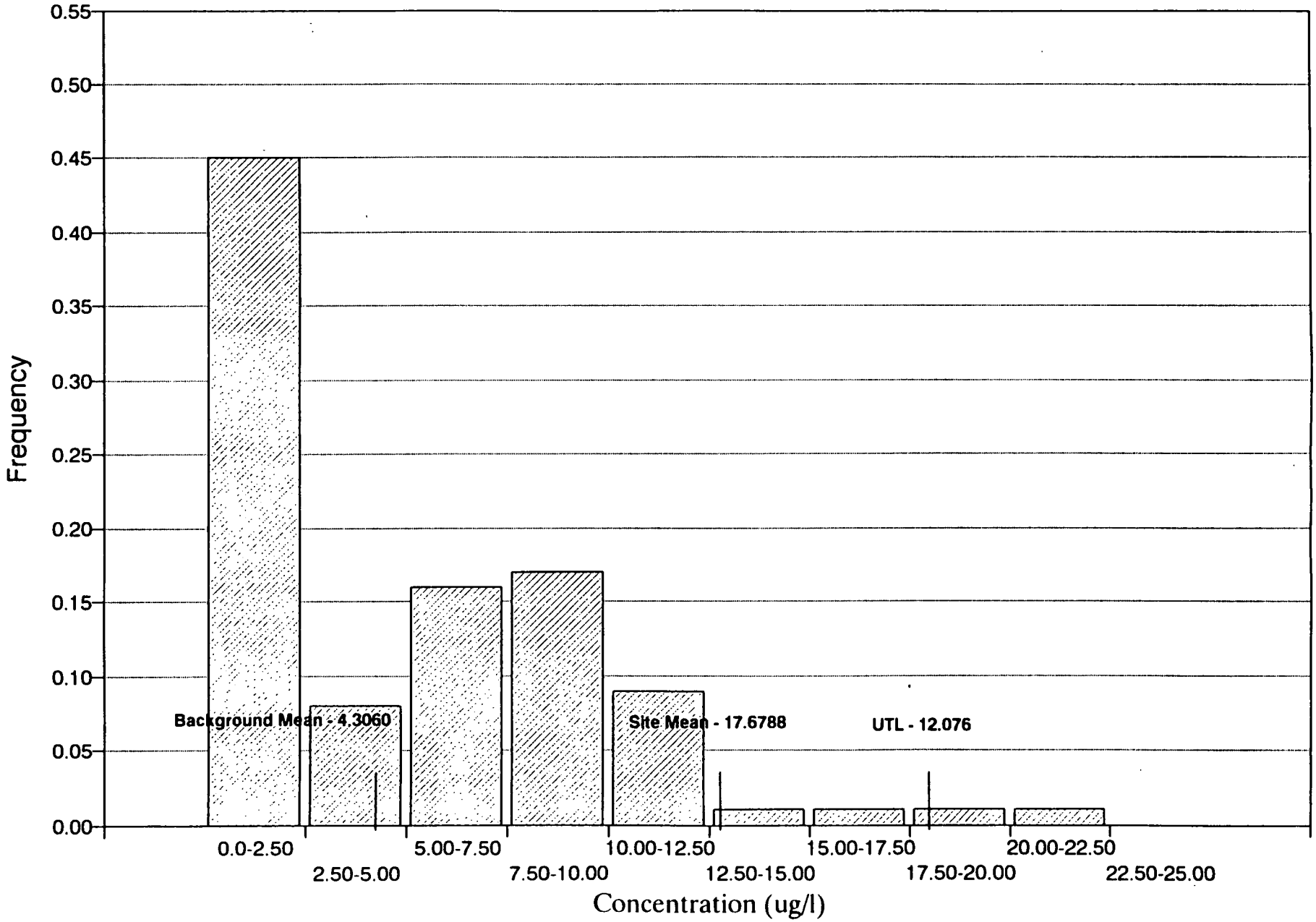


Figure D-84
Groundwater (RFA) Total Magnesium

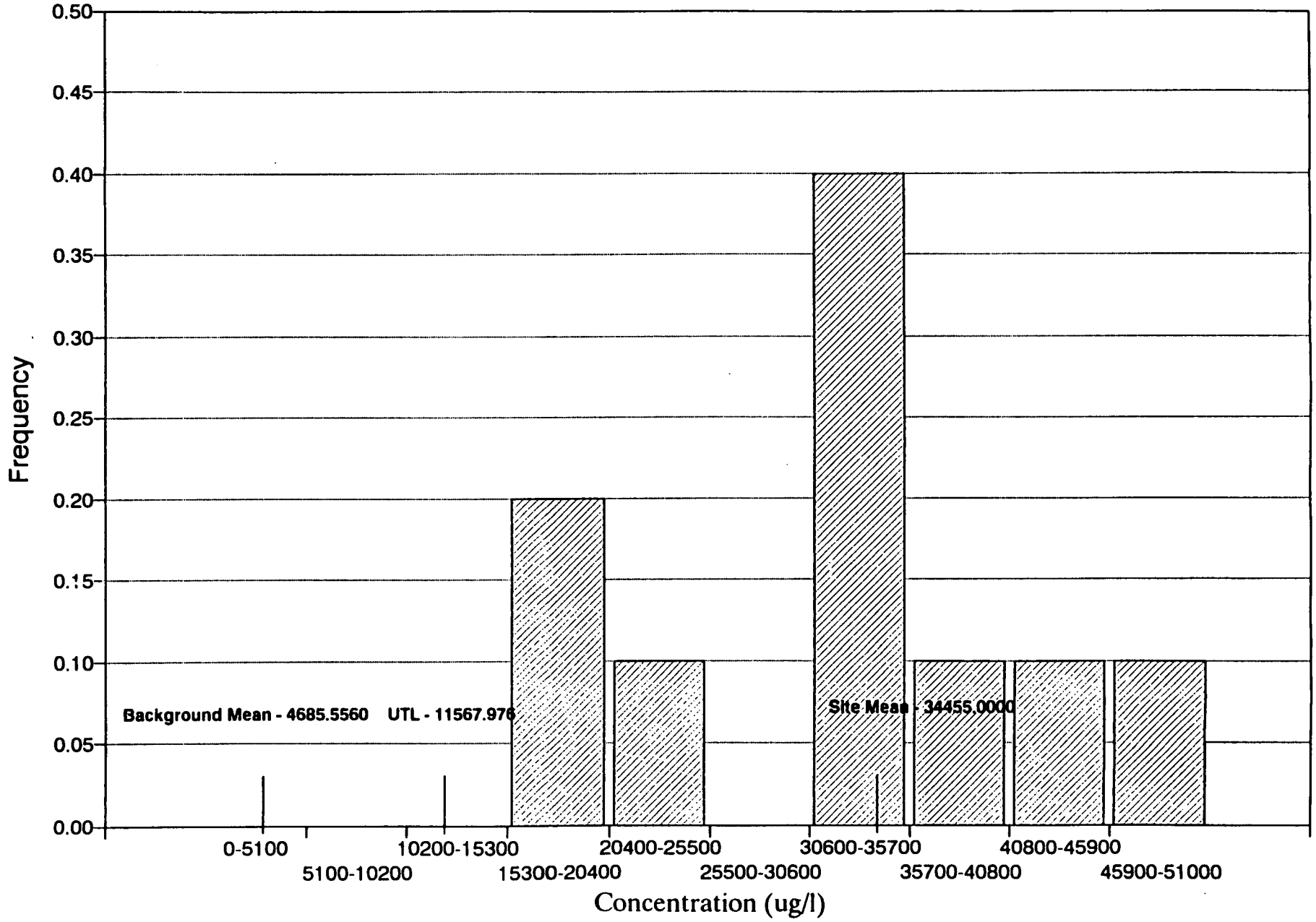


Figure D-85
Groundwater (WCS) Total Magnesium

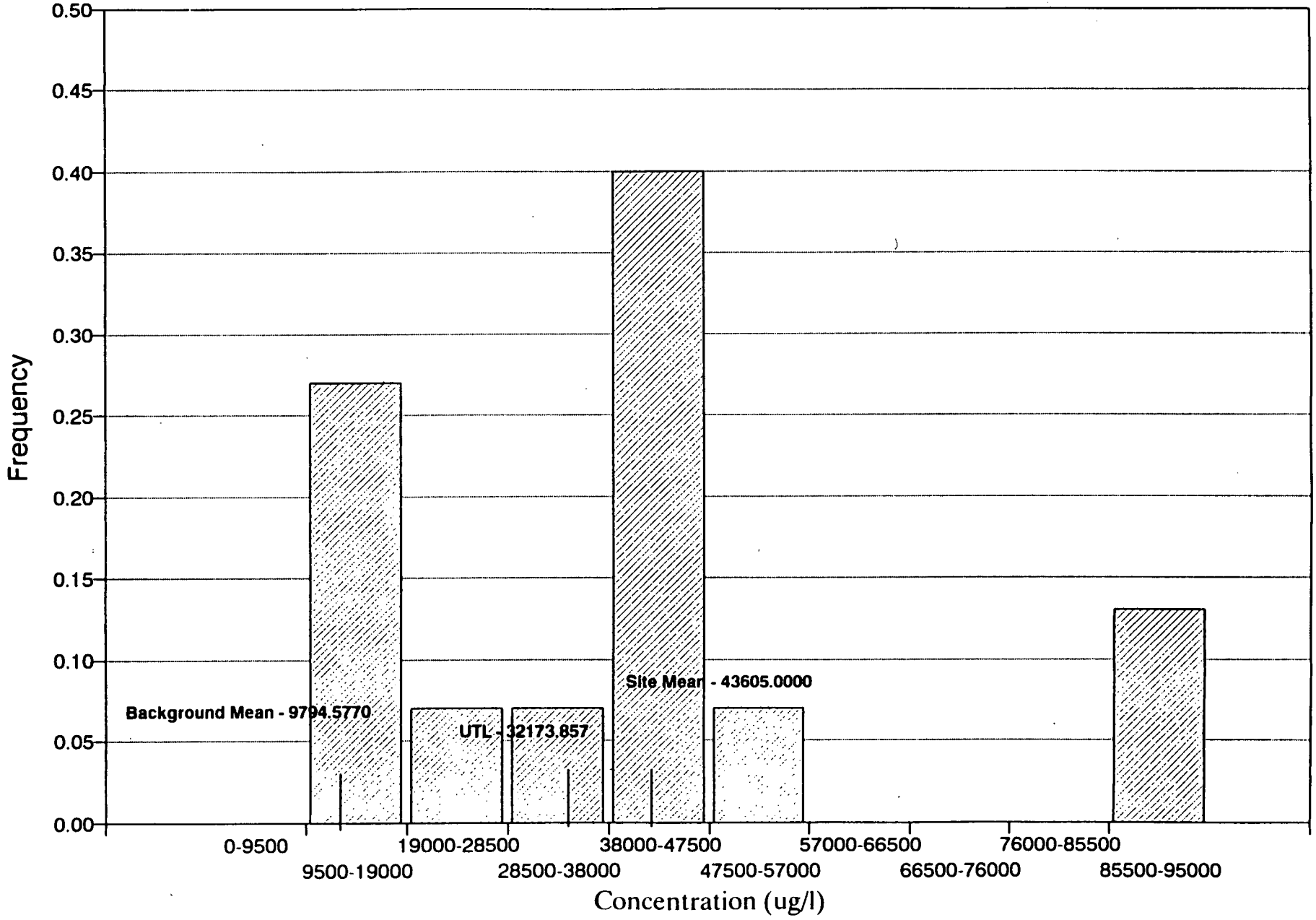


Figure D-86
Groundwater (KAR) Total Magnesium

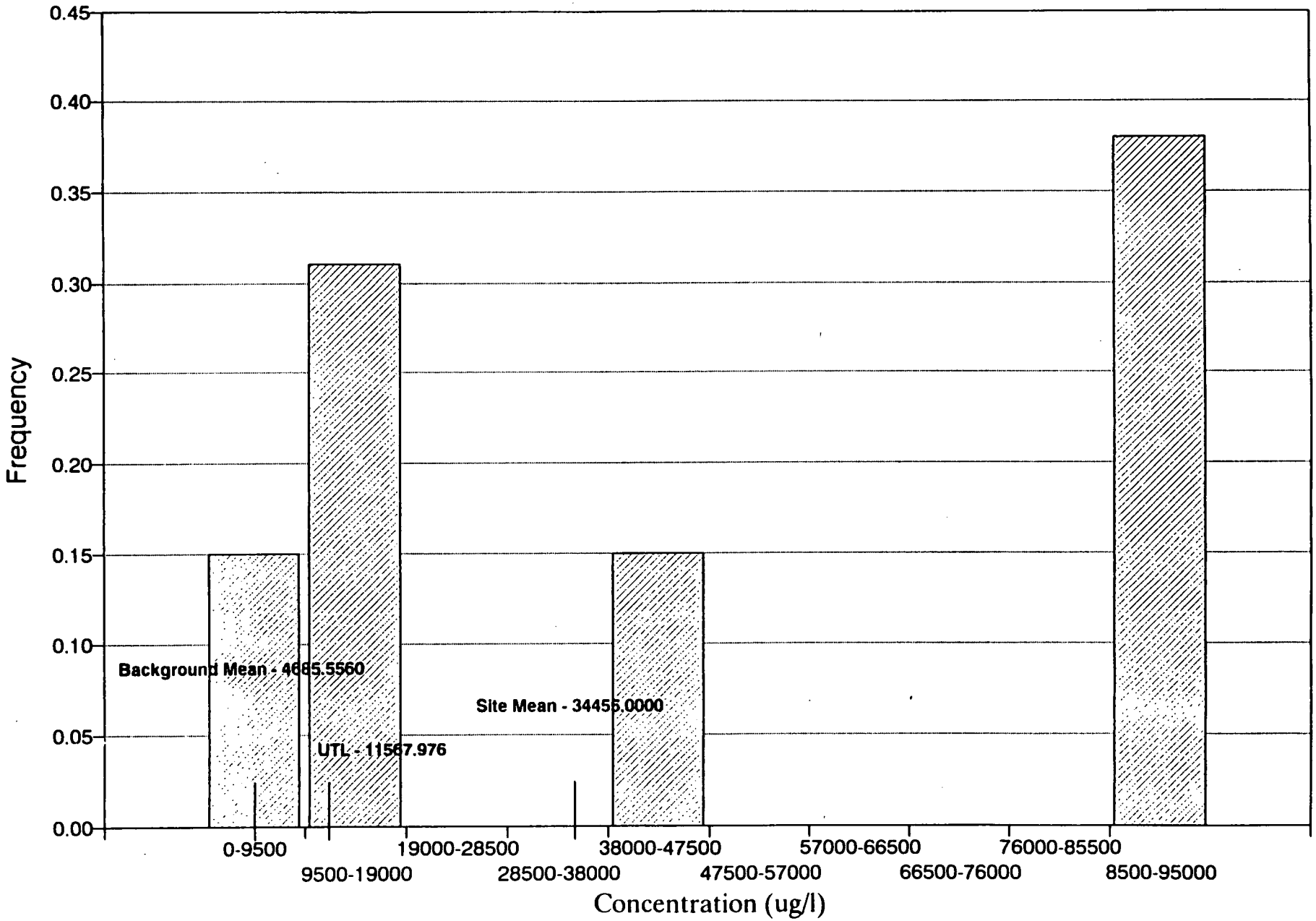


Figure D-87
Surface Water Total Magnesium

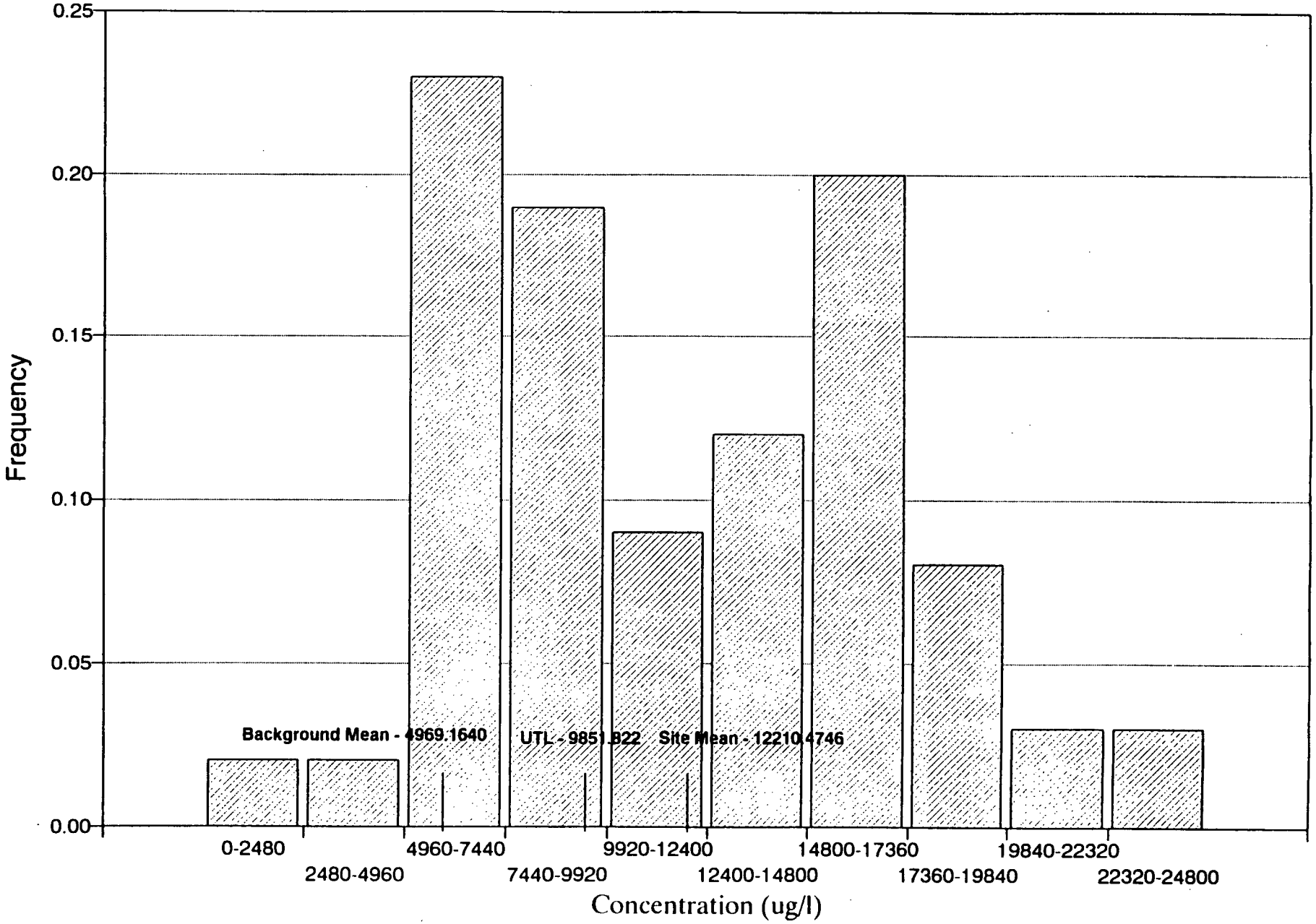


Figure D-90
Groundwater (COL) Total Manganese

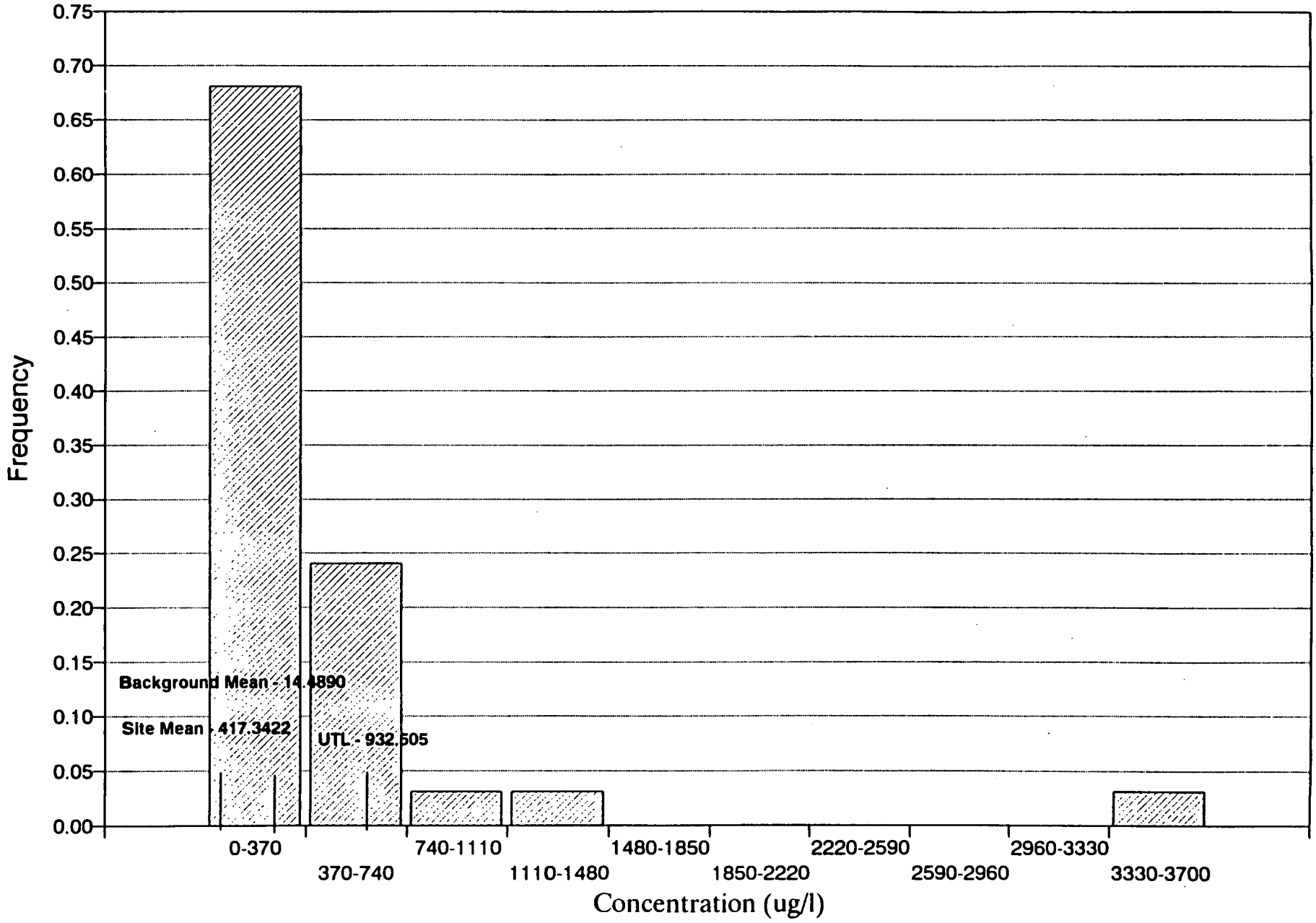


Figure D-91
Groundwater (VFA) Total Manganese

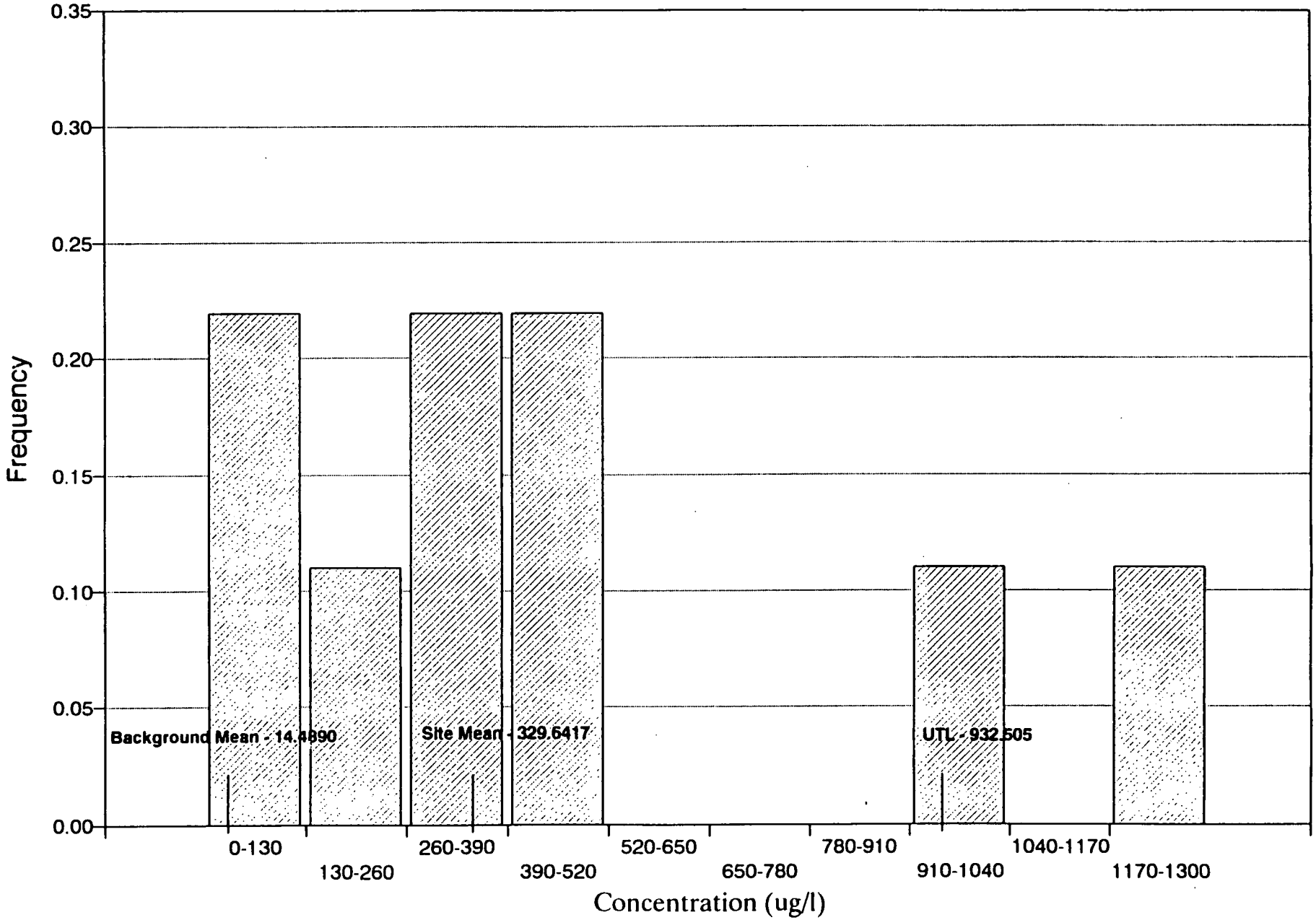


Figure D-92
Groundwater (WCS) Total Manganese

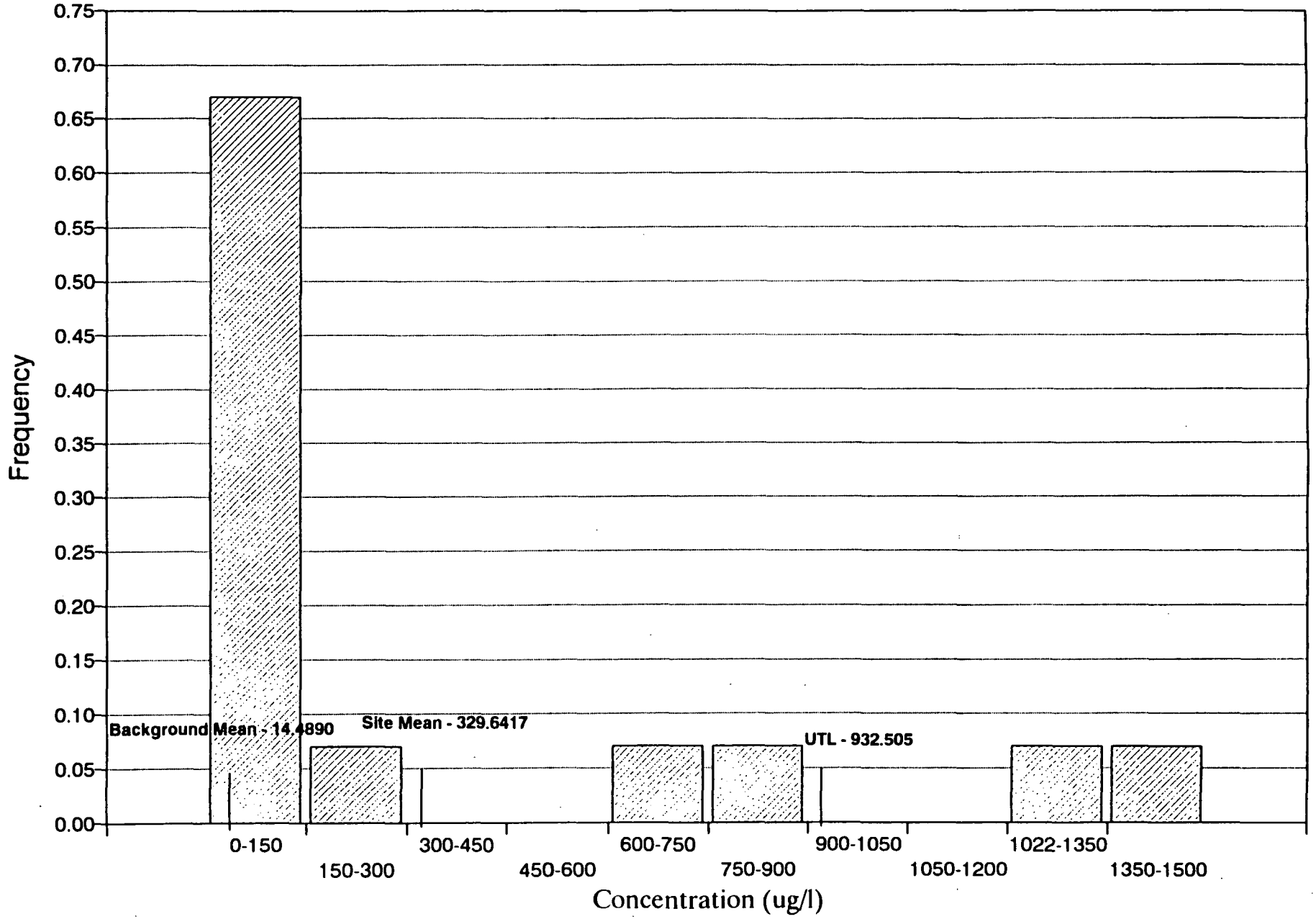


Figure D-93
Geologic Material (COL) Total Manganese

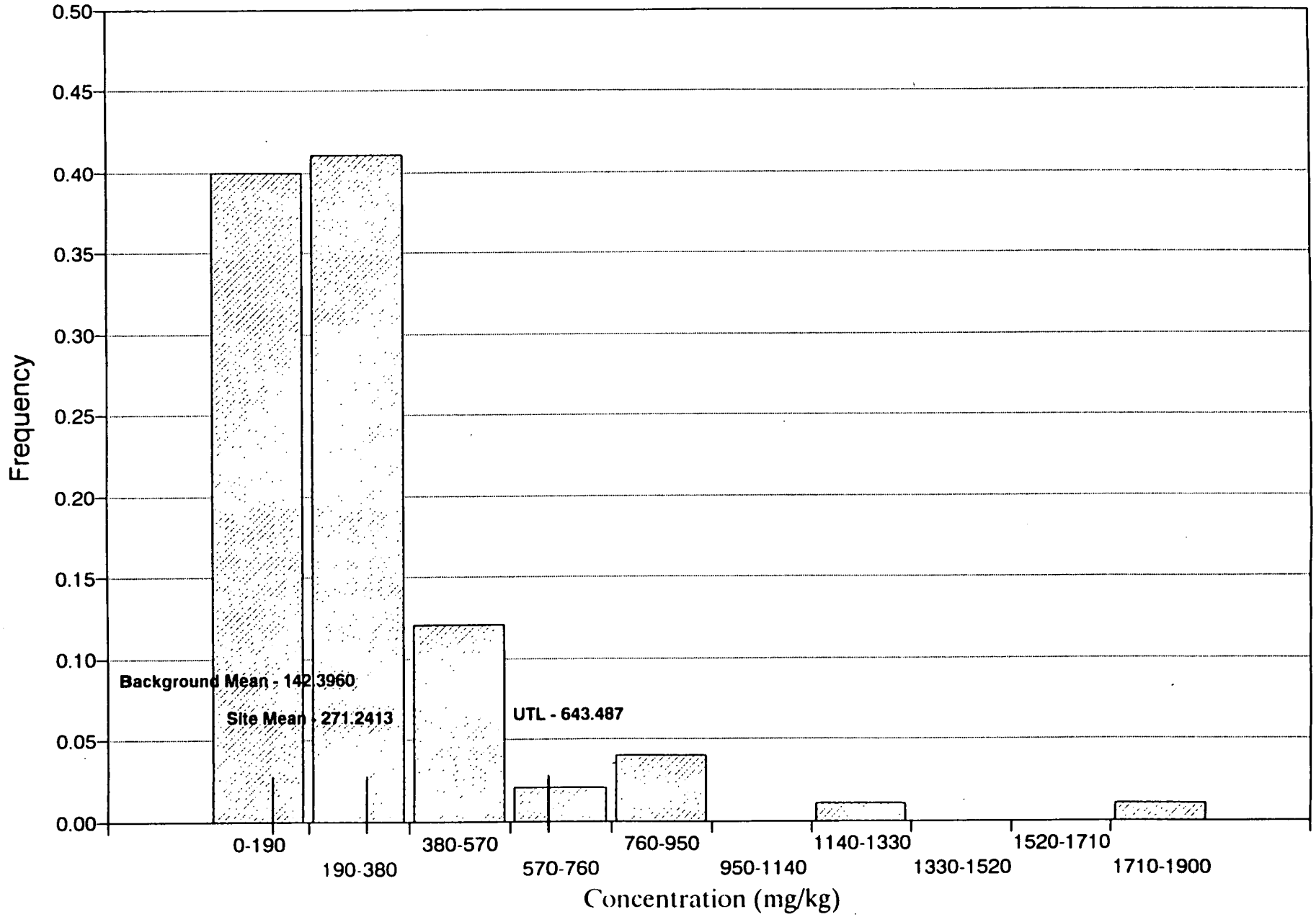


Figure D-96
Surface Soil Total Molybdenum

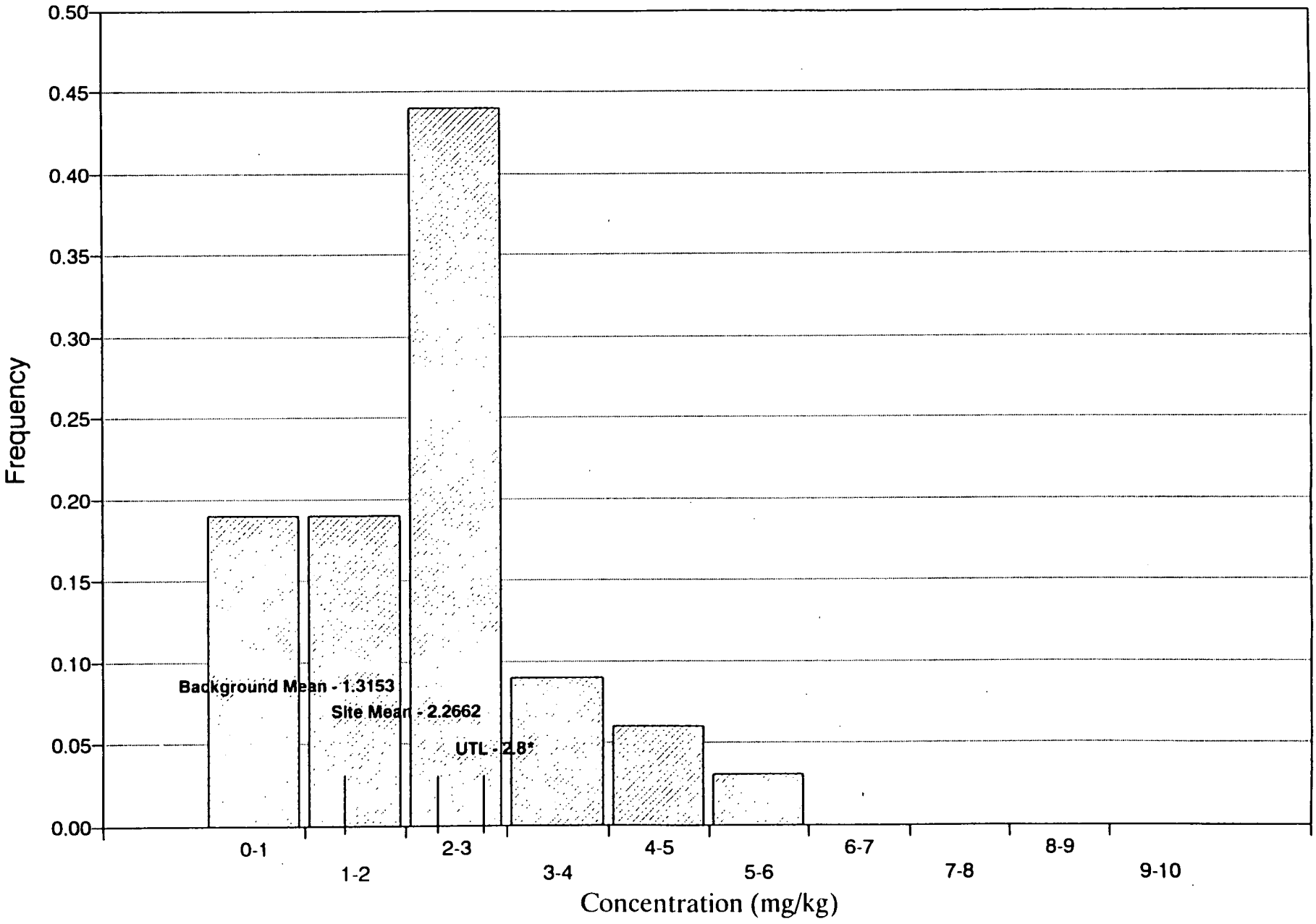


Figure D-97
Sediments Total Molybdenum

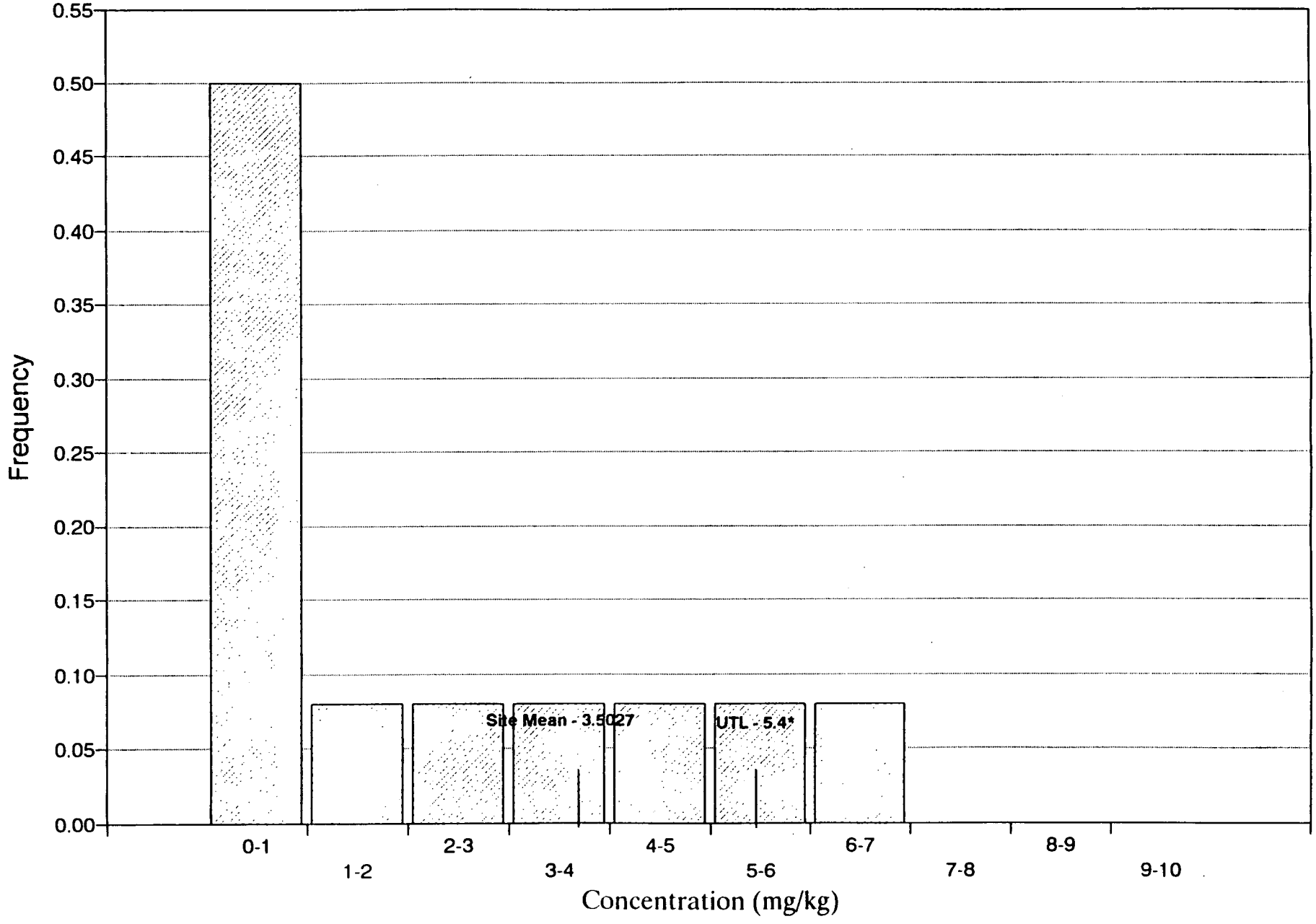


Figure D-98
Geologic Material (COL) Total Molybdenum

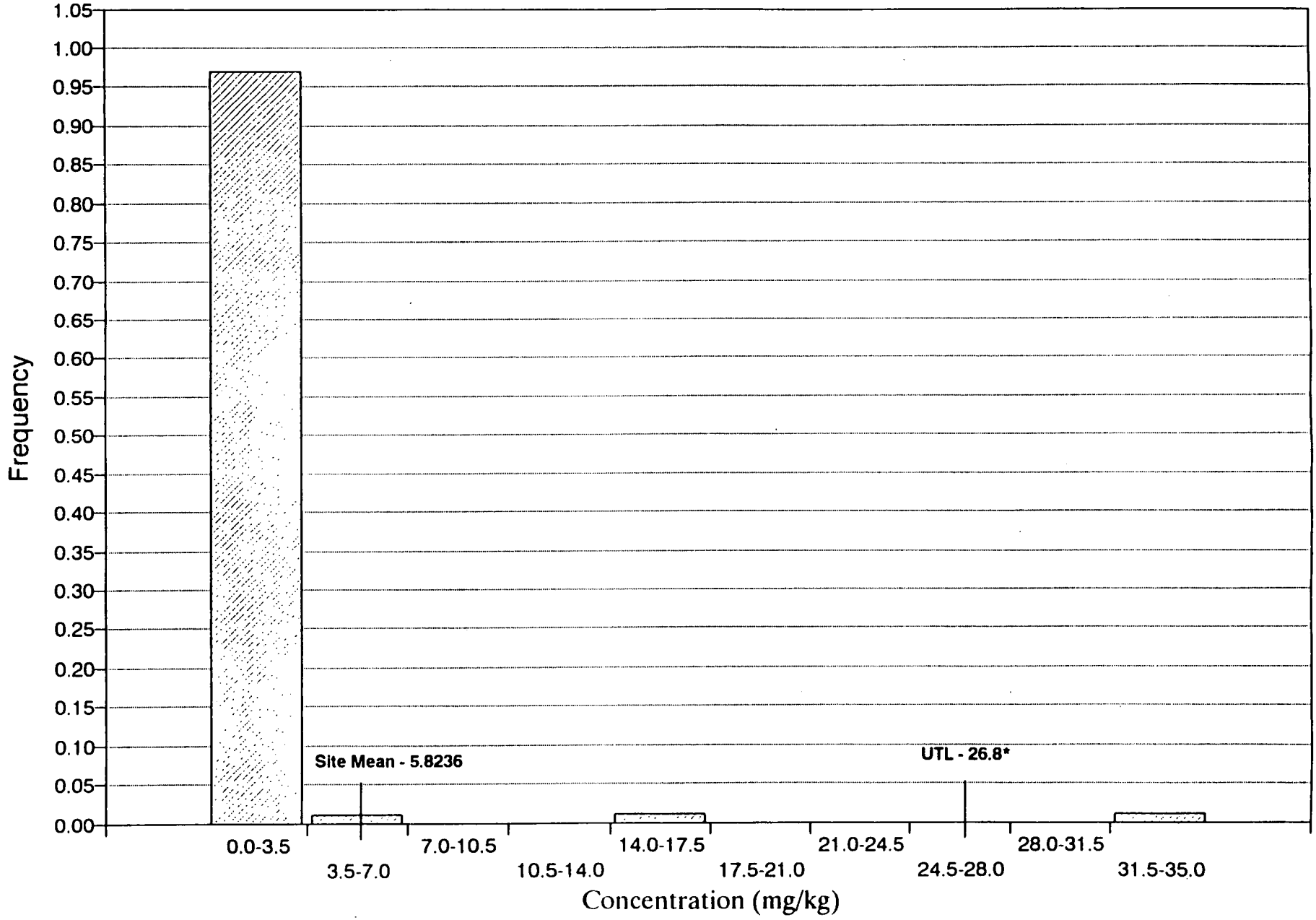


Figure D-102
Surface Water Total Nickel

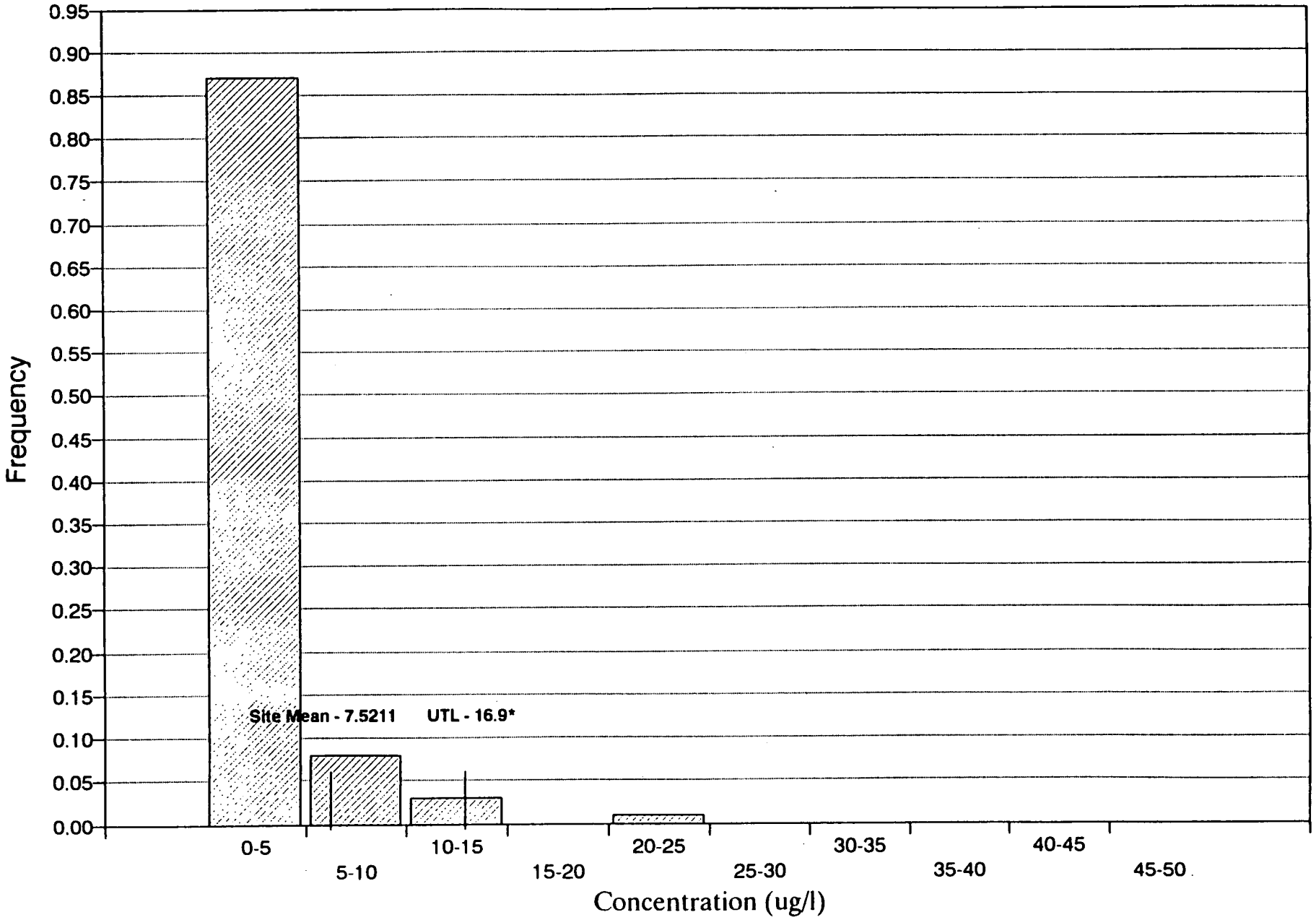


Figure D-104
Groundwater (RFA) Total Potassium

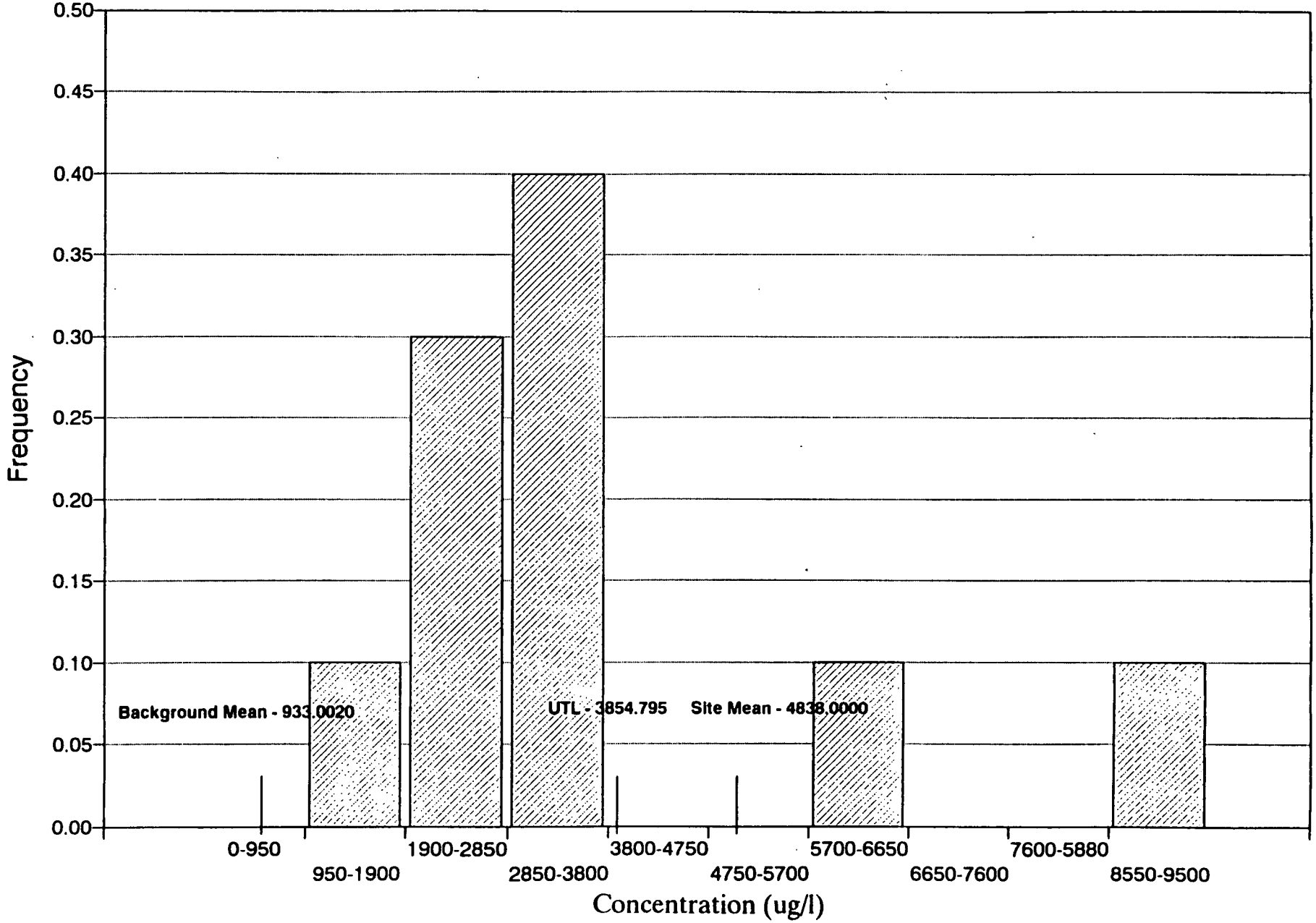


Figure D-105
Groundwater (COL) Total Potassium

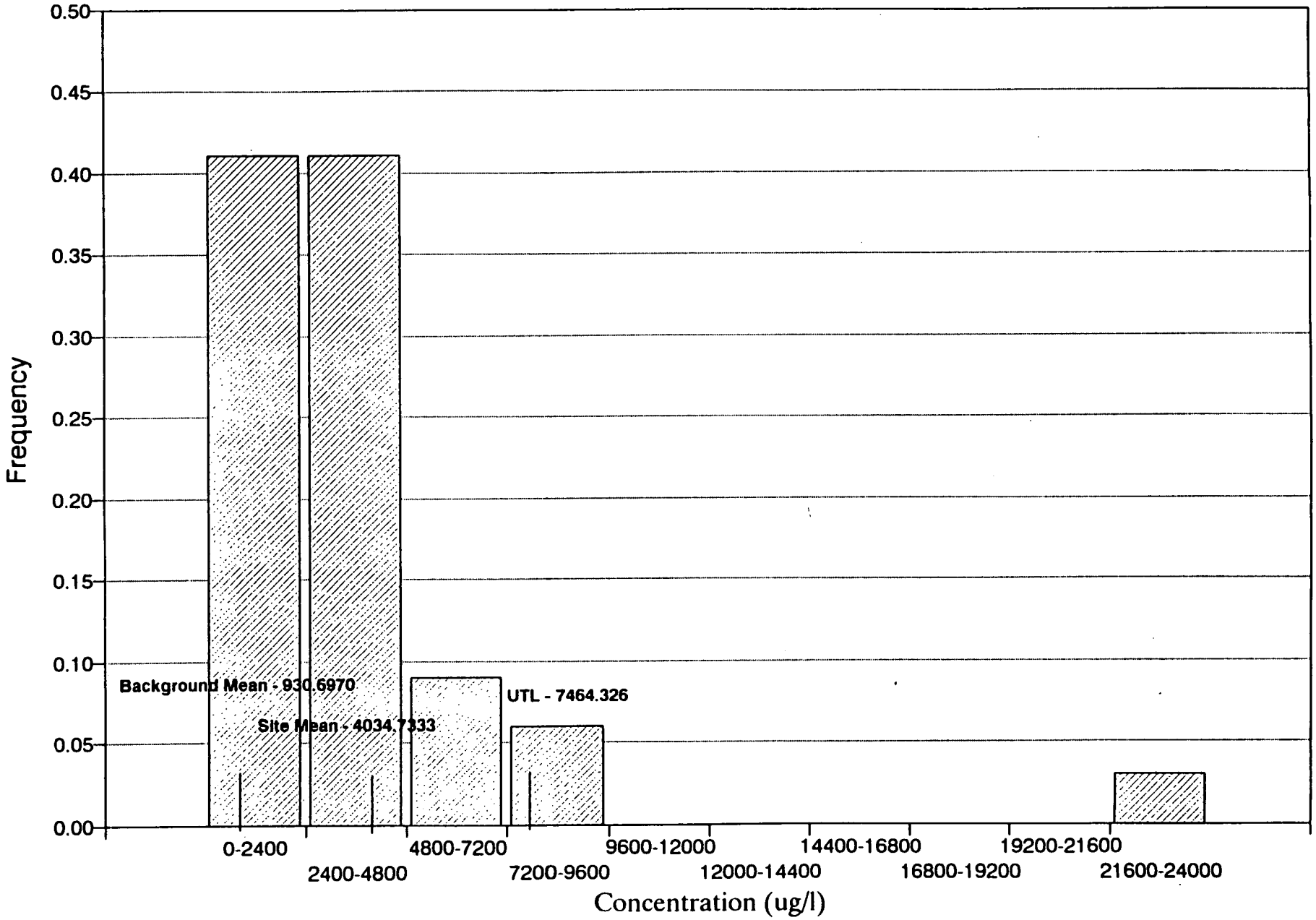


Figure D-106
Groundwater (WCS) Total Potassium

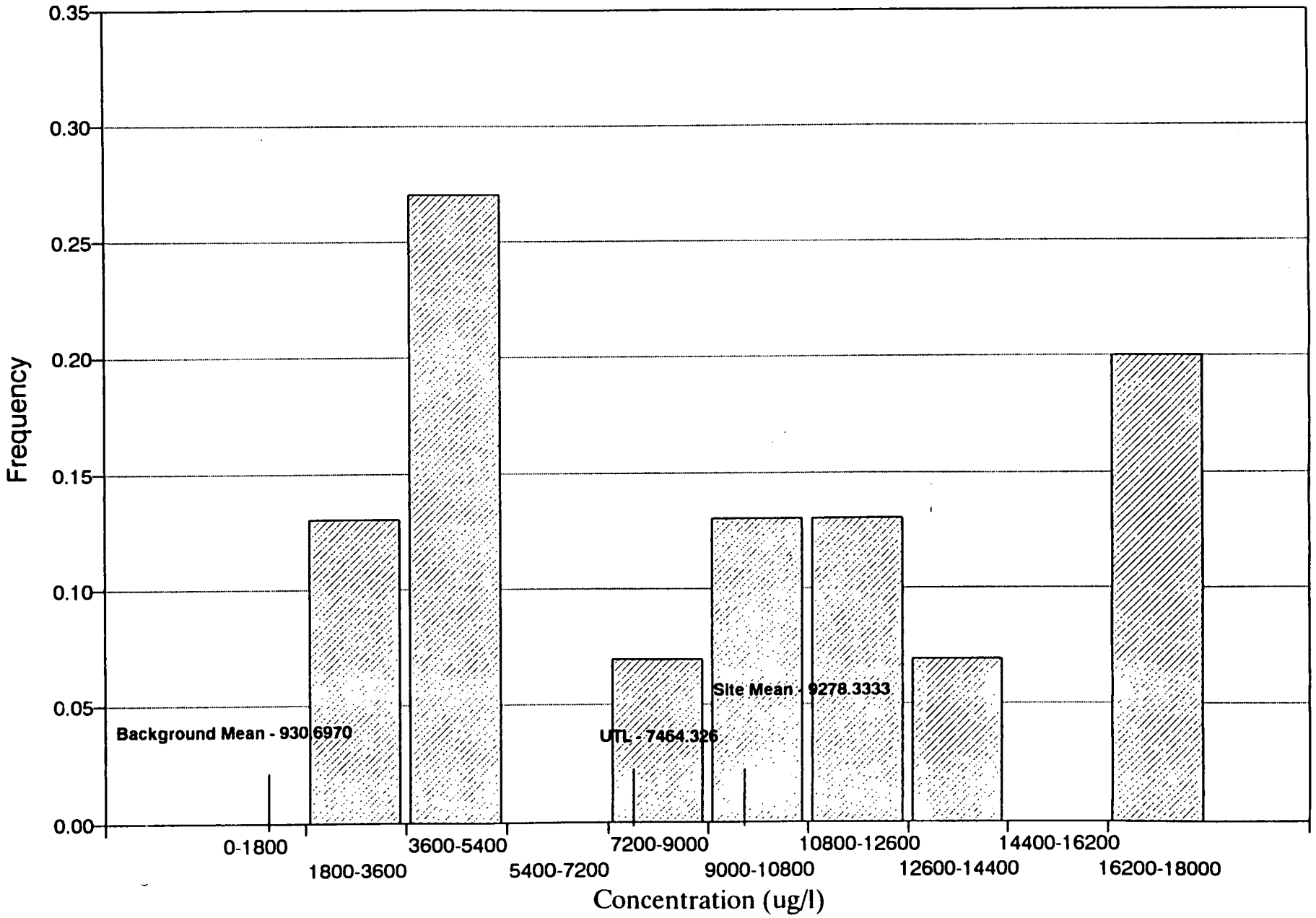


Figure D-107
Surface Water Total Potassium

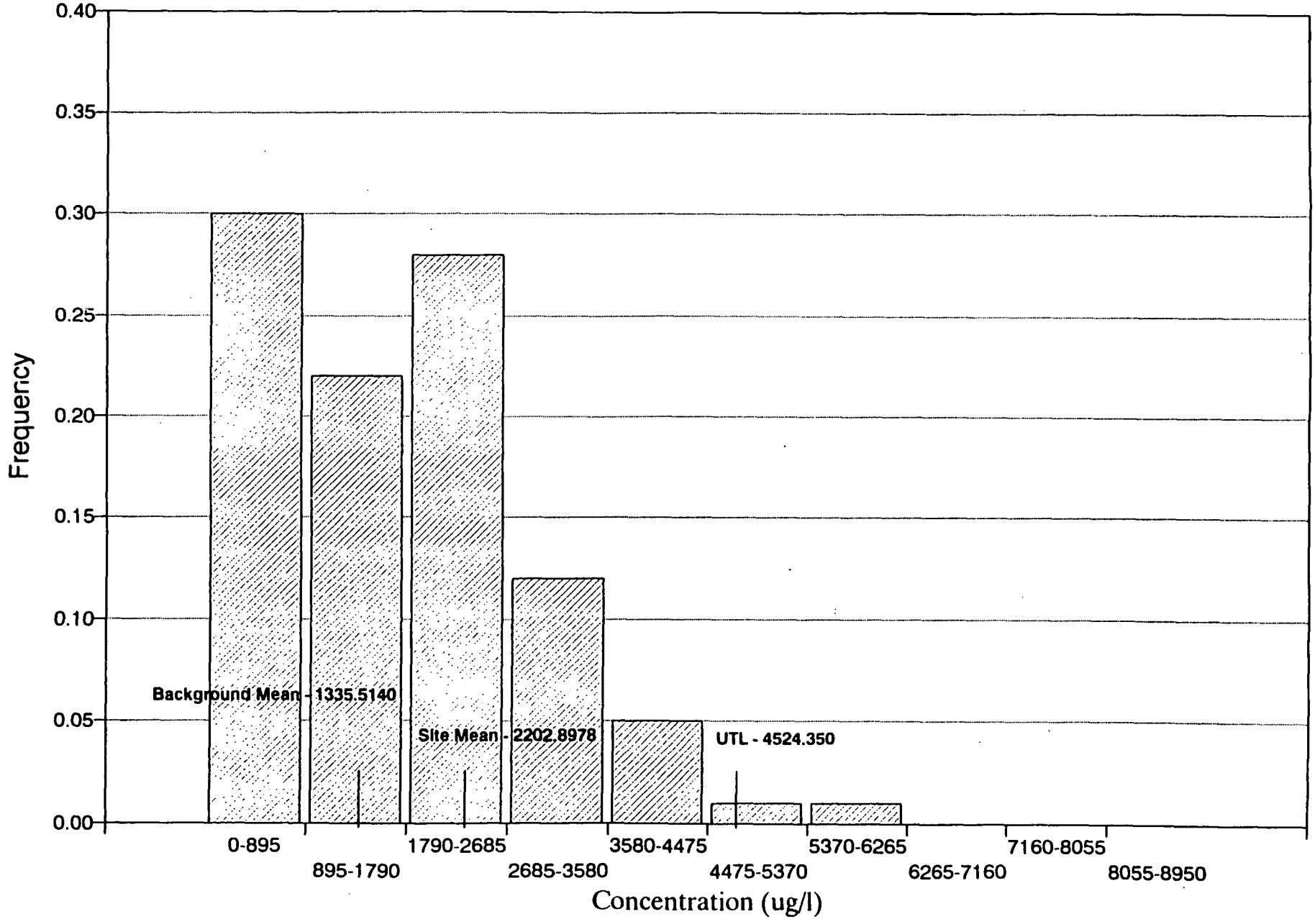


Figure D-110
Groundwater (COL) Total Selenium

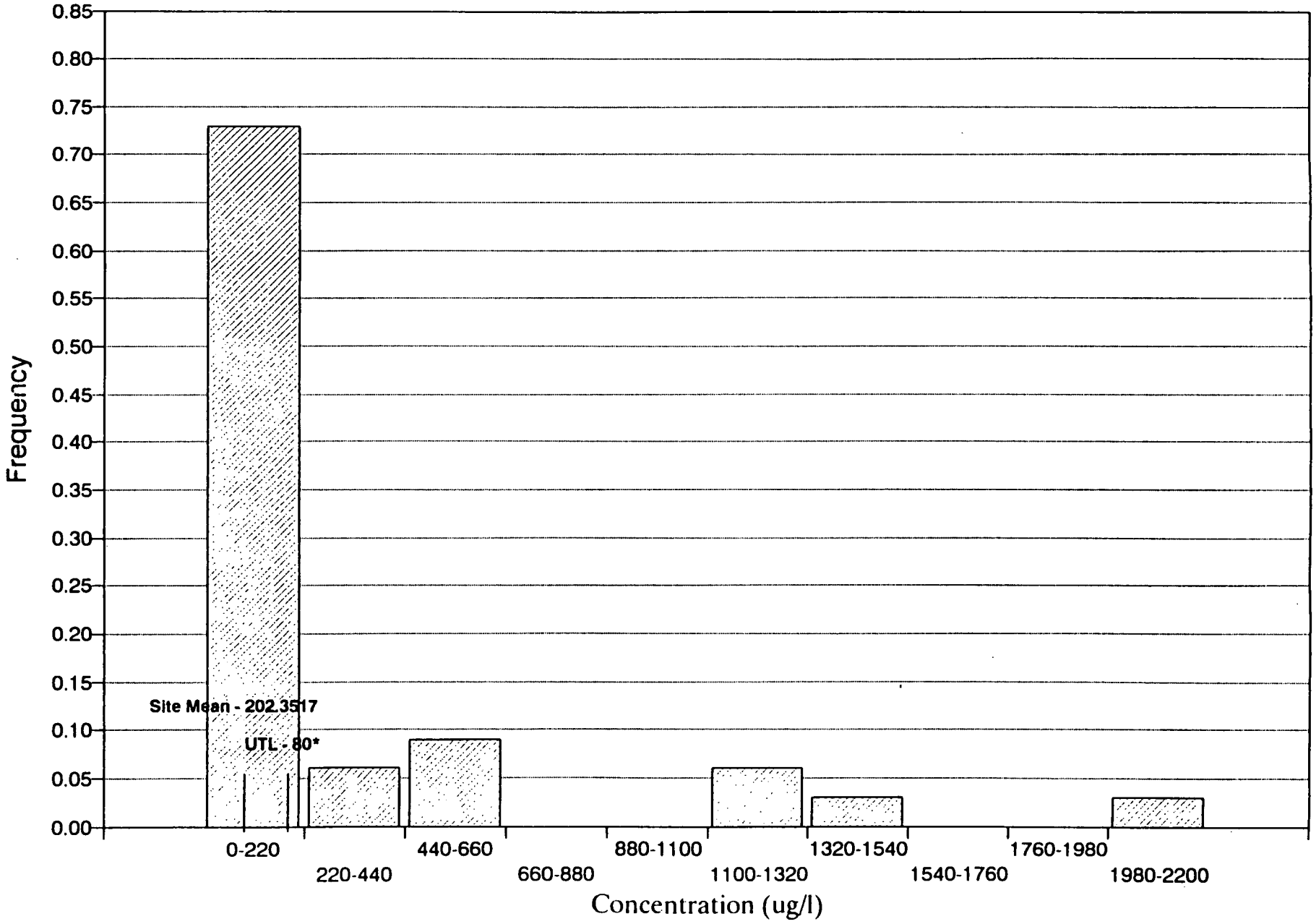


Figure D-111
Groundwater (WCS) Total Selenium

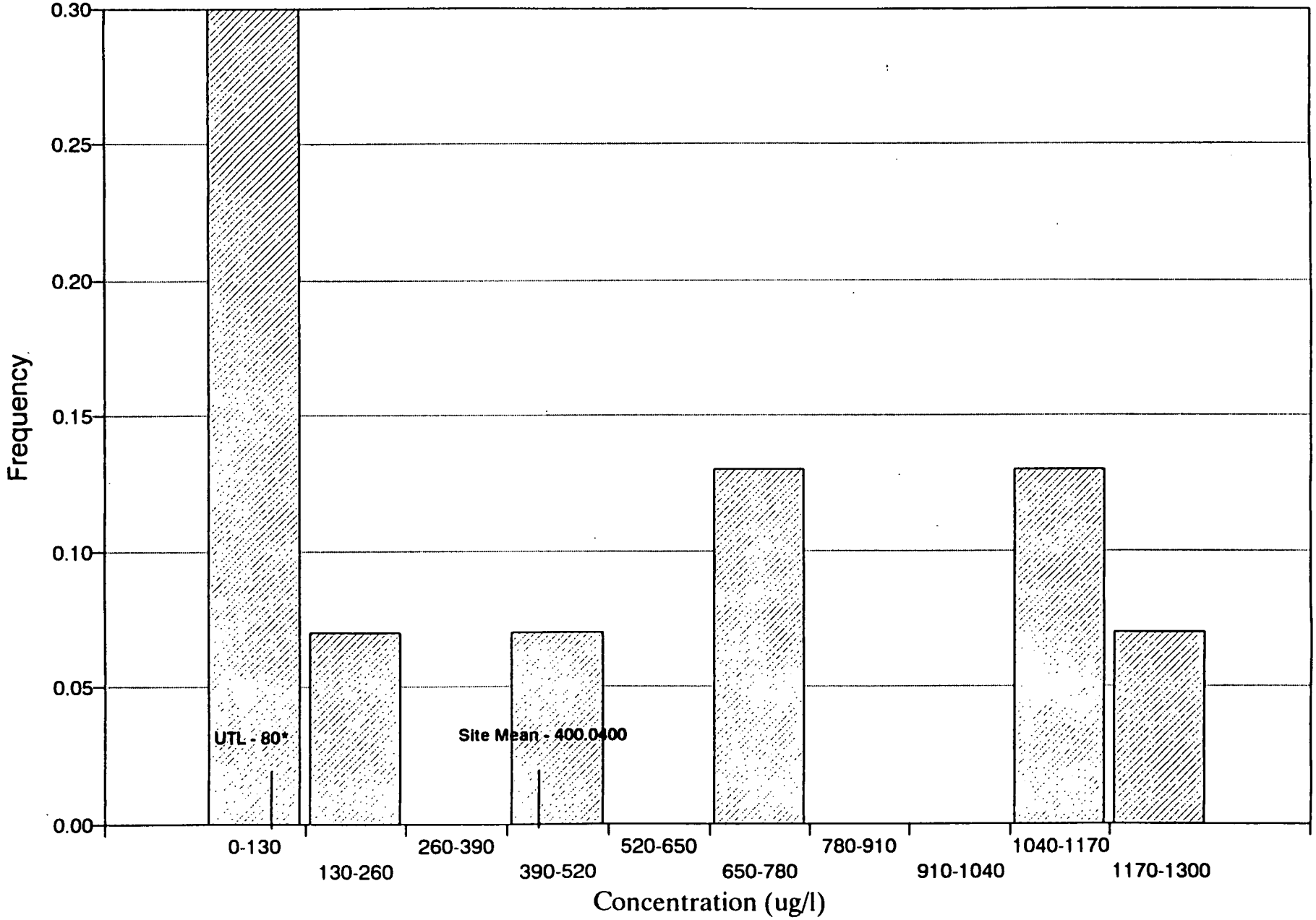


Figure D-112
Groundwater (KAR) Total Selenium

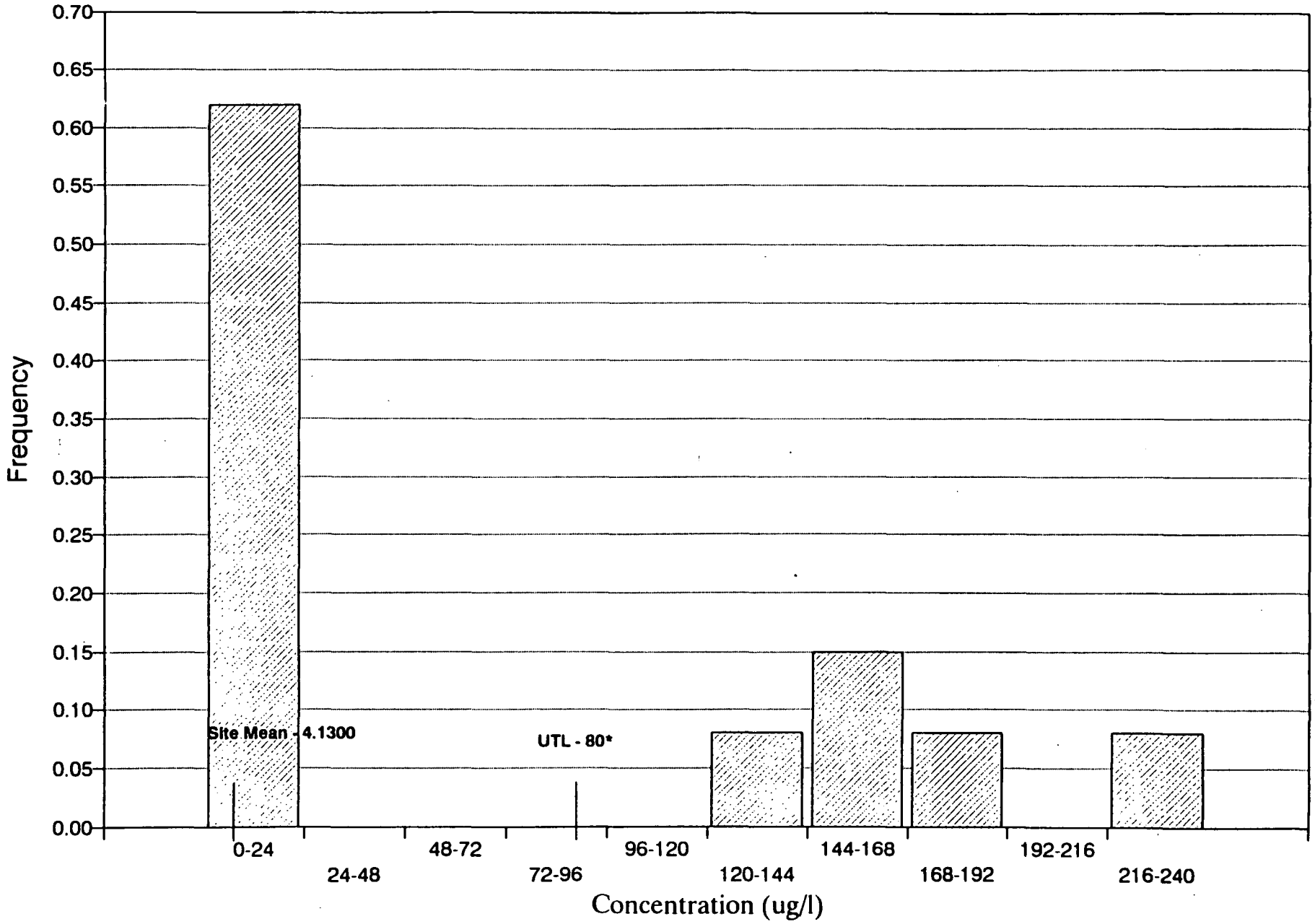


Figure D-113
Surface Water Total Selenium

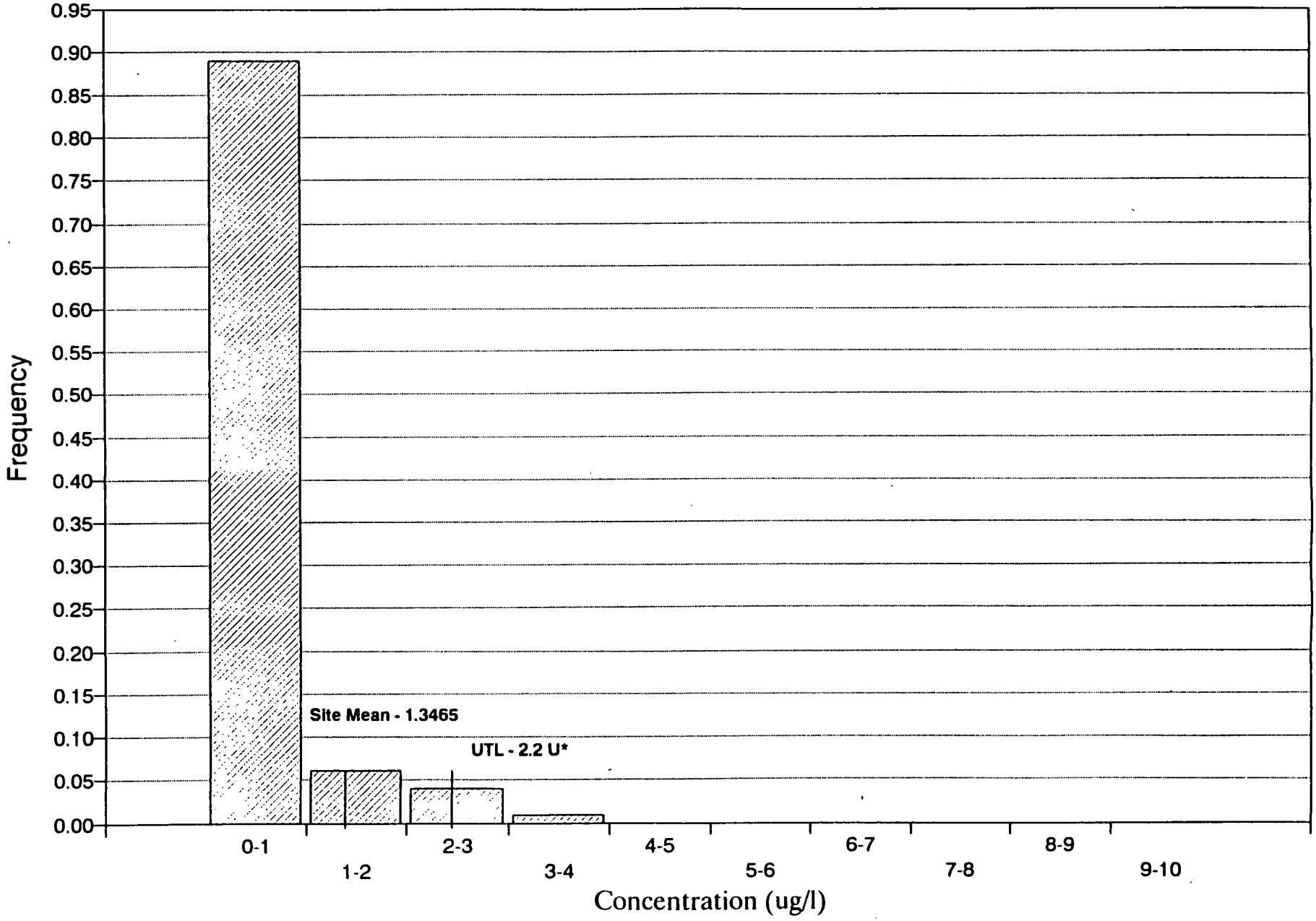


Figure D-116
Groundwater (COL) Total Silicon

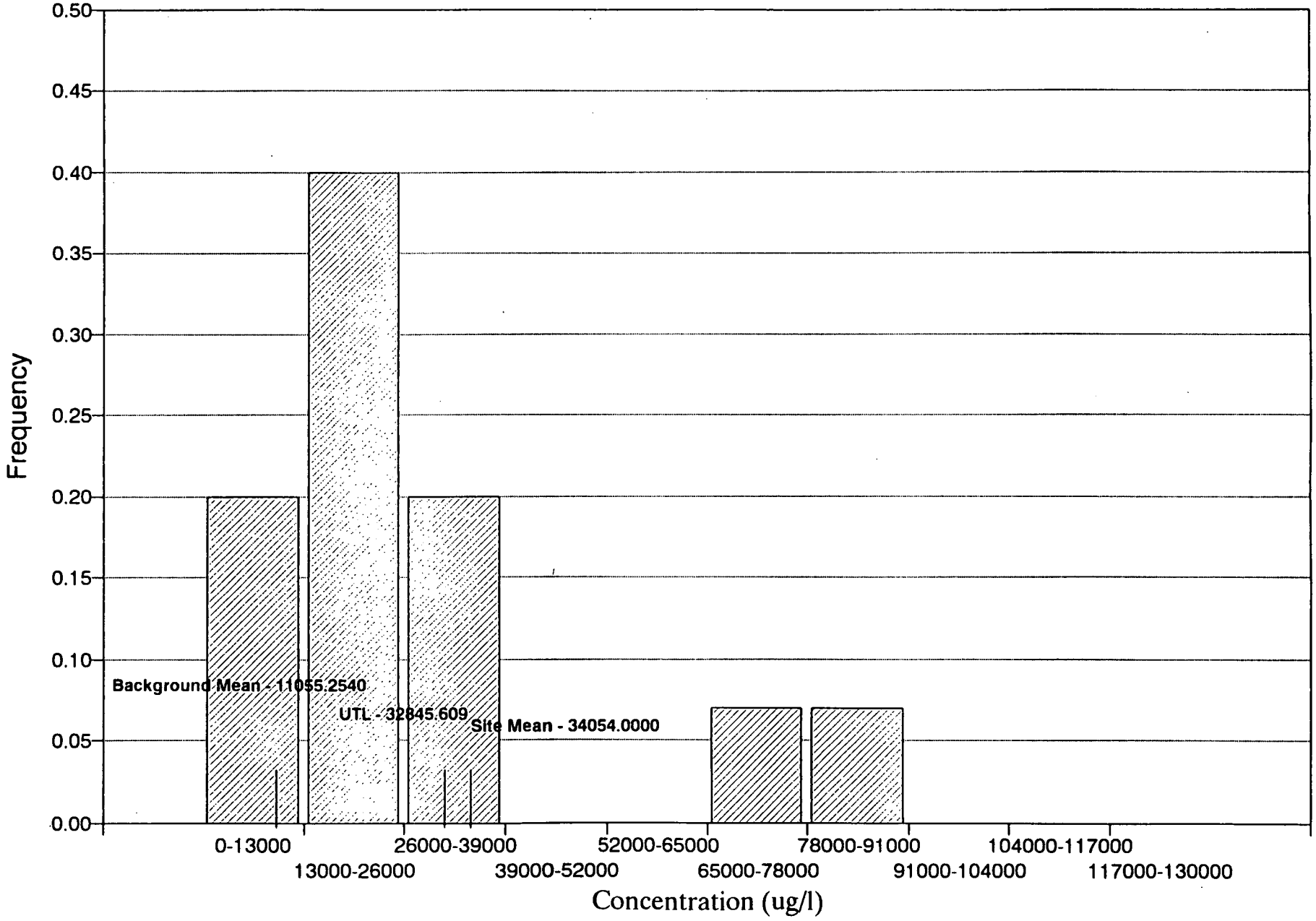


Figure D-117
Groundwater (WCS) Total Silicon

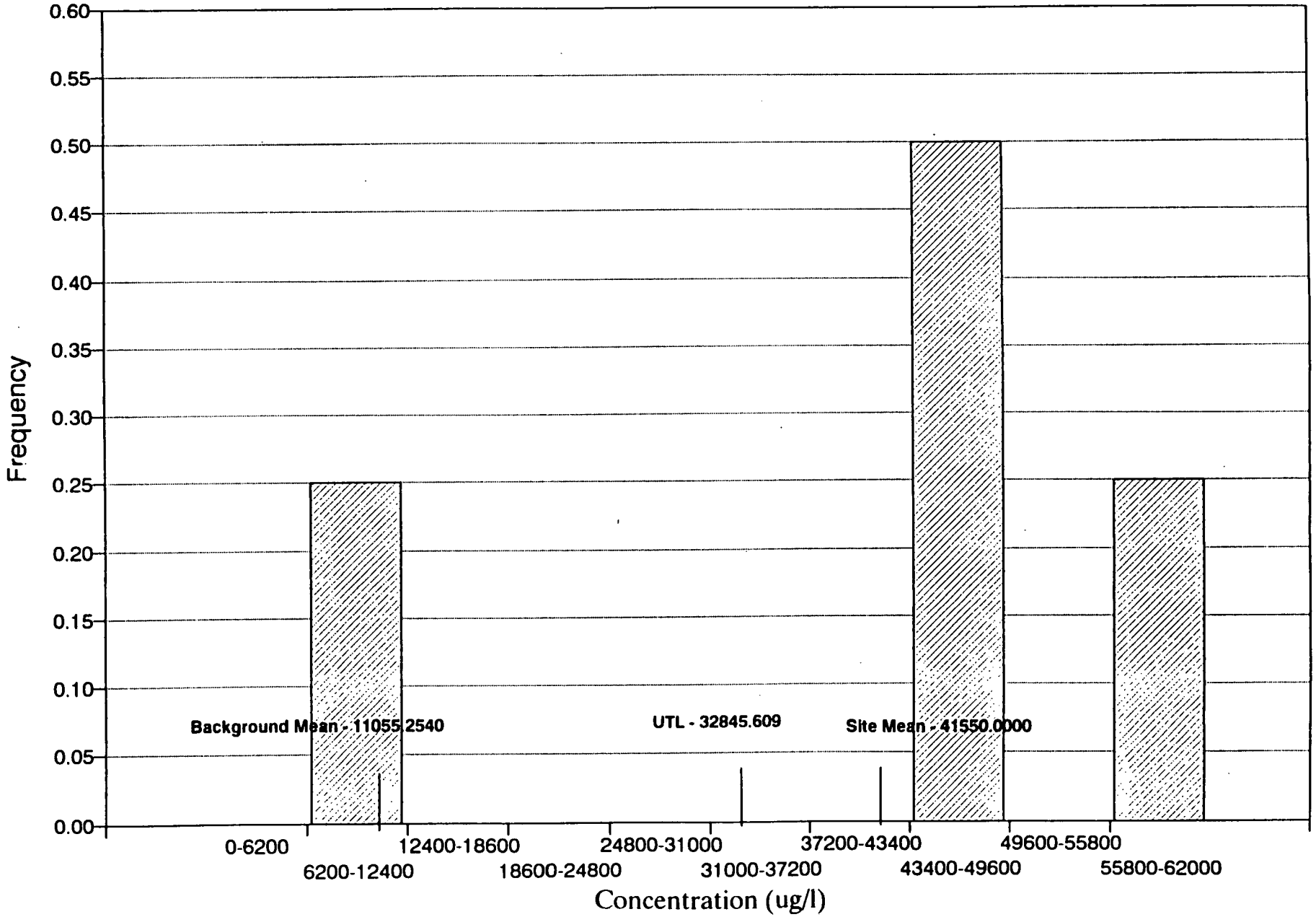


Figure D-118
Surface Soil Total Silicon

