U-005-303.1

289

REMEDIAL INVESTIGATION WORK PLAN ADDENDUM PRODUCTION AND ADDITIONAL SUSPECT AREAS WORK PLAN OCTOBER 1989

10-01-89

125
WORK PLAN

REMEDIAL INVESTIGATION WORK PLAN ADDENDUM

PRODUCTION AND ADDITIONAL SUSPECT AREAS WORK PLAN

OCTOBER 1989

REVISION 1

FEED MATERIALS PRODUCTION CENTER

FERNALD, OHIO

ORIGINAL

RI/FS
DOCUMENT CHANGE REQUEST

This form is used to initiate and update RI/FS plans and procedures, only.

SAFETY	
YES	NO
☐	☒
INVOLVED	

REQUEST NO: 33
Completed by: [illegible]
Revision/ 1.0
Issue Date: 10-16-89
DO NOT WRITE IN THIS BLOCK

REQUESTOR R. Lenyk PHONE NO.: 738-3100 DATE 9-22-89

DOCUMENT TITLE Work Plan DOCUMENT NUMBER NA

SECTION/PARAGRAPH/PAGE NO.: Section 4.2.1.7

ISSUE DATE January 1987 LATEST REVISION DATE March 1988

JUSTIFICATION

Sampling and analysis plans have been developed and approved as part of the sitewide RI/FS WORK Plan for all areas and environmental media outside of the active production facilities of the FMPC. In the case of the Production Area, however, only a general scope of work was presented in the approved RI/FS Work Plan. The Production And Additional Suspect Areas Work Plan presented here is to fulfill this requirement for a Sampling Plan to address areas within the Production area.

CONTENT OF CHANGE

The Production And Additional Suspect Areas Work Plan represents a compendium of individual Testing Plans for various facilities and suspect areas associated with the FMPC.

The Production And Additional Suspect Areas Work Plan is an Addendum to the RI/FS Work Plan Rev. 3. The Addendum will be Rev. 1.

CANCELLATION INSTRUCTIONS

CANCEL DOCUMENT NO.: NA

Reason for cancellation:

REQUIRED APPROVALS

R. Lenyk 9/22/89	NA
ASI PROJECT DIRECTOR/DATE	WMCO PROJECT MGR./DATE
[illegible] 9/22/89	NA
ASI QA OFFICER/DATE	WMCO IMPACT ASSESS. MGR./DATE
[illegible] 9/22/89	NA
IT PROJECT DIR./DATE	WMCO QA OFFICER/DATE
NA	James A. Rodgers 10/13/89
IT QA OFFICER/DATE	DOE COTR/DATE

TO BE COMPLETED BY DOE

A. PRIOR EPA NOTIFICATION REQUIRED ? YES ✓ NO ____

B. PRIOR EPA APPROVAL REQUIRED ? YES ✓ NO ____

C. IMMEDIATE IMPLEMENTATION. YES ✓ NO ____

REMEDIAL INVESTIGATION
WORK PLAN ADDENDUM

PRODUCTION AND ADDITIONAL SUSPECT AREAS
WORK PLAN

FEED MATERIALS PRODUCTION CENTER

FERNALD, OHIO

OCTOBER 1989

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1.0 INTRODUCTION

Chapter 1 presents the purpose of the Production and Additional Suspect Areas Work Plan. The overall technical approach supporting this strategy for the Production Area is the subject of Chapter 2.0. Specific testing requirements, e.g., the number and location of sampling points and the corresponding analytical parameters, are addressed in Chapter 3.0. The testing of the special facilities within the Production Area and the suspect areas outside of the Production Area will be addressed on an individual unit basis as required by the specific site conditions and testing methods. Separate sampling and analysis plans have been developed for each special facility and suspect area and are presented in Chapters 4.0 and 5.0, respectively.

1.1 PURPOSE

On July 18, 1986, a Federal Facility Compliance Agreement (FFCA) was jointly signed by the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (U.S. EPA) pertaining to environmental impacts associated with DOE's Feed Materials Production Center (FMPC). In response, a sitewide Remedial Investigation and Feasibility Study (RI/FS) is in progress to thoroughly and adequately investigate any such impacts so that appropriate remedial response actions can be formulated, assessed, and implemented.

One requirement of the FFCA was the development and execution of a ". . . sampling and analysis program to characterize . . . all materials emitted, discharge, released, or potentially released into the environment." Sampling and analysis plans have been developed and approved as part of the sitewide RI/FS Work Plan for all areas and environmental media outside of the active production facilities of the FMPC. In the case of the Production Area, however, only a general scope of work was presented in the

approved RI/FS Work Plan. The Production and Additional Suspect Areas Work Plan presented here is to fulfill this requirement for a sampling plan to address areas within the Production Area.

The overall objective of the work to be performed under this Production and Additional Suspect Areas Work Plan is to determine if a release of hazardous and/or radioactive materials has occurred, or has a reasonable potential for occurring, from the production facilities and suspect areas both within the Production Area and throughout the FMPC. For purposes of this testing program, the term "suspect area" represents any localized area of the FMPC that could potentially contribute to environmental contamination as a result of specific activities, previous production operations, or past disposal practices. Any such areas accounted for by other RI activities or previous investigations are excluded from the facilities testing program. Specific objectives of the facilities testing program are the following:

- To define the nature and extent of current ground water contamination associated with production facilities and identified suspect areas;

- To evaluate the potential for ground water contamination by defining the lateral and vertical extent of radionuclide and hazardous substance contamination of surface and subsurface soils;

- To confirm that problems do not exist in those areas of the Production Area not associated with production facilities and suspect areas and to adequately define any problems that are found; and

- To gain a refined understanding of the hydrogeologic system and ground water flow patterns throughout the till underlying the Production Area.

1.2 SCOPE

The Production and Additional Suspect Areas Work Plan described herein actually represents a compendium of individual testing plans for various facilities and suspect areas associated with the FMPC. For purposes of the Production and Additional Suspect Areas Work Plan, the relevant units of the FMPC have been separated into the following three groupings:

- Production Area - The Production Area grouping includes those facilities, suspect areas, and land areas within the inner fence of the FMPC. Active production facilities are included in this grouping. In particular, the following types of facilities and suspect areas are incorporated into the overall investigation of the Production Area:

  - Raw product and waste container storage and transfer facilities
  - Oil burner area (north of boiler plant)
  - Graphite burner area
  - Area southwest of laboratory
  - Metal scrap pile area
  - Polychlorinated biphenyls (PCB) transformer/hydraulic oil area
  - Waste solvent drum storage area behind laboratory
  - Abandoned drum areas
  - Plant 1 shot blaster area
  - South interior end of Plant 6

  The drum baling area and the nearby burial trench, although identified as suspect areas within the Production Area, have already been investigated in relation to recent construction activities and will not be specifically addressed in this Production and Additional Suspect Areas Work Plan. The work Plan for the drum baling area investigation is provided as Appendix B.

- Special Facilities Within Production Area - Four types of special facilities represent exceptions to the Production Area grouping. Included in the special facilities grouping are the underground storage tanks, below-grade piping, the main effluent line from the clear well to Manhole 175, and a

former drum storage area behind the laboratory. A differentiation of these facilities is necessary to best accommodate the technical requirements of the respective testing programs. In particular, each of these four facility types is associated with testing techniques that are considerably different from those proposed for the Production Area as a whole.

- Suspect Areas Outside Production Area - Several of the identified suspect areas are physically located outside of the Production Area. Included in this grouping are: the fire training area, an area north and east of the fire training area, area south of the laboratory where laboratory hoods were buried, the southfield area, several rubble mounds and abandoned drum locations, and an area in the vicinity of the flagpole near the entrance to the administrative building. Although many of these areas have already been surficially investigated as part of the radiation measurement and soil sampling programs, more definitive investigations of the nature and extent of any associated releases and impacts will be conducted under the facilities testing program.

For purposes of technical flexibility and management control, the Production Area grouping will be divided into six sectors for investigation. The sectioning of the Production Area has considered the types of past and present operations performed, the types of materials handled and their respective chemical forms and solubility, and any other conditions or activities that would dictate a need for special testing methods. The underlying goal is to create sectors with common conditions that would result in the most effective scoping and sequencing of testing programs. The recommended approach is to proceed with the investigation of the six sectors in a sequential manner. The order of investigation will be based on the probability that contamination is present in the till and ground water underlying each sector as well as the potential public health and environmental impacts associated with any such contamination. The selection and prioritization of the sectors were based in large part on the findings of a special task force

of Westinghouse Materials Company of Ohio (WMCO) personnel assembled for the purpose of identifying areas requiring special consideration in the development of sampling strategies.

The investigation of each sector within the Production Area will include three types of activities. In the first, soil borings will be systematically installed on a grid pattern throughout each sector to confirm whether uranium or nitrates are present at elevated levels in the till. The objective of this activity is to provide assurance that problems do not exist in those areas not previously identified as suspect areas. The second activity will also involve the installation of soil borings but, in this case, at selected locations based on known or suspected points of environmental release or contamination. This activity will be performed for the purpose of better defining the nature and extent of any contamination associated with a past or current point of release. The third activity will be the installation of 2000-Series monitor wells into the sand and gravel aquifer at selected locations. Priority will be given to locations downgradient from the most critical facilities and suspect areas associated with potential releases of soluble forms of uranium. Such wells will serve to monitor the ground water pathway that could link materials initially released to the subsurface environment of the Production Area with off-site receptors.

2.0 TECHNICAL APPROACH: PRODUCTION AREA

Section 1.2 introduced a three-step investigative program to be implemented for each of the six sectors within the Production Area. This program includes a systematic soil boring program to be conducted along a predefined grid, a focused soil boring program to augment the scope of the investigation near known or suspected problem areas, and a monitor well program to evaluate any related effects on the regional sand and gravel aquifer. Both the objectives of this strategy and the investigative methods to be employed will be essentially the same from sector to sector. The purpose of Chapter 2.0 is to provide a detailed description of the objectives and methodologies common to all sectors for each of the three steps in the investigative process. Sector-specific information on the number and locations of borings and wells, the parameters for which the samples will be analyzed, and any special testing requirements will be the subject of Chapter 3.0.

2.1 OVERVIEW

The proposed drilling program is designed to identify any contamination of perched water within the production buildings. Generally the buildings were constructed on concrete columns that rest on concrete footings. The foundations do not include subsurface walls that would block or direct the flow of contaminants, or serve as preferential sinks of contaminated water in highly permeable backfill material. Therefore the perched water found in a boring on the outside of a building and the water found in a boring on the inside of the building may well be part of the same perched water system. Water level elevations and chemical similarities will be evaluated to determine continuity of individual

water bodies. If a removal action is required in an area, the final proof of the dimensions of a perched water unit will be shown by the response of the water levels in the piezometers to the removal action.

2.2 SYSTEMATIC SOIL BORING PROGRAM

A 250-by-250-foot grid will be established across all sectors of the Production Area for purposes of the systematic soil boring program. Except for those conditions noted below, borings will be placed at all points of intersection of the grid. Ninety-three borings will result from the selected grid spacing.

Systematic boring locations that fall inside buildings will be evaluated on a case-by-case basis. In general, borings inside buildings will be limited to those associated with the focused sampling of suspected problem areas. Each grid boring that would otherwise fall within a building will be replaced, however, by a boring located just outside of the nearest wall along the same grid line, unless an adjacent grid boring is already in close proximity to the building wall. If a grid point falls within a diked containment area, the boring will be installed immediately outside of the area. Grid borings will be installed through paved and gravel-covered areas unless conditions warrant a slight shifting of locations, e.g., along shoulders of roads rather than through the pavement. If a grid point falls in close proximity to a suspect area being investigated under a focused program, the borings being placed for the suspect area will take precedence over the systematic boring.

The logic diagram for the soil boring program is presented in Figure 2-1. All borings will be advanced using an eight-inch hollow-stem auger. Unless dictated otherwise by available

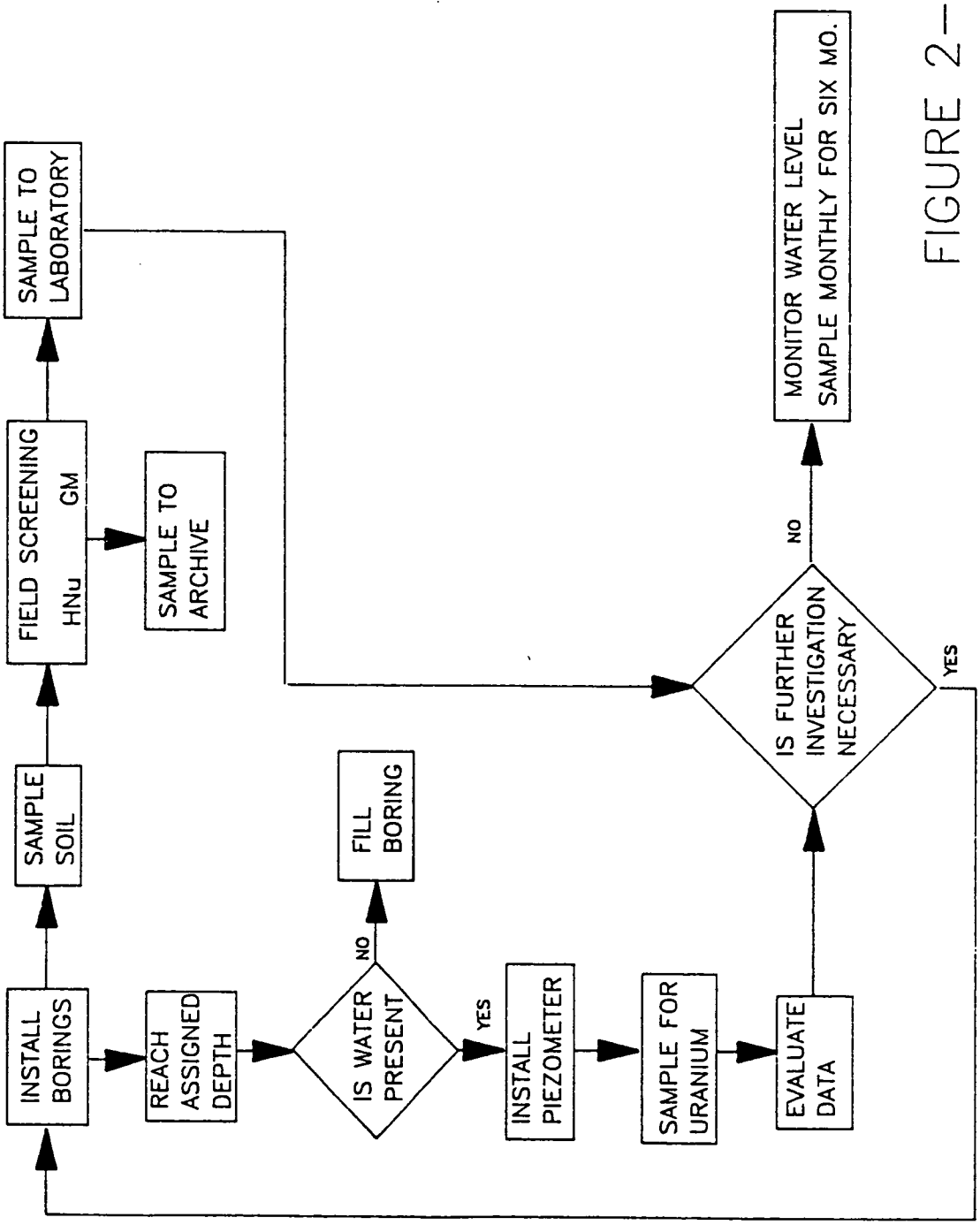


FIGURE 2-1
BORING LOGIC DIAGRAM

information on the subject area, each boring will be advanced to a depth of 20 feet or to the first water-bearing zone. If a water-bearing zone is encountered at a depth shallower than 20 feet, the boring will be advanced until a clay layer is reached or until the total depth of the boring reaches 20 feet. The 20-foot depth will be a strict limit on each hollow-stem auger boring to prevent the boring from penetrating the till and draining perched water downward into the sand and gravel aquifer.

Borings that do not encounter water will be backfilled with Volclay grout. Borings that encounter water will be completed as two-inch-diameter piezometers constructed of PVC. The piezometers will allow water levels to be monitored to interpret the local perched water table. Water levels will be taken monthly for six months as part of the overall water level measurement program being conducted under the RI/FS. The piezometers will also be adequate for the collection of ground water samples for laboratory analysis.
Screen length will vary from two to ten feet to be determined in the field for each boring. Factors that will influence the screen length will be the depth of the boring, the apparent thickness of the saturated zone, and the need to provide an adequate surface seal. All screen will be 2-inch inside diameter, 0.02-inch machine slotted Schedule 40 PVC. In some instances where future pumping is expected, 4-inch diameter rather than 2-inch diameter screen and casing will be used.

Records of the materials encountered in the borings will be maintained in the same manner as used in the installation of monitor wells in the RI/FS. The same Visual Classification of Soils and Piezometer Installation Sheet will be used. Figure 2-2 is a diagram showing the typical construction for piezometers installed in this program.

Because some of the piezometer may be finished in a flush mounted well enclosure, revised installation diagrams have been developed for this work and are presented in Figures 2-3 and 2-4.

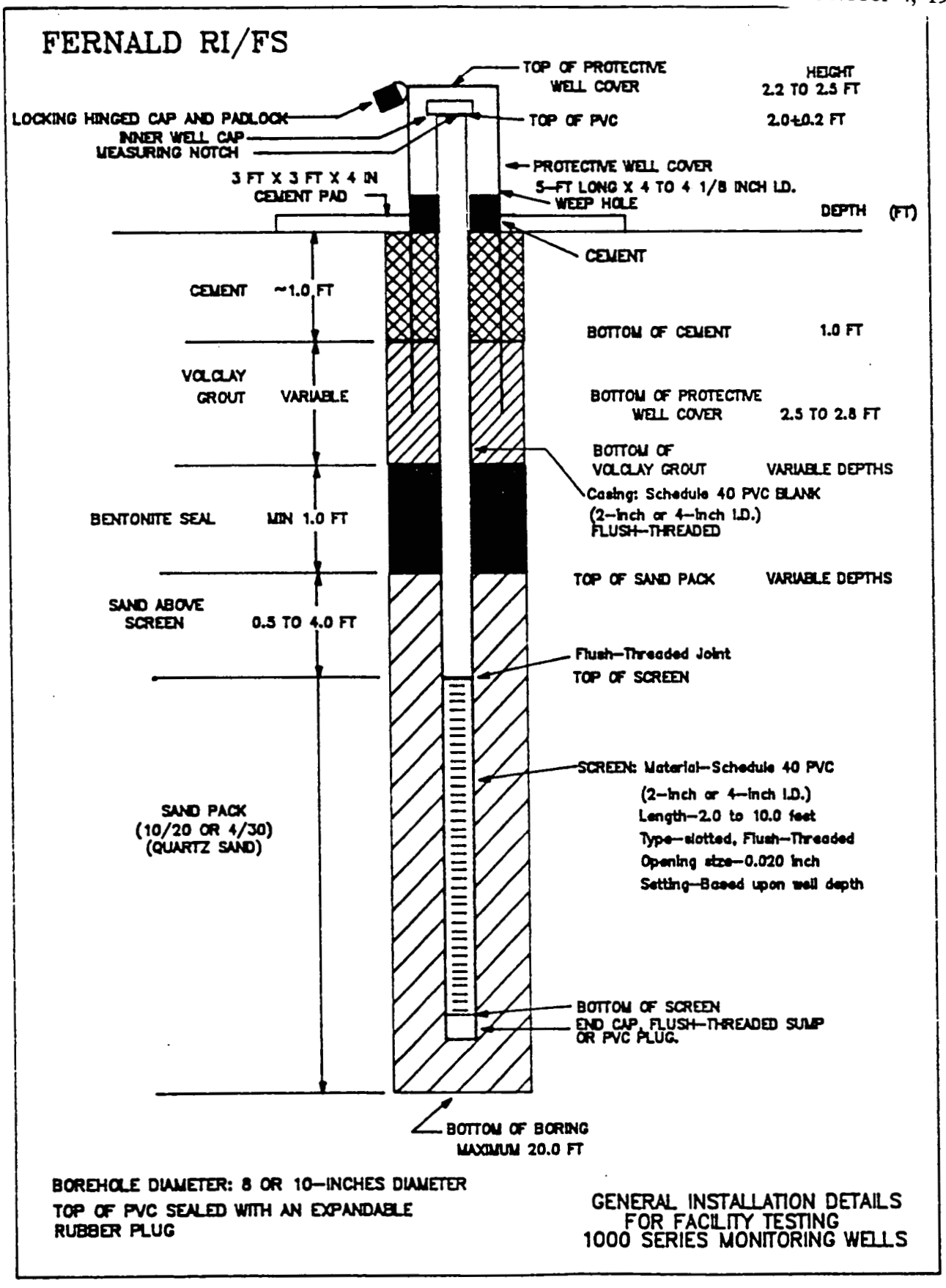


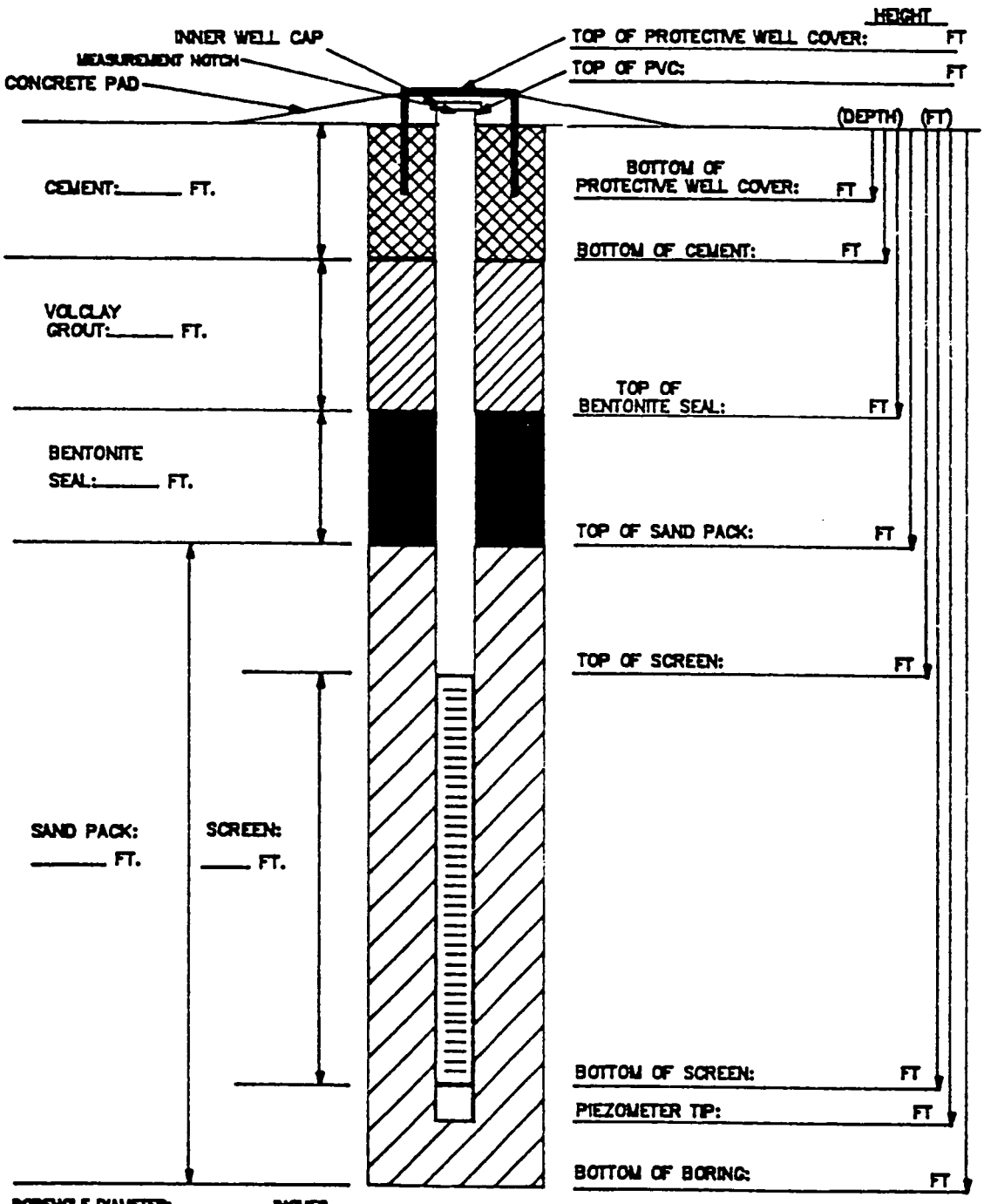
FIGURE 2-2 GENERAL INSTALLATION DIAGRAM 16

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.

