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START

WORK PLAN

HAZARDOUS SUBSTANCE
SOURCE EVALUATION
SIEMENS NUCLEAR POWER CORPORATION
RICHLAND, WASHINGTON

PROJECT NO. WA183.06

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Prepared for

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RICHLAND, WASHINGTON

INTRODUCTION

This work plan has been prepared by Geraghty & Miller, Inc. for an investigation of potential source areas for hazardous substances that have been detected in the ground-water at the Siemens Nuclear Power Corporation (SNP) fuels fabrication facility (SNP facility) in Richland, Washington (Figure 1). The purpose of the work plan is to present an approach for obtaining soils data to evaluate potential hazardous substance source (source) areas identified at the site which may be or may have been sources of chemical/radiological constituents found in ground water. Specifically, this work plan presents a soils sampling approach to evaluate potential source areas that have been identified within the active facility boundaries (within the fenced area) which have the potential for impacting ground water.

This work plan uses a number of terms interchangeably (i.e., hazardous substance, COC, source material), some of which have specific legal definitions under MTCA or federal or state laws. These terms are used in this work plan as a general technical characterization rather than within their legal context.

ORGANIZATION

This work plan consists of the following elements:

- A statement identifying the **objectives** of the source evaluation.
- A brief summary of **background** information concerning the site.

- A description of each of the **potential hazardous source areas for investigation** and the rationale for selection of areas for further investigation.

- A summary of the general **technical approach** that will be taken to accomplish the stated project objectives and the specific methodologies for investigation.

- A **schedule** for carrying out the various tasks of the Hazardous Substance Source Evaluation.

The Sampling and Analysis Plan (SAP), Quality Assurance Project Plan (QAPP), and Health and Safety Plan (HASP) included in the Phase I Ground-Water Study Work Plan (Geraghty & Miller 1991a) will generally be followed during the source evaluation. A summary of the sampling and analysis activities is provided in the Technical Approach section of this work plan.

OBJECTIVES

The objectives of the source evaluation are as follows:

- Investigate the soils in areas identified as potential source areas to determine if the areas are potential sources of COCs to ground water.

- Determine the nature and distribution of constituents in soils (i.e., vertical and areal extent, and constituents).

- Generate data from the potential source areas necessary for the risk evaluation task of the RI/FS.

- Generate data necessary to support the FS.

BACKGROUND

A brief summary of the site location and description, and hydrogeology is presented in this section. A comprehensive summary of the site characteristics is provided in the Phase II Ground-Water Study Work Plan (Geraghty & Miller 1992b).

SITE LOCATION AND DESCRIPTION

The SNP facility is located at 2101 Horn Rapids Road in Richland, Washington (Figure 1). The facility has been operating since the early 1970s, manufacturing nuclear fuel assemblies for boiling-water and pressurized-water reactors. The active portion of the SNP's property includes the Uranium Dioxide (UO_2) Building, where uranium hexafluoride and uranyl nitrate are converted to UO_2, which is pressed into pellets, sintered, and fabricated into fuel rod assemblies, some of which are etched and autoclaved; the Engineering Laboratory Operations (ELO) Building, where uranium purification by solvent extraction occurs; the Specialty Fuels Building, where neutron-absorber fuel is fabricated and non-hazardous uranium-containing waste is incinerated; an office complex; several warehouses and shops; the Ammonia Recovery Facility (ARF), and six process solution lagoons (Figure 2).

Twelve ground-water monitoring wells were constructed at the SNP facility in October 1991 as part of the SNP Phase I Ground-Water Study (Figure 3). The wells are designated GM-1 through GM-12. Four additional monitoring wells (GM-13 through GM-16), three piezometers (P-1 through P-3), and a large-diameter well for conducting a pumping test (PW-1) were installed in March and April 1992 as part of the SNP Phase II Ground-Water Study.

SITE HYDROGEOLOGY

The SNP facility is underlain primarily by poorly and well graded sands and gravels of the Hanford and Ringold Formations. The Hanford Formation overlies the Ringold Formation. The unit of the Hanford Formation exposed in the area of the SNP facility is informally referred to as the Pasco Gravels. The Hanford and Ringold Formations are differentiated by the basalt content of the sand and gravel fractions of the cuttings and soil samples. (Pasco Gravels tend to be basalt rich, and the upper portions of the Ringold Formation tend to be basalt poor).

A silt aquitard, underlying the unconfined aquifer, has been identified in previous studies [J-U-B Engineering (J-U-B) 1982 and U.S. Department of Energy (USDOE) 1990]. The thickness of the aquitard was determined to be at least 17 feet(ft) at on-site Well TW-16 (J-U-B 1982), approximately 32.5 feet at P-3 (Figure 3), and approximately 33 ft at Well MW-9, which is located at the Horn Rapids Landfill (USDOE 1990). During drilling in the Phase I and Phase II Ground-Water Studies, the aquitard was encountered in the monitoring well boreholes at depths of approximately 27.5 ft below land surface (bls) to 49.5 ft bls.

Ground-water generally occurs at approximately 10 to 15 ft bls beneath the active SNP facility. Water-level data collected from the monitoring wells indicate the direction of ground-water flow is generally to the north-northeast.

GROUND-WATER QUALITY

COCs that have been detected in the ground water at the SNP facility include TCE, TCA, nitrate, ammonium, fluoride, and radionuclides (measured as gross-alpha and gross-beta radiation). A summary of the historical water-quality data is included in the Phase I Ground-Water Study Work Plan (Geraghty & Miller 1991a). The water-quality data from the November 1991 sampling effort, conducted as part of the Phase I

Ground-Water Study, is provided in the Quarterly Ground-Water Monitoring Report (Geraghty & Miller 1992c).

The following information regarding ground-water quality beneath the active facility is based on results of the November 1991 sampling effort.

- TCE concentrations in ground water within or immediately adjacent to the active facility were highest at Wells GM-3 and GM-5.

- 1,1,1-TCA concentrations were highest at Well GM-3.

- Ammonium, fluoride, and nitrate concentrations were generally highest near Well GM-5.

- Radionuclide concentrations (gross-alpha and gross-beta radiation) were generally highest near Wells GM-4 and GM-5.

PREVIOUS SOILS INVESTIGATIONS

Geraghty & Miller conducted a limited soils investigation near the ARF and an area near the northeast corner of Lagoon 1 between July and November 1991. The investigation was conducted to determine the extent of impact to the soils resulting from four releases of process solutions. A detailed summary of the releases is provided in Lockhaven (1991). Since the soils investigation was completed in the ARF area (November 1991), an additional release has been reported, rendering some of the earlier sampling results outdated. The results of the soil sampling will be presented in the RI/FS report; however, the results will also be used as a guide during further investigation of the ARF area.

