WORK PLAN FOR IMPROVEMENT OF GROUNDWATER CONTAINMENT SYSTEM EFFECTIVENESS REVISION I NIROP FRIDLEY MN

4/12/1995

MORRISON KNUDSEN CORPORATION

(23)

WORK PLAN FOR

IMPROVEMENT OF GROUNDWATER CONTAINMENT SYSTEM EFFECTIVENESS

NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT
FRIDLEY, MINNESOTA

CONTRACT NO. N62467-93-D-1106
DELIVERY ORDER 0014
STATEMENT OF WORK #015
TASK 2

REVISION 1
APRIL 12, 1995

Prepared For:

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WORK PLAN

IMPROVEMENT OF GROUNDWATER CONTAINMENT SYSTEM EFFECTIVENESS

NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT FRIDLEY, MINNESOTA

Revision 0
March 21, 1995

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MK Program Manager — Date

ACCEPTANCE

[signature] — 13APR95
U.S. Navy Responsible Authority — Date

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1.0
INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

The groundwater extraction system currently functioning at the Naval Industrial Reserve Ordnance Plant (NIROP) in Fridley, Minnesota, consists of four extraction wells and a water pretreatment unit operated by United Defense. The treated water from this unit is sent to a sanitary sewer owned by Metropolitan Council Wastewater Services (MCWS).

Contaminant concentrations in the combined discharge from the four extraction wells have remained below the limits specified in the MCWS permit for discharge in the sanitary sewer; therefore, the pretreatment system may be discontinued. However, the efficiency of the four wells has been below design capacity and the extraction system is currently not providing the hydraulic containment required by the Record of Decision (USEPA, 1990).

This Work Plan describes the upgrade of the NIROP groundwater extraction system. The purpose of the upgrade is to more effectively contain contaminated groundwater as part of the remedial action activities. The basis for this Work Plan is the report *Workplan for Improvement of Groundwater Containment System Effectiveness for the Naval Industrial Reserve Ordnance Plant*, prepared by RMT, Inc. (RMT) in January 1995. This RMT report, located in Appendix A, provides information on the existing groundwater extraction and pretreatment systems, and describes the proposed upgrades to the existing extraction system and the effectiveness of hydraulically containing the contaminated water.

The objectives of this Work Plan are to:

- Perform all work to maximize worker safety and minimize environmental impacts.
- Obtain appropriate permits and approvals.
- Construct two new extraction wells and install well pumping equipment.
- Install additional piping to connect the new wells to the pretreatment facility.
- Upgrade connections and piping at the Control House (where the combined discharge from the extraction wells flows to the pretreatment building).
- Support startup operation activities.
- Handle, transport, and dispose of waste materials in accordance with regulatory requirements.
- Restore impacted areas to original condition.

All work will be coordinated with the property owner and pretreatment facility operator, United Defense.

1.2 WORK PLAN ORGANIZATION

This Work Plan is organized into the following sections:

- The remainder of Section 1.0 focuses on background descriptions of the site and information on the subsurface conditions.
- Section 2.0, Organization and Responsibilities, identifies the MK project team members and associated responsibilities for this Delivery Order.
- Section 3.0, Environmental Compliance, identifies regulatory compliance requirements, permits and approvals, and provisions to protect the environment during Work Plan activities.
- Section 4.0, Work Approach, outlines the specific work to be performed for this Delivery Order.
- Section 5.0 summarizes Health and Safety activities.
- Section 6.0 outlines quality control requirements.
- Section 7.0 presents a schedule showing implementation activities and durations, as well as important milestones.
- Section 8.0 lists references used in the Work Plan.

Supporting plans to this Work Plan are provided in the following appendices: the RMT Report (RMT 1995), Environmental Conditions Report (Appendix B), Environmental Protection Plan (Appendix C), Waste Management Plan (Appendix D), Health and Safety Plan (Appendix E), Quality Control Plan (Appendix F), and the Subcontracting Plan which includes the final design drawings and construction specifications (Appendix G).

1.3 SITE DESCRIPTIONS

NIROP is located in Fridley, Minnesota, near Minneapolis/St. Paul. NIROP Fridley began producing naval guns in 1941. The plant has diversified into the production of guided missile launching systems, torpedo tubes, and hydraulic and electric power drive and control systems. The facility encompasses 138 acres. The federal government owns 83 acres which are operated by United Defense Corporation (United Defense). United Defense owns and operates the remaining 55 acres.

The facility lies less than 1 mile south of Interstate 694 and approximately 1,000 feet east of the Mississippi River. The site is located on a broad, flat outwash terrace and is largely covered by pavement or buildings.

An investigation was begun following the discovery of trichloroethene (TCE) in three water supply wells at NIROP, in the storm sewer outfalls to the Mississippi River, and in a downstream waterworks intake from the river.

An Initial Assessment Study (IAS), completed in 1983, determined that drummed waste had been buried at the site and that the area below the main plant building may have been contributing to groundwater contamination. Magnetometer surveys and terrain conductivity surveys were conducted in 1983, resulting in the excavation, removal, and disposition of 43 drums. Several monitoring wells were installed at the site. The monitoring network was expanded as part of a groundwater remedial investigation (RI) begun in 1986. The RI confirmed the earlier findings that the groundwater was contaminated with TCE and other volatile organic compounds (VOCs) and that groundwater gradient is to the southwest.

In addition to the geophysical survey in 1983, a soil pore gas survey was conducted in 1987 to screen and identify areas of potential shallow VOC-contaminated soil. A soil boring program was conducted in 1990. An RI for the soils Operable Unit was completed in September 1993.

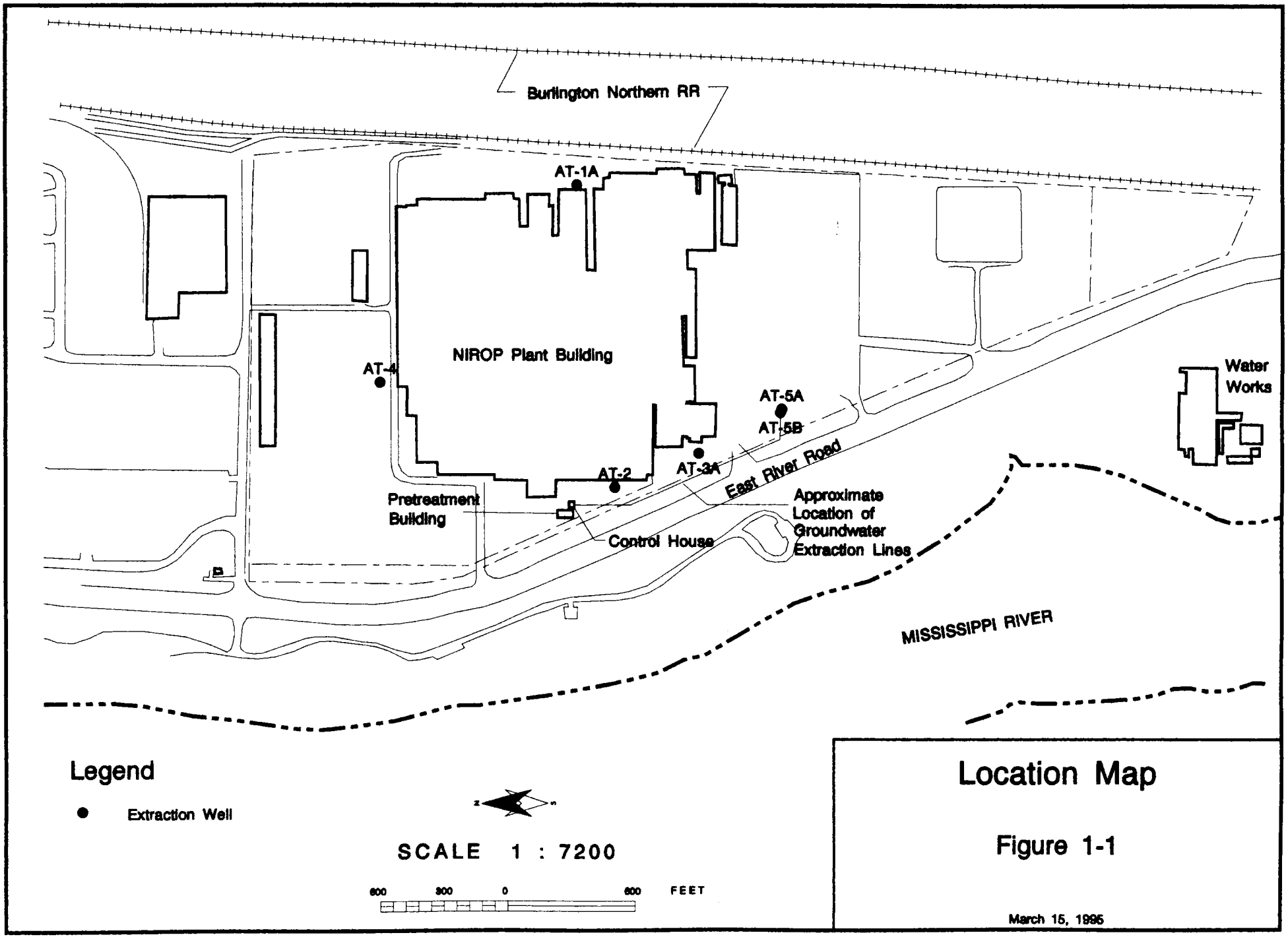
A Record of Decision (ROD) (USEPA 1990) was signed in September 1990. The ROD selected a groundwater containment and treatment alternative. Four recovery and containment wells and additional monitoring wells were subsequently installed in late 1991, and monitoring began in September 1992.

The RMT report (RMT 1995) determined that a certain portion of the aquifer is not being captured and the groundwater containment system requires upgrading. The upgrade includes adding two additional extraction wells and a system upgrade. The wells will be constructed in a parking lot near the southwest corner of the main plant building (Figure 1-1). Additional piping will be installed to connect the new wells to the pretreatment facility, and electrical connections and piping in the Control House will be upgraded.

The Environmental Conditions Report (Appendix B) provides additional detail on site conditions.

1.4 SUBSURFACE CONDITIONS

Soils in the overall site area formed in sandy glacial deposits. The deposits at the site consist of coarse sand, fine to medium sand, and some gravelly sand. Discontinuous layers of silt and clay occur at some locations. These unconsolidated deposits are up to 150 feet thick in the vicinity of the site. Based on four borings, conditions at the location of the two new wells are highly variable. Two layers of fine to coarse sand are separated by a clay layer. The clay layer varies significantly in thickness (28 to 37 feet) and elevation (763 to 789 feet mean sea level [MSL]).


Burlington Northern RR
AT-1A
NIROP Plant Building
AT-4
AT-5A
AT-5B
AT-3A
AT-2
Water Works
East River Road
Pretreatment Building
Control House
Approximate Location of Groundwater Extraction Lines
MISSISSIPPI RIVER
Legend
Extraction Well
SCALE 1 : 7200
600 300 0 600 FEET
Location Map
Figure 1-1
March 15, 1995

Groundwater gradient at the site is generally to the southwest. The static groundwater level at the site varies from approximately 804 to 816 feet above MSL. The static groundwater level is expected to be 20 feet below ground surface at the location of the two proposed wells.

Additional detail is presented in Appendix B, Environmental Conditions Report.

2.0
ORGANIZATION AND RESPONSIBILITIES

2.1 PROJECT TEAM ORGANIZATION

The MK project team has been organized specifically for this Delivery Order, with each member responsible for functions commensurate with project requirements and their demonstrated experience. Figure 2-1 presents the project organization chart.

2.2 PROJECT TEAM RESPONSIBILITIES

Project team member responsibilities are listed in Table 2-1.

Additional responsibilities are outlined below for the Project Manager, Site Superintendent, Site Hydrogeologist, Site Health and Safety, Site Quality Control Manager, and Site Project Controls Manager.

2.3 PROJECT MANAGER

The Project Manager (PM) has overall responsibility for the implementation of this Work Plan, as well as all other project activities. The PM will report to the designated Navy SOUTHDIV representative for all project-related issues. The PM will report to the MK Program Management Office in North Charleston, South Carolina, for project oversight, management direction, and resolution of any company-related matters. The PM will coordinate all off-site support and will maintain contact with the Site Superintendent. In addition, the PM will ensure the following:

- Maintenance of a single point of contact for SOUTHDIV liaison on all project-related schedule, cost, safety, and technical matters including any communications, meetings, or updates.

- Coordination of the project resources to ensure that adequate safety and industrial hygiene controls are enforced to ensure safe and efficient conduct of project operations in compliance with the appropriate plans, procedures, and regulatory requirements.

- Provision of sufficient resources to support the successful completion of the Work Plan and other project tasks.

- Maintenance of all appropriate project data, documents, and records, as well as the compilation of a final report which accurately reflects the work performed.

Figure 2-1 Organizational Chart

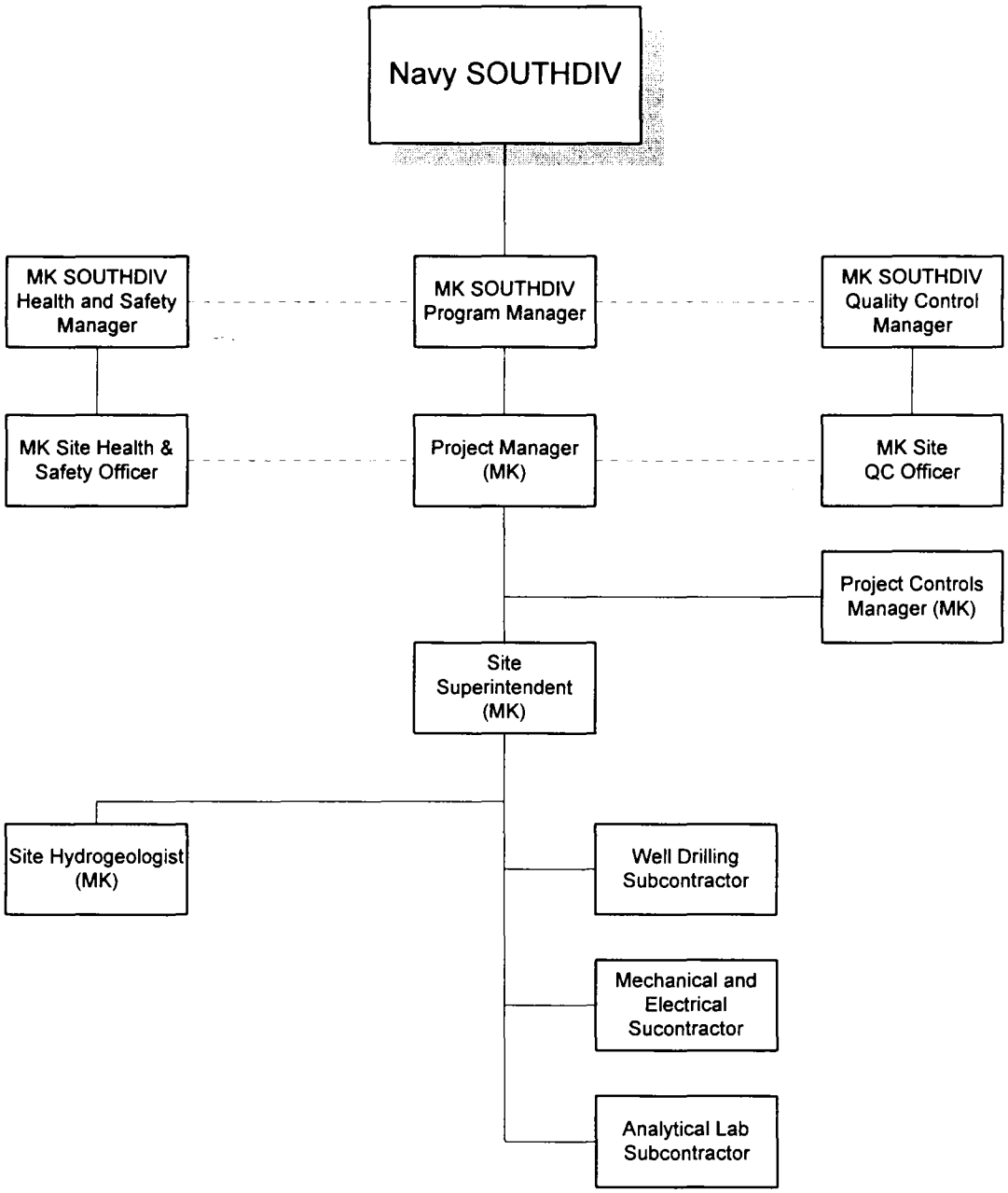


Table 2-1
Project Team Responsibilities

Team Member	Responsibilities
Project Manager (MK)	Responsible for overall execution of the Delivery Order.
Site Superintendent (MK)	Organizes and supervises direct hires and other performance contractors for mob/demob of support facilities, drilling, mechanical, electrical, and related activities.
Site Safety and Health Officer (MK)	Prepares Health and Safety Plan with the help of Certified Industrial Hygienist (CIH); responsible for implementing and ensuring compliance with the plan.
Site Quality Control Manager (MK)	Responsible for periodic audits to verify compliance with Work Plan procedures. Responsible for preparation of daily quality control reports.
Project Controls Manager (MK)	Responsible for establishing the project schedule and for tracking progress and expenditures.
Site Hydrogeologist (MK)	Responsible for overseeing all well construction activities, and collecting samples.
Analytical Laboratory	Responsible for analyzing samples in accordance with prescribed procedures.
Well Drilling Subcontractor	Responsible for constructing the two extraction wells and installing well pumps. Responsible for proper handling and containing drill cuttings, well development water, and decon water.
Mechanical and Electrical Subcontractor	Responsible for trench excavation, piping installation, and hookup to existing system. Responsible for proper handling of excavated soil and removal of any precipitation from trench.

2.4 SITE SUPERINTENDENT

The Site Superintendent will report directly to the PM and has overall responsibility for implementing the field work. Specific responsibilities include the following:

- Controls all on-site professional, technical, and labor forces to ensure the adequate and timely completion of planned project tasks.
- Organizes and supervises other performance subcontractors.
- Oversees all field work including mobilization/demobilization of support facilities, drilling, mechanical work, electrical work, and related activities.

2.5 SITE HYDROGEOLOGIST

The Site Hydrogeologist reports to the Site Superintendent and is responsible for overseeing all well construction activities. Specific responsibilities include the following:

- Coordinate field activities with the Drilling Subcontractor to ensure the work is completed in accordance with the specifications.
- Based on results of soil samples, will approve the well screen size and type selected by the Drilling Subcontractor and determine the location of the screen.
- Maintain daily driller's log to record drilling activities.
- Supervise well development and aquifer test actions.
- Resource water levels during tests.

2.6 SITE SAFETY AND HEALTH OFFICER

The Site Safety and Health Officer (SSHO) will report directly to the PM and the MK SOUTHDIV Health and Safety Manager to ensure that the technical aspects of the project are in compliance with all plans, procedures, and regulatory requirements. Specific responsibilities include the following:

- Make recommendations, if necessary, to the PM for the control and elimination of existing and potential industrial hazards.
- Oversee the bioassay (if necessary) and sampling program to ensure proper monitoring of internal and external exposures.

- Assist, if necessary, in training individuals in the biological effects of hazards, as needed.

- Perform a technical review of the data and final report which declares that the project site (or areas within the project site) may be released for use with no monitoring restrictions.

- Develop and implement a site-specific safety and health plan and ensure that all project employees, subcontractors, and visitors understand the safety and health plan.

- Conduct appropriate surveys and inspections to ensure that all industrial safety and hygiene hazards are appropriately identified, and ensure that necessary precautions are in place prior to the initiation of work activities.

- Specify appropriate industrial hygiene and safety controls for work permits.

- Select instrumentation, personal protective equipment, and work techniques appropriate for the protection of project personnel, the public, and the environment.

- Review and maintain all appropriate project personnel records, including survey data; training, certification, and qualification records; industrial hygiene, and safety surveys; and permits, licenses, and instrument records.

- Maintain industrial hygiene, safety supplies and instrument inventories.

- Inspect and assist in the preparation of waste materials for shipment.

- Stop work when necessary to maintain a safe industrial work area.

- Implement, enforce, and adhere to any applicable work permit requirements.

- Act under the direction of the PM to conduct all required monitoring surveys and other project tasks.

2.7 QUALITY CONTROL OFFICER

The Site Quality Control (QC) Officer will interface daily with the PM, but report directly to the SOUTHDIV QC Manager to ensure materials and activities are in compliance with all plans, procedures, and QC requirements. The QC Officer's responsibilities include the following:

- Reports to the PM and the SOUTHDIV QC Manager for project activities and daily project updates.

- Coordinates with procurement, expediting, and planning and scheduling departments.
- Performs QC inspections as delineated in the QC Plan.
- Sign off on all submittals.
- Oversees and implements the two phases of QC into construction process.

2.8 PROJECT CONTROLS MANAGER

The Project Controls Manager will be located at the MK Navy SOUTHDIV office, and will report to the Project Manager. The Project Controls Manager has primary responsibility for the maintenance of the Contract Manager System of cost and schedule controls, including regular assessments of performance. The Project Controls Manager's responsibilities include the following:

- Provide administrative support services for projects.
- Evaluate cost of time data and organizing information in a standard format.
- Prepare monthly progress reports.
- Review all cost/schedule reports including subcontractor's.
- Recommend corrective actions to the PM.
- Maintain the document control system.
- Maintain project man-day total and contract change notice log.

3.0
ENVIRONMENTAL PROTECTION AND COMPLIANCE

The environment will be protected through a number of mechanisms. The Environmental Protection Plan (Appendix C) lists the ways in which the land, biological, water, historical and air resources will be protected during the course of this work. The Waste Management Plan (Appendix D) provides guidance for handling the expected waste types. Compliance with environmental laws and regulations is discussed in Section 3.1, and permits and approvals which may be required are discussed in Section 3.2.

3.1 COMPLIANCE REQUIREMENTS

Under Comprehensive Environmental Response, Compensation, and Liability Act actions, activities are generally regulated under the requirements listed in the ROD. These requirements, called Applicable or Relevant and Appropriate Requirements (ARARs) generally list specific requirements with which the action must comply. ARARs are usually federal requirements, unless a promulgated state requirement is more stringent.

The ROD for this action is very general; therefore, specific requirements cannot be identified based on the available information. The following regulations and guidance may impact the activities addressed in this Work Plan.

- U.S. Environmental Protection Agency
  40 CFR 260 — 268, Hazardous Waste Regulations

- U.S. Department of Transportation
  49 CFR 172 *et seq.*, Hazardous Materials Transportation Regulations

- U.S. Navy
  OPNAV Instruction 5090.1B, Environmental and Natural Resources Program Manual
  Navy Installation Restoration Manual

- Minnesota Department of Health
  Chapter 4725, Wells and Borings

- Minnesota Pollution Control Agency
  Chapter 7005 *et seq.*, Air Pollution Control Rules
  Chapter 7045 *et seq.*, Hazardous Waste
  Chapter 7050 *et seq.*, Waters of the State

- City of Fridley
  Rules regarding excavation.

Some of these regulations will also require a permit. Possible permitting requirements are discussed in Section 3.2. Permitting must be coordinated with NIROP and Navy Southern Division.

In general, the air emissions will have to comply with state standards governing VOC emissions. A preliminary review of the regulations indicates that any airborne contaminant emissions resulting from construction or operation will likely be below thresholds requiring regulatory approval or additional emission control. The Site Health and Safety Officer will monitor air emissions to ensure that OSHA permissible exposure limits are not exceeded.

The wastewater from drilling and drill testing operations will be sampled and analyzed to determine final disposition. The wastewater will either be discharged to the pretreatment plant or to the MCWS facility, as described in the Waste Management Plan (Appendix D).

All waste products from the activities in this Work Plan will be disposed of as described in Section 4.8 and the Waste Management Plan (Appendix D). Any waste determined to be hazardous will be handled, packaged, treated, and disposed of in accordance with 40 CFR 262, 264, and 268, the corresponding state regulations (Minnesota Rules, Chapter 7045 *et seq.*, and the Department of Transportation regulations in 49 CFR 172 *et seq.*

Well drilling must comply with the Minnesota Department of Health regulations in Chapter 4725, Wells and Borings.

Excavation of the trenches must comply with the City of Fridley regulations for excavations. The soil will be screened with field instruments before trenching begins. Soil which fails the field screening will be sampled and analyzed as discussed in the Waste Management Plan (Appendix D). Hazardous soil will be packaged and disposed of in accordance with the Waste Management Plan (Appendix D). Soil which passes the field screening and soil which, though sampling and analysis, is determined to be nonhazardous will be used to backfill the excavations.

3.2 PERMITS AND APPROVALS

A number of permits and approvals will be required for implementing the groundwater extraction system improvements. MK and its subcontractors will be responsible only for those permits directly related to the excavation, well drilling, and well testing. All permitting will be coordinated with NIROP and SouthDiv. Permits and approvals that may be required are summarized below.

- ***Well Construction Notification***: A notification to construct new wells will be required from the Minnesota Department of Health, Well Management Unit. The requirements are set forth in Chapter 4725 of the Minnesota Rules, Wells and Borings. The Drilling Subcontractor will be responsible for notifying the Department and for complying with all applicable requirements.

- ***MCWS Industrial Permit***: The current Industrial Discharge Permit for the discharge of pretreated groundwater to the MCWS sanitary sewer will not have to be modified to reflect the changes in discharge rate. MK will submit a letter requesting approval and providing necessary data to MCWS as soon as possible. Approval generally takes two weeks.

- ***Water Appropriation Permit***: Water Appropriation Permit No. 92-6127 for the four existing extraction wells may have to be amended through the Minnesota Department of Natural Resources, Division of Waters, Permits Unit, to address the additional extraction wells. This is NIROP's responsibility.

- ***The City of Fridley*** will require a permit for excavation. MK will submit an application, trenching plans and maps, and make an appointment with the City as soon as possible. Typically, excavation permit approval time is about two weeks.