_____

INSTALLATION DATE: _____



BOREHOLE DIAMETER: _____ INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY:
BENTONITE PELLETS (5-GALLON BUCKETS):
BAGS OF VOLCLAY GROUT:
AMOUNT OF CEMENT:
AMOUNT OF WATER USED:
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESES INDICATE DEPTH BELOW GROUND LEVEL.

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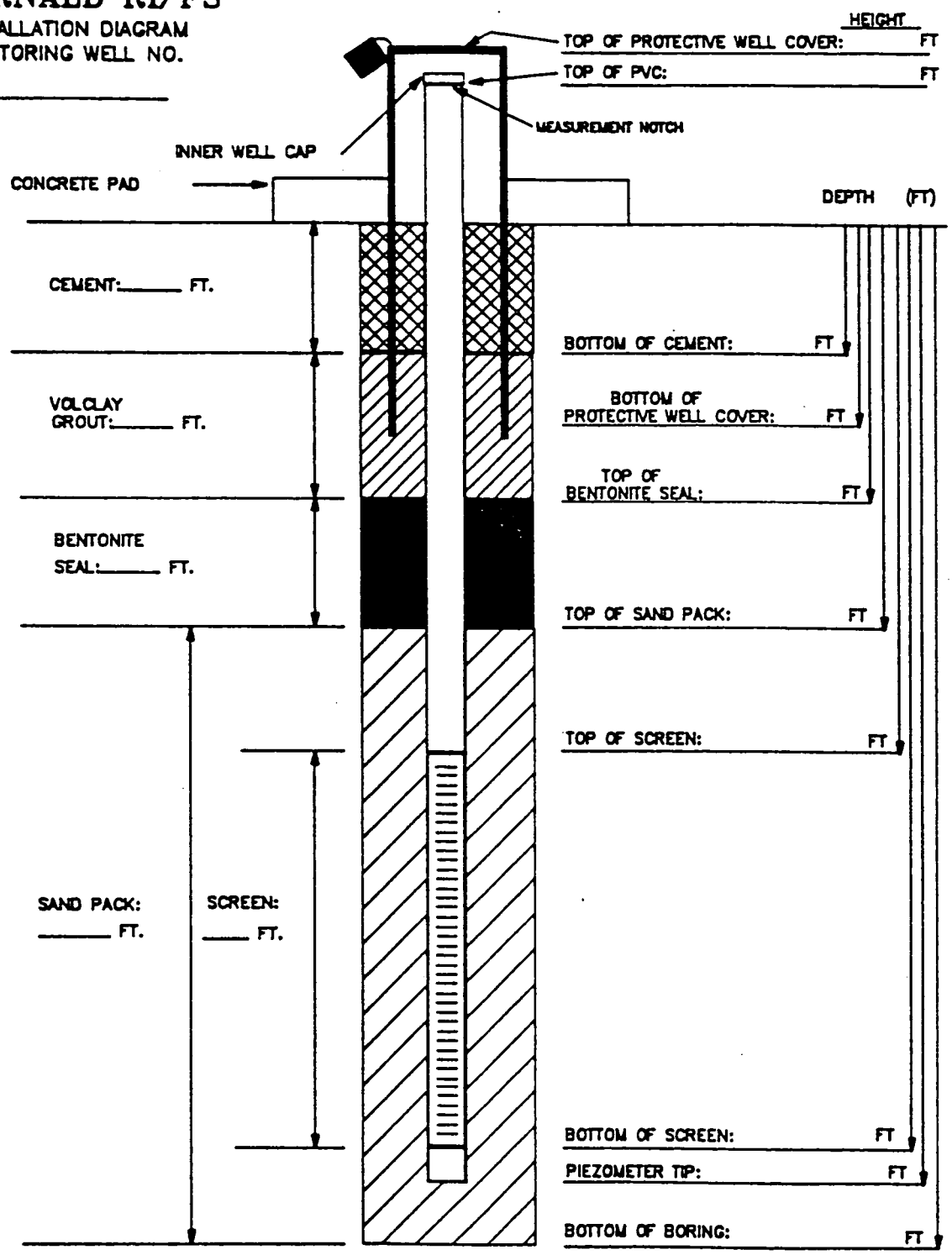
TASK: GEOLOGIST/ENGINEER:

FIGURE 2-3 FLUSH PIEZOMETER COMPLETION

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. _____

INSTALLATION DATE: _____



BOREHOLE DIAMETER: _____ INCHES

MATERIALS USED:
SAND TYPE AND QUANITITY:
BENTONITE PELLETS (5-GALLON BUCKETS):
BAGS OF VOLCLAY GROUT:
AMOUNT OF CEMENT:
AMOUNT OF WATER USED:
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK:

GEOLOGIST/ENGINEER:

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FIGURE 2-4 STANDARD PIEZOMETER COMPLETION

During the preparation and negotiation of the Work Plan for the sitewide RI/FS, the DOE prepared a technical position paper that disputed, from a data objectives standpoint, the need for stainless steel risers and screens for the monitor wells. This position was rejected by the U.S. EPA due to the fact that the FFCA required DOE "...to characterize any plumes of contamination at the site utilizing monitor wells constructed of teflon or stainless steel 316." For the following reasons, we do not consider that this requirement is programmatically transferable or technically justified for the piezometers proposed under the subject plan:

- The piezometers are not intended as monitor wells -- rather, the intent is to perform a one-time sampling of the perched groundwater to confirm the presence or absence of radiological or chemical materials. If organic materials are found which are incompatible with or affected by PVC, and which require long-term monitoring, the boring will be redrilled and the PVC replaced with stainless steel using an appropriate length of screen to form a monitor well.

- The time frame of the monitoring program does not substantiate the use of stainless steel. On the one hand, the time frame anticipated for use of the piezometers is insufficient for any degradation of the PVC by chemicals in the water or soils to occur. On the other hand, the shallow depth of the piezometer and the purging requirements reduce the contact time between the sample and the PVC to the extent that chemical exchange will be of no concern. Again, a substitution to stainless steel will take place if warranted by the results of the initial sampling and the need for long-term monitoring.

Samples will be collected from each piezometer for total uranium and total thorium and nitrates at the time of installation and at a minimum of one more occasion under different seasonal conditions. All sampling procedures and protocols will be the same as those specified in the RI/FS Work Plan (Revision 3) dated March 1988.

Continuous split-spoon samples will be collected throughout the full depth of each boring using an 18-inch long split-spoon sampler. Each sample will undergo radiological and volatile organic screening and will be characterized by a geologist in accordance with the procedures in the RI/FS Work Plan (Revision 3). Samples from the following depth increments will be sent to the WMCO laboratory for total uranium and total thorium analysis: 0.0 to 0.5 feet, 2.0 to 2.5 feet, 5.0 to 5.5 feet, and at each successive 5.0-foot increment until perched water or the bottom of the boring is reached. If any soil samples exceed the field screening criteria of a sustained reading greater than 5 ppm on the HNU for at least 10 seconds, the sample that exhibits the highest reading from each boring will be transferred to an appropriate laboratory for full Hazardous Substances List (HSL) testing. HNu screening is not the sole criteria for selecting a sample for HSL analysis. HSL analyses are also called for in areas where organics have been used or stored. This approach, to directly sample and analyze in areas of suspected contamination while basing the selection of samples for analysis on screening in areas with less likelihood of contamination, is completely consistent with the approved procedures in the overall RI/FS Work Plan.

Soil samples will not be collected for laboratory analyses from below the water table. Analysis of a soil sample collected from below the water table is still an analysis that is dominated by the constituents in the ground water. Each deeper sample is injected with ground water that is within the augers and therefore defining the lower limit of contamination by sampling soils below the water table is not feasible. The plan calls for 6-inch sample intervals spread over roughly 243 borings. The plan further allows for

additional borings if any contamination is found in the initial boring program. This will provide the data necessary to define the vertical and lateral extent of contamination in the unsaturated soils. The data from soil and water analyses will be combined with field observations based on screening instruments, soil color, and texture, as well as historic operations in an area to determine if further investigation of the area is warranted.

Piezometers in the saturated zones in the till will provide the lateral extent of contamination within the till. A comparison of the quality of water in the till with the quality of water in the underlying aquifer will indicate the extent of vertical migration. It is possible to install multiple piezometer clusters in the till to refine the vertical distribution of any contaminant; however, the risk that such a program would pose in penetrating the till and providing a new pathway to the underlying aquifer outweighs the value of such a program. Once the extent of contamination in the shallowest saturated zone is defined and evaluated, a further refinement of the vertical extent of contamination in deeper perched zones in the till may be warranted.

All cuttings will be drummed at the boring. Disposition of the drummed cuttings will be in accordance with DOE and WMCO requirements based on results of the analysis of samples from that boring. As with any program being conducted under the RI/FS, the results will be analyzed to determine the need for additional borings or other field activities if contamination of the soils or perched ground water is observed. The definition of the source of observed contamination will be an important investigative issue. Further investigation to define sources of any contamination identified in this investigation will be presented in the form of an addendum to the Work Plan.

2.3 FOCUSED SOIL BORING PROGRAM

The focused soil boring program involves the advancement and sampling of additional borings specifically sited due to the suspected presence of environmental contamination. The focused program for each sector is presented in Chapter 3.0 and represents a baseline program intended to document the nature and general magnitude of environmental releases and contamination associated with the Production Area. If contamination is found, the program may be expanded to better define the source and extent of any problem in accordance with the overall phased approach of the RI/FS. The expansion of the program will be presented as an additional addendum to the Work Plan.

As will be discussed in more detail in Chapter 3.0, the number and specific locations of borings in each selected area will vary considerably, depending on local site conditions and the potential magnitude of the suspected problem. It is expected that the scope of the focused soil boring program at a given location will range from a single boring in a suspect drainage ditch to numerous borings spanning and surrounding major suspected release zones. The focused boring program will be extended to the interior of buildings if a high probability exists that an environmental problem will be found beneath the building. The logic of the focused boring program and the procedures to be utilized are essentially identical to those discussed for the systematic boring program (Figure 2-1). One exception is that analytical parameters over and above total uranium and nitrates may be selected for soil and ground water samples from certain locations depending on the type of chemicals handled or stored at those locations. Specific sample analysis programs are presented in Chapter 3.0.

The FMPC Facility Task Force, comprised of long-term environmental management and production operations personnel, evaluated all existing FMPC production facilities for their potential for impact to the environment. The Task Force considered all existing sumps and wastewater treatment facilities within this survey. The results of the investigation were documented in the Facility Task Force Report. This report directly supported the development of the focused boring program. Sumps and waste water treatment operations considered to have a significant potential based on the Facility Task Force Report for release are taken into consideration and are discussed in Section 3.0.

2.4 MONITOR WELLS

The ground water flow system in the sand and gravel aquifer is the critical pathway through which contamination underlying the Production Area could reach off-site receptors. RI/FS data collected to date indicate that elevated levels of uranium exist in the sand and gravel aquifer under the waste storage area that lies hydraulically upgradient from the Production Area. Uranium levels of approximately 2 to 3 micrograms per liter (ug/l) have also been detected in wells to the east, downgradient of the Production Area. What remains to be determined is the relative contribution of any releases from the Production Area to the observed uranium in the underlying aquifer when compared to the contribution from the waste storage area. Pinpointing any critical sources of ground water contamination within the Production Area is a related goal.

Discharges from the till to surface drainages are covered in the sitewide RI/FS under the surface water and sediment program and will be addressed in Operable Unit 5,

Environmental Media. This investigation will provide data regarding the sources of contamination and migration within the till to sumps.

For purposes of the testing program within the Production Area, 2000-Series monitor wells will be installed downgradient from those facilities and suspect areas considered to have the highest potential for the release of uranium or other radionuclides or chemicals to the sand and gravel aquifer. Specific locations for the proposed wells are presented in Chapter 3.0. In general, significantly fewer wells than borings are required since the wells are monitoring a regional, continuous aquifer in which any contaminants released from a particular facility or area would be adverted and dispersed. Borings that encounter water will be completed as piezometers which will provide in effect a monitor well network in the till. Water level and analytical data from the piezometers will be used to determine the extent of migration of contaminants within the till. Additional 2000-series monitor wells may be required and sited on the basis of the analysis of the data from the piezometers.

A logic diagram for the monitor well program is given in Figure 2-5. All 2000-Series wells installed as part of the facilities testing program will be constructed using the procedures and specifications given in the RI/FS Work Plan (Revision 3) and supporting Quality Assurance Project Plan (QAPP). Soil samples will be collected during the installation of monitor wells according to the same procedures used throughout the RI/FS program. The detailed sampling program for these wells is presented in Section 3.0. The wells will become part of the FMPC monitor wells network and will be sampled on two occasions

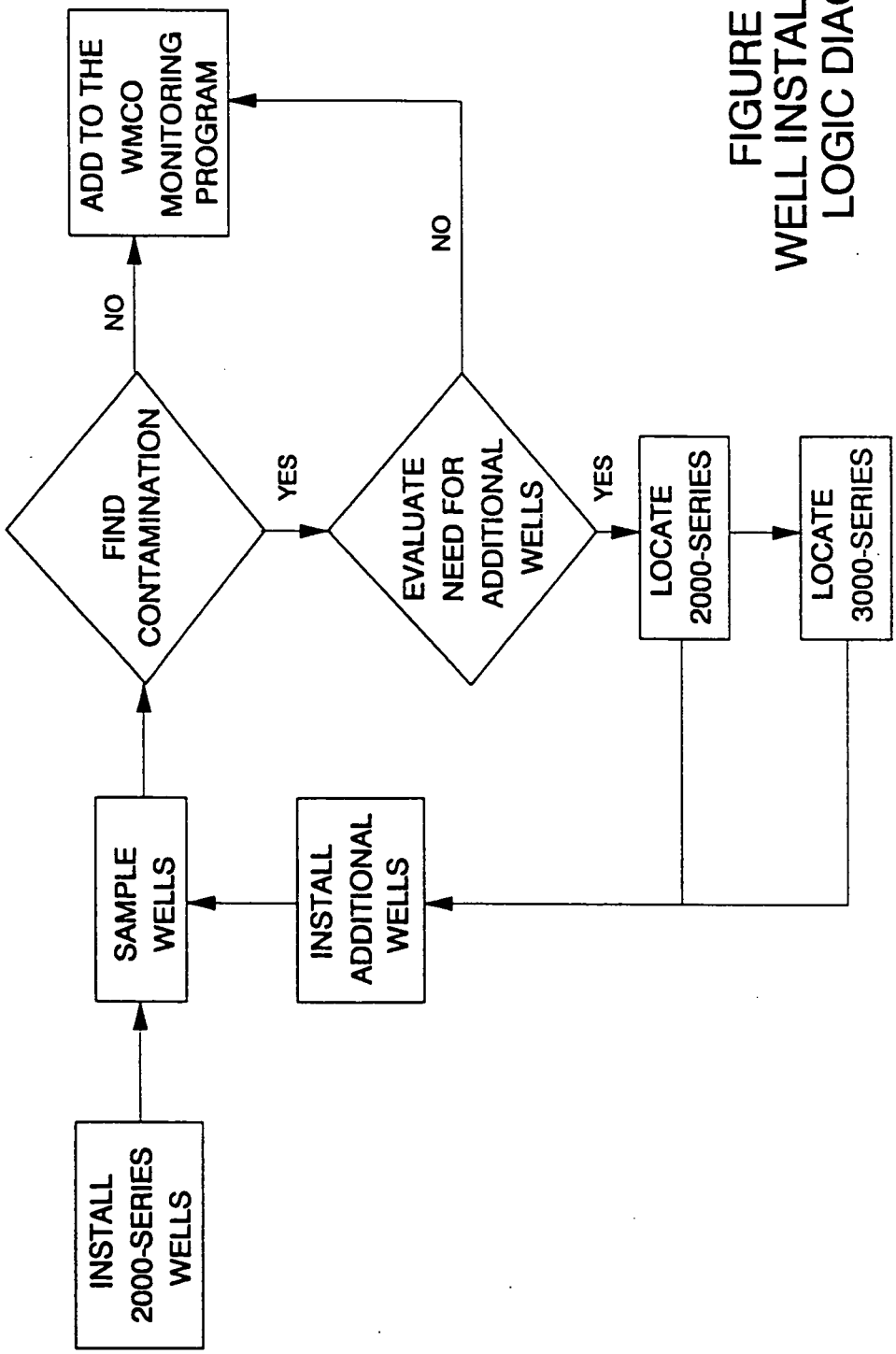

FIGURE 2-5
WELL INSTALLATION
LOGIC DIAGRAM

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under the Production Area testing program. The initial water sample from each well will be analyzed for the full HSL and full radiological parameters. As with all other wells in the RI/FS, all subsequent analyses will be for the general ground water parameters and full radiological parameters as specified in the RI/FS Work Plan. If the initialHSL analysis reveals anomalous amounts of unexpected materials, then the analytical program for that well will be expanded to confirm the presence or absence of the anomalous material.

The proposed wells are placed on the downgradient side of the most likely source of contamination and not simply at the edge of the sector. Contingency wells are also included to reduce the spacing between 2000 series wells should contamination be found. As with the piezometers, this is an initial drilling and sampling program. Figure 2-5 shows the logic used for the analysis of data from these wells. As with the piezometers, the data will be evaluated and if further wells are required they will be recommended. The recommendations will be made after considering the data from both the till and aquifer sampling. For example, if gross contamination of the perched ground water is found in an area not already targeted for a monitoring well, a well will be considered for placement downgradient of the contaminated zone. The decision to install a well will be based on all the data available from the till and nearby aquifer wells.

There are no plans for collecting samples for physical testing at this time. The usefulness of such tests is severely limited in a heterogeneous environment such as the till and thus they are not a high priority investigative item. If a removal action is required in a particular area, however, then such tests will be considered.

3.0 PRODUCTION AREA SECTORS

The production of uranium metal products at the FMPC involves a series of chemical and metallurgical conversions that occur in nine specialized plants within the Production Area. A number of other buildings on the site house support operations. Each of these facilities has a distinct purpose, resulting in significant differences in the process operations, chemical forms, and types of individual conveyance, storage, and containment units associated with the respective facilities. Figure 3-1, located in the back pocket, provides an overview of the scope of the Production and Additional Suspect Areas sampling program.

3.1 OVERVIEW

To better focus the investigation of this complex production network into a manageable technical framework, the Production Area has been separated into six distinct sectors (Figure 3-1). The principal criteria used for sectioning the Production Area centered on the types of operations associated with the principal plants and the types of chemicals handled or stored. It is noteworthy, however, that the designated sectors also closely correspond with the principal surface water drainage systems in the Production Area. The six sectors can be referenced to the following principal facilities and operations:

- Sector 1 (Plants 4, 5, 6, and 7) - Principal processes include metals production, fabrication, and machining;

Figure 3-1 (see back pocket)

- Sector 2 (Plants 2/3, Plant 8, and General Sump) - Principal processes include uranium digestion in the refinery, uranium recovery and oxidation, and water/wastewater treatment;

- Sector 3 (Pilot Plant and Laboratory) - Principal activities include uranium reduction (UF_6 to UF_4), various types of pilot-scale operations, and sample testing and analysis;

- Sector 4 (Plant 9, D&D Facility, Maintenance Building, and Metal Scrap Pile) - Principal activities include special uranium products casting, thorium processing, decontamination and decommissioning of equipment, equipment maintenance, and metal scrap storage;

- Sector 5 (Plant 1 and Drum Storage Pad) - Principal activities include materials sampling, analysis, and storage; and

- Sector 6 (Main Substation and Garage) - No processing activities involved; activities limited to the central distribution station for petroleum products, vehicle maintenance, and the plant electrical substation.

The numbering of the sectors reflects the prioritization placed on each sector in terms of its overall potential for environmental release and subsurface contamination. As such, the numbering also represents the proposed sequencing of the investigations. The selection of the metals production and fabrication facilities as the highest priority sector is the result of the recently documented problems underlying Plant 6 and the elevated levels of uranium observed in monitor well 1054. In the case of the remaining five sectors, the prioritization and sequencing better reflects a sectorwide evaluation of potential contamination, although the associated concerns are typically centered in one or two facilities within each sector.

The following sections will present the proposed testing program for each sector. The discussion will deal primarily with the focused soil boring program and monitor well program due to the site-specific justification for each proposed activity. Table 3-1 lists the wells that will be installed by sector and indicates the facility for which they are being installed. The systematic boring program is straightforward and requires no further explanation unless an exception to the grid-based program is particularly noteworthy.

All focused boring and well locations presented in the following sections are based on the input received from WMCO's facilities task force. The locations are approximate; refinement will likely be necessary in the field to allow for access underground utilities and to optimize the locations in relation to the study objectives.

The individual sector testing programs will call for a variety of analyses. Table 3.2 lists the analytical groups and the parameters that are included in each group. These groups are the same as those used in the RI/FS investigation.

TABLE 3-1

2000 - SERIES WELLS

SECTOR	FACILITY
1	Plant 6
1	Plant 6
1	Plant 6
2	Plant 2/3
2	Raffinate Processing
3	Pilot Plant

TABLE 3-2
ANALYTICAL PARAMETERS

ANALC'L GROUP	ANALYTICAL PARAMETERS	VOLUME, CONTAINER	PRESERVATION
WATER	HSL		
	• HSL Organics		
	- Volatiles	2-40 ml vial (with teflon septum cap)	Cool 4° C
	• Semivolaties	4 liter, amber glass (with teflon-lined cap)	Cool 4° C
	• HSL Inorganics		
	- Metals (plus Molybdenm)	2-1 liter, plastic	HNO_3, pH<2 filtered
	- Mercury	500 ml, glass	HNO_3, pH<2
	- Cyanide	1 liter, plastic	Cool 4° C NaOH, pH>12
	Full HSL is the above and:		
	• HSL Pesticides/PCB	4 liter, amber glass (with teflon-lined cap)	Cool 4° C None
	HSL+ is all the above and:		
	• Organophosphorus Pesticides		
	• Dioxin, Furans		
SOIL	Same as for Water	500 ml, glass wide-mouth jar with teflon lid liner	None
WATER	Full Radiological		
	• Total Uranium	4 liter plastic	HNO_3, pH<2
	• Isotopic Uranium		
	• Isotopic Plutonium		
	• Radium-226		
	• Radium-228		
	• Neptunium-237		
	• Total Thorium		
	• Isotopic Thorium		
	• Technetium-99		
	• Cesium-137		
	• Strontium-90		
	• Ruthenium-106		
SOIL	Same as Water	500 ml, glass or plastic container	None

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3.2 SECTOR 1 - TESTING PROGRAM

Sector 1 consists of several facilities in the east-central portion of the Production Area. The principal facilities include the Green Salt Plant (Plant 4), the Metals Production Plant (Plant 5), the Metals Fabrication Plant (Plant 6), and the uranium hexachloride reduction facility, Plant 7. Plant 7 is currently used for product storage. Each of these plants is associated with uranium production, fabrication, and machining operations. From an environmental standpoint, the common denominator among these facilities is the predominance of insoluble, solid forms of uranium. Only small amounts of other chemicals are handled in this sector. Sector 1 would, therefore, represent a low environmental release potential on a sectorwide basis. One exception to this scenario is the presence of nitric acid pickling operations that result in the formation of uranyl nitrate. The investigation of Plant 6 was conducted because of the presence of these pickling operations.

