

received
5 July 2000



U.S Army Corps of Engineers

New England District

**REMEDY SELECTION REPORT
ON-SITE VERSUS OFF-SITE DISPOSAL OPTIONS**

**LANDFILL REMEDIATION PROJECT
DEVENS RESERVE TRAINING AREA**

DEVENS, MASSACHUSETTS

Prepared Under:

CONTRACT NO. DACW33-97-D-0002
DELIVERY ORDER NO. 0010

MARCH 2000

 Stone & Webster 

Appendix C

Subcontract Statements of Work Issued for Bids/Proposals

PART II ON-SITE OPTION



Stone & Webster

FOUNDED
1889

ATLANTA, GA
BOSTON, MA
CHATANOOGA, TN
CHERRY HILL, NJ
DENVER, CO
HOUSTON, TX
NEW YORK, NY
WASHINGTON, DC
MIAMI, FL
PLEASANTON, CA

October 27, 1999

ABU DHABI, UAE
AL KHOBAR, SAUDI ARABIA
BANGKOK, THAILAND
DAMMAM, SAUDI ARABIA
KUALA LUMPUR, MALAYSIA
KUWAIT CITY, KUWAIT
MILTON KEYNES, ENGLAND
JAKARTA, INDONESIA
SEOUL, KOREA
TORONTO, CANADA

Request for Proposal

No.068511000-02

Provide Consolidation Landfill Construction, Operations and
Closure Services

AT THE

LANDFILL REMEDIATION PROJECT, DEVENS, MA

To All Offerors:

You are invited to submit a firm, fixed price proposal to perform the referenced services for Stone & Webster Engineering Corporation (SWEC) at the DEVENS LANDFILL REMEDIATION PROJECT in support of SWEC's New England RAC Contract# DACW33-97-D-0002 with the NE USACE. The work to be procured and the requirements for performance are described more fully in the enclosed Scope of Work and subcontract documents.

Address your proposal and all questions concerning this solicitation to:

Stone & Webster
245 Summer Street
Boston, MA 02210-1127
Attn: Don Fournier (617) 589-7057
Senior Contracts Administrator

All technical questions should be directed to Bruce McCampbell at (617) 589-2626.

All proposals must be received NO LATER THAN MONDAY, DECEMBER 6, 1999, 4:00 PM. Questions should be received by SWEC within a reasonable time to allow for a reply to reach all Offerors before the proposal due date. Answers to any questions will be furnished to all Offerors as an amendment to this Request for Proposal. DO NOT ADDRESS QUESTIONS TO ANYONE OTHER THAN THE INDIVIDUALS DESIGNATED IN THIS LETTER.

The following criteria will be used in evaluating your proposal:

1. Availability of labor, and equipment resources.
2. Qualifications and work experience in these methods.
3. Price
4. Socio-Economic Status
5. All other factors as specified in the "Scope of Work".

If you do not intend to submit a proposal, a prompt negative response would be appreciated.

Your attention is called to the following enclosed documents and notifications:

1. PROPOSAL INSTRUCTIONS - Please carefully review these instructions for the submission of your proposal.
2. SCOPE OF WORK - Please carefully review the scope of services requested, and include with your proposal any specific exceptions you take to the requirements. Alternative, cost-effective approaches recommended should also be detailed in your proposal.
3. PRICING FORM - Please submit your prices on the enclosed pricing form.
4. SUBCONTRACT PROVISIONS - The provisions of the Stone & Webster's General Conditions for Subcontracts for Government Funded Contracts, and applicable FAR and Flow-down Clauses, will apply to the resulting subcontract covering services awarded as a result of this solicitation. All attachments and enclosures will be incorporated into, and become part of the resulting subcontract.
5. This project is governed by Davis Bacon Wage Rates. The submission of certified payrolls will be required. The applicable wage determination is enclosed for your convenience.
6. The work is scheduled to take place AS SET FORTH IN THE SCOPE OF WORK. Contractor must be able to mobilize within five (5) days after receiving notice to proceed.
7. 40 Hour Hazwopper trained personnel will be required for the performance of work on this portion of the project.
8. Due to the size of this project, it is likely that more than one subcontract will be issued as a result of this RFP.
9. Bonding & Insurance requirements - The subcontractor(s) will be required to obtain bid/performance/payment bonds for 100%

of the original contract price. These bond levels will change if/as contract price levels change. Insurance requirements are set forth in the enclosed general conditions.

If you have any questions, please call the undersigned at (617) 589-7057.

Sincerely,

STONE & WEBSTER



Don Fournier
Senior Contracts Administrator

Enclosures: (X) Proposal Instructions
 (X) Scope of Work
 (X) Pricing Form
 (X) Representations & Certifications
 (X) Maps (See Scope of Work)
 (X) Site Plan(s) (See Scope of Work)
 (X) Applicable FAR/Flow-down Clauses
 (X) Applicable Wage Rate Schedule
 (X) Project Labor Agreement / Letter of Assent
 (See Scope of Work)
 (X) Stone & Webster General Conditions for
 Subcontracts for Government Funded Contracts
 (X) Standard Form 1413
 X=Enclosed
 *=Previously Sent
 #=#To be sent under separate cover.

PRICING FORM

Contract 1 – Construction of the Landfill

<u>Item</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total Price</u>
1. Mobilization	Lump Sum	1	_____	_____
2. Clearing and Grubbing	Lump Sum	1	_____	_____
3. Excavation and Disposal	CY	33,000	_____	_____
4. Subgrade – Landfill Base	CY	40,000	_____	_____
5. Aggregate Stabilization	Ton	10	_____	_____
6. Low Permeability Clay Layer	Lump Sum	1	_____	_____
7. 60 Mil HDPE Liner and Bottom Cell Geocomposite	Lump Sum	1	_____	_____
8. Drainage layer	Lump Sum	1	_____	_____
9. Leachate Collection System	Lump Sum	1	_____	_____
10. Leachate Pumping System	Lump Sum	1	_____	_____
11. Leachate Force Main Piping	Linear Feet	1210	_____	_____
12. Aggregate Road Base	Lump Sum	1	_____	_____
13. Electrical	Lump Sum	1	_____	_____
14. Storm Water Management/ Erosion and Sediment	Lump Sum	1	_____	_____
Total Proposed Price				_____

Bidders' Checklist:

Have the following been included with the proposal:

- | | Yes | No |
|---|--------------------------|--------------------------|
| 1. Examples and contacts of previous landfills constructed and details about the landfills. | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Proposed Schedule | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Separate priced proposal for Contract 1 | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Representations & Certifications | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. PLA Letter of Assent | <input type="checkbox"/> | <input type="checkbox"/> |

PRICING FORM

Contract 2 – Operation and Closure of the Landfill

<u>Item</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total Price</u>
1. Mobilization	Lump Sum	1	_____	_____
2. Debris Handling and Disposal in Onsite Landfill				
AOC 9	Ton	180,000	_____	_____
AOC 11	Ton	42,000	_____	_____
Study Area 12	Ton	6,300	_____	_____
Study Area 13	Ton	6,700	_____	_____
AOC 40	Ton	175,000	_____	_____
AOC 41	Ton	900	_____	_____
3. Subgrade – Landfill Cap	CY	14,000	_____	_____
4. 40 Mil VFPE Liner and Cap Geocomposite	Lump Sum	1	_____	_____
5. Protective Layer	CY	14,000	_____	_____
6. Vegetative Support Layer	Lump Sum	1	_____	_____
7. Topsoil and Permanent Seeding	Lump Sum	1	_____	_____
8. Leachate Management	Lump Sum	1	_____	_____
9. Storm Water Management/ Erosion and Sediment	Lump Sum	1	_____	_____
10. Gas Vents	Each	11	_____	_____
Total Proposed Price				_____

Bidders' Checklist

Have the following been included with the proposal:

	Yes	No
1. Experience summaries for landfill operation and closure efforts done by the bidder in the past.	<input type="checkbox"/>	<input type="checkbox"/>
2. Proposed Schedule	<input type="checkbox"/>	<input type="checkbox"/>
3. Separate priced proposal for Contract 2	<input type="checkbox"/>	<input type="checkbox"/>
4. Proposed alternatives (separately priced)	<input type="checkbox"/>	<input type="checkbox"/>
5. Representations & Certifications	<input type="checkbox"/>	<input type="checkbox"/>
6. PLA Letter of Assent	<input type="checkbox"/>	<input type="checkbox"/>

SECTION K
REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS

K.1 52.203-2 CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (APR 1985)

(a) The offeror certifies that--

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to (i) those prices, (ii) the intention to submit an offer, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory--

(1) is the person in the offeror's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above; or

(2)(i) has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above _____

(insert full name of person(s) in the offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror's organization);

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(c) If the offeror deletes or modifies subparagraph (a)(2) above, the offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

(End of provision)

K.2 52.203-4 CONTINGENT FEE REPRESENTATION AND AGREEMENT (APR 1984)

(a) Representation. The offeror represents that, except for full-time bona fide employees working solely for the offeror; the offeror--
[Note: The offeror must check the appropriate boxes. For interpretation of the representation, including the term "bona fide employee," see Subpart 3.4 of the Federal Acquisition Regulation.]

(1) /_/_ has, /_/_ has not employed or retained any person or company to solicit or obtain this contract; and

(2) /_/_ has, /_/_ has not paid or agreed to pay to any person or company employed or retained to solicit or obtain this contract any commission, percentage, brokerage, or other fee contingent upon or resulting from the award of this contract.

(b) Agreement. The offeror agrees to provide information relating to the above Representation as requested by the Contracting Officer and, when subparagraph (a)(1) or (a)(2) is answered affirmatively, to promptly submit to the Contracting Officer--

(1) A completed Standard Form 119, Statement of Contingent or Other Fees, (SF 119); or

(2) A signed statement indicating that the SF 119 was previously submitted to the same contracting office, including the date and applicable solicitation or contract number, and representing that the prior SF 119 applies to this offer or quotation.

(End of provision)

(R 7-2002.1 1974 APR)

(R 1-1.505)

K.3 52.203-8 1 REQUIREMENT FOR CERTIFICATE OF PROCUREMENT INTEGRITY (NOV 1990)--
ALTERNATE 1 (SEP 1990)

(a) Definitions. The definitions at FAR 3.104-4 are hereby incorporated in this provision.

(b) Certifications. As required in paragraph (c) of this provision, the officer or employee responsible for this offer shall execute the following certification:

CERTIFICATE OF PROCUREMENT INTEGRITY

(1) I, _____ [Name of certifier], as the officer or employee responsible for the preparation of this offer and hereby certify that, to the best of my knowledge and belief, with the exception of any information described in this certificate, I have no information concerning a violation or possible violation of subsection 27(a), (b), (d), or (f) of the Office of Federal Procurement Policy Act, as amended* (41.U.S.C. 423), (hereinafter referred to as "the Act"), as implemented in the FAR, occurring during the conduct of this procurement _____ (solicitation number).

(2) As required by subsection 27(e)(1)(B) of the Act, I further certify that, to the best of my knowledge and belief, each officer, employee, agent, representative, and consultant of _____ (Name of Offeror) who has participated personally and substantially in the preparation or submission of this offer has certified that he or she is familiar with, and will comply with, the requirements of subsection 27(a) of the Act, as implemented in the FAR, and will report immediately to me any information concerning a violation or possible violation of subsections 27(a), (b), (d), or (f) of the Act, as implemented in the FAR, pertaining to this procurement.

(3) Violations or possible violations: (Continue on plain bond paper if necessary and label Certificate of Procurement Integrity (Continuation Sheet), ENTER NONE IF NONE EXIST)

(4) I agree that, if awarded a contract under this solicitation, the certifications required by subsection 27(e)(1)(B) of the Act shall be maintained in accordance with paragraph (f) of this provision.

[Signature of the officer or employee responsible for the offer and date]

[Typed name of the officer or employee responsible for the offer]
* Subsections 27(a), (b), and (d) are effective on December 1, 1990. Subsection 27(f) is effective on June 1, 1991.

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER TITLE 18, UNITED STATES CODE, SECTION 1001.

(End of certification)

(c) For procurements, including contract modifications, in excess of \$100,000 made using procedures other than sealed bidding, the signed certifications shall be submitted by the successful Offeror to the Contracting Officer within the time period specified by the Contracting Officer when requesting the certificates except as provided in subparagraphs (c)(1) through (c)(5) of this clause. In no event shall the certificate be submitted subsequent to award of a contract or execution of a contract modification:

(1) For letter contracts, other unpriced contracts, or unpriced contract modifications, whether or not the unpriced contract or modification contains a maximum or not to exceed price, the signed certifications shall be submitted prior to the award of the letter contract, unpriced contract, or unpriced contract modification, and prior to the definitization of the letter contract or the establishment of the price of the unpriced contract or unpriced contract modification. The second certification shall apply only to the period between award of the letter contract and execution of the document definitizing the letter contract, or award of the unpriced contract or unpriced contract modification and execution of the document establishing the definitive price of such unpriced contract or unpriced contract modification.

(2) For basic ordering agreements, prior to the execution of a priced order; prior to the execution of an unpriced order, whether or not the unpriced order contains a maximum or not to exceed price; and, prior to establishing the price of an unpriced order. The second certificate to be submitted for unpriced orders shall apply only to the period between award of the unpriced order and execution of the document establishing the definitive price for such order.

(3) A certificate is not required for indefinite delivery contracts (see Subpart 16.5) unless the total estimated value of all orders eventually to be placed under the contract is expected to exceed \$100,000.

(4) For contracts and contract modifications which include options, a certificate is required when the aggregate value of the contract or contract modification and all options (see 3.104-4(e)) exceeds \$100,000.

(5) For purposes of contracts entered into under section 8(a) of the SBA, the business entity with whom the SBA contracts, and not the SBA, shall be required to comply with the certification requirements of subsection 27(e). The SBA shall obtain the signed certificate from the business entity and forward the certificate to the Contracting Officer prior to the award of a contract to the SBA.

(6) Failure of an Offeror to submit the signed certificate within the

time prescribed by the Contracting Officer shall cause the offer to be rejected.

(d) Pursuant to FAR 3.104-9(d), the Offeror may be requested to execute additional certifications at the request of the Government. Failure of an Offeror to submit the additional certifications shall cause its offer to be rejected.

(e) A certification containing a disclosure of a violation or possible violation will not necessarily result in the withholding of award under this solicitation. However, the Government, after evaluation of the disclosure, may cancel this procurement or take any other appropriate actions in the interests of the Government, such as disqualification of the Offeror.

(f) In making the certification in paragraph (2) of the certificate, the officer or employee of the competing Contractor responsible for the offer may rely upon a one-time certification from each individual required to submit a certification to the competing Contractor, supplemented by periodic training. These certifications shall be obtained at the earliest possible date after an individual required to certify begins employment or association with the Contractor. If a Contractor decides to rely on a certification executed prior to the suspension of section 27 (i.e., prior to December 1, 1989), the Contractor shall ensure that an individual who has so certified is notified that section 27 has been reinstated. These certifications shall be maintained by the Contractor for 6 years from the date a certifying employee's employment with the company ends or, for an agent, representative, or consultant, 6 years from the date such individual ceases to act on behalf of the Contractor.

(g) Certifications under paragraphs (b) and (d) of this provision are material representations of fact upon which reliance will be placed in awarding a contract.

(End of provision)

K.4 52.203-11 CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (APR 1991)

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The offeror, by signing its offer, hereby certifies to the best of

his or her knowledge and belief that on or after December 23, 1989,--

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan, or cooperative agreement;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the offeror shall complete and submit, with its offer, OMB standard form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of \$100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000, for each such failure.

(End of provision)

K.5 52.204-3 TAXPAYER IDENTIFICATION (MAR 1994)

(a) Definitions.

"Common parent," as used in this solicitation provision, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.

"Corporate status," as used in this solicitation provision, means a

designation as to whether the offeror is a corporate entity, an unincorporated entity (e.g., sole proprietorship or partnership), or a corporation providing medical and health care services.

"Taxpayer Identification Number (TIN)," as used in this solicitation provision, means the number required by the IRS to be used by the offeror in reporting income tax and other returns.

(b) All offerors are required to submit the information required in paragraphs (c) through (e) of this solicitation provision in order to comply with reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M and implementing regulations issued by the Internal Revenue Service (IRS). If the resulting contract is subject to the reporting requirements described in FAR 4.903, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.

(c) Taxpayer Identification Number (TIN).

TIN: _____

TIN has been applied for.

TIN is not required because:

Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the U.S. and does not have an office or place of business or a fiscal paying agent in the U.S.;

Offeror is an agency or instrumentality of a foreign government;

Offeror is an agency or instrumentality of a Federal, state, or local government;

Other. State basis. _____

(d) Corporate Status.

Corporation providing medical and health care services, or engaged in the billing and collecting of payments for such services;

Other corporate entity;

Not a corporate entity;

Sole proprietorship

Partnership

Hospital or extended care facility described in 26 CFR 501(c)(3) that is exempt from taxation under 26 CFR 501(a).

(e) Common Parent.

Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this clause.

Name and TIN of common parent:

Name _____

TIN _____

(End of provision)

K.6 52.204-5 WOMEN-OWNED BUSINESS (OCT 1995)

(a) Representation. The offeror represents that it [] is, [] is not a women-owned business concern.

(b) Definition. "Women-owned business concern," as used in this provision, means a concern which is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

(End of provision)

K.7 52.209-5 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS (MAY 1989)

(a)(1) The Offeror certifies, to the best of its knowledge and belief, that--

(i) The Offeror and/or any of its Principals--

(A) Are / / are not / / presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) Have / / have not / / , within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property; and

(C) Are / / are not / / presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision

(a)(1)(i)(B) of this provision.

(1) The Offeror has / / has not / /, within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER SECTION 1001, TITLE 18, UNITED STATES CODE.

(b) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror nonresponsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this solicitation for default.

(End of provision)

The offeror or quoter, by checking the applicable box, represents that--
 (a) It operates as a corporation incorporated under the laws of the State of _____, an individual, a partnership, a nonprofit organization, or a joint venture.

(b) If the offeror or quoter is a foreign entity, it operates as an individual, a partnership, a nonprofit organization, a joint venture, or a corporation, registered for business in

 (country).

(End of provision)

K.9 52.215-11 AUTHORIZED NEGOTIATORS (APR 1984)

The offeror or quoter represents that the following persons are authorized to negotiate on its behalf with the Government in connection with this request for proposals or quotations:

Name	Title	Telephone number
_____	_____	_____
_____	_____	_____

[list names, titles, and telephone numbers of the authorized negotiators].

(End of provision)

(R 3-501(b) Sec K (iv))

K.10 52.215-20 PLACE OF PERFORMANCE (APR 1984)

(a) The offeror or quoter, in the performance of any contract resulting from this solicitation, intends, does not intend (check applicable block) to use one or more plants or facilities located at a different address from the address of the offeror or quoter as indicated in this proposal or quotation.

(b) If the offeror or quoter checks "intends" in paragraph (a) above, it shall insert in the spaces provided below the required information:

Place of Performance (Street Address, City, County, State, Zip Code)	Name and Address of Owner and Operator of the Plant or Facility if Other than Offeror or Quoter
--	---

(End of provision)
(R 3-501(b) Sec K (viii))

K.11 52.215-30 FACILITIES CAPITAL COST OF MONEY (SEP 1987)

(a) Facilities capital cost of money will be an allowable cost under the contemplated contract, if the criteria for allowability in subparagraph 31.205-10(a)(2) of the Federal Acquisition Regulation are met. One of the allowability criteria requires the prospective contractor to propose facilities capital cost of money in its offer.

(b) If the prospective Contractor does not propose this cost, the resulting contract will include the clause Waiver of Facilities Capital Cost of Money.

(End of provision)

K.12 52.219-1 SMALL BUSINESS PROGRAM REPRESENTATIONS (OCT 1995)

(a)(1) The standard industrial classification (SIC) code for this acquisition is _____

(2) The small business size standard is _____

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b) Representations. (1) The offeror represents and certifies as part of its offer that it [] is, [] is not a small business concern.

(2) (Complete only if offeror represented itself as a small business concern in block (b)(1) of this section.) The offeror represents as part of its offer that it [] is, [] is not a small disadvantaged business concern.

(3) (Complete only if offeror represented itself as a small business

concern in block (b)(1) of this section.) The offeror represents as part of its offer that it [] is, [] is not a women-owned small business concern.

(c) Definitions. Small business concern, as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and the size standard in paragraph (a) of this provision.

"Small disadvantaged business concern," as used in this provision, means a small business concern that (1) is at least 51 percent unconditionally owned by one or more individuals who are both socially and economically disadvantaged, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one or more socially and economically disadvantaged individuals, and (2) has its management and daily business controlled by one or more such individuals. This term also means a small business concern that is at least 51 percent unconditionally owned by an economically disadvantaged Indian tribe or Native Hawaiian Organization, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one or more of these entities, which has its management and daily business controlled by members of an economically disadvantaged Indian tribe or Native Hawaiian Organization, and which meets the requirements of 13 CFR Part 124.

"Women-owned small business concern," as used in this provision, means a small business concern--

(1) Which is at least 51 percent owned by one or more women or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

(d) Notice. (1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small or small disadvantaged business concern in order to obtain a contract to be awarded under the preference programs established pursuant to sections 8(a), 8(d), 9, or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall--

(i) Be punished by imposition of fine, imprisonment, or both;

- (ii) Be subject to administrative remedies, including suspension and debarment; and
- (iii) Be ineligible for participation in programs conducted under the authority of the Act.

(End of provision)

K.13 52.222-21 CERTIFICATION OF NONSEGREGATED FACILITIES (APR 1984)

(a) "Segregated facilities," as used in this provision, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise.

(b) By the submission of this offer, the offeror certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The offeror agrees that a breach of this certification is a violation of the Equal Opportunity clause in the contract.

(c) The offeror further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) it will--

(1) Obtain identical certifications from proposed subcontractors before the award of subcontracts under which the subcontractor will be subject to the Equal Opportunity clause;

(2) Retain the certifications in the files; and

(3) Forward the following notice to the proposed subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES.

A Certification of Nonsegregated Facilities must be submitted before the award of a subcontract under which the subcontractor will be subject to the Equal Opportunity clause. The certification may

be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

(End of provision)
(R 7-2003.14(b)(1)(A) 1970 AUG)
(R 1-12.803-10(d))

K.14 52.222-22 PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (APR 1984)

The offeror represents that--

(a) It /_/ has, /_/ has not, participated in a previous contract or subcontract subject either to the Equal Opportunity clause of this solicitation, the clause originally contained in Section 310 of Executive Order No. 10925, or the clause contained in Section 201 of Executive Order No. 11114;

(b) It /_/ has, /_/ has not, filed all required compliance reports; and

(c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

(End of provision)
(R 7-2003.14(b)(1)(B) 1973 APR)

K.15 52.222-25 AFFIRMATIVE ACTION COMPLIANCE (APR 1984)

The offeror represents that (a) it /_/ has developed and has on file, /_/ has not developed and does not have on file, at each establishment, affirmative action programs required by the rules and regulations of the Secretary of Labor (41 CFR 60-1 and 60-2), or (b) it /_/ has not previously had contracts subject to the written affirmative action programs requirement of the rules and regulations of the Secretary of Labor.

(End of provision)
(R 7-2003.14(b) 1979 SEP)
(R 1-12.805-4)

K.16 52.223-1 CLEAN AIR AND WATER CERTIFICATION (APR 1984)

The Offeror certifies that--

(a) Any facility to be used in the performance of this proposed contract is / is not / listed on the Environmental Protection Agency (EPA) List of Violating Facilities;

(b) The Offeror will immediately notify the Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the EPA, indicating that any facility that the Offeror proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and

(c) The Offeror will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

(End of provision)
(AV 7-2003.71 1977 JUN)
(AV 1-1.2302-1)

K.17 52.223-5 CERTIFICATION REGARDING A DRUG-FREE WORKPLACE (JUL 1995)

(a) Definitions. As used in this provision,

"Controlled substance" means a controlled substance in schedules I through V of section 202 of the Controlled Substances Act (21 U.S.C. 812) and as further defined in regulation at 21 CFR 1308.11 - 1308.15.

"Conviction" means a finding of guilt (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statutes.

"Criminal drug statute" means a Federal or non-Federal criminal statute involving the manufacture, distribution, dispensing, possession or use of any controlled substance.

"Drug-free workplace" means the site(s) for the performance of work done by the Contractor in connection with a specific contract at which employees of the Contractor are prohibited from engaging in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance.

"Employee" means an employee of a Contractor directly engaged in the performance of work under a Government contract. "Directly engaged" is defined to include all direct cost employees and any other Contractor employee who has other than a minimal impact or involvement in contract

performance.

"Individual" means an offeror/contractor that has no more than one employee including the offeror/contractor.

(b) By submission of its offer, the offeror (other than an individual) responding to a solicitation that is expected to exceed the simplified acquisition threshold, certifies and agrees, that with respect to all employees of the offeror to be employed under a contract resulting from this solicitation, it will--no later than 30 calendar days after contract award (unless a longer period is agreed to in writing), for contracts of 30 calendar days or more performance duration; or as soon as possible for contracts of less than 30 calendar days performance duration, but in any case, by a date prior to when performance is expected to be completed--

(1) Publish a statement notifying such employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in the Contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition;

(2) Establish an ongoing drug-free awareness program to inform such employees about--

(i) The dangers of drug abuse in the workplace;

(ii) The Contractor's policy of maintaining a drug-free workplace;

(iii) Any available drug counseling, rehabilitation, and employee assistance programs; and

(iv) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(3) Provide all employees engaged in performance of the contract with a copy of the statement required by subparagraph (b)(1) of this provision;

(4) Notify such employees in writing in the statement required by subparagraph (b)(1) of this provision, that as a condition of continued employment on the contract resulting from this solicitation, the employee will--

(i) Abide by the terms of the statement; and

(ii) Notify the employer in writing of the employee's conviction under a criminal drug statute for a violation occurring in the workplace no later than 5 calendar days after such conviction;

(5) Notify the Contracting Officer in writing within 10 calendar days after receiving notice under subdivision (b)(4)(ii) of this provision, from an employee or otherwise receiving actual notice of such conviction. The notice shall include the position title of the employee; and

within 30 calendar days after receiving notice under subdivision (b) of this provision of a conviction, take one of the following actions with respect to any employee who is convicted of a drug abuse offense occurring in the workplace:

Take appropriate personnel action against such employee, up to and including termination; or

Require such employee to satisfactorily participate in a drug assistance or rehabilitation program approved for such purposes by Federal, State, or local health, law enforcement, or other appropriate agency.

Make a good faith effort to maintain a drug-free workplace through implementation of subparagraphs (b)(1) through (b)(6) of this provision. In connection with its offer, the offeror, if an individual who is the offeror of any dollar value, certifies and agrees that the offeror is not engaged in the unlawful manufacture, distribution, dispensing, or use of a controlled substance in the performance of the solicitation resulting from this solicitation.

Failure of the offeror to provide the certification required by (b) or (c) of this provision, renders the offeror unqualified to be eligible for award. (See FAR 9.104-1(g) and 19.602-1(a)(2)(i).) In addition to other remedies available to the Government, the violation of paragraphs (b) or (c) of this provision concerns a matter within the jurisdiction of an agency of the United States and the making of a false, fictitious, or fraudulent certification may render the maker liable for prosecution under Title 18, United States Code, Section 1001.

(End of provision)

BUY AMERICAN CERTIFICATE (DEC 1989)

The offeror certifies that each end product, except those listed as domestic end product (as defined in the clause entitled "Buy American Act--Supplies"), and that components of unknown origin are not known to have been mined, produced, or manufactured outside the United States.

End Products

Country of Origin

(List as necessary)
Offerors may obtain from the contracting officer lists of articles,
materials, and supplies excepted from the Buy American Act.
(End of provision)

K.19 252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST
COUNTRY (SEP 1994)

(a) Definitions.

As used in this provision--

(1) "Government of a terrorist country" includes the state and the government of a terrorist country, as well as any political subdivision, agency, or instrumentality thereof.

(2) "Terrorist country" means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 (50 U.S.C. App. 2405(j)(1)(A)), to be a country the government of which has repeatedly provided support for acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran, Iraq, Libya, North Korea, Sudan, and Syria.

(3) "Significant interest" means--

(i) Ownership of or beneficial interest in 5 percent or more of the firm's or subsidiary's securities. Beneficial interest includes holding 5 percent or more of any class of the firm's securities in "nominee shares," "street names," or some other method of holding securities that does not disclose the beneficial owner;

(ii) Holding a management position in the firm, such as a director or officer;

(iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;

(iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings, real estate, or other tangible assets of the firm; or

(v) Holding 50 percent or more of the indebtedness of a firm.

(b) Prohibition on award.

In accordance with 10 U.S.C. 2327, no contract may be awarded to a firm

or a subsidiary of a firm if the government of a terrorist country has a significant interest in the firm or subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) Disclosure.

If the government of a terrorist country has a significant interest in the Offeror or a subsidiary of the Offeror, the Offeror shall disclose such interest in an attachment to its offer. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the subsidiary. The disclosure shall include--

- (1) Identification of each government holding a significant interest;
 - and
 - (2) A description of the significant interest held by each government.
- (End of provision)

K.20 252.219-7000 .SMALL DISADVANTAGED BUSINESS CONCERN REPRESENTATION (D&D CONTRACTS) (APR 1994)

(a) Definition. "Small disadvantaged business concern," as used in this provision, means a small business concern, owned and controlled by individuals who are both socially and economically disadvantaged, as defined by the Small Business Administration at 13 CFR Part 124, the majority of earnings of which directly accrue to such individuals. This term also means a small business concern owned and controlled by an economically disadvantaged Indian tribe or Native Hawaiian organization which meets the requirements of 13 CFR 124.112 or 13 CFR 124.113, respectively. In general, 13 CFR Part 124 describes a small disadvantaged business concern as a small business concern--

- (1) Which is at least 51 percent unconditionally owned by one or more socially and economically disadvantaged individuals; or
- (2) In the case of any publicly owned business, at least 51 percent of the voting stock is unconditionally owned by one or more socially and economically disadvantaged individuals; and
- (3) Whose management and daily business operations are controlled by one or more such individuals.

(b) Representations. Check the category in which your ownership falls--

- _____ Subcontinent Asian (Asian-Indian) American (U.S. citizen with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, or Nepal)
- _____ Asian-Pacific American (U.S. citizen with origins from Japan,

China, the Philippines, Vietnam, Korea, Samoa, Guam, U.S. Trust Territory of the Pacific Islands (Republic of Palau), the Northern Mariana Islands, Laos, Kampuchea (Cambodia), Taiwan, Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Republic of the Marshall Islands, or the Federated States of Micronesia)

_____ Black American (U.S. citizen)

_____ Hispanic American (U.S. citizen with origins from South America, Central America, Mexico, Cuba, the Dominican Republic, Puerto Rico, Spain, or Portugal)

_____ Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians, including Indian tribes or Native Hawaiian organizations)

_____ Individual/concern, other than one of the preceding, currently certified for participation in the Minority Small Business and Capital Ownership Development Program under Section 8(a) of the Small Business Act

_____ Other

(c) Certifications. Complete the following--

(1) The offeror is _____ is not _____ a small disadvantaged business concern.

(2) The Small Business Administration (SBA) has _____ has not _____ made a determination concerning the offeror's status as a small disadvantaged business concern. If the SBA has made a determination, the date of the determination was _____ and the offeror--

_____ Was found by SBA to be socially and economically disadvantaged and no circumstances have changed to vary that determination.

_____ Was found by SBA not to be socially and economically disadvantaged but circumstances which caused the determination have changed.

(d) Penalties and Remedies. Anyone who misrepresents the status of a concern as a small disadvantaged business for the purpose of securing a contract or subcontract shall--

(1) Be punished by imposition of a fine, imprisonment, or both;

(2) Be subject to administrative remedies, including suspension and debarment; and

(3) Be ineligible for participation in programs conducted under authority of the Small Business Act.

(End of provision)

The Offeror shall attach to its offer an identification of all documents or other media incorporating technical data or computer software it intends to deliver under this contract with other than unlimited rights that are identical or substantially similar to documents or other media that the Offeror has produced for, delivered to, or is obligated to deliver to the Government under any contract or subcontract. The attachment shall identify--

- (a) The contract number under which the data or software were produced;
- (b) The contract number under which, and the name and address of the organization to whom, the data or software were most recently delivered or will be delivered; and
- (c) Any limitations on the Government's right to use or disclose the data or software, including, when applicable, identification of the earliest date the limitations expire.

(End of provision)

K.22 52.223-5013 CERTIFICATION OF TOXIC CHEMICAL RELEASE REPORTING (OCT 1995)

(a) The offeror, by signing this offer, certifies that --

(NOTE: The offeror must check the appropriate box(es).)

(X) (1) To the best of its knowledge and belief, it is not subject to the filing and reporting requirements described in Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) sections 313(a) and (g) and Pollution Prevention Act of 1990 (PPA) section 6607 because none of its owned or operated facilities to be used in the performance of this contract currently --

(X) (i) Manufacture, process or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c).

(X) (ii) Have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023 (b)(1)(A).

(X) (iii) Meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an

appropriate certification form has been filed with EPA).

(X) (iv) Fall within Standard Industrial Classification Code (SIC) designations 20 through 39 as set forth in FAR section 19.102.

(X) (2) If awarded a contract resulting from this solicitation, its owned or operated facilities to be used in the performance of this contract, unless otherwise exempt, will file and continue to file for the life of the contract the Toxic Chemical Release Inventory Form (Form R) as described in EPCRA sections 313(a) and (g) and PPA section 6607 (42 U.S.C. 13106).

(b) Submission of this certification is a prerequisite for making or entering into this contract imposed by Executive Order 12969, August 8, 1995 (60 FR 40989-40992).

(End of provision)

X.23 52.219-19

SMALL BUSINESS CONCERN REPRESENTATION FOR THE SMALL BUSINESS
COMPETITIVENESS DEMONSTRATION PROGRAM (JUL 1991)

(a) Definition.

"Emerging small business" as used in this solicitation, means a small business concern whose size is no greater than 50 percent of the numerical size standard applicable to the standard industrial classification code assigned to a contracting opportunity.

(b) (Complete only if the Offeror has certified itself under the provision at 52.219-1 as a small business concern under the size standards of this solicitation.)

The Offeror represents and certifies as part of its offer that it / / is, / / is not an emerging small business.

(c) (Complete only if the Offeror is a small business or an emerging small business, indicating its size range.)

Offeror's number of employees for the past 12 months (check this column if size standard stated in solicitation is expressed in terms of number of employees) or Offeror's average annual gross revenue for the last 3 fiscal years (check this column if size standard stated in solicitation is expressed in terms of annual receipts). (Check one of the following.)

No. of Employees	Avg. Annual Gross Revenues
<u> </u> 50 or fewer	<u> </u> \$1 million or less
<u> </u> 51-100	<u> </u> \$1,000,001-\$2 million
<u> </u> 101-250	<u> </u> \$2,000,001-\$3.5 million
<u> </u> 251-500	<u> </u> \$3,500,001-\$5 million
<u> </u> 501-750	<u> </u> \$5,000,001-\$10 million
<u> </u> 751-1,000	<u> </u> \$10,000,001-\$17 million
<u> </u> Over 1,000	<u> </u> Over \$17 million

END OF SECTION K

1.2 LISTING OF CONTRACT CLAUSES INCORPORATED BY REFERENCE**SECTION I PART I
CONTRACT CLAUSES**

1.1	52.252-2	CLAUSES INCORPORATED BY REFERENCE (JUN 1988)
1.2	52.219-14	LIMITATIONS ON SUBCONTRACTING (JAN 1991)
1.3	52.203-3	GRATUITIES (APR 1984)
1.4	52.203-5	COVENANT AGAINST CONTINGENT FEES (APR 1984)
1.5	52.203-6	RESTRICTIONS ON SUBCONTRACTOR SALES TO THE GOVERNMENT (JUL 1995)
1.6	52.203-7	ANTI-KICKBACK PROCEDURES (JUL 1995)
1.7	52.203-9	REQUIREMENT FOR CERTIFICATE OF PROCUREMENT INTEGRITY MODIFICATION (SEPT 1995)
1.8	52.203-10	PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY (SEPT 1990)
1.9	52.203-12	LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (JAN 1990)
1.10	52.204-4	PRINTING/COPYING DOUBLE-SIDED ON RECYCLED PAPER (MAY 1995)
1.11	52.209-6	PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT (AUG 1995)
1.12	52.215-2	AUDIT AND RECORDS--NEGOTIATION (OCT 1995)
1.13	52.215-22	PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA (OCT 1995)
1.14	52.215-24	SUBCONTRACTOR COST OR PRICING DATA (OCT 1995)
1.15	52.215-27	TERMINATION OF DEFINED BENEFIT PENSION PLANS (MAR 1996)
1.16	52.215-39	REVISION OR ADJUSTMENT OF PLANS FOR POSTRETIREMENT BENEFITS OTHER THAN PENSIONS (PRB) (MAR 1996)
1.17	52.215-40	NOTIFICATION OF OWNERSHIP CHANGES (FEB 1995)
1.18	52.219-8	UTILIZATION OF SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS CONCERNS (OCT 1995)
1.19	52.219-9	SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (OCT 1995)
1.20	52.219-16	LIQUIDATED DAMAGES--SUBCONTRACTING PLAN (OCT 1995)

Subcontract No.

1.21	52.222-1	NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (APR 1984)
1.22	52.222-3	CONVICT LABOR (APR 1984)
1.23	52.222-4	CONTRACT WORK HOURS AND SAFETY STANDARDS ACT-- OVERTIME COMPENSATION (JUL 1995)
1.24	52.222-26	EQUAL OPPORTUNITY (APR 1984)
1.25	52.222-35	AFFIRMATIVE ACTION FOR SPECIAL DISABLED AND VIETNAM ERA VETERANS (APR 1984)
1.26	52.222-36	AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS (APR 1984)
1.27	52.222-37	EMPLOYMENT REPORTS ON SPECIAL DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (JAN 1988)
1.28	52.223-2	CLEAN AIR AND WATER (APR 1984)
1.29	52.223-3	HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA (NOV 1991)
1.30	52.223-6	DRUG-FREE WORKPLACE (JUL 1990)
1.31	52.225-11	RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (MAY 1992)
1.32	52.227-1	AUTHORIZATION AND CONSENT (JUL 1995)
1.33	52.227-2	NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT (APR 1984)
1.34	52.227-14	RIGHTS IN DATA--GENERAL (JUN 1987)
1.35	52.227-23	RIGHTS TO PROPOSAL DATA (TECHNICAL) (JUN 1987)
1.36	52.230-2	COST ACCOUNTING STANDARDS (AUG 1992)
1.37	52.230-6	ADMINISTRATION OF COST ACCOUNTING STANDARDS (FEB 1995)
1.38	52.232-17	INTEREST (JAN 1991)
1.39	52.232-23	ASSIGNMENT OF CLAIMS (JAN 1986)
1.40	52.232-28	ELECTRONIC FUNDS TRANSFER PAYMENT METHODS (APR 1989)
1.41	52.233-1	DISPUTES (OCT 1995)
1.42	52.242-13	BANKRUPTCY (JUL 1995)
1.43	52.245-1	PROPERTY RECORDS (APR 1984)
1.44	52.251-1	GOVERNMENT SUPPLY SOURCES (APR 1984)
1.45	252.201-7000	CONTRACTING OFFICER'S REPRESENTATIVE (DEC 1991)
1.46	252.203-7000	STATUTORY PROHIBITION ON COMPENSATION TO FORMER

DEPARTMENT OF DEFENSE

1.47	252.203-7001	SPECIAL PROHIBITION ON EMPLOYMENT (NOV 1995)
1.48	252.203-7002	DISPLAY OF DOD HOTLINE POSTER (DEC 1991)
1.49	252.204-7000	DISCLOSURE OF INFORMATION (DEC 1991)
1.50	252.204-7003	CONTROL OF GOVERNMENT PERSONNEL WORK PRODUCT (APR 1992)
1.51	252.205-7000	PROVISION OF INFORMATION TO COOPERATIVE AGREEMENT HOLDERS (DEC 1991)
1.52	252.215-7000	PRICING ADJUSTMENTS (DEC 1991)
1.53	252.215-7002	COST ESTIMATING SYSTEM REQUIREMENTS (DEC 1991)
1.54	252.222-7001	RIGHT OF FIRST REFUSAL OF EMPLOYMENT--CLOSURE OF MILITARY INSTALLATIONS (APR 1993)
1.55	252.223-7001	HAZARD WARNING LABELS (DEC 1991)
1.56	252.223-7004	DRUG-FREE WORK FORCE (SEP 1988)
1.57	252.223-7006	PROHIBITION ON STORAGE AND DISPOSAL OF TOXIC AND HAZARDOUS MATERIALS (APR 1993)
1.58	252.225-7031	SECONDARY ARAB BOYCOTT OF ISRAEL (JUN 1992)
1.59	252.227-7022	GOVERNMENT RIGHTS (UNLIMITED) (MAR 1979)
1.60	252.227-7023	DRAWINGS AND OTHER DATA TO BECOME PROPERTY OF GOVERNMENT (MAR 1979)
1.61	252.227-7025	LIMITATIONS ON THE USE OR DISCLOSURE OF GOVERNMENT-FURNISHED INFORMATION MARKED WITH RESTRICTIVE LEGENDS (JUN 1995)
1.62	252.227-7030	TECHNICAL DATA--WITHHOLDING OF PAYMENT (OCT 1988)
1.63	252.227-7036	CERTIFICATION OF TECHNICAL DATA CONFORMITY (MAY 1987)
1.64	252.231-7000	SUPPLEMENTAL COST PRINCIPLES (DEC 1991)
1.65	252.232-7006	REDUCTION OR SUSPENSION OF CONTRACT PAYMENTS UPON FINDING OF FRAUD (AUG 1992)
1.66	252.233-7000	CERTIFICATION OF CLAIMS AND REQUESTS FOR ADJUSTMENT OR RELIEF (MAY 1994)
1.67	252.242-7000	POSTAWARD CONFERENCE (DEC 1991)
1.68	52.215-33	ORDER OF PRECEDENCE (JAN 1986)

Subcontract No.

- 1.69 52.215-41 REQUIREMENTS FOR COST OR PRICING DATA OR INFORMATION OTHER THAN COST OR PRICING DATA (OCT 1995)
- 1.70 52.215-42 REQUIREMENTS FOR COST OR PRICING DATA OR INFORMATION OTHER THAN COSTS OR PRICING DATA--MODIFICATIONS (OCT 1995)
- 1.71 52.216-18 ORDERING (OCT 1995)
- 1.72 52.216-22 INDEFINITE QUANTITY (OCT 1995)
- 1.73 52.217-9 OPTION TO EXTEND THE TERM OF THE CONTRACT (MAR 1989)
- 1.74 252.219-7003 SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (DOD CONTRACTS) (NOV 1995)
- 1.75 252.219-7005 INCENTIVE FOR SUBCONTRACTING WITH SMALL BUSINESSES, SMALL DISADVANTAGED BUSINESSES, HISTORICALLY BLACK COLLEGES AND UNIVERSITIES, AND MINORITY INSTITUTIONS (NOV 1995)
- 1.76 252.227-7037 VALIDATION OF RESTRICTIVE MARKINGS ON TECHNICAL DATA (NOV 1995)
- 1.77 252.247-7023 TRANSPORTATION OF SUPPLIES BY SEA (NOV 1995)
- 1.78 52.233-3 PROTEST AFTER AWARD (OCT 1995)
- 1.79 252-243-7001 PRICING OF CONTRACT MODIFICATIONS (DEC 1991)
- 1.80 252.251-7000 ORDERING FROM GOVERNMENT SUPPLY SOURCES (MAY 1995)
- 1.81 52.228-5 INSURANCE--WORK ON A GOVERNMENT INSTALLATION (SEP 1989)
- 1.82 52.229-3 FEDERAL, STATE, AND LOCAL TAXES (JAN 1991)

END OF SECTION I

**SECTION I PART IV
 APPLICABLE TO ALL FIRM PRICE CONSTRUCTION TASK ORDERS**

IV.1	52.202-1 I	DEFINITIONS (OCT 1995)--ALTERNATE I (APR 1984)
IV.2	52.204-2 II	SECURITY REQUIREMENTS (JUL 1995)--ALTERNATE II (APR 1984)
IV.3	52.222-6	DAVIS-BACON ACT (FEB 1995)
IV.4	52.222-7	WITHHOLDING OF FUNDS (FEB 1988)
IV.5	52.222-8	PAYROLLS AND BASIC RECORDS (FEB 1988)
IV.6	52.222-9	APPRENTICES AND TRAINEES (FEB 1988)
IV.7	52.222-10	COMPLIANCE WITH COPELAND ACT REQUIREMENTS (FEB 1988)
IV.8	52.222-11	SUBCONTRACTS (LABOR STANDARDS) (FEB 1988)
IV.9	52.222-12	CONTRACT TERMINATION--EBARMENT (FEB 1988)
IV.10	52.222-13	COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REGULATIONS (FEB 1988)
IV.11	52.222-14	DISPUTES CONCERNING LABOR STANDARDS (FEB 1988)
IV.12	52.222-15	CERTIFICATION OF ELIGIBILITY (FEB 1988)
IV.13	52.222-16	APPROVAL OF WAGE RATES (FEB 1988)
IV.14	52.222-27	AFFIRMATIVE ACTION-- COMPLIANCE REQUIREMENTS FOR CONSTRUCTION (APR 1984)
IV.15	52.225-5	BUY AMERICAN ACT--CONSTRUCTION MATERIALS (MAY 1992)
IV.16	52.225-15	BUY AMERICAN ACT--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS ACT AND NORTH AMERICAN FREE TRADE AGREEMENT (JAN 1996)
IV.17	52.227-4	PATENT INDEMNITY--CONSTRUCTION CONTRACTS (APR 1984)
IV.18	52.228-2	ADDITIONAL BOND SECURITY (APR 1984)
IV.19	52.228-11	PLEDGES OF ASSETS (FEB 1992)
IV.20	52.232-5	PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (APR 1989)
IV.21	52.232-27	PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS (MAR 1994)
IV.22	52.236-1	PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984)
IV.23	52.236-2	DIFFERING SITE CONDITIONS (APR 1984)

Subcontract No.

IV.24	52.236-3	SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK (APR 1984)
IV.25	52.236-4	PHYSICAL DATA (APR 1984)
IV.26	52.236-5	MATERIAL AND WORKMANSHIP (APR 1984)
IV.27	52.236-6	SUPERINTENDENCE BY THE CONTRACTOR (APR 1984)
IV.28	52.236-7	PERMITS AND RESPONSIBILITIES (NOV 1991)
IV.29	52.236-8	OTHER CONTRACTS (APR 1984)
IV.30	52.236-9	PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (APR 1984)
IV.31	52.236-10	OPERATIONS AND STORAGE AREAS (APR 1984)
IV.32	52.236-11	USE AND POSSESSION PRIOR TO COMPLETION (APR 1984)
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IV.34	52.236-13 I	ACCIDENT PREVENTION (NOV 1991)--ALTERNATE I (NOV 1991)
IV.35	52.236-14	AVAILABILITY AND USE OF UTILITY SERVICES (APR 1984)
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IV.47	52.249-10	DEFAULT (FIXED-PRICE CONSTRUCTION) (APR 1984)
IV.48	252.227-7033	RIGHTS IN SHOP DRAWING (APR 1966)
IV.49	252-236-7000	MODIFICATION PROPOSALS--PRICE BREAKDOWN (DEC 1991)

- IV.50 252.236-7001 CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS (DEC 1991)
 - IV.51 252.236-7003 PAYMENT FOR MOBILIZATION AND PREPARATORY WORK (DEC 1991)
 - IV.52 252.236-7004 PAYMENT FOR MOBILIZATION AND DEMOBILIZATION (DEC 1991)
 - IV.53 252.236-7008 CONTRACT PRICES--BIDDING SCHEDULES (DEC 1991)
- END OF SECTION IV

LETTER OF ASSENT

All prime Contractors and their Subcontractors (at whatever tier) shall agree to be bound by the terms and conditions of the project labor agreement by executing either the Agreement(s) directly or the following Letter of Assent:

(This Letter to be typed on the appropriate Contractor's letterhead)

Mr. Charles Sekinger
Manager, Labor Relations
Stone & Webster Construction Company, Inc.
245 Summer Street
Boston, MA 02210

date:

RE: DEVENS RESERVE FORCES TRAINING AREA LANDFILL
REMEDIATION PROJECT LABOR AGREEMENT

Dear Mr. Sekinger,

Pursuant to the terms of the bid specifications issued for the Devens Reserve Forces Training Area Landfill Project, by Stone & Webster Construction Company, Inc.; and the above-referenced Project Labor Agreement(s) with the Laborers International Union of North America Environmental Partnering Project Agreement, the International Union Of Operating Engineers, and the International Brotherhood of Teamsters National Environmental Remediation Project Agreement; the undersigned Contractor (or Subcontractor) hereby agrees that it will be bound by and comply with all terms and conditions of said labor agreement(s) originally entered into on _____, 1999, _____, 1999, and _____, 1999, respectively, and any Amendments thereto.

This Letter of Assent will remain effective for the duration of the Agreement, and for any extensions, after which this Understanding will automatically terminate.

Sincerely,

(Name of Contractor or Subcontractor)

By: _____
Title

STONE & WEBSTER ENGINEERING CORPORATION
ENVIRONMENTAL PARTNERING PROJECT AGREEMENT

with the

Laborers' International Union of North America, AFL-CIO



January 1995

LIUNA ENVIRONMENTAL PARTNERING PROJECT AGREEMENT -

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ENVIRONMENTAL PARTNERING PROJECT AGREEMENT

between

STONE & WEBSTER ENGINEERING CORPORATION

and the

LABORERS' INTERNATIONAL UNION OF NORTH AMERICA, AFL-CIO

This Agreement is made and entered into this _____ day of _____, 19 ____, by and between Stone & Webster Engineering Corporation (hereinafter referred to as the "Employer") and the Laborers' International Union of North America, AFL-CIO (hereinafter referred to as the "Union") for Environmental Remediation Projects.

ARTICLE I

PURPOSE

Section 1. The purpose of this Agreement is to promote efficiency of operations on the project and provide for peaceful settlement of labor disputes without strikes or lockouts, thereby promoting the public interest in assuring the timely and economical completion of the work.

Section 2. The Employer and the Union desire to mutually establish and stabilize wages, hours and working conditions for the workers employed under this Agreement by the Employer, and further, to encourage close cooperation between the Employer and the Union to the end that a satisfactory, continuous, and harmonious relationship will exist between the parties to this Agreement.

Section 3. The Union has established environmental remediation and hazardous waste training programs which meet or exceed all of the requirements of the federal regulations.

Section 4. The Union has in its Local Union membership throughout the United States the competent, skilled, qualified and certified workers required to perform the work incidental to the effective accomplishment of this project.

ARTICLE II
SCOPE OF AGREEMENT

Section 1. It is the intent of the parties that this Agreement be utilized as a stabilization agreement for environmental remediation projects. Extensions for this Agreement shall be sought by the Employer, in writing, on an individual location basis via the completion of Addendum "A".

Section 2. The Employer recognizes the Union as the sole and exclusive bargaining representatives for all employees performing work coming within the recognized trade jurisdiction of the Union. This Agreement is between the Employer and the International Union.

Section 3. This Agreement shall not apply to executives, engineers, technicians, draftsmen, supervisors, assistant supervisors, timekeepers, messengers, office workers, guards, or other nonmanual employees.

Section 4. This Agreement represents the complete understanding of the parties; and the Employer shall not be required to sign any other agreement during the performance of the work described herein, except such participation agreements, relating to the payment of fringe benefits, which may be required by any fringe benefit trust fund.

Section 5. Both parties recognize that there may be extenuating circumstances when it is to the mutual interest of both parties to modify the terms of this Agreement. In that event, it will not be a violation of this Agreement for the parties to meet and mutually agree to make such modifications to meet a specific need on a specific project.

Section 6. This Agreement shall supersede all other agreements between the Employer and any Local of the Union for any work covered herein.

Section 7. The liability of the Employer and the liability of the Union shall be several and not joint.

ARTICLE III
UNION SECURITY

Section 1. The employees covered by this agreement shall become and remain members of the Union as a condition of employment from the seventh (7th) but not later than the eighth (8th) day of employment, or the effective date of this Agreement, whichever is later.

Section 2. It is further agreed that all Union members employed by the Employer shall maintain their membership in good standing in the Union.

Section 3. Failure of any employee to pay or tender normal initiation fees or dues as required by this Agreement shall, upon the request of the Union in writing, result in the termination of such employee.

ARTICLE IV
REFERRAL OF EMPLOYEES

Section 1. The Employer shall have the right to select and hire directly all supervisors it considers necessary and desirable. Applicants for the various classifications covered by the Agreement required by the Employer on its projects shall be referred to the Employer by the Union and/or its respective Local Unions. The Employer shall have the right to determine the competency of all employees, the right to determine the number of employees required, and the sole responsibility for selecting the employees to be laid off, discharges, suspended or disciplined for proper cause. The Employer shall also have the right to reject any applicant referred by the Union and/or its respective Local Unions.

Section 2. The Union represents that its Local Unions administer and control their referrals and it is agreed that these referrals will be made in a nondiscriminatory manner and in full compliance with federal, state and local laws and regulations which require equal employment opportunities and nondiscrimination. Referrals shall not be affected in any way by the rules, regulations, by-laws, constitutional provisions, or any other aspect or obligation of Union membership, policies or requirements.

Section 3. In the event the referral facilities maintained by the Local Unions do not refer the employees as requested by the Employer within a forty-eight (48) hour period after such requisition is made by the Employer (Saturdays, Sundays and Holidays excluded), the Employer may employ applicants from any source.

Section 4. The Employer agrees to be bound by the hiring referral rules in a local area not inconsistent with the terms of this Agreement. Where the hiring referral rules that prevail in a local area are on other than an exclusive basis, such rules shall be applicable if not in violation of either state or federal law.

Section 5. The Union and its respective Local Unions will exert their utmost efforts to recruit sufficient number of skilled and certified craftsmen to fulfill the manpower requirements of the Employer.

Section 6. The Employer shall have the right to assign key employees to the project. Key employees are defined as craft employees who possess special skills or abilities and are not readily available in the area. Key personnel shall be named and agreed to by the parties at the pre-job conference.

Section 7. Where governmental agencies impose equal employment obligations on the Employer's project, referral procedures shall be subordinate to such obligations.

Section 8. The Employer shall have the right to recall to employment within six months of layoff employees previously assigned to work covered by this Agreement.

Section 9. In referring to employees in this Agreement, the masculine gender is used for convenience only and shall refer both to males and females.

ARTICLE V
MANAGEMENT RIGHTS

Section 1. The Employer retains and shall exercise full and exclusive authority and responsibility for the management of its operations, except as expressly limited by the terms of this Agreement.

ARTICLE VI
HOURS OF WORK, OVERTIME, SHIFTS AND HOLIDAYS

Section 1. The standard work day shall consist of eight (8) hours of work between 6:00 a.m. and 6:00 p.m. with one-half hour designated as an unpaid period for lunch. The standard work week shall be five (5) consecutive days of work commencing on Monday. Nothing herein shall be construed as guaranteeing any employee eight (8) hours of work per day or forty (40) hours of work per week.

Section 2. Any employee reporting for work and for whom no work is provided, due to inclement weather or other conditions beyond the control of the Employer, shall receive two (2) hours pay at the regular straight time hourly rate. Any employee who starts to work and works beyond the two (2) hours will be paid for actual time worked. Whenever minimum reporting pay is provided for employees, they will be required to remain at the project site available for work for such time as they receive pay, unless released sooner by the Employer's principal supervisor or designated representative. The provisions of this Section are not applicable where the employee voluntarily quits or lays off, in which case the employee shall be paid for the actual time worked.

Section 3. All time before and after the established work day of eight (8) hours, Monday through Friday, and all time on Saturday shall be paid at the rate of time and one-half. All time on Sundays and the Holidays stated in Section 8 shall be paid for at the rate of double time.

Section 4. It will not be a violation of this Agreement when the Employer considers it necessary to shut down to avoid the possible loss of human life because of an emergency situation that could endanger the life and safety of an employee. In such case, employees will be compensated only for the actual time worked. In the case of a situation described above whereby the Employer requests employees to wait in a designated area available for work, the employees will be compensated for the waiting time.

Section 5. Shifts may be established when considered necessary by the Employer.

A. Shift hours and rates will be as follows:

First Shift: Eight (8) hours pay for eight (8) hours worked plus one-half (1/2) hour unpaid lunch period.

Second Shift: Eight (8) hours pay for seven and one-half (7 1/2) hours worked plus one-half (1/2) hour unpaid lunch period.

Third Shift: Eight (8) hours pay for seven (7) hours worked plus one-half (1/2) hour unpaid lunch period.

B. Shifts may be established and continue for a minimum of three (3) consecutive work days.

C. If only two shifts are to be worked, the Employer may regulate starting times of the two shift operations to permit the maximum utilization of daylight hours.

Section 6. In lieu of Section 5 above, the Employer may establish one (1) or two (2) four (4) day ten (10) hour shifts at the regular straight time hourly rate of pay, Monday through Thursday. These shifts are exclusive of a thirty (30) minute unpaid lunch period. The day shift shall start work between the hours of 6:00 a.m. and 8:00 a.m. and the second shift shall start work at a time designated by the Employer. The day shift shall work four (4) days at ten (10) hours for ten (10) hours pay. The second shift shall work four (4) days at nine and one-half (9 1/2) hours for ten (10) hours pay. Straight time is not to exceed ten (10) hours a day or forty (40) hours per week. Staggered starting times may be established for various work operations. The Employer will notify the Union at least three (3) working days prior to starting a four (4) day ten (10) hour shift.

Section 6. A. If employees lose ten (10) or more straight time hours in any given work week due to weather, or other conditions beyond the control of the Employer; the Employer, at his option, may schedule a voluntary make-up day on Friday (if a four (4) day week is scheduled).

Section 7. It is recognized by the parties to this Agreement that the standard work week may not be desirable or cost effective for some projects, and other arrangements for hours of work could be necessary. On projects where job conditions require a change in the work day, work week, and/or shifts, the parties may change these conditions to meet the requirements of the project.

Section 8. Recognized holidays shall be as follows: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Day after Thanksgiving and Christmas Day.

Under no circumstances shall any work be performed on Labor Day except in cases of emergency involving life or property. In the event a holiday falls on a Sunday; the following day, Monday, shall be observed as such holiday. There shall be no paid holidays. If employees are required to work on a holiday, they shall receive the appropriate rate, but in no case shall such overtime rate be more than double the straight time rate.

ARTICLE VII

WAGE SCALES AND BENEFITS

Section 1. The Employer and the Union agree that only those wages, fringes and premiums incorporated in the appropriate Davis-Bacon wage determination at the time the Employer is authorized to perform work will be paid.

The Employer adopts and agrees to be bound by the written terms of the applicable International Union or Local Union trust agreements. The Employer authorizes the parties to such trust agreements to appoint trustees and successor trustees to administer the trust funds and thereby ratifies and accepts the trustees so appointed as if appointed by the Employer. Nothing contained in this Section is intended to require the Employer to become a party to or be bound by any local collective bargaining agreement except for the employee benefit fund contributions as specified therein, nor is the Employer required to become a member of any employer group or association as a condition for making such contributions.

Section 2. It is agreed and understood that in the event a subcontractor becomes delinquent on the payment of required wages or fringe benefit contributions, the Employer, upon written notice from the Union, shall become liable therefore, provided however, that:

- (1) written notice of any such delinquency is received by the Employer within two weeks of the time payment was due from the subcontractor,
- (2) the delinquency is for contributions for hours performed on the Employer's project only, and
- (3) the Employer has not yet paid the subcontractor.

Section 3. Upon presentation of a proper authorization form executed by the individual employee, the Employer agrees to deduct union dues as well as other authorized deductions from net pay after taxes and remit same to the appropriate Local Union. The Employer will transmit dues to the Local Union in the manner and at the time established by local practice.

Section 4. The Employer agrees to make fringe benefit contributions for key men to the trust funds designated by the key men as their home trust funds, and shall not be obligated to contribute for the key men to any other trust funds, provided that the trust funds so designated agree to accept the contributions and credit the key men for those contributions in accordance with the trust funds' rules. The contributions shall be at the customary rates set by the home trust funds. In accordance with this Section, the key men for whom contributions are made to their designated home trust funds shall look only to those trust funds for benefits.

Section 5. Notwithstanding the first paragraph of Section 1 of this Article, the Employer agrees to submit to the Laborers' Employers Cooperation and Education Trust ("LECET") the amount of ten cents (\$.10) per hour for all hours worked by all employees of the Employer covered by this agreement, unless the applicable local agreement requires a contribution to a Regional or Local LECET, in which case the Regional or local agreement provision shall apply.

Section 6. In the event the Davis-Bacon determination does not meet the area minimum rates of the Union, the parties shall meet and establish comparable wage rates and fringe benefits in order to utilize the trained and certified crafts on the project.

ARTICLE VIII GRIEVANCE PROCEDURE

Section 1. It is specifically agreed that in the event any disputes arise out of the interpretation or application of this Agreement, excluding questions of jurisdiction of work, the dispute(s) shall be settled by means of the procedure set forth herein. No such grievance shall be recognized unless called to the attention of the Employer by the Union or to the attention of the Union by the Employer within ten (10) calendar days after the alleged violation was committed.

Section 2. A grievance shall be settled according to the following procedure:

STEP 1: The dispute shall be referred to the Business Manager of the Local Union involved or his designated representative and the Project Superintendent and/or the Employer's representative at the project.

STEP 2: In the event that the Business Representative of the Local Union and the Project Superintendent and/or the Employer representative at the project site cannot reach agreement within ten (10) calendar days after a meeting is arranged and held, the matter shall be referred to the International Union and the Labor Relations Representative of the responsible Employer.

STEP 3: In the event that the International Representative and the Labor Relations Representative of the Employer are unable to resolve the dispute within ten (10) calendar days after completion of Step 2, it shall be referred, in writing, to the General President of the Union involved and the Home Office representative of the Employer.

STEP 4: If the dispute is not resolved within ten (10) calendar days after completion of Step 3, the Employer and the Union shall choose a mutually agreed upon Arbitrator for final and binding arbitration. The impartial Arbitrator shall be selected from a panel of arbitrators submitted by and in accordance with the rules and regulations of the American Arbitration Association. The decision of the Arbitrator shall be binding upon all parties. The Arbitrator shall have no authority to change, amend, add to, or detract from any of the provisions of this Agreement. The expense of the impartial Arbitrator shall be borne equally by the Employer and the involved Union.

Section 3. The time limits specified in any step of the Grievance Procedure may be extended by mutual agreement of the parties initiated by the written request of one party to the other, at the appropriate Step of the Grievance Procedure. However, failure to process a grievance, or failure to respond in writing within the time limits provided above, without a request for an extension of time, shall be deemed a waiver of such grievance to the other without prejudice, or without precedent to the processing of and/or resolution of like or similar grievances or disputes.

Section 4. In order to encourage the resolution of disputes and grievances at Section 1 and 2 of this Grievance Procedure, the parties agree that such settlements shall not be precedent-setting.

ARTICLE IX
JURISDICTIONAL DISPUTES

Section 1. There will be no strikes, no work stoppages or slowdowns, or other interferences with the work because of jurisdictional disputes.

Section 2. Project conditions do not always justify strict adherence to craft lines which in itself does not establish precedent or change the appropriate jurisdiction of the crafts involved. Periodic review of the work assignments shall be made for the purpose of adjusting such assignments as appropriate to take care of changing needs.

Section 3. In the event of a jurisdictional dispute, the International Unions shall promptly assign International Representatives to meet with the Employer and attempt a settlement in the event of questions of assignment.

Section 4. If the International Representatives cannot reach agreement on the dispute, they shall jointly prepare and sign a complete statement of the facts and circumstances involved in the dispute, which shall be submitted to the respective General Presidents for final resolution.

ARTICLE X
GENERAL WORKING CONDITIONS

Section 1. The selection of craft foremen and/or general foremen and the number of foremen required shall be entirely the responsibility of the Employer, it being understood that in the selection of such foremen and/or general foremen the Employer will give primary consideration to qualified individuals available in the local area. After giving such consideration, the Employer may select individuals from other areas. All foremen and/or general foremen shall take orders from the designated Employer representatives. Craft foremen shall be designated working foremen at the discretion of the Employer.

Section 2. There shall be no limit on production by workmen nor restrictions on the full use of tools or equipment. Craftsmen using tools shall perform any of the work of the trade and shall work under the direction of the craft foremen. There shall be no restrictions on efficient use of manpower other than as may be required by safety regulations.

Section 3. Workers shall be at their place of work at the starting time and shall remain at their place of work performing their assigned functions under the supervision of the Employer until quitting time. The parties reaffirm their policy of a fair day's work for a fair day's wage.

Section 4. The Employer may utilize the most efficient methods or techniques of construction, tools or other labor saving devices to accomplish work. Practices not a part of the terms and conditions of this Agreement will not be recognized.

Section 5. Neither the Union nor its Local Unions shall coerce or in any way interfere with the Owner's personnel, operation or facilities at the project site. The Owner's right to contract directly with other companies for work at the project site shall not be limited, and the Union shall cooperate and not interfere with that Employer's operations. There shall be no intermingling of Owner personnel with the Employer's Union personnel.

Section 6. Slowdowns, standby crews, and featherbedding practices will not be tolerated.

Section 7. Individual seniority shall not be recognized or applied to employees working on projects under this Agreement.

Section 8. The Employer shall establish such reasonable project rules as the Employer deems appropriate. These rules will be reviewed at the pre-job conference and posted at the project site by the Employer, and may be amended thereafter as necessary.

Section 9. In order for this Agreement to be utilized, and prior to the commencement of any project under this Agreement, the Employer agrees to make notification to the Union at International Headquarters, 905 - 16th Street, N.W., Washington, DC 20006, (202) 737-8320, Fax: (202) 737-2754. This notification will include all information as specified on the Job Notification Form (see Addendum "A"). The Union agrees to acknowledge receipt of the job notification with written approval for the project specified in said notification. Each project extension request will be reviewed and approved on an individual basis.

Section 10. Employers and representatives of the International Unions, District Councils and/or Local Unions having jurisdiction shall hold a pre-job conference so that the start and continuation of work may progress without interruption. The Employer agrees to notify the Union at International Headquarters, 905 - 16th Street, N.W., Washington, DC 20006, (202) 737-8320, Fax: (202) 737-2754, prior to commencing any work covered by this Agreement. It shall be the purpose of the pre-job conference for the Employer and the Unions to agree on such matters as the length of the work week, the number of key employees to be brought in, the number of employees employed, the method of referral, the check-off of union dues, initiation fees or agency shop fees, the applicable wage rates and fringe benefit contributions in accordance with the local agreement, as well as review the site plan, site safety and health plan, site control, air monitoring, and all other aspects pertaining to the project; provided that it is agreed that the interpretation shall be a matter for the principal parties hereto.

Section 11. Employees required to wear protective clothing will be given sufficient time to go through the required procedures for dressing, undressing and decontamination and this shall be considered time worked.

ARTICLE XI

SAFETY

Section 1. The employees covered by the terms of this Agreement shall at all times while in the employ of the Employer be bound by the safety rules and regulations as established by the Employer in accordance with the Construction Safety Act, OSHA, 29 CFR 1910.120, and any other federal and state regulations. These rules and regulations will be published and posted at conspicuous places throughout the project.

Section 2. In accordance with all federal and state regulations, it shall be the exclusive responsibility of each Employer on a project site to which this Agreement applies, to assure safe working conditions for its employees and compliance by them with any safety rules contained herein or established by the Employer. Nothing in this Agreement will make the Union or any of its locals liable to any employees or to other persons in the event that injury or accidents occur.

ARTICLE XII

WORK STOPPAGES AND LOCKOUTS

Section 1. During the term of this Agreement there shall be no strikes, picketing, work stoppages, slowdowns, or other disruptive activity for any reason by the Union, its applicable Local Unions, or by any employee and there shall be no lockout by the Employer.

Section 2. The Union and its applicable Local Union shall not sanction, aid or abet, encourage or continue any work stoppage, strike, picketing, or other disruptive activity at the Employer's project site and shall undertake all reasonable means to prevent or to terminate any such activity. No employee shall engage in activities which violate this Article. Any employee who participates in or encourages any activity which interferes with the normal operation of the project shall be subject to disciplinary action, including discharge.

Section 3. Neither the Union nor its applicable Local Unions shall be liable for acts of employees for which it has no responsibility. The International Union General President will immediately instruct, order, and use the best efforts of his office to cause the Local Union or Unions to cease any violations of this Article. The principal officer or officers of a Local Union will immediately instruct, order, and use the best efforts of their office to cause the employees the Local Union represents to cease any violations of this Article. A Local Union complying with this obligation shall not be liable for unauthorized acts of the employees it represents. The failure of the Employer to exercise its right in any instance shall not be deemed a waiver of its right in any other instance.

ARTICLE XIII

PAYMENT OF WAGES - CHECKING IN AND OUT

Section 1. Employees shall be paid in full prior to normal quitting time on the project once each week (on the same day), but in no event shall more than three (3) days (Saturday, Sunday and Holidays excluded), wages be withheld. The Employer shall make arrangements with a local bank to cash regular out-of-state payroll checks.

A. If the regular pay day falls on a holiday, the employees shall be paid on the last regular work day before the holiday.

B. If payment is not made as provided herein, the employee shall be paid for waiting time. Waiting time is to be paid at the rate of two (2) hours pay at the appropriate wage rate for each twenty-four (24) hour period.

C. An employee's pay check stub or attached statement shall contain an itemized statement showing the breakdown of straight time hours, overtime hours and all authorized deductions, and must indicate the name and address of the Employer.

D. Notwithstanding the above, if circumstances beyond the control of the Employer occur, Section 1(B) will not apply.

Section 2. Employees who quit shall be paid no later than the next regular pay period.

Section 3. When employees are laid off or discharged, they shall be paid in full immediately. In the event that the employee is not paid immediately they shall receive two (2) hours pay at the appropriate hourly wage rate for each twenty-four (24) hour period or portion thereof until said check is mailed to an address of the employee's choice. The postmark on the envelope will serve as the cutoff for any penalty.

Section 4. The Employer may utilize brassing, time clocks, or other systems to check employees in and out. Each Employee must check himself in and out. The Employer will provide adequate facilities for checking in and out in an expeditious manner.

ARTICLE XIV

UNION REPRESENTATION

Section 1. Authorized representatives of the Union and its Local Unions shall have access to the project, provided they do not interfere with the work of the employees and further provided that such representatives fully comply with the visitor and security rules established for the particular project.

Section 2. The Union, or its applicable Local Union, shall have the right to designate a working journeyman as a Steward. Such designated Steward shall be a qualified worker performing the work of the craft and shall not exercise any supervisory functions. The Steward shall be concerned with the employees of the Steward's employer and not with the employees of any other employer. The Employer shall notify the Union twenty-four (24) hours prior to discharge of the Steward.

Section 3. Where the Owner's personnel may be working in close proximity to the construction activities, the Union agrees that under any and all conditions Union representatives, Stewards, and individual workmen will not interfere in any manner with the Owner's personnel or with the work which is being performed by the Owner's personnel.

ARTICLE XV
SUBCONTRACTING

Subcontractors performing work at the project shall become signatory to and be bound by the terms and conditions of this Agreement. It is understood that qualified union, competitive subcontractors may not be available. If this is the case, the Union(s) will endeavor to locate suitable, qualified, competitive union subcontractors to perform the work. If in seven (7) days the Union(s) are unable to locate such qualified, competitive union subcontractors, it is understood and agreed that the Employer may employ a non-signatory subcontractor who shall become signatory to this agreement prior to starting work.

ARTICLE XVI
GENERAL SAVINGS CLAUSE

Section 1. If any Article or provision of this Agreement shall be declared invalid, inoperative, or unenforceable by any competent authority of the executive, legislative, judicial or administrative branch of the Federal or any State government, the Employer and the Union shall suspend the operation of such Article or provision during the period of its invalidity and shall substitute by mutual consent, in its place and stead, an Article or provision which will meet the objections to its validity and which will be in accord with the intent and purpose of the Article or provisions in question.

If any Article or provision of this Agreement shall be held invalid, inoperative, or unenforceable by operation of law or by any of the above mentioned tribunals of competent jurisdiction, the remainder of this Agreement or the application of such article or provision to persons or circumstances other than those to which it has been held invalid, inoperative or unenforceable shall not be affected thereby.

ARTICLE XVII

DURATION

This Agreement shall become effective the _____ day of _____, 19_____, and shall continue in full force and effect for the duration of each project as specified through the application of "Addendum A".

This Agreement may be amended only by written agreement signed by the parties signatory hereto.

ACCEPTANCE OF AGREEMENT

SIGNED THIS _____ DAY OF _____,

LABORERS INTERNATIONAL UNION OF
NORTH AMERICA, AFL-CIO

FOR THE EMPLOYER:

General President



Signature

F. Pastor, Jr., Vice President

Name and Title

General Secretary-Treasurer

Stone & Webster Engineering Corporation
Company Name

245 Summer Street
Address

Boston, Massachusetts 02210
City State Zip

(617) 589-5111 Fax: (617) 589-1792
Telephone and Fax Numbers

ADDENDUM "A"
ENVIRONMENTAL PARTNERING PROJECT AGREEMENT
JOB NOTIFICATION FORM

Please mail and/or fax a copy of this form to LIUNA prior to the commencement of any project that is to be performed under your Environmental Partnering Project Agreement.

TO: Laborers' International Union of North America (LIUNA)
905 - 16th Street, N.W. / Construction, Maintenance and Service Trades Division
Washington, DC 20006
Telephone: (202) 737-8320 Fax: (202) 737-2754

Date: _____

Client/Owner's Name and Address:

Project Location: _____

(City/County/State) _____

Starting Date: _____ Approximate Duration of Project: _____

Nature of Work: (circle one) Lead Abatement / Hazardous Waste Remediation / Asbestos Abatement

Description of Work: _____

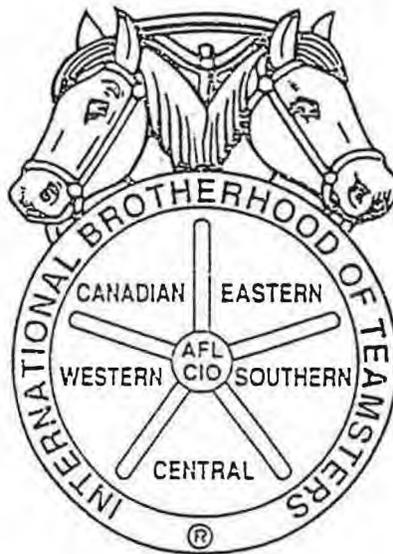
Estimated Dollar Value of Project: _____ Number of Laborers to be employed: _____

Names and Social Security Numbers of Key Men: _____

Company Name	Address	City	State	Zip Code
Telephone Number	Fax Number			
Authorized Signature	Printed Name and Title			

INTERNATIONAL BROTHERHOOD
OF TEAMSTERS

*National Environmental Remediation
Project Agreement*



NATIONAL
ENVIRONMENTAL
REMEDIATION
PROJECT
AGREEMENT

NATIONAL ENVIRONMENTAL REMEDIATION PROJECT AGREEMENT

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NATIONAL ENVIRONMENTAL REMEDIATION PROJECT AGREEMENT
between
SIGNATORY CONTRACTOR
and the
INTERNATIONAL BROTHERHOOD OF TEAMSTERS

This Agreement is made and entered into this _____ day of _____, 19 ____, by and between _____ (hereinafter referred to as the "Employer") and the International Brotherhood of Teamsters, (hereinafter referred to as "Union") for Environmental Remediation Projects.

ARTICLE I
PURPOSE

Section 1. The purpose of this Agreement is to promote efficiency of operations on the project and provide for peaceful settlement of labor disputes without strikes or lockouts, thereby promoting the public interest in assuring the timely and economical completion of the work.

Section 2. The Employer and the Union desire to mutually establish and stabilize wages, hours and working conditions for the workers employed under this Agreement by the Employer and, further, to encourage close cooperation between the Employer and the Union to the end that a satisfactory, continuous, and harmonious relationship will exist between the parties to this Agreement.

Section 3. The Union has established environmental remediation and hazardous waste training programs which meet or exceed all of the requirements of the federal regulations.

Section 4. The Union has in its Local Union membership throughout the United States competent, skilled, qualified and certified workers required to perform the work incidental to the effective accomplishment of this project.

ARTICLE II
ADMINISTRATIVE PROCEDURE

Section 1. Extensions for this Agreement shall be on a location-to-location basis and shall be sought, in writing, for each location.

Section 2. This Agreement is between the Employer and the International Union only.

ARTICLE III
SCOPE OF AGREEMENT

Section 1. It is the intent of the parties that this Agreement be utilized as a stabilization agreement for environmental remediation projects.

Section 2. Employer, as used herein, refers to the signatory employer and subcontractors of any tier performing work on projects for which the signatory employer has management responsibility under its prime contract.

Section 3. This Agreement does not limit the selection or utilization of subcontractors for the performance of the work described herein; however, such subcontractors shall become signatory to this Agreement.

Section 4. The Employer recognizes the Union as the sole and exclusive bargaining representative for all employees performing work coming within the recognized trade jurisdiction of the Union.

Section 5. This Agreement shall not apply to executives, engineers, draftsmen, supervisors, assistant supervisors, timekeepers, messengers, office workers, guards, or other nonmanual employees.

Section 6. This Agreement represents the complete understanding of the parties; and the Employer shall not be required to sign any other agreement during the performance of the work described herein, except such participation agreements, relating to the payment of fringe benefits, which may be required by any fringe benefit trust fund.

Section 7. Both parties recognize that there may be extenuating circumstances when it is to the mutual interest of both parties to modify the terms of this Agreement. In that event, it will not be a violation of this Agreement for the parties to meet and mutually agree to make such modifications to meet a specific need on a specific project in the form of an addendum to this Agreement.

Section 8. This Agreement shall supersede all other agreements between the Employer and any Local of the Union for any work covered herein.

Section 9. The liability of the Employer and the liability of the Union shall be several and not joint.

Section 10. This Agreement shall have application only to work locations agreed upon between the Employer and the Unions in accordance with Article II, Section 1.

ARTICLE IV UNION SECURITY

Section 1. The Employees shall become and remain members of the Union as a condition of employment from the seventh (7th) but not later than the eighth (8th) day of employment, or the effective date of this Agreement, whichever is later.

Section 2. It is further agreed that all Union members employed by the Employer shall maintain their membership in good standing in the Union.

Section 3. Failure of any employee to pay or tender normal initiation fees or dues as required by this Agreement shall, upon the request of the Union in writing, result in the termination of such employee.

Section 4. The provisions of this Article shall not apply where and if such a requirement for continued employment is prohibited by state law; provided, however, that where an Agency Shop is lawful in any such state, conformity therewith shall be a condition of employment on the eighth day following the beginning of such employment, or the effective date of this Agreement, whichever is later.

ARTICLE V REFERRAL OF EMPLOYEES

Section 1. The Employer shall have the right to select and hire directly all supervisors it considers necessary and desirable. Applicants for the various classifications covered by the Agreement required by the Employer on its projects shall be referred to the Employer by the Union and/or its respective Local Unions. The Employer shall have the right to determine the competency of all employees, the right to determine the number of employees required, and the sole responsibility for selecting the employees to be laid off.

Section 2. The Union represents that its Local Unions administer and control their referrals and it is agreed that these referrals will be made in a nondiscriminatory manner and in full compliance with federal, state and local laws and regulations which require equal employment opportunities and nondiscrimination. Referrals shall not be affected in any way by the rules, regulations, by-laws, constitutional provisions, or any other aspect or obligation of union membership, policies or requirements.

Section 3. In the event the referral facilities maintained by the Local Unions do not refer the employees as requested by the Employer within a forty-eight (48) hour period after such request is made by the Employer (Saturdays, Sundays and Holidays excluded), the Employer may employ applicants from any source.

Section 4. The Employer agrees to be bound by the hiring referral rules in a local area not inconsistent with the terms of this Agreement. Notwithstanding Section 2 above, the hiring referral rules that prevail in a local area are on other than an exclusive basis, such rules shall be applicable if not in violation of either state or federal law.

Section 5. The Union and its respective Local Unions will exert their utmost efforts to recruit sufficient number of skilled and certified craftsmen to fulfill the manpower requirements of the Employer.

Section 6. The Employer shall have the right to assign key employees to the project. Key employees are defined as craft employees who possess special skills or abilities and are not readily available in the area. Key personnel shall be named and agreed to at the prejob conference.

Section 7. Where governmental agencies impose equal employment obligations on the Employer's project, referral procedures shall be subordinate to such obligations.

Section 8. In referring to employees in this Agreement, the masculine gender is used for convenience only and shall refer both to males and females.

ARTICLE VI MANAGEMENT RIGHTS

Section 1. The Employer retains and shall exercise full and exclusive authority and responsibility for the management of its operations, except as expressly limited by the terms of this Agreement.

ARTICLE VII HOURS OF WORK, OVERTIME, SHIFTS AND HOLIDAYS

Section 1. The standard work day shall consist of eight (8) hours of work between 6:00 a.m. and 6:00 p.m. with one-half hour designated as an unpaid period for lunch. The standard work week shall be five (5) consecutive days of work commencing on Monday. Nothing herein shall be construed as guaranteeing any employee eight (8) hours of work per day or forty (40) hours of work per week.

Section 2. Any employee reporting for work and for whom no work is provided, due to inclement weather or other conditions beyond the control of the Employer, shall receive two (2) hours pay at the regular straight time hourly rate. Any employee who starts to work and works beyond the two (2) hours will be paid for actual time worked except as provided in Section 3. Whenever minimum reporting pay is provided for employees, they will be required to remain at the project site available for work for such time as they receive pay, unless released sooner by the Employer's principal supervisor or designated representative. The provisions of this Section are not applicable where the employee voluntarily quits, in which case the employee shall be paid for the actual time worked.

Section 3. All time before and after the established work day of eight (8) hours, Monday through Friday, and all time on Saturday shall be paid at the rate of time and one-half. All time on Sundays and the Holidays stated in Section 8 shall be paid for at the rate of double time.

Section 4. It will not be a violation of this Agreement when the Employer considers it necessary to shut down to avoid the possible loss of human life because of an emergency situation that could endanger the life and safety of an employee. In such case, employees shall receive two (2) hours pay at the regular straight time hourly rate. Any employee who starts to work and works beyond the two (2) hours will be paid for actual time worked. In the case of a situation described above whereby the Employer requests employees to wait in a designated area available for work, the employees will be compensated for the waiting time.

Section 5. Shifts may be established when considered necessary by the Employer.

A. Shift hours and rates will be as follows:

- First Shift: Eight (8) hours pay for eight (8) hours worked plus one-half (1/2) hour unpaid lunch period.
- Second Shift: Eight (8) hours pay for seven and one-half (7 1/2) hours worked plus one-half (1/2) hour unpaid lunch period.
- Third Shift: Eight (8) hours pay for seven (7) hours worked plus one-half (1/2) hour unpaid lunch period.

B. Shifts shall be established and continue for a minimum of three (3) consecutive work days.

C. If only two shifts are to be worked, the Employer may regulate starting times of the two shift operations to permit the maximum utilization of daylight hours.

Section 6. In lieu of Section 5 above, the Employer may establish one (1) or two (2) four (4) day, ten (10) hour shifts at the regular straight time hourly rate of pay, Monday through Thursday. These shifts are exclusive of a thirty (30) minute unpaid lunch period. The day shift shall start work between the hours of 6:00 a.m. and 8:00 a.m. and the second shift shall start work at a time designated by the Employer. The day shift shall work four (4) days at ten (10) hours for ten (10) hours pay. The second shift shall work four (4) days at nine and one-half (9 1/2) hours for ten (10) hours pay. Straight time is not to exceed ten (10) hours a day for forty (40) hours per week. Staggered starting times may be established for various work operations. The Employer will notify the Union at least three (3) working days prior to starting a four (4) day, ten (10) hour shift.

A. If employees lose ten (10) or more straight time hours in any given week due to weather or other conditions beyond the control of the Employer, the Employer may, at his option, schedule a voluntary make-up day on Friday (if a four (4) day week is scheduled).

Section 7. It is recognized by the parties to this Agreement that the standard work week may not be desirable or cost effective for some projects, and other arrangements for hours of work could be necessary. On projects where job conditions require a change in the work day, work week, and/or shifts, the parties mutually may change these conditions to meet the requirements of the project.

Section 8. Recognized holidays shall be as follows: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Day after Thanksgiving and Christmas Day. In the event a holiday falls on a Sunday, the following day, Monday, shall be observed as such holiday; if any of the above holidays fall on Saturday, Friday shall be observed as the holiday. There shall be no paid holidays. If employees are required to work on a holiday, they shall receive the appropriate rate, but in no case shall such overtime rate be more than double the straight time rate.

ARTICLE VIII WAGE SCALES AND BENEFITS

Section 1. Wage rates shall be those as set forth in the current appropriate Labor Agreement of the affiliated Local Union where such work is to be performed, unless modified pursuant to Article III, Section 7 or Article VIII, Section 3 of this Agreement. With respect to premiums, only those premiums incorporated in the appropriate Davis-Bacon wage determination at the time the Employer is authorized to perform work will be paid. Premiums so incorporated will be paid on all work.

Section 2. The Employer agrees to pay the fringe benefit contribution rates contained in the Local Agreement referenced above, and adopts and agrees to be bound by the written terms of legally established trust agreements specifying the detailed basis on which payments are to be made to such trust funds. The Employer authorizes the parties to such trust agreements to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the Employer. Nothing contained in this Section is intended to require the Employer to become a member of any employer group or association as a condition of making such contributions. In addition to the contributions required by the Local Agreement, Section 5 of this Article shall apply to all work.

Section 3. In the event the Davis-Bacon determination does not meet the local negotiated wage rates and fringes of the signatory Unions for that classification of work, the parties shall meet and establish comparable wages and fringe benefits, which will be attached as Appendix "A," in order to utilize the trained and certified crafts on the project.

Section 4. Upon presentation of a proper authorization form executed by the individual employee, the Employer agrees to deduct union dues from net pay after taxes and remit same to the Union in accordance with applicable law. It is understood the Employer will remit each month the Union dues deducted in accordance with this Article on the transmittal forms used for fringe benefit contributions and that the pro-rata costs of such forms and the collection and accounting thereof will be paid by the Union to the fringe benefit administrator.

Section 5. The Employer agrees to submit to the national training fund sponsored by the International Brotherhood of Teamsters the amount of ten cents (\$.10) per hour for all hours worked by all employees of the Employer covered by this Agreement.

ARTICLE IX GRIEVANCE PROCEDURE

Section 1. It is specifically agreed that in the event any disputes arise out of the interpretation or application of this Agreement, excluding questions of jurisdiction, the same shall be settled by means of the procedure set out herein. No such grievance shall be recognized unless called to the attention of the Employer by the Union and/or its respective Local Union or to the attention of the Union and/or its respective Local Union by the Employer within ten (10) calendar days after the alleged violation was committed.

Section 2. Grievances shall be settled according to the following procedure:

- STEP 1:** The dispute shall be referred to the Business Representative of the Local Union involved or his designated representative and the Project Superintendent and/or the Employer's representative at the project.
- STEP 2:** In the event that the Business Representative of the Local Union and the Project Superintendent and/or the Employer representative at the project site cannot reach agreement within ten (10) calendar days after a meeting is arranged and held, the matter shall be referred to the International Union and the Labor Relations Representative of the responsible Employer.
- STEP 3:** In the event that the International Representative and the Labor Relations Representative of the Employer are unable to resolve the dispute within ten (10) calendar days after completion of Step 2, it shall be referred, in writing, to the General President of the Union and the Home Office representative of the Employer.
- STEP 4:** If the dispute is not resolved within ten (10) calendar days after completion of Step 3, the Employer and the Union and/or its respective Local Union shall choose a mutually agreed upon Arbitrator for final and binding arbitration. The impartial Arbitrator shall be selected from a panel of arbitrators, who have knowledge and experience of the construction industry, submitted by and in accordance with the rules and regulations of the American Arbitration Association. The decision of the Arbitrator shall be binding upon all parties. The Arbitrator shall have no authority to change, amend, add to, or detract from any of the provisions of this Agreement. The expense of the impartial Arbitrator shall be borne equally by the Employer and the Union's respective Local Union.

Section 3. The time limits specified in any step of the Grievance Procedure may be extended by mutual agreement of the parties initiated by the written request of one party to the other, at the appropriate Step of the Grievance Procedure. However, failure to process a grievance, or failure to respond in writing within the time limits provided above, without a request for an extension of time, shall be deemed a waiver of such grievance to the other without prejudice, or without precedent to the processing of and/or resolution of like or similar grievances or disputes.

Section 4. In order to encourage the resolution of disputes and grievances at Section 1 and 2 of this Grievance Procedure, the parties agree that such settlements shall not be precedent-setting.

ARTICLE X JURISDICTIONAL DISPUTES

Section 1. There will be no strikes, no work stoppages or slowdowns, or other interferences with the work because of jurisdictional disputes.

Section 2. The parties to this Agreement agree to the concept that craft jurisdictional lines shall be followed, and work assignments shall be made in accordance with the Procedural Rules and Regulations of the Plan for the Settlement of Jurisdictional Disputes in the Construction Industry. However, jurisdictional disputes cannot and shall not interfere with the efficient and continuous operations required in the successful application of the intent of this Agreement. Periodic review of the work assignments shall be made for the purpose of adjusting such assignments as appropriate to take care of changing needs.

Section 3. The Local Unions involved agree that the International Unions shall be requested to promptly assign International Representatives to meet and attempt a settlement in the event of questions of assignment.

Section 4. If the International Representatives cannot reach agreement on the dispute, they shall jointly prepare and sign a complete statement of the facts and circumstances involved in the dispute, which shall be submitted to the respective General Presidents for final resolution.

ARTICLE XI GENERAL WORKING CONDITIONS

Section 1. The selection of craft foremen and/or master mechanic and the number of foremen shall be entirely the responsibility of the Employer, it being understood that in the selection of such foremen and/or master mechanic the Employer will give primary consideration to the qualified individuals available in the local area. After giving such consideration, the Employer may select individuals from other areas. All foremen shall take orders from the designated Employer representatives. Craft foremen shall be designated working foremen at the request of the Employer.

Section 2. There shall be no limit on production by workmen nor restrictions on the full use of tools or equipment. Craftsmen using tools shall perform any of the work of the trade and shall work under the direction of the craft foremen. There shall be no restrictions on efficient use of manpower other than as may be required by safety regulations.

Section 3. Employees shall be at their place of work at the designated starting time and shall remain at their place during working hours until the designated quitting time. Where the employees place of work requires Employer-furnished transportation, the employees shall be transported on the Employer's time. The parties reaffirm their policy of a fair day's work for a fair day's wage.

Section 4. The Employer may utilize the most efficient methods or techniques of construction, tools or other labor-saving devices to accomplish work. Practices not a part of the terms and conditions of this Agreement will not be recognized.

Section 5. Neither the Union nor its Local Unions shall coerce or in any way interfere with the Owner's personnel, operation or facilities at the job site. The Owner's right to contract

directly with other companies for work at the job site shall not be limited, and the Union shall cooperate and not interfere with the Employer's operations. There shall be no intermingling of Owner personnel with the Employer's Union personnel.

Section 6. Due to the nature of the work covered by this Agreement, Teamsters shall be allowed to take personal relief time not to exceed ten (10) minutes once during the first half of the shift and once during the second half of the shift. The Union agrees that this will not be abused. To the extent necessary, personal protective clothing shall be changed on company time. The Employer will determine the time during the shift when relief time will be taken. Relief time will not be taken simultaneously by all employees, unless directed by the Employer.

Section 7. Slowdowns, standby crews, and featherbedding practices will not be tolerated.

Section 8. Individual seniority shall not be recognized or applied to employees working on projects under this Agreement.

Section 9. The Employer shall establish such reasonable project rules as the Employer deems appropriate. These rules will be reviewed at the prejob conference and posted at the project site by the Employer, and may be amended thereafter as necessary.

Section 10. The Employer shall notify the International Union prior to the start of a new project of any work to be performed by the Employer within the scope of this Agreement.

Section 11. Employers and representatives of the International Union, or Local Unions having jurisdiction, shall hold a prejob conference so that the start and continuation of work may progress without interruption. It shall be the purpose of the prejob conference for the Employer and the Unions to agree on such matters as work assignments in accordance with Appendix B, the proper, safe manning of equipment, the length of the work week, the number of key employees to be brought in, the number of employees employed, the method of referral, the check-off of union dues, initiation fees or agency shop fees, the applicable wage rates and fringe benefit contribution in accordance with the contract, a review of the site plan, site safety and health plan, site control, air monitoring, and all other aspects pertaining to the project, provided it is agreed that the interpretation shall be a matter for the principal parties hereto.

Section 12. Employees required to wear protective clothing will be given sufficient time to go through the required procedures for dressing, undressing and decontamination, and this shall be considered time worked.

ARTICLE XII SAFETY

Section 1. The employees covered by the terms of this Agreement shall at all times while in the employ of the Employer be bound by the safety rules and regulations as established by

the Employer in accordance with the Construction Safety Act, OSHA, 29 CFR 1910.120, and any other federal and state regulations. These rules and regulations will be published and posted at conspicuous places throughout the project.

Section 2. In accordance with all federal and state regulations, it shall be the exclusive responsibility of each Employer on a job site to which this Agreement applies, to assure safe working conditions for its employees and compliance by them with any safety rules contained herein or established by the Employer. Nothing in this Agreement will make the Union or any of its Locals liable to any employees or to other persons in the event that injury or accidents occur.

ARTICLE XIII WORK STOPPAGES AND LOCKOUTS

Section 1. During the term of this Agreement there shall be no strikes, picketing, work stoppages, slowdowns, or other disruptive activity by the Union, its applicable Local Union, or by any employee, and there shall be no lockout by the Employer.

In the event of nonpayment of wages, fringes, and workers' compensation, the Union may take any appropriate action it deems necessary and the Union will not be considered in violation of this Article should a work stoppage occur.

Section 2. The Union and its applicable Local Union shall not sanction, aid or abet, encourage or continue any work stoppage, strike, picketing, or other disruptive activity relative of Section 1 above at the Employer's project site and shall undertake all reasonable means to prevent or to terminate any such activity. No employee shall engage in activities which violate this Article. Any employee who participates in or encourages any activity which interferes with the normal operation of the project shall be subject to disciplinary action, including discharge.

Section 3. Neither the Union nor its applicable Local Union shall be liable for acts of employees for which it has no responsibility. Upon being notified that the applicable Local Union is violating this Article, the International Union General President will immediately use the best efforts of his office to cause the applicable Local Union to cease any violations of this Article. Upon being notified that employees of the Local Union are violating this Article, the principal officer or officers of a Local Union will immediately use the best efforts of their office to cause the employees the Local Union represents to cease any violations of this Article. Compliance with this obligation shall render the Union or the applicable Local Union not liable for acts of employees. The failure of the Employer to exercise its right in any instance shall not be deemed a waiver of its right in any other instance.

ARTICLE XIV PAYMENT OF WAGES—CHECKING IN AND OUT

Section 1. Wages will be paid weekly by check on a designated day during working hours and in no case shall more than three (3) days pay be held back in any one payroll week.

Section 2. The Employer may utilize brassing, time clocks, or other systems to check employees in and out. Each employee must check himself/herself in and out. The Employer will provide adequate facilities for checking in and out in an expeditious manner.

Section 3. When employees are laid off or discharged, they shall be paid in full immediately. If not paid within twenty-four (24) hours, a four (4) hour penalty shall be levied upon the Employer.

ARTICLE XV UNION REPRESENTATION

Section 1. Authorized representatives of the Union and its Local Unions shall have access to the project provided they do not interfere with the work of the employees and further provided that such representatives fully comply with the visitor and security rules established for the particular project.

Section 2. The Union, or its applicable Local Union, shall have the right to designate a working journeyman as a Steward. Such designated Steward shall be a qualified worker performing the work of the craft and shall not exercise any supervisory functions. The Steward shall be concerned with the employees of the Steward's Employer and not with the employees of any other Employer.

Section 3. Where the Owner's personnel may be working in close proximity to the construction activities, the Union agrees that under any and all conditions Union representatives, Stewards and individual workmen will not interfere in any manner with the Owner's personnel or with the work which is being performed by the Owner's personnel.

ARTICLE XVI SUBCONTRACTING

Section 1. The Employer agrees that neither the Employer nor any of its subcontractors will subcontract any work to be done on the project except to a person, firm, or corporation which agrees to become party to this Agreement. Any contractor or subcontractor working on the project shall become signatory to and perform all work under the terms of this Agreement.

ARTICLE XVII GENERAL SAVINGS CLAUSE

Section 1. If any Article or provision of this Agreement shall be declared invalid, inoperative, or unenforceable by any competent authority of the executive, legislative, judicial or administrative branch of the federal or any state government, the Employer and the Union shall suspend the operation of such Article or provision during the period of its invalidity and shall substitute by mutual consent, in its place and stead, an Article or provision which will meet the objections to its validity and which will be in accord with the intent and purpose of the Article or provisions in question.

If any Article of provision of this Agreement shall be held invalid, inoperative, or unenforceable by operation of law or by any of the above mentioned tribunals of competent jurisdiction, the remainder of this Agreement or the applications of such Article or provision to persons or circumstances other than those as to which it has been held invalid, inoperative or unenforceable shall not be affected thereby.

**ARTICLE XVIII
DURATION**

This Agreement shall become effective the _____ day of _____, 19____, and shall continue in full force and effect for the duration of the project.

This Agreement may be amended only by written agreement signed by the parties signatory hereto.

SIGNED THIS _____ DAY OF _____, 19____

INTERNATIONAL BROTHERHOOD
OF TEAMSTERS, AFL-CIO

FOR THE EMPLOYER:

_____ Company Name

_____ Ron Carey, General President

_____ Street Address

_____ City State Zip

_____ Area Code Phone Number

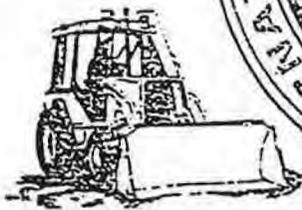
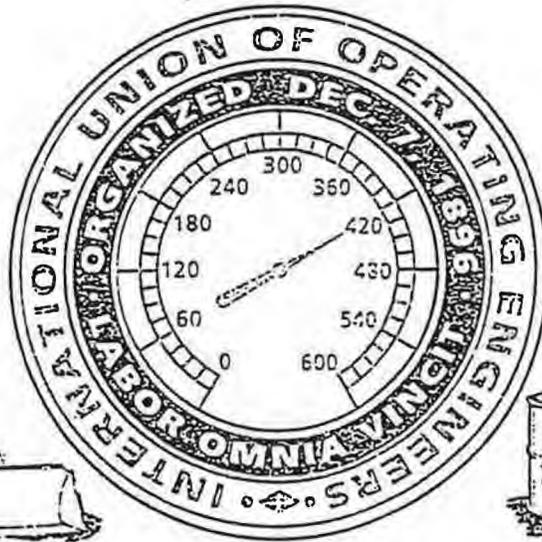
_____ Signature

_____ Name/Title Signature

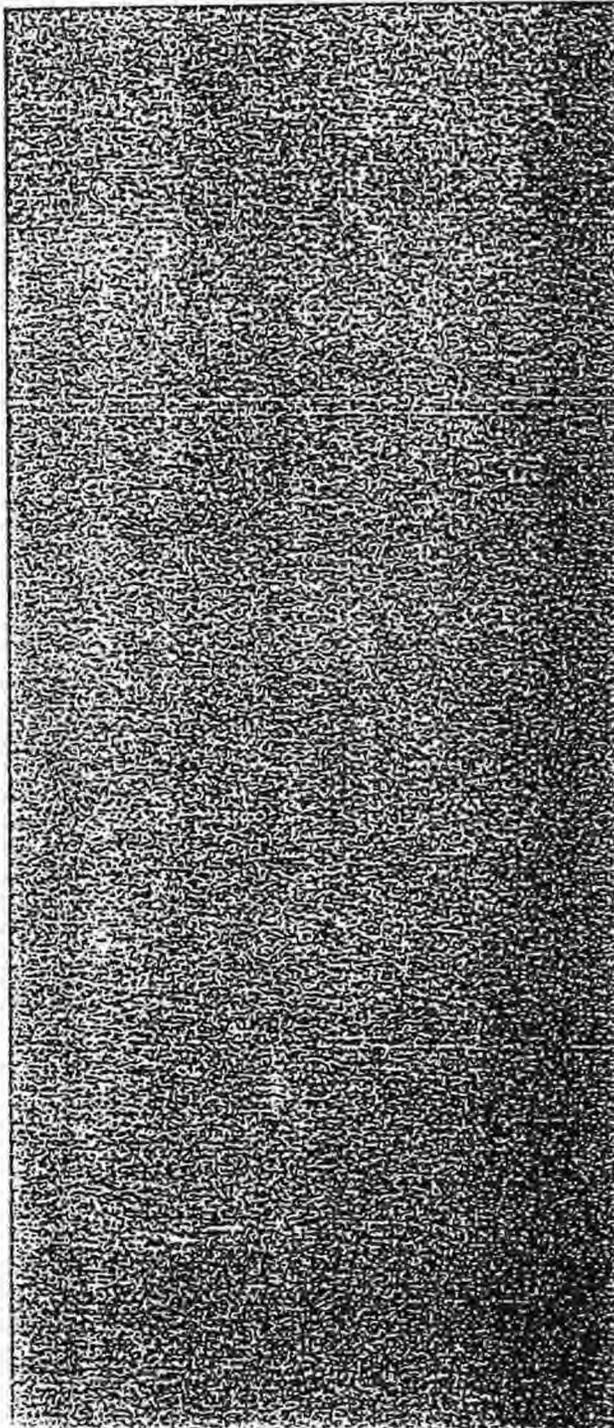
_____ Date

INTERNATIONAL UNION OF OPERATING ENGINEERS

National Environmental Remediation Project Agreement



**NATIONAL
ENVIRONMENTAL
REMEDICATION
PROJECT
AGREEMENT**



NATIONAL ENVIRONMENTAL REMEDIATION PROJECT AGREEMENT

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NATIONAL ENVIRONMENTAL REMEDIATION PROJECT AGREEMENT
between
SIGNATORY CONTRACTOR
and the
INTERNATIONAL UNION OF OPERATING ENGINEERS

This Agreement is made and entered into this _____ day of _____, 19____, by and between _____ (hereinafter referred to as the "Employer") and the International Union of Operating Engineers, (hereinafter referred to as "Union") for Environmental Remediation Projects.

ARTICLE I
PURPOSE

Section 1. The purpose of this Agreement is to promote efficiency of operations on the project and provide for peaceful settlement of labor disputes without strikes or lockouts, thereby promoting the public interest in assuring the timely and economical completion of the work.

Section 2. The Employer and the Union desire to mutually establish and stabilize wages, hours and working conditions for the workers employed under this Agreement by the Employer and, further, to encourage close cooperation between the Employer and the Union to the end that a satisfactory, continuous, and harmonious relationship will exist between the parties to this Agreement.

Section 3. The Union has established environmental remediation and hazardous waste training programs which meet or exceed all of the requirements of the federal regulations.

Section 4. The Union has in its Local Union membership throughout the United States competent, skilled, qualified and certified workers required to perform the work incidental to the effective accomplishment of this project.

ARTICLE II
ADMINISTRATIVE PROCEDURE

Section 1. Extensions for this Agreement shall be on a location-to-location basis and shall be sought, in writing, for each location.

Section 2. This Agreement is between the Employer and the International Union only.

ARTICLE III
SCOPE OF AGREEMENT

Section 1. It is the intent of the parties that this Agreement be utilized as a stabilization agreement for environmental remediation projects.

Section 2. Employer, as used herein, refers to the signatory employer and subcontractors of any tier performing work on projects for which the signatory employer has management responsibility under its prime contract.

Section 3. This Agreement does not limit the selection or utilization of subcontractors for the performance of the work described herein; however, such subcontractors shall become signatory to this Agreement.

Section 4. The Employer recognizes the Union as the sole and exclusive bargaining representative for all employees performing work coming within the recognized trade jurisdiction of the Union.

Section 5. This Agreement shall not apply to executives, engineers, draftsmen, supervisors, assistant supervisors, timekeepers, messengers, office workers, guards, or other nonmanual employees.

Section 6. This Agreement represents the complete understanding of the parties; and the Employer shall not be required to sign any other agreement during the performance of the work described herein, except such participation agreements, relating to the payment of fringe benefits, which may be required by any fringe benefit trust fund.

Section 7. Both parties recognize that there may be extenuating circumstances when it is to the mutual interest of both parties to modify the terms of this Agreement. In that event, it will not be a violation of this Agreement for the parties to meet and mutually agree to make such modifications to meet a specific need on a specific project in the form of an addendum to this Agreement.

Section 8. This Agreement shall supersede all other agreements between the Employer and any Local of the Union for any work covered herein.

Section 9. The liability of the Employer and the liability of the Union shall be several and not joint.

Section 10. This Agreement shall have application only to work locations agreed upon between the Employer and the Unions in accordance with Article II, Section 1.

ARTICLE IV UNION SECURITY

Section 1. The Employees shall become and remain members of the Union as a condition of employment from the seventh (7th) but not later than the eighth (8th) day of employment, or the effective date of this Agreement, whichever is later.

Section 2. It is further agreed that all Union members employed by the Employer shall maintain their membership in good standing in the Union.

Section 3. Failure of any employee to pay or tender normal initiation fees or dues as required by this Agreement shall, upon the request of the Union in writing, result in the termination of such employee.

Section 4. The provisions of this Article shall not apply where and if such a requirement for continued employment is prohibited by state law; provided, however, that where an Agency Shop is lawful in any such state, conformity therewith shall be a condition of employment on the eighth day following the beginning of such employment, or the effective date of this Agreement, whichever is later.

ARTICLE V REFERRAL OF EMPLOYEES

Section 1. The Employer shall have the right to select and hire directly all supervisors it considers necessary and desirable. Applicants for the various classifications covered by the Agreement required by the Employer on its projects shall be referred to the Employer by the Union and/or its respective Local Unions. The Employer shall have the right to determine

the competency of all employees, the right to determine the number of employees required, and the sole responsibility for selecting the employees to be laid off.

Section 2. The Union represents that its Local Unions administer and control their referrals and it is agreed that these referrals will be made in a nondiscriminatory manner and in full compliance with federal, state and local laws and regulations which require equal employment opportunities and nondiscrimination. Referrals shall not be affected in any way by the rules, regulations, by-laws, constitutional provisions, or any other aspect or obligation of union membership, policies or requirements.

Section 3. In the event the referral facilities maintained by the Local Unions do not refer the employees as requested by the Employer within a forty-eight (48) hour period after such request is made by the Employer (Saturdays, Sundays and Holidays excluded), the Employer may employ applicants from any source.

Section 4. The Employer agrees to be bound by the hiring referral rules in a local area not inconsistent with the terms of this Agreement. Notwithstanding Section 2 above, the hiring referral rules that prevail in a local area are on other than an exclusive basis, such rules shall be applicable if not in violation of either state or federal law.

Section 5. The Union and its respective Local Unions will exert their utmost efforts to recruit sufficient number of skilled and certified craftsmen to fulfill the manpower requirements of the Employer.

Section 6. The Employer shall have the right to assign key employees to the project. Key employees are defined as craft employees who possess special skills or abilities and are not readily available in the area. Key personnel shall be named and agreed to at the pre-job conference.

Section 7. Where governmental agencies impose equal employment obligations on the Employer's project, referral procedures shall be subordinate to such obligations.

Section 8. In referring to employees in this Agreement, the masculine gender is used for convenience only and shall refer both to males and females.

ARTICLE VI MANAGEMENT RIGHTS

Section 1. The Employer retains and shall exercise full and exclusive authority and responsibility for the management of its operations, except as expressly limited by the terms of this Agreement.

ARTICLE VII HOURS OF WORK, OVERTIME, SHIFTS AND HOLIDAYS

Section 1. The standard work day shall consist of eight (8) hours of work between 6:00 a.m. and 6:00 p.m. with one-half hour designated as an unpaid period for lunch. The standard work week shall be five (5) consecutive days of work commencing on Monday. Nothing herein shall be construed as guaranteeing any employee eight (8) hours of work per day or forty (40) hours of work per week.

Section 2. Any employee reporting for work and for whom no work is provided, due to inclement weather or other conditions beyond the control of the Employer, shall receive two (2) hours pay at the regular straight time hourly rate. Any employee who starts to work and works beyond the two (2) hours will be paid for actual time worked except as provided in

Section 3. Whenever minimum reporting pay is provided for employees, they will be required to remain at the project site available for work for such time as they receive pay, unless released sooner by the Employer's principal supervisor or designated representative. The provisions of this Section are not applicable where the employee voluntarily quits, in which case the employee shall be paid for the actual time worked.

Section 3. All time before and after the established work day of eight (8) hours, Monday through Friday, and all time on Saturday shall be paid at the rate of time and one-half. All time on Sundays and the Holidays stated in Section 8 shall be paid for at the rate of double time.

Section 4. It will not be a violation of this Agreement when the Employer considers it necessary to shut down to avoid the possible loss of human life because of an emergency situation that could endanger the life and safety of an employee. In such case, employees shall receive two (2) hours pay at the regular straight time hourly rate. Any employee who starts to work and works beyond the two (2) hours will be paid for actual time worked. In the case of a situation described above whereby the Employer requests employees to wait in a designated area available for work, the employees will be compensated for the waiting time.

Section 5. Shifts may be established when considered necessary by the Employer.

A. Shift hours and rates will be as follows:

First Shift: Eight (8) hours pay for eight (8) hours worked plus one-half (1/2) hour unpaid lunch period.

Second Shift: Eight (8) hours pay for seven and one-half (7 1/2) hours worked plus one-half (1/2) hour unpaid lunch period.

Third Shift: Eight (8) hours pay for seven (7) hours worked plus one-half (1/2) hour unpaid lunch period.

B. Shifts shall be established and continue for a minimum of three (3) consecutive work days.

C. If only two shifts are to be worked, the Employer may regulate starting times of the two shift operations to permit the maximum utilization of daylight hours.

Section 6. In lieu of Section 5 above, the Employer may establish one (1) or two (2) four (4) day, ten (10) hour shifts at the regular straight time hourly rate of pay, Monday through Thursday. These shifts are exclusive of a thirty (30) minute unpaid lunch period. The day shift shall start work between the hours of 6:00 a.m. and 8:00 a.m. and the second shift shall start work at a time designated by the Employer. The day shift shall work four (4) days at ten (10) hours for ten (10) hours pay. The second shift shall work four (4) days at nine and one-half (9 1/2) hours for ten (10) hours pay. Straight time is not to exceed ten (10) hours a day for forty (40) hours per week. Staggered starting times may be established for various work operations. The Employer will notify the Union at least three (3) working days prior to starting a four (4) day, ten (10) hour shift.

A. If employees lose ten (10) or more straight time hours in any given week due to weather or other conditions beyond the control of the Employer, the Employer may, at his option, schedule a voluntary make-up day on Friday (if a four (4) day week is scheduled).

Section 7. It is recognized by the parties to this Agreement that the standard work week may not be desirable or cost effective for some projects, and other arrangements for hours of work could be necessary. On projects where job conditions require a change in the work day, work

week, and/or shifts, the parties mutually may change these conditions to meet the requirements of the project.

Section 8. Recognized holidays shall be as follows: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Day after Thanksgiving and Christmas Day. In the event a holiday falls on a Sunday, the following day, Monday, shall be observed as such holiday; if any of the above holidays fall on Saturday, Friday shall be observed as the holiday. There shall be no paid holidays. If employees are required to work on a holiday, they shall receive the appropriate rate, but in no case shall such overtime rate be more than double the straight time rate.

ARTICLE VIII WAGE SCALES AND BENEFITS

Section 1. Wage rates shall be those as set forth in the current appropriate Labor Agreement of the affiliated Local Union where such work is to be performed, unless modified pursuant to Article III, Section 7 or Article VIII, Section 3 of this Agreement. With respect to premiums, only those premiums incorporated in the appropriate Davis-Bacon wage determination at the time the Employer is authorized to perform work will be paid. Premiums so incorporated will be paid on all work.

Section 2. The Employer agrees to pay the fringe benefit contribution rates contained in the Local Agreement referenced above, and adopts and agrees to be bound by the written terms of legally established trust agreements specifying the detailed basis on which payments are to be made to such trust funds. The Employer authorizes the parties to such trust agreements to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the Employer. Nothing contained in this Section is intended to require the Employer to become a member of any employer group or association as a condition for making such contributions. In addition to the contributions required by the Local Agreement, Section 5 of this Article shall apply to all work.

Section 3. In the event the Davis-Bacon determination does not meet the local negotiated wage rates and fringes of the signatory Unions for that classification of work, the parties shall meet and establish comparable wages and fringe benefits, which will be attached as Appendix "A," in order to utilize the trained and certified crafts on the project.

Section 4. Upon presentation of a proper authorization form executed by the individual employee, the Employer agrees to deduct union dues from net pay after taxes and remit same to the Union in accordance with applicable law. It is understood the Employer will remit each month the Union dues deducted in accordance with this Article on the transmittal forms used for fringe benefit contributions and that the pro-rata costs of such forms and the collection and accounting thereof will be paid by the Union to the fringe benefit administrator.

Section 5. The Employer agrees to submit to the national training fund sponsored by the International Union of Operating Engineers the amount of ten cents (\$.10) per hour for all hours worked by all employees of the Employer covered by this Agreement.

ARTICLE IX GRIEVANCE PROCEDURE

Section 1. It is specifically agreed that in the event any disputes arise out of the interpretation or application of this Agreement, excluding questions of jurisdiction, the same shall be settled by means of the procedure set out herein. No such grievance shall be recognized unless

called to the attention of the Employer by the Union and/or its respective Local Union or to the attention of the Union and/or its respective Local Union by the Employer within ten (10) calendar days after the alleged violation was committed.

Section 2. Grievances shall be settled according to the following procedure:

- STEP 1:** The dispute shall be referred to the Business Representative of the Local Union involved or his designated representative and the Project Superintendent and/or the Employer's representative at the project.
- STEP 2:** In the event that the Business Representative of the Local Union and the Project Superintendent and/or the Employer representative at the project site cannot reach agreement within ten (10) calendar days after a meeting is arranged and held, the matter shall be referred to the International Union and the Labor Relations Representative of the responsible Employer.
- STEP 3:** In the event that the International Representative and the Labor Relations Representative of the Employer are unable to resolve the dispute within ten (10) calendar days after completion of Step 2, it shall be referred, in writing, to the General President of the Union and the Home Office representative of the Employer.
- STEP 4:** If the dispute is not resolved within ten (10) calendar days after completion of Step 3, the Employer and the Union and/or its respective Local Union shall choose a mutually agreed upon Arbitrator for final and binding arbitration. The impartial Arbitrator shall be selected from a panel of arbitrators, who have knowledge and experience of the construction industry, submitted by and in accordance with the rules and regulations of the American Arbitration Association. The decision of the Arbitrator shall be binding upon all parties. The Arbitrator shall have no authority to change, amend, add to, or detract from any of the provisions of this Agreement. The expense of the impartial Arbitrator shall be borne equally by the Employer and the Union's respective Local Union.

Section 3. The time limits specified in any step of the Grievance Procedure may be extended by mutual agreement of the parties initiated by the written request of one party to the other, at the appropriate Step of the Grievance Procedure. However, failure to process a grievance, or failure to respond in writing within the time limits provided above, without a request for an extension of time, shall be deemed a waiver of such grievance to the other without prejudice, or without precedent to the processing of and/or resolution of like or similar grievances or disputes.

Section 4. In order to encourage the resolution of disputes and grievances at Section 1 and 2 of this Grievance Procedure, the parties agree that such settlements shall not be precedent-setting.

ARTICLE X JURISDICTIONAL DISPUTES

Section 1. There will be no strikes, no work stoppages or slowdowns, or other interferences with the work because of jurisdictional disputes.

Section 2. The parties to this Agreement agree to the concept that craft jurisdictional lines shall be followed, and work assignments shall be made in accordance with the Procedural Rules and Regulations of the Plan for the Settlement of Jurisdictional Disputes in the

Construction Industry. However, jurisdictional disputes cannot and shall not interfere with the efficient and continuous operations required in the successful application of the intent of this Agreement. Periodic review of the work assignments shall be made for the purpose of adjusting such assignments as appropriate to take care of changing needs.

Section 3. The Local Unions involved agree that the International Unions shall be requested to promptly assign International Representatives to meet and attempt a settlement in the event of questions of assignment.

Section 4. If the International Representatives cannot reach agreement on the dispute, they shall jointly prepare and sign a complete statement of the facts and circumstances involved in the dispute, which shall be submitted to the respective General Presidents for final resolution.

ARTICLE XI GENERAL WORKING CONDITIONS

Section 1. The selection of craft foremen and/or master mechanic and the number of foremen shall be entirely the responsibility of the Employer, it being understood that in the selection of such foremen and/or master mechanic the Employer will give primary consideration to the qualified individuals available in the local area. After giving such consideration, the Employer may select individuals from other areas. All foremen shall take orders from the designated Employer representatives. Craft foremen shall be designated working foremen at the request of the Employer.

Section 2. There shall be no limit on production by workmen nor restrictions on the full use of tools or equipment. Craftsmen using tools shall perform any of the work of the trade and shall work under the direction of the craft foremen. There shall be no restrictions on efficient use of manpower other than as may be required by safety regulations.

Section 3. Employees shall be at their place of work at the designated starting time and shall remain at their place during working hours until the designated quitting time. Where the employees place of work requires Employer-furnished transportation, the employees shall be transported on the Employer's time. The parties reaffirm their policy of a fair day's work for a fair day's wage.

Section 4. The Employer may utilize the most efficient methods or techniques of construction, tools or other labor-saving devices to accomplish work. Practices not a part of the terms and conditions of this Agreement will not be recognized.

Section 5. Neither the Union nor its Local Unions shall coerce or in any way interfere with the Owner's personnel, operation or facilities at the jobsite. The Owner's right to contract directly with other companies for work at the jobsite shall not be limited, and the Union shall cooperate and not interfere with the Employer's operations. There shall be no intermingling of Owner personnel with the Employer's Union personnel.

Section 6. Due to the nature of the work covered by this Agreement, Operating Engineers shall be allowed to take personal relief time not to exceed ten (10) minutes once during the first half of the shift and once during the second half of the shift. The Union agrees that this will not be abused. To the extent necessary, personal protective clothing shall be changed on company time. The Employer will determine the time during the shift when relief time will be taken. Relief time will not be taken simultaneously by all employees, unless directed by the Employer.

Section 7. Slowdowns, standby crews, and featherbedding practices will not be tolerated.

Section 8. Individual seniority shall not be recognized or applied to employees working on projects under this Agreement.

Section 9. The Employer shall establish such reasonable project rules as the Employer deems appropriate. These rules will be reviewed at the pre-job conference and posted at the project site by the Employer, and may be amended thereafter as necessary.

Section 10. The Employer shall notify the International Union prior to the start of a new project of any work to be performed by the Employer within the scope of this Agreement.

Section 11. Employers and representatives of the International Union, or Local Unions having jurisdiction, shall hold a pre-job conference so that the start and continuation of work may progress without interruption. It shall be the purpose of the pre-job conference for the Employer and the Unions to agree on such matters as work assignments in accordance with Appendix B, the proper, safe manning of equipment, the length of the work week, the number of key employees to be brought in, the number of employees employed, the method of referral, the check-off of union dues, initiation fees or agency shop fees, the applicable wage rates and fringe benefit contribution in accordance with the contract, a review of the site plan, site safety and health plan, site control, air monitoring, and all other aspects pertaining to the project, provided it is agreed that the interpretation shall be a matter for the principal parties hereto.

Section 12. Employees required to wear protective clothing will be given sufficient time to go through the required procedures for dressing, undressing and decontamination, and this shall be considered time worked.

ARTICLE XII SAFETY

Section 1. The employees covered by the terms of this Agreement shall at all times while in the employ of the Employer be bound by the safety rules and regulations as established by the Employer in accordance with the Construction Safety Act, OSHA, 29 CFR 1910.120, and any other federal and state regulations. These rules and regulations will be published and posted at conspicuous places throughout the project.

Section 2. In accordance with all federal and state regulations, it shall be the exclusive responsibility of each Employer on a job site to which this Agreement applies, to assure safe working conditions for its employees and compliance by them with any safety rules contained herein or established by the Employer. Nothing in this Agreement will make the Union or any of its Locals liable to any employees or to other persons in the event that injury or accidents occur.

ARTICLE XIII WORK STOPPAGES AND LOCKOUTS

Section 1. During the term of this Agreement there shall be no strikes, picketing, work stoppages, slowdowns, or other disruptive activity by the Union, its applicable Local Union, or by any employee, and there shall be no lockout by the Employer.

In the event of nonpayment of wages, fringes, and workers' compensation, the Union may take any appropriate action it deems necessary and the Union will not be considered in violation of this Article should a work stoppage occur.

Section 2. The Union and its applicable Local Union shall not sanction, aid or abet, encourage or continue any work stoppage, strike, picketing, or other disruptive activity relative of Section 1 above at the Employer's project site and shall undertake all reasonable means to prevent or to terminate any such activity. No employee shall engage in activities which violate this Article. Any employee who participates in or encourages any activity which interferes with the normal operation of the project shall be subject to disciplinary action, including discharge.

Section 3. Neither the Union nor its applicable Local Union shall be liable for acts of employees for which it has no responsibility. Upon being notified that the applicable Local Union is violating this Article, the International Union General President will immediately use the best efforts of his office to cause the applicable Local Union to cease any violations of this Article. Upon being notified that employees of the Local Union are violating this Article, the principal officer or officers of a Local Union will immediately use the best efforts of their office to cause the employees the Local Union represents to cease any violations of this Article. Compliance with this obligation shall render the Union or the applicable Local Union not liable for acts of employees. The failure of the Employer to exercise its right in any instance shall not be deemed a waiver of its right in any other instance.

ARTICLE XIV PAYMENT OF WAGES — CHECKING IN AND OUT

Section 1. Wages will be paid weekly by check on a designated day during working hours and in no case shall more than three (3) days pay be held back in any one payroll week.

Section 2. The Employer may utilize brassing, time clocks, or other systems to check employees in and out. Each employee must check himself/herself in and out. The Employer will provide adequate facilities for checking in and out in an expeditious manner.

Section 3. When employees are laid off or discharged, they shall be paid in full immediately. If not paid within twenty-four (24) hours, a four (4) hour penalty shall be levied upon the Employer.

ARTICLE XV UNION REPRESENTATION

Section 1. Authorized representatives of the Union and its Local Unions shall have access to the project provided they do not interfere with the work of the employees and further provided that such representatives fully comply with the visitor and security rules established for the particular project.

Section 2. The Union, or its applicable Local Union, shall have the right to designate a working journeyman as a Steward. Such designated Steward shall be a qualified worker performing the work of the craft and shall not exercise any supervisory functions. The Steward shall be concerned with the employees of the Steward's Employer and not with the employees of any other Employer.

Section 3. Where the Owner's personnel may be working in close proximity to the construction activities, the Union agrees that under any and all conditions Union representatives, Stewards and individual workmen will not interfere in any manner with the Owner's personnel or with the work which is being performed by the Owner's personnel.

**ARTICLE XVI
SUBCONTRACTING**

Section 1. The Employer agrees that neither the Employer nor any of its subcontractors will subcontract any work to be done on the project except to a person, firm, or corporation which agrees to become party to this Agreement. Any contractor or subcontractor working on the project shall become signatory to and perform all work under the terms of this Agreement.

**ARTICLE XVII
GENERAL SAVINGS CLAUSE**

Section 1. If any Article or provision of this Agreement shall be declared invalid, inoperative, or unenforceable by any competent authority of the executive, legislative, judicial or administrative branch of the federal or any state government, the Employer and the Union shall suspend the operation of such Article or provision during the period of its invalidity and shall substitute by mutual consent, in its place and stead, an Article or provision which will meet the objections to its validity and which will be in accord with the intent and purpose of the Article or provisions in question.

If any Article of provision of this Agreement shall be held invalid, inoperative, or unenforceable by operation of law or by any of the above mentioned tribunals of competent jurisdiction, the remainder of this Agreement or the applications of such Article or provision to persons or circumstances other than those as to which it has been held invalid, inoperative or unenforceable shall not be affected thereby.

**ARTICLE XVIII
DURATION**

This Agreement shall become effective the _____ day of _____, 19____, and shall continue in full force and effect for the duration of the project.

This Agreement may be amended only by written agreement signed by the parties signatory hereto.

SIGNED THIS _____ DAY OF _____ 19____.

INTERNATIONAL UNION OF OPERATING
ENGINEERS, AFL-CIO

FOR THE EMPLOYER:

Company Name _____

Frank Hanley-General President

Street Address

City State Zip

Area Code Phone Number

Signature

Name/Title Signature

Date

APPENDIX 'B' EQUIPMENT LIST

The following power equipment and machinery is recognized as within the jurisdiction of the International Union of Operating Engineers. The International Union of Operating Engineers claims jurisdiction of all equipment as granted by the AFL Convention, November 11-23, 1907, Resolution No. 124, and also claims jurisdiction of any new equipment introduced to the industry. This listing is not to be considered exclusive.

Air Compressor	Incinerators (different)
Associated Monitoring Instruments	Loader
Backhoe	Mechanic
Barrel Grappler Devices (all)	Pugmill
Batchplant	Pump & Treat Systems
Bobcats	Pumpcrete Machine
Boom Truck	Power Shovel
Clamshell	Robotic Equipment (all)
Concrete Breaker	Roller
Concrete Pump	Scraper (Self-propelled or tractor drawn)
Concrete Saw	Side Boom Tractor
Cranes (all)	Skid Steer Loader
Crusher	Slip Form Paver
Dozer	Sloper Paver
Dragline	Stationary Central Compressed Air Plant
Elevating Grader	Sweeper
Elevator	Tractor
Endloader	Trencher
Farm Tractor	Vertical Lifting Hoists
Filter Press	Vibrating Compaction Equipment—Self Propelled
Forklift	Welder
Generator	Welding Machine
Gradall	Well Drilling Rig
Grader	
Heater	

STONE & WEBSTER
GENERAL CONDITIONS FOR SUBCONTRACTS
FOR GOVERNMENT FUNDED CONTRACTS

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STONE & WEBSTER

GENERAL CONDITIONS FOR SUBCONTRACTS

FOR GOVERNMENT FUNDED CONTRACTS

1.0 GENERAL

1.1 DEFINITIONS

Unless the context clearly requires otherwise, each of the following terms, when used in this Subcontract with initial capitals, shall have the meaning set forth for such term below:

- a) "Approved" or "Approval" means approved in writing by Company and includes any subsequent written confirmation of a previous verbal approval. When applied by Company to Subcontractor's drawings or other submittals, these words mean that such drawings or other submittals appear to interface properly with Company-furnished components of the Project and Company has not identified any statement or feature that appears to deviate from the requirements of this Subcontract.
- b) "Approved as Noted", when applied by Company to Subcontractor's drawings or other submittals, means that, provided the comments noted by Company are incorporated by Subcontractor into its drawings or other submittals, such drawings or other submittals as revised appear to interface properly with Company-furnished components of the Project and, except as noted in Company's comments, Company has not identified any other statement or feature that appears to deviate from the requirements of this Subcontract.
- c) "Change Order" means a document prepared by Company to change this Subcontract, which document is signed by both Company and Subcontractor and which sets forth their agreement upon a change in the Work; the amount of the adjustment in the Subcontract Price, if any; and the extent of the adjustment in the Construction Schedule, if any.
- d) "Commercial Operation Date" means the date the Project is placed in service for commercial use.
- e) "Company" has the meaning set forth for that term in the Subcontract Agreement and, when the context implies such inclusion, shall include its successors or assigns, vendors, suppliers, officers, directors, agents, employees or other persons or entities performing work for Company.
- f) "Construction Schedule" means the detailed network schedule that is developed by Subcontractor using the critical path method of scheduling and planning the Work, and which may be revised from time to time. The Construction Schedule is to be approved by Company. In this regard, wherever used in this Subcontract, unless otherwise stated, "days" means "calendar days".
- g) "Construction Works" means all materials, supplies, construction equipment, construction tools, construction consumables and utilities, field office equipment, field office supplies, scaffolding and form lumber, templates and consumables, temporary buildings and facilities, computer software and computer hardware, used in the execution, performance, maintenance, completion or management of the Work by Subcontractor and all other items required for the Work but which are not intended to become a permanent part of the Project.
- h) "Drawings" mean the drawings referred to in this Subcontract which graphically or pictorially show the design, location and dimensions of the Work, including, but not limited to, plans, elevations, sections, details, schedules and diagrams, and any modifications to such drawings approved in writing by Company, and such other drawings as may from time to time be furnished or approved in writing by Company.
- i) "Effective Date" means the date set forth in the Subcontract Agreement as the date on which this Subcontract is effective.
- j) "Field Work Order" means a written order prepared and signed by Company which directs Subcontractor to perform a change in the Work and sets forth a proposed basis for adjustment, if any, in the Subcontract Price and/or the Construction Schedule.

- k) **"Final Acceptance"** shall occur when Company acknowledges to Subcontractor in writing that Final Completion has been achieved, as defined in Article 7.0.
- l) **"Final Completion"** means that all obligations of Subcontractor under this Subcontract have been completed as defined in Article 7.0, except for obligations which Company has waived or excused in writing, and except for obligations of Subcontractor that survive termination of this Subcontract, including but not limited to, warranty and indemnity.
- m) **"Goods"** means all of the materials, supplies, apparatus, equipment, machinery, reports, documentation, drawings and other submittals and all other items that Subcontractor is required to furnish pursuant to this Subcontract, including acceptance copies of this Subcontract and of any Change Order. Goods include Construction Works and Materials and Equipment.
- n) **"Government"** refers to the entity that will own the Work of Subcontractor following completion of Company's performance pursuant to its obligations with respect to said entity.
- o) **"Materials and Equipment"** means all materials, supplies, apparatus, equipment and machinery required for the Project to the extent they are included in the Work and will become a permanent part of the Project.
- p) **"Mechanical Completion"** means the stage in the progress of the Work when all Material and Equipment which Subcontractor is responsible to install: a) has been completely installed, connected mechanically and electrically, aligned, balanced, lubricated, charged with proper chemicals and/or gases; b) is otherwise mechanically and electrically sound in all respects; c) has successfully completed all pre-operational tests; and d) is capable of being operated within manufactures' recommended limits, in compliance with all applicable laws and without hazard or danger to any property and without danger of injury to persons.
- q) **"Modifications"** means: a) any Change Order; b) any Field Work Order or c) any written order for a minor change in the Work issued by Company.
- r) **"Notice To Proceed"** is the date Subcontractor is authorized by Company to start the Work.
- s) **"Project"** means the total construction undertaken by the Government, of which the Work performed under this Subcontract may be the whole or may be a part, and which may include construction by other subcontractors or sub-subcontractors to Company, or by Company, or by Government's own forces, including persons or entities under separate contracts with Government.
- t) **"Project Site"** means the land and other places on, under, in, or through which the Work is to be installed, executed or carried out, and any other lands or places provided by Government for the purposes of this Subcontract, together with such other places as may be specifically designated in this Subcontract as forming part of the Project Site. Where the Work is but a part of the Project, Subcontractor may be granted access to the particular part of the Project Site where the Work is to be performed, but not to the entire Project Site.
- u) **"Revise and Resubmit"**, when applied by Company to Subcontractor's drawings or other submittals, means that the drawings or other submittals are unsatisfactory to Company because they do not interface properly with Company-furnished components of the Project and/or do not comply with the requirements of this Subcontract.
- v) **"Site Manager"** refers to Company's senior representative on the Project Site.
- w) **"Specifications"** means those Subcontract Documents consisting of the written requirements for Materials and Equipment, construction systems, standards and workmanship for the Work and for the performance of related services.
- x) **"Subcontract"** or **"Subcontract Documents"** means the contract between Company and Subcontractor (the "Parties"), and includes all of the documents listed within the Subcontract Agreement; and all Modifications issued after the signing of this Subcontract.
- y) **"Subcontractor"** refers to the Party who or which has agreed to assume full responsibility for undertaking the execution of the Work under the terms of this Subcontract and to be primarily liable for the acceptable performance of the Work and for the payment of all legal debts pertaining thereto.
- z) **"Subcontract Price"** means the total amount payable to Subcontractor pursuant to this Subcontract.

- aa) "**Substantial Completion**" means the stage in the progress of the Work when: a) Mechanical Completion has been achieved; b) operational testing, whether by Subcontractor, or Company, or both, has been successfully completed; c) performance guarantees, if any, have been demonstrated; d) the Work is ready for uninterrupted operation; and e) the Work or designated portion thereof is sufficiently complete in accordance with this Subcontract so that Company or Government can occupy the Work and utilize it for its intended use.
- bb) "**Sub-subcontractor**" means any person or entity, at any tier, who has a direct or indirect subcontract with Subcontractor to perform a portion of the Work at the Project Site.
- cc) "**Supplier**" means any person or entity providing or supplying any Goods to Subcontractor or to its Sub-subcontractors for the Work.
- dd) "**Work**" means the supply by Subcontractor of all labor, facilities, Goods and all services required by this Subcontract, whether completed or partially completed and whether provided by Subcontractor or provided to Subcontractor by Company, Government or others in order to fulfill Subcontractor's obligations under this Subcontract. Work also includes all duties, responsibilities and obligations undertaken by Subcontractor under this Subcontract, whether expressed or implied. The Work may constitute the whole Project or may constitute a part of the Project.

1.2 TIME IS OF THE ESSENCE

1.2.1 Subcontractor understands and agrees that time is of the essence regarding this Subcontract with respect to Final Completion and with respect to the completion of any intermediate milestones which may be described elsewhere in this Subcontract.

1.2.2 With the exception of delays resulting from Force Majeure events under the provisions of Article 6.0, in the event of any delay or anticipated delay in Subcontractor's performance, Subcontractor shall give Company notice of such delay or anticipated delay in writing within five (5) days after the occurrence of the event giving rise to the delay became known to, or, with the exercise of reasonable diligence on the part of Subcontractor, should have become known to, Subcontractor. The notice to Company shall include a description of the source or cause of the delay and of the actions Subcontractor is undertaking to recover the delay, which actions shall be subject to Company's approval. If Subcontractor fails to take steps that Company determines are necessary to recover the delay or fails to bring its performance into compliance with the requirements of this Subcontract, Company may direct Subcontractor to accelerate its Work by supplying additional labor, including, but not limited to, overtime or additional shifts, and/or additional supervision and equipment as Company may reasonably require, in order to recover and maintain the Construction Schedule. All costs incurred by Subcontractor to accelerate its Work shall be to the account of Subcontractor. In addition to its right to direct Subcontractor to accelerate its Work, Company may exercise any other remedy specified herein or otherwise available to it under applicable law. Company's receipt of Subcontractor's notice of delay and/or Company's approval of Subcontractor's proposed action to recover the delay and/or Company's directive to accelerate the Work shall not constitute a waiver of any right or remedy available to Company, nor shall be deemed a waiver of the requirements of this Subcontract.

1.3 ENGLISH LANGUAGE

Subcontractor hereby represents that it has sufficient knowledge of the English language to fully understand this Subcontract. This Subcontract shall be in the English language. All documentation related thereto, including without limitation, any documentation to be provided by Subcontractor, Sub-subcontractors or Suppliers, shall also be in the English language. Subcontractor shall bear all costs of translation and assumes all risk of such translation.

