IMPLEMENTATION PLAN
FOR
FULL SCALE REMEDIAL ACTION
AT
NAVAL AIR STATION JOINT RESERVE BASE (NASJRB) WILLOW GROVE
HORSHAM TOWNSHIP, PENNSYLVANIA

Contract No. N62472-92-D-1296
Contract Task Order No. 0074

Prepared for:

Department of the Navy
Northern Division
Naval Facilities Engineering Command
10 Industrial Highway
Mail Stop No. 82
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March 25, 1997
DRAFT
EA Project No. 296.0074

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Sam Morekas Program Manager	Date
Carl G. Reitenbach, P.E. CTO Manager	Date

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1. PROJECT DESCRIPTION

1.1 INTRODUCTION AND OBJECTIVES

Under the Base Realignment and Closure (BRAC) multi-year Comprehensive Long-Term Environmental Action (CLEAN) Contract (Contract No. N62472-92-D-1296) Northern Division, Naval Facilities Engineering Command, issued Contract Task Order (CTO) No. 0074, to EA Engineering, Science, and Technology (EA), to install and operate a light non-aqueous phase liquid (LNAPL) recovery system for the fuel farm at the Naval Air Station Joint Reserve Base (NASJRB), Willow Grove Pennsylvania. This implementation plan is being prepared as generally specified by the Statement of Architect-Engineer Services dated 27 Feb 1997 (Appendix A).

The general objectives of this CTO are twofold: firstly, the distribution of non-petroleum, oil, and lubricant (POL) contamination at the site will be evaluated through soil and ground-water sampling. The second objective is to design and install a full scale LNAPL recovery system and operate it for a period of one year. The remedial system will consist of ground-water depression and vacuum enhanced LNAPL recovery at three recovery wells. In addition, a decision document will be prepared which justifies selection of this remedial action.

1.2 BACKGROUND

The Navy Fuel Farm is located along the north side of Privet Road and immediately south of the Pennsylvania Air National Guard (PAANG) portion of the Air Reserve Facility (ARF) at NASJRB Willow Grove (Figure 1). The Navy Fuel Farm is approximately 2 acres in area and consists of three aboveground storage tanks, associated aboveground piping, and building Nos. 119 and 81. The Navy Fuel Farm and a portion of the adjoining property to the north, occupied by PAANG (Buildings 345 and 340), constitute the area requiring remedial efforts. A site map with recorded LNAPL thicknesses from the 28 September 1995 gauging event is presented on Figure 2. Abutting the Navy Fuel Farm to the north are ARF Buildings 330, 340, and 345.

The topography of the Navy Fuel Farm area is characterized as flat and gently sloping to the north-northwest. There is a slight downgrade at the north end of the facility which encourages runoff to flow northeast.

1.2.1 Previous Sampling Events

Soil samples were first collected in the vicinity of the fuel farm in March 1989 as part of an investigation to assess potential subsurface hydrocarbon contamination in areas planned for future construction (*Environmental Test Boring Investigation at the Navy Fuel Farm*, EA 1989). At that time a total of 24 soil samples were collected from 18 borings installed around Building 340. The samples were analyzed for benzene, toluene, ethylbenzene, and xylenes

LNAPL during the period. In addition, SVE tests were conducted at several locations at the site during periods of both high and low water table conditions to evaluate the effectiveness of this technology.

Based on the results of the pilot study, the following conclusions were made:

- Based on a comparison of the analytical results from previous investigations to the PADEP action levels, the remedial action objectives at the Navy Fuel Farm should include source reduction through recovery of LNAPL and ground-water remediation.

- Significant amounts of LNAPL remain at the Navy Fuel Farm. Recoverable amounts of LNAPL have been gauged in wells NFFW-1, NFFW-2R, NFFW-7, NFFW-14, NFFW-16, and NFFW-20.

- LNAPL occurrence is directly related to ground-water table elevation. During periods of high ground-water table elevation, LNAPL is present in only a few monitoring wells. During periods of low ground-water table elevation, the occurrence of LNAPL increases, both in areal extent and in thickness of the LNAPL layer observed in the monitoring wells.

- Recovery of the LNAPL is limited by the hydrogeology of the site. In particular, the LNAPL appears to be present in the fractures of the bedrock and becomes isolated from the site wells during periods of high ground-water table elevation. The ground-water table fluctuates seasonally and with rainfall events.

- LNAPL recovery using ground-water table depression without vacuum-enhancement was an effective method of recovery. Automated skimming of LNAPL was not an effective method of recovery.

- Because of the small radius of influence and low vapor recovery rates, SVE is only marginally effective at the Navy Fuel Farm.

- LNAPL recovery using vacuum-enhanced recovery was limited due to both high and low ground-water table elevations resulting in the LNAPL/water interface being either above or below the level of the intake of the recovery pump during portions of the periods that vacuum-enhanced recovery was tested. However, when vapor-phase recovery of LNAPL is accounted for, vacuum-enhanced recovery did increase the amount of petroleum hydrocarbons recovered.

- The recommendation made, based on the pilot study, was to install two additional recovery wells and expand the existing remedial system to conduct vacuum enhanced LNAPL recovery these two new wells and the existing recovery well.

(BTEX). None of the samples collected contained individual BTEX components exceeding the soil action levels as defined by the Commonwealth of Pennsylvania Department of Environmental Protection (PADEP). Also in 1989, as part of additional investigations at the Navy Fuel Farm, 4 soil samples were collected during the installation of 3 monitoring wells and one soil boring. The samples were analyzed for several volatile organic compounds (VOC) and base neutral extractable compounds. Only 1 of the 4 samples collected contained VOC concentrations exceeding the PADEP action level. Methylene chloride and 2-butanone (or methyl ethyl ketone [MEK]) were reported in the soil sample collected from monitoring well NFFW-7. Methylene chloride was present at a concentration of 2,300 μg/kg and the action level is 500 μg/kg. The concentration of 2-butanone was 88 μg/kg and the action level is 50 μg/kg.

Additional soil samples were collected and analyzed for BTEX in April 1991 during the installation of 4 monitoring wells. Only 1 of the 4 samples collected contained concentrations of any analyte exceeding the PADEP action level. The sample collected from monitoring well NFFW-8 contained a total xylene concentration of 290,000 μg/kg compared to the action level of 5,000 μg/kg (*Final Interim Report on Investigations at the Navy Fuel Farm*, EA 1991).

A total of 36 ground-water samples were collected from selected monitoring wells on 5 occasions from June 1989 through June 1993. Of the 23 ground-water samples collected prior to June 1993, 8 samples contained concentrations of benzene in excess of the 5 μg/L PADEP action level with concentrations ranging from 10 to 990 μg/L. These wells were NFFW-1, 2 (two samples), 7 (two samples), 9, 13 and 16. None of the other analytes tested exceeded the guidance criteria. It should be noted that several existing wells were not sampled due to the occurrence of LNAPL.

During the most recent, June 1993, sampling event 5 of the 13 ground-water samples collected contained benzene concentrations in excess of the 5 μg/L PADEP action level with concentrations ranging from 6 to 67 μg/L (*Final Report of Interim Site Investigations, Navy Fuel Farm*, EA 1993). These wells were NFFW-5, 9, 11, 17, and 19. Benzene was the only analyte to exceed the action level. During this event wells NFFW-1, 2R, 6, 7, 12, 13, 14, 16, and 19 were not sampled due to the presence of LNAPL. The LNAPL present at the site has been characterized as JP-4 aviation fuel.

1.2.2 Previous Pilot Studies

A pilot study was conducted by EA from March 1994 to October 1996 to evaluate the effectiveness of LNAPL recovery and soil vapor extraction (SVE) in reducing source hydrocarbons at the Navy Fuel Farm. Initial operation included ground-water depression and LNAPL recovery at well NFFW-2R; vacuum enhancement was added in August 1995. During the pilot study approximately 1,513 gallons of LNAPL and 1,435,392 gallons of ground water were recovered from well NFFW-2R. Both passive and automated LNAPL skimming were also evaluated during the pilot study; these technologies recovered approximately 86 gallons of

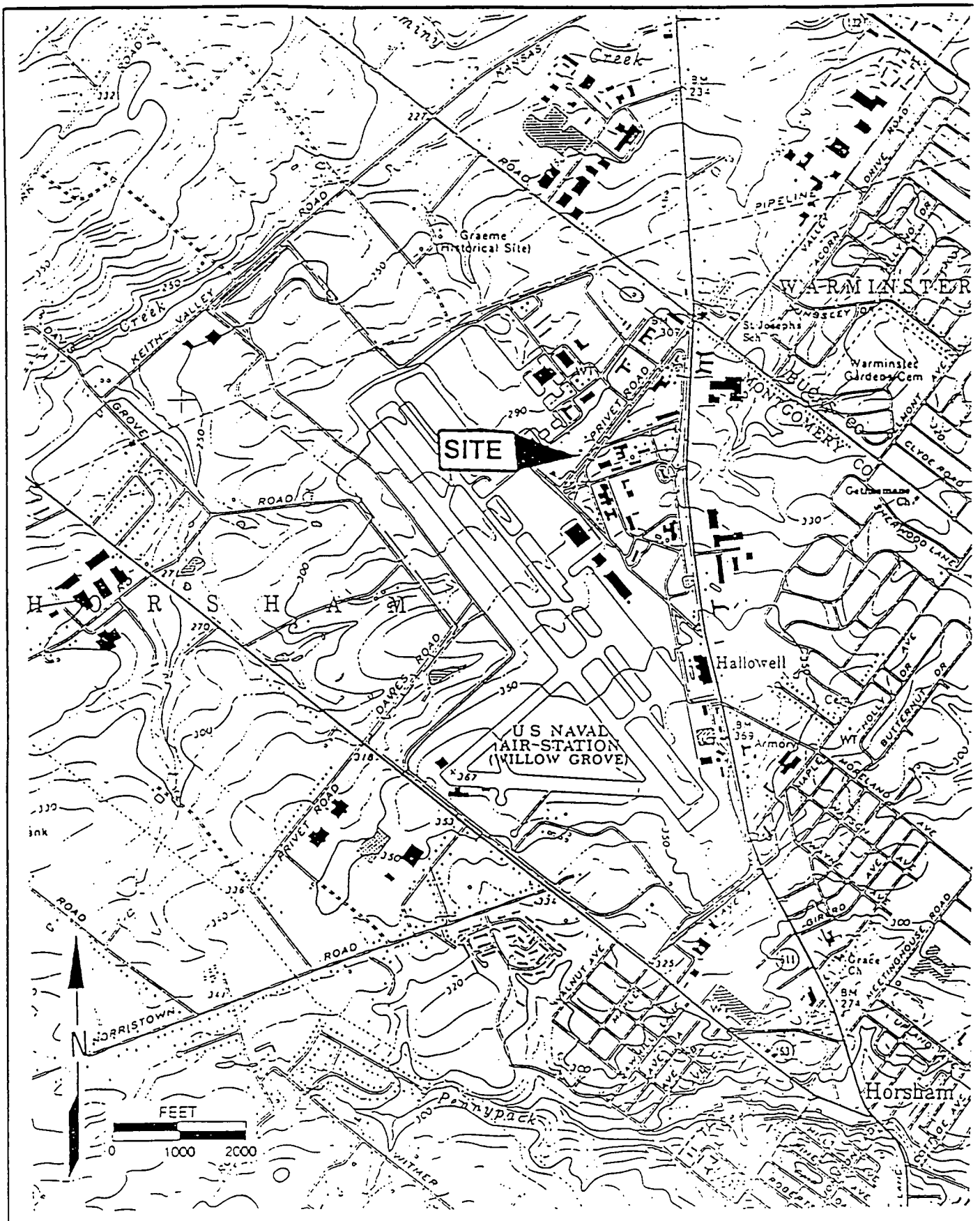
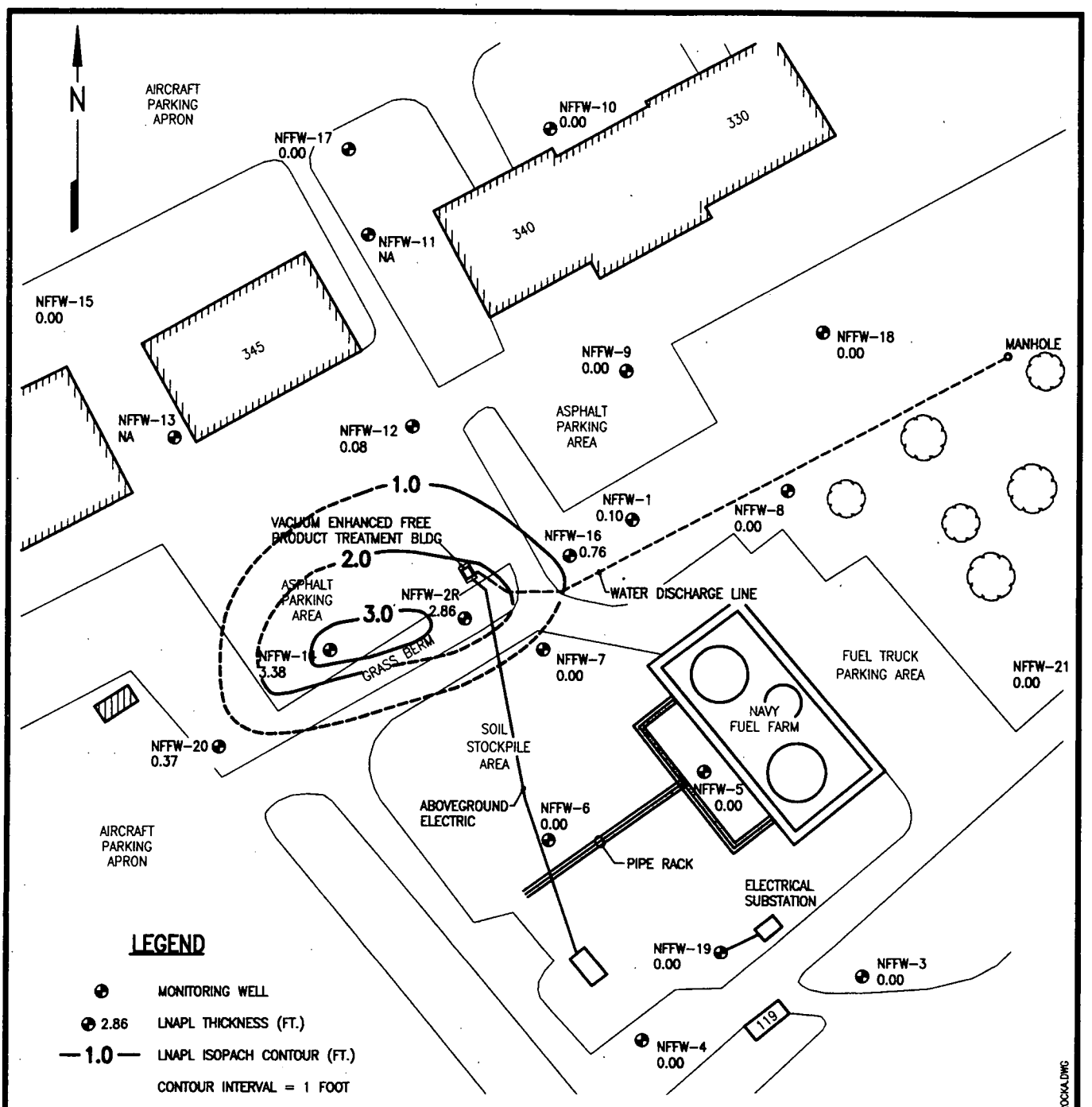


