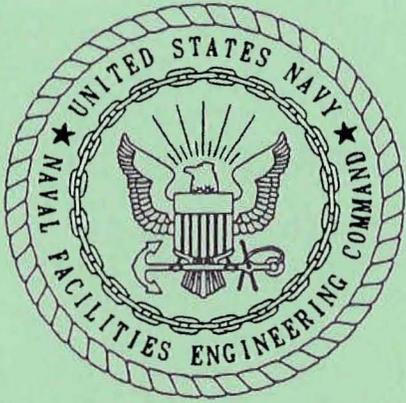


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FINAL DESIGN FOR SITE 5 BIOREMEDIATION NAS CECIL FIELD FL
4/1/1995
ABB ENVIRONMENTAL SERVICES



**FINAL DESIGN FOR
SITE 5 BIOREMEDIATION**

**NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA**

CONTRACT NO. N62467-89-D-0317/090

APRIL 1995



**SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA
29419-9010**

**FINAL DESIGN FOR
SITE 5 SOIL BIOREMEDIATION**

**NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA**

CONTRACT NO. N62467-89-D-0317/090

Prepared by:

**ABB Environmental Services, Inc.
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Tallahassee, Florida 32301**

Prepared for:

**Department of Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
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April 1995

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA
29419-9010

SPECIFICATION
NO. 18-89-0317

CONTRACT NO.
N62467-89-D-0317

APPROPRIATION:
ENVIR

SITE 5 SOIL BIOREMEDIATION

at the

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

DESIGN BY

ABB Environmental Services
2590 Executive Center Circle, East
Berkeley Building
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SUBMITTED BY

Robert C. Lunardini, Jr.
Robert C. Lunardini, Jr., P.E.

Richard D. May
Rich May
Deputy Program Manager
April 17, 1995

SPECIFICATION PREPARED BY

Maureen McGlone, P.E.
Environmental

J.O. No.: _____ W/R: _____ SEIC: _____ EIC: _____

APPROVED BY

EFD Specification
Branch Head: _____ Design Director: _____

For Commander, NAVFAC: _____ Date: _____



The engineering design and professional opinions rendered in the set of planning documents that describes the Site 5 Soil Bioremediation, NAS Cecil Field, Jacksonville, Florida, were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice. These planning documents are intended to be implemented by Southern Division, Naval Facilities Engineering Command's Response Action Contract (RAC) Contractor.

Robert C. Lunardini, Jr.

Professional Engineer No. 46657
Expires February 28, 1997

Robert C Lunardini Jr
17 Apr 95

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- 01300 SUBMITTALS
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- 02227 FREE PRODUCT REMOVAL

APPENDIX A

TREATMENT FACILITY STARTUP AND OPERATION AND MAINTENANCE

SPECIFICATION SECTIONS NOT INCLUDED

(assumed to be provided through the Response Action Contract Contractor's contract with Southern Division, Naval Facilities Engineering Command)

- 01025 MEASUREMENT AND PAYMENT
- 01041 PROJECT COORDINATION
- 01310 PROGRESS SCHEDULES
- 01400 QUALITY CONTROL
- 01500 CONSTRUCTION FACILITIES
- 01560 ENVIRONMENTAL PROTECTION
- 01700 PROJECT CLOSEOUT
- 02015 SUBSURFACE INFORMATION
- 02016 EXISTING UTILITIES AND UNDERGROUND STRUCTURES
- 02050 DEMOLITION AND REMOVAL
- 02057 EXCAVATED MATERIALS REMOVAL AND DISPOSAL
- 02102 CLEARING AND GRUBBING
- 02220 GENERAL EXCAVATION, FILLING, AND BACKFILLING
- 02229 VEHICLE AND EQUIPMENT DECONTAMINATION

13. 02220 GENERAL EXCAVATION, FILLING, AND BACKFILLING
14. 02229 VEHICLE AND EQUIPMENT DECONTAMINATION

1.3 SUBMITTALS

Not used.

1.4 MINIMUM INSURANCE REQUIREMENTS

Not used.

1.5 CONTRACTOR PERSONNEL REQUIREMENTS

Not used.

1.6 CONTRACTOR ACCESS AND USE OF PREMISES

Not used.

1.7 PRECONSTRUCTION CONFERENCE

Prior to commencement of any work at the site, meet with the Contracting Officer to discuss and develop a mutual understanding relative to the administration of the value engineering and safety program; preparation and submission of the schedule of prices, shop drawings, and other submittals; scheduling; programming; and prosecution of work. Major subcontractors who will be engaged in the work shall also attend.

1.7.1 Minimum Agenda

- a. Distribute and discuss.
 1. List of major subcontractors.
 2. Tentative construction schedules.
- b. Critical work sequencing.
- c. Relation and coordination of subcontractors.
- d. Designation of responsible personnel.
- e. Processing of field decisions and change orders.
- f. Submittal of shop drawings, project data, and samples.
- g. Use of premises:
 1. Office and storage areas.
 2. Owner's requirements.
- h. Payment and procurement of materials.
- i. Safety and first-aid procedures.
- j. Testing of materials.
- k. Estimates for partial payments.
- l. Environmental protection.

1.8 CONSTRUCTION SEQUENCE

The recommended construction sequence for this project is as follows:

- a. Clearing and grubbing of areas within designated limits of construction.
- b. Construction of the soil treatment facility.
- c. Construction of the soil stockpile area (if necessary).

manner described in the workplan prepared by BEI. All excavated materials shall be placed on the treatment pad as directed in the field by the Contracting Officer.

1.8.6 Treatment Facility Operation and Maintenance

Ex-situ bioremediation consists of creating optimal microbial conditions in excavated soil through the mechanical mixing of the soil and the addition of amendments. Soil shall be taken from the stockpile area and placed on the treatment pad as directed by the Contracting Officer. It is estimated that between 2,500 and 3,500 cubic yards (yds³) of soil can be treated in the treatment facility at one time. This corresponds to five treatment cycles. Operation and maintenance of the treatment facility is discussed further in the Operation and Maintenance Plan included as Appendix A to these specifications.

1.8.7 Site Restoration

Treated soil shall be used to backfill excavations and shall be compacted to 85 percent dry density. The site shall be graded to match existing contours. Provide 4 inches of topsoil for newly graded surfaces and areas disturbed by the Contractor. Seed shall match existing vegetation. Provide seed at 5 pounds per 1,000 square feet. Provide CID A-A-1909, Type I, Class 2, 10-10-10 analysis fertilizer at 25 pounds per 1,000 square feet. Provide commercial agricultural lime of 94-80-14 analysis at 70 pounds per 1,000 square feet. Provide mulch and water to establish an acceptable stand of grass.

--End of Section--

SECTION 01300

SUBMITTALS

04/15/95

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Submittal

Submittals are shop drawings, product data, samples, and administrative submittals presented for review and approval. Contract clauses "Material and Workmanship," paragraph (b) and "Specifications and Drawings for Construction," paragraphs (d), (e), and (f), apply to all "submittals."

1.1.2 Types of Submittals

The following four groupings of submittals into which all submittal descriptions are classified, are as designated in the paragraph entitled "Schedule of Submittal Descriptions."

- a. Shop drawings includes as used in this section, drawings, schedules, diagrams, and other data prepared specifically for this Contract, by the Contractor or through the Contractor by way of a subcontractor, manufacturer, supplier, distributor, or other lower tier contractor, to illustrate a portion of the work.
- b. Product data are preprinted material such as illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature, catalog data, and other data to illustrate a portion of the work, but not prepared exclusively for this Contract.
- c. Samples are physical examples of products, materials, equipment, assemblies, or workmanship that are physically identical to a portion of the work, illustrating a portion of the work, or establishing standards for evaluating the appearance of the finished work or both.
- d. Administrative submittals are data presented for reviews and approval to ensure that the administrative requirements of the project are adequately met but not to ensure directly that the work is in accordance with the design concept and in compliance with the Contract documents.

1.1.3 Approving Authority

The person authorized to approve a submittal.

- c. When acceptability of a submittal is dependent on conditions, items, or materials included in separate subsequent submittals, the submittal will be returned without review.
- d. Approval of a separate material, product, or component does not imply approval of the assembly in which the item functions.

1.3.3 Scheduling

- a. Coordinate scheduling, sequencing, preparing, and processing of submittals with performance of the work so that work will not be delayed by submittal processing. Allow for potential requirements to resubmit.
- b. Except as specified otherwise, allow a review period, beginning with receipt by the approving authority, that includes at least 15 working days for submittals for QC Manager approval and 25 working days for submittals for Contracting Officer approval. The period of review for submittals with Contracting Officer approval begins when the Government receives the submittal from the QC organization. The period of review for each resubmittal is the same as for the initial submittal.

1.3.4 Variations

Variations from contract requirements require Government approval pursuant to the contract clause entitled "Specifications and Drawings for Construction" and will be considered where advantageous to the Government. When proposing a variation, submit a written request to the Contracting Officer, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to the Government. If lower cost is a benefit, also include an estimate of the cost saving. Identify the proposed variation separately and include the documentation for the proposed variation along with the required submittal for the item. When submitting a variation for approval, the Contractor warrants the following.

1.3.4.1 Variation Is Compatible

The Contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of the work.

1.3.4.2 Contractor Is Responsible

The Contractor shall take actions and bear the additional costs, including review costs by the Government, necessary due to the proposed variation.

1.3.4.3 Review Schedule Is Modified

In addition to the normal submittal review period, a period of 15 working days will be allowed for consideration by the Government of submittals with variations.

- c. Review submittals for conformance with project design concepts and compliance with the Contract documents.
- d. Act on submittals, determining the appropriate action based on the QC organization's review of the submittal.
 - (1) When the QC Manager is the approving authority, take the appropriate action on the submittal from the possible actions defined in the paragraph entitled, "Actions Possible."
 - (2) When the Contracting Officer is the approving authority or when a variation has been proposed, forward the submittal to the Government with the certifying statement or return the submittal marked "not reviewed" or "revise and resubmit" as appropriate. The QC organization's review of the submittal determines the appropriate action.
- e. Ensure that material is clearly legible.
- f. Stamp each sheet of each submittal with the QC certifying statement or approving statement, except that data submitted in bound volume or on one sheet printed on two sides may be stamped on the front of the first sheet only.
 - (1) When the approving authority is the Contracting Officer, the QC organization will certify submittals forwarded to the Contracting Officer with the following certifying statement:

"I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is that proposed to be incorporated with Contract Number _____, is in compliance with the Contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval. Government approval of proposed variation, if any, is recommended.

Certified by Submittal Reviewer _____, Date _____ (Signature when applicable)

Certified by QC Manager _____, Date _____ (Signature)

- (2) When the approving authority is the QC Manager, the QC Manager will use the following approval statement when returning submittals to the Contractor as "Approved" or "Approved as Noted."

"I hereby certify that the (material) (equipment) (article) shown and marked in this submittal and proposed to be incorporated with Contract Number _____, is in compliance with the contract drawings and specification, can be installed in the allocated spaces, and is _____ approved for use, _____ approved for use subject to Government approval of proposed variation.

- b. Submittals marked "approved" or "approved as submitted" authorize the Contractor to proceed with the work covered.
- c. Submittals marked "approved as noted" or "approved except as noted; resubmission not required" authorize the Contractor to proceed with the work as noted provided the Contractor takes no exception to the notations.
- d. Submittals marked "revise and resubmit" or "disapproved" indicate the submittal is incomplete or does not comply with the design concept or the requirements of the Contract documents and shall be resubmitted with appropriate changes.

1.4 FORMAT OF SUBMITTALS

1.4.1 Transmittal Form

Transmit each submittal, except sample installations and sample panels, to the office of the approving authority. Transmit submittals with a transmittal form prescribed by the Contracting Officer and standard for the project. The transmittal form shall identify the Contractor, indicate the date of the submittal, and include information prescribed by the transmittal form and required in the paragraph entitled "Identifying Submittals." Process transmittal forms to record actions regarding sample panels and sample installations.

1.4.2 Identifying Submittals

Identify submittals, except sample panel and sample installation, with the following information permanently adhered to or noted on each separate component of each submittal and noted on the transmittal form. Mark each copy of each submittal identically, with the following:

- a. project title and location;
- b. construction Contract number;
- c. the Section number of the specification Section by which the submittal is required;
- d. the submittal description (SD) number of each component of the submittal;
- e. when a resubmission, an alphabetic suffix on the submittal description, for example, SD-10A, to indicate the resubmission;
- f. the name, address, and telephone number of the subcontractor, supplier, manufacturer, and any other second tier contractor associated with the submittal; and
- g. product identification and location in project.

