PROJECT SPECIFIC PLAN FOR AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

- 2459

SOIL AND DISPOSAL FACILITY PROJECT

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

AUGUST 1999

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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APPROVAL:

8/18/99

Rich Abitz, Area 3A/4A Project Manager
Soil and Disposal Facility Project

Date

8/18/99

Christine Messerly, Area 3A/4A Characterization Lead
Soil and Disposal Facility Project

Date

8/18/99

Linda Barlow
Waste Acceptance Organization

Date

8/20/99

Frank Thompson, Quality Assurance
Soil and Water Projects

Date

FERNALD ENVIRONMENTAL MONITORING PROJECT

Fluor Daniel Fernald
P.O. Box 538704
Cincinnati, Ohio 45253-8704

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LIST OF ACRONYMS AND ABBREVIATIONS

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ALARA	As Low As Reasonably Achievable
ASL	analytical support level
ccpm	corrected counts per minute
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
D&D	Decontamination and Dismantlement
DQO	Data Quality Objective
FACTS	Fernald Analytical Computerized Tracking System
FRL	Final Remediation Level
HWMU	hazardous waste management unit
ICP/AES	Inductively Coupled Plasma/Atomic Emission Spectroscopy
ICP/MS	Inductively Coupled Plasma/Mass Spectrometry
KPA	Kinetic Phosphorescence Analysis
mg/kg	milligram per kilogram
mL	milliliter
OSDF	On-Site Disposal Facility
OU5	Operable Unit 5
PCB	polychlorinated biphenyl
pCi/g	picoCuries per gram
PID	photoionization detector
ppm	parts per million
PSP	Project Specific Plan
QA	Quality Assurance
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RWP	Radiological Work Permit
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
SVOC	semi-volatile organic compound
TAL	Target Analyte List
μg/L	micrograms per liter
UST	underground storage tank
V/FCN	Variance/Field Change Notice
VOC	volatile organic compound
WAC	waste acceptance criteria
WAO	Waste Acceptance Organization

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1.0 INTRODUCTION

1.1 PURPOSE

This project specific plan (PSP) has been developed to investigate subsurface contamination in Remediation Areas 3A and 4A. Area 3A/4A comprises the eastern half of the Former Production Area, and is bounded generally by First Street to the south, the Former Production Area boundary fences to the east and north and B Street to the west (Figure 1-1). The following four objectives will drive the work performed under this PSP:

- define the extent of subsurface areas exceeding the waste acceptance criteria (WAC) for the On-Site Disposal Facility (OSDF)
- bound non-uranium contamination that is above the final remediation level (FRL) and will drive remediation beyond the extent of uranium contamination
- verify and/or redefine the high leachability areas in Area 3A/4A (see Figure 1-1)
- reduce the kriging uncertainty in the three-dimensional total uranium contamination computer model.

The information collected under this PSP will be used in the Area 3A/4A remedial design to identify the extent of above-WAC material and to further define the above-FRL excavation boundaries.

1.2 BACKGROUND

As shown on Figure 1-2, Area 3A/4A includes many of the site's largest facilities. The Boiler Plant, Maintenance Building, Plant 9, Building 64 (Thorium Warehouse), and Building 65 (Plant 5 Warehouse) are located in Area 3A. At this time, decontamination and dismantlement (D&D) have been completed on the Boiler Plant and Plant 9 and are currently underway on the Maintenance Building. Buildings 64 and 65 are scheduled for D&D in 2000. Area 4A includes Plants 4 and 7, which have already undergone D&D, and Plants 5 and 6, which will undergo D&D beginning in 1999 and 2000, respectively.

The subsurface of Area 3A/4A has been contaminated by spills, leaks, migration of airborne deposition, and perched groundwater movement. The primary contaminants of concern for the area, as identified in the Sitewide Excavation Plan (SEP), are total uranium, thorium-228, thorium-232,

radium-226, and radium-228. Although technetium-99 was not identified as a primary contaminant of concern, there are known areas of technetium-99 contamination in Area 3A/4A that exceed the OSDF WAC. These areas will be investigated as part of this PSP. A separate investigation has already addressed the extent of above-WAC constituents in the surface soil of Area 3A/4A (20200-PSP-0004, Project Specific Plan for Area 3A/4A Surface Predesign Investigation), so this investigation will generally focus on contamination at depths greater than 1 foot or located under buildings and pads.

Other subsurface features of Area 3A/4A, including potentially characteristic areas, hazardous waste management units (HWMUs), and underground storage tanks (USTs), will not be investigated as part of this PSP. The Project Specific Plan for the Area 3 Pre-Design Investigation of Potentially Characteristic Areas (20810-PSP-0002) was implemented in Winter 1998/1999 to investigate the potentially characteristic areas in Area 3A. The boundaries of the HWMUs and USTs in Area 3A/4A were established as part of the Project Specific Plan for Area 3A/4A Surface Predesign Investigation (20200-PSP-0004). If field conditions observed during remediation excavation of HWMUs and USTs indicate contamination beyond the existing boundaries, appropriate additional samples will be collected. This sampling activity would be varianced to the excavation PSP in place at the time. HWMU and UST closure sampling will be performed following excavation.

1.3 CONSTITUENTS ABOVE THE OSDF WAC

A search of the Sitewide Environmental Database (SED) was performed to identify all constituents present at concentrations that meet or exceed the OSDF WAC. Total uranium at six locations and technetium-99 at three locations were identified as exceeding the OSDF WAC. The results associated with these constituents are presented in Appendix A (above-WAC results) and their locations are illustrated in Figure 1-2.

1.4 CONSTITUENTS ABOVE THE FINAL REMEDIATION LEVEL

An additional search of the SED was performed to identify constituents present at concentrations that exceed the Area 3A/4A FRLs. These results were compared to the current three-dimensional computer model for total uranium concentrations to identify areas where non-uranium FRL exceedances are located outside the soil volume that is currently planned to be excavated due to uranium contamination. There were nine locations with above-FRL contaminants that fell outside the uranium excavation extent. One of these locations will be excavated with the Resource Conservation and Recovery Act

(RCRA) characteristic soil behind the Maintenance Building. Of the eight remaining locations, three are above the FRL for beryllium; two are above the FRL for thorium; one is above the FRL for 1,1-dichloroethene, aroclor-1260, and arsenic; one is above the FRL for aroclor-1254; and one is above the FRL for benzo(a)pyrene. The results associated with these eight locations are presented in Appendix A (above-FRL results) and the locations are shown on Figure 1-3. Because the FRL for technetium-99 is greater than the on-site WAC (30 pCi/g versus 29.1 pCi/g), all above-FRL technetium-99 locations are also above-WAC locations and therefore shown on Figure 1-2.

1.5 SCOPE

Under this PSP, physical samples will be collected from Area 3A/4A to meet the objectives stated in Section 1.1. Following a review of initial sampling results, additional samples may be collected if the extent of above-WAC or above-FRL contamination has not been adequately bounded. These samples would be identified by a Variance/Field Change Notice (V/FCN) to this PSP. Sampling activities carried out under this PSP will be performed in accordance with the Sitewide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ), the SEP, the WAC Attainment Plan for the OSDF, and Data Quality Objectives (DQO) SL-048, Revision 5 (see Appendix B).

1.6 KEY PROJECT PERSONNEL

The key project personnel are listed in Table 1-1.

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TABLE 1-1
KEY PERSONNEL

Title	Primary	Alternate
DOE Contact	Rob Janke	Kathi Nickel
Production Area Project Manager	Rich Abitz	Jyh-Dong Chiou
Production Area Characterization Lead	Christine Messerly	Bill Westerman
Field Sampling Lead	Mike Frank	Tom Buhrlage
Surveying Lead	Jim Schwing	Jim Capannari
Waste Acceptance Organization (WAO) Contact	Linda Barlow	Dave Lockerd
FEMP Sample Management Office Contact	Audrey Hannum	Grace Ruesink
Data Management Lead	Bill Westerman	Christine Messerly
Data Validation Contact	Jim Chambers	Jim Cross
Quality Assurance Contact	Reinhard Friske	Ervin O'Bryan
Health and Safety Contact	Debbie Grant	Lewis Wiedeman

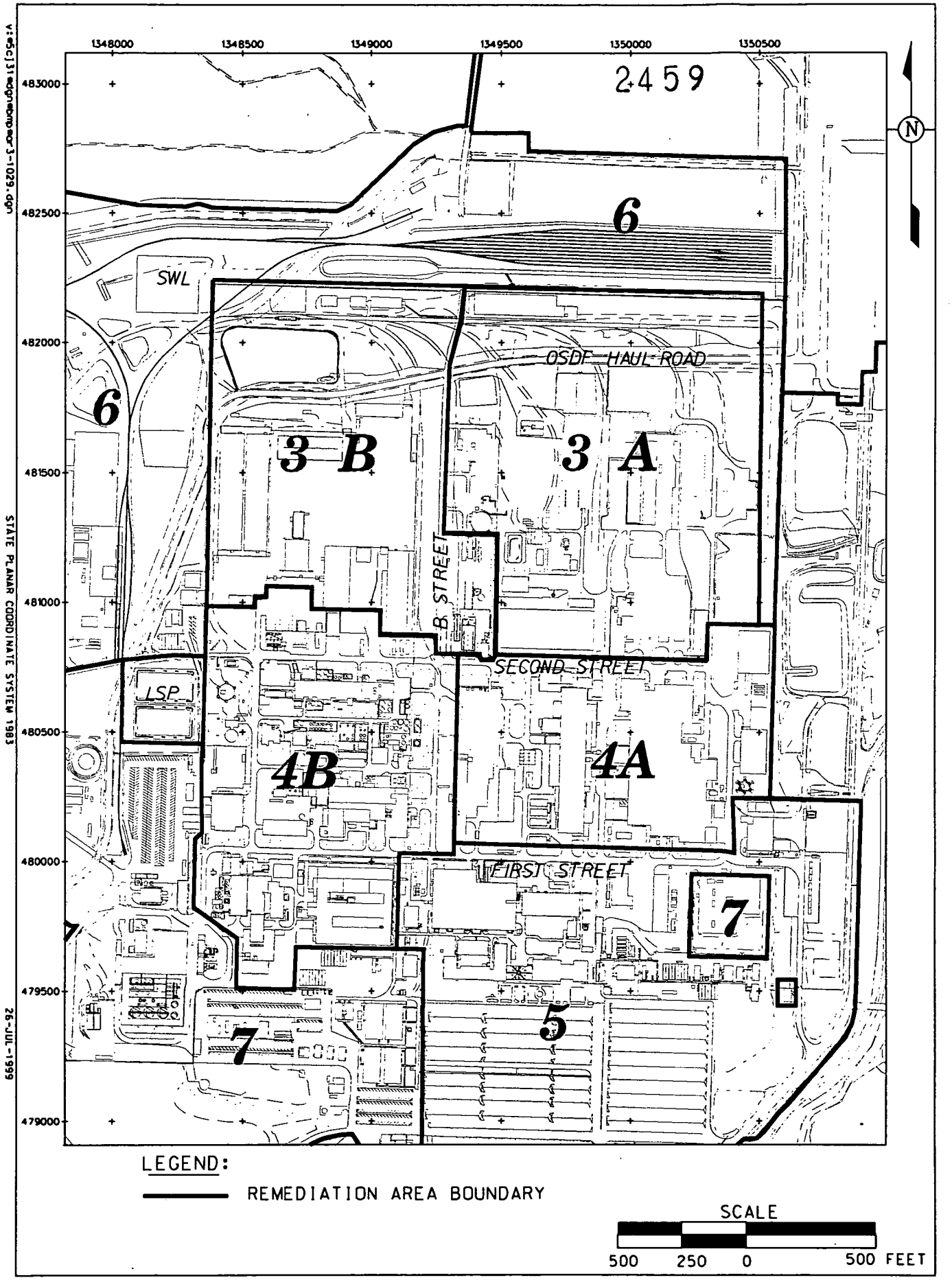

FIGURE 1-1. LOCATION OF AREAS 3A/4A

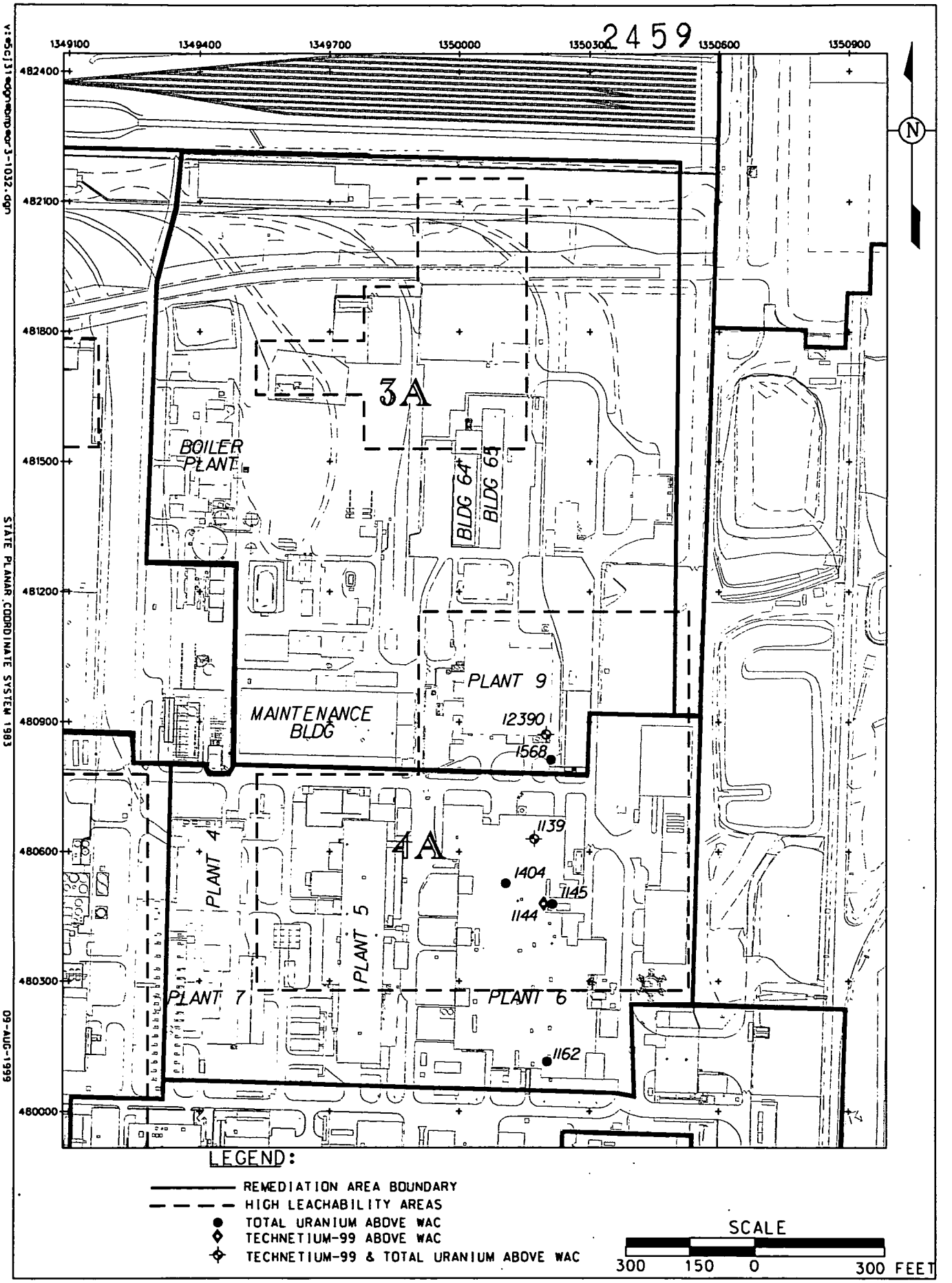

FIGURE 1-2. SUBSURFACE ABOVE-WAC LOCATIONS IN AREA 3A/4A

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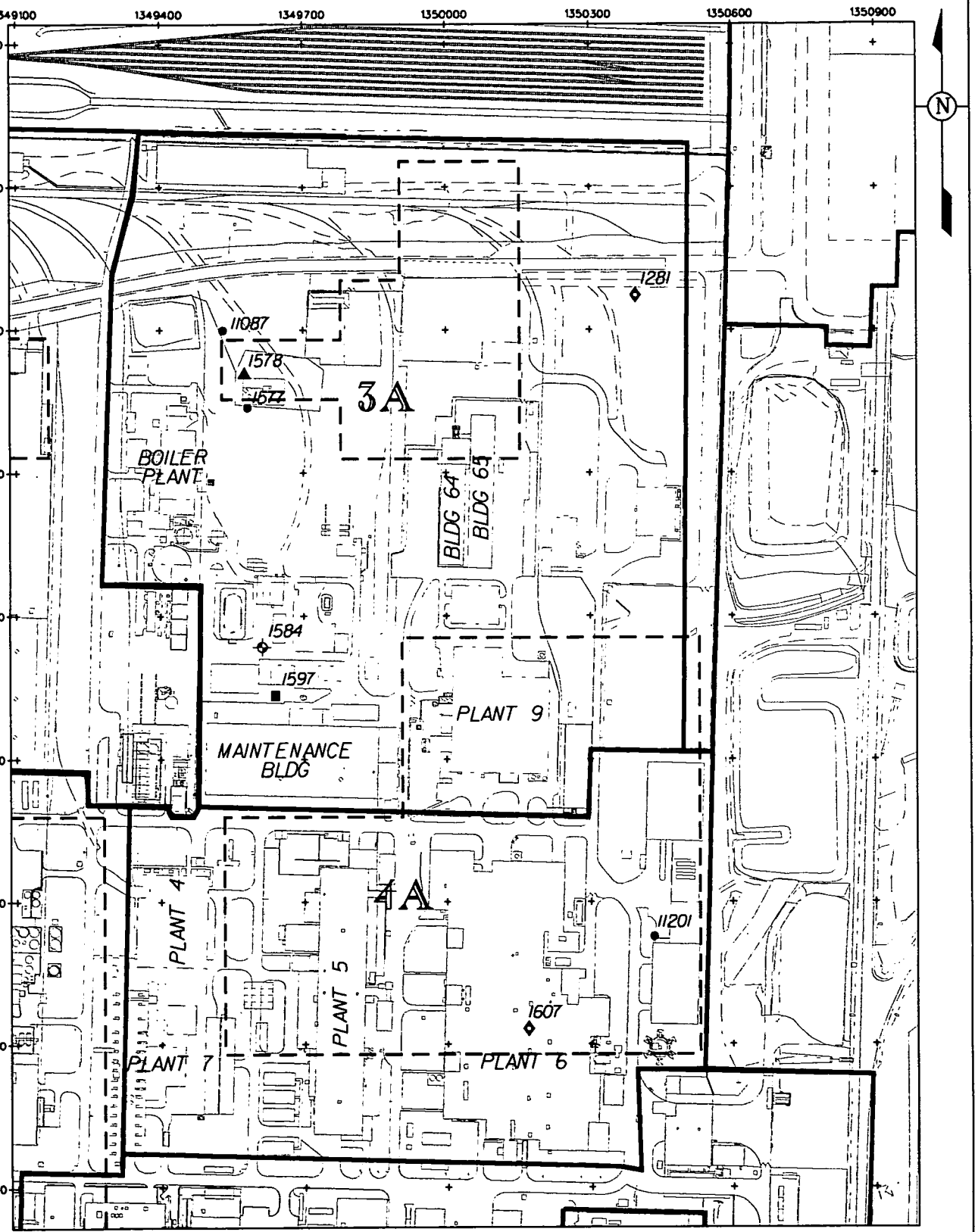

LEGEND:
- REMEDIATION AREA BOUNDARY
- HIGH LEACHABILITY AREAS
- ● BERYLLIUM ABOVE-FRL
- ◇ THORIUM ABOVE-FRL
- BENZO(A)PYRENE ABOVE-FRL
- ▲ AROCLOR-1254 ABOVE-FRL
- ■ AROCLOR-1260, ARSENIC AND 1,1,-DICHLORDETHENE ABOVE-FRL

SCALE
300 150 0 300 FEET

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FIGURE 1-3. SUBSURFACE ABOVE-FRL LOCATIONS IN AREA 3A/4A

2.0 PHYSICAL SAMPLING STRATEGY

2.1 SELECTION OF SAMPLE LOCATIONS

Sample locations were chosen to meet the objectives presented in Section 1.1. The boring locations and depths to bound above-WAC and above-FRL areas were identified in accordance with the SEP. Existing data were used in combination with the three-dimensional computer model of total uranium contamination to target areas of high modeling uncertainty and to identify areas with data gaps. The data from many of the borings will contribute to meeting several of the objectives of this PSP. For example, borings located in the above-WAC area in the north of Plant 6 will bound an above-WAC area, eliminate a data gap, and reduce an identified area of high uncertainty in the three-dimensional computer model.