Figure 1. Site location map, Navy Fuel Farm facility, Naval Air Station, Willow Grove Grove, Pennsylvania.



NOTE:

BASE MAP DEVELOPED FROM EA FIELD MEASUREMENTS AND SITE PLAN DEVELOPED BY EA (1993). NO AS-BUILT DRAWINGS OF NEW FUEL FARM FACILITY WERE AVAILABLE FROM NAVY PERSONNEL PRIOR TO DEVELOPMENT OF BASE MAP. BASE MAP IS INTENDED AS A REFERENCE ONLY. ANY DECISIONS MADE BASED ON THE CONTENT OF THIS MAP ARE THE SOLE RESPONSIBILITY OF THE USER.

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

NAVY FUEL FARM FACILITY
NAVAL AIR STATION WILLOW GROVE
HORSHAM TOWNSHIP, PENNSYLVANIA

ISOPACH MAP OF LNAPL MEASURED IN MONITORING WELLS 28 SEPTEMBER 1995

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
CR	TBL	CJV/PMH	BS	1"=150'	3-24-97	29600.09	2

2. PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 KEY PERSONNEL

Figure 2-1 shows the Project Organization for executing this CTO. Following are summaries of pertinent qualifications of the key personnel listed.

CTO Manager—Mr. Carl Reitenbach P.E.

Mr. Reitenbach is an environmental engineer and project manager with more than 12 years of experience in environmental investigations, remediation system design and construction, and system operation at industrial and federal facilities, including 10 years experience in remediation of underground storage tank sites. Mr. Reitenbach has a well-developed experience base of design and operation of remedial systems including LNAPL recovery and ground-water treatment. Mr. Reitenbach's project management experience includes more than three years of managing investigations, treatment system design, installation and operations and maintenance for previous pilot studies conducted for the Department of the Navy at NASJRB Willow Grove.

Project Engineer—Mr. Brian Stempowski

Mr. Stempowski has more than 5 years experience in environmental engineering and remedial design and construction. His experience includes construction oversight, inspection and design, permitting, and operation. This includes management of several large-scale ground-water, LNAPL recovery, and soil vapor extraction (SVE) system design, installation, and prove-out projects throughout the United States. Mr. Stempowski was project engineer for the previous pilot studies conducted by EA at NASJRB Willow Grove for the Department of the Navy.

Senior Technical Reviewer (General Engineering)—Mr. David Santoro, P.E., L.S.

Mr. Santoro is EA's Chief Engineer responsible for Quality Control and Senior Technical Review for civil, environmental, and process-related projects. He has participated as Chief Engineer or Principle-in-Charge for more than 100 Phase I and Phase II Superfund Investigations; four major state-funded Superfund projects; a number of remedial investigations/feasibility studies (RI/FS) for Corps of Engineers/EPA; more than 80 subsurface petroleum assessment projects; more than 30 remedial designs for UST projects; DERA investigations of abandoned NIKE missile sites; remedial designs for the Omaha District; remedial designs for the Navy SPCC Mechanicsburg; design permitting and operations assistance for solid waste management facilities; leachate handling and treatment systems; technical review of design and reports by others; and monitoring activities. Projects which have been completed for federal entities include: U.S. Air Force, U.S. Army Corps of Engineers, U.S. Navy, and the National Institute of Health.

Program Manager — Sam Morekas

Mr. Morekas has over 25 years experience with programs and projects related to Federal and State legislation, regulations, and programs to control hazardous and toxic waste. He has held management positions with U.S. EPA and the State of Maryland. He has managed and directed professional, technical, and administrative personnel, including engineers and scientists engaged in a wide variety of environmental and engineering projects. As Program Manager, he is responsible for managing, directing, and overseeing the Program Management Office (PMO) staff; directing the preparation of cost and performance reports; reviewing status reports of all projects; and recommending corrective actions where necessary.

2.2 QUALITY CONTROL

EA's primary means of building in quality at the inception of each project is through the use of the quality program EA has established for project planning and deliverables. EA's quality control program that applies to CTOs is fully described in the Program Quality Management Plan.

The CTO Manager, Senior Technical Reviewer, and Program Manager will approve the various deliverables as shown in the Project Deliverables Schedule (Appendix B). This process will involve review of deliverables against the CTO and approved Implementation Plan. This review will be done by experienced personnel independent of the day-to-day project work.

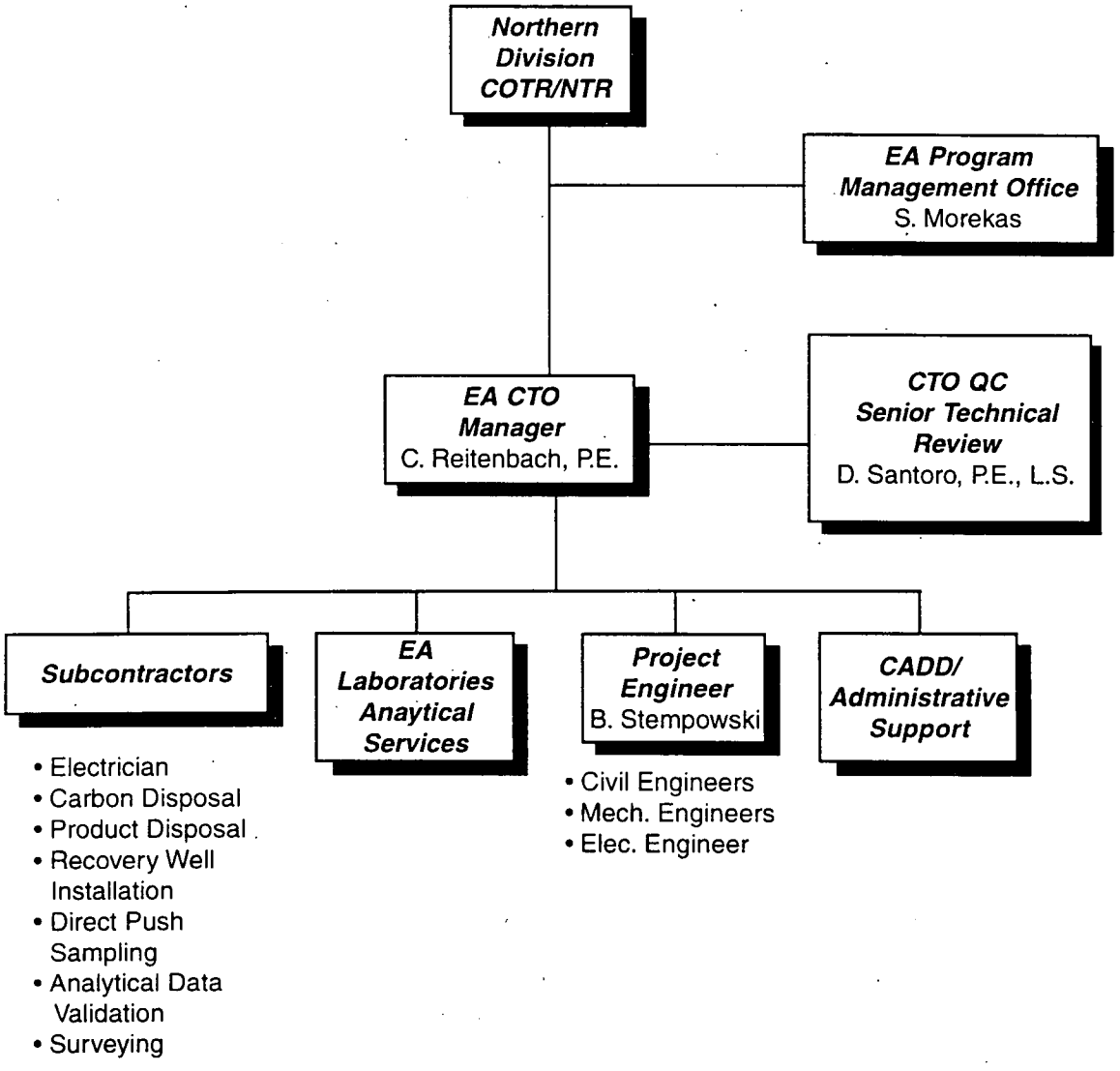


Figure 2-1. CTO Organization Chart.

3. SCOPE AND TECHNICAL APPROACH

The scope of work for this CTO will be performed in two primary tasks: 1) conduct soil and ground-water sampling to further assess the potential presence of non-petroleum constituents, and 2) to install a full scale vacuum enhanced LNAPL recovery system at the Navy Fuel Farm. For scheduling purposes, EA assumes that these two primary tasks will be conducted concurrently.

The following represents the scope of work under CTO No. 0074.

3.1 SAMPLING AND ANALYSIS PLAN (TASK 1)

Prior to the implementation of the field sampling, a Sampling and Analysis Plan shall be prepared. The sampling and analysis plan shall be one document and consist of a Field Sampling Plan, Quality Assurance Project Plan, and a Health and Safety Plan.