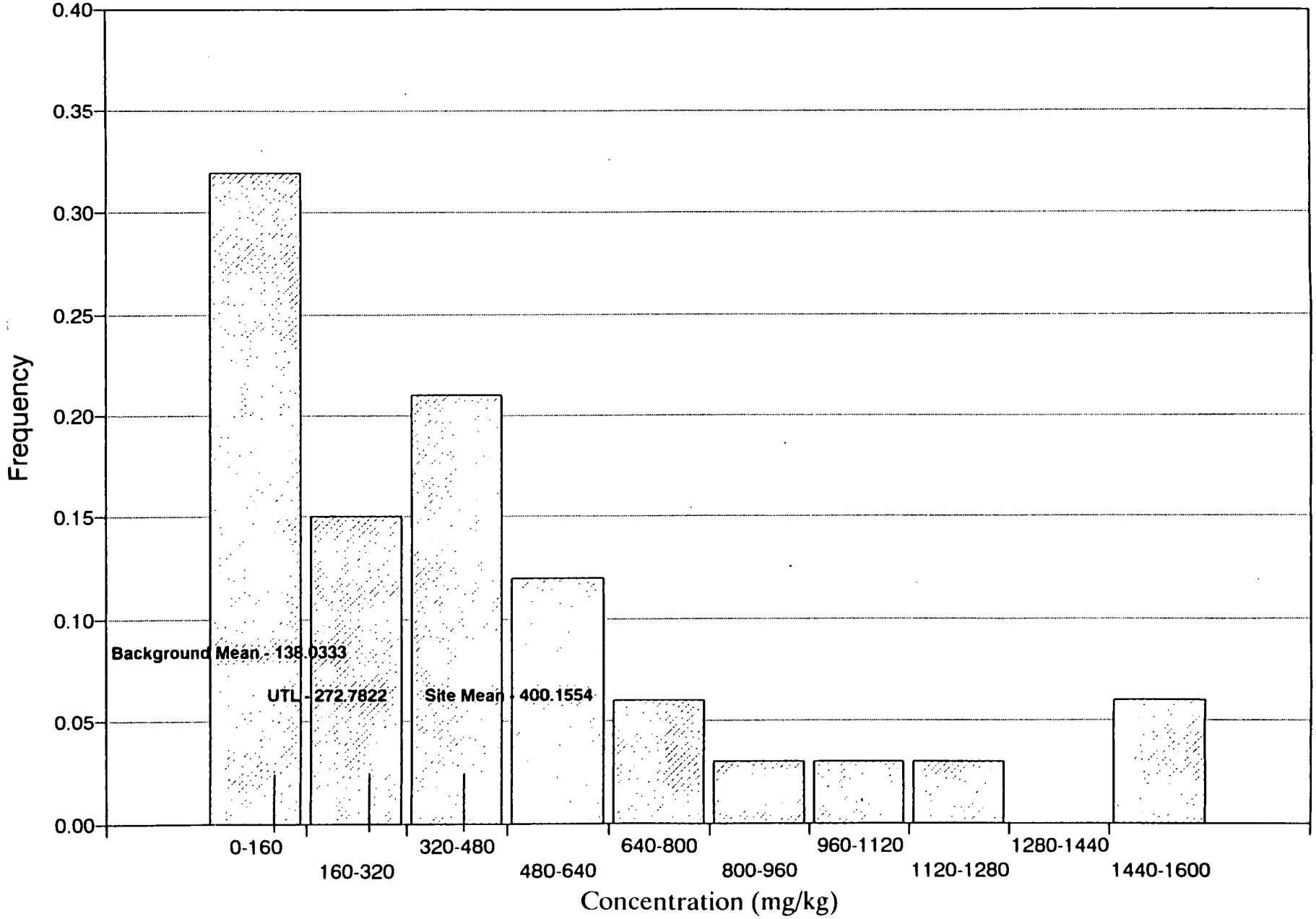


Figure D-122
Sediments Total Silver

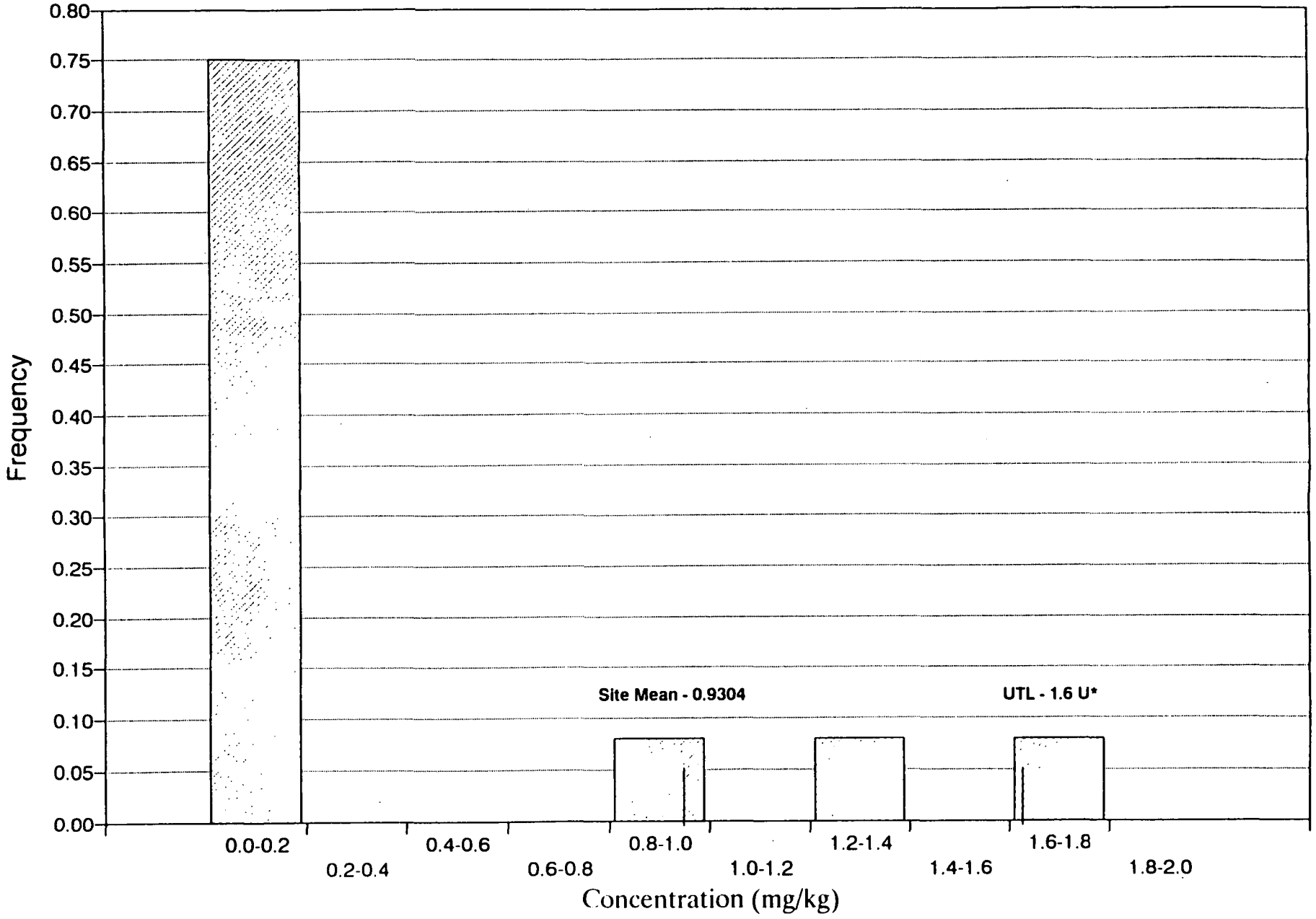


Figure D-123
Surface Water Total Silver

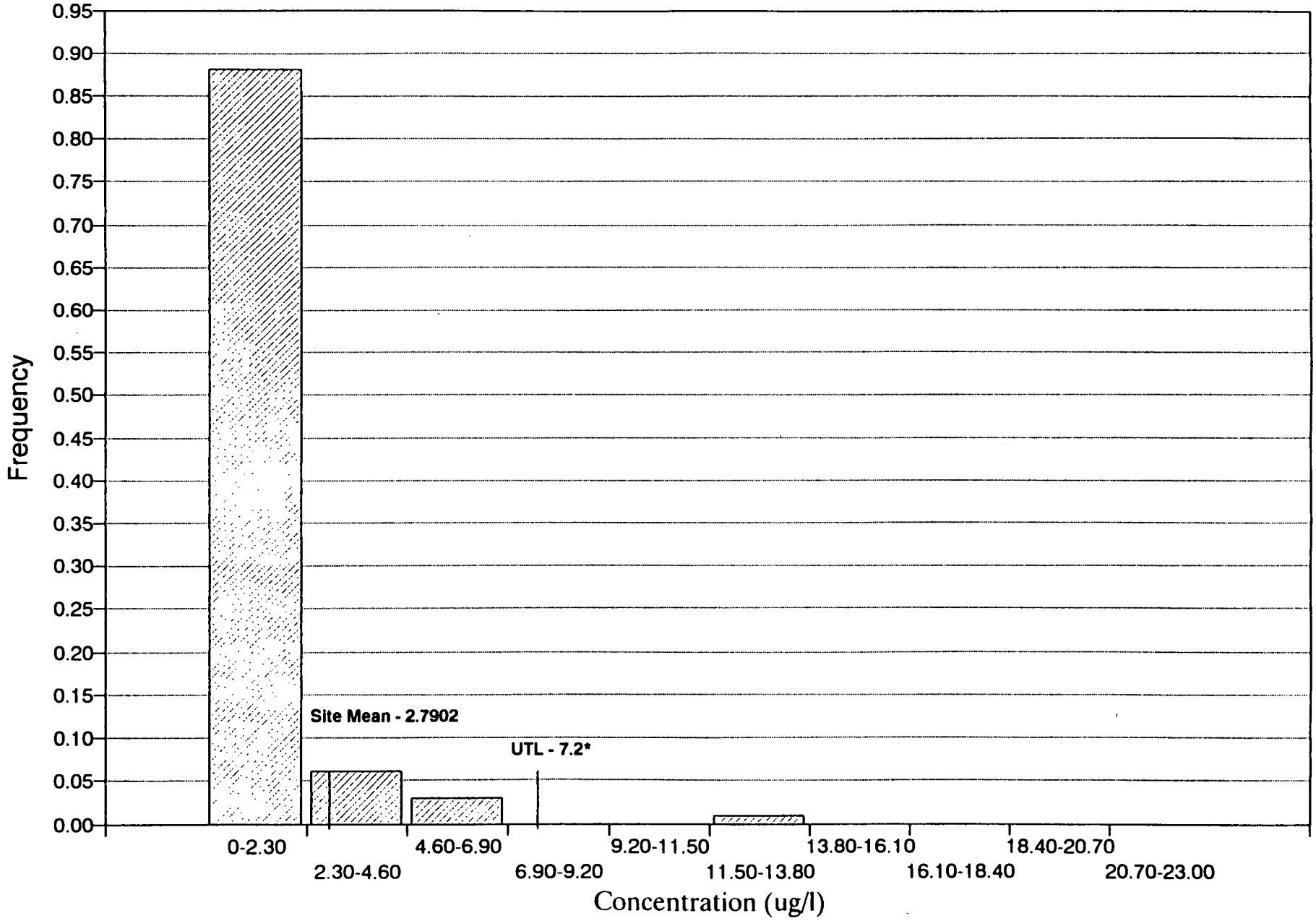


Figure D-126
Groundwater (RFA) Total Sodium

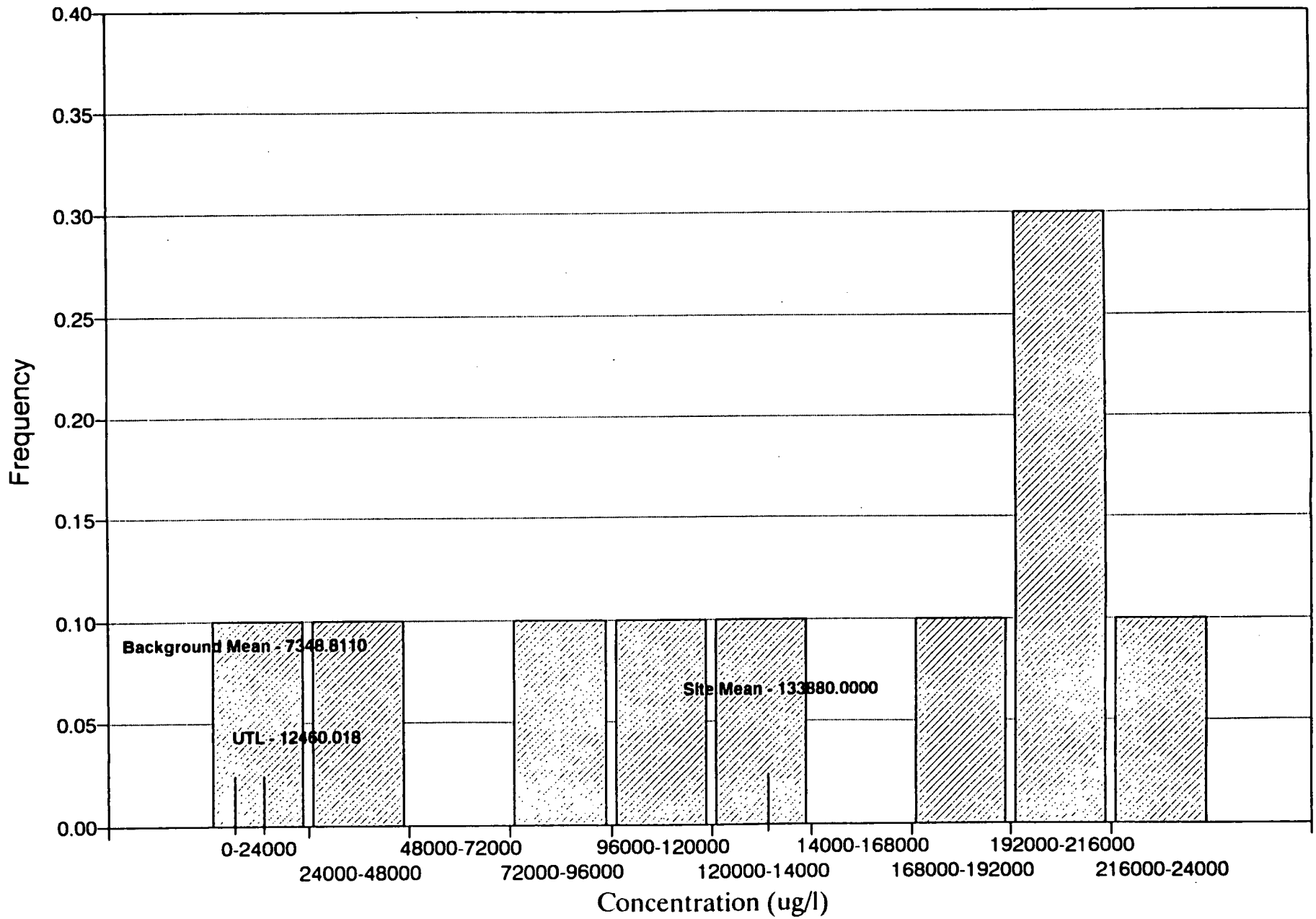


Figure D-127
Groundwater (WCS) Total Sodium

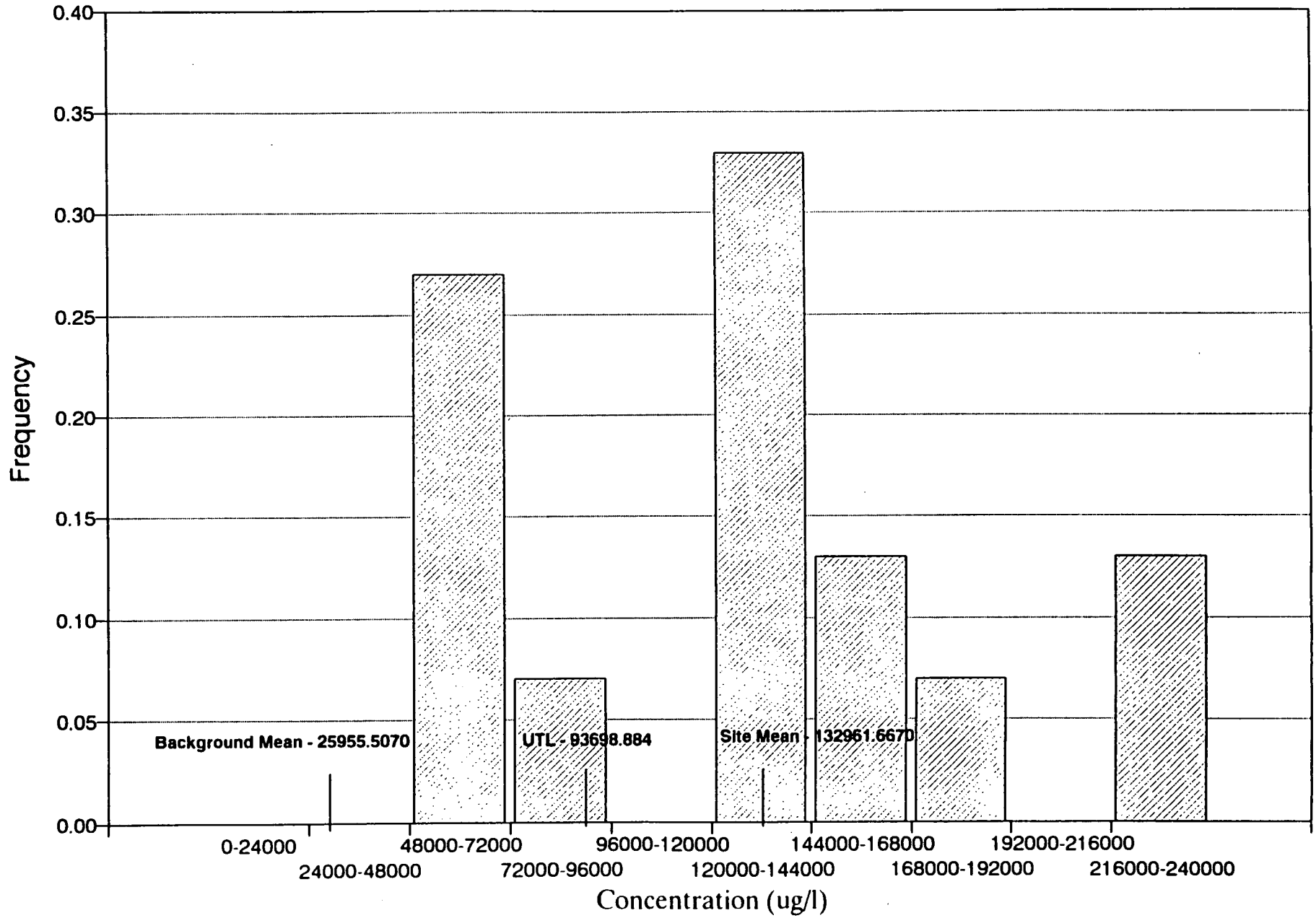


Figure D-128
Surface Water Total Sodium

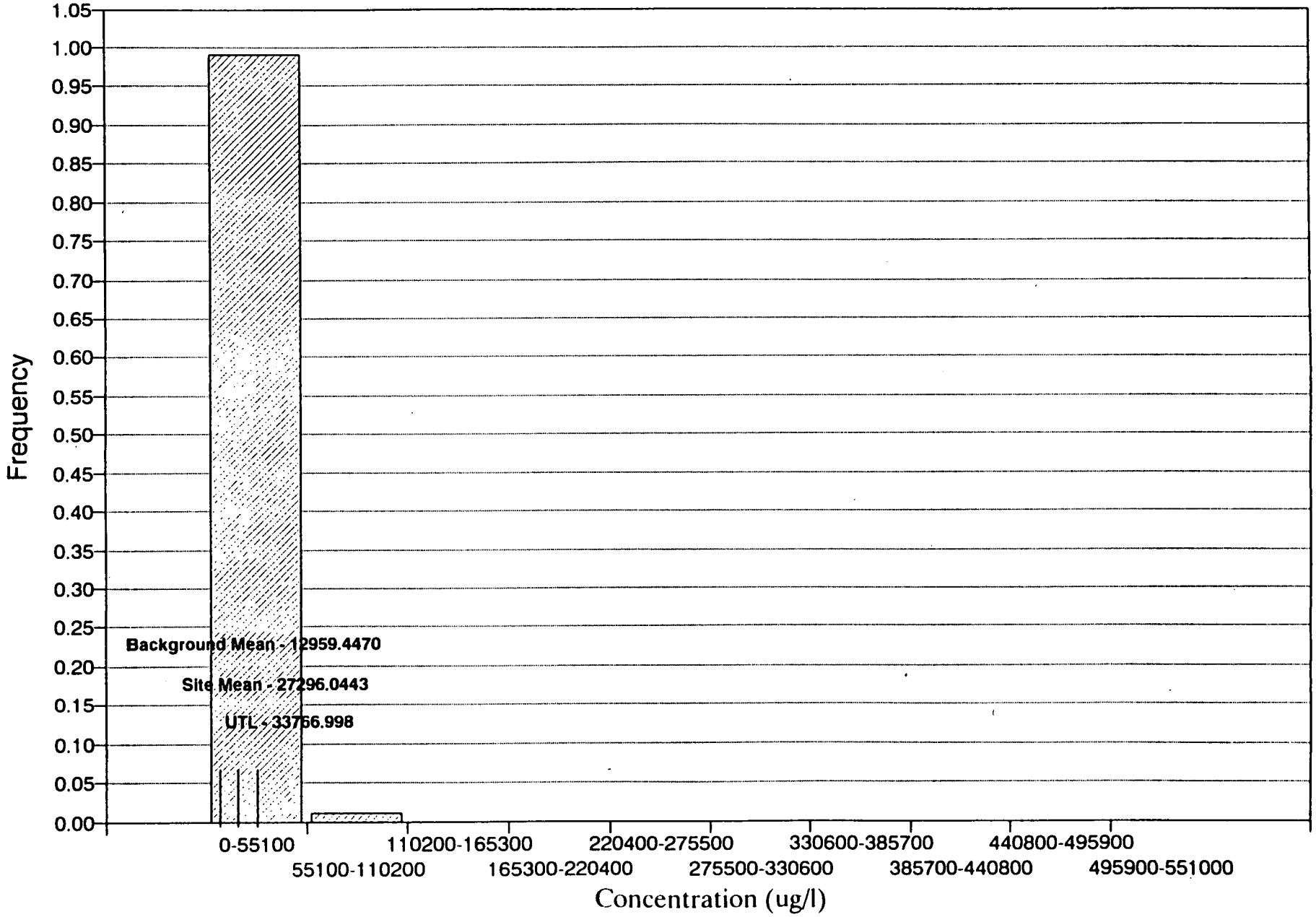


Figure D-129
Sediments Total Sodium

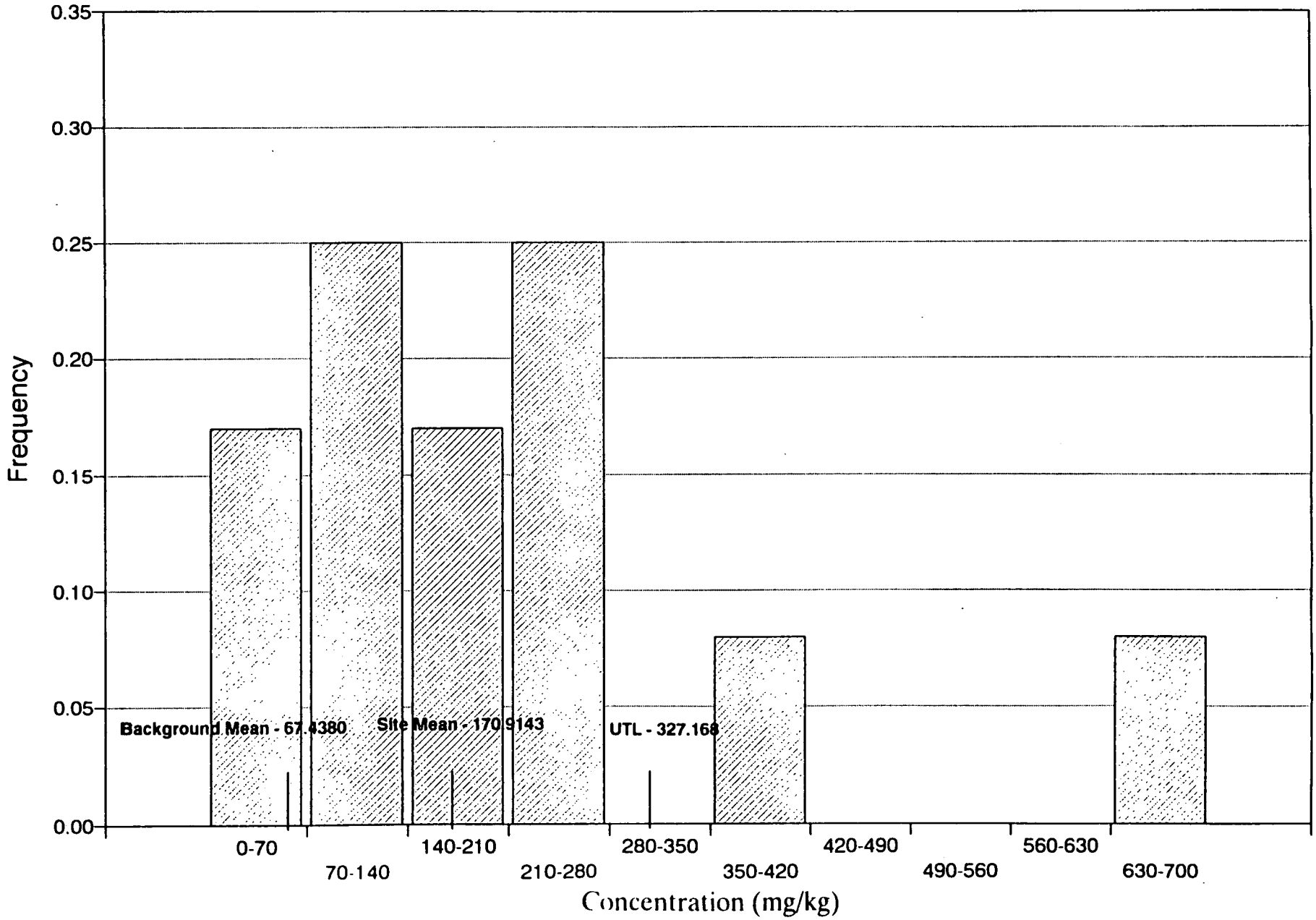


Figure D-133
Surface Soil Total Strontium

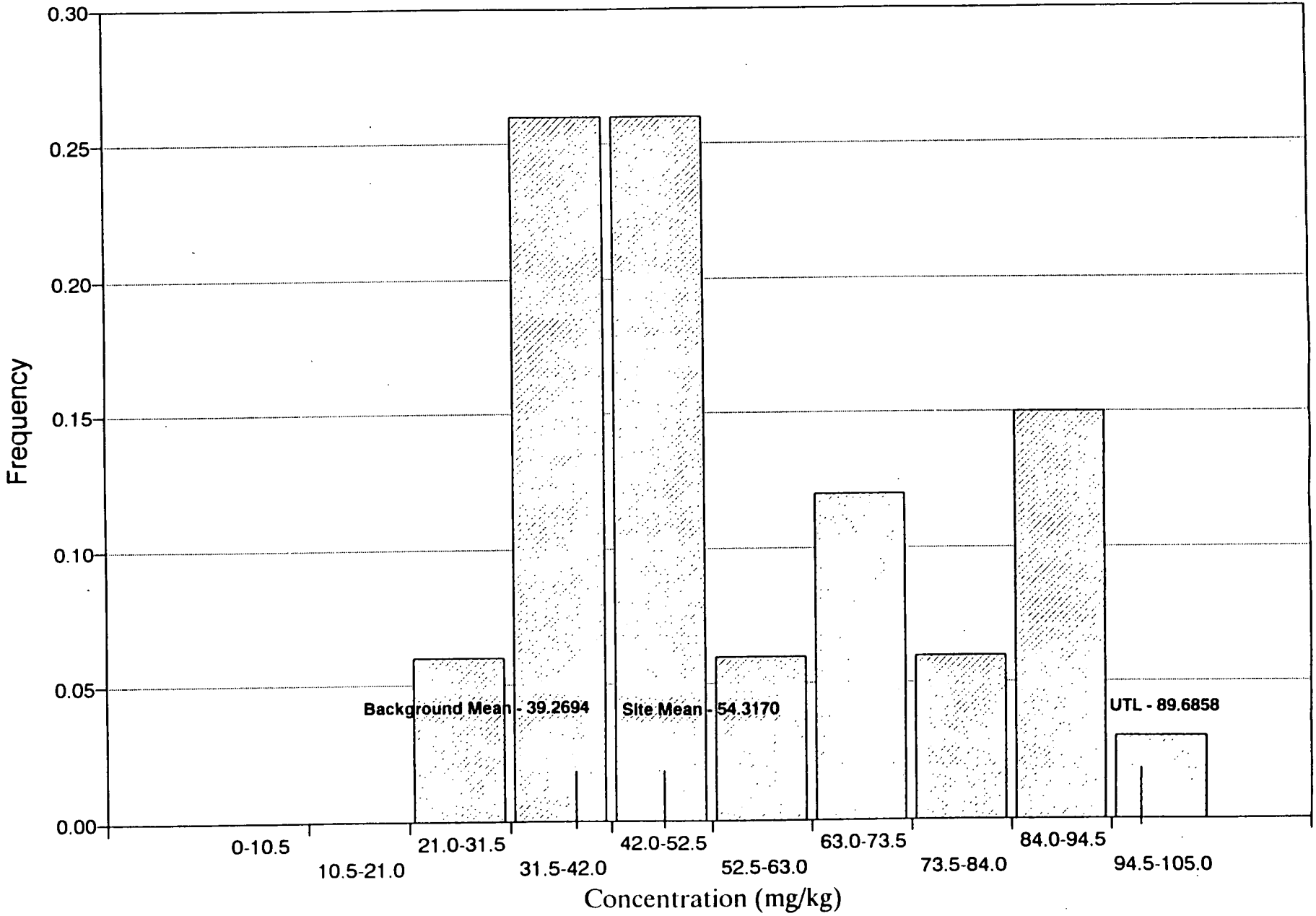


Figure D-134
Groundwater (RFA) Total Strontium

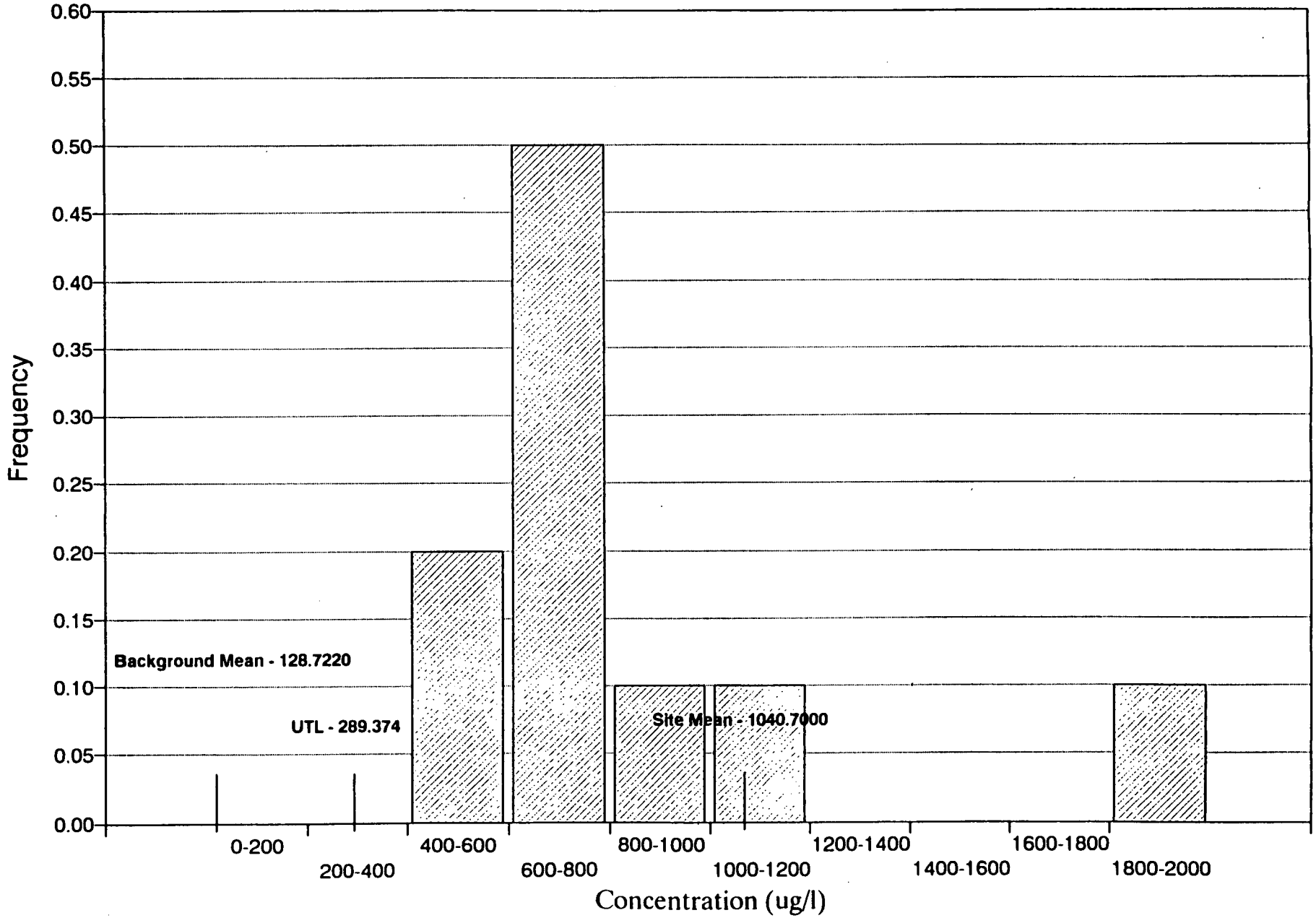


Figure D-135
Groundwater (WCS) Total Strontium

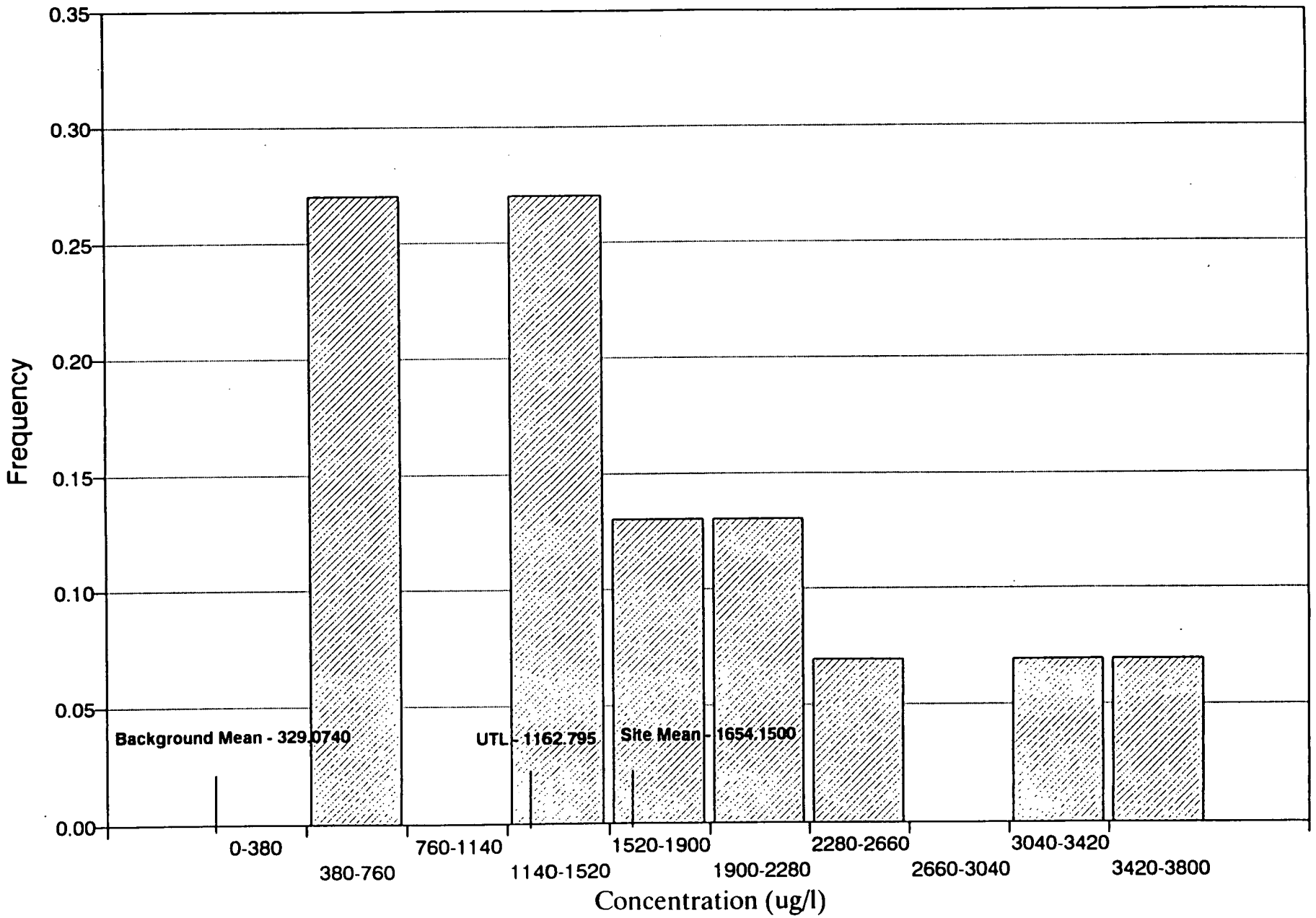


Figure D-136
Groundwater (KAR) Total Strontium

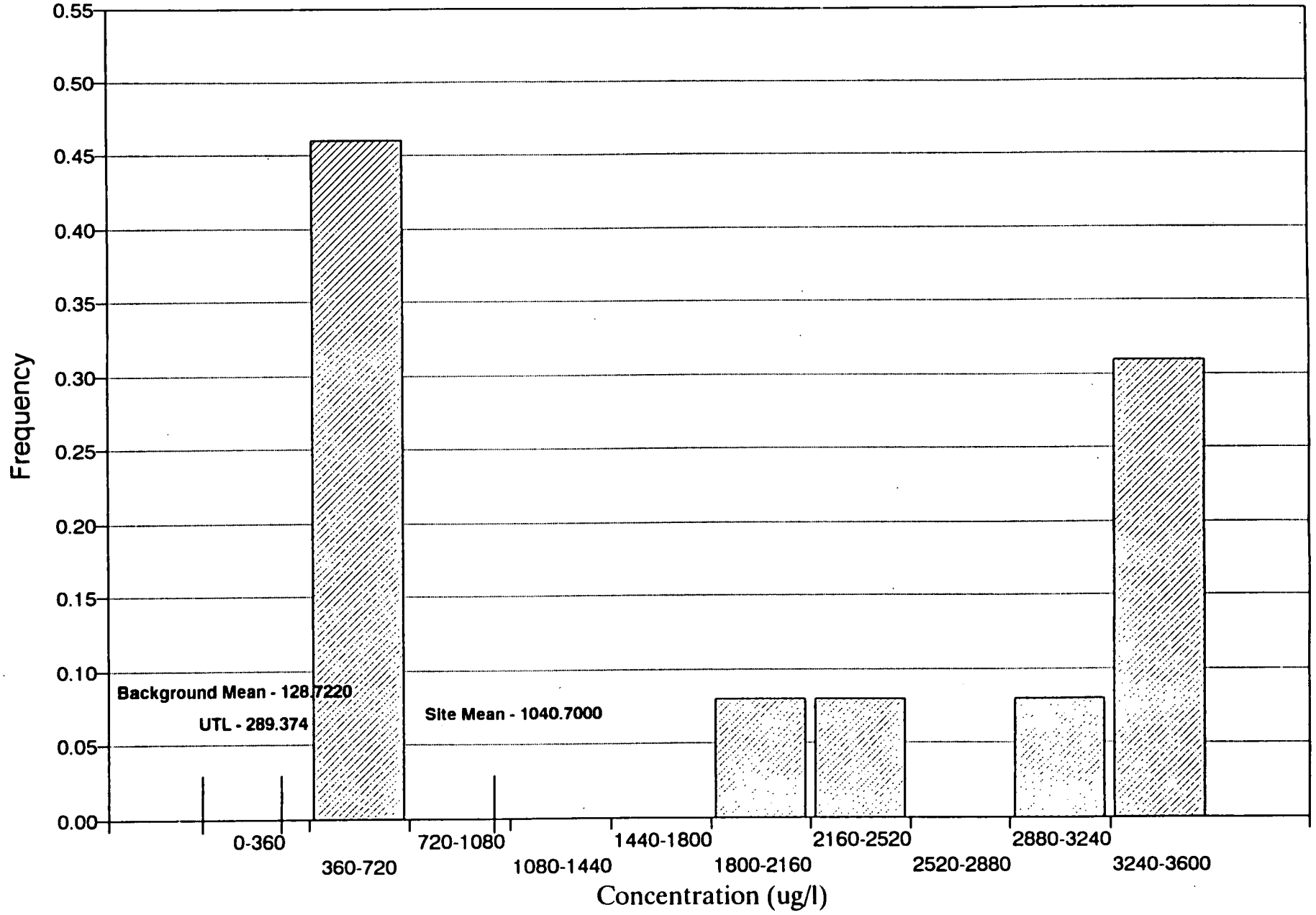


Figure D-137
Surface Water Total Strontium

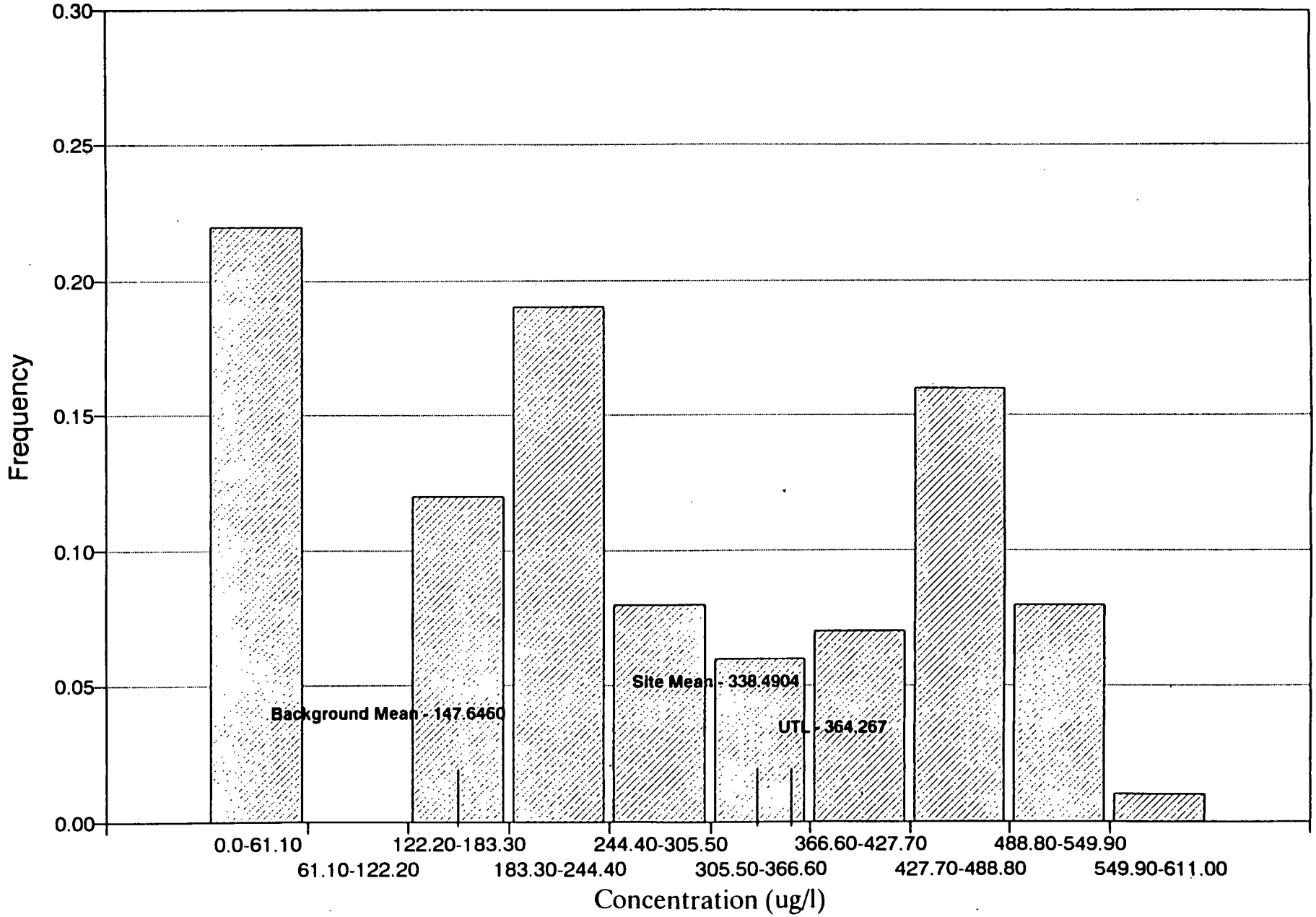


Figure D-138
Sediments Total Strontium

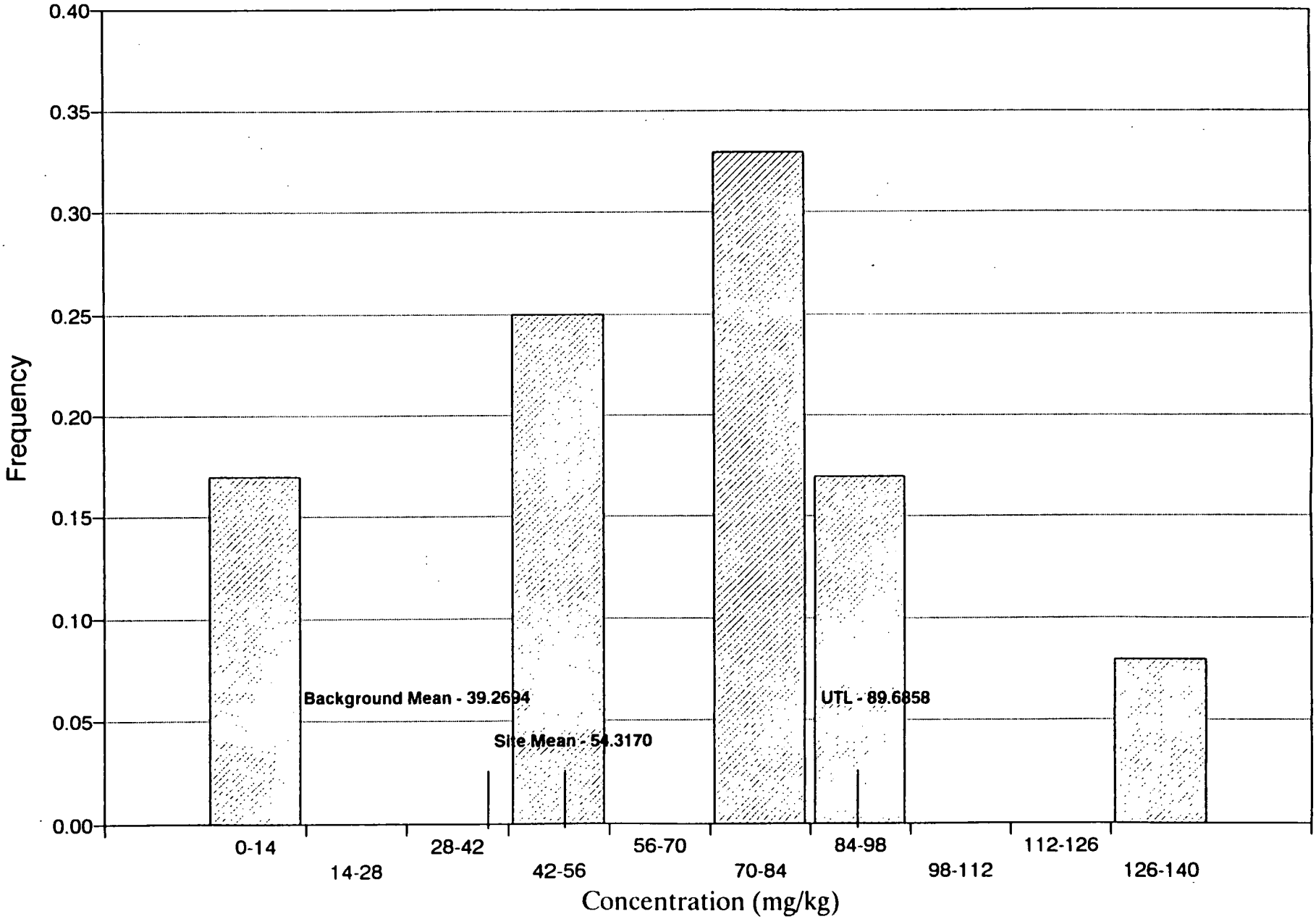


Figure D-139
Geologic Material (COL) Total Strontium

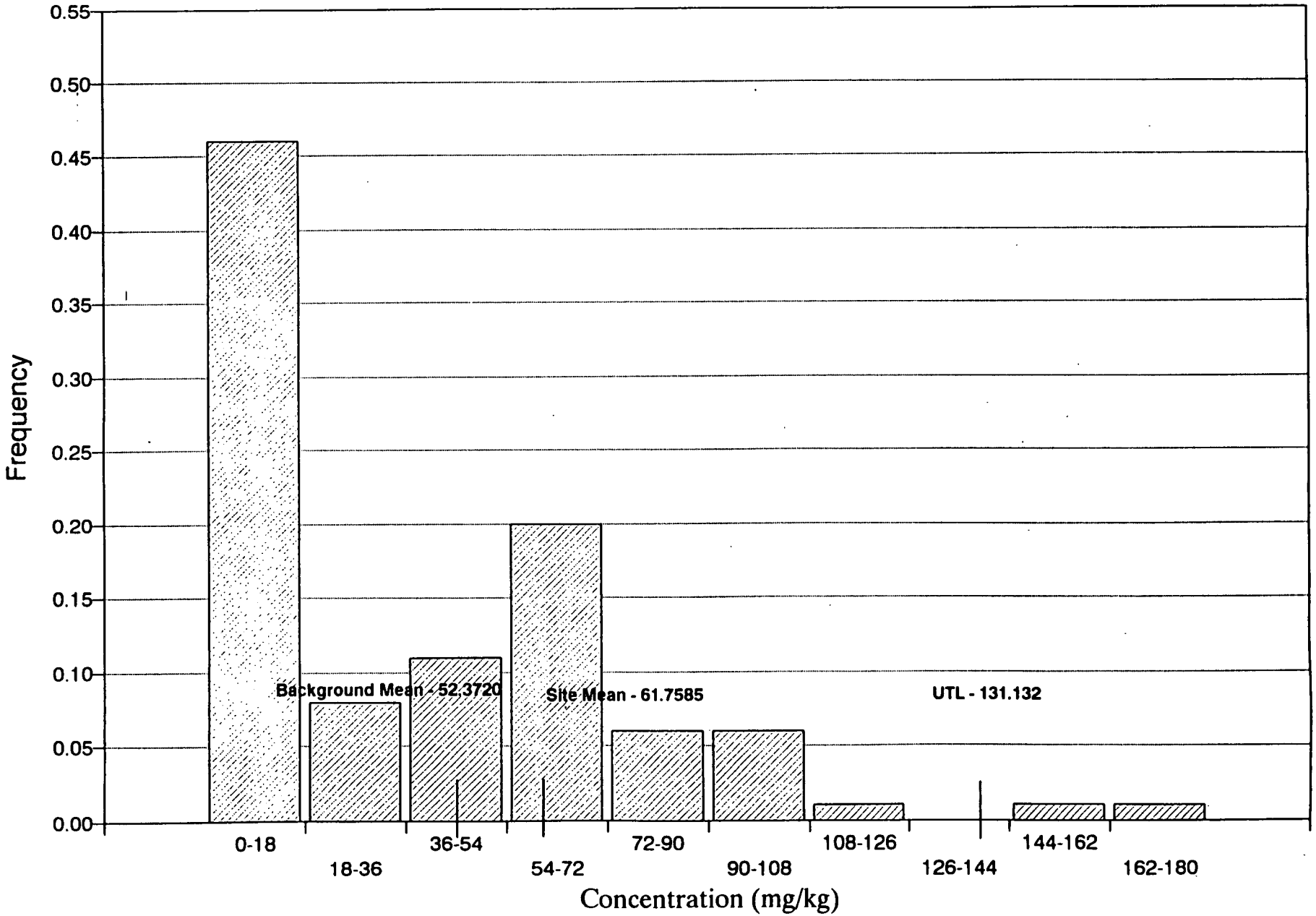


Figure D-145
Sediments Total Thallium

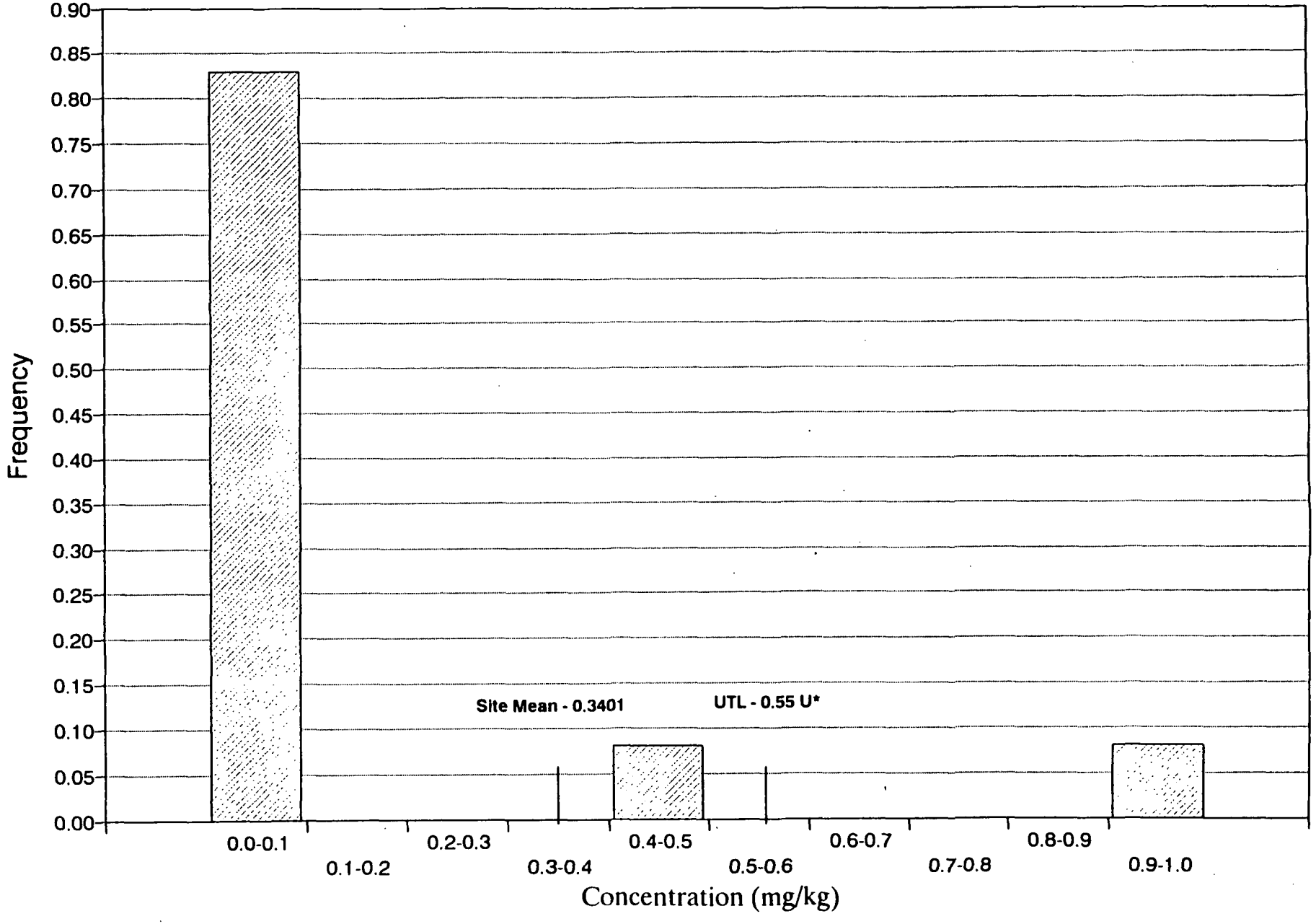


Figure D-147
Groundwater (COL) Total Vanadium

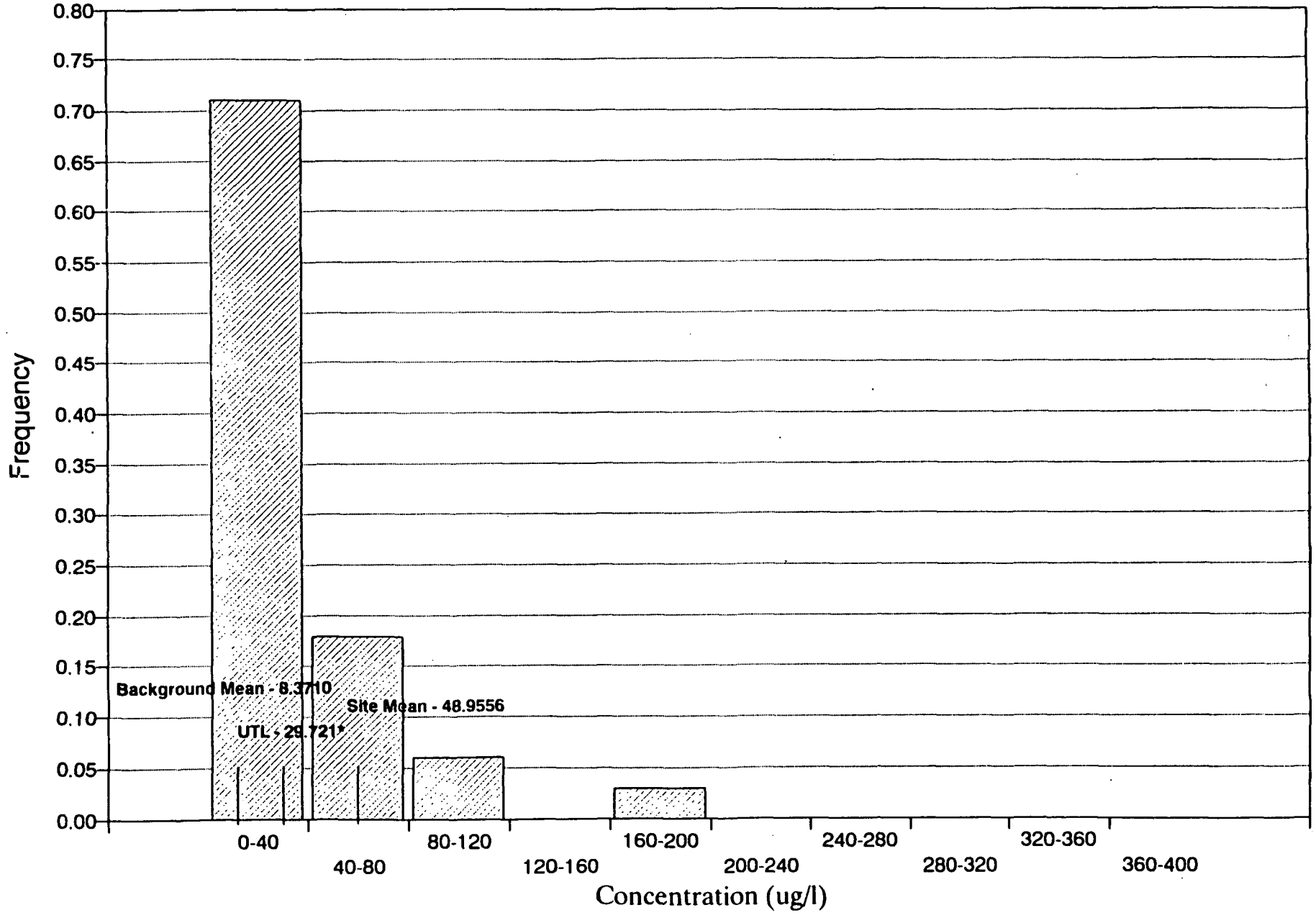


Figure D-148
Groundwater (WCS) Total Vanadium

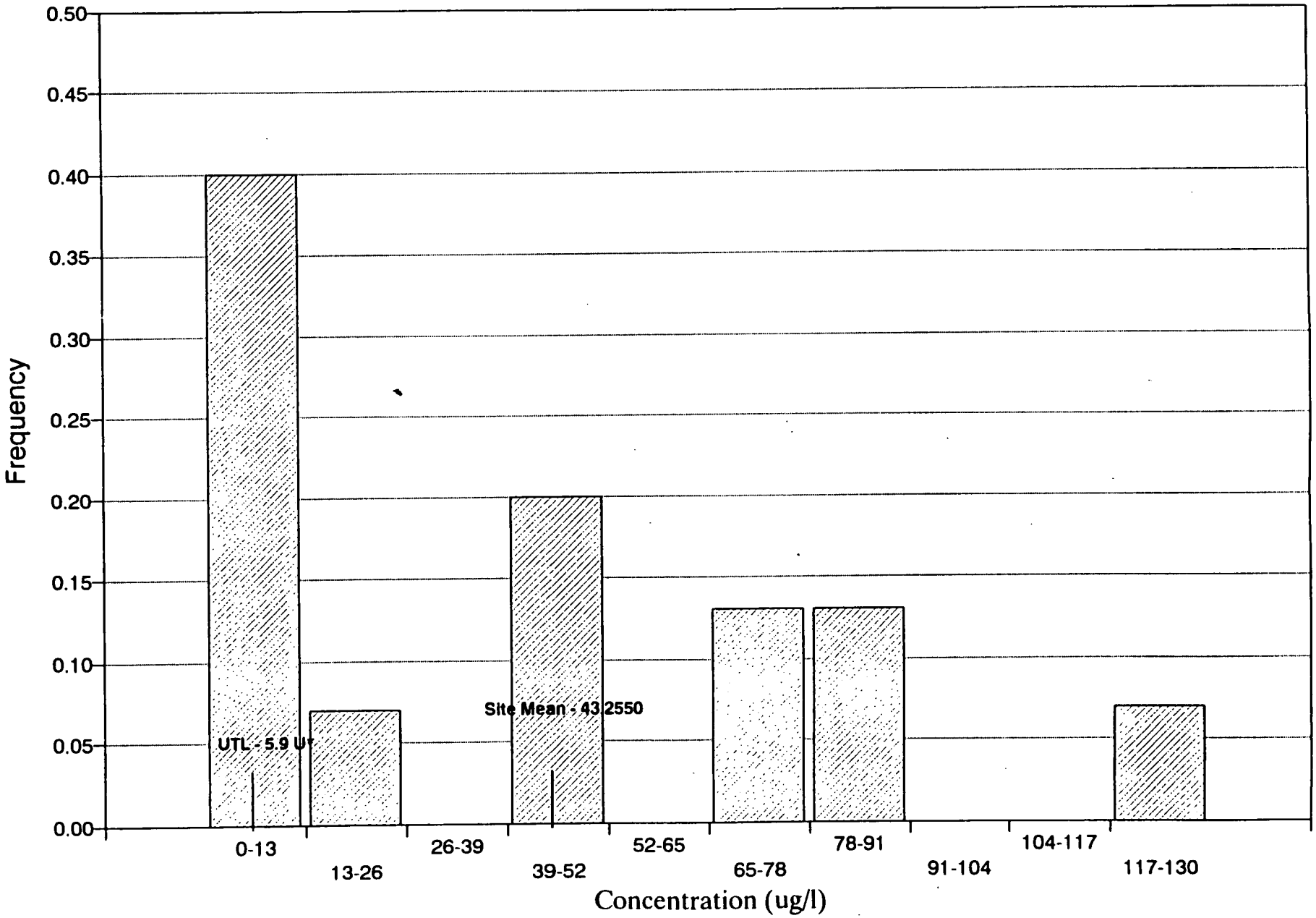


Figure D-149
Groundwater (KAR) Total Vanadium

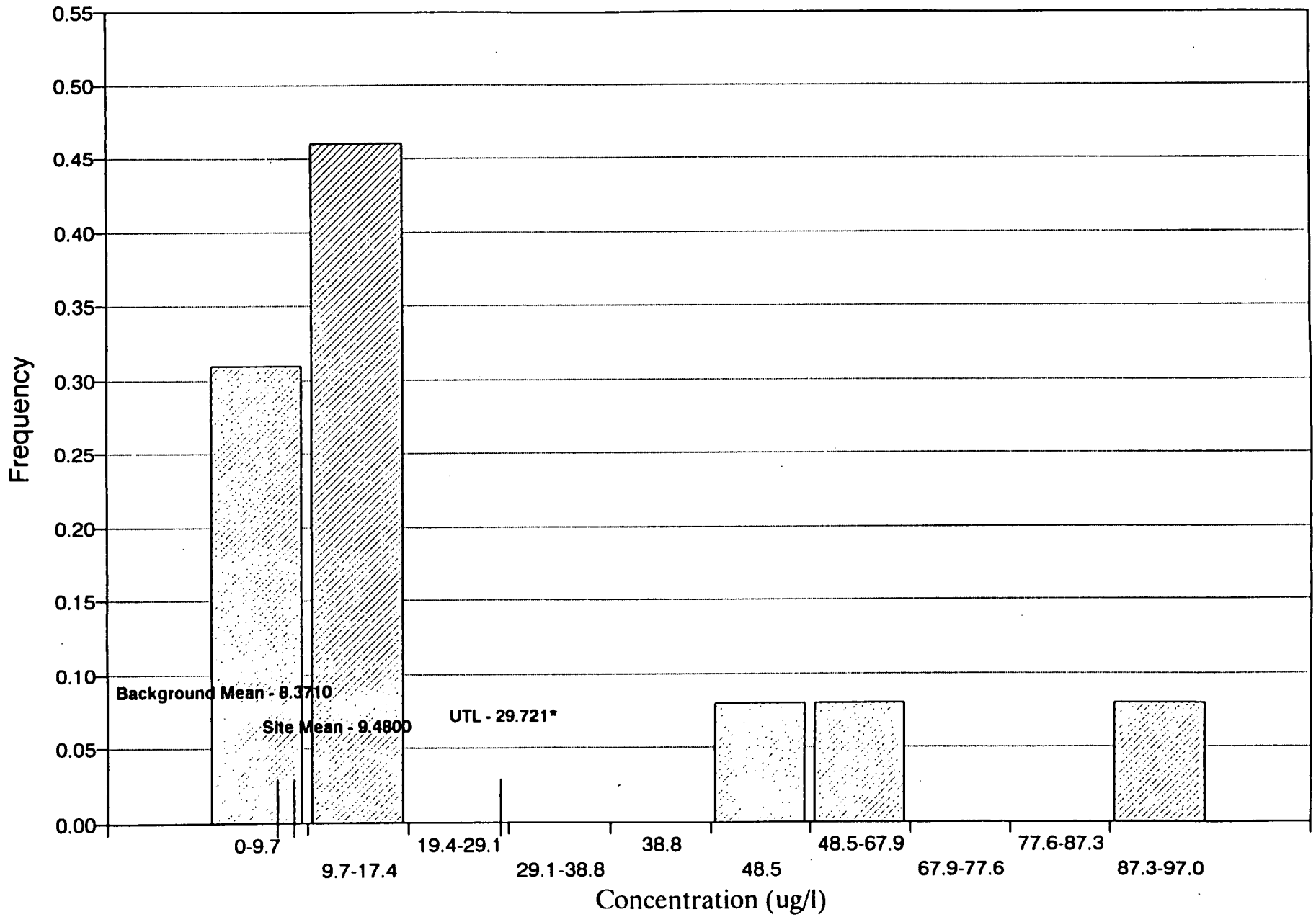


Figure D-150
Surface Water Total Vanadium

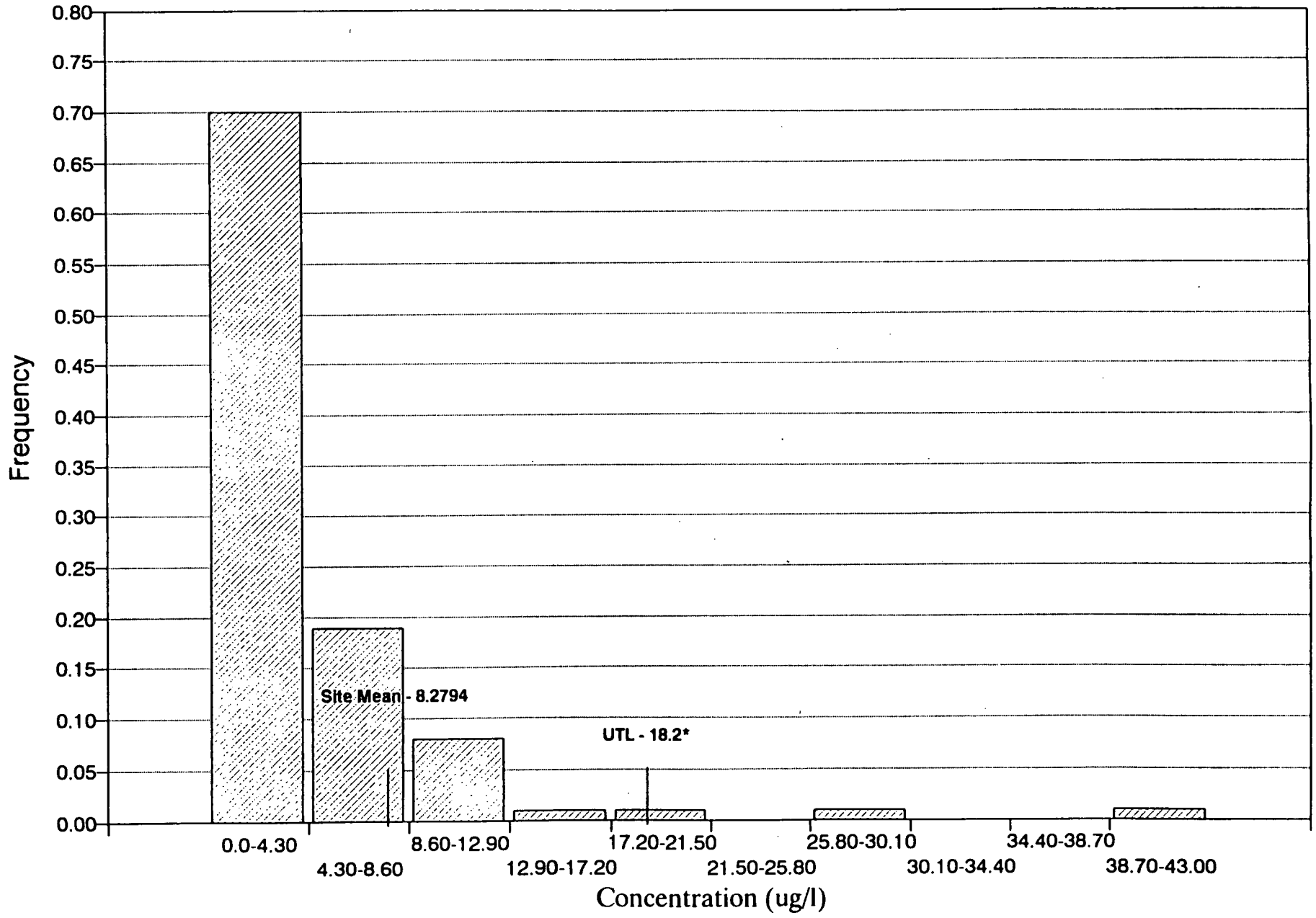


Figure D-153
Sediments Total Zinc

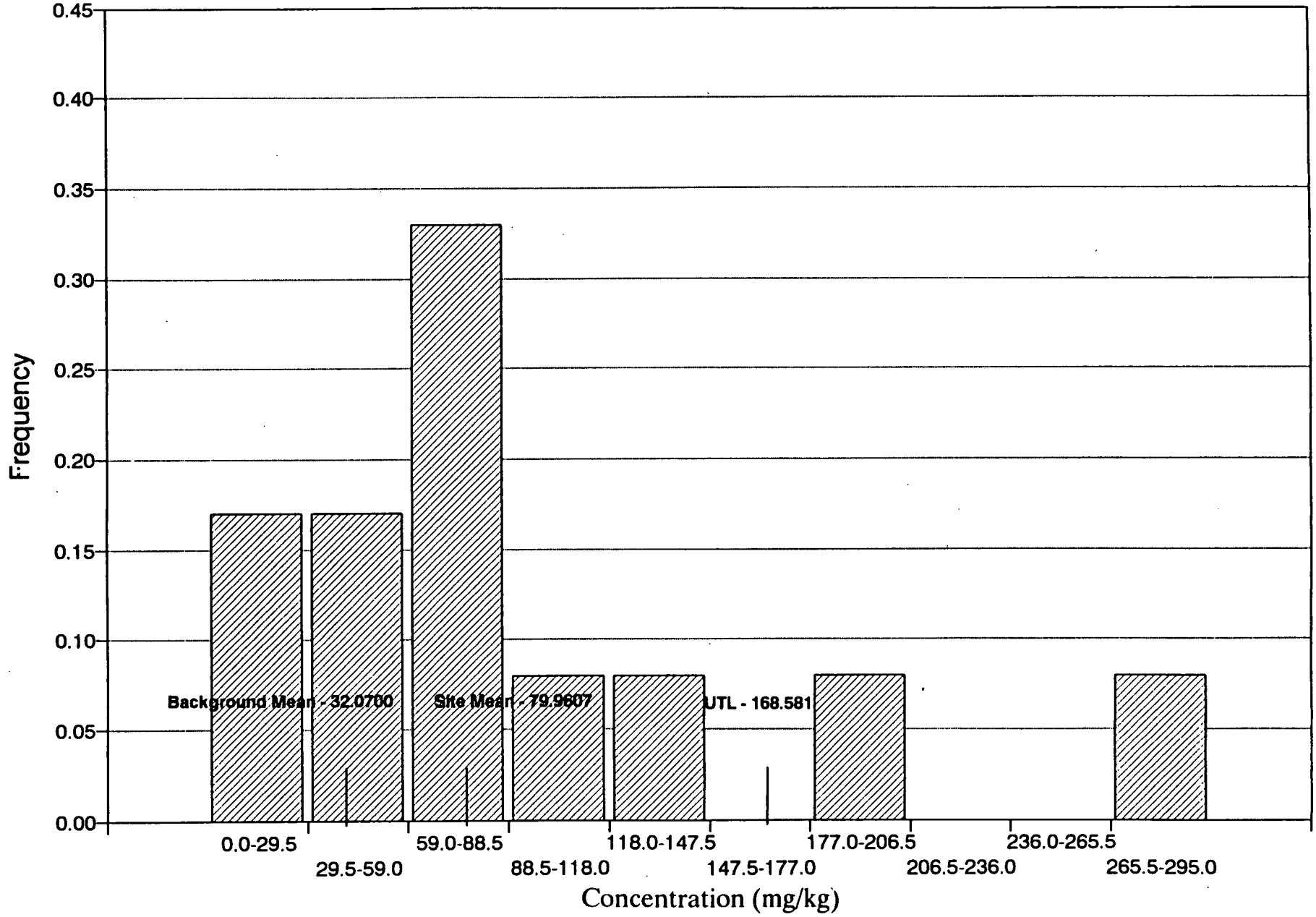


Figure D-155
Surface Soil Radionuclides
Americium-241

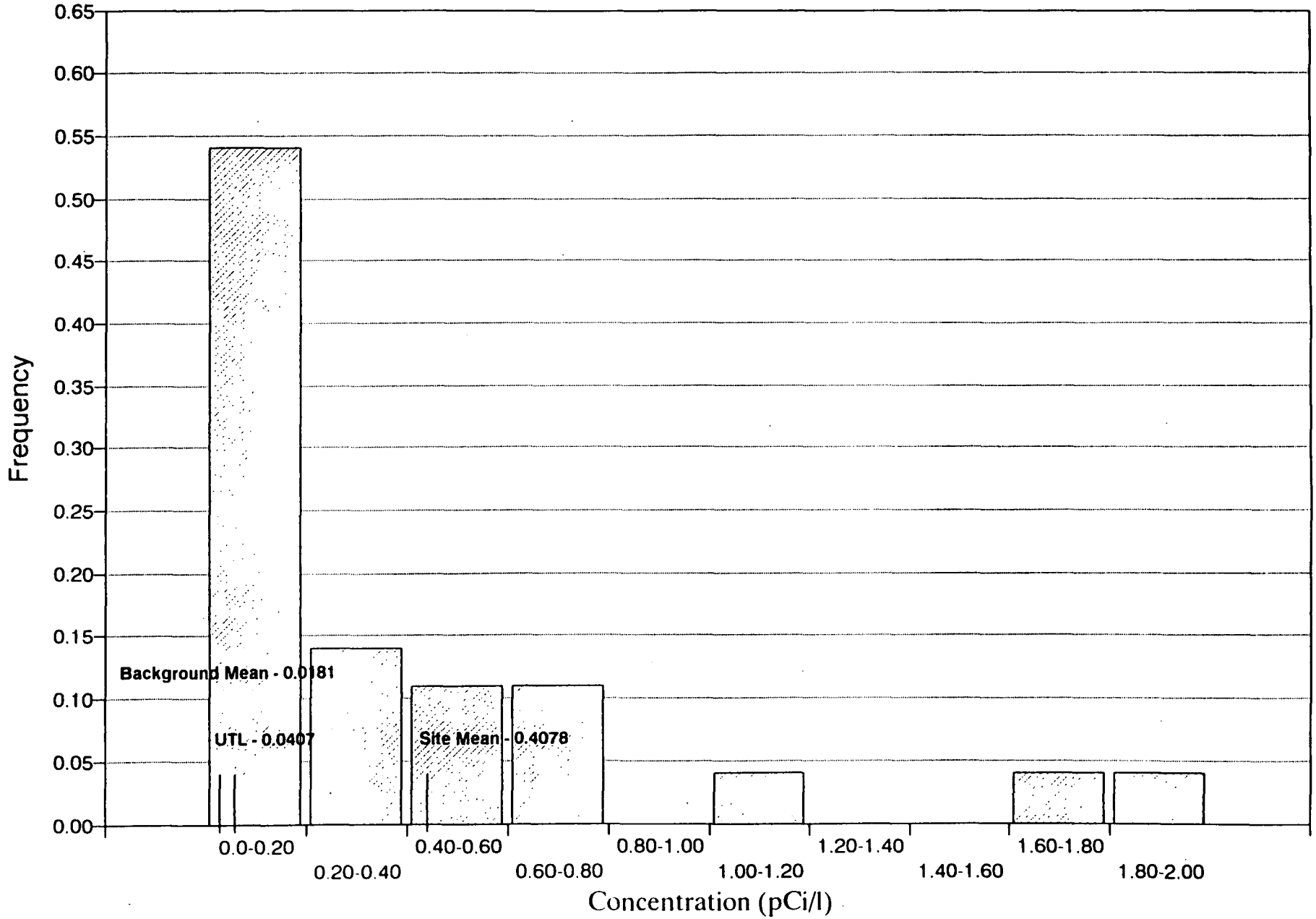


Figure D-156
Geologic Material (RFA) Radionuclides
Americium-241

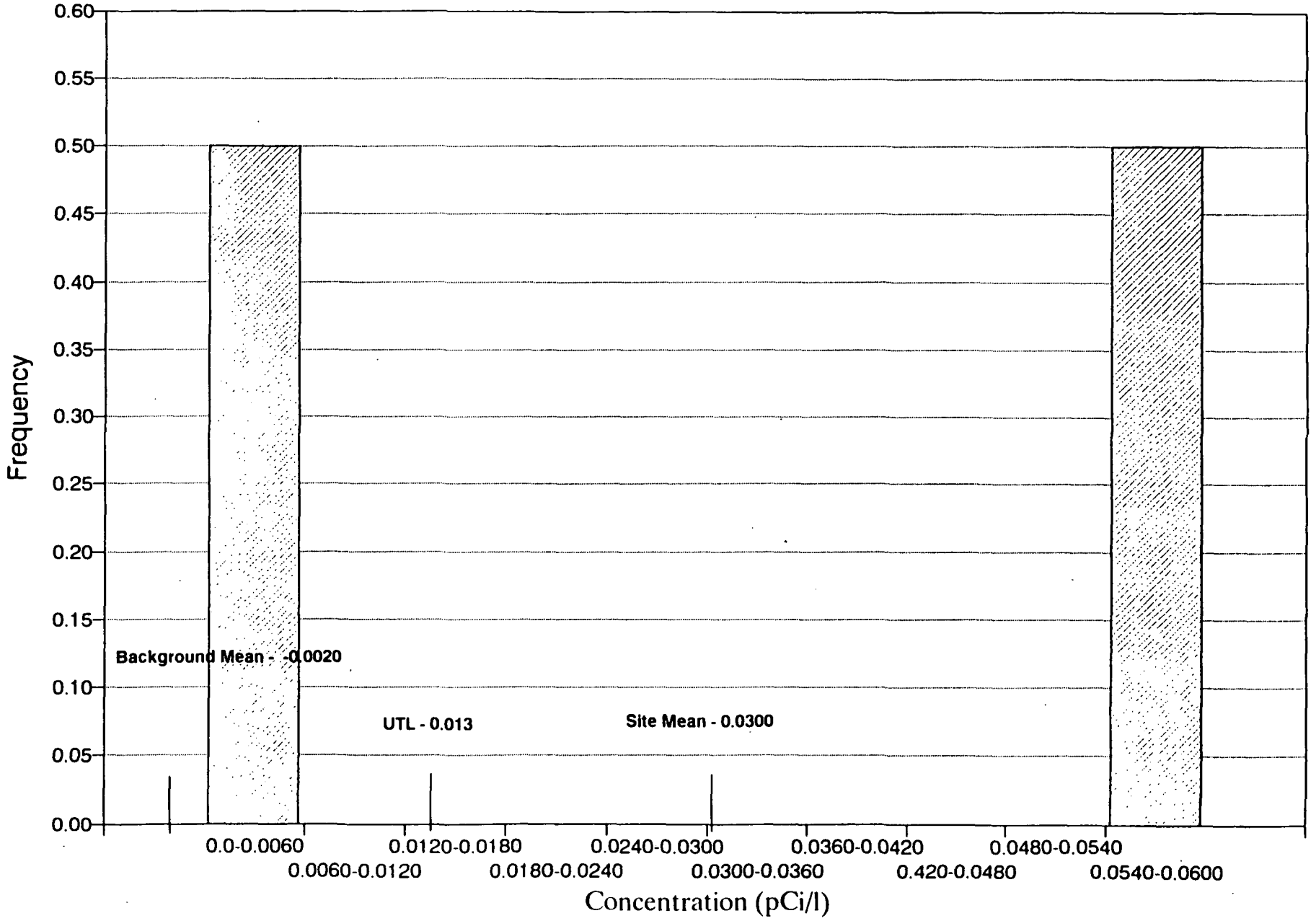


Figure D-157
Surface Water Radionuclides
Americium-241

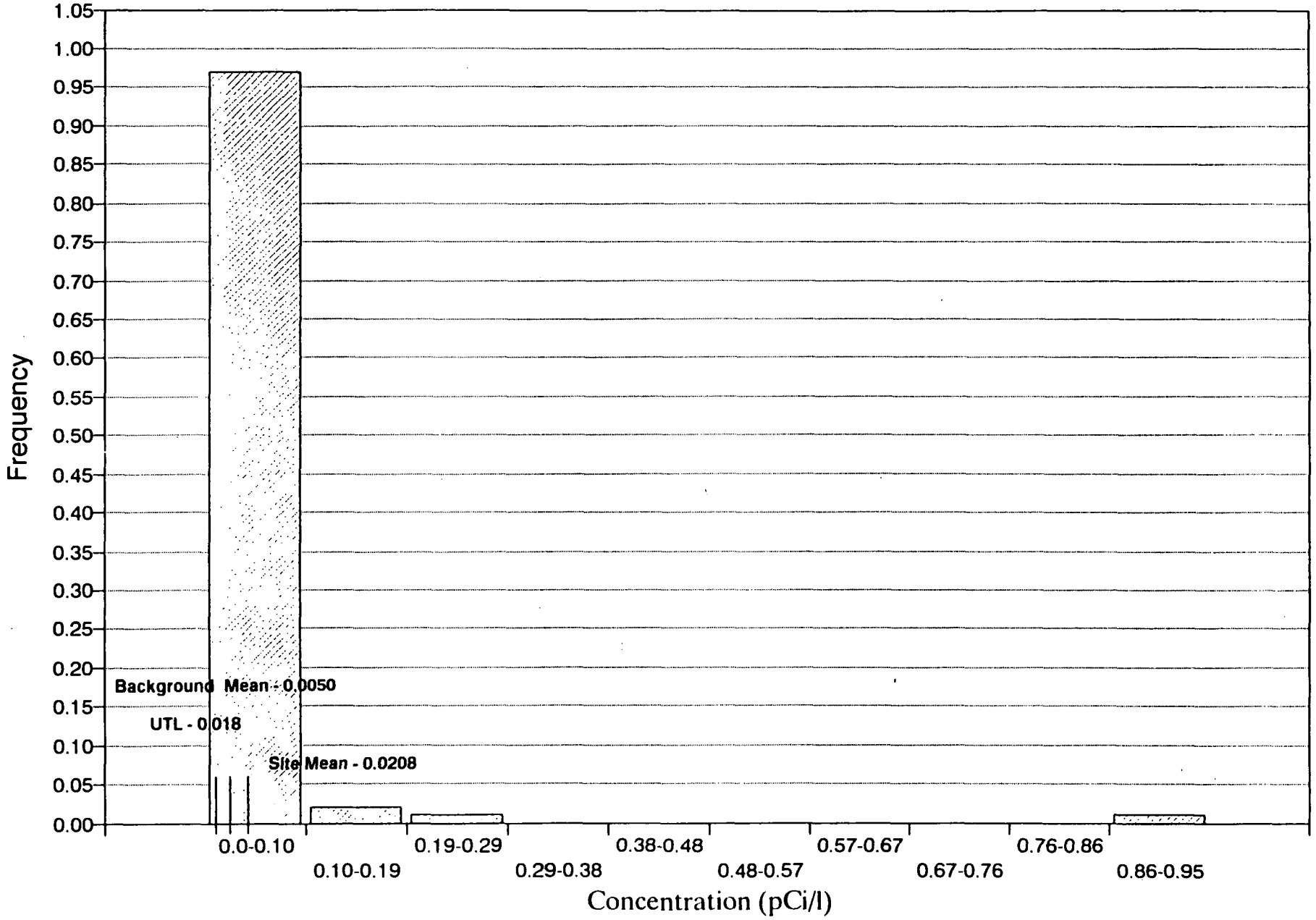


Figure D-158