- (7) Sample panel: 4 feet by 4 feet.
- (8) Sample installation: 100 square feet.
- b. Samples showing range of variation: Where variations are unavoidable due to the nature of the materials, submit sets of samples of not less than three units showing the extremes and middle of the range.
- c. Reusable samples: Incorporate returned samples into the work only if so specified or indicated. Incorporated samples shall be in undamaged condition at the time of use.
- d. Recording of sample installation: Note and preserve the notation of the area constituting the sample installation but remove the notation at the final clean up of the project.

1.4.6 Format of Administrative Closeout Submittals

- a. When the submittal includes a document that is to be used in the project or become a part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document, but to a separate sheet accompanying the document.

1.5 QUANTITY OF SUBMITTALS

1.5.1 Number of Copies of Product Data

- a. Submit three copies of submittals of product data requiring review and approval only by the QC organization and three copies of product data requiring review and approval by the Contracting Officer.

1.5.2 Number of Copies of Shop Drawings

- a. For shop drawings presented on sheets larger than 8 1/2-inches by 14 inches, submit one reproducible and three prints of each shop drawing prepared for this project.
 - (1) Transmit reproducibles rolled in mailing tubes.
 - (2) After review, the approving authority will retain the prints and return only the reproducible with notations resulting from the review.
- b. For shop drawings presented on sheets 8 1/2-inches by 14 inches or less, conform to the quantity requirements for product data.

1.5.3 Number of Samples

- a. Submit two samples, or two sets of samples showing range of variation, of each required item. One approved sample or set of samples will be retained by the approving authority and one will be returned to the Contractor.

SD-07, Schedules

A tabular list of data or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work. A type of shop drawing.

SD-08, Statements

A document, required of the Contractor, or through the Contractor by way of a supplier, installer, manufacturer, or other lower tier contractor, the purpose of which is to further the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, or qualifications or other verification of quality. A type of shop drawing.

SD-09, Reports

Reports of inspection and laboratory test, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

SD-10, Test Reports

A report signed by an authorized official of a testing laboratory that a material, product, or system identical to the material, product, or system to be provided has been tested in accordance with requirements specified by naming the test method and material. The test report must state the test was performed in accordance with the test requirements, state the test results, and indicate whether the material, product, or system has passed or failed the test. Testing must have been within 3 years of the date of award of this Contract. A type of product data.

SD-11, Factory Test Reports

A written report that includes the findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for this project before it is shipped to the job site. The report must be signed by an authorized official of a testing laboratory and must state the test was performed in accordance with the test requirements; state the test results, and indicate whether the material, product, or system has passed or failed the test. A type of shop drawing.

SD-12, Field Test Reports

A written report that includes the findings of a test made at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, or during or after installation. The report must be signed by an authorized official of a testing laboratory or agency and must state the test was performed in accordance with the test requirements, state the test results, and indicate whether the material, product, or system has passed or failed the test. A type of shop drawing.

NAVFAC 11013/13

Page ____ of ____

SUBMITTAL REGISTER (PART A)

Contract Number:		Project Title:				
Spec Section No.	SD No. and Type of Submittal MATERIAL OR PRODUCT	Spec Para No.	Classif/ Appr By CO	Gov't or A/E Reviewer	Trans Control No.	Planned Submittal Date
(a)	(b)	(c)	(d)	(e)	(f)	(g)
1) 01300	SD-18 Submittal Register	1.2.1	G			
2) 01410	SD-18 Sampling and Analysis Plan	1.3	G			
3) 01410	SD-18 Analytical Test Results	1.3	G			
4) 02227	SD-01 HDPE Liner	1.3	G			
5) 02227	SD-09 Drainage Sand Layer	1.3	G			
6) 02227	SD-09 Buffer Layer	1.3	G			
7) 02227	SD-09 HDPE Liner	1.3	G			
8) 02227	SD-13 HDPE Liner Certificate	1.3	G			
9) 02227	SD-09 Laboratory Grain Size Results	1.3.1	G			
10) 02227	SD-09 Laboratory Moisture Density Relationship Test	1.3.1	G			
11) 02227	SD-09 Laboratory Permeability Test Results	1.3.1	G			
12) 02227	SD-09 Field Grain Size Results	1.3.1	G			
13) 02227	SD-09 Field Moisture Density Test Results	1.3.1	G			
14) 02227	SD-09 Field Permeability Test Results	1.3.1	G			
15) 02227	SD-09 Field Density and Moisture Content Test Results	1.3.1	G			
16) 02227	SD-09 Laboratory Quality Assurance Test on HDPE Liner	1.3.1	G			
17) 02227	SD-09 Field Quality Assurance Test on HDPE Liner	1.3.1	G			
18) 02248	SD-01 Drainage Composite	1.3	G			
19) 02248	SD-01 HDPE Liner	1.3	G			
20) 02248	SD-01 Geotextile Filter Fabric	1.3	G			
21) 02248	SD-01 Storage Tank	1.3	G			
22) 02248	SD-01 PVC Pipe	1.3	G			
23) 02248	SD-01 Precast Concrete Manhole	1.3	G			
24) 02248	SD-01 Water Distribution System	1.3	G			
25) 02248	SD-01 Sump Pump	1.3	G			
26) 02248	SD-01 Soil Stockpile Liner and Cover Material	1.3	G			

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Page ____ of ____

SUBMITTAL REGISTER (PART A)

Contract Number:		Project Title:				
Spec Section No.	SD No. and Type of Submittal MATERIAL OR PRODUCT	Spec Para No.	Classif/ Appr By CO	Gov't or A/E Reviewer	Trans Control No.	Planned Submittal Date
(a)	(b)	(c)	(d)	(e)	(f)	(g)
51) APP. A	SD-13 Agricultural Lime Formulation	2.1	G			
52) APP. A	SD-13 Fertilizer Formulation	2.2	G			
53) APP. A	SD-13 Manure Type	2.3	G			
54) APP. A	SD-02 Gas Analysis Equipment	3.1	G			
55) APP. A	SD-02 Soil Moisture Probe	3.2	G			
56) APP. A	SD-02 Watering Equipment	3.2.1	G			

*Navy Notes:
Approved by:
G: Contracting Officer
Blank: CQC Manager

*NASA Notes:
Approved by:
Blank: Contracting Officer

*Army Notes:
Classification:
GA: Gov't Approval
FIO: for Information Only

SECTION 01410

CONFIRMATORY SAMPLING

04/15/95

PART 1 GENERAL

1.1 SUMMARY

This section covers the Contractor's requirements for sampling and analysis during excavation activities. All activities conducted under this section shall be in accordance with the Contractor's approved Site Safety and Health Plan (SSHP).

Sampling is required for the following:

- a. free product saturated soil.
- b. free product,
- c. total recoverable petroleum hydrocarbon (TRPH) contaminated soil, and
- d. post excavation risk assessment.

1.2 REFERENCES

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR 261 Representative Sampling Methods
Appendix I

40 CFR 761.60-.79 Toxic Substances Control Act

U.S. ENVIRONMENTAL PROTECTION AGENCY (USEPA)

EPA/600/8-89/046 Soil Sampling Quality Assurance User Guide (Second Edition)

EPA/548/G-89/004 Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA

SW-846 Test Methods for Evaluating Solid Waste
Physical/Chemical Methods, 3rd edition, November 1986, Revised December 1987 and December 1988

EPA/600/4-79-20 Methods for Chemical Analysis of Water and Wastes, Revised March 1983

EPA/600/4-84-076 Characterization of Hazardous Waste Sites, A Method Manual: Volume II. Available Sampling Methods, Second Edition, December 1984, NTIS No. PB85-168771.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 SAMPLING REQUIREMENTS

3.1.1 Documentation

Maintain a permanently bound field notebook onsite consisting of the date and time each sample was collected, sample identification, sample location (written description and map), depth of sample, name of sampling personnel, preservation method, type of analyses requested, and name of laboratory to perform analyses. A chain of custody and analysis request form shall be completed for each sample submitted for chemical analysis.

3.1.2 Free Product Saturated Soil

The Contractor shall collect one composite soil sample per drainage pad lift. Samples collected shall be sent to an NEESA-certified laboratory for confirmatory analysis. These samples shall be analyzed for polychlorinated biphenyls (PCBs) using USEPA SW-846 Method 8080. The Contractor shall request 24- or 48-hour turnaround for the laboratory samples. Analytical results shall dictate final disposal of soil as follows:

PCBs <1 ppm	Site 5 Soil Bioremediation
PCBs >1 ppm but <50 ppm	TSCA Chemical Waste Landfill per 40 CFR 761.75
PCBs >50 ppm but <500 ppm	Incinerate per 40 CFR 761.70
PCBs >500 ppm	Incinerate per 40 CFR 761.70

PCBs are defined as the sum of all Aroclors.

The Contractor shall also fulfill any other analytical requirements the approved disposal facility may have.

3.1.3 Free Product

Liquid wastes and free product shall be collected and drummed. The liquid waste and free product shall be incinerated per 40 CFR 761.75. The Contractor may manifest the drummed liquids based on knowledge of the waste or, if required, the Contractor shall sample liquids and free product to meet the analytical requirements of the disposal facility. The disposal facility analytical requirements shall be included in the Contractor prepared Sampling and Analysis Plan.

3.2.2 Sediment Sampling

A total of two (2) sediment samples from the drainage ditch south of the excavation area will be collected to establish whether overland contaminant transport has occurred. One sample will be collected adjacent to the site, and one sample shall be collected downgradient from the site.

3.2.3 Surface Soil Sampling

A total of six (6) surface soil samples shall be collected. Two (2) samples shall be collected from the truck loading area, two (2) samples shall be taken from the perimeter of the excavation, and two (2) samples shall be taken from locations topographically downgradient of the excavation. Surface soil samples shall be taken from 0 to 6 inches bls.

--End of Section--

SECTION 02227

FREE PRODUCT REMOVAL
04/15/95

PART 1 GENERAL

1.1 SUMMARY

This section covers the Contractor's requirements for the handling of free product and free product contaminated soil. A drainage pad shall be constructed as shown on the Drawings to separate free product from saturated, contaminated soil. Activities conducted under this section shall be in accordance with the Contractor's approved Site Safety and Health Plan (SSHP).

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. For all test methods, the most recent revision applies.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 638	1989 Test Method for Tensile Properties of Plastics
ASTM D 1004	1966 (R 1988) Test Method for Initial Tear Resistance of Plastic Film and Sheeting
ASTM D 1505	1985 Test Method for Density of Plastics by the Density-Gradient Method
ASTM D 1556	1986 Test Method for Density of Soil In Place by the Sand Cone Method
ASTM D 1557	1991 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb f/ft ³ (2,700 kN-m/m ³))
ASTM D 1621	1979 Test Method for Compressive Properties of Rigid Cellular Plastics
ASTM D 2167	1984 Test Method for Density and Unit Weight of Soil In Place by the Rubber Balloon Method
ASTM D 2434	1968 (R 1974) Test Method for Permeability of Granular Soils (Constant Head)

The following shall be submitted in accordance with Section 01300, "Submittals":

SD-01, Data; G

Manufacturer's Catalog Data

- a. High Density Polyethylene (HDPE) Liner

SD-09, Reports; G

- a. Drainage Sand Layer
- b. Buffer Layer
- c. HDPE Liner

SD-13, Certificates; G

- a. HDPE Liner

1.3.1 Reports

Laboratory test results of the soil materials proposed for the work:

- a. Grain size analytical results (ASTM C 117, C 136) for drainage sand layer and buffer layer, including percent passing information for each sieve designation and grain size curve.
- b. Moisture-density relationship test (ASTM D 1557) results for drainage sand layer and buffer layer, including density versus moisture content curve.
- c. Permeability test results (ASTM D 2434) for drainage sand layer and buffer layer, including graph of density versus permeability.

Test results shall be submitted by the Contractor prior to earthwork operations involving material from the source being tested.

During construction, submit copies of the following field test reports:

- a. Grain size analytical results including percent passing information for each sieve designation and grain size curve.
- b. Moisture density relationship test results (when test is required), including density versus moisture content curve.
- c. Permeability test results, if additional testing is required.
- d. Field density and moisture content test results (ASTM D 2922, D 3017, ASTM D 1556, or ASTM D 2167).
- e. Field and laboratory quality assurance testing performed on the HDPE liner.

1.4 DELIVERY, STORAGE, AND HANDLING

Perform in a manner to keep materials segregated and, thus, prevent cross contamination of materials.

3.2 DRAINAGE PAD CONSTRUCTION

The drainage pad consists of a 15 feet by 15 feet lined pad with 12 inches of drainage layer material on top of the liner. The lined pad shall be sloped to a collection trench that shall transport drained liquids to a collection sump. Construction of the drainage pad shall be as shown on the Drawings and shall be placed in the vicinity of the free product removal area. The pad shall be located to allow placement of excavated, saturated soil without requiring equipment to travel across the site.