- ***United Defense Approval***: Approval for accessing United Defense's property will be required for the new wells and buried piping to tie into the existing piping at the Control House. MK will coordinate with United Defense to obtain approval and to minimize disruptions during design and construction of the improvements.

- ***Verification of Buried Utilities***: The subcontractors must notify Gopher State One Call before any drilling or excavation activities. They will notify all applicable companies so that they can locate their utility lines at the site. Subcontractors will verify location of utilities by subsurface detection. Subcontractor is responsible for damages to any utilities. Gopher State One does not operate within the NIROP facility boundary.

MK will assist the subcontractor with coordination on site through United Defense (plant engineering and maintenance personnel) prior to the start of any excavation to obtain approval and to minimize disruptions during the construction of the improvements.

4.0
WORK APPROACH

4.1 METHODOLOGY

The existing groundwater extraction system consists of four extraction wells and pumps, the groundwater collection and conveyance system, Control House, and pretreatment facility. The current system (operated by United Defense) has been operating since September 1991 and extracts and treats an average of 300 gpm of TCE-impacted groundwater. The treated water is discharged to the sanitary sewer system. Currently, the system production rate is approximately 50 percent of design capacity.

Because the production rate is low, the hydraulic containment goals of the project have not been met. To meet these goals, two new extraction wells will be added and the existing system will be modified to increase total production to 660 gpm (RMT, 1995).

The principle project phases include (1) construction of two new extraction wells and installation of pumps, (2) installation of piping to connect the new wells to the pretreatment facility, (3) upgrading the Control House connections and piping, and (4) startup of the upgraded facility.

4.2 MOBILIZATION ACTIVITIES

Subcontractors, including well drilling, trenching and piping, mechanical, electrical and others, will begin mobilization as soon as subcontractors are notified of the bid award.

4.2.1 Equipment Yard and Laydown Area

United Defense will provide a secured area for the subcontractors to store equipment and materials. Equipment storage and the field office will be located north of the groundwater extraction ssytem control house.

4.2.2 Decontamination

The only decontamination facilities required are for drilling and sampling activities. The Drilling Subcontractor is responsible for providing facilities to decontaminate equipment, parts, and materials at the location specified by United Defense.

4.2.3 Utility Survey

The Mechanical and Electrical Subcontractor and the Drilling Subcontractor will perform utility surveys before any excavation or drilling activities begin.

4.3 INSTALLATION OF EXTRACTION WELLS

The two extraction wells will be installed 20 feet apart at the locations shown in Figure 2-1 of the RMT report in Appendix A. Well AT-5A will be constructed in the upper consolidated sand layer; well AT-5B will be constructed in the lower unconsolidated sand layer. The wells will be constructed using the cable tool method. Alternate drilling methods may be proposed by the subcontractor. Well AT-5B will be constructed prior to drilling well AT-5A.

Prior to drilling, a single above-grade pit will be constructed adjacent to the site at a location designated by United Defense. The pit will be constructed from straw bales and lined with 10-mil polyethylene. All soil cuttings, water, mud, and other materials generated from drilling operations will be temporarily placed in the pit. Fluids will be pumped from the pit into a tanker, tested, and disposed of. Cuttings and other solid material will be removed from the pit and placed in a poly-lined roll-out box and held for testing and final disposal.

Well AT-5B will be drilled approximately 135 feet to the top of bedrock (approximately 700 feet MSL) and will be screened approximately 55 feet across the lower sand between the bottom of the clay layer and the top of bedrock (Figure C-2, RMT report).

Well AT-5A will be drilled approximately 56 feet to the top of the clay layer (approximately 770 feet MSL) and will be screened across the unconsolidated sands above the clay (Figure C-1, RMT report). The screened interval will extend approximately 32 feet down from the water table to the top of the clay layer.

4.3.1 Well Construction

The Drilling Subcontractor will use field data to verify all well dimensions and adjust them as necessary, consistent with the dimensions shown in Figure C-1, RMT report. General instructions for constructing the extraction wells are as follows:

- Use cable tool to construct a 14-inch borehole to the total depth specified for each well.

- During drilling, cover the wellhead area with plastic sheeting or other suitable water-tight material to prevent drilling cuttings from contacting the ground surface and to prevent precipitation that may contact the drilling materials from contacting the ground surface.

- Perform split-spoon sampling according to ASTM D1586 at 2.5-foot intervals through the upper sand and clay layers on boring AT-5B, and sample at 5.0-foot intervals through the lower sand to the bottom of the borehole. Approximately 22 samples will be collected for well AT-5A, and 44 samples will be collected for well AT-5B.

- Place the well string consisting of, from bottom to top, a well end cap, well screen, transition piece, and blank casing in the borehole. Extend the blank casing 3 feet above the land surface and fit the casing with a temporary locking cap. Permanent well heads will be constructed during future groundwater extraction collection system upgrades.

  The material for the cap, screen, and transition piece will be 8-inch Type 304 stainless steel, and the blank casing material will be 8-inch Schedule 40 black steel. The well screen will be commercially fabricated, continuous wrap construction. The required slot size will be determined in the field based on ASTM 1140 grain-size analysis. The anticipated slot size is 0.040 inch based on previous borehole sample analysis. The Subcontractor will adjust the slot size, if necessary, according to the soil samples collected in the field with the approval of MK.

- Place a filter pack in the annulus between the casing and the borehole from the bottom of the borehole to 2 feet above the top of the screen. The filter pack is anticipated to be American Materials #30 sand or equivalent. The required filter pack will be determined based on grain-size analysis of formation materials, and shall be suitable for the selected screen size. Place 1 foot of fine sand on top of the filter pack to prevent the bentonite seal from invading the filter pack. Place a 5-foot bentonite seal on top of the fine sand. The bentonite seal will consist of organic-free, high-swelling, 100-percent pure bentonite, ¼-inch-diameter pellets.

- Fill the remainder of the annulus with a cement/bentonite grout to within 6 feet of the land surface. The grout will be mixed according to Minnesota Department of Health, Well Management Unit requirements.

- After completion, develop the extraction wells by alternate use of pumping and surging with a surge block or jetting with water as required in Specification 02670. Well development will not begin prior to 24 hours after the annular seal is installed. If parameters do not stabilized within 48 hours, MK will make the decision to continue well development or to determine appropriate actions to be taken.

- Pump well development water directly to a tanker truck. Water may be pumped or bailed into a temporary containment pit, if necessary, to remove drill cuttings and then pumped into a tanker truck.

- Decontaminate all well drilling and development equipment, shovels, and miscellaneous drilling equipment prior to moving to the next extraction well location and after the last well is completed. Place all water generated in the decontamination process in 55-gallon drums until it can be treated and disposed of.

- Above-grade wellhead protection will be provided by three sections of 4-inch steel casing extending 3 feet above grade and 2 feet below grade, positioned uniformly around the well casing.

4.3.2 Step-Drawdown Testing

A step-drawdown test will be conducted as specified in Specification 02670 of the contract in each extraction well after it is completed. Testing will be completed following ASTM 4050. Pumping will be maintained at a constant rate (± 10 percent) as follows:

	Required Test Pumping Rate	
Step	Well AT-5A	Well AT-5B
1st hour	25 gpm	100 gpm
2nd hour	50 gpm	150 gpm
3rd hour	100 gpm	200 gpm

Water levels in the extraction wells will be measured and recorded during each step every minute for the first 10 minutes and every 5 minutes for the following 50 minutes. A separate access tube set to a point 2 feet above the pump intake will be used for measuring water levels.

The pumping rate will be increased to the next higher step pumping rate, as specified above, and continued for another hour. Measurements will be taken according to the same schedule for each step as specified above.

The specified pumping rates will be maintained if the well has sufficient capacity to produce at those rates for the required time periods.

If the specified pumping rate cannot be maintained prior to completion of each 1-hour time step, subsequent steps at higher rates need not be attempted.

The flow rate will be reduced until the water level, while pumping, stabilizes at least 2 feet above the pump intake, and the test will be continued for 1 hour.

Water produced from the step-drawdown tests and constant-rate tests will be disposed of through the existing groundwater extraction and treatment system on the NIROP site or the MCWS. A buried 4-inch-diameter PVC pipeline will be used to convey water from the well performance tests to the groundwater pretreatment system operated by United Defense.

4.3.3 Constant-Rate Test

Based on the results of the step-drawdown testing, the approximate sustainable capacity of each extraction well will be determined. Each extraction well will be pumped at the chosen rate for four hours following full recovery after the step-drawdown test to verify the capability of the well to sustain the chosen rate. A water level will be taken and recorded at time intervals specified in Section 4.3.1.

Sand content will be measured at hourly intervals from a water sample that is representative of the entire flow in the pump discharge line from each well. Sand content is defined as the dry weight of materials retained by the #200 sieve per volume of water. Average sand content over the 4 hours should not exceed 2 mg/L. A well producing more than 2 mg/L by weight of sand will be redeveloped as specified under well development in Section 4.3.1, and the requirements of this section will be applied again. Any pumping following additional development will be at the estimated maximum sustainable pumping rate, and the maximum sand content will be 2 mg/L.

Water produced from the constant-rate test will be disposed of as described in Section 4.3.2 for the step-drawdown test.

4.4 INSTALLATION OF EXTRACTION WELL PUMPS

Installation work includes the furnishing, installation, and testing of groundwater extraction pumps, motors, and motor leads for two new extraction wells. After the completion and development of the extraction wells, each well will be fitted with a vertical turbine type pump and motor assembly for the extraction of groundwater in accordance with the Groundwater Extraction Well Pump specifications included in Appendix G.

The pumps also will be used to perform step-drawdown and constant-rate pumping tests, as specified in Sections 4.3.2 and 4.3.3, after the wells have been connected to the pretreatment facility or sanitary sewer.

The specifications (Appendix G) include detailed pump and motor design requirements. The assembly will be approximately 6⅝ inches in diameter including an outer shroud and strainer. The pumps will have a rated capacity of 50 gpm for well AT-5A and 150 gpm for well AT-5B. The pumps will be driven with 460-volt, three-phase, 60 Hz motors with a maximum motor horsepower of 5 hp and 7.5 hp, respectively.

The pump and motor assemblies will be equipped with lifting lugs and stainless steel lifting cables.

Electrical cables will be brought to the surface with sufficient excess to connect with the pretreatment facility control system. All electrical wiring will comply with NFPA 70, National Electrical Code.

4.5 MODIFICATION TO EXISTING GROUNDWATER COLLECTION SYSTEM

Modifications to the existing groundwater collection system will consist of the following:

- Extension of buried 4-inch PVC pipe and electrical conduit for well AT-5B.
- Excavation for new trench to place 2½-inch PVC pipe and electrical conduit for well AT-5A.
- Placement of 2½-inch PVC pipe, 4-inch PVC pipe, and electrical conduit.

During construction of the existing groundwater extraction system, a 4-inch-diameter buried pipeline and electrical conduits were installed from the Control House to the general location of the new extraction wells. The pipeline was capped prior to trench backfilling, and a marker was installed at grade to identify the end-of-pipe location. That pipeline has been unused since the original system was installed.

The existing buried pipeline will be used to convey the groundwater from well AT-5B to the Control House. A new 2½-inch-diameter buried pipeline and electrical conduit will be installed in a separate trench adjacent to the 4-inch pipeline to convey the discharge from well AT-5A to the Control House.

The buried 4-inch pipe and the new 2½-inch pipe will be used to convey water produced during step-drawdown and constant rate pump tests for the new wells.

4.5.1 Excavation of New Trench

The Mechanical and Electrical Subcontractor will excavate a new trench for the 2½-inch pipe adjacent to or parallel to the buried 4-inch pipe from the Control House to the new extraction wells. The 4-inch pipe will be extended to well AT-5B and placed in the same trench as excavated for the new 2½-inch pipe. The Mechanical and Electrical Subcontractor will verify the location of all buried utilities before any excavation begins.

The trench will be excavated to a depth between approximately 7 and 12 feet by a trencher and/or backhoe. The top 2 feet of the trench will be excavated and stored at the site for restoration of the completed trench. The remaining trench will be excavated in a single pass to the final depth and width along the trench line. Areas where the trenches cross existing utilities will be hand excavated. Where piping is installed below existing utilities, the utilities will be temporarily supported.

A 50-foot boring will be made to cross under the United Defense concrete driveway. The boring will be supported with an 8-inch steel casing.

Excavated material in excess of that required for backfilling will be handled as specified in Section 4.5.2.

4.5.2 Handling of Excavated Material

The excavated material is not expected to be contaminated, but the trench area and excavated material will be monitored with an HNU meter regularly for TCE and other VOCs by health and safety personnel. Any excavated material found to be contaminated will be stored in roll-offs and disposed of as described in the Waste Management Plan (Appendix D).

Groundwater is not expected to be encountered during excavation. Groundwater levels are about 20 feet below land surface. However, precipitation and runoff water may enter the open trench. Any water removed from the trench will also be monitored in the field and disposed of as specified in the Waste Management Plan (Appendix D).

4.5.3 Piping

The Mechanical and Electrical Subcontractor will place a new 2½-inch-diameter PVC pipe in the trench from the Control House to well AT-5A. The 4-inch buried pipe will be extended with 4-inch PVC to well AT-5B on one end and connected to the Control House. The static mixer on the 6-inch line from AT-5A to the treatment facility will be removed to allow the connection of the new 2½-inch line from well AT-5A. The pipe will be pressure tested as required in the RMT Specification 02494, Testing Pipelines and Piping (Appendix G).

The Control House will be upgraded to allow for connection of the two new extraction wells. Currently, there is only provision for connecting one new well.

4.5.4 Electrical

Electrical conduit for operating the new wells will also be placed in the trenches. A conduit for the buried 4-inch line is already in place. Electrical cable will be pulled after backfilling is complete. The Mechanical and Electrical Subcontractor will make required connections with the control system in the Control House. Electrical connections for the well pump and motor will be completed by the Drilling Subcontractor.

4.5.5 Restoration

Areas disturbed during trench excavation or well drilling will be restored by the Mechanical and Electrical Subcontractor according to the specification in Appendix G.

4.6 STARTUP AND TURNOVER FOR OPERATION

Startup and operation of the modified groundwater extraction system will consist of three phases:

- System checkout.
- Startup.
- Operation.

The startup period will include step-drawdown and constant-rate well tests. The subcontractors will provide services described in Section 4.6.1 as required after the new additions to the groundwater extraction system have been completed.

MK will prepare a plan and a procedure to coordinate and detail the activities required to implement startup. The mechanical and electrical subcontractor and the well drilling subcontractor will provide the following support services after the new additions to the groundwater extraction system have been completed

4.6.1 System Checkout

Inspect all installed systems to verify proper installation and make final adjustments of equipment and instrumentation prior to startup.

4.6.2 Startup

Assist MK and in initial startup debugging and placing all installed systems into successful service.

1. After inspections and final adjustments have been made the mechanical and electrical subcontractor will assist the well drilling subcontractor with the step-drawdown and constant-rate well tests.

2. After the well tests and final adjustments have been made, the subcontractors will certify in writing that the system is ready for initial operation.

4.6.3 Operation

During initial startup and operation, the subcontractors will work with designated United Defense operators to coordinate testing and startup with operation of the existing system. United Defense will begin operation of the new extraction wells after the subcontractors have certified that the modified system is ready for operation.

The two new wells will be brought on-line with the four existing wells. Construction of the new extraction wells and the tie-in to the existing piping and electrical system is

expected to require some interruption of the operation of the existing system. Temporary shutdown of the system as long as two days may be required to modify some system components. Completion of the well tests may also require shutdown of the system for an additional time. A shutdown may be required if additional modifications to the system are found to be necessary. If an extended shutdown is necessary, the USEPA and the MPCA will be notified in advance of the shutdown. During the week following initial operation, the subcontractors and MK will stand by to make any adjustments to the new system that are required.

4.7 DECONTAMINATION ACTIVITIES

4.7.1 Personnel Decontamination

A decontamination station consisting of an equipment drop, a boot wash station, and a glove wash station will be established in the contamination reduction zone. All personnel and clothing leaving an exclusion zone (contaminated or potentially contaminated area) shall be inspected and, if necessary, decontaminated to remove any potentially harmful substances that may have adhered to them. Some clothing may be disposed of rather than decontaminated. Discarded personal protective equipment and/or equipment (such as disposable sampling equipment) will be stored in properly marked, plastic-lined 55-gallon drums in the contamination reduction zone, followed by transport to an approved disposal facility.

4.7.2 Equipment Decontamination

Construction and drilling equipment that have come into contact with any potentially contaminated material will be decontaminated. After on-site removal of contaminated material, affected surfaces of the equipment will be wrapped in plastic and the equipment will be transported to a central, on-site decontamination location designated by United Defense. At the decontamination facility, exposed surfaces of construction and drilling equipment will be decontaminated using a solution of high-pressure/low-volume water or steam with detergent. The equipment will be visually inspected for signs of contamination and screened for organic vapors with a flame ionization detector or photoionization detector. If elevated levels (greater than environmental background) are measured with either instrument, the cleaning procedure will be repeated until the clean screening criteria have been met. Pumping equipment and associated hoses, including vacuum truck hoses, will be flushed with water and detergent, followed by a water rinse.

4.8 WASTE MANAGEMENT ACTIVITIES

Waste management, including disposal functions, will be conducted in accordance with Appendix D of this document and all applicable regulations, as specified in this Work Plan.

The waste streams expected to be generated during construction include:

- Drill cuttings.
- Soils from trench excavation.
- Potential water from trench excavation.
- Groundwater from well development.
- Groundwater from well testing.
- Decontamination water.
- Personnel protective equipment.
- Inert wastes.

For each waste stream that is anticipated to be generated, the approximate quantity, management, sampling, and disposal are summarized in the following table.

Waste Management Summary

Waste Stream	Estimated Quantity	Handling and Management	Sampling and Analysis	Probable Disposal
Drill cuttings	15 cubic yards	Temporarily stored in lined aboveground pit, then containerized in roll-offs.	Characterization described in Section 4 of the Waste Management Plan.	Off-site sanitary landfill (RCRA Subtitle D) or hazardous waste TSD (RCRA Subtitle C).
Groundwater from well development	5,000-10,000 gallons	Temporarily stored in lined aboveground pit, or pumped to a tankcar as required.	Characterization described in Section 4 of the Waste Management Plan.	On-site pre-treatment plant or MCWS.
Soil from trench excavation	1,300 cubic yards	Field screen. Sample, only if necessary. If hazardous, place in roll-offs. If not, place in dump truck.	Characterization described in Section 4 of the Waste Management Plan.	Backfill.
Potential trench water	Unknown	Pumped to a tankcar.	Characterization described in Section 4 of the Waste Management Plan.	On-site pre-treatment plant or MCWS.
Groundwater from testing	80,000-140,000 gallons	Initially piped to tankcar for sampling, then piped directly to pretreatment system or to MCWS.	Characterization described in Section 4 of the Waste Management Plan.	On-site pre-treatment plant or MCWS.

Waste Management Summary				
Waste Stream	**Estimated Quantity**	**Handling and Management**	**Sampling and Analysis**	**Probable Disposal**
Decontamination water	50 gallons	Containerized in 55-gallon drum.	Characterization described in Section 4 of the Waste Management Plan.	On-site pre-treatment plant or MCWS.
Personal protective equipment	1 drum	Containerized into a 55-gallon drum.	None	Off-site sanitary landfill.
Inert waste	1 roll-off	Placed in roll-offs.	Characterization described in Section 4 of the Waste Management Plan.	Off-site sanitary landfill.

Drums containing potentially contaminated material will be segregated from the drums containing uncontaminated materials. The drums will be staged away from the traffic flow of the construction area. The roll-offs containing potentially contaminated material will also be segregated from those containing uncontaminated materials. Like the staged drums, all roll-offs will be kept away from the traffic flow and construction area.

Containerized solid wastes will be transported off site for ultimate disposal in a local sanitary landfill. Containerized liquid wastes will be transferred to the pretreatment system, or directly to the MCWS facility, depending on sample results.

Any hazardous wastes will be taken to a CERCLA-approved, permitted hazardous waste treatment, storage, and disposal (TSD) facility.

4.9 SUBMITTALS

4.9.1 Completion Report to the Navy SouthDiv

A completion report will be prepared and submitted back to the Navy South Division for review following startup of the upgraded design. The Navy will forward the report to the US Environmental Protection Agency and the Minnesota Pollution Control Agency. The report will serve to document completion of the work as defined in the Work Plan and will discuss any deviations from the work approach. The following will be included:

- As-built drawings.

- Well logs.
- Quality Control Report.
- Summary of pumping tests.
- Waste management documentation including laboratory reports.
- Results form Startup monitoring.
- Any changes from the original design document.

4.9.2 Submittals to United Defense

The following submittals are required by the operating contractor, United Defense:

Extraction Wells

- Sand content measurement techniques for well developers.
- Grain-size analysis of all filter pack materials to be used in wells.
- Grain-size analysis of soil samples from the screened interval of the boring to determine filter pack grain size and screen slot size.
- Well performance testing data.
- Driller and geologist qualifications (relevant to licenses, registration, and training, as specified above).
- Well development form from each extraction well.
- Copies of all completed permits.

Well Pumps

- Submittals for Acceptance:
  - Drawings of pumps, including dimensional data and details of fittings and motor leads, materials of construction, and operating weight of complete pump assemblies.
  - Manufacturer's specifications for pump components and electric motor.
  - Descriptions of pump accessories and auxiliary equipment.
  - Characteristic curves for pumps with all components and materials of construction as specified, showing pump total head, pump brake horsepower, pump efficiency, and minimum submergence required over the full-flow capacity and head range of the installed pump.
  - Certified results of pump performance tests including, but not limited to, anticipated field performance curves and a schematic diagram of the laboratory testing equipment and arrangement.

- Submittals for Information Only:
  - General manufacturer's product data.
  - Electrical requirements for pumps.
  - Spare parts data, including recommended spare parts list.
  - Operating and maintenance instructions.
  - List of special tools required for pump installation, maintenance, or repair.

- Warranty information.

- Submit the number of opaque reproductions of each submittal as required by supplier, plus three copies which will be retained by United Defense. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this procurement.

- Notify United Defense in writing at the time of submittal of any deviations from requirements of the specifications.

- Do not fabricate products or begin work which requires submittals for acceptance until return of submittal with United Defense's acceptance. Do not ship finished pumps until return of certified results of pump performance tests that have been accepted by United Defense.

4.9.3 Submittals to Minnesota Department of Health

The extraction well drill logs and reports will be submitted to the Well Management Unit of the Minnesota Department of Health, Environmental Health Division, Drinking Water Protection Section.

5.0
HEALTH AND SAFETY

A Site Safety and Health Plan (SSHP), which constitutes Appendix E of this document, is bound separately. All details described in the Site Safety and Health Plan are to be strictly adhered to during the course of the work.

The potential risk of acute exposure to chemical contaminants is considered low. Trichloroethene (TCE) was found more frequently and at higher concentrations in groundwater than any other organic compound and has been considered to be an indicator chemical. During removal activities, the potential risk of acute exposure to the chemical contaminants listed in Table 2 of the Site Safety and Health Plan (SSHP) is considered low if the engineering controls, administrative controls and Personal Protective Equipment requirements are strictly adhered to.

Other hazards at this project site are construction safety hazards associated with heavy equipment, specifically drilling equipment; soil excavation and penetrations; contact with underground utilities; confined space entry during tie ins to lift stations; walking and working surfaces in wet environments; traffic control during work in parking areas; physical and biological hazards during clearing and grubbing, site restoration to include backfilling and compaction; and eye/head/feet physical hazards. Cold stress will likely be a problem during March and early April. In addition, plant safety procedures require all personnel to evacuate the area north of Building 37, between the building and the security fence, whenever and audible alarm is sounded prior to scheduled ballistics tests. Only the area to the east of the paved access road near Building 37 must be evacuated; work can continue in the area to the west of this access road in the north 40 area. The time required for the test, from sounding of the alarm until work can resume, is expected to be 15 minutes.

Minimum worker protection will be Level D PPE, as listed in Table 6 of the SSHP. Dress will be upgraded when conditions warrant, or as directed by the Site Safety and Health Officer (SSHO).

Activity Hazard Analyses (AHA) have been prepared for each anticipated task in accordance with EM 385-1-1, October 1992. These hazard analyses are contained in Appendix A of the SSHP. Each site activity must be reviewed by supervision as part of the Pre Entry Briefs prior to start to determine if the prepared hazard analysis adequately addresses the planned activity. If it is found the hazard analysis is not adequate, additional hazard analysis will be prepared as needed. Plan of the Day, Pre Entry and Post Entry Briefings will be conducted with all affected workers.

MK requires United Defense prepare a stand-alone SSHP for the O&M Phase of this project; or United Defense can incorporate all safety and health requirements into the existing (revised) Operations and Maintenance Manual (O&M). At a minimum, the following should be delineated for the O&M Phase: PPE requirements; emergency

procedures and response to off-normal conditions; energy control (lockout/tagout); hazardous material storage and handling; spill response and first aid and safety equipment.

6.0
QUALITY CONTROL

As the prime contractor, MK implements and retains full authority for the Quality Control Program. All matters involving Quality Control performed in the execution of SOUTHDIV ERAC Delivery Orders are managed by MK. This approach provides the Navy with a quality management system that has clear lines of authority and responsibility with a consistent approach and application of quality requirements.

The Quality Control Plan (QCP), included as Appendix F and bound under a separate cover, identifies quality testing and inspection requirements for the scope of work to be performed. At the heart of the QCP is the *Testing Plan and Log* which lists required tests and inspections for each definable feature of work. The Site QC Supervisor ensures that all tests and inspections are performed to the standards specified and at the required frequencies. Results of these tests and inspections are documented on the *Testing Plan and Log*. The Program QC Manager is the primary point of contact with the Navy Contracting Officer for quality matters and is based in the MK Program Management Office in North Charleston, SC.

The QC Manager is responsible for implementing the Three Phases of Control during construction activities to ensure that work complies with contract requirements. The Three Phases of Control consist of a Preparatory Phase, Initial Phase and Follow-up Phase, and are described in detail in the project QCP. The Three Phases of Control are performed to fully and adequately encompass both on-site and off-site work. The Three Phases of Control are performed for each definable feature of work delineated in the project-specific QC Plan.