Surface Water Radionuclides Cesium-137

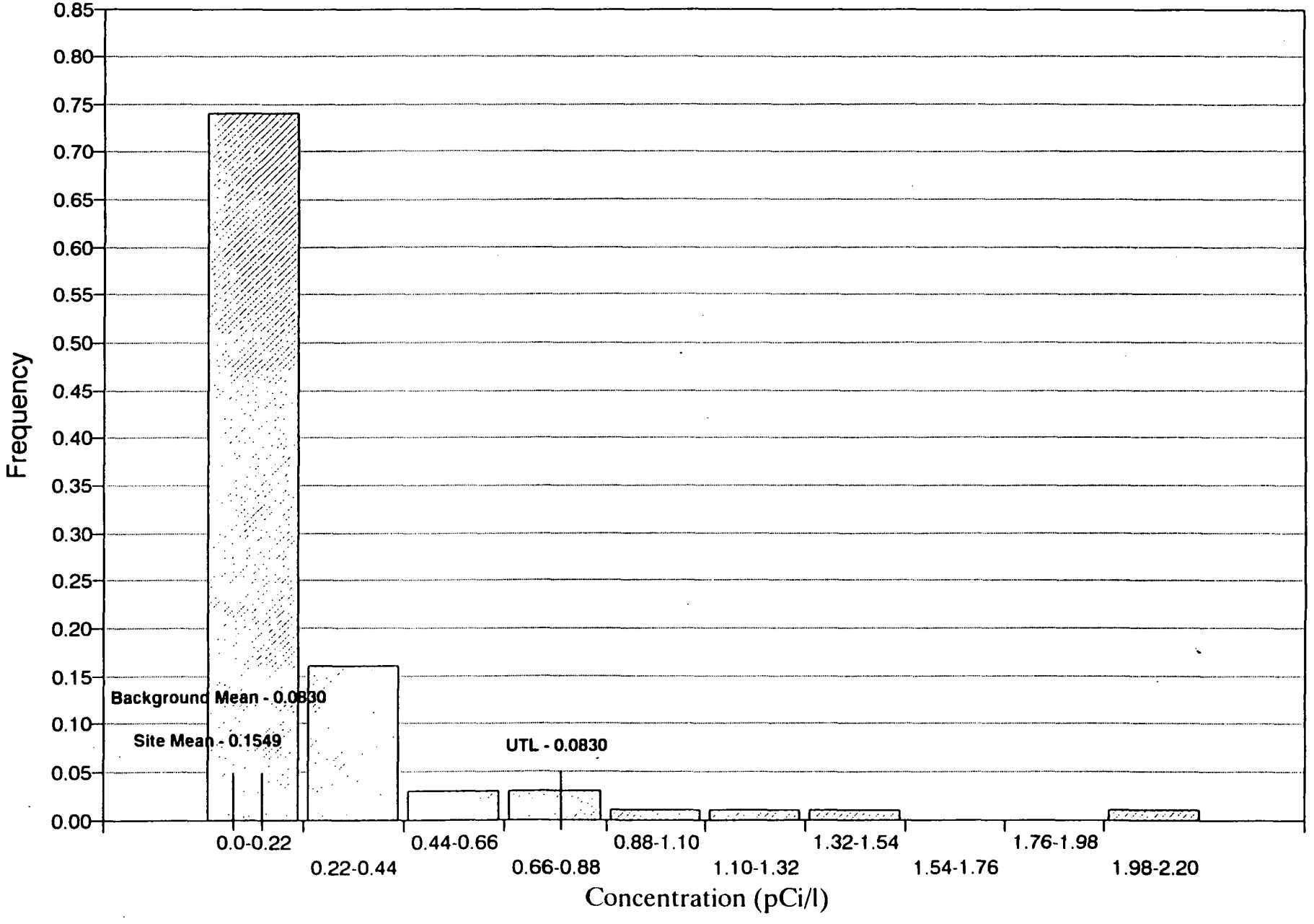


Figure D-159
Surface Soil Radionuclides
Plutonium-239,-240

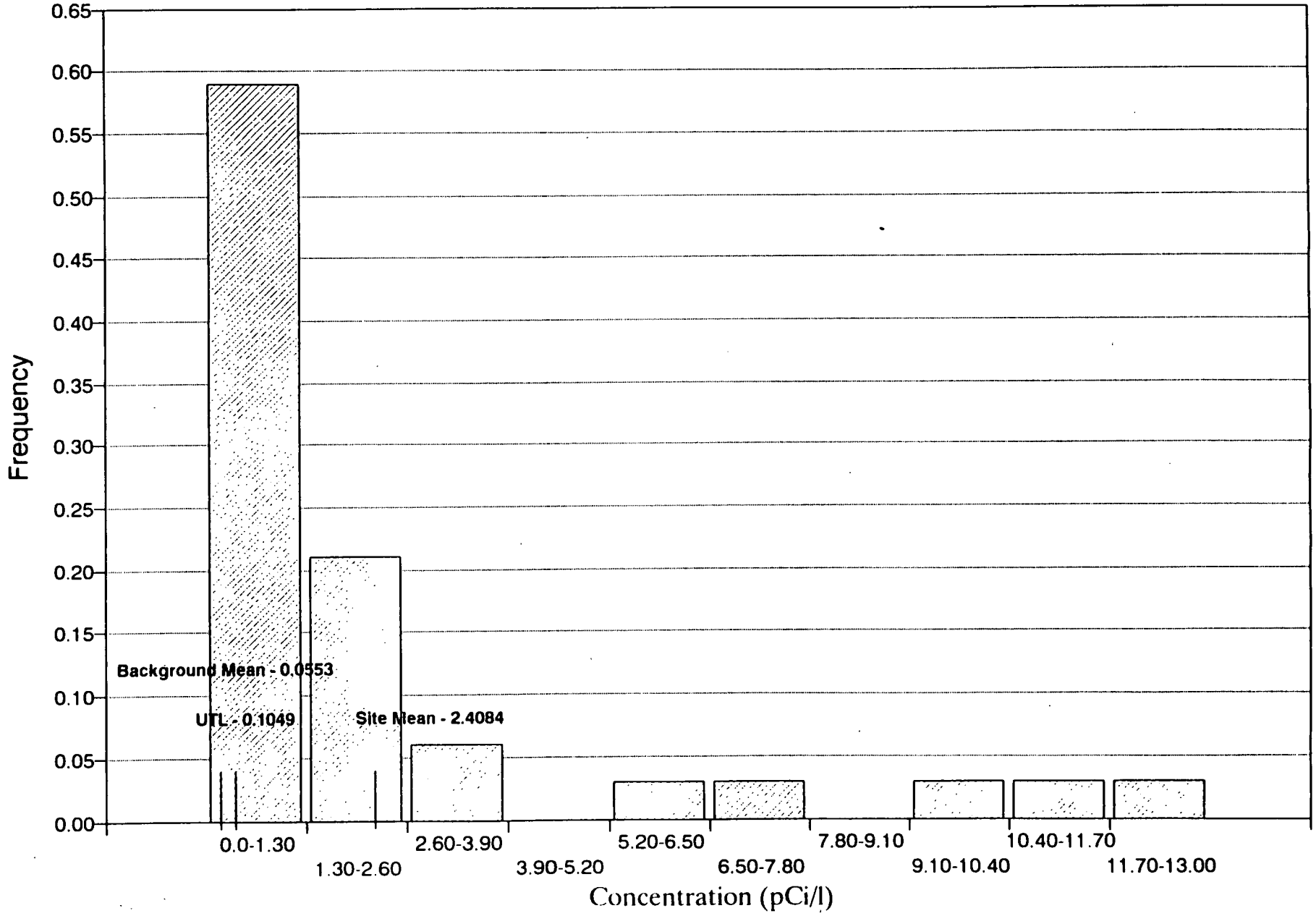


Figure D-160
Geologic Material (COL) Radionuclides
Tritium

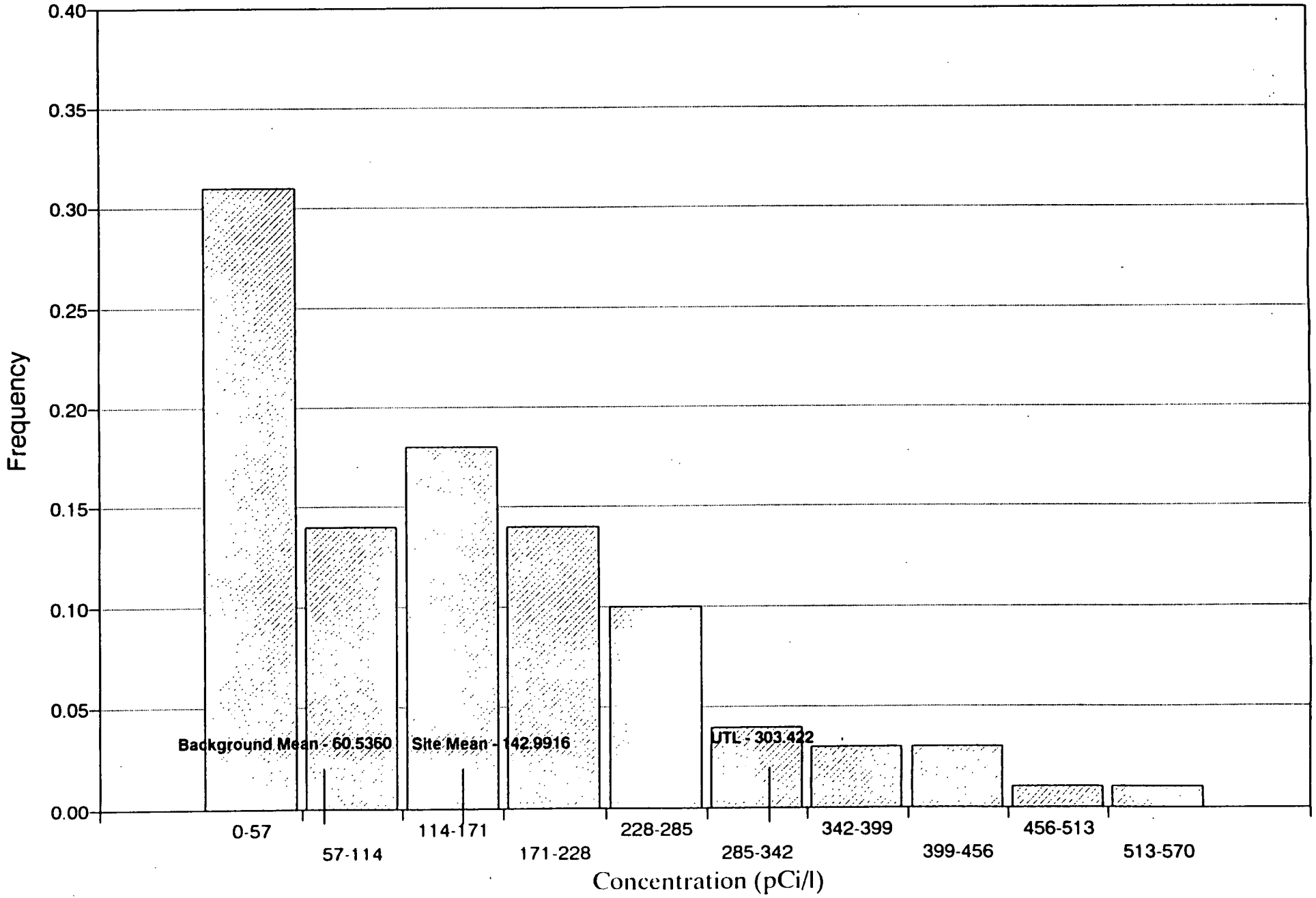


Figure D-162
Geologic Material (COL) Radionuclides
Uranium-238

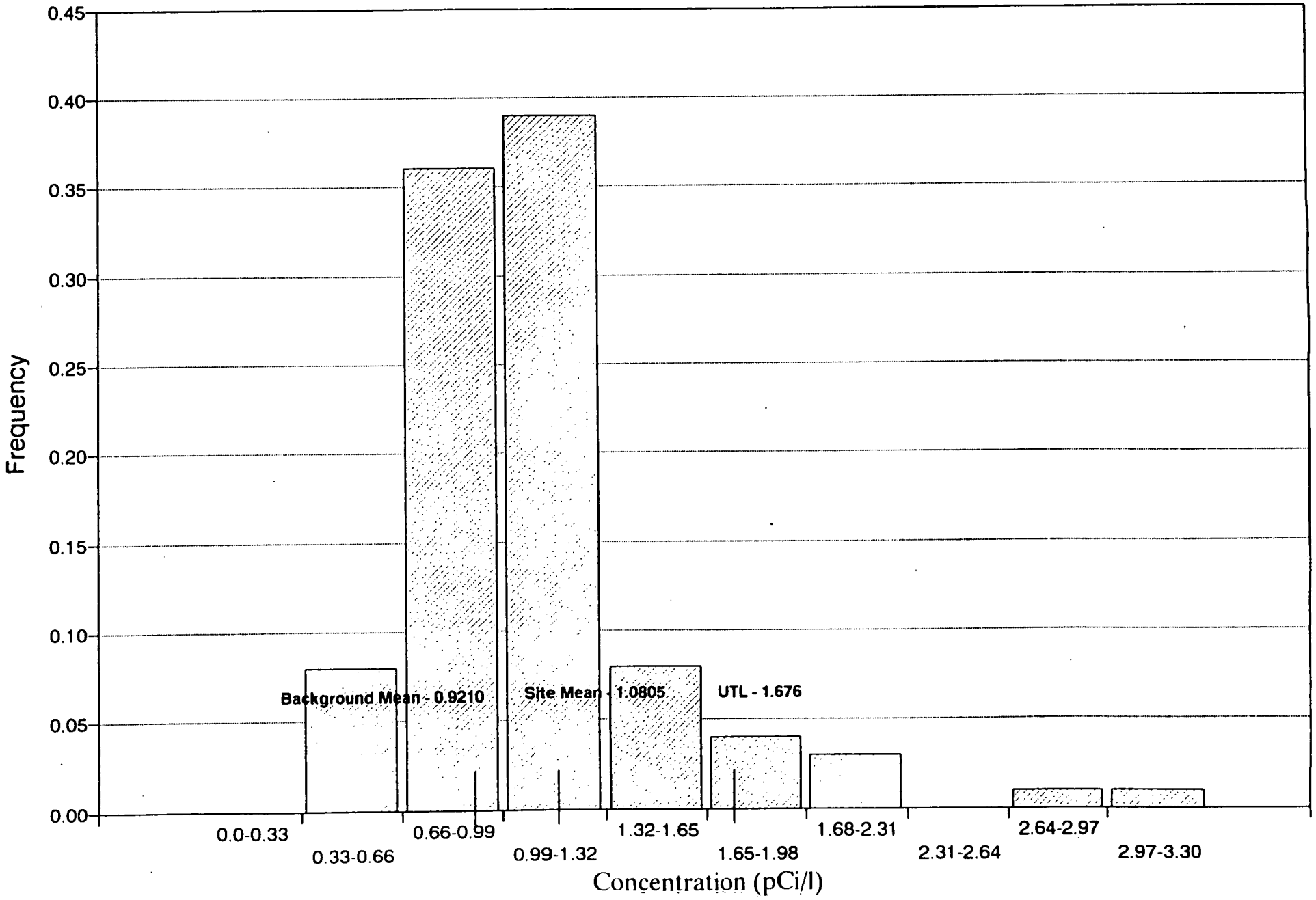


Figure D-163
Surface Soil Radionuclides
Uranium-233,-234

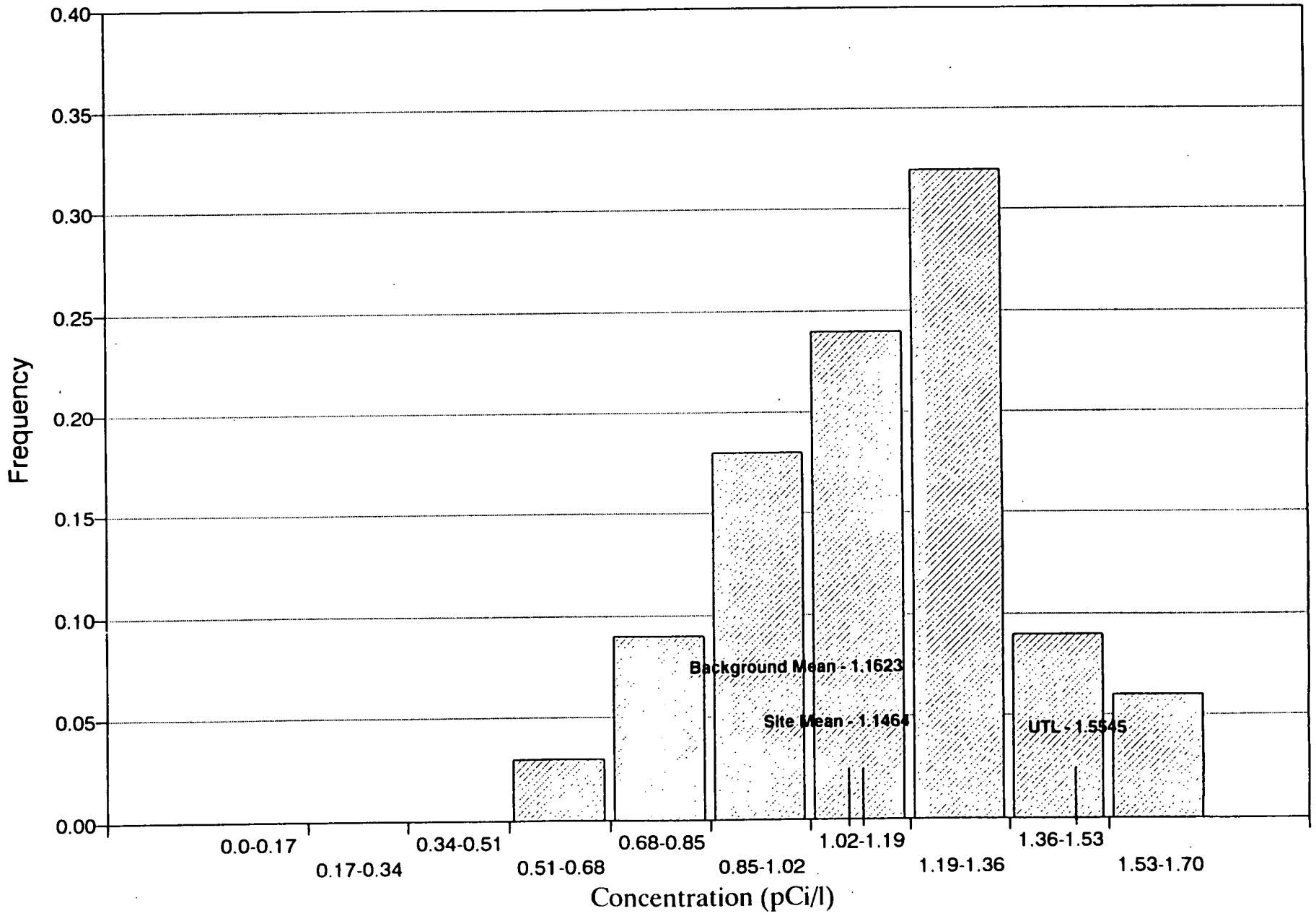


Figure D-164
Surface Soil Radionuclides
Uranium-238

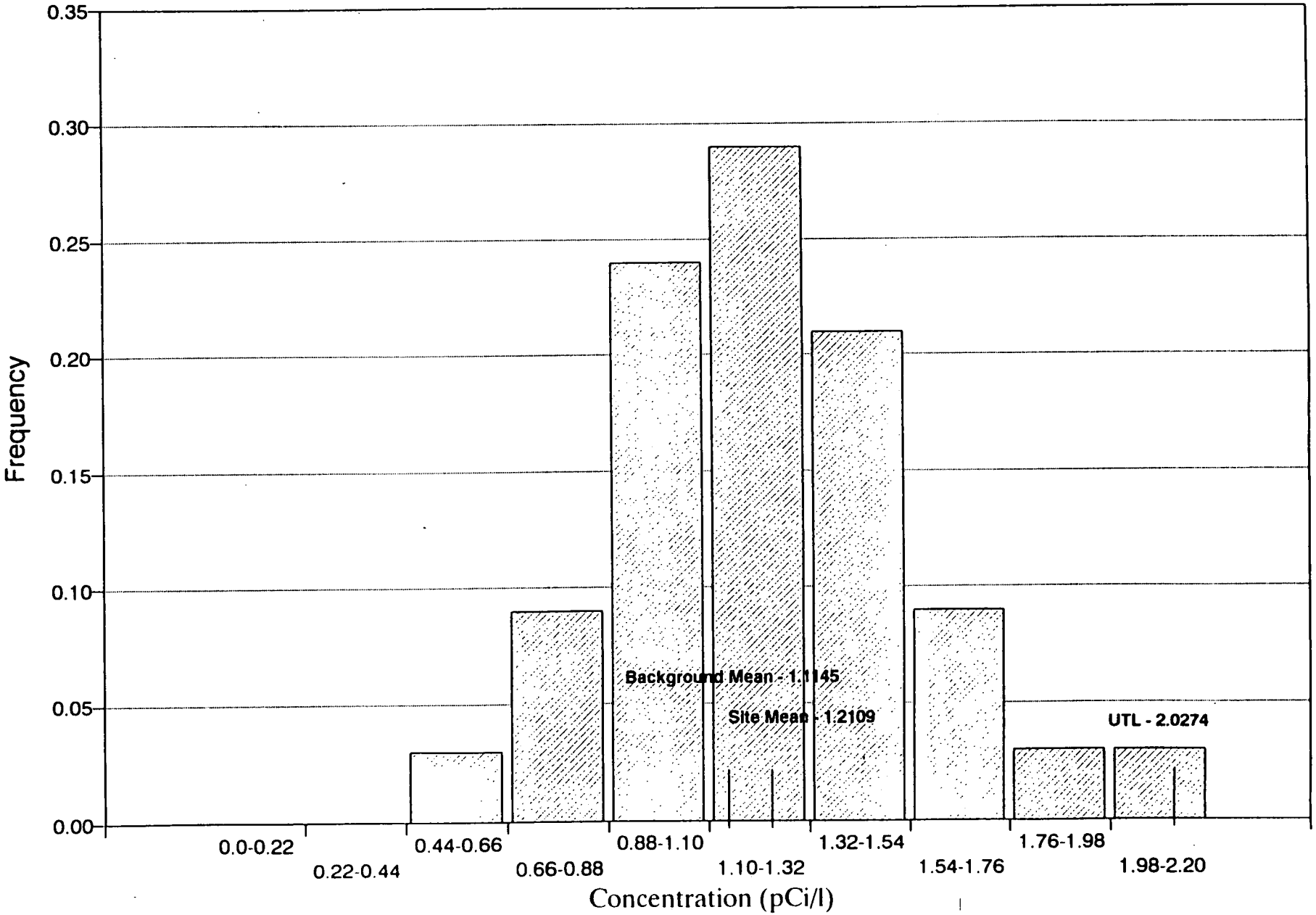


Figure D-165
Groundwater (RFA) Radionuclides
Uranium-235

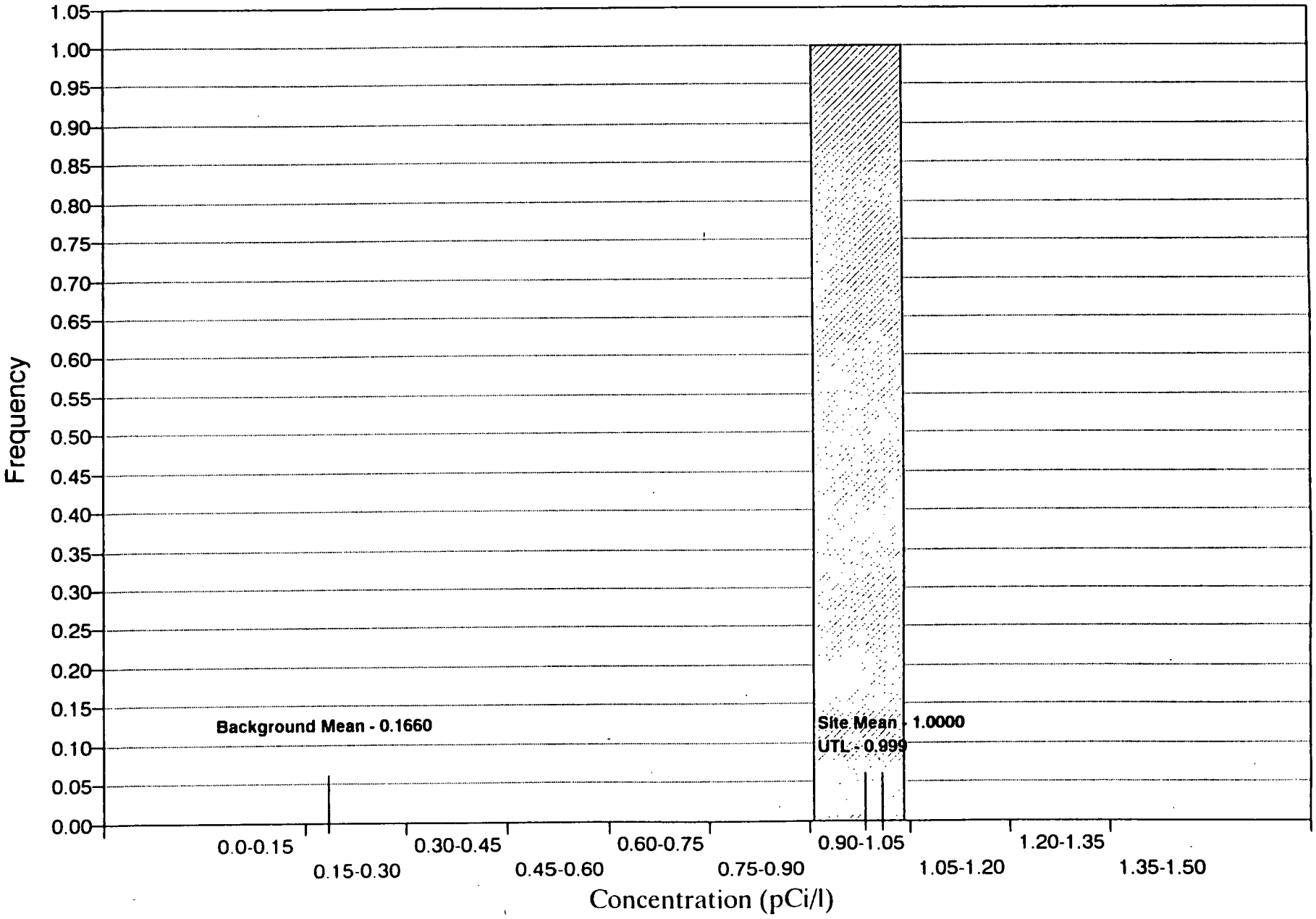


Figure D-166
Groundwater (RFA) Radionuclides
Uranium-238

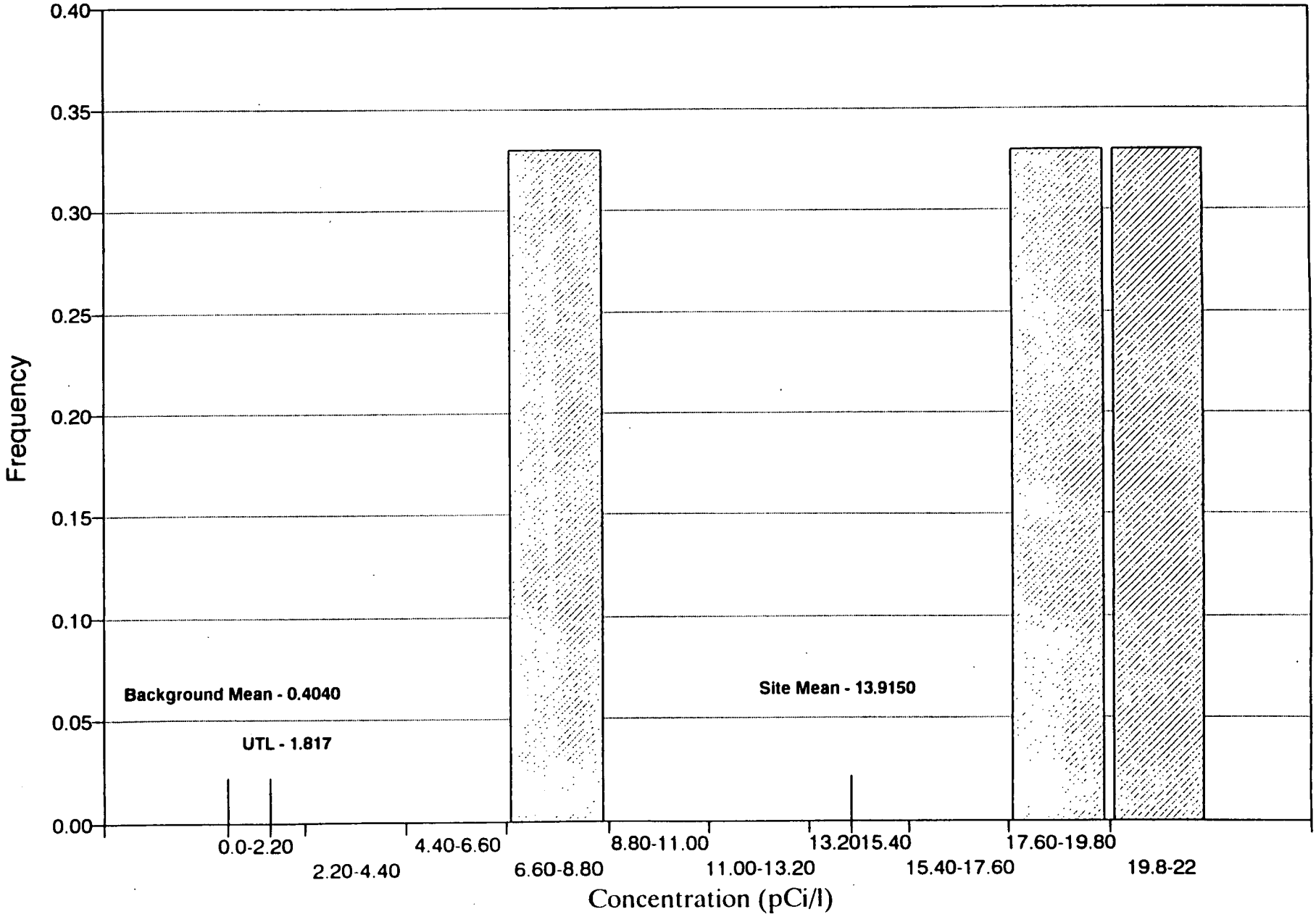


Figure D-167
Surface Water Radionuclides
Uranium-233,-234

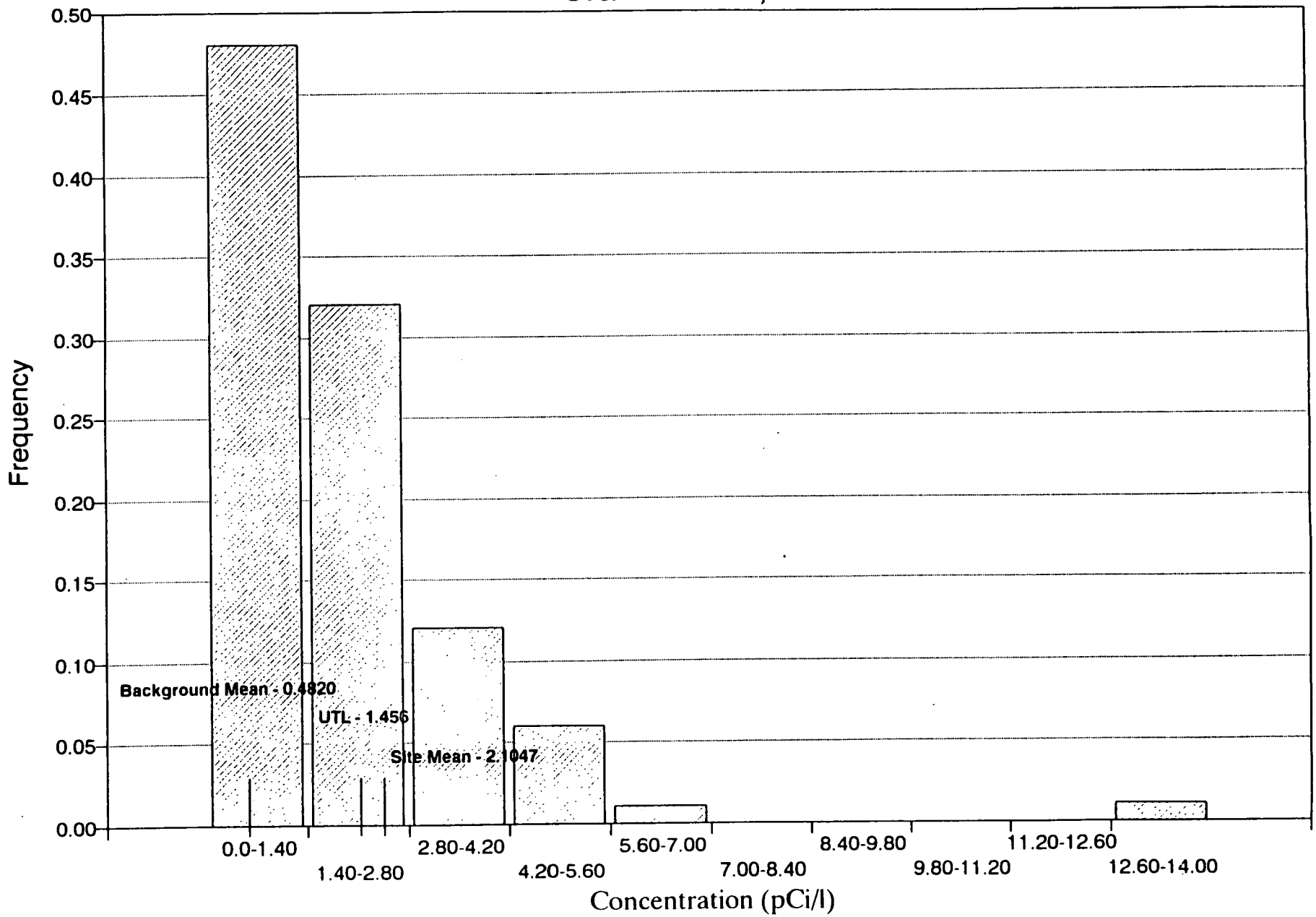


Figure D-168
Surface Water Radionuclides Uranium-235

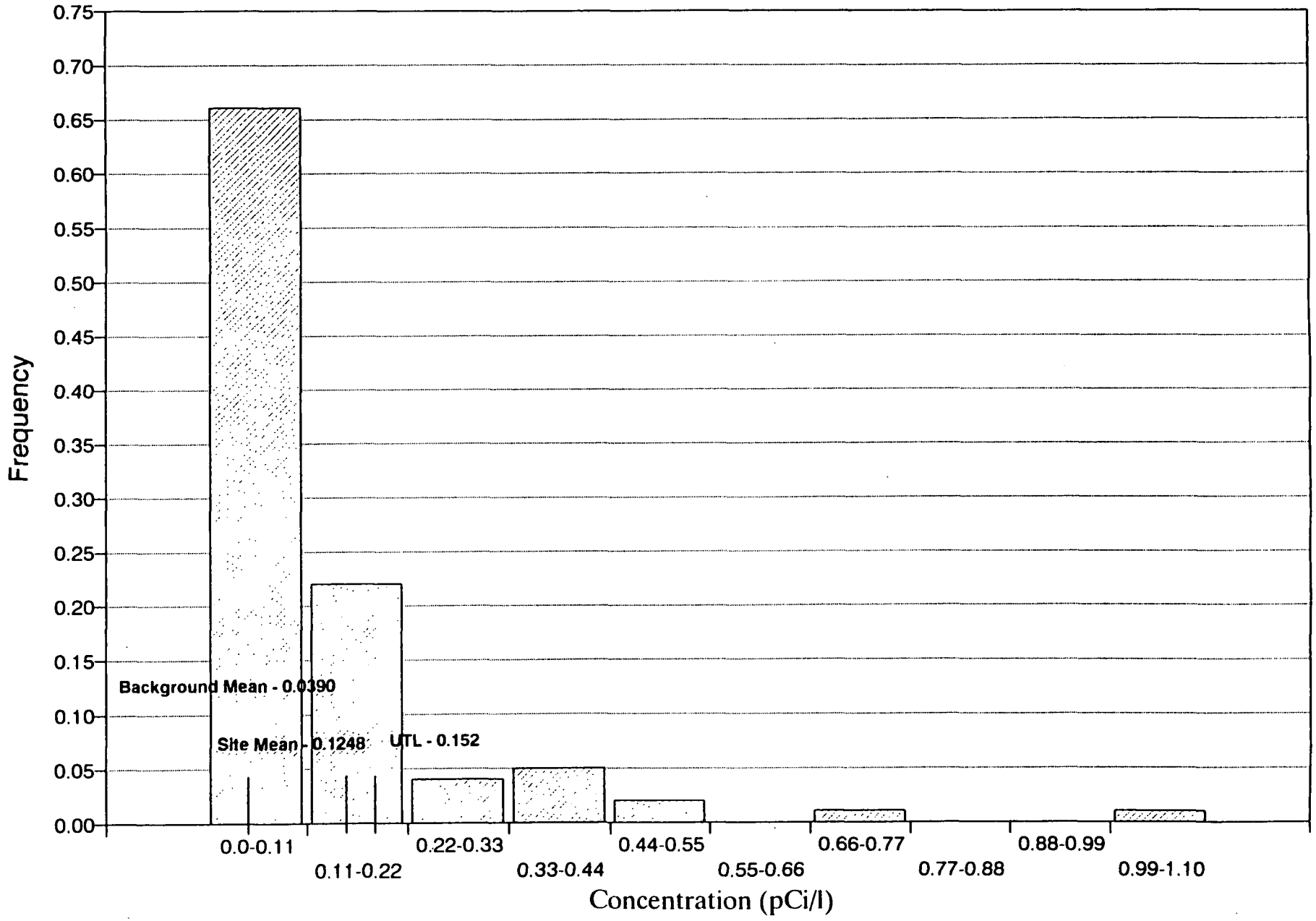


Figure D-169
Surface Water Radionuclides Uranium-238

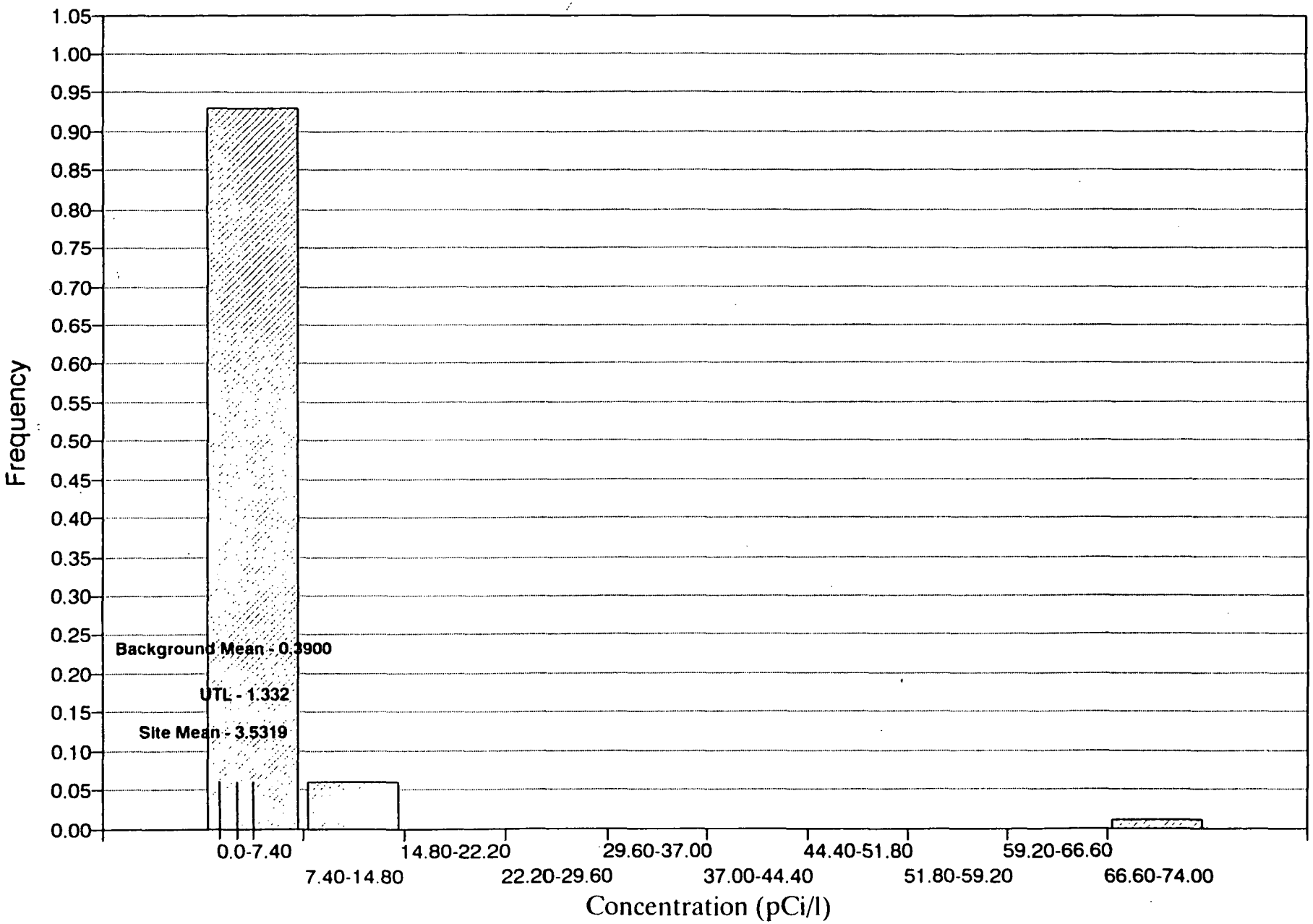


Figure D-173
Groundwater (RFA) Bicarbonate as $CACO_3$

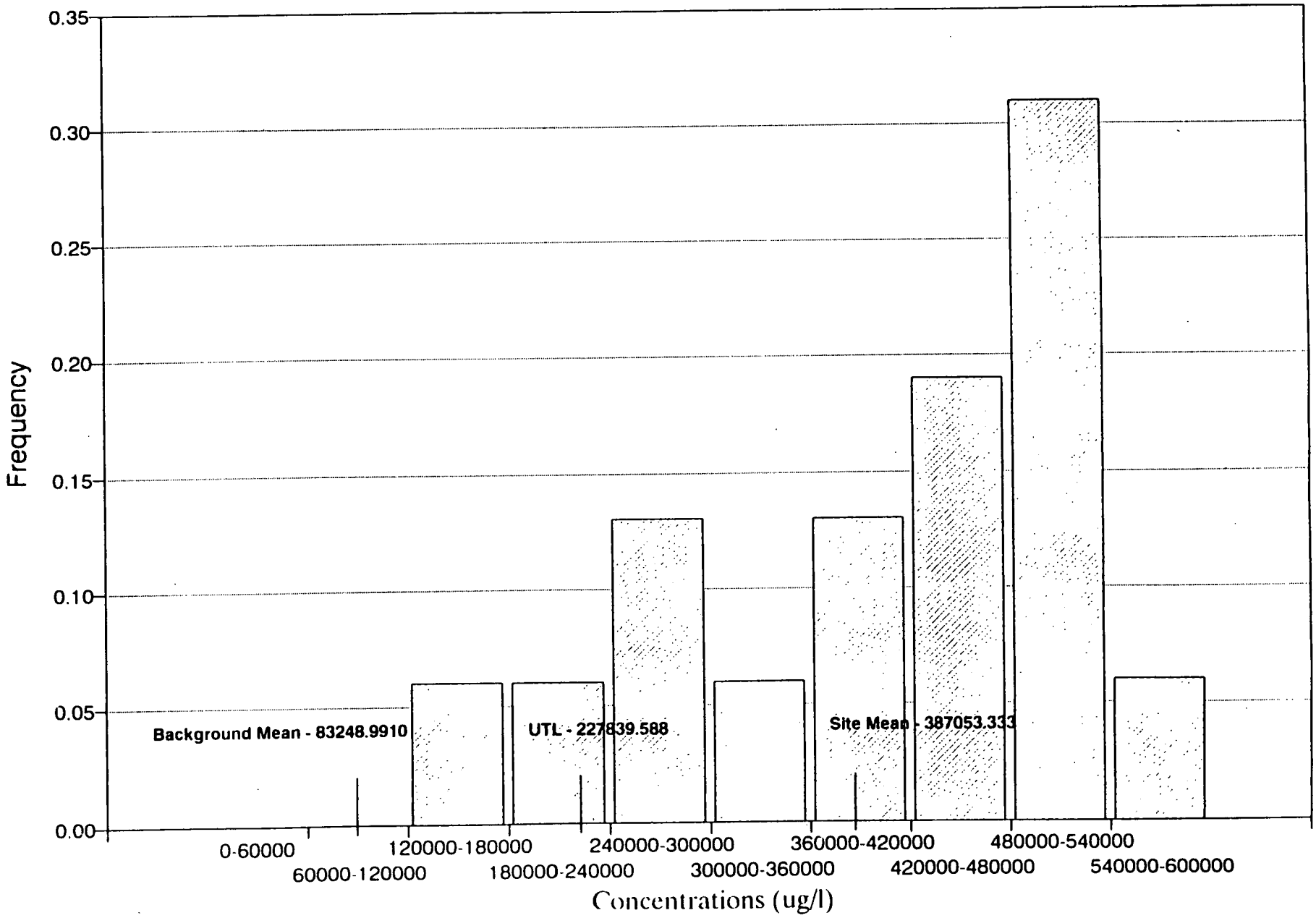


Figure D-174
Groundwater (COL) Bicarbonate as $CACO_3$

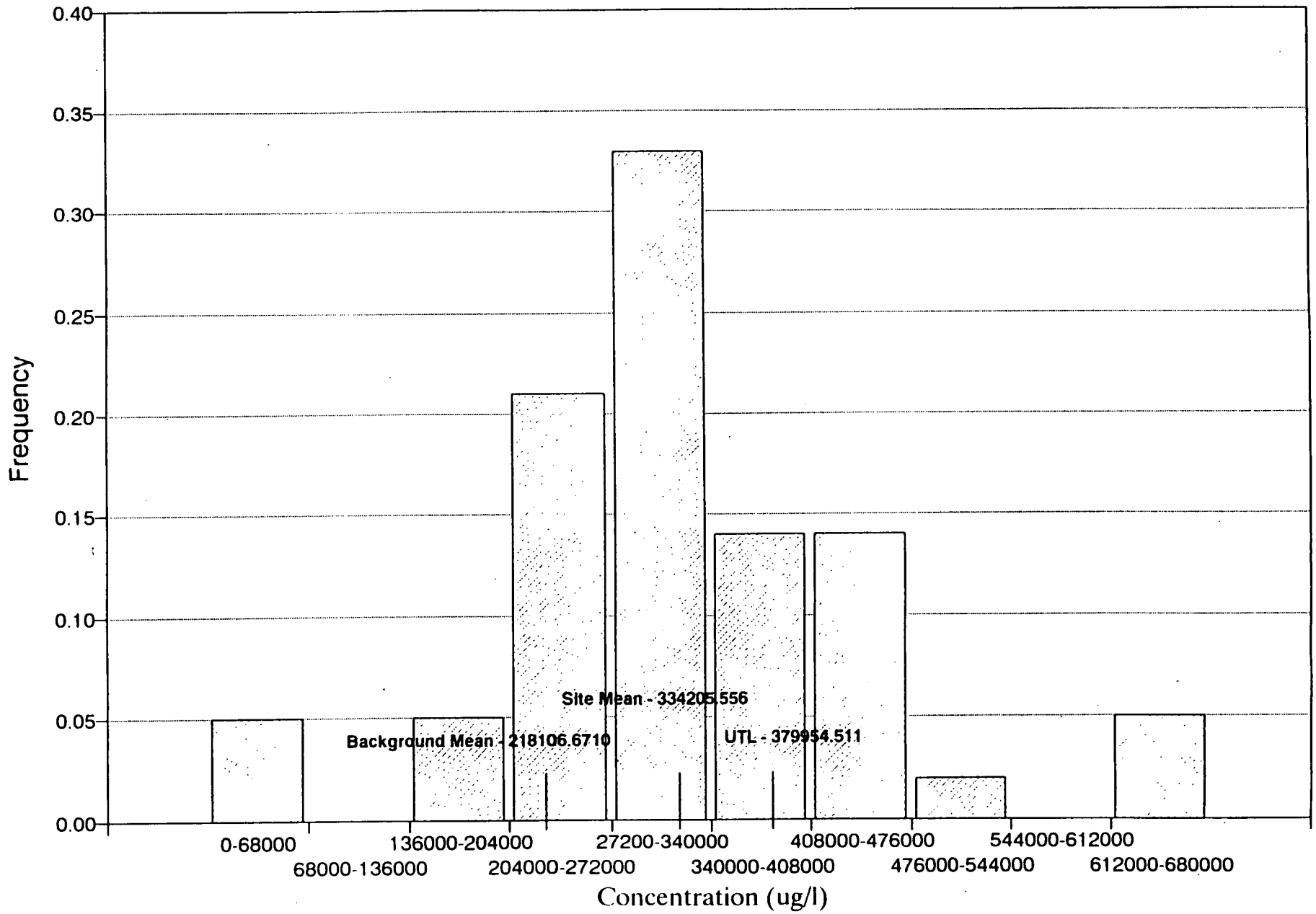


Figure D-175
Groundwater (KAR) Bicarbonate as $CACO_3$

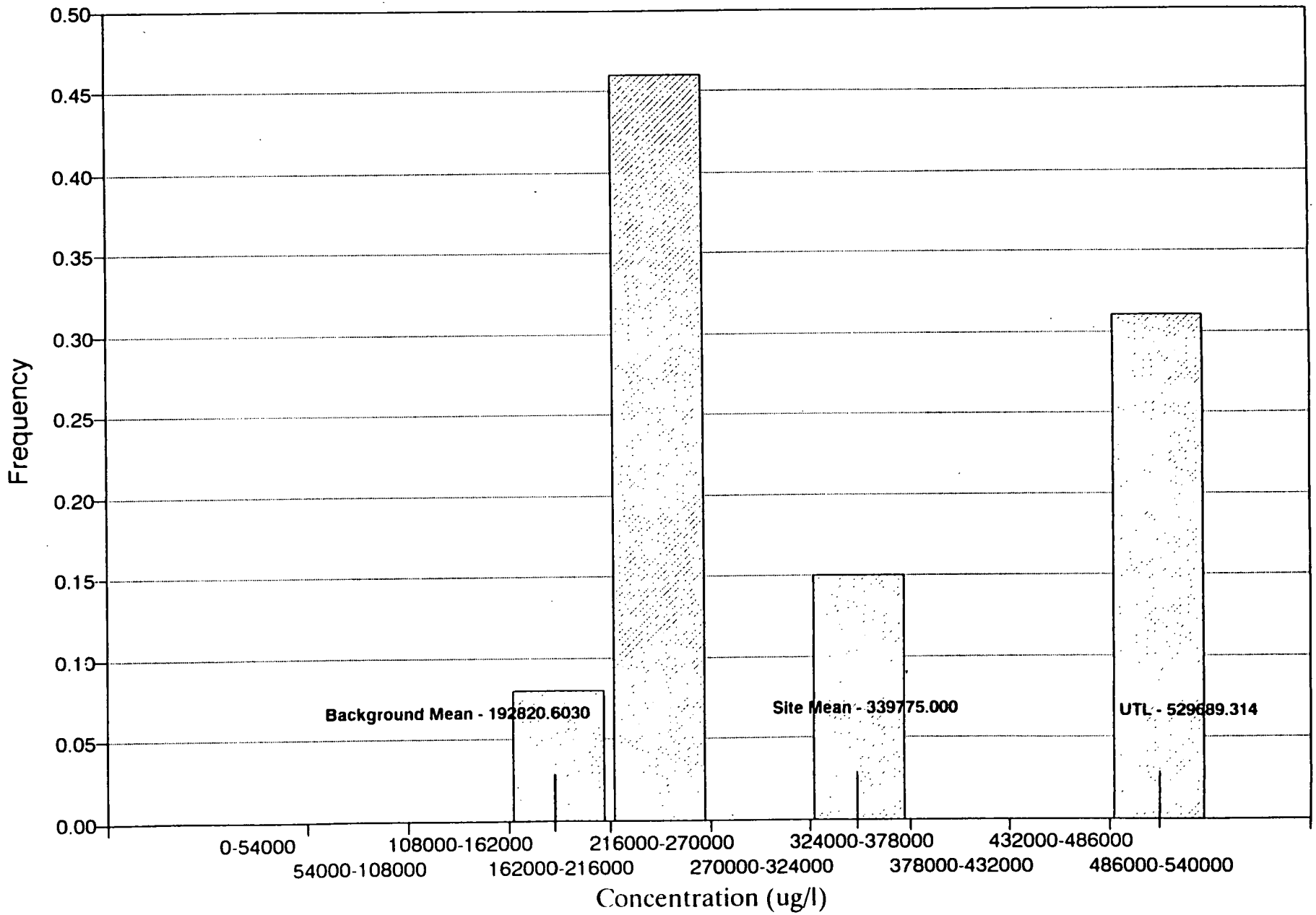


Figure D-176
Surface Water Bicarbontae as $CACO_3$

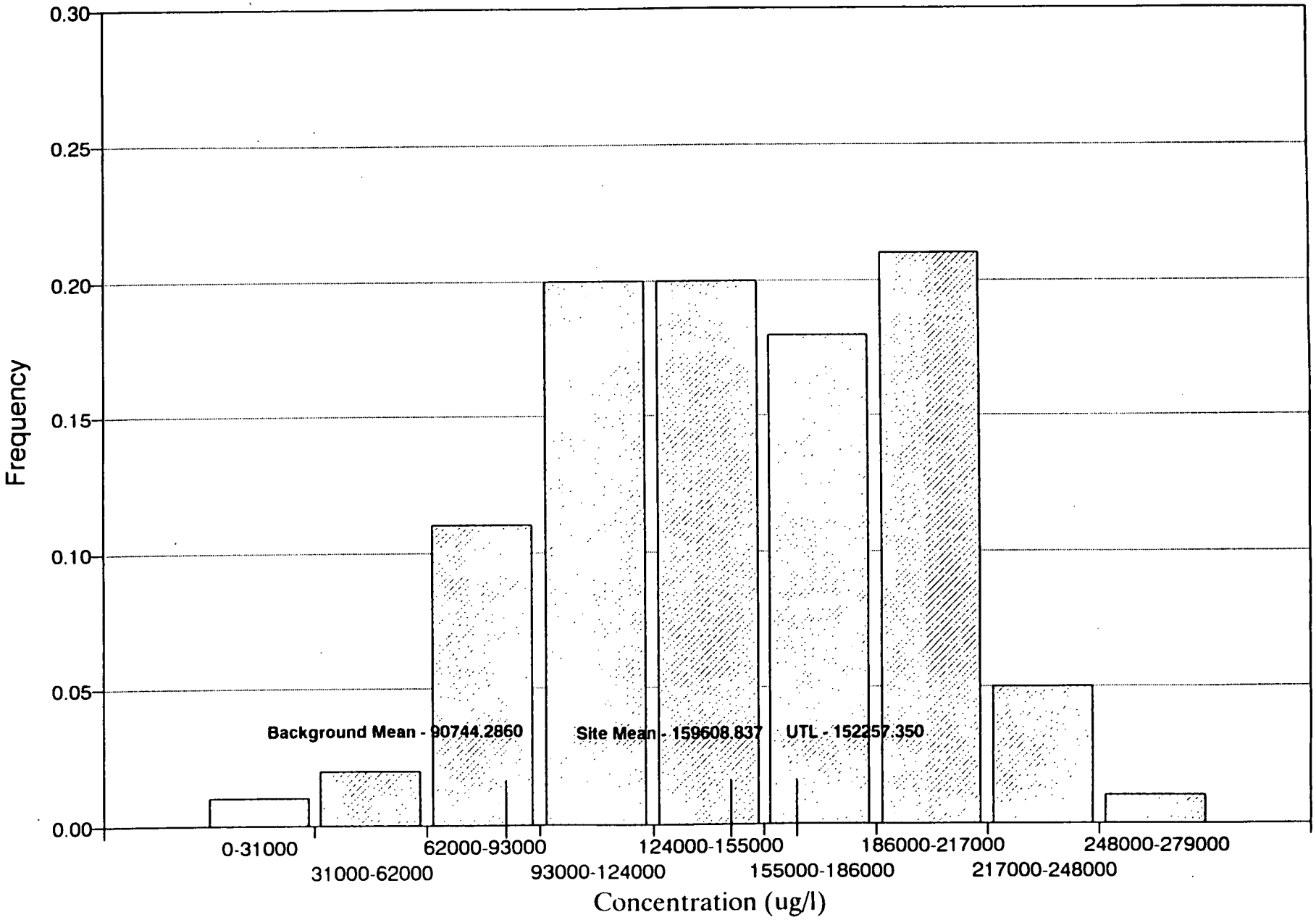


Figure D-179
Groundwater (RFA) Chloride

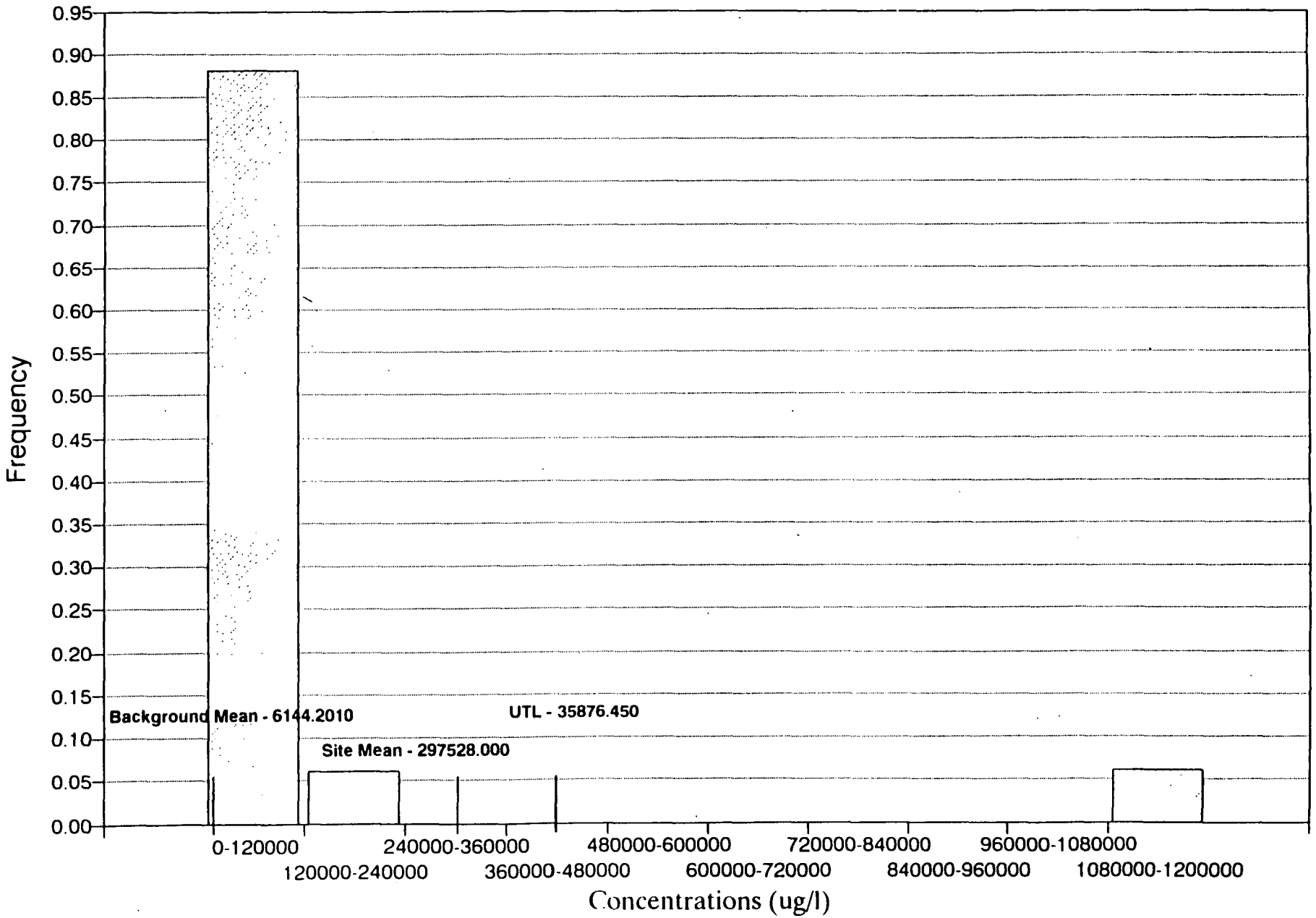


Figure D-180
Groundwater (COL) Chloride

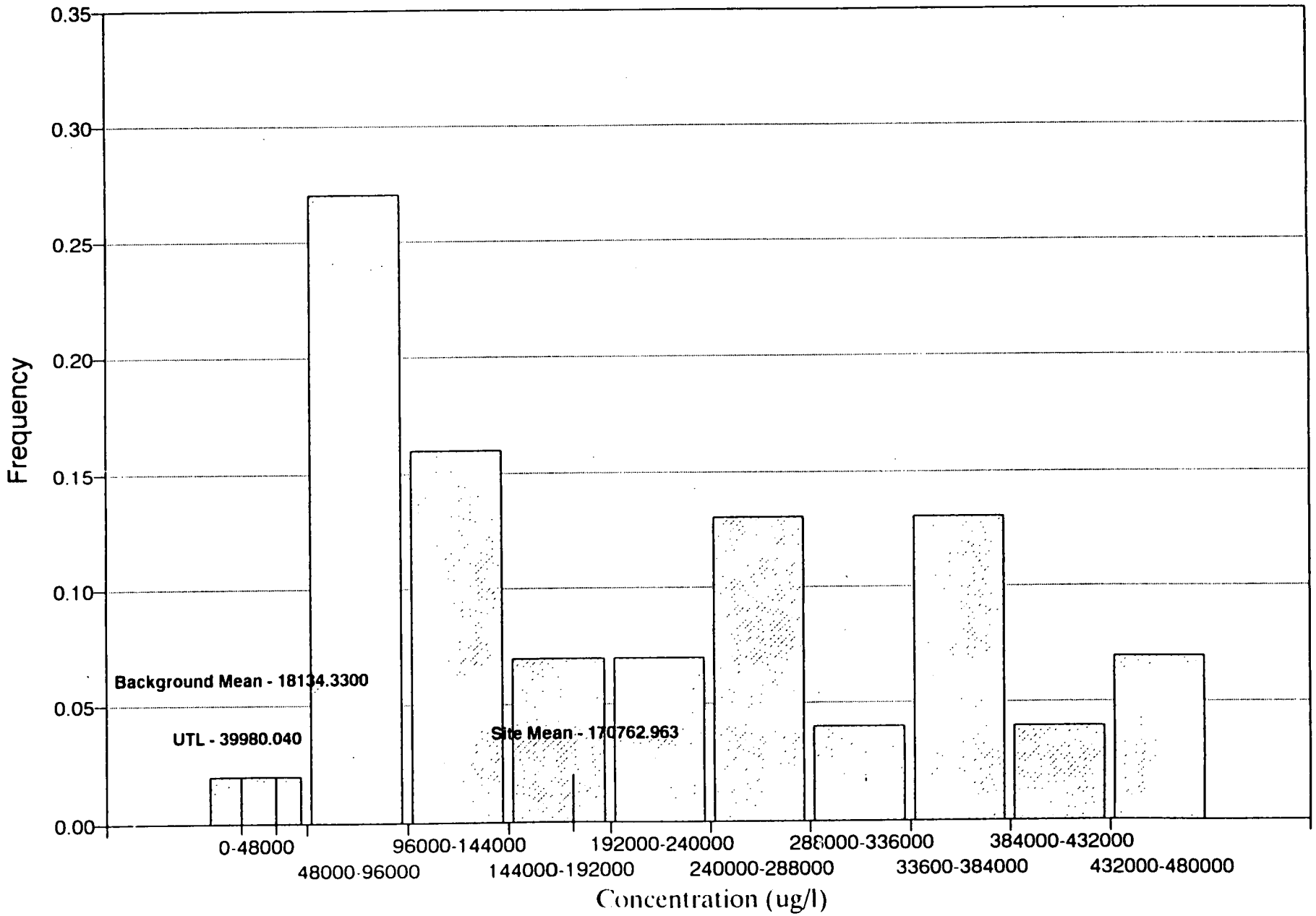


Figure D-181
Groundwater (WCS) Chloride

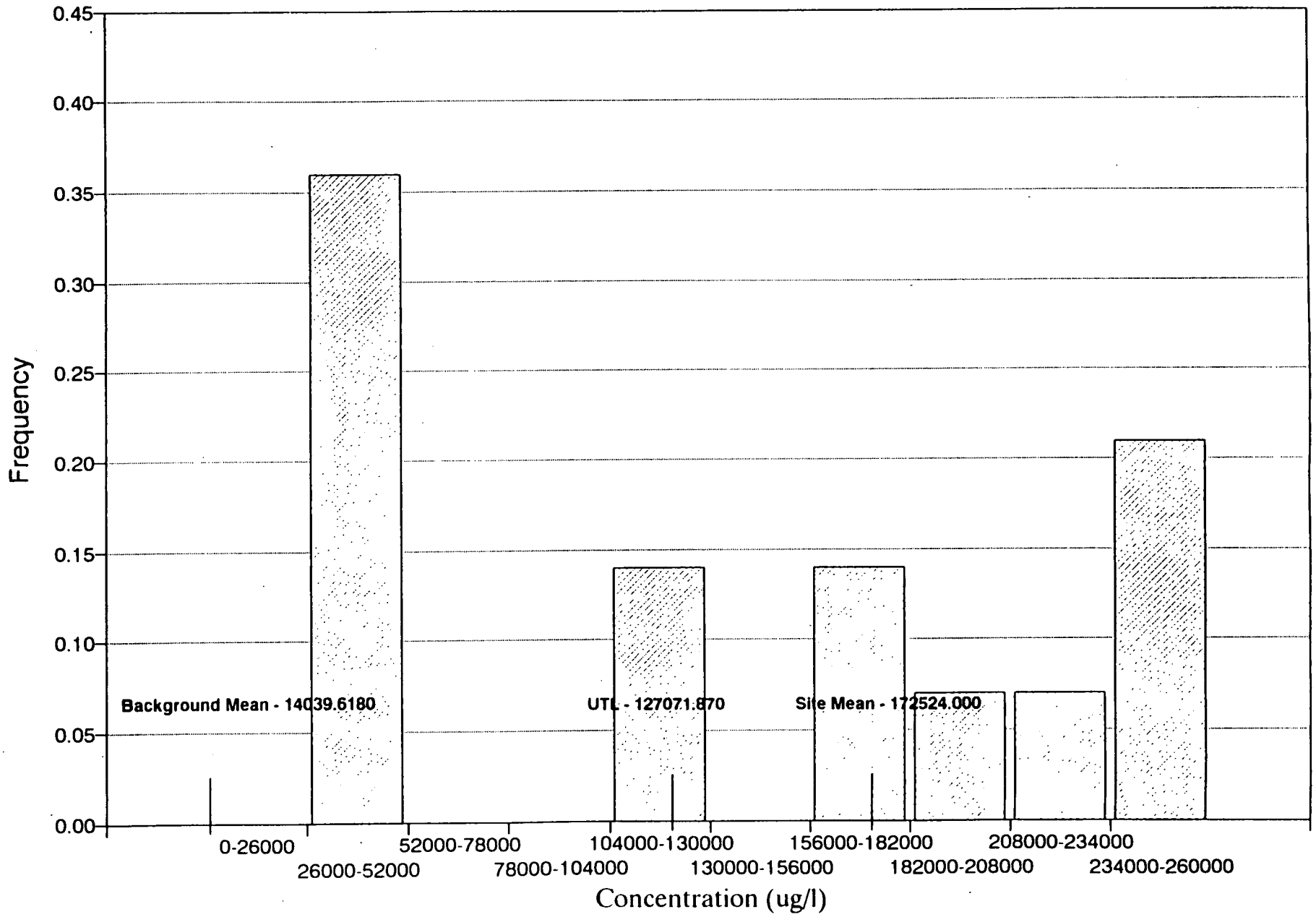
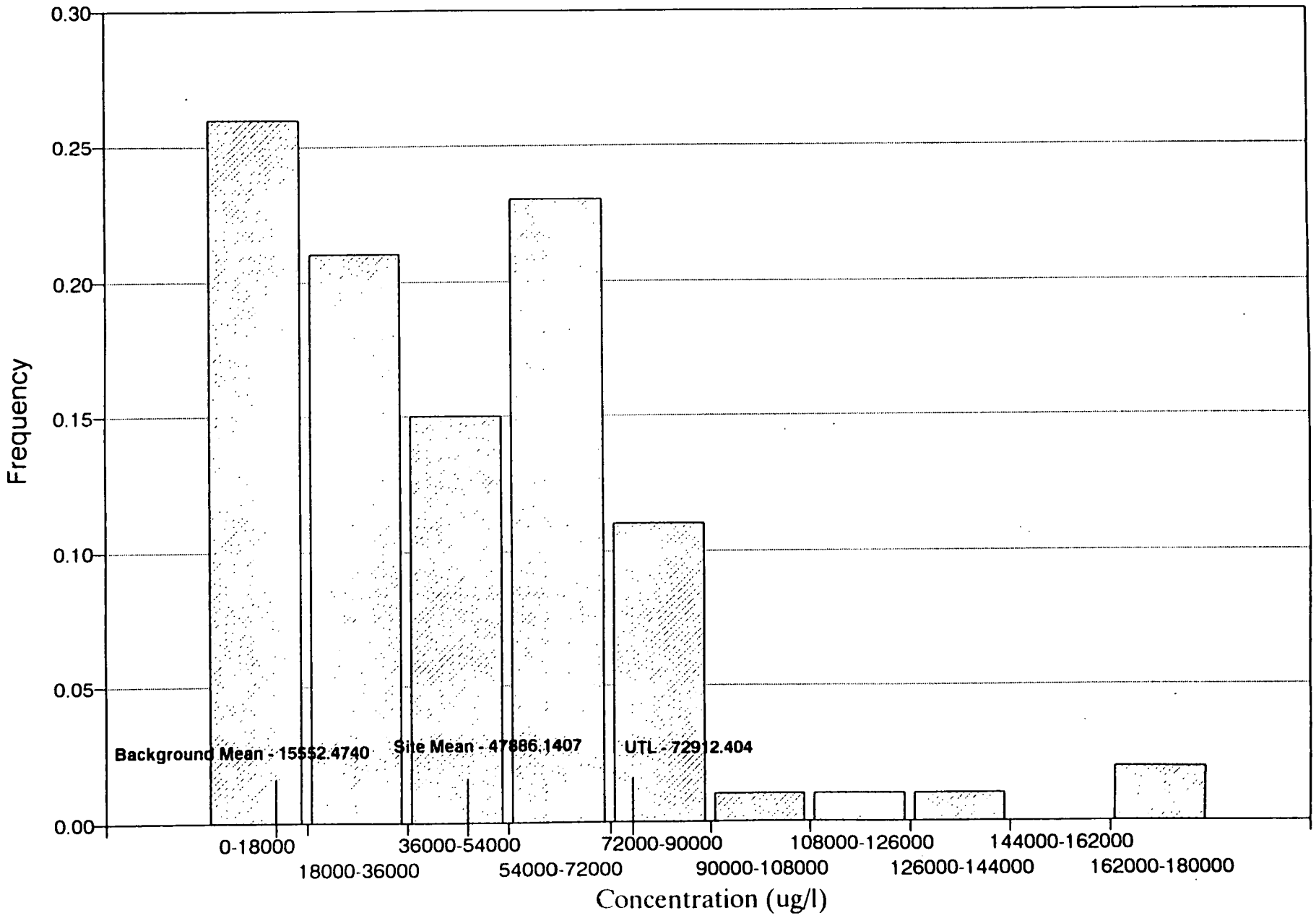
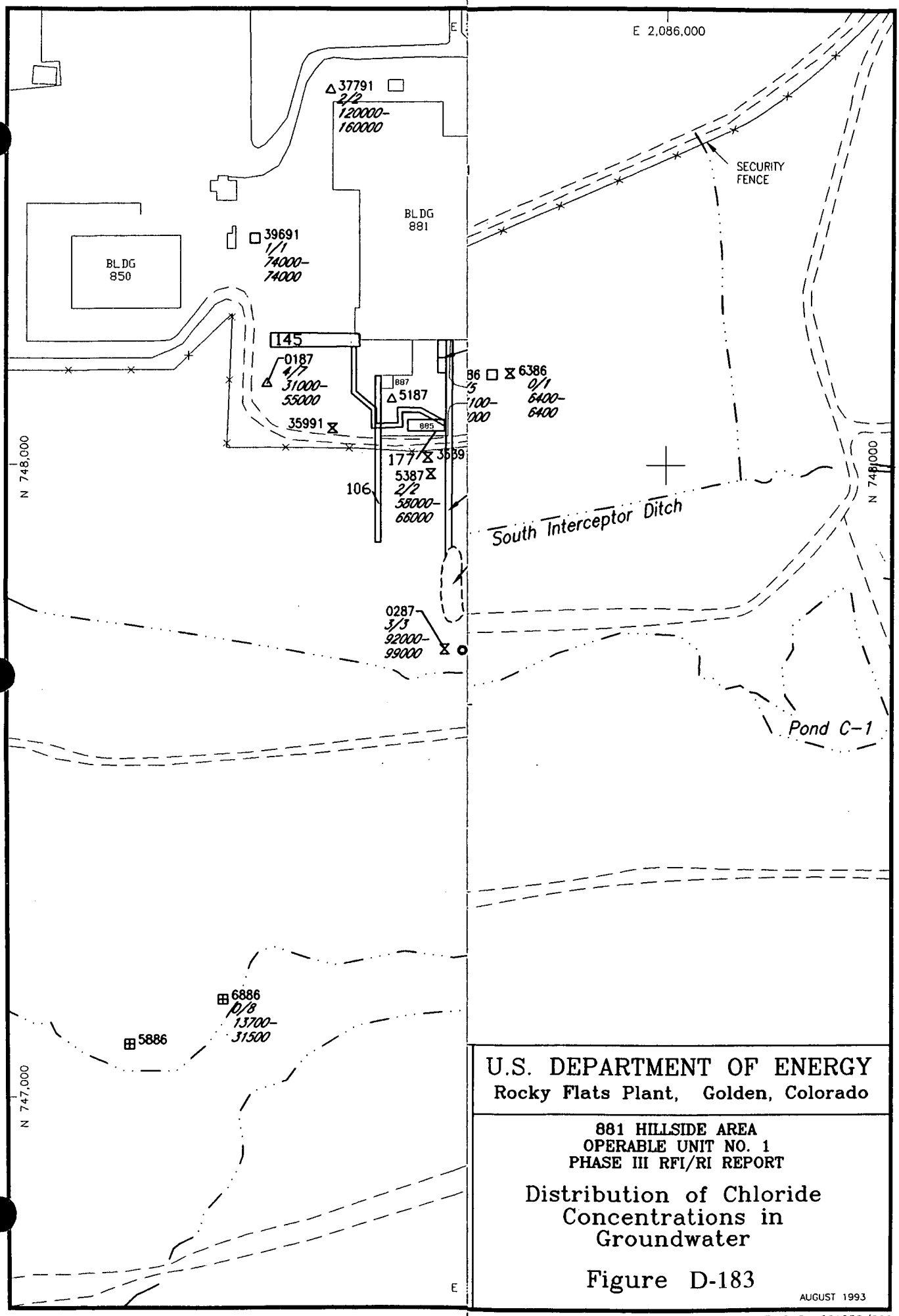


Figure D-182
Surface Water Chloride





U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Chloride Concentrations in Groundwater

Figure D-183

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Figure D-185
Surface Water Cyanide

