DOCKET NO. 040-00772 LICENSE NO. STB-424 (expir

Allied-Signal Aerospace Company

Allied Signal

Final Radiological Clean-Up Plan

for the

Allied-Signal Aerospace Teterboro Facility and Surrounding Properties Teterboro, New Jersey

Prepared by

EBASCO *Environmental*
A Division of Ebasco Services Incorporated

September 1990

Allied-Signal Aerospace Company

Allied Signal

Final Radiological Clean-Up Plan

for the

Allied-Signal Aerospace Teterboro Facility and Surrounding Properties Teterboro, New Jersey

Prepared by

EBASCO *Environmental*
A Division of Ebasco Services Incorporated

September 1990

FINAL

RADIOLOGICAL CLEAN-UP

PLAN

for the

ALLIED-SIGNAL AEROSPACE TETERBORO FACILITY
AND SURROUNDING PROPERTIES
TETERBORO, NEW JERSEY

Prepared by
Ebasco Environmental

September 1990

Prepared by:

James Mayberry
Radiological Remediation
Manager

Approved by:

Les Skoski
Project Manager

3204K

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

Based on the results of the radiological characterization program conducted in Spring 1990 for the Allied-Signal Aerospace Teterboro Facility and surrounding properties, areas were identified that contain elevated concentrations of radium and thorium. Elevated concentrations are concentrations above target or cleanup levels, 5 pCi/gram in the first 6 inches and 15 pCi/gram at succeeding 6 inch depths. Area identification was through the use of gamma radiation surveys coupled with soil sample analyses from selected boreholes. The areas so identified delineate candidate areas expected to require remediation. The characterization program and results are presented in the "Radiological Characterization Report for the Allied-Signal Aerospace Teterboro Facility and Surrounding Properties Teterboro, New Jersey, June 1990" (Radiological Characterization Report). These areas do not present a significant risk to the health and safety of the public, site workers or remediation workers.

The specific boreholes identified as isolated "hot spots" and the maximum contaminant concentrations included the following. Borehole SL-65, located in the east parking lot, had Ra-226 contamination up to 830 pCi/gram of soil. Borehole SL-79, located in front of the Hazardous Waste Storage Building, had Ra-226 levels in the soil of 96 pCi/gram. An additional area, located in the east parking lot, contained two boreholes with concentrations of environmental concern. The maximum level seen in these boreholes, SL-38 and SL-96, was 340 pCi/gram. A summary of environmental concerns is presented in Section 2.

In addition to these isolated "hot spots", the east bank of the west ditch contains drums of thorium-magnesium slag used as rip-rap over a 150 foot length of the bank. These drums have begun to deteriorate resulting in the contamination of the surrounding soil. Samples of the slag have revealed both

elevated thorium and radium concentrations. To stabilize the ditch bank, sheet piling was installed which isolated the slag and ditch bank from the ditch and ditch bed.

The objective of this plan is to outline the remedial activities necessary to remove the contaminated soil and slag and the estimated costs for these activities. Following the summary of environmental concerns (Section 2), the proposed remedial action is presented (Section 3). As part of this discussion, soil volumes and task durations have been estimated. Section 4 presents the work plan, including the post-remediation sampling and monitoring plan. Section 5 presents cost estimates and the schedule. Appendix A contains the Health and Safety Plan for the work.

2.0 SUMMARY OF CONCERNS

This section presents the results of the radiological investigations and conclusions about the results. Results are presented for each aspect of the investigation, i.e., outdoor gamma radiation survey, soil sampling, surface water and sediment sampling and indoor gamma radiation survey. The conclusions consist of recommendations regarding whether or not to remediate areas and the rationales for the recommendations. Figure 2-1 presents the area of investigation.

2.1 OUTDOOR GAMMA RADIATION SURVEY

An outdoor gamma radiation survey was conducted to identify potentially contaminated soil areas. Figure 2-2 presents a map of the site depicting areas of elevated (greater than 5 uR/hr) exposure* rates. The elevated exposure rate found on the Allied-Signal property ranged up to approximately 200 uR/hr at ground level in front of the Hazardous Waste Storage Building (approximately 22+0, 950L). The elevated areas on the Allied property fell into two categories. The elevated areas near the south of the property were fairly uniform over a definite area. Other areas were hot spots (elevated exposure rates over very small areas). Areas adjacent to buildings were not considered. Building material contains high concentrations of natural radioactive material, resulting in elevated exposure rate measurements. The elevated exposure rate on the Metpath Inc. property ranged up to 12 uR/hr. The elevated areas on the Metpath property were fairly uniform over asphalted surfaces. The ditch bank was excluded from the sampling.

---

* **Exposure** is a fundamental quantity of radiation protection and is a measure of the ionization produced in air by x- or gamma-radiation. This term does not mean that an individual is necessarily subjected to this radiation level, i.e., "exposure".

2.2 SOIL SAMPLING

Table 2-1 presents the results of the soil sampling program. The table contains the borehole number, the sample number, the depth (in inches) of the sample, the number of counts per five minutes determined during screening and, when applicable, the sample weight and the analytical laboratory results. Note that not all samples were sent to the laboratory. The results of samples sent to the laboratory were used to determine levels of contamination in all samples. The correlation between screening values and levels of contamination is presented in Appendix B of the Radiological Characterization Report. This appendix may be reviewed for a complete understanding of sample screening but the information is not needed to understand the conclusions.

Background concentrations of Ra-226 and Th-232, 0.77 pCi/gram and 0.85 pCi/gram respectively, must be subtracted from the values in Table 2-1 to determine the net concentration of these radionuclides. Based on the results in Table 2-1, four boreholes contain samples with levels greater than the soil guidelines. These samples are SL-28-01, SL-65-05, SL-65-09, SL-79-02, SL-79-03, SL-79-04, SL-96-01, SL-96-02, SL-96-03, and SL-96-04. Table 2-2 presents the results of these samples. The table includes screening, gamma logging and radionuclide concentration results. Figure 2-3 depicts the areas of concern. All areas are on the Allied-Signal property.

Samples SL-34-04 and SL-34-07 have soil concentrations of Ra-226, after correction for background and wet versus dry weight, slightly below the 15 pCi/gram guideline. This borehole (SL-34) is adjacent to boreholes SL-96 and SL-38 and any remediation plans for these two boreholes will include borehole SL-34.

Appendix B of the Radiological Characterization Report contains the presentation of the relationship between soil screening results and Ra-226 and Th-232 concentrations in soil. The appendix contains details on the screening procedure and the calculations that support the development of the calibration curves for Ra-226 and Th-232. These curves are used to relate net screening counts to concentration in soil. From these relationships, it can be determined what screening level corresponds to concentrations of concern (5 pCi/gram and 15 pCi/gram). The results show that 2410 counts per 5 minutes and 3340 counts per 5 minutes correspond to 5 pCi/gram for Ra-226 and Th-232, respectively. A concentration of 15 pCi/gram corresponds to 4000 counts per 5 minutes for Ra-226 and 6790 counts per 5 minutes for Th-232. The two critical values for Ra-226 (2410 counts per 5 minutes and 4000 counts per 5 minutes) are used here, since they are the limiting values.

To apply the critical values, Table 2-1 must be consulted. The screening results for samples not analyzed in the laboratory are reviewed. Any sample with the sample number "01" that has a screening value greater than 2410 counts per 5 minutes may exceed the 5 pCi/gram target value. Similarly, any other samples with screening values greater than 4000 counts per 5 minutes may exceed the 15 pCi/gram level. It can be seen from Table 2-1 that only samples analyzed by the laboratory exceed these levels. From this, it can be concluded that the samples not analyzed at the laboratory are below the appropriate target level. Appendix B of the Radiological Characterization Report can be consulted for the derivation of the correlation between screening results and soil concentrations of Ra-226 and Th-232.

Although the ditch bank was not investigated during the current investigations, samples of drum material were taken. These samples yielded Th-232 concentration ranging from below detection limits to 100 pCi/gram and Ra-226 concentrations below detection limits to 7.9 pCi/gram. Since drum material will be

mixed with soil, the concentrations in the excavated material should be less than those seen in the drums.

2.3 SURFACE WATER AND SEDIMENT SAMPLING

Table 2-3 presents the results of the surface water and sediment sampling program. Figure 2-4 presents the sample locations. All results are at background levels, with the exception of Th-232 in sediment sample WD-02. After subtracting background, WD-02 has a Th-232 concentration of 6 pCi/g. WD-02 is located near the drums of thorium-magnesium slag located on the Metpath property. Background levels are represented by samples WD-01 and ED-01, the upstream samples.

2.4 CONCLUSIONS AND RECOMMENDATIONS

This subsection presents conclusions and recommendations, as presented in the Radiological Characterization Report, regarding the remediation of contaminated areas. Also included here is a comparison of the results of this most recent investigation with the results from a previous investigation.

2.4.1 Soils

As presented earlier, Figure 2-3 illustrates those areas that have soil concentrations greater than the soil guidelines. The areas were identified as a result of the outdoor gamma survey and soil sampling program. These four areas correspond to boreholes SL-28, SL-65, SL-79, and SL-96 and SL-38. The three latter areas (SL-65, SL-79, and SL-96 and SL-38) require remediation and are discussed first, while the former area requires re-evaluation.

The areas corresponding to SL-65, SL-79, and SL-96 and SL-38 definitely have soil concentrations that greatly exceed the 5 and 15 pCi/gram target levels. These boreholes have maximum

concentrations of Ra-226 of 830 pCi/gram, 95 pCi/gram, and 340 pCi/gram. It is probable that the average concentration of these concentrations over 100 square meters, as suggested in the DOE guidelines, is less than the target values (i.e., each of these boreholes represent hot spots). However, it is recommended that the hot spots (contaminated soil) be remediated. The rationale for this conclusion includes:

- Since only hot spots were encountered, the work that would be required to remove the material is minimal.

- Since thorium-magnesium slag in the drums is to be disposed of at a licensed natural occurring radioactive material (NORM) disposal site, and since Ra-226 in soil above the guidelines is considered a NORM waste, the contaminated soil could be disposed of with the drum material.

- The work that may be required to demonstrate that the average concentration in the soil is below the target value may equal or exceed the work required to remove the material.

The area corresponding to SL-28 will be re-evaluated during remediation. It is recommended that additional soil samples be collected and screened to more accurately estimate radionuclide content. Since the laboratory (and screening) results are close to the target level, a small resampling effort could eliminate this area from concern.

2.4.2 Surface Water and Sediment

The sediment sample that exceeded soil guidelines, WD-02, is near the bank where drums containing thorium-magnesium slag are stored. Additional analysis of the sediment in this area may be required to characterize the extent of contamination in this

area. Areas found to be above levels of concern can be removed and disposed of along with the drum material on the ditch bank. It is therefore recommended that the additional sampling and remediation be part of the bank remediation, i.e., the remediation of the drums containing thorium-magnesium slag. Resolution of this issue will not affect the remediation plans for the ditch bank.

2.4.3 Plants 1, 4, and 5 - Indoor Survey

The results of the indoor radiation survey shows two areas of concern. These areas, in the DCASPRO production area, had elevated external exposure rates of 9.64 uR/hr and 12.4 uR/hr. An individual exposed to the 12.4 uR/hr rate for an entire working year (2000 hours) would receive a dose of 25 millirem (including background), or 0.5 percent of the occupational limit allowd by the Nuclear Regulatory Commission. It is not expected that these exposure rates would result in any adverse effects to workers. However, in order to assure that doeses are kept as low as reasonably achievable, it is recommended that the source of these elevated levels be identified, and if "reasonably achievable", remediated.

2.4.4 Comparison with Previous Study

The results from this investigation agree in general with the previous DOE study. The areas of elevated Ra-226 concentrations indicated by soil samples TJ283 and TJ284 (DOE designations) taken by the DOE correspond to SL-96 and SL-79. The DOE study failed to locate the area corresponding to SL-65.

One area indicated by the DOE as highly contaminated is the ballfield. Their sample, TJ282, showed a level of 230 pCi/gram of Ra-226 and sample TJ281, an adjacent sample, could not be analyzed due to high levels of radioactive material. The study also showed external gamma ray exposure rates exceeding 200,000

3.0 REMEDIAL ACTION

This section presents a description of the remedial action to be implemented at the site, along with any options considered. The calculation of soil volume to be excavated and task descriptions have been included here. This information is used in the Cost and Scheduling section (Section 5).

3.1 REMEDIATION OPTIONS

The overall approach to site remediation of the radioactive contamination is to remove the contaminated material, transport it to an acceptable disposal facility, and backfill the excavated areas with clean fill. The soil will be removed and transported in bulk, including the drums on the west ditch bank and any soils that have mixed with the slag. Both the radium and thorium contaminated material can be disposed of in a licensed naturally-occurring radioactive material (NORM) waste site, such as Envirocare (Clive, Utah). Areas currently under asphalt will be re-asphalted. The ditch bank backfilled area will be landscaped to establish a vegetative cover.

Two options were considered for the removal of drums and material from the ditch bank area. The first would be to selectively overpack the drums and selectively remove only the soil known to be mixed with slag. The second would be bulk removal of both drums and adjacent soil. Since soil contamination by the drum material has been observed, bulk removal of the material would assure that all of the contaminated material is removed. Overpacking the drums might neglect some of the contaminated soil. Also, given the fact that overpacking would be labor and time intensive, this option can be negated due to ALARA considerations. That is, labor and time intensive operations would result in increased dose to the

workers over bulk removal. Thus while the expected dose would be well within that allowable, bulk removal would result in an overall lower collective dose.

Three options were also reviewed for backfilling the drum/soil area. The first would be to place rip-rap on the excavated area to create a new stream bank. The second would be to backfill to the current contour of the bank and then place rip-rap on the bank. These two options would include the removal of the sheet piling. A third option would entail the backfilling to the level of the sheetpiling. This last option is presented here as the preferable option. The first option is not preferred since the widening of the stream may cause local interflow problems. Also, the sheet piling would be removed, which is costly and will disturb the ditch bottom. The second option would also require the removal of the sheet piling.

The sheet piling also provides a net benefit. If contamination of the bank is found below the water level, the sheet piling will facilitate the excavation of this area, by controlling water flow to the bank.

3.2 SOIL VOLUMES

To estimate the cost involved in remediating the site, soil volumes to be excavated needed to be approximated. For the contaminated boreholes, the soil volumes were estimated by the "area of influence" of the borehole and the depth of contamination. As stated in the characterization report, sampling points were arranged in a regular triangular grid. The triangles are equilateral triangles, with sides of length T. As shown in Figure 3-1, each grid point samples a hexagonal area. The area of the hexagon is 6XY, where X equals T/2 and Y equals the quantity T/2 divided by the square root of 3 (the tangent of 60 degrees). Soil samples were taken every 6 inches in the borehole. These six-inch increments were used to determine the

depth of contamination. The depth of contamination is the bottom of the lowest region of contamination shown in the sampling results.

Using the prior formulation, the "areas of influence" and estimated volumes of soil to be remediated was estimated for each of the boreholes exhibiting contamination levels above target values (see Section 2 and Figures 3-2 and 3-3).

The soil volumes for these boreholes, total area and total volume are presented below:

Borehole	T(ft)	Area (sq.ft)	Depth (ft)	Volume (cu. ft)
SL-65	16	221	4.5	990
SL-79	14	170	2.0	340
SL-38	16	221	1.5	330
SL-96	16	221	2.0	440
TOTAL		833		2100

The soil volume on the ditch bank was estimated by assuming that all the soil within a rectangular solid along this bank will be removed. The length of the region is 150 feet, the approximate extent of the drums plus contingency. The width of the area, from the ditch to the top of the ditch bank, is 10 feet. The depth of the bank is assumed to be 5 feet. These assumptions yield a soil volume of 7500 cubic feet. Note that this estimate, like the estimates for the boreholes, represent a worst case (i.e., greatest volume) estimate for the contaminated soil volume. It is likely that the actual volume to be disposed of will be less.

3.3 DURATION

The duration of the remediation is estimated to be 21 work days. This estimate is based on the following assumptions. The

bank remediation will take ten (10) days, the remediation of boreholes SL-38 and SL-96 will take three (3) days, the remediation of SL-79 will require two (2) days, while the remediation of SL-65 will take two (2) days. Mobilization/ demobilization is estimated to require four (4) days.