Due to the fact that existing results are only slightly above the FRLs, proposed borings are co-located with existing above-FRL locations to confirm the presence and level of the contamination. The three technetium-99 above-WAC locations will also be confirmed due to the mobility of technetium-99.

The location of borings proposed to delineate above-WAC and above-FRL areas are shown on Figures 2-1 through 2-3 and Figures 2-4 through 2-7, respectively. The borings planned to investigate the high leachability areas are illustrated and discussed in Section 3.0 of this PSP.

Borings located in Plant 6 have been identified to bound existing above-WAC and above-FRL locations. Since the original borings were completed in the late 1980s, Plant 6 has undergone Safe Shutdown which may have modified the interior of the building. If, during field implementation, access to any of the Plant 6 borings identified on Figures 2-2, 2-3, and 2-7 is limited or impossible, completion of those borings will be delayed until D&D of the building has been completed. A V/FCN would be completed if this situation arises.

2.2 SAMPLE COLLECTION METHODS

All soil borings will be completed using the Geoprobe® Model 5400 with the macro-core sampler or dual tube sampling system. The dual tube must be used for borings with depths that exceed 5 feet, where perched water is expected, where significant surface soil contamination exists, or where significant sidewall sloughing is anticipated. Soil samples will be collected in accordance with

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procedure SMPL-01, Solids Sampling. If refusal or resistance is encountered during sample collection, the location may be moved within a 3-foot radius of the identified sample location, unless precluded by the penetration permit. If the distance is greater than 3 feet from the originally planned sample point, the change must be documented on a V/FCN form, as described in Section 4.4.

Prior to collection of the soil cores, the field sampling technician will remove any surface vegetation within a 6-inch radius from the point to be sampled, using a clean-gloved hand and taking care not to remove any of the surface soil. When sampling below gravel, asphalt or concrete, the uppermost sampling interval will begin where the soil contains less than 50 percent gravel. Any debris (e.g., wood, concrete, metal) contained in the sample intervals will be removed. The Geoprobe® will be driven to the appropriate depth and, upon removal, all cores will be laid out on clean plastic. The entire length of each soil core will be surveyed with a beta/gamma (Geiger-Mueller) survey meter and all above-background survey results will be recorded on the sample collection log. Potential above-WAC intervals [i.e., intervals with readings above 450 corrected counts per minute (ccpm)] will be sampled and analyzed for total uranium. Because total thorium results can be obtained as part of the same method as total uranium [inductively coupled plasma/mass spectrometry (ICP/MS)], all soil samples undergoing total uranium analysis will also have the thorium results reported. Archive samples will be collected from the 6-inch intervals above and below any sample intervals that exceed 450 ccpm.

The entire length of each boring will be screened using a photoionization detector (PID). For Geoprobe® cores, the core liners will be opened for PID screening. Any sample interval with sustained 5 parts per million (ppm) above-background reading on the PID will be subjected to a headspace analysis, in accordance with procedure EQT-04, Photoionization Detector. Headspace analysis involves placing a small amount of soil into a sample container, covering the container opening with aluminum foil, placing the lid on the container, and placing it in an area where the temperature is greater than 60°F for five to ten minutes. The container lid is then removed, the PID tip inserted through the aluminum foil, and a PID measurement collected for ten seconds. The sample measurement will be recorded on the Field Activity Log. If the result of the headspace analysis is above 10 ppm, the sample interval will be submitted for total VOC analysis.

Following beta/gamma and PID screening, the appropriate sample intervals, as identified in Appendix D, will be separated from the core. The core from any boring with a planned depth of 12 feet or greater will be monitored by the field geologist to ensure that downward migration of contamination does not occur or is minimized through the use of appropriate sample tools. Sample volume and analysis information are summarized in Table 2-1.

Samples selected for analysis of radiological constituents and inorganics (arsenic and beryllium) will be sent to the on-site laboratory for analysis. The volatile organic compound (VOC), semi-volatile organic compound (SVOC), and pesticide/polychlorinated biphenyl (PCB) samples will be delivered to the on-site Sample Processing Laboratory, where they will be prepared for shipment to an approved off-site laboratory, in accordance with procedure 34-10-501, Shipping Samples to Off-Site Laboratories. One alpha/beta screening sample will be collected from a depth of 0.5-1.0 feet, or a more appropriate interval as determined by the field sampling lead, and analyzed on site for each boring with samples being sent off site for analysis. The samples will be analyzed for the appropriate Target Analyte List (TAL), as identified in Appendix C.

2.3 SAMPLE IDENTIFICATION

All physical samples collected for laboratory analysis or archiving will be assigned a unique sample identifier, as listed in Appendix D. This identifier will consist of the boring number, followed by a depth identification (1= 0-0.5 feet, 2= 0.5-1.0 feet, etc.), and followed by a letter designating the type of sample ("R" for radionuclides, "M" for metals, "L" for VOCs, "S" for SVOCs, "P" for pesticide/PCBs, and "AB" for alpha/beta screening). For example, 12545-8-R is the sample collected from the 3.5-4.0 foot interval of Boring 12545 and is a sample for radionuclide analysis.

Any archive samples collected will be assigned a "V" suffix (e.g., 12545-8-R-V) to designate an archive. Trip blanks will be labeled with a project designation (3A4A-SUB) and the suffix "TB." For example, 3A4A-SUB-TB3 would be the third trip blank collected under the Area 3A/4A subsurface investigation.

If a boring location requires multiple borings due to subsurface refusal, or if a boring is moved after attempting the original location, the boring identifier will be designated with an alphabetic suffix

(e.g., 12522A, 12522B, etc.). Therefore, a radiological sample collected from the 3.5-4.0 foot interval of the third attempt at Boring 12530 would be 12530C-8-R.

2.4 EQUIPMENT DECONTAMINATION

Decontamination is performed to protect worker health and safety and to prevent the introduction of contaminants from sampling equipment to subsequent soil samples. Sampling equipment will be decontaminated prior to transport to the sample field site, between sample locations, and after sampling performed under this PSP is completed. Equipment that comes into contact with sample material will be decontaminated at Level II (Section K.11, SCQ). Other equipment that does not contact sample media may be decontaminated at Level I, or wiped down using disposable towels. Clean disposable wipes may be used to replace air drying of the equipment.

2.5 WASTE DISPOSITION

Place excess soil back into the boring at the corresponding depths to the original horizon. Do not replace excess soil at depths greater than 15 feet. Soil not placed back in the boring can be disposed of on the ground or gravel surface in the same general area of the boring. Soil should not be disposed of outside the posted radiological designation of the boring location (i.e., don't cross radiological rope delineation).

2.6 BOREHOLE ABANDONMENT

Each borehole will be plugged using bentonite pellets or a bentonite grout slurry immediately after sampling is completed. If pellets are used, they will be placed in the borehole in 2-foot intervals, then hydrated with potable water. If the boring depth exceeds 12 feet, the field geologist will direct the field team on which abandonment option will be used. Any concrete or asphalt that is removed will be replaced with an equal thickness of cement. A Borehole Abandonment Log will be completed for each borehole.

TABLE 2-1
SAMPLING AND ANALYTICAL REQUIREMENTS

Analyte	Sample Matrix	Lab	ASL	Preservation	Holding Time	Container	Sample Volume/ Mass
Total Uranium, Total Thorium (TAL A)	Solid	On-site	B	None	12 months	250-mL widemouth glass or poly	300g[a] 50g[b]
Beryllium (TAL B)	Solid	On-site	B	Cool 2°-6° C	6 months	250-mL widemouth glass or poly	50g
Technetium-99 (TAL C)	Solid	On-site	B	None	12 months	120-mL widemouth glass or poly	20g[c]
Arsenic (TAL D)	Solid	On-site	B	Cool 2°-6° C	6 months	120-mL widemouth glass or poly	20g
Total Uranium (TAL E)	Water	On-site	B	HNO_3, pH<2	6 months	120-mL widemouth glass or poly	50-mL
SVOC - Benzo(a)pyrene (TAL F)	Solid	Off-site	B	Cool 2°-6° C	14 days	120-mL widemouth glass	120g
Pesticide/PCB - Aroclor-1254, Aroclor-1260 (TAL G)	Solid	Off-site	B	Cool 2°-6° C	14 days	120-mL widemouth glass	120g
VOC - 1,1-Dichloroethene (TAL H)	Solid	Off-site	B	Cool 2°-6° C	14 days	60-mL widemouth glass with Teflon cap	90g
VOC (TAL I)	Water (Trip Blank) or Soil (PID hit)	Off-site	B	Cool 2°-6° C (water and soil) HCl, pH<2 (water)	14 days	Water: 3 x 40-mL glass w/ Teflon cap Soil: 60-mL glass w/ Teflon cap	3 x 40-mL (Water) 1 x 60-mL (Soil)

[a] Samples collected for high-leachability area borings.
[b] Samples collected for above-WAC or above-FRL borings outside the high-leachability areas.
[c] Can be included in same container when collected with TAL A.

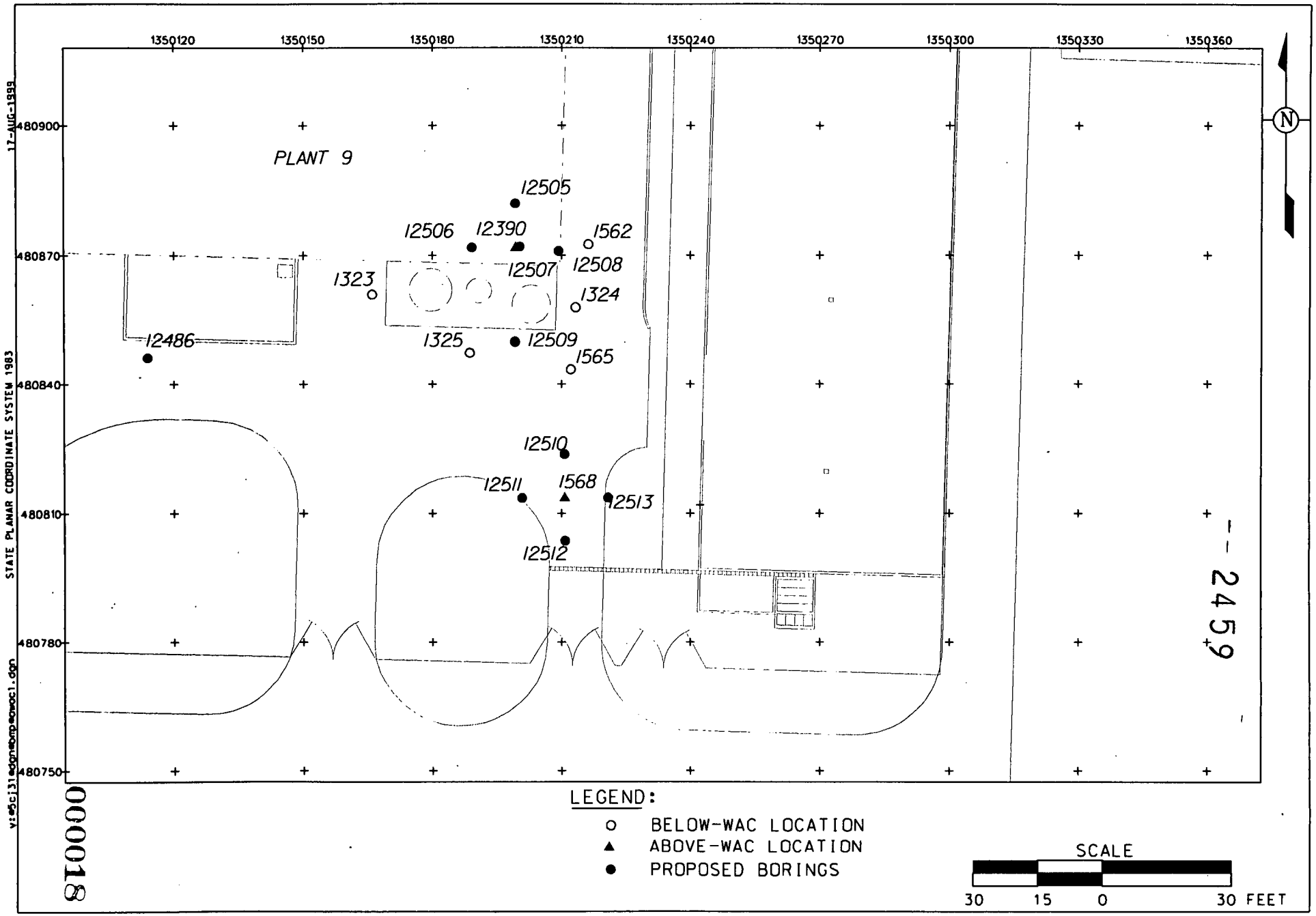

FIGURE 2-1. ABOVE-WAC LOCATIONS, PROPOSED BORINGS AND EXISTING BELOW-WAC LOCATIONS NEAR PLANT 9

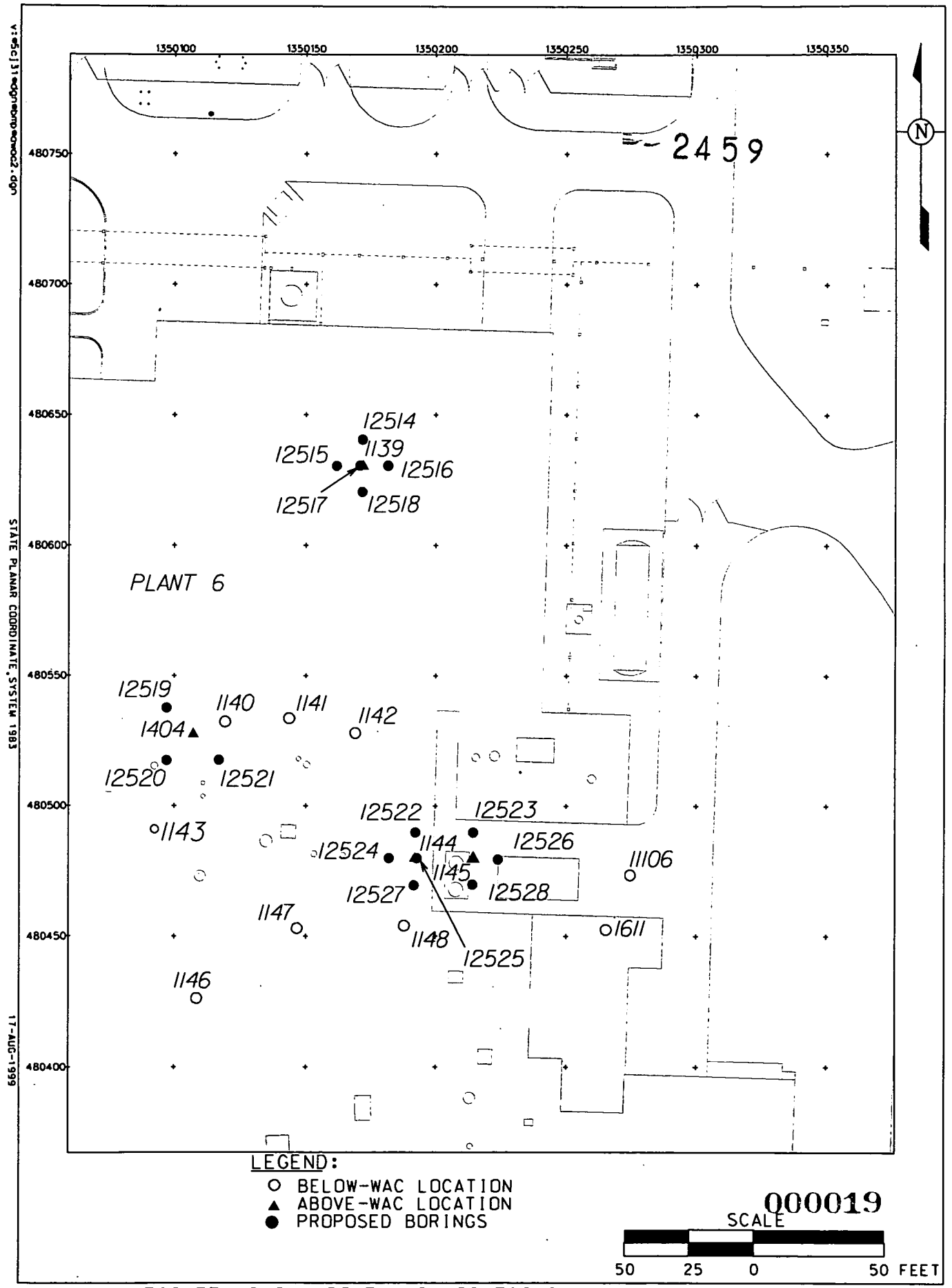

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FIGURE 2-2. ABOVE-WAC LOCATIONS, PROPOSED BORINGS, AND EXISTING BELOW-WAC LOCATIONS IN NORTH PLANT 6