IDENTIFICATION OF POTENTIAL SOURCE AREAS FOR INVESTIGATION

To identify potential source areas that may warrant further investigation, Geraghty & Miller and others researched the history of the facility and its management of hazardous substances. This research attempted to identify known releases of hazardous substances and materials handling practices that may have had a high potential for releases. The areas identified by this research as warranting further investigation are listed on Table 1 and shown on Figure 2.

RESEARCH METHODS

The research methods used to identify potential source areas were as follows:

- Compilation and evaluation of all reports and other information in SNP's records regarding the history of the use, handling, storage, processing, and releases of hazardous substances at the facility.

- Discussions with SNP employees regarding the history of the use, handling, storage, processing, and releases of hazardous substances at the facility.

- Several site visits to confirm information regarding potential hazardous substance source locations and history.

The emphasis of the investigation was on potential releases that could affect ground water. In particular, this research focused on identifying potential releases of one or more of the constituents of concern (COCs). For this investigation, the COCs are the following constituents, which have been detected in ground water beneath the SNP facility: trichloroethene (TCE), 1,1,1-trichloroethane (TCA), fluoride, nitrate, ammonia/ammonium, and radionuclides. The researchers did not attempt to catalogue

releases known to be de minimis or to follow up on historical practices not involving COCs or with a low risk for significant releases that could affect ground water.

POTENTIAL HAZARDOUS SUBSTANCE SOURCE AREAS

Based upon the historical research and evaluations the following sites were identified as areas of potential hazardous substance sources that may have contributed to elevated concentrations of COCs in ground-water:

- Chemical storage area north of the ARF
- The ARF
- Former west tank farm
- Former east tank farm
- Former neutralization tank and current etch-solution transfer sump
- Former paintbrush cleaning station near former paint trailer
- Unlined pit on the east side of the former paint trailer
- Drywell located east of the former paint trailer
- Former boneyard beneath the current location of the east end of the machine shop
- Area adjacent to current boneyard
- Areas on east and west sides of the chemical storage building
- Former waste-oil storage area beneath the current location of the west end of the machine shop
- Lagoon area
- South end of the UO_2 Building
- Concrete retention tanks

Table 1 summarizes information regarding these sites: location, potential constituents, and potential sources; Figure 2 shows their location. The following describes each site in more detail. The location of each area on Figure 2 is indicated

in parentheses in each section heading (e.g., Chemical Storage Area North of the ARF (1) indicates that this area is marked with locator number 1 on Figure 2).

Chemical Storage Area North of the ARF (1)

A liquid release containing 16 to 24 percent ammonium hydroxide occurred near the chemical storage area north of the ARF in January 1991 (Lockhaven 1991). The volume of the release was estimated to be less than 125 gallons. This area is targeted for investigation because of the potential for releases of ammonium, nitrate, fluoride, and radionuclides to ground water. Soil samples were collected from this area in July, October, and November 1991 and were analyzed for ammonium, nitrate, nitrite, fluoride, gross alpha, and gross beta. Results from these analyses will be examined along with the analytical results obtained during implementation of this work plan to evaluate this area as a potential source.

Ammonia Recovery Facility (ARF) (2)

The ARF area consists of the ARF itself and subsurface solution transfer lines that run through the area. The ARF recovers ammonia from conversion process solutions which contain uranium, ammonium, fluoride, nitrate, and sulfate. Releases of these solutions have occurred from different transfer lines which run between the ARF and the lagoons (Lockhaven 1991). The quantities of these releases are unknown. This area is targeted for investigation because of the potential for releases of ammonium, nitrate, fluoride, and radionuclides to ground water.

Former West Tank Farm (3)

The former west tank farm was located along the west side of the UO_2 Building and consisted of four tanks: a fiberglass UST for etch-room solutions, and three aboveground tanks, one containing ammonium hydroxide, one containing nitric acid, and

one neutralization tank. A release from the etch-room tank is known to have occurred. The quantity of the release is unknown. This area is targeted for investigation because of the potential for releases of ammonium, nitrate, and fluoride to ground water.

Former East Tank Farm (4)

The former east tank farm was located along the east side of the UO_2 Building and consisted of four aboveground tanks containing concentrated nitric acid, dilute nitric acid, liquid nitrogen, and an ammonium solution. A release of an unknown quantity of nitric acid is known to have occurred in this area. Soil samples were collected in this area from near ground surface to a depth of 12 ft bls on March 26, 1992. The samples were analyzed for constituents associated with the tank farm. When the results from these analyses become available, they will be examined along with the analytical results obtained during implementation of this work plan to evaluate this area as a potential source.

Former Neutralization Tank and Current Etch-Solution Transfer Sump (5)

The former neutralization tank was an epoxy-coated concrete tank located near the northwest corner of Lagoon 2 and the Etch Solution Sampler Building. This tank was built in 1974 for sulfuric acid neutralization of conversion solution and was abandoned in the early 1980s. Releases of unknown quantities of neutralized conversion solutions are known to have occurred in this area. Potential solutions or chemicals released from the former neutralization tank area are sulfuric acid, conversion solutions, and neutralized conversion solutions. Conversion solutions would be expected to contain uranium, nitrate, ammonium, and fluoride.

The current etch-solution transfer sump is located adjacent to the former neutralization tank and handles solutions which contain fluoride, ammonium, and nitrate. No releases are known to have occurred from the current etch-solution transfer sump;

however, the potential for a release is believed to be sufficient to warrant investigation. The former neutralization tank and current etch-solution transfer sump area is targeted for investigation because of the potential for releases of ammonium, nitrate, fluoride, and radionuclides to ground water.

Former Paint Trailer (6, 7, and 8)

The paint shop was located in a trailer southeast of the UO_2 Building from approximately 1977 until 1990. Potential source areas associated with the former paint trailer are: the former paintbrush cleaning station (Location 6), the unlined pit on the east side of the trailer (Location 7), and the drywell beneath the current location of the pesticide storage trailer (Location 8). It is possible that solvents used to clean brushes and other painting equipment and residual paint were discharged to the ground in these areas. These areas are targeted for investigation because of the potential for releases of solvents to ground water. Because metals are frequently associated with paints (in general), these areas will also be evaluated for the presence of metals; because of the proximity of the drywell to the current location of the pesticide storage trailer, the drywell area will also be evaluated for the presence of pesticides. No known releases of pesticides have occurred.

Former Boneyard Beneath Current Location of East End of Machine Shop (9)

From the mid-1970s through the early 1980s, the area which is currently beneath the east end of the machine shop was used as a boneyard which included a drum storage area. Due to the observed condition of the drums and other containers stored in this area, the potential exists for releases to have occurred. Soil samples will not be collected from this area as discussed in the Areas Targeted for Investigation section.