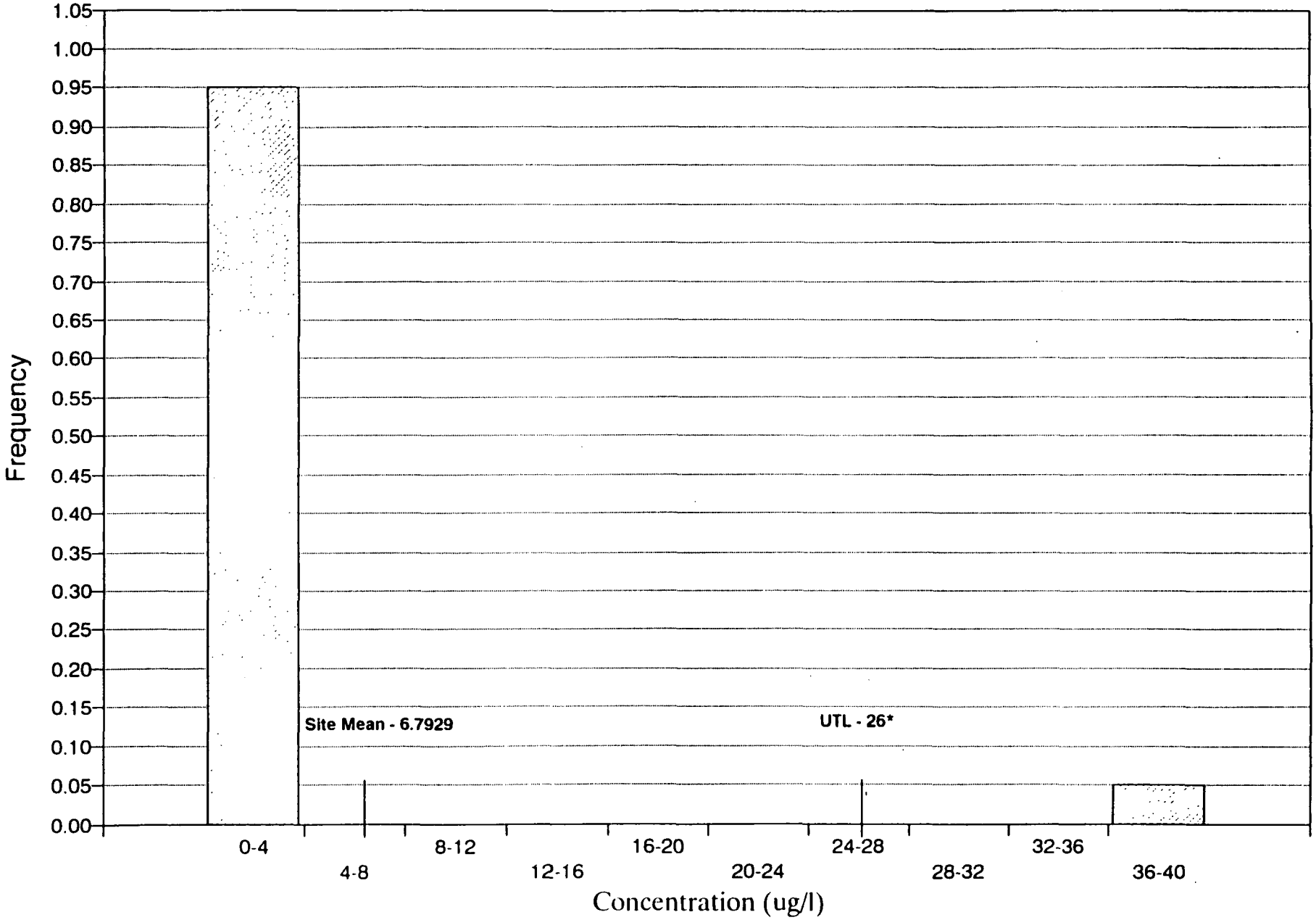


Figure D-187
Groundwater (RFA) Fluoride

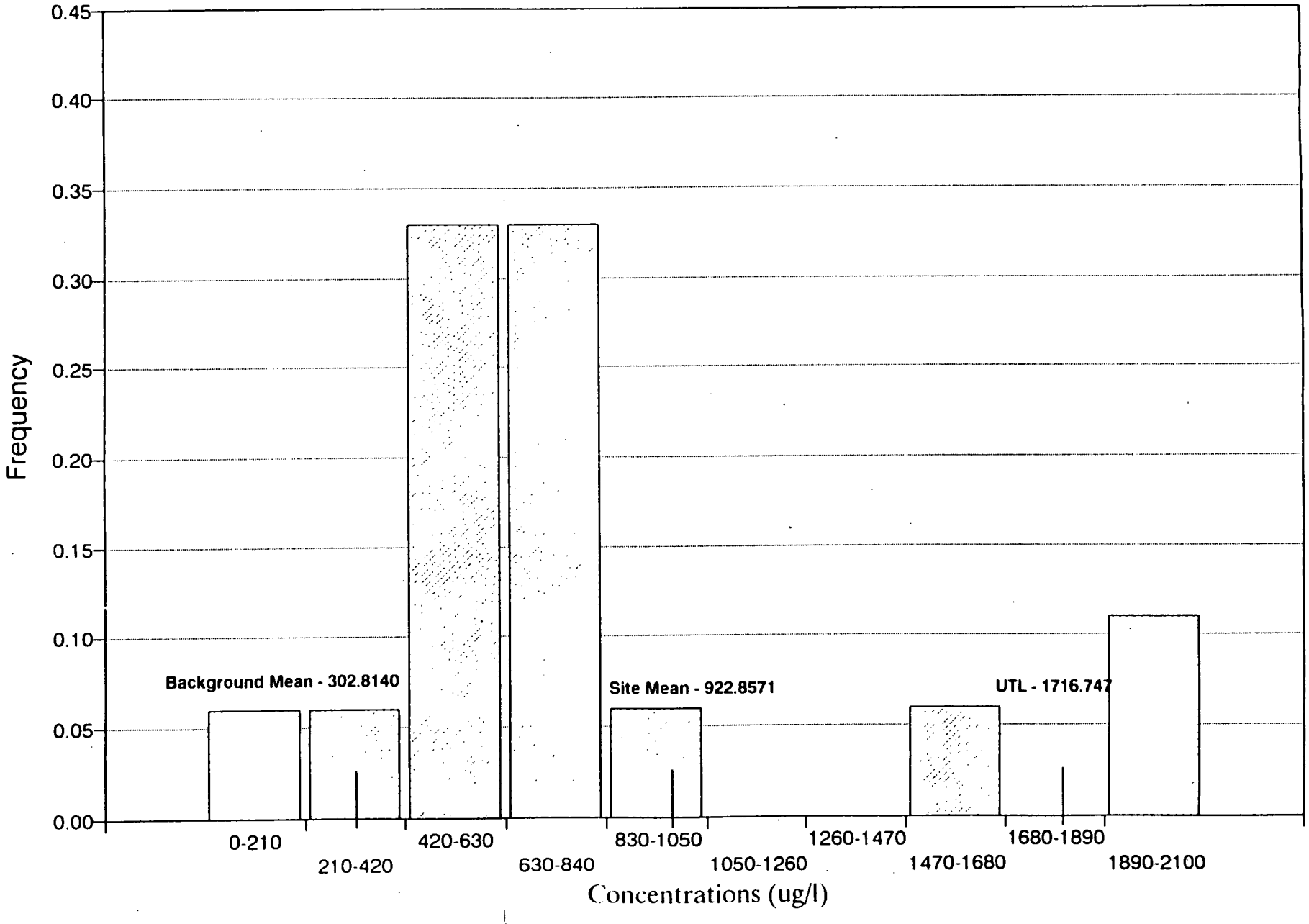


Figure D-188
Surface Water Fluoride

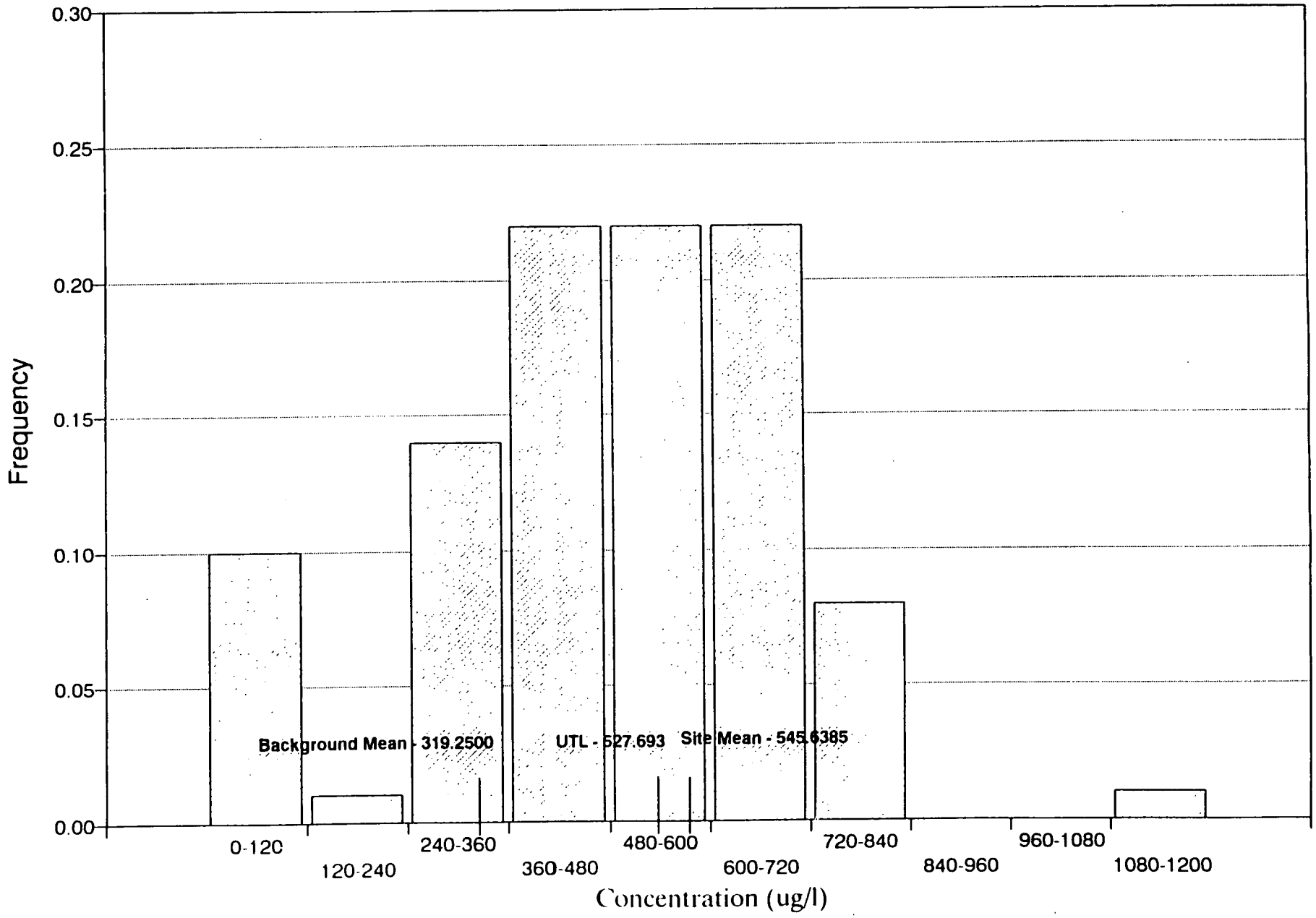


Figure D-191
Groundwater (RFA) Nitrate/Nitrite

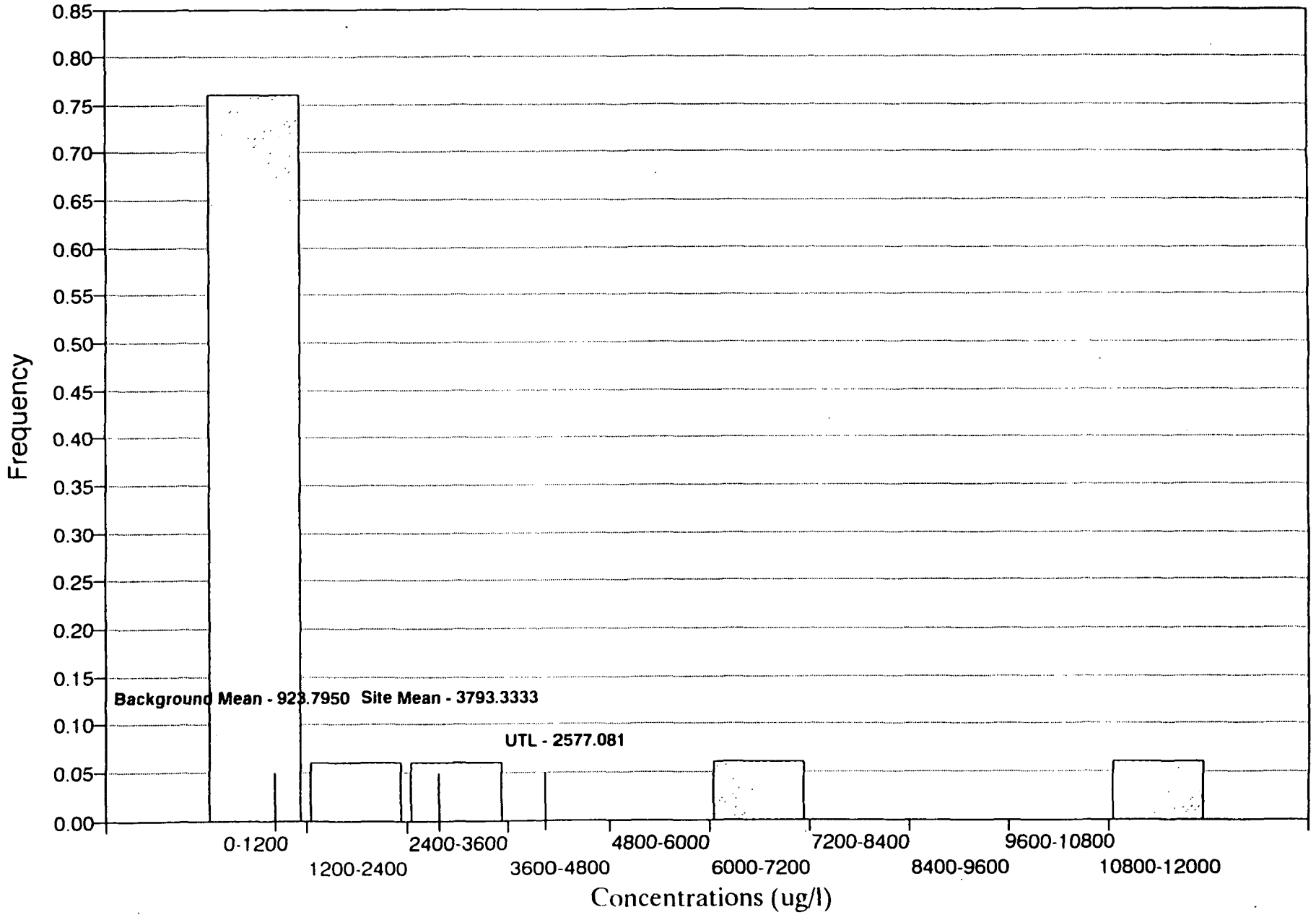


Figure D-192
Groundwater (COL) Nitrate/Nitrite

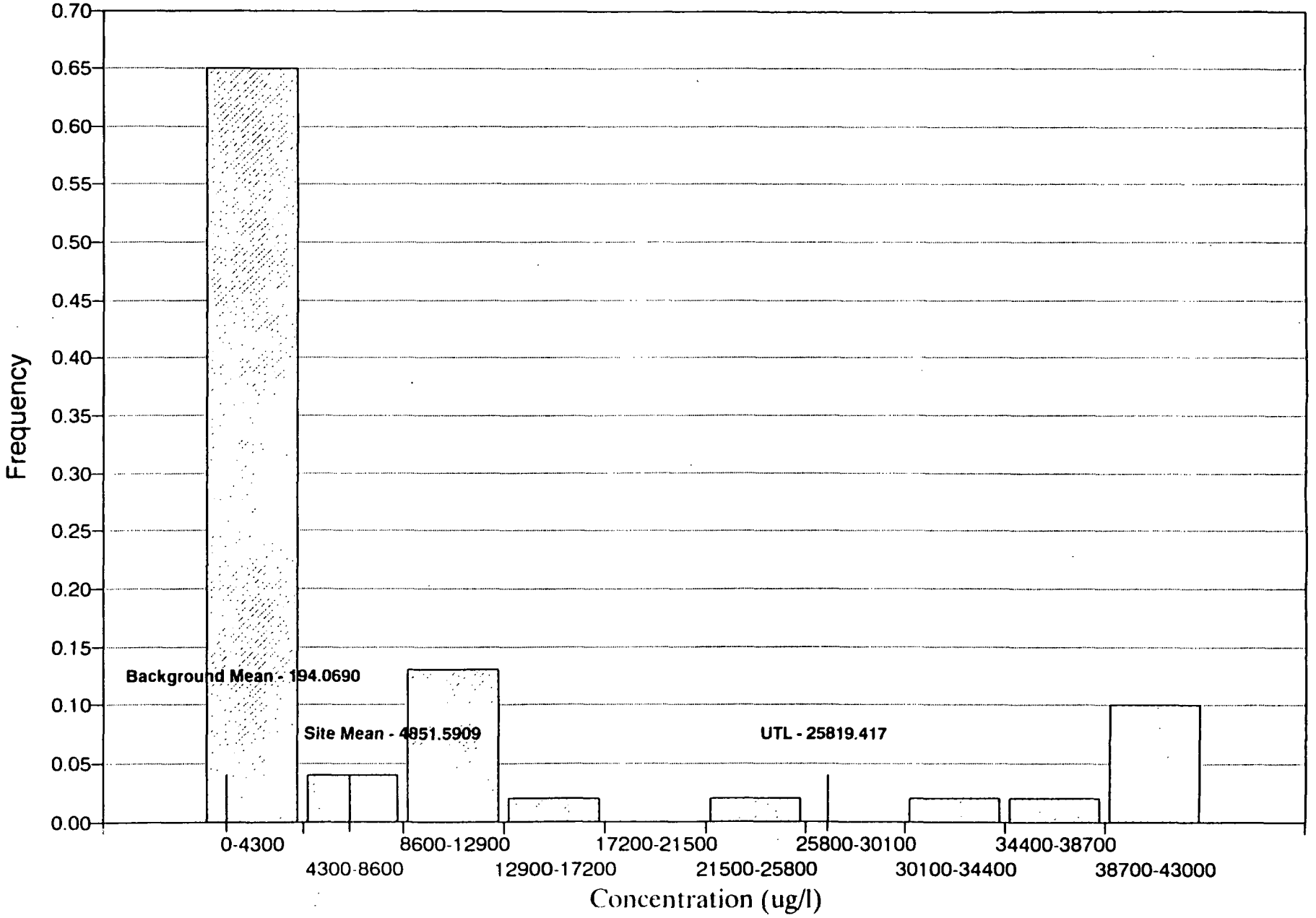


Figure D-193
Groundwater (VFA) Nitrate/Nitrite

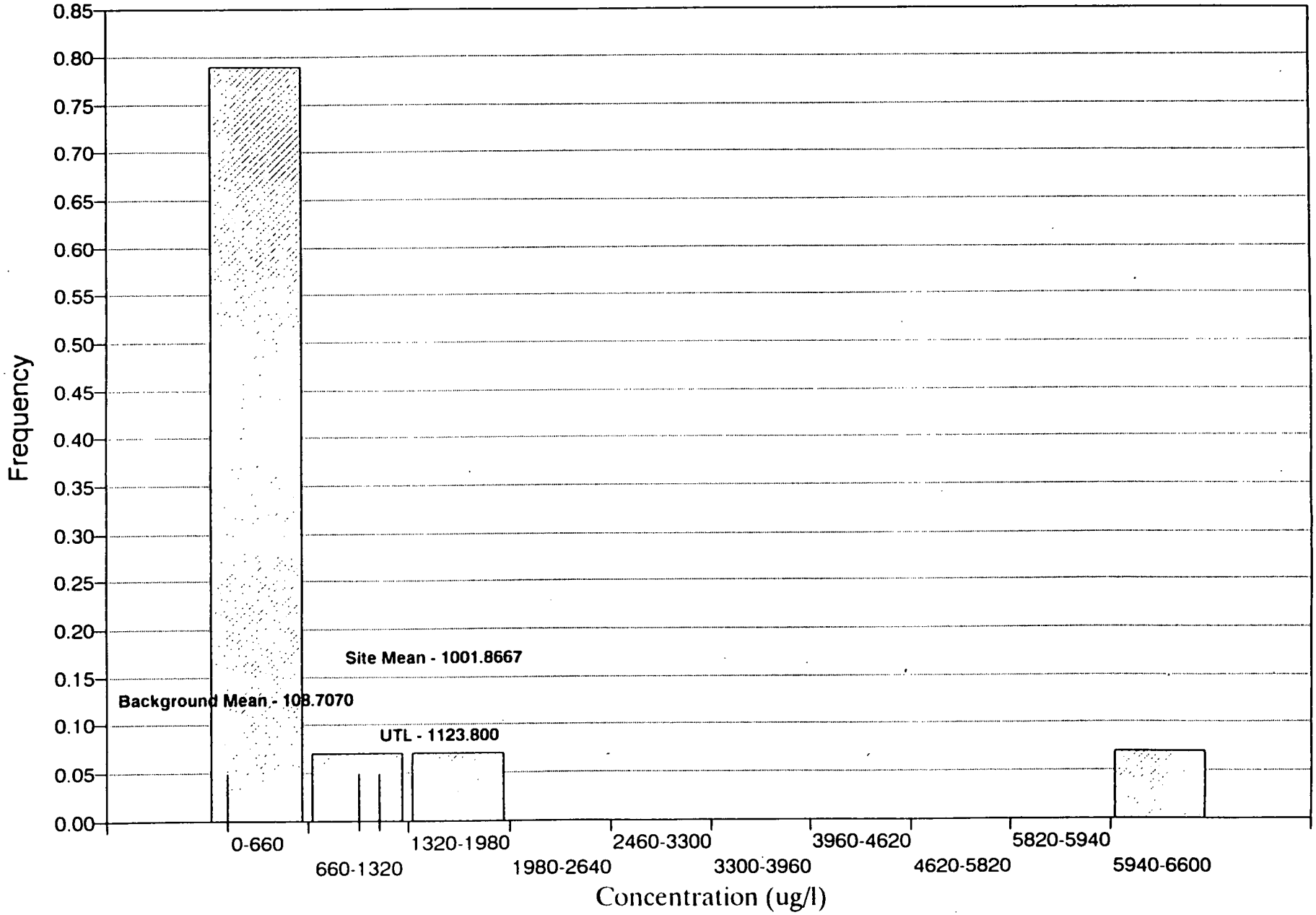


Figure D-194
Groundwater (WCS) Nitrate/Nitrite

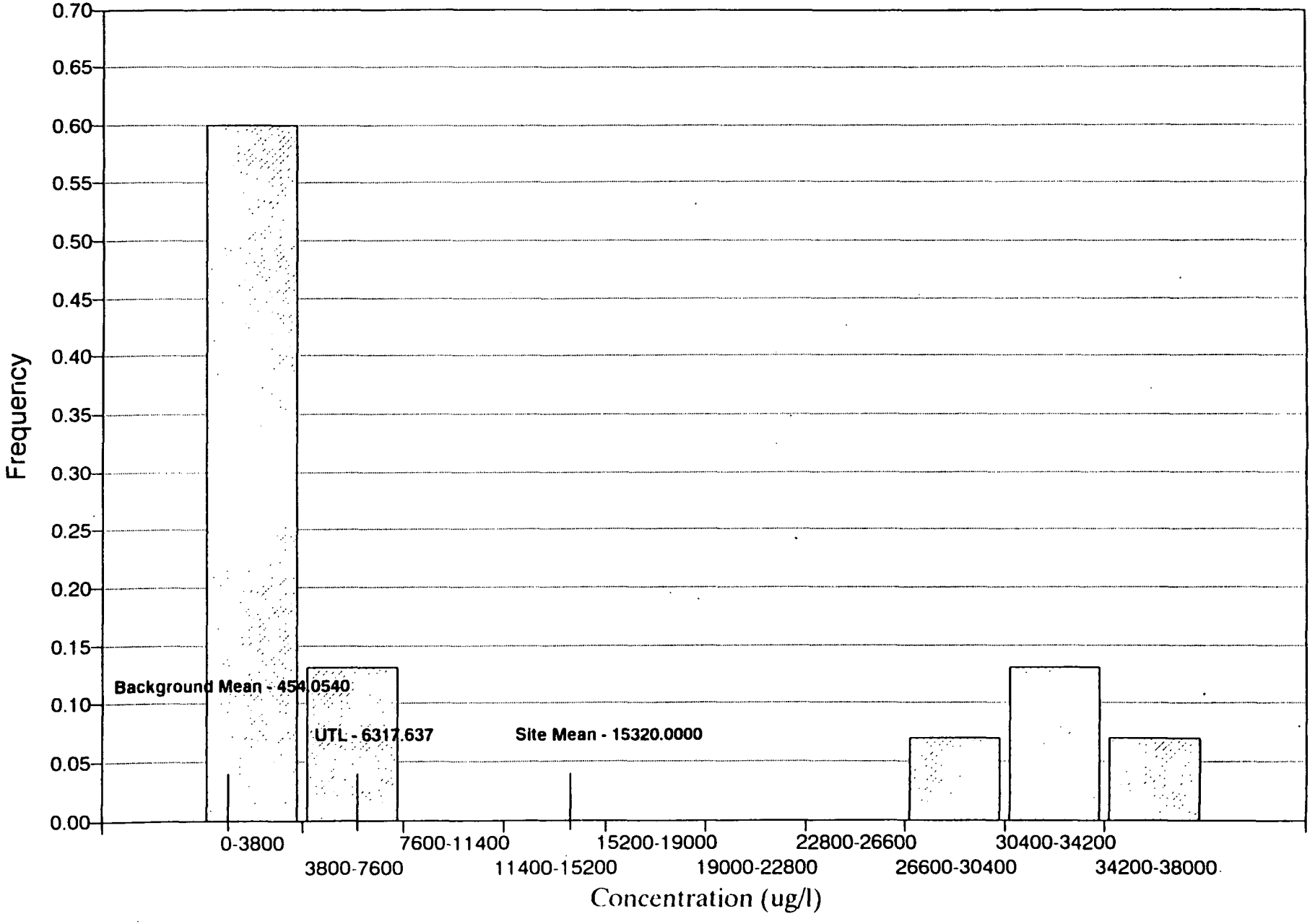


Figure D-195
Groundwater (KAR) Nitrate/Nitrite

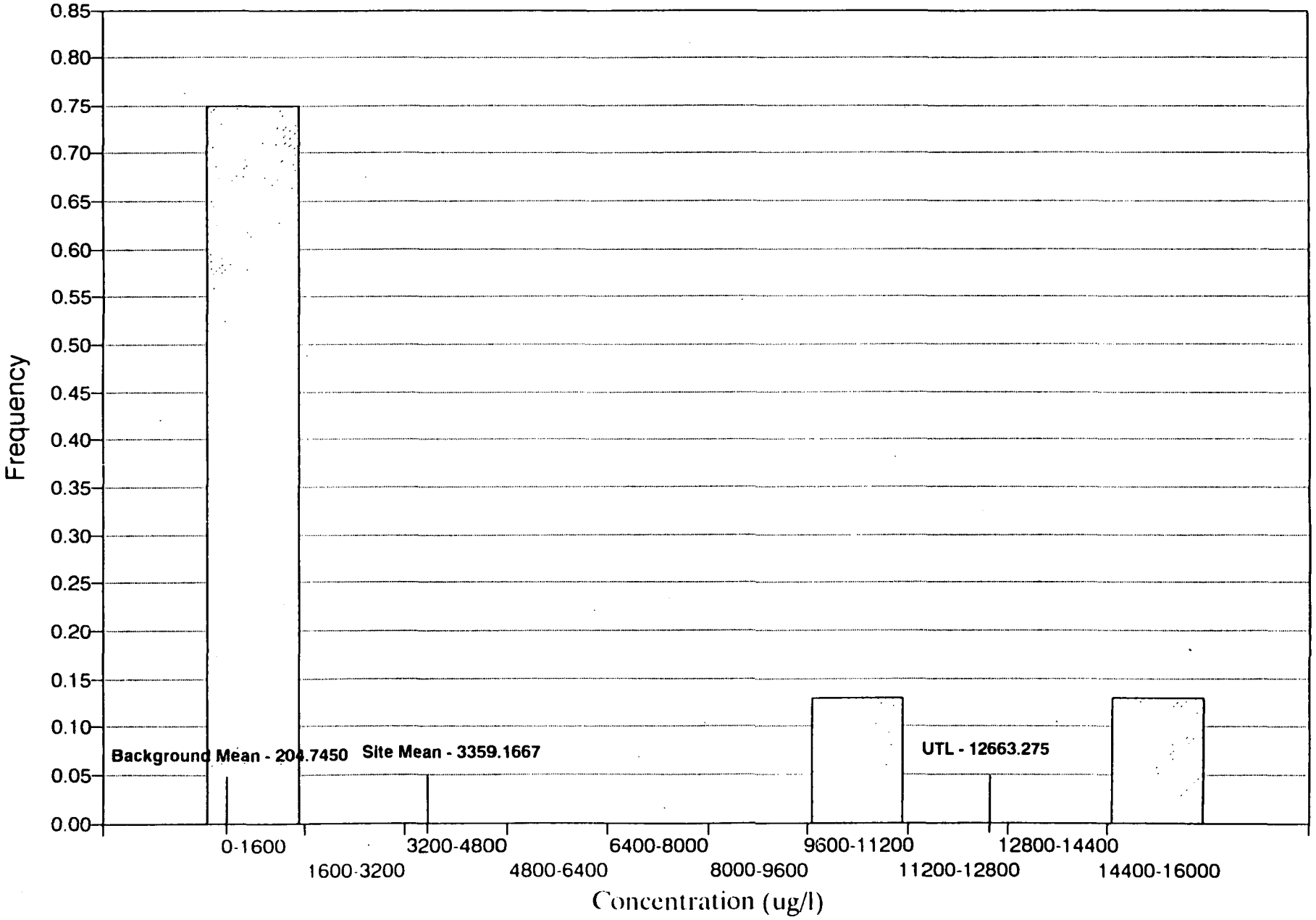


Figure D-196
Geologic Material (COL) Nitrate/Nitrite

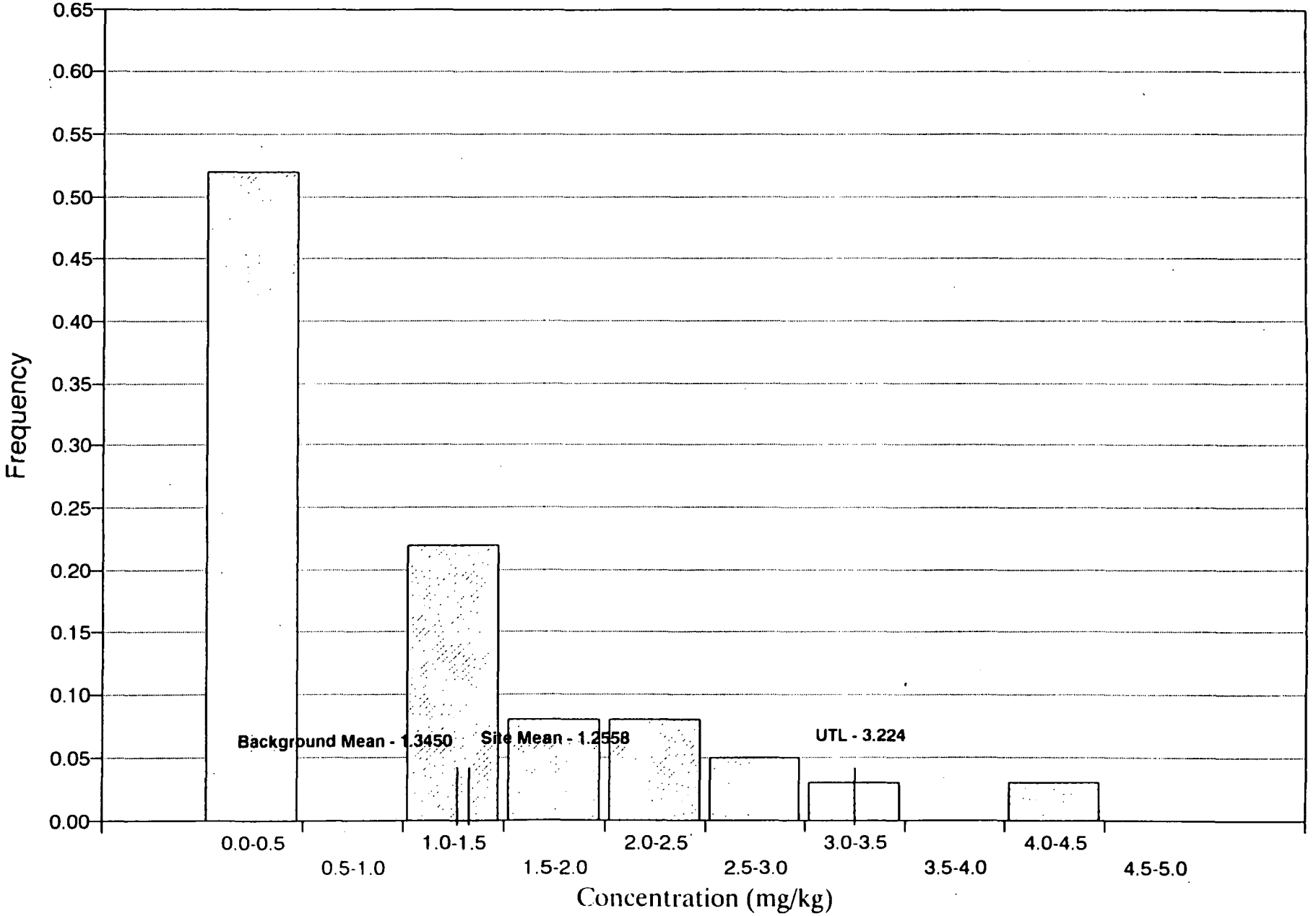


Figure D-197
Surface Water Nitrate/Nitrite

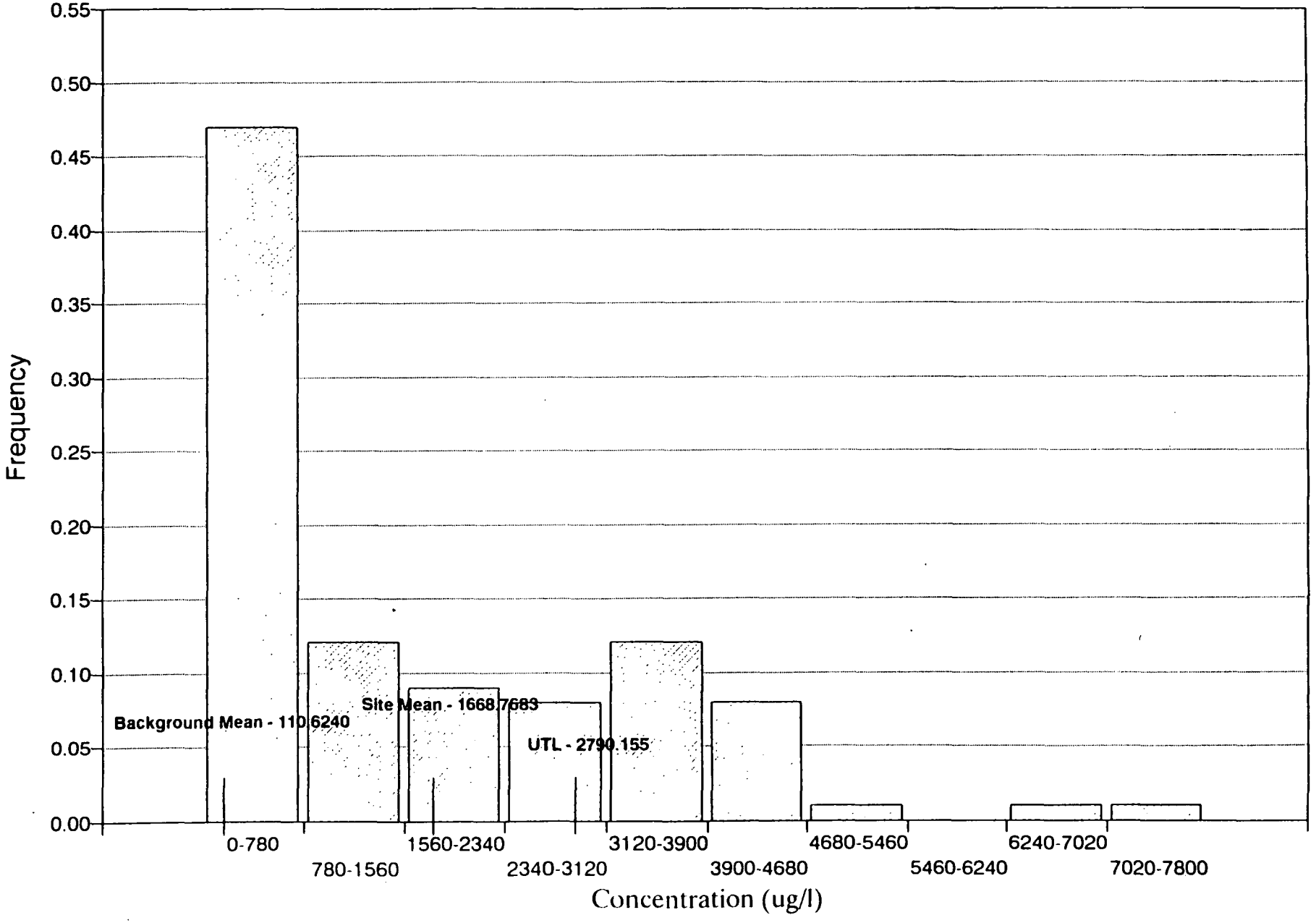


Figure D-200
Groundwater (COL) Orthophosphate

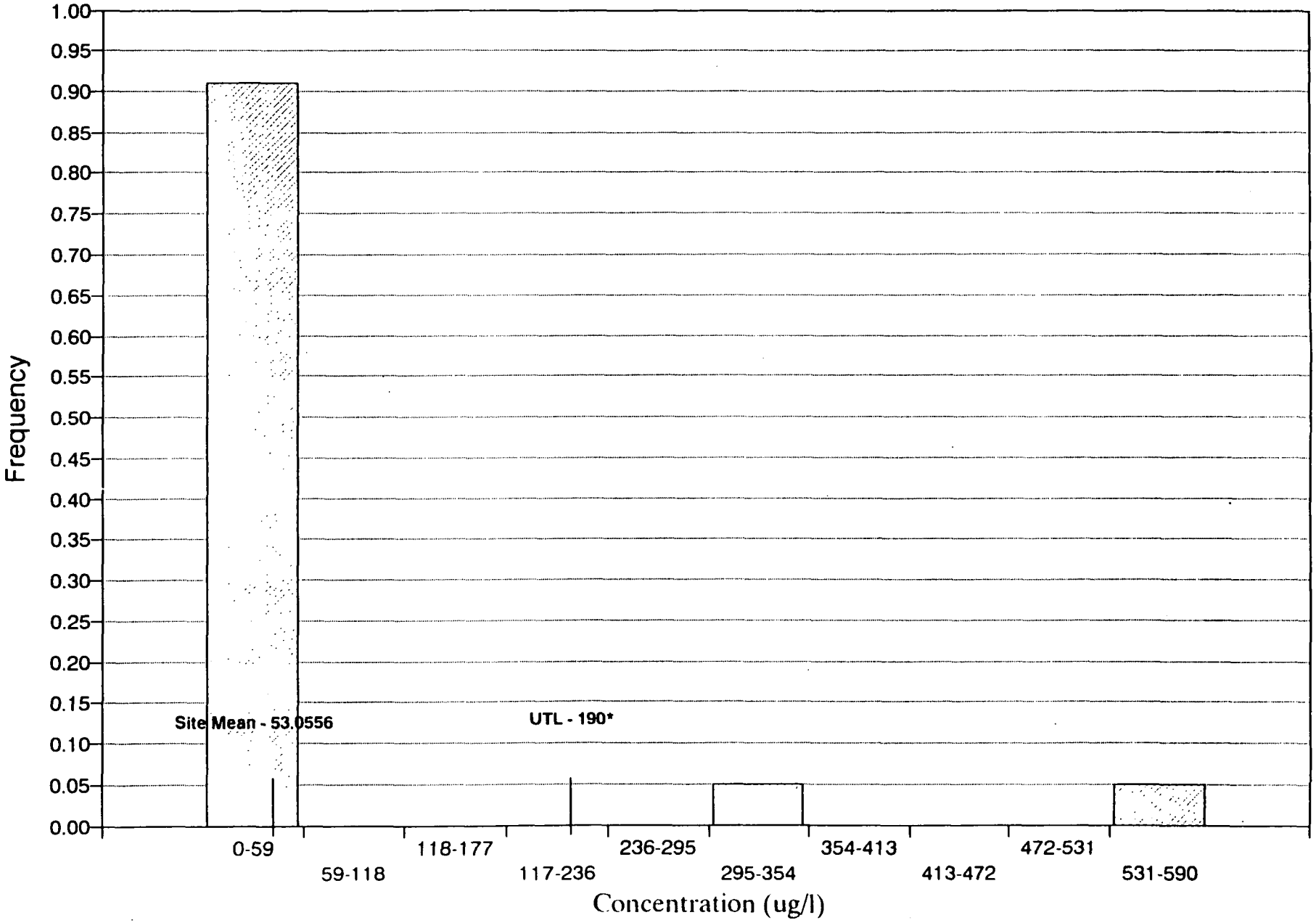


Figure D-202
Groundwater (RFA) Silica, Dissolved

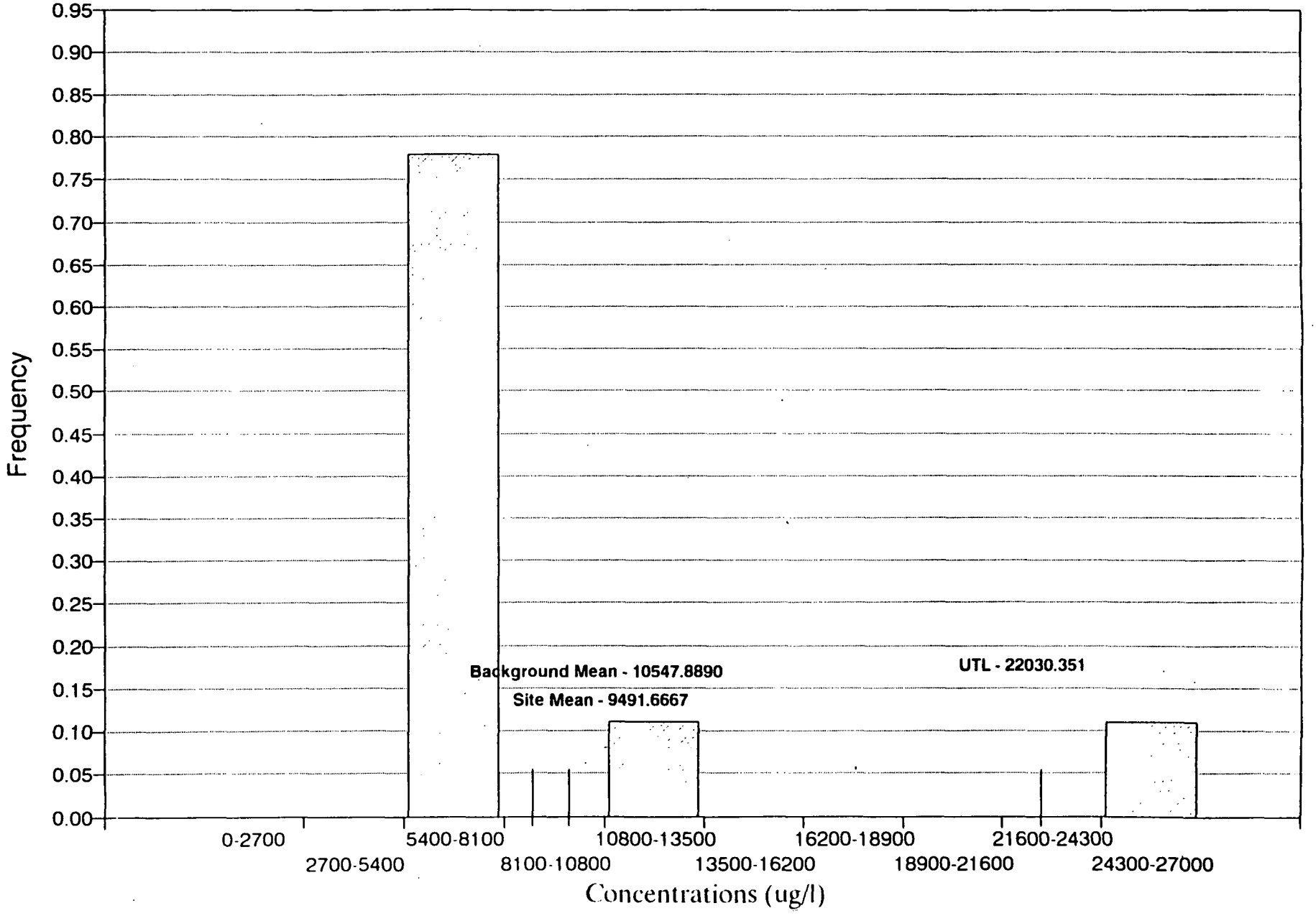


Figure D-203
Groundwater (COL) Silica, Dissolved

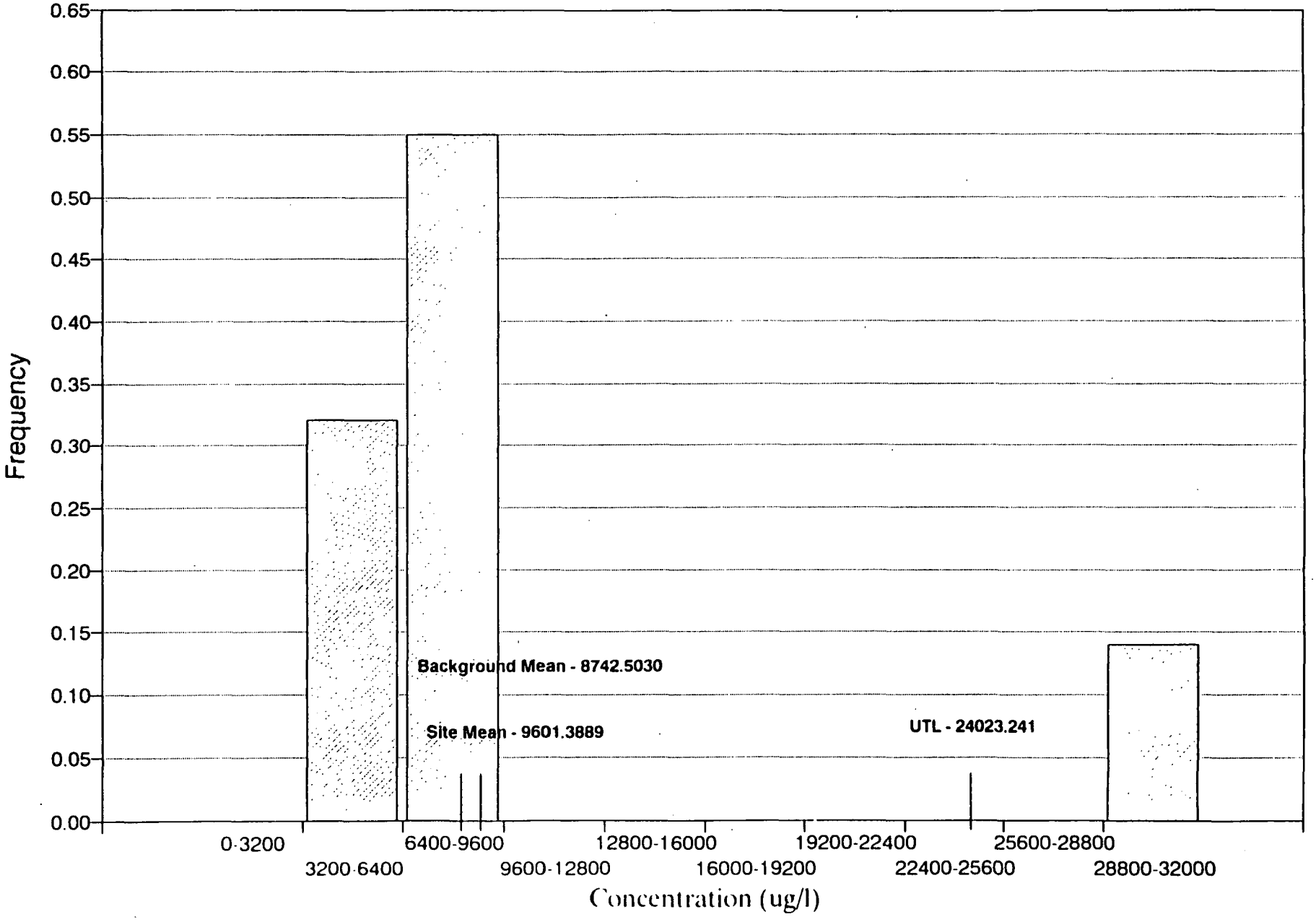


Figure D-204
Surface Water Silica, Dissolved

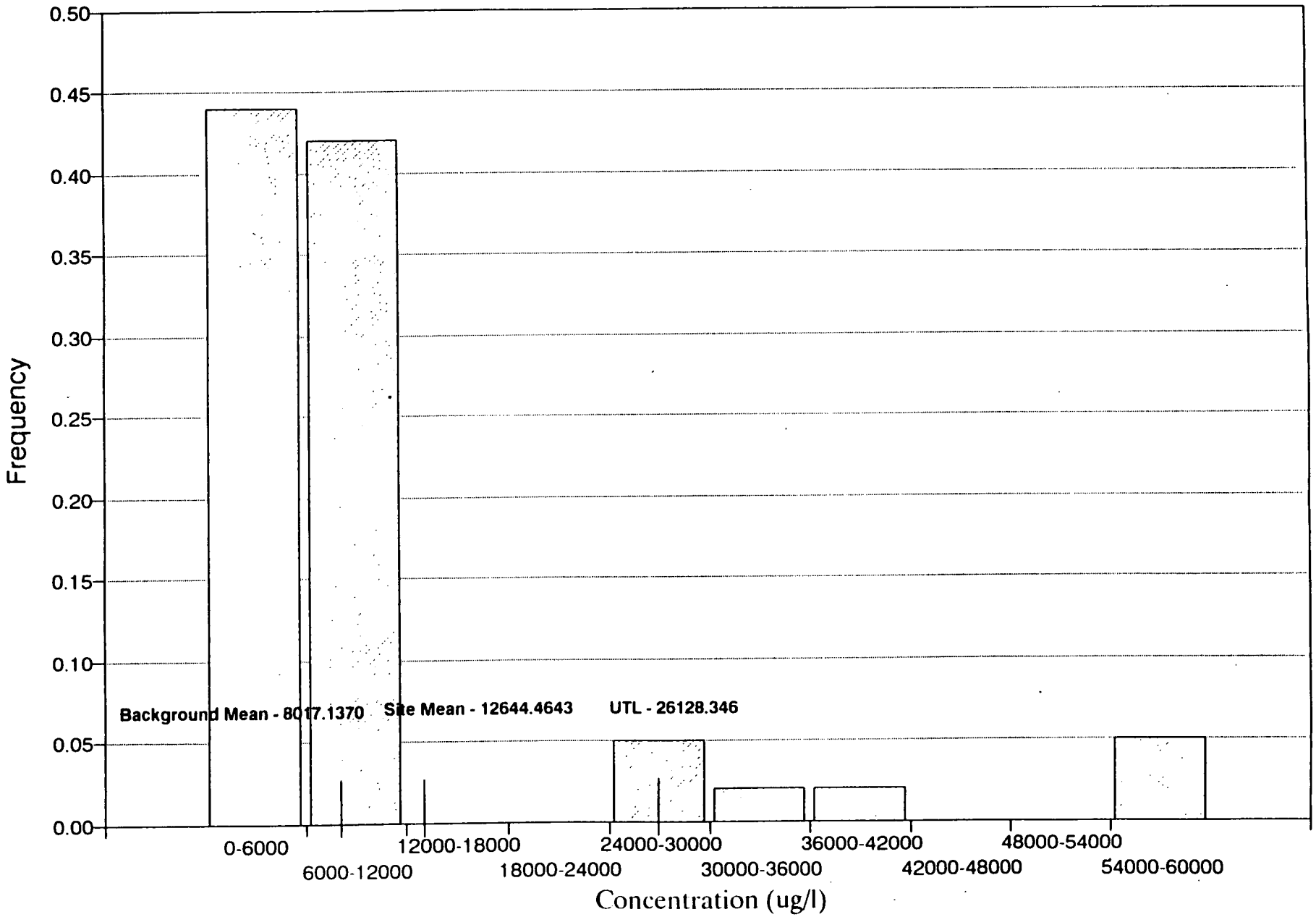


Figure D-207
Groundwater (RFA) Sulfate

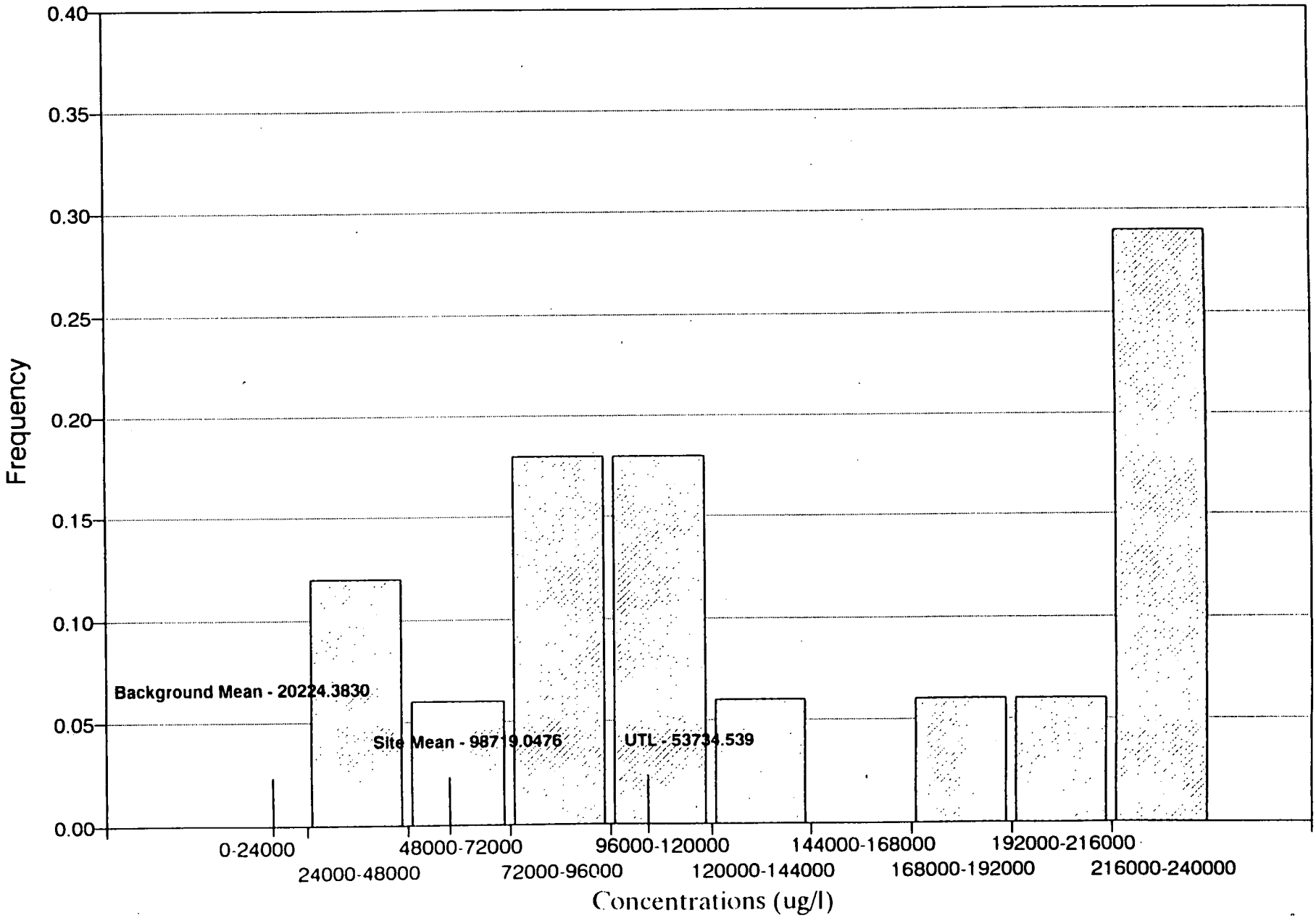


Figure D-208
Groundwater (WCS) Sulfate

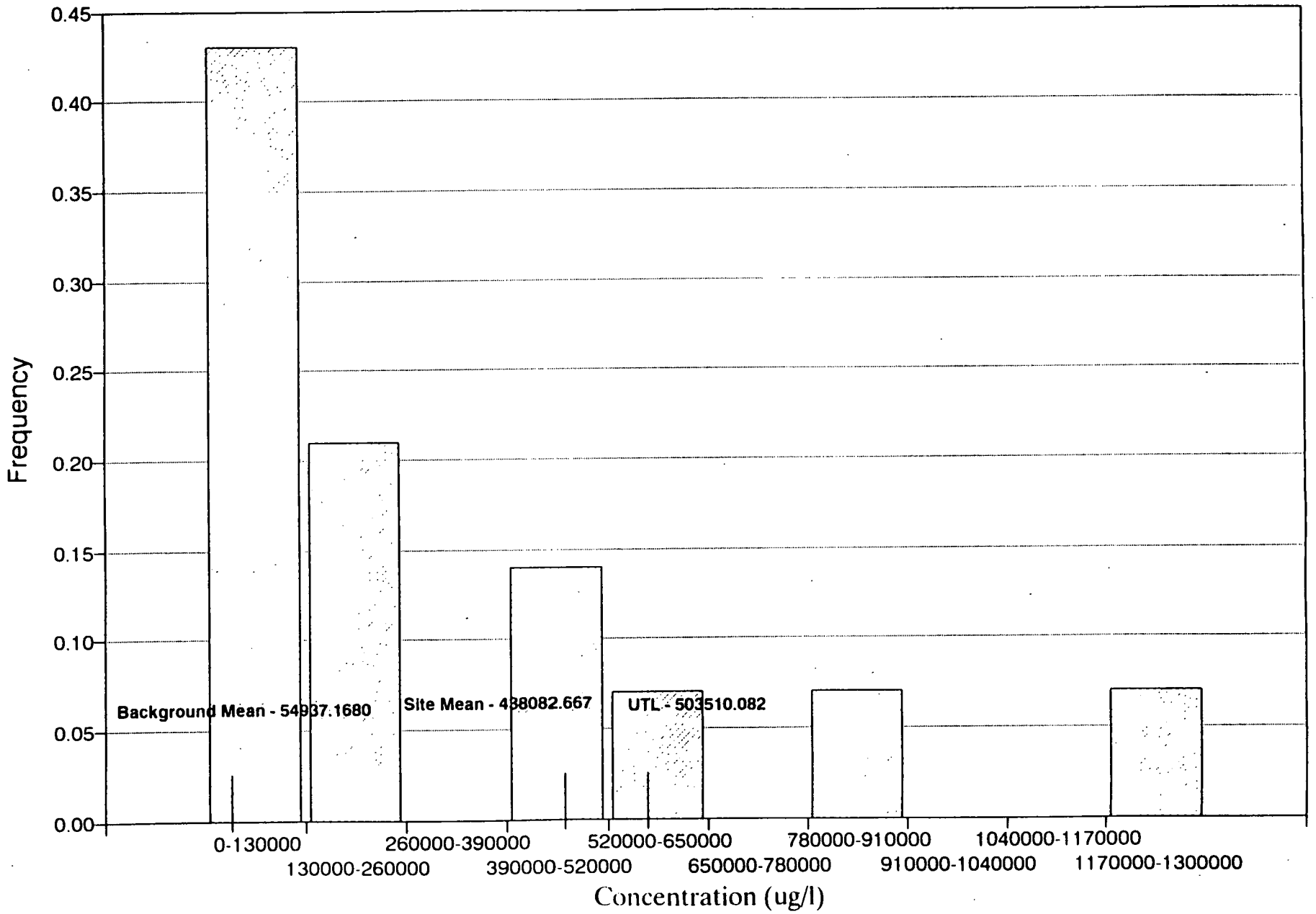


Figure D-209
Surface Water Sulfate

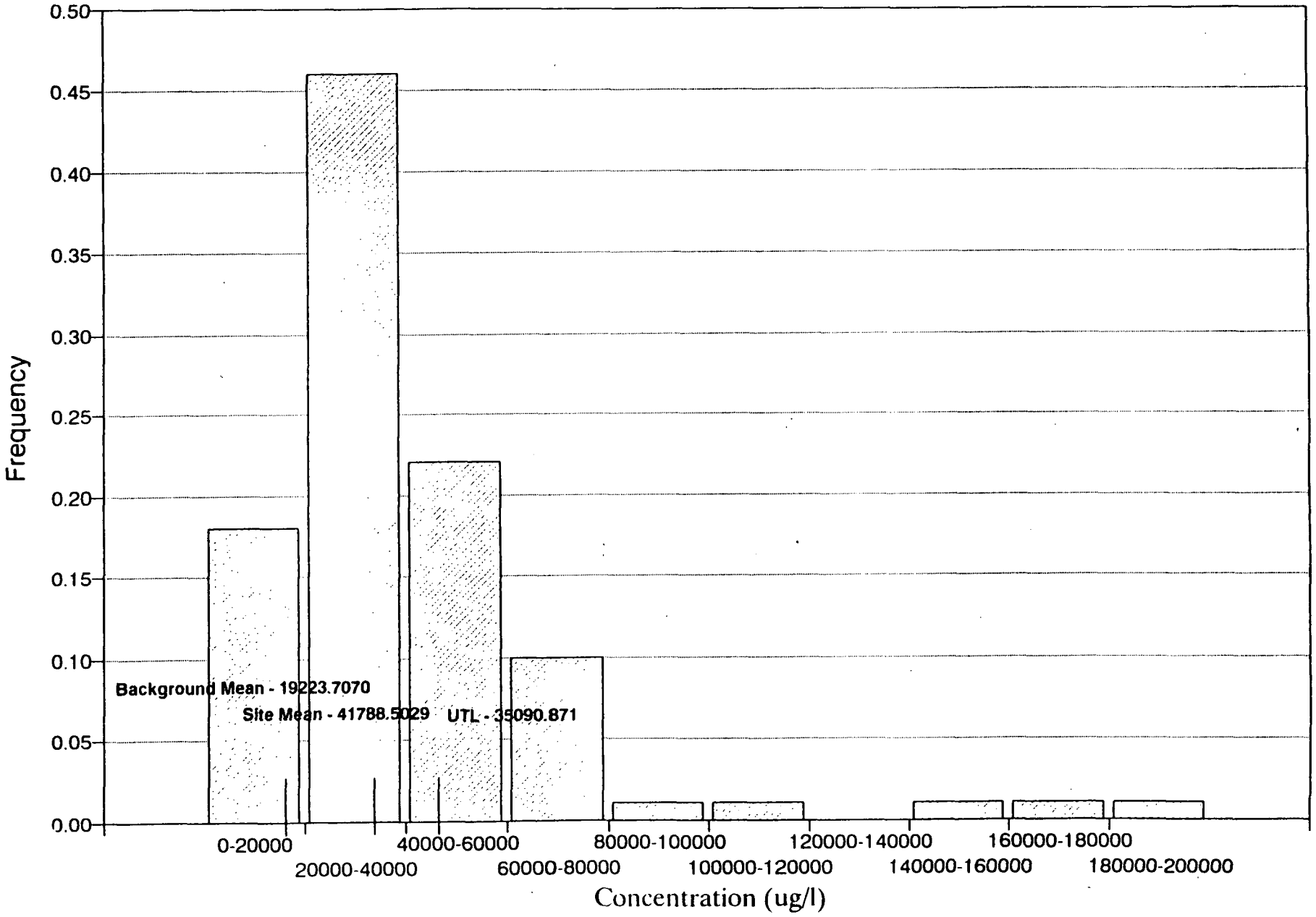


Figure D-212
Surface Water Sulfide

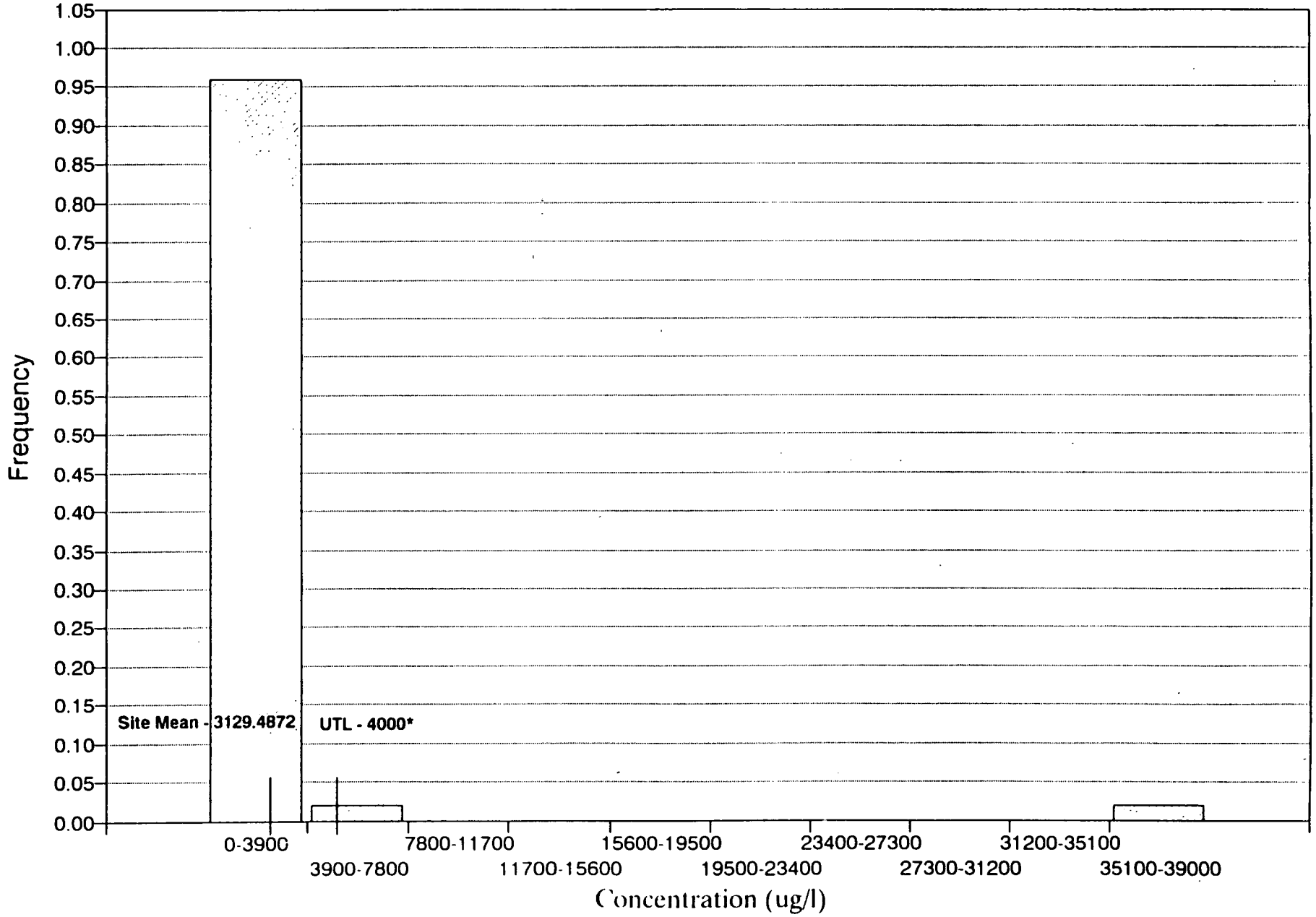


Figure D-214
Groundwater (RFA) Dissolved Soilds

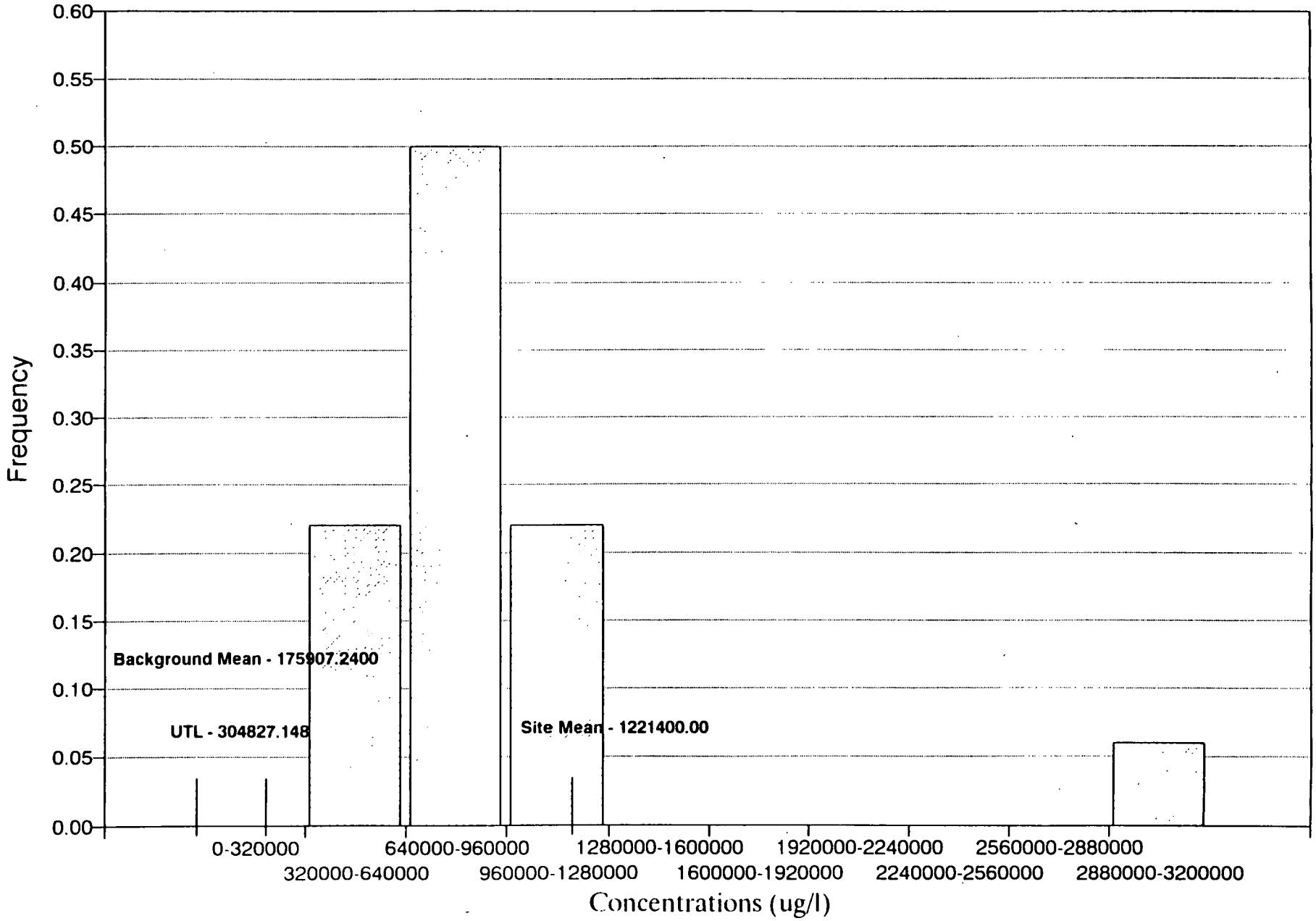


Figure D-215
Groundwater (COL) Dissolved Solids

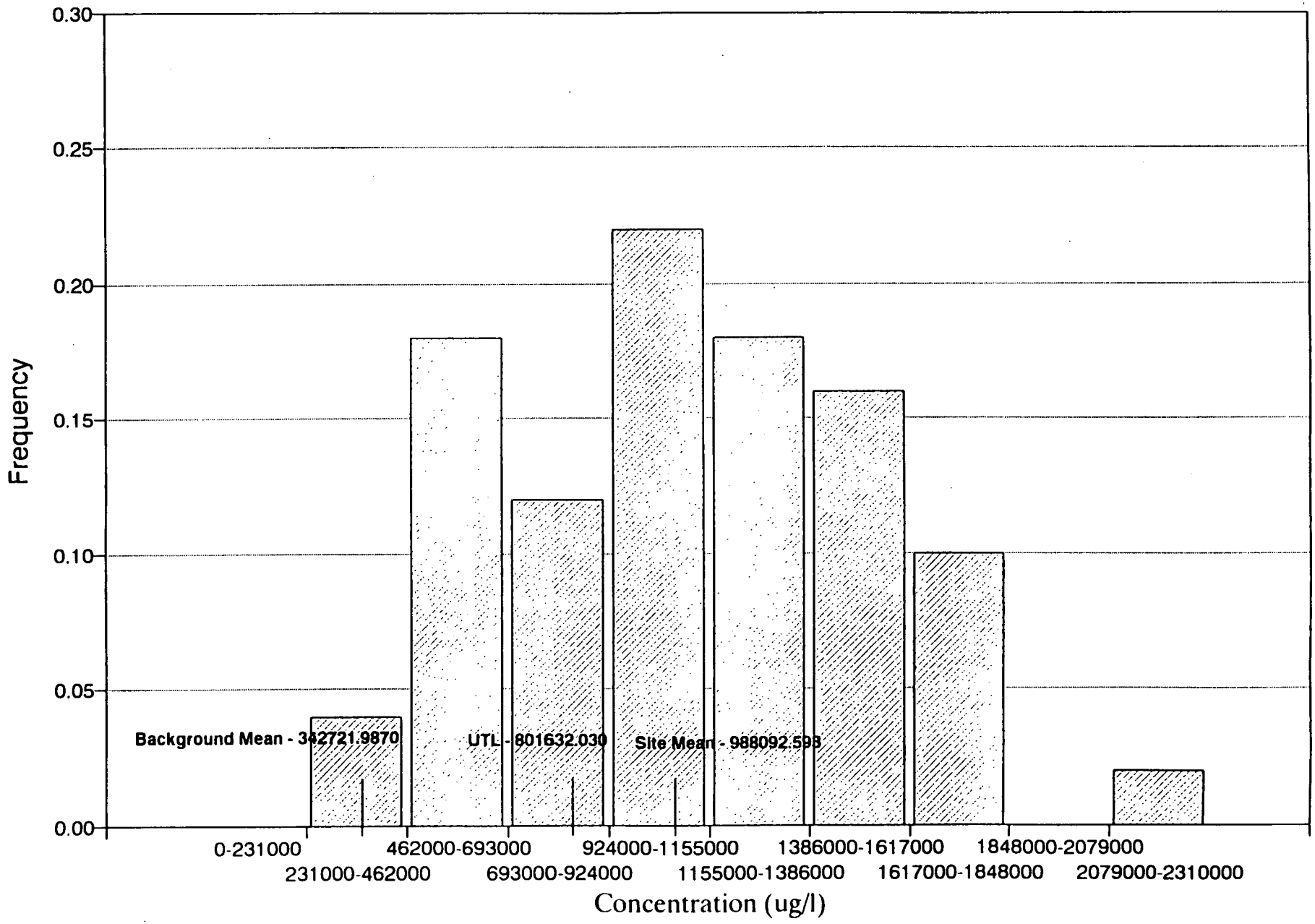


Figure D-216
Groundwater (WCS) Dissolved Soilds

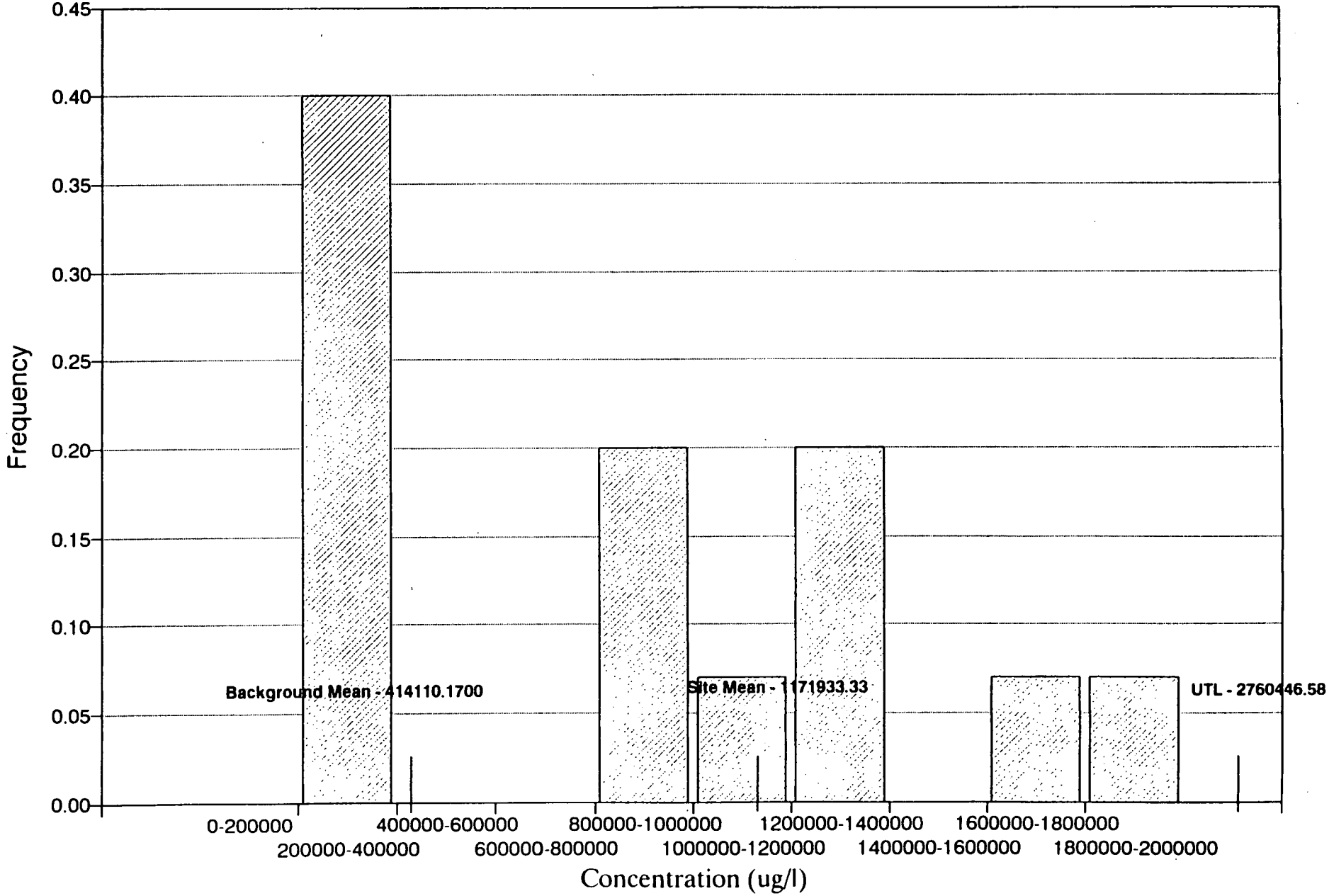


Figure D-217
Groundwater (KAR) Dissolved Solids

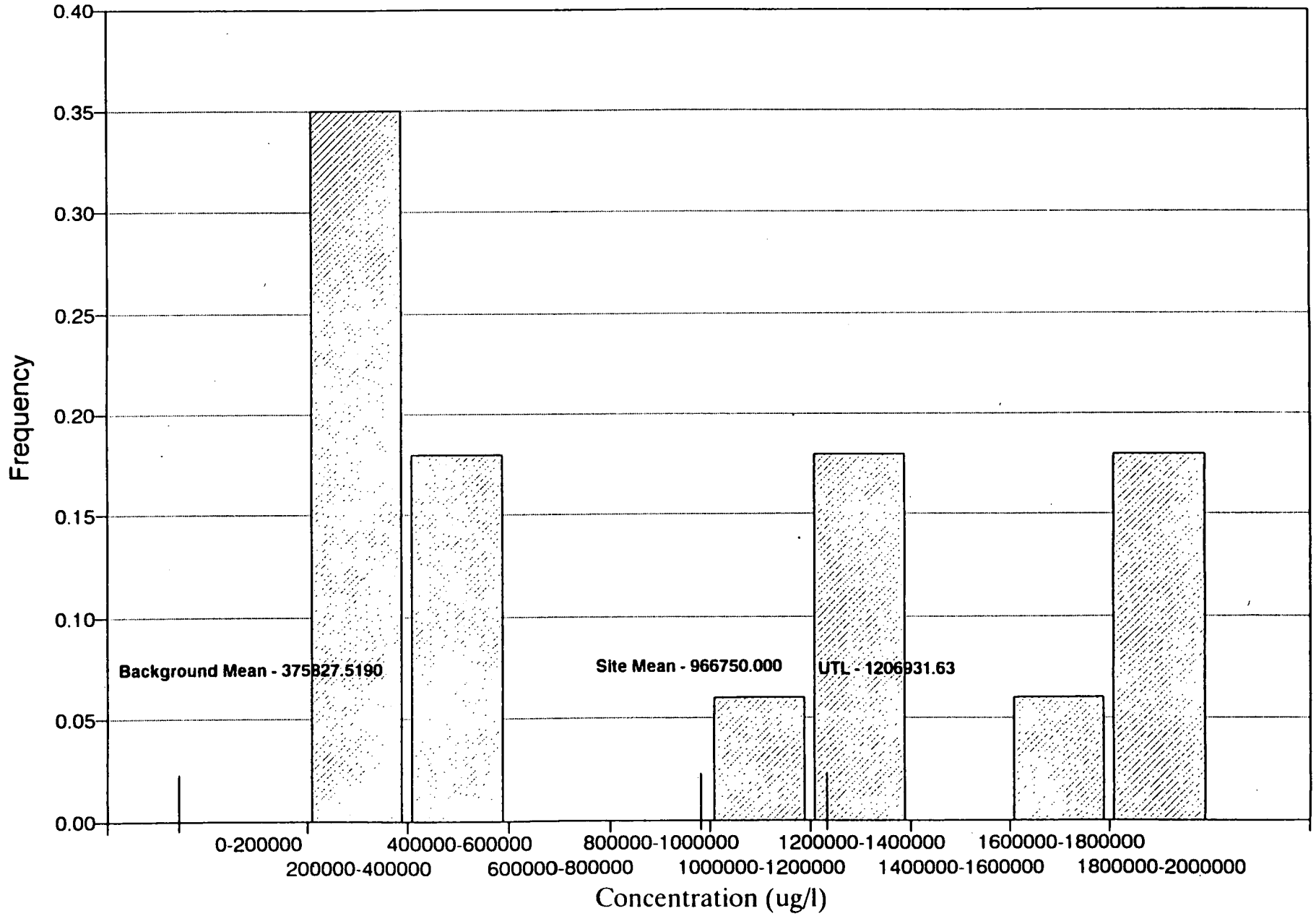


Figure D-218
Surface Water Dissolved Soilds

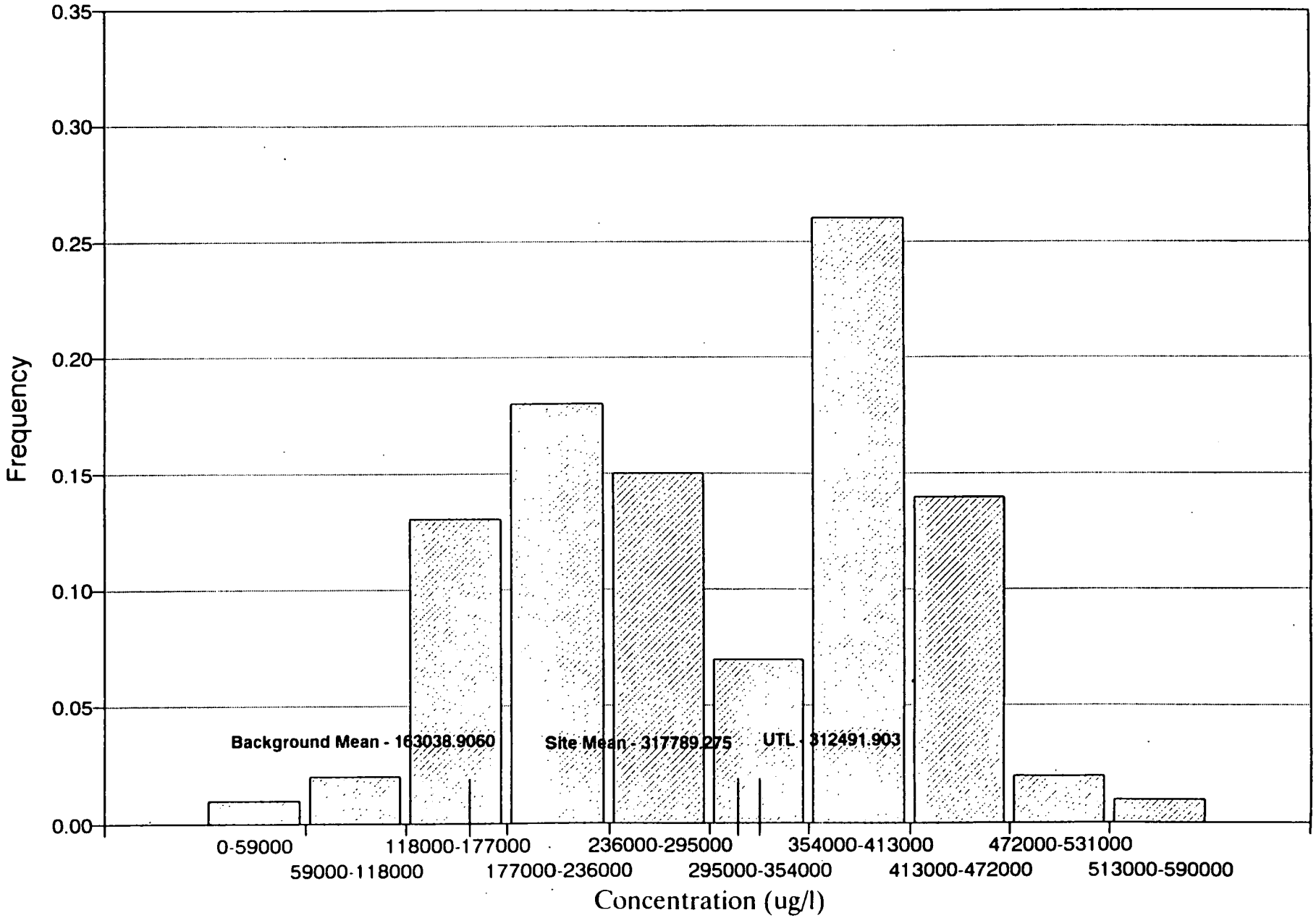


Figure D-223

WELL 974
(All non detects plotted as 0.10)

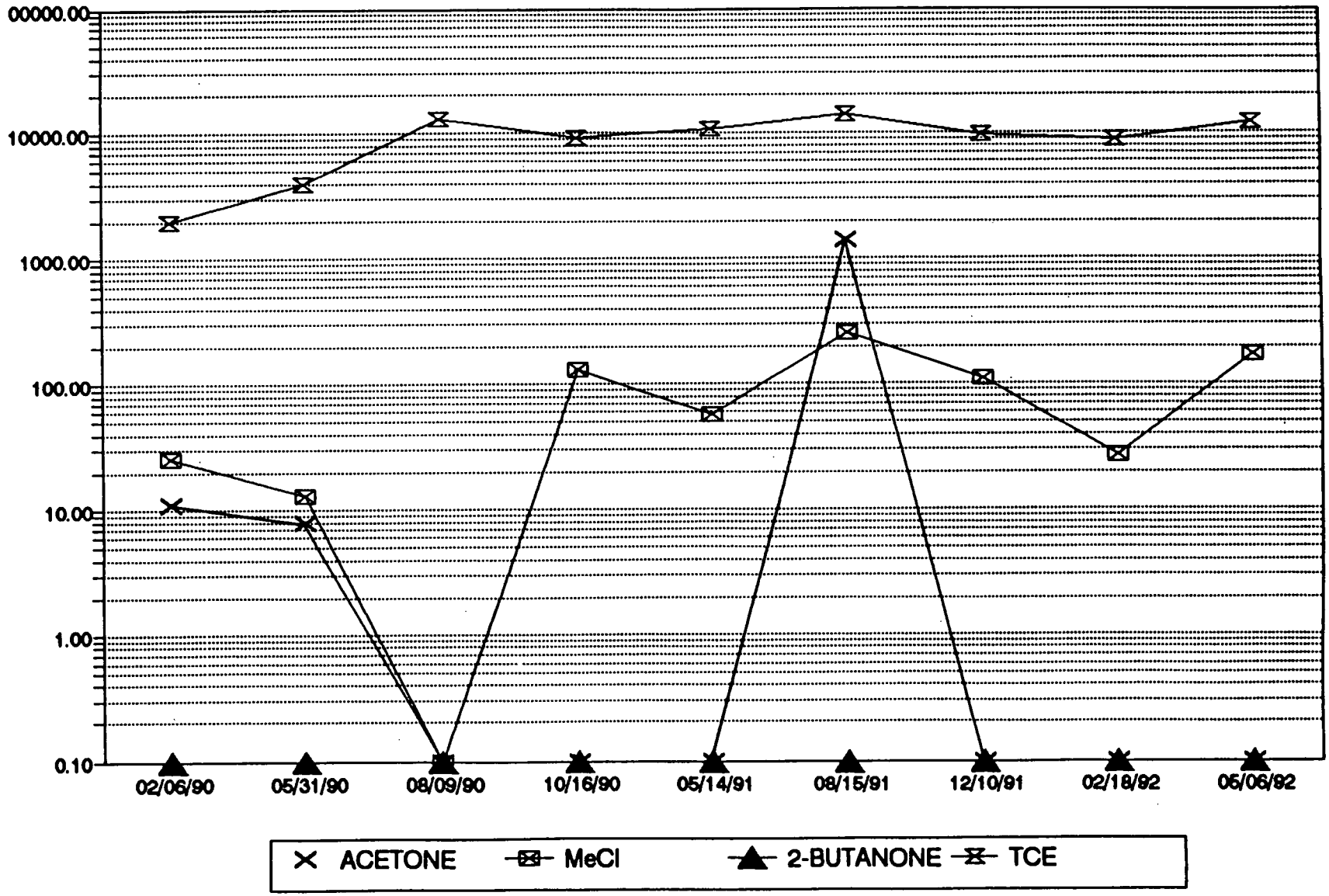
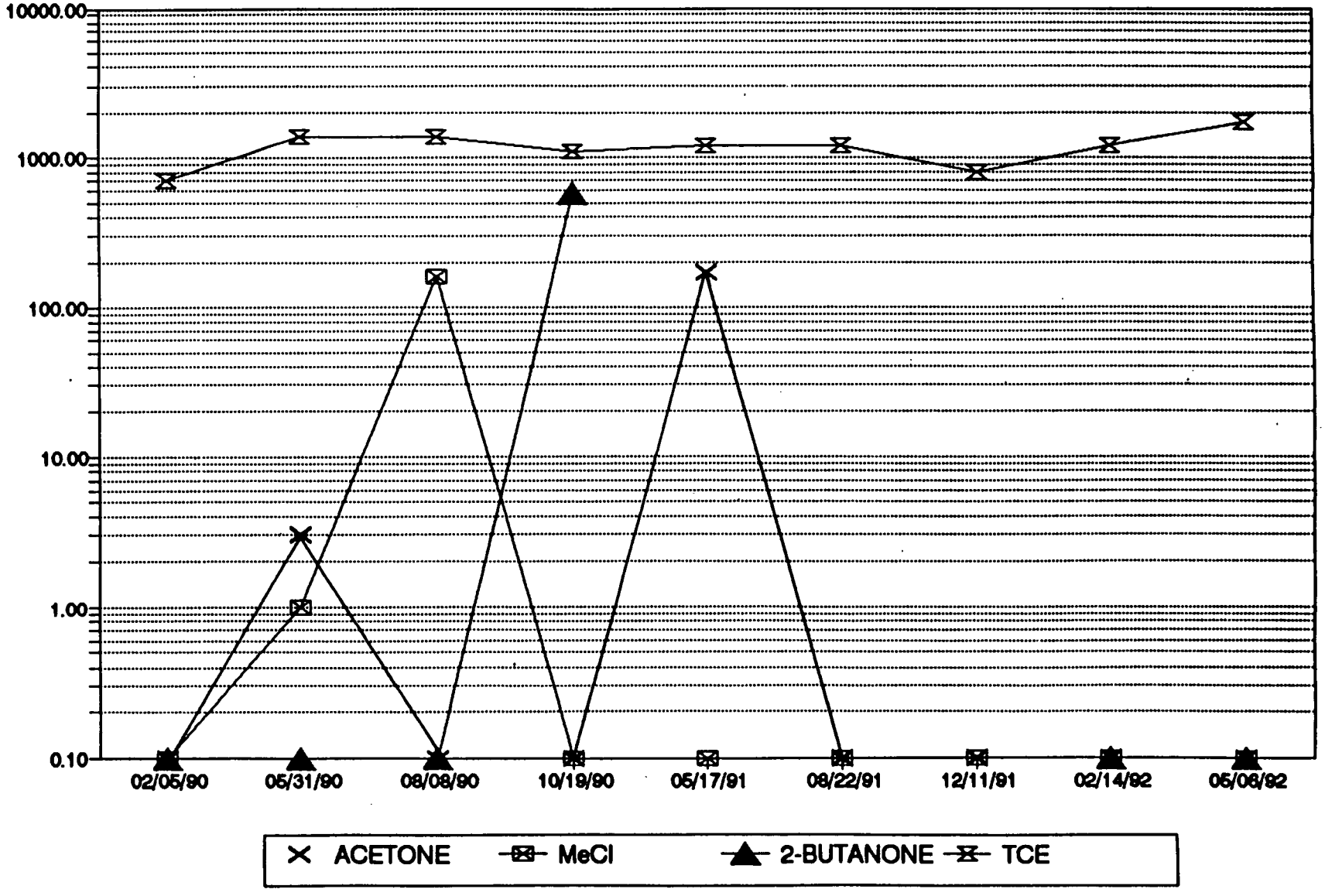
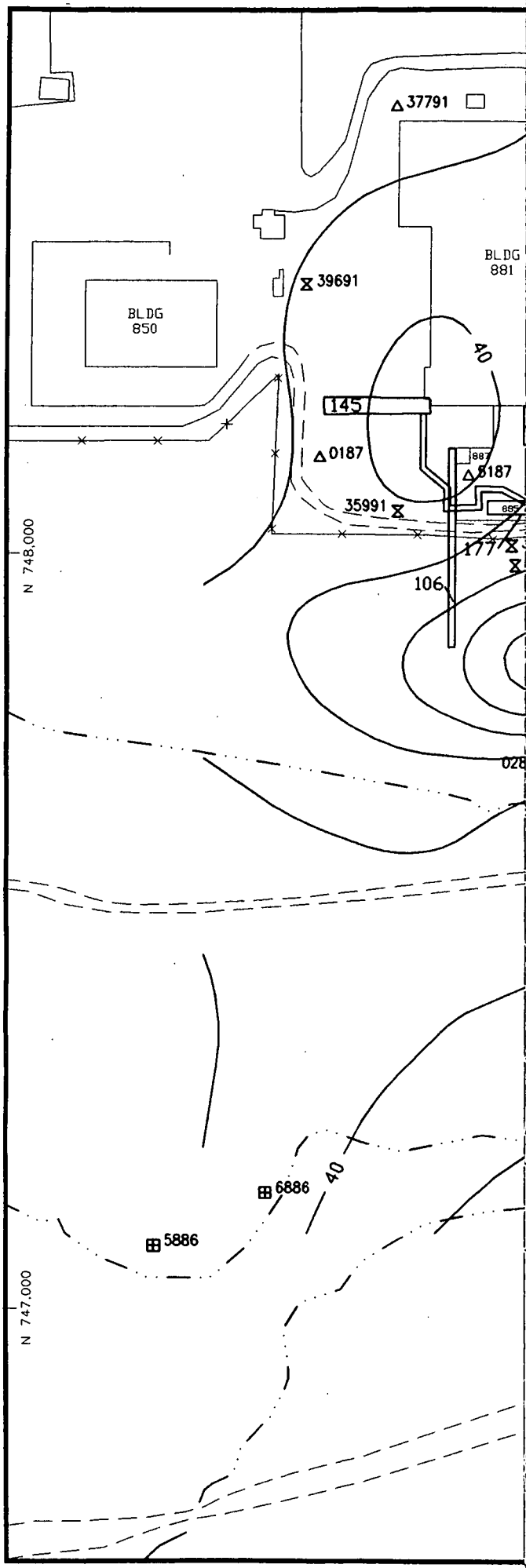


Figure D-224

WELL 1074
(All non detects plotted as 0.10)





Filtered Aluminum

Well	Mean Concentration (ug/l)
0187	48
0287	44
0387	28
0487	98
0587	114
0687	48
0887	61
0974	109
1074	100
31491	82
31791	63
31891	34
34791	59
35691	72
36191	13
36391	53
37191	69
37591	32
37791	55
37891	86
37991	292
38591	35
39191	84
4387	73
4587	582
4887	71
5187	39
5287	62
5487	58
5986	68
6286	31
6386	100
6886	36
6986	69

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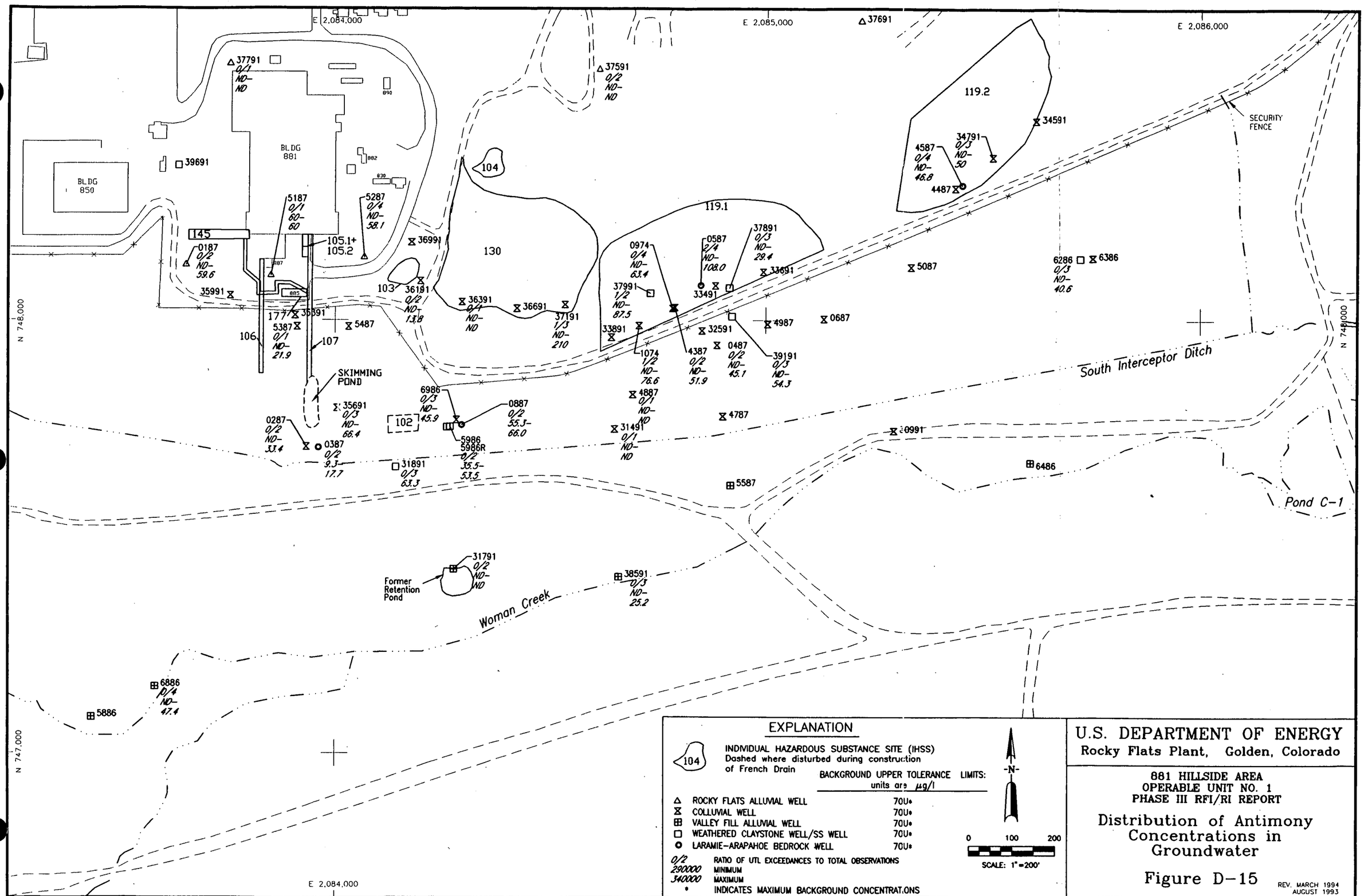
Isopleths of Aluminum Concentrations
Filtered Groundwater
Upper Hydrostratigraphic Unit

Figure D-9

AUGUST 1993

R74157.CWMBpj-052594/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are µg/l
△ ROCKY FLATS ALLUVIAL WELL	70U*
⧖ COLLUVIAL WELL	70U*
⊞ VALLEY FILL ALLUVIAL WELL	70U*
□ WEATHERED CLAYSTONE WELL/SS WELL	70U*
○ LARAMIE-ARAPAHOE BEDROCK WELL	70U*

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 — MINIMUM
340000 — MAXIMUM
* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1"=200'