Soil stockpiled on the pad shall be covered by a 20-mil polyethylene sheet at all times; the soil shall be placed to promote positive drainage off of the cover. The cover shall be secured with sandbags to maintain the integrity of the cover and to prevent ripping, blowing, etc.

3.4 FREE PRODUCT REMOVAL

Excavated soil saturated with free product shall be placed on the drainage pad.

3.4.1 Free Product Disposal

Any liquid recovered from the sump of the drainage pad shall be pumped into Department of Transportation (DOT)-approved containers, manifested, and disposed as required in Section 01410, "Confirmatory Sampling."

3.4.2 PCB-Contaminated Soil

Soil placed on the pad shall be allowed to drain for a minimum of 24 hours, but may drain longer if deemed necessary by the Contracting Officer. This soil shall be sampled and disposed as required in Section 01410, "Confirmatory Sampling."

3.4.3 Non-PCB-Contaminated Soil

Soil that is determined to contain PCB concentrations less than 1 mg/kg shall be removed from the drainage pad and placed in the soil stockpile area.

-- End of Section --

SECTION 02248

SOIL TREATMENT FACILITY

04/15/95

PART 1 GENERAL

1.1 SUMMARY

This section covers the Contractor's requirements for construction of a Soil Treatment Facility (STF) to be used for remediation of contaminated soil at Site 5. The STF will not be enclosed and shall consist of a bermed, lined treatment pad as shown on the Drawings. Activities conducted under this section shall be in accordance with the Contractor's Site Safety and Health Plan (SSHP), which was approved under a previous contract.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only. For all test methods, the most recent revision applies.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A-48	1993a Gray Iron Castings
ASTM C 32	1993 Sewer and Manhole Brick
ASTM C 33	1990 Concrete Aggregates
ASTM C 117	1987 Test Method for Material Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 136	1984 (Rev. A) Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 150	1989 Portland Cement
ASTM C 207	1988 Hydrated Lime for Masonry Purposes
ASTM C 478	1993 Precast Reinforced Concrete Manhole Sections
ASTM D 246	1989 Method for Distillation of Creosote and Creosote Coal Tar Solutions
ASTM D 413	1982 (R 1988) Test Methods for Rubber Property-Adhesion to Flexible Substrate
ASTM D 638	1989 Test Method for Tensile Properties of Plastics

- ASTM D 4491 1989 Test Methods for Water Permeability of Geotextiles by Permittivity
- ASTM D 4533 1985 Test Method for Trapezoidal Tearing Strength of Geotextiles
- ASTM D 4595 1986 (R 1991) Determining the Integrity of Factory Seams Used in Joining Manufactured Flexible Sheet Geomembranes
- ASTM D 4632 1986 Test Method for Breaking Load and Elongation of Geotextiles (Grab Method)
- ASTM D 4751 1987 Test Method for Determining the Apparent Opening Size of a Geotextile
- ASTM D 4716 1987 Test Method for Constant Head Hydraulic Transmittivity (In-Plane Flow) of Geotextiles and Geotextile Related Products
- ASTM D 4718 1987 Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
- ASTM D 4833 1988 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
- ASTM F 679 1989 Specification for Polyvinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
- ASTM F 789 1989 Specification for Type PS-46 Polyvinyl Chloride (PVC) Plastic Gravity Flow Sewer Pipe and Fittings

U.S. ARMY CORPS OF ENGINEERS (COE)

- EM 385-1-1 (October 1992) Safety and Health Requirements Manual

FLORIDA DEPARTMENT OF TRANSPORTATION (DOT)

- DOT SS-1 Road and Bridge Construction, 1991.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals having an "FIO" designation are for information only.

Test results shall be submitted by the Contractor prior to earthwork operations involving material from the source being tested.

During construction, submit copies of the following field test reports:

- a. Grain size analytical results including percent passing information for each sieve designation and grain size curve.
- b. Moisture density relationship test results (when test is required), including density versus moisture content curve.
- c. Permeability test results, if additional testing is required.
- d. Field density and moisture content test results (ASTM D 2922, D 3017, ASTM D 1556, or ASTM D 2167).
- e. Field and laboratory quality assurance testing performed on the HDPE liner.

1.4 DELIVERY, STORAGE, AND HANDLING

Perform in a manner to keep materials segregated and thus prevent cross contamination of materials.

1.5 CRITERIA FOR ESTIMATING

Assume the following criteria:

- a. A field survey shall be conducted prior to construction of the STF to document existing conditions and after construction to document as-built conditions.

1.6 QUALITY ASSURANCE AND QUALITY CONTROL

1.6.1 Codes and Standards

Perform any excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

2.1.1 Sources

Material for the construction of all fills may be obtained from a borrow source on NAS Cecil Field or, as necessary, from offsite borrow sources to comply with specifications. The Contractor must coordinate with the Contracting Officer prior to the use of any NAS Cecil Field borrow material. The Contracting Officer's representative shall be the sole judge of the suitability of any material for use as a fill material regardless of its source.

Material excavated as part of the STF construction may be used as fill material for the STF. This material shall be screened to the gradation

2.1.5 Preconstruction Phase Soil Borrow Source Testing

Soil shall be tested for compliance with specifications prior to removal from borrow sources and placement at the STF. The testing requirements for each material are as follows:

Soil Material	MINIMUM TESTING FREQUENCY		
	Gradation (ASTM C-117, C-136)	Moisture-Density (ASTM D 1557)	Remolded Permeability (ASTM D 2434)
Drainage Sand Layer	1 test per material	1 test per material	1 test per material ¹
Buffer Layer	1 test per material	1 test per material	NR ²
Drainage Stone	1 test per material	NR	NR

¹ Tests shall be conducted at 85, 90, and 95 percent of maximum dry density (ASTM D 1557) so as to determine the range in density that produces the required permeability.
² Not required.

2.1.6 Construction Phase Soil Borrow Source Testing

Collect soil samples at the borrow source(s) and test for specification compliance according to the following schedule:

Soil Material	MINIMUM TESTING FREQUENCY		
	Gradation (ASTM C-117, C-136)	Moisture-Density (ASTM D 1557)	Remolded Permeability (ASTM D 2434)
Drainage Sand Layer	1/2,000 yd ³	1 test per change in gradation	1 test per change in gradation and/or moisture and density
Buffer Layer	1 test	1 test per change in gradation	NR
Drainage Stone	1 test	NR	NR

Notes: yd³ = cubic yards.
 NR = not required.

2.2.2 Extrusion Joining Resin

Extrusion joining resin shall be produced from the same material as the sheet resin. Physical properties shall be the same as those of the resin used in the manufacture of the liner.

2.2.3 Other Materials

Pipe boots, patches, etc., shall be the same material as the membrane or a compatible, approved equal.

2.2.4 Mechanical Fastenings

Mechanical fastenings shall be of the material, size, and type detailed on the approved Shop Drawings.

2.3 DRAINAGE COMPOSITE

Drainage composite shall consist of a prefabricated polystyrene core with an attached polypropylene woven geotextile. The material shall exhibit the following physical characteristics:

PROPERTY	UNIT	MINIMUM VALUES	TEST METHOD
Composite System			
In Plane Flow Rate, Gradient, 0.1 Pressure, 14.5 psi	gpm/ft width	5	ASTM D 4716
Thickness	mils	405	ASTM D 1777
Weight	oz/ft ²	3.3	ASTM D 3776
Woven Geotextile			
Grab Tensile Strength	lb	250	ASTM D 4632
Water Flow Rate	gpm/ft ²	25	ASTM D 4491
Apparent Opening Size	U.S. Standard Sieve	70 to 100	ASTM D 4751
Weight	oz/yd ²	6.5	ASTM D 3776
Core, Net, and Mesh			
Weight	oz/ft ²	2.6	ASTM D 3776
Thickness	mils	260	ASTM D 5199
Compressive Strength at Yield	psi	145	ASTM D 1621
Notes: psi = pounds per square inch. lb = pound. gpm/ft gallons per minute per foot. oz/yd ² = ounces per square yard. oz/ft ² = ounces per square foot. gpm/ft ² = gallons per minute per square foot. ASTM = American Society for Testing and Materials.			

2.5.1.1 Construction Requirements

The PVC pipe shall be suitable for use as a gravity drainage conduit. Standard installation lengths shall be 20 feet or 10 feet. Perforated pipe shall be installed with perforated side facing down. The Contractor shall provide for contraction and expansion at each joint with a rubber ring. The bell shall consist of an integral wall section with a solid cross-sectional rubber ring, factory assembled, securely locked in place to prevent displacement during assembly.

2.5.1.2 Fittings

Fittings shall be manufactured and furnished by the pipe supplier or approved equal having bell and spigot configurations compatible with that of the pipe. Fittings shall be of the same strength and quality as the pipe. Minimum "pipe stiffness" (F/AY) shall be 46 pounds per square inch gauge (psig) for all sizes when tested in accordance with ASTM D-2412, "External Loadings Properties of Plastic Pipe by Parallel-Plate Loadings." Pipe bedding shall consist of Buffer Layer, as specified in this section, in the zone 6 inches around the solid PVC pipe. Drainage stone, as specified in this section, shall be used to fill the collection trench and shall be used as pipe bedding in the zone 2 inches (minimum) around the pipe.

2.5.2 Precast Concrete Manhole

The precast concrete manhole shall consist of reinforced concrete riser sections, an eccentric or concentric top, and a monolithic base section conforming with the dimensions indicated on the Drawings, and shall be manufactured in accordance with ASTM C 478-89. The minimum compressive strength of the concrete shall be 4,000 psi. The circumferential steel reinforcement for riser pipe, cone sections, and base walls shall be 0.12 square inch per linear foot. Reinforcing shall extend into the tongue and groove of each manhole section wall. Casting methods must assure each unit to be very dense in structure and impervious to water.

A hole shall be cast in the base section for the 4-inch pipe so that there is a clear distance as shown on the Drawings between the inside bottom of the base section and the pipe invert. The tongue and groove shall be formed of concrete so as to receive gaskets. Sections shall be set so as to be vertical and in true alignment. The pipe to manhole joint shall be a rubber boot either cast-in-place or press-wedged in place, or otherwise must be approved by the Contracting Officer's representative. All precast sections and base shall have the date of manufacture and the name or trademark of the manufacturer impressed or indelibly marked on the inside wall.

Manhole steps shall be 1/2 inch steel reinforced polypropylene plastic manufactured to ASTM D 246-89 Type II grade 16906 and ASTM C 478-89 standards. The steps shall be cast into walls of the precast section so as to form a continuous ladder with a distance of 12 inches between steps. Provide 2 holes for the purpose of handling and laying. These

2.5.3 Sump Pump

Provide a pump that will meet the following criteria:

- a. Pumping rate of 75 gallons per minute at 35 feet total dynamic head (TDH).
- b. Cast iron construction with stainless-steel hardware and accessories compatible with contaminants of concern.
- c. Mechanical seal with stainless steel, Buna N, and carbon and ceramic parts compatible with contaminants of concern.
- d. 2-inch inlet and 3-inch National Pipe Thread (NPT) discharge.
- e. Non-clogging vortex impeller that passes 2-inch spherical solids.
- f. 1 Hp, 230 volt, hermetically sealed, oil filled, single-phase motors.
- g. Automatic-reset thermal overload protection.
- h. UL- and CSA-Listed.
- i. Pump and all associated electrical components shall be explosion proof.

2.6 WATER STORAGE SYSTEM

Provide a temporary water-holding facility consisting of three onsite portable storage tanks with a minimum capacity of 20,000 gallons each. Inlet to storage tanks shall be fitted to accept discharge from sump or truck. Influent pipe from each source shall have a check valve and an easily accessible shut-off valve. Tanks shall be manifolded together.

2.7 WATER DISTRIBUTION SYSTEM

The water distribution system shall include 3-inch diameter HDPE piping as shown on Drawing P-1. The piping shall terminate at locations inside the treatment pad area with quick disconnect couplings sized as required to accommodate the water hose reel. Water will be supplied with a portable large diameter hose and reel such as the Reel Rain as Manufactured by Amadas or approved equal.

All piping connected to the water storage tanks shall be flexible to minimize leaking of storage water due to tank settlement.

Piping and sprinklers are required to deliver water to the windrows at a minimum rate of 0.5 inches per hour. The centrifugal pump must be capable of delivering water through the piping at an inlet pressure of 70 psi and a flow rate of 45 gpm. Each sprinkler shall have a minimum coverage width of 80 feet.