1.4 INTERPRETATION

The terms defined herein include the plural as well as the singular. Any reference to an article, section, exhibit, appendix or attachment refers to an article, section, exhibit, appendix or attachment of or to this Subcontract unless otherwise specified. The table of contents and the headings and subheadings are inserted for convenience only and shall not be deemed a part of this Subcontract nor shall be taken into consideration in the interpretation or construction of this Subcontract. The terms "hereof", "herein", "hereunder" and comparable terms refer to the entire Subcontract with respect to which such terms are used and not to any particular article, section or subdivision thereof. The words "include", "includes" and "including" are not limiting. If any provision of this Subcontract contemplates that Company and Subcontractor will negotiate any matter after the Effective Date, such provision shall be construed to include an obligation on the part of the Parties to negotiate in good faith in accordance with the intent of this Subcontract.

1.5 ENTIRE AGREEMENT

This Subcontract sets forth the entire and integrated agreement between Company and Subcontractor with respect to the subject matter of this Subcontract, and supersedes any and all prior negotiations, representations, understandings or agreements, either written or oral. Unless specifically referenced in this Subcontract, this Subcontract does not include other documents such as bidding requirements, including invitations to bid, instructions to bidders, sample forms, Subcontractor's bid or portions thereof, or addenda relating to bidding requirements. Any scope that may reasonably be inferred from the Scope of Work, including the Drawings or Specifications or other Subcontract Documents, as being required to perform the Work shall be supplied or furnished whether or not specifically called for. When words which have a well known technical or trade meaning are used to describe the Work, such words shall be interpreted in accordance with such meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the code of any governmental authority, whether such references be specific or by implication, shall mean the latest standard specification, manual or code in effect at the time of the Work is performed, except as may be otherwise set forth herein.

1.6 ASSIGNMENT

1.6.1 Subcontractor shall not assign this Subcontract wholly or in part, voluntarily, by operation of law, or otherwise, without first obtaining the prior written consent of Company. Any assignment of this Subcontract in violation of the foregoing shall be voidable at the option of Company. Subject to the foregoing, the provisions of this Subcontract shall extend to the benefit of and shall be binding upon the successors and assigns of the Parties hereto.

1.6.2 Company reserves the right, at its sole discretion, to assign this Subcontract to its affiliates or to Government or to any financial institution(s) participating in the financing of the Project.

1.6.3 In the event Company terminates this Subcontract, Subcontractor shall assign to Company, or to Government, as Company may direct, those subcontracts, supply agreements or lease and rental agreements as may be requested by Company. Subcontractor shall insure that all its subcontracts, supply agreements and lease and rental agreements pertaining to the Work contain provisions therein permitting assignment to Company or Government, and to their successors and assigns.

1.7 INDEPENDENT SUBCONTRACTOR

1.7.1 Subcontractor is and shall operate as an independent Subcontractor in the performance of this Subcontract, and not as an agent or employee of Company or Government. Nothing contained in this Subcontract shall alter Subcontractor's status as an independent Subcontractor, nor shall this Subcontract be construed as creating any contractual relationship whatsoever between Government and Subcontractor or between any persons or entities other than Company and Subcontractor.

1.7.2 All Subcontractor's subcontracts, supply agreements and lease and rental agreements, entered into pursuant to the Work, shall contain a provision expressly stating that no contractual relationship exists between Government or Company and the Sub-subcontractor, Supplier, person or entity with which Subcontractor has entered into a purchasing or subcontracting relationship.

1.7.3 At all times, Subcontractor shall be solely responsible for the means, methods, sequences and procedures for the performance of the Work under this Subcontract.

1.7.4 Subcontractor shall accept complete responsibility as a principal for its agents, Sub-subcontractors, Suppliers and all others it hires or engages to perform or assist in performing the Work, whether on or off the Project Site. Subject to Article 4.2, Subcontractor has sole authority and responsibility to employ, discharge and otherwise control its employees.

1.7.5 No provision of this Subcontract or of any subcontract or Supplier agreement awarded by Subcontractor shall be construed to create any contractual obligation for Company to pay or be responsible for the payment of any moneys to any such Sub-subcontractor or Supplier.

1.8 SEVERABILITY

The invalidity or unenforceability of any provision of this Subcontract, including but not limited to these General Conditions, shall in no way affect the validity or enforceability of any other provision hereof. Any invalid or unenforceable provision shall be deemed severed from this Subcontract and the balance of this Subcontract shall be

reformed in such a manner as to effect to the maximum extent possible the original intent of Company and Subcontractor.

1.9 SURVIVAL

In order that the Parties to this Subcontract may fully exercise their rights and perform their obligations hereunder arising from the performance of the Work, any provisions of this Subcontract that are required to ensure exercise of such rights or performance shall survive the expiration or termination of this Subcontract, regardless of the cause for such termination and regardless of whether or not such termination applies to all or only part of this Subcontract.

1.10 NON-WAIVER

Company's or Subcontractor's waiver of any breach or failure to enforce any of the terms, covenants, conditions or provisions of this Subcontract at any time shall not in any way affect, limit, modify, waive or be deemed to affect, limit, modify or waive that Party's right thereafter to enforce or compel strict compliance with every term, covenant, condition or provision hereof, any course of dealing or custom of the trade notwithstanding.

1.11 MODIFICATIONS AND AMENDMENTS

1.11.1 No Modification, amendment, rescission, waiver or other change of or to this Subcontract shall be of any force or effect unless such Modification, amendment, rescission, waiver, or other change be in writing, signed by the authorized representative of the Party to be bound thereby.

1.11.2 Notwithstanding Article 1.11.1, Company may, without invalidating this Subcontract, order Subcontractor to perform changes in the Work within the general scope of this Subcontract, consisting of additions, deletions, or other Modifications, with the Subcontract Price and the Construction Schedule being adjusted accordingly.

1.11.3 Subcontractor shall not suspend performance of this Subcontract during the review and negotiation of any Modification.

1.12 APPLICABLE LAW AND JUDICIAL FORUM

1.12.1 This Subcontract shall be governed by the laws of the jurisdiction specified elsewhere in this Subcontract, excluding that jurisdiction's conflict of laws principles.

1.12.2 Any litigation arising out of this Subcontract shall be conducted in judicial proceedings in the court or courts specified elsewhere in this Subcontract. Subcontractor and Company hereby waive any other venue to which each might otherwise be entitled to submit a controversy arising hereunder for adjudication.

1.13 DELIVERY TERM, RISK OF LOSS, TITLE

1.13.1 All Goods delivered to the Project Site for use in performing the Work or for incorporation into the Work shall be delivered to Subcontractor at no additional cost of any kind to Company. Subcontractor shall be solely responsible for all such costs, including, but not limited to, transportation, insurance, import and/or export licenses.

1.13.2 Risk of loss of the Materials and Equipment incorporated into the Work shall remain with Subcontractor until Final Acceptance of the Work.

1.13.3 Risk of loss for Materials and Equipment not incorporated into the Work shall remain with Subcontractor until Final Acceptance unless Company requests that Subcontractor turn over to Company any such Materials and Equipment, in which case risk of loss for such Materials and Equipment shall pass to Company at the time of turn over to Company.

1.13.4 Title to Materials and Equipment shall pass to Company: a) based upon the extent to which Subcontractor has received payment for same as part of Subcontractor's progress payments; or b) incorporation of the Materials and Equipment into the Project or, in the case of Materials and Equipment not incorporated into the Work, upon turnover to Company as described in Article 1.13.3, whichever a) or b) first occurs.

1.14 SECURITY INTEREST FOR GOODS IN PROCESS

If progress payments are made to Subcontractor for Goods in process, Company shall have and shall be entitled to perfect a security interest in such Goods to the extent of the progress payments made. Subcontractor shall execute such documents as may be necessary to effectuate such security interest under the laws of the jurisdiction governing this Subcontract.

1.15 COUNTRY OF ORIGIN

Materials and Equipment shall have their origin in the country or countries set forth in this Subcontract. Unless otherwise indicated in the Subcontract Documents, for compliance with the qualifying conditions of any applicable financing arrangements, the Country of Origin shall be considered that country in which the Materials and Equipment become a commercially recognizable product that is substantially different in basic characteristics, purpose or utility from its components and that results from fabricating, manufacturing, processing or a substantial and major assembling of components. The provisions of FAR clauses 52.225-11 and 52.225-3, plus any other clauses in Section I of this Subcontract shall take precedence over any provisions of this Article 1.15.

1.16 NOT USED

1.17 NOT USED

1.18 SPARE PARTS

Subcontractor shall be required to provide any spare parts manufactured or distributed by Subcontractor as Company or Government may elect to purchase from Subcontractor, provided that this election shall not relieve Subcontractor of any of its warranty obligations under this Subcontract. If the Work includes the furnishing of any engineered Materials and Equipment and if Subcontractor intends to terminate or discontinue the production of spare parts related to such Materials and Equipment, Subcontractor shall give Company and Government written notice of its intention to do so in sufficient time to permit Company and Government to obtain their spare parts requirements from Subcontractor or from others. Subcontractor shall provide Company and Government, at no cost, the drawings, blueprints and specifications for the fabrication, manufacture, and/or assembly of the spare parts if and as requested by Company and/or Government.

1.19 SUBSTITUTIONS

If the Work includes the furnishing of any engineered Materials and Equipment, and if the Subcontract Documents for the various portions of the Work specify certain specific materials, processes and/or products of manufacturers which will be required, Subcontractor will comply with such specification unless equivalent materials, processes and/or products are specifically approved in writing by Company. Should Subcontractor propose to furnish equivalent materials, processes and/or products, either in substitution for or as an alternate to Company's specification, Subcontractor shall submit full details thereof and obtain Company's prior written approval. Company's decision as to the suitability of any such equivalent materials, processes and/or products shall be final, but the approval of Company shall not relieve Subcontractor of its responsibility concerning performance of the Work or shall not affect the warranty or any guarantees covering all parts of the Work.

2.0 ADMINISTRATION OF THE SUBCONTRACT

2.1 Company will administer this Subcontract as described in the Subcontract Documents and, as part of such administration, Company rights include but are not limited to the following:

2.1.1 Company will periodically inspect the Work and monitor progress to determine in general whether the Work is being performed in accordance with the requirements this Subcontract. Company's failure to ascertain or to advise Subcontractor that any portion of the Work is not in compliance with this Subcontract shall not relieve Subcontractor of its continuing obligation to perform the entire Work in accordance with this Subcontract.

2.1.2 Company will coordinate the activities of other subcontractors and the activities of Government's or Company's own forces with the Work of Subcontractor. Subcontractor shall cooperate with such other parties performing work at the Project Site. Subcontractor shall participate with other subcontractors and Company in reviewing their collective construction schedules when directed to do so by Company. Subcontractor shall make any required revisions to its Construction Schedule after a joint review and mutual agreement of Company and Subcontractor. The Construction Schedule shall constitute the schedule to be used by Subcontractor unless and until subsequently revised by Subcontractor and approved by Company.

- 2.1.3 Company will review and approve all applications for payment submitted by Subcontractor, including Subcontractor's application for final payment.
- 2.1.4 Company will have authority to reject Work that does not conform to this Subcontract and to require inspection or testing of all re-performed Work in accordance with Article 11.0. In addition, whenever Company deems it necessary or advisable for the implementation of this Subcontract, Company shall have authority to require additional inspection or testing of the Work in accordance with Article 11.0, regardless of whether or not such Work is fabricated, installed or completed. Notwithstanding the foregoing, however, neither Company's authority to act under this Article nor any decision made by Company in good faith either to exercise or not to exercise such authority shall give rise to a duty or a responsibility on the part of Company to Subcontractor, or to its Sub-subcontractors, Suppliers, their agents or employees, or other persons performing any of the Work.
- 2.1.5 Company will receive from Subcontractor for review and approval, rejection or comment, in accordance with Article 12.0, all shop drawings and other submittals, and shall coordinate such shop drawings or other submittals with information received from other subcontractors. Any action taken by Company regarding such submittals shall be taken with reasonable promptness so as to cause no delay in the Work of Subcontractor, provided that Subcontractor's submittal is in itself complete and timely in accordance with the Construction Schedule and allows sufficient time to permit adequate review by Company. Any action taken by Company in connection with the review and approval of Subcontractor's submittals shall be for the limited purpose of checking for conformance with information given and the design concept expressed in this Subcontract, and shall not be conducted for the purpose of determining the accuracy and completeness of details such as dimensions and quantity, nor for substantiating instructions for installation, nor for the performance of Materials and Equipment or systems, all of which shall remain the responsibility of Subcontractor as required in this Subcontract. Company's review of Subcontractor's drawings or other submittals shall not relieve Subcontractor of its obligation to submit same or of its obligations to supervise and direct the Work or of its obligations under the warranty provisions of this Subcontract. Such review by Company shall not constitute approval of safety precautions or, unless otherwise specifically approved by Company, of any construction means, methods, techniques, sequences or procedures. Company's approval of a specific component shall not indicate approval of an assembly of which the component is a part.
- 2.1.6 Company will prepare all Change Orders and Field Work Orders in accordance with this Subcontract.
- 2.1.7 Company will conduct inspections to determine whether or not Substantial Completion and Final Completion have been achieved, and will receive and forward to Government all written warranties and related documents required by this Subcontract and assembled and submitted by Subcontractor.
- 2.1.8 Company will interpret and decide matters concerning performance under and requirements of this Subcontract.
- 2.2 Except to the extent set forth in Article 2.1.2 and except to the extent required to maintain overall health, safety and welfare at the Project Site, Company will not have control over or charge of and will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precaution programs in connection with the Work.
- 2.3 Unless otherwise stated in this Subcontract, all Company communications regarding Subcontractor's Sub-subcontractors and Suppliers or their agents or employees will be made through Subcontractor.

3.0 REPRESENTATIONS BY SUBCONTRACTOR

- 3.1 Subcontractor represents that it:
 - 3.1.1 Has examined the Subcontract Documents thoroughly.
 - 3.1.2 Has familiarized itself with federal, state, provincial, municipal, local and other governmental laws, ordinances, rules and regulations, ecological and environmental criteria, and building and safety codes, that pertain to the Work or to Subcontractor's performance of the Work.
 - 3.1.3 Has studied Project Site information provided or otherwise made available by Company.
 - 3.1.4 Has visited and carefully examined the Project Site to ascertain the nature and location of the Work; the character and accessibility of the Project Site, including, but not limited to, methods of ingress to and egress from the Project Site and the transportation, disposal, handling, and storage of the Goods; the character of Construction Works required for the performance of the Work; the existence of obstacles that could impact Subcontractor's performance or its schedule for

the performance of the Work; the availability of facilities and utilities, including, but not limited to, potable water, construction water and electricity; the location and the character of existing or adjacent work or structures; climatic conditions, river stages, tides, and similar physical conditions at the Project Site; the required Construction Schedule and the order and method of performance of the Work; and all other general and local conditions (including the availability and qualifications of labor) which might affect the performance of the Work or the cost thereof.

- 3.1.5 Is fully experienced and properly qualified to perform the Work and is properly equipped, organized and financed to perform such Work. Subcontractor represents that, at the time of its signing of this Subcontract and at all times during the performance of the Work, it is and will continue to be properly licensed and qualified to do business by all governmental agencies having jurisdiction over the Work. Upon request by Company, Subcontractor shall furnish such evidence as Company may require relating to Subcontractor's ability to fully perform this Subcontract, including evidence of its financial standing. Subcontractor agrees that it is an employer subject to all applicable unemployment compensation, occupational safety and health, or similar statutes, so as to relieve Company of any responsibility or liability for the treating Subcontractor's employees as employees of Company for the purpose of their safety or for the keeping of records, making reports or paying any payroll taxes or contributions. Subcontractor agrees to indemnify, hold harmless and defend Company, Government, their subsidiaries and affiliates, and all their directors, officers, employees, agents and representatives, from and against any liability, claims, demands, penalties, fines, lawsuits, judgments, losses and expenses, including reasonable attorneys' fees and court costs, incurred under said statutes in connection with employees of Subcontractor, including a sum equal to any unemployment benefits paid to those who were Subcontractor's employees where such benefit payments are charged to Company.
- 3.2 Any surface or subsurface reports, topographic maps, geotechnical reports, or other information made available to Subcontractor by Company are solely for Subcontractor's convenience. Subcontractor represents that it has satisfied itself as to the character, quality and quantity of surface and subsurface materials, structures, utilities or other obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the Project Site. Any failure by Subcontractor to take the actions described in this Article 3.2 or in the preceding Article 3.1 shall not relieve Subcontractor from its responsibility for properly estimating the difficulty and cost of successfully performing its Work or for proceeding to successfully perform the Work without additional expense to Company. Subcontractor acknowledges that Company assumes no responsibility or liability for conclusions or interpretations made by Subcontractor based on any information Company has made available to Subcontractor. Subcontractor further acknowledges that Company assumes no responsibility or liability for any understandings reached or representations made by third parties, including Government and its employees or agents, prior to the its signing of this Subcontract, concerning conditions which can affect the Work.

4.0 LABOR AND LABOR RELATIONS

- 4.1 Subcontractor shall provide an adequate number of qualified and competent supervisory staff, craft persons and other personnel to perform the Work. At all times during the course of the Work, Subcontractor shall provide at the Project Site a qualified, competent and responsible supervisor satisfactory to Company. Subcontractor's supervisor shall have authority to represent Subcontractor. Directions given to Subcontractor's supervisor by Company shall be binding on Subcontractor. Upon Company's written request, Subcontractor shall give the supervisor, in writing, complete authority to act on behalf of and to bind Subcontractor in all matters pertaining to the Work and this Subcontract and shall furnish Company a copy of such authorization. Subcontractor shall not transfer or remove or replace its supervisor or any of its supervisory staff assigned to this Subcontract without the prior written consent of Company.
- 4.2 In response to a request by Company, Subcontractor shall replace, at no cost to Company, any of its personnel or require its Sub-subcontractors to replace personnel performing the Work whom Company reasonably requests to be replaced, including, without limitation, personnel deemed by Company to be disruptive to the Project, or personnel who fail to comply with any drug and controlled substance abuse policies applicable to personnel working at the Project Site.
- 4.3 Subcontractor shall exercise its management rights in performing the Work. Such rights shall be deemed to include, but shall not be limited to, the rights to: a) hire, discharge, promote and transfer employees; b) select and remove foremen or other persons at other levels of supervision (subject to Article 4.2); c) establish and enforce reasonable standards of production; d) introduce, to the extent feasible, labor saving techniques and Materials and Equipment (subject to Company's approval if such Materials and Equipment quality has been specified in the Subcontract Documents and subject to Subcontractor's warranty that said Materials and Equipment meet the requirements of the Subcontract Documents); e) determine the number of craftsmen necessary to perform a task, job or activity; and f) establish, maintain and enforce rules and regulations conducive to efficient and productive operations; all provided, however, that if Company shall notify Subcontractor that it believes in good faith that any labor practice employed by Subcontractor is delaying the Work or causing increased cost to Company, Company and Subcontractor shall negotiate in good faith in an attempt to agree upon other practices mutually acceptable to Company and Subcontractor.

- 4.4 Subcontractor shall use its best efforts to minimize the risk of labor-related delays including, if union labor is employed and if requested to do so by Company, using its best efforts to negotiate a Project agreement which includes a no-strike provision. Subcontractor shall promptly notify Company and take any and all reasonable steps that may be available in connection with the resolution of violations of collective bargaining agreements and jurisdictional disputes including, without limitation, the filing of appropriate processes with any court or administrative agency having jurisdiction to settle, enjoin or to award damages resulting from violations of collective bargaining agreements or jurisdiction disputes.
- 4.5 Subcontractor shall promptly undertake such reasonable efforts as are necessary to prevent any strikes or labor disputes among its employees or the employees of its Sub-subcontractors or Suppliers.
- 4.6 Subcontractor shall promptly give notice to Company of any actual, anticipated or threatened labor dispute that might affect the performance of the Work of Subcontractor or by any of its Sub-subcontractors or Suppliers. Subcontractor acknowledges that Materials and Equipment to be furnished by Company or Government, if any, may not be provided by union shops, and Subcontractor expressly agrees that any labor disputes resulting from this circumstance shall not constitute an event for which Subcontractor may seek relief under the Force Majeure or any other provision of this Subcontract.
- 4.7 Subcontractor shall comply strictly with all work rules and procedures established by Company or Government for the conduct of work at the Project Site. Subcontractor shall ensure that all supervisory personnel, employees, agents and Sub-subcontractors at the Project Site comply strictly with such rules. Company reserves the right, from time to time, to revise any such rules and Subcontractor shall comply fully with such rules as revised in accordance with the foregoing provisions.
- 4.8 Subcontractor shall comply with all provisions of the Davis-Bacon Act (FAR 56.222.6) and/or the Service Contract Act (FAR 52.222.41) and/or any other such provisions as may be imposed by Section I of this Subcontract.

5.0 OVERTIME

Unless expressly stated elsewhere in this Subcontract, Subcontractor's hours of work at the Project Site shall be compatible with Company's starting and quitting times or such other times as are approved by Company in writing. Scheduled overtime work by Subcontractor must be approved in advance and in writing by Company. Subcontractor shall notify Company in advance of any incidental or spot overtime that Subcontractor elects to work due to such operations as concrete placement and non-disruptable work activities. Should Subcontractor be required to work overtime due to an emergency situation to protect life or property, Subcontractor shall so notify Company as soon as reasonably practicable. All overtime work, whether scheduled or incidental or for emergencies, shall be to Subcontractor's account.

6.0 FORCE MAJEURE

- 6.1 Neither Subcontractor (nor its Sub-subcontractors or Suppliers) nor Company shall be responsible for or liable for, or be deemed in breach of this Subcontract because of, any delay, interference, disruption, or hindrance in the performance of their respective obligations hereunder if and to the extent that any such impact in performance is due solely to a Force Majeure event, which is a condition or conditions beyond the reasonable control of the Party experiencing such an impact in performance (the "Affected Party"). Force Majeure events are acts of God, floods, hurricanes, tomadoes, typhoons, lightning strikes, landslides, earthquakes, epidemics, quarantines, war, civil insurrection, riots, sabotage, requirements of or actions of or failures to act on the part of governmental authorities preventing performance, embargoes, and accident or fire not caused by the Affected Party, provided that:
- 6.1.1 The Affected Party gives the other Party written notice describing the Force Majeure event and its impact or potential impact on Affected Party within seven (7) days after the Affected Party became aware of, or reasonably should have become aware of, such event;
- 6.1.2 The delay, interference, disruption, or hindrance or other inability to perform is of no greater scope and of no longer duration than is required as a direct result of the Force Majeure event.
- 6.2 The following events shall not be deemed to be delays within the meaning of Article 6.1: a) changes in market conditions or governmental actions that affect the demand for the services of Subcontractor (or Sub-subcontractors or Suppliers); b) late delivery of Goods caused by congestion at the facilities of Subcontractor (or Sub-subcontractors or Suppliers) or elsewhere, an oversold condition of the market, inefficiency, or similar occurrence or condition; c) late performance by Subcontractor (or Sub-subcontractors or Suppliers), caused by a shortage of labor or supervision,

inefficiency in prosecuting their respective portions of the Work, or similar occurrence or condition; d) Subcontractor's failure (or the failure of any of its Sub-subcontractors or Suppliers) to secure and maintain permits, licenses or other governmental approvals necessary for prosecution of the Work or their respective portions of the Work; e) normal weather conditions, including adverse weather conditions predictable through analysis of historical weather data, and; f) any negligent or intentional acts, errors, or omissions of the Affected Party (including acts, errors and omissions by its employees, agents, Sub-subcontractors or Suppliers), the Affected Party's failure to comply with any law, rule, regulation, order or ordinance (including any such failure to comply by any of its employees, agents, Sub-subcontractors or Suppliers), or any breach or default of this Subcontract by the Affected Party.

- 6.3 If Subcontractor experiences a delay, interference, disruption or hindrance or other inability to perform that is due solely to a Force Majeure event described in Article 6.1, the Construction Schedule shall be adjusted and, if appropriate, the scheduled completion date shall be extended by a period of time equal to the amount of time reasonably determined by Company to be necessary for Subcontractor to recover from such impact in performance. Subcontractor expressly agrees that adjustment of the Construction Schedule and extension of the scheduled completion date shall be Subcontractor's sole and exclusive remedy and Company's sole and exclusive liability in the event Subcontractor is delayed, interfered with, disrupted, or hindered in the performance of its Work by an event described in Article 6.1.
- 6.4 The Party claiming a delay under this Article 6.0 shall use its best efforts to remedy any inability to perform due to the occurrence of a Force Majeure event. As and when such Affected Party is able to resume performance of its obligations under this Subcontract, such Affected Party shall give the other Party written notice to that effect. The suspension of performance shall be of no greater scope and of no longer duration than is required by the delaying event.
- 6.5 If Subcontractor experiences a delay, interference, disruption or hindrance or other inability to perform that is due solely to a Force Majeure event described in Article 6.1, and if, within a reasonable time after the occurrence of a Force Majeure event, Subcontractor has failed to take such action as Subcontractor could lawfully and reasonably initiate to remove or relieve the delay, interference, disruption or hindrance or its direct or indirect effects, Company may, in its sole reasonable discretion and after written notice to Subcontractor, and at Subcontractor's expense, initiate such reasonable measures as will be designed to remove or relieve such delay, interference, disruption or hindrance or its direct or indirect effects and thereafter require Subcontractor to resume full or partial performance of the Work, or may declare Subcontractor in default under this Subcontract.
- 6.6 Failure of the Affected Party to provide the written notice or to take the prescribed actions hereunder shall be deemed a waiver by the Affected Party of its right to an extension of time for its performance.

7.0 FINAL COMPLETION AND ACCEPTANCE

- 7.1 Final Completion of the Work shall be deemed to have occurred when all of the following have been completed: a) Company has received all permits, licenses and approvals required to be obtained and submitted by Subcontractor; b) Company has received all specifications and drawings, including record and as-built drawings, test data and other technical information of the types and in the quantities required to be provided by Subcontractor under this Subcontract; c) Company agrees Subcontractor has successfully completed all tests required to be performed by Subcontractor under this Subcontract and under applicable permits, laws, rules, regulations, codes and standards and that Subcontractor has provided all required regulatory body certificates to Company; d) Company has received all required operation and maintenance manuals and spare parts required to be provided by Subcontractor under this Subcontract; e) all spare parts and all special tools to be provided by Subcontractor for Company as required by this Subcontract have been delivered to Company; f) all of Subcontractor's and Sub-subcontractor's personnel and all their supplies, equipment, waste material, rubbish, Construction Works and other temporary facilities have been removed from the Project Site; g) the Work complies with all applicable permits, laws, rules, regulations, codes, and standards and the Subcontract Documents, including the Specifications and Drawings; h) Subcontractor has complied with all requirements with respect to final lien waivers and releases of claims; and i) Subcontractor has performed all items required by this Subcontract including but not limited to all punch list items.
- 7.2 Within twenty (20) days after receipt by Company of written notice from Subcontractor that the Work is ready for inspection for Final Completion, Company, using reasonable efforts, shall inspect the Work and shall advise Subcontractor in writing of any defects, deficiencies or discrepancies between the installed Materials and Equipment and Subcontractor's workmanship and such Materials and Equipment and workmanship as required by the Subcontract Documents, including the Specifications and Drawings, of which Company then has knowledge. Upon receipt of such written notice from Company, Subcontractor shall perform corrective measures to remove such defects, deficiencies or discrepancies and shall thereafter provide another written notice to Company when the Work is ready for inspection for Final Completion. Company will have fifteen (15) days after such written notice, and after each subsequent written

notice as may be required, to re-inspect the Work and to advise Subcontractor of any additional or remaining defects, deficiencies or discrepancies of which Company is aware and which must be corrected by Subcontractor as a condition to Final Completion. Nothing in this Article shall relieve Subcontractor of its obligations to achieve Final Completion by the date stipulated in this Subcontract.

7.3 Promptly after Final Completion has been achieved as provided above, Company shall issue a Notice of Final Completion and Acceptance dated to reflect the actual date of Final Completion.

7.4 Issuance of the Notice of Final Completion and Acceptance by Company shall not relieve Subcontractor of its continuing obligations under this Subcontract, including its warranty obligations.

8.0 WARRANTIES

8.1 Subcontractor warrants to Company: a) that the Work shall comply strictly with the provisions of this Subcontract, including but not limited to, the Specifications and Drawings, whether expressly or by reference incorporated into this Subcontract; b) that the Work shall conform with all applicable codes and standards; c) that the Work shall be performed in a professional and workmanlike manner and shall be free from defects in design, materials, construction and workmanship; d) that all Materials and Equipment furnished by Subcontractor for the Work shall be new, merchantable, of the most suitable grade and fit for their specified purpose; e) that any design or engineering performed or otherwise provided by Subcontractor as a part of the Work shall be done in a professional and workmanlike manner by conforming to practice customary in the engineering profession then in effect for services of a similar nature; and f) that the completed Work and portions thereof shall operate and perform satisfactorily as specified in this Subcontract and shall remain free of any weakness, deficiency, defect, failure, break down or deterioration during testing, startup and commissioning and for the full warranty period specified in Article 8.2.

8.2 Subcontractor's warranties set forth in Article 8.1 shall be in full force and effect for a term of eighteen (18) months after the date of Final Completion and Acceptance of the Work by Company as set forth in Article 7.0 or twelve (12) months after the Commercial Operation Date of the Project, whichever period expires first (hereinafter the "Warranty Period"). Provided however that such term shall be extended by an amount of time equal to the time within the Warranty Period wherein the Work is not available for use by Government or Company due to the failure of the Work to comply with the warranties set forth in Article 8.1.

8.3 Subject to Article 8.7, if during the Warranty Period, all or any portion of the Work fails to conform to the warranties set forth in Article 8.1, the defective or nonconforming Work shall be redesigned, re-engineered, disassembled, removed, reconstructed, erected, reinstalled, repaired or replaced, re-assembled and re-inspected (hereinafter "Corrective Work") by and at the expense of Subcontractor as soon as reasonably possible, but in any event within, or commencing within, ten (10) days after Subcontractor receives written notice from Company or Government that the Work is nonconforming. If, despite Subcontractor's reasonable efforts, the Corrective Work cannot be performed within said ten (10) day period, Subcontractor shall diligently and without interruption perform such Corrective Work until it is completed and conforms to the warranties set forth in Article 8.1. All costs incurred in performing Corrective Work and all direct costs incurred by Company or Government as a result of the nonconforming Work shall be to the account of Subcontractor.

8.4 Notwithstanding Article 8.2, which applies to Subcontractor's Work in its entirety, all Corrective Work furnished or performed by Subcontractor pursuant to Article 8.3 shall be warranted by Subcontractor in accordance with Article 8.1 for a period of twelve (12) months from the date of completion of such Corrective Work, or for the remainder of the Warranty Period set forth in Article 8.2 above, whichever period expires last.

8.5 Subcontractor shall, at its sole expense, perform such tests as Company or Government may reasonably require and that are normal practice in the construction industry to demonstrate that the Corrective Work complies with this Subcontract.

8.6 If, during the Warranty Period, the performance of Corrective Work would disrupt the work of others or the commercial operation of the Project or any portion thereof, such Corrective Work shall be coordinated with Company or Government's operating personnel in order to minimize such disruption. In the event of such disruption, Company or Government may require that Corrective Work be performed on an around-the-clock basis, including weekends and holidays. All costs incidental to such Corrective Work, including but not limited to overtime premiums and shift differentials, shall be borne by Subcontractor.

8.7 In the event: a) Subcontractor fails to commence Corrective Work promptly within the ten (10) day period prescribed above; or b) Subcontractor commences Corrective Work within the ten (10) day period but, in Company's or Government's opinion, fails to diligently and without interruption prosecute the Corrective Work; or c) Company or

Government reasonably determine that a case of emergency exists, where delay in commencing Corrective Work could result in serious loss or damage to persons or property; or d) Company in its sole discretion determines that the requirements of its Project schedule or the Construction Schedule will be adversely affected if the Corrective Work is not performed prior to the expiration of the ten (10) day period; or e) Company or Government reasonably determine that the Corrective Work must be performed prior to the expiration of the ten (10) day period in order to return the Work or the Project to commercial use, then the Corrective Work may be performed by Company or Government and all costs therefore shall be to Subcontractor's account, provided, however, that Company or Government, as applicable, has given written notice thereof to Subcontractor and afforded Subcontractor the opportunity to perform Corrective Work within the time determined by Company or Government to be required.

- 8.8 Subcontractor agrees to the assignment by Company of Subcontractor's warranties in favor of Government after the Work has been placed in service for commercial operation.

9.0 WARRANTY OF TITLE

Subcontractor warrants that the Work, including the Materials and Equipment, shall be free from defects in title and that title to such Work and Materials and Equipment shall be clear and marketable, and free of any liens, charges or encumbrances whatsoever.

10.0 WARRANTY AGAINST INFRINGEMENT OF PATENTS, COPYRIGHTS, TRADEMARKS AND TRADE SECRETS

- 10.1 Subcontractor represents and warrants that the Goods or any portion thereof do not infringe any patent, copyright, trademark or trade secret.

- 10.2 Subcontractor agrees to indemnify, hold harmless and defend Company, Government, their subsidiaries and affiliates, and all their directors, officers, employees, agents and representatives, from and against any liability, claims, demands, penalties, fines, lawsuits, judgments, losses and expenses, including reasonable attorneys' fees and court costs, arising from any claim or legal action based on a claim that the Goods or any portion thereof, infringe any patent, copyright or trademark or constitute an unauthorized disclosure of any trade secret. Subcontractor shall pay all judgments and costs recovered against Company as a result of any such claim or in any such action and shall reimburse Company for costs and expenses incurred by Company in the defense thereof, provided that Company gives Subcontractor prompt notice of such claim or action, reasonable assistance in the defense thereof, and full opportunity to control all aspects of the defense thereof, including settlement. If the Goods or any portion thereof are held to constitute an infringement of any patent, copyright or trademark or an unauthorized disclosure of any trade secret and if the use of the Goods or any portion thereof is enjoined, Subcontractor shall pay any costs and damages awarded on account of such infringement or unauthorized disclosure and shall, at its own expense, and at Company's or Government's option: a) procure for Company or Government the right to use such Goods; b) replace the Goods with Goods that are not infringing or do not disclose any trade secret; or c) modify the Goods so that they become non-infringing or do not disclose any trade secret. Any such replacement of or modification to the Goods or any portion thereof shall meet the requirements of and shall be subject to the terms of this Subcontract.

- 10.3 Subcontractor's liability for infringement of any patent, copyright or trademark shall not apply to infringements pertaining to: a) a patented process performed by the Goods or a patented combination of Goods if such patented process or combination is specified in whole or in part by Company; b) Goods supplied in accordance with a detailed design developed by Company and furnished by Company to Subcontractor as part of this Subcontract; or c) modifications of the Goods by Company or combinations of the Goods by Company with other Company-furnished components not furnished by Subcontractor.

- 10.4 As used in this Article, the definition of Goods is expanded to include any methods, processes, designs, information, or other things (including construction methods) furnished by Subcontractor or Sub-subcontractors or Suppliers, in or for the performance of the Work.

11.0 EXPEDITING, INSPECTION, TESTING AND QUALITY CONTROL/ASSURANCE

- 11.1 Subcontractor shall inspect all Work and shall conduct a continuous program of quality control and quality assurance ("QA/QC") for all of the Work under this Subcontract. Subcontractor's QA/QC program and inspection procedures shall be submitted in writing to Company for review and approval no later than seven (7) days following award of this Subcontract. The QA/QC program shall be specific for this Subcontract and shall be in sufficient detail to delineate those items to be inspected and the manner in which they are to be inspected. The program shall describe all Subcontractor QA/QC activities contemplated, including provision for adequate documentation of Subcontractor's performance of its QA/QC and Subcontractor's schedule for inspection activities.

- 11.2** During the performance of the Work, Subcontractor shall, without additional compensation, make or cause to be made all inspections and tests required by this Subcontract. If the results or methods of performance of such inspections or tests fail to conform to the requirements of this Subcontract, Company may, at its sole discretion, require Subcontractor to perform additional inspections and tests, all costs of which shall be to the account of Subcontractor. Subcontractor shall furnish Company with satisfactory documentation of the results of all inspections and tests. Company shall be given not less than seven (7) days notice of any inspections or tests to be made by Subcontractor or its Sub-subcontractors or Suppliers, in order that Company may, at its option, witness any such inspections or tests.
- 11.3** As pertains to Work being performed at locations other than the Project Site and if the Work includes the furnishing of any engineered Materials and Equipment, the following provision applies.
- 11.3.1** All Goods shall be subject to expediting and inspection prior to shipment by Company and Government and/or their representatives and by third parties as may be required by applicable laws, ordinances and regulations. Company, Government, their representatives and such third parties may test the Goods, or have the Goods tested, in Subcontractor's facilities or the facilities of its Suppliers, to determine whether the Goods conform to the requirements of this Subcontract.
- 11.3.2** Subcontractor shall provide Company, Government, their representatives and third parties identified in Article 11.3.1 above reasonable access to its facilities and the facilities of its Suppliers. Subcontractor shall identify for Company all facilities in which the different parts or components of the Goods are fabricated, manufactured or assembled, and shall furnish all information that may be reasonably required by Company or Government to expedite the Goods, to confirm or verify that the Goods conform to the requirements of this Subcontract, and/or to test or witness tests specified in this Subcontract. Where the Work consists of fabrication, manufacturing, or assembly in Suppliers' facilities, Subcontractor shall arrange for access by Company, Government, their representatives and such third parties to: a) review unpriced copies of Subcontractor's purchase orders to its Suppliers; b) expedite and inspect the Goods, and c) test or witness tests, all in the same manner as if such expediting, inspection and testing were to be conducted in Subcontractor's facilities. Subcontractor shall provide at its own expense, and shall cause its Suppliers to provide at their own or Subcontractor's expense, the equipment, facilities and personnel necessary for the performance of the tests specified in this Subcontract to determine that the Goods or any component parts conform to the requirements of this Subcontract.
- 11.3.3** No Goods shall be shipped before all tests and inspections have been performed in accordance with this Subcontract and the results of such tests or inspections have been accepted in writing by Company. Certified copies of the test results and inspection reports shall be transmitted to Company in accordance with the required schedule dates therefore set forth in this Subcontract.
- 11.3.4** If any Goods are found to be defective or not in conformance with this Subcontract, Company shall have the right, upon giving notice to Subcontractor, to either: a) reject any or all defective or non-conforming Goods; or b) accept and subsequently correct such defective or non-conforming Goods; or c) accept such defective or nonconforming Goods without subsequent correction. Subcontractor shall pay all costs and expenses associated with such rejection or acceptance and correction, including those costs incurred as a result of the modification or alteration of the Goods necessary to make the Goods non-defective and conforming. If Company elects to utilize defective or nonconforming Goods without such correction, Subcontractor agrees that the Subcontract Price will be equitably credited to account for the defects or nonconformances in the Goods.
- 11.3.5** Any inspection or acceptance of the Goods at Subcontractor's or its Suppliers' facilities shall not preclude subsequent inspection and/or rejection of the Goods if the Goods are later discovered to be defective or nonconforming or if Company has reasonable grounds upon which to believe that the Goods may be defective or nonconforming.
- 11.4** As pertains to Work being performed at the Project Site:
- 11.4.1** Company, Government, their representatives or third parties as may be required by applicable laws, ordinances and regulations, shall have the right at all reasonable times to inspect the Work at the Project Site for conformance with this Subcontract. Subcontractor shall provide, or cause to be provided, access and sufficient, safe and proper facilities for such inspections.
- 11.4.2** If Subcontractor covers any portion of the Work prior to an inspection or test required by this Subcontract, specified in the inspection activities schedule, or previously requested by Company, the cost of uncovering and restoring the Work to allow for such inspection or test shall be to Subcontractor's account.
- 11.4.3** Re-examination of any Work may be ordered by Company. As a result of such re-examination, if any part of the Work is determined by Company to be defective or to otherwise fails to conform to this Subcontract, Subcontractor shall not be reimbursed for uncovering the Work, or for the repair or for the corrective work required to be performed or for any

or all restoration costs. If as a result of such re-examination, the Work is found to conform with the Subcontract requirements, Company shall reimburse Subcontractor for the allowable direct documented cost incurred by Subcontractor to uncover and restore the re-examined portion of the Work.

11.4.4 Rejection by Company of any non-conforming Work shall be final and binding. Rejected Work shall be promptly repaired or replaced by Subcontractor so as to conform to this Subcontract and all costs therefore shall be to Subcontractor's account. If Subcontractor fails to promptly commence and diligently continue the repair or replacement of such rejected Work upon receipt of written notice from Company to do so, Company may, at its option, cause the rejected Work to be repaired or replaced by others and all costs incurred therefore shall be to Subcontractor's account.

11.5 In regards to the rights of Company, Government, their representatives and third parties under this Article, neither their failure to perform or witness any inspections or tests of the Work nor their failure to discover any non-conformance during their performance of or witnessing of any inspections or tests of the Work shall: a) constitute an acceptance by Company of any defective or non-conforming Work; or b) be deemed to relieve Subcontractor of its continuing obligation to correct such defects or non-conformances at any time the same are discovered; or c) be deemed to be a waiver of the rights of Company to require that the Work conform to the requirements of this Subcontract. Further, the approval of or payment to Subcontractor for such Work shall not discharge Subcontractor from its obligation to supply Goods and perform Work that conforms to the requirements of this Subcontract, nor shall any or all payments to Subcontractor hereunder be construed to be an acceptance by Company of the Work.

12.0 SUBMITTALS

12.1 Subcontractor shall submit to Company all shop drawings, schematics, diagrams, plans, descriptive literature, illustrations or other representations of the Materials and Equipment, certificates of compliance, performance and test data, reports, procedures, performance and technical specifications, shipping documents and all other technical and commercial data and documents as may be required by this Subcontract. Unless this Subcontract indicates that any such submittal by Subcontractor is to be for Company's information only, Company, upon receipt of Subcontractor's submittals, shall review and return same to Subcontractor, marked "Approved", or "Approved as Noted" or "Revise and Resubmit". The timing of Subcontractor's submittals and Company's review shall be in accordance with Construction Schedule. The submission of any such shop drawing, schematic, or other submittal document by Subcontractor under this Subcontract shall be certification by Subcontractor that the information set forth therein is accurate in all material respects.

12.2 Upon receipt of a submittal marked "Approved", Subcontractor may proceed with its Work to the extent of and in accordance with the Approved submittal.

12.3 Upon receipt of a submittal marked "Approved as Noted" and if Subcontractor concurs with Company's comments, Subcontractor shall incorporate same and may proceed with its Work to the extent of and in accordance with the Approved as Noted submittal. Subcontractor shall submit to Company within fourteen (14) days a revised submittal in which Company's comments have been incorporated. If Subcontractor determines that it cannot incorporate Company's comments without prejudice to Subcontractor's warranty or other obligations under this Subcontract, Subcontractor shall so advise Company in writing within seven (7) days of its receipt of Company's comments, stating the reasons therefore. Subcontractor may proceed with its Work to the extent of and in accordance with the Approved as Noted submittal only upon Company and Subcontractor resolving Company's comments.

12.4 Upon receipt of a submittal marked "Revise and Resubmit", Subcontractor shall immediately take all necessary action to revise its submittal in accordance with Company's comments, the Specification and the Drawings and resubmit to Company. In no event shall Subcontractor proceed with the effected Work until its revised submittals have been returned to Subcontractor marked "Approved" or "Approved as Noted" by Company.

12.5 Use of the term Approved or Approved as Noted shall not absolve or otherwise discharge Subcontractor from its responsibility to supply Materials and Equipment that interface with Company-furnished components and comply with the requirements of this Subcontract, including the Specification and Drawings. Review and comment by Company of Subcontractor's drawings or other submittals shall not relieve Subcontractor of its obligation to complete the Work in accordance with this Subcontract, and any such review and comment by Company shall not constitute a waiver of Company's rights under this Subcontract with respect to nonconforming Work. The effect of the failure of Subcontractor to perform in accordance with the requirements of the this Article shall be to Subcontractor's account.

13.0 APPROVED FOR CONSTRUCTION DRAWINGS AND SPECIFICATIONS

- 13.1** Subcontractor shall perform the Work using Drawings and Specifications marked "Approved for Construction" or equivalent by Company. The affixing of the phrase "Approved for Construction" by Company to any Drawings or Specifications shall not relieve Subcontractor of any of its obligations under this Subcontract, nor shall constitute assumption of responsibility by Company for the accuracy or adequacy of any of information provided by Subcontractor and incorporated in such Drawings and Specifications. The designation "HOLD" on a Drawing or Specification that has otherwise been marked "Approved for Construction" signifies that Subcontractor is authorized to proceed with all Work shown on such a Drawing or Specification except for that Work contained in the designated or marked area of the Drawing or Specification to which the term "HOLD" applies..
- 13.2** Subcontractor shall perform all Work outside of the areas marked "HOLD" on Specifications and Drawings marked "Approved for Construction" to maintain the Construction Schedule, but shall not perform any Work in the areas or sections marked "HOLD" until revised Specifications and Drawings are received with the 'HOLD' markings deleted.
- 13.3** If the Construction Schedule will be delayed by "HOLD" markings on Specifications and Drawings, Subcontractor shall report such delay to Company in writing not less than seven (7) days after its receipt of such Specifications or Drawings.
- 13.4** Subcontractor shall maintain at the Project Site a complete and current set of "Approved for Construction" Drawings and Specifications. Subcontractor shall insure that all superseded Drawings and Specifications have been retrieved from their recipients and that such retrieved Drawings and Specifications have been documented as being superseded and archived.

14.0 DISCREPANCIES

Whenever, in Subcontractor's opinion, the Scope of Work, Specifications or Drawings for any portion of the Work are defective, deficient, or at variance with each other or with any rules, regulations, or ordinances applicable to the Work, or are such as would, if followed, result in unsafe, defective or deficient construction or in construction infringing upon any rules, regulations, or ordinances applicable thereto, or would cause the Work either during or after its construction to be insecure or to deteriorate (other than as a result of normal wear and tear) in any respect so as to result in any pecuniary loss to Company or in any damage or loss whatsoever to any person or property, Subcontractor will immediately discontinue performance on the portion of the Work affected thereby and notify Company in writing of such opinion and in what respect said Scope of Work, Specifications or Drawings are considered to be insufficient or improper, and will not proceed with the portion of the Work so affected until it has received a written order from Company directing what action, if any, is to be taken.

15.0 SAFETY

- 15.1** Subcontractor shall assume all responsibility and shall take all necessary safety and other precautions to protect property and persons from damage, injury or illness arising out of the performance of the Work. Subcontractor shall comply strictly with all local, municipal, state, provincial, national and other governmental laws, orders, codes, permits, rules and regulations pertaining to health or safety which are applicable to Subcontractor or to the Work, including without limitation any occupational safety and health legislation and any local, municipal, state, provincial or national plans and regulations approved thereunder, to the extent applicable and in effect at the time the work is performed. Subcontractor agrees to comply with the minimum standards established in Appendix A hereto, entitled "Safety, Health and Environmental Requirements", and Site Safety and Health Plan.
- 15.2** Within thirty (30) days following the its signing of this Subcontract, but in any event prior to mobilization of Subcontractor on the Project Site, Subcontractor shall submit in writing its safety program for the performance of the Work to Company for Company's review, comment and approval. Such safety program shall conform to the requirements set forth in this Subcontract. Approval by Company of Subcontractor's written safety program shall not in any way affect or reduce Subcontractor's obligation to perform its Work in a safe manner consistent with this Article 15.0, and any such review, comment or approval of Subcontractor's safety program shall not constitute a waiver of any of Company's rights under this Article 15.0 or any other provision of this Subcontract.
- 15.3** Subcontractor shall cooperate with Company in the formation of a Project Site safety committee and shall comply with and enforce the safety instructions and regulations issued by such committee.
- 15.4** Subcontractor warrants the Materials and Equipment and Construction Works to be incorporated into or to be used in connection with the performance of the Work shall comply with Article 15.1 at all times while any of Subcontractor's employees, agents, Sub-subcontractors or Suppliers are on the Project Site. Subcontractor shall be solely responsible for providing its employees, agents, Sub-subcontractors and Suppliers with a safe place of employment, and

Subcontractor shall inspect the places where its employees, agents, Sub-subcontractors and Suppliers are or may be present on the Project Site. Subcontractor shall promptly take action to correct conditions which are or may become an unsafe place of employment for the performance of the Work.

- 15.5 Accidents, injuries and illness requiring medical attention other than first aid; damage to property of Company, Subcontractor or third parties working at or in the vicinity of the Project Site; and fires, shall be orally reported to Company at the time of the incident. Written reports satisfactory in form and content to Company shall be submitted by Subcontractor promptly after each such incident.
- 15.6 Subcontractor shall maintain, in form and content approved by Company, Project Site accident, injury and illness statistics which shall be available for inspection by and submitted to Company upon its written request.
- 15.7 If, in the reasonable opinion of Company, Subcontractor has violated this Article 15.0, Company may suspense all or any portion of the Work until such time as the condition in violation of this Article 15.0 has been corrected. In the event of such suspension, Company shall not be liable for any costs or expenses claimed by Subcontractor arising out of such suspension. The Construction Schedule shall not be delayed on account of any such suspension.
- 15.8 Notwithstanding the provisions and requirements of this Article 15.0, including, but not limited to: a) the imposition by Company of specific safety requirements for the Project or the Project Site; b) Company's right to review and approve Subcontractor's safety program; c) Company's right to monitor the Project Site for safety; d) Company's right to direct Subcontractor when unsafe practices are observed; and e) Company's right to suspend Work in cases of safety violations, Subcontractor shall be and remain fully and solely responsible for safety with respect to the Work and for implementation and compliance with all safety related procedures, precautions and protective measures with respect to the Work. Company shall owe no duty or obligation to Subcontractor, its Sub-subcontractors or Suppliers, or their respective employees, to supervise Subcontractor's safety program or the Work of Subcontractor's employees, or its Sub-subcontractors or Suppliers and their employees. Company's designated safety monitor is present on the Project Site for the benefit of Company only. No act or failure to act on the part of Company or its employees shall pre-empt or be construed to pre-empt Subcontractor's sole responsibility for the proper implementation of its safety program. Subcontractor agrees to indemnify, hold harmless and defend Company, Government, their subsidiaries and affiliates, and all their directors, officers, employees, agents and representatives, from and against any liability, claims, demands, penalties, fines, lawsuits, judgments, losses and expenses, including reasonable attorneys' fees and court costs, on account of any bodily injuries, illness, death or property damage resulting from violations of the Project safety rules and regulations, of Subcontractor's safety program, of the safety requirements of any governmental entity having jurisdiction over the Work, of any applicable laws, rules, regulations or permits, or for any other unsafe practices by Subcontractor, Sub-subcontractors or Suppliers, or their failure to comply with this Article 15.0.

16.0 CLEANUP

- 16.1 Subcontractor shall at all times keep its Work area in a neat, clean and safe condition and shall remove from the Project Site and properly dispose of all debris and rubbish resulting from Subcontractor's operations. Upon completion of the Work, Subcontractor shall promptly return any unused Materials and Equipment furnished by Company or Government and remove from the Project Site all unused Materials and Equipment furnished by Subcontractor and all Construction Works, leaving the Project Site in a clean, safe and ready for use condition.
- 16.2 If Subcontractor fails to maintain its Work area as described above in a manner satisfactory to Company, or fails to perform such cleanup or removal immediately after receipt of written notice from Company to do so, Company shall have the right without notice to Subcontractor to perform such cleanup and remove such items on behalf of, at the risk of, and at the expense of Subcontractor. Company may store items removed at a place of its choosing on behalf of Subcontractor and at Subcontractor's risk and expense. Company shall promptly notify Subcontractor of such place of storage. Subcontractor shall promptly reimburse Company for the costs of such cleanup, removal and storage.

17.0 SECURITY

- 17.1 Subcontractor shall cooperate with Company on all security matters and shall promptly comply with any Project security requirements established by Company. Subcontractor shall at all times conduct all operations under this Subcontract in a manner to avoid the risk of loss, theft, or damage by vandalism, sabotage, or other means, of and to any property. Subcontractor shall promptly take all reasonable precautions which are necessary and adequate against any conditions which involve a risk of loss, theft, or damage to its property. Subcontractor shall continuously inspect all of the Work and facilities to discover and determine such conditions and shall be solely responsible for discovery, determination, and correction of any such conditions.

17.2 If Company considers it necessary, it will provide watchmen and guards to protect its own interests. Subcontractor shall provide guard service sufficient for the protection of its own property and equipment. Company will not be responsible for any loss of, theft of or damage to Subcontractor's property from any cause.

17.3 Subcontractor and its Sub-subcontractors and their employees shall observe all procedures for admission to the Project Site required by Company, including the establishment of a badging system for the employees of Subcontractor and its Sub-subcontractors.

18.0 SUB-SUBCONTRACTORS AND SUPPLIERS

18.1 Except for the furnishing of expendable supplies and minor components, Subcontractor shall not subcontract performance of all or any portion of the Work under this Subcontract, including Material and Equipment supply agreements, without first notifying Company in writing of Subcontractor's intention to do so and obtaining Company's written consent of the proposed subcontracting and the proposed Sub-subcontractor or Supplier. If requested by Company, Subcontractor shall furnish Company a copy of the proposed subcontract with the Sub-subcontractor or Supplier (with the subcontract price deleted if the subcontracted Work is a portion of the Work that Subcontractor is performing on a lump sum price basis under this Subcontract) for Company's review of the terms and conditions thereof. Subcontractor shall not sign such subcontract until Company has given its written consent to such form of subcontract. Failure of Subcontractor to comply with this Article may, at the sole discretion of Company, be deemed to be a material breach of this Subcontract. Subcontractor shall also furnish to Company such information pertaining to the proposed Sub-subcontractor or Supplier as Company may reasonably request, including, but not limited to, financial statements, safety data, safety plans and references. Company shall have the right to disapprove or reject any proposed Sub-subcontractor/Supplier for reasonable cause.

18.2 Subcontractor guarantees that its Sub-subcontractors and Suppliers will comply fully with the terms of this Subcontract applicable to the portion of the Work performed by them, whether or not such Subcontract terms include a specific reference to Subcontractor's Sub-subcontractors or Suppliers. If any portion of the Work which has been subcontracted by Subcontractor is not performed in accordance with the terms of this Subcontract, then, on written request of Company, the Sub-subcontractor or Supplier shall be replaced at no additional cost to Company and shall not be employed again on the Work.

18.3 Company shall have the right from time to time to contact Subcontractor's Sub-subcontractors and Suppliers to discuss their progress of the Work.

18.4 To the extent that specific Suppliers of Materials and Equipment are identified in the Subcontract Documents, Subcontractor shall procure such Materials and Equipment from such Suppliers. Notwithstanding the preceding sentence, Company shall have the right to disapprove or reject any proposed Supplier for reasonable cause.

18.5 Company's acquiescence in, consent to or approval of a proposed subcontracting of the Work, or of a proposed Sub-subcontractor or Supplier, shall not relieve Subcontractor of any of its obligations under this Subcontract. No such subcontract or Supplier agreement shall bind or purport to bind Company, and each such subcontract or Supplier agreement shall contain a provision permitting its assignment to Company or its designee upon Company's written request in the event of a default by Subcontractor or termination of this Subcontract.

19.0 NOT USED

20.0 POSSESSION PRIOR TO COMPLETION

Company and Government shall have the right to take possession of or use any completed or partially completed portion of the Work as Company and/or Government may deem necessary for their operations. If Company and/or Government desire to exercise the foregoing right, Company on its own behalf or on behalf of Government, will so notify Subcontractor in writing. Such possession or use shall not constitute acceptance of Subcontractor's Work, provided, however, that Subcontractor shall not be liable for damage or loss to the Work caused solely by the negligence of Company, Government, or third parties acting under the control of Company or Government.

21.0 CHANGE ORDERS

21.1 The Work shall be subject to change by additions, deletions or modifications thereto by Company. Subcontractor will be notified of such changes by receipt of notice from Company in the form of additional or revised Drawings, Specifications, exhibits or written orders.

- 21.2 In the event a notice of change received from Company affects Subcontractor's cost and/or the Construction Schedule, Subcontractor shall submit a proposal to Company within seven (7) days after receipt of said notice of change. The proposal shall include, as appropriate, a detailed takeoff with supporting calculations and pricing for the change, together with any adjustments in the Construction Schedule (including a network schedule analysis delineating the effects of the change upon the Construction Schedule) required for the performance of the Work as changed. Pricing shall be itemized as required by Company and shall be in sufficient detail to permit an analysis of all labor, Materials and Equipment and Construction Works, if any, required as a result of the change and shall cover all Work involved in the change, whether such Work was added, deleted or modified. Amounts related to subcontracts shall be supported in similar detail. If Subcontractor's proposal includes a request for an adjustment to the Construction Schedule, a justification therefore shall also be included.
- 21.3 Subcontractor's priced proposal covering a notice of change shall be based, at the direction of Company, upon one or a combination of the following methods:
- 21.3.1 Lump sum price basis, where such lump sum prices are either included in Subcontract or are subsequently developed by Subcontractor, properly itemized and supported by sufficient documentation to permit evaluation, and mutually agreed upon by Subcontractor and Company, or
- 21.3.2 Unit price basis, where such unit prices are either included in the Subcontract or are subsequently developed by Subcontractor, properly itemized and supported by sufficient documentation to permit evaluation, and mutually agreed upon by Subcontractor and Company, or
- 21.3.3 Time and material basis, which shall be limited to the costs and allowances described in the Subcontract.
- 21.4 Unless directed by Company to proceed under a written Field Work Order as provided in Article 22.0, Subcontractor shall not perform changes in the Work unless and until Company has approved in writing the pricing for the change and any adjustment in the Construction Schedule for the performance of the Work as changed. Upon receiving a written Change Order from Company, Subcontractor shall diligently perform the Work included in the Change Order in strict accordance with this Subcontract.
- 21.5 Except as may be approved by Company pursuant to Article 22.0, during the time required for: a) Subcontractor to prepare and submit its proposal for a change; b) the review of Subcontractor's proposal by Company; and c) any discussions or clarifications regarding the change or proposal. Subcontractor shall not suspend performance of any portion of its Work which would be unaffected by the change requested by Company. If Company and Subcontractor are unable to reach agreement for the pricing of a change or for the adjustment in the Construction Schedule requested for the performance of the changed Work, Subcontractor shall comply with the provisions of this Subcontract applicable to the resolution of disputes.
- 21.6 Subcontractor shall not perform changes in the Work which have been made orally, but rather shall: a) notify Company immediately of any oral request to Subcontractor for a change in the Work; b) identify the individual making such an oral request; and c) request Company's written concurrence with the alleged oral change. If Subcontractor believes that any oral notice or instruction received from Company, Government or any third party will involve a change in the cost or Construction Schedule or will affect the integrity of the Work, Subcontractor shall require a Change Order or a Field Work Order in writing by Company. Any costs incurred by Subcontractor in the performance of a change not supported by a Change Order or a Field Work Order as set forth in Article 22.0 shall be to Subcontractor's account. Subcontractor hereby waives any and all rights to assert claims against Company for costs or for an adjustment to the Construction Schedule incurred as the result of Subcontractor's performance of changes not reduced to a written Change Order or Field Work Order.
- 21.7 In determining costs in performing the changed Work, the amount of credit for a decrease or deletion or a change which results in a net decrease in the Subcontract Price shall be the actual net cost as confirmed by Company. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be determined on the basis of net increase, if any, with respect to such change. No allowance shall be made to Subcontractor for damages, including burden, overhead and loss of anticipated profits, on a decrease in the Work.

22.0 FIELD WORK ORDERS

- 22.1 A Field Work Order is a written order issued to Subcontractor by Company directing Subcontractor to perform a change in the Work and setting forth a proposed basis for adjustment, if any, in the Subcontract Price and/or the Construction Schedule.
- 22.2 A Field Work Order shall be used in the absence of a full agreement between Subcontractor and Company regarding the terms of a Change Order, or where Company, at its discretion, determines that the time required for the development and issuance of a Change Order will adversely impact the Construction Schedule or Company's Project schedule.
- 22.3 If the Field Work Order provides for an adjustment in the Subcontract Price, the adjustment shall be based upon one or a combination of the methods described in Article 21.3 above.
- 22.4 Upon receipt of a Field Work Order, Subcontractor shall promptly proceed with the change in the Work that Company has so directed and shall advise Company in writing of Subcontractor's agreement or disagreement with the terms of the Field Work Order, including as applicable, the method for determining the proposed adjustment in the Subcontract Price and/or the Construction Schedule. Subcontractor's agreement with the terms of a Field Work Order shall be indicated by signing the Field Work Order and returning same to Company. Such agreement shall be effective immediately and shall be subsequently recorded by Company as a Change Order to this Subcontract upon completion of the changed Work.
- 22.5 If Subcontractor does not respond to Company in writing within five (5) days from Subcontractor's receipt of a Field Work Order or if Subcontractor disagrees with the proposed method for adjustment in the Subcontract Price, the method and adjustment shall be determined by Company on the basis of reasonable expenditures and/or savings of Subcontractor attributable to the change in the Work.

23.0 MINOR CHANGES IN THE WORK

Company shall have the authority to order Subcontractor to perform minor changes in the Work not requiring adjustments in the Subcontract Price or the Construction Schedule and not inconsistent with the intent of the Subcontract Documents. Such changes shall be effected by a written order issued by Company. Subcontractor shall implement such written orders promptly.

24.0 NOT USED

25.0 NOT USED

26.0 NOT USED

27.0 NOT USED

28.0 PROTECTION OF THE WORK

- 28.1 Notwithstanding whether title is held by Subcontractor, Company, Government or other parties, Subcontractor shall, until Final Acceptance of the Work, be responsible for the care, custody, control, safekeeping and preservation of all Goods related to the Work or the performance of the Work, whether such Goods were furnished by Subcontractor, Company, Government or other parties. Subcontractor shall continuously maintain adequate protection of the Work and Work in progress from damage, and shall protect from loss or damage in a manner satisfactory to Company all Goods furnished by Company, Government or third parties for installation or erection by Subcontractor, whether such Goods are on or off the Project Site.
- 28.2 Subcontractor shall adequately protect all adjacent private and public property, including property of Company, Government or third parties, as provided by law and this Subcontract. Temporary protection of occupied or operating areas of the Project or of existing structures and facilities shall be the responsibility of Subcontractor and costs therefore shall be to Subcontractor's account.
- 28.3 Subcontractor shall provide at its expense protection of the Work from freezing, rain, wind and other elements that would be harmful to the Work. Subcontractor shall furnish protective shelters or temporary buildings and temporary heating as required for the performance and protection of the Work.

- 28.4 Subcontractor shall not load or permit any part of any structure to be loaded with a weight that would endanger its safety and shall provide and maintain adequate temporary supports, shores and bracing to keep the Work safe from failure or damage due to any loads that may be imposed on structures during the performance of the Work.
- 28.5 Subcontractor shall not perform any Work in finished areas or over finished floors unless due precautions have been taken to prevent soiling or damage resulting from such Work.
- 28.6 Subcontractor shall be responsible for promptly repairing or replacing any damage or loss as a result of its failure to comply with this Article 28.0.

29.0 CONSTRUCTION WORKS

Construction Works obtained or located at the Project Site shall be in first-class operating condition, safe, fit for the uses for which intended and suitable for the safe, legal and efficient performance of the Work. Such Construction Works shall be subject to inspection from time to time by Company, Government or third parties as may be required by applicable laws, ordinances and regulations. Any such Construction Works which are rejected by Company, Government or such third parties as not conforming with the foregoing shall be promptly removed by Subcontractor and replaced with equipment acceptable to Company, without additional cost to Company and without delaying the Construction Schedule for performance of the Work by Subcontractor.

30.0 SUBCONTRACTOR'S SHIPMENTS

- 30.1 Subcontractor shall be responsible for arranging for all shipments of Subcontractor-supplied Goods and Construction Works to the Project Site and shall consign such shipments to itself as consignee at the shipping address for the Project, freight fully prepaid. Subcontractor shall be responsible for making demurrage agreements and settlement with carriers for such shipments.
- 30.2 Subcontractor shall advise Company in writing in advance of major shipments of Materials and Equipment or the delivery of major items of Construction Works and shall coordinate with Company regarding the arrival, unloading, inspection and release of the carriers' equipment. Subcontractor shall promptly unload its shipments and shall promptly release the carriers' equipment from the Project Site.
- 30.3 If Subcontractor is unable to promptly unload its shipments, Subcontractor shall notify Company of such inability not less than fourteen (14) working days in advance of the scheduled arrival at the Project Site. Company may, at its option, unload or make arrangements for others to unload such shipments for the account of and at the risk of Subcontractor. Subcontractor will promptly reimburse Company for such costs of unloading.

31.0 CONTROL OF GOODS FURNISHED BY COMPANY OR GOVERNMENT

- 31.1 Goods furnished by Company or Government to Subcontractor for Subcontractor's installation, erection or use relative to the Work shall be offloaded and received by Subcontractor in the presence of Company's authorized representative. Quantities of such Goods shall be checked jointly by Subcontractor and Company. Subcontractor's receiving and acceptance of all such Goods shall be recorded in writing and evidenced by Subcontractor's signing of forms satisfactory to Company.
- 31.2 If the nature of the shipping packaging allows, Subcontractor shall inspect and carefully note any visible shortage of or damage to the Goods furnished by Company or Government prior to the unloading of same from the carrier. Where such inspection and inventory is not possible prior to unloading, Subcontractor shall inspect and inventory such Goods as reasonably soon after unloading as practicable, but in any event, prior to moving such Goods to storage. Such inspection and inventory may require the opening and resealing of crates or cartons in order to ascertain the existence of any visible damage or of shortages in the quantities indicated in the shipping documents.
- 31.3 Subcontractor shall assume full responsibility for any shortages in, loss of or damage to such Goods after its inspection and inventory of same as described in Article 31.2 above. Subcontractor shall also assume full responsibility for any shortages in, loss of or damage to such Goods if Subcontractor fails to inspect and inventory the Goods as required or fails to promptly notify Company of any shortages or damages noted during Subcontractor's inspection and inventory.
- 31.4 Subcontractor shall assume full responsibility for any delay in completion of the Work due to shortages in, loss of or damage to such Goods after its inspection and inventory of same as described in Article 31.2 above. Subcontractor shall also assume full responsibility for any delay in completion of the Work due to shortages in, loss of or damage to

such Goods if Subcontractor fails to inspect and inventory the Goods as required or fails to promptly notify Company of any shortages or damages noted during Subcontractor's inspection and inventory.

- 31.5** Subcontractor shall notify Company in writing of any additional requirement for Goods being supplied by Company or Government. Such notification shall be made as soon as the need for the additional requirement is discovered, but, in any event, in sufficient time for Company or Government to address the requirement. In the event of a misfit of the Goods furnished by Company or Government, Subcontractor shall immediately notify Company of such misfit. Subcontractor shall take all reasonable steps to avoid standby time due to lack of such Goods or misfits and shall continue to perform other portions of Work pending resolution of such situations by Company or Government.
- 31.6** Subcontractor shall notify Company of any Goods supplied to Subcontractor which are surplus and shall cooperate with Company in the disposition of such surplus as directed by Company.
- 31.7** Subcontractor shall maintain a system of inventory storage control and management for all Goods furnished by Company or Government. At a minimum, this system shall record the descriptions, quantities and dates each item of the Goods is received into Subcontractor's inventory and each time any item of such Goods is withdrawn for installation. The location of installation shall also be recorded for such Goods withdrawn from inventory.

32.0 CARE, CUSTODY AND CONTROL OF AND TITLE TO THE WORK

- 32.1** Good, clear and marketable title to the Work, including all Materials and Equipment furnished by Subcontractor under this Subcontract, shall pass to Company based upon the extent to which Subcontractor has received payment for same as part of Subcontractor's progress payments or the incorporation of the Materials and Equipment into the Project, whichever first occurs. Subcontractor shall ensure that its Sub-subcontractors and/or Suppliers do not retain, encumber or reserve title to such items of the Work.
- 32.2** Notwithstanding the provisions of Article 32.1, and with respect to the transfer of title to the Work, the care, custody and control of Subcontractor's Work incorporated into the Project shall remain with Subcontractor until Company's issuance of the Notice of Final Completion and Acceptance. Care, custody and control of the Work shall not be transferred to Company prior to its issuance of the Notice of Final Completion and Acceptance unless Company notifies Subcontractor in writing that the care, custody and control of the Work or any portion thereof is being assumed by Company. The taking of possession of Work by Company or Government pursuant to Article 20.0 shall not constitute the assumption of care, custody and control of such Work until such time as such Work has been either accepted in writing by Company or Subcontractor has been notified as set forth herein.

33.0 INDEMNITY

- 33.1** Subcontractor agrees to indemnify, hold harmless and defend Company, Government, their subsidiaries and affiliates, and all their directors, officers, employees, agents and representatives, from and against any liability, claims, demands, lawsuits, judgments, losses and expense: a) arising by reason of claims from any third party, including Sub-subcontractors, Suppliers and their employees, for any actual or asserted failure of Subcontractor to comply with this Subcontract or with any law, ordinance, regulation, rule, or order of any governmental or quasi-governmental body having jurisdiction over this Subcontract or over the Work, including but not limited to the actual or asserted failure of Subcontractor to pay taxes; b) on account of injury to, illness or death of persons (including the employees of Company, Government, other third parties, Subcontractor, Sub-subcontractors and Suppliers, or on account of damage to or loss of property (including the property of Company and Government), arising directly or indirectly out of this Subcontract, including that which arises from the Work and from the acts or omissions of Subcontractor, Sub-subcontractors, Suppliers, and employees or agents of any thereof, in the performance of the Work, including the use or operation by Subcontractor and its Sub-subcontractors of any Construction Works or facilities furnished to Subcontractor by Company or Government to perform the Work; c) on account of actual or alleged contamination, pollution or public or private nuisance arising directly or indirectly out of the Work, including the acts or omissions of Subcontractor, Sub-subcontractors or Suppliers, in the performance of the Work; and d) as stated elsewhere in this Subcontract, including but not limited to, Articles 3.0, 10.0, 15.0, 41.0, 44.0 and 52.0 hereof.
- 33.2** Subcontractor's indemnification obligations under this Article shall apply regardless of whether the party to be indemnified was contributorily or concurrently negligent and shall include any expenses and attorneys' fees incurred by the party to be indemnified by Subcontractor.
- 33.3** Subcontractor acknowledges specific payment of USD \$10.00 incorporated into the Subcontract Price as legal consideration for its indemnity obligations set forth in this Article and all other indemnities as may be provided in this Subcontract.

34.0 COMPANY'S REMEDIES

Except for any rights and remedies of Company that are designated as exclusive in this Subcontract, all rights and remedies of Company set forth in this Subcontract or existing at law or in equity shall be cumulative and may be exercised concurrently.

35.0 INSURANCE

35.1 Before any Work is commenced under this Subcontract, Subcontractor shall, at its sole cost, cause to be issued and maintained in force during the Work the below listed minimum insurance coverages from underwriters acceptable to the Company, except as such coverages may be modified elsewhere in the Subcontract. Where the base currency of the Subcontract is in other than US Dollars, the limits of liability shown below may be adjusted to reflect the base currency equivalent.

35.1.1 Worker's Compensation Insurance, including occupational illness or disease coverage, or other similar social insurance in accordance with the laws of the nation, state, territory or province exercising jurisdiction over Subcontractor and Employer's Liability Insurance with a minimum limit of USD \$1,000,000 per accident.

35.1.2 Comprehensive General Liability including Contractual Liability, Products and Completed Operations Liability, XCU coverage and Broad Form Property Damage Liability coverage with a minimum combined single limit of USD \$2,000,000 per occurrence.

35.1.3 Automobile Liability Insurance covering use of all owned, non-owned and hired automobiles with a minimum combined single limit of USD \$1,000,000 per occurrence for bodily injury and property damage liability.

35.1.4 Umbrella Liability in excess of Employers Liability, General Liability and Automobile Liability, with a combined single limit of USD \$5,000,000 per occurrence.

35.1.5 Insurance against loss of or damage to construction equipment (owned, leased, hired or borrowed) used in connection with the Work hereunder. The limit shall be the replacement value of the equipment.

35.1.6 For remediation, processing or transportation of hazardous materials, Pollution Liability coverage for bodily injury, property damage and cleanup coverage (including defense coverage), with a minimum combined single limit of USD \$1,000,000 per claim and aggregate.

35.2 Such benefits and such coverage as required herein, or in any other document to be considered a part hereof, shall not be deemed to limit Subcontractor's liability under this Subcontract. The Subcontractor shall likewise require its Sub-subcontractors, if any, to provide for such benefits and carry and maintain such insurance at no cost to the Company.

35.3 The foregoing coverages shall be primary and non-contributing with respect to any other insurance or self insurance which may be maintained by Company or Government. The policies (except for Worker's Compensation coverage) shall be endorsed to name Company, Government and their employees and affiliates as additional insureds. Subcontractor's Comprehensive General Liability and Automobile Liability policies shall contain a cross liability and a severability of interest clause. Subcontractor shall obtain from each of its insurers a waiver of subrogation in favor of Company, Government and their employees and affiliates with respect to losses arising out of or in connection with the Work.

35.4 As a condition for issuance of the Notice to Proceed by the Company, Subcontractor shall cause its insurance underwriters to issue Certificates of Insurance satisfactory in form to Company, evidencing that the coverages, coverage extensions, additional insured provisions and waivers of subrogation as required under this Subcontract are maintained in force and that not less than thirty (30) days prior written notice will be given to Company prior to any material modification or cancellation of the policies. At the request of Company, Subcontractor shall promptly provide it certified copies of each of the above-referenced insurance policies.

36.0 BONDS

Subcontractor shall furnish, when so requested by Company and at the cost of Company, a Performance Bond in an amount equal to 100% of the full amount of the Subcontract Price as a guaranty on behalf of Subcontractor that the terms of this Subcontract shall be complied with in every particular, and a Subcontractor's Payment Bond in an amount equal to 100% of the full amount of the Subcontract Price as security for the payment of all persons performing labor

or for payment for all Goods used in performance of the Work. Subcontractor shall obtain the Performance and Payment Bonds from sureties and on bond forms acceptable to Company.

37.0 PERMITS AND LICENSES

Subcontractor shall promptly apply for and procure without additional compensation all certificates, licenses and permits (except for such permits as may be specifically set forth as Company's or Government's responsibility elsewhere in this Subcontract) as may be required by any governmental entity having jurisdiction over the Work, over Subcontractor or over the Project Site.

38.0 CONFIDENTIAL INFORMATION

38.1 Drawings, Specifications and other information issued to or made available to Subcontractor by Company or Government in connection with the Work are proprietary information whether or not so marked by Company or Government, and shall be held in confidence by Subcontractor and shall not be used by Subcontractor for any purpose other than for the performance of Work or as otherwise authorized in writing by Company. All such documents furnished by Company or Government to Subcontractor shall remain Company's or Government's property. Upon completion of the Work, Subcontractor shall, as requested by Company, either destroy or return such documents, including any copies thereof.

38.2 Subcontractor represents and agrees that it will not disclose to third parties, without the prior written consent of Company, any information obtained from or through Company unless said information is found to be already in the public domain.

39.0 PUBLICITY

Subcontractor shall not issue news releases, publicize or issue advertising pertaining to the Work or to this Subcontract without first obtaining the written approval of Company.

40.0 GOVERNMENTSHIP AND USE OF DRAWINGS

40.1 Drawings, prints, technical documents and data and other submittals prepared or developed by Subcontractor, Sub-subcontractors or Suppliers and submitted to Company in the performance of the Work shall be the property of Company or Government and may be used by Company and Government without restriction.

40.2 Company and Government shall have the right to reproduce any and all drawings or other submittals received from Subcontractor that are considered necessary for engineering, construction, start-up, commissioning, maintenance, or other purposes related to the Project, despite any notice to the contrary appearing on the document.

41.0 LAWS AND REGULATIONS

41.1 Subcontractor shall comply strictly with all local, municipal, state, provincial, federal and other governmental laws, orders, codes, permits, rules and regulations applicable to Subcontractor's operations in the performance of the Work hereunder, in effect at the time the Work is performed.

41.2 Subcontractor shall not, under any circumstances, apply to or enter into negotiations with any governmental authority or agency for acceptance of variations from or revisions to safety, health, air, water or noise pollution laws or regulations relating to this Subcontract or to the performance thereof without Company's prior written approval.

41.3 Subcontractor shall not, under any circumstances, cause or permit, in connection with the Work to be performed hereunder, the discharge, emission or release of any hazardous substance or waste, pollutant, contaminant or other substance in violation of any applicable laws, rules or regulations which are now or hereafter promulgated by any governmental authorities having jurisdiction over the Work. Subcontractor shall comply with all legal regulatory requirements applicable to the Work performed under this Subcontract and shall be responsible for compliance with all hazardous waste, health and safety, and environmental protection laws, rules, regulations and requirements related to notices and training, including, but not limited to, any resource and recovery legislation or other applicable laws or regulations. Subcontractor shall submit material safety data sheets as required. Subcontractor warrants full compliance with the provisions of this Article and further warrants that it will adhere to all applicable hazardous waste procedures and, if necessary, obtain or arrange for, at its expense, all identification numbers; permits, applications and other things

required in connection with its activities under this Subcontract. Subcontractor agrees that it will not store any hazardous wastes at the Project Site for periods in excess of ninety (90) days or in violation of the applicable site storage limitations imposed by law, or by Government or Company, whichever shall be more restrictive. Subcontractor agrees to take, at its expense, all actions necessary to protect third parties, including without limitation, employees and agents of Company and Government, from any exposure to or hazards of, hazardous or toxic wastes or substances generated or utilized in Subcontractor's operations. Subcontractor agrees to report to the appropriate governmental agencies all discharges, releases and spills of hazardous substances or wastes required to be reported by law and to immediately notify Company of the same.

- 41.4 Subcontractor agrees to indemnify, hold harmless and defend Company, Government, their subsidiaries and affiliates, and all their directors, officers, employees, agents and representatives, from and against any liability, claims, demands, penalties, fines, lawsuits, judgments, losses and expenses, including reasonable attorneys' fees and court costs, arising from its failure to comply with this Article.

42.0 COMMUNICATIONS

Written communications from Subcontractor to Company shall be marked with the Subcontract number and addressed as set forth in PART I of this Subcontract.

43.0 SITE RECORDS

Subcontractor shall maintain at the Project Site one record copy of this Subcontract, including all Drawings, Specifications, addenda, Change Orders, Field Work Orders and other Modifications, in good order and currently marked to record changes and selections made during construction. In addition, Subcontractor shall maintain at the Project Site one record copy of approved shop drawings, product data, samples and other submittals required of Subcontractor. These record copies shall be available to Company at all times, and shall be delivered to Company upon completion of the Work. Delivery of the record copies shall be a condition precedent to Final Acceptance of the Work.

44.0 EMERGENCY MEDICAL SERVICES

Company or Government may establish on the Project Site facilities for emergency medical treatment, and, if so established, may furnish emergency medical treatment services or related services to the employees of Subcontractor, Sub-subcontractor or Suppliers in the case of Project-connected illnesses or injuries occurring at the Project Site. In the event available, all such services are furnished on a Good Samaritan basis and not as a contractual obligation. In consideration of any such services, Subcontractor acknowledges that it assumes full and complete responsibility and liability for such employees, and agrees to indemnify, hold harmless and defend Company, Government, their subsidiaries and affiliates, and all their directors, officers, employees, agents and representatives, from and against any liability, claims, demands, penalties, fines, lawsuits, judgments, losses and expenses, including reasonable attorneys' fees and court costs, arising out of such services rendered by or on behalf of Company or Government for illnesses or injuries to any such employees, or arising out of or allegedly attributable in any way thereto. Nothing contained herein shall be construed as imposing any duty upon Company or Government to establish such medical facilities or to furnish emergency medical treatment services or related services to employees of Subcontractor, Sub-subcontractor or Suppliers.

45.0 OFFSET

Any and all payments due Subcontractor hereunder may, at the discretion of Company, be offset or charged against any outstanding obligations of Subcontractor to Company under this Subcontract or any other subcontract or agreement.

46.0 RIGHT OF AUDIT

In addition to any audit rights demanded by the Government (refer Section I of this Subcontract), Subcontractor shall maintain for a period of three (3) years after final payment under this Subcontract all records and accounts pertaining to the Work under this Subcontract performed by Subcontractor on a unit price or a time and materials price basis. Company and Government or an independent certified public accountant designated by Company shall have the right to audit, copy and inspect said records and accounts at all reasonable times during the course of such Work and for the above three (3) year period for the purpose of verifying units furnished and costs incurred, as applicable. The expense of such audit shall be to Company's account.

47.0 LIENS

47.1 To the fullest extent permitted by applicable law, Subcontractor hereby waives and releases any and all rights to file mechanic's liens and similar rights for payment for services, labor, or Goods furnished by Subcontractor in the performance of the Work and granted by law to persons supplying services, labor or Goods or other things of value for the Work at the Project Site or property belonging to Government.

47.2 Subcontractor shall at all times promptly pay for all services, labor and Goods used or furnished by Subcontractor in the performance of the Work under this Subcontract, and shall at its expense keep the Project Site and all property belonging to Government free and clear of any and all of the above mentioned liens and rights of lien arising out of services, labor or Goods furnished by Subcontractor or its employees, Sub-subcontractors or Suppliers, in the performance of the Work. Subcontractor shall immediately comply with Company's request for partial lien waivers from Sub-subcontractors and Suppliers in format acceptable to Company. If Subcontractor fails to release and discharge any such lien or claim of lien against the Project Site or the property of Government arising out of performance of the Work within seven (7) working days after receipt of written notice from Company or Government to remove such lien or claim of lien, Company or Government may, at their option, discharge or release the lien or claim of lien or otherwise deal with the lien claimant, and Subcontractor shall pay Company or Government, as applicable, any and all costs and expenses incurred by Company or Government in so doing, including reasonable attorneys' fees and court costs so incurred.

48.0 FINAL LIEN WAIVER AND RELEASE OF CLAIMS

Company shall not be obligated to make final payment to Subcontractor until Subcontractor has delivered to Company a Final Lien Waiver and Release of Claims satisfactory to Company certifying: a) that Subcontractor has fully performed under this Subcontract and that all claims of Subcontractor for the Work are satisfied upon the making of such final payment; b) that no property of Government or other property used in connection with the Work is subject to any unsatisfied lien or claim as a result of the performance of the Work; c) that all rights of lien against Government's property in connection with the Work are released (including without limitation if Company requests, final releases of lien satisfactory in form to Company and executed by all persons who by reason of furnishing services, labor or other Goods to Subcontractor for the Work are potential lienors against Government's property); and d) that Subcontractor will have paid in full all outstanding obligations against the Work promptly upon receipt of final payment.

49.0 NOT USED

50.0 IMPROPER PAYMENTS

50.1 Subcontractor (including its employees, agents, and representatives) certifies that it has not given and will not give, and has not offered and will not offer to give, any gifts, entertainment, payments, loans or other things of value to an officer, official, or employee of Company or Government or to a government official or candidate for government office or to a political party, to influence the award of or to obtain favorable treatment for itself or others under this Subcontract or any other purchase order, subcontract or agreement between Subcontractor and Company or Government. Subcontractor warrants that it is aware of the provisions of the Federal Corrupt Practices Act of the United States of America and similar laws of any country having a nexus with this Subcontract and further warrants that it will take appropriate steps to avoid violation of any such laws.

50.2 Violation of this Article 50.0 may be deemed by Company to be a material breach of this Subcontract and of any other purchase order, subcontract or agreement between Subcontractor and Company or any of its affiliates, and may subject all such purchase orders, subcontracts or agreements with Subcontractor to termination for default under the provisions of this Subcontract, as well as any other remedies at law or in equity available to Company.

51.0 NOT USED

52.0 GUARANTEE OF YEAR 2000 COMPLIANCE

52.1 If the Work includes the furnishing of any engineered Goods, Subcontractor guarantees that such Goods to be furnished pursuant to this Subcontract are Year 2000 ("Y2K") compliant. This guarantee shall apply to all of the Goods (and individual components thereof) furnished by Subcontractor (or its Sub-subcontractors or Suppliers) hereunder, including any computer chip(s), computer hardware or computer software that sorts data or information, compares dates, generates and maintains schedules, orders tables, calculates dates, generates reports, develops or maintains relational databases or performs similar functions, calculations, or activities, notwithstanding that Subcontractor (or its Sub-subcontractors or Suppliers) may have retained an Governmentship, proprietary, or other reversionary interest in same. Subcontractor guarantees that all Goods shall be "Y2K" compliant and shall process all date years on and after January 1, 2000, for the actual date year. Such guarantee shall also apply to any calculations

covering the date of February 29 in all leap years starting in the year 2000. This guarantee shall extend until either December 31, 2001 or until the end of the Warranty period established in Article 8.0, whichever date occurs last. If the Goods fail to conform to such guarantee, Subcontractor shall, at its own expense, redesign, correct or replace the Goods, including, as appropriate, computer chip(s), computer hardware or computer software, or any combination thereof, in order for the Goods to so conform. If Subcontractor fails to perform such redesign, corrective work, or replacement within thirty (30) calendar days after Subcontractor's receipt of written notice from Company that the Goods do not meet the guarantee set forth in this Article 52.0, Company shall have the right to perform or to have performed on its behalf such redesign, corrective work or replacement, all costs of which shall be to Subcontractor's account.

- 52.2** Subcontractor further guarantees that its operations and the operations of its Sub-subcontractors and Suppliers hereunder shall be such that no "Y2K" related problem shall serve to delay, prevent or otherwise adversely affect the timely performance of Work under this Subcontract.
- 52.3** Subcontractor shall, at its own expense and at the request of Company, demonstrate, by means of successful testing, compliance with Articles 52.1 and 52.2 above. Such testing may, at Company's direction, be performed in the shop of Subcontractor or its Sub-subcontractors or Suppliers, as appropriate, or at the Project Site. Such testing shall not relieve Subcontractor from its guarantee and indemnification obligations under this Article 52.0.
- 52.4** Subcontractor agrees to indemnify, hold harmless and defend Company, Government and their subsidiaries and affiliates, and all their directors, officers, employees, agents and representatives, from and against any liability, claims, demands, penalties, fines, lawsuits, judgments, losses and expenses, including reasonable attorneys' fees and court costs, arising from the failure of Subcontractor to comply with the provisions of this Article 52.0.

53.0 NOTICE OF AFFIRMATIVE ACTION

If the Work or any portion thereof is performed in the United States of America, then, for such Goods or portion of the Goods, Subcontractor shall comply with Executive Order 11246 (as amended), the Vocational Rehabilitation Act of 1973 (as amended), the Vietnam Era Veterans' Readjustment Assistance Act of 1974 (as amended), and their implementing regulations codified at 41 C.F.R. 60-1.4(a), 41 C.F.R. 60-741.4, and 41 C.F.R. 60-250.4, respectively, all of which are incorporated herein by reference and made part of this Subcontract.

54.0 CONSTRUCTION SCHEDULING, REPORTING AND COORDINATION

Subcontractor and its Sub-subcontractors agree to participate actively in the Cost and Schedule Control Program established for the Project. As a part of the program, Subcontractor and its Sub-subcontractors shall provide specific and accurate man hour, quantity and schedule information to Company in the format and with the frequency specified in Appendix B hereto, entitled "Cost and Schedule Control Program", or in Section C, Part 1 of the Subcontract, entitled Scope of Work. Said information shall be used by Company for cost and schedule monitoring purposes to ensure that schedule interfaces with other subcontractors are met and to monitor overall Project performance.

Stone & Webster Construction Co., Inc.

**245 Summer Street
Boston, MA 02210
Tel. 617-589-7057 Fax. 617-589-1200**

RE: Completion of the attached Standard Form 1413

Dear Vendor/Subcontractor:

Enclosed is a Standard Form 1413. This is for your information only.

The government requires the completion and submission of this form on most construction- related projects.

If you are awarded work as a result of this RFP, you will be required to complete sections 13, 14, 15, and 16.

At the time of award, all other sections will be completed by Stone & Webster, and forwarded to you for completion

The completed form will be returned to my attention at :

Stone & Webster
245 Summer Street
Boston, MA 02210
Attn: Don Fournier

If you have questions regarding this matter please call me at 617-589-7057.

Sincerely,
Stone & Webster

Don Fournier,
Senior Contracts Administrator

Enclosure

STATEMENT AND ACKNOWLEDGMENTFORM APPROVED OMB NO
9000-0014

Public reporting burden for this collection of information is estimated to average .15 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the FAR Secretariat (VRS), Office of Federal Acquisition and Regulatory Policy, GSA, Washington, D.C. 20405; and to the Office of Management and Budget, Paperwork Reduction Project (9000-0014), Washington, D.C. 20503.

PART I - STATEMENT OF PRIME CONTRACTOR

1. PRIME CONTRACT NO.	2. DATE SUBCONTRACT AWARDED	3. SUBCONTRACT NUMBER
4. PRIME CONTRACTOR (Name, address and ZIP code)		5. SUBCONTRACTOR (Name, address and ZIP code)

6. The prime contractor states that under the contract shown in Item 1, a subcontract was awarded on date shown in Item 2 by (Name of Awarding Firm)

to the subcontractor identified in Item 5, for the following work:

7. PROJECT	8. LOCATION	
9. NAME AND TITLE OF PERSON SIGNING	10. BY (Signature)	11. DATE SIGNED

PART II - ACKNOWLEDGMENT OF SUBCONTRACTOR

12. The subcontractor acknowledges that the following clauses of the contract shown in Item 1 are included in this subcontract:

Contract Work Hours and Safety	Davis- Bacon Act
Standards Act - Overtime	Apprentices and Trainees
Compensation - Construction	Compliance with Copeland Regulations
Payrolls and Basic Records	Subcontracts
Withholding of Funds	Contract Termination -Debarment
Disputes Concerning Labor Standards	Certification of Eligibility

13. NAME(S) OF ANY INTERMEDIATE SUBCONTRACTORS, IF ANY

14. NAME AND TITLE OF PERSON SIGNING	15. BY (Signature)	16. DATE SIGNED
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General Decision Number MA990018

General Decision Number MA990018
 Superseded General Decision No. MA990019

HEAVY MARINE

County(ies):

BARNSTABLE	ESSEX	NORFOLK
BRISTOL	MIDDLESEX	PLYMOUTH
DUKES	NANTUCKET	SUFFOLK

HEAVY AND MARINE CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	03/12/1999
1	05/14/1999
2	05/21/1999
3	06/04/1999
4	06/11/1999
5	06/18/1999
6	06/25/1999
7	07/16/1999
8	07/30/1999

COUNTY(ies):

BARNSTABLE	ESSEX	NORFOLK
BRISTOL	MIDDLESEX	PLYMOUTH
DUKES	NANTUCKET	SUFFOLK

BOIL0029A 01/01/1997

	Rates	Fringes
BOILERMAKERS	23.28	12%+8.69

BRMA0001K 09/01/1997

Rates Fringes
 BRISTOL (Attleboro, Berkley, Dighton, Mansfield, North Attleboro, Norton, Raynham, Rehoboth, Seekonk, Taunton); NORFOLK (Bellingham, Canton, Dedham, Foxboro, Franklin, Norfolk, Norwood, Plainville, Sharon, Walpole, Westwood, Wrentham); and PLYMOUTH (Lakeville)

BRICKLAYERS & CEMENT MASONS	26.61	10.14
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BRMA0001L 09/01/1997

Rates Fringes
 MIDDLESEX (Acton, Ashby, Ayer, Bedford, Billerica, Boxboro, Carlisle, Chemsford, Dracut, Dunstabale, Ft Devens, Groton, Littleton, Lowell, North Acton, Pepperell, Shirley, South Acton, Tewksbury, Townsend, Tyngsboro, West Acton, Westford, Wilmington)

BRICKLAYERS	25.36	11.39
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BRMA0001M 09/01/1997

Rates Fringes
 MIDDLESEX (Ashland, Framingham, Holliston, Hopkinton, Hudson, Maynard, Natick, Sherbourn, Stow); and NORFOLK (Medfield, Medway, Millis)

BRICKLAYERS	25.01	11.74
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BRMA0003A 07/01/1998

	Rates	Fringes
MARBLE, TILE & TERRAZZO WORKERS	27.25	11.02

TERRAZZO FINISHERS	30.40	6.60
MARBLE & TILE FINISHERS	22.13	10.65

BRMA0003C 02/01/1998

	Rates	Fringes
MIDDLESEX (Arlington, Cambridge, Everett, Malden, Medford, Melrose, Somerville); NORFOLK (Brookline, Milton); and SUFFOLK		
BRICKLAYERS	27.96	10.44

BRMA0003K 02/01/1998

	Rates	Fringes
ESSEX (Amesbury, Andover, Beverly, Boxford, Danvers, Essex, Georgetown, Gloucester, Haverhill, Hamilton, Haverhill, Ipswich, Lawrence, Lynn, Lynnfield, Manchester, Marblehead, Merrimac, Methuen, Middleton, Nahant, Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley, Salisbury, Salem, Saugus, Swampscott, Topsfield, Wakefield, Wenham, West Newbury); and MIDDLESEX (North Reading, Reading, Wakefield)		
BRICKLAYERS & CEMENT MASONS	27.71	10.69

BRMA0003L 02/01/1998

	Rates	Fringes
MIDDLESEX (Belmont, Burlington, Concord, Lexington, Lincoln, Stoneham, Sudbury, Waltham, Watertown, Wayland, Weston, Winchester, Woburn)		
BRICKLAYERS	26.81	11.59
MIDDLESEX (Newton) AND NORFOLK (Dover, Needham, Wellesley) COUNTIES		
BRICKLAYERS & CEMENT MASONS	27.06	11.34

BRMA0003M 02/01/1998

	Rates	Fringes
BARNSTABLE; BRISTOL (Acushnet, Dartmouth, Fairhaven, Fall River, Freetown, New Bedford, Somerset, Swansea, Westport); DUKES; NANTUCKET; PLYMOUTH (Marion, Mattapoisett, Rochester, Wareham)		
BRICKLAYERS & CEMENT MASONS	27.41	10.99

BRMA0003N 02/01/1998

	Rates	Fringes
PLYMOUTH COUNTY (Abington, Bridgewater, Brockton, Carver, Duxbury, East Bridgewater, Halifax, Hanover, Hanson, Hingham, Hull, Kingston, Marshfield, Middleboro, Norwell, Pembroke, Plymouth, Rockland, Scituate, West Bridgewater, Whitman)		
BRICKLAYERS & CEMENT MASONS	26.46	11.94

BRMA0032D 02/01/1998

	Rates	Fringes
MIDDLESEX (Newton) AND NORFOLK COUNTIES		
BRICKLAYERS & CEMENT MASONS	27.06	11.34

* CARP0026C 04/01/1999

	Rates	Fringes
BRISTOL (Attleborough, North Attleborough); ESSEX; MIDDLESEX (Except Belmont, Somerville); AND NORFOLK (Bellingham, Braintree, Canton, Cohasset, Foxboro, Franklin, Medfield, Medway, Millis, Needham, Norfolk, Norwood, Plainville, Quincy, Sharon, Walpole, Wellesley, Westwood, Weymouth, Wrentham) COUNTIES		
CARPENTERS	21.38	10.11

CARP0033C 04/01/1999

	Rates	Fringes
MIDDLESEX (Belmont, Cambridge, Everett, Malden, Medford, Somerville); NORFOLK (Brookline, Dedham, Milton); AND SUFFOLK		

COUNTIES	Rates	Fringes
CARPENTERS	25.27	11.46

CARP0056A 08/01/1998		
All of SUFFOLK COUNTY; and those areas of BARNSTABLE, BRISTOL, ESSEX, MIDDLESEX, NORFOLK, and PLYMOUTH COUNTIES situated INSIDE Boston Beltway (I-495) and North of Cape Cod Canal		
PILEDRIVERMEN & DIVER TENDERS	24.29	10.91

CARP0056B 04/01/1999		
4/1/1999UKES and NANTUCKET COUNTIES; and those areas of BARNSTABLE, BRISTOL, PLYMOUTH, and NORFOLK COUNTIES situated OUTSIDE Boston Beltway (I-495) and South of Cape Cod Canal		
PILEDRIVERMEN & DIVER TENDERS	22.08	10.91

CARP0056C 04/01/1999		
Those areas of ESSEX and MIDDLESEX COUNTIES situated OUTSIDE Boston Beltway (I-495)		
PILEDRIVERMEN & DIVER TENDERS	22.82	10.91

CARP0056D 08/01/1998		
DIVERS	34.01	10.91

CARP0424A 04/01/1999		
NORFOLK (Braintree, Quincy, Cohasset, Weymouth, etc.) PLYMOUTH (Duxbury, Hanover, Hull, Hingham, Marshfield, Norwell, Pembroke Rockland, Scituate)		
CARPENTERS	21.38	10.11

CARP0624B 04/01/1999		
BARNSTABLE; BRISTOL (Except Attleboro & North Attleboro); DUKES; NANTUCKET; NORFOLK (Avon, Holbrook, Randolph, Stoughton); PLYMOUTH (Bridgewater, Kingston, Lakeville, Middleboro, Plymouth, S. Hanover, Whitman)		
CARPENTERS	19.89	10.11

CARP1121A 04/01/1999		
MILLWRIGHTS	23.71	12.16

ELEC0096A 12/01/1998		
MIDDLESEX (Ashby, Ashland, Ayer, Ft. Devens, Groton, Hopkinton, Hudson, Marlboro, Pepperell, Shirley, Stow, Townsend)		
ELECTRICIAN	24.44	8.46+3%
TELEDATE SYSTEM INSTALLERS	17.06	6.55

ELEC0099A 06/01/1999		
BRISTOL (Attleboro, North Attleboro, Seekonk)		
ELECTRICIANS	23.86	41%
TELEDATE SYSTEM INSTALLERS	17.55	4.06+8%

ELEC0103B 09/01/1998		
ESSEX (Amesbury, Andover, Boxford, Georgetown, Groveland, Haverhill, Lawrence, Merrimac, Methuen, Newbury, Newburyport, North Andover, Rowley, Salisbury, West Newbury); MIDDLESEX (Bedford, Billerica,		

Dracut, Dunstable littleton, Lowell, North Reading, Tewksbury,
Tyngsboro, Westford, Wilmington)

	Rates	Fringes
ELECTRICIANS	23.41	12.883

ELEC0103D 09/01/1998

	Rates	Fringes
ESSEX (Beverly, Danvers, Essex, Gloucester, Hamilton, Ipswich, Manchester, Marblehead, Middleton, Peabody, Rockport, Salem, Topsfield, Wenham)		
ELECTRICIANS	22.36	11.22

ELEC0103E 09/01/1998

	Rates	Fringes
ESSEX (Lynn, Lynnfield, Nahant, Saugus, Swampscott); MIDDLESEX (Acton, Arlington Framingham, Holliston, Lexington, Lincoln, Malden, Maynard, Medford, Melrose, Natick, Newton, Reading, Sherborn, Somerville, Stoneham, Sudbury, Wakefield, Waltham, Watertown, Wayland, Weston, Winchester, Woburn); NORFOLK (Bellingham, Braintree, Brookline, Canton, Cohasset, Dedham, Dover, Foxboro, Franklin, Medfield, Medway, Millis, Milton, Needham, Norfolk, Norwood, Quincy, Sharon, Walpole, Wellesley, Westwood, Weymouth, Wrentham); PLYMOUTH (Hingham and Hull); SUFFOLK		
ELECTRICIANS	29.53	12.21

ELEC0104A 09/01/1998

	Rates	Fringes
LINE CONSTRUCTION:		
Lineman	26.00	7.96+3%+A

FOOTNOTES:

A. PAID HOLIDAYS: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Christmas Day and Columbus Day, provided the employee has been employed 5 working days prior to any one of the listed holidays.

ELEC0223B 09/01/1998

	Rates	Fringes
BARNSTABLE, BRISTOL (Except Attleboro, North Attleboro, Seekonk); DUKES; NANTUCKET; PLYMOUTH (Except Hingham and Hull Twps); NORFOLK (Avon, Halbrook, Randolph, Sloughton)		
ELECTRICIANS	23.22	37%-1.27

ENGI0004I 06/01/1999

	Rates	Fringes
POWER EQUIPMENT OPERATORS:		
Group 1	26.77	10.62+A
Group 2	26.60	10.62+A
Group 3	21.11	10.62+A
Group 4	23.69	10.62+A
Group 5	17.84	10.62+A
Group 6	19.42	10.62+A

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:

A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Labor Day, Memorial Day, Independence Day, Patriot's Day, Columbus Day, Veteran's Day, Thanksgiving Day, Christmas Day

HOURLY PREMIUM FOR BOOM LENGTHS (Including Jib):

Over 150 ft.	+1.17
Over 185 ft.	+2.06
Over 210 ft.	+2.89
Over 250 ft.	+4.38
Over 295 ft.	+6.07

POWER EQUIPMENT OPERATORS CLASSIFICATIONS
[HEAVY CONSTRUCTION]

Group 1: Power shovel; crane; truck crane; derrick; pile driver;

trenching machine; mechanical hoist pavement breaker; cement concrete paver; dragline; hoisting engine; three drum machine; pumpcrete machine; loaders; shovel dozer; front end loader; mucking machine; shaft hoist; steam engine; backhoe; gradall; cable way; fork lift; cherry picker; boring machine; rotary drill; post hole hammer; post hole digger; asphalt plant on job site; concrete batching and/or mixing plant on job site; crusher plant on job site; paving concrete mixer; timber jack

Group 2: Sonic or vibratory hammer; grader; scraper; tandem scraper; bulldozer; tractor; mechanic - maintenance; York rake; mulching machine; paving screed machine; stationary steam boiler; paving concrete finishing machine; grout pump; portable steam boiler; portable steam generator; roller; spreader; asphalt paver; locomotives or machines used in place thereof; tamper (self propelled or tractor-draw); cal tracks; ballast regulator; rail anchor machine; switch tamper; tire truck

Group 3: Pumps (1-3 grouped); compressor; welding machines (1-3 grouped); generator; sighting plant; heaters (power driven, 1-5); syphon-pulsometer; concrete mixer; valves controlling permanent plant air steam, conveyor, wellpoint system (operating)

Group 4: Assistant engineer (fireman)

Group 5: Oiler (other than truck cranes and gradalls)

Group 6: Oiler (on truck cranes and gradalls)

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

[MARINE CONSTRUCTION]

Group 1: Shovel; crane; truck crane; cherry picker; derrick; pile driver; two or more drum machines; lighters; derrick boats; trenching machines; mechanic hoist pavement breakers; cement concrete pavers; draglines; hoisting engines; pumpcrete machines elevating graders; shovel dozer; front end loader; backhoe; gradall; cable ways; boring machine; rotary drill; post hole hammer; post hole digger; fork lift; timber jack; asphalt plant batching and/or mixing plant (on site); paving concrete mixer

Group 2: Stationary steam boiler; portable steam generator; sonic or vibratory hammer; grader; scraper; tandem scraper; concrete pump; bulldozer; tractor; York rake; mulching machine; roller; spreader; tamper (self-propelled or tractor-drawn); asphalt paver; concrete mixer with side loader; mechanic - maintenance; cal tracks; ballast regulator; switch tamper; rail anchor machine; tire truck

Group 3: Pumps (1-3 grouped); compressor; welding machines (1-3 grouped); generator; lighting plant; heaters (power driven 1-5); syphon-pulsometer; concrete mixer; valves controlling permanent plant air or steam; conveyor; well point systems; auger (powered by independent engines and attached to pile drivers); hydraulic saws

Group 4: Fireman

Group 5: Assistant engineer (other than truck crane and gradall)

Group 6: Assistant engineer (on truck crane and gradall)

IRON0007A 03/16/1999

	Rates	Fringes
BRISTOL (Easton); ESSEX (Beverly, Gloucester, Lynn, Lynnfield, Manchester, Marblehead, Nahant, Salem, Saugus, Swampscott); MIDDLESEX (Arlington, Bedford, Belmont, Burlington, Cambridge, Concord, Everett, Framingham, Lexington, Lincoln, Malden, Maynard, Medford, Melrose, Natick, Newton, Reading, Sherborn, Somerville, Stoneham, Sudbury, Wakefield, Waltham, Watertown, Wayland, Weston, Winchester, Woburn); NORFOLK (Except Medway); PLYMOUTH (Abington, Bridgewater, Brocton, Duxbury, East Bridgewater, Halifax, Hanover, Hanson, Hingham, Hull, Kingston, Marshfield, Norwell, Pembroke, Plymouth, Plympton, Rockland, Scituate, West, Bridgewater, Whitman); SUFFOLK		

IRONWORKERS	24.75	13.44
ESSEX (Amesbury, Andover, Boxford, Danvers, Essex, Georgetown, Hamilton, Haverhill, Ipswich, Lawrence, Merrimac, Methuen, Newbury, Newburyport, North Andover, Rockport, Rowley, Salisbury, Topsfield, Wenham, West Newbury); MIDDLESEX (Action, Billerica, Carlisle, Chelmsford, Dracut, Dunstable, Groton, Groveland, Littleton, Lowell, Middleton, North Reading, Pepperell, Tewksbury, Tyngsboro, Westford, Wilmington)		
IRONWORKERS	20.34	13.44

IRON0037B 01/04/1999

	Rates	Fringes
BARNSTABLE; BRISTOL (Bourne, Attleboro, Berkley, Dartmouth, Dighton, Fairhaven, Fall River, Freetown, Mansfield, New Bedford, North Attleboro, Norton, Raynham, Rehoboth, Seekonk, Somerset, Swansea, Taunton, Westport); DUKES; NANTUCKET; NORFOLK (Billingham, Franklin, Plainville, Wrentham); PLYMOUTH (Lakeville, Marion, Mattapoisett, Middleboro, Rochester, Wareham)		
IRONWORKERS	23.33	11.40

IRON0057A 05/01/1999

	Rates	Fringes
MIDDLESEX (Ashby, Ashland, Ayer, Boxboro, Holliston, Hopkinton, Hudson, Marlboro, Shirley, Stow, Townsend); NORFOLK (Medway)		
IRONWORKERS	25.90	12.00

LAB00022F 06/01/1999

	Rates	Fringes
SUFFOLK COUNTY (Boston, Cambridge, Chelsea, Deer Island, Nut Island, Revere, Winthrop)		
LABORERS :		
GROUP 1	20.75	7.95
GROUP 2	21.00	7.95
GROUP 3	21.50	7.95
GROUP 4	21.75	7.95
GROUP 5	14.85	7.95
GROUP 6	22.75	7.95

LABORERS CLASSIFICATIONS

GROUP 1: Laborers; carpenter tenders; cement finisher tenders
 GROUP 2: Asphalt raker; fence and guard rail erector; laser beam operator; mason tender; pipelayer; pneumatic drill operator; pneumatic tool operator; wagon drill operator
 GROUP 3: Air track operator; block paver; rammer; curb setter
 GROUP 4: Blaster; powderman
 GROUP 5: Flagger
 GROUP 6: Asbestos Abatement; Toxic and Hazardous Waste Laborers

LAB00022L 06/01/1999

	Rates	Fringes
BARNSTABLE, BRISTOL, DUKES, ESSEX, MIDDLESEX, NANTUCKET, NORFOLK AND PLYMOUTH COUNTIES		
LABORERS:		
GROUP 1	19.05	7.45
GROUP 2	19.30	7.45
GROUP 3	19.80	7.45
GROUP 4	20.05	7.45
GROUP 5	13.15	7.45
GROUP 6	21.05	7.45

LABORERS CLASSIFICATIONS

GROUP 1: Laborers; carpenter tenders; cement finisher tenders
 GROUP 2: Asphalt raker; fence and guard rail erector; laser beam operator; mason tender; pipelayer; pneumatic drill operator; pneumatic tool operator; wagon drilloperator
 GROUP 3: Air track operator; block paver; rammer; curb setter

GROUP 4: Blaster; powderman
 GROUP 5: Flagger
 GROUP 6: Asbestos Abatement; Toxic and Hazardous Waste Laborers

LABO0022M 06/01/1999

	Rates	Fringes
LABORERS (TUNNELS, CRISSON & CYLINDER WORK IN COMPRESSED AIR)		
GROUP 1	20.70	7.20+A
GROUP 2	31.18	7.20+A
GROUP 3	31.18	7.20+A
GROUP 4	31.18	7.20+A
GROUP 5	33.18	7.20+A

LABORERS CLASSIFICATIONS

GROUP 1: Powder watchman; Top man on iron bolt; change house attendant
 GROUP 2: Brakeman; trackman; groutman; laborer; outside lock tender; lock tender; guage tender
 GROUP 3: Motorman
 GROUP 4: Blaster
 GROUP 5: Mucking machine operator

LABORERS (FREE AIR OPERATION):

SHIELD DRIVEN AND LINER PLATE IN FREE AIR)

GROUP 1	23.25	7.20+A
GROUP 2	23.25	7.20+A

LABORERS CLASSIFICATIONS

GROUP 1: Miner; miner welder; conveyor operator; motorman; mucking machine operator; nozzle man; grout man; shaft and tunnel steel and rodman; shield and erector arm operators

GROUP 2: Brakeman; trackman

CLEANING CONCRETE AND CAULKING TUNNEL (Both New & Existing)

GROUP 1	23.25	7.20+A
GROUP 2	23.25	7.20+A

LABORERS CLASSIFICATIONS

GROUP 1: Concrete workers; strippers and form movers (wood & steel rock shaft, concrete lining of same and tunnel in free air

GROUP 2: Form erector

ROCK SHAFT, CONCRETE LINING OF SAME AND TUNNEL IN FREE AIR

GROUP 1	20.70	7.20+A
GROUP 2	23.25	7.20+A
GROUP 3	23.25	7.20+A
GROUP 4	23.25	7.20+A

LABORERS CLASSIFICATIONS

GROUP 1: Change house attendants

GROUP 2: L

GROUP 3: Brakeman; trackman; tunnel laborers; shaft laborers

GROUP 4: Miner; cage tender; bellman

LABORERS (OPEN AIR CAISSONS, UNDERPINNING AND TEST BORING INDUSTRIES):

OPEN AIR CAISSON, UNDERPINNING WORK & BORING CREW

Laborers; Top man	20.75	7.20+A
Bottom man	21.70	7.20+A

TEST BORING & WELL DRILLING

Laborer	20.75	7.20+A
Driller	22.15	7.20+A

FOOTNOTE FOR LABORERS:

A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Columbus Day, Veteran's Day, Thanksgiving Day, and Christmas Day

LAB01421A 06/01/1999

	Rates	Fringes
ESSEX; SUFFOLK; MIDDLESEX; NORFOLK; AND PLYMOUTH COUNTIES		
WRECKING LABORERS:		
Yardmen Laborer (Salvage Yard only)	16.85	7.95
Yardmen Burners, Sawyers	19.95	7.95
Wrecking Laborers	20.85	7.95
Adzeman	20.85	7.95
Burners, Jackhammers	21.10	7.95
Small Front Loaders on Tracks and Bobcat Operators	21.35	7.95
Asbestos Removers	22.85	7.95
BARNSTABLE; BRISTOL; DUKES; AND NANTUCKET COUNTIES		
WRECKING LABORERS	20.85	7.95

PAIN0035A 07/01/1999

	Rates	Fringes
BARNSTABLE BRISTOL; DUKES; ESSEX; NANTUCKET; PLYMOUTH (Remainder of NORFOLK; MIDDLESEX AND SUFFOLK COUNTIES)		
PAINTERS:		
NEW CONSTRUCTION:		
Brush	24.75	9.17
Spray, Sandblast	25.75	9.17
Bridge	30.01	9.17
REPAINT:		
Brush	22.81	9.17
Spray, Sandblast	23.81	9.17
Bridge	30.01	9.17

PAIN00350 07/01/1999

	Rates	Fringes
MIDDLESEX (Cambridge, Everett, Malden, Medford, Somerville) SUFFOLK COUNTY (Boston, Chelsea) NORFOLK COUNTY (Brookline)		
PAINTERS:		
NEW CONSTRUCTION:		
Brush, Taper	28.05	9.17
Spray, Sandblast	29.05	9.17
REPAINT:		
Brush, Taper	26.11	9.17
Spray, Sandblast	27.11	9.17
Bridge	30.01	9.17

PAIN0035R 06/01/1998

	Rates	Fringes
SIGN PAINTERS	16.38	6.02

PLAS0534A 09/01/1998

	Rates	Fringes
ESSEX (Amesbury, Andover, Boxford, Georgetown, Groveland, Haverhill, Lawrence, Merrimac, Methuen, North Andover, Salisbury, West Newbury); MIDDLESEX (Acton, Arlington, Bedford, Billerica, Burlington, Cambridge, Carlisle, Chemsford, Dracut, Dunstable, Everett, Littleton, Lowell, Malden, Medford, Melrose, Reading, North Reading, Stoneham, Tewksbury, Tyngsboro, Wakefield, Westford, Wilmington, Winchester & Woburn); AND NORFOLK (Brookline, Milton) SUFFOLK COUNTY		
CEMENT MASONS	25.10	14.17

PLUM0004A 03/01/1999

	Rates	Fringes
MIDDLESEX (Ashby, Ayer - West of Greenville branch of Boston and Maine Railroad, Ft. Devens, Groton, Shirley, Townsend)		
PLUMBERS & PIPE FITTERS	23.46	9.20

PLUM0012A 03/01/1999

	Rates	Fringes
ESSEX (Lynn, Lynnfield, Nahant, Saugus, Swampscott); MIDDLESEX (Acton, Arlington of Boston & Maine RR, Bedford, Belmont, Billerica, Boxboro, Burlington, Cambridge, Carlisle, Chelmsford, Concord, Dracut, Dunstable, Everett, Framingham, Hudson, Holliston, Hopkinton, Lexington, Lincoln, Littleton, Lowell, Malden, Marlboro, Maynard, Medford, Melrose, Needham, Newton, North Reading, Pepperell, Reading, Sherborn, Somerville, Stoneham, Stow, Sudbury, Tewksbury, Tyngsboro, Wakefield, Waltham, Watertown, Wayland, Westford, Wilmington, Winchester, Woburn); NORFOLK (Bellingham, Braintree, Brookline, Canton, Cohasset, Dedham, Dover, Foxboro, Franklin, Medfield, Medway, Millis, Milton, Needham, Norfolk, Norwood, Plainville, Quincy, Sharon, Walpole, Wellesley, Westwood, Weymouth, Wrentham); PLYMOUTH (Hingham, Hull, Scituate); SUFFOLK		
PLUMBERS	28.22	11.68

PLUM0051E 09/01/1998

	Rates	Fringes
BARNSTABLE; BRISTOL; DUKES; NANTUCKET; NORFOLK (Avon, Holbrook, Randolph, Stoughton) PLYMOUTH (Remainder of County)		
PLUMBERS & PIPEFITTERS	23.45	9.77

PLUM0138A 09/01/1998

	Rates	Fringes
ESSEX (Ames, Andover, Beverly, Boxford, Byfield, Danvers, Essex, Georgetown, Gloucester, Groveland, Hamilton, Haverhill, Ipswich, Lawrence, Manchester, Marblehead, Merrimac, Methuen, Middleton, Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley, Salem, Salisbury, Topsfield, Wenham, West Newbury)		
PLUMBERS, PIPEFITTERS, and STEAMFITTERS	23.57	10.35

PLUM0537A 03/01/1999

	Rates	Fringes
MIDDLESEX (Arlington, Cambridge, Everett, Malden, Medford, Melrose, Reading, Wakefield, Winchester and Woburn); NORFOLK (Bellingham, Braintree, Brookline, Canton, Cashasset, Dedham, Foxboro, Franklin, Millis, Milton, Sharon, Walpole, Westwood, and Wrentham); PLYMOUTH (Hingham, Hull, Scituate); ESSEX (Lynn, Lynnfield, Nahant, Saugus, Swampscott); SUFFOLK (Boston and Chelsea)		
PIPEFITTERS	28.26	11.69

TEAM0379A 12/01/1998

	Rates	Fringes
TRUCK DRIVERS:		
Group 1	21.03	8.36+A+B
Group 2	21.20	8.36+A+B
Group 3	21.27	8.36+A+B
Group 4	21.39	8.36+A+B
Group 5	21.49	8.36+A+B
Group 6	21.78	8.36+A+B
Group 7	22.07	8.36+A+B

POWER TRUCKS \$.25 DIFFERENTIAL BY AXLE

TUNNEL WORK (UNDERGROUND ONLY) \$.40 DIFFERENTIAL BY AXLE

TRUCK DRIVERS CLASSIFICATIONS

Group 1: Station wagons; panel trucks; and pickup trucks
 Group 2: Two axle equipment; & forklift operator
 Group 3: Three axle equipment and tireman
 Group 4: Four and Five Axle equipment
 Group 5: Specialized earth moving equipment under 35 tons other than conventional type trucks; low bed; vachual;

- mechanics, paving restoration equipment"
- Group 6: Specialized earth moving equipment over 35 tons
- Group 7: Trailers for earth moving equipment (double hookup)

FOOTNOTES:

- A. PAID HOLIDAYS: New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Patriot's Day, Columbus Day, Veteran's Day, Thanksgiving Day, and Christmas Day
- B. PAID VACATION: Employees with 4 months to 1 year of service receive 1/2 day's pay per month; 1 week vacation for 1 - 5 years of service; 2 weeks vacation for 5 - 10 years of service; and 3 weeks vacation for more than 10 years of service

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(v)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an

interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to: .

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.
END OF GENERAL DECISION



**SCOPE OF WORK
CONSOLIDATION LANDFILL
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SCOPE OF WORK

CONSOLIDATION LANDFILL

1. DESCRIPTION OF WORK – GENERAL

- 1.1 The former Fort Devens is a United States Environmental Protection Agency (USEPA) Comprehensive Environmental Response Compensation and Liability Act (CERCLA) National Priorities List (NPL) site located in the Towns of Ayer and Shirley (Middlesex County) and Harvard and Lancaster (Worcester County), approximately 35 miles northwest of Boston, Massachusetts. Prior to closure, the installation (now referred to as “Devens”) occupied approximately 9,600 acres and was divided into the North Post, Main Post, and South Post.
- 1.2 The subject property was established as Camp Devens, a temporary United States military training facility, in 1917. The base was made a permanent installation, known as Fort Devens, in 1931 and was operated as a military induction center as well as a unit mobilization and demobilization post.
- 1.3 Developed areas of the facility currently consist of residential and light commercial areas with paved roadways, sewer and storm-water collection, public water, gas and electric services. Undeveloped areas of the site consist of woodland areas, ponds and wetlands, as well as the Nashua River, which runs south through the west portion of the base.
- 1.4 In 1989, the USEPA placed Devens on the National Priority List (NPL) under CERCLA [as amended by the Superfund Amendments and Reauthorization Act (SARA)]. Between 1989 and 1998, numerous assessments and investigations were conducted at Devens to evaluate the site conditions, compliance status, potential clean up alternatives and pre-design development.
- 1.5 Pursuant to the environmental studies performed at Devens a Record of Decision (ROD) was signed which requires excavation and restoration of six debris disposal areas and either onsite consolidation in a lined landfill to be constructed or offsite transportation and disposal. In total, approximately 300,000 cubic yards (CY) of non-hazardous debris will be addressed. The selection of the disposal option will be based on an evaluation of proposals submitted for the onsite and offsite alternatives. The 4 “levels of acceptability” for the review board are; (1) overall protection of human health and the environment (e.g., the offsite landfill will have the same level of environmental protection as the onsite landfill design), (2) Subcontractor’s past performance, (3) ability to satisfy health and safety concerns identified by local residents and public officials, and (4) cost. Assuming the first 3 are satisfied, the selection will fall to the cost. A 5.6 million dollar credit will be applied to the off site disposal option.
- 1.6 Six sites have been identified at Devens, and are described briefly below. Waste materials excavated from the six sites will be removed for either disposal in an on-site landfill or will be transported off site for disposal at commercial landfill facility(s). A brief discussion of

each of the six sites follows. The location of the six sites and the potential on-site landfill are shown on Figure 1 .

Area AOC-9

AOC-9 consists of one large disposal area and four smaller areas adjacent to the wetlands to the south. The disposal area is partially vegetated, with the four smaller areas containing debris at the near surface level. Approximately 121,000 CY of debris are estimated to be located in AOC-9.

AOC-9 is located on the North Post, north of Walker Road and west of the wastewater treatment plant. AOC-9 was used from the late 1950's through 1978 for disposal of primarily demolition debris (wood, concrete, asphalt, metal, brick, glass and stumps).

Area AOC-11

Located east of Lovell Road on the Main Post, AOC-11 is adjacent to the Nashua River. AOC-11 was primarily used for the disposal of demolition debris from the wood frame base hospital from 1975 to 1980.

AOC-11 is approximately two acres in size and is bordered to the north and south by wetlands. A 40-foot wide berm segregates the landfill from the Nashua River to the east. An estimated 35,000 CY are contained within AOC-11.

Area SA-12

SA-12 is located across from Dixie Road on the South Post. This site was utilized from 1960 to the mid 1980s for disposal of construction and range debris (wood, concrete, sheet metal, soil and leaves).

SA-12 is approximately 0.5 acres in size and contains roughly 8,700 CY of debris. This area is situated on a steep wooded slope adjacent to the Nashua River flood plain and wetland areas.

Area SA-13

Located on the west side of Lake George Street, near Hattonsville Road on the Main Post, SA-13 was used from 1965 to 1990 for disposal of construction debris, stumps and brush.

Approximately 10,000 CY of debris are estimated to be contained within the one-acre site. SA-13 is bordered by trees, as well as a wetland area at the base of the steep slope to the south.

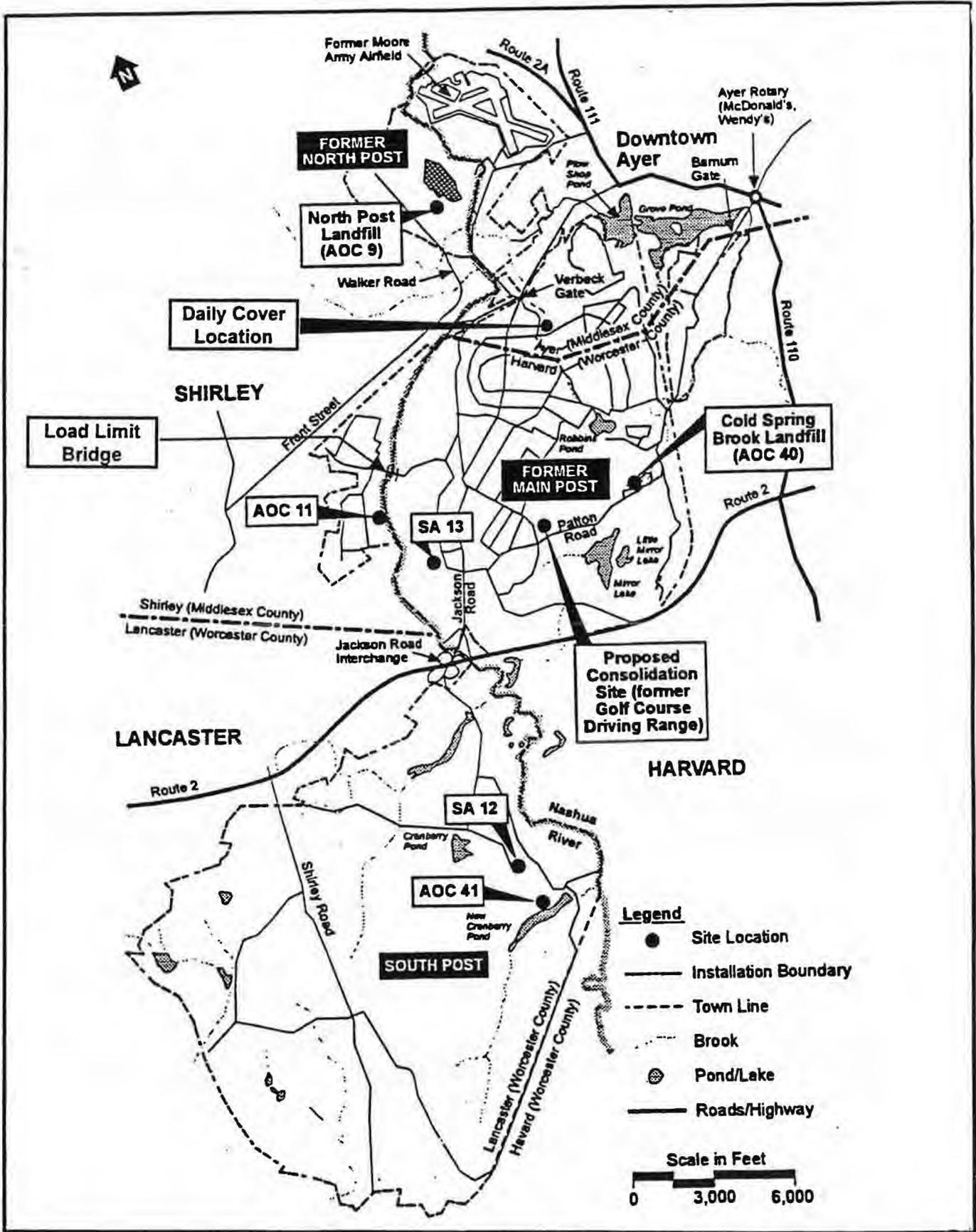


Figure 1. SITE MAP

Area AOC-40

AOC-40 is located along the edge of Patton Road, in the southeastern portion of the Main Post. This area was used for the disposal of construction debris (masonry, asphalt, wire and metal), ash, stumps, and logs.

AOC-40 covers an area of approximately four acres and contains an estimated 125,400 CY of debris. Portions of the landfill area are situated in a wetland, and are currently submerged under Cold Spring Brook Pond. The area is densely populated with small trees and other vegetative cover. The landfill area is within a recharge zone for the Patton water supply well.

Area AOC-41

AOC-41 is located on the South Post, west of the Still River Gate, on the north shore of New Cranberry Pond. This area was used until the 1950s for disposal of non-explosive military (including vehicle parts) and household debris.

AOC-41 contains approximately 1500 CY of debris over less than 0.25 acres. This site is overgrown with trees and brush.

- 1.7 As indicated in the ROD, the location selected is on the main post at the old golf driving range adjacent to Patton Road. Approximately 15 acres of land is available for constructing the landfill. The site is currently naturally screened to the north by an esker, to the east by a stand of large trees, and to the west by a row of trees which currently line Queenstown Street. Approximately 300 feet of the site is currently exposed along Patton Road to the south. The landfill cell footprint is approximately nine acres and is located entirely within the Regulatory Restriction Boundary. The leachate pump station and force main are located east of the landfill cell, also within the Regulatory Restriction Boundary. The access road traverses the eastern perimeter of the landfill cell, from Patton Road to the leachate pump station. The storm water management pond is located in the northeast corner of the site, at the lowest elevation.
- 1.8 This site is currently owned by MassDevelopment, the agency responsible for redevelopment of the former military base. As documented in the ROD, this site was determined to be the most suitable location on the former military base which met the regulatory Landfill Siting Criteria defined by the Massachusetts Department of Environmental Protection and non-regulatory criteria based on local community input.
- 1.9 **Definitions**

“The Company” - Stone & Webster as Prime Contractor to the United States Army Corps of Engineers/New England District (USACE/NAE) under contract DACA-33-97-D-0002 who is procuring the services under this Scope of Work

“The Subcontractor” – Company providing the services to be procured under this Scope of Work.

2. SPECIFICATIONS AND DRAWINGS

All work shall be performed in strict accordance with all referenced specifications, drawings, and other documents, all of which are incorporated by reference herein and made part of the Scope of Work and the Subcontract. Refer to Appendix A for the Specifications and Drawings.

2.1 Specifications

<u>Specification No.</u>	<u>Title</u>
01270	Measurement and Payment
01320	Project Schedule
01330	Submittal Procedures
01351	Safety, Health, and Emergency Response
01410	Environmental Protection
01450	Chemical Data Quality Control
01451	Subcontractor Quality Control
01500	Temporary Construction Facilities
02120	Loading, Transportation, and Disposal of Debris Materials
02140	Select Fill and Topsoil for Landfill Cover
02230	Clearing and Grubbing
02273	Geocomposite
02300	Earthwork
02316	Excavation, Trenching, and Backfilling for Utilities
02371	Wire Mesh Gabions
02372	Waste Containment Geomembrane
02373	Separation/Filtration Geotextile
02377	Low Permeability Clay Liner
02532	Force Mains
02620	Subdrainage System
02921	Seeding
03307	Concrete for Minor Structures
11310	Leachate Pump Station

2.2 Drawings: If not specifically identified on the drawings, the effective date of each drawing shall be the date of the Request for Proposal.

<u>Drawing No.</u>	<u>Title</u>	<u>Rev. No.</u>
T-1	Title Sheet	
C-1	Site Plan	
C-2	Existing Conditions Plan	
C-3	Excavation Plan	
C-4	Liner Grading Plan	

C-5	Landfill Details I
C-6	Landfill Details II
C-7	Final Conditions Plan
C-8	Capping Details
C-9	Longitudinal and Transverse Sections
C-10	Operations Plan
C-11	Operations Plan, Longitudinal Sections
M-1	Pumping Station
M-2	Force Main Profile
ES-1	Erosion and Sediment Control
ES-2	Erosion and Sediment Control Pond
E-1	Electrical

3. DESCRIPTION OF WORK – SPECIFIC

3.1 The onsite consolidation landfill will be done in 2 separate contracts with the following scopes:

Contract 1 - construction of the landfill

Contract 2 - hauling the debris from the 6 onsite areas and from an area with available daily cover to the landfill, placing the debris in the landfill, and capping of the landfill.

3.2 All work in both contracts is to be done in accordance with Massachusetts Department of Environmental Protection 310 CMR 19.00 design standards. The landfill will be approximately 8.4 acres and a minimum of 4 feet above the high ground water table and native bedrock. The design also includes an access road, leachate pumping station, sediment control pond and other supporting structures.

3.3 Subcontractor shall provide all materials, labor, supervision, construction equipment, tools, supplies, temporary facilities, and all other items and services, required for the performance of the work as detailed herein including the construction, operation, and closure of the consolidated landfill.

3.4 Such requirements shall include, but not necessarily be limited to, the following activities relating to the work.

Construction of the Landfill

1. Mobilization and Demobilization
2. Clearing and grubbing of the site to the limits indicated on the drawings.
3. Stripping and stockpiling of topsoil for use in final grading.
4. Excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations specified.
5. Preparation of subgrades and backfill of structures.

6. Testing required as specified.
7. Excavation and backfilling of trenches for utilities.
8. Furnish and install gabion retaining walls.
9. Furnish and install geomembrane.
10. Furnish and install geotextiles.
11. Install, compact and test the low permeability clay layer.
12. Furnish and install all components of the force mains
13. Furnish and install filter fabric and pipe for subdrains.
14. Place and grade topsoil and seed areas as defined on the drawings.
15. Furnish and install concrete structures as defined on the drawings including all reinforcing and embedments.
16. Furnish and install complete leachate pump station including piping, controls, enclosure, electrical wiring, and testing.

Operation and Closure of the Landfill

1. Mobilization and Demobilization
2. Transportation of the debris from the 6 debris areas to the onsite landfill. Loading of trucks is by others. Additionally, 20,000 cubic yards of material found suitable for landfill daily cover must be transported to the landfill from a stockpile on site (just south of the Verbeck Gate). Loading of trucks is by others.
3. Operate the landfill in accordance with the 310 CMR 19.0 requirements including daily cover and compaction. Refer to Appendix B which contains Sections 4 and 5 of the Design Analysis Report for the landfill. These sections cover landfill operation and final cover design and should be used as a starting point for landfill operation planning.
4. Closure of the landfill cells in accordance with 310 CMR 19.0.

3.2 Contracts 1 and 2 scopes are broken down into pay items as follows:

<u>Item</u>	<u>Unit</u>	<u>Quantity</u>	<u>Contract</u>
1. Mobilization	Lump Sum	1	1 & 2
2. Clearing and Grubbing	Lump Sum	1	1
3. Excavation and Disposal	CY	33,000	1
4. Subgrade – Landfill Base	CY	40,000	1
5. Aggregate Stabilization	Ton	10	1
6. Low Permeability Clay Layer	Lump Sum	1	1
7. 60 Mil HDPE Liner and	Lump Sum	1	1

Devens Reserve Forces Training Area

Bottom Cell Geocomposite			
8. Drainage layer	Lump Sum	1	1
9. Leachate Collection System & Pumping system installation	Lump Sum	1	1
10. Debris Handling and Disposal in Onsite Landfill			
10.1 AOC 9	Ton	180,000	2
10.2 AOC 11	Ton	42,000	2
10.3 Study Area 12	Ton	6,300	2
10.4 Study Area 13	Ton	6,700	2
10.5 AOC 40	Ton	175,000	2
10.6 AOC 41	Ton	900	2
11. Subgrade – Landfill Cap	CY	14,000	2
12. 40 Mil VFPE Liner and Cap Geocomposite	Lump Sum	1	2
13. Protective Layer	CY	14,000	2
14. Vegetative Support Layer	Lump Sum	1	2
15. Topsoil and Permanent Seeding	Lump Sum	1	2
16. Leachate Pumping System operation	Lump Sum	1	2
17. Leachate Force Main Piping	Linear Feet	1210	1
18. Aggregate Road Base	Lump Sum	1	1
19. Electrical	Lump Sum	1	1
20. Leachate Management	Lump Sum	1	2
21. Storm Water Management/ Erosion and Sediment	Lump Sum	1	1 & 2
22. Gas Vents	Each	11	2

Since the quantities of materials to be landfilled are only estimates, the Subcontractor shall provided unit rates for all non lump sum quantities above in addition to the fixed price proposal based on the above quantities. The unit rates will be used to adjust the final cost based on final quantities.

4. PERMITS REQUIRED TO BE OBTAINED BY SUBCONTRACTOR

- 4.1 On December 21, 1989, Fort Devens was placed on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Action (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. A Federal Facilities Agreement (Interagency Agreement [IAG]) was developed and signed by the Army and U.S. Environmental Protection Agency (EPA) Region I (New England) on May 13, 1991 and finalized on November 15, 1991. The IAG provides the framework for the implementation of the CERCLA/SARA process at Fort Devens. The Subcontractor shall be responsible for implementing the terms and requirements of the appropriate permits as needed for the project as indicated in the specifications, see Appendix A.

5. RESPONSIBILITIES OF CLIENT AND COMPANY

The following will be provided by the Company or by the Company on behalf of the client:

1. Toilet and hand wash facilities will be supplied by the Company.
2. Loading of trucks at the 6 areas
3. Sampling and analysis of the material to be transported in 500 cy lots. Sampling will include volatile organic compounds, semi-volatile organic compounds, pesticides, PCBs, RCRA metals and analysis for RCRA TCLP hazardous status. Data will be made available to the Subcontractor.
4. Segregation of hazardous waste from non-hazardous waste.

6. RESPONSIBILITIES OF SUBCONTRACTOR

- 6.1 Subcontractor shall arrange for delivery of its materials and equipment to the project site.
- 6.2 Subcontractor shall arrange for a daily cleanup and street sweeping of all haul roads used onsite.

7. SUBCONTRACTOR USE OF PREMISES

- 7.1 Subcontractor shall abide by the constraints regarding use of the premises as stated in the General Conditions, and/or in this Scope of Work. The area within the project limits, as defined on the drawings listed in Section 2.0, will be available to the Subcontractor for storage of its equipment, materials, and trailers during performance of the Work, subject to the approval by the Company.
- 7.2 Subcontractor shall confine its storage areas to the limits designated by the Company and shall be responsible for the security of the areas.

- 7.3 Subcontractor shall be responsible for maintenance and cleanup of its work areas, temporary work areas, laydown areas, and access areas. Subcontractor shall keep these areas clean and orderly and shall return them to their original condition upon completion of the Work, subject to the approval of and at no additional cost to the Company.
- 7.4 Subcontractor shall confine its operations to areas within the limits indicated on the Subcontract Drawings. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
- 7.5 Subcontractor shall be responsible for all of its equipment, apparatus, and materials (and that of its sub-tier Subcontractors) stored on the project site.