Chemical quality management is addressed in the Waste Management Plan (Appendix D).

7.0
SCHEDULE

A construction schedule for the project is presented on the next page. Site work is expected to commence by March 22, 1995. The extraction system should be operational by May 8, 1995.

Mobilization:	March 22, 1995
Begin Drilling:	March 29, 1995
Install Pumps:	April 24, 1995
Start Testing:	April 28, 1995
Startup:	May 2, 1995
Turnover:	May 8, 1995

EARLY START	EARLY FINISH	REM DUR	PCT
31JAN95A		0	100
17FEB95A	17FEB95A	0	100
28FEB95A	28FEB95A	0	100
28FEB95A	28FEB95A	0	100
1MAR95A	6MAR95A	0	100
1MAR95A	6MAR95A	0	100
1MAR95A	13MAR95A	0	100
1MAR95A	22MAR95A	0	100
1MAR95A	22MAR95A	0	100
3MAR95A	3MAR95A	0	100
3MAR95A	15MAR95A	0	100
7MAR95A	7MAR95A	0	100
8MAR95A	31MAR95A	0	100
23MAR95A	23MAR95A	0	100
24MAR95A	24MAR95A	0	100
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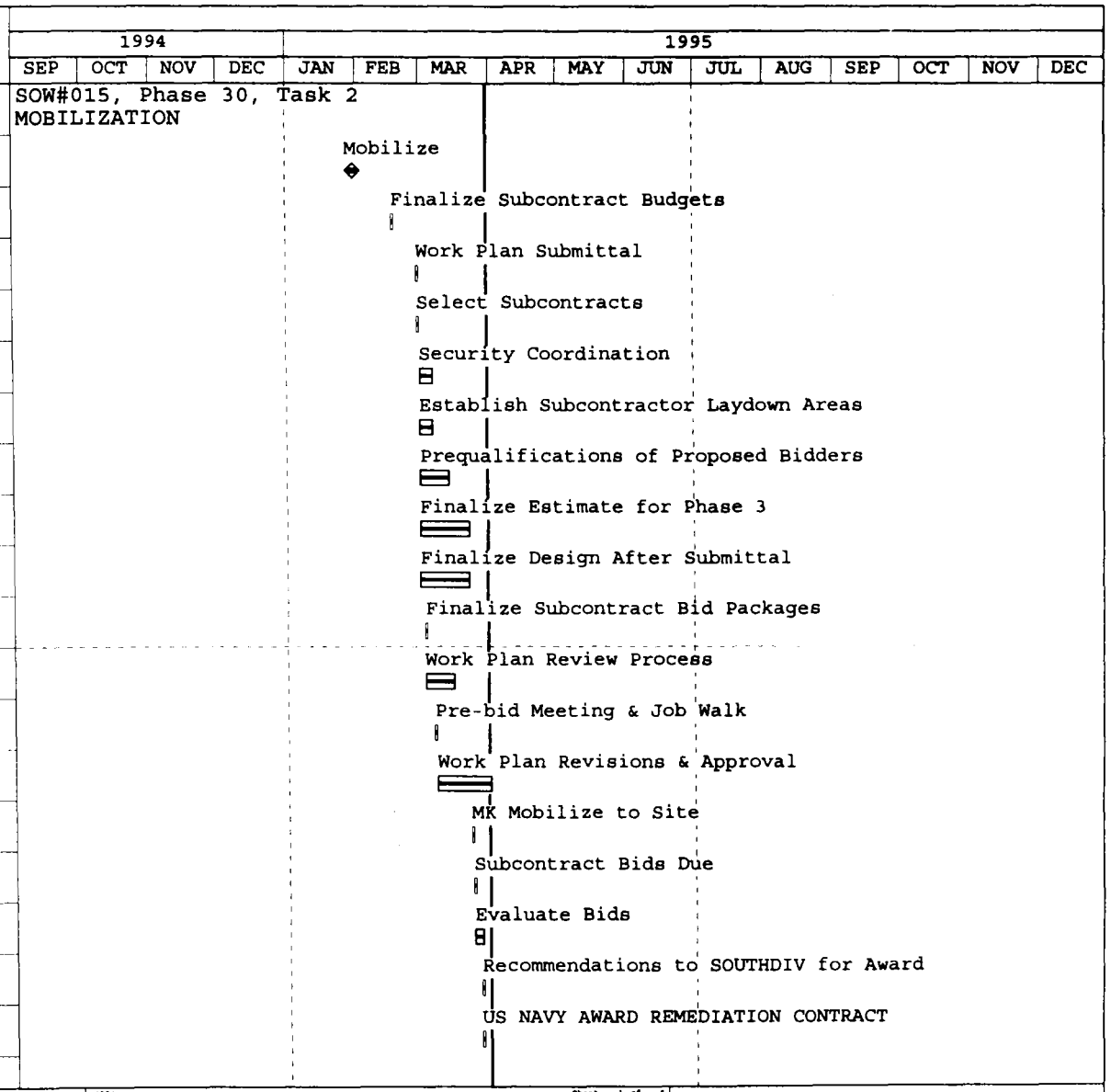
27MAR95A	27MAR95A	0	100
27MAR95A	27MAR95A	0	100



Plot Date 11APR95
Data Date 31MAR95
Project Start 1MAR94
Project Finish 31MAR99 *

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Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

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DO#0014 - FRIDLEY MASTER SCHEDULE

Date	Revision	Checked	Approved

EARLY START	EARLY FINISH	REM DUR	PCT
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28MAR95A	7APR95	6	10
	30MAR95A	0	100
31MAR95A	31MAR95A	0	100
4APR95	4APR95	1	0
4APR95	8MAY95	25	0
29MAR95A		0	100
30MAR95A		0	100
31MAR95	10MAY95	29	0
31MAR95	10MAY95	29	0
3APR95	11APR95	7	0
10APR95	28APR95	15	0
11APR95	12APR95	2	0
13APR95	20APR95	6	0
21APR95	24APR95	2	0
24APR95	28APR95	5	0
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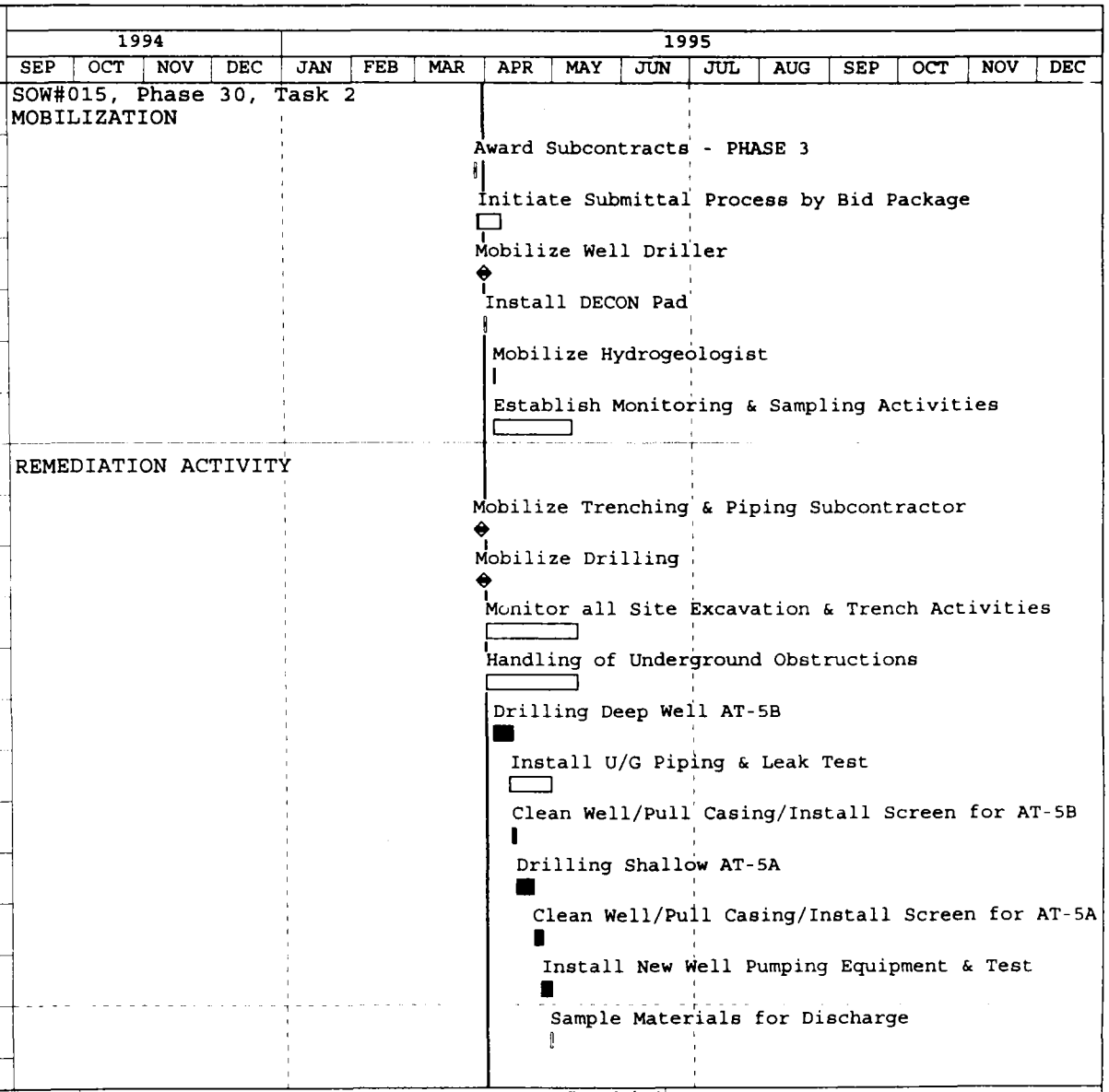

Plot Date 11APR95
Data Date 31MAR95
Project Start 1MAR94
Project Finish 31MAR99 *

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Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

4324 Sheet 3 of 4

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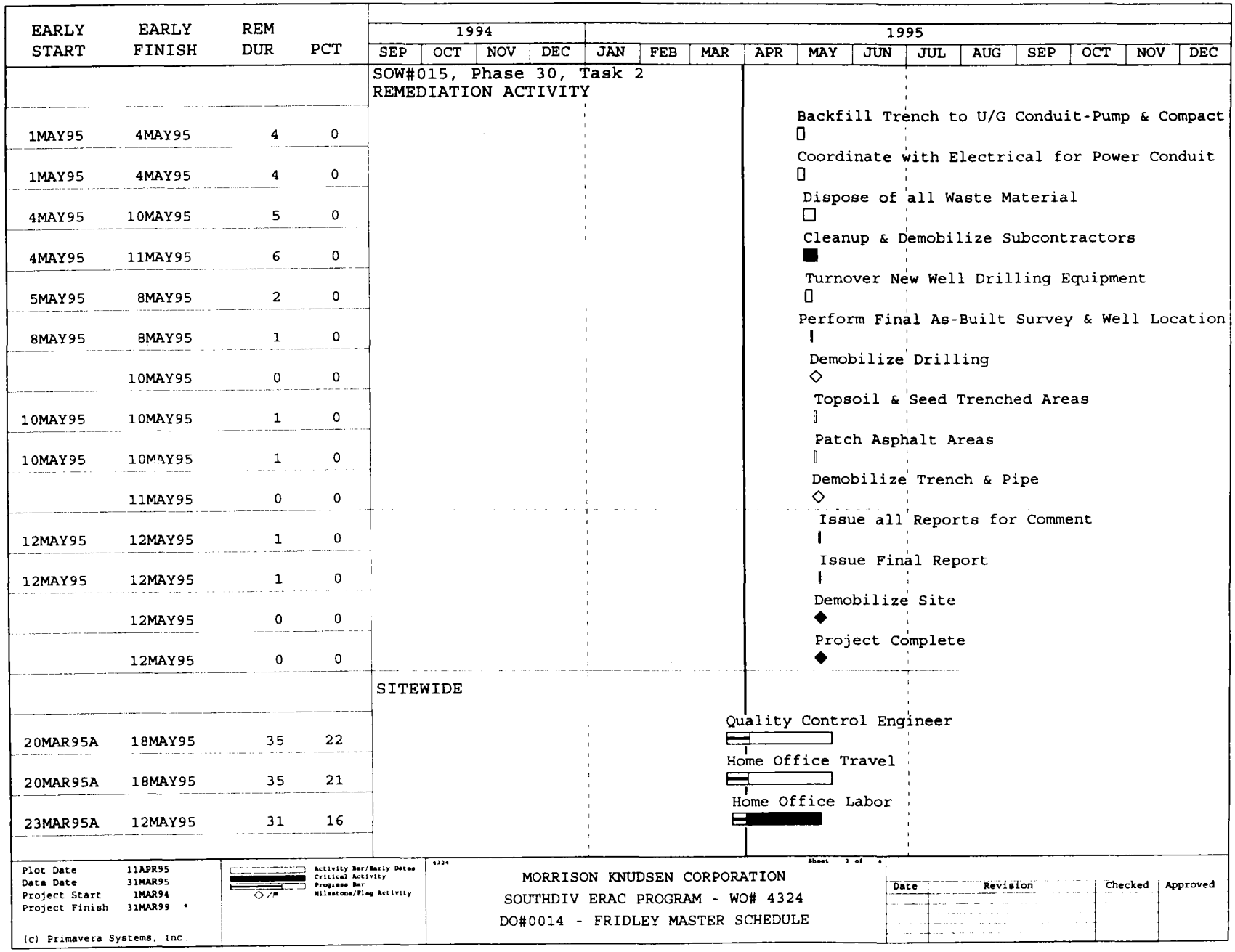
Date	Revision	Checked	Approved


EARLY START
EARLY FINISH
REM DUR
PCT
1994
1995
SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
SOW#015, Phase 30, Task 2
REMEDIATION ACTIVITY
1MAY95 4MAY95 4 0
Backfill Trench to U/G Conduit-Pump & Compact
1MAY95 4MAY95 4 0
Coordinate with Electrical for Power Conduit
4MAY95 10MAY95 5 0
Dispose of all Waste Material
4MAY95 11MAY95 6 0
Cleanup & Demobilize Subcontractors
5MAY95 8MAY95 2 0
Turnover New Well Drilling Equipment
8MAY95 8MAY95 1 0
Perform Final As-Built Survey & Well Location
10MAY95 0 0
Demobilize Drilling
10MAY95 10MAY95 1 0
Topsoil & Seed Trenched Areas
10MAY95 10MAY95 1 0
Patch Asphalt Areas
11MAY95 0 0
Demobilize Trench & Pipe
12MAY95 12MAY95 1 0
Issue all Reports for Comment
12MAY95 12MAY95 1 0
Issue Final Report
12MAY95 0 0
Demobilize Site
12MAY95 0 0
Project Complete
SITEWIDE
20MAR95A 18MAY95 35 22
Quality Control Engineer
20MAR95A 18MAY95 35 21
Home Office Travel
23MAR95A 12MAY95 31 16
Home Office Labor
Plot Date 11APR95
Data Date 31MAR95
Project Start 1MAR94
Project Finish 31MAR99
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Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity
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Approved

EARLY START	EARLY FINISH	REM DUR	PCT
23MAR95A	12MAY95	31	16
23MAR95A	12MAY95	31	16
23MAR95A	23MAY95	38	14
24MAR95A	12MAY95	31	22
24MAR95A	12MAY95	31	22
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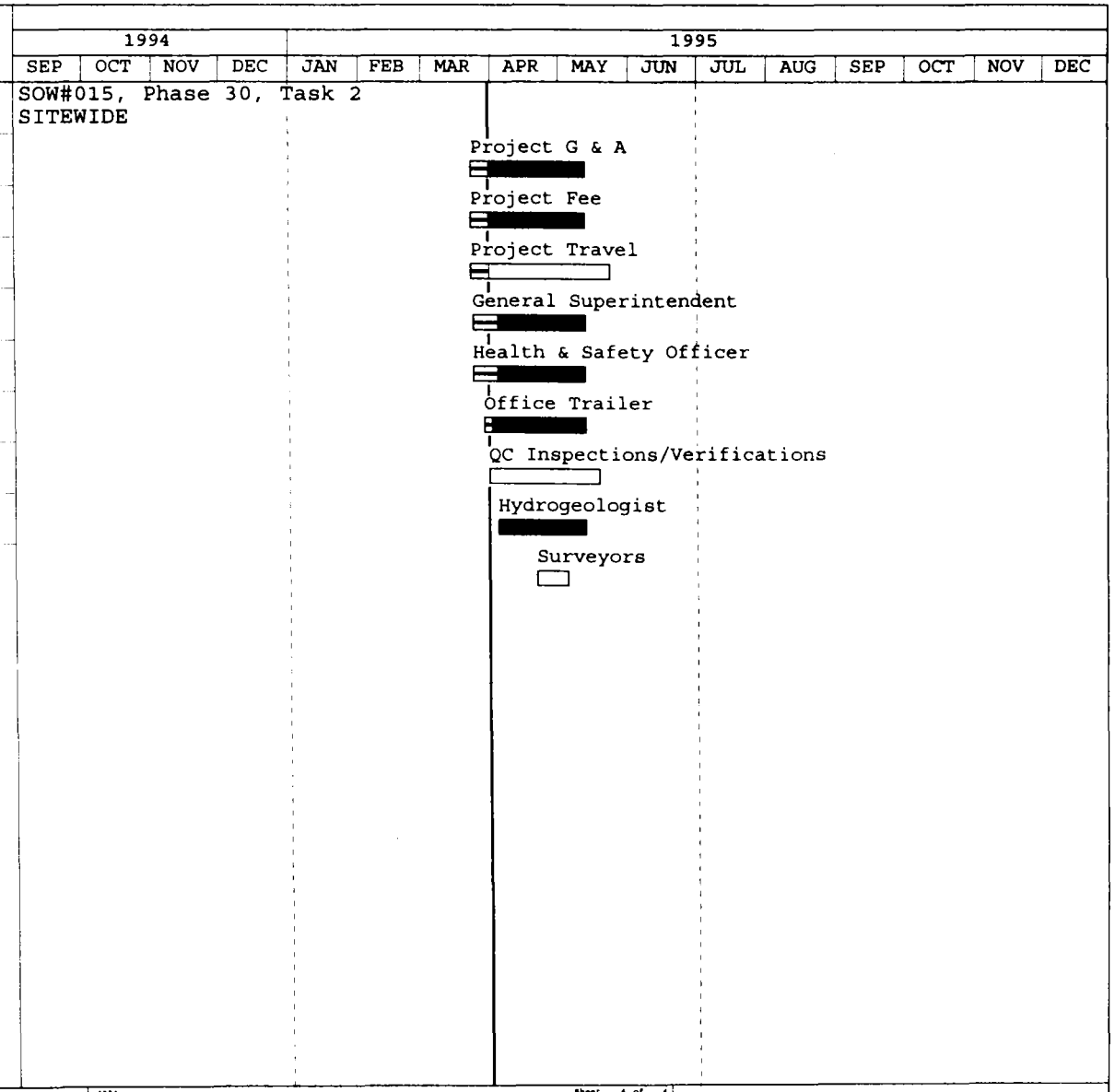

Plot Date 11APR95
Data Date 31MAR95
Project Start 1MAR94
Project Finish 31MAR99

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Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

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Date	Revision	Checked	Approved

8.0
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RMT, Inc., 1995. *Workplan for Improvement of Groundwater Containment System Effectiveness for the Naval Industrial Reserve Ordnance Plant, Fridley, Minnesota*. RMT, Inc. Madison, Wisconsin. January.

U.S. Environmental Protection Agency, 1992. *SW-846 Third Edition, Test Methods for Evaluating Solid Wastes*, Volumes 1B and 1C. July.

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APPENDIX A

RMT REPORT

[RMT Report will be provided upon request]

APPENDIX B
ENVIRONMENTAL CONDITIONS REPORT

1.0 INTRODUCTION AND SITE HISTORY

The Naval Industrial Reserve Ordnance Plant (NIROP) is located in Fridley, Minnesota, near Minneapolis/St. Paul. Although Fridley's population was estimated to be 28,000 in 1990, the Minneapolis-St. Paul metropolitan statistical area which includes Fridley has an estimated population of 2,350,000.

NIROP Fridley began producing naval guns in 1941. The plant has diversified into the production of guided missile launching systems, torpedo tubes, and hydraulic and electric power drive and control systems. The facility encompasses 138 acres. The federal government owns 83 acres which are operated by FMC Corporation (FMC). FMC owns and operates the remaining 55 acres.

The facility is located on a broad, flat outwash terrace and is largely covered with buildings or pavement.

The facility lies less than 1 mile south of Interstate 694 and approximately 1,000 feet east of the Mississippi River. The site is bordered by the Burlington Northern Railroad on the east and East River Road on the west. The Anoka County Riverfront Regional Park lies between East River road and the Mississippi River. The park is a 60-acre day-use recreational facility. All other adjacent property is zoned heavy industrial.

The Mississippi River is the significant waterway nearest the site. Rice Creek lies approximately two miles to the north. In addition to recreational activities, the Mississippi is a source of both private and public drinking water. The intake for the City of Minneapolis Waterworks is located 2,000 feet downstream of NIROP Fridley's southern boundary.

An investigation was begun following the discovery of trichloroethene (TCE) in three water supply wells at NIROP, the storm sewer outfalls to the Mississippi River, and the waterworks intake from the river. The facility was divided into the South Study Area (FMC-owned) and the North Study Area (government-owned). FMC has pursued the investigation of the South area while the Navy implemented the investigation and remediation of the North area.

An Initial Assessment Study (IAS) for the North Area, completed in 1983, determined that drummed waste had been buried in the North Area and that the area below the main plant building may have been contributing to the groundwater contamination. In 1983, the U.S. Army Corps of Engineers (COE) performed

geophysical surveys consisting of magnetometer surveys and terrain conductivity surveys. The COE identified 20 conductivity anomalies, and selected 9 for excavation. Forty-three drums were excavated, removed, and disposed at that time. The COE then installed and sampled several monitoring wells in the shallow, intermediate, and deep portions of the unconsolidated glacial deposits and also in the bedrock. The monitoring network was expanded as part of a groundwater remedial investigation (RI) begun in 1986. The RI confirmed the earlier findings that the groundwater was contaminated with TCE and other volatile organic compounds (VOCs) and that groundwater flow is southwest.

A Record of Decision (ROD) was signed in 1990. The ROD selected a groundwater containment and treatment alternative. Four recovery and containment wells and additional monitoring wells were subsequently installed in late 1991, and monitoring began in September 1992.

In addition to the geophysical survey in 1983 following the IAS, a soil pore gas survey was conducted in 1987 to screen and identify areas of potential shallow VOC-contaminated soil. A soil boring program was conducted in October and November of 1990. The program consisted of 55 borings. An RI for the soils Operable Unit was completed in September 1993.

2.0 SOIL CONTAMINATION

Soils in the overall site area formed in sandy glacial deposits. The deposits at the site consist of coarse sand, fine to medium sand, and some gravelly sand. Discontinuous layers of silt and clay occur at some locations. These unconsolidated deposits are up to 150 feet thick in the vicinity. Based on four borings in the location, conditions at the specific location of the two new wells are highly variable. Two layers of fine to coarse sand are separated by a clay layer. The clay layer varies significantly in thickness (28 to 37 feet) and elevation (763 to 789 feet mean sea level [MSL]).

Maximum soil contaminant levels for the overall site are shown in Table B-1.

3.0 GROUNDWATER CONTAMINATION

The static groundwater level at the site varies from approximately 804 to 816 feet above MSL. The static ground level at the proposed location for the two new wells is expected to be approximately 813 feet MSL. Groundwater gradient at the site is generally to the southwest.

Maximum groundwater contaminant levels for the overall site are shown in Table B-1.

TABLE B-1
MAXIMUM CONCENTRATION OF CONTAMINANTS IN SOIL AND WATER[1]

Compound	Maximum Concentration in Groundwater (ppm)	Maximum Concentration in Soils (mg/kg)
VOLATILE ORGANIC COMPOUND		
Benzene	0.022	<0.63
Chloroform	0.0026	<0.63
1,1-Dichloroethane	0.170	3.0
1,2-Dichloroethene	3.80	62
Ethylbenzene	0.037	10.6
Methylene chloride	6.0	7.0
Tetrachloroethene	0.37	16.5
1,1,1-Trichloroethane	0.75	14
Trichloroethene[2]	21.0	207
Trichlorofluoromethane	0.0077	7.0
Toluene	0.063	7.9
METALS		
Arsenic	0.008	0.0277
Barium	0.256	0.300
Cadmium	0.0092	0.0052
Chromium	0.057	0.130
Copper	0.084	14.0
Lead	0.334	2.33
Mercury	0.0013	0.001
Nickel	0.107	0.110
Silver	0.005	0.004
Zinc	9.250	1.6

[1] All data from RMT, 1995
[2] Indicator chemical

APPENDIX C
ENVIRONMENTAL PROTECTION PLAN

1.0 INTRODUCTION

This Plan describes the environmental protection measures Morrison Knudsen Corporation (MK) proposes to use during the drilling and testing of wells as part of the plan for improving groundwater containment system effectiveness for the Naval Industrial Reserve Ordnance Plant (NIROP) at Fridley, Minnesota. The project involves drilling two new extraction wells and installing new pumps and collection piping for conveying the groundwater from the new wells to the existing piping in the Control House, and installing associated electrical power supply, controls, and instrumentation.

MK will perform all work in a manner to minimize pollution. Within applicable regulatory requirements, noise and the disposal of solid waste materials and other pollutants will be controlled.

2.0 LAND AND BIOLOGICAL RESOURCES

Natural resources in the area includes the Anoka County Parkland directly across East River Road from the NIROP, and the Mississippi River.

No national wildlife refuges or critical habitats of endangered species have been identified in the vicinity of the site. This work will not disturb fish or wildlife, alter water flows, or otherwise significantly disturb the native habitat on or adjacent to the project.