Area Adjacent to Current Boneyard (10)

Releases have occurred in the area south and southwest of the current boneyard from drums that were stored in the boneyard area. The quantity of the releases and composition of the releases is not known. This area is targeted for investigation because of the potential for releases of COCs to ground water.

Areas on East and West Sides of Chemical Storage Building (11)

Releases have occurred in the areas east and west of the Chemical Storage Building, from the drums that were stored in these areas. The quantity and composition of the releases are not known. These areas are targeted for investigation because of the potential for releases of COCs to ground water.

Former Waste Oil Storage Area Beneath West End of the Machine Shop (12)

The western end of the machine shop was expanded in the late 1980s. Prior to this expansion of the machine shop, this area was used as a storage and possibly disposal area for waste oils generated at the facility. The waste oils were primarily cooling oils, which may have contained mineral oils; synthetic oils were also used during a portion of this time. The potential exists that the waste oils may have contained minor quantities of solvents. This area is targeted for investigation because of the potential for releases of solvents to ground water. Because of the potential for the presence of metals in the waste oils, the soils in this area will also be evaluated for the presence of metals.

Lagoon Area (13)

SNP currently operates several surface impoundments including six process solution lagoons and the Sand Trench, which contains wind-deposited sand removed from the bottom of the lagoons. Installed between 1971 and 1983, the lagoons range in

capacity from 680,000 gallons to 4.05 million gallons and have handled nearly all of the facility's liquid solution streams at one time or another. All of the lagoons are currently lined with at least two synthetic liners (Hypalon™), although from 1971 to 1978-79, Lagoons 1, 2, and 3 were single-lined with Petromat™, a non-woven polypropylene cloth coated with asbestos-impregnated asphalt. During installation of the Hypalon™ liners, an adhesive was used to bond the liner sections together. This adhesive contained TCE, and TCE was used to clean the liner surfaces in preparation for bonding. Releases of the adhesive and/or TCE to the ground surface may have occurred during the installation process. All lagoons are currently in operation except Lagoon 1.

The underground piping systems used to convey solutions to and between the lagoons are currently being upgraded to include secondary-containment consisting of external piping and, more recently, leak detection. However, leaks have occurred in the past from the single-walled pipes.

The ground-water quality data from wells adjacent to the lagoons have suggested that the lagoons and their associated piping systems may have been the sources of occasional releases of solutions since the facility began operations in 1971. Lagoon solutions would be expected to contain uranium, nitrate, ammonium, and fluoride. The lagoon area is targeted for investigation because of the potential for releases of TCE, nitrate, ammonium, fluoride, and radionuclides to ground water.

South End of UO_2 Building (14)

Wind-deposited sand removed from Lagoon 1 was used as fill under the south end of the UO_2 Building when the building was expanded in 1973. The sand may have contained process solution constituents including nitrate, ammonium, fluoride, and uranium. Although this area may be a potential source to ground water, this potential is minimized because the UO_2 Building acts as an impermeable cap over the area. Soil

samples will not be collected from this area as discussed in the Areas Targeted for Investigation section.

Concrete Retention Tanks (15)

Due south of the UO_2 Building are two subsurface concrete retention tanks which have approximate capacities of 33,000 gallons each. The retention tanks were installed in 1970 with the original facility. They initially held conversion solutions, then cooling water effluent in 1971 when cooling water was routed from the Specialty Fuels Facility. After the Specialty Fuels operation shut down, neutralized etch solutions were diverted to the retention tanks and some solution neutralization may have occurred in the tanks at this time. The retention tanks have also held other liquids including laundry effluent and small quantities of laboratory solutions. Solutions held in the retention tanks have contained uranium, fluoride, nitrate, and ammonium. No releases have been documented. However, the potential exists that releases from the retention tanks may have occurred. Soil samples will not be collected from this area as discussed in the Areas Targeted for Investigation section.

AREAS TARGETED FOR INVESTIGATION

The hazardous substance source review identified 15 sites where COCs were or may have been released that may have impacted ground water (Figure 2, Table 1). Twelve of these sites and two background locations are targeted for soil sampling in this work plan. Those sites include:

- Chemical storage area north of the ARF (investigation completed)
- The ARF
- Former west tank farm
- Former east tank farm (investigation completed)
- Former neutralization tank and current etch-solution transfer sump

- Former paintbrush cleaning station near former paint trailer
- Unlined pit on the east side of the former paint trailer
- Drywell located east of the former paint trailer
- Area adjacent to current boneyard
- Areas on east and west sides of the chemical storage building
- Area west of west wall of machine shop
- Lagoon 1
- Background locations outside the active facility area

The sampling locations for these sites are shown on Figure 4 and details regarding the number of samples and analytical parameters are summarized in Table 2. The background locations, which are not shown of Figure 4, will be outside of the fenced facility in areas believed to be free from the impact of historical activities. The general area currently identified is southeast of the fenced facility on SNP's property. The specific methodologies for investigating all of these areas are presented in the Technical Approach section.

AREAS NOT TARGETED FOR INVESTIGATION

The following potential source areas have been identified but will not be investigated through soil sampling under this work plan:

Former Boneyard Beneath Current Location of East End of Machine Shop (9)

The soils in this area will not be sampled because historical accounts indicate that the former boneyard was located almost entirely beneath the current location of the machine shop. Water quality data collected during the Phase II Ground-Water Study from Well GM-2 (upgradient of the former boneyard) and Well GM-14 (downgradient of the former boneyard) will be examined to evaluate the location as a potential source of COCs to ground water (i.e., upgradient and downgradient constituent concentrations

will be compared). If it is determined through evaluation of ground-water quality data from these wells, that the former boneyard area is a probable source of hazardous substances to the ground water, it will be assumed for purposes of completing the FS that the area is a source. The volume of the source will be estimated on the basis of historical accounts of the dimensions of the boneyard and drum storage area and the thickness of the unsaturated soil zone. Concentrations of hazardous substances in the soils within the source area will also be assumed.

Lagoons 2 through 5B and Sand Trench (13)

Lagoons 2 through 5B and the Sand Trench are currently in-service and collection of soil samples from them is not feasible. Soil samples will be collected from beneath Lagoon 1, which is currently out-of-service, and the results from analysis of these samples will be used to provide a general representation of potential constituent concentrations beneath the lagoon area. The probability of COCs being present in soil samples from beneath Lagoon 1, as well as Lagoons 2 and 3, is considered to be high because they were originally lined with a single Petromat™ liner. The other lagoons (4, 5A, and 5B) have been double-lined with synthetic liners throughout their service life and there is no evidence that they have leaked to ground water.