8. OCCUPANCY BY COMPANY, AND CLIENT

Company and Client reserve the right to occupy, place, and install equipment in completed areas before substantial Completion. Such placing of equipment and occupancy shall not constitute acceptance of the work.

9. REFERENCED DOCUMENTS

- 9.1 The specification may include references to various standards. Subcontractor shall notify Company of apparent conflicts between the specifications and the reference documents. The effective date of any referenced document shall be the date identified in the specification. If the specification does not specify a date, then the effective date shall be considered the date in effect at the time of the Company's issuance of the Request for Proposal or Invitation for Bids.

10. COORDINATION

- 10.1 Subcontractor shall coordinate its performance of the work to ensure efficient and orderly sequence of completion.
- 10.2 Subcontractor shall also coordinate its performance of the work with other Subcontractors who may be performing work at the site.

11. FIELD ENGINEERING

- 11.1 Subcontractor shall provide field engineering, establish grades, lines and levels by use of recognized engineering survey practices.
- 11.2 Monuments for setting out the work are established at the project site.
- 11.3 Subcontractor shall carefully preserve all monuments, benchmarks, reference points, and stakes. Subcontractor will be charged with the expense of replacement of any such items that it destroys, and shall be responsible for any mistake or loss of time that it causes. Permanent monuments or benchmarks that must be removed or disturbed shall be adequately protected

by the Subcontractor until they can be properly referenced for relocation. Subcontractor shall furnish materials and assistance for the proper replacement of such monuments or benchmarks.

12. PERFORMANCE SCHEDULE AND SEQUENCE OF WORK

- 12.1 It is intended that the Subcontractor shall commence the work within (5) five calendar days after it receives a Notice To Proceed (NTP).
- 12.2 Subcontractor shall comply with the time set forth in the project schedule, inclusive to the extent of the scope of work of the subcontract. Dates shown are based on the handling of 1500 cubic yards per day. The following draft schedule should be used as the basis for the proposal:

Remedial Site	Approx.	Approximate Production		Draft Schedule			
	Volume	Excavation	Trans/Disposal	Excavation		Trans/Disposal	
	(cy)	(cy/day)	(cy/day)	Early Start	Early Finish	Early Start	Early Finish
AOC-9	121,000	2,400	1,500	09-Jun-00	18-Aug-00	19-Jun-00	06-Nov-00
AOC-11	35,000	2,250	1,500	28-Aug-00	18-Sep-00	04-Sep-00	05-Oct-00
SA-13	10,000	1,300	1,500	25-Sep-00	04-Oct-00	02-Oct-00	10-Oct-00
AOC-40	125,400	2,100	1,500	04-Jun-01	24-Aug-00	18-Jun-01	11-Oct-01
SA-12	8,700	1,100	1,500	03-Sep-01	12-Sep-00	10-Sep-01	17-Sep-01
AOC-41	1,500	1,500	1,500	13-Sep-01	14-Sep-00	18-Sep-01	18-Sep-01

13. PROJECT CONTROL REQUIREMENTS

- 13.1 Subcontractor shall implement and /or provide the following to the company's construction site manager.

Progress Reviews and Coordination

Biweekly meetings will be held as necessary to review progress, cost / schedule impacts, problem areas, change orders, etc. These meetings will be held at the company's office until mobilization and at the jobsite thereafter.

Daily Force Report

Subcontractor shall submit daily force reports on forms furnished by the company, starting on the first day of mobilization. These reports shall be submitted to the company's construction site manager by 9:00 a.m. each day, for the activities of the previous day. Daily force reports shall include the following information:

- Labor Utilization: Craft type and total
- Administrative Personnel: type and total
- Major equipment - operated and standby

Work activities: brief description of work performed.

14. SAFETY

- 14.1 Subcontractor shall prepare and shall be bound to the Project Site Safety and Health Plan (SSHP), and shall ensure that its employees fully comply with the SSHP.
- 14.2 Subcontractor shall attend a pre-entry briefing of the SSHP. Subcontractor shall acknowledge its understanding of the requirements of the SSHP by signing the SSHP.
- 14.3 Subcontractor shall provide the necessary Task Hazard Analysis (THA) for the control of hazards.

15. PRODUCT DATA

- 15.1 Product data shall be submitted as required in the specifications.

16. CERTIFICATE OF COMPLIANCE AND TEST REPORTS

- 16.1 Certificates of compliance and test reports shall be submitted as required in the specifications and 310 CMR 19.0.

17. QUALITY CONTROL

- 17.1 Subcontractor is responsible for meeting the quality control requirements contained in the specifications and in 310CMR 19.0.

18. SUBMITTALS

- 18.1 Reference specification 01330, Part 1, section 1.3 for the submittal process.
- 18.2 Subcontractor shall make all submittals as defined in 310 CMR 19.0 and as required in the specifications.

19. HANDLING OF MATERIALS, EQUIPMENT, AND PRODUCTS

- 19.1 Trucks will be prohibited from entering the site using other than approved access and egress locations.
- 19.2 Access to and from AOC 11 is limited by 2 bridges with inadequate load limits. Alternate routes on the site must be coordinated to avoid use of these bridges.

20. MISCELLANEOUS

- 20.1 Subcontractor will furnish all flashers, guards, warning lights and other safety equipment necessary for the safe execution of the work.

21. PROJECT LABOR AGREEMENT (PLA)

- 21.1 National Union of Operating Engineers, the Laborer's International Union of North America, AFL-CIO and the International Brotherhood of Teamsters. The Subcontractor is hereby bound to the terms and conditions of these Agreements and shall sign a letter of assent that it agrees to be bound to the terms and conditions of these Agreements. See Appendix C which contains a copy of the Project Labor Agreement.

22. BIDDERS' SUBMITTALS

- 22.1 The following submittals are required to be submitted as part of all proposals for the two contracts described herein:
1. Separate priced proposals clearly labeled as to which contract it applies to and broken down by contract pay items as defined in Section 3 of this scope.
 2. For Contract 1, construction of the landfill, provide the proposal for the work as specified herein and in the specifications and drawings. If the bidder wants to propose alternative methods, sequences of construction, or any other aspect which is contrary to what is shown in the contract documents, these should be clearly explained and marked as alternates with separate pricing as well as any schedule impact.
 3. For Contract 1, provide examples and contacts of previous landfills constructed and details about the landfills.
 4. For Contract 2, operation and closure of the landfill, provide the proposal for the work as specified herein and in the specifications and drawings. If the bidder wants to propose alternative methods, sequences of landfill operation or closure, or any other aspect which is contrary to what is shown in the contract documents, these should be clearly explained and marked as alternates with separate pricing as well as any schedule impact.
 5. For Contract 2, provide experience summaries for landfill operation and closure efforts done by the bidder in the past.
 6. For both contracts, the bidders shall submit a separate proposed schedule for their work.

Appendix A

Specifications and Drawings

BOUND SEPARATELY

Appendix B

Design Analysis Report Sections 4 and 5

4. LANDFILL OPERATION

4.1 SCOPE AND PURPOSE

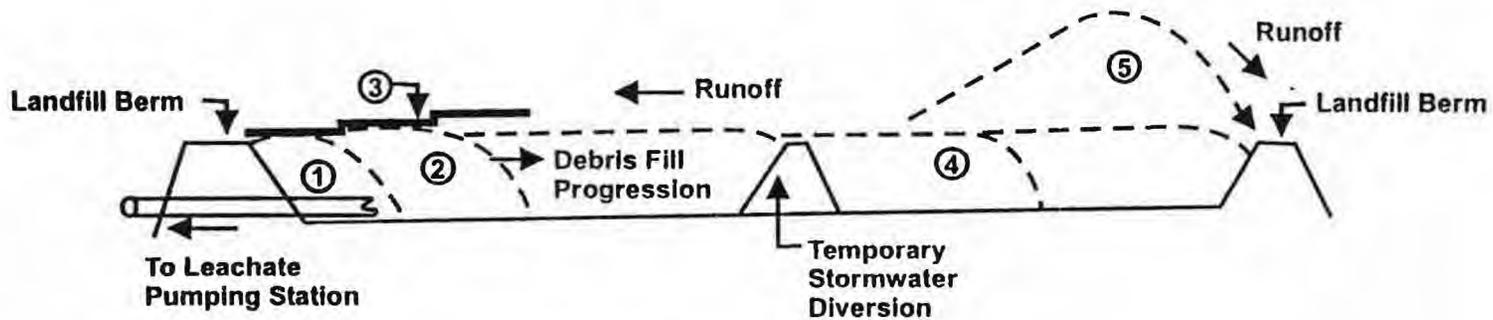
The Consolidation Landfill will be constructed, filled, and capped within an 18- to 24-month period as estimated by the U.S. Army Corps of Engineers, New England District (USACE). Upon completion of the Consolidation Landfill liner construction, the Contractor will begin hauling and landfilling debris from the six disposal sites identified in Chapter 1. The Contractor is required to operate the Consolidation Landfill as shown and described on the Operations Plan in the Contract Drawings.

The operations of the landfilling of debris will be performed to minimize leachate generation. Four subcells will be constructed within the landfill as discussed in Section 3.3, Cell Grading and Capacity. This includes two subcells divided by a small lined diversion berm dividing the cell north to south. These subcells are to be divided in half by a temporary lined diversion berm. The Operations Plan directs the Contractor how to fill the subcells to minimize leachate generation. The Contractor is also required to operate the landfill in accordance with 310 CMR 19.130, Operation and Maintenance Requirements. This section describes the rationale behind the waste placement sequence and the operating requirements for the landfill.

The filling of the debris will occur to grades 4 ft below those shown on the Final Conditions Plan. In the event that the actual volume of debris to be disposed is less than the design capacity of the consolidation landfill, the Contractor shall reduce the cap height while providing the minimum required cap slope.

4.2 WASTE PLACEMENT AND LEACHATE MANAGEMENT

The landfill will be operated to compact and consolidate debris, achieve the capping grades, and minimize leachate generation. Minimization of leachate generation is accomplished by filling the landfill subcells in a specific order and will reduce capital and operational costs associated with the collection and treatment of leachate. The debris placement for each phase will occur at the downgradient end of the operational phase. Waste will be graded to allow runoff from the debris off of the landfill. Progressive filling of debris will be to elevations to promote runoff and minimize rainfall infiltration into the leachate collection layer. Figure 4-1 shows the concept of operations to minimize leachate generation. This is also detailed on the Contract Drawings. Plastic sheeting will be deployed on top of the debris as it is placed to the operational grades shown. Infiltration will be limited to the immediate working area until the cell can be totally



Notes:

- ① Landfilling begins a low grade at elevation to allow runoff.
- ② Continued landfilling with minimal slope back to collection drainage layer, again to promote runoff.
- ③ Sequential placement of plastic cover with shingled over lap and anchoring.
- ④ Continued landfilling upgradient and plastic cover. Remove temp. berm.
- ⑤ Final phase of landfilling shall commence after base layer placed to design grade to allow run off. Downgradient plastic sheeting to remain until overfilling with 2-ft lifts and proper grading.

Figure 4-1. Debris Filling Operations Concept.

covered with plastic sheeting. The temporary plastic sheeting will remain until the final operational phases of filling progress over the area.

Debris will be compacted with sheepsfoot rollers or landfill compactors to maximize cell capacity. Debris will be spread in 2-ft lifts with dozers and compacted with a minimum of four passes with the compacting devices. The initial 4-ft debris lift shall not contain any large or protruding debris that may damage the drainage layer or cell liner. Items shall be removed and the contractor shall monitor the initial lift for such potential damaging objects.

Interim grading plans and cross-sections identifying the waste placement sequence are shown on the Operations Plan. Upon completion of cell construction, filling will be performed in six phases. Phases 1 through 4 will include covering of the landfill drainage layer. Phase 5 will begin the lift placement on the south end and will continually fill slopes to grade while allowing drainage off the landfill. The grading of Phase 6 is the final cap grading plan. Below is the approximate volumes and filling time estimated at a disposal rate of 2000 cubic yards per day, 5 days per week.

Phase	Acreage	Capacity (cy)	Time to reach grade (weeks)
1	2.3	22,000	2.2
2	1.8	17,000	1.7
3	2.3	37,000	3.6
4	1.8	35,000	3.6
5	n/a	64,000	6.4
6	8.1	165,000	16

This filling time frame is indicated in Figure 4-2. The figure also indicates the acreage of exposed drainage layer planned during the operational phases. As can be seen, the sequencing will limit the area to about 2.3 acres.

4.3 OPERATING REQUIREMENTS

Stormwater that collects in non-operational subcells or behind the temporary diversion berm will be pumped to the perimeter runoff channels by the contractor. Temporary diversion berms will be removed and the drainage layer restored to a continuous layer when the debris filling sequence reaches the upgradient area. A gravity drainage outlet may be provided on the east subcell as Phases I and II occur to outlet stormwater. This outlet will be capped when the subcell becomes operational.

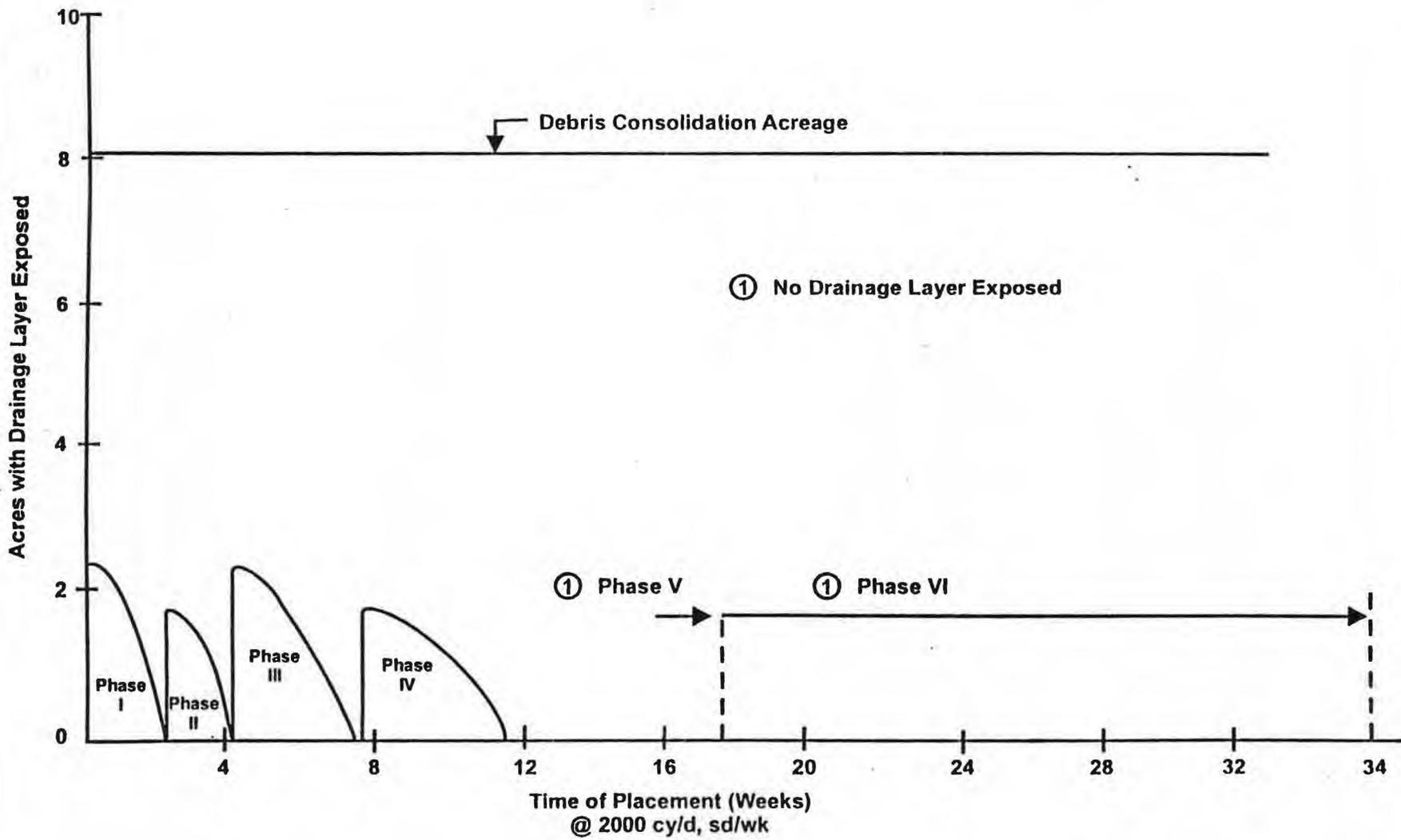


Figure 4-2.



The capacity of the diversion berms is calculated in Appendix B. The diversion berm in the eastern subcell can contain a 1-in. rainfall, while the diversion berm in the western subcell can contain a 6-in. rainfall. The western subcell can contain more water because the slope of the cell floor is flatter.

Access to operational phases shall be by haul roads constructed of compacted debris. Aggregate may be placed if needed to maintain traffic flow. Haul roads will be constructed to avoid damage to the leachate collection geocomposite and geomembrane.

Fill shall be placed to the grades indicated on the Contract Drawings and in the sequence shown. Capping will occur when final grade has been achieved or when excavation of the debris areas is complete. If the excavated debris volume is less than anticipated, the cap will be constructed to a flatter grade while maintaining the required minimum slope. Benches will be constructed as shown on the Final Conditions Plan to minimize erosion of the cover soil. Bench locations may be altered if excavated debris volume is less than anticipated.

The leachate pumping station will be operated and maintained by the Contractor until the final cover system has been accepted by the Government. The Contractor will discharge leachate through the force main into the existing sanitary sewer. The leachate will be sampled quarterly for the parameters listed in 40 CFR 258 Appendix I.

5. LANDFILL FINAL COVER DESIGN

5.1 SCOPE AND PURPOSE

Upon completion of filling the Consolidation Landfill, it will be capped in accordance with the Record of Decision (ROD) and 310 CMR 19.112, Landfill Final Cover Systems. The cap will isolate the waste from the environment and will limit rainfall infiltration through the waste, thus limiting leachate generation. The following aspects of the final cover system are discussed in this section:

- Final cover grading;
- Capping system components;
- Passive gas venting system; and
- Final cover drainage.

5.2 FINAL COVER GRADING

The final cover system is graded to promote surface runoff, reduce erosion potential, and provide an adequate factor of safety against slope stability. The final slopes will be 4H:1V, or 25 percent, meeting the requirements of 310 CMR 19.112.2.a (slopes must be between 5 percent and 33 percent). As designed, the cell has a capacity of approximately 340,000 cy. If the final volume of waste to be consolidated in the cell is less than 340,000 cy, the top of the landfill will be flattened to 5 percent to reduce the capacity of the cell and maintain adequate surface drainage.

Settlement of the waste may adversely impact surface runoff. Waste settlement due to placement of the cap is evaluated in Appendix D to determine the maximum potential settlement of the middle of the landfill. The middle of the landfill will settle a maximum of 1.65 ft which will not affect drainage off the slopes.

Benches are provided along the cap side slopes to reduce erosion potential. The benches are 10 ft wide and 1 ft deep, creating a backslope of 10 percent. The benches will not be graded into the waste, but will be graded into the subgrade. Based on the 4H:1V slopes, benches are placed to collect surface runoff over a maximum vertical distance of 40 ft as shown on the Final Conditions Plan. The expected soil erosion rate is calculated in Appendix D using the Universal

Soil Loss Equation (USLE). A calculated 1.1 tons/acre/year will erode from the cap - less than the 2 tons/acre/year recommended in the Massachusetts Landfill Technical Guidance Manual.

The stability of the cap must be checked to verify an adequate design factor of safety against slope failure. There are four potential critical interfaces:

- Subgrade layer/geocomposite gas venting layer;
- Geocomposite gas venting layer/flexible membrane liner;
- Flexible membrane liner/geocomposite drainage layer; and
- Geocomposite drainage layer/vegetative support/protection layer.

The geocomposite/soil interfaces are most critical, with specified interface friction angles of 21°, which is attainable with the proposed materials. The cover system veneer stability has been evaluated in Appendix D. The cover system has a factor of safety of 1.6 for static slope stability. The cover system can withstand a maximum horizontal acceleration of 0.13g during a seismic event before permanent displacement will occur. The cover system is not a critical component of the landfill's containment structure and is not be designed to be stable during a seismic event which has a 0.30g horizontal acceleration like the cell liner system is. The cap can be easily accessed and patched if permanent slope movements and damage to the cover system occur during a large seismic event.

The contractor is required to verify the assumed material interface properties by performing ASTM D-5321 (1998), "Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method," with actual materials to be used in the cap construction.

5.3 CAPPING SYSTEM COMPONENTS

The final cover system is designed to minimize infiltration of rainwater into the waste and separate the waste from the environment. The following capping system components will be constructed on the waste to achieve these goals:

- Subgrade layer;
- Gas venting layer;
- Flexible membrane liner;

- Geocomposite drainage layer;
- Vegetative support/protection layer; and
- Vegetative cover layer.

A detail of the capping system components is shown on the Cover Details Sheet. Each capping component is described in the following sections.

5.3.1 Subgrade Layer

The subgrade is placed on the waste to provide a smooth, stable surface on which to construct the cap. It provides a cushion between the waste and the flexible membrane liner to reduce the potential of puncturing the membrane. The subgrade layer meets the requirements of 310 CMR 19.112.4, Subgrade Layer Standards.

5.3.2 Gas Venting Layer

The gas venting layer will be a geocomposite placed on the subgrade to transmit landfill gas generated within the waste to the passive gas vents shown on the Final Conditions Plan. The layer limits buildup of gas pressure beneath the flexible membrane liner. Gas pressure beneath the membrane causes uplift forces on it and reduces the factor of safety for slope stability. The gas venting layer meets the requirements of 310 CMR 19.112.5, Landfill Gas Venting Layer.

The geotextile on the bottom of the geocomposite limits infiltration of the subgrade soil into the geonet component, maintaining the gas transmission capacity of the geonet. The geotextile on top of the geocomposite is required to provide a higher interface friction angle with the geomembrane. The geonet by itself has a very low interface friction angle with the textured membrane.

5.3.3 Flexible Membrane Liner

The flexible membrane liner is textured 40-mil very-flexible polyethylene (VFPE) and will be placed directly over the geocomposite gas venting layer. It is the primary component of the capping system for reducing infiltration into the waste. VFPE is flexible and can elongate to accommodate differential settling of the landfill material. It meets the requirements of 310 CMR 19.112.6, Low Permeability Layer Standards.

The membrane will be textured to improve its interface friction characteristics with the geocomposites above and below it. It will be seamed and tested to verify its integrity and will be anchored in the landfill perimeter berm on top of the cell liner membrane. The membrane will extend to the limits shown on the Final Conditions Plan.

5.3.4 Drainage Layer

The drainage layer is a geocomposite capable of transmitting the infiltration from a 25-yr storm to the surface drainage benches and swales. The geocomposite drainage capacity calculations are shown in Appendix D. The geocomposite consists of a polyethylene geonet with 8 oz/sy nonwoven geotextiles heat bonded to both sides. Vertical percolation of infiltrated rainwater will be retarded by the flexible membrane liner and will flow laterally through the drainage layer. The drainage layer meets the requirements of 310 CMR 112.7, Drainage Layers.

The geotextile on the top of the geocomposite allows infiltration of rainwater and filters the vegetative support/protection layer soil from entering the geonet component, maintaining subsurface flow capacity of the geonet. The geotextile permittivity must be sufficient to maintain flow through it (see calculations in Appendix D).

The geotextile on the bottom of the geocomposite is required to provide an adequate factor of safety for slope stability. The geotextile/textured geomembrane has a much higher interface friction angle than the geonet/textured geomembrane interface.

5.3.5 Vegetative Support/Protection Layer

The vegetative support/protection layer will be 30 in. thick to provide frost protection for the flexible membrane liner. In conjunction with the vegetative cover layer, a total of 3 ft of cover is provided over the membrane. The layer also supports the growth of the vegetation on the cap. The layer meets the requirements of 310 CMR 19.112.9.

The soil particles in the vegetative support/protection layer must be large enough so they are retained on the nonwoven geotextile heat-bonded to the top of the geonet. The apparent opening size (AOS) of a typical 8 oz/sy geotextile was used to evaluate the minimum required soil size of the vegetative support/protection layer. The calculations were performed for the leachate collection geocomposite and are included in Appendix A. The calculations indicate the vegetative support/protection layer soil must have a maximum of 85 percent finer than 0.09mm (No. 170 U.S. sieve). This requirement is included in the Specifications.

5.3.6 Vegetative Cover Layer

The vegetated cover layer is the primary support layer for growth of vegetation on the cap. It will be 6 in. of topsoil placed over the vegetative support/protection layer. This layer is critical for establishment of vegetation as required by 310 CMR 19.112.10. The cover layer will be seeded with grass which will minimize erosion potential of the underlying soil and self-propagate. The root system of the grass will not interfere with proper drainage through the drainage layer.

5.4 PASSIVE GAS VENTING SYSTEM

A passive gas venting system will be installed with the cap. The gas venting system is necessary for removing landfill gas that would be trapped under the low-permeability membrane liner. The anticipated non-methane organic compound (NMOC) emission rate from the landfill is 8 Mg/yr as calculated in Appendix D. This is well below the maximum rate of 50 Mg/yr for passive gas venting systems listed in 40 CFR 60.

The components of the gas venting system are the gas venting layer (as discussed previously) and the passive landfill gas vents shown on the Final Conditions Plan and detailed on the Capping Details Sheet. The gas vents will be constructed along the ridge line of the landfill and the tops of the benches at high points of the geomembrane. Gas collected in the gas venting layer will flow to 11 PVC gas vents. More than one vent per acre of landfill is provided, an industry standard for municipal solid waste landfills.

The passive gas vents will transmit gas upward through the cap geomembrane. Each vent will consist of a perforated pipe set vertically in a shallow, gravel-filled excavation. The vents will penetrate the geosynthetics and the penetrations will be sealed to limit precipitation infiltration into the waste. The vents will extend above ground and will have goose-neck fittings to prevent precipitation from falling directly into the vents. Each vent will be fitted with an insect screen.

5.5 FINAL COVER DRAINAGE

The landfill final cover system is designed to handle the flow from a 25-yr storm in accordance with 310 CMR 19.115, Storm Water Controls. Stormwater runs off the cap and into benches along the side slopes of the landfill. The benches limit the length of sheet flow over the grass cover and reduce erosion potential. The benches have sufficient capacity to convey runoff from the 25-yr storm as calculated in Appendix D.

The benches drain to gabion slope drains that run down the side slopes and into the perimeter swales. Gabion slope drain capacity calculations are included in Appendix D. A detail of the gabion slope drains is shown on the Capping Details Sheet. Stormwater flow in the perimeter swales is discussed in Section 3.6, Stormwater Management and Site Drainage. Riprap will be placed in the perimeter swales at the base of the downchutes to reduce erosion potential.

Stormwater which infiltrates into the cap is collected in the geocomposite drainage layer on top of the flexible membrane liner. The geocomposite drainage layer is also placed in the benches, carrying subsurface flow to the gabion slope drains. A 4-in. perforated PVC pipe will also be placed in the benches to carry the flow to the slope drain (see calculations in Appendix D). A detail of the bench/gabion slope drain transition is shown on the Capping Details Sheet.

Appendix C

Project Labor Agreement

LETTER OF ASSENT

All prime Contractors and their Subcontractors (at whatever tier) shall agree to be bound by the terms and conditions of the project labor agreement by executing either the Agreement(s) directly or the following Letter of Assent:

(This Letter to be typed on the appropriate Contractor's letterhead)

Mr. Charles Sekinger
Manager, Labor Relations
Stone & Webster Construction Company, Inc.
245 Summer Street
Boston, MA 02210

date:

RE: DEVENS RESERVE FORCES TRAINING AREA LANDFILL
REMEDICATION PROJECT LABOR AGREEMENT

_Dear Mr. Sekinger,

Pursuant to the terms of the bid specifications issued for the Devens Reserve Forces Training Area Landfill Project, by Stone & Webster Construction Company, Inc.; and the above-referenced Project Labor Agreement(s) with the Laborers International Union of North America Environmental Partnering Project Agreement, the International Union Of Operating Engineers, and the International Brotherhood of Teamsters National Environmental Remediation Project Agreement; the undersigned Contractor (or Subcontractor) hereby agrees that it will be bound by and comply with all terms and conditions of said labor agreement(s) originally entered into on _____, 1999, _____, 1999, and _____, 1999, respectively, and any Amendments thereto.

This Letter of Assent will remain effective for the duration of the Agreement, and for any extensions, after which this Understanding will automatically terminate.

Sincerely,

(Name of Contractor or Subcontractor)

By: _____
Title

STONE & WEBSTER ENGINEERING CORPORATION
ENVIRONMENTAL PARTNERING PROJECT AGREEMENT

with the

Laborers' International Union of North America, AFL-CIO



January 1995

LIUNA ENVIRONMENTAL PARTNERING PROJECT AGREEMENT

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ENVIRONMENTAL PARTNERING PROJECT AGREEMENT

between

STONE & WEBSTER ENGINEERING CORPORATION

and the

LABORERS' INTERNATIONAL UNION OF NORTH AMERICA, AFL-CIO

This Agreement is made and entered into this _____ day of _____, 19 ____, by and between Stone & Webster Engineering Corporation (hereinafter referred to as the "Employer") and the Laborers' International Union of North America, AFL-CIO (hereinafter referred to as the "Union") for Environmental Remediation Projects.

ARTICLE I

PURPOSE

Section 1. The purpose of this Agreement is to promote efficiency of operations on the project and provide for peaceful settlement of labor disputes without strikes or lockouts, thereby promoting the public interest in assuring the timely and economical completion of the work.

Section 2. The Employer and the Union desire to mutually establish and stabilize wages, hours and working conditions for the workers employed under this Agreement by the Employer, and further, to encourage close cooperation between the Employer and the Union to the end that a satisfactory, continuous, and harmonious relationship will exist between the parties to this Agreement.

Section 3. The Union has established environmental remediation and hazardous waste training programs which meet or exceed all of the requirements of the federal regulations.

Section 4. The Union has in its Local Union membership throughout the United States the competent, skilled, qualified and certified workers required to perform the work incidental to the effective accomplishment of this project.

ARTICLE II
SCOPE OF AGREEMENT

Section 1. It is the intent of the parties that this Agreement be utilized as a stabilization agreement for environmental remediation projects. Extensions for this Agreement shall be sought by the Employer, in writing, on an individual location basis via the completion of Addendum "A".

Section 2. The Employer recognizes the Union as the sole and exclusive bargaining representatives for all employees performing work coming within the recognized trade jurisdiction of the Union. This Agreement is between the Employer and the International Union.

Section 3. This Agreement shall not apply to executives, engineers, technicians, draftsmen, supervisors, assistant supervisors, timekeepers, messengers, office workers, guards, or other nonmanual employees.

Section 4. This Agreement represents the complete understanding of the parties; and the Employer shall not be required to sign any other agreement during the performance of the work described herein, except such participation agreements, relating to the payment of fringe benefits, which may be required by any fringe benefit trust fund.

Section 5. Both parties recognize that there may be extenuating circumstances when it is to the mutual interest of both parties to modify the terms of this Agreement. In that event, it will not be a violation of this Agreement for the parties to meet and mutually agree to make such modifications to meet a specific need on a specific project.

Section 6. This Agreement shall supersede all other agreements between the Employer and any Local of the Union for any work covered herein.

Section 7. The liability of the Employer and the liability of the Union shall be several and not joint.

ARTICLE III
UNION SECURITY

Section 1. The employees covered by this agreement shall become and remain members of the Union as a condition of employment from the seventh (7th) but not later than the eighth (8th) day of employment, or the effective date of this Agreement, whichever is later.

Section 2. It is further agreed that all Union members employed by the Employer shall maintain their membership in good standing in the Union.

Section 3. Failure of any employee to pay or tender normal initiation fees or dues as required by this Agreement shall, upon the request of the Union in writing, result in the termination of such employee.

ARTICLE IV
REFERRAL OF EMPLOYEES

Section 1. The Employer shall have the right to select and hire directly all supervisors it considers necessary and desirable. Applicants for the various classifications covered by the Agreement required by the Employer on its projects shall be referred to the Employer by the Union and/or its respective Local Unions. The Employer shall have the right to determine the competency of all employees, the right to determine the number of employees required, and the sole responsibility for selecting the employees to be laid off, discharges, suspended or disciplined for proper cause. The Employer shall also have the right to reject any applicant referred by the Union and/or its respective Local Unions.

Section 2. The Union represents that its Local Unions administer and control their referrals and it is agreed that these referrals will be made in a nondiscriminatory manner and in full compliance with federal, state and local laws and regulations which require equal employment opportunities and nondiscrimination. Referrals shall not be affected in any way by the rules, regulations, by-laws, constitutional provisions, or any other aspect or obligation of Union membership, policies or requirements.

Section 3. In the event the referral facilities maintained by the Local Unions do not refer the employees as requested by the Employer within a forty-eight (48) hour period after such requisition is made by the Employer (Saturdays, Sundays and Holidays excluded), the Employer may employ applicants from any source.

Section 4. The Employer agrees to be bound by the hiring referral rules in a local area not inconsistent with the terms of this Agreement. Where the hiring referral rules that prevail in a local area are on other than an exclusive basis, such rules shall be applicable if not in violation of either state or federal law.

Section 5. The Union and its respective Local Unions will exert their utmost efforts to recruit sufficient number of skilled and certified craftsmen to fulfill the manpower requirements of the Employer.

Section 6. The Employer shall have the right to assign key employees to the project. Key employees are defined as craft employees who possess special skills or abilities and are not readily available in the area. Key personnel shall be named and agreed to by the parties at the pre-job conference.

Section 7. Where governmental agencies impose equal employment obligations on the Employer's project, referral procedures shall be subordinate to such obligations.

Section 8. The Employer shall have the right to recall to employment within six months of layoff employees previously assigned to work covered by this Agreement.

Section 9. In referring to employees in this Agreement, the masculine gender is used for convenience only and shall refer both to males and females.

ARTICLE V
MANAGEMENT RIGHTS

Section 1. The Employer retains and shall exercise full and exclusive authority and responsibility for the management of its operations, except as expressly limited by the terms of this Agreement.

ARTICLE VI
HOURS OF WORK, OVERTIME, SHIFTS AND HOLIDAYS

Section 1. The standard work day shall consist of eight (8) hours of work between 6:00 a.m. and 6:00 p.m. with one-half hour designated as an unpaid period for lunch. The standard work week shall be five (5) consecutive days of work commencing on Monday. Nothing herein shall be construed as guaranteeing any employee eight (8) hours of work per day or forty (40) hours of work per week.

Section 2. Any employee reporting for work and for whom no work is provided, due to inclement weather or other conditions beyond the control of the Employer, shall receive two (2) hours pay at the regular straight time hourly rate. Any employee who starts to work and works beyond the two (2) hours will be paid for actual time worked. Whenever minimum reporting pay is provided for employees, they will be required to remain at the project site available for work for such time as they receive pay, unless released sooner by the Employer's principal supervisor or designated representative. The provisions of this Section are not applicable where the employee voluntarily quits or lays off, in which case the employee shall be paid for the actual time worked.

Section 3. All time before and after the established work day of eight (8) hours, Monday through Friday, and all time on Saturday shall be paid at the rate of time and one-half. All time on Sundays and the Holidays stated in Section 8 shall be paid for at the rate of double time.

Section 4. It will not be a violation of this Agreement when the Employer considers it necessary to shut down to avoid the possible loss of human life because of an emergency situation that could endanger the life and safety of an employee. In such case, employees will be compensated only for the actual time worked. In the case of a situation described above whereby the Employer requests employees to wait in a designated area available for work, the employees will be compensated for the waiting time.

Section 5. Shifts may be established when considered necessary by the Employer.

A. Shift hours and rates will be as follows:

First Shift: Eight (8) hours pay for eight (8) hours worked plus one-half (1/2) hour unpaid lunch period.

Second Shift: Eight (8) hours pay for seven and one-half (7 1/2) hours worked plus one-half (1/2) hour unpaid lunch period.

Third Shift: Eight (8) hours pay for seven (7) hours worked plus one-half (1/2) hour unpaid lunch period.

B. Shifts may be established and continue for a minimum of three (3) consecutive work days.

C. If only two shifts are to be worked, the Employer may regulate starting times of the two shift operations to permit the maximum utilization of daylight hours.

Section 6. In lieu of Section 5 above, the Employer may establish one (1) or two (2) four (4) day ten (10) hour shifts at the regular straight time hourly rate of pay, Monday through Thursday. These shifts are exclusive of a thirty (30) minute unpaid lunch period. The day shift shall start work between the hours of 6:00 a.m. and 8:00 a.m. and the second shift shall start work at a time designated by the Employer. The day shift shall work four (4) days at ten (10) hours for ten (10) hours pay. The second shift shall work four (4) days at nine and one-half (9 1/2) hours for ten (10) hours pay. Straight time is not to exceed ten (10) hours a day or forty (40) hours per week. Staggered starting times may be established for various work operations. The Employer will notify the Union at least three (3) working days prior to starting a four (4) day ten (10) hour shift.

Section 6. A. If employees lose ten (10) or more straight time hours in any given week due to weather, or other conditions beyond the control of the Employer; the Employer, at his option, may schedule a voluntary make-up day on Friday (if a four (4) day week is scheduled).

Section 7. It is recognized by the parties to this Agreement that the standard work week may not be desirable or cost effective for some projects, and other arrangements for hours of work could be necessary. On projects where job conditions require a change in the work day, work week, and/or shifts, the parties may change these conditions to meet the requirements of the project.

Section 8. Recognized holidays shall be as follows: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Day after Thanksgiving and Christmas Day.

Under no circumstances shall any work be performed on Labor Day except in cases of emergency involving life or property. In the event a holiday falls on a Sunday; the following day, Monday, shall be observed as such holiday. There shall be no paid holidays. If employees are required to work on a holiday, they shall receive the appropriate rate, but in no case shall such overtime rate be more than double the straight time rate.

ARTICLE VII

WAGE SCALES AND BENEFITS

Section 1. The Employer and the Union agree that only those wages, fringes and premiums incorporated in the appropriate Davis-Bacon wage determination at the time the Employer is authorized to perform work will be paid.

The Employer adopts and agrees to be bound by the written terms of the applicable International Union or Local Union trust agreements. The Employer authorizes the parties to such trust agreements to appoint trustees and successor trustees to administer the trust funds and thereby ratifies and accepts the trustees so appointed as if appointed by the Employer. Nothing contained in this Section is intended to require the Employer to become a party to or be bound by any local collective bargaining agreement except for the employee benefit fund contributions as specified therein, nor is the Employer required to become a member of any employer group or association as a condition for making such contributions.

Section 2. It is agreed and understood that in the event a subcontractor becomes delinquent on the payment of required wages or fringe benefit contributions, the Employer, upon written notice from the Union, shall become liable therefore, provided however, that:

- (1) written notice of any such delinquency is received by the Employer within two weeks of the time payment was due from the subcontractor,
- (2) the delinquency is for contributions for hours performed on the Employer's project only, and
- (3) the Employer has not yet paid the subcontractor.

Section 3. Upon presentation of a proper authorization form executed by the individual employee, the Employer agrees to deduct union dues as well as other authorized deductions from net pay after taxes and remit same to the appropriate Local Union. The Employer will transmit dues to the Local Union in the manner and at the time established by local practice.

Section 4. The Employer agrees to make fringe benefit contributions for key men to the trust funds designated by the key men as their home trust funds, and shall not be obligated to contribute for the key men to any other trust funds, provided that the trust funds so designated agree to accept the contributions and credit the key men for those contributions in accordance with the trust funds' rules. The contributions shall be at the customary rates set by the home trust funds. In accordance with this Section, the key men for whom contributions are made to their designated home trust funds shall look only to those trust funds for benefits.

Section 5. Notwithstanding the first paragraph of Section 1 of this Article, the Employer agrees to submit to the Laborers' Employers Cooperation and Education Trust ("LECET") the amount of ten cents (\$.10) per hour for all hours worked by all employees of the Employer covered by this agreement, unless the applicable local agreement requires a contribution to a Regional or Local LECET, in which case the Regional or local agreement provision shall apply.

Section 6. In the event the Davis-Bacon determination does not meet the area minimum rates of the Union, the parties shall meet and establish comparable wage rates and fringe benefits in order to utilize the trained and certified crafts on the project.

ARTICLE VIII GRIEVANCE PROCEDURE

Section 1. It is specifically agreed that in the event any disputes arise out of the interpretation or application of this Agreement, excluding questions of jurisdiction of work, the dispute(s) shall be settled by means of the procedure set forth herein. No such grievance shall be recognized unless called to the attention of the Employer by the Union or to the attention of the Union by the Employer within ten (10) calendar days after the alleged violation was committed.

Section 2. A grievance shall be settled according to the following procedure:

STEP 1: The dispute shall be referred to the Business Manager of the Local Union involved or his designated representative and the Project Superintendent and/or the Employer's representative at the project.

STEP 2: In the event that the Business Representative of the Local Union and the Project Superintendent and/or the Employer representative at the project site cannot reach agreement within ten (10) calendar days after a meeting is arranged and held, the matter shall be referred to the International Union and the Labor Relations Representative of the responsible Employer.

STEP 3: In the event that the International Representative and the Labor Relations Representative of the Employer are unable to resolve the dispute within ten (10) calendar days after completion of Step 2, it shall be referred, in writing, to the General President of the Union involved and the Home Office representative of the Employer.

STEP 4: If the dispute is not resolved within ten (10) calendar days after completion of Step 3, the Employer and the Union shall choose a mutually agreed upon Arbitrator for final and binding arbitration. The impartial Arbitrator shall be selected from a panel of arbitrators submitted by and in accordance with the rules and regulations of the American Arbitration Association. The decision of the Arbitrator shall be binding upon all parties. The Arbitrator shall have no authority to change, amend, add to, or detract from any of the provisions of this Agreement. The expense of the impartial Arbitrator shall be borne equally by the Employer and the involved Union.

Section 3. The time limits specified in any step of the Grievance Procedure may be extended by mutual agreement of the parties initiated by the written request of one party to the other, at the appropriate Step of the Grievance Procedure. However, failure to process a grievance, or failure to respond in writing within the time limits provided above, without a request for an extension of time, shall be deemed a waiver of such grievance to the other without prejudice, or without precedent to the processing of and/or resolution of like or similar grievances or disputes.

Section 4. In order to encourage the resolution of disputes and grievances at Section 1 and 2 of this Grievance Procedure, the parties agree that such settlements shall not be precedent-setting.

ARTICLE IX
JURISDICTIONAL DISPUTES

Section 1. There will be no strikes, no work stoppages or slowdowns, or other interferences with the work because of jurisdictional disputes.

Section 2. Project conditions do not always justify strict adherence to craft lines which in itself does not establish precedent or change the appropriate jurisdiction of the crafts involved. Periodic review of the work assignments shall be made for the purpose of adjusting such assignments as appropriate to take care of changing needs.

Section 3. In the event of a jurisdictional dispute, the International Unions shall promptly assign International Representatives to meet with the Employer and attempt a settlement in the event of questions of assignment.

Section 4. If the International Representatives cannot reach agreement on the dispute, they shall jointly prepare and sign a complete statement of the facts and circumstances involved in the dispute, which shall be submitted to the respective General Presidents for final resolution.

ARTICLE X
GENERAL WORKING CONDITIONS

Section 1. The selection of craft foremen and/or general foremen and the number of foremen required shall be entirely the responsibility of the Employer, it being understood that in the selection of such foremen and/or general foremen the Employer will give primary consideration to qualified individuals available in the local area. After giving such consideration, the Employer may select individuals from other areas. All foremen and/or general foremen shall take orders from the designated Employer representatives. Craft foremen shall be designated working foremen at the discretion of the Employer.

Section 2. There shall be no limit on production by workmen nor restrictions on the full use of tools or equipment. Craftsmen using tools shall perform any of the work of the trade and shall work under the direction of the craft foremen. There shall be no restrictions on efficient use of manpower other than as may be required by safety regulations.

Section 3. Workers shall be at their place of work at the starting time and shall remain at their place of work performing their assigned functions under the supervision of the Employer until quitting time. The parties reaffirm their policy of a fair day's work for a fair day's wage.

Section 4. The Employer may utilize the most efficient methods or techniques of construction, tools or other labor saving devices to accomplish work. Practices not a part of the terms and conditions of this Agreement will not be recognized.

Section 5. Neither the Union nor its Local Unions shall coerce or in any way interfere with the Owner's personnel, operation or facilities at the project site. The Owner's right to contract directly with other companies for work at the project site shall not be limited, and the Union shall cooperate and not interfere with that Employer's operations. There shall be no intermingling of Owner personnel with the Employer's Union personnel.

Section 6. Slowdowns, standby crews, and featherbedding practices will not be tolerated.

Section 7. Individual seniority shall not be recognized or applied to employees working on projects under this Agreement.

Section 8. The Employer shall establish such reasonable project rules as the Employer deems appropriate. These rules will be reviewed at the pre-job conference and posted at the project site by the Employer, and may be amended thereafter as necessary.

Section 9. In order for this Agreement to be utilized, and prior to the commencement of any project under this Agreement, the Employer agrees to make notification to the Union at International Headquarters, 905 - 16th Street, N.W., Washington, DC 20006, (202) 737-8320, Fax: (202) 737-2754. This notification will include all information as specified on the Job Notification Form (see Addendum "A"). The Union agrees to acknowledge receipt of the job notification with written approval for the project specified in said notification. Each project extension request will be reviewed and approved on an individual basis.

Section 10. Employers and representatives of the International Unions, District Councils and/or Local Unions having jurisdiction shall hold a pre-job conference so that the start and continuation of work may progress without interruption. The Employer agrees to notify the Union at International Headquarters, 905 - 16th Street, N.W., Washington, DC 20006, (202) 737-8320, Fax: (202) 737-2754, prior to commencing any work covered by this Agreement. It shall be the purpose of the pre-job conference for the Employer and the Unions to agree on such matters as the length of the work week, the number of key employees to be brought in, the number of employees employed, the method of referral, the check-off of union dues, initiation fees or agency shop fees, the applicable wage rates and fringe benefit contributions in accordance with the local agreement, as well as review the site plan, site safety and health plan, site control, air monitoring, and all other aspects pertaining to the project; provided that it is agreed that the interpretation shall be a matter for the principal parties hereto.

Section 11. Employees required to wear protective clothing will be given sufficient time to go through the required procedures for dressing, undressing and decontamination and this shall be considered time worked.

ARTICLE XI

SAFETY

Section 1. The employees covered by the terms of this Agreement shall at all times while in the employ of the Employer be bound by the safety rules and regulations as established by the Employer in accordance with the Construction Safety Act, OSHA, 29 CFR 1910.120, and any other federal and state regulations. These rules and regulations will be published and posted at conspicuous places throughout the project.

Section 2. In accordance with all federal and state regulations, it shall be the exclusive responsibility of each Employer on a project site to which this Agreement applies, to assure safe working conditions for its employees and compliance by them with any safety rules contained herein or established by the Employer. Nothing in this Agreement will make the Union or any of its locals liable to any employees or to other persons in the event that injury or accidents occur.

ARTICLE XII

WORK STOPPAGES AND LOCKOUTS

Section 1. During the term of this Agreement there shall be no strikes, picketing, work stoppages, slowdowns, or other disruptive activity for any reason by the Union, its applicable Local Unions, or by any employee and there shall be no lockout by the Employer.

Section 2. The Union and its applicable Local Union shall not sanction, aid or abet, encourage or continue any work stoppage, strike, picketing, or other disruptive activity at the Employer's project site and shall undertake all reasonable means to prevent or to terminate any such activity. No employee shall engage in activities which violate this Article. Any employee who participates in or encourages any activity which interferes with the normal operation of the project shall be subject to disciplinary action, including discharge.

Section 3. Neither the Union nor its applicable Local Unions shall be liable for acts of employees for which it has no responsibility. The International Union General President will immediately instruct, order, and use the best efforts of his office to cause the Local Union or Unions to cease any violations of this Article. The principal officer or officers of a Local Union will immediately instruct, order, and use the best efforts of their office to cause the employees the Local Union represents to cease any violations of this Article. A Local Union complying with this obligation shall not be liable for unauthorized acts of the employees it represents. The failure of the Employer to exercise its right in any instance shall not be deemed a waiver of its right in any other instance.

ARTICLE XIII

PAYMENT OF WAGES - CHECKING IN AND OUT

Section 1. Employees shall be paid in full prior to normal quitting time on the project once each week (on the same day), but in no event shall more than three (3) days (Saturday, Sunday and Holidays excluded), wages be withheld. The Employer shall make arrangements with a local bank to cash regular out-of-state payroll checks.

A. If the regular pay day falls on a holiday, the employees shall be paid on the last regular work day before the holiday.

B. If payment is not made as provided herein, the employee shall be paid for waiting time. Waiting time is to be paid at the rate of two (2) hours pay at the appropriate wage rate for each twenty-four (24) hour period.

C. An employee's pay check stub or attached statement shall contain an itemized statement showing the breakdown of straight time hours, overtime hours and all authorized deductions, and must indicate the name and address of the Employer.

D. Notwithstanding the above, if circumstances beyond the control of the Employer occur, Section 1(B) will not apply.

Section 2. Employees who quit shall be paid no later than the next regular pay period.

Section 3. When employees are laid off or discharged, they shall be paid in full immediately. In the event that the employee is not paid immediately they shall receive two (2) hours pay at the appropriate hourly wage rate for each twenty-four (24) hour period or portion thereof until said check is mailed to an address of the employee's choice. The postmark on the envelope will serve as the cutoff for any penalty.

Section 4. The Employer may utilize brassing, time clocks, or other systems to check employees in and out. Each Employee must check himself in and out. The Employer will provide adequate facilities for checking in and out in an expeditious manner.

ARTICLE XIV UNION REPRESENTATION

Section 1. Authorized representatives of the Union and its Local Unions shall have access to the project, provided they do not interfere with the work of the employees and further provided that such representatives fully comply with the visitor and security rules established for the particular project.

Section 2. The Union, or its applicable Local Union, shall have the right to designate a working journeyman as a Steward. Such designated Steward shall be a qualified worker performing the work of the craft and shall not exercise any supervisory functions. The Steward shall be concerned with the employees of the Steward's employer and not with the employees of any other employer. The Employer shall notify the Union twenty-four (24) hours prior to discharge of the Steward.

Section 3. Where the Owner's personnel may be working in close proximity to the construction activities, the Union agrees that under any and all conditions Union representatives, Stewards, and individual workmen will not interfere in any manner with the Owner's personnel or with the work which is being performed by the Owner's personnel.

ARTICLE XV
SUBCONTRACTING

Subcontractors performing work at the project shall become signatory to and be bound by the terms and conditions of this Agreement. It is understood that qualified union, competitive subcontractors may not be available. If this is the case, the Union(s) will endeavor to locate suitable, qualified, competitive union subcontractors to perform the work. If in seven (7) days the Union(s) are unable to locate such qualified, competitive union subcontractors, it is understood and agreed that the Employer may employ a non-signatory subcontractor who shall become signatory to this agreement prior to starting work.

ARTICLE XVI
GENERAL SAVINGS CLAUSE

Section 1. If any Article or provision of this Agreement shall be declared invalid, inoperative, or unenforceable by any competent authority of the executive, legislative, judicial or administrative branch of the Federal or any State government, the Employer and the Union shall suspend the operation of such Article or provision during the period of its invalidity and shall substitute by mutual consent, in its place and stead, an Article or provision which will meet the objections to its validity and which will be in accord with the intent and purpose of the Article or provisions in question.

If any Article or provision of this Agreement shall be held invalid, inoperative, or unenforceable by operation of law or by any of the above mentioned tribunals of competent jurisdiction, the remainder of this Agreement or the application of such article or provision to persons or circumstances other than those to which it has been held invalid, inoperative or unenforceable shall not be affected thereby.

ARTICLE XVII

DURATION

This Agreement shall become effective the _____ day of _____, 19_____, and shall continue in full force and effect for the duration of each project as specified through the application of "Addendum A".

This Agreement may be amended only by written agreement signed by the parties signatory hereto.

ACCEPTANCE OF AGREEMENT

SIGNED THIS _____ DAY OF _____,

LABORERS INTERNATIONAL UNION OF
NORTH AMERICA, AFL-CIO

FOR THE EMPLOYER:

General President



Signature

F. Pastor, Jr., Vice President

Name and Title

General Secretary-Treasurer

Stone & Webster Engineering Corporation
Company Name

245 Summer Street
Address

Boston, Massachusetts 02210
City State Zip

(617) 589-5111 Fax: (617) 589-1792
Telephone and Fax Numbers

INTERNATIONAL BROTHERHOOD
OF TEAMSTERS

*National Environmental Remediation
Project Agreement*



NATIONAL
ENVIRONMENTAL
REMEDICATION
PROJECT
AGREEMENT

NATIONAL ENVIRONMENTAL REMEDIATION PROJECT AGREEMENT

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NATIONAL ENVIRONMENTAL REMEDIATION PROJECT AGREEMENT
between
SIGNATORY CONTRACTOR
and the
INTERNATIONAL BROTHERHOOD OF TEAMSTERS

This Agreement is made and entered into this _____ day of _____, 19 ____, by and between _____ (hereinafter referred to as the "Employer") and the International Brotherhood of Teamsters, (hereinafter referred to as "Union") for Environmental Remediation Projects.

ARTICLE I
PURPOSE

Section 1. The purpose of this Agreement is to promote efficiency of operations on the project and provide for peaceful settlement of labor disputes without strikes or lockouts, thereby promoting the public interest in assuring the timely and economical completion of the work.

Section 2. The Employer and the Union desire to mutually establish and stabilize wages, hours and working conditions for the workers employed under this Agreement by the Employer and, further, to encourage close cooperation between the Employer and the Union to the end that a satisfactory, continuous, and harmonious relationship will exist between the parties to this Agreement.

Section 3. The Union has established environmental remediation and hazardous waste training programs which meet or exceed all of the requirements of the federal regulations.

Section 4. The Union has in its Local Union membership throughout the United States competent, skilled, qualified and certified workers required to perform the work incidental to the effective accomplishment of this project.

ARTICLE II
ADMINISTRATIVE PROCEDURE

Section 1. Extensions for this Agreement shall be on a location-to-location basis and shall be sought, in writing, for each location.

Section 2. This Agreement is between the Employer and the International Union only.

ARTICLE III
SCOPE OF AGREEMENT

Section 1. It is the intent of the parties that this Agreement be utilized as a stabilization agreement for environmental remediation projects.

Section 2. Employer, as used herein, refers to the signatory employer and subcontractors of any tier performing work on projects for which the signatory employer has management responsibility under its prime contract.

Section 3. This Agreement does not limit the selection or utilization of subcontractors for the performance of the work described herein; however, such subcontractors shall become signatory to this Agreement.

Section 4. The Employer recognizes the Union as the sole and exclusive bargaining representative for all employees performing work coming within the recognized trade jurisdiction of the Union.

Section 5. This Agreement shall not apply to executives, engineers, draftsmen, supervisors, assistant supervisors, timekeepers, messengers, office workers, guards, or other nonmanual employees.

Section 6. This Agreement represents the complete understanding of the parties; and the Employer shall not be required to sign any other agreement during the performance of the work described herein, except such participation agreements, relating to the payment of fringe benefits, which may be required by any fringe benefit trust fund.

Section 7. Both parties recognize that there may be extenuating circumstances when it is to the mutual interest of both parties to modify the terms of this Agreement. In that event, it will not be a violation of this Agreement for the parties to meet and mutually agree to make such modifications to meet a specific need on a specific project in the form of an addendum to this Agreement.

Section 8. This Agreement shall supersede all other agreements between the Employer and any Local of the Union for any work covered herein.

Section 9. The liability of the Employer and the liability of the Union shall be several and not joint.

Section 10. This Agreement shall have application only to work locations agreed upon between the Employer and the Unions in accordance with Article II, Section 1.

ARTICLE IV UNION SECURITY

Section 1. The Employees shall become and remain members of the Union as a condition of employment from the seventh (7th) but not later than the eighth (8th) day of employment, or the effective date of this Agreement, whichever is later.

Section 2. It is further agreed that all Union members employed by the Employer shall maintain their membership in good standing in the Union.

Section 3. Failure of any employee to pay or tender normal initiation fees or dues as required by this Agreement shall, upon the request of the Union in writing, result in the termination of such employee.

Section 4. The provisions of this Article shall not apply where and if such a requirement for continued employment is prohibited by state law; provided, however, that where an Agency Shop is lawful in any such state, conformity therewith shall be a condition of employment on the eighth day following the beginning of such employment, or the effective date of this Agreement, whichever is later.

ARTICLE V REFERRAL OF EMPLOYEES

Section 1. The Employer shall have the right to select and hire directly all supervisors it considers necessary and desirable. Applicants for the various classifications covered by the Agreement required by the Employer on its projects shall be referred to the Employer by the Union and/or its respective Local Unions. The Employer shall have the right to determine the competency of all employees, the right to determine the number of employees required, and the sole responsibility for selecting the employees to be laid off.

Section 2. The Union represents that its Local Unions administer and control their referrals and it is agreed that these referrals will be made in a nondiscriminatory manner and in full compliance with federal, state and local laws and regulations which require equal employment opportunities and nondiscrimination. Referrals shall not be affected in any way by the rules, regulations, by-laws, constitutional provisions, or any other aspect or obligation of union membership, policies or requirements.

Section 3. In the event the referral facilities maintained by the Local Unions do not refer the employees as requested by the Employer within a forty-eight (48) hour period after such request is made by the Employer (Saturdays, Sundays and Holidays excluded), the Employer may employ applicants from any source.

Section 4. The Employer agrees to be bound by the hiring referral rules in a local area not inconsistent with the terms of this Agreement. Notwithstanding Section 2 above, the hiring referral rules that prevail in a local area are on other than an exclusive basis, such rules shall be applicable if not in violation of either state or federal law.

Section 5. The Union and its respective Local Unions will exert their utmost efforts to recruit sufficient number of skilled and certified craftsmen to fulfill the manpower requirements of the Employer.

Section 6. The Employer shall have the right to assign key employees to the project. Key employees are defined as craft employees who possess special skills or abilities and are not readily available in the area. Key personnel shall be named and agreed to at the prejob conference.

Section 7. Where governmental agencies impose equal employment obligations on the Employer's project, referral procedures shall be subordinate to such obligations.

Section 8. In referring to employees in this Agreement, the masculine gender is used for convenience only and shall refer both to males and females.

ARTICLE VI MANAGEMENT RIGHTS

Section 1. The Employer retains and shall exercise full and exclusive authority and responsibility for the management of its operations, except as expressly limited by the terms of this Agreement.

ARTICLE VII HOURS OF WORK, OVERTIME, SHIFTS AND HOLIDAYS

Section 1. The standard work day shall consist of eight (8) hours of work between 6:00 a.m. and 6:00 p.m. with one-half hour designated as an unpaid period for lunch. The standard work week shall be five (5) consecutive days of work commencing on Monday. Nothing herein shall be construed as guaranteeing any employee eight (8) hours of work per day or forty (40) hours of work per week.

Section 2. Any employee reporting for work and for whom no work is provided, due to inclement weather or other conditions beyond the control of the Employer, shall receive two (2) hours pay at the regular straight time hourly rate. Any employee who starts to work and works beyond the two (2) hours will be paid for actual time worked except as provided in Section 3. Whenever minimum reporting pay is provided for employees, they will be required to remain at the project site available for work for such time as they receive pay, unless released sooner by the Employer's principal supervisor or designated representative. The provisions of this Section are not applicable where the employee voluntarily quits, in which case the employee shall be paid for the actual time worked.

Section 3. All time before and after the established work day of eight (8) hours, Monday through Friday, and all time on Saturday shall be paid at the rate of time and one-half. All time on Sundays and the Holidays stated in Section 8 shall be paid for at the rate of double time.

Section 4. It will not be a violation of this Agreement when the Employer considers it necessary to shut down to avoid the possible loss of human life because of an emergency situation that could endanger the life and safety of an employee. In such case, employees shall receive two (2) hours pay at the regular straight time hourly rate. Any employee who starts to work and works beyond the two (2) hours will be paid for actual time worked. In the case of a situation described above whereby the Employer requests employees to wait in a designated area available for work, the employees will be compensated for the waiting time.

Section 5. Shifts may be established when considered necessary by the Employer.

A. Shift hours and rates will be as follows:

- First Shift: Eight (8) hours pay for eight (8) hours worked plus one-half (1/2) hour unpaid lunch period.
- Second Shift: Eight (8) hours pay for seven and one-half (7 1/2) hours worked plus one-half (1/2) hour unpaid lunch period.
- Third Shift: Eight (8) hours pay for seven (7) hours worked plus one-half (1/2) hour unpaid lunch period.

B. Shifts shall be established and continue for a minimum of three (3) consecutive work days.

C. If only two shifts are to be worked, the Employer may regulate starting times of the two shift operations to permit the maximum utilization of daylight hours.

Section 6. In lieu of Section 5 above, the Employer may establish one (1) or two (2) four (4) day, ten (10) hour shifts at the regular straight time hourly rate of pay, Monday through Thursday. These shifts are exclusive of a thirty (30) minute unpaid lunch period. The day shift shall start work between the hours of 6:00 a.m. and 8:00 a.m. and the second shift shall start work at a time designated by the Employer. The day shift shall work four (4) days at ten (10) hours for ten (10) hours pay. The second shift shall work four (4) days at nine and one-half (9 1/2) hours for ten (10) hours pay. Straight time is not to exceed ten (10) hours a day for forty (40) hours per week. Staggered starting times may be established for various work operations. The Employer will notify the Union at least three (3) working days prior to starting a four (4) day, ten (10) hour shift.

A. If employees lose ten (10) or more straight time hours in any given week due to weather or other conditions beyond the control of the Employer, the Employer may, at his option, schedule a voluntary make-up day on Friday (if a four (4) day week is scheduled).

Section 7. It is recognized by the parties to this Agreement that the standard work week may not be desirable or cost effective for some projects, and other arrangements for hours of work could be necessary. On projects where job conditions require a change in the work day, work week, and/or shifts, the parties mutually may change these conditions to meet the requirements of the project.

Section 8. Recognized holidays shall be as follows: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Day after Thanksgiving and Christmas Day. In the event a holiday falls on a Sunday, the following day, Monday, shall be observed as such holiday; if any of the above holidays fall on Saturday, Friday shall be observed as the holiday. There shall be no paid holidays. If employees are required to work on a holiday, they shall receive the appropriate rate, but in no case shall such overtime rate be more than double the straight time rate.

ARTICLE VIII WAGE SCALES AND BENEFITS

Section 1. Wage rates shall be those as set forth in the current appropriate Labor Agreement of the affiliated Local Union where such work is to be performed, unless modified pursuant to Article III, Section 7 or Article VIII, Section 3 of this Agreement. With respect to premiums, only those premiums incorporated in the appropriate Davis-Bacon wage determination at the time the Employer is authorized to perform work will be paid. Premiums so incorporated will be paid on all work.

Section 2. The Employer agrees to pay the fringe benefit contribution rates contained in the Local Agreement referenced above, and adopts and agrees to be bound by the written terms of legally established trust agreements specifying the detailed basis on which payments are to be made to such trust funds. The Employer authorizes the parties to such trust agreements to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the Employer. Nothing contained in this Section is intended to require the Employer to become a member of any employer group or association as a condition of making such contributions. In addition to the contributions required by the Local Agreement, Section 5 of this Article shall apply to all work.

Section 3. In the event the Davis-Bacon determination does not meet the local negotiated wage rates and fringes of the signatory Unions for that classification of work, the parties shall meet and establish comparable wages and fringe benefits, which will be attached as Appendix "A," in order to utilize the trained and certified crafts on the project.

Section 4. Upon presentation of a proper authorization form executed by the individual employee, the Employer agrees to deduct union dues from net pay after taxes and remit same to the Union in accordance with applicable law. It is understood the Employer will remit each month the Union dues deducted in accordance with this Article on the transmittal forms used for fringe benefit contributions and that the pro-rata costs of such forms and the collection and accounting thereof will be paid by the Union to the fringe benefit administrator.

Section 5. The Employer agrees to submit to the national training fund sponsored by the International Brotherhood of Teamsters the amount of ten cents (\$.10) per hour for all hours worked by all employees of the Employer covered by this Agreement.

ARTICLE IX GRIEVANCE PROCEDURE

Section 1. It is specifically agreed that in the event any disputes arise out of the interpretation or application of this Agreement, excluding questions of jurisdiction, the same shall be settled by means of the procedure set out herein. No such grievance shall be recognized unless called to the attention of the Employer by the Union and/or its respective Local Union or to the attention of the Union and/or its respective Local Union by the Employer within ten (10) calendar days after the alleged violation was committed.

Section 2. Grievances shall be settled according to the following procedure:

- STEP 1:** The dispute shall be referred to the Business Representative of the Local Union involved or his designated representative and the Project Superintendent and/or the Employer's representative at the project.
- STEP 2:** In the event that the Business Representative of the Local Union and the Project Superintendent and/or the Employer representative at the project site cannot reach agreement within ten (10) calendar days after a meeting is arranged and held, the matter shall be referred to the International Union and the Labor Relations Representative of the responsible Employer.
- STEP 3:** In the event that the International Representative and the Labor Relations Representative of the Employer are unable to resolve the dispute within ten (10) calendar days after completion of Step 2, it shall be referred, in writing, to the General President of the Union and the Home Office representative of the Employer.
- STEP 4:** If the dispute is not resolved within ten (10) calendar days after completion of Step 3, the Employer and the Union and/or its respective Local Union shall choose a mutually agreed upon Arbitrator for final and binding arbitration. The impartial Arbitrator shall be selected from a panel of arbitrators, who have knowledge and experience of the construction industry, submitted by and in accordance with the rules and regulations of the American Arbitration Association. The decision of the Arbitrator shall be binding upon all parties. The Arbitrator shall have no authority to change, amend, add to, or detract from any of the provisions of this Agreement. The expense of the impartial Arbitrator shall be borne equally by the Employer and the Union's respective Local Union.

Section 3. The time limits specified in any step of the Grievance Procedure may be extended by mutual agreement of the parties initiated by the written request of one party to the other, at the appropriate Step of the Grievance Procedure. However, failure to process a grievance, or failure to respond in writing within the time limits provided above, without a request for an extension of time, shall be deemed a waiver of such grievance to the other without prejudice, or without precedent to the processing of and/or resolution of like or similar grievances or disputes.

Section 4. In order to encourage the resolution of disputes and grievances at Section 1 and 2 of this Grievance Procedure, the parties agree that such settlements shall not be precedent-setting.

ARTICLE X JURISDICTIONAL DISPUTES

Section 1. There will be no strikes, no work stoppages or slowdowns, or other interferences with the work because of jurisdictional disputes.

Section 2. The parties to this Agreement agree to the concept that craft jurisdictional lines shall be followed, and work assignments shall be made in accordance with the Procedural Rules and Regulations of the Plan for the Settlement of Jurisdictional Disputes in the Construction Industry. However, jurisdictional disputes cannot and shall not interfere with the efficient and continuous operations required in the successful application of the intent of this Agreement. Periodic review of the work assignments shall be made for the purpose of adjusting such assignments as appropriate to take care of changing needs.

Section 3. The Local Unions involved agree that the International Unions shall be requested to promptly assign International Representatives to meet and attempt a settlement in the event of questions of assignment.

Section 4. If the International Representatives cannot reach agreement on the dispute, they shall jointly prepare and sign a complete statement of the facts and circumstances involved in the dispute, which shall be submitted to the respective General Presidents for final resolution.

ARTICLE XI GENERAL WORKING CONDITIONS

Section 1. The selection of craft foremen and/or master mechanic and the number of foremen shall be entirely the responsibility of the Employer, it being understood that in the selection of such foremen and/or master mechanic the Employer will give primary consideration to the qualified individuals available in the local area. After giving such consideration, the Employer may select individuals from other areas. All foremen shall take orders from the designated Employer representatives. Craft foremen shall be designated working foremen at the request of the Employer.

Section 2. There shall be no limit on production by workmen nor restrictions on the full use of tools or equipment. Craftsmen using tools shall perform any of the work of the trade and shall work under the direction of the craft foremen. There shall be no restrictions on efficient use of manpower other than as may be required by safety regulations.

Section 3. Employees shall be at their place of work at the designated starting time and shall remain at their place during working hours until the designated quitting time. Where the employees place of work requires Employer-furnished transportation, the employees shall be transported on the Employer's time. The parties reaffirm their policy of a fair day's work for a fair day's wage.

Section 4. The Employer may utilize the most efficient methods or techniques of construction, tools or other labor-saving devices to accomplish work. Practices not a part of the terms and conditions of this Agreement will not be recognized.

Section 5. Neither the Union nor its Local Unions shall coerce or in any way interfere with the Owner's personnel, operation or facilities at the job site. The Owner's right to contract

directly with other companies for work at the job site shall not be limited, and the Union shall cooperate and not interfere with the Employer's operations. There shall be no intermingling of Owner personnel with the Employer's Union personnel.

Section 6. Due to the nature of the work covered by this Agreement, Teamsters shall be allowed to take personal relief time not to exceed ten (10) minutes once during the first half of the shift and once during the second half of the shift. The Union agrees that this will not be abused. To the extent necessary, personal protective clothing shall be changed on company time. The Employer will determine the time during the shift when relief time will be taken. Relief time will not be taken simultaneously by all employees, unless directed by the Employer.

Section 7. Slowdowns, standby crews, and featherbedding practices will not be tolerated.

Section 8. Individual seniority shall not be recognized or applied to employees working on projects under this Agreement.

Section 9. The Employer shall establish such reasonable project rules as the Employer deems appropriate. These rules will be reviewed at the prejob conference and posted at the project site by the Employer, and may be amended thereafter as necessary.

Section 10. The Employer shall notify the International Union prior to the start of a new project of any work to be performed by the Employer within the scope of this Agreement.

Section 11. Employers and representatives of the International Union, or Local Unions having jurisdiction, shall hold a prejob conference so that the start and continuation of work may progress without interruption. It shall be the purpose of the prejob conference for the Employer and the Unions to agree on such matters as work assignments in accordance with Appendix B, the proper, safe manning of equipment, the length of the work week, the number of key employees to be brought in, the number of employees employed, the method of referral, the check-off of union dues, initiation fees or agency shop fees, the applicable wage rates and fringe benefit contribution in accordance with the contract, a review of the site plan, site safety and health plan, site control, air monitoring, and all other aspects pertaining to the project, provided it is agreed that the interpretation shall be a matter for the principal parties hereto.

Section 12. Employees required to wear protective clothing will be given sufficient time to go through the required procedures for dressing, undressing and decontamination, and this shall be considered time worked.

ARTICLE XII SAFETY

Section 1. The employees covered by the terms of this Agreement shall at all times while in the employ of the Employer be bound by the safety rules and regulations as established by

the Employer in accordance with the Construction Safety Act, OSHA, 29 CFR 1910.120, and any other federal and state regulations. These rules and regulations will be published and posted at conspicuous places throughout the project.

Section 2. In accordance with all federal and state regulations, it shall be the exclusive responsibility of each Employer on a job site to which this Agreement applies, to assure safe working conditions for its employees and compliance by them with any safety rules contained herein or established by the Employer. Nothing in this Agreement will make the Union or any of its Locals liable to any employees or to other persons in the event that injury or accidents occur.

ARTICLE XIII WORK STOPPAGES AND LOCKOUTS

Section 1. During the term of this Agreement there shall be no strikes, picketing, work stoppages, slowdowns, or other disruptive activity by the Union, its applicable Local Union, or by any employee, and there shall be no lockout by the Employer.

In the event of nonpayment of wages, fringes, and workers' compensation, the Union may take any appropriate action it deems necessary and the Union will not be considered in violation of this Article should a work stoppage occur.

Section 2. The Union and its applicable Local Union shall not sanction, aid or abet, encourage or continue any work stoppage, strike, picketing, or other disruptive activity relative of Section 1 above at the Employer's project site and shall undertake all reasonable means to prevent or to terminate any such activity. No employee shall engage in activities which violate this Article. Any employee who participates in or encourages any activity which interferes with the normal operation of the project shall be subject to disciplinary action, including discharge.

Section 3. Neither the Union nor its applicable Local Union shall be liable for acts of employees for which it has no responsibility. Upon being notified that the applicable Local Union is violating this Article, the International Union General President will immediately use the best efforts of his office to cause the applicable Local Union to cease any violations of this Article. Upon being notified that employees of the Local Union are violating this Article, the principal officer or officers of a Local Union will immediately use the best efforts of their office to cause the employees the Local Union represents to cease any violations of this Article. Compliance with this obligation shall render the Union or the applicable Local Union not liable for acts of employees. The failure of the Employer to exercise its right in any instance shall not be deemed a waiver of its right in any other instance.

ARTICLE XIV PAYMENT OF WAGES—CHECKING IN AND OUT

Section 1. Wages will be paid weekly by check on a designated day during working hours and in no case shall more than three (3) days pay be held back in any one payroll week.

Section 2. The Employer may utilize brassing, time clocks, or other systems to check employees in and out. Each employee must check himself/herself in and out. The Employer will provide adequate facilities for checking in and out in an expeditious manner.

Section 3. When employees are laid off or discharged, they shall be paid in full immediately. If not paid within twenty-four (24) hours, a four (4) hour penalty shall be levied upon the Employer.

ARTICLE XV UNION REPRESENTATION

Section 1. Authorized representatives of the Union and its Local Unions shall have access to the project provided they do not interfere with the work of the employees and further provided that such representatives fully comply with the visitor and security rules established for the particular project.

Section 2. The Union, or its applicable Local Union, shall have the right to designate a working journeyman as a Steward. Such designated Steward shall be a qualified worker performing the work of the craft and shall not exercise any supervisory functions. The Steward shall be concerned with the employees of the Steward's Employer and not with the employees of any other Employer.

Section 3. Where the Owner's personnel may be working in close proximity to the construction activities, the Union agrees that under any and all conditions Union representatives, Stewards and individual workmen will not interfere in any manner with the Owner's personnel or with the work which is being performed by the Owner's personnel.

ARTICLE XVI SUBCONTRACTING

Section 1. The Employer agrees that neither the Employer nor any of its subcontractors will subcontract any work to be done on the project except to a person, firm, or corporation which agrees to become party to this Agreement. Any contractor or subcontractor working on the project shall become signatory to and perform all work under the terms of this Agreement.

ARTICLE XVII GENERAL SAVINGS CLAUSE

Section 1. If any Article or provision of this Agreement shall be declared invalid, inoperative, or unenforceable by any competent authority of the executive, legislative, judicial or administrative branch of the federal or any state government, the Employer and the Union shall suspend the operation of such Article or provision during the period of its invalidity and shall substitute by mutual consent, in its place and stead, an Article or provision which will meet the objections to its validity and which will be in accord with the intent and purpose of the Article or provisions in question.

If any Article of provision of this Agreement shall be held invalid, inoperative, or unenforceable by operation of law or by any of the above mentioned tribunals of competent jurisdiction, the remainder of this Agreement or the applications of such Article or provision to persons or circumstances other than those as to which it has been held invalid, inoperative or unenforceable shall not be affected thereby.

**ARTICLE XVIII
DURATION**

This Agreement shall become effective the _____ day of _____ 19 ____, and shall continue in full force and effect for the duration of the project.

This Agreement may be amended only by written agreement signed by the parties signatory hereto.

SIGNED THIS _____ DAY OF _____, 19__

INTERNATIONAL BROTHERHOOD
OF TEAMSTERS, AFL-CIO

FOR THE EMPLOYER:

_____ Company Name

_____ Ron Carey, General President

_____ Street Address

_____ City State Zip

_____ Area Code Phone Number

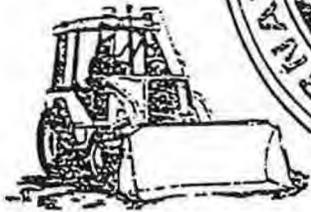
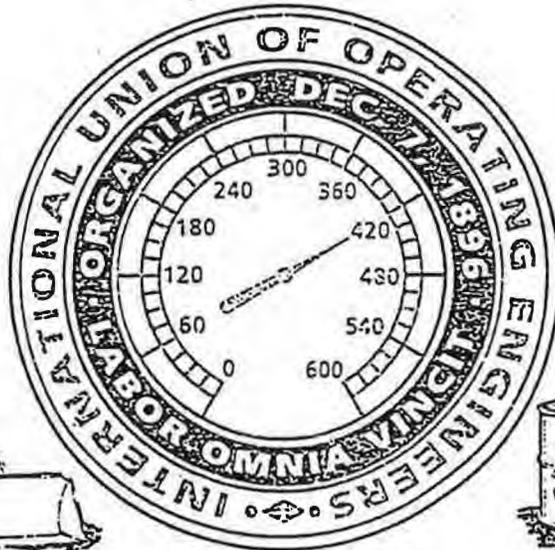
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_____ Name/Title Signature

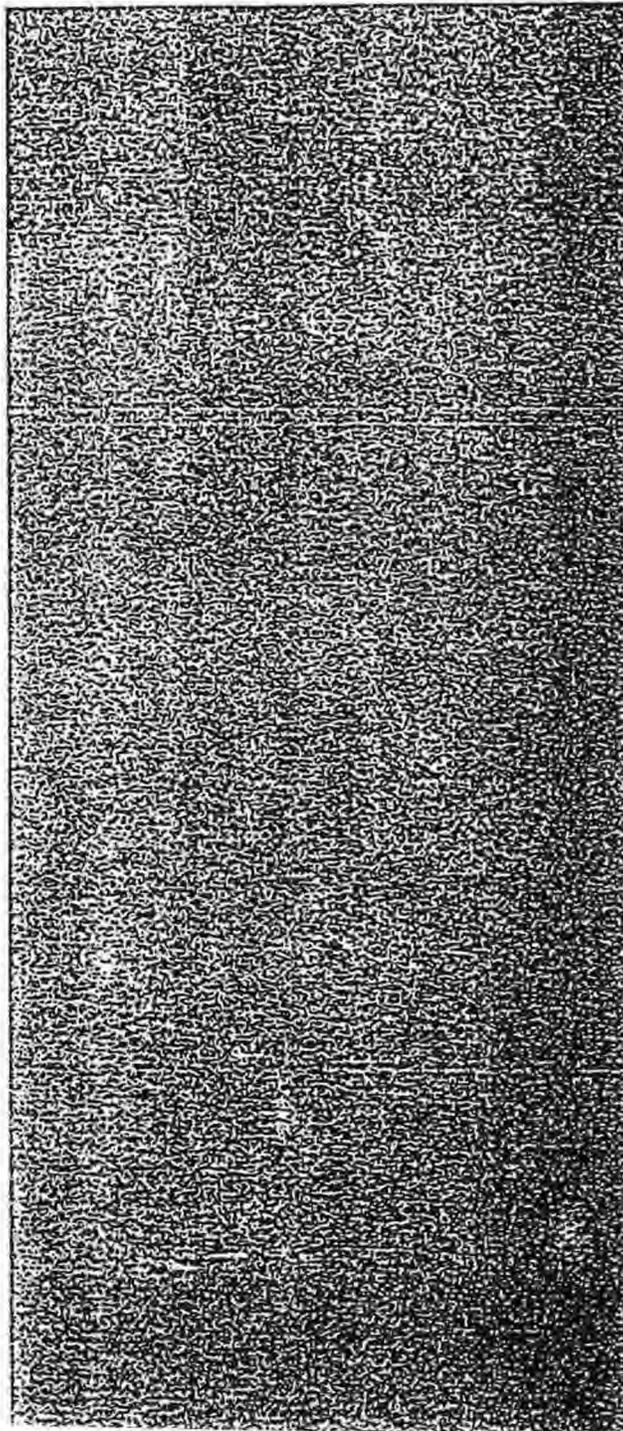
_____ Date

INTERNATIONAL UNION OF OPERATING ENGINEERS

National Environmental Remediation Project Agreement



**NATIONAL
ENVIRONMENTAL
REMEDIATION
PROJECT
AGREEMENT**



NATIONAL ENVIRONMENTAL REMEDIATION PROJECT AGREEMENT

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NATIONAL ENVIRONMENTAL REMEDIATION PROJECT AGREEMENT
between
SIGNATORY CONTRACTOR
and the
INTERNATIONAL UNION OF OPERATING ENGINEERS

This Agreement is made and entered into this _____ day of _____, 19____, by and between _____ (hereinafter referred to as the "Employer") and the International Union of Operating Engineers, (hereinafter referred to as "Union") for Environmental Remediation Projects.

ARTICLE I
PURPOSE

Section 1. The purpose of this Agreement is to promote efficiency of operations on the project and provide for peaceful settlement of labor disputes without strikes or lockouts, thereby promoting the public interest in assuring the timely and economical completion of the work.

Section 2. The Employer and the Union desire to mutually establish and stabilize wages, hours and working conditions for the workers employed under this Agreement by the Employer and, further, to encourage close cooperation between the Employer and the Union to the end that a satisfactory, continuous, and harmonious relationship will exist between the parties to this Agreement.

Section 3. The Union has established environmental remediation and hazardous waste training programs which meet or exceed all of the requirements of the federal regulations.

Section 4. The Union has in its Local Union membership throughout the United States competent, skilled, qualified and certified workers required to perform the work incidental to the effective accomplishment of this project.

ARTICLE II
ADMINISTRATIVE PROCEDURE

Section 1. Extensions for this Agreement shall be on a location-to-location basis and shall be sought, in writing, for each location.

Section 2. This Agreement is between the Employer and the International Union only.

ARTICLE III
SCOPE OF AGREEMENT

Section 1. It is the intent of the parties that this Agreement be utilized as a stabilization agreement for environmental remediation projects.

Section 2. Employer, as used herein, refers to the signatory employer and subcontractors of any tier performing work on projects for which the signatory employer has management responsibility under its prime contract.

Section 3. This Agreement does not limit the selection or utilization of subcontractors for the performance of the work described herein; however, such subcontractors shall become signatory to this Agreement.

Section 4. The Employer recognizes the Union as the sole and exclusive bargaining representative for all employees performing work coming within the recognized trade jurisdiction of the Union.

Section 5. This Agreement shall not apply to executives, engineers, draftsmen, supervisors, assistant supervisors, timekeepers, messengers, office workers, guards, or other nonmanual employees.

Section 6. This Agreement represents the complete understanding of the parties; and the Employer shall not be required to sign any other agreement during the performance of the work described herein, except such participation agreements, relating to the payment of fringe benefits, which may be required by any fringe benefit trust fund.

Section 7. Both parties recognize that there may be extenuating circumstances when it is to the mutual interest of both parties to modify the terms of this Agreement. In that event, it will not be a violation of this Agreement for the parties to meet and mutually agree to make such modifications to meet a specific need on a specific project in the form of an addendum to this Agreement.

Section 8. This Agreement shall supersede all other agreements between the Employer and any Local of the Union for any work covered herein.

Section 9. The liability of the Employer and the liability of the Union shall be several and not joint.

Section 10. This Agreement shall have application only to work locations agreed upon between the Employer and the Unions in accordance with Article II, Section 1.

ARTICLE IV UNION SECURITY

Section 1. The Employees shall become and remain members of the Union as a condition of employment from the seventh (7th) but not later than the eighth (8th) day of employment, or the effective date of this Agreement, whichever is later.

Section 2. It is further agreed that all Union members employed by the Employer shall maintain their membership in good standing in the Union.

Section 3. Failure of any employee to pay or tender normal initiation fees or dues as required by this Agreement shall, upon the request of the Union in writing, result in the termination of such employee.

Section 4. The provisions of this Article shall not apply where and if such a requirement for continued employment is prohibited by state law; provided, however, that where an Agency Shop is lawful in any such state, conformity therewith shall be a condition of employment on the eighth day following the beginning of such employment, or the effective date of this Agreement, whichever is later.

ARTICLE V REFERRAL OF EMPLOYEES

Section 1. The Employer shall have the right to select and hire directly all supervisors it considers necessary and desirable. Applicants for the various classifications covered by the Agreement required by the Employer on its projects shall be referred to the Employer by the Union and/or its respective Local Unions. The Employer shall have the right to determine

the competency of all employees, the right to determine the number of employees required, and the sole responsibility for selecting the employees to be laid off.

Section 2. The Union represents that its Local Unions administer and control their referrals and it is agreed that these referrals will be made in a nondiscriminatory manner and in full compliance with federal, state and local laws and regulations which require equal employment opportunities and nondiscrimination. Referrals shall not be affected in any way by the rules, regulations, by-laws, constitutional provisions, or any other aspect or obligation of union membership, policies or requirements.

Section 3. In the event the referral facilities maintained by the Local Unions do not refer the employees as requested by the Employer within a forty-eight (48) hour period after such request is made by the Employer (Saturdays, Sundays and Holidays excluded), the Employer may employ applicants from any source.

Section 4. The Employer agrees to be bound by the hiring referral rules in a local area not inconsistent with the terms of this Agreement. Notwithstanding Section 2 above, the hiring referral rules that prevail in a local area are on other than an exclusive basis, such rules shall be applicable if not in violation of either state or federal law.

Section 5. The Union and its respective Local Unions will exert their utmost efforts to recruit sufficient number of skilled and certified craftsmen to fulfill the manpower requirements of the Employer.

Section 6. The Employer shall have the right to assign key employees to the project. Key employees are defined as craft employees who possess special skills or abilities and are not readily available in the area. Key personnel shall be named and agreed to at the pre-job conference.

Section 7. Where governmental agencies impose equal employment obligations on the Employer's project, referral procedures shall be subordinate to such obligations.

Section 8. In referring to employees in this Agreement, the masculine gender is used for convenience only and shall refer both to males and females.

ARTICLE VI MANAGEMENT RIGHTS

Section 1. The Employer retains and shall exercise full and exclusive authority and responsibility for the management of its operations, except as expressly limited by the terms of this Agreement.

ARTICLE VII HOURS OF WORK, OVERTIME, SHIFTS AND HOLIDAYS

Section 1. The standard work day shall consist of eight (8) hours of work between 6:00 a.m. and 6:00 p.m. with one-half hour designated as an unpaid period for lunch. The standard work week shall be five (5) consecutive days of work commencing on Monday. Nothing herein shall be construed as guaranteeing any employee eight (8) hours of work per day or forty (40) hours of work per week.

Section 2. Any employee reporting for work and for whom no work is provided, due to inclement weather or other conditions beyond the control of the Employer, shall receive two (2) hours pay at the regular straight time hourly rate. Any employee who starts to work and works beyond the two (2) hours will be paid for actual time worked except as provided in

Section 3. Whenever minimum reporting pay is provided for employees, they will be required to remain at the project site available for work for such time as they receive pay, unless released sooner by the Employer's principal supervisor or designated representative. The provisions of this Section are not applicable where the employee voluntarily quits, in which case the employee shall be paid for the actual time worked.

Section 3. All time before and after the established work day of eight (8) hours, Monday through Friday, and all time on Saturday shall be paid at the rate of time and one-half. All time on Sundays and the Holidays stated in Section 8 shall be paid for at the rate of double time.

Section 4. It will not be a violation of this Agreement when the Employer considers it necessary to shut down to avoid the possible loss of human life because of an emergency situation that could endanger the life and safety of an employee. In such case, employees shall receive two (2) hours pay at the regular straight time hourly rate. Any employee who starts to work and works beyond the two (2) hours will be paid for actual time worked. In the case of a situation described above whereby the Employer requests employees to wait in a designated area available for work, the employees will be compensated for the waiting time.

Section 5. Shifts may be established when considered necessary by the Employer.

A. Shift hours and rates will be as follows:

First Shift: Eight (8) hours pay for eight (8) hours worked plus one-half (1/2) hour unpaid lunch period.

Second Shift: Eight (8) hours pay for seven and one-half (7 1/2) hours worked plus one-half (1/2) hour unpaid lunch period.

Third Shift: Eight (8) hours pay for seven (7) hours worked plus one-half (1/2) hour unpaid lunch period.

B. Shifts shall be established and continue for a minimum of three (3) consecutive work days.

C. If only two shifts are to be worked, the Employer may regulate starting times of the two shift operations to permit the maximum utilization of daylight hours.

Section 6. In lieu of Section 5 above, the Employer may establish one (1) or two (2) four (4) day, ten (10) hour shifts at the regular straight time hourly rate of pay, Monday through Thursday. These shifts are exclusive of a thirty (30) minute unpaid lunch period. The day shift shall start work between the hours of 6:00 a.m. and 8:00 a.m. and the second shift shall start work at a time designated by the Employer. The day shift shall work four (4) days at ten (10) hours for ten (10) hours pay. The second shift shall work four (4) days at nine and one-half (9 1/2) hours for ten (10) hours pay. Straight time is not to exceed ten (10) hours a day for forty (40) hours per week. Staggered starting times may be established for various work operations. The Employer will notify the Union at least three (3) working days prior to starting a four (4) day, ten (10) hour shift.

A. If employees lose ten (10) or more straight time hours in any given week due to weather or other conditions beyond the control of the Employer, the Employer may, at his option, schedule a voluntary make-up day on Friday (if a four (4) day week is scheduled).

Section 7. It is recognized by the parties to this Agreement that the standard work week may not be desirable or cost effective for some projects, and other arrangements for hours of work could be necessary. On projects where job conditions require a change in the work day, work

week, and/or shifts, the parties mutually may change these conditions to meet the requirements of the project.

Section 8. Recognized holidays shall be as follows: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Day after Thanksgiving and Christmas Day. In the event a holiday falls on a Sunday, the following day, Monday, shall be observed as such holiday; if any of the above holidays fall on Saturday, Friday shall be observed as the holiday. There shall be no paid holidays. If employees are required to work on a holiday, they shall receive the appropriate rate, but in no case shall such overtime rate be more than double the straight time rate.

ARTICLE VIII WAGE SCALES AND BENEFITS

Section 1. Wage rates shall be those as set forth in the current appropriate Labor Agreement of the affiliated Local Union where such work is to be performed, unless modified pursuant to Article III, Section 7 or Article VIII, Section 3 of this Agreement. With respect to premiums, only those premiums incorporated in the appropriate Davis-Bacon wage determination at the time the Employer is authorized to perform work will be paid. Premiums so incorporated will be paid on all work.

Section 2. The Employer agrees to pay the fringe benefit contribution rates contained in the Local Agreement referenced above, and adopts and agrees to be bound by the written terms of legally established trust agreements specifying the detailed basis on which payments are to be made to such trust funds. The Employer authorizes the parties to such trust agreements to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the Employer. Nothing contained in this Section is intended to require the Employer to become a member of any employer group or association as a condition for making such contributions. In addition to the contributions required by the Local Agreement, Section 5 of this Article shall apply to all work.

Section 3. In the event the Davis-Bacon determination does not meet the local negotiated wage rates and fringes of the signatory Unions for that classification of work, the parties shall meet and establish comparable wages and fringe benefits, which will be attached as Appendix "A," in order to utilize the trained and certified crafts on the project.

Section 4. Upon presentation of a proper authorization form executed by the individual employee, the Employer agrees to deduct union dues from net pay after taxes and remit same to the Union in accordance with applicable law. It is understood the Employer will remit each month the Union dues deducted in accordance with this Article on the transmittal forms used for fringe benefit contributions and that the pro-rata costs of such forms and the collection and accounting thereof will be paid by the Union to the fringe benefit administrator.

Section 5. The Employer agrees to submit to the national training fund sponsored by the International Union of Operating Engineers the amount of ten cents (\$0.10) per hour for all hours worked by all employees of the Employer covered by this Agreement.

ARTICLE IX GRIEVANCE PROCEDURE

Section 1. It is specifically agreed that in the event any disputes arise out of the interpretation or application of this Agreement, excluding questions of jurisdiction, the same shall be settled by means of the procedure set out herein. No such grievance shall be recognized unless

called to the attention of the Employer by the Union and/or its respective Local Union or to the attention of the Union and/or its respective Local Union by the Employer within ten (10) calendar days after the alleged violation was committed.

Section 2. Grievances shall be settled according to the following procedure:

STEP 1: The dispute shall be referred to the Business Representative of the Local Union involved or his designated representative and the Project Superintendent and/or the Employer's representative at the project.

STEP 2: In the event that the Business Representative of the Local Union and the Project Superintendent and/or the Employer representative at the project site cannot reach agreement within ten (10) calendar days after a meeting is arranged and held, the matter shall be referred to the International Union and the Labor Relations Representative of the responsible Employer.

STEP 3: In the event that the International Representative and the Labor Relations Representative of the Employer are unable to resolve the dispute within ten (10) calendar days after completion of Step 2, it shall be referred, in writing, to the General President of the Union and the Home Office representative of the Employer.

STEP 4: If the dispute is not resolved within ten (10) calendar days after completion of Step 3, the Employer and the Union and/or its respective Local Union shall choose a mutually agreed upon Arbitrator for final and binding arbitration. The impartial Arbitrator shall be selected from a panel of arbitrators, who have knowledge and experience of the construction industry, submitted by and in accordance with the rules and regulations of the American Arbitration Association. The decision of the Arbitrator shall be binding upon all parties. The Arbitrator shall have no authority to change, amend, add to, or detract from any of the provisions of this Agreement. The expense of the impartial Arbitrator shall be borne equally by the Employer and the Union's respective Local Union.

Section 3. The time limits specified in any step of the Grievance Procedure may be extended by mutual agreement of the parties initiated by the written request of one party to the other, at the appropriate Step of the Grievance Procedure. However, failure to process a grievance, or failure to respond in writing within the time limits provided above, without a request for an extension of time, shall be deemed a waiver of such grievance to the other without prejudice, or without precedent to the processing of and/or resolution of like or similar grievances or disputes.

Section 4. In order to encourage the resolution of disputes and grievances at Section 1 and 2 of this Grievance Procedure, the parties agree that such settlements shall not be precedent-setting.

ARTICLE X JURISDICTIONAL DISPUTES

Section 1. There will be no strikes, no work stoppages or slowdowns, or other interferences with the work because of jurisdictional disputes.

Section 2. The parties to this Agreement agree to the concept that craft jurisdictional lines shall be followed, and work assignments shall be made in accordance with the Procedural Rules and Regulations of the Plan for the Settlement of Jurisdictional Disputes in the

Construction Industry. However, jurisdictional disputes cannot and shall not interfere with the efficient and continuous operations required in the successful application of the intent of this Agreement. Periodic review of the work assignments shall be made for the purpose of adjusting such assignments as appropriate to take care of changing needs.

Section 3. The Local Unions involved agree that the International Unions shall be requested to promptly assign International Representatives to meet and attempt a settlement in the event of questions of assignment.

Section 4. If the International Representatives cannot reach agreement on the dispute, they shall jointly prepare and sign a complete statement of the facts and circumstances involved in the dispute, which shall be submitted to the respective General Presidents for final resolution.

ARTICLE XI GENERAL WORKING CONDITIONS

Section 1. The selection of craft foremen and/or master mechanic and the number of foremen shall be entirely the responsibility of the Employer, it being understood that in the selection of such foremen and/or master mechanic the Employer will give primary consideration to the qualified individuals available in the local area. After giving such consideration, the Employer may select individuals from other areas. All foremen shall take orders from the designated Employer representatives. Craft foremen shall be designated working foremen at the request of the Employer.

Section 2. There shall be no limit on production by workmen nor restrictions on the full use of tools or equipment. Craftsmen using tools shall perform any of the work of the trade and shall work under the direction of the craft foremen. There shall be no restrictions on efficient use of manpower other than as may be required by safety regulations.

Section 3. Employees shall be at their place of work at the designated starting time and shall remain at their place during working hours until the designated quitting time. Where the employees place of work requires Employer-furnished transportation, the employees shall be transported on the Employer's time. The parties reaffirm their policy of a fair day's work for a fair day's wage.

Section 4. The Employer may utilize the most efficient methods or techniques of construction, tools or other labor-saving devices to accomplish work. Practices not a part of the terms and conditions of this Agreement will not be recognized.

Section 5. Neither the Union nor its Local Unions shall coerce or in any way interfere with the Owner's personnel, operation or facilities at the jobsite. The Owner's right to contract directly with other companies for work at the jobsite shall not be limited, and the Union shall cooperate and not interfere with the Employer's operations. There shall be no intermingling of Owner personnel with the Employer's Union personnel.

Section 6. Due to the nature of the work covered by this Agreement, Operating Engineers shall be allowed to take personal relief time not to exceed ten (10) minutes once during the first half of the shift and once during the second half of the shift. The Union agrees that this will not be abused. To the extent necessary, personal protective clothing shall be changed on company time. The Employer will determine the time during the shift when relief time will be taken. Relief time will not be taken simultaneously by all employees, unless directed by the Employer.

Section 7. Slowdowns, standby crews, and featherbedding practices will not be tolerated.

Section 8. Individual seniority shall not be recognized or applied to employees working on projects under this Agreement.

Section 9. The Employer shall establish such reasonable project rules as the Employer deems appropriate. These rules will be reviewed at the pre-job conference and posted at the project site by the Employer, and may be amended thereafter as necessary.

Section 10. The Employer shall notify the International Union prior to the start of a new project of any work to be performed by the Employer within the scope of this Agreement.

Section 11. Employers and representatives of the International Union, or Local Unions having jurisdiction, shall hold a pre-job conference so that the start and continuation of work may progress without interruption. It shall be the purpose of the pre-job conference for the Employer and the Unions to agree on such matters as work assignments in accordance with Appendix B, the proper, safe manning of equipment, the length of the work week, the number of key employees to be brought in, the number of employees employed, the method of referral, the check-off of union dues, initiation fees or agency shop fees, the applicable wage rates and fringe benefit contribution in accordance with the contract, a review of the site plan, site safety and health plan, site control, air monitoring, and all other aspects pertaining to the project, provided it is agreed that the interpretation shall be a matter for the principal parties hereto.

Section 12. Employees required to wear protective clothing will be given sufficient time to go through the required procedures for dressing, undressing and decontamination, and this shall be considered time worked.

ARTICLE XII SAFETY

Section 1. The employees covered by the terms of this Agreement shall at all times while in the employ of the Employer be bound by the safety rules and regulations as established by the Employer in accordance with the Construction Safety Act, OSHA, 29 CFR 1910.120, and any other federal and state regulations. These rules and regulations will be published and posted at conspicuous places throughout the project.

Section 2. In accordance with all federal and state regulations, it shall be the exclusive responsibility of each Employer on a job site to which this Agreement applies, to assure safe working conditions for its employees and compliance by them with any safety rules contained herein or established by the Employer. Nothing in this Agreement will make the Union or any of its Locals liable to any employees or to other persons in the event that injury or accidents occur.

ARTICLE XIII WORK STOPPAGES AND LOCKOUTS

Section 1. During the term of this Agreement there shall be no strikes, picketing, work stoppages, slowdowns, or other disruptive activity by the Union, its applicable Local Union, or by any employee, and there shall be no lockout by the Employer.

In the event of nonpayment of wages, fringes, and workers' compensation, the Union may take any appropriate action it deems necessary and the Union will not be considered in violation of this Article should a work stoppage occur.

Section 2. The Union and its applicable Local Union shall not sanction, aid or abet, encourage or continue any work stoppage, strike, picketing, or other disruptive activity relative of Section 1 above at the Employer's project site and shall undertake all reasonable means to prevent or to terminate any such activity. No employee shall engage in activities which violate this Article. Any employee who participates in or encourages any activity which interferes with the normal operation of the project shall be subject to disciplinary action, including discharge.

Section 3. Neither the Union nor its applicable Local Union shall be liable for acts of employees for which it has no responsibility. Upon being notified that the applicable Local Union is violating this Article, the International Union General President will immediately use the best efforts of his office to cause the applicable Local Union to cease any violations of this Article. Upon being notified that employees of the Local Union are violating this Article, the principal officer or officers of a Local Union will immediately use the best efforts of their office to cause the employees the Local Union represents to cease any violations of this Article. Compliance with this obligation shall render the Union or the applicable Local Union not liable for acts of employees. The failure of the Employer to exercise its right in any instance shall not be deemed a waiver of its right in any other instance.

ARTICLE XIV PAYMENT OF WAGES — CHECKING IN AND OUT

Section 1. Wages will be paid weekly by check on a designated day during working hours and in no case shall more than three (3) days pay be held back in any one payroll week.

Section 2. The Employer may utilize brassing, time clocks, or other systems to check employees in and out. Each employee must check himself/herself in and out. The Employer will provide adequate facilities for checking in and out in an expeditious manner.

Section 3. When employees are laid off or discharged, they shall be paid in full immediately. If not paid within twenty-four (24) hours, a four (4) hour penalty shall be levied upon the Employer.

ARTICLE XV UNION REPRESENTATION

Section 1. Authorized representatives of the Union and its Local Unions shall have access to the project provided they do not interfere with the work of the employees and further provided that such representatives fully comply with the visitor and security rules established for the particular project.

Section 2. The Union, or its applicable Local Union, shall have the right to designate a working journeyman as a Steward. Such designated Steward shall be a qualified worker performing the work of the craft and shall not exercise any supervisory functions. The Steward shall be concerned with the employees of the Steward's Employer and not with the employees of any other Employer.

Section 3. Where the Owner's personnel may be working in close proximity to the construction activities, the Union agrees that under any and all conditions Union representatives, Stewards and individual workmen will not interfere in any manner with the Owner's personnel or with the work which is being performed by the Owner's personnel.

**ARTICLE XVI
SUBCONTRACTING**

Section 1. The Employer agrees that neither the Employer nor any of its subcontractors will subcontract any work to be done on the project except to a person, firm, or corporation which agrees to become party to this Agreement. Any contractor or subcontractor working on the project shall become signatory to and perform all work under the terms of this Agreement.

**ARTICLE XVII
GENERAL SAVINGS CLAUSE**

Section 1. If any Article or provision of this Agreement shall be declared invalid, inoperative, or unenforceable by any competent authority of the executive, legislative, judicial or administrative branch of the federal or any state government, the Employer and the Union shall suspend the operation of such Article or provision during the period of its invalidity and shall substitute by mutual consent, in its place and stead, an Article or provision which will meet the objections to its validity and which will be in accord with the intent and purpose of the Article or provisions in question.

If any Article of provision of this Agreement shall be held invalid, inoperative, or unenforceable by operation of law or by any of the above mentioned tribunals of competent jurisdiction, the remainder of this Agreement or the applications of such Article or provision to persons or circumstances other than those as to which it has been held invalid, inoperative or unenforceable shall not be affected thereby.

**ARTICLE XVIII
DURATION**

This Agreement shall become effective the _____ day of _____, 19____, and shall continue in full force and effect for the duration of the project.

This Agreement may be amended only by written agreement signed by the parties signatory hereto.

SIGNED THIS _____ DAY OF _____ 19____.

INTERNATIONAL UNION OF OPERATING
ENGINEERS, AFL-CIO

FOR THE EMPLOYER:

Company Name _____

Frank Hanley-General President

Street Address _____

City _____ State _____ Zip _____

Area Code _____ Phone Number _____

Signature _____

Name/Title _____ Signature _____

Date _____

APPENDIX 'B' EQUIPMENT LIST

The following power equipment and machinery is recognized as within the jurisdiction of the International Union of Operating Engineers. The International Union of Operating Engineers claims jurisdiction of all equipment as granted by the AFL Convention, November 11-23, 1907, Resolution No. 124, and also claims jurisdiction of any new equipment introduced to the industry. This listing is not to be considered exclusive.

Air Compressor	Incinerators (different)
Associated Monitoring Instruments	Loader
Backhoe	Mechanic
Barrel Grapppler Devices (all)	Pugmill
Batchplant	Pump & Treat Systems
Bobcats	Pumpcrete Machine
Boom Truck	Power Shovel
Clamshell	Robotic Equipment (all)
Concrete Breaker	Roller
Concrete Pump	Scraper (Self-propelled or tractor drawn)
Concrete Saw	Side Boom Tractor
Cranes (all)	Skid Steer Loader
Crusher	Slip Form Paver
Dozer	Sloper Paver
Dragline	Stationary Central Compressed Air Plant
Elevating Grader	Sweeper
Elevator	Tractor
Endloader	Trencher
Farm Tractor	Vertical Lifting Hoists
Filter Press	Vibrating Compaction Equipment—Self Propelled
Forklift	Welder
Generator	Welding Machine
Gradall	Well Drilling Rig
Grader	
Heater	



LABORERS' INTERNATIONAL UNION OF NORTH AMERICA

October 22, 1999

ARTHUR A. COIA
General President

CARL E. BOOKER
General Secretary-Treasurer

Vice Presidents:

MASON M. WARREN

VERE O. HAYNES

CHUCK BARNES

GEORGE R. GUDGER

MIKE QUEVEDO, JR.

MAND E. SABITONI

PETER J. FOSCO

TERRENCE M. HEALY

RAYMOND M. POCINO

EDWARD M. SMITH

JAMES C. HALE

TERENCE M. O'SULLIVAN
Assistant to the
General President

JOSEPH S. MANCINELLI

WILLIAM H. QUINN

MICHAEL S. BEARSE
General Counsel

Stone & Webster Engineering Corporation
Mr. Chuck J. Sekinger, Manager Labor Relations
245 Summer Street
Boston, MA 02110

RE: Environmental Partnering Project Agreement
Stone & Webster Engineering Corporation, Boston, MA
Devens Reserve Forces Training Facility, Ayers, Littleton, Shirley, MA

Dear Mr. Sekinger:

Please be advised that your Addendum A dated October 14, 1999, regarding the above-referenced project that has been approved on behalf of this International Union. Please contact the Regional Office specified below in order to schedule a mutually convenient time and location to conduct a pre-job conference.

Mr. Armand E. Sabitoni
Vice President
226 South Main Street
Providence, RI 02903
(401) 751-8010

Your time and attention to this matter are appreciated.

With kind regards, I am

Sincerely yours,

Arthur A. Coia
ARTHUR A. COIA
General President

pej

cc: New England Regional Office

HEADQUARTERS:
905-16th Street, NW
Washington, D.C.
20006-1765
(202) 737-8320
Fax: (202) 737-2754

Post-It® Fax Note	7671	Date	10/22	# of pages	1
To	Chuck Sekinger	From	Ar Coia		
Co./Dept	Stone + Webster	Co.	SW		
Phone #		Phone #			
Fax #	601 7589-1153	Fax #			



**Final Design
Technical Specifications
for
Consolidation Landfill
Devens Reserve Forces Training Area**

DRAFT

Prepared for

**U.S. Army Corps of Engineers–New England District
Concord, Massachusetts
DACA31-94-D-0025**

Prepared by

**EA Engineering, Science, and Technology
175 Middlesex Turnpike
Wyman Boulevard
Bedford, Massachusetts 01730
781-275-8846**

October 1999

Project No. 60957.34

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SECTION 01270
MEASUREMENT AND PAYMENT
02/94

PART 1 GENERAL

1.1 REFERENCES - NOT USED

1.2 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Weight Certificates, GA.

Submit certified weight certificates for aggregate base and aggregate stabilization.

Survey and Calculations, GA

CROSS SECTIONS AND VOLUME EARTH WORK CALCULATIONS, SURVEY SUPPORTING DATA.

1.3 LUMP SUM PAYMENT ITEMS

Payment items for the work of this contract for which contract lump sum payments will be made are listed in the BIDDING SCHEDULE and described below. All costs for items of work, which are not specifically mentioned to be included in a particular lump sum or unit price payment item, shall be included in the listed lump sum item most closely associated with the work involved. The lump sum price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.3.1 Bidding Schedule Item 1, Mobilization and Demobilization

1.3.1.1 Payment

Payment will be made for costs associated with mobilization and demobilization, as defined in Special Clause PAYMENT FOR MOBILIZATION AND DEMOBILIZATION.

1.3.1.2 Unit of Measure

Unit of measure: Lump sum.

1.3.2 Bidding Schedule Item 2, Clearing and Grubbing

1.3.2.1 Payment

Payment will be made for costs associated with clearing and grubbing including disposal of vegetation, roots, trees and debris, and irrigation piping encountered during performance of the work in accordance with the Contract Plans and Specifications. Cleared and grubbed material shall be disposed of off site by contractor. Payment will constitute full compensation for all labor, equipment, materials, testing, chipping, grubbing, disposal, hauling, and all incidentals necessary to complete the work in accordance with the Contract Documents.

1.3.2.2 Unit of Measure

Unit of measure: Lump Sum

1.3.3 Bidding Schedule Item 6, Prepared Low Permeability Clay Layer.

1.3.3.1 Payment

Payment will be made for all costs associated with furnishing, transporting, testing, placing, compacting, and constructing Prepared Low Permeability Clay Layer and all incidentals necessary to complete the work in accordance with the contract Documents.

1.3.3.2 Unit of Measure

Unit of measure: Lump sum

1.3.4 Bidding Schedule Item 7, 60 Mil HDPE Liner and Bottom Geocomposite.

1.3.4.1 Payment

Payment will be made for costs associated with operations necessary for construction of the 60 mil HDPE Liner and Geocomposite as shown on the Contract Plans and Specifications. Payment will constitute full compensation for all labor, equipment, materials testing, seaming, quality assurance, inspection, anchor trenching, liner boots, sewing and incidentals necessary to complete the work in accordance with contract documents.

1.3.4.2 Unit of Measure

Unit of measure: Lump sum

1.3.5 Bidding Schedule Item 8, Drainage Layer

1.3.5.1 Payment

Payment will be made for costs associated constructing the drainage layer as specified in the Contract Documents. Payment will constitute full compensation for all labor, equipment, materials, testing, spreading, hauling, and all incidentals necessary to complete the work in accordance with the Contract Documents.

1.3.5.2 Unit of Measure

Unit of measure: Lump sum.

1.3.6 Bidding Schedule Item 9, Leachate Collection System

1.3.6.1 Payment

Payment will be made for costs associated with operations necessary for construction of the leachate collection system as shown on the Contract Plans and Specifications. Payment will constitute full compensation for all labor, equipment, materials, testing, spreading, hauling, and all incidentals necessary to complete the work in accordance with the Contract Documents. Leachate collection system will include landfill non pressure piping, aggregate drainage stone and geotextile wrapping, leachate collection sumps, non pressure piping outside the landfill liner limits to the pumping station, all backfilling and testing requirements.

1.3.6.2 Unit of Measure

Unit of measure: Lump sum.

1.3.7 Bidding Schedule Item 12, 40 mil VFPE Liner and Cap Geocomposite

1.3.7.1 Payment

Payment will be made for costs associated with operations necessary for construction of the 40 mil VFPE liner and geocomposites as shown on the Contract Plans and Specifications. Geocomposites shall include both the gas collection layer and drainage layer geocomposite, passive gas vents, and liner boots. Payment will constitute full compensation for all labor, equipment, materials, testing, spreading, hauling, and all incidentals necessary to complete the work in accordance with the Contract Documents.

1.3.7.2 Unit of Measure

Unit of measure: Lump sum.

1.3.8 Bidding Schedule Item 14, Vegetative Support Layer

1.3.8.1 Payment

Payment will be made for costs associated constructing the vegetative support layer as specified in the Contract Documents. Payment will constitute full compensation for all labor, equipment, materials, testing, spreading, hauling, and all incidentals necessary to complete the work in accordance with the Contract Documents.

1.3.8.2 Unit of Measure

Unit of measure: Lump sum.

1.3.9. Bidding Schedule Item 15, Topsoil and Permanent Seeding

1.3.9.1 Payment

Payment will be made for costs associated constructing the topsoil layer and establishment of permanent seeding as specified in the Contract Documents. Payment will constitute full compensation for all labor, equipment, materials, testing, spreading, discing, watering, seeding, mulching, hauling, and all incidentals necessary to complete the work in accordance with the Contract Document.

1.3.9.2 Unit of Measure

Unit of measure: Lump sum.

1.3.10 Bidding Schedule Item 16, Leachate Pumping Station

1.3.10.1 Payment

Payment will be made for costs associated with operations necessary for construction of the Pumping Station as shown on the Contract Plans and Specifications. Payment includes all backfilling, concrete foundation work, valving, piping, instrumentation, flow meter, wet well, housing and all equipment associated with the pumping station structure. Payment will constitute full compensation for all labor, equipment, materials, testing, spreading, hauling, and all incidentals necessary to complete the work in accordance with the Contract Document.

1.3.10.2 Unit of Measure

Unit of measure: Lump sum.

1.3.11 Bidding Schedule Item 18, Aggregate Road Base

1.3.11.1 Payment

Payment will be made for costs associated with road furnishing, transporting, placing, compacting, and constructing aggregate road base on the access roadway and pump station and all incidentals necessary to complete the work in accordance with the Contract Documents.

1.3.11.2 Unit of Measure

Unit of Measure: Ton

1.3.12 Bidding Schedule Item 19, Electrical

1.3.12.1 Payment

Payment will be made for costs associated with operations necessary for construction of the electrical components shown on the Contract Plans and Specifications and as required by the utility company to service the pumping station. Power will be furnished by the Contractor, coordinating service requirements from the local utility company to the pumping station. Payment will constitute full compensation for all labor, equipment, permitting, materials, testing, mounting, service connections, and all incidentals necessary to complete the work in accordance with the Contract Document.

1.3.12.2 Unit Of Measurement

Unit of measure: Lump sum.

1.3.14 Bidding Schedule Item 20, Leachate Management

1.3.14.1 Payment

Payment will be made for costs associated with operations necessary for operations of the leachate management system and pumping station until accepted by the Government as shown on the Contract Plans and Specifications. Payment shall include pumping of stormwater, operations of the leachate pumping station, sampling for 16 events and necessary maintenance. Government shall pay for disposal fees to sanitary sewer.

1.3.14.2 Unit Of Measure

Unit of measure: Lump sum.

1.3.15 Bidding Schedule Item 21 Stormwater Management, Erosion and Sediment Control

1.3.15.1 Payment

Payment will be made for costs associated with operations necessary for construction of the stormwater management basin and site erosion and sediment control as shown on the Contract Plans and Specifications. Payment will include piping, silt fence, layout, and all cleaning and repairs. Payment will constitute full compensation for all labor, equipment, materials, testing, inspection, excavation and disposal of soils to construct the sediment basin, temporary diversion berms, runoff channel, riprap, toe drainage riprap, gabion and bench slope drains, silt fence, cleaning of sediment from channels and roads, compaction, hauling, and all incidentals necessary to complete the work in accordance with the Contract Documents.

1.3.15.2 Unit Of Measure

Unit of measure: Lump sum.

1.4 UNIT PRICE PAYMENT ITEMS

Payment items for the work of this contract on which the contract unit price payments will be made are listed in the BIDDING SCHEDULE and described below. The unit price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for each of the unit price items.

1.4.1 Bidding Schedule Item 3, Excavation and Disposal

1.4.1.1 Payment

Payment will be made for costs associated with construction of the landfill excavation to the grades shown on the contract plans and required disposal of excavated materials in accordance with the Contract Plans and

specifications, Payment will constitute full compensation for all labor, equipment, materials, hauling to government approved disposal area, compaction, excavating, loading, and all incidentals necessary to complete the work in accordance with the Contract Documents. Excavation for force main anchor trenches, and stormwater management are covered under their respective bid items.

1.4.1.2 Measurement

The total quantity of Excavation and disposal for which payment shall be made with the quantity of fill between the cleared and grubbed condition and the final excavated grade as shown on the Contract Drawings.

Quantities shall be computed by the Contractor as approved by the Contracting Officer using field run survey by a surveyor licensed in the state of Massachusetts. Volume shall be calculated using average end area method at 50-ft minimum sections along a common project base line. Sections shall be plotted on graph paper at 1 in = 50-ft Horizontal and 1 in = 5-ft Vertical scale with baseline and edge of liner located on the cross sections. Cross sectional areas shall be labeled on each section.

1.4.1.3 Unit of Measure

Unit of Measure: Cubic yard of excavated material

1.4.2 Bidding Schedule Item 4, Subgrade- Landfill Base

1.4.2.1 Payment

Payment will be made for costs associated with construction of the landfill subgrade to the grades shown on the contract plans for the landfill base, perimeter berms, access roadways, pumping station, and swales in accordance with the Contract Plans and specifications. Payment will constitute full compensation for all labor, equipment, materials, testing, hauling, compaction, wetting, drying, scarifying, and all incidentals necessary to complete the work in accordance with the Contract Documents.

1.4.2.2 Measurement

The total quantity of subgrade-landfill base for which payment shall be made with the quantity of compacted fill between the excavated condition and the final subgrade ready for low permeability clay layer, and including swales, access roadway (less aggregated stabilization), perimeter berm and pump station base as shown on the Contract Drawings.

Quantities shall be computed by the Contractor as approved by the Contracting Officer using field run survey by a surveyor licensed in the state of Massachusetts. Volume shall be calculated using average end area method at 50-ft minimum sections along a common project base line. Sections shall be plotted on graph paper at 1 in = 50-ft Horizontal and 1 in = 5-ft Vertical scale with baseline and edge of liner located on the cross sections. Cross sectional areas shall be labeled on each section.

1.4.2.3 Unit of Measure

Unit of Measure: Cubic yard in place

1.4.3 Bidding Schedule Item 5, Aggregate Stabilization

1.4.3.1 Payment

Payment will be made for costs associated with furnishing, transporting, placing, and constructing aggregate stabilization as specified in the Contract Documents.

1.4.3.2 Measurement

Measurement Aggregate Stabilization will be measured for payment by the ton (2,000 pounds) by weighing each truckload to the nearest 0.1 ton, and the final quantity of will be rounded to the nearest whole ton. The aggregate stabilization will be measured for payment by being weighed on approved scales before being placed in the work. Quarry weights will not be accepted. Scales shall be of sufficient length to permit simultaneous weighing all axle loads and shall be inspected, tested and sealed as directed to assure accuracy with 0.5 percent throughout the range of the scales. The scales, located at the site of the work, shall be certified as to accuracy by an acceptable scales company representative prior to weighing any riprap. Scales will be checked and certified before riprap hauling and rechecked and recertified whenever a variance is suspected. The Contractor shall furnish the scales. If commercial scales are readily available in close proximity 10 miles of site of work, the Contracting Officer may approve the use of the scales. The riprap shall be weighed in the presence of the Government representative. The Contracting Officer may elect to accept certified weight certificates furnished by a public weighmaster in lieu of scale weights at the jobsite.

1.4.3.3 Unit of Measure

Unit of measure: Per Ton

1.4.4 Bidding Schedule Item 10, Debris Disposal

1.4.4.1 Payment

Payment will be made for costs associated with hauling and placement of debris from the Study Areas and Areas of Concern to the grades shown on the contract plans in accordance with the Contract Plans and Specifications. Payment will constitute full compensation for all labor, equipment, materials, hauling, loading, grading, permitting, compaction, and all incidentals necessary to complete the work in accordance with the Contract Documents. Each debris removal area has a separate pay item as indicated on the Bid Form.

1.4.4.2 Measurement

The total quantity of debris disposed for which payment shall be made with be the quantity excavated debris hauled and disposed of in the consolidation landfill as shown on the contract drawings.

Quantities shall be calculated per ton by weigh or approved scale facility in accordance with method under Bid Item 5. Aggregate Stabilization.

Contractor shall provide scale facility as approved by the Contracting Officer.

1.4.4.3 Measurement

Unit of Measure: Per Ton

1.4.5 Bidding Schedule Item 11, Subgrade - Landfill Closure Cap

1.4.5.1 Payment

Payment will be made for costs associated with construction of the subgrade-landfill cap to the grades shown on the contract plans in accordance with the Contract Plans and Specifications. Payment will constitute full compensation for all labor, equipment, materials, hauling, loading, grading, permitting, compaction, and all incidentals necessary to complete the work in accordance with the Contract Documents.

1.4.5.2 Measurement

The total quantity of subgrade-landfill cap for which payment shall be made will be the quantity of subgrade placed in the consolidation landfill as subgrade as shown on the Contract Drawings.

Quantities shall be computed by the Contractor as approved by the Contracting Officer using field run survey by a surveyor licensed in the state of Massachusetts. Volume shall be calculated using average end area method at

50-ft minimum sections along a common project base line. Sections shall be plotted on graph paper at 1 in = 50-ft Horizontal and 1 in = 5-ft Vertical scale with baseline and edge of liner located on the cross sections. Cross sectional areas shall be labeled on each section.

1.4.5.3 Unit of Measure

Unit of Measure: Cubic yard in place.

1.4.6 Bidding Schedule Item 13, Protective Layer

1.4.6.1 Payment

Payment will be made for costs associated with construction of the protective layer to the grade as shown on the contract plans in accordance with the Contract Plans and Specifications. Payment will constitute full compensation for all labor, equipment, materials, hauling, loading, grading, permitting, compaction, and all incidentals necessary to complete the work in accordance with the Contract Documents.

1.4.6.2 Measurement

The total quantity of protected layer for which payment shall be made will be the quantity of between the landfill cap membrane liner and the top of the finished protective layer in the consolidation landfill as shown on the Contract Drawings.

Quantities shall be computed by the Contractor as approved by the Contracting Officer using field run survey by a surveyor licensed in the state of Massachusetts. Volume shall be calculated using average end area method at 50-ft minimum sections along a common project base line. Sections shall be plotted on graph paper at 1 in = 50 ft Horizontal and 1 in = 5-ft Vertical scale with baseline and edge of liner located on the cross sections. Cross sectional areas shall be labeled on each section.

1.4.6.3 Unit of Measure

Unit of Measure: Cubic yard in place.

1.4.7 Bidding Schedule Item 17, Leachate Force Main Piping

1.4.7.1 Payment

Payment will be made for costs associated with installation of the force main piping including excavation and backfill in accordance with the Contract Plans and Specifications. Payment will constitute full compensation for all labor, equipment, materials, hauling, loading, grading, permitting, compaction, and all incidentals necessary to complete the work in accordance with the Contract Documents.

1.4.7.2 Measurement

Unit of Measurement: Linear foot

1.4.8 Bidding Schedule Item 22, Gas Vents

1.4.8.1 Payment

Payment will be made for costs associated with construction of the landfill gas vents to the grades shown on the contract plans in accordance with the contract plans and specifications. Payment will constitute full compensation for all labor, equipment, materials, hauling, compaction, excavating, loading, and all incidentals necessary to complete the work in accordance with the Contract Documents.

1.4.8.2 Measurement

The quantity of gas vents for which payment shall be made shall be per each installed in accordance with the Contract Documents.

1.4.8.2 Unit of Measure

Unit of Measure: Per each installed

SECTION 01320
PROJECT SCHEDULE
06/97

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-07 Schedules

Initial Project Schedule; GA. Preliminary Project Schedule; GA. Periodic Schedule Updates; GA.

Three copies of the schedules showing codes, values, categories, numbers, items, etc., as required.

SD-08 Statements

Qualifications; FIO.

Documentation showing qualifications of personnel preparing schedule reports.

SD-09 Reports

Narrative Report; GA. Schedule Reports; GA.

(3) copies of the reports showing numbers, descriptions, dates, float, starts, finishes, durations, sequences, etc., as required.

1.2 QUALIFICATIONS

The Contractor shall designate an authorized representative who shall be responsible for the preparation of all required project schedule reports.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL

Pursuant to the Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS, a Project Schedule as described below shall be prepared. The scheduling of construction shall be the responsibility of the Contractor. Contractor management personnel shall actively participate in its development. Subcontractors and suppliers working on the project may also contribute in developing and maintaining an accurate Project Schedule. The approved Project Schedule shall be used to measure the progress of the work, to aid in evaluating time extensions, and to provide the basis of all progress payments.

3.2 BASIS FOR PAYMENT

The schedule shall be the basis for measuring Contractor progress. Lack of an approved schedule or scheduling personnel shall result in an inability of the Contracting Officer to evaluate Contractor progress for the purposes of payment. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire Project Schedule submission and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. In the case where Project Schedule revisions have been directed by the Contracting Officer and those revisions have not been included in the Project Schedule, then the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until revisions to the Project Schedule have been made.

3.3 PROJECT SCHEDULE

The computer software system utilized by the Contractor to produce the Project Schedule shall be capable of providing all requirements of this specification. Failure of the Contractor to meet the requirements of this specification shall result in the disapproval of the schedule. Manual methods used to produce any required information shall require approval by the Contracting Officer.

3.3.1 Use of the Critical Path Method

The Critical Path Method (CPM) of network calculation shall be used to generate the Project Schedule. The Contractor shall provide the Project Schedule in either the Precedence Diagram Method (PDM) or the Arrow Diagram Method (ADM).

3.3.2 Level of Detail Required

With the exception of the initial and preliminary schedule submission, the Project Schedule shall include an appropriate level of detail. Failure to develop or update the Project Schedule or provide data to the Contracting Officer at the appropriate level of detail, as specified by the Contracting Officer, shall result in the disapproval of the schedule. The Contracting Officer will use, but is not limited to, the following conditions to determine the appropriate level of detail to be used in the Project Schedule.

3.3.2.1 Activity Durations

Contractor submissions shall follow the direction of the Contracting Officer regarding reasonable activity durations. Reasonable durations are those that allow the progress of activities to be accurately determined between payment periods (usually less than 2 percent of all non-procurement activities' Original Durations shall be greater than 20 days).

3.3.2.2 Procurement Activities

Tasks related to the procurement of long lead materials or equipment shall be included as separate activities in the project schedule. Long lead materials and equipment are those materials that have a procurement cycle of over 90 days. Examples of procurement process activities include, but are not limited to: submittals, approvals, procurement, fabrication, delivery, installation, start-up, and testing.

3.3.2.3 Government Activities

Government and other agency activities that could impact progress shall be shown. These activities include, but are not limited to: approvals, inspections, utility tie-in, Government Furnished Equipment (GFE) and notice to proceed for phasing requirements.

3.3.2.4 Workers Per Day-Not used

3.3.2.5 Responsibility-Not used

3.3.2.6 Work Areas-Not used

3.3.2.7 Modification or Claim Number-Not used

3.3.2.8 Bid Item-Not used

3.3.2.9 Phase of Work

All activities shall be identified in the project schedule by the phases of work in which the activity occurs. Activities shall not contain work in more than one phase of work. The project phase of each activity shall be by the unique Phase of Work Code.

3.3.2.10 Category of Work - Not Used

3.3.2.11 Feature of Work - Not Used

3.3.3 Scheduled Project Completion

The schedule interval shall extend from notice-to-proceed to the contract completion date.

3.3.3.1 Project Start Date

The schedule shall start no earlier than the date that the Notice to Proceed (NTP) was acknowledged. The Contractor shall include as the first activity in the project schedule an activity called "Start Project". The "Start Project" activity shall have: a "ES" constraint, a constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

3.3.3.2 Constraint of Last Activity

Completion of the last activity in the schedule shall be constrained by the contract completion date. Calculation on project updates shall be such that if the early finish of the last activity falls after the contract completion date, then the float calculation shall reflect a negative float on the critical path. The Contractor shall include as the last activity in the project schedule an activity call "End Project". The "End Project" activity shall have: a "LF" constraint, a constraint date equal to the completion date for the project, and a zero day duration.

3.3.3.3 Early Project Completion

In the event the project schedule shows completion of the project prior to the contract completion date, the Contractor shall identify those activities that have been accelerated and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. Contractor shall specifically address each of the activities noted at every project schedule update period to assist the Contracting Officer in evaluating the Contractor's ability to actually complete prior to the contract period.

3.3.4 Interim Completion Dates

Contractually specified interim completion dates shall also be constrained to show negative float if the early finish date of the last activity in that phase falls after the interim completion date.

3.3.4.1 Start Phase

The Contractor shall include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The "Start Phase X" activity shall have: a "ES" constraint, a constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

3.3.4.2 End Phase

The Contractor shall include as the last activity in a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have: a "LF" constraint, a constraint date equal to the completion date for the project, and a zero day duration.

3.3.4.3 Phase X

The Contractor shall include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" activity shall be logically tied to the earliest and latest activities in the phase.

3.3.5 Default Progress Data Disallowed

Actual Start and Finish dates shall not be automatically updated by default mechanisms that may be included in CPM scheduling software systems. Actual Start and Finish dates on the CPM schedule shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the Actual Start and Finish dates on the Daily Quality Control report for every in-progress or completed activity and Ensure that the data contained on the Daily Quality Control reports is the sole basis for

schedule updating shall result in the disapproval of the Contractor's schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes.

3.3.6 Out-of-Sequence Progress

Activities that have posted progress without predecessors being completed (Out-of-Sequence Progress) will be allowed only on a case-by-case approval of the Contracting Officer. The Contracting Officer may direct that changes in schedule logic be made to correct any or all out-of-sequence work.

3.3.7 Extended Non-Work Periods-Not used

3.3.8 Negative Lags

Lag durations contained in the project schedule shall not have a negative value.

3.4 PROJECT SCHEDULE SUBMISSIONS

The Contractor shall provide the submissions as described below. The data disk, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

3.4.1 Preliminary Project Schedule Submission

The Preliminary Project Schedule, defining the Contractor's planned operations for the first 60 calendar days shall be submitted for approval within 20 calendar days after Notice to Proceed is acknowledged. The approved preliminary schedule shall be used for payment purposes not to exceed 60 calendar days after Notice to Proceed.

3.4.2 Initial Project Schedule Submission

The Initial Project Schedule shall be submitted for approval within 40 calendar days after Notice to Proceed. The schedule shall provide a reasonable sequence of activities which represent work through the entire project and shall be at a reasonable level of detail.

3.4.3 Periodic Schedule Updates

Based on the result of progress meetings, specified in "Periodic Progress Meetings," the Contractor shall submit periodic schedule updates. These submissions shall enable the Contracting Officer or to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgement of the Contracting Officer or authorized representative, is necessary for verifying the contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made.

3.4.4 Standard Activity Coding Dictionary-Not used

3.5 SUBMISSION REQUIREMENTS

The following items shall be submitted by the Contractor for the initial submission, and every periodic project schedule update throughout the life of the project:

3.5.1 Data Disks

Three data disks containing the project schedule shall be provided. Data on the disks shall be in the format specified by the contracting office.

3.5.1.1 File Medium

Required data shall be submitted on 3.5 disks, formatted to hold 1.44MB of data, under the MS-DOS Version 5.0 operating system.

3.5.1.2 Disk Label

A permanent exterior label shall be affixed to each disk submitted. The label shall indicate the type of schedule (Initial, Update, or Change), full contract number, project name, project location, data date, name and telephone number or person responsible for the schedule, and the MS-DOS version used to format the disk.

3.5.1.3 File Name-Not used

3.5.2 Narrative Report

A Narrative Report shall be provided with each update of the project schedule. This report shall be provided as the basis of the Contractor's progress payment request. The Narrative Report shall include: a description of activities along the 4 most critical paths, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken.

3.5.3 Approved Changes Verification

Only project schedule changes that have been previously approved by the Contracting Officer shall be included in the schedule submission. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

3.5.4 Schedule Reports

The format for each activity for the schedule reports listed below shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float. Actual Start and Actual Finish Dates shall be printed for those activities in progress or completed.

3.5.4.1 Activity Report

A list of all activities sorted according to activity number and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

3.5.4.2 Logic Report

A list of Preceding and Succeeding activities for every activity in ascending order by activity number and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

3.5.4.3 Total Float Report

A list of all activities sorted in ascending order of total float. Activities which have the same amount of total float shall be listed in ascending order of Early Start Dates.

3.5.4.4 Earnings Report

A compilation of the Contractor's Total Earnings on the project from the Notice to Proceed until the most recent Monthly Progress Meeting. This report shall reflect the Earnings of specific activities based on the agreements made in the field and approved between the Contractor and Contracting Officer at the most recent Monthly Progress Meeting. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining Contractor Payment. Activities shall be grouped by bid item and sorted by activity numbers. This report shall: sum all activities in a bid item and provide a bid item percent; and complete and sum all bid items to provide a total project percent complete. The printed report shall contain, for each activity: Activity Number, Activity Description, Original Budgeted Amount, Total Quantity, Quantity to Date, Percent Complete (based on cost), Earnings to Date.

3.5.5 Network Diagram

The network diagram shall be required on the initial schedule submission. The network diagram shall depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.5.5.1 Continuous Flow

Diagrams shall show a continuous flow from left to right with no arrows from right to left. The activity or event number, description, duration, and estimated earned value shall be shown on the diagram.

3.5.5.2 Project Milestone Dates

Dates shall be shown on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.5.3 Critical Path

The critical path shall be clearly shown.

3.5.5.4 Banding - Not Used

3.5.5.5 S-Curves - Not Used

3.6 PERIODIC PROGRESS MEETINGS

Progress meetings to discuss payment shall include a monthly onsite meeting or other regular intervals mutually agreed to at the preconstruction conference. During this meeting the Contractor shall describe, on an activity by activity basis, all proposed revisions and adjustments to the project schedule required to reflect the current status of the project. The Contracting Officer will approve activity progress, proposed revisions, and adjustments as appropriate.

3.6.1 Meeting Attendance

The Contractor's Project Manager and Scheduler shall attend the regular progress meeting.

3.6.2 Update Submission Following Progress Meeting

A complete update of the project schedule containing all approved progress, revisions, and adjustments, based on the regular progress meeting, shall be submitted not later than 4 working days after the monthly progress meeting.

3.6.3 Progress Meeting Contents

Update information, including Actual Start Dates, Actual Finish Dates, Remaining Durations, and Cost-to-Date shall be subject to the approval of the Contracting Officer. The following minimum set of items which the Contractor shall address, on an activity by activity basis, during each progress meeting.

3.6.3.1 Start and Finish Dates

The Actual Start and Actual Finish dates for each activity currently in-progress or completed activities.

3.6.3.2 Time Completion

The estimated Remaining Duration for each activity in-progress. Time-based progress calculations must be based on Remaining Duration for each activity.

3.6.3.3 Cost Completion

The earnings for each activity started. Payment will be based on earnings for each in-progress or completed activity. Payment for individual activities will not be made for work that contains quality defects. A portion of the overall project amount may be retained based on delays of activities.

3.6.3.4 Logic Changes

All logic changes pertaining to Notice to Proceed on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress and other changes that have been made pursuant to contract provisions shall be specifically identified and discussed.

3.6.3.5 Other Changes

Other changes required due to delays in completion of any activity or group of activities include: 1) delays beyond the Contractor's control, such as strikes and unusual weather. 2) delays encountered due to submittals, Government Activities, deliveries or work stoppages which make re-planning the work necessary, and 3) a schedule which does not represent the actual prosecution and progress of the work.

3.7 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor requests an extension of the contract completion date, he shall furnish such justification, project schedule data and supporting evidence as the Contracting Officer may deem necessary for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof of delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is obligatory to any approvals.

3.7.1 Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with this request. The Contracting Officer's determination as to the number of allowable days of contract extension shall be based upon the project schedule updates in effect for the time period in question, and other factual information. Actual delays that are found to be caused by the Contractor's own actions, which result in the extension of the schedule, will not be a cause for a time extension to the contract completion date.

3.7.2 Submission Requirements

The Contractor shall submit a justification for each request for a change in the contract completion date of under 2 weeks based upon the most recent schedule update at the time of the Notice to Proceed or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

- a. A list of affected activities, with their associated project schedule activity number.
- b. A brief explanation of the causes of the change.
- c. An analysis of the overall impact of the changes proposed.
- d. A sub-network of the affected area.

Activities impacted in each justification for change shall be identified by a unique activity code contained in the required data file.

3.7.3 Additional Submission Requirements

For any requested time extension of over 2 weeks, the Contracting Officer may request an interim update with revised activities for a specific change request. The Contractor shall provide this disk within 4 days of the Contracting Officer's request.