There are no federal or state freshwater wetlands located within 1 mile of the site.

MK will coordinate with United Defense, the property owners, to minimize disruptions to those in the vicinity. Once the remediation system is installed, all temporary facilities will be removed. All excavations in the paved area of the site will be repaved.

The drilling area is on a median in a paved parking lot. During drilling the wellhead area will be covered with plastic sheeting or other suitable water-tight material to prevent drill cuttings from contacting the ground surface and to prevent water from precipitation that may contact the drilling materials from contacting the ground surface. No land or biological resources will be adversely affected by the activities.

3.0 PROTECTION OF WATER RESOURCES

The Mississippi River is approximately 700 feet from the site. There are no known major drainages adjacent to the well area. The Health and Safety Officer will inspect the area and, if necessary, will install temporary barriers to prevent any spills from entering storm or other drainages.

All water, mud, soil cuttings, and other materials from the drilling operations will be contained. All development water from each well, and all decontamination water will be contained. No wastewater will be allowed to flow away from the site.

In the event there is a release of liquid during the project, the spill response procedures will be implemented. These spill response procedures can be found in the Site Safety and Health Plan (Appendix E).

4.0 HISTORICAL AND ARCHEOLOGICAL RESOURCES

Although no historical and archeological items or human skeletal remains are expected to be found, the Contracting Officer's representative will be notified immediately in the event any archeological items are encountered. Any items discovered will be carefully preserved and work will be stopped in the area until direction is received from the Contracting Officer to resume work.

5.0 AIR QUALITY

Well drilling activities could potentially generate fugitive dust and emissions of volatile organic compounds (VOCs). These issues are discussed in the following sections.

5.1 PARTICULATE EMISSIONS

All reasonable precautions will be taken to prevent the generation of fugitive dust during drilling and installation of the wells.

Atmospheric conditions which might affect dispersion of particulates will be considered. Reasonable precautions will be taken to suppress and contain dust during the well drilling. Dust discharge will be monitored for hazardous contamination by the Site Health and Safety Officer.

Fugitive dust may also be generated by vehicle traffic. These emissions will be controlled by the application of either water or chemical dust suppressants to the road surface.

5.2 VOLATILE ORGANIC COMPOUNDS

Volatile organic compounds found in the soil and groundwater nearby include benzene, chloroform, 1,1-dichloroethane, 1,2-dichloroethene, ethylbenzene, methylene chloride, tetrachloroethene, 1,1,1-trichloroethane, trichloroethene, trichlorofluoromethane, and toluene. A number of heavy metals are also found in the soil and water nearby; however, the concentrations are not expected to pose an air quality problem.

The Site Health and Safety Officer will create an exclusion zone around the drilling operation in accordance with the Health and Safety Plan. The officer will monitor for VOCs to confirm emissions do not exceed standards and ensure there is no danger to worker or public health.

6.0 OTHER COMPLIANCE ISSUES

All drill cuttings, soil from excavation, water from excavation, groundwater from well development and testing, decontamination water, and personal protective equipment will be collected, analyzed as appropriate, and disposed of in accordance with the Waste Management Plan (Appendix D).

APPENDIX D
WASTE MANAGEMENT PLAN

1.0 INTRODUCTION

This plan details Morrison Knudsen Corporation's (MK's) approach to manage and dispose of the various waste streams generated during this project. All waste will be collected and stored on site in appropriate containers or piles, field screened using portable instruments, sampled and analyzed for characterization purposes if necessary, and disposed of according to appropriate federal, state and local regulations.

MK is responsible for the following activities:

- Ensuring that all waste streams are managed in accordance with the procedures in this plan.
- Providing field oversight to ensure subcontractor compliance with the procedures in this plan.
- Ensuring that appropriate waste containers and secondary containment are provided.
- Preparing for U.S. Navy signature all required paperwork and documentation, including manifests, for any hazardous wastes generated during system installation and startup activities.
- Ensuring all waste containers are properly labeled.
- Maintaining waste records as appropriate.

2.0 WASTE STREAMS

Waste streams expected to be generated during the project include:

- Soil from drill cuttings.
- Soil from trench excavation.
- Water from trench excavation.
- Groundwater from well development.
- Groundwater from well testing.
- Decontamination water.
- Disposable personnel protective equipment and clothing.

- Inert wastes (construction debris).

2.1 DEVELOPMENT WATER

Before any work is started, a single above-grade pit will be constructed from straw bales and lined with 10-mil polyethylene. All drill cuttings and development water produced from drilling operations will be temporarily placed in the pit.

Development water will be pumped from the pit to a tankcar, where it will be sampled and analyzed as described in Section 4.0 of this plan. If it meets MCWS criteria, it will be taken there for treatment. If it does not meet MCWS criteria, arrangements will be made for pretreatment at the existing pretreatment facility.

2.2 DRILL CUTTINGS

Drilling cuttings and other solid material will be removed from the temporary above-grade pit, field screened, and placed in roll-offs. The material will then be sampled and analyzed as described in Section 4.0. Hazardous material will be packaged and shipped to a permitted hazardous waste treatment and disposal facility as described in Sections 5.0 and 6.0 of this plan. Nonhazardous material will be shipped to a sanitary landfill.

2.3 EXCAVATED SOIL

Contaminated soil could be encountered during trench excavation for installation of piping. The Health and Safety Officer will screen the soil as it is being excavated with portable field instruments to ensure that applicable levels are not being exceeded. If organic vapor levels are high, the soil will be sampled and analyzed as described in Section 4.0 of this plan.

If the soil is hazardous, all excavated soils will be stored in roll-offs and then transported to a hazardous waste treatment and disposal facility as described in Sections 5.0 and 6.0 of this plan. If the soil is not hazardous, it will be backfilled.

2.4 EXCAVATED TRENCH WATER

It is unlikely that water will accumulate in the trench. However, if it does, the water will be pumped to a tankcar. Any trench water will be sampled and analyzed as described in Section 4.0 of this plan. If it complies with the MCWS criteria, it will be taken to their facility. If it does not, arrangements will be made for treatment in the on-site pretreatment facility.

2.5 WELL TESTING WATER

Wastewater from well testing will be initially diverted to a tankcar for sampling and analysis in accordance with Section 4.0 of this plan. If it complies with the MCWS criteria, it will be piped via the sanitary sewer to the MCWS facility. If it does not, arrangements will be made for treatment in the on-site pretreatment facility. A buried 4-inch-diameter PVC pipeline will convey water from the well performance tests to the existing pretreatment system.

2.6 DECONTAMINATION WATER

Decontamination water will be generated during steam cleaning of drilling rig equipment and during manual decontamination of sampling equipment. All water used in decontamination will be collected in 55-gallon drums.

Because the decontamination water may contain low concentrations of the site contaminants, the decontamination water will be sampled and analyzed in accordance with Section 4.0, Sampling and Analysis of Wastes. If it complies with the MCWS criteria, it will be piped via the sanitary sewer to the MCWS facility. If it does not, arrangements will be made for treatment in the on-site pretreatment facility.

2.7 DISPOSABLE PERSONNEL PROTECTIVE EQUIPMENT

Personnel protective equipment (PPE) may include disposable Tyvek suits, gloves, boots, respirator cartridges and visquene. The quantity of PPE generated depends upon the schedule and number of times PPE is discarded daily. Contaminated PPE will be placed in a plastic lined 55-gallon drum immediately after use. The drum will be field screened and transported to an off-site sanitary landfill for ultimate disposal.

2.8 INERT WASTES

Inert wastes consisting of construction debris such as concrete and asphalt will be generated during construction activities. These wastes will be placed into a roll-off prior to disposal. Construction debris is generally a nonhazardous waste and can be disposed of in a sanitary landfill. If the waste exceeds applicable field screening levels, it will be sampled and analyzed in accordance with Section 4.0, Sampling and Analysis of Wastes. If the wastes comply with the acceptance criteria of the sanitary landfill, they will be transported there. If they exceed acceptance levels, the wastes will be packaged and transported to a CERCLA-approved hazardous waste treatment and disposal facility.

3.0 SPILL PREVENTION AND CONTROL

The spill prevention and control guidelines for reporting and responding to spills are detailed in the Site Safety and Health Plan, Appendix E.

4.0 SAMPLING AND ANALYSIS OF WASTES

The sampling procedures and analyses presented in this section are based on guidelines in USEPA SW-846, *Test Methods for Evaluating Solid Waste*, the Naval Energy and Environmental Support Activity (NEESA) requirements for sampling and chemical analysis quality assurance, and MK Quality Execution Procedure (QEP) 6.1 provided in Attachment 1 (EPA, 1992; NEESA, 1988).

4.1 PROPOSED SAMPLING

4.1.1 Project Sampling Objectives

The sampling objective for this plan is to characterize waste streams generated during delivery order activities. These waste streams, as identified in Section 2.0, consist of drill cuttings and well development water generated during well installation, decontamination water collected during decontamination activities, groundwater produced during well pump testing, potential soil from trench excavation activities, potential trench water, PPE, and inert construction debris.

4.1.2 Analytical Level Requirements

NEESA analytical level C requirements will apply to the waste characterization samples collected for this Delivery Order. These requirements include the use of EPA analytical methods as well as specific data set deliverables and validation guidelines.

4.1.3 Data Quality Objectives

The overall quality assurance objective for this delivery order is to produce data of acceptable quality to determine final disposition of the waste materials by controlling sample collection, sample transfer, sample analysis, and data reporting. In order to meet the work plan objectives identified in Section 1.1 of the Work Plan, sufficient data must be collected to determine the final disposition of waste materials generated during this delivery order.

Specific data quality indicators to meet the Work Plan and sampling objectives include requirements for precision, accuracy, detection limits, representativeness, comparability, and completeness. These requirements are presented in Tables D-1 and D-2.

4.2 SAMPLE AND DATA COLLECTION

The sampling and analysis strategy for this delivery order is summarized in Table D-3. Sample analyses, volumes, and preservation requirements are presented in Table D-4.

Pre-cleaned and certified analyte-free sample containers will be obtained from the laboratory prior to sample collection activities.

4.2.1 Site Access

Site access for sampling waste materials will be coordinated with the property owner, United Defense.

4.2.2 Sampling of Liquids

The following sampling approach will be used to collect liquid samples during waste management activities:

Well development water, well testing water, decontamination water, and potential trench water. The containerized water will be sampled directly from tanker trucks through the tank's inspection port and from drums through the drum opening. The tank or drum opening will first be screened by the FID, and readings recorded. In general, a disposable Teflon bailer will be used to collect the samples. However, if FID readings exceed 5 ppm, an uncontaminated disposable Coliwasa will be used for volatile organic sampling. The use of the Coliwasa will enable visual observation of any organic stratification occurring. The proposed order of sample collection is: volatile organics, chemical oxygen demand (COD), total suspended solids (TSS), and pH. The volatile organic water samples will be collected by lowering the bailer slowly into the water column to avoid degassing. The water samples for volatile organic analysis will be transferred from the bailer with a minimum of agitation. The vials will be filled with the sample and preservative to a level creating a convex meniscus on the neck of the vial and carefully closing and securing the top of the bottle. The vial will be inspected to insure an air free sample. If air is present in the sample bottle, the sample bottle will be opened and a new meniscus will be formed with the additional sample water. If an air-free sample is not achieved in two attempts, the sample will be poured out of the vial, and the sample procedure discussed above will be repeated. All other samples will be collected by using a disposable Teflon bailer and transferring directly into the sample containers.

4.2.3 Sampling of Solids

The following sampling approach will be used to collect solid samples during waste management activities:

Table D-1
Data Quality Indicators

Waste Stream/ Analytical Level	Precision[1]	Accuracy[2]	Detection Limit	Representativeness	Comparability	Completeness
Drill cuttings Level C	Within QC limits specified in SW-846 methods. (see also QEP 6.1)	Within QC limits specified in SW-846 methods. (see also QEP 6.1)	MDLs of EPA SW-846 methods. See also Attachment 2.	Composite (metals) and grab (VOAs) samples collected using standard collection techniques (see Section 4.2.3)	Standard sampling and analytical protocol for all samples. Data reported in µg/kg for characterization and µg/L for TCLP.	90% minimum
Groundwater from well development Level C	Within QC limits specified in SW-846 methods. (see also QEP 6.1)	Within QC limits specified in SW-846 methods. (see also QEP 6.1)	MDLs of EPA SW-846 methods. See also Table D-2.	Grab samples collected as needed prior to discharge using standard collection techniques (see Section 4.2.2).	Standard sampling and analytical protocol for all samples. Data reported in µg/L.	90% minimum
Soil from trench excavation Level C	Within QC limits specified in SW-846 methods. (see also QEP 6.1).	Within QC limits specified in SW-846 methods. (see also QEP 6.1)	MDLs of EPA SW-846 methods. See also Atrtachment 2.	Composite (metals) and grab (VOAs) samples collected systematically from grid locations using standard collection techniques (see Section 4.2.3)	Standard sampling and analytical protocol for all samples. Data reported in µg/kg for characterization and µg/L for TCLP.	90% minimum
Potential trench water Level C	Within QC limits specified in SW-846 methods. (see also QEP 6.1)	Within QC limits specified in SW-846 methods. (see also QEP 6.1)	MDLs for SW-846 methods. See also Table D-2.	Grab samples collected using standard collection techniques (see Section 4.2.2).	Standard sampling and analytical protocol for all samples. Data reported in µg/L.	90% minimum
Groundwater from testing Level C	Within QC limits specified in SW-846 methods. (see also QEP 6.1)	Within QC limits specified in SW-846 methods. (see also QEP 6.1)	MDLs for SW-846 methods. See also Table D-2.	Grab samples collected as needed prior to discharge using standard collection techniques (see Section 4.2.2).	Standard sampling and analytical protocol for all samples. Data reported in µg/L.	90% minimum
Decon water Level C	Within QC limits specified in SW-846 methods. (see also QEP 6.1)	Within QC limits specified in SW-846 methods. (see also QEP 6.1)	MDLs for SW-846 methods. See also Table D-2.	Grab samples collected as needed prior to discharge collection techniques (see Section 4.2.2).	Standard sampling and analytical protocol for all samples. Data reported in µg/L.	90% minimum
Inert waste Level C	Within QC limits specified in SW-846 methods. (see also QEP 6.1)	Within QC limits specified in SW-846 methods. (see also QEP 6.1)	MDLs for SW-846 methods. See also Attachment 2.	Grab samples collected using standard collection techniques (see Section 4.2.2).	Standard sampling and analytical protocol for all samples. Data reported in µg/kg for characterization and µg/L for TCLP.	90% minimum

Notes: CRQL: contract required quantitation limit
MDL: method detection limit
SOW: Statement of Work
QEP: Quality Execution Procedure

Level C[4]: analyses performed by off-site laboratory according to EPA methods

[1] Precision for duplicate analyses will be calculated as the RPD:

$$RPD = \frac{[D^1 - D_2] * 100}{[D^1 + D_2]/2}$$

where: RPD = relative percent difference
D_1 = sample value
D_2 = duplicate sample value

[2] Accuracy will be calculated as the ratio of the measured value to a reference value:

$$\text{percent recovery} = \frac{\text{measured value} * 100}{\text{reference value}}$$

[3] Detection limit may be one or more orders of magnitude higher in samples given dilution factor and % solids.

[4] NEESA analytical levels

Table D-2
Volatile Analysis Detection Limit Requirements for Water Samples Representing Waste Discharge

Parameter	Detection Limit µg/l
bromomethane	6.700
vinyl chloride	3.300
chloroethane	3.300
methylene chloride	3.300
trichlorofluoromethane	3.300
1,1-dichloroethene	3.300
1,1-dichloroethane	3.300
trans-1,2-dichloroethene	3.300
chloroform	3.300
1,2-dichloroethane	6.700
1,1,1-trichloroethane	3.300
carbon tetrachloride	3.300
bromodichloromethane	3.300
1,2-dichloropropane	6.700
trnas-1,3-dichloropropene	3.300
trichloroethene	3.300
dibromochloromethane	6.700
cis-1,3-dichloropropene	3.300
1,1,2-trichloroethane	6.700
benzene	3.300
2-chloroethylvinylether	13.000
bromoform	3.300
1,1,2,2-tetrachloroethane	3.300
tetrachloroethene	3.300
toluene	3.300
chlorobenzene	3.300
ethylbenzene	3.300
p & o-xylene	3.300
m-xylene	3.300

Source: Existing NIROP Industrial Discharge Permit No. 2154

Table D-3
Sampling and Analysis Strategy

Waste Stream	Constituents	Sampling Method	Analytical Method	Field QC Sample Requirements
Drill cuttings	VOAs Metals PCBs RCRA characteristics Paint filter test	Collect composite (metals) and grab (VOAs) samples from containerized waste using hand tools	SW-846 Methods 8260 6010/7470 8080A RCRA Ignitibility Corrosivity Reactivity RCRA TCLP Volatiles 8260 Semivolatiles 8270A Metals 6010A Herbicides 8150A Pesticides 8080A Paint Filter Test (9095)	1 duplicate for every 10 samples 1 equipment rinsate blank per day
Groundwater from well development	VOAs COD TSS pH	Grab samples collected as needed prior to discharge using standard techniques	SW-846 Methods 8260 6010/7470 410.1 160.2 9040	1 duplicate for every 10 samples 1 trip blank per cooler 1 equipment rinsate blank per day
Soil from trench excavation	RCRA characteristics Paint filter test	Collect composite (metals) and grab (VOAs) samples from stockpiled or containerized waste material using hand tools	RCRA Ignitibility Corrosivity Reactivity RCRA TCLP Volatiles 8260 Semivolatiles 8270A Metals 6010A Herbicides 8150A Pesticides 8080A Paint Filter Test (9095)	1 duplicate for every 10 samples 1 equipment rinsate blank per day
Potential trench water	VOAs COD TSS pH	Grab samples collected as needed prior to discharge using standard techniques	SW-846 Methods 8260 6010/7470 410.1 160.2 9040	1 duplicate for every 10 samples 1 trip blank per cooler 1 equipment rinsate blank per day
Groundwater from pump testing	VOAs COD TSS pH	Grab samples collected as needed prior to discharge using standard techniques	SW-846 Methods 8260 6010/7470 410.1 160.2 9040	1 duplicate for every 10 samples 1 trip blank per cooler 1 equipment rinsate blank per day
Decon water	VOAs COD TSS pH	Grab samples collected as needed prior to discharge using standard techniques	SW-846 Methods 8260 6010/7470 410.1 160.2 9040	1 duplicate sample for every 10 samples 1 field blank 1 trip blank per cooler 1 equipment rinsate blank per day
Inert waste - asphalt	RCRA characteristics Paint filter test	Collect grab samples from stockpiled construction debris using hand tools	RCRA Ignitibility Corrosivity Reactivity RCRA TCLP Volatiles 8240A Semivolatiles 8270A Metals 6010A Herbicides 8150A Pesticides 8080A Paint Filter Test (9095)	1 duplicate for every 10 samples 1 trip blank per cooler 1 equipment rinsate blank per day

Note: Monitoring for personnel protection is addressed in the Site Safety and Health Plan

VOAs: Volatile organic compounds
COD: Chemical oxygen demand
TSS: Total suspended solids

Table D-4
Sample Requirements

Sample	Analytical Method	Sample Container	Preservative	Maximum Holding Time
Solid Samples				
• Drill cuttings	SW-846 Methods 8260 6010/7470 8080 RCRA TCLP (full) Volatiles (8260) Semivolatiles (8270) Metals (6010/7000 Series) Herbicides (8150) Pesticides (8080) RCRA Ignitibility (1010) Corrosivity (9045) Reactivity (9010) Paint Filter Test (9095)	4-oz. jar (VOAs) 4 oz. jar (metals) 4-oz. jar (PCBs) 4-oz. jar (TCLP VOAs) 16-oz. jar (all TCLP but VOAs) 4-oz. jar 4-oz. jar 4-oz. jar 250-mL jar	4°C 4°C 4°C 4°C 4°C 4°C 4°C 4°C None	14 days (analysis) 6 months (analysis) 14 days (extraction) 14 days (TCLP extraction-VOAs) 14 days (extraction to analysis) 14 days (TCLP extraction) 7 days (analysis) 24 hours (analysis) 7 days (analysis) N/A
• Soils from extraction • Inert waste-asphalt	RCRA TCLP (full) Volatiles (8260) Semivolatiles (8270) Metals (6010/7000 Series) Herbicides (8150) Pesticides (8080) RCRA Ignitibility (1010) Corrosivity (9045) Reactivity (9010) Paint Filter Test (9095)	 4-oz. jar (TCLP VOAs) 16-oz. jar (all TCLP but VOAs) 4-oz. jar 4-oz. jar 4-oz. jar 4-oz. jar	 4°C 4°C 4°C 4°C 4°C None	 14 days (TCLP extraction-VOAs) 14 days (extraction to analysis) 14 days (TCLP extraction) 7 days (analysis) 24 hours (analysis) 7 days (analysis) N/A
Liquid Samples				
• Groundwater from well development • Groundwater from pump testing • Decon water • Potential trench water	SW-846 Method 8260 Chemical oxygen demand Total suspended solids pH	 4 x VOA vials 4-oz. plastic 16-oz. plastic 4-oz. plastic	 4°C 0.25 mL H_2SO_4, 4°C 4°C 4°C	 7 days (analysis) 28 days (analysis) 7 days (analysis) Immediately
Note: Containers must be certified analyte-free clean from the laboratory.				

Drill cuttings. Cuttings samples will be collected by initially cutting 12 to 18 inches into the pile with a clean trowel or shovel. A decontaminated stainless steel spoon will be used to collect the sample, and place it in the container. The containerized material will be quartered and a sample collected in each quarter for a composite sample. For volatile organics compound analyses, care will be used to minimize disturbance to the soil when transferring into the sample container.

Soil from trench excavation. Stockpiled soil will be field screened with a FID and visually inspected for potential areas of contamination. Samples will be collected from areas which are stained or have high field screening readings. Sampling frequency will be determined by the requirements of the waste disposal facility. Samples of cuttings will be collected by initially cutting 12 to 18 inches into the pile with a clean trowel or shovel. A decontaminated stainless steel spoon will be used to scrap off the soil surface, collect the sample, and place it in the container. The area of the stockpile will be quartered and a sample collected in each quarter for a composite sample. For volatile organics compound analyses, care will be used to minimize disturbance to the soil when transferring into the sample container, and ensure the sample container is topped off.

Inert waste. Most construction debris will not required analyses unless elevated organic vapors are detected, the debris contains asphalt, or stained areas are observed. If observations warrant sampling, the samples will be collected using decontaminated stainless steel hand tools, and transferred directly into sample containers.

Personal protective equipment. The drummed PPE will be field screened, then transported directly to an off-site sanitary landfill.

4.2.4 Decontamination

Sampling equipment will be decontaminated to prevent cross contamination of samples and the spread of contaminated material off site. Clean sampling tools will be used to collect each sample or composite sample. Equipment will be decontaminated before it is removed from the site.

Equipment will be decontaminated at a specific decontamination zone designed at the site. All nondisposable equipment (such as stainless steel hand tools) will be decontaminated according to the procedures summarized below:

- Manual scrub with Alconox™ soap solution plus tap water wash.
- Tap water rinse.
- Distilled/Deionized water rinse.
- 10% nitric acid rinse (for metals only).
- Distilled/Deionized water rinse.
- Isopropanol or acetone rinse (for organics only).

- Air dry.

4.2.5 Sample Analyses, Preservation, and Handling

Immediately after collection, samples will be transferred to properly labeled sample containers with all necessary preservatives added (see Table D-4). Samples requiring refrigeration for preservation will be immediately transferred to coolers packed with ice or ice packs. Proper chain-of-custody documentation will be maintained as discussed below in Section 4.3, Sample Documentation.

Samples will be packaged, labeled and shipped according to the guidelines established in Section 4.4.

4.2.6 Field Quality Control

Quality assurance will be addressed in the field by following a standard sampling and decontamination procedure described in this plan and in accordance with NEESA requirements. Quality control samples will be collected during the sampling as described below:

- Ten percent of the sample locations will have field duplicates.

- During sampling events, daily equipment rinsate blanks will be collected; however, only samples from every other day will be analyzed. Other samples will be held and analyzed only if evidence of contamination exists.

- Field blanks will be collected at a frequency of one per source per sampling event.

- One trip blank, containing analyte-free water supplied by the laboratory, will accompany each cooler containing water samples designated for volatile organics analysis.

- All sampling containers will be certified pre-cleaned and analyte-free, and supplied by the contracted laboratory. Any containers with chips, broken or loose tops, or otherwise compromised will be discarded.

These field quality control samples are defined in QEP 6.1.

4.3 SAMPLE DOCUMENTATION AND CHAIN OF CUSTODY PROCEDURES

4.3.1 Sample Identification

Samples will be labeled, preserved, and properly packaged for shipment to the analytical laboratory. Information on the sample label will include:

- Sample identification number.
- Name of the individual collecting sample.
- Date and time of sampling.
- Place of collection.
- Analyses to be performed on the sample.

Sample identification numbers will be used to provide a tracking procedure so that information on a particular sample location can be easily and accurately retrieved. This system also ensures that each sample is unique and not confused with any other sample. The Project Manager will maintain a complete list of sample numbers. The sample identification number consists of eight digits that represent the following information:

- Site name.
- Sample matrix.
- QC sample type (when applicable).
- Sample location number.
- Sample interval or depth (when applicable).

The project will use a specific prefix, FRI, separated from the sample identification number with a backslash (*e.g.*, FRI\12345678). The laboratory will not use the site-specific prefix.

Digits 1, 2, and 3 indicate the sample origin. These digits are alphanumeric and are created with some mnemonic device for the true name of the site. The first digit is an alphabetical character in order to facilitate data processing. Sample origin abbreviations are developed according to specific project requirements. Examples are given below:

- Tank #10 = T10
- SWMU #9 = S09
- Background = B01

The type of installation is represented by digits 4, 5 and 6. Designations for a well or boring installation are made using a "W" or "B" respectively, in the fourth digit, followed by the two digit sample location identifier. The sample location identifier is a number assigned to the specific well or borehole.