3.1.1 Field Sampling Plan

The field sampling plan shall provide detailed information and procedures for the collection of analytical samples at the Navy Fuel Farm. The field sampling plan shall consist of an introduction, background site history and description of the sampling to be performed. The document shall also include discussion and rationale for the number and location of samples to be collected and types of analysis to be performed. Detailed discussions of sampling procedures, sample designation, sample documentation, equipment decontamination, and investigative derived waste shall also be included.

3.1.2 Quality Assurance Project Plan

A Quality Assurance Project Plan (QAPP) shall be prepared as part of the Sampling and Analysis plan and shall serve as a controlling mechanism during field sampling and laboratory activities to ensure the data collected are valid, comparable, reliable and legally defensible. The QAPP shall outline the organization, objectives, and all Quality Assurance/Quality Control (QA/QC) activities which will ensure achievement of desired data quality goals. Specific sections of the QAPP shall include: quality assurance objectives for measurement data; sampling procedures; sample custody; calibration procedures; analytical procedures; data collection and verification; internal quality control checks and frequency; preventive maintenance; corrective action; and quality assurance reported to management.

3.1.3 Health and Safety Plan

In order to provide a means of ensuring the safety and well being of project staff, EA shall develop a health and safety plan specifically for the tasks included in this CTO. This document is an essential component to the sampling, construction, monitoring and maintenance phases associated with implementation of the full scale remedial system. The elements of health and

safety to be addressed in the plan include minimum site worker training requirements, physical and chemical hazard identification, monitoring requirements, and first aid/emergency procedures.

3.1.4 Deliverables

A Rough Draft of the Sampling and Analysis Plan shall be submitted to the Navy for review prior to submission of a draft document to the regulatory community. Written responses to review comments shall be incorporated and included as an appendix in the draft and final submissions.

3.2 IMPLEMENT SAMPLING AND ANALYSIS PLAN (TASK 2)

Upon review, comment, and approval of the Sampling and Analysis Plan, soil and ground-water samples will be collected. Based on discussions held at the 11 March 1997 scope clarification meeting held at NASJRB Willow Grove, it was mutually decided between EA and the Navy that 10 direct push soil borings will be installed and that 10 monitoring wells in the source area and down gradient shall be analyzed. An additional round of ground-water sampling shall be conducted following one year of remedial system operation. Analytical laboratory results of these sampling events shall require third party data validation.

3.2.1 Deliverables

A Sampling and Analysis Summary Report shall be prepared and will present a summary of sampling procedures, analytical results and results of data validation. A rough draft of the Sampling and Analysis Summary Report shall be submitted to the Navy for review prior to submission of a draft document to the regulatory community. Written responses to review comments shall be incorporated into the draft and final submissions.

3.2.2 Assumptions

- Ten soil borings shall be installed by direct push methods. One sample shall be collected from each boring and analyzed for VOC by Method SW-846 8260.
- Ten monitoring wells will be sampled for VOC by Method SW-846 8260. Ground-water samples shall be collected using slow-pumping methodology. One ground-water sample shall be collected (if encountered) from a direct push sampling location that will be installed in close proximity to former monitoring well NFFW-11, which was destroyed during hanger construction activities.
- Analytical data will receive third party validation.
- Generated purge water will be treated by activated carbon adsorbtion and discharged to the sanuitary sewer.

- Generation of soil cuttings shall be minimal. Cuttings that are created will be spread on-site

3.3 REMEDIAL DECISION DOCUMENT (TASK 3)

EA shall prepare a remedial decision document prior to development of the remedial action work plan. This decision document shall consist of an evaluation of the site and include the purpose of the remedial system, site conditions and background, threats to public health and environment, costs evaluation of various proposed remedial actions, and a cost evaluation of other remedial technologies as applicable to the Navy Fuel Farm Site.

A rough draft of the Remedial Decision Document shall be submitted to the Navy for review prior to submission of a draft document to the regulatory community. Written responses to review comments shall be incorporated and included as an appendix in the draft and final submissions.

3.4 REMEDIAL ACTION ENGINEERING WORK PLAN (TASK 4)

EA shall prepare a Remedial Action Engineering Work Plan for the LNAPL recovery system expansion based on results of the pilot study and the sampling and analysis performed under this CTO. The engineering work plan shall act as the governing document for the system installation and will be considered the "design" document. The engineering work plan shall clearly describe methods, materials, and testing of all equipment and installations to be accomplished as part of this CTO, including the following: scope of work; site plans with pertinent existing features, structures, utilities, etc.; proposed system manufacturing data and materials of construction; quality assurance/quality control plan; erosion controls, if necessary; preliminary engineering design data; preliminary engineering design drawings; proposed submittal register; and proposed project schedule.

A draft of the Remedial Action Engineering Work Plan shall be submitted to the Navy for review. Write responses to review comments shall be incorporated into the final submission.

3.5 REMEDIAL SYSTEM INSTALLATION AND START-UP (TASK 5) AND OPERATION AND MAINTENANCE (TASK 6)

Upon Navy review and acceptance of the Remedial Action Engineering Work Plan, EA shall install the remedial system. The remedial system shall consist of ground-water, soil vapor, and LNAPL extraction components.

The installation of the remedial system will be performed by EA and its subcontractors. EA will be responsible for the supervision of its subcontractors. The system installation is anticipated to be completed in approximately four weeks.

3.5.1 System Start-Up/Prove-Out Period

Following the installation of the remedial system, a 5-day system start-up/prove-out period will be performed to monitor system operation and to make adjustments as required to optimize performance. During the start-up/prove-out period, an EA technician and engineer shall be on-site daily.

3.5.2 Extended Monitoring Period

Following satisfactory performance as exhibited during the start-up/prove-out period, an extended (12 month) monitoring period will be implemented. On a bi-monthly (twice per month) basis an EA technician shall visit the site to verify proper equipment operation, record ground-water flow (instantaneous and cumulative), volume of LNAPL recovered, gauge recovery wells, gauge monitoring wells (monthly), and perform routine system maintenance.

The remedial system will be equipped with an auto-dialer that will notify EA in the event that the system shuts down. An EA technician shall visit the site in the event of a system shutdown to restart the system. Labor costs were developed assuming that the technician would visit the site once every two months for these unexpected visits. An EA engineer shall also visit the site once every three months to evaluate system performance.

Monthly system analytical samples shall be collected from before the first carbon vessel, between the carbon vessels, and after the second carbon vessel to assess carbon loading. These samples shall be analyzed for BTEX by Method SW-846 8020. Data validation will not be performed on these samples.

Upon conclusion of the one-year operational period ground-water samples will be collected from the same monitoring wells as prior to the operation of the remedial system, as discussed in Section 3.2.

3.5.3 Operations and Maintenance Manual

Simultaneous with equipment installation and development of as-built drawings, a comprehensive Operations and Maintenance (O&M) Manual will be prepared. The O&M Manual will include vendor specific cut-sheets detailing materials of construction, specifications, operating instructions, maintenance procedures, and trouble shooting recommendations. Electronic (Auto-CADD) files of as-builts will also be provided. Supporting vendor information and summary text and tables defining routine monitoring, maintenance, and data recording requirements will be included. The manual will also serve as a manual for the field technician during the start-up/prove-out, and extended monitoring phase of the pilot study.

3.5.4 Summary Reports

Monthly system performance reports shall be prepared to summarize the operation and performance of the remedial system for each monthly period. Information to be contained in this report shall include monitoring data collected as part of the bi-monthly O&M visits.

A final system performance report shall be submitted in draft and final form to summarize one year of system operation. Information to be contained in this report includes monitoring and gauging data collected during the first year of the extended monitoring period. A comparison of ground-water analytical results from before and after system operation will be presented along with recommendations for improving system performance. Anticipated annual costs for the maintenance of the existing system will also be presented.

3.5.5 Assumptions

The following assumptions were used in the development of budgets for the following construction tasks:

Recovery Well Installation

- Two additional 8" recovery wells shall be installed. The new recovery wells will be located close to existing NFFW-14 and NFFW-16, respectively.
- The wells shall be installed to a depth of approximately 40 ft below grade and shall contain 30 ft of screen.
- Soil samples or rock cores will not be collected during recovery well installation due to their close proximity to existing wells.
- No waste will require off-site disposal. Extracted ground-water (from installation and development) shall be treated using the existing pilot system. Soil cuttings shall be spread on-site.
- Labor, equipment usage, and per diem costs were developed based on one geologist and one technician on-site for three days.

Excavation

- All utilities will be marked out by Navy personnel and all areas requiring excavation will not require relocation of existing utilities.
- Installed process piping from the remedial system to the recovery wells will be bedded in and backfilled with a layer of sand prior to backfilling with existing soil.

- The discharge line to the sanitary sewer will be backfilled with native soil.
- All excavations will be backfilled with existing soil. Remaining soil will be spread on-site.
- Labor, equipment usage, and per diem costs were developed based on one engineer, one equipment operator, and one technician on-site for five days.
- All disturbed areas shall be re-graded and re-seeded. Disturbed asphalt areas will be also be patched with asphalt.

Building Installation

- The GAC vessels will be installed in a new, heated, lighted, building located next to the existing pilot system. All ground-water pump controls will be located in the new building.
- The building shall be installed on a concrete pad, similar to the existing pilot system.
- The ground-water treatment building is not considered a hazardous location according to the National Electric Code.
- Labor, equipment usage, and per diem costs were developed based on one engineer, one equipment operator, and one technician on-site for five days.

Ground-Water Extraction System

- Ground-water shall be extracted from the two new recovery wells and the existing recovery well NFFW-2R.
- Three new variable speed ground-water pumps will be installed. The variable speed drives will be integrated with submersible pressure transducers to regulate the water level in the well. Additional pressure sensors will be installed in each well to compensate for the applied vacuum.
- Extracted ground-water will be treated using two 1,000 lb granular activated carbon (GAC) vessels configured in series. The carbon vessels will be capable of treating a ground-water flow rate of 45 gpm.
- Treated ground-water shall be discharged to the NASJRB Willow Grove sanitary sewer system. A new 6-inch PVC discharge line from the treatment system to the sanitary sewer shall be installed below ground.

- Two carbon changeouts (including disposal) of up to 2,000 lbs. each are also included.

- Labor, equipment usage, and per diem costs were developed based on one engineer, one equipment operator, and one technician on-site for five days.

Vapor Extraction System

- The existing vacuum blower will be utilized and will remain in the existing building.

- Offgas will be treated using the existing thermal oxidizer.

- The thermal oxidizer is currently rented. The thermal oxidizer shall be purchased and retrofitted with a heat exchanger to save in supplemental fuel costs.

- Air discharges will be regulated under existing air permits.

- Labor, equipment usage, and per diem costs are included in the ground-water system installation.

LNAPL Recovery

- Three new LNAPL recovery pumps shall be purchased.

- Existing LNAPL recovery pumps are not practical for the wells with ground-water depression due to size constraints.

- All recovered LNAPL will be stored in the existing above ground storage tank. Each well shall be equipped with an LNAPL flow meter to monitor product recovery from each individual well. The tank will be equipped with a high-level alarm that will turn the pumps off in the event that the tank is full.

- All product lines will be double contained and installed below-ground.

- Disposal of up to 2,000 gallons of recovered LNAPL has been included.

- Labor, equipment usage, and per diem costs are included in the ground-water system installation.

Electrical and Controls

- The existing electrical supply is sufficient for the proposed system operation.

- A phone line will be provided to the system by NASJRB Willow Grove.
- The system will be equipped with an alarm dial-out that will notify EA (or others) that the system has shut down.
- An optional Supervisory Control and Data Acquisition (SCADA) system has been included. The SCADA system will provide for the end user to view system status, monitor system performance, and respond to system alarms. The data outputs for the system shall include total ground-water treated, individual depth to water in all three recovery wells, and individual applied vacuum in all three recovery wells. The system shall be supported by Ionics GENESIS computer software that is currently used by Northern Division at other sites.
- Existing controls for the thermal oxidizer and vacuum system shall be integrated with the new control panel.
- Labor, equipment usage, and per diem costs were developed based on one engineer, one equipment operator, and one technician on-site for five days.
- An electrical subcontractor shall be utilized for the electrical installation. EA personnel shall assist in the installation of the control panels and below-ground electrical conduit.