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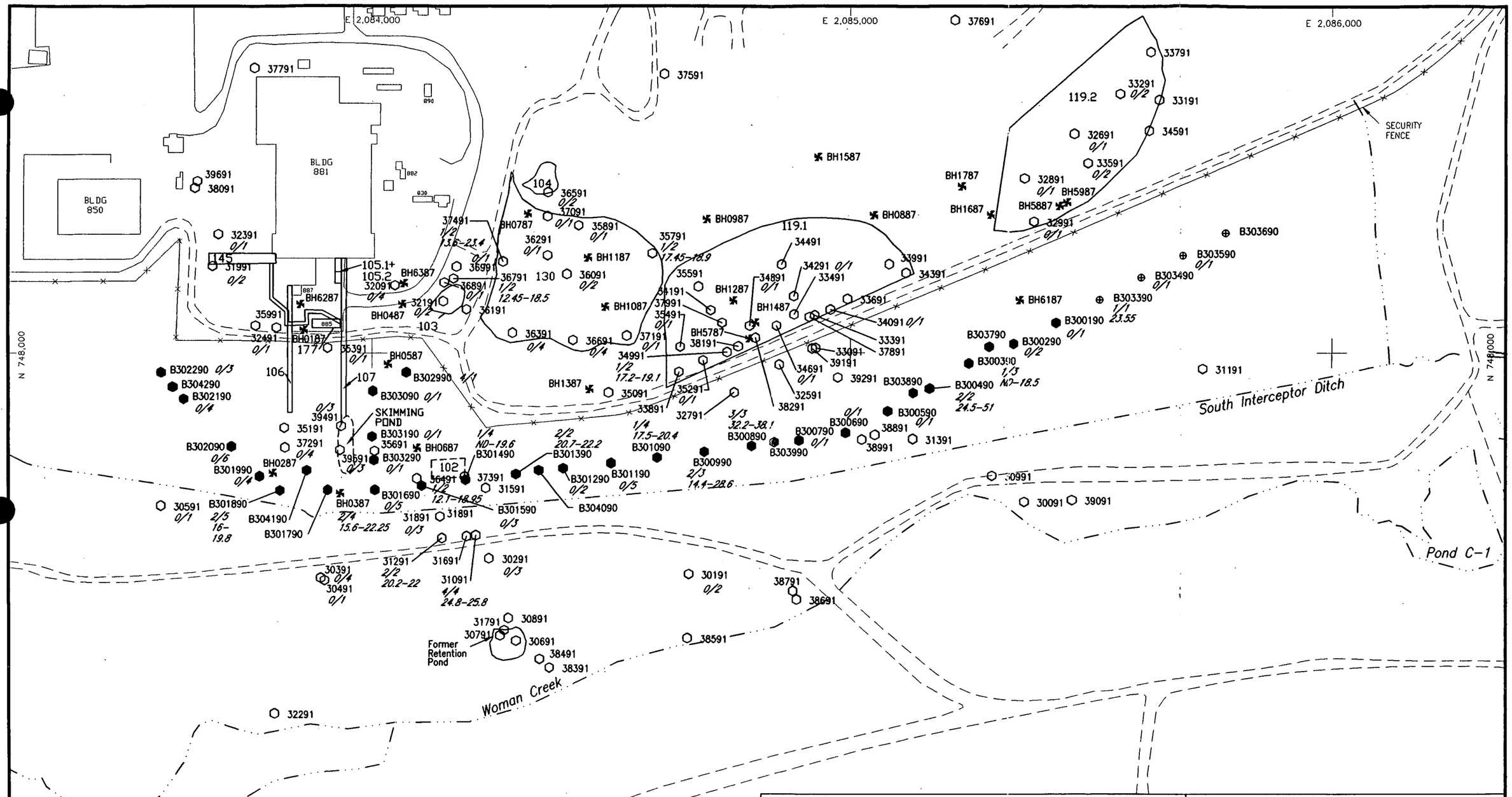
Distribution of Antimony Concentrations in Groundwater

Figure D-15

REV. MARCH 1994
AUGUST 1993

R74137.CWMB030494/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) DASHED WHERE DISTURBED DURING CONSTRUCTION OF FRENCH DRAIN

BACKGROUND UPPER TOLERANCE LIMIT: units are µg/kg — 18.1U

BH0887 PHASE I/II BOREHOLES

30191 PHASE III BOREHOLES

B300190 FRENCH DRAIN BOREHOLE

B303390 FRENCH DRAIN PIEZOMETER

0/2 RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS

290000 MINIMUM

340000 MAXIMUM

* INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200

SCALE: 1" =200'

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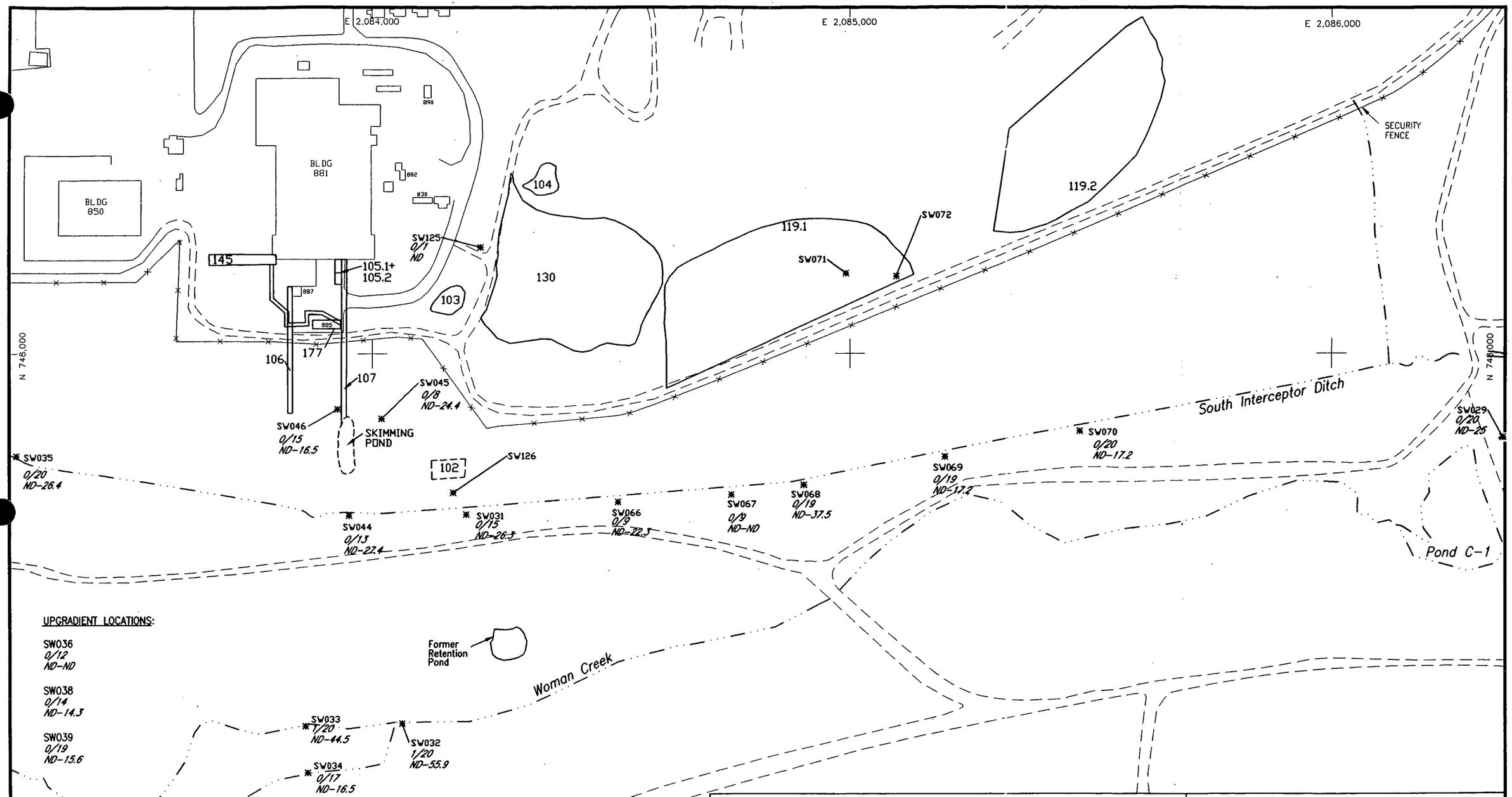
Distribution of Antimony Concentrations in Geologic Materials

Figure D-16

AUGUST 1993

R74203.MB090293/200



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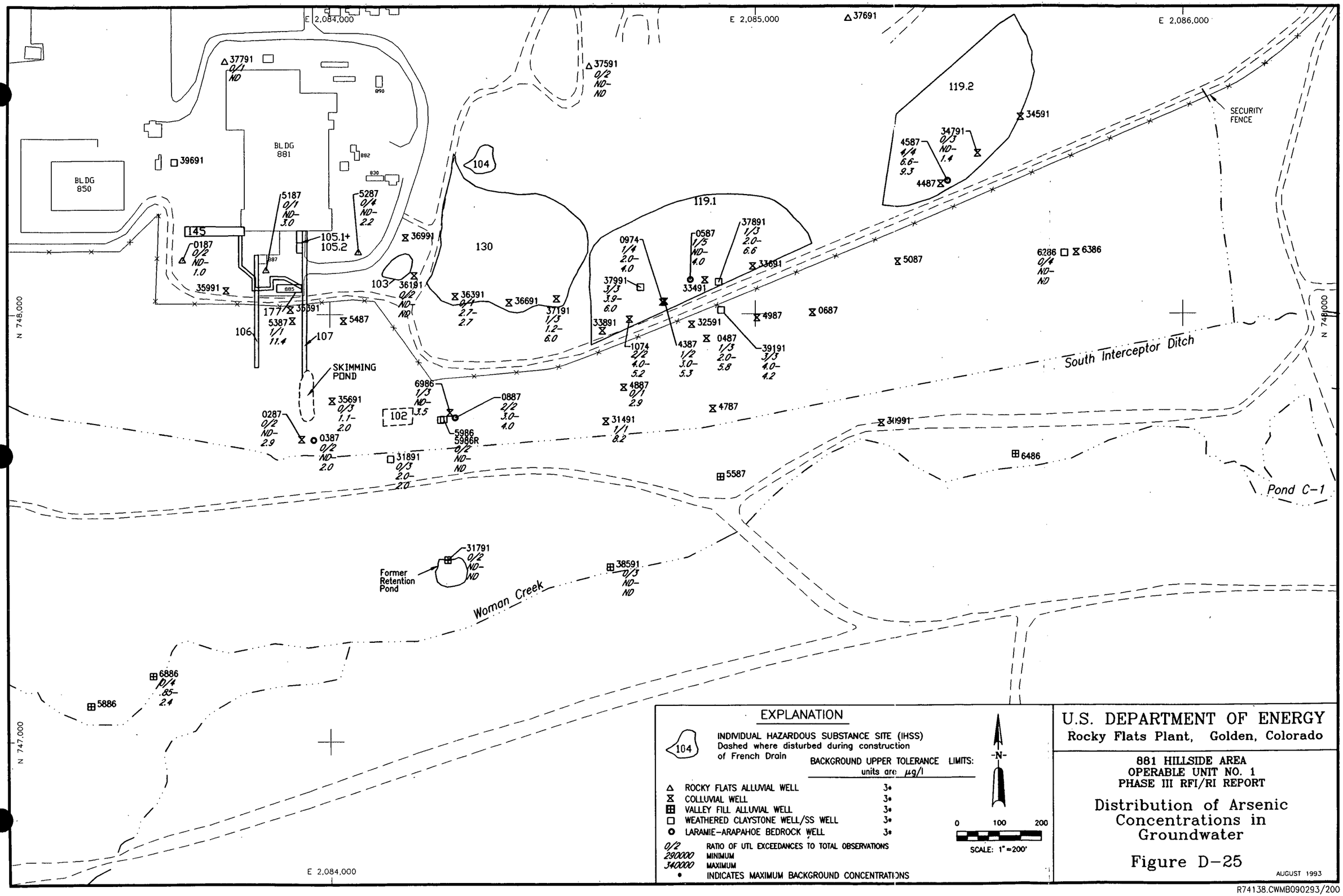
Distribution of Antimony Concentrations in Surface Water

Figure D-17

AUGUST 1993

R74171.CWMB090293/200



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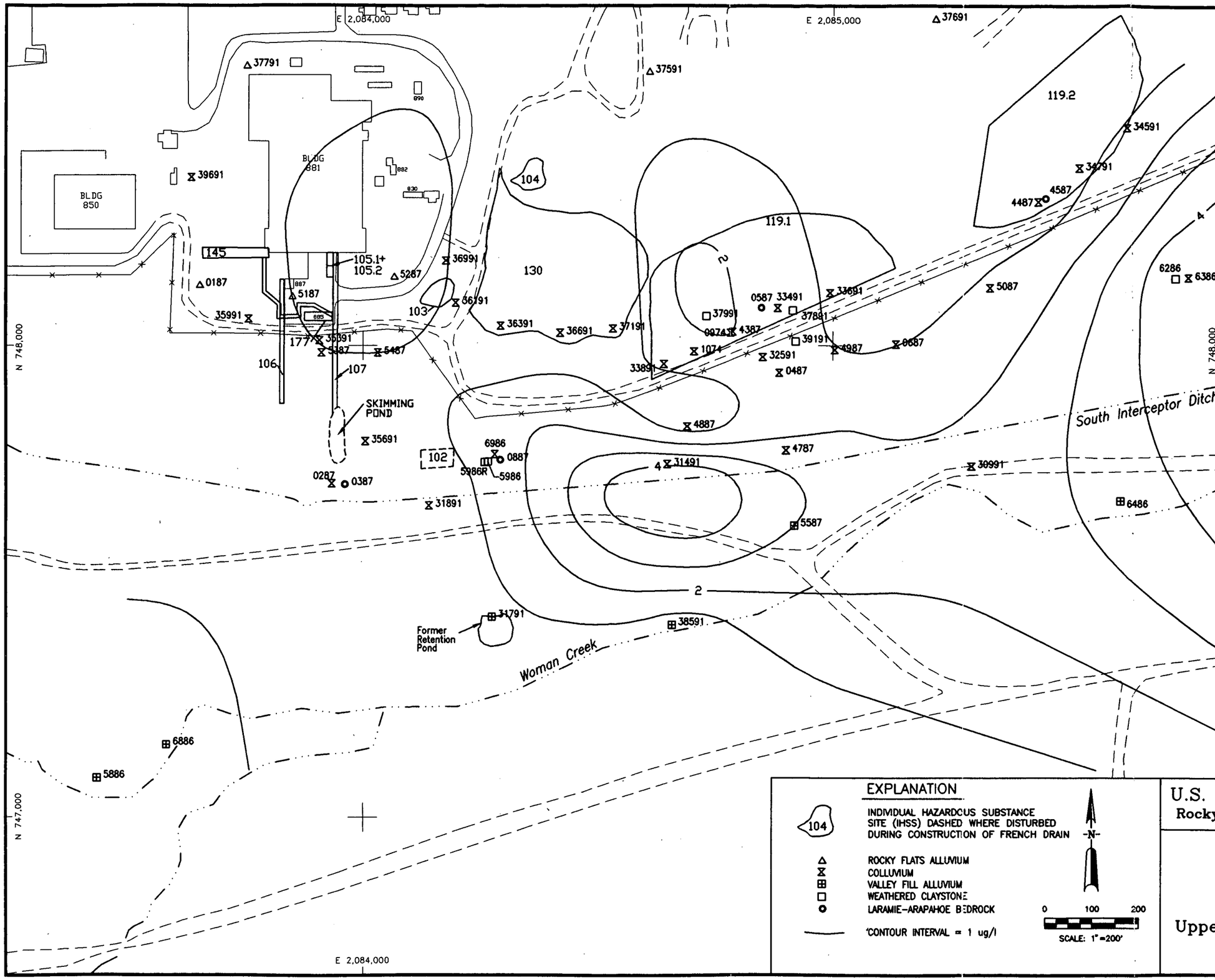
Distribution of Arsenic Concentrations in Groundwater

Figure D-25

AUGUST 1993

R74138.CWMB090293/200



Filtered Arsenic

Well	Mean Concentration (ug/l)
0187	0.8
0287	1.0
0387	1.2
0487	1.4
0587	1.4
0687	1.0
0887	0.9
0974	2.5
1074	1.7
31491	4.6
31791	0.8
31891	0.7
34791	0.8
35691	0.8
36191	0.5
36391	0.5
37191	0.7
37591	0.5
37791	0.5
37891	1.5
37991	1.3
38591	0.7
39191	0.8
4387	2.0
4587	8.2
4887	0.5
5187	1.0
5287	1.6
5487	1.0
5986	0.9
6286	0.9
6386	5.0
6886	1.3
6986	1.7

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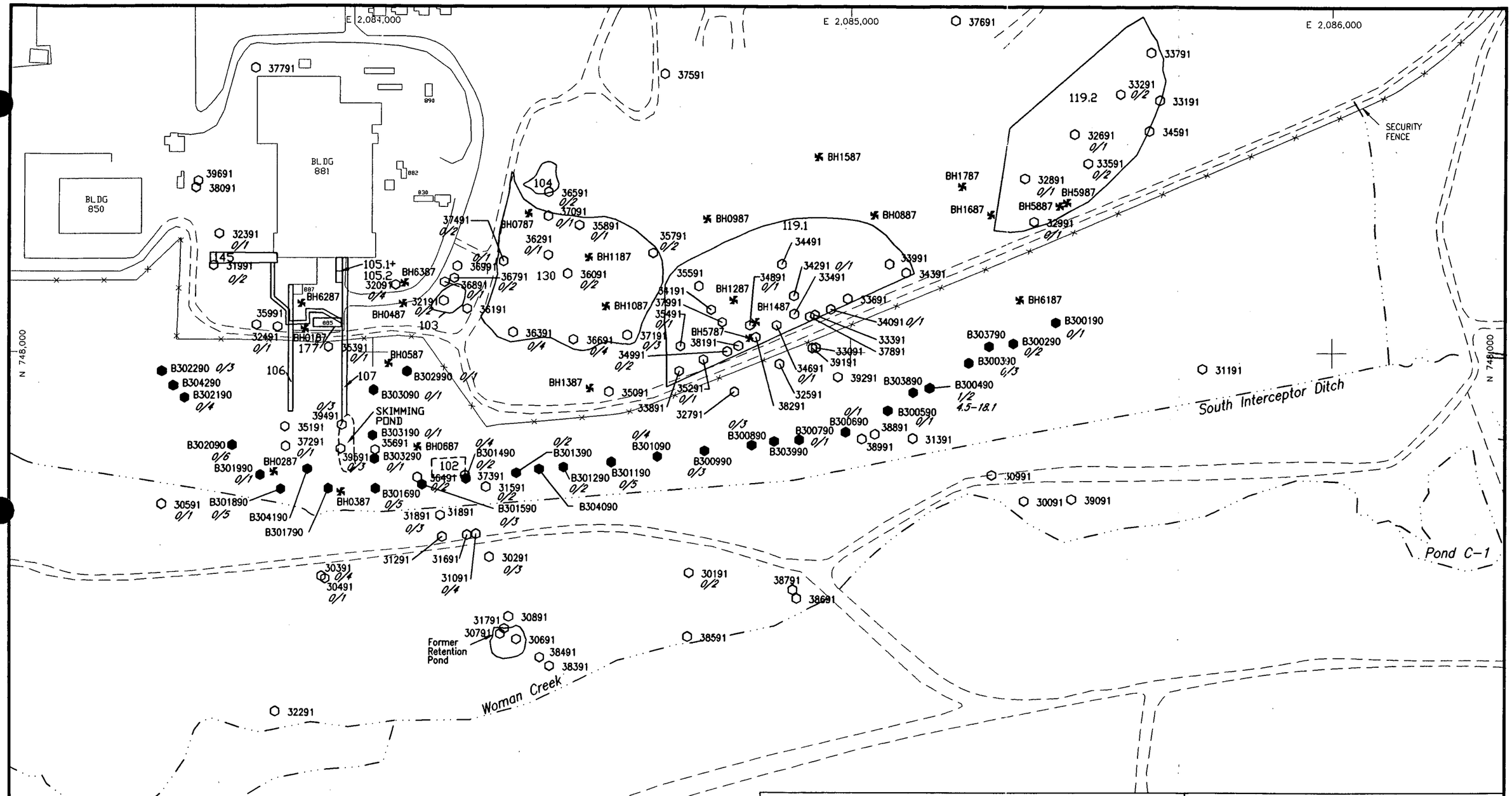
Isopleths of Arsenic Concentrations
Filtered Groundwater
Upper Hydrostratigraphic Unit

Figure D-26

AUGUST 1993

R74158.CWMBpj-052594/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) DASHED WHERE DISTURBED DURING CONSTRUCTION OF FRENCH DRAIN

BACKGROUND UPPER TOLERANCE LIMIT: units are µg/kg — 12.140

BH0887 — PHASE I/II BOREHOLES

30191 — PHASE III BOREHOLES

B300190 — FRENCH DRAIN BOREHOLE

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS

290000 — MINIMUM

340000 — MAXIMUM

* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

N

0 100 200

SCALE: 1"=200'

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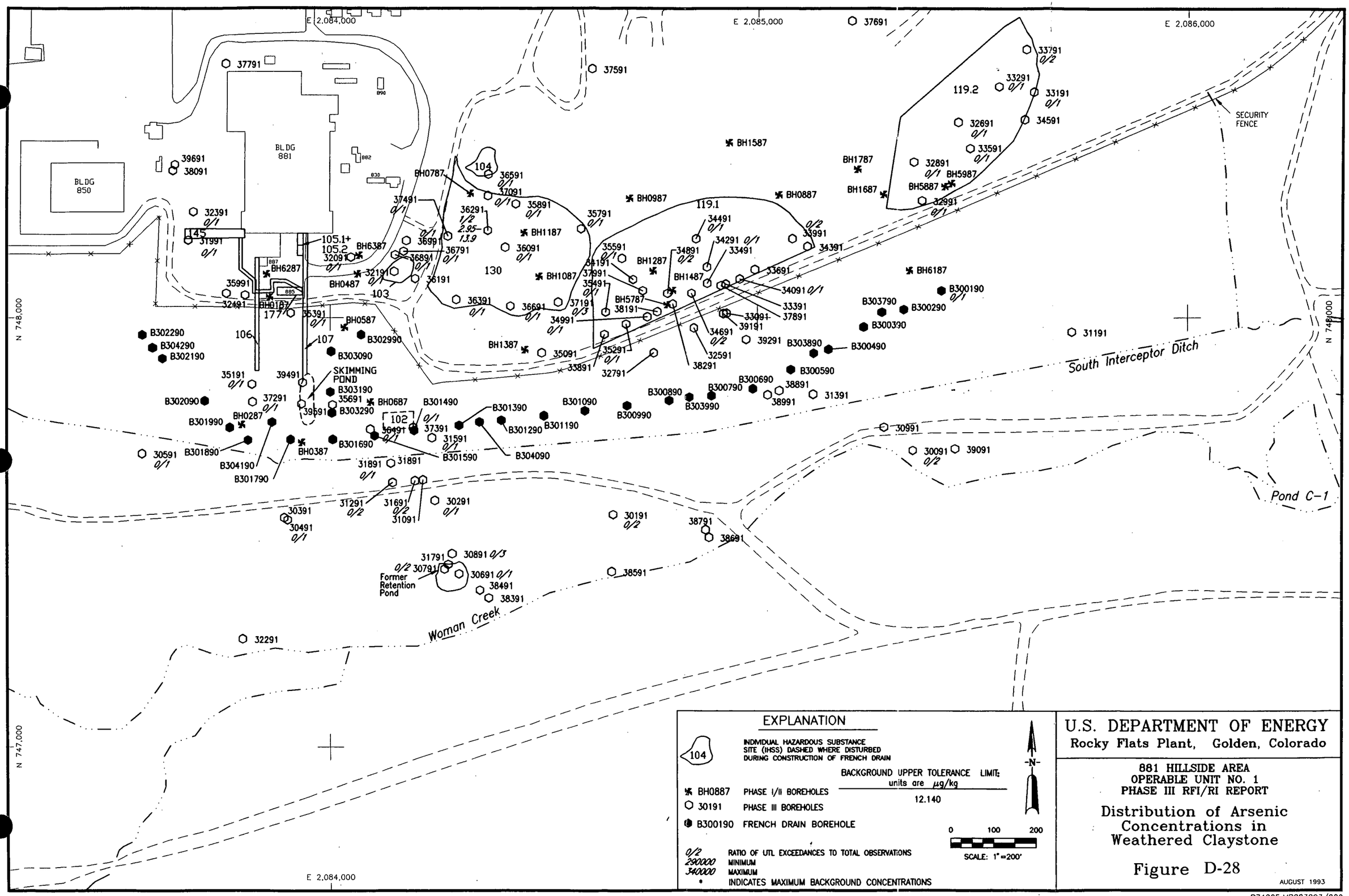
Distribution of Arsenic Concentrations in Colluvial Geologic Materials

Figure D-27

AUGUST 1993

R74204.MB083093/200



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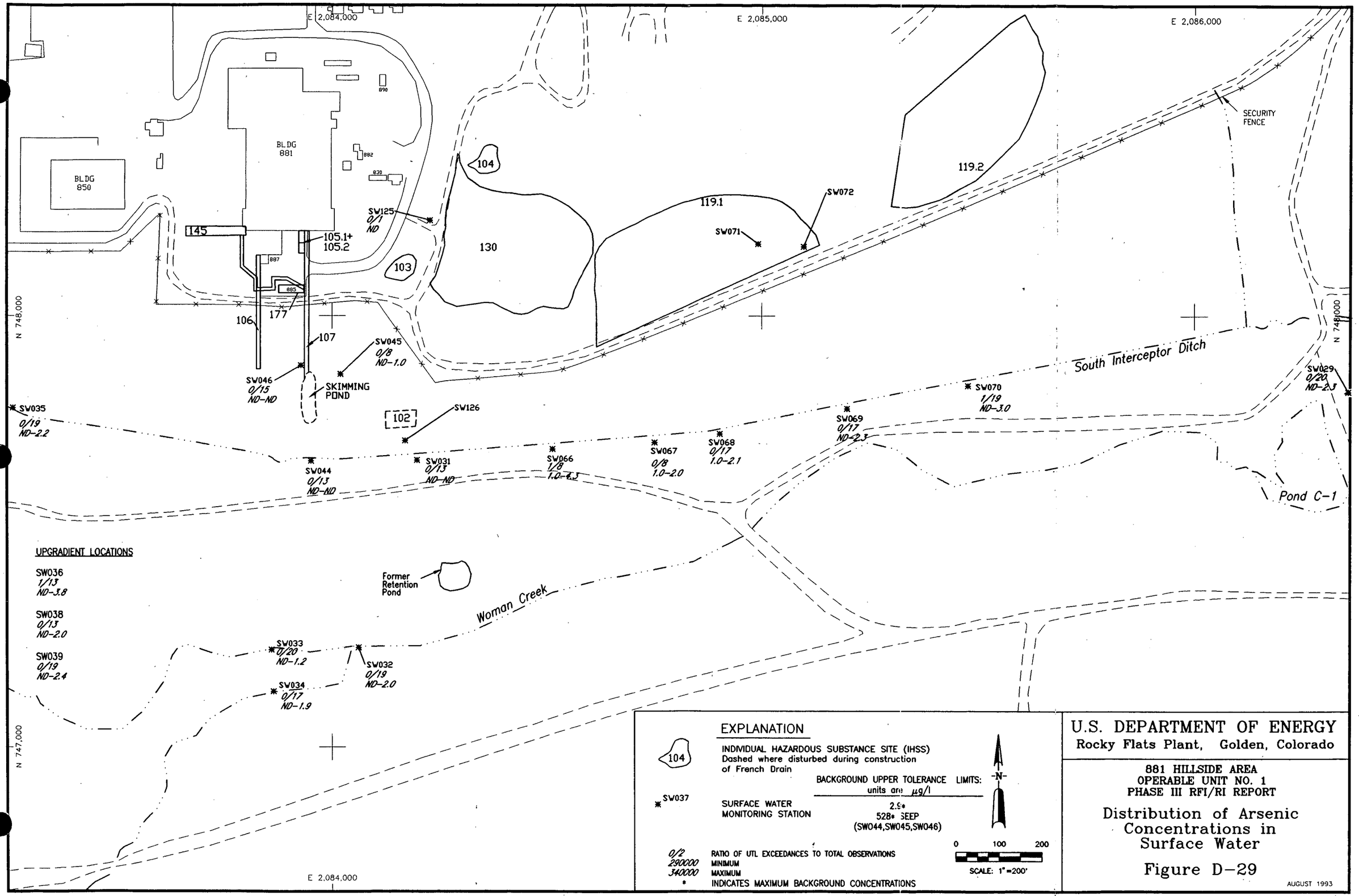
Distribution of Arsenic Concentrations in Weathered Claystone

Figure D-28

AUGUST 1993

R74205.MB083093/200



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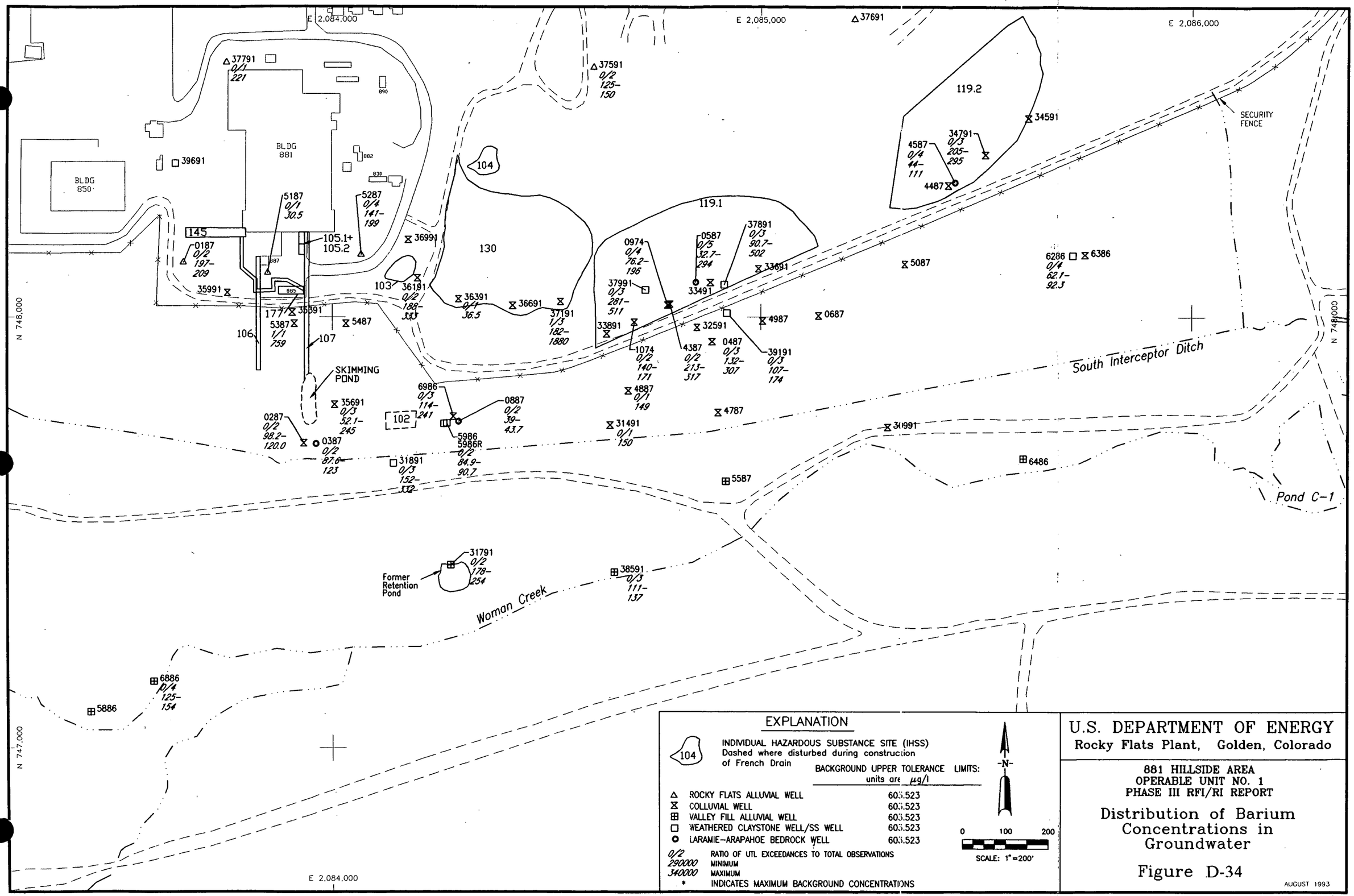
Distribution of Arsenic Concentrations in Surface Water

Figure D-29

AUGUST 1993

R74170.CWMB090293/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are µg/l
△ ROCKY FLATS ALLUVIAL WELL	603.523
⧖ COLLUVIAL WELL	603.523
⊞ VALLEY FILL ALLUVIAL WELL	603.523
□ WEATHERED CLAYSTONE WELL/SS WELL	603.523
○ LARAMIE-ARAPAHOE BEDROCK WELL	603.523

0/2 RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 MINIMUM
340000 MAXIMUM
* INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1"=200'

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Rocky Flats Plant, Golden, Colorado

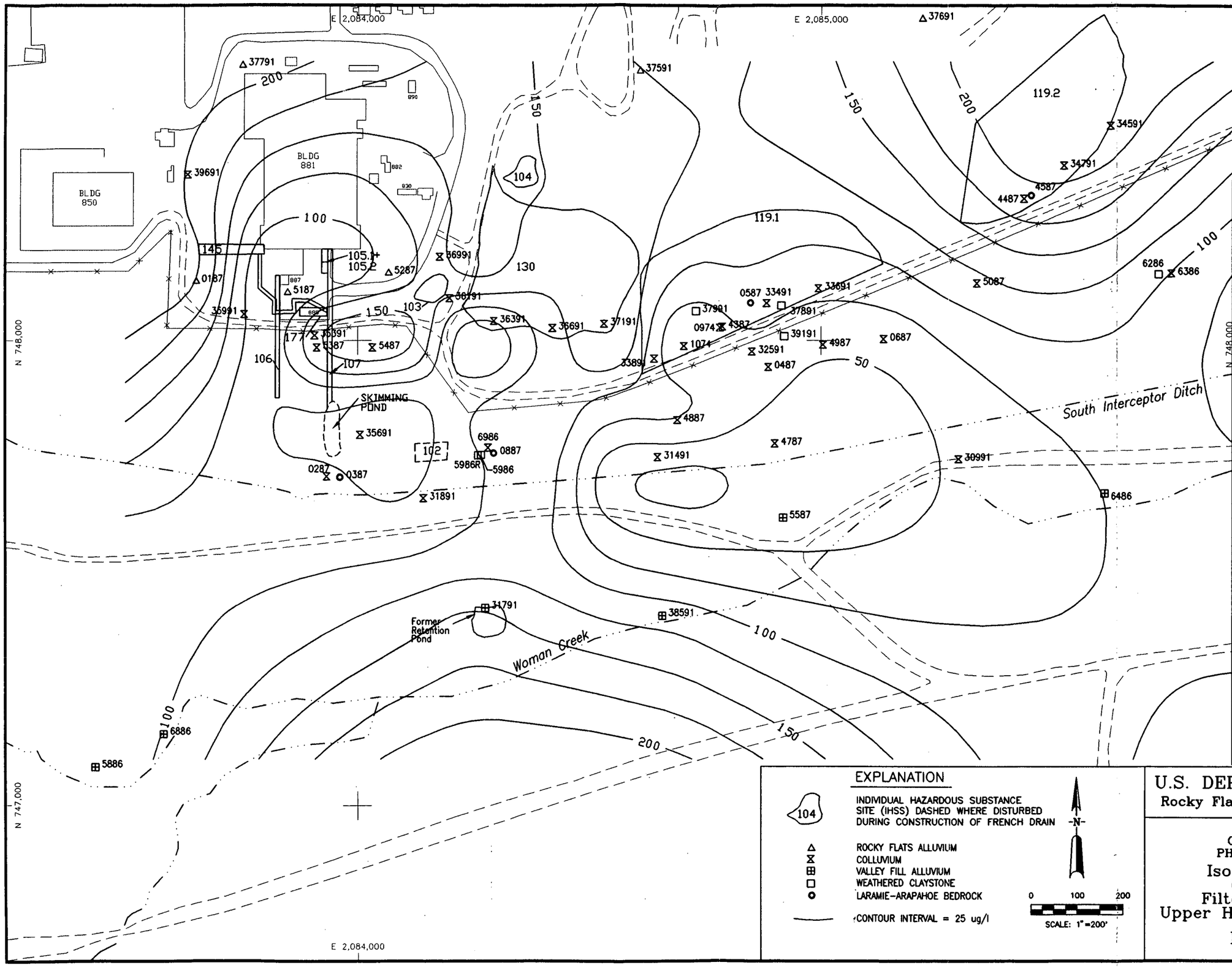
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Barium Concentrations in Groundwater

Figure D-34

AUGUST 1993

R74139.CWMB081893/200



Filtered Barium

Well	Mean Concentration (ug/l)
0187	198
0287	77
0387	88
0487	57
0587	37
0687	60
0887	16
0974	78
1074	55
31491	24
31791	148
31891	77
34791	204
35691	72
36191	136
36391	75
37191	152
37591	126
37791	214
37891	69
37991	177
38591	114
39191	27
4387	70
4587	57
4887	74
5187	68
5287	113
5487	156
5986	87
6286	56
6386	100
6886	101
6986	108

EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) DASHED WHERE DISTURBED DURING CONSTRUCTION OF FRENCH DRAIN

△ ROCKY FLATS ALLUVIUM

⧖ COLLUVIUM

⊞ VALLEY FILL ALLUVIUM

□ WEATHERED CLAYSTONE

○ LARAMIE-ARAPAHOE BEDROCK

—— CONTOUR INTERVAL = 25 ug/l

-N-

0 100 200

SCALE: 1"=200'

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881 HILLSIDE AREA
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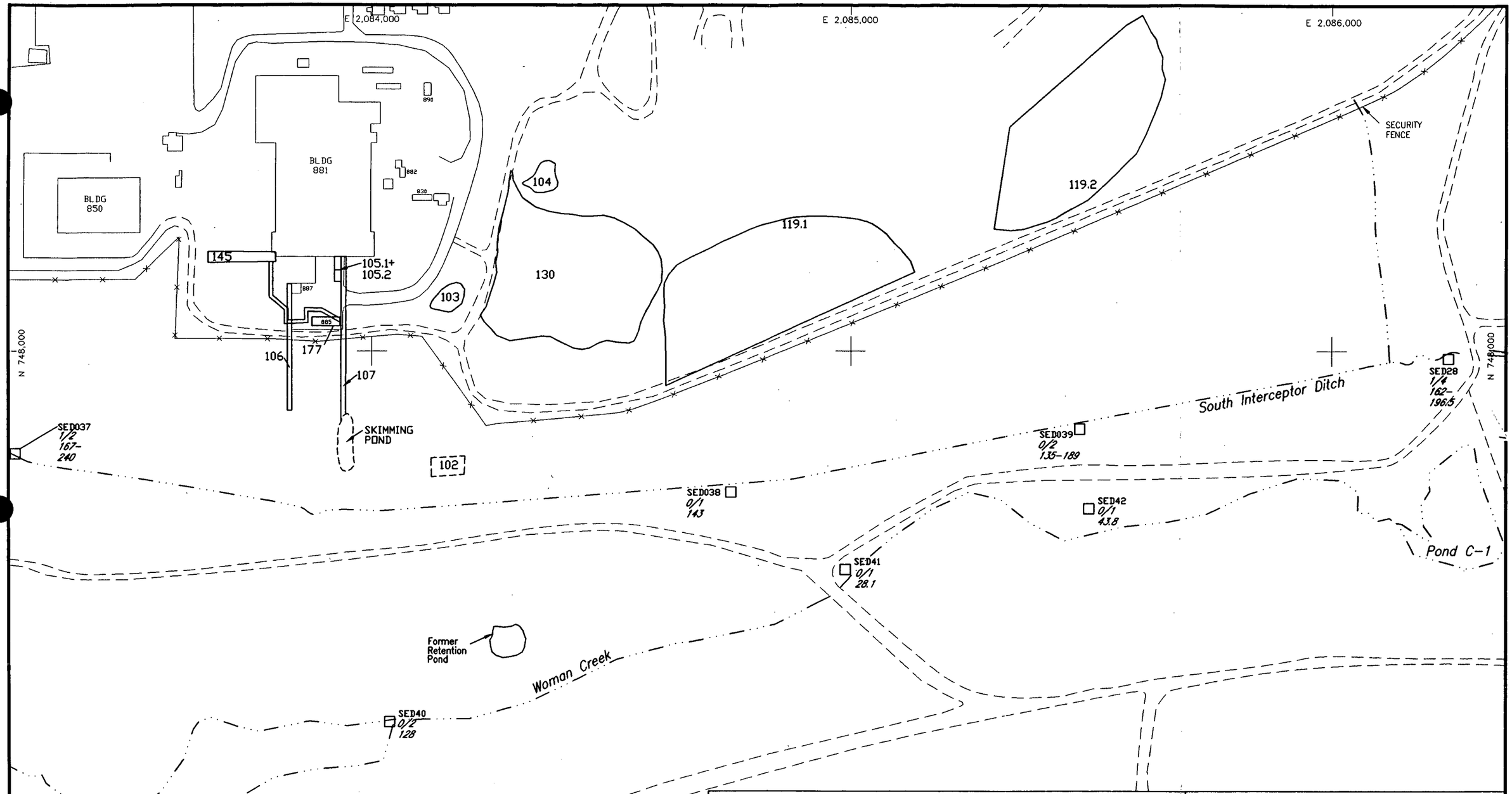
PHASE III RFI/RI REPORT

Isopleths of Barium Concentrations
Filtered Groundwater
Upper Hydrostratigraphic Unit

Figure D-35

AUGUST 1993

R74159.CWMBpj-052594/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

BACKGROUND UPPER TOLERANCE LIMIT: units are mg/kg

SED40 — SEDIMENT SAMPLING STATION 193.741*

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 — MINIMUM
340000 — MAXIMUM
* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" = 200'

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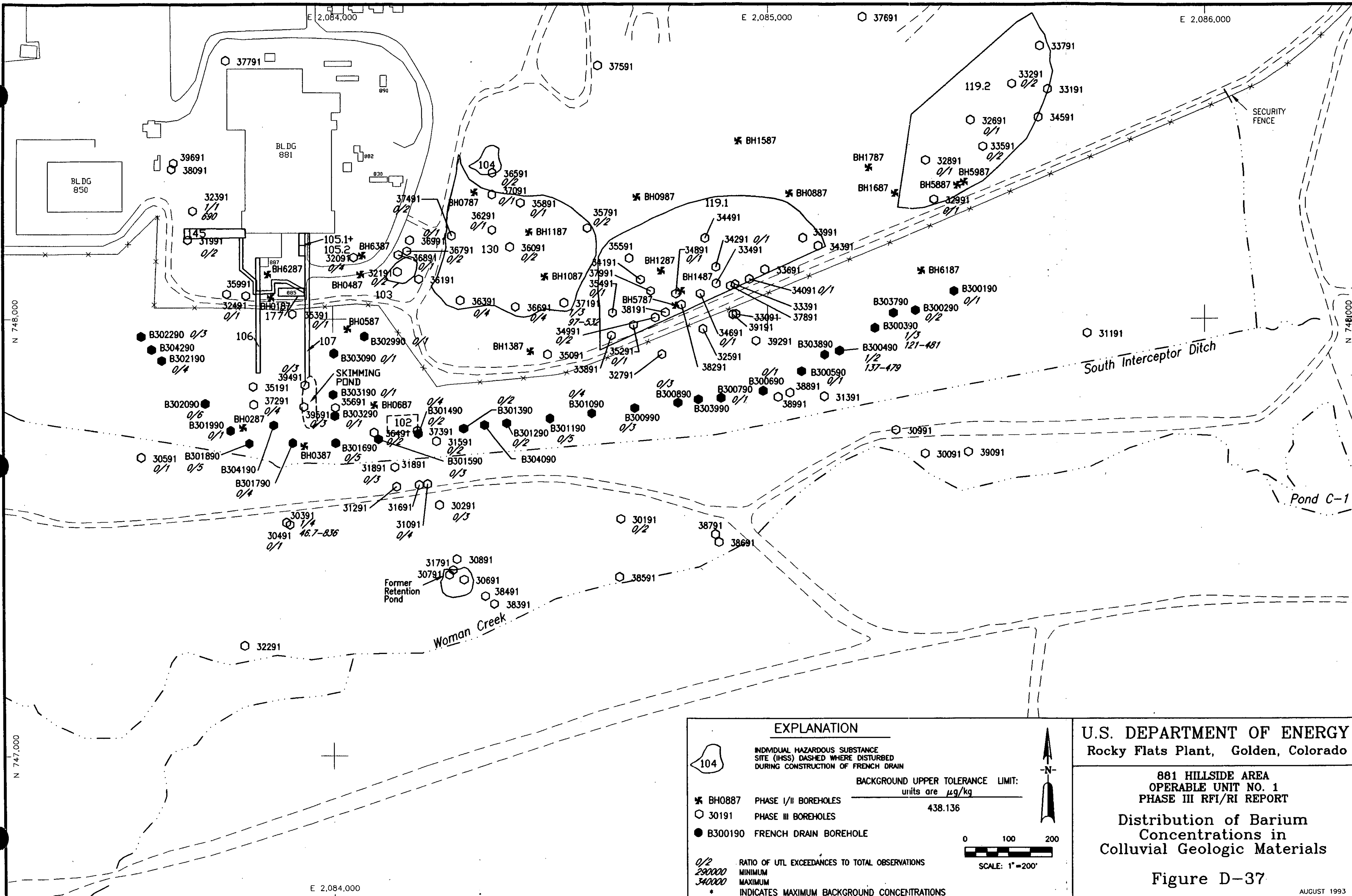
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Barium Concentrations in Sediment

Figure D-36

AUGUST 1993

R74169.CWMB090293/200



EXPLANATION

104 INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) DASHED WHERE DISTURBED DURING CONSTRUCTION OF FRENCH DRAIN

BACKGROUND UPPER TOLERANCE LIMIT: units are μg/kg
438.136

- BH0887 PHASE I/II BOREHOLES
- 30191 PHASE III BOREHOLES
- B300190 FRENCH DRAIN BOREHOLE

0/2 RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 MINIMUM
340000 MAXIMUM
* INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" = 200'

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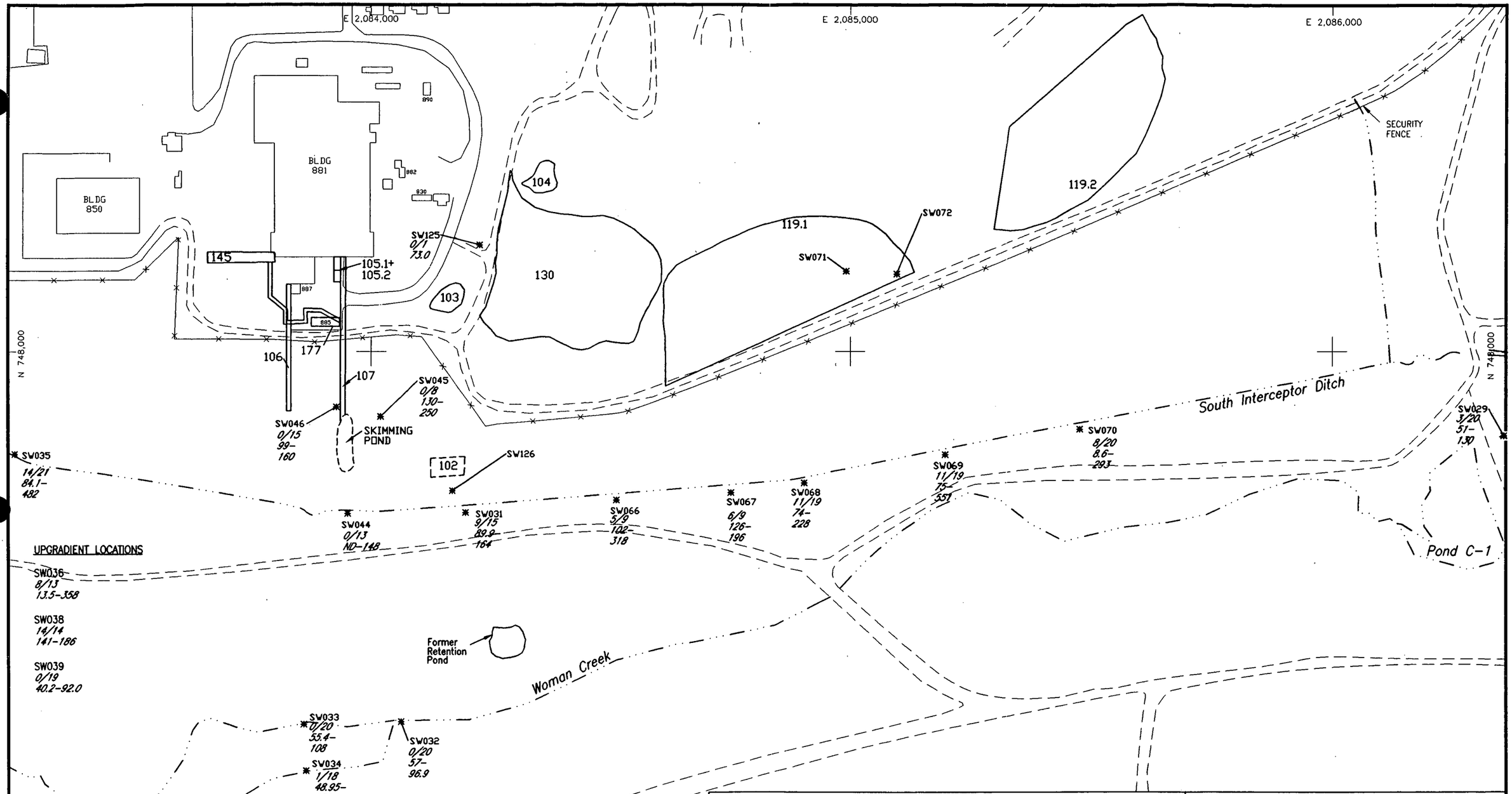
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Barium Concentrations in Colluvial Geologic Materials

Figure D-37

AUGUST 1993

R74206.MB090293/200



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

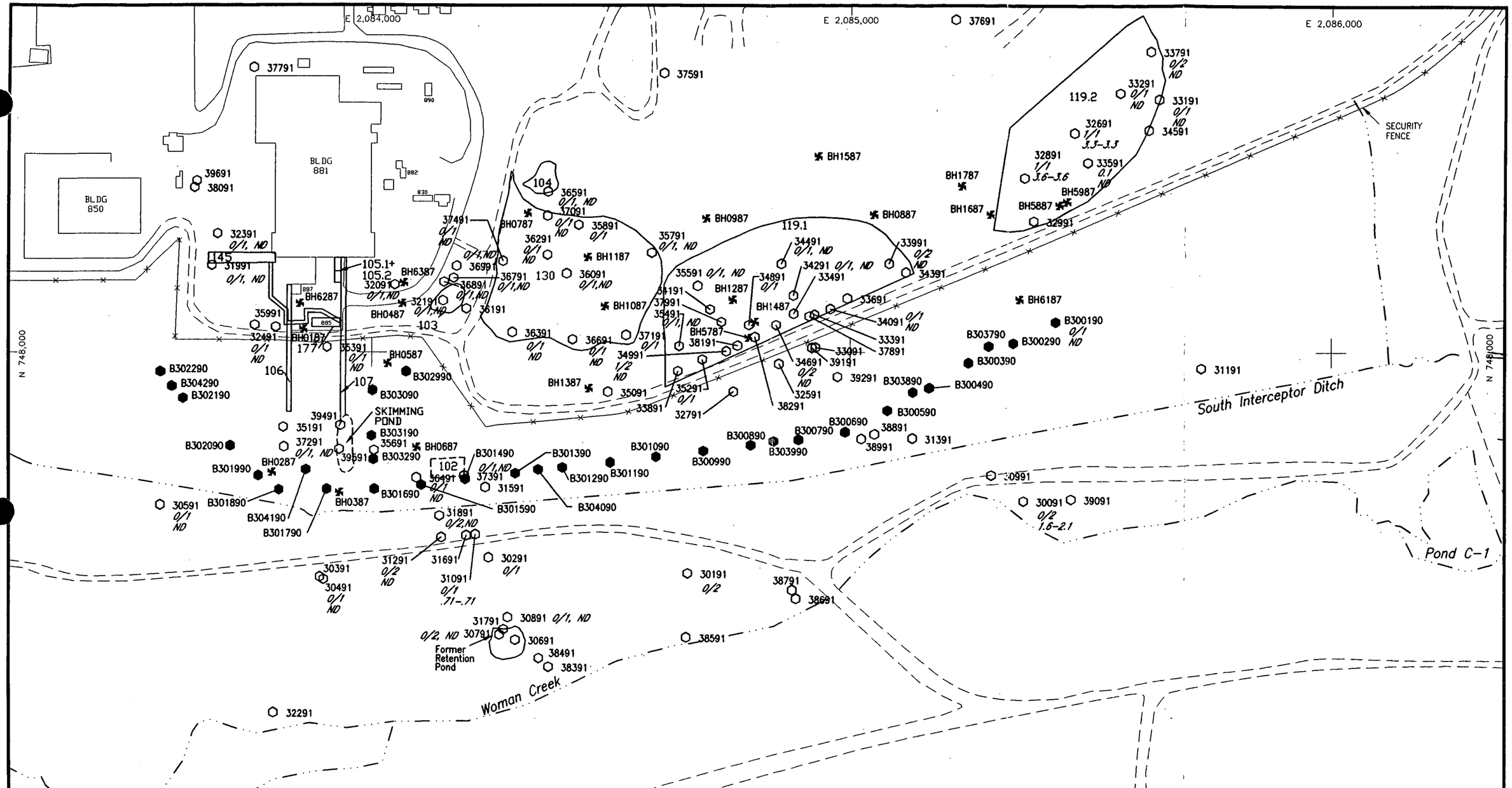
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Barium Concentrations in Surface Water

Figure D-38

AUGUST 1993

R74168.CWMB090293/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) DASHED WHERE DISTURBED DURING CONSTRUCTION OF FRENCH DRAIN

BACKGROUND UPPER TOLERANCE LIMIT: units are µg/kg — 1.8

BH0887 — PHASE I/II BOREHOLES

30191 — PHASE III BOREHOLES

B300190 — FRENCH DRAIN BOREHOLE

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS

290000 — MINIMUM

340000 — MAXIMUM

* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200

SCALE: 1"=200'

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant, Golden, Colorado

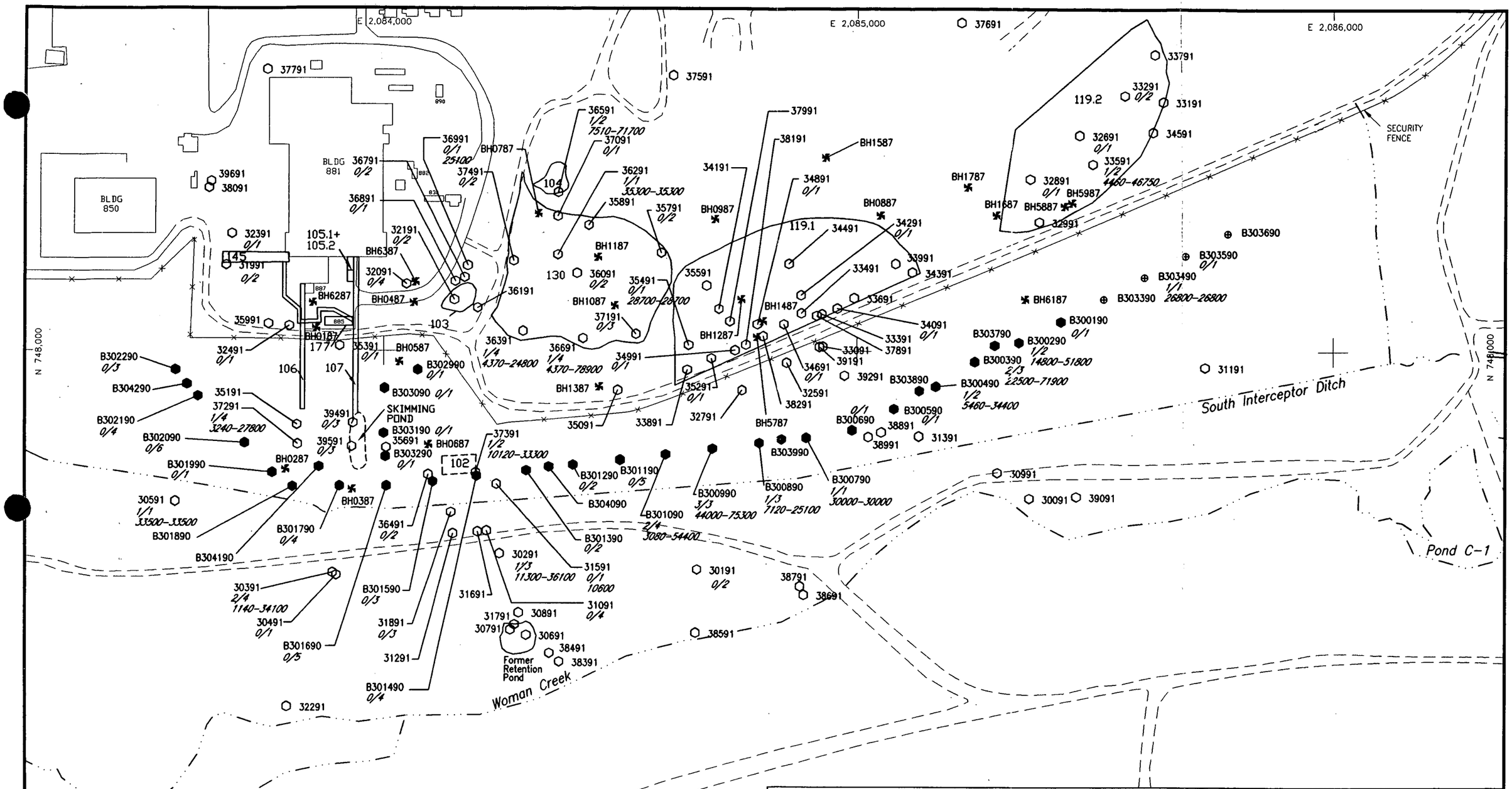
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Cadmium Concentrations in Geologic Materials

Figure D-40

AUGUST 1993

R74207.MB083093/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) DASHED WHERE DISTURBED DURING CONSTRUCTION OF FRENCH DRAIN

BACKGROUND UPPER TOLERANCE LIMIT: units are µg/kg — 23236

- BH0887 — PHASE I/II BOREHOLES
- 30191 — PHASE III BOREHOLES
- B300190 — FRENCH DRAIN BOREHOLE
- B303390 — FRENCH DRAIN PIEZOMETER

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 — MINIMUM
340000 — MAXIMUM
• — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

N

0 100 200
SCALE: 1"=200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

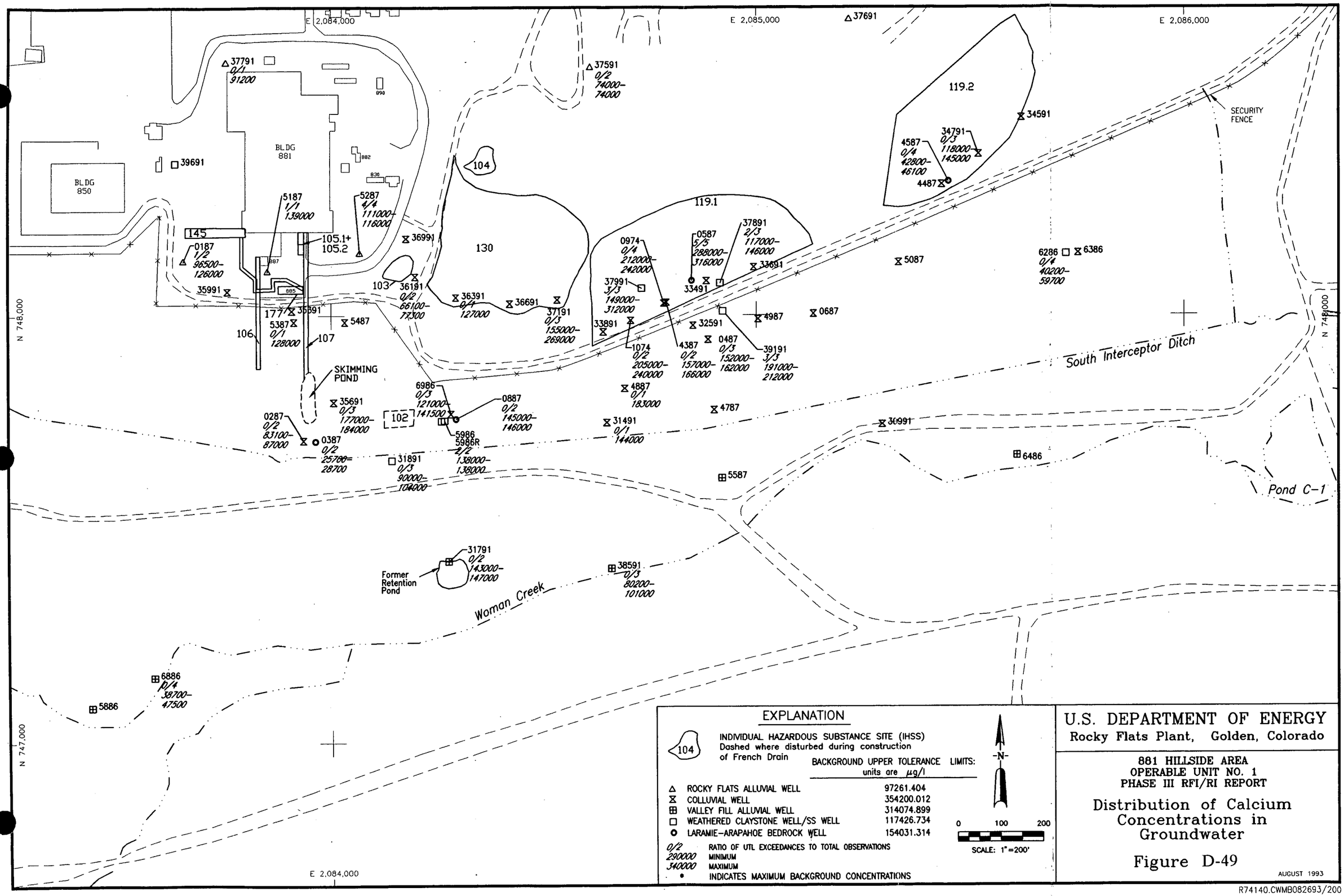
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Calcium Concentrations in Geologic Materials

Figure D-48

AUGUST 1993

R74208.MB090293/200



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Rocky Flats Plant, Golden, Colorado

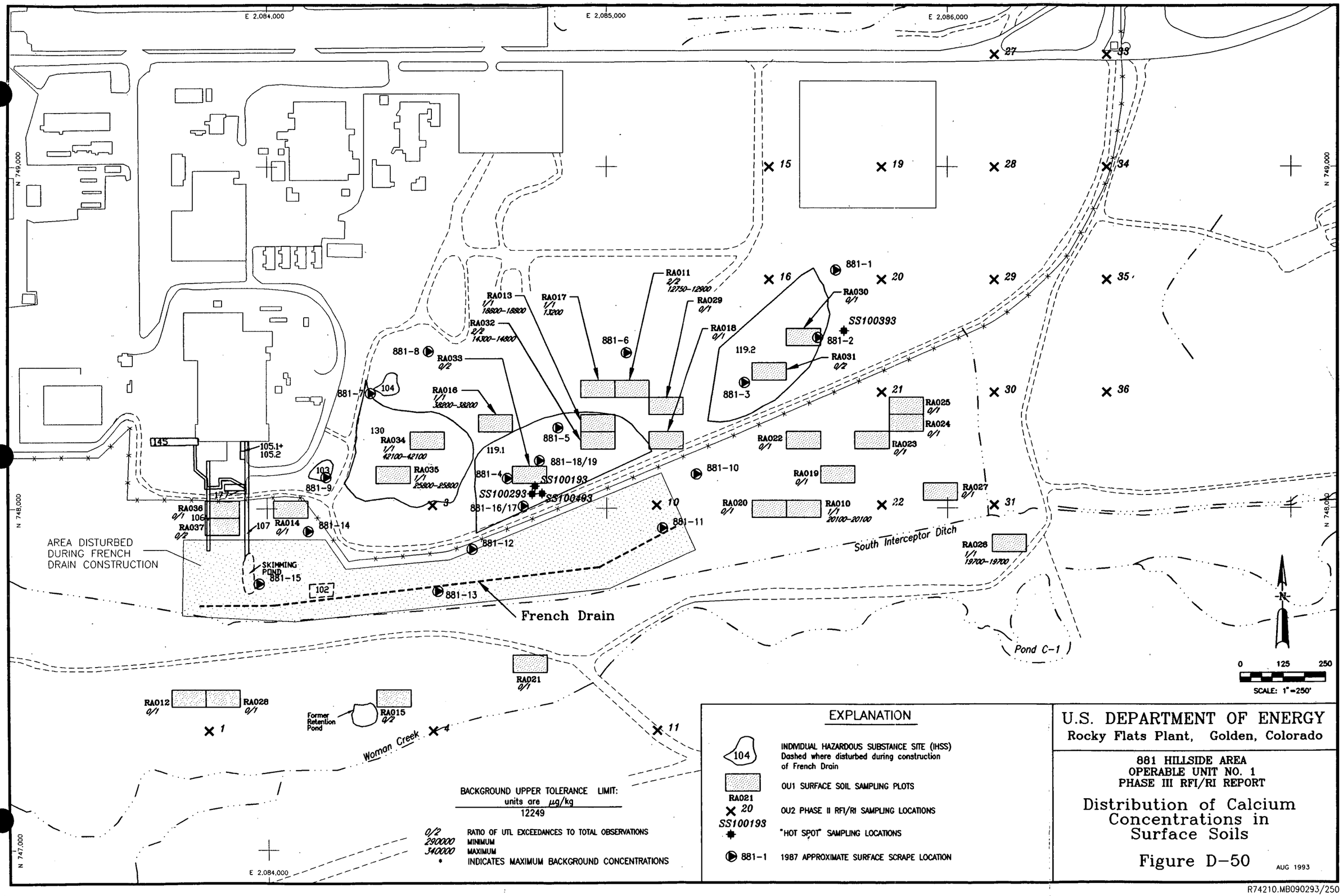
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Calcium Concentrations in Groundwater

Figure D-49

AUGUST 1993

R74140.CWMB082693/200



EXPLANATION

104	INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain
RA021	OU1 SURFACE SOIL SAMPLING PLOTS
20	OU2 PHASE II RFI/RI SAMPLING LOCATIONS
SS100193	"HOT SPOT" SAMPLING LOCATIONS
881-1	1987 APPROXIMATE SURFACE SCRAPE LOCATION

BACKGROUND UPPER TOLERANCE LIMIT:
units are µg/kg
12249

0/2	RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000	MINIMUM
340000	MAXIMUM
*	INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

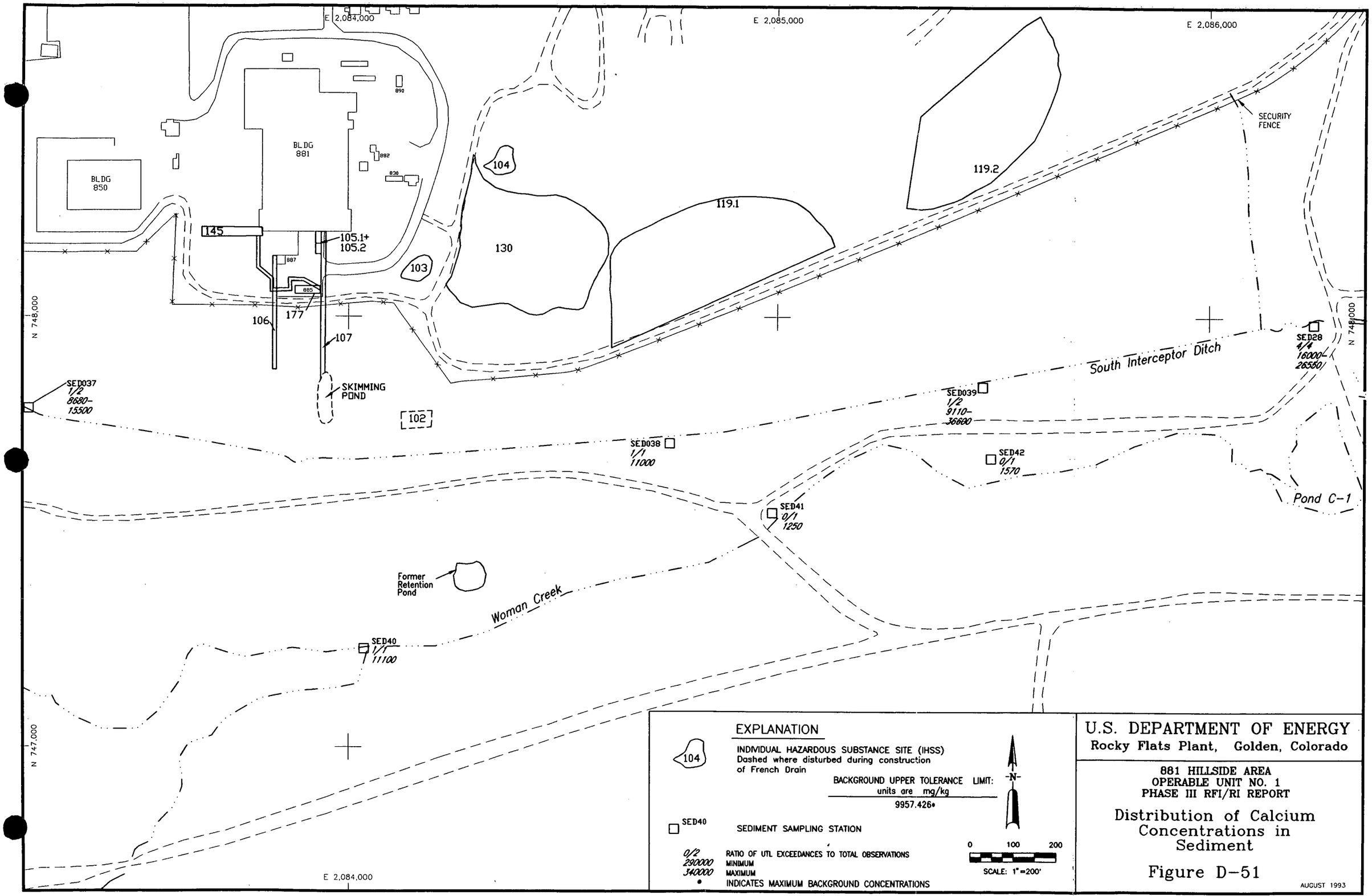
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Calcium Concentrations in Surface Soils

Figure D-50

AUG 1993

R74210.MB090293/250



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

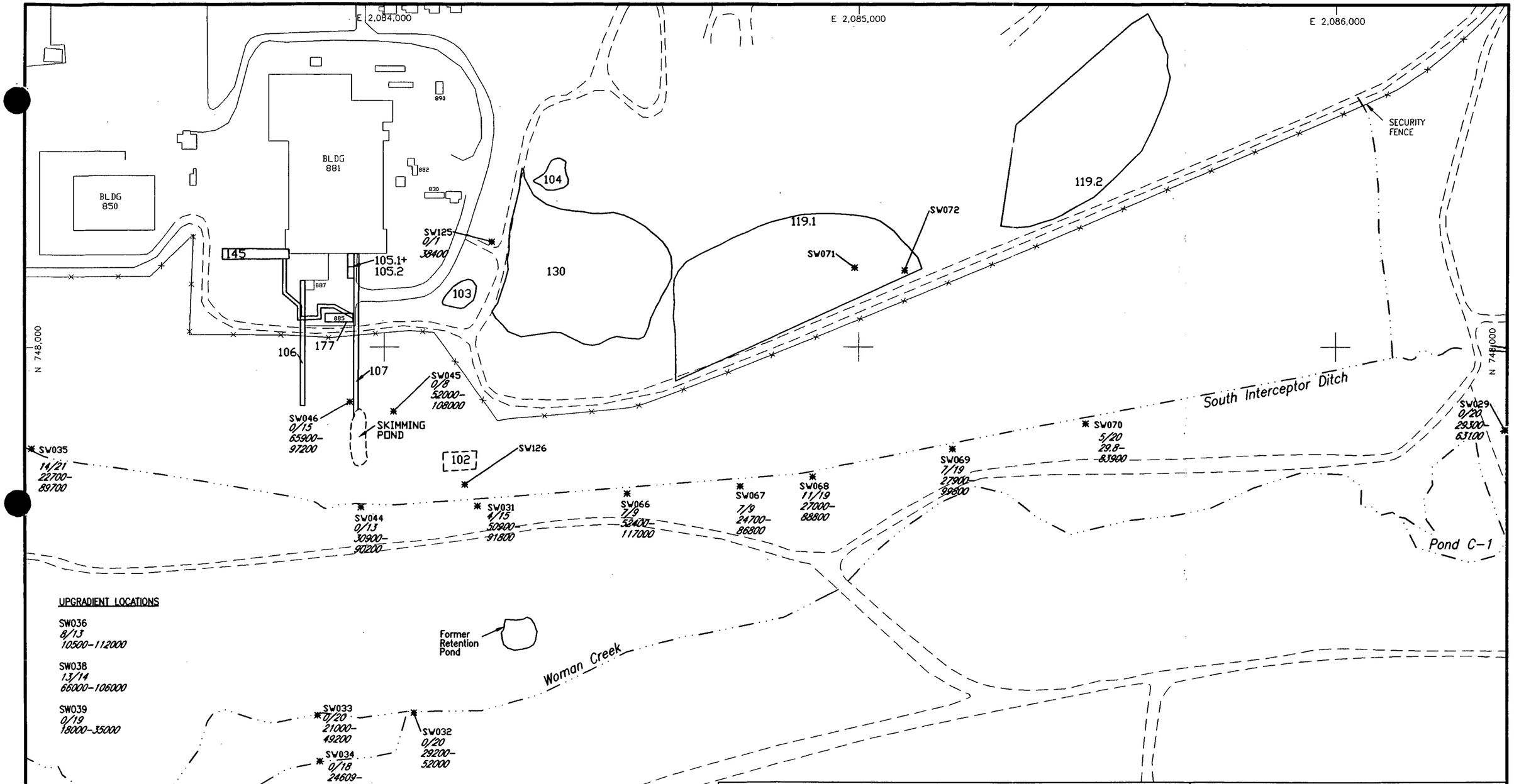
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Calcium Concentrations in Sediment

Figure D-51

AUGUST 1993

R74167.CWMB090293/200



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

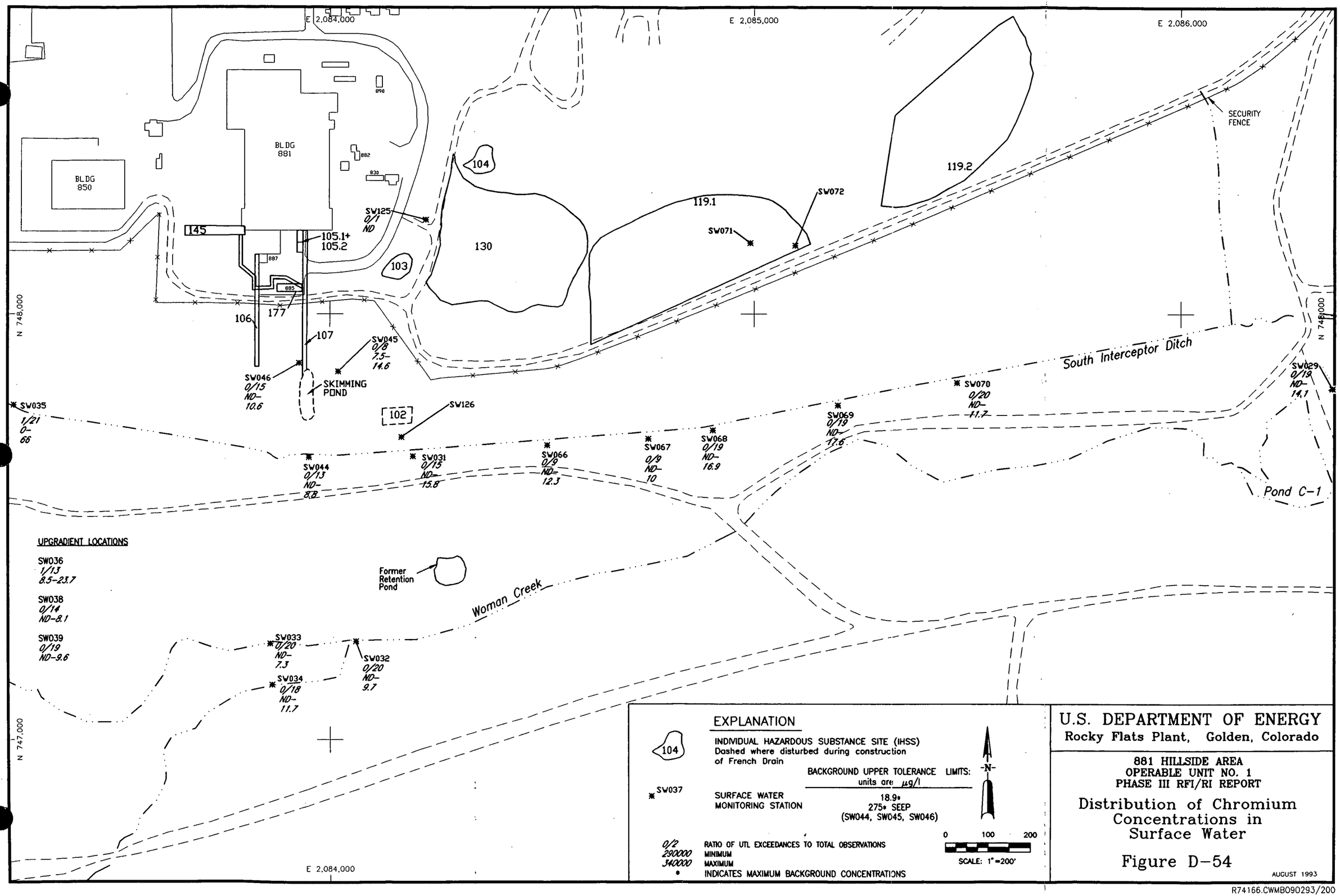
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Calcium Concentrations in Surface Water

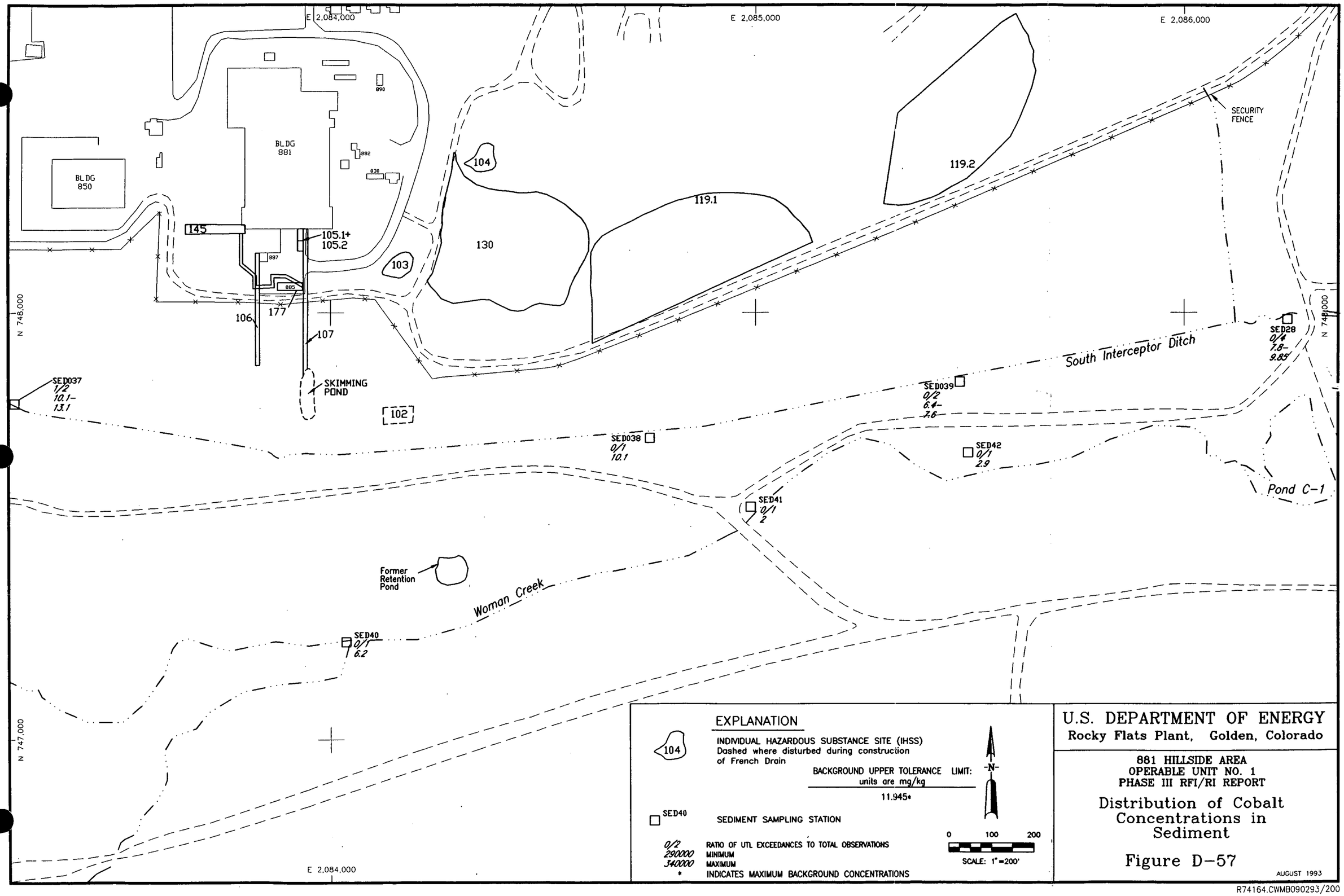
Figure D-52

REV. AUG 1993
OCTOBER 1992

R74165.CWMB090293/200



R74166.CWMB090293/200



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

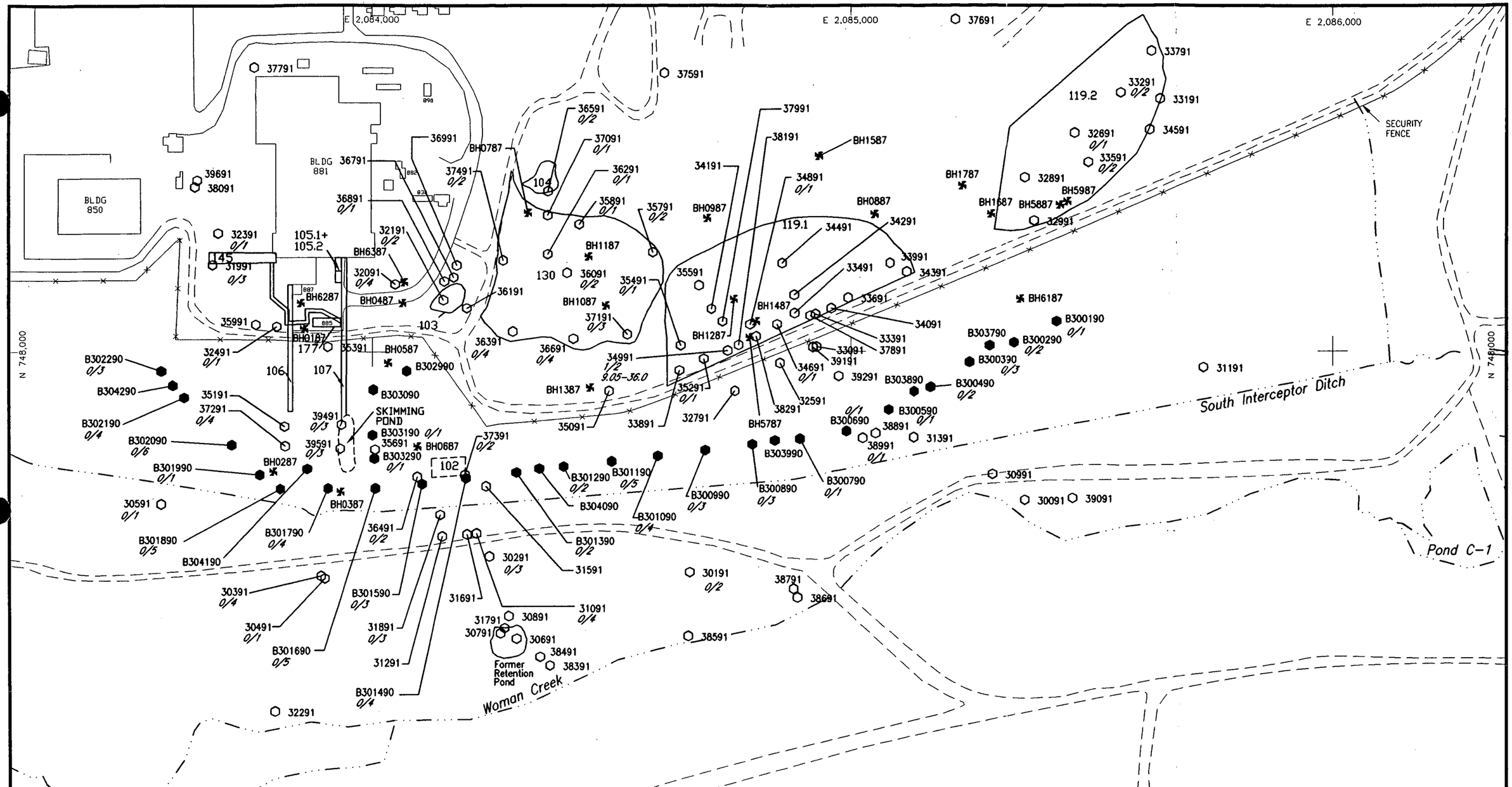
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Cobalt Concentrations in Sediment

Figure D-57

AUGUST 1993

R74164.CWMB090293/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) DASHED WHERE DISTURBED DURING CONSTRUCTION OF FRENCH DRAIN

BACKGROUND UPPER TOLERANCE LIMIT: units are µg/kg — 29.7

BH0887 — PHASE I/II BOREHOLES

30191 — PHASE III BOREHOLES

B300190 — FRENCH DRAIN BOREHOLE

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS

290000 — MINIMUM

340000 — MAXIMUM

• — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200

SCALE: 1" =200'