4.0 WORK PLAN

This section provides the details of the remediation work to be performed. The discussion includes presentations on the excavation and associated activities, the post-remediation sampling plan, and radiation analysis activities. Before any of the activities discussed below are begun, the requirements of the Health and Safety Plan (see Appendix A) must be implemented.

4.1 SOIL EXCAVATION

The first phase of the remediation program is the excavation of contaminated soil. This phase includes the excavation, backfill, and landscaping of areas. The boreholes and stream bank are considered separately. The general steps to be performed for the contaminated boreholes are:

1) Locate the contaminated borehole and mark off the "are of influence" from the borehole. This area may be staked, chalked, etc. The area of influence for each borehole is defined in Section 3.2. A gamma radiation survey of the area should be made, noting readings greater than twice background.

2) Locate underground utilities in the area and determine what excavation activities (e.g., heavy equipment, pick and shovel, combination) are required.

3) Begin excavation at the borehole. Excavation is to be accomplished with a backhoe or by hand (when use of heavy equipment is precluded).

4) Excavation should proceed to the specified depth from the borehole location outward. The excavation should proceed in increments of 25 percent (or other convenient fraction) of the total area of influence.

5) Following each excavation increment, a radiation survey of the excavated area and remaining surface area should be conducted. If the area is thought to be "clean" (i.e., have soil concentrations below the clean-up target levels), then Phase I of the post-remediation sampling program should be implemented (see Section 4.2). If not, excavation should continue. Details on conducting the radiation survey can be found in Section 4.3.

6) If radiation survey results indicate that excavation should continue outside the marked area, then plans should be expanded to accomodate this need. Again, a pattern of excavation followed by radiation survey should be repeated.

7) Conduct post-remediation sampling, as specified in Section 4.2.

8) Decontaminate excavation equipment at proper location using a water spray.

For the contaminated ditch bank, the following steps should be implemented:

1) Locate drums of magnesium-thorium slag and mark off a "zone of contamination". This zone should consist of the drum(s) and a buffer zone to accomodate any drum material in the soil.

2) Locate and mark off areas of soil contamination not associated with a drum's "zone of contamination". these areas are to be located by a radiation survey (see Section 4.3).

3) Excavate areas to a depth equal to the ditch water level.

4) Conduct a radiation survey of the ditch bank to identify additional areas of soil contamination. Repeat steps 3 and 4 until all areas have been located.

5) Conduct post-remediation sampling, as specified in Section 4.2.

6) Decontaminate excavation equipment at proper location using a water spray.

In general, the following steps will be taken to handle the contaminated material. First, the excavated material will be removed and placed onto plastic by the backhoe (or similar equipment). Then, a front-end loader (or similar equipment) will transfer the material to a transportation/disposal container sitting adjacent to the excavation and on plastic as well. The plastic serves as a means to control the spread of contaminated soil. When excavation in an area is completed, the plastic will be placed in a disposal container. The containers will be staged in a central area and await transport to a disposal site.

In addition to the soil excavation activities, a small area within Plant #1 may need remediation. As discussed in Section 2, a localized area of elevated gamma exposure rate was found during characterization. The following steps are to be taken to cleanup this area.

1. Perform a radiation survey of the walls and floor of the rooms with elevated exposure rates. The survey will include gamma and alpha measurements. The objective of this survey is to locate the contamination.

2. If possible, the contaminated surfaces will be scraped clean. Debris will be vacuumed and the vacuumed material will be disposed of with the excavated soil.

3. Steps 1 and 2 are repeated until contaminants on surfaces have been removed.

4. If indications are that conventional scrapping is ineffective the need to remediate the area should be revisited, in light of the low external readings (3 or 4 times background).

4.2 POST-REMEDIATION SAMPLING

Post-remediation sampling results are used to verify that the areas with soil contamination above target levels have been remediated. The sampling program has been broken up into three phases. The first phase is used to delineate areas of contamination from "clean" areas. The steps involved in this phase include:

1) Take soil samples along the edge of the excavated area. The samples should be approximately 500 grams and be taken from each of the six-inch depth intervals under investigation.

2) Screen samples as detailed in Section 4.3.

3) Proceed with remediation as dictated by the screening results (i.e., continue post-remediation sampling or soil excavation).

The second phase is conducted to certify that the area has been sufficiently remediated. This phase should include areas to be

re-evaluated or further characterized as recommended in the Radiological Characterization Report. The steps in this phase are:

1) Survey ground to determine location of highest gamma radiation within remediated area.

2) Sample each six-inch soil depth interval at the location. The last sample is to be taken at the six-inch interval below the depth of excavation.

3) Screen soil samples as detailed in Section 4.3.

4) Any sample in excess of 75% of the screening target levels (2410 counts per 5 minutes for the first six-inch interval, 4000 counts per minute in subsequent six-inch intervals) will be sent to the analytical laboratory. Also, the sample with the greatest number of counts will be sent to the lab.

The final phase of the post-remediation sampling program consists of sampling the waste material to be shipped to the disposal site. The activity of NORM radionuclides must be recorded on a shipping manifest. Random samples, approximately 500 grams, of the material to be shipped will be taken to aid in the estimate of radionuclide-specific activities.

4.3 RADIOLOGICAL ANALYSES

Three types of radiological analyses will be used to support the remedial activities at the site. Gamma radiation surveys determine areas of elevated exposure rates, pinpointing locations of contamination. Soil sample screening determines if soil areas are likely to comply with clean-up target values.

Laboratory analyses quantify the concentration of specific radionuclides in soil. Prior to any field analyses, instruments must be source and background checked (daily) and properly calibrated (see Section 4.3.4.7).

4.3.1 Gamma Radiation Survey

The gamma radiation survey is conducted with a microR meter. This meter is sensitive enough to detect small changes in the gamma radiation fields at the site (a few microR/hr). A NaI detector and exposure rate meter will be used. Contaminated areas are pinpointed as follows:

1. Determine the background exposure rate for the area. This determination is made by taking a number of exposure rate measurements in the vicinity of the excavation, yet away from the influence of the contamination.

2. Take exposure rate measurements at the surface of the excavation (within 3 inches). The reading will be recorded once the instrument has stabilized (10-15 seconds).

3. Repeat step 2 over all areas under investigation, recording range of values.

4. Exposure rate levels greater than twice background may indicate areas of contamination.

4.3.2 Soil Sample Screening

Soil sample screening facilitates the identification of zones of soil contamination as well as "clean" zones. A shielded counter system employing a NaI detector and scaler is used to measure the activity in the sample. The steps involved in soil sample screening include:

1. Set-up counting system, which includes a lead shielded cavity for sample and detector, a SPA-3 NaI detector and an ESP-2 rate meter/scaler. Establish the range of background measurements by taking 20 5-minute background counts.

2. Weigh sample and subtract the weight of container.

3. Count soil samples for 5 minutes.

4. Compare counts for soil samples with counts to activity conversion factors established during radiological characterization.

5. Record estimate for Ra-226 concentration.

4.3.3 Laboratory Analyses

To support post-remediation confirmation sampling, a number of soil samples will be analyzed by an analytic laboratory for gamma-emitting radionuclides. Samples are first screened according to the procedure presented above. Then, selected samples are sent to an analytic laboratory for analysis (TMA Eberline). Samples are sent to the lab if they are expected to approach or exceed target clean-up values. However, at least one sample (the sample with the highest activity) from each area is to be sent to the laboratory, regardless of its estimated activity. The laboratory will perform a gamma-spectroscopy analysis on the sample. System sensitivities will be such to assure a minimum detectable concentration of 0.5 pCi/gram for Ra-226 and Th-232. Appendix B contains the laboratory procedures.

4.3.4 Quality Assurance of Field Activities

Quality Assurance and Quality Control (QA/QC) during the sampling program will be overseen by an Ebasco QA/QC Officer.

The QA/QC Officer may initially accompany sampling personnel into the field to verify that sampling is being correctly implemented according to the Work Plan.

4.3.4.1 Sample Documentation

The sampling team or individual performing a particular sampling activity is required to keep a field notebook. This field notebook will be a bound weatherproof logbook that shall be filled out at the location of sample collection immediately after sampling. It will contain information on the samples including sample number, sample collection time, sample location, sample descriptions, sampling methods used, daily weather condition, field measurements, name of sampler, and other site specific observations. The field notebook will contain any deviations from protocol, visitors' or workers' names or community contacts during sampling, and other site-specific information that the Field Operations Leader determines to be noteworthy.

Chain of Custody Forms, Sample Labels, and Custody Seals will be filled out for each sample. Field team members will also use a specific field data sheet to record exposure rate values at sampling locations.

4.3.4.2 Field Blank Procedure

A field blank is deionized, analyte free water that has been used to rinse the field sampling equipment after decontamination. Preservation of blanks will be the same as for environmental samples. One field blank per equipment type per decontamination event, not to exceed one per day, will be prepared. In this manner, any possible cross-contamination occurring among samples due to the repeated use of the same sampling equipment can be assessed. The procedure for taking field blanks is:

1. Decontaminate all sampling equipment following procedures specified in Subsection 4.3.4.5 of this plan.

2. Pour deionized water through the sampler and collect in the sample bottles, samples should be preserved using the same procedures as for environmental samples.

3. Field blanks should be analyzed for the same parameters as the samples taken with the sampling equipment.

4. Seal jars.

5. Fill out field notebook, labels and chain-of-custody forms.

6. The samples will be shipped to the laboratory.

4.3.4.3 Deionized Water Blank Procedure

A deionized water (DI) blank will be collected and analyzed initially or any time a new source of deionized water is used. The analysis is to demonstrate that the water is deionized. The procedure is:

1. Fill sample containers with deionized water which was obtained from the same source as that used in the field blanks.

2. Preserve samples and seal jar.

3. Fill out field notebook, labels and chain-of-custody forms.

4. The samples will be shipped to the laboratory. The DI water blank will be shipped and analyzed separately from the environmental samples.

4.3.4.4 Duplicate Samples

Duplicate/split samples will be analyzed to check laboratory reproducibility of analytical data. At least five percent (i.e., one out of every 20 samples) of the total samples will be duplicated to evaluate the precision of the methods used.

4.3.4.5 Decontamination

As presented below, all equipment involved in field sampling activities will be decontaminated prior to sampling. Equipment leaving the site will also be decontaminated as called for in the HASP. All down-hole drilling equipment and buckets on backhoes will be steam-cleaned prior to use and between use at different boring (or test pit) locations.

Decontamination of the sampling equipment will be conducted according to this procedure:

1. Tap water/phosphate-free detergent scrub.

2. Tap water rinse.

3. 10% nitric acid rinse or 1% nitric acid (ultrapure grade or better) for carbon steel split spoons.

4. Tap water rinse.

5. DI water rinse.

6. Air dry.

7. Wrap in aluminum foil, shiny side out, until equipment is ready to be used for sampling.

Note: While sampling, cleaned equipment may rest on but never be wrapped in polyethylene sheeting.

Extraneous contamination and cross-contamination will be controlled by the decontamination procedure, wrapping the sampling equipment with aluminum foil when not in use, and charging and disposing of the sampler's gloves between samples.

Personnel directly involved in equipment decontamination will wear protective clothing, as specified in the HASP.

The pH, conductivity, and temperature measurements of water samples will be performed in the field. To avoid cross-contamination, the probes will be cleaned using deionized distilled water.

4.3.4.3 Sample Packaging and Shipping

Samples will be packaged and shipped according to Ebasco procedural guidelines. The sample packaging requirements include:

- Place sample container, properly identified and with a sealed lid, in a polyethylene bag, and seal the bag.
- Place sample in a fiberboard container or picnic cooler that has been lined with a large polyethylene bag.
- Pack with enough noncombustible, absorbent, cushioning materials to minimize the possibility of the container breaking.
- Seal large bag.
- Tape sample paper work to the inside of the cooler lid.
- Seal outside container with a chain-of-custody seal.

The estimated activity of each sample wi be reviewed to determine if the sample meets the criteria for "limited quantities of radioactive materials" specified in 49 CFR 173.421. The activity estimates will be based on the calibration of count rate versus concentration for the radionuclides of concern. This specifies that the total activity is not to exceed the A2 value. Section 173.433(b)(6) specifies the A2 value for mixed radionuclides of unknown identity as 2 millicuries (mCi). If the count rate, with appropriate corrections for the geometry and counter efficiency, indicates that the total sample has an activity below 2 mCi, the sample is suitable for shipment in a DOT Type "A" container, provided the external radiation on the surface of the package does not exceed a dose rate of 0.5 mR/hr and provided that a wipe test shows that the level of removable radioactive contamination does not exceed the limits specified in Section 173.443(a).

Samples not conforming to the designation described above will be shipped in a Type "B" container.

Ths shipping procedures for samples categorized as radioactive material are described in detail in Title 49 of the Code of Federal Regulations. The specific requirements for such samples will be dependent upon:

- The physical state of the sample;
- The radionuclides present or assumed to be present;
- The quantity of radionuclides present;
- The specific activity of radioactivity present; and
- The size or mass of the sample.

4.3.4.7 Equipment Calibration

Calibration activities shall be performed in accordance with written instructions. The Field Operations Leader or designee

is responsible for assuring that the following procedures are implemented for field calibrated equipment:

1. A list is established to include the measuring and testing devices to be calibrated and the frequency of calibration of these devices. The method and interval of calibration shall be based on the type of device, stability characteristics, required accuracy, and other conditions affecting measurement control.

2. The measuring and testing devices to be used are of the proper range, type and accuracy for the test being performed.

3. A master calibration file is maintained for each measuring and testing device which includes at least the following information:

   a) Name of device
   b) Device serial and/or identification number
   c) Frequency of calibration
   d) Date of last calibration
   e) Name of party performing last calibration
   f) Due data of next calibration
   g) Nuclide(s) for which the instrument was calibrated

4. Measuring and testing devices are marked with calibration due dates when possible. When this marking is not possible, alternative methods of tracing the device to its calibration date (such as serialization) shall be employed.

5. Measuring and testing devices are calibrated in accordance with the requirementr of this section. Prior to field use each instrument shall be calibrated. and documentation that substantiates same shall be available.

6. A system for issuance, collection, and return of all measuring and testing devices shall be developed and maintained. This system shall provide for the identification of personnel withdrawing devices, methods for issuing devices, and methods for the collection and/or return of devices, at prescribed calibration times or as otherwise required.

7. Methods are employed to assure proper handling, storage, and care of the test equipment in order to maintain its required accuracy.

Field equipment utilized for on-site measurements is calibrated at intervals recommended by the equipment manufacturer or industry practice. Prior to field use each instrument shall be checked for accuracy and if required shall be calibrated. If any measuring or test device requiring calibration cannot immediately be removed from service, the Radiological Remediation Manager or designee can extend the calibration cycle providing a review of the equipment's history warrants the issuance of an extension. No equipment shall be extended more than twice during a calibration cycle, nor shall the extension exceed one-half the prescribed calibration cycle.

4.3.4.8 Field Changes

The Project Manager, or designee, is responsible for all site activities. The Project Manager may be required to modify site programs to accommodate site-specific needs or unforeseeable events. When it becomes necessary to modify a program, the

Radiological Remediation Manager will notify the Project Manager of the anticipated change and implement these changes. If these changes are subsequently determined to be unacceptable the action taken during this period of deviation from the program will be evaluated for their significance.

The changes in the program are documented on a Field Change Request (FCR) form which is signed by both the initiator the Radiological Remediation Manager and Project Manager. The FCRs for each document shall be numbered sequentially starting with the number "1".

The Project Manager is responsible for the control, tracking and implementation of the identified changes. Completed FCRs are distributed to affected parties which will include, at a minimum, Allied Project Coordinator, Project Manager, Radiological Remediation Manager, and Quality Assurance Manager.

5.0 COSTS AND SCHEDULE

This section presents the costs and schedule for the remediation. Costs are based on estimates for unit costs and soil volumes and do not represent Subcontractor estimates. The schedule depicts the relationship of remedial activities to one another.

5.1 COSTS

Table 5-1 presents the unit costs that were used in the estimate. Except where otherwise noted, the source of the cost data is a cost data base prepared by Ebasco for the U.S. Environmental Protection Agency, supplemented by internal Ebasco data. All contractor costs are estimated. It is assumed that the radiological remediation will take place concurrently with the chemical sampling work or remediation and that costs of office and decon trailers can be shared.