The proposed Production Area testing program for Sector 1 is presented in Figure 3-2. In addition to 22 systematic borings along the 250 foot grid pattern, the investigation will include three 2000-Series monitor wells and 23 focused soil borings near facilities of particular concern. One monitor well will be added to the existing 1000-Series and 3000-Series wells at Location 54. As indicated in Figure 3-2, wells 2118 and 2109 will be located downgradient from the two known problem areas associated with Plant 6. These wells will be installed outside the eastern and southern exterior walls of the plant buildings as shown in Figure 3-2.

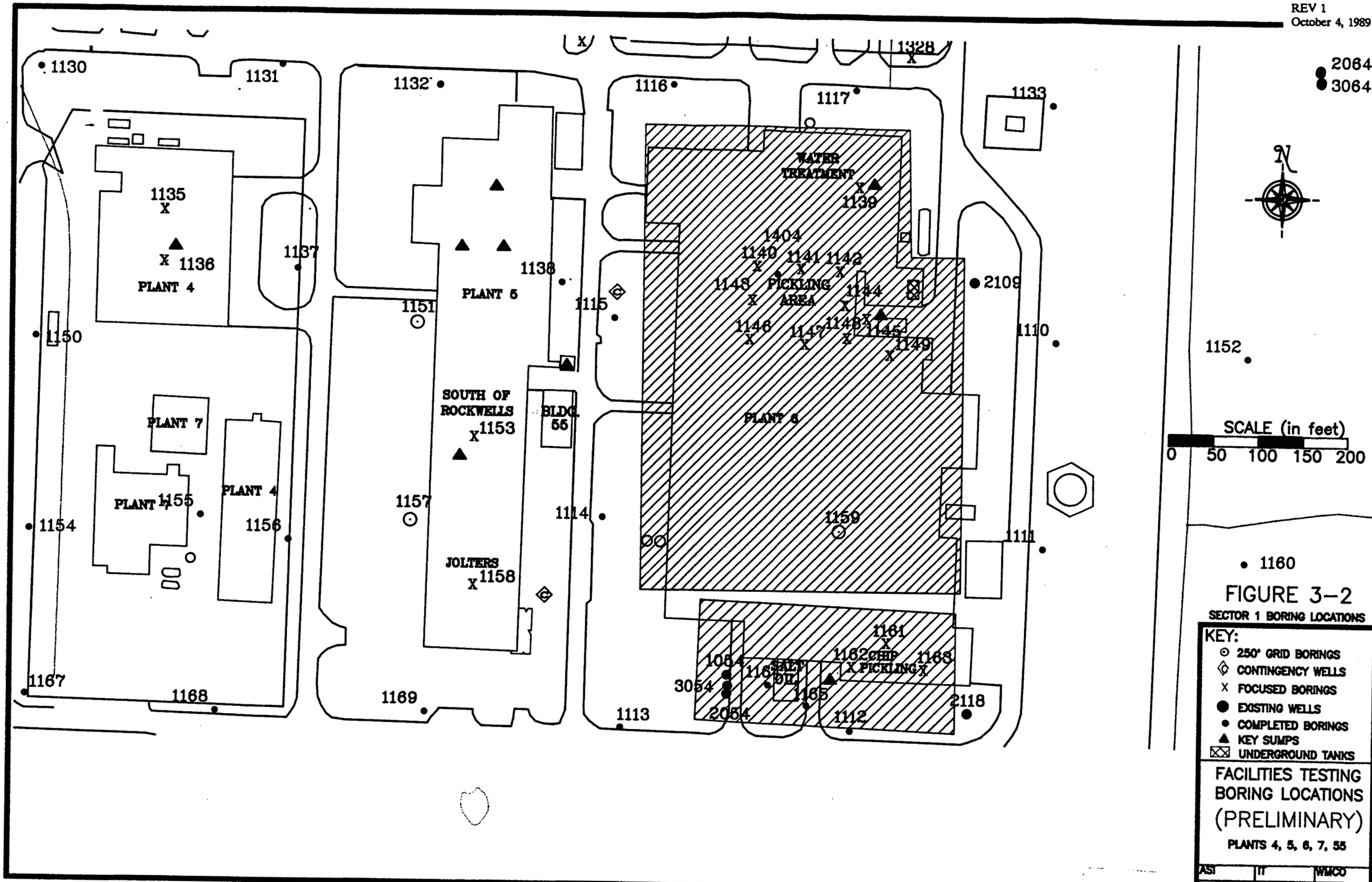

FIGURE 3–2
SECTOR 1 BORING LOCATIONS

KEY:
- ⊙ 250' GRID BORINGS
- ◇ CONTINGENCY WELLS
- X FOCUSED BORINGS
- ● EXISTING WELLS
- • COMPLETED BORINGS
- ▲ KEY SUMPS
- ⊠ UNDERGROUND TANKS

FACILITIES TESTING BORING LOCATIONS (PRELIMINARY)

PLANTS 4, 5, 6, 7, 55

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DATE – 09/22/89		

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The two known areas of contamination associated with Plant 6 are believed to be associated with the two pickling areas in the plant. There is a known occurrence of uranium entering the storm sewer that runs along the south side of Plant 6 in the late 1970's. The apparent source of this uranium was the sump inside Plant 6 in the Chip Pickling Area. Reportedly, when the sump was repaired and sealed the leakage of uranium into the sewer stopped. The biased and grid borings along the southern portion of Plant 6 are to investigate the area affected by this leakage.

The second area was discovered in July of 1988 during the modernization of the pickling area in the north central part of the plant. Water containing uranyl nitrate apparently entered the perched ground water either through spillage or overflow of the sump, or because the floor was used as a conveyance mechanism under the belief that the acid bricks prevented leakage. Ground water is currently being drained from the area through a hole in the wall of a below grade sump near the process equipment room. The square pattern of focused borings in the north central part of Plant 6 is expected to encompass the impacted area. Thorium operations in Plant 6 were limited to an area near the eastern entrance in the center of the plant. Consequently, the monitor well located near this entrance is in close proximity to the site of the thorium operations. The placement of well 2054 was selected because both the 1000- and 3000- series wells at that location contained elevated levels of uranium. This 2000-series well would help determine if the uranium in the 3000-series was entering the area laterally from other sources or vertically from contamination in the till.

If elevated levels of uranium are found in any of the 2000 series wells to be installed around Plant 6, an upgradient well will be installed to determine if the source is Plant 6 or further upgradient. Figure 3-2 shows the location of the two upgradient contingency wells. The decision to install a contingency well will be made on the basis of results from the initial samples from the 2000 series wells. The results from sampling the contingency well will be used to evaluate whether the source is indeed in Plant 6 or further upgradient. In either case, a new work plan to complete the investigation of that area will be written and submitted as an addendum before any further investigation is conducted.

Two of the 23 focused borings are located in the drainage in Sector 1. The drainage consists of a linear shallow depression along the roadway in which rainwater collects and is directed to the storm water sewer system. It is for this reason that the drainage is a candidate for sampling. No unusual activity or known spill is involved. In Plants 4 and 5, single borings will be advanced through the building floors near subgrade sumps. Building 55, the Slag Recycling Plant, was used for slag milling and involved only the dry processing of magnesium fluoride. The nature of this operation is not conducive to the release of soluble forms of uranium, and thus no focused borings are necessary in relation to this portion of Sector 1. Borings along the drainage east of Building 55 will test for the accumulation of fugitive dust releases from this operation. Three groupings of borings will be installed in Plant 6. Eight borings will be placed in the cardinal directions Figure 3-2 around a pickling operation where elevated levels of uranium have been found in the underlying soils and perched ground water. Several additional borings will be placed near adjacent

transfer lines, and a systematic boring will be utilized to monitor conditions near the southern end of Plant 6. A set of three borings will be installed around a sump suspected to have leaked in the chip pickling area. Two borings will be installed on opposite sides of a salt storage facility where ground staining has been observed.

Due to the nature of the operations in Sector 1, the analytical parameter of concern is uranium. One exception is that the top two samples from soil borings 1164 and 1165, near the salt storage facility, will be analyzed for HSL organics and PCBs due to the possible presence of used machining or cutting oils. Table 3-3 lists the borings and types of analysis.

3.3 SECTOR 2 - TESTING PROGRAM

The facilities included in Sector 2 lie immediately to the west of Sector 1. Included in Sector 2 are the Refinery (Plant 2/3), the Recovery Plant (Plant 8), and the General Sump. This sector is distinguished by acid-based chemical processing operations, resulting in the handling of the vast majority of the uranium in soluble forms within the FMPC. The hot raffinate process used for the extraction of K-65 ores during the early years of plant operation is also located in Sector 2, thereby creating the potential for historic radium releases. The processing and storage of thorium materials are associated with Plant 8. Inorganic chemicals such as lime and sodium chloride are typically used in the water and wastewater treatment operations, and various chemicals, principly nitric acid and sodium hydroxide, are stored in above-grade tanks within the area.

TABLE 3-3

SECTOR 1 ANALYSIS SCHEDULE

BORINGS TYPE OR LOCATION	NUMBER OF BORINGS	SPECIAL AREA	NUMBER OF ANALYSES: TOTAL TH / TOTAL U	FULL RAD	FULL HSL	HSL +	PCB's	NITRATE	TRIBUTAL PHOSPHATE
SYSTEMATIC	22	SOIL SAMPLES	132						
FOCUSED	21		126						
	2	SALT STORAGE	8		4		4		
		WATER SAMPLES							
PIEZOMETERS (50% OF BORINGS)	23		23				23		
WELLS	3			3	3				
TOTALS	71		289	3	7		4	23	

The overall conditions in Plant 2/3, in particular the dominance of uranyl nitrate and concentrated acidic solutions, represent the greatest potential in comparison with other sectors for the release of uranium and other radionuclides to the environment. Figure 3-3 summarizes the proposed testing program for Sector 2. Systematic soil borings will be advanced at 16 locations. Wells 2006 and 2007 will also be installed in Sector 2. These wells will be located on the downgradient eastern side of both Plant 2/3 and the hot raffinate process building. Note that these same wells will serve a dual purpose as upgradient wells for Sector 1 and, in particular, Plant 6. These wells are suitable as upgradient wells for Plant 6 because the facilities that lie between the wells and Plant 6 handle materials that are in a dry form of insoluble uranium compounds. If ground water contamination is found to be associated with these facilities, further investigation will be necessary to determine if an intermediate source of contamination to the aquifer exists. The plan does show the location of contingency wells on the upgradient side of Plant 6. If the wells on the downgradient side of Plant 6 show contamination, these wells will be installed in order to confirm that the problem is at Plant 6 and not from further upgradient.

The general sump principally consists of aboveground tanks. The sump processes waste water with relatively low levels of uranium as compared to the liquids handled in the Raffinate Area and Plant 2/3 where uranium is digested. Wells 2006 and 2007 have thus been placed downgradient of the facilities that pose the greatest risk to the environment. If these wells show contamination, then additional wells will be considered for the area. In addition, the presence of overhead piping prevents

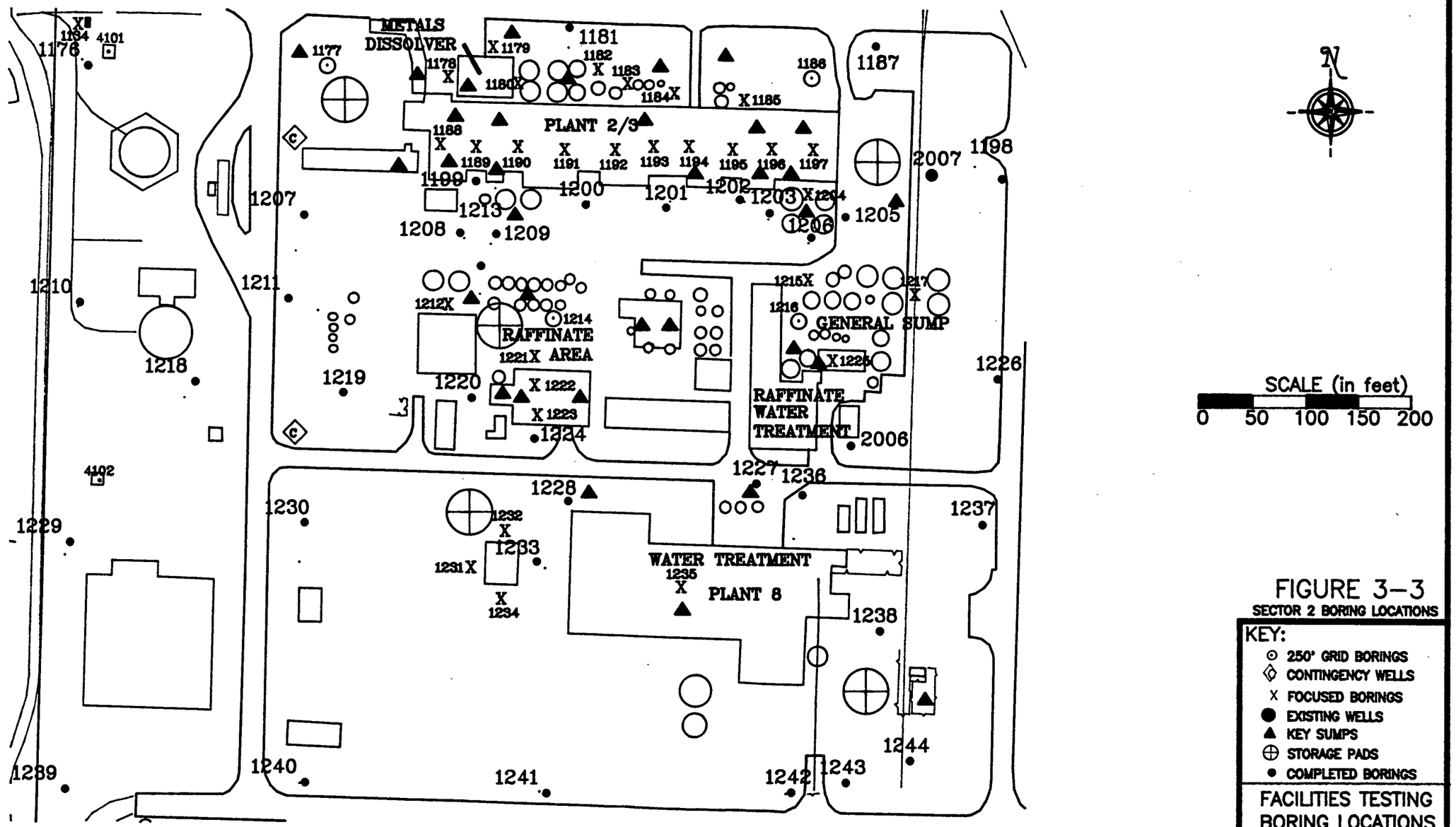

FIGURE 3-3
SECTOR 2 BORING LOCATIONS

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the installation of a well on the east side of the general sump. The well would have to be placed on the east side of the north-south roadway where a grid boring is already located. Data from that grid boring will be used to determine if it is necessary to add a 2000-series well in the area.A total of 54 focused soil borings will be installed throughout Sector 2 as shown in Figure 3-3. This large number of borings is indicative of the multitude of potential release points in the general area of the refinery. Seven of these borings are located within drainages and two are located along the transfer line from the raffinate building to the K-65 silos. Six borings are located at the lowest point of drainage from storage pads. As indicated in Figure 3-3, approximately 20 borings are positioned near various types of above-grade storage tanks and associated sumps. Many of these latter boring locations are also part of boring sequences to be systematically placed along the exterior walls of Plant 2/3, the raffinate process building, and the metal dissolver building. Borings 1178 through 1180 are placed around the metals dissolver building. The top two soil samples and any water samples collected from these borings will be analyzed for uranium and tributyl phosphate. Four borings are also proposed around the exterior of a small maintenance shop near Plant 8. All soil samples collected for analysis from the nine borings in the vicinity of Plant 8 will be analyzed for thorium and uranium.

Focused borings through the floors of four buildings are proposed. Single borings near sumps are proposed in Plant 8 and in the General Sump building. In the hot raffinate building, borings will be advanced at two locations accessible to the drilling equipment. In Plant 2/3, ten borings will be advanced at equal distances along the

central corridor. It is believed that sufficient access will be available only along this open corridor. If access is possible to the north or south of this corridor, a portion of the borings will be relocated to preferred locations. The metals dissolver building is considered to be inaccessible to drilling equipment.

All samples will be analyzed for total uranium. Because thorium was processed in the west end of Plant 8, soil samples collected from the three borings near the east end of Plant 8 will be analyzed for the full set of radionuclides parameters. The results of the on-site analyses for total uranium will be used as a guide to select other soil samples for full radiological analysis. All ground water samples from the two wells will be analyzed for the full set of radiological parameters and full HSL organics and inorganics.

Other special analyses to be performed on the soil and ground water samples from Sector 2 will vary by location. Special analyses include:

- Total HSL, including PCBs and TBP, from two locations in the tank and drum storage area to the southeast of Plant 2/3 at borings 1203 and 1206;

- Full radiological from all locations within and adjacent to Plant 8, including the associated drainageways; Figure 3-3 identifies borings 1231 - 1236, 1238, 1227, and 1228.

- Full radiological from all locations associated with the hot raffinate process building, including the transfer line borings 1211 through 1214 and 1218 through 1224; and

- Tributyl phosphate, (TBP) and full HSL organics from borings 1182 and 1183 adjacent to the kerosene storage tanks north of Plant 2/3.

These analyses will be conducted on the top two samples from each boring. Deeper samples will be analyzed for total uranium. Table 3-4 summarizes the number of analyses to be performed.

TABLE 3-4

SECTOR 2 ANALYSIS SCHEDULE

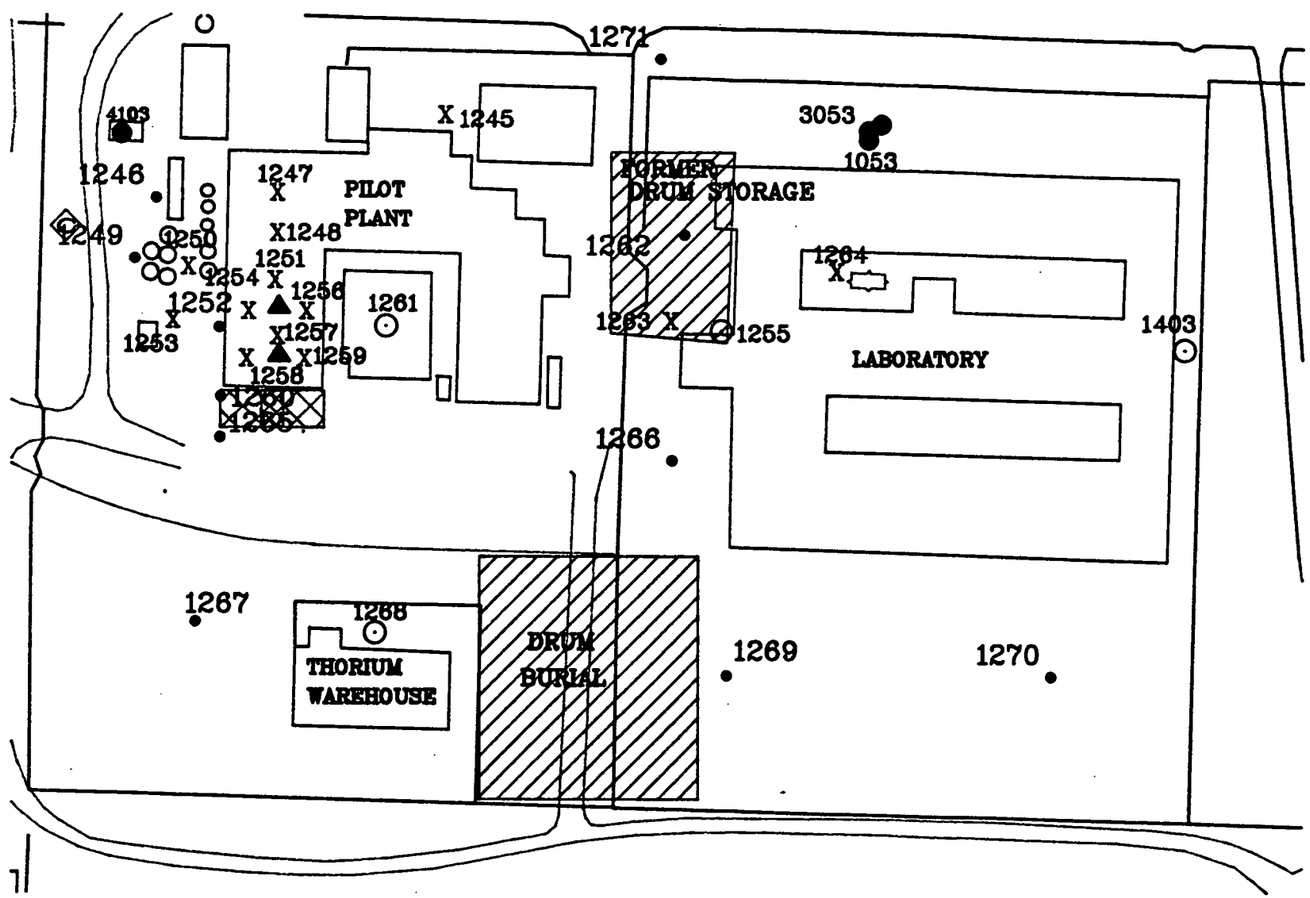
BORINGS TYPE OR LOCATION	NUMBER OF BORINGS	SPECIAL AREA	NUMBER OF ANALYSES: TOTAL TH TOTAL U	FULL RAD	FULL HSL	HSL +	PCB's	NITRATE	TRIBUTAL PHOSPHATE
		SOIL SAMPLES							
SYSTEMATIC	13		78						
	2	PLANT 8	8	4					
	1	RAFFINATE BUILDING	4	2					
FOCUSED	28		168						
	3	EAST END PLANT 8	12	6					
	2	SOUTHEAST PLANT 2/3	8	4		4		4	
	10	PLANT 8	40	20					
	9	RAFFINATE BUILDING	36	18					
	2	NORTH OF PLANT 2/3	8	4	12			12	
		WATER SAMPLES							
PIEZOMETERS (50% OF BORINGS)	35		35				35		
WELLS	2			2	2				
TOTALS	107		397	62	14		4	35	16

3.4 SECTOR 3 - TESTING PROGRAM

Sector 3, located in the southwest corner of the Production Area, consists principally of the pilot plant and the laboratory. Each of these facilities is associated with a wide variety of related operations and material types. The pilot plant was originally used for the pilot testing of plant operations prior to start-up and continues today as the center for process optimization studies. In terms of potential environmental release and contamination, it singly represents the most complex unit at the FMPC due to the multitude of processes performed and radioactive materials and chemicals handled. Some thorium storage also occurs near the pilot plant.

The proposed investigation of Sector 3 includes 6 systematic soil borings, 22 focused soil borings, and one 2000-Series well. Each is shown in Figure 3-4. The single well will be added to the cluster Wells 1053 and 3053. It is positioned in sufficient proximity to the eastern side of the pilot plant to serve as a downgradient well for the facility. The water table gradient in 2000-series wells in the area of the Pilot Plant is to the east northeast, therefore, the location of this well serves to both complete the cluster and provide a monitoring point down gradient of the Pilot Plant. If there is contamination in the till under or near the Pilot Plant, an additional 2000-series well will be considered and its location will be based on the location of contamination in the till as well as the water table in the till. A single contingence well site is located west of the Pilot Plant.

With reference to Figure 3-4, approximately one-half of the proposed focused borings are positioned either within drainages or in close proximity to above-grade tanks near



SCALE (in feet)
0 50 100 150 200

FIGURE 3–4
SECTOR 3 BORING LOCATIONS

KEY:
- ⊙ 250' GRID BORINGS
- ◇ CONTINGENCY WELLS
- X FOCUSED BORINGS
- ● COMPLETED BORINGS
- ⊠ UNDERGROUND TANKS
- ▨ SUSPECT AREAS
- ▲ KEY SUMPS

FACILITIES TESTING
BORING LOCATIONS
(PRELIMINARY)
PILOT PLANT
LABORATORY
THORIUM WAREHOUSE

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the pilot plant. Within the pilot plant, a series of eight borings will be advanced through the building floor. Several additional borings will be located in two areas immediately west of the laboratory. In the area where waste solvent drums were stored at the west end of the laboratory the top two samples will be analyzed for full HSL including PCBs/pesticides even if there is no elevated reading on the HNu. Samples will also be collected for full radiological analysis. The only soil boring proposed for the interior portions of the laboratory will be located adjacent to the main sump.