2.8 SOIL STOCKPILE LINER AND COVER MATERIAL

The soil stockpile area shall be underlain and covered with sheets of 6-mil polyethylene. The material shall be installed according to manufacturer's specifications.

ground pressure placement equipment (contact pressure less than 5 psi) to place drainage sand layer. A minimum 12-inch buffer (1 lift) must be placed above the drainage composite prior to allowing low ground pressure construction equipment traffic. Routine construction equipment may traffic the drainage sand layer after a minimum of 2 feet has been placed.

3.3.2.4 Lift Thicknesses

Place fill materials in loose lifts of the following maximum thicknesses.

- a. Buffer Layer: 6 inches.
- b. Drainage Sand Layer: 12 inches.
- c. Drainage Stone: 6 inches.

3.3.3 Compaction

Compaction shall be expressed as a percentage of maximum density (ASTM D 1557). Control soil compaction during construction to meet required percent maximum dry density for each soil and condition.

3.3.3.1 Moisture Requirements

Provide moisture control to the extent that the soil mix remains in a workable state during placement. Where a layer of soil material must be moisture-conditioned before compaction, uniformly apply water to the surface of the layer of soil material at such a rate as to avoid free water from appearing on the surface during or subsequent to compaction operations.

Remove, or scarify and air dry, soil material that is too wet to permit compaction to the specified density. Excessively wet soil that has been removed may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing, or pulverizing until the moisture content is reduced to a satisfactory value as determined by moisture-density relation tests.

3.3.3.2 Compaction Requirements

Material shall be spread with bulldozer, other approved equipment, or by hand to form uniformly loose layers not greater than the thickness specified. Each layer of fill shall be compacted using a vibratory roller or hand-operated vibrating plate compactor or similar equipment, where necessary. Material compaction shall be expressed as a percent of maximum dry density (ASTM D-1557). Material compaction requirements are as follows.

- a. Drainage Sand Layer: Compact to an in-place density such that the sand meets the minimum permeability requirements of 5×10^{-3} cm/sec.
The compaction requirements will be established from the results of the pre-construction phase soil borrow source testing.
- b. Buffer Layer: Compact to 90 percent of maximum dry density.

3.3.6.1 Test Welds

Test welds shall be run from each seaming machine a minimum of 3 times per day or whenever a new operator takes over.

3.3.6.2 Vacuum Test

Perform vacuum tests using a vacuum box or other approved vacuum method along all extrusion bonds. Repair and retest structural faults in the seams.

3.3.6.3 Air Test

Perform air testing on all dual hot wedge fusion seams. Any leaks found shall be repaired by extrusion welding and shall be 100 percent vacuum tested.

3.3.6.4 Destructive Testing

Take random weld samples from in place liner at a frequency of 1 per 600 feet of welded seam. The test strip shall be cut into three 14-inch coupons and the following tests performed:

- a. visually inspect for holes, blemishes, or other detrimental defects;
- b. five field shear and peel tests according to ASTM D 4437; and
- c. five shear and peel tests (ASTM D 4437) by an independent laboratory.

3.3.7 Water Collection System

3.3.7.1 PVC Pipe

Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in this section. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material that does not provide firm and uniform bearing along the outside length of the pipe. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts to the required grade, without high spots. Do not drive the pipe down to grade by striking it with a shovel handle, timber, hammer, or any other unyielding object. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawings. Take all necessary precautions to prevent flotation of the pipe in the trench.

Connect pipe in accordance with the latest manufacturer's instructions and recommendations. Clear each pipe length, coupling, and fitting of

3.10 SOIL STOCKPILE AREA CONSTRUCTION

The soil stockpile area (if necessary) shall be as shown on the Drawings. A layer of 6-mil plastic shall be placed on top of surface contaminated soil. A berm shall be constructed on the outer edge of the plastic to contain excavated soil. Soil stockpiled on the pad shall be covered with 6-mil plastic and tied down at all times as shown on the Drawings. The soil shall be stockpiled to promote positive drainage off the cover, eliminating the need for a sump.

-- End of Section --

APPENDIX A
OPERATIONS AND MAINTENANCE

OPERATIONS AND MAINTENANCE

This section describes the activities required to operate the Biological Treatment system at Operable Unit 2, Site 5. Specific elements that are discussed include:

- Section 1, Windrow Construction;
- Section 2, Amendment Application;
- Section 3, Process Monitoring;
- Section 4, Water Storage and Management;
- Section 5, Sampling and Analysis; and
- Section 6, Communication.

1.0 WINDROW CONSTRUCTION

Windrows shall be constructed as follows:

- dimensions: 20 feet by 350 feet by 7 feet,
- Number windrows: three, and
- average total recoverable petroleum hydrocarbons (TRPH) concentration: 2,500 milligrams per kilogram (mg/kg).

and will include the following amendments at set-up:

- agricultural lime,
- fertilizer, and
- cow manure.

The estimated quantity of TRPH contaminated soil at Site 5 is 16,300 cubic yards (yd³). The soil shall be excavated and treated biologically in five lifts of approximately 3,400 yd³ each. Each lift shall be made up of three windrows of at least 1,100 yd³ each.

Efforts should be made to have all windrows at an average concentration of 2,500 mg/kg TRPH. The contractor shall mix the excavated soil accordingly to try to achieve this concentration.

The soil shall be loaded onto the treatment pad in a north to south line, constructing one windrow at a time working from one end of the pad to the other. Amendments shall be placed on top of the soil in the order: lime, fertilizer, and manure. The windrows shall be assembled using a SCAT tow-type bioremediation turner (or approved equivalent). The contractor shall till the soil until amendments are fully mixed and windrows are at the specified dimensions.

by ABB-ES personnel using a Lantech oxygen and carbon dioxide meter (or equivalent). Soil gas samples shall be collected from the interior of the windrows and samples shall not be collected if the soil is saturated or near saturation. If the oxygen levels in the soil fall below 5 percent, then the soil shall be tilled within the next 2 days.

After major rain events, the soil should be allowed to drain for 24 hours and tilled if oxygen levels are low or if deemed necessary based on visual observations.

3.1.1 Aeration Schedule. Aeration will be accomplished by regularly tilling the soil in the windrows with a SCAT tow-type bioremediation turner (or approved equivalent). For each lift, it is estimated the soil shall be tilled twice a week for the first 30 days of biotreatment and one time a week for the remainder of the operation.

Any recommended changes in the tilling schedule will be communicated to the contractor by ABB-ES technical personnel.

3.2 Moisture Content

Soil moisture must be maintained during treatment to facilitate biodegradation. Attempts should be made to maintain the moisture content near 50 percent of the field capacity, which is 15 percent moisture. The operating range during treatment shall be 5 to 25 percent moisture. Both visual observation by the contractor and process monitoring measurements taken by ABB-ES will be used to evaluate moisture content. Soil moisture will be measured as part of the process monitoring chemical analyses program and onsite inspections by ABB-ES. Field measurements will be taken using a moisture probe (Soilmoisture Equipment Corporation meter, or equivalent) no less than once a week and more frequently during dry periods.

Weather conditions will dictate when moisture will be added, so no schedule is provided here. However, as a guideline water should be added when moisture levels drop below 7 percent (laboratory measurement), soil suction is above 30 centibars (field measurement), or when the soil appears dry visually.

3.2.1 Moisture Addition. An Amadus Reelrain (or approved equivalent) mobile sprinkler watering system will be used to provide water to the windrows. Treatment soil could require up to 90,000 gallons of water per watering event during dry periods. Normal watering operations will likely require applications of 1 inch of water (approximately 17,000 gallons) per event. Using a flow rate of 45 gallons per minute, the sprinkler system can apply that volume of water in approximately 7 hours.

The hose sprinkler shall be placed on the outer edge of the treatment pad, parallel to one of the exterior windrows. The water shall be applied in one direction so all three of the windrows are covered. The sprinkler system shall be set to automatically reel the hose in and water will be applied along that line at the desired rate. Efforts shall be made to avoid over saturating the soil when it is being watered.

<p align="center">Table 1 Process Monitoring Samples</p> <p align="center">Operable Unit 2, Site 5 NAS Cecil Field Jacksonville, Florida</p>					
Day	Analyses ¹				
	TPH-IR	TPH-GC/FID	N P, Ph	Moisture	Bacteria
0	9	3	3	9	3
10	3	3	3	3	3
30	3	3	3	3	3
60	3	3	3	3	3
90	9	3	3	3	3
100					
Subtotal	27	15	15	27	15
QC Samples	1 dup per batch	1 dup per batch	1 dup per batch	1 dup per batch	1 dup per batch
Subtotal	5	5	10	5	5
Total Per Lift	32	20	25	32	20
Program Total	160	100	125	160	100

¹ Nine samples = three composite samples will be prepared from each windrow; three samples = one composite sample will be prepared from each windrow.

Notes: This sample schedule was prepared under the assumption that there will be five lifts of 3,400 cubic yards each. All analyses will be performed in the ABB Environmental Services, Inc., laboratory in Wakefield, Massachusetts.

TPH-IR = total petroleum hydrocarbons by infrared.
 TPH-GC/FID = total petroleum hydrocarbons by gas chromatograph and flame ionization detector
 N = nitrogen.
 P = phosphorus.
 Ph = expression of the intensity of the hydrogen ion concentration.
 QC = quality control.
 dup = duplicate.
 MS = matrix spike.

**Table 3
Treatment Confirmation Samples**

Operable Unit 2, Site 5
NAS Cecil Field
Jacksonville, Florida

Time	Analyses and Method			
	TRPH-IR USEPA 418.1	PAH USEPA Method 8270	VOA USEPA Method 8010	PCB USEPA Method 8080
Day 0				9
Day 100	9	9	9	
Total Lift	9	9	9	9
QC Samples per Program	1 dup per batch	1 dup per 20 1 MS/MSD program	trip blank 1 dup per 20 1 MS/MSD program	1 dup per 20 1 MS/MSD program
Program Total	50	50	55	50

Notes: Nine samples per lift are the number required for 3,400 cubic yards (yd³) under Chapter 17-775, Florida Administrative Code (FAC).

Metals will not be analyzed as part of this program because they have not historically exceeded standards in soil designated for biological treatment.

This sample schedule was prepared under the assumption that there will be five lifts of 3,400 yd³ each. All analyses will be performed in a Florida-certified laboratory.

USEPA = U.S. Environmental Protection Agency.
 QC = quality control.
 dup = duplicate.
 MS/MSD = matrix spike and matrix spike duplicate.

6.0 COMMUNICATION

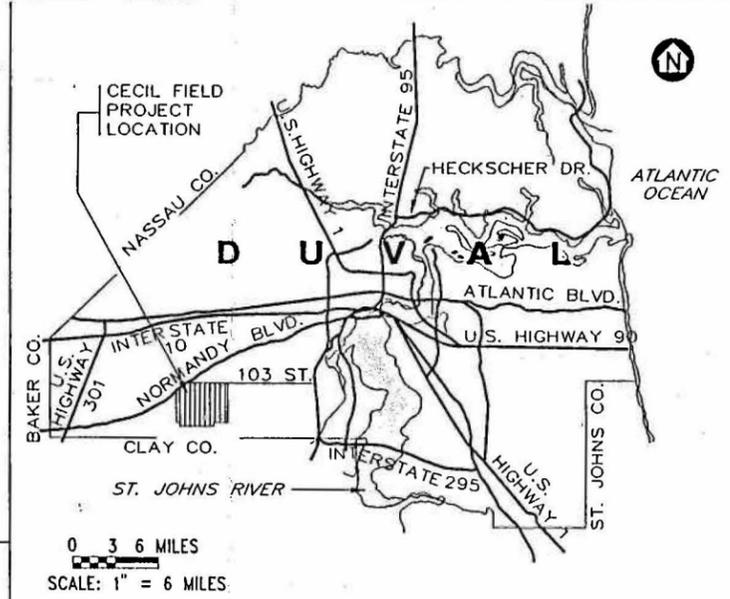
Regular communication between the contractor and ABB-ES will be necessary to ensure the goals of this project are met. The contractor is responsible for construction and physical operations of the remedial operation; however, ABB-ES will assist with the operation by providing technical oversight. ABB-ES input to the project will include construction oversight. ABB-ES will provide input as it relates to amendment application, water management, and maintenance of TRPH degrading conditions. ABB-ES will also be responsible for sampling and analysis (process monitoring and treatment confirmation).

The schedule specified in the operation and maintenance plan will be used to establish initial maintenance schedules. As the project progresses, any recommendation or modification to the schedule will be communicated by ABB-ES directly to a person designated by the contractor. The contractor shall inspect the treatment operation daily and report any observations, particularly anything out of the ordinary, to either the ABB-ES oversight engineer or one of the designated ABB-ES technical staff located in Wakefield, Massachusetts.