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant, Golden, Colorado

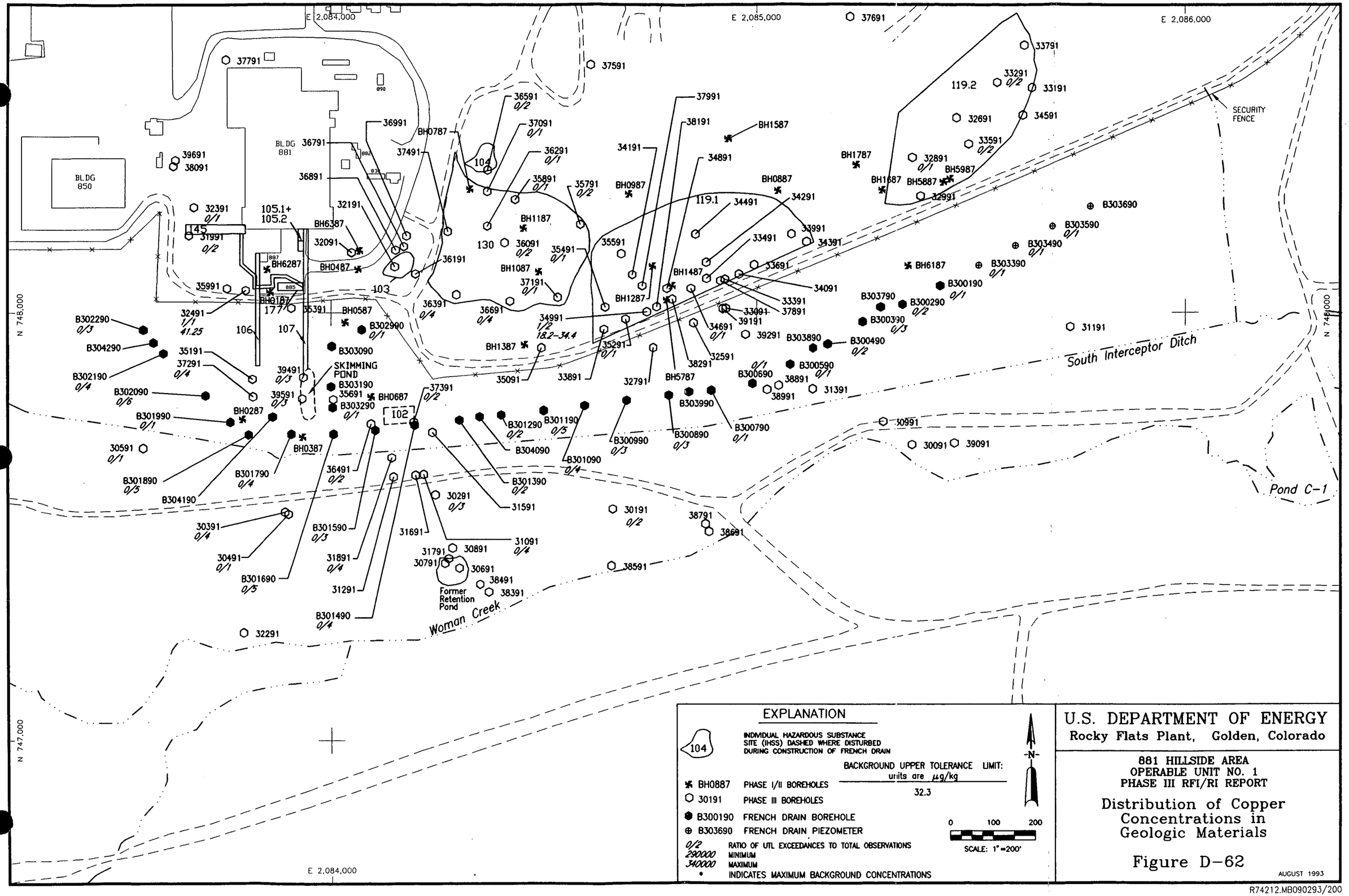
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Cobalt Concentrations in Geologic Materials

Figure D-58

AUGUST 1993

R74211.MB090293/200



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

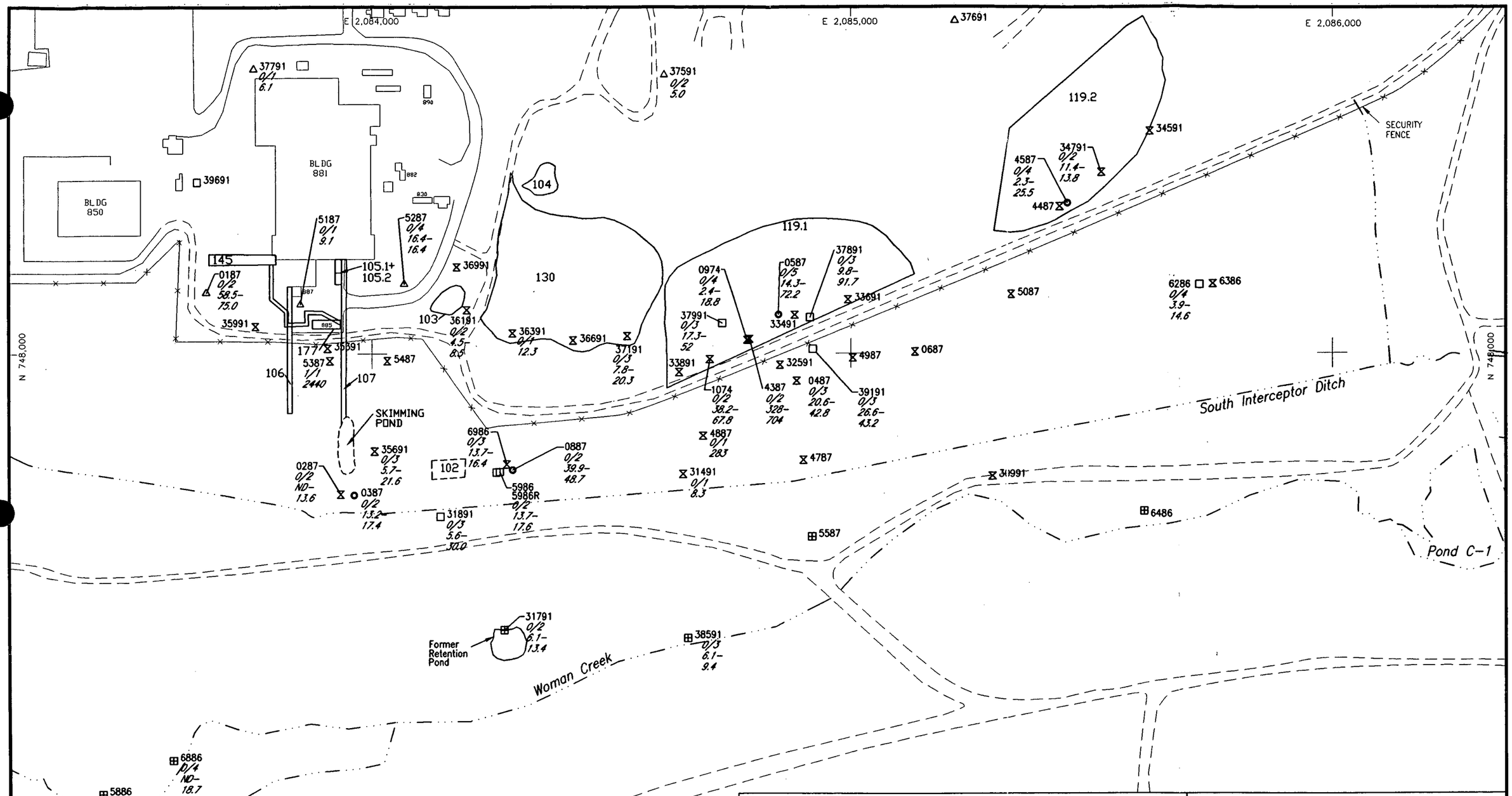
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Copper Concentrations in Geologic Materials

Figure D-62

AUGUST 1993

R74212.MB090293/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are µg/l
△ ROCKY FLATS ALLUVIAL WELL	1750*
⧖ COLLUVIAL WELL	1750*
⊞ VALLEY FILL ALLUVIAL WELL	1750*
□ WEATHERED CLAYSTONE WELL/SS WELL	1750*
○ LARAMIE-ARAPAHOE BEDROCK WELL	1750*

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 — MINIMUM
340000 — MAXIMUM
* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" = 200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

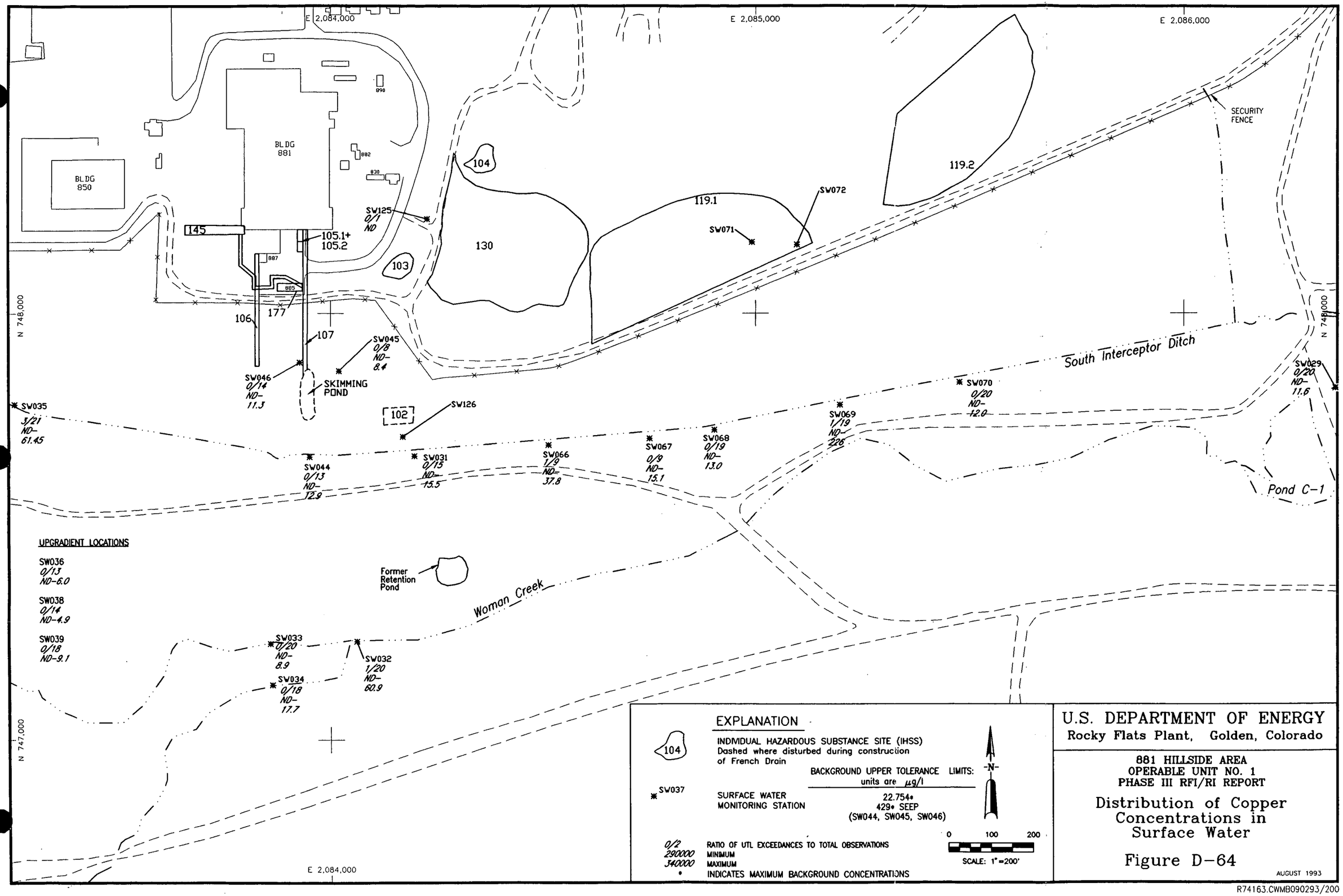
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Copper Concentrations in Groundwater

Figure D-63

AUGUST 1993

R74142.CW090293/200



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

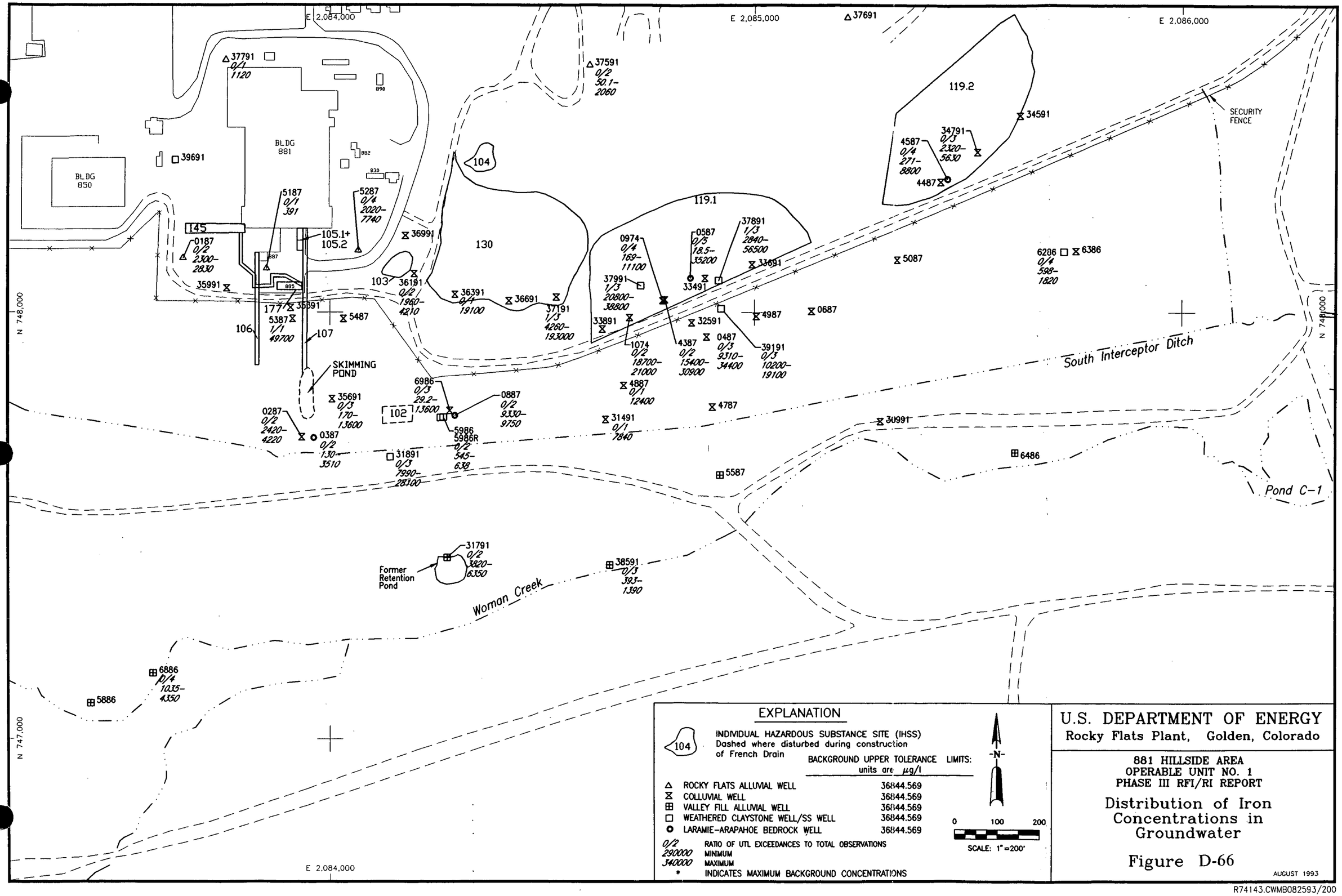
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Copper Concentrations in Surface Water

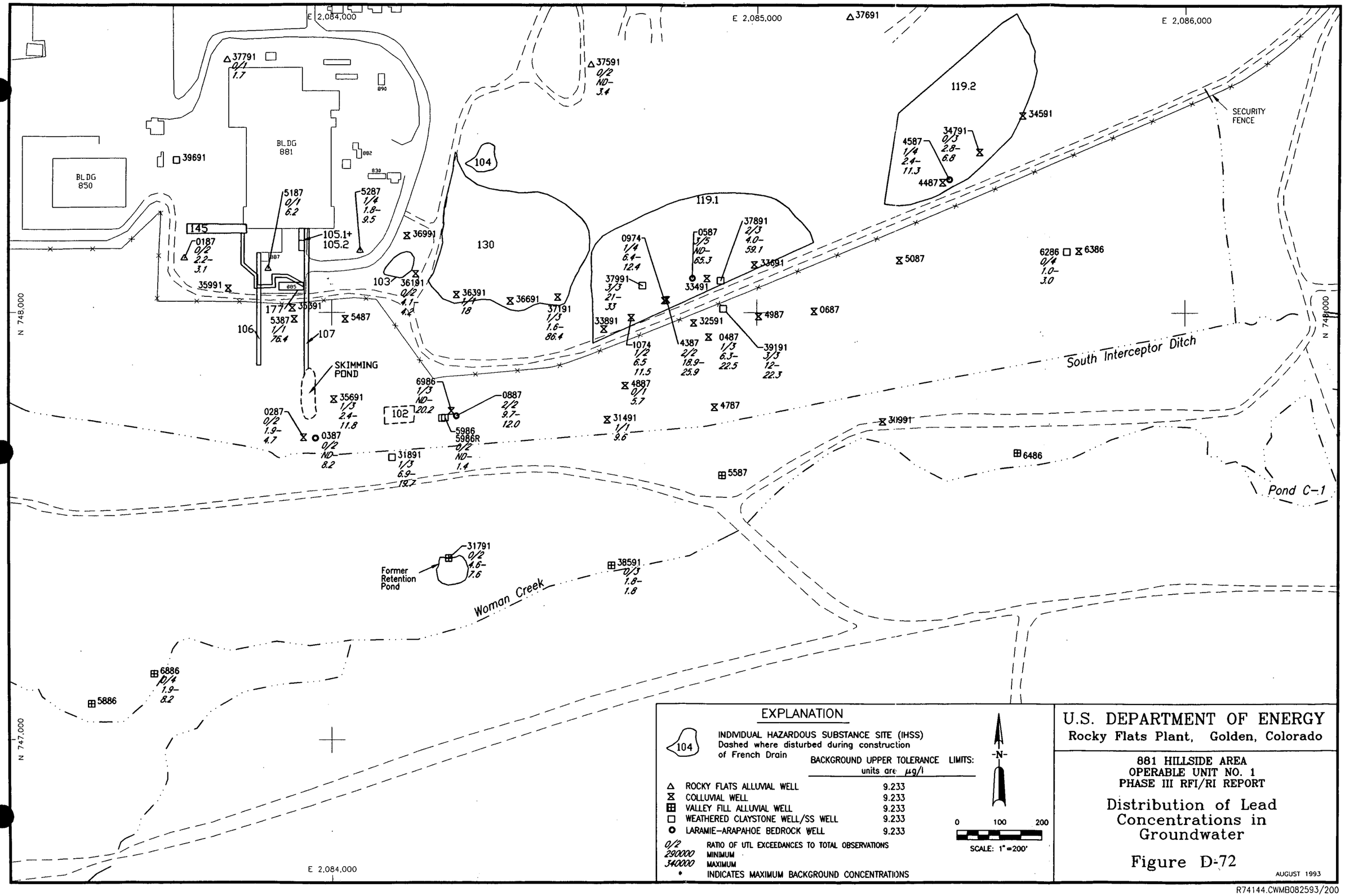
Figure D-64

AUGUST 1993

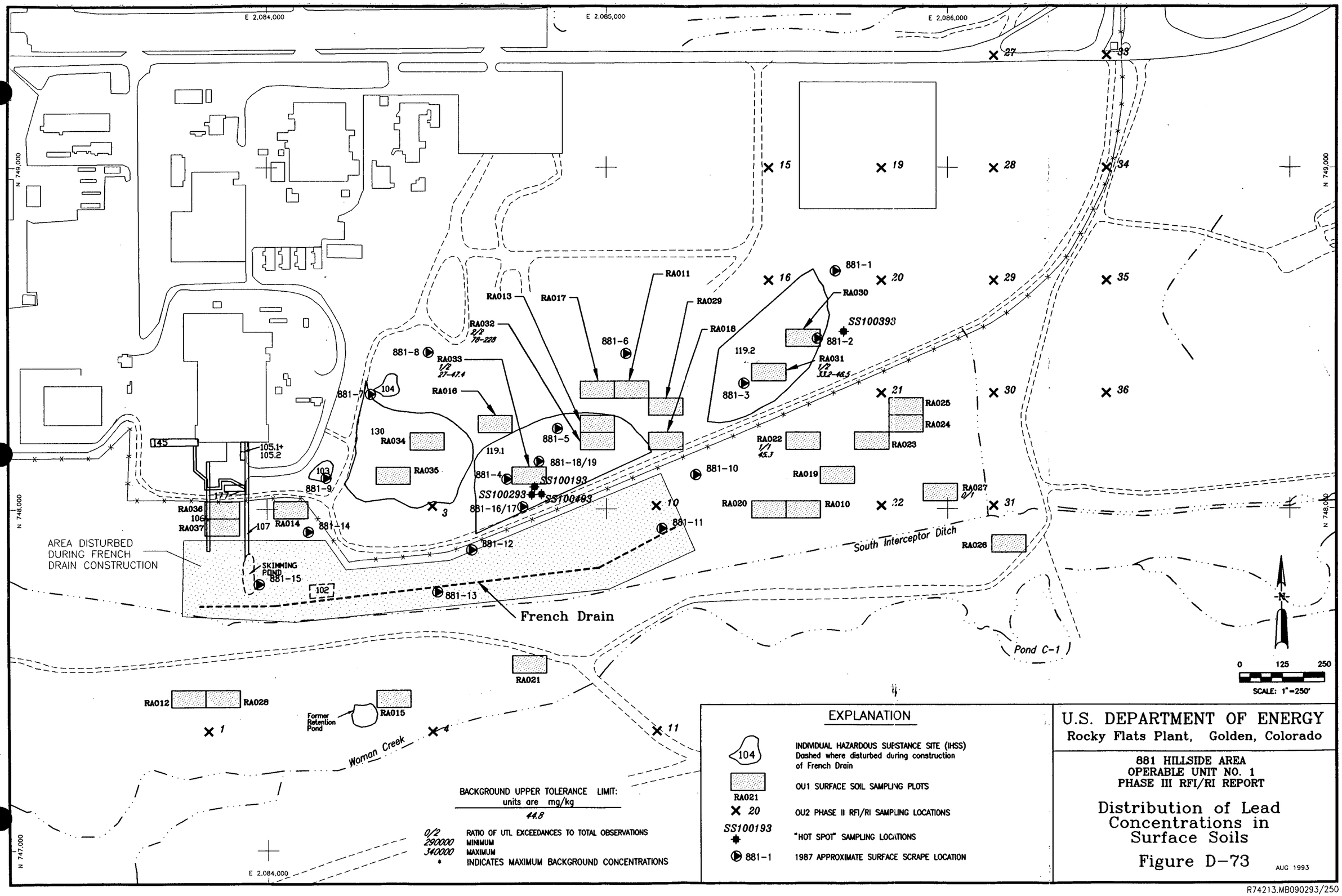
R74163.CWMB090293/200



R74143.CWMB082593/200



R74144.CWMB082593/200



EXPLANATION

104	INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain
RA021	OU1 SURFACE SOIL SAMPLING PLOTS
× 20	OU2 PHASE II RFI/RI SAMPLING LOCATIONS
SS100193	"HOT SPOT" SAMPLING LOCATIONS
881-1	1987 APPROXIMATE SURFACE SCRAPE LOCATION

BACKGROUND UPPER TOLERANCE LIMIT:
units are mg/kg
44.8

0/2	RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000	MINIMUM
340000	MAXIMUM
*	INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

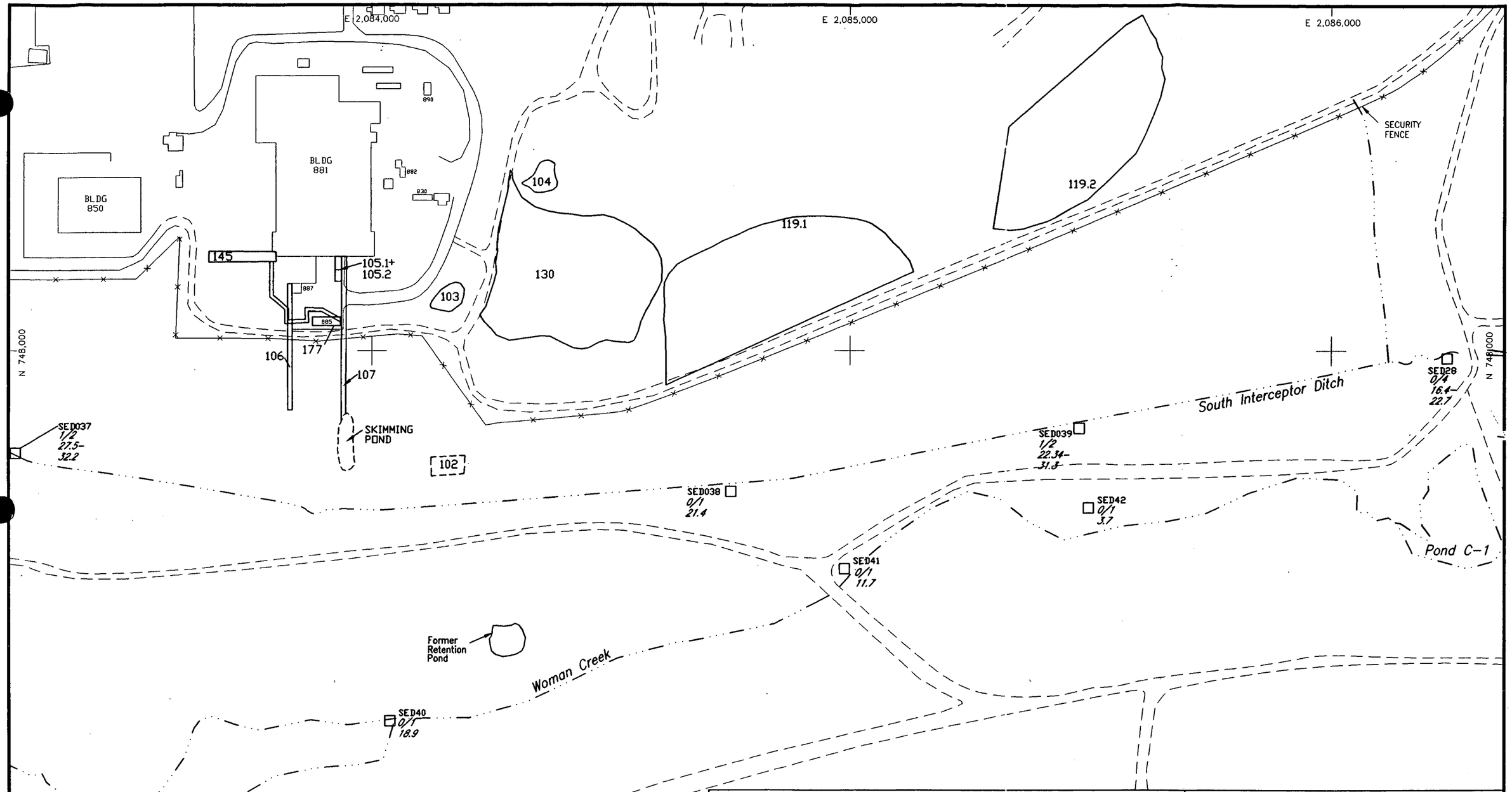
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Lead Concentrations in Surface Soils

Figure D-73

AUG 1993

R74213.MB090293/250



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

BACKGROUND UPPER TOLERANCE LIMIT: units are mg/kg
28.042

SED40 — SEDIMENT SAMPLING STATION

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 — MINIMUM
340000 — MAXIMUM
• — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1"=200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

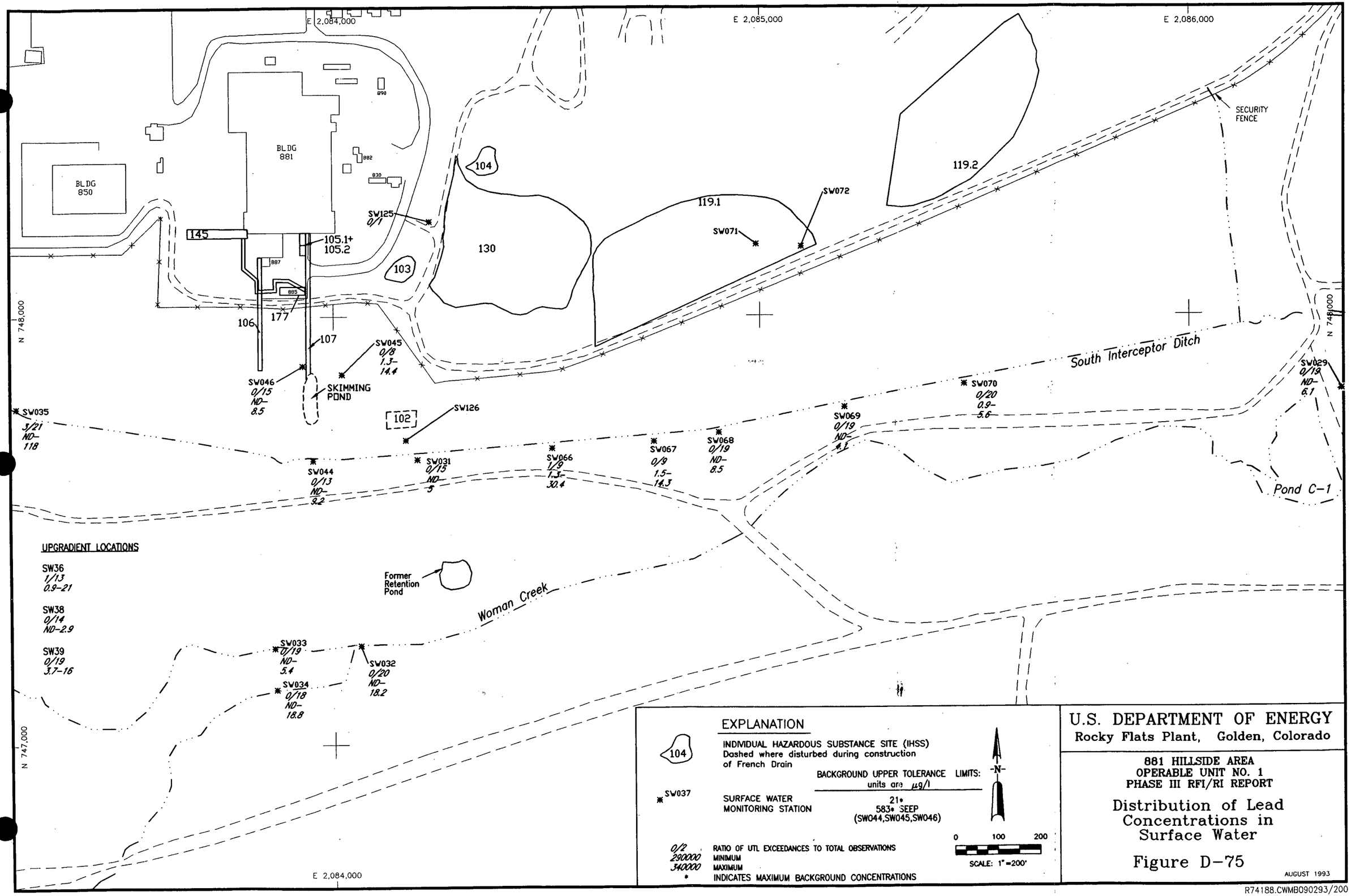
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Lead Concentrations in Sediment

Figure D-74

AUGUST 1993

R74178.CWMB090293/200



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

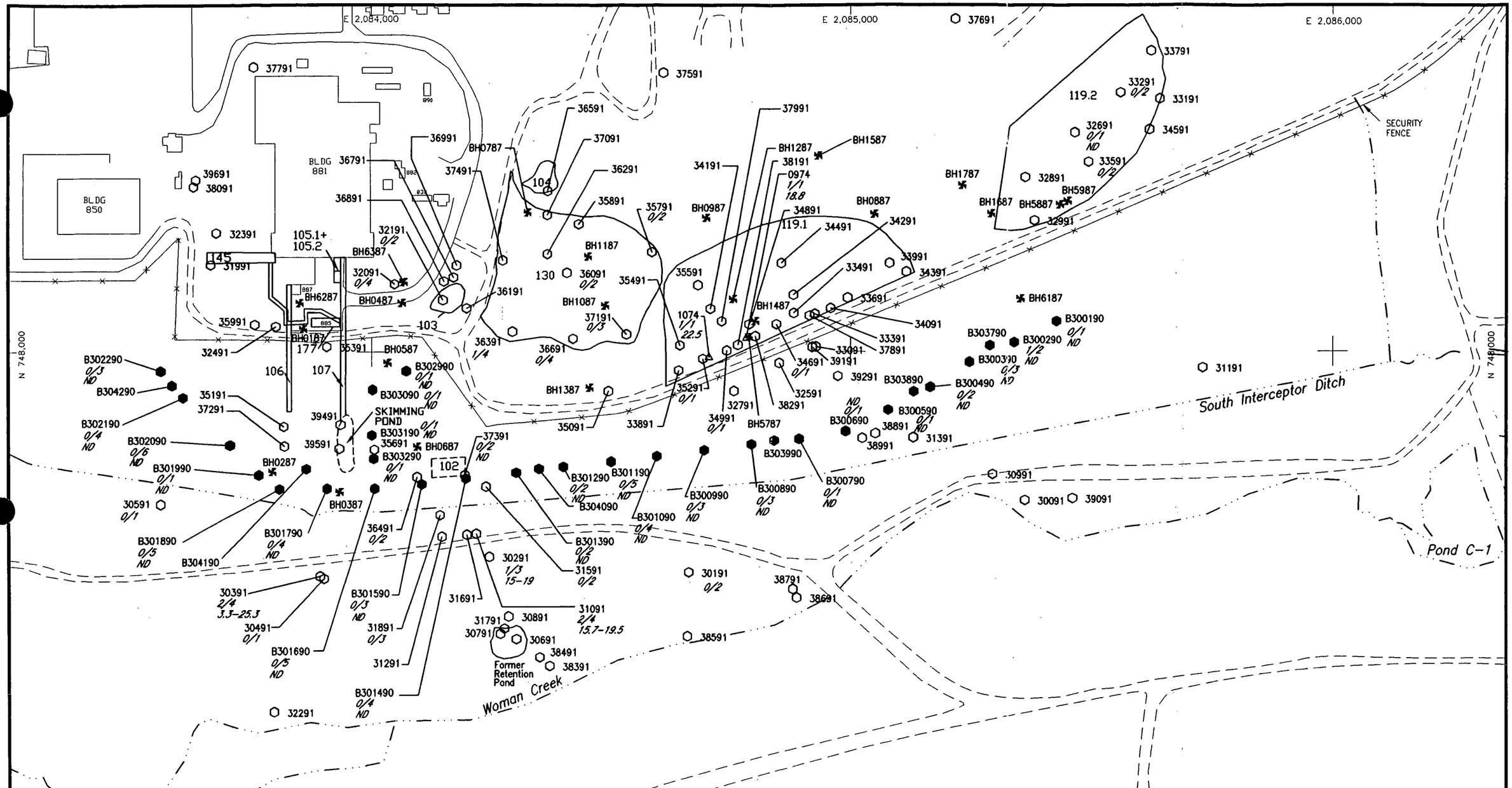
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Lead Concentrations in Surface Water

Figure D-75

AUGUST 1993

R74188.CWMB090293/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) DASHED WHERE DISTURBED DURING CONSTRUCTION OF FRENCH DRAIN

BACKGROUND UPPER TOLERANCE LIMIT: units are µg/kg — 18.5

BH0887 — PHASE I/II BOREHOLES

30191 — PHASE III BOREHOLES

B300190 — FRENCH DRAIN BOREHOLE

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS

290000 — MINIMUM

340000 — MAXIMUM

* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200

SCALE: 1" = 200'

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant, Golden, Colorado

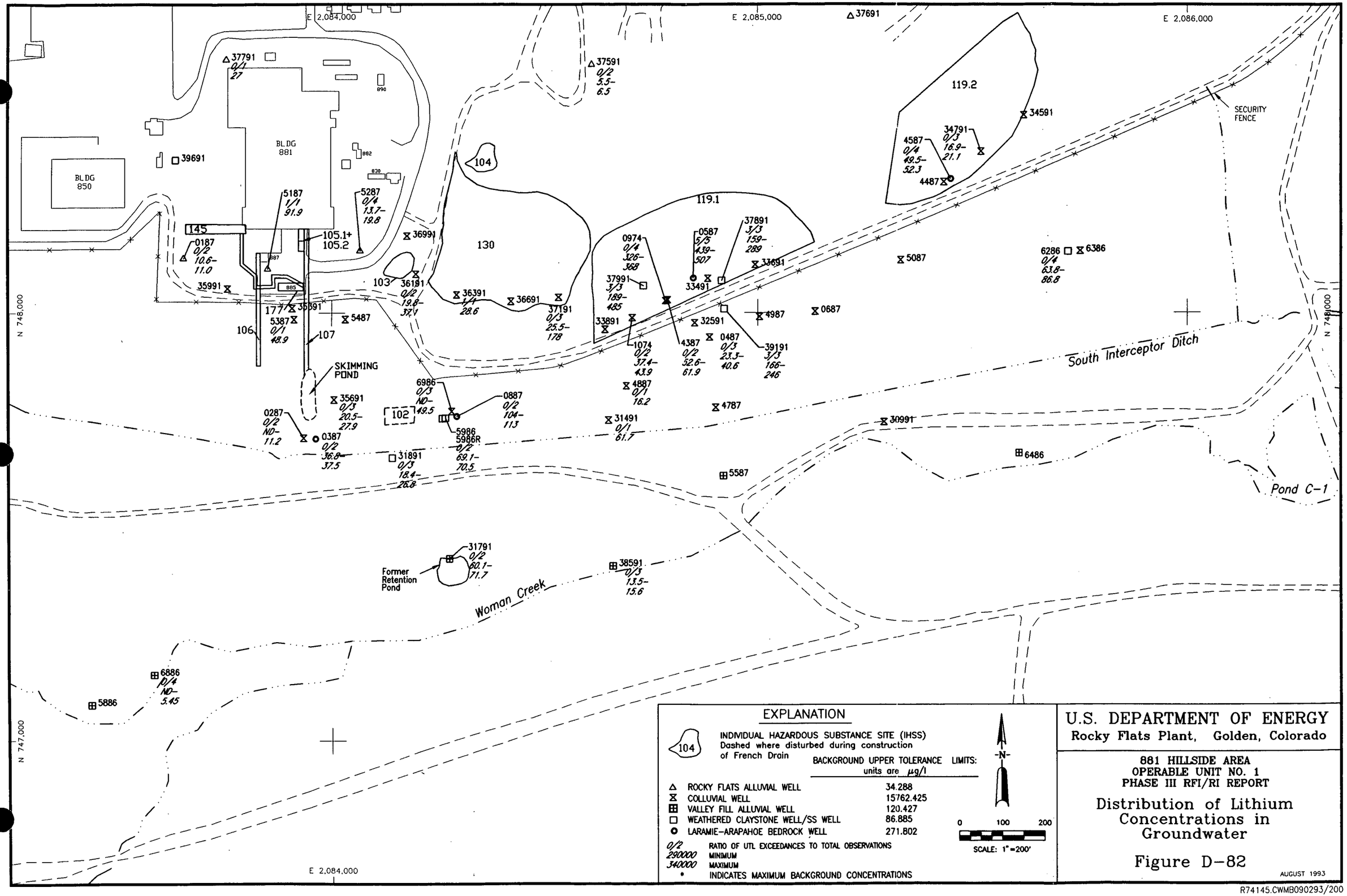
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Lithium Concentrations in Geologic Materials

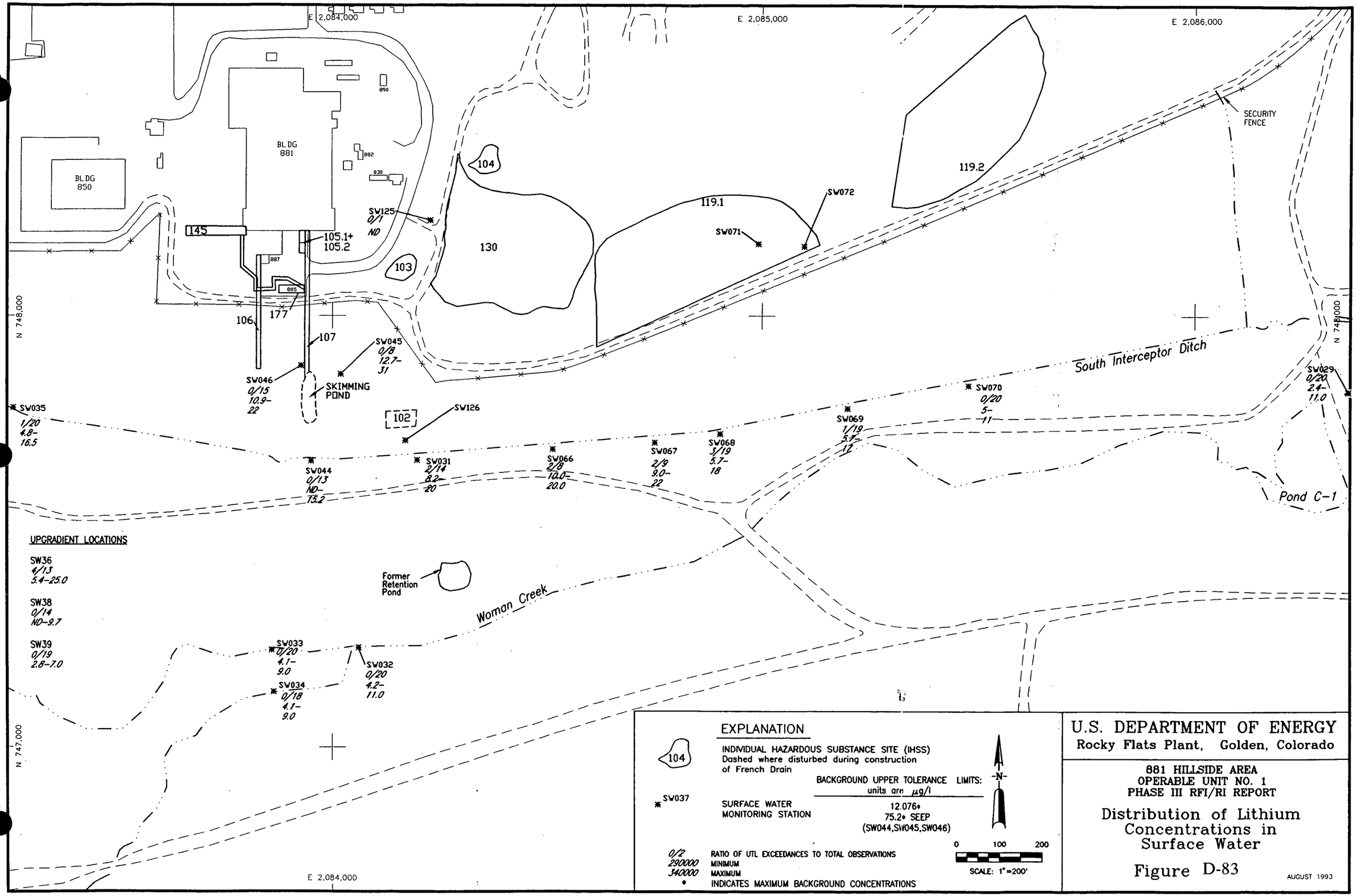
Figure D-81

AUGUST 1993

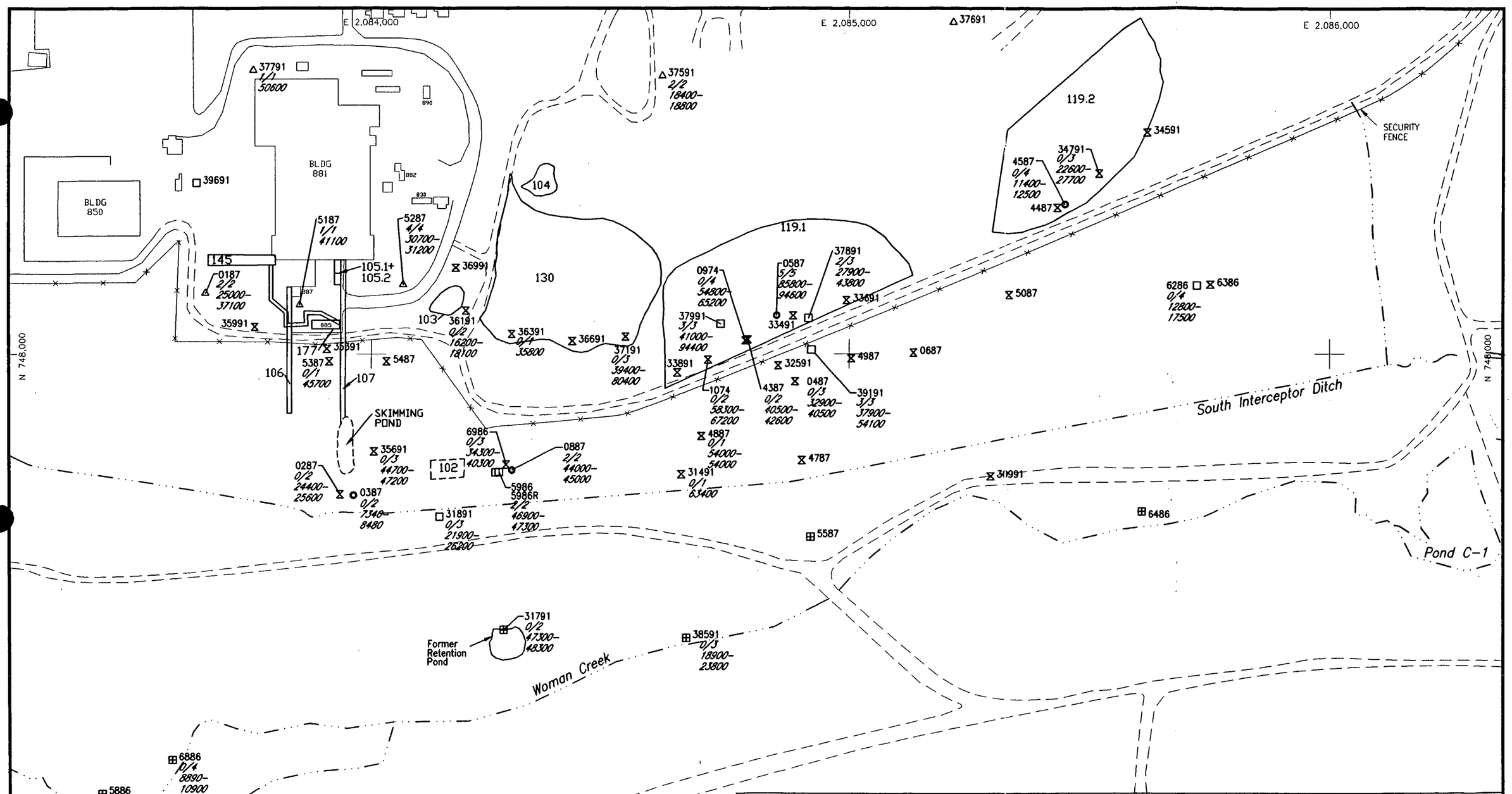
R74214.MB090293/200



R74145.CWMB090293/200



R74183.CWMB083093/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are: µg/l
△ ROCKY FLATS ALLUVIAL WELL	11567.976
⧗ COLLUVIAL WELL	115184.880
⊞ VALLEY FILL ALLUVIAL WELL	56291.142
□ WEATHERED CLAYSTONE WELL/SS WELL	32173.857
○ LARAMIE-ARAPAHOE BEDROCK WELL	26784.488

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 — MINIMUM
340000 — MAXIMUM
• — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" = 200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

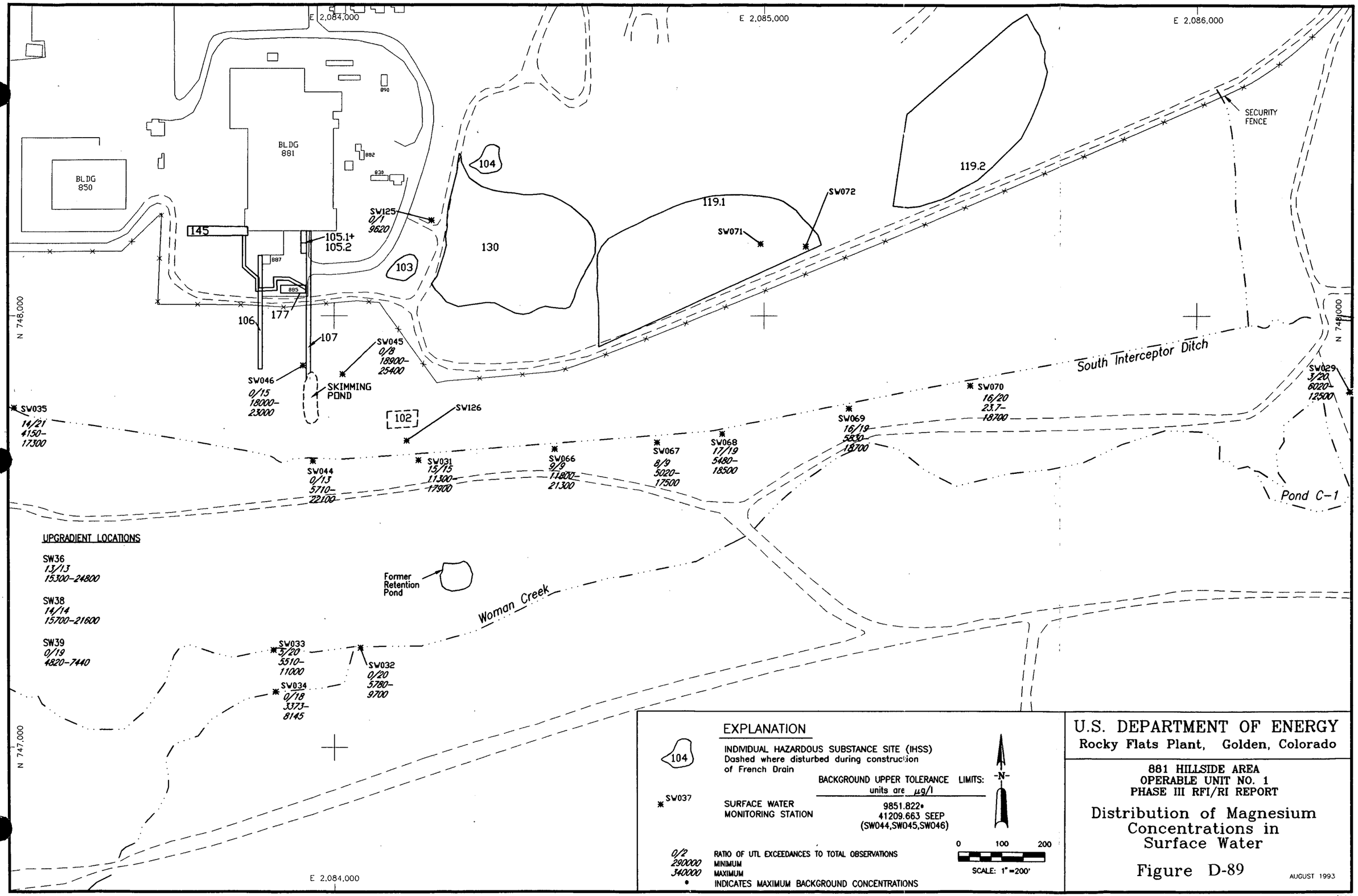
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Magnesium Concentrations in Groundwater

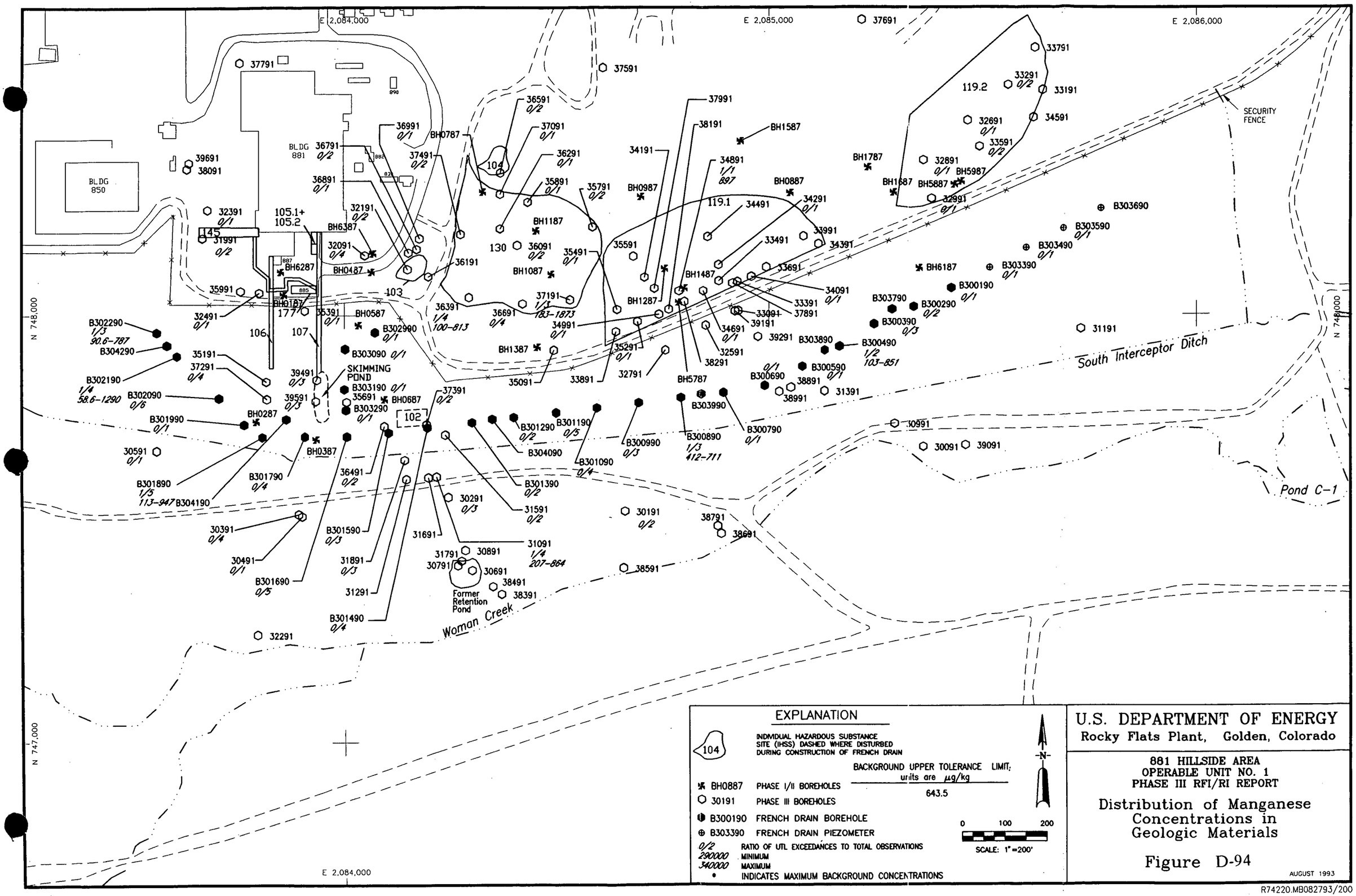
Figure D-88

AUGUST 1993

R74146.CWMB083093/200



R74182.CWMB083093/200



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

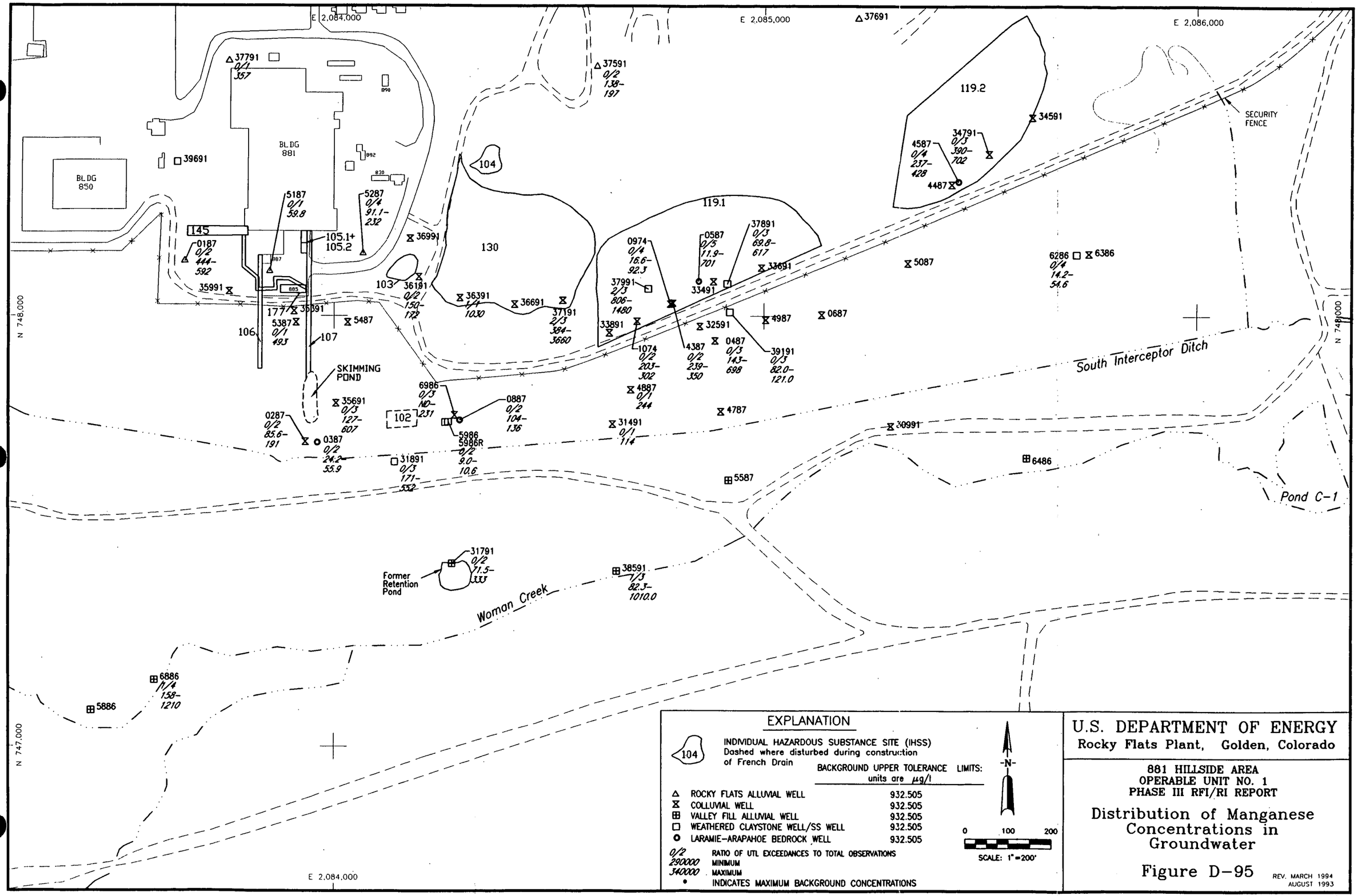
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Manganese Concentrations in Geologic Materials

Figure D-94

AUGUST 1993

R74220.MB082793/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are µg/l
△ ROCKY FLATS ALLUVIAL WELL	932.505
⧖ COLLUVIAL WELL	932.505
⊞ VALLEY FILL ALLUVIAL WELL	932.505
□ WEATHERED CLAYSTONE WELL/SS WELL	932.505
○ LARAMIE-ARAPAHOE BEDROCK WELL	932.505

0/2 RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 MINIMUM
340000 MAXIMUM
• INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" = 200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

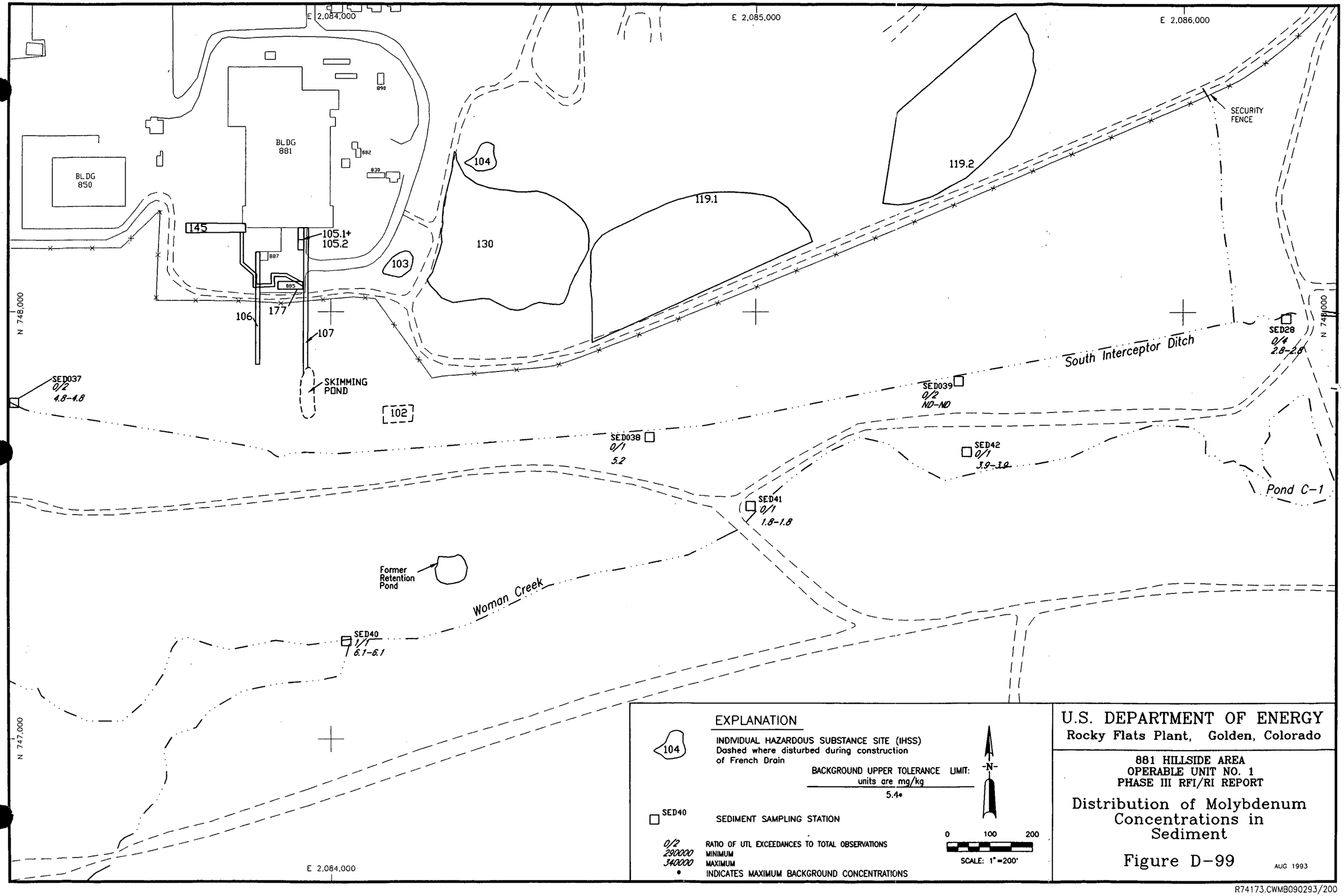
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Manganese Concentrations in Groundwater

Figure D-95

REV. MARCH 1994
AUGUST 1993

R74147.CWMB030494/200



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

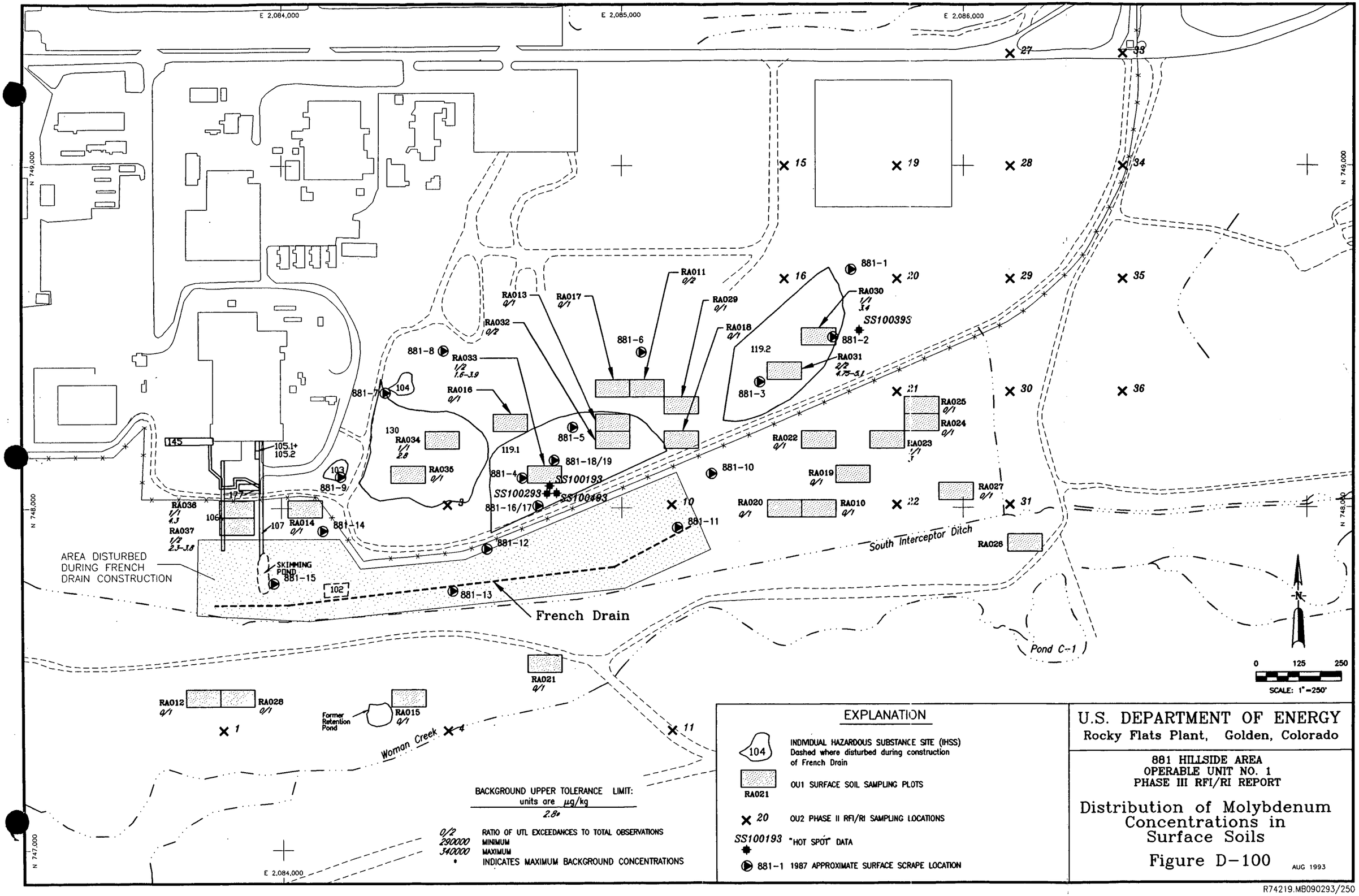
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Molybdenum Concentrations in Sediment

Figure D-99

AUG 1993

R74173.CWMB090293/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain

RA021 — OU1 SURFACE SOIL SAMPLING PLOTS

× 20 — OU2 PHASE II RFI/RI SAMPLING LOCATIONS

SS100193 — "HOT SPOT" DATA

881-1 — 1987 APPROXIMATE SURFACE SCRAPE LOCATION

BACKGROUND UPPER TOLERANCE LIMIT:
units are µg/kg
2.8*

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 — MINIMUM
340000 — MAXIMUM
* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

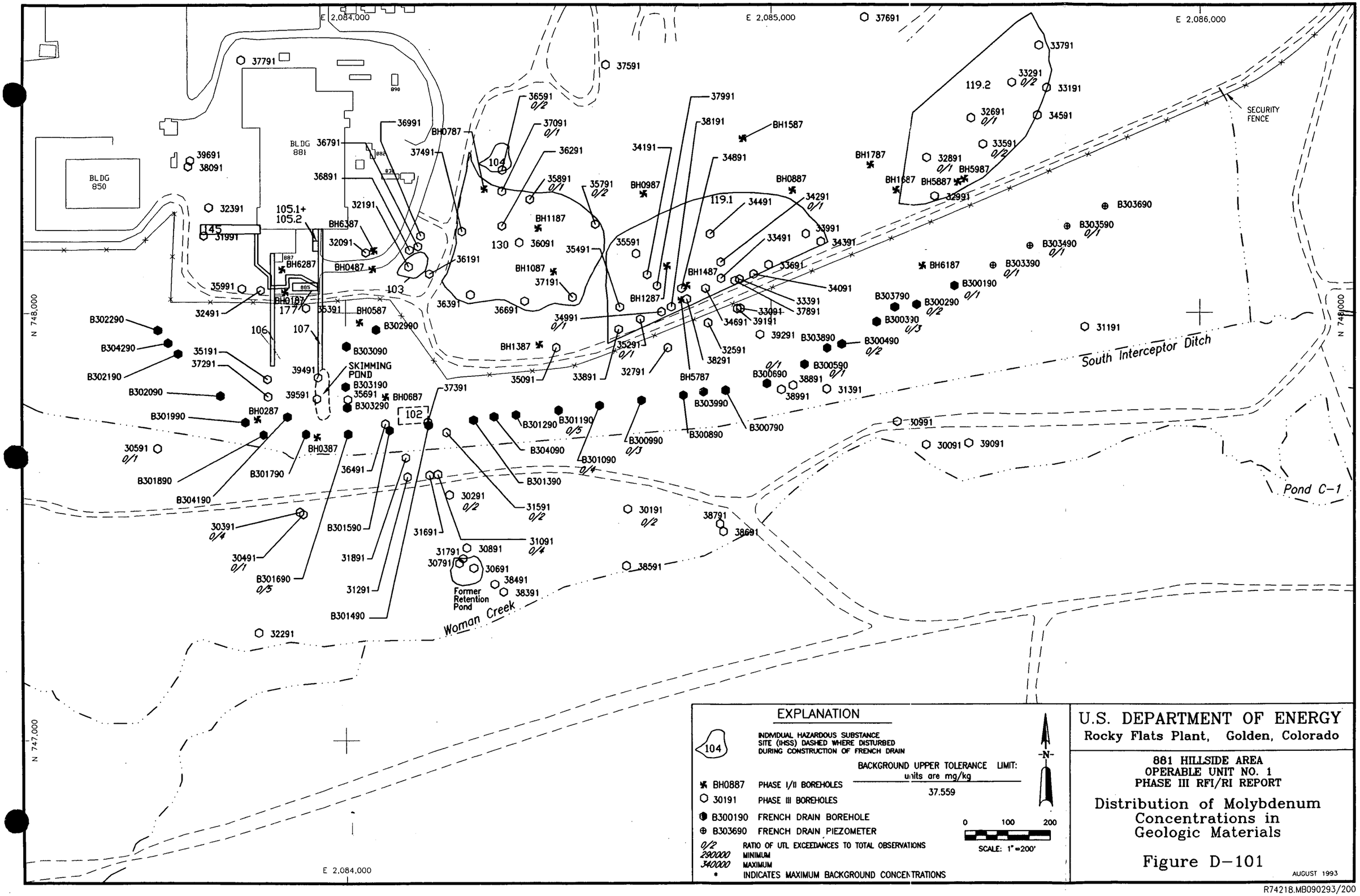
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Molybdenum Concentrations in Surface Soils

Figure D-100

AUG 1993

R74219.MB090293/250



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

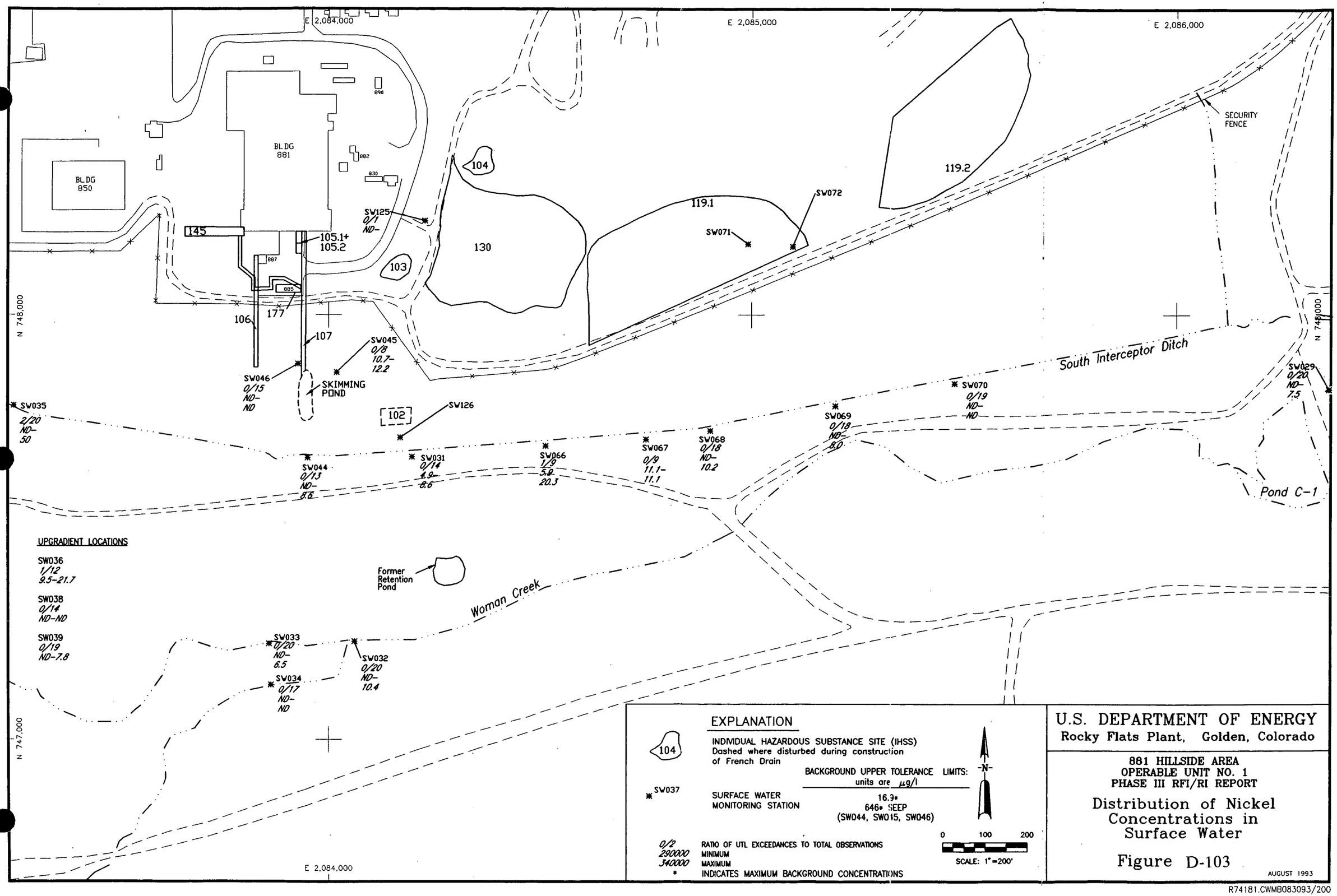
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Molybdenum Concentrations in Geologic Materials

Figure D-101

AUGUST 1993

R74218.MB090293/200



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

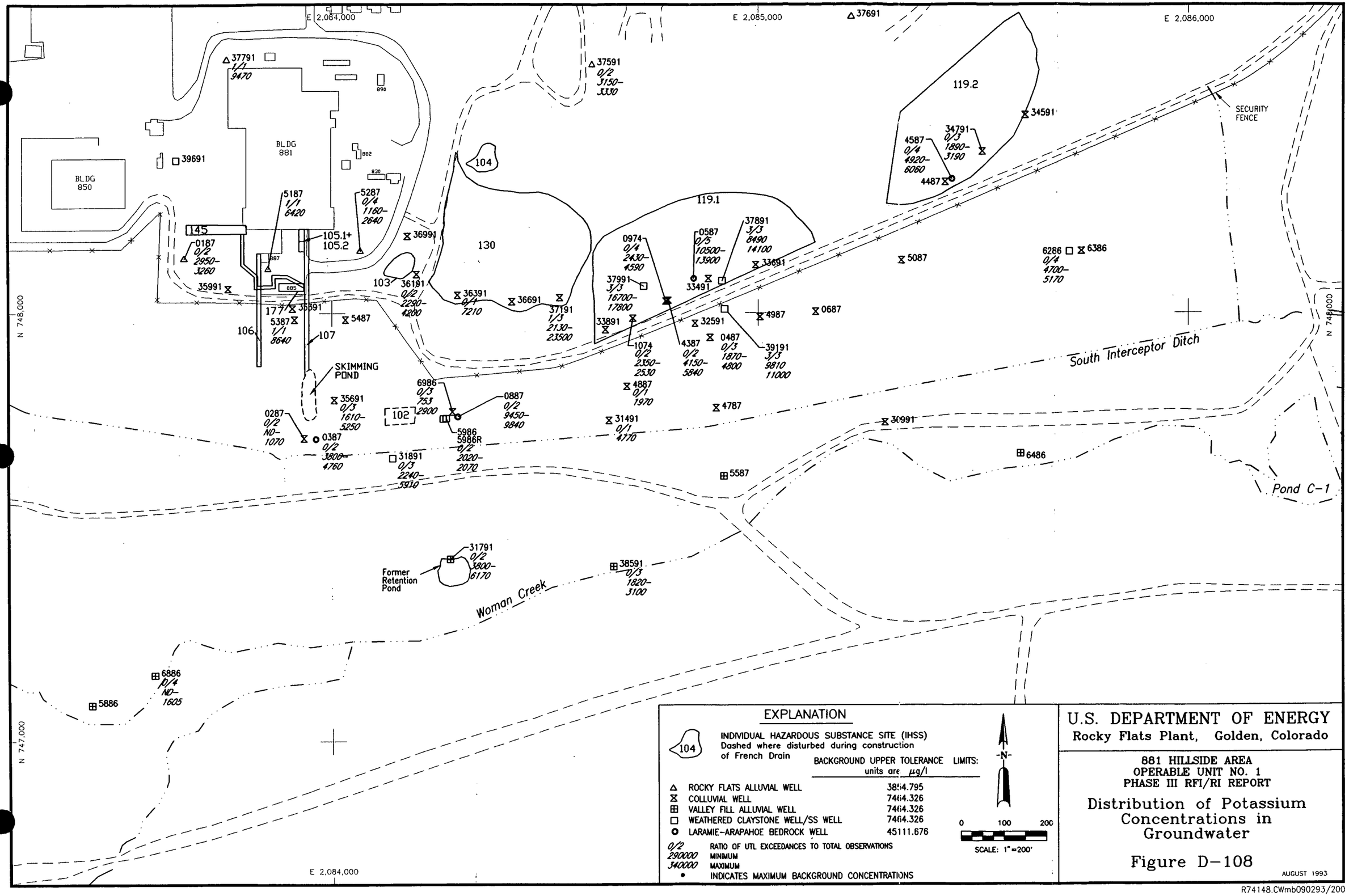
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Nickel Concentrations in Surface Water

Figure D-103

AUGUST 1993

R74181.CWMB083093/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are µg/l
△ ROCKY FLATS ALLUVIAL WELL	3854.795
⧖ COLLUVIAL WELL	7464.326
⊞ VALLEY FILL ALLUVIAL WELL	7464.326
□ WEATHERED CLAYSTONE WELL/SS WELL	7464.326
○ LARAMIE-ARAPAHOE BEDROCK WELL	45111.676

0/2 RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 MINIMUM
340000 MAXIMUM
• INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1"=200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

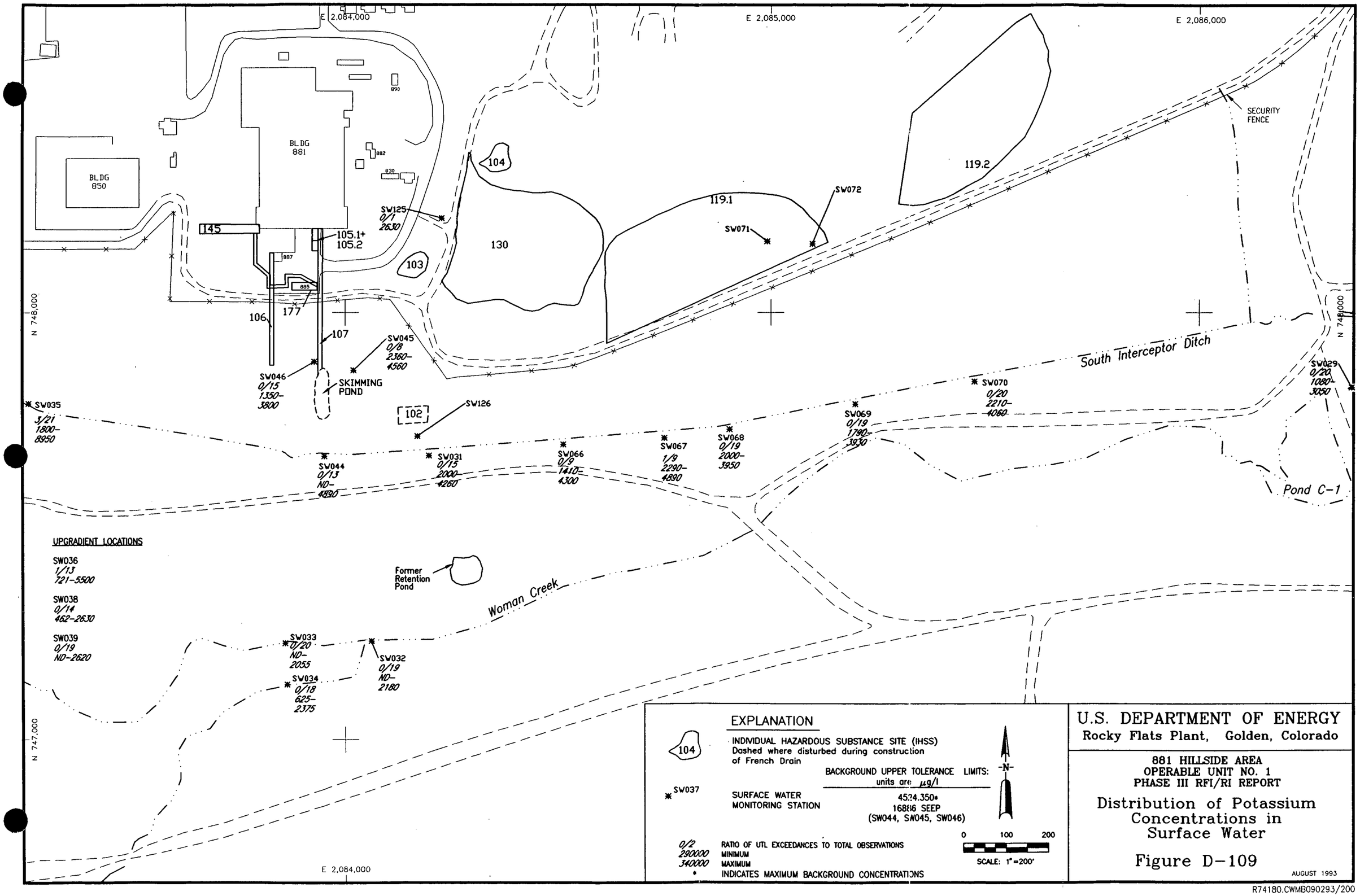
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Potassium Concentrations in Groundwater

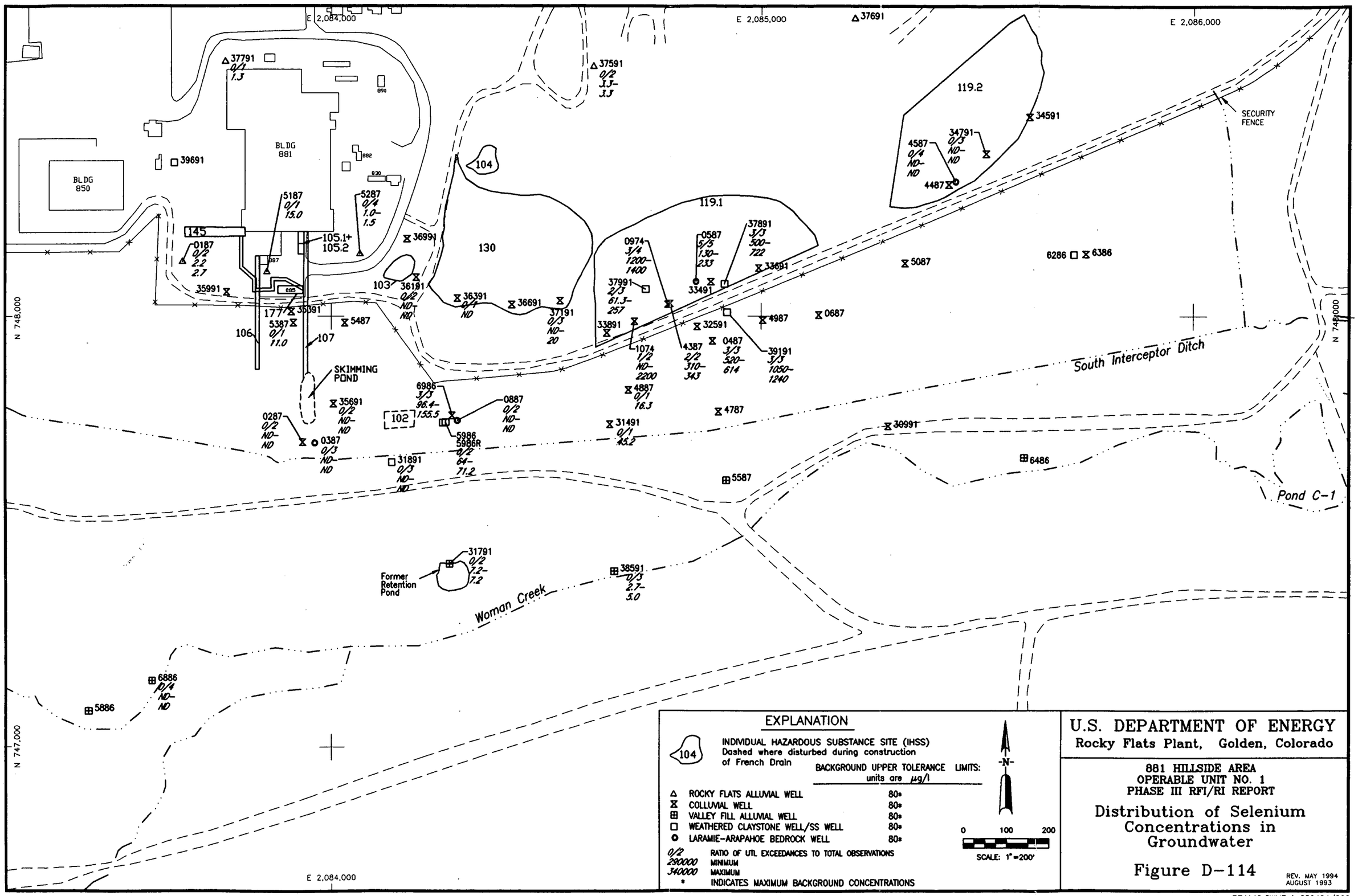
Figure D-108

AUGUST 1993

R74148.CWmb090293/200



R74180.CWMB090293/200



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

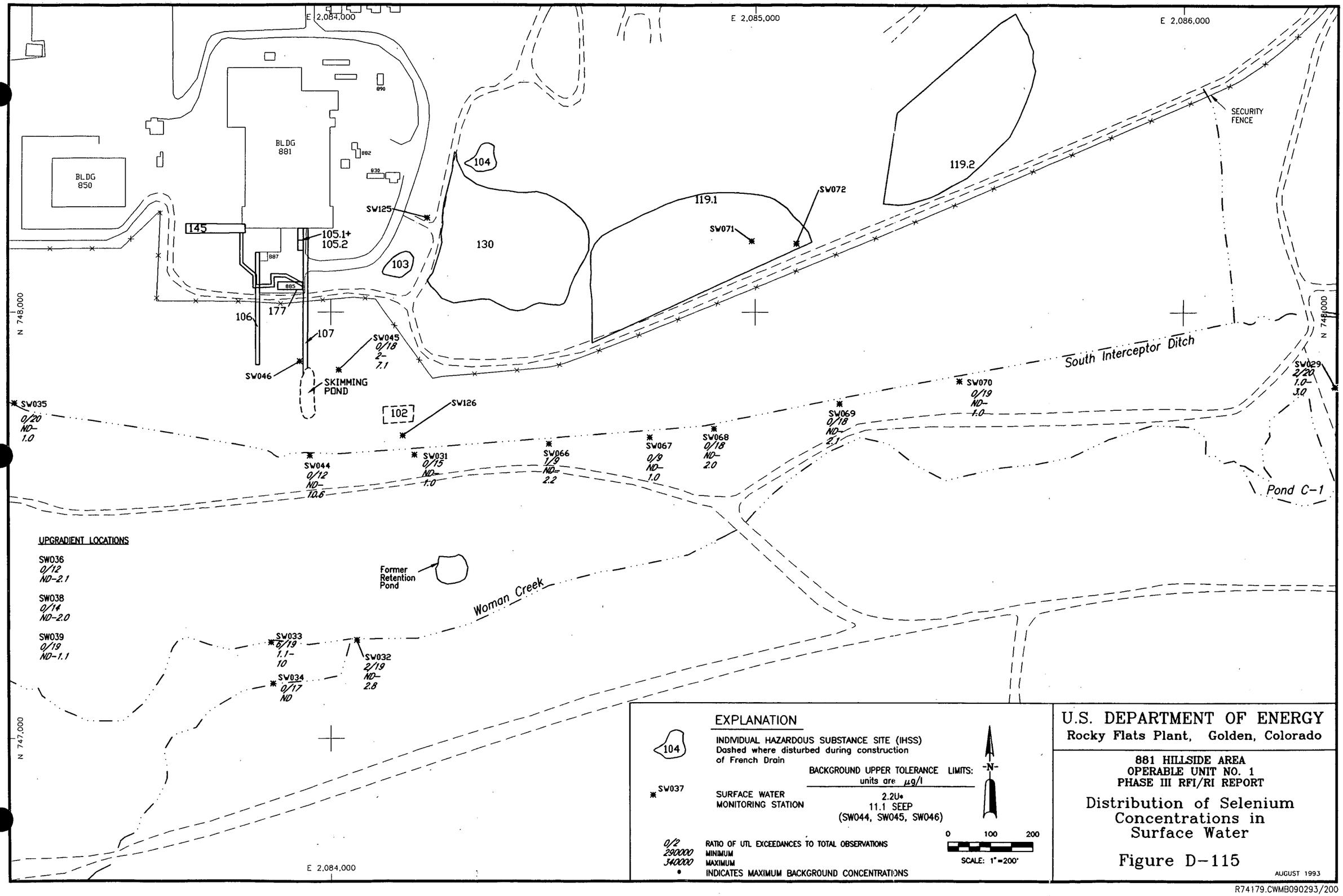
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Selenium Concentrations in Groundwater