The cost of the radiological remediation is estimated below from the prior volume estimates and the costs presented in Table 5-1:

- Excavation, bulk loading, transportation and clean fill backfill - 9600 cu ft x $10.06/cu ft = $96,516

- Disposal of Material - 9600 cu ft x $30./cu ft = $288,000

- Repaving - 833 sq ft x $3.00/sq ft = $ 2,499

- Sample Analysis- on-site radiological analysis 100 samples x $10/sample = $ 1,000
  - off site radiological analysis 20 x $150/sample = $ 3,000
  - 5 chemical analysis samples x $710/sample = $ 3,550

  Analyses subtotal = $ 7,550

- o Support Labor - 21 days x $1200/day = $ 25,200

- o Landscaping $ 5,000

Summing the elements leads to an estimated cost for remediation of $424,825. Folding in a 25% contingency factor, which includes engineering costs, leads to a final estimated cost of $531,000.

It should be noted that over 68% of the estimated cost is for the disposal of material. A technique for on-site analyses of samples on a nearly real time basis will assure that only material above the limits are excavated and bulk loaded. This will result in tight control over the material to be shipped and disposed of which will be reflected in a reduction in cost.

5.2 SCHEDULE

The presentation below depicts the schedule for activities from the start of soil excavation. The schedule excludes activities such as the development of detailed protocols, pre-remediation investigations and contractor bids. The schedule calls for twenty-one (21) days on site.

	Days From Start																				
Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Mobilization	-----																				
Excavation			-----	.	.	.	.	-------													
Sampling, Phase I				-	.	.	.	.	.	.	.	--									
Backfill, finish							--------	.	.	.	.	----------									
Sampling, Phase II								-	.	.	.	.	.	.	.	-	.	.	.	.	--
Load Trucks																			-------		
Demobilization																				-----	

6.0 TABLES AND FIGURES

TABLE 2-1 (Page 1 of 24)

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-00	01	0-6	7950	353	0.8	30	17
SL-01	01	0-6	1340	298	0.4	0.5	12
SL-01	02	6-12	1380	516	0.2	0.3	10
SL-01	03	12-18	1270	705	0.4	0.4	10
SL-01	04	18-24	1440	575	0.7	1.2	19
SL-01	05	24-36	1980	435	1	1.3	10
SL-01	06	30-36	1550	476	0.4	0.6	20
SL-01	07	36-42	1640	533	0.5	0.6	18
SL-01	09	48-54	1450	456	0.5	0.6	20
SL-01	10	54-60	1830	691	0.6	0.9	20
SL-01	11	60-66	1600	619	0.5	0.4	19
SL-01	12	66-72	1560	398	0.3	0.5	19
SL-02	01	0-6	1190				
SL-02	02	6-12	1110				
SL-02	03	12-18	1360				
SL-02	04	18-24	1430				
SL-02	05	24-36	1140				
SL-02	06	30-36	1800	526	0.7	0.9	6
SL-02	07	36-42	1630				
SL-02	08	42-48	1770				
SL-02	09	48-54	1540				
SL-02	10	54-60	1770				
SL-02	11	60-66	1680				
SL-02	12	66-72	1760				
SL-03	01	0-6	1320				
SL-03	02	6-12	1270				
SL-03	03	12-18	1390				
SL-03	04	18-24	1210				
SL-03	07	36-42	1520				
SL-03	09	48-54	1730	632	0.4	0.8	8
SL-04	01	0-6	1330				
SL-04	02	6-12	1510				
SL-04	03	12-18	1990	650	0.5	0.7	8
SL-04	04	18-24	1550				
SL-04	05	24-36	1470				
SL-04	06	30-36	1610				
SL-04	08	42-48	1420				
SL-04	09	48-54	1430				
SL-04	10	54-60	1690				
SL-04	11	60-66	1920				
SL-04	12	66-72	1770				
SL-05	01	0-6	1540	493	0.7	1	16
SL-05	02	6-12	1430	534	0.2	0.4	9
SL-05	03	12-18	1340	243	0.5	0.8	15
SL-05	05	24-36	1480	275	0.8	0.9	14
SL-05	06	30-36	1300	268	0.6	0.8	15
SL-05	07	36-42	1360	153	0.7	1.2	20
SL-05	09	48-54	1380	219	0.4	0.6	19
SL-05	10	54-60	1530	567	0.3	0.5	18

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-05	11	60-66	1460	219	0.7	1	17
SL-05	09D	DUP	1930	236	0.5	0.6	18
SL-05	11D	DUP	1360	263	0.5	0.6	18
SL-06	01	0-6	1370				
SL-06	02	6-12	1350				
SL-06	03	12-18	1520				
SL-06	04	18-24	NR				
SL-06	05	24-36	1340				
SL-06	06	30-36	1460				
SL-06	07	36-42	1510				
SL-06	08	42-48	NR				
SL-06	09	48-54	1560				
SL-06	10	54-60	1360				
SL-06	11	60-66	1500				
SL-06	12	66-72	1700	652	0.4	0.6	7
SL-07	01	0-6	1790				
SL-07	02	6-12	2110	597	0.8	0.6	11
SL-07	03	12-18	1220				
SL-07	04	18-24	2300	602	0.9	0.8	11
SL-07	05	24-36	1630				
SL-07	06	30-36	1260				
SL-07	07	36-42	1180				
SL-07	08	42-48	1340				
SL-07	09	48-54	1500				
SL-07	10	54-60	1500				
SL-07	11	60-66	1780				
SL-07	12	66-72	1560				
SL-07	13	72-78	1400				
SL-07	14	78-84	1560				
SL-07	15	84-90	1750				
SL-07	16	90-96	1990				
SL-08	01	0-6	1480				
SL-08	02	6-12	1510				
SL-08	03	12-18	1720				
SL-08	04	18-24	NR				
SL-08	05	24-36	1390				
SL-08	06	30-36	1750	561	0.6	0.7	9
SL-08	07	36-42	1500				
SL-08	08	42-48	1340				
SL-08	09	48-54	1490				
SL-08	10	54-60	1470				
SL-08	11	60-66	1400				
SL-08	12	66-72	1570				
SL-09	01	0-6	1350				
SL-09	02	6-12	1450				
SL-09	03	12-18	1630				
SL-09	04	18-24	NR				
SL-09	05	24-36	1470				
SL-09	06	30-36	1250				
SL-09	07	36-42	1210				
SL-09	08	42-48	1130				
SL-09	09	48-54	1260				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-09	10	54-60	1400				
SL-09	11	60-66	1750				
SL-09	12	66-72	1930	644	0.5	0.6	6
SL-10	01	0-6	1370				
SL-10	02	6-12	1510				
SL-10	03	12-18	1440				
SL-10	04	18-24	1480				
SL-10	05	24-36	1310				
SL-10	06	30-36	1150				
SL-10	07	36-42	1350				
SL-10	08	42-48	NR				
SL-10	09	48-54	1270				
SL-10	10	54-60	1640				
SL-10	11	60-66	1570				
SL-10	12	66-72	1700	494	0.8	0.8	8
SL-11	01	0-6	1210				
SL-11	02	6-12	1360				
SL-11	03	12-18	1480				
SL-11	04	18-24	1540				
SL-11	05	24-36	1270				
SL-11	06	30-36	1300				
SL-11	07	36-42	1180				
SL-11	08	42-48	1310				
SL-11	09	48-54	1320				
SL-11	10	54-60	1350				
SL-11	11	60-66	1610				
SL-11	12	66-72	1810	692	0.4	0.6	6
SL-12	01	0-6	1340				
SL-12	02	6-12	1570				
SL-12	03	12-18	1460				
SL-12	04	18-24	NR				
SL-12	05	24-36	1420				
SL-12	06	30-36	1460				
SL-12	07	36-42	1450				
SL-12	08	42-48	1550				
SL-12	09	48-54	1570				
SL-12	10	54-60	1450				
SL-12	11	60-66	1700	494	0.6	1	11
SL-12	12	66-72	1570				
SL-13	01	0-6	1280				
SL-13	02	6-12	1410				
SL-13	03	12-18	1290				
SL-13	04	18-24	1390				
SL-13	05	24-36	1370				
SL-13	06	30-36	1410				
SL-13	07	36-42	1310				
SL-13	08	42-48	1390				
SL-13	09	48-54	1260				
SL-13	10	54-60	1310				
SL-13	11	60-66	1580	592	0.4	0.5	9
SL-13	12	66-72	1580	595	0.4	0.4	7
SL-14	01	0-6	1360				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-14	02	6-12	1830	530	0.7	0.6	10
SL-14	03	12-18	1810	451	0.8	0.9	10
SL-14	04	18-24	NR				
SL-14	05	24-36	1300				
SL-14	06	30-36	1180				
SL-14	07	36-42	1450				
SL-14	08	42-48	1440				
SL-14	09	48-54	1430				
SL-14	10	54-60	1590				
SL-14	11	60-66	1600				
SL-14	12	66-72	1440				
SL-14	13	72-78	1830	666	0.6	0.7	9
SL-14	14	78-84	1770				
SL-14	15	84-90	1630				
SL-14	16	90-96	1510				
SL-15	01	0-6	1570	487	0.9	1.1	15
SL-15	02	6-12	1550				
SL-15	03	12-18	1330				
SL-15	04	18-24	1240				
SL-15	05	24-36	1280				
SL-15	06	30-36	1420				
SL-15	07	36-42	1330				
SL-15	08	42-48	1330				
SL-15	09	48-54	1350				
SL-15	10	54-60	1490				
SL-15	11	60-66	1520				
SL-15	12	66-72	1580	489	0.8	1	14
SL-15	13	72-78	1330				
SL-15	14	78-84	1360				
SL-15	15	84-90	1820				
SL-15	16	90-96	1490				
SL-16	01	0-6	1900	454	5	1.1	11
SL-16	02	6-12	1750				
SL-16	03	12-18	1410				
SL-16	04	18-24	1350				
SL-16	05	24-36	1180				
SL-16	06	30-36	1180				
SL-16	07	36-42	1240				
SL-16	08	42-48	1350				
SL-16	09	48-54	1330				
SL-16	10	54-60	1420				
SL-16	11	60-66	1520				
SL-16	12	66-72	1590				
SL-17	01	0-6	1740				
SL-17	02	6-12	1810	353	1.6	1.1	17
SL-17	03	12-18	1490				
SL-17	04	18-24	1410				
SL-17	05	24-36	1260				
SL-17	06	30-36	1370				
SL-17	07	36-42	1310				
SL-17	08	42-48	1440				
SL-17	09	48-54	1460				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-17	10	54-60	1440				
SL-17	11	60-66	1480				
SL-17	12	66-72	1290				
SL-18	01	0-6	1320				
SL-18	02	6-12	1380				
SL-18	03	12-18	1370				
SL-18	04	18-24	1330				
SL-18	05	24-36	1310				
SL-18	06	30-36	1340				
SL-18	07	36-42	1370				
SL-18	08	42-48	1420				
SL-18	09	48-54	1340				
SL-18	10	54-60	1360				
SL-18	11	60-66	1450	449	0.5	0.6	13
SL-18	12	66-72	1350				
SL-19	01	0-6	1410				
SL-19	02	6-12	1790	433	1	1.1	13
SL-19	03	12-18	NR				
SL-19	04	18-24	NR				
SL-19	05	24-36	1820	274	1.4	1.8	12
SL-19	06	30-36	1340				
SL-19	07	36-42	1250				
SL-19	08	42-48	NR				
SL-19	09	48-54	1390				
SL-19	10	54-60	1500				
SL-19	11	60-66	1420				
SL-19	12	66-72	1480				
SL-19	13	72-78	1270				
SL-19	14	78-84	1340				
SL-19	15	84-90	1420				
SL-19	16	90-96	1480				
SL-19	17	96-102	1390				
SL-19	18	102-108	1380				
SL-19	19	108-114	1590				
SL-19	20	114-120	1670				
SL-19	14D	DUP	1350				
SL-20	01	0-6	1250				
SL-20	02	6-12	1220				
SL-20	03	12-18	1490				
SL-20	04	18-24	1910	456	3.6	0.8	8
SL-20	05	24-36	1180				
SL-20	06	30-36	1560				
SL-20	07	36-42	1610				
SL-20	08	42-48	1410				
SL-20	09	48-54	NR				
SL-20	10	54-60	1350				
SL-20	11	60-66	1350				
SL-20	12	66-72	1420				
SL-20	13	72-78	1440				
SL-20	14	78-84	1360				
SL-20	15	84-90	1350				
SL-20	16	90-96	1410				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-21	01	0-6	1360				
SL-21	02	6-12	1550				
SL-21	03	12-18	1510				
SL-21	04	18-24	1440				
SL-21	05	24-36	1400				
SL-21	06	30-36	1350				
SL-21	07	36-42	1300				
SL-21	08	42-48	NR				
SL-21	09	48-54	1390				
SL-21	10	54-60	1390				
SL-21	11	60-66	1410				
SL-21	12	66-72	1310				
SL-21	13	72-78	1260				
SL-21	14	78-84	1380				
SL-21	15	84-90	1570	507	0.5	0.7	14
SL-21	16	90-96	1390				
SL-21	17	96-102	1420				
SL-21	18	102-108	1390				
SL-21	19	108-114	1380				
SL-21	20	114-120	1570	453	0.8	1.2	15
SL-22	01	0-6	1250				
SL-22	02	6-12	NR				
SL-22	03	12-18	NR				
SL-22	04	18-24	NR				
SL-22	05	24-36	1300				
SL-22	06	30-36	1300				
SL-22	07	36-42	1130				
SL-22	08	42-48	NR				
SL-22	09	48-54	1250				
SL-22	10	54-60	1410				
SL-22	11	60-66	1530	340	0.6	0.9	13
SL-22	12	66-72	NR				
SL-22	13	72-78	1400				
SL-22	14	78-84	1230				
SL-23	01	0-6	1340				
SL-23	02	6-12	1420				
SL-23	03	12-18	1390				
SL-23	04	18-24	1390				
SL-23	05	24-36	1270				
SL-23	06	30-36	1330				
SL-23	07	36-42	1350				
SL-23	08	42-48	1300				
SL-23	09	48-54	1370				
SL-23	10	54-60	1250				
SL-23	11	60-66	1320				
SL-23	12	66-72	1510				
SL-23	13	72-78	1270				
SL-23	14	78-84	1470				
SL-23	15	84-90	1640				
SL-23	16	90-96	1360				
SL-23	17	96-102	1360				
SL-23	18	102-108	1390				

TABLE 2-1 (Page 7 of 24)