System Installation

- System installation will consist of installation of the vacuum wellhead assemblies and integration of the separate components.
- It is assumed that all required equipment and materials will be received within a period of 5 weeks or less from the time of order.
- Labor, equipment usage, and per diem costs were developed based on one engineer, one equipment operator, and one technician on-site for five days.

3.6 REGULATORY SUPPORT MEETINGS (TASK 7)

As requested by Northern Division, EA will attend a total of five meetings. It is assumed that meetings may include meetings with the regulatory community, the RAB, and Northern Division and that all meetings will be conducted in the greater Philadelphia area. All meetings will be attended by the CTO Manager, and at least four meetings will be attended by the Project Engineer.

3.7 PROJECT MANAGEMENT (TASK 8)

This task covers the cost associated with the CTO Manager responsibilities to coordinate/consult with the Navy, regulators, EA BRAC Program Managers, the EA project team members and subcontractors to ensure the successful completion of the project within the prescribed time and budgetary constraints. Under this task, the CTO Manager will carry out activities described below.

- Conduct project tracking (cost and schedule), prepare monthly reports, and manage client requests.
- Coordinate with the Navy Remedial Project Manager, the Navy Remedial Technical Manager, and Design Technical Representatives.
- Coordinate with the EA Program and Deputy Program Managers, with other EA project team members and EA subcontractors.
- Coordinate and interact with regulatory agencies and others designated by the Navy.
- Provide ad-hoc consultation services to the Navy as requested.

ASSUMPTION:

1. The project begins in April 1997 and is completed in November 1998.

4. SCHEDULE AND DISTRIBUTION OF DELIVERABLES

4.1 SCHEDULE

Based on the design milestone schedule in CTO 0074 dated 06 March 1997, the schedule shown on Table 4-1 is proposed for the full scale LNAPL recovery system at the NAS Willow Grove Fuel Farm. The proposed schedule assumes timely review of work plans and acquiring regulatory approval for permits necessary to install and operate the pilot system.

EA assumes that the activities associated with the sampling tasks and remedial system tasks will be performed concurrently.

4.2 DISTRIBUTION OF DELIVERABLES

The distribution of deliverables will be as set forth by Section 3.1 of the Distribution Schedule shown in the Statement-of-Services in Appendix A.

TABLE 4-1 PROJECT SCHEDULE FOR FULL SCALE LNAPL RECOVERY SYSTEM AT THE NASJRB WILLOW GROVE NAVAL FUEL FARM

Project Task	Date
Scoping Meeting	11 Mar 97 (Completed)
Submit Proposal	26 Mar 97
Definitization Modification Issued	7 Apr 97
Sampling and Analysis Plan - Rough Draft	17 Apr 97
Sampling and Analysis Plan - Draft	09 May 97
Sampling and Analysis Plan - Final	20 Jun 97
Sampling and Analysis Field Work Starts	07 July 97
Sampling and Analysis Field Work Complete	07 Sep 97
Sampling and Analysis Final Report - Rough Draft	01 Dec 97
Sampling and Analysis Final Report - Draft	15 Jan 97
Sampling and Analysis Final Report - Final	27 Mar 98
Remedial Decision Document - Rough Draft	14 Apr 97
Remedial Decision Document - Draft	30 Apr 97
Remedial Decision Document - Final	6 May 97
Installation Work Plan - Draft	30 Apr 97
Installation Work Plan - Final	13 Jun 97
Installation Start	07 Jul 97
Installation Complete	15 Aug 97
System O&M	Sep 97 - Aug 98
O&M Manual - Draft	11 Aug 97
O&M Manual - Final	21 Nov 97

5. CASH FLOW SCHEDULE AND COST CONTROL PROCEDURES

EA maintains a computerized integrated database management, accounting, project cost, and billing system. EA's project accounting/reporting systems comply with Government Cost Accounting Standards (CAS). Standard project reports from EA's Project Accounting System that will be used regularly by the CTO Manager, Program Management Office staff, and Finance and Administration staff include:

- 75 percent Complete Reports—identify actual vs. budget variances for projects 75 percent or more complete.
- Project Performance Reports—summarize cost, marked-up costs, and revenue; also identify goal and actual profitability measures and receivables balances.
- Project Effort Detail Reports—identify month to date and period to date effort vs. budgeted effort.
- Project Profitability Reports—identify revenue and cost categories with emphasis on actual vs. goal profitability measures.

Any significant purchase will be formally competed and price justified, and all items purchased will receive price analysis and documentation. Further details on cost control and accounting are given in Section 3.6 Cost Accounting of the Program Management Plan.

Purchases anticipated in association with this task order include, ground-water pumps, LNAPL pumps, two 1,000 lb GAC vessels, thermal oxidizer with a heat exchanger, and other material purchases made in support of the full scale remedial system installation.

6. SUBCONTRACTING

EA proposes to subcontract soil borings, well installation, electrical work, surveying, and excavation to businesses located in the vicinity of NAS Willow Grove. Subcontractor costs from past work orders conducted at NASJRB Willow Grove and other locations were used as the basis of EA's cost estimate for these tasks.

Laboratory analytical costs are based on comparative pricing obtained from three laboratories.

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.
Contract No. N62472-92-D-1296
CTO No.: 0074; IMPLEMENTATION PLAN
Project Titl : REMEDIAL ACTION
Project Location: NASJRB WILLOW GROVE

LABOR	94,906.00
LABOR - PMO	1,382.00
Subtotal Labor	96,288.00
X OH 117.96%	113,581.00
LABOR COST	209,869.00
EXPENSES	
ODCs	122,718.00
ODCs - PMO	67.00
Travel	19,657.00
Subtotal Expenses	142,442.00
LABOR & ODCs	352,311.00
G&A 10.57%	37,239.00
Subtotal	389,550.00
INTERNAL LAB	10,330.00
Subtotal Labor, ODCs. and Internal Lab	399,880.00
AWARD FEE BASE	378,145.00
AWARD FEE 10%	37,815.00
TOTAL EA COST AND FEE	437,695.00
SUBCONTRACTOR COSTS	
Team Subcontractors	0.00
External Laboratory	0.00
Other Specialty Subcontractors	75,910.00
Subtotal Subcontractor Costs	75,910.00
G&A 10.57%	8,024.00
Subtotal	83,934.00
AWARD FEE BASE	83,934.00
AWARD FEE 5%	4,197.00
TOTAL SUBCONTRACTOR COST AND FEE	88,131.00
TOTAL PROJECT ESTIMATE	525,826.00

INSTALLATION OF OPTIONAL SCADA SYSTEM

LABOR	0.00
LABOR - PMO	0.00
Subtotal Labor	0.00
X OH 117.96%	0.00
LABOR COST	0.00
EXPENSES	
ODCs	0.00
ODCs - PMO	0.00
Travel	0.00
Subtotal Expenses	0.00
LABOR & ODCs	0.00
G&A 10.57%	0.00
Subtotal	0.00
INTERNAL LAB	0.00
Subtotal Labor, ODCs. and Internal Lab	0.00
AWARD FEE BASE	0.00
AWARD FEE 10%	0.00
TOTAL EA COST AND FEE	0.00
SUBCONTRACTOR COSTS	
Other Specialty Subcontractors	16,300.00
Subtotal Subcontractor Costs	16,300.00
G&A 10.57%	1,723.00
Subtotal	18,023.00
AWARD FEE 5%	901.00
TOTAL SUBCONTRACTOR COST AND FEE	18,924.00
TOTAL PROJECT ESTIMATE WITH OPTIONAL ITEM	525,826.00
LESS OPTIONAL ITEM	18,924.00
TOTAL PROJECT ESTIMATE WITHOUT OPTIONAL ITEM	506,902.00

LEVEL OF EFFORT - PMO

EA

	Contract Admin.	Clerical	Subcontr. Admin.	TOTAL
Tasks (0097)	CA	T3	SCA	0
1. CTO Administration	15.6			15.6
2. Invoice Review	4			4
3. Procurement	4		10	14
4. Subcontract Administration			11.5	11.5
5. Subcontract Invoice			2	2
6. Lab Support				0
7. Subcontract Close-out				0
8. OCI	2.5			2.5
9. Rate Offender Tracking	1.5			1.5
10. Program/Document Maintenance/				0
Database Management				0
11. Administration Support		10		10
	27.6	10	23.5	61.1
Labor Rates:	$27.94	$16.02	$24.64	
Direct Costs:	$771.14	$160.20	$579.04	

TOTAL DIRECT LABOR COST: $1,510.38

EA

	Communications		Reproduction			Postage & Shipping	
	Tel.	FAX	Procurement	Subcontract	G&A	Subcontract	
Tasks (0097)	Package	Package	Packages	Packages	Packages	Packages	CTO
1. Procurement							
2. Subcontract							
3. G&A							
4. CTO	3	3		1			
	3	3	0	1	0	0	0
Unit Rates:	$6.00	$2.00	$60.00	$42.50	$7.50	$57.00	$19.00
Direct Costs:	$18.00	$6.00	$0.00	$42.50	$0.00	$0.00	$0.00

TOTAL OTHER DIRECT COST: $66.50

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.
Contract No. N62472-92-D-1296
CTO No.: 0074; IMPLEMENTATION PLAN
Project Title: REMEDIAL ACTION
Project Location: NASJRB WILLOW GROVE

25-Mar-97

LABOR EFFORT

ENGINEERING SERVICES :

Task 1: Sampling and Analysis Plan (4100)

Activities	Senior Review P5	CTO Manager P3	Scientist P3	Scientist P2	Scientist P1	Environ Chemist P3	CADD Operator T3	Word Processor T2	Clerical T2	TOTALS
Review existing information		1	0	4	4					9
Prepare Rough Draft Plan	8	16	0	60	40	12	16	12	2	166
Prepare Draft per Navy comments	2	6	0	20	20	8	8	6	2	72
Prepare Final Plan per regulators comments	1	5	0	16	8	4	4	4	2	44
Total Hours:	11	28	0	100	72	24	28	22	6	291
Labor Rates:	$48.13	$25.58	$25.58	$21.49	$16.24	$25.58	$16.02	$12.62	$12.62	
Direct Costs:	$529.43	$716.24	$0.00	$2,149.00	$1,169.28	$613.92	$448.56	$277.64	$75.72	

vs 210

SUBTOTAL : $5,979.79 vs. 5156 OK

Task 2: Implement Sampling Plan (4220)

Activities	Senior Review P5	CTO Manager P3	Scientist P5	Scientist P2	Scientist P1	Field Technician T3	CADD Operator T3	Word Processor T2	Clerical T2	TOTALS
Subtask 2a Collect Samples :										
Collect soil samples		4	0	2	0	20	0	0	0	26
Collect ground-water samples (2 events)		18	0	10	0	160	0	0	0	188
Subtask 2b Validate Data :										
Assemble information and review report	2	3		12	8					25
Subtask 2c Prepare Analytical Summary Report:										
Prepare Rough Draft Report	4	17		80	40		16	12	3	172
Prepare Draft Report per Navy comments	2	8		40	20		8	6	2	86
Prepare Final Report per regulators comments	4	5		20	10		6	2	2	49
Total Hours:	12	55	0	164	78	180	30	20	7	546
Labor Rates:	$48.13	$25.58	$48.13	$21.49	$16.24	$16.02	$16.02	$12.62	$12.62	
Direct Costs:	$577.56	$1,406.90	$0.00	$3,524.36	$1,266.72	$2,883.60	$480.60	$252.40	$88.34	

vs. 362

SUBTOTAL : $10,480.48 vs. 8902 OK

Task 3: Prepare Remedial Decision Document (3720)

Activities	Senior Review P5	CTO Manager P3	Scientist P5	Scientist P2	Scientist P1	Field Technician T3	CADD Operator T3	Word Processor T2	Clerical T2	TOTALS
Prepare Remedial Decision Document:										
Prepare Rough Draft Report	3	8		40	20		8	4	2	85
Prepare Draft Report per Navy comments	2	4		20	10		4	2	1	43
Prepare Final Report per regulators comments	1	3		16	8		2	1	3	34
Total Hours:	6	15	0	76	38	0	14	7	6	162
Labor Rates:	$48.13	$25.58	$48.13	$21.49	$16.24	$16.02	$16.02	$12.62	$12.62	
Direct Costs:	$288.78	$383.70	$0.00	$1,633.24	$617.12	$0.00	$224.28	$88.34	$75.72	

vs. 210

SUBTOTAL : $3,311.18 vs. 4829 OK

Task 4: Prepare Remedial Action Work Plan (4300)