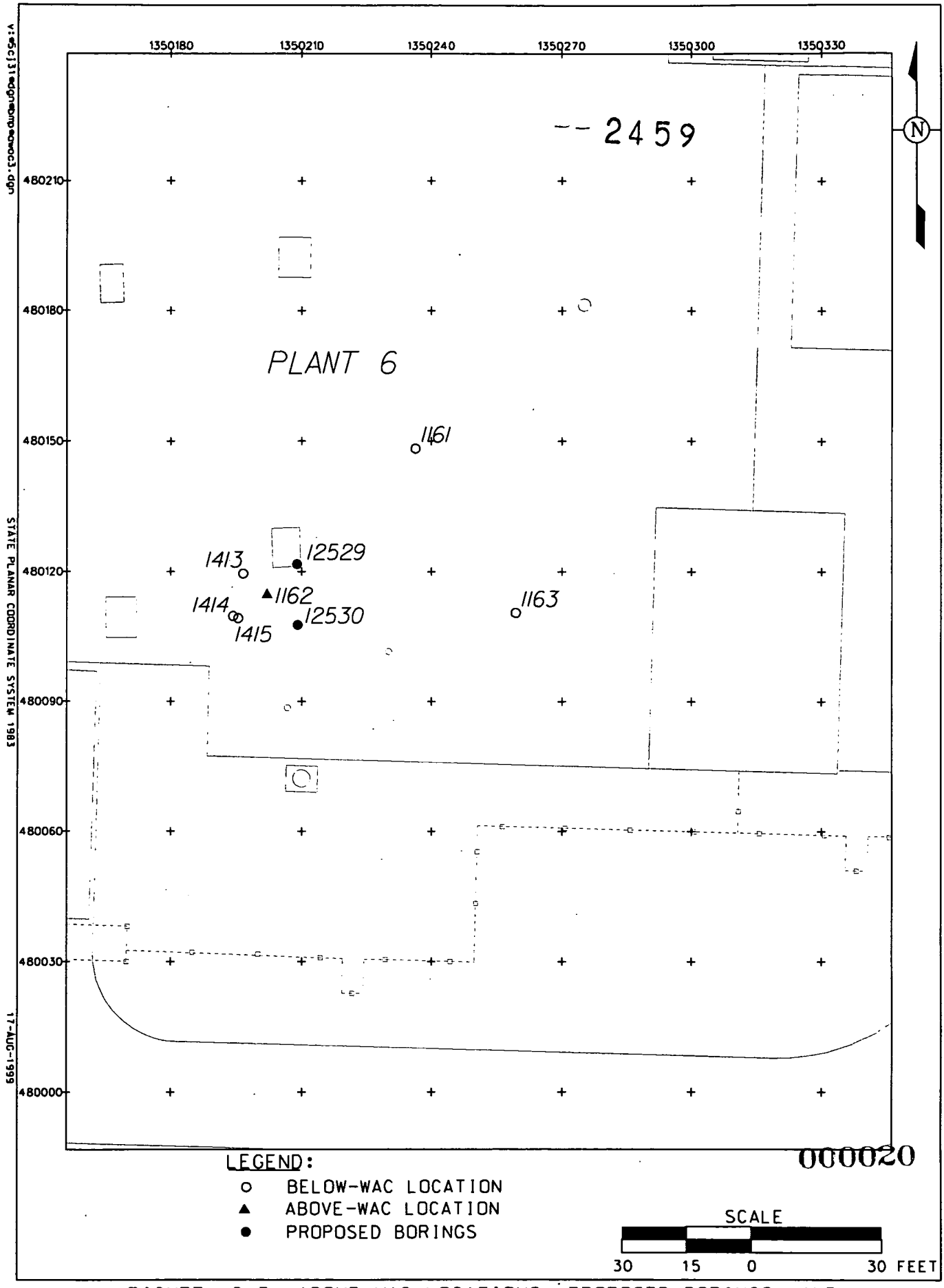

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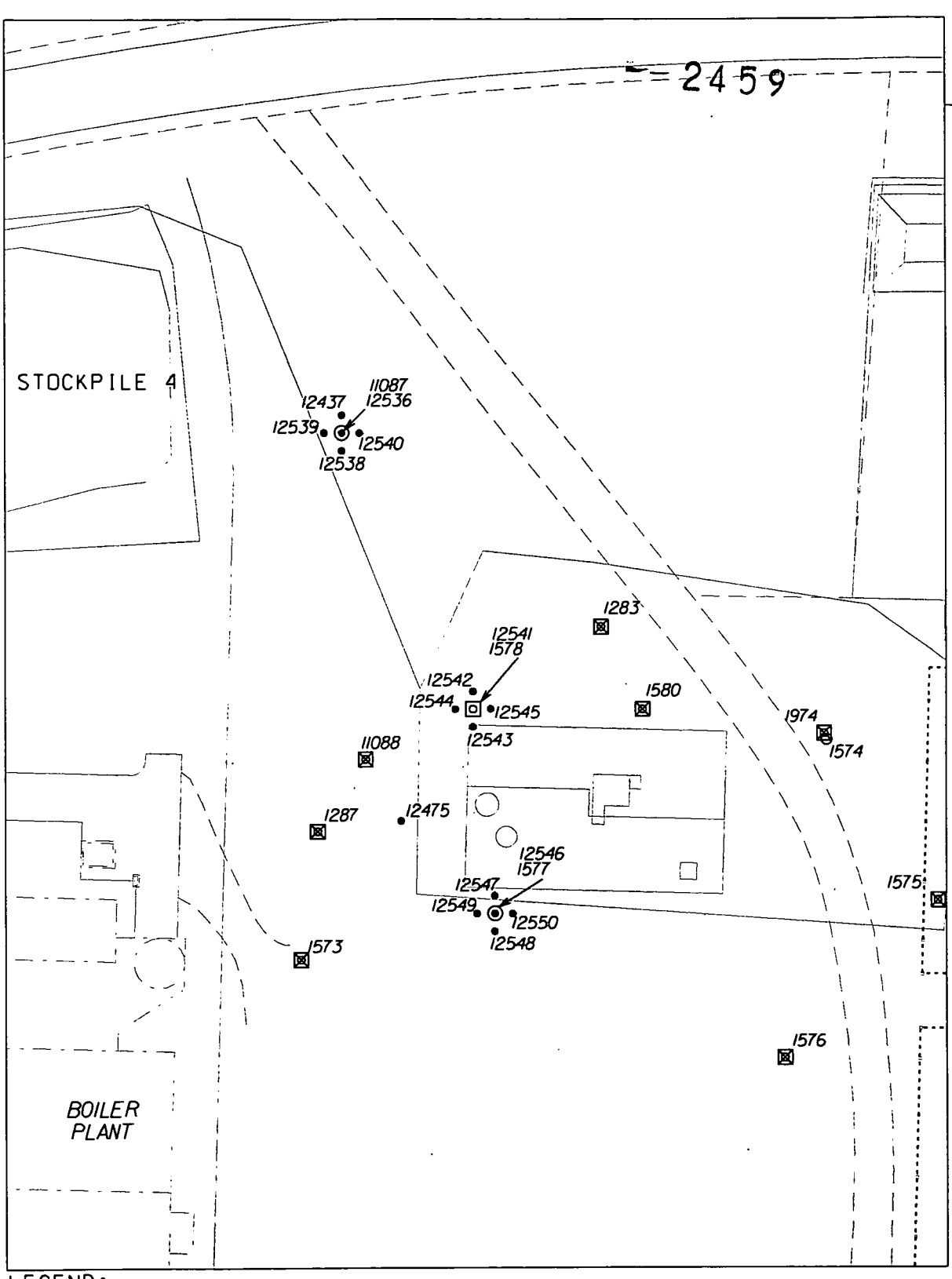
FIGURE 2-3. ABOVE-WAC LOCATIONS, PROPOSED BORINGS, AND EXISTING BELOW-WAC LOCATIONS IN SOUTH PLANT 6



LEGEND:

- ⊙ ABOVE BERYLLIUM FRL AND PROPOSED BORING
- ○ BELOW BERYLLIUM FRL
- ⊡ ABOVE ARSENIC, 1,1-DICHLOROETHENE, AROCLOR-1260 FRL AND PROPOSED BORING
- ⊠ BELOW ARSENIC, 1,1-DICHLOROETHENE, AROCLOR-1260 FRL
- ⊠ BELOW ARSENIC, BERYLLIUM, 1,1-DICHLOROETHENE, AROCLOR-1260 FRL
- • PROPOSED BORING

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SCALE

50 25 0 50 FEET

FIGURE 2-4. ABOVE-FRL LOCATIONS PROPOSED BORINGS, AND BELOW-FRL LOCATIONS NEAR BOILER PLANT

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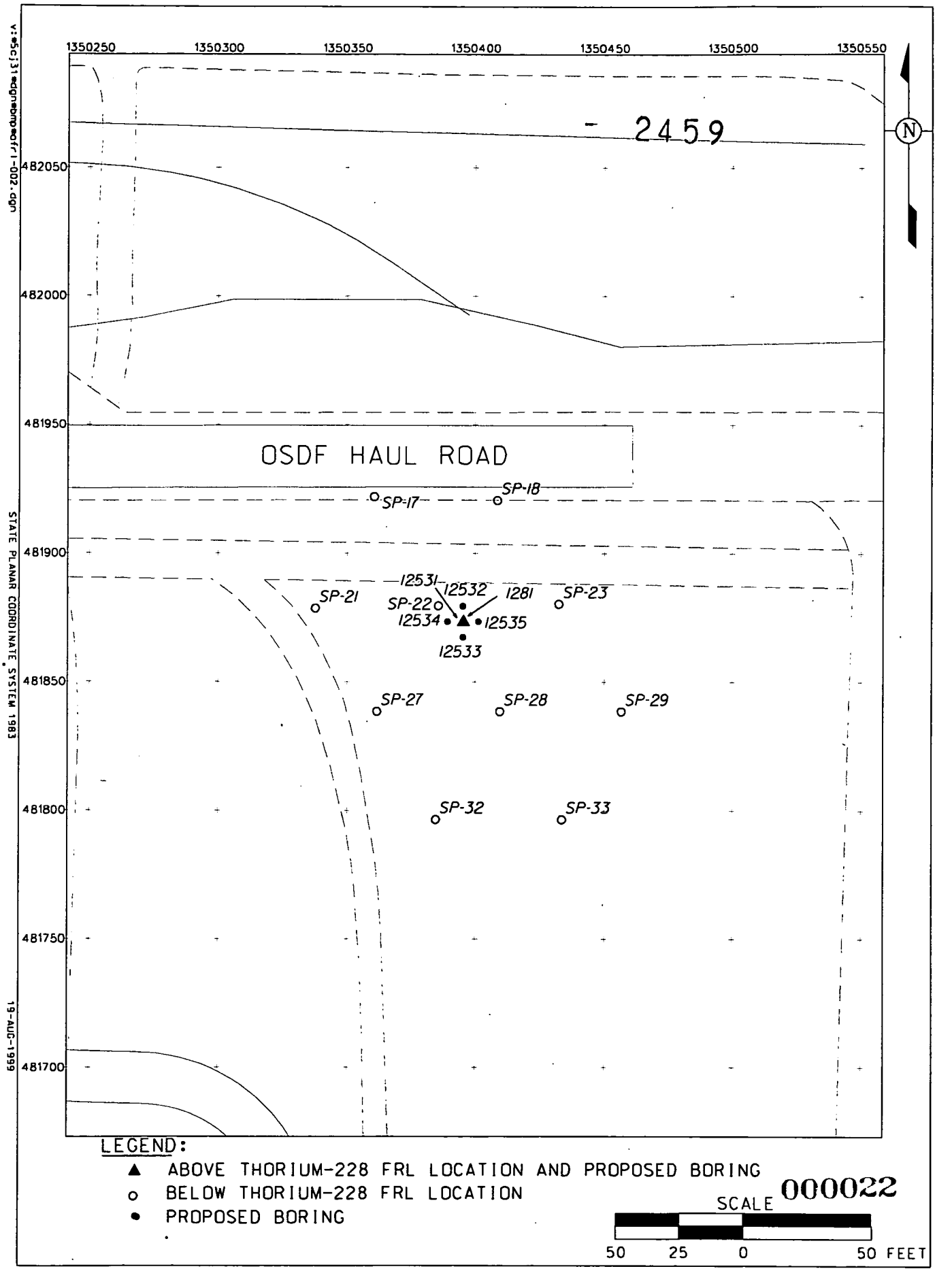

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FIGURE 2-5. ABOVE-FRL LOCATION, PROPOSED BORINGS, AND BELOW FRL LOCATIONS IN NORTHEAST CORNER OF AREA 3A

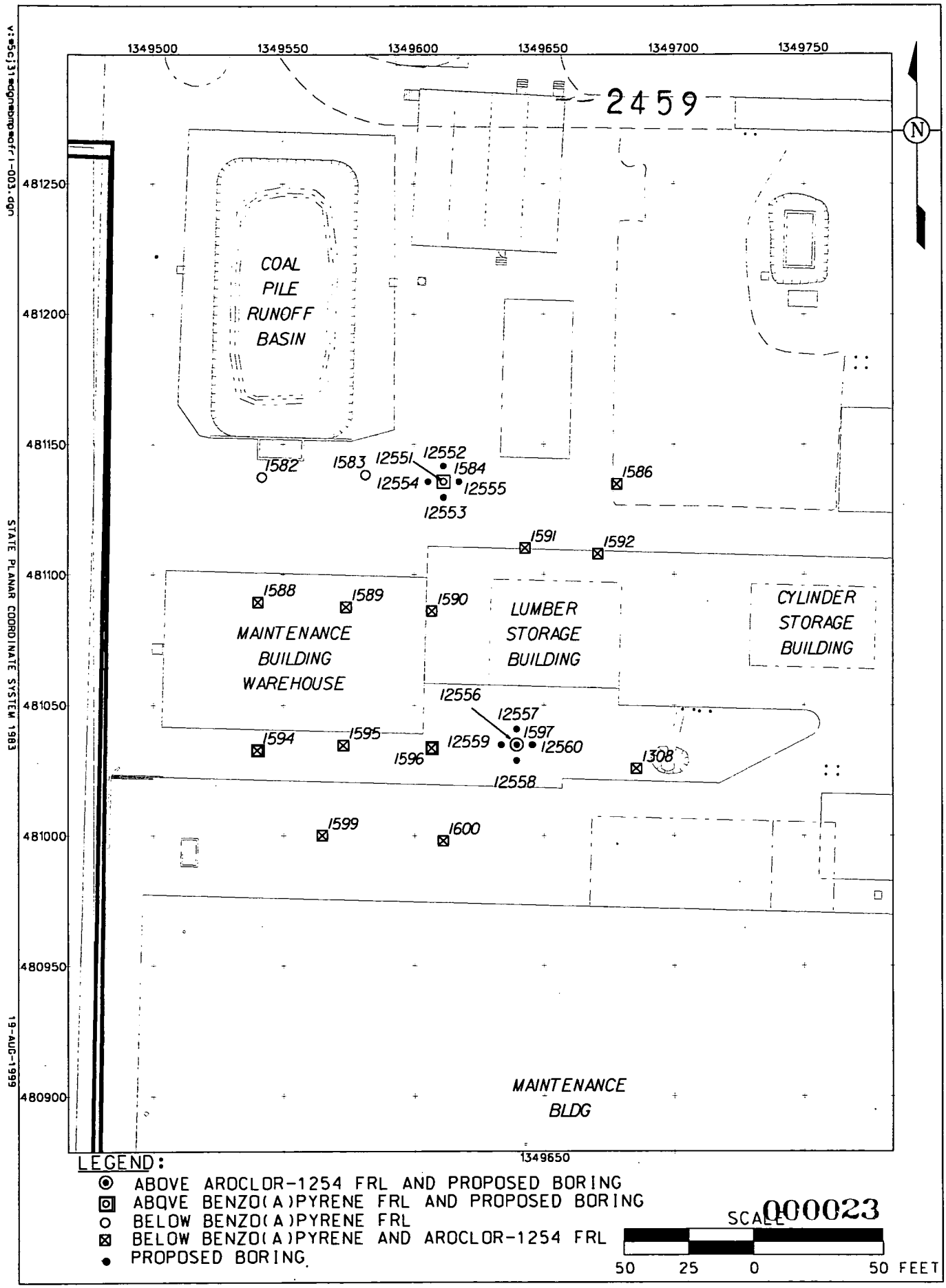

FIGURE 2-6. ABOVE-FRL LOCATIONS, PROPOSED BORINGS, AND BELOW-FRL LOCATIONS NEAR MAINTENANCE BUILDING

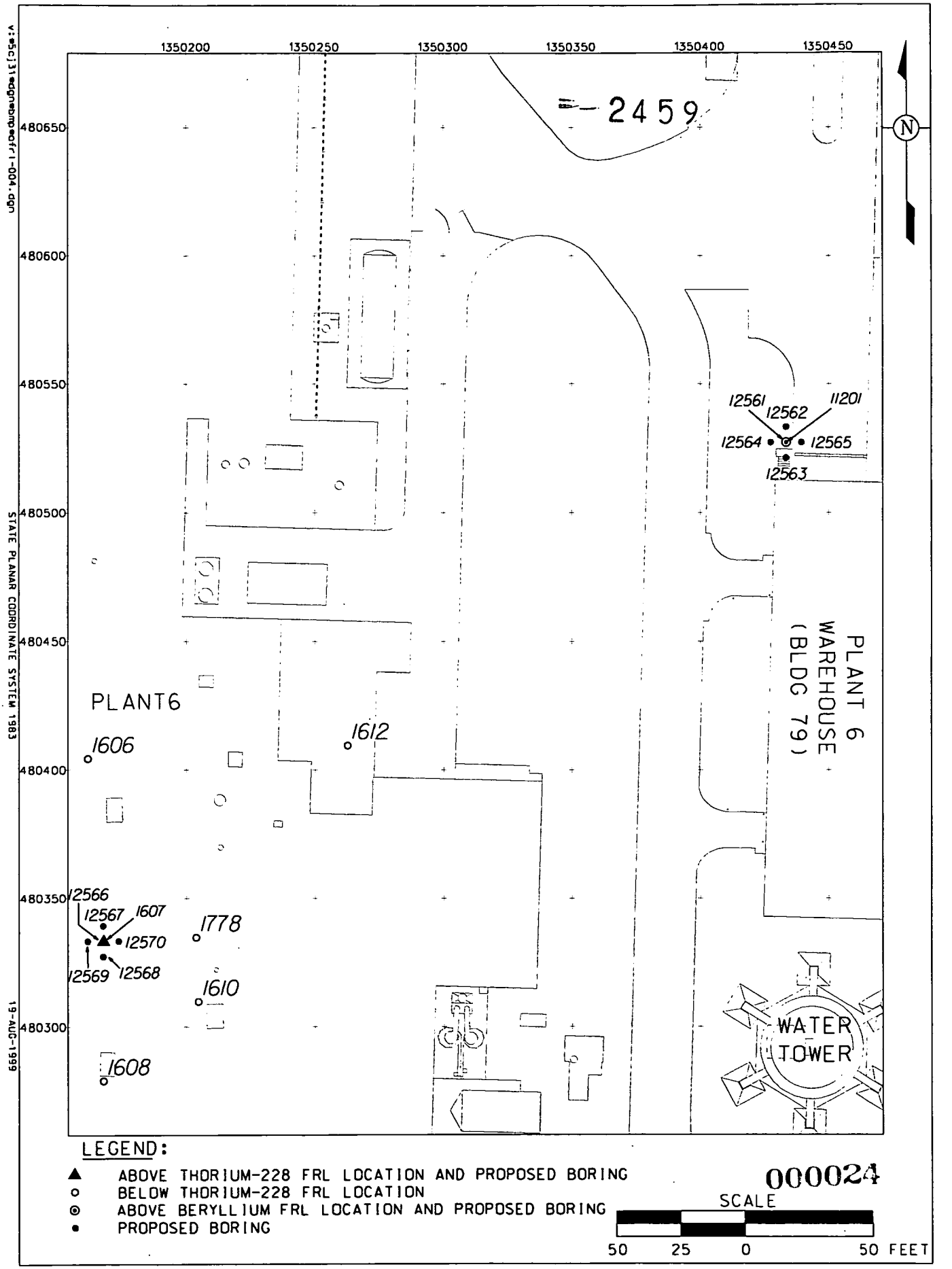

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FIGURE 2-7. ABOVE-FRL LOCATIONS, PROPOSED BORINGS, AND BELOW-FRL LOCATIONS NEAR PLANT 6

3.0 SAMPLING TO SUPPORT LEACHABILITY STUDY

Soil and perched groundwater samples will be collected from the two high-leachability areas in Area 3A/4A and will be analyzed for total uranium and total thorium. The results from this sampling will then be used to select samples for a batch leach test that will determine the leachability of uranium from the soil in the two designated areas.