Digits 7 and 8 are matrix-dependent and represent sample intervals for soil samples or sample identifiers for groundwater samples. For groundwater samples, each sample is given a number by sequential collection. Duplicate samples have the same sample identification, but contain the letter "D" in place of the eighth digit. For example:

- XXX\S11B0901 represents the first soil sample from SWMU 11 at boring #9.

- XXX\P12W0702 represents the second groundwater sample collected from well #7 at plume #12.
- XXX\P12W072D represents a duplicate of the above example.

QC samples are numbered by replacing digit 4 with the proper QC sample code, listed below, followed by the month and day it was collected as digits 5, 6, 7, and 8. For example, August 14 would appear in the last four digits of the sample identification number as 0814. QC sample codes used during the project are:

- F = field blank
- E = equipment rinsate
- T = trip blank

The sample number is entered on sample labels, chain-of-custody forms, and in the appropriate section of the Testing Plan and Log found in the QC Plan. All sample identification information will also be documented in the sampler's field logbook, especially information not incorporated in the sample number.

4.3.2 Custody Seals

Samples will be placed in shipping containers that are locked or sealed for shipment to the laboratory. Custody seals will be affixed to the sealed shipping container and/or individual sample containers. Information on the custody seal will include the date when the container was sealed and the signature of the sampler or relinquisher. Broken custody seals will be noted in the remarks section of the chain-of-custody record.

4.3.3 Field Logbook

All information pertinent to field surveys or samples will be recorded in the logbook as a permanent record. The minimum entries in the logbook will include:

- Client description and address.
- Name and address of field contact.
- Location of sampling point.
- Description of sample origination and known characteristics (including field screening results).
- Sample identification and volume collected.

4.3.4 Chain-of-Custody Record

All sample shipments will be accompanied by a chain-of-custody record. The chain-of-custody record includes the following information:

- Package contents.

- Sample identification numbers.
- Sample location.
- Date and time of sample collection.
- Analytical tests for each sample.
- Appropriate project identification information.

The chain-of-custody record will be completed with information and wording consistent with information and wording reported on sample labels and seals.

When transferring custody, the sampler will record the time and date and sign the chain-of-custody form in the "relinquished by" block. The receiver will sign "received by" block upon sample receipt. The original chain-of-custody record will accompany the shipment, and a copy will be retained by the Project Manager or designee. A signed chain-of-custody record will obtained from the laboratory custodian after the samples have been received and their condition checked.

4.4 SAMPLE PACKAGING AND TRANSPORTATION

Individuals responsible for the safe packaging, labeling, and shipping of hazardous environmental samples (hazardous materials) must meet the training requirements specified in U.S. Department of Transportation(DOT) 49 CFR 172.700.

Sample packaging and shipping procedures will be conducted according to DOT regulations (49 CAR Parts 171–177). The International Air Transport Association (IATA) Dangerous Goods Regulations must be adhered to for all air carrier shipments, such as Federal Express.

The following waste material samples for this delivery order will be handled as nonhazardous environmental samples unless additional hazardous constituents are found during field screening procedures:

- Drill cuttings.
- Soil samples.
- Inert waste samples.
- Water samples without preservatives.

Water samples containing corrosive preservatives (such as H_2SO_4) will be handled as hazardous environmental samples and marked and labeled as Environmental Hazardous Substances, Liquid, N.O.S. ([name of acid preservative]), Hazardous Class 9, United Nations #3082.

Procedures for packaging and shipping nonhazardous and hazardous environmental samples are outlined in Attachment 3.

4.5 DATA VALIDATION AND REPORTING

4.5.1 Data Validation

Data validation for Level C data will be performed according to Section 7.3.2 of NEESA 20.2-047B. Data validation activities shall be coordinated by the MK Project Manager.

All data from field and laboratory measurements and analyses will be expressed in Standard International (SI) units or units specifically required by the analytical protocols. Only significant figures as specified in analytical protocols will be reported. All data will be reviewed and receive appropriate approval before being reported by the MK Project Manager. Field data will be reviewed and approved by the Site Hydrogeologist and analytical data will be approved by the laboratory manager prior to reporting.

Field and analytical results will be in compliance with holding times, instrument calibration, sample handling requirements, instrument tuning and performance information, and other method-specific requirements. Results from field and laboratory quality control samples will be analyzed to evaluate the precision and accuracy of analytical results.

4.5.2 Data Reporting

For all analyses, the laboratory report will provide the following information, at a minimum:

- Project identification
- Field sample number
- Laboratory sample number
- Sample matrix description
- Date of sample collection
- Date of sample receipt at laboratory
- Analytical method description and reference citation
- Individual parameter results
- Date of analysis
- Quantification limits achieved
- Corresponding QC report (to include method blanks, blanks/spikes, and continuing calibration checks)
- Final, completed sample COC forms

Additional data set deliverables are required for Level C data, and are presented in Table D-5.

Table D-5
Data Set Deliverables for Level C QA

Contaminants	Method Requirements	Deliverables[1]
Organics	Method blank spikes with results and control charts. Run with each batch of samples processed.	Control chart
	Results to be reported on CLP Form 1. Sample results using CLP data flags.	Form 1 1/Sample chromatograms/and mass spectra
	Surrogate recovery from samples reported on CLP Form 2. Surrogates to be used in volatiles, semivolatiles, pesticides/PCBs. For volatiles by GC, the names of surrogates should be changed to reflect the surrogate used.	Form 2
	Matrix spike/spike duplicate 1 spike and spike duplicate per 20 samples of similar matrix reported on Form 3.	Form 3
	Method blank reported on CLP Form 4. For volatiles by GC, a similar format will be used as CLP Form 4 for blanks.	Form 4
	GC/MS Tuning for volatiles/semi-volatiles. Report results on Form 5.	Form 5
	Initial calibration data reported on Form 6. For volatiles by GC, the initial calibration data with response factors must be reported. For pesticides/PCB data Form 9 must be used for calibration data.	Form 6 No Form Form 9
	Continuing calibration data, the response factors and their percent differences from the initial must be reported. Internal Standard Area for volatiles and semivolatiles.	No Form Form 8
	For pesticides/PCB data, the CLP Form 9 must be presented. No chromatograms or mass spectra are presented for calibration. These data should be filed in the laboratory and available if problems arise in reviewing/validating the data. The calibration information should be available for checking during on-site audits.	Form 9
	Internal standard area for GC/MS analyses CLP Form VIII shall be supplied.	Form 8
	Second column confirmation shall be done for all GC work when compounds are detected above reporting limits. Chromatograms of confirmation must be provided.	Chromatograms

Table D-5
Data Set Deliverables for Level C QA

Contaminants	Method Requirements	Deliverables[1]
Metals	Sample results with CLP flagging system.	Form 1
	Initial and continuing calibration.	Form 2, Part 1 only
	Blanks 10% frequency	Form 3
	Method blank taken through digestion (1/20 samples of same matrix).	Form 3
	ICP interference check sample.	Form 4
	Matrix spike recovery (1 per 20 samples of similar matrix).	Form 5, Part 1
	Postdigestion spike sample recovery for ICP metals. Only done if predigest spike recovery exceed CLP limits.	Form 5, Part 2 (never used for GFAA work)
	Postdigest spike for GFAA.	Recovery will be noted on raw data
	Duplicates (1 per 20 samples will be split and digested as separate)	Form 6 samples
	Method blank spike information will be plotted on control chart, one per batch of samples processed.	Control chart
	Standard addition. The decision process outlined in CLP page E-3 will be used to determine when standard additions are required.	Form 8
	Holding times	Form 10
Wet Chemistry	Blank spike 1/batch	Control chart
	Method blank 1/batch	Report result, no format
	Sample results	Report result, no format
	Matrix spike/spike duplicate or calibration information	Report result if applicable
	Calibration check report percent RSD or percent difference from initial calibration	Report percent or percent difference, no format

[1] - Forms 1 through 10 are CLP (Contract Laboratory Protocol) forms, required by NEESA 20.2-047B.

Analytical results will be reported verbally and via facsimile by the laboratory to the MK Project Manager as soon as the results are available. The results then will be submitted in written and electronic form to the MK Project Manager upon completion of data validation.

5.0 PACKAGING AND TRANSPORTATION

5.1 NONHAZARDOUS MATERIAL

5.1.1 Packaging

Nonhazardous materials dispositioned for shipment will be placed in roll-offs or drums as appropriate. It is anticipated that nonhazardous drill cutting wastes and inert construction waste will be placed in roll-offs and that personal protective equipment will be containerized in a 55-gallon drum as described in Section 4.8. All containers will be sealed or otherwise protected against weather after they have been filled and placed in a proper storage or staging area.

5.1.2 Transportation

Nonhazardous wastes will be transported in the conventional manner using roll-offs or other waste containers which will be labeled as "NONHAZARDOUS." Shipping papers will include the shipping manifest specified by the landfill of final destination. In addition, any nonhazardous contaminated soils will be accompanied by the waste characterization data as specified by the landfill of final destination. See Section 4.0, Sampling and Analysis, for parameters to be analyzed.

5.2 HAZARDOUS MATERIALS

5.2.1 Packaging

All hazardous materials will be packaged and shipped in accordance with the U.S. Department of Transportation (DOT) regulations in 49 CFR 172 and 173 and the Minnesota Pollution Control Agency regulations for hazardous waste generation and transportation (generally Chapter 7045.0205 — 7045.397). The proper shipping name will be determined and the hazard class, UN number, and the proper marking, labeling, placarding, and packaging requirements will be identified.

All packaging will conform to the requirements in 49 CFR 173.24, General Requirements for Packagings and Packages. All containers will be sealed or otherwise protected against the weather after they have been filled and placed in a proper storage or staging area.

5.2.2 Transportation

All hazardous wastes being transported off site will be hauled by licensed hazardous waste haulers. The shipping papers will be completed in accordance with 49 CFR 172.200 *et seq.* and the MPCA regulations in Chapter 7045.0261 *et seq.* Hazardous waste manifests will be completed, reviewed, and delivered to the NIROP representative for signature as the generator.

The waste manifest package will include:

1. Completed shipping manifest or bill of lading describing the name and address of the shipper and consignee, the wastes proper shipping name, hazard class, United Nations number, packing group number, and the 24-hour emergency phone number.

2. Completed hazardous waste manifest. Information is similar to the shipping manifest or bill of lading. Hazardous waste manifests will be completed, reviewed, and delivered to the NIROP representative for signature as the generator.

3. A completed Waste Safety Data Sheet (WSDS) or hazard guide selected from DOT's Emergency Response Guidebook.

4. The disposal site's approved waste profile.

5. A completed land disposal restriction notification and certification form.

6.0 TREATMENT AND DISPOSAL

All wastes shipped offsite must be sent either to a permitted sanitary landfill or to a CERCLA-approved, permitted treatment and disposal facility. All waste approvals must be finalized before any waste is allowed to leave the site.

All hazardous substances, pollutants, and contaminants which are transferred off of a CERCLA site must be disposed of in a facility complying with the regulations in 40 CFR 300.440, "the offsite rule." MK or its subcontractor will ensure that any hazardous waste shipped offsite is sent to a facility which is on the approved list by that Region's EPA Offsite Coordinator.

7.0 REPORTING

Because NIROP is the generator of any hazardous waste leaving the site, they will be responsible for recordkeeping and reporting.

The MK Site Superintendent will assist the NIROP representative in tracking the manifest. If a confirmation copy of the manifest with the handwritten signature of the owner or operator of the designated TSD facility is not received within 35 days of the date the waste was accepted by the initial transporter, the transporter and the TSD facility must be contacted to determine the status of the hazardous waste. If the confirmation manifest is not received within 45 days of the date the waste was accepted by the initial transporter, the MK Site Superintendent will assist the NIROP representative in submitting an exception report to the Minnesota Pollution Control Agency. The report will include a legible copy of the manifest and a cover letter signed by the NIROP representative explaining the efforts taken to locate the hazardous waste and the results of those efforts.

ATTACHMENT 1

Quality Execution Procedure (QEP) 6.1
Identification and Control of Samples

4.1.2.3 **Drilling Equipment**

Steam-clean downhole equipment on drill rigs, such as augers, drill rods, and drill bits, prior to and/or after use at a designated wash pad. Remove visible soil and grease.

4.1.2.4 **Monitoring Well Installations**

- Steam-clean casing, screen, couplings, and caps used in monitoring well installation prior to installation. Remove visible foreign matter.
- Steam-clean the exterior surfaces and accessible interior portions of submersible, centrifugal, and positive-displacement pumps prior to each use.
- Steam-clean bailers and wash in phosphate-free detergent solution and rinse twice in distilled or DI water prior to each use. Water used for rinsing will be tested for all target analytes except dioxins at the beginning of the field programs to show that target analytes are not present above the reporting detection limit. Discard rope or string (used with bailers or disposable sampling bottles) that has been in contact with the water in the well or boring in accordance with WMPs, and replace with new string after each sample is collected.
- Wash steel tapes, well sounders, transducers, and water quality probes in a phosphate-free detergent solution, and rinse in distilled or DI water or wipe clean after each use. Clean the portion of these devices inserted into wells with a mild soap solution.

4.2 Sample Numbering

4.2.1 Sample identification will include the following information:

- Site name
- Sample matrix
- QC sample type
- Well or boring location number
- Sample interval/depth (when applicable)

4.2.2 The project will utilize a specific prefix, XXX, to the sample identification number. The prefix will be separated from the sample identification number with a backslash; for example, XXX\12345678. The laboratory will not utilize the site-specific prefix.

4.2.3 The eight digit format will require that site designation, sample matrix, sample location, QC sample type, and sampling method/depth are coded and defined in the following format:

3.3 Equipment Rinsates

Equipment rinsates are a type of QC sample and are the final analyte-free water rinse from equipment cleaning collected daily during a sampling event. Initially, samples from every other day should be analyzed. If analytes pertinent to the project are found in the rinsate, the remaining samples must be analyzed. The results from the blanks will be used to flag or assess the levels of analytes in the samples. This comparison is made during data validation. The rinsates are analyzed for the same parameters as the related samples.

3.4 Field Blanks

Field blanks are a type of QC sample that consist of the source water used in decontamination and steam cleaning. At a minimum, one field blank from each event and each source of water must be collected and analyzed for the same parameters as the related samples.

3.5 Field Duplicates/Splits

Duplicates or splits for soil samples are collected, homogenized, and split. All samples except VOA's are homogenized and split. Volatiles are not mixed, but select segments of soil are taken from the length of the core and placed in 40 ml glass vials. Cores may be sealed and shipped to the laboratory for subsampling if the project deems this appropriate. The duplicates for water samples should be collected simultaneously. Field duplicates should be collected at a frequency of 10% per sample matrix for Levels C and D. For Level E, the duplicates should be analyzed at a frequency of 5%. All the duplicates should be sent to the primary laboratory responsible for analysis. The same samples used for field duplicates shall be split by the laboratory and be used as the laboratory duplicate or matrix spike. This means that for the duplicate sample, there will be analyses of the normal sample, the field duplicate, and the laboratory matrix spike/duplicate.

4.0 SAMPLING REQUIREMENTS

4.1 Decontamination

4.1.1 Equipment that may come in contact with potentially contaminated soil, sediment, waste, or water will be decontaminated prior to and after use. Decontamination consists of steam cleaning (high pressure, hot water washing), phosphate-free detergent wash, and distilled, deionized (DI), or clean water rinse, as appropriate.

4.1.2 Sampling, drilling, and monitoring well installation equipment will be decontaminated utilizing EPA guidelines. Summary decontamination steps are as follows:

4.1.2.1 **Water Sampling Equipment**

Prior to collecting a water sample, non-dedicated sampling equipment must be decontaminated according to the following procedure.

1. *Equipment.* Remove all visible contamination with clean tap water and an Alconox™ solution.. If this is not effective, use a clean soft cloth or sponge or use pressurized water to clean equipment. If required, a brush may be used to clean stainless steel or metal equipment but not plastic equipment, which may be scratched by the brush.

   After cleaning equipment with tap water, triple rinse equipment with distilled water.

2. *Hoses.* Pump clean tap water through hoses. If necessary, use pressurized tap water.

   After cleaning hoses with tap water, pump 3 volumes of distilled water through hoses.

3. *Probe tips and meters.* Triple rinse with distilled water.

4. Collect sample according to the specific procedure for the sample type.

5. Rinse all sample collection equipment with clean tap water followed by distilled water. Store equipment in clean containers.

4.1.2.2 **Soil and Sediment Sampling Equipment**

Equipment used to collect samples for chemical analysis requires thorough decontamination, as described below:

1. Wash equipment (augers, split spoons, etc.) with distilled water, an Alconox™ solution, and/or a high-pressure washer. **If visible contamination remains, steam clean the equipment.**

2. A solvent rinse (Hexane or Acetone) may be required to remove organic contamination that is not removed by washing and/or steam-cleaning.

3. Rinse with clean tap water.

4. Triple rinse all equipment with distilled water and allow to air dry.

5. Collect sample according to the specific procedure for the sample type.

6. Rinse all sample collection equipment with clean tap water followed by distilled water. Store equipment in clean containers.

1 2 3 4 5 6 7 8

4.2.4 The first three digits, 1, 2, and 3, will indicate the sample origin. These digits are alphanumeric and will be created with some mnemonic device for the true name of the site. The first digit is an alphabetical character in order to facilitate data processing. Sample origin abbreviations will vary widely according to specific project requirements. Examples are given below:

- SMWU #9 - S09
- Plume #3 - P03
- Unit #10 - U10
- Background - B01

4.2.5 The type of installation will be represented by digits 4, 5, and 6. Designations for a well or boring installations will be made by using a "W" or a "B" respectively in the fourth digit, followed by the two-digit sample location identifier. The sample location identifier is a number assigned to the specific well or borehole.

4.2.6 The seventh and eighth digits are matrix-dependent and will represent sample intervals for soil samples or sample identifiers for groundwater samples. For groundwater samples, each sample will be given a number by sequential collection. Duplicate samples will have the same sample identification but will have the letter "D" in place of the eighth digit. **Examples:**

- XXX\S11B0901 represents the first soil sample from SWMU 11 at boring #9.

- XXX\P12W0702 represents the second groundwater sample collected from well #7 at plume #12.

- XXX\P12W072D represents a duplicate of the second sample example above.

4.2.7 The sample number shall be entered on sample labels, chain of custody forms, and in the appropriate section of the Testing Plan and Log in Section 8.0 of QC Plans. All sample identification information will also be documented in the sampler's field logbook, especially information not incorporated in the sample number.

4.2.8 QA/QC samples used to assess the precision and accuracy of the sampling and analyses will replace the fourth-digit (well or boring designation) when used. Digit 4 will represent the type of QC sample, followed by the month and day it was collected as digits 5, 6, 7, and 8. Samples required to meet this data quality objective are given below with their appropriate code:

<u>QA Sample Codes:</u>

F --- field blank
E --- equipment rinsate

T --- trip blank

4.2.9 The sample code will be followed by a four-digit date where the first two digits indicate the month and the second two digits indicate the day, (ex: August 14 would be written as 0814). As an example, XXX-W06-F1025 is the sample identifier for the field blank collected at SWMU 6 on October 25.

4.3 Sample Packaging and Transport

4.3.1 Each sample will be packaged and transported appropriately as described in the following protocol:

- Collect samples in appropriate containers and add preservatives, as needed (Table 1).
- Print the following information clearly in waterproof ink on the label for each sample container: the preservative that has been added to each sample container, the sample number, the project number, the initials of the sample collector, and the date and time the sample was collected. For water samples, package sets together if appropriate. Each VOC set should be placed together in a labeled ziplock plastic bag.
- Fill out field sample log and chain of custody record.
- Separate and place samples in coolers according to laboratory destination and according to expected concentrations (e.g., lowest concentration samples together). Each cooler must weigh less than 70 pounds including ice. Package samples well to protect from shipping damage.
- Place samples on ice, as necessary (Table 1).
- Seal the top two copies of each chain of custody form inside a ziplock bag. Use strapping tape to attach the packet to the inside of the cooler lid. Samples will always be accompanied by a chain of custody record. When transferring samples, both the individuals relinquishing and receiving the samples will sign and date the chain of custody record. Samples will be packaged properly for shipment, including isolation of samples thought to have high chemical concentrations, and dispatched to the appropriate laboratory for analysis.
- Secure cooler with custody seal, if appropriate. Custody seals will be used when samples are shipped via courier service. Custody seals are not deemed necessary when the samples will be in continuous possession of MK Team project or laboratory personnel.
- Label coolers correctly; placing "Fragile" and "This-End-Up" labels on coolers, as appropriate.

- Transport the coolers to the designated analytical laboratories via MK Team personnel or designated couriers. The planned mode of sample transport is to use couriers employed by the laboratory. Alternatively, commercial couriers, MK Team couriers, or overnight shipment may be used. Specific transportation arrangements are dependent on the location of the Delivery Order Site and the analytical laboratories; specific procedures will be described in site-specific planning documents.

4.3.2 Soil samples intended for immunoassay-based field screening methods (e.g., EnSys methods for pentachlorophenol, total petroleum hydrocarbons) will be collected and stored in labeled containers that are appropriate for the type of analysis to be performed.

4.4 Sample Custody

4.4.1 Sample custody procedures will be followed through sample collection, transfer, analysis, and ultimate disposal. The purpose of these procedures is to assure that the integrity of samples is maintained during their collection, transportation, and storage prior to analysis, and sample material is properly disposed after analysis. Sample custody begins with the shipment of the empty sample containers. Sample containers are shipped from the laboratory in sealed coolers or cartons with appropriate seals and custody documentation. Sample quantities, types, and locations will be determined before the actual field work commences. The Sample Technician will be responsible for the care and custody of the samples until properly transferred. Custody transfer will be documented on the Chain of Custody Form.

4.4.2 At the chemical laboratory, a designated sample custodian will accept custody of the shipped samples and verify that the information on the sample label matches that on the chain of custody form(s). Pertinent information as to sample condition, shipment, pickup, and courier will also be checked on the chain of custody form(s). In addition, a project receipt checklist (e.g., Cooler Receipt Form) will also be completed by the custodian. Information on the date and time of receipt, method of shipment, and sample condition will be recorded on this form. The custodian will then enter the appropriate data into the laboratory sample tracking system. The laboratory custodian will use the sample number on the sample label as well as assign a unique laboratory number to each sample. The custodian will then transfer the sample(s) to the proper analyst(s) or store the sample(s) in the appropriate secure area.

4.4.3 Laboratory personnel will be responsible for the care and custody of samples from the time they are received, and are responsible for sample disposal. Data sheets and laboratory records will be retained as part of the permanent documentation for a period of at least 3 years.

4.4.4 Samples and extracts are retained by the analytical laboratory for up to 30 days after the data are reported by the laboratory. Unless notified otherwise by the site managers, excess or unused samples are disposed by the laboratory in a manner consistent with appropriate government regulations.

4.5 Sample Documentation

4.5.1 Each sample will be labeled and sealed properly immediately after collection. Sample identification documents will be carefully prepared so that identification and chain of custody records can be maintained and sample disposition can be controlled. Forms will be filled out with waterproof ink. The following identification documents will be used during the investigation.

- Sample Labels
- Field Logs
- Chain of Custody Forms

4.6 Sample Labels

4.6.1 Sample labels are necessary to prevent misidentification of samples. Preprinted sample labels will be provided. Where necessary, the label will be protected from water and solvents with clear label-protection tape. Each label contains the following information:

- Project name
- Project number
- Name of collector
- Date and time of collection
- Place of collection (job site)
- Sample number
- Well/boring number
- Depth
- Preservative, if any

4.7 Field Logs

A Field Log will be used daily by the Sample Technician to record activities as they relate to the progress of the investigation. The field logs will be retained in the investigation files according to project number for that task. Entries in the field log will include at least the following information:

- Project name
- Project number
- Name of author and date

- Chronology and location of activities
- Names and affiliations of personnel onsite
- Instrument calibration details and identification number
- Decontamination procedures
- Sample collection or measurement methods
- Number of samples collected
- Sample identification numbers
- Sample distribution (laboratory)
- Field observations and comments
- Any modifications to or deviation from the site specific work plan.

4.8 Chain of Custody Record

4.8.1 A chain of custody record will be filled out for and will accompany every sample to the analytical laboratory to establish the documentation necessary to track sample possession from the time of collection. A copy of the chain of custody form will be retained in the investigation files according to project number. The record will contain the following information:

- Sample number or identification
- Names of samplers
- Signature of collector, sampler, or recorder
- Location of project
- Project manager's name
- Date of collection
- Place of collection (site location)
- Sample type
- Analyses requested
- Inclusive dates of possession
- Signature of person relinquishing or receiving sample
- Laboratory sample number, where applicable
- Date and time of sample receipt.
- Method of shipment and courier name.

4.9 Corrections to Sample Documentation

4.9.1 Original data recorded in field investigation daily reports, chain of custody records, and other forms will be written in waterproof ink. None of these documents will be altered, destroyed, or discarded, even if they are illegible or contain inaccuracies that require a replacement document.

4.9.2 If an error is made on a document compiled by one individual, that individual will make the necessary correction by crossing a single line through the error, entering the correct information, and initialing and dating the change. The erroneous information

will not be obliterated. Any subsequent error(s) discovered on a document will be corrected by the person discovering the error. All corrections will be initialed and dated. Site-specific documentation will be reviewed by site managers on a daily basis.

4.10 Transfer of Field Documentation

4.10.1 During site-specific field operations, field investigation daily logs will be telefaxed to Site Managers on a daily basis. In the absence of a facsimile, field geologists and/or engineers will be in contact with Site Managers, or at a minimum the field operations manager via mobile telephones. During drilling associated with the installation of monitoring wells, site managers will review boring logs prior to constructing the well.

4.10.2 At the end of each week of field operations, all field documentation will be copied, and hard copies sent to Site Managers for review. A copy of this documentation will also be kept at the onsite field office for future reference, if necessary. The original field documents will be sent to the MK Project Management office and will be kept in the project files.