3.8 DIRECTED CHANGES

If Notice to Proceed (NTP) is issued for changes prior to settlement of price and/or time, the Contractor shall submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The proposed revisions to the schedule will be approved by the Contracting Officer prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until revisions are submitted, and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, the Contractor shall advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless of the objections, the Contractor shall continue to update the schedule with the Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

3.9 OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

SECTION 01330
SUBMITTAL PROCEDURES
09/97

PART 1 GENERAL

1.1 SUBMITTAL IDENTIFICATION

Submittals required are identified by SD numbers as follows:

- SD-01 Data
- SD-04 Drawings
- SD-06 Instructions
- SD-07 Schedules
- SD-08 Statements
- SD-09 Reports
- SD-13 Certificates
- SD-14 Samples
- SD-16 Records
- SD-19 Operation and Maintenance Manuals

1.2 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.2.1 Government Approved

Governmental approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.2.2 Information Only

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.3 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of

construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the CQC requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.4 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

1.5 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) representative and each item shall be stamped, signed, and dated by the CQC representative indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

3.2 SUBMITTAL REGISTER (ENG FORM 4288)

End form 4228 shall be obtained from the contracting office. It lists, items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals

may be required. The Contractor will also be given the submittal register as a diskette containing the computerized ENG Form 4288 and instructions on the use of the diskette. Columns "d" through "r" have been completed by the Government; the Contractor shall complete columns "a" and "s" through "u" and submit the forms (hard copy plus associated electronic file) to the Contracting Officer for approval within 14 calendar days after Notice to Proceed. The Contractor shall keep this diskette up-to-date and shall submit it to the Government together with the monthly payment request. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated.

3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 30 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals.

3.4 TRANSMITTAL FORM (ENG FORM 4025)

The sample transmittal form (ENG Form 4025), should be obtained from the contracting office and used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

3.5 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

3.5.1 Procedures

Submittals shall be provided to Fort Devens Reserve Training Center Building 666. Personnel will be identified at a later date.

3.5.2 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

3.6 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

3.7 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Two (2) copies of the submittal will be retained by the Contracting Officer and five (5) copies of the submittal will be returned to the Contractor.

3.8 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

3.9 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

CONTRACTOR

(Firm Name)

_____ Approved

_____ Approved with corrections as noted on submittal data and/or
attached sheets (s).

SIGNATURE: _____

TITLE: _____

DATE: _____

SECTION 01351

SAFETY, HEALTH, AND EMERGENCY RESPONSE (HTRW/UST)
05/97

1.1 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.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH-02 (1998) Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z358.1 (1990) Emergency Eyewash and Shower Equipment

AMERICAN PETROLEUM INSTITUTE (API)

API Publ 2219 (1986) Safe Operation of Vacuum Trucks in Petroleum Service

API Std 2015 (1994) Safe Entry and Cleaning of Petroleum Storage Tanks

API RP 1604 (1996) Closure Underground Petroleum Storage Tanks

CODE OF FEDERAL REGULATIONS (CFR)

10 CFR 20 Standards for Protection Against Radiation

29 CFR 1904 Recording and Reporting Occupational Injuries and Illnesses

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1926 Safety and Health Regulations for Construction

49 CFR 171 General Information, Regulations, and Definitions

49 CFR 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

ENGINEERING MANUALS

EM 385-1-1

Stet) U.S. Army Corps of Engineers Safety and Health Requirements Manual

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH Pub No. 85-115

(1985) Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities

1.2 DESCRIPTION OF WORK

This section provides additional requirements for implementing the accident prevention provisions of EM 385-1-1, and specifies a Site Safety and Health Plan (SSHP) which shall satisfy the requirements for submission of a separate Accident Prevention Plan (APP) as required by EM 385-1-1. The requirements shall apply to work performed in both "contaminated" and "clean" areas.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Work Zones; GA.

Drawings shall include initial work zone boundaries: Exclusion Zone (EZ), including restricted and regulated areas; Contamination Reduction Zone (CRZ); and Support Zone (SZ).

Decontamination Facilities; GA.

Drawings shall show the layout of the personnel and equipment decontamination areas.

SD-09 Reports

Monitoring/Sampling Results; GA.

Personnel exposure monitoring/sampling results.

Site Control Log; GA.

Record of each entry and exit into the site, as specified.

1.4 REGULATORY REQUIREMENTS

First Aid and CPR Records, current certificates or cards for persons responsible for providing first aid and CPR. Hazard Waste Training Records and hazardous waste workers most current training certificates. Medical Records and hazardous waste workers current physicians report on fitness to work.

Work performed under this contract shall comply with EM 385-1-1, applicable Federal, state, and local safety and occupational health laws and regulations. This includes, but is not limited to, Occupational Safety and Health Administration (OSHA) standards, 29 CFR 1910, especially Section .120, "Hazardous Waste Site Operations and Emergency Response" and 29 CFR 1926, especially Section .65, "Hazardous Waste Site Operations and Emergency Response". Matters of interpretation of standards shall be submitted to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.

1.5 PRECONSTRUCTION SAFETY CONFERENCE

[See section 1.7.2].

1.6 SAFETY AND HEALTH PROGRAM

OSHA Standards 29 CFR 1910, Section .120 (b) and 29 CFR 1926, Section .65 (b) require employers to develop and implement a written Safety and Health Program for employees involved in hazardous waste operations. These aforementioned hazardous regulations shall apply to debris waste exposure activities including loading, hauling, placing, compacting, and excavating. Contractor shall apply NAE safety and health guidelines for other typical construction activities. The site-specific program requirements of the OSHA Standards shall be integrated into one site-specific document, the Site Safety and Health Plan (SSHP). The SSHP shall interface with the employer's overall Safety and Health Program. Any portions of the overall Safety and Health Program that are referenced in the SSHP shall be included as appendices to the SSHP.

1.7 SITE SAFETY AND HEALTH PLAN

1.7.1 Preparation and Implementation

A Site Safety and Health Plan (SSHP) shall be prepared covering onsite work to be performed by the Contractor and all subcontractors. The Safety and Health Manager shall be responsible for the development, implementation and oversight of the SSHP. The SSHP shall establish, in detail, the protocols necessary for the anticipation, recognition, evaluation, and control of hazards associated with each task performed. The SSHP shall address site-specific safety and health requirements and procedures based upon site-specific conditions. The level of detail provided in the SSHP shall be tailored to the type of work, complexity of operations to be performed, and hazards anticipated. Details about some activities may not be available when the initial SSHP is prepared and submitted. Therefore, the SSHP shall address, in as much detail as possible, anticipated tasks, their related hazards and anticipated control measures. Additional details shall be included in the activity hazard analyses as described in paragraph ACTIVITY HAZARD ANALYSES.

1.7.2 Acceptance and Modifications

Prior to submittal, the SSHP shall be signed and dated by the Safety and Health Manager and the Site Superintendent. The SSHP shall be submitted for review 20 days prior to the Preconstruction Safety Conference. Deficiencies in the SSHP will be discussed at the preconstruction safety conference, and

the SSHP shall be revised to correct the deficiencies and resubmitted for acceptance. Onsite work shall not begin until the plan has been accepted. A copy of the written SSHP shall be maintained onsite. As work proceeds, the SSHP shall be adapted to new situations and new conditions. Changes and modifications to the accepted SSHP shall be made with the knowledge and concurrence of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer. Should any unforeseen hazard become evident during the performance of the work, the Site Safety and Health Officer (SSHO) shall bring such hazard to the attention of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, necessary action shall be taken to re-establish and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment. Disregard for the provisions of this specification or the accepted SSHP shall be cause for stopping of work until the matter has been rectified.

1.7.3 Availability

The SSHP shall be made available in accordance with 29 CFR 1910, Section .120 (b) (1) (v) and 29 CFR 1926, Section .65 (b) (1) (v).

1.7.4 Elements

Topics required by 29 CFR 1910, Section .120 (b) (4) 29 CFR 1926, Section .65 (b) (4) and the Accident Prevention Plan as described in Appendix A of EM 385-1-1 and those described in this section shall be addressed in the SSHP. Where the use of a specific topic is not applicable to the project, the SSHP shall include a statement to justify its omission or reduced level of detail and establish that adequate consideration was given the topic.

1.8 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

1.8.1 Project/Site Conditions

Appendix A is a record of site contaminants and a description of the debris disposal pits. This information is provided to assist in preparing the SSHP. Additional sources of information are available as listed below.

- a. Draft Record of Decision, HLA, March 99.
- b. Proposed Plan, HLA, Dec 98.
- c. Landfill Remediation Feasibility Study Addendum Report, HLA, Nov 98
- d. Landfill Remediation Feasibility Study Report, ABB-ES, Jan 97

1.8.1.2 List of Available Documents

Further information is available from Fort Devens Reserve Training Area, Building 666.

1.8.2 Plan Requirements

The SSHP shall include a site description and contamination characterization section that addresses the following elements:

- a. Description of site location, topography, size and past uses of the site.

- b. A list of contaminants, which may present occupational health and safety, hazards. This list shall be created by evaluating the analytical results in this section and by researching sources of information from past site investigation activities. Chemical names, concentration ranges, media in which found, locations onsite, and estimated quantities/volumes to be impacted by site work shall be included if known. [Chemical names, radioisotopes, concentration ranges and strength of radiation fields and levels of radioactive contamination, media in which found, locations onsite, and estimated quantities/volumes to be impacted by site work shall be included if known.] The contamination characterization shall be reviewed and revised if new chemicals are identified as work progresses.

1.8.3 Ordnance and Explosive Waste (OEW)

If explosives, chemical surety and warfare materials (CSM/CWM), or unexploded ordnance (UXO) are discovered at any time during operations, the Contractor shall immediately stop operations in the affected area, mark the location, notify onsite personnel of the OEW hazard and the area's restrictions, and notify the Contracting Officer. The Government will make appropriate arrangements for evaluation and proper disposal of each device. The SSHP shall specifically address procedures to be followed, if known or potential CSM/CWM, ordnance, or other such items are encountered during any phase of field work.

1.9 HAZARD/RISK ANALYSIS

The SSHP shall include a safety and health hazard/risk analysis for each site task and operation to be performed. The hazard/risk analysis shall provide information necessary for determining safety and health procedures, equipment, and training to protect onsite personnel, the environment, and the public. Available site information shall be reviewed when preparing the "Hazard/Risk Analysis" section of the SSHP. The following elements, at a minimum, shall be addressed.

1.9.1 Site Tasks and Operations (Workplan)

The SSHP shall include a comprehensive section that addresses the tasks and objectives of the site operations and the logistics and resources required to reach those tasks and objectives. Based on the type of remediation required, the following is a list of anticipated major site tasks and operations to be performed: Excavating, loading, hauling, backfilling, compacting of debris material; mechanical construction and earthwork as indicated in the Contract Documents. This is not a complete list of site tasks and operations; therefore, it shall be expanded and/or revised, during preparation of the SSHP as necessary.

1.9.2 Hazards

The following potential hazards may be encountered during site work. These are not complete lists; therefore, they shall be expanded and/or revised as necessary during preparation of the SSHP.

1.9.2.1 Safety Hazards

The following hazards may be present: excavations, slips, trips, and faults; electricity; construction equipment and machinery; trenching; debris handling; and underground lines.

1.9.2.2 Chemical Hazards

Potential chemical hazards that may be encountered during site work are discussed in paragraph SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION. The Hazard/Risk Analysis section of the SSHP shall describe the chemical, physical, and toxicological properties of contaminants, sources and pathways of employee exposures, anticipated onsite and offsite exposure level potentials, and regulatory (including Federal, state, and local) or recommended protective exposure standards. The SSHP shall also address employee exposure to hazardous substances brought onsite, and shall comply with the requirements of 29 CFR 1910, Section .1200 and 29 CFR 1926, Section .59, Hazard Communication.

1.9.2.3 Physical Agents

The following hazards may be encountered: noise, heat and cold stress and vibration.

1.9.2.4 Radiological Hazards

Radiological hazards are not anticipated.

1.9.2.5 Biological Hazards

Poisonous plants, animals, and ticks (Lyme Disease) may be encountered.

1.9.3 Action Levels

1.9.3.1 General

Action levels shall be established for the situations listed below, at a minimum. The action levels and required actions (engineering controls, changes in PPE, etc.) shall be presented in the SSHP in both text and tabular form.

- a. Implementation of engineering controls and work practices.
- b. Upgrade or downgrade in level of personal protective equipment.
- c. Work stoppage and/or emergency evacuation of onsite personnel.
- d. Prevention and/or minimization of public exposures to hazards created by site activities.

1.9.3.2 Confined Space Entry

Entry into and work in a confined space will not be allowed when oxygen readings are less than 19.5% or greater than 23.5% or if the Lower Flammable Limit (LFL) reading is greater than 10%, unless these conditions are adequately addressed in the confined space entry program. In addition, action levels for toxic atmospheres shall be determined.

1.10 ACTIVITY HAZARD ANALYSES

Prior to beginning each major phase of work, an Activity Hazard Analysis shall be prepared by the Contractor performing that work and submitted for review and acceptance. The format shall be in accordance with EM 385-1-1, figure 1-1. A major phase of work is defined as an operation involving a type of work presenting hazards not experienced in previous operations or where a new subcontractor or work crew is to perform. The analysis shall define the activities to be performed and identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the activity hazard analysis has been accepted and a preparatory meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activities, including the government onsite representatives. The activity hazard analyses shall be continuously reviewed and when appropriate modified to address changing site conditions or operations, with the concurrence of the Safety and Health Manager, the Site Superintendent, and the Contracting Officer. Activity hazard analyses shall be attached to and become a part of the SSHP.

1.11 STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

An organizational structure shall be developed that sets forth lines of authority (chain of command), responsibilities, and communication procedures concerning site safety, health, and emergency response. This organizational structure shall cover management, supervisors and employees of the Contractor and subcontractors. The structure shall include the means for coordinating and controlling work activities of subcontractors and suppliers. The SSHP shall include a description of this organizational structure as well as qualifications and responsibilities of each of the following individuals. The Contractor shall obtain Contracting Officer's acceptance before replacing any member of the Safety and Health Staff. Requests shall include the names, qualifications, duties, and responsibilities of each proposed replacement.

1.11.1 Site Superintendent

A Site Superintendent, who has responsibility to implement the SSHP, the authority to direct work performed under this contract and verify compliance, shall be designated.

1.11.2 Safety and Health Manager

1.11.2.1 Qualifications

The services of [an Industrial Hygienist certified by the American Board of Industrial Hygiene] [a safety professional certified by the Board of Certified Safety Professionals] shall be utilized. The name, qualifications (education summary and documentation, ABIH certificate), and work experience summary shall be included in the SSHP. The Safety and Health Manager shall have the following additional qualifications:

- a. A minimum of 3 years experience in developing and implementing safety and health programs at hazardous waste sites [in the hazardous waste disposal industry] [in the chemical industry] [in

the petroleum processing industry] [at underground storage tank removal projects].

- b. Documented experience in supervising professional and technician level personnel.
- c. Documented experience in developing worker exposure assessment programs and air monitoring programs and techniques.
- d. Documented experience in the development of personal protective equipment programs, including programs for working in and around potentially toxic, flammable and combustible atmospheres and confined spaces.
- e. Working knowledge of state and Federal occupational safety and health regulations.

1.11.2.2 Responsibilities

The Safety and Health Manager shall:

- a. Be responsible for the development, implementation, oversight, and enforcement of the SSHP.
- b. Sign and date the SSHP prior to submittal.
- c. Conduct initial site-specific training.
- d. Be present onsite during the first day of remedial activities and at the startup of each new major phase.
- e. Visit the site as needed and at least [once per week] once per month for the duration of activities, to audit the effectiveness of the SSHP.
- f. Be available for emergencies.
- g. Provide onsite consultation as needed to ensure the SSHP is fully implemented.
- h. Coordinate any modifications to the SSHP with the Site Superintendent, the SSHO, and the Contracting Officer.
- i. Provide continued support for upgrading/downgrading of the level of personal protection.
- j. Be responsible for evaluating air monitoring data and recommending changes to engineering controls, work practices, and PPE.
- k. Review accident reports and results of daily inspections.
- l. Serve as a member of the Contractor's quality control staff.

1.11.3 Site Safety and Health Officer (SSHO)

1.11.3.1 Qualifications of SSHO

An individual and one alternate shall be designated the Site Safety and Health Officer (SSHO). The name, qualifications (education and training summary and documentation), and work experience of the Site Safety and Health Officer and alternate [alternates] shall be included in the SSHP. The SSHO shall have the following qualifications:

- a. A minimum of 1 year experience in implementing safety and health programs at hazardous waste sites Level C personal protective equipment was required.
- b. Documented experience in construction techniques and construction safety procedures.
- c. Working knowledge of Federal and state occupational safety and health regulations.
- d. Specific training in personal and respiratory protective equipment program implementation, confined space program oversight, and in the proper use of air monitoring instruments, and air sampling methods.

1.11.3.2 Responsibilities of SSHO

The Site Safety and Health Officer shall:

- a. Assist and represent the Safety and Health Manager in onsite training and the day to day onsite implementation and enforcement of the accepted SSHP.
- b. Be assigned to the site on a full time basis for the duration of field activities. The SSHO shall have no duties other than Safety and Health related duties. If operations are performed during more than 1 work shift per day, a site Safety and Health Officer shall be present for each shift.
- c. Have authority to ensure site compliance with specified safety and health requirements, Federal, state and OSHA regulations and all aspects of the SSHP including, but not limited to, activity hazard analyses, air monitoring, use of PPE, decontamination, site control, standard operating procedures used to minimize hazards, safe use of engineering controls, the emergency response plan, confined space entry procedures, spill containment program, and preparation of records by performing a daily safety and health inspection and documenting results on the Daily Safety Inspection Log.
- d. Have authority to stop work if unacceptable health or safety conditions exist, and take necessary action to re-establish and maintain safe working conditions.
- e. Consult with and coordinate any modifications to the SSHP with the Safety and Health Manager, the Site Superintendent, and the Contracting Officer.

- f. Serve as a member of the Contractor's quality control staff on matters relating to safety and health.
- g. Conduct accident investigations and prepare accident reports.
- h. Review results of daily quality control inspections and document safety and health findings into the Daily Safety Inspection Log.
- i. In coordination with site management and the Safety and Health Manager, recommend corrective actions for identified deficiencies and oversee the corrective actions.

1.11.4 Occupational Physician (OP)

1.11.4.1 Qualifications of OP

The services of a licensed physician, who is certified in occupational medicine by the American Board of Preventative Medicine, or who, by necessary training and experience is Board eligible, shall be utilized.

1.11.4.2 Responsibilities of OP

The physician shall be responsible for the determination of medical surveillance protocols and for review of examination/test results performed in compliance with 29 CFR 1910, Section .120 (f) and 29 CFR 1926, Section .65 (f) and paragraph MEDICAL SURVEILLANCE.

1.11.5 Persons Certified in First Aid and CPR

At least two persons who are currently certified in first aid and CPR by the American Red Cross or other approved agency shall be onsite at all times during site operations. They shall be trained in universal precautions and the use of PPE as described in the Bloodborne Pathogens Standard of 29 CFR 1910, Section .1030. These persons may perform other duties but shall be immediately available to render first aid when needed.

1.11.6 Safety and Health Technicians

For each work crew in the exclusion zone, one person, designated as a Safety and Health technician, shall perform activities such as air monitoring, decontamination, and safety oversight on behalf of the SSHO. They shall have appropriate training equivalent to the SSHO in each specific area for which they have responsibility and shall report to and be under the supervision of the SSHO.

1.12 TRAINING

Personnel shall receive training in accordance with the Contractor's written safety and health training program and 29 CFR 1910 Section .120, 29 CFR 1926 Section .65, and 29 CFR 1926 Section .21. The SSHP shall include a section describing training requirements.

1.12.1 General Hazardous Waste Operations Training

Personnel exposed to the consolidation debris (debris loading, transport, filling, compacting, and grading operations) shall have successfully

completed 40 hours of hazardous waste instruction off the site; 3 days actual field experience under the direct supervision of a trained, experienced supervisor; and 8 hours refresher training annually. Onsite supervisors shall have completed the above training and 8 hours of additional, specialized training covering at least the following topics: the employer's safety and health program, personal protective equipment program, spill containment program, and health hazard monitoring procedures and techniques. Copies of current training certification statements shall be submitted prior to initial entry onto the work site.

1.12.2 Site-specific Training

Site-specific training sessions shall be documented in accordance with Section 01.B.03.b of EM 385-1-1.

1.12.2.1 Initial Session (Pre-entry Briefing)

Prior to commencement of onsite field activities, all site employees, including those assigned only to the Support Zone, shall attend a site-specific safety and health training session of at least 2 hours duration. This session shall be conducted by the Safety and Health Manager and the Site Safety and Health Officer to ensure that all personnel are familiar with requirements and responsibilities for maintaining a safe and healthful work environment. Procedures and contents of the accepted SSHP and Sections 01.B.02 and 28.D.03 of EM 385-1-1 shall be thoroughly discussed. The Contracting Officer shall be notified at least 5 days prior to the initial site-specific training session so government personnel involved in the project may attend.

1.12.2.2 Periodic Sessions

Periodic onsite training shall be conducted by the SSHO at least weekly for personnel assigned to work at the site during the following week. The training shall address safety and health procedures, work practices, any changes in the SSHP, activity hazard analyses, work tasks, or schedule; results of previous week's air monitoring, review of safety discrepancies and accidents. Should an operational change affecting onsite field work be made, a meeting prior to implementation of the change shall be convened to explain safety and health procedures. Site-specific training sessions for new personnel, visitors, and suppliers shall be conducted by the SSHO using the training curriculum outlines developed by the Safety and Health Manager.

1.12.2.3 Other Training

The Safety and Health Manager shall provide training as specified by 29 CFR 1910 Section .146, for employees who are required to supervise, standby, or enter permit-required confined spaces. Persons involved in any aspect of the transportation of hazardous materials shall be trained in accordance with 49 CFR 172 Subpart H.

1.13 PERSONAL PROTECTIVE EQUIPMENT

1.13.1 General

In accordance with 29 CFR 1910 Section .120 (g)(5) and 29 CFR 1926 Section .65 (g)(5), a written Personal Protective Equipment (PPE) program which addresses the elements listed in that regulation, and which complies with

respiratory protection program requirements of 29 CFR 1910 Section .134, is to be included in the employer's Safety and Health Program. The Site Safety and Health Plan shall detail the minimum PPE ensembles (including respirators) and specific materials from which the PPE components are constructed for each site-specific task and operation to be performed, based upon the hazard/risk analysis. Components of levels of protection (B, C, D and modifications) must be relevant to site-specific conditions, including heat and cold stress potential and safety hazards. Only respirators approved by NIOSH shall be used. Onsite personnel shall be provided with appropriate personal protective equipment. Protective equipment and clothing shall be kept clean and well maintained. The PPE section of the SSHP shall include site-specific procedures to determine PPE program effectiveness and for onsite fit-testing of respirators, cleaning, maintenance, inspection, and storage of PPE.

1.13.2 Levels of Protection

The Safety and Health Manager shall establish appropriate levels of protection for each work activity based on review of historical site information, existing data, an evaluation of the potential for exposure (inhalation, dermal, ingestion, and injection) during each task, past air monitoring results, and a continuing safety and health monitoring program. The Safety and Health Manager shall also establish action levels for upgrade or downgrade in levels of PPE from the following specified minimum levels of protection. Protocols and the communication network for changing the level of protection shall be described in the SSHP. The PPE reassessment protocol shall address air monitoring results, potential for exposure, changes in site conditions, work phases, job tasks, weather, temperature extremes, individual medical considerations, etc.

1.13.2.1 Components of Levels of Protection

The following items constitute minimum protective clothing and equipment ensembles to be utilized during this project: (see 29 CFR 1910 for Level Description)

Level D

Modified Level D

Level C

Level B

See appendix L of EM 385-1-1.

1.13.2.2 Initial Minimum Levels of PPE by Task

The SSHP shall identify minimum levels of PPE by task and be submitted to the Contracting Officer for approval.

1.13.3 PPE for Government Personnel

Three clean sets of personal protective equipment and clothing (excluding air-purifying negative-pressure respirators and safety shoes, which will be provided by individual visitors), as required for entry into the Exclusion Zone and/or Contamination Reduction Zone, shall be available for use by the

Contracting Officer or official visitors. The items shall be cleaned and maintained by the Contractor and stored at the site and clearly marked: "FOR USE BY GOVERNMENT ONLY." The Contractor shall provide basic training in the use and limitations of the PPE provided, and institute administrative controls to check prerequisites prior to issuance. Such prerequisites include meeting minimum training requirements for the work tasks to be performed and medical clearance for site hazards and respirator use.

1.14 MEDICAL SURVEILLANCE

The Safety and Health Manager, in conjunction with the Occupational Physician, shall detail, in the employer's Safety and Health Program and the SSHP, the medical surveillance program that includes scheduling of examinations, certification of fitness for duty, compliance with OSHA requirements, and information provided to the physician. Examinations shall be performed by or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine, and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place. Medical surveillance protocols and examination and test results shall be reviewed by the Occupational Physician. The medical surveillance program shall contain the requirements specified below. Personnel working in contaminated areas (relating to handling, transportation, compacting, and placing of debris) of the site shall have been examined as prescribed in 29 CFR 1910 Section .120, and 29 CFR 1926 Section .65, and determined medically fit to perform their duties.

1.14.1 Frequency of Examinations

Employees shall have been provided with medical examinations as specified, within the past 12 months and shall receive exams annually thereafter (if contract duration exceeds 1 year); on termination of employment; reassignment in accordance with 29 CFR 1910 Section .120 (f) (3) (i), and 29 CFR 1926 Section .65 (f) (3) (i) (C); if the employee develops signs or symptoms of illness related to workplace exposures; if the physician determines examinations need to be conducted more often than once a year; and when an employee develops a lost time injury or illness during the period of this contract. The supervisor shall be provided with a written statement signed by the physician prior to allowing the employee to return to the work site after injury or illness resulting in a lost workday, as defined in 29 CFR 1904 Section .12 (f).

1.14.2 Content of Examinations

The following elements shall be included in the medical surveillance program. Additional elements may be included at the discretion of the occupational physician responsible for reviewing the medical surveillance protocols.

- a. Complete medical and occupational history (initial exam only).
- b. General physical examination of major organ systems.
- c. Pulmonary function testing including FVC and FEV1.0.
- d. CBC with differential.
- e. Blood chemistry screening profile (e.g. SMAC 20/25).

- f. Urinalysis with microscopic examination.
- g. Audiometric testing (as required by Hearing Conservation Program).
- h. Visual acuity.
- i. Chest x-ray. (This test should be performed no more frequently than every 4 years, unless directed by Occupational Physician.)
- j. Electrocardiogram (as directed by Occupational Physician).
- k. Urine heavy metals (arsenic, manganese, lead, cadmium, chromium, and mercury).

1.14.3 Information Provided to the Occupational Physician

The physician shall be furnished with the following:

- a. Site information from paragraph, SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION.
- b. information on the employee's anticipated or measured exposure.
- c. a description of any PPE used or to be used.
- d. A description of the employee's duties as they relate to the employee's exposures (including physical demands on the employee and heat/cold stress).
- e. A copy of 29 CFR 1910 Section .120, or 29 CFR 1926 Section .65.
- f. Information from previous examinations not readily available to the examining physician.
- g. A copy of Section 5.0 of NIOSH Pub No. 85-115.
- h. Information required by 29 CFR 1910 Section .134.

1.14.4 Physician's Written Opinion

Before work begins a copy of the physician's written opinion for each employee shall be obtained and furnished to the Safety and Health Manager; and the employee. The opinion shall address the employee's ability to perform hazardous remediation work and shall contain the following:

- a. The physician's recommended limitations upon the employee's assigned work and/or PPE usage.
- b. The physician's opinion about increased risk to the employee's health resulting from work; and
- c. A statement that the employee has been informed and advised about the results of the examination.

1.14.5 Medical Records

Documentation of medical exams shall be provided as part of the Certificate of Worker or Visitor Acknowledgment. Medical records shall be maintained in accordance with 29 CFR 1910 Section .120, and 29 CFR 1926Section .65.

1.16 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

The Safety and Health Manager shall prepare and implement an exposure monitoring/air sampling program to identify and quantify safety and health hazards and airborne levels of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment for affected site personnel. Minimum initial requirements for the program are delineated below. Available site information shall be reviewed and the exposure monitoring/air sampling program shall be expanded and/or revised for submittal as part of the SSHP.

Appendix A contains testpit information related to the debris disposal pits.

1.17 HEAT AND COLD STRESS MONITORING

The Safety and Health Manager shall develop a heat stress and cold stress monitoring program for onsite activities. Details of the monitoring program, including schedules for work and rest, and physiological monitoring requirements, shall be described in the SSHP. Personnel shall be trained to recognize the symptoms of heat and cold stress. The SSHO and an alternate person shall be designated, in writing, to be responsible for the heat and cold stress monitoring program.

1.17.1 Heat Stress

Physiological monitoring shall commence when the ambient temperature is above 70 degrees F and workers are wearing impermeable or semi-permeable clothing. Monitoring frequency shall increase as the ambient temperature increases or as slow recovery rates are observed. An adequate supply of cool drinking water shall be provided for the workers. NIOSH Pub No. 85-115 may be consulted for guidance in determining protocols for prevention of heat stress.

1.17.2 Cold Stress

To guard against cold injury, appropriate clothing and warm shelter for rest periods shall be provided. Procedures to monitor and avoid cold stress shall be followed in accordance with the current TLVs for Cold Stress as recommended in ACGIH-02.

1.18 SAFETY PROCEDURES, ENGINEERING CONTROLS AND WORK PRACTICES

The SSHP shall describe the standard operating safety procedures, engineering controls and safe work practices to be implemented for the work covered. These shall include, but not be limited to, the following:

1.18.1 General Site Rules/Prohibitions

General site rules/prohibitions (buddy system, eating, drinking, and smoking restrictions, etc.).

1.18.2 Work Permit Requirements

Excavation, hot work, confined space, etc.

1.18.3 Material Handling Procedures

Soils, liquids.

1.18.3.1 Spill and Discharge Control

Written spill and discharge containment/control procedures shall be developed and implemented. These procedures shall address hazardous materials, material handling equipment, as well as drum and container handling, opening, sampling, shipping and transport. These procedures shall describe prevention measures, such as building berms or dikes; spill control measures and material to be used (e.g. booms, vermiculite); location of the spill control material; personal protective equipment required to cleanup spills; disposal of contaminated material; and who is responsible to report the spill. Storage of contaminated material or hazardous materials shall be appropriately bermed, diked and/or contained to prevent any spillage of material on uncontaminated soil. If the spill or discharge is reportable, and/or human health or the environment are threatened, the National Response Center, the state, and the Contracting Officer shall be notified as soon as possible.

1.18.4 Drum and Container Handling

Not anticipated

1.18.5 Confined Space Entry Procedures

Not anticipated

1.18.6 Hot Work

Not anticipated.

1.18.8 Fire Protection and Prevention

Include fire protection and prevention includes sources of ignition, housekeeping, fire extinguishers, and smoking policy.

1.18.9 Electrical Safety

All electrical equipment and installation in hazardous locations shall be in accordance with the National Electrical Code.

1.18.10 Excavation and Trench Safety

Comply with OSHA 29 CFR 26.

All equipment shall be properly guarded.

1.18.12 Lockout/Tagout

Comply with 29 CFR 1910.147.

1.18.14 Hazard Communication

Comply with 29 CFR 1926.59.

1.18.15 Illumination

Comply with 29 Cfr 1926.56.

1.18.16 Sanitation

Comply with 29 CFR 1926.51.

1.18.17 Engineering Controls

Engineering controls shall be implemented whenever feasible in preference over administration or personal protective controls.

1.18.18 Process Safety Management - Not Used.

1.18.19 Signs and Labels

[Comply with 29 CFR 1926.200].

1.19 SITE CONTROL MEASURES

In order to prevent the spread of contamination and control the flow of personnel, vehicles, and materials into and out of work areas, site control measures shall be established and described in the SSHP. The SSHP shall describe the methodology to be used by the Safety and Health Manager and SSHA in determining work zone designations and their modifications, and procedures to limit the spread of contamination. The SSHP shall include procedures for the implementation and enforcement of safety and health rules for all persons on the site, including employers, employees, outside Contractors, government representatives, and visitors.

1.19.1 Work Zones

Initial anticipated work zone boundaries are shown on the drawings. Utilizing this guidance, work zone boundaries (exclusion zone, including restricted and regulated areas; contamination reduction zone; and support zone) and access points shall be established and the boundary delineations shall be included on the drawings and in the SSHP. Delineation of work zone boundaries shall be based on the contamination characterization data and the hazard/risk analysis to be performed as described in paragraph: HAZARD/RISK ANALYSIS. As work progresses and field conditions are monitored, work zone boundaries may be modified with approval of the Contracting Officer. Work zones shall be clearly identified and marked in the field (using fences, tape, signs, etc.). A site map, showing work zone boundaries and locations of decontamination facilities, shall be posted in the onsite office. Work zones shall consist of the following:

- a. Exclusion Zone (EZ): The exclusion zone is the area where hazardous contamination is either known or expected to occur and the greatest potential for exposure exists. Entry into this area shall be controlled and exit may only be made through the CRZ.

- b. Contamination Reduction Zone (CRZ): The CRZ is the transition area between the Exclusion Zone and the Support Zone. The personnel and equipment decontamination areas shall be separate and unique areas located in the CRZ.
- c. Support Zone (SZ): The Support Zone is defined as areas of the site, other than exclusion zones and contamination reduction zones, where workers do not have the potential to be exposed to hazardous substances or dangerous conditions resulting from hazardous waste operations. The Support Zone shall be secured against active or passive contamination. Site offices, parking areas, and other support facilities shall be located in the Support Zone.

1.19.2 Site Control Log

A log of personnel visiting, entering, or working on the site shall be maintained. The log shall include the following: date, name, agency or company, time entering and exiting site, time entering and exiting the exclusion zone (if applicable), and personal protective equipment utilized. Before visitors are allowed to enter the Contamination Reduction Zone or Exclusion Zone, they shall show proof of current training, medical surveillance and respirator fit testing (if respirators are required for the tasks to be performed) and shall fill out the Certificate of Worker or Visitor Acknowledgment. This visitor information, including date, shall be recorded in the log.

1.19.3 Communication

An employee alarm system that has adequate means of on and off site communication shall be provided and installed in accordance with 29 CFR 1910 Section .165. The means of communication shall be able to be perceived above ambient noise or light levels by employees in the affected portions of the workplace. The signals shall be distinctive and recognizable as messages to evacuate or to perform critical operations. This includes: confined space entry and as determined by the SSHP.

1.19.4 Site Security

The following site security shall be provided: Signs shall be printed in bold large letters on contrasting backgrounds in English and/or where appropriate, in the predominant language of workers unable to read English. Signs shall be visible from all points where entry might occur and at such distances from the restricted area that employees may read the signs and take necessary protective steps before entering.

1.20 PERSONAL HYGIENE AND DECONTAMINATION

Personnel entering the Exclusion or Contamination Reduction Zones or otherwise exposed or subject to exposure to hazardous chemical vapors, liquids, or contaminated solids shall adhere to the following personal hygiene and decontamination provisions. Decontamination shall be performed in the CRZ prior to entering the Support Zone from the Exclusion Zone. Chapter 10.0 of NIOSH Pub No. 85-115 shall be consulted when preparing decontamination procedures. A detailed discussion of personal hygiene and decontamination facilities and procedures to be followed by site workers shall be submitted as part of the SSHP. Employees shall be trained in the procedures and the procedures shall be enforced throughout site operations.

Persons disregarding these provisions of the SSHP shall be barred from the site.

1.20.1 Decontamination Facilities

The following facilities shall be provided:

A personnel decontamination facility in the CRZ. This facility shall be used by both Contractor personnel and government representatives. The decontamination facility shall provide for separation of street clothing and contaminated PPE and shall be equipped with heating, lighting, ventilation, a change room and lockers, hot and cold water, shower facilities with hot and cold water, towels, soap in sufficient quantities for all anticipated personnel, and waste water storage facilities for controlling the disposal of used water. Laundry facilities or provisions of laundry service. If an off-site laundry service is used, they shall be notified, in writing, of the possibility and nature of contaminants expected on clothing.

1.20.2 Procedures

Minimum decontamination procedures are listed below. Available site information shall be reviewed and these procedures shall be expanded and/or revised for submittal as part of the SSHP.

1.21 EQUIPMENT DECONTAMINATION

Vehicles and equipment used in the EZ shall be decontaminated in the CRZ prior to leaving the site. The procedures for decontamination of vehicles and equipment shall be addressed in the SSHP.

1.21.1 Decontamination Facilities - Not Used

1.21.2 Procedures

Procedures for equipment decontamination shall be developed and utilized to prevent the spread of contamination into the SZ and off-site areas. These procedures shall address disposal of contaminated products and spent materials used on the site, including containers, fluids, oils, etc. Any item taken into the EZ shall be assumed to be contaminated and shall be inspected and/or decontaminated before the item leaves the area. Vehicles, equipment, and materials shall be cleaned and decontaminated prior to leaving the site. Construction material shall be handled in such a way as to minimize the potential for contaminants being spread and/or carried offsite. Prior to exiting the site, vehicles and equipment shall be monitored to ensure the adequacy of decontamination.

1.22 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

The SSHP shall describe the emergency and first aid equipment to be available onsite. The following items, as a minimum, shall be maintained onsite and available for immediate use:

- a. First aid equipment and supplies approved by the consulting physician.
- b. Emergency eyewashes and showers which comply with ANSI Z358.1.

- c. Fire extinguishers with a minimum rating of 20-A:120-B:C shall be provided at site facilities and in all vehicles and at any other site locations where flammable or combustible materials present a fire risk.

1.23 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

An Emergency Response Plan, that meets the requirements of 29 CFR 1910 Section .120 (1) and 29 CFR 1926 Section .65 (1), shall be developed and implemented as a section of the SSHP. In the event of any emergency associated with remedial action, the Contractor shall, without delay, alert all onsite employees that there is an emergency situation; take action to remove or otherwise minimize the cause of the emergency; alert the Contracting Officer; and institute measures necessary to prevent repetition of the conditions or actions leading to, or resulting in, the emergency. Employees that are required to respond to hazardous emergency situations shall be trained in how to respond to such expected emergencies. The plan shall be rehearsed regularly as part of the overall training program for site operations. The plan shall be reviewed periodically and revised as necessary to reflect new or changing site conditions or information. Copies of the accepted SSHP and revisions shall be provided to the affected local emergency response agencies. The following elements, as a minimum, shall be addressed in the plan:

- a. Pre-emergency planning. The local emergency response agencies shall be contacted and met with during preparation of the Emergency Response Plan. Agencies to be contacted include local fire, police, and rescue authorities with jurisdiction and nearby medical facilities that may be utilized for emergency treatment of injured personnel. At these meetings, the agencies shall be notified of upcoming site activities and potential emergency situations. The response agencies' capabilities shall be ascertained and written response commitments obtained. The Contractor shall ensure the Emergency Response Plan for the site is compatible and integrated with the disaster, fire and/or emergency response plans of local, state, and Federal agencies.
- b. Personnel roles, lines of authority, communications for emergencies.
- c. Emergency recognition and prevention.
- d. Site topography, layout, and prevailing weather conditions.
- e. Criteria and procedures for site evacuation (emergency alerting procedures, employee alarm system, emergency PPE and equipment, safe distances, places of refuge, evacuation routes, site security and control).
- f. Specific procedures for decontamination and medical treatment of injured personnel.
- g. Route maps to nearest prenotified medical facility. Site-support vehicles shall be equipped with maps. At the beginning of project operations, drivers of the support vehicles shall become familiar with the emergency route and the travel time required.

- h. Emergency alerting and response procedures including posted instructions and a list of names and telephone numbers of emergency contacts (physician, nearby medical facility, fire and police departments, ambulance service, Federal, state, and local environmental agencies; as well as Safety and Health Manager, the Site Superintendent, the Contracting Officer and/or their alternates).
- i. Criteria for initiating community alert program, contacts, and responsibilities.
- j. Procedures for reporting incidents to appropriate government agencies. In the event that an incident such as an explosion or fire, or a spill or release of toxic materials occurs during the course of the project, the appropriate government agencies shall be immediately notified. In addition, the Contracting Officer shall be verbally notified immediately and receive a written notification within 24 hours. The report shall include the following items:
 - (1) Name, organization, telephone number, and location of the Contractor.
 - (2) Name and title of the person(s) reporting.
 - (3) Date and time of the incident.
 - (4) Location of the incident, i.e., site location, facility name.
 - (5) Brief summary of the incident giving pertinent details including type of operation ongoing at the time of the incident.
 - (6) Cause of the incident, if known.
 - (7) Casualties (fatalities, disabling injuries).
 - (8) Details of any existing chemical hazard or contamination.
 - (9) Estimated property damage, if applicable.
 - (10) Nature of damage, effect on contract schedule.
 - (11) Action taken to ensure safety and security.
 - (12) Other damage or injuries sustained, public or private.
- k. Procedures for critique of emergency responses and follow-up.

1.24 CERTIFICATE OF WORKER/VISITOR ACKNOWLEDGEMENT

A copy of a Contractor-generated certificate of worker/visitor acknowledgement shall be completed and submitted for each visitor allowed to enter contamination reduction or exclusion zones, and for each employee, following the example certificate at the end of this section.

1.25 INSPECTIONS

The SSO shall perform daily inspections of the jobsite and the work in progress to ensure compliance with EM 385-1-1, the Safety and Health Program, the SSHP and other occupational health and safety requirements of the contract, and to determine the effectiveness of the SSHP. Procedures for correcting deficiencies (including actions, timetable and responsibilities) shall be described in the SSHP. Follow-up inspections to ensure correction of deficiencies shall be conducted and documented. Daily safety inspection logs shall be used to document the inspections, noting safety and health deficiencies, deficiencies in the effectiveness of the SSHP, and corrective actions taken. The SSO's Daily Inspection Logs shall be attached to and submitted with the Daily Quality Control reports. Each entry shall include the following: date, work area checked, employees present in work area, PPE and work equipment being used in each area, special safety and health issues and notes, and signature of preparer. In the event of an accident, the Contracting Officer shall be notified according to EM 385-1-1. Within 2 working days of any reportable accident, an Accident Report shall be completed on ENG Form 3394 and submitted.

1.26 SAFETY AND HEALTH PHASE-OUT REPORT

A Safety and Health Phase-Out Report shall be submitted within 10 working days following completion of the work, prior to final acceptance of the work. The following minimum information shall be included:

- a. Summary of the overall performance of safety and health (accidents or incidents including near misses, unusual events, lessons learned, etc.).
- b. Final decontamination documentation including procedures and techniques used to decontaminate equipment, vehicles, and on site facilities.
- c. Summary of exposure monitoring and air sampling accomplished during the project.
- d. Signatures of Safety and Health Manager and SSO.

EXAMPLE CERTIFICATE OF WORKER/VISITOR ACKNOWLEDGMENT

PROJECT NAME
PROJECT ADDRESS
CONTRACTOR'S NAME
[EMPLOYEE'S] [VISITOR'S] NAME

CONTRACT NO.

The contract for the above project requires the following: that you be provided with and complete formal and site-specific training; that you be supplied with proper personal protective equipment including respirators; that you be trained in its use; and that you receive a medical examination to evaluate your physical capacity to perform your assigned work tasks, under the environmental conditions expected, while wearing the required personal protective equipment. These things are to be done at no cost to you. By signing this certification, you are acknowledging that your employer has met these obligations to you.

I HAVE READ, UNDERSTAND AND AGREE TO FOLLOW THE SITE SAFETY AND HEALTH PLAN FOR THIS SITE.

Name Date

FORMAL TRAINING: I have completed the following formal training courses that meet OSHA's requirements:

Date Completed

40 hour:
8 hour supervisory:
8 hour refresher:

SITE-SPECIFIC TRAINING: I have been provided and have completed the site-specific training required by this Contract. The Site Safety and Health Officer conducted the training.

RESPIRATORY PROTECTION: I have been trained in accordance with the criteria in [the Contractor's] my Employer's Respiratory Protection program. I have been trained in the proper work procedures and use and limitations of the respirator(s) I will wear. I have been trained in and will abide by the facial hair policy.

RESPIRATOR FIT-TEST TRAINING: I have been trained in the proper selection, fit, use, care, cleaning, and maintenance, and storage of the respirator(s) that I will wear. I have been fit-tested in accordance with the criteria in [the Contractor's] my employer's Respiratory Program and have received a satisfactory fit. I have been assigned my individual respirator. I have been taught how to properly perform positive and negative pressure fit-check upon donning negative pressure respirators each time.

MEDICAL EXAMINATION: I have had a medical examination within the last twelve months which was paid for by my employer. The examination included: health history, pulmonary function tests and may have included an evaluation of a chest ax-ray. A physician made determination regarding my physical capacity to perform work tasks on the project while wearing protective equipment including a respirator. I was personally provided a copy and informed of the results of that examination. My employer's industrial hygienist evaluated the medical certification provided by the physician and checked the appropriate blank below. The physician determined that there:

_____ were no limitations to performing the required work tasks;

_____ were identified physical limitations to performing the required work tasks.

Date medical exam completed _____

[Employee's] [Visitor's] Signature _____
Date _____

Printed Name _____

Social Security Number _____

Contractor's Site Safety and Health Officer Signature _____

Date _____

Printed Name _____

Social Security Number _____

SECTION 01410

ENVIRONMENT PROTECTION
02/97

1.1 GENERAL REQUIREMENTS

The Contractor shall perform the work minimizing environmental pollution and damage as the result of construction operations. Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of land, water, and air, and includes management of visual aesthetics, noise, solid waste, as well as other pollutants. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract.

1.1.1 Subcontractors

The Contractor shall ensure compliance with this section by subcontractors.

1.1.2 Environmental Protection Plan

The Contractor shall submit an environmental protection plan within 15 days after receipt of the notice to proceed. Approval of the Contractor's plan will not relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures. The environmental protection plan shall include, but shall not be limited to, the following:

- a. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.
- b. Methods for protection of features to be preserved within authorized work areas like trees, shrubs, vines, grasses and ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, archaeological, and cultural resources.
- c. Procedures to be implemented to provide the required environmental protection, to comply with the applicable laws and regulations, and to correct pollution due to accident, natural causes, or failure to follow the procedures of the environmental protection plan.
- d. Location of the solid waste disposal area. Generated from on site activities.
- e. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, stream crossings, material storage

areas, structures, sanitary facilities, and stockpiles of excess or spoil materials.

- f. Environmental monitoring plans for the job site, including land, water, air, and noise monitoring.
- g. Traffic control plan including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather, and the amount of mud transported onto paved public roads by vehicles or runoff.
- h. Methods of protecting surface and ground water during construction activities.
- i. Plan showing the proposed activity in each portion of the work area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas.
- j. A stormwater pond removal plan 120 days prior to removal work. The plan shall include the method of removing and testing of the collected sediment.
- k. Training for Contractor's personnel during the construction period.
- l. Contractor shall provide an operations and maintenance plan for the facility. The plan shall include manufacturers recommended maintenance of the leachate pumping station system including drawings and maintenance schedules. A description of recommended mowing and closure care procedures and post closure plan shall also be outlined in accordance with the Massachusetts Landfill Guidance Manual.

1.1.3 Permits

The Contractor shall obtain all needed permits or licenses. The Government will not obtain any permits for this project; see Contract Clause PERMITS AND RESPONSIBILITIES. The Contractor shall be responsible for implementing the terms and requirements of the appropriate permits as needed and for payment of all fees.

1.1.4 Preconstruction Survey

Prior to starting any onsite construction activities, the Contractor and the Contracting Officer shall make a joint condition survey after which the Contractor shall prepare a brief report indicating on a layout plan the condition of trees, shrubs and grassed areas immediately adjacent to work sites and adjacent to the assigned storage area and access routes as applicable. This report will be signed by both the Contracting Officer and the Contractor upon mutual agreement as to its accuracy and completeness.

1.1.5 Meetings

The Contractor shall meet with representatives of the Contracting Officer to alter the environmental protection plan as needed for compliance with the environmental pollution control program.

1.1.6 Notification

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with the previously mentioned Federal, State or local laws or regulations, permits, and other elements of the Contractor's environmental protection plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of proposed corrective action and take such action when approved. If the Contractor fails to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or costs or damages allowed to the Contractor for any such suspensions.

1.1.7 Litigation

If work is suspended, delayed, or interrupted due to a court order of competent jurisdiction, the Contracting Officer will determine whether the order is due in any part to the acts or omissions of the Contractor, or subcontractors at any tier, not required by the terms of the contract. If it is determined that the order is not due to Contractor's failing, such suspension, delay, or interruption shall be considered as ordered by the Contracting Officer in the administration of the contract under the contract clause SUSPENSION OF WORK.

1.1.8 Previously Used Equipment

The Contractor shall thoroughly clean all construction equipment previously used at other sites before it is brought into the work areas, ensuring that soil residuals are removed and that egg deposits from plant pests are not present; the Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements.

1.1.9 Payment

No separate payment will be made for work covered under this section; all costs associated with this section shall be included in the contract unit and/or lump sum prices in the Bidding Schedule.

1.2 LAND RESOURCES

The Contractor shall confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, the Contractor shall identify the land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without permission. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. Where such emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, earth or other material displaced into uncleared areas shall be removed.

1.2.1 Work Area Limits

Prior to any construction, the Contractor shall mark the areas that need not be disturbed under this contract. Isolated areas within the general work

area which are to be saved and protected shall also be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, the markers shall be visible. The Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

1.2.2 Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques.

1.2.3 Unprotected Erodible Soils

Earthwork brought to final grade shall be finished as indicated. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Except in cases where the constructed feature obscures borrow areas, quarries, and waste material areas, these areas shall not initially be totally cleared. Clearing of such areas shall progress in reasonably sized increments as needed to use the developed areas as approved by the Contracting Officer.

1.2.4 Disturbed Areas

The Contractor shall effectively prevent erosion and control sedimentation through approved methods including, but not limited to, the following:

- a. Retardation and control of runoff. Runoff from the construction site or from storms shall be controlled, retarded, and diverted to protected drainage courses by means of diversion ditches, benches, berms, and by any measures required by area wide plans under the Clean Water Act.
- b. Erosion and sedimentation control devices. The Contractor shall construct or install temporary and permanent erosion and sedimentation control features as indicated on the drawings. Berms, dikes, drains, sedimentation basins, grassing, and mulching shall be maintained until permanent drainage and erosion control facilities are completed and operative.
- c. Sediment basins. Sediment from construction areas shall be trapped in temporary or permanent sediment basins in accordance with the drawings. The basins shall accommodate the runoff of a local 25 year storm. After each storm, the basins shall be pumped dry and accumulated sediment shall be removed to maintain basin effectiveness. Overflow shall be controlled by paved weirs or by vertical overflow pipes. The collected topsoil sediment shall be reused for fill on the construction site, and/or stockpiled for use at another site. The Contractor shall institute effluent quality monitoring programs as required by State and local environmental agencies.

1.2.5 Contractor Facilities and Work Areas

The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only when approved. Borrow areas shall be managed to minimize erosion and to prevent sediment from entering nearby waters. Spoil areas shall be managed and controlled to limit spoil intrusion into areas designated on the drawings and to prevent erosion of soil or sediment from entering nearby waters. Spoil areas shall be developed in accordance with the grading plan indicated on the drawings. Temporary excavation and embankments for plant and/or work areas shall be controlled to protect adjacent areas from despoilment.

1.3 WATER RESOURCES

The Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation when such application may cause contamination of the fresh water reserve. Monitoring of water areas affected by construction shall be the Contractor's responsibility. All water areas affected by construction activities shall be monitored by the Contractor.

1.3.1 Washing and Curing Water

Waste waters directly derived from construction activities shall not be allowed to enter water areas. Waste waters shall be collected and placed in retention ponds where suspended material can be settled out or the water evaporates to separate pollutants from the water. Analysis shall be performed and results reviewed and approved before water in retention ponds is discharged.

1.3.2 Cofferdam and Diversion Operations

Construction operations for dewatering, removal of cofferdams, tailrace excavation, and tunnel closure shall be controlled at all times to limit the impact of water turbidity on the habitat for wildlife and on water quality for downstream use.

1.3.3 Stream Crossings

Stream crossings shall allow movement of materials or equipment without violating water pollution control standards of the Federal, State or local government.

1.3.4 Fish and Wildlife

The Contractor shall minimize interference with, disturbance to, and damage of fish and wildlife. Species that require specific attention along with measures for their protection shall be listed by the Contractor prior to beginning of construction operations.

1.4 AIR RESOURCES

Equipment operation and activities or processes performed by the Contractor in accomplishing the specified construction shall be in accordance with the

State's rules and all Federal emission and performance laws and standards. Ambient Air Quality Standards set by the Environmental Protection Agency shall be maintained. Monitoring of air quality shall be the Contractor's responsibility. All air areas affected by the construction activities shall be monitored by the Contractor. Monitoring results will be periodically reviewed by the Government to ensure compliance.

1.4.1 Particulates

Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, such as from asphaltic batch plants; shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. The Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

1.4.2 Hydrocarbons and Carbon Monoxide

Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

1.4.3 Odors

Odors shall be controlled at all times for all construction activities, processing and preparation of materials.

1.4.4 Sound Intrusions

The Contractor shall keep construction activities under surveillance and control to minimize environment damage by noise.

1.5 WASTE DISPOSAL

Disposal of wastes shall be as specified below.

1.5.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. The Contractor shall transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. The Contractor shall comply with Federal, State, and local laws and regulations pertaining to the use of landfill areas.

1.5.2 Chemical Wastes

Chemicals shall be dispensed ensuring no spillage to ground or water. Periodic inspections of dispensing areas to identify leakage and initiate corrective action shall be performed and documented. This documentation will be periodically reviewed by the Government. Chemical waste shall be collected in corrosion resistant, compatible containers. Collection drums shall be monitored and removed to a staging or storage area when contents are within 6 inches of the top. Wastes shall be disposed of in accordance with Federal and local laws and regulations.

1.5.3 Hazardous Wastes

The Contractor shall take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing and shall collect waste in suitable containers observing compatibility. The Contractor shall transport hazardous waste off Government property and dispose of it in compliance with Federal and local laws and regulations. Spills of hazardous or toxic materials shall be immediately reported to the Contracting Officer. Cleanup and cleanup costs due to spills shall be the Contractor's responsibility.

1.5.4 Burning

No burning will be allowed.

1.7 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all areas used for construction.

1.8 RESTORATION OF LANDSCAPE DAMAGE

The Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work areas.

1.9 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

1.10 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel shall be trained in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental pollution control.

SECTION 01450

CHEMICAL DATA QUALITY CONTROL
10/97

PART 1 GENERAL

1.1 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.

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 268	Land Disposal Restrictions
49 CFR 172	Hazardous Material Table, Special Provisions, Hazardous Material Communications, Emergency Response Information, and Training Requirements
49 CFR 178	Specifications for Packaging

U.S. ARMY CORPS OF ENGINEER MANUAL (EM)

EM 200-1-1	(1994) Validation of Analytical Chemistry Laboratories
EM 200-1-3	(1994) Requirements for the Preparation of Sampling and Analysis Plans Ch 1
EM 200-1-6	(1997) Chemical Quality Assurance

U.S. ARMY CORPS OF ENGINEERS ENGINEER MANUAL (ER)

ER 1110-1-263	(1996) Data Quality Management for Hazardous, Toxic, Radioactive Waste Remedial Activities
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ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 540/R 94-012	(1994) Contract Laboratory Program National Functional Guidelines for Inorganic Data Review
EPA 540/R 94-013	(1994) Contract Laboratory Program National Functional Guidelines for Organic Data Review
EPA SW-846	(Rev O; updates I, II, IIA, IIB, and III) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II)

U.S. ARMY CORPS OF ENGINEERS (HQ)

USACE HQ SHELL for Analytical Chemistry Requirements,
Interim Policy

U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY (USAEHA)

USAEHA-01 (1993) Sampling Protocol Building Demolition
Debris and Buildings Painted with Lead-Based
Paint

1.2 ACRONYMS

The definition of acronyms used by the Contractor that pertain to chemical data quality control shall be clearly defined for all contract related products and communications.

1.3 MEASUREMENT AND PAYMENT

Separate payment will not be made for providing and maintaining the chemical data quality requirements including the chemical data quality management, chemical data validation, minimum chemical data reporting requirements, and chemical data quality submittal requirements; these costs shall be included in the applicable unit prices or lump sum prices contained in the bidding schedule.

1.4 CHEMISTRY REQUIREMENTS

Chemical Data Quality Control (CDQC) shall be as defined in ER 1110-1-263; this ER, which integrates USACE guidance on the subject, shall be supplemented by EM 200-1-6 for detail technical guidance on CDQC. Tables and charts defining Design Analysis (DA), ROD, and remedial technology specific chemistry shall be according to or consistent with EM 200-1-3.

1.4.1 Site History-Contractor will obtain borrow from offsite source approved by the Contracting Officer.

1.4.2 Data Quality Objectives (DQO)

Sample acquisition, chemical analysis and chemical parameter measurements shall be performed so that the resulting data meet and support data use requirements. The chemical data shall be acquired, documented, verified and reported to ensure that the specified precision, accuracy, representativeness, comparability, completeness and sensitivity requirements are achieved as described in EM 200 1-2.

1.4.3 Sampling, Analysis and Measurement

1.4.3.1 Soil/Sediment and Ground/Surface Water Samples-Not Used

1.4.3.2 Process Solid and Liquid Samples-Not Used

1.4.3.3 Borrow or Fill Material Samples

Borrow or fill material samples shall be collected and analyzed according to the following table or the most recent version of Update III, SW-846:

Analysis	Method
Toxicity Characteristic Leaching Procedure (TCLP)	SW-846 6010
	SW-846 8270
	SW-846 8080
	SW-846 8240
Total Petroleum Hydrocarbons	SW-846 9071

Note: Three representative samples from each borrow source shall be collected and analyzed for the above parameters. Samples shall be taken from borings or excavations at each borrow site under the supervision of the Contracting Officer. One additional sample will be taken from each borrow source when directed by the Contracting Officer as borrow is placed on site.

- 1.4.3.4 Investigation Derived Waste Samples - Not Used
- 1.4.3.5 Manifesting Samples - Not Used
- 1.4.3.6 Process Gas and Particulate Emission Samples - Not Used
- 1.4.3.7 Real-Time Instrumental Measurement Samples - Not Used
- 1.4.3.8 Perimeter Air Monitoring Samples - Not Used
- 1.4.3.9 Compatibility Field Testing for Bulking Operations - Not Used
- 1.4.3.10 Demolition Samples - Not Used
- 1.4.3.11 Field Screening -
- 1.4.3.12 Leachate Sampling

Leachate samples shall be collected and analyzed according to the following table:

Analysis	Method
Total Volatiles	EPA 624
Total Semi-Volatiles	EPA 625
Chlorinated Pesticides/PCBs	EPA 608
Metals	EPA 200.7/245.5
Ammonia	EPA 350.1
BOD	EPA 405.1
TNFR	EPA 160.2
TFR	EPA 160.1
Cyanide	EPA 335.4

Note: During the first two (2) weeks of Initial Leachate System Start-up, four (4) sampling events will occur. Sampling events will then occur on a monthly frequency. Samples shall be taken under the supervision of the Contracting Officer.

1.5 QUALITY ASSURANCE ELEMENTS

The Contractor shall be responsible for the following QA elements necessary to monitor and ensure the quality of chemical data produced.

1.5.1 Laboratory Validation Requirements

The Contractor shall propose the minimum number of laboratories that can attain or have attained U.S. Army Corps of Engineers (USACE) validation in accordance with EM 200-1-1 and consistent with contract required chemical data quality. The Contractor may propose laboratories that shall subsequently be validated by the USACE, or select currently validated USACE laboratories. The Contractor shall identify all proposed project laboratories in the sampling and analysis plan (SAP). If a proposed analytical laboratory cannot meet specified analytical requirements or achieve the required validation, the Contractor shall select another laboratory. If not currently validated, the USACE laboratory validation process requires a nominal 120 day process.

1.5.2 Quality Assurance Sample Collection and Analysis - Not Used

1.5.3 Single or Double Blind Performance Evaluation Samples - Not Used

1.5.4 Review of Primary Laboratory Data

The Contractor shall be responsible for the independent data review of the entire primary data set.

1.5.5 Validation of Data

Data evaluation for this project will be performed by the contractor. Consistent with EPA/540/G-87/003, this Level III data collection will not be accompanied by CLP-type validation normally associated with Level IV data collection activities. The data validation for this project will rather key off of Chapter 2 of EM 200-1-6 (Reference 7.11) dated 10 October 1997. Although the contractor will propose the exact plan for data validation, typical data validation activities would include the following:

- a. Review of chain-of-custody documents to verify sample identities.
- b. Review of sample log-in documents to verify any potential problems with custody seals, container integrity, sample preservation, labeling, etc.
- c. Review of field rinsate blank data to ascertain any potential problems with container contamination, preservative contamination, sampling equipment contamination, or cross contamination between samples during transport.
- d. Review of trip blank data to identify any potential problems with sample container contamination, preservative contamination, laboratory reagent water contamination, or cross contamination between samples during transport.
- e. Review of method blank data to determine the presence of any sources of contamination in the analytical process.
- f. Review the matrix spike (MS) data to evaluate the potential for matrix effects and as a measure of analytical accuracy. MS recoveries will be compared against laboratory acceptance criteria to determine if they are within or outside of warning and control limits for percent recoveries.
- g. Review of matrix spike/matrix spike duplicate (MS/MSD) data to evaluate sample homogeneity and as a measure of analytical precision. MS/MSD data will be compared to laboratory acceptance criteria for the maximum relative percent deviation (RPD).
- h. Review of any blank spike BS data (if available) as a measure of analytical accuracy. BS recoveries will be compared against laboratory acceptance

criteria to determine if they are within or outside of warning and control limits for percent recoveries.

- i. Review of blank spike and blank spike duplicate (BS/BSD) data (if available) as a measure of analytical precision. BS/BSD data will be compared to laboratory acceptance criteria for the maximum RPD.
- j. Review of standard reference material (SRM) or Laboratory Control Sample (LCS) data (if available) as a measure of analytical accuracy. SRM and LCS data will be compared to the certified acceptable ranges of analytical values.
- k. Review of sample and sample duplicate data (if available) as a measure of sample homogeneity and as a measure of analytical precision. Sample and sample duplicate data will be compared against the laboratory acceptance criteria for the maximum RPD.
- l. Review of surrogate recovery data to assess extraction efficiency, effectiveness of sample introduction, and possible loss during cleanup activities. Surrogate recoveries will be compared to laboratory acceptance criteria to determine if they are within or outside of acceptable limits.
- m. Review of sample dates, extraction/digestion dates, and analysis dates to determine if maximum holding times were met or exceeded. The following items would typically not be reviewed under a Level III data validation effort: instrument tunes; standard curves; internal standard recoveries; system performance check compound results; continuing calibration results; interelement correction check results; laboratory notebook pages; calculations, etc.

Contract Laboratory Validation

All sample analyses required for this project shall be performed by a lab which has been validated by the USACE HTRW-CX, Omaha, NE, and by the state, if applicable. Commercial laboratory validation procedures are specified in Appendix C of ER 1110-1-263. The Contract Laboratory will analyze samples from this project only after successful completion of the USACE validation process.

1.6 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Sampling and Analysis Plan; GA.

The SAP including the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP), no later than 14 days after receipt of notice to proceed.

SD-09 Reports

Quality Assurance Sample Collection and Analysis; GA.

The QA Laboratory Advance Notification (QALAN); it shall be provided to the QA laboratory at least 10 business days before the initial shipment of samples.

Chemistry Data Package; GA.

The chemistry data package; it shall be provided as an attachment to the CDFR within 21 days of sampling.

Chemical Data Final Report; GA.

Each report shall be labeled with the contract number, project name and location.

1.7 QUALIFICATIONS

1.7.1 Chemical Quality Control Officer

As a minimum, the Contractor's Chemical Quality Control Officer shall have: a BA or BS degree in Chemistry; 2 years of experience related to investigations, studies, design and remedial actions at HTRW sites; and 1 field season (or one continuous calendar year experience) in calibration and operation of various field monitoring devices as well as standard analytical chemistry methods common for analyzing soil, water, air and other materials for chemical contamination assessment, including hazardous waste manifesting. The Chemical Quality Control Officer shall ensure that all chemistry related objectives including responsibilities for DQO definitions, sampling and analysis, project requirements for data documentation and validation, and final project reports are attained. The Chemical Quality Control officer need not be present onsite during routine sampling, but shall be available for consultation with Government and Contractor personnel.

1.7.2 Project Chemist - Not Used

1.7.3 Environmental Sampler

As a minimum, the Contractor's Environmental Sampler shall have: a degree in Chemistry, Environmental Science, Engineering, Geology, Hydrology, or a related field; 1 year of experience in the development and preparation of SAP and work plans; 1 year of experience in and knowledge of EPA methods for collecting environmental and hazardous waste samples; 1 year of experience in operation of field screening equipment (e.g. PID, FID, infrared spectrometer, immunoassay, etc.); and 1 field season of experience with the particular field screening techniques for use on this project. The Environmental Sampler shall collect all onsite samples and perform all field screening tests. The Environmental Sampler shall review the sampling results, and provide recommendations for the Contractor's sampling program. The Environmental Sampler shall be onsite during all excavation and stockpiling operations involving contaminated soil or soil to be checked for contamination.

1.8 COORDINATION MEETING

After the preconstruction conference, before any sampling or testing, the Contractor and the Contracting Officer will meet at the construction site 1 to discuss the CQC Plan and the SAP. The coordination meeting will be simultaneous to any CQC coordination meeting required in Section 01451 CONTRACTOR QUALITY CONTROL unless otherwise indicated or directed. A list of definable features that involve chemical measurements shall be agreed upon. At a minimum, each matrix (soil, water, air, containerized wastes, radioactive wastes, instrumental chemical parameter measurement, etc.) shall

be a definable work feature. Management of the chemical data quality system including project DQO, project submittals, chemical data documentation, chemical data assessment, required sampling and analysis protocols, and minimum data reporting requirements shall be agreed upon. The meeting will serve to establish an interrelationship between the Contractor's chemical data quality management and Government chemical quality assurance requirements. Minutes of the meeting will be documented by the Government and shall be signed by both the Contractor and the Contracting Officer. The minutes will include any or all unresolved chemical issues along with the conditions for resolution and will become a part of the contract file.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

The Contractor shall be responsible for chemical sample acquisition, sample analysis, and instrumental measurements of chemical parameters and for chemical data quality control. An effective chemical data quality control system shall be established that meets the requirements for the chemical measurement DQO applicable to the project. The system shall cover chemical measurements pertaining to and required for Contractor and subcontractor produced chemical data. The Contractor shall control field screening, sampling, and testing in conjunction with remedial activities to meet all DQO; minimize the amount of excavated material requiring temporary storage; prevent dilution of contaminated soils with clean soils; and ensure completion of work within the required time.

3.2 QUALITY CONTROL PLAN

3.2.1 General

In addition to the quality control requirements specified in Section 01451 CONTRACTOR QUALITY CONTROL, the CQC Plan shall incorporate the qualifications, authority and responsibilities of all chemical quality management and support personnel. Chemical measurements including sampling and/or chemical parameter measurement will not be permitted to begin until after production and acceptance of the CQC Plan, and Government approval of the SAP.

3.2.2 Chemistry Elements of the CQC Plan

To cover contract related chemical measurements by the Contractor and all subcontractors, the CQC Plan shall include the following as a minimum.

3.2.2.1 Qualifications

Names, education, experience qualifications, authorities, and decision-making responsibilities of all chemical quality management and support personnel. The CQC Plan shall contain a copy of a letter from the project QC manager designating and authorizing a Chemical Quality Control Officer and chemical quality control organization staff.

3.2.2.2 Authority and Responsibility

A diagram, flow chart, or figure clearly depicting the chemical data quality management and support staff and the authority and responsibility of each for chemical sampling and analysis, procedures for corrective actions, deliverables and submittals, deviations and changes, chemical quality documentation, data validation, minimum data reporting requirements, and DQO for chemical parameter measurement by the Contractor and subcontractors. The contents of this section of the CQC Plan shall be included in the applicable "Project Organization" elements of the FSP and the QAPP.

3.3 SAMPLING AND ANALYSIS PLAN

The SAP shall be prepared in accordance with CDQC requirements and EM 200-1-3. The SAP shall be a single document that contains two distinct elements: FSP and QAPP. Sections of the FSP and QAPP shall be cross referenced. The SAP shall confirm the Contractor's understanding of the contract requirements for chemical data quality control, and shall describe procedures for field sampling and sample submittal for analysis, field chemical parameter measurement, data documentation, data assessment and data reporting requirements. The SAP shall delineate the methods the Contractor intends to use to accomplish the chemical quality control items to assure accurate, precise, representative, complete, legally defensible and comparable data. The SAP shall describe all chemical parameter measurements for all matrices for all phases of the remediation contract. As a single interrelated document, the SAP shall be provided to field and laboratory personnel. The Contractor may propose original/innovative approaches to chemical parameter measurements for cost reduction and remediation efficiency by abbreviated sampling, contingency sampling and/or contingency analysis, indicator or tracer analysis, onsite analytical services, equivalency or screening methods. The SAP shall clearly identify the Contractor obtained laboratories. The Contractor shall furnish copies of the Government approved SAP to all laboratories and the Contractor's field sampling crew. The SAP shall address all levels of the investigation with enough detail to become a document, which may be used as an audit guide for field and laboratory work.

3.3.1 Field Sampling Plan

The FSP shall contain necessary technical detail and direction for the field personnel to understand sampling and field measurement requirements. The FSP shall provide a comprehensive description and full detail for personnel to perform all onsite activities required to attain project DQO, including: locations of samples, sampling procedures for onsite and offsite chemical analysis, summaries of analyses to be performed on samples, shipment of samples for offsite analyses, performance of onsite and offsite instrumental parameter measurements, data documentation and reporting requirements.

3.3.2 Quality Assurance Project Plan

The QAPP shall contain necessary technical detail and direction for field and laboratory personnel to understand project sample analysis, quality control and data reporting requirements, analytical methods, required quantification limits, QC requirements, and data validation and reporting requirements.

3.4 CHEMISTRY DATA PACKAGE

The chemistry data package shall be produced and provided through USACE CO as an attachment to the CDFR. The chemistry data package shall contain information to demonstrate that the project's DQO have been fulfilled. The QA function will compare QA sample results to corresponding primary sample results, will assess the Contractor's compliance with the SAP, and will recommend corrective action as necessary.

3.5 CONTROL OF CHEMICAL DATA QUALITY

Contractor chemical data quality control shall ensure that a quality control program is in place that assures sampling and analytical activities and the resulting chemical parameter measurement data comply with the DQO and the requirements of the SAP. The Contractor shall utilize the three-phase control system that includes a preparatory, initial and follow-up phase for each definable feature of work. The Contractor's three-phase chemical data control process shall ensure that data reporting requirements are achieved and shall be implemented according to Section 01451 CONTRACTOR QUALITY CONTROL. The three-phase chemical data control process shall be combined with that under Section 01451 CONTRACTOR QUALITY CONTROL.

3.6 ANALYTICAL TESTING LABORATORIES

The Contractor shall propose the analytical laboratories to be used for the primary samples analyses. Laboratory validation requirements shall be in accordance with paragraph LABORATORY VALIDATION REQUIREMENTS. The Contractor may utilize its own laboratory or utilize subcontract laboratories to achieve the primary required sample analyses.

3.6.1 Laboratory Analytical Requirements

The Contractor shall provide the specified chemical analyses by the Contractor's laboratory. The Contractor shall provide chemical analyses to achieve the project DQO for all parameters specified by the methods. To give the USACE programs the greatest flexibility in the execution of its projects, the EPA SW-846 methods are generally the methods employed for the analytical testing of environmental samples. These methods are flexible and shall be adapted to individual project-specific requirements.

3.6.2 Laboratory Performance

The Contractor shall provide continued acceptable analytical performance and shall establish a procedure to address data deficiencies noted by review and/or quality assurance sample results. The Contractor shall provide and implement a mechanism for providing analytical labs with the SAP or QAPP portion of the SAP, for monitoring the lab's performance and for performing corrective action procedures. The Contractor shall acquire analytical services with additional State of Massachusetts validated laboratories in the event a project lab loses its validation status during the project.

3.7 CHEMICAL DATA FINAL REPORT

The CDFR shall be produced including a summary of quality control practices employed and all chemical parameter measurement activities after project completion. As a minimum, the CDFR shall contain the following:

- a. Summary of project scope and description.
- b. Summary of any deviations from the design chemical parameter measurement specifications.
- c. Summary of chemical parameter measurements performed as contingent measurements.
- d. Summary discussion of resulting data including achieving data reporting requirements.
- e. Summary of achieving project specific DQO.
- f. Presentation and evaluation of the data to include an overall assessment on the quality of the data for each method and matrix.
- g. Internal QC data generated during the project, including tabular summaries correlating sample identifiers with all blank, matrix spikes, surrogates, duplicates, laboratory control samples, and batch identifiers.
- h. A list of the affected sample results for each analyte (indexed by method and matrix) including the appropriate data qualifier flag (J, B, R, etc.), where sample results are negatively impacted by adverse quality control criteria.
- i. Summary of field and laboratory oversight activities, providing a discussion of the reliability of the data, QC problems encountered, and a summary of the evaluation of data quality for each analysis and matrix as indicated by the laboratory QC data and any other relevant findings.
- j. Conclusions and recommendations.
- k. Appendices containing: (1) Chemistry data package, and (2) Results of the Chemical Quality Assurance Report (CQAR). The CQAR is a Government produced document achieved through the inspection and analysis of QA samples and corresponding project sample data. The CQAR will include review of all QC parameters such as holding times, detection limits, method blanks, surrogate recoveries, matrix spikes and duplicates, and inter-laboratory and intra-laboratory data comparisons.
- l. Conformance to USACE HQ SHELL requirements.

3.8 DOCUMENTATION

Documentation records shall be provided as factual evidence that required chemical data has been produced and chemical data quality has been achieved. The documentation shall comply with the requirements specified in paragraphs SAMPLING AND ANALYSIS PLAN, CHEMISTRY DATA PACKAGE, and CHEMICAL DATA FINAL REPORT. Documentation requirements shall be in accordance with Section 01240 COST AND PERFORMANCE REPORT.

3.9 NOTIFICATION OF NON-COMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice.

SECTION 01451

CONTRACTOR QUALITY CONTROL
04/97

PART 1 GENERAL

1.1 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740 (1996) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

ASTM E 329 (1995b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction". The quality control system shall consist of plans, procedures, and organization necessary to produce an end product, which complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with quality requirements specified in the contract. The project superintendent in this context shall mean the individual with the responsibility for the overall management of the project including quality and production.

3.2 QUALITY CONTROL PLAN

3.2.1 General

The Contractor shall furnish for review by the Government, not later than 30 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Government will consider an interim plan for the first 60 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.2 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

- a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.
- b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.
- c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.
- d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330 SUBMITTAL PROCEDURES.
- e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer).
- f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

- g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.
- h. Reporting procedures, including proposed reporting formats.
- i. A list of the definable features of work. A definable feature of work is a task, which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.4 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 14 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures, which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 General

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure contract compliance at a minimum EM-200-1-6 shall be followed. The Contractor shall provide a CQC organization which shall be at the site at all times during progress of the work and with complete authority to take any action necessary to ensure compliance with the contract. All CQC staff members shall be subject to acceptance by the Contracting Officer.

3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a construction person with a minimum of 2 years in related work. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be assigned no other duties. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: electrical, civil, structural, environmental, submittals clerk. These individuals may be employees of the prime or subcontractor; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan.

Experience Matrix

	Area	Qualifications
a.	Civil	Graduate Civil Engineer with 2 years experience in the type of work being performed on this project or technician with 5 yrs related experience
b.	Mechanical	Graduate Mechanical Engineer with 2 yrs experience or person with 5 yrs related experience
c.	Electrical	Graduate Electrical Engineer with 2 yrs

- d. Structural related experience or person with 5 yrs related experience
- e. Architectural Graduate Structural Engineer with 2 yrs experience or person with 5 yrs related experience
- f. Environmental Graduate Architect with 2 yrs experience or person with 5 yrs related experience
- g. Submittals Graduate Environmental Engineer with 3 yrs experience
- h. Occupied family housing Submittal Clerk with 1 yrs experience
- i. Concrete, Pavements and Soils Person, customer relations type, coordinator experience
- Materials Technician with 2 yrs experience for the appropriate area

3.4.4 Additional Requirement

3.4.5 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS

Submittals shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

- a. A review of each paragraph of applicable specifications.

- b. A review of the contract drawings.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- j. Discussion of the initial control phase.
- k. The Government shall be notified at least 72 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

- a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- d. Resolve all differences.

- e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
- f. The Government shall be notified at least 72 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
- g. The initial phase should be repeated for each new crew to work onsite; or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, onsite production supervision or work crew, if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

- e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.7.2.2 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge of 1500.00 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials shall be borne by the Contractor. Coordination for each specific test, exact delivery location, and data will be made through the area office.

Coordination for each specific test, exact delivery location, and dates will be made through the Area Office.

3.8 COMPLETION INSPECTION

3.8.1 Punch-Out Inspection

Near the completion of all work or any increment thereof established by a completion time stated in the Special Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a punch list of items which do not conform to the approved

drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2 Pre-Final Inspection

The Government will perform this inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government so that a Final inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at this inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notice shall be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

- d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals reviewed, with contract reference, by whom, and action taken.
- g. Off-site surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- i. Instructions given/received and conflicts in plans and/or specifications.
- j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 SAMPLE FORMS

Sample forms enclosed at the end of this section.

3.11 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES 02/97

1.1 GENERAL REQUIREMENTS

1.1.1 Site Plan

The Contractor shall prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Any areas which may have to be graveled to prevent the tracking of mud shall also be identified. The Contractor shall also indicate if the use of a supplemental or other staging area is desired.

1.1.2 Identification of Employees

The Contractor shall be responsible for furnishing to each employee, and for requiring each employee engaged on the work to display, identification as approved and directed by the Contracting Officer. Prescribed identification shall immediately be delivered to the Contracting Officer for cancellation upon release of any employee. When required, the Contractor shall obtain and provide fingerprints of persons employed on the project. Contractor and subcontractor personnel shall wear identifying markings on hard hats clearly identifying the company for whom the employee works.

1.1.3 Employee Parking

Contractor employees shall park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable walking distance of the construction site. Contractor employee parking shall not interfere with existing and established parking requirements of the military installation.

1.2 AVAILABILITY AND USE OF UTILITY SERVICES

1.2.1 Payment for Utility Services

The Government will make all reasonably required utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the Government or, where the utility is produced by the Government, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.

1.2.2 Meters and Temporary Connections

The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall provide and maintain necessary temporary connections, distribution lines, and meter bases required to measure the amount of each utility used for the purpose of determining charges. The Contractor shall notify the Contracting Officer, in writing, 5 working days

before final electrical connection is desired so that a utilities contract can be established. The Government will provide a meter and make the final hot connection after inspection and approval of the Contractor's temporary wiring installation. The Contractor shall not make the final electrical connection.

1.2.3 Advance Deposit

An advance deposit for utilities consisting of an estimated month's usage or a minimum of \$50.00 will be required. The last monthly bills for the fiscal year will normally be offset by the deposit and adjustments will be billed or returned as appropriate. Services to be rendered for the next fiscal year, beginning 1 October, will require a new deposit. Notification of the due date for this deposit will be mailed to the Contractor prior to the end of the current fiscal year.

1.2.4 Final Meter Reading

Before completion of the work and final acceptance of the work by the Government, the Contractor shall notify the Contracting Officer, in writing, 5 working days before termination is desired. The Government will take a final meter reading, disconnect service, and remove the meters. The Contractor shall then remove all the temporary distribution lines, meter bases, and associated paraphernalia. The Contractor shall pay all outstanding utility bills before final acceptance of the work by the Government.

1.2.5 Sanitation

The Contractor shall provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel.

1.2.6 Telephone

The Contractor shall make arrangements and pay all costs for telephone facilities desired.

1.3 BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.3.1 Bulletin Board

Immediately upon beginning of work, the Contractor shall provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. The bulletin board shall be located at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer. Legible copies of the aforementioned data shall be displayed until work is completed. Upon completion of work the bulletin board shall be removed by and remain the property of the Contractor.

1.3.2 Project and Safety Signs

The requirements for the signs, their content, and location shall be as shown on the drawings. The signs shall be erected within 15 days after receipt of the notice to proceed. The data required by the safety sign shall be corrected daily, with light colored metallic or non-metallic numerals. Upon completion of the project, the signs shall be removed from the site.

1.4 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction the Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The Contractor shall maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

1.4.1 Haul Roads

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract, within the project work limits. Haul roads shall be constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided. The Contractor shall provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Lighting shall be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations. Upon completion of the work, haul roads designated by the Contracting Officer shall be removed.

1.4.2 Barricades

The Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.5 CONTRACTOR'S TEMPORARY FACILITIES

1.5.1 Administrative Field Offices

The Contractor shall provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

1.5.2 Storage Area

The Contractor shall construct a temporary 6 foot high chain link fence around trailers and materials. The fence shall include plastic strip inserts, colored green, so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Trailers, materials, or equipment shall not be placed or stored outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the military boundaries. Trailers, equipment, or materials shall not be open to public view with the exception of those items which are in support of ongoing work on any given day. Materials shall not be stockpiled outside the fence in preparation for the next day's work. Mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment, shall be parked within the fenced area at the end of each work day.

1.5.3 Supplemental Storage Area

Upon Contractor's request, the Contracting Officer will designate another or supplemental area for the Contractor's use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but shall be within the military boundaries. Fencing of materials or equipment will not be required at this site; however, the Contractor shall be responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area. Utilities will not be provided to this area by the Government.

1.5.4 Appearance of Trailers

Trailers utilized by the Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on the military property.

1.5.5 Maintenance of Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the Contractor elect to traverse, with construction equipment or other vehicles, grassed or unpaved areas which are not established roadways, such areas shall be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways; gravel gradation shall be at the Contractor's discretion. Grass located within the boundaries of the construction site shall be mowed for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers shall be edged or trimmed neatly.

1.5.6 New Building-Not Used

1.5.7 Security Provisions

Adequate outside security lighting shall be provided at the Contractor's temporary facilities. The Contractor shall be responsible for the security of its own equipment; in addition, the Contractor shall notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

1.6 PLANT COMMUNICATION-NOT USED

1.7 TEMPORARY PROJECT SAFETY FENCING

The Contractor shall furnish and erect temporary project safety fencing at the work site. The safety fencing shall be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 42 inches high, supported and tightly secured to steel posts located on maximum 10 foot centers, constructed at the approved location. The safety fencing shall be maintained by the Contractor during the life of the contract and, upon completion and acceptance of the work, shall become the property of the Contractor and shall be removed from the work site.

1.8 CLEANUP

Construction debris, waste materials, packaging material and the like shall be removed from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways shall be cleaned away. Stored material not in trailers, whether new or salvaged, shall be neatly stacked when stored.

1.9 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and will become the property of the Contractor. Areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition. Gravel used to traverse grassed areas shall be removed and the area restored to its original condition, including top soil and seeding as necessary.

2.0 TEMPORARY STANDBY GENERATOR

The contractor is to provide a temporary standby generator for automatic operation of the pump station in the event of a power failure. The temporary power shall be removed following capping of the consolidation landfill and final project acceptance

Contractor shall be responsible for hook-up details, fuel, and continued operation in the event of power failure.

SECTION 02120

LOADING, TRANSPORTATION AND DISPOSAL OF DEBRIS MATERIALS
10/96

PART 1 GENERAL

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.

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
49 CFR 173	Shippers - General Requirements for Shipments and Packaging

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-1 Data

Debris Management; GA.

Prior to start of work, a plan detailing the manner in which debris shall be loaded, managed, and hauled to the consolidation landfill.

SD-09 Reports

Spill Response; FIO.

In the event of a spill or release of a debris (as designated, or pollutant or contaminant, or oil (as governed by the Oil Pollution Act (OPA), 33 U.S.C. 2701 et seq.), the Contractor shall notify the Contracting Officer immediately. If the spill exceeds a reporting threshold, the Contractor shall follow the pre-established procedures for immediate reporting to the Contracting Officer.

SD-18 Records

Notices of Non-Compliance and Notices of Violation; FIO.

Notices of non-compliance or notices of violation by a Federal, state, or local regulatory agency issued to the Contractor in relation to any work performed under this contract. The Contractor shall immediately provide copies of such notices to the Contracting Officer. The Contractor shall also furnish all relevant documents regarding the incident and any information requested by the Contracting Officer, and shall coordinate its response to the notice with the Contracting Officer or his designated representative prior to submission to the notifying authority. The

Contractor shall also furnish a copy to the Contracting Officer of all documents submitted to the regulatory authority, including the final reply to the notice, and all other materials, until the matter is resolved.

SD20 - Scale Facility

Contractor shall provide intended scale to weigh debris for payment purposes. Scale shall be certified to be accurate to the nearest .1 tons.

1.3 QUALIFICATIONS

1.3.1 Transportation and Disposal Coordinator

The Contractor shall designate, by position and title, one person to act as the Transportation and Disposal Coordinator (TDC) for this contract. The TDC shall serve as the single point of contact for all environmental regulatory matters and shall have overall responsibility for total environmental compliance at the site including but not limited to accurate record keeping of daily waste haul loads from each debris site.

1.3.2 Training

The Contractor's hazardous materials employees shall be trained, tested, and certified to safely and effectively carry out their assigned duties in accordance with Section 01350 SAFETY, HEALTH, AND EMERGENCY RESPONSE (HTRW/UST). The Contractor's employees transporting hazardous materials or preparing hazardous materials for transportation shall be trained, tested, and certified in accordance with 49 CFR 172.

1.3.3 Certification-Not Used

1.4 LAWS AND REGULATIONS REQUIREMENTS

Work shall meet or exceed the minimum requirements established by Federal, state, and local laws and regulations, which are applicable. These requirements are amended frequently and the Contractor shall be responsible for complying with amendments as they become effective. In the event that compliance exceeds the scope of work or conflicts with specific requirements of the contract, the Contractor shall notify the Contracting Officer immediately.

1.5 DEFINITIONS - Not Used

1.6 DISPOSAL

Contractor is to load and haul debris from six (6) of the landfills identified on the Contract Drawings to the consolidation landfill after acceptance by the Contracting Officer. Results of Test Pitting Investigation and analytical description of the debris disposal pit sites is included in Appendix A to the specifications. A summary description of the disposal areas is provided below:

- * AOC9, the North Post Landfill, is located on the former North Post, west of the wastewater treatment plant. It is known informally as the old "stump dump" or "wood dump."

The landfill was operated from the late 1950s until 1978 and was used by the Army, National Guard, contractors, and off-post personnel. Landfill material at AOC 9 is generally demolition debris, including wood, concrete, asphalt, metal, brick, glass, and tree stumps. Debris volume is estimated to be approximately 121,000 cy. Because of the extent of the partially vegetated cover, the area is generally not recognizable as a former landfill.

- AOC11, the Lovell Road Debris Disposal Area, also referred to as AOC 11, is a two-acre landfill that received wood-frame hospital demolition debris from 1975 to 1980.

Debris volume is estimated to be approximately 28,000 cy. The landfill is within a wetlands complex that runs along the western side of the Nashua River. East of the landfill, a 40-ft wide soil berm separates the landfill from the Nashua River. Refuse, including large pieces of metal, wood, bricks, and other construction debris is exposed at the ground surface throughout the site, except where an access road has been constructed over the fill. The landfill area is vegetated and is bordered on the north and south by wetlands.

- SA12, about one-half acre in size, is located on a steep, wooded slope adjacent to the Nashua River floodplain and partially encroaching on wetlands on the South Post. The landfill is located across Dixie Road from B and P Ranges. SA 12 was used by the Army beginning in 1960, was still in use in 1982, and appeared in 1988 to have been inactive for several years. The debris came from construction and range operations.

Debris at SA12 consist mostly of lumber, sheet metal, concrete, and leaves mixed with soil. Debris volume is estimated to be approximately 4,200 cy.

- SA13, The Lake George Street Landfill, also referred to as SA13, was used between 1965 and 1990 for disposal of construction debris, stumps, and brush. Debris volume is estimated to be approximately 4,500 cy. The landfill is less than one acre in size and is located on the west side of Lake George Street near Hattonsville Road on the former Main Post.

In 1989, recently disposed stumps, branches, steel fencing, plumbing fixtures and pipes were removed from the site. The landfill is currently closed to debris disposal.

- SA13 is surrounded by large trees, but no trees are growing on the landfill itself. Tree stumps, limbs, and trunks have been deposited on the surface of the landfill and down the steep lower slope. A wetland is located at the base of this slope.
- AOC40 occupies approximately four acres along the edge of Patton Road in the southeastern part of the former Main Post. It extends for approximately 800 ft along Patton Road and out into the former wetland along Cold Spring Brook, now mostly submerged beneath Cold Spring Brook Pond. The upper surface of the landfill slopes gently toward the north and east. The surface is densely covered with small trees and scrub, the trees being predominantly pines.

Debris in the landfill is mostly wood, concrete, asphalt, metal, brick, wire, ash, stumps, and logs. Debris volume is estimated at approximately 118,000 cy.

- AOC41 is located on the former South Post of Fort Devens, approximately 0.5 mile west of the Still River Gate, on the north shore of New Cranberry Pond. The landfill, less than one-quarter acre in size, was used up to the 1950s for disposal of nonexplosive military and household debris. The site is overgrown with trees and brush.

Debris at AOC41 includes beverage cans, bottles, and miscellaneous debris. Debris volume is estimated to be approximately 600 cy.

PART 2 PRODUCTS

2.1 MATERIALS

The Contractor shall provide all of the materials required for the transportation and packaging of loading of debris wastes in conformance with Department of Transportation standards. Details in this specification shall not be construed as establishing the limits of the Contractor's responsibility.

2.1.1 Spill Response Materials

The Contractor shall provide spill response materials including, but not limited to, containers, adsorbent, shovels, and personal protective equipment. Spill response materials shall be available at all times in which wastes are being handled or transported.

2.2 EQUIPMENT AND TOOLS

The Contractor shall provide miscellaneous equipment and tools necessary to handle debris materials in a safe and environmentally sound manner.

PART 3 EXECUTION

3.1 ON-SITE DEBRIS MANAGEMENT

These paragraphs apply to Government owned waste only. Contractors are prohibited by 10 U.S.C. 2692 from storing contractor owned waste on site for any length of time. The Contractor shall be responsible for ensuring compliance with all Federal, state, and local waste laws and regulations and shall verify those requirements when preparing reports, waste shipment records, or other documents. The Contractor shall only use trucks in good condition and compatible with state transportation regulations for hauling. The Contractor shall be responsible for ensuring trucks are covered except when adding or removing waste. The Contractor shall be responsible for inspecting roadways for signs of deterioration and shall be responsible for any spills or damage from hauling. The Contractor shall inspect all haul roadways daily and shall provide written documentation of the inspection. Inspection logs will contain date and time of inspection, name of individual conducting the inspection, problems noted, and corrective actions taken.

3.1.2 Management Plan

The Contractor shall prepare a plan detailing the manner in which debris shall be managed. The plan shall identify the method of loading, hauling, and placement of debris.

3.2 LOADING AND DEBRIS DISPOSAL

Contractor shall load debris from disposal areas that have been stockpiled by the Government at each of the sites. Contractor is required to visit each debris disposal site at the bid walkthrough to become aware of site constraints and hauling/loading restrictions. Others shall stockpile debris for loading by Contractor in areas as identified at the Prebid meeting. Contractor shall provide a schedule indicating anticipated loading rates at each disposal area and schedule for completion of removal of debris from each area. A minimum 7500 cubic yards of solid waste debris will be available for the contractor to load and haul on a weekly basis. The 7500 cy may be available from one or more of the six sites.

Stockpile shall be within 1000 ft. of the debris disposal areas.

Contractor shall clean stockpile area of all debris, subgrade damage from hauling, and loading shall be restored to a level clean area.

3.3 SPILL RESPONSE

The Contractor shall respond to any spill of debris which is in the custody or care of the Contractor pursuant to this contract. Any direction from the Contracting Officer concerning a spill or release shall not be considered a change under the contract. The Contractor shall comply with all applicable requirements of Federal, state, or local laws or regulations regarding any spill incident.

3.4 DEBRIS PLACEMENT

Disposal debris from Study Areas and Areas of Concern are to be placed in accordance with the Operations Plan shown on the Contract Drawings. Contractor shall grade the debris to promote runoff off from the landfill cell and minimize leachate collected in the drainage layer. Ponding of runoff in the debris placed in the consolidation landfill will not be permitted. Contractor shall pump stormwater from the temporary diversion berms into the adjacent perimeter runoff channel immediately following or during storm events as needed to prevent overflow into the operational area. Runoff from an operational area or filled area into a non-operational phase is permitted if graded to inhibit leachate infiltration. Changes to the plan requested by the Contractor shall be approved by the Contracting Officer in writing.

Debris shall be placed to prevent damage to the drainage layer and leachate collection system. The initial 4-ft lift shall not contain any items that may penetrate or damage the collection and liner system and shall be back dumped and graded with a dozer. Access to the working face shall be made with a 4-ft minimum layer of debris.

Contractor shall submit his operational filling and access plan to the Contracting Officer for approval for all disposal activities. Debris placed in the consolidation landfill shall be spread and compacted with sheeps

foot roller waste compaction equipment a minimum of 4 passes. Lift thickness shall not exceed 2-ft, except the initial 4 ft lift.

Contractor shall be responsible for removing stormwater behind the temporary stormwater diversion berms during operations and construction. Stormwater shall be pumped to adjacent ditches. Contractor shall remove temporary stormwater diversion berms immediately prior to placement of debris in upgradient filling sequence. UV resistant polyethylene temporary plastic (12 MIL minimum) plastic sheeting shall be deployed by contractor as indicated on the contract drawings.

3.5 LANDFILL OPERATIONS

The contractor shall be responsible for the sampling of the leachate management system as described in Section 01450 CHEMICAL DATA QUALITY CONTROL. Contractor shall submit analytical laboratory results and quality control information to the Contracting Officer. Samples shall be taken from the wet well of the leachate pumping station.

1.3 EQUIPMENT

Equipment and compaction procedures will be approved by the Contracting Officer. The Contractor shall obtain written approval from the geosynthetic manufacturers for soil placement equipment and compaction procedures proposed for use above any geosynthetic layer.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted according to Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Finished Grades; GA.

Cross-sections of finished grades.

SD-08 Statements

Equipment; GA.

Documentation on equipment to be used including operating speeds, traffic patterns, number of passes, and sequence of operations. Geosynthetic manufacturer's equipment approval statements shall also be included.

SD-09 Reports

Classification Determinations; GA.

Borrow soil classification test results.

Moisture Content; GA.

Results of moisture content testing on borrow material.

Select Fill Compaction Testing; GA.

Moisture-density test results on borrow material.

In-Place Classification Tests; GA.

In-place soil classification test results.

In-Place Moisture and Density Tests; GA.

In-place moisture-density test results.

SD-13 Certificates

Procurement of Borrow Material; GA.

The location, plan view and estimated available quantity, locations and logs of subsurface explorations, and laboratory test results for each select fill and topsoil borrow source.

Procurement of Borrow Materials; F10.

Federal, State, and local permits required for the excavation and reclamation of all borrow sources.

PART 2 PRODUCTS

2.1 SUITABLE SELECT FILL MATERIALS

Suitable select fill materials shall consist of soils classified in Section 02300 EARTHWORK for Protective Layer and Vegetative Support Layer. The material, used in the protective layer shall have 100 percent of the material by weight passing the 2 inch sieve. Suitable select fill shall be free of chemical contamination, as specified in Section 01450 CHEMICAL DATA QUALITY CONTROL.

2.2 UNSUITABLE SELECT FILL MATERIALS

Unsuitable select fill materials include all materials that contain debris, roots, brush, sod, organic or frozen materials, and materials classified in accordance with ASTM D 2487 not included in paragraph SUITABLE SELECT FILL MATERIALS definition above.

2.3 SUITABLE TOPSOIL

Suitable topsoil is defined as selectively excavated, natural, friable soil that is representative of soils in the vicinity which produce heavy growths of crops, grass, or other vegetation and is reasonably free from underlying subsoil, clay lumps, objectionable weeds, litter, brush, matted roots, toxic substances, or any material that might be harmful to plant growth or be a hindrance to grading, planting, or maintenance operations. Soils from ditch bottoms, drained ponds, or eroded areas, handled when too wet or soggy are not acceptable. Topsoil shall not contain more than 5 percent by volume of stones, stumps, or other objects larger than 1 inch in any dimension. Topsoil shall have a pH value of between 6.0 and 7.5. If the pH is not within the 6.0 to 7.5 range, the Contractor shall add the material required to achieve that pH balance. Topsoil shall contain from 5 to 20 percent organic matter as determined by the organic carbon 6A chemical analysis method described in USDA-01. Topsoil shall be free from chemical contamination as specified in Section 01450 CHEMICAL DATA QUALITY CONTROL. Topsoil shall be approved by the Contracting Officer. See Section 02921 SEEDING for additional requirements.

2.4 PROCUREMENT OF BORROW MATERIAL

The Contractor shall procure required select fill borrow and topsoil borrow materials from outside the limits of Government-controlled land, shall obtain from the owners the right to procure materials, shall pay all royalties and other charges involved, and shall bear the expenses of developing the sources, including rights-of-way for hauling. No select fill borrow or topsoil borrow materials shall be obtained within the limits of the project site. The Contractor shall comply with all Federal, State, and local requirements for the excavation and reclamation of all borrow sources.

PART 3 EXECUTION

3.1 PLACEMENT OF SELECT FILL AND TOPSOIL

3.1.1 General Requirements

Before placement of select fill over geosynthetic material, the geosynthetic material shall be inspected and approved by the Contractor's quality control supervisor and Resident Engineer. The select fill and topsoil shall be placed at the locations and to the lines and grades shown on the drawings.

3.1.2 Backfilling Around Piping

Piping, such as methane gas collection pipelines or groundwater monitoring wells, within the limits of the select fill shall be protected from damage during backfilling, and if damaged during any construction activity, shall be repaired.

3.1.3 Select Fill Placement and Compaction

No soil placement equipment shall be pulled or driven directly on the geosynthetic material. Soil placement equipment will be allowed on areas underlain by the geosynthetic material only after the first lift of fill has been placed. The first lift of select fill material shall be a 12 inch lift each subsequent lift shall be placed in a minimum of 8 inch and a maximum of 12 inch loose thickness. The allowable moisture content range of the select fill shall be the optimum moisture content, determined in accordance with ASTM D 698, plus or minus 2 percent. Select fill shall be placed by starting at the toe of the slope and working up the slope. Select fill shall not be dumped or dropped directly onto the geosynthetic material from a height greater than 3 feet. Placement equipment shall have low ground pressures not exceeding 5 psi for the first lift. Select fill shall not be stockpiled on the geosynthetic material. Placement equipment shall not cause excessive rutting of lifts nor cause geosynthetic materials to fold over on themselves. Select fill is not subject to specific density requirements for the first lift. A minimum allowable density of 80 percent of maximum dry density based on ASTM D 1557 shall be obtained for subsequent lifts. Any damage to the geosynthetic material caused by the Contractor's placement operation shall be repaired. Select fill shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading. The surface of the select fill shall not be scarified. The finished grade of the select fill shall meet the finish surface requirements specified in the paragraph FINISHED GRADES.

3.1.4 Topsoil Placement

Topsoil shall be uniformly distributed on the designated areas and evenly spread to a thickness of 6 inches. Spreading shall be performed to allow planting to proceed with little additional soil preparation or tillage. The surface resulting from topsoiling shall meet the finish surface requirements in paragraph FINISHED GRADES. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading or the proposed planting. Previously constructed select fill grades shall be repaired, if necessary, so that the areas to be topsoiled conform to the cross-sections indicated on the drawings. Compaction of topsoil requires at least 1 complete coverage by spreading equipment after placement.

3.2 TESTS AND CONTROL

3.2.1 Sampling and Testing

Quality control sampling and testing shall be performed according to SPECIAL CONTRACT REQUIREMENTS and as specified herein.

3.2.2 Testing Prior to Construction

Test results shall be approved prior to placement of select fill material.

3.2.2.1 Chemical Testing for Borrow

Off-site select fill borrow material and topsoil borrow material shall be sampled and analyzed for chemical contamination before use, as specified in Section 01450 CHEMICAL DATA QUALITY CONTROL. If borrow material does not meet the criteria as specified, borrow material from another source that meets the criteria shall be acquired. No additional sampling and analysis of on-site borrow material for chemical contamination is required.

3.2.2.2 Classification Determinations

A soils classification in accordance with ASTM D 2487 shall be performed on representative samples of select fill for each principal type of material or combination of materials encountered or used. The testing shall include Atterberg limits and grain size determination (sieve and hydrometer analyses). Tests shall be in accordance with ASTM D 4318, ASTM D 422, and ASTM D 1140 respectively. Classification testing shall be done at a rate of 1 test per 5000 cubic yards of borrow material.

3.2.2.3 Moisture Content

Moisture content testing, according to ASTM D 2216, shall be performed at frequency of once per 2000 cubic yards of borrow.

3.2.2.4 Select Fill Compaction Testing

The Contractor shall perform and submit laboratory moisture-density test results based on ASTM D 1557. At a minimum, 1 moisture-density test shall be performed on a representative sample of each principal type or combination of borrow materials.

3.2.2.5 Test Section-Not Used

3.2.3 Test During Construction

3.2.3.1 In-Place Classification Tests

One set of classification tests (ASTM D 422, ASTM D 1140, and ASTM D 4318) shall be performed per lift, per 5 acres of select fill placed.

3.2.3.2 In-Place Moisture and Density Tests

A minimum of 5 density and 5 moisture content tests shall be performed per lift. Rapid ASTM D 2922, ASTM D 3017, or methods may be used to perform moisture and density tests. However, at least 1 density test per lift, per

5 acres must be performed using ASTM D 1556 or ASTM D 2167 and at least 1 moisture content test per lift, per 5 acres must be performed using ASTM D 2216.

3.3 FINISHED GRADES

All areas, including filled sections and adjacent transition areas, shall be uniformly smooth graded. The completed surface shall be reasonably smooth, and free from irregular surface changes. The degree of finish shall be that ordinarily obtained from a blade-grader or scraper operation, except as otherwise specified. The completed surface shall be not more than 0.15 foot above or below the established grade or approved cross-section and shall be free of depressed areas where water would pond. All areas shall be graded to drain readily.

3.4 COVER PROTECTION

Where ruts occur in the cover, the cover shall be brought to grade, reshaped if required, and re-compacted prior to the placing of additional fill. Storage or stockpiling of material on the cover will not be permitted.

SECTION 02273

Geocomposite
11/96

The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 413	(1998) Rubber Property - Adhesion to Flexible Substrate
ASTM D 1238	(1998) Flow Rates of Thermoplastics by Extrusion Plastometer
ASTM D 1505	(1998) Density of Plastics by the Density-Gradient Technique
ASTM D 4218	(1996) Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
ASTM D 4716	(1995) Constant Head Hydraulic Transmissivity (In-Plane Flow) of Geotextiles and Geotextile Related Products
ASTM D 5035	(1998) Breaking Strength and Elongation of Textile Fabrics (Strip Method)
ASTM D 5321	(1992) Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method

GEOSYNTHETICS RESEARCH INSTITUTE (GRI)

GRI Test Meth GS 4	(1987) Time Dependent (Creep) Deformation Under Normal Pressure
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1.2 MEASUREMENT AND PAYMENT - Not Used

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Bond Properties; GA.

Manufacturer's certified data sheets for bond adhesion.

SD-06 Instructions

Sampling and Testing; GA.

Manufacturer's quality control (QC) manual.

SD-09 Reports

Interface Friction Testing; GA.

Certified laboratory interface friction test results including description of equipment and test method.

Geonet; F10.

Manufacturer's certified raw and roll material test results. Test results not meeting the requirements in Table 1 will result in rejection of the applicable rolls. Certified test results shall be provided 7 days prior to delivery to the site.

SD-14 Samples

Geonet; GA.

One properly identified 24 by 24 inch minimum size geonet sample with any attached geotextiles.

1.4 DELIVERY, STORAGE AND HANDLING

The geonet materials shall be packaged, shipped, stored and handled ensuring that no damage is incurred. Under no circumstances shall the Contractor drag the geonet across a textured geomembrane during placement if a geotextile is attached to the geonet surface facing the geomembrane. Materials shall be delivered only after the required submittals have been received and approved by the Contracting Officer. The Contractor shall be responsible for keeping the geonet free of dirt, dust, mud, or any other foreign materials. Any geonet material found to be damaged shall be replaced with new material. Each roll shall be labelled with the Manufacturer's name, product identification, lot number, roll number, and roll dimensions. Geotextiles, geocomposites, and geonet shall be protected from UV exposure during storage and shall not be exposed more than 7 days when placed on the landfill cell.

PART 2 PRODUCTS

2.1 GEONET

The polymer used to manufacture the geonet shall be nonthermally degraded polyethylene which is clean and free of any foreign contaminants. Re grind material which consists of edge trimmings and other scraps that have never reached the consumer may be used to manufacture the geonet; however, post-consumer recycled materials shall not be used. The manufactured geonet shall conform to the property requirements listed in Table 1 and shall be free of defects including tears, nodules or other manufacturing defects which may affect its serviceability.

TABLE 1 - GEONET PROPERTIES

PROPERTY	TEST METHOD	TEST VALUE
Polymer Density, minimum.	ASTM D 1505	0.930 g/cc
Polymer Melt Index, maximum.	ASTM D 1238	1.1 g/10 min.
Carbon Black Content	ASTM D 4218	2-3 percent.
Tensile Strength, min.	ASTM D 5035	25 lbs/in.
Transmissivity, minimum square - Geocomposite	ASTM D 4716	1X10 ⁻³ meters per second. squared
Creep Strain, max. at psi 174	GRI GS4	33%, 10,000 hrs.

Note: Transmissivity shall be measured using water at 70°F with a gradient of 1.0 under a normal pressure of 15,000 psf. Geotextiles shall be attached to the geonet in the same configuration as will be used in the field for transmissivity testing. The drainage net shall be sandwiched between 8 oz geotextiles on the bottom and 8 ounce on the top. A minimum seating period of 60 minutes shall be used.

2.2 GEOTEXTILE PROPERTIES

The geonet shall be covered on both sides with a geotextile. The geotextile shall comply with requirements specified in Section 02373 SEPARATION/FILTRATION GEOTEXTILE 8 ounce.

2.3 BOND PROPERTIES

A geocomposite shall be created by heat bonding geotextiles to the geonet with ply adhesion meeting the requirements of ASTM D 413. The bond between the geotextile and the geonet shall exhibit a minimum peel strength of 1 lbs/inch.

2.4 SAMPLING AND TESTING

2.4.1 General Requirements

Geonet testing shall be performed by a laboratory approved by the Contracting Officer. The geonet shall be randomly sampled and tested in accordance with the manufacturer's approved QC manual. A minimum of one transmissivity test[s] shall be performed in accordance with the requirements specified in Table 1.

2.4.2 Interface Friction Testing

The Contractor shall perform laboratory interface friction tests on geocomposite/textured liner in accordance with ASTM D 5321. Normal stresses of 1, 2, and 5 psi along with a displacement rate of 0.04 inches/min. shall be used. The composite and adjacent geosynthetics shall be oriented such that the shear force is parallel to the downslope orientation of the composite in the field. Geotextiles shall be attached to the geonet in the same configuration as will be used in the field. The minimum interface friction angle is as specified in Section 02372 WASTE

CONTAINMENT GEOMEMBRANES required between all interface components. These tests shall be performed and the results submitted and approved prior to delivery of any composite material.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Surface Preparation

Prior to placement of the composite, the surface of the geomembrane and cap subgrade shall be cleaned of all soil, rock, and other materials which could damage the geo composite.

3.1.2 Placement

All geocomposites shall be seamed within the benches with contact maintained between the geonets to not impede flow. The Contractor shall deploy the geocomposite ensuring that the geocomposite and underlying materials are not damaged. Faulty or damaged geocomposite shall be replaced or repaired as specified in paragraph REPAIRS. The geocomposite shall be unrolled downslope keeping the net in slight tension to minimize wrinkles and folds. The geocomposite shall be maintained free of dirt, mud, or any other foreign materials at all times during construction. Rolls which are contaminated with these materials shall be cleaned or replaced. Adequate loading (e.g. sandbags) shall be placed to prevent uplift by wind.

3.1.2.1 Overlap and Fasteners

Adjacent rolls shall be overlapped a minimum of 6 inches. Fasteners, as recommended by the Manufacturer and approved by the Contracting Officer, shall be used to join adjacent rolls. Metallic fasteners will not be allowed. Fasteners shall be spaced a maximum of 5 feet along downslope roll overlaps and a maximum of 2 feet along cross slope roll overlaps. Fasteners shall be of contrasting color from the geonet to facilitate visual inspection. Geocomposite shall not be welded to geomembranes.

3.1.2.2 Stacked Geonet Layers

When more than one layer of geonet is required, joints shall be staggered. Stacked geocomposite layers shall always be laid in the same direction to maintain transmissivity requirements.

3.1.2.3 Corners

In the corners of side slopes, where overlaps between rolls of nets are staggered, an extra layer of geocomposite shall be installed from the top to the bottom of the slope.

3.2 REPAIRS

Holes or tears in the geocomposite shall be repaired by placing a patch of geonet extending a minimum of 2 feet beyond the edges of the hole or tear. Approved fasteners, spaced every 6 inches around the patch, shall be used to fasten the patch to the original roll.

3.3 PENETRATIONS

Geocomposite penetration details shall be as recommended by the geocomposite manufacturer and as approved by the Contracting Officer.

3.4 FINAL COVER

Upon completion and acceptance of the geocomposite in an area, the geocomposite shall be covered with the required materials within 14 days of acceptance in accordance with the drawings and specifications.

SECTION 02230

CLEARING AND GRUBBING
06/97

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Clearing

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring in the areas to be cleared.

1.1.2 Grubbing

Grubbing shall consist of removal and disposal of stumps, roots larger than 3 inches in diameter, existing irrigative piping and appuratanes, and matted roots from the designated grubbing areas.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 CLEARING

Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work.

3.2 GRUBBING

Material to be grubbed, shall be removed to a depth of not less than 24 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings, and areas to be paved. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3.3 TREE REMOVAL

Where indicated or directed, trees and stumps that are designated as trees shall be removed from areas outside those areas designated for clearing and grubbing. This work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING. Trees shall be disposed of as specified in paragraph DISPOSAL OF MATERIALS.

3.4 DISPOSAL OF MATERIALS

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, shall be disposed of outside the limits of Government-controlled land at the Contractor's responsibility except when otherwise directed in writing. Such directive will state the conditions covering the disposal of such products and will also state the areas in which they may be placed.

SECTION 02300

EARTHWORK

12/97

PART 1 GENERAL

1.1 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM c 136	(1966; Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1140	(1992) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(1990) R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. Ft. (2,700 kN-m/cu. M))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method AST
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 2937	(1994) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 3017	(1998; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 DEFINITIONS

1.2.1.1 Satisfactory Materials

Satisfactory materials for subgrade shall compromise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GC, GP-GC, GM-GC, SW, SP,

SM, SW-SM, SC, SW-SC, SP-SM, SP-SC. Satisfactory materials for grading shall be comprised of stones less than 8 inches, except for fill material for protective layer which shall be comprised of stones less than 2 inches in any dimension.

Satisfactory materials for protective layer and vegetative support layer shall comprise any materials classified by ASTM D 2487 as SM, SW-SM, SC, SW-SC, SP-SM, SP-SC. Satisfactory materials for grading shall be comprised of stones less than 8 inches, except for fill material for protective layer which shall be comprised of stones less than 2 inches in any dimension.

1.2.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. The Contracting Officer shall be notified of any contaminated materials.

Measurement and payment shall be based on completed work performed in accordance with the drawings and specifications.

1.2.3 Cohesionless and Cohesive materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Testing required for classifying materials shall be in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.

1.2.4 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as a percent of laboratory maximum density.

1.4.5 Overhaul - Not Used

1.4.6 Topsoil - As specified in Section 02140 SELECT FILL AND TOPSOIL FOR LANDFILL COVER

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation, submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

SD-08 Statements

Earthwork;

Procedure and location for disposal of unused satisfactory material.
Blasting is not permitted. Proposed source of borrow material.

Sd-09 Reports

Testing;

Within 24 hours of conclusion of physical tests, 4 copies of test results, including calibration curves and results of calibration tests.

SD-13 Certificates

Testing;

Qualifications of the commercial testing laboratory or Contractor's testing facilities.

SD-18 Records

Earthwork;

Notification of encountering rock in the project. Advance notice on the opening of excavation or borrow areas. Advance notice on shoulder construction for rigid pavements.

1.4 SUBSURFACE DATA

Subsurface soil boring logs are appended to the SPECIAL CONTRACT REQUIREMENTS. The subsoil investigation report may be examined at the Contracting Officer's office. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

1.5 BLASTING - NOT USED

1.5 UTILIZATION OF EXCAVATED MATERIALS

Materials removed from excavations shall be disposed of in designated waste areas within one mile of the project site and shall be identified at the Pre-Bid Meeting.

No satisfactory excavated material shall be wasted or used by contractor for other work without specific written authorization. Satisfactory material authorized to be wasted shall be disposed of in designated areas approved for surplus material storage or designated waste areas as directed. Newly designated waste areas on Government-controlled land shall be cleared and grubbed before disposal of waste material thereon. Coarse rock from excavations shall be stockpiled and used for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. No excavated material shall be disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

Where indicated or directed, topsoil shall be stripped to a depth of 6 in. Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil layer, (landfill cap) or at locations indicated or specified by the Government within a one-mile radius of the project site. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 1 inches in diameter, and other materials that would interfere with planting and maintenance operations.

3.2 GENERAL EXCAVATION

The Contractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with the typical sections shown and the tolerances specified in paragraph FINISHING. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Such excavated material and the satisfactory material ordered as replacement shall be included in excavation. Surplus satisfactory excavated material not required for fill or embankment shall be disposed of in areas approved for surplus material storage or designated waste areas. Unsatisfactory excavated material shall be disposed of in designated waste or spoil areas.

Designated disposal areas include:

Areas identified by the Government within a one-mile radius of the project site.

During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill or embankment in excess of that produced by excavation within the grading limits shall be excavated from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

3.2.1 Ditches and Channel Changes

Excavation of ditches and channel changes shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Ditches shall not be excavated below grades shown. Excessive open ditch excavation shall be backfilled with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Material excavated shall be disposed of as shown or as directed, except that in no case shall material be deposited less than 4 feet from the edge of a ditch. The Contractor shall maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.2.2 Drainage Structures

Excavations shall be made to the lines, grades, and elevations shown, or as directed. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of

structure footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm, level, stepped, or serrated surface. Loose disintegrated rock and thin strata shall be removed. When concrete or masonry is to be placed in an excavated area, the bottom of the excavation shall not be disturbed. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.3 SELECTION OF BORROW MATERIAL

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from the approved sources, either private or selected by the Contractor. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling. Borrow material from approved sources on Government-controlled land may be obtained without payment of royalties. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation.

3.4 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS - NOT USED

3.5 GRADING AREAS - NOT USED

3.6 BACKFILL

Backfill adjacent to any and all types of structures shall be placed and compacted to at least 87 percent laboratory maximum density for cohesive materials or 92 percent laboratory maximum density for cohesionless materials to prevent wedging action or eccentric loading upon or against the structure. Ground surface on which backfill is to be placed shall be prepared as specified in paragraph PREPARATION OF GROUND SURFACE FOR EMBANKMENTS. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs PREPARATION OF GROUND SURFACE FOR EMBANKMENTS, EMBANKMENTS, AND SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.7 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS

3.7.1 General Requirements

Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up to a depth of 1-ft; pulverized; moistened or aerated as necessary; thoroughly mixed; and compacted to a least 87 percent laboratory maximum density for cohesionless materials. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment materials to assure adequate bond between embankment material and the prepared ground surface.

3.7.2 Frozen Material

Embankment shall not be placed on a foundation which contains frozen material, or which has been subjected to freeze-thaw action. This prohibition encompasses all foundation types, including the natural ground, all prepared subgrades (whether in an excavation or on an embankment) and all layers of previously placed and compacted earth fill which become the foundations for successive layers of earth fill. All material that freezes or has been subjected to freeze-thaw action during the construction work, or during periods of temporary shutdowns, such as, but not limited to, nights, holidays, weekends, winter shutdowns, or earthwork operations, shall be removed to a depth that is acceptable to the Contracting Officer and replaced with new material. Alternatively, the material will be thawed, dried, reworked, and recompactd to the specified criteria before additional material is placed. The Contracting Officer will determine when placement of fill shall cease due to cold weather. The Contracting Officer may elect to use average daily air temperatures, and/or physical observation of the soils for his determination. Embankment material shall not contain frozen clumps of soil, snow, or ice.

3.8 EMBANKMENTS.

3.8.1 Earth Embankments

Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 8 inches in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to a least 87 percent laboratory maximum density for cohesive materials or 92 percent laboratory maximum density for cohesionless materials. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall be identical with those requirements specified in paragraph SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.8.2 Rock Embankments - Not used

3.9 SUBGRADE AND TEMPORARY SWALE PREPARATION

3.9.1 Construction

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed by the Contracting Officer. Subgrade shall be proof rolled with loaded dump truck prior to placement of fill over the subgrade. Pumping will not be allowed and shall be under cut or stabilized with aggregate. Rock encountered in the cut section shall be excavated to a depth of 6 inches below finished grade for the subgrade. Low areas resulting from removal of

unsatisfactory material or excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. The elevation of the finish subgrade shall not vary more than 0.05 foot from the established grade and cross section.

Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Except for paved areas and railroads, each layer of the embankment shall be compacted IN 8-IN. maximum loose lifts as specified in Section 3.8.1.

3.9.1.1 Subgrade for Railroads - Not Used

3.9.1.2 Subgrade for Pavements - Not Used

3.9.1.3 Subgrade for Shoulders - Not Used

3.10 SHOULDER CONSTRUCTION - NOT USED

3.11 FINISHING

The surface of excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for graded areas shall be within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph SUBGRADE PREPARATION. Swales shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials.

3.12 PLACING TOPSOIL - NOT USED

3.13 TESTING

Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. If the Contractor elects to establish testing facilities, no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved by the Contracting Officer. The first inspection will be at the expense of the Government. Cost incurred for any subsequent inspections required because of failure of the first inspection will be charged to the Contractor. Field in-place density shall be determined in accordance with ASTM D 2922. When ASTM D2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D-2922 results in a wet unit weight of soil and when using this method A STM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017; the calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. [ASTM D 2937, Drive Cylinder Method, shall be used only for soft, fine-grained cohesive soils.] When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and

recompacted to meet specification requirements. Tests on recompacted areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests.

The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.12.1 Fill and Backfill Material Gradation

One test per 3,000 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM D 422.

3.13.2 In-Place Densities

- a. One test per 10,000 square feet of subgrade, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.
- b. One test per 5,000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.
- c. One test per 100 linear feet, or fraction thereof, of each lift of embankment or backfill for roads and utility trench.

3.13.3 Check Tests on In-Place Densities

If ASTM D 2922 nuclear method is used, in-place densities shall be checked by ASTM Sand Cone Method D 1556 as follows:

- a. One check test per 20 nuclear density tests or backfill compacted by other than hand-operated machines.
- b. One check test per lift for each 5,000 square feet, of fill or backfill areas compacted by hand-operated machines.
- c. One check test per lift for each 50 linear feet, or fraction thereof, of embankment or backfill for roads and utility trench.

3.13.4 Moisture Contents - Not Used

3.13.5 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 5,000 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.13.6 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION shall be made during construction of the subgrades.

SUBGRADE AND EMBANKMENT PROTECTION

During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the contractor in a satisfactory condition until ballast, sublease, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted. No sublease, base course, ballast, or pavement shall be laid until the subgrade has been checked and approved, and in no case shall sublease, base, surfacing, pavement, or ballast be placed on a muddy, spongy, or frozen subgrade.

3.14 GABION SUBGRADE

After excavation or stripping to the extent indicated on the drawings or as directed by the Contracting Officer, all remaining loose or otherwise unsuitable materials shall be removed. All depressions shall be carefully backfilled to grade. Depressions shall be backfilled with suitable materials from adjacent required excavation, or other approved source, and compacted to a density at least equal to that of the adjacent foundation. Any buried debris protruding from the foundation that will impede the proper installation and final appearance of the Gabon layer shall also be removed, and the voids carefully backfilled and compacted as specified above. Immediately prior to placing the material, the prepared foundation surface shall be inspected by the Contracting Officer, and no material shall be placed thereon until that area has been approved.

SECTION 02316

EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS
11/97

PART 1 GENERAL

1.1 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

1.2 DEGREE OF COMPACTION

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09 Reports

Field Density Tests; F10. Testing of Backfill Materials; F10.

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials - Trench Backfilling

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SW-SC, SP-SM, SP-SC,

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 2 inches. The Contracting Officer shall be notified of any contaminated materials.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials shall include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials shall include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM shall be identified as cohesionless only when the fines are nonplastic.

2.1.4 Unyielding Material

Unyielding material shall consist of rock and gravelly soils with stones greater than 2 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller.

2.1.5 Unstable Material

Unstable material shall consist of materials too wet to properly support the utility pipe, conduit, or appurtenant structure.

2.1.6 Select Granular Material

Select granular material, ASTM C33 coarse aggregated size #8 or #67, shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles. The maximum allowable aggregate size shall be 1 inch, or the maximum size recommended by the pipe manufacturer, whichever is smaller.

2.1.7 Initial Backfill Material

Initial backfill shall consist of select granular material or satisfactory materials free from rocks 2 inches or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller.

2.2 PLASTIC MARKING TAPE

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 6 inches wide with minimum thickness of 0.004 inch. Tape shall have a minimum strength of 1750 psi lengthwise and 1500 psi crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in TABLE 1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 1. Tape Color

Blue: Water Systems

PART 3 EXECUTION

3.1 EXCAVATION

Excavation shall be performed to the lines and grades indicated. Trenching shall be in accordance with OSHA 29 CFR 26 and Section 01351 SAFETY, HEALTH AND EMERGENCY RESPONSE. Earth excavation shall include removal and disposal of material not classified as rock excavation. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to 1/2 the depth of the excavation, but in no instance closer than 2 feet. Excavated material not required or not satisfactory for backfill shall be removed from the site or shall be disposed of by placement at areas designated by the government within a 1 mile radius of the project site. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating shall be removed to maintain the stability of the bottom and sides of the excavation.

3.1.1 Trench Excavation Requirements

The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be sloped, or made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical. Trench walls more than 5 feet high shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in. Vertical trench walls more than 5 feet high shall be shored. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. The trench width below the top of pipe shall not exceed dimensions shown on the Drawings. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional cost to the Government.

3.1.1.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 2 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.

3.1.1.2 Removal of Unyielding Material

Where unyielding material is encountered in the bottom of the trench, such material shall be removed 6 inches below the required grade and replaced with suitable materials as provided in paragraph BACKFILLING AND COMPACTION.

3.1.1.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Government.

3.1.1.4 Excavation for Appurtenances

Excavation for manholes, catch-basins, inlets, or similar structures shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members. Rock shall be cleaned of loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Loose disintegrated rock and thin strata shall be removed. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.1.1.5 Jacking, Boring, and Tunneling-Not Used

3.1.2 Stockpiles

Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed by rubber-tired equipment, excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government. Locations of stockpiles of satisfactory materials shall be subject to prior approval of the Contracting Officer.

3.2 BACKFILLING AND COMPACTION

Backfill material shall consist of cohesionless, satisfactory material. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 percent maximum density for cohesionless soils and 90 percent maximum density under roadways and structures, and 90 percent maximum density elsewhere.

3.2.1 Trench Backfill

Trenches shall be backfilled to the grade shown.

3.2.1.1 Replacement of Unyielding Material

Unyielding material removed from the bottom of the trench shall be replaced with select granular material or initial backfill material.

3.2.1.2 Replacement of Unstable Material

Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 6 inches loose thickness.

3.2.1.3 Bedding and Initial Backfill

Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe.

3.2.1.4 Final Backfill

The remainder of the trench, except for special materials for roadways, railroads and airfields, shall be filled with satisfactory material. Backfill material shall be placed and compacted as follows:

Backfill shall be deposited in layers of a maximum of 12 inch loose thickness, and compacted to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils.

3.2.2 Backfill for Appurtenances

After the manholes, leachate pump station wetwell, inlet, or similar structure has been constructed, backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be brought up evenly on all sides of the structure to prevent eccentric loading and excessive stress. Open trench cut across the paved road shall be replaced in kind in accordance with The Devens Enterprise Commissions Development Rules and Regulations.

3.3 SPECIAL REQUIREMENTS

- 3.3.1 Gas Distribution-Not Used
- 3.3.2 Water Lines-Not Used
- 3.3.3 Heat Distribution System-Not Used
- 3.3.4 Electrical Distribution System-Not Used
- 3.3.5 Plastic Marking Tape

Warning tapes shall be installed directly above the pipe, at a depth of 18 inches below finished grade unless otherwise shown.

3.4 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government.

3.4.1 Testing Facilities

Tests shall be performed by an approved commercial testing laboratory or may be tested by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved by the Contracting Officer. The first inspection shall be at the expense of the Government. Cost incurred for any subsequent inspection required because of failure of the first inspection will be charged to the Contractor.

3.4.2 Testing of Backfill Materials

Characteristics of backfill materials shall be determined in accordance with particle size analysis of soils ASTM D 422 and moisture-density relations of soils ASTM D 1557. A minimum of one particle size analysis and one moisture-density relation test shall be performed on each different type of material used for bedding and backfill.

3.4.3 Field Density Tests

Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one field density test per lift of backfill for every 100 feet of installation shall be performed. Field in-place density shall be determined in accordance with ASTM D 1556 ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the Contracting Officer. Copies of calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the Contracting Officer. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Government.

3.4.4 Displacement of Sewers-Not Used

SECTION 02371

WIRE MESH GABIONS

12/92

PART 1 GENERAL

1.1 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 90/A 90M	(1995a) Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
ASTM A 185	(1990a) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 313/A 313M	(1995a) Stainless Steel Spring Wire
ASTM A 428/A 428M	(1995) Weight (Mass) of Coating on Aluminum-Coated Iron or Steel Articles
ASTM A 764	(1990) Steel Wire, Carbon, Drawn Galvanized and Galvanized at Size for Mechanical Springs
ASTM A 818	(1991; R 1996) Coppered Carbon Steel Wire
ASTM A 853	(1993) Steel Wire, Carbon, for General Use
ASTM B 6	(1987) Zinc
ASTM B 117	(1990) Salt Spray (Fog) Testing
ASTM D 412	(1987) Rubber Properties in Tension
ASTM D 638	(1990) Test Method for Tensile Properties of Plastics
ASTM D 638M	(1997) Test Method for Tensile Properties of Plastics (Metric)
ASTM D 746	(1979; R 1987) Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D 792	(1986) Specific Gravity (Relative Density) and Density of Plastics by Displacement
ASTM D 1242	(1987) Resistance of Plastic Materials to Abrasion

ASTM D 1499	(1984; R 1990) Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Plastics
ASTM D 2240	(1986) Rubber Property - Durometer Hardness
ASTM D 2287	(1981; R 1988) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
ASTM G 23	(1990) Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials

1.2 GENERAL REQUIREMENTS

The work under this specification includes furnishing, assembling, filling, and tying open wire mesh rectangular compartmented gabions placed on a prepared surface of geotextile as specified herein, and in accordance with the lines, grades, and dimensions shown on the drawings or otherwise established in the field by the Contracting Officer.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-13 Certificates

Gabions; FIO. Alternative Wire Fasteners for Gabions; FIO.
Gradation of Stone in Gabion

For each shipment of wire materials to the site, the Contractor shall furnish the Contracting Officer, in duplicate a manufacturer's certificate or affidavit signed by a legally authorized official from the company manufacturing the gabion units and wire fasteners, that all material contained within that shipment meets the composition, physical, and manufacturing requirements stated in this specification.

SD-14 Samples

Stone Fill; GA.

Samples of stone fill material submitted for approval prior to delivery.

1.4 DESCRIPTION

Gabion units shall consist of compartmented rectangular basket containers filled with stone. Welded wire mesh shall be used. Baskets shall be fabricated from galvanized steel wire formed into a nonraveling mesh.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Gabions

Wire mesh gabions shall be galvanized

2.1.1.1 Steel Twisted Wire Mesh Gabions

Gabion basket units shall be of nonraveling construction and fabricated from a double twisted hexagonal wire mesh. The size of mesh openings shall be approximately 3 1/4 inches by 4 1/2 inches. The gabion mesh wires shall be wrapped around the selvage wire no less than 1 1/2 times and shall interconnect with adjacent mesh wires. All steel wire used shall be galvanized or prior to fabrication into mesh. All gabion diaphragm and frame wire shall equal or exceed ASTM A 641/A 641M, ASTM A 809, ASTM A 818, and ASTM A 853, and possess soft tensile strength of 60,000 pounds per square inch (psi) with a tolerance of minus 2,000 psi. The galvanized wire shall have a Finish 5, Class 3, zinc coating, as indicated in ASTM A 641/A 641M. The weight of coating shall be determined by ASTM A 90/A 90M. The grade of zinc used for coating shall be High Grade or Special High Grade as prescribed in ASTM B 6, Table 1. The uniformity of coating shall equal or exceed four 1-minute dips by the Preece Test, as determined by ASTM A 239. The surface of coating shall be smooth and show no visible loose flakes and scratch marks due to manufacturing and fabricating process or handling. Wire used for lacing or as internal connecting wire within basket cells may have soft tensile strength designation. As an alternative to lacing, wire fasteners may be used. All wire used shall meet the following nominal minimum requirements:

GALVANIZED WIRE			
TYPE OF WIRE	WIRE DIAMETER AFTER COATING (inches)	COATING WEIGHT (oz/sq ft)	TENSILE STRENGTH (psi)
Mesh Wire	0.120	0.85	60,000
Selvage Wire	0.150	0.85	60,000
Lacing Wire or Internal Connecting Wire]	0.087	0.70	60,000

2.1.1.2 PVC-Coated Steel Twisted Wire Mesh Gabions-Not Used

2.1.1.3 - Not Used

2.1.1.4 PVC-Coated Steel Welded Wire Mesh Gabions-Not Used

2.1.2 Alternative Wire Fasteners for Gabions

2.1.2.1 General

Subject to approval of the Contracting Officer, wire fasteners including interlocking fasteners, ring fasteners, twist ties, and spiral binders may

be used in lieu of lacing wire. When seeking such approval, the Contractor shall demonstrate to the satisfaction of the Contracting Officer:

- a. That the proposed fastener system can consistently produce a joint with a strength of 1,400 pounds per lineal foot when tested in accordance with paragraph PULL-APART RESISTANCE TEST;
- b. That the proposed fastener system does not cause damage to the protective coating on the wire;
- c. That the Contractor has the proper equipment and trained employees to correctly install the fasteners; and
- d. That proper installation can be readily verified by visual inspection.

The Contractor shall provide a complete description of the fastener system, including the number of fasteners required, the number and size of wires that fastener is capable of properly joining, and a description of a properly installed fastener, including drawings or photographs if necessary. A properly installed fastener shall meet the same requirements as that specified for the fasteners in the paragraph SALT SPRAY TEST. If gages or other aids are needed to verify the proper installation of the fasteners, the Contractor shall furnish the Government such gages or aids, in such number as may reasonably be required, for the use of Government inspectors. If more than one wire fastener is proposed (e.g. different gage or length of wire) for different joints, the fasteners shall be readily distinguishable. Alternate wire fasteners shall not be used to join more wires, or larger wires, than for which they were tested and approved. As a minimum, a fastener shall be installed at each mesh opening at the location where mesh wire meets selvage or edge wire. Alternate wire fasteners shall not be used to close basket lids unless specifically approved for that purpose. When seeking approval to use alternate wire fasteners to close basket lids, the Contractor shall demonstrate to the satisfaction of the Contracting Officer that the fasteners can be properly installed on a properly filled gabion without stretching the gabion to the point that the gabion, or the protective wire coating, is damaged.

2.1.2.2 Wire Fasteners Materials

Galvanized wire fasteners shall be used with galvanized gabions. Galvanized wire fasteners, except twist tie and spiral binder fasteners, shall conform to ASTM A 764, Finish 1 with Type III coating. Twist tie or spiral binder fasteners shall meet the requirements of lacing wires as specified in paragraph STEEL TWISTED WIRE MESH GABIONS.

2.1.2.3 Testings

Test records made within 5 years by certified laboratories and Government agencies will be used to determine the acceptability of wire fasteners. Samples of wire fasteners with their certified test records shall be submitted at least 60 days in advance to the Contracting Officer for approval. The Government reserves the right to test additional samples to verify the submitted test records at the Government's expense. When the first test results indicate that the fasteners do not meet the specified requirements, the additional test will be at the Contractor's expense. The fasteners will be rejected after two tests failing to meet the requirements.

All types of fasteners including fasteners made of stainless steel shall be subject to the salt spray test and pull-apart resistance test.

a. Salt Spray Test - A set of two identical rectangular gabion panels, each with a width about 10-1/2 mesh openings along a selvage wire, shall be jointed by properly installed wire fasteners along the two selvage wires so that each fastener confines two selvage and two mesh wires. If the fasteners are also to be used to joint two individual empty gabion baskets, two additional selvage wires which are each mechanically wrapped with mesh wires shall be included so that each fastener confines four selvage and four mesh wires. The set of the jointed panels shall be subject to salt spray test, ASTM B 117, for a period of not less than 48 hours. At the end of the test, the fasteners, the selvage, or mesh wires confined by the fasteners shall show no rusty spots on any part of the surface excluding the cut ends. A properly installed fastener shall meet the following requirements:

- (1) Each interlocking fastener shall be in a locked and closed position.
- (2) Each ring fastener shall be closed, and the free ends of the fastener shall overlap a minimum of 1 inch.
- (3) Each twist tie shall be closed and maintain a minimum of two full turns.
- (4) The spiral binder shall be tied at both ends.

b. Pull-Apart Resistance Test - A new set of the jointed panels, which are prepared by the same method as specified in the salt spray test but without being subject to the 48-hour salt spray test, shall be mounted on a loading machine with grips or clamps such that the panels are uniformly secured along the full width. The grips or clamps shall be designed to transmit only tension forces. The load will then be applied at a uniform rate of 50 pounds per second until failure occurs. The failure is defined as when the maximum load is reached and a drop of strength is observed with subsequent loading or the opening between any two closest selvage wires, applicable to a fastener confining either two or four selvage wires, becomes greater than 2 inches at any place along the panel width. The strength of the jointed panels at failure shall have a minimum of 1,400 pounds per linear foot.

2.1.3 Stone Fill

2.1.3.1 Quality

Stone shall be durable and of suitable quality to ensure permanence in the structure and climate in which it is to be used. It shall be free of cracks, seams, and other defects that would tend to increase unduly its deterioration from natural causes or reduce its size to that which could not be retained in the gabion baskets. The inclusion of more than 5% by weight of dirt, sand, clay, and rock fines will not be permitted. The sources from which the Contractor proposes to obtain the material shall be selected well in advance of the time when the material will be required in the work. Suitable samples of stone fill material shall be collected in the presence of a Government representative and submitted to the Contracting Officer for approval prior to delivery of any such material to the site of the work.