Uranium FRLs for soil within Area 3A/4A were established in the Operable Unit 5 (OU5) Record of Decision (ROD). Outside of the high-leachability areas, the FRL for total uranium is 82 mg/kg with an As Low As Reasonably Achievable (ALARA) goal of 50 mg/kg. Within the high-leachability areas, the FRL for total uranium is 20 mg/kg. The sampling to support the leachability study will be targeting soil with uranium concentrations between 20 and 50 mg/kg.

3.1 SELECTION OF SAMPLE LOCATIONS

Sample locations were selected in a two-step process. The first step involved establishing potential boring locations on approximately a 100-foot grid pattern within the exposed areas of the high leachability areas. In the second step of this process, the three-dimensional computer model was used to identify borings that were:

- located within the modeled volume of the 20 to 50 milligrams per kilogram (mg/kg) total uranium contamination
- outside of the areas requiring excavation due to removal of building foundations
- located in areas with minimal existing data.

The three-dimensional computer model was also used to determine the approximate depth of the 20-50 mg/kg uranium contamination at each boring location. These depths became targeted sampling intervals for the borings. The boring locations selected as a result of this analysis are shown on Figures 3-1 and 3-2, and the depth of each boring is listed in Appendix D. Figure 3-1 indicates only seven borings in the northern high-leachability area were selected for investigation. This is due to existing data from previous investigations that shows uranium contamination above 20 mg/kg is limited to the top 3-5 feet of soil (i.e., there is no deep source of leachable uranium). Figure 3-2 identifies 26 locations in the southern high-leachability area for further investigation. These borings were

selected to cover data gaps in the three-dimensional model (e.g., between Plants 5 and 6), and to target the deeper portions of the 20-50 mg/kg uranium contamination.

3.2 SAMPLE COLLECTION METHODS

Sample collection methods will generally follow the methods described in Section 2.2. Specific information about the samples to be collected for the leachability study and the procedures for collecting perched groundwater samples are presented below.

Soil samples will be collected from 1-foot intervals at approximately 3-foot spacing down the length of each boring identified on Figures 3-1 and 3-2. The first interval to be collected will be staggered in each boring so that the exact same 1-foot intervals will not be collected from each boring. The specific intervals to be collected are identified in Appendix D. All soil samples will be analyzed for total uranium and total thorium at the on-site laboratory using ICP/MS. Since total thorium results can be obtained as part of the same method as total uranium (ICP/MS), all soil samples undergoing total uranium analysis will have the thorium results reported. Because any of the soil samples may be selected for further leachability testing, each sample will consist of at least 250 grams. Duplicate samples will be collected at a rate of one for every 20 samples. Duplicate sample intervals will be selected by the Field Sampling Lead and will be created by compositioning and splitting adjacent 1-foot sample intervals in the field. Sample volume and analysis information is summarized in Table 2-1.

If perched groundwater is encountered, a water sample will be collected, as described below, in conjunction with each soil sample collected in the perched groundwater zone. If the perched groundwater zone falls between identified soil samples (i.e., the perched groundwater zone is less than 3 feet thick) an additional soil (or sediment) and perched groundwater sample should be collected from that zone. This will ensure that at least one water and one soil sample are collected from each perched groundwater zone.

When a perched groundwater zone is encountered, one of the following collection methods will be employed: 1) a temporary screen point (screen point 15) sampler, 2) a mill-slotted rod sampler, 3) a tubing bottom check valve assembly, or 4) a small-volume bailer. All water sampling will be accomplished following the procedure SMPL-02, Liquids and Sludge Sampling. A perched groundwater sample (approximately 50 ml) will be collected and filtered through a 0.45 micron filter

(to ensure only soluble uranium is present) prior to being placed into the sample container. A pH measurement will also be done at the time of sample collection and recorded on the Sample Collection Log. Perched groundwater samples will be analyzed for total uranium at the on-site laboratory using ICP/MS or Kinetic Phosphorescence Analysis (KPA). Thorium analysis will not be done because dissolved thorium generally never exceeds current analytical detection levels. Sample volume and analysis information is summarized in Table 2-1.

Soil sample identifiers will be based on the same system as described in Section 2.3. The one difference is that samples collected to support the leachability study will be collected in 1-foot intervals. Therefore, a depth identifier of "1" will designate the 0-1 foot interval, a depth identifier of "2" will designate the 1-2 foot interval, etc. Duplicate soil samples will be noted with a "-D" after the analysis identifier (e.g., 12511-5-R-D). Perched groundwater samples will be distinguished from soil samples by adding a GW after the depth code and before the analysis identifier. For example, 12511-5-GW-R is a perched groundwater sample collected from the 4.0-5.0 foot interval of Boring 12511.

3.3 SAMPLE PREPARATION AND ANALYSIS

Following collection, each soil sample will be dried, ground, and homogenized in the laboratory in accordance with method ALS 5507, Drying and Grinding Solid Samples in Preparation for Laboratory Analysis. After sample preparation is complete, a sample aliquot will be collected from the bulk sample volume and total uranium and total thorium analysis will be performed at the on-site laboratory using ICP/MS. The bulk sample will be kept for possible later use in the batch leach tests.

3.4 BATCH LEACH TEST

The following procedure for performing a batch leach test is based on the OU5 K_l Study that was performed outside of the Former Production Area in 1994 (Attachment F.2.I of the OU5 Feasibility Study).

Following review of the total uranium results, up to 50 soil samples will be selected to undergo a batch leach test. Selected samples will have a uranium concentration between 20 and 82 mg/kg and will be representative of the different areas and depths of contamination. The concentration range 20 to 82 mg/kg was selected because soil with concentrations below 20 mg/kg will remain in place and soil

with concentrations above 82 mg/kg will be excavated regardless of the location. Soil with uranium concentrations between 50 to 82 mg/kg could potentially remain in place if the high-leachability area boundaries are refined, so samples with concentrations in that range will also be included in the study.

The leaching test, which will be performed at the University of Cincinnati, will be used to determine the mobility of the uranium in the contaminated soil. This information will be used to verify and/or refine the boundaries of the high-leachability areas that were identified in the OU5 Feasibility Study. This test will be performed using uncontaminated perched groundwater extracted from the horizontal well underneath Cell 3 of the OSDF. This water will be collected by the FDF Groundwater Monitoring group in compliance with procedure SMPL-02, Liquid and Sludge Sampling. Representative samples of the uncontaminated perched groundwater will be analyzed for total uranium in the on-site laboratory before being used in the batch leach test. Previous analysis of this perched groundwater indicates that the background uranium concentration is approximately 3 micrograms per liter (μg/L).

The procedure for performing the batch leach test is documented in Modification to University of Cincinnati Task Order No. 039 (Leaching of Contaminated Soil Samples from the Former Production Area), included as Appendix E of this PSP. Analytical results and data interpretation from this study will be addressed in a future summary report.

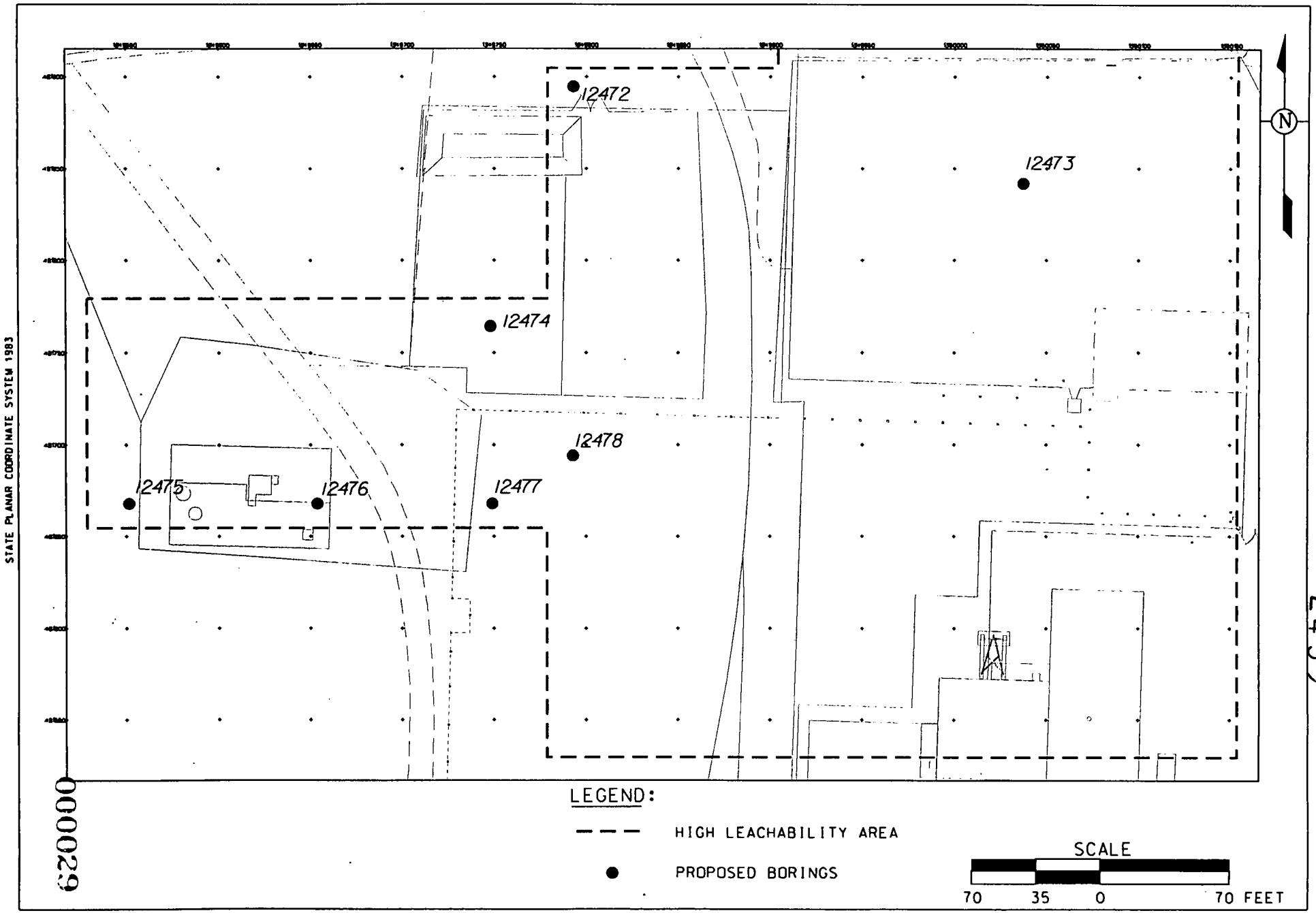

FIGURE 3-1. BORINGS TO CONFIRM AREA 3A/4A NORTHERN HIGH LEACHABILITY AREA

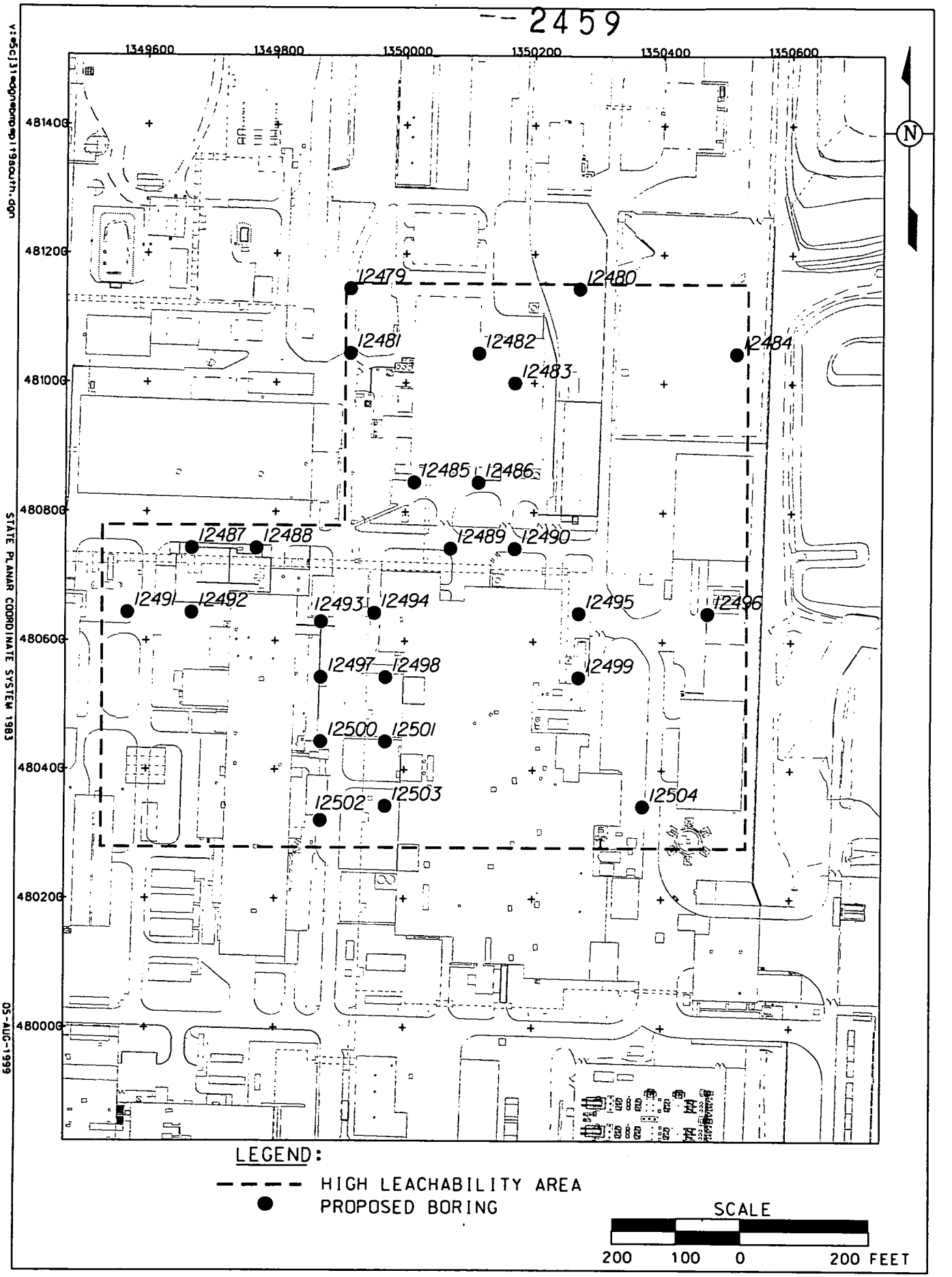

FIGURE 3-2. BORINGS TO CONFIRM AREA 3A/4A SOUTHERN HIGH LEACHABILITY AREA

4.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

4.1 FIELD QUALITY CONTROL SAMPLES, ANALYTICAL REQUIREMENTS, AND DATA VALIDATION

In accordance with the requirements of DQO SL-048, Rev. 5 (see Appendix B), the field quality control, analytical, and data validation requirements are as follows:

- Ten percent of the soil and perched water samples collected from the high-leachability areas will be analyzed at ASL D and all other laboratory analyses will be performed at analytical support level (ASL) B (ASLs are defined in the SCQ).
- One trip blank will be taken each day that VOC samples are collected or one per 20 VOC samples that are collected, whichever is more frequent. In addition, a lab matrix spike and matrix spike duplicate will be designated on the Chain of Custody form for each organic release sent for off-site analysis.
- All field data will be validated. All analytical data will require a certificate of analysis, and 10 percent of the analytical data will also require the associated quality assurance/quality control results and will be validated to ASL B.

If any sample collection or analysis methods are used that are not in accordance with the SCQ, the Project Manager and Characterization Lead must determine if the qualitative data from the samples will be beneficial to predesign decision making. If the data will be beneficial, the Project Manager and Characterization Lead will ensure that:

- the PSP is varianced to include references confirming that the new method is sufficient to support data needs,
- variations from the SCQ methodology are documented in the PSP, or
- data validation of the affected samples is requested or qualifier codes of J (estimated) and R (rejected) be attached to detected and nondetected results, respectively.

4.2 PROJECT-SPECIFIC PROCEDURES, MANUALS, AND DOCUMENTS

To assure consistency and data integrity, field activities in support of this PSP will follow the requirements and responsibilities outlined in controlled procedures and manufacturer operational manuals. Applicable procedures, manuals, and documents include:

- SMPL-01, Solids Sampling
- SMPL-02, Liquids and Sludge Sampling
- SMPL-21, Collection of Field Quality Control Samples
- EQT-04, Photoionization Detector
- EQT-05, Geodimeter® 4000 Survey System - Operation, Maintenance, and Calibration
- EQT-06, Geoprobe® Model 5400 Operation and Maintenance Manual
- EW-0002, Chain of Custody/Request for Analysis Record for Sample Control
- ALS 5507, Drying and Grinding Solid Samples in Preparation for Laboratory Analysis
- SDM 970007, Processing Samples through the Sample Processing Laboratory
- SDM 970021, Using the FACTS Database to Process Samples Within the Laboratory Building
- SDM 970026, Sample Processing Laboratory Internal Chain of Custody
- 34-10-501, Shipping Samples to Off-Site Laboratories
- RM-0020, Radiological Control Requirements Manual
- RM-0021, Safety Performance Requirements Manual
- Sitewide CERCLA Quality Assurance Project Plan (SCQ)
- Sitewide Excavation Plan (SEP)
- Waste Acceptance Criteria Attainment Plan for the On-Site Disposal Facility

4.3 PROJECT REQUIREMENTS FOR INDEPENDENT ASSESSMENTS

Project management has ultimate responsibility for the quality of the work processes and the results of the sampling activities covered by this PSP. The Quality Assurance (QA) organization will conduct independent assessments of the work processes and operations to assure the quality of performance. Assessment will encompass technical and procedural requirements of this PSP and the SCQ. Independent assessments will be performed by conducting a surveillance. Surveillances will be planned and documented according to Section 12.3 of the SCQ.