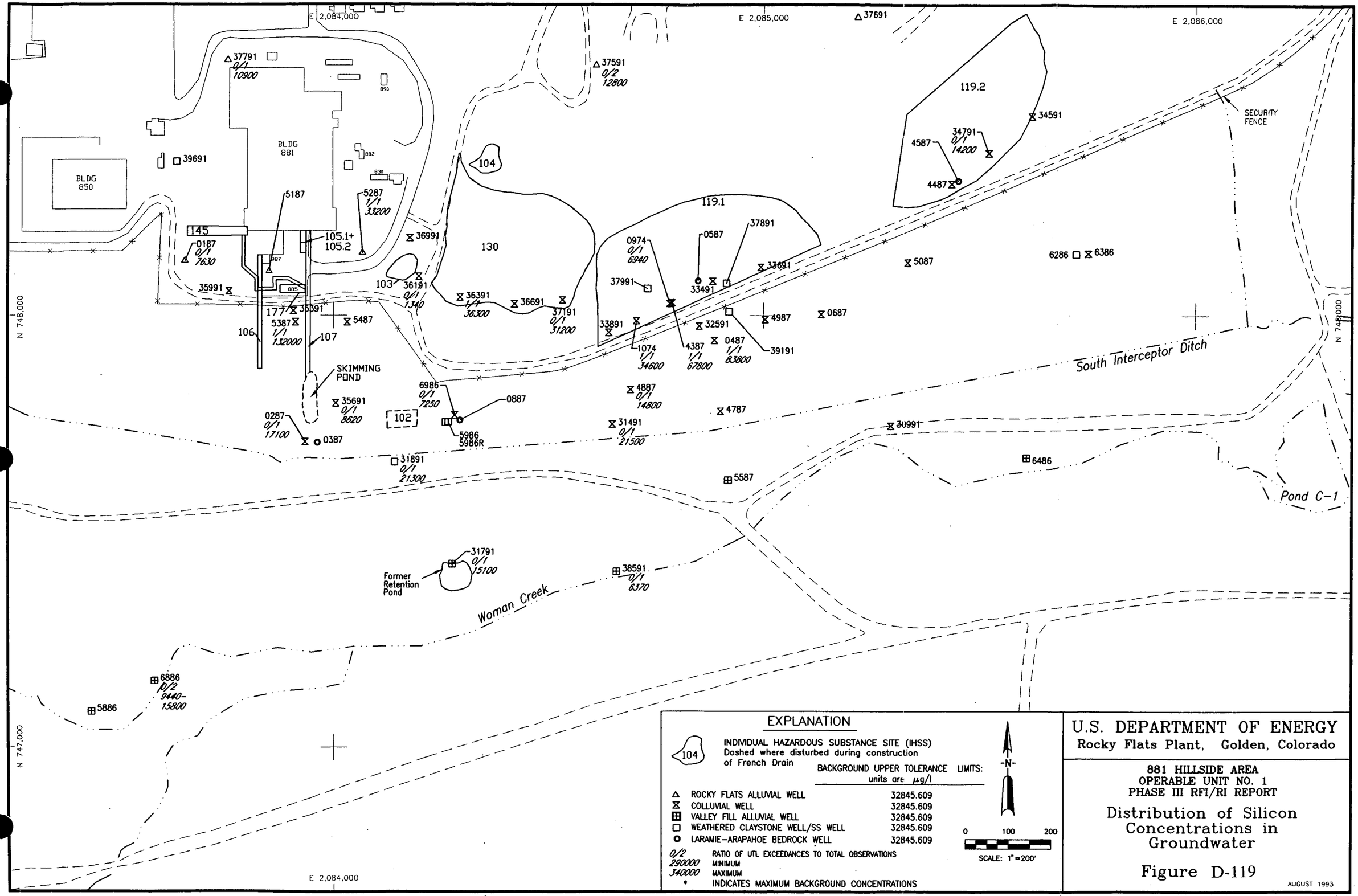
Figure D-114

REV. MAY 1994
AUGUST 1993

R74149.CWMBpj-052494/200



R74179.CWMB090293/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are µg/l
△ ROCKY FLATS ALLUVIAL WELL	32845.609
⧖ COLLUVIAL WELL	32845.609
⊞ VALLEY FILL ALLUVIAL WELL	32845.609
□ WEATHERED CLAYSTONE WELL/SS WELL	32845.609
○ LARAMIE-ARAPAHOE BEDROCK WELL	32845.609

0/2 RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 MINIMUM
340000 MAXIMUM
* INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" = 200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

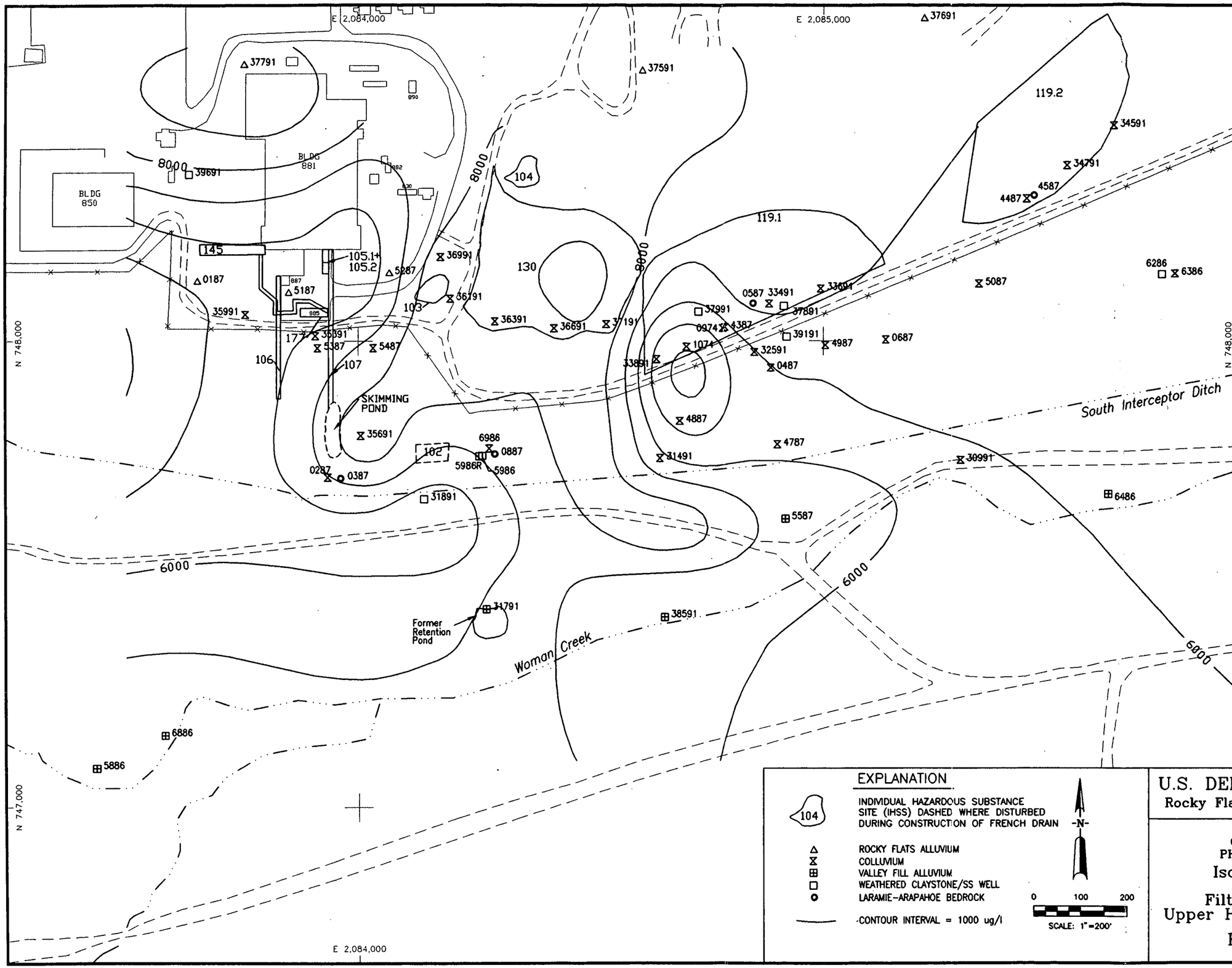
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Silicon Concentrations in Groundwater

Figure D-119

AUGUST 1993

R74150.CW-082093/200



Filtered Silicon

Well	Mean Concentration (ug/l)
0187	5130
0287	6630
0487	5975
0587	7125
0974	6267
1074	4070
31491	7750
31791	7070
31891	5890
34791	6750
35691	8370
36191	8750
36391	9030
37191	8620
37591	8100
37791	9070
37891	8390
37991	9870
38591	6310
39191	6030
4387	6630
4587	9310
4887	3070
5287	6433
6286	7140
6386	6690
6886	7715

EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) DASHED WHERE DISTURBED DURING CONSTRUCTION OF FRENCH DRAIN

△ ROCKY FLATS ALLUVIUM

⧖ COLLUVIUM

⊞ VALLEY FILL ALLUVIUM

□ WEATHERED CLAYSTONE/SS WELL

○ LARAMIE-ARAPAHOE BEDROCK

—— CONTOUR INTERVAL = 1000 ug/l

-N-

0 100 200

SCALE: 1"=200'

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant, Golden, Colorado

881 HILLSIDE AREA
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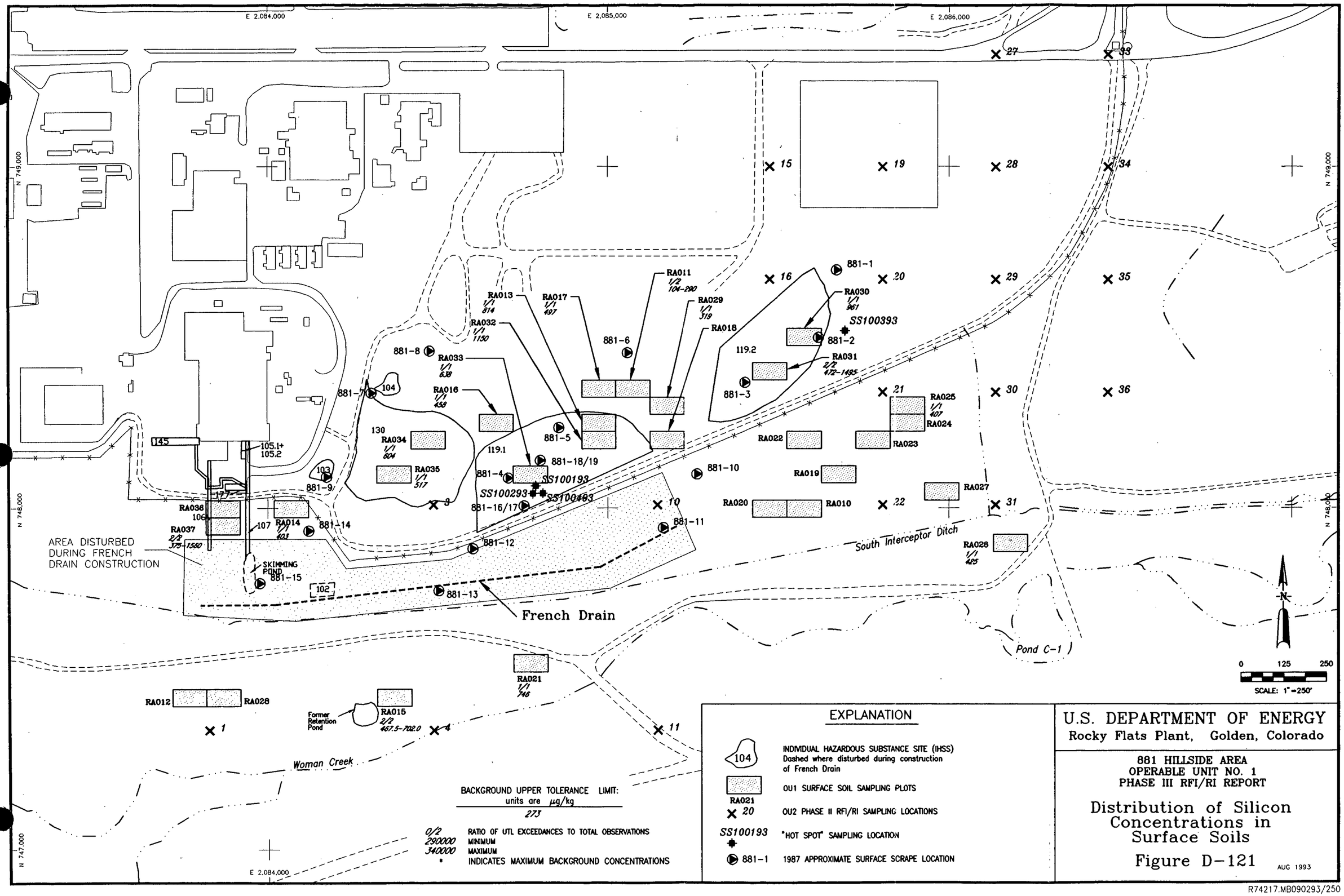
Isopleths of Silicon Concentrations
Filtered Groundwater
Upper Hydrostratigraphic Unit

Figure D-120

AUGUST 1993

R74160.CWMBpj-052594/200



EXPLANATION

104	INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain
RA021	OU1 SURFACE SOIL SAMPLING PLOTS
20	OU2 PHASE II RFI/RI SAMPLING LOCATIONS
SS100193	"HOT SPOT" SAMPLING LOCATION
881-1	1987 APPROXIMATE SURFACE SCRAPE LOCATION

BACKGROUND UPPER TOLERANCE LIMIT:
units are µg/kg
273

0/2	RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000	MINIMUM
340000	MAXIMUM
•	INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

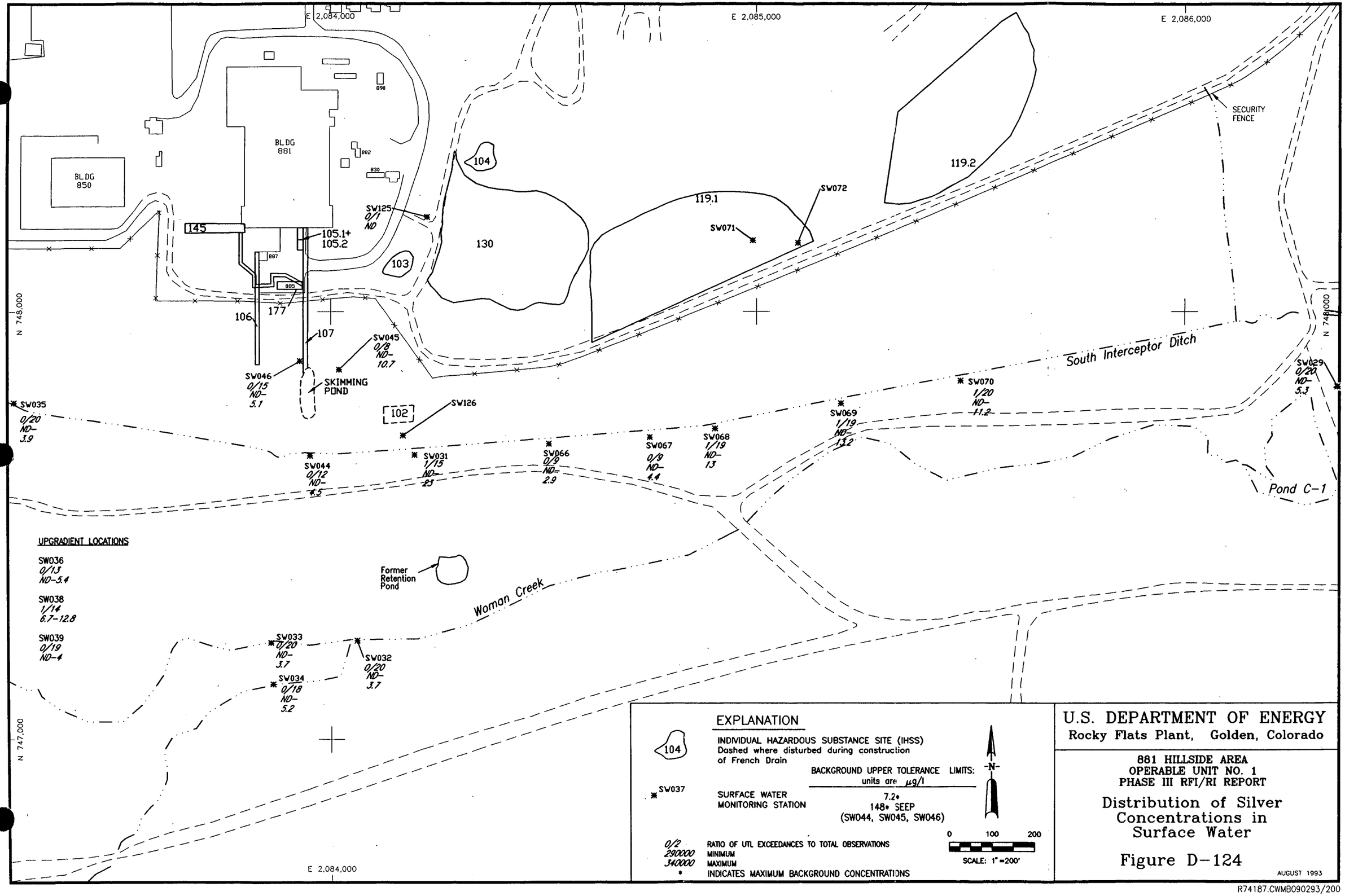
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Silicon Concentrations in Surface Soils

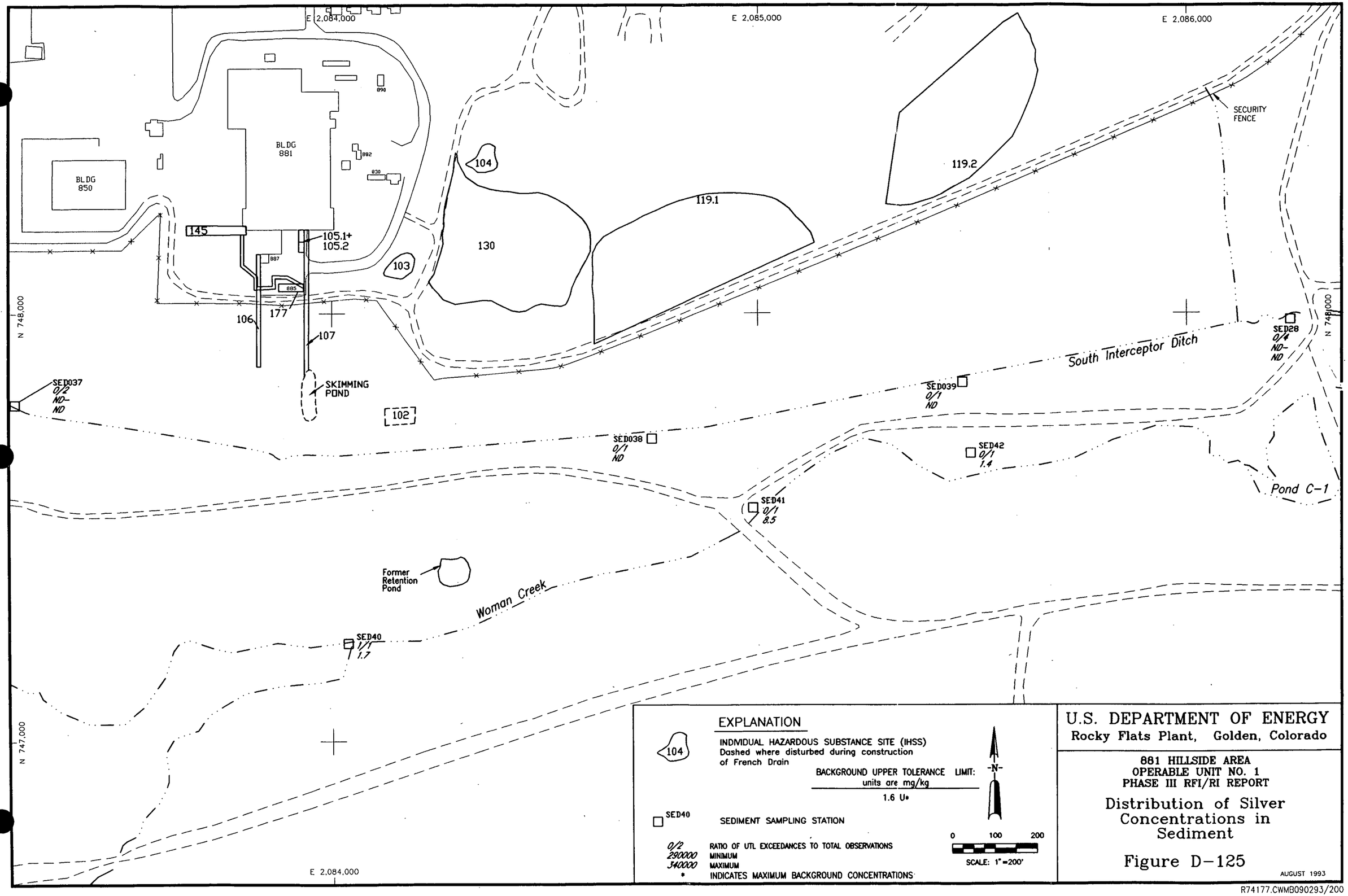
Figure D-121

AUG 1993

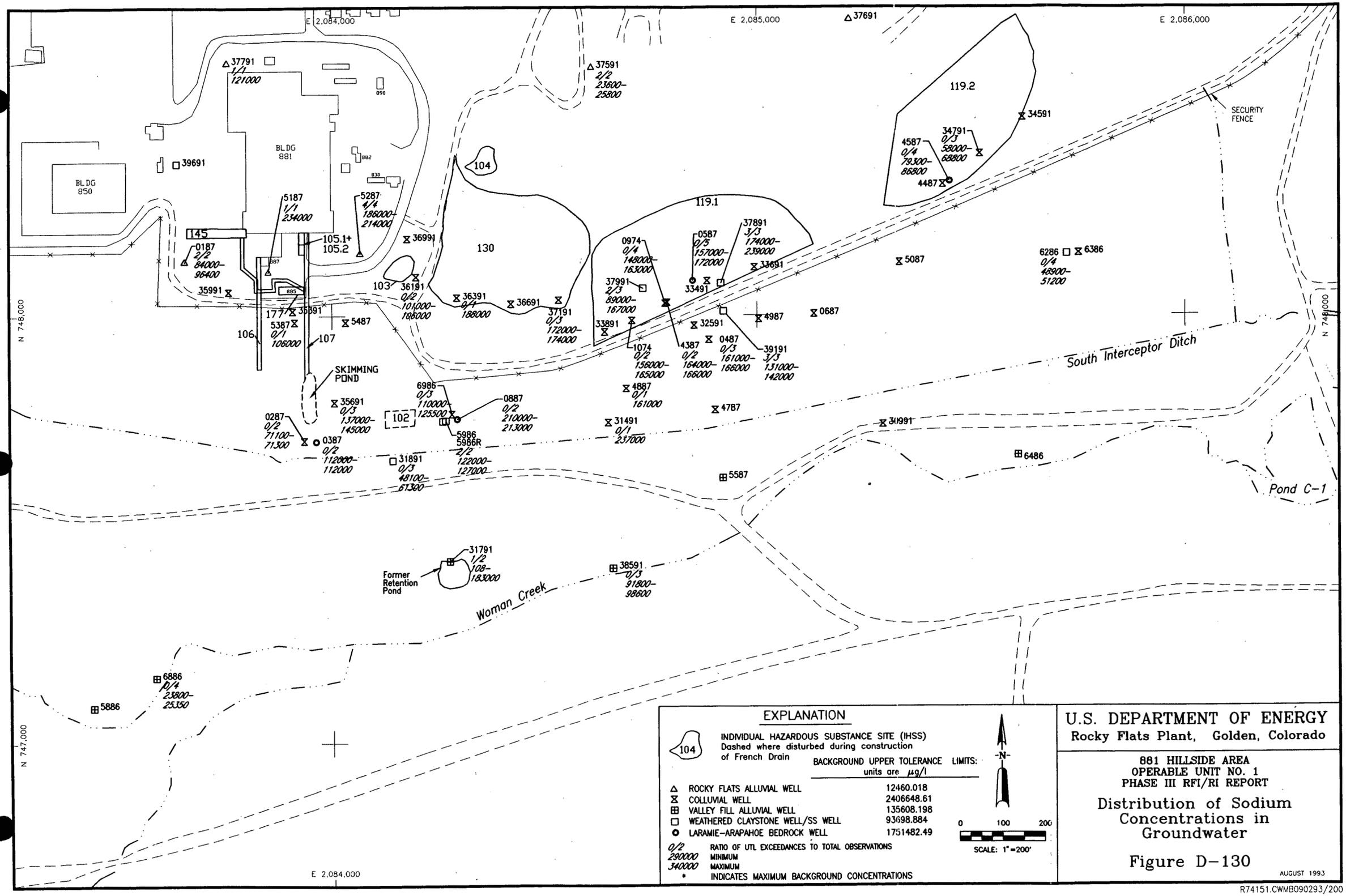
R74217.MB090293/250



R74187.CWMB090293/200



R74177.CWMB090293/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are µg/l
△ ROCKY FLATS ALLUVIAL WELL	12460.018
⧖ COLLUVIAL WELL	2406648.61
⊞ VALLEY FILL ALLUVIAL WELL	135608.198
□ WEATHERED CLAYSTONE WELL/SS WELL	93698.884
○ LARAMIE-ARAPAHOE BEDROCK WELL	1751482.49

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 — MINIMUM
340000 — MAXIMUM
* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" = 200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

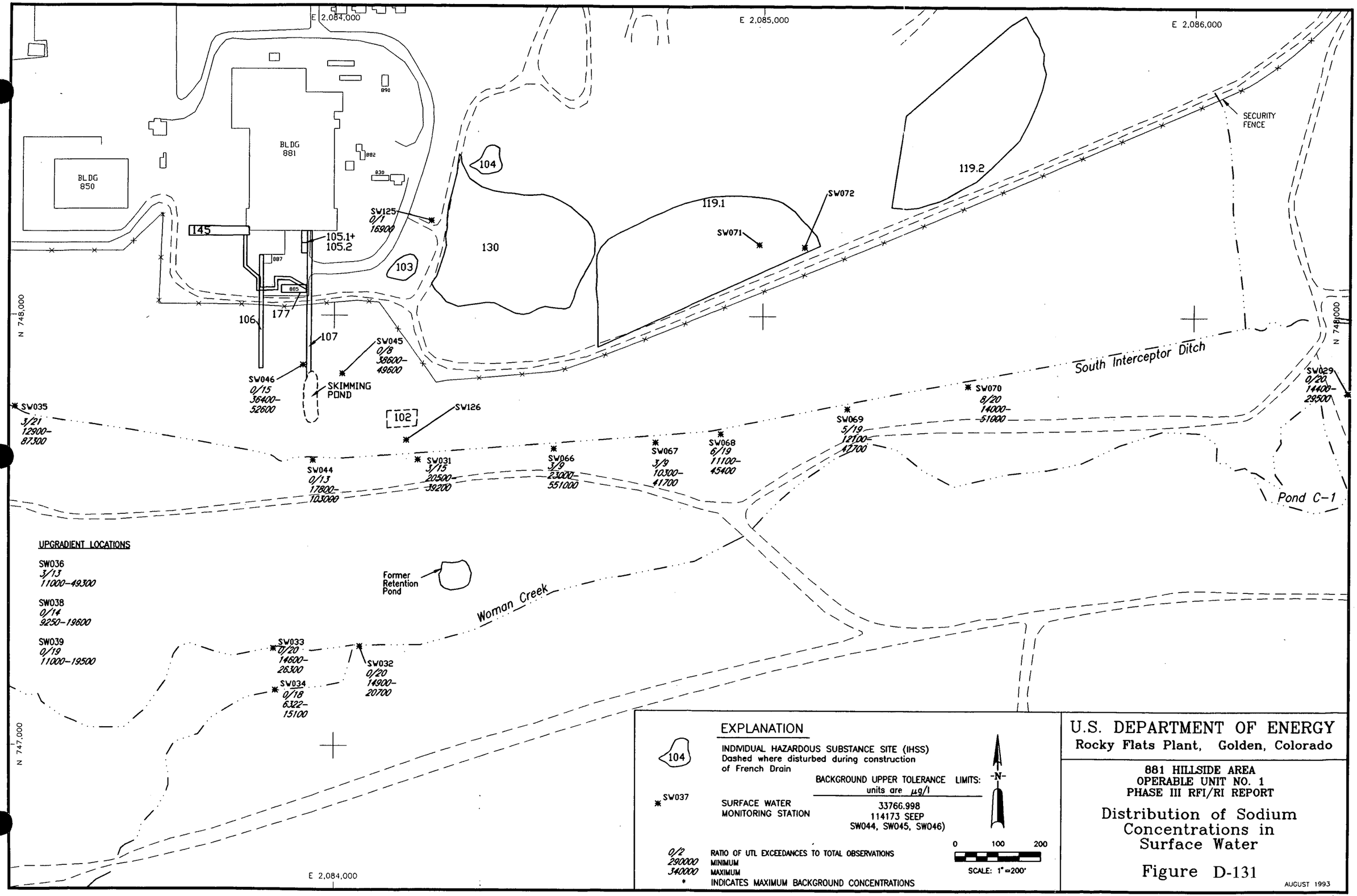
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Sodium Concentrations in Groundwater

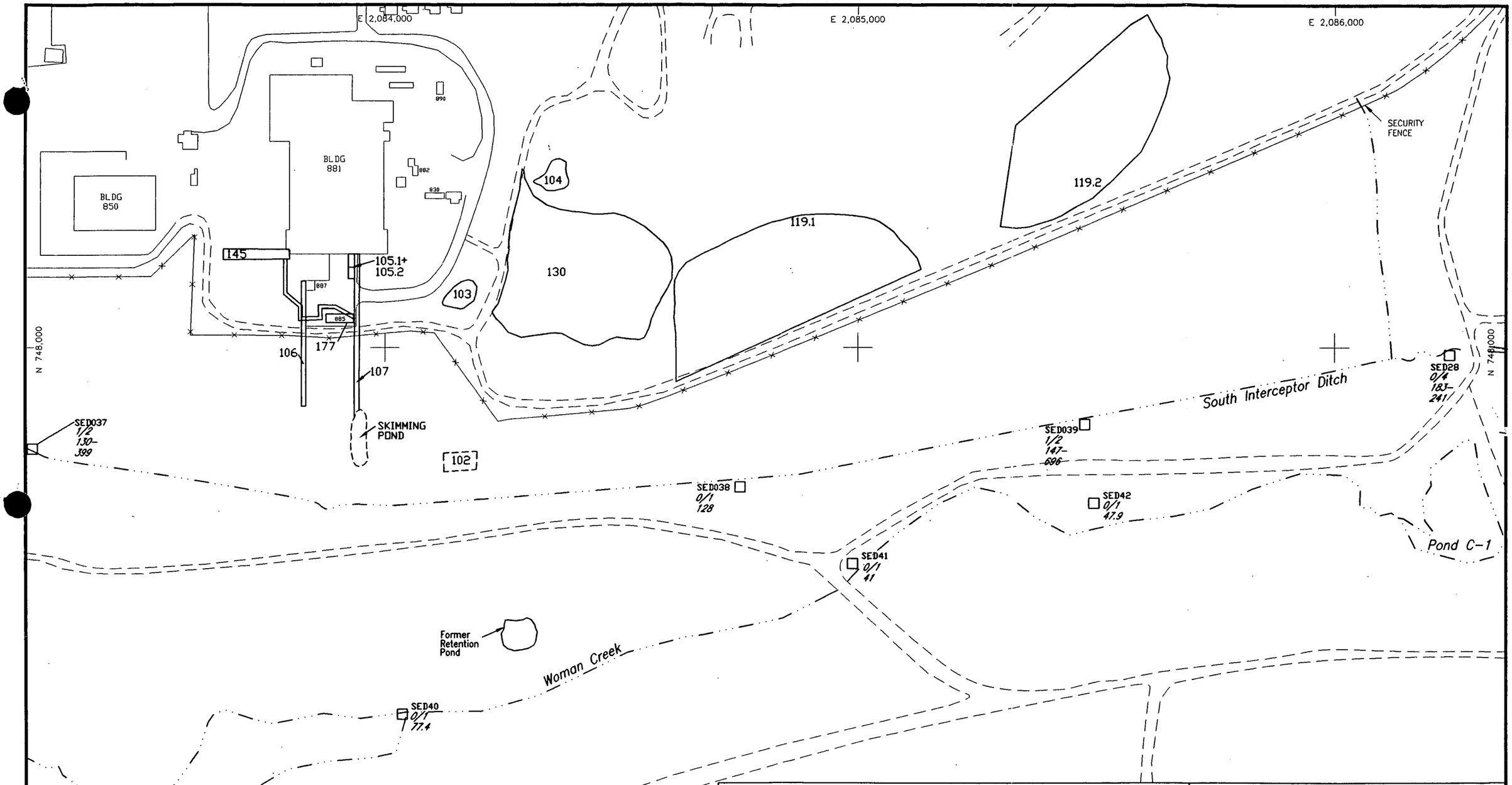
Figure D-130

AUGUST 1993

R74151.CWMB090293/200



R74186.CWMB083093/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

BACKGROUND UPPER TOLERANCE LIMIT: units are mg/kg
327.168*

SED40 — SEDIMENT SAMPLING STATION

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 — MINIMUM
340000 — MAXIMUM
* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1"=200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

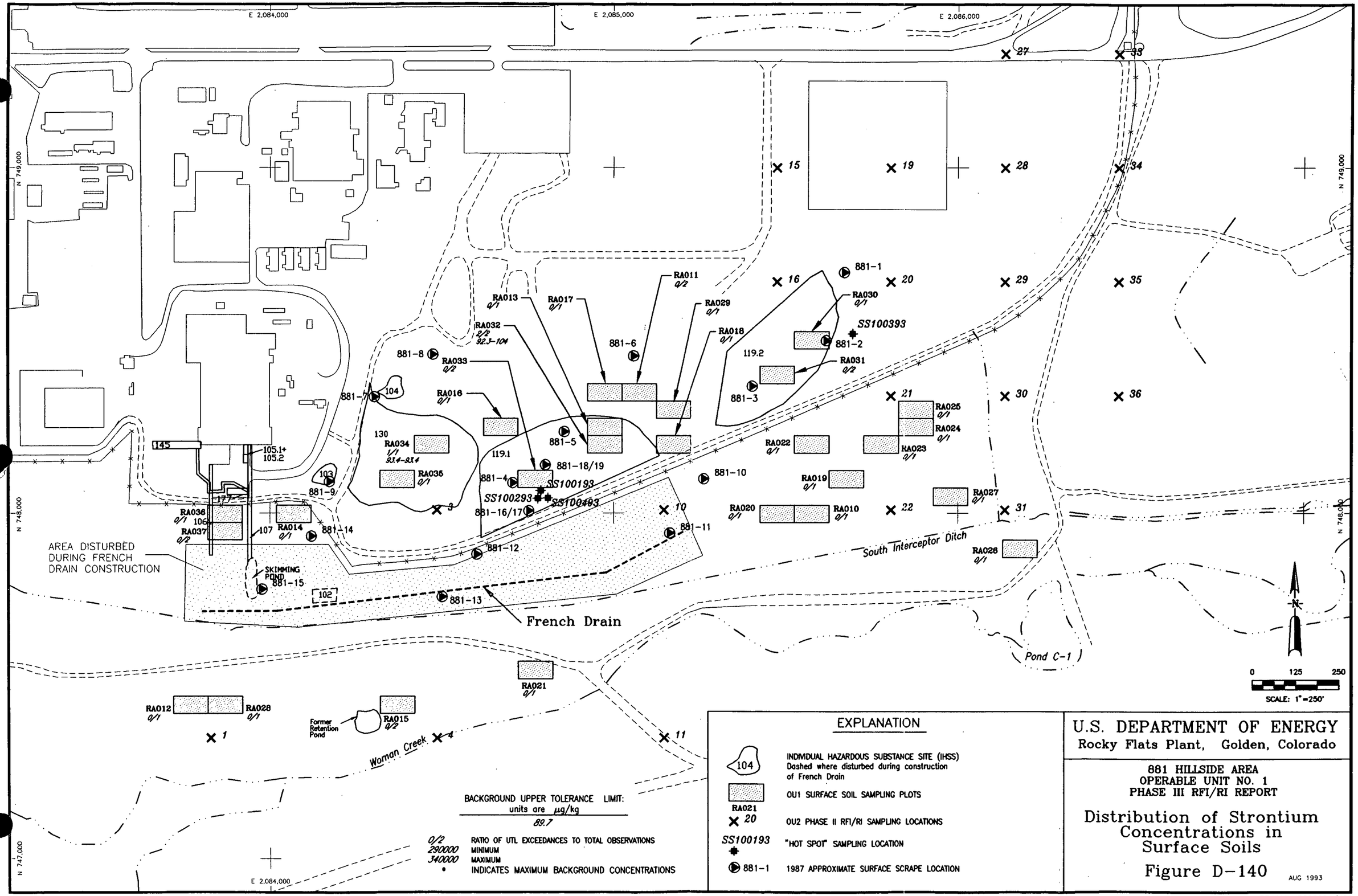
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Sodium Concentrations in Sediment

Figure D-132

AUGUST 1993

R74176.CWMB090293/200



EXPLANATION

104	INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain
RA021	OU1 SURFACE SOIL SAMPLING PLOTS
20	OU2 PHASE II RFI/RI SAMPLING LOCATIONS
SS100193	"HOT SPOT" SAMPLING LOCATION
881-1	1987 APPROXIMATE SURFACE SCRAPE LOCATION

BACKGROUND UPPER TOLERANCE LIMIT:
units are µg/kg
89.7

0/2	RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000	MINIMUM
340000	MAXIMUM
•	INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant, Golden, Colorado

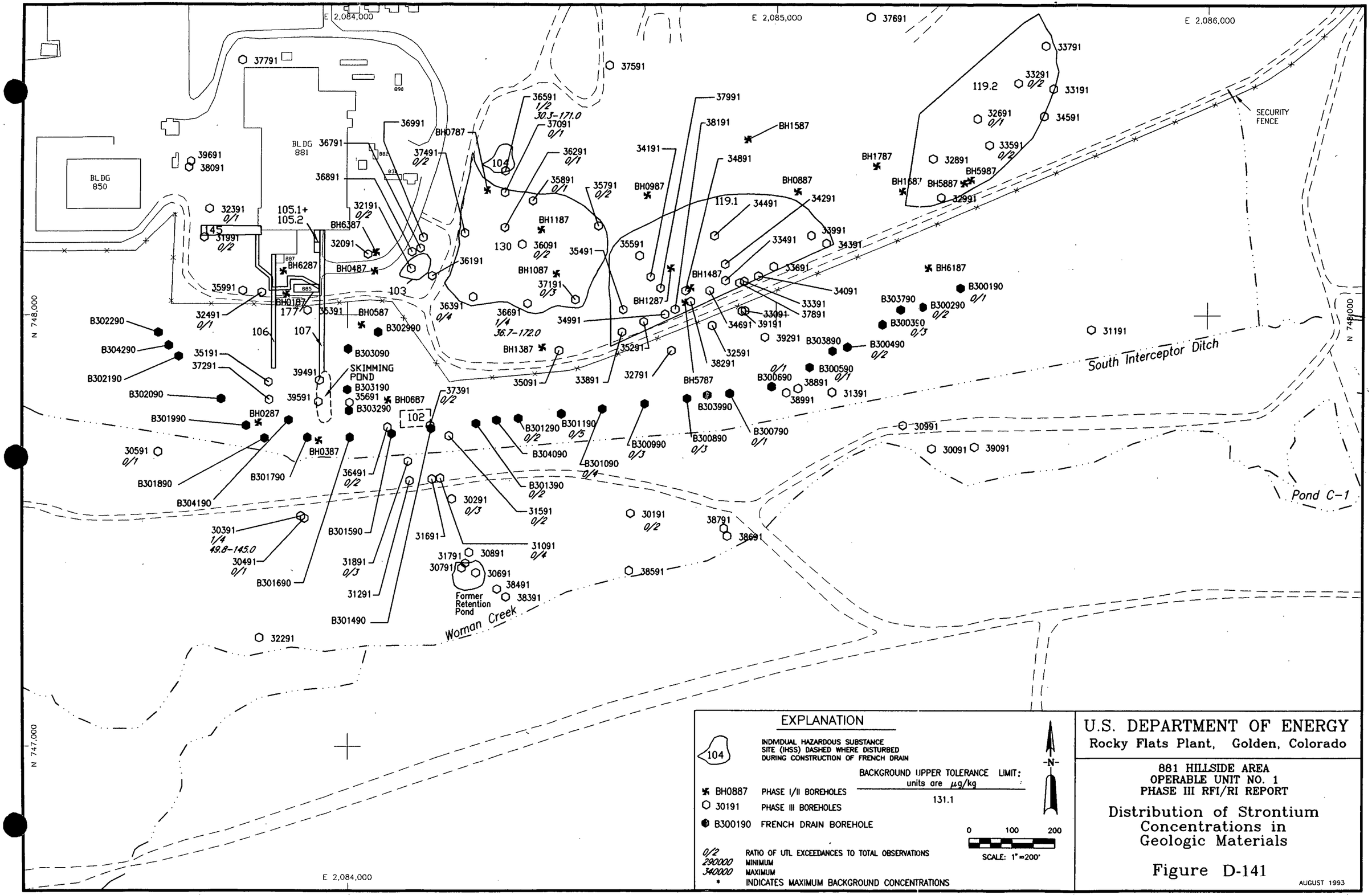
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Strontium Concentrations in Surface Soils

Figure D-140

AUG 1993

R74215.MB090293/250



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

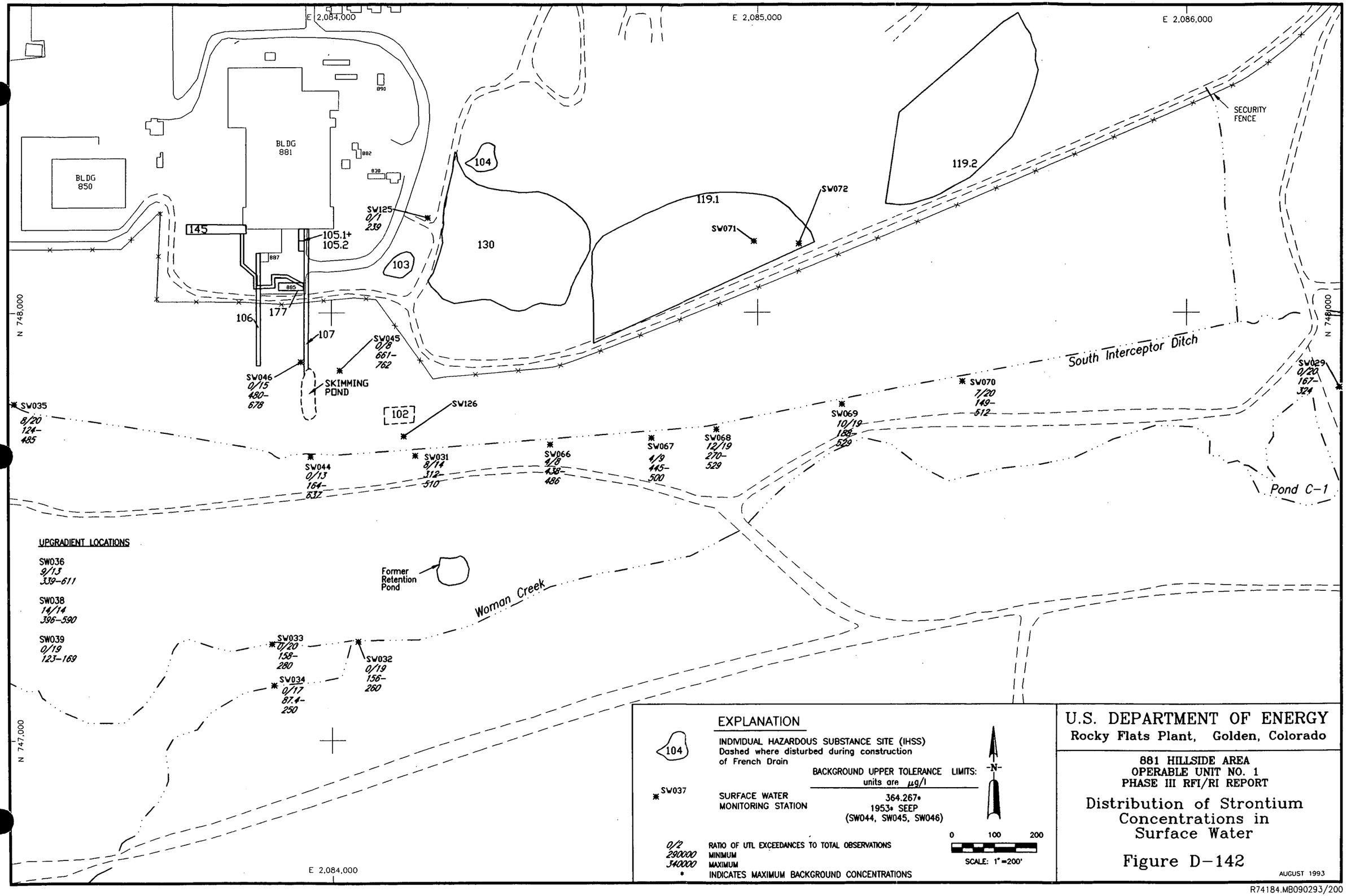
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Strontium Concentrations in Geologic Materials

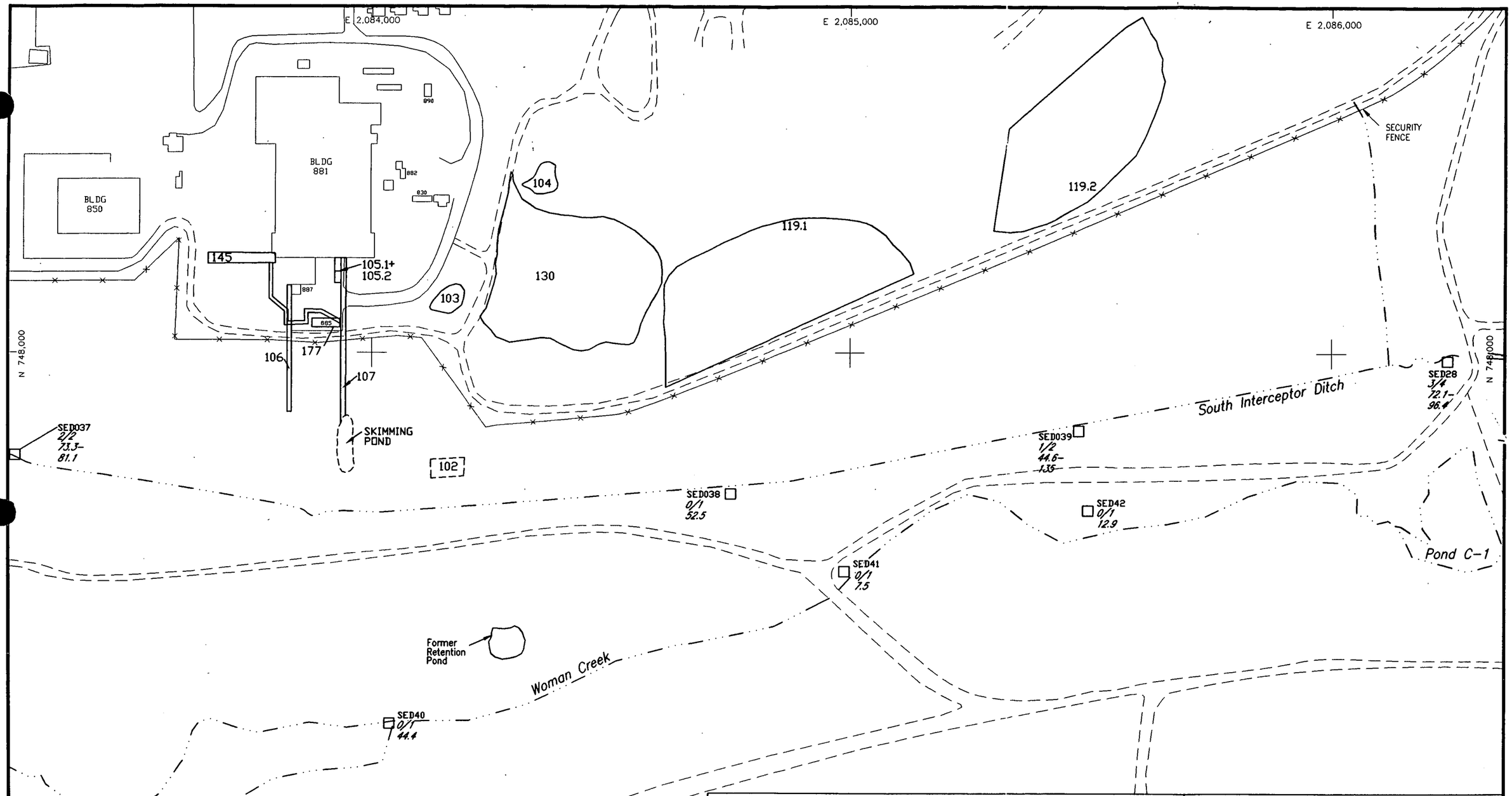
Figure D-141

AUGUST 1993

R74216.MB082693/200



R74184.MB090293/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

BACKGROUND UPPER TOLERANCE LIMIT: units are mg/kg
73.210*

SED40 — SEDIMENT SAMPLING STATION

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 — MINIMUM
340000 — MAXIMUM
* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" = 200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

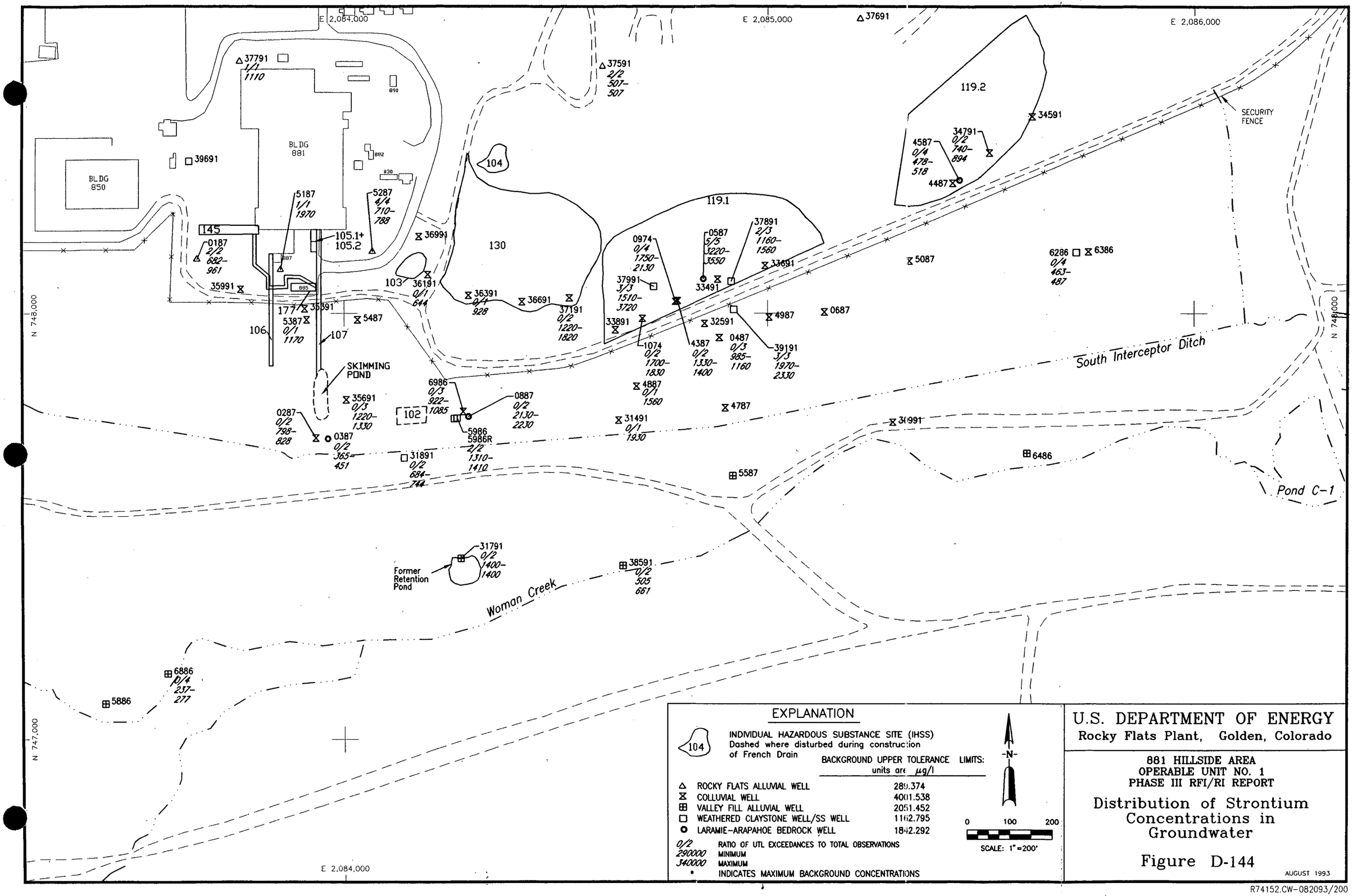
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Strontium Concentrations in Sediment

Figure D-143

AUGUST 1993

R74174.CW-083093/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are µg/l
△ ROCKY FLATS ALLUVIAL WELL	289.374
⧖ COLLUVIAL WELL	4001.538
⊞ VALLEY FILL ALLUVIAL WELL	2051.452
□ WEATHERED CLAYSTONE WELL/SS WELL	1162.795
○ LARAMIE-ARAPAHOE BEDROCK WELL	1842.292

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 — MINIMUM
340000 — MAXIMUM
* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" = 200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

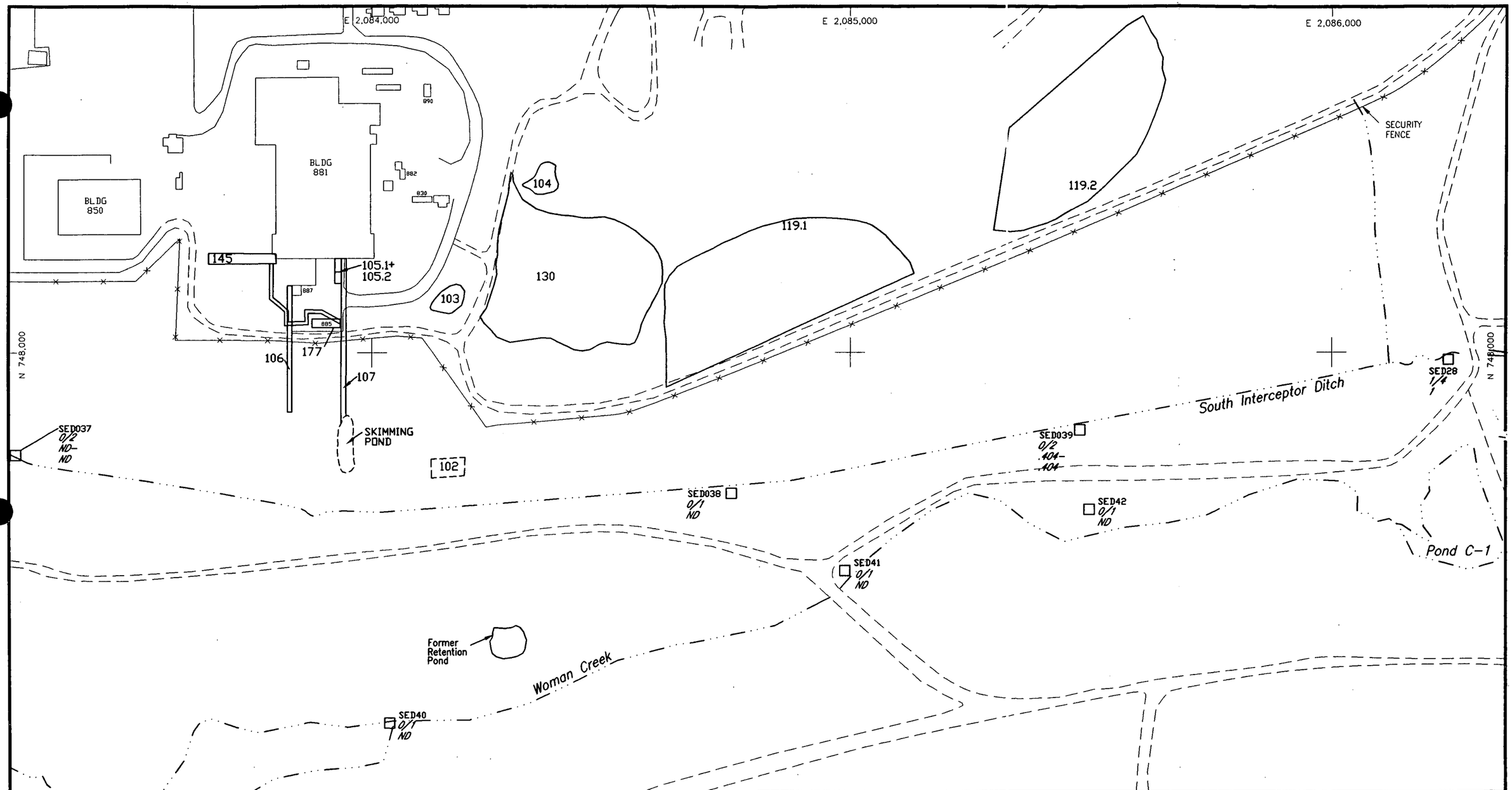
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Strontium Concentrations in Groundwater

Figure D-144

AUGUST 1993

R74152.CW-082093/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

BACKGROUND UPPER TOLERANCE LIMIT: units are mg/kg
0.55 U*

SED40 — SEDIMENT SAMPLING STATION

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 — MINIMUM
340000 — MAXIMUM
* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" = 200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

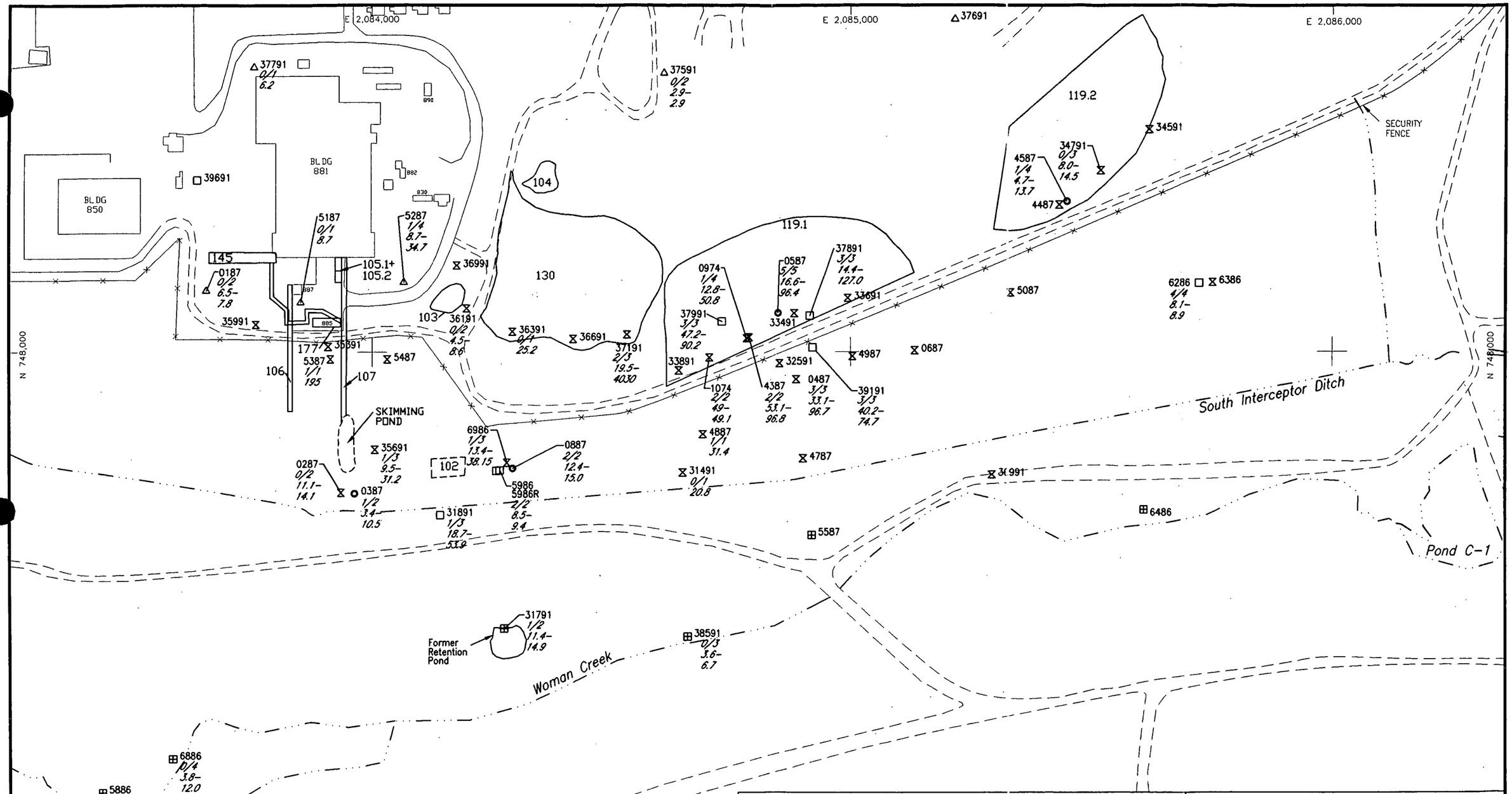
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Thallium Concentrations in Sediment

Figure D-146

AUGUST 1993

R74175.CWMB083093/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are µg/l
△ ROCKY FLATS ALLUVIAL WELL	29.721*
⧖ COLLUVIAL WELL	29.721*
⊞ VALLEY FILL ALLUVIAL WELL	12.323
□ WEATHERED CLAYSTONE WELL/SS WELL	5.96 U*
○ LARAMIE-ARAPAHOE BEDROCK WELL	6.3½

0/2 RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 MINIMUM
340000 MAXIMUM
* INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" = 200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

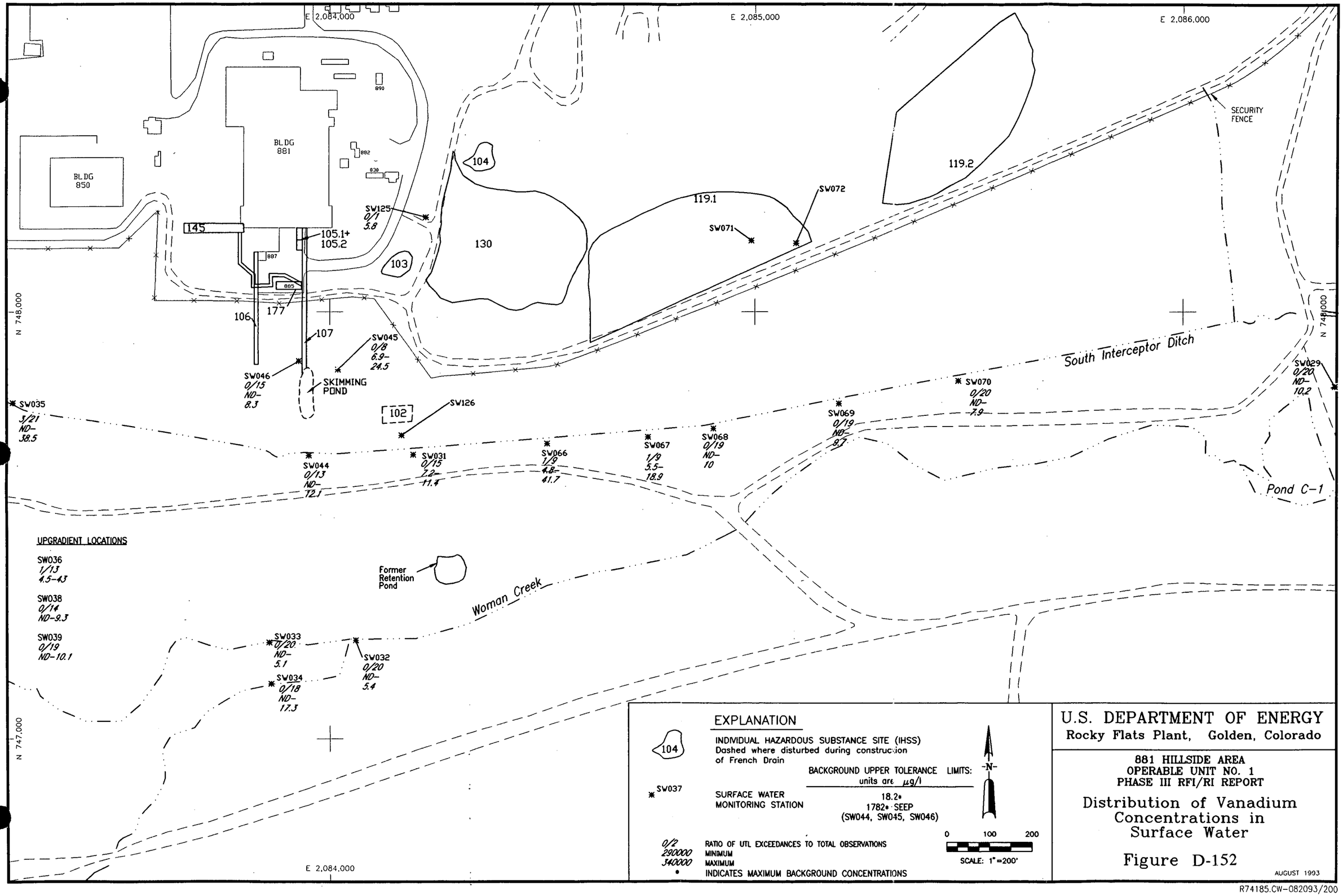
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Vanadium Concentrations in Groundwater

Figure D-151

AUGUST 1993

R74153.CWMB090293/200



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

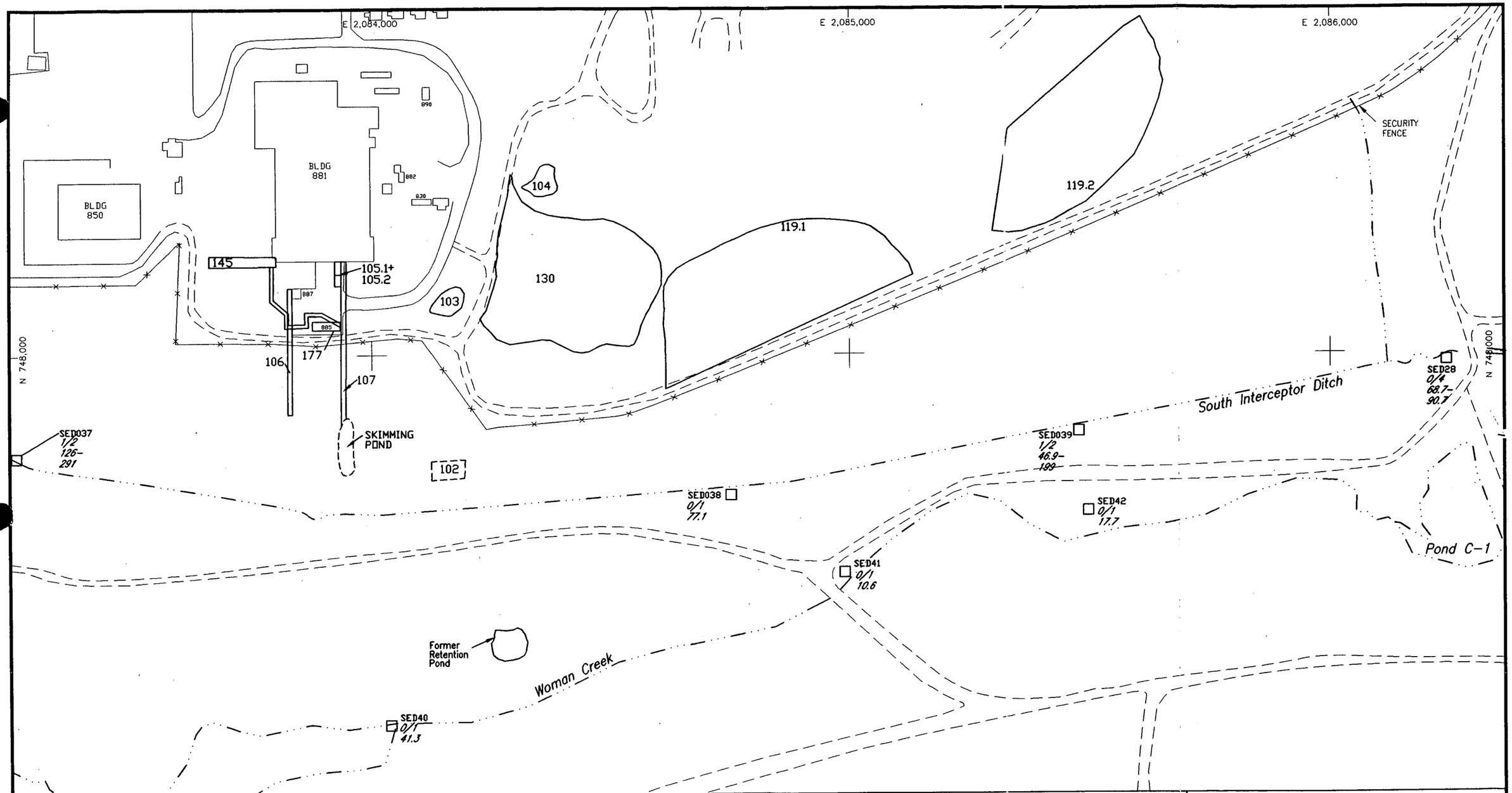
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Vanadium Concentrations in Surface Water

Figure D-152

AUGUST 1993

R74185.CW-082093/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain

BACKGROUND UPPER TOLERANCE LIMIT: units are mg/kg
168.381*

SED40 — SEDIMENT SAMPLING STATION

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 — MINIMUM
340000 — MAXIMUM
* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" =200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

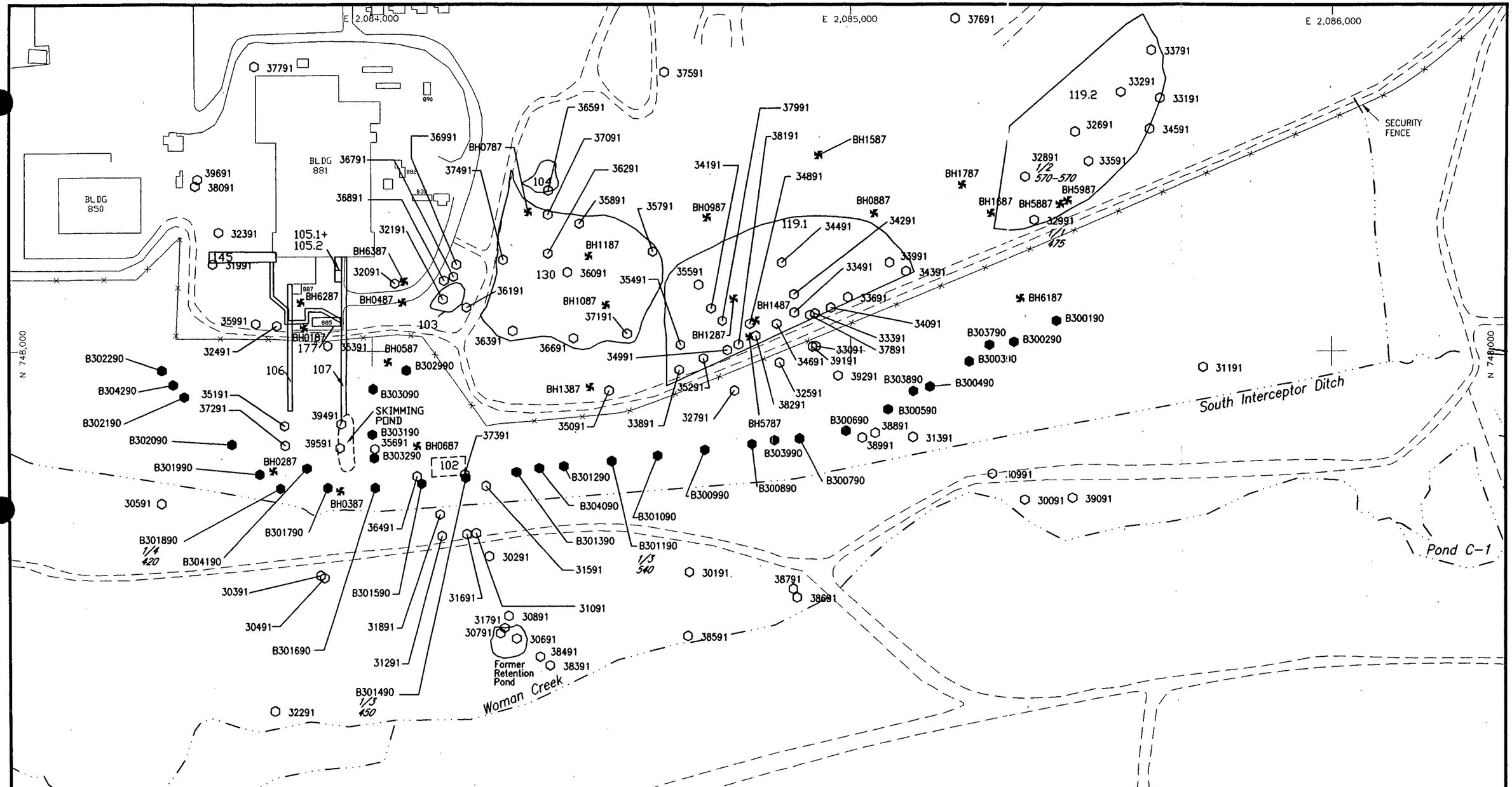
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Zinc Concentrations in Sediment

Figure D-154

AUGUST 1993

R74162.CWMB090293/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) DASHED WHERE DISTURBED DURING CONSTRUCTION OF FRENCH DRAIN

BACKGROUND UPPER TOLERANCE LIMIT: units are pCi/l — 411.5

BH0887 PHASE I/II BOREHOLES

30191 PHASE III BOREHOLES

B300190 FRENCH DRAIN BOREHOLE

0/2 RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS

290000 MINIMUM

340000 MAXIMUM

* INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200

SCALE: 1" = 200'

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant, Golden, Colorado

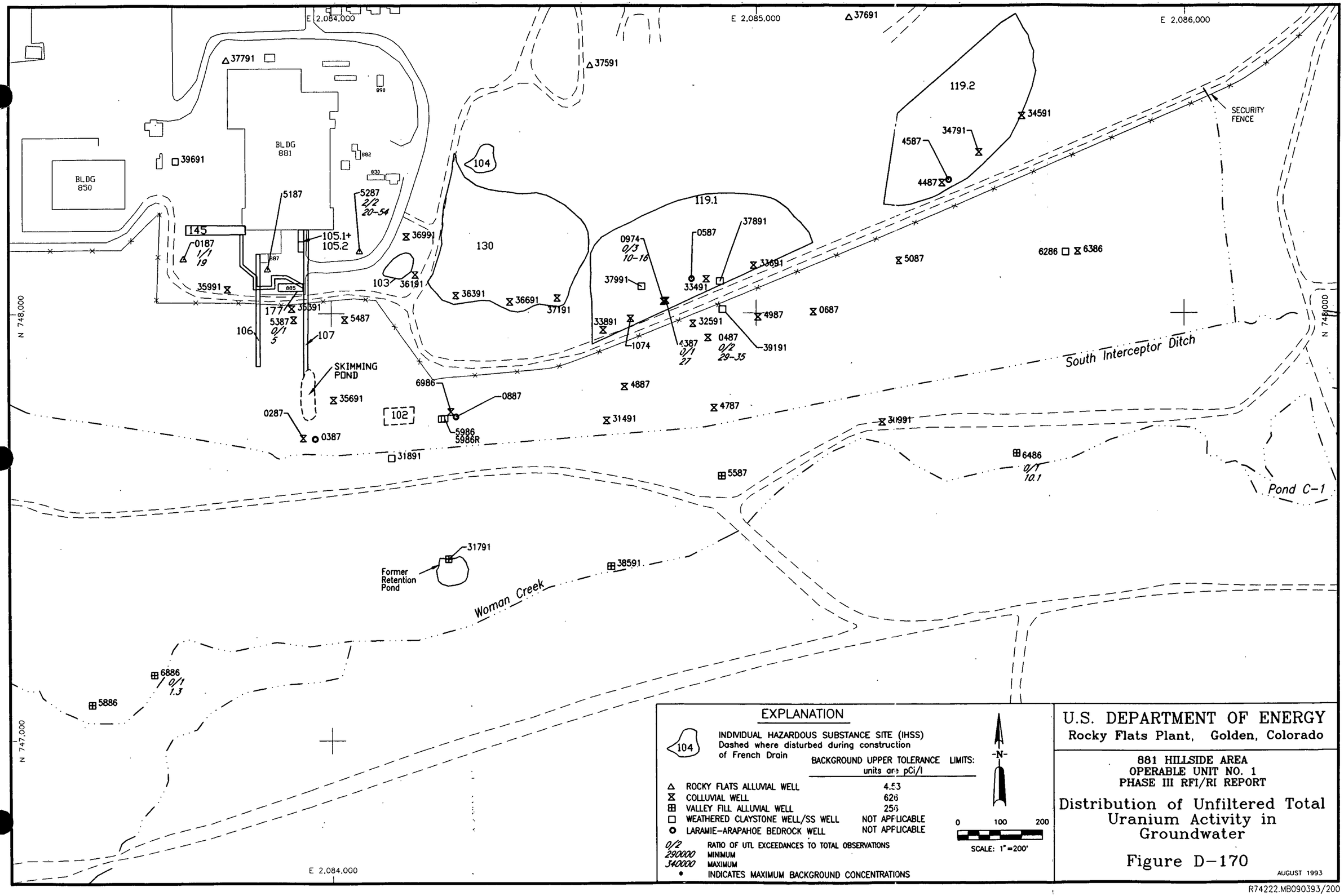
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Tritium Concentrations in Geologic Materials

Figure D-161

AUGUST 1993

R74221.MB082093/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are pCi/l
△ ROCKY FLATS ALLUVIAL WELL	4.53
⧖ COLLUVIAL WELL	626
⊞ VALLEY FILL ALLUVIAL WELL	256
□ WEATHERED CLAYSTONE WELL/SS WELL	NOT APPLICABLE
○ LARAMIE-ARAPAHOE BEDROCK WELL	NOT APPLICABLE

0/2 RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 MINIMUM
340000 MAXIMUM
• INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1"=200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

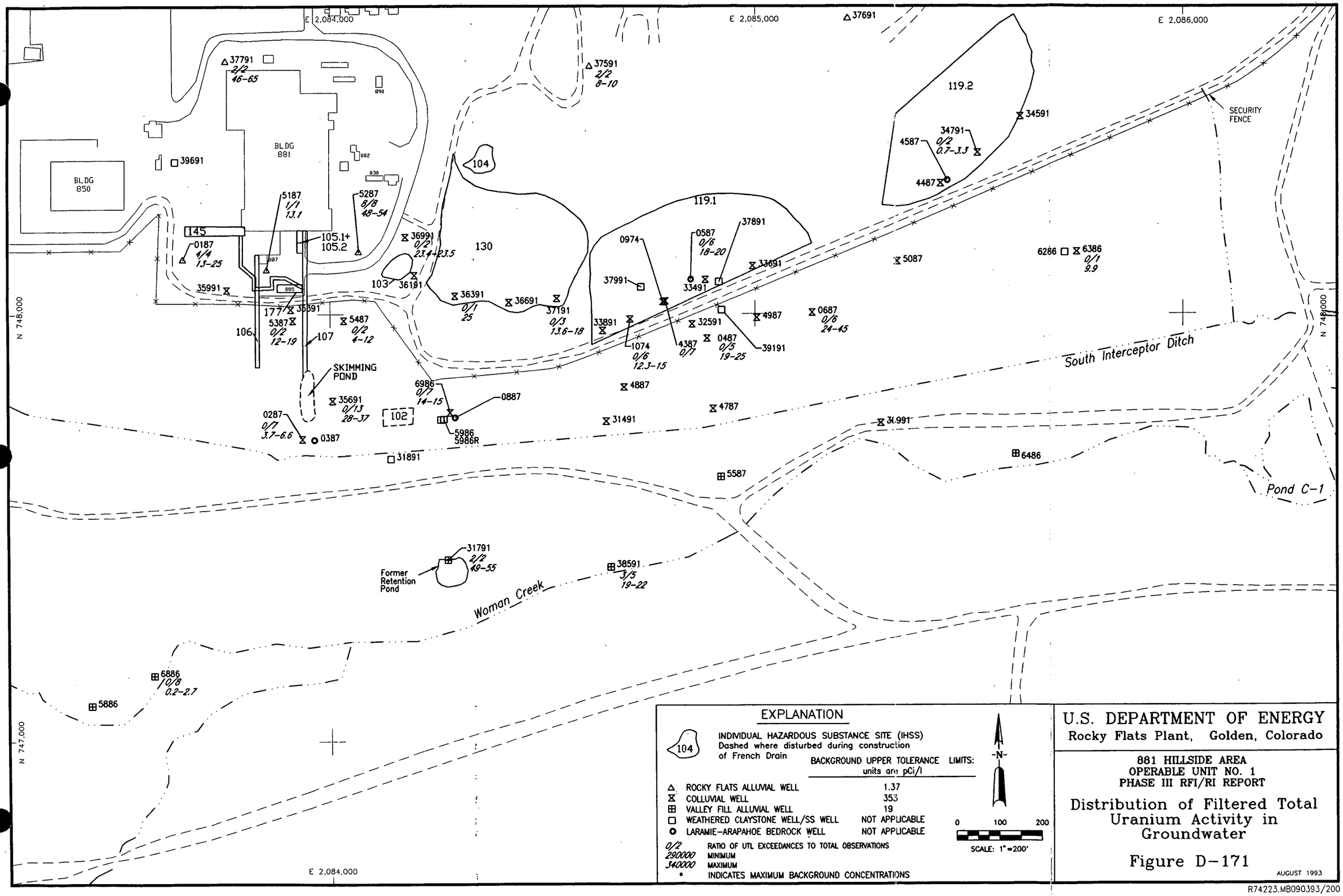
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Unfiltered Total Uranium Activity in Groundwater

Figure D-170

AUGUST 1993

R74222.MB090393/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are pCi/l
△ ROCKY FLATS ALLUVIAL WELL	1.37
⧖ COLLUVIAL WELL	353
⊞ VALLEY FILL ALLUVIAL WELL	19
□ WEATHERED CLAYSTONE WELL/SS WELL	NOT APPLICABLE
○ LARAMIE–ARAPAHOE BEDROCK WELL	NOT APPLICABLE

0/2 RATIO OF UTL EXCEEDANCES TO TOTAL OBSERVATIONS
290000 MINIMUM
340000 MAXIMUM
* INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" = 200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

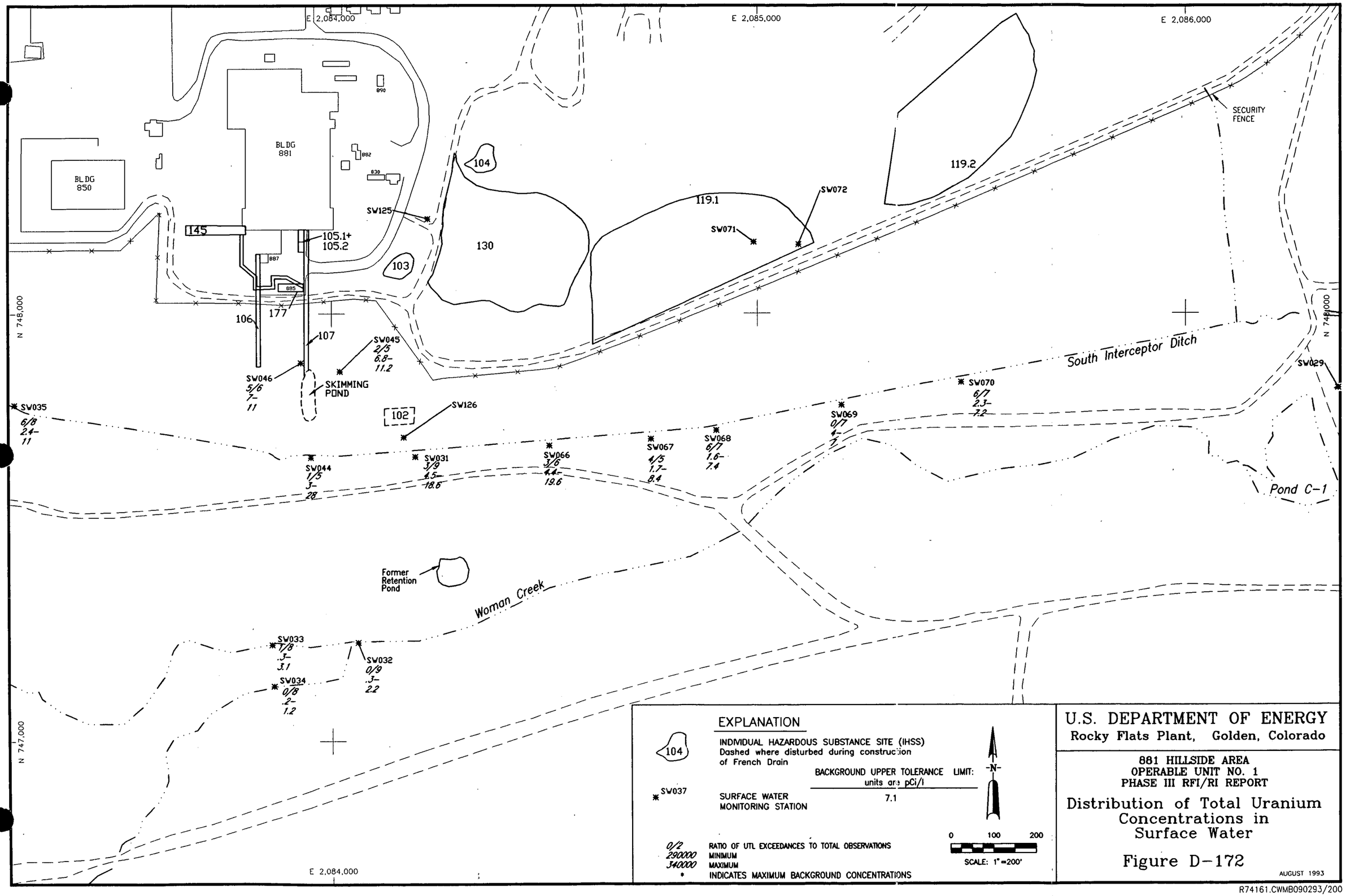
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Filtered Total Uranium Activity in Groundwater