The top two soil samples from borings within and adjacent to the pilot plant will be analyzed for the full radiological analysis. The top two soil samples from borings 1249, 1252, and 1260 will be analyzed for extended HSL analyses. Soil samples that register on the HNu will be forwarded to the laboratory for full HSL analysis. All ground water samples from the pilot plant area, including samples from the new Well 2053, will be analyzed for the full set of radiological parameters and the full HSL parameters including PCB's. If piezometers are installed in the vicinity of the pilot plant, at least one ground water sample will also undergo full HSL analysis. This sample will be selected in the piezometer with the highest HNu reading or if the HNu fails to detect anything the most down gradient piezometer will be sampled. In the vicinity of the laboratory, the top two soil samples from boring 1266 will be analyzed for the full set of HSL parameters. For all other borings, the top two soil samples will be tested for the full set of radiological parameters. Total uranium will be measured in other samples. Table 3-5 summarizes the borings and analyses for Sector 3.

TABLE 3-5

SECTOR 3 ANALYSIS SCHEDULE

BORINGS TYPE OR LOCATION	NUMBER OF BORINGS	SPECIAL AREA	NUMBER OF ANALYSES: TOTAL TH TOTAL U	FULL RAD	FULL HSL	HSL +	PCB's	NITRATE TRIBUTAL PHOSPHATE
		SOIL SAMPLES						
SYSTEMATIC	4		24					
	1	PILOT PLANT	4	2				
	1	LABORATORY	4	2				
FOCUSED	16	PILOT PLANT	64	32	3			
	1	SOUTH WEST OF LAB.	4		2			
	5	LABORATORY AREA	20	10				
		WATER SAMPLES						
PIEZOMETERS (50% OF BORINGS)	15		15		1		15	
WELLS	1			1		1		
TOTALS	43		135	47	6		1	15	

3.5 SECTOR 4 - TESTING PROGRAM

Sector 4 is located in the northeast corner of the Production Area. It includes a wide variety of facilities, including the Special Products Plant (Plant 9), the D&D facility, the former drum baling area, the maintenance building, the metal scrap pile, and buildings 64 and 65 which are the principal warehouses for the drummed thorium inventory. The drum baling area and the nearby trench located within Sector 4 have been investigated and are not included in the proposed testing program. Appendix B contains the work plan for investigating the drum baling area.

In general, the operations in Sector 4 involved insoluble forms of uranium. A particular aspect of Plant 9 was the handling of slightly enriched uranium products and thorium. Machine oils and solvents are a special concern in the vicinity of the maintenance building.

As depicted in Figure 3-5, a total of 59 soil borings are proposed throughout Sector 4. These include 26 systematic borings and 33 focused borings. The focused borings directly correspond to individual facilities. In particular, four borings will be placed in the principal quadrants around each of the following:

- A sump in the tank farm in the southwest corner of Sector 4;
- The area that includes both the abandoned oil burner and the graphite burner;
- The metal scrap pile area; and
- Building 64/65 warehouses.

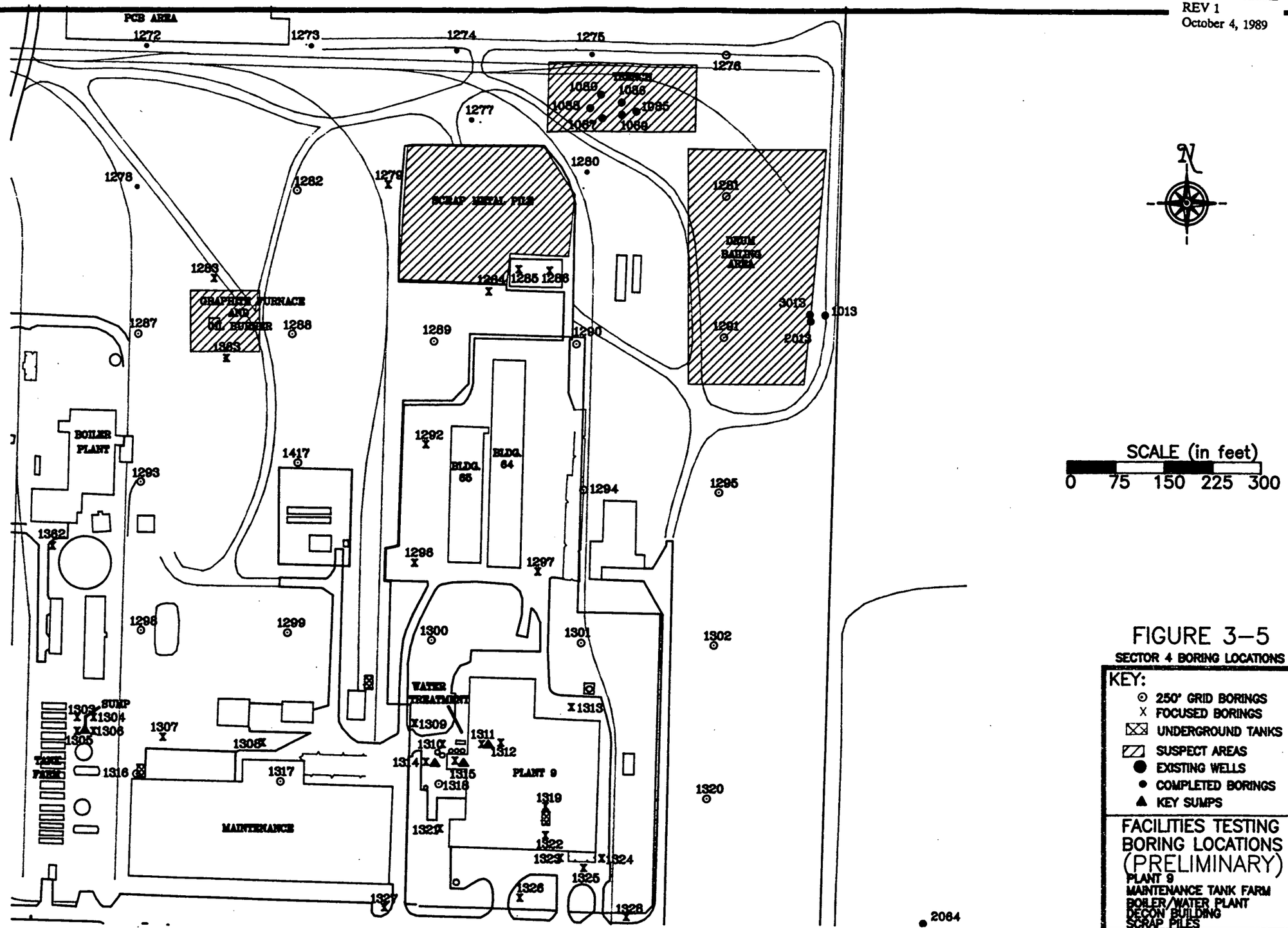

FIGURE 3–5
SECTOR 4 BORING LOCATIONS

KEY:
- ⊙ 250' GRID BORINGS
- X FOCUSED BORINGS
- ⊠ UNDERGROUND TANKS
- ▨ SUSPECT AREAS
- ● EXISTING WELLS
- • COMPLETED BORINGS
- ▲ KEY SUMPS

FACILITIES TESTING
BORING LOCATIONS
(PRELIMINARY)
PLANT 9
MAINTENANCE TANK FARM
BOILER/WATER PLANT
DECON BUILDING
SCRAP PILES

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Near the maintenance shop, three borings will be located within the principal drainages. Two borings will also be located within the D&D facility. At Plant 9, borings will be advanced in drainageways and near above-grade tanks. Five borings will also be installed within Plant 9. Specific locations include the main entrance way, in the area of the Zirnlo process, and near sumps.

In addition to total uranium, the following samples will undergo special analyses:

- The top two samples from borings 1318, 1310 through 1315, 1319 and 1321 through 1326 within and adjacent to Plant 9 will undergo full radiological analysis;

- For borings 1292, 1294, 1296 and 1297 near Building 64/65, the top two samples from each boring will be analyzed for full radiological analysis;

- The top two soil samples from borings 1316, 1217, 1307, 1308, and 1327 near the maintenance building will undergo a full HSL analysis, including PCBs; and

- The top two samples from borings 1283, 1287, 1288 and 1363 around the oil burner and graphite furnace areas will be analyzed for full HSL and PCBs including dioxin and furan analysis. It may be necessary to collect additional material using hand augers adjacent to the boring to collect sufficient material for all these analyses.

Table 3-6 summarizes the borings and analyses for Sector 4.

3.6 SECTOR 5 - TESTING PROGRAM

Sector 5, located in the northwest quadrant of the Production Area, includes the Sampling Plant (Plant 1) and the associated drum storage pad. The activities in this

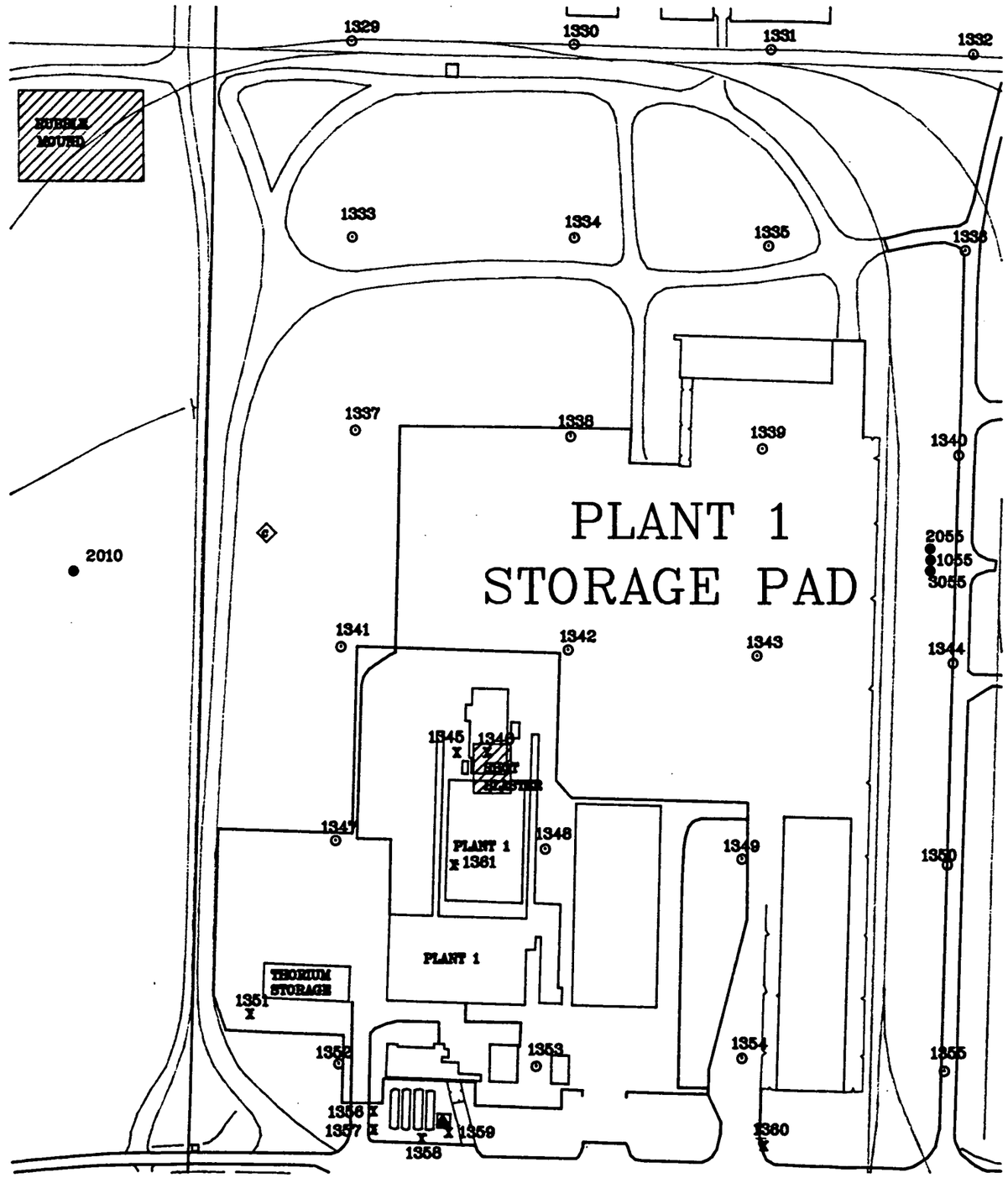
TABLE 3-6

SECTOR 4 ANALYSIS SCHEDULE

BORINGS TYPE OR LOCATION	NUMBER OF BORINGS	SPECIAL AREA	NUMBER OF ANALYSES: TOTAL TH TOTAL U	FULL RAD	FULL HSL	HSL +	PCB's	NITRATE TRIBUTAL PHOSPHATE
		SOIL SAMPLES						
SYSTEMATIC	20		120					
	2	OIL & GRAPHITE BURNER	8		4		4	
	1	BUILDING 64/65	4	2				
	1	PLANT 9	4	2				
	2	MAINTENANCE	8		4		4	
FOCUSED	11		66					
	2	OIL & GRAPHITE BURNER	8			8		
	3	BUILDING 64/65	12	6				
	3	MAINTENANCE	12		6		6	
	14	PLANT 9	56	28				
		WATER SAMPLES						
PIEZOMETERS (50% OF BORINGS)	30		30				30	
WELLS								
TOTALS	89		328	38	14	8	14	30

sector have generally been limited to the sampling and analysis of incoming materials and the storage of residues and other materials awaiting off-site shipment. An area surrounding the abandoned shot blaster in Plant 1 was previously identified as a suspect area due to the potential for residual lead contamination.

The proposed testing program for Sector 5, is illustrated in Figure 3-6. The systematic boring program will be utilized for the evaluation of the drum storage pad and adjacent areas. There are 24 systematic and nine focused soil borings proposed. Four of the focused borings are located near the uranyl nitrate storage tanks. Two other borings are positioned within drainages. The two borings will be located inside and outside of the building that encloses the lead shot blaster. A single 2000-Series well is also proposed for Sector 1. The principal purpose of this well is to complete the three-well cluster at Location 55 to effectively monitor any releases from the Plant 1 drum storage pad. A single contingency well is sited on the west side of the drum storage pad. The data from the borings and piezometers will be analyzed to determine if additional 2000-series wells should be installed in the area. All samples collected in Sector 5 will be analyzed for total uranium and total thorium. In addition, the top two samples from the westernmost boring near the thorium storage area will be analyzed for full radiological analysis. The top two soil samples from borings 1345 and 1346 near the drum shot blaster will be analyzed for the HSL metals. Table 3-7 summarizes the analyses for Sector 5.



SCALE (in feet)
0 75 150 225 300

FIGURE 3-6
SECTION 5 BORING LOCATIONS

KEY:
- 250' GRID BORINGS
- 2000 SERIES WELLS
- CONTINGENCY WELLS
- X FOCUSED BORINGS
- SUSPECT AREAS
- EXISTING WELLS
- KEY SUMPS

FACILITIES TESTING
BORING LOCATIONS
(PRELIMINARY)
PLANT 1 AND
STORAGE AREA

ASI	IT	WMCO
DATE – 09/22/89		

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TABLE 3-7

SECTOR 5 ANALYSIS SCHEDULE

BORINGS TYPE OR LOCATION	NUMBER OF BORINGS	SPECIAL AREA	NUMBER OF ANALYSES: TOTAL TH TOTAL U	FULL RAD	FULL HSL	HSL +	PCB's	NITRATE	TRIBUTAL PHOSPHATE
		SOIL SAMPLES							
SYSTEMATIC	24		144						
FOCUSED	6		36						
	1	THORIUM STORAGE	4	2					
	2	SHOT BLASTER	8		4				
		WATER SAMPLES							
PIEZOMETERS (50% OF BORINGS)	16		16				16		
WELLS	1			1	1				
TOTALS	49		208	3	5		16		

3.7 SECTOR 6 - TESTING PROGRAM

Sector 6 is located in the southeast corner of the Production Area. This sector includes the main substation and the garage (Figure 3-7), neither of which is directly involved with production operations and uranium handling. The principal concerns are the potential presence of PCB-laden dielectric oils in the transformer area and petroleum tanks buried near the garage. The latter case is being investigated under the underground storage tank (UST) program and doesn't need to be considered in this plan.

One piezometer will be installed next to the underground tanks adjacent to the garage. The six soil samples from this boring will be analyzed for HSL organics. This piezometer will be used in the testing of these tanks. A water sample from the piezometer will be analyzed for HSL volatile and semivolatile organic compounds.

The substation will be investigated by a series of ten 18-inch deep soil borings made with hand augers in any areas of visible soil staining. The six-inch surface soil sample from each sampling location within the substation will be analyzed for PCBs. The remaining samples for the intervals 6 to 12 and 12 to 18 inches will be archived for possible later analysis. In the event that there are no stained areas to bias the boring location, the borings will be made on a systematic grid. Three systematic borings are located in Section 6. Table 3-8 summarizes the analyses for Sector 6.

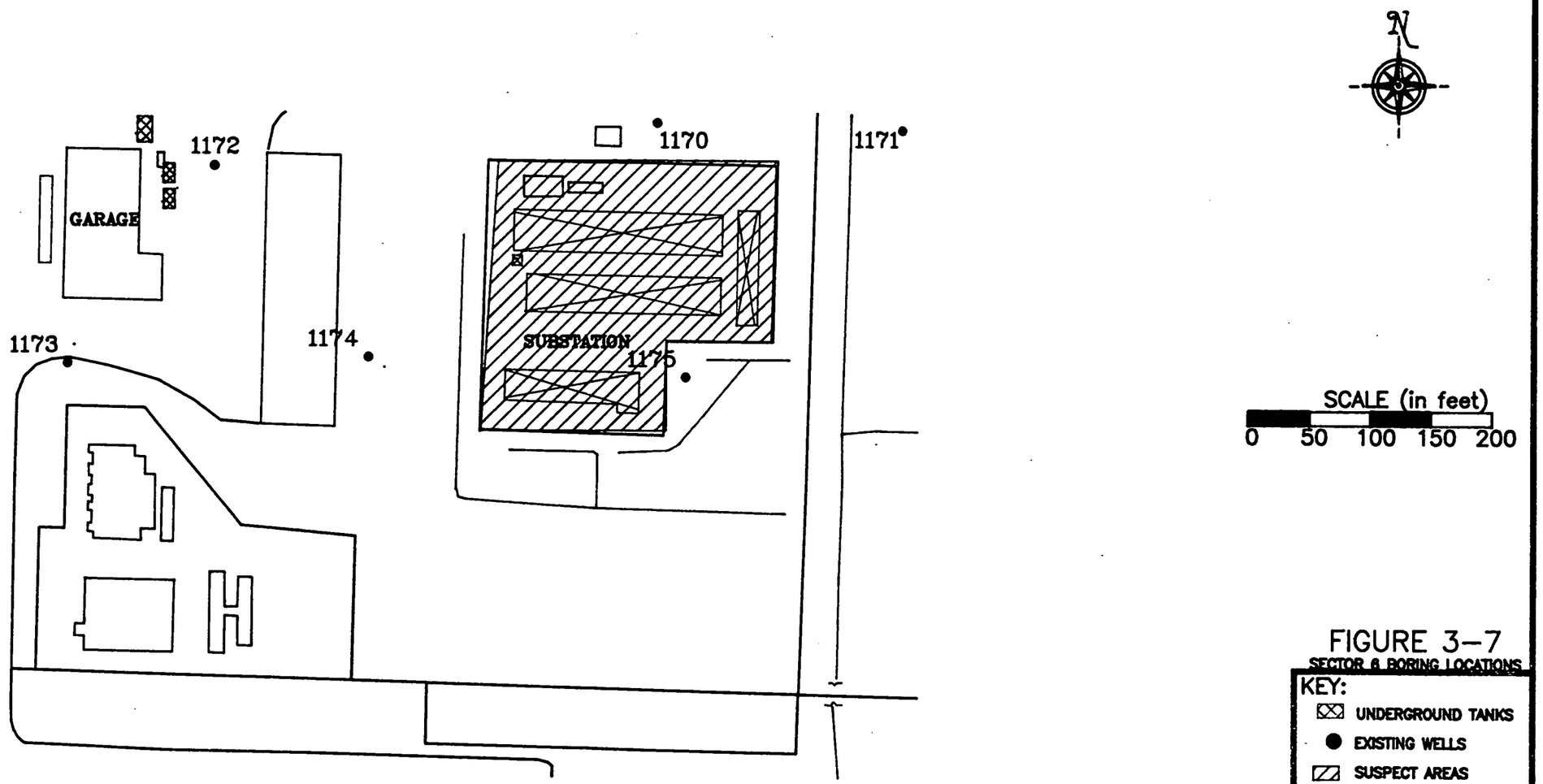

FIGURE 3-7
SECTOR 6 BORING LOCATIONS

KEY:
- UNDERGROUND TANKS
- EXISTING WELLS
- SUSPECT AREAS

FACILITIES TESTING
BORING LOCATIONS
(PRELIMINARY)

SUBSTATION
GARAGES

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ASI	IT	WMCO
DATE - 09/22/89		

TABLE 3-8

SECTOR 6 ANALYSIS SCHEDULE

BORINGS TYPE OR LOCATION	NUMBER OF BORINGS	SPECIAL AREA	NUMBER OF ANALYSES: TOTAL TH TOTAL U	FULL RAD	FULL HSL	HSL +	PCB's	NITRATE TRIBUTAL PHOSPHATE
		SOIL SAMPLES						
SYSTEMATIC	3		18					
FOCUSED	1	FUEL TANKS	6		6			
HAND AUGER	10					10		
		WATER SAMPLES						
PIEZOMETERS (50% OF BORINGS)	1		1		1		1	
WELLS								
TOTALS	14		25		7		10	1

3.8 WATER TOWER AREA SAMPLING

In 1988 the two water towers were sandblasted in preparation for painting. Sampling is required to determine if surface contamination by lead is present as a result of the sandblasting. Four surface samples will be collected in the area of the base of each water tower. A second sample will be collected at each of these eight locations at a depth of six to twelve inches. All sixteen samples will be analyses by ICP for metals including lead. A comparison will be made between the surface and subsurface sample to determine if the residues from the sandblasting have been removed. Given the poor permeability of the soils and the fact that the lead should have been bound in the paint this will be a valid determination of the impact of the sandblasting. In the event that high levels of lead are found in both the surface and subsurface samples an additional sampling program will have to be developed.

4.0 SPECIAL FACILITIES WITHIN THE PRODUCTION AREA

Four types of special facilities represent exceptions to the general investigation program within the Production Area. These special facilities are the underground tanks, below-grade piping, the main effluent line from the clearwell to Manhole-175, and the abandoned drum buried area southwest of the laboratory. Individual testing plans for the examination of each of these special facilities are presented in this chapter of the Production and Additional Suspect Areas Work Plan.

4.1 UNDERGROUND STORAGE TANKS

The current WMCO plan calls for the removal, or closure in place of all but four underground storage tanks, in accordance with U.S. EPA and Ohio Fire Marshal regulations. Three of the remaining underground tanks are for diesel fuels and gasoline and will be tested using the Petro Tite method. The fourth tank is located in Plant 9. This 5,000-gallon tank is better described as a steel-lined sump than as a tank. It is oriented with its long axis vertical. The top of the tank is open, with removable floor plates covering the open end of the tank. This tank cannot be tested using the Petro Tite method, as there is no way to impose a head greater than the top of the tank. An alternate testing method is under consideration for this unusual tank arrangement. Borings are being placed on two-sides of the tank in the Sector 4 investigation.

4.2 BELOW-GRADE PIPING

The intent of the investigation of the below grade lines is to determine if there is infiltration into the system or the possibility that the lines have leaked to the environment. To that end, the boring program presented in Section 3 of this plan will determine the presence or absence of water bearing zones within the till that would influence infiltration to the below grade lines.