4.4 IMPLEMENTATION OF FIELD CHANGES

If field conditions require changes or variances, the Field Sampling Lead must obtain written or verbal approval (electronic mail is acceptable) from the Characterization Lead, QA, and WAO before the changes may be implemented. Changes to this PSP will be noted in the applicable Field Activity Logs and on a V/FCN. QA must receive the completed V/FCN, which includes the signatures of the Characterization Lead, Sampling Lead, Project Manager, WAO, and QA within seven working days of implementation of the change.

5.0 HEALTH AND SAFETY

The Health and Safety Lead, Field Sampling Leads, and team members will assess the safety of performing sampling activities in Area 3A/4A. This will include vehicle/equipment positioning limitations and fall hazards.

Technicians will conform to precautionary surveys performed by Radiological Control, Safety, and Industrial Hygiene personnel. All work on this project will be performed in accordance with applicable Environmental Monitoring procedures, RM-0020 (Radiological Control Requirements Manual), RM-0021 (Safety Performance Requirements Manual), Fluor Daniel Fernald work permit, Radiological Work Permit (RWP), penetration permit and other applicable permits. Concurrence with applicable safety permits (as indicated by the signature of each field team member assigned to this project) is required by each team member in the performance of their assigned duties.

The Field Sampling Lead will ensure that each technician performing work related to this project has been trained to the relevant sampling procedures including safety precautions. Technicians who do not sign project safety and technical briefing forms will not participate in any activities related to the completion of assigned project responsibilities. A copy of applicable safety permits/surveys issued for worker safety and health will be posted in the affected area during field activities.

A safety briefing will be conducted prior to the initiation of field activities. All emergencies will be reported immediately to the site communication center at 648-6511 by cell phone, 911 on-site phone, or by contacting "control" on the radio.

6.0 DATA MANAGEMENT

A data management process will be implemented so information collected during the investigation will be properly managed to satisfy data end use requirements after completion of the field activities. As specified in Section 5.1 of the SCQ, sampling teams will describe daily activities on a Field Activity Log, which should be sufficient for accurate reconstruction of the events at a later date without reliance on memory. Sample Collection Logs will be completed according to protocol specified in Appendix B of the SCQ and in applicable procedures. These forms will be maintained in loose-leaf form and uniquely numbered following the field sampling event. At least weekly, a copy of all field logs will be sent to the Characterization Lead.

All field measurements, observations, and sample collection information associated with physical sample collection will be recorded, as applicable, on the Sample Collection Log, the Field Activity Log, and the Chain of Custody/Request for Analysis Form, as required. The method of sample collection will be specified in the Field Activity Log. Borehole Abandonment Logs are required. The PSP number (20200-PSP-0005) will be on all documentation associated with these sampling activities.

Samples will be assigned a unique sample number as explained in Sections 2.3 and 3.2 and listed in Appendix D. This unique sample identifier will appear on the Sample Collection Log and Chain of Custody/Request for Analysis and will be used to identify the samples during analysis, data entry, and data management.

Technicians will review all field data for completeness and accuracy and then forward the data package to the Field Data Validation Contact for final review. The field data package will be filed in the records of the Environmental Management Project. Analytical data that is designated for data validation will be forwarded to the Data Validation Group. The PSP requirements for analytical data validation are outlined in Section 4.1. Analytical data from the on- and off-site laboratories will be reviewed by the Data Management Lead prior to transfer of the data to the SED from the Fernald Analytical Computerized Tracking System (FACTS) database.

Following field and analytical data validation, the Sample Data Management organization will perform data entry into the SED. After entry into the SED, a data group form will be completed for each material tracking location (as identified by WAO) and transmitted for WAC documentation.

APPENDIX A

PREVIOUS AREA 3A/4A SUBSURFACE SAMPLING RESULTS

APPENDIX A
PREVIOUS AREA 3A/4A SUBSURFACE SAMPLING RESULTS

ABOVE-WAC RESULTS

BORING	SAMPLE ID	SAMPLE DATE	MATERIAL	SAMPLE DEPTH (FEET) TOP	BOTTOM	PARAMETER	RESULT	QUALIFIER	OSDF WAC	NORTHING	EASTING
12390	A3-12390-5	23-Oct-98	SOIL	1.83	2.33	Technetium-99	457 pCi/g	J	29.1 pCi/g	480871.98	1350199.17
1139	055120	03-Jul-89	SOIL	0	0.5	Technetium-99	210 pCi/g	-	29.1 pCi/g	480630.44	1350171.91
1144	015847	28-Jul-89	SOIL	1.5	2	Technetium-99	37.9 pCi/g	-	29.1 pCi/g	480480.02	1350191.92
1139	055120	03-Jul-89	SOIL	0	0.5	Uranium, Total	39180 mg/kg	-	1030 mg/kg	480630.44	1350171.91
1139	015740	30-Jul-89	SOIL	3	3.5	Uranium, Total	39100 mg/kg	J	1030 mg/kg	480630.44	1350171.91
1139	015744	30-Jul-89	SOIL	5	5.5	Uranium, Total	1278 mg/kg	J	1030 mg/kg	480630.44	1350171.91
12390	A3-12390-4	23-Oct-98	SOIL	1.33	1.83	Uranium, Total	14200 mg/kg	NV	1030 mg/kg	480871.98	1350199.17
12390	A3-12390-5	23-Oct-98	SOIL	1.83	2.33	Uranium, Total	35900 mg/kg	-	1030 mg/kg	480871.98	1350199.17
12390	A3-12390-6	23-Oct-98	SOIL	2.33	2.83	Uranium, Total	1330 mg/kg	NV	1030 mg/kg	480871.98	1350199.17
12390	A3-12390-15	23-Oct-98	SOIL	6.33	6.83	Uranium, Total	12100 mg/kg	-	1030 mg/kg	480871.98	1350199.17
1162	016245	29-Jun-89	SOIL	1	1.5	Uranium, Total	8059 mg/kg	NV	1030 mg/kg	480114.70	1350201.97
1162	016247	29-Jun-89	SOIL	2	2.5	Uranium, Total	16879 mg/kg	NV	1030 mg/kg	480114.70	1350201.97
1162	016253	29-Jun-89	SOIL	5	5.5	Uranium, Total	4763 mg/kg	NV	1030 mg/kg	480114.70	1350201.97
1404	055077	14-Jun-89	SOIL	1	1.5	Uranium, Total	6897 mg/kg	J	1030 mg/kg	480527.65	1350107.09
1568	056140	15-Aug-90	SOIL	1	1.5	Uranium, Total	3504 mg/kg	J	1030 mg/kg	480813.56	1350210.79
1145	015870	15-Aug-89	SOIL	0.5	1	Uranium, Total	1416 mg/kg	J	1030 mg/kg	480480.06	1350214.42

ABOVE-FRL RESULTS*

BORING	SAMPLE ID	SAMPLE DATE	MATERIAL	SAMPLE DEPTH (FEET) TOP	BOTTOM	PARAMETER	RESULT	QUALIFIER	FRL	NORTHING	EASTING
1597	056774	04-Oct-90	SOIL	2	2.5	Aroclor-1254	240 ug/kg	J	130 ug/kg	481034.75	1349639.5
1578	056948	06-Nov-90	SOIL	4	4.5	Aroclor-1260	210 ug/kg	J	130 ug/kg	481705.45	1349575.9
1578	056948	06-Nov-90	SOIL	4	4.5	Arsenic	15 mg/kg	-	12 mg/kg	481705.45	1349575.9
1584	056576	24-Sep-90	SOIL	2	2.5	Benzo(a)pyrene	3400 ug/kg	-	2000 ug/kg	481135.55	1349611.44
11201	121660	12-Jul-93	SOIL	2.5	3	Beryllium	1.9 mg/kg	-	1.5 mg/kg	480527.28	1350433.42
11087	121228	16-Jul-93	SOIL	9	9.5	Beryllium	2.9 mg/kg	J	1.5 mg/kg	481798.48	1349531.74
1577	056939	06-Nov-90	SOIL	4	4.5	Beryllium	2.2 mg/kg	-	1.5 mg/kg	481636.56	1349583.05
1578	056948	06-Nov-90	SOIL	4	4.5	1,1-Dichloroethene	460 ug/kg	J	410 ug/kg	481705.45	1349575.9
1281	018763	28-Jun-89	SOIL	6	6.5	Thorium-228	2.76 pCi/g	-	1.7 pCi/g	481873.41	1350395.3
1607	057234	02-Feb-91	SOIL	5	5.5	Thorium-228	2.04 pCi/g	-	1.7 pCi/g	480333.17	1350167.74
1281	018763	28-Jun-89	SOIL	6	6.5	Thorium-232	2.55 pCi/g	-	1.5 pCi/g	481873.41	1350395.3

* The results reported are for constituents other than uranium that exceed the FRL and are outside of the uranium-driven excavation boundary.

DATA QUALIFIERS:

- No qualification; the positive result or detection limit is confident as reported.
J Positive result is estimated or imprecise; data point is usable for decision-making purposes. Positive results less than the contract required reporting limit area also qualified in this manner.
NV Not Validated. The results for this sample were not validated.

APPENDIX B

DATA QUALITY OBJECTIVES SL-048, REV. 5

Control Number -- 2459

Fernald Environmental Management Project

Data Quality Objectives

Title: Delineating the Extent of Constituents of Concern During Remediation Sampling

Number: SL-048

Revision: 5

Effective Date: February 26, 1999

Contact Name: Eric Kroger

Approval: (signature on file) Date: 2/25/99
James E. Chambers
DQO Coordinator

Approval: (signature on file) Date: 2/26/99
J.D. Chiou
SCEP Project Director

Rev. #	0	1	2	3	4	5	6
Effective Date:	9/19/97	10/3/97	4/15/98	6/17/98	7/14/98	2/26/99	

DATA QUALITY OBJECTIVES
Delineating the Extent of Constituents of Concern During Remediation Sampling

Members of Data Quality Objectives (DQO) Scoping Team
The members of the DQO team include a project lead, a project engineer, a field lead, a statistician, a lead chemist, a sampling supervisor, and a data management lead.

Conceptual Model of the Site
Media is considered contaminated if the concentration of a constituent of concern (COC) exceeds the final remediation levels (FRLs). The extent of specific media contamination was estimated and published in the Operable Unit 5 Feasibility Study (FS). These estimates were based on kriging analysis of available data for media collected during the Remedial Investigation (RI) effort and other FEMP environmental characterization studies. Maps outlining contaminated media boundaries were generated for the Operable Unit 5 FS by overlaying the results of the kriging analysis data with isoconcentration maps of the other constituents of concern (COCs), as presented in the Operable Unit 5 RI report, and further modified by spatial analysis of maps reflecting the most current media characterization data. A sequential remediation plan has been presented that subdivides the FEMP into seven construction areas. During the course of remediation, areas of specific media may require additional characterization so remediation can be carried out as thoroughly and efficiently as possible. As a result, additional sampling may be necessary to accurately delineate a volume of specific media as exceeding a target level, such as the FRL or the Waste Attainment Criterion (WAC). Each individual Project-Specific Plan (PSP) will identify and describe the particular media to be sampled. This DQO covers all physical sampling activities associated with Pre-design Investigations, precertification sampling, WAC attainment sampling or regulatory monitoring that is required during site remediation.

1.0 Statement of Problem

If the extent (depth and/or area) of the media COC contamination is unknown, then it must be defined with respect to the appropriate target level (FRL, WAC, or other specified media concentration).

2.0 Identify the Decision

Delineate the horizontal and/or vertical extent of media COC contamination in an area with respect to the appropriate target level.

3.0 Inputs That Affect the Decision

Informational Inputs - Historical data, process history knowledge, the modeled extent of COC contamination, and the origins of contamination will be required to

establish a sampling plan to delineate the extent of COC contamination. The desired precision of the delineation must be weighed against the cost of collecting and analyzing additional samples in order to determine the optimal sampling density. The project-specific plan will identify the optimal sampling density.

Action Levels - COCs must be delineated with respect to a specific action level, such as FRLs and On-Site Disposal Facility (OSDF) WAC concentrations. Specific media FRLs are established in the OU2 and OU5 RODs, and the WAC concentrations are published in the OU5 ROD. Media COCs may also require delineation with respect to other action levels that act as remediation drivers, such as Benchmark Toxicity Values (BTVs).

4.0 The Boundaries of the Situation

Temporal Boundaries - Sampling must be completed within a time frame sufficient to meet the remediation schedule. Time frames must allow for the scheduling of sampling and analytical activities, the collection of samples, analysis of samples and the processing of analytical data when received.

Scale of Decision Making - The decision made based upon the data collected in this investigation will be the extent of COC contamination at or above the appropriate action level. This delineation will result in media contaminant concentration information being incorporated into engineering design, and the attainment of established remediation goals.

Parameters of Interest - The parameters of interest are the COCs that have been determined to require additional delineation before remediation design can be finalized with the optimal degree of accuracy.

5.0 Decision Rule

If existing data provide an unacceptable level of uncertainty in the COC delineation model, then additional sampling will take place to decrease the model uncertainty. When deciding what additional data is needed, the costs of additional sampling and analysis must be weighed against the benefit of reduced uncertainty in the delineation model, which will eventually be used for assigning excavation, or for other purposes.

6.0 Limits on Decision Errors

In order to be useful, data must be collected with sufficient areal and depth coverage, and at sufficient density to ensure an accurate delineation of COC concentrations. Analytical sensitivity and reproducibility must be sufficient to differentiate the COC concentrations below their respective target levels.

Types of Decision Errors and Consequences

Decision Error 1 - This decision error occurs when the decision maker determines that the extent of media contaminated with COCs above action levels is not as extensive as it actually is. This error can result in a remediation design that fails to incorporate media contaminated with COC(s) above the action level(s). This could result in the re-mobilization of excavation equipment and delays in the remediation schedule. Also, this could result in media contaminated above action levels remaining after remediation is considered complete, posing a potential threat to human health and the environment.

Decision Error 2 - This decision error occurs when the decision maker determines that the extent of media contaminated above COC action levels is more extensive than it actually is. This error could result in more excavation than necessary, and this excess volume of materials being transferred to the OSDF, or an off-site disposal facility if contamination levels exceed the OSDF WAC.

True State of Nature for the Decision Errors - The true state of nature for Decision Error 1 is that the maximum extent of contamination above the FRL is more extensive than was determined. The true state of nature for Decision Error 2 is that the maximum extent of contamination above the FRL is not as extensive as was determined. Decision Error 1 is the more severe error.

7.0 Optimizing Design for Useable Data

7.1 Sample Collection

A sampling and analytical testing program will delineate the extent of COC contamination in a given area with respect to the action level of interest. Existing data, process knowledge, modeled concentration data, and the origins of contamination will be considered when determining the lateral and vertical extent of sample collection. The cost of collecting and analyzing additional samples will be weighed against the benefit of reduced uncertainty in the delineation model. This will determine the sampling density. Individual PSPs will identify the locations and depths to be sampled, the sampling density necessary to obtain the desired accuracy of the delineation, and if samples will be analyzed by the on-site or off-site laboratory. The PSP will also identify the sampling increments to be selectively analyzed for concentrations of the COC(s) of interest, along with field work requirements. Analytical requirements will be listed in the PSP. The chosen analytical methodologies are able to achieve a detection limit capable of resolving the COC action level. Sampling of groundwater monitoring wells may require different purge requirements than those stated in the SCQ (i.e., dry well definitions or small purge volumes). In order to accommodate sampling of wells that go dry prior to completing the purge of the necessary well volume, attempts to sample the

monitoring wells will be made 24 hours after purging the well dry. If, after the 24 hour period, the well does not yield the required volume, the analytes will be collected in the order stated in the applicable PSP until the well goes dry. Any remaining analytes will not be collected. In some instances, after the 24 hour wait the well may not yield any water. For these cases, the well will be considered dry and will not be sampled.

7.2 COC Delineation

The media COC delineation will use all data collected under the PSP, and if deemed appropriate by the Project Lead, may also include existing data obtained from physical samples, and if applicable, information obtained through real-time screening. The delineation may be accomplished through modeling (e.g. kriging) of the COC concentration data with a confidence limit specific to project needs that will reduce the potential for Decision Error 1. A very conservative approach to delineation may also be utilized where the boundaries of the contaminated media are extended to the first known vertical and horizontal sample locations that reveal concentrations below the desired action level.

7.3 QC Considerations

Laboratory work will follow the requirements specified in the SCQ. If analysis is to be carried out by an off-site laboratory, it will be a Fluor Daniel Fernald approved full service laboratory. Laboratory quality control measures include a media prep blank, a laboratory control sample (LCS), matrix duplicates and matrix spike. Typical Field QC samples are not required for ASL B analysis. However the PSPs may specify appropriate field QC samples for the media type with respect to the ASL in accordance with the SCQ, such as field blanks, trip blanks, and container blanks. All field QC samples will be analyzed at the associated field sample ASL. Data will be validated per project requirements, which must meet the requirements specified in the SCQ. Project-specific validation requirements will be listed in the PSP.

Per the Sitewide Excavation Plan, the following ASL and data validation requirements apply to all **soil and soil field QC samples** collected in association with this DQO:

- If samples are analyzed for Pre-design Investigations and/or Precertification, 100% of the data will be analyzed per ASL B requirements. For each laboratory used for a project, 90% of the data will require only a Certificate of Analysis, the other 10% will require the Certificate of Analysis and all associated QA/QC results, and will be validated to ASL B. Per Appendix H of the SEP, the minimum detection level (MDL) for these analyses will be established at approximately 10% of the action level (the action level for precertification is the

FRL; the action level for pre-design investigations can be several different action levels, including the FRL, the WAC, RCRA levels, ALARA levels, etc.). If this MDL is different from the SCQ-specified MDL, the ASL will default to ASL E, though other analytical requirements will remain as specified for ASL B.

- If samples are analyzed for WAC Attainment and/or RCRA Characteristic Areas Delineation, 100% of the data will be analyzed and reported to ASL B with 10% validated. The ASL B package will include a Certificate of Analysis along with all associated QA/QC results. Total uranium analyses using a higher detection limit than is required for ASL B (10 mg/kg) may be appropriate for WAC attainment purposes since the WAC limit for total uranium is 1,030 mg/kg. In this case, an ASL E designation will apply to the analysis and reporting to be performed under the following conditions:

    - all of the ASL B laboratory QA/QC methods and reporting criteria will apply with the exception of the total uranium detection limit

    - the detection limit will be ≤10% of the WAC limit (e.g., ≤103 mg/kg for total uranium).

- If delineation data are also to be used for certification, the data must meet the data quality objectives specified in the Certification DQO (SL-043).

- Validation will include field validation of field packages for ASL B or ASL D data.

All data will undergo an evaluation by the Project Team, including a comparison for consistency with historical data. Deviations from QC considerations resulting from evaluating inputs to the decision from Section 3, must be justified in the PSP such that the objectives of the decision rule in Section 5 are met.

7.4 Independent Assessment

Independent assessment shall be performed by the FEMP QA organization by conducting surveillances. Surveillances will be planned and documented in accordance with Section 12.3 of the SCQ.

7.5 Data Management

Upon receipt from the laboratory, all results will be entered into the SED as qualified data using standard data entry protocol. The required ASL B, D or E data will undergo analytical validation by the FEMP validation team, as required (see Section 7.3). The Project Manager will be responsible to determine data usability as it pertains to supporting the DQO decision of determining delineation of media

COC's.