South End of UO_2 Building (14)

The soils in this area will not be sampled because the sand from Lagoon 1 reportedly used as fill is located beneath the UO_2 Building, severely limiting access for sampling. As mentioned earlier, although the area has been identified as a potential source area because source material is potentially present, the potential for the fill to impact ground water is low for the following reasons:

- It is believed that the fill was not placed to a depth below the water table, so the possibility of direct contact between the fill and the ground water is remote.

- The fill was placed beneath the building, between the building's footings, so that the fill is effectively isolated from infiltration from precipitation.

To evaluate the area beneath the UO_2 Building as a potential source of COCs to ground water, water quality data collected during the Phase II Ground-Water Study from Well GM-3 (upgradient of the UO_2 Building) and Well GM-4 (downgradient of the UO_2 Building) will be examined. If it is determined through evaluation of ground-water quality data from these wells, that the area beneath the UO_2 Building is a probable source of hazardous substances to the ground water, it will be assumed for purposes of completing the FS that the area is a source. The volume of the source will be estimated on the basis of historical accounts of the dimensions of the area over which the fill was placed and the approximate thickness. Concentrations of hazardous substances in the soils within source area will also be assumed.

Concrete Retention Tanks (15)

The soils in this area will not be sampled because the elevation of the bottom of the retention tanks is lower than the water table elevation (i.e., there are no unsaturated soils to sample). Water quality data collected during the Phase II Ground-Water Study from Well GM-14 (upgradient of the retention tank area) and Well GM-3 (downgradient of the retention tanks) will be examined to evaluate the location as a potential source of COCs to ground water. If it is determined through evaluation of ground-water quality data from these wells, that the retention tanks are a probable source of hazardous substances to the ground water, additional measures will be taken to determine if the retention tanks are leaking.

TECHNICAL APPROACH

The technical approach for evaluating the selected potential source areas was developed on the basis of the results of previous investigations including recent ground-water sampling results, discussions with SNP personnel, the hazardous substance source literature review, and site reconnaissance. The technical approach may be modified as additional water-quality data become available.

SOIL SAMPLING

The primary method of investigation for this work plan will be collection of soil samples from excavations. Previous investigations conducted by Geraghty & Miller at the site indicate that collection of soil samples by drilling methods is generally unsuccessful because of the presence of subsurface gravels and cobbles which prevent the collection of a representative soil sample. Therefore, soil samples will be collected during this investigation from the target source areas by excavating with hand tools and, where feasible, with a backhoe. The excavations will initially be dug by hand to depths of approximately 5 ft bls to expose potential underground piping. The excavation will then be extended using the backhoe to the maximum depth necessary to adequately characterize the area, or to the maximum feasible depth. Where use of a backhoe is not feasible, use of a hand-driven probe will be attempted. Use of the hand-driven probe may not be successful if gravels and cobbles are present. Such factors as the proximity to structures will be used to determine maximum feasible depths of the excavations in the field to avoid potential structural damage. In excavations adjacent to pipelines, steel plating will be used to protect the pipelines.

A detailed description of the soil sampling methodologies and quality assurance/quality control protocols are included in the Sampling and Analysis Plan (SAP) and the Quality Assurance Project Plan, respectively (Geraghty & Miller 1991a). The sampling methodology and sample handling protocol are summarized below.

Soil samples will be collected from each excavation at approximately 5 ft intervals to the base of the excavation. A near surface sample will also be collected approximately 1 ft bls. The estimated number of excavations and soil samples to be collected from each source area is included in Table 2. The actual number of excavations and samples, as well as the excavation locations, will be determined in the field.

Sampling equipment that will come in contact with soil samples will be decontaminated before each sample is collected. Decontamination will consist of washing with a laboratory-grade, non-phosphate detergent solution and rinsing with distilled or deionized water. The backhoe bucket will be decontaminated between excavations by steam cleaning.

Soil samples will be collected directly from the undisturbed soils in the hand-dug excavations and directly from the backhoe bucket in the backhoe excavations. Soil samples will be collected in stainless-steel tubes. Following collection of each sample in a stainless-steel tube, the ends of the tube will be covered with Teflon™ sheeting, capped tightly, and sealed with nonadhesive, silicon rubber tape. Care will be taken to minimize disturbance of the sample and contact time with air to minimize loss of any volatile compounds. A sample identification label identifying the sample number, date and time of sampling, matrix (in this case, soil), and initials of sampling personnel will be affixed to the sample container. The sample will then be sealed in a plastic bag and stored in a cooler with water ice or frozen reusable ice packs.

A sampling log will be kept during collection of the soil samples to document the location and depth of each sample, names of sampling personnel, analyses to be performed, and other pertinent information. A copy of the soil sampling log is provided as Figure A-4 in the SAP (Geraghty & Miller 1991a). Chain-of-custody procedures outlined in the SAP will be followed so that samples are traceable from the time of collection through analysis.

ANALYTICAL PROGRAM

Soil samples from each excavation will be submitted to the laboratory for analysis. Table 2 lists the anticipated number of samples from each excavation that will be submitted to the laboratory and the analyte groups for each location. The analytes were selected on the basis of the types of constituents known or suspected at each area of investigation. Table 3 presents the chemicals/groups associated with each analyte group identified on Table 2 and their respective analytical methods.

SCHEDULE

Figure 5 presents a preliminary schedule for carrying out the source evaluation. The schedule includes the period from June through August 1992.

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TABLES

TABLE 1. POTENTIAL HAZARDOUS SUBSTANCE SOURCE AREAS
HAZARDOUS SUBSTANCE SOURCE EVALUATION
SIEMENS NUCLEAR POWER CORPORATION, RICHLAND, WASHINGTON