The below-grade lines of the FMPC are a combination of gravity and pressure lines and are described in the Spill Prevention Control and Countermeasure (SPCC) Plan. Several maps and drawings showing the locations and engineering specifications of the below-grade lines are available through DOE. Lengths of the buried lines in the storm sewer system which drain to MH-34 were approximated from FMPC Drawings Nos. 22X-5500P-00537 and 22X-7000P-00068 and are shown in Table 4-1. Figure 4-1 and Figure 4-2 (located in pockets in the back) show the roadways and underground piping for the site. It is anticipated that the combination of the systematic and focused borings for Sectors 1 through 6 will determine whether or not these lines are the source of any environmental problems. The intent is to review the results of these boring programs along with the piping maps and determine whether or not specific testing is required. Such testing will be presented as an addendum to the Work Plan.

4.3 LINE FROM CLEARWELL TO MH-175

Treated process wastewater was previously discharged through a process effluent line from the Clearwell to MH-175. The line now carries only excess surface water runoff

in those cases where the Clearwell overflows. The flow is eventually discharged from MH-175, along with other surface water and treated wastewater to the Great Miami River.

TABLE 4.1
PIPING FOR STORM WATER SEWER SYSTEM
FACILITIES TESTING PLAN - FMPC SITE

TYPE OF PIPE	ORIGIN LOCATION/ LOCATION NUMBER[a]	TERMINATION LOCATION[a]	LENGTH (ft)
Collectors			
	MH-1	MH-6	1,300
	MH-4	MH-6	1,100
	MH-7	Lateral	500
	MH-8	MH-10	650
	MH-6	MH-10	200
	MH-10	MH-11	300
	MH-55	MH-56	400
	MH-54	MH-53	400
	MH-51	MH-62	750
	MH-52	MH-62	300
	MH-62	MH-53	200
	MH-53	MH-56	100
	MH-56	MH-57	500
	10	MH-57	400
	20	MH-58	300
	MH-57	MH-58	250
	MH-58	MH-21	450
	MH-50	MH-60	650
	12	MH-61	400
	10	MH-58	450
	12	MH-58	400
	MH-60	MH-61	250
	MH-61	MH-58	400
	MH-71	MH-72	350
	72	MH-72	150
	MH-72	MH-11	550

See footnote at end of table.

TABLE 4.1
(Continued)

TYPE OF PIPE	ORIGIN LOCATION/ LOCATION NUMBER[a]	TERMINATION LOCATION[a]	LENGTH (ft)
Collectors (Cont'd)			
	2	MH-11	300
	30	MH-12	800
	MH-11	MH-12	250
	MH-12	MH-21	100
	MH-47	MH-48	900
	64	MH-50	1,100
	9	MH-50	350
	MH-48	MH-50	900
	MH-42	MH-44	600
	MH-43	MH-45	650
	MH-44	MH-45	300
	9	MH-46	500
	MH-45	MH-46	500
	9	MH-46	400
	6	MH-18	300
	27	MH-18	200
	MH-46	MH-18	400
	MH-18	MH-19	500
	12	MH-19	300
	12	MH-20	300
	5	MH-19	400
	MH-19	MH-20	400
	MH-20	MH-21	250
	MH-24	MH-25	400
	MH-25	MH-26	250
	MH-26	MH-27	500
	6	MH-28	350
	5	MH-28	300

See footnote at end of table.

TABLE 4.1
(Continued)

TYPE OF PIPE	ORIGIN LOCATION/ LOCATION NUMBER[a]	TERMINATION LOCATION[a]	LENGTH (ft)
Collectors (Cont'd)			
	MH-28	MH-29	300
	6	MH-29	300
	5	MH-29	250
	MH-29	MH-30	350
	MH-27	MH-30	400
	31	MH-27	200
	5	MH-30	450
	4	MH-31	350
	MH-31	MH-32	400
	MH-32	MH-33	300
	7	MH-33	250
	MH-30	MH-33	450
	MH-70	MH-60	350
	MH-69	MH-68	150
	MH-64	MH-65	150
	MH-65	MH-14	350
	MH-13	MH-14	550
	3	MH-67	300
	MH-67	MH-63	300
	3	MH-66	400
	MH-66	MH-14	350
	MH-14	MH-15	500
	13	MH-15	400
	54	MH-16	500
	MH-15	MH-16	250
	MH-16	MH-17	300
	MH-73	MH-74	300
	MH-74	MH-23	200

See footnote at end of table.

TABLE 4.1
(Continued)

TYPE OF PIPE	ORIGIN LOCATION/ LOCATION NUMBER[a]	TERMINATION LOCATION[a]	LENGTH (ft)
Collectors (Cont'd)			
	MH-21	MH-22	300
	MH-22	MH-23	400
	MH-23	MH-34	250
	MH-17	MH-34	150
	MH-33	MH-34	150
		Subtotal	34,800
Effluent			
	MH-34	MH-35	550
	MH-35	Storm water retention pond	700
		Subtotal	1,250
		Approximate Total	36,000

[a]Manhole numbers and other designations refer to FMPC Drawings Nos. 22X-5500P-00537 and 22X-7000P-00068.

Figure 4-1 (See Back Pocket)

Figure 4-2 (See Back Pocket)

Based on information obtained from FMPC personnel, the 0.5-mile-long line from the Clearwell to MH-175 is comprised of 8-, 12-, and 14-inch-diameter metal pipe with approximately six 45- and 90-degree elbows.

Due to the number of bends and the small diameter, internal inspection of the line by sight or television camera is not possible. Complete excavation and direct inspection of the line are not feasible due to its length. Within these operational constraints, acoustic emission tests will be utilized for the detection of leaks in the above-ground portions of the pipe or where it can be reached in manholes. To determine the presence of contaminants from past operation of the line, soil samples will be taken from as near to the invert of the pipe trench as possible at each bend or change in diameter of the line. Soil sampling will also be performed at locations where the acoustic emission tests indicate leaks and where repairs were previously made to the line. Selected soil samples will be analyzed for total uranium, based on portable instrument screening. A minimum of ten samples will be analyzed. Screening for volatile organics will also be performed using an HNu analyzer.

4.4 BURIED DRUM AREA SOUTHWEST OF THE LABORATORY

It is suspected that drummed wastes containing zirconium and thorium are buried in an area southwest of the laboratory. In an effort to confirm the presence and to delineate the extent of the drum burial area, two geophysical techniques will be used in the area. A magnetometer survey will first be conducted over the area to detect the general location of the drums. Fences and buildings are nearby and their

presence may complicate the data interpretation. Therefore, a gravity survey will also be conducted across the area. The high density of the wastes may allow the buried drums to be differentiated from the native soils, although the mass of the nearby buildings could complicate the gravity data interpretation. The combination of these two geophysical techniques, however, has the highest potential for delineating the location of the buried drums if they are present.

If the geophysical methods are unsuccessful at delineating the area where the drums are buried, exploratory trenching will be used to confirm and refine the location of the drums. A single trench will initially be excavated across the center of the area in a north-south line to determine if drums are present. If drums are encountered, parallel trenches at 20-foot intervals will be excavated to determine the full extent of drum burial. If no drums are encountered, the spacing between follow-up trenches will be reduced by one-half. The drums will be exposed only sufficiently to verify their presence. This plan does not include provisions for excavating and removing drums.

Once the limits of the drum burial area are defined, four borings will be installed around the burial area to determine if the presence of the drums is having an adverse impact on the environment. Borings will be advanced using the same procedures as for other parts of the Production Area. Soil samples from the following intervals will be analyzed for the full radiological analysis: 0.0 to 0.5 feet, 2.0 to 2.5 feet, 5.0 to 5.5 feet, and at each 5-foot increment thereafter to a total depth of 20 feet.

5.0 SUSPECT AREAS OUTSIDE THE PRODUCTION AREA

The southfield area and two adjacent areas, several rubble mounds and drum storage areas, the fire training area, the laboratory equipment burial area, and a small area around the flagpole represent the identified suspect areas outside of the Production Area. This chapter presents the individual investigation plans for each of these areas. Figure 3-1 is a map showing the location and approximate boundaries of these areas.

5.1 SOUTHFIELD AREA

The southfield is an area where construction rubble, including the old administration building, was disposed of and graded to provide a level surface. Surface radiation measurements were made over the area as part of the Characterization Investigation Study (CIS). The surface measurements indicated elevated readings in the drainage ditch along the gravel roadway and in the drainage along the western side of the area. Twelve borings were also distributed over the adjacent fly ash disposal area and around the perimeter of the southfield during the CIS.

The exact boundaries of the southfield burial area are not known. It is assumed that material was dumped down the natural surface of a meander scar formed by Paddy's Run eroding into the till. As material was dumped, the fill would have extended outward in layers roughly parallel to the natural angle of repose. The south boundary of the southfield area is the steep slope rising from the floodplain of Paddy's Run just north of the running track. The western boundary is the approximate location of a small drainage which leads to Paddy's Run. It appears

from the CIS data that the western third of the fill is predominantly fly ash. The eastern boundary is uncertain but probably lies immediately west of the roadway leading to the running track. The northern boundary is much less certain. Surface evidence indicates that the burial area may be restricted to the south of the east/west road in the area. Neither Boring 1046, just south of the road, nor Boring 1047, north of the road, encountered any fill material.

The CIS found lead, nickel, vanadium, and zinc in the fly ash. PCBs were also found along with uranium, thorium, and radium in the tens of parts per million (ppm) range. The CIS did not attempt to investigate the central part of the south field where the majority of the building rubble is thought to be located.

Because the fill is likely to contain large amounts of building rubble and concrete, it is unlikely that standard geotechnical equipment such as hollow-stem augers and split-spoon samples will be effective in sampling this material. A series of six test pits will, therefore, be excavated through the fill to characterize the fill and to provide samples for chemical and radiological analysis. The six test pits will be excavated in the locations shown in Figure 5-1. All of the pits will be oriented approximately north/south and the surface length of the pit will be 50 feet. The width and length of the trench bottom will vary with the fill consistency and thickness. The trenches will be excavated with a track-mounted backhoe with an 18- to 24-inch bucket. The pits will be mapped and described by a field geologist. These maps will include the locations of all soil sampling.

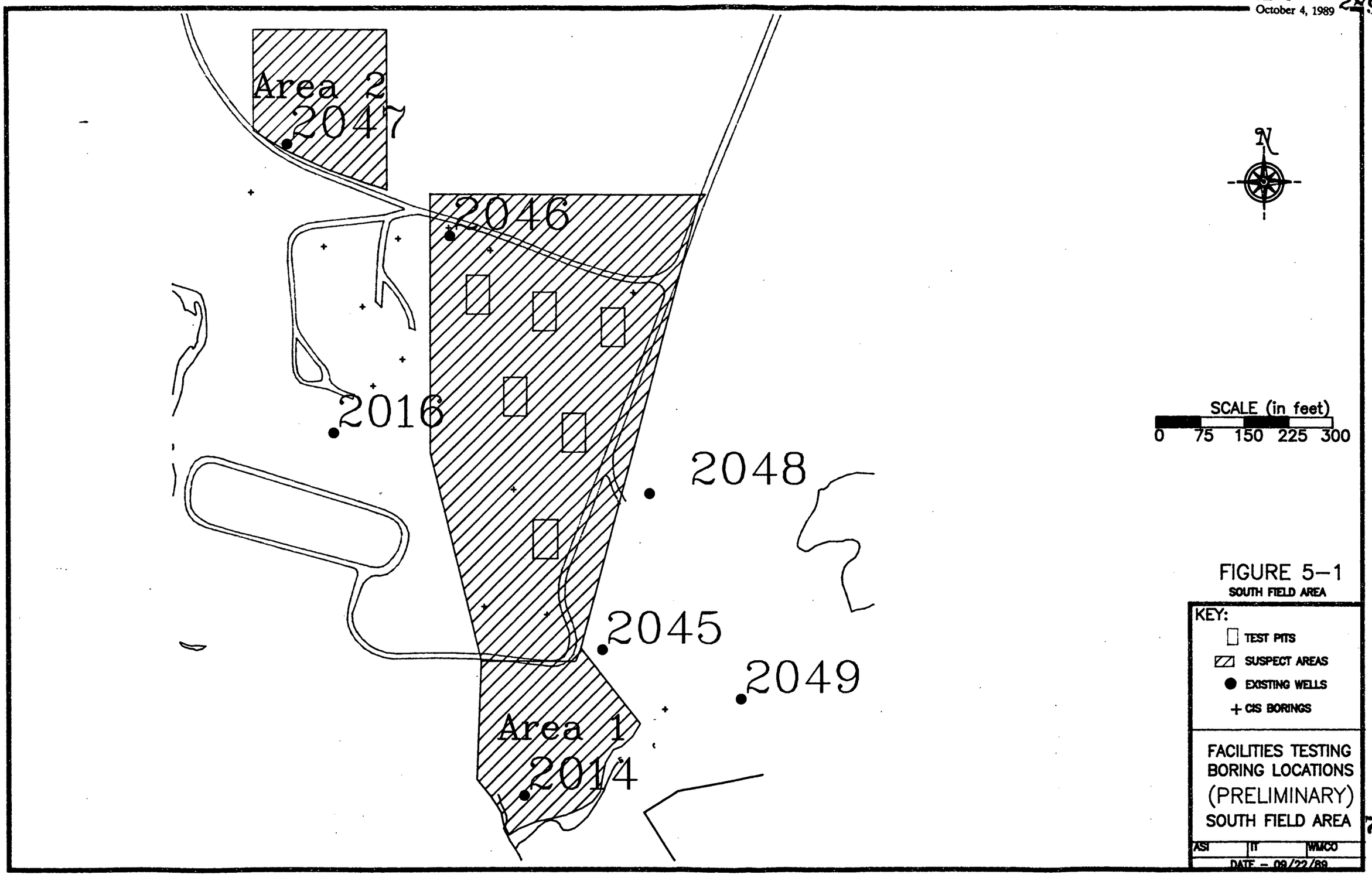

FIGURE 5-1
SOUTH FIELD AREA

During excavation, samples will be collected with the backhoe for field screening with a pancake GM and an HNu. These samples will be collected at depth intervals offive feet at three equally-spaced locations along the length of the trench. The maximum thickness of the fill is estimated to be 20 feet. Therefore, the maximum number of samples for screening from any trench would be 12; that is, samples at 5, 10, 15, and 20 feet at three locations. The deepest sample will be from the native soils beneath the till. A portion of each sample will also be placed in a 500-milliliter (ml) wide-mouth jar and submitted for full radiological analysis.

If a reading is detected with the HNu, a sample will be collected for full HSL analysis, including HSL pesticides/PCBs as well as organophosphorus pesticide analyses. If more than one sample from a trench gives a sustained reading of 5 ppm for 10 seconds on the HNu, then the sample with the highest reading will be sent to the laboratory for HSL analysis. If all samples from a pit exhibit above-background HNu readings, then two samples with the highest readings and widest separations will be sent to the laboratory. If there is no field evidence of chemical contamination, then a single sample will be collected from the deepest part of the fill. A total of 6 to 12 samples will be submitted for HSL analyses.

A SPA-3 probe attached to a pole with a rate meter scale will be used to scan at least five vertical profiles along the length of the test pit on one side. The location and vertical and lateral extent of any zones with high counts will be delineated on the geologic map of the pit wall.

The corners of the test pit will be staked so they can be accurately surveyed. The depth of the pit will also be carefully measured using rods to determine the thickness of the fill. All measurements are to be made from the surface and all samples are to be collected with the backhoe. If the test pit sides are unstable, the pit depths and relative thicknesses of fill will be estimated by reference marks on the side of the backhoe boom. It is anticipated that the sides of the trench will be stable and measurements can be made from the surface. In the event that the sides are not stable, measurements which require standing near the edge of the pit will not be made.

After the test pit has been inspected, sampled, and described, it will be backfilled with the material which was excavated from the pit. The entire disturbed area will be covered with six inches of clean soil borrowed from elsewhere on the FMPC. The bucket of the backhoe will be steam cleaned at the excavation site after each trench is excavated and backfilled.

South Field Area 1: This flat area is underlain with flood plain deposits from Paddy's Run and is not covered with till. The area is bounded on the west at the tree line and extends to the east to include the fill for the culvert over the outfall ditch.

A surface walkover survey using SPA 3 and FIDLER instrumentation will be conducted in the flat open area between the South Field and Paddy's Run. The walkover survey will be conducted on 25 foot grids as was done in the original

walkover survey for the RI/FS. Biased soil samples will also be collected in the survey area using the same selection procedures as in the RI/FS Work Plan.

Three pits in Area 1 are clearly located on a 1954 photograph. The location of the pits will be determined by triangulating from features that appear on the 1954 photograph and still exist today. A single auger boring will be drilled into the center of each pit in the same manner as the other borings in this plan. Samples will be screened as they are collected. Alternate six-inch samples over the length of the boring will be analyzed for the full set of radiological parameters. Any split spoon sample that has 5 ppm reading for 10 seconds on the HNu will be analyzed for full HSL, including PCBs.

South Field Area 2: The second area located north-northwest of the South Field Area is where a crane appeared to be piling dirt in roughly north south oriented piles in the 1954 photograph. It is unknown if this was simply a borrow pit where cover material was removed or if some burial activity was going on. This area is now partially covered by the tree farm. However, at least the middle portion of this suspect area is where trees were removed from the tree farm and planted along the entrance road to the FMPC, leaving an open area in which to conduct the investigation.

Since the area was graded for tree planting and disturbed again for the tree removal, it is not likely that a surface walkover survey will be useful in this area. A surface magnetometer survey will be conducted over this area along a series of six east/west

traverses. Readings will be taken at ten-foot intervals along each of the traverses. Four of the traverses will be spread over the width of the open area. The remaining two traverses will be to the north and south of the first row of trees that bounds the clear area. Since these traverses are to be perpendicular to the alignment of the piles in the 1954 photograph, they should detect any buried metals.

Unless the magnetic survey produces an indication of specific areas where buried material may be present, a single trench will be excavated across the present clear area from east to west. This trench will be excavated to a depth of ten feet and sampled in the same manner as the trenches in the South Field. Since this trench will be perpendicular to the orientation of the suspected burial activity, it should be able to address or disprove the question of the presence of any burial activity. If the magnetic survey does detect buried metal, an excavation will be made to determine the nature of the material.

Northeast Area: A third area identified in the 1954 photograph is a strip of land extending east, along the north side of the gravel road, from the fire training area to the north access road. This area was reportedly used by construction contractors for staging equipment during construction of the FMPC. The area to be investigated is about 100 feet wide and is within the present tree farm.

A surface walkover survey will be conducted along the south edge of this area between the drainage ditch and the first row of trees. There is not sufficient room within the tree farm to conduct a meaningful walkover survey. A series of 25 foot

grids will be laid out and surveyed using the same procedures and equipment as the walkover survey in the RI/FS. The need for biased soil samples will also be determined from the results of the walkover survey as was done in the site wide RI/FS.

A ground magnetic survey will be conducted along the edge of the drainage, along the south edge of the tree farm, and between the next three rows of trees to the north for a total of five traverses. Based on the number and frequency of anomalies identified by the magnetic survey, a hand auguring program may be developed to sample the soils. Soils will be analyzed for total uranium and screened with an HNu. If HNu readings are above background, a full HSL analysis will be performed on the sample with the highest reading from each site.

There is one small area in the northeast part of this investigation area that was identified as a possible burial site. If there is a magnetic anomaly in that area, a boring will be made with a hollow stem auger in the same manner as in the production area.

5.2 RUBBLE PILES AND DRUM STORAGE AREAS

As indicated in Figure 3-1, there are three locations where rubble has been placed on the land surface outside of the southfield area. One area is west of the K-65 Silos and forms the east bank of Paddy's Run. A single test pit will be excavated and sampled in this area. The excavation will begin 100 feet south of Monitor Well 1032 and extend southward for 50 feet. The excavation, sampling, data collection, and

backfilling of this test pit will use the same procedures as for the test pits in the southfield area.

The second and third rubble areas are located approximately halfway between the K-65 Silos and the Production Area and in the northeast corner of the Waste Storage Area, respectively. Again, a single test pit will be excavated and sampled in each of these areas. It is suspected that these were areas where materials where dumped on the relatively level surface of the site; therefore, these are not likely to be a test pit more than a few feet deep. The orientation of the pit will be east/west.

In each rubble pile drum storage area, an inventory of empty drums will be made. The empty drums will be scanned with a SPA-3 to determine if the drums contain radiological contamination. The location of drums that appear not to be empty will also be recorded. The input for this investigation will include these inventories and an assessment as to the best course of action for dealing with these drum.

5.3 FLAGPOLE AREA

A large tank was reportedly buried in the area of the flagpole. The tank could contain radioactive wastes. Since this is an area where a great deal of public pedestrian traffic routinely passes, it is necessary to proceed with extra caution in this area before attempting any sampling of the subsurface. Consequently, two geophysical methods will be used to attempt to define the location and orientation of the buried tank prior to subsurface disturbance. Since the tank is reportedly made of steel, a surface magnetometer survey will be conducted to try to define a magnetic

anomaly. Interference from the metal in the adjacent buildings and fences may prevent a meaningful interpretation of the data if the tank is close to the building. A gravity survey will also be conducted over the area since a tank, even if only partially filled with radioactive material, should have a significantly greater density than the adjacent soils. Again, the presence of the administration building may hamper the data interpretation; however, the combined results of the two surveys may lead to a definition of the size and orientation of the tank.

Four borings will be placed around the tank to determine if there is or has been leakage from the tank. The borings will be placed at the ends and on either side of the tank provided there is sufficient room between the tank and existing structures. The borings will be installed using the same procedures as for the borings in the Production Area, as described in Section 2.2 of this plan.

The wastes are thought to be radioactive material from the Manhattan Project. Since this is a buried vessel with unknown contents, both full HSL and full radiological analyses will be made. Beginning at the depth of five feet every other 6-inch sample will be analyzed for full HSL+. The remaining 6-inch samples will be analyzed for full radiological analysis. This alternating analysis will continue to the water table, if present. If water is present, a water sample from the piezometer will be analyzed for both full HSL+ and full radiological analysis. As with all other aspects of the investigation, the sampling will be expanded if there is evidence that the currently scoped effort is insufficient to characterize the nature and extent of contamination.

If ground water is encountered, the corresponding boring will be converted to a piezometer. The piezometer will be completed with a watertight protective cover installed flush with the ground surface. Water samples will be collected from all piezometers and analyzed for the full radiological analysis.

The purpose of this investigation is to determine if the presence of the tank and its unknown contents is presently causing any environmental degradation. There will be no attempt in this investigation to penetrate the tank or to determine the nature of the contents of the tank.

5.4 FIRE TRAINING AREA

The fire training area is located on the north side of the site outside the Production Area. It is used for training site firefighters responding to fires in buildings, oil fires, and fires around tanks. Three sites within the fire training area are to be investigated: a fire training building, an oil-fire pond, and a metal trough containing oil and water. Each of these areas is to be sampled for radiological and HSL analyses. The purpose of the investigation is to determine if oil and other materials used in the area have seeped into the subsurface environment.

Surface soil samples will be collected at six locations around the fire training building at the edge of the pavement. These samples will be analyzed for total uranium and

full HSL+ analysis, including pesticides/PCBs, organo-phosphorous pesticides, dioxin and furnas.

Four test borings will also be drilled around the perimeter of the oil fire pond using hollow-stem augers, as described in Section 2.2. Samples will be screened with an HNu for volatile organics. The sample with the highest reading from each boring will be sent to the laboratory for full HSL+ analysis. If the HNU does not detect anything in any of the samples, then the sample from the 2.0-to 2.5-foot interval will be sent to the laboratory. Piezometers will be installed in borings which encounter ground water. Water samples will be collected from each piezometer for full radiological and HSL+ analysis.

Four borings will also be installed around the oil-filled trough. Borings will be placed near the ends and at the midpoints along the sides of the trough. Sampling procedures and decision points will be the same as those for the oil-fire pond.

5.5 WASTE WATER TREATMENT PLANT

The drying beds and the trickling filters at the waste water treatment plant are being considered a new suspect area. The sludge drying beds are periodically cleaned out and the sludge is reprocessed to recover any uranium that may be present. Four borings will be installed at the center point of each side of the sludge drying bed area as shown in Figure 3-1. Samples will be collected for full radiological analysis at the eight standard depths intervals as specified in Section 2 of the Work Plan. If water is encountered, it will be analyzed for full radiological and full HSL analysis.