Unless otherwise specified, all test samples shall be obtained by the Contractor and delivered at his expense to at least 60 days in advance of the time when the placing of the stone-filled gabions is expected to begin. Suitable tests and/or service records will be used to determine the acceptability of the stone. In the event suitable test reports and service records are not available, as in the case of newly operated sources, the material shall be subjected to such tests as are necessary to determine its acceptability for use in the work. Tests to which the material may be subjected include petrographic analysis, specific gravity, absorption, wetting and drying, freezing and thawing, and such other tests as may be considered necessary to demonstrate to the satisfaction of the Contracting Officer that the materials are acceptable for use in the work. All tests will be made by or under the supervision of the Government and at its expense.

2.1.3.2 Gradation

Stone fill used in the gabions shall be a well-graded mixture with sizes ranging between 4 inches and 8 inches, based on US Standard square mesh sieves. No stone shall have a minimum dimension less than 4 inches and a maximum dimension greater than 12 inches in any direction. The ratio of the maximum dimension to the minimum dimension shall not be greater than two. If the height of the gabion basket is 12 inches or less, stone shall have no dimensions greater than 8 inches in any direction.

2.1.4 Filter Material-Not Used

PART 3 EXECUTION

3.1 FOUNDATION PREPARATION - SEE SECTION 02300, 3.15

3.2 FILTER PLACEMENT - NOT USED

3.3 FABRICATION

3.3.1 Galvanized or Steel Wire Mesh Gabions

Gabions shall be fabricated in such a manner that the sides, ends, lid, and diaphragms can be assembled at the construction site into rectangular baskets of the sizes specified and shown on the drawings. Gabions shall be of single unit construction, i.e., the base, lid, ends, and sides shall be either woven into a single unit, or one edge of these members connected to the base section of the gabion in such a manner that the minimum strengths of the wire mesh and connections as stated in paragraph MATERIALS are met. Where the length of the gabion exceeds one and one-half its horizontal width, the gabion shall be equally divided by diaphragms of the same mesh and gage as the body of the gabions, into cells whose length does not exceed the horizontal width. The gabion shall be furnished with the necessary diaphragms secured in proper position on the base in such a manner that no additional tying at this juncture will be necessary. For twisted wire gabions, all perimeter edges of the mesh forming the gabion shall be securely selvaged so that the joints formed by tying the selvages have at least the strengths as specified in paragraph MATERIALS. In addition, the selvaged edges shall be so wrapped and reinforced with the mesh ends that the selvage wire will not be deformed locally about the lacing wire or wire fasteners when baskets are filled or during lid closing. Lacing wire,

connecting wire, and/or wire fasteners shall be supplied in sufficient quantity for securely fastening all diaphragms and edges of the gabion.

3.4 ASSEMBLY AND INSTALLATION

3.4.1 Precaution for PVC-Coated Materials-Not Used

3.4.2 Gabion Units

Empty gabion units shall be assembled individually and placed on the approved surface to the lines and grades as shown on the drawings or as directed by the Contracting Officer, with the sides, ends, and diaphragms erected in such a manner to ensure the correct position of all creases and that the tops of all sides are level. Filling of gabion units in one place and then transporting them to their final position in the work will not be permitted. The front row of gabion units shall be placed first and successively constructed toward the top of the slope or the back of the structure. Finished gabion structure shall have no gaps along the perimeter of the contact surfaces between adjoining gabion basket units. All adjoining empty gabion units shall be connected by lacing wire/or wire fasteners along the perimeter of their contact surfaces in order to obtain a monolithic structure. Lacing of adjoining basket units shall be accomplished by continuous stitching with alternating single and double loops at intervals of not more than 5 inches, and a half hitch shall be included at every double loop. All lacing wire terminals shall be securely fastened. Wire fasteners may be used in lieu of lacing wire for forming individual baskets and joining empty baskets together prior to stone filling. All joining shall be made through selvage-to-selvage or selvage-to-edge wire connection; mesh-to-mesh or selvage-to-mesh wire connection is prohibited except in the case where baskets are offset or stacked and selvage-to-mesh or mesh-to-mesh wire connection would be necessary. Wire fasteners shall not be used to tie or join stone-filled baskets, unless approved by the Contracting Officer. Each wire fastener shall be properly installed and closed as specified in paragraph ALTERNATIVE WIRE FASTENERS FOR GABIONS, subparagraph TESTING, sub-subparagraph SALT SPRAY TEST. As a minimum, a fastener shall be installed at each mesh opening at the location where mesh wire meets selvage or edge wire. The initial line of basket units shall be placed on the prepared filter layer surface and partially filled to provide anchorage against deformation and displacement during filling operations. After adjoining empty basket units are set to line and grade and common sides with adjacent units thoroughly laced or fastened, they shall be placed in tension and stretched to remove any kinks from the mesh and to a uniform alignment. The stretching of empty basket units shall be accomplished in such a manner as to prevent any possible unraveling. Stone filling operations shall carefully proceed with placement by hand or machine so as not to damage galvanized wire coating, to assure a minimum of voids between the stones, and the maintenance of alignment throughout the filling process. Undue deformation and bulging of the mesh shall be corrected prior to further stone filling. To avoid localized deformation, the basket units in any row are to be filled in stages consisting of maximum 12-inch courses, and at no time shall any cell be filled to a depth exceeding 1 foot more than the adjoining cell. The maximum height from which the stone may be dropped into the basket units shall be 36 inches. Connecting wires or alternatively the preformed stiffeners shall be looped around two twisted wire mesh openings or a welded wire joint at each basket face and the wire terminals shall be securely twisted to prevent their loosening. For twisted wire gabions, the internal connecting wires or

preformed stiffeners are installed as shown on the drawings. Along all exposed faces, the outer layer of stone shall be carefully placed and arranged by hand to ensure a neat and compact appearance. The last layer of stone shall be uniformly overfilled 1 to 2 inches to compensate for the future settlement in rock but still allow for the proper closing of the lid and to provide an even surface that is uniform in appearance. Final adjustments for compaction and surface tolerance shall be done by hand. Lids shall be stretched tight over the stone fill using only an approved lid closing tool, until the lid meets the perimeter edges of the front and end panels. Using crowbars or other single point leverage bars for lid closing shall be prohibited. The lid shall then be tightly tied with lacing wire, or with wire fasteners if approved by the Contracting Officer, along all edges, ends, and internal cell diaphragms by continuous stitching with alternating single and double loops at intervals of not more than 5 inches, and a half hitch shall be included at every double loop. Special attention shall be given to see that all projections or wire ends are turned into the baskets. Roll-out lids shall be fabricated of the same material as the basket units. Where shown on the drawings or as directed by the Contracting Officer, or where a complete gabion unit cannot be installed because of space limitations, the basket unit shall be cut, folded, and wired together to suit existing site conditions. The mesh must be cleanly cut and the surplus mesh cut out completely, or folded back and neatly wired to an adjacent gabion face. The assembling, installation, filling, lid closing, and lacing of the reshaped gabion units shall be carried out as specified above.

SECTION 02372

WASTE CONTAINMENT GEOMEMBRANE
12/97

1.1 REFERENCES

The publications listed below form a part of the specification to the extent referenced. The publications are referenced in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 638	(1998) Tensile Properties of Plastics
ASTM D 746	(1998) Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D 1004	(1994a) Initial Tear Resistance of Plastic Film and Sheeting
ASTM D 1603	(1994) Carbon Black in Olefin Plastics
ASTM D 1765	(1999) Classification System for Carbon Blacks Used in Rubber Products
ASTM D 3895	Test Method for Oxidative Induction Time of Polyolefins by Thermal Analysis
ASTM D 4437	(1984; R 1988) Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes
ASTM D 4833	(1988; R 1996) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 5199	(1998) Measuring Nominal Thickness of Geotextiles and Geomembranes
ASTM D 5321	(1998) Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method
ASTM D 5397	(1995) Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
ASTM D 5617	(1994) Multi-Axial Tension Test for Geosynthetics
ASTM D 5721	Practice for Air-Over Aging of Polyolefin Geomembranes
ASTM D 5994	(1998) Measuring Normal Thickness of Geotextiles and Geomembranes

GEOSYNTHETIC RESEARCH INSTITUTE (GRI)

GRI Test Meth GM-7 (1995) Accelerated Curing of Geomembrane Test Strip Seams Made by Chemical Fusion Methods

GRI TEST METH GM-11 Accelerated Weathering of Geomembranes using a Fluorescent VVA - Condensation Exposure Device.

1.2 MEASUREMENT-NOT USED

1.3 PAYMENT-NOT USED

1.4 QUALIFICATIONS

1.4.1 Manufacturer

Manufacturer shall have produced the proposed geomembrane sheets for at least 5 completed projects having a total minimum area of 50 million square feet.

1.4.2 Fabricator - Not Used

1.4.3 Installer

The installer is responsible for field handling, deploying, seaming, anchoring, and field quality control testing of the geomembrane. The installer shall have installed the proposed geomembrane material for at least 5 completed projects having a total minimum area of 20 million square feet. At least one seamer shall have experience seaming a minimum of 500,000 square feet of the proposed geomembrane using the same type of seaming equipment and geomembrane thickness specified for this project.

1.4.4 Inspector

The inspector is the third party quality assurance person or corporation, independent from the manufacturer, fabricator, and installer, who is responsible for monitoring and documenting activities related to the quality assurance of the geomembrane from manufacturing through installation. Inspector shall have provided quality assurance inspection during installation of the proposed geomembrane material for at least 5 completed projects having a total minimum area of 2 million square feet.

1.4.5 Independent Laboratory

The independent laboratory is the third party quality assurance laboratory, independent from the manufacturer, fabricator, and installer who is responsible for laboratory quality assurance geomembrane testing. Independent laboratory shall have provided quality control and/or quality assurance testing of the proposed geomembrane seams for at least five completed projects having a total minimum area of 2 million square feet. The laboratory shall be accredited via the Geosynthetic Accreditation Institute's Laboratory Accreditation Program (GAI-LAP).

1.5 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Materials; GA.

Manufacturer's certified raw and sheet material data sheets along with a copy of quality control certificates. Manufacturer's property specifications a minimum of 30 days prior to delivery of geomembrane to the site.

SD-04 Drawings

Layout and Detail Drawings; GA.

Geomembrane panel layout and penetration detail drawings, including membrane line pipe boot, a minimum of 30 days prior to delivery of geomembrane to the site.

As-built Drawings; GA.

Final as-built drawings of geomembrane installation showing panel/sheet numbers, seam numbers, and location of repairs, destructive seam samples, and penetrations.

SD-06 Instructions

Tests, Inspections, and Verifications; GA.

Manufacturer's and fabricator's quality control manuals.

Field Seaming; GA.

Installer's quality control manual.

SD-08 Statements

Qualifications; GA.

Manufacturer's, fabricator's, installer's, inspector's, and independent laboratory's qualification statements including resumes of key personnel involved in the project.

Surface Preparation; GA.

Certification from the inspector and installer of the acceptability of the surface on which the geomembrane is to be placed immediately prior to geomembrane placement.

Destructive Field Seam Testing; GA.

Certified test results on field seams prior to acceptance of the seams.

Destructive Seam Test Repairs; GA.

Certified test results on all repaired seams prior to covering the seamed areas.

SD-09 Reports

Tests, Inspections, and Verifications; GA.

Manufacturer's and fabricator's certified quality control test results.

Interface Friction Testing; GA.

Certified laboratory interface friction test results including description of equipment and test methods, a minimum of 30 days prior to delivery of geomembrane to the site.

Field Seaming; GA.

Installer's certified quality control test results.

SD-14 Samples

Geomembrane Sampling; GA.

One 12 by 12 inches minimum size geomembrane sample along with appropriate identification for quality assurance testing and permanent record of actual furnished material.

1.6 DELIVERY, STORAGE AND HANDLING

Geomembrane shall not be off-loaded unless the Contracting Officer is present. The geomembrane shall be protected from puncture, abrasion, excessive heat or cold, material degradation, adhesion of individual layers or other damaging circumstances. Temporary storage at the project site shall be away from standing water and performed without crushing the core of roll goods or flattening of the rolls. A sacrificial opaque and waterproof covering shall be provided over the stored geomembrane for protection against precipitation, ultraviolet exposure, and accidental damage. Damaged geomembrane shall be removed from the site.

1.7 WEATHER LIMITATIONS

Geomembrane shall be deployed and field-seamed only when the geomembrane is dry and winds are low and there is no precipitation. In marginal conditions, as determined by the Contracting Officer, seaming shall cease unless tests confirm that satisfactory seam strengths are being obtained. Geomembrane shall not be deployed outside the range of 40°F - 104°F unless demonstrated that it can be performed in accordance with the seaming requirements.

1.8 EQUIPMENT

Equipment used in performance of the work shall be in accordance with the geomembrane manufacturer's recommendations and shall be maintained in satisfactory working condition.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Raw Materials

Resin used in manufacturing geomembranes shall be made of virgin uncontaminated ingredients. Polyethylene geomembrane resins shall have a density of [greater than or equal to .94 and 0.92 for HDPE and VFPE respectively. Carbon black used in polyethylene geomembranes shall be a Group 3 category, or lower, as defined in ASTM D 1765 and shall be 2.0 to 3.0 percent by weight in accordance with ASTM D 1603. No more than (2) percent regrind, reworked, or trim material in the form of chips or edge strips shall be used. All regrind, reworked, or trim materials shall be from the same manufacturer and exactly the same formulation as the geomembrane sheet being produced. Materials with previous service life, which are recycled, will not be allowed. Resins shall not contain fatty acid residues, epoxy, or secondary plasticizers.

2.1.2 Sheet Materials

A sheet is defined as a manufactured seamless geomembrane unit with a width equal to or greater than 5 feet. Geomembrane sheets shall be uniform in color, thickness, and surface texture. Sheets shall be textured on both faces. The textured surface features shall consist of polymers identical to that of the parent sheet material. The sheets shall be free of and resistant to fungal or bacterial attack; and free of cuts, abrasions, holes, blisters, contaminants and other imperfections.

2.1.3 Geomembrane Physical Properties

Geomembrane sheets and factory seams shall conform to the physical requirements listed in Table 1. Test values shown in Table 1, except when specified as minimum or maximum, are average lot property values.

TABLE 1. GEOMEMBRANE PHYSICAL PROPERTIES

PROPERTY	TEST VALUE		TEST METHOD
Thickness, mils, (nominal)	TEXTURED (HDPE) 60	TEXTURED (VFPE) 40	ASTM D 5994
Thickness, mils, (min) Note 1	54	36	ASTM D 5994
Tensile Strength at Break, lbs/in. width	75	65	ASTM D 638
Elongation at Break, percent	120	400	ASTM D 638
Multi-axial Tensile Strain at rupture, percent, (minimum)	15	60	ASTM D 5617

Tear Resistance, lbs	42	24	
Oxidative Induction Time (Standard OIT), min.	100		ASTM D 3895
Over Aging @ 85°C (Standard OIT), percent	55		ASTM 3895
Ozone Resistance (Standard OIT)	P		ASTM D 168 hrs ASTM D 3895
Puncture Resistance, lbs.	90	85	ASTM D 4833
Low Temperature Brittleness, degrees F	-90	-90	ASTM D 746
Seam Shear Strength, lbs./in. width (minimum) Note 2	113	48	ASTM D 4437
Seam Peel Adhesion, lbs./in. width, (minimum) Note 3	88	40	ASTM D 4437

Note 1: ASTM D 5199 shall be used for non-textured geomembranes and a screw or ported micrometer shall be used for textured geomembranes in accordance with the manufacturer's recommendations.

Note 2: Test results shall be considered passing if the minimum shear strength value is reached or the geomembrane elongates greater than 12 inches without failing regardless of the shear strength value.

Note 3: Seams tested for peel adhesion must fail in the Film Tear Bond mode. This is a failure in the ductile mode of one of the bonded sheets by tearing or breaking prior to complete separation of the bonded area. Where applicable, both tracks of a double hot wedge seam shall be tested for peel adhesion.

2.2 TESTS, INSPECTIONS, AND VERIFICATIONS

2.2.1 Interface Friction Testing

Laboratory interface friction tests shall be conducted on geocomposite/geomembrane composite textured interfaces using ASTM D 5321. Normal stresses of 1, 2, and 5 psi along with a displacement rate of 0.04 inches per minute shall be used for cap components and 10, 20, and 40 psi for bottom landfill interfaces. Soil components shall be compacted to the same moisture-density requirements specified for full-scale field placement and saturated prior to shear. The shear force in the geosynthetics shall be parallel to the downslope orientation of these components in the field.

A minimum peak interface friction angle is required between materials as described below:

<u>Interface</u>	<u>Minimal Friction Angle</u>
Geocomposite/ Textured Liner	22°
Clay/ Textured Liner	22°
Protective Layer/ Geocomposite	21°
Subgrade Landfill Cap/ Geocomposite	21°

Two tests for each interface shall be performed; one prior to construction and one taken from field samples as directed by the contracting officer.

2.2.2 Manufacturing, Sampling, and Testing

2.2.2.1 Resin Materials

Resin shall be tested in accordance with the approved geomembrane manufacturer's quality control manual. Any resin which fails to meet the geomembrane manufacturer's specified physical properties shall not be accepted for manufacturing the sheet. Polyethylene seaming rod and pellets shall be manufactured of resin which is essentially identical to that used in the geomembrane sheet. Seaming rods and pellets shall be tested for density, melt index and carbon black content in accordance with the approved geomembrane manufacturer's quality control manual. Seaming rods and pellets which fail to meet the corresponding property values required for the sheet material, shall be rejected.

2.2.2.2 Geomembrane Sampling

Geomembrane sheets shall be randomly sampled and tested in accordance with the manufacturer's approved quality control manual. Sheets not meeting the minimum requirements specified in Table 1 shall be rejected.

2.2.2.3 Multi-Axial Tensile Test

As a minimum, 1 multi axial tensile test shall be run per 200,000 square feet of geomembrane used. Testing shall be conducted prior to installation in accordance with ASTM D 5617.

2.2.3 Fabrication, Sampling, and Testing

2.2.3.1 General

Prior to or during factory seaming, roll goods shall be visually inspected on both sides for defects and impurities and in accordance with the manufacturer's approved QA plan. Defects and impurities shall be removed and repaired prior to completion of the fabrication process. Thickness measurements shall be made at the center and each edge of the beginning and end of each roll of material in accordance with the methods specified in Table 1. Rolls having a thickness less than the minimum value specified in Table 1 shall be rejected.

2.2.3.2 Non-Destructive Factory Seam Testing - Not Used

2.2.3.3 Destructive Factory Seam Testing - Not Used

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Surface Preparation

Surface preparation shall be performed in accordance with Section 02300 Earthwork. Rocks larger than 1/2inch in diameter and any other debris which could damage the geomembrane shall be removed from the surfaces to be covered with the geomembrane. Construction equipment tire or track deformation beneath the geomembrane shall not be greater than 1 inch in depth. The subgrade surface shall be observed daily by the inspector and installer to evaluate the surface condition. Any damage to the subgrade caused by the Contractor's operations shall be repaired.

3.1.2 Anchor/Drainage Trenches

Only the amount of [anchor] trench required for the geomembrane to be anchored in one day shall be excavated. Trench corners shall be slightly rounded to avoid sharp bends in the geomembrane. Loose soil, rock larger than 1 inch in diameter, and any other debris which could damage the geomembrane shall be removed from the surfaces of the trench 02300 Earthwork.

3.2 GEOMEMBRANE DEPLOYMENT

The geomembrane shall be placed with minimum handling. The procedures and equipment used shall not damage the geomembrane or underlying subgrade. Geomembrane damaged during installation shall be removed or repaired, at the Contracting Officer's discretion and as specified in paragraph Patches. Only geomembrane that can be anchored and seamed together the same day shall be deployed. Adequate ballast (e.g., sandbags) shall be placed on the geomembrane, without damaging the geomembrane, to prevent uplift by wind. Only small rubber tired equipment, with maximum tire inflation pressures of 5 LB per square inch, shall be allowed directly on the geomembrane. The method used to deploy the geomembrane shall not scratch, crimp or excessively elongate the geomembrane as determined by the Contracting Officer. Seams shall be oriented parallel to the line of maximum slope. Where seams can only be oriented across the slope, the upper panel/sheet shall be lapped over the lower panel/sheet.

No horizontal seams shall be allowed on slopes greater than 10 horizontal to 1 vertical.

3.2.1 Wrinkles

The method used to deploy the geomembrane shall minimize wrinkles. The geomembrane manufacturer and installer shall coordinate efforts to provide sufficient slack in the deployed geomembrane for the coldest temperature anticipated, to prevent tensile stresses in the geomembrane and its seams during installation and after the geomembrane is covered. The geomembrane shall have adequate slack to prevent uplift from the subgrade or substrate material at any location.

3.2.2 Thickness Measurement

For textured geomembrane, a screw or ported micrometer shall be used to take the same number of thickness readings specified for the non-textured geomembrane. Panels/sheets whose thickness falls below the specified minimum value shall be rejected and replaced.

3.3 FIELD SEAMING

3.3.1 Trial Seams

Trial seams shall be made on test strips of excess geomembrane under field conditions to verify that seaming conditions are adequate. Trial seams shall be made each day prior to production seaming, whenever there is a change in seaming personnel or seaming equipment and at least once every four hours, by each seamer and each piece of seaming equipment used that day. One sample shall be obtained from each trial seam. This sample shall be at least 36 inches long by 20 inches wide with the seam centered lengthwise. Ten random specimens 1 inch wide shall be cut from the sample. Five seam specimens shall be tested for shear strength and 5 for peel adhesion using an approved quantitative tensiometer. Jaw separation speed shall be in accordance with the installer's approved quality control manual. Where necessary, accelerated curing of trial seams made by chemical fusion methods shall be conducted in accordance with GRI Test Meth GM-7. To be acceptable, 4 out of 5 replicate test specimens shall meet specified seam strength requirements. If the field tests fail to meet these requirements, the entire operation shall be repeated. If the additional trial seam fails, the seaming apparatus or seamer shall not be accepted or used for seaming until the deficiencies are corrected by the installer and 2 consecutive successful trial seams are achieved.

3.3.2 Field Seams

3.3.2.1 General Requirements

Panels/sheets shall be overlapped a minimum of 3 inches. In corners and odd-shaped geometric locations, the number of field seams shall be minimized. Seaming shall extend to the outside edge of panels/sheets to be placed in anchor and/or drainage trenches. Seaming shall not be conducted in the presence of standing water and/or soft subgrades as determined by the Contracting Officer. Wet surfaces shall be thoroughly dried and soft subgrades compacted and approved by the installer and Contracting Officer prior to seaming. The seam area shall be cleaned of dust, dirt, and foreign material prior to and during seaming.

3.3.2.2 Polyethylene Seams

Polyethylene geomembranes shall be seamed by thermal fusion methods. Extrusion welding shall only be used for patching and seaming around appurtenances. If seam overlap grinding is required, the grinding marks shall be oriented perpendicular to the seam direction and no marks shall extend beyond the extrudate after placement. The depth of the grinding marks shall be no greater than 10 percent of the sheet thickness. Extrusion welding shall begin within 10 minutes after grinding. Where extrusion fillet welds are temporarily terminated long enough to cool, they shall be ground prior to applying new extrudate over the existing seam.

3.3.3 Field Sampling and Testing

3.3.3.1 Non-Destructive Field Seam Continuity Testing

Field seams shall be non-destructively tested over their full length in accordance with the procedure below or Installer's approved quality control manual, whichever is stricter, to ensure seam continuity. Seam testing shall be performed as the seaming work progresses, not at the completion of field seaming. Any seams which fail shall be documented and repaired in accordance with the installer's approved quality control manual.

Vacuum Box Testing: All field seams shall be inspected for unbonded areas by applying a vacuum to a soaped section of seam. The vacuum shall be applied by a vacuum box equipped with a vacuum gage, a clear glass view panel in the top, and a soft rubber gasket on the periphery of the open bottom. The vacuum box shall be similar to the Series A 100

Straight Seam Tester as supplied by the American Parts and Service Company, 2201 West Commonwealth Avenue, P.O. Box 702, Alhambra, California 91802. A section of the seam shall be soaped thoroughly and the inspection box shall be placed over the soaped seam section and the gasket sealed to the cap. A vacuum of between 4 and 8 inches of Mercury (Hg) shall be applied to the box by use of a gasoline or electric driven power-vacuum pump apparatus. The applied vacuum will show bubbles over unbonded areas and the unbonded areas will then be marked by the CONTRACTOR for repair by the CONTRACTOR.

Pressure Testing: Wedge welded seams shall be pressure tested at 25 psi for 5 minutes. No more than a 3 psi drop is allowed or the seam shall fail and will be cap stripped with a 2-foot wide Liner sheet the whole length of the seam.

3.3.3.2 Destructive Field Seam Testing

A minimum of one destructive test sample per 500 feet of field seam shall be obtained at locations specified by the Contracting Officer. Sample locations shall not be identified prior to seaming. Samples shall be a minimum of 12 inches wide by 42 inches long with the seam centered lengthwise. Each sample shall be cut into three equal pieces with one piece retained by the installer, one piece given to the independent laboratory, and the remaining piece given to the Contracting Officer for quality assurance testing and permanent record. Each sample shall be numbered and cross referenced to a field log which identifies: (1) panel/sheet number; (2) seam number; (3) top sheet; (4) date and time cut; (5) ambient temperature within 6 inches above the geomembrane; (6) seaming unit designation; (7) name of seamer; and (8) seaming apparatus temperature and pressures (where applicable). Ten 1-inch wide replicate specimens shall be cut from the installer's sample. Five specimens shall be tested for shear strength and 5 for peel adhesion using an approved field quantitative tensiometer. Jaw separation speed shall be in accordance with the installer's approved quality control manual. To be acceptable, 4 out of 5 replicate test specimens shall meet the specified seam strength requirements. If the field tests pass, 5 specimens shall be tested at the independent laboratory for shear strength and 5 for peel adhesion in accordance with ASTM D 4437. To be acceptable, 4 out of 5 replicate test specimens shall meet specified seam strength requirements. If the field or laboratory tests fail, the seam shall be repaired in accordance with paragraph Destructive Seam Test Repairs. In addition, destructive seam sample holes shall be repaired the same day as cut.

3.3.4 Defects and Repairs

3.3.4.1 Destructive Seam Test Repairs

Seams that fail destructive seam testing may be overlaid with a strip of new material and seamed (cap stripped). Alternatively, the seaming path shall be retraced to an intermediate location a minimum of 10 feet on each side of the failed seam location. At each location a 12 by 18-inch minimum size seam sample shall be taken for two additional shear strength and two additional peel adhesion tests using an approved quantitative field tensiometer. If these tests pass, then the remaining seam sample portion shall be sent to the independent laboratory for five shear strength and five peel adhesion tests in accordance with ASTM D 4437. To be acceptable, four out of five replicate test specimens must meet specified seam strength requirements. If these laboratory tests pass, then the seam shall be cap stripped between that location and the original failed location. If field or laboratory tests fail, then the process is repeated. After cap stripping, the entire cap stripped seam shall be non-destructively tested.

3.3.4.2 Patches

Tears, holes, blisters and areas with undispersed raw materials or foreign material contamination shall be repaired with patches. Patches shall have rounded corners, be made of the same geomembrane, and extend a minimum of 6 inches beyond the edge of defects. Minor localized flaws shall be repaired by spot welding or seaming as determined by the Contracting Officer. Repairs shall be non-destructively tested. The Contracting Officer may also elect to perform a destructive seam test on a suspect area.

3.3.4.3 Visual Inspection and Evaluation

Immediately prior to covering the geomembrane, seams and non-seam areas shall be visually inspected by the inspector and Contracting Officer for defects, holes, or damage due to weather conditions or construction activities. At the Contracting Officer's discretion, the surface of the geomembrane shall be brushed, blown, or washed by the installer if the amount of dust, mud, or foreign material inhibits inspection or functioning of the overlying material. Each suspect location shall be non-destructively tested. Each location that fails non-destructive testing shall be repaired in accordance with paragraph Patches and non-destructively tested prior to acceptance.

3.4 PENETRATIONS

Geomembrane penetration details shall be as recommended by the geomembrane manufacturer, fabricator or installer. Factory fabricated boots shall be used wherever possible. Tailored area field seams shall be non-destructively tested in accordance with the installer's approved quality control manual. Seams that fail non-destructive testing shall be repaired in accordance with the installer's approved quality control manual and non-destructively tested prior to acceptance.

3.5 PROTECTION AND BACKFILLING

The deployed and seamed geomembrane shall be covered with the required soil within 5 days of acceptance. Permanent folding over of geomembrane wrinkles

will not be allowed prior to or during placement of cover materials. Placement of soil shall proceed from a stable working area adjacent to the deployed geomembrane and gradually progress outward. Soil shall not be dropped from heights in excess of 3 feet onto the underlying geosynthetics. The initial loose soil lift height over the geomembrane shall be between 8 inches and 12 inches. Equipment with ground pressures less than 5 psi shall be used to place the first lift over the geomembrane.

SECTION 02373

SEPARATION/FILTRATION GEOTEXTILE
02/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3786	(1987) Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method
ASTM D 4354	(1996) Sampling of Geosynthetics for Testing
ASTM D 4355	(1992) Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
ASTM D 4491	(1995) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1995) Determining Apparent Opening Size of a Geotextile
ASTM D 4759	(1988; R 1996) Determining the Specification Conformance of Geosynthetics
ASTM D 4833	(1988; R 1996) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 4873	(1995) Identification, Storage, and Handling of Geosynthetic Rolls

1.2 MEASUREMENT - Not Used

1.3 PAYMENT - Not Used

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation. Submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Thread; FIO.

A minimum of 14 days prior to scheduled use, proposed thread type for sewn seams along with data sheets showing the physical properties of the thread.

SD-06 Instructions

Manufacturing Quality Control Sampling and Testing; .

A minimum of 14 days prior to scheduled use, manufacturer's quality control manual including instructions for geotextile storage, handling, installation, seaming, and repair.

SD-09 Reports

Seams; FIO.

Seam strength test results. Proposed horizontal seam locations on geocomposite seams.

SD-13 Certificates

Geotextile; GA .

A minimum of 14 days prior to scheduled use, manufacturer's certificate of compliance stating that the geotextile meets the requirements of this section. This submittal shall include copies of manufacturer's quality control test results. For needle punched geotextiles, the manufacturer shall also certify that the geotextile has been continuously inspected using permanent on-line full-width metal detectors and does not contain any needles which could damage other geosynthetic layers. The certificate of compliance shall be attested to by a person having legal authority to bind the geotextile manufacturer.

SD-14 Samples

Quality Assurance Samples and Tests; GA.

Samples for quality assurance testing; 7 days shall be allotted in the schedule to allow for testing.

1.5 DELIVERY, STORAGE AND HANDLING

Delivery, storage, and handling of geotextile shall be in accordance with ASTM D 4873.

1.5.1 Delivery

The Contracting Officer will be present during delivery and unloading of the geotextile. Rolls shall be packaged in an opaque, waterproof, protective plastic wrapping. The plastic wrapping shall not be removed until deployment. If quality assurance samples are collected, rolls shall be immediately rewrapped with the plastic wrapping. Geotextile or plastic wrapping damaged during storage or handling shall be repaired or replaced, as directed. Each roll shall be labeled with the manufacturer's name, geotextile type, roll number, roll dimensions (length, width, gross weight), and date manufactured.

1.5.2 Storage

Geotextile rolls shall be protected from becoming saturated. Rolls shall either be elevated off the ground or placed on a sacrificial sheet of plastic. The geotextile rolls shall also be protected from the following: construction equipment, ultraviolet radiation, chemicals, sparks and flames, temperatures in excess of 160 degrees F, and any other environmental condition that may damage the physical properties of the geotextile.

1.5.3 Handling

Geotextile rolls shall be handled and unloaded with load carrying straps, a fork lift with a stinger bar, or an axial bar assembly. Rolls shall not be dragged along the ground, lifted by one end, or dropped to the ground.

PART 2 PRODUCTS

2.1 RAW MATERIALS

2.1.1 Geotextile

Geotextile shall be a nonwoven 10 oz. and 8 oz. pervious sheet of polymeric material and shall consist of long-chain synthetic polymers composed of at least 95 percent by weight polyolefins, polyesters, or polyamides. Geotextiles bonded to geonet shall be 8 oz, all others shall be 10 oz. The use of woven slit film geotextiles (i.e. geotextiles made from yarns of a flat, tape-like character) will not be allowed. Stabilizers and/or inhibitors shall be added to the base polymer, as needed, to make the filaments resistant to deterioration by ultraviolet light, oxidation, and heat exposure. Re grind material, which consists of edge trimmings and other scraps that have never reached the consumer, may be used to produce the geotextile. Post-consumer recycled material shall not be used. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the selvages. Geotextiles and factory seams shall meet the requirements specified in Table 1. Where applicable, Table 1 property values represent minimum average roll values (MARV) in the weakest principal direction. Values for AOS represent maximum average roll values.

TABLE 1. GEOTEXTILE PHYSICAL PROPERTIES

PROPERTY	TEST METHOD		TEST VALUE
	8oz	10oz.	
Elongation at Break, percent	50	50	ASTM D 4632
Apparent Opening Size (U.S. Sieve)	80	100	ASTM D 4751
Permittivity, sec-1	1.5	1.0	ASTM D 4491
Puncture, lbs.	135	180	ASTM D 4633
Grab Tensile, lbs	220	200	ASTM D 4632
Trapezoidal Tear, lbs.	95	100	ASTM D 4533
Burst Strength, psi	420	520	ASTM D 3786
Ultraviolet Stability (percent strength retained at 500 hours)	70	70	ASTM D 4355
Seam Strength, lbs.	100	100	ASTM D 4632

2.1.2 Thread

Sewn seams shall be constructed with high-strength polyester, nylon, or other approved thread type. Thread shall have ultraviolet light stability equivalent to the geotextile and the color shall contrast with the geotextile.

2.2 MANUFACTURING QUALITY CONTROL SAMPLING AND TESTING

Manufacturing quality control sampling and testing shall be performed in accordance with the manufacturer's approved quality control manual. As a minimum, geotextiles shall be randomly sampled for testing in accordance with ASTM D 4354, Procedure A.

PART 3 EXECUTION

3.1 QUALITY ASSURANCE SAMPLES AND TESTS

3.1.1 Quality Assurance Samples

The Contractor shall provide assistance to the Contracting Officer in the collection of quality assurance samples. Samples shall be collected upon delivery to the site for quality assurance testing at a frequency of one per 100,000 square feet. Samples shall be identified with a waterproof marker by manufacturer's name, product identification, lot number, roll number, and

machine direction. The date and a unique sample number shall also be noted on the sample. The outer layer of the geotextile roll shall be discarded prior to sampling a roll. Samples shall then be collected by cutting the full-width of the geotextile sheet a minimum of 3 feet long in the machine direction. Rolls which are sampled shall be immediately rewrapped in their protective covering.

3.1.2 Quality Assurance Tests

The Contractor shall provide quality assurance samples to an Independent Laboratory hired by the Government. Samples will be tested to verify that geotextile meets the requirements specified in Table 1. Test method ASTM D 4355 shall not be performed on the collected samples. Geotextile product acceptance shall be based on ASTM D 4759. Tests not meeting the specified requirements shall result in the rejection of applicable rolls.

3.2 INSTALLATION

3.2.1 Subgrade Preparation

The surface underlying the geotextile shall be smooth and free of ruts or protrusions which could damage the geotextile. Subgrade materials and compaction requirements shall be in accordance with Section 02300 EARTHWORK.

3.2.2 Placement

The Contractor shall request the presence of the Contracting Officer during handling and installation. Geotextile rolls which are damaged or contain imperfections shall be repaired or replaced as directed. The geotextile shall be laid flat and smooth so that it is in direct contact with the subgrade. The geotextile shall also be free of tensile stresses, folds, and wrinkles. On slopes greater than 5 horizontal on 1 vertical, the geotextile shall be laid with the machine direction of the fabric parallel to the slope direction.

3.3 SEAMS

3.3.1 Overlap Seams

Geotextile panels shall be continuously overlapped a minimum of 12 inches. Where it is required that seams be oriented across the slope, the upper panel shall be lapped over the lower panel. The Contractor has the option of field sewing instead of overlapping.

3.3.2 Sewn Seams

Geotextile seams, for the geocomposite, shall be vertical (up and down) where the slope grades exceed 10% - horizontal seams on slopes greater than 10% will only be permitted in cap benches. The location of horizontal seams shall be provided as a submittal 2 weeks prior to construction. A flat seam with one row of a two-thread chain stitch shall be used unless otherwise recommended by manufacturer. The thread at the end of each seam run shall be tied off to prevent unraveling. Seams shall be on the top side of the geotextile to allow inspection. Skipped stitches or discontinuities shall be sewn with an extra line of stitching with a minimum of 18 inches of overlap.

3.4 PROTECTION

The geotextile shall be protected during installation from clogging, tears, and other damage. Damaged geotextile shall be repaired or replaced as directed. Adequate ballast (e.g. sand bags) shall be used to prevent uplift by wind. The geotextile shall not be left uncovered for more than 14 days during installation.

3.5 REPAIRS

Geotextile damaged during installation shall be repaired by placing a patch of the same type of geotextile which extends a minimum of 12 inches beyond the edge of the damage or defect. Patches shall be continuously fastened using a sewn seam or other approved method. The machine direction of the patch shall be aligned with the machine direction of the geotextile being repaired. Geotextile which cannot be repaired shall be replaced.

3.6 PENETRATIONS

Engineered penetrations of the geotextile shall be constructed by methods recommended by the geotextile manufacturer.

3.7 COVERING

Geotextile shall not be covered prior to approval by the Contracting Officer. The Contractor shall request the presence of the Contracting Officer during covering of the geotextile. Cover soil requirements are described in Section 02620 SUBDRAINAGE SYSTEM. The direction of backfilling shall proceed in the direction of down gradient shingling of geotextile overlaps. However, on side slopes, soil backfill shall be placed from the bottom of the slope upward. Cover soil shall be placed in a manner that prevents soil from entering the geotextile overlap zone, prevents tensile stress from being mobilized in the geotextile, and prevents wrinkles from folding over onto themselves. No equipment shall be operated directly on top of the geotextile. A minimum of 12 inches of soil shall be maintained between full-scale construction equipment tires/tracks and the geotextile during the covering process. Compaction and testing requirements for cover soil are described in Section 02620 SUBDRAINAGE SYSTEM.

3.8 FRICTION TESTING

See Section 02372 WASTE CONTAINMENT GEOMEMBRANE for friction testing requirements for geocomposite materials.

SECTION 02377

LOW PERMEABILITY CLAY LAYER
12/97

PART 1 GENERAL

1.1 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.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1140	(1992) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 1587	(1994) Thin-Walled Tube Geotechnical Sampling of Soils
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil and Rock
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2488	(1993) Description and Identification of Soils (Visual-Manual Procedure)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4220	(1995) Preserving and Transporting Soil Samples
ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 UNIT PRICES - NOT USED

1.3 EQUIPMENT

1.3.1 Compaction Equipment

Compaction equipment shall consist of tamping foot rollers which have a minimum weight of 40,000 pounds. At least one tamping foot shall be provided for each 110 square inches of drum surface. The length of each tamping foot, from the outside surface of the drum shall be equal to or greater than the loose lift thickness. During compaction operations, the spaces between the tamping feet shall be maintained clear of materials which would impair the effectiveness of the tamping foot rollers. Compaction equipment shall be operated at a speed not to exceed 5.0 miles per hour. Vibrating compaction is permitted.

1.3.2 Scarification Equipment

Disks, rotor tillers, or other means shall be provided to scarify the surface of each lift of clay prior to placement of the next lift. The scarification equipment shall be capable of uniformly disturbing the upper 1-inch of the clay surface to provide good bonding between lifts.

1.3.3 Steel Wheeled Rollers

A smooth steel-wheeled roller shall be used to produce a smooth compacted surface on the clay layer. Steel-wheeled rollers shall weigh a minimum of 20,000 pounds.

1.3.4 Hand Operated Tampers

Hand operated tampers shall consist of rammers or other impact type equipment. Vibratory type equipment will not be allowed.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation. Submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Materials Handling Plan; F10.

The Materials Handling Plan describing the following: processing and placement of the clay; type, model number, weight and critical dimensions of equipment to be used for construction of the clay layer and subgrade; method of protecting processed clay from contamination and changes in moisture content prior to placement; methods of protecting the clay layer from desiccation and freezing during construction.

SD-08 Statements

Commercial Testing Laboratory; GA.

Name and qualifications of the proposed commercial testing laboratory.

SD-09 Reports

Borrow Source Assessment; GA. Borrow Tests; GA. Subgrade Testing; GA. Moisture Content and Density Tests; GA. Hydraulic Conductivity Tests; GA.

The Borrow Source Assessment Report at least 30 days prior to delivery of clay to the site. No clay placement shall begin until the Borrow Source Assessment Report is approved. The report shall include the following: location of each borrow source; plan view and estimated available quantity of clay; locations and logs of subsurface explorations; laboratory test results; moisture-density curves showing the "Acceptable Zone" of moisture contents and densities which achieve the required permeability for each principal type of material or combination of materials. A zero air voids curve shall be included with each moisture-density curve.

SD-14 Samples

Low Permeability Clay; GA. Undisturbed Samples; GA.

A minimum of 100 pounds of each principal type of material or combination of materials to the Government's designated laboratory at least 45 days prior to placement.

PART 2 PRODUCTS

2.1 LOW PERMEABILITY CLAY

Clay shall be free of roots, debris, organic or frozen material, and shall have a maximum clod size of 2 inches at the time of compaction. Clay used must also satisfy the criteria listed in Table 1.

TABLE 1
REQUIRED PHYSICAL PROPERTIES OF CLAY

<u>Property</u>	<u>Test Value</u>	<u>Test Method</u>
Max. particle size (inches)	1	ASTM D 422
Min. percent passing No. 4 sieve	80	ASTM D 422
Min. percent passing No. 200 sieve	50	ASTM D 1140
Min. liquid limit	35	ASTM D 4318
Min. plasticity index	10	ASTM D 4318
Max. plasticity index	40	ASTM D 4318

PART 3 EXECUTION

3.1 BORROW SOURCE ASSESSMENT

3.1.1 General Requirements

Borrow source assessment tests shall be performed on each principal type or combination of material proposed for use as low permeability clay to assure compliance with specified requirements and to develop compaction requirements for placement. At a minimum, one set of borrow assessment tests shall be performed for each borrow source proposed. A set of borrow source assessment tests shall consist of classification testing, moisture-density (compaction) testing, and hydraulic conductivity testing.

3.1.2 Classification Testing

Test pits placed in a grid pattern shall be used to characterize each proposed borrow source. The test pits shall extend to the full depth of the proposed borrow source. Visual classification as described in ASTM D 2488 shall be performed over the full depth of each test pit by a qualified geologist or geotechnical engineer. Soils shall be grouped into "principal types" based on visual classification. Classification testing shall be performed on representative samples of each principal type or combination of materials. At a minimum, one set of classification tests shall be performed per 6500 cubic yards of proposed borrow. Classification testing shall consist of liquid and plastic limits in accordance with ASTM D 4318 and particle size analysis in accordance with ASTM D 422. Moisture content testing of proposed borrow shall be performed at a frequency of once per 2000 cubic yards.

3.1.3 Compaction Testing

A representative sample from each principal type or combination of materials shall be tested to establish a compaction curve using ASTM D 1557. A minimum of one set of compaction tests shall be performed per 6,500 cubic yards of proposed borrow. A minimum of 5 points shall be used to develop each compaction curve. The compaction curves shall be plotted on a single graph of dry density versus moisture content.

3.1.4 Hydraulic Conductivity Testing

A set of hydraulic conductivity tests shall be performed on representative samples of each principal type or combination of materials. A minimum of one set of tests shall be performed per 13,000 cubic yards of proposed borrow. A set of tests shall consist of a minimum of 6 test specimens. The moisture contents and densities of the specimens shall meet the criteria outlined in paragraph Acceptable Zone Development. Hydraulic conductivity testing referenced in this section shall be conducted in accordance with ASTM D 5084. In addition, the following procedures shall also be adhered to when performing the testing:

- a. Saturation of test specimens shall be verified by determination of the B coefficient. The B coefficient must be at least 0.95. The B coefficient is defined as the change in pore water pressure divided by the change in confining pressure.

- b. During consolidation of the test specimens, outflow volumes shall be recorded to confirm primary consolidation has been completed prior to initiation of the hydraulic conductivity test.
- c. The permeant used for back pressure saturation and hydraulic conductivity testing shall be 0.005 N calcium sulfate as specified in ASTM D 5084.
- d. The average effective confining pressure shall be 40 psi.

3.1.5 Acceptable Zone Development

An "Acceptable Zone" of moisture contents and densities shall be developed and displayed on the compaction curve graphs for each principal type of material or combination of materials. The "Acceptable Zone" shall consist of moisture-density values that meet the following requirements:

- a. Maximum Allowable Permeability = 1×10^{-7} cm per second
- b. The minimum allowable moisture content shall be no less than optimum moisture content -0.0% based on ASTM D 1557. The maximum allowable moisture content shall be +4.0%.
- c. The minimum allowable density shall be no less than 90% of maximum dry density based on ASTM D 1557 and 95% for a clay plug.

3.1.6 Chemical Contamination Testing

Borrow used for the clay layer and subgrade shall be free of contamination. Each proposed borrow source shall be sampled and analyzed for chemical contamination per 01450, 1.4.3.3.

3.1.7 Commercial Testing Laboratory

Tests for the clay layer and subgrade shall be performed by an approved commercial testing laboratory or may be tested by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved. The first inspection will be at the Government's expense. Cost incurred for subsequent inspections required because of failure of the first inspection will be charged to the Contractor.

3.2 SUBGRADE PREPARATION

Low permeability clay shall not be placed on surfaces that are muddy, frozen, or contain frost. Unsatisfactory material shall be removed from the upper 4 inches of surfaces to receive clay and shall be replaced with satisfactory material. Satisfactory material includes materials classified in ASTM D 2487 as coarse grained soils and shall be free of contamination, trash, debris, roots or other organic matter, or stones larger than 3 inches in any dimension. Unsatisfactory material includes materials classified in ASTM D 2487 as Pt, OH, OL, and any fine grained soils and any other materials not defined as satisfactory.

3.2.1 Scarification and Compaction

When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill. Compaction shall be accomplished by sheepsfoot roller, pneumatic-tired roller, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to plus or minus -0+2 percent of optimum moisture to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Minimum subgrade density shall be 90% of ASTM D 1557 maximum density.

3.2.2 Subgrade Testing

3.3 INSTALLATION

3.3.1 Clay Placement

Clay shall be placed to the lines and grades shown on the drawings. The clay shall be placed in loose lifts not to exceed 8 inches in thickness. In areas where hand operated tampers must be used, the loose lift thickness shall not exceed 4 inches. If grade stakes are driven into the clay layer to control lift thickness, they shall be numbered and accounted for at the end of each shift. When removing grade stakes, no broken portion of the grade stakes shall be left in the clay layer. Holes left by grade stakes shall be backfilled with grout. Grout shall meet ASTM C1107-91a

3.3.2 Moisture Control

Clay shall be placed and compacted within the moisture content range approved in the Borrow Source Assessment Report. The moisture content shall be maintained uniform throughout each lift. Moisture added shall be thoroughly incorporated into the clay to ensure uniformity of moisture content prior to compaction.

3.3.3 Compaction

Clay shall be compacted to the density requirements in the approved Borrow Source Assessment Report and by at least 5 passes of the approved compaction equipment over all areas of each lift. For self-propelled compactors, one pass is defined as one pass of the entire vehicle. Hand operated tampers shall be used in areas where standard compaction equipment cannot be operated. An approved non-penetrating type compactor shall be used to compact the first lift of clay.

3.3.4 Scarification

Scarification shall be performed on all areas of the upper surface of each clay lift prior to placement of the next lift. Scarification shall be accomplished with approved equipment. The final lift of clay shall not be scarified. It shall be rolled with at least 3 passes of the approved smooth steel-wheeled roller to provide a smooth surface with no ridges or depressions.

3.3.5 Repair of Voids

Voids in the clay created during construction, including penetrations for test samples, grade stakes, and other penetrations necessary for construction shall be repaired immediately by removing sand or other non-clay material, placing clay backfill in lifts no thicker than 3 inches and tamping each lift with a steel rod. Each lift shall be tamped a minimum of 25 times altering the location of the rod within the void. Other ruts and depressions in the surface of the lifts shall be scarified, filled, and then compacted to grade.

3.4 CONSTRUCTION TOLERANCES

The top surface of the clay layer shall be no greater than 3 inches above the lines and grades shown on the drawings. No minus tolerance will be permitted.

3.5 TESTS

3.5.1 Borrow Tests

Representative samples shall be taken for testing at the frequencies listed in Table 2 after a loose lift of clay has been placed. Test results shall meet the requirements listed in Table 1. Where test results indicate a previously undefined material type, additional testing shall be performed as described in paragraph BORROW ASSESSMENT.

TABLE 2
BORROW TESTS

<u>Property</u>	<u>Frequency</u>	<u>Test Method</u>
Percent passing No. 4 sieve (Note 1)	1,000 cubic yards	ASTM D 422
Percent passing No. 200 sieve (Note 1)	1,000 cubic yards	ASTM D 1140
Liquid and plastic limits (Note 1)	1,000 cubic yards	ASTM D 4318
Compaction	5,200 cubic yards	ASTM D 1557

Note 1: At least one test shall be performed each day that soil is placed.

3.5.2 Moisture Content and Density Tests

Moisture content and density tests shall be performed in a grid pattern. The grid pattern shall be staggered for successive lifts so that sampling points are not at the same location in each lift. Moisture content and density tests shall be performed in accordance with Table 3.

TABLE 3
MOISTURE CONTENT AND DENSITY TESTS

Property	Frequency	Test Method
Rapid Moisture Content	8,500 square feet	ASTM D 3017
Standard Moisture Content	1 for every 10 rapid tests	ASTM D 2216
Rapid Density	8,500 square feet	ASTM D 2922
Standard Density	1 for every 20 rapid tests	ASTM D 1556 ASTM D 2167

Rapid moisture and density test results shall be checked against standard test results to verify good correlation. A minimum of one moisture content and density test shall be performed each day clay is compacted. Nuclear density gauges shall be used in the direct transmission mode. Nuclear density and moisture calibration curves shall be checked and adjusted by the procedures described in ASTM D 2922 and ASTM D 3017. The nuclear gauge calibration checks shall be made at the beginning of a job, on each different type of material to be placed, and at intervals as directed. At the start of construction, a minimum of ten measurements shall be made on representative samples of compacted clay using both standard methods and any rapid moisture or density testing methods to be used. Results shall be compared to verify good correlation. The field moisture content and density test results shall be plotted on the "Acceptable Zone" plot that corresponds to the appropriate material type being tested. If test results are not within the "Acceptable Zone" for moisture content or density, 3 additional tests shall be taken at the location of the failed parameter. If all retests pass, no additional action shall be taken. If any of the retests fail, the lift of soil shall be removed and replaced to the limits defined by passing tests for that parameter. The area shall then be retested as directed. Documentation shall be provided concerning the corrective measures taken in response to failed test results.

3.5.3 Hydraulic Conductivity Tests

Undisturbed samples shall be taken for hydraulic conductivity testing at a frequency of once per 40000 square feet for each lift of clay placed. Vertical samples shall be cut from the lift in accordance with ASTM D 1587 and transported in the vertical position in accordance with ASTM D 4220, Group C. Each undisturbed sample shall be tested for hydraulic conductivity in accordance with ASTM D 5084, moisture content in accordance with ASTM D 2216, particle size analysis in accordance with ASTM D 422, and liquid and plastic limits in accordance with ASTM D 4318. Hydraulic conductivity testing shall be conducted in accordance with the requirements in paragraph Hydraulic Conductivity Testing. If any test result is greater than the "Maximum Allowable Permeability", modifications shall be proposed and approved for the placement of additional clay of that type. If the hydraulic conductivity of any test is more than the "Maximum Allowable Permeability", the area of the failed test shall be retested and repaired as directed. Documentation shall be submitted describing the corrective

measures taken in response to failed test results. Holes left by samples shall be backfilled with grout meeting ASTM C1107-91a.

3.5.4 Undisturbed Samples

Undisturbed Samples shall be taken at locations as directed and sent to the Government's designated laboratory. Samples shall be taken at a frequency of once per 40000 square feet for each lift of clay placed. Vertical samples shall be cut from the lift in accordance with ASTM D 1587 and shipped in the vertical position in accordance with ASTM D 4220, Group C. Holes left by samples shall be backfilled with grout meeting ASTM C1107-91a.

3.6 PROTECTION

3.6.1 Weather Conditions

Clay placement and compaction shall not take place during adverse weather conditions of freezing, desiccation, or excessive moisture.

3.6.2 Excess Surface Water

Excess moisture shall be removed prior to placement of additional clay. If in place clay is reworked and recompacted, affected areas shall be retested at the same frequency as the rest of the project. Occurrences of excess surface water shall be documented including location and volume of soil affected, corrective action taken, replacement, and retesting. Erosion that occurs in the clay layer prior to acceptance of the work shall be repaired and grades re-established.

3.6.3 Freezing and Desiccation

Freezing and desiccation of the clay layer shall be prevented. If freezing or desiccation occurs, the affected soil shall be removed or reconditioned as directed. Affected areas shall be retested at the same frequency as the rest of the project. Occurrences of freezing or desiccation of the clay layer shall be documented including location and volume of soil affected, corrective action taken, replacement, and retesting.

SECTION 02532

FORCE MAINS
07/98

PART 1 GENERAL

1.1 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.

AMERICAN PETROLEUM INSTITUTE (API)

API Spec 6D (1994; Supple 1 Jun 1996; Supple 2 Dec 1997)
Pipeline Valves (Gate, Plug, Ball, and Check
Valves)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53 (1997) ASTM C 478 (1996) Precast
Reinforced Concrete Manhole Sections

ASTM C 478M (1996) Precast Reinforced Concrete Manhole
Sections (Metric)

ASTM D 1784 (1996) Rigid Poly(Vinyl Chloride) (PVC)
Compounds and Chlorinated Poly(Vinyl
Chloride) (CPVC) Compounds

ASTM D 1785 (1996a) Poly(Vinyl Chloride) (PVC) Plastic
Pipe, Schedules 40, 80, and 120

ASTM D 2122 (1995) Determining Dimensions of
Thermoplastic Pipe and Fittings

ASTM D 2241 (1996a) Poly(Vinyl Chloride) (PVC) Pressure-
Rated Pipe (SDR Series)

ASTM D 2464 (1996a) Threaded Poly(Vinyl Chloride) (PVC)
Plastic Pipe Fittings, Schedule 80

ASTM D 2564 (1996a) Solvent Cements for Poly(Vinyl
Chloride) (PVC) Plastic Piping Systems

ASTM D 2774 (1994) Underground Installation of
Thermoplastic Pressure Piping

ASTM D 3035 (1995) Polyethylene (PE) Plastic Pipe (DR-PR)
Based on Controlled Outside Diameter

ASTM D 3139 (1996a) Joints for Plastic Pressure Pipes
Using Flexible Elastomeric Seals

- ASTM D 3350 (1996) Polyethylene Plastics Pipe and Fittings Material
- ASTM F 477 (1995) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- ASTM F 1483 (1993) Oriented Poly(Vinyl Chloride), PVCO, Pressure Pipe

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

AMERICAN WATER WORKS ASSOCIATION (AWWA)

- AWWA ANSI/AWWA C110/A21.10 (1993) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm through 1200 mm), for Water and Other Liquids
- AWWA ANSI/AWWA C111/A21.11 (1995) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- AWWA ANSI/AWWA C115/A21.15 (1994) Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
- AWWA ANSI/AWWA C151/A21.51 (1996) Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
- AWWA C207 (1994) Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144 In. (100 mm through 3,600 mm)
- AWWA ANSI/AWWA C208 (1996) Dimensions for Fabricated Steel Water Pipe Fittings
- AWWA C500 (1993; C500a) Metal-Seated Gate Valves for Water Supply Service
- AWWA ANSI/AWWA C508 (1993; C508a) Swing-Check Valves for Waterworks Service, 2 In. (50 mm) Through 24 In. (600 mm) NPS
- AWWA C600 (1993) Installation of Ductile-Iron Water Mains and Their Appurtenances
- AWWA C900 (1989; C900a) Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution

DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

- MSS SP-78 (1987; R 1992) Cast Iron Plug Valves, Flanged and Threaded Ends

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09 Reports

Hydrostatic Tests; GA.

Copies of test results.

1.3 DELIVERY AND STORAGE

Pipe, fittings and accessories, and pipe coatings shall not be damaged during delivery, handling, and storage.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

Pipe shall conform to the respective specifications and other requirements specified below.

2.1.1 Concrete Pressure Pipe-Not Used

2.1.2 Plastic Pipe

Pipe may be PVC or PE. The contract plans indicate PVC Pipe. Should PE Pipe be chosen by contractor, fittings and detailed specifications are to be submitted by the contractor for approval.

2.1.2.1 PVC Pipe

- a. PVC Pipe and Fittings 4 inches Diameter and Larger: ASTM D 2241, SDR 21 with push-on joints.

2.1.2.2 PE Pipe

- a. PE Pipe shall meet ASTM D 3035 minimum pressure rating of 100 psi at 73.4°F and be SDR-1.

ASTM D 3350 and ASTM D 3035, minimum pressure rating of 100 psi at 73.4 degrees F.

2.2 JOINTS

2.2.1 PVC Piping

- a. Screw Joint Fittings: ASTM D 2464, Schedule 80.
- b. Push-On Joint Fittings: ASTM D 3139, with ASTM F 477 gaskets.
- c. Solvent Cement: ASTM D 2564.

- d. Couplings for use with plain end pipe shall have centering rings or stops to ensure the coupling is centered on the joint.

2.2.2 PE Piping

Heat fusion joints shall comply with manufacturers instructions concerning equipment, temperature, melt time, heat coat, and joining time.

2.3 VALVES

2.3.1 Plug Valves

Plug valves shall be cast iron and comply with MSS-SP-78. Valves for buried service shall be non-rising stem (NRS), 2 inch square nut operated with joints applicable to the pipe or installation. Buried valves shall be furnished with extension stems comprising socket, extension stem and operating nut, and shall be of an appropriate length to bring operating nut to within 6 inches of grade. One 4 foot "T" handle valve wrench shall be furnished. Gate valves that are exposed or installed inside shall be outside creew and yoke (OS&Y), handwheel operated with flange ends unless otherwise indicated. Gate valve operating nuts and handwheels shall have an arrow and the word "OPEN" cast in raised letters to indicate the direction of operning.

2.3.2 Check Valves

Check valves shall permit free flow of sewage forward and provide a positive check against backflow. Check valves shall be designed for a minimum working pressure of 150 psi or as indicated. The body shall be iron. The manufacturer's name, initials, or trademark and also the size of the valve, working pressure, and direction of flow shall be directly cast on the body.

- a. Swing Check Valves shall comply with AWWA ANSI/AWWA C508 and shall be iron body, bronze mounted, and shall have flanged ends. Flanges shall be the 125 pound type complying with ASME B16.1.

2.4 VALVE BOXES

Valve boxes shall be cast iron or concrete, except that concrete boxes may be installed only in locations not subject to vehicular traffic. Cast iron boxes shall be the extension type with slide type adjustment and with flared base. The minimum thickness of metal shall be 3/16 inch. The box length shall be adaptable, without full extension, to the depth of cover over the pipe at the valve locations. Concrete boxes shall be the standard product of a manufacturer of precast concrete equipment. The word "SEWER" shall be cast in the cover.

2.6.2 Joint Lubricants

Joint lubricants shall be as recommended by the pipe manufacturer.

2.6.3 Bolts, Nuts and Glands

AWWA ANSI/AWWA C111/A21.11.

2.6.4 Joint Compound

A stiff mixture of graphite and oil or inert filler and oil.

2.6.5 Joint Tape

ASTM D 3308.

2.6.6 Bond Wire

Bond wire type RHW or USE, Size 1/0 AWG, neoprene jacketed copper conductor shaped to stand clear of the joint.

PART 3 EXECUTION

3.1 INSTALLATION

Pipe, pipe fittings, and appurtenances shall be installed at the locations indicated. Excavation, trenching, and backfilling shall be as specified in Section 02316 EXCAVATION, TRENCHING AND BACKFILLING FOR UTILITIES SYSTEMS.

3.1.2 Cutting

Pipe shall be cut in a neat manner with mechanical cutters. Wheel cutters shall be used where practicable. Sharp and rough edges shall be ground smooth and loose material removed from the pipe before laying.

3.1.3 Laying

Except where otherwise authorized, pipe shall be laid with bells facing the direction of laying. Before lowering and while suspended, the pipe shall be inspected for defects. Defective material shall be rejected. Pipe shall be laid in compliance with the following:

3.1.4 Jointing

3.1.4.1 Joints for PVC Pipe

- a. Threaded joints shall be made by wrapping the male threads with joint tape or by applying an approved thread lubricant, then threading the joining members together. The joint shall be tightened with strap wrenches which will not damage the pipe and fittings. The joint shall be tightened no more than 2 threads past hand-tight.
- b. Push-on joints: The ends of pipe for push-on joints shall be beveled to facilitate assembly. Pipe shall be marked to indicate when the pipe is fully seated. The gasket shall be lubricated to prevent displacement. The gasket shall remain in proper position in the bell or coupling while the joint is made.
- c. Solvent-weld joints shall comply with the manufacturer's instructions.

3.1.4.2 Joints for PE Pipe

Heat fusion joints shall comply with the manufacturer's instructions concerning equipment, temperature, melt time, heat coat, and joining time. Flanged and mechanical joints shall be made in compliance with the manufacturer's instructions.

3.1.5 Installation of Valves

Prior to installation, valves shall be cleaned of all foreign matter and inspected for damage. Valves shall be fully opened and closed to ensure that all parts are properly operating. Valves shall be installed with the stem in the vertical position.

3.1.6 Installation of Valve Boxes

Valve boxes shall be installed over each outside gate valve, unless otherwise indicated. Valve boxes shall be centered over the valve. Fill shall be carefully tamped around each valve box to a distance of 4 feet on all sides or to undisturbed trench face, if less than 4 feet.

3.1.7 Thrust Blocks

Thrust blocking shall be concrete of a mix as specified in Massachusetts Highway Department M402.00 not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 3000 psi after 28 days. Blocking shall be placed between solid ground and the fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth. The sides of thrust blocks not subject to thrust may be poured against forms. The area of bearing shall be as shown or as directed. Blocking shall be placed so that the fitting joints will be accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks.

3.1.8 Grout

Grout for exterior joint protection on concrete structures shall be a mix of 1 part portland cement, 2 parts sand, and of sufficient liquid consistency to flow into the joint recess beneath the diaper. Grout for interior joint protection shall be a mix of 1 part portland cement and 1 part sand. A polyurethane foam loop, impregnated with portland cement, may be substituted for grout for exterior joints.

3.2 HYDROSTATIC TESTS

The pipeline shall be subjected to both a pressure test and a leakage test. The method proposed for disposal of waste water from hydrostatic tests shall be approved by the Contracting Officer. Testing shall be the responsibility of the Contractor. The test may be witnessed by the Contracting Officer. The Contracting Officer shall be notified at least 7 days in advance of equipment tests. The final test report shall be delivered to the Contracting Officer within 30 days of the test.

3.2.1 Pressure Test

After the pipe has been installed, joints completed, thrust blocks have been in place for at least five days, and the trench has been partially backfilled, leaving the joints exposed for examination, the pipe shall be filled with water to expel all air. The pipeline shall be subjected to a test pressure of 100 psi or 150 percent of the working pressure, whichever is greater, for a period of at least one hour. Each valve shall be opened and closed several times during the test. The exposed pipe, joints, fitting, and valves shall be examined for leaks. Visible leaks shall be stopped or the defective pipe, fitting, joints, or valve shall be replaced.

3.2.2 Leakage Test

The leakage test may be conducted subsequent to or concurrently with the pressure test. The amount of water permitted as leakage for the line shall be placed in a sealed container attached to the supply side of the test pump. No other source of supply will be permitted to be applied to the pump or line under test. The water shall be pumped into the line by the test pump as required to maintain the specified test pressure as described for pressure test for a 2 hour period. Exhaustion of the supply or the inability to maintain the required pressure will be considered test failure. PE pipe can experience diametric expansion and pressure elongation during initial testing. The manufacturer shall be consulted prior to testing for special testing considerations. Allowable leakage shall be determined by the following I-P formula:

$L = NDP/K$ Where:

L = Allowable leakage in gallons per hour.

N = Number of joints in length of pipeline tested.

D = Nominal diameter of the pipe in inches.

P = Square root of the test pressure in psig.

K = 7400 for pipe materials.

At the conclusion of the test, the amount of water remaining in the container shall be measured and the results recorded in the test report.

3.2.3 Retesting

If any deficiencies are revealed during any test, such deficiencies shall be corrected and the tests shall be reconducted until the results of the tests are within specified allowances, without additional cost to the Government.

SECTION 02620

SUBDRAINAGE SYSTEM
08/97

PART 1 GENERAL

1.1 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.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3034	(1994) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM F 758	(1993) Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage
ASTM C 33	(1993) Standard Specifications for Concrete AGGREGATION
ASTM D 2434	(1994) STANDARD TEST METHOD FOR PERMEABILITY OF GRANULAR SOILS
ASTM D 2216	(1992) LABORATORY DETERMINATION OF WATER (MOISTURE) CONTENT OF SOIL AND ROCK
ASTM D 422	(1963; R 1990) Particle Size Analysis of Soils

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-13 Certificates

Filter Fabric; GA. Pipe for Subdrains; GA.

Certifications from the manufacturers attesting that materials meet specification requirements. Certificates are required for drain pipe, drain tile, fittings, entrance ramp details, filter fabric, and seaming method.

SD-14 Samples

Filter Fabric; GA. Pipe for Subdrains; GA.

Samples of filter fabric, pipe, and pipe fittings, before starting the work.

1.3 DELIVER, STORAGE, AND HANDLING

1.3.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with minimum handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. During shipment and storage, filter fabric shall be wrapped in burlap or similar heavy duty protective covering. The storage area shall protect the fabric from mud, soil, dust, and debris. Filter fabric materials that are not to be installed immediately shall not be stored in direct sunlight. Plastic pipe shall be installed within 6 months from the date of manufacture unless otherwise approved.

1.3.2 Handling

Materials shall be handled in such a manner as to insure delivery to the trench in sound undamaged condition. Pipe shall be carried and not dragged to the trench.

PART 2 PRODUCTS

2.1 PIPE

2.1.1 Plastic Pipe

Plastic pipe shall contain ultraviolet inhibitor to provide protection from exposure to direct sunlight.

2.1.2 Polyvinyl Chloride (PVC) Pipe and Fittings

Polyvinyl chloride (PVC) pipe shall be sch 80 and fittings and shall conform to ASTM 1785, 2672, 2467.

2.1.3 Pipe Perforations

Water inlet area shall be a minimum of 0.5 square inch per linear foot. Manufacturer's standard perforated pipe which essentially meets these requirements may be substituted with prior approval of the Contracting Officer.

- a. Circular Perforations in Plastic Pipe: Circular holes shall be cleanly cut not more than 3/8 inch or less than 3/16 inch in diameter and arranged in rows parallel to the longitudinal axis of the pipe. Perforations shall be approximately 3 inches center-to-center along rows. The rows (2) shall be approximately 1-1/2 inches apart and arranged in a staggered pattern so that all perforations lie at the midpoint between perforations in adjacent rows. The rows shall be spaced over not more than 155 degrees of circumference. The spigot or tongue end of the pipe shall not be perforated for a length equal to the depth of the socket, and perforations shall continue at uniform spacing over the entire length of the pipe.

- b. Slotted Perforations in Plastic Pipe: Circumferential slots shall be cleanly cut so as not to restrict the inflow of water and uniformly spaced along the length and circumference of the tubing. Width of slots shall not exceed 1/8 inch nor be less than 1/32 inch. The length of individual slots shall not exceed 1-1/4 inches on 3 inch diameter tubing, 10 percent of the tubing inside nominal circumference on 4 to 8 inch diameter tubing, and 2-1/2 inches on 10 inch diameter tubing. Rows of slots shall be symmetrically spaced so that they are fully contained in 2 quadrants of the pipe. Slots shall be centered in the valleys of the corrugations of profile wall pipe.

2.2 FILTER FABRIC

Filter fabric shall be as specified in Section 02373 for 10 ounce geotextiles.

2.2 LEACHATE COLLECTION AGGREGATE AND DRAINAGE LAYER

Leachate collection aggregate shall be washed non-calcareous stone. Drainage Layer shall not contain corrosive agents, organic matter, or soft, friable, thin, or be non calcareous elongated particles and shall be evenly graded between the limits specified in TABLE I. Gradation curves will exhibit no abrupt changes in slope denoting skip or gap grading. Drainage Layer shall be clean and free from soil and foreign materials. Drainage Layer found to be dirty or otherwise contaminated shall be removed and replaced with material meeting the specific requirements, at no additional cost to the Government. The Leachate Collection Aggregate and Drainage Layer shall meet the following gradations.

TABLE I. Pipe Leachate Collection Aggregate
(Coarse Granular Material)

Percent Finer

U.S. Standard Sieve Opening

3 INCH	100
2 INCH	90-100
1.5 INCH	70-100
1.0 INCH	0-15
0.5 INCH	0-3

Drainage Layer shall conform to ASTM C-33- Fine aggregate, non-calcareous, and the gradation shall be required to achieve a permeability of not less than 1×10^{-3} cm/sec when compacted to at least 75% relative density. Sand shall not have more than 2% fines passing a No. 200 sieve.

PART 3 EXECUTION

3.1 INSTALLATION OF FILTER FABRIC AND PIPE FOR SUBDRAINS

3.1.1 Installation of Filter Fabric

3.1.1.3 Trench Lining and Overlaps

Trenches to be lined with filter fabric shall be graded to obtain smooth side and bottom surfaces so that the fabric will not bridge cavities in the soil or be damaged by projecting rock. The fabric shall be laid flat but not stretched on the soil, and it shall be secured with anchor pins. Overlaps shall be at least 24 inches or sewn in an approved manner in accordance with Section 02373 SEPARATION/ FILTER GEOTEXTILES.

3.1.2 Installation of Pipe for Subdrains

3.1.2.1 Pipelaying

Each pipe shall be carefully inspected before it is laid. Any defective or damaged pipe shall be rejected. No pipe shall be laid when the trench conditions or weather is unsuitable for such work. Water shall be removed from trenches by sump pumping or other approved methods. The pipe shall be laid to the grades and alignment as indicated. The pipe shall be bedded to the established gradeline. Perforations shall be centered on the bottom of the pipe. Pipes of either the bell-and-spigot type or the tongue-and-groove type shall be laid with the bell or groove ends upstream. All pipes in place shall be approved before backfilling.

3.1.2.2 Jointings

- a. Polyvinyl Chloride (PVC) Pipe: Joints shall be in accordance with the requirements of ASTM D 3139 and ASTM D 2774.

3.2 INSTALLATION OF AND BACKFILLING OF LEACHATE COLLECTION ZONE AGGREGATE AND DRAINAGE LAYER

3.2.1 Installation of the Drainage Layer and Leachate Collection Zone Aggregate

Placement of leachate collection zone material shall not begin until perimeter liner anchor trenches are completely backfilled.

Equipment used for placing and spreading the zone and protective cover aggregates shall not be driven directly on the underlying HDPE liner or geotextiles. A protective layer consisting of a minimum thickness of 18 inches of Drainage Layer shall be placed over the geosynthetic lining system in advance of any equipment treading over it. On slopes flatter than 15%, leachate collection zone aggregate shall be placed using equipment with ground contact pressure not exceeding 6 pounds per square inch (psi). Equipment ground contact pressure shall not exceed 4.25 psi on slopes steeper than 15%. In heavy traffic areas, such as access ramps, or where ground contact pressure could not exceed 6 psi, drainage layer shall be placed a minimum of 3 ft thick before equipment treads over liner. Should the contracting officer observe the Contractor neglecting to maintain the minimum thickness requirements, the Contracting Officer may direct the Contractor to provide an inspection of the underlying geosynthetics throughout the entire limits of said areas at no additional cost to the owner. Damage incurred to the underlying geosynthetic materials shall be repaired at the expense of the Contractor.

Placement of the Drainage Layer shall be performed by the Contractor so as to minimize the formation of wrinkles in the HDPE liner. As specified the Contractor shall be responsible for adequately exposing and repairing those

wrinkles formed within the HDPE liner that are deemed unacceptable by the Contracting Officer.

Drainage Layer shall be placed on sideslopes by beginning at the toe of slope and continuing up the slope with aggregate placement. Drainage Layer shall be dumped on drainage layer and pushed over geosynthetics. Top-to-bottom of slope placement is prohibited.

The contractor shall measure the leachate collection zone and protective cover thickness to verify the thickness required during construction, as well as the final thickness required during construction, as well as the final thicknesses, are met. Placement of material shall be completed to avoid damage to the various geosynthetic materials.

3.2.2 Geotextiles

Geotextiles shall be installed in accordance with the requirements of Section 02373 and as shown on drawings. They shall be placed up the entire slope and shall extend into the anchor trench. No horizontal seams of geotextile shall be allowed on slopes greater than ten (10) percent. Leachate Collective Zone aggregate shall be placed around the collection laterals and header pipes as detailed on the Drawings. As nonwoven, needle-punched geotextile shall be used as a wrap to separate this aggregate from the primary leachate collection zone aggregate. Upon placement of the collection pipe and pipe aggregate materials, each non-woven geotextile shall be folded over the top of the aggregated material. A minimum 2-foot overlap shall be maintained. The Contractor shall exercise care to insure an adequate thickness of leachate collection zone aggregate covers the liner for protection as shown on the Drawings, and that proper equipment and operating technique is used so that underlying materials are not damaged during this work.

3.2.3 Fittings

Collection materials and header pipes shall be installed as required herein as shown on the Drawings. Fabricated fittings shall be used where the leachate collection pipe header enters and exits the sump area. The Contractor shall field verify the fitting angle prior to fabrication of the fitting. The ends of lateral and header pipes and clean outs shall be installed as detailed on the Drawings.

3.2.4 Sump Installation

Coarse granular material to be used within the collection sump shall meet the permeability requirements of these specifications. The material shall be carefully placed upon the geotextile shown on the Drawings in two lifts of equal thickness by the Contractor. All areas adjacent to and under the leachate collection pipes shall be filled with coarse granular material. No voids shall be permitted.

The prefabricated liner penetration shall be installed as detailed on the Drawings. The bootless pipe penetration shall be constructed of materials specified in specification 02372. The boot (skirt and sleeve), and bootless penetration including all welds, clamps, and ancillary equipment, shall be installed in the presence of the Contracting Officer. The Contractor shall supply the Contracting Officer with a written notice (1 day in advance) of his scheduled penetration installation.

3.2.5 Temporary Ramps

Temporary entrance ramps shall be constructed only after the HDPE liner, geotextiles, and drainage nets have been installed, tested and approved by the Engineer. The Contractor shall submit to the Contracting Officer for review and written approval the location, slope, and dimensions of all proposed temporary entrance ramps. The Contractor shall allow two weeks for the review and approval process. The Contractor will not be permitted to end-dump drainage layer material directly onto the face of a slope when construction of the entrance ramp commences. Rather, a sufficiently-sized buffer of material approved by the Contracting Officer shall be installed at the toe of the slope on the floor of the cell prior to placing stone directly on the face of the slope.

The access ramp(s) and all other areas subjected to heavy traffic shall be constructed with a minimum thickness of 3 feet. The ramp(s) shall be constructed out of approved Drainage layer.

3.3 TESTS

3.3.1 Pipe Test

Strength tests of pipe shall conform to field service test requirements of the Federal Specification, ASTM specification, or AASHTO specification covering the product (paragraph PIPE FOR SUBDRAINS).

3.3.2 Testing of Drainage Layer and Leachate Collection Aggregate

3.3.2.1 Pre-Construction Testing

Prior to delivery of any Drainage Layer and Leachate collection zone aggregate, the Contractor shall notify the Contracting officer in writing of the location of his proposed aggregate borrow source(s). The Contracting Officer shall visit and inspect each proposed borrow source. During said inspection, the Contractor shall provide any equipment necessary to excavate test pits throughout the limits of the proposed source to assure the Contracting Officer of the material's uniformity. Upon visual acceptance by the Contracting Officer, a minimum of two (2) representative 100-pound samples of each aggregate material from each borrow source shall be obtained by the Contractor and transported to the approved geotechnical testing laboratory to confirm that the proposed materials are in conformance with these Specifications. The laboratory program shall include the following tests and shall be performed in accordance with the specified methods and frequencies:

Laboratory Testing Program for Each Proposed Leachate Collection Aggregate and Drainage Layer Borrow Source Sample		
Property	No. of Tests	Test Method
Permeability (samples shall be compacted to at least 75% relative density (D_r))	1	ASTM D2434
Grain-size Distribution	1	ASTM D422
Maximum and Minimum Index Densities	1	ASTM D4253

The Contractor shall provide test reports certified by the geotechnical laboratory containing the results of the required laboratory tests to the Contracting Officer for review and approval before delivery of any leachate collection zone aggregate materials. If the tests results show the permeability and/or the gradation requirements are not met, or that significant variability exists between the test results, the Contracting Officer shall decide whether to test more samples, revise the gradation requirements, or obtain a new borrow source.

No material shall be delivered to the site until the material is approved by the Contracting Officer.

3.3.2.2 Construction Frequency Testing

Laboratory Testing- Throughout the construction of the Subdrain system, samples from each approved borrow source shall be supplied to an approved geotechnical laboratory by and at the expense of the Contractor to confirm the materials being delivered to the site are in conformance with these Specifications. The laboratory testing program shall include the following tests and shall be performed in accordance with the specified methods and frequencies:

Required Laboratory Frequency Testing Program for Drainage Layer and Leachate Collection Zone Aggregate During Construction of Subdrain System		
Property	Frequency of Test Per Volume Delivered to Site (yd ³)	Test Method
Permeability (samples shall be compacted to at least 75% relative density (Dr))	3,000	ASTM D2434
Grain-size Distribution	1,000	ASTM D422

In addition, testing shall be performed by the Contractor as directed by the Contracting Officer when visual observations by the Contracting Officer of construction performance indicate a potential problem or significant deviation from required material properties.

Field Density and Thickness Testing- The Contracting Officer may examine each delivered load of material prior to placement. Any material containing organics, trash, or excessive fines or moisture, at the discretion of the Contracting Officer, will be classified as unsuitable and shall not be used for construction. The Contractor shall remove and properly dispose of all rejected material at no cost to the Owner.

The Contractor shall measure Drainage Layer thickness periodically throughout each day of construction to verify that the design thickness required on the Drawings is met. The Contractor shall maintain a written log of these field measurement and their locations and provide them to the Contracting Officer on a daily basis and to the Owner at the project close-out. The Contracting Officer may make independent measurements of thickness, as necessary.

Styrofoam or equivalent non penetrating grade stakes shall be used to verify thickness.

The Contracting Officer may inspect and test any component of the leachate collection system at any time. Requirements for inspection and testing of drainage nets are specified in Section 02273 GEOCOMPOSITE and geotextile fabrics are specified in Section 02373 GEOCOMPOSITE. Unless otherwise indicated, testing shall be performed by an independent laboratory with materials furnished by the Contractor at the expense of the Contractor.

SECTION 02921

SEEDING
06/98

PART 1 GENERAL

1.1 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.

AGRICULTURAL MARKETING SERVICE (AMS)

AMS-01 (Aug 95) Federal Seed Act Regulations Part 201

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 602 (1995a) Agricultural Liming Materials
ASTM D 977 (1991) Emulsified Asphalt
ASTM D 2028 (1976; R 1992) Cutback Asphalt (Rapid-Curing Type)
ASTM D 4972 (1995a) pH of Soils
ASTM D 5268 (1992; R 1996) Topsoil Used for Landscaping Purposes
ASTM D 5883 (1996) Standard Guide for Use of Rotary Kiln Produced Expanded Shale, Clay or Slate (ESCS) as a Mineral Amendment in Topsoil Used for Landscaping and Related Purposes

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Equipment; F10. Surface Erosion Control Material; GA. Chemical Treatment Material; F10.

Manufacturer's literature including physical characteristics, application and installation instructions for equipment, surface erosion control material and chemical treatment material.

SD-07 Schedules

Equipment; F10.

A listing of equipment to be used for the seeding operation.

SD-08 Statements

Delivery; F10.

Delivery schedule.

Finished Grade and Topsoil; F10.

Finished grade status.

Topsoil; F10.

Availability of topsoil from the stripping and stock piling operation.

SD-09 Reports

Equipment Calibration; F10.

Certification of calibration tests conducted on the equipment used in the seeding operation.

Soil Test; F10.

Certified reports of inspections and laboratory tests, prepared by an independent testing agency, 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-13 Certificates

Seed; GA. Topsoil; GA. pH Adjuster; GA. Fertilizer; GA. Organic Material; GA. Soil Conditioner; GA. Mulch; GA. Asphalt Adhesive; GA. Pesticide; GA.

Prior to the delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following:

- a. Seed. Classification, botanical name, common name, percent pure live seed, minimum percent germination and hard seed, maximum percent weed seed content, and date tested.
- b. Topsoil. Particle size, pH, organic matter content, textural class, soluble salts, chemical and mechanical analyses.
- c. pH Adjuster. Calcium carbonate equivalent and sieve analysis.
- d. Fertilizer. Chemical analysis and composition percent.
- e. Organic Material: Composition and source.
- f. Soil Conditioner: Composition and source.
- g. Mulch: Composition and source.

h. Asphalt Adhesive: Composition.

i. Pesticide. EPA registration number and registered uses.

SD-14 Samples

from several locations at the source.

Bag count or bulk weight measurements of material used compared with area covered to determine the application rate and quantity installed.

Seed Establishment Period;

Calendar time period for the seed establishment period. When there is more than one seed establishment period, the boundaries of the seeded area covered for each period shall be described.

Maintenance Record;

Maintenance work performed, area repaired or reinstalled, diagnosis for unsatisfactory stand of grass plants.

1.3 SOURCE INSPECTION-NOT USED

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Delivery

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery.

1.4.1.1 Delivered Topsoil

Prior to the delivery of any topsoil, its availability shall be verified in paragraph TOPSOIL. A soil test shall be provided for topsoil delivered to the site.

1.4.1.2 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

1.4.1.3 Pesticides-Not used

1.4.2 Inspection

Seed shall be inspected upon arrival at the job site for conformity to species and quality. Seed that is wet, moldy, or bears a test date five months or older, shall be rejected. Other materials shall be inspected for compliance with specified requirements. The following shall be rejected: open soil amendment containers or wet soil amendments; topsoil that contains slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter; and topsoil that contains viable plants and plant parts. Unacceptable materials shall be removed from the job site.

1.4.3 Storage

Materials shall be stored in areas designated by the contracting office. Seed, lime, and fertilizer shall be stored in cool, dry locations away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with seeding operation materials and other landscape materials.

1.4.4 Handling

Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

1.4.5 Time Limitation-Not used

PART 2 PRODUCTS

2.1 SEED

2.1.1 Seed Classification

State-approved seed of the latest season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with AMS-01 and applicable state seed laws.

2.1.2 Permanent Seed Species and Mixtures

Permanent seed species and mixtures shall be as follows:

Seed will be in accordance with Mass. Highway Dept. section M 603.0 for Slopes and Shoulders.

2.1.3 Temporary Seed Species

Temporary seed species for surface erosion control or overseeding shall be as follows:

Seed will be in accordance with Mass. Highway Dept. section M 603.01

2.1.4 Quality

Weed seed shall be a maximum 1 percent by weight of the total mixture.

2.1.5 Seed Mixing

The mixing of seed may be done by the seed supplier prior to delivery, or on site as directed.

2.1.6 Substitutions

Substitutions will not be allowed without written request and approval from the Contracting Officer.

2.2 TOPSOIL

Topsoil shall be as defined in ASTM D 5268. When available, the topsoil shall be the existing surface soil stripped and stockpiled onsite in accordance with Section 02300 EARTHWORK. When additional topsoil is required beyond the available topsoil from the stripping operation, topsoil shall be delivered and amended as recommended by the soil test for the seed specified. Topsoil shall be free from slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter. Topsoil shall be free from viable plants and plant parts.

2.3 SOIL AMENDMENTS

Soil amendments shall consist of pH adjuster, fertilizer, organic material and soil conditioners meeting the following requirements. Vermiculite shall not be used.

2.3.1 pH Adjuster

The pH adjuster shall be an agricultural liming material in accordance with ASTM C 602. These materials may be burnt lime, hydrated lime, ground limestone, sulfur, or shells. The pH adjuster shall be used to create a favorable soil pH for the plant material specified.

2.3.1.1 Limestone

Limestone material shall contain a minimum calcium carbonate equivalent of 80 percent. Gradation: A minimum 95 percent shall pass through a No. 8 sieve and a minimum 55 percent shall pass through a No. 60 sieve. To raise soil pH, ground limestone shall be used.

2.3.1.2 Hydrated Lime

Hydrated lime shall contain a minimum calcium carbonate equivalent of 110 percent. Gradation: A minimum 100 percent shall pass through a No. 8 sieve and a minimum 97 percent shall pass through a No. 60 sieve.

2.3.1.3 Burnt Lime

Burnt lime shall contain a minimum calcium carbonate equivalent of 140 percent. Gradation: A minimum 95 percent shall pass through a No. 8 sieve and a minimum 35 percent shall pass through a No. 60 sieve.

2.3.2 Fertilizer

The nutrients ratio shall be 10 percent nitrogen, 20 percent phosphorus, and 10 percent potassium. Fertilizer shall be controlled release commercial grade, free flowing, uniform in composition, and consist of a nitrogen-phosphorus-potassium ratio. The fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.3.3 Nitrogen Carrier Fertilizer

It shall be as recommended by the soil test Nitrogen carrier fertilizer shall be commercial grade, free flowing, and uniform in composition. The fertilizer may be a liquid nitrogen solution.

2.3.4 Organic Material

Organic material shall consist of either bonemeal, rotted manure, decomposed wood derivatives, recycled compost, or worm castings.

2.3.4.1 Bonemeal

Bonemeal shall be finely ground, steamed bone product containing from 2 to 4 percent nitrogen and 16 to 40 percent phosphoric acid.

2.3.4.2 Rotted Manure

Rotted manure shall be unleached horse, chicken or cattle manure containing a maximum 25 percent by volume of straw, sawdust, or other bedding materials. It shall contain no chemicals or ingredients harmful to plants. The manure shall be heat treated to kill weed seeds and be free of stones, sticks, and soil.

2.3.4.3 Decomposed Wood Derivatives

Decomposed wood derivatives shall be ground bark, sawdust, yard trimmings, or other wood waste material that is free of stones, sticks, soil, and toxic substances harmful to plants, and is fully composted or stabilized with nitrogen.

2.3.4.4 Recycled Compost

Compost shall be a well decomposed, stable, weed free organic matter source. Compost shall be derived from food; agricultural or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 3/8 inch screen, possess a pH of 5.5 to 8.0, and have a moisture content between 35-55 percent by weight. The material shall not contain more than 1 percent by weight of man-made foreign matter. Compost shall be cleaned of plastic materials larger than 2 inches in length.

2.3.4.5 Worm Castings

Worm castings shall be screened from worms and food source, and shall be commercially packaged.

2.3.5 Soil Conditioner

Soil conditioner shall be sand, super absorbent polymers, calcined clay, or gypsum for use singly or in combination to meet the requirements of the soil test.

2.3.5.1 Sand

Sand shall be clean and free of toxic materials. Gradation: A minimum 95 percent by weight shall pass a No. 10 sieve and a minimum 10 percent by weight shall pass a No. 16 sieve. Greensand shall be balanced with the inclusion of trace minerals and nutrients.

2.3.5.2 Super Absorbent Polymers

To improve water retention in soils, super absorbent polymers shall be sized and applied according to the manufacturer's recommendations. Polymers shall be added as a soil amendment and be cross-linked polyacrylamide, with an absorption capacity of 250-400 times its weight. Polymers shall also be added to the seed and be a starch grafted polyacrylonitrile, with graphite added as a tacky sticker. It shall have an absorption capacity of 100 plus times its weight.

2.3.5.3 Calcined Clay

Calcined clay shall be granular particles produced from montmorillonite clay calcined to a minimum temperature of 1200 degrees F. Gradation: A minimum 90 percent shall pass a No. 8 sieve; a minimum 99 percent shall be retained on a No. 60 sieve; and a maximum 2 percent shall pass a No. 100 sieve. Bulk density: A maximum 40 pounds per cubic foot.

2.3.5.4 Gypsum-Not used

2.3.5.5 Expanded Shale, Clay, or Slate (ESCS)-Not used

2.4 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region.

2.4.1 Straw

Straw shall be stalks from oats, wheat, rye, barley, or rice, furnished in air-dry condition and with a consistency for placing with commercial mulch-blowing equipment.

2.4.2 Hay

Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings, furnished in an air-dry condition suitable for placing with commercial mulch-blowing equipment.

2.4.3 Wood Cellulose Fiber

Wood cellulose fiber shall not contain any growth or germination-inhibiting factors and shall be dyed an appropriate color to facilitate placement during application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 4.5 to 6.0.

2.4.4 Paper Fiber

Paper fiber mulch shall be recycled news print that is shredded for the purpose of mulching seed.

2.5 ASPHALT ADHESIVE

Asphalt adhesive shall conform to the following: Emulsified asphalt, conforming to ASTM D 977, Grade SS-1; and cutback asphalt, conforming to ASTM D 2028, Designation RC-70.

2.6 WATER

Water shall be the responsibility of the Contractor, unless otherwise noted. Water shall not contain elements toxic to plant life.

2.7 PESTICIDE-NOT USED

2.8 SURFACE EROSION CONTROL MATERIAL

Surface erosion control material shall conform to the following:

2.8.1 Surface Erosion Control Blanket

Blanket shall be machine produced mat of wood excelsior formed from a web of interlocking wood fibers; covered on one side with either knitted straw blanket-like mat construction; covered with biodegradable plastic mesh; or interwoven biodegradable thread, plastic netting, or twisted kraft paper cord netting.

2.8.2 Surface Erosion Control Fabric

Fabric shall be knitted construction of polypropylene yarn with uniform mesh openings 3/4 to 1 inch square with strips of biodegradable paper. Filler paper strips shall have a minimum life of 6 months.

2.8.3 Surface Erosion Control Net

Net shall be heavy, twisted jute mesh, weighing approximately 1.22 pounds per linear yard and 4 feet wide with mesh openings of approximately 1 inch square.

2.8.4 Surface Erosion Control Chemicals - Not used

2.8.5 Hydrophilic Colloids - Not used

2.8.6 Erosion Control Material Anchors

Erosion control anchors shall be as recommended by the manufacturer.

PART 3 EXECUTION

3.1 INSTALLING SEED TIME AND CONDITIONS

3.1.1 Seeding Time

Seed shall be installed from 1 April to 1 June and from 1 Aug to 15 Sept for fall establishment.

3.1.2 Seeding Conditions

Seeding operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the seeding operations, proposed alternate times shall be submitted for approval.

3.1.3 Equipment Calibration

Immediately prior to the commencement of seeding operations, calibration tests shall be conducted on the equipment to be used. These tests shall confirm that the equipment is operating within the manufacturer's specifications and will meet the specified criteria. The equipment shall be calibrated a minimum of once every day during the operation. The calibration test results shall be provided within 1 week of testing.

3.1.4 Soil Test

Delivered topsoil, existing soil in smooth graded areas, and stockpiled topsoil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size, pH, organic matter content, textural class, chemical analysis, soluble salts analysis, and mechanical analysis. Sample collection on site shall be random over the entire site. Sample collection for stockpiled topsoil shall be at different levels in the stockpile. The soil shall be free from debris, noxious weeds, toxic substances, or other materials harmful to plant growth. The test shall determine the quantities and type of soil amendments required to meet local growing conditions for the seed species specified.

3.2 SITE PREPARATION

3.2.1 Finished Grade and Topsoil

The Contractor shall verify that finished grades are as indicated on drawings, and the placing of topsoil, smooth grading, and compaction requirements have been completed in accordance with Section 02300 EARTHWORK, prior to the commencement of the seeding operation.

3.2.2 Application of Soil Amendments

3.2.2.1 Applying pH Adjuster

The pH adjuster shall be applied as recommended by the soil test. The pH adjuster shall be incorporated into the soil to a maximum 4 inch depth or may be incorporated as part of the tillage operation.

3.2.2.2 Applying Fertilizer

The fertilizer shall be applied as recommended by the soil test. Fertilizer shall be incorporated into the soil to a maximum 4 inch depth or may be incorporated as part of the tillage or hydroseeding operation.

3.2.2.3 Applying Soil Conditioner

The soil conditioner shall be as recommended by the soil test. The soil conditioner shall be spread uniformly over the soil a minimum 1 inch depth

and thoroughly incorporated by tillage into the soil to a maximum 4 inch depth.

3.2.2.4 Applying Super Absorbent Polymers-Not used

3.2.3 Tillage

Soil on slopes up to a maximum 3-horizontal-to-1-vertical shall be tilled to a minimum 4 inch depth. On slopes between 3-horizontal-to-1-vertical and 1-horizontal-to-1 vertical, the soil shall be tilled to a minimum 2 inch depth by scarifying with heavy rakes, or other method. Rototillers shall be used where soil conditions and length of slope permit. On slopes 1-horizontal-to-1 vertical and steeper, no tillage is required. Drainage patterns shall be maintained as indicated on drawings. Areas compacted by construction operations shall be completely pulverized by tillage. Soil used for repair of surface erosion or grade deficiencies shall conform to topsoil requirements. The pH adjuster, fertilizer, and soil conditioner may be applied during this procedure.

3.2.4 Prepared Surface

3.2.4.1 Preparation

The prepared surface shall be a maximum 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas. The prepared surface shall be completed with a light raking to remove debris.

3.2.4.2 Lawn Area Debris

Debris and stones over a minimum 5/8 inch in any dimension shall be removed from the surface.

3.2.4.3 Field Area Debris

Debris and stones over a minimum 3 inch in any dimension shall be removed from the surface.

3.2.4.4 Protection

Areas with the prepared surface shall be protected from compaction or damage by vehicular or pedestrian traffic and surface erosion.

3.3 INSTALLATION

Prior to installing seed, any previously prepared surface compacted or damaged shall be reworked to meet the requirements of paragraph SITE PREPARATION. Seeding operations shall not take place when the wind velocity will prevent uniform seed distribution.

3.3.1 Installing Seed

Seeding method shall be hydroseeding. Seeding procedure shall ensure even coverage. Gravity feed applicators, which drop seed directly from a hopper onto the prepared soil, shall not be used because of the difficulty in achieving even coverage, unless otherwise approved.

3.3.1.1 Broadcast Seeding - Not Used

3.3.1.2 Drill Seeding - Not Used

3.3.1.3 Rolling

The entire area shall be firmed with a roller not exceeding 90 pounds per foot roller width. Slopes over a maximum 3-horizontal-to-1 vertical shall not be rolled. Areas seeded with seed drills equipped with rollers shall not be rolled.

3.3.2 Hydroseeding

Seed shall be mixed to ensure broadcast at the rate of 50 pounds per acre. Seed and fertilizer shall be added to water and thoroughly mixed to meet the rates specified. The time period for the seed to be held in the slurry shall be a maximum 24 hours. Wood cellulose fiber mulch and tackifier shall be added at the rates recommended by the manufacturer after the seed, fertilizer, and water have been thoroughly mixed to produce a homogeneous slurry. Slurry shall be uniformly applied under pressure over the entire area. The hydroseeded area shall not be rolled.

3.3.3 Mulching

3.3.3.1 Hay or Straw Mulch

Hay or straw mulch shall be spread uniformly at the rate of 2 tons per acre. Mulch shall be spread by hand, blower-type mulch spreader, or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of steep slopes, and continued uniformly until the area is covered. The mulch shall not be bunched or clumped. All areas installed with seed shall be mulched on the same day as the seeding. Mulch shall be anchored immediately following spreading.

3.3.3.2 Mechanical Anchor

Mechanical anchor shall be a V-type-wheel land packer; a scalloped-disk land packer designed to force mulch into the soil surface; or other suitable equipment.

3.3.3.3 Asphalt Adhesive Tackifier

Asphalt adhesive tackifier shall be sprayed at a rate between 10 to 13 gallons per 1000 square feet.

3.3.3.4 Non-Asphaltic Tackifier

Hydrophilic colloid shall be applied at the rate recommended by the manufacturer, using hydraulic equipment suitable for thoroughly mixing with water. A uniform mixture shall be applied over the area.

3.3.3.5 Asphalt Adhesive Coated Mulch

Hay or straw mulch may be spread simultaneously with asphalt adhesive applied at a rate between 10 to 13 gallons per 1000 square feet or 2 tons per acre, using power mulch equipment which shall be equipped with suitable asphalt pump and nozzle. The adhesive-coated mulch shall be applied evenly

over the surface. Sunlight shall not be completely excluded from penetrating to the ground surface.

3.3.3.6 Wood Cellulose Fiber, Paper Fiber, and Recycled Paper

Wood cellulose fiber, paper fiber, or recycled paper shall be applied as part of the hydroseeding operation. The mulch shall be mixed and applied in accordance with the manufacturer's recommendations.

3.3.4 Watering Seed

Watering shall be started immediately after completing the seeding of an area. Water shall be applied to supplement rainfall at a rate sufficient to ensure moist soil conditions to a minimum 1 inch depth. Run-off and puddling shall be prevented. Watering trucks shall not be driven over turf areas, unless otherwise directed. Watering of other adjacent areas or plant material shall be prevented.

3.4 SURFACE EROSION CONTROL

3.4.1 Surface Erosion Control Material

Where indicated or as directed, surface erosion control material shall be installed in accordance with manufacturer's instructions. Placement of the material shall be accomplished without damage to installed material or without deviation to finished grade.

3.4.2 Temporary Seeding

The application rate shall be as specified in Massachusetts Highway Department M6.0301. When directed during contract delays affecting the seeding operation or when a quick cover is required to prevent surface erosion, the areas designated shall be seeded in accordance with temporary seed species listed under Paragraph SEED.

3.4.2.1 Soil Amendments

When soil amendments have not been applied to the area, the quantity of 1/2 of the required soil amendments shall be applied and the area tilled in accordance with paragraph SITE PREPARATION. The area shall be watered in accordance with paragraph Watering Seed.

3.4.2.2 Remaining Soil Amendments

The remaining soil amendments shall be applied in accordance with the paragraph Tillage when the surface is prepared for installing seed.

3.5 QUANTITY CHECK

For materials provided in bags, the empty bags shall be retained for recording the amount used. For materials provided in bulk, the weight certificates shall be retained as a record of the amount used. The amount of material used shall be compared with the total area covered to determine the rate of application used. Differences between the quantity applied and the quantity specified shall be adjusted as directed.

3.6 APPLICATION OF PESTICIDE

When application of a pesticide becomes necessary to remove a pest or disease, a pesticide treatment plan shall be submitted and coordinated with the installation pest management program.

3.6.1 Technical Representative

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for pest or disease control. They may be present during treatment application.

3.6.2 Application

A state certified applicator shall apply required pesticides in accordance with EPA label restrictions and recommendations. Clothing and personal protective equipment shall be used as specified on the pesticide label. A closed system is recommended as it prevents the pesticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying pesticide shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately. A pesticide plan shall be submitted.

3.7 RESTORATION AND CLEAN UP

3.7.1 Restoration

Existing turf areas, pavements, and facilities that have been damaged from the seeding operation shall be restored to original condition at Contractor's expense.

3.7.2 Clean Up

Excess and waste material shall be removed from the seeded areas and shall be disposed offsite. Adjacent paved areas shall be cleaned.

3.8 PROTECTION OF INSTALLED AREAS

Immediately upon completion of the seeding operation in an area, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed by the contracting office.

3.9 SEED ESTABLISHMENT PERIOD

3.9.1 Commencement

The seed establishment period to obtain a healthy stand of grass plants shall begin on the first day of work under this contract and shall end 3 months after the last day of the seeding operation. Written calendar time to the contracting office period shall be furnished for the seed establishment period. When there is more than 1 seed establishment period, the boundaries of the seeded area covered for each period shall be

described. The seed establishment period shall be modified for inclement weather, shut down periods, or for separate completion dates of areas.

3.9.2 Satisfactory Stand of Grass Plants

Grass plants shall be evaluated for species and health when the grass plants are a minimum 1 inch high.

3.9.2.1 Lawn Area-Not used

3.9.2.2 Field Area

A satisfactory stand of grass plants from the seeding operation for a field area shall be a minimum 10 grass plants per square foot. The total bare spots shall not exceed 2 percent of the total seeded area.

3.9.3 Maintenance During Establishment Period

Maintenance of the seeded areas shall include eradicating weeds, insects and diseases; protecting embankments and ditches from surface erosion; maintaining erosion control materials and mulch; protecting installed areas from traffic; mowing; watering; and post-fertilization.

3.9.3.1 Mowing-Not used

3.9.3.2 Post-Fertilization

A maximum 1/2 pound per 1000 square feet of actual available nitrogen shall be provided to the grass plants. The application shall be timed prior to the advent of winter dormancy and shall be made without burning the installed grass plants.

3.9.3.3 Pesticide Treatment

Treatment for disease or pest shall be in accordance with paragraph APPLICATION OF PESTICIDE.

3.9.3.4 Repair or Reinstall

Unsatisfactory stand of grass plants and mulch shall be repaired or reinstalled, and eroded areas shall be repaired in accordance with paragraph SITE PREPARATION.

3.9.3.5 Maintenance Record

A record of each site visit shall be furnished, describing the maintenance work performed; areas repaired or reinstalled; and diagnosis for unsatisfactory stand of grass plants.

SECTION 03307

CONCRETE FOR MINOR STRUCTURES
12/92

PART 1 GENERAL

1.1 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.

ACI INTERNATIONAL (ACI)

ACI 308	(1992) Standard Practice for Curing Concrete
ACI 318/318R	(1992) Building Code Requirements for Reinforced Concrete
ACI 318M/318RM	(1992) Building Code Requirements for Reinforced Concrete (Metric)
ACI 347R	(1994) Formwork for Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185	(1994) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 615/A 615M	(1995a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 31	(1991) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1993) Concrete Aggregate
ASTM C 39	(1993) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 94	(1994) Ready-Mixed Concrete
ASTM C 143	(1990a) Slump of Hydraulic Cement Concrete
ASTM C 150	(1995) Portland Cement
ASTM C 171	(1992) Sheet Materials for Curing Concrete
ASTM C 172	(1990) Sampling Freshly Mixed Concrete
ASTM C 231	(1991b) Air Content of Freshly Mixed Concrete by the Pressure Method

Mass Highway Dept Spec Section 476 Comet Concrete Par

ASTM C 260	(1994) Air-Entraining Admixtures for Concrete
ASTM C 309	(1994) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	(1992) Chemical Admixtures for Concrete
ASTM C 595	(1994a) Blended Hydraulic Cements
ASTM C 595M	(1995) Blended Hydraulic Cements (Metric)
ASTM C 618	(1994a) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C 685	(1994) Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C 920	(1994) Elastomeric Joint Sealants
ASTM D 75	(1987; R 1992) Sampling Aggregates
ASTM D 98	(1993) Calcium Chloride
ASTM D 1752	(1984; R 1992) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM E 96	(1995) Water Vapor Transmission of Materials

CORPS OF ENGINEERS (COE)

COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete
COE CRD-C 572	(1974) Corps of Engineers Specifications for Polyvinylchloride Waterstop
COE CRD-C 506	(1972) Sealing Compound: Elastomeric Type, Multi-Component (for Caulking, Sealing, and Glazing in Buildings and Other Structures)

1.2 UNIT PRICES - NOT USED

1.3 DESIGN AND PERFORMANCE REQUIREMENTS

The Government will maintain the option to sample and test joint sealer, joint filler material, waterstop, aggregates and concrete to determine compliance with the specifications. The Contractor shall provide facilities and labor as may be necessary to assist the Government in procurement of representative test samples. Samples of aggregates will be obtained at the point of batching in accordance with ASTM D 75. Concrete will be sampled in accordance with ASTM C 172. Slump and air content will be determined in accordance with ASTM C 143 and ASTM C 231, respectively, when cylinders are molded. Compression test specimens will be made, cured, and transported in accordance with ASTM C 31. Compression test specimens will be tested in accordance with ASTM C 39. Samples for strength tests will be taken not

less than once each shift in which concrete is produced [from each class of concrete required]. A minimum of three specimens will be made from each sample; two will be tested at 28 days for acceptance, and one will be tested at 7 days for information.

1.3.1 Strength

Acceptance test results will be the average strengths of two specimens tested at 28 days. The strength of the concrete will be considered satisfactory so long as the average of three consecutive acceptance test results equal or exceed the specified compressive strength, f'c, and no individual acceptance test result falls below f'c by more than 500 psi.

1.3.2 Construction Tolerances

A Class "C" finish shall apply to all surfaces except those specified to receive a Class "D" finish. A Class "D" finish shall apply to all surfaces which will be permanently concealed after construction. The surface requirements for the classes of finish required shall be as specified in ACI 347R.

1.3.3 Concrete Mixture Proportions

Concrete mixture proportions shall be the responsibility of the Contractor. Mixture proportions shall include the dry weights of cementitious material(s); the nominal maximum size of the coarse aggregate; the specific gravities, absorptions, and saturated surface-dry weights of fine and coarse aggregates; the quantities, types, and names of admixtures; and quantity of water per cubic yard of concrete. All materials included in the mixture proportions shall be of the same type and from the same source as will be used on the project. Specified compressive strength f'c shall be 3,000 psi at 28 days. The maximum nominal size coarse aggregate shall be 3/4 inch, in accordance with ACI 318/318R. The air content shall be between 4.5 and 7.5 percent. The slump shall be between 2 and 5 inches. The maximum water cement ratio shall be 0.50.

1.4 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Air-Entraining Admixture; GA. Accelerating Admixture; FIO. Water-Reducing or Retarding Admixture; FIO. Curing Materials; FIO. Reinforcing Steel; GA. Expansion Joint Filler Strips, Premolded; FIO. Joint Sealants - Field Molded Sealants; FIO. Waterstops; FIO.

Manufacturer's literature is available from suppliers which demonstrates compliance with applicable specifications for the above materials.

Batching and Mixing Equipment; FIO.

Batching and mixing equipment will be accepted on the basis of manufacturer's data which demonstrates compliance with the applicable specifications.

Conveying and Placing Concrete; FIO.

The methods and equipment for transporting, handling, depositing, and consolidating the concrete shall be submitted prior to the first concrete placement.

SD-08 Statements

Formwork; FIO.

Formwork design shall be submitted prior to the first concrete placement.

SD-09 Reports

Aggregates; GA.

Aggregates will be accepted on the basis of certificates of compliance and test reports that show the material(s) meets the quality and grading requirements of the specifications under which it is furnished.

Concrete Mixture Proportions; GA.

Ten days prior to placement of concrete, the contractor shall submit the mixture proportions that will produce concrete of the quality required. Applicable test reports shall be submitted to verify that the concrete mixture proportions selected will produce concrete of the quality specified.

SD-13 Certificates

Cementitious Materials; GA.

Certificates of compliance attesting that the concrete materials meet the requirements of the specifications shall be submitted in accordance with the Special Clause "CERTIFICATES OF COMPLIANCE". Cementitious material will be accepted on the basis of a manufacturer's certificate of compliance, accompanied by mill test reports that the material(s) meet the requirements of the specification under which it is furnished.

Aggregates; GA.

Aggregates will be accepted on the basis of certificates of compliance and tests reports that show the material(s) meet the quality and grading requirements of the specifications under which it is furnished.

1.5 REGULATORY REQUIREMENTS

The state statutory and regulatory requirements section 476 Mass Highway Dept listed below form a part of this specification to the extent referenced.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Cementitious Materials

Cementitious materials shall conform to the appropriate specifications listed:

2.1.1.1 Portland Cement

ASTM C 150, Use type II

2.1.1.2 Blended Hydraulic Cement-Not Used

2.1.1.3 Pozzolan-Not Used

2.1.2 Aggregates

Aggregates shall meet the quality and grading requirements of ASTM C 33-Nos. 57 or 67

2.1.3 Admixtures- Not used unless specified

Admixtures to be used, when required or approved, shall comply with the appropriate specification listed.

2.1.3.1 Air-Entraining Admixture

Air-entraining admixture shall meet the requirements of ASTM C 260.

2.1.3.2 Accelerating Admixture-Not Used

2.1.3.3 Water-Reducing or Retarding Admixture-Not Used

2.1.4 Water

Water for mixing and curing shall be fresh, clean, potable, and free from injurious amounts of oil, acid, salt, or alkali, except that unpotable water may be used if it meets the requirements of COE CRD-C 400.

2.1.5 Reinforcing Steel

Reinforcing steel bar shall conform to the requirements of ASTM A 615/A 615M, Grade 60. # 5 Bar-12 o/c Welded steel wire fabric shall conform to the requirements of ASTM A 185.

2.1.6 Expansion Joint Filler Strips, Premolded-Not Used

2.1.7 Joint Sealants - Field Molded Sealants-Not Used

2.1.8 Waterstops-Not Used

2.1.9 Formwork-Acl 347

The design and engineering of the formwork as well as its construction, shall be the responsibility of the Contractor.

2.1.10 Form Coatings

Forms for exposed surfaces shall be coated with a non-staining form oil, which shall be applied shortly before concrete is placed.

2.1.11 Vapor Barrier

Vapor barrier shall be polyethylene sheeting with a minimum thickness of 6 mils or other equivalent material having a vapor permeance rating not exceeding 0.5 perms as determined in accordance with ASTM E 96.

2.1.12 Curing Materials

Curing materials shall conform to the following requirements.

2.1.12.1 Impervious Sheet Materials

Impervious sheet materials, ASTM C 171, type optional, except polyethylene film, if used, shall be white opaque.

2.1.12.2 Membrane-Forming Curing Compound

ASTM C 309, Type 1-D or 2, Class A.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 General

Construction joints shall be prepared to expose coarse aggregate, and the surface shall be clean, damp, and free of laitance. Snow, ice, standing or flowing water, loose particles, debris, and foreign matter shall have been removed. Earth foundations shall be satisfactorily compacted. The entire preparation shall be accepted by the Government prior to placing.

3.1.2 Embedded Items

Reinforcement shall be secured in place; joints, anchors, and other embedded items shall have been positioned. Internal ties shall be arranged so that when the forms are removed all metal will be not less than 2 inches from concrete surfaces permanently exposed to view or exposed to water on the finished structures. Embedded items shall be free of oil and other foreign matters such as loose coatings or rust, paint, and scale. All equipment needed to place, consolidate, protect, and cure the concrete shall be at the placement site and in good operating condition.

3.1.3 Formwork Installation

Forms shall be properly aligned, adequately supported, and mortar-tight. The form surfaces shall be smooth and free from irregularities, dents, sags, or holes when used for permanently exposed faces. All exposed joints and edges shall be chamfered, unless otherwise indicated, complying with ACI 347

3.1.4 Vapor Barrier Installation-Not Used

Vapor barriers shall be applied over gravel fill. Edges shall be lapped not less than 6 inches. All joints shall be sealed with pressure-sensitive adhesive not less than 2 inches wide. The vapor barrier shall be protected at all times to prevent injury or displacement prior to and during concrete placement.

3.1.5 Production of Concrete

3.1.5.1 Ready-Mixed Concrete

Ready-mixed concrete shall conform to ASTM C 94

3.1.5.2 Concrete made by volumetric batching and continuous mixing

Concrete made by volumetric batching and continuous mixing shall conform to ASTM C 685.

3.1.5.3 Batching and Mixing Equipment

The contractor shall have the option of using an on-site batching and mixing facility. The facility shall provide sufficient batching and mixing equipment capacity to prevent cold joints. The method of measuring materials, batching operation, and mixer shall be submitted for review.

3.1.6 Waterstops-Not Used

3.2 CONVEYING AND PLACING CONCRETE

Conveying and placing concrete shall conform to the following requirements.

3.2.1 General

Concrete placement shall not be permitted when weather conditions prevent proper placement and consolidation without approval. When concrete is mixed and/or transported by a truck mixer, the concrete shall be delivered to the site of the work and discharge shall be completed within 1-1/2 hours or 45 minutes when the placing temperature is 85 degrees F or greater unless a retarding admixture is used. Concrete shall be conveyed from the mixer to the forms as rapidly as practicable by methods which prevent segregation or loss of ingredients. Concrete shall be in place and consolidated within 15 minutes after discharge from the mixer. Concrete shall be deposited as close as possible to its final position in the forms and be so regulated that it may be effectively consolidated in horizontal layers 18 inches or less in thickness with a minimum of lateral movement. The placement shall be carried on at such a rate that the formation of cold joints will be prevented.

3.2.2 Consolidation

Each layer of concrete shall be consolidated by rodding, or mechanical vibrating equipment. Internal vibration shall be systematically accomplished by inserting the vibrator through the fresh concrete in the layer below at a uniform spacing over the entire area of placement. The distance between insertions shall be approximately 1.5 times the radius of action of the vibrator and overlay the adjacent, just-vibrated area by a few

inches. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the layer below, if such a layer exists. It shall be held stationary until the concrete is consolidated and then withdrawn slowly at the rate of about 3 inches per second.

3.2.3 Cold-Weather Requirements

No concrete placement shall be made when the ambient temperature is below 35 degrees F or if the ambient temperature is below 40 degrees F and falling. Suitable covering and other means as approved shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing and at a temperature above freezing for the remainder of the curing period. Salt, chemicals, or other foreign materials shall not be mixed with the concrete to prevent freezing. Any concrete damaged by freezing shall be removed and replaced at the expense of the contractor.

3.2.4 Hot-Weather Requirements

When the rate of evaporation of surface moisture, as determined by use of Figure 1 of ACI 308, is expected to exceed 0.2 pound per square foot per hour, provisions for windbreaks, shading, fog spraying, or covering with a light-colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as finishing operations will allow.

3.3 FORM REMOVAL

Forms shall not be removed before the expiration of 24 hours after concrete placement except where otherwise specifically authorized. Supporting forms and shoring shall not be removed until the concrete has cured for at least 5 days. When conditions on the work are such as to justify the requirement, forms will be required to remain in place for longer periods.

3.4 FINISHING

3.4.1 General

No finishing or repair will be done when either the concrete or the ambient temperature is below 50 degrees F.

3.4.2 Finishing Formed Surfaces

All fins and loose materials shall be removed, and surface defects including tie holes shall be filled. All honeycomb areas and other defects shall be repaired. All unsound concrete shall be removed from areas to be repaired. Surface defects greater than 1/2 inch in diameter and holes left by removal of tie rods in all surfaces not to receive additional concrete shall be reamed or chipped and filled with dry-pack mortar. The prepared area shall be brush-coated with an approved epoxy resin or latex bonding compound or with a neat cement grout after dampening and filled with mortar or concrete. The cement used in mortar or concrete for repairs to all surfaces permanently exposed to view shall be a blend of portland cement and white cement so that the final color when cured will be the same as adjacent concrete.

3.4.3 Finishing Unformed Surfaces

All unformed surfaces that are not to be covered by additional concrete or backfill shall be float finished to elevations shown, unless otherwise specified. Surfaces to receive additional concrete or backfill shall be brought to the elevations shown and left as a true and regular surface. Exterior surfaces shall be sloped for drainage unless otherwise shown. Joints shall be carefully made with a jointing tool. Unformed surfaces shall be finished to a tolerance of 3/8 inch for a float finish and 5/16 inch for a trowel finish as determined by a 10 foot straightedge placed on surfaces shown on the plans to be level or having a constant slope. Finishing shall not be performed while there is excess moisture or bleeding water on the surface. No water or cement shall be added to the surface during finishing.

3.4.3.1 Float Finish

Surfaces to be float finished shall be screeded and darbyed or bullfloated to eliminate the ridges and to fill in the voids left by the screed. In addition, the darby or bullfloat shall fill all surface voids and only slightly embed the coarse aggregate below the surface of the fresh concrete. When the water sheen disappears and the concrete will support a person's weight without deep imprint, floating should be completed. Floating should embed large aggregates just beneath the surface, remove slight imperfections, humps, and voids to produce a plane surface, compact the concrete, and consolidate mortar at the surface.

3.4.3.2 Trowel Finish-Not Used

3.4.3.3 Broom Finish-Not Used

3.4.3.4 Expansion and Contraction Joints-Not Used

3.5 CURING AND PROTECTION

Beginning immediately after placement and continuing for at least 7 days, all concrete shall be cured and protected from premature drying, extremes in temperature, rapid temperature change, freezing, mechanical damage, and exposure to rain or flowing water. All materials and equipment needed for adequate curing and protection shall be available and at the site of the placement prior to the start of concrete placement. Preservation of moisture for concrete surfaces not in contact with forms shall be accomplished by one of the following methods:

- a. Continuous sprinkling or ponding.
- b. Application of absorptive mats or fabrics kept continuously wet.
- c. Application of sand kept continuously wet.
- d. Application of impervious sheet material conforming to ASTM C 171.
- e. Application of membrane-forming curing compound conforming to ASTM C 309, Type 1-D, on surfaces permanently exposed to view and Type 2 on other surfaces shall be accomplished in accordance with manufacturer's instructions.

The preservation of moisture for concrete surfaces placed against wooden forms shall be accomplished by keeping the forms continuously wet for 7 days. If forms are removed prior to end of the required curing period, other curing methods shall be used for the balance of the curing period. During the period of protection removal, the temperature of the air in contact with the concrete shall not be allowed to drop more than 25 degrees F within a 24 hour period.

3.6 TESTS AND INSPECTIONS

3.6.1 General

The individuals who sample and test concrete as required in this specification shall have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Technicians, Grade I.

3.6.2 Inspection Details and Frequency of Testing

3.6.2.1 Preparations for Placing

Foundation or construction joints, forms, and embedded items shall be inspected in sufficient time prior to each concrete placement by the Contractor to certify that it is ready to receive concrete.

3.6.2.2 Air Content

Air content shall be checked during each shift that concrete is. Samples shall be obtained in accordance with ASTM C 172 and tested in accordance with ASTM C 231.

3.6.2.3 Slump

Slump shall be checked during each shift that concrete is produced. Samples shall be obtained in accordance with ASTM C 172 and tested in accordance with ASTM C 143.

3.6.2.4 Consolidation and Protection

The Contractor shall ensure that the concrete is properly consolidated, finished, protected, and cured.

3.6.3 Action Required

3.6.3.1 Placing

The placing foreman shall not permit placing to begin until he has verified that an adequate number of acceptable vibrators, which are in working order and have competent operators, are available. Placing shall not be continued if any pile is inadequately consolidated.

3.6.3.2 Air Content

Whenever a test result is outside the specification limits, the concrete shall not be delivered to the forms and an adjustment shall be made to the dosage of the air-entrainment admixture.

3.6.3.3 Slump

Whenever a test result is outside the specification limits, the concrete shall not be delivered to the forms and an adjustment should be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the water-cement ratio does not exceed that specified in the submitted concrete mixture proportion.

3.6.4 Reports

The results of all tests and inspections conducted at the project site shall be reported informally at the end of each shift and in writing weekly and shall be delivered within 3 days after the end of each weekly reporting period. See Section 01451 CONTRACTOR QUALITY CONTROL.

SECTION 11310

LEACHATE PUMP STATION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABEMA)

- | | |
|--------------|--|
| ABEMA Std 9 | (1990) Load Ratings and Fatigue Life for Ball Bearings |
| ABEMA Std 11 | (1990) Load Ratings and Fatigue Life for Roller Bearings |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|--------------|--|
| ASTM A 153 | (1996) Zinc Coating (Hot-Dip) on Iron and Steel Hardware |
| ASTM D883-69 | (1995) Standard Terminology Relating to Plastics |
| ASTM D3299 | (1995) Specification for Filament-Wound Glass-Fiber-Reinforced Thermoset Resin Chemical-Resistant Tanks. |
| ASTM 2563 | (1995) Clarifying Visual Defects in Glass-Reinforced Parts. |

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

- | | |
|------------|---|
| ASME B40.1 | (1991) Gauges - Pressure Indicating Dial Type - Elastic Element |
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NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- | | |
|------------|--|
| NEMA ICS 1 | (1993) Industrial Controls and Systems |
| NEMA MG 1 | (1993; Rev 1; Rev 2) Motors and Generators |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- | | |
|---------|---------------------------------|
| NFPA 70 | (1996) National Electrical Code |
|---------|---------------------------------|

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Pump System; GA.

Pump characteristic curves showing capacity in gpm, net positive suction head (NPSH), head, efficiency, and pumping horsepower from 0 gpm to 110 percent of design capacity. A complete list of equipment and material, including manufacturer's descriptive data and technical literature, performance charts and curves, catalog cuts, and installation instructions.

Certified reprime test data, prepared by the pump manufacturer and certified by a registered professional engineer, shall be submitted to the engineer for approval.

Spare Parts; GA.

Spare parts data for each different item of material and equipment specified, after approval of the related submittals, and not later than (2) months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

SD-04 Drawings

Pump System; GA.

Drawings containing complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

SD-06 Instructions

Pump System; GA.

Diagrams, instructions, and other sheets proposed for posting.

SD-09 Reports

Field Testing and Adjusting Equipment; GA.

Performance test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall indicate the final position of controls.

SD-19 Operation and Maintenance Manuals

Pump System; GA.

(6) copies of operation and (6) copies of maintenance manuals for the equipment furnished. One complete set prior to performance testing and the remainder upon acceptance. Operation manuals shall detail the step-by-step procedures required for system startup, operation, and shutdown. Operation manuals shall include the manufacturer's name, model number, parts list, and

brief description of all equipment and their basic operating features. Maintenance manuals shall list routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. Maintenance manuals shall include piping and equipment layout and simplified wiring and control diagrams of the system as installed. Manuals shall be approved prior to the field training course.

1.3 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be stored with protection from the weather, excessive humidity and excessive temperature variation; and dirt, dust, or other contaminants.

1.4 FIELD MEASUREMENTS

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

1.5 ELECTRIC SERVICE

Contractor shall obtain electrical service from the utility company for operations at the leachate pumping station. Contractor shall pay all fees to have power furnished to the pumping station and any permits required by the utility company will be obtained by the contractor.

PART 2 PRODUCTS

2.1 GENERAL MATERIAL AND EQUIPMENT REQUIREMENTS

Materials and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site. Pump casings shall be constructed of cast iron of uniform quality and free from blowholes, porosity, hard spots, shrinkage defects, cracks, and other injurious defects. Impellers shall be 316 stainless steel.

2.1.1 Nameplates

Each major item of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

2.1.2 Equipment Guards

Belts, pulleys, chains, gears, projecting set screws, keys, and other rotating parts so located that any person may come in close proximity thereto shall be enclosed or guarded.

2.1.3 Special Tools

One set of special tools, calibration devices, and instruments required for operation, calibration, and maintenance of the equipment shall be provided.

2.1.4 Electric Motors

Motors shall conform to NEMA MG 1.

2.1.5 Motor Controls

Controls shall conform to NEMA ICS 1.

2.1.6 Bolts, Nuts, Anchors, and Washers

Bolts, nuts, anchors, and washers shall be steel; galvanized in accordance with ASTM A 153.

2.1.7 Spare Parts Kit

There shall be furnished the following minimum spare parts:

- a. One spare pump mechanical seal (complete), and with it all gaskets, seals, sleeves, and o-rings required to be replaced during replacement of the seal.
- b. One set of impeller clearance adjustment shims.
- c. One quart of seal lubricant.
- d. One cover plate O-rings.
- e. One rotating assembly O-rings.

2.1.8 Gauge Kit

Provide gauges kit for each pump as follows:

- a. Glycerin-filled compound gauge to monitor suction pressures, and a glycerin-filled pressure gauge to monitor discharge pressures.
- b. Gauges shall be a minimum of 4 inches in diameter, and shall be graduated in feet water column. Rated accuracy shall be 1 percent of full-scale reading. Suction gauges shall be graduated -34 feet to +34 feet water column. Pressure gauges shall be graduated 0 to 140 feet water column.
- c. Gauges shall be mounted on a resilient panel and frame assembly which shall be firmly secured to pumps or piping.
- d. Gauge installations shall be complete with all hoses and fittings, and shall include a shutoff valve installed in each gauge inlet at the point of connection to suction and discharge pipes.

2.1.9 Pump Drain Kit

The pump drain kit shall consist of a 10 foot length of plastic hose with a quick connect female Kamlock fitting on one end of hose and a set of fittings for each pump drain. Each set of fittings for pump drain includes a pipe nipple; bushing, bronze gate valve and quick connect male Kamlock fitting.

2.2 STATION ENCLOSURE

One station enclosures shall contain and enclose all pumps and equipment, and shall be constructed to enhance serviceability by incorporating the following design characteristics:

2.2.1 Access Panels

Provide access panels as follows:

- a. Access panels shall be provided. Panels shall be sized and placed to permit routine maintenance operations through the panel openings of the enclosure. For these purposes, routine maintenance shall include pump and motor inspection, drive belt adjustment, and pump cleanout. Panels shall be secured with tamper-proof hardware.
- b. Four access panels shall be provided with a hinge and latch. Such panels shall provide access to frequently performed adjustments and inspections of the electrical controls. Hinge shall be the continuous type. Latch shall engage the enclosure at not less than two places, and shall be protected by a keyed lock.
- c. One access panel shall contain a screened vent to maximize airflow for enclosure ventilation.

2.2.2 Serviceability

Station enclosure, less base must be completely removable or able to be disassembled following the removal of reusable hardware. After removal or disassembly, no portion of the enclosure shall project above the surface of the base to interfere with maintenance operations or endanger personnel. Removal or disassembly of the enclosure shall be accomplished by not more than two maintenance personnel without the use of lifting equipment.

2.2.3 Materials

Enclosure shall be constructed as follows:

- a. Station enclosure shall be manufactured of molded reinforced orthophthalic polyester Resins with a minimum of 30% fiberglass, and a maximum of 70% resin. Resin fillers or extenders shall not be used. Glass fibers shall have a minimum average length of 1 1/4 inches. Major design considerations shall be given to structural stability, corrosion resistance, and watertight properties. The polyester laminates shall provide a balance of mechanical, chemical, and electrical properties to insure long life. They must be impervious to microorganisms, mildew, mold, fungus, corrosive liquids, and gases, which can reasonably be expected to be present in the environment surrounding the wet well.
- b. All interior surfaces of the housing shall be coated with a polyester resin-rich finish. It shall provide: maintenance-free service; abrasion resistance; and protection from sewage, greases, oils, gasoline, and other common chemicals.
- c. The outside of the enclosure shall be coated with a suitable pigmented resin compounded to insure long, maintenance-free life.

2.2.4 Enclosure Base

Enclosure base shall be constructed as follows:

- a. The station base shall be constructed of pre-cast, reinforced concrete, bonded inside a fiberglass form covering top and sides, and shall be designed to insure adequate strength to resist deformation of structure during shipping, lifting, or handling. Base shall incorporate drainage provisions, and shall be provided with an opening of sufficient size to permit piping and service connections to the wet well.
- b. Station base shall incorporate anchor recesses for securing the pump station to the concrete pad supplied by the contractor in accordance with the station plans.
- c. Color used shall de-emphasize the presence of dirt, grease, etc.

2.2.5 Ventilation Blower

Ventilation blower shall be provided as follows:

- a. A 115 VAC exhaust blower shall be mounted in the roof of enclosure. Blower capacity shall be sufficient to change station air once every two minutes. Blower motor shall be operated automatically and shall be turned on at approximately 70-degrees F and shall turn off at 55-degree F.
- b. Blower motor and control circuit shall be protected by a thermal-magnetic air circuit breaker to provide overcurrent and overload protection; overcurrent protection may alternatively be provided by an internal thermal switch embedded in the windings if manually resettable.
- c. Blower exhaust outlet shall be protected by a screen, and shall be designed to prevent the entrance of rain, snow, rocks, and foreign material.

2.2.6 Station Heater

The enclosure shall be provided with a 1300/1500 watt, 115-volt electric heater with cord and grounding plug. Ungrounded heaters shall not be acceptable.

2.2.7 Low Station Enclosure Temperature

The enclosure shall be provided with an adjustable thermostat to serve as a low temperature alarm.

2.3 SELF-PRIMING CENTRIFUGAL PUMPS

Self-priming centrifugal pumps shall be designed to pump solids up to 2.5 inches in diameter and shall be of the centrifugal type capable of repeated reprime when handling trash-laden sewage.

2.3.1 Pump Characteristics

Pumps shall have the following operating characteristics:

- a. Pump Service: Leachate
- b. Design Operating Point: 250 gpm flow at 56 feet total dynamic head
- c. Maximum Operating Point: 270 gpm flow at 54 feet total dynamic head
- d. Minimum Operating Point: 225 gpm flow at 58 feet total dynamic head
- e. Minimum Shutoff Head: 76 feet
- f. Suction Connection: 3 inch flanged
- g. Discharge Connection: 3 inch flanged
- h. Minimum Reprime Lift Capability at Operating Speed: 21 feet
- i. Impeller Type: Semi-Open
- j. Impeller Diameter: 8-3/4 inches
- k. Rotation Direction: Counterclockwise
- l. Operating Speed: 1640 rpm
- m. Motor Type: Open Dripproof
- n. Motor Size: 10 horsepower
- o. Electrical Characteristics: 200-230/460 volts ac, 3 phase, 60 Hz.
- p. Pump Control: Bubbler

2.3.2 Pump Reprime Performance

Each pump must be capable of the specified reprime lift while operating at the selected pump speed and impeller diameter. Reprime lift is defined as the static height of pump suction centerline above liquid that the pump will prime; and delivery within five minutes on liquid remaining in the pump casing after a delivering pump is shut down with the suction check valve removed. Additional standards under which reprime tests shall be run are:

- a. Piping shall incorporate a discharge check valve down stream from the pump. Check valve size shall be equal (or greater than) the pump discharge diameter.
- b. A ten-foot length of one-inch pipe shall be installed between pump and discharge check valve. This line shall be open to atmosphere at all times to duplicate the air displacement rate of a typical pump station fitted with an air release valve.
- c. No restrictions shall be present in pump or suction piping which could serve to restrict the rate of siphon drop of the suction leg. Suction pipe configuration for reprime test shall incorporate a minimum horizontal run of 4.5 feet and one 90-degree elbow.

- d. Impeller shall be set at the clearances recommended by the manufacturer in the pump service manual.
- e. Reprime lift repeatability shall be demonstrated by five sequential reprime cycles.
- f. Liquid to be used for reprime test shall be water.

Certified reprime test data, prepared by the pump manufacturer and certified by a registered professional engineer, shall be submitted to the engineer for approval.

2.3.3 Pump Casing

Pump casing shall be constructed as follows:

- a. Constructed of gray iron No. 30. The casing shall be foot supported, and shall have a horizontal centerline suction and vertical discharge.
- b. The casing shall have a top mounted 3/4-inch priming fill port with a safety lock bar cover. In consideration for safety, hand nut threads must provide slow release of pressure, and the clamp bar shall be retained by detent lugs. A Teflon gasket shall prevent adhesion of the fill port cover to the casing.
- c. The casing shall have a minimum 1/4-inch diameter drain hole.
- d. The casing shall be capable of withstanding pressures 50 percent greater than the maximum operating pressures.
- e. The pump casing shall contain no openings of smaller diameter than the specified sphere size. There shall be no internal devices that will inhibit maintenance or interfere with priming and performance.
- f. The pump shall be designed to retain sufficient liquid in the casing to ensure unattended operation. The casing shall be such that the impeller can be removed without disturbing the suction and discharge connections.
- g. Front access cover plate shall be provided to permit inspection and cleaning of the pump interior and replacement of the impeller without removing the motor or the suction or discharge piping.

2.3.4 Impeller

The impeller shall be of the two-vane, semi-open, non-clog type cast in 316 stainless steel with pump-out vanes cast integrally on its backside. Impeller shall thread onto the pump shaft and be secured with a lockscrew. The lockscrew shall be covered with a cone shaped shroud to prevent wear of the lockscrew.

2.3.5 Cover Plate

Cover plate shall be cast iron Class 30. Retained by hand nuts for complete access to pump interior. Cover plate removal must provide ample clearance for removal of stoppages, and the allow removal or service to the impeller, seal, wear plate or suction flap valve. A Buna-N O-ring shall seal cover

plate to the pump casing. In consideration for safety, a pressure relief valve shall be supplied in the cover plate. Relief valve shall open at 75 - 200 PSI.

2.3.6 Wear Plate

The wear plate shall be 316 stainless steel of sufficient width to maintain the manufacturer's recommended clearance between the entire edge of each impeller vane and the wear plate. The wear plate shall be bolted to the cover plate by means of two threaded studs welded to the wear plate. Attachment hardware shall be located out of the direct flow path of the liquid into the impeller.

2.3.7 Pump Shaft

Pump shaft shall be 17-4PH stainless steel and shall be of adequate size and strength to transmit the full driver horsepower with a liberal safety factor. The pump shaft shall not require a shaft sleeve.

2.3.8 Seal Plate

Replaceable seal plate shall be 316 stainless steel and shall be bolted to the bearing housing.

2.3.9 Mechanical Seal

The pump shaft shall be sealed against leakage by oil lubricated mechanical seal. The stationary and rotating sealing member shall be tungsten titanium carbide. The seal shall be double floating so that the faces will not lose alignment during shock loads that cause deflection, vibration, and axial or radial movement of the pump shaft. The seal shall be lubricated with oil from a separate, oil-filled reservoir. The same oil shall not be used to lubricate both the mechanical seal and the shaft bearings.

2.3.10 Bearings

Pump bearings shall be ball or roller type designed to handle all thrust loads in either direction.

2.3.11 Lubrication

Bearings shall be oil bath lubricated. An oil reservoir for oil bath lubricated bearings shall be provided. The reservoir shall have an overflow opening to prevent overfilling and shall have a drain at the lowest point. Bearings shall be lubricated from a separate reservoir. Pump designs in which the same oil lubricates both the shaft bearings and the mechanical seal shall not be acceptable.

2.3.12 Suction Check Valve

Molded neoprene with integral steel and nylon reinforcement. A blow-out center shall protect the pump casing from hydraulic shock or excessive pressure. Removal or installation of the check valve must be accomplished through the cover plate opening without disturbing the suction piping. Sole function of the suction flap valve shall be to save energy by eliminating need to reprime after each pumping cycle. Pumps requiring a suction check valve to assist reprime will not be acceptable.

2.3.13 Suction and Discharge Spool

Each pump shall be equipped with a one-piece, cast iron suction spool and discharge spool, flanged on each end. Each spool shall have one 1½-inch NPT and one ¾-inch NPT tapped hole with pipe plugs for mounting of gauges or other instrumentation.

2.4 PUMP SERVICEABILITY

The pump manufacturer shall demonstrate to the engineer's satisfaction that due consideration has been given to reducing maintenance costs by incorporating the following features.

2.4.1 Special Tools

No special tools shall be required for replacement of any components within the pump.

2.4.2 Removable Cover Plate

The pump must be equipped with a removable cover plate, allowing access for service and repairs without removing suction or discharge piping. The cover plate must be large enough to allow removal and replacement of the impeller or seal plate assembly through the cover plate opening.

2.4.3 Replaceable Wear Plate

The pump shall be fitted with a replaceable wear plate. Replacement of the wear plate, impeller, seal, and suction check valve shall be accomplished through the removable cover plate. The entire rotating assembly, which includes bearings, shaft, seal, and impeller, shall be removable as a unit without removing the pump volute or piping. The rotating assembly shall be easily detached from the pump by removal of four bolts. The rotating assembly shall be equipped with a replaceable seal plate manufactured of gray iron no. 30.

2.4.4 External Adjustment

Means shall be provided for external adjustment of the clearance between the impeller and wear plate. The entire rotating assembly shall move as one unit to enable the clearances to be adjusted. Clearance adjustment by means of moving the shaft, thereby reducing pressure on the seal, shall not be acceptable.