LOCATION	LOCATOR NUMBER[1]	POTENTIAL SOURCE SUBSTANCES	COMMENTS
Chemical storage area north of the ARF (above-ground tanks)	1	Ammonium hydroxide, sodium hydroxide	Potential sources include: overflow from the hose remainder liquids.
ARF	2	Nitrate, nitric acid, sodium and ammonium hydroxide, ammonia, fluoride, radioisotopes	Potential sources include: pipeline breaks
Former west tank farm	3	Etch solutions and neutralized etch solutions, nitric acid, ammonium hydroxide, sodium hydroxide	Potential sources include: the former west tank farm, etch and nitric acid drains
Former east tank farm	4	Nitric acid, GdSX, ammonium hydroxide	Potential sources include: the former east tank farm
Former neutralization pit & current etch-solution transfer sump	5	Neutralized conversion solutions, etch solutions, sulfuric acid	Potential sources include: the former neutralization pit, pipeline breaks, sulfuric acid tank
Former paintbrush cleaning station near former paint trailer	6	Paint residues, solvents	Potential sources include: potential discharge of spent paintbrush cleaning materials to the ground surface
Unlined pit on the east side of the former paint trailer	7	Paints, solvents	Potential sources include: paints and solvents potentially discharged to the unlined pit from the sink inside the trailer
Drywell located east of the former paint trailer	8	Paints, solvents	Potential sources include: paints and solvents potentially discharged to the drywell from the sink.
Former boneyard beneath the current location of the east end of the machine shop	9	Hazardous substances	Potential sources include: the former boneyard which included a drum storage area
Area adjacent to current boneyard	10	Unknown	Potential sources include: potential discharge of unknown liquids to ground surface
Area of potential discharges of unknown liquids to the ground surface on the east & west sides of the Chemical Storage Building	11	Unknown	Potential sources include: potential discharge of unknown liquids to ground surface
Former waste oil storage area beneath the current location of the west end of the machine shop	12	Waste oils	Potential sources include: the former waste oil storage area

TABLE 1. (Continued)

LOCATION	LOCATOR NUMBER[1]	POTENTIAL SOURCE SUBSTANCES	COMMENTS
Lagoon area including the sand trench	13	Process solutions which contain ammonia, fluoride, nitrate, and radioisotopes. Liner adhesives which contained TCE.	Potential sources include: lagoon liner leaks, liquids blowing over lagoon berms, pipeline leaks, possible release of TCE during installation of lagoon liners
South end of the UO_2 Building	14	Nitrate, ammonium, fluoride, and radioisotopes	Potential sources include: sand from the lagoons used as fill under the UO_2 Building
Concrete retention tanks	15	Etch solutions, solvents	Potential sources include: possible leakage from the retention tank

1 Refers to location markers on Figure 2.
ARF Ammonia Recovery Facility
GdSX Gadolinium solvent extraction process chemicals
TCE Trichloroethene

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TABLE 2. TARGET AREAS FOR INVESTIGATION
HAZARDOUS SUBSTANCE SOURCE EVALUATION
SIEMENS NUCLEAR POWER CORPORATION, RICHLAND, WASHINGTON

LOCATION	LOCATOR NUMBER[1]	POTENTIAL SOURCE MATERIALS OR CONSTITUENTS OF CONCERN IN THE AREA	APPROACH[2]	NUMBER OF EXCAVATIONS	NUMBER OF SAMPLES[3]	ANALYTE GROUPS[4]	COMMENTS
Ammonia Recovery Facility	2	Nitric acid, sodium and ammonium hydroxide, fluoride, radionuclides	Excavation by hand tools and hand-driven sampling probe (piping will probably preclude use of a backhoe)	3	2 or 3 from each excavation	Ions, pH, radionuclides	
Former west tank farm	3	Etch solutions, neutralized etch solutions, nitric acid	Excavation[2] (trench)	2	4 to 6 from each excavation	Ions, pH	
Former east tank farm [Sampling Completed]	4	Nitric acid, ammonium hydroxide, GdSX process chemicals	Excavation	1	8	GdSX process chemicals, ions, pH, radionuclides	An excavation was dug to a depth of 12 ft and sampled for analysis for the listed constituents on March 26, 1992.
Former neutralization tank and current etch solution transfer sump	5	Etch solutions, neutralized etch solutions, sulfuric acid	Excavation by hand tools and hand-driven sampling probe (piping precludes use of a backhoe)	1	4 to 6	Ions, pH, radionuclides	
Former paintbrush cleaning station near former paint trailer	6	Paints, solvents	Excavation	1	2 to 3	Organics, metals	
Unlined pit adjacent to the east side of the former paint trailer	7	Paints, solvents	Excavation by hand (proximity to structure precludes use of backhoe)	1	2	Organics, metals	

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TABLE 2. (Continued)

LOCATION	LOCATOR NUMBER[1]	POTENTIAL SOURCE MATERIALS OR CONSTITUENTS OF CONCERN IN THE AREA	APPROACH[2]	NUMBER OF EXCAVATIONS	NUMBER OF SAMPLES[3]	ANALYTE GROUPS[4]	COMMENTS
Drywell located beneath the current pesticide storage trailer location (east of former paint trailer)	8	Paints, solvents	Excavation	1	2 or 3	Organics, metals, pesticides	Samples collected near the drywell will be analyzed for selected pesticides because of the proximity of the pesticide storage trailer. No known releases of pesticides have occurred.
Area adjacent to current boneyard	10	Unknown	Excavation (trench)	3	6 to 9 from each excavation	Ions, pH, organics, radionuclides	
Area of potential discharges of unknown liquids to the ground surface on the east & west sides of the Chemical Storage Building	11	Unknown	Excavation	2	4 to 6 from excavation on west side of building and 2 to 3 from excavation on east side of building	Ions, pH, organics, radionuclides	
Area west of west wall of machine shop	12	Waste oils	Excavation	1	2 or 3	Waste oils, metals, organics	

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TABLE 2. (Continued)

LOCATION	LOCATOR NUMBER[1]	POTENTIAL SOURCE MATERIALS OR CONSTITUENTS OF CONCERN IN THE AREA	APPROACH[2]	NUMBER OF EXCAVATIONS	NUMBER OF SAMPLES[3]	ANALYTE GROUPS[4]	COMMENTS
Lagoon 1	13	Process solutions which contain ammonium, fluoride, nitrate, and radioisotopes. Liner adhesives which contained TCE.	Excavation by hand tools and hand-driven sampling probe (potential for extensive liner damage precludes use of backhoe)	5	2 from each excavation	Ions, pH, organics, radionuclides	Lagoon 1 is currently out-of-service so that sampling beneath the liner system is feasible. All other lagoons are currently in-service so that sampling of soils beneath these lagoons is not feasible.
Background (south of fenced facility)	16	None	Excavation	2	3 from each excavation	Ions, pH, organics, radionuclides, metals, waste oils	Background sampling is necessary for risk evaluation. GdSX process chemicals and/or pesticides will be added to the list of analytes if results for the East Tank Farm (Location 4) or the drywell near the former paint shop (Location 8) indicate the presence of these constituents

1 Refers to locations marked on Figure 4.
2 Each excavation will be hand-dug to a depth of approximately 4 to 6 feet and extended to greater depths (maximum 12 feet) with a backhoe, if possible.
3 The number of samples collected will depend on the depth of the excavation. Typically, the first sample will be collected at a depth of 1 foot, the second at approximately 5 to 7 feet, and the third at the bottom if the excavation depth is greater than about 9 feet.
4 Refers to categories of constituents listed on Table 3.
GdSX Gadolinium solvent extraction
TCE Trichloroethene