Results from data analysis and recommendations made by ABB-ES will be summarized and distributed to the contractor and Southern Division, Naval Facilities Engineering Command, in a monthly progress report. Any progress reports prepared by the contractor shall in turn be distributed to ABB-ES.

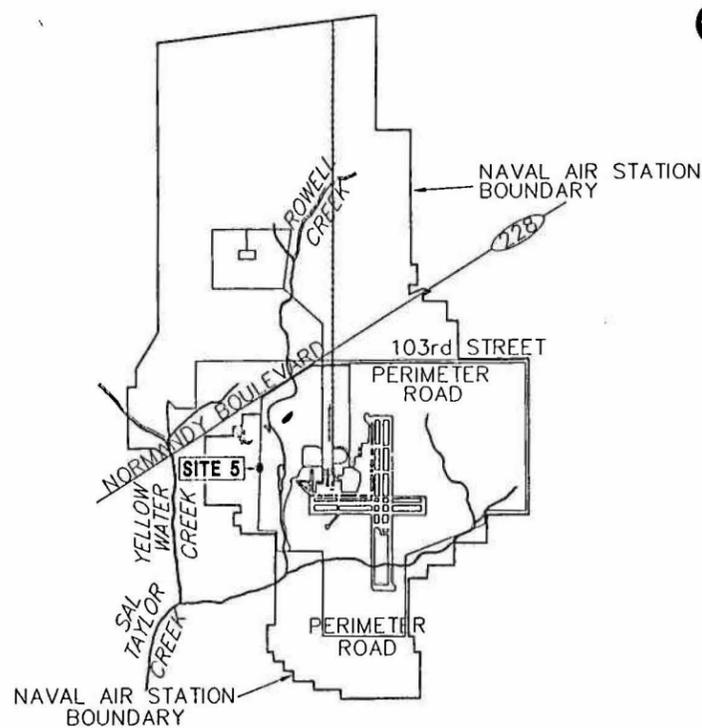
SITE 5 BIOREMEDIATION NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA

CONSTRUCTION CONTRACT NO. N62467-89-D-0317
SPECIFICATION NO. 18-89-0317



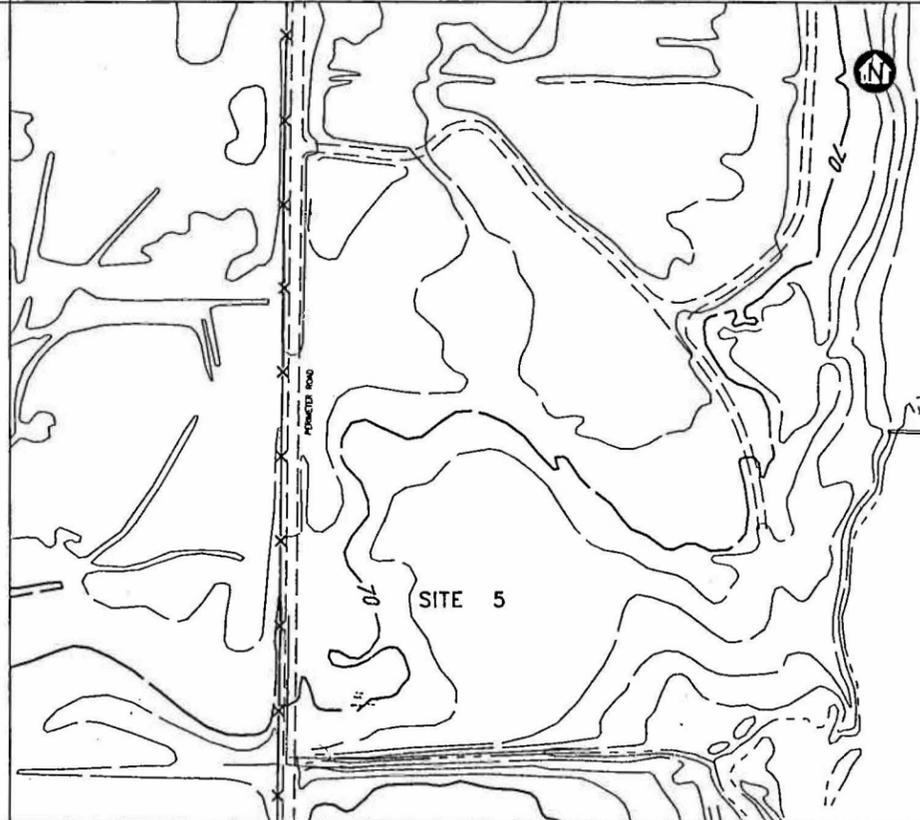
FACILITY MAP

0 3000 6000
SCALE: 1" = 6000'



LOCATION MAP

0 100 200
SCALE: 1" = 200'

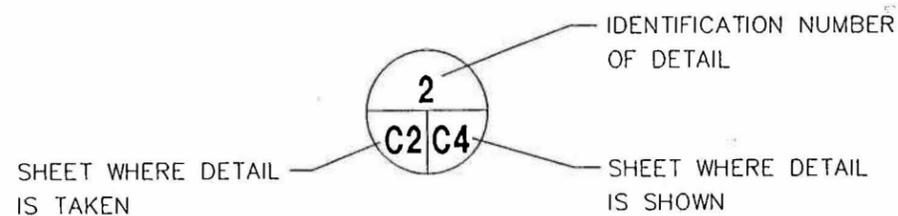


VICINITY MAP

INDEX

SHEET NO.	NAVFAC DRAWING NO.	TITLE
T-1	5294383	INDEX SHEET
C-1	5294384	SITE PLAN
C-2	5294385	SOIL TREATMENT FACILITY & DETAILS
C-3	5294386	WINDROW/PAD SECTIONS AND DETAILS
C-4	5294387	SOIL STOCKPILE LAYOUT AND DETAILS
C-5	5294388	EXCAVATION SEQUENCE
P-1	5294389	PROCESS FLOW

EXAMPLE - DETAIL SYMBOL



EXAMPLE - SECTION SYMBOL

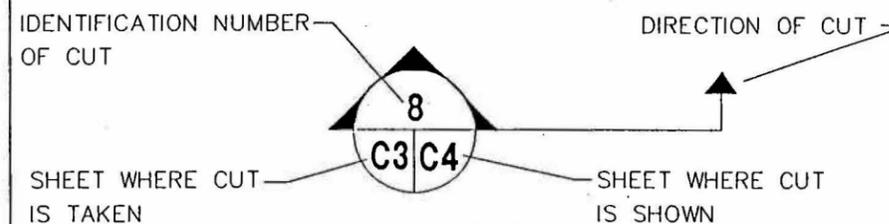


ABB Environmental Services, Inc.
10000 W. Highway 301, Jacksonville, Florida 32217
DATE: 4/14/95
BY: [Signature]
CHECKED BY: [Signature]
APPROVED BY: [Signature]

REV.	DESCRIPTION	DATE	APPROVED
A	INTERNAL AND CLIENT REVIEW	3/21/95	EAL
B	CLIENT AND REGULATORY REVIEW	3/28/95	KHM
D	ISSUED FOR CONSTRUCTION	4/14/95	KHM

NAVY FACILITIES ENGINEERING COMMAND
SOUTHERN DIVISION
JACKSONVILLE, FLORIDA
EMWISTON, S.C.

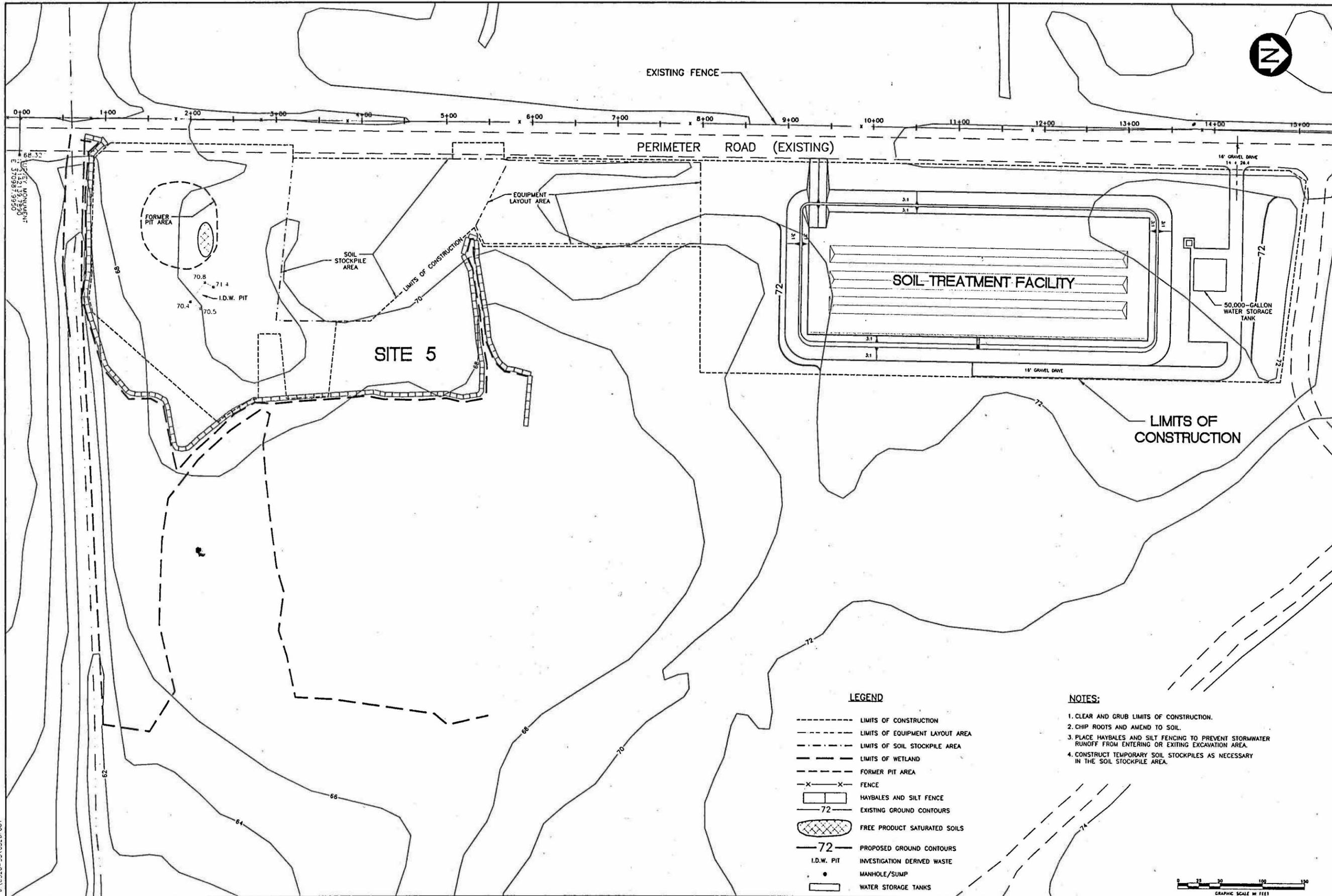
NAVAL AIR STATION
CECIL FIELD

SITE 5 SOIL BIOREMEDIATION
TITLE SHEET

APPROVED: [Signature]
DATE: [Blank]
EPL FOR COMMAND: [Blank]

RECORD DRAWING DATE: [Blank]
CODE ID. NO.: [Blank]
DRAWING SIZE: D
SPEC. NO. 18-89-0317
CONSTR. CONTR. NO. N62467-89-D-0317
NAVFAC DRAWING NO. 5294383
SHEET 1 OF 7

T-1



LEGEND

- LIMITS OF CONSTRUCTION
- LIMITS OF EQUIPMENT LAYOUT AREA
- LIMITS OF SOIL STOCKPILE AREA
- LIMITS OF WETLAND
- FORMER PIT AREA
- x-x- FENCE
- [] HAYBALES AND SILT FENCE
- 72 EXISTING GROUND CONTOURS
- [] FREE PRODUCT SATURATED SOILS
- 72 PROPOSED GROUND CONTOURS
- I.D.W. PIT
- MANHOLE/SUMP
- [] WATER STORAGE TANKS

NOTES:

1. CLEAR AND GRUB LIMITS OF CONSTRUCTION.
2. CHIP ROOTS AND AMEND TO SOIL.
3. PLACE HAYBALES AND SILT FENCING TO PREVENT STORMWATER RUNOFF FROM ENTERING OR EXITING EXCAVATION AREA.
4. CONSTRUCT TEMPORARY SOIL STOCKPILES AS NECESSARY IN THE SOIL STOCKPILE AREA.