Activities	Senior Review P5	CTO Manager P3	Engineer P4	Engineer P2	Engineer P1	Engineer P3	CADD Operator T3	Word Processor T2	Clerical T2	TOTALS
Prepare Draft Report	8	41	20	120	120	20	80		8	417
Prepare Final Report per Navy comments	2	14	10	50	40		20		4	140
Total Hours:	10	55	30	170	160	20	100	0	12	557
Labor Rates:	$48.13	$25.58	$32.32	$21.49	$16.24	$25.58	$16.02	$12.62	$12.62	
Direct Costs:	$481.30	$1,406.90	$969.60	$3,653.30	$2,598.40	$511.60	$1,602.00	$0.00	$151.44	

SUBTOTAL : $11,374.54

TOTAL THIS PAGE: $31,145.99

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.
Contract No. N62472-92-D-1296
CTO No.: 0074; IMPLEMENTATION PLAN
Project Title: REMEDIAL ACTION
Project Location: NASJRB WILLOW GROVE

25-Mar-97

LABOR EFFORT

Task 5: Installation of Remedial System (5400)

Activities	Senior Review P5	CTO Manager P3	Engineer P4	Engineer P2	Engineer P1	Equipment Operator P3	Technician T3	Geologist P2	Clerical T2	TOTALS
Mobilization/Equipment Procurement		10	10	32	40				10	102
Recovery Well Installation		8		8			40	40		96
Discharge and System Trenching		20		60		60	60			200
Building Installation		18		60		60	60			198
Electrical/Control Installation		18		60		60	60			198
System Installation		24	10	80	40	80	80			314
System Start-up		14	10	60			60			144
Total Hours:	0	112	30	360	80	260	360	40	10	1,252
Labor Rates:	$48.13	$25.58	$32.32	$21.49	$16.24	$25.58	$16.02	$21.49	$12.62	
Direct Costs:	$0.00	$2,864.96	$969.60	$7,736.40	$1,299.20	$6,650.80	$5,767.20	$859.60	$126.20	

SUBTOTAL : $26,273.96

Task 6: Operation and Maintenance (7200)

Activities	Senior Review P5	CTO Manager P3	Engineer P4	Engineer P2	Engineer P1	Technician T3	CADD Operator T3	Word Processor T2	Clerical T2	TOTALS
Bimonthly O&M Site Visits		33				288				321
Other Site Visits		10		40		60				110
Operation and Maintenance Manual (Draft)	8	29	40	100	80		20	16	4	297
Operation and Maintenance Manual (Final)	4	10	8	40	20		10	8	4	104
Monthly Reports	12	22		50	48			48	24	204
Final Report (Draft)	4	28	10	120	80		20	16	4	282
Final Report (Final)	2	14	5	60	40		10	8	4	143
Total Hours:	30	146	63	410	268	348	60	96	40	1,461
Labor Rates:	$48.13	$25.58	$32.32	$21.49	$16.24	$16.02	$16.02	$12.62	$12.62	
Direct Costs:	$1,443.90	$3,734.68	$2,036.16	$8,810.90	$4,352.32	$5,574.96	$961.20	$1,211.52	$504.80	

SUBTOTAL : $28,630.44

Task 7: Meetings/Travel (9300)

Activities	Senior Review P5	CTO Manager P3	Engineer P4	Engineer P2	Engineer P1	GIS Operator P3	CADD Operator T3	Word Processor T2	Clerical T2	TOTALS
Meetings/Travel	10	50		40					10	110
Total Hours:	10	50	0	40	0	0	0	0	10	110
Labor Rates:	$48.13	$25.58	$32.32	$21.49	$16.24	$25.58	$16.02	$12.62	$12.62	
Direct Costs:	$481.30	$1,279.00	$0.00	$859.60	$0.00	$0.00	$0.00	$0.00	$126.20	

vs. 130

SUBTOTAL : $2,746.10 vs. 4954 OK

Task 8: Project Management (9130)

Activities	Senior Review P5	CTO Manager P3	Engineer P4	Engineer P2	GIS Operator P3	Word Processor T2	CADD Operator T3	Clerical T2	TOTALS
Project Management		155	48			32		15	250
Total Hours:	0	155	48	0	0	32	0	15	250
Labor Rates:	$48.13	$25.58	$32.32	$21.49	$25.58	$12.62	$16.02	$12.62	
Direct Costs:	$0.00	$3,964.90	$1,551.36	$0.00	$0.00	$403.84	$0.00	$189.30	

SUBTOTAL : $6,109.40

TOTAL THIS PAGE: $63,759.90

TOTAL LABOR COST $102,075.19

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.
Contract No. N62472-92-D-1296
CTO No.: 0074; IMPLEMENTATION PLAN
Project Title: REMEDIAL ACTION
Project Location: NASJRB WILLOW GROVE

30-Dec-1899

OTHER DIRECT COSTS

ENGINEERING SERVICES :

Task 1: Sampling and Analysis Plan (4100)

	Communications (Fax, Pages)	Communications (phone-min)	Repro-Graphics (Page)	Color Repro-Graphics (Page)	CADD Usage (Hours)	Sampling Supplies (Lump)	Postage & Shipping (Each)	Postage & Shipping (Per Cooler)
Prepare Sampling and Analysis Plan								
Prepare Rough Draft Report	20	120	600		16		2	
Prepare Draft Report per Navy comments	10	60	600		8		2	
Prepare Final Report per regulators comments	10	20	700		4		3	0
Total Units	40	200	1,900	0	28	0	7	0
Unit Rates:	$1.25	$0.40	$0.06	$1.75	$15.00	$100.00	$9.50	$60.00
Direct Costs:	$50.00	$80.00	$114.00	$0.00	$420.00	$0.00	$66.50	$0.00

SUBTOTAL: $730.50 vs 555 OK

Task 2: Implement Sampling Plan (4220)

Activities	Generator (Day)	Submersible Pump (Day)	Interface Probe (Day)	PID (Day)	YSI 3800 (Day)	Trash Pump (Day)	Misc. (LS)	Postage & Shipping (Per Cooler)
Soil Sample Collection			1	1			1	1
Ground-Water Sample Collection (2 rounds)	12	12	12	12	12	6	2	3
Total Units	12	12	13	13	12	6	3	4
Unit Rates:	$50.00	$22.00	$62.00	$75.00	$136.00	$27.00	$20.00	$60.00
Direct Costs:	$600.00	$264.00	$806.00	$975.00	$1,656.00	$162.00	$60.00	$240.00

SUBTOTAL: $4,763.00 vs. 1500 OK

Task 2: Implement Sampling Plan (4220)

Activities	Communications (Fax, Pages)	Communications (phone-min)	Repro-Graphics (Page)	Color Repro-Graphics (Page)	CADD Usage (Hours)	Sampling Supplies (Lump)	Postage & Shipping (Each)	Postage & Shipping (Per Cooler)
Subtask 2c Prepare Analytical Summary Report:								
Prepare Rough Draft Report	50	240	600		16		2	0
Prepare Draft Report per Navy comments	25	120	600		8		2	
Prepare Final Report per regulators comments	10	60	3,000		6		15	
Total Units	85	420	4,200	0	30	0	19	0
Unit Rates:	$1.25	$0.40	$0.06	$1.75	$15.00	$1,000.00	$9.50	$60.00
Direct Costs:	$106.25	$168.00	$252.00	$0.00	$450.00	$0.00	$180.50	$0.00

SUBTOTAL: $1,156.75 vs. 2150 OK

5920

4692 OK

Task 3: Prepare Remedial Decision Document (3720)

Activities	Communications (Fax, Pages)	Communications (phone-min)	Repro-Graphics (Page)	Color Repro-Graphics (Page)	CADD Usage (Hours)	Sampling Supplies (Lump)	Postage & Shipping (Each)	Postage & Shipping (Per Cooler)
Prepare Remedial Decision Document:								
Prepare Rough Draft Report	10	60	600		8		2	
Prepare Draft Report per Navy comments	5	30	600		4		2	
Prepare Final Report per regulators comments	2	15	2,600		3		22	
Total Units	17	105	3,800	0	15	0	26	0
Unit Rates:	$1.25	$0.40	$0.06	$1.75	$15.00	$1,000.00	$9.50	$60.00
Direct Costs:	$21.25	$42.00	$228.00	$0.00	$225.00	$0.00	$247.00	$0.00

SUBTOTAL: $763.25

Task 4: Prepare Remedial Action Work Plan (4300)

Activities	Communications (Fax, Pages)	Communications (phone-min)	Repro-Graphics (Page)	Color Repro-Graphics (Page)	CADD Usage (Hours)	Sampling Supplies (Lump)	Postage & Shipping (Each)	Postage & Shipping (Per Cooler)
Prepare Draft Report	50	120	1,100		80		3	
Prepare Final Report per Navy comments	10	60	1,100		40		3	
Total Units	60	180	2,200	0	120	0	6	0
Unit Rates:	$1.25	$0.40	$0.06	$1.75	$15.00	$100.00	$9.50	$60.00
Direct Costs:	$75.00	$72.00	$132.00	$0.00	$1,800.00	$0.00	$57.00	$0.00

SUBTOTAL: $2,136.00

TOTAL THIS PAGE: $9,549.50

Task 5: Installation of Remedial System (5400)

Activities	Backhoe (Week)	Plate Compactor (Day)	Bobcat (Week)	Sand (Ton)	Construction Barricades (Days)	2" PVC (LF)	2" PVC Fittings (LS)	6" PVC (LF)	6" PVC Fittings (EA)
Mobilization/Equipment Procurement									
Recovery Well Installation					2				
Discharge and System Trenching	1	5	1	34	20	1500	2	500	30
Building Installation	1				10		1		1
Electrical/Control Installation	1								1
System Installation	1						1		1
System Start-up									
Total Units	4	5	1	34	32	1500	4	500	33
Unit Rates:	$600.00	$45.00	$425.00	$30.00	$6.00	$0.85	$250.00	$3.00	$20.00
Direct Costs:	$2,400.00	$225.00	$425.00	$1,020.00	$192.00	$1,275.00	$1,000.00	$1,500.00	$660.00

SUBTOTAL: $8,697.00

Task 5: Installation of Remedial System (5400)

Activities	Stone Backfill (Ton)	Asphalt Patch (LS)	Jackhammer (Day)	Concrete Saw (Day)	Seed/Straw (LS)	Concrete (YD)	Concrete Forms (LS)	Thermal Oxidizer (LS)	Heat Exchanger (LS)
Mobilization/Equipment Procurement									
Recovery Well Installation									
Discharge and System Trenching	5	1	2	3	1				
Building Installation						6	1		
Electrical/Control Installation									
System Installation								1	1
System Start-up									
Total Units	5	1	2	3	1	6	1	1	1
Unit Rates:	$20.00	$200.00	$150.00	$175.00	$200.00	$85.00	$250.00	$13,000.00	$13,000.00
Direct Costs:	$100.00	$200.00	$300.00	$525.00	$200.00	$510.00	$250.00	$13,000.00	$13,000.00

SUBTOTAL: $28,085.00

Task 5: Installation of Remedial System (5400)

Activities	Signet Flow Sensor (EA)	Surge Tank with pump (EA)	Pitot Tube + Magnahelic (EA)	Pressure Gauge (EA)	Product Flow Meter (EA)	Wellhead Assembly (EA)	Fence (FT)	Interface Probe (Day)	Propane (month)
Mobilization/Equipment Procurement									
Recovery Well Installation								3	
Discharge and System Trenching									
Building Installation									
Electrical/Control Installation									
System Installation	4	1	3	3	3	3	250		12
System Start-up								5	
								5	
Total Units	4	1	3	3	3	3	250	13	12
Unit Rates:	$1,100.00	$1,200.00	$350.00	$55.00	$165.00	$250.00	$12.00	$62.00	$400.00
Direct Costs:	$4,400.00	$1,200.00	$1,050.00	$165.00	$495.00	$750.00	$3,000.00	$806.00	$4,800.00