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TABLE 3. ANALYTES AND METHODS FOR SOILS ANALYSIS
HAZARDOUS SUBSTANCE SOURCE EVALUATION
SIEMENS NUCLEAR POWER CORPORATION, RICHLAND, WASHINGTON

ANALYTE GROUP[1]	CHEMICAL/GROUP	ANALYTICAL METHOD
Organics	Halogenated organics	EPA 8240/8260
	Isopropyl Alcohol	EPA 8240/8260
GdSX	n-Dodecane	EPA 8270
	Tributylphosphate	EPA 8270
	Aluminum	EPA 6010
Ions	Fluoride	EPA 340.2
	Nitrate as N	EPA 300.0
	Nitrite as N	EPA 300.0
	Ammonia/Ammonium as N	EPA 350.2
	Sulfate	EPA 300.0
Metals	Arsenic	EPA 6010
	Barium	EPA 6010
	Cadmium	EPA 6010
	Chromium	EPA 6010
	Lead	EPA 7421
	Mercury	EPA 7471
	Selenium	EPA 7740
	Silver	EPA 6010
Pesticides	Organochlorine pesticides	EPA 8080
	Organophosphorus pesticides	EPA 8140
	Chlorinated herbicides	EPA 8150
Radionuclides	Gross alpha	EPA 900
	Gross beta	EPA 900
	Technetium-99[2]	to be determined
	Thorium/Protactinium-234[2]	to be determined
	Uranium (total)[2]	to be determined
Waste Oils	TPH	EPA 418.1
	PCBs	EPA 8080
	Phenols	EPA 8270
	PAHs	EPA 8270
pH	NA	EPA 9045

1 Corresponds to analyte groups identified in Table 2.
2 A subset of the samples analyzed for gross alpha and gross beta will be analyzed for these radionuclides.
GdSX Gadolinium solvent extraction process chemicals
N Nitrogen
TPH Total petroleum hydrocarbons
PCBs Polychlorinated biphenyls
PAHs Polycyclic aromatic hydrocarbons
NA Not applicable

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FIGURES

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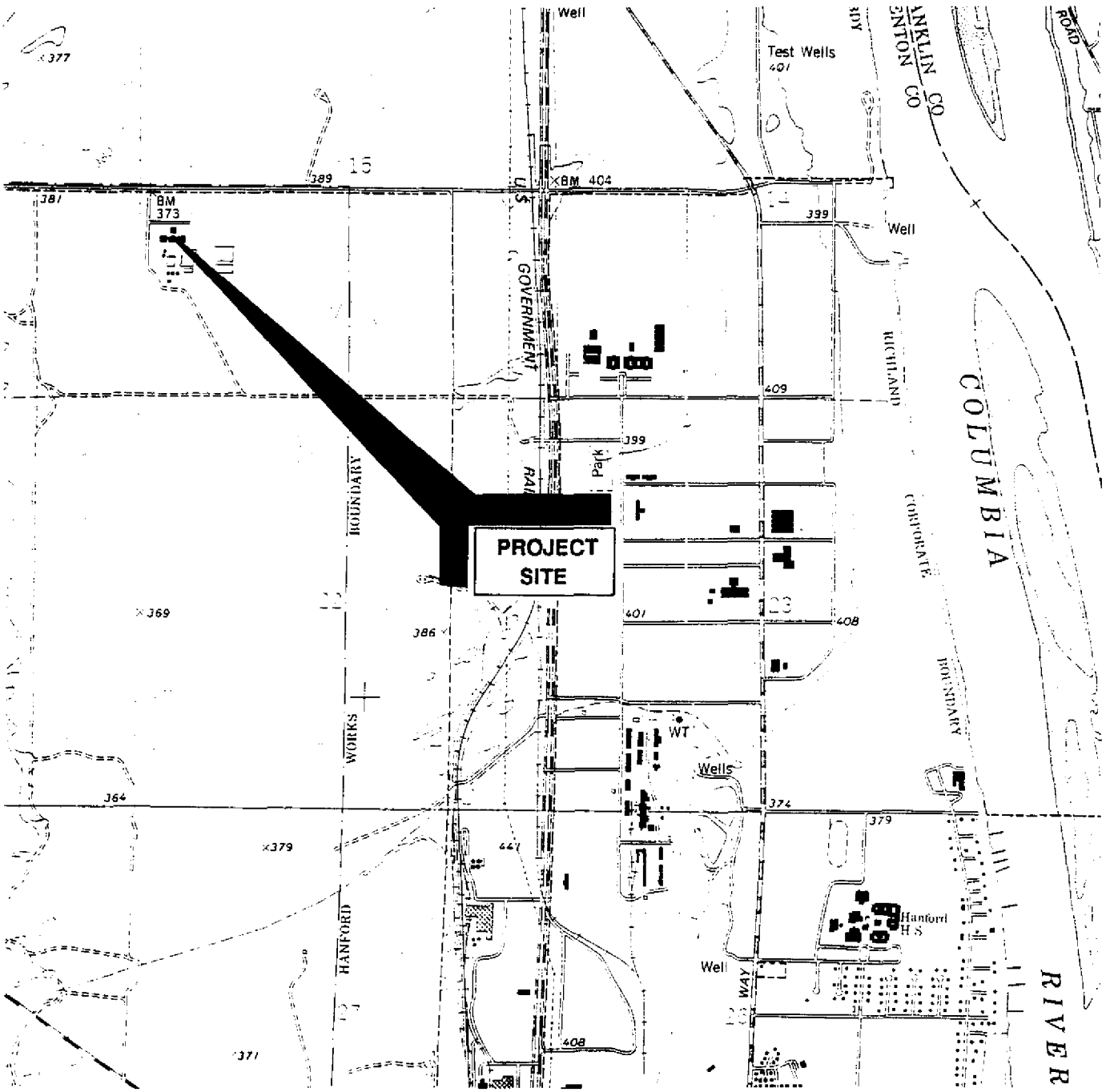

SOURCE: USGS 7.5 Minute Topographic Map, RICHLAND, WASHINGTON Quadrangle, 1978.