ABB Environmental Services, Inc.
 Tallahassee, Florida
 PREP BY: JKH
 DATE: 3-21-95
 APPROVED: [Signature]
 DATE: 4/14/95

REV.	DESCRIPTION	PREP BY	DATE	APPROVED
A	INTERNAL AND CLIENT REVIEW	EJL	3-21-95	
B	CLIENT AND REGULATORY REVIEW	KHM	3-28-95	
0	ISSUED FOR CONSTRUCTION	KHM	4/14/95	

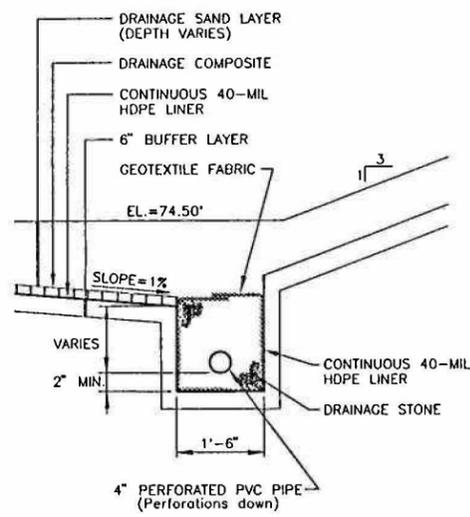
SOUTHERN DIVISION
 JACKSONVILLE, FLORIDA
SITE 5 SOIL BIOREMEDIATION
 SITE PLAN

APPROVED: [Signature]
 DATE: []

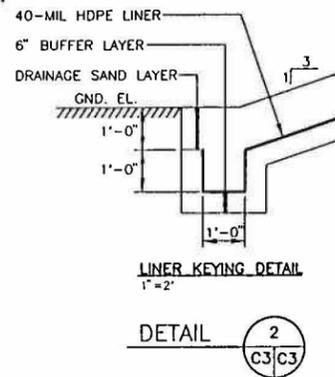


REVISED DRAWING DATE	
CODE ID. NO.	
DRAWING SIZE	0
SPEC. NO.	18-88-0317
CONSTR. CONTR. NO.	N62467-89-D-0317
NAVFAC DRAWING NO.	5294384
SHEET	2 OF 7

C-1

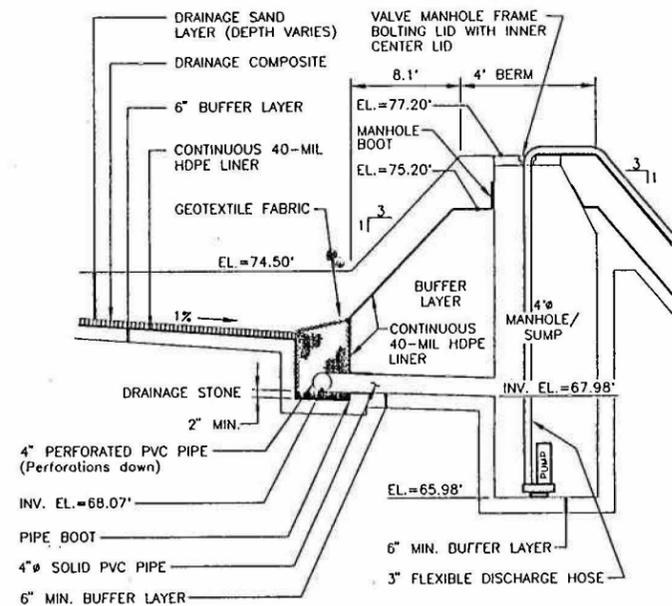


DRAINAGE TRENCH DETAIL
N.T.S.



LINER KEYING DETAIL
1\"/>

DETAIL 2
C3/C3

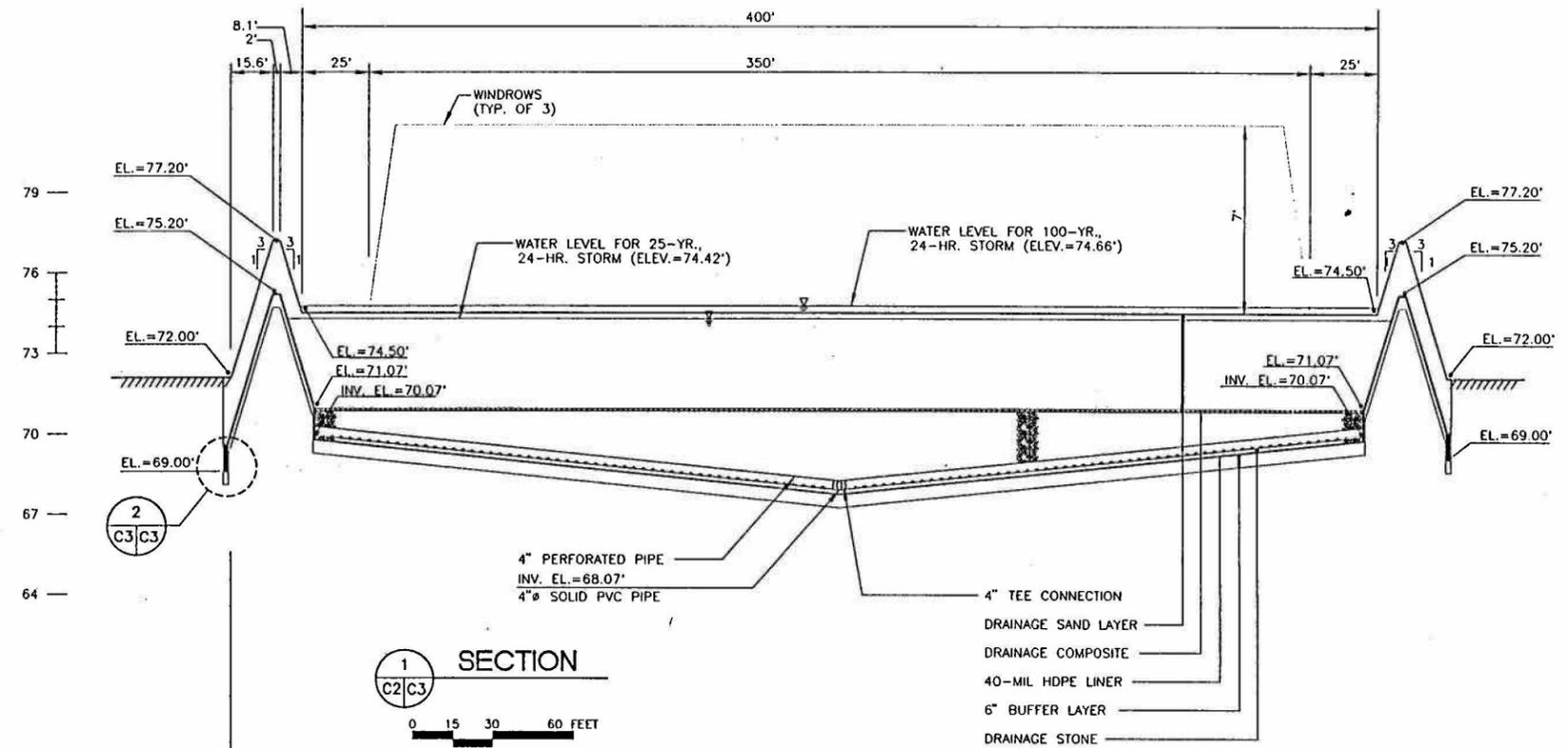


NOTES:

- MATERIAL USED FOR PIPE AND MANHOLE BEDDING SHALL BE BUFFER LAYER MATERIAL.