4.11 Project Files

4.11.1 It is anticipated that two sets of project files will be kept for each Delivery Order site. The original field documentation will be kept in the MK Project Management office. Copies of site-specific field documentation will be kept in site files by site managers.

5.0 REFERENCED FORMS

a. Chain of Custody Record

6.0 EXHIBITS/TABLES

a. EXHIBIT 1: Sample Labels and Chain of Custody Seal

b. TABLE 1: Sample Preservation and Storage Requirements

c. TABLE 2: Field Measurement Calibration Procedures and Precision Requirements

d. TABLE 3: Example Summary of External (Field) QC Samples

e. TABLE 4: Example Summary of Internal (Laboratory) QC Samples

f. TABLE 5: Example Quality Assurance Goals-Precision

g. TABLE 6: Example Quality Assurance Goals-Accuracy, Percent Recovery

h. TABLE 7: Summary of Calibration Procedures

EXHIBIT 1-SAMPLE TAGS

STANDARD

Sample ID:
Sample Description:
Sample Date/Time:
Requested Analyses:

MORRISON KNUDSEN CORPORATION

Project Number:
Task Number:
Phone Number:

Preservative:
Submission Date to Lab:
Sampler's Signature:

SOILS

Sample ID:
Sample Description:
Location:
Sample Date/Time:
Sampler's Signature:

MORRISON KNUDSEN CORPORATION

Project No.

WATER

DATE:	PUMP ID#:	
SAMPLE #:	FLOW:	
TIME ON:	TIME OFF	PROJECT NO.:

MORRISON KNUDSEN CORPORATION

CUSTODY SEAL

CUSTODY SEAL

DATE

SIGNATURE

Table 1. Sample Preservation and Storage Requirements

A. Volatile Organics

Matrix	Container	Minimum Sample Size/Container	Preservative	Holding Time (From Date Sampled)
Water Samples				
No Residual Chlorine Present	3 40-ml vials with Teflon lined septum caps	40 ml	HCl, H_2SO_4 or $NaHSO_4$ to pH<2, 4°C ± 2°C	14 days
Residual Chlorine Present	3 40-ml vials with Teflon lined septum caps	40 ml	4 drops of 10% sodium thiosulfate, HCl to pH <2, 4° ± 2°C	14 days
Soils/Sediments and Sludges	4-ounce glass jar with Teflon liner or core tube with Teflon liner	500 g	4°C ± 2°C	14 days
Concentrated Waste Samples	4-ounce glass jar with Teflon liner or core tube with Teflon liner	500 g	None	14 days

The above information applies to the following parameters and methods:

Parameter	Method
Volatile Hydrocarbons as Gasoline	DOHS LUFT
Volatile Aromatics (BTEX)	SW-846A 8020 (GC)
Volatile Organics	SW-846B 8240 (GC/MS)

B. Semivolatile Organics

Matrix	Container	Minimum Sample Size/Container	Preservative	Holding Time (From Date Sampled)
Water Samples				
No Residual Chlorine Present	(2) 1-liter amber glass with Teflon liner	1 liter	4°C ± 2°C	Samples must be extracted within 7 days and analyzed within 40 days of extraction
Residual Chlorine Present	(2) 1-liter amber glass with Teflon liner	1 liter	Add 3 ml 10% sodium thiosulfate per gallon 4°C ± 2°C	Samples must be extracted within 7 days and analyzed within 40 days of extraction
Soils/Sediments and Sludges	4-ounce wide-mouth glass jar with Teflon liner	500 g	4°C ± 2°C	Samples must be extracted within 14 days and analyzed within 40 days of extraction
Concentrated Waste Samples	4-ounce glass jar with Teflon liner or core tube with Teflon liner	500 g	None	Samples must be extracted within 14 days and analyzed within 40 days of extraction

The above information applies to the following parameters and methods:

Parameter	Method		
Semivolatile Organics	SW-846B	8270	(GC/MS)
PAHs	SW-846B	8270	(GC/MS)
PCBs	SW-846B	8080	(GC)
Herbicides	SW-846B	8150	(GC)
Explosives	SW-846A	8330	(HPLC)

C. Other Organics

Parameter	Method No.	Matrix	Holding Time (From Date Sampled)	Containers	Preservative	Minimum Sample Size/Container
Dioxins/Furans	SW-846B 8280	Water	30 days extraction 40 days analysis	(2) 1-liter amber glass	4°C ± 2°C	1,000 ml
		Soil/Waste	30 days extraction 40 days analysis	core tube or glass jar	4°C ± 2°C	500 g
Petroleum Hydrocarbons as Gasoline	DOHS LUFT	Water	14 days	(3) 40-ml vials with teflon liner	4°C, HCL or $NaHSO_4$ to pH < 2	40 ml
		Soil/Waste	14 days	core tube or glass jar	4°C ± 2°C	500 g
Petroleum Hydrocarbons as Diesel, Fog Oil and Motor Oil	DOHS LUFT	Water	14 days extraction 40 days analysis	(2) 1-liter glass	4°C ± 2°C	1,000 ml
		Soil/Waste	14 days extraction 40 days analysis	core tube or glass jar	4°C ± 2°C	500 g
Non-Polar Oil and Grease	Std. Methods (5520)	Water	28 days	(2) 1-liter glass	4°C, H_2SO_4 to pH <2	1,000 ml
		Soil/Waste	28 days	core tube or glass jar	4°C ± 2°C	500 g

D. Metals

Parameter	Method No.	Matrix	Holding Time (From Date Sampled to Analysis)	Container	Preservative[a]	Minimum Sample Size/Container
Metals ICP, AA (except mercury and CrVI)	CLP SOW ILMO 3.0	Water	6 months	poly	HNO_3 to pH < 2.0	500 ml
		Soil/Waste	6 months	core tube/glass jar	4°C ± 2°C	500 g
Mercury (CV-AA)	CLP SOW ILMO 3.0	Water	28 days	poly	HNO_3 to pH < 2.0	500 ml
		Soil/Waste	28 days	core tube/glass jar	4°C ± 2°C	
Hexavalent Chromium	SW-846B 7196	Water	24 hours	poly	4°C ± 2°C	500 ml
		Soil/Waste	72 hours extraction[b] 24 hours analysis	core tube/glass jar	4°C ± 2°C	500 g
Organic Lead	DOHS LUFT	Water	28 days	poly		
		Soil/Waste	28 days	core tube/glass jar	4°C ± 2°C	500 g

[a] Listed preservative is for total metals. Dissolved or suspended metals require filtration prior to pH adjustment.

[b] Holding time for Chromium VI on soil matrix has not been established. Samples will be extracted within 72 hours. Once extracted, the water holding time of 24 hours will be adopted.

E. Wet Chemistry

Parameter	Method No.	Matrix	Holding Time (From Date Sampled to Analysis)	Container	Preservative	Minimum Sample Size/Container
Bicarbonate Alkalinity	Std. Methods 2320	Water	14 days	poly	4°C ± 2°C	250 ml
Chloride	MCAWW 300.0	Water	28 days	poly	4°C ± 2°C	250 ml
Nitrate (include Nitrite)	MCAWW 353.2	Water	28 days	glass	4°C ± 2°C, H_2SO_4 to pH < 2	250 ml
Sulfate	MCAWW 300.0	Water	28 days	poly	4°C ± 2°C	250 ml
pH	MCAWW 150.1	Water	ASAP	poly	4°C ± 2°C	250 ml
	SW-846B 9045	Soil	ASAP	poly or glass	4°C ± 2°C	100 g

Guide to Methods

SW-846A - Test Methods for Evaluating Solid Waste Physical/Chemical, Third Edition, Rev. 2, 1992.
SW-846B - Test Methods for Evaluating Solid Waste Physical/Chemical, Third Edition, Rev. 1, 1990.
DOHS LUFT - California Department of Health Services Leaking Underground Fuel Tank Manual, May 1988.
CLP SOW - EPA Contract Laboratory Program Statement of Work for Inorganic Analysis, ILMO 3.0, 1991.
MCAWW - Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1983.
Std. Methods - Standard Methods for the Examination of Water and Wastewater, APHA-AWWA-WPCF, 17th Edition, 1989.2

Table 2. Field Measurement Calibration Procedures and Precision Requirements

Field Measurement	Instrument	Calibration Procedure	Precision
Water Level Survey	Electrical Sounder Pressure Transducer	Reference to Steel Tape Manufacturers Specifications	0.01 foot 0.01 foot
Elevation of Sample Site	Level and rod	Surveyor Calibration	0.01 foot
Location of Sample Site	Steel of Fiberglass Tape	Reference to New Tape	1 foot
Soil Sample Depth	Steel or Fiberglass Tape	Reference to New Tape	Variable, depending on depth and surface irregularities
	Length of Drill Rod	Referenced to Steel Tape	0.5 foot
Water pH	pH Meter	2-Point Buffer Solutions	0.1 pH unit
Soil Slurry pH	pH Meter	2-Point Buffer Solutions	0.1 pH unit
Electrical Conductivity	Conductivity Meter	KCl Reference Solution	8 percent
Water Temperature	Temperature meter and Thermistor	Reference to NBS Mercury Thermometer	0.1°C
Water Flow Rate	1 liter graduated cylinder and water	Reference to Calibrated Containers and Clock	0.10 L
	Flowmeters	Factory Calibrated	1 gallon per minute
Water Bicarbonate Alkalinity	pH Meter and Buret	2-Point Buffer Solutions $NaHCO_3$ Reference Solution	0.1 pH unit
Portable Gas Analyzers	GC/PID or GC/FID	3 Dilutions of Standard Calibration Gas	Variable, depending on specific instrument and matrix
Subsurface Gas	Combustible Gas Indicator	2 Phases of Standard Calibration Gas	1%

Table 3. Example Summary of External (Field) QC Samples per Sampling Event[1]

Type of Sample	Level C		Level D		Level E	
	Metal	Organic	Metal	Organic	Metal	Organic
Trip Blank (for volatiles only)	N/A	1/cooler	N/A	1/cooler	N/A	1/cooler
Equipment Rinsate[2]	1/day	1/day	1/day	1/day	1/day	1/day
Field Blank	1/source/event[3] for all levels and all analytes					
Field Duplicates/Splits[4]	10%	10%	10%	10%	5%	5%

[1]From NEESA 20.2-047B, (Second Revision June-1988), *"Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program"*

[2]Samples are collected daily; however, only samples from every other day are analyzed. Other samples are held and analyzed only if evidence of contamination exists.

[3]Sampling event is defined in Section 3.0 of QEP 6.1.

[4]The duplicate must be taken from the same sample which will become the laboratory matrix/spike duplicate for organics or for the sample used as a duplicate in inorganic analysis.

Table 4. Example Summary of Internal (Laboratory) QC Samples

Analysis	Method Blank	Matrix Duplicate	Matrix Spike/Matrix Spike Duplicate	Blank Spike/Blank Spike Duplicate	Surrogate Spikes
TPH as gasoline	1/20[a]	NA	1/20[b]	1/20[b]	All samples
TPH as diesel, fog oil, motor oil	1/20[a]	NA	1/20[b]	1/20[b]	All samples
BTEX (8020)	1/20[a]	NA	1/20[b]	1/20[b]	All samples
VOCs (8240)	1/20[a]	NA	1/20[b]	1/20[b]	All samples
SVOCs (8270)	1/20[a]	NA	1/20[b]	1/20[b]	All samples
Dioxins (8280)	1/20[a]	NA	1/20[b]	1/20[b]	NA
Explosives (8330)	1/20[a]	NA	1/20[b]	1/20[b]	All samples
Metals	1/20[a]	1/20	1/20[b,c]	1/20[b,c]	NA
PCBs (8080)	1/20[a]	NA	1/20[b]	1/20[b]	All samples
Non-Polar Oil and Grease	1/20[a]	NA	1/20[b]	1/20[b]	NA
PAHs (8270)	1/20[a]	NA	1/20[b]	1/20[b]	All samples
Major Cations/Anions	1/20[a]	NA	1/20[b]	1/20[b]	NA
Organic Lead	1/20[a]	1/20	1/20[b,c]	1/20[b,c]	NA
pH	NA	1/20	NA	NA	NA

[a] = One per 20 or per lot of samples (as defined by laboratory), whichever is more frequent.
[b] = General frequency of one per 20 samples, or as specified by the method.
[c] = Matrix spike or blank spike duplicate not required.

Table 5. Example Quality Assurance Goals-Precision

Parameter	Water			Soil	
	Laboratory Blank Spike Duplicate[1]	Matrix Spike Duplicate[2]	Field Duplicate[3]	Laboratory Blank Spike Duplicate[1]	Matrix Spike Duplicate[2]
Aromatic Volatile Organics					
Benzene	12	25	30	12	25
Toluene	18	25	30	12	25
Ethylbenzene	18	25	30	13	25
Xylenes (total)	14	25	30	12	25
PCBs					
Aroclor 1254	36	40	50	29	35
Volatile Organics					
1,1-Dichloroethene	16	14	30	18	22
Trichloroethene	12	14	30	17	24
Benzene	12	11	30	21	21
Toluene	12	13	30	17	21
Chlorobenzene	12	13	30	12	21
Semivolatile Organics					
Phenol	29	42	50	25	35
2-Chlorophenol	28	40	50	22	50
1,4-Dichlorobenzene	28	28	50	22	27
n-Nitroso-di-n-propylamine	18	38	50	21	38
1,2,4-Trichlorobenzene	25	28	50	21	23
4-Chloro-3-methylphenol	25	42	50	17	33
Acenapthene	16	31	50	16	19
4-Nitrophenol	50	50	50	50	50
2,4-Dinitrotoluene	15	38	50	16	47
Pentachlorophenol	45	50	50	47	47
Pyrene	24	31	50	23	36

Parameter	Water			Soil	
	Laboratory Blank Spike Duplicate[1]	Matrix Spike Duplicate[2]	Field Duplicate[3]	Laboratory Blank Spike Duplicate[1]	Matrix Spike Duplicate[2]
Polycyclic Aromatic Hydrocarbons					
Naphthalene	30	35	50	30	35
Fluorene	30	35	50	30	35
Pyrene	30	35	50	30	35
Benzo(a)pyrene	30	35	50	30	35
Indeno(1,2,3-cd)pyrene	30	35	50	30	35
Dioxins and Furans					
2,3,7,8-TCDF	50	50	50	50	50
1,2,3,7,8-PeCDF	50	50	50	50	50
2,3,4,7,8-PeCDF	50	50	50	50	50
1,2,3,4,7,8-HxCDF	50	50	50	50	50
1,2,3,4,6,7,8-HpCDF	50	50	50	50	50
OCDF	50	50	50	50	50
2,3,7,8-TCDD	50	50	50	50	50
1,2,3,7,8-PeCDD	50	50	50	50	50
1,2,3,4,7,8-HxCDD	50	50	50	50	50
1,2,3,4,6,7,8-HpCDD	50	50	50	50	50
OCDD	50	50	50	50	50
Total Petroleum Hydrocarbons					
Diesel fuel	29	30	50	30	30
Gasoline	15	30	30	15	30
Fog Oil	30*	NA	50	30*	NA
Motor Oil	NA	NA	50	NA	NA
Non-Polar Oil and Grease	36	40	50	37	40
Metals by ICP					
Barium	NA	20	50	NA	20
Beryllium	NA	20	50	NA	20
Cadmium	NA	20	50	NA	20

Parameter	Water			Soil	
	Laboratory Blank Spike Duplicate[1]	Matrix Spike Duplicate[2]	Field Duplicate[3]	Laboratory Blank Spike Duplicate[1]	Matrix Spike Duplicate[2]
Calcium	NA	20	50	NA	20
Chromium	NA	20	50	NA	20
Cobalt	NA	20	50	NA	20
Copper	NA	20	50	NA	20
Iron	NA	20	50	NA	20
Magnesium	NA	20	50	NA	20
Molybdenum	NA	20	50	NA	20
Nickel	NA	20	50	NA	20
Potassium	NA	20	50	NA	20
Silver	NA	20	50	NA	20
Sodium	NA	20	50	NA	20
Vanadium	NA	20	50	NA	20
Zinc	NA	20	50	NA	20
Metals by Furnace AA					
Antimony	NA	20	50	NA	20
Arsenic	NA	20	50	NA	20
Lead	NA	20	50	NA	20
Selenium	NA	20	50	NA	20
Thallium	NA	20	50	NA	20
Mercury (cold vapor)	NA	20	50	NA	20
Hexavalent Chromium	20	20	50	20	20
Bicarbonate Alkalinity	NA	20	50	NA	20
Anions by Ion Chromatography					
Chloride	NA	20	50	NA	NA
Sulfate	NA	20	50	NA	NA
Nitrate/Nitrite	NA	20	50	NA	NA

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Parameter	Water			Soil	
	Laboratory Blank Spike Duplicate[1]	Matrix Spike Duplicate[2]	Field Duplicate[3]	Laboratory Blank Spike Duplicate[1]	Matrix Spike Duplicate[2]
Organic Lead (LUFT)	NA	20	50	NA	20

* No historical method performance data available.

[1] Quality Assurance goals based on laboratory historical performance or as provided by commercial supplier.

[2] Quality Assurance goals are from EPA's Test Method for Evaluating Solid Waste SW-846, Third Edition, 1986b, or EPA Contract Laboratory Program Statement of Work, 1988. If method goals are not available, goals as based on prior experience and laboratory historical performance. Sample duplicate performed in lieu of matrix spike duplicate for metals analyses.

[3] For high level samples requiring dilution, 100% RPD is acceptable.

Parameter	Water			Soil		
	Laboratory Spike[2] Surrogate	Laboratory Blank Spike[1]	Laboratory Matrix Spike[2]	Laboratory Spike[2] Surrogate	Laboratory Blank Spike[1]	Laboratory Matrix Spike[2]
1,2,4-Trichlorobenzene	NA	39-110	39-98	NA	41-104	38-107
4-Chloro-3-methylphenol	NA	54-116	23-97	NA	26-103	26-103
Acenapthene	NA	49-111	46-118	NA	46-89	31-137
4-Nitrophenol	NA	10-80	10-80	NA	39-114	11-114
2,4-Dinitrotoluene	NA	48-118	24-96	NA	28-89	28-89
Pentachlorophenol	NA	13-153	9-103	NA	43-109	17-109
Pyrene	NA	57-150	26-127	NA	41-130	35-142
Nitrobenzene-d5	36-114	NA	NA	23-120	NA	NA
2-Fluorobiphenyl	43-116	NA	NA	30-115	NA	NA
Terphenyl-d14	33-141	NA	NA	18-137	NA	NA
Phenol-d5	10-94	NA	NA	24-113	NA	NA
2-Fluorophenol	21-100	NA	NA	25-121	NA	NA
2,4,6-Tribromophenol	10-123	NA	NA	19-122	NA	NA
Polynuclear Aromatic Hydrocarbons						
Naphthalene	NA	40-160	40-160	NA	40-160	40-160
Fluorene	NA	40-160	40-160	NA	40-160	40-160
Pyrene	NA	40-160	40-160	NA	40-160	40-160
Benzo(a)pyrene	NA	40-160	40-160	NA	40-160	40-160
Indeno(1,2,3-cd)pyrene	NA	40-160	40-160	NA	40-160	40-160
Nitrobenzene-d5	36-114	NA	NA	23-120	NA	NA
2-Fluorobiphenyl	43-116	NA	NA	30-115	NA	NA
Terphenyl-d14	33-141	NA	NA	18-137	NA	NA
Dioxins and Furans						
2,3,7,8-TCDF	NA	60-140	60-140	NA	60-140	60-140
1,2,3,7,8-PeCDF	NA	60-140	60-140	NA	60-140	60-140
2,3,4,7,8-PeCDF	NA	60-140	60-140	NA	60-140	60-140
1,2,3,4,7,8-HxCDF	NA	60-140	60-140	NA	60-140	60-140
1,2,3,4,6,7,8-HpCDF	NA	60-140	60-140	NA	60-140	60-140
OCDF	NA	60-140	60-140	NA	60-140	60-140
2,3,7,8-TCDD	NA	60-140	60-140	NA	60-140	60-140

Parameter	Water			Soil		
	Laboratory Spike[2] Surrogate	Laboratory Blank Spike[1]	Laboratory Matrix Spike[2]	Laboratory Spike[2] Surrogate	Laboratory Blank Spike[1]	Laboratory Matrix Spike[2]
1,2,3,7,8-PeCDD	NA	60-140	60-140	NA	60-140	60-140
1,2,3,4,7,8-HxCDD	NA	60-140	60-140	NA	60-140	60-140
1,2,3,4,6,7,8-HpCDD	NA	60-140	60-140	NA	60-140	60-140
OCDD	NA	60-140	60-140	NA	60-140	60-140
Total Petroleum Hydrocarbons						
Gasoline	NA	75-125	65-135	NA	75-125	65-135
4-Bromofluorobenzene	70-130	NA	NA	70-130	NA	NA
Fog Oil	NA	65-150*	NA	NA	65-150*	NA
Motor Oil	NA	NA	NA	NA	NA	NA
Diesel Fuel	NA	65-150	65-150	NA	65-150	65-150
Ortho-terphenyl	65-150	NNA	NA	50-150	NA	65-150
Non-Polar Oil and Grease	NA	65-135	65-135	NA	65-135	65-135
Organic Lead (LUFT)	NA	75-125	75-125	NA	75-125	75-125
Metals by ICP						
Barium	NA	75-125	75-125	NA	75-125	75-125
Beryllium	NA	75-125	75-125	NA	75-125	75-125
Calcium	NA	75-125	75-125	NA	75-125	75-125
Cadmium	NA	75-125	75-125	NA	75-125	75-125
Cobalt	NA	75-125	75-125	NA	75-125	75-125
Chromium	NA	75-125	75-125	NA	75-125	75-125
Copper	NA	75-125	75-125	NA	75-125	75-125
Iron	NA	75-125	75-125	NA	75-125	75-125
Magnesium	NA	75-125	75-125	NA	75-125	75-125
Molybdenum	NA	75-125	75-125	NA	75-125	75-125
Nickel	NA	75-125	75-125	NA	75-125	75-125
Potassium	NA	75-125	75-125	NA	75-125	75-125
Silver	NA	75-125	75-125	NA	75-125	75-125
Sodium	NA	75-125	75-125	NA	75-125	75-125

Table 7. Summary of Calibration Procedures

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
8015 (Modified) (GC/FID)	Total Petroleum Hydrocarbons	Multipoint calibration (minimum 5 points) each of gasoline or diesel	Initially and as required	r ≥ 0.995 or % RSD <20%	1) Evaluate system 2) Repeat calibration
		Continuing calibration check standard	Every 10 samples and beginning and end of sequence	+/- 15% from expected value for each standard beginning each 10 sample sequence	1) Evaluate system 2) Reanalyze standard 3) Recalibrate if appropriate
8020 (GC/PID)	Volatile Aromatics	Multipoint calibration (minimum 5 points)	Initially and as required	r > 0.995 or % RSD ≤20%	Recalibrate as necessary
		Continuing calibration check standard	Daily, before sample analyses	+/- 15% from expected value for each standard beginning each 10 sample sequence	1) Evaluate system 2) Reanalyze standard 3) Recalibrate if appropriate
8240 (GC/MS)	Volatile Organics	Check of instrument tuning criteria using BFB	Every 12 hours	Refer to method (SW846)	1) Retune instrument 2) Repeat BFB analysis
		Multipoint calibration (minimum 5 points)	Initially and as required	% RSD for CCCs < 30% Avg. RF > 0.30 (0.25 for $CHBr_3$) for SPCCs	1) Evaluate system 2) Recalibrate as necessary
		Continuing calibration check standard	Every 12 hours	RF > 0.30 (0.25 for bromoform) for SPCCs % Difference < 25% for CCCs	1) Evaluate system 2) Repeat calibration check 3) Recalibrate as appropriate
8270 (GC/MS)	Semivolatile Organics	Check of instrument tuning criteria using DFTPP	Every 12 hours	Refer to method (SW846)	1) Retune instrument 2) Repeat DFTPP analysis
		Multipoint calibration (minimum 5 points)	Initially and as required	% RSD for CCCs <30% Avg. RF > 0.050 for SPCCs	1) Evaluate system 2) Recalibrate if appropriate
		Continuing calibration check standard	Every 12 hours	RF > 0.050 for SPCCs % Difference ≤ 25% for CCCs	1) Evaluate system 2) Repeat calibration check 3) Recalibrate if appropriate
8280 (GC/MS)	Dioxin and Furans	Check of instrument tuning using FC43 in high mass range	As required	Tune for maximum sensitivity of M/Z 414 & M/Z 502 a 4-10% of M/Z 219 (base peak)	Retune instrument

Table 7. Summary of Calibration Procedures (continued)

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
		Multipoint calibration (5 point - CC1-CC5)	Initially and as required	Relative intensity criteria are isomer specific Internal std. and surrogates PCDDs/PCDFs ≤ 15% RSD	1) Evaluate system 2) Recalibrate if appropriate
		Continuing calibration check standard	12 hours	RSD ≤ 30% for RRF	1) Evaluate system 2) Repeat calibration as needed.
8080 (GC/ECD)	PCBs	Multipoint calibration (minimum five points)	Initially and as required	r > 0.995 or % RSD ≤ 20%; or RSE ≤ 20% for quadratic curve	Recalibrate as necessary
		Check standard	Every 10 samples and end of sequence	15% from expected value for each standard beginning each 10 sample sequence	1) Evaluate system 2) Repeat calibration check 3) Recalibrate 4) Rerun affected samples
6010 (ICP)	Metals, Total and Dissolved	Laboratory mixed standard calibration	Daily prior to analyses	Linear Curve	Recalibrate if appropriate
		Calibration blank	After initial calibration	+/- RL	1) Rerun 2) Clean system 3) Rerun samples back to clean blank
		ICP interference check	Run at beginning of daily run, after 8 hours and/or end of run	80-120% of true value for EPA check sample elements	1) Recalibrate if appropriate 2) See inorganic supervisor
		Initial calibration check	After calibration	+/- 10%	Recalibrate if appropriate
		Continuing calibration check	10%	+/- 10%	1) Rerun 2) Recalibrate if appropriate
7421 7060 7740 7470/7471 7041 7841	Org. Lead/Lead Arsenic Selenium Mercury Antimony Thallium	Multipoint calibration (minimum 3 points, 4 for mercury)	Daily prior to analyses	r > 0.995	Recalibrate if appropriate