SUBTOTAL: $16,666.00

TOTAL THIS PAGE: $53,448.00

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.
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CTO No.: 0074; IMPLEMENTATION PLAN
Project Title: REMEDIAL ACTION
Project Location: NASJRB WILLOW GROVE

30-Dec-1899

OTHER DIRECT COSTS

Task 5: Installation of Remedial System (5400)

Activities	Submersible Pump (EA)	Product Pump (EA)	Product Line (LF)	Building (heated) (EA)	1,000 LB GAC Vessel (EA)	Utility Truck (Day)	Utility Truck (Mileage)	Other Misc (LS)
Mobilization/Equipment Procurement								
Recovery Well Installation								
Discharge and System Trenching			300			5	600	
Building Installation				1		5	600	1
Electrical/Control Installation						5	600	0.5
System Installation	3	3			2	5	600	1
System Start-up						5	600	0.5
Total Units	3	3	300	1	2	25	3000	3
Unit Rates:	$1,500.00	$8,000.00	$2.25	$9,000.00	$5,000.00	$42.00	$0.09	$1,500.00
Direct Costs:	$4,500.00	$24,000.00	$675.00	$9,000.00	$10,000.00	$1,050.00	$270.00	$4,500.00

SUBTOTAL: $53,995.00

Task 6: Operation and Maintenance (7200)

Activities	Communi-cations (Fax, Pages)	Communi-cations (phone-min)	Repro-Graphics (Page)	Interface Probe (Day)	CADD Usage (Hours)	Sampling Supplies (Lump)	Postage & Shipping (Each)	Postage & Shipping (Per Cooler)
Bimonthly O&M Site Visits		720	0	24	0	3	0	12
Other Site Visits								
Operation and Maintenance Manual (Draft)	20	60	1000		20		2	
Operation and Maintenance Manual (Final)	10	30	1000		10		2	
Monthly Reports	120	120	3600		24		24	
Final Report (Draft)	60	120	750		20		2	
Final Report (Final)	10	60	1400		10		3	
Total Units	220	1,110	7,750	24	84	3	33	12
Unit Rates:	$1.25	$0.40	$0.06	$62.00	$15.00	$100.00	$9.50	$60.00
Direct Costs:	$275.00	$444.00	$465.00	$1,488.00	$1,260.00	$300.00	$313.50	$720.00

SUBTOTAL: $5,265.50

Task 7: Meetings/Travel (9300)

	Communi-cations (Fax, Pages)	Communi-cations (phone-min)	Repro-Graphics (Page)	Color Repro-Graphics (Page)	CADD Usage (Hours)	Sampling Supplies (Lump)	Postage & Shipping (Each)	Postage & Shipping (Per Cooler)
Meetings/Travel	50	240	200					
Total Units	50	240	200	0	0	0	0	0
Unit Rates:	$1.25	$0.40	$0.06	$1.75	$15.00	$100.00	$9.50	$60.00
Direct Costs:	$62.50	$96.00	$12.00	$0.00	$0.00	$0.00	$0.00	$0.00

SUBTOTAL: $170.50 vs. 213 01C

Task 8: Project Management (9130)

Activities	Communi-cations (Fax, Pages)	Communi-cations (phone-min)	Repro-Graphics (Page)	Color Repro-Graphics (Page)	CADD Usage (Hours)	Sampling Supplies (Lump)	Postage & Shipping (Each)	Postage & Shipping (Per Cooler)
Project Management	50	300	200				10	
Total Units	50	300	200	0	0	0	10	0
Unit Rates:	$1.25	$0.40	$0.06	$1.75	$15.00	$100.00	$9.50	$60.00
Direct Costs:	$62.50	$120.00	$12.00	$0.00	$0.00	$0.00	$95.00	$0.00

SUBTOTAL: $289.50

TOTAL THIS PAGE: $59,720.50

TOTAL ODCS: $124,638.00

TRAVEL AND OTHER ASSOCIATED COSTS

ENGINEERING SERVICES :

Task 2: Implement Sampling Plan (4220)

Activities	Vehicle Usage (Days)	Vehicle Usage (Days)	Vehicle Usage (Mileage)	Vehicle Usage (Mileage)	Tolls (Round Trip)	Per Diem (Lodging)	Per Diem (Meals)	Per Diem (Meals)
Implement Work Plan								
Collect Soil Samples		2		400	1	1	1	
Collect Ground-Water Samples (2 events)		12		1600	4	12	12	0
Total Units	0	14	0	2000	5	13	13	0
Unit Rates:	$47.00	$56.00	$0.10	$0.12	$5.70	$100.00	$38.00	$17.00
Direct Costs:	$0.00	$784.00	$0.00	$240.00	$28.50	$1,300.00	$494.00	$0.00

12 DAYS VS 8 DAYS (GE) OK

SUBTOTAL : $2,846.50

VS. 1352 OK

Task 5: Installation of Remedial System (5400)

Activities	Vehicle Usage (Days)	Vehicle Usage (Days)	Vehicle Usage (Mileage)	Vehicle Usage (Mileage)	Tolls (Round Trip)	Per Diem (Lodging)	Per Diem (Meals)	Per Diem (Meals)
Recovery Well Installation		3		400	1	1	1	
Discharge and System Trenching		10		800	2	12	15	
Building Installation		10		800	2	12	15	
Electrical/Control Installation		10		800	2	12	15	
System Installation		10		800	2	12	15	
System Start-up	5	5	400	400	2	12	15	
Total Units	5	48	400	4000	11	61	76	0
Unit Rates:	$47.00	$56.00	$0.10	$0.12	$5.70	$100.00	$38.00	$17.00
Direct Costs:	$235.00	$2,688.00	$40.00	$480.00	$62.70	$6,100.00	$2,888.00	$0.00

SUBTOTAL : $12,493.70

Task 6: Operation and Maintenance (7200)

Activities	Vehicle Usage (Days)	Vehicle Usage (Days)	Vehicle Usage (Mileage)	Vehicle Usage (Mileage)	Tolls (Round Trip)	Per Diem (Lodging)	Per Diem (Meals)	Per Diem (Meals)
Bimonthly O&M Site Visits		24		7200	24			24
Other Site Visits	10		3000		10			10
Total Units	10	24	3000	7200	34	0	0	34
Unit Rates:	$47.00	$56.00	$0.10	$0.12	$5.70	$100.00	$38.00	$17.00
Direct Costs:	$470.00	$1,344.00	$300.00	$864.00	$193.80	$0.00	$0.00	$578.00

SUBTOTAL : $3,749.80

Task 7: Meetings/Travel (9300)

Activities	Vehicle Usage (Days)	Vehicle Usage (Days)	Vehicle Usage (Mileage)	Vehicle Usage (Mileage)	Tolls Tolls (Round Trip)	Per Diem (Lodging) (Days)	Per Diem (Meals) (Days)	Per Diem (Meals) (Days)
Meetings/Travel	5	0	1500	0	5	0	0	9
Total Units	5	0	1500	0	5	0	0	9
Unit Rates:	$47.00	$56.00	$0.10	$0.12	$5.70	$100.00	$38.00	$17.00
Direct Costs:	$235.00	$0.00	$150.00	$0.00	$28.50	$0.00	$0.00	$153.00

SUBTOTAL : $568.50

VS. 1405 OK

TOTAL TRAVEL COSTS: $19,656.50

GE INAD. EST. FOR LODGING BUT NONE REQ'D AS ASSUMED BY EA PROPOSAL

INTERNAL LABORATORIES

Analytical Laboratories (4220)	$10,330.00

TOTAL INTERNAL LAB COST: $10,330.00

vs. 10,000 GE OK

OTHER SUBCONTRACTOR COSTS

SUBCONTRACTOR SERVICES:

Independent Data Validator (4220)	Provide 3rd party validation of analytical data	$2,108.00

GE omitted is regd. Acceptable.

SUBTOTAL GENERAL CONTRACTOR $2,108.00

Direct Push Soil Sampling (4220)	Collection of 10 soil samples	$1,750.00

SUBTOTAL GENERAL CONTRACTOR $1,750.00

vs. GE of 1650 OK

Well Installation (4220)	Installation of (2) 40 ft recovery wells with 30 ft screen. Constructed of 8" PVC, installed in 12" auger hole	$10,500.00

SUBTOTAL GENERAL CONTRACTOR $10,500.00

Incl mob/demob portion of GE.

Surveyor	Survey new recovery wells and soil sampling locations.	$2,500.00

SUBTOTAL GENERAL CONTRACTOR $2,500.00

Carbon Disposal (5400)	Disposal and replacement of 4,000 lbs of spent carbon	$2,300.00

SUBTOTAL GENERAL CONTRACTOR $2,300.00

Product Disposal (5400)	Four product disposal events of 500 gal/event	$4,000.00

SUBTOTAL GENERAL CONTRACTOR $4,000.00

Electrical (5400)	Provide integration of controls. Includes PLC controls, variable speed drives controlled by pressure transducer and all electrical hardware.	$26,122.00

SUBTOTAL GENERAL CONTRACTOR $26,122.00

Optional SCADA System (5400)	Provide installation and configuration of GENESIS SCADA software. Includes programmer labor, CPU, and computer to log data.	$16,300.00

SUBTOTAL GENERAL CONTRACTOR $16,300.00

TOTAL SUBCONTRACTOR COST: $75,910.00

APPENDIX A

STATEMENT OF ARCHITECT-ENGINEER (A/E) SERVICES
DATED 27 FEB 1996

APPENDIX B

PROJECT DELIVERABLES SCHEDULE

PROJECT DELIVERABLES SCHEDULE

NAVY ACTIVITY: Naval Air Station Joint Reserve Base Willow Grove

PROJECT NAME: Full Scale Remedial Action

PROJECT NO: 2960074

PROJECT DESCRIPTION: _____

CTO MANAGER: Carl Reitenbach

PROJECT LOCATION: Willow Grove, PA

DATE PREPARED: 3/19/97

DATE REVISED: _____

DATE IMPLEMENTATION PLAN APPROVED BY NAVY: _____

TYPE OF DELIVERABLE	Date To Reviewers	Client Due Date	REVIEW/SIGN OFF (ID BY NAME)				
			CTOM*	STR*	PM*	AM	OTHER
Sampling and Analysis Plan - Rough Draft	11 Apr 97	17 Apr 97	Reitenbach	Santoro	Morekas		
Sampling and Analysis Plan - Draft	02 May 97	09 May 97	Reitenbach	Santoro	Morekas		
Sampling and Analysis Plan - Final	13 Jun 97	20 Jun 97	Reitenbach	Santoro	Morekas		
Sampling and Analysis Final Report - Rough Draft	24 Nov 97	01 Dec 97	Reitenbach	Santoro	Morekas		
Sampling and Analysis Final Report - Draft	8 Jan 97	15 Jan 97	Reitenbach	Santoro	Morekas		
Sampling and Analysis Final Report - Final	22 Mar 97	27 Mar 98	Reitenbach	Santoro	Morekas		
Remedial Decision Document - Rough Draft	07 Apr 97	14 Apr 97	Reitenbach	Santoro	Morekas		
Remedial Decision Document - Draft	23 Apr 97	30 Apr 97	Reitenbach	Santoro	Morekas		
Remedial Decision Document- Final	29 Apr 97	6 May 97	Reitenbach	Santoro	Morekas		
Installation Work Plan - Draft	23 Apr 97	30 Apr 97	Reitenbach	Santoro	Morekas		
Installation Work Plan - Final	8 Jun 97	13 Jun 97	Reitenbach	Santoro	Morekas		
O&M Manual -Draft	4 Aug 97	11 Aug 97	Reitenbach	Santoro	Morekas		
O&M Manual - Final	14 Nov 97	21 Nov 97	Reitenbach	Santoro	Morekas		

* Sign off by this individual required.