Two borings will be installed next to each of the trickling filters. Samples from the eight standard sample intervals will be analyzed for full radiological analysis. If groundwater is encountered, the water will be sampled for full radiological and full HSL+ analysis.

In addition to the borings in the Waste Water Treatment Plant area, ten archived surface soil samples will be selected for mercury analysis. These will be the ten samples that showed the highest uranium values. These sample results will be used to evaluate the possibility that mercury containing wastes were burned in the old incinerator.

5.6 LABORATORY WASTE PITS

The laboratory waste pits were open on the 1962 and 1964 photographs and grassed over in the 1968 photograph. The pits will be located by triangulation from fence corners that still exist today and appear on the 1962 and 1964 photographs. It appears that the location of these pits is at the south edge of the parking area at the construction site for the new pilot plant. It is possible that the pits are currently located under some construction trailers. Once the pits are located, a single boring will be drilled into each pit to determine if scrap metal is present. If metal is present, the boring will be advanced and a sample of soil taken from the location of the pit for full HSL+ and full radiological analysis.

APPENDIX A

Production and Additional Suspect Areas
Health and Safety Plan

INTRODUCTION

The following Health and Safety Plan for the Facilities Testing task is to be considered an addendum to the Fernald Remedial Investigation and Feasibility Study (RI/FS) Health and Safety Plan. The Facilities Testing Health and Safety Plan is designed to set health and safety parameters for situations and conditions that will be unique to the Facilities Testing task for the RI/FS. All work during the Facilities Testing task will be in accordance with the health and safety requirements of the Unites States Department of Energy, the United States Department of Labor (OSHA), the National Fire Protection Association (NFPA), Westinghouse Materials Company of Ohio (WMCO), Advanced Sciences, Incorporated, and International Technology Corporation.

GENERAL SAFETY

All work locations (drill sites) will be inspected by the site health and safety officer prior to the initiation of work. All sites will be inspected for physical hazards, such as overhead electrical lines and piping, chemical storage tanks, chemical hazards, and nuisance dusts. All work sites will be monitored for both radiological and chemical hazards prior to the initiation of work. WMCO will be consulted to aid in identifying work site hazards. WMCO radiation work permits will be utilized to document radiological hazards and define safety criteria. WMCO excavation/penetration permits will be completed prior to beginning any boring or trenching operation.

A trenching operation planned for one of the sites will be conducted per the procedure in Attachment A plus any additional WMCO requirements. At a minimum, all WMCO health and safety policies and procedures will be followed. Attachment B documents WMCO's health and safety requirements that are unique to the Facilities Testing task. Tailgate safety meetings will be conducted on a daily basis prior to initiation of work to communicate hazards and safety requirements for the work site.

Work sites will be visited by a Field Health and Safety Representative at least once per day. Sites encountering radioactive or chemical contamination will be visited more frequently. Full-time safety coverage will be implemented when conditions dictate. The lead geologist at each drilling site will be responsible for ensuring that health and safety procedures are followed and requirements are met. Two-way

radios will permit communication with the field health and safety officer. Each field crew will also have a fire extinguisher, a first aid kit, and an eye-wash bottle available at each site.

EXTERNAL RADIATION PROTECTION

External radiation exposures to drilling teams will be maintained as low as reasonably achievable (ALARA). Radiation sources, primarily uranium in processing plants, will be removed from the immediate work area when possible, or will be shielded to minimize worker exposure. The number of workers in radiation areas will be minimized in order to reduce total man-Rem received during drilling in radiation areas. WMCO Radiation Work Permits and associated monitoring will be utilized to establish and document worker stay times and job controls at each site. Radiation Work Permits will be required prior to starting work at each individual drill site or cluster of borings. A WMCO thermoluminescent dosimeter (TLD) will be worn by each worker who enters the FMPC production area. The dosimeter measures the amount of radiation a worker is exposed to while working at the FMPC. Dosimeters are processed on a monthly basis, and the results are forwarded to the RI/FS Project Health and Safety Officer, who reviews the data.

INTERNAL RADIATION PROTECTION

When radioactive contamination is suspected or detected at each drill site, general air sampling and/or breathing zone sampling will be conducted to measure and document activity concentrations of long-lived radionuclides (primarily uranium) in the air. Respiratory protection will be utilized when air concentrations are anticipated or are measured to reach 10% of the applicable maximum permissible concentration (MPC) Guides.

Respiratory protection will be donned whenever radioactivity is encountered during routine monitoring of soil during auguring operations. Half-face air purifying respirators will be adequate for most cases where airborne radioactivity is encountered or anticipated during drilling operations. Full-face air purifying respirators will be required if airborne levels approach five times the MPC. WMCO respirators will be used by the Facilities Testing Crew when needed. Crew members will be medically qualified, fit tested, and trained in respirator use by WMCO.

PROTECTIVE CLOTHING

Minimum dress for drilling in the FMPC process area will be equivalent to EPA Level D criteria. Protective clothing will consists of WMCO-issued coveralls, WMCO-issued steel toed boots, safety glasses, hard hats, and leather-palmed gloves. If radioactive or chemical contamination is anticipated or is detected during monitoring of soil during drilling operations, EPA Level C criteria will be required. Level C criteria includes, in addition to Level D requirements, tyvek or saranex suits, shoe covers, nitrile gloves, glove liners, and half-face air purifying respirators. Tyvek suits will be used for radioactive contamination and saranex for organic chemical contamination.

CONTAMINATION CONTROL

An exclusion or contamination control zone will be established around each drill rig site. Each zone's entrance/exit will be supplied with a Geiger-Mueller type detector. If radioactive contamination is detected in soil during auguring, workers exiting the zone will be required to monitor themselves for gross levels of radioactive contamination. If contamination levels exceed 1000 counts-per-minute above background during the monitoring of a worker, the WMCO health physics department or the RI/FS Health and Safety Officer will be notified immediately for decontamination instructions.

In addition to using the exclusion zone, all workers will shower, change out their clothing, and use the WMCO hand and foot monitors prior to exiting the FMPC facility. WMCO hand and foot monitors are set to detect the limits recommended in ANSI draft standard N13.12 for Thorium-232 (Attachment C). If Level C protective clothing is used, it will be doffed and bagged before exiting the exclusion zone. Used respirators will also be bagged separately.

If radioactive contamination is detected at a drilling site, the drill rig and associated equipment will be monitored for gross levels of contamination before moving to another drill site within the process area. Equipment exceeding 1000 dpm alpha/100 cm^2 removable and 5000 dpm alpha/100 cm^2 fixed will be decontaminated before moving to the next drill site. WMCO will conduct all decontaminations at its decontamination facility.

Prior to exiting the site, all equipment will be monitored by WMCO for radioactive contamination. Release levels for unrestricted use at WMCO are 200 dpm alpha/100 cm^2 removable and 1000 dpm alpha/100 cm^2 fixed, slightly more restrictive than the Thorium-232 guidelines set in ANSI N13.12.

CHEMICAL PROTECTION

Each work site will be both visually inspected for chemical hazards and monitored prior to the beginning of work. WMCO will also be contacted to learn of any unique chemical hazard present at the work sites. Each work site will be monitored with a photo-ionization detector for the presence of organic and some inorganic vapors.

Each drill site will also be monitored with an Exotox instrument capable of analyzing for combustible gas, O_2 levels, H_2S and CO. During drilling operations, routine monitoring of the soil will be performed using the HNu detector. Soil that appears to contain moisture will be monitored for suspect chemical contamination. Detectable organic or inorganic vapors will trigger Level C protective clothing. If the contaminant can be identified in the field (usually by Draeger Tubes), air purifying respirators will be used when air concentrations reach 50% of the TLV. Air-supplied respirators will be necessary when air concentrations exceed two times the TLV.

TRAINING

All personnel working in the FMPC process area during the Facilities Testing Task will meet the following training requirements.

1. OSHA 40-Hour Hazardous Waste Site Training
2. RI/FS Site-Specific Training
3. WMCO Radiation Worker Training
4. WMCO Respirator Training
5. OSHA 8-Hour Annual Refresher Training

STANDARD PROCEDURE

PROCEDURE NO. ITC 900 35

DATE July 7, 1986

SUPERSEDES

APPROVED David R. Smi

SUBJECT:

EXCAVATION AND TRENCHING

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STANDARD PROCEDURE

PROCEDURE NO ITC PRO 9532
DATE July 7, 1986
SUPERSEDES ---
APPROVED David R. Smith

SUBJECT:

EXCAVATION AND TRENCHING

I. PURPOSE

To set forth minimum health and safety requirements and procedures for personnel who either design or direct the installation of shoring, sloping, and benching systems, or who work in and about trenches or excavations.

II. REFERENCES

A. Title 29, CFR, 1926(P); Federal OSHA Construction Safety Standards - Excavations, Trenching, and Shoring

B. Title 8, Article 6, California Administrative Code; Cal-OSHA Construction Safety Orders - Excavations, Trenches, Earthwork

C. ITC PRO 9532.4; Cal-OSHA Work Permit Requirements for Demolitions, Scaffolding, Excavations, and Trenching

III. ATTACHMENTS

A. ITC FORM 9532.9-1, "Trench/Excavation Project Notification Worksheet"

B. ITC FORM 9532.9-2, "Excavation and Trenching Project Notification Log"

C. Cal-OSHA FORM 691-b, "Scaffolding-Falsework-Excavation/Trenches Job Description Form #1"

D. State of California, Department of Industrial Relations, Division of Occupational Safety and Health; "Permit - Annual Excavation/Trenching"

ITC FORM 1215-2 (Replaces 10-101 Rev. 10-84)

IV. DISCUSSION

Multiple hazards associated with working in and about trenches or excavations include: the potential of running soils, cave-ins, dislodged spoil, lack of quick access and egress, and those associated with performance of work in confined spaces. Federal OSHA reports that as many as 100 workers die each year in trenching and excavation operations. Nonfatal injuries occur with greater frequency. Causes of bodily injury, illness, or death include asphyxiation, internal injuries due to physical crushing, and toxic exposures.

This directive prescribes minimum requirements to protect employees potentially exposed to hazardous ground movement during excavation or trenching operations.

Specific requirements include project review by the Regional Health and Safety Office for any construction of trenches or excavations that are five feet or deeper and into which a person is required to descend, system design by an IT-defined "Design Engineer", installation of shoring systems or sloping and benching under the direction of a Project Supervisor, and constant supervision of all work performed in an excavation or trench.

V. DEFINITIONS

A. Accepted Engineering Requirements

Those requirements or practices which are compatible with standards required by a registered architect, a registered professional engineer, or other duly licensed or recognized authority.

B. Angle of Repose

The greatest angle above the horizontal plane at which a material will lie without sliding.

C. Benching

A method of excavation whereby the faces of an excavation or trench are widened progressively outward with respect to the bottom by a specific series of horizontal and vertical cuts to provide protection against the hazard of moving ground.

D. Competent Person (Federal OSHA, 29 CFR 1926.32(f))

A person, such as a supervisor or engineer, who is capable of identifying existing and predictable hazards in the excavation/

trenching work area and who has the authority to take prompt corrective measures to eliminate them. Nomenclature for responsibilities equivalent to a Competent Person varies from state to state. For example, in California, the individual with excavation/trenching installation and supervision responsibilities is a "qualified person".

E. Confined Space

Enclosure having limited means for entry and exit, by reason of location, size, or numbers of openings; and unfavorable natural ventilation that could contain or produce dangerous air contaminants, flammable atmospheres, and/or oxygen deficiency.

F. Design Engineer

An individual, currently registered as a civil engineer in the applicable state, who, in all other respects, meets the requirements of a pertinent State OSHA Program, or Federal OSHA (see Qualified Person: V.K.) in terms of his or her ability to design shoring, sloping, benching, or alternate trench/excavation systems.

G. Excavation

Any manmade cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation.

H. Hard Compact Soil

All earth materials not classified as running or unstable.

I. Project Manager

An individual who is responsible to coordinate and direct the activities of both the Design Engineer and Project Supervisor. The Project Manager is responsible to assure that all pre-excavation requirements are met: site preparation, Health and Safety Office notification, OSHA and/or IT internal project permitting, and employee training.

J. Project Supervisor

A person, such as a supervisor or engineer, who is familiar with the installation of shoring or sloping/benching systems and the attendant hazards of excavation or trenching operations. Project supervisors shall meet the particular requirements of State OSHA Programs, or where applicable, the requirements of a Federal OSHA Competent Person. Project Supervisors shall assure that excavation/trenching work practices are properly followed.

K. Qualified Person (Federal OSHA, 29 CFR 1926.32(i))

A person, such as an engineer, who by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience has successfully demonstrated his or her ability to design shoring, sloping/benching or alternate systems that meet accepted engineering requirements.

L. Running Soil

Earth material where the angle of repose is approximately zero, as in the case of soil in a nearly liquid state, or dry, unpacked sand which flows freely under slight pressure. Running material also includes loose or disturbed earth that can only be contained with solid sheeting.

M. Shoring System

A temporary structure for the support of earth surfaces formed as a result of excavation work. This structure is formed with metal-wood or hydraulic shoring with sheeting, or use of a trench shield.

N. Sloping

A method of excavation whereby the faces of an excavation or trench are laid back to provide protection from moving ground.

O. Spoil

The earth material that is removed in the formation of an excavation.

P. Trench

An excavation made below the surface of the ground. In general, the depth is greater than the width at the bottom, but the width of a trench at the bottom is not greater than 15 feet.

Q. Trench Shield

A shoring system composed of steel plates and bracing, welded or bolted together, which support the walls of a trench from the ground level to the trench bottom and which can be moved along as work progresses.

R. Unstable Soil

Earth material, other than running, that because of its nature or the influence of related conditions, cannot be depended upon to remain in place without extra support, such as would be furnished by a system of shoring.

VI. PROCEDURE

A. Pre-excavation Requirements

1. Preparation for Excavation/Trenching

a. All existing utility or other underground facilities shall be located before excavation work commences. If a utility company cannot be utilized, an appropriate device, such as a cable- avoiding tool or similar device, shall be used to locate gas lines, electrical lines, water lines, etc. All known owners of such facilities shall be advised of the proposed work at least two days (excluding Saturdays, Sundays, and holidays) prior to start of excavation work.

b. Trees, boulders, poles, and other surface encumbrances located at the excavation/trenching site shall be made safe or removed prior to beginning excavation/trenching.

2. Notification

a. Any project involving trenching or excavations that are five feet or deeper where a person is required to descend shall be reviewed and approved by the Regional Manager, Health and Safety, or his designee (ITC PRO 9021.1).

b. The "Trench/Excavation Project Notification Worksheet" (Attachment A) shall be completed by the Project Manager and submitted to the appropriate Regional Health and Safety Office in advance of any such project.

c. The Health and Safety Office shall review the "Trench/Excavation Project Notification Worksheet" and upon approval issue a unique IT Health and Safety Department permit number for the project. An "Excavation/Trenching Project Notification Log" (Attachment B) shall be maintained in each Regional Health and Safety Office.

d. California Specific Requirement: Regional Health and Safety Offices shall submit the appropriate pre-job notification to Cal-OSHA; the Cal-OSHA Form 691-b (Attachment C).

3. Permits

a. California Specific: Cal-OSHA requires the issuance of an excavation and/or trenching permit prior to the initiation of any work five feet or deeper into which a person may be required to descend (8 CAC 1539).

Rather than obtaining such a permit for each and every job for which it might be necessary, an Annual Excavation/Trenching Permit (Attachment B) has been obtained by ITC. This permit is good for any work location within the State of California. However, implicit in the issuance of the permit is Cal-OSHA notification of all excavation and trenching projects using Cal-OSHA Form 691-6 (Attachment C), and the use of safe work practices and conditions.

b. California Specific: A copy of the annual permit must be posted at every job site where an excavation/trenching permit is required.

The annual permit copy shall be dated and initialed, and then posted only for the duration of the reviewed job.

c. Outside of California: Project Managers shall consult the Regional Health and Safety Office to determine whether or not an OSHA excavation/trenching permit is required. Other State OSHA programs that may require permitting include: Alaska, Hawaii, Michigan, Oregon, and Washington.

4. Employee Training and Indoctrination

a. Formal Classroom Training

Employees assigned to design, supervise or work in or about excavations/trenches shall have completed formal classroom training which includes the following:

(1) Types of hazards associated with excavation/trenching operations;
(2) Safe work practices and techniques;
(3) Applicable Federal, state, and local regulations;
(4) International Technology Corporation excavation/trenching policies and procedures.

b. Tailgate Safety Meetings

Tailgate Safety Meetings detailing specific hazards of the work to be performed and safety precautions and procedures specific for the job shall be conducted by the Project Supervisor at the beginning of each shift for each job, and shall be documented in writing by use of ITC Form 9540-1, in accordance with ITC PRO 9540.1 (Tailgate Safety Meetings).

c. Retraining

Personnel shall be periodically retrained in the subject areas listed in "4.a" above. Proof of training and

retraining shall be fully documented in writing. Records shall be maintained by the Corporate Training Department.

d. Supervisory Reinforcement

The training described above shall be complemented with effective, on-going, on-the-job training and one-on-one instruction by regional management, as part of standard employee supervision, and to the extent necessary to assure compliance with this directive, other IT Corporation policies and procedures, and good health and safety practices.

8. Excavation/Trenching Work Practices

1. Design

Walls and faces of all excavations and trenches five feet or greater in depth, into which employees may enter, shall be guarded by shoring, sloping of the ground, or equivalent means. Design of shoring, sloping, or benching systems shall conform with accepted engineering requirements and applicable State or Federal OSHA regulations. All design work shall be approved by a Design Engineer.

2. Installation

The Project Supervisor shall ensure that installation of shoring, sloping or alternative systems, designed to allow work in an excavation or trench, shall conform with accepted engineering requirements and applicable State or Federal OSHA regulations. As necessary, the Design Engineer shall visit the excavation/trenching site to assure proper installation of the sloping, shoring, or alternate system.

3. Work Supervision

Work in an excavation or trench shall at all times be supervised by an IT Project Supervisor. This individual will remain above the excavation at all times and will be responsible for identifying any unusual developments above ground which may warn of impending earth movement. The Project Supervisor shall not make changes in the shoring or sloping system without first consulting the Design Engineer.

4. Inspections

Frequent inspections of excavations shall be made by the Project Supervisor, both before initial entry and as work progresses. If there is any evidence of possible cave-ins or slides, all

work in an excavation shall cease until the necessary safeguards have been taken. Particular attention shall be paid after rainstorms or other earth destabilizing events.

5. Work Adjacent to Excavations

No employee shall work adjacent to any excavation until a reasonable examination of the excavation and surrounding area has been made to determine that no conditions exist that may expose employees to injury from moving ground. Special precautions shall be taken at excavations adjacent to streets, railroad tracks, or other sources of external vibrations or superimposed loads.

6. Hazard Prevention Reinforcement

Employees shall be reminded daily, prior to the start of the workshift, of the hazards associated with excavation/trenches. Signs of potential earth movement shall be brought to the immediate attention of the Project Supervisor. These reminders shall take place during the Tailgate Safety Meeting in accordance with ITC PRO 9540.

7. Confined Space Work

Trenching and Excavation work that requires employee entry into a confined space shall be performed in accordance with ITC PRO 9531.1 (Confined Space Industrial).

8. Unauthorized Entry

No employees shall be permitted to enter the excavation/trench unless they are specifically required to do so. Unauthorized persons shall not be allowed access.

9. Spoil Placement

All spoil shall be located at least two feet from the edge of the excavation to prevent it from falling back into the excavation. Since surface subsidence indicators, such as fissures or cracks, usually occur within a four-foot distance from the lip of the trench or excavation, it is important that Project Supervisors consider placing spoil at a greater distance from the lip so that surface indicators are not covered. No method that disturbs the soil in place (such as driving stakes) shall be used to contain the spoil material.

10. Worksite Guarding

Trenches and excavations shall be guarded on all sides with wooden or metal barricades that are linked with at least 3/4 inch wide yellow or yellow and black barricade tape. A minimum

distance of two feet from the edges shall be maintained where possible. This is to warn employees and/or equipment operators from inadvertantly falling into the excavation or trench.

11. Battery-lighted Barricades

Battery-lighted barricades shall be used as follows:

a. A minimum of two battery-lighted barricades shall be used at corners, one on either side of the barricade.

b. At least one battery-lighted barricade shall be used where vehicular traffic approaches the trench at right angles.

c. Where trenches parallel roadways, distance between battery-lighted barricades shall not exceed 40 feet unless this requirement conflicts with (a) or (b) above and additional units are required.

d. All battery-lighted units shall be serviced as necessary to ensure equipment is operating.

12. Entry and Egress

Safe means of entry and egress from the excavation/trench shall be provided. This may be a ladder, stairway, or ramp securely fastened in place. Use of ladders for this purpose requires that the ladder side rails shall extend at least three feet above the original ground surface level. Trench access shall be provided and located so as to require no more than 25 feet of lateral travel.

13. Walkways and Bridges

Trenches shall only be crossed where safe crossings have been provided. When the depth of the excavation or trench exceeds 7.5 feet, walkways and bridges shall have standard guardrails (42 inches high at minimum and able to withstand 200 pounds force laterally at the center), and toeboards.

14. Pedestrian Bridges

Pedestrian bridges shall be of sufficient strength to prevent a vertical deflection greater than 0.5 inches when a weight of 250 pounds is applied in the center.

15. Vehicle Bridges

Bridges intended for vehicles shall be constructed to withstand twice the load of the heaviest vehicle anticipated.

16. Operating Equipment

Employees working near operating excavation equipment shall not be allowed to work in positions that place them in danger of contacting the equipment's moving parts.

17. Undermining

No undermining is permitted without prior review and approval by the Regional Health and Safety Office.

18. Surrounding Work Area

The work area around the excavation/trench shall be kept as free as possible of unnecessary clutter and equipment.

19. Water Entry and Drainage

Appropriate measures shall be taken to prevent surface water from entering the trench or excavation and to provide adequate drainage of the area adjacent to the excavation/trench. Accumulation of water or fluids that could endanger the health and safety of IT employees, either directly or through affecting the excavation/trench's stability, shall be controlled before further work progresses.

20. Backfilling

All trenches, excavations, temporary walls, exploratory drilling, etc., shall be promptly backfilled after work is completed and all associated equipment is removed.

21. Other IT Procedures

All applicable IT procedures specific to the job are to be followed in addition to these noted excavation/trench work practices and conditions.

9532-9

Attachment B

CONSTRUCTION KICK-OFF MEETING
SUBCONTRACTOR HEALTH & SAFETY REQUIREMENTS

Conference Date:

SUBCONTRACTOR: ASI - PENNA. DRILLING
CONTRACT(S):
LOCATION(S): Sitewide
OPERATION(S): Auger Sampling, Soil Sampling, Well Drilling
NUMBER OF EMPLOYEES: G-10
WMCO PROJECT ENGINEER: D. J. Carr
ASI SAFETY OFFICER: J. F. Poliziani

This information is provided as a convenience to the subcontractor in highlighting the health and safety requirements at the FMPC. All work at the FMPC shall be performed in accordance with the safety and health requirements and programs of the U. S. Department of Energy (DOE), the U. S. Department of Labor (OSHA), the National Fire Protection Association (NFPA), and Westinghouse Materials Company of Ohio (WMCO).

SAFETY AND FIRE PROTECTION REQUIREMENTS

Prior to the commencement of any construction activity, the subcontractor shall submit an accident prevention program for the specific contracted work, implementing in detail the pertinent requirements of the safety standards referenced herein.

The subcontractor shall administer and enforce all safety and health requirements as herein referenced in all subcontracts, of any tier, related to the work to be performed.

All subcontractors' equipment and tools will be inspected by WMCO Fire & Safety personnel prior to entry into the FMPC and throughout the course of the work activities. Equipment which fails to meet the safety requirements herein referenced, will not be permitted on the site.

All injuries shall be reported to the WMCO Medical facility as soon as is practical following the injury.