0 1 MILE

0 1000 2000 3000 4000 5000 6000 7000 FEET

N

QUADRANGLE LOCATION

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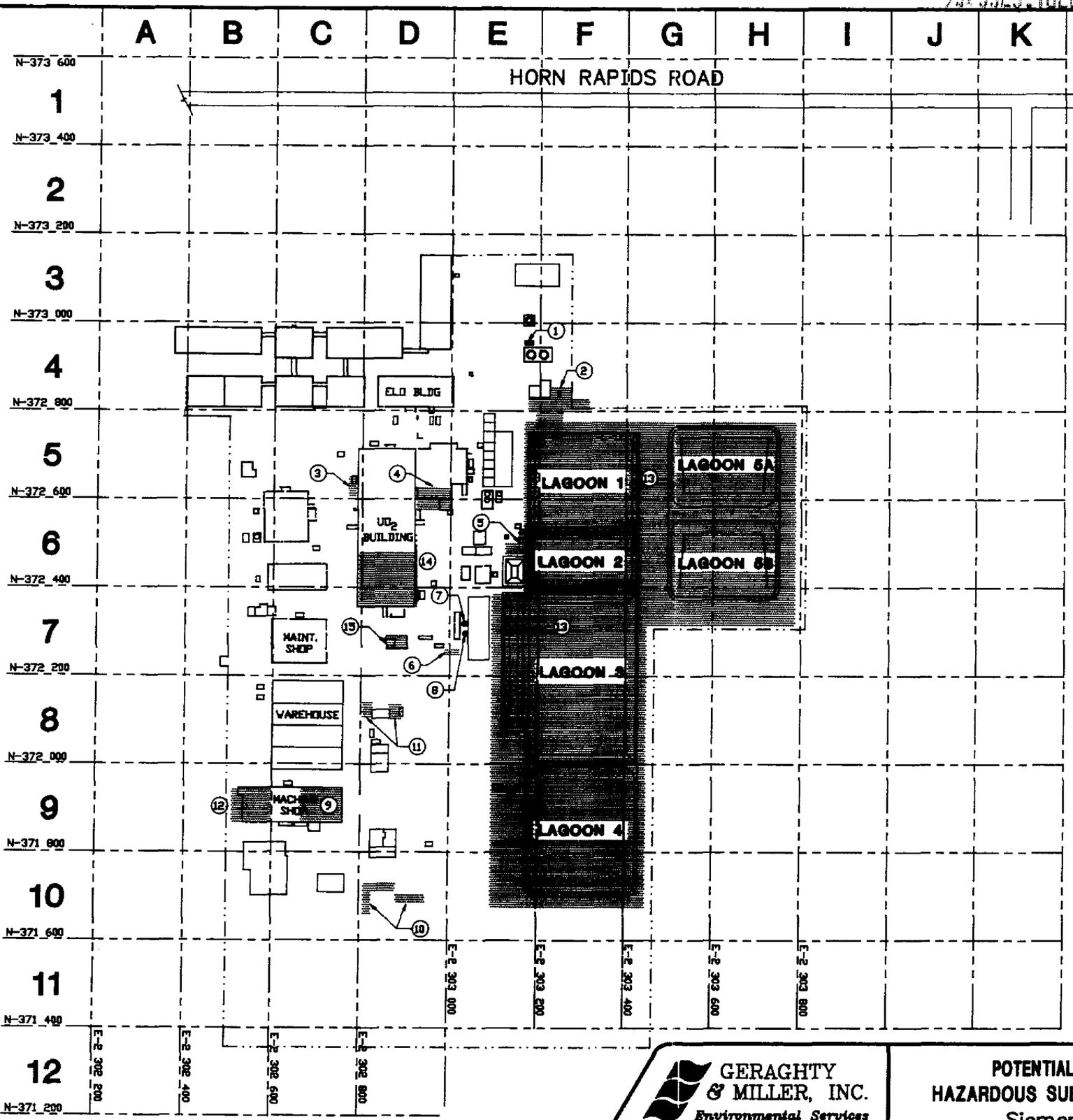
SITE LOCATION MAP

Siemens Nuclear Power Corporation
Richland, Washington

FIGURE
1

9513323.1020

DRAFTER: CH | APPROVED: LER | CHECKED: JB | DRAWING: 2 | FILE NO.: WA183.06 | PRJCT NO.: WA183.06 | DWG DATE: 05-21-92



LEGEND

- Fence Line
- Grid at 200' Intervals
- ⑧ Table 1 Potential Source Location for Investigation
- Potential Source Area (shaded area not to scale)
- • Sumps and Dry Wells

N

0 125' 250' 500'