Figure D–171

AUGUST 1993

R74223.MB090393/200



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

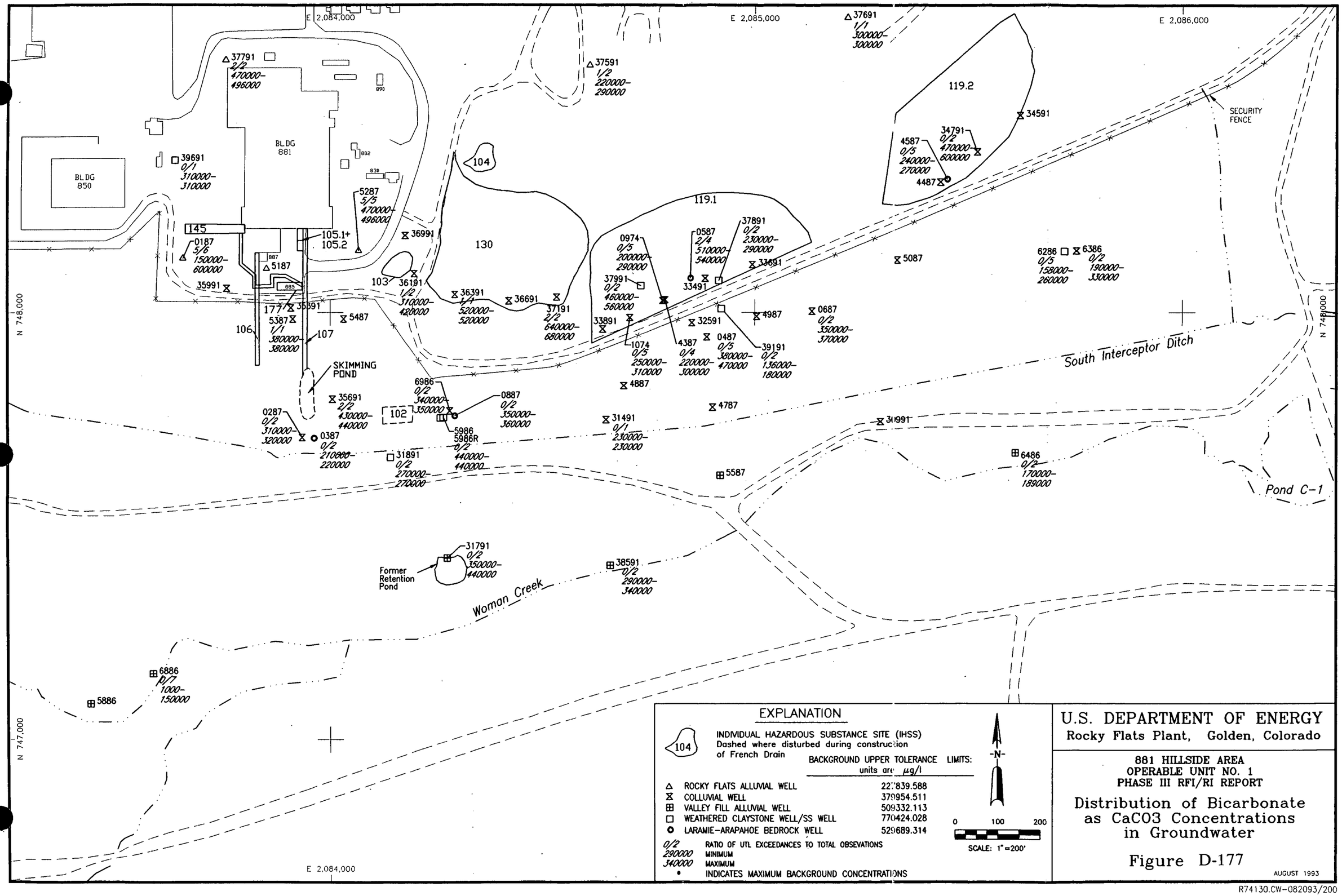
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Total Uranium Concentrations in Surface Water

Figure D-172

AUGUST 1993

R74161.CWMB090293/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are µg/l
△ ROCKY FLATS ALLUVIAL WELL	227839.588
⧖ COLLUVIAL WELL	379954.511
⊞ VALLEY FILL ALLUVIAL WELL	509332.113
□ WEATHERED CLAYSTONE WELL/SS WELL	770424.028
○ LARAMIE-ARAPAHOE BEDROCK WELL	529689.314

0/2 RATIO OF UTL EXCEEDANCES TO TOTAL OBSEVATIONS
290000 MINIMUM
340000 MAXIMUM
• INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1"=200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

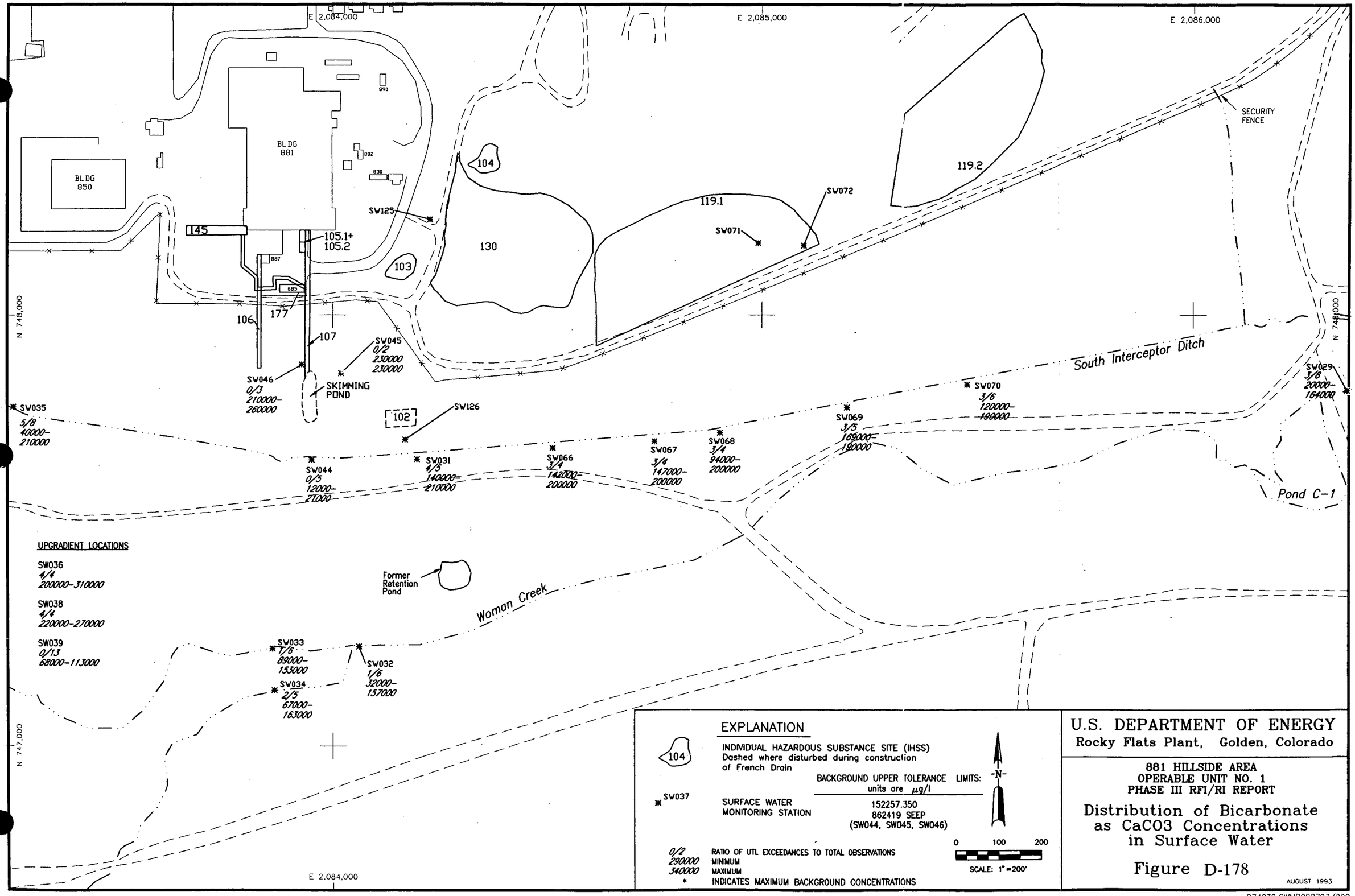
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Bicarbonate as CaCO3 Concentrations in Groundwater

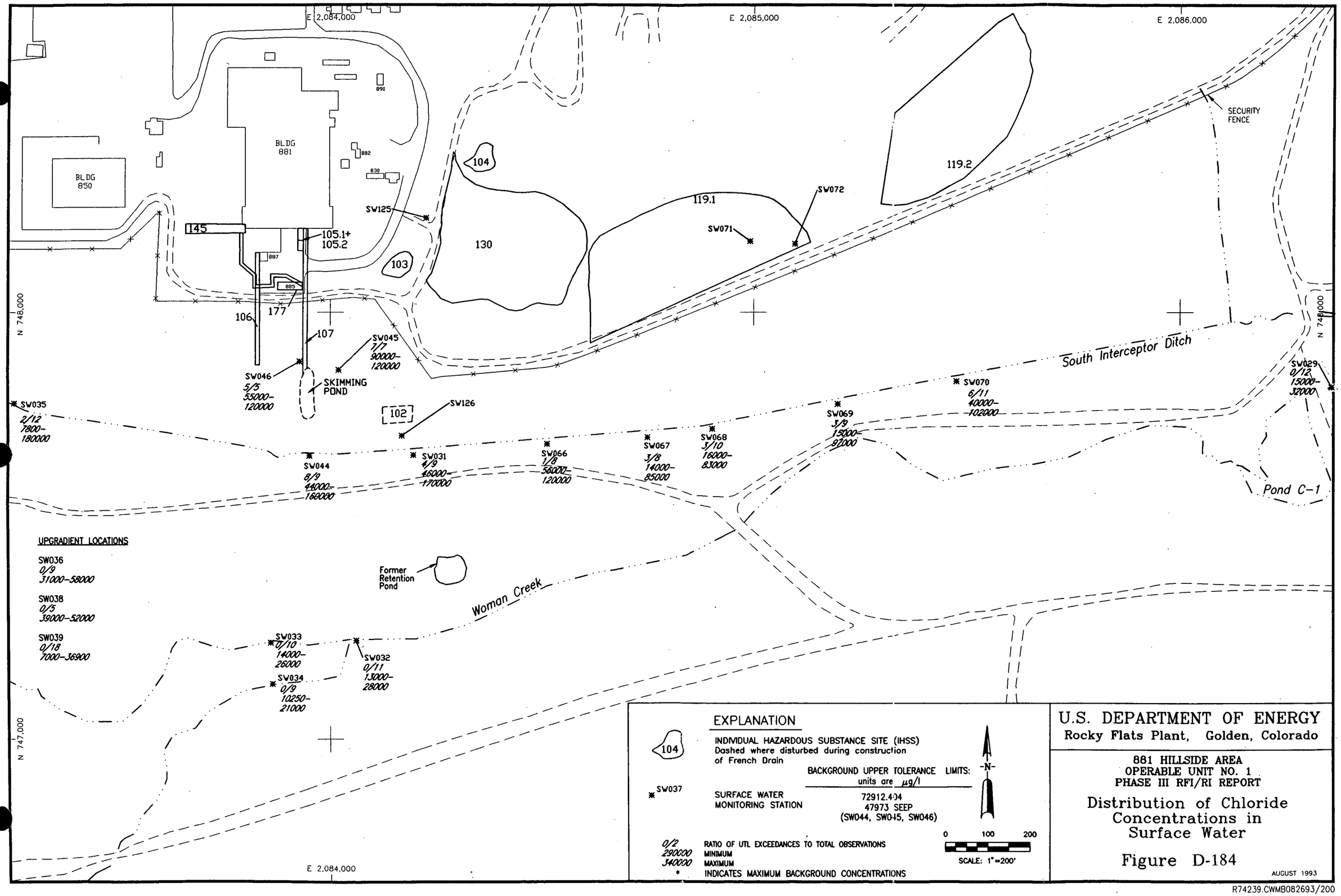
Figure D-177

AUGUST 1993

R74130.CW-082093/200



R74238.CWMB082793/200



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Rocky Flats Plant, Golden, Colorado

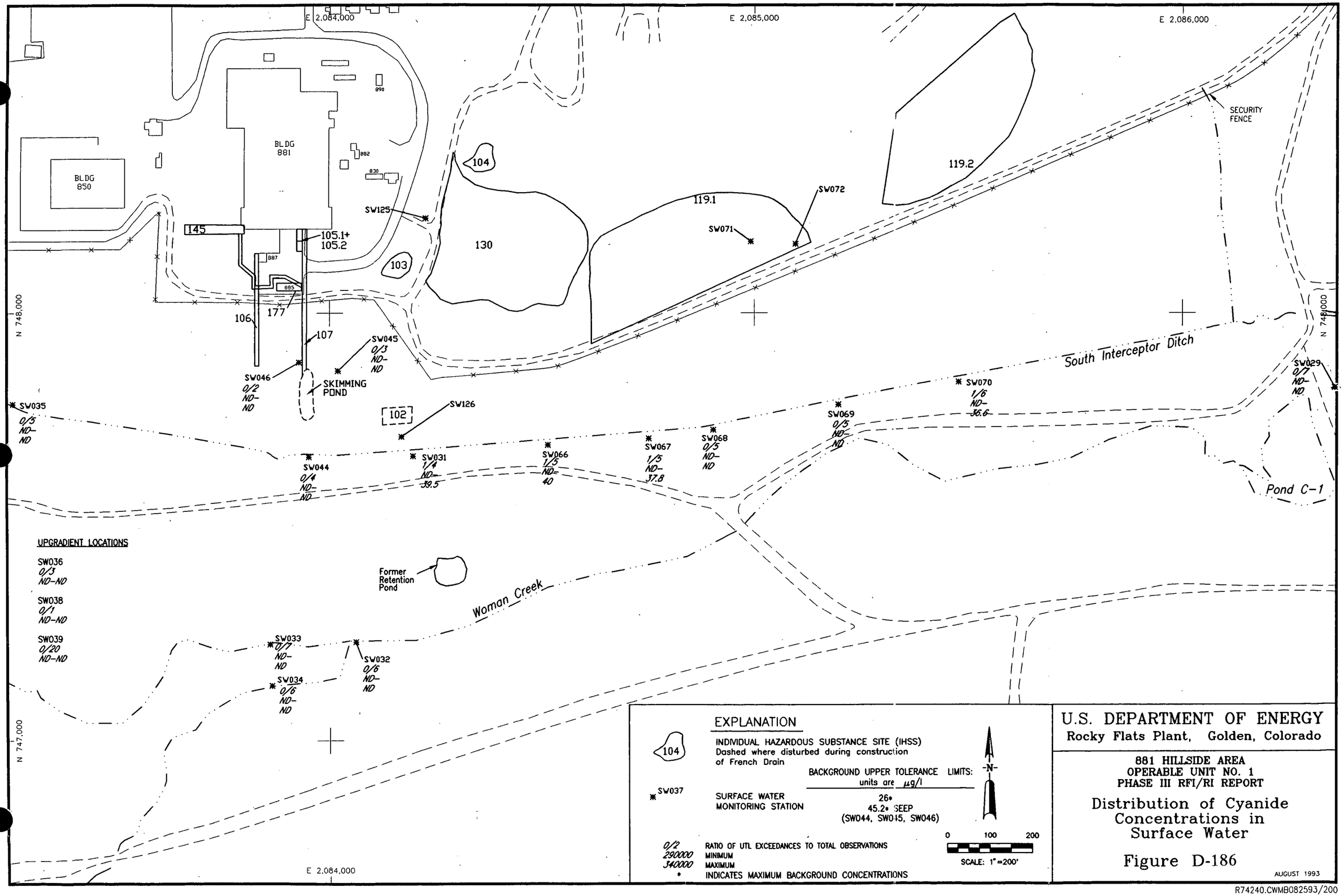
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Chloride Concentrations in Surface Water

Figure D-184

AUGUST 1993

R74239.CWMB082693/200



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Rocky Flats Plant, Golden, Colorado

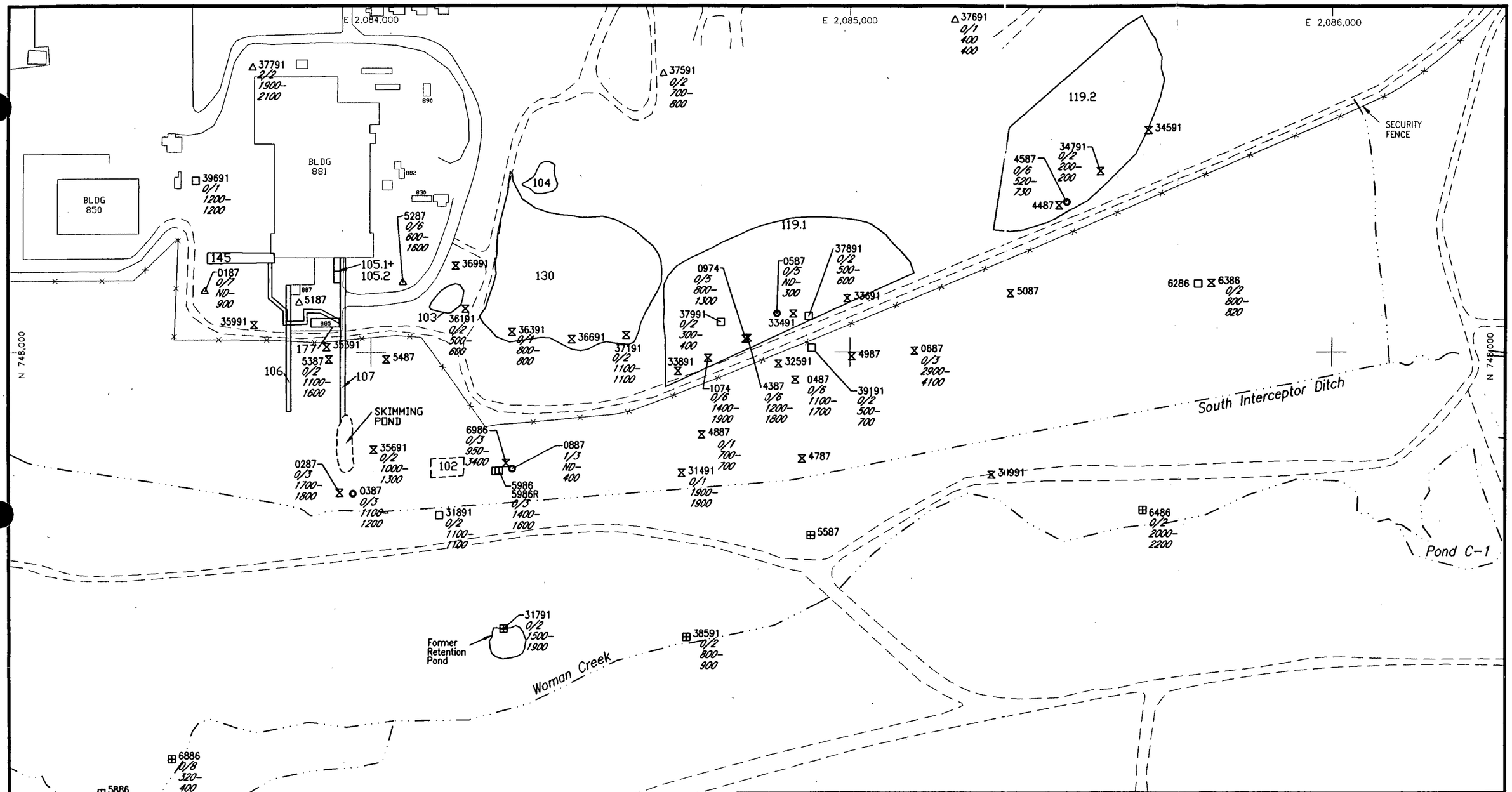
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Cyanide Concentrations in Surface Water

Figure D-186

AUGUST 1993

R74240.CWMB082593/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are µg/l
△ ROCKY FLATS ALLUVIAL WELL	17[illegible]6.747
⧖ COLLUVIAL WELL	7841.469
⊞ VALLEY FILL ALLUVIAL WELL	95[illegible]7.363
□ WEATHERED CLAYSTONE WELL/SS WELL	17[illegible]1.180
○ LARAMIE-ARAPAHOE BEDROCK WELL	26[illegible]2.161

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSEVATIONS
290000 — MINIMUM
340000 — MAXIMUM
* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1"=200'

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Rocky Flats Plant, Golden, Colorado

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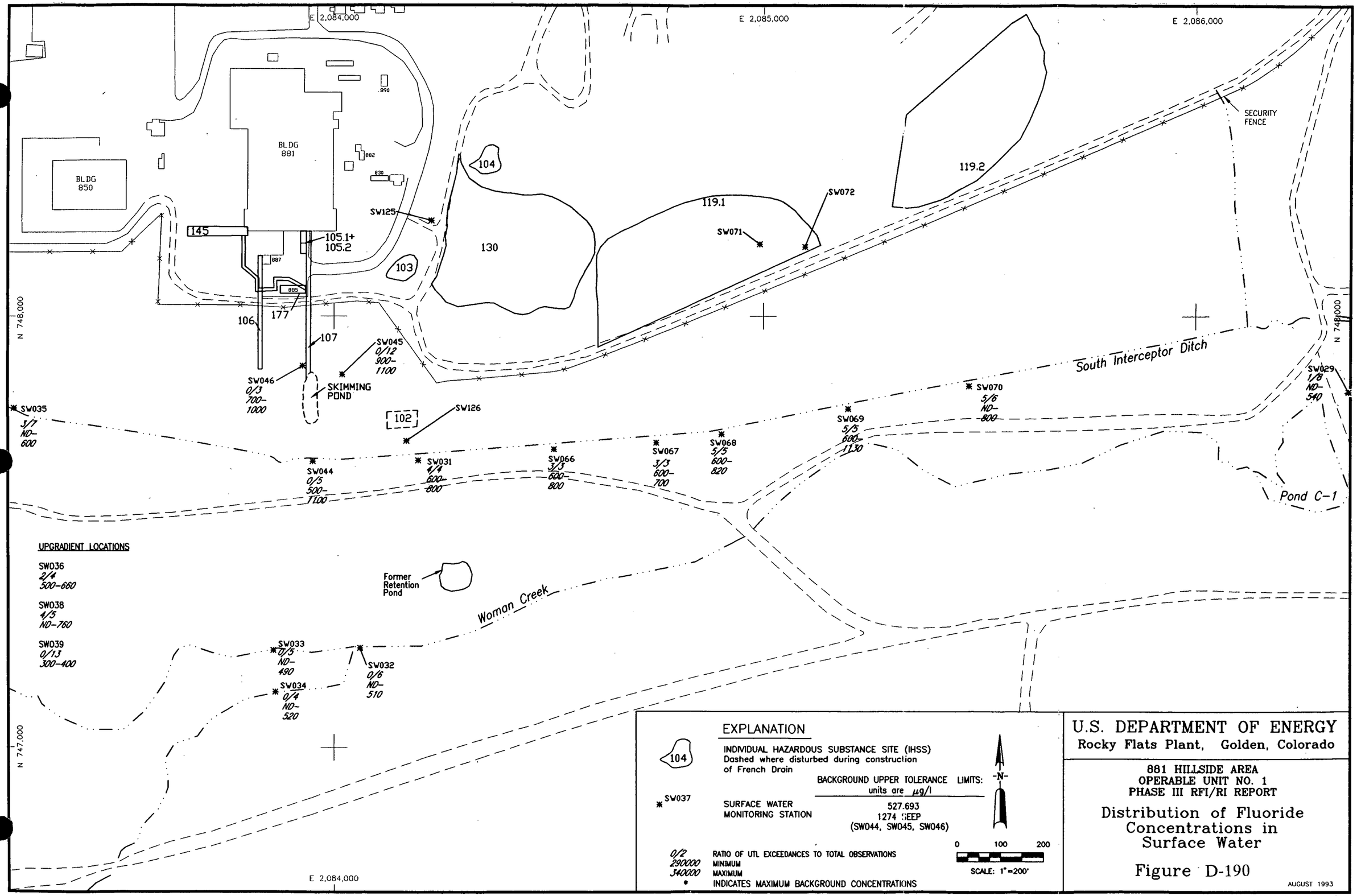
PHASE III RFI/RI REPORT

Distribution of Fluoride Concentrations in Groundwater

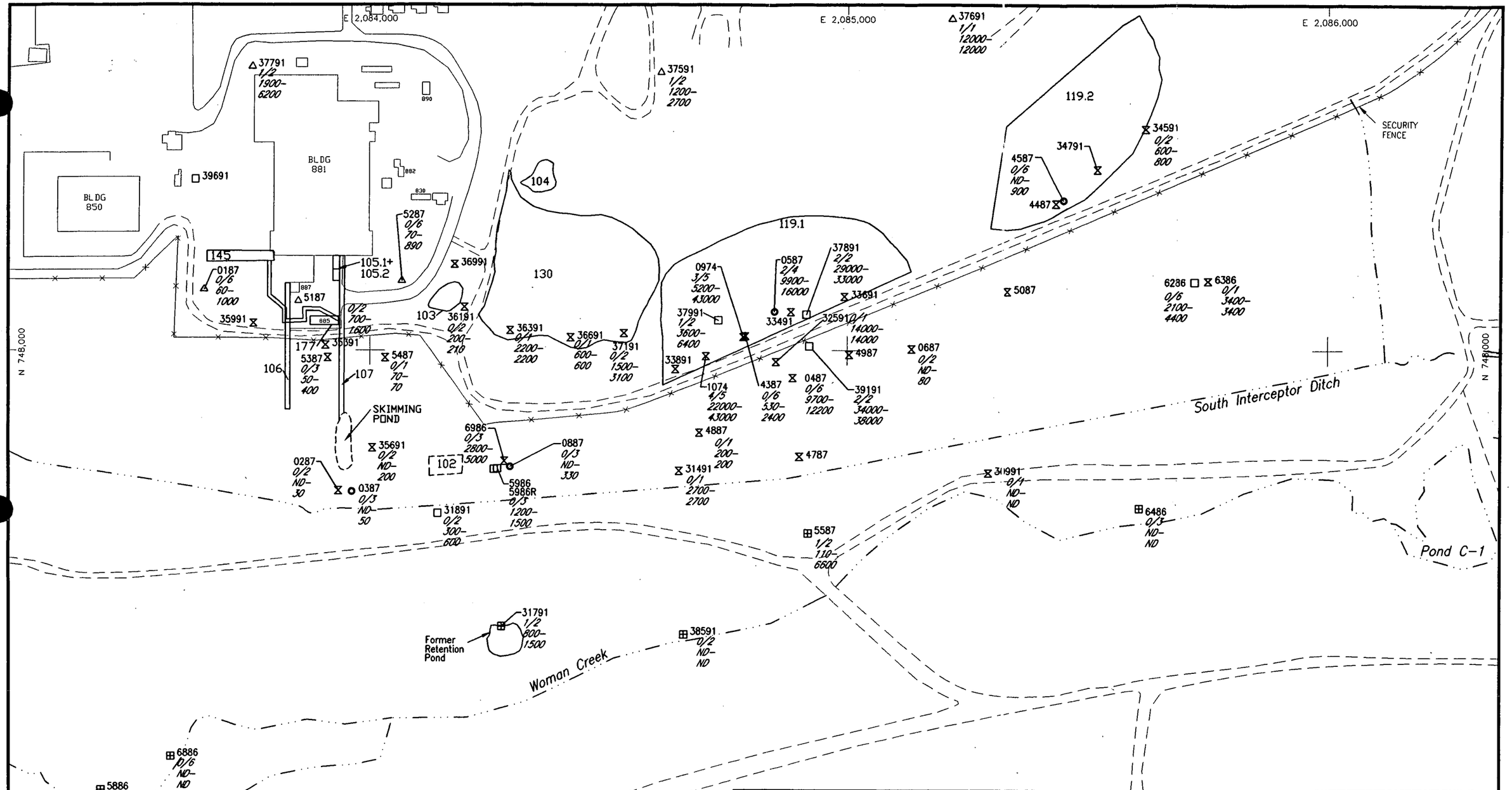
Figure D-189

AUGUST 1993

R74132.pj-082393/200



R74241.CWMB083093/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are µg/l
△ ROCKY FLATS ALLUVIAL WELL	25[illegible]7.081
⧖ COLLUVIAL WELL	258[illegible]9.417
⊞ VALLEY FILL ALLUVIAL WELL	11[illegible]3.800
□ WEATHERED CLAYSTONE WELL/SS WELL	63[illegible]7.637
○ LARAMIE-ARAPAHOE BEDROCK WELL	12663.275

0/2 RATIO OF UTL EXCEEDANCES TO TOTAL OBSEVATIONS
290000 MINIMUM
340000 MAXIMUM
* INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" =200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

881 HILLSIDE AREA
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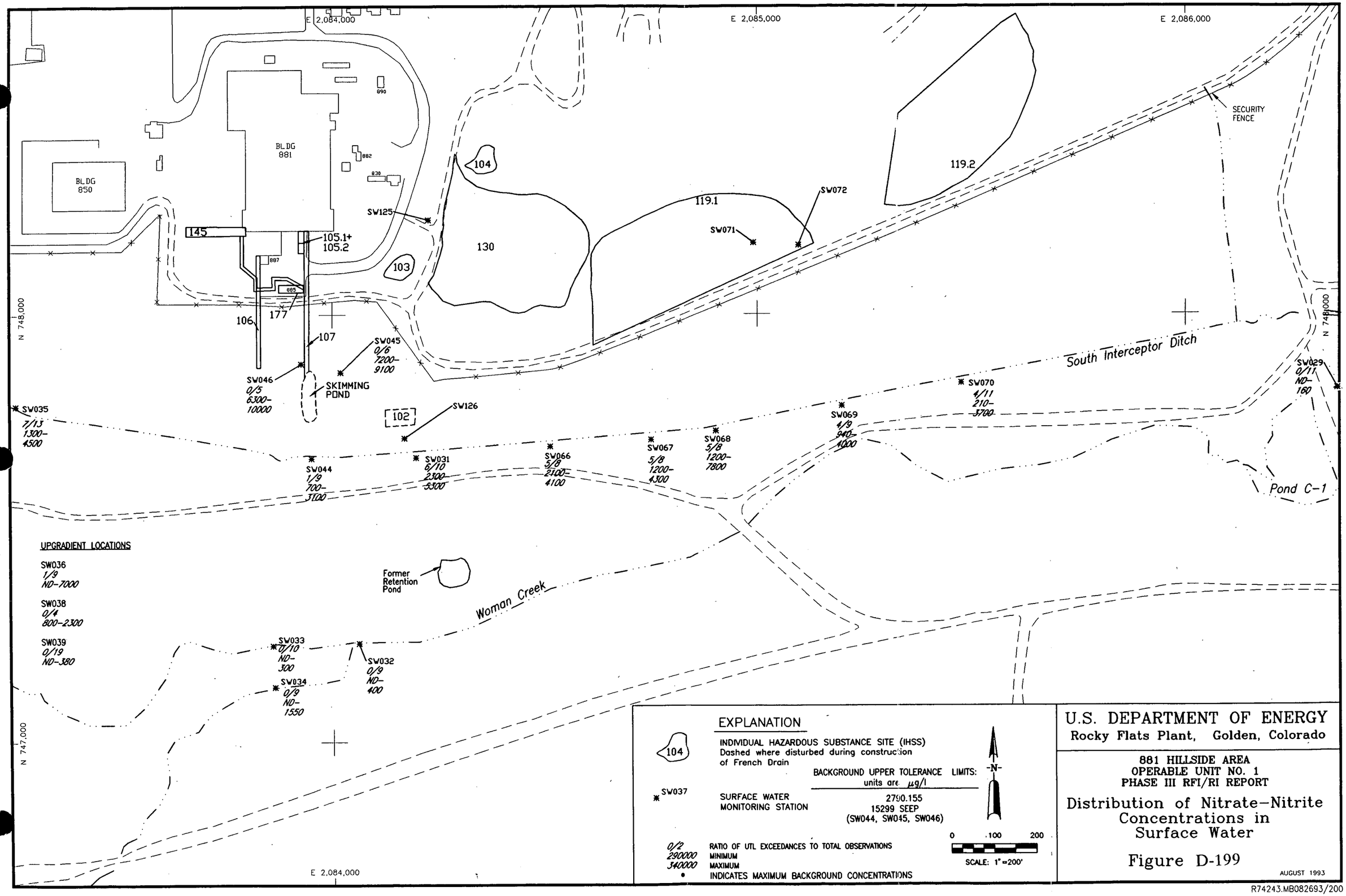
PHASE III RFI/RI REPORT

Distribution of Nitrate/Nitrite Concentrations in Groundwater

Figure D-198

AUGUST 1993

R74133.PJMB082393/200



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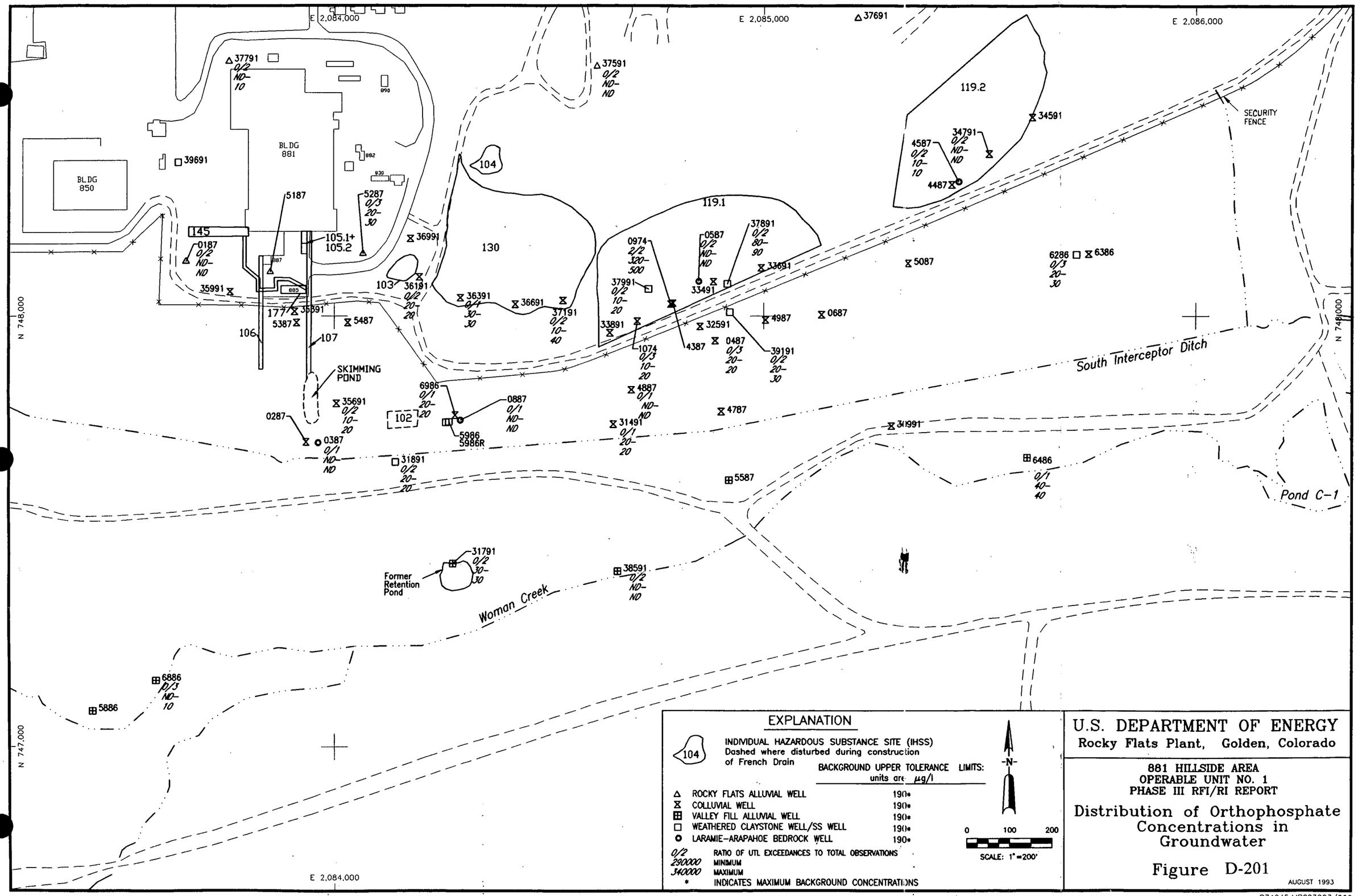
PHASE III RFI/RI REPORT

Distribution of Nitrate–Nitrite Concentrations in Surface Water

Figure D-199

AUGUST 1993

R74243.MB082693/200



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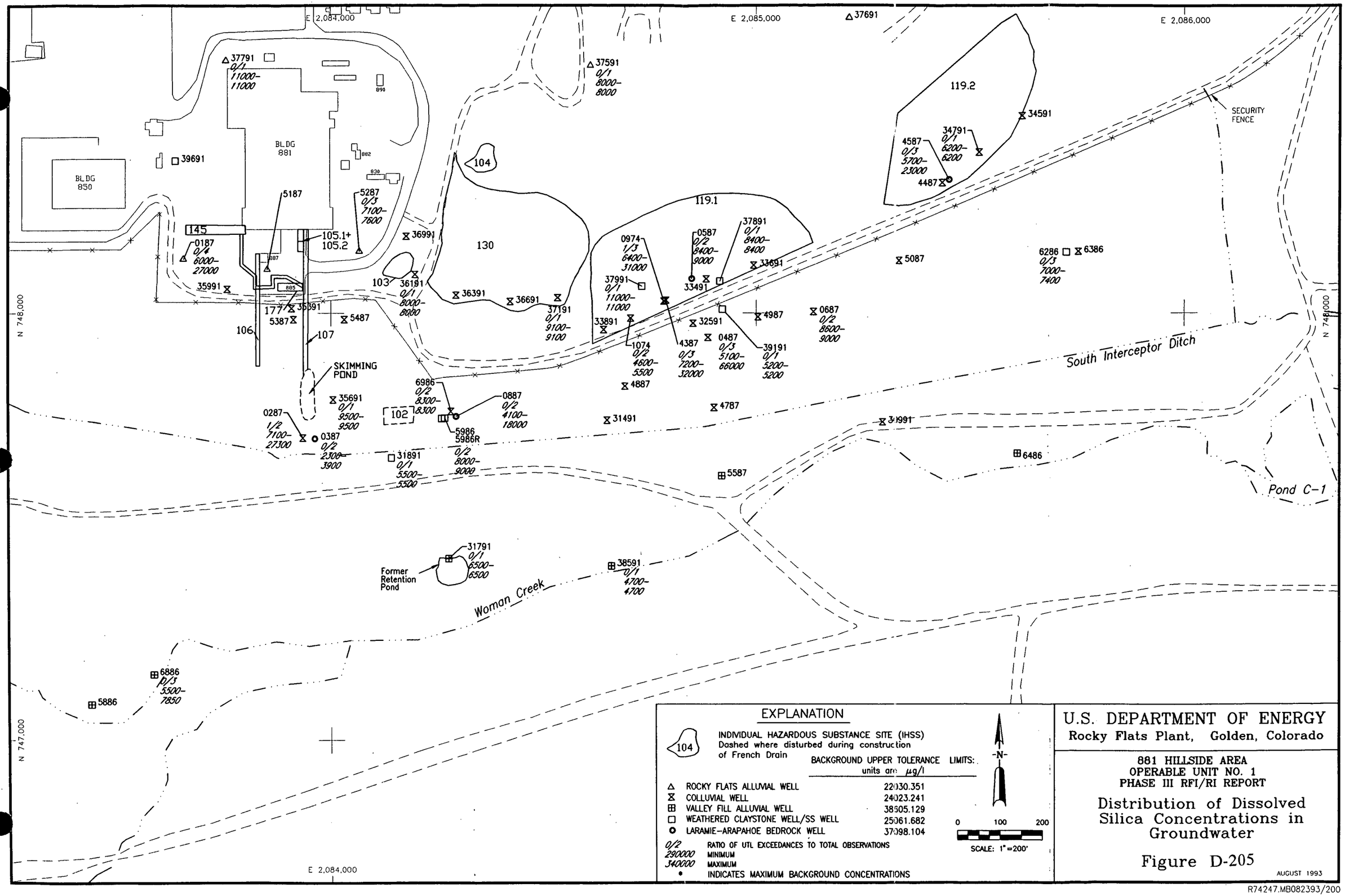
Distribution of Orthophosphate Concentrations in Groundwater

Figure D-201

AUGUST 1993

R74245.MB083093/200



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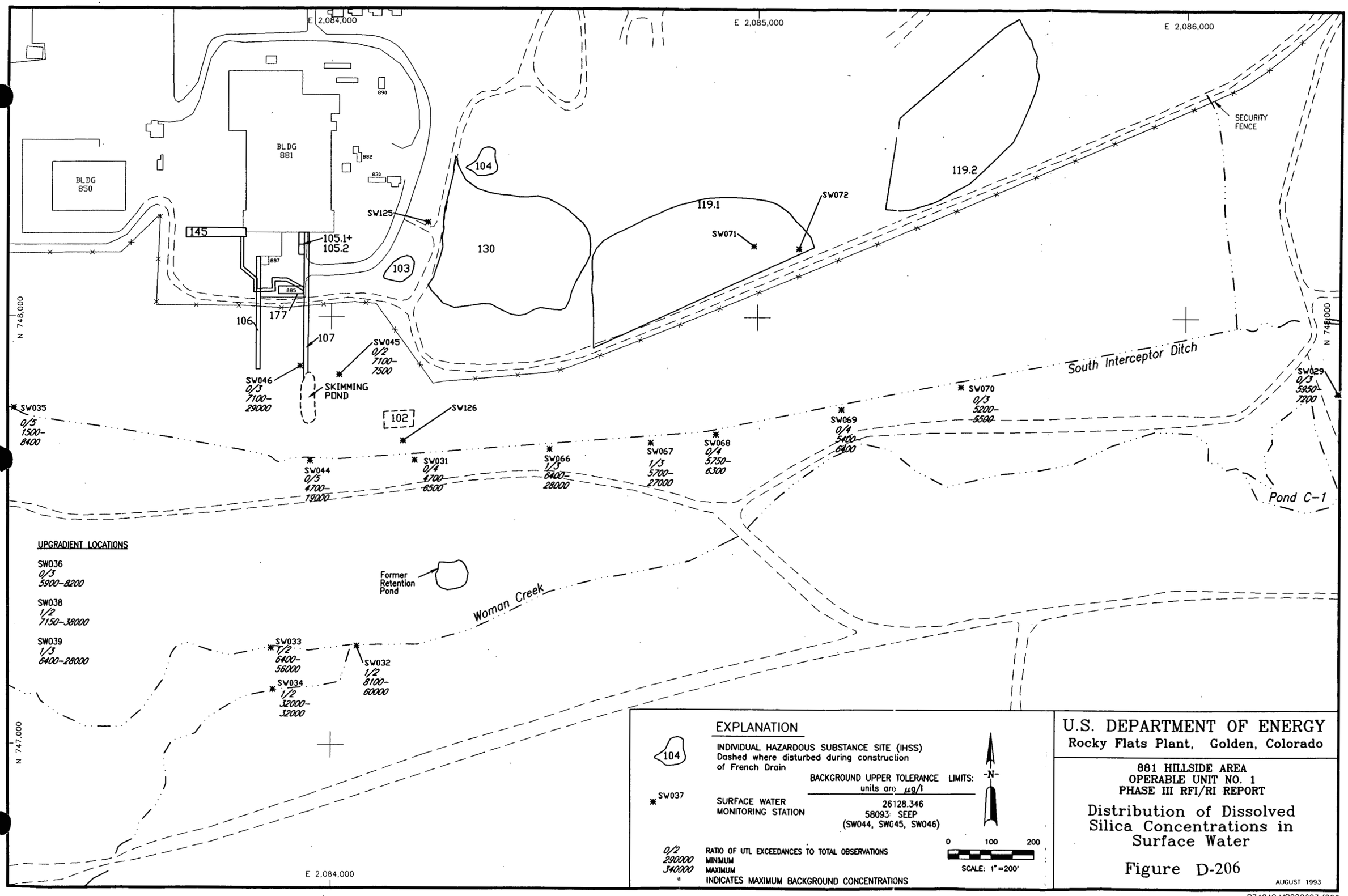
Distribution of Dissolved Silica Concentrations in Groundwater

Figure D-205

AUGUST 1993

R74247.MB082393/200



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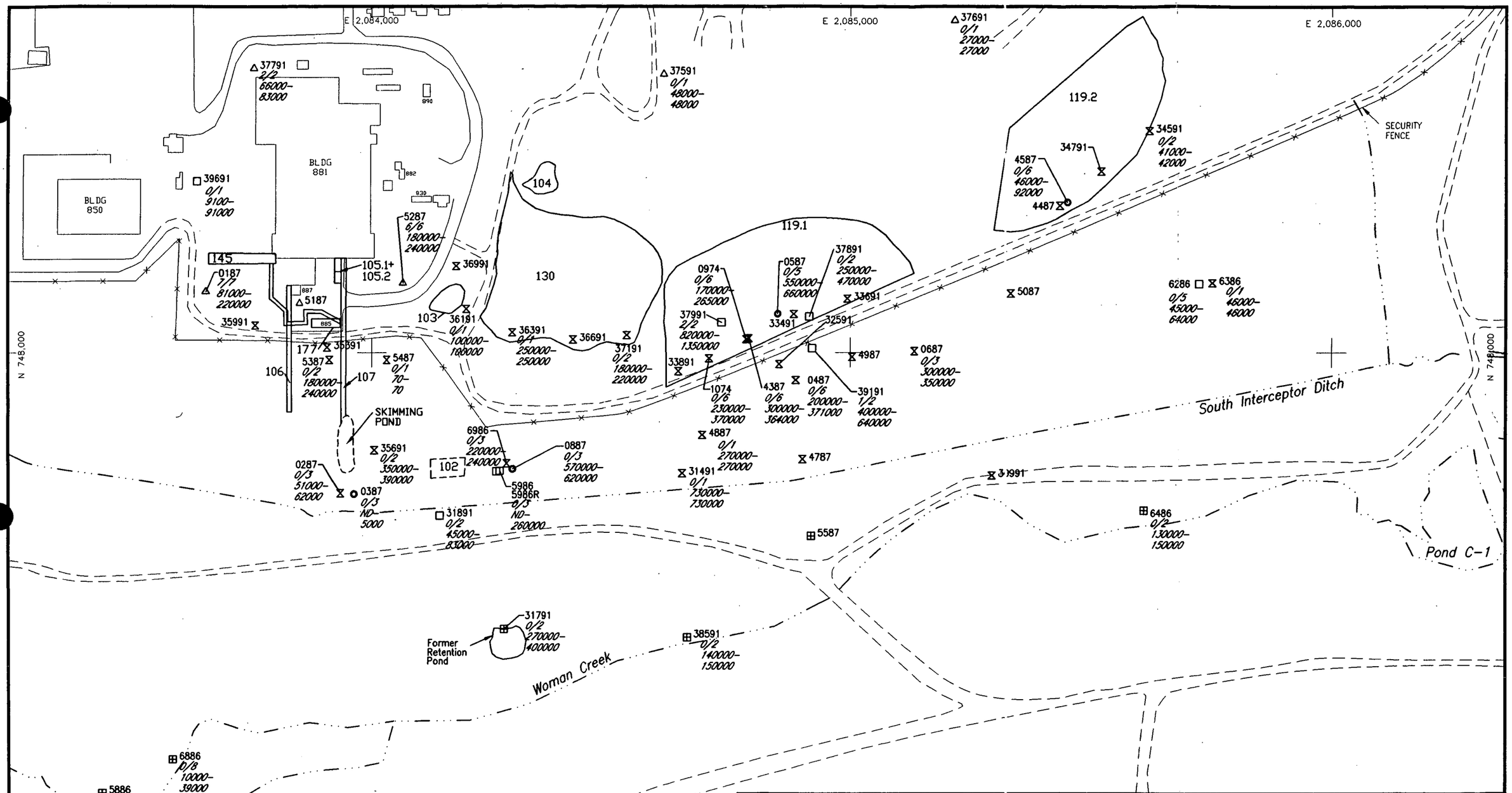
PHASE III RFI/RI REPORT

Distribution of Dissolved Silica Concentrations in Surface Water

Figure D-206

AUGUST 1993

R74248.MB082693/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are: µg/l
△ ROCKY FLATS ALLUVIAL WELL	53734.539
⧖ COLLUVIAL WELL	106329.46
⊞ VALLEY FILL ALLUVIAL WELL	1063290.46
□ WEATHERED CLAYSTONE WELL/SS WELL	503510.082
○ LARAMIE-ARAPAHOE BEDROCK WELL	895031.054

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSEVATIONS
290000 — MINIMUM
340000 — MAXIMUM
* — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" = 200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

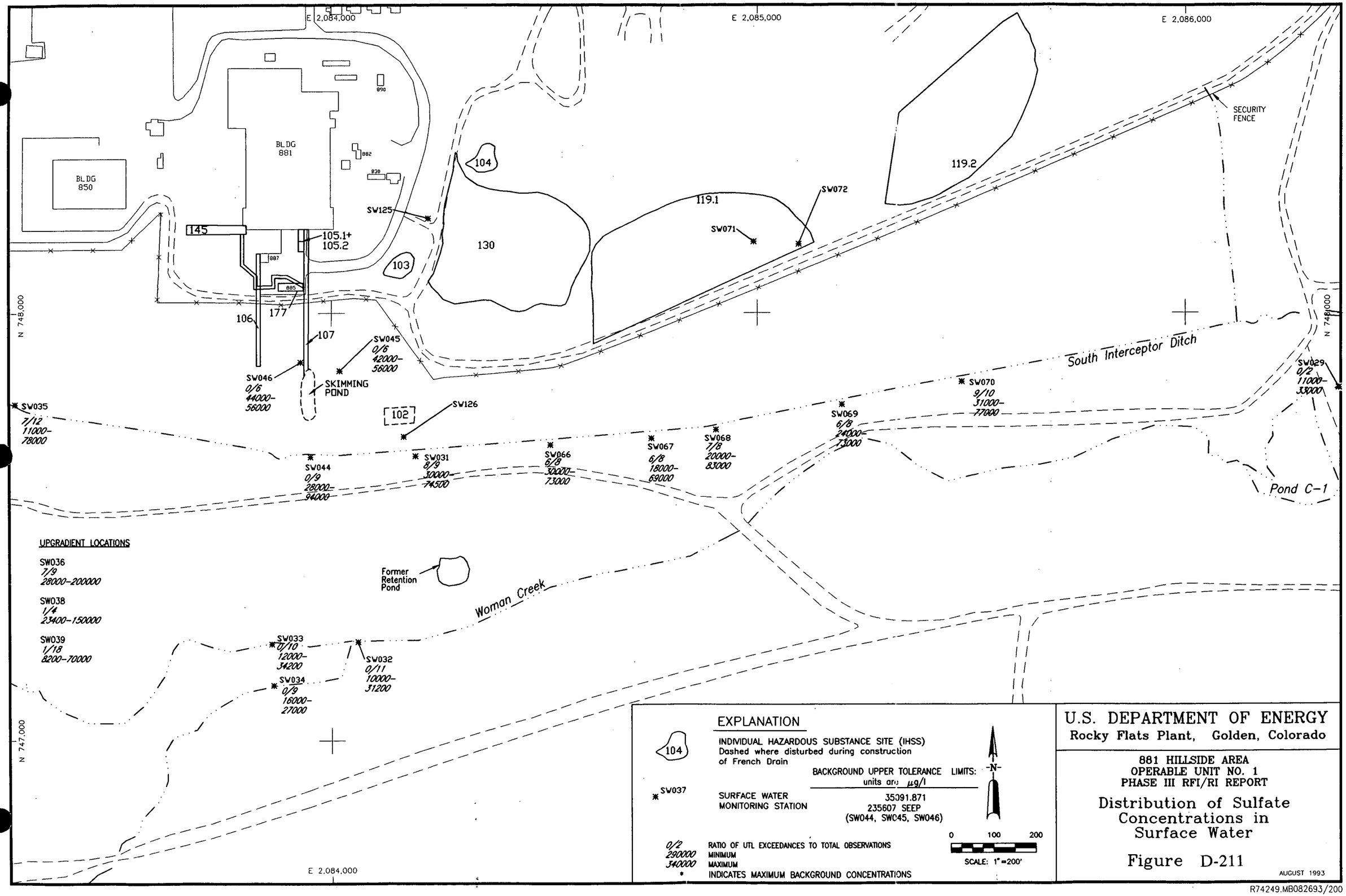
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Sulfate Concentrations in Groundwater

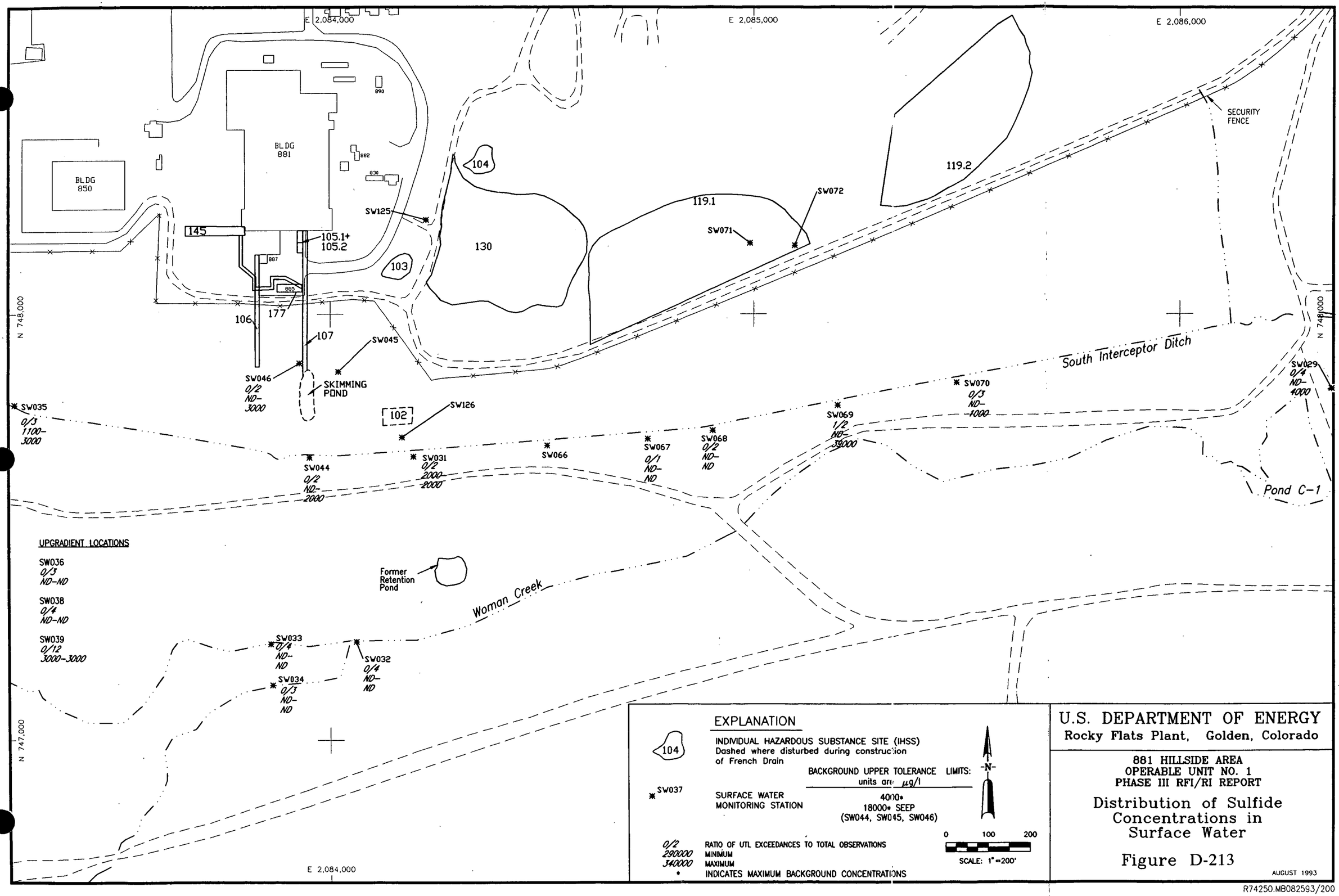
Figure D-210

AUGUST 1993

R74134.PJMB083093/200



R74249.MB082693/200



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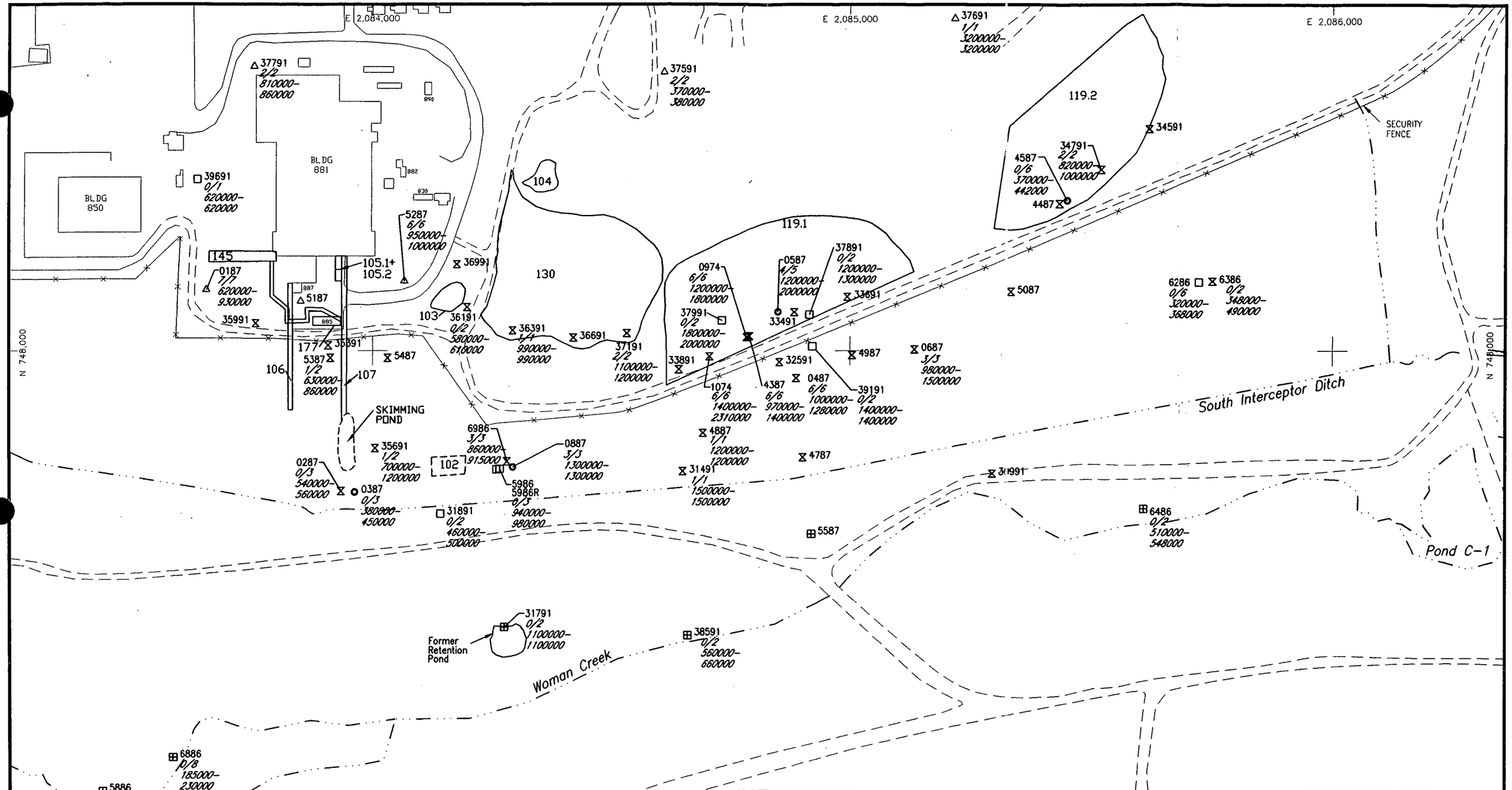
PHASE III RFI/RI REPORT

Distribution of Sulfide Concentrations in Surface Water

Figure D-213

AUGUST 1993

R74250.MB082593/200



EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS)
Dashed where disturbed during construction of French Drain

	BACKGROUND UPPER TOLERANCE LIMITS: units are µg/l
△ ROCKY FLATS ALLUVIAL WELL	304827.148
⧖ COLLUVIAL WELL	801632.030
⊞ VALLEY FILL ALLUVIAL WELL	5208971.59
□ WEATHERED CLAYSTONE WELL/SS WELL	2760446.58
○ LARAMIE-ARAPAHOE BEDROCK WELL	1206931.63

0/2 — RATIO OF UTL EXCEEDANCES TO TOTAL OBSEVATIONS
290000 — MINIMUM
540000 — MAXIMUM
• — INDICATES MAXIMUM BACKGROUND CONCENTRATIONS

-N-

0 100 200
SCALE: 1" = 200'

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

881 HILLSIDE AREA
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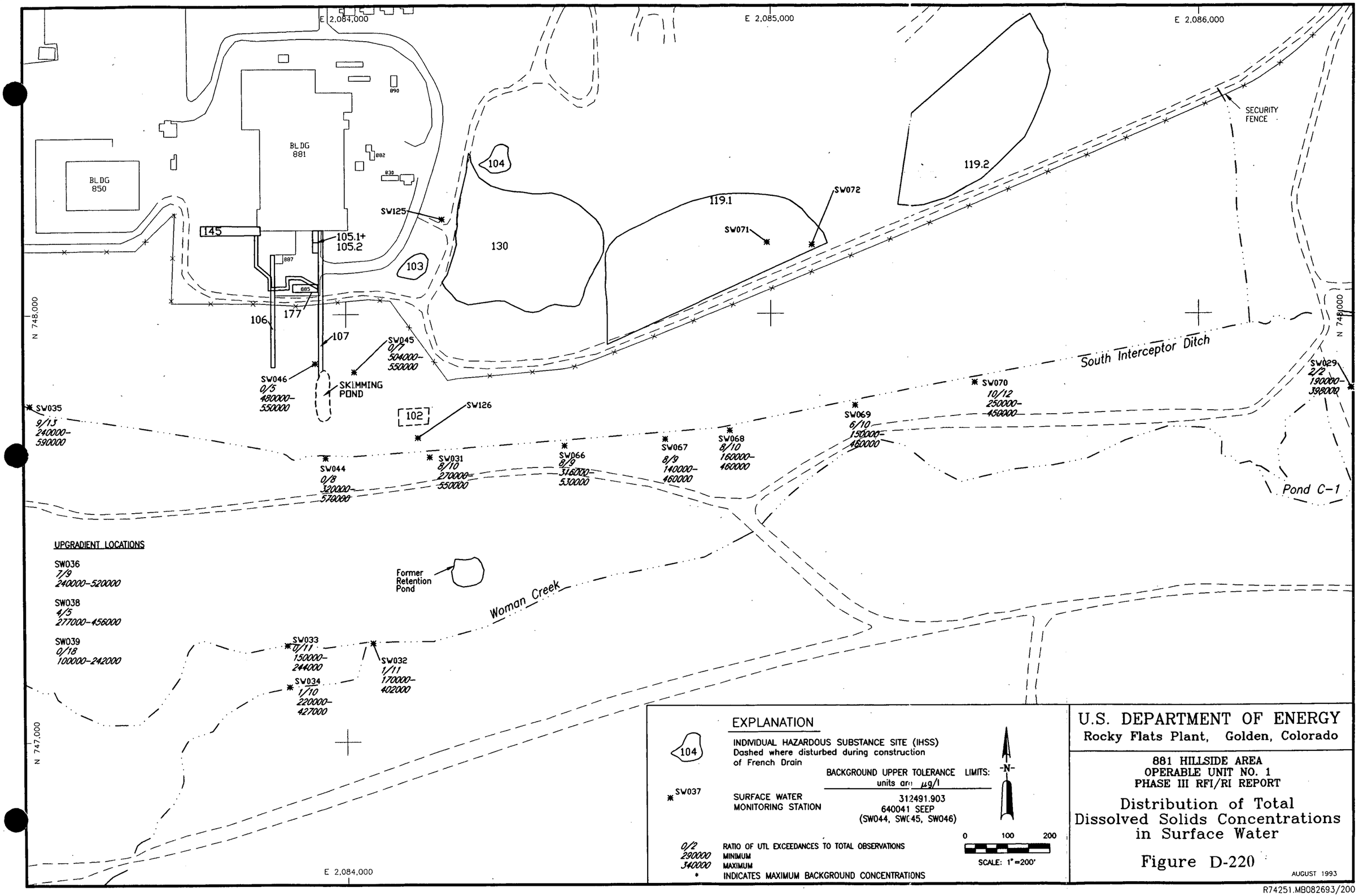
PHASE III RFI/RI REPORT

Distribution of Total Dissolved Solid Concentrations in Groundwater

Figure D-219

AUGUST 1993

R74135.CWMB082393/200



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

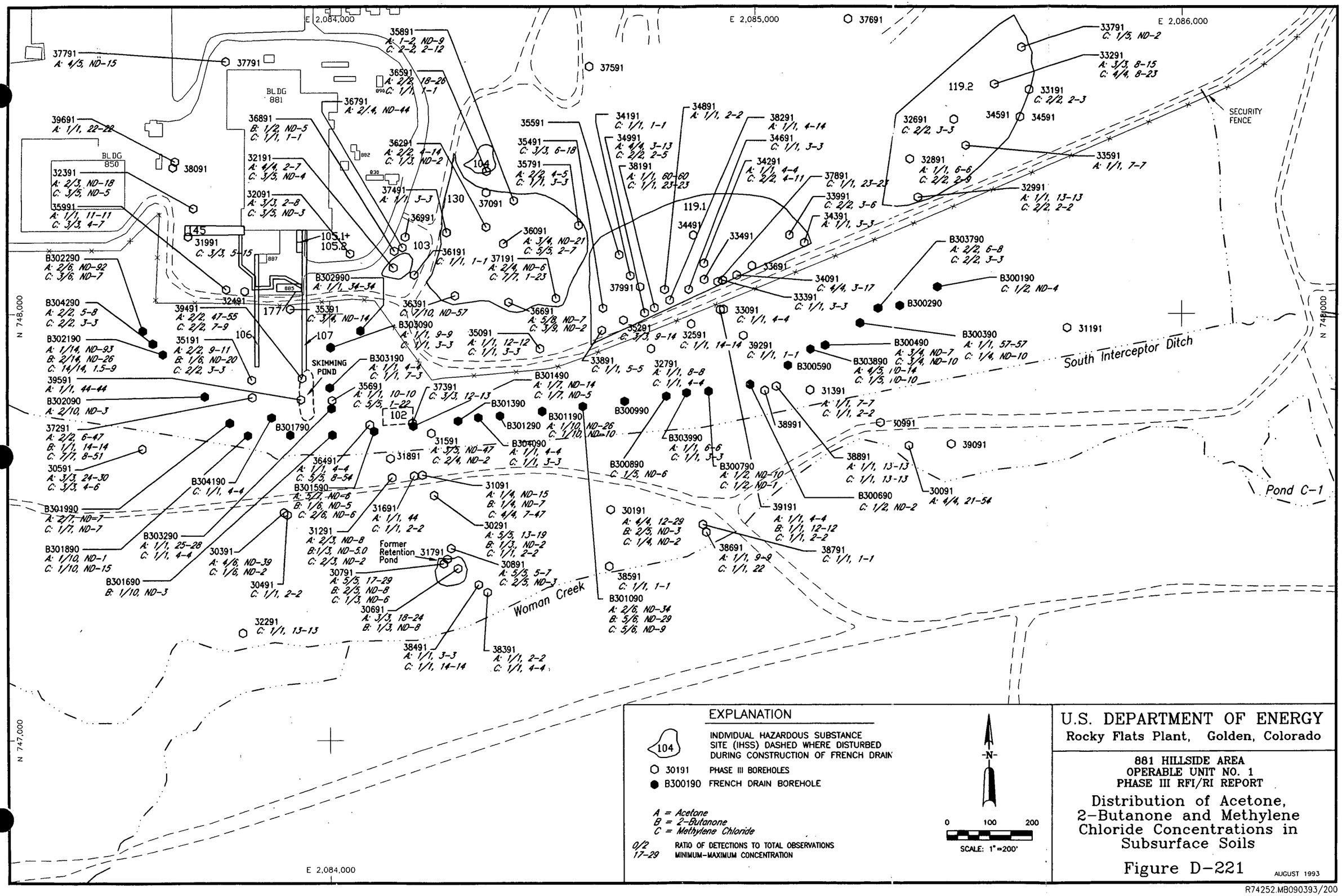
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Total Dissolved Solids Concentrations in Surface Water

Figure D-220

AUGUST 1993

R74251.MB082693/200



U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant, Golden, Colorado

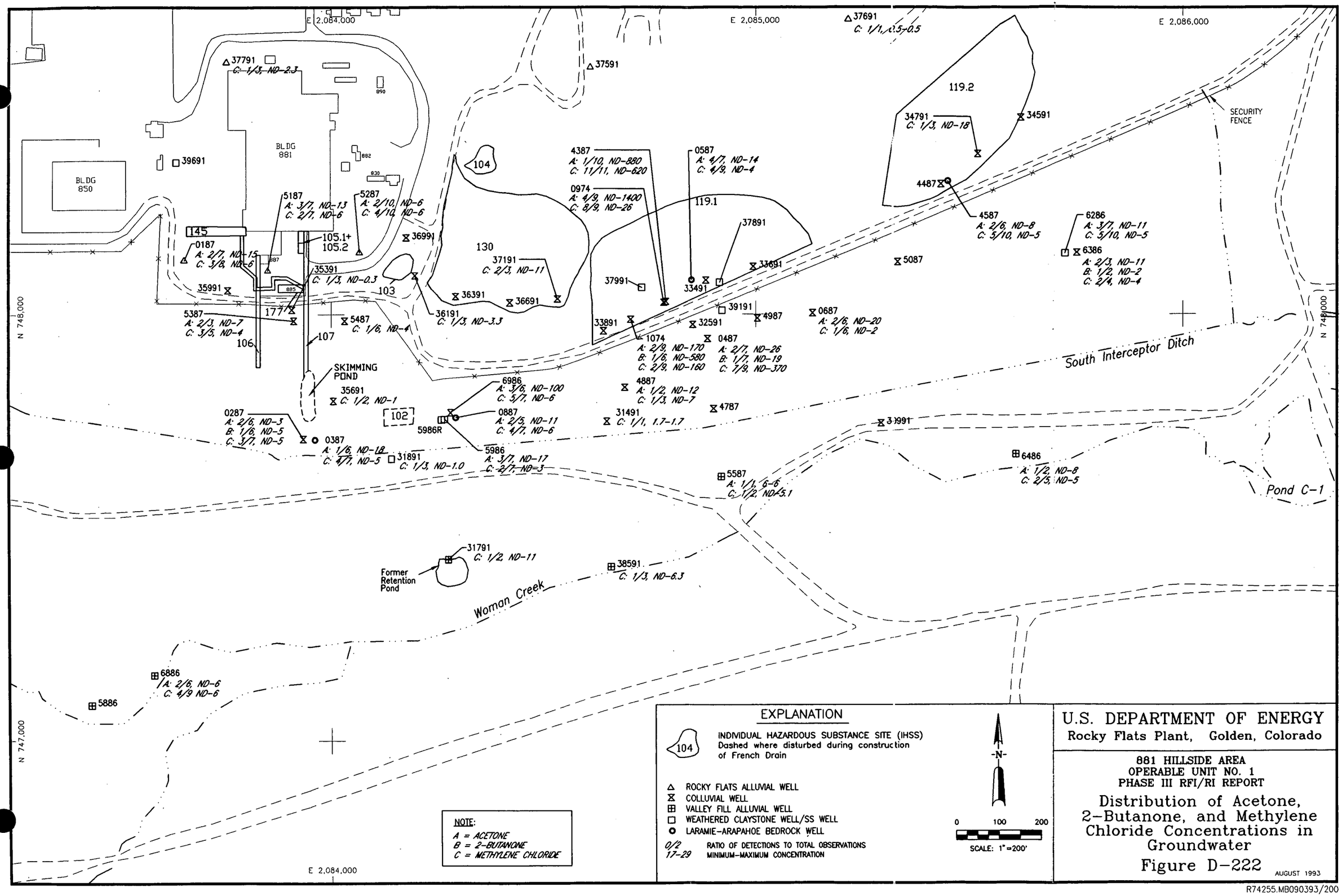
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Distribution of Acetone, 2-Butanone and Methylene Chloride Concentrations in Subsurface Soils

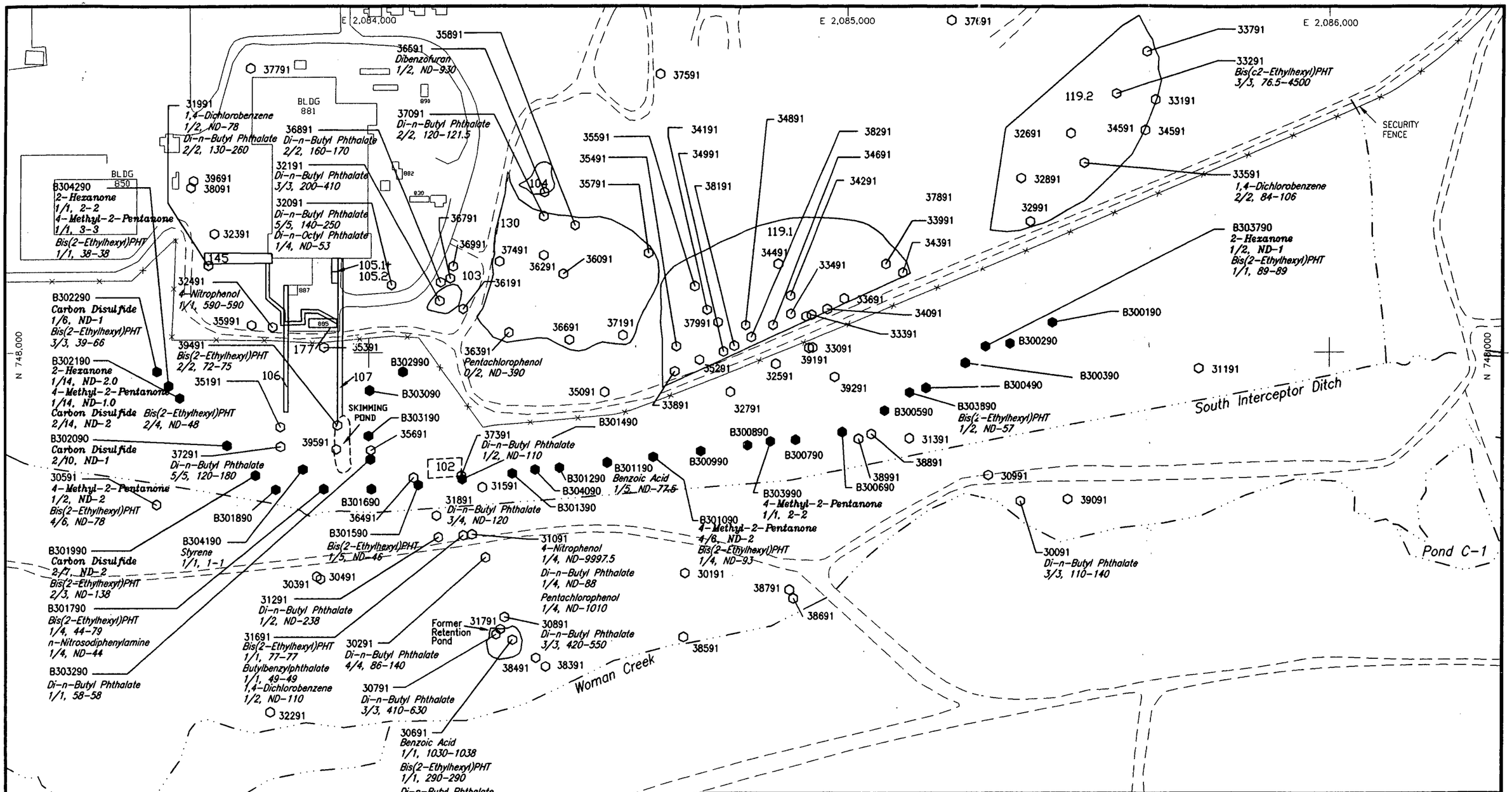
Figure D-221

AUGUST 1993

R74252.MB090393/200



R74255.MB090393/200



BNA	VOA
1,4-Dichlorobenzene	2-Hexanone
4-Nitrophenol	4-Methyl-2-Pentanone
Benzoic Acid	Benzene
Bis(2-Ethylhexyl)Phthalate (PHT)	Carbon Disulfide
Butylbenzylphthalate	Dichlorodifluoromethane
Di-n-Butyl Phthalate	m-Xylene
Di-n-Octyl Phthalate	p-Chlorotoluene
Dibenzofuran	p-Cymene
Diethyl Phthalate	sec-Butylbenzene
n-Nitrosodiphenylamine	Styrene
Pentachlorophenol	tert-Butylbenzene
	Trichlorofluoromethane
	Vinyl Chloride

EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) DASHED WHERE DISTURBED DURING CONSTRUCTION OF FRENCH DRAIN

○ 30191 — PHASE III BOREHOLES

● B300190 — FRENCH DRAIN BOREHOLE

0/2 — RATIO OF DETECTIONS TO TOTAL OBSERVATIONS

17-29 — MINIMUM-MAXIMUM CONCENTRATION

-N-

0 100 200

SCALE: 1"=200'

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant, Golden, Colorado

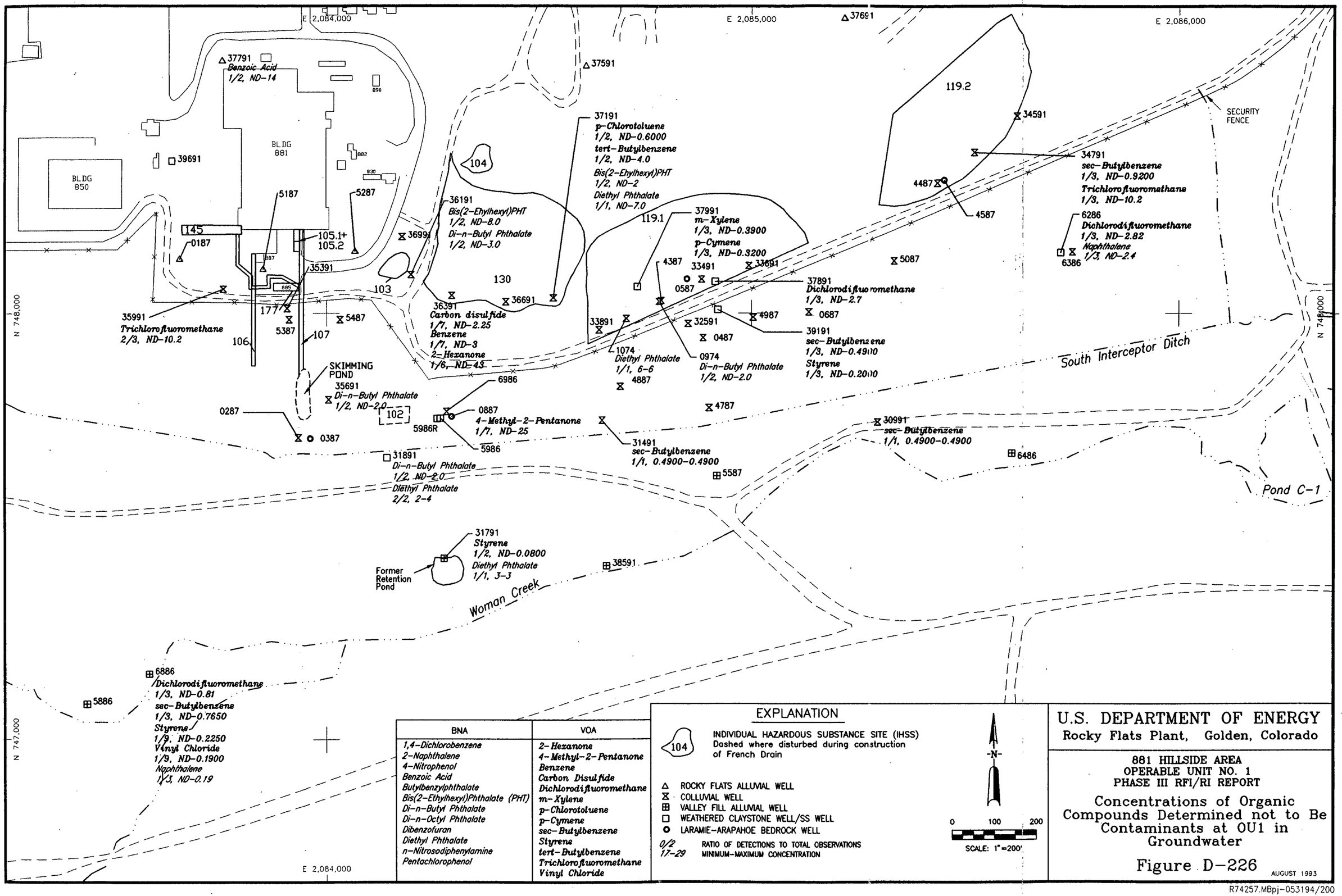
881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Concentrations of Organic Compounds Determined not to Be Contaminants at OU1 in Subsurface Soils

Figure D-225

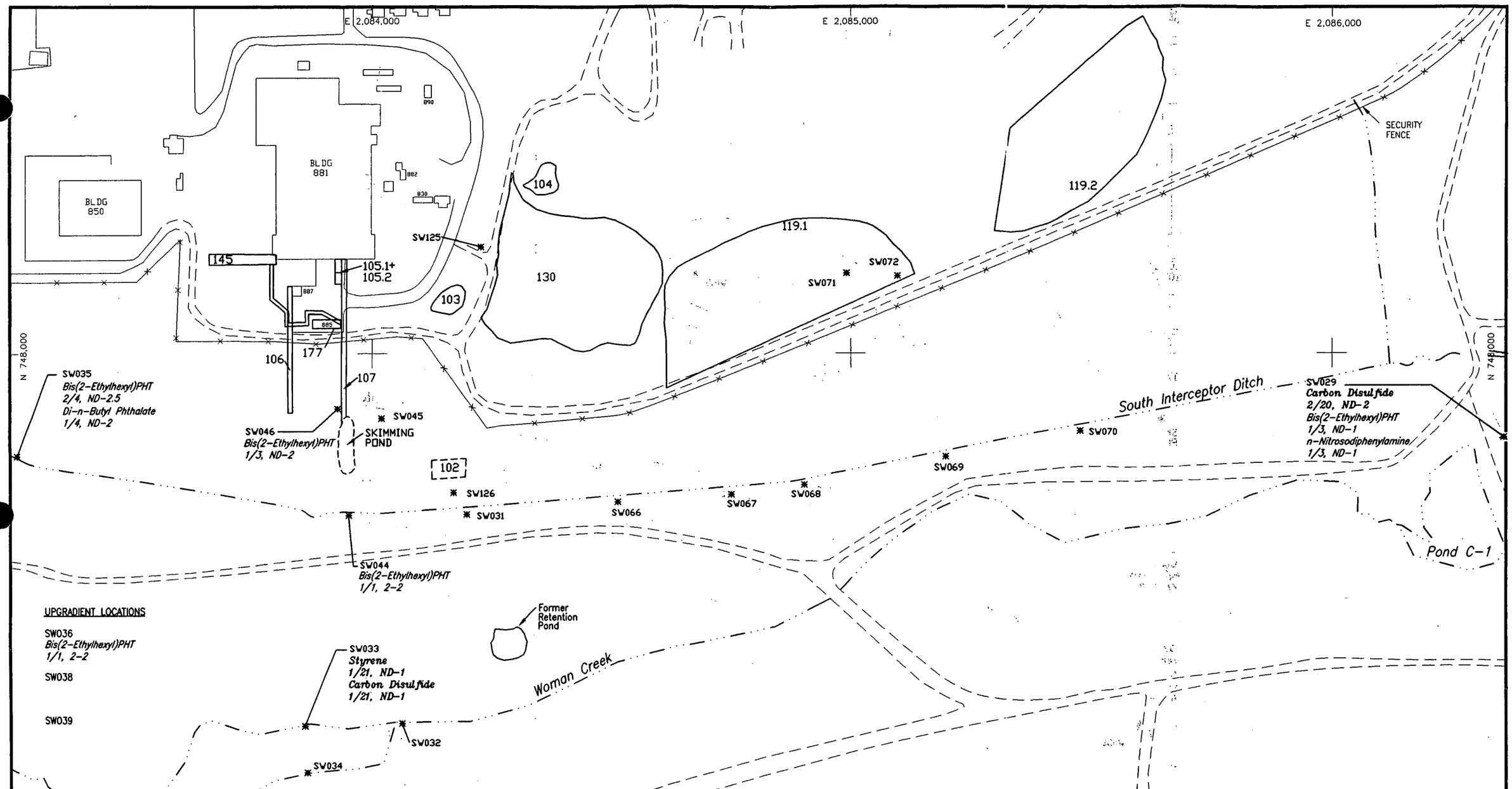
AUGUST 1993

R74256.MBpj-053194/200



BNA	VOA
1,4-Dichlorobenzene	2-Hexanone
2-Naphthalene	4-Methyl-2-Pentanone
4-Nitrophenol	Benzene
Benzoic Acid	Carbon Disulfide
Butylbenzylphthalate	Dichlorodifluoromethane
Bis(2-Ethylhexyl)Phthalate (PHT)	m-Xylene
Di-n-Butyl Phthalate	p-Chlorotoluene
Di-n-Octyl Phthalate	p-Cymene
Dibenzofuran	sec-Butylbenzene
Diethyl Phthalate	Styrene
n-Nitrosodiphenylamine	tert-Butylbenzene
Pentachlorophenol	Trichlorofluoromethane
	Vinyl Chloride

R74257.MBpj-053194/200



BNA	VOA
1,4-Dichlorobenzene	2-Hexanone
2-Methylnaphthalene	4-Methyl-2-Pentanone
4-Nitrophenol	Benzene
Benzoic Acid	Carbon Disulfide
Butylbenzylphthalate	Dichlorodifluoromethane
Bis(2-Ethylhexyl)Phthalate (PHT)	m-Xylene
Di-n-Butyl Phthalate	p-Chlorotoluene
Di-n-Octyl Phthalate	p-Cymene
Dibenzofuran	sec-Butylbenzene
Diethyl Phthalate	Styrene
n-Nitrosodiphenylamine	tert-Butylbenzene
Pentachlorophenol	Trichlorofluoromethane
	Vinyl Chloride

EXPLANATION

104 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE (IHSS) Dashed where disturbed during construction of French Drain

SW037 — SURFACE WATER MONITORING STATION

SEEP — SW044, SW045, SW046

0/2 — RATIO OF DETECTIONS TO TOTAL OBSERVATIONS

17-29 — MINIMUM-MAXIMUM CONCENTRATION

-N-

0 100 200

SCALE: 1"=200'

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant, Golden, Colorado

881 HILLSIDE AREA
OPERABLE UNIT NO. 1
PHASE III RFI/RI REPORT

Concentrations of Organic Compounds Determined not to Be Contaminants at OU1 in Surface Water

Figure D-227

AUGUST 1993

R74258.MB090393/200