All safety glasses and other eye protection shall comply with ANSI Z87.1, Practice for Occupational and Educational Eye and Face Protection.

Safety glasses, hard hats, and a complete clothing change-out, including company issued safety shoes, are required for all work within the process area. A shower is required prior to leaving the process area.

All persons engaged in burning/welding activities or persons assisting those doing the work shall wear clothing with fire retardant characteristics.

Safety glasses with side shields or cover goggles are required during any operation, manual or with powered equipment, which produces dust or possible flying particles, e.g. chipping, grinding, sawing, etc.

A radiation work permit (RWP) is required for all construction work within the FMPC Process Area.

Safety belts and/or lifelines are required for all elevated work above six (6) feet where a worker must leave a scaffold, ladder, or other work position not otherwise affording full fall protection.

All cranes and derricks must conform to DOE/OSHA annual inspection and certification requirments as contained in 29CFR1926.550. A copy of the most recent safety inspection and certification must accompany the equipment to the FMPC.

All self-propelled construction equipment and vehicles shall be equipped with an audible reverse signal alarm.

The transporting of personnel in the beds of pick-up trucks or other motor vehicles is prohibited unless such vehicles is provided with fixed seating as required by DOE/OSHA.

Ground Fault Circuit Interrupters (GFCI's) are required on all electrical equipment used outside of buildings or in damp places.

All flexible cords (extension cords) shall be of a type rated for hard usage and damp locations.

All temporary wiring and lighting shall conform to the requirements of the latest edition of the National Electrical Code.

The work area shall be completely roped off from other plant areas. The use of yellow "CAUTION" tape is permitted. All markings and/or barricades shall be maintained at an appropriate height and in good order to provide adequate warning of hazards.

Lighted barricades are required to mark all construction hazards, which are in close proximity to roadways, pedestrian walkways, and other established traffic routes.

An FMPC construction excavation/penetration permit must be secured prior to commencing any excavation or penetration of the ground, slabs, or structural components.

Open fires are prohibited at the FMPC.

Flammable or combustible liquids with a flash point of 140° F. or less (i.e., gasoline, diesel fuel, solvents,etc.) shall be handled in factory mutual approved safety cans with operable flame arrestor and self-closing lid(s). All safety cans shall be properly marked with the name of the liquid contents.

All areas where flammable liquids are stored or paints are mixed shall have "NO SMOKING" signs posted and no one is to smoke in the posted areas.

Liquified Petroleum Gas (i.e., propane, butane, MAPP, etc.) shall not be stored inside any FMPC building.

All compressed gas cylinders are to be stored and transported in an approved rack or otherwise securely supported in an upright position.

All fuel gas-oxygen combinations used in cutting and welding equipment shall have reverse-flow check valves installed between the torch and the regulator.

Subcontractors shall provide suitable approved portable fire extinguisher for all work and storage areas which are not considered a part of the permanent facility.

A completed FMPC Flame and Welding Permit is required for all cutting, welding, and burning operations.

Combustible scrap and debris shall be removed at regular intervals during the course of construction. Disposal shall be in accordance with established WMCO requirements.

The storage of combustible materials shall be kept at least 50 feet from any building or structure.

Only flame resistant tarpaulins or approved materials of equal fire retardant characteristics shall be used for temporary enclosures. Subcontractors shall provide documented verification of fire retardancy to the WMCO Fire & Safety Group upon request.

Subcontractors shall not move any plant materials or equipment without the prior permission of the local production supervisor and/or the WMCO Project Engineer.

All employes are to immediately leave the building upon activation of localized evacuation alarms.

INDUSTRIAL HYGIENE REQUIREMENTS

Hearing Protection

Hearing protection (muff or plug type) shall be worn by all personnel in accordance with 29 CFR 1926.52, Occupational Noise Exposure and 29 CFR 1926.101, Hearing Protection, or if personnel are exposed to noise levels exceeding 90 dBA; e.g., grinding wheels, jackhammers, air compressors, sandblasting, etc.

Hearing protection shall be worn in all posted areas.

Respiratory Protection

Respirators shall be used in accordance with ANSI Z-88.2-1980. No individual shall be assigned to a job in which a respirator is or may be required unless he is properly medically certified, trained, fit-tested, and he is clean shaven in all face-sealing areas. Records documenting this shall be provided to and approved by WMCO's Industrial Hygiene and Safety

Section prior to the start of any job.

Only NIOSH-approved respiratory protection equipment that is properly maintained shall be used.

Airline respirators shall be supplied with breathing air from a compressor that generates CGA, G-7.1-1973 Grade D quality air or better. Unknown subcontractor compressors shall be checked for proper air quality and for presence of a high temperature alarm or carbon monoxide alarm.

Appropriate properly equipped respirators shall be used to protect all personnel from potential work area respiratory hazards in all posted areas, or whenever necessary such as during welding, spray painting, dusty operations, and some cleaning operations.

Hazard Communication

All materials considered hazardous under 29 CFR 1910.1200 (Hazard Communication Standard) must be properly labeled. This includes all containers into which a hazardous material has been transferred.

Material Safety Data Sheets (MSDSs) for all materials used by the subcontractor and considered to be hazardous shall be submitted to the IH Department at least one week prior to the materials' arrival at the FMPC.

Attachment C

TABLE D ANSI N13.12
SURFACE CONTAMINATION LIMITS*

Contaminants			Limit (Activity) (dpm/100 cm^2)**	
Group	Description	Nuclides (Note 1)	Removable	Total (Fixed plu Removable
1	Nuclides for which the nonoccupational MCP_a (Note 2) is 2 x 10^{-13} Ci/m^3 or less or for which the nonoccupational MCP_w (Note 4) is 2 x 10^{-7} Ci/m^3 or less.	^{227}Ac $^{241,242m,243}Am$ $^{249,250,251,252}Cf$ $^{243,244,245,246,247,248}Cm$ $^{125,129}I$ ^{237}Np ^{231}Pa ^{210}Pb $^{238,239,240,242,244}Pu$ $^{226,228}Ra$ $^{228,230}Th$	20	Nondetectable (Note 3)
2	Those nuclides not in Group 1 for which the nonoccupational MCP_o (Note 2) is 1 x 10^{-12} Ci/m^3 or less	^{254}Es ^{256}Fm $^{126,131,133}I$ ^{210}Po ^{223}Ra ^{90}Sr ^{232}Th ^{232}U	200	2000 a Nondetectable (Note 3)
3	Those nuclides not in Group 1 or Group 2		1000	5000

Attachment C (Continued)

TABLE D (Continued)
ALTERNATE SURFACE CONTAMINATION LIMITS
(All Alpha Emitters, except U_{nat} and Th_{nat} Considered as a Group)*

Contamination Contingencies	Limit (Activity) (dpm/100 cm^2)** Removable	Total (Fixed plus Removable)
If the contaminant cannot be identified: or if alpha emitters other than U_{nat} (Note 1) and Th_{nat} are present; or if the beta emitters comprise ^{227}Ac or ^{228}Ra	20	Nondetectable (Note 2)
If it is known that all alpha emitters are generated from U_{nat} (Note 1) and Th_{nat}; and if beta emitters are present that, while not identified, do not include ^{227}Ac, ^{125}I, ^{226}Ra, and ^{228}Ra	200	2000 alpha Nondetectable beta-gamma (Note 3)
If it is known that alpha emitters are generated only from U_{nat} (Note 1) and Th_{nat} in equilibrium with its decay products; and if the beta emitters, while not identified, do not include ^{227}Ac, ^{125}I, ^{129}I, ^{90}Sr, ^{226}Ra, ^{228}Ra, ^{125}I, ^{131}I, and ^{133}I	1000	5000

* The levels may be averaged over one square meter provided the maximum activity in any area of 100 cm^2 is less than three times the limit value. For purposes of averaging with regard to isolated spots of activity, any square meter of surface shall be considered to be contaminated above the limit L, applicable to 100 cm^2, if (1) from measurements of a representative number n of sections it is determined that $1/n \sum_n S_i \geq L$, where S_i is the dpm/100 cm^2 determined from measurements of section i; or (2) it is determined that the activity of all isolated spots or particles in any area less than 100 cm^2 exceeds 3L.

Attachment C (Continued)

TABLE D ANSI N13.12 (Continued)
SURFACE CONTAMINATION LIMITS*

* The levels may be averaged over one square meter provided the maximum activity in any area of 100 cm^2 is less than three times the limit value. For purposes of averaging with regard to isolated spots of activity, any square meter of surface shall be considered to be contaminated above the limit L, applicable to 100 cm^2 if (1) from measurements of a representative number n of sections it is determined that $1/n \sum_{i} S_i \geq L$, where S_i is the dpm/100 cm^2 determined from measurements of section i; or (2) it is determined that the activity of all isolated spots or particles in any area less than 100 cm^2 exceed 3L.

** Disintegrations per minute per square decimeter.

NOTES:

(1) Values presented here are obtained from the Code of Federal Regulations, Title 10, Part 20, April 30, 1975. The most limiting of all given MCP values (for example, soluble versus insoluble) are to be used. In the event of the occurrence of mixtures of radionuclides, the fraction contributed by each constituent of its own limit shall be determined and the sum of the fractions shall be less than 1.

(2) Maximum permissible concentration in air applicable to continuous exposure of members of the public as published by or derived from an authoritative source such as the National Committee on Radiation Protection and Measurements (NCRP), the International Commission on Radiological Protection (ICRP), or the Nuclear Regulatory Commission (NRC). From the Code of Federal Regulations, Title 10, Part 20, Appendix B, Table 2, Column 1.

(3) The instrument utilized for this measurement shall be calibrated to measure at least 100 pCi of any Group-1 contaminants uniformly spread over 100 cm^2.

(4) Maximum permissible concentration in water applicable to members of the public.

Attachment C (Continued)

TABLE D ANSI N13.12 (Continued)
SURFACE CONTAMINATION LIMITS*

(3) The instrument utilized for this measurement shall be calibrated to measure at least 1 nCi of any Group-2 beta or gamma contaminants uniformly spread over an area equivalent to the sensitive area of the detector. Direct survey for unconditional release should be performed in areas where the background is ≤100 counts per minute. When the survey must be performed in a background exceeding 100 counts per minute, it may be necessary to use the indirect survey method to provide the additional sensitivity required.

APPENDIX B

Work Plan for Investigation of Drum Baling Area and Nearby Burial Trench

APPENDIX B

Work Plan for Investigation of Drum Baling Area and Nearby Burial Trench

C.1.0 INTRODUCTION

The RI/FS investigation team has been asked to characterize the D&D facility construction site in order to determine the nature and extent of either radioactive or chemical contamination. The proposed construction site in part covers an area where a temporary drum baling operation existed in the 1950's. The investigation is also to determine if there are hazardous wastes in the soils and groundwater adjacent to a known trench. A site walkover of the area, including inspection of shallow trenches and fence post holes, indicates that much of the area is covered with a thin layer of rubble. It appears that the rubble is generally less than 12-inches thick and includes metal scrap and slag-like material. Scattered meter readings indicate radioactivity is associated with the scrap, discolored natural rock surfaces, layers within the rubble, and the slag.

A surface radiation survey was conducted over the proposed D&D facility site and several areas were found to have elevated readings. As preliminary excavation began for construction of the facility, it was discovered that there is some radioactive material beneath the surface. This material could not have been detected by the surface radiation readings. A number of three- to four-foot deep pits were dug in the area to determine if there is radioactive material below the surface. During a site walkover March 1, 1988, several of these pits had water accumulated in them to a depth of six inches or more. This amount of water accumulation during a period of no rainfall indicates there are shallow discontinuous saturated zones in the till.

The discovery of the buried contamination lead to a review of land usage in the area. This review indicated that the eastern portion of the construction site had been used for drum storage and baling. It was also determined that a scrap metal burial trench was located along the extreme northern edge of the construction site, along the south side of the railroad tracks. The trench was apparently on the order of ten feet deep and 150 feet long.

This sampling program is designed to determine the extent and level of near surface radiation. It will also determine if there are significant levels of hazardous chemicals in the soil where the drum storage and baling operation was located. This program will also determine if there is soil contamination in the vicinity of the burial trench, if there is ground water in the till adjacent to the trench and if the ground water contains hazardous materials. A report will be submitted at the end of the investigation with the findings and a recommended coarse of action. Should immediate action be warranted, the report will include recommended plans.

C.2.0 GEOPHYSICAL SURVEYING

In order to focus the drilling and sampling effort, ground penetrating radar (GPR) will be used to try to determine the location of the trench and determine if there are any other unknown trenches in the construction site area. A magnetometer survey was not done because of the presence of scrap metal piles, a large crane parked in the area, and scrap metal in the surface rubble. If the GPR is unable to define the trench boundaries, native soil or fill, then a solid stem auger will be used to drill shallow borings This drilling will be done in as many locations as are required to determine the location and orientation of the trench.

There are three locations where it appears there is access to do GPR traverses across the trench. Most of the area where the trench is thought to be is covered with large wooden boxes of asbestos wastes. One GPR traverse will also be run the length of the trench area. Three to four GPR traverses will be run over the entire site in an attempt to verify that there are no other trenches. Since the clay and moisture content of the soil influence the ability of the radar to penetrate the soil, at least one of these traverses will cross the storm sewer pipe in the area. If the GPR can locate the pipe, it will provide a measure of how deep the radar is penetrating under the field conditions at the time of the survey.

If the GPR surveys identifies other trenches, then the sampling program and the level of protection for the drilling and sampling crew will be revised.

C.3.0 CHARACTERIZATION SAMPLING

Prior to execution at the contamination site, a walkover radiation survey was done and indicated some radioactive contamination present. The ongoing surface radiation survey task will do a walkover radiation survey on the 100 foot grids to the south of the construction area. This survey will indicate if there is a similar level of surface contamination and if there is any reason to extend the soil investigation to the south.

Two soil sampling programs will be conducted. First, a shallow soil sampling program will be used over most of the area to quickly determine the degree of contamination and what remedial measures will be required to allow construction to proceed. Second, a deeper soil investigation will be conducted in the area of the former trench. This area is located on the northern fringe of the construction area and is less critical to construction progress.

C.3.1 Shallow Soil Sampling

The shallow soil sampling program will be used to define the vertical and lateral extent of the radioactive contamination. Approximately 96 shallow soil borings will be made on a 50-foot grid. The actual number of boring locations will be dependent on the amount of area covered by piles of scrap metal. The 50-foot grid will be tied to the RI/FS grid which is in place in the area. Prior to sampling, the surface at each sample location will be cleared of rocks or metal scraps that are too large to fit into the sampler. Soil samples will be collected using standard 18-inch, split spoon samplers. The samplers will be pushed into the soil with the hydraulic rams on an auger drilling rig. Two split spoons will be driven at each site to recover samples at a depth of 12, 24, and 36 inches.

The split spoon will be opened and a six inch length of core centered on the sample depth will be cut and placed in a 500 milliliter glass jar. The jar will be tightly closed, wiped clean on the outside, sealed with chain-of-custody tape and labeled with a unique sample number. The grid location and sample depth will be indicated on the label. Samples will be transferred to the RI/FS field trailers where a gamma scan will be made in a low background environment. The samples will then be returned to the investigation area and placed in 55-gallon drums for temporary storage. The drums will be sealed with chain of custody tape. After review of the scan data the samples for laboratory analysis will be removed from the drums and shipped to the IT Laboratory for analysis.

A gamma scan will be made of the samples to determine relative uranium concentrations. The procedures for the gamma scan are presented in Addendum A. Ten samples representing a range of scan readings will be selected and sent to the laboratory for gamma spectral analysis. The results of these ten samples will

be used to develop a calibration curve to convert the field counts per minute readings to uranium values in parts per million. The calibration curve will be used to determine which soils are less than 200 ppm uranium. Seven additional samples will be sent to the laboratory for isotopic analysis to verify that uranium is the only source for the gamma radiation.

Soil samples are required to determine if hazardous chemical contamination exists in the soils from the drum storage and baling operations. Based on the sample results from the Characterization Investigation Study (CIS) a wide variety of chemicals could be present. In order to assess the potential for risk to the environment, the initial sample analyses for an area has to include the full spectrum of possible contaminants for the site. The results of the initial sampling can be used to justify limiting further sample analysis to a few constituents should additional investigation be required.

Two soil samples will be collected for HSL inorganics, volatile and semi-volatile organics, and PCB analysis. These samples will determine if hazardous materials are present in the area. These samples will include the native soil immediately below the fill. Suitable volumes of soil will be collected at each location, sealed in glass jars, labeled with unique sample numbers, date, time, location and depth of sample and shipped to the IT Laboratory for analysis. All samples will be handled under full chain of custody procedures.

Soil sampling for radiation measurements will begin in the area where the former drum storage and baling operation took place. As the samples for the radiation survey are collected, a portable organic vapor meter (HNu) will be used to screen the samples. If visible staining or HNu readings indicate the presence of organics in an area, the HSL samples will be collected from the portion of the area that appears to have the highest levels of

contamination. If no field evidence for hazardous chemicals is discovered, the HSL samples will be selected at random from the drum handling area.

Two till wells exist on the east side of the construction site at well cluster 13. The till wells do not have any water in them at this time so they are of no immediate use to this investigation. They are included in the routine RI/FS water level measurement program and if water should accumulate in them in the future the need for sampling will be reevaluated.

C.3.2 Burial Trench Investigation

The burial trench is believed to contain scrap metal wastes. This investigation is to determine the location of the trench and determine if the contents of the trench constitute a threat to the environment. In order to make this evaluation the soils adjacent to the trench and any ground water in the vicinity of the trench must be sampled and analyzed for the full spectrum of materials that could have been placed in the trench. The basis for choosing the initial analyses has to be based on the CIS results. The results of the initial screening can be used to justify a more limited analytical program if further investigation or testing is warranted.

C.3.2.1 Locating the Trench

Most of the area where the trench is thought to be located is covered with wooden boxes and palates of asbestos waste. These boxes will have to be moved before a full definition of the trench location can be completed. If the GPR survey does not define the limits of the trench than a series of shallow borings across the area will have to be used to determine the limits of the trench. These borings will be made with a solid stem auger. Borings will be made to a depth of no more than five feet.

Borings will be placed in lines perpendicular to the suspected trench side and spaced at five foot intervals. If the auger does not encounter fill the next boring toward the trench will be drilled. If the auger encounters fill than the next boring away from the trench will be drilled. A sufficient number of traverses will be made to define a reasonable limit to the sides of the trench. All boreholes will be grouted to the surface and soil cuttings properly contained.

The trench is thought to be approximately 150 feet long, ten feet deep and anywhere from ten to 30 feet wide. In order to assess the impact of a trench, the investigation will begin with six borings. One boring will be placed at each end and two borings will be placed at even spacing along either side of the trench. The six borings will be made using hollow-stem augers. Since the borings will be in till and only 18 feet deep, the use of hollow stem augers does not pose any problem in terms of creating cross contamination pathways to the much deeper sand and gravel aquifer. Augers and drilling equipment will be decontaminated between boreholes in accordance with the standard RI/FS procedures.

These borings will be sampled over the initial three feet using the same procedures as in the shallow sampling program. Continuous split spoon samples will be taken to the total depth of each boring to determine nature of the subsurface material. If the sampling indicates that the boring is going into trench material, the boring will be stopped, the hole will be filled with Volclay grout, and relocated beyond the trench boundary. The intent of the characterization is to determine what, if anything, is migrating from the trench rather than characterize the fill in the trench. Soils from these borings will be drummed and transferred to WMCO for disposal.

One sample from each boring will be collected for extended HSL analysis. If visible staining or the field HNu indicates contamination, the sample will be selected form the area with the highest contamination. If no field evidence exists with which to deuterium a sample point, the sample will be collected from the 10- to 15-foot interval. This interval was selected because it is below the bottom of the trench and is where contaminants would be migrating. If shallow ground water is encountered in the boring, and the HNu readings do not indicate organics are present, then no soil sample from that boring will be sent to the laboratory. Only a water sample will be collected after the well is installed and developed. There is no value in collecting soil samples for analysis when the sample is below the water table. If the contamination is below the water table it is a ground water problem.

All six borings will be completed as monitoring wells with ten feet of screen in the bottom of the wells. All screen materials, well completion procedures, and decontamination procedures will be the same as the RI/FS. The elevation of the wells will be surveyed. Water table measurements will be made three days after the wells are completed to determine the local water table gradient in the vicinity of the trench. If there is no field evidence for contamination, a water sample will be collected from the upgradient well and two of the most down gradient wells.

Water samples will be collected from all six wells located around the former trench if there is field evidence for either radiological or chemical contamination in any well. Samples from the six wells will indicate if there are contaminants migrating from the trench and if there are local water bearing units within the till. The two shallowest wells in cluster 13 are till wells that were dry when drilled. The next shallowest well is apparently a 200-series well as defined in the RI/FS. The till wells, if they contains water, will indicate if contaminants are

migrating from the construction site area. The 200- series well will indicate if there is ground water contamination in the upper portion of the upper sand and gravel aquifer. All water samples will be analyzed for full radiological analysis and the extended HSL parameters.

C.4.0 SCHEDULE

The walkover radiation survey and the staking of boring locations will begin on Saturday, March 5, 1988. The GPR survey will be done on Monday, March 7. One drilling rig will begin the shallow soil sampling on Thursday, March 10. A second drilling rig machine will start on Saturday, March 12. Radiological screening will be done on site and the results compiled daily. The shallow soil sampling will be completed in two to three days barring delays due to weather. The determination of the trench boundaries will take one day. The deeper sampling will follow and will be completed in three days. Water sampling will be completed at the end of the installation and development of all wells.

C.5.0 HEALTH AND SAFETY

The health and safety plan for this activity is included in Addendum B. These procedures are in addition to the normal health and safety procedures specified in the RI/FS work plan.

C.6.0 REPORTS

A summary report will be generated at the end of the shallow soil sampling program that will indicate the extent of the radiological sampling and if there is extensive contamination by organic chemicals. The data in this report will allow a decision to be made regarding the resumption of the construction program. This report will be ready five days after the soil sampling is

completed as the gamma spectral analyses will take three days. A final report will be submitted after the laboratory results are received for the HSL analyses. This report will present the results of the investigation and recommendations if further action is required. Unless the data indicate that a more extensive investigation is warranted, the full data analysis will be included in the RI Report.

ADDENDUM A

FIELD GAMMA MEASUREMENTS

TITLE: Correlation of Shielded Sodium Iodide Detector with Total Uranium in Soil	NO: RSL-2007	PAGE 1 of 5
	REVISION: 0	DATE: 3/8/88

1.0 PURPOSE

This procedure provides the approach and method to scan soil samples in the field in order to determine the concentration of total uranium in soil, reported in parts per million (wt/wt). These samples will be collected during the Remedial Investigation conducted at the Fernald Feed Materials Production Center.

2.0 SCOPE

This procedure applies to the use of radiation survey instruments used to conduct indirect radiation measurements in an effort to characterize radiation material in soil samples.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the Leader for Task leader, or his designee, to see that this procedure is followed during the field program phase.

3.2 It is the responsibility of the Leader for Task leader, or his designee, to delegate the performance of this procedure to personnel that are experienced with this procedure, and the shielded large volume scintillation detector.

3.3 It is the responsibility of the technician performing this procedure to follow it and report abnormal occurrences or results to the task leader, or his designee, immediately.

4.0 REFERENCES

4.1 Operation manuals for the large volume scintillation detector and ratemeter.

4.2 Field Screening of Subsurface Soil Samples for Radioactive Contamination, Quality Assurance Project Plan for Remedial Investigation, FMPC Fernald, Ohio, Volume V, Section 6.6.2.

5.0 REQUIREMENTS

5.1 All procedures must be previously approved by the project management team.

5.2 Each soil sample must be previously packaged and labeled with the appropriate sample numbers.

6.0 PROCEDURE

6.1 Field Screening

6.1.1 Perform a background count with an empty sample container (500 milliliters wide mouth jar) inside the shielded enclosure, counting for 2 minutes. Record the data. Repeat this measurement at least three (3) times.

6.1.2 Perform a source check using a thorium lantern mantle at a previously determined position inside the shield. Count for 2 minutes. Record the data.