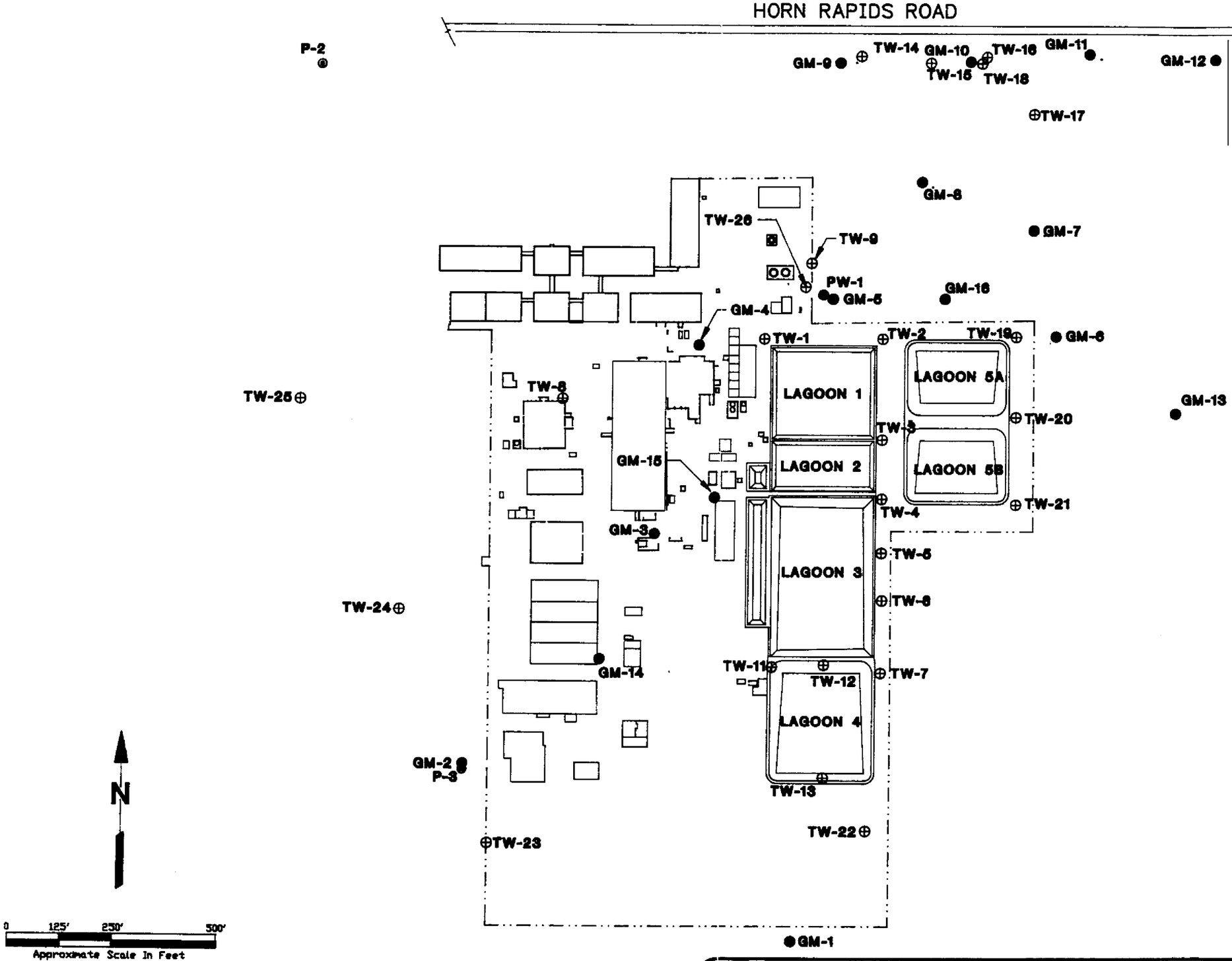
Approximate Scale In Feet

GERAGHTY & MILLER, INC.
Environmental Services

JOB #WA183.06

POTENTIAL HAZARDOUS SUBSTANCE SOURCE AREAS
HAZARDOUS SUBSTANCE SOURCE EVALUATION WORK PLAN
Siemens Nuclear Power Corporation
2101 Horn Rapids Road
Richland, Washington 99352

FIGURE
2



LEGEND

● PW-1	Pumping Well
● P-3	Piezometer
● GM-8	SNP Monitoring Wells
⊕ TW-22	SNP Test Wells
— · — · —	Fence Line

GERAGHTY & MILLER, INC.
Environmental Services

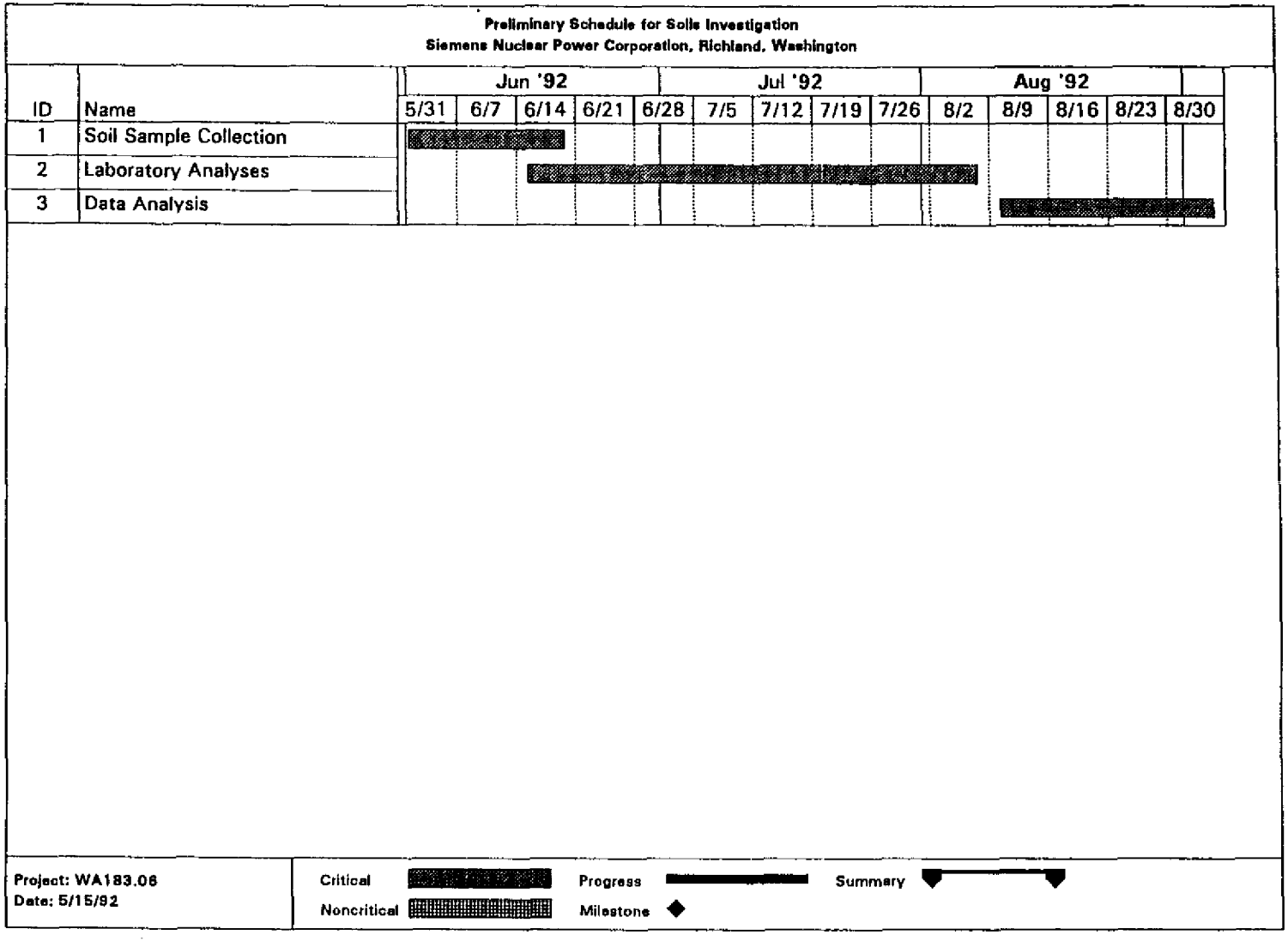
JOB #WA183.03

WELL LOCATIONS
HAZARDOUS SUBSTANCE SOURCE EVALUATION WORKPLAN
Siemens Nuclear Power Corporation
2101 Horn Rapids Road
Richland, Washington 99352

FIGURE
3

DRAFTER: CH | APPROVED: LER | CHECKED: JB | DRAWING: 3 | FILE NO.: WA183.03 | PROJCT NO.: WA183.03 | DWG DATE: 05-21-92

DWG DATE: APR 1992	PRJCT NO.:	FILE NO.:	DRAWING:	CHECKED:	APPROVED:	DRAFTER:



GERAGHTY & MILLER, INC.
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PRELIMINARY SCHEDULE FOR SOURCE EVALUATION

Siemens Nuclear Power Corporation
Richland, Washington

FIGURE
5

163135

Unable to Microfilm

Drawings without Authors

signature, Confidential (Figure 4)

G. Stern 1-24-95

Per Gary Harrison