Table 7. Summary of Calibration Procedures (continued)

Method	Parameter	Calibration	Frequency	Acceptance Criteria	Corrective Action
		Initial calibration check	After calibration	+/- 10% for 7420 +/- 20% for 7470/7471	1) Rerun 2) Recalibrate as appropriate 3) Reanalyze affected samples
		Continuing calibration check standard	10%, plus end of run	Same as initial calibration check	Recalibrate as appropriate
		Calibration blank	After initial calibration	+/- RL	1) Rerun 2) Clean system 3) Rerun samples back to last clean blank
300.0 Ion Chromatography	Chloride	Multipoint calibration (minimum 3 points)	Initially and as required	$r > 0.995$	1) Check calculations 2) Repeat calibration
300.0 Ion Chromatography	Sulfate	Calibration blank	Daily	< RL	1) Rerun 2) Clean system 3) Rerun samples back to last clean blank
353.2	Nitrate plus Nitrite	Continuing calibration check standard	10%	+/- 10%	1) Check calculations 2) Recalibrate
310.1 Alkalinity	pH	Two-point calibration	Prior to analysis	Measured value within +/- 0.1 pH	1) Repeat calibration 2) See instrument manual
5520	Non Polar Oil and Grease	According to manufacturer's specifications	Prior to use	Manufacturer's specifications	Recalibrate

ATTACHMENT 2

Local Sanitary Landfill Parameter List Limits

PARAMETER LIST LIMITS FO USTRIAL WASTE DISPOSAL
ELK RIVER LANDFILL (SW 74)
A COMBINED LIST OF GROUNDWATER AND LEACHATE MONITORING REQUIREMENTS
AT ERL "VERSION E"

NO		PARAMETER	CONVERT TO mg/l	UNITS	ERL ACTION LIMIT	COMBINED HAZWASTE LIMIT a	RAL b	MCL c	MCLG d	TYPICAL DETECTION LIMIT f	PRIORITY g	SAX & LEWIS DESIG	MWCC LEACHATE LIMIT
1	P	(DIMETHYLAMINO)AZOBENZENE	0.3	µg/l	300	N	N	N	N	10	N	0TK400	N
2		ACENAPHTHENE	30	µg/l	30000	N	4000	N	N	10	6	N	-
3		ACENAPHTHYLENE	10	µg/l	10000	N	N	N	N	10	0	AAF500	-
4		ACETONE	7	µg/l	7000	N	700	N	N	25	6	ABC750	-
5		ACETONITRILE (METHYL CYANIDE)	6.7	µg/l	5700	N	N	N	N	100	N	ABE500	N
6		ACETOPHENONE	1.3	µg/l	1300	N	N	N	N	10	N	ABH000	N
7	2	ACETYLAMINOFLUORENE	0.45	µg/l	450	N	N	N	N	20	N	FDA000	N
8		ACROLEIN	0.03805	µg/l	38.85	N	N	N	N	2	3	ADA000	-
9		ACRYLAMIDE	0.0026	µg/l	2.6	N	0.08	N	0e	N	N	ADS250	-
10		ACRYLONITRILE	0.007	µg/l	7	N	0.8	N	N	N	3	ADX500	-
11		ALACILOR	0.06	µg/l	60	N	4	N	0e	N	N	CFX000	-
12		ALDICARB	0.1	µg/l	100	N	9	N	N	N	N	CBM600	-
13		ALDRIN	0.00018	µg/l	0.18	N	0.02	N	N	10	1	AFK250	-
14		ALLYL CHLORIDE (3 CHLOROPROPYLENE)	0.1	µg/l	100	N	1	N	N	5	N	AGB250	N
15	4	AMINOBIPHENYL	0.75	µg/l	750	N	N	N	N	20	N	BGE500	N
16		AMMONIA NITROGEN	2500	µg/l	2500000	N	N	N	N	N	N	N	N
17		ANTHRACENE	15	µg/l	15000	N	2000	N	N	10	5	APG500	-
18		ANTIMONY	0.2	µg/l	200	N	2	6	6	30	5	AQB750	N
19		ARSENIC	3.5	µg/l	3500	6000	0.2	50	N	N	1	ARA750	-
20		ASBESTOS		fibers/l	18000	N	70000000	N	7000000d	N	6	ARM250	N
21		BARIUM	70	µg/l	70000	100000	2000	1000	6000d	N	5	BAH250	-
22		BENZENE	0.2	µg/l	200	500	10	5	0	N	1	BBL250	-
23		BENZIDINE	0.025	µg/l	25	N	0.002	N	N	25	2	BBX000	N
24		BENZO (A) ANTHRACENE	0.01	µg/l	10	N	N	N	N	10	1	BBC250	N
25		BENZO (A) PYRENE	0.25	µg/l	250	N	N	0.2	0	10	1	BCS750	N
26		BENZO (B) FLUORANTHENE	0.01	µg/l	10	N	N	N	N	10	1	BAW250	N
27		BENZO (G, H, I) PERYLENE	0.02	µg/l	20	N	N	N	N	10	6	BCH000	N
28		BENZO (K) FLUORANTHENE	0.02	µg/l	20	N	N	N	N	10	6	BCJ750	N
29		BENZYL ALCOHOL	1.845	µg/l	1845	N	N	N	N	20	7	BDX500	N
30		BERYLLIUM	0.005	µg/l	5	N	N	4	4	5	1	BFO750	N
31	TOTAL	BOD5	100000	µg/l	100000000	N	N	N	N	N	N	N	N
32		BORON	7.6	µg/l	7500	N	600	N	N	100	5	BMD500	N
33		BROMOCHLOROMETHANE	7.5	µg/l	7600	N	N	N	N	0.1	7	BNA500	N
34		BROMODICHLOROMETHANE	1.37	µg/l	1370	N	3	100f	N	N	2	BNO600	-
35		BROMOFORM	1.72	µg/l	1720	N	40	100f	N	N	3	BNL000	-
36		BROMOMETHANE	0.001	µg/l	1	N	0.1	N	N	N	4	BNM500	-
37	4	BROMOPHENYL PHENYL ETHER	0.01	µg/l	10	N	N	N	N	10	N	N	-
38		BUTYL BENZYL PHTHALATE	1	µg/l	1000	N	100	N	N	10	N	BEC500	-
39		CADMIUM	0.7	µg/l	700	1000	4	10	N	N	1	CAD000	2000
40		CALCIUM	2000	µg/l	2000000	N	N	N	N	10	N	CAL250	N
41		CARBOFURAN	0.36	µg/l	360	N	40	N	40e	N	N	FPE000	-
42		CARBON DISULFIDE	7	µg/l	7000	N	700	N	N	N	4	CBV500	-
43		CARBON TETRACHLORIDE	0.03	µg/l	30	600	3	5	0	N	2	CBY000	-
44		CHLORDANE	0.0027	µg/l	2.7	30	0.3	N	0e	N	2	CDR750	-
45		CHLORIDES	1250	µg/l	250000	N	N	N	250000h	N	N	CDU250	N
46	P	CHLORO-M-CRESOL	0.036	µg/l	36	N	N	N	N	20	4	MEK250	N
47	P	CHLOROANILINE	0.465	µg/l	465	N	N	N	N	20	6	CEM8H0	N
48		CHLORODENZENE (MONOCHLOROBENZENE)	1	µg/l	1000	100000	100	N	N	N	3	BDM750	-
49		CHLOROBENZILATE	0.8	µg/l	800	N	N	N	N	10	N	N	N
50		CHLOROETHANE	0.06	µg/l	60	N	N	N	N	10	2	EHH000	-

* Table notes can be found on Page 6

PARAMETER LIST LIMITS ... DUSTRIAL WASTE DISPOSAL
ELK RIVER LANDFILL (SW-74)
A COMBINED LIST OF GROUNDWATER AND LEACHATE MONITORING REQUIREMENTS
AT ERL "VERSION E"

NO		PARAMETER	CONVERT TO mg/l	UNITS	ERL ACTION LIMIT	COMBINED HAZWASTE LIMIT a	BAL b	MCL c	MCLG d	TYPICAL DETECTION LIMIT f	PRIORITY g	BAX & LEWIS DESIG	MWCC LEACHATE LIMIT
61	BIS 2 -	CHLOROETHOXY METHANE	0.06	µg/l	50	N	N	N	N	10	N	N	*
62	BIS 2	CHLOROETHYL ETHER	0.026	µg/l	25	N	0.3	N	N	10	2	BIC750	*
63	2 -	CHLOROETHYLVINYL ETHER	0.38	µg/l	380	N	N	N	N	10	N	CIH750	*
64		CHLOROFORM	0.6	µg/l	600	6000	60	100f	N	N	1	CNJ500	*
65	BIS 2 -	CHLOROISOPROPYL ETHER	0.05	µg/l	50	N	N	N	N	10	N	N	N
66		CHLOROMETHANE	1	µg/l	1000	N	N	N	N	10	3	CNX500	*
67	2 -	CHLORONAPHTHALENE	3.12	µg/l	3120	N	N	N	N	10	N	CJA000	*
68	2 -	CHLOROPHENOL	0.3	µg/l	300	N	30	N	N	10	6	CJK750	*
69	4 -	CHLOROPHENYL PHENYL ETHER	1	µg/l	1000	N	N	N	N	10	6	N	*
70		CHLOROPROPENE	0.9	µg/l	900	N	N	N	N	50	N	N	N
71		CHROMIUM	3.5	µg/l	3500	6000	100	50	100	N	1	CMI750	8000
72		CHRYSENE	0.1	µg/l	100	N	N	N	N	10	1	CNL810	N
73		COBALT	1.25	µg/l	1250	N	2	N	N	10	5	CNA250	N
74	TOTAL	COD	10000	µg/l	10000000	N	N	N	N	5	N	CFM825	N
75		COPPER	1	µg/l	1000	N	1000	N	1000h	N	3	CNI000	6000
76	O -	CRESOL	2	µg/l	2010	200000	N	N	N	N	N	CNX000	*
77	M -	CRESOL	2	µg/l	2000	200000	N	N	N	N	N	CNW750	*
78	P -	CRESOL	2	µg/l	2000	200000	N	N	N	N	N	CNX250	*
79	TOTAL	CRESOL (M, O, M, P NOT TESTED SEPARATELY)	6	µg/l	5000	200000	30	N	N	N	N	CNW500	*
80		CUMENE (ISOPROPYLBENZENE)	2.1	µg/l	2100	N	300	N	N	0.3	N	COE750	*
81	TOTAL	CYANIDE	1	µg/l	1000	N	100	200	200	N	N	COI500	4000
82	4,4 -	DDD	0.17	µg/l	170	N	N	N	N	0.11	2	BIM500	N
83	4,4 -	DDE	1.32	µg/l	1320	N	N	N	N	0.04	2	BIM750	N
84	4,4 -	DDT	0.13	µg/l	130	N	1	N	N	0.12	2	DAD700	N
85		DI N OCTYL PHTHALATE	0.02	µg/l	20	N	N	N	N	10	8	N	*
86		DI N BUTYL PHTHALATE	1.4	µg/l	1300	N	700	N	N	10	N	N	P
87		DIALLATE	0.69	µg/l	690	N	N	N	N	10	N	DBI200	N
88		DIBENZO (A, H) ANTHRACENE	0.3	µg/l	300	N	N	N	N	10	1	DCT400	N
89		DIBENZOFURAN	0.17	µg/l	170	N	N	N	N	10	8	DDB600	N
90		DIBROMOCHLOROMETHANE	0.2	µg/l	200	N	10	100f	N	N	N	CFK500	*
91		DIBROMOCHLOROPROPANE (DBCP)	0.03	µg/l	30	N	0.3	N	0e	N	8	DDX800	N
92	1,2 -	DIBROMOETHANE (ETHYLENE DIBROMIDE (EDB))	0.002	µg/l	2	N	0.004	N	0e	N	N	EIY500	N
93	2,3 -	DICHLORO-1-PROPENE	0.48	µg/l	480	N	N	N	N	0.2	N	DGH400	N
94	1,4 -	DICHLORO-2-BUTENE (TRANS)	0.23	µg/l	230	N	N	N	N	100	N	BRQ000	N
95		DICHLOROACETONITRILE	0.2	µg/l	200	N	N	N	N	0.4	N	DEN000	N
96	1,3 -	DICHLOROBENZENE (META)	6.2	µg/l	6200	N	600	N	N	N	4	DEP899	*
97	1,2 -	DICHLOROBENZENE (ORTH-)	6	µg/l	6000	N	600	N	600e	N	4	DEP600	*
98	1,4 -	DICHLOROBENZENE (PARA-)	1	µg/l	1000	7600	10	75	75	N	1	DEP800	*
99	3,3 -	DICHLOROBENZIDINE	0.05	µg/l	50	N	0.8	N	N	N	2	DEQ600	N
100		DICHLORODIFLUOROMETHANE	9	µg/l	8000	N	1000	N	N	N	4	DFA600	*
101	1,1 -	DICHLOROETHANE	0.8	µg/l	800	N	70	N	N	N	3	DFE809	*
102	1,2 -	DICHLOROETHANE	0.038	µg/l	38	600	4	5	0	N	2	DFF900	*
103	1,1 -	DICHLOROETHYLENE	0.07	µg/l	70	700	6	7	7	N	2	DFI000	*
104	1,2 -	DICHLOROETHYLENE (CIS-)	0.7	µg/l	700	N	70	N	70e	N	6	DFI200	N
105	1,2 -	DICHLOROETHYLENE (TRANS-)	1	µg/l	1000	N	100	N	100e	N	7	ACY000	*
106		DICHLOROFLUOROMETHANE	1	µg/l	1000	N	N	N	N	0.3	N	DFL000	N
107		DICHLOROMETHANE (METHYLENE CHLORIDE)	0.40	µg/l	400	N	50	5	0	6	1	MDR000	*
108	2,4 -	DICHLOROPHENOL	0.2	µg/l	200	N	20	N	N	10	4	DFX800	*
109	2,6-	DICHLOROPHENOL	4.41	µg/l	4410	N	N	N	N	10	N	DFY000	N
110	2,4 -	DICHLOROPHENOXYACETIC ACID (2,4-D)	0.7	µg/l	700	10000	70	100	N	N	7	N	*

* Table notes can be found on Page 6

PARAMETER LIST LIMITS FOR INDUSTRIAL WASTE DISPOSAL

EEK RIVER LANDFILL (SW 74)

A COMBINED LIST OF GROUNDWATER AND LEACHATE MONITORING REQUIREMENTS

AT EEL "VERSION E"

NO		PARAMETER	CONVERT TO mg/l	UNITS	EEL ACTION LIMIT	COMBINED HAZWASTE LIMIT a	RAL b	MCL c	MCLG d	TYPICAL DETECTION LIMIT f	PRIORITY g	SAX & LEWIS DESIG	MWCC LEACHATE LIMIT
101	1,2	DICHLOROPROPANE	0.0501	µg/l	50.4	N	5	N	0e	N	2	DGF600	*
102	1,3 -	DICHLOROPROPANE	1	µg/l	1000	N	N	N	N	0.2	N	DGF800	N
103	2,2 -	DICHLOROPROPANE	3.28	µg/l	3290	N	N	N	N	0.5	N	DGI900	N
104	1,1 -	DICHLOROPROPENE	1	µg/l	1000	N	N	N	N	0.2	N	N	N
105	1,3 -	DICHLOROPROPENE (CIS-)	0.2	µg/l	200	N	2	N	N	N	8	DGH200	N
106	1,3 -	DICHLOROPROPENE (TRANS)	0.2	µg/l	200	N	2	N	N	6	5	DGH000	*
107		DIELDRIN	0.01	µg/l	10	N	0.02	N	N	N	1	DIB400	N
108		DIETHYLPHTHALATE	12.9	µg/l	12900	N	6000	N	N	10	4	DJX000	*
109		DIMETHOATE	0.23	µg/l	230	N	N	N	N	20	N	DSP400	N
110	7,12-	DIMETHYLBENZ(A)ANTHRACENE	0.49	µg/l	490	N	N	N	N	10	N	DOJ200	N
111	3,3-	DIMETHYLBENZIDINE	0.61	µg/l	610	N	N	N	N	10	N	TGJ760	N
112	2,4 -	DIMETHYLPHENOL	4.8	µg/l	4800	N	600	N	N	10	4	XKJ500	*
113		DIMETHYPHTHALATE	14	µg/l	14000	N	7000	N	N	10	4	N	*
114	4,6 -	DINITRO-O-CRESOL	0.15	µg/l	150	N	N	N	N	10	4	DUT400	N
115	M	DINITROBENZENE	0.12	µg/l	120	N	N	N	N	20	N	DUQ200	N
116	2,4 -	DINITROPHENOL	0.14	µg/l	140	N	10	N	N	N	4	DUZ000	*
117	2,4 -	DINITROTOLUENE	0.04	µg/l	40	130	1	N	N	N	2	DVH000	*
118	2,6 -	DINITROTOLUENE	0.15	µg/l	150	N	N	N	N	10	3	DVH400	*
119		DINOSEB	0.1	µg/l	100	N	10	7	7	58	N	DRE500	N
120		DIPHENYLAMINE	0.5	µg/l	500	N	N	N	N	10	N	DVX800	N
121	1,2 -	DIPHENYLHYDRAZINE	0.005	µg/l	5	N	0.5	N	N	N	3	DIG000	*
122	TOTAL	DISSOLVED SOLIDS	5000	µg/l	5000000	N	N	N	500000h	N	N	N	N
123		DISULFOTON	0.038	µg/l	38	N	0.3	N	N	10	6	EKF000	N
124	ALPHA -	ENDOSULFAN	0.074	µg/l	74	N	N	N	N	0.14	5	N	N
125	BETA -	ENDOSULFAN	0.074	µg/l	74	N	N	N	N	0.04	5	N	N
126		ENDOSULFAN SULFATE	0.01	µg/l	10	N	N	N	N	0.66	6	N	N
127		ENDRIN	0.016	µg/l	16	20	2	2	2	N	3	EAT500	*
128		ENDRIN ALDEHYDE	0.00023	µg/l	0.23	N	N	N	N	0.23	3	N	N
129		EPICHLOROHYDRIN	0.35	µg/l	350	N	30	N	N	N	N	CON750	*
130		ETHYL BENZENE	6.8	µg/l	6800	N	700	N	700e	N	N	EGP500	*
131		ETHYL ETHER	1.828	µg/l	1828	N	1000	N	N	1.3	N	EJJ000	*
132		ETHYL METHACRYLATE	22	µg/l	22000	N	N	N	N	5	N	EMF000	N
133		ETHYL METHANESULFONATE	0.76	µg/l	760	N	N	N	N	20	N	EMF500	N
134	BIS-2 -	ETHYLHEXYL PHTHALATE	0.4	µg/l	400	N	40	6	0	N	1	BJS000	*
135		FAMPHUR	0.0625	µg/l	62.6	N	N	N	N	20	N	FHQ759	N
136		FLASHPOINT		of (oC)	> 140(60)	< = 140(60)	N	N	N	N	N	N/A	N
137		FLUORANTHENE	3	µg/l	3000	N	300	N	N	10	4	FDF000	*
138		FLUORENE	3	µg/l	3000	N	300	N	N	10	6	N	*
139		FLUORIDE	15	µg/l	15000	N	N	4000	4000	N	6	FLX875	N
140		HEPTACHLOR	0.0008	µg/l	0.8	8	0.08	N	0e	N	1	HAR000	N
141		HEPTACHLOR EPOXIDE	0.0004	µg/l	0.4	N	0.04	N	0e	N	1	EBW500	N
142		HEXACHLOROBENZENE	0.0002	µg/l	2	130	0.2	1	0	N	3	HCC500	*
143		HEXACHLOROBUTADIENE	0.135	µg/l	135	500	1	N	N	N	4	PCF000	*
144	ALPHA -	HEXACHLOROCYCLOHEXANE (BHC)	0.0006	µg/l	0.8	N	0.08	N	N	0.03	2	BBO000	N
145	BETA -	HEXACHLOROCYCLOHEXANE (BHC)	0.002	µg/l	2	N	0.2	N	N	0.08	2	BBR000	N
146	DELTA -	HEXACHLOROCYCLOHEXANE (BHC)	0.0009	µg/l	0.9	N	N	N	N	0.09	2	N	N
147	GAMMA	HEXACHLOROCYCLOHEXANE (BHC, LINDANE)	0.003	µg/l	3	400	0.3	4	0.2e	N	2	N	N
148		HEXACHLOROCYCLOPENTADIENE	0.1696	µg/l	169.6	N	50	50	50	10	6	HCE600	*
149		HEXACHLORODIBENZODIOXIN	0.001	µg/l	1	N	0.0001	N	N	N	N	HAJ500	N
150		HEXACHLOROETHANE	2	µg/l	2000	3000	1	N	N	N	4	HCI000	*

* Table notes can be found on Page 6

PARAMETER LIST LIMITS INDUSTRIAL WASTE DISPOSAL

ELK RIVER LANDFILL (SW 74)

A COMBINED LIST OF GROUNDWATER AND LEACHATE MONITORING REQUIREMENTS

AT ERL "VERSION E"

NO.		PARAMETER	CONVERT TO mg/l	UNITS	ERL ACTION LIMIT	COMBINED HAZWASTE LIMIT a	RAL b	MCL c	MCLG d	TYPICAL DETECTION LIMIT f	PRIORITY g	SAX & LEWIS DESIG	MWCC LEACHATE LIMIT
151		HEXACHLOROPROPENE	0.6	µg/l	600	N	N	N	N	10	N	HCM000	N
152		INDENO (1, 2, 3 - C, D) PYRENE	0.1	µg/l	100	N	N	N	N	10	3	IBZ000	N
153		INDENO(1,2,3-cd)PYRENE	0.0065	µg/l	6.5	N	N	N	N	10	N	IBZ000	N
154		IRON	260	µg/l	260000	N	N	N	0.3h	N	N	IOK000	N
155		ISOBUTANOL	3.69	µg/l	3690	N	N	N	N	N	N	IIL000	*
156		ISODRIN	0.0105	µg/l	10.5	N	N	N	N	20	N	INO000	N
157		ISOPHORONE	3.495	µg/l	3495	N	100	N	N	10	2	IIO000	*
158		ISOSAFROLE	2.01	µg/l	2010	N	N	N	N	10	N	IIZ000	N
159		KEPONE	0.1425	µg/l	142.5	N	N	N	N	20	N	KEA000	N
160		LEAD	3.5	µg/l	3500	5000	20	50	N	N	1	LCF000	1000
161		MAGNESIUM	330	µg/l	330000	N	N	N	N	0	N	MAC750	N
162		MANGANESE	300	µg/l	300000	N	600	N	50h	N	5	MAP750	N
163		MERCURY	0.075	µg/l	75	200	2	2	N	N	2	MCW250	100
164		METHACRYLONITRILE	0.1	µg/l	100	N	N	N	N	5	N	N	N
165		METHAPYRILENE	0.08	µg/l	80	N	N	N	N	100	N	DPJ200	N
166		METHOXYCHLOR	3.4	µg/l	3400	10000	30	100	N	N	7	DO0400	*
167		METHYL BROMIDE	0.1	µg/l	100	N	0.003	N	N	N	4	BNM500	N
168		METHYL BUTYL KETONE (2-HEXANONE)	3.885	µg/l	3885	N	N	N	N	50	6	HEV000	N
169		METHYL CHLORIDE	0.2	µg/l	200	N	N	N	N	10	3	CHX500	N
170		METHYL ETHYL KETONE (2-butanone)	3	µg/l	3000	200000	300	N	N	N	N	BOV250	*
171		METHYL IODIDE	0.225	µg/l	225	N	N	N	N	40	N	IEQ000	N
172		METHYL ISOBUTYL KETONE	3.6	µg/l	3500	N	300	N	N	N	N	HFG500	*
173		METHYL METHACRYLATE	11.808	µg/l	11808	N	N	N	N	2	8	MUU750	N
174		METHYL METHANESULFONATE	0.3376	µg/l	337.5	N	N	N	N	10	N	MUH600	N
175		METHYL PARATHION	0.019	µg/l	19	N	2	N	N	10	N	MNH000	N
176	3-	METHYLCHOLANTHRENE	0.1	µg/l	100	N	N	N	N	10	N	MUJ750	N
177		METHYLENE BROMIDE (DIBROMOMETHANE)	0.5	µg/l	500	N	N	N	N	15	N	DUP800	N
178		METHYLENE CHLORIDE	0.6	µg/l	600	N	50	N	N	N	1	MDR000	*
179	2-	METHYLNAPHTHALENE	2.445	µg/l	2445	N	N	N	N	10	6	MMC000	N
180	1,4-	NAPHTHOQUINONE	0.285	µg/l	285	N	N	N	N	10	N	NBA500	N
181	1-	NAPHTHYLAMINE	1.1685	µg/l	1168.5	N	N	N	N	10	N	NBE000	N
182	2-	NAPHTHYLAMINE	1.0605	µg/l	1060.5	N	N	N	N	10	N	NBE500	N
183		NAPTHALENE	1	µg/l	1000	N	30	N	N	10	3	NAJ500	*
184		NICKEL	1	µg/l	1000	N	140	100	100	N	N	NCW500	6000
185		NITRATE NITROGEN	100	µg/l	100000	N	10000	10000	N	N	6	N	N
186		NITRITE NITROGEN	10	µg/l	10000	N	1000	N	1000e	N	6	N	N
187	5-	NITRO-O-TOLUIDINE	0.2	µg/l	200	N	N	N	N	10	N	N	N
188	O-	NITROANILINE	2.4	µg/l	2400	N	N	N	N	50	7	NEO000	N
189	M-	NITROANILINE	0.8025	µg/l	802.5	N	N	N	N	50	8	NEN500	N
190	P-	NITROANILINE	1.125	µg/l	1125	N	N	N	N	20	N	NEO500	N
191		NITROBENZENE	0.4	µg/l	400	2000	3	N	N	10	3	NEX000	*
192	2-	NITROPHENOL	0.61	µg/l	510	N	N	N	N	10	7	NIL500	*
193	4-	NITROPHENOL	0.25	µg/l	250	N	N	N	N	50	6	NIF000	*
194	N-	NITROSODI-N-BUTYLAMINE	1.8	µg/l	1800	N	0.06	N	N	10	N	BRY500	N
195	N-	NITROSODI-N-PROPYLAMINE	0.72	µg/l	720	N	N	N	N	10	2	DWU600	*
196	N-	NITROSODIETHYLAMINE	0.08	µg/l	80	N	0.002	N	N	20	N	DSY400	N
197	N-	NITROSODIMETHYLAMINE	0.0007	µg/l	0.7	N	0.007	N	N	N	2	DSY300	*
198	N-	NITROSODIPHENYLAMINE	0.7	µg/l	700	N	70	N	N	N	1	DVA000	*
199	N-	NITROSODIPROPYLAMINE	0.72	µg/l	720	N	N	N	N	10	N	DWU600	N
200	N-	NITROSOMETHYLETHALAMINE	0.135	µg/l	135	N	N	N	N	10	N	MKB000	N