6.1.3 Select a sample and position it inside the shielded enclosure.

6.1.3.1 Record the sample number and the volume of the sample in the container.

6.1.3.2 Count the sample for 2 minutes.

6.1.3.3 Record the total counts measured.

6.1.4 Remove the sample and repeat step 6.1.3.

6.1.5 Repeat the background check and source check for each case of samples, not to exceed 12 samples and at the end of the counting procedure. Record the data.

6.2 Laboratory Analysis of Samples

6.2.1 Select several samples for analysis by IT/RSL.

6.2.1.1 Determine the range of the data for all samples analyzed.

6.2.1.2 Select 2 samples with a countrate equivalent to the system background.

NOTE: Ensure that at least one of these samples was collected from a depth greater than 24".

6.2.1.3 Select 3 samples with a countrate at approximately the arithmetic average of all samples analyzed.

NOTE: As appropriate, select samples that were collected below the surface of the soil.

6.2.1.4 Select 2 samples with a countrate at approximately a 75 percentile of the samples analyzed.

6.2.1.5 Select at least 3 samples collected from depths greater than 12" where the countrate exceeded background.

6.2.2 Submit the 10 samples to RSL for gamma spectroscopy only. Measure the total uranium present in ppm, U-238 and U-235.

6.2.2.1 If the U-235 enrichment exceeds 0.72%, the task leader may select alpha spectroscopy to measure the U-234 component.

6.2.2.2 U-238 should be calculated by measuring the quantity of thorium-234 present in the sample and assumed to be in equilibrium with U-238.

6.2.2.3 Identify all significant gamma emitting isotopes measured by the gamma spectroscopy system.

6.3 <u>Correlate Field Instrument</u>

6.3.1 After performing analysis in 6.2.2, correlate the data from the laboratory (ppm total uranium) with the shielded SPA-3 using the following regression equation.

$$E = a\ (Em) + b$$

Where:

E is the lab data in ppm of total uranium
a is the slope of the line
E_m is the SPA-3 reading in average counts per minute
b is the y-axis intercept

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7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsible for Inspection

8.1.1 The Health Physics Services Manager, or his designee, shall inspect the work of technicians performing this procedure for completeness and adequate quality.

8.1.2 The technicians performing this procedure shall inspect data forms for accuracy and completeness and shall inspect instrument for proper operation and calibration.

8.2 Equipment Monitoring

8.2.1 The instrument being used shall be checked to see that calibration date has not expired.

9.0 CALCULATIONS

None

10.0 APPENDICES

TITLE: Correlation of Shielded Sodium Iodide Detector with Total Uranium in Soil	NO: RSL-2007	PAGE: 5 of 5
	REVISION: 0	DATE: 3/8/88

RADIATION SURVEY OF SOIL

Instrument: Eberline Model ESP-1 Serial Number 141
Detector Model SPA-3 Serial Number 405023

Location:_____ Background:_____ Counts in____ min

Date:_____ Source:_____ Counts in____ min

Each sample was counted for ___ minutes

Sample ID#	Total Counts	Sample ID#	Total Counts

* Selected for full radiological analysis

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ADDENDUM B

HEALTH AND SAFETY PLAN

SITE SAFETY WORKSHEET

Site Name: FMPC **Date:** March 1, 1988

Location: D&D Facility Area

Type of Site:

(X)	Industrial	( )	Construction
( )	Excavation	(X)	Drilling
( )	Demolition	( )	Drilling with Air

Site Status: (X) Active ( ) Inactive

If the activities involve excavation or drilling, attach a diagram showing the locations of buried utilities relative to the planned work locations. Include the sources of information.

Anticipated Activities: Surface Soil Sampling, Subsurface Sampling with a hollow stem auger drill rig, decontamination, steam cleaning.

Unusual Features: Surface and Subsurface Contamination by radioactive materials including uranium-metal.

Will personnel enter excavations deeper than five feet? No.

If 'yes', attach a soil description and diagrams showing how the walls will be sloped or describing in detail the method of shoring. Show where spoils will be placed in relation to the excavation, and the locations of nearby heavy equipment and objects.

Heavy Equipment to be Used: Hollow stem auger drill rig and steam cleaner.

If equipment with booms or derricks is to be used, provide the voltage of overhead power lines and the source of information.

Source of Information: R. Haaker performed inspection of work area on March 2, 1988.

Observe the following working clearance between equipment and power lines: (mark the appropriate blank)

_____ 10 feet (less than 50 kV) _____ 20 feet (less than 345 kV)

_____ 33 feet (less than 750 kV) __X__ There are no overhead power lines in the area.

Observe the following in-transit clearance between equipment and power lines: (mark the appropriate blank)

_____ 4 feet (less than 50 kV) __X__ 10 feet (less than 345 kV)

_____ 16 feet (less than 750 kV)

Describe plans for storage of any compressed gas cylinders to be used. Identify the gases.

None to be used.

Describe plans for storage of gasoline or diesel fuel on the site. give quantities of each.

Safety cans required.

Does work involve asbestos, biological agents, hazardous substances, chemical products, radioactive materials, or materials contaminated with these? Describe.

Radioactive materials. See Attachments 1 and 2. Asbestos is stored in the area.

Describe the fire hazards associated with the work activity. Attach plans of how the hazards will be controlled.

Pyrophoric uranium, hydrogen. See Attachment 5.

Does work involve confined space entry? No.

If yes, describe: _____

Entry is prohibited unless a Confined Space Permit is attached.

Do activities involve walking on tops of tanks, silos, or other structures? __No.__ If yes, attach documentation of their integrity.

Protective equipment required: (X) Hard Hat, (X) Work Clothes

(X) Safety Toe Boots, ( ) Safety Glasses,

( ) Hearing Protection, (X) Other (specify):

See Attachments No. 3 and No. 4

Monitoring Equipment Required: Smear Counter for α & β, uR meter, G-M Pancake detector, γ- Scintillometer, CGI, PID. G-M detector and α - Scintillometer will be checked per requirement stated in Attachment No. 1 and No. 2.

Emergency Telephone Numbers:

Ambulance*: 738-6511 (on-site)

Police Department: 738-6511

Fire Department: 738-6511

Nearest Hospital: _____
(w/emergency room)

Route to clinic: (attach diagram) _____

Travel time from site: _____

Communications: The crews will have 2-way radios. The dispatcher can send ambulance to the work area.

Names of persons on-site that have first aid certificates:

Location of First Aid Kit: Located at entry to hot zone.

Location of nearest sanitary facilities and drinking water:

Location of Fire Extinguisher: Each drill rig will have its own fire extinguisher.

*On-site Westinghouse provides ambulance service, security and fire protection.

APPROVALS

_____	_____
Project Manager	Date
Rick Haaker*	_____
ASI Health & Safety Officer	Date
_____	_____
Site Safety Coordinator	Date

*Approval contingent on blanks in plan marked with being filled in. Penetration must be attached.

SITE WORKER BRIEFING

Given by: _____ Date: _____

Attendees: _____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Monitoring/Dosimetry

Regular asbestos and gross alpha air samples will be collected in the worker's breathing zones.

Each person will wear a dosimeter badge.

Breathing zones and borehole head spaces will be monitored with an HNu and CGI.

ATTACHMENT 2

DESIGNERS AND MANUFACTURERS OF
Scientific and Industrial Instruments

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LUDLUM MEASUREMENTS, INC.
915 · 235-5494 - 235-4947 TELEX No. 4668320 TD
POST OFFICE BOX 810 FAX NO. (915) 235-4672
501 OAK STREET
SWEETWATER, TEXAS, U. S. A. 79556

February 19, 1988

Mr. Richard Haaker
Advanced Sciences, Inc.
2620 San Mateo NE
Suite D
Albuquerque, NM 87110

Dear Mr. Haaker:

Per your inquiry, we will respond as follows.

The Ludlum Model 43-5 should be checked for proper operation after each mylar face change. Check the efficiency at the toe, center, and heal with an Alpha check source. The counts obtained over a one minute period should be within ±10% at all three points. Background of the Model 43-5 should be below 3 CPM at the operating voltage. The efficiency of the Model 43-5 is approximately 25% 2 Pi.

In regards to calibration, Ludlum Measurements recommends at least one year calibration. Because of radioactive sources or Government regulated agencies, one may need to consult the nearest Health Physicist or Radiation Safety Officer to find out proper calibration period. If equipment is used daily, a check source may be purchased to check the calibration of the instrument before each use.

If we may be of further service, please feel free to call on us.

Yours truly,

Chris Maxwell

Chris Maxwell
Nuclear Instrument Sales

CM-lb

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ATTACHMENT 3

Protective Clothing Requirements

- Cotton coveralls
- One pair of Saranex coveralls
- Boots (safety toe), boot covers, and PE liners between boots and covers. Liners taped to inner tyvek
- Two pairs of examination gloves, the inner pair taped to the inner tyvek
- One pair of chemical protective gloves
- Hard hat

ATTACHMENT 4

Decontamination Plan (Personnel)

Four zones will constitute the decontamination line. The decontamination sequence will consist of 10 steps. The decontamination sequence and the zone where each step will be completed are as follows:

Step No.	Step	Zone
1	Remove outer tape	Hot 1
2	Remove boot covers	Hot 1
3	Remove saranex[1,2]	Hot 2
4	Remove outer gloves	Hot 2
5	Remove outer exam gloves	Gray
6	(Wipe off APR)[3]	Gray
7	(Remove APR)[3]	Gray
8	Remove inner exam gloves	Gray
9	Personnel contamination survey	Clean
10	Exit to support zone	Support

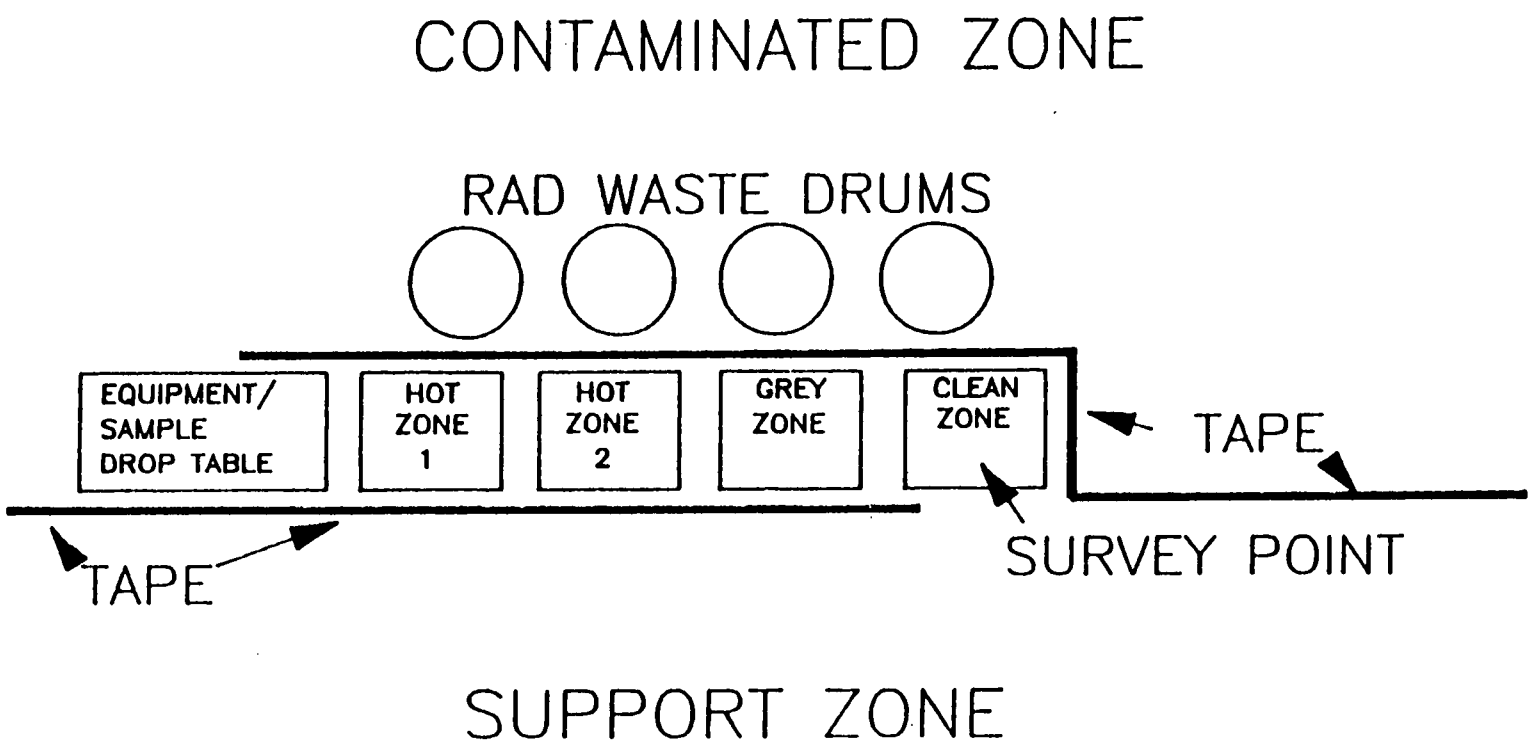
---

[1]Persons may not enter Hot Zone 2 while wearing boot covers. Saranex will not touch any surface in Hot Zone 1.

[2]Persons may not enter the gray zone while wearing saranex. Work boots will not touch any surface in Hot Zone 2.

[3]If APR is worn.

DIAGRAM OF DECON LINE



ATTACHMENT 5

Contamination Control Plan

1. Whenever possible, equipment will be bagged and sealed before entering the contaminated area.

2. Vehicles (other than the drill rig) will not go into the contaminated area.

3. No eating, drinking, or smoking in the contaminated area.

4. Persons will be frisked each time before drinking water.

FIGURE 3-1

PRODUCTION AND
ADDITIONAL SUSPECT AREAS

LOCATIONS OF PROCESS AREA
SECTORS AND SUSPECT AREAS

- SUSPECT AREAS
- UNDERGROUND TANKS
- KEY SUMPS
- STORAGE PADS
- EXISTING WELLS
- CONTINGENCY WELLS
- 2000 SERIES WELLS
- 250' GRID BORINGS
- FOCUSED BORINGS
- COMPLETED BORINGS

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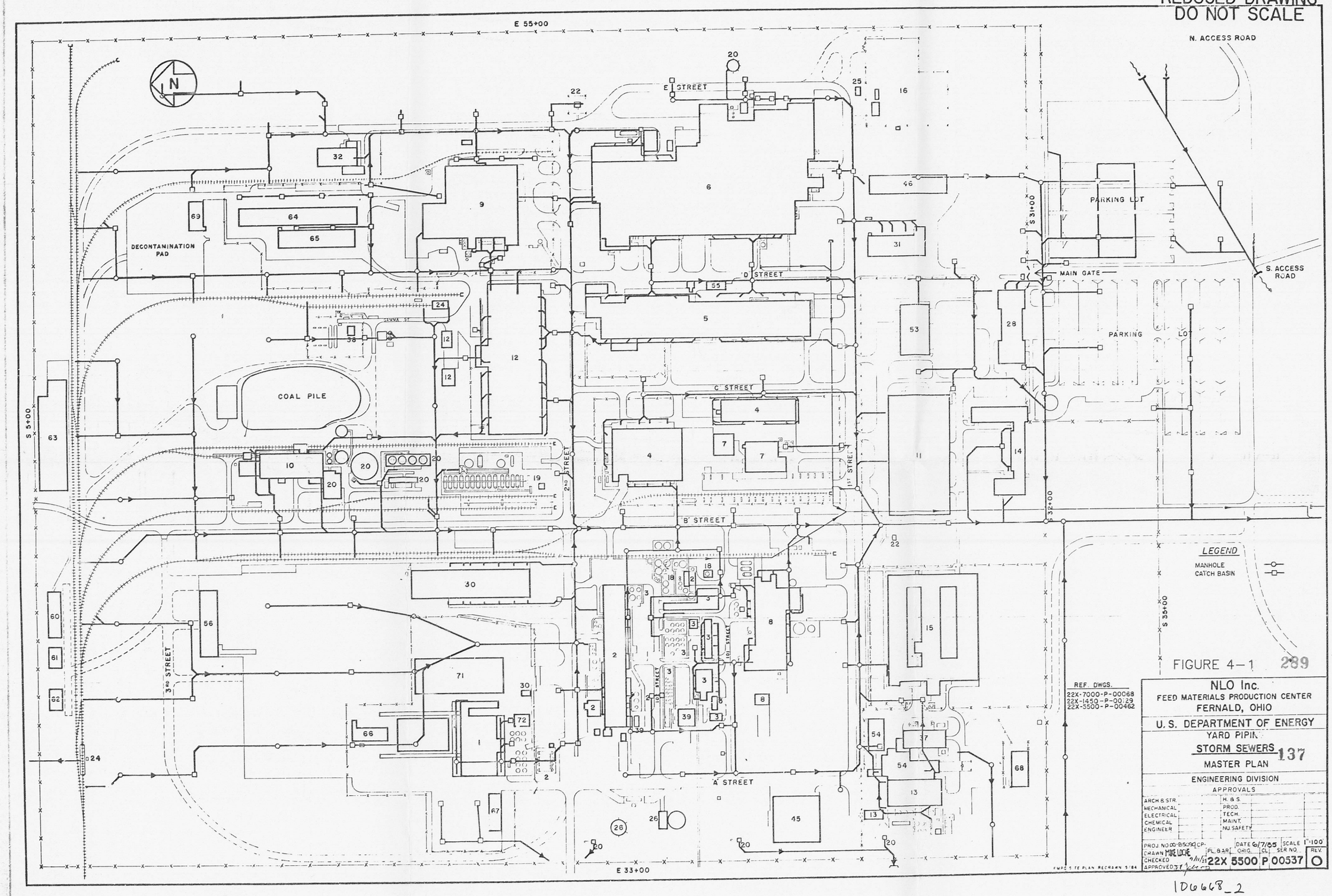
OCT 3 1 '89

106668_1

REDUCED DRAWING
DO NOT SCALE



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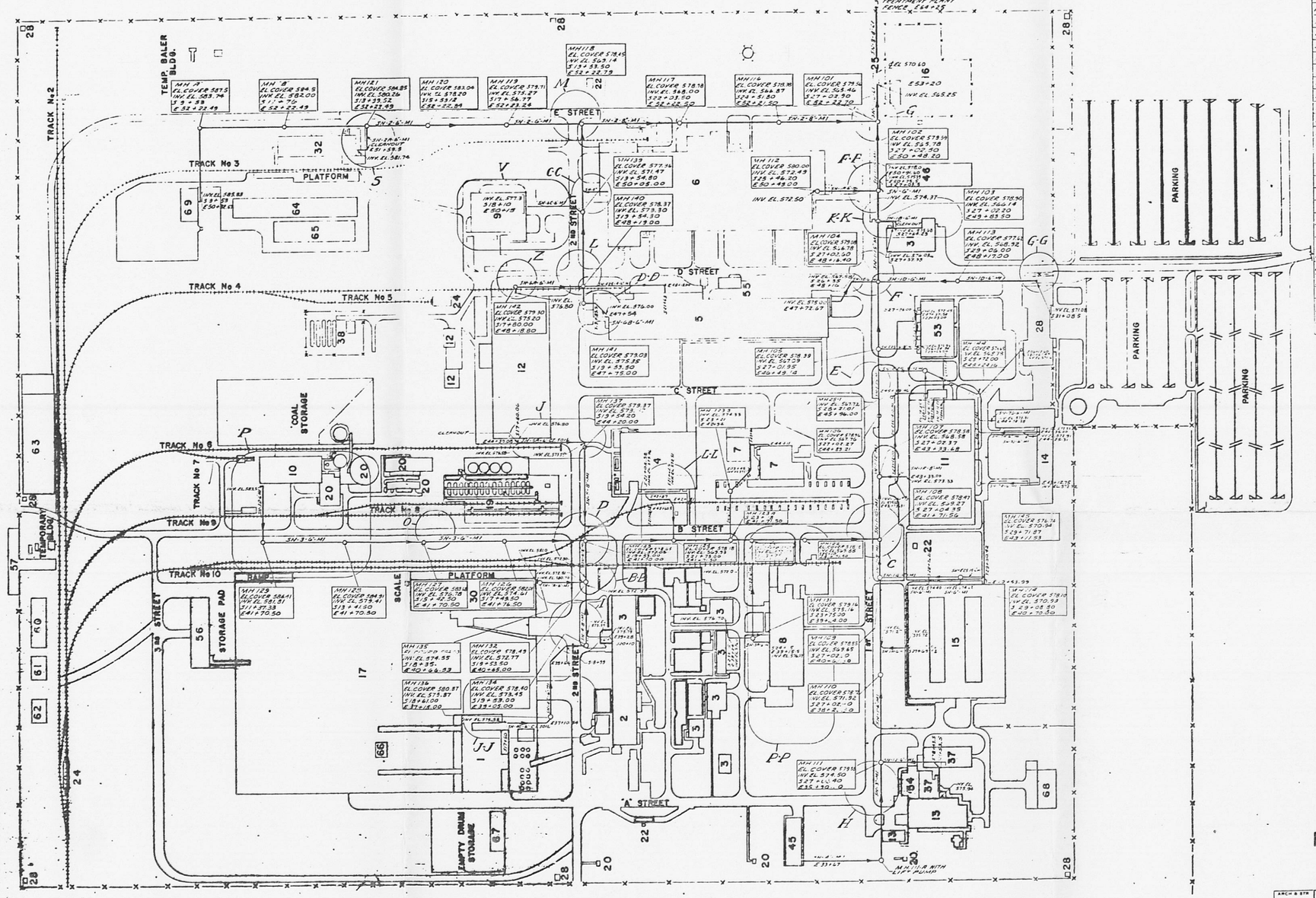
22-5002



REFERENCE DRAWINGS	
DETAIL PLAN	DWG. NO.
AREA C	3022-H-53-A
AREA D	3022-H-54-A
AREA E	3022-H-62-A
AREA F	3022-H-61-A
AREA G	3022-H-81-A
AREA H	3022-H-83-A
AREA I & J-J	3022-H-84-A
AREA J	3022-H-55-A
AREA L & Z	3022-H-56-A
AREA M & F-F	3022-H-57-A
AREA O	3022-H-87-A
AREA P	3022-H-58-A
AREA G-G	3022-H-35-A
AREA K-K	3022-H-104-A
AREA V	3022-H-90-A
AREA B-B	3022-H-89-A
AREA C-C & D-D	3022-H-88-A
AREA S	3022-H-91-A
AREA L-L	3022-H-112-A
AREA P-P	3022-H-125-A
PLANT 5 AREA	5250-22M-5008
PLANT 6 AREA	5250-22M-5009
PLANT 7 AREA	3241-A-14001
PLANT 3 MAINT. BLDG.	5250-3A-5081
SERVICE BLDG. AREA	5250-22M-5019
ADMINISTRATION BLDG. AREA	5250-22M-5020
LABORATORY BLDG. AREA	5250-22M-5030
PERSONNEL & SECURITY BLDG. AREA	5250-22M-5013
HEALTH & SAFETY BLDG. AREA	5250-22M-5015
PILOT PLANT ANNEX BLDG. AREA	37-4143
DEVELOPMENT MACHINE SHOP AREA	45-4001
DECONTAMINATION BLDG. AREA	69-4011

SS-2005

FIGURE 4-2 289

REDUCED DRAWING
DO NOT SCALE

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ARCH & STR	NATIONAL LEAD COMPANY OF OHIO
MECHANICAL	FEED MATERIALS PRODUCTION CENTER
	FERNALD, OHIO
ELECTRICAL	U.S. ATOMIC ENERGY COMMISSION
CHEMICAL	REVISED PLAN OF UNDERGROUND SANITARY SEWERS
PROJ ENGR	ENGINEERING DIVISION
	PROJECT NO. 6-152 — CP-F-
	DRAWN CLIFT / TRACED — CHECKED / APPROVED — REV. 0
	DATE 5-5-83 — DWG. NO. 22-5002
	SCALE 1"=100'

INDEX CODE
22X5500P00461

REF. DWG. NO.	REF. DWG. TITLE	NO.	REVISIONS	DATE	BY

1066668_3

SS-2005-R1-X55-R00-6-00481