4\"/>

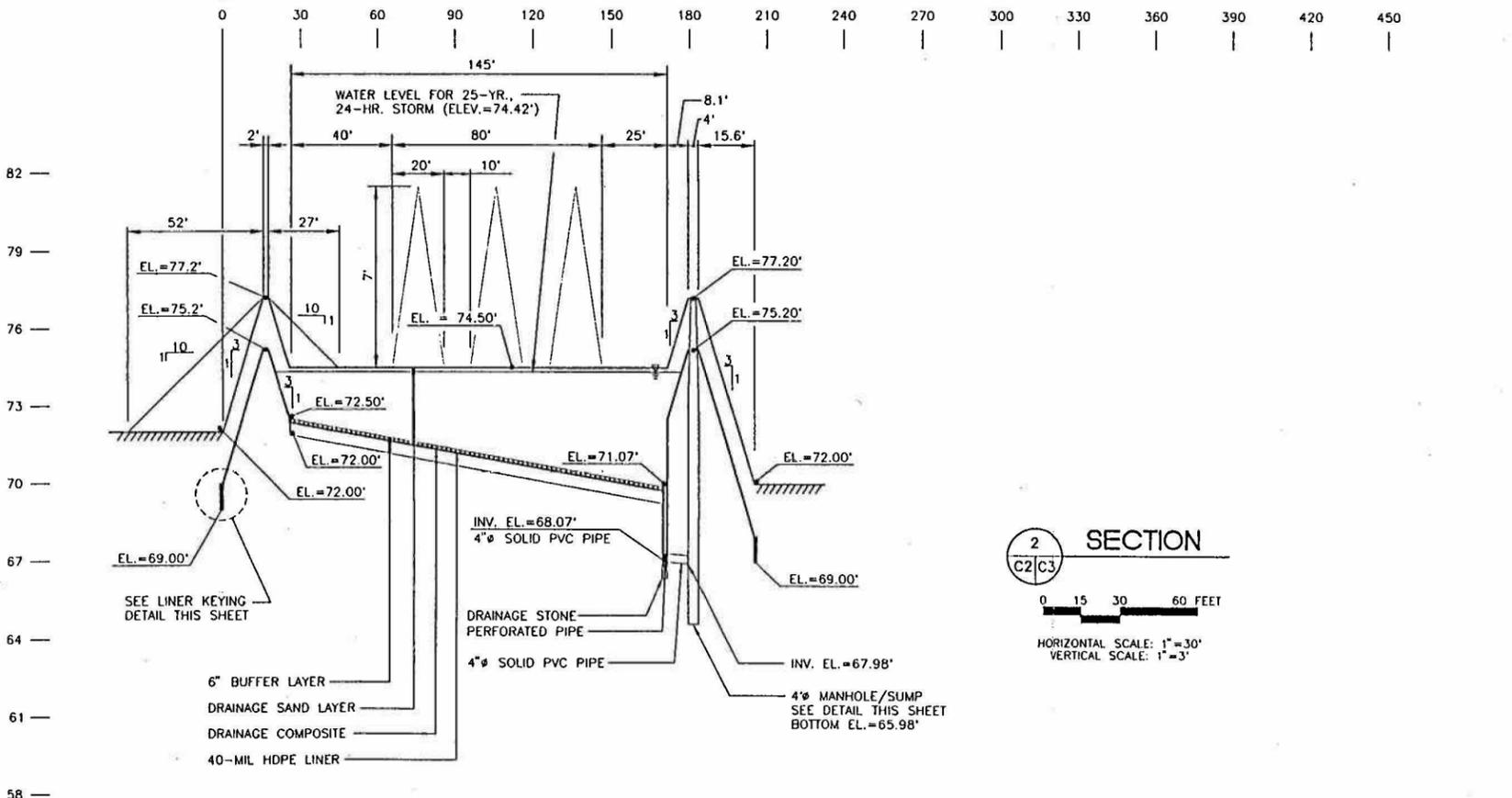
DETAIL 1
C2/C3



SECTION 1
C2/C3

0 15 30 60 FEET

HORIZONTAL SCALE: 1\"/>



SECTION 2
C2/C3

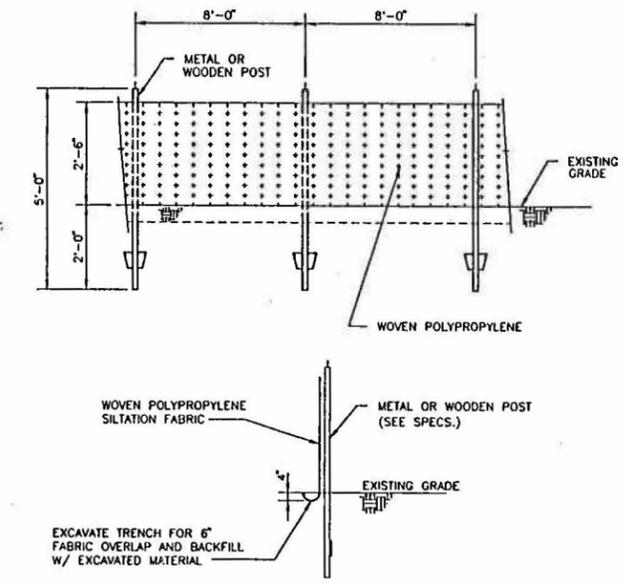
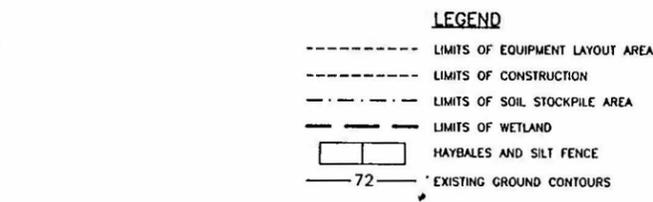
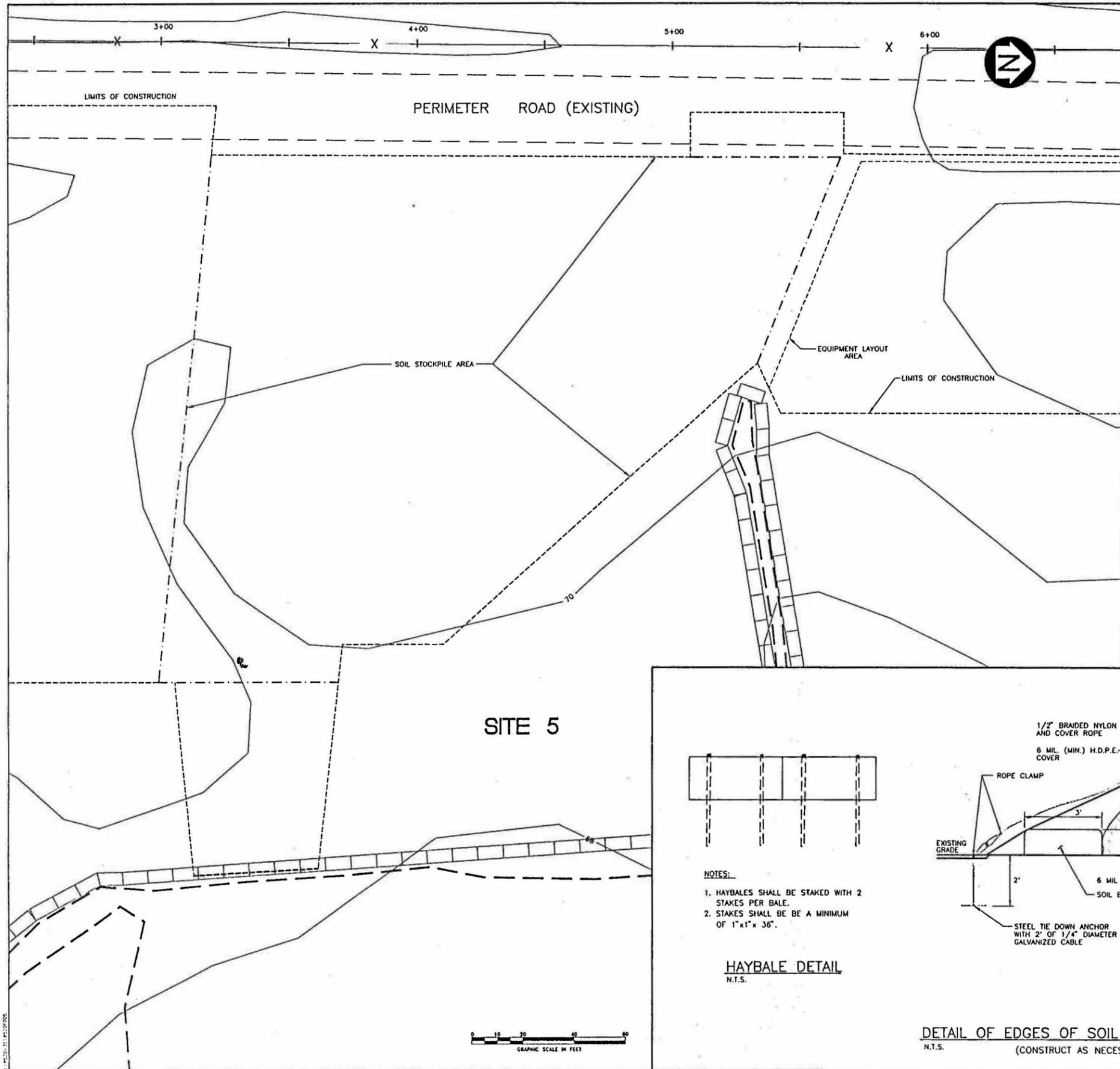
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HORIZONTAL SCALE: 1\"/>

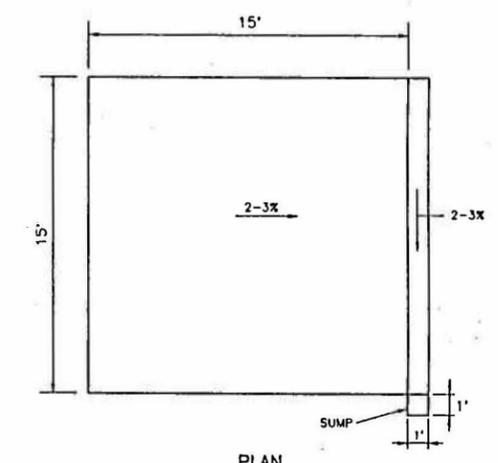
REV.	DESCRIPTION	PREP BY	DATE	APPROV
A	INTERNAL AND CLIENT REVIEW	KHM	3-21-95	
B	CLIENT AND REGULATORY REVIEW	KHM	3/28/95	
D	ISSUED FOR CONSTRUCTION	KHM	4/14/95	

ABB Environmental Services, Inc. Tallahassee, Florida PROJECT NO. 10111 DRAWING NO. 5294386 SHEET NO. 3 OF 7	SOUTHERN DIVISION JACKSONVILLE, FLORIDA CHELSEA, SC. SITE 5 SOIL BIOREMEDIATION WINDROW/PAD SECTIONS AND DETAILS
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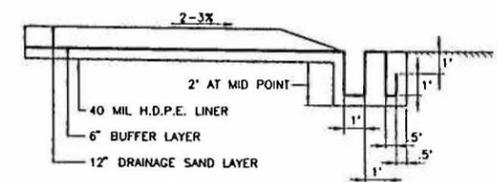
DEPARTMENT OF THE ARMY CIVIL ENGINEERING CENTER WASHINGTON, D.C. 20315 STATE OF FLORIDA REGISTERED PROFESSIONAL ENGINEER NO. 10111	REVISED DRAWING DATE CODE I.D. NO. DRAWING SITE SPEC. NO. 18-88-0317 CONSTRUCTION CONTRACT NO. H62467-89-D-0317 NAVFAC DRAWING NO. 5294386 SHEET 3 OF 7 C-3
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SILTATION FENCE
N.T.S.

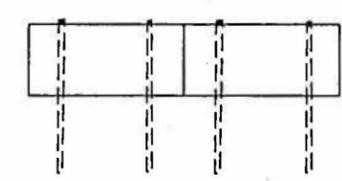


PLAN



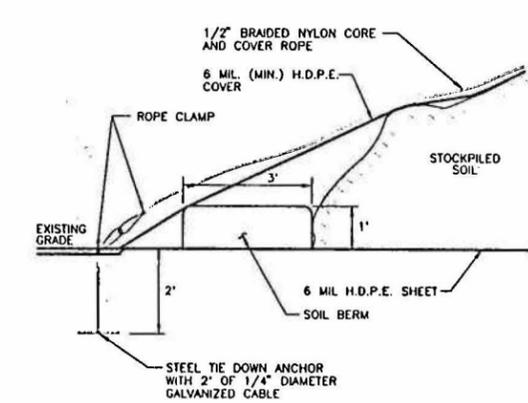
PROFILE

DRAINAGE PAD DETAIL
1/4" = 1'-0"



- NOTES:**
1. HAYBALES SHALL BE STAKED WITH 2 STAKES PER BALE.
 2. STAKES SHALL BE A MINIMUM OF 1"x1" x 36".

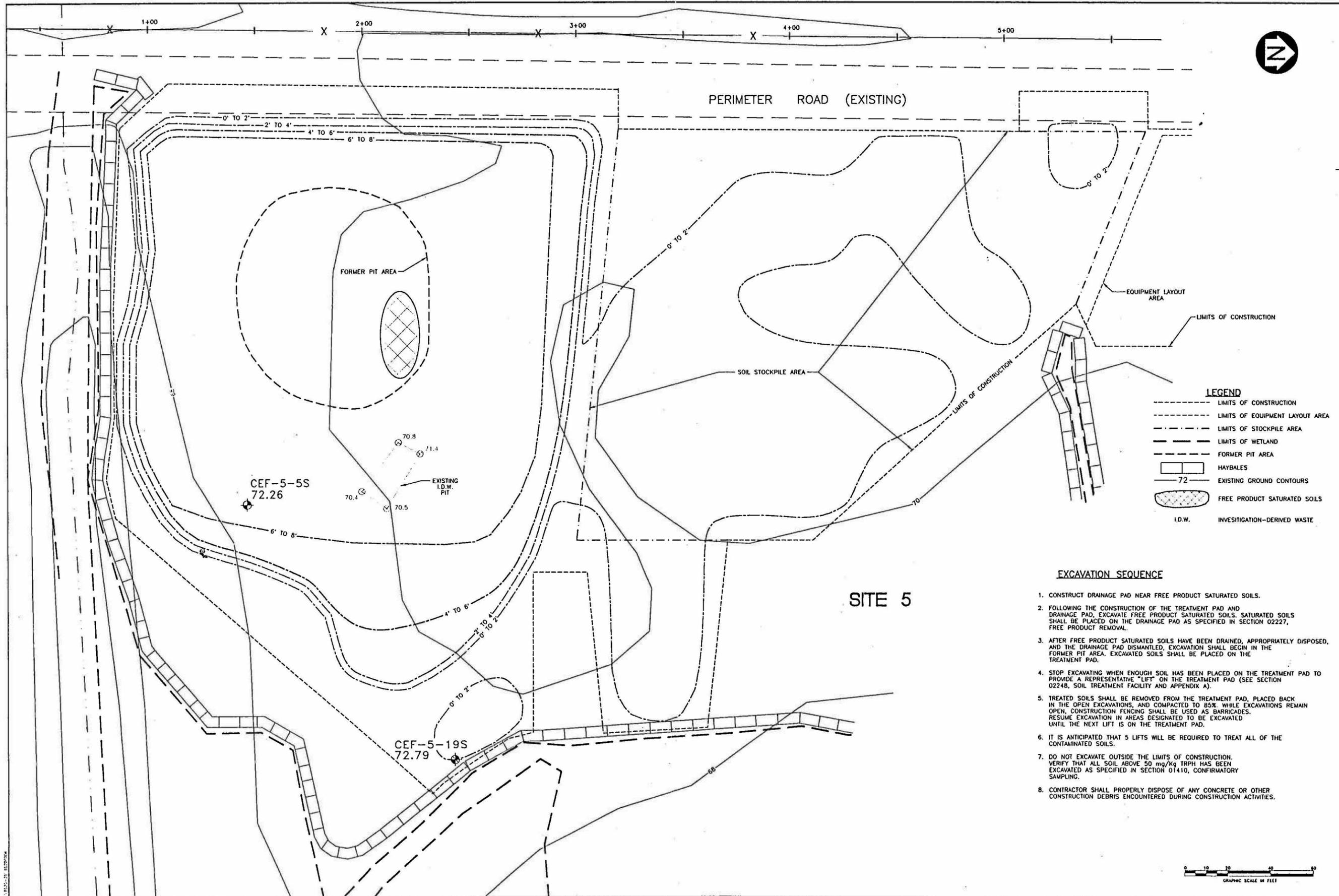
HAYBALE DETAIL
N.T.S.