7.6 Applicable Procedures

Sample collection will be described in the PSP with a listing of applicable procedures. Typical related plans and procedures are the following:

- Sitewide Excavation Plan (SEP)
- Sitewide CERCLA Quality Assurance Project Plan (SCQ).
- SMPL-01, *Solids Sampling*
- SMPL-02, *Liquids and Sludge Sampling*
- SMPL-21, *Collection of Field Quality Control Samples*
- EQT-06, *Geoprobe® Model 5400 Operation and Maintenance*
- EQT-23, *Operation of High Purity Germanium Detectors*
- EQT-30, *Operation of Radiation Tracking Vehicle Sodium Iodide Detection System*

Data Quality Objectives
Delineating the Extent of Constituents of Concern During Remediation Sampling

1A. Task/Description: Delineating the extent of contamination above the FRLs

1.B. Project Phase: (Put an X in the appropriate selection.)

RI ☐ FS ☐ RD ☒ RA ☐ R_vA ☐ OTHER ☐

1.C. DQO No.: SL-048, Rev. 5 DQO Reference No.:_____

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2. Media Characterization: (Put an X in the appropriate selection.)

Air ☐ Biological ☐ Groundwater ☒ Sediment ☒ Soil ☒

Waste ☒ Wastewater ☐ Surface water ☐ Other (specify) _____

---

3. Data Use with Analytical Support Level (A-E): (Put an X in the appropriate Analytical Support Level selection(s) beside each applicable Data Use.)

Site Characterization
A ☐ B ☒ C ☐ D ☒ E ☒

Risk Assessment
A ☐ B ☐ C ☐ D ☐ E ☐

Evaluation of Alternatives
A ☐ B ☐ C ☐ D ☐ E ☐

Engineering Design
A ☐ B ☒ C ☐ D ☒ E ☒

Monitoring during remediation
A ☒ B ☒ C ☐ D ☒ E ☒

Other
A ☐ B ☐ C ☐ D ☐ E ☐

4.A. Drivers: Remedial Action Work Plans, Applicable or Relevant and Appropriate Requirements (ARARs) and the OU2 and/or OU5 Record of Decision (ROD).

4.B. Objective: Delineate the extent of media contaminated with a COC (or COCs) with respect to the action level(s) of interest.

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5. Site Information (Description):

6.A. Data Types with appropriate Analytical Support Level Equipment Selection and SCQ Reference: (Place an "X" to the right of the appropriate box or boxes selecting the type of analysis or analyses required. Then select the type of equipment to perform the analysis if appropriate. Please include a reference to the SCQ Section.)

1.	pH	X *	2.	Uranium	X *	3.	BTX	☐
	Temperature	X *		Full Radiological	X *		TPH	☐
	Specific Conductance	X *		Metals	X *		Oil/Grease	☐
	Dissolved Oxygen	X *		Cyanide	☐			
	Technetium-99	X *		Silica	☐			

4.	Cations	☐	5.	VOA	X *	6.	Other (specify)
	Anions	☐		BNA	X *		
	TOC	☐		Pesticides	X *		
	TCLP	X *		PCB	X *		
	CEC	☐		COD	☐		

*If constituent is identified for delineation in the individual PSP.

6.B. Equipment Selection and SCQ Reference:

	Equipment Selection	Refer to SCQ Section
ASL A		SCQ Section:
ASL B	X	SCQ Section: App. G Tables G-1&G-3
ASL C		SCQ Section:
ASL D	X	SCQ Section: App. G Tables G-1&G-3
ASL E	X (See sect. 7.3, pg. 6)	SCQ Section: App. G Tables G-1&G-3

7.A. Sampling Methods: (Put an X in the appropriate selection.)

Biased X Composite ☐ Environmental X Grab X Grid X

Intrusive X Non-Intrusive ☐ Phased ☐ Source ☐

DQO Number: SL-048, Rev. 5

7.B. Sample Work Plan Reference: This DQO is being written prior to the PSPs.

Background samples: OU5 RI

7.C. Sample Collection Reference:

Sample Collection Reference: SMPL-01, SMPL-02, EQT-06

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8. Quality Control Samples: (Place an "X" in the appropriate selection box.)

8.A. Field Quality Control Samples:

Trip Blanks	X *	Container Blanks	X ++
Field Blanks	X +	Duplicate Samples	X ***
Equipment Rinsate Samples	X ***	Split Samples	X **
Preservative Blanks	☐	Performance Evaluation Samples	☐
Other (specify)			

* For volatile organics only
** Split samples will be collected where required by EPA or OEPA.
*** If specified in PSP.
\+ Collected at the discretion of the Project Manager (if warranted by field conditions)
\+ + One per Area and Phase Area per container type (i.e. stainless steel core liner/plastic core liner/Geoprobe tube).

8.B. Laboratory Quality Control Samples:

Method Blank	X	Matrix Duplicate/Replicate	X
Matrix Spike	X	Surrogate Spikes	☐
Tracer Spike	☐		

Other (specify) Per SCQ

9. Other: Please provide any other germane information that may impact the data quality or gathering of this particular objective, task or data use.

APPENDIX C

TARGET ANALYTE LISTS

APPENDIX C
TARGET ANALYTE LISTS

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TAL 20200-PSP-0005-A

Soil Analysis - ICP/MS		
1	ASL B[a]	Total Uranium
2	ASL B[a]	Total Thorium

TAL 20200-PSP-0005-B

Soil Analysis - ICP/MS or ICP/AES		
3	ASL B	Beryllium[b]

TAL 20200-PSP-0005-C

Soil Analysis - Gas Proportional Count		
1	ASL B	Technetium-99

TAL 20200-PSP-0005-D

Soil Analysis -ICP/MS or ICP/AES		
1	ASL B	Arsenic[c]

TAL 20200-PSP-0005-E

Water Analysis - ICP/MS or KPA		
1	ASL B[a]	Total Uranium

TAL 20200-PSP-0005-F

Soil Analysis - Total Semivolatiles, Off-Site		
1	ASL B	Benzo(a)pyrene

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TAL 20200-PSP-0005-G

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Soil Analysis - Total Pesticide/PCBs, Off-Site		
1	ASL B	Aroclor-1254
2	ASL B	Aroclor-1260

TAL 20200-PSP-0005-H

Soil Analysis - Total Volatiles, Off-Site		
1	ASL B	1,1-Dichloroethene

TAL 20200-PSP-0005-I

Water (trip blank) and Soil (PID hit) Analysis - Total Volatiles, Off-Site		
1	ASL B	Chloromethane
2	ASL B	Bromomethane
3	ASL B	Vinyl Chloride
4	ASL B	Chloroethane
5	ASL B	Methylene Chloride
6	ASL B	Acetone
7	ASL B	Carbon Disulfide
8	ASL B	1,1-Dichloroethene
9	ASL B	1,1-Dichloroethane
10	ASL B	Cis-1,2-Dichlorothene
11	ASL B	Trans-1,2-Dichloroethene
12	ASL B	Chloroform
13	ASL B	1,2-Dichloroethane
14	ASL B	2-Butanone
15	ASL B	1,1,1-Trichloroethane
16	ASL B	Carbon Tetrachloride
17	ASL B	Bromodichloromethane

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TAL 20200-PSP-0005-I
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Water (trip blank) and Soil (PID hit) Analysis - Total Volatiles, Off-Site		
18	ASL B	1,2-Dichloropropane
19	ASL B	Cis-1,3-Dichloropropene
20	ASL B	Trichloroethene
21	ASL B	Dibromochloromethane
22	ASL B	1,1,2-Trichloroethene
23	ASL B	Benzene
24	ASL B	Trans-1,3-Dichloropropene
25	ASL B	Bromoform
26	ASL B	4-Methyl-2-pentanone
27	ASL B	2-Hexanone
28	ASL B	Tetrachloroethene
29	ASL B	1,1,2,2-Tetrachloroethene
30	ASL B	Toluene
31	ASL B	Chlorobenzene
32	ASL B	Ethylbenzene
33	ASL B	Styrene
34	ASL B	Xylenes (total)

[a] Ten percent of the soil uranium/thorium and water total uranium samples collected in the high-leachability areas will be analyzed at ASL D.
[b] If beryllium analysis is by ICP/MS, results for total uranium and total thorium will also be reported.
[c] If arsenic analysis is by ICP/MS, results for total uranium and total thorium will also be reported.

APPENDIX D

SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

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Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
High Leachability Borings						
12472	481894.7	1349792.9	0'-1'	12472-1-R	TAL A	Total U, Total Th
			3'-4'	12472-4-R	TAL A	Total U, Total Th
			5'-6'	12472-6-R	TAL A	Total U, Total Th
12473	481841.8	1350037.3	0'-1'	12473-1-R	TAL A	Total U, Total Th
			3'-4'	12473-4-R	TAL A	Total U, Total Th
			6'-7'	12473-7-R	TAL A	Total U, Total Th
			9'-10'	12473-10-R	TAL A	Total U, Total Th
			11'-12'	12473-12-R	TAL A	Total U, Total Th
12474	481764.5	1349748.0	0'-1'	12474-1-R	TAL A	Total U, Total Th
			3'-4'	12474-4-R	TAL A	Total U, Total Th
			6'-7'	12474-7-R	TAL A	Total U, Total Th
			8'-9'	12474-9-R	TAL A	Total U, Total Th
12475	481667.9	1349551.5	0'-1'	12475-1-R	TAL A	Total U, Total Th
			3'-4'	12475-4-R	TAL A	Total U, Total Th
			5'-6'	12475-6-R	TAL A	Total U, Total Th
12476	481667.9	1349653.6	1'-2'	12476-2-R	TAL A	Total U, Total Th
			4'-5'	12476-5-R	TAL A	Total U, Total Th
			7'-8'	12476-8-R	TAL A	Total U, Total Th
			9'-10'	12476-10-R	TAL A	Total U, Total Th
12477	481667.9	1349749.1	2'-3'	12477-3-R	TAL A	Total U, Total Th
			5'-6'	12477-6-R	TAL A	Total U, Total Th
			8'-9'	12477-9-R	TAL A	Total U, Total Th
12478	481694.2	1349792.9	1'-2'	12478-2-R	TAL A	Total U, Total Th
			4'-5'	12478-5-R	TAL A	Total U, Total Th
			6'-7'	12478-7-R	TAL A	Total U, Total Th
			8'-9'	12478-9-R	TAL A	Total U, Total Th
12479	481146.0	1349913.8	11'-12'	12479-12-R	TAL A	Total U, Total Th
			13'-14'	12479-14-R	TAL A	Total U, Total Th
			15'-16'	12479-16-R	TAL A	Total U, Total Th
12480	481146.0	1350270.0	0'-1'	12480-1-R	TAL A	Total U, Total Th
			3'-4'	12480-4-R	TAL A	Total U, Total Th
			6'-7'	12480-7-R	TAL A	Total U, Total Th
			9'-10'	12480-10-R	TAL A	Total U, Total Th
			11'-12'	12480-12-R	TAL A	Total U, Total Th
12481	481046.0	1349913.8	8'-9'	12481-9-R	TAL A	Total U, Total Th
			11'-12'	12481-12-R	TAL A	Total U, Total Th
12482	481046.0	1350113.8	7'-8'	12482-8-R	TAL A	Total U, Total Th
			9'-10'	12482-10-R	TAL A	Total U, Total Th
			11'-12'	12482-12-R	TAL A	Total U, Total Th
12483	481000.0	1350170.0	7'-8'	12483-8-R	TAL A	Total U, Total Th
			9'-10'	12483-10-R	TAL A	Total U, Total Th
			11'-12'	12483-12-R	TAL A	Total U, Total Th
12484	481046.0	1350513.8	0'-1'	12484-1-R	TAL A	Total U, Total Th
			3'-4'	12484-4-R	TAL A	Total U, Total Th
			6'-7'	12484-7-R	TAL A	Total U, Total Th
			9'-10'	12484-10-R	TAL A	Total U, Total Th
			11'-12'	12484-12-R	TAL A	Total U, Total Th

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APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
12485	480846.0	1350013.8	17'-18'	12485-18-R	TAL A	Total U, Total Th
			19'-20'	12485-20-R	TAL A	Total U, Total Th
			21'-22'	12485-22-R	TAL A	Total U, Total Th
12486	480846.0	1350113.8	17'-18'	12486-18-R	TAL A	Total U, Total Th
			19'-20'	12486-20-R	TAL A	Total U, Total Th
			21'-22'	12486-22-R	TAL A	Total U, Total Th
12487	480743.7	1349670.4	1'-2'	12487-2-R	TAL A	Total U, Total Th
			4'-5'	12487-5-R	TAL A	Total U, Total Th
12488	480743.7	1349770.4	0'-1'	12488-1-R	TAL A	Total U, Total Th
			2'-3'	12488-3-R	TAL A	Total U, Total Th
			4'-5'	12488-5-R	TAL A	Total U, Total Th
12489	480743.7	1350070.4	5'-6'	12489-6-R	TAL A	Total U, Total Th
			13'-14'	12489-14-R	TAL A	Total U, Total Th
			16'-17'	12489-17-R	TAL A	Total U, Total Th
			19'-20'	12489-20-R	TAL A	Total U, Total Th
12490	480743.7	1350170.4	6'-7'	12490-7-R	TAL A	Total U, Total Th
			13'-14'	12490-14-R	TAL A	Total U, Total Th
			16'-17'	12490-17-R	TAL A	Total U, Total Th
			19'-20'	12490-20-R	TAL A	Total U, Total Th
12491	480643.7	1349570.4	0'-1'	12491-1-R	TAL A	Total U, Total Th
			3'-4'	12491-4-R	TAL A	Total U, Total Th
12492	480643.7	1349670.4	1'-2'	12492-2-R	TAL A	Total U, Total Th
			4'-5'	12492-5-R	TAL A	Total U, Total Th
12493	480630.0	1349870.4	1'-2'	12493-2-R	TAL A	Total U, Total Th
			4'-5'	12493-5-R	TAL A	Total U, Total Th
			7'-8'	12493-8-R	TAL A	Total U, Total Th
12494	480643.7	1349952.5	24'-25'	12494-25-R	TAL A	Total U, Total Th
			27'-28'	12494-28-R	TAL A	Total U, Total Th
12495	480643.7	1350270.4	1'-2'	12495-2-R	TAL A	Total U, Total Th
			4'-5'	12495-5-R	TAL A	Total U, Total Th
			7'-8'	12495-8-R	TAL A	Total U, Total Th
			10'-11'	12495-11-R	TAL A	Total U, Total Th
			13'-14'	12495-14-R	TAL A	Total U, Total Th
			16'-17'	12495-17-R	TAL A	Total U, Total Th
			19'-20'	12495-20-R	TAL A	Total U, Total Th
12496	480643.7	1350470.4	0'-1'	12496-1-R	TAL A	Total U, Total Th
			3'-4'	12496-4-R	TAL A	Total U, Total Th
			6'-7'	12496-7-R	TAL A	Total U, Total Th
			9'-10'	12496-10-R	TAL A	Total U, Total Th
			11'-12'	12496-12-R	TAL A	Total U, Total Th
12497	480543.7	1349870.4	0'-1'	12497-1-R	TAL A	Total U, Total Th
			3'-4'	12497-4-R	TAL A	Total U, Total Th
			6'-7'	12497-7-R	TAL A	Total U, Total Th
			9'-10'	12497-10-R	TAL A	Total U, Total Th
			14'-15'	12497-15-R	TAL A	Total U, Total Th
			17'-18'	12497-18-R	TAL A	Total U, Total Th
			19'-20'	12497-20-R	TAL A	Total U, Total Th

APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

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Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
12498	480543.7	1349970.4	24'-25'	12498-25-R	TAL A	Total U, Total Th
			27'-28'	12498-28-R	TAL A	Total U, Total Th
12499	480543.7	1350270.4	1'-2'	12499-2-R	TAL A	Total U, Total Th
			4'-5'	12499-5-R	TAL A	Total U, Total Th
			7'-8'	12499-8-R	TAL A	Total U, Total Th
			10'-11'	12499-11-R	TAL A	Total U, Total Th
			13'-14'	12499-14-R	TAL A	Total U, Total Th
			16'-17'	12499-17-R	TAL A	Total U, Total Th
			19'-20'	12499-20-R	TAL A	Total U, Total Th
12500	480443.7	1349870.4	0'-1'	12500-1-R	TAL A	Total U, Total Th
			3'-4'	12500-4-R	TAL A	Total U, Total Th
			6'-7'	12500-7-R	TAL A	Total U, Total Th
			8'-9'	12500-9-R	TAL A	Total U, Total Th
12501	480443.7	1349970.4	24'-25'	12501-25-R	TAL A	Total U, Total Th
			27'-28'	12501-28-R	TAL A	Total U, Total Th
12502	480321.3	1349870.4	1'-2'	12502-2-R	TAL A	Total U, Total Th
			4'-5'	12502-5-R	TAL A	Total U, Total Th
			7'-8'	12502-8-R	TAL A	Total U, Total Th
12503	480343.7	1349970.4	24'-25'	12503-25-R	TAL A	Total U, Total Th
			27'-28'	12503-28-R	TAL A	Total U, Total Th
12504	480343.7	1350370.4	2'-3'	12504-3-R	TAL A	Total U, Total Th
			4'-5'	12504-5-R	TAL A	Total U, Total Th
			6'-7'	12504-7-R	TAL A	Total U, Total Th
Above-WAC Borings						
12505	480882.95	1350198.43	0'-0.5'	12505-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12505-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12505-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12505-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.0'-4.5'	12505-9-R	TAL A, C	Total U, Total Th, Tc-99
			5.0'-5.5'	12505-11-R	TAL A, C	Total U, Total Th, Tc-99
			6.0'-6.5'	12505-13-R	TAL A, C	Total U, Total Th, Tc-99
			7.0'-7.5'	12505-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12505-17-R	TAL A	Total U, Total Th
			9.5'-10.0'	12505-20-R	TAL A	Total U, Total Th
12506	480871.25	1350184.51	0'-0.5'	12506-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12506-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12506-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12506-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.0'-4.5'	12506-9-R	TAL A, C	Total U, Total Th, Tc-99
			5.0'-5.5'	12506-11-R	TAL A, C	Total U, Total Th, Tc-99
			6.0'-6.5'	12506-13-R	TAL A, C	Total U, Total Th, Tc-99
			7.0'-7.5'	12506-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12506-17-R	TAL A	Total U, Total Th
			9.5'-10.0'	12506-20-R	TAL A	Total U, Total Th

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APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