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-23	19	108-114	1590				
SL-23	20	114-120	1720	677	0.6	0.7	10
SL-24	01	0-6	1270				
SL-24	02	6-12	1630	380	0.8	1.1	10
SL-24	03	12-18	1310				
SL-24	04	18-24	NR				
SL-24	05	24-36	1410				
SL-24	06	30-36	1480				
SL-24	07	36-42	1470				
SL-24	08	42-48	1300				
SL-24	09	48-54	1440				
SL-24	10	54-60	1370				
SL-24	11	60-66	1440				
SL-24	12	66-72	1480				
SL-25	01	0-6	1370				
SL-25	02	6-12	NR				
SL-25	03	12-18	NR				
SL-25	04	18-24	NR				
SL-25	05	24-36	1430				
SL-25	06	30-36	1420				
SL-25	07	36-42	1330				
SL-25	08	42-48	1400				
SL-25	09	48-54	1410				
SL-25	10	54-60	1460	455	0.5	0.9	11
SL-25	11	60-66	1340				
SL-25	12	66-72	1290				
SL-26	01	0-6	1140				
SL-26	02	6-12	1450				
SL-26	03	12-18	1470				
SL-26	04	18-24	NR				
SL-26	05	24-36	1300				
SL-26	06	30-36	1360				
SL-26	07	36-42	1420				
SL-26	08	42-48	1420				
SL-26	09	48-54	1330				
SL-26	10	54-60	1570	446	0.5	1	12
SL-26	11	60-66	1490				
SL-27	01	0-6	1380				
SL-27	02	6-12	1330				
SL-27	03	12-18	1450				
SL-27	04	18-24	1470				
SL-27	05	24-36	1400				
SL-27	06	30-36	1370				
SL-27	07	36-42	1390				
SL-27	08	42-48	1460				
SL-27	09	48-54	1440				
SL-27	10	54-60	1500				
SL-27	11	60-66	1630	519	0.6	1	10
SL-27	12	66-72	1480				
SL-28	01	0-6	1680	415	6.5	<0.5	10
SL-28	02	6-12	1380				
SL-28	03	12-18	1330				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-28	04	18-24	1460				
SL-28	05	24-36	1280				
SL-28	06	30-36	1470				
SL-28	07	36-42	1500				
SL-28	08	42-48	1400				
SL-28	09	48-54	1420				
SL-28	10	54-60	1530				
SL-28	11	60-66	1400				
SL-28	12	66-72	1500				
SL-29	01	0-6	1390				
SL-29	02	6-12	1400				
SL-29	03	12-18	1400				
SL-29	04	18-24	1400				
SL-29	05	24-36	1300				
SL-29	06	30-36	1310				
SL-29	07	36-42	1400				
SL-29	08	42-48	1520				
SL-29	09	48-54	1420				
SL-29	10	54-60	1520				
SL-29	11	60-66	1520				
SL-29	12	66-72	1520				
SL-29	13	72-78	1530				
SL-29	14	78-84	1610				
SL-29	15	84-90	1610	444	0.6	1	.4
SL-29	16	90-96	1600				
SL-30	01	0-6	1440				
SL-30	02	6-12	1340				
SL-30	03	12-18	1450				
SL-30	04	18-24	1430				
SL-30	05	24-36	1350				
SL-30	06	30-36	1330				
SL-30	07	36-42	1350				
SL-30	08	42-48	1290				
SL-30	09	48-54	1290				
SL-30	10	54-60	1360				
SL-30	11	60-66	1440				
SL-30	12	66-72	1300				
SL-30	13	72-78	1370				
SL-30	14	78-84	1320				
SL-30	15	84-90	1440				
SL-30	16	90-96	1310				
SL-30	17	96-102	1460				
SL-30	18	102-108	1700	452	1	1.3	9
SL-30	19	108-114	1510				
SL-30	20	114-120	1680				
SL-31	01	0-6	1200				
SL-31	02	6-12	1320				
SL-31	03	12-18	1460				
SL-31	04	18-24	1370				
SL-31	05	24-36	1350				
SL-31	06	30-36	1410				
SL-31	07	36-42	1390				

3204K

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-31	08	42-48	1270				
SL-31	09	48-54	1370				
SL-31	10	54-60	1400				
SL-31	11	60-66	1460				
SL-31	12	66-72	1400				
SL-31	13	72-78	1500				
SL-31	14	78-84	1510	481	0.8	1.0	18
SL-31	15	84-90	1430				
SL-31	16	90-96	1500				
SL-32	01	0-6	1370				
SL-32	02	6-12	1440				
SL-32	03	12-18	NR				
SL-32	04	18-24	NR				
SL-32	05	24-36	1410				
SL-32	06	30-36	1520				
SL-32	07	36-42	1490				
SL-32	08	42-48	NR				
SL-32	09	48-54	1450				
SL-32	10	54-60	1460				
SL-32	11	60-66	1540				
SL-32	12	66-72	1560				
SL-32	13	72-78	1590				
SL-32	14	78-84	1630				
SL-32	15	84-90	1710				
SL-32	16	90-96	1840	425	0.8	1.4	29
SL-33	05	24-36	1660	467	1.3	0.9	17
SL-33	06	30-36	1460				
SL-33	07	36-42	1430				
SL-34	01	0-6	NR				
SL-34	02	6-12	NR				
SL-34	03	12-18	1400				
SL-34	04	18-24	2500	478	15	1.2	20
SL-34	05	24-36	NR				
SL-34	06	30-36	NR				
SL-34	07	36-42	3560	562	16	0.8	13
SL-34	08	42-48	1470				
SL-34	09	48-54	1940				
SL-34	10	54-60	1570				
SL-34	11	60-66	1410				
SL-34	12	66-72	1540				
SL-35	01	0-6	NR				
SL-35	02	6-12	1320				
SL-35	03	12-18	1680	539	2.9	1.0	17
SL-35	04	18-24	1580				
SL-35	05	24-36	NR				
SL-35	06	30-36	1540				
SL-35	07	36-42	1430	569	0.5	0.9	8
SL-35	08	42-48	1560				
SL-36	01	0-6	1200				
SL-36	02	6-12	1270				
SL-36	03	12-18	1320				
SL-36	04	18-24	1410				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-36	05	24-36	1400				
SL-36	06	30-36	1460				
SL-36	07	36-42	1630	331	0.7	1.3	19
SL-36	08	42-48	1370				
SL-37	01	0-6	1280				
SL-37	02	6-12	NR				
SL-37	03	12-18	1250				
SL-37	04	18-24	1220				
SL-37	05	24-36	1250				
SL-37	06	30-36	1330				
SL-37	07	36-42	1370				
SL-37	08	42-48	1510	490	1.3	0.6	20
SL-37	09	48-54	1480				
SL-37	10	54-60	1510	437	0.7	0.9	19
SL-37	11	60-66	1320				
SL-37	12	66-72	1330				
SL-38	03	12-18	4680	466	24	0.4	15
SL-38	04	18-24	1680	455	0.9	0.8	19
SL-38	05	24-36	NR				
SL-38	06	30-36	NR				
SL-38	07	36-42	1390				
SL-38	08	42-48	1340				
SL-39	07	36-42	1540				
SL-39	08	42-48	1440				
SL-40	01	0-6	1370				
SL-40	02	6-12	NR				
SL-40	03	12-18	1610				
SL-40	04	18-24	1680	395	1.2	1.2	18
SL-40	05	24-36	1620				
SL-40	06	30-36	1400				
SL-40	07	36-42	1590				
SL-40	08	42-48	1470				
SL-41	01	0-6	1380				
SL-41	02	6-12	NR				
SL-41	03	12-18	NR				
SL-41	04	18-24	1350				
SL-41	05	24-36	1540				
SL-41	06	30-36	1570				
SL-41	07	36-42	1620				
SL-41	08	42-48	1600				
SL-41	09	48-54	1790				
SL-41	10	54-60	1590				
SL-41	11	60-66	1520	200	1.4	2.3	23
SL-41	12	66-72	1650				
SL-41	11D	DUP	1470	188	0.9	1.3	22
SL-42	03	12-18	1500				
SL-42	04	18-24	1540				
SL-42	05	24-36	1580				
SL-42	06	30-36	1590	443	0.8	2.4	8
SL-43	03	12-18	1280				
SL-43	04	18-24	1680	477	0.6	1.1	12
SL-43	05	24-36	NR				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-43	06	30-36	NR				
SL-43	07	36-42	1670				
SL-43	08	42-48	1630				
SL-44	02	6-12	1290				
SL-44	03	12-18	1260				
SL-44	04	18-24	1710				
SL-44	05	24-36	NR				
SL-44	06	30-36	NR				
SL-44	07	36-42	1470	300	0.7	0.9	12
SL-44	08	42-48	1470				
SL-44	07D	DUP	1470	233	0.7	1.0	13
SL-45	01	0-6	1340				
SL-45	02	6-12	1480				
SL-45	03	12-18	1290				
SL-45	04	18-24	1490	314	1.2	1.4	14
SL-45	05	24-36	NR				
SL-45	06	30-36	NR				
SL-45	07	36-42	1400				
SL-45	08	42-48	1400				
SL-46	02	6-12	1340				
SL-46	03	12-18	1320				
SL-46	04	18-24	1600	332	1.0	1.3	18
SL-46	05	24-36	NR				
SL-46	06	30-36	1420				
SL-46	07	36-42	1580				
SL-46	08	42-48	1590				
SL-47	02	6-12	1950	334	1.1	3.4	12
SL-47	03	12-18	1600				
SL-47	04	18-24	1440				
SL-47	05	24-36	1480				
SL-47	06	30-36	1620				
SL-47	07	36-42	1740				
SL-47	08	42-48	1790				
SL-48	02	6-12	1500				
SL-48	03	12-18	1440				
SL-48	04	18-24	1380				
SL-48	05	24-36	1500	237	0.8	1.3	16
SL-48	06	30-36	1570				
SL-48	07	36-42	1870				
SL-48	08	42-48	1020				
SL-48	05D	DUP	1440	204	0.6	0.8	15
SL-49	03	12-18	1410				
SL-49	04	18-24	1500				
SL-49	05	24-36	NR				
SL-49	06	30-36	1730	623	0.5	0.4	11
SL-49	07	36-42	1650				
SL-49	08	42-48	1680				
SL-50	01	0-6	1260				
SL-50	02	6-12	1300				
SL-50	03	12-18	1420				
SL-50	04	18-24	1510				
SL-50	05	24-36	NR				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-50	06	30-36	NR				
SL-50	07	36-42	1610	536	0.6	1.0	13
SL-50	08	42-48	1580				
SL-51	01	0-6	1560				
SL-51	02	6-12	1340				
SL-51	03	12-18	1630				
SL-51	04	18-24	1230				
SL-51	05	24-36	1240	149	1.0	1.2	20
SL-51	06	30-36	1510				
SL-51	07	36-42	1320				
SL-51	08	42-48	1480				
SL-51	09	48-54	1460				
SL-51	10	54-60	1300				
SL-51	11	60-66	1450				
SL-51	12	66-72	1370				
SL-51	13	72-[illegible]	1460				
SL-51	14	78-84	1360				
SL-51	15	84-90	1410				
SL-51	16	90-96	1310				
SL-51	05D	DUP	1330	157	0.8	1.0	21
SL-52	01	0-6	1420				
SL-52	02	6-12	1370				
SL-52	03	12-18	1260				
SL-52	04	18-24	1290				
SL-52	05	24-36	1380				
SL-52	06	30-36	1490	346	0.6	1.0	14
SL-52	07	36-42	1380				
SL-52	08	42-48	1460				
SL-53	01	0-6	1400				
SL-53	02	6-12	1440				
SL-53	03	12-18	1310				
SL-53	04	18-24	1260				
SL-53	05	24-36	1390				
SL-53	06	30-36	1460				
SL-53	07	36-42	1500				
SL-53	08	42-48	1600				
SL-53	09	48-54	1610				
SL-53	10	54-60	1630	453	0.6	1.2	20
SL-53	11	60-66	1600				
SL-53	12	66-72	1430				
SL-54	01	0-6	1310				
SL-54	02	6-12	1480				
SL-54	03	12-18	1390				
SL-54	04	18-24	1380				
SL-54	05	24-36	1460				
SL-54	06	30-36	1550	363	0.7	1.3	21
SL-54	07	36-42	1460				
SL-54	08	42-48	1480				
SL-54	09	48-54	1220				
SL-54	10	54-60	1200				
SL-54	11	60-66	1320				
SL-54	12	66-72	1330				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-55	01	0-6	1340				
SL-55	02	6-12	1510				
SL-55	03	12-18	1370				
SL-55	04	18-24	1400				
SL-55	05	24-36	1470				
SL-55	06	30-36	1550				
SL-55	07	36-42	1680				
SL-55	08	42-48	1910	467	1.1	1.3	24
SL-56	01	0-6	1980	384	1.4	1.4	13
SL-56	02	6-12	1460				
SL-56	03	12-18	1480				
SL-56	04	18-24	1880				
SL-56	05	24-36	1510				
SL-56	06	30-36	1430				
SL-56	07	36-42	1490				
SL-56	08	42-48	1460				
SL-57	06	30-36	1400				
SL-57	07	36-42	1500				
SL-57	08	42-48	1530				
SL-57	09	48-54	NR				
SL-57	10	54-60	1380				
SL-57	11	60-66	1510				
SL-57	12	66-72	1620				
SL-57	13	72-78	1510				
SL-57	14	78-84	1380				
SL-57	15	84-90	1500				
SL-57	16	90-96	1630	417	1.2	1.5	18
SL-58	02	6-12	1290				
SL-58	03	12-18	1220				
SL-58	04	18-24	1240				
SL-58	05	24-36	NR				
SL-58	06	30-36	NR				
SL-58	07	36-42	1320				
SL-58	08	42-48	1310				
SL-58	09	48-54	1150				
SL-58	10	54-60	1670				
SL-58	11	60-66	1650				
SL-58	12	66-72	1450				
SL-59	02	6-12	1270				
SL-59	03	12-18	1330				
SL-59	04	18-24	1510				
SL-59	05	24-36	1590				
SL-59	06	30-36	1590				
SL-59	07	36-42	1560				
SL-59	08	42-48	1480				
SL-59	09	48-54	1450				
SL-59	10	54-60	1680				
SL-59	11	60-66	1630				
SL-59	12	66-72	1440				
SL-59	13	72-78	NR				
SL-59	14	78-84	1580				
SL-59	15	84-90	1750	422	1.2	1.5	22

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-59	16	90-96	1730				
SL-60	03	12-18	1420				
SL-60	04	18-24	1440				
SL-60	05	24-36	1590				
SL-60	06	30-36	1470				
SL-60	07	36-42	1490				
SL-60	08	42-48	1640				
SL-60	09	48-54	1340				
SL-60	10	54-60	1340				
SL-60	11	60-66	1600				
SL-60	12	66-72	1760	526	0.8	1.0	20
SL-61	03	12-18	1410				
SL-61	04	18-24	1310				
SL-61	05	24-36	1690				
SL-61	06	30-36	1640				
SL-61	07	36-42	1420				
SL-61	08	42-48	1550				
SL-61	09	48-54	NR				
SL-61	10	54-60	1640				
SL-61	11	60-66	1640				
SL-61	12	66-72	2240				
SL-62	02	6-12	1290				
SL-62	03	12-18	1480				
SL-62	04	18-24	1290				
SL-62	05	24-36	1490				
SL-62	06	30-36	1510				
SL-62	07	36-42	1560	479	0.8	1.1	10
SL-62	08	42-48	1560				
SL-63	01	0-6	NR				
SL-63	02	6-12	NR				
SL-63	03	12-18	1220				
SL-63	04	18-24	1370				
SL-63	05	24-36	1320				
SL-63	06	30-36	1480				
SL-63	07	36-42	1390				
SL-63	08	42-48	1410				
SL-63	09	48-54	1520				
SL-63	10	54-60	1440				
SL-63	11	60-66	1450				
SL-63	12	66-72	1670	274	1.2	1.9	21
SL-63	12D	DUP	1240	160	1.1	1.6	20
SL-64	01	0-6	NR				
SL-64	02	6-12	NR				
SL-64	03	12-18	NR				
SL-64	04	18-24	NR				
SL-64	05	24-36	1210				
SL-64	06	30-36	1210	234	0.5	0.6	13
SL-64	07	36-42	1270				
SL-64	08	42-48	1450				
SL-64	09	48-54	NR				
SL-64	10	54-60	1520				
SL-64	11	60-66	1540				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-64	12	66-72	1710	531	0.9	1.5	16
SL-64	06D	DUP	1250	278	0.5	0.5	12
SL-65	01	0-6	NR				
SL-65	02	6-12	NR				
SL-65	03	12-18	NR				
SL-65	04	18-24	NR				
SL-65	05	24-36	100000	472	830	<3	13
SL-65	06	30-36	1500				
SL-65	07	36-42	1510				
SL-65	08	42-48	1830				
SL-65	09	48-54	9440	544	77	<1	12
SL-65	10	54-60	1910				
SL-65	11	60-66	1520				
SL-65	12	66-72	1870				
SL-66	01	0-6	NR				
SL-66	02	6-12	NR				
SL-66	03	12-18	1260				
SL-66	04	18-24	1380				
SL-66	05	24-36	1280				
SL-66	06	30-36	1500				
SL-66	07	36-42	1380				
SL-66	08	42-48	1580				
SL-66	09	48-54	NR				
SL-66	10	54-60	1580				
SL-66	11	60-66	1510				
SL-66	12	66-72	1740	553	1.3	1.7	20
SL-67	01	0-6	NR				
SL-67	02	6-12	NR				
SL-67	03	12-18	1410				
SL-67	04	18-24	1510				
SL-67	05	24-36	1410				
SL-67	06	30-36	1410				
SL-67	07	36-42	1390				
SL-67	08	42-48	1470				
SL-67	09	48-54	1480				
SL-67	10	54-60	1470				
SL-67	11	60-66	1810	527	0.7	1.1	15
SL-67	12	66-72	1800				
SL-68	01	0-6	1280				
SL-68	02	6-12	1330				
SL-68	03	12-18	1380	513	0.6	0.6	16
SL-68	04	18-24	1380				
SL-69	01	0-6	1660	433	1.0	1.4	19
SL-69	02	6-12	1390				
SL-69	03	12-18	1440				
SL-69	04	18-24	1510				
SL-69	05	24-36	1500				
SL-69	06	30-36	1600				
SL-69	07	36-42	NR				
SL-69	08	42-48	1510				
SL-70	01	0-6	1360				
SL-70	02	6-12	1610				