DETAIL OF EDGES OF SOIL STOCKPILE AREA
N.T.S. (CONSTRUCT AS NECESSARY)



ABB Environmental Services, Inc. Tallahassee, Florida		DATE	APPROV
REV. A	INTERNAL AND CLIENT REVIEW	EIL	3/21/95
REV. B	CLIENT AND REGULATORY REVIEW	KHM	3/28/95
REV. D	ISSUED FOR CONSTRUCTION	KHM	4/14/95
SOUTHERN DIVISION CHARLESTON, SC		DATE	APPROV
JACKSONVILLE, FLORIDA		DATE	APPROV
SITE 5 SOIL BIOREMEDIATION		DATE	APPROV
SOIL STOCKPILE LAYOUT AND DETAILS		DATE	APPROV
REVISIONS		DATE	APPROV
CODE I.D. NO.		DATE	APPROV
DRAWING SIZE		DATE	APPROV
SPEC. NO. 18-89-0317		DATE	APPROV
CONSTRUCTION CENTER NO. N62467-89-D-0317		DATE	APPROV
DRAWING NO. 5294387		DATE	APPROV
SHEET 3 OF 7		DATE	APPROV



LEGEND

- LIMITS OF CONSTRUCTION
- LIMITS OF EQUIPMENT LAYOUT AREA
- LIMITS OF STOCKPILE AREA
- LIMITS OF WETLAND
- FORMER PIT AREA
- HAYBALES
- 72 --- EXISTING GROUND CONTOURS
- FREE PRODUCT SATURATED SOILS
- I.D.W. --- INVESTIGATION-DERIVED WASTE

EXCAVATION SEQUENCE

1. CONSTRUCT DRAINAGE PAD NEAR FREE PRODUCT SATURATED SOILS.
2. FOLLOWING THE CONSTRUCTION OF THE TREATMENT PAD AND DRAINAGE PAD, EXCAVATE FREE PRODUCT SATURATED SOILS. SATURATED SOILS SHALL BE PLACED ON THE DRAINAGE PAD AS SPECIFIED IN SECTION 02227, FREE PRODUCT REMOVAL.
3. AFTER FREE PRODUCT SATURATED SOILS HAVE BEEN DRAINED, APPROPRIATELY DISPOSED, AND THE DRAINAGE PAD DISMANTLED, EXCAVATION SHALL BEGIN IN THE FORMER PIT AREA. EXCAVATED SOILS SHALL BE PLACED ON THE TREATMENT PAD.
4. STOP EXCAVATING WHEN ENOUGH SOIL HAS BEEN PLACED ON THE TREATMENT PAD TO PROVIDE A REPRESENTATIVE "LIFT" ON THE TREATMENT PAD (SEE SECTION 02248, SOIL TREATMENT FACILITY AND APPENDIX A).
5. TREATED SOILS SHALL BE REMOVED FROM THE TREATMENT PAD, PLACED BACK IN THE OPEN EXCAVATIONS, AND COMPACTED TO 85%. WHILE EXCAVATIONS REMAIN OPEN, CONSTRUCTION FENCING SHALL BE USED AS BARRICADES. RESUME EXCAVATION IN AREAS DESIGNATED TO BE EXCAVATED UNTIL THE NEXT LIFT IS ON THE TREATMENT PAD.
6. IT IS ANTICIPATED THAT 5 LIFTS WILL BE REQUIRED TO TREAT ALL OF THE CONTAMINATED SOILS.
7. DO NOT EXCAVATE OUTSIDE THE LIMITS OF CONSTRUCTION. VERIFY THAT ALL SOIL ABOVE 50 mg/Kg TRPH HAS BEEN EXCAVATED AS SPECIFIED IN SECTION 01410, CONFIRMATORY SAMPLING.
8. CONTRACTOR SHALL PROPERLY DISPOSE OF ANY CONCRETE OR OTHER CONSTRUCTION DEBRIS ENCOUNTERED DURING CONSTRUCTION ACTIVITIES.

ABB Environmental Services, Inc. Tallahassee, Florida	DATE	APPROVED
PREP BY	DATE	APPROVED
3/21/95		
INTERNAL AND CLIENT REVIEW	E.J.L.	3/21/95
CLIENT AND REGULATORY REVIEW	K.H.M.	3/28/95
ISSUED FOR CONSTRUCTION	K.H.M.	4/14/95

DESCRIPTION	REV.	DATE	APPROVED
INTERNAL AND CLIENT REVIEW	A	3/21/95	
CLIENT AND REGULATORY REVIEW	B	3/28/95	
ISSUED FOR CONSTRUCTION	D	4/14/95	

SOUTHERN DIVISION
CHARLESTON, S.C.

JACKSONVILLE, FLORIDA

SITE 5 SOIL BIOREMEDIATION
EXCAVATION SEQUENCE

APPROVED

DATE

EDS FOR CONTRACTOR: MAF/K

DATE

REVISED DRAWING DATE

CODE ID. NO.

DRAWING SIZE

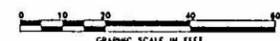
SPEC. NO. 18-89-0317

CONSTR. CONTR. NO. N62467-89-D-0317

MAF/K DRAWING NO. 5294388

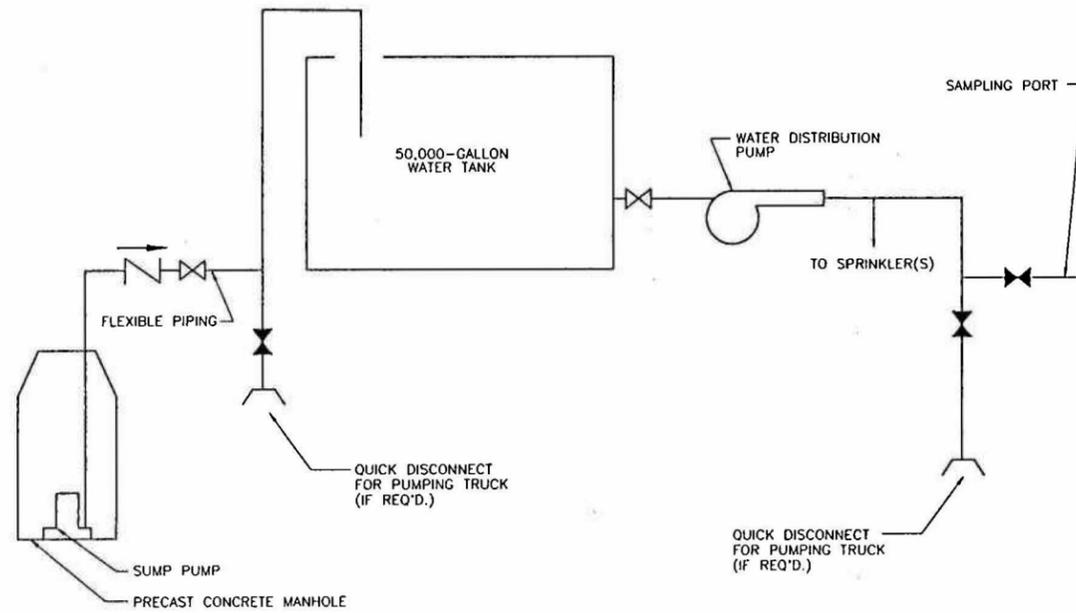
SHEET 8 OF 7

C-5



LEGEND

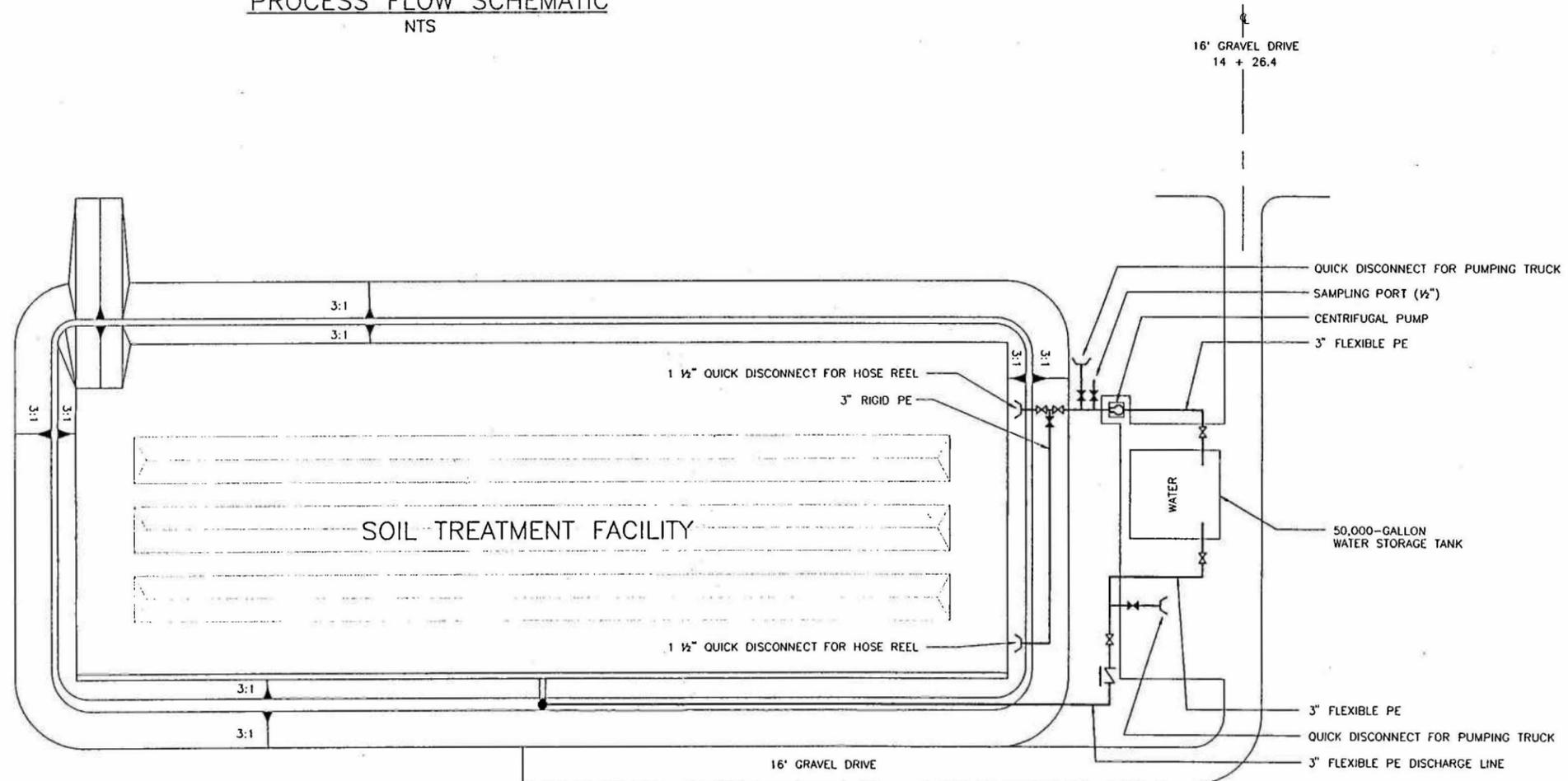
- ☒ CHECK VALVE
- ☒ SHUT-OFF VALVE (NORMALLY CLOSED)
- ☒ SHUT-OFF VALVE (NORMALLY OPEN)



PROCESS FLOW SCHEMATIC
NTS

NOTES:

1. ELECTRICAL POWER IS NOT AVAILABLE ON SITE AND THEREFORE, A GENERATOR SHALL BE USED TO POWER PUMPS AND OTHER ELECTRICAL EQUIPMENT. GENERATOR SHALL BE SIZED AS NECESSARY. FOR MOTOR SIZES SEE SPECIFICATION SECTION 02248, SOIL TREATMENT FACILITY AND THE OPERATION AND MAINTENANCE PLAN INCLUDED AS APPENDIX A TO THE SPECIFICATIONS.
2. ALL ELECTRICAL CONNECTIONS SHALL BE MADE BY A STATE OF FLORIDA LICENSED ELECTRICIAN.
3. SEE SECTION 02248, SOIL TREATMENT FACILITY, FOR SPECIFICATIONS ON THE CENTRIFUGAL PUMP.



PIPING PLAN
1" = 30'

NOTE:

CONNECTIONS AT WATER STORAGE TANK SHALL BE FLEXIBLE CONNECTIONS.

ABB Environmental Services, Inc. Tallahassee, Florida		PREP BY E.J.L.	DATE 3/21/95	APPROV K.H.M.
REV. A	DESCRIPTION INTERNAL AND CLIENT REVIEW	PREP BY E.J.L.	DATE 3/21/95	APPROV K.H.M.
REV. B	DESCRIPTION CLIENT AND REGULATORY REVIEW	PREP BY K.H.M.	DATE 3/28/95	APPROV K.H.M.
REV. O	DESCRIPTION ISSUED FOR CONSTRUCTION	PREP BY K.H.M.	DATE 4/14/95	APPROV K.H.M.
SOUTHERN DIVISION CHARLESTON, S.C.		JACKSONVILLE, FLORIDA		
SITE 5 SOIL BIOREMEDIATION PROCESS FLOW				
DEPARTMENT OF THE NAVY NAVAL AIR STATION CECIL FIELD		ETS FOR COMMANDER, NAVFAC		
SEAL AREA 		DATE		
REVISION DRAWING DATE				
CODE ID NO.				
DRAWING SIZE				
SPEC. NO. 18-89-0317				
CONSTR. COOR. NO. N62467-89-D-0317				
NAVFAC DRAWING NO. 5294389				
SHEET 7 OF 7				
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