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Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
12507	480870.85	1350201.48	0'-0.5'	12507-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12507-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12507-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12507-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.0'-4.5'	12507-9-R	TAL A, C	Total U, Total Th, Tc-99
			5.0'-5.5'	12507-11-R	TAL A, C	Total U, Total Th, Tc-99
			6.0'-6.5'	12507-13-R	TAL A, C	Total U, Total Th, Tc-99
			7.0'-7.5'	12507-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12507-17-R	TAL A	Total U, Total Th
			9.5'-10.0'	12507-20-R	TAL A	Total U, Total Th
12508	480870.25	1350211.13	0'-0.5'	12508-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12508-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12508-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12508-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.0'-4.5'	12508-9-R	TAL A, C	Total U, Total Th, Tc-99
			5.0'-5.5'	12508-11-R	TAL A, C	Total U, Total Th, Tc-99
			6.0'-6.5'	12508-13-R	TAL A, C	Total U, Total Th, Tc-99
			7.0'-7.5'	12508-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12508-17-R	TAL A	Total U, Total Th
			9.5'-10.0'	12508-20-R	TAL A	Total U, Total Th
12509	480850.08	1350199.23	0'-0.5'	12509-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12509-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12509-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12509-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.0'-4.5'	12509-9-R	TAL A, C	Total U, Total Th, Tc-99
			5.0'-5.5'	12509-11-R	TAL A, C	Total U, Total Th, Tc-99
			6.0'-6.5'	12509-13-R	TAL A, C	Total U, Total Th, Tc-99
			7.0'-7.5'	12509-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12509-17-R	TAL A	Total U, Total Th
			9.5'-10.0'	12509-20-R	TAL A	Total U, Total Th
12510	480820.84	1350209.92	0'-0.5'	12510-1-R	TAL A	Total U, Total Th
			1.0'-1.5'	12510-3-R	TAL A	Total U, Total Th
			2.0'-2.5'	12510-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12510-7-R	TAL A	Total U, Total Th
			4.5'-5.0'	12510-10-R	TAL A	Total U, Total Th
12511	480812.77	1350201.86	0'-0.5'	12511-1-R	TAL A	Total U, Total Th
			1.0'-1.5'	12511-3-R	TAL A	Total U, Total Th
			2.0'-2.5'	12511-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12511-7-R	TAL A	Total U, Total Th
			4.5'-5.0'	12511-10-R	TAL A	Total U, Total Th
12512	480803.90	1350208.91	0'-0.5'	12512-1-R	TAL A	Total U, Total Th
			1.0'-1.5'	12512-3-R	TAL A	Total U, Total Th
			2.0'-2.5'	12512-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12512-7-R	TAL A	Total U, Total Th
			4.5'-5.0'	12512-10-R	TAL A	Total U, Total Th

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APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

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Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
12513	480811.76	1350217.79	0'-0.5'	12513-1-R	TAL A	Total U, Total Th
			1.0'-1.5'	12513-3-R	TAL A	Total U, Total Th
			2.0'-2.5'	12513-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12513-7-R	TAL A	Total U, Total Th
			4.5'-5.0'	12513-10-R	TAL A	Total U, Total Th
12514	480646.42	1350169.68	0'-0.5'	12514-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12514-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12514-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12514-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.0'-4.5'	12514-9-R	TAL A, C	Total U, Total Th, Tc-99
			5.0'-5.5'	12514-11-R	TAL A, C	Total U, Total Th, Tc-99
			6.0'-6.5'	12514-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12514-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12514-17-R	TAL A	Total U, Total Th
12515	480629.33	1350151.56	0'-0.5'	12515-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12515-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12515-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12515-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.0'-4.5'	12515-9-R	TAL A, C	Total U, Total Th, Tc-99
			5.0'-5.5'	12515-11-R	TAL A, C	Total U, Total Th, Tc-99
			6.0'-6.5'	12515-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12515-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12515-17-R	TAL A	Total U, Total Th
12516	480627.25	1350189.36	0'-0.5'	12516-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12516-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12516-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12516-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.0'-4.5'	12516-9-R	TAL A, C	Total U, Total Th, Tc-99
			5.0'-5.5'	12516-11-R	TAL A, C	Total U, Total Th, Tc-99
			6.0'-6.5'	12516-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12516-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12516-17-R	TAL A	Total U, Total Th
12517	480628.61	1350165.32	0'-0.5'	12517-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12517-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12517-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12517-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.0'-4.5'	12517-9-R	TAL A, C	Total U, Total Th, Tc-99
			5.0'-5.5'	12517-11-R	TAL A, C	Total U, Total Th, Tc-99
			6.0'-6.5'	12517-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12517-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12517-17-R	TAL A	Total U, Total Th

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APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
12518	480612.75	1350169.68	0'-0.5'	12518-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12518-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12518-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12518-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.0'-4.5'	12518-9-R	TAL A, C	Total U, Total Th, Tc-99
			5.0'-5.5'	12518-11-R	TAL A, C	Total U, Total Th, Tc-99
			6.0'-6.5'	12518-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12518-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12518-17-R	TAL A	Total U, Total Th
12519	480535.04	1350100.30	0'-0.5'	12519-1-R	TAL A	Total U, Total Th
			1.0'-1.5'	12519-3-R	TAL A	Total U, Total Th
			2.0'-2.5'	12519-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12519-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12519-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12519-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12519-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12519-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12519-17-R	TAL A	Total U, Total Th
12520	480518.46	1350094.61	0'-0.5'	12520-1-R	TAL A	Total U, Total Th
			1.0'-1.5'	12520-3-R	TAL A	Total U, Total Th
			2.0'-2.5'	12520-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12520-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12520-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12520-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12520-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12520-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12520-17-R	TAL A	Total U, Total Th
12521	480517.42	1350111.69	0'-0.5'	12521-1-R	TAL A	Total U, Total Th
			1.0'-1.5'	12521-3-R	TAL A	Total U, Total Th
			2.0'-2.5'	12521-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12521-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12521-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12521-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12521-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12521-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12521-17-R	TAL A	Total U, Total Th
12522	480489.45	1350188.84	0'-0.5'	12522-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12522-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12522-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12522-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.5'-5.0'	12522-10-R	TAL A, C	Total U, Total Th, Tc-99
12523	480489.45	1350212.66	0'-0.5'	12523-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12523-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12523-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12523-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.5'-5.0'	12523-10-R	TAL A, C	Total U, Total Th, Tc-99

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APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

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Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
12524	480477.01	1350177.97	0'-0.5'	12524-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12524-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12524-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12524-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.5'-5.0'	12524-10-R	TAL A, C	Total U, Total Th, Tc-99
12525	480478.77	1350195.71	0'-0.5'	12525-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12525-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12525-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12525-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.5'-5.0'	12525-10-R	TAL A, C	Total U, Total Th, Tc-99
12526	480479.60	1350227.15	0'-0.5'	12526-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12526-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12526-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12526-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.5'-5.0'	12526-10-R	TAL A, C	Total U, Total Th, Tc-99
12527	480465.10	1350190.40	0'-0.5'	12527-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12527-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12527-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12527-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.5'-5.0'	12527-10-R	TAL A, C	Total U, Total Th, Tc-99
12528	480464.06	1350214.21	0'-0.5'	12528-1-R	TAL A, C	Total U, Total Th, Tc-99
			1.0'-1.5'	12528-3-R	TAL A, C	Total U, Total Th, Tc-99
			2.0'-2.5'	12528-5-R	TAL A, C	Total U, Total Th, Tc-99
			3.0'-3.5'	12528-7-R	TAL A, C	Total U, Total Th, Tc-99
			4.5'-5.0'	12528-10-R	TAL A, C	Total U, Total Th, Tc-99
12529	480120.00	1350206.82	0'-0.5'	12529-1-R	TAL A	Total U, Total Th
			1.0'-1.5'	12529-3-R	TAL A	Total U, Total Th
			2.0'-2.5'	12529-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12529-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12529-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12529-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12529-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12529-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12529-17-R	TAL A	Total U, Total Th
			9.0'-9.5'	12529-19-R	TAL A	Total U, Total Th
			10.0'-10.5'	12529-21-R	TAL A	Total U, Total Th
			11.5'-12.0'	12529-24-R	TAL A	Total U, Total Th

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APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

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Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
12530	480108.31	1350206.31	0'-0.5'	12530-1-R	TAL A	Total U, Total Th
			1.0'-1.5'	12530-3-R	TAL A	Total U, Total Th
			2.0'-2.5'	12530-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12530-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12530-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12530-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12530-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12530-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12530-17-R	TAL A	Total U, Total Th
			9.0'-9.5'	12530-19-R	TAL A	Total U, Total Th
			10.0'-10.5'	12530-21-R	TAL A	Total U, Total Th
			11.5'-12.0'	12530-24-R	TAL A	Total U, Total Th
Above-FRL Borings						
12531	481873.41	1350395.30	2.0'-2.5'	12531-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12531-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12531-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12531-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12531-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12531-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12531-17-R	TAL A	Total U, Total Th
			9.0'-9.5'	12531-19-R	TAL A	Total U, Total Th
12532	481879.41	1350395.30	2.0'-2.5'	12532-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12532-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12532-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12532-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12532-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12532-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12532-17-R	TAL A	Total U, Total Th
			9.0'-9.5'	12532-19-R	TAL A	Total U, Total Th
12533	481867.41	1350395.30	2.0'-2.5'	12533-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12533-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12533-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12533-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12533-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12533-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12533-17-R	TAL A	Total U, Total Th
			9.0'-9.5'	12533-19-R	TAL A	Total U, Total Th
12534	481873.41	1350389.30	2.0'-2.5'	12534-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12534-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12534-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12534-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12534-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12534-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12534-17-R	TAL A	Total U, Total Th
			9.0'-9.5'	12534-19-R	TAL A	Total U, Total Th

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APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

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Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
12535	481873.41	1350401.30	2.0'-2.5'	12535-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12535-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12535-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12535-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12535-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12535-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12535-17-R	TAL A	Total U, Total Th
			9.0'-9.5'	12535-19-R	TAL A	Total U, Total Th
12536	481798.48	1349531.74	1.0'-1.5'	12536-3-M	TAL B	Beryllium
			2.0'-2.5'	12536-5-M	TAL B	Beryllium
			3.0'-3.5'	12536-7-M	TAL B	Beryllium
			4.0'-4.5'	12536-9-M	TAL B	Beryllium
			5.0'-5.5'	12536-11-M	TAL B	Beryllium
			6.0'-6.5'	12536-13-M	TAL B	Beryllium
			7.0'-7.5'	12536-15-M	TAL B	Beryllium
			8.0'-8.5'	12536-17-M	TAL B	Beryllium
			9.0'-9.5'	12536-19-M	TAL B	Beryllium
			10.0'-10.5'	12536-21-M	TAL B	Beryllium
			11.0'-11.5'	12536-23-M	TAL B	Beryllium
			12.0'-12.5'	12536-25-M	TAL B	Beryllium
12537	481804.48	1349531.74	1.0'-1.5'	12537-3-M	TAL B	Beryllium
			2.0'-2.5'	12537-5-M	TAL B	Beryllium
			3.0'-3.5'	12537-7-M	TAL B	Beryllium
			4.0'-4.5'	12537-9-M	TAL B	Beryllium
			5.0'-5.5'	12537-11-M	TAL B	Beryllium
			6.0'-6.5'	12537-13-M	TAL B	Beryllium
			7.0'-7.5'	12537-15-M	TAL B	Beryllium
			8.0'-8.5'	12537-17-M	TAL B	Beryllium
			9.0'-9.5'	12537-19-M	TAL B	Beryllium
			10.0'-10.5'	12537-21-M	TAL B	Beryllium
			11.0'-11.5'	12537-23-M	TAL B	Beryllium
			12.0'-12.5'	12537-25-M	TAL B	Beryllium
12538	481792.48	1349531.74	1.0'-1.5'	12538-3-M	TAL B	Beryllium
			2.0'-2.5'	12538-5-M	TAL B	Beryllium
			3.0'-3.5'	12538-7-M	TAL B	Beryllium
			4.0'-4.5'	12538-9-M	TAL B	Beryllium
			5.0'-5.5'	12538-11-M	TAL B	Beryllium
			6.0'-6.5'	12538-13-M	TAL B	Beryllium
			7.0'-7.5'	12538-15-M	TAL B	Beryllium
			8.0'-8.5'	12538-17-M	TAL B	Beryllium
			9.0'-9.5'	12538-19-M	TAL B	Beryllium
			10.0'-10.5'	12538-21-M	TAL B	Beryllium
			11.0'-11.5'	12538-23-M	TAL B	Beryllium
			12.0'-12.5'	12538-25-M	TAL B	Beryllium

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APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION -- 2459

Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
12539	481798.48	1349525.74	1.0'-1.5'	12539-3-M	TAL B	Beryllium
			2.0'-2.5'	12539-5-M	TAL B	Beryllium
			3.0'-3.5'	12539-7-M	TAL B	Beryllium
			4.0'-4.5'	12539-9-M	TAL B	Beryllium
			5.0'-5.5'	12539-11-M	TAL B	Beryllium
			6.0'-6.5'	12539-13-M	TAL B	Beryllium
			7.0'-7.5'	12539-15-M	TAL B	Beryllium
			8.0'-8.5'	12539-17-M	TAL B	Beryllium
			9.0'-9.5'	12539-19-M	TAL B	Beryllium
			10.0'-10.5'	12539-21-M	TAL B	Beryllium
			11.0'-11.5'	12539-23-M	TAL B	Beryllium
			12.0'-12.5'	12539-25-M	TAL B	Beryllium
12540	481798.48	1349537.74	1.0'-1.5'	12540-3-M	TAL B	Beryllium
			2.0'-2.5'	12540-5-M	TAL B	Beryllium
			3.0'-3.5'	12540-7-M	TAL B	Beryllium
			4.0'-4.5'	12540-9-M	TAL B	Beryllium
			5.0'-5.5'	12540-11-M	TAL B	Beryllium
			6.0'-6.5'	12540-13-M	TAL B	Beryllium
			7.0'-7.5'	12540-15-M	TAL B	Beryllium
			8.0'-8.5'	12540-17-M	TAL B	Beryllium
			9.0'-9.5'	12540-19-M	TAL B	Beryllium
			10.0'-10.5'	12540-21-M	TAL B	Beryllium
			11.0'-11.5'	12540-23-M	TAL B	Beryllium
			12.0'-12.5'	12540-25-M	TAL B	Beryllium
12541	481705.45	1349575.90	0.5'-1.0'	12541-2-AB	N/A	Gross alpha/beta
			3.0'-3.5'	12541-7-L	TAL H	1,1-Dichlorethene
				12541-7-P	TAL G	Aroclor-1254, Aroclor-1260
				12541-7-M	TAL D	Arsenic
			4.0'-4.5'	12541-9-L	TAL H	1,1-Dichlorethene
				12541-9-P	TAL G	Aroclor-1254, Aroclor-1260
				12541-9-M	TAL D	Arsenic
			5.0'-5.5'	12541-11-L	TAL H	1,1-Dichlorethene
				12541-11-P	TAL G	Aroclor-1254, Aroclor-1260
				12541-11-M	TAL D	Arsenic
			6.0'-6.5'	12541-13-L	TAL H	1,1-Dichlorethene
				12541-13-P	TAL G	Aroclor-1254, Aroclor-1260
				12541-13-M	TAL D	Arsenic
			7.0'-7.5'	12541-15-L	TAL H	1,1-Dichlorethene
				12541-15-P	TAL G	Aroclor-1254, Aroclor-1260
				12541-15-M	TAL D	Arsenic

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APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

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Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
12542	481711.45	1349575.90	0.5'-1.0'	12542-2-AB	N/A	Gross alpha/beta
			3.0'-3.5'	12542-7-L	TAL H	1,1-Dichlorethene
				12542-7-P	TAL G	Aroclor-1254, Aroclor-1260
				12542-7-M	TAL D	Arsenic
			4.0'-4.5'	12542-9-L	TAL H	1,1-Dichlorethene
				12542-9-P	TAL G	Aroclor-1254, Aroclor-1260
				12542-9-M	TAL D	Arsenic
			5.0'-5.5'	12542-11-L	TAL H	1,1-Dichlorethene
				12542-11-P	TAL G	Aroclor-1254, Aroclor-1260
				12542-11-M	TAL D	Arsenic
			6.0'-6.5'	12542-13-L	TAL H	1,1-Dichlorethene
				12542-13-P	TAL G	Aroclor-1254, Aroclor-1260
				12542-13-M	TAL D	Arsenic
			7.0'-7.5'	12542-15-L	TAL H	1,1-Dichlorethene
				12542-15-P	TAL G	Aroclor-1254, Aroclor-1260
				12542-15-M	TAL D	Arsenic
12543	481699.45	1349575.90	0.5'-1.0'	12543-2-AB	N/A	Gross alpha/beta
			3.0'-3.5'	12543-7-L	TAL H	1,1-Dichlorethene
				12543-7-P	TAL G	Aroclor-1254, Aroclor-1260
				12543-7-M	TAL D	Arsenic
			4.0'-4.5'	12543-9-L	TAL H	1,1-Dichlorethene
				12543-9-P	TAL G	Aroclor-1254, Aroclor-1260
				12543-9-M	TAL D	Arsenic
			5.0'-5.5'	12543-11-L	TAL H	1,1-Dichlorethene
				12543-11-P	TAL G	Aroclor-1254, Aroclor-1260
				12543-11-M	TAL D	Arsenic
			6.0'-6.5'	12543-13-L	TAL H	1,1-Dichlorethene
				12543-13-P	TAL G	Aroclor-1254, Aroclor-1260
				12543-13-M	TAL D	Arsenic
			7.0'-7.5'	12543-15-L	TAL H	1,1-Dichlorethene
				12543-15-P	TAL G	Aroclor-1254, Aroclor-1260
				12543-15-M	TAL D	Arsenic
12544	481705.45	1349569.90	0.5'-1.0'	12544-2-AB	N/A	Gross alpha/beta
			3.0'-3.5'	12544-7-L	TAL H	1,1-Dichlorethene
				12544-7-P	TAL G	Aroclor-1254, Aroclor-1260
				12544-7-M	TAL D	Arsenic
			4.0'-4.5'	12544-9-L	TAL H	1,1-Dichlorethene
				12544-9-P	TAL G	Aroclor-1254, Aroclor-1260
				12544-9-M	TAL D	Arsenic
			5.0'-5.5'	12544-11-L	TAL H	1,1-Dichlorethene
				12544-11-P	TAL G	Aroclor-1254, Aroclor-1260
				12544-11-M	TAL D	Arsenic
			6.0'-6.5'	12544-13-L	TAL H	1,1-Dichlorethene
				12544-13-P	TAL G	Aroclor-1254, Aroclor-1260
				12544-13-M	TAL D	Arsenic
			7.0'-7.5'	12544-15-L	TAL H	1,1-Dichlorethene
				12544-15-P	TAL G	Aroclor-1254, Aroclor-1260
				12544-15-M	TAL D	Arsenic

APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

2459

Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
12545	481705.45	1349581.90	0.5'-1.0'	12545-2-AB	N/A	Gross alpha/beta
			3.0'-3.5'	12545-7-L	TAL H	1,1-Dichlorethene
				12545-7-P	TAL G	Aroclor-1254, Aroclor-1260
				12545-7-M	TAL D	Arsenic
			4.0'-4.5'	12545-9-L	TAL H	1,1-Dichlorethene
				12545-9-P	TAL G	Aroclor-1254, Aroclor-1260
				12545-9-M	TAL D	Arsenic
			5.0'-5.5'	12545-11-L	TAL H	1,1-Dichlorethene
				12545-11-P	TAL G	Aroclor-1254, Aroclor-1260
				12545-11-M	TAL D	Arsenic
			6.0'-6.5'	12545-13-L	TAL H	1,1-Dichlorethene
				12545-13-P	TAL G	Aroclor-1254, Aroclor-1260
				12545-13-M	TAL D	Arsenic
			7.0'-7.5'	12545-15-L	TAL H	1,1-Dichlorethene
				12545-15-P	TAL G	Aroclor-1254, Aroclor-1260
				12545-15-M	TAL D	Arsenic
12546	481636.56	1349583.05	3.0'-3.5'	12546-7-M	TAL B	Beryllium
			4.0'-4.5'	12546-9-M	TAL B	Beryllium
			5.0'-5.5'	12546-11-M	TAL B	Beryllium
			6.0'-6.5'	12546-13-M	TAL B	Beryllium
			7.0'-7.5'	12546-15-M	TAL B	Beryllium
12547	481642.56	1349583.05	3.0'-3.5'	12547-7-M	TAL B	Beryllium
			4.0'-4.5'	12547-9-M	TAL B	Beryllium
			5.0'-5.5'	12547-11-M	TAL B	Beryllium
			6.0'-6.5'	12547-13-M	TAL B	Beryllium
			7.0'-7.5'	12547-15-M	TAL B	Beryllium
12548	481630.56	1349583.05	3.0'-3.5'	12548-7-M	TAL B	Beryllium
			4.0'-4.5'	12548-9-M	TAL B	Beryllium
			5.0'-5.5'	12548-11-M	TAL B	Beryllium
			6.0'-6.5'	12548-13-M	TAL B	Beryllium
			7.0'-7.5'	12548-15-M	TAL B	Beryllium
12549	481636.56	1349577.05	3.0'-3.5'	12549-7-M	TAL B	Beryllium
			4.0'-4.5'	12549-9-M	TAL B	Beryllium
			5.0'-5.5'	12549-11-M	TAL B	Beryllium
			6.0'-6.5'	12549-13-M	TAL B	Beryllium
			7.0'-7.5'	12549-15-M	TAL B	Beryllium
12550	481636.56	1349589.05	3.0'-3.5'	12550-7-M	TAL B	Beryllium
			4.0'-4.5'	12550-9-M	TAL B	Beryllium
			5.0'-5.5'	12550-11-M	TAL B	Beryllium
			6.0'-6.5'	12550-13-M	TAL B	Beryllium
			7.0'-7.5'	12550-15-M	TAL B	Beryllium
12551	481135.55	1349611.44	0.5'-1.0'	12551-2-AB	N/A	Gross alpha/beta
			1.0'-1.5'	12551-3-S	TAL F	Benzo(a)pyrene
			2.0'-2.5'	12551-5-S	TAL F	Benzo(a)pyrene
			3.0'-3.5'	12551-7-S	TAL F	Benzo(a)pyrene
			4.0'-4.5'	12551-9-S	TAL F	Benzo(a)pyrene
			5.0'-5.5'	12551-11-S	TAL F	Benzo(a)pyrene

APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

-- 2459

Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
12552	481141.55	1349611.44	0.5'-1.0'	12552-2-AB	N/A	Gross alpha/beta
			1.0'-1.5'	12552-3-S	TAL F	Benzo(a)pyrene
			2.0'-2.5'	12552-5-S	TAL F	Benzo(a)pyrene
			3.0'-3.5'	12552-7-S	TAL F	Benzo(a)pyrene
			4.0'-4.5'	12552-9-S	TAL F	Benzo(a)pyrene
			5.0'-5.5'	12552-11-S	TAL F	Benzo(a)pyrene
12553	481129.55	1349611.44	0.5'-1.0'	12553-2-AB	N/A	Gross alpha/beta
			1.0'-1.5'	12553-3-S	TAL F	Benzo(a)pyrene
			2.0'-2.5'	12553-5-S	TAL F	Benzo(a)pyrene
			3.0'-3.5'	12553-7-S	TAL F	Benzo(a)pyrene
			4.0'-4.5'	12553-9-S	TAL F	Benzo(a)pyrene
			5.0'-5.5'	12553-11-S	TAL F	Benzo(a)pyrene
12554	481135.55	1349605.44	0.5'-1.0'	12554-2-AB	N/A	Gross alpha/beta
			1.0'-1.5'	12554-3-S	TAL F	Benzo(a)pyrene
			2.0'-2.5'	12554-5-S	TAL F	Benzo(a)pyrene
			3.0'-3.5'	12554-7-S	TAL F	Benzo(a)pyrene
			4.0'-4.5'	12554-9-S	TAL F	Benzo(a)pyrene
			5.0'-5.5'	12554-11-S	TAL F	Benzo(a)pyrene
12555	481135.55	1349617.44	0.5'-1.0'	12555-2-AB	N/A	Gross alpha/beta
			1.0'-1.5'	12555-3-S	TAL F	Benzo(a)pyrene
			2.0'-2.5'	12555-5-S	TAL F	Benzo(a)pyrene
			3.0'-3.5'	12555-7-S	TAL F	Benzo(a)pyrene
			4.0'-4.5'	12555-9-S	TAL F	Benzo(a)pyrene
			5.0'-5.5'	12555-11-S	TAL F	Benzo(a)pyrene
12556	481034.75	1349639.50	0.5'-1.0'	12556-2-AB	N/A	Gross alpha/beta
			1.0'-1.5'	12556-3-P	TAL G	Aroclor-1254, Aroclor-1260
			2.0'-2.5'	12556-5-P	TAL G	Aroclor-1254, Aroclor-1260
			3.0'-3.5'	12556-7-P	TAL G	Aroclor-1254, Aroclor-1260
			4.0'-4.5'	12556-9-P	TAL G	Aroclor-1254, Aroclor-1260
			5.0'-5.5'	12556-11-P	TAL G	Aroclor-1254, Aroclor-1260
12557	481040.75	1349639.50	0.5'-1.0'	12557-2-AB	N/A	Gross alpha/beta
			1.0'-1.5'	12557-3-P	TAL G	Aroclor-1254, Aroclor-1260
			2.0'-2.5'	12557-5-P	TAL G	Aroclor-1254, Aroclor-1260
			3.0'-3.5'	12557-7-P	TAL G	Aroclor-1254, Aroclor-1260
			4.0'-4.5'	12557-9-P	TAL G	Aroclor-1254, Aroclor-1260
			5.0'-5.5'	12557-11-P	TAL G	Aroclor-1254, Aroclor-1260
12558	481028.75	1349639.50	0.5'-1.0'	12558-2-AB	N/A	Gross alpha/beta
			1.0'-1.5'	12558-3-P	TAL G	Aroclor-1254, Aroclor-1260
			2.0'-2.5'	12558-5-P	TAL G	Aroclor-1254, Aroclor-1260
			3.0'-3.5'	12558-7-P	TAL G	Aroclor-1254, Aroclor-1260
			4.0'-4.5'	12558-9-P	TAL G	Aroclor-1254, Aroclor-1260
			5.0'-5.5'	12558-11-P	TAL G	Aroclor-1254, Aroclor-1260
12559	481034.75	1349633.50	0.5'-1.0'	12559-2-AB	N/A	Gross alpha/beta
			1.0'-1.5'	12559-3-P	TAL G	Aroclor-1254, Aroclor-1260
			2.0'-2.5'	12559-5-P	TAL G	Aroclor-1254, Aroclor-1260
			3.0'-3.5'	12559-7-P	TAL G	Aroclor-1254, Aroclor-1260
			4.0'-4.5'	12559-9-P	TAL G	Aroclor-1254, Aroclor-1260
			5.0'-5.5'	12559-11-P	TAL G	Aroclor-1254, Aroclor-1260

APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

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Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
12560	481034.75	1349645.50	0.5'-1.0'	12560-2-AB	N/A	Gross alpha/beta
			1.0'-1.5'	12560-3-P	TAL G	Aroclor-1254, Aroclor-1260
			2.0'-2.5'	12560-5-P	TAL G	Aroclor-1254, Aroclor-1260
			3.0'-3.5'	12560-7-P	TAL G	Aroclor-1254, Aroclor-1260
			4.0'-4.5'	12560-9-P	TAL G	Aroclor-1254, Aroclor-1260
			5.0'-5.5'	12560-11-P	TAL G	Aroclor-1254, Aroclor-1260
12561	480527.28	1350433.42	1.0'-1.5'	12561-3-M	TAL B	Beryllium
			2.0'-2.5'	12561-5-M	TAL B	Beryllium
			3.0'-3.5'	12561-7-M	TAL B	Beryllium
			4.0'-4.5'	12561-9-M	TAL B	Beryllium
			5.0'-5.5'	12561-11-M	TAL B	Beryllium
			6.0'-6.5'	12561-13-M	TAL B	Beryllium
12562	480533.28	1350433.42	1.0'-1.5'	12562-3-M	TAL B	Beryllium
			2.0'-2.5'	12562-5-M	TAL B	Beryllium
			3.0'-3.5'	12562-7-M	TAL B	Beryllium
			4.0'-4.5'	12562-9-M	TAL B	Beryllium
			5.0'-5.5'	12562-11-M	TAL B	Beryllium
			6.0'-6.5'	12562-13-M	TAL B	Beryllium
12563	480521.28	1350433.42	1.0'-1.5'	12563-3-M	TAL B	Beryllium
			2.0'-2.5'	12563-5-M	TAL B	Beryllium
			3.0'-3.5'	12563-7-M	TAL B	Beryllium
			4.0'-4.5'	12563-9-M	TAL B	Beryllium
			5.0'-5.5'	12563-11-M	TAL B	Beryllium
			6.0'-6.5'	12563-13-M	TAL B	Beryllium
12564	480527.28	1350427.42	1.0'-1.5'	12564-3-M	TAL B	Beryllium
			2.0'-2.5'	12564-5-M	TAL B	Beryllium
			3.0'-3.5'	12564-7-M	TAL B	Beryllium
			4.0'-4.5'	12564-9-M	TAL B	Beryllium
			5.0'-5.5'	12564-11-M	TAL B	Beryllium
			6.0'-6.5'	12564-13-M	TAL B	Beryllium
12565	480527.28	1350439.42	1.0'-1.5'	12565-3-M	TAL B	Beryllium
			2.0'-2.5'	12565-5-M	TAL B	Beryllium
			3.0'-3.5'	12565-7-M	TAL B	Beryllium
			4.0'-4.5'	12565-9-M	TAL B	Beryllium
			5.0'-5.5'	12565-11-M	TAL B	Beryllium
			6.0'-6.5'	12565-13-M	TAL B	Beryllium
12566	480333.17	1350167.74	1.0'-1.5'	12566-3-R	TAL A	Total U, Total Th
			2.0'-2.5'	12566-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12566-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12566-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12566-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12566-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12566-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12566-17-R	TAL A	Total U, Total Th

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APPENDIX D
SOIL SAMPLES TO BE COLLECTED FOR THE AREA 3A/4A SUBSURFACE PREDESIGN INVESTIGATION

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Location	Northing	Easting	Depth	Sample Id	Analysis	Analytes
12567	480339.17	1350167.74	1.0'-1.5'	12567-3-R	TAL A	Total U, Total Th
			2.0'-2.5'	12567-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12567-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12567-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12567-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12567-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12567-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12567-17-R	TAL A	Total U, Total Th
12568	480327.17	1350167.74	1.0'-1.5'	12568-3-R	TAL A	Total U, Total Th
			2.0'-2.5'	12568-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12568-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12568-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12568-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12568-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12568-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12568-17-R	TAL A	Total U, Total Th
12569	480333.17	1350161.74	1.0'-1.5'	12569-3-R	TAL A	Total U, Total Th
			2.0'-2.5'	12569-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12569-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12569-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12569-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12569-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12569-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12569-17-R	TAL A	Total U, Total Th
12570	480333.17	1350173.74	1.0'-1.5'	12570-3-R	TAL A	Total U, Total Th
			2.0'-2.5'	12570-5-R	TAL A	Total U, Total Th
			3.0'-3.5'	12570-7-R	TAL A	Total U, Total Th
			4.0'-4.5'	12570-9-R	TAL A	Total U, Total Th
			5.0'-5.5'	12570-11-R	TAL A	Total U, Total Th
			6.0'-6.5'	12570-13-R	TAL A	Total U, Total Th
			7.0'-7.5'	12570-15-R	TAL A	Total U, Total Th
			8.0'-8.5'	12570-17-R	TAL A	Total U, Total Th

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APPENDIX E

MODIFICATION TO UNIVERSITY OF CINCINNATI TASK ORDER NO. 039 (LEACHING OF CONTAMINATED SOIL SAMPLES FROM THE FORMER PRODUCTION AREA)

Draft Modification to UC Task Order No. 039
BOA No. 96SS000296
August 4, 1999

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Leaching of Contaminated Soil Samples from the Former Production Area

PURPOSE

The purpose of this modification is to investigate the leachability of uranium from contaminated soil samples collected within the former Production Area. Mobilization of uranium, from a mass balance and geochemical perspective, will be investigated with a two-step leach test similar to the test outlined in Attachment F.2.I of the OU5 Feasibility Study (attached). The leaching agent will be uncontaminated perched groundwater collected from a suitable background location.

This modification to the task order represents new leach-testing work that will investigate uranium mobility in subsurface-soil samples below the OU5 FS leach areas identified in the former Production Area. DOE and FDF have agreed that this work is needed to provide technical data to support a decision on the depth of excavation within the leach areas (i.e., excavate to a uranium contamination level of 20 or 50 mg/kg). Soil excavation to a contamination depth of 20 mg/kg results in the removal of approximately 30 percent more soil, relative to a depth of 50 mg/kg. Therefore, the fundamental technical question to be answered is does the soil with uranium contamination in the 20 to 50 mg/kg range pose a threat to the underlying GMA due to the uranium being in a form that is highly susceptible to leaching by infiltrating water. The maximum activity of uranium isotopes expected to be found in the collected soil samples is:

uranium-238	23,000 pCi/g
uranium-235	1,073 pCi/g
uranium-234	23,000 pCi/g

SCOPE

UC shall provide a Project Specific Plan (PSP) for the proposed two-step leach test with contaminated soil and background perched groundwater. The PSP will include a test plan, budget, schedule and quality assurance program to ensure the integrity of the study. Following review and concurrence of the PSP by FDF, and receipt of test materials, UC shall initiate the leach tests, prepare reports, and participate in progress and review meetings. Performance characteristics include an investigation of the leachability of uranium from contaminated soil

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using a two-step batch test and data analysis. Based on results associated with the evaluation, UC shall provide a final report for the study that summarizes the experimental approach, test materials and conditions, analytical methods, results, and interpretations.

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RESPONSIBILITY

The FDF Cognizant Technical Representative (COTR) for overall contract with universities is:

Name	Keith Wilkerson
Department	Technical University Programs
Address (Mail)	P.O. Box 538704 MS-50 Cincinnati OH, 45253
Address (Shipping)	7400 Willey Rd. Hamilton, OH 45013-9402
Telephone Number	(513) 648-4115
Facsimile Number	(513) 648-4040

For this task the COTR has delegated technical authority to the FDF Technical Task Manager:

Name	Richard Abitz
Department	Soil and Water Projects
Address (Mail)	P.O. Box 538704, Mail Stop 52-0 Cincinnati OH, 45253
Address (Shipping)	7400 Willey Road Hamilton, OH 45013-9402
Telephone Number	(513) 648-4629
Facsimile Number	(513) 648-5131

REQUIREMENTS

UC will:

a) Investigate the leachability of uranium from contaminated soil samples from a mass balance and geochemical perspective.

b) Conduct up to 50 two-step batch tests using 200 grams of contaminated soil and 2 liters of uncontaminated perched groundwater per test (i.e., a liquid/solid weight ratio of 10). The two-step test is conducted as follows:

STEP 1 Pass each soil sample through a No. 10 (2 millimeter) screen and place 200 grams of soil and 2 liters of groundwater in a reaction vessel. (Note: the soil sample for duplicate runs should be screened as a single sample and splits taken after screening). Agitate the vessel daily for a minimum of 5 minutes and record the pH of the solution/soil mixture (Note:

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on sampling days agitate the vessel prior to removing the sample). Remove a 10 milliliter (mL) sample from the reaction vessel on days 3, 7, 10, 12, and 14. The sample will be collected using a 0.45 micron filtered syringe or similar protocol. Acidify the 10 mL sample to a pH less than 2 with nitric acid (Note: do not acidify a sample if there is visible sediment; replace the sample in the vessel and resample until a suitable sample is obtained). After removing the sample, add 10 mL of fresh groundwater to the reaction vessel. Upon completion of the 14-day sampling event, pass the entire contents of the reaction vessel through a 0.45 micron filter and collect the aqueous portion in a suitable clean container (Note: do not use distilled water or any other reagent to rinse the soil sample). After all fluid has passed through the filter and contained soil, measure the volume of the aqueous sample and archive the sample without adding any preservatives.

STEP 2 Return the soil in the filter to the reaction vessel and rinse the soil stuck to the filter into the reaction vessel using fresh groundwater. Bring the volume of fresh groundwater in the reaction vessel up to 2 liters and perform the second leach test in the same fashion as the first. At the conclusion of the second leach test, air dry the soil sample and filter in the reaction vessel and archive the vessel.

c) Prepare and run duplicates at a minimum frequency of 10 percent.

d) Provide all experimental data (e.g., log book, pH measurements, etc) and test materials to FDF at the completion of the tests.

e) Prepare and submit a final report two weeks after the conclusion of STEP 2 (approximately November 1, 1999) that summarizes the experimental approach, test materials and conditions, results, and interpretations. Graphs, illustrations, and tables should be used to summarize data.

FDF will:

a) Provide the Technical Task Manager for the university PI

b) Provide feedback, as required, in a timely fashion

c) Provide all soil and groundwater materials for the tests.

DELIVERABLES

The University shall submit documentation in accordance with the Reporting Requirements List.

Information may be provided to FDF by E-mail.

REPORTING REQUIREMENTS LIST

Biweekly Teleconference Minutes:	Every other week beginning with the initiation of the task effort (approximately September 15, 1999). Distributed to the FDF Technical Task Manager, Task Order Manager, and other identified participants at close of business on the third normal work day following the teleconference. May be completed by UC or FDF.
Draft Final Report	Distributed to the FDF Technical Task Manager, Task Order Manager, and other identified participants at approximately the 90% point of the approved activity schedule (approximately October 15, 1999)
Final Report	Distributed to the FDF Technical Task Manager, Task Order Manager, and other identified participants as shown on the approved activity schedule in the PSP.

All data, documentation, computer products, if any, shall be delivered with unlimited data rights. All research reports, data, and presentations derived from the tasks and projects are to be submitted to FDF for review and approval.

GOVERNMENT FURNISHED PROPERTY

The university's proposal shall include a list of available equipment and equipment to be purchased. All to-be-purchased equipment included in the budget for this effort is government owned-contractor provided equipment. Purchase or lease of any equipment or any ADP software product, regardless of dollar value, is not an allowable cost unless specifically approved in writing by the FDF Buyer prior to incurring the cost. All government equipment will be decontaminated, packaged, and shipped to FDF at the expense of the university.