TABLE 2-1 (Page 16 of 24)

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-70	03	12-18	1650	496	0.5	0.8	13
SL-70	04	18-24	NR				
SL-70	05	24-36	1460				
SL-70	06	30-36	1600				
SL-70	07	36-42	1620				
SL-70	08	42-48	1490				
SL-71	01	0-6	NR				
SL-71	02	6-12	1410				
SL-71	03	12-18	1490				
SL-71	04	18-24	1640				
SL-71	05	24-36	NR				
SL-71	06	30-36	1510				
SL-71	07	36-42	1550				
SL-71	08	42-48	1760	476	1.2	1.2	18
SL-72	01	0-6	NR				
SL-72	02	6-12	1250				
SL-72	03	12-18	1470				
SL-72	04	18-24	1500				
SL-72	05	24-36	1390				
SL-72	06	30-36	1450				
SL-72	07	36-42	1410				
SL-72	08	42-48	1590	428	1.0	1.4	25
SL-73	01	0-6	NR				
SL-73	02	6-12	1400				
SL-73	03	12-18	1630				
SL-73	04	18-24	1840	624	0.7	1.1	14
SL-73	05	24-36	NR				
SL-73	06	30-36	1600				
SL-73	07	36-42	1570				
SL-73	08	42-48	1470				
SL-73	09	48-54	1400				
SL-73	10	54-60	1500				
SL-73	11	60-66	1510				
SL-73	12	66-72	1740				
SL-73	13	72-78	1580				
SL-73	14	78-84	1560				
SL-73	15	84-90	1480				
SL-73	16	90-96	1550				
SL-74	03	12-18	1470				
SL-74	04	18-24	1610				
SL-74	05	24-36	1630				
SL-74	06	30-36	1470				
SL-74	07	36-42	1490				
SL-74	08	42-48	1340				
SL-74	09	48-54	1480				
SL-74	10	54-60	1500				
SL-74	11	60-66	1640				
SL-74	12	66-72	1300	262	0.4	0.6	10
SL-74	12D	DUP	1400	312	0.5	0.5	14
SL-75	02	6-12	1420				
SL-75	03	12-18	1990	485	1.1	1.4	20
SL-75	04	18-24	1570				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-75	05	24-36	NR				
SL-75	06	30-36	NR				
SL-75	07	36-42	NR				
SL-75	08	42-48	NR				
SL-75	09	48-54	1600	395	0.8	1.0	19
SL-75	10	54-60	1520				
SL-75	11	60-66	1600	511	0.7	0.9	22
SL-75	12	66-72	1460				
SL-75	13	72-78	1450				
SL-75	14	78-84	1280				
SL-75	15	84-90	1550				
SL-75	16	90-96	1360				
SL-75	17	96-102	1500				
SL-75	18	102-108	1550				
SL-75	19	108-114	NR				
SL-75	20	114-120	1570				
SL-76	02	6-12	1700				
SL-76	03	12-18	1610				
SL-76	04	18-24	1700				
SL-76	05	24-36	1780				
SL-76	06	30-36	1750				
SL-76	07	36-42	1860	495	1.1	1.4	12
SL-76	08	42-48	1700				
SL-76	09	48-54	1200				
SL-76	10	54-60	1370				
SL-76	11	60-66	1600				
SL-76	12	66-72	1620				
SL-77	01	0-6	NR				
SL-77	02	6-12	1380				
SL-77	03	12-18	1350				
SL-77	04	18-24	1330				
SL-77	05	24-36	NR				
SL-77	06	30-36	1740				
SL-77	07	36-42	1660				
SL-77	08	42-48	1790	469	1	1.5	16
SL-78	01	0-6	NR				
SL-78	02	6-12	1700				
SL-78	03	12-18	2100	437	0.6	4.1	4
SL-78	04	18-24	1720				
SL-78	05	24-36	1910	419	2.4	0.9	10
SL-78	06	30-36	1580				
SL-78	07	36-42	1560				
SL-78	08	42-48	1470				
SL-78	09	48-54	1700				
SL-79	01	0-6	NR				
SL-79	02	6-12	8610	511	13	<0.6	8
SL-79	03	12-18	18100	331	96	1.7	12
SL-79	04	18-24	17100	502	80	<1	11
SL-79	05	24-36	2040	373	4.2	0.9	14
SL-79	05D	DUP	2060	441	2.5	0.9	11
SL-80	01	0-6	1520				
SL-80	02	6-12	1750	489	0.6	0.9	11

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-80	03	12-18	1360				
SL-80	04	18-24	1610				
SL-80	05	24-36	1370				
SL-80	06	30-36	1410				
SL-80	07	36-42	1510				
SL-80	08	42-48	NR				
SL-80	09	48-54	1600				
SL-80	10	54-60	1420				
SL-80	11	60-66	1520				
SL-80	A	ASFAULT	1330				
SL-81	01	0-6	1430				
SL-81	02	6-12	1660				
SL-81	03	12-18	1590				
SL-81	04	18-24	1830				
SL-81	05	24-36	1490				
SL-81	06	30-36	1930	573	1.4	1.3	13
SL-82	01	0-6	1510				
SL-82	02	6-12	1370				
SL-82	03	12-18	1370				
SL-82	04	18-24	1400				
SL-82	05	24-36	1400				
SL-82	06	30-36	1390				
SL-82	07	36-42	1310				
SL-82	08	42-48	1470				
SL-82	09	48-54	1560				
SL-82	10	54-60	1480				
SL-82	11	60-66	1620	639	0.5	0.7	12
SL-82	12	66-72	1510				
SL-82	13	72-78	1520				
SL-82	14	78-84	1600				
SL-83	01	0-6	1380				
SL-83	02	6-12	1480				
SL-83	03	12-18	14[illegible]				
SL-83	04	18-24	1340				
SL-83	05	24-36	1350				
SL-83	06	30-36	1310				
SL-83	07	36-42	1490				
SL-83	08	42-48	1480				
SL-83	09	48-54	1590	491	1.0	1.5	19
SL-84	01	0-6	1440				
SL-84	02	6-12	1820	345	2.1	1.3	30
SL-84	03	12-18	1750				
SL-84	04	18-24	1800				
SL-84	05	24-36	1460				
SL-84	06	30-36	1360				
SL-84	07	36-42	1340				
SL-84	08	42-48	1380				
SL-84	09	48-54	1380				
SL-84	10	54-60	1450				
SL-85	01	0-6	1390				
SL-85	02	6-12	1370				
SL-85	03	12-18	1360				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-85	04	18-24	1370				
SL-85	05	24-36	1220				
SL-85	06	30-36	1480				
SL-85	07	36-42	1490				
SL-85	08	42-48	1530	486	0.4	0.7	13
SL-85	09	48-54	1450				
SL-85	10	54-60	1480				
SL-85	11	60-66	1480				
SL-86	01	0-6	1340				
SL-86	02	6-12	1420	350	<0.2	1.1	13
SL-86	03	12-18	1360				
SL-87	01	0-6	1460				
SL-87	02	6-12	1530				
SL-87	03	12-18	1150				
SL-87	04	18-24	1230				
SL-87	05	24-36	1230				
SL-87	06	30-36	1520				
SL-87	07	36-42	1500				
SL-87	08	42-48	1610				
SL-87	09	48-54	1720	727	0.6	0.9	16
SL-88	01	0-6	1500				
SL-88	02	6-12	1610	522	3.0	0.8	17
SL-89	01	0-6	1410				
SL-89	02	6-12	1600	577	0.9	1.3	20
SL-90	01	0-6	1710	512	1.2	0.9	18
SL-90	02	6-12	1330				
SL-91	01	0-6	1380				
SL-91	02	6-12	1520				
SL-91	03	12-18	1600				
SL-91	04	18-24	1770	616	1.3	0.9	16
SL-91	05	24-36	1630				
SL-91	06	30-36	1540				
SL-91	07	36-42	1410				
SL-91	08	42-48	1520				
SL-92	01	0-6	1340				
SL-92	02	6-12	1550	580	1.6	1.2	20
SL-92	03	12-18	1430				
SL-92	04	18-24	1380				
SL-93	01	0-6	1380				
SL-93	02	6-12	1540	421	1.3	1.5	20
SL-93	03	12-18	1440				
SL-93	04	18-24	1530				
SL-93	05	24-36	1640				
SL-94	01	0-6	1680				
SL-94	02	6-12	1830	427	1.3	1.5	20
SL-94	03	12-18	1710				
SL-94	04	18-24	1770				
SL-94	05	24-36	1630				
SL-94	06	30-36	1530				
SL-94	07	36-42	1340				
SL-94	08	42-48	1420				
SL-94	09	48-54	1460				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-94	10	54-60	1610				
SL-94	11	60-66	1730				
SL-95	01	0-6	2220	490	3.5	1.3	20
SL-95	02	6-12	1780				
SL-95	03	12-18	1690				
SL-95	04	18-24	1560				
SL-95	05	24-36	1540				
SL-95	06	30-36	1330				
SL-95	07	36-42	1570				
SL-95	08	42-48	1630				
SL-95	09	48-54	1770				
SL-95	10	54-60	1930				
SL-96	01	0-6	46800	327	300	<2	12
SL-96	02	6-12	60300	391	340	<2	13
SL-96	03	12-18	60000	547	230	<2	12
SL-96	04	18-24	27600	622	160	<1	8
SL-100	01	0-6	1880	360	0.6	2.6	22
SL-100	02	6-12	1850				
SL-100	03	12-18	1510				
SL-100	04	18-24	1480				
SL-100	05	24-36	1380				
SL-100	06	30-36	1380				
SL-100	07	36-42	NR				
SL-100	08	42-48	NR				
SL-100	09	48-54	1420				
SL-100	10	54-60	1450				
SL-100	11	60-66	1350				
SL-100	12	66-72	1540				
SL-101	01	0-6	2090	546	0.6	3.6	28
SL-101	02	6-12	1620				
SL-101	03	12-18	NR				
SL-101	04	18-24	NR				
SL-101	05	24-36	1300				
SL-101	06	30-36	1410				
SL-101	07	36-42	1560				
SL-101	08	42-48	1370				
SL-101	09	48-54	1530				
SL-101	10	54-60	1400				
SL-101	11	60-66	1340				
SL-101	12	66-72	1450				
SL-101	13	72-78	1630				
SL-101	14	78-84	1420				
SL-101	15	84-90	1650				
SL-101	16	90-96	1580				
SL-102	01	0-6	2590	651	0.4	1.9	19
SL-102	02	6-12	1530				
SL-102	03	12-18	1660				
SL-102	04	18-24	NR				
SL-102	05	24-36	1540				
SL-102	06	30-36	1410				
SL-102	07	36-42	1440				
SL-102	08	42-48	NR				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-102	09	48-54	1360				
SL-102	10	54-60	1210				
SL-102	11	60-66	1390				
SL-102	12	66-72	1560				
SL-102	13	72-78	1420				
SL-102	14	78-84	1360				
SL-102	15	84-90	1460				
SL-102	16	90-96	1340				
SL-102	17	96-102	1290				
SL-102	18	102-108	1300				
SL-102	19	108-114	1270				
SL-102	20	114-120	1590				
SL-103	01	0-6	2210	568	0.8	3.7	25
SL-103	02	6-12	1680				
SL-103	03	12-18	1560				
SL-103	04	18-24	NR				
SL-103	05	24-36	1630				
SL-103	06	30-36	NR				
SL-103	07	36-42	NR				
SL-103	08	42-48	NR				
SL-103	09	48-54	1510				
SL-103	10	54-60	1390				
SL-103	11	60-66	NR				
SL-103	12	66-72	NR				
SL-103	13	72-78	1750				
SL-103	14	78-84	1590				
SL-103	15	84-90	1560				
SL-104	01	0-6	1350				
SL-104	02	6-12	1780				
SL-104	03	12-18	1500				
SL-104	04	18-24	NR				
SL-104	05	24-36	1630				
SL-104	06	30-36	1800	551	0.9	1.2	14
SL-104	07	36-42	1410				
SL-104	08	42-48	1340				
SL-104	09	48-54	1450				
SL-104	10	54-60	1480				
SL-104	11	60-66	NR				
SL-104	12	66-72	NR				
SL-104	13	72-78	1400				
SL-104	14	78-84	1430				
SL-104	15	84-90	1330				
SL-104	16	90-96	1450				
SL-104	17	96-102	1400				
SL-104	18	102-108	1420				
SL-104	19	108-114	1290				
SL-104	20	114-120	1430				
SL-105	01	0-6	1520				
SL-105	02	6-12	1540				
SL-105	03	12-18	1610				
SL-105	04	18-24	NR				
SL-105	05	24-36	1660				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-105	06	30-36	1480				
SL-105	07	36-42	1390				
SL-105	08	42-48	1370				
SL-105	09	48-54	1290				
SL-105	10	54-60	1400				
SL-105	11	60-66	1540				
SL-105	12	66-72	NR				
SL-105	13	72-78	1570				
SL-105	14	78-84	NR				
SL-105	15	84-90	1440				
SL-105	16	90-96	1560				
SL-105	17	96-102	1650				
SL-106	01	0-6	1280				
SL-106	02	6-12	1340				
SL-106	03	12-18	1380				
SL-106	04	18-24	1560				
SL-106	05	24-36	1410				
SL-106	06	30-36	1490				
SL-106	07	36-42	1460				
SL-106	08	42-48	1520				
SL-106	09	48-54	1490				
SL-106	10	54-60	1800				
SL-106	11	60-66	1460				
SL-106	12	66-72	1480				
SL-107	01	0-6	1440				
SL-107	02	6-12	1790				
SL-107	03	12-18	1750				
SL-107	04	18-24	NR				
SL-107	05	24-36	1550				
SL-107	06	30-36	1640				
SL-107	07	36-42	NR				
SL-107	08	42-48	NR				
SL-107	09	48-54	1340				
SL-107	10	54-60	1250				
SL-107	11	60-66	1370				
SL-107	12	66-72	1540				
SL-107	13	72-78	1380				
SL-107	14	78-84	1360				
SL-107	15	84-90	1270				
SL-107	16	90-96	1350				
SL-107	17	96-102	1360				
SL-107	18	102-108	1300				
SL-107	19	108-114	1840				
SL-107	20	114-120	1810				
SL-107	19D	DUP	1300				
SL-107	20D	DUP	1540				
SL-108	01	0-6	1420				
SL-108	02	6-12	1550				
SL-108	03	12-18	1480				
SL-108	04	18-24	1240				
SL-108	05	24-36	1430				
SL-108	06	30-36	1370				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-108	07	36-42	1270				
SL-108	08	42-48	NR				
SL-108	09	48-54	1430				
SL-108	10	54-60	1490				
SL-108	11	60-66	1560	412	0.9	0.9	13
SL-109		NO SAMPLES TAKEN					
SL-110	01	0-6	1410				
SL-110	02	6-12	1190				
SL-110	03	12-18	1430				
SL-110	04	18-24	NR				
SL-110	05	24-36	NR				
SL-110	06	30-36	NR				
SL-110	07	36-42	NR				
SL-110	08	42-48	NR				
SL-110	09	48-54	1630	584	0.5	0.5	11
SL-110	10	54-60	1420				
SL-110	11	60-66	1220				
SL-110	12	66-72	NR				
SL-110	13	72-78	1560				
SL-110	14	78-84	1270				
SL-110	15	84-90	1280				
SL-110	16	90-96	1290				
SL-110	17	96-102	1310				
SL-110	18	102-108	1270				
SL-110	19	108-114	1380				
SL-110	20	114-120	1290				
SL-110	21	120-126	1480				
SL-110	22	126-132	1300				
SL-110	23	132-138	1360				
SL-110	24	138-144	1460				
SL-111	01	0-6	1410				
SL-111	02	6-12	1540				
SL-111	03	12-18	1560	559	0.4	1	11
SL-111	04	18-24	NR				
SL-111	05	24-36	1400				
SL-111	06	30-36	1310				
SL-111	07	36-42	NR				
SL-111	08	42-48	NR				
SL-111	09	48-54	1380				
SL-111	10	54-60	1430				
SL-111	11	60-66	1480				
SL-111	12	66-72	1490				
SL-112	01	0-6	1810	384	0.4	2	17
SL-112	02	6-12	NR				
SL-112	03	12-18	1220				
SL-112	04	18-24	1430				
SL-112	05	24-36	1290				
SL-112	06	30-36	1400				
SL-113	01	0-6	1330				
SL-113	02	6-12	1870	549	0.7	1.5	18
SL-113	03	12-18	1440				
SL-113	04	18-24	NR				

RADIOLOGICAL SAMPLING DATA, SOIL (SL)

Borehole Number	Sample Number	Depth (in)	Screening Result (counts/5 min)	Weight (g)	Laboratory Analysis Results (pCi/g) Ra-226	Th-232	K-40
SL-113	05	24-36	1510				
SL-113	06	30-36	1510				
SL-113	07	36-42	NR				
SL-113	08	42-48	NR				
SL-113	09	48-54	1290				
SL-113	10	54-60	1200				
SL-113	11	60-66	NR				
SL-113	12	66-72	NR				
SL-113	13	72-78	1350				
SL-113	14	78-84	1370				
SL-113	15	84-90	1520				
SL-114		NO SUCH SAMPLING LOCATION					
SL-115	01	0-6	1660	522	0.3	1.8	13
SL-115	02	6-12	1370				
SL-115	03	12-18	1410				
SL-115	04	18-24	NR				
SL-115	05	24-36	1530				
SL-115	06	30-36	1390				
SL-116	01	0-6	1330				
SL-116	02	6-12	1690				
SL-116	03	12-18	1600				
SL-116	04	18-24	1590				
SL-116	05	24-36	1630				
SL-116	06	30-36	1720				
SL-116	07	36-42	1690				
SL-116	08	42-48	2030	818	0.8	0.9	10
SL-116	09	48-54	1640				

NOTES:

1) All samples contained less than the minimum detectable concentration for U-238 except for SL-66-12, which had 5 pCi/g of U-238.