2.5 VALVES AND PIPING

2.5.1 Check Valves

Check valves shall be constructed as follows:

- a. Each pump shall be equipped with a 6-inch full flow type check valve, capable of passing a 3 inch spherical solid, with flanged ends and be fitted with an external lever and spring. Bronze body ring shall be threaded into the valve port. Valve clapper shall be cast iron, bronze face, and shall swing completely clear of waterway when valve is full open. The hinge pin shall be of 18-8 stainless steel construction and shall be utilized with bronze bushings and

o-ring seals. Valve shall be rated at 175-PSI water working pressure, 350 PSI hydrostatic test pressure.

- b. Valves shall be equipped with removable cover plate to permit entry without removing the valve from the line.
- c. Valves other than full flow type or valves mounted in such a manner that prevents the passage of a 3 inch spherical solid shall not be acceptable.

2.5.2 Plug Valves

Plug valves shall be constructed as follows:

- a. The discharge header shall include a 4 inch, 3-way plug valve to permit either or both pumps to be isolated from the common discharge header. Valves shall have ports designed to pass spherical solids equal to the pumps capability. The plug valve shall be non-lubricated, tapered type. Valve body shall be semi-steel with flanged end connections drilled to 125 pound standard. Valve shall be furnished with a drip-tight shutoff plug mounted in stainless steel bearings, and shall have a resilient facing bonded to the sealing surface.
- b. Valve shall be operated with a single lever actuator providing lift, turn, and reseal action. The lever shall be equipped with a locking device to hold the plug in the desired position.

2.5.3 Air Release Valves

Check valves shall be constructed as follows:

- a. Each pump shall be equipped with one automatic air release valve, designed to permit the escape of air to the atmosphere during initial priming or unattended repriming cycles. Upon completion of the priming or repriming cycle, the valve shall close to prevent recirculation. The valve shall provide visible indication of valve closure, and shall operate solely on discharge pressure. Valves that require connection to the suction line shall not be acceptable.
- b. All valve parts exposed to sewage shall be constructed of cast iron, stainless steel, or similar corrosion resistant materials. Diaphragms, if used, shall be fabric-reinforced neoprene.
- c. A cleanout port, 3 inches or larger in diameter, shall be provided for ease of inspection, cleanout, and service.
- d. Valves shall be field adjustable for varying discharge heads.

2.5.4 Station Piping

Station piping shall be constructed as follows:

- a. Flanged header pipe (excluding all valves and fittings) shall be centrifugally cast, ductile iron, complying with ANSI/AWWA a21.51/c115 and class 53 thickness flanges shall be cast iron class 125 and comply with ANSI b16.1. Pipe and flanges shall be threaded

and suitable thread sealant applied before assembling flange to pipe.

- b. Bolt holes shall be in angular alignment within 1/2-degree between flanges.
- c. Flanges shall be faced and a gasket finish applied that shall have concentric grooves a minimum of 0.01 inch deep by approximately 0.03 inch wide, with a minimum of three grooves on any given surface spaced a maximum of 1/4 inch apart.
- d. All pipes connected to the pump station shall be supported according to good commercial practice to prevent piping loads from being transmitted to the pumps.
- e. Pump station discharge force main piping shall be anchored with thrust blocks where shown on the contract Drawings.

2.5.5 Supports and Thrust Blocks

All pipes connected to the pump station shall be supported according to good commercial practice to prevent piping loads from being transmitted to the pumps. Pump station discharge force main piping shall be anchored with thrust blocks where shown on the contract Drawings.

2.5.6 Emergency By-pass Piping

The station header pipe pump station shall be supported according to good commercial practice to prevent piping loads from being transmitted to the pumps. Pump station discharge force main piping shall be anchored with thrust blocks where shown on the contract Drawings.

2.6 DRIVE UNIT

2.6.1 Motors

The pump motors shall be horizontal, open drip-proof, 1750 RPM, induction type, with normal starting torque and low starting current characteristics, suitable for 3 phase, 60 hertz, ac electrical current. The motors shall not be overloaded at the design condition or at any head in the operating range as specified. Each motor shall be in current NEMA design cast iron frame with copper windings.

2.6.2 Drive Transmission

Drive transmission shall be as follows:

- a. Power shall be transmitted from motors to pumps by means of v-belt drive assemblies. The drive assemblies must be selected to establish proper pump speed to meet the specified operating conditions. Each drive assembly shall have a minimum of two v-belts. In no case will a single belt drive be acceptable.
- b. Each v-belt drive assembly shall be selected on the basis that adequate power will be transmitted from driver to pump. Drive systems with a safety factor of less than 1.5 shall not be considered sufficient for the service intended. Computation of

safety factors shall be based on performance data published by the drive manufacturer.

2.6.3 Belt Guards

Belt guards shall be constructed as follows:

- a. Pump drive transmissions shall be enclosed on all sides in a guard constructed of any one or combination of materials consisting of expanded, perforated, or solid sheet metal, except that maximum perforated or expanded openings shall not exceed 1/2 inch. Guards shall be manufactured to permit complete removal from the pump unit without interference with any unit component, and shall be securely fastened to the unit base and rigidly braced to some fixed part. All metal shall be free of burrs and sharp edges. Structural joints shall be continuously welded. Panels may be riveted to frames with not more than five-inch spacing. Tack welds shall not exceed four-inch spacing. The guard shall be primed with a minimum of 1.5 mils of zinc-based synthetic primer.
- b. A finish acrylic enamel coating (minimum 1.5 mils) shall be applied in accordance with section 3, color definitions of ANSI 253.1; 1967, safety color code for marking physical hazards.

2.7 PUMP CONTROL SYSTEM

2.7.1 General

This specification covers a pump control system for the duplex pumping station including motor circuit breakers, starters, thermal overload relays, door mounted operator controls, and liquid level controls. The liquid level control will include an air bubbler level control, electronic pressure switch, pump sequence control, alarms and pump safety shutdowns.

2.7.2 Panel Enclosures

Panel enclosures shall be constructed as follows:

- a. The pump station shall be furnished with duplex pump controls for outside mounting as shown on the Drawings. The electrical control equipment shall be mounted within NEMA 3R, dead front type control enclosures fabricated for stainless steel. Enclosure doors shall be gasketed with neoprene, shall be hinged, and shall be equipped with captive closing hardware - including one lockable set opposite the hinged side. Control compartments shall include removable back panels on which control components shall be mounted. Back panel shall be secured to enclosures with collar studs.
- b. Provide panel heater, single phase, 120 volt, 100 watt silicon rubber anti-condensation strip heater with adjustable thermostat.
- c. An Underwriters Laboratories label shall be displayed on outside surface of the panel enclosure. The label shall state that the entire panel and all components within the panel or cover mounted are listed as an "enclosed industrial control panel". An open listed panel is not acceptable.

- d. All operating controls and instruments shall be securely mounted and shall be clearly labeled to indicate function.

2.7.3 Mounting

All motor branch components shall be of the highest industrial quality, securely fastened to a removable sub-plate with screws and lock washers. The sub-plate shall be tapped to accept all mounting screws. Self-tapping screws shall not be used to mount any components.

2.7.4 Main Connections

Each control assembly shall be furnished with main terminals and ground lug for field connection of the electrical supply and grounding electrode conductor. The connections shall be designed to accept copper conductors of sufficient size to serve the loads. The main terminals shall be mounted to allow incoming wire bending space in accordance with article 373 of the national electric code (NEC). A separate terminal strip shall be provided for 115 volt, single phase control power and shall be segregated from the main terminals. Ten percent of the control terminals shall be furnished as spares.

2.7.5 Three Phase Voltage Monitor

The control panel shall be equipped to monitor the incoming power and shut down the pump, as adjusted, to protect the, motor(s) from damage caused by phase-reversal, phase loss and under/over voltage. The motor(s) shall automatically restart when power conditions return to normal.

2.7.6 Circuit Breakers and Operating Mechanisms

A properly sized heavy-duty molded case thermal-magnetic air circuit breaker shall be furnished for each pump motor, and shall have a symmetrical RMS interrupting rating of 10,000 amperes at 240 volts. These circuit breakers shall have adjustable trip settings. An external padlocking operating mechanism shall be installed on each motor circuit breaker. Operator handles for the mechanisms shall be located on the exterior of the control compartment door, with interlocks which permit the door to be opened only when circuit breakers are in the "off" position, except as permitted with a tool-only by-pass.

2.7.7 Motor Starters

An open frame, across the line, NEMA rated magnetic motor starter shall be furnished for each pump motor. Starters of NEMA size 1 and above shall be designed for addition of at least two auxiliary contacts. Starters rated "0", "00", or fractional size shall not be acceptable. Power contacts shall be double-break and made of cadmium oxide silver. All motor starters shall be equipped to provide under voltage release and overload protection on all three phases. Motor starter contacts shall be easily replaceable without removing the motor starter from its mounted position.

2.7.8 Overload Relays

Overload relays shall be block-type; utilizing melting alloy or bi-metallic type spindles, and shall have visual trip indication with trip-free operation. Pressing of the overload reset lever shall not actuate the control contact until such time as the overload spindle has reset.

Resetting of the overload reset lever will cause a snap-action control contact to reset, thus re-establishing a control circuit. Overload relays shall be manual reset only and not field convertible to automatic reset. Trip setting shall be determined by heater element only and not by adjustable settings. An overload reset pushbutton shall be mounted through the door of the control panel in such a manner as to permit resetting the overload relays without opening the control panel door.

2.7.9 Control Circuit

The control circuit shall be protected by a molded-case thermal-magnetic air circuit breaker that shall be sized and connected in such a manner as to allow control power to be disconnected from all control circuits.

2.7.10 Pump Mode Selection

Pump mode selector switches shall be mounted internally and connected to permit manual start and manual stop of each pump individually, and to select automatic operation of each pump under control of the level control system. Manual operation shall override all shutdown systems, but not the motor overload relays. Selector switches shall be toggle switches meeting military standards (ms) for quality. Switch contacts shall be rated 15 amperes minimum at 120 volts non-inductive.

2.7.11 Alternator Relay

Pump alternator relay shall be of electromechanical industrial design. Relay contacts shall be rated 10 amperes minimum at 120 volts non-inductive.

2.7.12 Pump Run Indicators

Control panel shall be equipped with one exterior pilot light for each pump motor. Light shall be wired in parallel with the related pump motor starter to indicate that the motor is or should be running.

2.7.13 Elapsed Time Indicators

Six digit elapsed time indicators (non-reset type) shall be mounted internally and connected to each motor starter to indicate the total running time of each pump in "hours" and "tenths of hours".

2.7.14 Sequence Selector

An external switch shall be provided to permit the station operator to select automatic alternation of the pumps, to select pump number 1 to be the lead pump for each pumping cycle, or to select pump number 2 to be the lead pump for each pumping cycle.

2.7.15 High Pump Temperature Protection

The control panel shall be equipped with circuitry to override the level control system and shut down the pump motor(s) when required to protect the pump from damage caused by excessive temperature. A thermostat shall be mounted on each pump to detect its temperature, and an electrical switch shall be supplied for each thermostat. If the pump temperature should rise to a level which could cause pump damage, the thermostat shall cause the switch to drop out the motor starter. An indicator, visible on the front of the control panel shall indicate that the pump motor has been stopped

because of a high temperature condition. The pump shall remain locked out until the pump has cooled and the circuit has been manually reset either independently or by use of the overload reset pushbutton. Automatic reset of such a circuit shall not be acceptable.

2.7.16 Lag Pump Start Delay

Pump No. 2 shall be provided with an adjustable internal time delay to prevent simultaneous motor starts following power outage.

2.7.17 Telemetry Contacts

Telemetry contacts shall be provided as follows:

- a. Provide DPDT dry contacts in the level control panel as applicable for each of the following:
 1. High wet well level alarm, EPS
 2. High pump temperature and motor overload alarm, pump #1
 3. High pump temperature and motor overload alarm, pump #2
 4. Pump #1 run
 5. Pump #2 run
 6. Voltage/phase failure alarm
 7. Low enclosure temperature alarm
- b. The contacts shall be normally open and wired to a terminal strip in the panel for wiring an automatic telephone dialer to be supplied with the pump station controls.

2.7.18 Circuit Breakers

The receptacle, fan, alarm, air pumps, and heater branch circuits will be supplied from molded-case circuit breakers rated to match the wiring and load devices.

2.7.19 Secondary Surge Arrestor

The control panel shall be equipped with a surge arrestor to minimize damage to the pump motors and control from transient voltage surges. The arrestor will be connected to the panel incoming line conductors and the auxiliary equipment ground. The arrestor shall utilize metal-oxide varistors encapsulated in a non-conductive housing. The arrestor shall be rated 240 volts RMS nominal with a discharge capacity of 2000 amps.

2.7.20 Receptacle

A 201 ampere duplex ground fault interrupter general purpose external receptacle providing 115 VAC, 60 hertz, single-phase current shall be mounted on the side of the control enclosure.

2.8 WIRING

2.8.1 General

The pump station as furnished by the manufacturer shall be completely wired except for the power feeder lines to the branch circuit breakers and final connections to remote alarm devices. All wiring, workmanship, and schematic wiring diagrams shall be compliance with applicable standards and specifications set forth by the national electric code (NEC). All user serviceable wiring shall be type MTW or THW, 600 volts, and shall be color-coded as follows:

- | | |
|--|----------------|
| a. Motor Load circuits, ac power | orange |
| b. Ac control circuits | brown |
| c. Dc control circuits | brown |
| d. Interlock control circuit, from external source | yellow |
| e. Equipment grounding conductor | green |
| f. Current carrying neutral | white/gray |
| g. Hot with circuit breaker open | black/red/blue |

2.8.2 Wire Identification and Sizing

Wiring shall be provided as follows:

- Control circuit wiring inside the panel, with the exception of internal wiring of individual components, shall be 16-gauge minimum, type MTW or THW, 600 volts. Wiring in conduit shall be 14-gauge minimum. Motor branch wiring shall be #8-gauge copper minimum.
- Motor branch conductors and other power conductors shall not be loaded above 60-degree c temperature rating. Wires shall be clearly identified at each end in the shop drawings in conformance with applicable standards. All wire connectors in the control panel shall be of the ring tongue type with nylon insulated shanks. All wires on the sub-plate shall be bundled and tied.
- All wires extending from components mounted on door shall be terminated on a terminal block mounted on the back panel. All wiring outside the panel shall be installed in conduit.

2.8.3 Wire Bundles

Control conductors connecting components mounted on the enclosure door shall be bundled and tied in accordance with good commercial practice. Bundles shall be made flexible at the hinged side of the enclosure. Adequate length and flex shall be allowed so that the door can swing to its full open position without undue mechanical stress or abrasion on the conductors or insulation. Bundles shall be clamped and held in place with mechanical fastening devices on each side of the hinge.

2.8.4 Conduit

Conduit shall be provided as follows:

- a. All conduit and fittings shall be UL listed.
- b. Liquid tight flexible metal conduit shall be constructed of a smooth, flexible galvanized steel core with smooth abrasion resistant, liquid tight, polyvinyl chloride cover.
- c. Conduit shall be supported in accordance with articles 346, 347, and 350 of the national electric code.
- d. Conduit shall be sized according to the National Electric Code.

2.8.5 Grounding

Grounding shall be as follows:

- a. The pump station manufacturer shall ground all electrical equipment inside the pump station to the enclosure back panel. The mounting surface of all ground connections shall have any paint removed before making final connections.
- b. The CONTRACTOR shall provide an earth driven ground connection to the pump station at the main grounding lug in accordance with the National Electric Code (NEC) and the drawings.

2.9 LEVEL CONTROL SYSTEM

2.9.1 Functional Description

The level control system shall start and stop the pump motors in response to changes in the wet well level, as set forth herein.

2.9.2 Type

The level control system shall be the air bubbler type, containing air bubbler piping that extends into the wet well. A pressure sensor contained within the electronic pressure switch shall sense the air pressure in this piping to provide wet well level signals for the remainder of the level control system.

2.9.3 Sequence of Operation

The electronic pressure switch shall continuously monitor the wet well level; permitting the operator to read wet well level at any time. Upon operator selection of automatic operation, the electronic pressure switch shall start the motor for one pump when the liquid level in the wet well rises to the "lead pump start level". When the liquid is lowered to the "lead pump stop level", the electronic pressure switch shall stop this pump. These actions shall constitute one pumping cycle. Should the wet well level continue to rise, the electronic pressure switch shall start the second pump when the liquid reaches the "lag pump start level" so that both pumps are operating. These levels shall be adjustable as described below.

2.9.4 Automatic Pump Alternation

The level control system shall utilize the alternator relay to select first one pump, then the second pump, to run as lead pump for a pumping cycle. Alternation shall occur at the end of a pumping cycle.

2.9.5 Electronic Pressure Switch

Electronic pressure switch shall be provided as follows:

a. Description

1. The electronic pressure switch shall include integral components to perform all pressure sensing signal conditioning, EMI and RFI suppression, DC power supply and 120 volt outputs. Comparators shall be solid state, and shall be integrated with other components to perform as described below.
2. The electronic pressure switch shall be capable of operating on a supply voltage of 108 volts to 132 volts AC, 60 hertz, in an ambient temperature range of -18 degrees C (0 degrees F) through +55 degrees C (131 degrees F). Control range shall be 0 to 12.0 feet of water with an overall repeat accuracy of plus or minus 0.1 feet of water.
3. The electronic pressure switch shall consist of the following integral components: pressure sensor, display, electronic comparators, and output relays.

b. Pressure Sensor

1. The pressure sensor shall be a strain gauge transducer and shall receive an input pressure from the air bubbler system. The transducer shall convert the input to a proportional electrical signal for distribution to the display and electronic comparators. The transducer output shall be filtered to prevent control response to level pulsations or surges. The transducer range shall be 0 to 15 PSI, temperature compensated from -40 degrees C (-40 degrees F) through +85 degrees C (+185 degrees F), with a repeat accuracy of plus or minus 0.25% full scale about a fixed temperature.
2. Transducer over pressure rating shall be 3 times full scale.

c. Display, External

1. The electronic pressure switch shall incorporate a digital panel meter, which upon operator selection, shall display liquid level in the wet well, and the preset start and stop levels for both the lead and lag pumps.
2. The meter shall be a 3 1/4-inches digit display calibrated to read out directly in feet of water, accurate to within one-tenth foot (0.1 foot), with a full scale indication of not less than 33 feet.

d. Electronic Comparators

1. Level adjustments shall be electronic comparator setpoints to control the levels at which the lead and lag pumps start and stop. Each of the level settings shall be adjustable, and accessible to the operator without opening the control panel or any cover panel on the electronic pressure switch. Controls shall be provided to permit the operator to read the selected levels on the display. Such adjustments shall not require hard wiring, the use of electronic test equipment, artificial level simulation or introduction of pressure to the electronic pressure switch.

e. Output Relays, Internal

1. Each output relay in the electronic pressure switch shall be solid state. Each relay input shall be optically isolated from its output and shall incorporate zero crossover switching to provide high immunity to electrical noise. The "on" state of each relay shall be indicated by illumination of a light emitting diode. The output of each relay shall be individually fused providing fused overload and short circuit protection.
2. Each output relay shall have an inductive load rating equivalent to one NEMA size 4 contactor. A pilot relay shall be incorporated for loads greater than a size 4 contactor.

f. Serviceability

1. The electronic pressure switch shall be equipped with replaceable plug-in integrated circuits and output fuses. The main circuit board assembly shall be provided with keyed plug-in connections to "off board" components permitting main board removal without de-soldering. All printed circuits shall have a conformal coating applied to both sides to protect against moisture or fungus.

g. Independent Lag Pump

1. Circuit design in which the application of power to the lag pump motor starter is contingent upon completion of the lead pump circuit shall not be acceptable.

h. High Water Alarm

1. The electronic pressure switch shall be equipped with an additional electronic comparator and solid state output relay to alert maintenance personnel to a high liquid level in the wet well. In the event that the wet well liquid reaches a preset high water alarm level, the high water alarm output relay shall energize a signal relay. The signal relay shall complete a 115-volt AC circuit for the external alarm light and remote devices.
2. A visible indicator, on the front of the control panel, shall indicate that a high wet well level exists. The signal relay shall maintain the alarm signal until the wet well level has been lowered and the circuit has been manually reset.

i. Alarm Silence

1. An internal alarm silence switch and relay shall be provided to permit maintenance personnel to deenergize the external alarm device while corrective actions are underway.
2. After silencing the alarm device, manual reset of the signal relay shall provide automatic reset of the alarm silence relay.

2.9.6 Air Bubbler System and Piping

Provide air bubbler system and piping as follows:

a. Air Flow Indicator

1. An air flow indicator gauge shall be provided and connected to the air bubbler piping to provide a visual indication of rate of flow in standard cubic feet per hour.

b. Air pumps

1. Two (2) vibrating reed, industrial rated, air pumps shall be furnished to deliver free air at a rate of approximately 5 cubic feet per hour and a pressure not to exceed 7 PSI. Liquid level control systems utilizing air compressors delivering greater quantities of air at higher pressures, requiring pressure reducing valves, rate of flow control valves, air storage reservoirs, and other maintenance nuisance items will not be acceptable.
2. A selector switch shall be furnished to provide manual alternation of the air pumps. The switch shall be connected in such a manner that either air pump may be selected to operate continuously.

c. Air Bell

1. Constructed of PVC 3 inches in diameter shall be provided for installation at the outlet end of the air bubbler line in the wet well. The bell shall have a 3/8-inch NPT tapped fitting for connection of the bubbler line.

2.9.7 Alarm Light (External)

The pump station shall be supplied with one 115-volt alarm light in a vapor-tight fixture with red globe, guard, conduit box, and mounting fixtures. The CONTRACTOR shall install the alarm light as shown on the Drawings.

2.10 ELECTRICAL WORK

Electrical motor driven equipment specified shall be provided complete with motors, motor starters, and controls for a complete operational system. Electric equipment and wiring shall be in accordance with the National Electric Code or equivalent sections of standardized defense installation codes. Manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices but not shown, shall be provided.

2.11 WET WELL

Provide fiberglass wet well and appurtenances as follows:

2.11.1 Resin

The resin used shall be of a commercial grade, FDA-approved, and shall either be evaluated as a laminate by test or determined by previous service to be acceptable for the environment.

2.11.2 Reinforcing Material

The resin used shall be of a commercial grade of glass fiber having a coupling agent which will provide a suitable bond between the glass reinforcement and the resin.

2.11.3 Laminate

The laminate shall consist of an inner surface, an interior layer, and an exterior layer of laminate body.

2.11.4 Inner Surface

The inner surface shall be free of cracks and crazing with a smooth finish. Some waviness is permissible as long as the surface is smooth and free of pits. Between 0.010 and 0.020 inches of resin-rich surface shall be provided. This may be a gelcote surface or reinforced with glass surface veil.

2.11.5 Interior Layer

A minimum of 0.100 inch of the laminate next to the inner surface shall be reinforced with not less than 20 percent nor more than 30 percent by weight of noncontinuous glass strands having fiber lengths from 0.5 inches to 2.0 inches.

2.11.6 Exterior Layer

The exterior layer of body of laminate shall be of construction suitable for the service intended and contain sufficient glass by weight to provide the aggregate strength necessary to meet the tensile and flexural requirements. The exterior surface shall be relatively smooth with no exposed fibers or sharp projections. Hand work finish is acceptable, but enough resin shall be present to prevent fiber show.

2.11.7 Wet Well Wall

The wet well wall must be designed to withstand wall collapse based on the assumption that saturated soil exerts hydrostatic pressure on the structure. See boring logs for soil characteristics. The well wall laminate must be constructed to withstand or exceed two times the actual imposed loading on any depth of basin. Stress calculations must be submitted verifying the results obtained using hydrostatic pressure and two times actual imposed loading on any depth basin. Depth of bury and pump station load to be specified on purchase order with wall thickness calculated and guaranteed by the manufacturer.

2.11.8 Wet Well Bottom

Must be constructed suitable for dry ground conditions. Under totally water submerged conditions, the center deflection of any empty well bottom must be less than 3/8 inch as not to interfere with bottom pump mounting requirements and rail systems.

2.11.9 Wet Well Basin

The basin shall be constructed of fiberglass to the diameter and depth indicated on the drawings. The bottom of the basin shall be reinforced with a fiberglass plate extending 6 inches beyond the basin diameter for anchoring to the concrete buoyancy pad.

2.11.10 Access Hatch

The access hatch shall be Type K-1, single leaf aluminum construction as manufactured by The Bilco Company or approved equal. The access hatch hardware shall be 316 stainless steel.

2.12 Flow Meter

The contractor shall provide and install a PVDF Flow Sensor with analog flow rate and accumulating totalizer. The flow sensor will be the rotary type constructed of PVDF with linearity of +/- 1% of full range, repeatability of +/- 0.5% of full range, and flow rate range from 1 to 20 ft/s. An acceptable model will be a Signet 515 PVDF Flow Sensor or approved equal by the contracting officer.

The analog flow rate accumulating instrument shall provide accurate fluid flow rate and real-time flow rate readings. The accumulating flow totalizer shall be the 8-digit resettable type with accuracy +/- 0.5% of reading. The real-time flow rate display range shall be 0-300 gpm. The flow sensor element and flow rate/totalizer shall be furnished for use with a 125 VAC electrical supply, if required, including any low voltage conversion equipment necessary for operation of the instruments. An acceptable model will be a Signet 5500 Flow Monitor or approved equal by the contracting officer.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION

3.1.1 Pump Station Installation

Install, level, and align pump station as indicated on project Drawings. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery and as follows:

- a. Suction pipe connections must be vacuum tight. Fasteners at all pipe connections must be tight. Install pipe with supports and thrust blocks to prevent strain and vibration on pump station piping. Install and secure all service lines (level control, air release valve or pump drain lines) as required in wet well.

- b. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to station control panel.
- c. Prior to applying electrical power to motors or control equipment, check all wiring for tight connection. Verify that fuses and circuit breakers conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.
- d. After all anchor bolts, piping connections are installed, seal all openings between wet well and pump enclosure.

3.1.2 Concrete

Concrete shall conform to Section 03307 CONCRETE FOR MINOR STRUCTURES.

3.2 PAINTING

Exterior surfaces of pumps, piping, and steel framework shall be chemically or mechanically cleaned prior to painting. Exposed surfaces to be coated with a gray, non-lift water reducible primer possessing low VOC, high solids characteristics. The bright white semi-gloss acrylic enamel shall incorporate rust inhibitive additives. The finish coat shall be 1.0 to 1.5 mil dry film thickness (minimum), resistant to oil mist exposure and solvent contact. Salt spray exposure test shall be rated 100 hours (minimum). The factory finish shall allow for over-coating and touch up after final installation. Field painting required for ferrous surfaces not finished at the factory is specified by manufacturer.

3.3 FIELD TESTING AND ADJUSTING EQUIPMENT

3.3.1 Operational Test

Prior to acceptance, an operational test of all pumps, drivers, and control systems shall be performed to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that the equipment is not electrically, mechanically, structurally, or otherwise defective; is in safe and satisfactory operating condition; and conforms with the specified operating characteristics. Prior to applying electrical power to any motor driven equipment, the drive train shall be rotated by hand to demonstrate free operation of all mechanical parts. Tests shall include checks for excessive vibration, leaks in all piping and seals, correct operation of control systems and equipment, proper alignment, excessive noise levels, and power consumption.

3.3.2 Retesting

If any deficiencies are revealed during any test, such deficiencies shall be corrected and the tests shall be reconducted.

3.4 MANUFACTURER'S SERVICES

Services of a manufacturer's representative who is experienced in the installation, adjustment, and operation of the equipment specified shall be

provided. The representative shall supervise the installation, adjustment, and testing of the equipment.

3.5 FIELD TRAINING

A field training course shall be provided for designated operating and maintenance staff members. Training shall be provided for a total period of 4 hours of normal working time and shall start after the system is functionally complete but prior to final acceptance tests. Field training shall cover all of the items contained in the operating and maintenance manuals.

3.6 CLEANING

Prior to acceptance, inspect interior and exterior of pump station for dirt, splashed material or damaged paint. Clean or repair accordingly. Remove from the job site all tools, surplus materials, scrap and debris.

SECTION 16375

ELECTRICAL DISTRIBUTION SYSTEM, GENERAL, AND UNDERGROUND
11/92

PART 1 GENERAL

1.1 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.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI C12.1 (1995) Code for Electricity Metering
- ANSI C57.12.26 (1993) Pad-Mounted Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers for Use with Separable Insulated High-Voltage Connectors, High-Voltage, 34 500 Grd Y/19 920 Volts and Below; 2500 kVa and Smaller

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM B 8 (1993) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
- ASTM B 301 (1995) Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

- FM P7825a (1998) Approval Guide Electrical Equipment

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- IEEE C2 (1997) National Electrical Safety Code
- IEEE Std 81 (1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)
- IEEE Std 100 (1996) IEEE Standard Dictionary of Electrical and Electronics Terms

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- NEMA AB 1 (1993) Molded Case Circuit Breakers and Molded Case Switches
- NEMA FB 1 (1993) Fittings, Cast Metal Boxes and Conduit Bodies for Conduit and Cable Assemblies

NEMA FU 1 (1986) Low Voltage Cartridge Fuses

NEMA LA 1 (1992) Surge Arresters

NEMA PB 1 (1990) Panelboards

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1999; National Electrical Code)

UNDERWRITERS LABORATORIES (UL)

UL 467 (1993; Rev thru Aug 1996) Grounding and Bonding Equipment

UL 486A (1997) Wire Connectors and Soldering Lugs for Use with Copper Conductors

UL 486B (1997; Rev Jun 1997) Wire Connectors for Use with Aluminum Conductors

UL 489 (1996; Rev thru Nov 1997) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

UL 510 (1994; Rev thru Nov 1997) Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape

UL 854 (1996; Rev Apr 1996) Service-Entrance Cables

1.2 GENERAL REQUIREMENTS

1.2.1 Terminology

Terminology used in this specification is as defined in IEEE Std 100.

1.2.2 Service Conditions

Items provided under this section shall be specifically suitable for the following service conditions:

a. Ambient Temperature 104 degrees F

b. Frequency 60HZ

1.3 SUBMITTALS

Governmental approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Manufacturer's Catalog Data; FIO.

Catalog cuts, brochures, circulars, specifications, product data, and printed information in sufficient detail and scope to verify compliance with the requirements of the contract documents.

Material, Equipment, and Fixture Lists; FIO.

A complete itemized listing of equipment and materials proposed for incorporation into the work. Each entry shall include an item number, the quantity of items proposed, and the name of the manufacturer of each such item.

Field Testing; Grounding.

A proposed field test plan, 10 days prior to testing the installed system. No field test shall be performed until the test plan is approved. The test plan shall consist of complete field test procedures including tests to be performed, test equipment required, and tolerance limits.

Test Reports; Grounding.

Two copies of the information described below in 8-1/2 by 11 inch binders having a minimum of three rings, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

- a. A list of equipment used, with calibration certifications.
- b. A copy of measurements taken.
- c. The dates of testing.
- d. The equipment and values to be verified.
- e. The condition specified for the test.
- f. The test results, signed and dated.
- g. A description of adjustments made.

Materials and Equipment.

Where materials or equipment are specified to conform to the standards of the Underwriters Laboratories (UL) or to be constructed or tested, or both, in accordance with the standards of the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineers (IEEE), or the National Electrical Manufacturers Association (NEMA), the Contractor shall submit proof that the items provided conform to such requirements. The label of, or listing by, UL will be acceptable as evidence that the items conform. Either a certification or a published catalog specification data statement, to the effect that the item is in accordance with the referenced ANSI or IEEE standard, will be acceptable as evidence that the item conforms. A similar certification or published catalog specification data statement to the effect that the item is in

accordance with the referenced NEMA standard, by a company listed as a member company of NEMA, will be acceptable as evidence that the item conforms. In lieu of such certification or published data, the Contractor may submit a certificate from a recognized testing agency equipped and competent to perform such services, stating that the items have been tested and that they conform to the requirements listed, including methods of testing of the specified agencies. Compliance with above-named requirements does not relieve the Contractor from compliance with any other requirements of the specifications.

SD-19 OPERATION AND MAINTENANCE MANUALS

1.4 DELIVERY, STORAGE, AND HANDLING

Devices and equipment shall be visually inspected by the Contractor when received and prior to acceptance from conveyance. Stored items shall be protected from the environment in accordance with the manufacturer's published instructions. Damaged items shall be replaced. Oil filled transformers shall be stored in accordance with the manufacturer's requirements. Wood poles held in storage for more than 2 weeks shall be stored in accordance with ANSI O5.1. Handling of wood poles shall be in accordance with ANSI O5.1, except that pointed tools capable of producing indentations more than 1 inch in depth shall not be used.

1.5 EXTRA MATERIALS

One additional spare fuse or fuse element for each furnished fuse or fuse element shall be delivered to the contracting officer when the electrical system is accepted. Two complete sets of all special tools required for maintenance shall be provided, complete with a suitable tool box. Special tools are those that only the manufacturer provides, for special purposes (to access compartments, or operate, adjust, or maintain special parts).

PART 2 PRODUCTS

2.1 STANDARD PRODUCT

Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

2.2 NAMEPLATES

2.2.1 General

Each major component of this specification shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a nameplate securely attached to the equipment. As a minimum, nameplates shall be provided for transformers, circuit breakers, and switches.

2.2.2 Liquid-Filled Transformer Nameplates

Power transformers shall be provided with nameplate information in accordance with IEEE ANSI/IEEE C57.12.00. Nameplates shall indicate the number of gallons and composition of liquid-dielectric, and shall be

permanently marked with a statement that the transformer dielectric to be supplied is non-polychlorinated biphenyl. If transformer nameplate is not so marked, the Contractor shall furnish manufacturer's certification for each transformer that the dielectric is non-PCB classified, with less than 50 ppm PCB content in accordance with paragraph LIQUID DIELECTRICS. Certifications shall be related to serial numbers on transformer nameplates. Transformer dielectric exceeding the 50 ppm PCB content or transformers without certification will be considered as PCB insulated and will not be accepted.

2.3 CORROSION PROTECTION

2.3.1 Aluminum Materials

Aluminum shall not be used in contact with earth or concrete. Where aluminum conductors are connected to dissimilar metal, fittings conforming to UL 486B shall be used.

2.3.2 Ferrous Metal Materials

2.3.2.1 Hardware

Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A 153 and ASTM A 123.

2.3.3 Finishing

Painting required for surfaces not otherwise specified and finish painting of items only primed at the factory shall be as specified in Section 09900 PAINTING, GENERAL.

2.4 CABLES

2.4.1.1 General

Cable construction shall be Type MV, conforming to NFPA 70 and UL 1072. Cables shall be manufactured for use in direct burial applications.

2.4.1.2 Ratings

Cables shall be rated for a circuit voltage of 15 kV.

2.4.1.3 Conductor Material

Underground cables shall be soft drawn copper complying with ASTM B 3 and ASTM B 8 for regular concentric and compressed stranding or ASTM B 496 for compact stranding.

2.4.1.4 Insulation

Cable insulation shall be ethylene-propylene-rubber (EPR) insulation conforming to the requirements of NEMA WC 8 and AEIC CS6. A 100 percent insulation level shall be used on 15 kV rated cables.

2.4.1.5 Shielding

Cables rated for 2 kV and above shall have a semiconducting conductor shield, a semiconducting insulation shield, and an overall copper tape shield for each phase. The shield tape shall be sized to meet IEEE C2 requirements for a ground fault availability of 30 kilo-amperes.

2.4.1.6 Neutrals

Cables shall conform to the requirements of NFPA 70, and must be UL listed for the application or meet the applicable section of NEMA standards.

2.4.2.1 Conductor Material

Underground cables shall be annealed copper complying with ASTM B 3 and ASTM B 8 conductors complying with ASTM B 800 and ASTM B 801.

2.4.2.2 Insulation

Insulation must be in accordance with NFPA 70, and must be UL listed for the application or meet the applicable sections of NEMA standards.

2.4.2.3 Jackets

Multiconductor cables shall have an overall PVC or EPR outer jacket.

2.4.2.4 Direct Buried

Single and multi-conductor cables shall be of a type identified for direct burial. Service entrance cables shall conform to UL 854 for Type USE service entrance cable.

2.5 CABLE TERMINATIONS AND CONNECTORS

2.5.1 Low-Voltage Cable Splices

Low-voltage cable splices and terminations shall be rated at not less than 600 Volts. Splices in conductors No. 10 AWG and smaller shall be made with an insulated, solderless, pressure type connector, conforming to the applicable requirements of UL 486A. Splices in conductors No. 8 AWG and larger shall be made with noninsulated, solderless, pressure type connector, conforming to the applicable requirements of UL 486A and UL 486B. Splices shall then be covered with an insulation and jacket material equivalent to the conductor insulation and jacket. Splices below grade or in wet locations shall be sealed type conforming to ANSI C119.1 or shall be waterproofed by a sealant-filled, thick wall, heat shrinkable, thermosetting tubing or by pouring a thermosetting resin into a mold that surrounds the joined conductors.

2.5.2 Terminations

Terminations shall be in accordance with IEEE Std 48, Class 1 or Class 2; of the molded elastomer, wet-process porcelain, prestretched elastomer, or heat-shrinkable elastomer, type. Acceptable elastomers are track-resistant silicone rubber or track-resistant ethylene propylene compounds, such as ethylene propylene rubber or ethylene propylene diene monomer. Separable insulated connectors may be used for apparatus terminations, when such

apparatus is provided with suitable bushings. Terminations shall be of the outdoor type, except that where installed inside outdoor equipment housings which are sealed against normal infiltration of moisture and outside air, indoor, Class 2 terminations are acceptable. Class 3 terminations are not acceptable. Terminations, where required, shall be provided with mounting brackets suitable for the intended installation and with grounding provisions for the cable shielding, metallic sheath, and armor.

2.5.2.1 Factory Preformed Type

Molded elastomer, wet-process porcelain, prestretched, and heat-shrinkable terminations shall utilize factory preformed components to the maximum extent practicable rather than tape build-up. Terminations shall have basic impulse levels as required for the system voltage level. [Leakage distances shall comply with wet withstand voltage test requirements of IEEE Std 48 for the next higher Basic Insulation Level (BIL) level.] [Anti-tracking tape shall be applied over exposed insulation of preformed molded elastomer terminations].

Poles and hardware shall be in accordance with Section 16370 ELECTRICAL DISTRIBUTION SYSTEM, AERIAL.

2.6 TRANSFORMERS, SUBSTATIONS, AND SWITCHGEAR

2.6.2 Pad-Mounted Transformers

Pad-mounted transformers shall comply with ANSI C57.12.26 and shall be of the radial loop feed type. Pad-mounted transformer stations shall be assembled and coordinated by one manufacturer and each transformer station shall be shipped as a complete unit so that field installation requirements are limited to mounting each unit on a concrete pad and connecting it to primary and secondary lines. Stainless steel pins and hinges shall be provided. Barriers shall be provided between high- and low-voltage compartments. High-voltage compartment doors shall be interlocked with low-voltage compartment doors to prevent access to any high-voltage section unless its associated low-voltage section door has first been opened. Compartments shall be sized to meet the specific dimensional requirements of ANSI C57.12.26. Pentahead locking bolts shall be provided with provisions for a padlock.

2.6.2.1 High-Voltage Compartments

The high-voltage compartment shall be dead-front construction. Primary switching and protective devices shall include loadbreak switching, oil-immersed, current-limiting, bayonet-type fuses, medium-voltage separable loadbreak connectors, universal bushing wells and inserts or integral one piece bushings and surge arresters. Fuses shall comply with the requirements of paragraph METERING AND PROTECTIVE DEVICES. The switch shall be mounted inside transformer tank with switch operating handle located in high-voltage compartment and equipped with metal loop for hook stick operation. Fuses shall be interlocked with switches so that fuses can be removed only when the associated switch is in the "OPEN" position. Adjacent to medium-voltage cable connections, a nameplate or equivalent stencilled inscription shall be provided inscribed "DO NOT OPEN CABLE CONNECTORS UNLESS SWITCH IS OPEN." Surge arresters shall be fully insulated and configured to terminate on the same bushing as the primary cable by means of a loadbreak, feed-through bushing insert.

2.6.2.2 Load-Break Switch

Radial-feed oil-immersed type rated at 15 kV, BIL, with a continuous current rating and load-break rating of 5 ampere, and a make-and-latch rating of 10,000 rms amperes symmetrical. Locate the switch handle in the high-voltage compartment.

2.6.2.3 Transformer Tank Sections

Transformers shall comply with IEEE ANSI/IEEE C57.12.00, ANSI C57.12.21, and ANSI C57.12.26 and shall be of the mineral oil-insulated type. Transformers shall be suitable for outdoor use and shall have 2 separate windings per phase. Standard NEMA primary taps shall be provided. Where primary taps are not specified, 4, 2-1/2 percent rated kVA high-voltage taps shall be provided 2 above and 2 below rated, primary voltage. Operating handles for primary tap changers for de-energized operation shall be located within high-voltage compartments, externally to transformer tanks. Adjacent to the tap changer operating handle, a nameplate or equivalent stenciled inscription shall be provided and inscribed "DO NOT OPERATE UNDER LOAD." Transformer ratings at 60 Hz shall be as follows:

Three-phase capacity.....	35 kVA.
Impedance.....	6%.
Temperature Rise.....	65 degrees C.
High-voltage winding.....	13.2 L volts.
High-voltage winding connections.....	delta.
Low-voltage winding.....	120Y208 volts.
Low-voltage winding connections.....	Y

2.6.2.4 Low-Voltage Cable Compartments

Neutrals shall be provided with fully-insulated bushings. Clamp type cable terminations, suitable for copper or aluminum conductors entering from below, shall be provided as necessary.

2.6.2.5 Accessories

High-voltage warning signs shall be permanently attached to each side of transformer stations. Voltage warning signs shall comply with IEEE C2. Copper-faced steel or stainless steel ground connection pads shall be provided in both the high- and low-voltage compartments. Dial-type thermometer, liquid-level gauge, and drain valve with built-in sampling device shall be provided for each transformer station. Insulated-bushing-type parking stands shall be provided adjacent to each separable load-break elbow to provide for cable isolation during sectionalizing operations.

2.7 METERING AND PROTECTIVE DEVICES

2.7.1 Molded-Case Circuit Breakers

NEMA AB 1 and UL 489.

Fuses, Medium-Voltage, Including Current-Limiting

2.7.1.1 Construction

Units shall be suitable for outdoor use. Fuses shall have integral blown-fuse indicators. All ratings shall be clearly visible.

2.7.1.2 Ratings

[Expulsion-type] power fuses shall have ratings in accordance with ANSI C37.46 and as follows:

- Nominal voltage.....13.2 kV.
- Rated maximum voltage.....15 kV.
- Maximum symmetrical interrupting capacity.....50 KA.
- Rated continuous current.....5 amp.

2.7.2 Fuses, Low-Voltage, Current-Limiting

2.7.2.1

Low-voltage fuses shall conform to NEMA FU 1. Equipment provided under this contract shall be provided with a complete set of properly rated fuses when the equipment manufacturer utilizes fuses in the manufacture of the equipment, or if current-limiting fuses are required to be installed to limit the ampere-interrupting capacity of circuit breakers or equipment to less than the maximum available fault current at the location of the equipment to be installed. Fuses shall have a voltage rating of not less than the phase-to-phase circuit voltage, and shall have the time-current characteristics required for effective power system coordination.

2.7.2.2 Transformer Circuit Fuses

Transformer circuit fuses shall be Class RK1 or RK5, current-limiting, time-delay with 10,000 amperes interrupting capacity.

2.8 SURGE ARRESTERS

Surge arresters shall comply with NEMA LA 1, IEEE C62.1, IEEE C62.2, and IEEE C62.11 and shall be provided where indicated. Arresters shall be distribution class, rated as shown. Arresters shall be equipped with mounting brackets suitable for the indicated installations. Arresters shall be of the valve or combination valve-metal-oxide varistor type.

2.9 GROUNDING AND BONDING

2.9.1 Driven Ground Rods

Ground rods shall be copper-clad steel conforming to UL 467 not less than 5/8 inch in diameter by 8 feet in length. Sectional type rods may be used.

2.9.2 Grounding Conductors

Grounding conductors shall be bare, except where installed in conduit with associated phase conductors. Insulated conductors shall be of the same material as phase conductors and green color-coded, except that conductors shall be rated no more than 600 volts. Bare conductors shall be ASTM B 8 soft-drawn unless otherwise indicated. Aluminum is not acceptable.

2.10 LIQUID DIELECTRICS

Liquid dielectrics for transformers, shall be non-polychlorinated biphenyl (PCB) mineral-oil. Equipment with test results indicating PCB level exceeding 50 ppm shall be replaced.

2.11 FENCING

Fencing shall conform to the requirements of Section 02831 CHAIN LINK FENCE.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Equipment and devices shall be installed and energized in accordance with the manufacturer's published instructions. Circuits installed aerially shall conform to the requirements of Section 16370 ELECTRICAL DISTRIBUTION SYSTEM, AERIAL. Except as covered herein, excavation, trenching, and backfilling shall conform to the requirements of Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.1.1 Conformance to Codes

The installation shall comply with the requirements and recommendations of NFPA 70 and IEEE C2 as applicable.

3.1.2 Verification of Dimensions

The Contractor shall become familiar with details of the work, shall verify dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work.

3.2 CABLE AND BUSWAY INSTALLATION

3.2.1 Direct-Burial

Low-voltage cables shall be buried directly in the earth as indicated. Minimum cover from the top of a cable to finished grade shall be 24 inches.

3.2.1.1 Trenching

Trenches for direct-burial cables shall be excavated to depths required to provide the minimum necessary cable cover. Bottoms of trenches shall be smooth and free of stones and sharp objects. Where bottoms of trenches comprise materials other than sand, a 3 inch layer of sand shall be laid first and compacted to approximate densities of surrounding firm soil.

3.2.1.2 Cable Burial

Cables shall be unreeled along the sides of or in trenches and carefully placed on sand or earth bottoms. Pulling cables into direct-burial trenches from a fixed reel position will not be permitted, except as required to pull cables through conduits under paving or railroad tracks. Where cables cross, a separation of at least 3 inches shall be provided, unless each cable circuit is protected by a nonmetallic conduit sleeve at the crossing. Where single-conductor cable is installed, all 3 phases and the neutral shall be installed in the same sleeve. Bend radius of any cable shall be not less than 12 times the diameter of the cable. In no case shall cables be left under longitudinal tension. The first 6 inch layer of backfill shall be of sand. Machine compaction shall not be used within 6 inches of the cable.

3.2.1.3 Low-Voltage Cable Splices

Cable joints or splices in direct-burial cables are not permitted in runs of 1000 feet or less, nor at intervals of less than 1000 feet in longer runs, except as required for taps. Locations of cable joints or splices in shorter intervals, where required to avoid obstructions or damage to cables, shall be approved. Cable joints or splices in direct burial installations shall be installed in above-ground junction boxes or in cast metal splice boxes suitable for direct burial use.

3.2.1.4 Cable Markers

Markers shall be located near the ends of cable runs. In addition to markers, a 5 mil, brightly colored plastic tape not less than 3 inches in width and suitably inscribed at not more than 10 feet on centers, or other approved dig-in warning indication, shall be placed approximately 12 inches below finished grade levels of trenches.

3.3 PAD-MOUNTED EQUIPMENT INSTALLATION

Pad-mounted equipment, shall be installed on concrete pads in accordance with the manufacturer's published, standard installation drawings and procedures, except that they shall be modified to meet the requirements of this document. Units shall be installed so that they do not damage equipment or scratch painted or coated surfaces. After installation, surfaces shall be inspected and scratches touched up with a paint or coating provided by the manufacturer especially for this purpose. Three-phase transformers shall be installed with A-B-C phase sequence. Primary taps shall be set at center.

3.3.1 Concrete Pads

3.3.1.1 Construction

Concrete pads for pad-mounted electrical equipment [may be either pre-fabricated or] [shall be] poured-in-place. Pads shall be constructed as indicated, except that exact pad dimensions and mounting details are equipment specific and are the responsibility of the Contractor. Tops of concrete pads shall be level and shall project 4 inches above finished paving or grade and sloped to drain. Edges of concrete pads shall have 3/4 inch chamfer. Sleeves for primary, secondary, and grounding conductors shall be set in place prior to placement of concrete pads. Where grounding electrode conductors are installed through concrete pads, PVC conduit sleeves shall be installed through the concrete to provide physical protection.

3.3.1.2 Concrete and Reinforcement

Concrete work shall have minimum 3000 psi compressive strength and conform to the requirements of Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. Concrete pad reinforcement shall be in accordance with Section 03200 CONCRETE REINFORCEMENT.

3.3.1.3 Sealing

When the installation is complete, the Contractor shall seal all conduit and other entries into the equipment enclosure with an approved sealing compound. Seals shall be of sufficient strength and durability to protect all energized live parts of the equipment from rodents, insects, or other foreign matter.

3.3.2 Padlocks

Padlocks shall be provided for pad-mounted equipment and for each fence gate. Padlocks shall be keyed as directed by the Contracting Officer. Padlocks shall comply with ASTM F 883.

3.4 CONNECTIONS BETWEEN AERIAL AND UNDERGROUND SYSTEMS

Connections between aerial and underground systems shall be made as shown. Underground cables shall be extended up poles in guards to cable terminations. Cable guards shall be secured to poles in accordance with the manufacturer's published procedures. Cables shall be supported by devices separate from the conduit or guard, near their point of exit from the conduit or guard.

3.4.1 Pole Installation

Pole installation shall be in accordance with Section 16370 ELECTRICAL DISTRIBUTION SYSTEM, AERIAL.

3.5 GROUNDING

A ground ring consisting of the indicated configuration of bare copper conductors and driven ground rods shall be installed at pad-mounted equipment as shown. Equipment frames of metal-enclosed equipment, and other

noncurrent-carrying metal parts, such as cable shields, cable sheaths and armor, and metallic conduit shall be grounded.

3.5.1 Grounding Electrodes

Grounding electrodes shall be installed as shown on the drawings and as follows:

- a. Driven rod electrodes - Unless otherwise indicated, ground rods shall be driven into the earth until the tops of the rods are approximately 1 foot below finished grade.
- b. Additional electrodes - When the required ground resistance is not met, additional electrodes shall be provided interconnected with grounding conductors to achieve the specified ground resistance. The additional electrodes will be up to three, 8 feet rods spaced a minimum of 10 feet apart driven perpendicular to grade. In high ground resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 10 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately.

3.5.2 Grounding and Bonding Connections

Connections above grade shall be made by the fusion-welding process or with bolted solderless connectors, in compliance with UL #67, and those below grade shall be made by a fusion-welding process. Where grounding conductors are connected to aluminum-composition conductors, specially treated or lined copper-to-aluminum connectors suitable for this purpose shall be used.

3.5.3 Grounding and Bonding Conductors

Grounding and bonding conductors include conductors used to bond transformer enclosures and equipment frames to the grounding electrode system. Grounding and bonding conductors shall be sized as shown, and located to provide maximum physical protection. Bends greater than 45 degrees in ground conductors are not permitted. Routing of ground conductors through concrete shall be avoided. When concrete penetration is necessary, nonmetallic conduit shall be cast flush with the points of concrete entrance and exit so as to provide an opening for the ground conductor, and the opening shall be sealed with a suitable compound after installation.

3.5.4 Surge Arrester Grounding

Surge arresters and neutrals shall be bonded directly to the transformer enclosure and then to the grounding electrode system with a bare copper conductor, sized as shown. Lead lengths shall be kept as short as practicable with no kinks or sharp bends.

3.5.5 Riser Pole Grounding

A single continuous vertical grounding electrode conductor shall be installed on each riser pole and connected directly to the grounding electrodes indicated on the drawings or required by these specifications. All equipment, neutrals, surge arresters, and items required to be grounded shall be connected directly to this vertical conductor. The grounding

electrode conductor shall be sized as shown. Grounding electrode conductors shall be stapled to wood poles at intervals not exceeding 2 feet.

3.6 FIELD TESTING

3.6.1 General

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer [_____] days prior to conducting tests. The Contractor shall furnish all materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform all tests and inspections recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of all tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. Field test reports shall be signed and dated by the Contractor.

3.6.2 Safety

The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor shall replace any devices or equipment which are damaged due to improper test procedures or handling.

3.6.3 Ground-Resistance Tests

The resistance of each grounding electrode system shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

- a. Multiple rod electrodes - 10 ohms.

3.6.4 Ground-Mat Connection Inspection

All below-grade ground-mat connections will be visually inspected by the Contracting Officer before backfilling. The Contractor shall notify the Contracting Officer 72 hours before the site is ready for inspection.

Low-voltage cable, complete with splices, shall be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energization. The test voltage shall be 500 volts dc, applied for one minute between each conductor and ground and between all possible combinations of conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or conduit. The minimum value of insulation shall be:

R in megohms = (rated voltage in kV + 1) x 1000 / (length of cable in feet

Each cable failing this test shall be repaired or replaced. The repaired cable shall be retested until failures have been eliminated.

3.6.5 Liquid-Filled Transformer Tests

The following field tests shall be performed on [all liquid-filled transformers. Pass-fail criteria shall be in accordance with transformer manufacturer's specifications.

- a. Insulation resistance test phase-to-ground.
- b. Turns ratio test.
- c. Correct phase sequence.
- d. Correct operation of tap changer.

3.6.6 Operating Tests

After the installation is completed, and at such times as the Contracting Officer may direct, the Contractor shall conduct operating tests for approval. The equipment shall be demonstrated to operate in accordance with the requirements herein. An operating test report shall be submitted in accordance with paragraph SUBMITTALS.

3.7 ACCEPTANCE

Final acceptance of the facility will not be given until the Contractor has successfully completed all tests and after all defects in installation, material or operation have been corrected.

SECTION 16415

ELECTRICAL WORK, INTERIOR
08/96

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(1991) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA AB 1	(1993) Molded Case Circuit Breakers and Molded Case Switches
NEMA ICS 1	(1993) Industrial Control and Systems
NEMA ICS 2	(1993) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated Not More Than 2,000 Volts AC or 750 Volts DC
NEMA ICS 3	(1993) Industrial Control and Systems Factory Built Assemblies
NEMA ICS 6	(1993) Industrial Control and Systems Enclosures
NEMA MG 1	(1993; Rev 1; Rev 2; Rev 3) Motors and Generators
NEMA MG 10	(1994) Energy Management Guide for Selection and Use of Polyphase Motors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1996; Errata 96-4) National Electrical Code
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UNDERWRITERS LABORATORIES (UL)

UL-03	(1990; Supplement) Electrical Construction Materials Directory
UL 50	(1995; Rev thru Oct 1997) Enclosures for Electrical Equipment
UL 83	(1996; Rev Sep 1997) Thermoplastic-Insulated Wires and Cables
UL 467	(1993; Rev thru Aug 1996) Grounding and Bonding Equipment
UL 486A	(1997) Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 486C	(1997) Splicing Wire Connectors

UL 489	(1996; Rev thru Nov 1997) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 508	(1993; Rev thru Oct 1997) Industrial Control Equipment
UL 510	(1994; Rev thru Nov 1997) Insulating Tape
UL 719	(1996) Nonmetallic-Sheathed Cables
UL 869A	(Mar 23, 1987; 1 st Ed; Rev thru Nov 23, 1990) Service Equipment

PART 2 PRODUCTS

Products shall conform to the respective publications and other requirements specified below. Materials and equipment not listed below shall be as specified elsewhere in this section. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

2.1 CABLES AND WIRES

Conductors in cables shall be annealed copper. Design is based on copper conductors. Cables shall be single-conductor type, unless otherwise indicated. Cables and wires shall conform to UL 83 for the thermoplastic-insulated type and UL 719 for the nonmetallic-sheathed cables.

2.1.1 Service Entrance Cables

Service entrance (SE) and underground service entrance (USE) cables, UL 854.

2.1.2 Grounding Cables

Grounding cables shall be bare or shall have green low-voltage insulation.

2.2 CIRCUIT BREAKERS

Circuit breakers shall have voltage, current, and interrupting ratings as indicated. Fully-rated circuit breakers shall be provided to obtain the specified interrupting rating.

2.2.1 MOLDED-CASE CIRCUIT BREAKERS

Molded-case circuit breakers shall conform to NEMA AB 1 and UL 489. Single-pole breakers shall be full module size; two poles shall not be installed in a single module. Multipole breakers shall be of the common-trip type having a single operating handle.

2.3 RECEPTACLES

2.3.1 Standard Grade

UL 498.

2.4 SERVICE ENTRANCE EQUIPMENT

UL 869A.

2.5 SPLICE, CONDUCTOR

UL 486C.

2.6 TAPES

2.6.1 Plastic Tape

UL 510.

PART 3 EXECUTION

3.1 WIRING METHODS

3.1.1 Cables and Conductors

Installation shall conform to the requirements of NFPA 70. Wire connectors of insulating material or solderless pressure connectors properly taped shall be utilized for all splices.

3.1.1.1 Sizing

Unless otherwise noted, all sizes are based on copper conductors and the insulation types indicated. Sizes shall be not less than indicated. Branch-circuit conductors shall be not smaller than No. 12 AWG. Conductors for branch circuits of 120 volts more than 100 feet long and of 277 volts more than 230 feet long, from panel to load center, shall be no smaller than No. 10 AWG.

3.1.1.2 Conductor Identification and Tagging

Power, control, and signal circuit conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly the electrical characteristics, circuit number, and panel designation. Phase conductors of low voltage power circuits shall be identified by color coding. Phase identification by a particular color shall be maintained continuously for the length of a circuit, including junctions.

- a. Color coding shall be provided for service, feeder, branch, and ground conductors. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in the same raceway or box, other neutral shall be white with colored (not green) stripe. The color coding for 3-phase and single-phase low voltage systems shall be as follows:

120/208-volt, 3-phase: Black(A), red(B), and blue(C).

- b. Conductor phase and voltage identification shall be made by color-coded insulation for all conductors smaller than No. 6 AWG. For conductors No. 6 AWG and larger, identification shall be made by

color-coded insulation, or conductors with black insulation may be furnished and identified by the use of half-lapped bands of colored electrical tape wrapped around the insulation for a minimum of 3 inches of length near the end, or other method as submitted by the Contractor and approved by the Contracting Officer.

- c. Control and signal circuit conductor identification shall be made by color-coded insulated conductors, plastic-coated self-sticking printed markers, permanently attached stamped metal foil markers, or equivalent means as approved. Control circuit terminals of equipment shall be properly identified. Terminal and conductor identification shall match that shown on approved detail drawings. Hand lettering or marking is not acceptable.

3.2 RECEPTACLES

3.2.1 Single and Duplex, 15 or 20-ampere, 125 volt

Single and duplex receptacles shall be rated 20 amperes, 125 volts, two-pole, three-wire, grounding type with polarized parallel slots. Bodies shall be brown and supported by mounting strap having plaster ears. Contact arrangement shall be such that contact is made on two sides of an inserted blade. Receptacle shall be side- or back-wired with two screws per terminal. The third grounding pole shall be connected to the metal mounting yoke.

3.3 SERVICE EQUIPMENT

Service-disconnecting means shall be of the enclosed molded-case circuit breaker type with an external handle for manual operation. When service disconnecting means is a part of an assembly, the assembly shall be listed as suitable for service entrance equipment. Enclosures shall be sheet metal with hinged cover for surface mounting unless otherwise indicated.

3.4 AERIAL SERVICE

Services shall conform to the requirements of Section 16370 ELECTRICAL DISTRIBUTION SYSTEM, AERIAL, IEEE C2, and NFPA 70. The service drop conductors shall be continuous from the point of connection on the last pole to the service mast or structural support, connected to the service entrance conductors, and shall be routed to a weatherhead, or weatherproof conduit fitting, before entry into an enclosing conduit. A drip loop shall be formed in each service conductor below the entrance to the weatherhead or the weatherproof conduit fitting. The weatherhead or weatherproof service entrance conduit fitting shall be securely fastened to a rigid galvanized steel (RGS) conduit that shall be terminated in the service entrance equipment.

APPENDIX A

**DEBRIS DISPOSAL PIT TEST PITTING
LOGS/MATERIAL DESCRIPTION**



ABB Environmental Services, Inc

511 Congress Street / P.O. Box 7050 Portland, Maine 04112
(207) 775-5401

MEMORANDUM

TO: Mark R. Applebee, CENED
DATE: June 11, 1997
FROM: Mark Stelmack *MS*
SUBJECT: Devens Landfill Remediation (ESPS 002)
Test Excavation Summaries

As you requested on May 22, 1997, attached are summaries of test excavations performed at the seven waste disposal sites being evaluated under ESPS 002. Included with the written summaries are excavation logs and a plan of each of the seven sites. The plans show the location of the test excavations.

If you have any questions about the summaries, please call me at 207-828-3592.

cc: James C. Chambers, BRAC/BEC

SA 6.

No. of test excavation locations: Six, excavated on 8/25/94.

Excavation depth range: Zero to 8.5 feet below ground surface (bgs).

Observed waste depth: Zero to 7.0 feet bgs.

Amount of waste below water table: None noted.

Volume of excavated debris/soil: 65 cu.yds. (13% of total estimated debris/soil volume).

Type of waste observed: Household refuse (e.g., glass bottles, bedsprings, shoe and boot remains) mixed with soil. No visual indication of burning of refuse. No visual indication of hazardous or potentially hazardous waste.

For more site information: (1) *Archaeological Monitoring, Study Area No. 6, South Post, Fort Devens, Massachusetts*, prepared by The Public Archaeology Laboratory, Inc. September 1994 (revised), and (2) *Landfill Study Data Package, Fort Devens, Massachusetts*, prepared by ABB Environmental Services, Inc. for USACE, December 23, 1994.

AOC 9.

No. of test excavation locations: A total of thirty, excavated on three occasions: four excavated on 7/7/92; four additional trenches excavated on 8/24/94; and twenty-two more excavated by SEA Consultants on 5/2/96 and 5/3/96.

Excavation depth range: Zero to 9 feet bgs on 7/7/92 with no water encountered; zero to 10 feet bgs on 8/24/94, with water table observed from 4.5 to 9.5 feet bgs; zero to 25 feet bgs, with water table observed from 3 to 16 feet bgs, in May 1996.

Observed waste depth: Zero to 24 feet bgs overall.

Amount of waste below water table: Approximately 10% of total estimated waste volume, using September 1992 groundwater table elevations.

Volume of excavated debris/soil: 605 cu.yds. (0.5% of total estimated debris/soil volume).

Type of waste observed: Generally, demolition debris and solid waste (i.e., wood, concrete, asphalt, metal, brick, plastic, glass, and tree stumps), mixed with soil. Perched water was encountered in most of the test pits. Groundwater table was observed in two test pits at about elevation 205.

A "petroleum odor" was noted on the perched water table at SEA test pit No. 103. At SEA test pit No. 112, numerous 5-gallon pails of oil and transmission fluid were noted; excavation was halted at a depth of six feet due to "presence of sheen on water in pit and strong odor".

For further site information: Revised Final Site Investigation Report, Fort Devens, Groups 3, 5, and 6, prepared by ABB Environmental Services, Inc., January 1996.

AOC 11.

No. of test excavation locations: A total of twelve, by Arthur D. Little, Inc. Six test pits were excavated during the 1993 SI. Six additional test pits were excavated from 8/12/94 to 8/15/94, during the RI. Only the RI test excavation logs are attached to this memo.

Excavation depth range: Zero to 16 feet bgs.

Observed waste depth: Zero to 16 feet bgs.

Amount of waste below water table: Approximately 20% of total estimated waste volume, based on water table observations made in August 1994.

Volume of excavated debris/soil: 114 cu. yds (0.3% of total estimated debris/soil volume).

Type of waste observed: Demolition debris, including wood, concrete, metal pipes, scrap metal, wire, tiles, and glass. No visual indication of hazardous or potentially hazardous waste.

For more site information: Draft Remedial Investigation Report, AOC-11, Fort Devens, Massachusetts, prepared by Arthur D. Little, Inc., April 1995.

SA 12.

No. of test trenches: Five, excavated on 8/18/94.

Excavation depth range: Zero to ten feet bgs.

Observed waste depth: Zero to six feet bgs.

Amount of waste below water table: None noted.

Volume of excavated debris/soil: 28 cu. yds. (0.3% of total estimated debris/soil volume).

Type of waste observed: Demolition debris and brush (i.e., wood, concrete, bricks, steel cable, rebars, plastic sheeting, asphalt roofing tiles, leaves, wood ash), mixed with soil.

No visual indication of hazardous or potentially hazardous waste.

For more site information: Revised Final Groups 2 & 7 Site Investigation Report, Fort Devens, Massachusetts, prepared by ABB Environmental Services, Inc., October 1995.

SA 13.

No. of test trenches: Six, excavated on 8/23/94.

Excavation depth range: Zero to 12 feet bgs.

Observed waste depth: Zero to 12 feet bgs.

Amount of waste below water table: None noted.

Volume of excavated debris/soil: 157 cu. yds. (1.5% of total estimated debris/soil volume).

Type of waste observed: Demolition debris (i.e., wood, concrete, bricks, steel cable, sheet metal) mixed with soil. No visual indication of hazardous or potentially hazardous waste.

For more site information: Revised Final Groups 2 & 7 Site Investigation Report, Fort Devens, Massachusetts, prepared by ABB Environment Services, Inc., October 1995.

AOC 40.

No. of test trenches: Eight, excavated by SEA Consultants, Inc. on May 1, 1996.

Excavation depth range: Zero to 26 feet bgs.

Observed waste depth: Zero to 26 feet bgs.

Amount of waste below water table: Approximately 30% of total estimated debris volume, based on groundwater table elevation of 244 observed by SEA.

Volume of excavated debris/soil: 1,887 cu. yds. (1.7% of total estimated debris/soil volume).

Type of waste observed: Demolition debris (i.e., lumber, pieces of asphalt and reinforced concrete, bricks, wire, plastic, and piping) and tree stumps/logs mixed with soil. In November 1987, fourteen 55-gallon drums were observed along the edge of AOC 40 at Cold Spring Brook Pond. The original contents of several of the drums was determined to be antifreeze. Apparently, the drums were painted yellow and reused prior to disposal at AOC 40. No indication of hazardous or potentially hazardous wastes were noted during the RI investigation or during test excavations by SEA.

For more site information: Final Remedial Investigations Report for Areas of Contamination 4, 5, 18, and 40, Fort Devens, Massachusetts, prepared by Ecology and Environment, Inc., April 1993.

AOC 41.

No. of test trenches: Three, excavated on 10/4 and 10/5/94.

Excavation depth range: Zero to 11 feet bgs.

Observed waste depth: Waste observed only on ground surface.

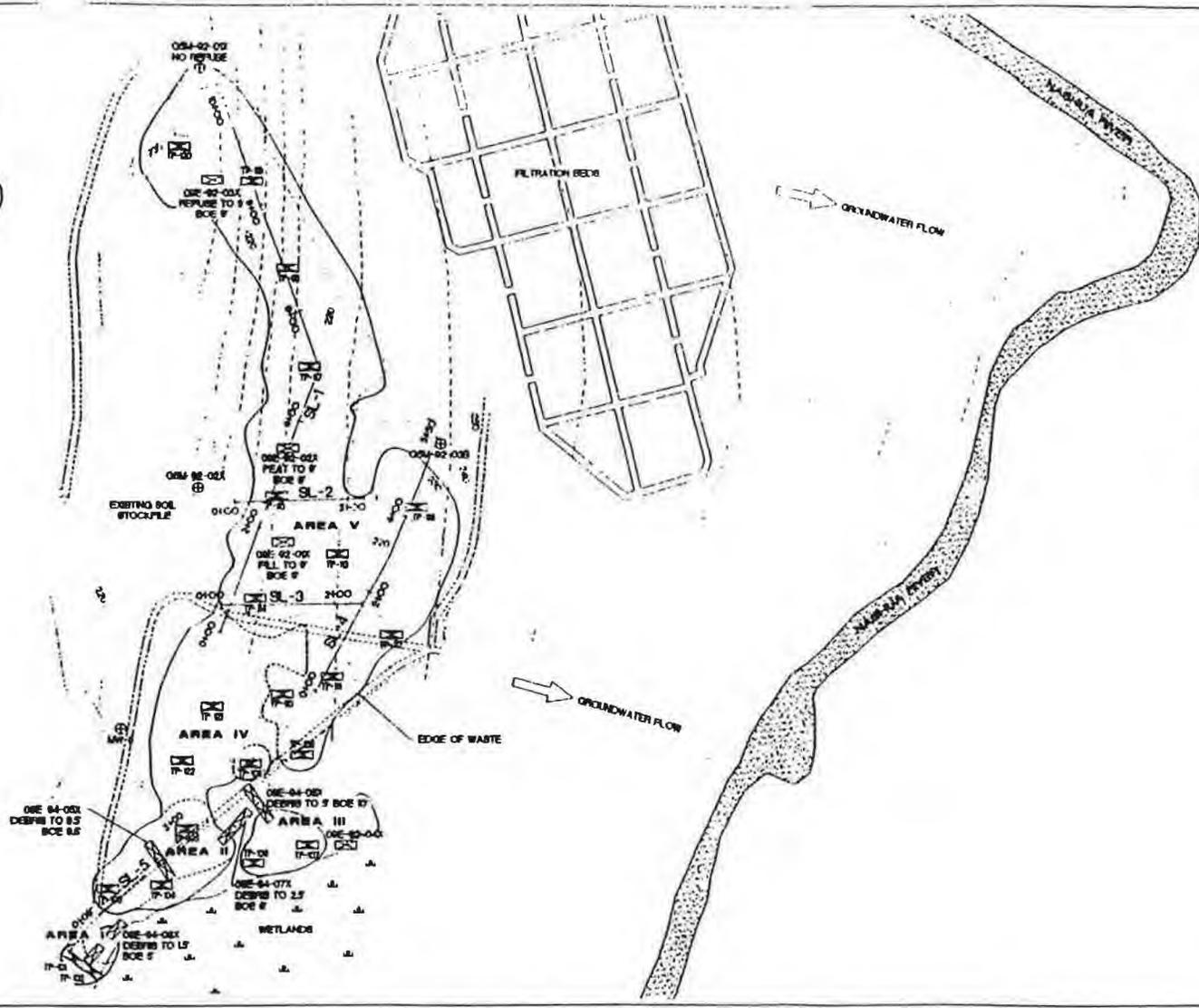
Amount of waste below water table: None.

Volume of excavated debris:/soil: 37 cu. yds. (2.4% of total estimated debris/soil volume).

Type of waste observed: Beverage cans, glass bottles, car parts, charred wood pieces.

No indication of hazardous or potentially hazardous waste was noted.

For more site information: Final Remedial Investigation Report, Area of Contamination 41, Fort Devens, Massachusetts, prepared by ABB Environmental Services, Inc., February 1996.



AOC-9 NORTH POST LANDFILL

SCALE 1"=200'

LEGEND

-  WATER
-  SURFACE CONTOURS
-  GROUNDWATER CONTOURS
-  EDGE OF WASTE
-  WETLANDS
-  SEA TEST PIT
-  ABB TEST PIT
-  MONITORING WELLS

TEST PIT FIELD LOG - FORT DEVENS, MA		PROJECT NO.: 6917-04	TEST PIT NO.: 09E9201X
CLIENT: AEC	DATE: 7/7/92		STUDY AREA: SA-9, LF-5
CONTRACTOR: D. L. Maher	Time: 1320	End: 1405	PROTECTION: Level D
GEOLOGIST: J. Broadwater, J. Corulle	GROUND ELEV.: 222.1'		TOTAL DEPTH: 9'

DEPTH	SOIL DESCRIPTION	USCS	NOTES
0'	SAND, poorly graded, medium, 0-10% gravel, loose, moist, brown.	SP	
1'			
2'			
3'	PEAT, mostly wood with some electrical conduit pipes, occasional brick, some wood appears black and charred, Fill.	PT	MS/MSD volume taken at 4' feet (#178)
4'			
5'			
6'			
7'			
8'			
9'	End of Test Pit at 9' (no water encountered)		
10'			
11'			
12'			
13'			
14'			

No.	Serial No.	Depth	Field #	PID
S-1	178	4'	EX090104	BKG
S-2	179	8'	EX090108	BKG

SOIL BORING LOG - FORT DEVENS, MA.

BORING NO.: G5M-92-03B

SAMPLE NO.	DEPTH (ft)	PEN/REC (R/R)	PID OF SPOON (ppm)	SOIL DESCRIPTION AND PHYSICAL CONDITIONS	BLOWS/6"	COMMENTS
S-7	30-32	2.0/1.2	0	Similar to S-6 except 10YR4/2 Munsell dark grayish brown, very dense, Saturated, bedding. SP	12/16/17/16	Analytical sample collected. 3" spoon. Grain size analysis performed-->SP-SM.
S-8	35-37	2.0/0.7	0	SAND, well graded, fine to medium with some (~20%) coarse sand, little (~15%) fine gravel, and trace (~5%) silt. medium dense, wet, 10YR6/6 Munsell brownish yellow, no bedding. SW	5/5/7/8	
BOE at 38'						

TEST PIT FIELD LOG - FORT DEVINS, MA		PROJECT NO.: 6917-04	TEST PIT NO.: 09E9202X	
CLIENT: AEC		DATE: 7/7/92		STUDY AREA: SA-9, LF-5
CONTRACTOR: D. L. Maher		Time: 1120	End:	PROTECTION: Level D
GEOLOGIST: I. Broadwater, J. Corulla		GROUND ELEV.: 222.1'		TOTAL DEPTH: 9'

DEPTH	SOIL DESCRIPTION	USCS	NOTES
0'	SAND, poorly graded, medium, 10-20% gravel, loose, moist, brown.	SP	
1'			
2'			
3'			
4'	PEAT, charred wood with stained sand	PT	
5'			
6'			
7'			
8'	End of Test Pit at 9' (no water encountered)		
9'			
10'			
11'			
12'			
13'			
14'			

No.	Serial No.	Depth	Field #	PID
S-1	182 A,B,C	5'	EX090205	BKG
S-2	183 A,B,C	8'	ED090208	BKG
S-2	439 A,B,C	8'	EX090205	BKG

TEST PIT FIELD LOG - FORT DEVENS, MA		PROJECT NO.: 6917-04	TEST PIT NO.: 09E9203X
CLIENT: AEC	DATE: 7/7/92		STUDY AREA: SA-9, LF-5
CONTRACTOR: D. L. Maher	Time: 0855	End:	PROTECTION: Level D
GEOLOGIST: I. Broadwater, J. Corulla	GROUND ELEV.: 225.2'		TOTAL DEPTH: 9'

DEPTH	SOIL DESCRIPTION	USCS	NOTES
0'	SAND, well graded, fine to coarse, 10-20% gravel, loose, moist, brown	SW	
1'			
2'	MIXED REFUSE, tires, bottles, roof slate at 2.5-feet, carpet, clear plastic, automobile parts (red)	N/A	
3'			
4'			
5'			
6'			
7'			
8'			
9'	End of Test Pit at 9' (no water encountered)		
10'			
11'			
12'			
13'			
14'			

No.	Serial No.	Depth	Field #	PID
S-1	186 A,B,C	1'	EX090301	BKG
S-2	187 A,B,C	5'	ED090305	BKG
S-3	188 A,B,C	9'	EX090309	BKG

TEST PIT FIELD LOG - FORT DEVENS, MA

PROJECT NO.: 6917-04

TEST PIT NO.: 09E5204X

CLIENT: AEC

DATE: 7/7/92

STUDY AREA: SA-9, LF-5

CONTRACTOR: D. L. Maher

Time: 1530

End:

PROTECTION: Level D

GEOLOGIST: I. Broadwater, J. Corulle

GROUND ELEV.: 209.6'

TOTAL DEPTH: 9'

DEPTH	SOIL DESCRIPTION	USCS	NOTES
0'	SAND, poorly graded, medium to coarse, 0-10% silt, 0-10% angular gravel, moist	SP	
1'			
2'			
3'	PEAT, decayed organics, 10-20% silt and clay, saturated, soft	PT	
3'	SILT, slightly plastic, 20% fine to medium sand, saturated, soft	ML	
4'			
5'			
6'			
7'			
8'			
9'	End of Test Pit at 9' (no water encountered)		
10'			
11'			
12'			
13'			
14'			

No.	Serial No.	Depth	Field #	PID
S-1	404 A,B,C	3'	EX090403	BKG

SOIL BORING LOG - FORT DEVENS, MA.		PROJECT NO.: 6917.07	BORING NO.: 21B-93-01X
CLIENT: AEC	DATE STARTED: 6/7/93	STUDY AREA: 21	
CONTRACTOR: none	DATE COMPLETED: 6/7/93	PROTECTION: Modified	
METHOD: hand dug	BORING DIAMETER:	PID METER: Model 5808	
GROUND ELEV:	REFERENCE FT. ELEV.:	TOTAL DEPTH: 4'	
LOGGED BY: D. Pierce	CHECKED BY:	WATER TABLE BGS: > 4'	

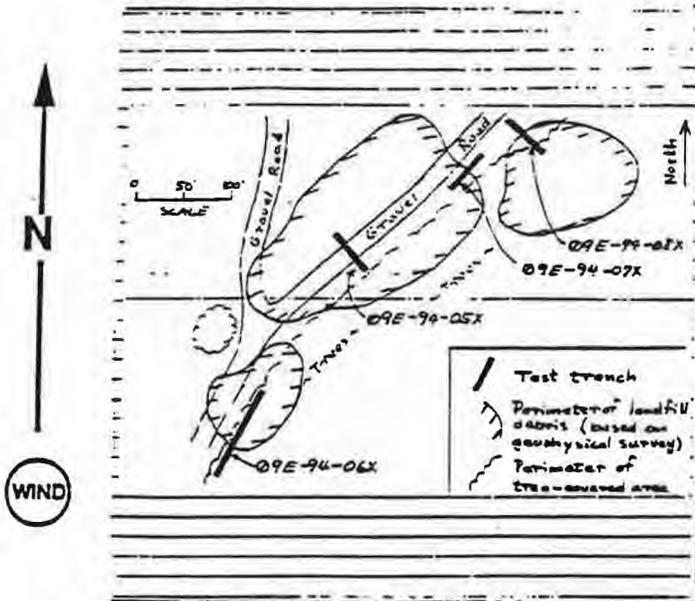
SAMPLE NO.	DEPTH (ft.)	PEN./REC. (ft./ft.)	PID OF SPOON (ppm)	SOIL/ROCK DESCRIPTION AND PHYSICAL CONDITIONS	BLOWS/6 IN.	USCS SOIL CLASS.	COMMENTS
S-1	0 - 1.2	NA	BKG	Clayey SAND, fine to medium sand, 5 - 10% gravel to 1 in. max. (sub-rounded), 20 - 30% slightly to mod plastic fines, loose, damp, dark grayish brown (10YR4/2), small root fibers, apparent FILL	NA	SC	Hole dug by hand shovel.
S-2	1.2 - 1.6	NA	BKG	SAND, poorly graded, fine to medium sand, < 5% fine gravel (sub-rounded), 5 - 12% nonplastic fines, loose, damp, very dark brown (10YR2/2), small root fibers, rich in decayed organics, buried RESIDUAL SOIL	NA	SP-SM	
S-3	1.6 - 4.0	NA	BKG	SAND, poorly graded, fine to medium sand, 5 - 10% gravel to 3 in. max. (sub-rounded), < 5% nonplastic fines, medium dense, damp, dark yellowish brown (10YR4/6), small root fibers	NA	SP	Analytical sample BX210102 composited from 2.0'-4.0' with stainless steel spoon and pail.

BOE at 4.0'

TEST PIT RECORD

Study Area: SA 9
 Well/Boring _____ Date 8/24/94 Time _____ End _____
 Coordinates _____ Grid Element _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 200 FT.

NOTES: Test pits 09E-92-01X through 09E-92-04X excavated in 1992.
Purpose of test pits 09E-94-05X through 09E-94-06X is to define waste type and extent in southern "pods" identified during 1992 geophysical survey.

Crew Members:

1. D. Pierce, ABB
2. P. Joseph, Clean Harbors
3. P. Hsieh, Clean Harbors
4. E. Gonyea, Clean Harbors
- 5.
- 6.

Monitor Equipment:

PI Meter N
 Explosive Gas N
 Avail. Oxygen N
 OVA Y N
 Other _____

H₂S

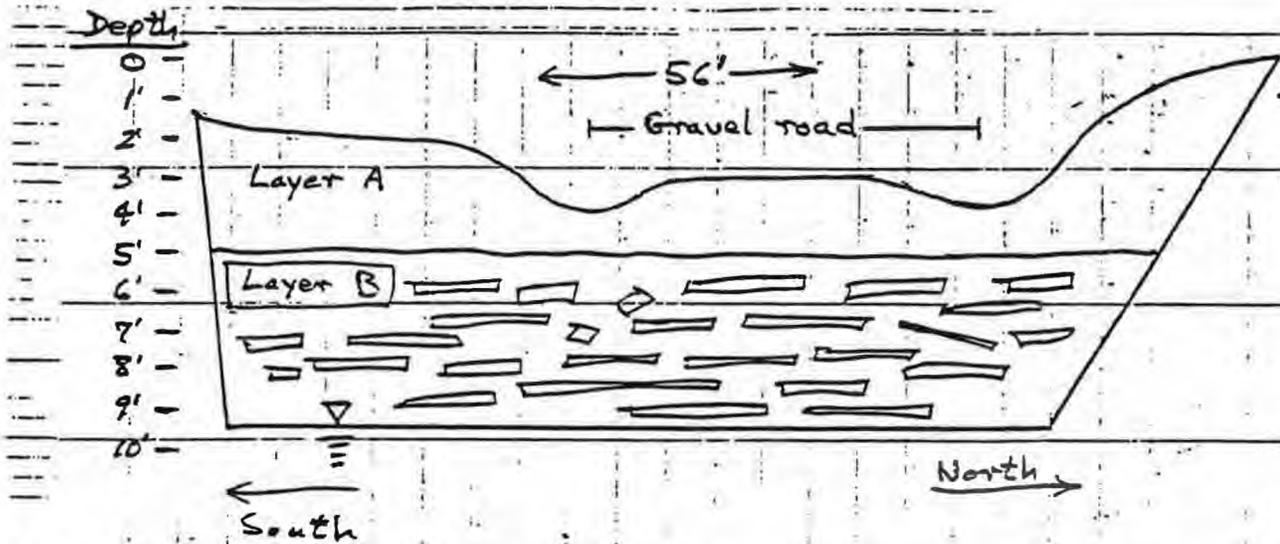
Photographs, Roll 2

Exposure 4-12

Profile Along Test Pit: 09E-94-05X

Study Area: 9

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT. (Vertical) 1" = 10 FT (Horizontal)
 DEPTH (FT). 4.5

NOTES:

Layer A: Clean fill, gravelly sand with rounded cobbles to 10" max. diameter, dry. No debris.

Layer B: Concentrated building demolition debris mostly wood (lumber), concrete, sheet metal, structural steel, pipes, asphalt, insulation. Layer is black, suggesting burning. Bottom of debris not observed. extends below water table.

PID = background

O₂ = 20.6

LEL = 000

H₂S = 000

no.	Int. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg. 52

ATTACHMENTS _____

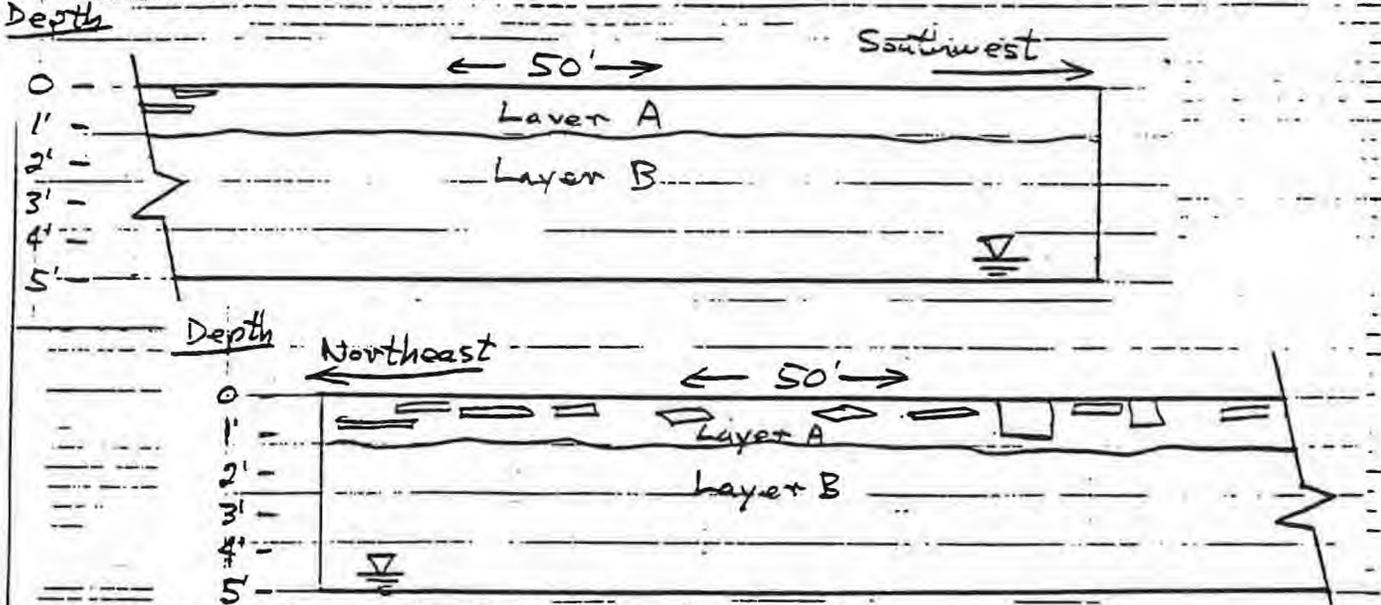
SIGNATURE: D. J. Rivera

TEST PIT RECORD

Profile Along Test Pit: 09E-94-016X

Study Area: 9

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT. (Vertical) 1" = 10 FT (Horizontal)
 DEPTH (FT.) 5

NOTES:

Layer A: Organic-rich sand, rootzone underlying thick growth of alder, poplar, and birch. Refuse in upper foot of soil beginning 4 ft. from southwest end. Sheet metal, pipe, steel cable, brick, concrete.

Layer B: Natural soil, no debris. Gravelly sand to silty fine sand. Med. yellow.

PID = background

O₂ = 20.6

LEL = 000

H₂S = 000

no.	Int. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg. 57

ATTACHMENTS _____

SIGNATURE: P. A. Pierce

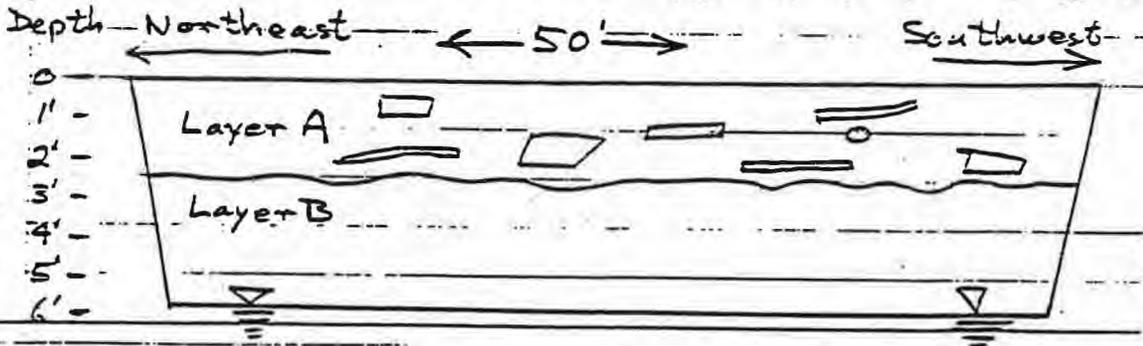
TEST PIT RECORD

02021590

Profile Along Test Pit: 09E-94-07X

Study Area: 9

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT. (VERTICAL) 1" = 10 FT (HORIZONTAL)
 DEPTH (FT.) 6

NOTES:

Layer A: Similar to Layer A in 09E-94-06X
 except unit is 2 1/2 feet deep with roots
 and debris throughout.

Layer B: Same as Layer B in 09E-94-06X.
 No debris

PID = background

O₂ = 21.0

LEL = 000

H₂S = 000

no.	Int. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg. 59

ATTACHMENTS _____

SIGNATURE: D.A. Pierce

TEST PIT RECORD

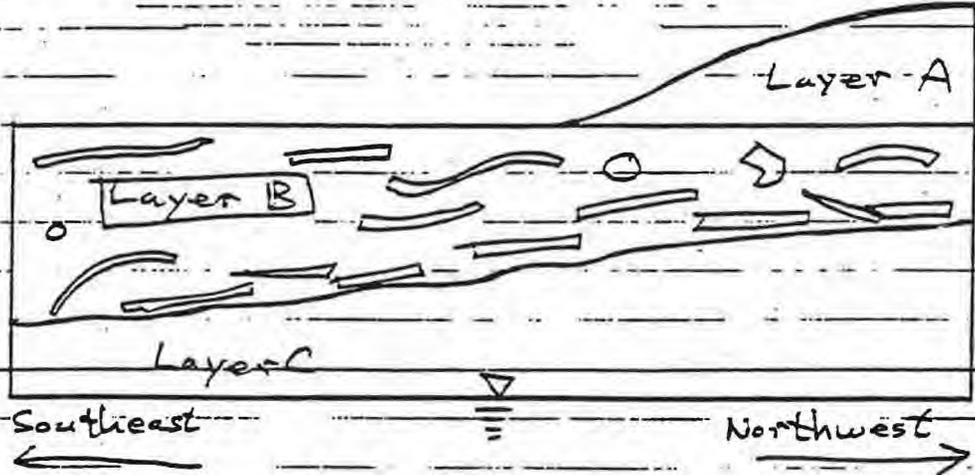
Profile Along Test Pit: 09E-94-08X

Study Area: 9

SKETCH MAP OF TEST PIT PROFILE

Depth

0'
1'
2'
3'
4'
5'
6'
7'
8'
9'
10'



SCALE 1" = 5 FT. (Vertical) 1" = 10 FT (Horizontal)
DEPTH (FT) 10

NOTES: Southwestern end of trench in thick growth of alder, viburnum, and poplar

Layer A: Gravelly sand fill mounded in a berm along the roadside. Sparsely vegetated.

Layer B: Same as Layer A in 09E-94-07X. Debris mostly sheet metal, pipes and concrete. No apparent burning.

Layer C: Same as Layer B in 09E-94-07X.

no.	Inl. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

PID = background

O₂ = 20.9

LEL = 000

H₂S = 000

REFERENCE: FIELD BOOK, Pg. 61

ATTACHMENTS _____

SIGNATURE: D. Pierce

TEST PIT FIELD LOG



S & E Consultants Inc

PROJECT: DEVENS

TEST PIT NO. TP 101 & 102

LOCATION SA-9

DATE: 5/3/96

GROUND ELEVATION: 215.37

CONTRACTOR: MDR

WEATHER: SUN 60°

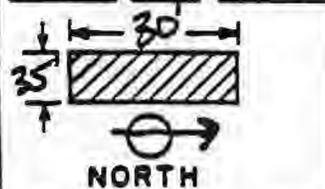
LOG PREPARED BY: TAT

EQUIPMENT: 330 EXAV

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD COUNT	REMRK. NO.	
0						
1		MED COARSE TAN SAND & GRAVEL	E			
2						
3			E	A		
4						
5	▽		PERCHED	E	A	
6						
7			E	A		
8						
9		SHIFT PIT WEST ACROSS ROAD	E	A		
10		END OF PIT = 12'				
11		NO WASTE ENCOUNTERED	E	A		
12						
13						
14						

REMARKS:

TEST PIT PLAN



VOLUME = _____ cu.yd.

LEGEND:

BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION
6" - 18"	A
18" - 36"	B
36" AND LARGER	C

PROPORTIONS USED

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

GROUNDWATER

- ▼ Observed Groundwater
- EXCAVATION EFFORT**
- E — EASY
- M — MODERATE
- D — DIFFICULT

TEST PIT FIELD LOG



SEA Consultants Inc.

PROJECT: DEVENS
LOCATION: SA-9

TEST PIT NO.: TP-103
DATE: 5/3/96

GROUND ELEVATION: 216.59
LOG PREPARED BY: JAT

CONTRACTOR: MOR
EQUIPMENT: 330 EXCA

WEATHER: SUN 70

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD. COUNT	REMRK. NO.
0		YELLOW MED COARSE SAND & GRAVEL	E		
1					
2					
3		DENSE BUILDING DEBRIS - WOOD / METAL / CONCR / ASPHALT MIXED WITH SAND & GRAVEL	D	A	
4					
5	4 ft	PERCHED			
6		BOTTOM WASTE = 7'	D	A	I
7					
8		GREY FINE SAND & SILT	E		
9		↓ END OF PIT = 13'	E		
10					
11					
12					
13			E		
14					

REMARKS: D) PETROLEUM ODOUR

<p>TEST PIT PLAN</p> <p style="text-align: center;">NORTH</p> <p>VOLUME = _____ cu.yd.</p>	<p>LEGEND:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>BOULDER SIZE RANGE CLASSIFICATION</th> <th>COUNT LETTER DESIGNATION</th> </tr> </thead> <tbody> <tr> <td>6" - 18"</td> <td>A</td> </tr> <tr> <td>18" - 36"</td> <td>B</td> </tr> <tr> <td>36" AND LARGER</td> <td>C</td> </tr> </tbody> </table>	BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION	6" - 18"	A	18" - 36"	B	36" AND LARGER	C	<p>PROPORTIONS USED</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>TRACE</td> <td>0 - 10%</td> </tr> <tr> <td>LITTLE</td> <td>10 - 20%</td> </tr> <tr> <td>SOME</td> <td>20 - 35%</td> </tr> <tr> <td>AND</td> <td>35 - 50%</td> </tr> </tbody> </table>	TRACE	0 - 10%	LITTLE	10 - 20%	SOME	20 - 35%	AND	35 - 50%	<p>GROUNDWATER</p> <p>▼ Observed Groundwater</p> <p>EXCAVATION EFFORT</p> <p>E — EASY M — MODERATE D — DIFFICULT</p>
BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION																		
6" - 18"	A																		
18" - 36"	B																		
36" AND LARGER	C																		
TRACE	0 - 10%																		
LITTLE	10 - 20%																		
SOME	20 - 35%																		
AND	35 - 50%																		

FIELD LOG

CONSULTANTS, INC

PROJECT: DEVENS
 LOCATION: NORTH EAST - SA-9
 CLIENT: DDC
 WEATHER: SUNNY 50s

TEST PIT No. TP-104

PROJECT No.:

216.19
 513130
 513130
 MAR 23 2002
 T. T. ...

GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH	STABILIZATION TIME

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARK NO	
1	PERCHED	YELLOW MEDIUM COARSE SAND AND GRAVEL LITTLE BOULDERZS	E	A		
2						
3						
4			SEVERAL PIECES OF WOOD, CABLE	E	B	
5						
6						
7						
8						
9			GREY FINE SAND AND SILT, MOIST	E		
10			WASTE VISIBLE FAR END - SHIFT PIT NORTH	M		
11			1 DENSE BUILDING DEBRIS, METAL WOOD	M		
12			2 CONC	M		
13						
14						
15		PERCHED	M			
16						
17						
18		BOTTOM WASTE = B	M			
19		DENSE GREY SAND AND SILT, MOIST	M			
20						
21		1' ORGANICS	M			
22		SAND SILT WITH ROOTS (NATIVE)				
23		END OF PIT IS				
24						
25						

REMARKS: 1) PIT IS SHIFTED NORTH TO CHASE WASTE START TIME: 8:20
 FINISH TIME: 8:40

PORTIONS USED	EXCAVATION EFFORT	BOULDER COUNT	TEST PIT PLAN	NORTH
ac 0 to 10% lf 10 to 20% oc 20 to 35% ol 35 to 50%	E - EASY M - MODERATE D - DIFFICULT	SIZE 6" 10" 18" 24" 36"	41 VOLUME = cu.yd.	←

TEST PIT FIELD LOG

S E A CONSULTANTS, INC.
 Engineers Architects
 485 Massachusetts Avenue
 Cambridge, MA 02139-0018

PROJECT: DEVENUS
LOCATION: 1000 F-SA-9
CLIENT: CCC
WEATHER: Sunny 50s

TEST PIT No. TP-105

PROJECT No.:

Ground Surface Elevation 214.75

Date Started 5/3/96

Date Finished 5/3/96

Contractor Equipment: MOR 330 L

Soil Engineer Geologist T. T. 0540

GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH	STABILIZATION TIME

DEPTH ()	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARK NO
1	PERCHED	METAL, WOOD, STYROFOAM, CONC	M		
2			M		
3		VERY DENSE BUILDING DEBRIS	M		
4		- ODOR			
5			M		
6		SAND/GRAVEL, WET	M		
7		VERY DENSE BUILDING DEBRIS	M		
8		BOTTOM WASTE = 8'			
9		FINE GREY SAND & SILT, MOIST (NATIVE)	F		
10					
11		END OF PIT = 12'			
12					
13					
14					
15					
16					
17					
18					
19					
20					
22					
23					
24					

REMARKS:

PHOTO 19

START TIME: 7:55
FINISH TIME: 8:16

PROPORTIONS USED	EXCAVATION EFFORT	BOULDER COUNT	TEST PIT PLAN	NORTH
Trace 0 to 10%	E - EASY	SIZE LETTER	10 VOLUME = cu.yd.	+
Little 10 to 20%	M - MODERATE	6" - 18" A		
Some 20 to 35%	D - DIFFICULT	18" - 36" B		
And 35 to 50%		> 36" C		

TEST PIT FIELD LOG

SEA CONSULTANTS, INC.
 Engineers Architects
 85 Massachusetts Avenue
 Cambridge, MA 02139-4018

PROJECT: DEVERS
 LOCATION: LOCAL FOSTER - SA-9
 CLIENT: DEC
 WEATHER: SUNNY 50s

TEST PIT No. TP-106

PROJECT No.:

Ground Surface Elevation 218.55
 Date Started 5/2/96
 Date Finished 5/3/96
 Contractor Equipment MCR 370
 Soil Engineer Geologist T. TOLSKO

GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH	STABILIZATION TIME
5/3/96		5'	

DEPTH ()	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARK NO.
1		6" organics	E	A	
2		MEDIUM/COURSE YELLOW SAND AND			
3		GRAVEL SOME BOULDERS ROOTS	E	A	
4					
5	PERCHED		E	A	
6					
7					
8		PIECE OF LUMBER	E	A	
9		BOTTOM OF WASTE = 10'			
10		DARK GRAY LAYER	E	A	
11					
12		MEDIUM/COURSE SAND AND GRAVEL	E	A	
13		SOME BOULDERS, WET			
14			E	A	
15					
16		HOLE IS COLLAPSING			
17		END OF PIT = 16'			
18					
19					
20					
21					
22					
23					
24					
25					

REMARKS:

START TIME: 7:20
 FINISH TIME:

PROPORTIONS USED	EXCAVATION EFFORT	BOULDER COUNT	TEST PIT PLAN	NORTH
Trace 0 to 10%	F - EASY	SIZE LETTER		
Little 10 to 20%	M - MODERATE	6" - 18" A		
Some 20 to 35%	D - DIFFICULT	18" - 36" B		
And 35 to 50%		> 36" C		

TEST PIT FIELD LOG



S E A Consultants Inc.

PROJECT: DEVENS

TEST PIT NO.: TP-107

LOCATION SA-9

DATE: 5/2/96

GROUND ELEVATION: 215.4

CONTRACTOR: MDR

WEATHER: SUN 70

LOG PREPARED BY: TAT

EQUIPMENT: 330 EXCAV

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD. COUNT	REMRK. NO.
0		MED/COARSE SAND AND GRAVEL			
1'					
2'		PIECE OF METAL			
3'					
4'	▽	SAND & GRAVEL			
5'					
6'		PIECE OF LUMBER			
7'					
8'		SAND & GRAVEL			
9'					
10'					
11'		END OF PIT = 11'			1
12'		BOTTOM OF WASTE ~ 6'			
13'					
14'					

REMARKS: 1) SIDE WALLS CONTINUALLY COLLAPSING

<p>TEST PIT PLAN</p> <p style="text-align: center;">NORTH</p> <p>VOLUME = _____ cu.yd.</p>	<p>LEGEND:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>BOULDER SIZE RANGE CLASSIFICATION</th> <th>COUNT LETTER DESIGNATION</th> </tr> </thead> <tbody> <tr> <td>6" - 18"</td> <td>A</td> </tr> <tr> <td>18" - 36"</td> <td>B</td> </tr> <tr> <td>36" AND LARGER</td> <td>C</td> </tr> </tbody> </table>	BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION	6" - 18"	A	18" - 36"	B	36" AND LARGER	C	<p>PROPORTIONS USED</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>TRACE</td> <td>0 - 10%</td> </tr> <tr> <td>LITTLE</td> <td>10 - 20%</td> </tr> <tr> <td>SOME</td> <td>20 - 35%</td> </tr> <tr> <td>AND</td> <td>35 - 50%</td> </tr> </tbody> </table>	TRACE	0 - 10%	LITTLE	10 - 20%	SOME	20 - 35%	AND	35 - 50%	<p>GROUNDWATER EXCAVATION EFFORT</p> <p>▽ Observed Groundwater</p> <p>E — EASY</p> <p>M — MODERATE</p> <p>D — DIFFICULT</p>
BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION																		
6" - 18"	A																		
18" - 36"	B																		
36" AND LARGER	C																		
TRACE	0 - 10%																		
LITTLE	10 - 20%																		
SOME	20 - 35%																		
AND	35 - 50%																		

TEST PIT FIELD LOG

SEA CONSULTANTS, INC.
 Engineers / Architects
 485 Massachusetts Avenue
 Cambridge, MA 02139-4018

PROJECT: DEVEN'S
LOCATION: WORTH PKY SA-9
CLIENT: DCL
WEATHER: SUNNY 70's

TEST PIT No. TP-08

PROJECT No.:

Ground Surface Elevation: 216.00
Date Started: 5/2/94
Date Finished: 5/2/94
Contractor Equipment: M02 330
Soil Engineer / Geologist: T. TOLSK

GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH	STABILIZATION TIME
		3'	

DEPTH ()	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARK NO.
1		MED SAND & GRAVEL WITH PIECE OF METAL / SAND BAG			
2			E	A	
3					
4		BOTTOM OF WASTE = 4'			
5					
6		MEDIUM / COARSE SAND W/ GRAVEL / BOULDERS	E	A	
7					
8			E	A	
9					
10					
11		HOLE KEEPS COLLAPSING			
12		NO WASTE	E	A	
13					
14		END OF PIT ~ 13-14'			
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

REMARKS:

Photo 4

START TIME: 8:25
FINISH TIME: 9:20

PROPORTIONS USED	EXCAVATION EFFORT	BOULDER COUNT	TEST PIT PLAN	NORTH
Trace 0 to 10%	E - EASY	SIZE LETTER	30 VOLUME = cu.yd.	+
Little 10 to 20%	M - MODERATE	6" - 18" A		
Some 20 to 35%	D - DIFFICULT	18" - 36" B		
And 35 to 50%		> 36" C		

TEST PIT FIELD LOG

S E A CONSULTANTS, INC.
 Engineers / Architects
 485 Massachusetts Avenue
 Cambridge, MA 02139-4018

PROJECT: DEVENS
LOCATION: SA-9
CLIENT: DCC
WEATHER: SUN 70S

TEST PIT No. TP-109
PROJECT No.:

Ground Surface Elevation: 213.0'
 Date Started: 5/2/96
 Date Finished: 5/2/96
 Contractor Equipment: MOR 330 L
 Soil Engineer / Geologist: T. T. WOSKO

GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH	STABILIZATION TIME

DEPTH ()	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARK NO.
1		MEDIUM / COARSE SAND AND			
2		GRAVEL, LITTLE BOULDERS	E	A	
3		2 PIECES OF WOOD			
4		12" DRAIN PIPE RUNNING UNDER ROAD			
5	PERFORATED	MEDIUM COARSE SAND AND	E	1	
6		GRAVEL, NO WASTE			
7			E	A	
8		WATER IN HOLE			
9					
10					
11					
12					
13		HOLE COLLAPSING			
14		BOTTOM PIT ~ 13-14'			
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

REMARKS:

(1) ASBESTOS PIPE

START TIME: 9:20
FINISH TIME: 4:50

PROPORTIONS USED	EXCAVATION EFFORT	BOULDER COUNT	TEST PIT PLAN	NORTH
Trace 0 to 10%	E - EASY	SIZE LETTER	27	+
Little 10 to 20%	M - MODERATE	6" - 18" A	VOLUME = cu.yd.	
Some 20 to 35%	D - DIFFICULT	18" - 36" B		
And 35 to 50%		> 36" C		

TEST PIT FIELD LOG 142



SEA Consultants Inc

PROJECT: DEVENS

TEST PIT NO.: TP-110

LOCATION SA-9

DATE: 5/2/96

GROUND ELEVATION: 216.81

CONTRACTOR: MDR

WEATHER:

LOG PREPARED BY: TBT

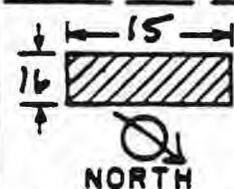
EQUIPMENT: 330

SUN SU°

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD. COUNT	REMRK. NO.
0		6" GRANULES			
1'		SAND & GRAVEL	E	A	
2'		DENSE BUILDING DEBRIS - LUMBER METAL CONC/WIRE			
3'			M	A	
4'					
5'	▽ =	PERCHED WATER			
6'		DENSE BUILDING DEBRIS	M	A	
7'					
8'			M	A	
9'					
10'			M	A	
11'					
12'		BOTTOM OF WASTE - 12'	E	A	
13'		YELLOW MEDIUM COARSE SAND, SOME GRAVEL, NET			
14'			E	A	

REMARKS:

TEST PIT PLAN



VOLUME = _____ cu.yd.

LEGEND:

BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION
6" - 18"	A
18" - 36"	B
36" AND LARGER	C

PROPORTIONS USED

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

GROUNDWATER

- ▼ Observed Groundwater
- EXCAVATION EFFORT**
- E — EASY
- M — MODERATE
- D — DIFFICULT

TEST PIT FIELD LOG

S E A CONSULTANTS, INC.
 Engineers / Architects
 485 Massachusetts Avenue
 Cambridge, MA 02139-4018

PROJECT: DEYENS
LOCATION: SA-9
CLIENT: DCC
WEATHER: SUN 70

TEST PIT No. TP-111

PROJECT No.:

Ground Surface Elevation: **215.76**

Date Started:

Date Finished: **5/2/96**

Contractor Equipment: **MDE 330**

Soil Engineer / Geologist: **TAT**

GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH	STABILIZATION TIME

DEPTH ()	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARK NO.
1		6" ORGANIC			
2					
3		SAND GRAVEL WITH CONC, METAL, PIPE			
4					
5	PERFORATED	BOTTOM OF WASTE = 5'			
6		YELLOW MEDIUM COARSE SAND, SOME GRAVEL			
7					
8					
9		GREEN MEDIUM SAND/SILT			
10		HOLE IS COLLAPSING			
11		BOTTOM OF PIT = 9'			
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

REMARKS:

START TIME: 9:55
FINISH TIME: 10:15

PROPORTIONS USED	EXCAVATION EFFORT	BOULDER COUNT	TEST PIT PLAN	NORTH
Trace 0 to 10%	E - EASY	SIZE LETTER	10 VOLUME = cu.yd.	+
Little 10 to 20%	M - MODERATE	6" - 18" A		
Some 20 to 35%	D - DIFFICULT	18" - 36" B		
And 35 to 50%		> 36" C		

TEST PIT FIELD LOG



SEA Consultants Inc.

PROJECT: DEVENS

TEST PIT NO.: TP-112

LOCATION: SA-9

DATE: 5/2/96

GROUND ELEVATION: 216.64

CONTRACTOR: MDR

WEATHER: SUN 70°

LOG PREPARED BY: TAT

EQUIPMENT: 330 EXCAV

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD COUNT	REMRK. NO.
0		C&C @ SURFACE			
1'		NUMEROUS 5 GAL PAILS OF OIL / TRAPS FLUID - STRONG PETROLEUM ODOR <div style="text-align: center; margin-top: 20px;"> </div> BOTTOM OF PIT = 6'			
2'					
3'					
4'					
5'	D 11				
6'					1
7'					
8'					
9'					
10'					
11'					
12'					
13'					
14'					

REMARKS: 1) TERMINATED PIT @ 6' BY DUE PRESENCE OF SHEEN ON WATER IN PIT & STRONG ODOR.

TEST PIT PLAN	LEGEND:	PROPORTIONS USED	GROUNDWATER																
<p>VOLUME = _____ cu yd</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>BOULDER SIZE RANGE CLASSIFICATION</th> <th>COUNT LETTER DESIGNATION</th> </tr> <tr> <td>6" - 18"</td> <td style="text-align: center;">A</td> </tr> <tr> <td>18" - 36"</td> <td style="text-align: center;">B</td> </tr> <tr> <td>36" AND LARGER</td> <td style="text-align: center;">C</td> </tr> </table>	BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION	6" - 18"	A	18" - 36"	B	36" AND LARGER	C	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>TRACE</th> <th>0 - 10%</th> </tr> <tr> <th>LITTLE</th> <th>10 - 20%</th> </tr> <tr> <th>SOME</th> <th>20 - 35%</th> </tr> <tr> <th>AND</th> <th>35 - 50%</th> </tr> </table>	TRACE	0 - 10%	LITTLE	10 - 20%	SOME	20 - 35%	AND	35 - 50%	<p>▼ Observed Groundwater</p> <p style="text-align: center;">EXCAVATION EFFORT</p> <p>E — EASY M — MODERATE D — DIFFICULT</p>
BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION																		
6" - 18"	A																		
18" - 36"	B																		
36" AND LARGER	C																		
TRACE	0 - 10%																		
LITTLE	10 - 20%																		
SOME	20 - 35%																		
AND	35 - 50%																		

TEST PIT FIELD LOG

S E A CONSULTANTS, INC. Engineers / Architects 485 Massachusetts Avenue Cambridge, MA 02139-4018	PROJECT: DEWENS LOCATION: NORTH POST - SA-9 CLIENT: DCC WEATHER: SUNNY 70's	TEST PIT No. TP-113 PROJECT No.:
--	--	---

Ground Surface Elevation: 221.09 Date Started: 5/2/96 Date Finished: 5/2/96 Contractor / Equipment: MDR 330L Soil Engineer / Geologist: TOLUOSKO	GROUNDWATER OBSERVATIONS								
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%;">DATE</th> <th style="width: 25%;">TIME</th> <th style="width: 25%;">DEPTH</th> <th style="width: 25%;">STABILIZATION TIME</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>	DATE	TIME	DEPTH	STABILIZATION TIME				
DATE	TIME	DEPTH	STABILIZATION TIME						

DEPTH ()	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARK NO.
1		6" DEWANS			
2		DK TAN SAND WITH LUMBER /	E	-	
3		ASPHALT SHINGLES / METAL PIPE			
4					
5		DENSE BUILDING DEBRIS - WOOD /	M	-	
6		ASPHALT SHINGLES			
7					
8					
9					
10	14	METAL COR. PIPE, PLASTIC WRAP	D	-	
11		DENSE BUILDING DEBRIS			2
12					
13					
14					
15					
16					
17					
18					
19					
20			M	-	
21					
22					
23		BOTTOM OF WASTE = 23'			
24		DARK, ORGANIC PEAT, MAST			
25		END OF PIT = 25'	M	-	

REMARKS: (1) DID NOT OBSERVE ASBESTOS FIBER, BOARD FIBER.
 (2) WATER, DEBRIS VERY DARK IN COLOR

START TIME: 10:15
FINISH TIME: 10:50

PROPORTIONS USED	EXCAVATION EFFORT	BOULDER COUNT	TEST PIT PLAN	NORTH
Trace 0 to 10%	E - EASY	SIZE LETTER	23 VOLUME = cu.yd.	+
Little 10 to 20%	M - MODERATE	6" - 18" A		
Some 20 to 35%	D - DIFFICULT	18" - 36" B		
And 35 to 50%		> 36" C		

TEST PIT FIELD LOG

SEA CONSULTANTS, INC.
 Engineers Architects
 485 Massachusetts Avenue
 Cambridge, MA 02139-4018

PROJECT: DEVEN'S
LOCATION: NORTH POST LF SA-9
CLIENT: DGC
WEATHER: SUNNY SO'S

TEST PIT No. TP-114

PROJECT No.:

Ground Surface Elevation: 221.71
 Date Started: 5/2/96
 Date Finished: 5/2/96
 Contractor Equipment: MDC 330L
 Soil Engineer Geologist: [Signature]

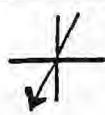
GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH	STABILIZATION TIME
5/2	7:35	~10'	

DEPTH ()	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARK NO.
1		2" size BRNLS			
2		LUMBER, CLAY PIPE, LONG, METAL,	E	B	
3		PIPES WITH DARK BROWN SANDY			
4		GRAVEL			
5					
6			M	A	
7					
8			E		
9					A
10					
11			E		
12					
13					
14			← BOTTOM OF WASTE = 15'		
15					
16	=	← WEST YELLOW MEDIUM SAND	E		
17					
18		← END OF TEST PIT = 18'			
19					
20					
21					
22					
23					
24					
25					

REMARKS: No ODR, SHOWN ON WATER

START TIME: 7:25
FINISH TIME: 7:40

ROPORTIONS USED	EXCAVATION EFFORT	BOULDER COUNT	TEST PIT PLAN	NORTH
Trace 0 to 10%	E - EASY	SIZE LETTER	14 	
Little 10 to 20%	M - MODERATE	6" - 18" A		
Some 20 to 35%	D - DIFFICULT	18" - 36" B		
And 35 to 50%		> 36" C		

TEST PIT FIELD LOG

SEA CONSULTANTS, INC.
 Engineers / Architects
 485 Massachusetts Avenue
 Cambridge, MA 02139-4018

PROJECT: DEVENIS
LOCATION: SA-9
CLIENT: DCC
WEATHER: SUN 70°

TEST PIT No. TP-115

PROJECT No.:

Ground Surface Elevation: ~~213.15~~ 223.19
 Date Started: 5/2/96
 Date Finished: 5/2/96
 Contractor / Equipment: MOE 3304
 Soil Engineer / Geologist: TAT

GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH	STABILIZATION TIME
NOT ENCOUNTERED			

DEPTH ()	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARK NO.
1		6" ORGANICS	E	-	
2		YELLOW MEDIUM SAND			
3			E		
4		DENSE WOOD, CONC, METAL, CON FOOT			
5		WITH SAND, METAL PIPES			
6		INSULATION (FOAM) YELLOW	D		
7			M		
8					
9					
10		BOTTOM OF WASTE = 11'	M		
11					
12		YELLOW, MEDIUM COARSE SAND		A	
13		WITH GRAVEL, MOIST			
14					
15					
16		END OF PIT = 16'			
17					
18					
19					
20					
21					
22					
23					
24					
25					

REMARKS:

START TIME: 10:45
 FINISH TIME: 11:00

PROPORTIONS USED	EXCAVATION EFFORT	BOULDER COUNT	TEST PIT PLAN	NORTH
Trace 0 to 10%	E - EASY	SIZE LETTER	14 VOLUME = cu.yd.	+
Little 10 to 20%	M - MODERATE	6" - 18" A		
Some 20 to 35%	D - DIFFICULT	18" - 36" B		
And 35 to 50%		> 36" C		

TEST PIT FIELD LOG

SFA CONSULTANTS, INC.

PROJECT: **DEVENS**
 LOCATION: **SA-9**
 CLIENT: **DCC**
 WEATHER: **SUN 70°**

TEST PIT No. **TP-116**

PROJECT No.:

Engineers Architects
 485 Massachusetts Avenue
 Cambridge, MA 02139-4018

Ground Surface Elevation **226.23**
 Date Started **5/2/96**
 Date Finished **5/2/96**
 Contractor Equipment **MDC 330**
 Soil Engineer Geologist **TAT**

GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH	STABILIZATION TIME

DEPTH ()	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARK NO.
2		BRICK PIECES CONC (4' Ø), BRICK WOOD	M	A	
3		METAL PIPE, CONC FOOTINGS WITH DATCH SANDS, WRAVER/BOULDER	M	B	
4					
5					
6			D		
7		ASPHALT SHINGLES, CONC, WOOD			
8			M		
9					
10			M		
11		BOTTOM OF WASTE = 11'			
12		YELLOW, MED/COARSE SAND AND WRAVER, SOME BOULDERS		A	
13					
14					
15		BOTTOM OF PIT = 14'			
16					
17					
18					
19					
20					
21					
22					
23					
24					

REMARKS: START TIME: 1345
FINISH TIME: 1405

PROPORTIONS USED	EXCAVATION EFFORT	BOULDER COUNT	TEST PIT PLAN	NORTH
Trace 0 to 10%	E - EASY	SIZE LETTER	<p style="text-align: center;">18'</p> <p style="text-align: center;">VOLUME = cu.yd.</p>	+
Little 10 to 20%	M - MODERATE	6" - 18" A		
Some 20 to 35%	D - DIFFICULT	18" - 36" B		
And 35 to 50%		> 36" C		

TEST PIT FIELD LOG

S E A CONSULTANTS, INC. Engineers / Architects 485 Massachusetts Avenue Cambridge, MA 02139-4018	PROJECT: DEVENS LOCATION: SA-9 CLIENT: DCC WEATHER: SUN 70°	TEST PIT No. TP-117 <hr/> PROJECT No.:
--	--	--

Ground Surface Elevation: 220.98 Date Started: 5/2/96 Date Finished: 5/2/96 Contractor / Equipment: MOR 330 Soil Engineer / Geologist: TAT	GROUNDWATER OBSERVATIONS												
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">DATE</th> <th style="width: 15%;">TIME</th> <th style="width: 15%;">DEPTH</th> <th style="width: 55%;">STABILIZATION TIME</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	DATE	TIME	DEPTH	STABILIZATION TIME								
DATE	TIME	DEPTH	STABILIZATION TIME										

DEPTH ()	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARK NO.
1		COARSE SAND & GRAVEL W/ SOME CONC	M	A	
2					
3					
4					
5		MOSTLY SAND & GRAVEL W/ LUMBER	M	-	
6					
7					
8		DENSE BUILDING DEBRIS - WOOD/CONC/METAL/ASPHALT	D		
9					
10					
11					
12					
13					
14					
15					
16			M	A	
17					
18			M	B	
19					
20					
21			D		
22					
23					
24		BOTTOM OF WASTE = 24' DENSE TILL - MOST			
25		BOTTOM OF TP = 25'	D		

REMARKS: JOHN REGAN - DEP RON - DIPIPO - ARMY OBSERVE ACTIVITIES	START TIME: 11:05 FINISH TIME: 11:45
--	---

PROPORTIONS USED	EXCAVATION EFFORT	BOULDER COUNT	TEST PIT PLAN	NORT
Trace 0 to 10%	E - EASY	SIZE LETTER	25	+
Little 10 to 20%	M - MODERATE	6" - 18" A	VOLUME = cu.yd.	
Some 20 to 35%	D - DIFFICULT	18" - 36" B		
And 35 to 50%		> 36" C		

TEST PIT FIELD LOG

S E A CONSULTANTS, INC.
 Engineers Architects
 Massachusetts Avenue
 Cambridge, MA 02139-4018

PROJECT: **DEVENS**
 LOCATION: **SA-9**
 CLIENT: **DCC**
 WEATHER: **SUN 70**

TEST PIT No. **TP-118**

PROJECT No.:

Ground Surface Elevation: **222.48**
 Date Started: **5/2/96**
 Date Finished: **5/2/96**
 Contractor/Equipment: **MDR 330**
 Soil Engineer/Geologist: **TAT**

GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH	STABILIZATION TIME
5/2/96		~11	

DEPTH ()	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARK NO
1		MEDIUM/LARGE SAND AND GRAVEL	E	A	
2		SEVERAL PIECES OF WOOD			
3					
4		BOTTOM OF WASTE ~ 4'			
5		↑ YELLOW SAND & GRAVEL	E		
6		NO WASTE			
7					
8			E	A	
9					
10			E	A	
11					
12			E	A	
13					
14			E	A	
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					



REMARKS:

START TIME: **11:45**
 FINISH TIME: **12:05**

PROPORTIONS USED	EXCAVATION EFFORT	BOULDER COUNT	TEST PIT PLAN	NORTH
0 to 10% 10 to 20% 20 to 35% 35 to 50%	E - EASY M - MODERATE D - DIFFICULT	SIZE LETTER 6" - 18" A 18" - 36" B > 36" C	22 VOLUME = cu.yd.	

TEST PIT FIELD LOG

S E A CONSULTANTS, INC. Engineers - Architects 485 Massachusetts Avenue Cambridge, MA 02139-1018	PROJECT: DEVENS LOCATION: SA-9 CLIENT: OCC WEATHER: SUN 70s	TEST PIT No. TP-119 <hr/> PROJECT No.:
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Ground Surface Elevation 227.24 Date Started 5/2/96 Date Finished Contractor Equipment MDE 330 Soil Engineer Geologist TAT	GROUNDWATER OBSERVATIONS <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>DATE</th> <th>TIME</th> <th>DEPTH</th> <th>STABILIZATION TIME</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	DATE	TIME	DEPTH	STABILIZATION TIME												
DATE	TIME	DEPTH	STABILIZATION TIME														

DEPTH (-)	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARK NO.
1		YELLOW MEDIUM SAND	E		
2					
3					
4		EASILY DENSE BUILDING	M	13	
5		DEBRIS - WOOD, SHINGLES, PIPE			
6		CONC, BRICK, SOME PLASTIC	M		
7		WITH DARK TAN SAND & GRAVEL			
8					
9					
10	11A - PERLITE		D		
11					
12			M		
13					
14					
15			M		
16					
17		↓ BOTTOM OF WASTE = 17'			
18		DRY PEAT			
19		END OF PIT = 18'			
20					
21					
22					
23					
24					
25					

REMARKS: START TIME: 1250
FINISH TIME: 1320

PROPORTIONS USED	EXCAVATION EFFORT	BOULDER COUNT	TEST PIT PLAN	NORTH
Trace 0 to 10%	F - EASY	SIZE LETTER		+
Little 10 to 20%	M - MODERATE	6" - 18" A		
Some 20 to 35%	D - DIFFICULT	18" - 36" B		
And 35 to 50%		> 36" C		

TEST PIT FIELD LOG

SEA CONSULTANTS, INC.
 Engineers - Architects
 15 Massachusetts Avenue
 Cambridge, MA 02139-4018

PROJECT: **DEVENS**
 LOCATION: **SA-9**
 CLIENT: **DCC**
 WEATHER: **SUN 70**

TEST PIT No. **TP-120**

PROJECT No.:

Ground Surface Elevation **227.93**
 Date Started
 Date Finished **5/2/96**
 Contractor Equipment **MOR 336**
 Soil Engineer Geologist **TAT**

GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH	STABILIZATION TIME
NOT FOUNTAINED			

DEPTH ()	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARK NO
1		YELLOW MED / COARSE SAND & GRAVEL		A	
2					
3					
4					
5		↑ VERY DENSE BUILDING DEBRIS WOOD / CONC / METAL ↓	VD	-	
6			VD	-	
7			VD	-	
8			VD	-	
9			VD	-	
10			VD	-	
11			VD	-	
12					
13					
14					
15					
16		↓ BOTTOM OF WASTE = 17'			
17		MED / COARSE SAND AND GRAVEL	VD		
18					
19					
20		↓ END OF PIT = 19'			
21					
22					
23					
24					

REMARKS:

START TIME: **1320**
 FINISH TIME: **1340**

PROPORTIONS USED	EXCAVATION EFFORT	BOULDER COUNT	TEST PIT PLAN	NORTH
Trace 0 to 10%	E - EASY	SIZE LETTER	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> 73 VOLUME = cu.yd. </div>	+
Little 10 to 20%	M - MODERATE	6" - 18" A		
Some 20 to 35%	D - DIFFICULT	18" - 36" B		
And 35 to 50%		> 36" C		

TEST PIT FIELD LOG



SEA Consultants Inc.

PROJECT: DEVENS
LOCATION: SA-9

TEST PIT NO.: TP-121
DATE: 5/8/96

GROUND ELEVATION: ~ 217.06
LOG PREPARED BY: TAT

CONTRACTOR: MDE
EQUIPMENT: 330 EXCAV

WEATHER: CLOUDS 70s

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD. COUNT	REMRK. NO.
0		6" ORGANICS	E	A	
1'		SAND & GRAVEL WITH SOME CONC / REBAR / METAL / NODS			
2'					
3'			E	B	
4'					
5'	▼ =	PERCHED	E	A	
6'		BOTTOM OF WASTE = 6' ALONG EASTERN WALL ⇒ SHIFT PIT EAST			
7'					
8'		DENSE BUILDING DEBRIS - WOOD / CONC / CABLES / METAL	E		
9'			E		
10'		BOTTOM OF WASTE = 8'	E		
11'		YELLOW MED / COARSE SAND / GRAVEL	E		
12'		8-13'	E		
13'		BOTTOM OF PIT = 13'			
14'					

REMARKS:

<p>TEST PIT PLAN</p> <p style="text-align: center;">NORTH</p> <p>VOLUME = _____ cu.yd.</p>	<p>LEGEND:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>BOULDER SIZE RANGE CLASSIFICATION</th> <th>COUNT LETTER DESIGNATION</th> </tr> </thead> <tbody> <tr> <td>6" - 18"</td> <td>A</td> </tr> <tr> <td>18" - 36"</td> <td>B</td> </tr> <tr> <td>36" AND LARGER</td> <td>C</td> </tr> </tbody> </table>	BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION	6" - 18"	A	18" - 36"	B	36" AND LARGER	C	<p>PROPORTIONS USED</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>TRACE</th> <th>0 - 10%</th> </tr> </thead> <tbody> <tr> <td>LITTLE</td> <td>10 - 20%</td> </tr> <tr> <td>SOME</td> <td>20 - 35%</td> </tr> <tr> <td>AND</td> <td>35 - 50%</td> </tr> </tbody> </table>	TRACE	0 - 10%	LITTLE	10 - 20%	SOME	20 - 35%	AND	35 - 50%	<p>GROUNDWATER</p> <p>▼ Observed Groundwater</p> <p>EXCAVATION EFFORT</p> <p>E — EASY M — MODERATE D — DIFFICULT</p>
BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION																		
6" - 18"	A																		
18" - 36"	B																		
36" AND LARGER	C																		
TRACE	0 - 10%																		
LITTLE	10 - 20%																		
SOME	20 - 35%																		
AND	35 - 50%																		

STACONSULTANTS, INC.
 Engineers, Architects
 45 Main Street, Suite
 100, Boston, MA 02108

PROJECT: DEGENS
 LOCATION: NORTH POST SA-9
 CLIENT: DCC
 WEATHER: CLN 80's

TEST PIT No. 15-02

PROJECT No.:

GROUNDWATER OBSERVATIONS

DATE	TIME	DEPTH	STABILIZATION TIME

Surface Elevation
 Elev. Staged 511.20
 Elev. Finished 511.20
 Elev. Equipment MDC 5304
 Elev. of Equipment 7.70560

DEPTH (ft)	STRATA CHANGE	SOIL DESCRIPTION	EXCAVATION EFFORT	BOULDER COUNT	REMARKS
0-2		SAND GRAVEL 0-2 FINE SAND SILT 2-5			
1		MOVE NORTH SAME AS ABOVE			
		MOVE NORTH KEEP MOVING NORTH TO A DEPTH OF ~ 5-6 FT, JUST ABOVE WATER			
		SPARSE PIECES OF WOOD, METAL PIPE, BRICK, CONCR IN TOP 2'. SAND/GRAVEL 2'-5/6'			

REMARKS:

START TIME: 10:15
 FINISH TIME: 11:50

PROPORTIONS USED ve 0 to 10% Little 10 to 20% Some 20 to 35% And 35 to 50%	EXCAVATION EFFORT E - EASY M - MODERATE D - DIFFICULT	BOULDER COUNT SIZE FEET 6" - 12" 1 18" - 36" 0 36" 0	TEST PIT PLAN - 150 - VOLUME = cu.yd.	NORTH

Arthur D Little

EXCAVATION PROFILE LOG

11E-94-01X

Client USAEC

Project FT. DEVENUS IV

Case No. 67064

Date 8/12/94

Date Start 8/12/94

Contractor T. Ford

Date Complete 8/12/94

Heavy Equipment ID Komatsu B50 Excavator

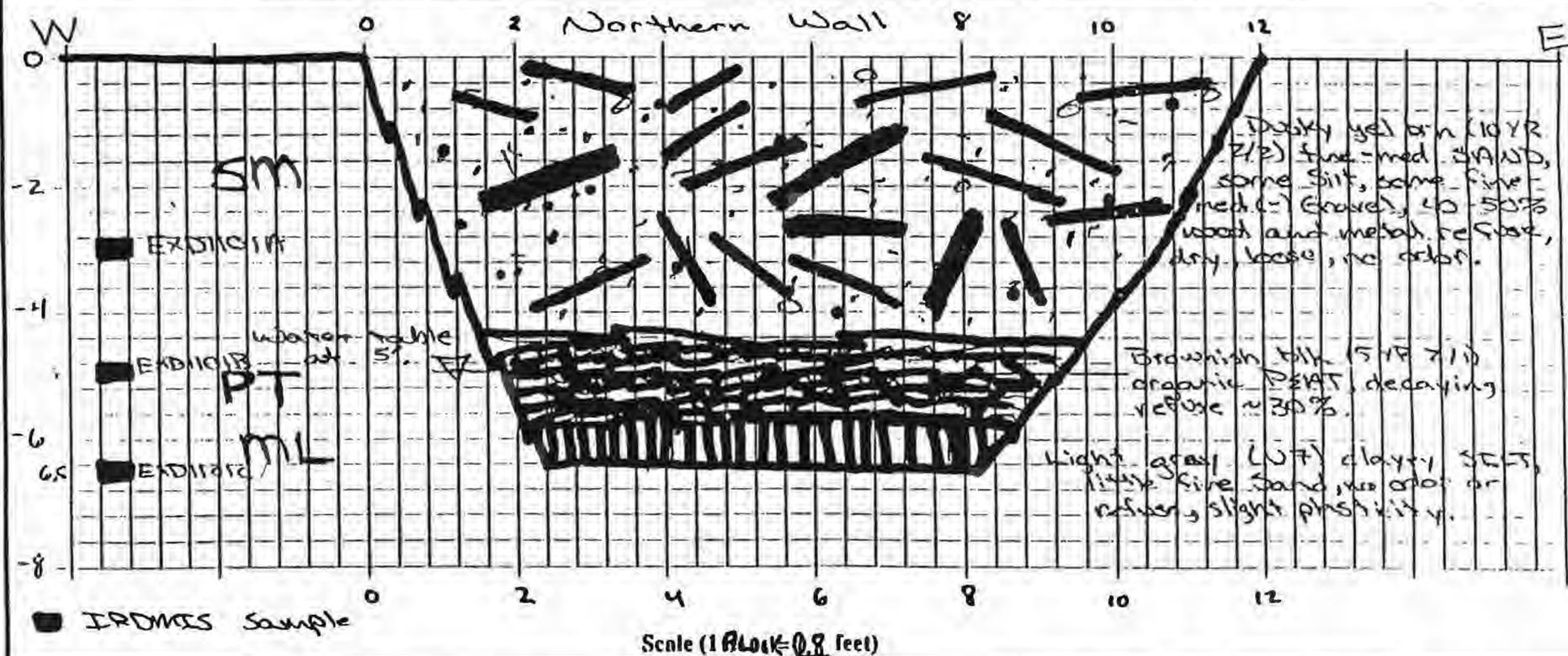
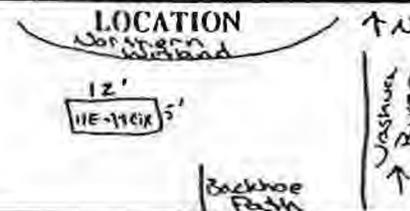
Sampling Method Test Pit

Geologist H. Schaeffer, F. Ricciardi

Pit/Trench Dimensions (LxWxD) 12'x5'x6.5'

Vapor Monitoring Device Microtip PID

Pit Orientation (include wall depicted) Northern wall runs west to east



Directions: Locate on profile (in code) all stratigraphic layers, sample locations, and other areas of comment. This profile should be as close to scale as possible. Identify all codes used below.

Refuse was found from 0'-6' and stopped abruptly at the clayey silt layer, water table at 5'.

Refuse comprised of rotted wood (~80%) and various pieces of metal, most of which was pipe (~20%)

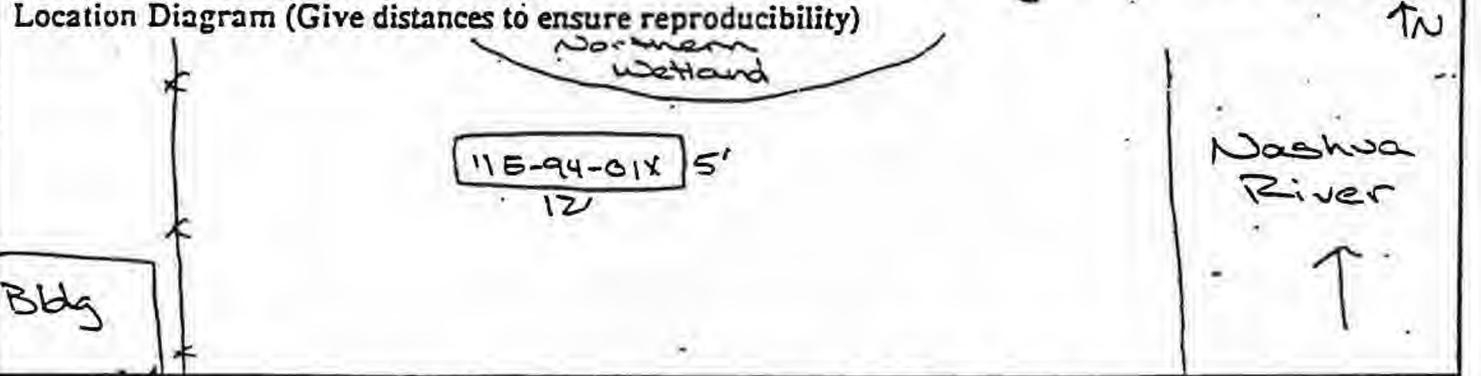
Was pit/Trench Photographed (Y/N) Y

Type and Number of Samples Collected 3 IRDMIS Samples (VC, S10C, P10T, TPH, Metals)

Arthur D Little	Soil Sample Log	Client <u>USAEC</u>
		Project <u>A. DEWEES IV</u>
		Case No. <u>67064</u>
		Date <u>8/12/94</u>

Sampling Method <u>Test Pit 11E-94-01X</u>	Equipment Used <u>Komatsu PC153 Excavator</u>
Geologist(s) <u>H. Schaeffer, F. Ricciardi</u>	Decontamination Procedure <u>Distilled Water</u>

Comments
AOC 11; Water table at 5' below ground surface



Sample Number	Auger Hole ID	Total Organics (ppm)	GEOLOGIC DESCRIPTION
			Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
EXD1101A	Depth = 3' 11E-94-01X	0	Dusky yel brn (10 YR 2/2) fine-med SAND, some silt, some fine-med (-) Gravel, 40-50% wood + metal refuse, dry, frag. no odor
EXD1101B	Depth = 5' 11E-94-01X	0	Brownish blk (5 YR 2/1) organic PEAT, decaying refuse (can see the fibrous remains of wood)
EXD1101C	Depth = 6.5' 11E-94-01X	0	Light gray (N7) clayey SILT, little fine SAND, no odor or refuse.