* Table notes can be found on Page 6

PARAMETER LIST LIMITS ... DUSTRIAL WASTE DISPOSAL
ELK RIVER ...FILL (SW-74)
A COMBINED LIST OF GROUNDWATER AND LEACHATE MONITORING REQUIREMENTS
AT ERL. "VERSION E"

NO.		PARAMETER	CONVERT TO mg/l	UNITS	ERL ACTION LIMIT	COMBINED HAZWASTE LIMIT a	RAL b	MCL c	MCLG d	TYPICAL DETECTION LIMIT f	PRIORITY g	SAX & LEWIS DESIG.	MWCC LEACHATE LIMIT
201	N	NITROSOPIPERIDINE	0.3	µg/l	300	N	N	N	N	20	N	NLJ500	N
202	N	NITROSOPYRROLIDINE	1.36	µg/l	1350	N	N	N	N	40	N	NLP500	N
203	TOTAL	P.A.H.'s (CARCINOGENIC)	200	µg/l	200000	N	0.03	N	N	N	N	N	N
204		PARATHION	0.03	µg/l	30	N	N	N	N	10	8	PAK000	N
205		PCB (TOTAL) * 50000 HAZ WASTE	35	µg/l	35000	N *	0.05	N	0*	N	1	PJL750	*
206		PCB-1016	20	µg/l	20000	N *	N	N	N	N	1	N	N
207		PCB-1221	35	µg/l	35000	N *	N	N	N	N	1	PJM000	N
208		PCB-1232	35	µg/l	35000	N *	N	N	N	N	1	PJM250	N
209		PCB-1242	35	µg/l	35000	N *	N	N	N	N	1	PJM500	N
210		PCB-1248	35	µg/l	35000	N *	N	N	N	N	1	PJM750	N
211		PCB-1254	35	µg/l	35000	N *	N	N	N	N	1	PJN000	N
212		PCB-1260	35	µg/l	35000	N *	N	N	N	N	1	PJN250	N
213		PENTACHLOROBENZENE	0.96	µg/l	960	N	6	N	N	10	8	PAV600	N
214		PENTACHLOROETHANE	0.76	µg/l	250	N	N	N	N	N	N	PAW600	*
215		PENTACHLORONITROBENZENE	2.476	µg/l	2476	N	N	N	N	20	N	PAX000	N
216		PENTACHLOROPHENOL	2.2	µg/l	2200	100000	200	N	200e	N	2	PAX250	*
217		pH		units	<4, >10.6	<2, >12.6	N	6.6-8.6	N	N	N	N/A	5.0-11.0
218		PHENACETIN	1	µg/l	1000	N	N	N	N	20	N	ABQ750	N
219		PHENANTHRENE	1.05	µg/l	1050	N	N	N	N	10	4	PCW250	*
220	TOTAL	PHENOL	2.62	µg/l	2620	N	4000	N	N	N	2	PDN750	*
221	P-	PHENYLENEDIAMINE	0.12	µg/l	120	N	N	N	N	10	N	PEX600	N
222		PHORATE	9.885	µg/l	9885	N	N	N	N	10	N	PGS000	N
223	TOTAL	PHOSPHORUS	250	µg/l	250000	N	N	N	N	100	N	N	N
224		POTASSIUM	6000	µg/l	6000000	N	N	N	N	10	N	PKT250	N
225		PRONAMIDE	8.43	µg/l	8430	N	50	N	N	10	N	DTT600	N
226		PROPIONONITRILE (ETHYL CYANIDE)	0.0585	µg/l	58.5	N	N	N	N	80	N	PMV760	N
227		PYRENE	2	µg/l	2000	N	200	N	N	10	5	PQN250	N
228		PYRIDENE	2.5	µg/l	2500	6000	N	N	N	N	N	PDC250	*
229		SAFROLE	2.925	µg/l	2925	N	N	N	N	10	N	SA0000	N
230		SELENIUM	0.7	µg/l	700	1000	20	10	N	N	2	SB0500	*
231		SILVER	3.6	µg/l	3500	6000	20	50	N	N	3	SD8500	*
232		SODIUM	9000	µg/l	9000000	N	N	N	N	N	N	SEE500	N
233		STYRENE	2.5	µg/l	2500	N	10	N	0e	0.35	6	SM0000	*
234		SULFATE	3000	µg/l	3000000	N	N	N	250000h	N	N	SWS000	N
235		SULFIDE	0.1	µg/l	100	N	N	N	N	4000	N	HIC500	N
236	TOTAL	SUSPENDED SOLIDS	10000	µg/l	10000000	N	N	N	N	4000	N	N	N
237	1,2,4,5-	TETRACHLOROBENZENE	2.25	µg/l	2250	N	2	N	N	10	N	TBN750	N
238	2,3,7,8-	TETRACHLORODIBENZO-P-DIOXIN (TCDD)	0.00003	µg/l	0.03	N	N	0.00003	0	N	1	TAD00	N
239	1,1,1,2-	TETRACHLOROETHANE	0.15	µg/l	150	N	20	N	N	0.06	N	TBD000	*
240	1,1,2,2-	TETRACHLOROETHANE	0.02	µg/l	20	N	2	N	N	0.1	2	ACK500	*
241		TETRACHLOROETHYLENE	0.07	µg/l	70	700	7	N	0e	0.6	1	TBQ250	*
242	2,3,4,6-	TETRACHLOROPHENOL	0.7	µg/l	700	N	200	N	N	10	N	TBT000	N
243		TETRAHYDROFURAN	1.54	µg/l	1540	N	100	N	N	5.2	8	TCH750	*
244		THALLIUM	0.006	µg/l	6	N	0.6	2	0.5	10	4	TE1000	N
245		THIONAZIN	5.25	µg/l	5250	N	N	N	N	20	N	EPC500	N
246		TIN	400	µg/l	400000	N	4000	N	N	40	5	TQB250	N
247		TOLUENE	10	µg/l	10000	N	1000	N	2000e	0.3	1	TGK750	*
248	O-	TOLUIDINE	1.005	µg/l	1005	N	N	N	N	10	N	TQQ750	N
249		TOXAPHENE	0.0826	µg/l	82.6	500	0.3	5	0e	2	3	THH750	*
250	2,4,5	TP (SILVEX)	0.6	µg/l	600	1000	80	10	50e	2	2	TIX500	N

* Table notes can be found on Page 8

A COMBINED LIST OF GROUNDWATER AND LEACHATE MONITORING REQUIREMENTS
AT ERL "VERSION E"

NO.		PARAMETER	CONVERT TO mg/l	UNITS	ERL ACTION LIMIT	COMBINED HAZWASTE LIMIT a	RAL b	MCL c	MCLG d	TYPICAL DETECTION LIMIT i	PRIORITY g	SAX & LEWIS DESIG.	MWCC LEACHATE LIMIT
251	1,2,4 -	TRICHLOROBENZENE	1.134	µg/l	1134	N	N	70	70	0.36	4	TIK250	*
252	1,1,1 -	TRICHLOROETHANE	6	µg/l	6000	N	600	200	200	0.36	3	TIM750	*
253	1,1,2 -	TRICHLOROETHANE	0.3	µg/l	300	N	3	5	3	0.36	1	TIN000	*
254		TRICHLOROETHYLENE (TCE)	0.25	µg/l	250	500	30	5	0	0.33	1	TIO750	*
255		TRICHLOROFLUOROMETHANE	20	µg/l	20000	N	2000	N	N	0.3	N	TIP500	*
256	2,4,6 -	TRICHLOROPHENOL	1.8	µg/l	1800	400000	N	N	N	10	N	TIV750	N
257	2,4,6 -	TRICHLOROPHENOL	0.3	µg/l	300	2000	30	N	N	10	N	TIW000	*
258	2,4,5 -	TRICHLOROPHENOXYACETIC ACID (2,4,5-T)	0.45	µg/l	450	N	70	N	N	2	7	TIW500	N
259	1,2,3 -	TRICHLOROPROPANE	0.4	µg/l	400	N	40	N	N	5	6	AGU000	*
260	1,1,2 -	TRICHLOROTRIFLUOROETHANE	2000	µg/l	2000000	N	200000	N	N	1.5	N	FQ0000	N
261	0,0,0 -	TRIETHYL PHOSPHOROTHIOATE	0.89	µg/l	890	N	N	N	N	10	N	TJU000	N
262	1,3,5	TRINITROBENZENE	0.675	µg/l	675	N	0.3	N	N	10	8	TME500	N
263		VANADIUM	0.51	µg/l	510	N	40	N	N	80	6	VCP000	N
264		VINYL ACETATE	4.38	µg/l	4380	N	N	N	N	50	5	AAX000	N
265		VINYL CHLORIDE	0.02	µg/l	20	700	0.1	2	0	0.4	1	VNP000	*
266	M,P & O -	XYLENE	15	µg/l	15000	N	10000	N	10000e	5	3	XGS000	*
267		ZINC	1400	µg/l	1400000	N	1400000	N	5000h	20	2	ZBJ000	8000

Notes:
N - Does not apply or is not listed.
* - Limit is 3000 ug/l for any one compound or 10000 ug/l for total of all compounds with *, per MWCC permit, 1993.
Sax & Lewis, Dangerous Properties of Industrial Materials, Seventh Edition, 1989.

a. Combined list of TCLP and other hazwaste limits.
b. Recommended Allowable Limits for drinking water, MDH Rel. 3, as modified per MPCA.
c. Maximum Contaminant Levels, per 40 CFR 141 & 141, mod. July, 1992.
d. Maximum Contaminant Level Goals per 40 CFR 141.
e. Proposed limits per Federal Register, May 22, 1989
f. Total for all trihalomethanes (nos. 30, 31, 48, and 70).
g. Priority List of Hazardous Substances, Federal Register, Apr. 17, 1987.
h. For aesthetic quality per 40 CFR 143.
i. Typical detection limits for common methods. PQL values per Subtitle D Appendix II (40 CFR Part 258) used where applicable.

* Table notes can be found on Page 8

ATTACHMENT 3

Sample Packaging and Shipping Procedures

ATTACHMENT 3

PACKAGING AND SHIPPING PROCEDURES FOR ENVIRONMENTAL SAMPLES

Sample packaging and shipping procedures are dependent upon sample composition and quantity and must be conducted in accordance with DOT regulations (49 CFR, Parts 171 through 177) for hazardous materials. The DOT also has established regulations that are consistent with the International Air Transport Association (IATA) Dangerous Goods Regulations. Air carriers will carry only nonbulk packages that comply with the packaging and shipping requirements specified by IATA. The following packaging and shipping procedures are in compliance with the specifications set forth by IATA for dangerous goods.

NONHAZARDOUS ENVIRONMENTAL SAMPLES

Nonhazardous environmental samples pose a low potential health hazard (if any) and are generally associated with drinking water samples that are cooled to 4 degrees centigrade to preserve integrity; low concentration soil samples that generally do not require cooling but may include other sample preservation methods outlined in the site sampling plan or laboratory protocol; or air samples collected on filters or absorption media. Packaging and shipping procedures for nonhazardous environmental samples are as follows:

1. Attach a completed sample label or tag to the sample container (bottle, bag sorbent tube, etc.) to readily identify the sample and to provide a project sample record. Use custody seals in accordance with MK QEP 6.1.

2. Tape all container openings, except those for organic compound analysis, with adhesive tape such as electrical, evidence, or safety to prevent accidental leakage. Vials, bottles, or sorbent tubes collected for organic analysis must be first taped with teflon tape to prevent accidental cross contamination and leakage and then taped with other adhesive tape, if necessary, to prevent leakage.

3. Place sample container in a plastic resealable bag, remove the air, and tape the bag opening.

4. Prepare the outer shipping package and ensure it is waterproof and leak proof. Picnic-type coolers are acceptable as outer packages only for nonhazardous environmental samples if the drain plug's inner and outer openings are taped and physically covered to prevent accidental leakage. The outer package is initially prepared for shipping by lining the container with a waterproof inner liner such as a plastic garbage bag. A container insulation barrier is then formed by placing approximately 1 inch of packing material such as asbestos-free vermiculite, perlite, or styrofoam beads in the bottom of the inner liner.

5. Place all plastic bagged sample containers inside the lined shipping container and use cardboard dividers if sample container separation is desired.

6. Place and pack ice (preferably blue ice) in the cooler and around plastic bagged sample containers. Fold, twist, tie, and tape inner liner opening to minimize leakage.

7. Complete and "top-off" the lined shipping container with packing material. Sufficient packing material should be used to prevent sample containers from making contact during shipment.

8. Place completed documents (including chain of custody (COC), analytical services agreement, or order form) in a resealable waterproof bag such as resealable plastic sandwich or food freezing bags and seal the bag. Note the last block on the COC form should indicate the carrier and shipping document number, such as bill of lading or air bill number.

9. Place the sealed waterproof bag with contents on top of the closed liner or affix it to the inside of the shipping container cover.

10. Close and seal the shipping container with high-strength filament packaging tape.

11. Place at least two signed custody seals on the container cover joints, one on the front and one on the back.

12. Submit the sealed shipping container along with a completed shipping document to a reputable transport carrier such as Federal Express, Airborne, or United Parcel Post for shipping. Retain copies of all documents/transmittals for project records.

HAZARDOUS ENVIRONMENTAL SAMPLES

Hazardous environmental samples are medium- and high-concentration samples that are capable of posing an unreasonable level of risk to health, safety, or environment.

However, sample handling or transport of certain medium-concentration environmental samples, such as highly alkaline drinking water or soil samples, may not pose a health, safety, or environmental risk. Therefore, certain medium-concentration samples may be packaged and shipped as nonhazardous environmental samples if the project manager determines that the sample is not a hazardous material or dangerous good. Packaging and shipping requirements and procedures are more intensive for hazardous environmental samples than for nonhazardous environmental samples. Minor differences of packaging and shipping requirements exist among states and EPA regions and should

be verified through local MK field offices or EPA regional offices. Samples considered hazardous wastes must be shipped as hazardous environmental samples.

The packaging and shipping of hazardous environmental samples must follow a six-step process:

1. Determine the correct technical name or material composition.

2. Select the mode of material transportation and evaluate applicable state or operator variances.

3. Select the proper packaging materials according to its Packing Group specified in DOT's Hazardous Materials Table or IATA's Dangerous Goods Regulations.

4. Identify the appropriate package markings that include shippers and consignee name and address, proper shipping name, UN number, and package specifications or designate Limited Quantity packaging.

5. Identify the applicable package hazard and handling labels that may include the primary hazard, the subsidiary risk, package orientation, and Cargo Aircraft Only labels.

6. Complete the appropriate shipping documentation including a shipping manifest, declaration of dangerous goods for air carrier shipments, and hazardous waste manifest, if applicable. (Refer to Attachment A for examples.) Solicit and use forms provided by the carrier when readily available.

A 24-hour emergency response telephone number must be provided on the shipping documents for use in the event of an emergency involving a hazardous material. At all times while the hazardous material is in transit, the telephone number must be monitored by a person who has knowledge or has immediate access to knowledge of the hazardous material being shipped and has knowledge or access to knowledge of comprehensive emergency response and incident mitigation information for that material. An MK contract has been established with the Chemical Transportation Emergency Center (CHEMTREC) for 24-hour emergency response support. **CHEMTREC's 24-hour emergency response number is 1-800-424-9300.** However, MSDSs or WSDSs must be submitted to CHEMTREC Center, 2501 M Street, N.W., Washington, D.C. 20037, 30 days before referencing CHEMTREC's 24-hour emergency number. CHEMTREC nonemergency services hotline is 1-800-262-8200.

Packaging and shipping requirements for hazardous environmental samples are as follows:

1. Attach a completed sample label or tag to the sample container (bottle, bag, sorbent tube, etc.). Use custody seals in accordance with MK QEP 6.1.

2. Tape all container openings, except those for volatile/semivolatile organics, PCBs, and dioxins analysis, with adhesive tape such as electrical, evidence, or safety to prevent accidental leakage. Vials or other containers collected for volatile/semivolatile organics analysis must be first taped with teflon tape to prevent accidental cross contamination and leakage and then taped with other adhesive tape, if necessary, to prevent leakage.

3. Place sample container in a plastic resealable bag, remove as much of the air as possible, and tape the opening.

4. Place the bagged sample in an inner package that is compatible with the sample and pack in shock-absorbent material such as vermiculite. The CLP program recommends metal paint cans, but other metal, plastic, cardboard, or glass inner packages may be used if suitably cushioned by the outer container. All lid or cover joints must be sealed with filament or evidence tape.

5. All inner packages must be labeled and contain the proper shipping name with United Nations (UN) number, sample identification number or character, and an arrow indicating which end of the inner package is up.

6. If sample cooling is required, the inner package must be moisture proof and placed in either:

   • An IATA-unapproved cooler with IATA-approved outer package or,
   • an IATA-approved cooler that will also serve as an outer package.

7. All coolers must be lined with a waterproof inner liner such as a plastic bag. An insulation barrier is formed by placing approximately 1 inch of packing material such as asbestos-free vermiculite, perlite, or styrofoam beads in the base of the lined cooler.

8. Place the inner package in the lined cooler with insulation barrier and pack in ice (preferably blue ice). Fold, twist, tie and tape cooler inner liner opening to minimize leakage. Fill all remaining voids with packing material to prevent inner package movement during shipping. If cooler is not the outer package, use same labeling as directed for inner packages.

9. Use only IATA-approved and performance-tested outer packages having the United Nations packaging symbol stamped on the exterior by the manufacturer for shipment.

   Typical picnic coolers are not IATA-certified and must not be used as outer package for hazardous environmental samples.

Outer-package UN specifications are described in Attachment D, and potential outer package suppliers that satisfy UN specifications are listed in Attachment E.

10. Place 1-inch depth vermiculite in the base of the outer package before placement of the inner package. All documents to be transmitted to the laboratory, including a completed COC, are to be placed in a resealable plastic bag and either taped to the inside of the outer package lid or laid on the inner package. Fill all outer package voids with additional shock absorbent material and then seal the package with high-strength filament shipping tape. Place at least two custody seals on the package lid joints (one on the front and one on the back). Additional custody seals may be necessary if package tampering is a concern.

11. The outer package must contain the following markings:

    - Proper shipping name with UN number.
    - Shipper's or cosignee's name, and address.
    - Wording to indicate upright position of outer package if shipment contains liquid hazardous material.
    - Appropriate hazard class labels (placed below the proper shipping name).
    - Designate shipment for "Cargo Aircraft Only" if maximum environmental sample weights exceed maximum quantities per package for passenger aircraft. Maximum acceptable shipment quantities for general hazard classes are reported in Table 1 and for more specific hazardous materials or wastes see IATA Dangerous Goods Regulations, Section 4.

12. Accurately complete and certify all appropriate shipping documents describing:

    - Shipper and consignee name and address,
    - proper shipping name,
    - UN number,
    - hazard class and subsidiary risk if applicable,
    - packing group,
    - package instructions,
    - package description,
    - 24-hour emergency response telephone number, and
    - attach a copy of material safety data sheet, waste safety data sheet, or DOT Hazardous Material Response Guide.

Shipping document examples are shown in Attachment A. MK personnel are instructed to not sign or certify hazardous waste shipping manifests unless it is specifically designated in the contract.

13. Submit package and completed shipping documents to a reputable transport carrier such as Federal Express, Airborne, or United Parcel Post for shipping. Retain copies of all documents completed for project record.

APPENDIX E
SITE SAFETY AND HEALTH PLAN

PROVIDED UNDER SEPARATE COVER

APPENDIX F
QUALITY CONTROL PLAN

APPENDIX G
SUBCONTRACTING PLAN

1.0 INTRODUCTION

As part of the Record of Decision (ROD) for Ground Water Remediation at the NIROP Plant, a pumping study was conducted to determine the effectiveness of the installed system under the PRAC program conducted by the Corps of Engineers in 1990 and 1991. As a result of that study, it was determined that enhancements to the design were required to better stabilize and remove groundwater contaminants more effectively. The following is a description of the activities required to implement these enhanced features.

2.0 PLAN DESCRIPTION

The Environmental Services Division of Morrison Knudsen Corporation (MK) will establish an office at the NIROP site near the Control House erected during the PRAC Program in 1991. Power and phone lines are located in this area from the previous activities. The NIROP field office will be used to coordinate all field activities for this SOUTHDIV Project. Other services such as water and sanitary services will be temporary. The NIROP Plant will provide security and laydown areas for material, equipment, and supplies.

3.0 PLANS AND SPECIFICATIONS

RMT, Inc. of Madison, Wisconsin has prepared the Design Drawings and Technical Specifications for this Scope of Work. All Subcontract Work will be in accordance with this Design for Groundwater Enhancement as indicated.

All activities will be subcontracted as follows:

- Subcontract No. NIROP-SC-4324-01, "Well Drilling"

  MK will subcontract the drilling of two new production wells (AT-5A and AT-5B) as shown on Drawing Nos. 3 and 4 of 14 in the design package. Work shall include decontamination pits and other necessary features required to monitor, contain, and dispose of contaminated materials as well all well screening, cleaning, and required development prior to final installation of all well equipment. The Drilling Subcontractor will provide all equipment required for well drilling and final installation and performance testing including the purchase of screens and engineered pumping equipment. The Drilling Subcontractor will also provide all monitoring equipment required per the Health and Safety Plan. At the completion of well testing, the Drilling

Subcontractor will clean up the well head areas and install all finish surface features as contained in the design documents, including pipe bollards for well protection.

- Subcontract No. NIROP-SC-4324-02, "Mechanical and Electrical"

  MK will subcontract the trenching and installation of the underground piping required to transport the well discharge to the pretreatment facility for processing and discharge through equipment previously installed under the PRAC program. Work will include purchase of all required materials, horizontal boring and associated casings, and support materials under existing roads and other features as described in the design package. Because this work is required to be performed in the late winter and in potentially contaminated areas, the Subcontractor will be required to remove the frozen soils as necessary, stockpile for soils reuse if possible, or dispose of and import new materials in accordance with the specifications and laws applicable to this contract. This phase of the work will also require the purchase and installation of the new electrical controls required for the well installation design in existing facilities. Work will also include the hookup of the MK office trailer to on-site temporary power. Work will include the installation of conduit and other features in conjunction with pipe trenching activities for power distribution at the well locations. All touchup work required or caused by the subcontractor to existing plant features affected by this scope of work will be required to be completed prior to final payment.

- Subcontract No. NIROP-SC-4324-03, "Analytical Testing"

  MK will subcontract the work required to be performed for all laboratory work to a Navy-approved certified laboratory.

Schedule for the work is included in Section 7.0 of the Work Plan and is required to be completed on or before May 8, 1995.

4.0 FINAL DESIGN DRAWINGS AND SPECIFICATIONS

The Final Design Drawings and Technical Specifications for each subcontract are attached.

Final Design Drawing Index

Sheet No. 1	Title Sheet/Index
Sheet No. 2	Site Plan
Sheet No. 3	Work Location Plan
Sheet No. 4	Groundwater Extraction Line Profile
Sheet No. 5	Piping and Instrumentation Diagram Symbol Sheet

Sheet No. 6	Piping and Instrumentation Diagram
Sheet No. 7	Civil Details
Sheet No. 8	Control House Piping Plan and Details
Sheet No. 9	Well Construction Details and Wellhead Completion Details
Sheet No. 10	Single-Line Diagrams
Sheet No. 11	Well Pump Control Panel and Schematics
Sheet No. 12	Electrical Conduit Routing
Sheet No. 13	Electrical One-Line Diagram and Schematic
Sheet No. 14	Control House Electrical Details and Panel Schedules

Mechanical & Electrical Subcontract Specifications Index

Section 01007	General Requirements
Section 02221	Trenching, Backfilling, and Compacting
Section 02494	Testing Pipelines and Piping
Section 02510	Asphaltic Concrete Paving
Section 02615	PVC Piping, Below-Grade
Section 02931	Seeding
Section 02935	Fertilizing
Section 03516	Concrete Work
Section 11211	Wellhead and Pump Installation
Section 11215	Aboveground Piping
Section 11315	Instrumentation
Section 16010	Basic Electrical Requirements
Section 16011	Tests - Motor and Motor Circuits
Section 16111	Conduit Fittings
Section 16123	Wire and Cable
Section 16130	Boxes
Section 16170	Grounding and Bonding
Section 16190	Supporting Devices
Section 16195	Electrical Identification

Well Drilling Subcontract Specifications Index

Section 01007	General Requirements
Section 02670	Extraction Wells
Section 02931	Seeding
Section 02935	Fertilizing
Section 11200	Groundwater Extraction Pumps
Section 11211	Wellhead and Pump Installation
Section 16011	Tests - Motor and Motor Circuits

Analytical Laboratory Subcontract Specification Index

Section 01010	Statement of Work