2) "NR" means no recovery. No soil was collected at this depth.

3) Weight is dry weight, except for samples SL-02-06, SL-03-09, SL-04-03, SL-06-12, SL-07-02, SL-07-04, SL-06-08, SL-09-12, SL-10-12, SL-11-12, SL-12-11, SL-13-11, SL-13-12, SL-14-02, SL-14-03, SL-14-13, and SL-23-20.

4) The last sample for each bore hole represents the level of the clay layer.

5) Standard deviation values are provided in the laboratory results (see Appendix E).

TABLE 2-2

SOIL SAMPLING RESULTS
SAMPLES GREATER THAN SOIL GUIDELINES

Sample	Screening (Counts/5 min)	Gamma-Logging (uR/hr)	Net Radionuclide Concentration, pCi/g*	
			Ra-226	Th-232
SL-28-01	2,680	2.00	5.7	<0.5
SL-65-05	100,000	515	830	<3
SL-65-09	9,440	NA**	.6	<1
SL-79-03	18,100	NA	95	0.85
SL-79-04	17,100	NA	79	<1
SL-96-01	46,800	NA	300	<2
SL-96-02	60,300	NA	340	<2
SL-96-03	60,000	NA	230	<2
SL-96-04	27,600	NA	160	<1

*Net concentration equals values in Table 2-1 less background (0.77 pCi/g for Ra-226 and 0.85 pCi/g fo Th-232).

**Not available.

TABLE 2-3

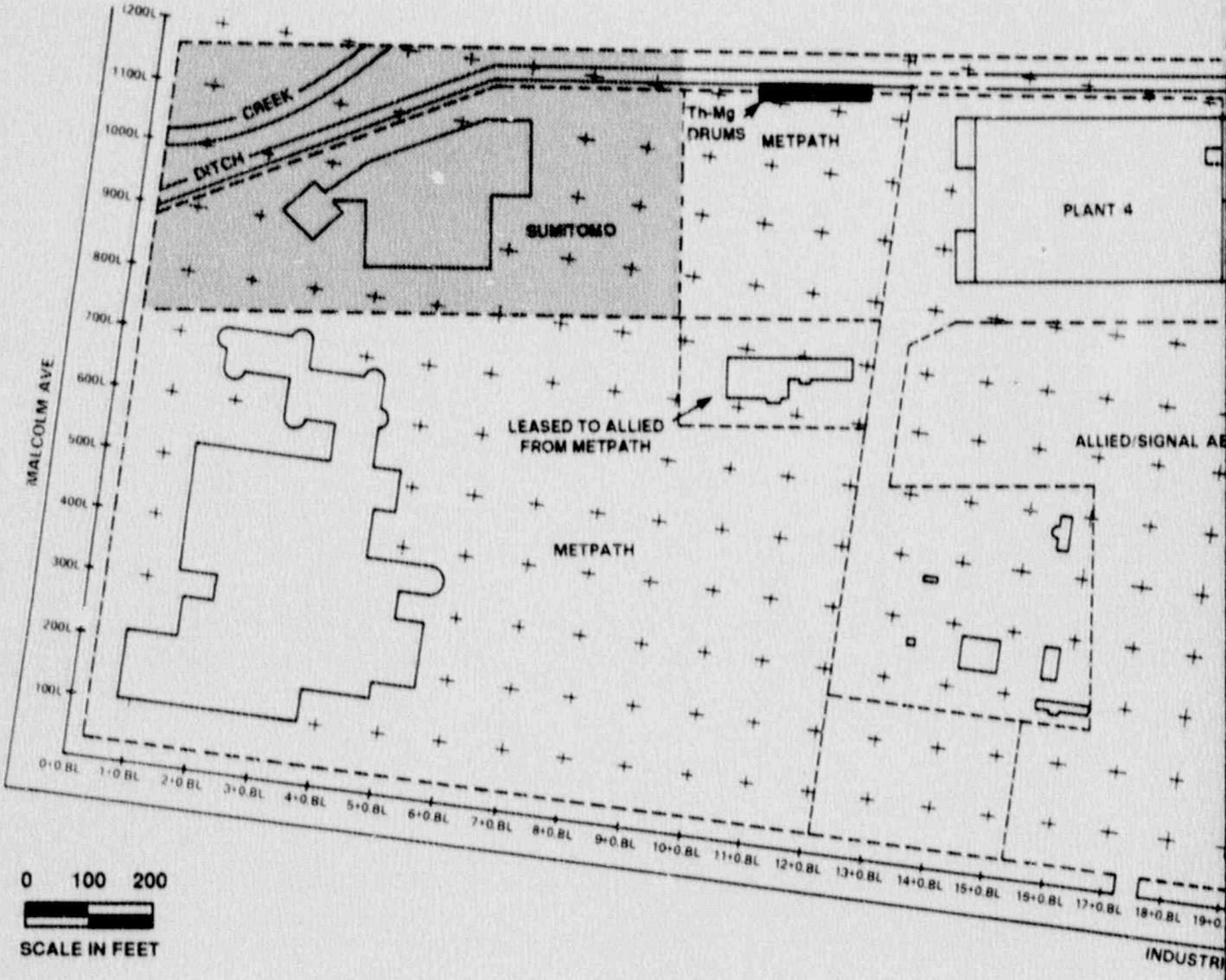
SURFACE WATER AND SEDIMENT SAMPLING
RADIONUCLIDE CONCENTRATIONS

Sample	Radionuclide Concentration, pCi/g			
	U-238	Ra-226	Th-232	K-40
Surface Water				
WD-01	<0.2	<0.7	<0.08	<0.4
WD-02	<1.8	<0.2	<0.3	<1.1
WD-03	<1.5	<0.2	<0.3	<1
WD-04	<0.6	<0.3	<0.2	<1.5
WD-05	<1.5	<0.2	<0.2	<1.1
EQ-01	<0.5	<0.2	<0.2	<0.7
ED-01	<1.9	<0.2	<0.3	<1.3
ED-02	<0.7	<0.2	<0.2	<0.9
ED-03	<0.6	<0.2	<0.2	<0.9
Sediment				
WD-01	<4	0.5	1.2	15
WD-02	<5	1.5	7.2	12
WD-03	<2	0.8	0.7	12
WD-04	<6	1.3	1.1	25
WD-05	<4	0.9	1.0	19
EQ-01	<3	0.6	0.7	12
ED-01	<3	1.0	0.8	19
ED-02	<3	0.4	0.5	11
ED-03	<5	0.5	0.8	9

TABLE 5-1

UNIT AND OTHER COSTS FOR RADIOLOGICAL REMEDIATION

Activity/Material	Cost $/Cubic Foot
1. Excavation	0.56
2. Trailer (bulk) loading, Containers	3.19
3. Transportation	5.56
4. Disposal	30.00
5. Cleanfill backfill	0.75
6. Repaving-gravel base	0.57/sq. ft
asphalt	2.43/sq. ft
7. Sample Analysis	
- on-site radiological analysis	$10/sample
- off-site radiological analysis	$150/sample
- chemical analysis	$710/sample
8. Support Labor	
- Health and Safety Technician	
- Field Technician	
- Decon Personnel	
Total labor costs	$1200/day
9. Landscaping for Bank Area	$5000



0 100 200

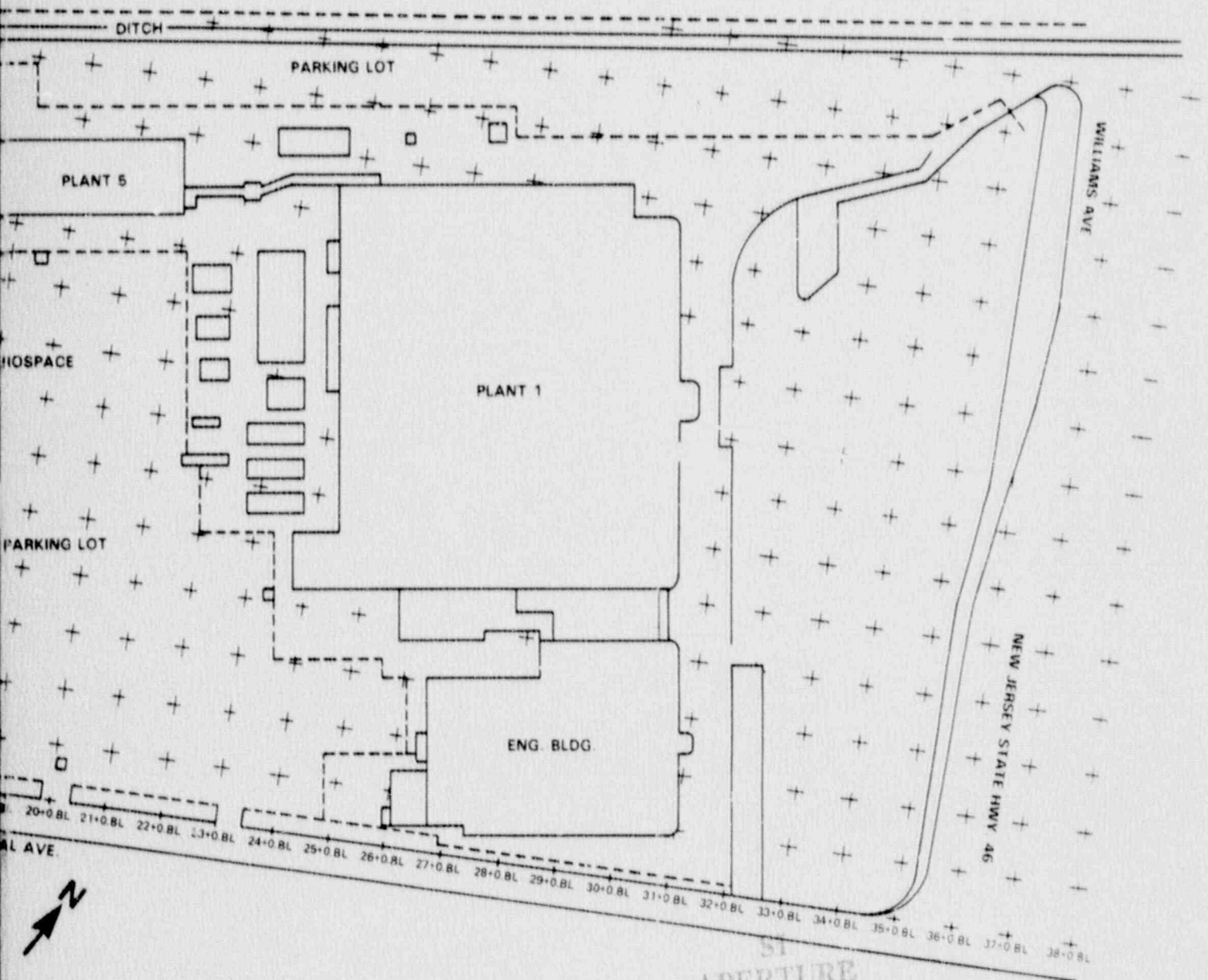
SCALE IN FEET

KEY:

\+ SURVEY GRID INTERSECTION

– – – PROPERTY BOUNDARY

AREA NOT INVESTIGATED



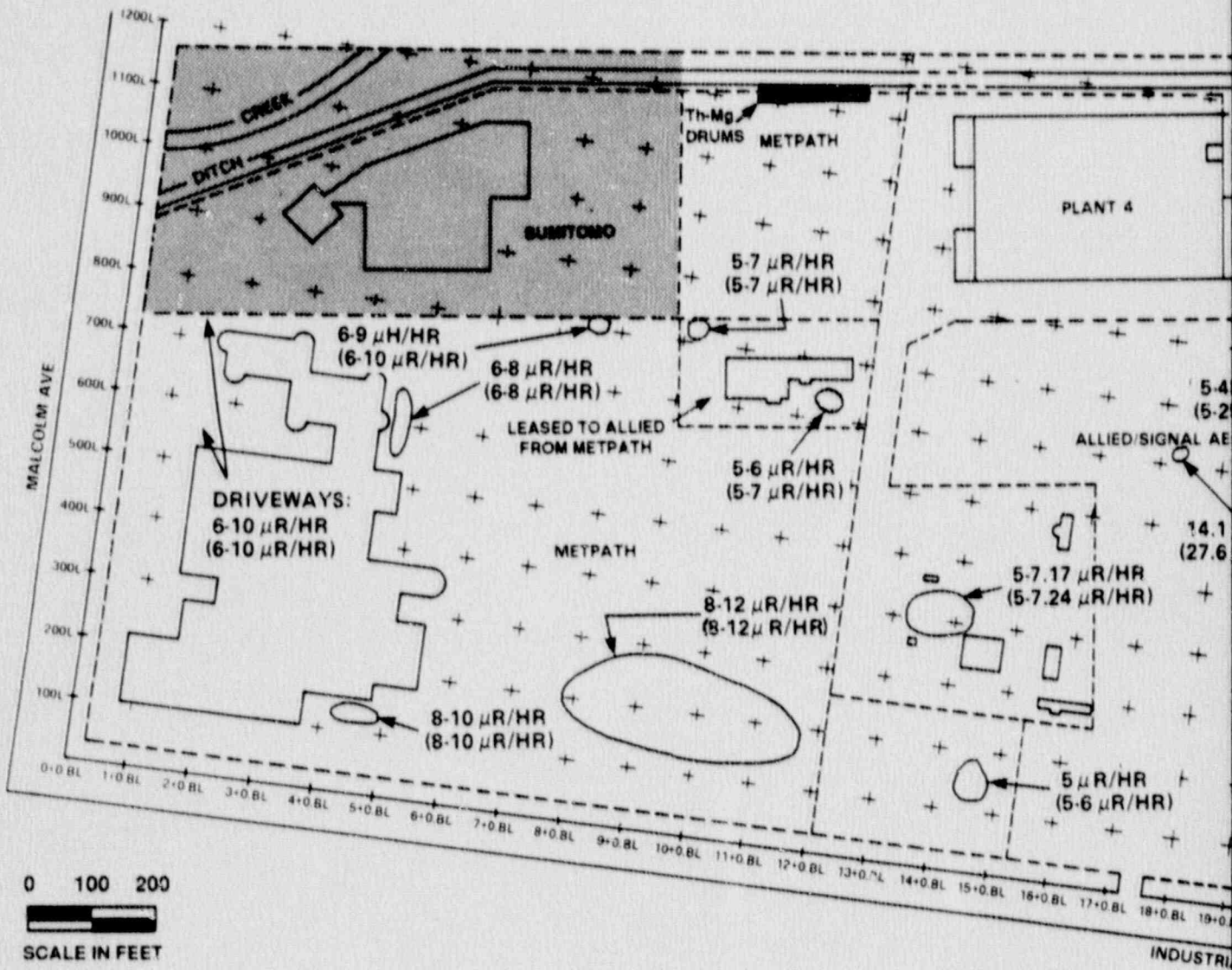
9012070191-01

ALLIED/SIGNAL AEROSPACE COMPANY
CLEAN-UP PLAN

EBASCO ENVIRONMENTAL

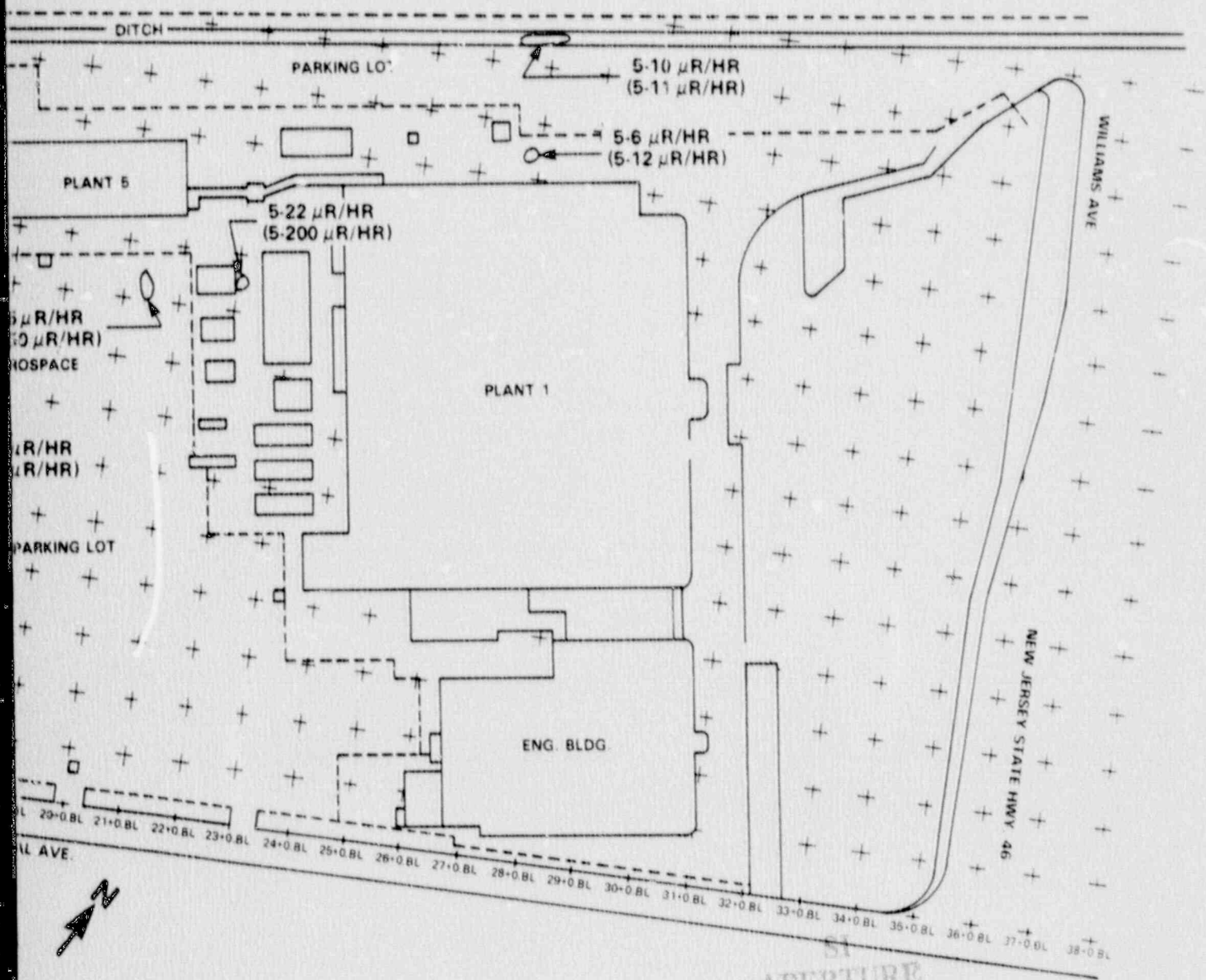
ALLIED/SIGNAL
TETERBORO, NEW JERSEY
AREA OF INVESTIGATION

FIGURE 2-1



KEY:

- AREA OF ELEVATED (>5 μR/HR) GAMMA RADIATION LEVELS
- 5-45 μR/HR (5-250 μR/HR) – EXPOSURE RATE @ 1 METER (EXPOSURE AT GROUND LEVEL)
- AREA NOT INVESTIGATED



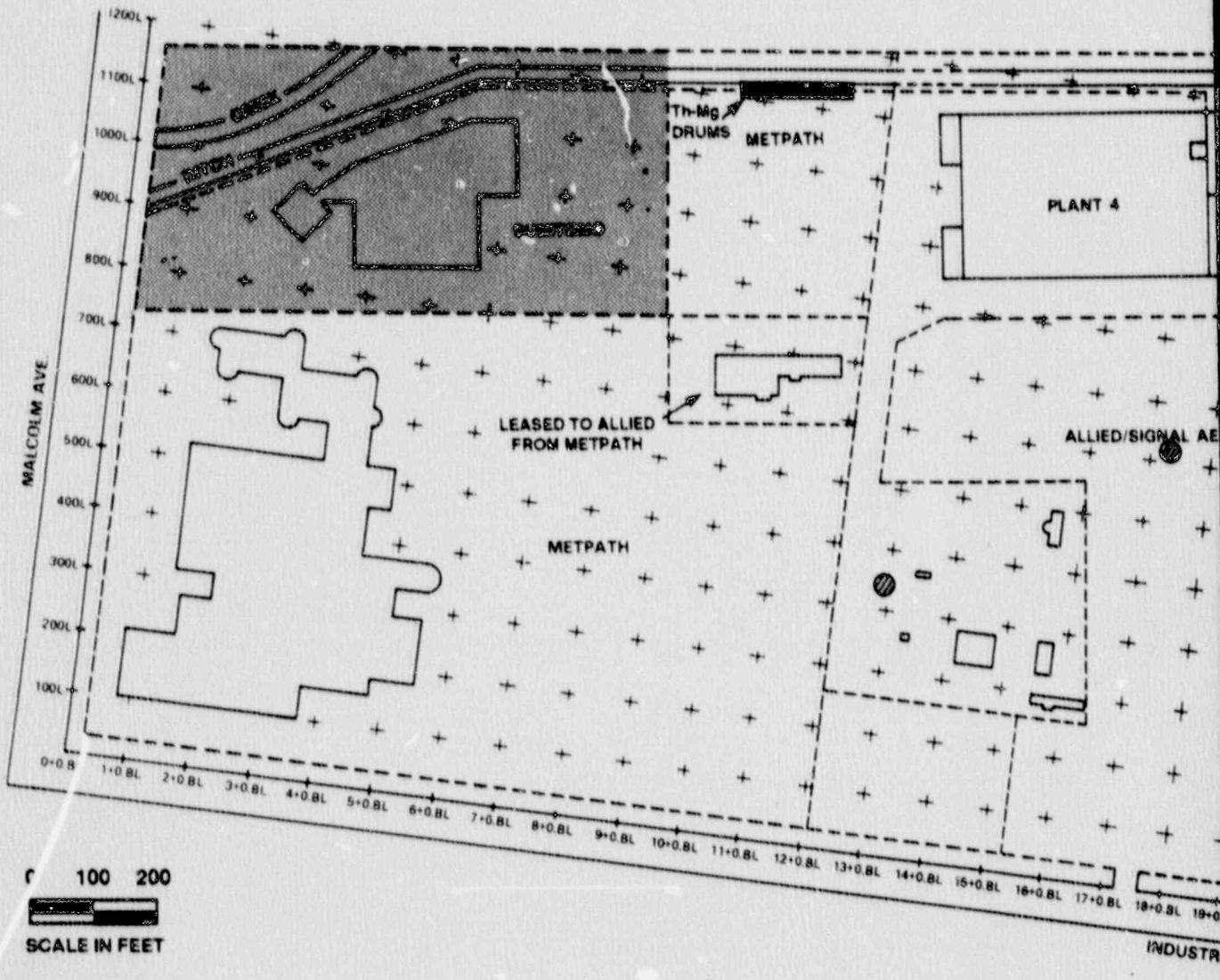
9012070191-02

ALLIED/SIGNAL AEROSPACE COMPANY
CLEAN-UP PLAN

EBASCO ENVIRONMENTAL

ALLIED/SIGNAL
TETERBORO, NEW JERSEY
ELEVATED EXPOSURE RATES

FIGURE 2-2



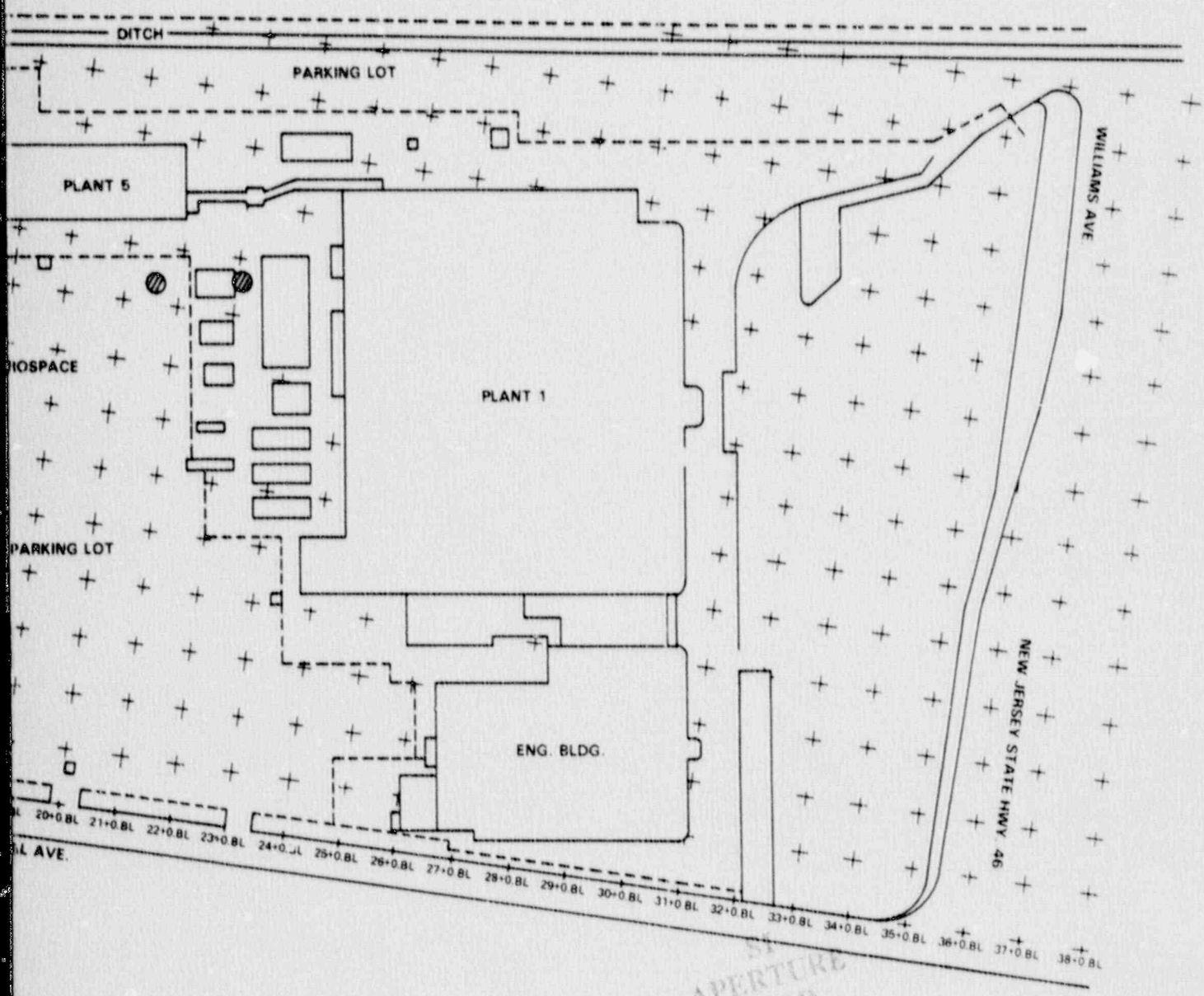
KEY:

+ GRID SURVEY INTERSECTION

PROPERTY BOUNDRY

AREA NOT INVESTIGATED

REGION OF ELEVATED Ra-226 IN SOILS



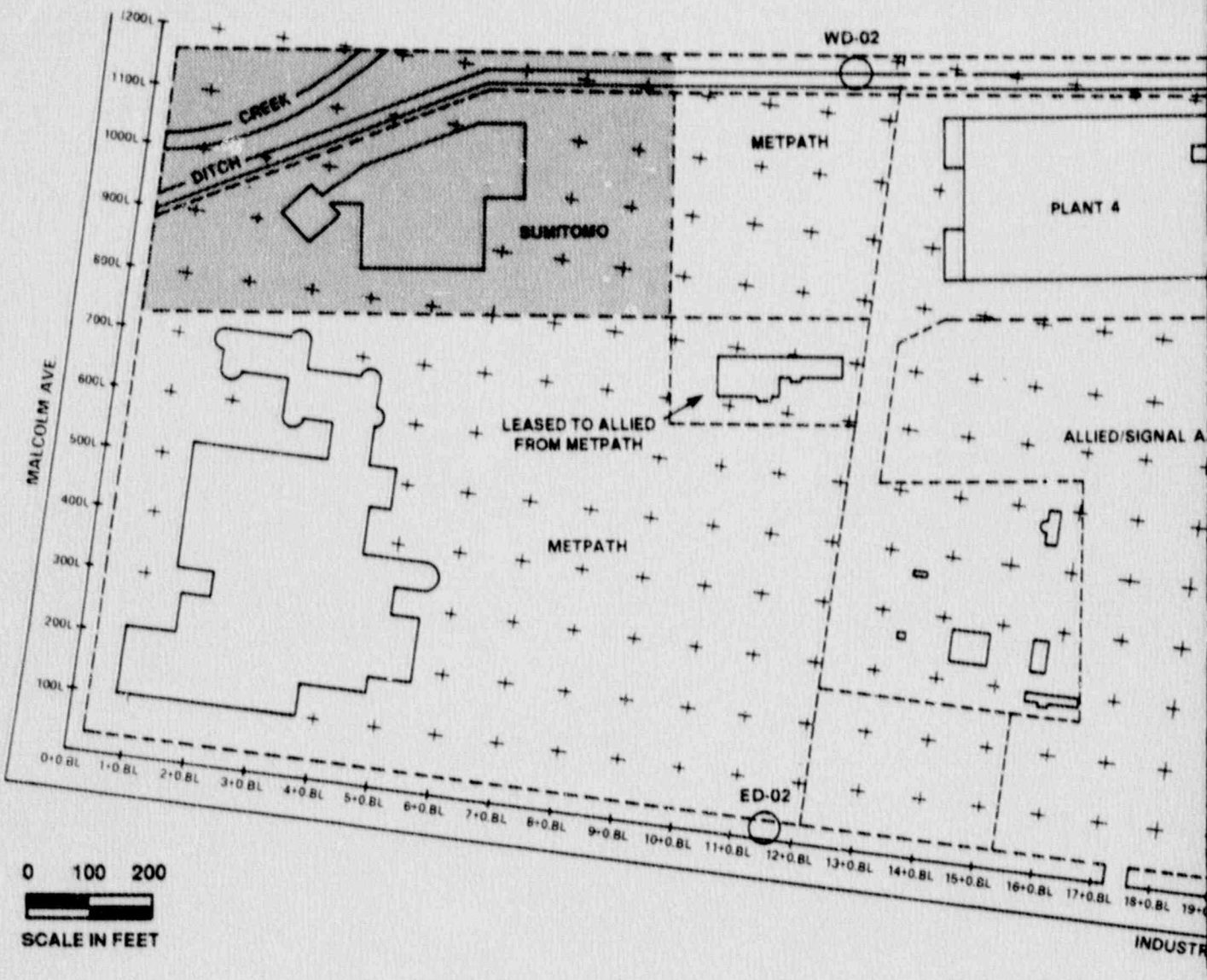
9012070191-03

ALLIED/SIGNAL AEROSPACE COMPANY
CLEAN-UP PLAN

EBASCO ENVIRONMENTAL

REGIONS OF ELEVATED
Ra226 IN SOILS

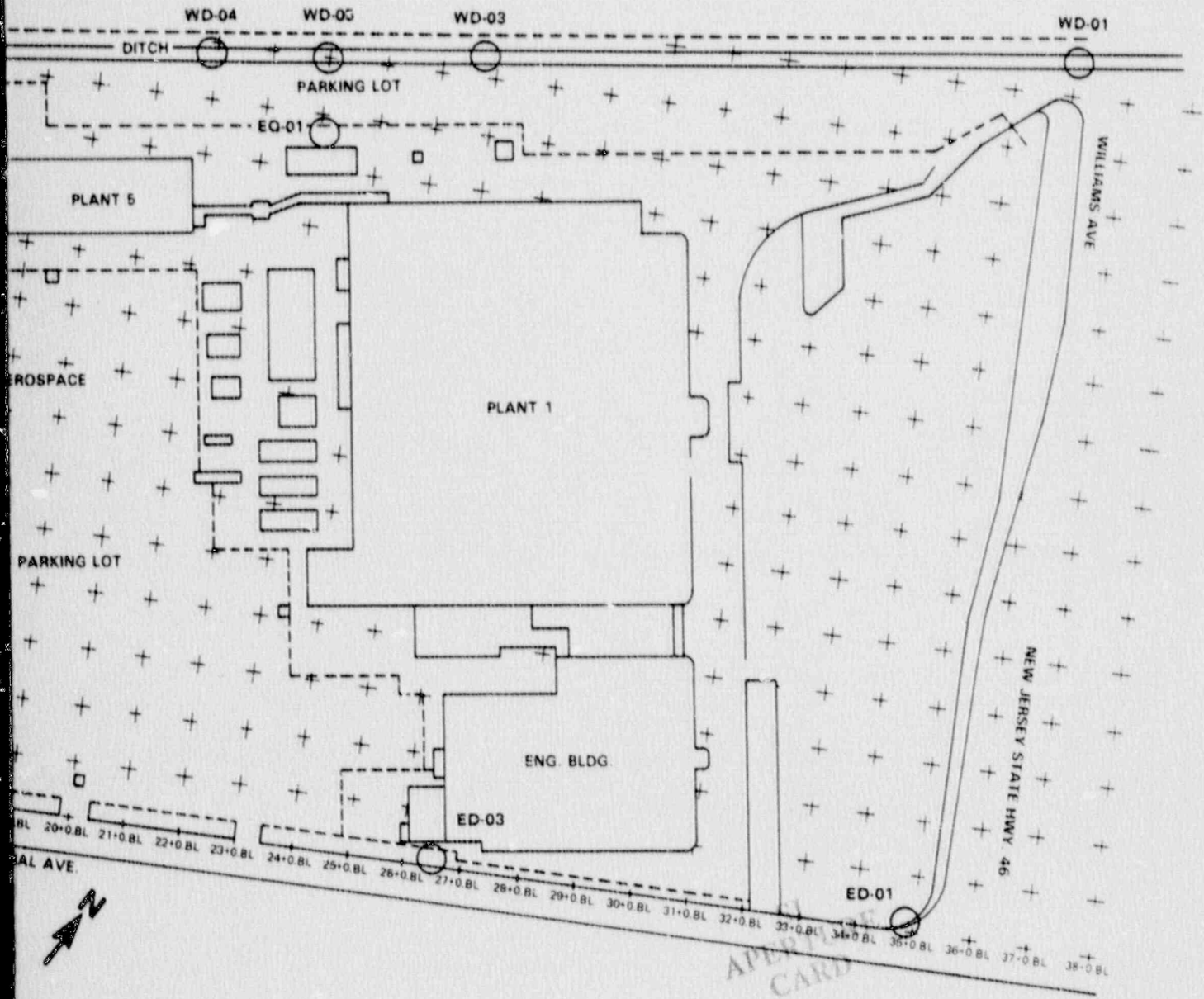
FIGURE 2-3



KEY:

AREA NOT INCLUDED IN INVESTIGATION.

ED-01 SAMPLING LOCATION



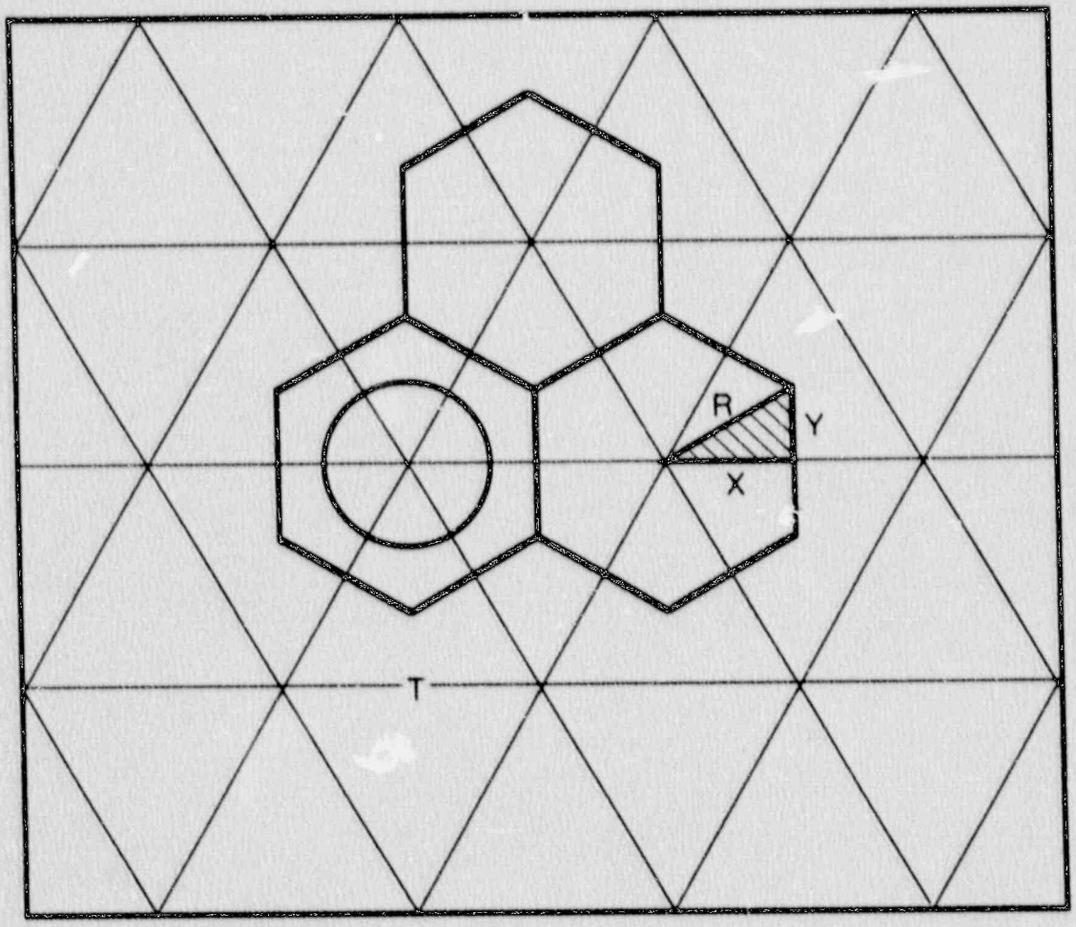
9012070191-04

ALLIED/SIGNAL AEROSPACE COMPANY
CLEAN-UP PLAN

EBASCO ENVIRONMENTAL

SURFACE WATER AND
SEDIMENT SAMPLING LOCATIONS

FIGURE 2-4

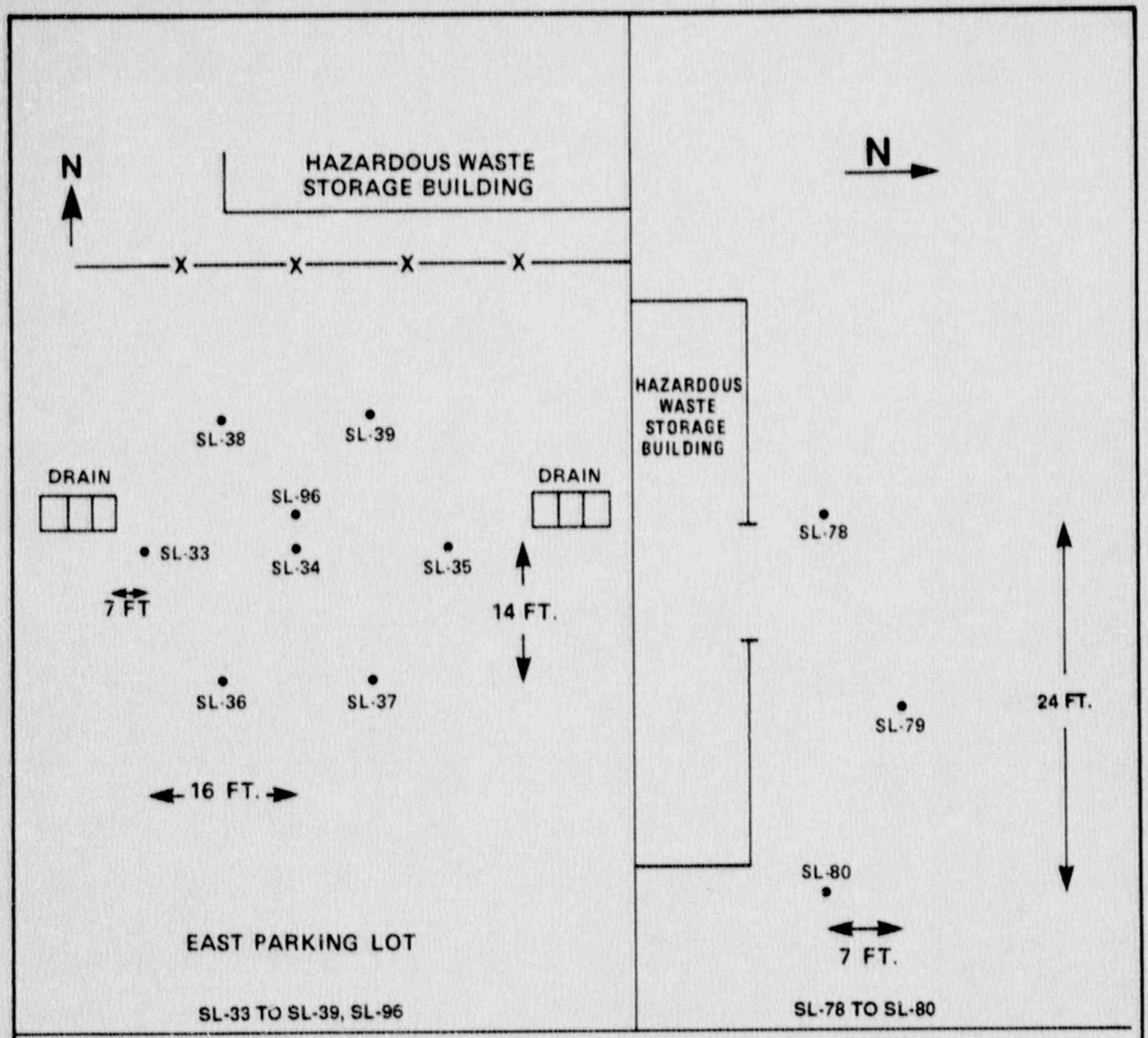


ALLIED/SIGNAL AEROSPACE COMPANY
CLEAN-UP PLAN

EBASCO ENVIRONMENTAL

SCHEMATIC DIAGRAM OF THE
"AREA OF INFLUENCE"

FIGURE 3-1



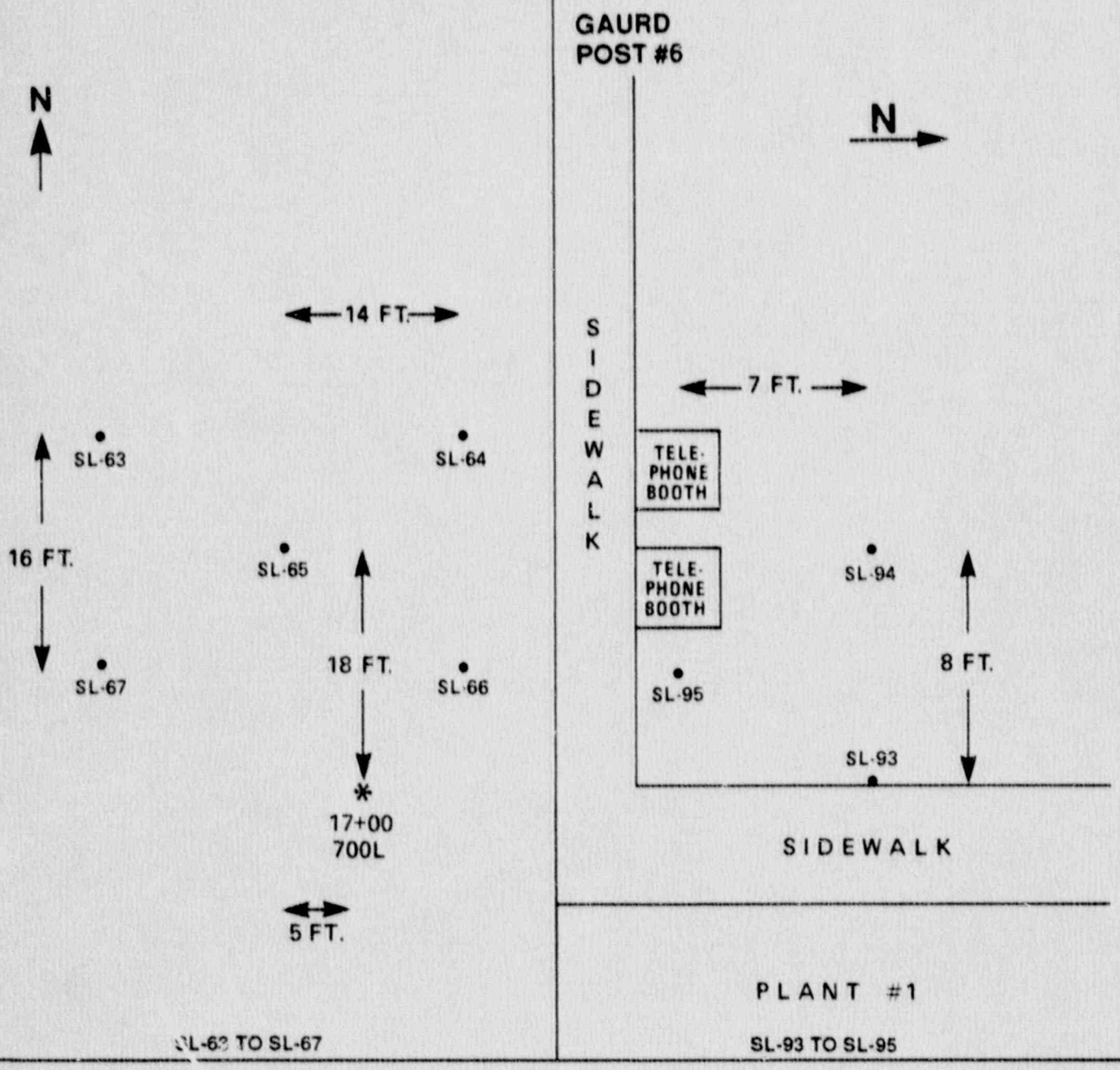
KEY:

—X—X— FENCE

SL-53 SAMPLING LOCATION

ALLIED/SIGNAL AEROSPACE COMPANY CLEAN-UP PLAN
EBASCO ENVIRONMENTAL
BIASED SAMPLING LOCATIONS SL-33 TO SL-39, SL-96 AND SL-78 TO SL-80

FIGURE 3-2



KEY:

—X—X— FENCE

SL-53 SAMPLING LOCATION

ALLIED/SIGNAL AEROSPACE COMPANY CLEAN-UP PLAN
EBASCO ENVIRONMENTAL
BIASED SAMPLING LOCATIONS SL-63 TO SL-67 AND SL-93 TO SL-95 FIGURE 3-3

APPENDIX A

HEALTH AND SAFETY PLAN