PROGRAM MANAGER APPROVED: _____

DATE: _____

CTOM - CONTRACT TASK ORDER MANAGER
PM - PROGRAM MANAGER
AM - ACTIVITY MANAGER
STR - SENIOR TECHNICAL REVIEWER

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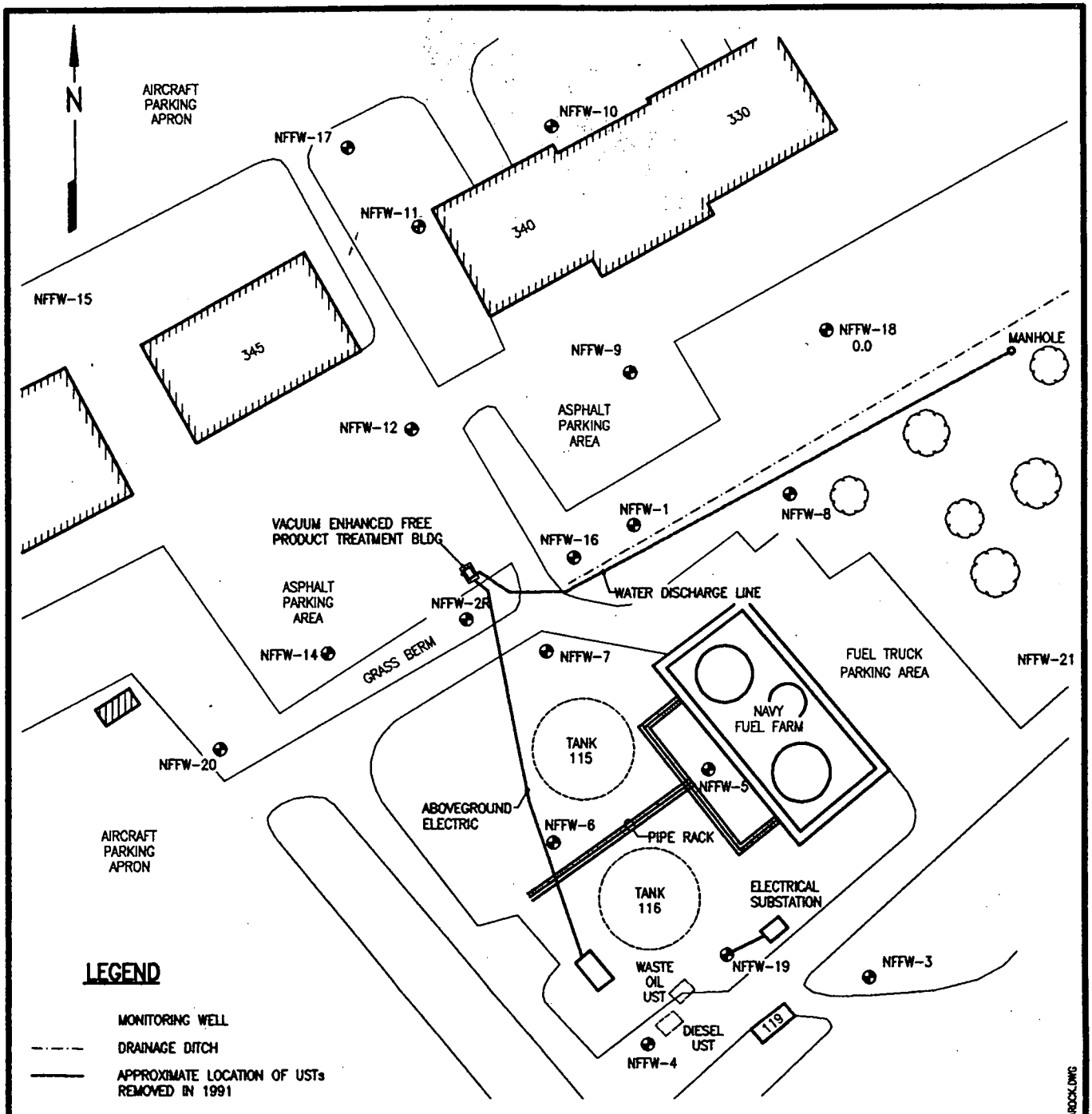

NOTE:

BASE MAP DEVELOPED FROM EA FIELD MEASUREMENTS AND SITE PLAN DEVELOPED BY EA (1993). NO AS-BUILT DRAWINGS OF NEW FUEL FARM FACILITY WERE AVAILABLE FROM NAVY PERSONNEL PRIOR TO DEVELOPMENT OF BASE MAP. BASE MAP IS INTENDED AS A REFERENCE ONLY. ANY DECISIONS MADE BASED ON THE CONTENT OF THIS MAP ARE THE SOLE RESPONSIBILITY OF THE USER.

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APPROXIMATE SCALE

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EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

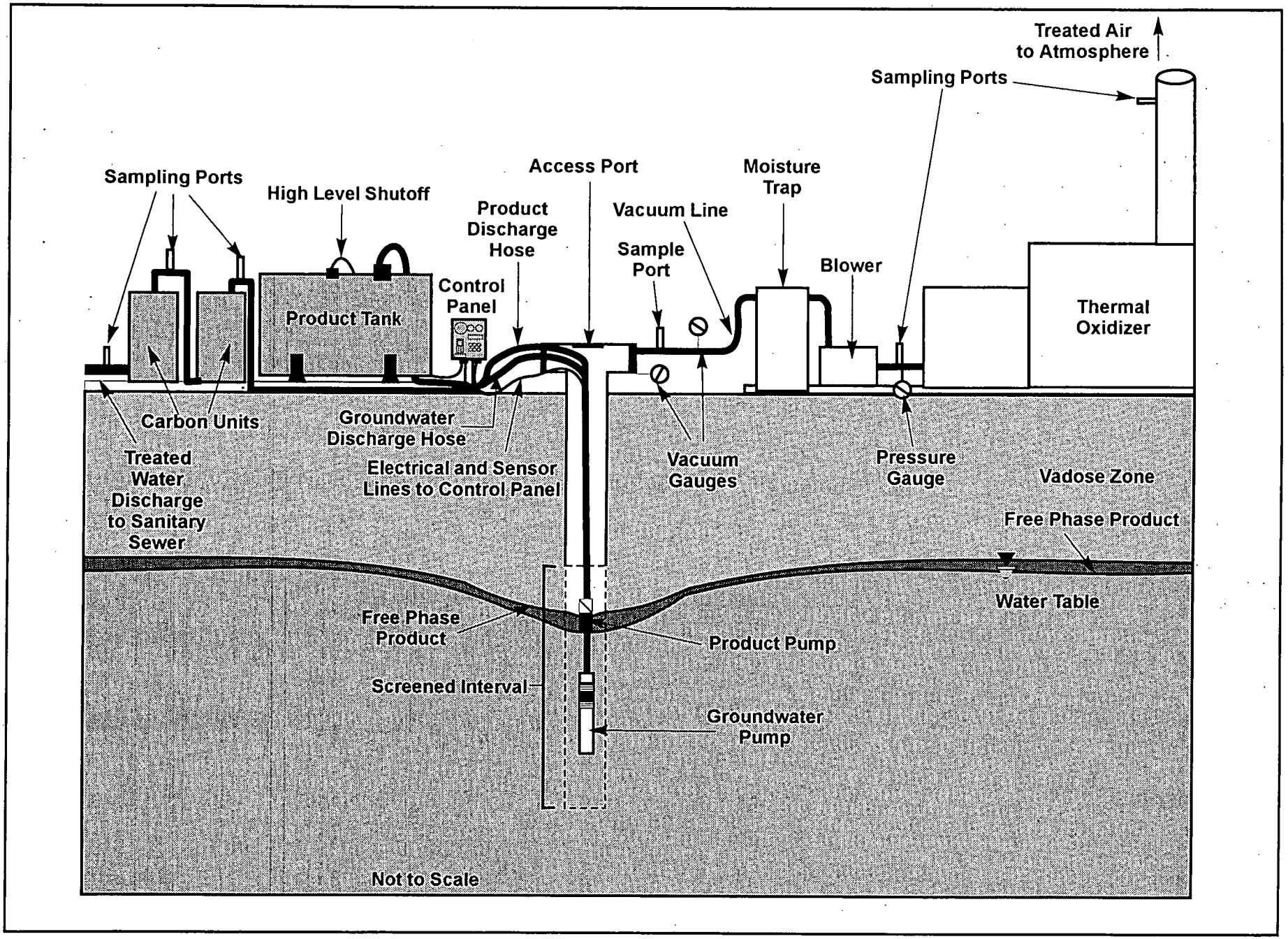
NAVY FUEL FARM FACILITY
NAVAL AIR STATION
WILLOW GROVE, PENNSYLVANIA

SITE PLAN

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
CR	TBL	CJV/PMH	CR	1"=150'	3-21-95	29600.09	2

Pilot Study Objectives

- Recover jet fuel
- Evaluate effectiveness of likely remedial options:
    - Vacuum enhanced recovery
    - Soil vapor extraction



Schematic of vacuum-enhanced free product recovery system installed at
Well NFFW-2R, Navy Fuel Farm facility, NAS Willow Grove, Horsham Township, Pennsylvania.

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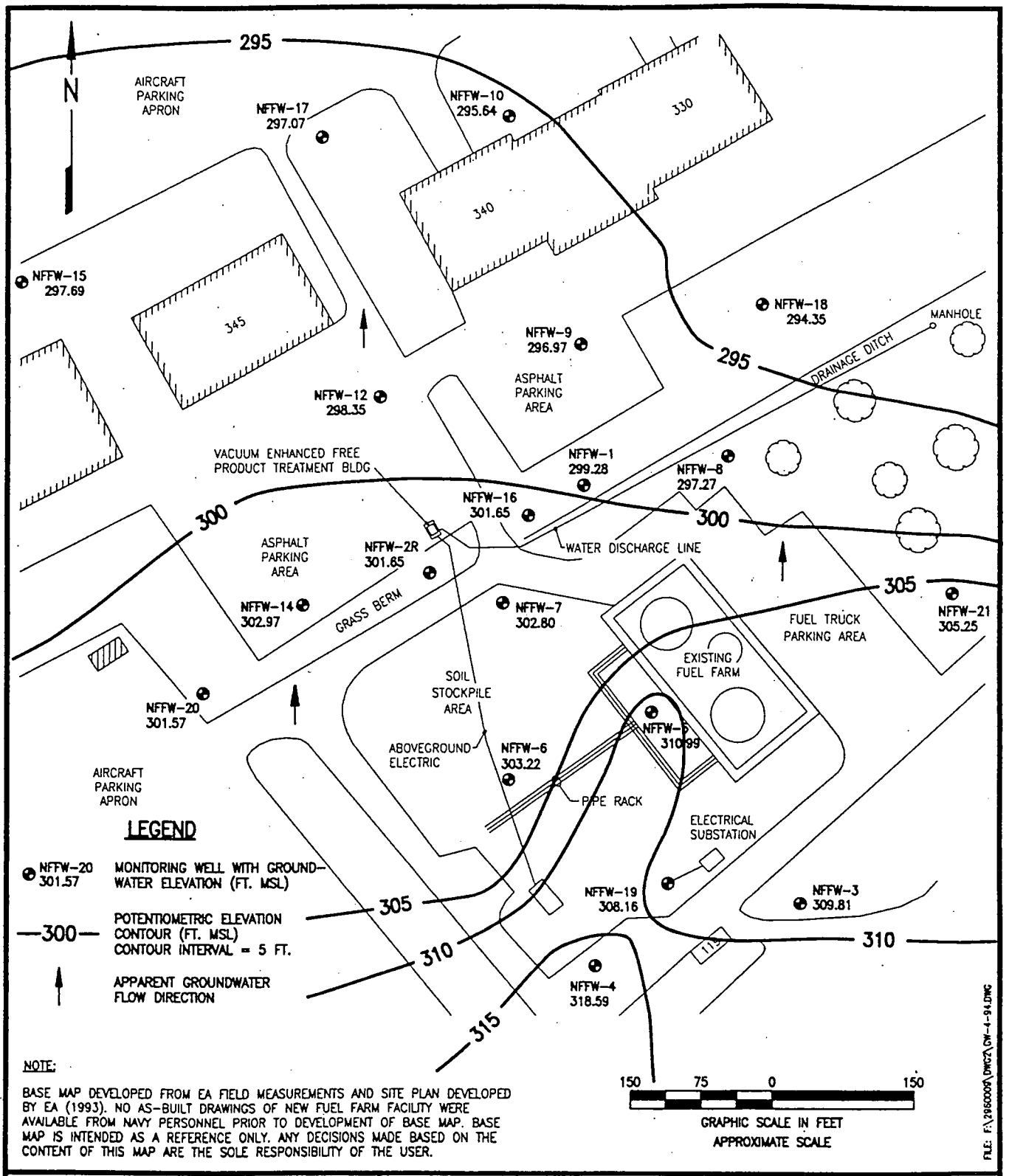
SUMMARY OF FREE PRODUCT RECOVERY

NAVY FUEL FARM FACILITY
NAVAL AIR STATION, WILLOW GROVE
HORSHAM TOWNSHIP, PENNSYLVANIA

Well No.	Cumulative Product Recovered (gal)*
NFFW-1	0.25
NFFW-2R	1427.02/400.83
NFFW-6	1.86
NFFW-7	2.00
NFFW-12	0.25
NFFW-14	67.29
NFFW-16	14.32
NFFW-19	0.00
NFFW-20	0.35
TOTAL	**1513.09/400.83**

Note: * Where two numbers appear (1312.75/378), the first number references product recovered as liquid-phase and the second number estimates the liquid equivalent of product recovered via vapor-phase during vacuum enhanced free product recovery. Vacuum enhanced free product recovery from well NFFW-2R began on 17 August 1995 and has been operated on an intermittent basis.