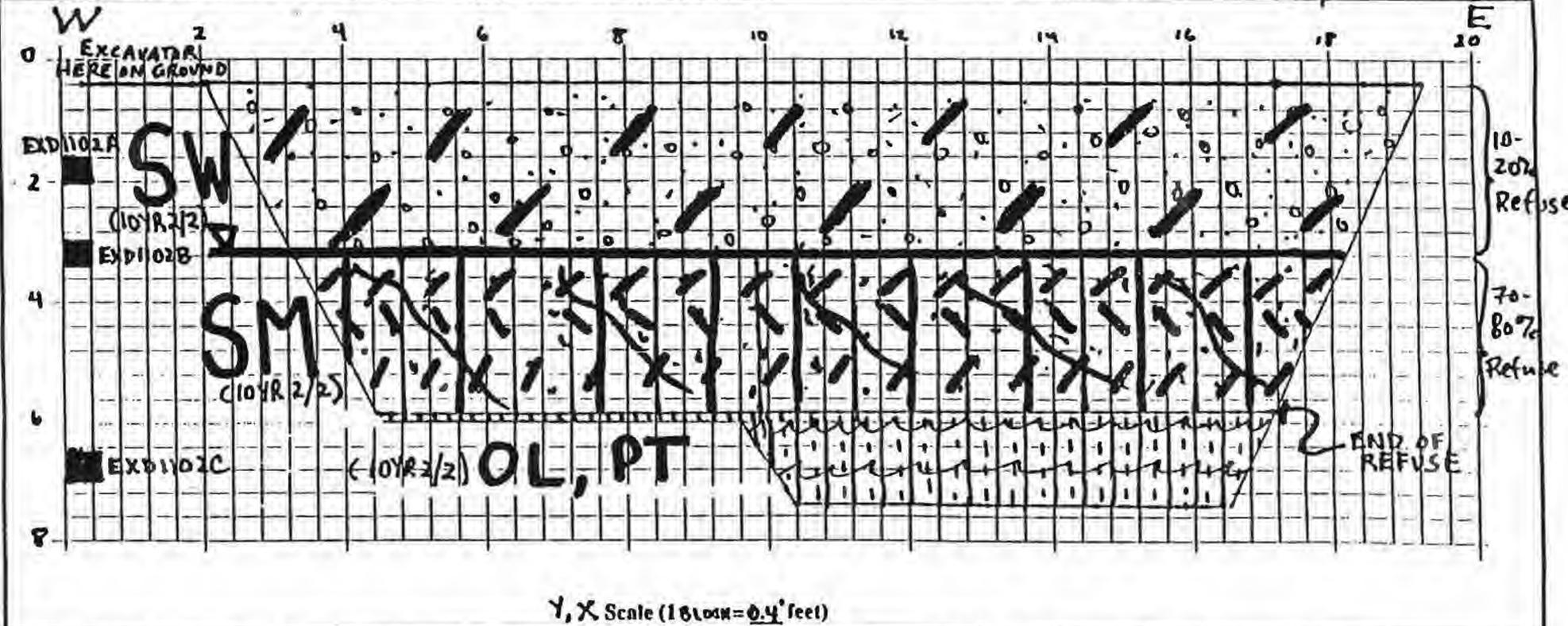
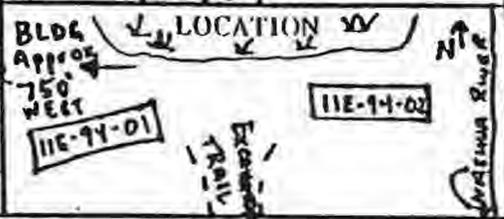
Arthur D Little

EXCAVATION PROFILE LOG

11E-94-02X

Client **USAEC**
 Project **FORT DEVENS IV**
 Case No. **67064**
 Date **8/15/94**

Date Start **8/15/94** Contractor **T. FORD**
 Date Complete **8/15/94** Heavy Equipment ID **KOMATSU PC 150 EXCAVATOR**
 Sampling Method **GRAB - SS. Spoon** Geologist **F. RICCIARDI**
 Pit/Trench Dimensions (LxWxD) **14.5' x 5' x 7.5'** Vapor Monitoring Device **COMBUSTIBLE GAS INDICATOR, PID MICROTIP HL 2000**
 Pit Orientation (include wall depicted) **NORTHERN WALL RUNS W TO E**



Y, X Scale (1 Block = 0.4' feet)

Directions: Locate on profile (in code) all stratigraphic layers, sample locations, and other areas of comment. This profile should be as close to scale as possible. Identify all codes used below.

- = SW = FINE-COARSE SAND, LITTLE SILT, FEW COBBLES
 - = SM = FINE-MED. SAND, SOME SILT, DELAYING ORGANIC MATTER
 - = SAMPLING LOCATION
 - ▨ = OL = ORGANIC SILTS LITTLE CLAY
 - ▩ = PT = PEAT
 - ▧ = 10-20% REFUSE
 - ▦ = 70-80% REFUSE
- * REFUSE = WOOD, WIRE, CONCRETE SLAB, SCRAP METAL, GLASS, FLOORING AND OTHER LIGHT DEBRIS

Was pit/Trench Photographed (N)

Type and Number of Samples Collected **3 SAMPLES - VOC, SVOC, METALS, PEST/PCB, TPH**

Arthur D Little

Soil Sample Log

11E-94-02X

Client USAEC

Project Ft. DEVENS TASK 4

Case No. 67064

Date

Sampling Method

GRAB FROM TEST PIT

Equipment Used KOMATSU PC150 EXCAVATOR

S.S. BOWL, SPOON

Geologist(s)

F. RICCIARDI, N. WEBBER

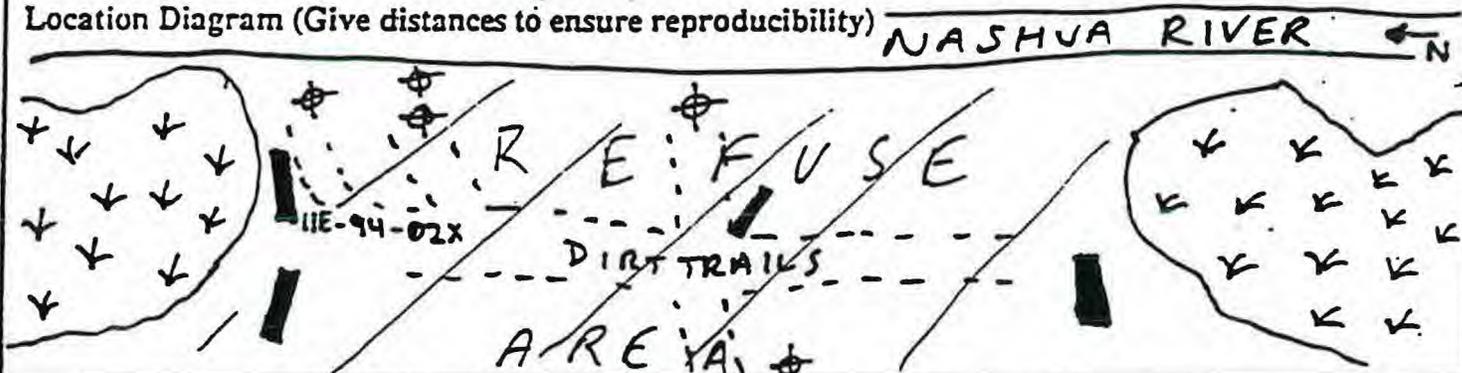
Decontamination Procedure

D/WATER

Comments

AOC 11 - WATER TABLE AT 3.5' BELOW GROUND SURFACE

Location Diagram (Give distances to ensure reproducibility)



Sample Number	Auger Hole ID	Total Organics (ppm)	GEOLOGIC DESCRIPTION
			Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
IRDMIS EXD1102A	-	15.4	DUSKY YELLOWISH BROWN (10YR 2/2) FINE-COARSE SAND, LITTLE SILT, FBW SMALL CORBLES, 20% REFUSE MOIST, LOOSE, NO ODOR
IRDMIS EXD1102B	-	4.6	DUSKY YELLOWISH BROWN (10YR 2/2) FINE-MEDIUM SAND, SOME SILT, SOME DECAYING ORGANIC MATTER AND SAME ODOR, WET 70-80% REFUSE LOOSE
IRDMIS EXD1102C	-	0	DUSKY YELLOWISH BROWN (10YR 1/2) ORGANIC SILT, LITTLE CLAY, LITTLE ORGANIC MATTER (PEAT) WET, ORGANIC ODOR, COMPACT

Arthur D Little

EXCAVATION PROFILE LOG

11E-94-03X

Client USAEC

Project FORT DEVENS IX

Case No. 67064

Date 8/12/94

Date Start 8/12/94

Contractor T. FORD

Date Complete 8/12/94

Heavy Equipment ID PC-150 KOMATSU

Sampling Method GRAB w/ S.S. SPOON

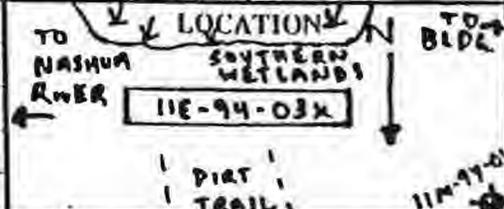
Geologist F. Ricciardi / H. Schaeffer

Pit/Trench Dimensions (LxWxD) 17x6x13.5

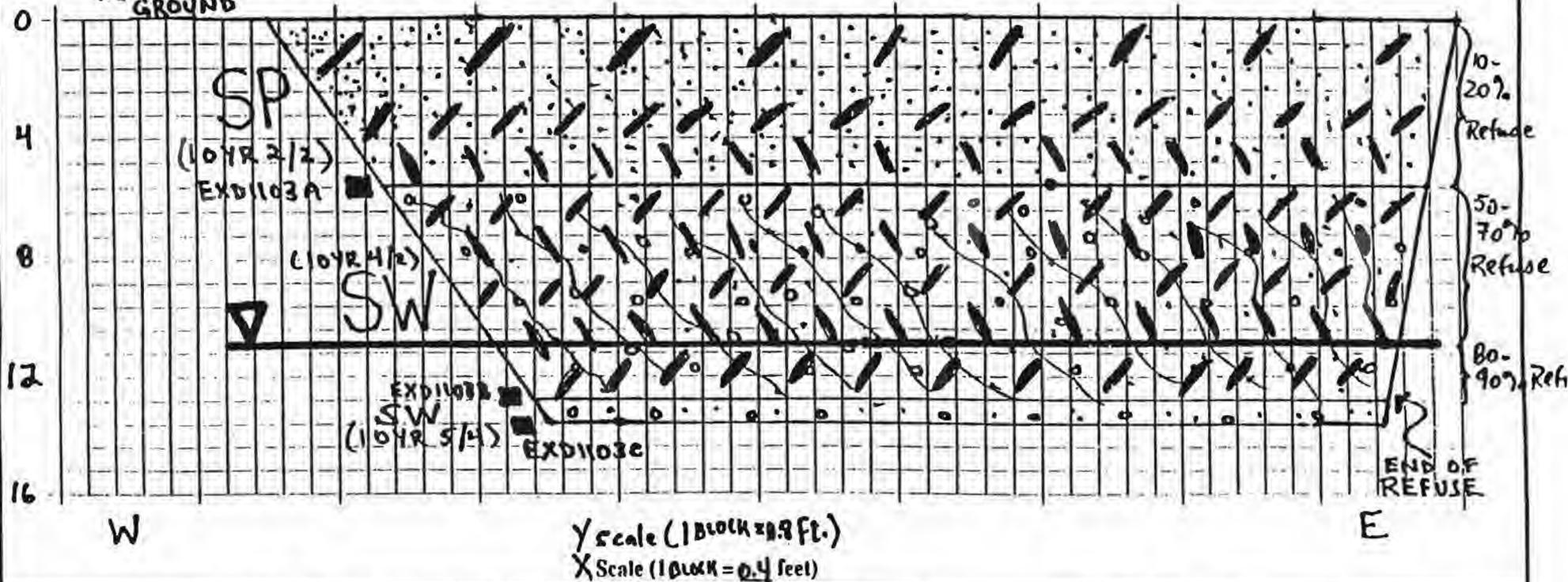
Vapor Monitoring Device COMBUSTIBLE GAS

Pit Orientation (include wall depicted)

SOUTHERN WALL RUNS W to E INDICATOR / PID



EXCAVATOR LOCATED HERE ON GROUND



Directions: Locate on profile (in code) all stratigraphic layers, sample locations, and other areas of comment. This profile should be as close to scale as possible. Identify all codes used below.

= FINE SAND, TRACE SILT

= 10-20% REFUSE

= FINE-COARSE(S) SAND, SOME SILT

= 50-70% REFUSE

= 80-90% REFUSE

= SAMPLE LOCATION

* REFUSE = WOOD, CONCRETE, CRAP METAL, WIRE, GLASS, FLOOR TILES AND OTHER CONST. DEBRIS

Was pit/Trench Photographed (Y/N)

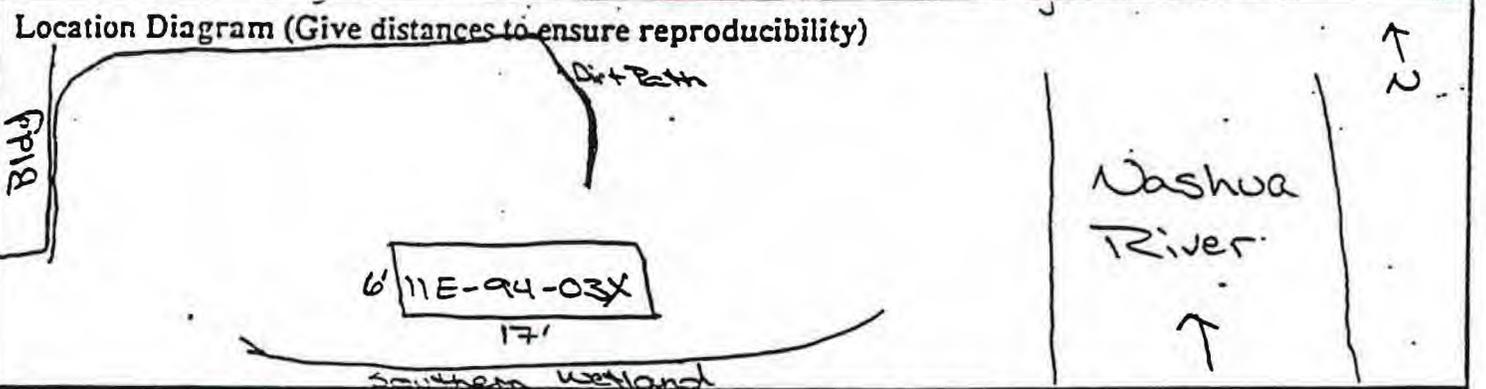
Type and Number of Samples Collected 3 SAMPLES - VOC, SVOC, METALS, PEST/PCB, TPH

Arthur D Little	Soil Sample Log	Client <u>USAEC</u>
		Project <u>FT. DEVENS IV</u>
		Case No. <u>67064</u>
		Date <u>8/12/94</u>

Sampling Method <u>Test Pit 11E-94-03X</u>	Equipment Used <u>Komatsu PC150 Excavator</u>
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Geologist(s) <u>H. Schaeffer, F. Ricciardi</u>	Decontamination Procedure <u>Distilled Water</u>
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Comments
AOC 11; Water table at 11' below ground surface



Sample Number	Auger Hole ID	Total Organics (ppm)	GEOLOGIC DESCRIPTION
			Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
EXD1103A	Depth = 5.5' 11E-94-03X	0	Dusky yel brn (10 YR 2/2) fine SAND, trace silt, poorly sorted, 40% refuse (wood + metal pipe) no odor, dry, loose.
EXD1103B	Depth = 11' 11E-94-03X	0	Dk yel brn (10 YR 4/2) fine - coarse SAND, some silt, 70% wood refuse.
EXD1103C	Depth = 13' 11E-94-03X	0	Med yel brn (10 YR 5/4) med - coarse SAND, wet, loose, no odor.

Arthur D Little

EXCAVATION PROFILE LOG

11E-94-04X

Client USAEC

Project FORT DEVENS IV

Case No. 67064

Date 8/15/94

Date Start 8/15/94

Contractor T. FORD

Date Complete 8/16/94

Heavy Equipment ID PC150 KOMATSU EXCAVATOR

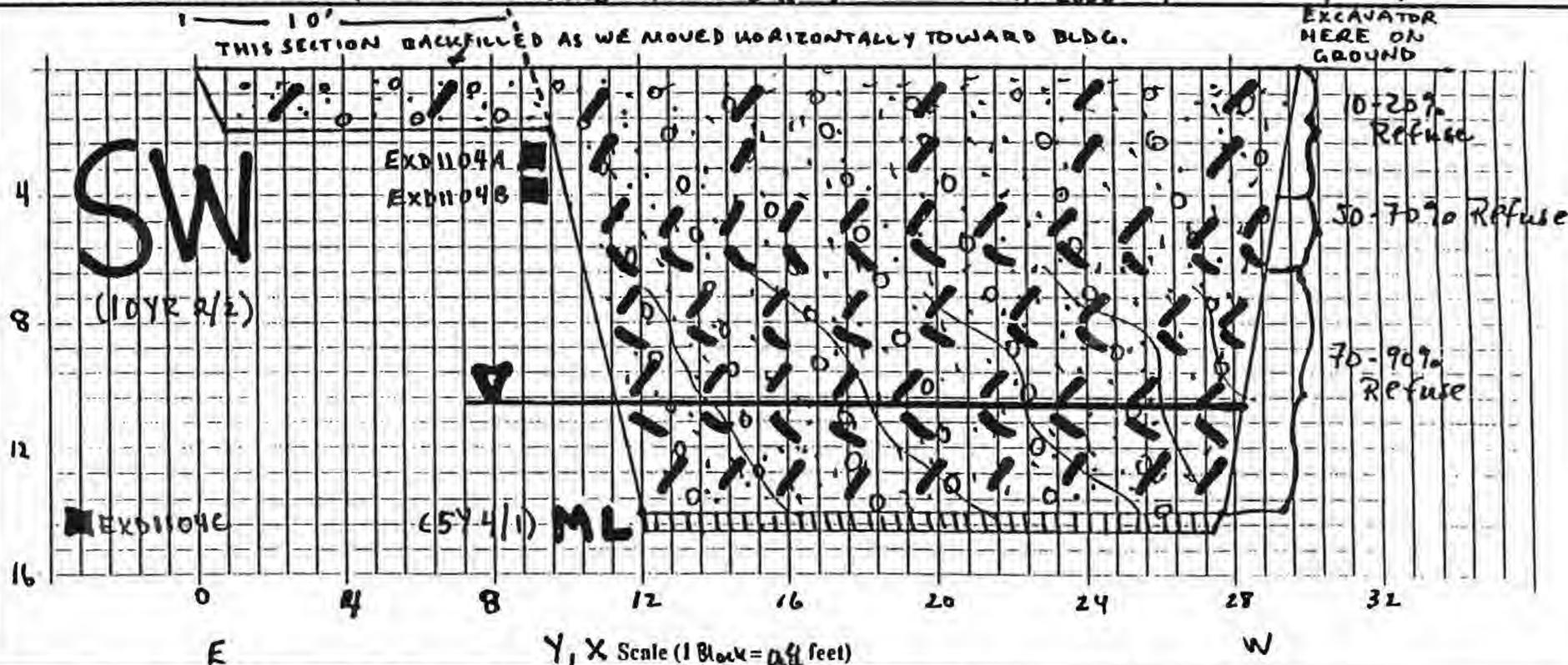
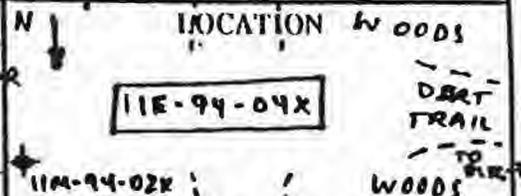
Sampling Method GRAB SS SPOON

Geologist F. RICCIARDI

Pit/Trench Dimensions (LxWxD) 21'x7.5'x13.8'

Vapor Monitoring Device COMBUSTIBLE GAS INDICATOR, MICROTIP, HL-2000

Pit Orientation (include wall depicted) SOUTH WALL, DEPICTED E-W



Directions: Locate on profile (in code) all stratigraphic layers, sample locations, and other areas of comment. This profile should be as close to scale as possible. Identify all codes used below.

○ = SW = FINE-COARSE SAND, SOME GRAVEL, FEW SMALL COBBLES

/// = 10-20% REFUSE

|||| = ML = FINE SAND WITH SILT

\\ = 50-70% REFUSE

■ = SAMPLING LOCATION

/// = 70-90% REFUSE

Was pit/Trench Photographed (Y/N)

Type and Number of Samples Collected 3 SAMPLES - VOL, SVOC, PEST/PCB, METALS, TPH

Arthur D Little

Soil Sample Log
11E-94-04X

Client USAEC

Project FORT DEVENS 4

Case No. 67064

Date 8/11/94

Sampling Method GRAB FROM TEST PIT

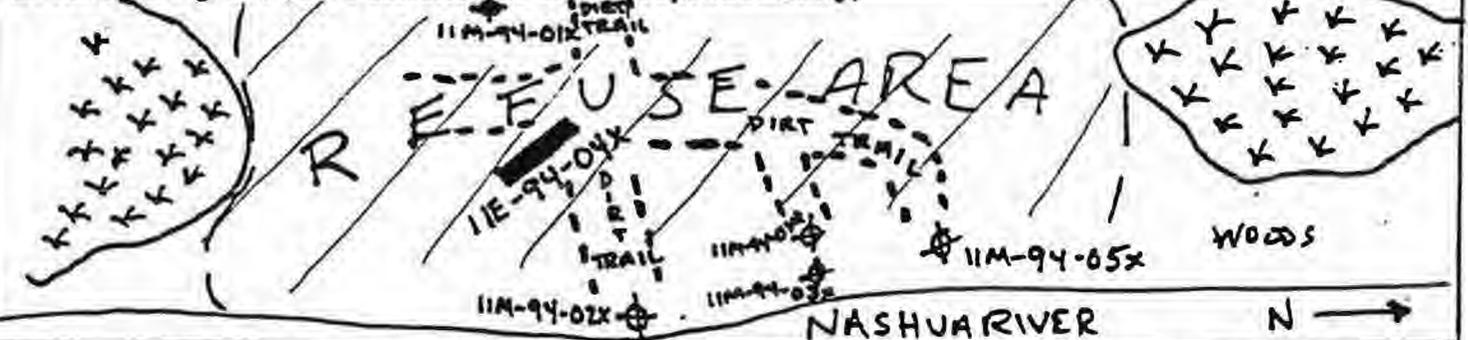
Equipment Used STAINLESS STEEL BOWL
AND SPOON; KOMATSU PC150 EXCAVATOR

Geologist(s)

F. RICCIARDI / H. WEBBER

Decontamination Procedure EXCAVATOR -
STEAM CLEANED / BOWL + SPOON - DI WATERComments TEST PIT FOR FIRST 30 FEET IN LENGTH WAS 3' DEEP. THIS LENGTH WAS EXCAVATED
TO TRY TO CHARACTERIZE THE REFUSE. AS WE EXCAVATED HORIZONTALLY NORTHWARD
REFUSE WAS STILL ENCOUNTERED THEREFORE WE BACKFILLED THE SOUTHERNMOST 10' OF THE PIT

Location Diagram (Give distances to ensure reproducibility)



Sample Number	Auger Hole ID FROM WHERE IN TEST PIT (L x D)	Total Organics (ppm)	GEOLOGIC DESCRIPTION Unified Soil Class ID, color (Munsell System), grain size, sorting, moisture, compaction, indication of contaminants (unusual odor or sheen), and general stratigraphic description
EXD1104A (IRDMIS)	FROM (5' x 3')	36.0	DUSKY YELLOWISH BROWN (10YR 2/2) FINE-COARSE SAND, SOME GRAVEL, FEW SMALL COBBLES, 10-20% REFUSE, BLACK STAINING, FINE SPOTS, SLIGHT PETROLEUM ODOR, LOOSE, DRY
	(10.5' x 3')	15.9	NO ODOR OR STAINING SAME AS ABOVE SOIL 10-20% REFUSE
	(13' x 3')	4.6	SAME AS ABOVE 10-20% REFUSE
	(16' x 3')	15.6	SAME AS ABOVE 10-20% REFUSE
	(20' x 3')	0.0	SAME AS ABOVE 10-20% REFUSE
	(23' x 3')	0.0	SAME AS ABOVE 10-20% REFUSE
	(26' x 3')	14.4	SAME AS ABOVE 10-20% REFUSE
EXD1104B	(13' x 5')	1.5	SAME AS ABOVE 10-20% REFUSE
	(17.5' x 5')	0.0	SAME AS ABOVE 10-20% REFUSE
	(18' x 5')	0.0	SAME AS ABOVE 56-70% REFUSE

* FOR REFUSE DESCRIPTION PLEASE SEE REFUSE LOG IN FIELD NOTE - Page 1 of 1
BOOK #

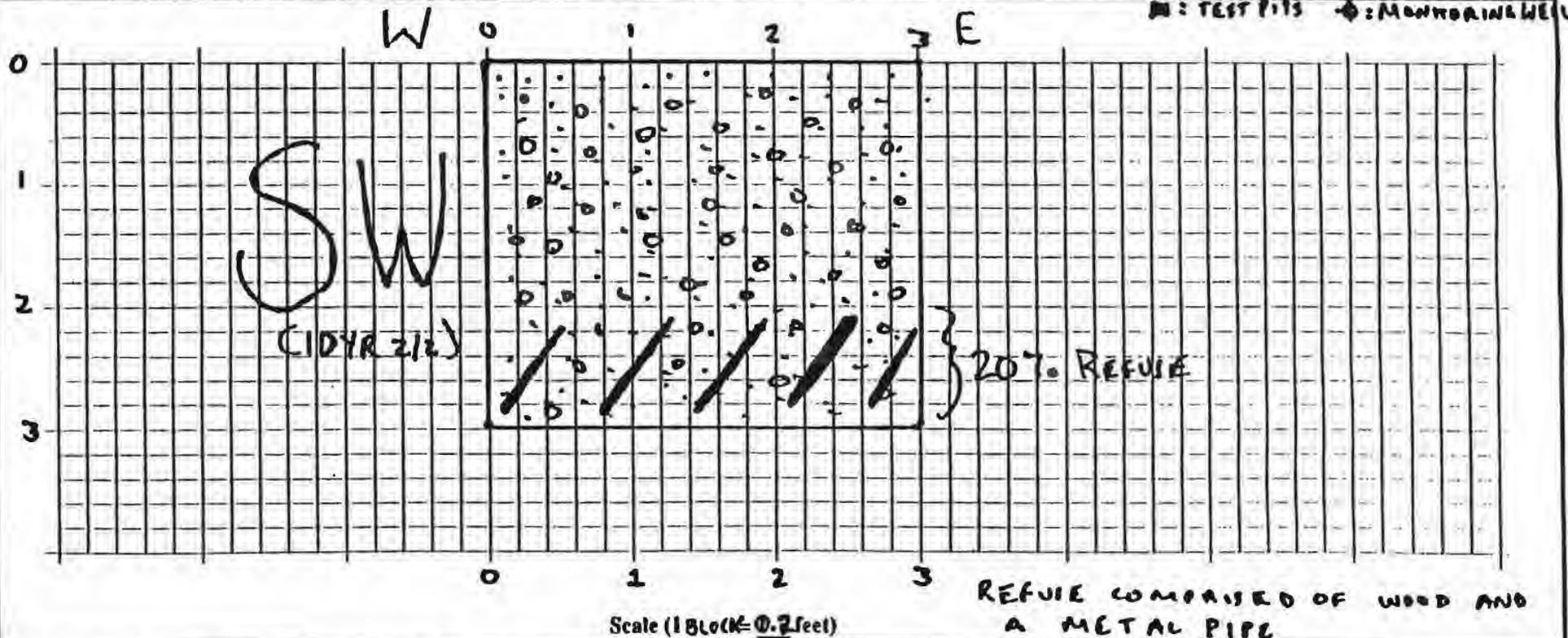
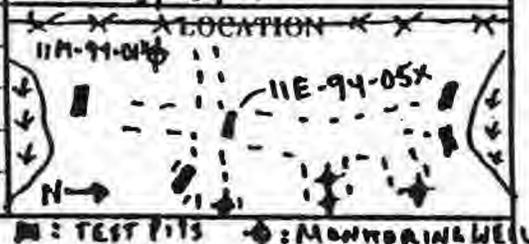
Arthur D Little

EXCAVATION PROFILE LOG

11E-94-05X

Client USAEC
 Project FORT DEVENS 4
 Case No. 67064
 Date 8/15/94

Date Start 8/15/94 Contractor T. FORD
 Date Complete 8/15/94 Heavy Equipment ID Komatsu PC 150 EXCAV.
 Sampling Method NA Geologist F. RICCIARDI
 Pit/Trench Dimensions (LxWxD) 3'x3'x3' Vapor Monitoring Device MICROTIP HL-2000 PID
 Pit Orientation (include wall depicted) (-) NORTHERN WALL DEPICTED



Directions: Locate on profile (in code) all stratigraphic layers, sample locations, and other areas of comment. This profile should be as close to scale as possible. Identify all codes used below.

- NO HEADSPACE OR IRDMIS SAMPLES COLLECTED
- = WELL SORTED GRAVELLY SANDS.
- ▣ = 10-20% REFUSE

Was Photographed (Y/N) Type and Number of Samples Collected NONE

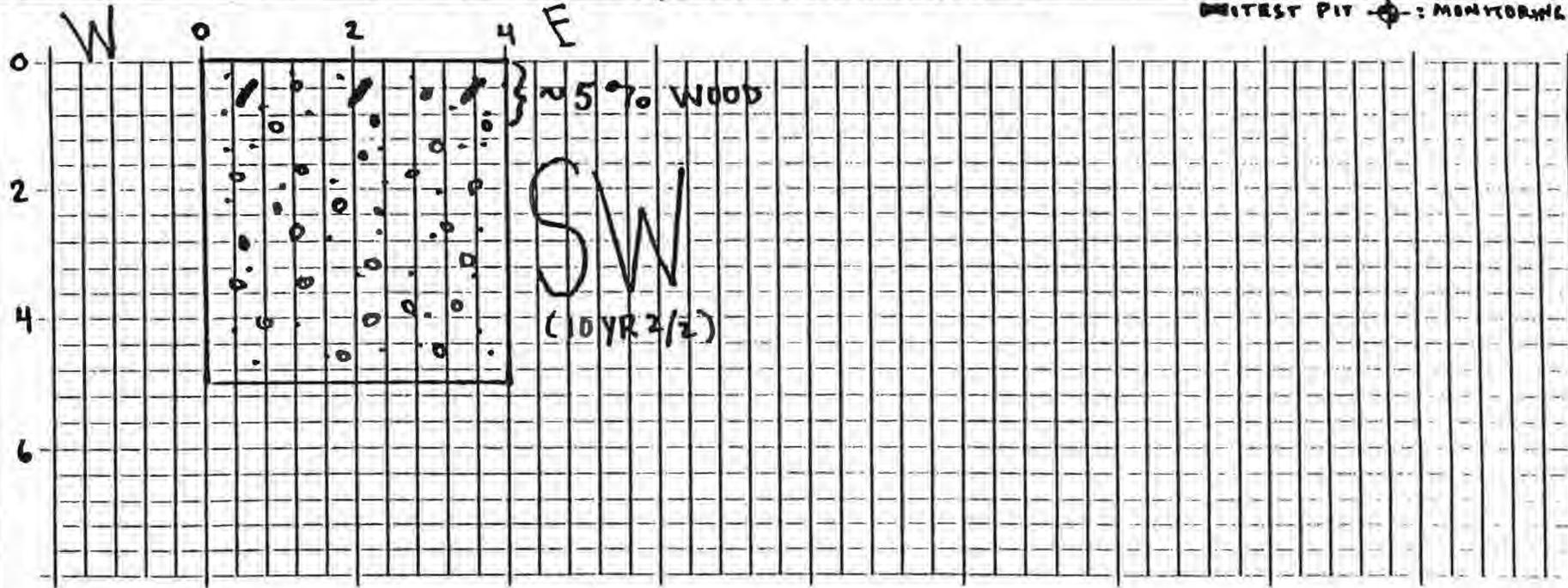
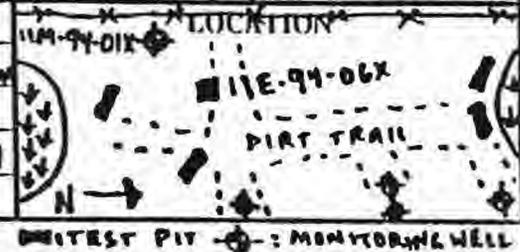
Arthur D Little

EXCAVATION PROFILE LOG

11E-94-06X

Client USAEC
Project FORT DEVENS 4
Case No. 67064
Date 8/15/94

Date Start 8/15/94 Contractor T. FORD
Date Complete 8/15/94 Heavy Equipment ID KOMATSU PC 150 Excavator
Sampling Method NA Geologist F. RICCIARDI
Pit/Trench Dimensions (LxWxD) 4x4x5 Vapor Monitoring Device MICROTIP HL-2000 PID
Pit Orientation (include wall depicted) W - E NORTHERN WALL DEPICTED



Scale (1 Block = 0.4 feet)

Directions: Locate on profile (in code) all stratigraphic layers, sample locations, and other areas of comment. This profile should be as close to scale as possible. Identify all codes used below.

◻ = ~5% WOOD

◻ = WELL SORTED GRAVELLY SANDS

Was pit/Trench Photographed (Y/N)

Type and Number of Samples Collected NONE



E 563300
N 547400

LIMITS OF BORDERING
VEGETATED WETLAND
AND FEDERAL
JURISDICTIONAL WETLAND

100-FOOT
BUFFER ZONE

DIXIE

UPOLE
#3848

BITUMINOUS CONCRETE PAVEMENT

ROAD

E 563300
N 547100

UPOLE
#3848

12M-92-01X

TP #12E-94-01X

12S-92-02X

TP #12E-94-02X

TP #12E-94-05X

TP #12E-94-03X

TP #12E-94-04X

12S-92-01X

A11

A10

A9

A8

12S-92-03X

A7

A6

A5

A4

A3

A2

A1

A14

A13

A12

A11

A10

A9

A8

A7

A6

A5

A4

A3

A2

A1

A14

A13

A12

A11

A10

A9

A8

A7

A6

A5

A4

A3

A2

A1

A14

A13

A12

A11

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A3

A2

A1

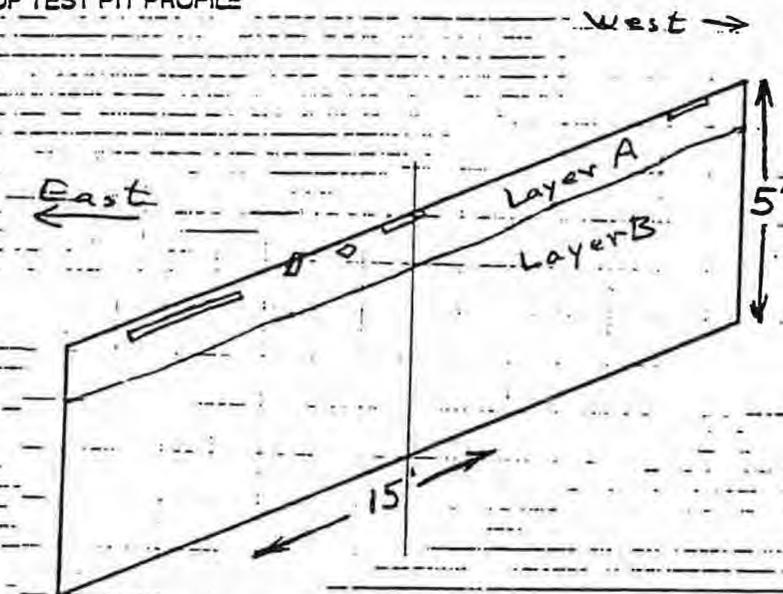
A14

TEST PIT RECORD

Profile Along Test Pit: 12E-94-01X

Study Area: 12

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 4 FT.
DEPTH (FT) 5

NOTES:

Only debris is old lumber near the surface.

Layer A: gravelly sand, boulders and cobbles to 1 ft max, fine and coarse gravel (10-20%), well-graded coarse to fine sand, <5% fines, loose, dry, organics and fibrous roots, med. brown (Sw)

Layer B: Similar to Layer A, except no organics yellowish brown (Sw)

no.	Int. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg. 17

ATTACHMENTS _____

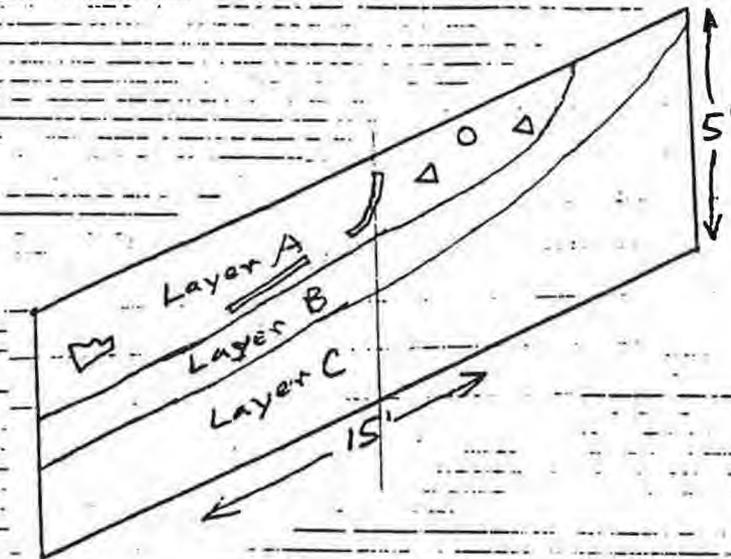
SIGNATURE: D. K. Hirsch

TEST PIT RECORD

Profile Along Test Pit: 12E-94-02X

Study Area: 12

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 4 FT.
DEPTH (FT) 5

NOTES:

Layer A: Gravelly sand, boulders to 1.5' max., loose, dry, variegated brown and yellow, 5% fines (SP) Sparse debris throughout layer.
Layer B: Concentrated leaves, wood and wood ash, mixed with soil similar to Layer A.
Layer C: Similar to Layer B in 12E-94-01X except scattered roots or limbs to 1" diam. (SVV) No debris.

no.	Int. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

PID = background

O₂ = _____

LEL = 000

H₂S = 000

REFERENCE: FIELD BOOK, Pg. 19

ATTACHMENTS _____

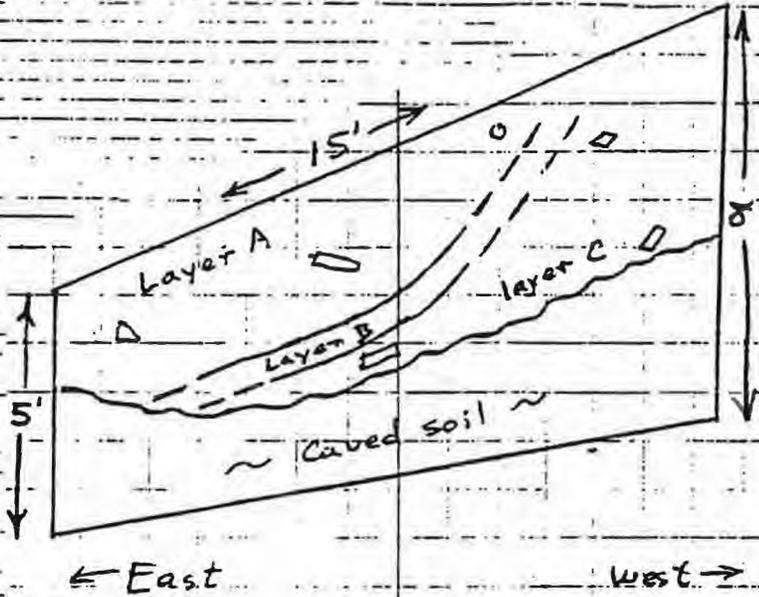
SIGNATURE: D. Piore

TEST PIT RECORD

Profile Along Test Pit: 12E-94-03X

Study Area: 12

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 4 FT.
DEPTH (FT.) 8

NOTES:

Sand is very loose, began to cave near tractor's left rear pad.

Debris found at all levels: consists of bricks, steel cable, rebar, angle iron, concrete, timbers sand bags, bolts

Layer A: Finely sand, boulders to 2ft, very loose Debris sparse

Layer B: Same as Layer B in 12E-94-02X

Layer C: Silty sand, gravel and cobbles to 3" max, sand gen fine to med, 20-40% fines, 10-30% gravel More soil than debris

PID = background

O₂ = 20.8

LEL = 000

H₂S = 000

no.	Inl. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg. 21

ATTACHMENTS _____

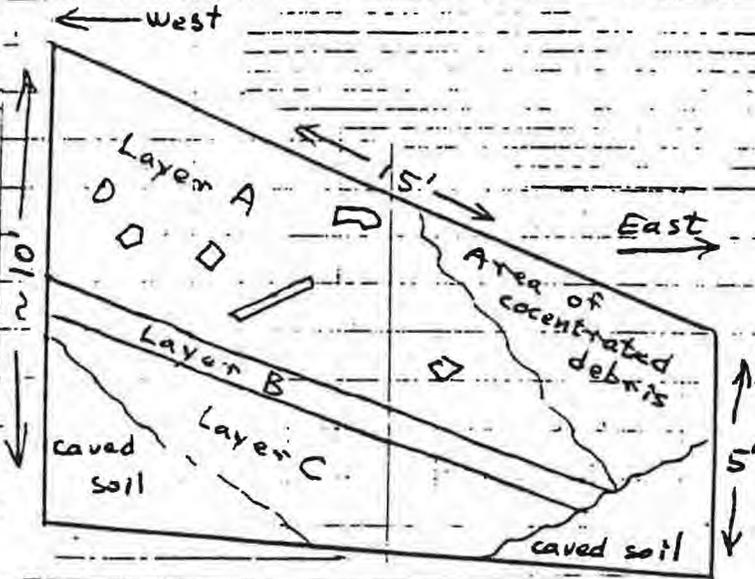
SIGNATURE: D. A. Pinner

TEST PIT RECORD

Profile Along Test Pit: 12E-94-04X

Study Area: 12

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 4 FT.
DEPTH (FT.) 10

NOTES:

Debris observed in layers A and B only. Consists of brick, concrete, lumber, window screen, marble slabs, rebar, plastic sheeting.

Layer A: Gravelly sand, poorly graded, coarse to fine med to fine, well rounded gravel to cobble size (10-20% gravel), < 10% fines, variable organic content, med. brown to light yellowish brown (SP).

Layer B: Same as Layer B in 12E-94-02X.

Layer C: Silty gravelly sand, similar to Layer C in 12E-94-03X. Layered parallel to slope.

PID = background
D₂ = 20.7
LEL = 000
H₂S = 000

no.	Int. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg. 23

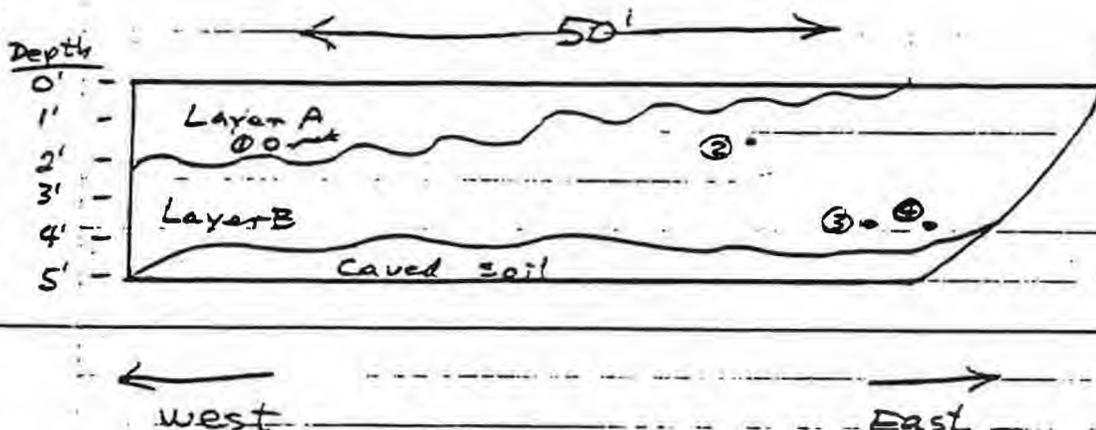
ATTACHMENTS _____

SIGNATURE: D. Rivera

Profile Along Test Pit: 12E-94-05X

Study Area: 12

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT. (Vertical) 1" = 10 FT (Horizontal)
 DEPTH (FT.) 5

NOTES:

- Excavated to verify that landfill does not extend west toward Dixie Road.
- The only debris exposed are shown on profile:
 - ① Sawn tree limb and steel cable.
 - ② Brass shell casing.
 - ③ Creosoted wood.
 - ④ Stovepipe, brick, asphalt roofing.
- Exposed soil is fill or reworked till.
- Layer A: Sand, poorly graded, med. to fine, 5-12% fines, moist, med. dense, yellowish brown (SP-SM)
- Layer B: Disturbed contact with Layer A.
- Silty sand, gravelly silty sand, and sand lenses, becomes cobbly westward. One lense of crushed stone yellow, gray, and dk. brown.

no.	Inl. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg. 27

ATTACHMENTS _____

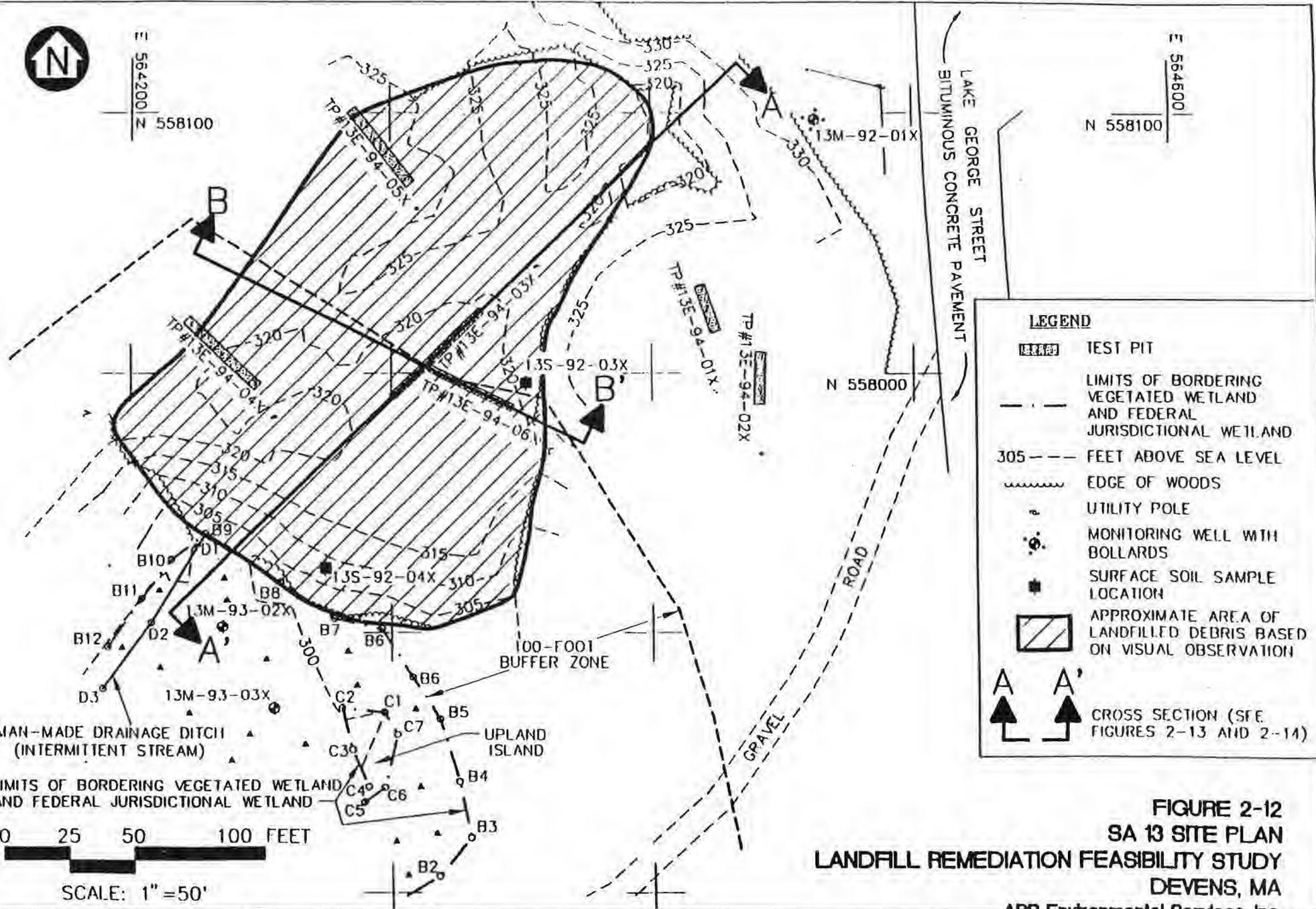
SIGNATURE: D. Pierce

PiD = background.
 O₂ = 21.0
 LEL = 000
 H₂S = 000



E 564200
N 558100

E 564600
N 558100



LEGEND

- TEST PIT
- LIMITS OF BORDERING VEGETATED WETLAND AND FEDERAL JURISDICTIONAL WETLAND
- 305 --- FEET ABOVE SEA LEVEL
- EDGE OF WOODS
- UTILITY POLE
- MONITORING WELL WITH BOLLARDS
- SURFACE SOIL SAMPLE LOCATION
- APPROXIMATE AREA OF LANDFILLED DEBRIS BASED ON VISUAL OBSERVATION

A **A'**
CROSS SECTION (SEE FIGURES 2-13 AND 2-14)

FIGURE 2-12
SA 13 SITE PLAN
LANDFILL REMEDIATION FEASIBILITY STUDY
DEVENS, MA

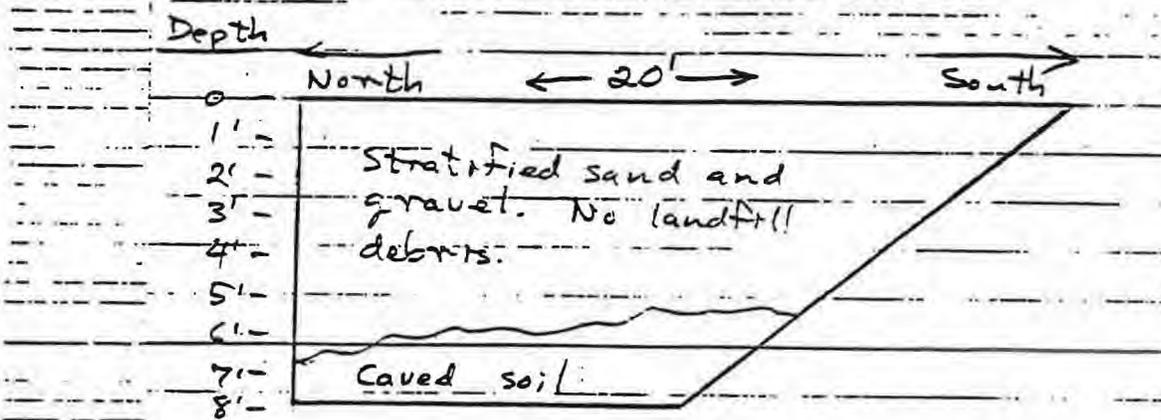
TEST PIT RECORD

8202159D

Profile Along Test Pit: 13E-94-01X

Study Area: 13

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.
DEPTH (FT.) 8

NOTES:

Soil is loose, distinctly stratified sand and gravel. Stratified sands have cut-and-fill structure typical of river or deltaic deposits. No landfill debris.

PID = background

C₂ = 21.0

LEL = 000

H₂S = 000

no.	Int. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg. 45

ATTACHMENTS _____

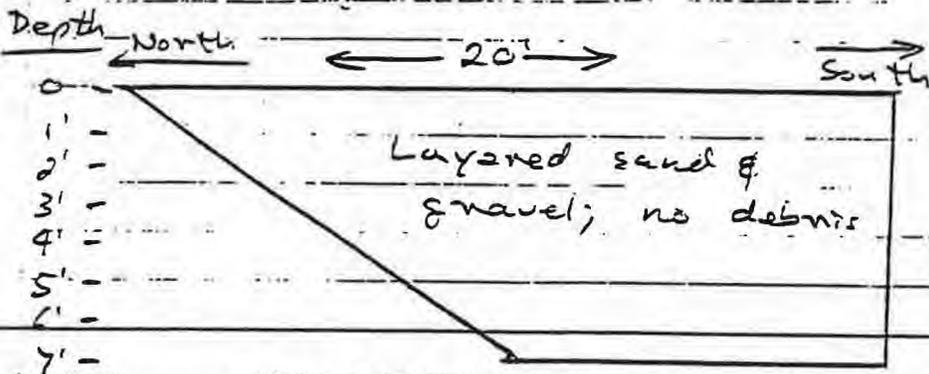
SIGNATURE: D. Kierce

TEST PIT RECORD

Profile Along Test Pit: 13E-94-02X

Study Area: 13

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT.

DEPTH (FT.) 7

NOTES:

Material is loose stratified sand and gravel.

No debris observed below ground or on surface

PID = background

O₂ = 21.0

LEL = 000

H₂S = 000

no.	Int. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg. 43

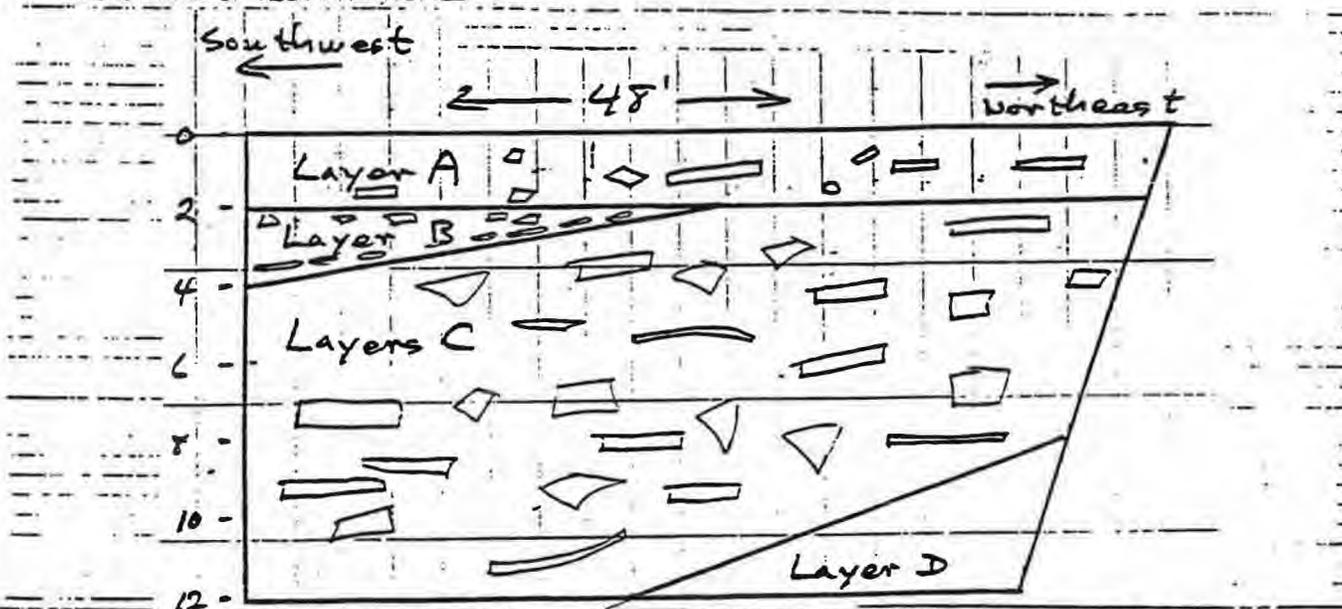
ATTACHMENTS _____

SIGNATURE: D.A. Pierce

Profile Along Test Pit: 13E-94-03X

Study Area: 13

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT. (Vertical) 1" = 10 FT (Horizontal)
 DEPTH (FT) 12

NOTES:

Debris consists of lumber; some asphalt, bricks, concrete, air ducts, steel cable, electric cable, angle iron, sheet metal.

Layer A: Gravelly sand (fill); limited debris; organic rich in upper 1 foot dry.

Layer B: Charred and burned wood. Perched water seeping from layer from previous day's heavy rain.

Layer C: Boulderly sand; concentrated layers of debris. Dry.

Layer D: Boulder till, yellow, dry; appears undisturbed and contains no debris.

PID = 0.0
 O₂ = 20.7
 LEL = 000
 H₂S = 000

no.	Int. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg. 3A

ATTACHMENTS _____

SIGNATURE: D.A. Pierce

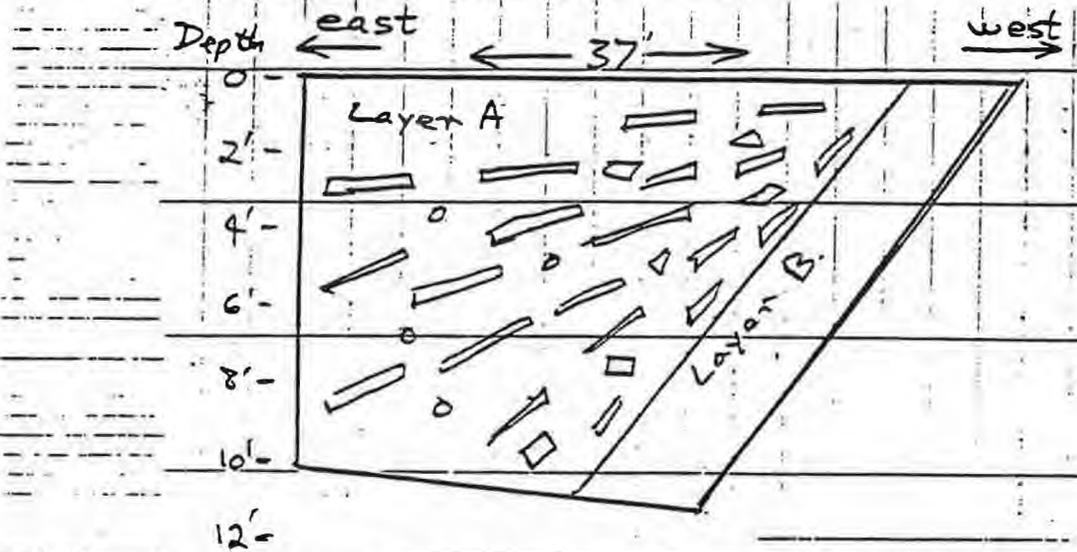
TEST PIT RECORD

82021580

Profile Along Test Pit: 13E-94-04X

Study Area: 13

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT. (Vertical) 1" = 10 FT (Horizontal)
 DEPTH (FT.) 10

NOTES:

West edge of landfill. Higher proportion of soil to debris than in 13E-94-03X.
Debris consists of lumber, concrete slabs, electric cable, sheet metal, pipes. Dry.
Layer A: Gravelly sand mixed with debris. Base of layer has concentrated roots, suggesting in-situ pre-landfill ground surface, now buried.
Layer B: Yellow till, same as Layer D in 13E-94-03X. May be covered with loose sandy gravel fill near the ground surface.

no.	Inl. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg 38

ATTACHMENTS _____

SIGNATURE: D. Pierce

PID = background

O₂ = 21.0

iEL = 000

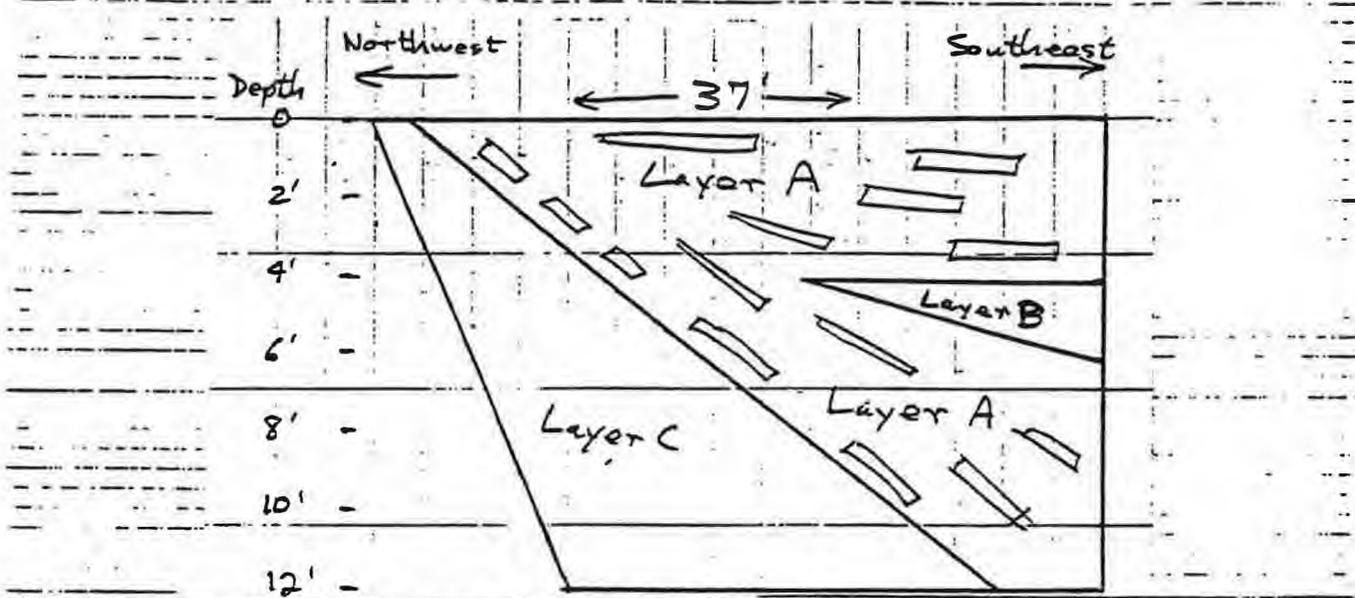
H₂S = 000

TEST PIT RECORD

Profile Along Test Pit: 13E-94-05X

Study Area: 13

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT. (Vertical) 1" = 10 FT. (Horizontal)
 DEPTH (FT.) 12

NOTES:

Layer A: Same as Layer A in 13E-94-03X
 Debris mostly lumber, some concrete, sheet metal, electric cable, roofing material

Layer B: Same as Layer B in 13E-94-03X
 Water seeping from layer underlying layer is dry.

Layer C: Same as Layer B in 13E-94-04X.

PID = background

O₂ = 21.0

LEL = 000

H₂S = 000

no.	Int. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg. 40

ATTACHMENTS _____

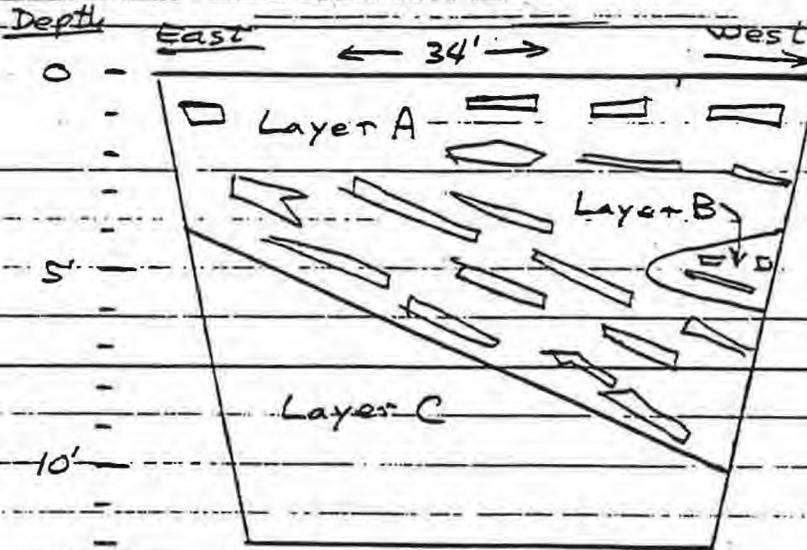
SIGNATURE: D. J. Pierce

TEST PIT RECORD

Profile Along Test Pit: 13E-94-06X

Study Area: 13

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 5 FT. (Vertical) 1" = 10 FT (Horizontal)
 DEPTH (FT.) 12

NOTES:

Layer A: Same as Layer A in 13E-94-03X:
 debris throughout layer. Mostly lumber,
 some pipes, sheet metal, cable, concrete,
 bricks. Tank (7 1/2' x 2 1/2') found at 7 ft. at
 south end of trench. Dry soil.

Layer B: Same as Layer B in 13E-94-03X,
 except dry.

Layer C: Till, gravelly silty fine sand
 yellow, no debris

PID = background

O₂ = 20.9

LEL = 000

H₂S = 000

no.	Int. Ser. No.	Depth (FL)	HD. SP. VOA PPM
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg. 47

ATTACHMENTS _____

SIGNATURE: D. Pierce

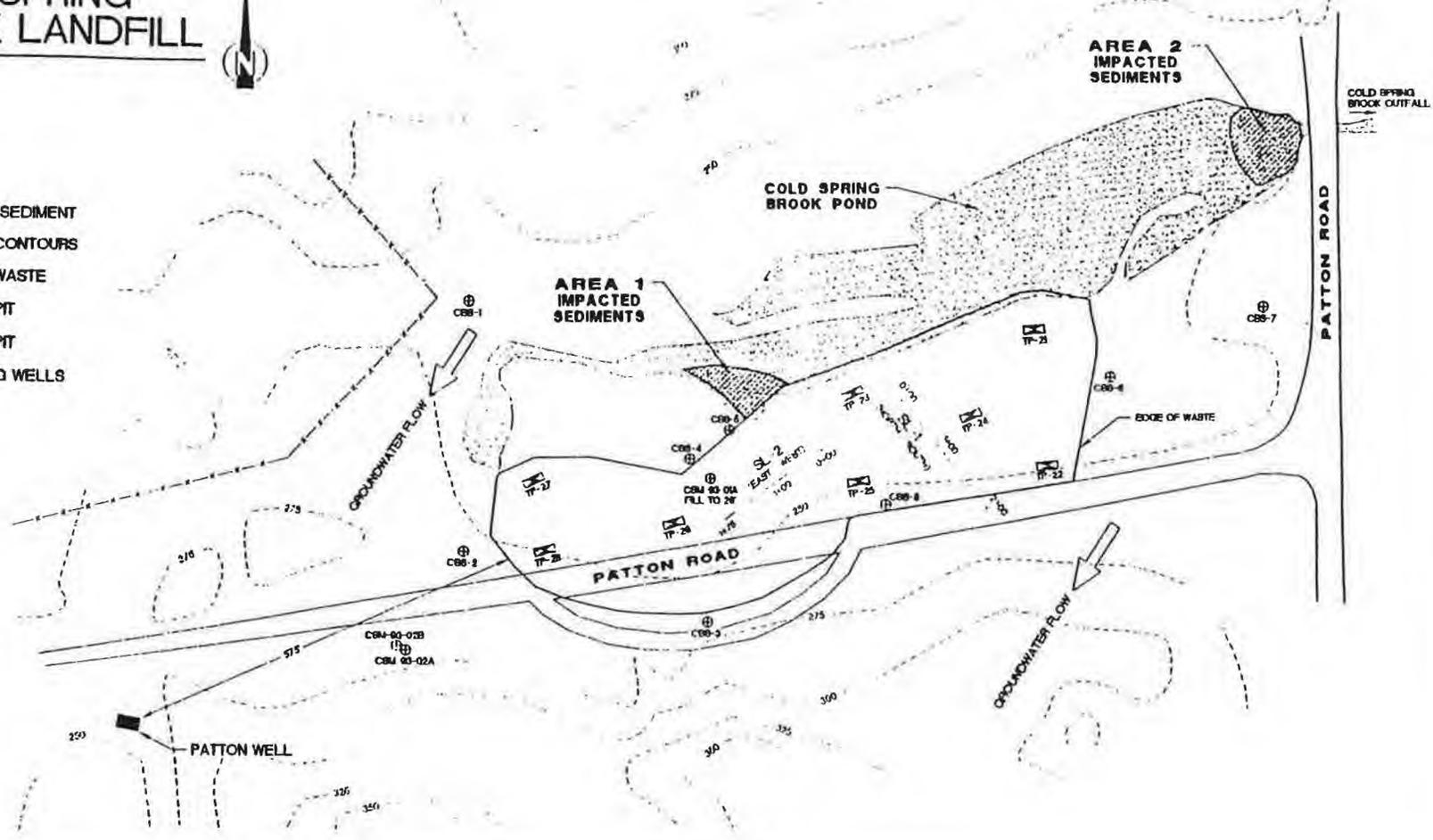
AOC-40 COLD SPRING BROOK LANDFILL

SCALE: 1"=160'



LEGEND

-  WATER
-  IMPACTED SEDIMENT
-  250 SURFACE CONTOURS
-  EDGE OF WASTE
-  SEA TEST PIT
-  ABB TEST PIT
-  MONITORING WELLS



TEST PIT FIELD LOG 142



SEA Consultants Inc.

PROJECT: DEVENS
LOCATION: SA-40

TEST PIT NO.: TP-21
DATE: 5/1/96

GROUND ELEVATION: 251.08
LOG PREPARED BY: JAT

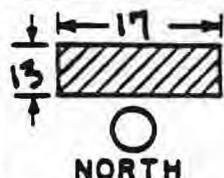
CONTRACTOR: MDR
EQUIPMENT: 330 EX

WEATHER: SUN 60's

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD. COUNT	REMRK. NO.
0		ASPHALT @ SURFACE			
1'		DK BROWN GRAVEL WITH CONC / BECK / CABLE	E	A	
2'					
3'			E	A	
4'					
5'		WOOD STUMPS / LUMBER / ASPHALT MIXED WITH SAND & GRAVEL	E	B	
6'					
7'	▼ =		M	B	
8'					
9'			M	B	
10'					
11'			M	B	
12'					
13'			M	B	
14'					

REMARKS:

TEST PIT PLAN



VOLUME = _____ cu.yd.

LEGEND:

BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION
6" - 18"	A
18" - 36"	B
36" AND LARGER	C

PROPORTIONS USED

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

GROUNDWATER

▼ Observed Groundwater
EXCAVATION EFFORT
E — EASY
M — MODERATE
D — DIFFICULT

TEST PIT FIELD LOG 242



SEA Consultants Inc.

PROJECT: DEVENS

TEST PIT NO.: TP-21

LOCATION SA-40

DATE: 5/1/96

GROUND ELEVATION: 251.08

CONTRACTOR: MOR

WEATHER: SUN 60's

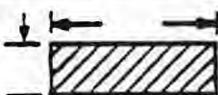
LOG PREPARED BY: TAT

EQUIPMENT: 330 EX

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD COUNT	REMRK. NO.
014					
15		As ABOVE			
216		↓	D	B	
317					
418			D	A	
519					
620		Well graded, grey sand & silt (native)			
721		END OF PIT ~ 20'			
822					
9'					
10'					
11'					
12'					
13'					
14'					

REMARKS:

TEST PIT PLAN



NORTH

VOLUME = _____ cu.yd.

LEGEND:

BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION
6" - 18"	A
18" - 36"	B
36" AND LARGER	C

PROPORTIONS USED

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

GROUNDWATER

- ▼ Observed Groundwater
- EXCAVATION EFFORT**
- E — EASY
 - M — MODERATE
 - D — DIFFICULT

TEST PIT FIELD LOG 142



S & E Consultants Inc

PROJECT: DEVESS

TEST PIT NO.: TP-22

LOCATION SA-40

DATE: 5/1/96

GROUND ELEVATION: 255.12

CONTRACTOR: MDR

WEATHER: SUN 60's

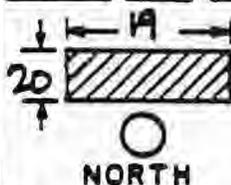
LOG PREPARED BY: TAT

EQUIPMENT: 330 EXCAV.

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV.	BOULD	REMRK. NO.
			EFFORT	COUNT	
0'					
1'		ORGANICS			
2'		MEDIUM SAND & GRAVEL	M	A	
3'		SAND & GRAVEL MIXED WITH LOGS / STUMPS			
4'		SOME ASPHALT	M	A	
5'					
6'			M	A	
7'					
8'			M	A	
9'	▼ =		M		
10'		MOSTLY SAND & GRAVEL WITH PIECES ASPHALT SOME STUMPS & LOGS	M	A	
11'					
12'			D	A	
13'					
14'			D	A	

REMARKS:

TEST PIT PLAN



VOLUME = _____ cu.yd.

LEGEND:

BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION
6" - 18"	A
18" - 36"	B
36" AND LARGER	C

PROPORTIONS USED

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

GROUNDWATER

- ▼ Observed Groundwater
- EXCAVATION EFFORT**
- E — EASY
- M — MODERATE
- D — DIFFICULT

TEST PIT FIELD LOG 242



SEA Consultants Inc.

PROJECT: DEVENS

TEST PIT NO.: TP-22

LOCATION: SA-40

DATE: 5/1/96

GROUND ELEVATION: 255.12

CONTRACTOR: _____

WEATHER: _____

LOG PREPARED BY: TAT

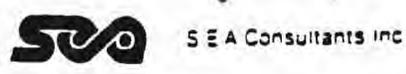
EQUIPMENT: _____

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD COUNT	REMRK NO.
0'4"					
1'5"		AS ABOVE	M	A	
2'6"		↓ GREY, WELL GRADED SAND & SILT (NATIVE) END OF PIT ~ 26'			
3'7"					
4'8"			D	A	
5'9"					
6'20"			M		
7'					
8'					
9'					
10'					
11'					
12'					
13'					
14'					

REMARKS:

<p>TEST PIT PLAN</p> <p style="text-align: center;">NORTH</p> <p>VOLUME = _____ cu.yd.</p>	<p>LEGEND:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>BOULDER SIZE RANGE CLASSIFICATION</th> <th>COUNT LETTER DESIGNATION</th> </tr> </thead> <tbody> <tr> <td>6" - 18"</td> <td>A</td> </tr> <tr> <td>18" - 36"</td> <td>B</td> </tr> <tr> <td>36" AND LARGER</td> <td>C</td> </tr> </tbody> </table>	BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION	6" - 18"	A	18" - 36"	B	36" AND LARGER	C	<p>PROPORTIONS USED</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>TRACE</th> <th>0 - 10%</th> </tr> </thead> <tbody> <tr> <td>LITTLE</td> <td>10 - 20%</td> </tr> <tr> <td>SOME</td> <td>20 - 35%</td> </tr> <tr> <td>AND</td> <td>35 - 50%</td> </tr> </tbody> </table>	TRACE	0 - 10%	LITTLE	10 - 20%	SOME	20 - 35%	AND	35 - 50%	<p>GROUNDWATER</p> <p>▼ Observed Groundwater</p> <p>EXCAVATION EFFORT</p> <p>E — EASY</p> <p>M — MODERATE</p> <p>D — DIFFICULT.</p>
BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION																		
6" - 18"	A																		
18" - 36"	B																		
36" AND LARGER	C																		
TRACE	0 - 10%																		
LITTLE	10 - 20%																		
SOME	20 - 35%																		
AND	35 - 50%																		

TEST PIT FIELD LOG 142



PROJECT: DEVENS
 LOCATION: SA-40

TEST PIT NO.: TP-23
 DATE: Sept 60's 5/1/96

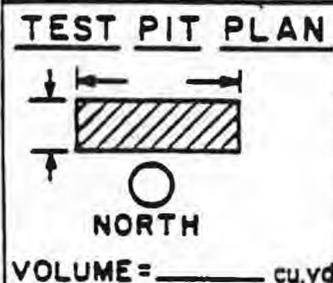
GROUND ELEVATION: 249.84
 LOG PREPARED BY: TAT

CONTRACTOR: MDR
 EQUIPMENT: 330 EXCAV.

WEATHER: SUN 60's

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD COUNT	REMRK NO.
0'		DARK ORGANKS			
1'					
2'		DK BROWN MED / COARSE SAND & GRAVEL MIXED WITH WOOD / CONC / METAL	E	A	
3'					
4'					
5'					
6'	▼ ≡	DK BROWN SAND & GRAVEL WITH ASPHALT CONC / METAL, SOME LOGS	D	A	
7'					
8'					
9'					
10'					
11'					
12'					
13'					
14'			D	A	

REMARKS:



LEGEND:

BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION
6" - 18"	A
18" - 36"	B
36" AND LARGER	C

PROPORTIONS USED

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

GROUNDWATER

▼ Observed Groundwater

EXCAVATION EFFORT

E — EASY
 M — MODERATE
 D — DIFFICULT

TEST PIT FIELD LOG 292



SEA Consultants Inc.

PROJECT: DEVEUS
LOCATION: SA-40

TEST PIT NO.: TP-23
DATE: 5/1/96

GROUND ELEVATION: 249.84
LOG PREPARED BY: TAT

CONTRACTOR: MDE
EQUIPMENT: 330 EXCAV.

WEATHER: SUN 60's

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD COUNT	REMRK. NO.	
0'14"		AS ABOVE * ↓ WELL GRADED, DENSE GREY FINE SAND AND SILT, MOIST (NATIVE) END OF PIT = 20' WATER ENCOUNTERED ~ 6' BG	D	A		
15'						
2'16"						
3'17"				D	A	
4'18"				D	A	
5'19"						
6'20"				D	—	
7'21"						
8'22"						
9'23"						
10'24"						
11'						
12'						
13'						
14'						

REMARKS:

<p>TEST PIT PLAN</p> <p style="text-align: center;">NORTH</p> <p>VOLUME = _____ cu.yd.</p>	<p>LEGEND:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>BOULDER SIZE RANGE CLASSIFICATION</th> <th>COUNT LETTER DESIGNATION</th> </tr> </thead> <tbody> <tr> <td>6" - 18"</td> <td>A</td> </tr> <tr> <td>18" - 36"</td> <td>B</td> </tr> <tr> <td>36" AND LARGER</td> <td>C</td> </tr> </tbody> </table>	BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION	6" - 18"	A	18" - 36"	B	36" AND LARGER	C	<p>PROPORTIONS USED</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>PERCENTAGE</th> </tr> </thead> <tbody> <tr> <td>TRACE</td> <td>0 - 10%</td> </tr> <tr> <td>LITTLE</td> <td>10 - 20%</td> </tr> <tr> <td>SOME</td> <td>20 - 35%</td> </tr> <tr> <td>AND</td> <td>35 - 50%</td> </tr> </tbody> </table>		PERCENTAGE	TRACE	0 - 10%	LITTLE	10 - 20%	SOME	20 - 35%	AND	35 - 50%	<p>GROUNDWATER</p> <p>▼ Observed Groundwater</p> <p>EXCAVATION EFFORT</p> <p>E — EASY M — MODERATE D — DIFFICULT</p>
BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION																				
6" - 18"	A																				
18" - 36"	B																				
36" AND LARGER	C																				
	PERCENTAGE																				
TRACE	0 - 10%																				
LITTLE	10 - 20%																				
SOME	20 - 35%																				
AND	35 - 50%																				

TEST PIT FIELD LOG 142



SEA Consultants Inc

PROJECT: DEVENS

TEST PIT NO.: TP-24

LOCATION SA-40

DATE: 5/1/96

GROUND ELEVATION: 253.52

CONTRACTOR: MDR

WEATHER: SUN 60's

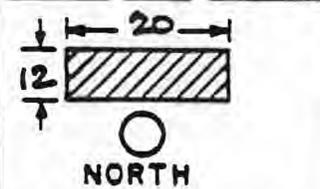
LOG PREPARED BY: TAT

EQUIPMENT: 330 EXCAV.

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD COUNT	REMRK. NO.
0		ORGANICS			
1'		YELLOW MED / COARSE SAND & GRAVEL, LITTLE BOULDERS	M	A	
2'					
3'		DK BROWN MED / COARSE SAND & GRAVEL MIXED WITH ASPHALT / CONC FOOTINGS / LOGS / CABLE / STUMPS			
4'					
5'			M	A	
6'					
7'			M	A	
8'	▼ =				
9'			M	A	
10'					
11'		M	A		
12'					
13'		M	A		
14'					
			M	A	

REMARKS:

TEST PIT PLAN



VOLUME = _____ cu.yd.

LEGEND:

BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION
6" - 18"	A
18" - 36"	B
36" AND LARGER	C

PROPORTIONS USED

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

GROUNDWATER

- ▼ Observed Groundwater
- EXCAVATION EFFORT**
- E — EASY
- M — MODERATE
- D — DIFFICULT

TEST PIT FIELD LOG 142



SEA Consultants Inc.

PROJECT: DEVENS

TEST PIT NO.: TP-25

LOCATION SA-40

DATE: 5/1/96

GROUND ELEVATION: 259.87

CONTRACTOR: MOE

WEATHER: SUN 60s

LOG PREPARED BY: JAT

EQUIPMENT: 330

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV EFFORT	BOULD COUNT	REMRK. NO.
0		CONCRETE @ SURFACE			
1'		TAN MEDIUM / COARSE SAND & GRAVEL MIXED WITH CONC / ASPHALT / BRICK / METAL 			
2'					
3'			M	A	
4'					
5'			M	A	
6'					
7'					
8'					
9'			M	A	
10'					
11'					
12'					
13'			D	B	
14'					

REMARKS:

<p>TEST PIT PLAN</p> <p style="text-align: center;">NORTH</p> <p>VOLUME = _____ cu.yd.</p>	<p>LEGEND:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>BOULDER SIZE RANGE CLASSIFICATION</th> <th>COUNT LETTER DESIGNATION</th> </tr> </thead> <tbody> <tr> <td>6" - 18"</td> <td>A</td> </tr> <tr> <td>18" - 36"</td> <td>B</td> </tr> <tr> <td>36" AND LARGER</td> <td>C</td> </tr> </tbody> </table>	BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION	6" - 18"	A	18" - 36"	B	36" AND LARGER	C	<p>PROPORTIONS USED</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>TRACE</th> <th>0 - 10%</th> </tr> </thead> <tbody> <tr> <td>LITTLE</td> <td>10 - 20%</td> </tr> <tr> <td>SOME</td> <td>20 - 35%</td> </tr> <tr> <td>AND</td> <td>35 - 50%</td> </tr> </tbody> </table>	TRACE	0 - 10%	LITTLE	10 - 20%	SOME	20 - 35%	AND	35 - 50%	<p>GROUNDWATER</p> <p>▼ Observed Groundwater</p> <p>EXCAVATION EFFORT</p> <p>E — EASY</p> <p>M — MODERATE</p> <p>D — DIFFICULT</p>
BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION																		
6" - 18"	A																		
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36" AND LARGER	C																		
TRACE	0 - 10%																		
LITTLE	10 - 20%																		
SOME	20 - 35%																		
AND	35 - 50%																		

TEST PIT FIELD LOG 242



SEA Consultants Inc

PROJECT: Devens
LOCATION: SA-40

TEST PIT NO.: TP-25
DATE: 5/1/96

GROUND ELEVATION: 259.87
LOG PREPARED BY: TAT

CONTRACTOR: MDR
EQUIPMENT: 330

WEATHER: SUN 60°

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD. COUNT	REMRK. NO.
0/14		AS ABOVE 			
1/15					
2/16			M	A	
3/17					
4/18			M	A	
5/19					
6/20			M	A	
7/21					
8/22			M	A	
9/23					
10/24		YELLOW MEDIUM FINE SAND & SILT END OF PIT ~ 24' WATER NOT ENCOUNTERED			
11'					
12'					
13'					
14'					

REMARKS:

TEST PIT PLAN	LEGEND:	PROPORTIONS USED	GROUNDWATER																
<p>VOLUME = _____ cu.yd.</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>BOULDER SIZE RANGE CLASSIFICATION</th> <th>COUNT LETTER DESIGNATION</th> </tr> </thead> <tbody> <tr> <td>6" - 18"</td> <td>A</td> </tr> <tr> <td>18" - 36"</td> <td>B</td> </tr> <tr> <td>36" AND LARGER</td> <td>C</td> </tr> </tbody> </table>	BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION	6" - 18"	A	18" - 36"	B	36" AND LARGER	C	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>TRACE</th> <th>0 - 10%</th> </tr> </thead> <tbody> <tr> <td>LITTLE</td> <td>10 - 20%</td> </tr> <tr> <td>SOME</td> <td>20 - 35%</td> </tr> <tr> <td>AND</td> <td>35 - 50%</td> </tr> </tbody> </table>	TRACE	0 - 10%	LITTLE	10 - 20%	SOME	20 - 35%	AND	35 - 50%	<p>▼ Observed Groundwater</p> <p>EXCAVATION EFFORT</p> <p>E — EASY M — MODERATE D — DIFFICULT</p>
BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION																		
6" - 18"	A																		
18" - 36"	B																		
36" AND LARGER	C																		
TRACE	0 - 10%																		
LITTLE	10 - 20%																		
SOME	20 - 35%																		
AND	35 - 50%																		

TEST PIT FIELD LOG 1 of 2



SEA Consultants Inc.

PROJECT: DEVENS

TEST PIT NO.: TP-26

LOCATION SA-40

DATE: 5/1/96

GROUND ELEVATION: 262.97

CONTRACTOR: MDR

WEATHER: SUN 60's

LOG PREPARED BY: JAT

EQUIPMENT: 330 EXCAV.

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD. COUNT	REMRK. NO.
0		6" TOPSOIL	E		
1		DK BROWN SAND & GRAVEL, LITTLE SILT MIXED WITH BRICK / METAL / PIECES CONC / PLASTIC WRAP, PIPE			
2					
3					
4		WHITE ASH WITH BRICK	E		
5					
6		SAND & GRAVEL WITH LARGE 2' PIECES CONC	E		
7				A	
8				B	A 1
9					
10		SAND & GRAVEL WITH CONC / BRICK / METAL / PLASTIC			
11					
12				D	A
13					
14			D	A	

REMARKS: 1) CONC W/ 1/4" REBAR

TEST PIT PLAN



LEGEND:

BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION
6" - 18"	A
18" - 36"	B
36" AND LARGER	C

PROPORTIONS USED

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
MUCH	35 - 50%

GROUNDWATER

▼ Observed Groundwater EXCAVATION EFFORT

E — EASY
M — MODERATE
D — DIFFICULT

TEST PIT FIELD LOG 2 of 2



SEA Consultants Inc.

PROJECT: DEVENS

TEST PIT NO.: TP-2

LOCATION SA-40

DATE: 5/1/96

GROUND ELEVATION: 262.97

CONTRACTOR: MDR

WEATHER: SUN 60's

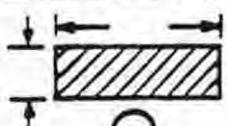
LOG PREPARED BY: JAT

EQUIPMENT: 330 EXCAV.

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD COUNT	REMRK. NO.	
0'4"						
15'		<div style="display: flex; justify-content: center; align-items: center;"> <div style="text-align: center; margin-right: 10px;">↑</div> <div style="text-align: center; margin-right: 10px;">↓</div> </div> <p>SAND & GRAVEL W/ CONC / WIRE / CABLES</p> <p>MOST SAND & GRAVEL WITH PIECES OF BRICK</p> <p>END OF PIT 25'</p> <p>NO WATER ENCOUNTERED</p>	M	A		
26'						
37'				M	A	
48'						
59'						
20'				M	A	
21'						
22'						
23'						
24'						
25'					2	
26'						
13'						
14'						

REMARKS: 2) LIMIT OF EXCAVATOR ~ 25'

TEST PIT PLAN



NORTH

VOLUME = _____ cu.yd.

LEGEND:

BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION
6" - 18"	A
18" - 36"	B
36" AND LARGER	C

PROPORTIONS USED

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

GROUNDWATER

- ▼ Observed Groundwater
- EXCAVATION EFFORT**
- E — EASY
- M — MODERATE
- D — DIFFICULT

TEST PIT FIELD LOG 1 of 2



SEA Consultants Inc

PROJECT: DEVENS

TEST PIT NO.: TP-27

LOCATION SA-40

DATE: 5/1/96

GROUND ELEVATION: 261.54

CONTRACTOR: MORZ

WEATHER: SUN 60S

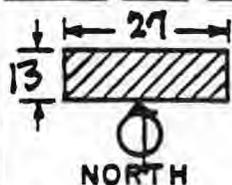
LOG PREPARED BY: TAT

EQUIPMENT: 320 EX

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD COUNT	REMRK. NO.
0		DEBRIS / ROOTS			
1'		↓ YELLOW MEDIUM / COARSE SAND & GRAVEL WITH SOME CONC / BRICK SAND & GRAVEL SAND & GRAVEL WITH SOME PLASTIC / CONC	E	A	
2'			E	A	
3'			E	A	
4'			E	A	
5'			E	A	
6'			E	A	
7'			E	A	
8'			E	A	
9'			E	A	
10'			E	A	
11'		E	A		
12'		E	A		
13'		E	A		
14'		M	A		

REMARKS:

TEST PIT PLAN



VOLUME:

LEGEND:

BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION
6" - 18"	A
18" - 36"	B
36" AND LARGER	C

PROPORTIONS USED

PROPORTION	PERCENTAGE
TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

GROUNDWATER

▼ Observed Groundwater EXCAVATION EFFORT

E — EASY
M — MODERATE
D — DIFFICULT

TEST PIT FIELD LOG 2 of 2



SEA Consultants Inc.

PROJECT: DEVENS

TEST PIT NO.: TP-27

LOCATION SA-40

DATE: 5/1/96

GROUND ELEVATION: 261.54

CONTRACTOR: MDC

WEATHER: SUN 60°

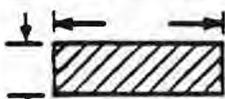
LOG PREPARED BY: TAT

EQUIPMENT: 330

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD COUNT	REMRK. NO.
0/14					
1/15		AS ABOVE			
2/16		SAND & GRAVEL WITH SOME WOOD & STUMPS			
3/17					
4/18					
5/19					
6/20					
7/21					
8/22		GREY SAND & SILT WITH WOOD / BRICK / CONC / METAL PIPE - MOIST			
9/23					
10/24					
11/25		END OF PIT - 26' (LIMIT OF MACHINE) NO WATER ENCOUNTERED			
12/26					
13/27					
14'					

REMARKS:

TEST PIT PLAN



NORTH

VOLUME = _____ cu.yd.

LEGEND:

BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION
6" - 18"	A
18" - 36"	B
36" AND LARGER	C

PROPORTIONS USED

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

GROUNDWATER

- ▼ Observed Groundwater
- EXCAVATION EFFORT**
- E — EASY
- M — MODERATE
- D — DIFFICULT

TEST PIT FIELD LOG 142



SEA Consultants Inc

PROJECT: DEVENS

TEST PIT NO.: TP-28

LOCATION SA-40

DATE: 5/1/96

GROUND ELEVATION: 265.51

CONTRACTOR: MDR

WEATHER: SUN 60°

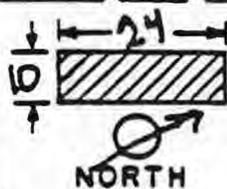
LOG PREPARED BY: TAT

EQUIPMENT: 330 EXCAV

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD. COUNT	REMRK. NO.
0					
1'		ORLUMBS			
2'		DK BROWN GRAVEL & SAND MIXED WITH CONC / LUMBER	M	A	
3'					
4'			M	A	
5'					
6'			M	A	
7'		BROWN MEDIUM / COARSE SAND & GRAVEL			
8'			M	A	
9'					
10'					
11'		MOSTLY SAND & GRAVEL WITH STUMPS / LOGS	M	A	
12'					
13'			M	A	
14'					

REMARKS:

TEST PIT PLAN



VOLUME = _____ cu.yd.

LEGEND:

BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION
6" - 18"	A
18" - 36"	B
36" AND LARGER	C

PROPORTIONS USED

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

GROUNDWATER

- ▼ Observed Groundwater
- EXCAVATION EFFORT**
- E — EASY
- M — MODERATE
- D — DIFFICULT

TEST PIT FIELD LOG 2 of 2



SEA Consultants Inc.

PROJECT: Devens

TEST PIT NO.: TP-28

LOCATION SA-4D

DATE: 5/1/96

GROUND ELEVATION: 265.51

CONTRACTOR: MDR

WEATHER: SUN 60°

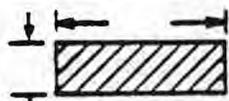
LOG PREPARED BY: TAT

EQUIPMENT: 330 Exc

DEPTH	STRATA CHANGE	SOIL DESCRIPTION	EXCAV. EFFORT	BOULD. COUNT	REMRK. NO.	
0/4		AS ABOVE ↓ SAND & GRAVEL WITH SOME CON FOOTINGS & STUMPS	M	A		
1/5						
2/6						
3/7				M	A	
4/8						
5/9				M	A	
6/20						
7/21				M	A	
8/22						
9/23			PIECE OF PVC PIPE	M	A	
10/24		GREY MEDIUM/FINE SAND & SILT (NATIVE)				
11'		END OF PIT ~ 24'				
12'		WATER NOT ENCOUNTERED				
13'						
14'						

REMARKS:

TEST PIT PLAN



NORTH

VOLUME = _____ cu.yd.

LEGEND:

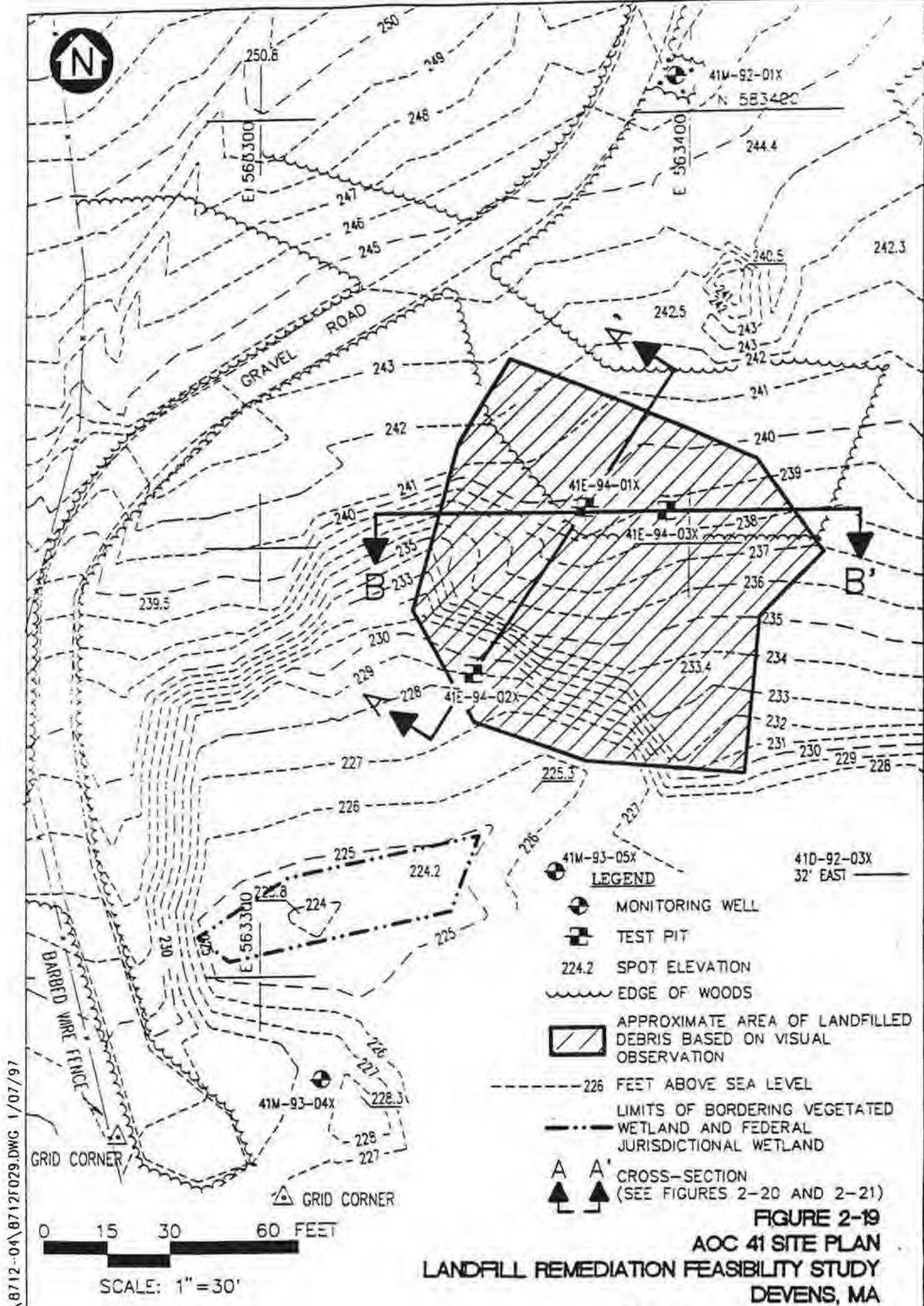
BOULDER SIZE RANGE CLASSIFICATION	COUNT LETTER DESIGNATION
6" - 18"	A
18" - 36"	B
36" AND LARGER	C

PROPORTIONS USED

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	35 - 50%

GROUNDWATER

- ▼ Observed Groundwater
- EXCAVATION EFFORT**
- E — EASY
- M — MODERATE
- D — DIFFICULT



\8712-04\8712F029.DWG 1/07/97

0 15 30 60 FEET
 SCALE: 1" = 30'

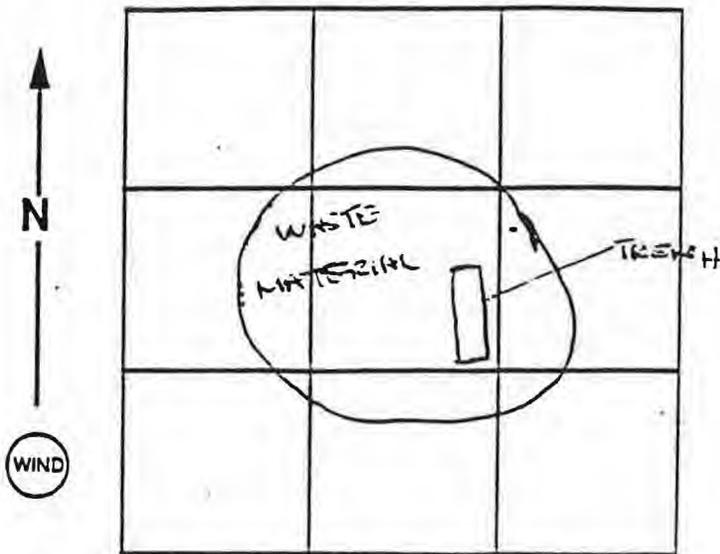
- LEGEND**
- MONITORING WELL
 - TEST PIT
 - 224.2 SPOT ELEVATION
 - EDGE OF WOODS
 - APPROXIMATE AREA OF LANDFILLED DEBRIS BASED ON VISUAL OBSERVATION
 - - - - 226 FEET ABOVE SEA LEVEL
 - · - · - LIMITS OF BORDERING VEGETATED WETLAND AND FEDERAL JURISDICTIONAL WETLAND
 - CROSS-SECTION (SEE FIGURES 2-20 AND 2-21)

FIGURE 2-19
AOC 41 SITE PLAN
LANDFILL REMEDIATION FEASIBILITY STUDY
DEVENS, MA

TEST PIT RECORD

Study Area: D-RANGE
 Well/Boring: 41E-94-01X Date: 10-4-94 Time: 1245 End: 1430
 Coordinates: _____ Grid Element: _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES:

DIMENSIONS 13 FT. LONG, 2 FT. WIDE,
1 FT. DEEP.

SCATTERED BEERCANS (CONICAL TOP)
AND GLASS BOTTLES ON GROUND
SURFACE.

Crew Members:

1. BOB BLANDIERO
2. BRUCE MCE
3. DAVE BEAN!
4. _____
5. _____
6. _____

Monitor Equipment:

PI Meter _____
 Explosive Gas Y N
 Avail. Oxygen Y N
 OVA Y N
 Other _____

Photographs, Roll _____

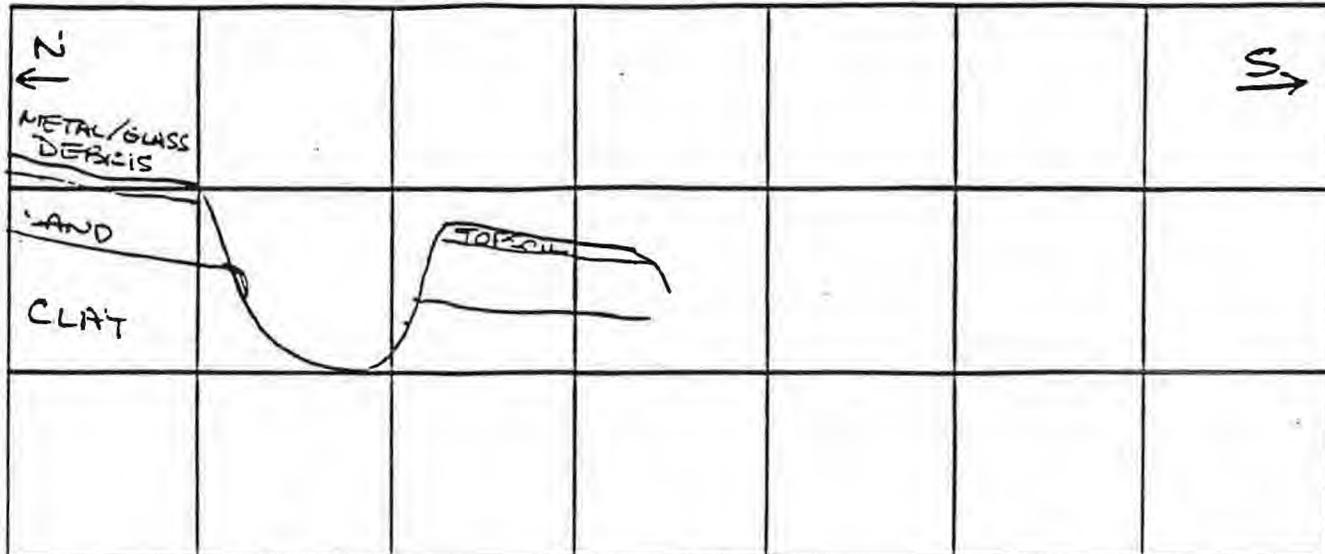
Exposure _____

TEST PIT RECORD

Profile Along Test Pit: _____

Study Area: FT DEVENS - D-Road

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 10 FT.
DEPTH (FT) _____

NOTES:

0-1' TOPSOIL ROOTS.
1-4' SAND FINE COARSING
DOWNWARDS, YELLOW BROWN,
DAMP-MOIST (PERCHED WATER
AT 4 FT.) TRACE GRAVEL, NO ODOR
OR STAINING APPARENT.
4-10' CLAY, STIFF-PLASTIC,
LIGHT GRAY AND LIGHT YELLOW BROWN,
DRY-MOIST, TRACE GRAVEL, NO
ODOR OR STAIN.

NO FILL.

TRENCH BACK FILLED ON 10/5/94

no.	Int. Ser. No.	Depth (Ft.)	HD. SP VOA PPM
S-1	TP40104S	2	0.6
S-2	TP40104S	4	0.3
S-3	TP40104S	10	0.2
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK. Pg. 56-57

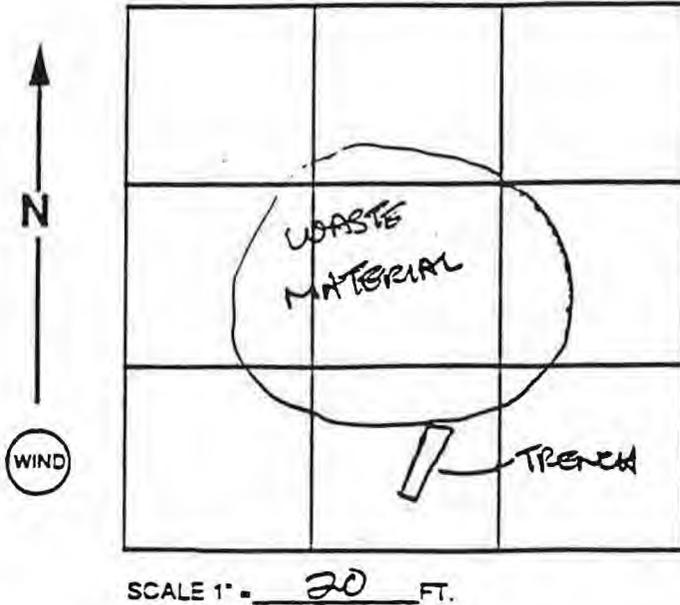
ATTACHMENTS

SIGNATURE: D.H. Betan

TEST PIT RECORD

Study Area: D-RANGE
 Well/Boring: 41E-94-02X Date: 10-4-94 Time: 1530 End: 1650
 Coordinates: _____ Grid Element: _____

SKETCH MAP OF TEST PIT SITE



NOTES: _____

DIMENSIONS: 18 FT. LONG, 2 FT. WIDE,
9.5 FT. DEEP

SCATTERED METAL DEBRIS ON GROUND
(ALTI PARTS, WATER CANS, ETC...)

Crew Members:

1. BOB BLANDFORD
2. BRUCE MOE
3. DAVE BELAN
4. _____
5. _____
6. _____

Monitor Equipment:

PI Meter Y N
 Explosive Gas Y N
 Avail. Oxygen Y N
 OVA Y N
 Other _____

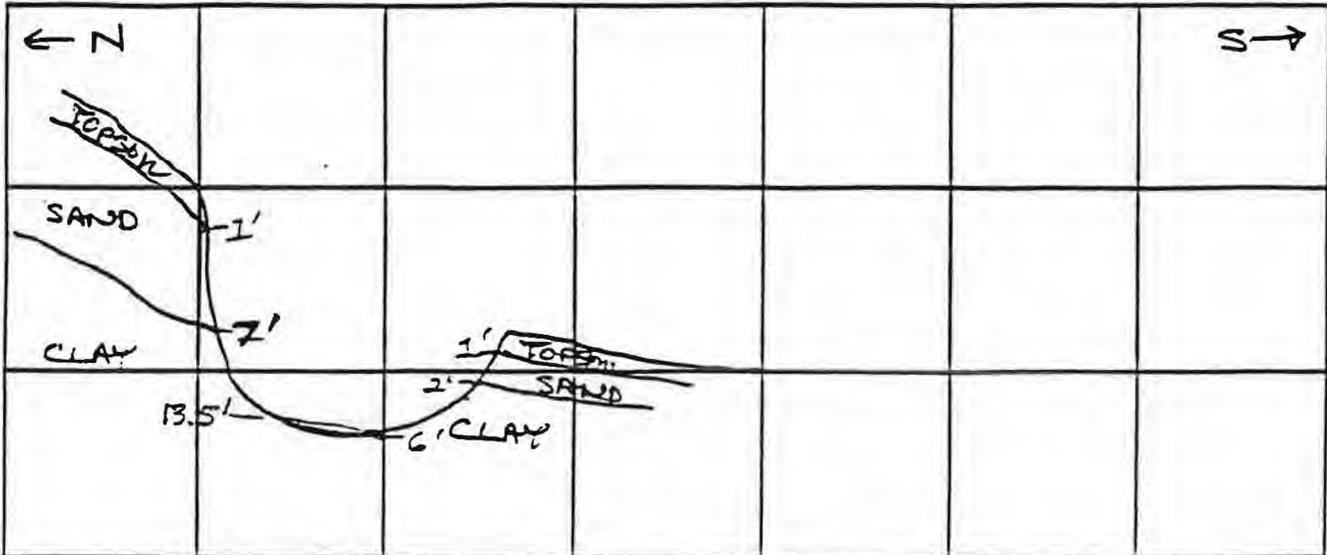
Photographs, Roll _____
 Exposure _____

FIGURE 4-1
 TEST PIT RECORD
 PROJECT OPERATIONS PLAN
 FORT DEVENS, MASSACHUSETTS
 ABB Environmental Services, Inc.

Profile Along Test Pit: _____

Study Area: FT. DEVENS D-RANGE

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 10 FT.
DEPTH (FT) _____

NOTES:

0-1' - TOPSOIL, ROOTS
 1-(2-7') - SAND, FINE, SOME COARSE INK
 DOWNWARDS, YELLOW BROWN, DAMP,
 TRACE GRAVEL, NO ODOR OR STAIN.
 (2-7')-(6-13.5') CLAY, STIFF - SLIGHTLY
 PLASTIC, LIGHT GRAY, SOME LIGHT YELLOW
 BROWN. DRW - ^{DAMP} DAMP, TRACE GRAVEL,
 NO ODOR OR STAIN. MOIST AT TRENCH
 BOTTOM.
 NO FILL.

TRENCH BACKFILLED ON 10/5/94

no.	Int. Ser. No.	Depth (Ft)	HD SP VOA PPM
S-1	TP402025	2	0.3
S-2	TP402095	9.5	0.3
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg 57-58,60

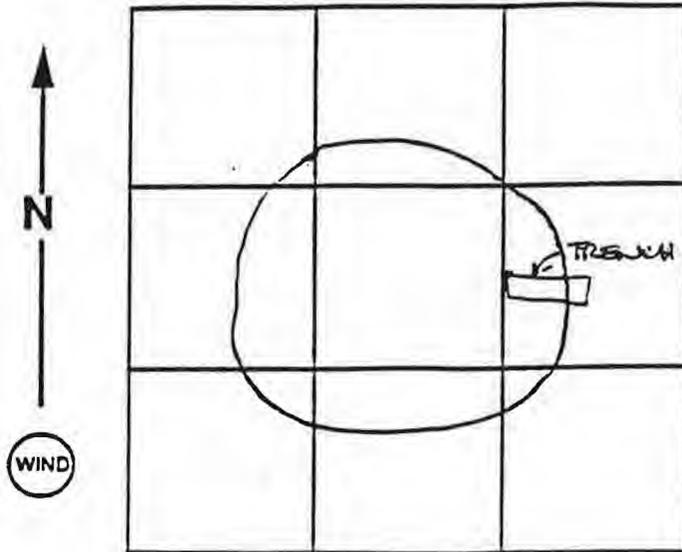
ATTACHMENTS _____

SIGNATURE David N. Belan

TEST PIT RECORD

Study Area: D-RANGE
 Well/Boring: 41E-94-03X Date: 10-5-94 Time: _____ End: _____
 Coordinates: _____ Grid Element: _____

SKETCH MAP OF TEST PIT SITE



SCALE 1" = 20 FT.

NOTES: _____
DIMENSIONS: 18 FT. LONG, 2 FT. WIDE
11 FT. DEEP.

SCATTERED BEER CANS (CONICAL TOP)
AND GLASS BOTTLES ON GROUND
SURFACE.

Crew Members:

1. BOB BLUMFORD
2. BRUCE MOE
3. DAVE BELAN
4. _____
5. _____
6. _____

Monitor Equipment:

PI Meter	<u>Y</u>	N
Explosive Gas	Y	N
Avail. Oxygen	Y	N
OVA	Y	N
Other	_____	_____

Photographs, Roll _____

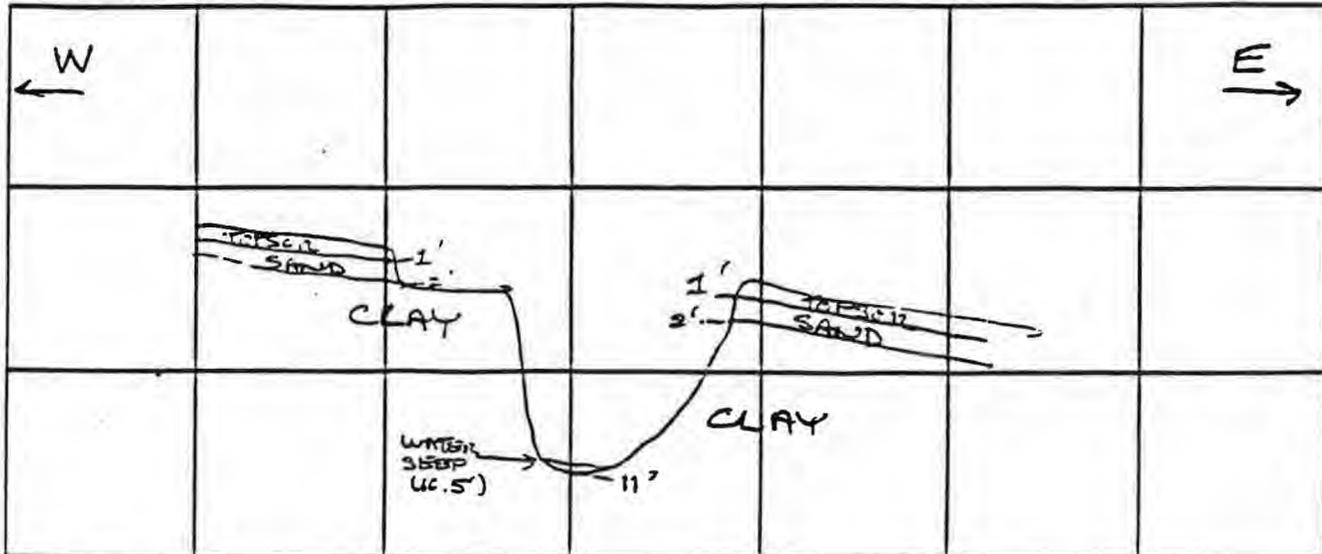
Exposure _____

TEST PIT RECORD

Profile Along Test Pit: _____

Study Area: FT. DEVENS D-RANGE

SKETCH MAP OF TEST PIT PROFILE



SCALE 1" = 10 FT.
DEPTH (FT). _____

NOTES:

0-1' TOPSOIL ROOTS.
1-2' SAND, FINE-MEDIUM, YELLOW BROWN DAMP, TRACE GRAVEL, NO ODOR OR STAIN.
2-11' CLAY, STIFF-SLIGHTLY PLASTIC LIGHT GRAY, LITTLE LIGHT YELLOW BROWN, DRY-DAMP, TRACE GRAVEL, NO ODOR OR STAIN. SLIGHT WATER ACCUMULATION AT 10.5 FEET.

NO FILL.

TRENCH BACKFILLED ON 10/5/94.

no.	Int. Ser. No.	Depth (Fl.)	HD. SP. VOA PPM
S-1	—	—	—
S-2	—	—	—
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			

REFERENCE: FIELD BOOK, Pg. 61-63

ATTACHMENTS _____

SIGNATURE: David H. Belan

FIGURE 4-1 (CONT.)
 TEST PIT RECORD
 PROJECT OPERATIONS PLAN
 FORT DEVENS, MASSACHUSETTS

AOC 9
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Health Standard (Region III RBC) (µg/g)	Site Specific Health Standard (MCP 8-2) (µg/g)	No of Sample Locations where Site Specific Health Standard is Exceeded
Surface Soil								
Arsenic	2	2/2	20	19	21	0.97 ¹	30	0
Sediment								
Arsenic	3	3/3	14	7.6	NA	0.97 ¹	30	0
Subsurface Soil								
Arsenic	3	1/7	21	16	21	1.6 ²	30	0
Beryllium	3	3/7	1	0.64	0.347	0.67 ²	0.8	3
Benzo(a)anthracene	3	3/7	40	7.04	NA	2.7 ²	0.7	3
Benzo(a)pyrene	3	2/7	40	7.48	NA	0.39 ²	0.7	2
Benzo(b)fluoranthene	3	2/7	40	7.4	NA	3.2 ²	0.7	2
Benzo(g,h,i)perylene	3	2/7	20	4.34	NA	18 ²	30	0
Benzo(k)fluoranthene	3	3/7	30	4.9	NA	7.4 ²	0.7	3
Indeno(1,2,3-cd)pyrene	3	2/7	20	4.54	NA	1.4 ²	0.7	2

1. Region III Residential Soil Risk Based Concentration (RBC)

2. Region III Commercial/Industrial Soil RBC

This table is a summary of the Preliminary Risk Evaluation presented in the January 1996 Final SI Report.

(µg/g) = micrograms per gram

MCP = Massachusetts Contingency Plan

AOC 9
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standards (µg/L)	Region III Tap Water Standard (µg/L)	MCP GW-1 (µg/L)
Groundwater									
Aluminum	5 ¹	10/10	70400	20000	6870	50-200	50-200	37000	NA
Arsenic	5 ¹	10/10	220	78.76	10.5	50	50	0.045	400
Chromium (total)	5 ¹	9/10	1040	155	14.7	100	100	37000	2000
Cobalt	5 ¹	5/10	93.7	35.2	25	NA	NA	2200	NA
Iron	5 ¹	10/10	90000	32767	9100	300	300	11000	NA
Lead	5 ¹	10/10	81.3	25.5	4.25	15	15	NA	30
Manganese	5 ¹	10/10	3270	1144	291	50	50	840	NA
Nickel	5 ¹	6/10	369	104	34.3	100	100	730	80
Surface Water									
Bis(2-ethylhexyl)phthalate	3	1/3	6.8	3.87	NA	6	NA	NA	30
Iron	3	3/3	5460	3133	NA	300	300	11000	NA

1. Two rounds sampled for each well

This table is a summary of the Preliminary Risk Evaluation data presented in the January 1998 Final SI Report.

(µg/L) = micrograms per liter

MCP = Massachusetts Contingency Plan

MCL = maximum contaminant level

AOC 9
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detections	Maximum Concentration ($\mu\text{g/g}$)	Average Concentration ($\mu\text{g/g}$)	Background Concentration ($\mu\text{g/g}$)	Ecological Benchmark ($\mu\text{g/g}$)	Number of Sample Locations Where Ecological Benchmark is Exceeded
Surface Soil							
Lead	2	2/2	81	44	34.4	48.4	1
Sediment							
Arsenic	3	3/3	14	7.6	NA	5	2
Lead	3	3/3	48	27	NA	27	1

This table is a summary of the ecological risk data as reported in the January 1996 Revised Final Site Investigation Report, Data Item A009.

Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors.

The ecological benchmarks for sediment analytes were derived as the lowest of available criteria and other guidance values. These values were used for the purpose of eliminating areas and/or analytes that do not represent an ecological risk. Conversely, the exceedance of these conservative screening values does not necessarily imply

that ecological impacts will occur, because they are not based on the site-specific attributes that determine exposure and toxicological response (e.g., sensitivity of resident organisms).

$\mu\text{g/g}$ = micrograms per gram

AOC 9
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standards (µg/L)	Ecological Benchmark (µg/L)	Number of Sample Locations Where Ecological Benchmark is Exceeded
Surface Water									
Aluminum	3	1/3	123	123	733	50-200	50-200	87	1
Iron	3	3/3	5460	3133	1630	300	300	1000	3
Lead	3	3/3	23	2.3	8.68	15	15	1.4	3

This table is a summary of the ecological risk data as reported in the January 1996 Revised Final Site Investigation Report, Data Item A009.

Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors.

µg/L = micrograms per liter

MCL = maximum contaminant level

AOC 11
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Health Standard (Region III RBC) (µg/g)	Site Specific Health Standard (MCP S-2) (µg/g)	No of Sample Locations where Site Specific Health Standard is Exceeded
Surface Soil								
Benzo(a)anthracene	16	4/16	12	2.3	NA	0.88	1	7
Benzo(a)pyrene	16	4/16	8.3	1.2	NA	0.088	0.7	4
Benzo(b)fluoranthene	16	13/16	12.0	2.7	NA	0.88	1	9
Dibenzo(a,h)anthracene	16	1/16	0.670	0.042	NA	0.088	0.7	0
Phenanthrene	16	14/16	11	1.8	NA	NA	100	0
4,4' - DDT	16	15/16	8	1.4	5.60	1.9	2	2
Chlordane	16	3/16	0.279	0.032	0.136	1.8	2	0
Arsenic	16	16/16	22.9	13.7	19.0	0.43	30	0
Cadmium	16	3/16	4.5	0.6	1.28	39	80	0
Chromium	16	16/16	78.1	24.2	33.0	78000	2500	0
Manganese	16	16/16	407	193	380	1800	NA	NA
Mercury	16	14/16	6.5	1.2	0.11	23	60	0
Vanadium	16	16/16	27.4	16.1	32.3	550	2000	0
Sediment								
Benzo(a)anthracene	15	8/15	1.8	0.43	0.32	0.88	1	2
Benzo(b)fluoranthene	15	1/15	2.5	0.17	NA	0.88	1	1
Bis(2-ethylhexyl)phthalate	15	5/15	70.0	5.3	1.60	48	300	0
PCB - 1016	15	2/15	1.08	0.11	NA	5.5	NA	NA
PCB - 1254	15	3/15	0.837	0.11	NA	1.6	NA	NA
PCB - 1260	15	2/15	1.18	0.10	NA	NA	NA	NA
Antimony	15	1/15	163	10.9	NA	31	40	1
Arsenic	15	11/15	61.1	18.1	3.06	0.43	30	4
Beryllium	15	1/15	1.96	0.13	NA	0.15	0.8	1
Cadmium	15	13/15	303	41.2	117	39	80	1
Chromium	15	15/15	435	111	102	78000	2500	0
Manganese	15	12/15	512	147	142	1800	NA	NA
Mercury	15	15/15	11.0	2.7	2.52	23	60	0
Vanadium	15	15/15	69.2	28.8	44.5	550	2000	0
Zinc	15	15/15	2155	563	716	23000	2500	0
Subsurface Soil								
Arsenic	13	25/26	230	26.4	NA	0.43	30	3
Barium	13	26/26	205	56.1	NA	5500	2500	0
Beryllium	13	1/26	0.828	0.032	NA	0.15	0.8	1
Copper	13	21/28	3300	140	NA	270000	NA	NA
Iron	13	26/26	43200	15000	NA	23000	NA	NA
Dieldrin	13	10/26	0.0580	0.011	NA	0.04	0.04	2
DDT	13	19/26	2.80	0.7	NA	1.9	2	2
Benzo(a)anthracene	13	13/26	6.00	1.5	NA	0.88	1	9
Benzo(b)fluoranthene	13	5/26	5.60	0.61	NA	0.88	1	5

AOC 11
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standard (µg/L)	Region III Tap Water Standard (µg/L)	MCP GW-3 (µg/L)
Groundwater¹									
Arsenic	5	8/10	260	81.1	NA	50	50	0.045	400
Beryllium	5	4/10	6.14	1.5	NA	4	4	0.018	50
Iron	5	10/10	56900	18000	NA	300	300	11000	NA
Manganese	5	10/10	6090	1800	NA	50	50	840	NA
Bis(2-ethylhexyl)phthalate	5	1/10	25	2.5	NA	6	NA	4.8	30
Surface Water									
Bis(2-ethylhexyl)phthalate	15	3/15	73.0	8.7	NA	6	NA	4.8	30
Antimony	15	3/15	155	20.7	NA	6	6	15	300
Arsenic	15	11/15	75.6	17.5	12.1	50	50	0.045	400
Barium	15	15/15	2730	270	360	2000	2000	2600	30000
Beryllium	15	7/15	7.77	1.64	NA	4	4	0.018	50
Cadmium	15	6/15	147	22.9	42.8	5	5	18	10
Chromium	15	7/15	301	50.2	68.2	100	100	37000	2000
Manganese	15	15/15	2090	527	255	50	50	840	NA
Silver	15	3/15	78.7	8.46	NA	100	100	180	7
Vanadium	15	4/15	127	18.9	43.9	NA	NA	260	2000
Zinc	15	10/15	12000	1500	392	55	5000	11000	900

1. 5 wells sampled in 2 rounds.

This table is a summary of the Human Health Risk Assessment presented in the April 1995 Draft RI Report.

(µg/g) = micrograms per gram

(µg/L) = micrograms per liter

RBC = risk based concentrations

MCP = Massachusetts Contingency Plan

MCL = maximum contaminant level

AOC 11
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Criteria (µg/g)	Number of Sample Locations Where Ecological Benchmark is Exceeded
Surface Soils							
Barium	16	16/16	131	43.3	54	41	3
Cadmium	16	3/16	4.5	1.08	1.28	0.44	3
Copper	16	16/16	49.8	18.9	13.5	28	3
Iron	16	16/16	18300	14200	18000	NA	NA
Calcium	16	16/16	3900	2140	810	NA	NA
Lead	16	16/16	2000	482	48	4	16
Mercury	16	14/16	6.5	1	0.11	3.6	1
Isodrin	16	1/16	0.00616	0.00179	NA	NA	NA
ppDDT	16	15/16	8	1.03	5.6	1.07	5
Benzo (a) anthracene	16	14/16	12	2.25	NA	8.9	1
Benzo (a) pyrene	16	4/16	8.3	1.71	NA	5.5	1
1,1,1-Trichloroethane	16	3/16	0.36	0.133	NA	NA	NA
Total Petroleum Hydrocarbons	16	14/16	1400	771	NA	NA	NA
Wetland Soils (Northern and Southern Sediments)							
Aluminum	10	10/10	22400	14260	NA	1700	10
Arsenic	10	9/10	61.1	21.7	NA	5	8
Calcium	10	10/10	14900	9940	NA	NA	NA
Chromium	10	10/10	171	88	NA	26	10
Copper	10	10/10	296	117	NA	16	10
Iron	10	10/10	94200	26100	NA	2000	10
Lead	10	10/10	930	337	NA	4	10
Magnesium	10	10/10	3050	2135	NA	NA	NA
Mercury	10	10/10	3.4	2.04	NA	0.11	10
Nickel	10	6/10	28.5	13.9	NA	16	5
Potassium	10	5/10	1530	595	NA	NA	NA
Selenium	10	3/10	5.45	1.4	NA	0.48	3
Silver	10	1/10	5.4	0.54	NA	1	1
Sodium	10	7/10	587	280	NA	NA	NA
Zinc	10	10/10	2160	663	NA	85	10
Dieldrin	10	5/10	0.047	0.012	NA	0.00002	4
Endosulfan II	10	2/10	0.0323	0.0045	NA	0.003	2
ppDDE	10	9/10	0.624	0.243	NA	0.002	9
ppDDD	10	10/10	2.3	0.9	NA	0.002	9
ppDDT	10	4/10	0.299	0.09	NA	0.001	5
Benzo (a) Anthracene	10	4/10	1.15	0.26	NA	0.23	4
Fluoranthene	10	5/10	1.7	0.43	NA	0.6	4
Phenanthrene	10	6/10	2.1	0.55	NA	0.225	5
Pyrene	10	6/10	3.3	0.9	NA	0.35	6
Total Petroleum Hydrocarbons	10	10/10	2100	876	NA	NA	NA

AOC 11
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Criteria (µg/g)	Number of Sample Locations Where Ecological Benchmark is Exceeded
Nashua River Sediment							
Aluminum	5	5/5	24100	13922	10500	1700	5
Antimony	5	1/5	163	32.6	NA	2	1
Arsenic	5	5/5	20.5	11	26	5	4
Barium	5	5/5	659	216.3	26.2	41	4
Beryllium	5	1/5	1.96	0.39	NA	0.88	1
Cadmium	5	5/5	303	71.9	0.5	0.44	5
Calcium	5	5/5	4710	2468	1100	NA	NA
Chromium	5	5/5	435	157	15.9	28	4
Copper	5	5/5	470	200	14.3	16	5
Iron	5	5/5	21300	16560	7900	2000	5
Lead	5	5/5	760	299	12.5	4	5
Magnesium	5	5/5	3390	2618	3100	NA	NA
Manganese	5	5/5	512	253	600	428	1
Mercury	5	5/5	11	4.15	0.05	0.11	5
Nickel	5	5/5	45.7	20.52	18.6	16	3
Potassium	5	5/5	1980	1236	292	NA	NA
Selenium	5	1/5	28.1	5.62	0.2	0.48	1
Silver	5	4/5	19.2	8.0	0.2	1	4
Sodium	5	5/5	250	179	289	NA	NA
Vanadium	5	5/5	69.2	29.4	13.3	10	5
Zinc	5	5/5	724	361	55.6	85	4
Dieldrin	5	2/5	0.0333	0.009	NA	0.00002	2
Endosulfan I	5	3/5	0.0312	0.0125	NA	0.0003	3
Endosulfan II	5	4/5	0.00993	0.0037	NA	0.0003	4
Endosulfan Sulfate	2	1/2	0.00678	0.00337	NA	0.0003	1
Heptachlor	5	3/5	0.0153	0.0071	NA	0.0003	3
Heptachlor Epoxide	5	4/5	0.0372	0.016	NA	0.0003	4
PCB 1016	5	2/5	1.08	0.329	NA	0.007	2
PCB 1254	5	1/5	0.274	0.055	NA	0.06	1
PCB 1260	5	2/5	1.18	0.307	NA	0.005	2
ppDDD	5	5/5	0.2	0.077	NA	0.002	5
ppDDE	5	4/5	0.12	0.032	NA	0.002	4
ppDDT	5	4/5	0.22	0.063	NA	0.001	4
2-Methylnaphthalene	5	1/5	0.15	0.03	NA	0.065	1
Anthracene	5	1/5	4.8	0.96	NA	0.085	1
Benzo (a) anthracene	5	4/5	1.8	0.76	NA	0.23	3
Benzo (b) fluoranthene	5	3/5	2.5	0.85	NA	2	1

AOC 11
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration ($\mu\text{g/g}$)	Average Concentration ($\mu\text{g/g}$)	Background Concentration ($\mu\text{g/g}$)	Screening Criteria ($\mu\text{g/g}$)	Number of Sample Locations Where Ecological Benchmark is Exceeded
<u>Nashua River Sediment</u>							
Bis (2-Ethylhexyl) Phthalate	5	5/5	70	16	NA	1.19	5
Chrysene	5	4/5	26	1.1	NA	0.4	3
Fluoranthrene	5	5/5	13	3.5	NA	0.6	4
Flourene	5	2/5	2.1	0.5	NA	0.035	2
Phenanthrene	5	5/5	21	5.59	NA	0.225	5
Pyrene	5	5/5	5	2.9	NA	0.35	5
Total Petroleum Hydrocarbons	5	5/5	3300	1498	NA	NA	NA

This table is a summary of the ecological risk data as reported in the January 1996 Revised Final Site Investigation Report, Data Item A009.

Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors.

The ecological benchmarks for sediment analytes were derived as the lowest of available criteria and other guidance values. These values were used for the purpose of eliminating areas and/or analytes that do not represent an ecological risk. Conversely, the exceedance of these conservative screening values does not necessarily imply that ecological impacts will occur, because they are not based on the site-specific attributes that determine exposure and toxicological response (e.g., sensitivity of resident organisms).

$\mu\text{g/g}$ = micrograms per gram

AOC 11
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standard (µg/L)	Screening Criteria (µg/L)	Number of Locations Where Screening Criteria is Exceeded (µg/L)
Northern Wetland Surface Water									
Aluminum	5	4/5	26900	11340	733	50-200	50-200	87	4
Antimony	5	2/5	155	49.52	NA	6	6	30	2
Barium	5	5/5	2730	705	40.1	2000	2000	NA	5
Beryllium	5	4/5	7.77	3.2	5	4	4	5.3	1
Cadmium	5	4/5	147	44.9	4	5	5	2.33	4
Calcium	5	5/5	280000	120400	20600	NA	NA	NA	5
Chromium	5	4/5	301	114	6	100	100	11	4
Copper	5	4/5	578	217	8.1	1300	1300	25.8	4
Iron	5	5/5	750000	325195	1630	300	300	1000	4
Lead	5	4/5	1800	434	8.68	15	15	10.2	4
Magnesium	5	5/5	13400	8364	3340	NA	NA	NA	5
Manganese	5	5/5	2090	1272	357	50	50	NA	5
Mercury	5	4/5	2.5	1.21	24	2	2	0.012	4
Potassium	5	4/5	10100	4624	3150	NA	NA	NA	4
Silver	5	2/5	78.7	21.1	NA	100	100	0.12	2
Sodium	5	5/5	14300	10604	36300	NA	NA	NA	5
Thallium	5	2/5	513	136	NA	2	2	40	2
Vanadium	5	3/5	127	40.1	11	NA	NA	NA	3
Zinc	5	5/5	12000	3344	33.4	5000	5000	230	4
Endrin	5	1/5	0.0479	0.0096	NA	2	2	0.002	1
Heptachlor	5	1/5	0.0219	0.0044	NA	0.4	0.4	0.003	1
Heptachlor Epoxide	5	1/5	0.0212	0.0042	NA	0.2	0.2	0.003	1
Isodrin	5	1/5	0.00793	0.0016	NA	NA	NA	NA	1
ppDDD	5	3/5	0.38	0.112	NA	NA	NA	0.001	3
ppDDE	5	3/5	0.152	0.0474	NA	NA	NA	0.001	3
ppDDT	5	3/5	0.43	0.099	NA	NA	NA	0.001	3
Total Petroleum Hydrocarbons	5	2/5	260	94	NA	NA	NA	NA	3

AOC 11
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standard (µg/L)	Screening Criteria (µg/L)	Number of Locations Where Screening Criteria is Exceeded (µg/L)
Southern Wetland Surface Water									
Aluminum	5	4/5	16000	5283	733	50-200	50-200	87	4
Antimony	5	1/5	62.5	12.5	NA	6	6	30	1
Beryllium	5	3/5	5.86	1.71	5	4	4	5.3	1
Cadmium	5	2/5	101	23.7	4	5	5	1.58	2
Calcium	5	5/5	112000	52900	20600	NA	NA	NA	5
Chromium	5	3/5	135	37.0	6	100	100	11	3
Copper	5	3/5	269	71.96	8.1	1300	1300	16.7	3
Iron	5	4/5	580000	153786	1630	300	300	1000	4
Lead	5	4/5	610	194	8.68	15	15	5.33	4
Magnesium	5	5/5	7310	5298	3340	NA	NA	NA	5
Manganese	5	5/5	562	163	357	50	50	NA	5
Potassium	5	5/5	7140	4008	3150	NA	NA	NA	5
Selenium	5	1/5	6.34	1.268	3.02	50	50	5	1
Silver	5	1/5	21.3	4.26	NA	100	100	0.12	1
Sodium	5	5/5	27400	13062	36300	NA	NA	NA	5
Vanadium	5	1/5	82.8	16.56	11	NA	NA	NA	1
Zinc	5	4/5	4590	1148	33.4	5000	5000	149	3
Dieldrin	5	1/5	0.016	0.0032	NA	NA	NA	0.001	1
ppDDD	5	4/5	0.84	0.2398	NA	NA	NA	0.001	4
ppDDE	5	4/5	0.146	0.0452	NA	NA	NA	0.001	4
ppDDT	5	3/5	0.0788	0.02854	NA	NA	NA	0.001	3
4-Methylphenol	5	1/5	32	6.4	NA	NA	NA	NA	1
1,1,1-Trichloroethane	5	2/5	2.6	2.1	NA	200	200	NA	2
Total Petroleum Hydrocarbons	5	2/5	220	74	NA	NA	NA	NA	4
Nashua River Surface Water									
Aluminum	5	5/5	218	152.8	733	50-200	50-200	87	5
Calcium	5	5/5	16900	15680	20600	NA	NA	NA	5
Lead	5	2/5	5.93	2.27	8.68	15	15	1.32	2
Magnesium	5	5/5	2460	2260	3340	NA	NA	NA	5
Potassium	5	5/5	4860	3968	3150	NA	NA	NA	5
Sodium	5	5/5	35500	32760	36300	NA	NA	NA	5

This table is a summary of the ecological risk data as reported in the January 1996 Revised Final Site Investigation Report, Data Item A009. Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors
µg/L = micrograms per liter
MCL = maximum contaminant level

SA 12
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration ($\mu\text{g/g}$)	Average Concentration ($\mu\text{g/g}$)	Background Concentration ($\mu\text{g/g}$)	Screening Health Standard (Region III RBC) ($\mu\text{g/g}$)	Site Specific Health Standard (MCP 8-2) ($\mu\text{g/g}$)	No of Sample Locations where Site Specific Health Standard is Exceeded
Surface Soil								
Arsenic	8	9/9	21	10	21	0.36	30	0
Beryllium	8	3/9	0.74	0.5	0.347	0.15	0.8	0
Lead	8	9/9	880	121.9	48.4	500	600	1
Benzo(b)fluoranthene	8	1/9	1	0.22	NA	0.87	0.7	1
Chrysene	8	1/9	0.8	0.17	NA	0.7	0.7	1
Aroclor-1254	8	1/9	6.9	0.84	NA	0.0083	2	1
TPH	8	4/9	1350	177	NA	500	500	1
Sediment								
Arsenic	6	6/6	22	15.83	NA	0.36	30	0
Beryllium	6	3/6	1.58	0.74	NA	0.15	0.8	3
Manganese	6	6/6	553	288	NA	390	NA	NA

This table is a summary of the Preliminary Risk Evaluation data presented in the October 1995 SI Report.

($\mu\text{g/g}$) = micrograms per gram

RBC = risk based concentrations

MCP = Massachusetts Contingency Plan

SA 12
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standards (µg/L)	Region #1 Tap Water Standard (µg/L)	MCP GW-3 (µg/L)
Groundwater									
Bis(2-ethylhexyl)phthalate	5	1/6	9.1	3.52	NA	6	NA	NA	30
Aluminum	5	6/6	25200	10486	6870	50-200	50-200	37000	NA
Antimony	5	1/6	6.96	2.41	3.03	6	6	15	300
Beryllium	5	1/6	6.63	3.12	5	4	4	0.018	50
Cadmium	5	1/6	12.1	3.68	4.01	5	5	18	10
Iron	5	6/6	40200	16843	9100	300	300	11000	NA
Lead	5	6/6	500	125.8	4.25	15	15	NA	30
Manganese	5	6/6	990	281.7	291	50	50	840	NA

This table is a summary of the Preliminary Risk Evaluation data presented in the October 1995 SI Report.

(µg/L) = micrograms per liter

MCP = Massachusetts Contingency Plan

MCL = maximum contaminant level

SA 12
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Ecological Benchmark (µg/g)	Number of Sample Locations Where Ecological Benchmark Is Exceeded
Surface Soil							
Barium	9	9/9	165	45.5	42.5	42.5	2
Lead	9	9/9	880	122	48.4	48.4	3
Zinc	9	9/9	736	119	35.5	640	1
Arochlor-1254	9	1/9	6.9	0.80	NA	3.1	1
Sediment¹							
Soil PCL's							
Aluminum	6	6/6	26300	16167	NA	15000	2
Barium	6	6/6	158	93.2	NA	42.5	6
Beryllium	6	3/6	1.58	0.65	NA	0.88	3
Cadmium	6	4/6	2.79	0.38	NA	2	3
Copper	6	6/6	39	31.7	NA	28	4
Lead	6	6/6	96	64.7	NA	48.4	4
Nickel	6	6/6	43.9	25.7	NA	35	2
Vanadium	6	6/6	60.2	33.7	NA	28.7	3
Sediment PCL's							
Heptachlor	6	1/6	0.02	0.0048	NA	0.003	1
4,4'-DDT	6	2/6	0.028	0.008	NA	0.022	1
4,4'-DDD	6	4/6	0.087	0.027	NA	0.022	3
4,4'-DDE	6	2/6	0.041	0.013	NA	0.022	1
Arsenic	6	6/6	22	15.8	NA	5	6
Cadmium	6	4/6	2.79	1.55	NA	0.8	4
Chromium	6	6/6	62.6	47.7	NA	28	6
Copper	6	6/6	39	31.7	NA	19	6
Iron	6	6/6	37800	21467	NA	24000	2
Lead	6	6/6	96	64.7	NA	27	6
Manganese	6	6/6	553	288	NA	428	1
Mercury	6	6/6	0.829	0.407	NA	0.11	6
Nickel	6	6/6	43.9	25.7	NA	22	3
Zinc	6	6/6	135	103	NA	85	5

1. Sediment samples were considered sediment/surface soil for purposes of ecological PRE and were compared to both sediment and surface soil protective contaminant levels (PCL's). This table is a summary of the ecological risk data as reported in the January 1998 Revised Final Site Investigation Report, Data Item A009.

Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors.

The ecological benchmarks for sediment analytes were derived as the lowest of available criteria and other guidance values. These values were used for the purpose of eliminating areas and/or analytes that do not represent an ecological risk. Conversely, the exceedance of these conservative screening values does not necessarily imply that ecological impacts will occur, because they are not based on the site-specific attributes that determine exposure and toxicological response (e.g., sensitivity of resident organisms)

µg/g = micrograms per gram

SA 13
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Health Standard (Region III RBC) (µg/g)	Site Specific Health Standard (MCP 8-2) (µg/g)	No of Sample Locations where Site Specific Health Standard is Exceeded
Surface Soil								
Arsenic	4	4/4	38	17.4	21	0.97	30	1
Beryllium	4	2/4	1.18	0.59	0.347	0.4	0.8	1
Benzo(a)anthracene	4	1/4	3	0.83	NA	1.6	1	1
Benzo(a)pyrene	4	1/4	2	0.63	NA	0.23	0.7	1
Benzo(b)fluoranthene	4	1/4	4	1.1	NA	1.9	1	1
Indeno(1,2,3-cd)pyrene	4	1/4	1	0.47	NA	0.84	1	0
Sediment								
Arsenic	3	3/3	22	9.8	NA	0.97	30	0
Beryllium	3	1/3	2.52	1.01	NA	0.4	0.8	1

This table is a summary of the Preliminary Risk Evaluation data presented in the October 1995 SI Report.

(µg/g) = micrograms per gram

RBC = risk based concentrations

MCP = Massachusetts Contingency Plan

SA 13
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standards (µg/L)	Region III Tap Water Standard (µg/L)	MCP GW-3 (µg/L)
Groundwater									
Aluminum	6	6/6	17400	7118	6870	50-200	50-200	37000	NA
Iron	6	6/6	26400	11358	9100	300	300	11000	NA
Lead	6	6/6	17.7	8.8	4.25	15	15	NA	30
Manganese	6	6/6	798	390	291	50	50	840	NA
Bis(2-ethylhexyl)phthalate	6	2/6	31	7.2	NA	6	NA	NA	30
Surface Water									
Aluminum	4	4/4	5060	3470	NA	50-200	50-200	37000	NA
Iron	4	4/4	3610	3115	NA	300	300	11000	NA
Lead	4	4/4	18.9	10.5	NA	15	15	NA	30
Manganese	4	4/4	1020	743	NA	50	50	840	NA
Bis(2-ethylhexyl)phthalate	4	1/4	6.9	3.5	NA	6	NA	NA	30
Nitroglycerine	4	1/4	38.5	13.4	NA	NA	NA	NA	NA

This table is a summary of the Preliminary Risk Evaluation data presented in the October 1995 SI Report.

(µg/L) = micrograms per liter

MCP = Massachusetts Contingency Plan

MCL = maximum contaminant level

SA 13
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Ecological Benchmark (µg/g)	Number of Sample Locations Where Ecological Benchmark is Exceeded
Surface Soil							
Arsenic	4	4/4	38	17.4	21	33	1
Barium	4	4/4	52.2	38.3	42.5	42.5	2
Beryllium	4	2/4	1.18	0.45	0.347	0.88	1
Cadmium	4	1/4	2.08	0.78	2	2	1
Lead	4	4/4	330	102.6	48.4	48.4	2
Selenium	4	1/4	0.9	0.32	NA	0.48	1
Sediment							
4,4'-DDE	3	2/3	0.059	0.024	NA	0.0274	1
Gamma-chlordane	3	3/3	0.049	0.03	NA	0.0002	3
Heptachlor	3	3/3	0.07	0.05	NA	0.00364	3
Arsenic	3	3/3	22	9.8	NA	5	1
Copper	3	3/3	25.9	11.2	NA	19	1
Lead	3	3/3	41	19.7	NA	27	1

This table is a summary of the ecological risk data as reported in the January 1996 Revised Final Site Investigation Report, Data Item A009.

Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors.

The ecological benchmarks for sediment analytes were derived as the lowest of available criteria and other guidance values. These values were used for the purpose of eliminating areas and/or analytes that do not represent an ecological risk. Conversely, the exceedance of these conservative screening values does not necessarily imply that ecological impacts will occur, because they are not based on the site-specific attributes that determine exposure and toxicological response (e.g., sensitivity of resident organisms).

µg/g = micrograms per gram

SA 13
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	Ecological Benchmark (µg/L)	Number of Sample Locations Where Ecological Benchmark is Exceeded
Surface Water							
Aluminum	4	4/4	5060	3470	733	87	4
Iron	4	4/4	3610	3115	1630	1000	4
Lead	4	4/4	18.9	10.5	8.68	6.61	3
Mercury	4	2/4	1.25	0.66	24	0.012	2

This table is a summary of the ecological risk data as reported in the January 1996 Revised Final Site Investigation Report, Data Item A009. Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors.
 µg/L = micrograms per liter

AOC 40
Summary of Human Health Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Health Standard (Region III RBC) (µg/g)	Site Specific Health Standard (MCP 6-2) (µg/g)	Number of Sample Locations Where Site-Specific Health Standard Is Exceeded
Surface Soil								
Arsenic	3	3/3	45	32.6	21	0.43	30	2
4,4'-DDD	3	1/3	0.101	0.047	NA	2.7	3	0
4,4'-DDT	3	1/3	0.232	0.131	NA	1.9	2	0
Anthracene	3	1/3	0.514	0.35	NA	23000	2500	0
Benzo(a)Anthracene	3	1/3	1.04	0.45	NA	0.88	1	1
Benzo(a)Pyrene	3	1/3	1.3	0.56	NA	0.088	0.7	1
Benzo(b)Fluoranthene	3	1/3	0.969	0.44	NA	0.88	1	0
Benzo(k)Fluoranthene	3	1/3	1.72	0.84	NA	8.8	10	0
Chrysene	3	1/3	1.2	0.55	NA	88	10	0
Fluoranthrene	3	2/3	2.56	1.18	NA	3100	1000	0
Indeno(1,2,3-cd)Pyrene	3	1/3	0.275	0.16	NA	0.88	1	0
Phenanthrene	3	1/3	1.11	0.51	NA	NA	100	0
Pyrene	3	2/3	2.49	1.1	NA	23000	2000	0
Sediment								
Arsenic	25	25/25	390	78	NA	0.43	30	14
Iron	25	25/25	45000	15258	NA	23000	NA	NA
Lead	25	25/25	570	69	NA	NA	600	0
Manganese	25	25/25	3000	610	NA	1800	NA	NA
Zinc	25	17/25	690	82	NA	23000	2500	0
4,4'-DDD	25	9/25	6.2	0.48	NA	2.7	3	1
Benzo(a)Anthracene	25	3/25	4.31	0.49	NA	0.88	1	1
Benzo(a)Pyrene	25	2/25	5.96	0.98	NA	0.088	0.7	2
Benzo(b)Fluoranthene	25	3/25	5.3	0.63	NA	0.88	1	2
Indeno(1,2,3-cd)Pyrene	25	1/25	1.64	0.10	NA	0.88	1	1

This table is a summary of Risk Evaluation data presented in the 1993 RI Report and the 1993 RI Addendum Report

(µg/g) = micrograms per gram

MCP = Massachusetts Contingency Plan

RBC = risk based concentrations

AOC 40
Summary of Human Health Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standards (µg/L)	Region III Tap Water Standard (µg/L)	MCP GW-3 (µg/L)
Surface Water									
Arsenic	9	9/9	17.7	7.98	NA	50	50	0.045	400
Iron	9	9/9	3200	1590	NA	300	300	11000	NA
Groundwater¹									
Unfiltered²									
Arsenic	4	2/4	40	17.1	10.5	50	50	0.045	400
Iron	4	4/4	25400	12488	9100	300	300	11000	NA
Manganese	4	4/4	5700	2614	291	50	50	840	NA
Filtered³									
Arsenic	3	1/3	19.8	2.98	NA	50	50	0.045	400
Iron	3	2/3	4000	1398	NA	300	300	11000	NA
Manganese	3	3/3	6120	2764	NA	50	50	840	NA

1 Round 1 (March 1993) and Round 2 (June 1993) data; wells CSM-93-01A, CSM-92-02A, and CSM-93-02B were sampled in both rounds. Well CSB-2 was sampled in Round 1 only.

2 Unfiltered samples from monitoring wells CSB-2, CSM-93-01A, CSM-93-02A, CSM-93-02B.

3 Filtered samples from monitoring wells CSB-2, CSM-93-01A, CSM-93-02A.

This table is a summary of Risk Evaluation data presented in the 1993 RI Report and the 1993 RI Addendum Report

(µg/L) = micrograms per liter

MCP = Massachusetts Contingency Plan

MCL = maximum contaminant level

AOC 40
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Ecological Benchmark (µg/g)	Number of Sample Locations Where Screening Criteria is Exceeded
Sediment							
Anthracene	25	1/25	3	0.27	NA	.085	1
benzo(a) anthracene	25	2/25	4	0.51	NA	241	0
benzo(a) pyrene	25	2/25	6	1.1	NA	194.5	0
benzo(b) fluoranthene	25	2/25	5	0.64	NA	194.5	0
benzo(k) fluoranthene	25	2/25	10	0.9	NA	194.5	0
bis(2-ethylhexyl) phthalate	25	1/25	2	1.4	NA	21.9	0
Chrysene	25	2/25	8	0.63	NA	194.5	0
Dibenzofuran	25	2/25	0.61	0.15	NA	NA	NA
Fluoranthene	25	11/25	10	1.6	NA	344.6	0
Phenanthrene	25	3/25	6	0.77	NA	25.4	0
Pyrene	25	5/25	20	2.2	NA	239.9	0
DDD	25	16/25	6.2	0.5	NA	0.152	9
DDE	25	14/25	0.72	0.09	NA	0.152	3
DDT	25	6/25	15	0.64	NA	0.152	2
Aluminum	25	25/25	17000	6108	NA	NA	NA
Arsenic	25	25/25	390	78	NA	33	13
Barium	25	24/25	115	36.8	NA	20	16
Beryllium	25	2/25	0.41	0.19	NA	NA	NA
Cobalt	25	8/25	19.6	3.38	NA	50	0
Chromium	25	15/25	64.8	15.1	NA	80	0
Copper	25	16/25	42.9	8.5	NA	70	0
Iron	25	25/25	45000	15232	NA	24000	5
Lead	25	25/25	570	69.5	NA	35	9
Manganese	25	25/25	3000	634	NA	428	13
Mercury	25	7/25	0.72	0.077	NA	0.15	3
Nickel	25	16/25	54.3	10.8	NA	30	2
Selenium	25	5/25	5.77	1.96	NA	NA	NA
Silver	25	4/25	6.35	0.65	NA	1	2
Vanadium	25	18/25	48.6	12.1	NA	NA	NA
Zinc	25	17/25	690	82.5	NA	120	4

This table is a summary of Risk Evaluation data presented in the 1993 RI Report and the 1993 RI Addendum Report.

µg/g = micrograms per gram

MCP = Massachusetts Contingency Plan

The ecological benchmarks for sediment analytes were derived as the lowest of available criteria and other guidance values. These values were used for the purpose of eliminating areas and/or analytes that do not represent an ecological risk. Conversely, the exceedance of these conservative screening values does not necessarily imply that ecological impacts will occur, because they are not based on the site-specific attributes that determine exposure and toxicological response (e.g., sensitivity of resident organisms).

AOC 40
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	Ecological Benchmark (µg/L)	Number of Locations Where Screening Criteria is Exceeded
Surface Water							
Arsenic	10	10/10	17.7	7.7	NA	190	0
Barium	10	10/10	13.4	10.7	NA	200	0
Chromium	10	2/10	4.76	2.7	NA	88	0
Copper	10	7/10	6.75	4.4	NA	4.8	6
Iron	10	10/10	3200	1560	NA	1000	10
Magnesium	10	10/10	400	151	NA	1000	0
Silver	10	1/10	0.708	0.2	NA	0.12	9
Zinc	10	3/10	86.3	21.8	NA	44	1

Ecological Benchmarks were developed to be protective of aquatic organisms only.

Wildlife exposures were also evaluated, and it was determined that the screening benchmark for sediment (as shown above), would be protective of wildlife as well.

This table is a summary of the ecological risk data as reported in the April 1993 RI Report, and the December 1993 RI Addendum Report, Data Item A009.

µg/L = micrograms per liter

SA 41
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Health Standard (Region III RBC) (µg/g)	Site Specific Health Standard (MCP S-2) (µg/g)	No of Sample Locations where Site Specific Health Standard is Exceeded
Surface Soil								
Arsenic	10	10/10	14	8.5	21	0.97	30	0
Beryllium	10	6/10	2.2	0.8	0.347	0.4	0.8	5
Lead	10	10/10	1400	287.9	48.4	500	600	1
Benzo(a)anthracene	10	2/10	2	0.37	NA	1.6	1	1
Benzo(a)pyrene	10	2/10	2	0.5	NA	0.23	0.7	2
Benzo(b)fluoranthene	10	2/10	2	0.38	NA	1.9	1	0
Indeno(1,2,3-c d)pyrene	10	1/10	1	0.23	NA	0.84	1	0
Sediment - Base of Landfill Low Area								
Arsenic	3	4/4	4.83	4.05	21	0.36	30	0
Benzo(a)anthracene	3	1/4	1.6	0.46	NA	0.87	0.7	1
Benzo(a)pyrene	3	1/4	2.1	0.62	NA	0.088	0.7	1
Benzo(b)fluoranthene	3	1/4	2.4	0.68	NA	0.87	0.7	1
Chrysene	3	1/4	2.4	0.65	NA	87	0.7	1
Indeno(1,2,3-c d)pyrene	3	1/4	1.6	0.51	NA	0.87	0.7	1
Aroclor - 1260	3	4/4	0.393	0.25	NA	0.083	2	0
Sediment - New Cranberry Pond								
Aroclor - 1260	4	2/4	0.316	0.15	NA	0.083	2	0
Arsenic	4	4/4	13.5	6.45	NA	0.36	30	0

This table is a summary of the Preliminary Risk Evaluation presented in the October 1995 SI Report.

(µg/g) = micrograms per gram

RBC = risk based concentrations

MCP = Massachusetts Contingency Plan

SA 41
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standard (µg/L)	Region III Tap Water Standard (µg/L)	MCP GW-S (µg/L)
Surface Water									
Aluminum	4	3/5	8100	1922	NA	50-200	NA	37000	NA
Iron	4	5/5	16400	4438	NA	300	NA	11000	NA
Lead	4	3/5	43.9	13.3	NA	15	15	NA	30
Manganese	4	5/5	976	268	NA	50	50	840	NA
Groundwater									
1,1,2,2 - Tetrachloroethane	5	5/13	170	17.2	NA	NA	NA	0.052	20000
Tetrachloroethylene	5	2/13	10	1.58	NA	5	5	1.1	5000
Trichloroethylene	5	8/13	220	65	NA	5	5	1.8	20000
Aluminum	5	13/13	82800	24253	6870	50-200	50-200	37000	NA
Arsenic	5	13/13	83.4	38.26	10.5	50	50	0.045	400
Beryllium	5	1/13	6.06	3.16	5	4	4	0.016	50
Chromium (total)	5	12/13	149	51.4	14.7	100	100	37000	2000
Iron	5	13/13	110000	43268	9100	300	300	11000	NA
Lead	5	12/13	48.6	20.5	4.25	15	15	NA	30
Manganese	5	13/13	1820	702	291	50	50	840	NA
Nickel	5	6/13	178	61.1	34.3	100	100	730	80
Nitrite, nitrate-non specific	1	2/2	11000	5523	NA	10000	10000	58000	NA

This table is a summary of the Preliminary Risk Evaluation presented in the October 1995 SI Report.

(µg/L) = micrograms per liter

MCP = Massachusetts Contingency Plan

MCL = maximum contaminant level

SA 41
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Ecological Benchmark (µg/g)	Number of Sample Locations Where Ecological Benchmark is Exceeded
Surface Soil							
Antimony	10	3/10	19.5	3.3	NA	7	2
Barium	10	10/10	307	69.2	42.5	42.5	5
Beryllium	10	6/10	2.2	0.72	0.347	0.68	5
Cadmium	10	2/10	15.5	7.57	2	2	0
Copper	10	10/10	54.4	17.2	8.39	34	2
Lead	10	10/10	1400	287.9	48.4	48.4	5
Zinc	10	10/10	9200	1003.7	35.5	640	1
Sediment							
4,4'-DDD	4	2/4	0.046	0.022	NA	0.018	2
4,4'-DDE	4	3/4	0.038	0.019	NA	0.018	2
Heptachlor	4	1/4	0.31	0.01	NA	0.022	1
Arsenic	4	4/4	13.5	6.5	NA	5	1
Lead	4	4/4	40	21.3	NA	27	1
Zinc	4	4/4	98.1	39.7	NA	65	1

This table is a summary of the ecological risk data as reported in the January 1996 Revised Final Site Investigation Report, Data Item A009.

Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors.

The ecological benchmarks for sediment analytes were derived as the lowest of available criteria and other guidance values. These values were used for the purpose of eliminating areas and/or analytes that do not represent an ecological risk. Conversely, the exceedance of these conservative screening values does not necessarily imply that ecological impacts will occur, because they are not based on the site-specific attributes that determine exposure and toxicological response (e.g., sensitivity of resident organisms).

µg/g = micrograms per gram

AOC 9
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Health Standard (Region III RBC) (µg/g)	Site Specific Health Standard (MCP 8-2) (µg/g)	No of Sample Locations where Site Specific Health Standard is Exceeded
Surface Soil								
Arsenic	2	2/2	20	19	21	0.97 ¹	30	0
Sediment								
Arsenic	3	3/3	14	7.6	NA	0.97 ¹	30	0
Subsurface Soil								
Arsenic	3	7/7	21	16	21	1.6 ²	30	0
Beryllium	3	3/7	1	0.64	0.347	0.67 ²	0.8	3
Benzo(a)anthracene	3	3/7	40	7.04	NA	2.7 ²	0.7	3
Benzo(a)pyrene	3	2/7	40	7.48	NA	0.39 ²	0.7	2
Benzo(b)fluoranthene	3	2/7	40	7.4	NA	3.2 ²	0.7	2
Benzo(g,h,i)perylene	3	2/7	20	4.34	NA	18 ²	30	0
Benzo(k)fluoranthene	3	3/7	30	4.9	NA	7.4 ²	0.7	3
Indeno(1,2,3-cd)pyrene	3	2/7	20	4.54	NA	1.4 ²	0.7	2

1. Region III Residential Soil Risk Based Concentration (RBC)

2. Region III Commercial/Industrial Soil RBC

This table is a summary of the Preliminary Risk Evaluation presented in the January 1996 Final SI Report.

(µg/g) = micrograms per gram

MCP = Massachusetts Contingency Plan

AOC 9
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standards (µg/L)	Region III Tap Water Standard (µg/L)	MCP GW-3 (µg/L)
Groundwater									
Aluminum	5 ¹	10/10	70400	20000	6870	50-200	50-200	37000	NA
Arsenic	5 ¹	10/10	220	78.76	10.5	50	50	0.045	400
Chromium (total)	5 ¹	9/10	1040	155	14.7	100	100	37000	2000
Cobalt	5 ¹	5/10	93.7	35.2	25	NA	NA	2200	NA
Iron	5 ¹	10/10	90000	32767	9100	300	300	11000	NA
Lead	5 ¹	10/10	81.3	25.5	4.25	15	15	NA	30
Manganese	5 ¹	10/10	3270	1144	291	50	50	840	NA
Nickel	5 ¹	6/10	369	104	34.3	100	100	730	60
Surface Water									
Bis(2-ethylhexyl)phthalate	3	1/3	6.8	3.67	NA	6	NA	NA	30
Iron	3	3/3	5460	3133	NA	300	300	11000	NA

1. Two rounds sampled for each well

This table is a summary of the Preliminary Risk Evaluation data presented in the January 1996 Final SI Report.

(µg/L) = micrograms per liter

MCP = Massachusetts Contingency Plan

MCL = maximum contaminant level

AOC 9
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detections	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Ecological Benchmark (µg/g)	Number of Sample Locations Where Ecological Benchmark is Exceeded
Surface Soil							
Lead	2	2/2	81	44	34.4	48.4	1
Sediment							
Arsenic	3	3/3	14	7.6	NA	5	2
Lead	3	3/3	46	27	NA	27	1

This table is a summary of the ecological risk data as reported in the January 1996 Revised Final Site Investigation Report, Data Item A009. Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors. The ecological benchmarks for sediment analytes were derived as the lowest of available criteria and other guidance values. These values were used for the purpose of eliminating areas and/or analytes that do not represent an ecological risk. Conversely, the exceedance of these conservative screening values does not necessarily imply that ecological impacts will occur, because they are not based on the site-specific attributes that determine exposure and toxicological response (e.g., sensitivity of resident organisms).
 µg/g = micrograms per gram

AOC 9
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standards (µg/L)	Ecological Benchmark (µg/L)	Number of Sample Locations Where Ecological Benchmark is Exceeded
Surface Water									
Aluminum	3	1/3	123	123	733	50-200	50-200	87	1
Iron	3	3/3	5460	3133	1630	300	300	1000	3
Lead	3	3/3	23	2.3	8.68	15	15	1.4	3

This table is a summary of the ecological risk data as reported in the January 1996 Revised Final Site Investigation Report, Data Item A009.

Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors.

µg/L = micrograms per liter

MCL = maximum contaminant level

AOC 11
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Health Standard (Region III RBC) (µg/g)	B16 Specific Health Standard (MCP S-2) (µg/g)	No of Sample Locations where Site Specific Health Standard is Exceeded
Surface Soil								
Benzo(a)anthracene	16	4/16	12	2.3	NA	0.88	1	7
Benzo(a)pyrene	16	4/16	8.3	1.2	NA	0.088	0.7	4
Benzo(b)fluoranthene	16	13/16	12.0	2.7	NA	0.88	1	9
Dibenzo(a,h)anthracene	16	1/16	0.670	0.042	NA	0.088	0.7	0
Phenanthrene	16	14/16	11	1.8	NA	NA	100	0
4,4' - DDT	16	15/16	8	1.4	5.60	1.9	2	2
Chlordane	16	3/16	0.279	0.032	0.136	1.8	2	0
Arsenic	16	16/16	22.9	13.7	19.0	0.43	30	0
Cadmium	16	3/16	4.5	0.6	1.28	39	80	0
Chromium	16	16/16	78.1	24.2	33.0	78000	2500	0
Manganese	16	16/16	407	193	380	1800	NA	NA
Mercury	16	14/16	6.5	1.2	0.11	23	60	0
Vanadium	16	16/16	27.4	16.1	32.3	550	2000	0
Sediment								
Benzo(a)anthracene	15	8/15	1.8	0.43	0.32	0.88	1	2
Benzo(b)fluoranthene	15	1/15	2.5	0.17	NA	0.88	1	1
Bis(2-ethylhexyl)phthalate	15	5/15	70.0	5.3	1.60	48	300	0
PCB - 1016	15	2/15	1.08	0.11	NA	5.5	NA	NA
PCB - 1254	15	3/15	0.837	0.11	NA	1.6	NA	NA
PCB - 1260	15	2/15	1.18	0.10	NA	NA	NA	NA
Antimony	15	1/15	163	10.9	NA	31	40	1
Arsenic	15	11/15	61.1	18.1	3.06	0.43	30	4
Beryllium	15	1/15	1.96	0.13	NA	0.15	0.8	1
Cadmium	15	13/15	303	41.2	117	39	80	1
Chromium	15	15/15	435	111	102	78000	2500	0
Manganese	15	12/15	512	147	142	1800	NA	NA
Mercury	15	15/15	11.0	2.7	2.52	23	60	0
Vanadium	15	15/15	69.2	28.8	44.5	550	2000	0
Zinc	15	15/15	2155	563	716	23000	2500	0
Subsurface Soil								
Arsenic	13	25/26	230	26.4	NA	0.43	30	3
Barium	13	26/26	205	56.1	NA	5500	2500	0
Beryllium	13	1/26	0.828	0.032	NA	0.15	0.8	1
Copper	13	21/26	3300	140	NA	270000	NA	NA
Iron	13	26/26	43200	15000	NA	23000	NA	NA
Dieldrin	13	10/26	0.0580	0.011	NA	0.04	0.04	2
DDT	13	19/26	2.80	0.7	NA	1.9	2	2
Benzo(a)anthracene	13	13/26	6.00	1.5	NA	0.88	1	9
Benzo(b)fluoranthene	13	5/26	5.60	0.61	NA	0.88	1	5

AOC 11
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standard (µg/L)	Region III Tap Water Standard (µg/L)	MCP GW-3 (µg/L)
Groundwater¹									
Arsenic	5	8/10	260	81.1	NA	50	50	0.045	400
Beryllium	5	4/10	6.14	1.5	NA	4	4	0.018	50
Iron	5	10/10	56900	18000	NA	300	300	11000	NA
Manganese	5	10/10	6090	1800	NA	50	50	840	NA
Bis(2-ethylhexyl)phthalate	5	1/10	25	2.5	NA	6	NA	4.8	30
Surface Water									
Bis(2-ethylhexyl)phthalate	15	3/15	73.0	8.7	NA	6	NA	4.8	30
Antimony	15	3/15	155	20.7	NA	6	6	15	300
Arsenic	15	11/15	75.6	17.5	12.1	50	50	0.045	400
Barium	15	15/15	2730	270	360	2000	2000	2600	30000
Beryllium	15	7/15	7.77	1.64	NA	4	4	0.018	50
Cadmium	15	6/15	147	22.9	42.8	5	5	18	10
Chromium	15	7/15	301	50.2	66.2	100	100	37000	2000
Manganese	15	15/15	2090	527	255	50	50	840	NA
Silver	15	3/15	78.7	8.48	NA	100	100	180	7
Vanadium	15	4/15	127	18.9	43.9	NA	NA	260	2000
Zinc	15	10/15	12000	1500	392	55	5000	11000	900

1. 5 wells sampled in 2 rounds.

This table is a summary of the Human Health Risk Assessment presented in the April 1995 Draft RI Report.

(µg/g) = micrograms per gram

(µg/L) = micrograms per liter

RBC = risk based concentrations

MCP = Massachusetts Contingency Plan

MCL = maximum contaminant level

AOC 11
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Criteria (µg/g)	Number of Sample Locations Where Ecological Benchmark is Exceeded
Nashua River Sediment							
Aluminum	5	5/5	24100	13922	10500	1700	5
Antimony	5	1/5	163	32.6	NA	2	1
Arsenic	5	5/5	20.5	11	26	5	4
Barium	5	5/5	659	216.3	26.2	41	4
Beryllium	5	1/5	1.96	0.39	NA	0.88	1
Cadmium	5	5/5	303	71.9	0.5	0.44	5
Calcium	5	5/5	4710	2468	1100	NA	NA
Chromium	5	5/5	435	157	15.9	26	4
Copper	5	5/5	470	200	14.3	16	5
Iron	5	5/5	21300	16560	7900	2000	5
Lead	5	5/5	760	299	12.5	4	5
Magnesium	5	5/5	3390	2618	3100	NA	NA
Manganese	5	5/5	512	253	600	428	1
Mercury	5	5/5	11	4.15	0.05	0.11	5
Nickel	5	5/5	45.7	20.52	18.6	16	3
Potassium	5	5/5	1980	1236	292	NA	NA
Selenium	5	1/5	28.1	5.62	0.2	0.48	1
Silver	5	4/5	19.2	8.0	0.2	1	4
Sodium	5	5/5	250	179	289	NA	NA
Vanadium	5	5/5	69.2	29.4	13.3	10	5
Zinc	5	5/5	724	361	55.6	85	4
Dieldrin	5	2/5	0.0333	0.009	NA	0.00002	2
Endosulfan I	5	3/5	0.0312	0.0125	NA	0.0003	3
Endosulfan II	5	4/5	0.00993	0.0037	NA	0.0003	4
Endosulfan Sulfate	2	1/2	0.00678	0.00337	NA	0.0003	1
Heptachlor	5	3/5	0.0153	0.0071	NA	0.0003	3
Heptachlor Epoxide	5	4/5	0.0372	0.016	NA	0.0003	4
PCB 1016	5	2/5	1.08	0.329	NA	0.007	2
PCB 1254	5	1/5	0.274	0.055	NA	0.06	1
PCB 1260	5	2/5	1.18	0.307	NA	0.005	2
ppDDD	5	5/5	0.2	0.077	NA	0.002	5
ppDDE	5	4/5	0.12	0.032	NA	0.002	4
ppDDT	5	4/5	0.22	0.063	NA	0.001	4
2-Methylnaphthalene	5	1/5	0.15	0.03	NA	0.065	1
Anthracene	5	1/5	4.8	0.96	NA	0.085	1
Benzo (a) anthracene	5	4/5	1.8	0.76	NA	0.23	3
Benzo (b) fluoranthene	5	3/5	2.5	0.85	NA	2	1

AOC 11
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Criteria (µg/g)	Number of Sample Locations Where Ecological Benchmark is Exceeded
Nashua River Sediment							
Bis (2-Ethylhexyl) Phthalate	5	5/5	70	16	NA	1.19	5
Chrysene	5	4/5	2.6	1.1	NA	0.4	3
Fluoranthrene	5	5/5	13	3.5	NA	0.6	4
Flourene	5	2/5	2.1	0.5	NA	0.035	2
Phenanthrene	5	5/5	21	5.59	NA	0.225	5
Pyrene	5	5/5	5	2.9	NA	0.35	5
Total Petroleum Hydrocarbons	5	5/5	3300	1498	NA	NA	NA

This table is a summary of the ecological risk data as reported in the January 1996 Revised Final Site Investigation Report, Data Item A009.

Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors.

The ecological benchmarks for sediment analytes were derived as the lowest of available criteria and other guidance values. These values were used for the purpose of eliminating areas and/or analytes that do not represent an ecological risk. Conversely, the exceedance of these conservative screening values does not necessarily imply that ecological impacts will occur, because they are not based on the site-specific attributes that determine exposure and toxicological response (e.g., sensitivity of resident organisms).
 µg/g = micrograms per gram

AOC 11
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standard (µg/L)	Screening Criteria (µg/L)	Number of Locations Where Screening Criteria is Exceeded (µg/L)
Northern Wetland Surface Water									
Aluminum	5	4/5	26900	11340	733	50-200	50-200	87	4
Antimony	5	2/5	155	49.52	NA	6	6	30	2
Barium	5	5/5	2730	705	40.1	2000	2000	NA	5
Beryllium	5	4/5	7.77	3.2	5	4	4	5.3	1
Cadmium	5	4/5	147	44.9	4	5	5	2.33	4
Calcium	5	5/5	280000	120400	20600	NA	NA	NA	5
Chromium	5	4/5	301	114	6	100	100	11	4
Copper	5	4/5	578	217	8.1	1300	1300	25.8	4
Iron	5	5/5	750000	325195	1630	300	300	1000	4
Lead	5	4/5	1800	434	8.68	15	15	10.2	4
Magnesium	5	5/5	13400	8364	3340	NA	NA	NA	5
Manganese	5	5/5	2090	1272	357	50	50	NA	5
Mercury	5	4/5	2.5	1.21	24	2	2	0.012	4
Potassium	5	4/5	10100	4624	3150	NA	NA	NA	4
Silver	5	2/5	78.7	21.1	NA	100	100	0.12	2
Sodium	5	5/5	14300	10604	36300	NA	NA	NA	5
Thallium	5	2/5	513	136	NA	2	2	40	2
Vanadium	5	3/5	127	40.1	11	NA	NA	NA	3
Zinc	5	5/5	12000	3344	33.4	5000	5000	230	4
Endrin	5	1/5	0.0479	0.0096	NA	2	2	0.002	1
Heptachlor	5	1/5	0.0219	0.0044	NA	0.4	0.4	0.003	1
Heptachlor Epoxide	5	1/5	0.0212	0.0042	NA	0.2	0.2	0.003	1
Isodrin	5	1/5	0.00793	0.0016	NA	NA	NA	NA	1
ppDDD	5	3/5	0.38	0.112	NA	NA	NA	0.001	3
ppDDE	5	3/5	0.152	0.0474	NA	NA	NA	0.001	3
ppDDT	5	3/5	0.43	0.099	NA	NA	NA	0.001	3
Total Petroleum Hydrocarbons	5	2/5	260	94	NA	NA	NA	NA	3

AOC 11
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standard (µg/L)	Screening Criteria (µg/L)	Number of Locations Where Screening Criteria is Exceeded (µg/L)
Southern Wetland Surface Water									
Aluminum	5	4/5	16000	5283	733	50-200	50-200	87	4
Antimony	5	1/5	62.5	12.5	NA	6	6	30	1
Beryllium	5	3/5	5.86	1.71	5	4	4	5.3	1
Cadmium	5	2/5	101	23.7	4	5	5	1.56	2
Calcium	5	5/5	112000	52900	20600	NA	NA	NA	5
Chromium	5	3/5	135	37.0	6	100	100	11	3
Copper	5	3/5	269	71.96	8.1	1300	1300	16.7	3
Iron	5	4/5	580000	153786	1630	300	300	1000	4
Lead	5	4/5	610	194	8.68	15	15	5.33	4
Magnesium	5	5/5	7310	5298	3340	NA	NA	NA	5
Manganese	5	5/5	562	163	357	50	50	NA	5
Potassium	5	5/5	7140	4008	3150	NA	NA	NA	5
Selenium	5	1/5	6.34	1.268	3.02	50	50	5	1
Silver	5	1/5	21.3	4.26	NA	100	100	0.12	1
Sodium	5	5/5	27400	13062	36300	NA	NA	NA	5
Vanadium	5	1/5	82.8	16.56	11	NA	NA	NA	1
Zinc	5	4/5	4590	1148	33.4	5000	5000	149	3
Dieldrin	5	1/5	0.016	0.0032	NA	NA	NA	0.001	1
ppDDD	5	4/5	0.84	0.2396	NA	NA	NA	0.001	4
ppDDE	5	4/5	0.146	0.0452	NA	NA	NA	0.001	4
ppDDT	5	3/5	0.0788	0.02854	NA	NA	NA	0.001	3
4-Methylphenol	5	1/5	32	6.4	NA	NA	NA	NA	1
1,1,1-Trichloroethane	5	2/5	2.6	2.1	NA	200	200	NA	2
Total Petroleum Hydrocarbons	5	2/5	220	74	NA	NA	NA	NA	4
Nashua River Surface Water									
Aluminum	5	5/5	218	152.8	733	50-200	50-200	87	5
Calcium	5	5/5	16900	15680	20600	NA	NA	NA	5
Lead	5	2/5	5.93	2.27	8.68	15	15	1.32	2
Magnesium	5	5/5	2460	2260	3340	NA	NA	NA	5
Potassium	5	5/5	4860	3968	3150	NA	NA	NA	5
Sodium	5	5/5	35500	32760	36300	NA	NA	NA	5

This table is a summary of the ecological risk data as reported in the January 1996 Revised Final Site Investigation Report, Data Item A009. Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors. µg/L = micrograms per liter. MCL = maximum contaminant level.

SA 12
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Health Standard (Region III RBC) (µg/g)	Site Specific Health Standard (MCP 6-2) (µg/g)	No of Sample Locations where Site Specific Health Standard is Exceeded
Surface Soil								
Arsenic	8	9/9	21	10	21	0.36	30	0
Beryllium	8	3/9	0.74	0.5	0.347	0.15	0.8	0
Lead	8	9/9	880	121.9	48.4	500	600	1
Benzo(b)fluoranthene	8	1/9	1	0.22	NA	0.87	0.7	1
Chrysene	8	1/9	0.8	0.17	NA	0.7	0.7	1
Aroclor-1254	8	1/9	6.9	0.84	NA	0.0083	2	1
TPH	8	4/9	1350	177	NA	500	500	1
Sediment								
Arsenic	6	6/6	22	15.83	NA	0.36	30	0
Beryllium	6	3/6	1.58	0.74	NA	0.15	0.8	3
Manganese	6	6/6	553	288	NA	390	NA	NA

This table is a summary of the Preliminary Risk Evaluation data presented in the October 1995 SI Report.

(µg/g) = micrograms per gram

RBC = risk based concentrations

MCP = Massachusetts Contingency Plan

SA 12
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standards (µg/L)	Region #1 Tap Water Standard (µg/L)	MCP GW-3 (µg/L)
Groundwater									
Bis(2-ethylhexyl)phthalate	5	1/6	9.1	3.52	NA	6	NA	NA	30
Aluminum	5	6/6	25200	10486	6870	50-200	50-200	37000	NA
Antimony	5	1/6	6.96	2.41	3.03	6	6	15	300
Beryllium	5	1/6	6.63	3.12	5	4	4	0.018	50
Cadmium	5	1/6	12.1	3.68	4.01	5	5	18	10
Iron	5	6/6	40200	16843	9100	300	300	11000	NA
Lead	5	6/6	500	125.8	4.25	15	15	NA	30
Manganese	5	6/6	990	281.7	291	50	50	840	NA

This table is a summary of the Preliminary Risk Evaluation data presented in the October 1995 SI Report.

(µg/L) = micrograms per liter

MCP = Massachusetts Contingency Plan

MCL = maximum contaminant level

SA 12
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Ecological Benchmark (µg/g)	Number of Sample Locations Where Ecological Benchmark is Exceeded
Surface Soil							
Barium	9	9/9	165	45.5	42.5	42.5	2
Lead	9	9/9	880	122	48.4	48.4	3
Zinc	9	9/9	736	119	35.5	640	1
Arochlor-1254	9	1/9	6.9	0.80	NA	3.1	1
Sediment¹							
Soil PCL's							
Aluminum	6	6/6	26300	16167	NA	15000	2
Barium	6	6/6	158	93.2	NA	42.5	6
Beryllium	6	3/6	1.58	0.65	NA	0.88	3
Cadmium	6	4/6	2.79	0.38	NA	2	3
Copper	6	6/6	39	31.7	NA	28	4
Lead	6	6/6	96	64.7	NA	48.4	4
Nickel	6	6/6	43.9	25.7	NA	35	2
Vanadium	6	6/6	60.2	33.7	NA	28.7	3
Sediment PCL's							
Heptachlor	6	1/6	0.02	0.0048	NA	0.003	1
4,4'-DDT	6	2/6	0.028	0.008	NA	0.022	1
4,4'-DDD	6	4/6	0.087	0.027	NA	0.022	3
4,4'-DDE	6	2/6	0.041	0.013	NA	0.022	1
Arsenic	6	6/6	22	15.8	NA	5	6
Cadmium	6	4/6	2.79	1.55	NA	0.8	4
Chromium	6	6/6	62.6	47.7	NA	26	6
Copper	6	6/6	39	31.7	NA	19	6
Iron	6	6/6	37800	21467	NA	24000	2
Lead	6	6/6	96	64.7	NA	27	6
Manganese	6	6/6	553	288	NA	428	1
Mercury	6	6/6	0.829	0.407	NA	0.11	6
Nickel	6	6/6	43.9	25.7	NA	22	3
Zinc	6	6/6	135	103	NA	85	5

1. Sediment samples were considered sediment/surface soil for purposes of ecological PRE and were compared to both sediment and surface soil protective contaminant levels (PCL's). This table is a summary of the ecological risk data as reported in the January 1996 Revised Final Site Investigation Report, Data Item A009.

Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors.

The ecological benchmarks for sediment analytes were derived as the lowest of available criteria and other guidance values. These values were used for the purpose of eliminating areas and/or analytes that do not represent an ecological risk. Conversely, the exceedance of these conservative screening values does not necessarily imply that ecological impacts will occur, because they are not based on the site-specific attributes that determine exposure and toxicological response (e.g., sensitivity of resident organisms).

µg/g = micrograms per gram

SA 13
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Health Standard (Region III RBC) (µg/g)	Site Specific Health Standard (MCP 8-2) (µg/g)	No of Sample Locations where Site Specific Health Standard is Exceeded
Surface Soil								
Arsenic	4	4/4	38	17.4	21	0.97	30	1
Beryllium	4	2/4	1.18	0.59	0.347	0.4	0.8	1
Benzo(a)anthracene	4	1/4	3	0.83	NA	1.6	1	1
Benzo(a)pyrene	4	1/4	2	0.63	NA	0.23	0.7	1
Benzo(b)fluoranthene	4	1/4	4	1.1	NA	1.9	1	1
Indeno(1,2,3-cd)pyrene	4	1/4	1	0.47	NA	0.84	1	0
Sediment								
Arsenic	3	3/3	22	9.8	NA	0.97	30	0
Beryllium	3	1/3	2.52	1.01	NA	0.4	0.8	1

This table is a summary of the Preliminary Risk Evaluation data presented in the October 1995 SI Report.

(µg/g) = micrograms per gram

RBC = risk based concentrations

MCP = Massachusetts Contingency Plan

SA 13
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standards (µg/L)	Region III Tap Water Standard (µg/L)	MCP GW-1 (µg/L)
Groundwater									
Aluminum	6	6/6	17400	7118	6870	50-200	50-200	37000	NA
Iron	6	6/6	26400	11358	9100	300	300	11000	NA
Lead	6	6/6	17.7	8.8	4.25	15	15	NA	30
Manganese	6	6/6	798	390	291	50	50	840	NA
Bis(2-ethylhexyl)phthalate	6	2/6	31	7.2	NA	6	NA	NA	30
Surface Water									
Aluminum	4	4/4	5060	3470	NA	50-200	50-200	37000	NA
Iron	4	4/4	3610	3115	NA	300	300	11000	NA
Lead	4	4/4	18.9	10.5	NA	15	15	NA	30
Manganese	4	4/4	1020	743	NA	50	50	840	NA
Bis(2-ethylhexyl)phthalate	4	1/4	6.9	3.5	NA	6	NA	NA	30
Nitroglycerine	4	1/4	38.5	13.4	NA	NA	NA	NA	NA

This table is a summary of the Preliminary Risk Evaluation data presented in the October 1995 SI Report.
 (µg/L) = micrograms per liter
 MCP = Massachusetts Contingency Plan
 MCL = maximum contaminant level

SA 13
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration ($\mu\text{g/g}$)	Average Concentration ($\mu\text{g/g}$)	Background Concentration ($\mu\text{g/g}$)	Ecological Benchmark ($\mu\text{g/g}$)	Number of Sample Locations Where Ecological Benchmark is Exceeded
Surface Soil							
Arsenic	4	4/4	38	17.4	21	33	1
Barium	4	4/4	52.2	38.3	42.5	42.5	2
Beryllium	4	2/4	1.18	0.45	0.347	0.88	1
Cadmium	4	1/4	2.08	0.78	2	2	1
Lead	4	4/4	330	102.6	48.4	48.4	2
Selenium	4	1/4	0.9	0.32	NA	0.48	1
Sediment							
4,4'-DDE	3	2/3	0.059	0.024	NA	0.0274	1
Gamma-chlordane	3	3/3	0.049	0.03	NA	0.0002	3
Heptachlor	3	3/3	0.07	0.05	NA	0.00364	3
Arsenic	3	3/3	22	9.8	NA	5	1
Copper	3	3/3	25.9	11.2	NA	19	1
Lead	3	3/3	41	19.7	NA	27	1

This table is a summary of the ecological risk data as reported in the January 1996 Revised Final Site Investigation Report, Data Item A009.

Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors.

The ecological benchmarks for sediment analytes were derived as the lowest of available criteria and other guidance values. These values were used for the purpose of eliminating areas and/or analytes that do not represent an ecological risk. Conversely, the exceedance of these conservative screening values does not necessarily imply that ecological impacts will occur, because they are not based on the site-specific attributes that determine exposure and toxicological response (e.g., sensitivity of resident organisms).
 $\mu\text{g/g}$ = micrograms per gram

SA 13
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	Ecological Benchmark (µg/L)	Number of Sample Locations Where Ecological Benchmark is Exceeded
Surface Water							
Aluminum	4	4/4	5060	3470	733	87	4
Iron	4	4/4	3610	3115	1630	1000	4
Lead	4	4/4	18.9	10.5	8.68	6.61	3
Mercury	4	2/4	1.25	0.66	24	0.012	2

This table is a summary of the ecological risk data as reported in the January 1996 Revised Final Site Investigation Report, Data Item A009.
 Ecological Benchmark is a combination of State and Federal Standards and guidance values intended to be protective of aquatic and semi-terrestrial receptors.
 µg/L = micrograms per liter

AOC 40
Summary of Human Health Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Health Standard (Region III RBC) (µg/g)	Site Specific Health Standard (MCP 8-2) (µg/g)	Number of Sample Locations Where Site-Specific Health Standard is Exceeded
Surface Soil								
Arsenic	3	3/3	45	32.6	21	0.43	30	2
4,4'-DDD	3	1/3	0.101	0.047	NA	2.7	3	0
4,4'-DDT	3	1/3	0.232	0.131	NA	1.9	2	0
Anthracene	3	1/3	0.514	0.35	NA	23000	2500	0
Benzo(a)Anthracene	3	1/3	1.04	0.45	NA	0.88	1	1
Benzo(a)Pyrene	3	1/3	1.3	0.56	NA	0.088	0.7	1
Benzo(b)Fluoranthene	3	1/3	0.969	0.44	NA	0.88	1	0
Benzo(k)Fluoranthene	3	1/3	1.72	0.84	NA	8.8	10	0
Chrysene	3	1/3	1.2	0.55	NA	88	10	0
Fluoranthrene	3	2/3	2.56	1.18	NA	3100	1000	0
Indeno(1,2,3-cd)Pyrene	3	1/3	0.275	0.16	NA	0.88	1	0
Phenanthrene	3	1/3	1.11	0.51	NA	NA	100	0
Pyrene	3	2/3	2.49	1.1	NA	23000	2000	0
Sediment								
Arsenic	25	25/25	390	78	NA	0.43	30	14
Iron	25	25/25	45000	15258	NA	23000	NA	NA
Lead	25	25/25	570	69	NA	NA	600	0
Manganese	25	25/25	3000	610	NA	1800	NA	NA
Zinc	25	17/25	690	82	NA	23000	2500	0
4,4'-DDD	25	9/25	6.2	0.48	NA	2.7	3	1
Benzo(a)Anthracene	25	3/25	4.31	0.49	NA	0.88	1	1
Benzo(a)Pyrene	25	2/25	5.96	0.98	NA	0.088	0.7	2
Benzo(b)Fluoranthene	25	3/25	5.3	0.63	NA	0.88	1	2
Indeno(1,2,3-cd)Pyrene	25	1/25	1.64	0.10	NA	0.88	1	1

This table is a summary of Risk Evaluation data presented in the 1993 RI Report and the 1993 RI Addendum Report

(µg/g) = micrograms per gram

MCP = Massachusetts Contingency Plan

RBC = risk based concentrations

AOC 40
Summary of Human Health Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standards (µg/L)	Region III Tap Water Standard (µg/L)	MCP GW-3 (µg/L)
Surface Water									
Arsenic	9	9/9	17.7	7.98	NA	50	50	0.045	400
Iron	9	9/9	3200	1590	NA	300	300	11000	NA
Groundwater¹									
Unfiltered²									
Arsenic	4	2/4	40	17.1	10.5	50	50	0.045	400
Iron	4	4/4	25400	12488	9100	300	300	11000	NA
Manganese	4	4/4	5700	2614	291	50	50	840	NA
Filtered³									
Arsenic	3	1/3	19.8	2.98	NA	50	50	0.045	400
Iron	3	2/3	4000	1398	NA	300	300	11000	NA
Manganese	3	3/3	6120	2764	NA	50	50	840	NA

1. Round 1 (March 1993) and Round 2 (June 1993) data; wells CSM-93-01A, CSM-92-02A, and CSM-93-02B were sampled in both rounds. Well CSB-2 was sampled in Round 1 only.

2. Unfiltered samples from monitoring wells CSB-2, CSM-93-01A, CSM-93-02A, CSM-93-02B.

3. Filtered samples from monitoring wells CSB-2, CSM-93-01A, CSM-93-02A.

This table is a summary of Risk Evaluation data presented in the 1993 RI Report and the 1993 RI Addendum Report

(µg/L) = micrograms per liter

MCP = Massachusetts Contingency Plan

MCL = maximum contaminant level

AOC 40
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Ecological Benchmark (µg/g)	Number of Sample Locations Where Screening Criteria is Exceeded
Sediment							
Anthracene	25	1/25	3	0.27	NA	.085	1
benzo(a) anthracene	25	2/25	4	0.51	NA	241	0
benzo(a) pyrene	25	2/25	6	1.1	NA	194.5	0
benzo(b) fluoranthene	25	2/25	5	0.64	NA	194.5	0
benzo(k) fluoranthene	25	2/25	10	0.9	NA	194.5	0
bis(2-ethylhexyl) phthalate	25	1/25	2	1.4	NA	21.9	0
Chrysene	25	2/25	8	0.63	NA	194.5	0
Dibenzofuran	25	2/25	0.61	0.15	NA	NA	NA
Fluoranthene	25	11/25	10	1.6	NA	344.6	0
Phenanthrene	25	3/25	6	0.77	NA	25.4	0
Pyrene	25	5/25	20	2.2	NA	239.9	0
DDD	25	16/25	6.2	0.5	NA	0.152	9
DDE	25	14/25	0.72	0.09	NA	0.152	3
DDT	25	6/25	15	0.64	NA	0.152	2
Aluminum	25	25/25	17000	6108	NA	NA	NA
Arsenic	25	25/25	390	78	NA	33	13
Barium	25	24/25	115	36.8	NA	20	16
Beryllium	25	2/25	0.41	0.19	NA	NA	NA
Cobalt	25	8/25	19.6	3.38	NA	50	0
Chromium	25	15/25	64.8	15.1	NA	80	0
Copper	25	16/25	42.9	8.5	NA	70	0
Iron	25	25/25	45000	15232	NA	24000	5
Lead	25	25/25	570	69.5	NA	35	9
Manganese	25	25/25	3000	634	NA	428	13
Mercury	25	7/25	0.72	0.077	NA	0.15	3
Nickel	25	16/25	54.3	10.8	NA	30	2
Selenium	25	5/25	5.77	1.96	NA	NA	NA
Silver	25	4/25	6.35	0.65	NA	1	2
Vanadium	25	18/25	48.6	12.1	NA	NA	NA
Zinc	25	17/25	690	82.5	NA	120	4

This table is a summary of Risk Evaluation data presented in the 1993 RI Report and the 1993 RI Addendum Report.

µg/g = micrograms per gram

MCP = Massachusetts Contingency Plan

The ecological benchmarks for sediment analytes were derived as the lowest of available criteria and other guidance values. These values were used for the purpose of eliminating areas and/or analytes that do not represent an ecological risk. Conversely, the exceedance of these conservative screening values does not necessarily imply that ecological impacts will occur, because they are not based on the site-specific attributes that determine exposure and toxicological response (e.g., sensitivity of resident organisms).

AOC 40
Summary of Ecological Risk Information
Devens, MA

Analyte	Number of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	Ecological Benchmark (µg/L)	Number of Locations Where Screening Criteria is Exceeded
<u>Surface Water</u>							
Arsenic	10	10/10	17.7	7.7	NA	190	0
Barium	10	10/10	13.4	10.7	NA	200	0
Chromium	10	2/10	4.76	2.7	NA	88	0
Copper	10	7/10	6.75	4.4	NA	4.8	6
Iron	10	10/10	3200	1560	NA	1000	10
Magnesium	10	10/10	400	151	NA	1000	0
Silver	10	1/10	0.708	0.2	NA	0.12	9
Zinc	10	3/10	86.3	21.8	NA	44	1

Ecological Benchmarks were developed to be protective of aquatic organisms only.

Wildlife exposures were also evaluated, and it was determined that the screening benchmark for sediment (as shown above), would be protective of wildlife as well.

This table is a summary of the ecological risk data as reported in the April 1993 RI Report, and the December 1993 RI Addendum Report, Data Item A009.

µg/L = micrograms per liter

SA 41
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/g)	Average Concentration (µg/g)	Background Concentration (µg/g)	Screening Health Standard (Region III RBC) (µg/g)	Site Specific Health Standard (MCP S-2) (µg/g)	No of Sample Locations where Site Specific Health Standard is Exceeded
Surface Soil								
Arsenic	10	10/10	14	8.5	21	0.97	30	0
Beryllium	10	6/10	2.2	0.8	0.347	0.4	0.8	5
Lead	10	10/10	1400	287.9	48.4	500	600	1
Benzo(a)anthracene	10	2/10	2	0.37	NA	1.6	1	1
Benzo(a)pyrene	10	2/10	2	0.5	NA	0.23	0.7	2
Benzo(b)fluoranthene	10	2/10	2	0.38	NA	1.9	1	0
Indeno(1,2,3-c d)pyrene	10	1/10	1	0.23	NA	0.84	1	0
Sediment - Base of Landfill Low Area								
Arsenic	3	4/4	4.83	4.05	21	0.36	30	0
Benzo(a)anthracene	3	1/4	1.6	0.46	NA	0.87	0.7	1
Benzo(a)pyrene	3	1/4	2.1	0.62	NA	0.088	0.7	1
Benzo(b)fluoranthene	3	1/4	2.4	0.68	NA	0.87	0.7	1
Chrysene	3	1/4	2.4	0.65	NA	87	0.7	1
Indeno(1,2,3-c d)pyrene	3	1/4	1.6	0.51	NA	0.87	0.7	1
Aroclor - 1260	3	4/4	0.393	0.25	NA	0.083	2	0
Sediment - New Cranberry Pond								
Aroclor - 1260	4	2/4	0.316	0.15	NA	0.083	2	0
Arsenic	4	4/4	13.5	6.45	NA	0.36	30	0

This table is a summary of the Preliminary Risk Evaluation presented in the October 1995 SI Report.

(µg/g) = micrograms per gram

RBC = risk based concentrations

MCP = Massachusetts Contingency Plan

SA 41
Summary of Human Health Risk Information
Devens, MA

Analyte	No of Different Locations Sampled	Frequency of Detection	Maximum Concentration (µg/L)	Average Concentration (µg/L)	Background Concentration (µg/L)	MCL (µg/L)	Massachusetts Drinking Water Standard (µg/L)	Region RI Tap Water Standard (µg/L)	MCP GW-3 (µg/L)
Surface Water									
Aluminum	4	3/5	8100	1922	NA	50-200	NA	37000	NA
Iron	4	5/5	16400	4438	NA	300	NA	11000	NA
Lead	4	3/5	43.9	13.3	NA	15	15	NA	30
Manganese	4	5/5	976	268	NA	50	50	840	NA
Groundwater									
1,1,2,2 - Tetrachloroethane	5	5/13	170	17.2	NA	NA	NA	0.052	20000
Tetrachloroethylene	5	2/13	10	1.58	NA	5	5	1.1	5000
Trichloroethylene	5	8/13	220	65	NA	5	5	1.6	20000
Aluminum	5	13/13	82800	24253	6870	50-200	50-200	37000	NA
Arsenic	5	13/13	83.4	38.26	10.5	50	50	0.045	400
Beryllium	5	1/13	6.06	3.16	5	4	4	0.016	50
Chromium (total)	5	12/13	149	51.4	14.7	100	100	37000	2000
Iron	5	13/13	110000	43268	9100	300	300	11000	NA
Lead	5	12/13	48.6	20.5	4.25	15	15	NA	30
Manganese	5	13/13	1820	702	291	50	50	840	NA
Nickel	5	6/13	178	61.1	34.3	100	100	730	80
Nitrite, nitrate-non specific	1	2/2	11000	5523	NA	10000	10000	58000	NA

This table is a summary of the Preliminary Risk Evaluation presented in the October 1995 SI Report.

(µg/L) = micrograms per liter

MCP = Massachusetts Contingency Plan

MCL = maximum contaminant level

APPENDIX B:
SITE BORING LOGS

**EXPLORATION LOCATION DETAILS
FGCDR PROPOSED LANDFILL**

**Hydrogeologic Report
Devens, Massachusetts**

EXPLORATION IDENTIFICATION	COORDINATES		DRILLING METHOD	MEDIA SCREENED	TOTAL DEPTH OF BORING (bgs)	ESTIMATED DEPTH TO BEDROCK (bgs)		ELEVATION OF PROTECTIVE CASING
	Northing	Easting				Weathered	Competent	
LFM-99-01B	557942.09	568000.61	D&W, Core	bedrock	33.0	7.0	8.0	351.64
LFM-99-02B	557557.13	568001.85	D&W, Core	bedrock	26.5	7.8	9	354.77
LFM-99-03B	558443.61	568193.11	HSA, D&W, Core	bedrock	48.5	N/R	34	343.15
LFM-99-04A	558015.51	568902.86	HSA	soil	20.0	not encountered	not encountered	307.49
LFM-99-04B	558020.34	568895.80	D&W, Core	bedrock	44.0	29.2	34	307.35
LFM-99-05A	558283.12	568577.22	HSA	soil	29.0	not encountered	not encountered	317.48
LFM-99-05B	558283.07	568570.25	D&W, Core	bedrock	56.5	44.1	46.5	317.53
LFM-99-06A	557729.92	568860.57	D&W	soil	19.0	19.0	N/R	317.19
LFB-99-07X	557879.48	568337.32	D&W	N/A	32.5	22.5	27.5	N/A
LFB-99-08X	558013.59	568113.81	D&W	N/A	21.0	19.3	19.5	N/A
LFB-99-09X	558168.67	568451.24	D&W	N/A	28.0	26.0	28	N/A
FGC-1	NF	NF	D&W	N/A	20	N/R	13	N/A
FGC-2	558288.91	568194.07	D&W	N/A	35	N/R	33.5	N/A
FGC-3	NF	NF	D&W	N/A	25	N/R	23	N/A
LFD-99-01	558530.68	568220.55	N/A	N/A	N/A	N/A	N/A	N/A
LFD-99-02	558213.36	568642.56	N/A	N/A	N/A	N/A	N/A	N/A
LFD-99-03	557926.62	569085.69	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

HSA = Hollow Stem Auger drilling method

D&W = Drive and Wash drilling method

NF = Not Found to survey

NR= Not Reported

Elevations based on stone monument CH, elevation 349.58 feet, plan dated Jan. 1952, "Location of building and utilities, horizontal and vertical control," Corps of Engineers, US Army.

* = Depth to water estimated during drilling in 1998

LFM = Landfill monitoring well

LFB = Landfill boring

FGC = Former Golf Course borings, 1998

LFD = Sediment Sample location

bgs = below ground surface

All measurements recorded in feet.

**BORING & MONITORING WELL COMPLETION DETAILS
FGCDR LANDFILL**

**Hydrogeologic Report
Devens, Massachusetts**

EXPLORATION IDENTIFICATION	ELEVATION OF TOP PVC	GROUND ELEVATION	DEPTH TO WATER (from top of PVC)	GROUNDWATER ELEVATION	WELL SCREEN INTERVAL (bgs)		WELL SCREEN ELEVATION	
					top	bottom	top	bottom
LFM-99-01B	351.47	349.5	32.14	319.33	23.3	33.3	326.2	316.2
LFM-99-02B	354.63	352.5	20.14	334.49	14.5	24.50	338.0	328.0
LFM-99-03B	342.88	341.0	43.94	298.94	38.2	48.20	302.8	292.8
LFM-99-04A	307.23	305.5	15.68	291.55	10.00	20.00	295.5	285.5
LFM-99-04B	307.24	305.5	14.82	292.42	39.30	44.30	266.2	261.2
LFM-99-05A	317.38	315.5	25.79	291.59	19.00	29.00	296.5	286.5
LFM-99-05B	317.38	315.5	26.64	290.74	51.50	56.50	264.0	259.0
LFM-99-06A	317.09	315.1	15.26	301.83	8.00	18.00	307.1	297.1
LFB-99-07X	N/A	342.5	N/A	N/A	N/A	N/A	N/A	N/A
LFB-99-08X	N/A	338.0	N/A	N/A	N/A	N/A	N/A	N/A
LFB-99-09X	N/A	325.9	N/A	N/A	N/A	N/A	N/A	N/A
FGC-1	N/A	NF	9 ft bgs*	N/A	N/A	N/A	N/A	N/A
FGC-2	N/A	339.2	20 ft bgs*	N/A	N/A	N/A	N/A	N/A
FGC-3	N/A	NF	10 ft bgs*	N/A	N/A	N/A	N/A	N/A
LFD-99-01	N/A	327.2	N/A	N/A	N/A	N/A	N/A	N/A
LFD-99-02	N/A	305.1	N/A	N/A	N/A	N/A	N/A	N/A
LFD-99-03	N/A	301.8	N/A	N/A	N/A	N/A	N/A	N/A

Notes:

HSA = Hollow Stem Auger drilling method

D&W = Drive and Wash drilling method

NF = Not Found to survey

NR= Not Reported

Elevations based on stone monument CH, elevation 349.58 feet, plan dated Jan. 1952, "Location of building and utilities, horizontal and vertical control," Corps of Engineers, US Army.

* = Depth to water estimated during drilling in 1998

LFM = Landfill monitoring well

LFB = Landfill boring

FGC = Former Golf Course borings, 1998

LFD = Sediment Sample location

bgs = below ground surface

All measurements recorded in feet

Stone & Webster Construction Co., Inc.

245 SUMMER STREET
BOSTON, MA 02210-1127

FAX LETTER/COVER SHEET

Date: November 19, 1999

To: _____

Company: _____

Telephone: _____

Fax: _____

From: Don Fournier

Company: Stone & Webster

Telephone: 617-589-7057

Fax: 617-589-1200

Pages: 12

Message: RE: RFP NO. 068511000-02 ADDENDUM NO.1 FOR THE
CONSOLIDATION LANDFILL CONSTRUCTION,
OPERATIONS AND CLOSURE SERVICES AT THE
LANDFILL REMEDIATION PROJECT, DEVENS, MA.

THE PURPOSE OF THIS FAX LETTER IS TO PROVIDE
ALL BIDDERS WITH A COPY OF THE ADDENDUM NO.
1 (ATTACHED) REGARDING THE SUBJECT RFP.

IF YOU HAVE ANY QUESTIONS REGARDING THIS FAX
LETTER PLEASE CALL ME AT 617-589-7057.

SINCERELY,

STONE & WEBSTER

DON FOURNIER

**RFP No. 068511000-002
Addendum No. 1**

**Provide Consolidation Landfill Construction, Operations and Closure Services
at the
Landfill Remediation Project
Devens, Massachusetts**

Request for Proposal:

Please note the following address and solicitation change:

The RFP is for services for Stone & Webster Construction Company, Inc. (SWCCI) located at 245 Summer Street, Boston, Massachusetts 02210. All proposals shall be addressed to SWCCI. The contacts for proposal/solicitation and technical questions remain the same.

Proposal Instructions:

Page 2, Instruction No. 5, second sentence, change the word "in" to "is."

Page 2, Instruction No. 5, add to end of paragraph the following:

All contractors and subcontractors (at whatever tier) shall agree to be bound by the terms and conditions of the Project Labor Agreement (PLA) for the duration of the project. The PLA is applicable for all on-site construction activities, including transport operations from site-to-site at the project locale, if applicable.

Page 2, Instruction No. 7, replace entire paragraph with the following:

"Personnel working at the Project Site shall comply with the requirement of Specification Section 01351."

Pricing Forms:

Replace Pricing Forms with attached Addendum No. 1 Pricing Forms

General Conditions for Subcontractors for Government Funded Contracts:

Page 6, add the following article:

1.20 Invoicing and Payment Terms

Subcontractor will submit invoices on a monthly basis. Subcontractor will invoice only for work performed and approved. Approved invoices will be paid in Net 30 Terms.

Page 9, add the following article:

4.9 Subcontractor shall be signatory to the Project Labor Agreement (PLA) for the duration of the project. The subcontractor shall agree to be bound by the terms and conditions of the PLA by executing either the Individual Agreement(s) directly or by submitting the Letter of Assent, issued on your own letter head, as provided in the Request for Proposal documents.

Page 12. add the following article:

- 8.9 In addition to Article 8.2, Subcontractor shall warranty the geomembrane against defects in installation and workmanship for a period of 24 months commencing with the date of final acceptance.

Scope of Work:

Page 4, Figure 1, add Figure 2 (attached) following Figure 1. Figure 2 shows the hauling restrictions for travel on the South Post during removal of debris to be loaded at SA-12.

Page 7, Item 3.1, revise as follows:

"The on-site consolidation landfill will be constructed under two separate contracts with the following scopes:

Contract 1 - Construction of the landfill and leachate collection system

Contract 2 - Operation and final closure of landfill, including: hauling debris from the five identified loading areas (ACO-41 to be loaded from SA-12 area), loading and hauling of 20,000 cy of contaminated soil suitable for landfill daily cover material, placing materials in the landfill, compaction, stormwater and leachate collection management, and capping of the landfill."

Page 7, Item 3.4, Construction of the Landfill, number 5, replace with the following:

"Preparation of subgrades, backfill, compaction and installation of structures."

Page 8, Item 3.4, Construction of the Landfill, number 8, replace with the following:

"Furnish and install gabion units as specified."

Page 8, Item 3.4, Operation and Closure of the Landfill, number 2, replace with the following:

"Transportation (loading by SWCCI) of the debris from the five stockpile areas (Note: AOC-41 to be removed from SA-12 area) to the on-site landfill. Loading and transport of the 20,000 cy of contaminated material from a stockpile area located just, south of the Verbeck Gate. The 20,000 cy of landfill cover material can be scheduled at the Subcontractors discretion for filling voids and contouring during operation of the landfill, but must all be disposed in the landfill during the operation timeframe."

Page 8, Item 3.4, add to end of section the following sentence:

"Transportation routes on the South Post, for area SA-12, must comply with the Base road restrictions as shown on Figure 2."

Page 8, Item 3.2, revise to Item No. "3.5".

Page 8, Item 3.2 (now Item 3.5), Pay Item 1, revise pay item to "Mobilization/Demobilization"

Page 9, Pay Item 10.3, revise quantity from 6,300 to "10,400"

Page 9, Pay Item 10.4, revise quantity from 6,700 to "12,000"

Page 9, Pay Item 10.6, revise quantity from 900 to "1,800"

Page 9, Pay Item 10, add pay item as follows:

"10.7 Landfill Cover Material	Ton	26,500	2"
-------------------------------	-----	--------	----

Page 9, Pay Item 18. revise units from Lump Sum to "Ton" and quantity from 1 to "750"

Page 9. at end of the Payment Items. add the following Payment Items:

<u>Item</u>	<u>Unit</u>	<u>Quantity</u>	<u>Contract</u>
23. Truck Demurrage	Hour	1	2
24. Truck Cancellation	Each	1	2

Page 9, at the end of the paragraph following the Payment Items, add the following:

"Truck demurrage costs shall be provided for non-scheduled delays in loading of debris greater than 1-hour which are caused solely by the Company or the Company's Client. Delays caused by improper notice, scheduling, inclement weather or other acts of God are not reimbursable. Demurrage slips must be verified in the field by a SWCCI Superintendent and be delivered to the SWCCI Site Construction Manager by 9AM the next day. Demurrage will be paid on an hourly basis per truck impacted.

Truck cancellation costs shall be provided for cancellation of a truck by SWCCI when less than 24-hours notice is given, except as noted above."

Page 10, Item 5, delete number 1 in its entirety, renumber numbers 2, 3, and 4 to 1, 2 and 3, accordingly, and add the following:

- 4. Certified scale to be provided and operated by SWCCI. Scale to be located at landfill area, or within approximately one mile of the landfill entrance area.
- 5. Disposal material will be sized to contain debris no larger than two feet in size/diameter. Stockpiled disposal material will have passed the Paint Filter Test prior to loading for disposal."

Page 10, Item 6, add the following item:

- "6.3 Subcontractor to provide all temporary support, temporary/permanent utilities hookups, vehicle/tire wash and any necessary equipment, supplies, labor, supervision and administration needed to complete the work."

Page 10, Item 6, add the following item:

- "6.4 Subcontractor is responsible to determine locations, size, type, etc., of all underground utilities from the municipality and the utility companies concerned, to give appropriate notices and to coordinate work with these companies, to pay all charges and bear all the costs that may be involved in working in the vicinity of these utilities or structures."

Page 11, Item 10, add the following item:

- "10.3 Subcontractor must comply with Post/Base Regulations for work on the South Post. Personnel working on the Base shall become familiar with and obey Base regulations such as, but not limited to, the following:
 - Keep within the limits of work and avenues of ingress and egress;
 - Do not enter into restricted areas unless required to do so and until cleared for such entry;
 - Permission to interrupt any Base roads, railways, or utility services shall be requested in writing a minimum of 15 calendar days prior to the desired date of interruption; and
 - Subcontractor's equipment shall be conspicuously marked for identification."

Page 12, Item 12.2, replace schedule with the following schedule:

Remedial Site	Approx. Volume (cy)	Approximate Production		Draft Schedule			
		Excavation (cy/day)	Transport & Disposal (cy/day)	Excavation		Transportation/Disposal	
				Early Start	Early Finish	Early Start	Early Finish
AOC-9	121,000	2,400	1,500	09-Jun-00	18-Aug-00	19-Jun-00	06-Nov-00
AOC-11	35,000	2,250	1,500	28-Aug-00	18-Sep-00	05-Sep-00	06-Oct-00
SA-13	10,000	1,300	1,500	25-Sep-00	04-Oct-00	02-Oct-00	11-Oct-00
Daily Cover	20,000	1,500	1,500	To be Completed at Subcontractor's Discretion			
AOC-40	125,400	2,100	1,500	04-Jun-01	24-Aug-01	18-Jun-01	19-Oct-01
SA-12	8,700	1,100	1,500	03-Sep-01	12-Sep-01	10-Sep-01	17-Sep-01
AOC-41	1,500	1,500	1,500	13-Sep-01	14-Sep-01	18-Sep-01	18-Sep-01

Page 12, Item 12, add the following item:

"12.3 Normal work hours are from 7AM through 4PM, Monday through Friday. Work beyond these hours will not be permitted without authorization from the SWCCI Site Construction Manager. The following legal holidays are observed: January 1st, 3rd Monday in January, 3rd Monday in February, last Monday of May, July 4th, 1st Monday of September, 2nd Monday of October, 11th of November, 4th Thursday of November and 25th of December. Any additional holidays as presented in the PLA will also be observed during this Project."

Page 13, Item 14.1, revise end of sentence to the following:

"...fully comply with the SSHP. The SSHP shall be prepared in accordance with the requirements of Specification Section 01351 and the USACE Safety and Health Requirements Manual (EM-365-1-1)".

Page 13, Item 14, add the following item:

"14.3 Subcontractor shall make provisions for personnel to attend a safety briefing, to be provided by SWCCI and the USACE. The safety briefing will likely be a half-day awareness meeting regarding Project safety and unexploded ordinance (UXO) avoidance procedures during construction activities. Although no UXO has been identified at the site, personnel awareness training will be required for those involved with evasive activities."

Page 13, Item 19, add the following item:

"19.3 Access to the South Post for transport from area SA-12 must follow the haul route as depicted on Figure 2."

Page 13, Item 20, add the following item:

"20.2 All equipment shall be in good working order, free of defects and must comply with the applicable federal, state, and local regulations including US DOT and OSHA operating standards."

Page 13, Item 20, add the following item:

"20.3 No analytical summaries are available at this time for the 20,000cy of daily cover material near the Verbeck Gate. For cost evaluation, it should be considered that this material does not exceed the applicable Massachusetts "Landfill Reuse Levels" in accordance with MA DEP Policy No. COMM-97-001."

Appendix B - Design Analysis Report Sections 4 & 5:

Appendix B has been provided for information purposes only. Any references to quantities and schedule were based on design estimates only and are not to be used in preparing proposals for this RFP. The purpose for providing this data is to provide information regarding the design approach prepared by the USACE and their design engineer.

PRICING FORM
Contract 1 – Construction of the Landfill
 (Page 1 of 2)

<u>Pay Item</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total Price</u>
1. Mobilization/Demobilization	Lump Sum	1	_____	_____
2. Clearing and Grubbing	Lump Sum	1	_____	_____
3. Excavation and Disposal	CY	33,000	_____	_____
4. Subgrade – Landfill Base	CY	40,000	_____	_____
5. Aggregate Stabilization	Ton	10	_____	_____
6. Low Permeability Clay Layer	Lump Sum	1	_____	_____
7. 60-Mil HDPE Liner and Bottom Cell Geocomposite	Lump Sum	1	_____	_____
8. Drainage Layer	Lump Sum	1	_____	_____
9. Leachate Collection System	Lump Sum	1	_____	_____
<i>10. through 15. Not Applicable</i>				
16. Leachate Pumping System	Lump Sum	1	_____	_____
17. Leachate Force Main Piping	Linear Feet	1,210	_____	_____
18. Aggregate Road Base	Ton	750	_____	_____
19. Electrical	Lump Sum	1	_____	_____
<i>20. Not Applicable</i>				
21. Storm Water Management/ Erosion and Sediment	Lump Sum	1	_____	_____
Total Proposed Price				_____

(Refer to Scope of Work and Specification Section 01270 for information regarding the above Pay Items)

PRICING FORM
Contract 1 – Construction of the Landfill
(Page 2 of 2)

Proposal Checklist:

Have the following been included with the proposal (refer to RFP Instructions and Scope of Work for further details and applicability):

- | | Yes | No |
|---|--------------------------|--------------------------|
| 1. Examples and contacts of previous landfills constructed and details about the landfills. | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Proposed Schedule | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Separate priced proposal for Contract 1 | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Representations & Certifications | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Project Labor Agreement (PLA) Letter of Assent | <input type="checkbox"/> | <input type="checkbox"/> |

Bidder's Company Name

Bidder's Authorized Representative (Print)

Bidder's Authorized Representative (Signature)

Date Signed

PRICING FORM
Contract 2 – Operation and Closure of the Landfill
 (Page 1 of 2)

<u>Pay Item</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Price</u>	<u>Total Price</u>
1. Mobilization/Demobilization	Lump Sum	1	_____	_____
<i>2. through 9. Not Applicable</i>				
10. Debris Handling and Disposal in On-site Landfill:*				
10.1 AOC - 9	Ton	180,000	_____	_____
10.2 AOC - 11	Ton	42,000	_____	_____
10.3 Study Area - 12	Ton	10,400	_____	_____
10.4 Study Area - 13	Ton	12,000	_____	_____
10.5 AOC - 40	Ton	175,000	_____	_____
10.6 AOC - 41	Ton	1,800	_____	_____
10.7 Daily Landfill Cover Mtl.	Ton	26,500	_____	_____
11. Subgrade – Landfill Cap	CY	14,000	_____	_____
12. 40-Mil VFPE Liner and Cap Geocomposite	Lump Sum	1	_____	_____
13. Protective Layer	CY	14,000	_____	_____
14. Vegetative Support Layer	Lump Sum	1	_____	_____
15. Topsoil & Permanent Seeding	Lump Sum	1	_____	_____
<i>16. through 19. Not Applicable</i>				
20. Leachate Management	Lump Sum	1	_____	_____
21. Storm Water Management/ Erosion and Sediment	Lump Sum	1	_____	_____
22. Gas Vents	Each	11	_____	_____
Total Proposed Price				_____

- *Actual quantities to be based on certified scale weight receipts as described in the Scope of Work. Unit prices shall be all inclusive and total payment will be based on adjusted actual quantities.*

(Refer to Scope of Work and Specification Section 01270 for information regarding the above Pay Items)

PRICING FORM
Contract 2 – Operation and Closure of the Landfill
(Page 2 of 2)

Proposal Checklist:

Have the following been included with the proposal (refer to RFP Instructions and Scope of Work for further details and applicability):

- | | Yes | No |
|--|--------------------------|--------------------------|
| 1. Experience summaries for landfill operation and closure efforts done by the bidder in the past. | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Proposed Schedule | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Separate priced proposal for Contract 2 | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Proposed alternatives (separately priced) | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Representations & Certifications | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Project Labor Agreement (PLA) Letter of Assent | <input type="checkbox"/> | <input type="checkbox"/> |

Bidder's Company Name

Bidder's Authorized Representative (Print)

Bidder's Authorized Representative (Signature)

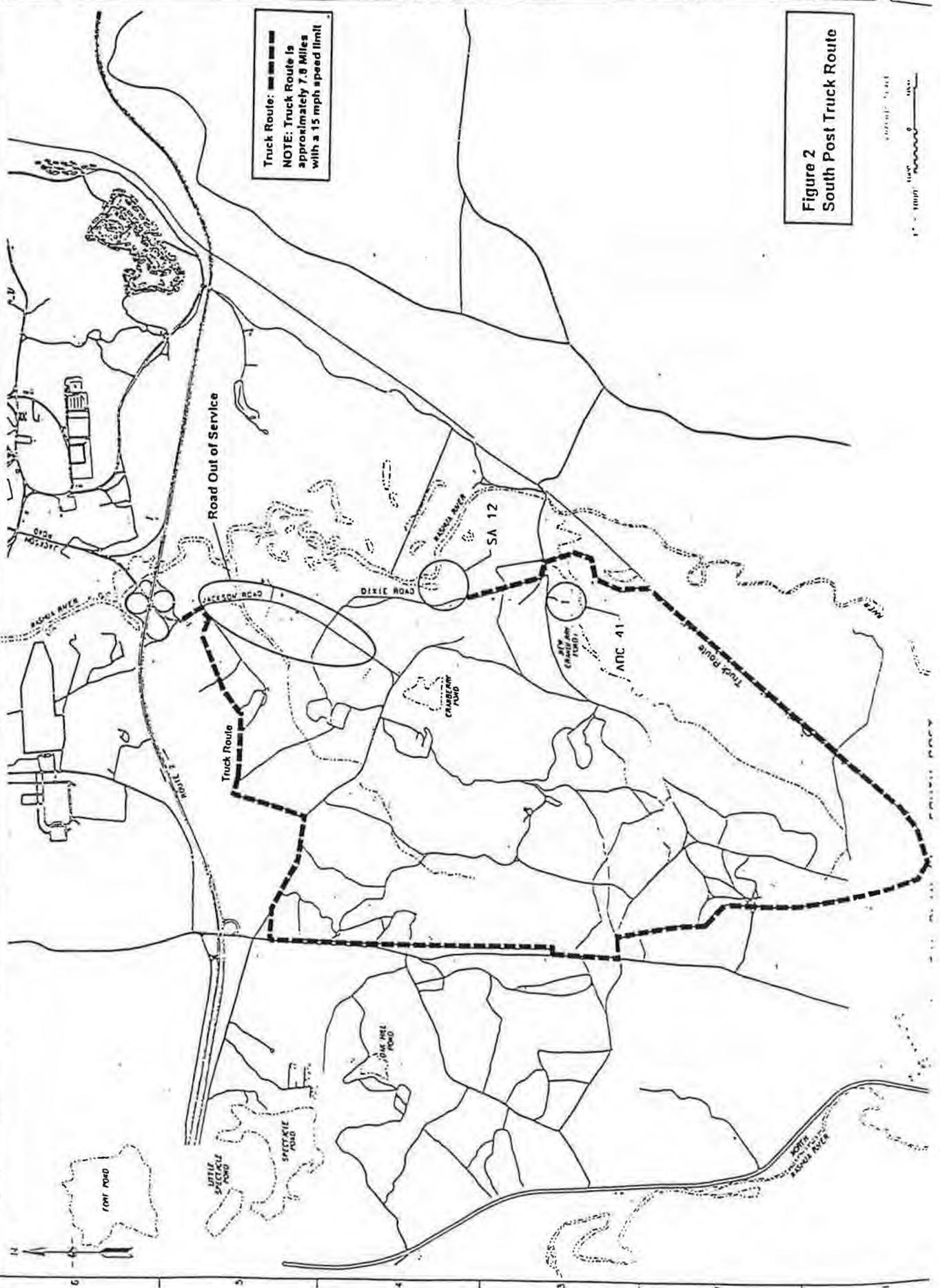
Date Signed



GENERAL PLAN - SOUTH POST
 1.000' SCALE
 DATE: 10/1/54
 DRAWN BY: [illegible]

FIGURE NO. 2
 SHEET NO. 1

A B C D E F G H



Truck Route:
 NOTE: Truck Route is approximately 7.8 Miles with a 15 mph speed limit

Figure 2
 South Post Truck Route

1" = 1000' SCALE

Stone & Webster Construction Co., Inc.

245 SUMMER STREET
BOSTON, MA 02210-1127

FAX LETTER/COVER SHEET

Date: December 2, 1999

To: _____

Company: _____

Telephone: _____

Fax: _____

From: Don Fournier

Company: Stone & Webster

Telephone: 617-589-7057

Fax: 617-589-1200

Pages: 3

Message: RE: RFP NO. 068511000-02 FOR THE CONSOLIDATION
LANDFILL CONSTRUCTION, OPERATIONS AND
CLOSURE SERVICES AT THE LANDFILL REMEDIATION
PROJECT, DEVENS, MA.

THE PURPOSE OF THIS FAX LETTER IS TO:

1) PROVIDE ALL BIDDERS WITH A COPY OF THE
CLARIFICATION RESPONSE NO. 1 (ATTACHED)
REGARDING THE SUBJECT RFP.

2) INFORM ALL BIDDERS THAT THE BID BOND
REQUIREMENT IS 20% OF THE BID TOTAL.

IF YOU HAVE ANY QUESTIONS REGARDING THIS FAX
LETTER PLEASE CALL ME AT 617-589-7057.

SINCERELY,

STONE & WEBSTER

DON FOURNIER

December 2, 1999

**RFP No. 068511000-002
Clarification Response No. 1**

**Contract 2
Provide Landfill Operations and Closure Services**

at the

**Landfill Remediation Project
Devens Reserve Forces Training Area
Devens, Massachusetts**

To all Offerors:

Stone & Webster Construction Company, Inc. (SWCCI) has prepared the following clarifications to recent questions regarding the Landfill Operations and Closure Portion of RFP No. 068511000-002 for the above-referenced project. The following sections provide information regarding the project which are hereby incorporated into the RFP. The deadline for proposals to be submitted to SWCCI has been extended until no later than December 8, 1999, 2PM.

DAILY COVER CLARIFICATION

Please be aware that in addition to the 20,000 cy of daily cover (Pay Item No. 10.7) available near the Verbeck gate, there will be approximately an additional 33,000 cy of daily cover type material available within one mile of the landfill site. This additional daily cover will be developed from excess excavate as part of the construction of the landfill (Contract 1 - Pay Item No. 3).

In determining your daily cover requirements, the additional 33,000 cy may be used for daily cover. All costs associated with handling, loading and transport of the material are to be included in the Subcontractor's proposal. Should you plan to use this material in developing your estimates, references must be made in your proposal detailing the anticipated quantity to be used, its intended use and approximate time frame.

When reviewing the requirements for intermediate cover under 310 CMR 19, assume that the plastic cover over Phases 1-4 adequately satisfy the requirements for intermediate cover.

STORM WATER MANAGEMENT

Under Pay Item 21 (Storm Water Management and Erosion Control), the construction of the storm water management system as shown on the drawings will be by the landfill constructor (Contract 1). The landfill operator (Contract 2) shall be responsible for maintaining the storm water control system once operation of the landfill commences.

All questions concerning the RFP and this Clarification should be addressed to Don Fournier at (617) 589-7057. Any technical questions may be directed to Bruce McCampbell at (617) 589-2626.

Sincerely,

Don Fournier
Senior Contracts Administrator

Appendix D

Bid Result Tables

Appendix E

Best Value Criteria (vs.) Subcontractor Bid/Proposal Performance

Landfill Operation and Closure

Webster Engineering Co., Inc.	F
Maximillian Technologies, Inc.	P
Franklin Environmental Services, Inc.	P
GZA GeoEnvironmental, Inc.	P

5. **On-Site Disposal Evaluation:** The proposals were evaluated independently by each of the OOSSB members using the screening criteria specified in the On/Off-Site Selection Plan (OOSSP). Proposals for on-site disposal were evaluated under the relevant screening criteria specified for Level 2 – Contractor’s Past Performance and Level 4 - Cost. The following is a brief summary of the results of the evaluation:

Landfill Construction – Contractor’s Past Performance

Coastal Environmental Corporation: This firm was found to have suitable corporate experience on similar lined landfill construction projects. They are teamed with a specialty liner subcontractor, RTD, who demonstrated substantial relevant experience. Project personnel have extensive landfill construction and related expertise. OOSSB Consensus: Pass

Webster Engineering Co., Inc.: This company did not provide any documentation of corporate experience or in-house management expertise in landfill construction. They proposed to subcontract for two experienced individuals from another firm through an undisclosed contract arrangement. The OOSSB members agreed that this proposal was inadequate. OOSSB Consensus: Fail

Nobis Engineering, Inc.: Nobis and their proposed team subcontractor, Maximillian Technologies, are both experienced in lined landfill construction, and both have experienced personnel assigned to the project. OOSSB Consensus: Pass

GZA GeoEnvironmental, Inc.: Neither GZA nor their team subcontractor, Cairns and Sons, listed any corporate landfill construction experience. OOSSB Consensus: Fail

Landfill Construction – Cost

Coastal Environmental Corp. had the lowest proposed cost of the passing Offerors at \$3,165,893.

Landfill Operation and Closure – Contractor’s Past Performance

Webster Engineering Co., Inc.: This company did not provide any documentation of corporate experience or in-house management expertise in landfill gas venting, leachate collection, or landfill cap construction. OOSSB Consensus: Fail

Maximillian Technologies, Inc.: This company has extensive experience in landfill operation and closure. Their liner subcontractor, Solmax International, has extensive experience in the manufacture and installation of geosynthetic landfill covers. OOSSB Consensus: Pass

Franklin Environmental Services, Inc.: This company has significant corporate experience in landfill operation and closure, and well qualified in-house personnel. Their liner subcontractor, Atlantic Lining Co., has extensive experience in liner installation. OOSSB Consensus: Pass

GZA GeoEnvironmental, Inc.: GZA has extensive corporate experience in landfill design, and their team subcontractor, Cairns and Sons, has experience in landfill operation and closure. The liner subcontractor, RTD Enterprises, has extensive experience in geosynthetic liner installation. OOSSB Consensus: Pass

Landfill Operation and Closure – Cost

Maximillian Technologies, Inc. had the lowest proposed cost of the passing Offerors at \$5,374,082.

6. **Off-Site Transportation & Disposal Offerors:** Firms submitting proposals and their pass (P) or fail (F) ratings are listed below:

GZA GeoEnvironmental, Inc.	P
Environmental Waste Technology, Inc.	P
Webster Engineering Co., Inc.	F
ADVENT Environmental, Inc.	P
Envirocraft Corporation	F

7. **Off-Site Transportation & Disposal Evaluation:** The proposals were evaluated independently by each of the OOSSB members using the following screening criteria specified in the On/Off-Site Selection Plan (OOSSP):

- Level 1** – Protection of human health and the environment
- Level 2** – Contractor’s past performance
- Level 3** – Ability to satisfy health and safety concerns identified by residents and public officials
- Level 4** – Cost

Envirocraft Corporation failed the Level 1 screening criteria because they did not submit any design or construction information which could be evaluated to determine if the disposal facility was equally protective of human health and the environment. Webster Engineering failed the Level 3 screening criteria because they did not submit a Transportation and Disposal Plan, T&D Coordinator, or haul route for evaluation. The other three firms all passed the screening criteria specified in the OOSSP. Environmental Waste Technology, Inc. had the lowest proposed cost of the passing Offerors at \$26,119,300.

8. **Recommended Remedy Selection:** The recommended remedy is the least costly of the disposal options after factoring a Community Concern Credit into the cost of the on-site disposal option, and is considered to represent the “Best Value”. The estimated cost of construction oversight is included in the total disposal costs as follows:

On-Site Disposal Option

Landfill Construction	\$3,165,893
Landfill Operation & Closure	\$5,374,082
Construction Oversight (est.)	\$1,900,000
Community Concern Credit	<u>\$5,619,376</u>
Total Cost	\$16,059,351

Off-Site Transportation & Disposal Option

Transportation and Disposal	\$26,119,300
Contract Oversight (est.)	<u>\$2,200,000</u>
Total Cost	\$28,319,300

The recommended remedy is On-Site Disposal at a total estimated cost of \$16,059,351.



Timothy L. Beauchemin, P.E.
Chairman,
On/Off-Site Selection Board

**On/Off-Site Selection Board Results
For
Devens Landfill Consolidation Project**

Landfill Construction – Contractor’s Past Performance

General: All proposals were evaluated using the “sieve” approach for the 4 “levels of acceptability” as outlined in the OOSSP. In evaluating the landfill construction proposals, it was assumed that Level 1 - Protection of human health & the environment, and Level 3 – Ability to satisfy health and safety concerns, were equally met by all proposals. This assumption was made because all proposals were based on construction of the same on-site landfill in the same location, which put all proposers on an equal footing.

Coastal Environmental Corporation: All reviewers agreed that this firm has extensive corporate experience on at least 4 similar lined landfill construction projects including clay liner construction. Their project personnel also have extensive landfill construction and related expertise. Their specialty liner subcontractor, RTD, demonstrated substantial relevant experience. OOSSB Consensus: Pass

Webster Engineering Co., Inc.: All reviewers agreed that this company had no corporate experience or in-house management expertise in landfill construction. The projects resumes provided were for dissimilar projects. They proposed to subcontract for two experienced individuals from another firm through an undisclosed contract arrangement. This was considered to be unacceptable. All OOSSB members agreed that this proposal was inadequate. OOSSB Consensus: Fail

Nobis Engineering, Inc.: Nobis proposed to team with Maximillian Technologies on this project. Tim and Jon felt that both firms were experienced in lined landfill construction, and both have experienced personnel assigned to the project. Jim felt that Maximillian was a good team subcontractor since their experience in landfill construction compensated for Nobis’ limited experience in this area. OOSSB Consensus: Pass

GZA GeoEnvironmental, Inc.: All reviewers agreed that neither GZA nor their team subcontractor, Cairns and Sons, demonstrated any corporate landfill construction experience in their proposal. Tim noted that GZA’s corporate experience was all as a general contractor with all actual work performed by subcontractors. Jim noted that most of GZA’s resume concentrated on design projects not construction. OOSSB Consensus: Fail

Landfill Construction – Cost

The cost proposals for Coastal Environmental Corp. and Nobis Engineering were reviewed by the team and found to be reasonable. Coastal Environmental Corp. had the lowest proposed cost of the passing Offerors at \$3,165,893.

Recommended Remedy Selection:

In accordance with the OOSPP, the recommended remedy is the least costly of the disposal options after factoring a Community Concern Credit into the cost of the on-site disposal option, and is considered to represent the "Best Value". The estimated cost of construction oversight is included in the total disposal costs as follows:

On-Site Disposal Option

Landfill Construction	\$3,165,893
Landfill Operation & Closure	\$5,374,082
Construction Oversight (est.)	\$1,900,000
Community Concern Credit	<u>\$5,619,376</u>
Total Cost	\$16,059,351

Off-Site Transportation & Disposal Option

Transportation and Disposal	\$26,119,300
Contract Oversight (est.)	<u>\$2,200,000</u>
Total Cost	\$28,319,300

The recommended remedy is On-Site Disposal at a total estimated cost of \$16,059,351.

**DEVENS RESERVE FORCES TRAINING AREA
Contract 1 - Construction of the Landfill**

RFP No. 068511000-002

Contract 1 - Provide Consolidation Landfill Construction				SUBCONTRACTOR NO. 1		SUBCONTRACTOR NO. 2		SUBCONTRACTOR NO. 3		SUBCONTRACTOR NO. 4 (UNSOLICITED)	
RFP No. 068511000-002		27-Oct-99									
Addendum No. 1		02-Dec-99									
Clarifications - 1 of 1		02-Dec-99									
RFP Due Date		04-Dec-99									
RFP Proposal Evaluation		29-Dec-99									
ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE	UNIT PRICE	TOTAL PRICE	UNIT PRICE	TOTAL PRICE	UNIT PRICE	TOTAL PRICE
1	Mobilization/Demobilization	Lump Sum	1	\$70,200.00	\$70,200.00	\$32,794.20	\$32,794.20	\$218,307.09	\$218,307.09	\$480,380.00	\$480,380.00
2	Clearing & Grubbing	Lump Sum	1	\$44,500.00	\$44,500.00	\$43,869.60	\$43,869.60	\$50,078.22	\$50,078.22	\$29,500.00	\$29,500.00
3	Excavation & Disposal	Cubic Yard	33,000	\$14.51	\$478,830.00	\$8.00	\$264,000.00	\$11.07	\$365,310.00	\$2.95	\$97,350.00
4	Subgrade - Landfill Base	Cubic Yard	40,000	\$14.29	\$571,600.00	\$17.70	\$708,000.00	\$15.38	\$615,200.00	\$0.95	\$38,000.00
5	Aggregate Stabilization	Ton	10	\$54.00	\$540.00	\$37.90	\$379.00	\$36.90	\$369.00	\$122.35	\$1,223.50
6	Low Permeability Clay Layer	Lump Sum	1	\$689,900.00	\$689,900.00	\$904,114.20	\$904,114.20	\$863,655.41	\$863,655.41	\$788,650.00	\$788,650.00
7	60-Mil HDPE Liner & Bottom Cell Geocomposite	Lump Sum	1	\$466,100.00	\$466,100.00	\$452,101.90	\$452,101.90	\$539,482.92	\$539,482.92	\$414,250.00	\$414,250.00
8	Drainage Layer	Lump Sum	1	\$376,000.00	\$376,000.00	\$294,495.80	\$294,495.80	\$584,701.41	\$584,701.41	\$409,030.00	\$409,030.00
9	Leachate Collection System	Lump Sum	1	\$37,600.00	\$37,600.00	\$26,987.40	\$26,987.40	\$34,879.11	\$34,879.11	\$66,080.00	\$66,080.00
16	Leachrate Pumping System	Lump Sum	1	\$145,800.00	\$145,800.00	\$69,248.40	\$69,248.40	\$166,050.00	\$166,050.00	\$145,300.00	\$145,300.00
17	Leachrate Force Main Piping	Linear Feet	1,210	\$18.00	\$21,780.00	\$23.00	\$27,830.00	\$33.94	\$41,067.40	\$37.98	\$45,955.80
18	Aggregate Road Base	Ton	750	\$25.79	\$19,342.50	\$33.20	\$24,900.00	\$22.85	\$17,137.50	\$21.05	\$15,787.50
19	Electrical	Lump Sum	1	\$27,000.00	\$27,000.00	\$47,397.90	\$47,397.90	\$65,263.80	\$65,263.80	\$36,720.00	\$36,720.00
21	Storm Water Management / Erosion & Sediment	Lump Sum	1	\$216,700.00	\$216,700.00	\$98,322.10	\$98,322.10	\$244,174.68	\$244,174.68	\$194,400.00	\$194,400.00
TOTAL				\$3,165,893		\$2,994,441		\$3,805,677		\$2,762,626.80	
SCHEDULE EVALUATED COST:				Months		Cost		Months		Cost	
Schedule Variance Impact \$ 156,048 per month				0	\$ -	1.4	\$ 212,793	0.9	\$ 141,862	0	\$ -
Evaluated Total Cost				\$3,165,893		\$3,207,233		\$3,947,538		\$2,762,627	
REQUIRED PROPOSAL ITEMS TO BE PROVIDED:											
Qualifications/Experience References				Yes		Yes		Yes		Yes	
Proposed Schedule				Yes		Yes		Yes		Yes	
Separate Priced Proposal for Alternate Proposed Work				NA		NA		NA		NA	
Certifications & Representations				Yes		On File		Yes		Yes	
Letter of Assent - PLA				Yes		Yes		Yes		Yes	
Bid Bond				Yes		Yes		Yes		Yes	

**DEVENS RESERVE FORCES TRAINING AREA
Contract 2 - Operation Landfill Closure**

RFP No. 068511000-002

CONTRACT 2 - OPERATION & CLOSURE OF THE LANDFILL				SUBCONTRACTOR NO. 2		SUBCONTRACTOR NO. 5		SUBCONTRACTOR NO. 6		SUBCONTRACTOR NO. 4	
RFP No. 068511000-002		27-Oct-99									
Addendum No. 1		02-Dec-99									
Clarifications - 1 of 1		02-Dec-99									
RFP Due Date		08-Dec-99									
RFP Revisions Accepted through		29-Dec-99									
RFP Evaluation		29-Dec-99									
ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE	UNIT PRICE	TOTAL PRICE	UNIT PRICE	TOTAL PRICE	UNIT PRICE	TOTAL PRICE
1	Mobilization/Demobilization	Lump Sum	1	\$263,782.00	\$263,782.00	\$316,813	\$316,813	\$273,000	\$273,000	\$1,340,000	\$1,340,000
10	Debris Handling & Disposal										
10.1	AOC-9	Ton	180,000	\$6.00	\$1,080,000.00	\$7.00	\$1,260,000	\$7.95	\$1,431,000	\$6.82	\$1,227,600
10.2	AOC-11	Ton	42,000	\$9.00	\$378,000.00	\$7.50	\$315,000	\$8.40	\$352,800	\$6.92	\$290,640
10.3	SA-12	Ton	10,400	\$10.50	\$109,200.00	\$10.00	\$104,000	\$8.96	\$93,184	\$9.03	\$93,912
10.4	SA-13	Ton	12,000	\$7.50	\$90,000.00	\$8.00	\$96,000	\$6.40	\$76,800	\$7.15	\$85,800
10.5	AOC-40	Ton	175,000	\$5.50	\$962,500.00	\$6.50	\$1,137,500	\$6.50	\$1,137,500	\$6.25	\$1,093,750
10.6	AOC-41	Ton	1,800	\$13.00	\$23,400.00	\$10.00	\$18,000	\$8.95	\$16,110	\$8.70	\$15,660
10.7	Daily Landfill Cover Mtl.	Ton	26,500	\$20.00	\$530,000.00	\$9.00	\$238,500	\$7.00	\$185,500	\$6.02	\$159,530
10.8	Daily Cover Shortfall	Ton	42,400	\$0.00	\$0.00	\$0.00	\$0	\$7.00	\$296,800	\$0.00	\$0
11	Subgrade - Landfill Cap	Cubic Yard	14,000	\$14.00	\$196,000.00	\$16.61	\$232,540	\$13.00	\$182,000	\$15.28	\$213,920
12	40 - Mil. VFPE Liner & Cap Geocomposite	Lump Sum	1	\$638,356.00	\$638,356.00	\$643,720	\$643,720	\$619,000	\$619,000	\$578,730	\$578,730
13	Protective Layer	Cubic Yard	14,000	\$11.00	\$154,000.00	\$15.61	\$218,540	\$16.50	\$231,000	\$18.52	\$259,280
14	Vegetative Support Layer	Lump Sum	1	\$298,000.00	\$298,000.00	\$358,160	\$358,160	\$334,000	\$334,000	\$396,390	\$396,390
15	Topsoil & Permanent Seeding	Lump Sum	1	\$125,541.00	\$125,541.00	\$209,740	\$209,740	\$215,000	\$215,000	\$135,030	\$135,030
20	Leachate Management	Lump Sum	1	\$25,776.00	\$25,776.00	\$54,000	\$54,000	\$190,000	\$190,000	\$285,015	\$285,015
21	Storm Water Management / Erosion & Sediment	Lump Sum	1	\$245,000.00	\$245,000.00	\$166,539.50	\$166,540	\$40,000.00	\$40,000	\$233,420	\$233,420
22	Gas Vents	Each	11	\$495.00	\$5,445.00	\$457.27	\$5,030	\$1,850	\$20,350	\$2,160	\$23,760
TOTALS				\$5,125,000		\$5,374,082		\$5,694,044		\$6,432,437	
ADDITIONAL COSTS REQUESTED:				Rate	Cost	Rate	Cost	Rate	Cost	Rate	Cost
		UOM	QTY								
	Truck Demurrage	Hour	1	\$70.00	\$70.00	\$75.00	\$75.00	\$95.00	\$95.00	\$125.00	\$125.00
	Truck Cancellation	Per Truck	1	\$280.00	\$280.00	\$300.00	\$300.00	\$500.00	\$500.00	\$5,000.00	\$5,000.00
SCHEDULE EVALUATED COST:				Months	Cost	Months	Cost	Months	Cost	Months	Cost
	Schedule Variance Impact	COST	UOM								
		\$ 110,538	per month	0	\$ -	2.0	\$ 221,076	1.5	\$ 165,807	1.5	\$ 165,807
Evaluated Total Cost				\$5,125,000		\$5,595,158		\$5,859,851		\$6,598,244	
REQUIRED PROPOSAL ITEMS TO BE PROVIDED:											
	Qualifications/Experience References			Yes		Yes		Yes		Yes	
	Proposed Schedule			Yes		Yes		Yes		Yes	
	Separate Priced Proposal for Alternate Proposed Work			NA		NA		Yes		NA	
	Certifications & Representations			Yes		Yes		Yes		Yes	
	Letter of Assent - PLA			Yes		Yes		Yes		Yes	
	Bid Bond			Yes		Yes		Yes		Yes	

DEVENS RESERVE FORCES TRAINING AREA
Contract 2 - Operation Landfill Closure

RFP No. 068511000-002

CONTRACT 2 - OPERATION & CLOSURE OF THE LANDFILL RFP No. 068511000-002 27-Oct-99 Addendum No. 1 02-Dec-99 Clarifications - 1 of 1 02-Dec-99 RFP Due Date 08-Dec-99 RFP Revisions Accepted through 29-Dec-99 RFP Evaluation 29-Dec-99	SUBCONTRACTOR NO. 2	SUBCONTRACTOR NO. 5	SUBCONTRACTOR NO. 6	SUBCONTRACTOR NO. 4
<u>EVALUATION CRITERIA LEVEL 1 - PROTECTION OF HUMAN HEALTH AND ENVIRONMENT:</u> Not applicable to the onsite landfill option.				
<u>EVALUATION CRITERIA LEVEL 2 - CONTRACTOR QUALIFICATIONS:</u> Although all responders to the RFP are qualified contractors, the work entailed requires specific specialty work tasks (e.g., landfill operations & liner installation). This category was used to determine if the contractor showed suitable evidence to convince Stone & Webster that they possess the necessary expertise to complete the project through previous experience as well as the qualifications of the proposed project management team. Learning on the job is not allowed.	Showed minimal experience in landfill operations, gas venting systems and liner installation. Adequate experience was presented for other associated work tasks (e.g., loading, hauling and roadwork). Proposed site management staff are not qualified to operate and close a landfill. None of the proposed individuals have any experience in operating a landfill. Overall, the company is not qualified to perform the scope of work for the project. The contractor has been contacted concerning this deficiency and is attempting to provide better staff.	Company has an excellent track record of performing "like" projects and has provided experience illustrating numerous projects involving operating landfills and closures. Company has significant experience including installation of HDPE liners, gas venting systems and leachate collection and handling systems. The proposed site management staff is very qualified, specifically their superintendent who has operated and closed numerous landfills. The company is very qualified .	Company has good experience in the field of landfill operations and closure, having completed three landfills in the past two years. The company has demonstrated their ability to perform all aspects of the project. The proposed site management team is qualified to manage the work, having performed similar duties on "like" projects. The company is very qualified .	Company has adequate qualifications to operate and close a landfill. Company experience with landfill operations, gas venting systems and HDPE liner installations is not extensive. Company experience is based more as an owner's engineer/construction manager than a constructor. The proposed site management team is adequate for similar reasons as mentioned above. Overall, the company is adequately qualified to perform the project.
<u>EVALUATION CRITERIA LEVEL 3 - ABILITY TO SATISFY HEALTH AND SAFETY CONCERNS:</u> Not applicable to the onsite landfill option.				

DEVENS RESERVE FORCES TRAINING AREA

OFFSITE TRANSPORTATION AND DISPOSAL

RFP No. 068511000-002

Transport & Disposal Services		27-Oct-99		Subcontractor A				Subcontractor B				Subcontractor C				Subcontractor D				Subcontractor E			
RFP No. 068511000-002																							
Addendum No. 1																							
Clarifications - 1 of 1		10-Nov-99																					
RFP Due Date		08-Dec-99																					
Proposal Evaluation		31-Dec-99																					
ITEM NO.	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL PRICE	ADD	DEDUCT	UNIT PRICE	TOTAL PRICE	ADD	DEDUCT	UNIT PRICE	TOTAL PRICE	ADD	DEDUCT	UNIT PRICE	TOTAL PRICE	ADD	DEDUCT	UNIT PRICE	TOTAL PRICE	ADD	DEDUCT
1	Debris Handling & Disposal																						
1.1	AOC-9	Ton	180,000	\$67.88	\$12,218,400	\$0.00	\$0.00	\$59.00	\$10,620,000	\$0.00	\$69.00	\$65.00	\$11,700,000	\$65.00	\$65.00	\$62.94	\$11,329,200	\$0.00	\$0.00				
1.2	AOC-11	Ton	42,000	\$66.50	\$2,793,000	\$0.00	\$0.00	\$59.00	\$2,478,000	\$0.00	\$69.00	\$65.00	\$2,730,000	\$65.00	\$65.00	\$62.94	\$2,643,480	\$0.00	\$0.00				
1.3	SA-12	Ton	6,300	\$67.40	\$424,620	\$0.00	\$0.00	\$59.00	\$371,700	\$0.00	\$69.00	\$65.00	\$409,500	\$65.00	\$65.00	\$63.94	\$402,822	\$0.00	\$0.00				
1.4	SA-13	Ton	12,000	\$66.54	\$798,480	\$0.00	\$0.00	\$59.00	\$708,000	\$0.00	\$69.00	\$65.00	\$780,000	\$65.00	\$65.00	\$62.94	\$755,280	\$0.00	\$0.00				
1.5	AOC-40	Ton	175,000	\$68.64	\$12,012,000	\$0.00	\$0.00	\$59.00	\$10,325,000	\$0.00	\$69.00	\$65.00	\$11,375,000	\$65.00	\$65.00	\$62.94	\$11,014,500	\$0.00	\$0.00				
1.6	AOC-41	Ton	900	\$68.11	\$61,299	\$0.00	\$0.00	\$59.00	\$53,100	\$0.00	\$69.00	\$65.00	\$58,500	\$65.00	\$65.00	\$63.94	\$57,546	\$0.00	\$0.00				
1.7	Daily Cover Pile	Ton	26,500	\$57.85	\$1,533,025	\$0.00	\$0.00	\$59.00	\$1,563,500	\$0.00	\$69.00	\$65.00	\$1,722,500	\$81.00	\$81.00	\$67.94	\$1,800,410	\$0.00	\$0.00				
TOTAL PRICE				\$29,840,824				\$26,119,300				\$28,775,500				\$28,003,238							

**Non Responsive
Did Not Bid Disposal
(See Alternate Recycling Proposal)**

ALTERNATE RECYCLING PROPOSAL

Transport & Disposal Services		27-Oct-99		Subcontractor E			
RFP No. 068511000-002							
Addendum No. 1							
Clarifications - 1 of 1		10-Nov-99					
RFP Due Date		08-Dec-99					
Proposal Evaluation		31-Dec-99					
				Based on 100,000 tons only			
ITEM NO.	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL PRICE	ADD	DEDUCT
1	Scened & Crushed Material	Ton	80,000	\$67.70	\$5,416,000	\$0.00	\$0.00
2	Bulk Wood & Material Unsuitable for Recycling	Ton	15,000	\$99.00	\$1,485,000	\$0.00	\$0.00
3	Scrap Metal	Ton	5,000	\$15.00	\$75,000	\$0.00	\$0.00
TOTAL PRICE				\$6,976,000			

	Subcontractor A	Subcontractor B	Subcontractor C	Subcontractor D	Subcontractor E
Truck Demurrage	\$125	\$65	\$78/Truck/hr	\$75/Truck/hr	None Documented
Truck Cancellation	\$500	\$120			

DEVENS RESERVE FORCES TRAINING AREA

Offsite Transportation and Disposal

RFP No. 068511000-001

Subcontractor Submittals	Subcontractor A	Subcontractor B	Subcontractor C	Subcontractor D	Subcontractor E
SOLID WASTE TRANSPORTATION AND MANAGEMENT PLAN	Yes	Yes	Yes	Yes	Alternative Proposal Provided.
Proposed Haul Routes, Methodologies and Transportation Capacities	<p>Subcontractor A proposes to truck waste directly from the site to a rail siding located on the east side of Devens. Waste will then be transferred into railroad cars and shipped to Lee County Landfill in Bishopville, South Carolina. The exception to this plan is the daily landfill cover which will be transferred into trailer dumps and shipped off-site to the Fitchburg Landfill in Fitchburg, Massachusetts.</p>	<p>Subcontractor B proposes to initially load and transport Construction and Debris including any asbestos materials in rail containers for shipment by a licensed hazardous waste transporter to the Devens railroad siding. Waste containers will be unloaded by Subcontractor B and dumped into awaiting cars with a ramp and disposal chute. The disposal chute will funnel and contain materials during dumping to minimize the potential for air emissions or spills during transfer. Waste will be transported via rail using gondola and intermodal type containers as required. Subcontractor B has a contractual agreement with CSX Transportation Inc. to ship wastes via rail to the appropriate disposal location and/or Minerva Enterprises, Inc. located in Waynesberg, Ohio. Subcontractor B also proposes Crapo Hills landfill, Turnkey (Waste Management of NH), North County Landfill (Casella Waste Systems), Noridgewalk (Waste Management of ME), Environmental Soils Management Inc. (ESMI), Aggregate Recycling Company (ARC) and Bardon Trimount Inc. for the disposal of materials unad</p>	<p>Subcontractor C proposes to truck Construction & Debris material to Waste Management of NH, Inc. Turnkey Recycling & Environmental Enterprises (T.R.E.E.) Non-Hazardous Waste Facility in Rochester, NH. Cover material is to be trucked to the Fitchburg/Westminster Landfill and Barre Integrated Solid Waste Facility. Barre accepts a broad range of recyclable materials such as scrap metal, white goods, tires, paper, containers, and other recyclable/reusable materials. Crossroads landfill in Maine may be utilized for Non-Hazardous Special Waste and is proposed as a backup facility.</p>	<p>Subcontractor D proposes to utilize ECDC a waste-by-rail subsidiary of Allied Waste to ship non-RCRA soil and debris from the Fort Devens site. Allied Wastes Lee County landfill is proposed with a 5,000 ft rail-spur on-site, and essentially direct service by the CSX Railroad. An on-site Transportation and Disposal coordinator will be responsible for all facets of transportation and disposal and will ensure proper paperwork, and generally oversee all day-to-day operations. The Construction and Debris material is proposed to be loaded into 20 ton dump trailers and brought to a consolidation area adjacent to the Boston & Maine rail siding. The consolidation area will include a loader capable of loading a 100 ton rail car gondola. The railcars will be manipulated on the track with appropriate equipment so they can be moved to accommodate loading.</p>	<p>Subcontractor E proposes to screen material excavated by others to remove paper, large wood, metal, pipes and other material that is unsuitable for reuse or recycling. The material would be segregated into three main stockpiles 1. Concrete, blocks, brick and soil 2. trash, paper, and wood, and 3. metal materials. Each stockpile would be transported off-site by Subcontractor E to the appropriate recycler, reuse facility, or disposal facility. The concrete, blocks, bricks and soil will be further processed with the use of a tub grinder. An approximate average of 600-900 tons per day will be taken off site.</p>

DEVENS RESERVE FORCES TRAINING AREA

Offsite Transportation and Disposal

RFP No. 068511000-001

Subcontractor Submittals	Subcontractor A	Subcontractor B	Subcontractor C	Subcontractor D	Subcontractor E
<p>Key Elements to Transportation & Management Plan</p>	<p>Transportation via railroad limits the number of trucks required for the project, and minimizes the use of off-site roadways for transportation</p>	<p>Transportation via railroad minimizes the use of off-site roadways for transportation. Transportation & Management Plan includes outlined Manifesting Handling Procedures, Contingency Plan, Manifest Recordkeeping and Inspection Checklist. Subcontractor B recommends segregation and separation based upon waste types. Segregated types to be disposed at Minerva will be appropriately shipped and upon testing of material by S&W, Subcontractor B will recommend the appropriate disposal facility of other waste materials.</p>	<p>Subcontractor C will assign a T&D coordinator on-site as well as a part-time Health and Safety Officer. Detailed information is not provided.</p>	<p>The Transportation and Disposal Coordinator is an essential interface for all day-to-day operations. All problem resolution will be handled through the T & D Coordinator so that a central control function exists. At any point in time with one central point of contact all parties involved can determine the status of on-site operations. The consolidation area is another key element to the Transportation and Management Plan. The area is to provide containment of the material. And will provide protection from wind, rain, and the elements such that the material will not blow or flow away from the area.</p>	<p>The concrete, blocks, bricks, and soil can be re-used at the OENJ facility in Bayonne, NJ to reclaim lands in an industrial development project. The facility accepts recyclable material for fill under an approved "Landfill Disruption, Closure, and Post-Closure Plan". The scrap metal can be recycled at any of a number of metal recyclers. Subcontractor E will make a determination of the best-priced alternative at the time the project is executed. The trash and material unsuitable for reuse will be disposed at a recycler like the LL&S processing facility or to Subtitle D landfill. Subcontractor E proposes to use the BFI landfill in Niagara Falls for material that cannot be reused or recycled.</p>
<p>Details of Transport Vehicles</p>	<p>All trucks will be loaded a minimum of 22 tons by the engineer at the stockpile location. A liner will be placed within each truck prior to loading, and each the trailer will be covered and placarded as required by current regulatory requirements. All drivers will be 40-hour HAZWOPER trained.</p>	<p>Subcontractor B will coordinate the transloading of wastes with the Massachusetts Department of Environmental Protection (MADEP) and CSX rail as required. Subcontractor B will provide vehicles sufficient to transport at least 1500 cubic yards on-site to the transload facility. It is anticipated that 15-20 transport vehicles will be required and 80% of the waste will be acceptable for disposal at Minerva Enterprises. Subcontractor B anticipates using 50 car uni-trains. The uni-train requires 50 railroad cars or containers but allows the waste to be transported in bulk without breaking up car sets. Subcontractor B anticipates 14 day</p>	<p>Waste Management will perform the trucking services. Approximately 20-25 loaded trucks will be transported per day. Additional details were not provided.</p>	<p>In general, 4-6 trucks will be used, each which carry a maximum of 30 tons of soil. Should it become necessary to utilize the weight limit bridge, smaller trucks (Rolloff-type) will be used. Drivers will be 40 hour HAZWOPER trained. The consolidation area will include a loader capable of loading a 100 ton railcar (gondola) and it will be necessary to have enough cars to facilitate loading 20 cars per day.</p>	<p>Detailed information is not provided. Proposed Transporters include: Wills Trucking, Inc., Richfield OH; Middlesex Materials, Iselin, NJ; and BFI Waste Management System of NA, Inc., Niagara Falls, NY.</p>
<p>Is a Hauling Rate Estimate in tons/day included?</p>	<p style="text-align: center;">Yes 2,000-2,500 tons/day</p>	<p>No. (Approximately 15-20 trucks in service; 50 uni-cars for rail service)</p>	<p>No. (20-25 trucks/day)</p>	<p>No. (Approximately 4-6 trucks in service)</p>	<p>Yes Average of 600-900 tons/day.</p>

DEVENS RESERVE FORCES TRAINING AREA
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Subcontractor Submittals	Subcontractor A	Subcontractor B	Subcontractor C	Subcontractor D	Subcontractor E
EVALUATION OF PROSPECTIVE DISPOSAL FACILITIES					
Does the Selected Disposal Facility(s) Possess the Required Licensing and Permitting?	Yes	Yes	Yes	Yes	Yes
Remaining Disposal Capacity	14.8M tons	40M cu yds (approx. 36 years)	Waste Management of NH, Inc. has been in operation 10 out of 15 years with a 10M ton original design capacity. The Barre Facility can accept no more than 375 tons per day; with an annual limit of 93,600 tons. The Barre and Fitchburg/Westminster Facilities together have a total annual cap of 156,000 tons.	14M tons	5M yds of material
Capacity that can be handled (tons/day)	12,200 tons/day	<u>Minerva Facility</u> - 1,500 tons/day; excess of 50 railcar offloading capacity <u>Crapo Hill Facility</u> - can handle no more than 425 tons/day	12,000 tons/week at Waste Management of NH, Inc. 375 tons/day at the Barre Landfill	100 tons to 8000 ton unit trains daily	15,000 tons/day
Information on the following: -Copies of Permits -Permit Status -Violations	Lee County has modified permit to allow 3.5M ton/yr. Lee County in discussions with the State to increase the annual volume cap to 3.5M ton/yr. Copies of permits and any revisions are available by fax/mail. No violations.	Documentation of permits is provided for all proposed facilities. No Violations exist.	Documentation of permits for the Barre/Fitchburg Facilities; Waste Management of NH, Inc. Facility and the Waste Management Disposal Services of ME, Crossroads Landfill is provided. Waste Management has provided documentation that there are no violations at either of the proposed Waste Management facilities.	Copies of permits and/or permit status is not provided. There are no violations at the Lee County Landfill.	Documentation is provided stating that the OENJ facility has no violations. In addition, OENJ's Closure and Post Closure Care Plan Approval is provided from the NJDEP. Permit copies are provided for the Niagara Recycling facility and the OENJ Bayonne Site Remediation and Landfill Closure permits are provided.

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Subcontractor Submittals	Subcontractor A	Subcontractor B	Subcontractor C	Subcontractor D	Subcontractor E
DISPOSAL FACILITY DESIGN DOCUMENTATION					
Liner Design	<p>OLD: 2 ft of sand on geonet w/ 60 mil HDPE then another geonet on top of a second 60 mil HDPE and 2 ft of compacted clay. NEW: same but with one layer of geonet and one layer of 60 mil HDPE</p>	Minerva - Recompacted soil liner with groundwater monitoring	Double liner with primary and secondary leachate collection. Leachate monitoring, gas monitoring, and groundwater monitoring	<p>OLD: 2 ft of sand on geonet w/ 60 mil HDPE then another geonet on top of a second 60 mil HDPE and 2 ft of compacted clay. NEW: same but with one layer of geonet and one layer of 60 mil HDPE</p>	Information not provided for the Bayonne sanitary landfill. Devens materials are to be use in Closure plan as fill. Closure plans are detailed.
Leachate Collection Design and Treatment	Approx. 3000 gal/day collected in tank and pumped to sewage treatment plant	Minerva - Yes	On site treatment of 60,000 GPD	Approx. 3000 gal/day Collected in tank and pumped to sewage treatment plant	Information not provided.
Storm Water Handling	Release to river 700 ft away.	Minerva - Yes	Piping System	Release to river 700 ft away.	Information not provided.
Depth to Groundwater	6'-17' above upper water table aquifer & 40'-50' above water supply aquifer.	Information not provided.	Information not provided	6'-17' above upper water table aquifer & 40'-50' above water supply aquifer.	Information not provided.
Closure Plan	<p style="text-align: center;">Yes</p> When closed they will have a synthetic cap , with gas collection.	Information not provided.	<p style="text-align: center;">Yes</p> Portions of the landfill have been closed in accordance with regulations	<p style="text-align: center;">Yes</p> When closed they will have a synthetic cap , with gas collection.	<p style="text-align: center;">Yes</p> Closure and capping of Bayonee sanitary landfill will be accomplished by using low permeability amended dredging material.
Post Closure Plan	<p style="text-align: center;">Yes</p> Post closure fund in place	Information not provided.	<p style="text-align: center;">Yes</p> State regs on post closure monitoring and maintenance	<p style="text-align: center;">Yes</p> Allied has a post-closure fund in place for all of their landfills.	<p style="text-align: center;">Yes</p> After the 130-acre upland area is closed, amended dredged material and recyclable materials will be utilized for fill in preparation for development of an 18-hole public golf course.

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Subcontractor Submittals	Subcontractor A	Subcontractor B	Subcontractor C	Subcontractor D	Subcontractor E
Subcontractors' CHECKLIST					
Written/Documentation Assurance that the Receiving Facility is Able and Willing to Accept the Waste Material	Yes Subcontractor A has provided documentation to confirm the facility can accept the waste; the bid document is assurance that the facility is willing.	Yes Subcontractor B has contracting licenses with the above mentioned facilities.	Yes Subcontractor C has provided documentation from Waste Management confirming their ability and capacity to accept the waste.	Yes Allied waste's Lee County facility is a permitted Subtitle D facility. Allied Waste is Subcontractor D's team member to meet the requirements of the Fort Devens scope of work.	Yes The OENJ Cherokee Corporation has provided confirmation that it will accept the Fort Devens materials (re-use facility for concrete, blocks, bricks and soil). They have a 5 Million yd capacity and have no violations.
Schedule	Yes The T&D work is to commence in May 2000. T&D work will progress until completion in September 2001.	Yes The T&D work is to commence in April 2000	No	Yes The T&D work is scheduled to commence in June 2000. Work will progress until completion in December 2001.	No Information will be provided should an award be made.
Solid Waste Transportation and Management Plan	Yes See above for additional details.	Yes See above for additional details.	Yes See above for additional details.	Yes See above for additional details.	No Information will be provided should an award be made.
Contractor Statement of Qualifications Provided	Yes	Yes	Yes	Yes	Yes
TSD Facility Statement of Qualifications Provided	Yes	Yes	Yes	Yes	No Information will be provided should an award be made.
Notices of Non-compliance and Notices of Violations	Yes Subcontractor A has provided documentation stating that there are no Notice of Violations at either site.	Yes Documentation that there are no Violations at the Minerva Facility is provided.	Yes Subcontractor C has provided documentation that there are no Notice of Violations at either of Waste Management Fitchburg landfill or the Barre Landfill.	Yes There are no Notice of Violations at the Lee County facility.	Yes Documentation was provided for the OENJ Bayonne facility; there are no violations. Violations status was not provided for the proposed BFI landfill in Niagara Falls.
Resume of Transportation and Disposal Coordinator Provided	Yes	Yes	TBD	Yes	No Information will be provided should an award be made.
Small Business Documentation	No Subcontractor A qualifies as a small business under SIC 8744. As such, Subcontractor A did not provide documentation for the proposal since Subcontractor A believes it is not required.	Yes Subcontractor B qualifies as a WBE.	No	Yes Subcontractor D provided documentation from the U.S. Small Business Administration confirming their certification as a small disadvantaged business (SDB).	No However, Subcontractor E believes they meet the criteria for a small business under FAR for this project. Their SIC designation would be 8744 and their annual sales are below the \$3.5M threshold.
Representations & Certifications Provided	Yes	Yes	Yes	Yes	Yes
Project Labor Agreement (PLA) Letter of Assent Provided	Yes	Yes	Yes	Yes	No Information will be provided should an award be made.

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Subcontractor Submittals	Subcontractor A	Subcontractor B	Subcontractor C	Subcontractor D	Subcontractor E
<p>Evaluation Criteria Level 1</p> <p>* Protection of Human Health Evaluation is based on the health and safety concerns with regards to the off-site landfill design and location as well as sitings at the proposed off-site landfill. Off-site landfill evaluation is to be compared to the on-site landfill alternative.</p>	<p>Subcontractor A has exhibited compliance with current regulatory requirements. In addition, neither Subcontractor A nor its selected disposal facilities have been sited, and no Notice of Violations exist. In comparison to the on-site plan, the off-site T&D presents more risk. Such risks include potential off-site public exposure to waste while transported, violation of regulations, and the potential of waste transported and disposed at a facility other than the one selected. The on-site plan eliminates risks by isolating waste materials on-site. Additionally, the proposed landfill on-site is designed equally in quality and health and safety requirements to the Subcontractor A proposed landfill; refer to the on-site evaluation.</p>	<p>Subcontractor B has exhibited compliance with current regulatory requirements. And neither Subcontractor B nor its selected disposal facilities have been sited, and no Notice of Violations exist. Subcontractor B T&M plan implements railroad transportation, however, waste is initially transported via truck in rail containers to a transfer point at the Devens rail spur. Waste is unloaded from the containers and loaded into gondolas. This method introduces a great deal of potential exposure on the roadways and potential dusting during unloading/loading. In comparison to the on-site plan, the off-site T&D presents more risk. Such risks include potential off-site public exposure to waste while transported, violation of regulations including the potential of waste transported and disposed at a facility other than the one selected. The on-site plan eliminates risks by isolating waste materials on-site. Additionally, the proposed landfill on-site is designed equally in quality, and health and safety requirements, to the Subcontractor B proposed landfill; refer to the on-site evaluation.</p>	<p>Detailed information for evaluation of transportation plan was not provided. However, in comparison to the on-site plan, the off-site T&D presents more risk due to the potential exposure of waste in 30 ton trucks transported over public roadways. In regards to on-site landfill health and safety concerns, the proposed landfill on-site is designed equally in quality and health and safety requirements to the Subcontractor C proposed landfill. For details, refer to the on-site evaluation.</p>	<p>Allied is without siting and no Notice of Violations exist. Subcontractor D has a complete T&D plan and has exhibited compliance with current regulatory requirements. However, in comparison to the on-site plan, the off-site T&D presents more risk. Such risks include potential off-site public exposure to waste while transported, violation of regulations including the potential of being transported and disposed at a facility other than the one selected. The on-site plan eliminates risks by isolating waste materials on-site. In regards to on-site landfill health and safety concerns, the proposed landfill on-site is designed equally in quality and health and safety requirements to the Subcontractor D proposed landfill. For details, refer to the on-site evaluation.</p>	<p>The proposal to reuse / recycle utilize public roadways for truck transport. This method is not the most effective method for Protection of Human Health due to potential public exposure on the roadways. In addition, the proposal includes the use of a tub grinder to further process materials; this may introduce dusting to the atmosphere. With respect to the proposed facilities OENJ does not have any violations. However, in comparison to the on-site plan, the off-site T&D presents more risk with the exposure of waste in 30 ton trucks transported over public roadways. In addition, waste material may be exposed to the public by tub grinding activities. In regards to landfill health and safety concerns, the proposed landfill on-site is designed equally in quality and health and safety requirements to the Subcontractor E proposed landfill. For details, refer to the on-site evaluation.</p>
<p>Evaluation Criteria Level 2</p> <p>* Contractor's Past Performance Evaluation is based on three components: 1. Experience on similar projects 2. Financial Resources 3. Possess the ability to comply with applicable regulatory requirements</p>	<p>Subcontractor A has been responsible for the transportation and disposal of more than 2.5 million cubic yards of contaminated soil in the past five years. Subcontractor A projects engulf both hazardous and non-hazardous materials management. Such projects include the Central Artery Soil Stockpile management project (750,000 cyd); Campanelli Companies site in Braintree (2,000 tons of petroleum-contaminated soil) and a Stone & Webster RAC Hope Island NAS Remediation project. As a previous subcontractor to S&W, Subcontractor A has multiple task experience with the USACE through work on the RAC contract. Subcontractor A has exhibited the ability to comply with licenses, permits, and regulations on past projects and possesses the financial resources for successful project execution.</p>	<p>Subcontractor B has past experience on several projects of comparable size and logistics as the Fort Devens Project. Such projects include the Central Artery Tunnel where Subcontractor B was the largest transporter of hazardous and non-hazardous waste transporting more than 400,000 tons. Subcontractor B won a "Diamond Drop" award for Flawless Shipping by Conrail and has provided transportation of more than 1,000 railcars without incident. Clients include Minerva Enterprises, Inc., Waste Management of NH, Casella Waste Systems Environmental Soils Management Inc. Etc. Subcontractor B has exhibited the ability to comply with licenses, permits, and regulations on past projects and possesses the financial resources for successful project execution.</p>	<p>Subcontractor C has provided information on prior projects. Projects include the Material Disposal System, Spectable Island for the Central Artery/Tunnel Project, MA where they performed a \$12M transportation contract of 4 million cubic yards of material; another is the Effluent Outfall Tunnel at Deer Island, MA where they handled 1.1 million cubic yards of material and the remediation of the Barnum Maintenance Yards at Fort Devens, MA. Subcontractor C has exhibited the ability to comply with licenses, permits, and regulations on past projects and possesses the financial resources for successful project execution.</p>	<p>Subcontractor D has stated the following: 1. Over the last five years ECDC/Allied has moved in excess of 10 million tons of material by rail. 2. Allied's financial depth (over \$6 1/2 billion in annual revenues) demonstrates ECDC's financial security. In addition, ECDC has provided documentation of projects which exceed 100,000 tons of material which were moved in short time frames and had unique operational issues. Subcontractor D has exhibited the ability to comply with licenses, permits, and regulations on past projects and possesses the financial resources for successful project execution.</p>	<p>Subcontractor E is qualified to provide this type of service. They have worked with NJDOT, and with USEPA and Army Corps on Superfund Projects in New Jersey to recycle and reuse materials. Subcontractor E has separated and segregated thousands of tons of material for NJDOT reusing almost all of it. Included in their bid are Qualifications Information and letters of reference. Subcontractor E has exhibited the ability to comply with licenses, permits, and regulations on past projects and possesses the financial resources for successful project execution.</p>

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Subcontractor Submittals	Subcontractor A	Subcontractor B	Subcontractor C	Subcontractor D	Subcontractor E
<p>Evaluation Criteria Level 3</p> <p>* Ability to Satisfy Health and Safety Concerns Identified by Residents and Public Officials</p> <p>Evaluation is based on the safe transportation of waste in a manner to minimize traffic, the ability of the proposed off-site landfill to accept waste, and the presentation of a transportation plan.</p>	<p>In addition to possessing a good relationship with the local and county community, Subcontractor A has developed a T&M Plan which minimizes the transportation of waste over public roadways. Currently Subcontractor A has no existing siting and the selected disposal facilities have no Notice of Violations. Subcontractor A has provided satisfactory documentation on the disposal facilities and their capabilities with regards to waste acceptance. USEPA documentation exists to affirm determination of acceptability for the Lee County Landfill. And, documentation from the Lee County Council outlines Lee County/Allied Waste relationship and the county's trust and security with Allied.</p>	<p>Subcontractor B has developed a T&M Plan which minimizes the transportation of waste over public roadways. Subcontractor B has a developed Management Approach which includes a health and safety plans and policies, Quality management, QA/QC, Methods of Inspection, Assurance of Regulatory compliance and other project management and monitoring procedures to insure that waste is transported in a safe and efficient manner. Currently Subcontractor B has no existing siting and the selected disposal facilities have no Notice of Violations. Subcontractor B has provided satisfactory documentation on the disposal facilities and their capabilities with regards to waste acceptance.</p>	<p>Information required for evaluation was not provided. However, Subcontractor C has provided satisfactory documentation on the disposal facilities and their capabilities with regards to waste acceptance.</p>	<p>In addition to Allied's strong link to the local communities and receptive host communities, the following is stated to satisfy health and safety concerns:</p> <ol style="list-style-type: none"> 1. Utilizing "unit" trains (50 cars or greater) allows between 5,000-10,000 tons of material to move each day. This eliminates the need for between 250-500 truckloads to move each day. 2. Rail eliminates the need for trucking through sensitive towns surrounding the base. 3. Off-hauling the material will relieve the need for long-term monitoring and eliminates the chance of contamination ever threatening Fort Devens' neighbors in the future. 4. Allied's four East Coast rail-served facilities are modern fully permitted, Subtitle D landfills. 5. Subcontractor D commitment is to work with S&W and the surrounding communities to develop and operate a safe and economical system. 	<p>Subcontractor E has worked with NJDOT, and with USEPA and Army Corps on Superfund Projects in New Jersey to recycle/reuse materials. Included in their bid are Qualifications Information and letters of reference. The letters of reference exhibit Subcontractor E's successful performance on related transportation, recycling and disposal projects. The NJ Turnpike Authority complimented Subcontractor E for their ability to perform without any hidden costs or delays and R&R International, Inc. commends Subcontractor E on their ability to execute project work 3 months ahead of schedule. Subcontractor E has no existing siting and the selected disposal facilities has no Notice of Violations. Subcontractor E has provided satisfactory documentation on the proposed recycling/disposal facilities and their capabilities with regards to waste acceptance and</p>