NOTE:

BASE MAP DEVELOPED FROM EA FIELD MEASUREMENTS AND SITE PLAN DEVELOPED BY EA (1993). NO AS-BUILT DRAWINGS OF NEW FUEL FARM FACILITY WERE AVAILABLE FROM NAVY PERSONNEL PRIOR TO DEVELOPMENT OF BASE MAP. BASE MAP IS INTENDED AS A REFERENCE ONLY. ANY DECISIONS MADE BASED ON THE CONTENT OF THIS MAP ARE THE SOLE RESPONSIBILITY OF THE USER.

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

NAVY FUEL FARM FACILITY
NAVAL AIR STATION
WILLOW GROVE, PENNSYLVANIA

POTENTIOMETRIC SURFACE
4 APRIL 1994

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
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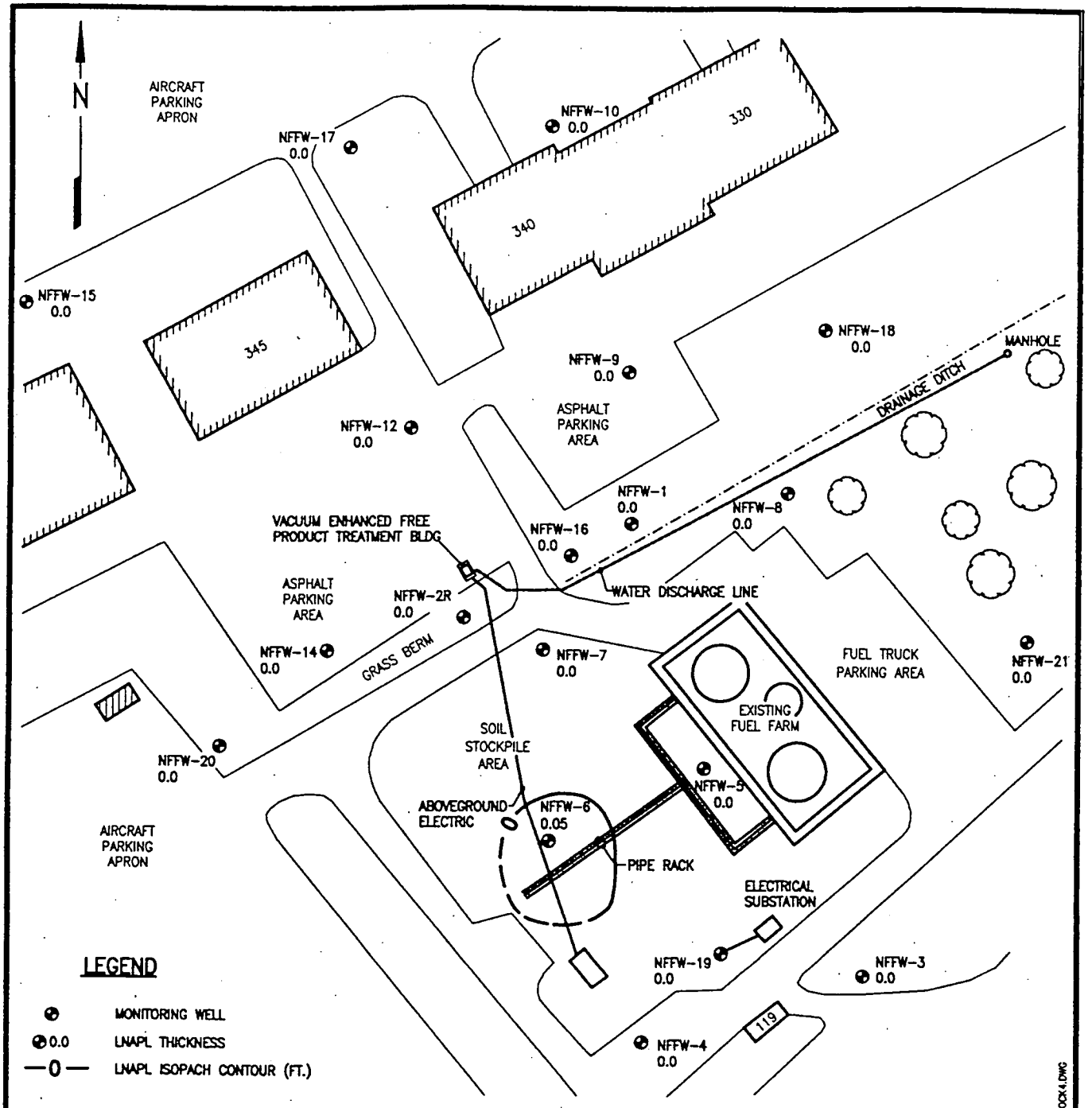

NOTE:

BASE MAP DEVELOPED FROM EA FIELD MEASUREMENTS AND SITE PLAN DEVELOPED BY EA (1993). NO AS-BUILT DRAWINGS OF NEW FUEL FARM FACILITY WERE AVAILABLE FROM NAVY PERSONNEL PRIOR TO DEVELOPMENT OF BASE MAP. BASE MAP IS INTENDED AS A REFERENCE ONLY. ANY DECISIONS MADE BASED ON THE CONTENT OF THIS MAP ARE THE SOLE RESPONSIBILITY OF THE USER.

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GRAPHIC SCALE IN FEET

APPROXIMATE SCALE

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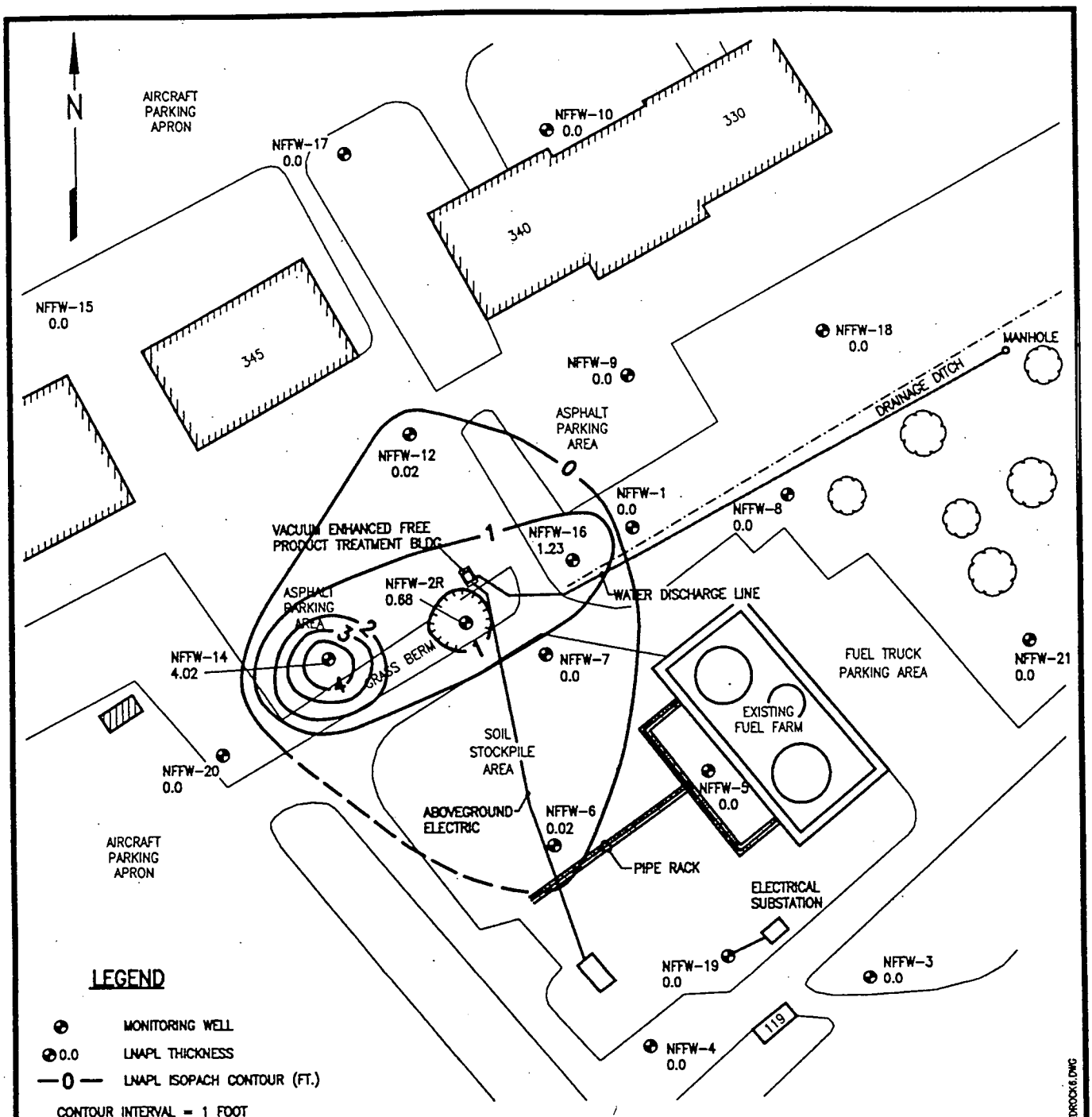
EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

NAVY FUEL FARM FACILITY
NAVAL AIR STATION
WILLOW GROVE, PENNSYLVANIA

ISOPACH MAP OF LNAPL MEASURED IN MONITORING WELLS
4 APRIL 1994

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
CR	TBL	AMPLS	CR	1"=150'	3-21-95	29600.09	12



EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.	NAVY FUEL FARM FACILITY NAVAL AIR STATION WILLOW GROVE, PENNSYLVANIA	ISOPACH MAP OF LNAPL MEASURED IN MONITORING WELLS 5 AUGUST 1994

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FIGURE
CR	TBL	CJV/PMH	CR	1"=150'	3-21-95	29600.09	11

Remedial Options

Option	Pros	Cons
Vacuum-Enhanced Recovery - all year	Separate phase product recovery maximized Vapor phase recovery maximized Fastest option Soil treatment inherent to process (volatilization and biodegradation) When water table falls below well, vapor phase recovery continues	Highest cost Vapor phase treatment required
Separate-Phase Jet Fuel Recovery with water table depression (no vacuum) - low ground-water flow	Cheapest option	Recovery conducted only during low water table conditions Longest recovery
Vacuum Enhanced Recovery when site conditions are favorable and using water table depression (no vacuum) with high ground-water flow when site conditions are unfavorable for vacuum enhanced recovery	Operates all year Soil treatment inherent to process (volatilization and biodegradation) When water table falls below well, vapor phase recovery continues	Vapor phase recovery only during periods of high water table

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Cost Comparison Summary - Remedial Alternatives

Option	Approximate Design Cost	Approximate Construction Cost	Approximate Operation and Maintenance Cost (Annual)
Vacuum-Enhanced Recovery - all year	$25,000-30,000	$320,000-510,000	$72,000-120,000
Separate-Phase Jet Fuel Recovery with water table depression (no vacuum) - low ground-water flow	$20,000-25,000	$250,000-420,000	$40,000-60,000
Vacuum Enhanced Recovery when site conditions are favorable and using water table depression (no vacuum) with high ground-water flow wh n site conditions are unfavorable for vacuum enhanced recovery	$25,000-30,000	$320,000-510,000	$55,000-65,000

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